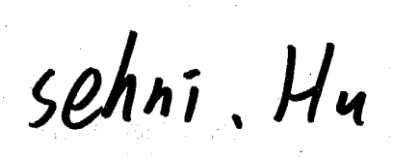
RADIO TEST REPORT
FCC 47 CFR PART 15 SUBPART C

Test Standard	**FCC Part 15.247**
Product name	**802.11b/g/n + BT 5.4 Module**
Brand Name	**USI**
Model No.	**WM-CW-26**
Test Result	**Pass**
Statements of Conformity	**Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.**

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory).

Approved by:



Sehni Hu
Supervisor

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	June 17, 2024	Initial Issue	ALL	Peggy Tsai
01	July 3, 2024	See the following Note Rev.(01)	P. 7, 9, 10, 23, 30, 34, 38, 114-117, A-2, A-3	Peggy Tsai

Note:
Rev.(01)
1. Modify instrument calibration in section 1.6.
2. Modify support and EUT accessories equipment in section 1.7.
3. Modify test setup diagram in section 1.8.
4. Modify test program in section 1.9.
5. Modify test setup in section 4.2.3, 4.3.3, 4.4.3, 4.5.3.
6. Modify test result in section 4.6.4.
7. Modify test photo in appendix-A.

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Universal Global Scientific Industrial Co., Ltd. No. 141, Lane 351, Sec.1, Taiping Road, Tsaotuen, Nantou County, 542007, Taiwan
Manufacturer	Universal Global Scientific Industrial Co., Ltd. No. 141, Lane 351, Sec.1, Taiping Road, Tsaotuen, Nantou County, 542007, Taiwan
Equipment	802.11b/g/n + BT 5.4 Module
Model No.	WM-CW-26
Model Discrepancy	N/A
Trade Name	USI
Received Date	May 3, 2024
Date of Test	May 13 ~ 24, 2024
Power Operation	Powered from Power supply: DC 3.6V
EUT Serial #	850160081201240307000010 32
HW Version	v1.0
FW Version	v7.95.55

Remark:
1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

1.2 EUT CHANNEL INFORMATION

Frequency Range	802.11b/g/n HT 20: 2412MHz ~ 2462MHz
Modulation Type	1. IEEE 802.11b mode: CCK 2. IEEE 802.11g mode: OFDM 3. IEEE 802.11n HT 20 MHz mode : OFDM
Number of channel	1. IEEE 802.11b mode: 11 Channels 2. IEEE 802.11g mode: 11 Channels 3. IEEE 802.11n HT 20 MHz mode : 11 Channels

Remark:
Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 for test channels

Number of frequencies to be tested		
Frequency range in which device operates	**Number of frequencies**	**Location in frequency range of operation**
☐ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☒ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.3 ANTENNA INFORMATION

Antenna Type	☐ PIFA ☐ PCB ☐ Dipole ☒ Ceramic Chip Antenna
Antenna Gain	Yageo / ANT3216LL11R2400A Gain: 3.68 dBi
Antenna Connector	N/A

Notes:
1.The antenna(s) of the EUT are permanently attached and there are no provisions for connection to an external antenna. So the EUT complies with the requirements of §15.203.

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.213 dB
Channel Bandwidth	± 2.7 %
RF output power (Power Meter + Power sensor)	± 0.243 dB
Power Spectral density	± 2.739 dB
Conducted Bandedge	± 2.739 dB
Conducted Spurious Emission	± 2.742 dB
Radiated Emission_9kHz-30MHz	± 3.761 dB
Radiated Emission_30MHz-200MHz	± 3.473 dB
Radiated Emission_200MHz-1GHz	± 3.946 dB
Radiated Emission_1GHz-6GHz	± 4.797 dB
Radiated Emission_6GHz-18GHz	± 4.803 dB
Radiated Emission_18GHz-26GHz	± 3.459 dB
Radiated Emission_26GHz-40GHz	± 3.297 dB

Remark:
1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	Czerny Lin	-
Radiation	Tony Chao、Ray Li	-
RF Conducted	Jerry Chang	-

Remark: The lab has been recognized as the FCC accredited lab. under the KDB 974614 D01 and is listed in the FCC pubic Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309

1.6 INSTRUMENT CALIBRATION

Conducted_FCC/IC/NCC (All)					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Power Sensor	Anritsu	MA2411B	1911387	2023-07-25	2024-07-24
Power Meter	Anritsu	ML2496A	2136002	2023-11-16	2024-11-15
Cable	Woken	WC12	CC003	2023-06-27	2024-06-26
EXA Signal Analyzer	Keysight	N9030B	MY62291089	2023-10-13	2024-10-12
Power Supply	ABM	GPC-3030D	8070184	2023-10-02	2024-10-01
Attenuator	Marvelous Microwave Inc.	MVE2213-10	08	2023-11-07	2024-11-06
Software	Radio Test Software Ver. 21				

966A_Radiated					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Signal Analyzer	KEYSIGHT	N9010A	MY54200716	2023-10-13	2024-10-12
Thermo-Hygro Meter	WISEWIND	1206	D07	2023-12-08	2024-12-07
Loop Antenna	COM-POWER	AL-130	121051	2023-05-23	2024-05-22
Bi-Log Antenna	Sunol Sciences	JB3	A030105	2023-08-08	2024-08-07
Preamplifier	EMEC	EM330	060609	2024-02-21	2025-02-20
Cable	Huber+Suhner	104PEA	20995+21000+182330	2024-02-21	2025-02-20
Horn Antenna	ETC	MCTD 1209	DRH13M02003	2023-12-28	2024-12-27
Preamplifier	HP	8449B	3008A00965	2023-12-22	2024-12-21
Cable	EMCI	EMC101G	221213+221011+221012	2023-10-17	2024-10-16
Attenuator	Mini-Circuits	BW-S9W5	BWS9W5-09-966A-01	2024-02-07	2025-02-06
High Pass Filters	Titan Microwave	T04H30001800070S01	22011402-4	2023-06-17	2024-06-16
Horn Antenna	SCHWARZBECK	BBHA9170	1047	2023-12-13	2024-12-12
Pre-Amplifier	EMCI	EMC184045SE	980860	2023-12-12	2024-12-11
DC Power Supply	ABM	9603D	D011314	2023-10-02	2024-10-01
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Site Validation	CCS	966A	N/A	2023-07-10	2024-07-09
Software	e3 V9-210616c				

Remark:
1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.

AC Mains Conduction					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
EMI Test Receiver	R&S	ESCI	100064	2023-06-07	2024-06-06
LISN	TESEQ	LN2-16N	22012	2024-02-29	2025-02-27
Cable	EMCI	CFD300-NL	CERF	2023-06-27	2024-06-26
Power Supply	GWINISTEK	SPS-3610	GPE880163	2023-10-16	2024-10-15
Software	e3 V6-110812				

Remark:
1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

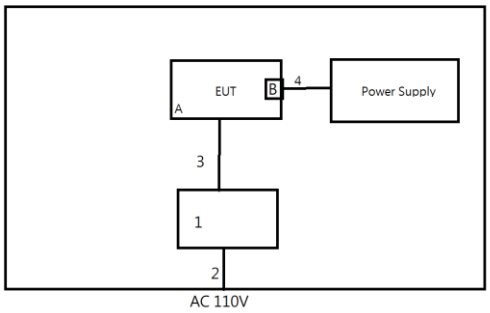
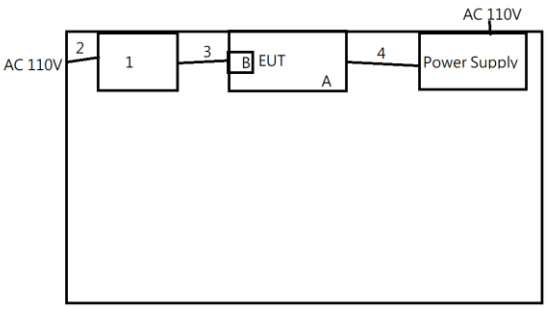
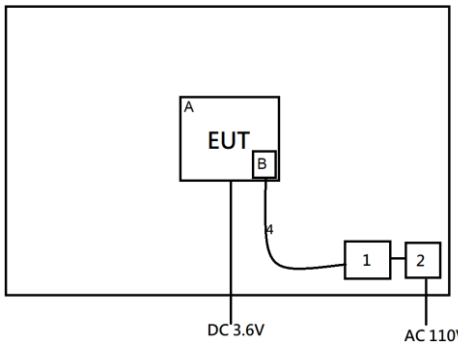
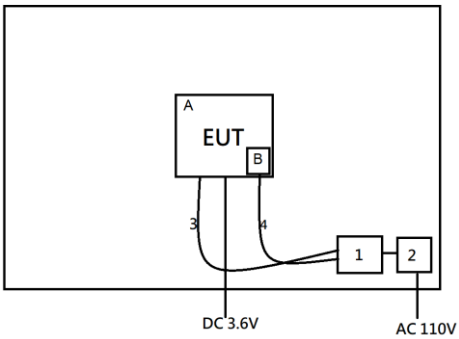
EUT Accessories Equipment						
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**	**IC**
A	Test Kitting	USI	WM-BN-BM-26_A_EVB	N/A	N/A	N/A

Support Equipment (Conducted)					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
1	NB(L)	Lenovo	X260	N/A	N/A
2	Adapter	Lenovo	ADLX45DLC3A	N/A	N/A
3	Micro USB	StarTech.	UUSBHAUB3M	N/A	N/A
4	DC Cable	MISUMI	MCR3S-RE	N/A	N/A
B	SDIO adapter card	USI	USB TO SDIO CARD	N/A	N/A

Support Equipment (RSE, Co-Location)					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
1	NB(D)	Lenovo	ThinkPad X260	N/A	N/A
2	Adapter	Lenovo	ADLX45DLC3A	N/A	N/A
3	Mini USB	RS Pro	2369084	N/A	N/A
4	Micro USB	StarTech.	UUSBHAUB3M	N/A	N/A
B	SDIO adapter card	USI	USB TO SDIO CARD	N/A	N/A

Support Equipment (Conduction)					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
1	NB(D)	Lenovo	ThinkPad X260	N/A	N/A
2	Adapter	Lenovo	ADLX45DLC3A	N/A	N/A
3	Mini USB	RS Pro	2369084	N/A	N/A
4	DC Cable	MISUMI	MCR3S-RE	N/A	N/A
B	SDIO adapter card	USI	USB TO SDIO CARD	N/A	N/A

1.8 TEST SETUP DIAGRAM

Conducted	Conduction
	
RSE	**Co-Location**
	

1.9 TEST PROGRAM

The EUT connection corresponds to the surrounding fixture control board.
This EUT uses the Linux system setup command to set the frequency, modulation, and power to allow the sample to continuously transmit (including frequency hopping mode and Co-Location).

