

**ELECTROMAGNETIC EMISSIONS
COMPLIANCE REPORT**

Applicant: T-mobile Usa, Inc.
12920 Se 38th Street, Bellevue, Washington, United States,
98006.

Manufacturer: T-mobile Usa, Inc.
12920 Se 38th Street, Bellevue, Washington, United States,
98006.

Product Name: SyncUP Kids Watch V2

Brand Name: T-Mobile

Model No.: TMUS-SKW-2

Report Number: TERF2402000332ER

FCC ID 2ASXC-TMO-SKW-02

Date of EUT Received: March 06, 2024

Date of Test: March 06, 2024 ~ April 16, 2024

Issue Date: April 30, 2024

Approved By _____

Jazz Huang

Jazz 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.

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
TERF2402000332ER	00	Original.	April 24, 2024	Kate Lai	
TERF2402000332ER	01	Revise: Product Name	April 30, 2024	Kate Lai	*

Note:

- 1、The remark "*" indicates modification of the report upon requests from certification body.
- 2、Variant information of main and 2nd source is provided by the applicant, test results of this report are applicable to the sample EUT(s) received. The AC power line conducted Emissions and Spurious Emissions were added to measure the above differences. The rest of the internal circuit board wiring technology and radio frequency functions of the main components are the same. Please refer to the 1.4 Basic Differences of Source for details.

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	SyncUP Kids Watch V2
Brand Name:	T-Mobile
Model No.:	TMUS-SKW-2
Hardware Version:	N/A
Firmware Version:	N/A
EUT Series No.:	X5A23L4047E4C040
Power Supply:	3.87Vdc from Rechargeable Li-ion Battery
Test Software (Name/Version)	QSPR/5.14.00227.1

1.2 RF Specification

WLAN 2.4GHz

Wi-Fi	Frequency Range	Channels	Rated Power (dBm)		Modulation Technology
			Peak	Avg.	
802.11b	2412~2462	11	22.13	18.94	DSSS
802.11g	2412~2462	11	21.43	16.92	OFDM
802.11n_HT20	2412~2462	11	22.13	17.85	OFDM
802.11n_HT40	2422~2452	7	22.87	17.67	OFDM
802.11ac_VHT20	2412~2462	11	22.08	17.80	OFDM
802.11ac_VHT40	2422~2452	7	22.76	17.63	OFDM
Modulation type:		CCK, DQPSK, DBPSK for DSSS in 802.11b			
		64QAM, 16QAM, QPSK, BPSK for OFDM in 802.11g, 11n			
		256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM in 802.11ac			
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			
		802.11n_HT40: up to 150Mbps			
		802.11ac_VHT20: up to 86.7Mbps			
		802.11ac_VHT40: up to 200Mbps			

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1.3 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
PIFA	Suzhou Aricomm Communications Co., Ltd.	DQ623112500	2412 – 2462	-3.81

Note:Antenna information is provided by the applicant.

1.4 Basic Differences of Source

	Model No.	Supplier
USB Cable(Data Cable) Main source	KCA-ET-5-0329	KSD CO., LTD
USB Cable(Data Cable) 2nd source	WJE240010B	GREATLAND ELECTRONICS TAIWAN LTD
PCB Main source	QNT0733	AT&S(China)Co., LTD
PCB 2nd source	6590409-G00-0T	COMPEQ MANUFACTURING CO.,LTD.
Memory Main source	FAPEA3216-58C2930	Longsys Electronics Co., Ltd.
Memory 2nd source	32CP16-M4MTC2W-GA68	KINGSTON TECHNOLOGY COMPANY
B71 Duplexer Main source	B39681B1266P810	RF360 Europe GmbH
B71 Duplexer 2nd source	SAYRH634MBA0C0A	MURATA
A+G sensor Main source	LSM6DSOWTR	STMicroelectronics
A+G sensor 2nd source	ICM-42607-P	TDK TAIWAN CORP.TDK XIAMEN CO.,LTD
Crystal for PMIC Main source	EXS00A-CS12755	Nihon Dempa Kogyo Co., Ltd.
Crystal for PMIC 2nd source	OW38470002	TAIWAN X'TAL CORPATION
Baromete Main source	LPS22DFTR	STMicroelectronics
Barometer 2nd source	ICP-20100	TDK TAIWAN CORP.TDK XIAMEN CO.,LTD
Display Main source	TA014XVHM52-00	Tianma Micro-Electronics CO., LTD.
Display 2nd source	ONO-0141C40719	Truly Semiconductors Ltd.
Speaker Main source	MS07-015008-002H	Luxshare Precision Limited
Speaker 2nd source	KDSG150808C-08PF	KINGSTATE ELECTRONICS

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1.5 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247
 FCC KDB 558074 D01 15.247 Meas Guidance v05r02
 ANSI C63.10:2013

1.6 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	
		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				
<p>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.</p>				

1.7 Special Accessories

There are no special accessories used while test was conducted.

1.8 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.

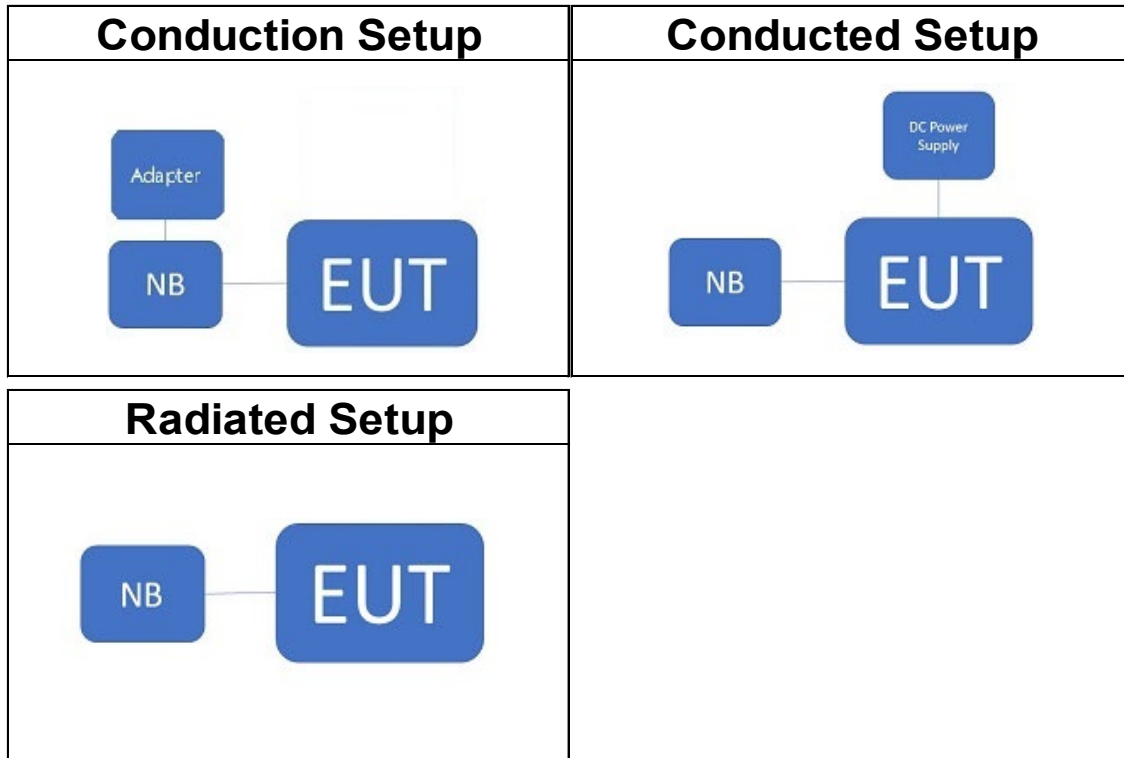
2.4.2 For all conducted test items:

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 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	T14	PF-380WLW	N/A	N/A
Adapter	Lenovo	ADLX65YAC3D	N/A	N/A	N/A
Conducted Emission Test Site: Conducted 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	T14	PF-380WLW	N/A	N/A
Radiated Emission Test Site: SAC 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	T14	PF-380WLW	N/A	N/A

