ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant:	GOOGLE LLC 1600 Amphitheatre Parkway Mountain View, CA 94043
Manufacturer:	GOOGLE LLC 1600 Amphitheatre Parkway Mountain View, CA 94043
Product Name:	Wireless product
Brand Name:	GOOGLE
Model No.:	G6ZUC
Report Number:	ER/2022/30037
FCC ID	A4R-G6ZUC
Date of EUT Received:	March 10, 2022
Date of Test:	March 15, 2022 ~ May 11, 2022
Issue Date:	June 1, 2022

Approved By _____

Blue Yang

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.

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

Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
ER/2022/30037	00	Original	May 24, 2022	Violetta Tang	*
ER/2022/30037	01	1. Correct typo of the report title on page 1 2. Add standard statements of section 8.3 on page 22 3. Add standard statements of section 10.1 on page 38	June 1, 2022	Violetta Tang	

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:	Wireless product
Brand Name:	GOOGLE
Model No.:	G6ZUC
EUT Series No.:	GG1937366 / GG1935428
Power Supply:	10V from AC Adapter
Test Software (Name/Version)	Qualcomm Radio Control Tool /V4.0.00195

1.2 RF Specification

WLAN 2.4GHz

Wi-Fi	Frequency Range	Channels	Rated Power in dBm (Avg)	Modulation Technology
802.11b	2412~2462	11	28.14	DSSS
802.11g	2412~2462	11	28.18	OFDM
802.11n20	2412~2462	11	28.71	OFDM
802.11n40	2422~2452	7	28.97	OFDM
802.11ax20	2412~2462	11	28.64	OFDMA
802.11ax40	2422~2452	7	28.72	OFDMA
Modulation type:		CCK, DQPSK, DBPSK for DSSS		
		64QAM, 16QAM, QPSK, BPSK for OFDM		
		1024 QAM, 256 QAM , 64QAM, 16QAM, QPSK, BPSK for OFDMA		
Data Rate:		802.11 b: 1/2/5.5/11 Mbps		
		802.11 g: 6/9/12/18/24/36/48/54 Mbps		
		802.11 n_20MHz:6.5 - 72.2Mbps		
		802.11 n_40MHz:13.5 - 150Mbps		
		802.11 ax_20MHz:7.3 - 143.4Mbps		
		802.11 ax_40MHz:14.6 - 286.8Mbps		

1.3 Antenna Designation

Antenna Type	Part No	Freq. (MHz)	Peak Antenna Gain (dBi)	Worst combination
PIFA	ANT5	2412~2462	2.40	V
	ANT6		2.30	V

Note:

1. Pre-scanned was done on the above antenna combination, measurements were demonstrated by using the antenna with the highest gain as the worst case scenarios.
2. Antenna information is provided by the applicant.
3. The EUT antenna combination is cross polarization.

1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247
FCC KDB 558074 D01 15.247 Meas Guidance v05r02
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
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 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.

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.

2.4 Measurement Results Explanation Example

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

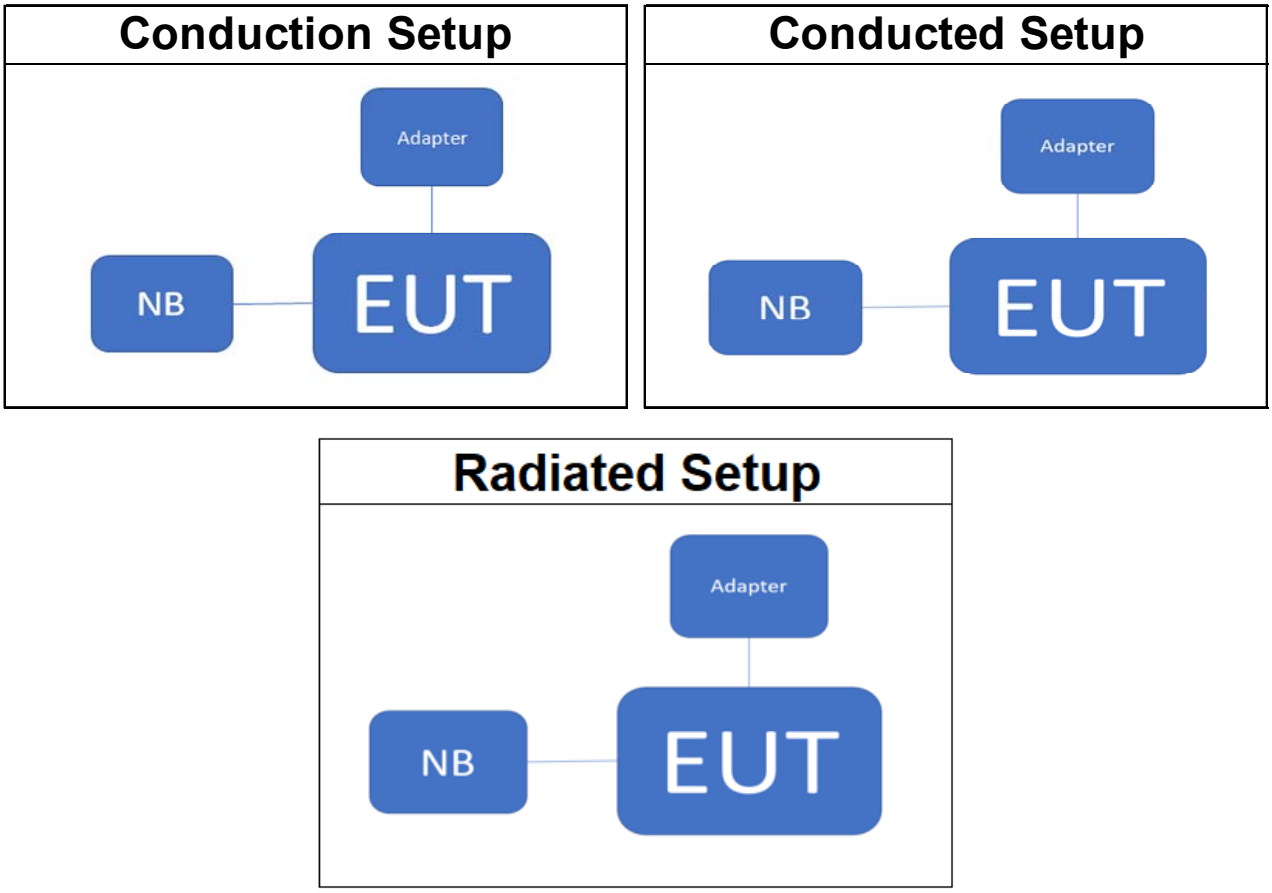
Radiated emission below 30MHz is measured in a 9m*6m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

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.

2.5 Test Configuration



2.6 Control Unit(s)

AC Power-Line Conducted Emission Test Site: Conduction 1					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Notebook	Lenovo	T440P	PC-01FYE9	N/A	N/A
Adapter	Shenzhen Honor Electronic Co., Ltd.	GKC2H	1HV00217NO00F011B	N/A	N/A
Test Software	Audix	e3	Ver. 9.210322	N.C.R	N.C.R

Conducted Emission Test Site: Conducted 2					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Test Software	SGS	Radio Test Software	Ver. 21	N.C.R	N.C.R
Adapter	Shenzhen Honor Electronic Co., Ltd.	GKC2H	1HV0021NO00A891B	N/A	N/A
Notebook	Lenovo	L480	PF-1S9NT5	N/A	N/A

Radiated Emission Test Site: SAC 1					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Test Software	Audix	e3	Ver. 9.210322	N.C.R	N.C.R
Adapter	Shenzhen Honor Electronic Co. Ltd.	GKC2H	1HV00217NO00F011B	N/A	N/A
Notebook	Lenovo	T440P	PC-01FYE9	N/A	N/A

3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(a)(2)	Emission Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	Radiated & Conducted Band Edge and Spurious Emission	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.203	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operation Frequencies

Modulation of 20MHz nominal bandwidth

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

Modulation of 40MHz nominal bandwidth

CHANNEL	FREQUENCY (MHz)
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452

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		Multi Transmission Spatial					
v	802.11 b	v	2TX				
v	802.11 g	v	2TX				
v	802.11 n	v	2TX	v	BF	v	MIMO
v	802.11 ax	v	2TX	v	BF	v	MIMO

4. Since the EUT antenna combination is cross polarization, the power and PSD of CDD mode is covering the BF mode.
5. 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					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1,6,11	DSSS	1	2TX
802.11g	1 to 11	1,6,11	OFDM	6	2TX
802.11n (HT20)	1 to 11	1,6,11	OFDM	MCS0	2TX
802.11n (HT40)	3 to 9	3,6,8,9	OFDM	MCS0	2TX
802.11ax (HE20)	1 to 11	1,6,11	OFDMA	MCS0	2TX
802.11ax (HE40)	3 to 9	3,6,8,9	OFDMA	MCS0	2TX

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	2TX

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	2TX
802.11g	1 to 11	1,6,11	OFDM	6	2TX
802.11n (HT20)	1 to 11	1,6,11	OFDM	MCS0	2TX
802.11n (HT40)	3 to 9	3,6,8,9	OFDM	MCS0	2TX
802.11ax (HE20)	1 to 11	1,6,11	OFDMA	MCS0	2TX
802.11ax (HE40)	3 to 9	3,6,8,9	OFDMA	MCS0	2TX

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.

5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty		
AC Power Line Conducted Emission	+/-	2.34	dB
Output Power measurement	+/-	1	dB
Emission Bandwidth	+/-	1.53	Hz
Undesignable radiated emission measurement	+/-	1.68	dB
Peak Power Density	+/-	1.62	dB
Temperature	+/-	0.4	°C
Humidity	+/-	3.5	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty				
Polarization: Vertical	**+/-**	**2.57**	**dB**	9kHz~30MHz
	+/-	**4.85**	**dB**	30MHz - 1000MHz
	+/-	**4.45**	**dB**	1GHz - 18GHz
	+/-	**4.24**	**dB**	18GHz - 40GHz
Polarization: Horizontal	**+/-**	**2.57**	**dB**	9kHz~30MHz
	+/-	**4.37**	**dB**	30MHz - 1000MHz
	+/-	**4.45**	**dB**	1GHz - 18GHz
	+/-	**4.24**	**dB**	18GHz - 40GHz

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.

6 MEASUREMENT EQUIPMENT USED

6.1 Emission from AC power line

AC Power-Line Conducted Emission Test Site: Conduction 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
LISN	SCHWARZBECK	NSLK 8127	1040	08/10/2021	08/09/2022
Coaxial Cables	N/A	Coaxial Cable	161207	12/07/2021	12/06/2022
EMI Test Receiver	R&S	ESCI 7	100759	08/26/2021	08/25/2022

6.2 Conducted Measurement

Conducted Emission Test Site: Conducted 2					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY60242081	09/30/2021	09/29/2022
PXA Spectrum Analyzer	KEYSIGHT	N9030A	MY53120760	04/28/2022	04/27/2023
Power Meter	Anritsu	ML2496A	2138003	11/12/2021	11/11/2022
Power Sensor	Anritsu	MA2411B	1911393	09/21/2021	09/20/2022
Power Sensor	Anritsu	MA2411B	1911394	09/21/2021	09/20/2022
Attenuator	Mini-Circuit	BW-S10W2+	4	12/14/2021	12/13/2022
DC Block	Mini-Circuits	BLK-18-S+	1	12/14/2021	12/13/2022

6.3 Radiated Measurement

Radiated Emission Test Site: SAC 1					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Horn Antenna	SCHWARZBECK	BBHA9120D	D803	12/20/2021	12/19/2022
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	01/03/2022	01/02/2023
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/16/2021	12/15/2022
Loop Antenna	ETS.LINDGREN	6502	148045	09/29/2021	09/28/2022
Site Cal	SGS	SAC I chamber	N/A	01/01/2022	12/31/2022
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/12/2021	05/11/2022
EMI Test Receiver	R&S	ESCI 7	100759	08/26/2021	08/25/2022
Pre-Amplifier	EMC Instruments	EMC184045B	980135	10/27/2021	10/26/2022
Pre-Amplifier	HP	8449B	3008A01973	12/16/2021	12/15/2022
Pre-Amplifier	HP	8447D	2944A09469	12/16/2021	12/15/2022
Attenuator	Mini-Circuit	BW-S10W2+	4	12/14/2021	12/13/2022
Bandreject Filter 2400-2483.5	EWT	EWT-14-0166	M1	12/14/2021	12/13/2022
3.2GHz High Pass Filter	WI	WHKX10-2624-80SS	3	12/14/2021	12/13/2022
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	EMC 104-SM-SM-2000	160123	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY2630/2	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY22962/2	12/16/2021	12/15/2022

7 CONDUCTED EMISSION TEST

7.1 Standard Applicable

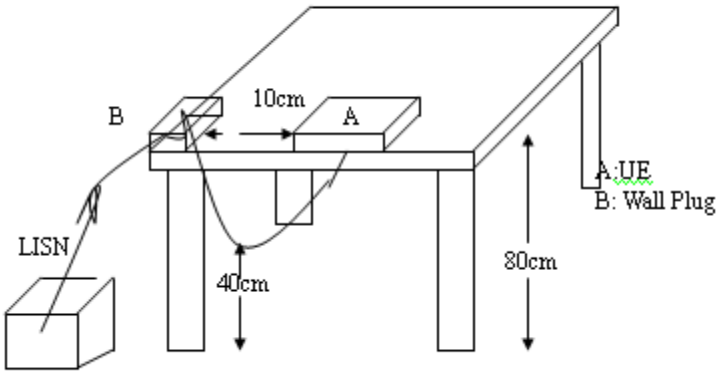
Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

