

Project No: TM-2309000207P  
 Report No.: TMWK2309003308KR

FCC ID: KA2MS30A1

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 Rev.: 00

# RADIO TEST REPORT

## FCC 47 CFR PART 15 SUBPART C

<b>Test Standard</b>	<b>FCC Part 15.247</b>
<b>Product name</b>	<b>AX3000 Wi-Fi 6 Smart Home Gateway Wi-Fi 6 AX3000 IoT Gateway</b>
<b>Brand Name</b>	<b>D-Link</b>
<b>Model No.</b>	<b>MS30</b>
<b>Test Result</b>	<b>Pass</b>
<b>Statements of Conformity</b>	<b>Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.</b>

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*

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Sehni Hu  
 Supervisor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.  
 除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

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## Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	July 30, 2024	Initial Issue	ALL	Peggy Tsai

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# 1. GENERAL INFORMATION

## 1.1 EUT INFORMATION

<b>Applicant</b>	D-Link Corporation 14420 Myford Road Suite 100 Irvine California United States 92606
<b>Manufacturer</b>	D-Link Corporation 14420 Myford Road Suite 100 Irvine California United States 92606
<b>Equipment</b>	AX3000 Wi-Fi 6 Smart Home Gateway Wi-Fi 6 AX3000 IoT Gateway
<b>Model No.</b>	MS30
<b>Model Discrepancy</b>	N/A
<b>Brand Name</b>	D-Link
<b>Received Date</b>	January 31, 2024
<b>Date of Test</b>	April 16 ~ June 27, 2024
<b>EUT Power Rating</b>	EUT Power from Adapter. (1) AMIGO / AMS200-1201500FU I/P: 100-240Vac, 50/60Hz, 0.8A Max/50VA O/P: 12.0Vdc, 1.5A (2) AMIGO / AMS200-1201500F I/P: 100-240Vac, 50/60Hz, 0.8A Max/50VA O/P: 12.0Vdc, 1.5A, 18.0W
<b>S.W Version</b>	1.00
<b>H.W: Version</b>	A1

**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/ax HE20: 2412MHz ~ 2462MHz 802.11n HT 40/ax HE40: 2422MHz ~ 2452MHz
Modulation Type	1. IEEE 802.11b mode: CCK 2. IEEE 802.11g mode: OFDM 3. IEEE 802.11n HT 20 MHz mode : OFDM 4. IEEE 802.11n HT 40 MHz mode : OFDM 5. IEEE 802.11ax HE 20 MHz mode : OFDMA 6. IEEE 802.11ax HE 40 MHz mode : OFDMA
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 4. IEEE 802.11n HT 40 MHz mode : 7 Channels 5. IEEE 802.11ax HE 20 MHz mode : 11 Channels 6. IEEE 802.11ax HE 40 MHz mode : 7 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
<input type="checkbox"/> 1 MHz or less	1	Middle
<input type="checkbox"/> 1 MHz to 10 MHz	2	1 near top and 1 near bottom
<input checked="" type="checkbox"/> More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

### 1.3 ANTENNA INFORMATION

<b>Antenna Type</b>	<input type="checkbox"/> PIFA <input type="checkbox"/> PCB <input checked="" type="checkbox"/> Dipole <input type="checkbox"/> Coils													
<b>Antenna Gain</b>	<table border="1"> <thead> <tr> <th>Frequency</th> <th>2G-1 (Chain 0) Gain (dBi)</th> <th>2G-2 (Chain 1) Gain (dBi)</th> <th>MIMO Gain (dBi)</th> <th>Total Gain (dBi)</th> </tr> </thead> <tbody> <tr> <td>2412-2472MHz</td> <td>1.27</td> <td>1.79</td> <td>1.54</td> <td>4.54</td> </tr> </tbody> </table>				Frequency	2G-1 (Chain 0) Gain (dBi)	2G-2 (Chain 1) Gain (dBi)	MIMO Gain (dBi)	Total Gain (dBi)	2412-2472MHz	1.27	1.79	1.54	4.54
	Frequency	2G-1 (Chain 0) Gain (dBi)	2G-2 (Chain 1) Gain (dBi)	MIMO Gain (dBi)	Total Gain (dBi)									
2412-2472MHz	1.27	1.79	1.54	4.54										
<b>Note:</b> Total Gain=antenna gain + beamforming gain														
<b>Antenna Trade / Model</b>	Chain 0: JAE / AP02DL2527487C0 Chain 1: JAE / AP02DL2527488C0													
<b>Antenna Connector</b>	MHF compatible													

**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.
2. Power Directional Gain =  $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$  dBi for BF Mode.  
 Power Directional gain =  $10 \log[(10G1/10 + 10G2/10 + \dots + 10GN/10)/NANT]$  dBi for MIMO(CDD) mode.

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## 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	Ben Yang	-
Radiation	Tony Chao 、 Ray Li	-
RF Conducted	Marco Chan	-

**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
Signal Analyzer	KEYSIGHT	N9030B	MY62291089	2023-10-13	2024-10-12
Attenuator	Marvelous Microwave Inc	MVE2213-10	08	2023-11-07	2024-11-06
<b>Software</b>	Radio Test Software Ver. 21				

966A_Radiated Wi-Fi 2.4GHz					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Signal Analyzer	KEYSIGHT	N9010A	MY52220817	2024-03-15	2025-03-14
Thermo-Hygro Meter	WISEWIND	1206	D07	2023-12-08	2024-12-07
Active Loop Antenna	SCHWARZBECK	FMZB 1513-60	1513-60-028	2023-12-13	2024-12-12
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
				2024-06-12	2025-06-13
Horn Antenna	SCHWARZBECK	BBHA9170	1047	2023-12-13	2024-12-12
Pre-Amplifier	EMCI	EMC184045SE	980860	2023-12-12	2024-12-11
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
<b>Software</b>	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	2024-06-14	2025-06-13
LISN	TESEQ	LN2-16N	22012	2024-02-29	2025-02-27
Cable	EMCI	CFD300-NL	CERF	2023-06-27	2024-06-26
				2024-06-26	2025-06-25
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

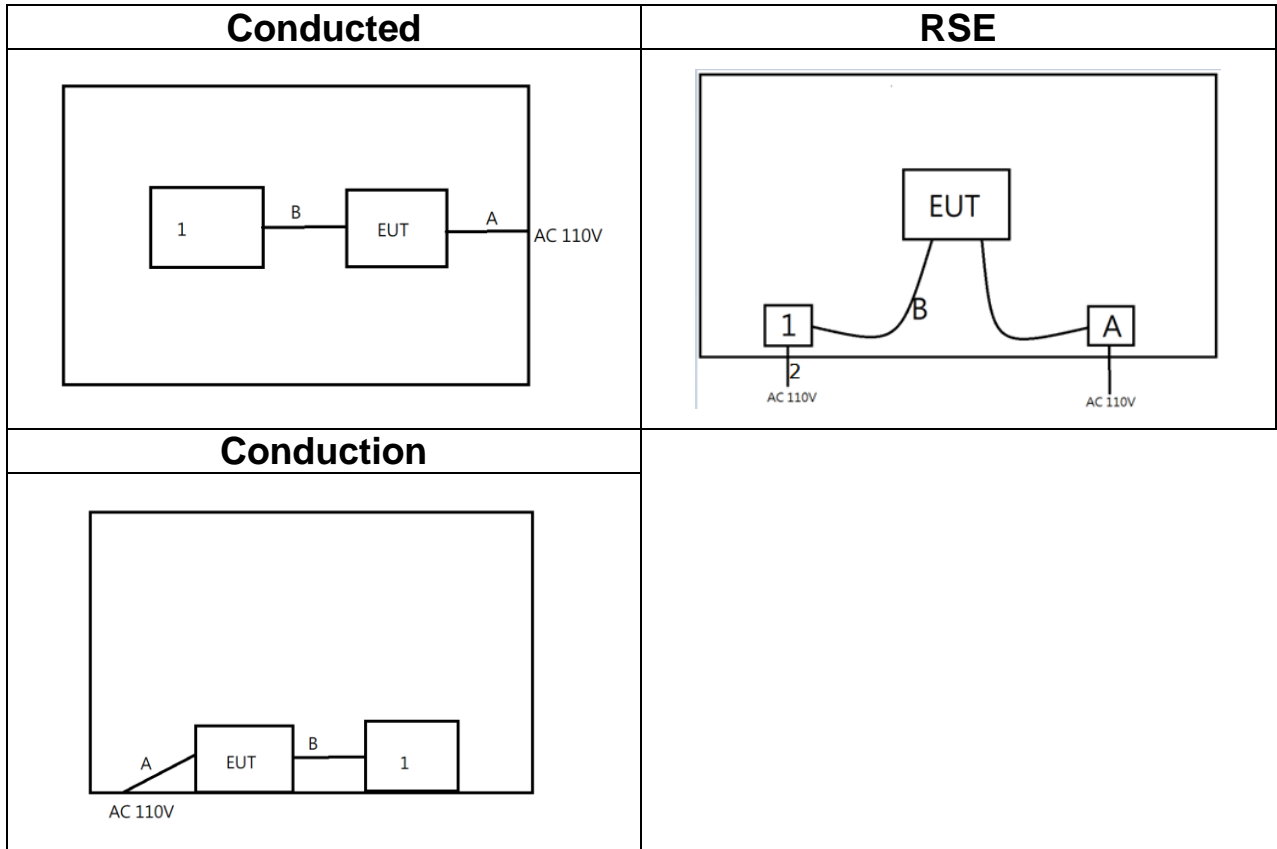
EUT Accessories Equipment						
No.	Equipment	Brand	Model	Series No.	FCC ID	IC
	N/A					

Support Equipment (Conducted)						
No.	Equipment	Brand	Model	Series No.	FCC ID	
1	NB(L)	Lenovo	X260	N/A	N/A	
A	Adapter	AMIGO	AMS200-1201500FU	N/A	N/A	
B	RJ45	Nienyi Group	NYS4710	N/A	N/A	

Support Equipment (RSE)						
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	
A	Adapter	AMIGO	AMS200-1201500FU	N/A	N/A	
B	RJ45	Nienyi Group	NYS4710	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	
A	Adapter	AMIGO	AMS200-1201500FU	N/A	N/A	
B	RJ45	Nienyi Group	NYS4710	N/A	N/A	

### 1.8 TEST SETUP DIAGRAM



### 1.9 TEST PROGRAM

The EUT connection corresponds to the surrounding fixture control board.

