ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant:	Qisda Corporation NO. 157, SHAN-YING ROAD, SHAN-TING LI, GUEISHAN DIST., TAOYUAN 333, Taiwan
Manufacturer:	Qisda Corporation NO. 157 & 159, SHANYING RD., GUEISHAN DIST., TAOYUAN CITY 33341, TAIWAN, R.O.C.
Product Name:	Bluetooth/WLAN Antenna device
Brand Name:	QISDA
Model No.:	S4CWM-19-BB255-C-C2
Report Number:	TERF2410003019E2
FCC ID	VRSS4CWM19C2
IC:	8729A-S4CWM19C2
Date of EUT Received:	October 1, 2024
Date of Test:	October 18, 2024～November 27, 2024
Issue Date:	December 19, 2024

Approved By Aken Huang

Aken Huang

We hereby certify that:
The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT comply with FCC rule part §15.247, ISED RSS-247.

The results of this report relate only to the sample identified in this report.

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Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2410003019E2	00	Original	December 19, 2024	Karen Huang	

Note:

1、 The remark "*" indicates modification of the report upon requests from certification body.

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	Bluetooth/WLAN Antenna device
Brand Name:	QISDA
Model No.:	S4CWM-19-BB255-C-C2
Hardware Version:	S16
Firmware Version:	FW_18_53
EUT Series No.:	000000851
Power Supply:	3.3Vdc
Test Software (Name/Version)	Putty v0.81

1.2 RF Specification

WLAN 2.4GHz

Wi-Fi	Frequency Range	Channels	Rated Power (dBm)		Modulation Technology
			Peak	Avg.	
802.11b	2412~2462	11	17.97	14.93	DSSS
802.11g	2412~2462	11	22.08	15.90	OFDM
802.11n_HT20	2412~2462	11	21.66	14.89	OFDM
802.11ax_HE20	2412~2462	11	22.03	11.91	OFDMA
Modulation type:		CCK, DQPSK, DBPSK for DSSS in 802.11b			
		64QAM, 16QAM, QPSK, BPSK for OFDM in 802.11g,11n			
		1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDMA in 802.11ax			
Data Rate:		802.11b: 1/2/5.5/11 Mbps			
		802.11g: 6/9/12/18/24/36/48/54 Mbps			
		802.11n_HT20:up to 72.2Mbps			
		802.11ax_HE20:up to 143.4Mbps			

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WLAN 2.4GHz for IC

Wi-Fi	Frequency Range	Channels	Rated Power (dBm)		Rated Power in dBm (EIRP)	Modulation Technology
			Peak	Avg.		
802.11b	2412~2462	11	17.97	14.93	17.37	DSSS
802.11g	2412~2462	11	22.08	15.90	18.34	OFDM
802.11n_HT20	2412~2462	11	21.66	14.89	17.33	OFDM
802.11ax_HE20	2412~2462	11	22.03	11.91	14.35	OFDMA
Modulation type:		CCK, DQPSK, DBPSK for DSSS in 802.11b				
		64QAM, 16QAM, QPSK, BPSK for OFDM in 802.11g,11n				
		1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDMA in 802.11ax				
Data Rate:		802.11b: 1/2/5.5/11 Mbps				
		802.11g: 6/9/12/18/24/36/48/54 Mbps				
		802.11n_HT20:up to 72.2Mbps				
		802.11ax_HE20:up to 143.4Mbps				

1.3 Antenna Designation

Antenna Type	Freq.	Antenna Port	Peak Antenna Gain (dBi)
Dipole Antenna	2.4GHz	Ch0	2.44

Note:

1. Antenna information is provided by the applicant.

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1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247
FCC KDB 558074 D01 15.247 Meas Guidance v05r02
RSS-Gen, Issue 5 April 2018, Amendment 2 (February 2021)
ANSI C63.10:2013

1.5 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 2		
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		
Note: Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.				

1.6 Special Accessories

There are no special accessories used while test was conducted.

1.7 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.

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2.4 Measurement Results Explanation Example

2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*6m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

2.4.2 For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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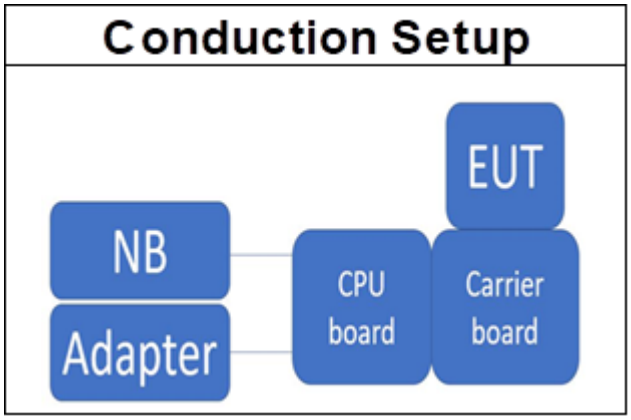
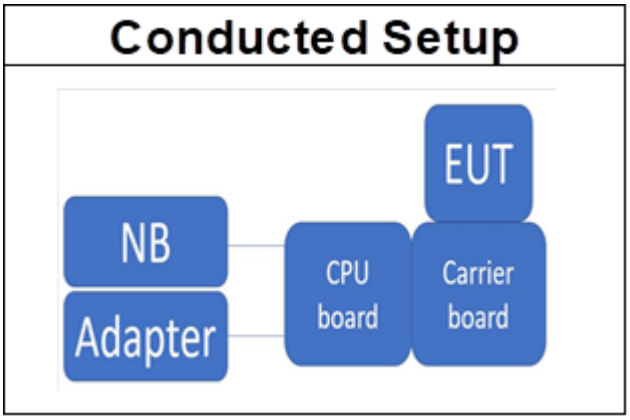
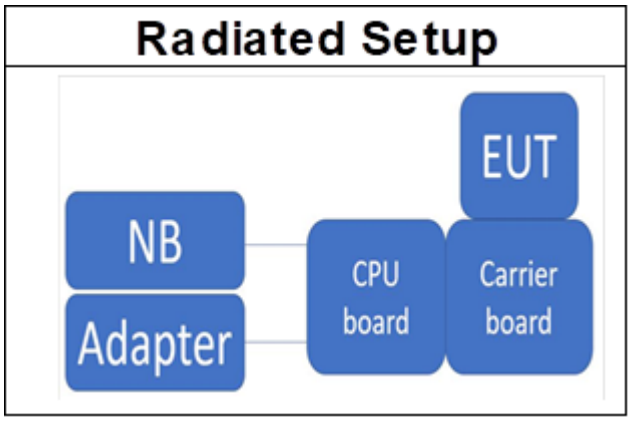
2.5 Test Configuration







2.6 Control Unit(s)

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
AC Adapter	Asian Power Devices Inc.	WA-36W12R	N/A	N/A	N/A
CPU board	Qisda	5E.64T51.001	N/A	N/A	N/A
Carrier board	Qisda	5E.64T50.001	N/A	N/A	N/A
LAN Cable	AMP	AMP-6e	4719862256612	N/A	N/A
Notebook	Lenovo	T470	P0001293	N/A	N/A
Conducted Emission Test Site: Conducted C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
LAN Cable	TATUNG	E210587	N/A	N/A	N/A
CPU board	Qisda	5E.64T51.001	N/A	N/A	N/A
Carrier board	Qisda	5E.64T50.001	N/A	N/A	N/A
Adapter	APD	WA-36W12R	N/A	N/A	N/A
Notebook	Lenovo	T14	P0003332	N/A	N/A

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Radiated Emission Test Site: SAC G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
AC Adapter	Asian Power Devices Inc.	WA-36W12R	N/A	N/A	N/A
CPU board	Qisda	5E.64T51.001	N/A	N/A	N/A
Carrier board	Qisda	5E.64T50.001	N/A	N/A	N/A
LAN Cable	AMP	AMP-6e	4719862256612	N/A	N/A
Notebook	Lenovo	T470	P0001293	N/A	N/A

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3 SUMMARY OF TEST RESULTS

FCC Rules	ISED Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	RSS-247 §5.4 d	Peak Output Power	Compliant
§15.247(a)(2)	RSS-247 §5.2 a RSS-Gen §6.7	Emission Bandwidth	Compliant
§15.209 §15.247(d)	RSS-247 §5.5	Conducted Band Edge and Spurious Emission	Compliant
§15.209 §15.247(d)	RSS-247 §5.5	Radiated Band Edge and Spurious Emission	Compliant
§15.205	RSS-Gen § 8.10	Restricted Bands	Compliant
§15.247(e)	RSS-247 §5.2 b	Power Spectral Density	Compliant
§15.203	N/A	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 Operating Frequencies

2400~2483.5 MHz	
20MHz	
CH	Freq. (MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.

   The given UE is pre-scanned among below modes.

Modulation		Transmission Chain								Single Transmission Spatial		Multi Transmission Spatial	
V	802.11 b	V	Ch0		Ch1		Ch2		Ch3	V	1TX		1TX
V	802.11 g	V	Ch0		Ch1		Ch2		Ch3	V	1TX		1TX
V	802.11 n	V	Ch0		Ch1		Ch2		Ch3	V	1TX		1TX
	802.11 ac		Ch0		Ch1		Ch2		Ch3		1TX		1TX
V	802.11 ax	V	Ch0		Ch1		Ch2		Ch3	V	1TX		1TX
	802.11 be		Ch0		Ch1		Ch2		Ch3		1TX		1TX

4. Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items.

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1,6,11	DSSS	1	ch0
802.11g	1 to 11	1,6,11	OFDM	6	ch0
802.11n_HT20	1 to 11	1,6,11	OFDM	MCS0	ch0

CONDUCTED TEST						
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	RU CONFIGURATION	DATA RATE (Mbps)	ANTENNA PORT
802.11ax_HE20	1 to 11	1,6,11	OFDMA	FULL RU 26/0,26/8 52/37,52/40 106/53,106/54	MCS0	ch0

TRANSMIT RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11g	1 to 11	6	OFDM	6	ch0

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TRANSMIT RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1,6,11	DSSS	1	ch0
802.11g	1 to 11	1,6,11	OFDM	6	ch0
802.11n_HT20	1 to 11	1,6,11	OFDM	MCS0	ch0

TRANSMIT RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	RU CONFIGURATION	DATA RATE (Mbps)	ANTENNA PORT
802.11ax_HE20	1 to 11	1,6,11	OFDMA	FULL RU 26/0,26/8 52/37,52/40 106/53,106/54	MCS0	ch0

Note:

The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty		
AC Power Line Conducted Emission	+/-	1.54	dB
Output Power measurement	+/-	0.97	dB
Emission Bandwidth	+/-	1.38	Hz
Conducted emission measurement	+/-	0.77	dB
Peak Power Density	+/-	0.61	dB
Temperature	+/-	0.6	°C
Humidity	+/-	3	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty				
Polarization: Vertical	**+/-**	**1.89**	**dB**	9kHz~30MHz
	+/-	**4.15**	**dB**	30MHz - 1000MHz
	+/-	**3.43**	**dB**	1GHz - 18GHz
	+/-	**3.86**	**dB**	18GHz - 40GHz
Polarization: Horizontal	**+/-**	**1.89**	**dB**	9kHz~30MHz
	+/-	**4.02**	**dB**	30MHz - 1000MHz
	+/-	**3.43**	**dB**	1GHz - 18GHz
	+/-	**3.86**	**dB**	18GHz - 40GHz
Radiated Spurious Emission	**+/-**	**2**	**dB**	33GHz-50GHz
	+/-	**1.59**	**dB**	50GHz-60GHz
	+/-	**1.7**	**dB**	60GHz-90GHz
	+/-	**1.64**	**dB**	90GHz-140GHz
	+/-	**3.83**	**dB**	140GHz-220GHz

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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6 MEASUREMENT EQUIPMENT USED

6.1 Emission from AC power line

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2024	03/26/2025
EMI Test Receiver	R&S	ESCI	101342	04/29/2024	04/28/2025
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	973	04/22/2024	04/21/2025
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2024	03/26/2025
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R