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



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

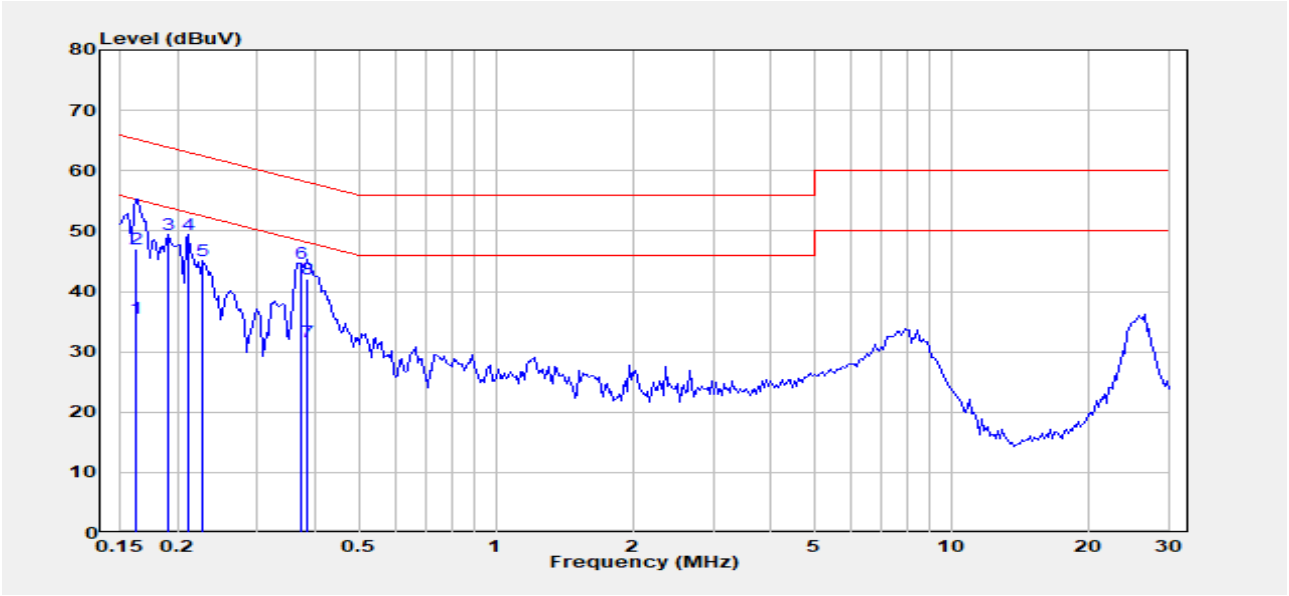
7.5 Measurement Result

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

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

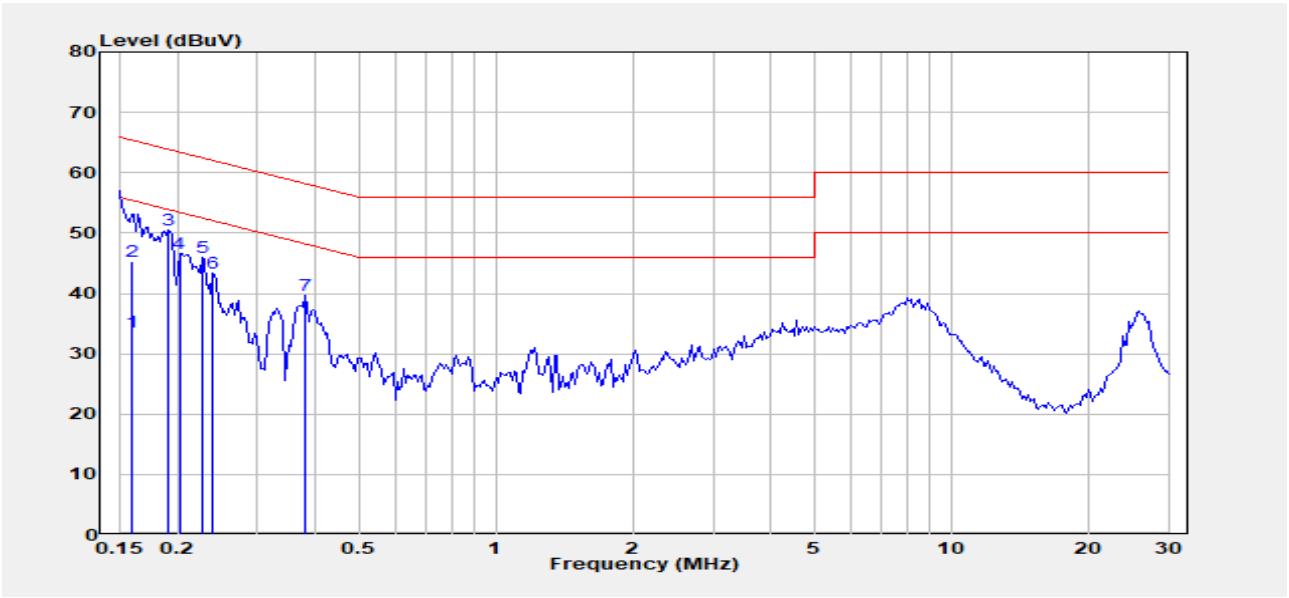
AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:ER/2022/30037	Test Site	:Conduction 1
Test Mode	:WIFI 2.4G	Test Date	:2022-03-15
Power	:120V/60Hz	Temp./Humi.	:22.5/57
Probe	:L	Engineer	:GN Lin
Note:	:		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.162	Average	35.57	0.02	35.59	55.38	-19.79
0.162	QP	47.13	0.02	47.15	65.38	-18.23
0.191	Peak	49.33	0.02	49.35	63.98	-14.63
0.211	Peak	49.39	0.02	49.41	63.18	-13.77
0.227	Peak	45.17	0.02	45.19	62.57	-17.38
0.373	Peak	44.61	0.06	44.67	58.43	-13.76
0.385	Average	31.65	0.07	31.72	48.17	-16.45
0.385	QP	42.04	0.07	42.11	58.17	-16.06

Report Number	:ER/2022/30037	Test Site	:Conduction 1
Test Mode	:WIFI 2.4G	Test Date	:2022-03-15
Power	:120V/60Hz	Temp./Humi.	:22.5/57
Probe	:N	Engineer	:GN Lin
Note:	:		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.158	Average	33.47	0.05	33.52	55.56	-22.04
0.158	QP	45.33	0.05	45.38	65.56	-20.18
0.191	Peak	50.30	0.17	50.47	63.98	-13.51
0.202	Peak	46.44	0.20	46.63	63.54	-16.90
0.227	Peak	45.90	0.17	46.07	62.57	-16.50
0.239	Peak	43.13	0.15	43.28	62.13	-18.85
0.381	Peak	39.65	0.08	39.73	58.25	-18.52

8 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

8.2 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.

8.3 Output Power

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

As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

If the transmitting antenna of directional gain greater than 6dBi are used the maximum conducted 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.

Note:

As per section F. 2). e). (ii) of FCC KDB 662911 D01

If antenna gains are not equal and each transmit antenna is driven by only one spatial stream, directional gain may be calculated by either of the following formulas.

- $$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

NSS = the number of independent spatial streams of data;

NANT = the total number of antennas

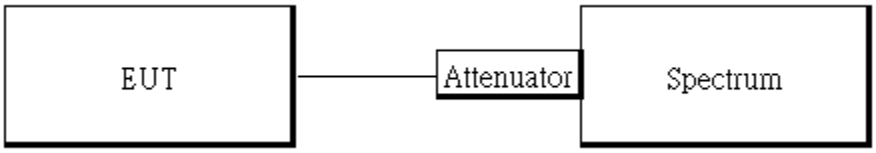
$g_{j,k} = 10^{Gk/20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;

G_k is the gain in dBi of the kth antenna.

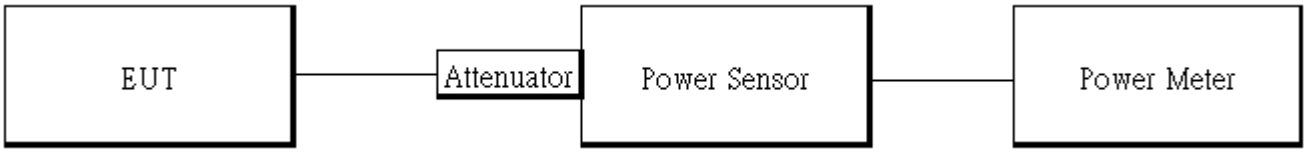
The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

8.4 Test Setup

8.4.1 Duty Cycle



8.4.2 Output Power:



8.5 Measurement Procedure

8.5.1 Duty Cycle:

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

8.5.2 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.
5. MIMO mode: offset is set with “measure and add 10 Log (N)” to measurement for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna.

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

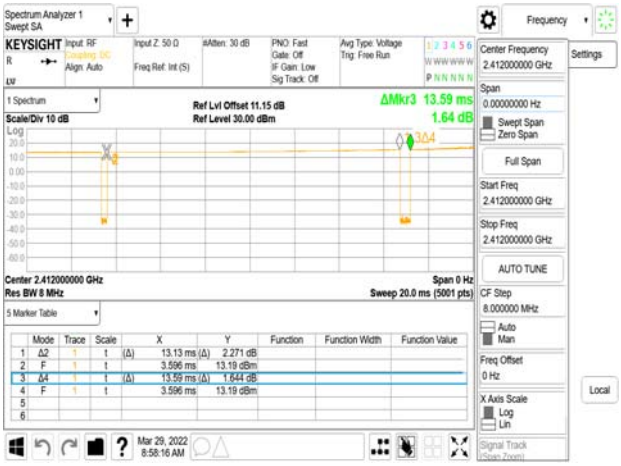
8.6 Measurement Result

8.6.1 Duty Cycle:

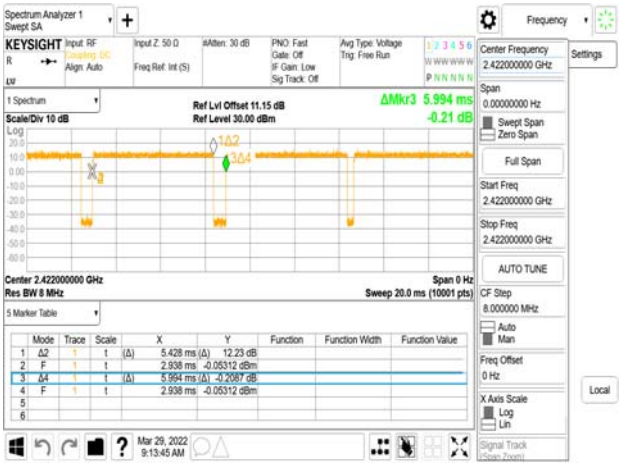
	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11b	96.59	0.15	0.08	1.00
802.11g	99.15	0.04	0.51	0.01
802.11n_20	91.52	0.38	0.18	1.00
802.11n_40	90.56	0.43	0.18	1.00
802.11ax_20	91.96	0.36	0.18	1.00
802.11ax_40	89.64	0.47	0.18	1.00

8.6.2 Duty Cycle test plots

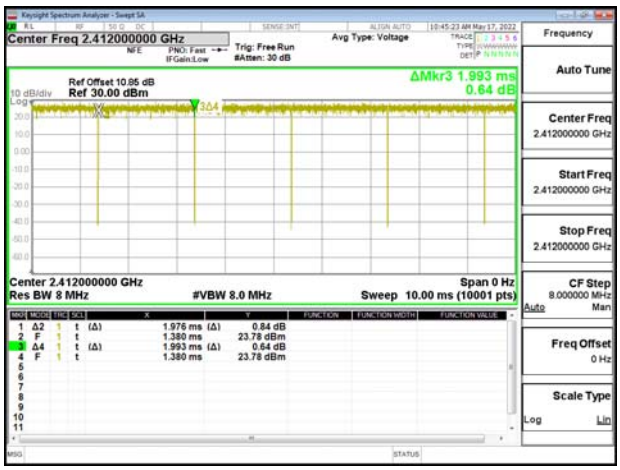
802.11b_20MHz_Chain0_2412MHz



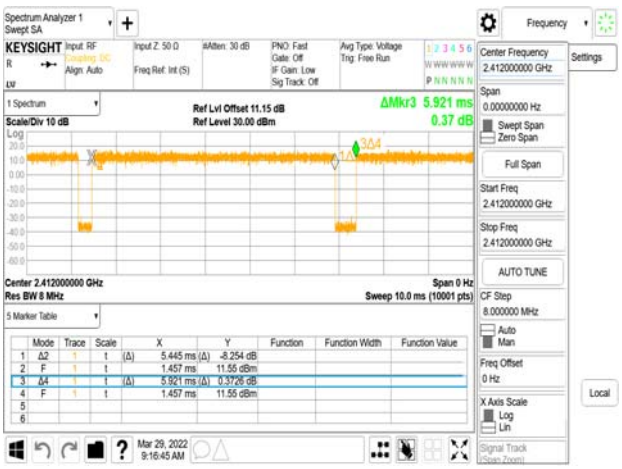
802.11n_40MHz_Chain0_2422MHz



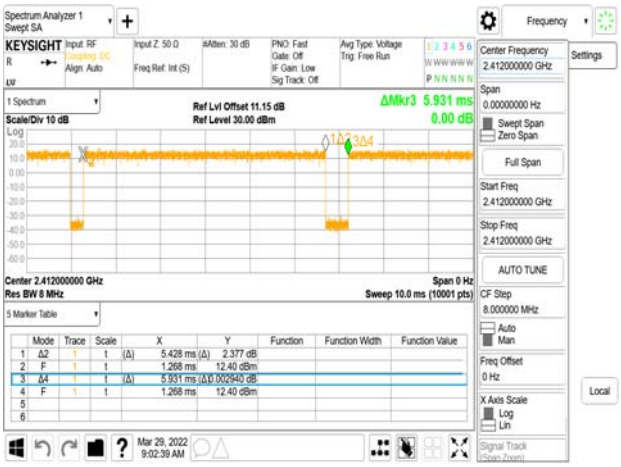
802.11g_20MHz_Chain0_2412MHz



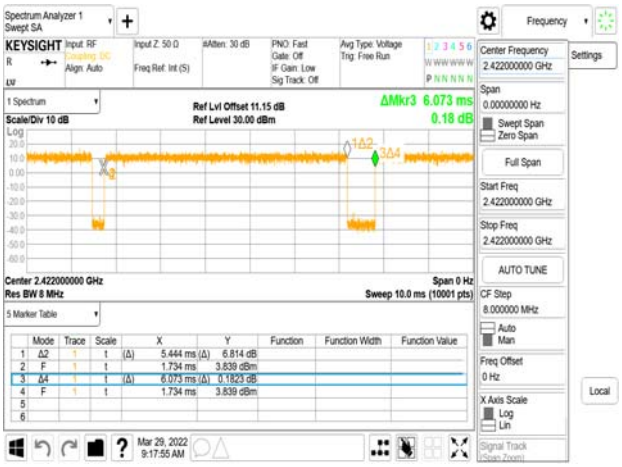
802.11ax_20MHz_Chain0_2412MHz



802.11n_20MHz_Chain0_2412MHz



802.11ax_40MHz_Chain0_2422MHz



8.6.3 Output Power

802.11b_2TX								
CH	Freq. (MHz)	Data Rate	Power set	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Limit (dBm)	RESULT
				CH 0	CH 1			
1	2412	1	24.5	24.92	25.03	28.14	30.00	PASS
6	2437	1	24.5	24.94	25.01	28.14	30.00	PASS
11	2462	1	24.5	24.85	25.07	28.12	30.00	PASS

802.11g_2TX								
CH	Freq. (MHz)	Data Rate	Power set	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Limit (dBm)	RESULT
				CH 0	CH 1			
1	2412	6	25	24.74	25.35	28.11	30.00	PASS
6	2437	6	25	25.08	24.88	28.03	30.00	PASS
11	2462	6	25	24.64	25.57	28.18	30.00	PASS

802.11n_HT20M 2TX								
CH	Freq. (MHz)	Data Rate	Power set	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Limit (dBm)	RESULT
				CH 0	CH 1			
1	2412	MCS0	25	25.49	24.85	28.57	30.00	PASS
6	2437	MCS0	25	25.05	25.58	28.71	30.00	PASS
11	2462	MCS0	25	25.37	24.89	28.53	30.00	PASS

802.11n_HT40M 2TX								
CH	Freq. (MHz)	Data Rate	Power set	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Limit (dBm)	RESULT
				CH 0	CH 1			
3	2422	MCS0	25	25.27	25.66	28.91	30.00	PASS
6	2437	MCS0	25	25.64	25.42	28.97	30.00	PASS
8	2447	MCS0	25	25.44	25.34	28.83	30.00	PASS
9	2452	MCS0	24	24.51	24.44	27.92	30.00	PASS