1.10 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, KDB 558074.

2. TEST SUMMARY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207(a)	4.1	AC Conducted Emission	Pass
15.247(a)(2)	4.2	6 dB Bandwidth	Pass
-	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(3)	4.3	Output Power Measurement	Pass
15.247(e)	4.4	Power Spectral Density	Pass
15.247(d)	4.5	Conducted Band Edge	Pass
15.247(d)	4.5	Conducted Emission	Pass
15.247(d) 15.205, 15.209	4.6	Radiation Band Edge	Pass
15.247(d) 15.205, 15.209	4.6	Radiation Spurious Emission	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	IEEE 802.11b mode :1Mbps IEEE 802.11g mode :6Mbps IEEE 802.11n HT20 mode :MCS0
Test Channel Frequencies	**IEEE 802.11b mode :** 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz **IEEE 802.11g mode :** 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz **IEEE 802.11n HT20 mode :** 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz
Operation Transmitter	IEEE 802.11b mode :1T1R IEEE 802.11g mode :1T1R IEEE 802.11n HT20 mode : 1T1R

Remark:
1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.
2. Based on FCC Part 15.31(m), the laboratory conducts a comprehensive evaluation of ch low, ch middle, and ch high. Other additional channels only evaluate the radiated restricted bands of operation and powers.

3.2 THE WORST MODE OF MEASUREMENT

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Power supply Mode	Mode 1: EUT Power by DC power Supply
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

AC Power Line Conducted Emission [co-location]	
Test Condition	Radiated Emission [co-location]
Power supply Mode	Mode 1: Wi-Fi 2.4G+ BT BR Mode 2: Wi-Fi 2.4G+ BLE 1M
Worst Mode	☒ Mode 1 ☒ Mode 2 ☐ Mode 3 ☐ Mode 4

Radiated Emission Measurement Above 1G	
Test Condition	Radiated Emission Above 1G
Power supply Mode	Mode 1: EUT power by Power supply
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4
Worst Position	☐ Placed in fixed position. ☒ Placed in fixed position at X-Plane (E2-Plane) ☐ Placed in fixed position at Y-Plane (E1-Plane) ☐ Placed in fixed position at Z-Plane (H-Plane)

Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Power supply Mode	Mode 1: EUT power by Power supply
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Radiated Emission Measurement [co-location]	
Test Condition	Radiated Emission [co-location]
Power supply Mode	Mode 1: Wi-Fi 2.4G+ BT BR Mode 2: Wi-Fi 2.4G+ BLE 1M
Worst Mode	☒ Mode 1 ☒ Mode 2 ☐ Mode 3 ☐ Mode 4

Remark:

1. The worst mode was record in this test report.
2. AC power line conducted emission was performed the EUT transmit at the highest output power channel as worse case.
3. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report

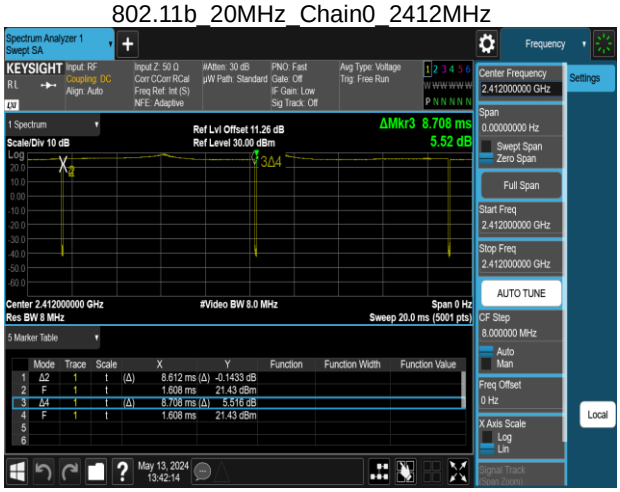
3.3 EUT DUTY CYCLE

Temperature: 20.5 ~ 24℃ **Test date:** May 13 ~ 20, 2024

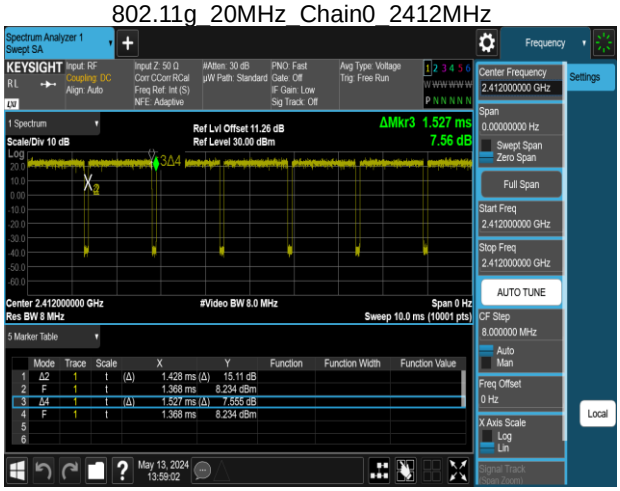
Humidity: 56 ~ 59% RH **Tested by:** Jerry Chang

Mode	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11b	98.90	0.05	0.12	0.01
802.11g	93.52	0.29	0.70	1.00
802.11n_20	93.10	0.31	0.75	1.00

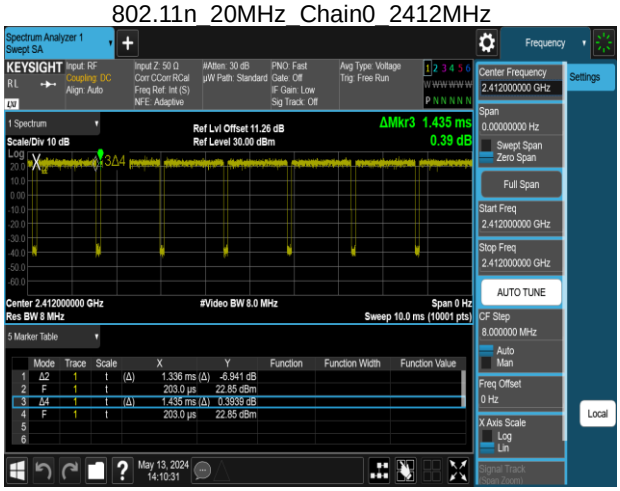
802.11b_20MHz_Chain0_2412MHz



802.11g_20MHz_Chain0_2412MHz



802.11n_20MHz_Chain0_2412MHz



4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a),

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

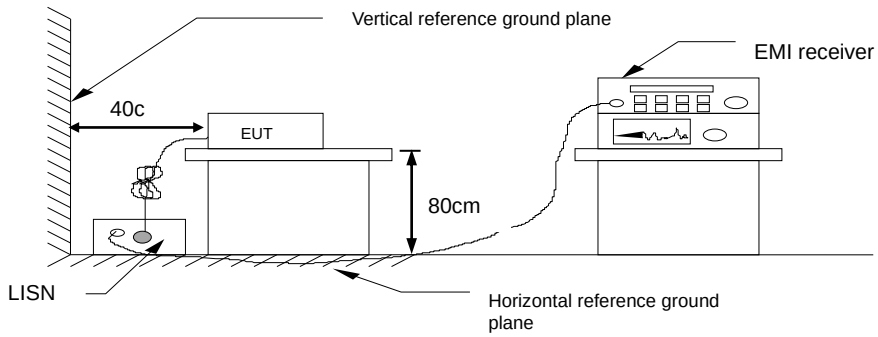
* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

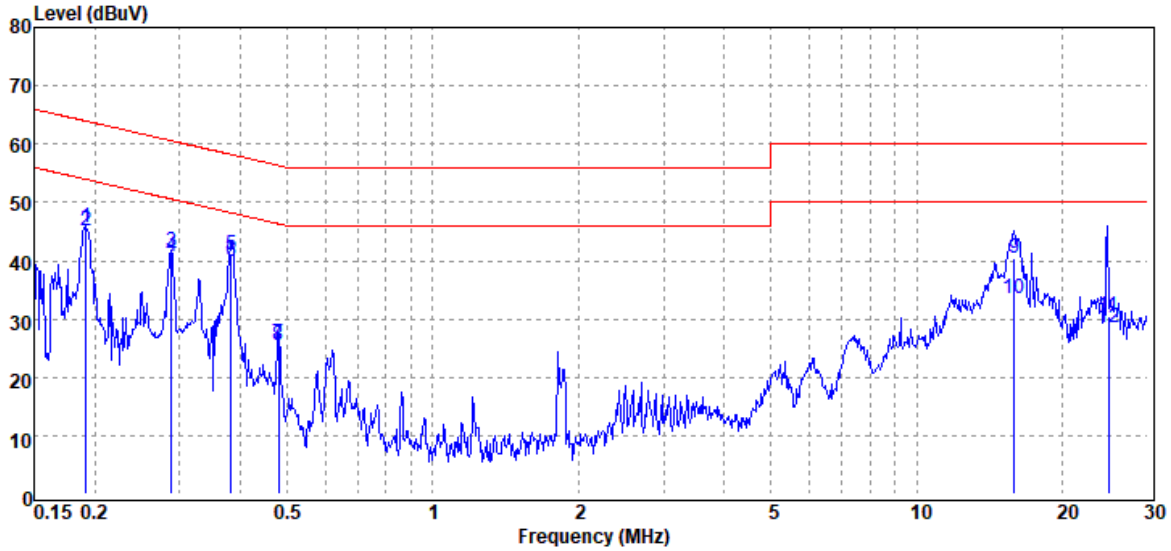
1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