6.2 Conducted Measurement

Conducted Emission Test Site: Conducted C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Attenuator	Woken	WATT-218FS-10	RF18	11/15/2023	11/14/2024
Attenuator	Woken	WATT-218FS-10	RF18	11/14/2024	11/13/2025
Attenuator	Woken	WATT-218FS-10	RF19	11/15/2023	11/14/2024
Attenuator	Woken	WATT-218FS-10	RF19	11/14/2024	11/13/2025
DC Block	PASTERNACK	PE8210	RF155	11/15/2023	11/14/2024
DC Block	PASTERNACK	PE8210	RF155	11/14/2024	11/13/2025
Power Meter	Anritsu	ML2496A	2138005	09/25/2024	09/24/2025
Power Sensor	Anritsu	MA2411B	1911395	09/25/2024	09/24/2025
Power Sensor	Anritsu	MA2411B	1911396	09/25/2024	09/24/2025
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	05/24/2024	05/23/2025
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R

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6.3 Radiated Measurement

Radiated Emission Test Site: SAC G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
3m Site NSA	SGS	966 chamber G	N/A	03/30/2024	03/29/2025
Active Loop Antenna	COM-POWER	AL-130R	10160105	12/04/2023	12/03/2024
Broadband Antenna	SCHWARZBECK	VULB 9168	1208	07/17/2024	07/16/2025
Coaxial Cable	EMC Instruments	EMC104-SM-SM-8000-5000-5000	210219、210220、210221	03/13/2024	03/12/2025
Coaxial Cable	EMC Instruments	EMCCFD400-NM-NM-8000-5000-2000	210216、210217、210218	03/13/2024	03/12/2025
High Pass Filter	WI	WHKX10-2624-3200-18000-80SS	RF210	11/14/2024	11/13/2025
Horn Antenna	RF SPIN	DRH18-E	210105A18E	04/12/2024	04/11/2025
Horn Antenna	Schwarzbeck	BBHA9170	184	12/28/2023	12/27/2024
Lowpass Filter	Woken	EWT-56-0019	RF173	11/14/2024	11/13/2025
Pre-Amplifier	EMC Instruments	EMC118A45SE	980815	05/08/2024	05/07/2025
Pre-Amplifier	EMC Instruments	EMC330N	980781	03/13/2024	03/12/2025
Spectrum Analyzer	KEYSIGHT	N9010B	MY63440390	02/16/2024	02/15/2025
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R

NOTE: *N.C.R refers to Not Calibrated Required.*

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7 CONDUCTED EMISSION TEST

7.1 Standard Applicable

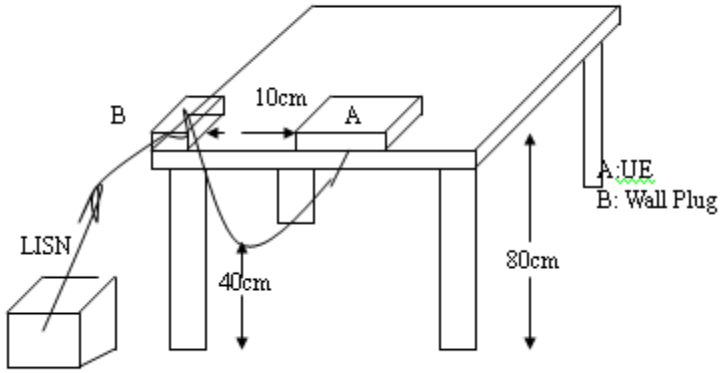
Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits (dBuV)	
	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
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

7.2 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

7.3 Test Setup



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7.4 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

7.5 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closest to the limit.

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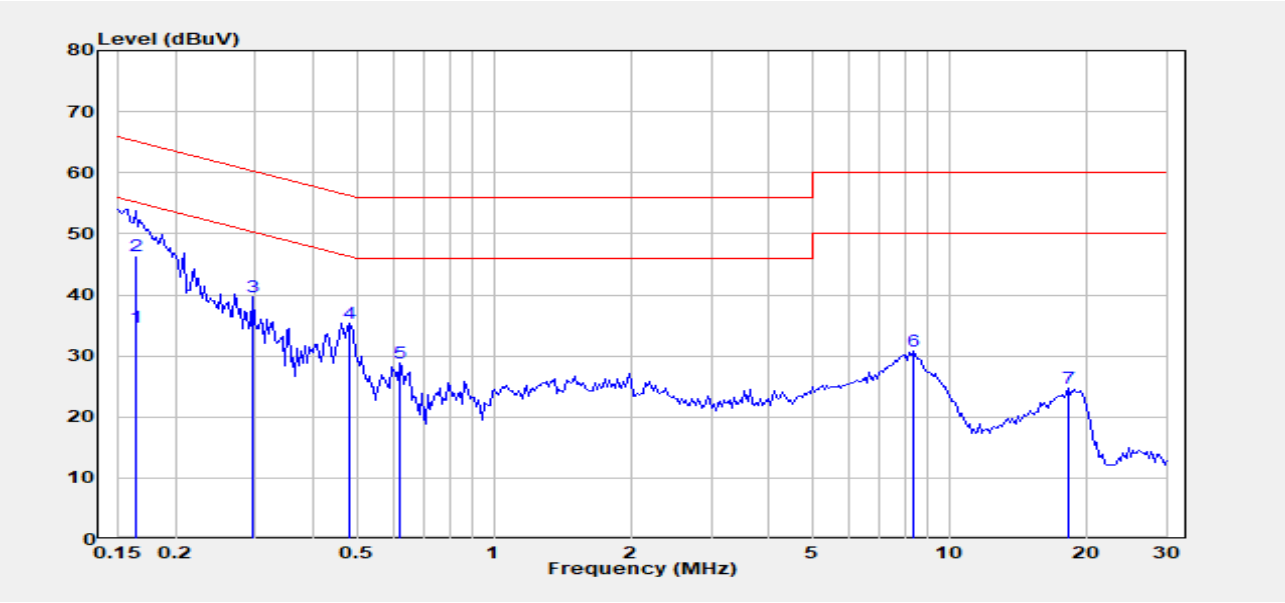
AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:TERF2410003019E2	Test Site	:Conduction C
Test Mode	:2.4G	Test Date	:2024-11-22
Power	:120V/60Hz	Temp./Humi	:22.3℃/55%
Probe	:L1	Engineer	:Alex Li



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.163	Average	24.00	10.65	34.65	55.30	-20.65
0.163	QP	35.80	10.65	46.45	65.30	-18.85
0.296	Peak	28.95	10.63	39.58	60.37	-20.79
0.481	Peak	24.81	10.62	35.43	56.32	-20.89
0.621	Peak	18.18	10.64	28.82	56.00	-27.18
8.323	Peak	19.90	10.96	30.85	60.00	-29.15
18.232	Peak	13.68	11.13	24.82	60.00	-35.18

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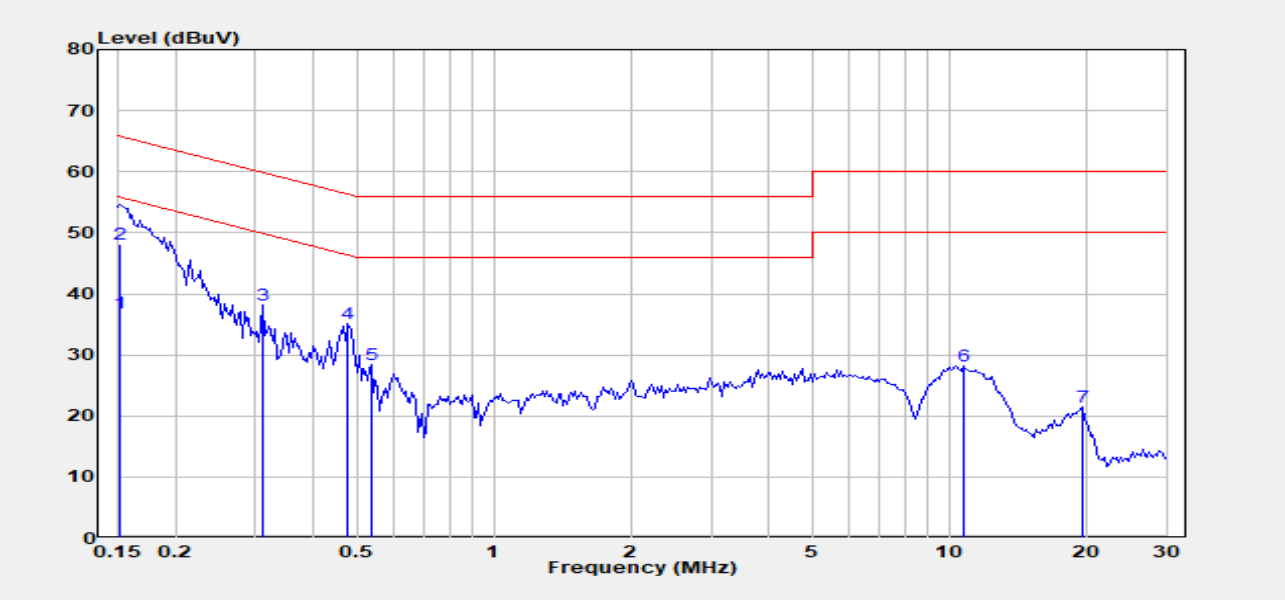
Report Number	:TERF2410003019E2	Test Site	:Conduction C
Test Mode	:2.4G	Test Date	:2024-11-22
Power	:120V/60Hz	Temp./Humi	:21.5℃/62%
Probe	:N	Engineer	:Alex Li



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.152	Average	26.20	10.66	36.86	55.91	-19.05
0.152	QP	37.50	10.66	48.16	65.91	-17.75
0.312	Peak	27.61	10.63	38.24	59.93	-21.69
0.476	Peak	24.45	10.60	35.06	56.41	-21.35
0.541	Peak	17.69	10.61	28.30	56.00	-27.70
10.733	Peak	17.30	10.97	28.27	60.00	-31.73
19.635	Peak	10.20	11.15	21.36	60.00	-38.64

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8 PEAK OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

8.1.1 Duty Cycle

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

8.1.2 FCC

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

8.1.3 ISED

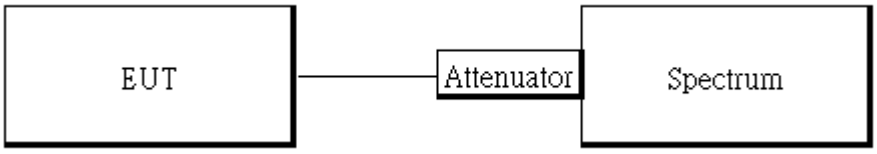
For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt and the e.i.r.p. shall not exceed 4 W (ISED only).

Note:

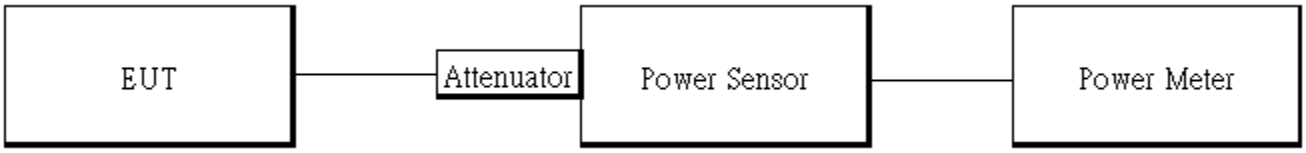
When the antenna gain is greater than 6 dBi, the power limit attenuated accordingly.

8.2 Test Setup

8.2.1 Duty Cycle



8.2.2 Output Power:



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8.3 Measurement Procedure

8.3.1 Duty Cycle:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

8.3.2 Output Power

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.
   Power Meter:
   It is used as the auxiliary test equipment to conduct the output power measurement.
4. Record the max. Reading as observed from Spectrum or Power Meter.