802.11ax_HE20M 2TX									
CH	Freq. (MHz)	Data Rate	RU Config	Power set	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Limit (dBm)	RESULT
					CH 0	CH 1			
1	2412	MCS0	full	25	25.02	25.51	28.64	30.00	PASS
6	2437	MCS0	full	25	25.47	24.89	28.56	30.00	PASS
11	2462	MCS0	full	25	25.26	24.88	28.44	30.00	PASS

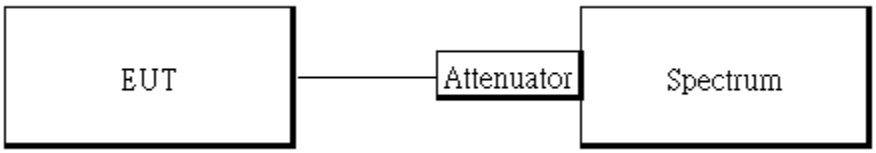
802.11ax_HE40M 2TX									
CH	Freq. (MHz)	Data Rate	RU Config	Power set	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Limit (dBm)	RESULT
					CH 0	CH 1			
3	2422	MCS0	full	25	25.23	24.95	28.57	30.00	PASS
6	2437	MCS0	full	25	25.35	25.12	28.72	30.00	PASS
8	2447	MCS0	full	25	25.18	24.96	28.55	30.00	PASS
9	2452	MCS0	full	24.5	24.84	24.54	28.17	30.00	PASS

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. 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 the spectrum analyzer as
   RBW= 100kHz ,
   VBW = 3 X RBW,
   Span= 2 to 5 times of the OBW,
   Sweep=auto,
   Detector = Peak, and Max hold for -6dB Bandwidth test.
5. Repeat above procedures until all test default channel is completed

9.4 6dB Bandwidth

802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	**8530.00**	≧ 500	PASS
2437	7583.00	≧ 500	PASS
2462	7121.00	≧ 500	PASS

802.11b Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	7613.00	≧ 500	PASS
2437	**8093.00**	≧ 500	PASS
2462	7589.00	≧ 500	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	13830.00	≧ 500	PASS
2437	**15080.00**	≧ 500	PASS
2462	**15080.00**	≧ 500	PASS

802.11g Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	13830.00	≧ 500	PASS
2437	**15080.00**	≧ 500	PASS
2462	13850.00	≧ 500	PASS

802.11nHT_20M Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	13850.00	≧ 500	PASS
2437	**15090.00**	≧ 500	PASS
2462	15050.00	≧ 500	PASS

802.11nHT_20M Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	12610.00	≧ 500	PASS
2437	**15110.00**	≧ 500	PASS
2462	15020.00	≧ 500	PASS

802.11nHT_40M Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	28820.00	≧ 500	PASS
2437	**33790.00**	≧ 500	PASS
2452	31370.00	≧ 500	PASS

802.11nHT_40M Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	29440.00	≧ 500	PASS
2437	**32620.00**	≧ 500	PASS
2452	31350.00	≧ 500	PASS

802.11ax_HE_20M Ch0

Freq. (MHz)	RU Config	6dB BW (kHz)	Limit (kHz)	Result
2412	full	15110.00	≧ 500	PASS
2437	full	15070.00	≧ 500	PASS
2462	full	15070.00	≧ 500	PASS

802.11ax_HE_20M Ch1

Freq. (MHz)	RU Config	6dB BW (kHz)	Limit (kHz)	Result
2412	full	13830.00	≧ 500	PASS
2437	full	15050.00	≧ 500	PASS
2462	full	12620.00	≧ 500	PASS

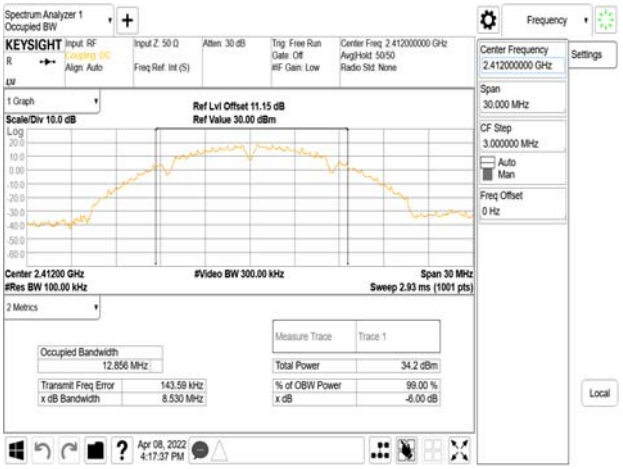
802.11ax_HE_40M Ch0

Freq. (MHz)	RU Config	6dB BW (kHz)	Limit (kHz)	Result
2422	full	**32580.00**	≧ 500	PASS
2437	full	32570.00	≧ 500	PASS
2452	full	30070.00	≧ 500	PASS

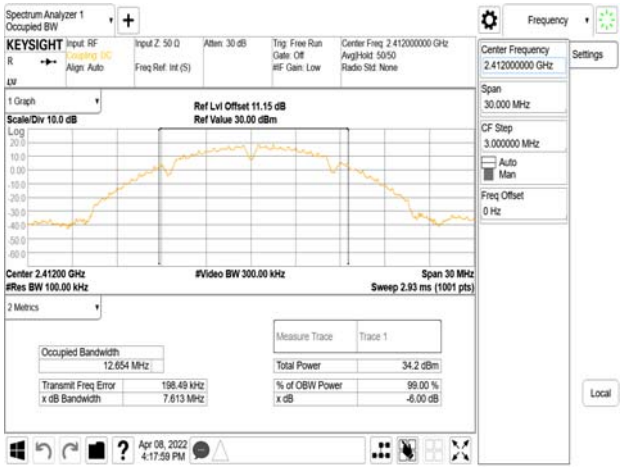
802.11ax_HE_40M Ch1

Freq. (MHz)	RU Config	6dB BW (kHz)	Limit (kHz)	Result
2422	full	31260.00	≧ 500	PASS
2437	full	**33810.00**	≧ 500	PASS
2452	full	31320.00	≧ 500	PASS