This EUT uses " Tera Term v4.73 " and " QA Tool v0.0.2.17 " software 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 662911 D01, KDB 558074 D01.

## 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 IEEE 802.11n HT40 mode :MCS0 IEEE 802.11ax HE20 mode :MCS0 IEEE 802.11ax HE40 mode :MCS0
Test Channel Frequencies	<b>IEEE 802.11b mode :</b> 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz <b>IEEE 802.11g mode :</b> 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz <b>IEEE 802.11n HT20 mode :</b> 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz <b>IEEE 802.11n HT40 mode :</b> 1. Lowest Channel : 2422MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2452MHz <b>IEEE 802.11ax HE20 mode :</b> 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz <b>IEEE 802.11ax HE40 mode :</b> 1. Lowest Channel : 2422MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2452MHz
Operation Transmitter	IEEE 802.11b mode : 2T2R (SISO) IEEE 802.11g mode : 2T2R (SISO) IEEE 802.11n HT20 mode : 2T2R (MIMO) IEEE 802.11n HT40 mode : 2T2R (MIMO) IEEE 802.11ax HE20 mode : 2T2R (MIMO) IEEE 802.11ax HE40 mode : 2T2R (MIMO)

**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 Adapter(AMS200-1201500FU) Mode 2: EUT Power by Adapter(AMS200-1201500F)
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

Radiated Emission Measurement Above 1G	
Test Condition	Radiated Emission Above 1G
Power supply Mode	Mode 1: EUT Power by Adapter(AMS200-1201500FU) Mode 2: EUT Power by Adapter(AMS200-1201500F)
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4
Worst Position	<input type="checkbox"/> Placed in fixed position. <input checked="" type="checkbox"/> Placed in fixed position at X-Plane (E2-Plane) <input type="checkbox"/> Placed in fixed position at Y-Plane (E1-Plane) <input type="checkbox"/> 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 Adapter(AMS200-1201500FU) Mode 2: EUT Power by Adapter(AMS200-1201500F)
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

Radiated Emission Measurement [Co-Location]	
Test Condition	Radiated Emission [Co-Location]
Power supply Mode	Mode 1: EUT Power by Wi-Fi 2.4G+Wi-Fi 5G+Zigbee Mode 2: EUT Power by Wi-Fi 2.4G+Wi-Fi 5G+BLE_2M
Worst Mode	<input type="checkbox"/> Mode 1 <input checked="" type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

**Remark:**

1. The worst mode was record in this test report.
2. AC power line conducted emission and were 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
4. The device supports SISO and MIMO at 802.11n20/n40/ax20/ax40 mode, per pre-test, MIMO 2TX mode was the worst and reported.
5. The device supports non\_BF and BF modes. Since the non \_BF mode similar to BF radio frequency characteristics, some test items of BF mode will be exempted.

### 3.3 EUT DUTY CYCLE

#### Non-Beamformig

**Temperature:** 20.3 ~ 24.5°C

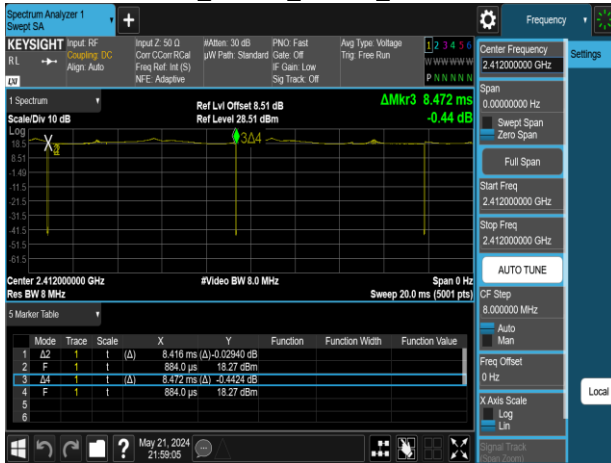
**Test date:** May 21 ~ June 27, 2024

**Humidity:** 53 ~ 64% RH

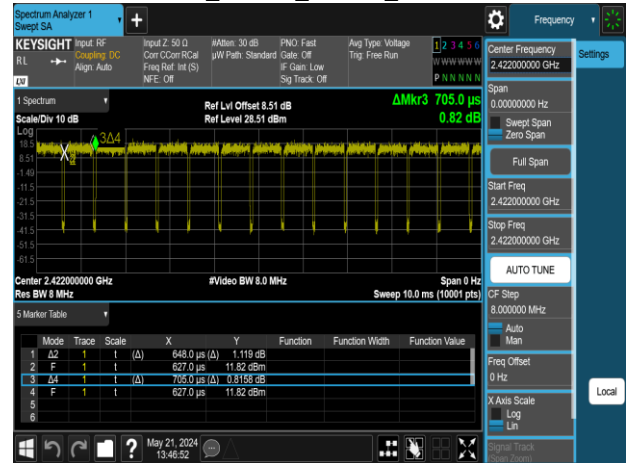
**Tested by:** Marco Chan

Mode		Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
802.11b		99.34	0.03	0.12	0.01
802.11g		96.01	0.18	0.72	1.00
802.11n_20		95.74	0.19	0.77	1.00
802.11n_40		91.91	0.37	1.54	2.00
Mode	RU Config	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
802.11ax_20	Full	94.74	0.23	0.97	1.00
802.11ax_40	Full	90.56	0.43	1.83	2.00