4.1.3 Test Setup



4.1.4 Test Result

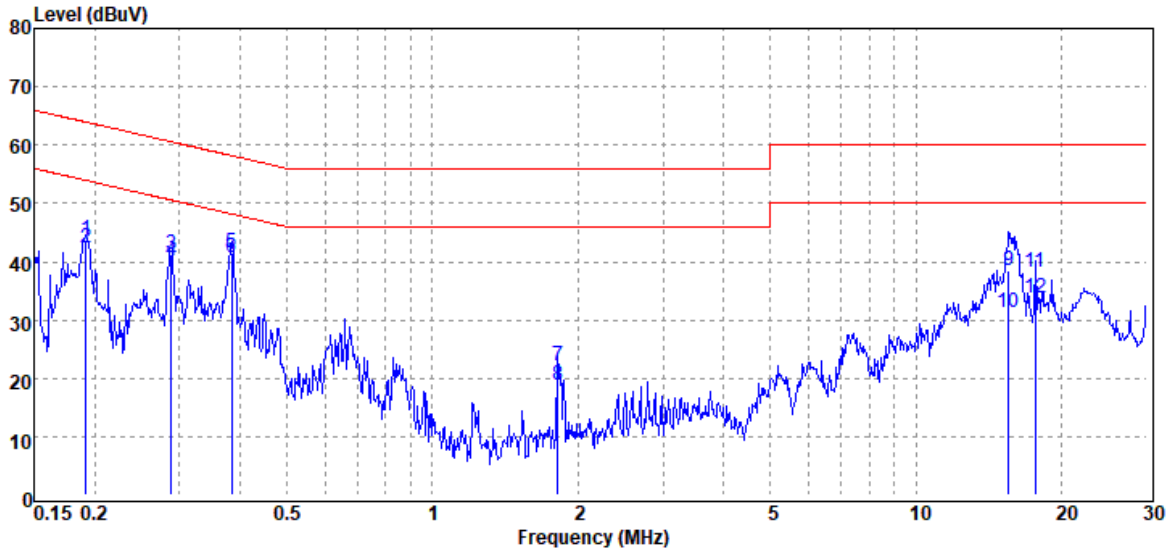
Project No	: TM-2405000018P	Test Date	: 2024-05-24
Operation Mode	: wifi2.4	Temp./Humi.	: 24.1°C / 55%
Test Chamber	: Conduction	Engineer	: Czerny Lin
Probe	: LINE	Test Voltage	: AC 120V/60Hz
Note	:		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.192	QP	45.65	0.15	45.80	63.95	-18.15
0.192	Average	44.90	0.15	45.05	53.95	-8.90
0.288	QP	41.40	0.15	41.55	60.58	-19.03
0.288	Average	40.41	0.15	40.56	50.58	-10.02
0.382	QP	40.82	0.15	40.97	58.23	-17.26
0.382	Average	39.71	0.15	39.86	48.23	-8.37
0.480	QP	25.55	0.15	25.70	56.34	-30.64
0.480	Average	25.38	0.15	25.53	46.34	-20.81
15.880	QP	39.84	0.46	40.30	60.00	-19.70
15.880	Average	32.95	0.46	33.41	50.00	-16.59
24.878	QP	29.75	0.59	30.34	60.00	-29.66
24.878	Average	28.02	0.59	28.61	50.00	-21.39

Note: 1. Actual FS= Spectrum Read Level + Factor
Note: 2. Margin= Actual FS - Limit

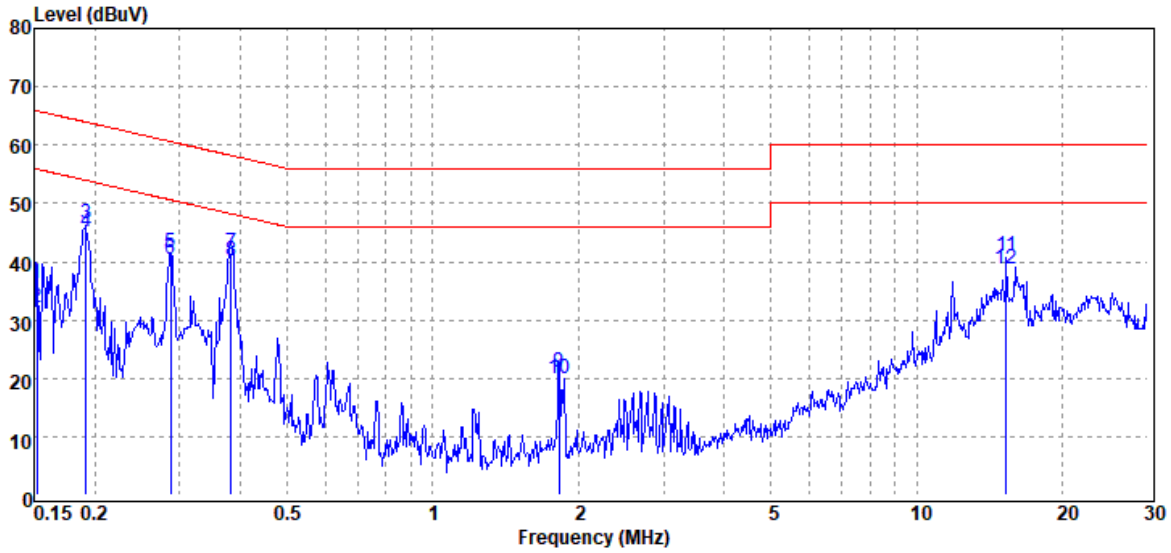
Project No	: TM-2405000018P	Test Date	: 2024-05-24
Operation Mode	: wifi2.4	Temp./Humi.	: 24.1°C / 55%
Test Chamber	: Conduction	Engineer	: Czerny Lin
Probe	: NEUTRAL	Test Voltage	: AC 120V/60Hz
Note	:		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.192	QP	43.65	0.19	43.84	63.95	-20.11
0.192	Average	42.22	0.19	42.41	53.95	-11.54
0.289	QP	40.94	0.19	41.13	60.57	-19.44
0.289	Average	39.98	0.19	40.17	50.57	-10.40
0.385	QP	41.21	0.19	41.40	58.18	-16.78
0.385	Average	40.46	0.19	40.65	48.18	-7.53
1.820	QP	21.83	0.25	22.08	56.00	-33.92
1.820	Average	18.55	0.25	18.80	46.00	-27.20
15.516	QP	38.03	0.47	38.50	60.00	-21.50
15.516	Average	30.95	0.47	31.42	50.00	-18.58
17.626	QP	37.83	0.49	38.32	60.00	-21.68
17.626	Average	33.39	0.49	33.88	50.00	-16.12

Note: 1. Actual FS= Spectrum Read Level + Factor
Note: 2. Margin= Actual FS - Limit

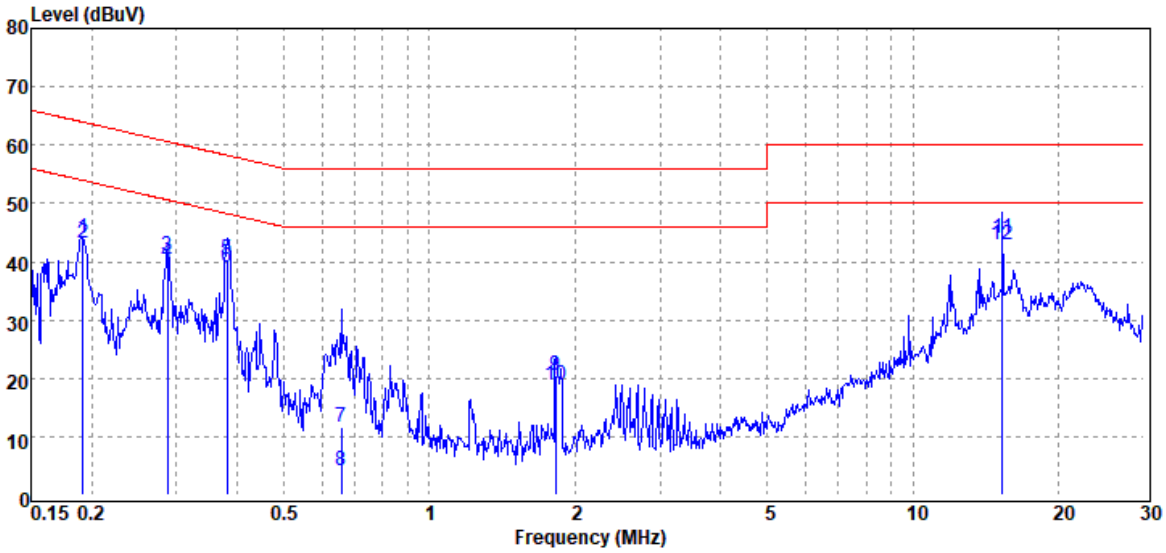
Project No	: TM-2405000018P	Test Date	: 2024-05-24
Operation Mode	: Wi-Fi+BT Co-Location	Temp./Humi.	: 24.1°C / 55%
Test Chamber	: Conduction	Engineer	: Czerny Lin
Probe	: LINE	Test Voltage	: AC 120V/60Hz
Note	:		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.152	QP	36.16	0.15	36.31	65.90	-29.59
0.152	Average	31.88	0.15	32.03	55.90	-23.87
0.192	QP	46.31	0.15	46.46	63.95	-17.49
0.192	Average	45.11	0.15	45.26	53.95	-8.69
0.288	QP	41.26	0.15	41.41	60.59	-19.18
0.288	Average	40.38	0.15	40.53	50.59	-10.06
0.383	QP	41.48	0.15	41.63	58.22	-16.59
0.383	Average	39.94	0.15	40.09	48.22	-8.13
1.823	QP	20.96	0.21	21.17	56.00	-34.83
1.823	Average	19.66	0.21	19.87	46.00	-26.13
15.280	QP	40.42	0.45	40.87	60.00	-19.13
15.280	Average	38.18	0.45	38.63	50.00	-11.37

Note: 1. Actual FS= Spectrum Read Level + Factor
Note: 2. Margin= Actual FS - Limit