**** Note: The duty cycle factor** and below **is compensated to obtain the maximum value of measurement in average.***

8.4 Measurement Result

8.4.1 Duty Cycle:

Mode		Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11b		98.94	0.05	0.12	0.01
802.11g		93.46	0.29	0.70	1.00
802.11n_20		93.04	0.31	0.75	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	91.26	0.40	0.96	1.00
	26 RU	96.28	0.16	0.19	1.00
	52 RU	92.88	0.32	0.38	1.00
	106 RU	96.28	0.16	0.19	1.00

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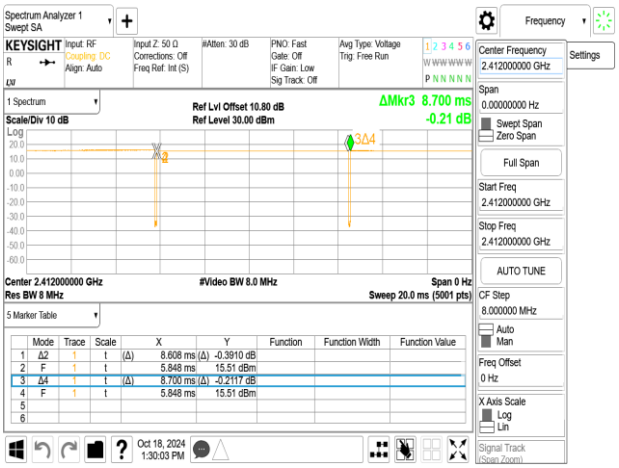
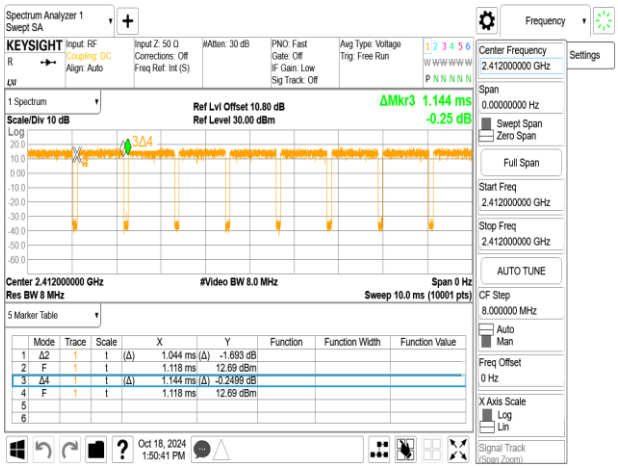
8.4.2 Duty Cycle test plots

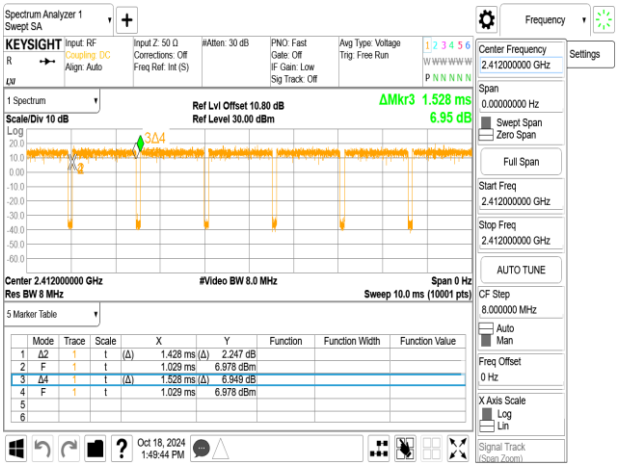
802.11b_20MHz_Chain0_2412MHz



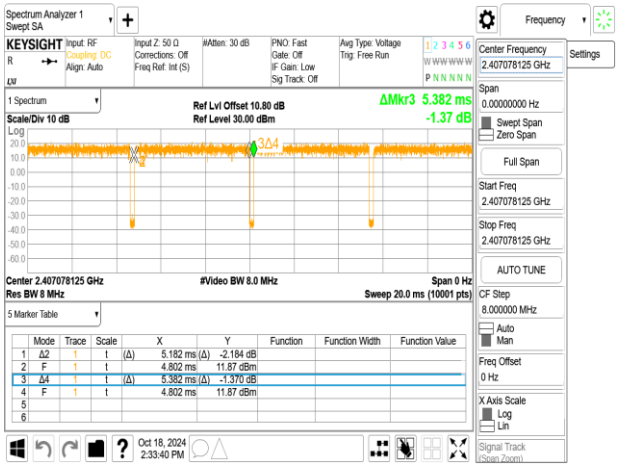
802.11ax_20MHz_Chain0_2412MHz



802.11g_20MHz_Chain0_2412MHz

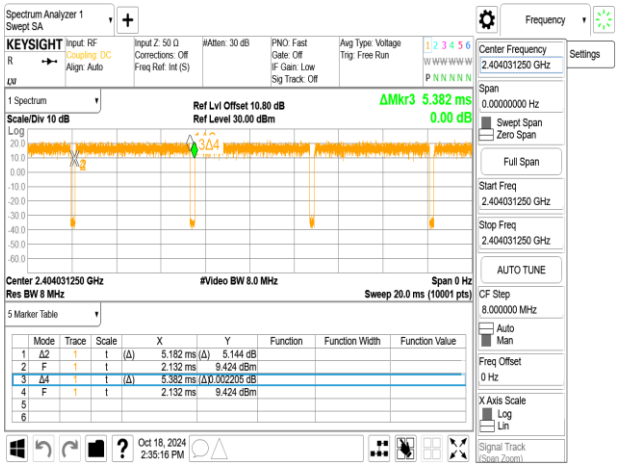


802.11ax_20MHz_Chain0_2412MHz_RU106_53



802.11n_20MHz_Chain0_2412MHz

802.11ax_20MHz_Chain0_2412MHz_RU26_0



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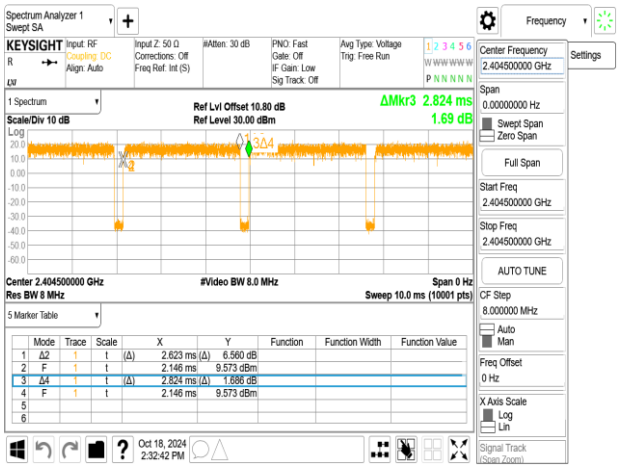
802.11ax_20MHz_Chain0_2412MHz_RU52_37



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8.4.3 Output Power

802.11b Ch0							
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (mW)	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	15	62.66	**17.97**	30.00	PASS
6	2437	1	15	61.52	17.89	30.00	PASS
11	2462	1	15	59.16	17.72	30.00	PASS
802.11b Ch0							
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (mW)	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	15	31.09	**14.93**	30.00	PASS
6	2437	1	15	30.73	14.88	30.00	PASS
11	2462	1	15	29.83	14.75	30.00	PASS

802.11g Ch0							
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (mW)	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	16	161.44	**22.08**	30.00	PASS
6	2437	6	16	157.40	21.97	30.00	PASS
11	2462	6	16	154.88	21.90	30.00	PASS
802.11g Ch0							
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (mW)	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	16	38.94	**15.90**	30.00	PASS
6	2437	6	16	38.40	15.84	30.00	PASS
11	2462	6	16	37.70	15.76	30.00	PASS

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802.11n_HT_20M Ch0							
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (mW)	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	15	146.55	**21.66**	30.00	PASS
6	2437	MCS0	15	142.56	21.54	30.00	PASS
11	2462	MCS0	15	140.28	21.47	30.00	PASS

802.11n_HT_20M Ch0							
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (mW)	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	15	30.86	**14.89**	30.00	PASS
6	2437	MCS0	15	30.29	14.81	30.00	PASS
11	2462	MCS0	15	29.81	14.74	30.00	PASS

802.11ax_HE_20M Ch0								
CH	Freq. (MHz)	Data Rate	RU Config	Power Setting	Peak Output Power (mW)	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	full	12	70.47	18.48	30.00	PASS
			26/0	39	76.03	18.81	30.00	PASS
			52/37	36	118.03	20.72	30.00	PASS
			106/53	34	159.59	**22.03**	30.00	PASS
6	2437	MCS0	full	12	69.50	18.42	30.00	PASS
11	2462	MCS0	full	12	68.23	18.34	30.00	PASS
			26/8	36	113.50	20.55	30.00	PASS
			52/40	33	139.96	21.46	30.00	PASS
			106/54	33	157.40	21.97	30.00	PASS

802.11ax_HE_20M Ch0								
CH	Freq. (MHz)	Data Rate	RU Config	Power Setting	Avg. Output Power (mW)	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	full	12	15.51	**11.91**	30.00	PASS
			26/0	39	8.19	9.13	30.00	PASS
			52/37	36	11.78	10.71	30.00	PASS
			106/53	34	13.98	11.45	30.00	PASS
6	2437	MCS0	full	12	15.23	11.83	30.00	PASS
11	2462	MCS0	full	12	14.88	11.73	30.00	PASS
			26/8	36	11.34	10.54	30.00	PASS
			52/40	33	14.59	11.64	30.00	PASS
			106/54	33	14.77	11.69	30.00	PASS

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8.4.4 EIRP

802.11b Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	1	14.93	2.44	**17.37**	36	PASS
6	2437	1	14.88	2.44	17.32	36	PASS
11	2462	1	14.75	2.44	17.19	36	PASS

802.11g Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	6	15.90	2.44	**18.34**	36	PASS
6	2437	6	15.84	2.44	18.28	36	PASS
11	2462	6	15.76	2.44	18.20	36	PASS

802.11n_HT_20M Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	14.89	2.44	**17.33**	36	PASS
6	2437	MCS0	14.81	2.44	17.25	36	PASS
11	2462	MCS0	14.74	2.44	17.18	36	PASS

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802.11ax_HE_20M Ch0								
CH	Freq. (MHz)	Data Rate	RU Config	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit	RESULT
1	2412	MCS0	full	11.91	2.44	**14.35**	36	PASS
			26/0	9.13	2.44	11.57	36	PASS
			52/37	10.71	2.44	13.15	36	PASS
			106/53	11.45	2.44	13.89	36	PASS
6	2437	MCS0	full	11.83	2.44	14.27	36	PASS
11	2462	MCS0	full	11.73	2.44	14.17	36	PASS
			26/8	10.54	2.44	12.98	36	PASS
			52/40	11.64	2.44	14.08	36	PASS
			106/54	11.69	2.44	14.13	36	PASS

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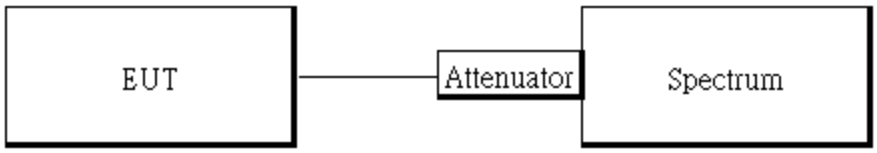
9 EMISSION BANDWIDTH MEASUREMENT

9.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz.

9.2 Test Setup



9.3 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

9.3.1 6dB BW measurements

1. The testing follows the Measurement Procedure of the KDB 558074 D01.
2. Set the spectrum analyzer as
   RBW= 100 kHz ,
   VBW = 3 X RBW,
   Span= 2 to 5 times of the OBW,
   Sweep=auto, Detector = Peak, and Max hold.
3. Mark the upper and lower frequencies of -6dB.
4. Repeat above procedures until all test default channel is completed.