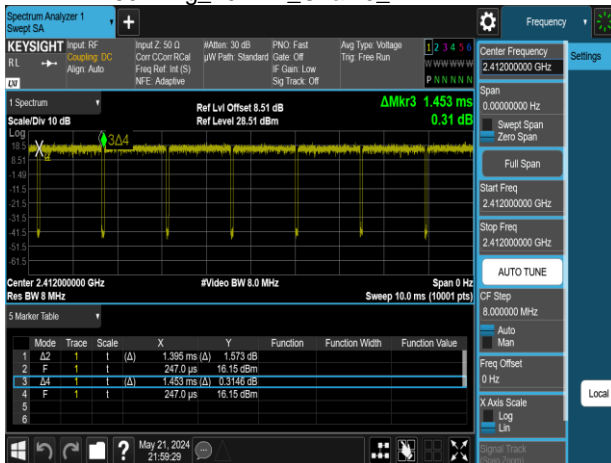
802.11b\_20MHz\_Chain0\_2412MHz



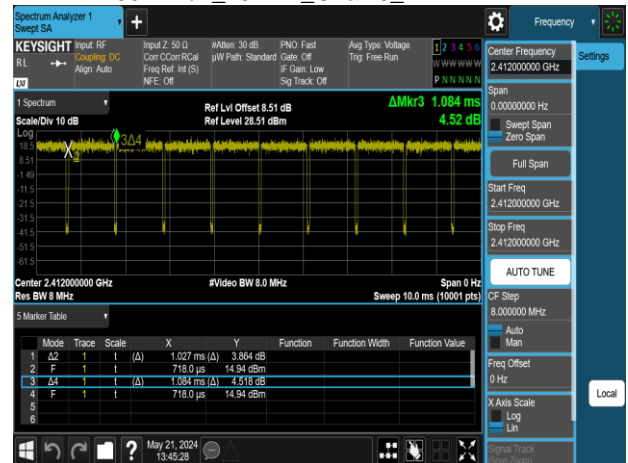
802.11n\_40MHz\_Chain0\_2422MHz



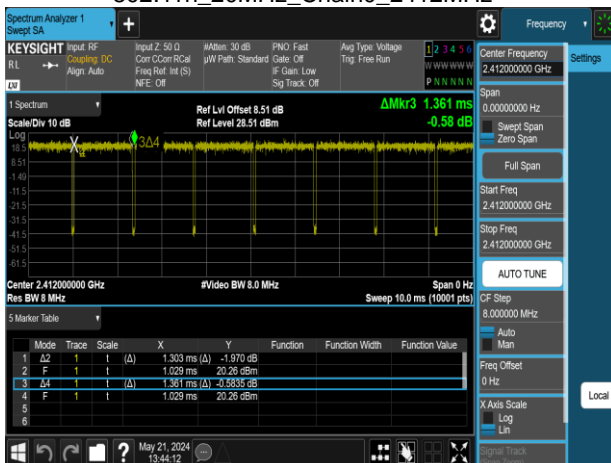
802.11g\_20MHz\_Chain0\_2412MHz



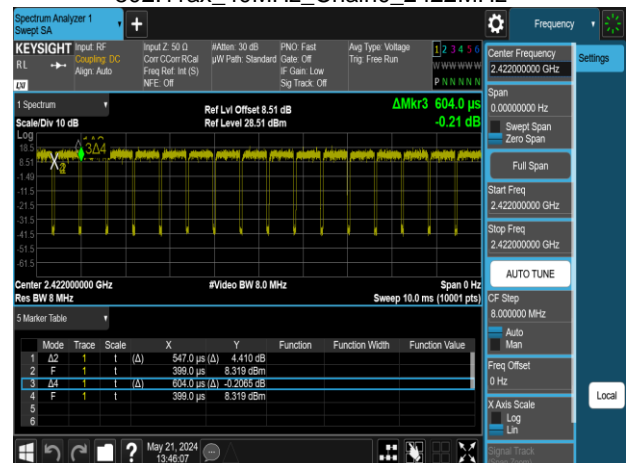
802.11ax\_20MHz\_Chain0\_2412MHz



802.11n\_20MHz\_Chain0\_2412MHz



802.11ax\_40MHz\_Chain0\_2422MHz





### **Beamformig**

**Temperature:** 23.7 ~ 23.8°C

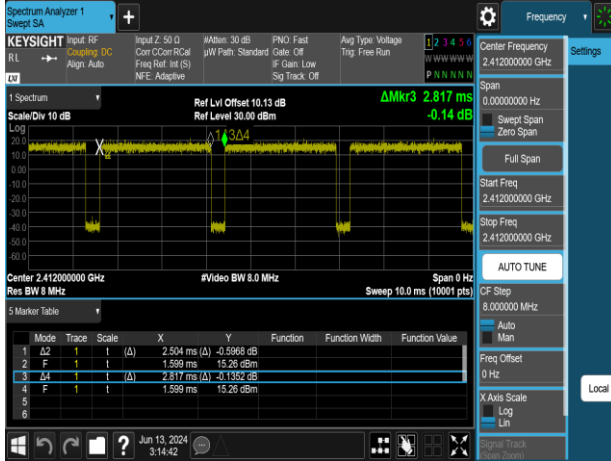
**Test date:** June 13 ~ 14, 2024

**Humidity:** 55 ~ 58% RH

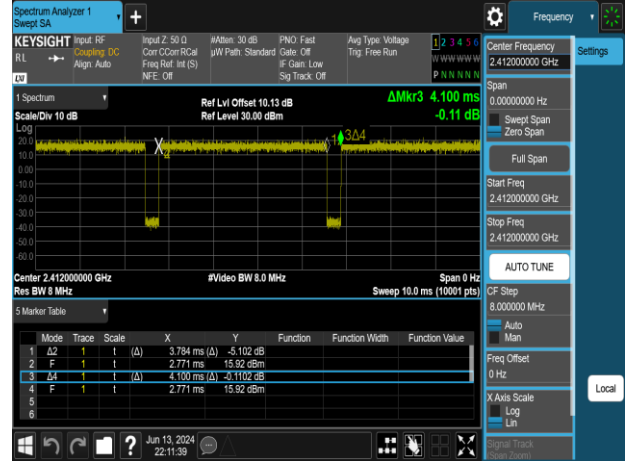
**Tested by:** Marco Chan

Mode		Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
802.11n_20		88.89	0.51	0.40	1.00
802.11n_40		88.71	0.52	0.41	1.00
Mode	RU Config	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
802.11ax_20	Full	92.29	0.35	0.26	1.00
802.11ax_40	Full	85.87	0.66	0.52	1.00

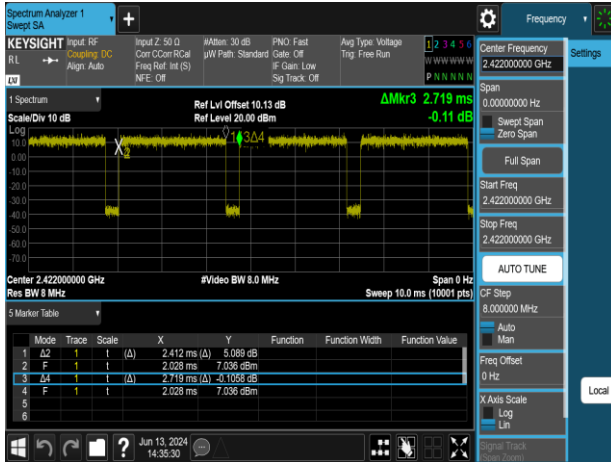
802.11n\_20MHz\_Chain0\_2412MHz



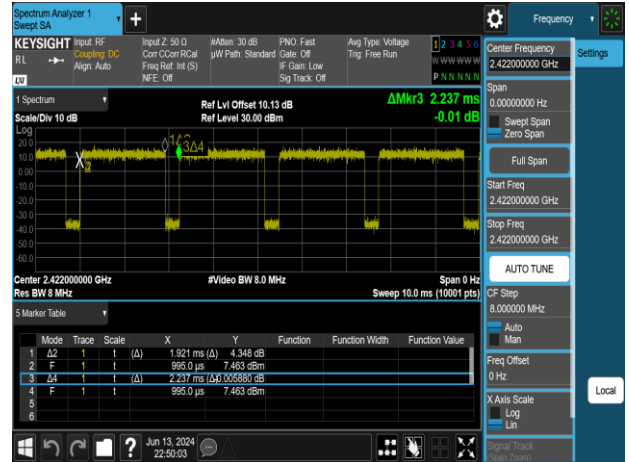
802.11ax\_20MHz\_Chain0\_2412MHz



802.11n\_40MHz\_Chain0\_2422MHz



802.11ax\_40MHz\_Chain0\_2422MHz



Report No.: TMWK2309003308KR

## 4. TEST RESULT

### 4.1 AC POWER LINE CONDUCTED EMISSION

#### 4.1.1 Test Limit

According to §15.207(a),

Frequency Range (MHz)	Limits(dB $\mu$ V)	
	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

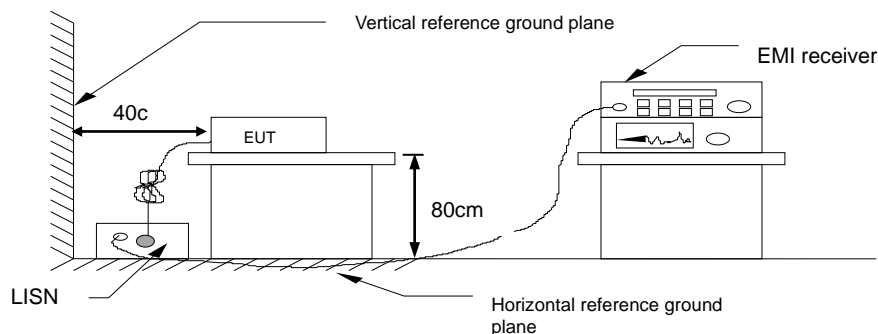
\* Decreases with the logarithm of the frequency.

#### 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.

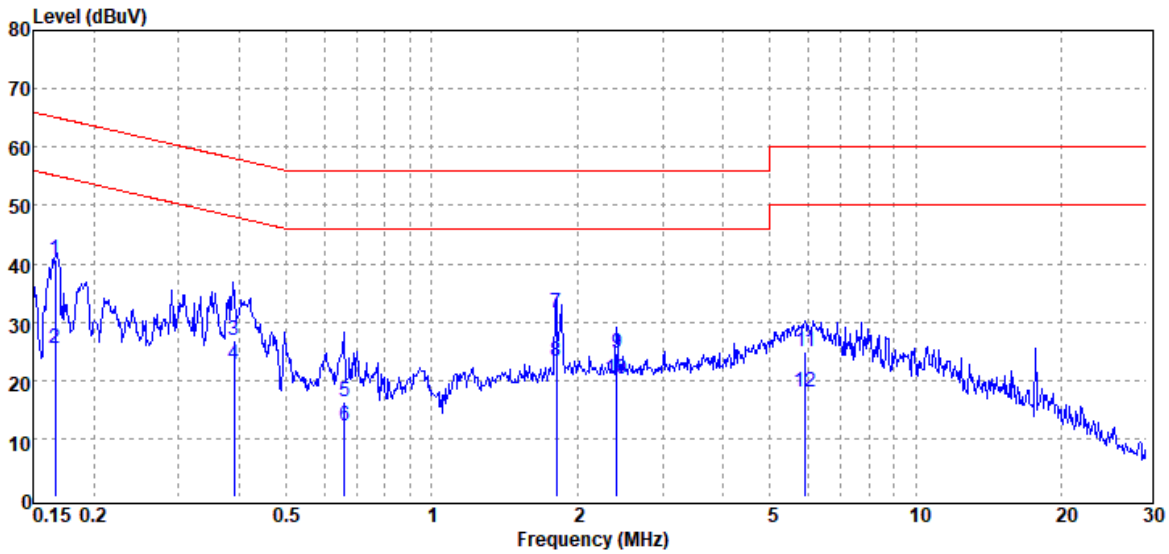
#### 4.1.3 Test Setup



## 4.1.4 Test Result

Project No : TM-2309000207P  
 Operation Mode : 2.4G  
 Test Chamber : Conduction  
 Probe : LINE  
 Note :

Test Date : 2024-06-24  
 Temp./Humi. : 23.4°C / 54%  
 Engineer : Ben Yang  
 Test Voltage : AC 120V/60Hz



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V	Limit dB $\mu$ V	Margin dB
0.167	QP	40.57	0.14	40.71	65.12	-24.41
0.167	Average	25.39	0.14	25.53	55.12	-29.59
0.390	QP	26.72	0.14	26.86	58.06	-31.20
0.390	Average	22.50	0.14	22.64	48.06	-25.42
0.661	QP	16.18	0.16	16.34	56.00	-39.66
0.661	Average	11.92	0.16	12.08	46.00	-33.92
1.809	QP	31.39	0.20	31.59	56.00	-24.41
1.809	Average	23.17	0.20	23.37	46.00	-22.63
2.414	QP	24.51	0.23	24.74	56.00	-31.26
2.414	Average	19.98	0.23	20.21	46.00	-25.79
5.922	QP	24.70	0.29	24.99	60.00	-35.01
5.922	Average	17.79	0.29	18.08	50.00	-31.92