2nd Source

AC Power-Line Conducted Emission Test Site: Conduction 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	T14	PF-380WLW	N/A	N/A
Adapter	Lenovo	ADLX65YAC3D	N/A	N/A	N/A
Radiated Emission Test Site: SAC 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	T14	PF-380WLW	N/A	N/A

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3 SUMMARY OF TEST RESULTS

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

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4 DESCRIPTION OF TEST MODES

4.1 Operating Frequencies

2400~2483.5 MHz			
20MHz		40MHz	
CH	Freq. (MHz)	CH	Freq. (MHz)
1	2412	3	2422
2	2417	4	2427
3	2422	5	2432
4	2427	6	2437
5	2432	7	2442
6	2437	8	2447
7	2442	9	2452
8	2447	10	2457
9	2452	11	2462
10	2457		
11	2462		
12	2467		
13	2472		

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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 gevin 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
V	802.11 ac	V	Ch0	Ch1	Ch2	Ch3	V 1TX	1TX
	802.11 ax		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
802.11n_HT40	3 to 9	3,6,9	OFDM	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

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
802.11n_HT40	3 to 9	3,6,9	OFDM	MCS0	ch0

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2nd Source

TRANSMIT RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	6	DSSS	1	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 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R
LISN	SCHWARZBECK	NSLK 8127	1040	09/06/2023	09/05/2024
Coaxial Cables	EMC Instruments Corp.	EMCCFD300-BM-BM-3000	161207	06/22/2023	06/21/2024
Pulse Limiter	SCHWARZBECK	VTSD 9561F-N	793	06/22/2023	06/21/2024
EMI Test Receiver	R&S	ESCI 7	100759	08/21/2023	08/20/2024

6.2 Conducted Measurement

Conducted Emission Test Site: Conducted 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY59071571	06/07/2023	06/06/2024
Test Software	SGS	Radio Test Software	Ver. 21	N.C.R	N.C.R
Power Meter	Anritsu	ML2496A	1242004	10/24/2023	10/23/2024
Power Sensor	Anritsu	MA2411B	1207365	10/24/2023	10/23/2024
Power Sensor	Anritsu	MA2411B	1207368	10/24/2023	10/23/2024
DC Power Supply	Agilent	E3640A	KR93300208	09/12/2023	09/11/2024
Attenuator	Mini-Circuits	BW-S10W2+	1	12/12/2023	12/11/2024
DC Block	Mini-Circuits	BLK-18-S+	31129	12/12/2023	12/11/2024

6.3 Radiated Measurement

Radiated Emission Test Site: SAC 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Loop Antenna	COM-POWER	AL-130R	10160104	12/04/2023	12/03/2024
Horn Antenna	RF SPIN	DRH0844	LE2D05A0844	07/03/2023	07/02/2024
Horn Antenna	SCHWARZBECK	BBHA9120D	D803	01/12/2024	01/11/2025
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	12/18/2023	12/17/2024
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY60242081	10/17/2023	10/16/2024
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R
Site Cal	SGS	SAC 1	N/A	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC184045B	980135	08/31/2023	08/30/2024
Pre-Amplifier	HP	8447D	2944A09469	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC118A45SEE	980933	07/31/2023	07/30/2024
4G High Pass Filter	WI	WHKX4.0	22	12/12/2023	12/11/2024
Band Reject Filter 2400-2483.5	EWT	EWT-14-0166	M3	12/12/2023	12/11/2024
Coaxial Cables	Huber Suhner	SUCOFLEX 102	RX Cable 18G-40G MY2630/2+805062/2	08/31/2023	08/30/2024
Coaxial Cable	EMCI	EMC104-SM-SM-8000+EMC106-SM-SM-7600	RX Cable 9K-18G(160125+150817)	09/12/2023	09/11/2024

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Radiated Emission Test Site: SAC 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Horn Antenna	RF SPIN	DRH0844	LE2D05A0844	07/03/2023	07/02/2024
Horn Antenna	SCHWARZBECK	BBHA9120D	1441	09/23/2023	09/22/2024
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY63440386	02/06/2024	02/05/2025
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R
Site Cal	SGS	SAC 3	N/A	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC184045B	980135	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC118A45SEE	980868	08/31/2023	08/30/2024
4G High Pass Filter	WI	WHKX4.0	22	12/12/2023	12/11/2024
Band Reject Filter 2400-2483.5	EWT	EWT-14-0166	M3	12/12/2023	12/11/2024
Coaxial Cables	Huber Suhner	SUCOFLEX 102	RX Cable 18G-40G MY2630/2+805062/ 2	08/31/2023	08/30/2024
Coaxial Cables	EMCI+Huber Suhner	EMC107-SM-SM- 1000+EMC107-SM- SM-1500+EMC107- SM-SM- 8000+SUCOFLEX 104PEA	RX Cable 9K-18G (221110+221106+22 1212+MY4251/4PE A)	08/31/2023	08/30/2024

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

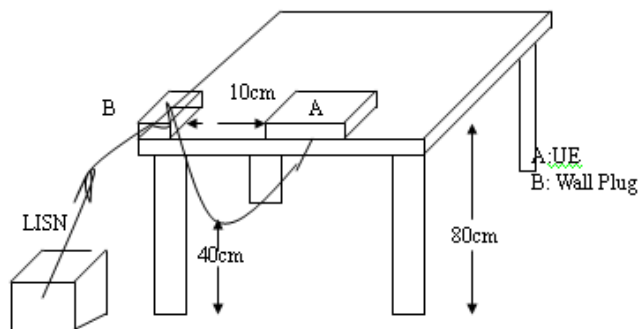
Note

- The lower limit shall apply at the transition frequencies
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

7.2 EUT Setup:

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

7.3 Test Setup



7.4 Measurement Procedure

- The EUT was placed on a table which is 0.8m above ground plane.
- Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 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.

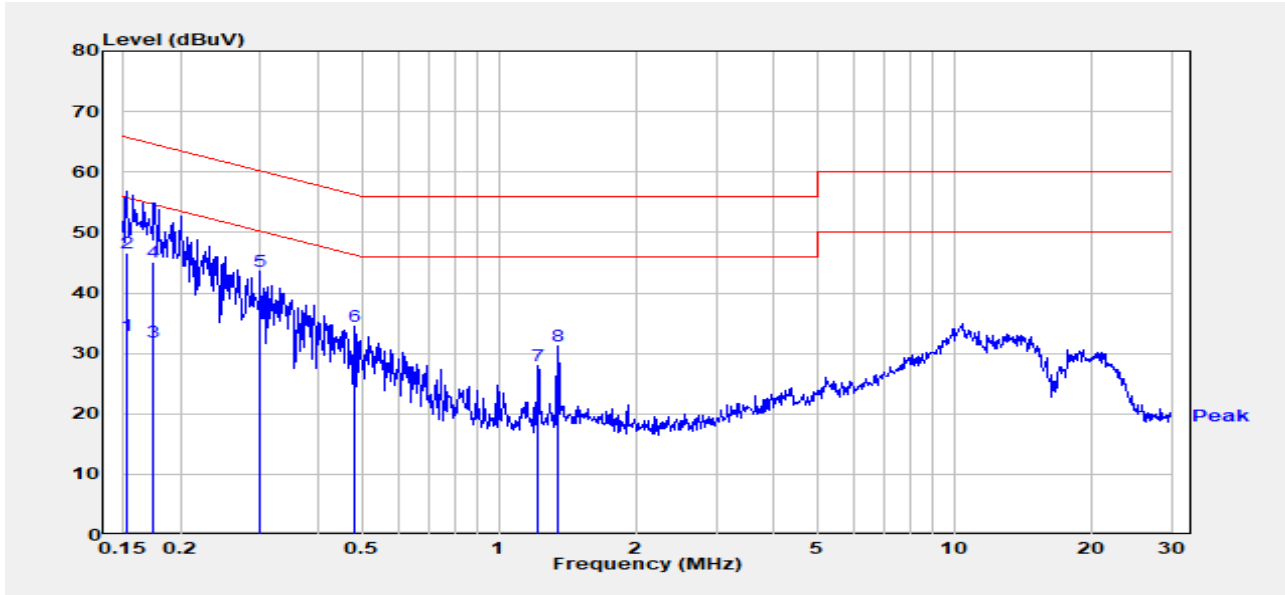
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:TERF2402000332ER	Test Site	:Conduction 1
Operation Mode	:2.4G	Test Date	:2024-04-01
Power	:120V/60Hz	Temp./Humi.	:24.9°C/61%
Probe	:L	Engineer	:Cooper Hsu