9.3.2 99% BW measurements

1. The testing follows the Measurement Procedure of the RSS-Gen section 6.7.
2. Set the spectrum analyzer as
   RBW= 1 % to 5% of 99%,
   VBW ≥ 3 X RBW,
   Span= large enough to capture all products of the modulation process
   Sweep=auto, Detector = Peak, and Max hold.
3. Mark the upper and lower frequencies of 99%.
4. Repeat above procedures until all test default channel is completed.

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9.4 Measurement Result:

9.4.1 6dB BW measurements

802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	**9268.00**	≧ 500	PASS
2437	9107.00	≧ 500	PASS
2462	8854.00	≧ 500	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16520.00	≧ 500	PASS
2437	**16530.00**	≧ 500	PASS
2462	**16530.00**	≧ 500	PASS

802.11n_HT_20M Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17780.00	≧ 500	PASS
2437	17780.00	≧ 500	PASS
2462	**17790.00**	≧ 500	PASS

802.11ax_HE_20M Ch0

Freq. (MHz)	RU Config	6dB BW (kHz)	Limit (kHz)	Result
2412	full	19130.00	≧ 500	PASS
2437	full	**19140.00**	≧ 500	PASS
2462	full	19030.00	≧ 500	PASS

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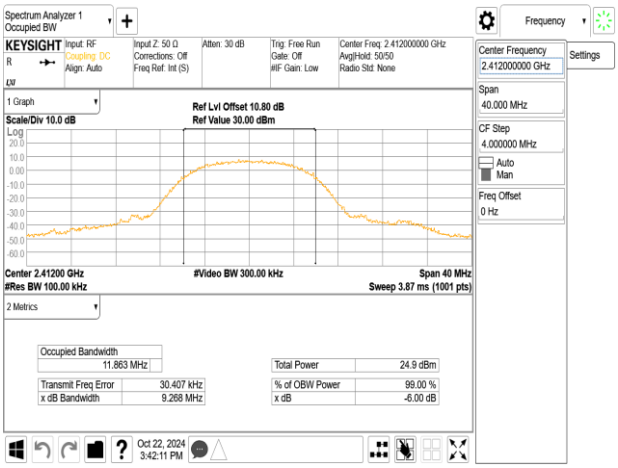
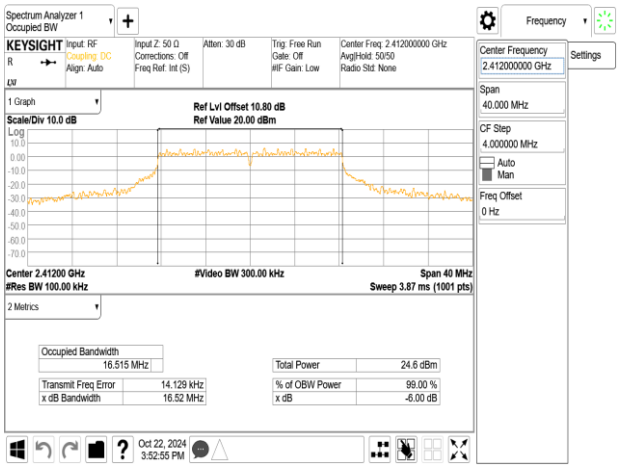
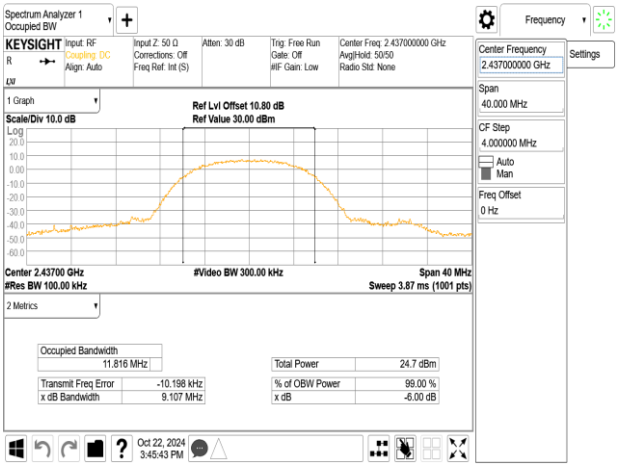
802.11b_20MHz_Chain0_2412MHz



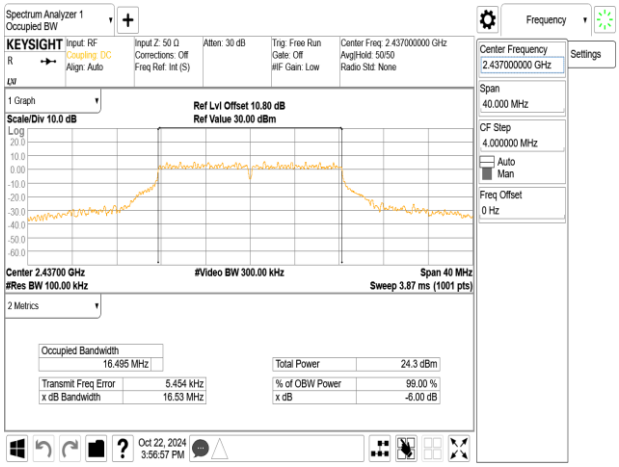
802.11g_20MHz_Chain0_2412MHz



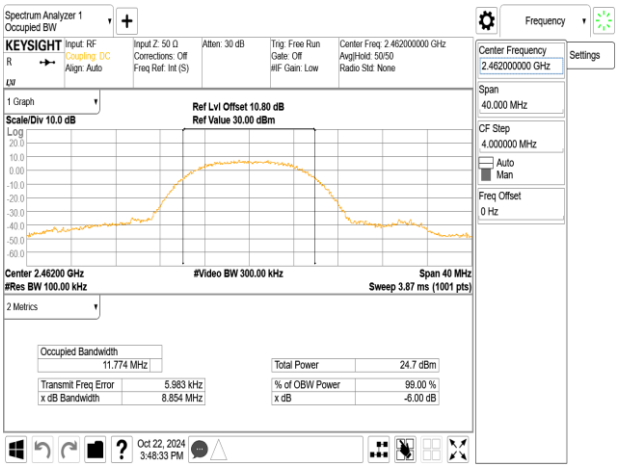
802.11b_20MHz_Chain0_2437MHz



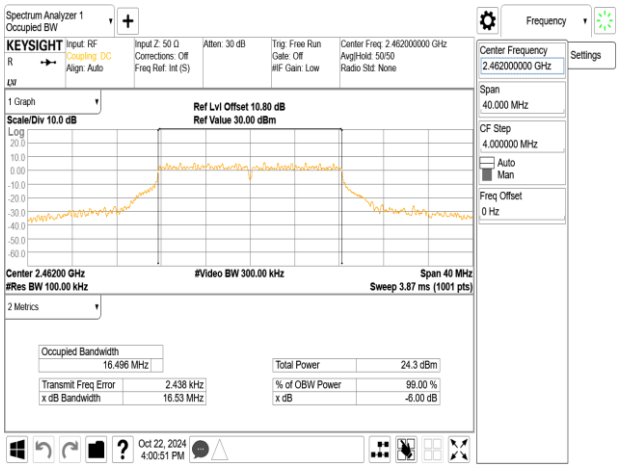
802.11g_20MHz_Chain0_2437MHz



802.11b_20MHz_Chain0_2462MHz



802.11g_20MHz_Chain0_2462MHz



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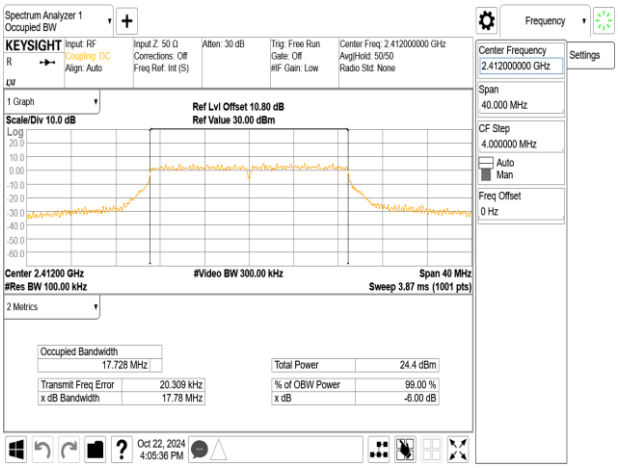
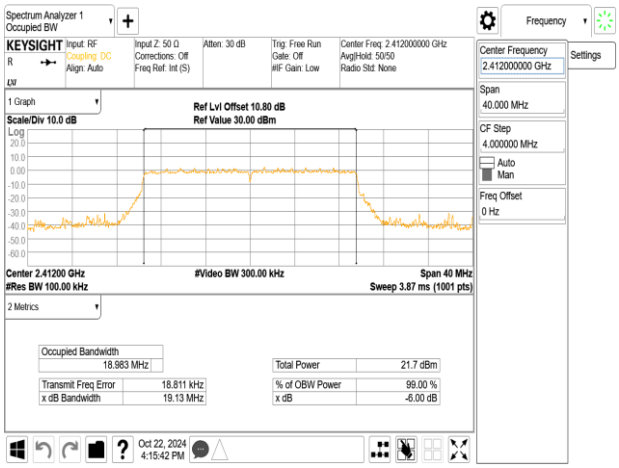
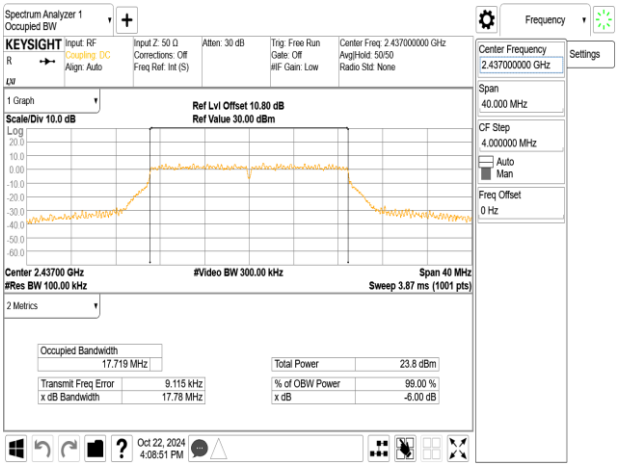
802.11n_20MHz_Chain0_2412MHz



802.11ax_20MHz_Chain0_2412MHz



802.11n_20MHz_Chain0_2437MHz



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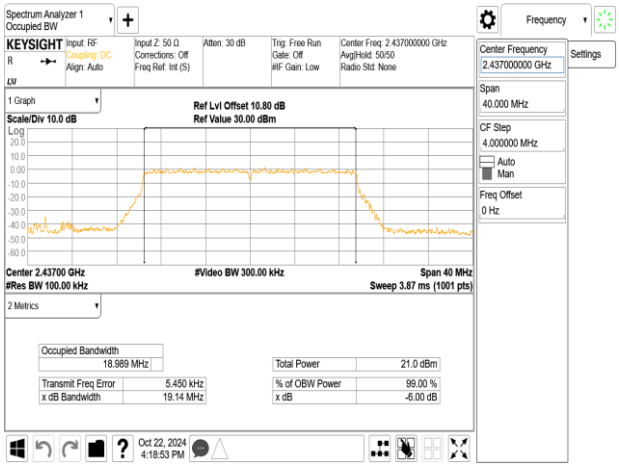
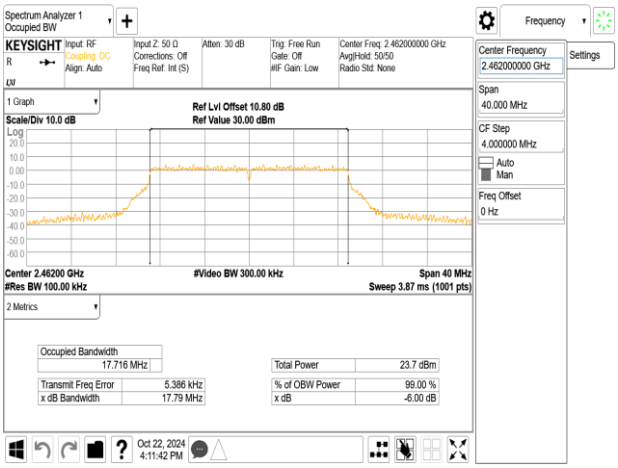
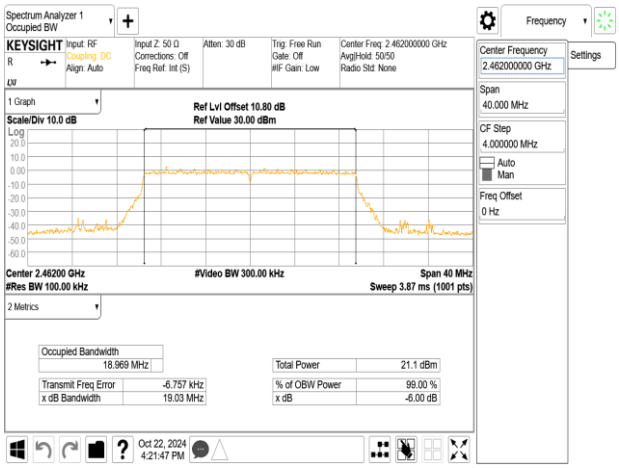