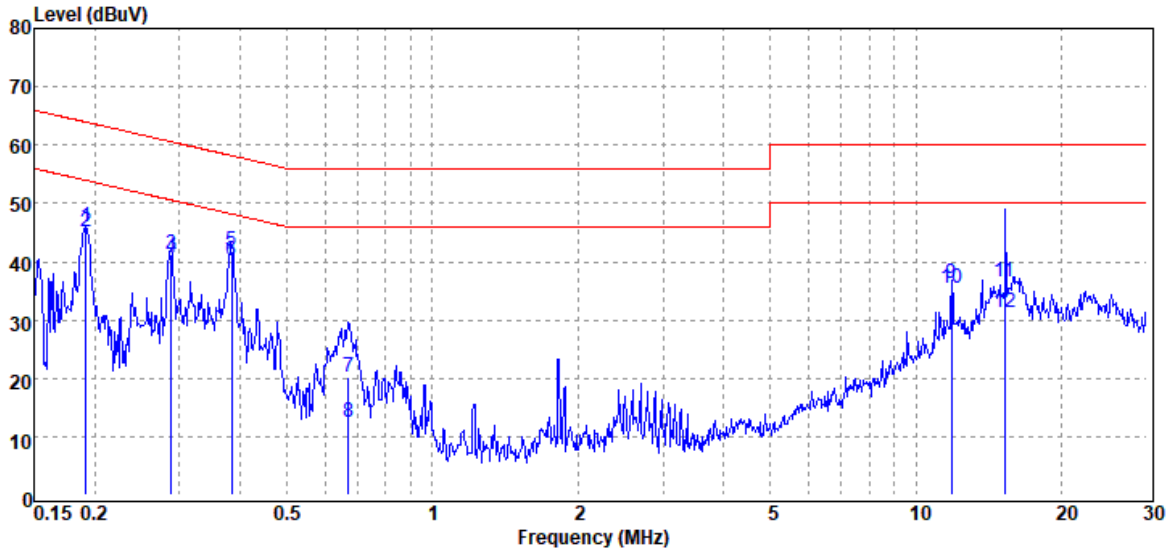
Project No	: TM-2405000018P	Test Date	: 2024-05-24
Operation Mode	: Wi-Fi+BT Co-Location	Temp./Humi.	: 24.1°C / 55%
Test Chamber	: Conduction	Engineer	: Czerny Lin
Probe	: NEUTRAL	Test Voltage	: AC 120V/60Hz
Note	:		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.192	QP	43.86	0.19	44.05	63.95	-19.90
0.192	Average	43.07	0.19	43.26	53.95	-10.69
0.287	QP	40.79	0.19	40.98	60.61	-19.63
0.287	Average	39.67	0.19	39.86	50.61	-10.75
0.382	QP	40.16	0.19	40.35	58.24	-17.89
0.382	Average	38.73	0.19	38.92	48.24	-9.32
0.658	QP	11.49	0.21	11.70	56.00	-44.30
0.658	Average	4.05	0.21	4.26	46.00	-41.74
1.825	QP	20.31	0.25	20.56	56.00	-35.44
1.825	Average	18.68	0.25	18.93	46.00	-27.07
15.280	QP	43.49	0.47	43.96	60.00	-16.04
15.280	Average	42.39	0.47	42.86	50.00	-7.14

Note: 1. Actual FS= Spectrum Read Level + Factor
Note: 2. Margin= Actual FS - Limit

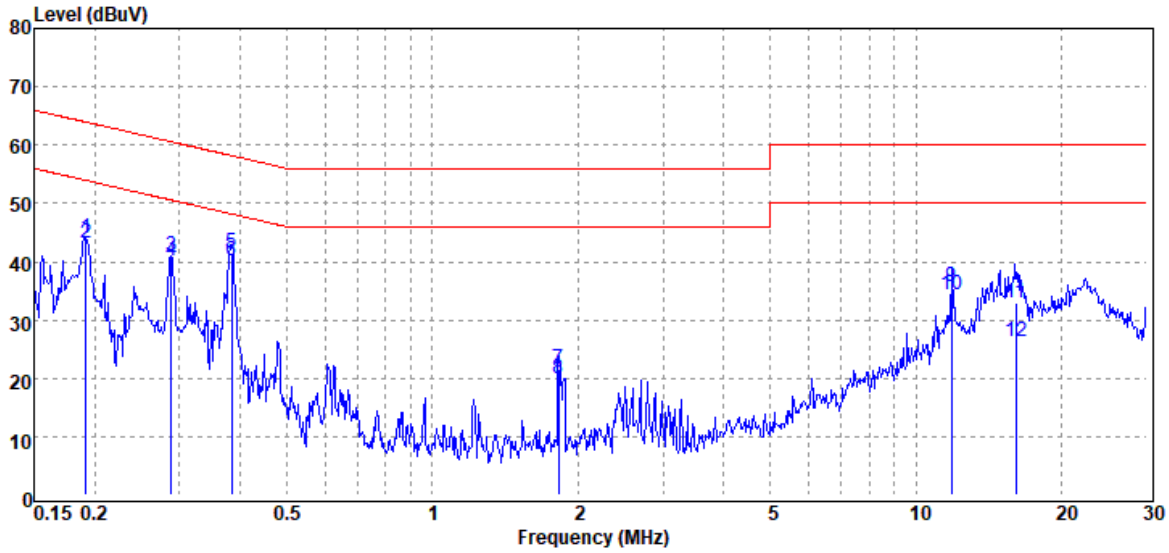
Project No	: TM-2405000018P	Test Date	: 2024-05-24
Operation Mode	: Wi-Fi+BLE Co-Location	Temp./Humi.	: 24.1°C / 55%
Test Chamber	: Conduction	Engineer	: Czerny Lin
Probe	: LINE	Test Voltage	: AC 120V/60Hz
Note	:		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.192	QP	45.78	0.15	45.93	63.96	-18.03
0.192	Average	45.04	0.15	45.19	53.96	-8.77
0.288	QP	41.15	0.15	41.30	60.58	-19.28
0.288	Average	40.41	0.15	40.56	50.58	-10.02
0.384	QP	41.62	0.15	41.77	58.20	-16.43
0.384	Average	40.06	0.15	40.21	48.20	-7.99
0.671	QP	20.09	0.16	20.25	56.00	-35.75
0.671	Average	12.36	0.16	12.52	46.00	-33.48
11.824	QP	35.96	0.40	36.36	60.00	-23.64
11.824	Average	34.95	0.40	35.35	50.00	-14.65
15.278	QP	36.01	0.45	36.46	60.00	-23.54
15.278	Average	30.91	0.45	31.36	50.00	-18.64

Note: 1. Actual FS= Spectrum Read Level + Factor
Note: 2. Margin= Actual FS - Limit

Project No	: TM-2405000018P	Test Date	: 2024-05-24
Operation Mode	: Wi-Fi+BLE Co-Location	Temp./Humi.	: 24.1°C / 55%
Test Chamber	: Conduction	Engineer	: Czerny Lin
Probe	: NEUTRAL	Test Voltage	: AC 120V/60Hz
Note	:		



Freq.	Detector Mode	Spectrum Read Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.192	QP	43.81	0.19	44.00	63.95	-19.95
0.192	Average	42.98	0.19	43.17	53.95	-10.78
0.288	QP	40.92	0.19	41.11	60.57	-19.46
0.288	Average	40.00	0.19	40.19	50.57	-10.38
0.384	QP	41.31	0.19	41.50	58.19	-16.69
0.384	Average	40.08	0.19	40.27	48.19	-7.92
1.827	QP	21.27	0.25	21.52	56.00	-34.48
1.827	Average	19.75	0.25	20.00	46.00	-26.00
11.825	QP	35.26	0.42	35.68	60.00	-24.32
11.825	Average	33.97	0.42	34.39	50.00	-15.61
16.084	QP	32.53	0.47	33.00	60.00	-27.00
16.084	Average	25.71	0.47	26.18	50.00	-23.82

Note: 1. Actual FS= Spectrum Read Level + Factor
Note: 2. Margin= Actual FS - Limit

4.2 6DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

4.2.1 Test Limit

According to §15.247(a)(2),

6 dB Bandwidth ：

Limit	Shall be at least 500kHz

Occupied Bandwidth(99%) ： For reporting purposes only.

4.2.2 Test Procedure

Test method Refer as KDB 558074 D01 and ANSI C63.10: 2013 clause 6.9.2,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 100kHz, VBW = 300kHz and Detector = Peak, to measurement 6 dB Bandwidth.
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

4.2.3 Test Setup

Refer to section 1.8.

4.2.4 Test Result

Temperature:	20.5 ~ 24℃	**Test date:**	May 13 ~ 20, 2024
Humidity:	56 ~ 59% RH	**Tested by:**	Jerry Chang

6dB BANDWIDTH

802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	**7072.00**	≧ 500	PASS
2437	**7072.00**	≧ 500	PASS
2462	7051.00	≧ 500	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15150.00	≧ 500	PASS
2437	**15160.00**	≧ 500	PASS
2462	15150.00	≧ 500	PASS

802.11n_HT_20M Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	**15160.00**	≧ 500	PASS
2437	15150.00	≧ 500	PASS
2462	15140.00	≧ 500	PASS