Note: 1. Actual FS= Spectrum Read Level + Factor

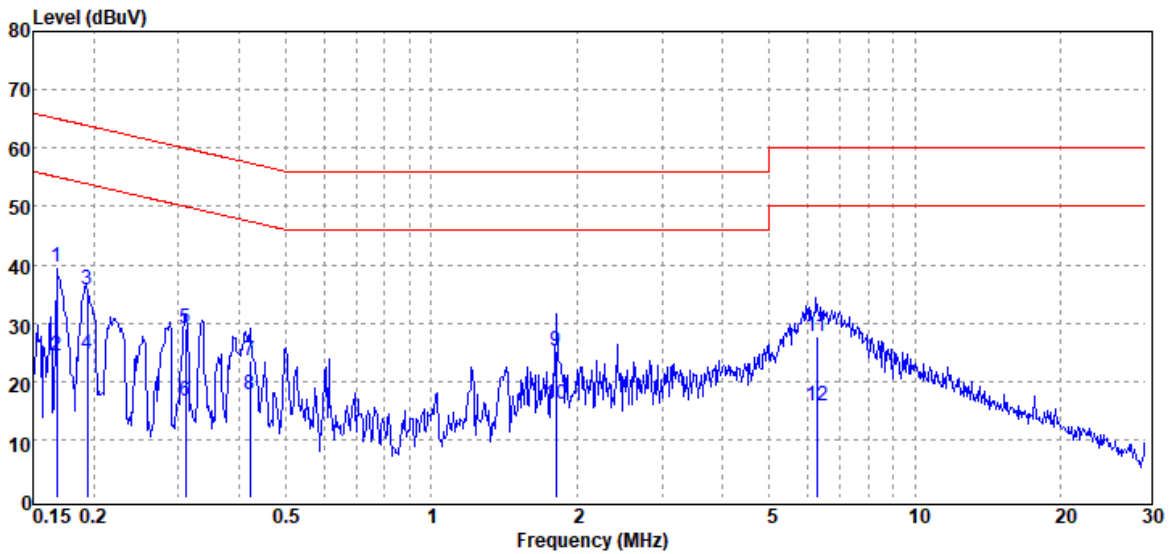
Note: 2. Margin= Actual FS - Limit

Report No.: TMWK2309003308KR

Rev.: 00

Project No : TM-2309000207P  
 Operation Mode : 2.4G  
 Test Chamber : Conduction  
 Probe : NEUTRAL  
 Note :

Test Date : 2024-06-24  
 Temp./Humi. : 23.4°C / 54%  
 Engineer : Ben Yang  
 Test Voltage : AC 120V/60Hz



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.168	QP	39.36	0.11	39.47	65.06	-25.59
0.168	Average	24.11	0.11	24.22	55.06	-30.84
0.194	QP	35.61	0.11	35.72	63.86	-28.14
0.194	Average	24.48	0.11	24.59	53.86	-29.27
0.310	QP	28.87	0.11	28.98	59.97	-30.99
0.310	Average	16.46	0.11	16.57	49.97	-33.40
0.422	QP	23.37	0.11	23.48	57.41	-33.93
0.422	Average	17.60	0.11	17.71	47.41	-29.70
1.812	QP	25.10	0.18	25.28	56.00	-30.72
1.812	Average	15.78	0.18	15.96	46.00	-30.04
6.277	QP	27.46	0.27	27.73	60.00	-32.27
6.277	Average	15.52	0.27	15.79	50.00	-34.21

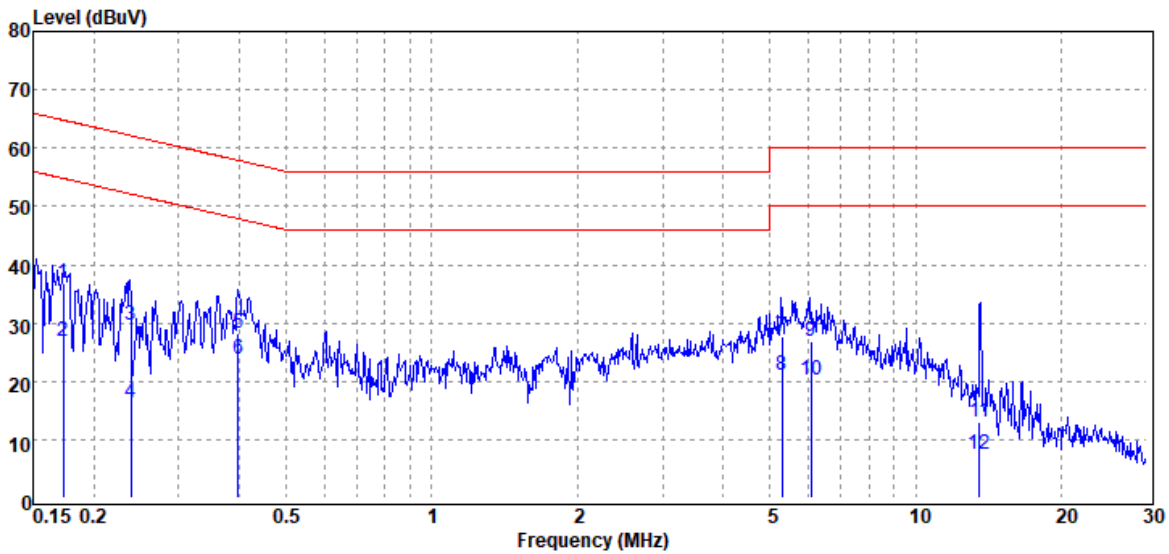
Note: 1. Actual FS= Spectrum Read Level + Factor  
 Note: 2. Margin= Actual FS - Limit

Report No.: TMWK2309003308KR

Rev.: 00

Project No : TM-2309000207P  
 Operation Mode : 2.4G  
 Test Chamber : Conduction  
 Probe : LINE  
 Note :

Test Date : 2024-06-24  
 Temp./Humi. : 23.4°C / 54%  
 Engineer : Ben Yang  
 Test Voltage : AC 230V/50Hz



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.173	QP	36.80	0.14	36.94	64.80	-27.86
0.173	Average	26.83	0.14	26.97	54.80	-27.83
0.239	QP	29.60	0.14	29.74	62.14	-32.40
0.239	Average	16.21	0.14	16.35	52.14	-35.79
0.398	QP	27.98	0.14	28.12	57.90	-29.78
0.398	Average	23.72	0.14	23.86	47.90	-24.04
5.290	QP	27.29	0.29	27.58	60.00	-32.42
5.290	Average	20.81	0.29	21.10	50.00	-28.90
6.077	QP	26.67	0.29	26.96	60.00	-33.04
6.077	Average	20.02	0.29	20.31	50.00	-29.69
13.560	QP	12.61	0.40	13.01	60.00	-46.99
13.560	Average	7.15	0.40	7.55	50.00	-42.45

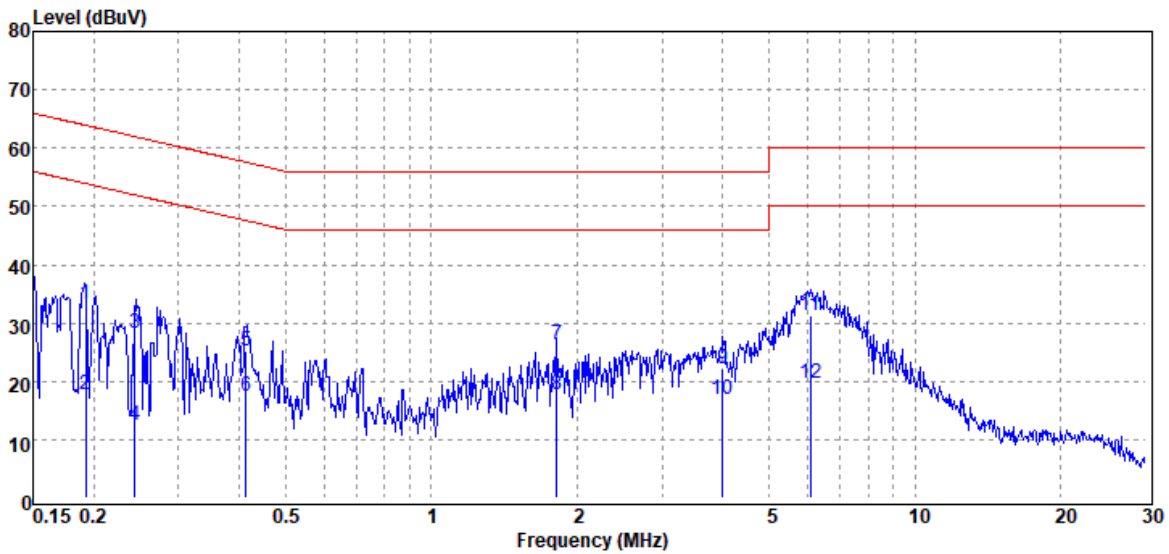
Note: 1. Actual FS= Spectrum Read Level + Factor  
 Note: 2. Margin= Actual FS - Limit

Report No.: TMWK2309003308KR

Rev.: 00

Project No : TM-2309000207P  
 Operation Mode : 2.4G  
 Test Chamber : Conduction  
 Probe : NEUTRAL  
 Note :

Test Date : 2024-06-24  
 Temp./Humi. : 23.4°C / 54%  
 Engineer : Ben Yang  
 Test Voltage : AC 230V/50Hz



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.193	QP	33.16	0.11	33.27	63.91	-30.64
0.193	Average	17.49	0.11	17.60	53.91	-36.31
0.244	QP	28.19	0.11	28.30	61.97	-33.67
0.244	Average	12.34	0.11	12.45	51.97	-39.52
0.414	QP	24.95	0.11	25.06	57.57	-32.51
0.414	Average	17.24	0.11	17.35	47.57	-30.22
1.814	QP	26.13	0.18	26.31	56.00	-29.69
1.814	Average	17.49	0.18	17.67	46.00	-28.33
3.998	QP	21.95	0.23	22.18	56.00	-33.82
3.998	Average	16.53	0.23	16.76	46.00	-29.24
6.073	QP	31.07	0.27	31.34	60.00	-28.66
6.073	Average	19.33	0.27	19.60	50.00	-30.40

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

Report No.: TMWK2309003308KR

## 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

### Non-Beamformig

Temperature: 20.3 ~ 24.5°C

Test date: May 21 ~ June 27, 2024

Humidity: 53 ~ 64% RH

Tested by: Marco Chan

### 6dB BANDWIDTH

#### 1. Chain 0

##### 802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	8062.00	≥ 500	PASS
2437	<b>8071.00</b>	≥ 500	PASS
2462	8069.00	≥ 500	PASS

##### 802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15770.00	≥ 500	PASS
2437	<b>16070.00</b>	≥ 500	PASS
2462	16050.00	≥ 500	PASS