802.11n_20MHz_Chain0_2462MHz



802.11ax_20MHz_Chain0_2462MHz



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9.4.2 99% Bandwidth

802.11b Ch0

Freq. (MHz)	99% BW (MHz)
2412	**11.829**
2437	11.806
2462	11.785

802.11g Ch0

Freq. (MHz)	99% BW (MHz)
2412	**16.971**
2437	16.891
2462	16.889

802.11n_HT20M Ch0

Freq. (MHz)	99% BW (MHz)
2412	18.045
2437	**18.051**
2462	18.027

802.11ax_HE20M Ch0

Freq. (MHz)	RU Config	99% BW (MHz)
2412	full	**19.102**
2437	full	19.084
2462	full	19.091

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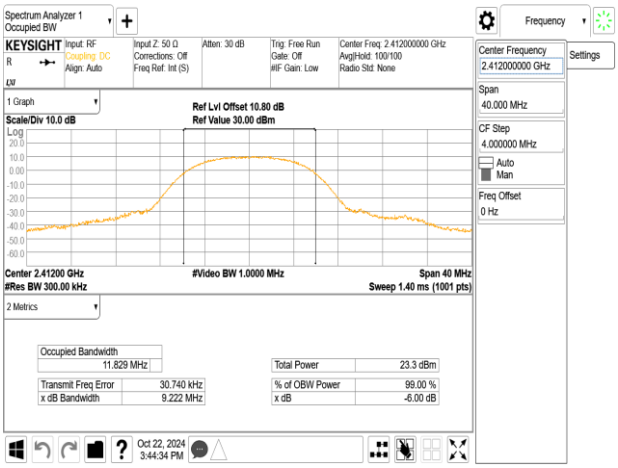
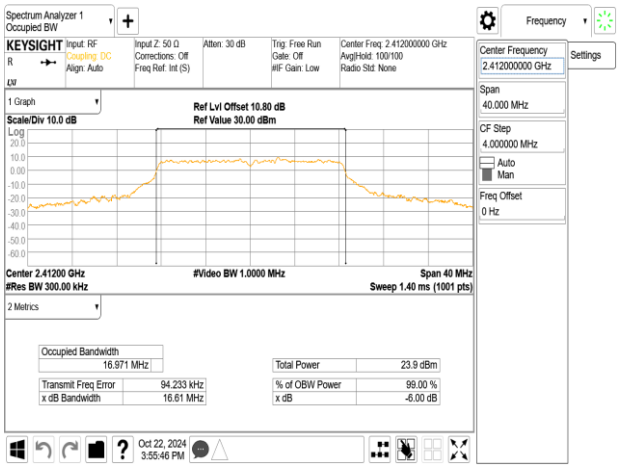
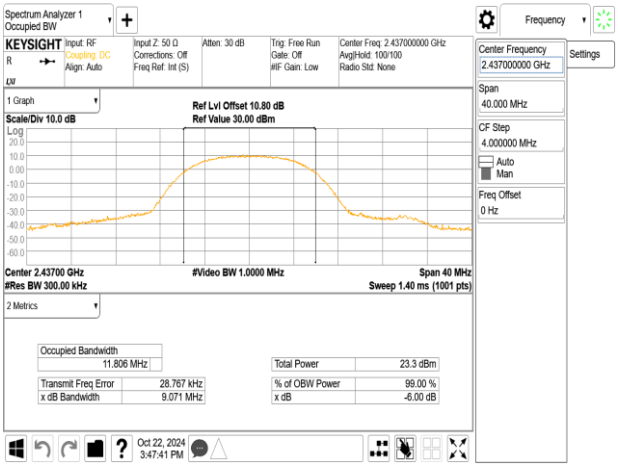
802.11b_20MHz_Chain0_2412MHz



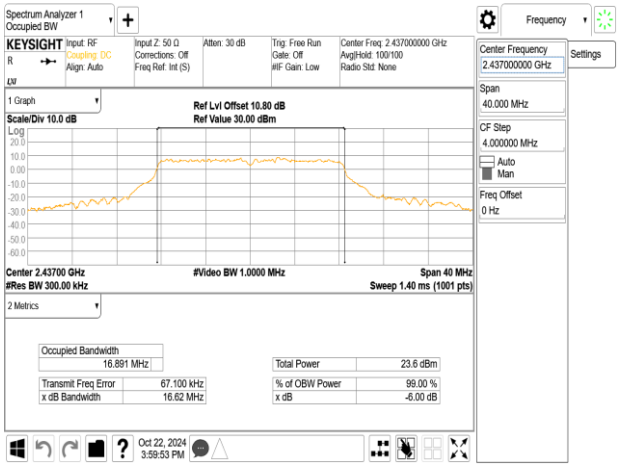
802.11g_20MHz_Chain0_2412MHz



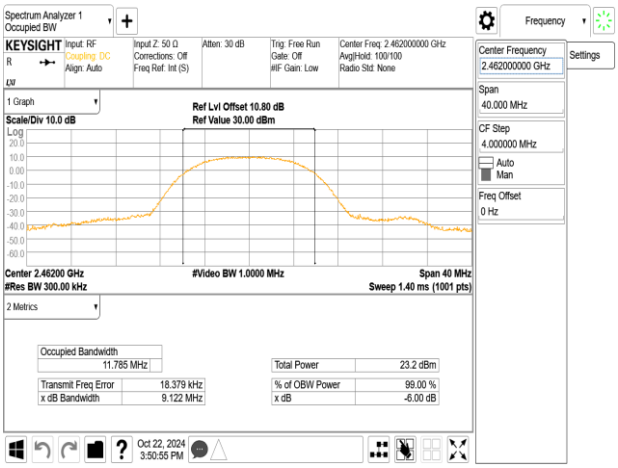
802.11b_20MHz_Chain0_2437MHz



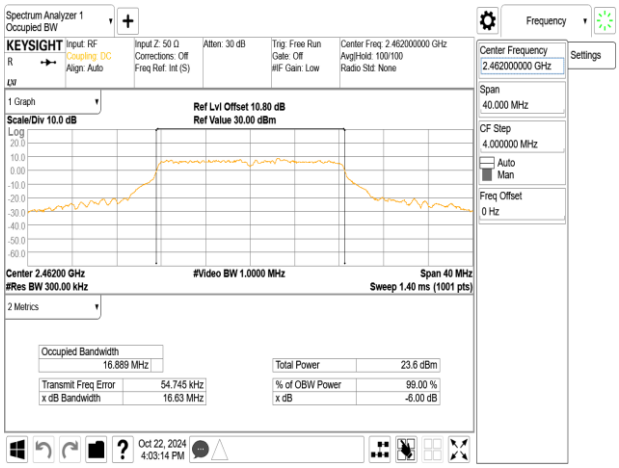
802.11g_20MHz_Chain0_2437MHz



802.11b_20MHz_Chain0_2462MHz



802.11g_20MHz_Chain0_2462MHz



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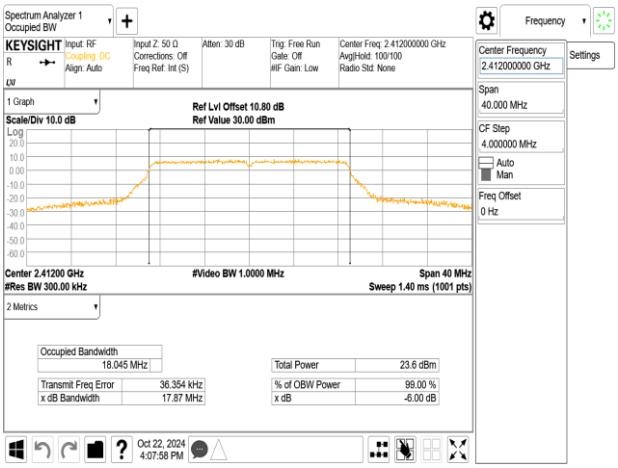
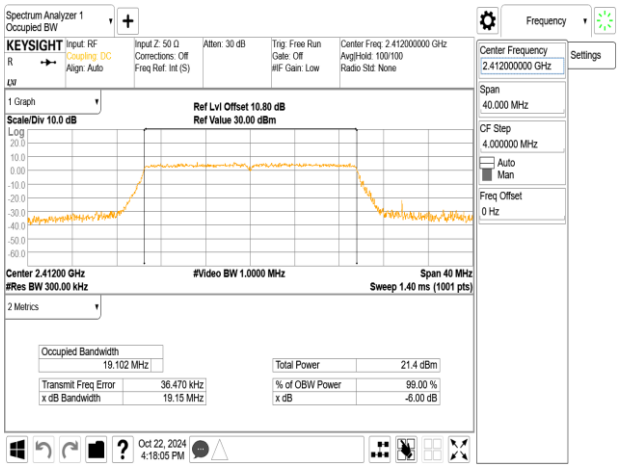
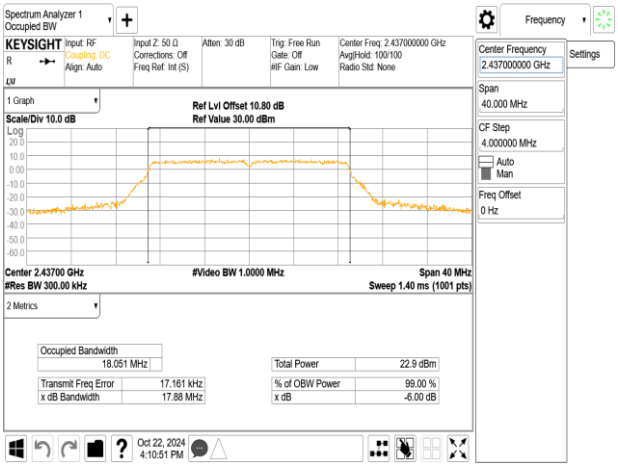
802.11n_20MHz_Chain0_2412MHz