Freq. MHz	Detector Mode	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.152	Average	22.80	10.13	32.93	55.87	-22.94
0.152	QP	36.40	10.13	46.53	65.87	-19.34
0.175	Average	21.80	10.13	31.93	54.72	-22.79
0.175	QP	35.00	10.13	45.13	64.72	-19.59
0.299	Peak	33.41	10.14	43.55	60.28	-16.72
0.481	Peak	24.23	10.16	34.39	56.32	-21.92
1.223	Peak	17.69	10.20	27.89	56.00	-28.11
1.352	Peak	21.13	10.20	31.33	56.00	-24.67

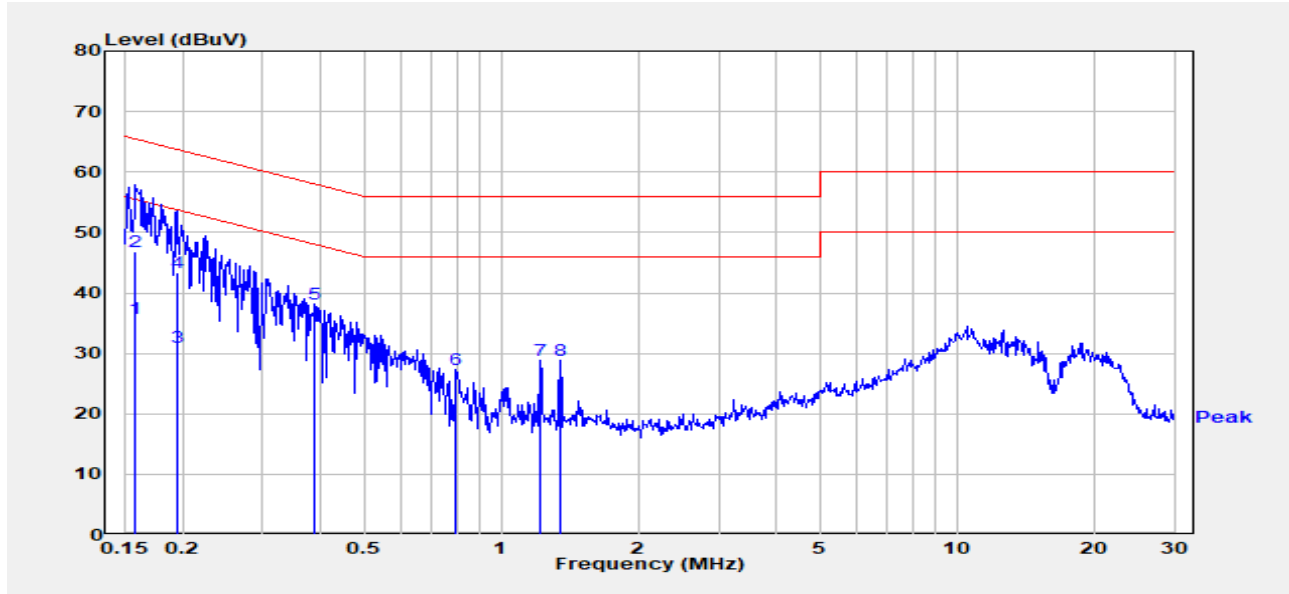
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Report Number :TERF2402000332ER
 Operation Mode :2.4G
 Power :120V/60Hz
 Probe :N

Test Site :Conduction 1
 Test Date :2024-04-01
 Temp./Humi. :24.9°C/61%
 Engineer :Cooper Hsu



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V	Limit dB μ V	Margin dB
0.157	Average	25.70	10.12	35.82	55.60	-19.78
0.157	QP	36.80	10.12	46.92	65.60	-18.68
0.194	Average	20.80	10.12	30.92	53.84	-22.92
0.194	QP	33.30	10.12	43.42	63.84	-20.42
0.389	Peak	28.03	10.15	38.18	58.08	-19.90
0.796	Peak	17.24	10.18	27.42	56.00	-28.58
1.223	Peak	18.57	10.19	28.76	56.00	-27.24
1.345	Peak	18.75	10.19	28.94	56.00	-27.06

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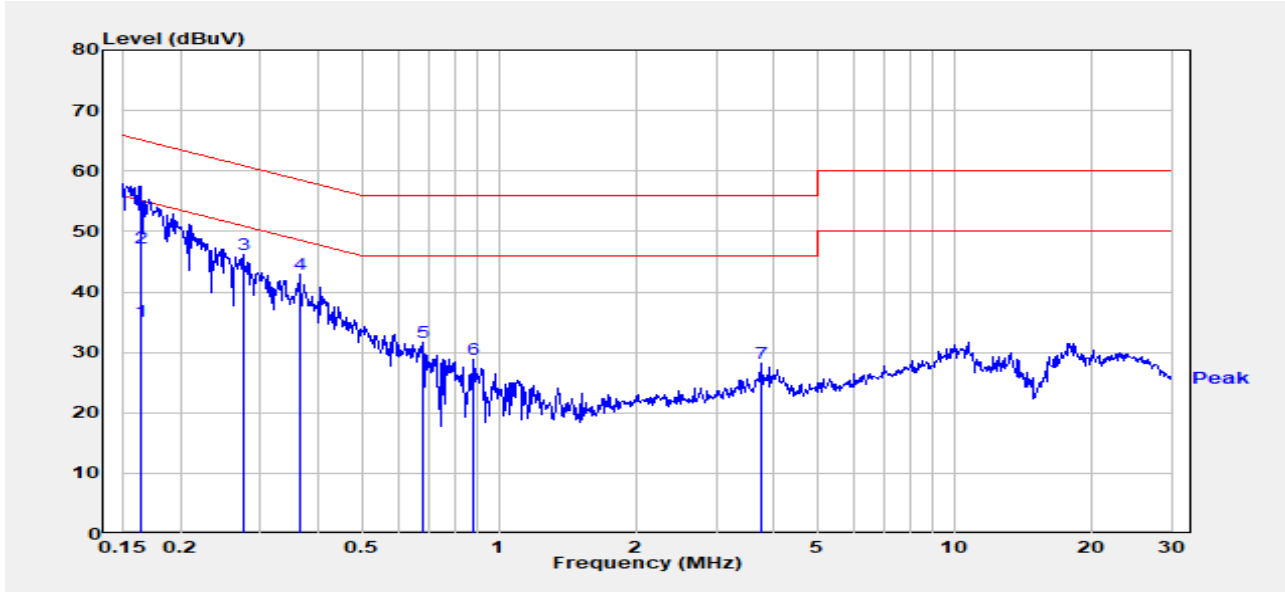
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2nd Source

Report Number :TERF2402000332ER
 Operation Mode :2.4G
 Power :120V/60Hz
 Probe :L

Test Site :Conduction 1
 Test Date :2024-04-16
 Temp./Humi. :24.7°C/63%
 Engineer :Cooper Hsu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V	Limit dB μ V	Margin dB
0.163	Average	25.00	10.13	35.13	55.30	-20.17
0.163	QP	37.20	10.13	47.33	65.30	-17.97
0.274	Peak	36.04	10.14	46.17	60.98	-14.81
0.365	Peak	32.86	10.15	43.01	58.61	-15.59
0.683	Peak	21.51	10.18	31.70	56.00	-24.30
0.880	Peak	18.55	10.19	28.74	56.00	-27.26
3.759	Peak	17.93	10.29	28.22	56.00	-27.78