#### 2. Chain 1

##### 802.11b Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	<b>8085.00</b>	≥ 500	PASS
2437	8081.00	≥ 500	PASS
2462	8076.00	≥ 500	PASS

##### 802.11g Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16310.00	≥ 500	PASS
2437	16320.00	≥ 500	PASS
2462	<b>16330.00</b>	≥ 500	PASS

### 3. MIMO

#### 802.11n\_HT\_20M Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	<b>16950.00</b>	$\geq 500$	PASS
2437	16310.00	$\geq 500$	PASS
2462	16380.00	$\geq 500$	PASS

#### 802.11n\_HT\_20M Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17560.00	$\geq 500$	PASS
2437	17580.00	$\geq 500$	PASS
2462	<b>17590.00</b>	$\geq 500$	PASS

#### 802.11n\_HT\_40M Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	<b>35180.00</b>	$\geq 500$	PASS
2437	35160.00	$\geq 500$	PASS
2452	35170.00	$\geq 500$	PASS

#### 802.11n\_HT\_40M Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	35150.00	$\geq 500$	PASS
2437	<b>35190.00</b>	$\geq 500$	PASS
2452	35180.00	$\geq 500$	PASS

**802.11ax\_HE\_20M Ch0**

Freq. (MHz)	RU Config	6dB BW (kHz)	Limit (kHz)	Result
2412	full	<b>18700.00</b>	$\geq 500$	PASS
2437	full	18660.00	$\geq 500$	PASS
2462	full	18460.00	$\geq 500$	PASS

**802.11ax\_HE\_20M Ch1**

Freq. (MHz)	RU Config	6dB BW (kHz)	Limit (kHz)	Result
2412	full	<b>18780.00</b>	$\geq 500$	PASS
2437	full	18370.00	$\geq 500$	PASS
2462	full	18560.00	$\geq 500$	PASS

**802.11ax\_HE\_40M Ch0**

Freq. (MHz)	RU Config	6dB BW (kHz)	Limit (kHz)	Result
2422	full	35510.00	$\geq 500$	PASS
2437	full	35180.00	$\geq 500$	PASS
2452	full	36440.00	$\geq 500$	PASS

**802.11ax\_HE\_40M Ch1**

Freq. (MHz)	RU Config	6dB BW (kHz)	Limit (kHz)	Result
2422	full	35200.00	$\geq 500$	PASS
2437	full	<b>35920.00</b>	$\geq 500$	PASS
2452	full	35400.00	$\geq 500$	PASS

**BANDWIDTH 99%**

**1. Chain 0**

**802.11b Ch0**

<b>Freq. (MHz)</b>	<b>99% BW (MHz)</b>
2412	12.542
2437	12.595
2462	<b>12.774</b>

**802.11g Ch0**

<b>Freq. (MHz)</b>	<b>99% BW (MHz)</b>
2412	17.010
2437	<b>17.341</b>
2462	17.059

**2. Chain 1**

**802.11b Ch1**

<b>Freq. (MHz)</b>	<b>99% BW (MHz)</b>
2412	12.662
2437	12.674
2462	<b>12.811</b>

**802.11g Ch0**

<b>Freq. (MHz)</b>	<b>99% BW (MHz)</b>
2412	16.808
2437	<b>18.123</b>
2462	16.945

### 3. MIMO

#### 802.11n\_HT20M Ch0

Freq. (MHz)	99% BW (MHz)
2412	18.014
2437	<b>19.168</b>
2462	18.095

#### 802.11n\_HT20M Ch1

Freq. (MHz)	99% BW (MHz)
2412	18.019
2437	<b>18.133</b>
2462	17.992

#### 802.11n\_HT40M Ch0

Freq. (MHz)	99% BW (MHz)
2422	36.408
2437	<b>36.589</b>
2452	36.516

#### 802.11n\_HT40M Ch1

Freq. (MHz)	99% BW (MHz)
2422	36.208
2437	<b>36.329</b>
2452	36.277

#### 802.11ax\_HE20M Ch0

Freq. (MHz)	RU Config	99% BW (MHz)
2412	full	18.910
2437	full	<b>19.367</b>
2462	full	19.130

#### 802.11ax\_HE20M Ch1

Freq. (MHz)	RU Config	99% BW (MHz)
2412	full	18.902
2437	full	<b>19.214</b>
2462	full	19.104

#### 802.11ax\_HE40M Ch0

Freq. (MHz)	RU Config	99% BW (MHz)
2422	full	37.599
2437	full	37.667
2452	full	<b>37.708</b>

#### 802.11ax\_HE40M Ch0

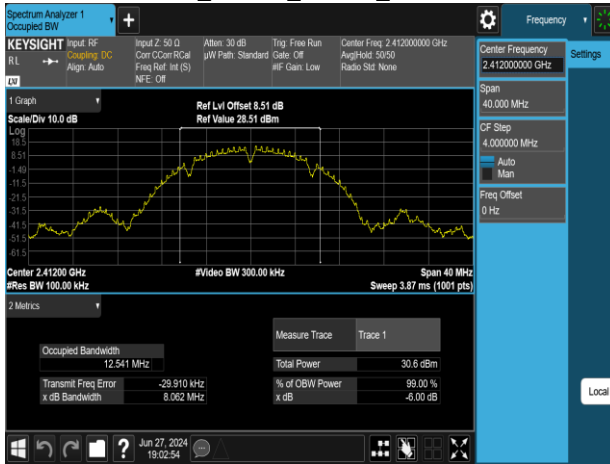
Freq. (MHz)	RU Config	99% BW (MHz)
2422	full	37.599
2437	full	37.667
2452	full	<b>37.708</b>