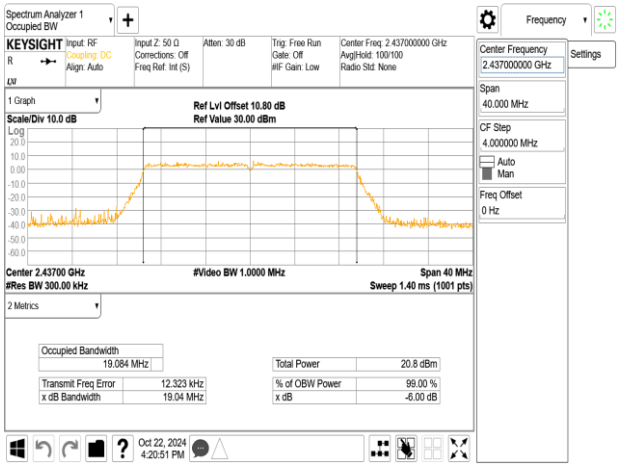
802.11ax_20MHz_Chain0_2412MHz



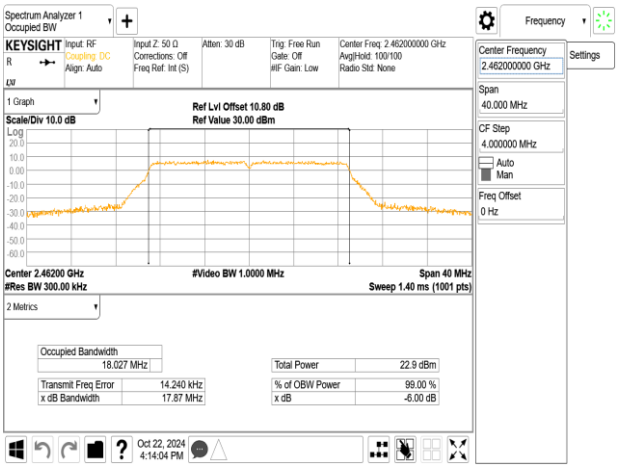
802.11n_20MHz_Chain0_2437MHz



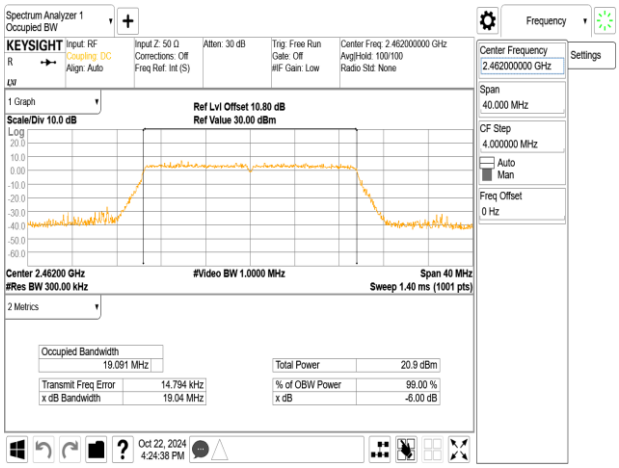
802.11ax_20MHz_Chain0_2437MHz



802.11n_20MHz_Chain0_2462MHz



802.11ax_20MHz_Chain0_2462MHz



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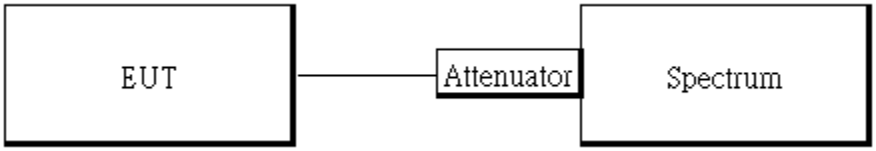
10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) & RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.9.

10.2 Test Setup



10.3 Measurement Procedure

10.3.1 Reference Level of Emission Limit:

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 100kHz & VBW = 300 kHz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.

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10.3.2 Conducted Band Edge:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
6. Mark the highest reading of the emission as the reference level measurement.
7. Set DL as the limit = reading on marker of reference level measurement -20 dBm
8. Mark the highest readings of the emissions outside of 2400MHz~2483.5MHz.
9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

10.3.3 Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Set RBW = 100 kHz & VBW= 300 kHz, Detector =Peak, Sweep = Auto.
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

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10.4 Measurement Result

802.11b Ch0

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	8.14	-11.86
2437	7.53	-12.47
2462	7.40	-12.60

802.11g Ch0

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	6.15	-13.85
2437	5.56	-14.44
2462	5.57	-14.43

802.11n_HT_20M Ch0

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	5.04	-14.96
2437	4.32	-15.68
2462	4.18	-15.82

802.11ax_HE_20M Ch0

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	2.48	-17.52
2437	2.11	-17.89
2462	1.12	-18.88

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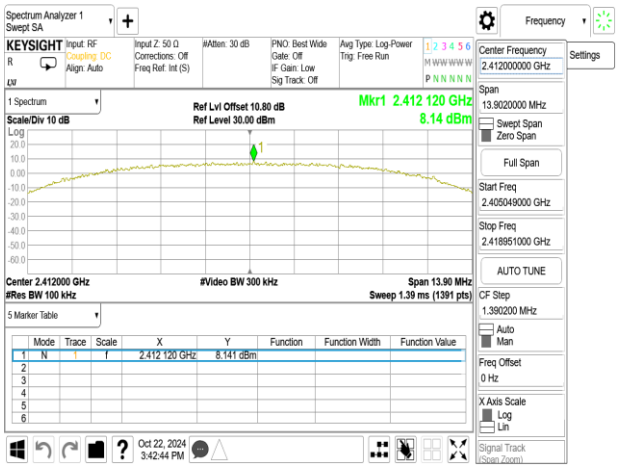
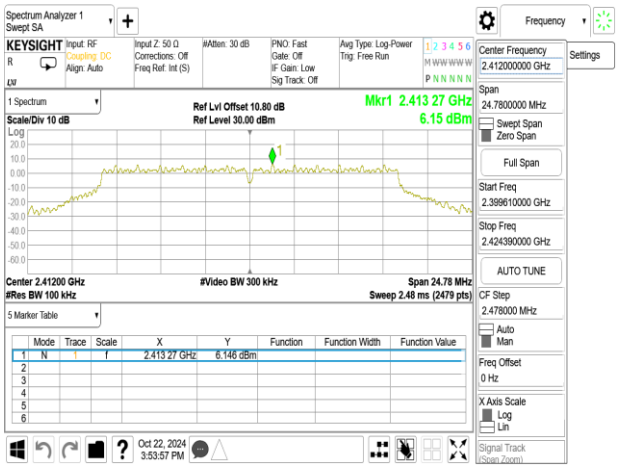
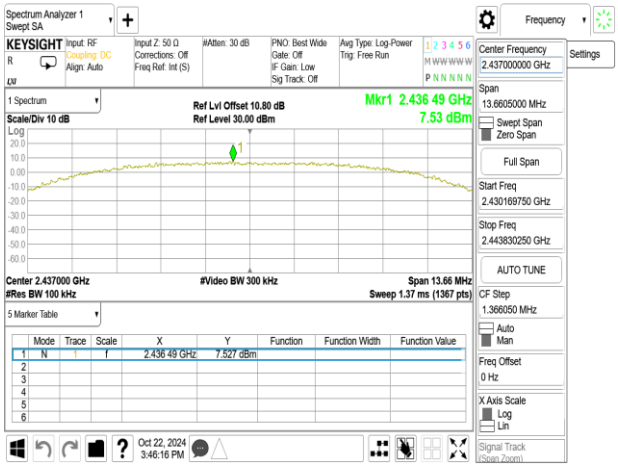
802.11b_20MHz_Chain0_2412MHz



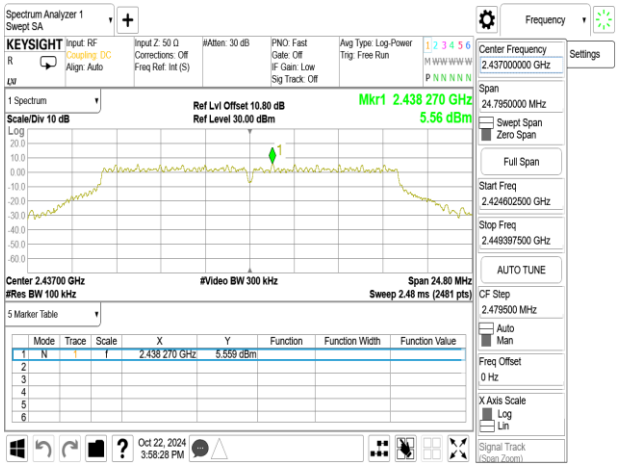
802.11g_20MHz_Chain0_2412MHz



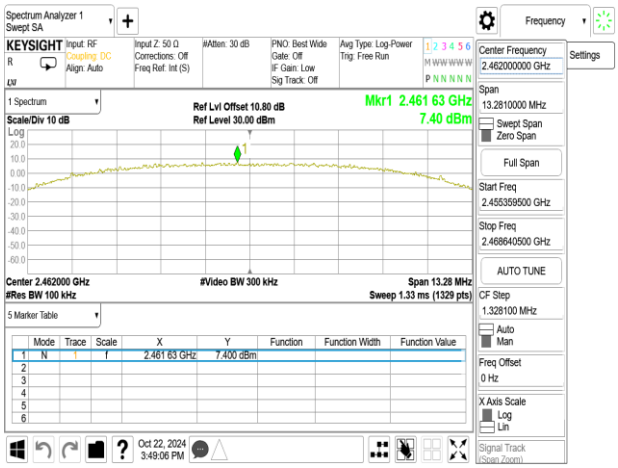
802.11b_20MHz_Chain0_2437MHz



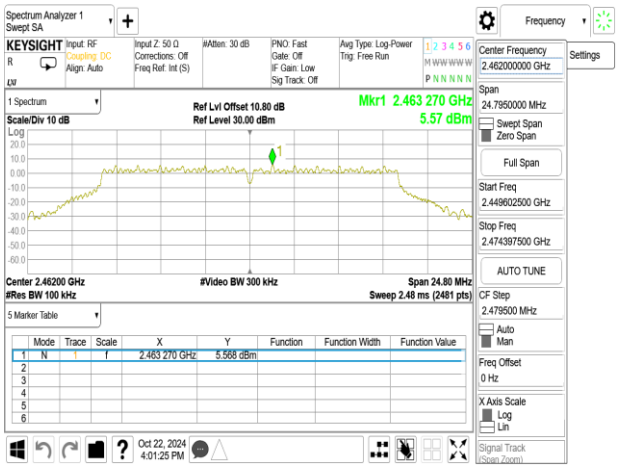
802.11g_20MHz_Chain0_2437MHz



802.11b_20MHz_Chain0_2462MHz



802.11g_20MHz_Chain0_2462MHz



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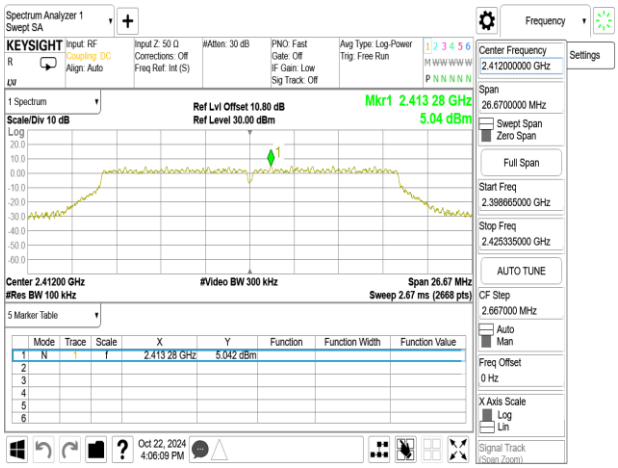
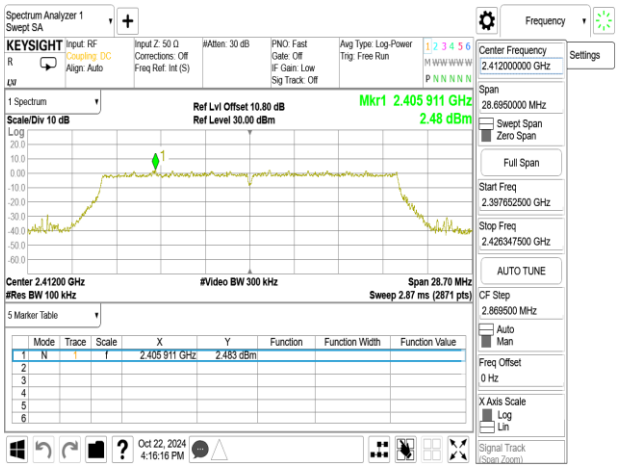
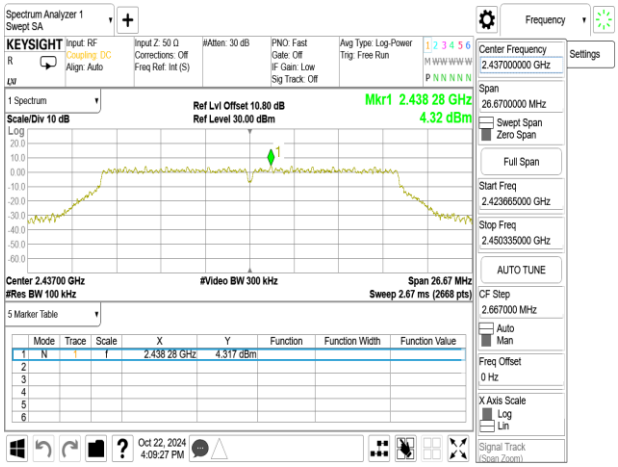
802.11n_20MHz_Chain0_2412MHz