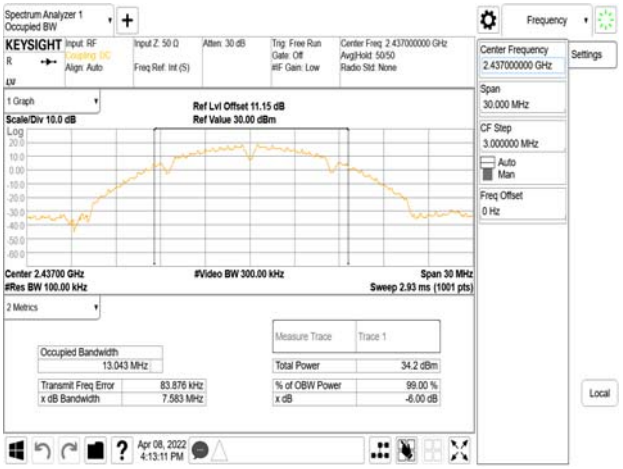
802.11b_20MHz_Chain0_2412MHz



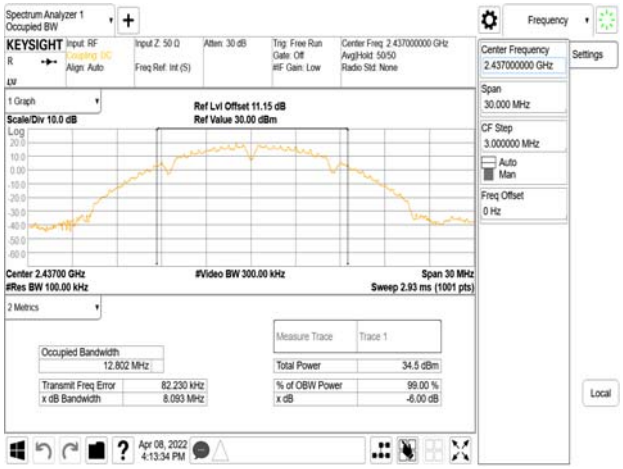
802.11b_20MHz_Chain1_2412MHz



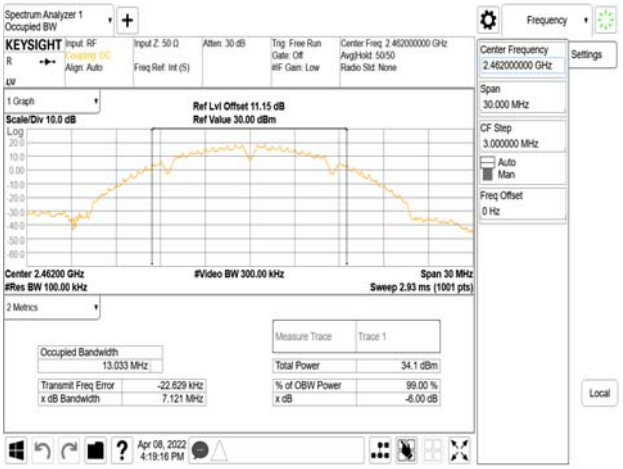
802.11b_20MHz_Chain0_2437MHz



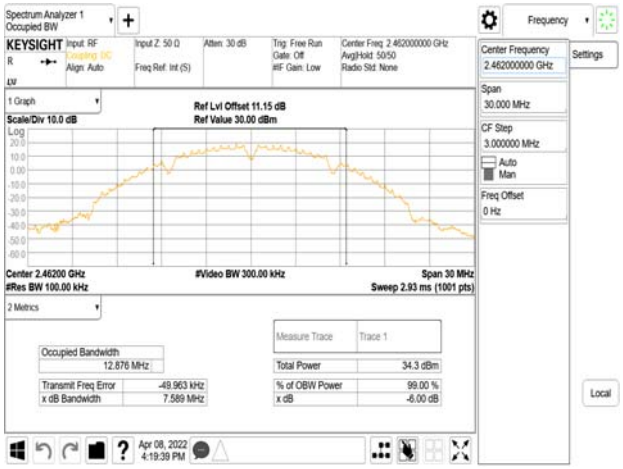
802.11b_20MHz_Chain1_2437MHz



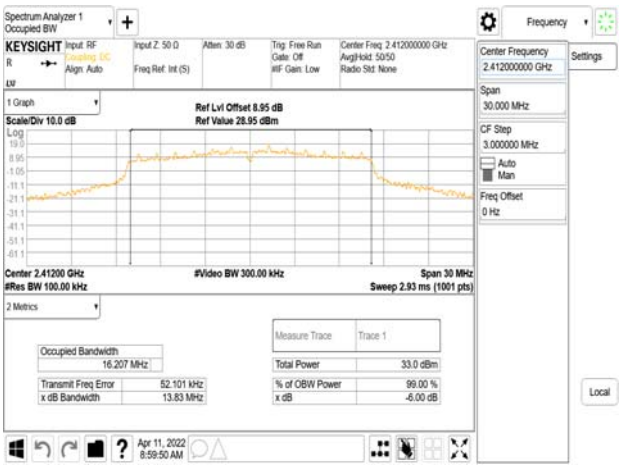
802.11b_20MHz_Chain0_2462MHz



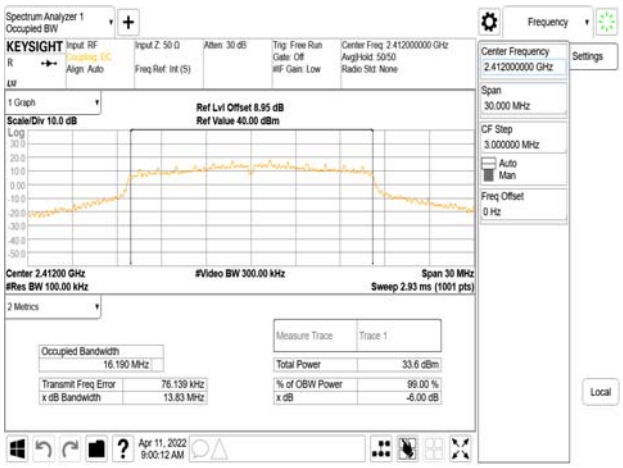
802.11b_20MHz_Chain1_2462MHz



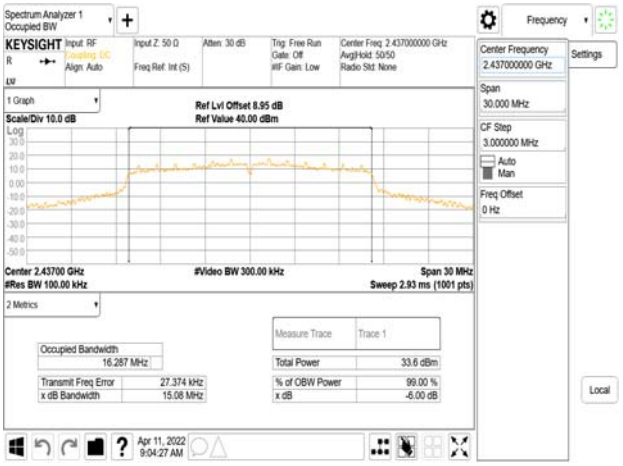
802.11g_20MHz_Chain0_2412MHz



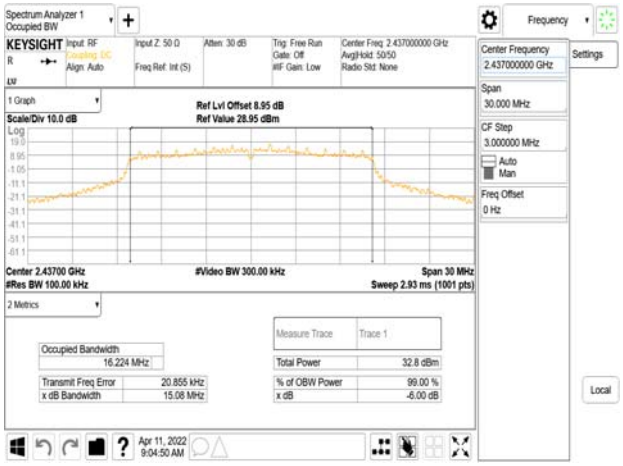
802.11g_20MHz_Chain1_2412MHz



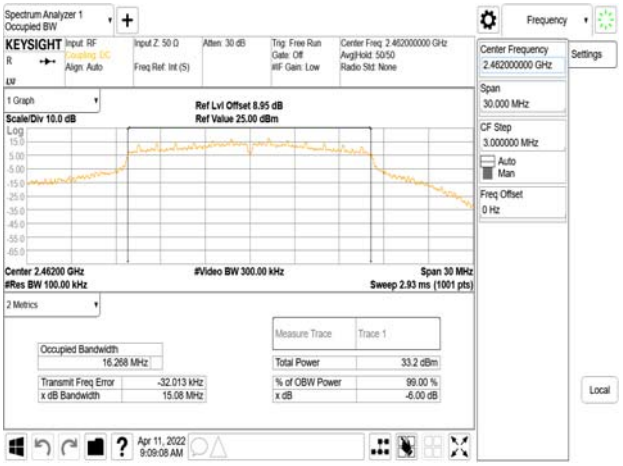
802.11g_20MHz_Chain0_2437MHz



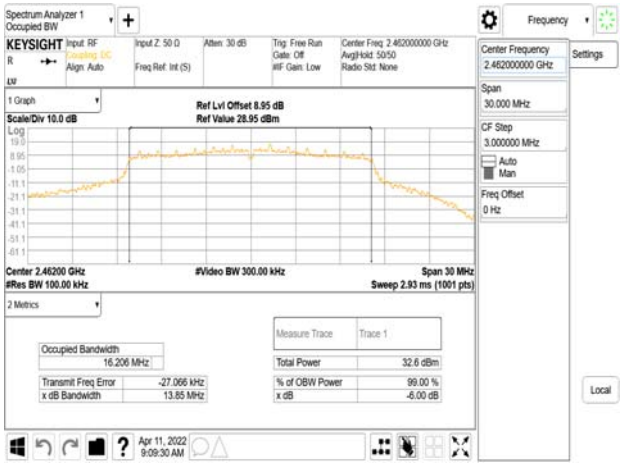
802.11g_20MHz_Chain1_2437MHz



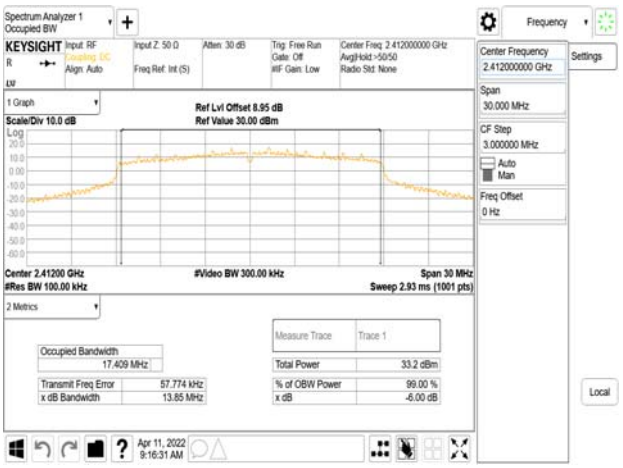
802.11g_20MHz_Chain0_2462MHz



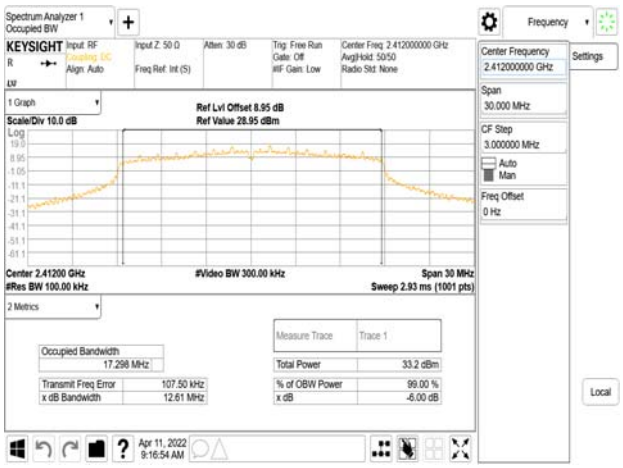
802.11g_20MHz_Chain1_2462MHz



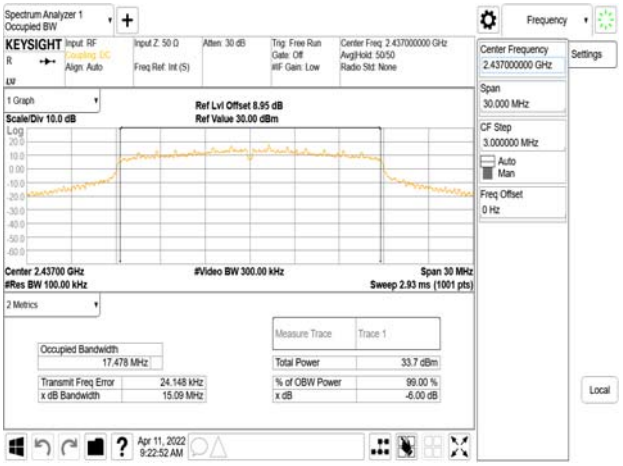
802.11n_20MHz_Chain0_2412MHz



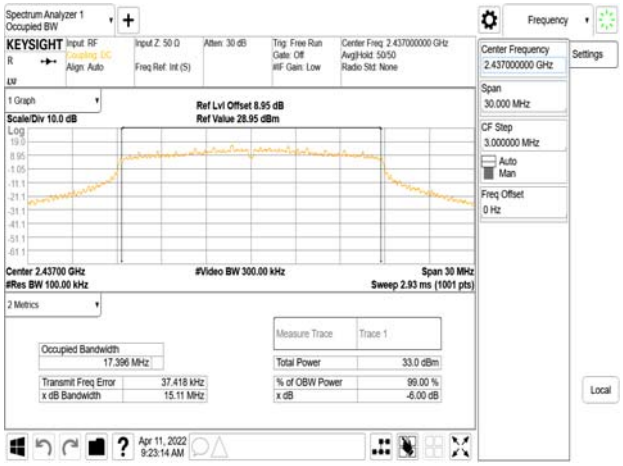
802.11n_20MHz_Chain1_2412MHz



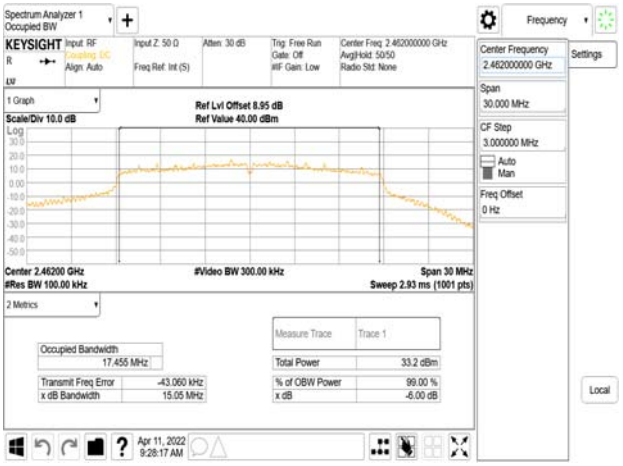
802.11n_20MHz_Chain0_2437MHz



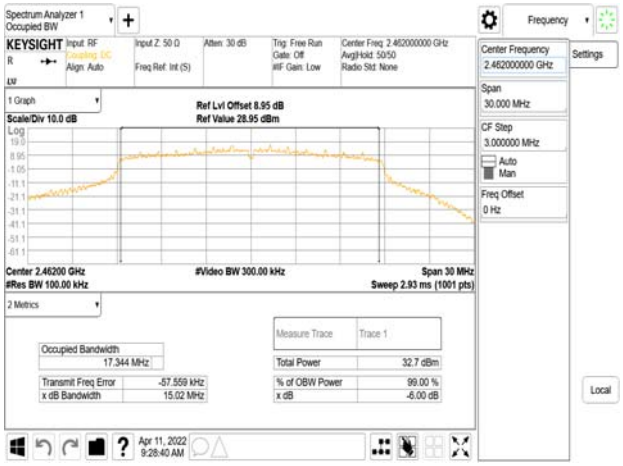
802.11n_20MHz_Chain1_2437MHz



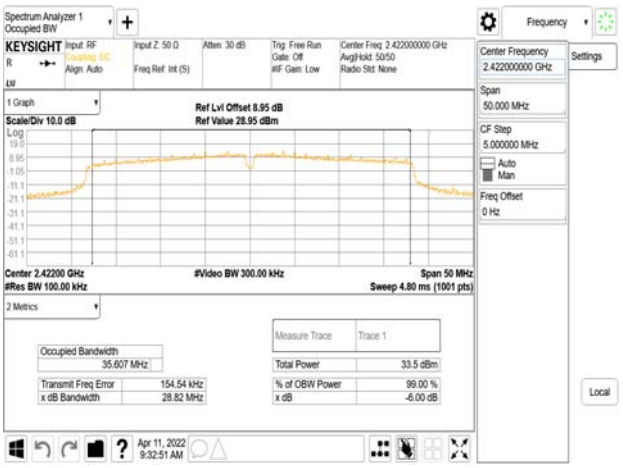
802.11n_20MHz_Chain0_2462MHz



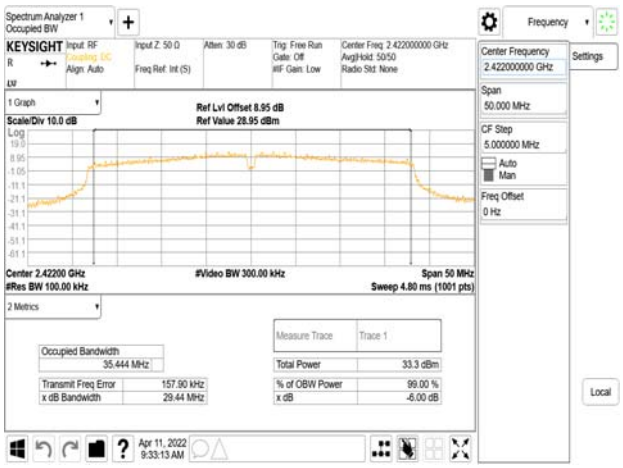
802.11n_20MHz_Chain1_2462MHz



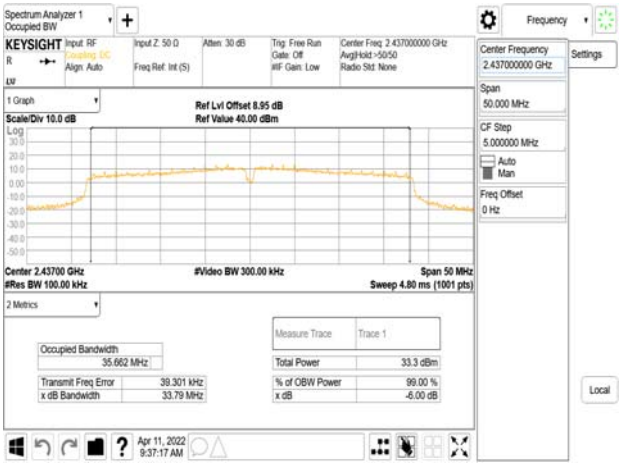
802.11n_40MHz_Chain0_2422MHz



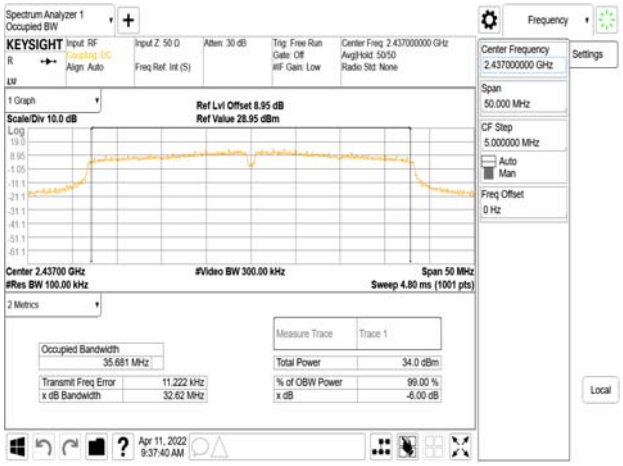
802.11n_40MHz_Chain1_2422MHz



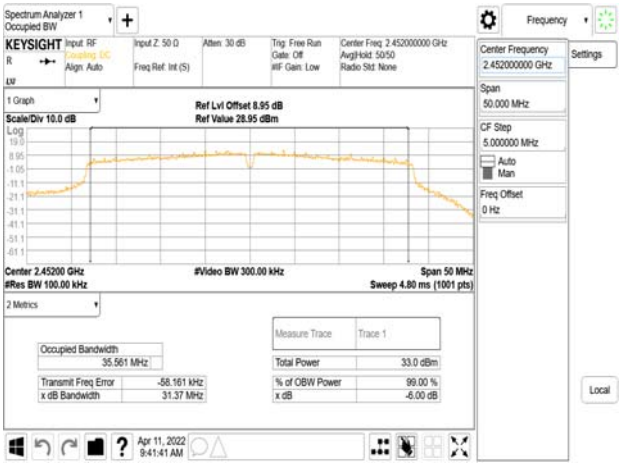
802.11n_40MHz_Chain0_2437MHz



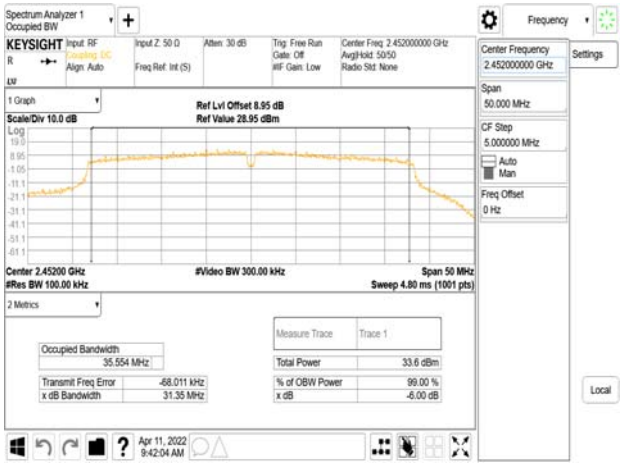
802.11n_40MHz_Chain1_2437MHz



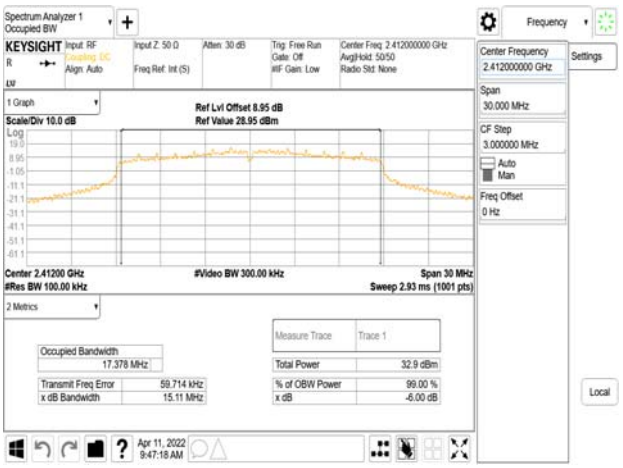
802.11n_40MHz_Chain0_2452MHz



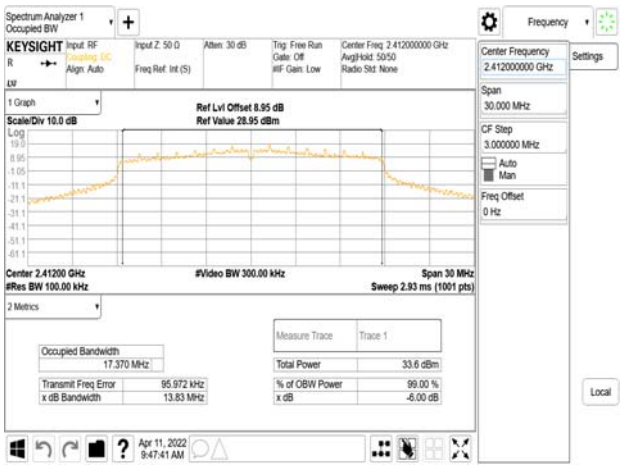
802.11n_40MHz_Chain1_2452MHz



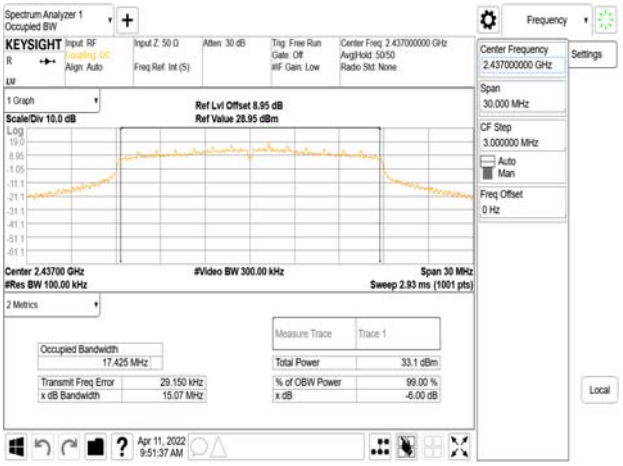
802.11ax_20MHz_Chain0_2412MHz



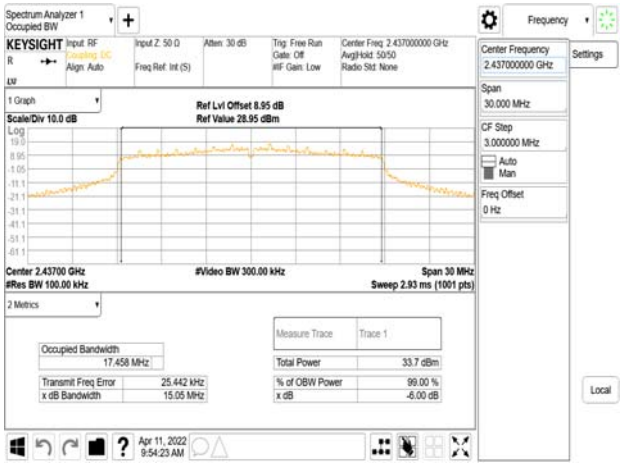
802.11ax_20MHz_Chain1_2412MHz



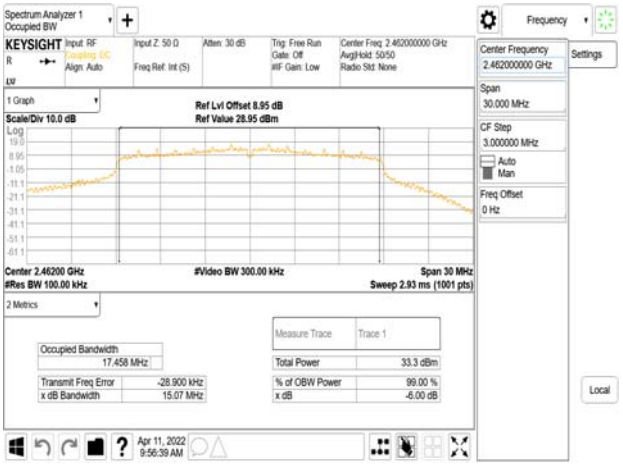
802.11ax_20MHz_Chain0_2437MHz



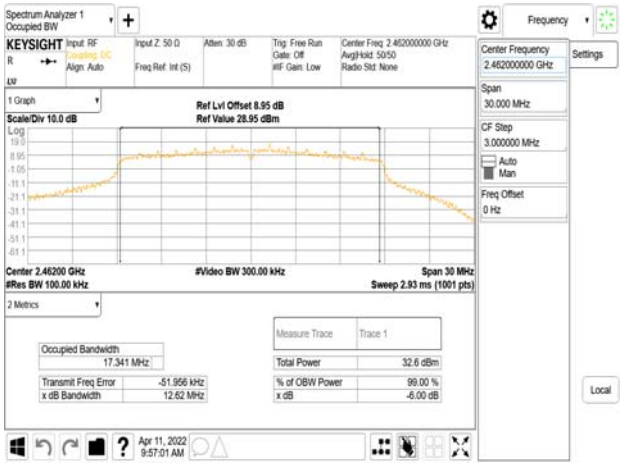
802.11ax_20MHz_Chain1_2437MHz



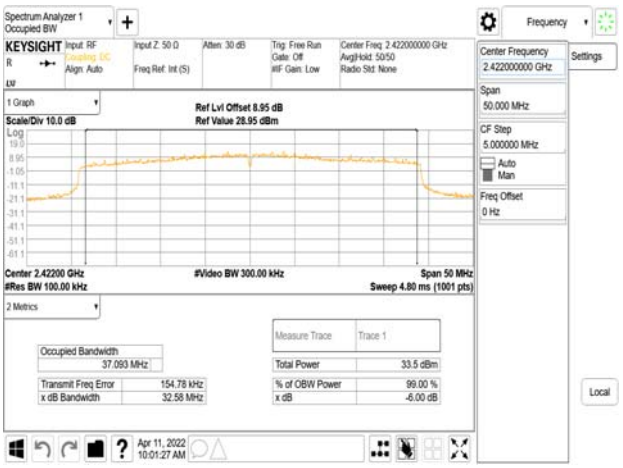
802.11ax_20MHz_Chain0_2462MHz



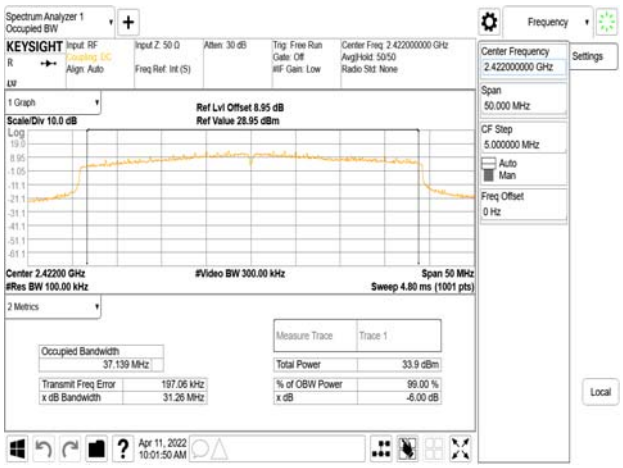
802.11ax_20MHz_Chain1_2462MHz



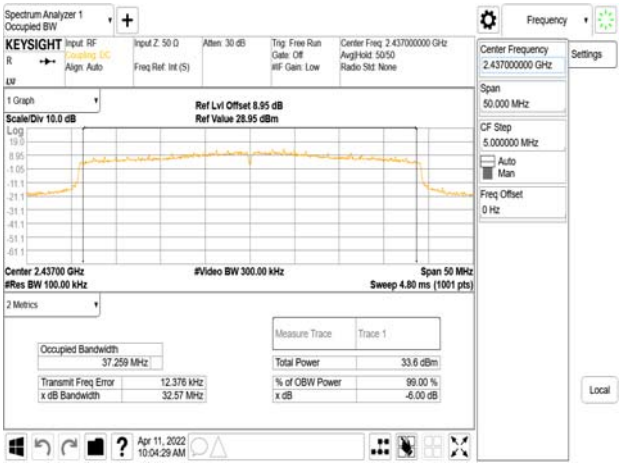
802.11ax_40MHz_Chain0_2422MHz



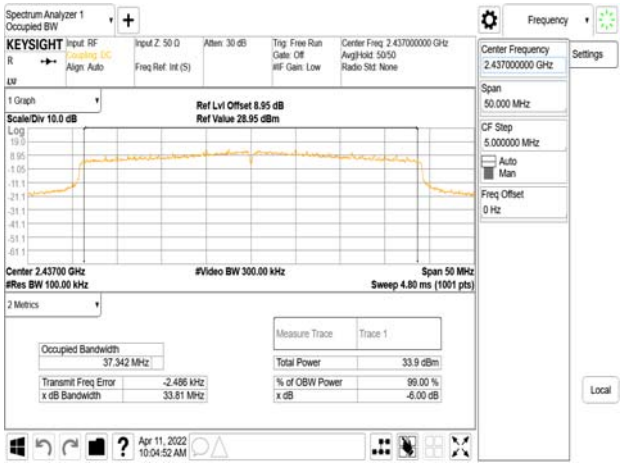
802.11ax_40MHz_Chain1_2422MHz



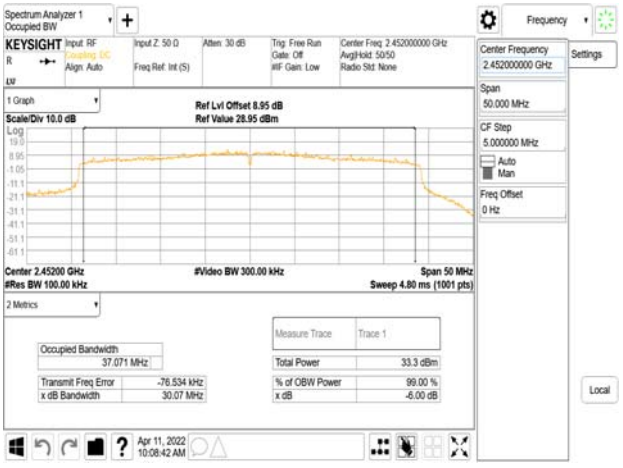
802.11ax_40MHz_Chain0_2437MHz



802.11ax_40MHz_Chain1_2437MHz



802.11ax_40MHz_Chain0_2452MHz



802.11ax_40MHz_Chain1_2452MHz

10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

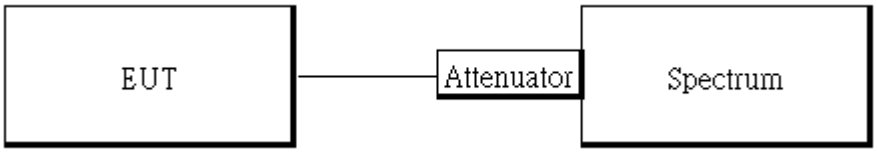
10.1 Standard Applicable

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.

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions 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) (see § 15.205(c)).