## Test Data

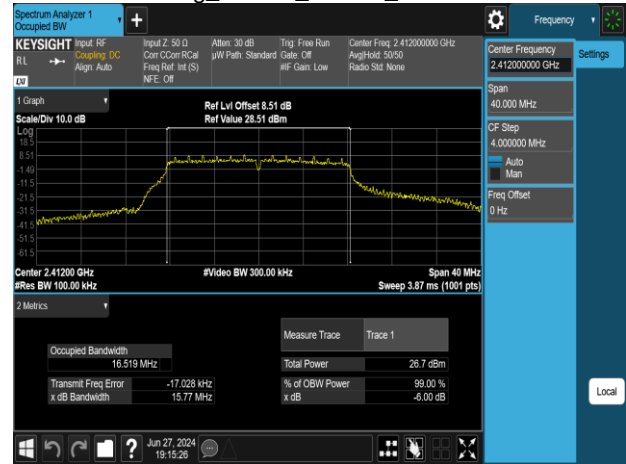
### 6dB BANDWIDTH

#### 1. Chain 0

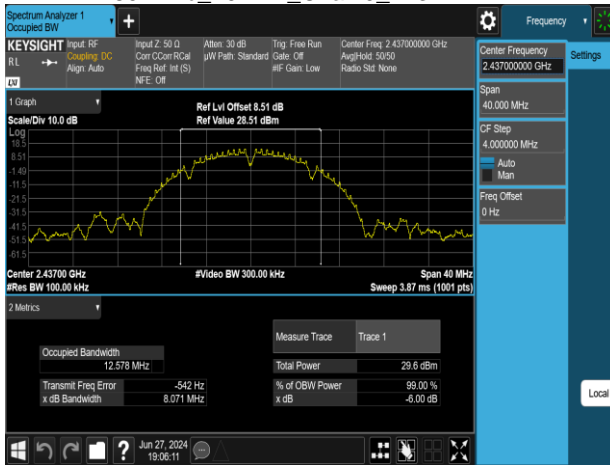
802.11b\_20MHz\_Chain0\_2412MHz



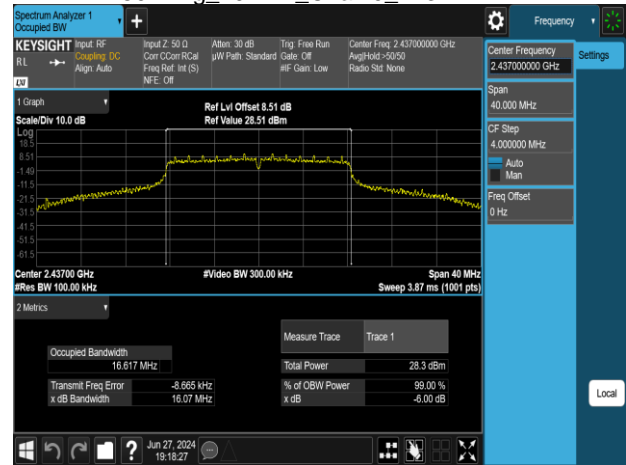
802.11g\_20MHz\_Chain0\_2412MHz



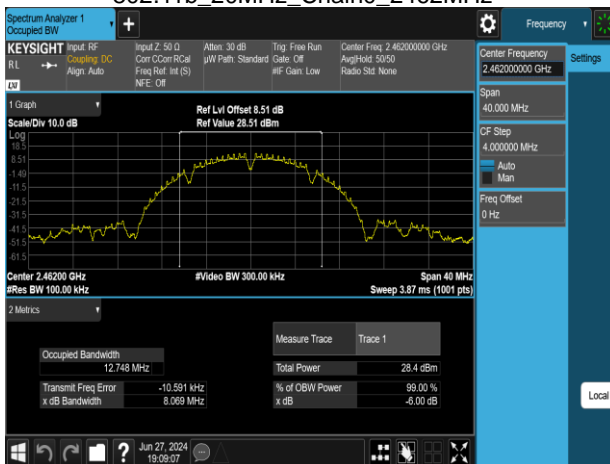
802.11b\_20MHz\_Chain0\_2437MHz



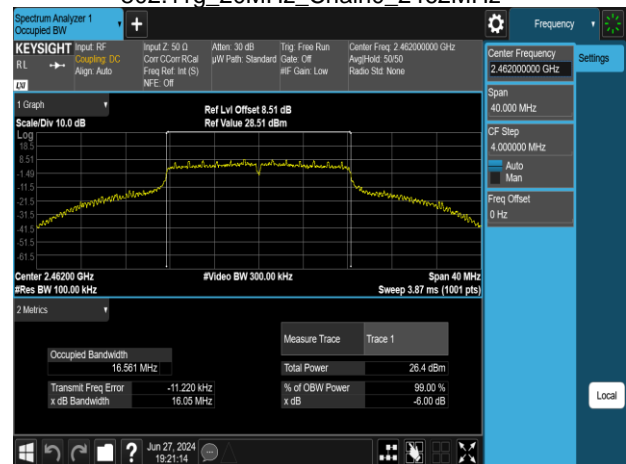
802.11g\_20MHz\_Chain0\_2437MHz



802.11b\_20MHz\_Chain0\_2462MHz



802.11g\_20MHz\_Chain0\_2462MHz

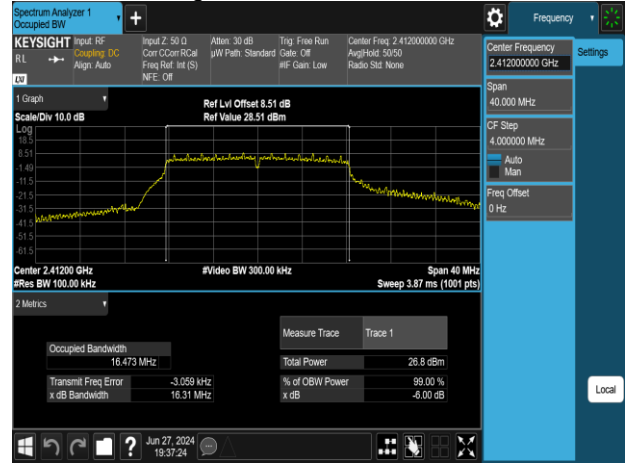


## 2. Chain 1

802.11b\_20MHz\_Chain1\_2412MHz



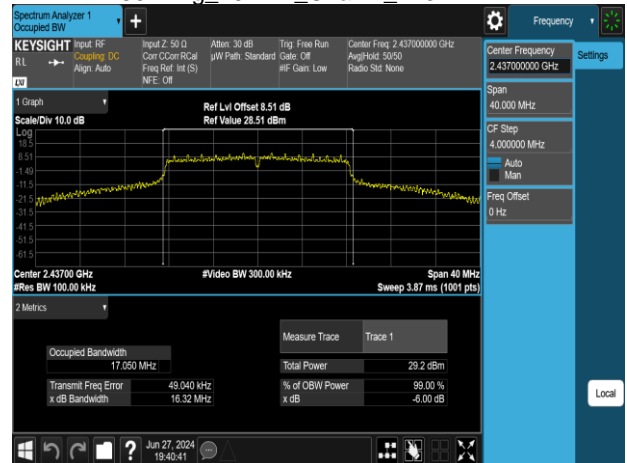
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802.11b\_20MHz\_Chain1\_2437MHz



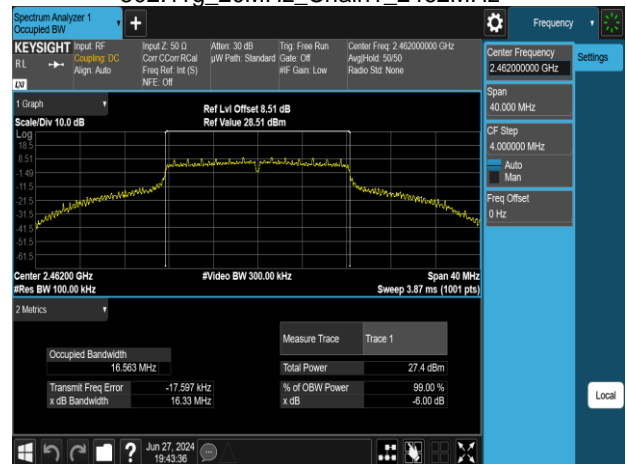
802.11g\_20MHz\_Chain1\_2437MHz



802.11b\_20MHz\_Chain1\_2462MHz

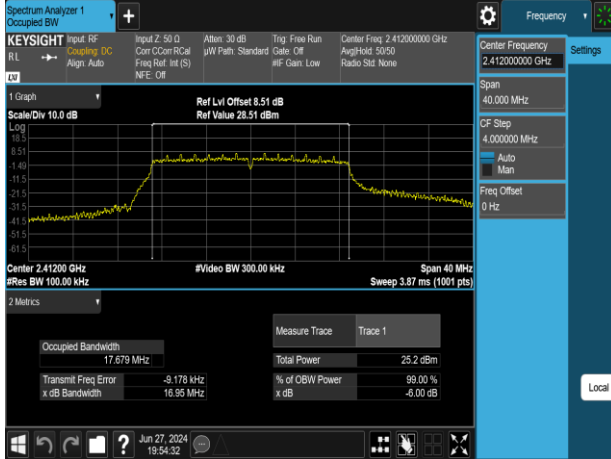


802.11g\_20MHz\_Chain1\_2462MHz

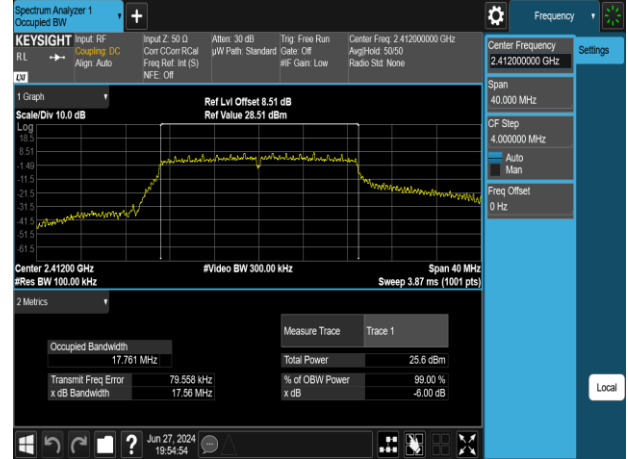


## 3. MIMO

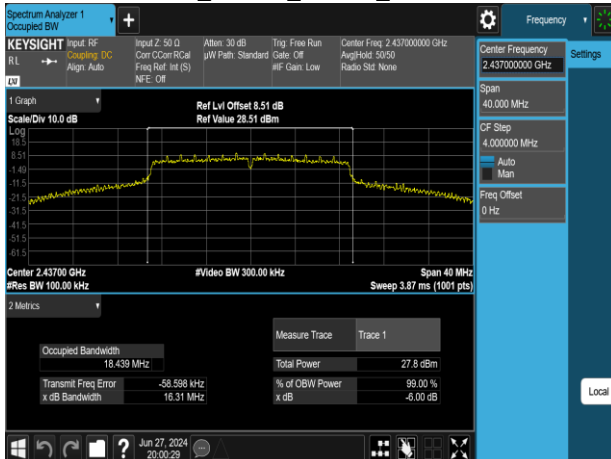
802.11n\_20MHz\_Chain0\_2412MHz



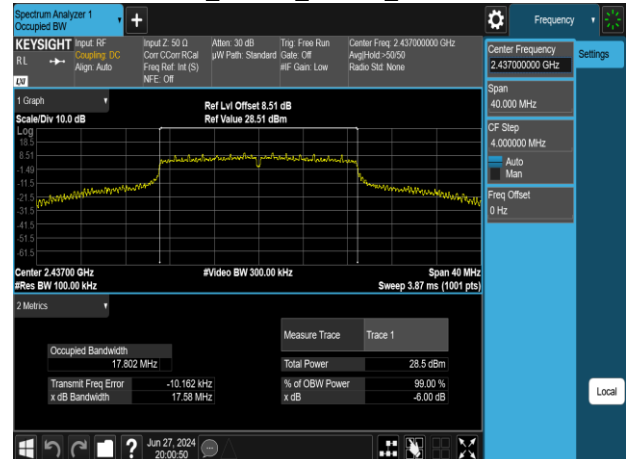
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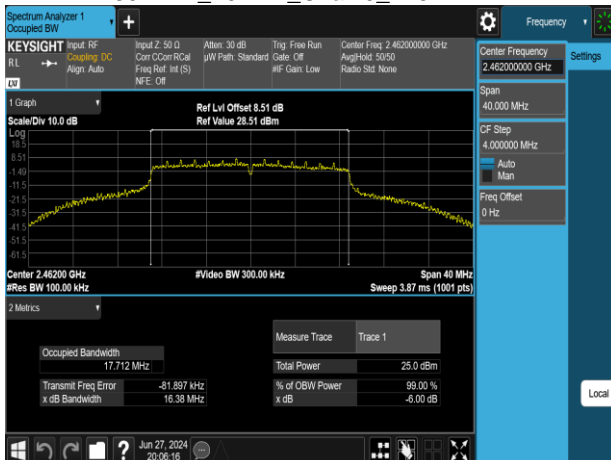
802.11n\_20MHz\_Chain0\_2437MHz