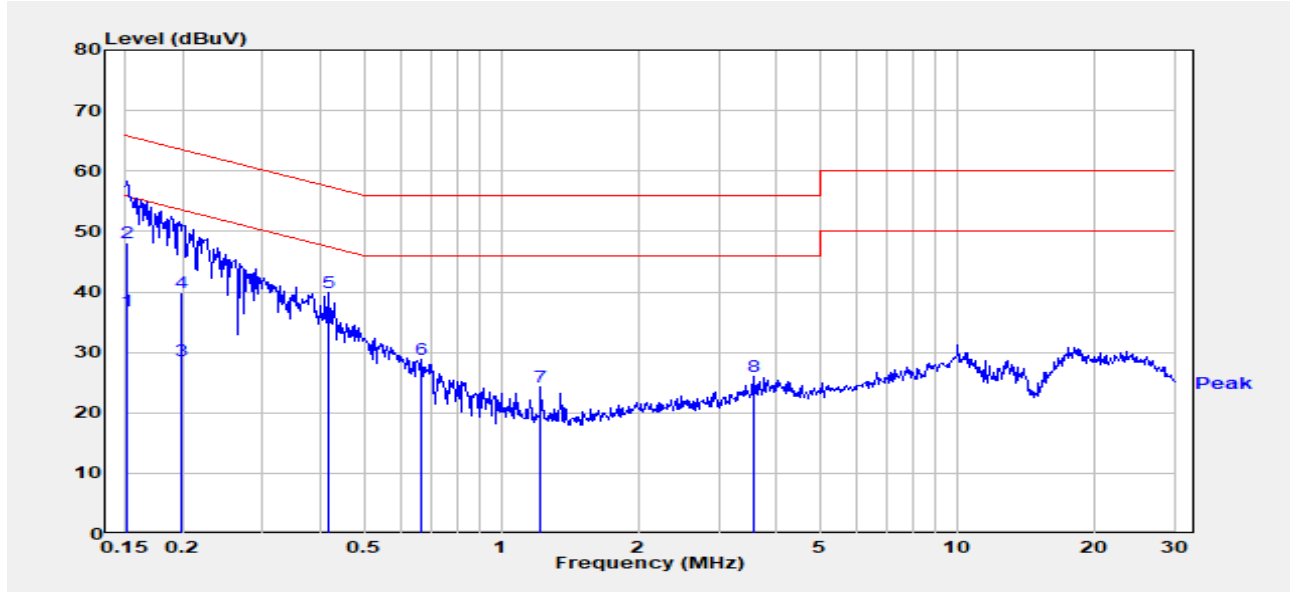
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Report Number :TERF2402000332ER
 Operation Mode :2.4G
 Power :120V/60Hz
 Probe :N

Test Site :Conduction 1
 Test Date :2024-04-16
 Temp./Humi. :24.7°C/63%
 Engineer :Cooper Hsu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V	Limit dB μ V	Margin dB
0.152	Average	26.70	10.12	36.82	55.91	-19.09
0.152	QP	38.10	10.12	48.22	65.91	-17.69
0.200	Average	18.50	10.12	28.62	53.62	-25.00
0.200	QP	29.80	10.12	39.92	63.62	-23.70
0.419	Peak	29.74	10.15	39.89	57.46	-17.57
0.665	Peak	18.62	10.17	28.79	56.00	-27.21
1.223	Peak	14.16	10.19	24.35	56.00	-31.65
3.584	Peak	15.77	10.29	26.06	56.00	-29.94

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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

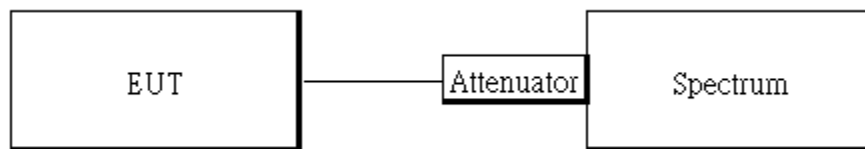
For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power from 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.

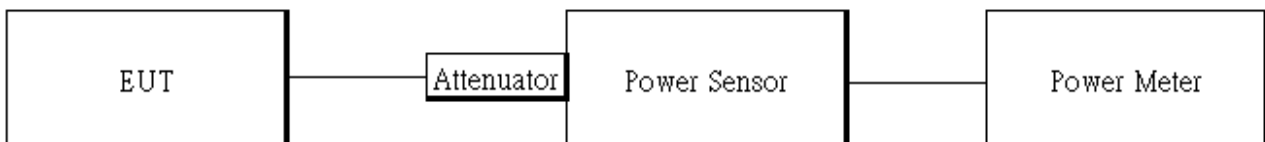
In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

8.2 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:

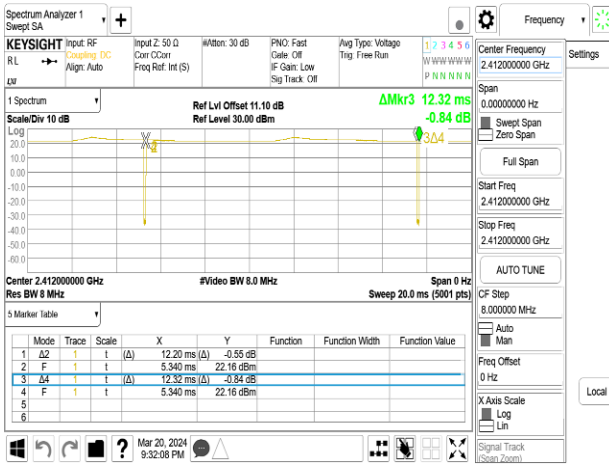
Mode	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11b	99.09	0.04	0.08	0.01
802.11g	98.16	0.08	0.49	0.01
802.11n_20	98.03	0.09	0.53	0.01
802.11n_40	94.79	0.23	1.08	2.00
802.11ac_20	98.04	0.09	0.53	0.01
802.11ac_40	94.83	0.23	1.07	2.00

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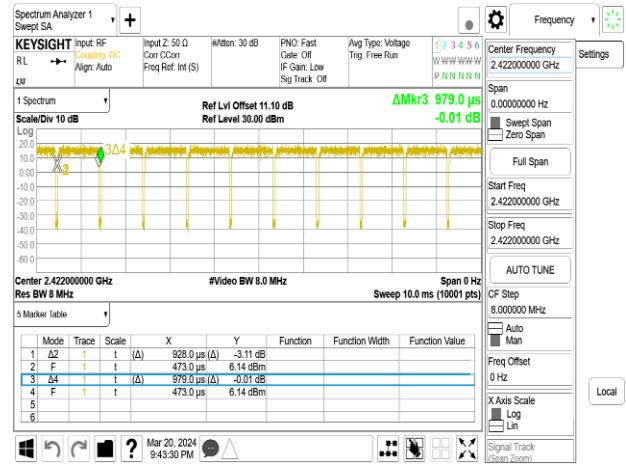
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8.4.2 Duty Cycle test plots