In addition, radiated emissions 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).

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.
10. MIMO mode: offset is set following “measure and add 10 Log (N)” on spectrum to measure for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna.

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 – 30dBm
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. MIMO mode: offset is set following “measure and add 10 Log (N)” on spectrum to measure for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna.

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.
7. MIMO mode: offset is set following “measure and add 10 Log (N)” on spectrum to measure for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna.

Note:

For test of MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome.

10.4 Measurement Result

802.11b Ch0

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	16.76	-13.24
2437	16.41	-13.59
2462	16.07	-13.93

802.11b Ch1

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	17.21	-12.79
2437	16.16	-13.84
2462	16.11	-13.89

802.11g Ch0

Reference Level of Limit 802.11g mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	17.21	-12.79
2437	17.72	-12.28
2462	17.32	-12.68

802.11g Ch1

Reference Level of Limit 802.11g mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	17.95	-12.05
2437	16.71	-13.29
2462	16.85	-13.15

802.11nHT_20M Ch0

Reference Level of Limit 802.11n20 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	16.44	-13.56
2437	17.12	-12.88
2462	17.26	-12.74

802.11nHT_20M Ch1

Reference Level of Limit 802.11ac20 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	17.00	-13.00
2437	16.86	-13.14
2462	15.98	-14.02

802.11nHT_40M Ch0

Reference Level of Limit 802.11n40 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2422	13.08	-16.92
2437	13.44	-16.56
2452	11.63	-18.37

802.11nHT_40M Ch1

Reference Level of Limit 802.11ac40 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2422	13.26	-16.74
2437	13.31	-16.69
2452	11.93	-18.07

802.11ax_HE_20M Ch0

Reference Level of Limit 802.11ax20 mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	17.12	-12.88
2437	17.30	-12.70
2462	15.61	-14.39

802.11ax_HE_20M Ch1

Reference Level of Limit 802.11ax20 mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	17.38	-12.62
2437	17.32	-12.68
2462	17.25	-12.75

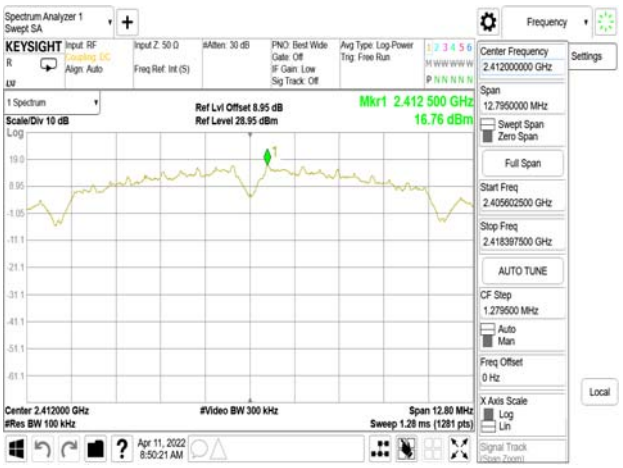
802.11ax_HE_40M Ch0

Reference Level of Limit 802.11ax40 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2422	12.77	-17.23
2437	13.49	-16.51
2452	12.72	-17.28

802.11ax_HE_40M Ch1

Reference Level of Limit 802.11ax40 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2422	13.63	-16.37
2437	12.97	-17.03
2452	12.73	-17.27