802.11ax_20MHz_Chain0_2412MHz



802.11n_20MHz_Chain0_2437MHz



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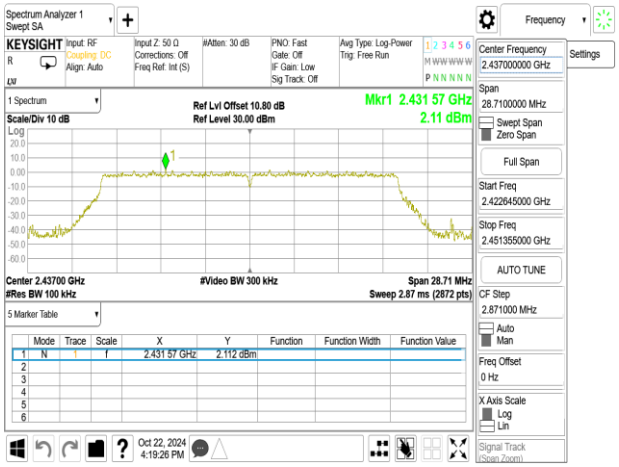

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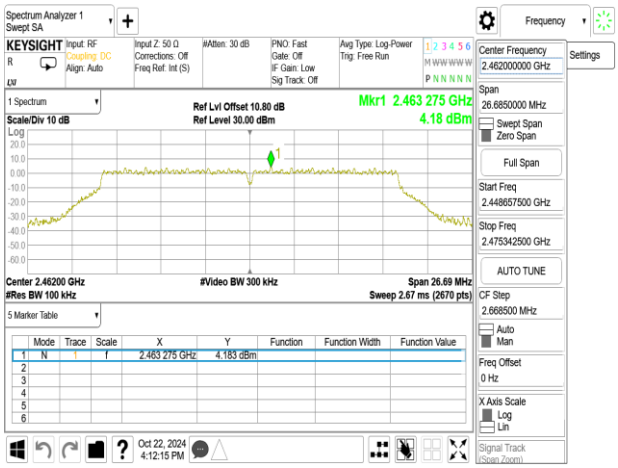

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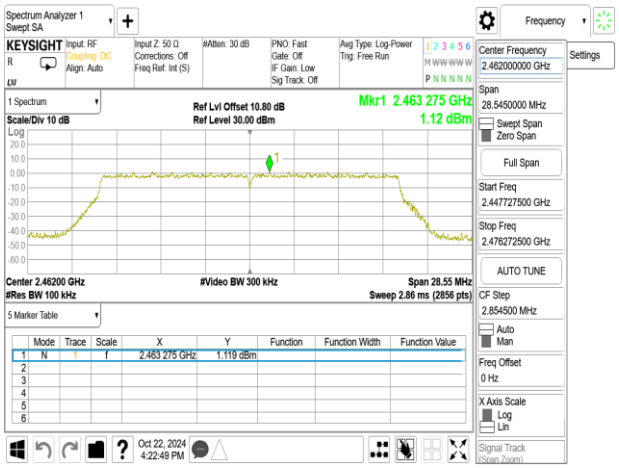

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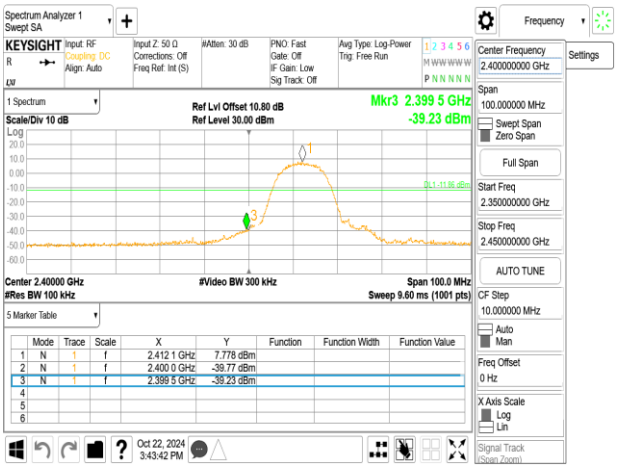
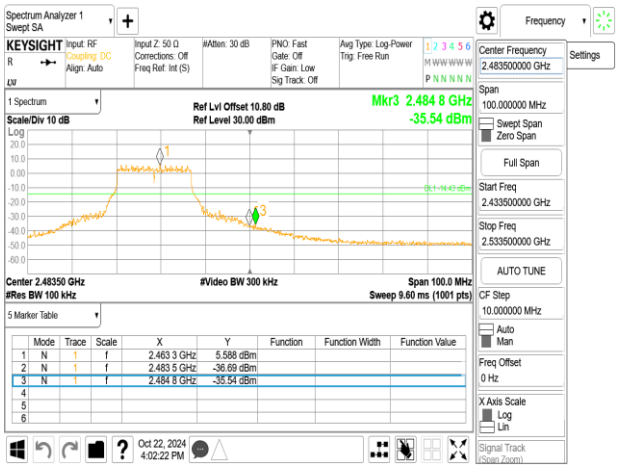
802.11b_20MHz_Chain0_2412MHz



802.11g_20MHz_Chain0_2462MHz



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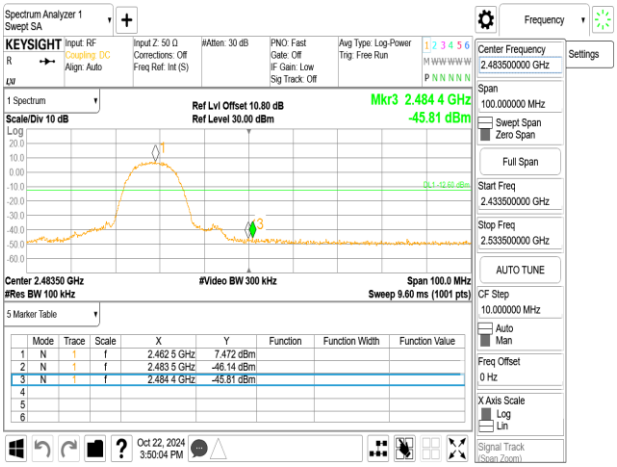
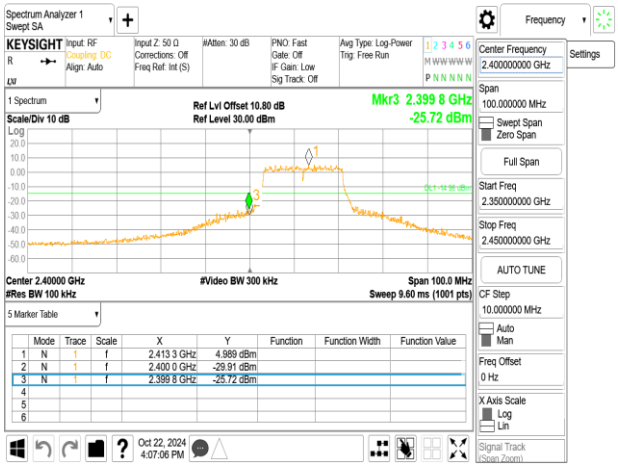
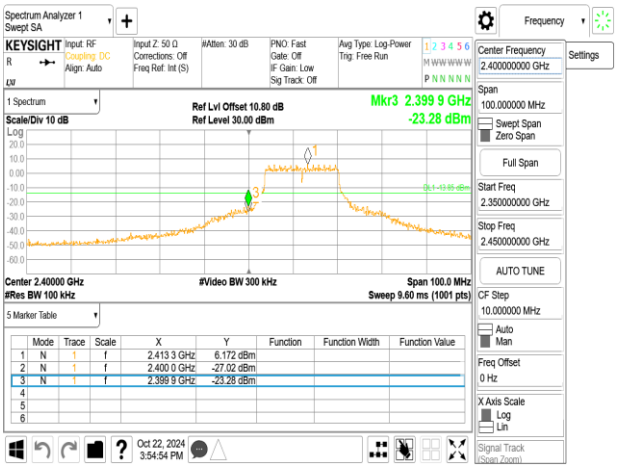


802.11n_20MHz_Chain0_2412MHz



802.11g_20MHz_Chain0_2412MHz



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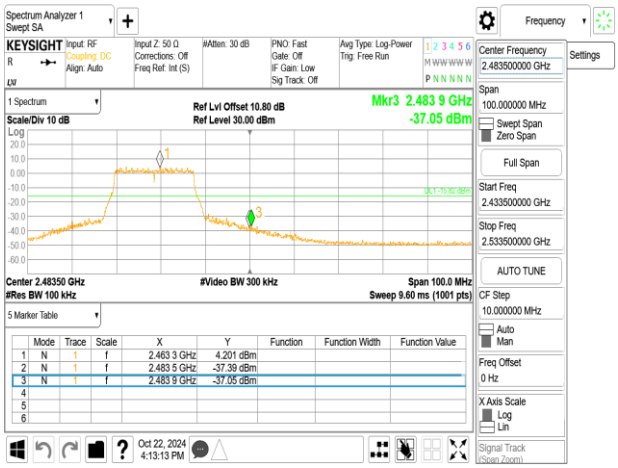

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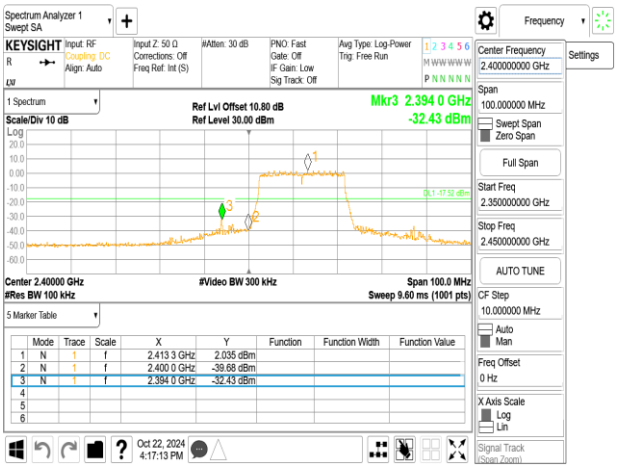
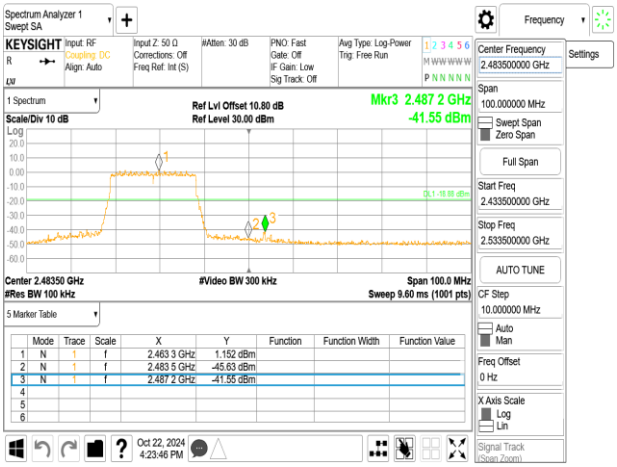
802.11ax_20MHz_Chain0_2412MHz