802.11b_20MHz_Chain0_2412MHz



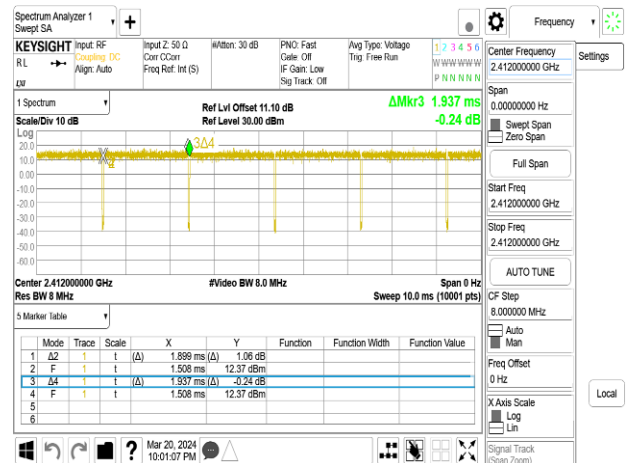
802.11n_40MHz_Chain0_2422MHz



802.11g_20MHz_Chain0_2412MHz



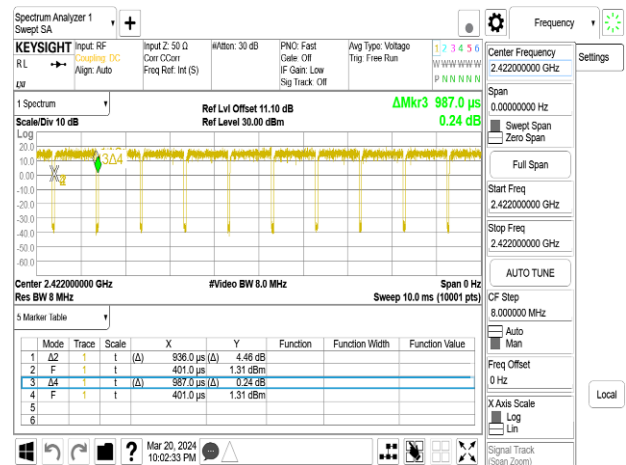
802.11ac_20MHz_Chain0_2412MHz



802.11n_20MHz_Chain0_2412MHz



802.11ac_40MHz_Chain0_2422MHz



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8.4.3 Output Power

802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	18.5	22.13	30.00	PASS
6	2437	1	19.5	22.01	30.00	PASS
11	2462	1	18	22.09	30.00	PASS
802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	18.5	18.94	30.00	PASS
6	2437	1	19.5	18.91	30.00	PASS
11	2462	1	18	18.93	30.00	PASS

802.11g Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	17	21.43	30.00	PASS
6	2437	6	18	21.33	30.00	PASS
11	2462	6	16.5	21.23	30.00	PASS
802.11g Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	17	16.92	30.00	PASS
6	2437	6	18	16.89	30.00	PASS
11	2462	6	16.5	16.82	30.00	PASS

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802.11n_HT_20M Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	18	22.13	30.00	PASS
6	2437	MCS0	19	22.01	30.00	PASS
11	2462	MCS0	18	22.09	30.00	PASS
802.11n_HT_20M Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	18	17.85	30.00	PASS
6	2437	MCS0	19	17.66	30.00	PASS
11	2462	MCS0	18	17.75	30.00	PASS

802.11n_HT_40M Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	17.5	22.62	30.00	PASS
6	2437	MCS0	18	22.87	30.00	PASS
9	2452	MCS0	18	22.24	30.00	PASS
802.11n_HT_40M Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	17.5	17.32	30.00	PASS
6	2437	MCS0	18	17.67	30.00	PASS
9	2452	MCS0	18	17.09	30.00	PASS

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802.11ac_VHT_20M Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	18	22.08	30.00	PASS
6	2437	MCS0	19	21.96	30.00	PASS
11	2462	MCS0	18	22.04	30.00	PASS
802.11ac_VHT_20M Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	18	17.80	30.00	PASS
6	2437	MCS0	19	17.64	30.00	PASS
11	2462	MCS0	18	17.72	30.00	PASS

802.11ac_VHT_40M Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	17.5	22.38	30.00	PASS
6	2437	MCS0	18	22.76	30.00	PASS
9	2452	MCS0	18	22.17	30.00	PASS
802.11ac_VHT_40M Ch0						
CH	Freq. (MHz)	Data Rate	Power Setting	Avg. Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	17.5	17.28	30.00	PASS
6	2437	MCS0	18	17.63	30.00	PASS
9	2452	MCS0	18	17.01	30.00	PASS

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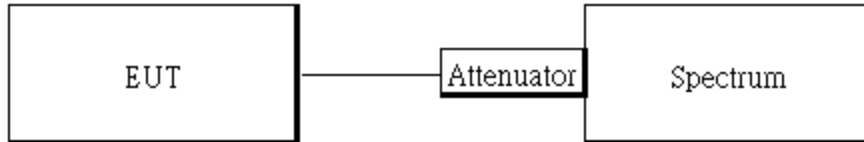
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9 EMISSION BANDWIDTH MEASUREMENT

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.

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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	9052.00	≥ 500	PASS
2437	9068.00	≥ 500	PASS
2462	8605.00	≥ 500	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16040.00	≥ 500	PASS
2437	16080.00	≥ 500	PASS
2462	15930.00	≥ 500	PASS

802.11n_HT_20M Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15740.00	≥ 500	PASS
2437	17300.00	≥ 500	PASS
2462	16000.00	≥ 500	PASS

802.11n_HT_40M Ch0

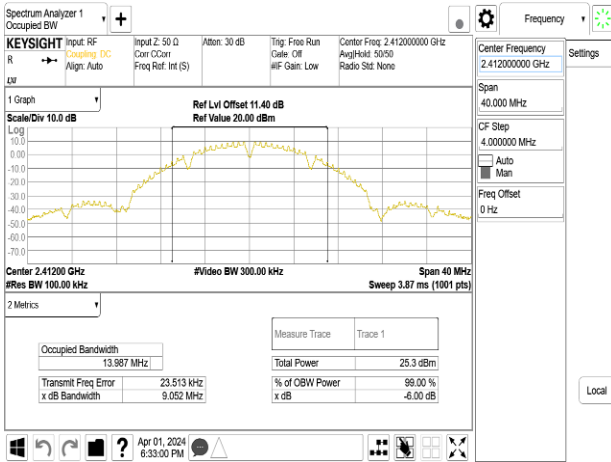
Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	36420.00	≥ 500	PASS
2437	36410.00	≥ 500	PASS
2452	35510.00	≥ 500	PASS

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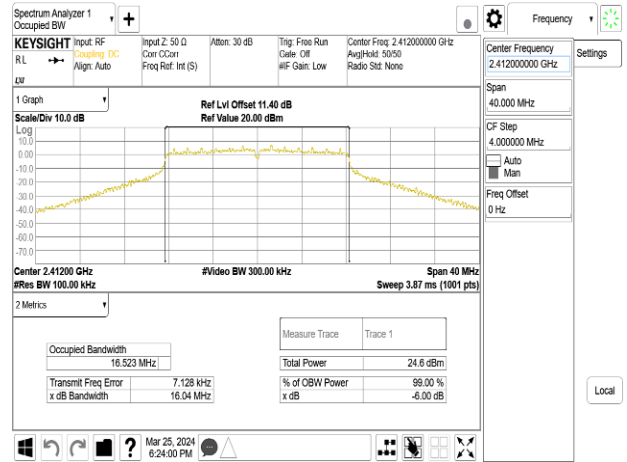
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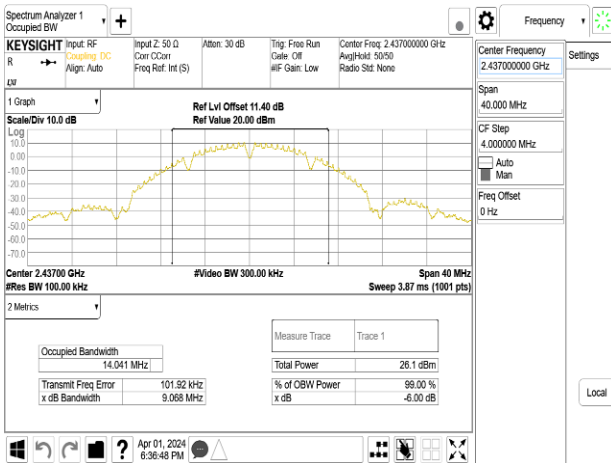
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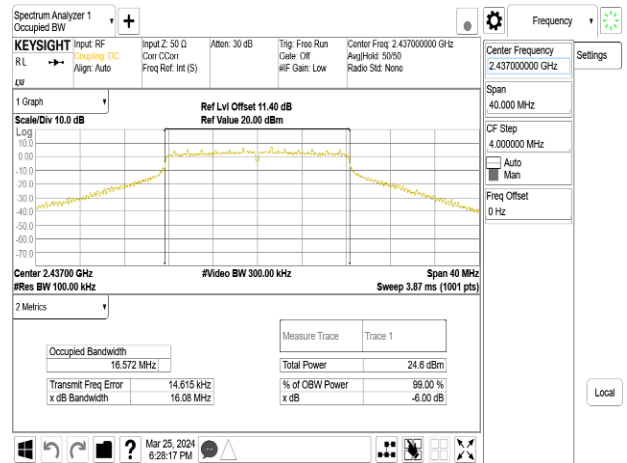
802.11g_20MHz_Chain0_2412MHz