BANDWIDTH 99%

802.11b Ch0

Freq. (MHz)	99% BW (MHz)
2412	**14.485**
2437	14.065
2462	12.660

802.11g Ch0

Freq. (MHz)	99% BW (MHz)
2412	16.491
2437	**16.891**
2462	16.470

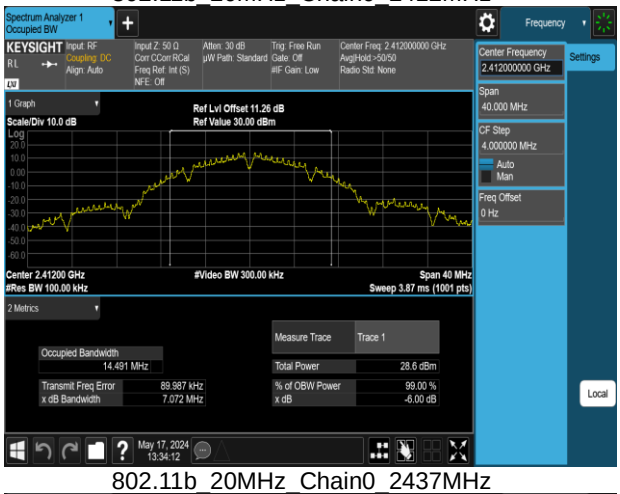
802.11n_HT20M Ch0

Freq. (MHz)	99% BW (MHz)
2412	17.560
2437	**17.946**
2462	17.564

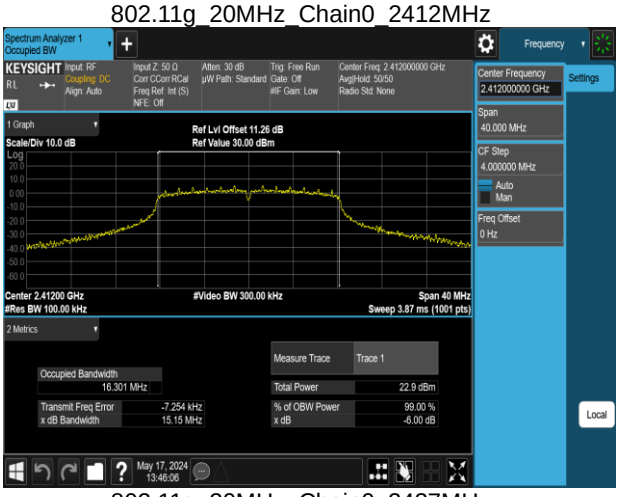
Test Data

6dB BANDWIDTH

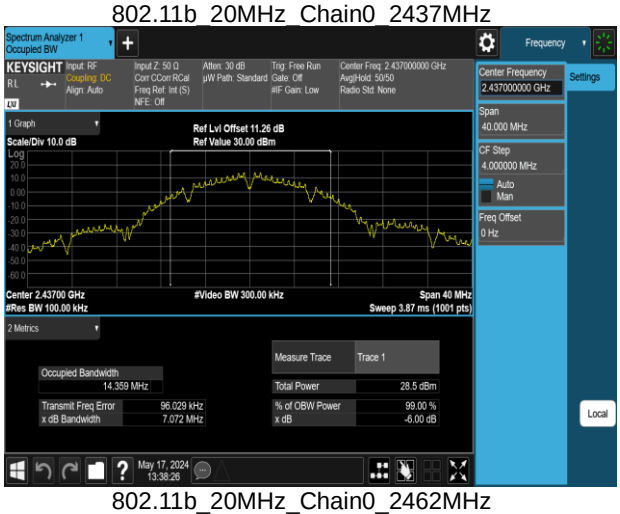
802.11b_20MHz_Chain0_2412MHz



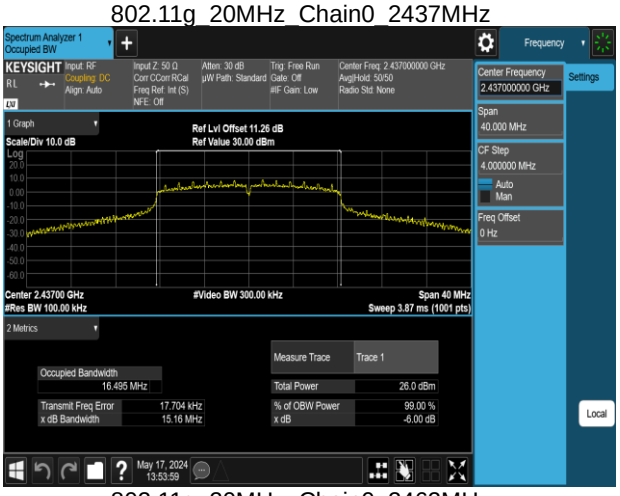
802.11g_20MHz_Chain0_2412MHz



802.11b_20MHz_Chain0_2437MHz

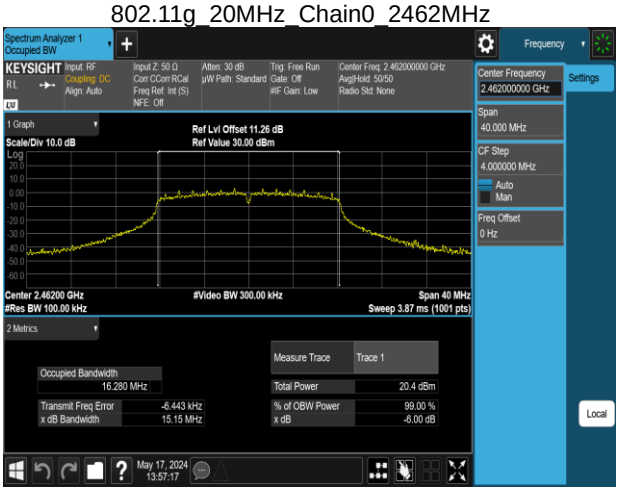


802.11g_20MHz_Chain0_2437MHz

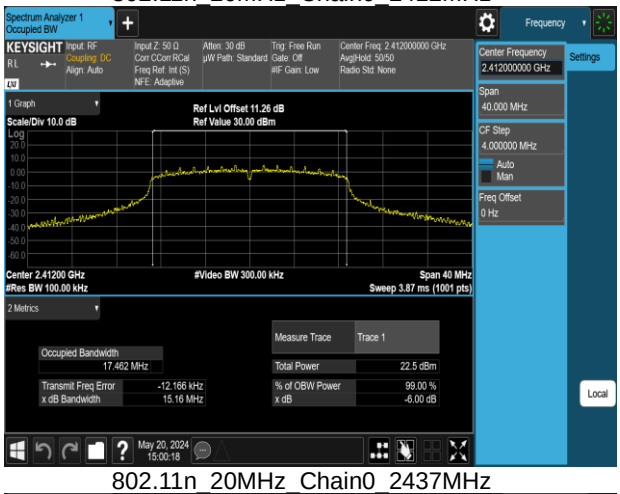


802.11b_20MHz_Chain0_2462MHz

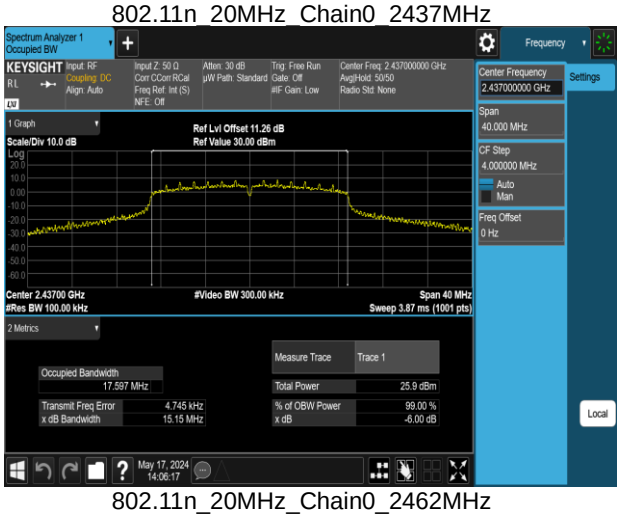
802.11g_20MHz_Chain0_2462MHz



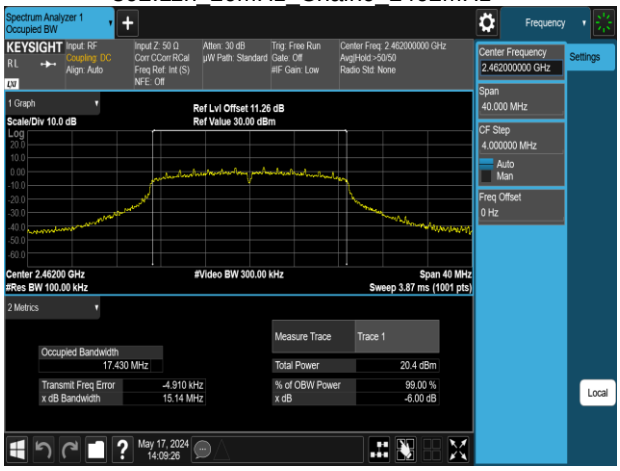
802.11n_20MHz_Chain0_2412MHz



802.11n_20MHz_Chain0_2437MHz

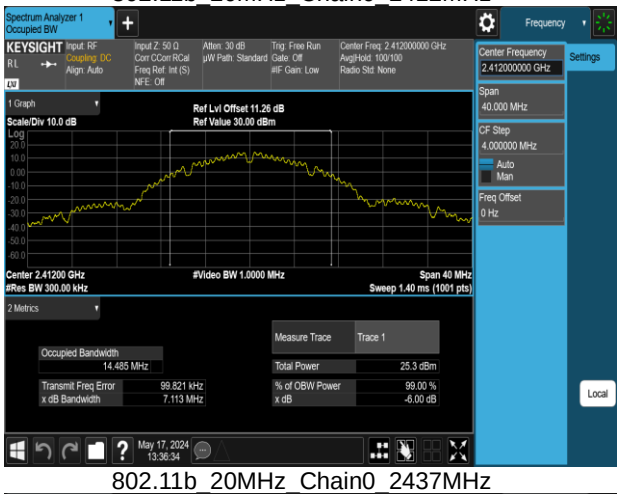


802.11n_20MHz_Chain0_2462MHz

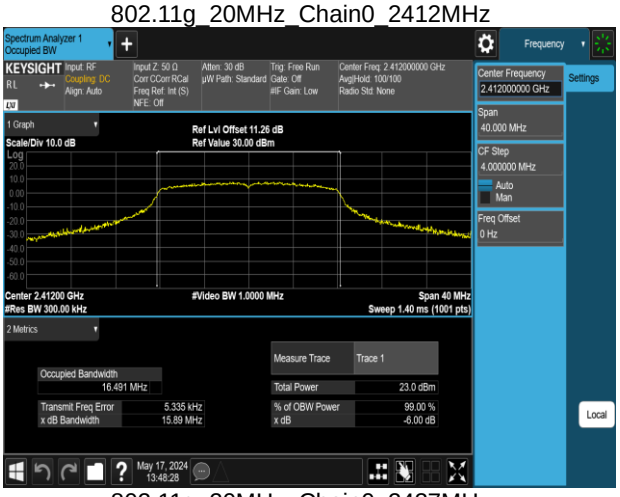


BANDWIDTH 99%

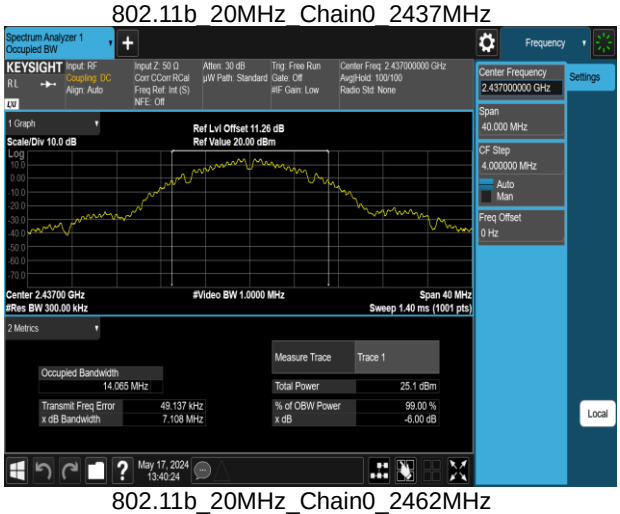
802.11b_20MHz_Chain0_2412MHz



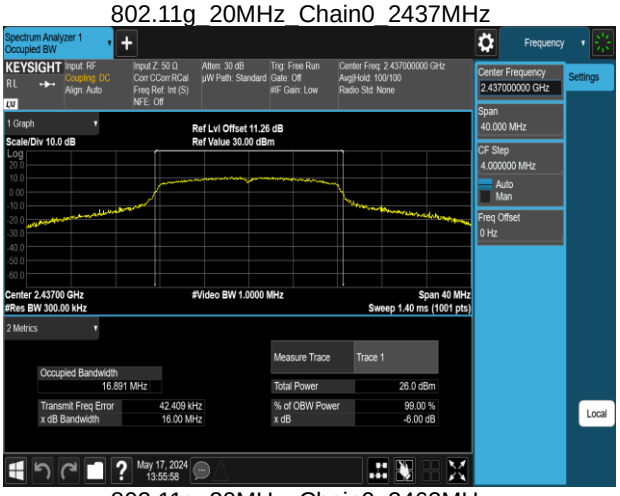
802.11g_20MHz_Chain0_2412MHz



802.11b_20MHz_Chain0_2437MHz

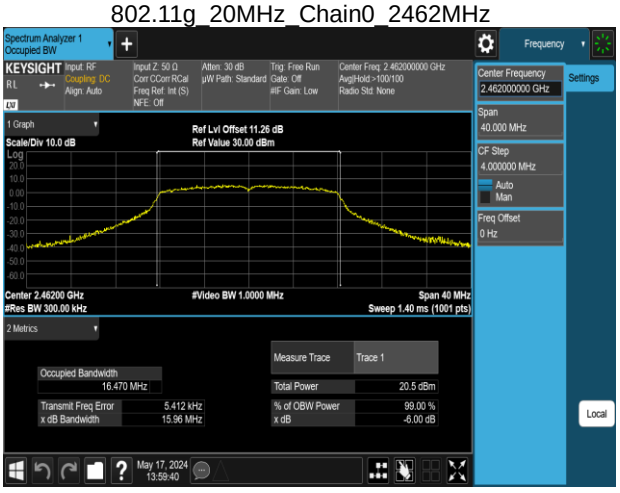


802.11g_20MHz_Chain0_2437MHz

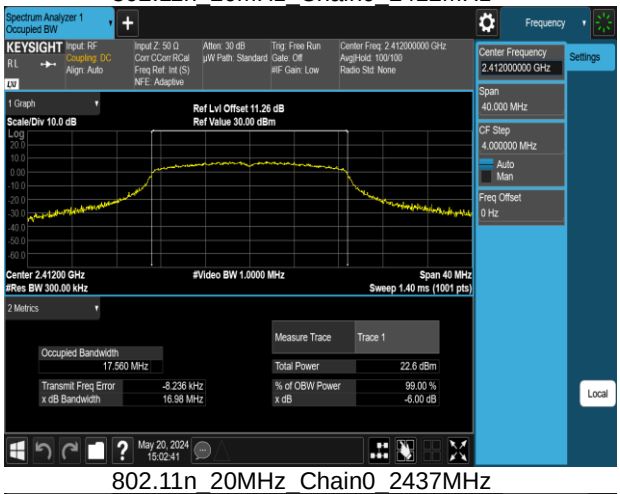


802.11b_20MHz_Chain0_2462MHz

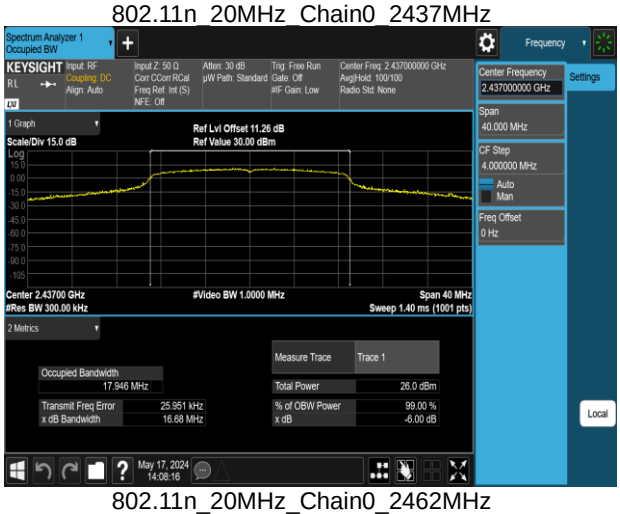
802.11g_20MHz_Chain0_2462MHz



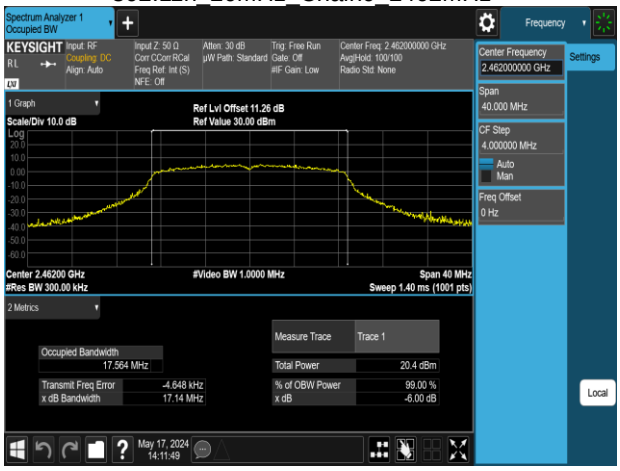
802.11n_20MHz_Chain0_2412MHz



802.11n_20MHz_Chain0_2437MHz



802.11n_20MHz_Chain0_2462MHz



4.3 OUTPUT POWER MEASUREMENT

4.3.1 Test Limit

According to §15.247(b),

Peak output power：

For systems using digital modulation in the 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt(30 dBm) and the e.i.r.p. shall not exceed 4Watt(36 dBm), base on the use of antennas with directional gain not exceed 6 dBi If transmitting antennas of directional gain greater than 6dBi are used the peak output power 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 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Limit	☒ Antenna not exceed 6 dBi：30dBm ☐ Antenna with DG greater than 6 dBi： [Limit = 30 – (DG – 6)] ☐ Point-to-point operation：

Average output power：For reporting purposes only.

4.3.2 Test Procedure

Test method Refer as KDB 558074 D01.

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

4.3.3 Test Setup

Refer to section 1.8.

4.3.4 Test Result

Temperature:	20.5 ~ 24℃	**Test date:**	May 13 ~ 20, 2024
Humidity:	56 ~ 59% RH	**Tested by:**	Jerry Chang

Peak & Average output power：

802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	19	23.82	30.00	PASS
6	2437	1	19	23.66	30.00	PASS
8	2447	1	19	**23.99**	30.00	PASS
9	2452	1	18	22.90	30.00	PASS
10	2457	1	17	21.36	30.00	PASS
11	2462	1	16	19.95	30.00	PASS
802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	19	**21.23**	30.00	PASS
6	2437	1	19	21.13	30.00	PASS
8	2447	1	19	21.13	30.00	PASS
9	2452	1	18	19.67	30.00	PASS