802.11b_20MHz_Chain0_2412MHz

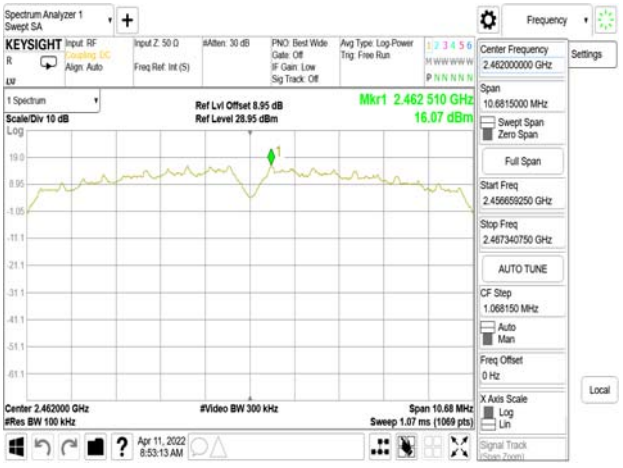


802.11b_20MHz_Chain1_2412MHz

802.11b_20MHz_Chain0_2437MHz

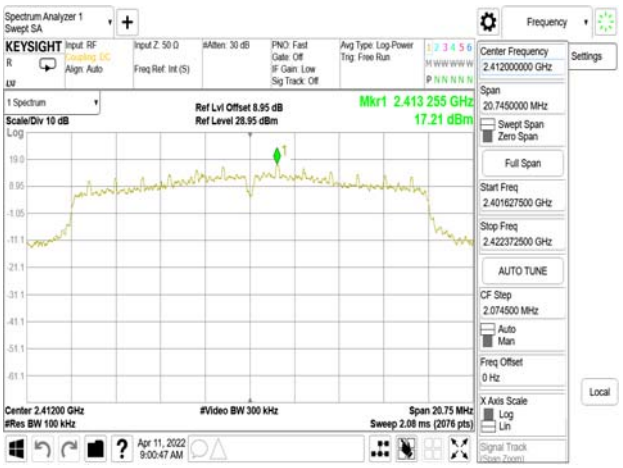
802.11b_20MHz_Chain1_2437MHz

802.11b_20MHz_Chain0_2462MHz

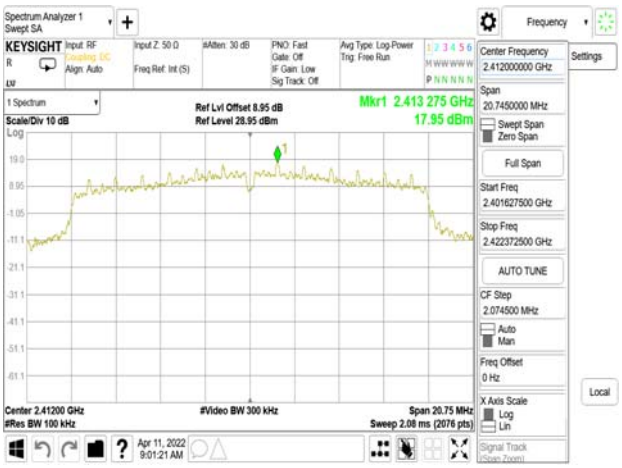


802.11b_20MHz_Chain1_2462MHz

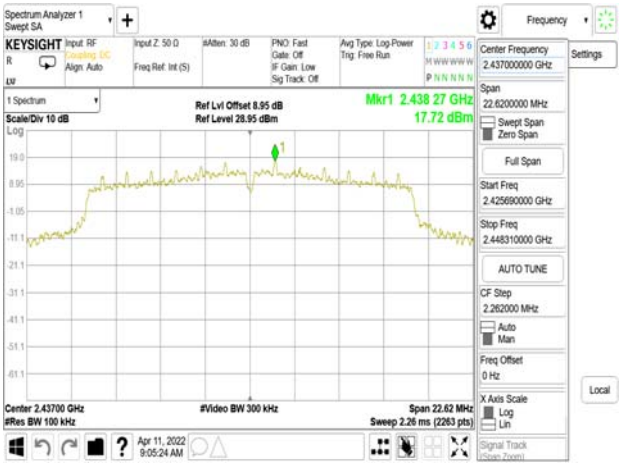
802.11g_20MHz_Chain0_2412MHz



802.11g_20MHz_Chain1_2412MHz



802.11g_20MHz_Chain0_2437MHz

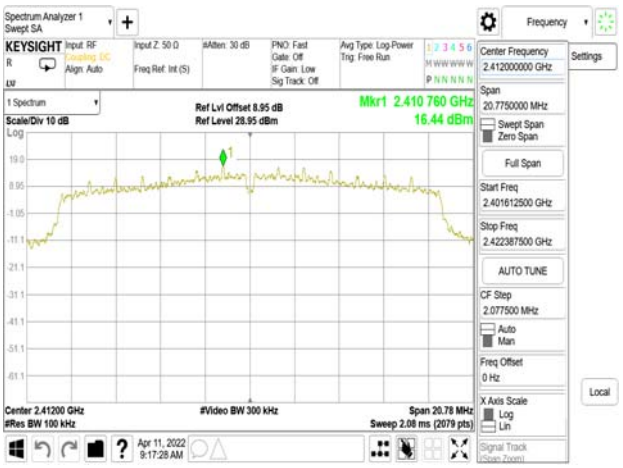


802.11g_20MHz_Chain1_2437MHz

802.11g_20MHz_Chain0_2462MHz

802.11g_20MHz_Chain1_2462MHz

802.11n_20MHz_Chain0_2412MHz



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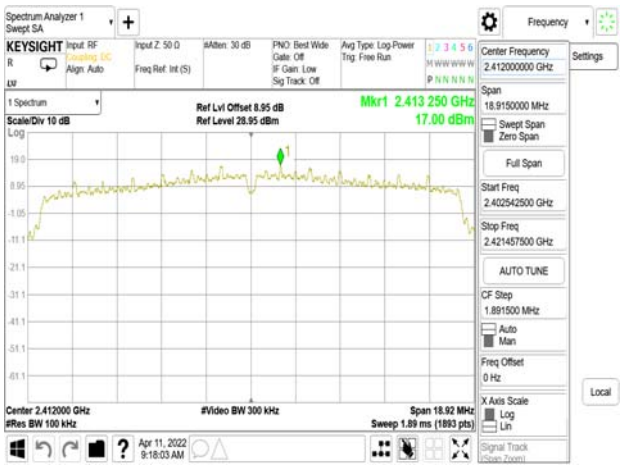
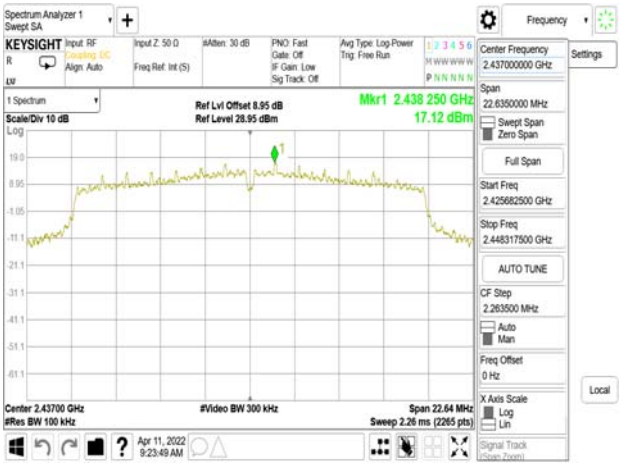
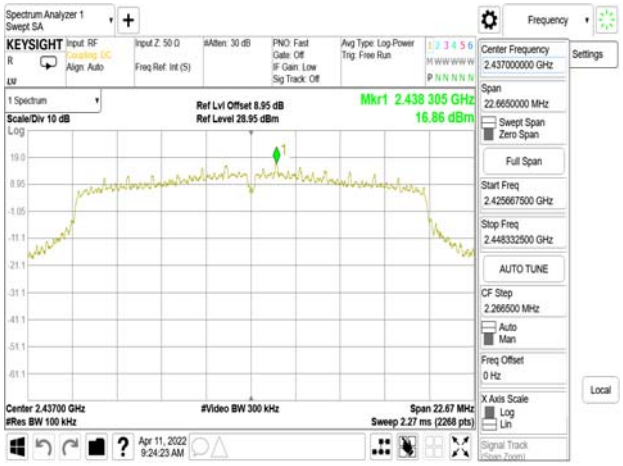