802.11n\_20MHz\_Chain1\_2437MHz



802.11n\_20MHz\_Chain0\_2462MHz

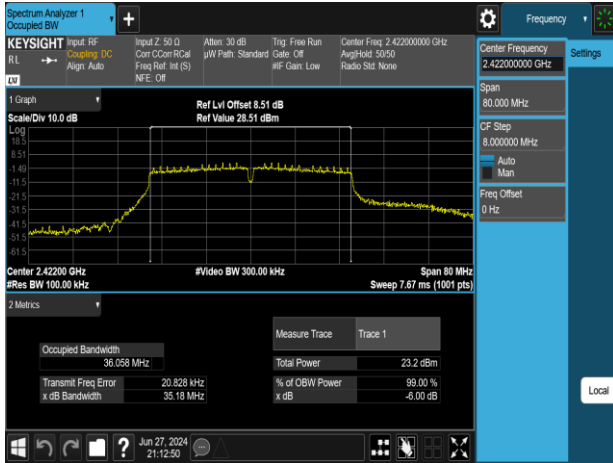


802.11n\_20MHz\_Chain1\_2462MHz





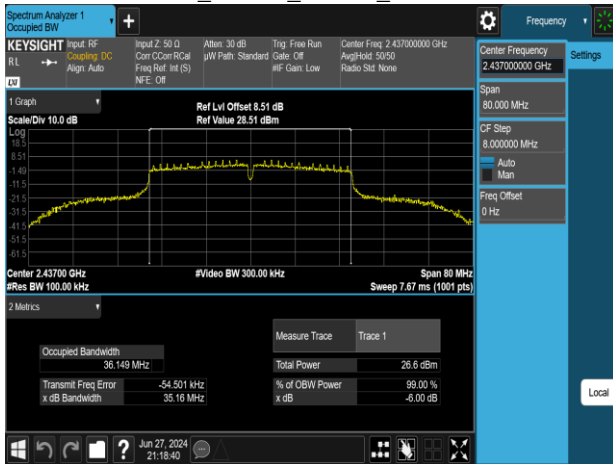
802.11n\_40MHz\_Chain0\_2422MHz



802.11n\_40MHz\_Chain1\_2422MHz



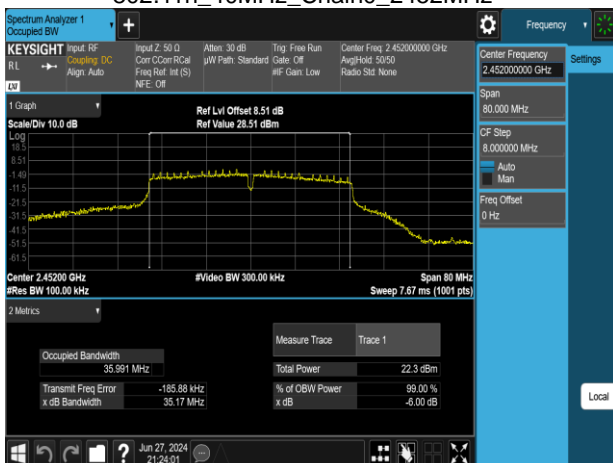
802.11n\_40MHz\_Chain0\_2437MHz



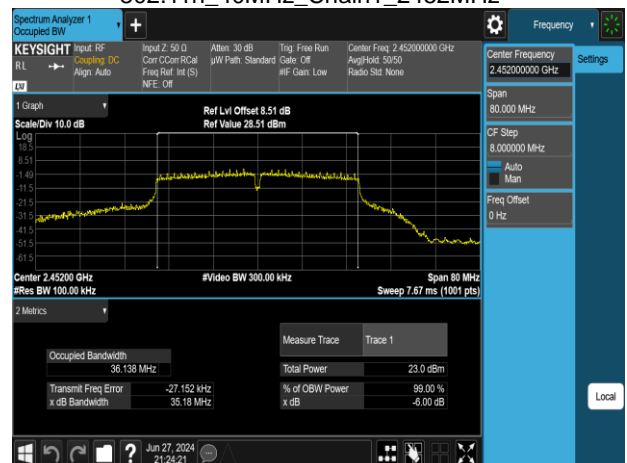
802.11n\_40MHz\_Chain1\_2437MHz



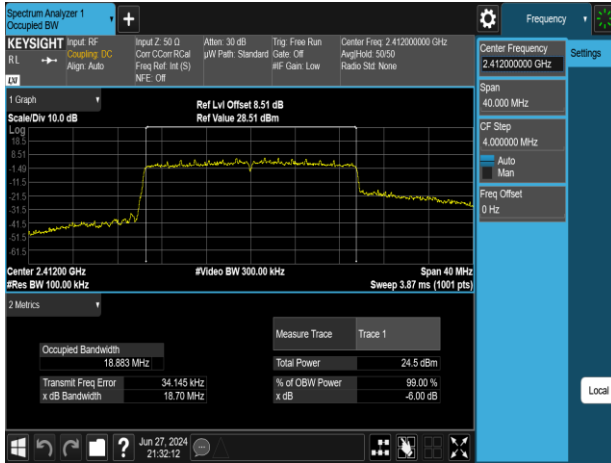
802.11n\_40MHz\_Chain0\_2452MHz



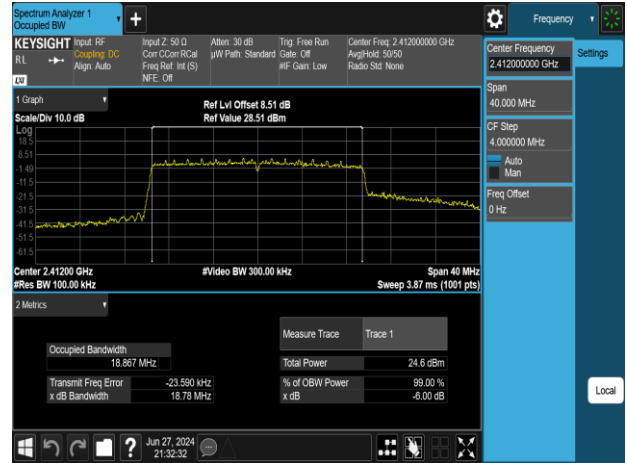
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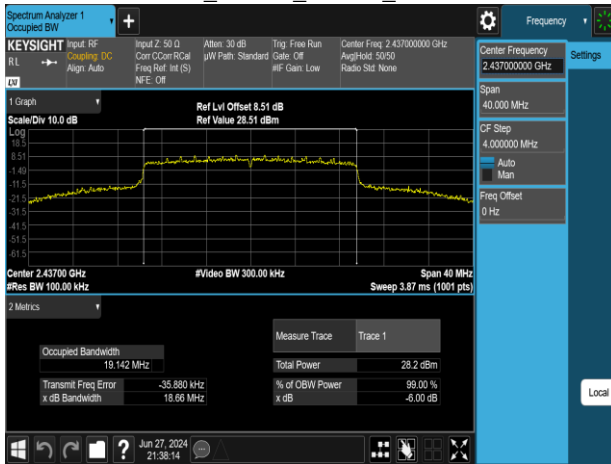
802.11ax\_20MHz\_Chain0\_2412MHz