10	2457	1	17	18.11	30.00	PASS
11	2462	1	16	16.77	30.00	PASS

Note: Measured by power meter, cable loss + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.

802.11g Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	15	24.11	30.00	PASS
2	2417	6	18	**25.20**	30.00	PASS
6	2437	6	18	25.03	30.00	PASS
7	2442	6	17	25.02	30.00	PASS
8	2447	6	16	24.89	30.00	PASS
9	2452	6	15	24.26	30.00	PASS
10	2457	6	13	24.03	30.00	PASS
11	2462	6	12	23.12	30.00	PASS
802.11g Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	15	15.66	30.00	PASS
2	2417	6	18	**18.72**	30.00	PASS
6	2437	6	18	18.57	30.00	PASS
7	2442	6	17	17.71	30.00	PASS
8	2447	6	16	16.82	30.00	PASS
9	2452	6	15	15.96	30.00	PASS
10	2457	6	13	14.36	30.00	PASS
11	2462	6	12	13.21	30.00	PASS

Note: Measured by power meter, cable loss + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.

802.11n_HT_20M Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	15	24.06	30.00	PASS
2	2417	MCS0	17	25.02	30.00	PASS
3	2422	MCS0	18	**25.18**	30.00	PASS
6	2437	MCS0	18	24.90	30.00	PASS
7	2442	MCS0	17	25.08	30.00	PASS
8	2447	MCS0	16	24.94	30.00	PASS
9	2452	MCS0	15	24.26	30.00	PASS
10	2457	MCS0	13	23.68	30.00	PASS
11	2462	MCS0	12	23.02	30.00	PASS
802.11n_HT_20M Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	15	15.25	30.00	PASS
2	2417	MCS0	17	17.56	30.00	PASS
3	2422	MCS0	18	**18.58**	30.00	PASS
6	2437	MCS0	18	18.46	30.00	PASS
7	2442	MCS0	17	17.56	30.00	PASS
8	2447	MCS0	16	16.73	30.00	PASS
9	2452	MCS0	15	15.77	30.00	PASS
10	2457	MCS0	13	14.18	30.00	PASS
11	2462	MCS0	12	13.14	30.00	PASS

Note: Measured by power meter, cable loss + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.

4.4 POWER SPECTRAL DENSITY

4.4.1 Test Limit

According to §15.247(e),

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Limit	☒ Antenna not exceed 6 dBi：8dBm ☐ Antenna with DG greater than 6 dBi： [Limit = 8 – (DG – 6)] ☐ Point-to-point operation：

4.4.2 Test Procedure

Test method Refer as KDB 558074 D01

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 10kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss were compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

4.4.3 Test Setup

Refer to section 1.8.

4.4.4 Test Result

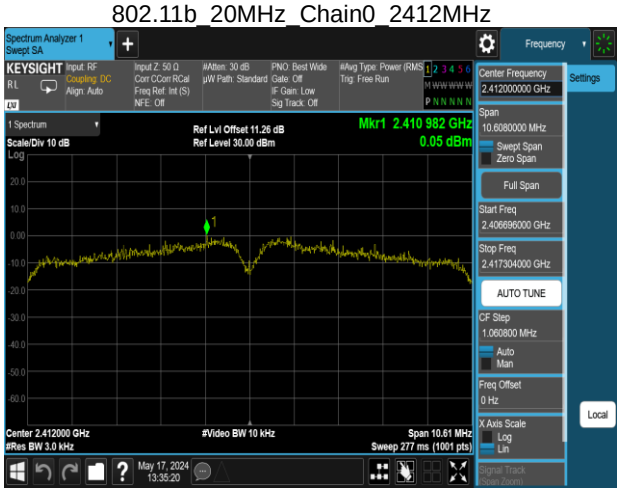
Temperature: 20.5 ~ 24℃ **Test date:** May 13 ~ 20, 2024

Humidity: 56 ~ 59% RH **Tested by:** Jerry Chang

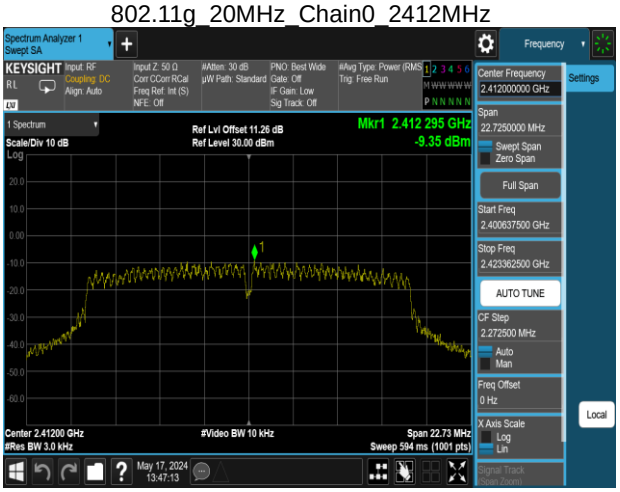
POWER DENSITY 802.11b				
Freq. (MHz)	Ch0 PSD	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	0.05	0.05	8.00	PASS
2437	0.31	0.31	8.00	PASS
2462	-4.32	-4.32	8.00	PASS
POWER DENSITY 802.11g				
Freq. (MHz)	Ch0 PSD	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-9.35	-9.35	8.00	PASS
2437	-5.52	-5.52	8.00	PASS
2462	-11.64	-11.64	8.00	PASS
POWER DENSITY 802.11n HT20				
Freq. (MHz)	Ch0 PSD	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-9.42	-9.42	8.00	PASS
2437	-6.14	-6.14	8.00	PASS
2462	-12.09	-12.09	8.00	PASS