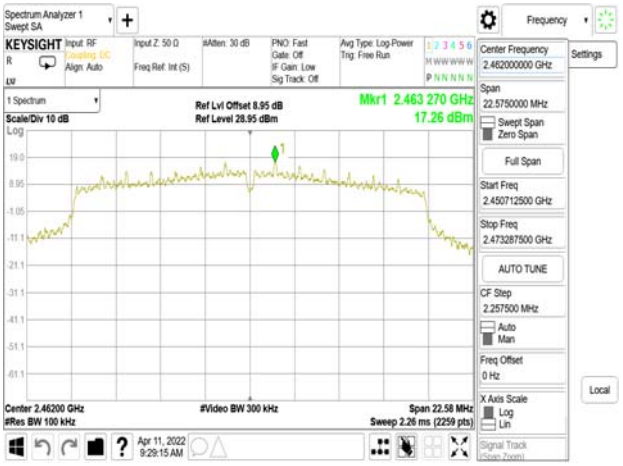
802.11n_20MHz_Chain0_2437MHz



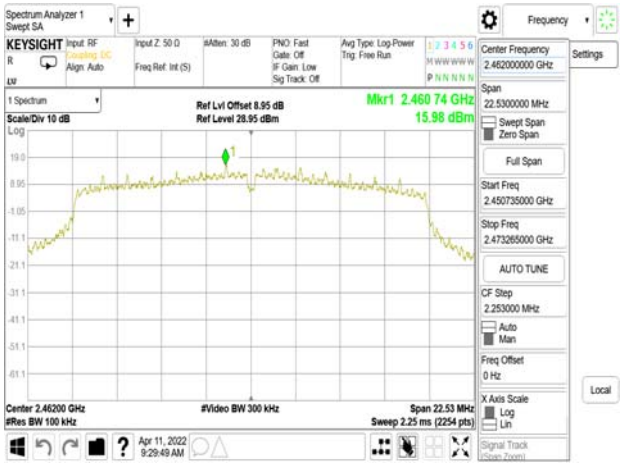
802.11n_20MHz_Chain1_2437MHz



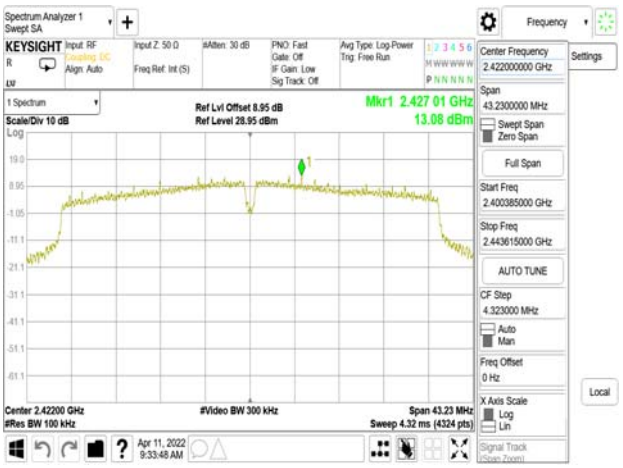
802.11n_20MHz_Chain0_2462MHz



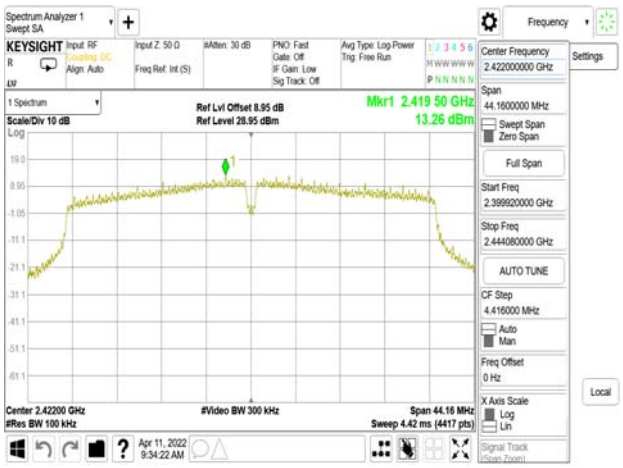
802.11n_20MHz_Chain1_2462MHz



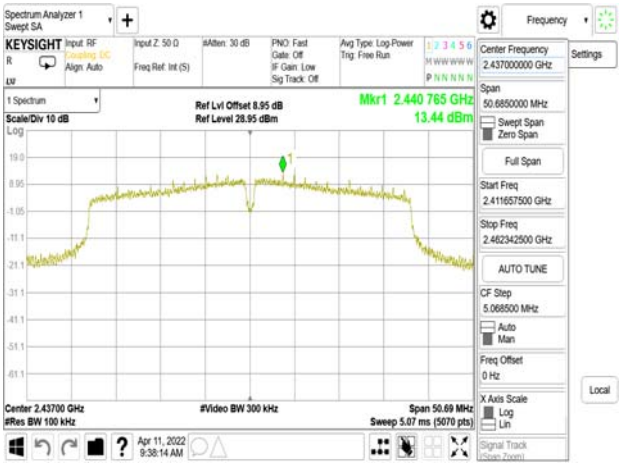
802.11n_40MHz_Chain0_2422MHz



802.11n_40MHz_Chain1_2422MHz

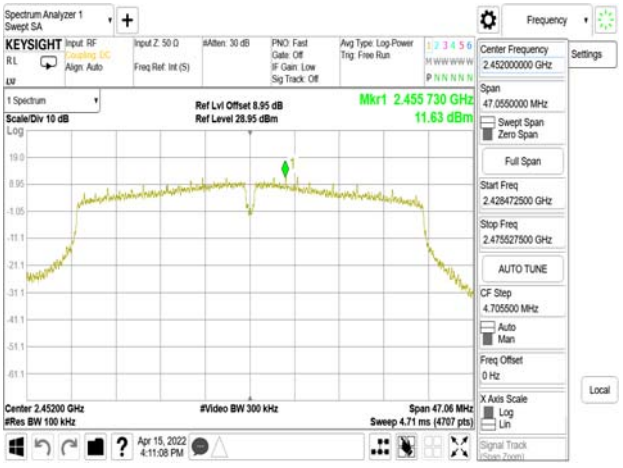


802.11n_40MHz_Chain0_2437MHz



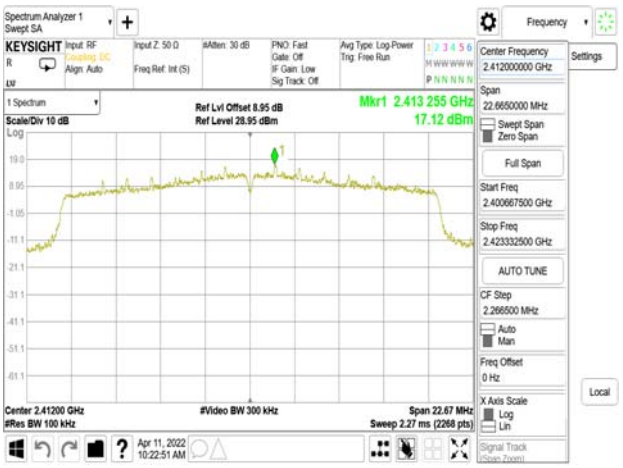
802.11n_40MHz_Chain1_2437MHz

802.11n_40MHz_Chain0_2452MHz

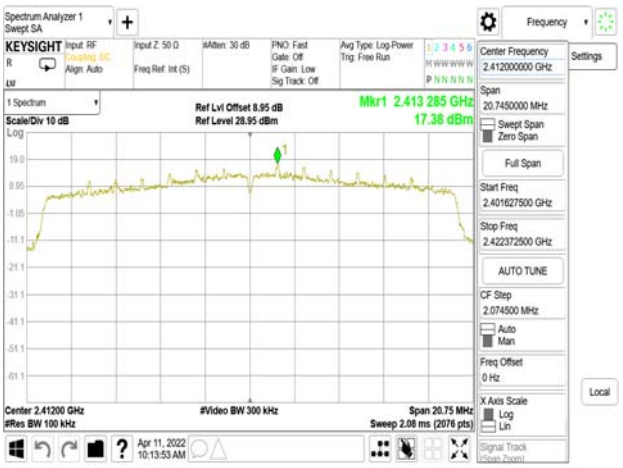


802.11n_40MHz_Chain1_2452MHz

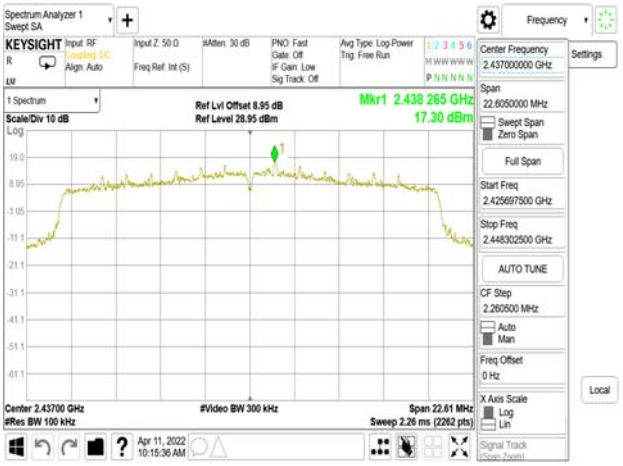
802.11ax_20MHz_Chain0_2412MHz



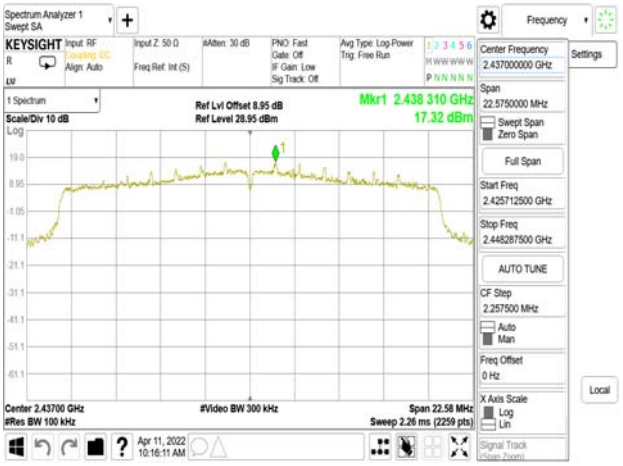
802.11ax_20MHz_Chain1_2412MHz



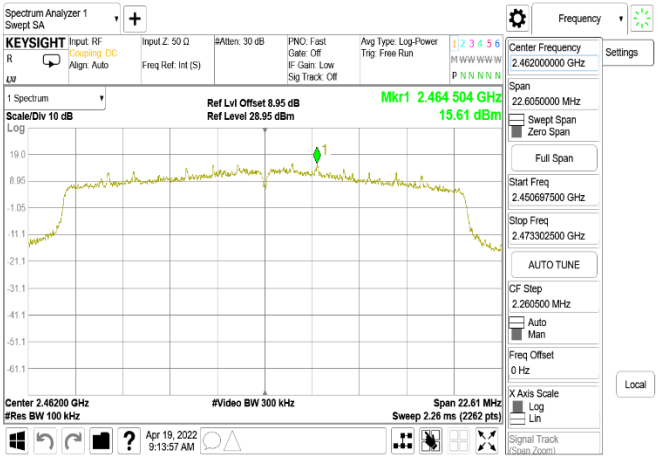
802.11ax_20MHz_Chain0_2437MHz



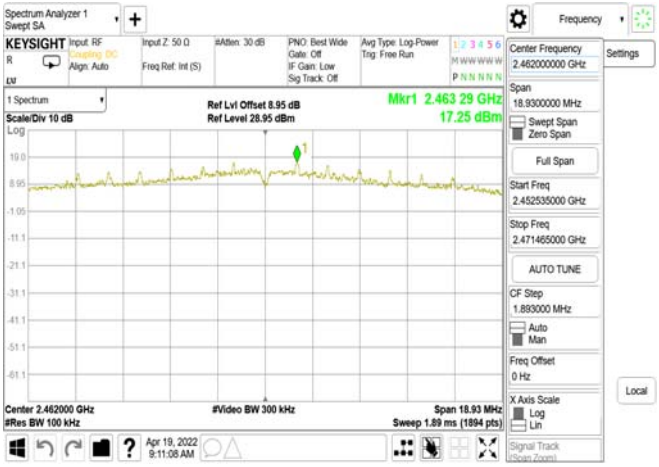
802.11ax_20MHz_Chain1_2437MHz



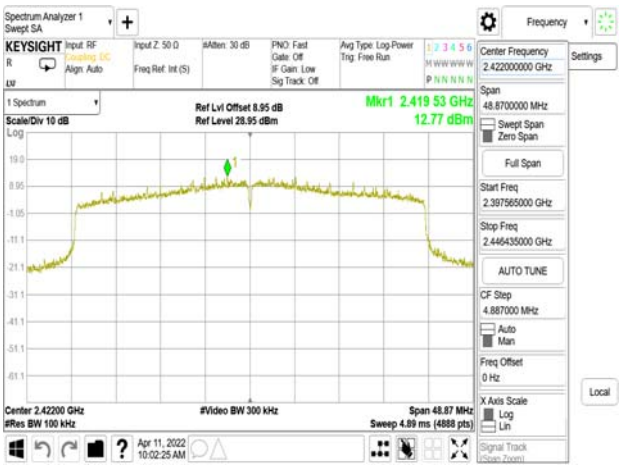
802.11ax_20MHz_Chain0_2462MHz



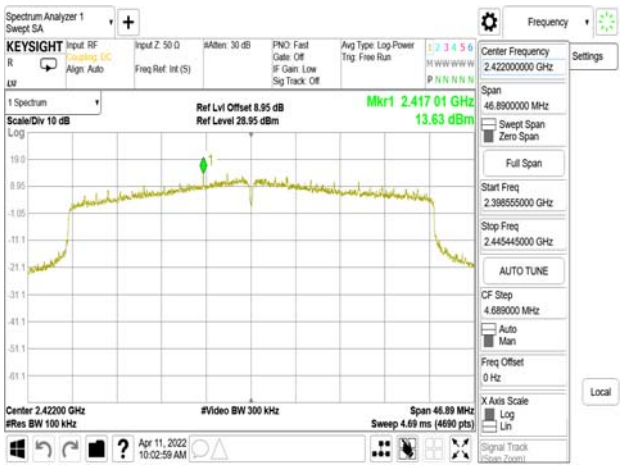
802.11ax_20MHz_Chain1_2462MHz



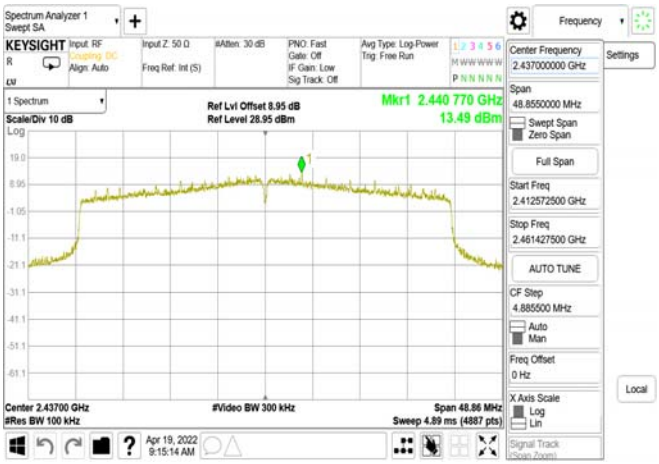
802.11ax_40MHz_Chain0_2422MHz



802.11ax_40MHz_Chain1_2422MHz



802.11ax_40MHz_Chain0_2437MHz

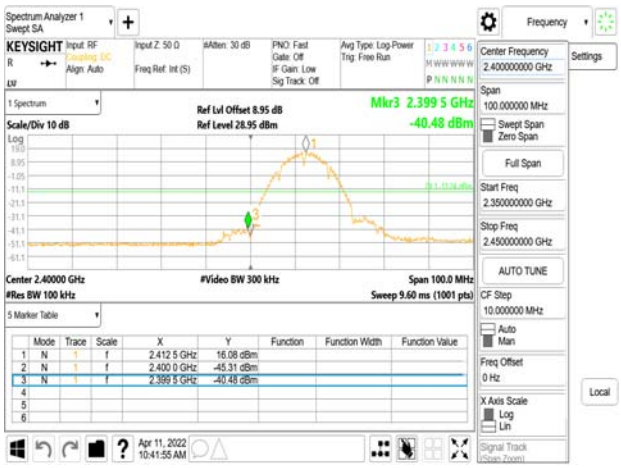


802.11ax_40MHz_Chain1_2437MHz

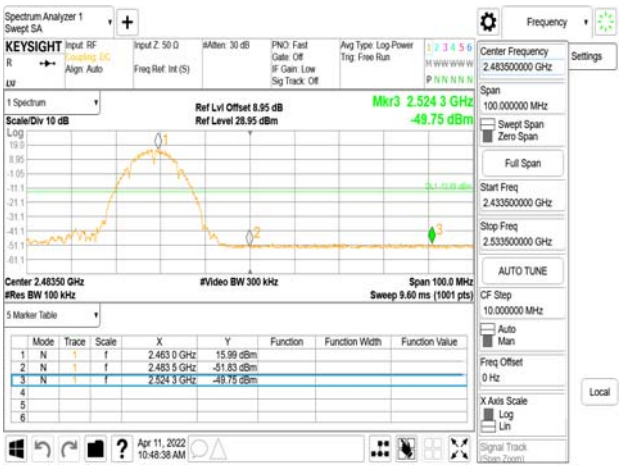
802.11ax_40MHz_Chain0_2452MHz

802.11ax_40MHz_Chain1_2452MHz

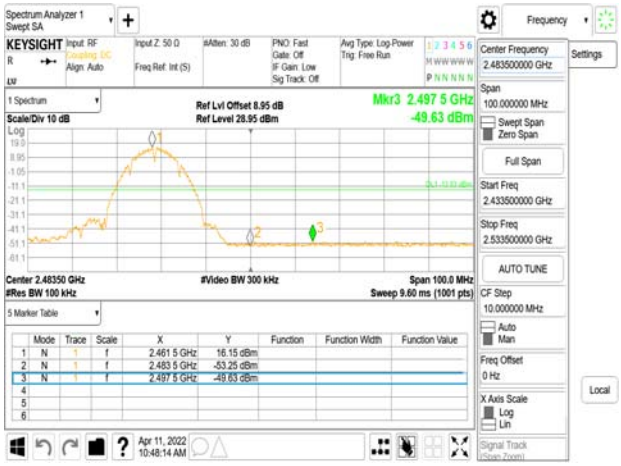
802.11b_20MHz_Chain0_2412MHz



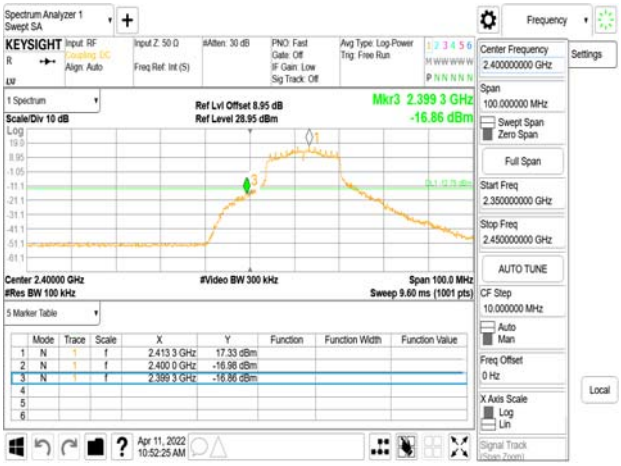