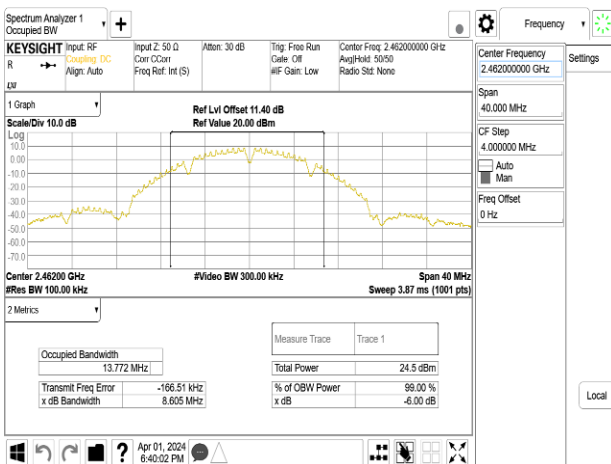
802.11b_20MHz_Chain0_2437MHz



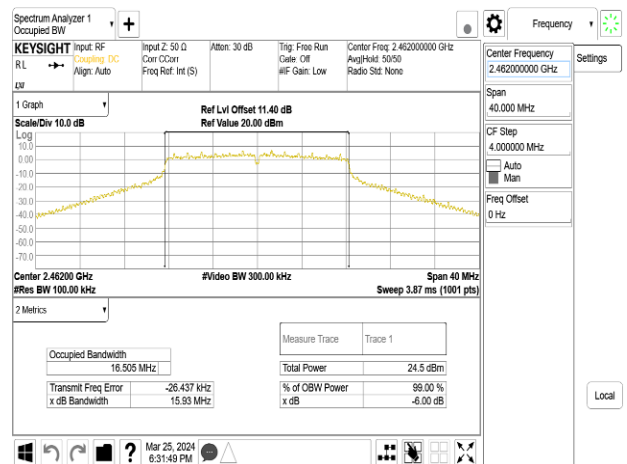
802.11g_20MHz_Chain0_2437MHz



802.11b_20MHz_Chain0_2462MHz



802.11g_20MHz_Chain0_2462MHz

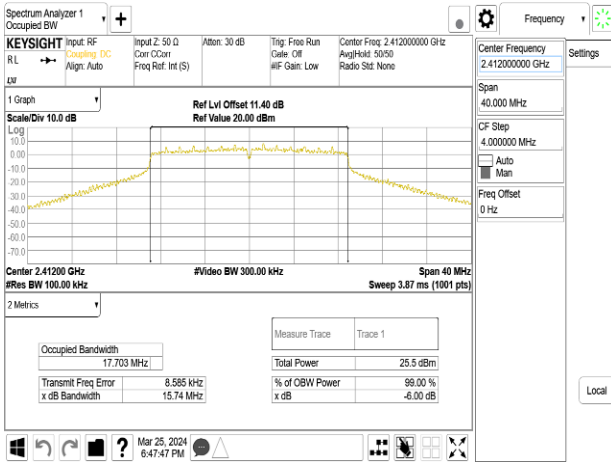


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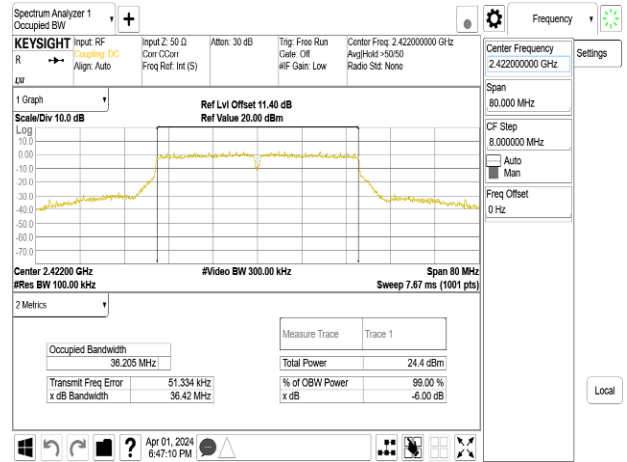
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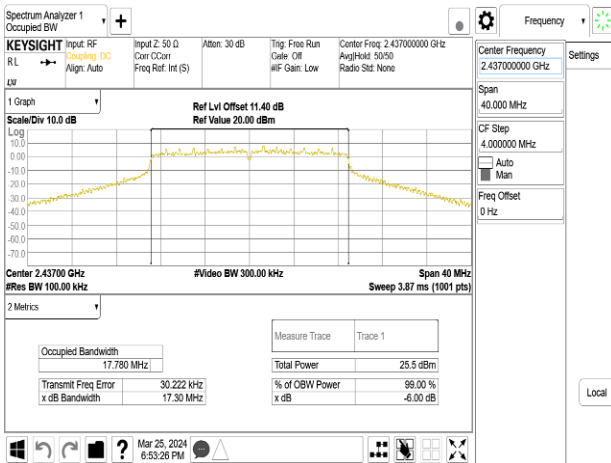
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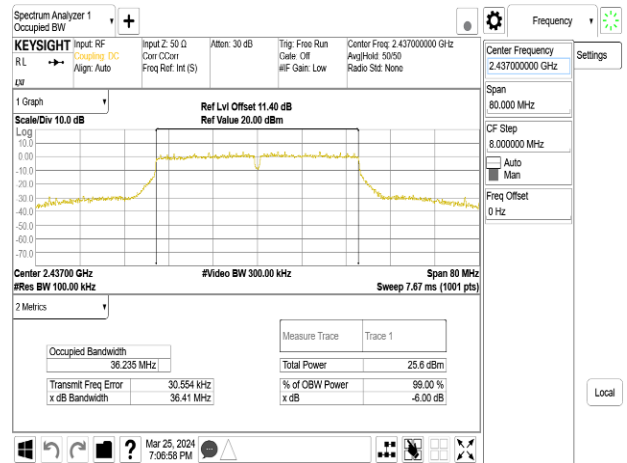
802.11n_40MHz_Chain0_2422MHz



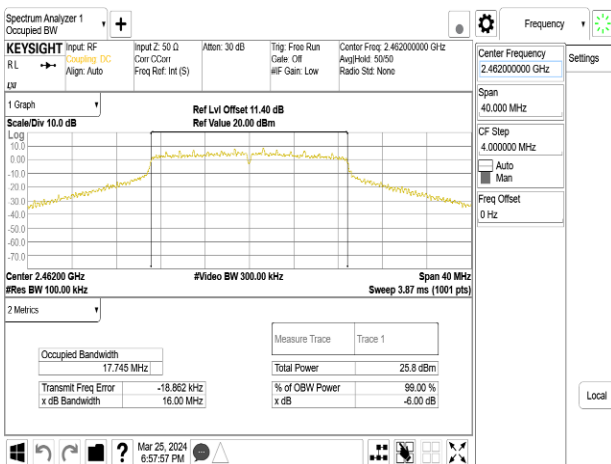
802.11n_20MHz_Chain0_2437MHz



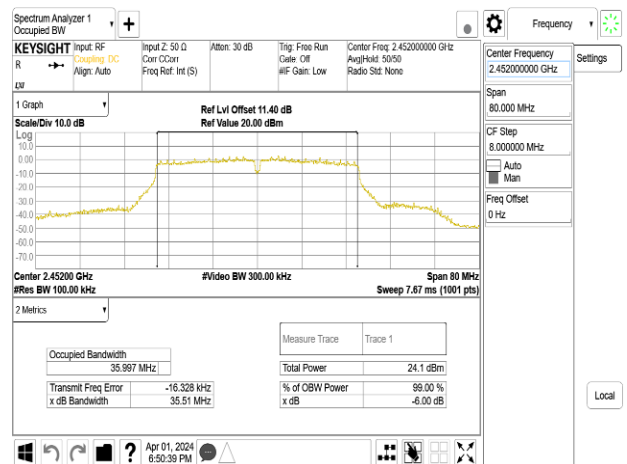
802.11n_40MHz_Chain0_2437MHz



802.11n_20MHz_Chain0_2462MHz



802.11n_40MHz_Chain0_2452MHz



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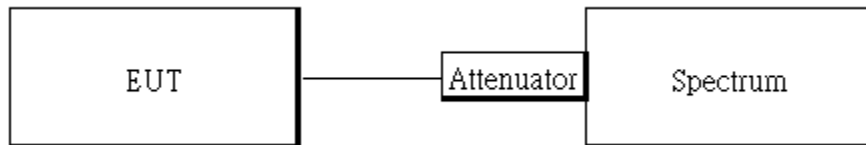
10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

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), 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.