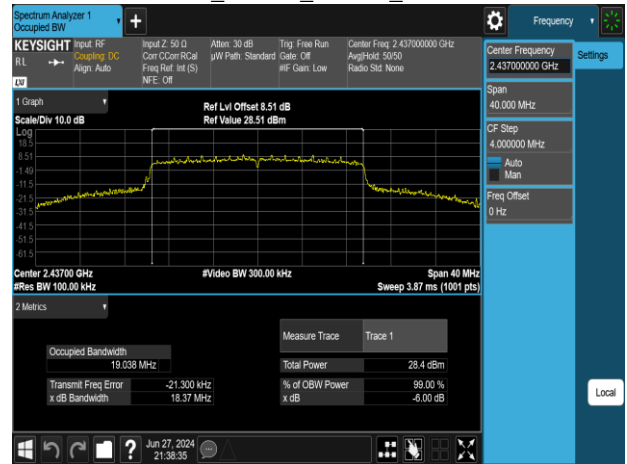
802.11ax\_20MHz\_Chain1\_2412MHz



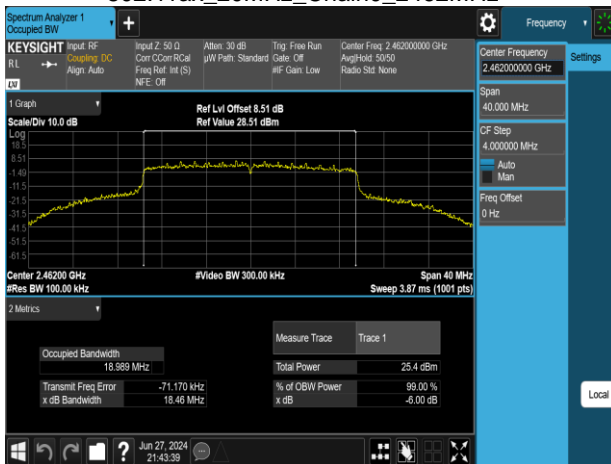
802.11ax\_20MHz\_Chain0\_2437MHz



802.11ax\_20MHz\_Chain1\_2437MHz



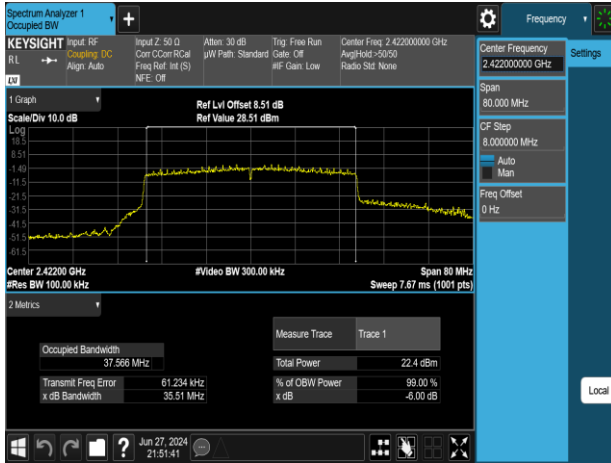
802.11ax\_20MHz\_Chain0\_2462MHz



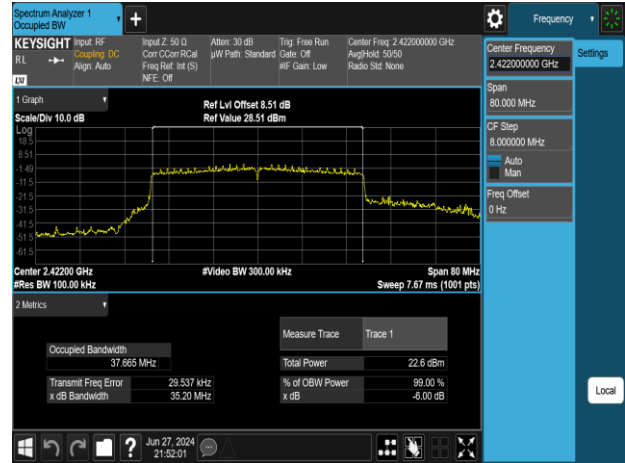
802.11ax\_20MHz\_Chain1\_2462MHz



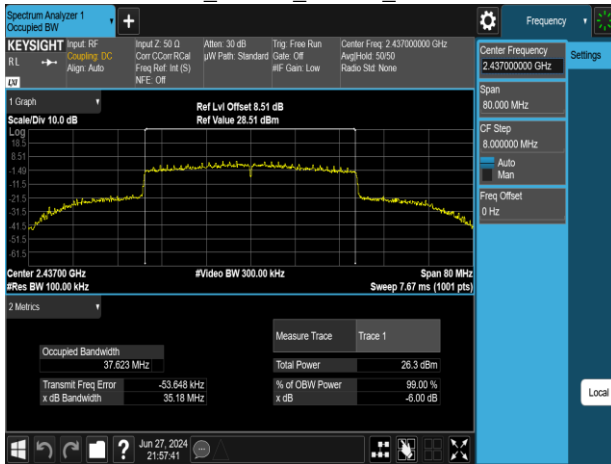
802.11ax\_40MHz\_Chain0\_2422MHz



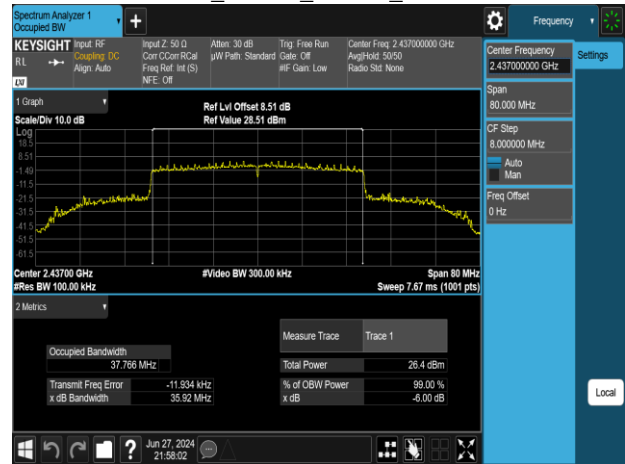
802.11ax\_40MHz\_Chain1\_2422MHz



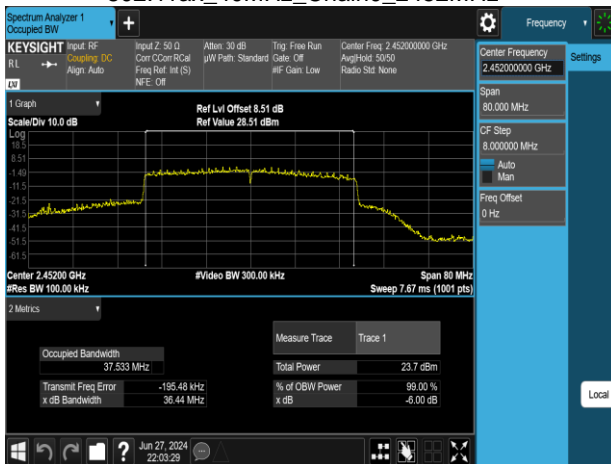
802.11ax\_40MHz\_Chain0\_2437MHz



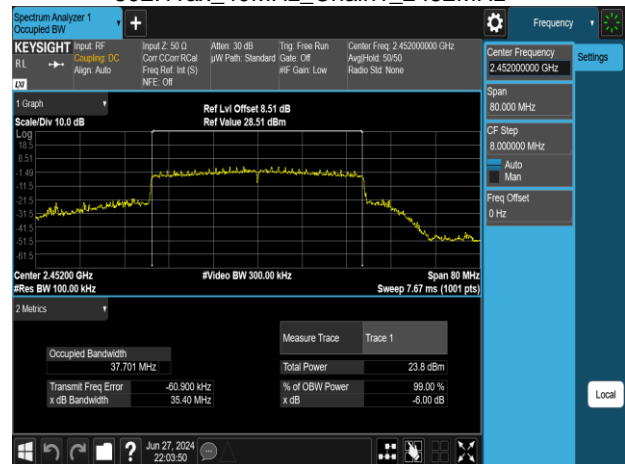
802.11ax\_40MHz\_Chain1\_2437MHz



802.11ax\_40MHz\_Chain0\_2452MHz



802.11ax\_40MHz\_Chain1\_2452MHz



## BANDWIDTH 99%

### 1. Chain 0

802.11b\_20MHz\_Chain0\_2412MHz



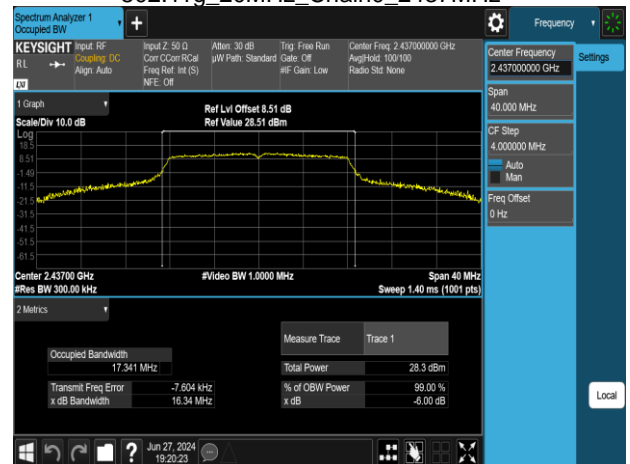
802.11g\_20MHz\_Chain0\_2412MHz



802.11b\_20MHz\_Chain0\_2437MHz



802.11g\_20MHz\_Chain0\_2437MHz



802.11b\_20MHz\_Chain0\_2462MHz

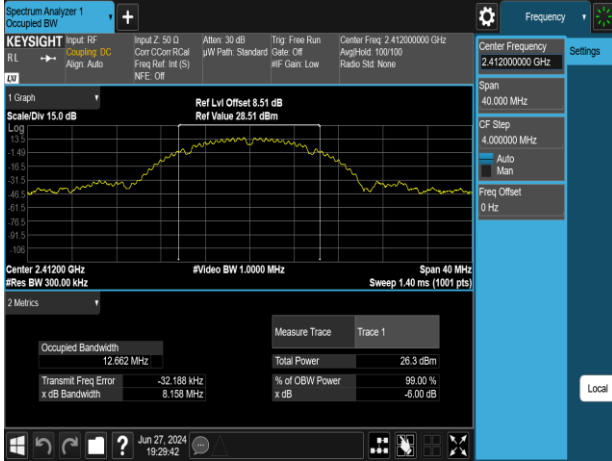


802.11g\_20MHz\_Chain0\_2462MHz

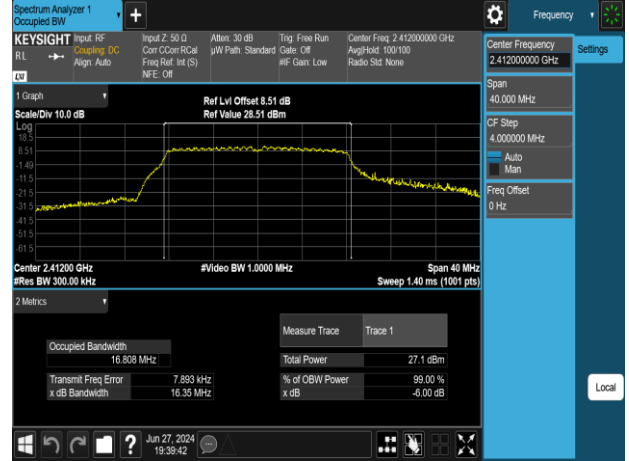


## 2. Chain 1

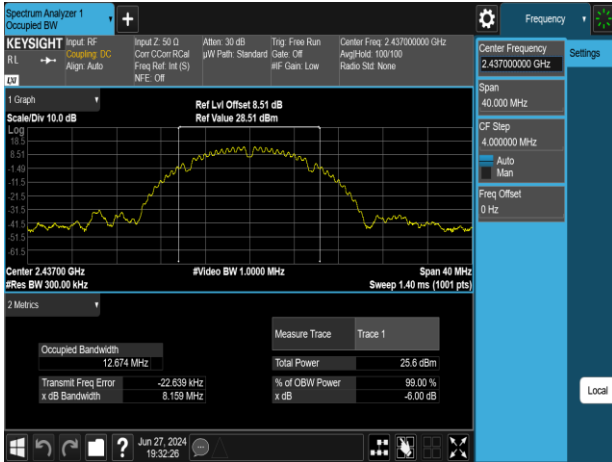
802.11b\_20MHz\_Chain1\_2412MHz



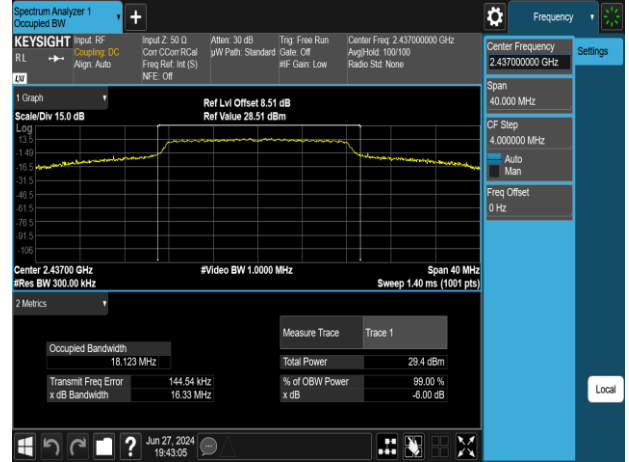
802.11g\_20MHz\_Chain1\_2412MHz



802.11b\_20MHz\_Chain1\_2437MHz



802.11g\_20MHz\_Chain1\_2437MHz



802.11b\_20MHz\_Chain1\_2462MHz



802.11g\_20MHz\_Chain1\_2462MHz