802.11b_20MHz_Chain1_2462MHz



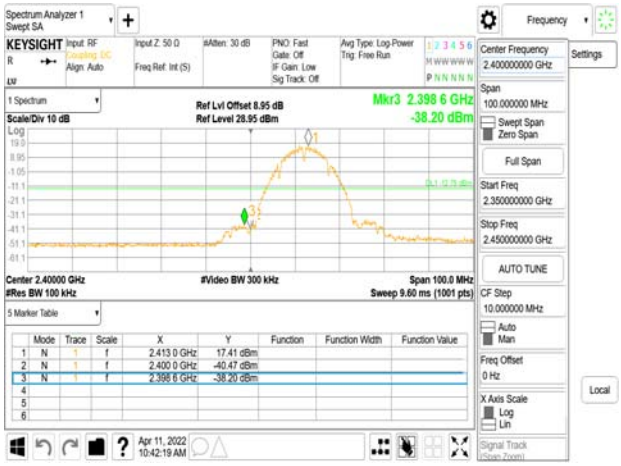
802.11b_20MHz_Chain0_2462MHz



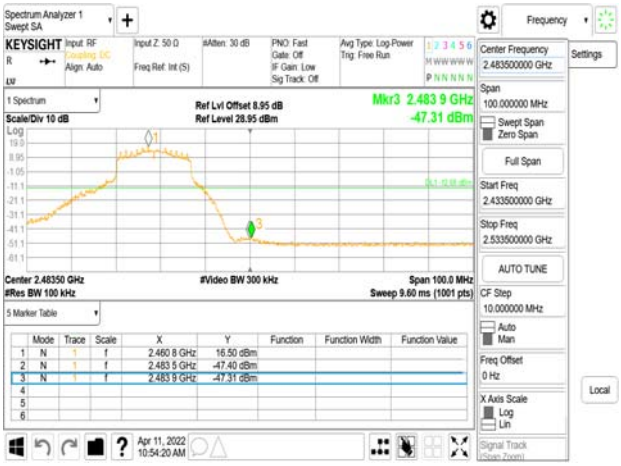
802.11g_20MHz_Chain0_2412MHz



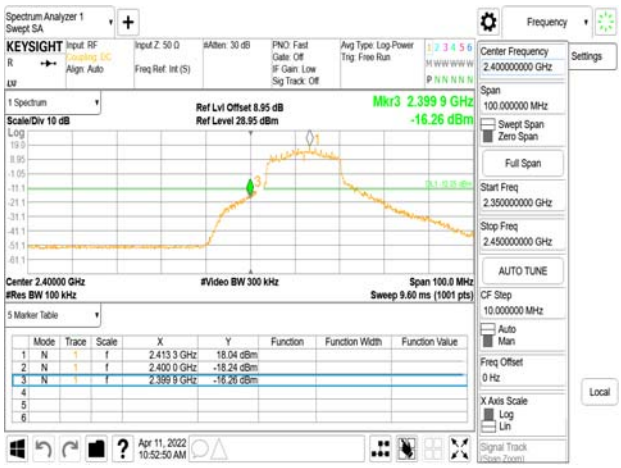
802.11b_20MHz_Chain1_2412MHz



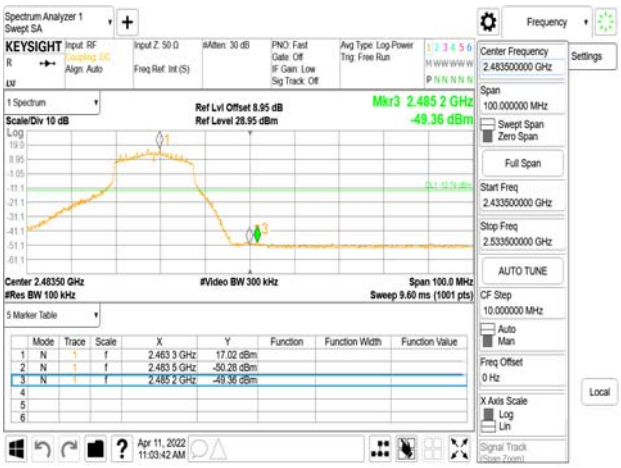
802.11g_20MHz_Chain0_2462MHz



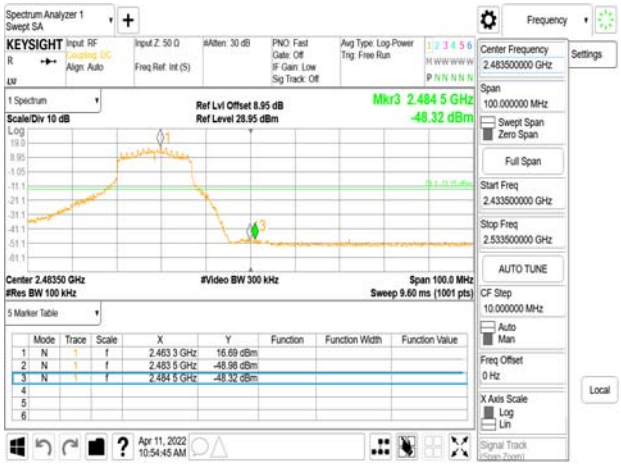
802.11g_20MHz_Chain1_2412MHz



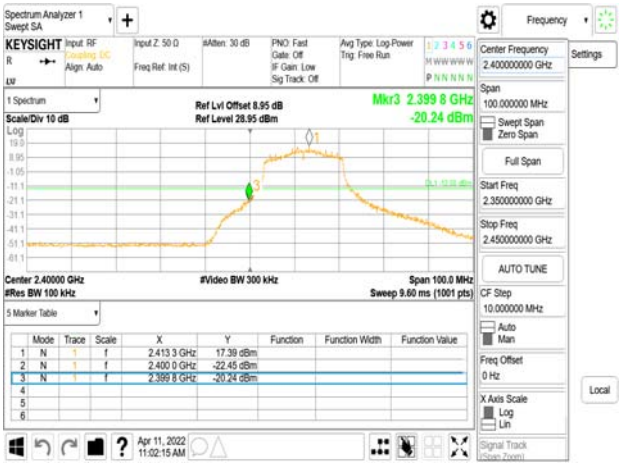
802.11n_20MHz_Chain0_2462MHz



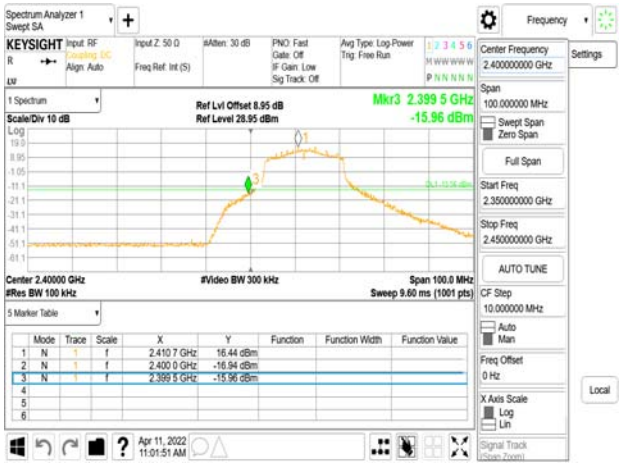
802.11g_20MHz_Chain1_2462MHz



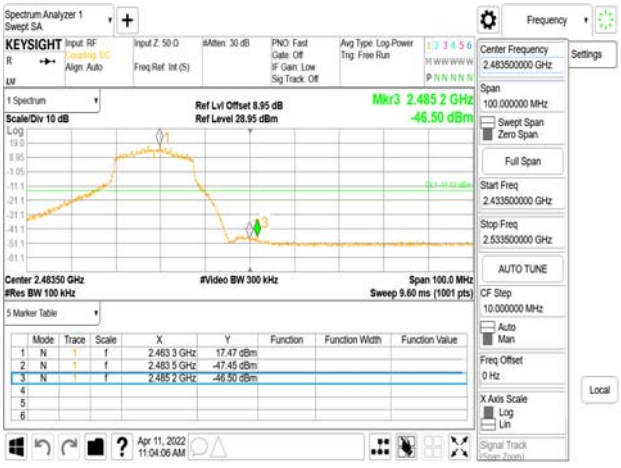
802.11n_20MHz_Chain1_2412MHz



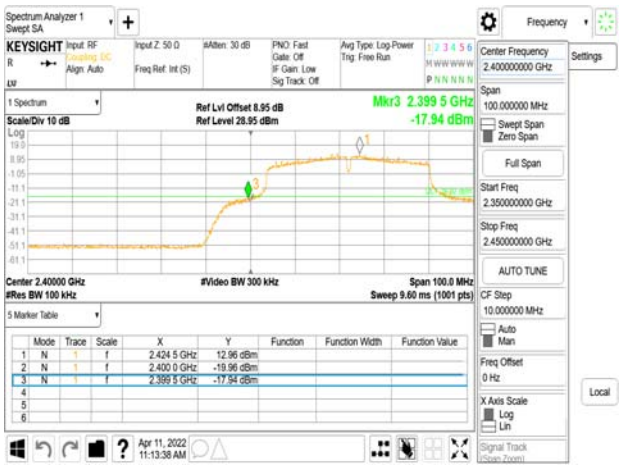
802.11n_20MHz_Chain0_2412MHz



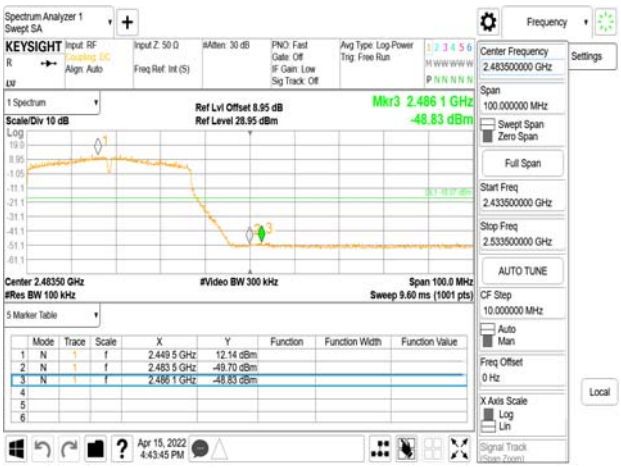
802.11n_20MHz_Chain1_2462MHz



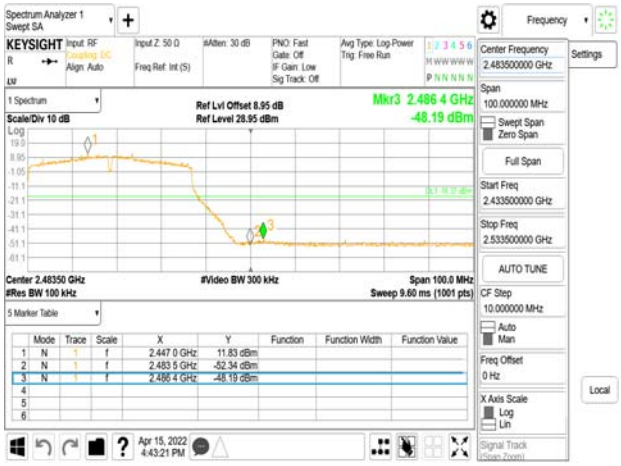
802.11n_40MHz_Chain0_2422MHz



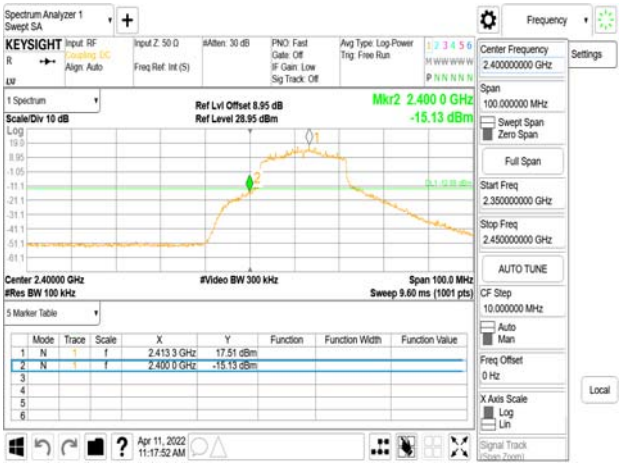
802.11n_40MHz_Chain1_2452MHz



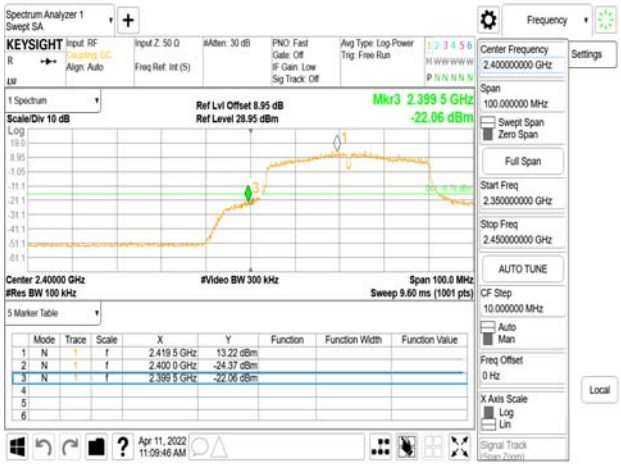
802.11n_40MHz_Chain0_2452MHz



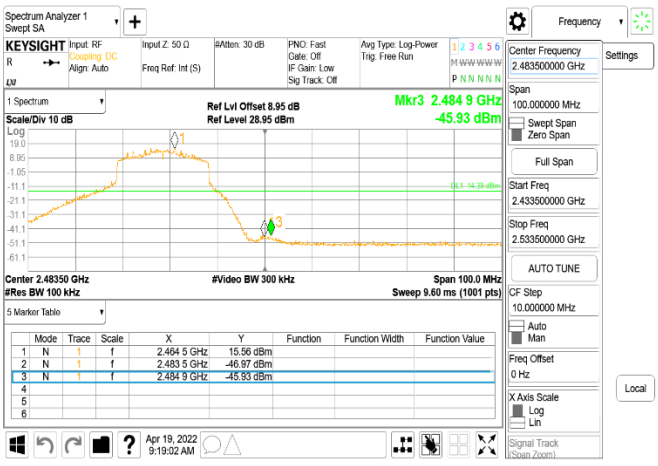
802.11ax_20MHz_Chain0_2412MHz



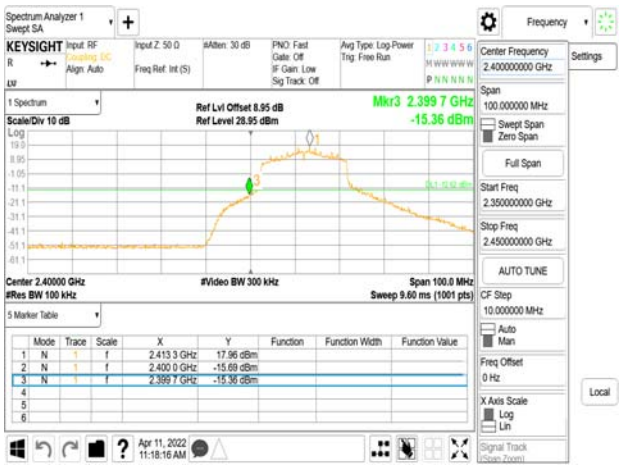
802.11n_40MHz_Chain1_2422MHz



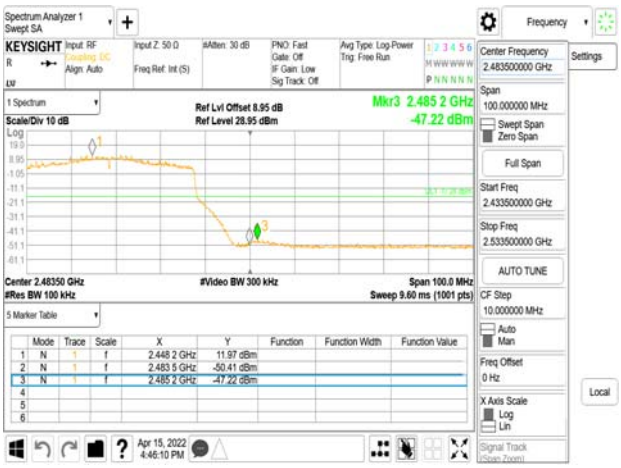
802.11ax_20MHz_Chain0_2462MHz



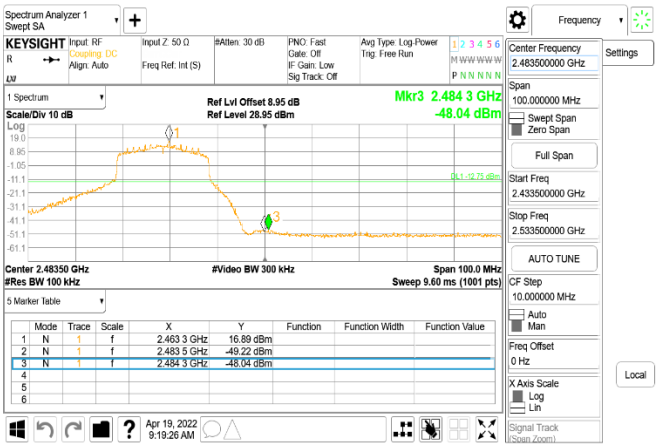
802.11ax_20MHz_Chain1_2412MHz



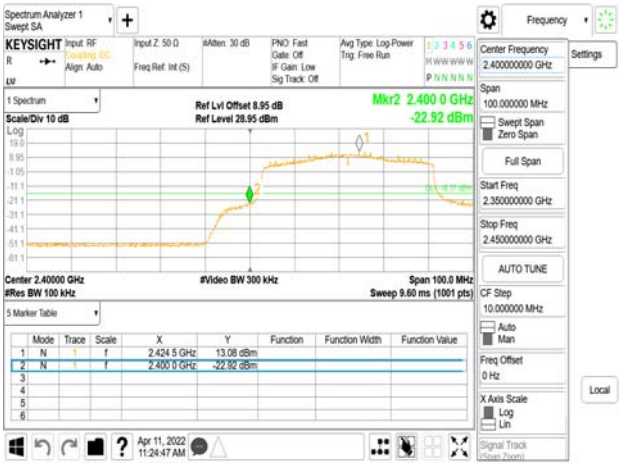
802.11ax_40MHz_Chain0_2452MHz



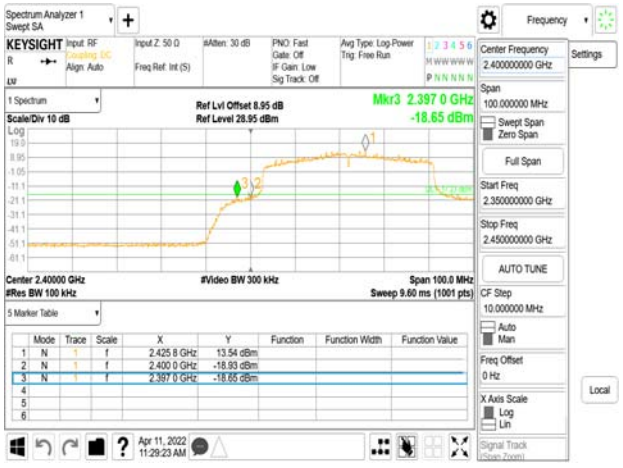
802.11ax_20MHz_Chain1_2462MHz



802.11ax_40MHz_Chain1_2422MHz



802.11ax_40MHz_Chain0_2422MHz



802.11ax_40MHz_Chain1_2452MHz