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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.

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	9.45	-10.55
2437	10.35	-9.65
2462	8.78	-11.22

802.11g Ch0

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	6.72	-13.28
2437	6.98	-13.02
2462	7.00	-13.00

802.11n_HT_20M Ch0

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	7.88	-12.12
2437	7.78	-12.22
2462	8.36	-11.64

802.11n_HT_40M Ch0

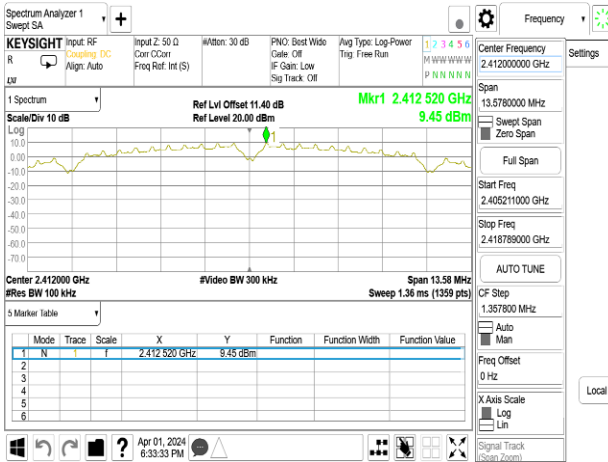
Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2422	2.53	-17.47
2437	3.65	-16.35
2452	2.62	-17.38

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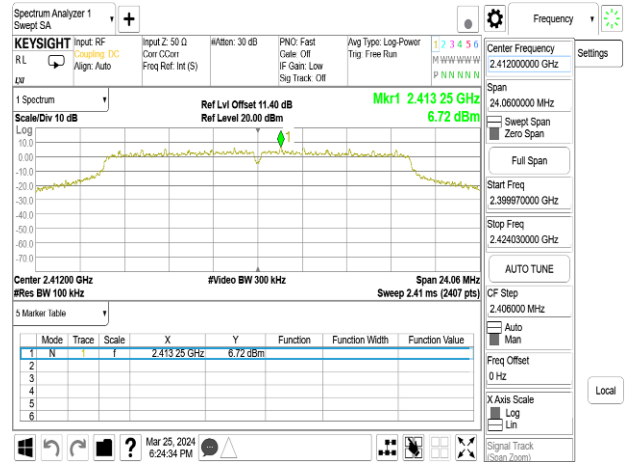
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802.11b_20MHz_Chain0_2412MHz



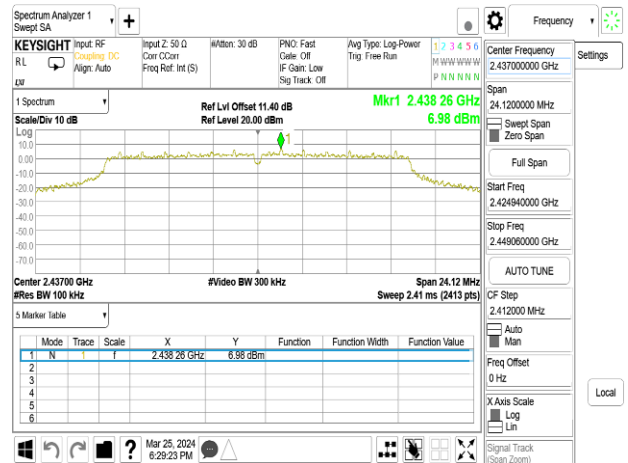
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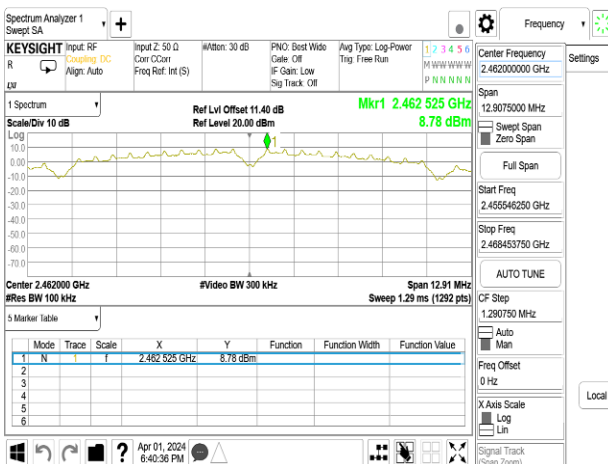
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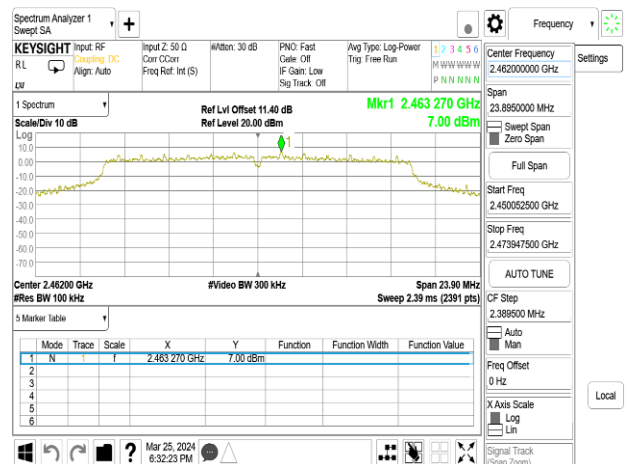
802.11g_20MHz_Chain0_2437MHz