Test Data

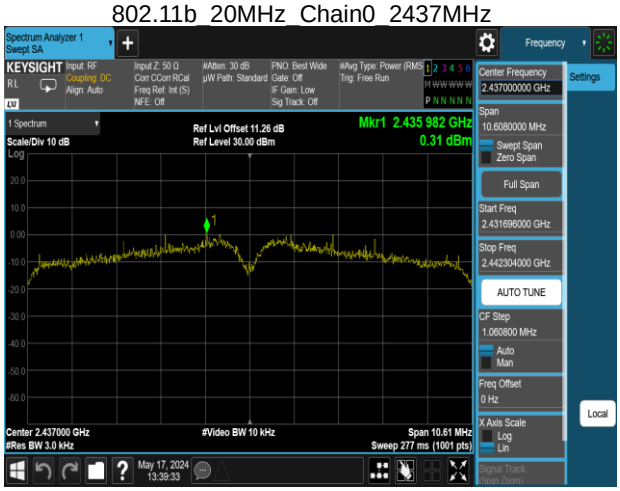
802.11b_20MHz_Chain0_2412MHz



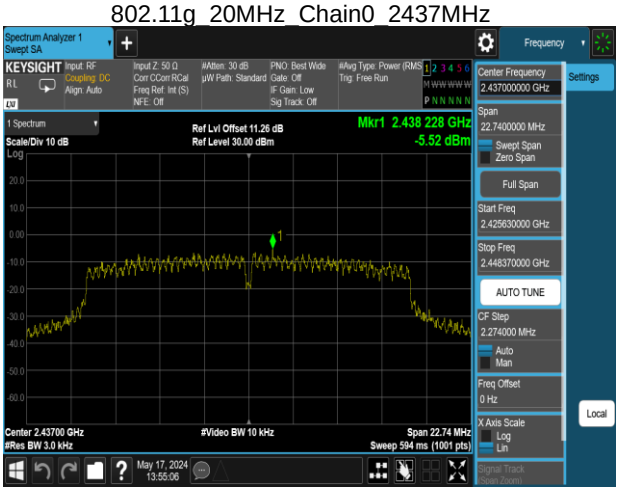
802.11g_20MHz_Chain0_2412MHz



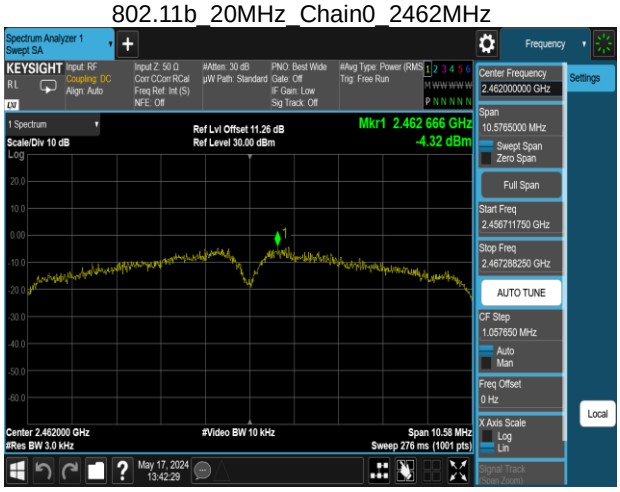
802.11b_20MHz_Chain0_2437MHz



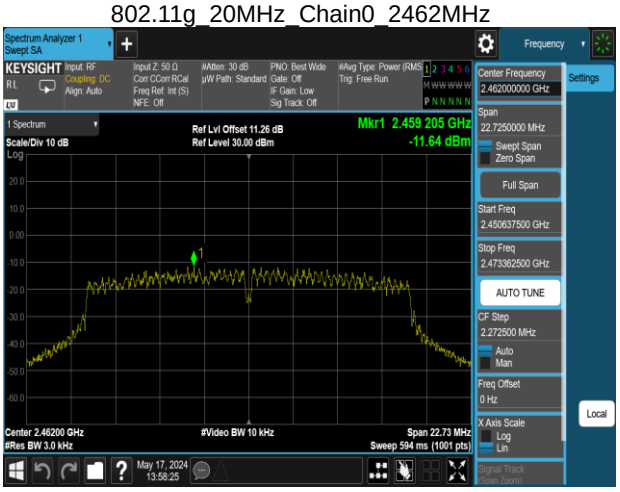
802.11g_20MHz_Chain0_2437MHz



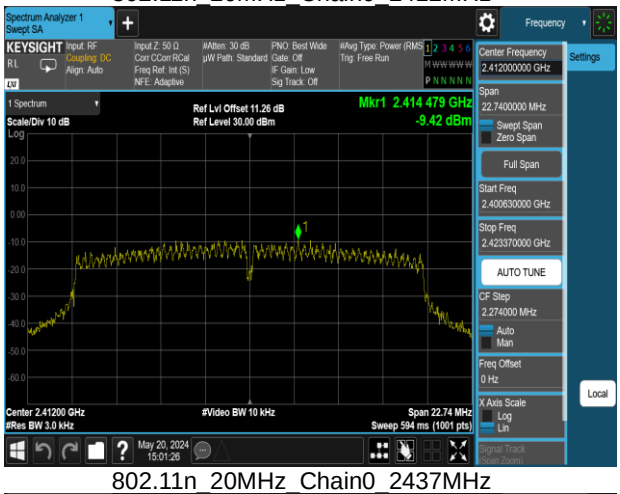
802.11b_20MHz_Chain0_2462MHz



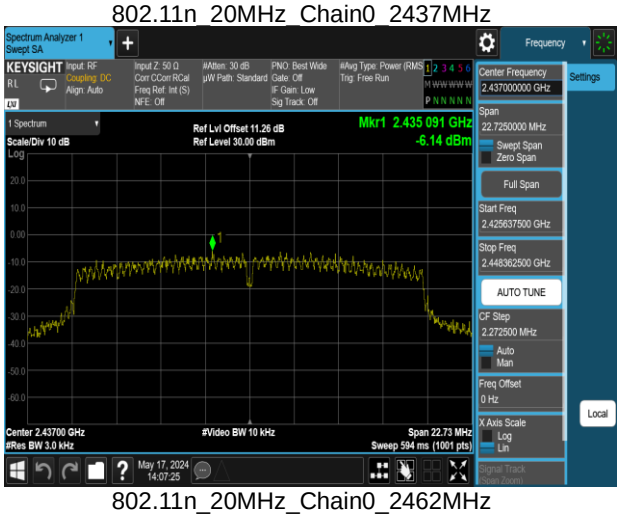
802.11g_20MHz_Chain0_2462MHz



802.11n_20MHz_Chain0_2412MHz



802.11n_20MHz_Chain0_2437MHz



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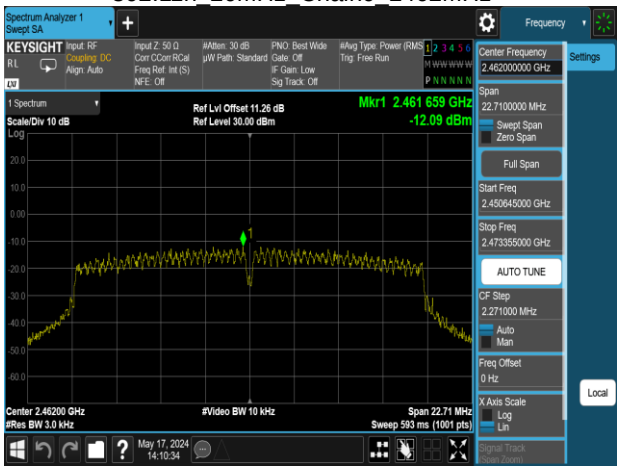


4.5 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

4.5.1 Test Limit

According to §15.247(d),

In any 100 kHz bandwidth outside the authorized frequency band,

Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

4.5.2 Test Procedure

Test method Refer as KDB 662911 D01, KDB 558074 D01.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. f the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

4.5.3 Test Setup

Refer to section 1.8.

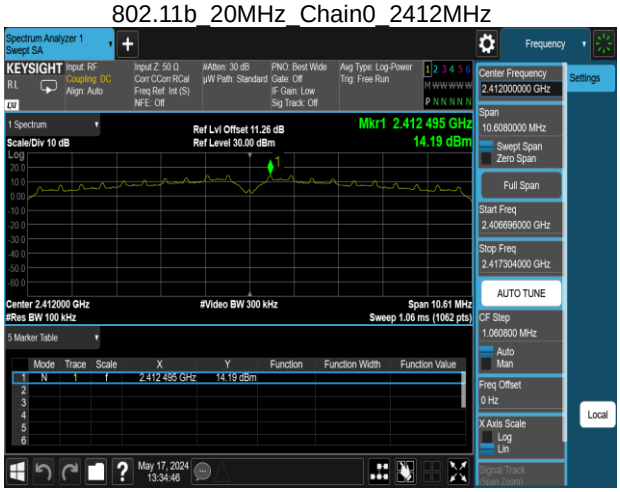
4.5.4 Test Result

Test Data

Temperature:	20.5 ~ 24℃	**Test date:**	May 13 ~ 20, 2024
Humidity:	56 ~ 59% RH	**Tested by:**	Jerry Chang