802.11ax_20MHz_Chain0_2462MHz



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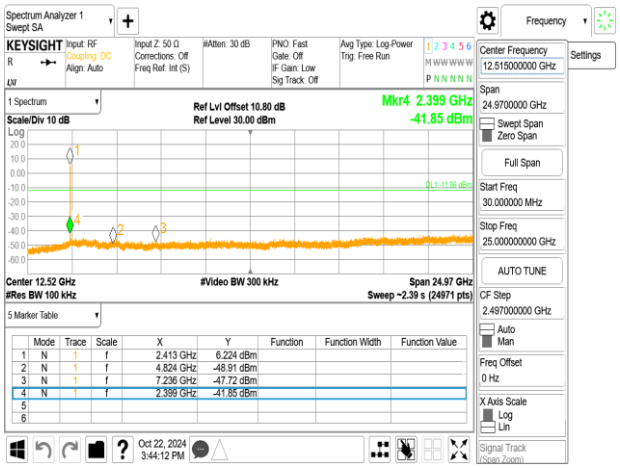
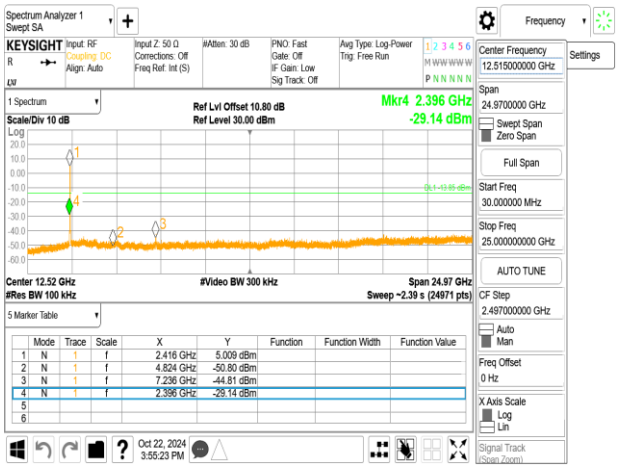
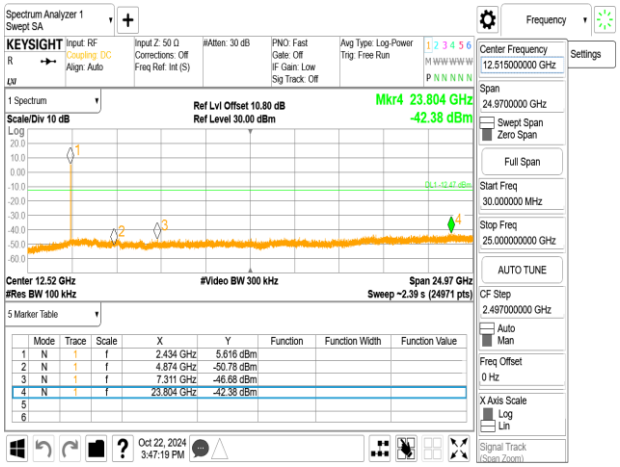
802.11b_20MHz_Chain0_2412MHz



802.11g_20MHz_Chain0_2412MHz



802.11b_20MHz_Chain0_2437MHz



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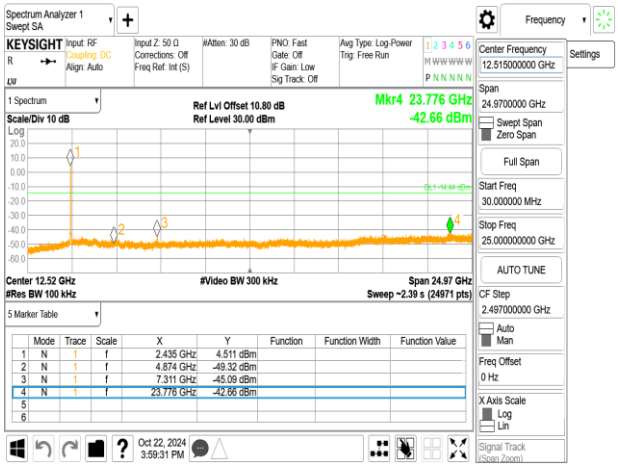
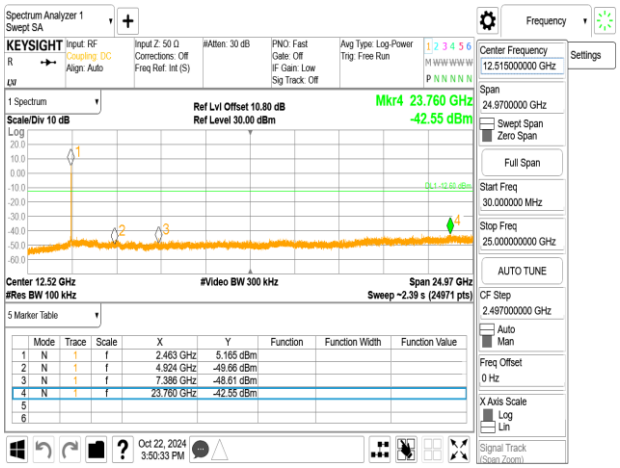
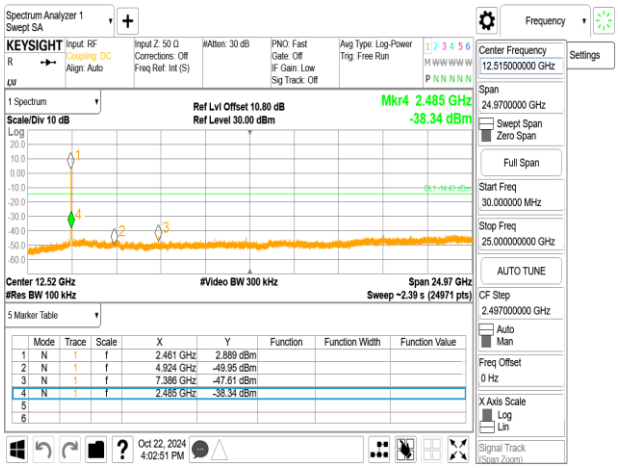


802.11b_20MHz_Chain0_2462MHz



802.11g_20MHz_Chain0_2462MHz



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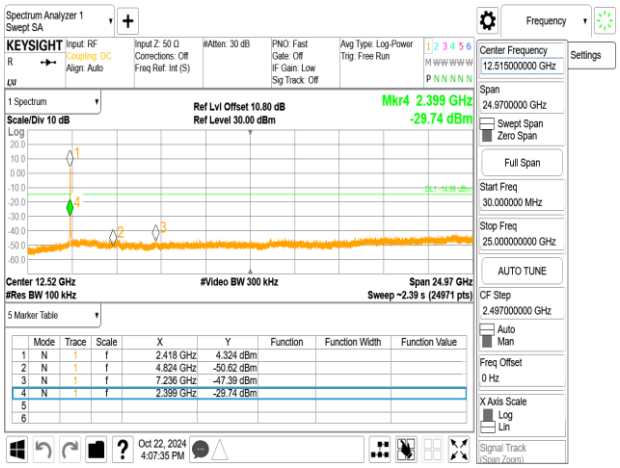
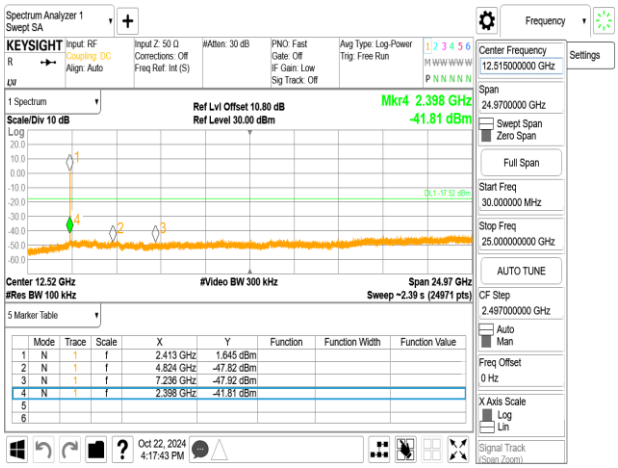
802.11n_20MHz_Chain0_2412MHz



802.11ax_20MHz_Chain0_2412MHz



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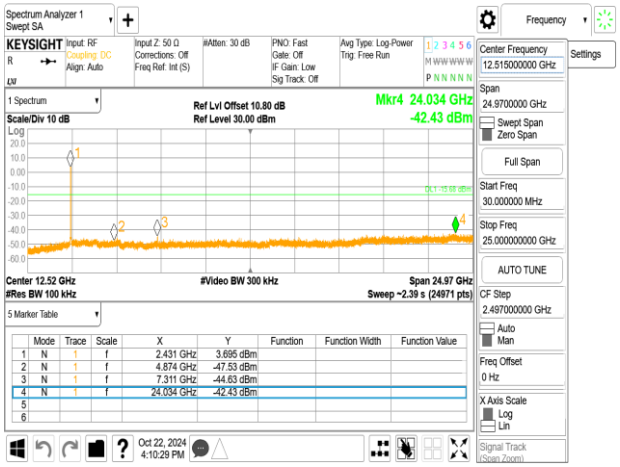

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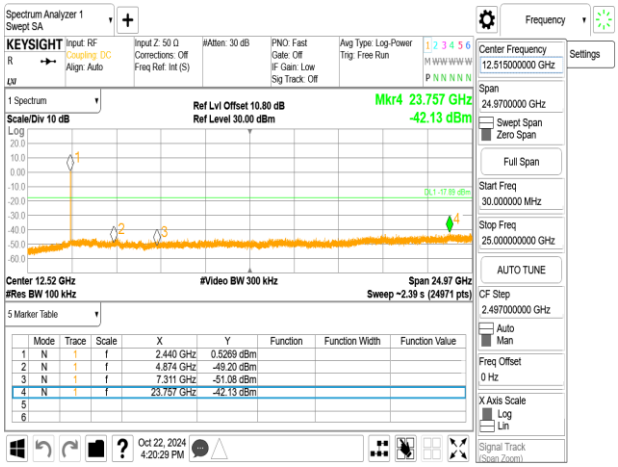

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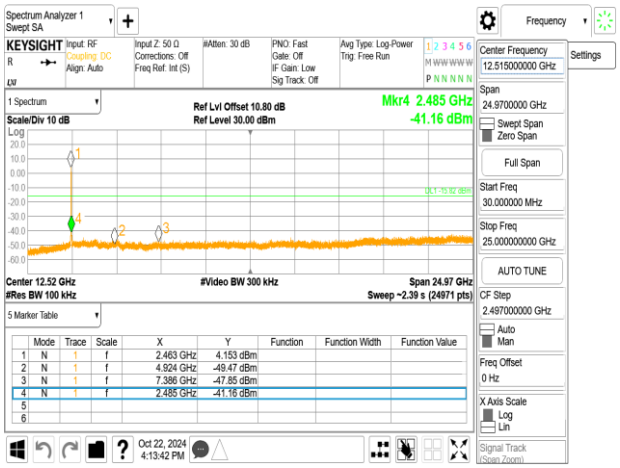

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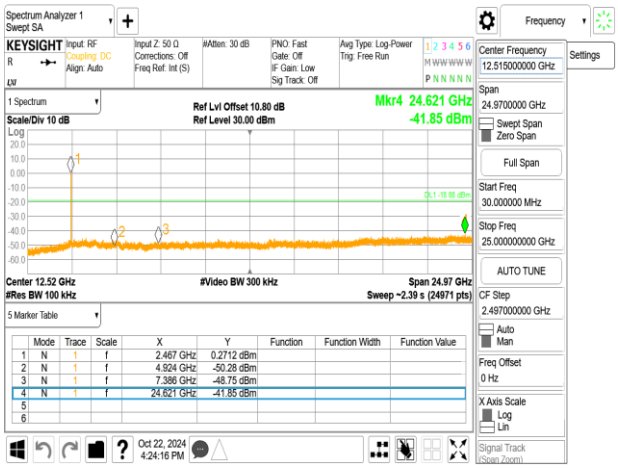

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