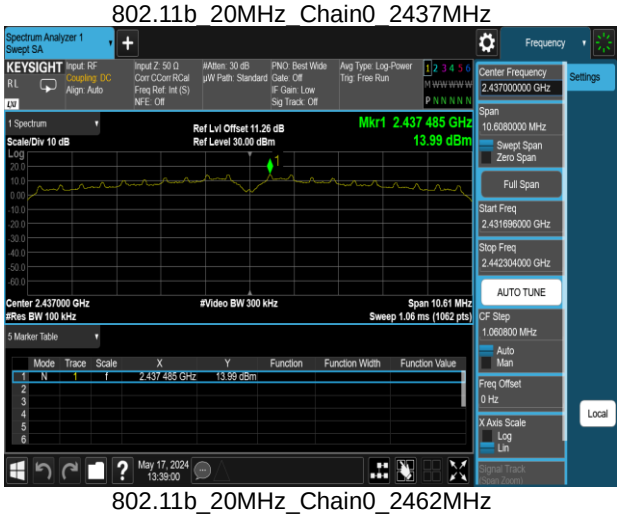
Reference Level

802.11b_20MHz_Chain0_2412MHz

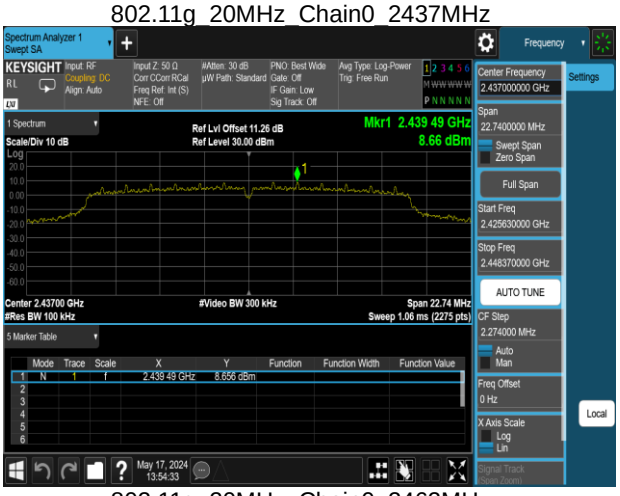


802.11g_20MHz_Chain0_2412MHz

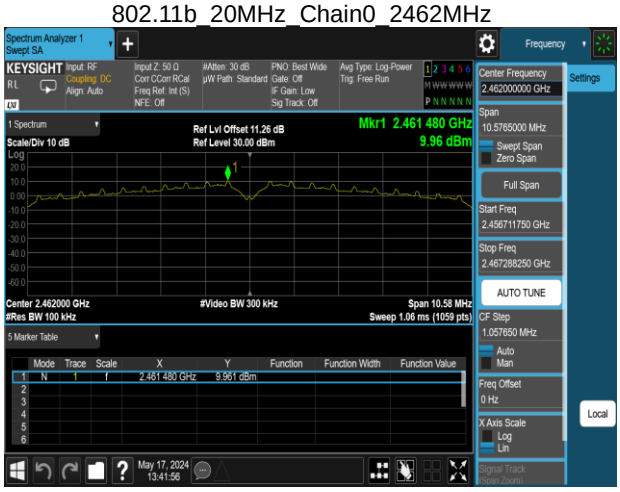
802.11b_20MHz_Chain0_2437MHz



802.11g_20MHz_Chain0_2437MHz

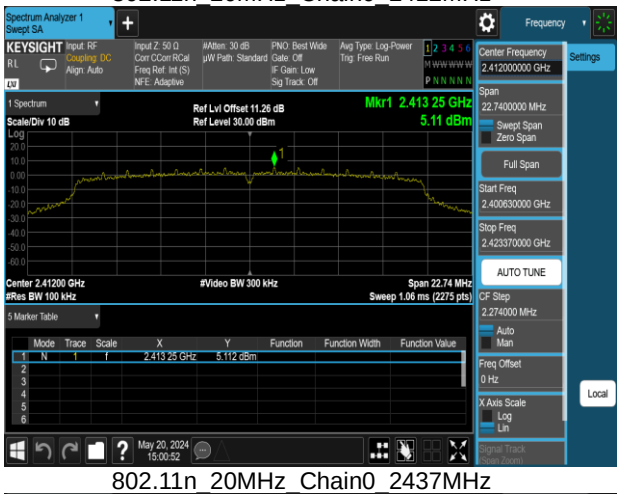


802.11b_20MHz_Chain0_2462MHz



802.11g_20MHz_Chain0_2462MHz

802.11n_20MHz_Chain0_2412MHz



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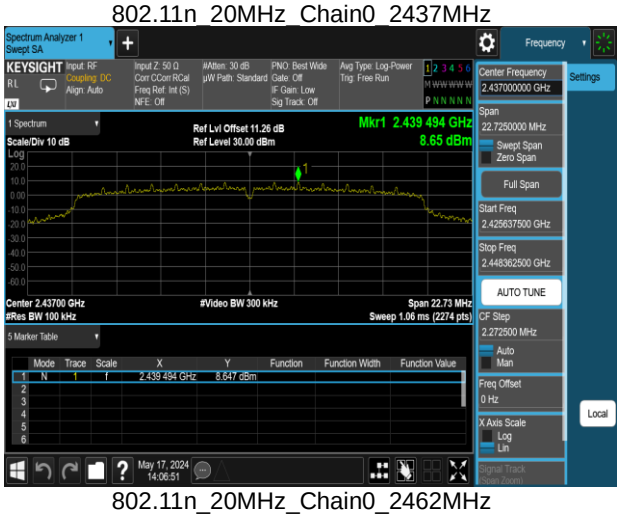
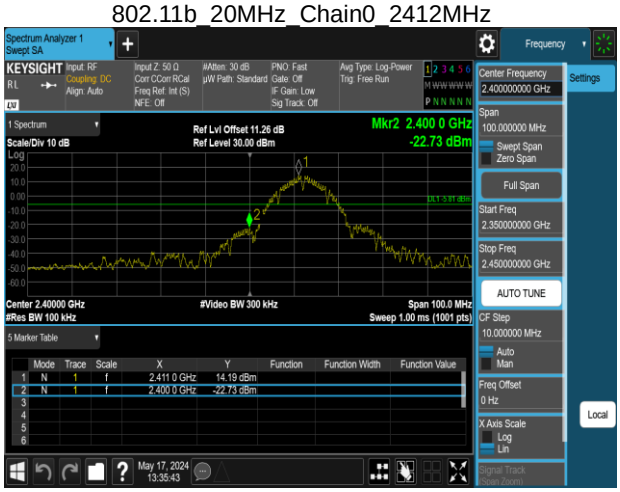


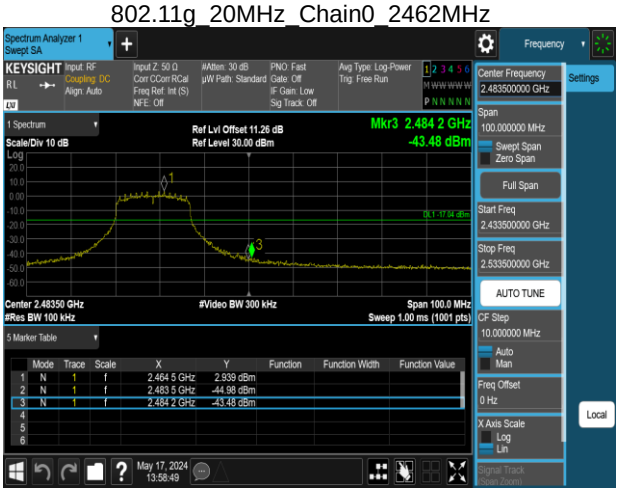
802.11n_20MHz_Chain0_2462MHz

Band Edge

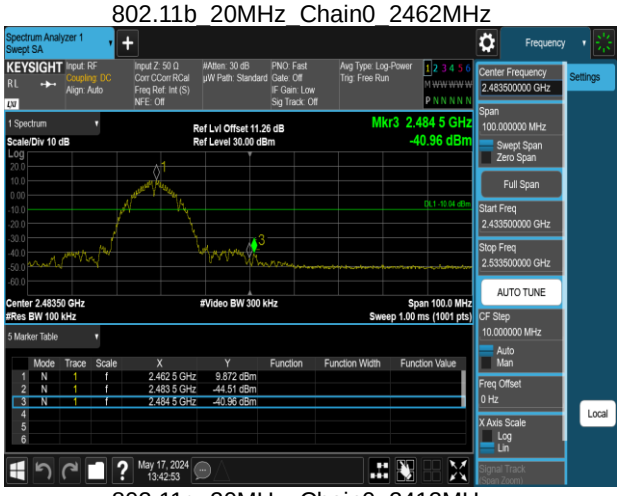
802.11b_20MHz_Chain0_2412MHz



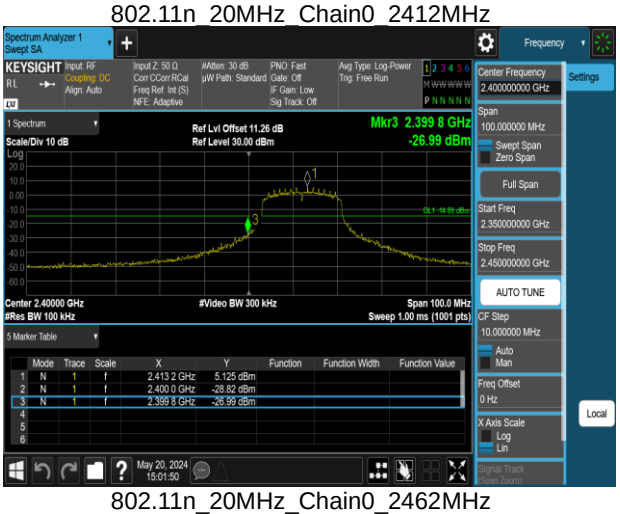
802.11g_20MHz_Chain0_2462MHz



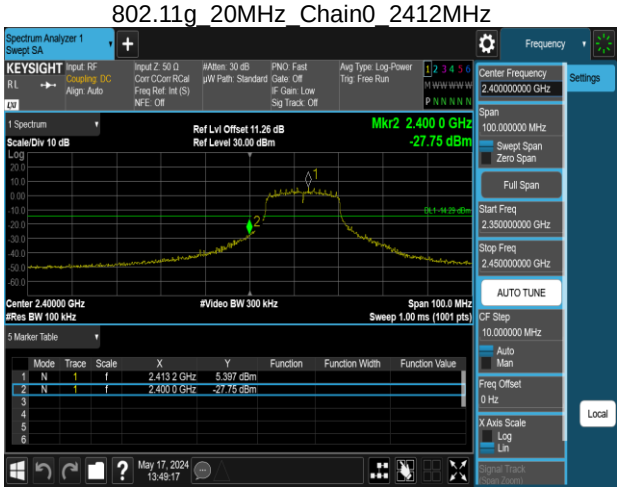
802.11b_20MHz_Chain0_2462MHz



802.11n_20MHz_Chain0_2412MHz



802.11g_20MHz_Chain0_2412MHz



802.11n_20MHz_Chain0_2462MHz