802.11b_20MHz_Chain0_2462MHz



802.11g_20MHz_Chain0_2462MHz

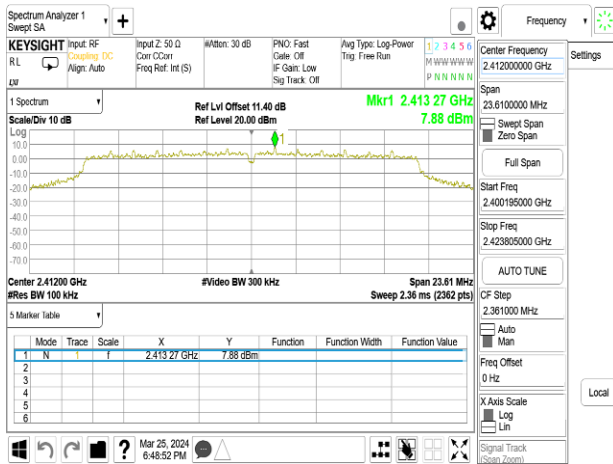


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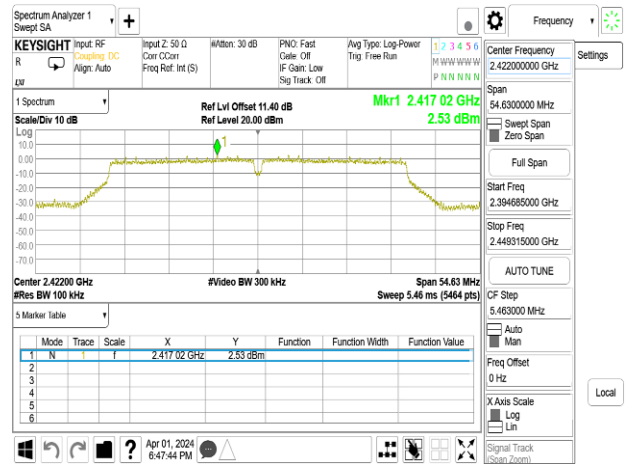
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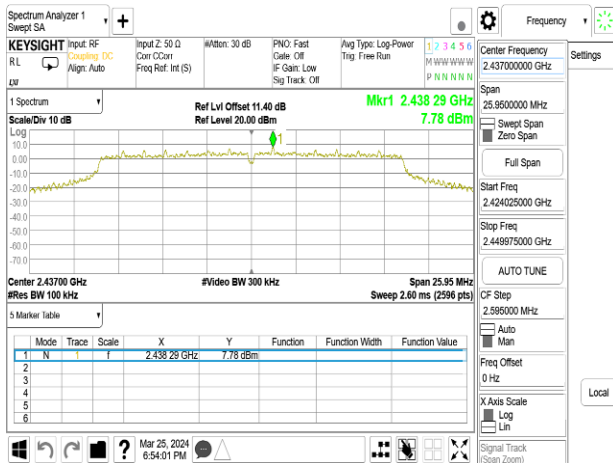
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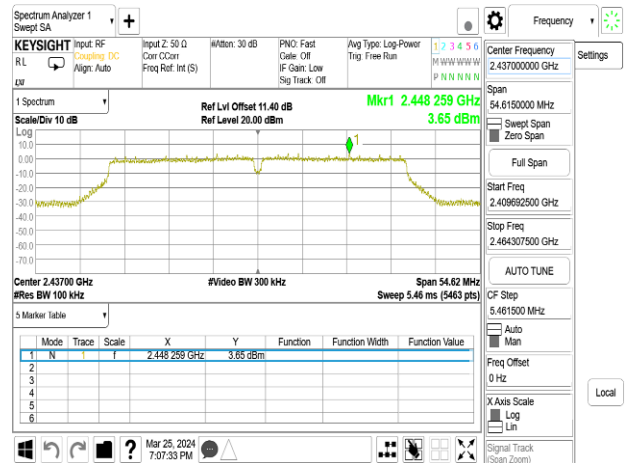
802.11n_40MHz_Chain0_2422MHz



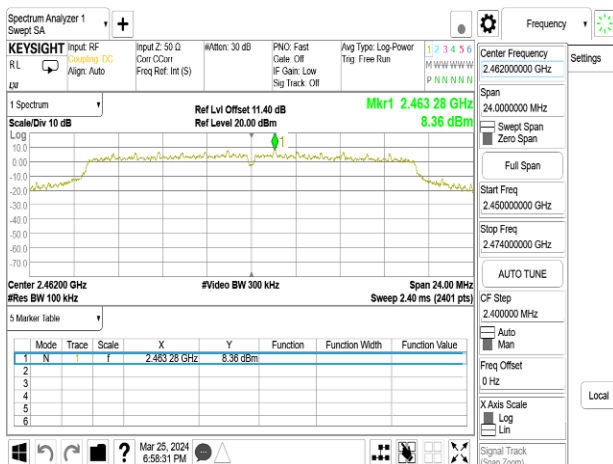
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802.11n_40MHz_Chain0_2437MHz



802.11n_20MHz_Chain0_2462MHz



802.11n_40MHz_Chain0_2452MHz

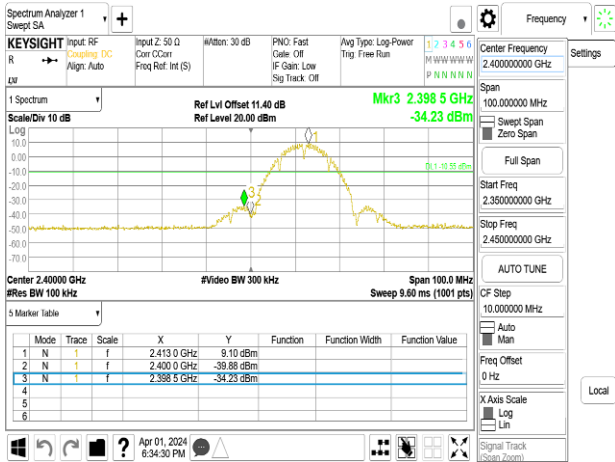


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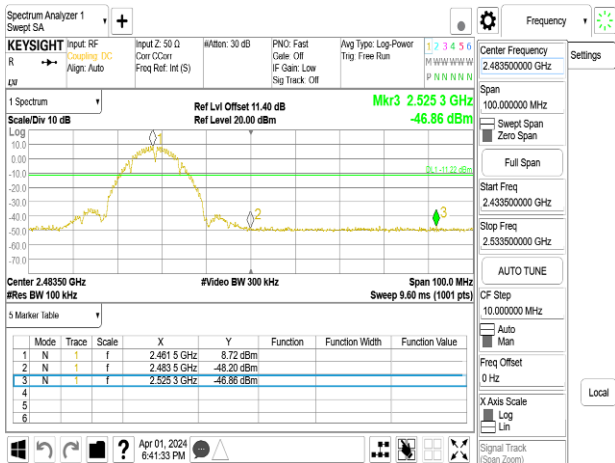
802.11b_20MHz_Chain0_2412MHz



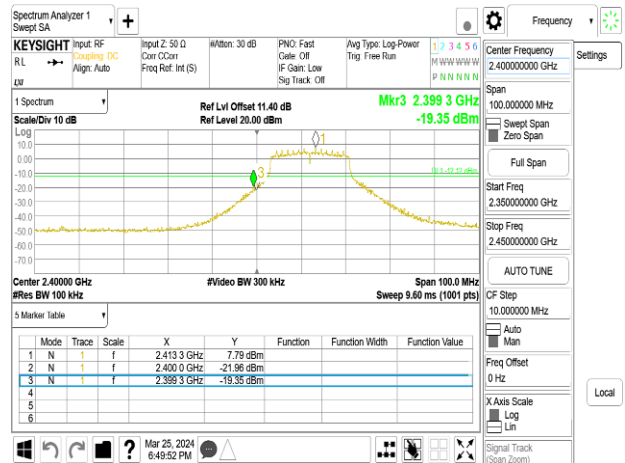
802.11g_20MHz_Chain0_2462MHz



802.11b_20MHz_Chain0_2462MHz



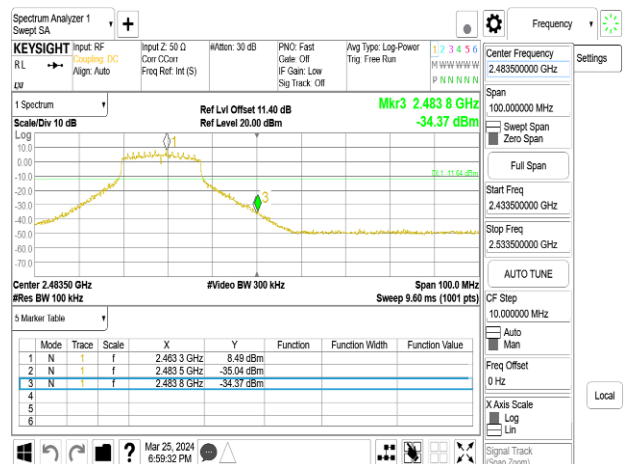
802.11n_20MHz_Chain0_2412MHz



802.11g_20MHz_Chain0_2412MHz



802.11n_20MHz_Chain0_2462MHz

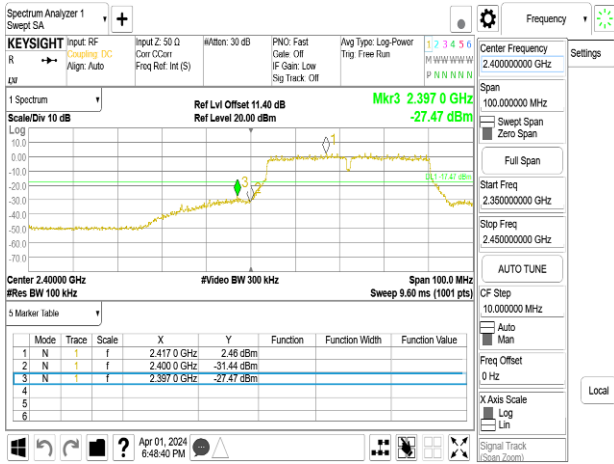


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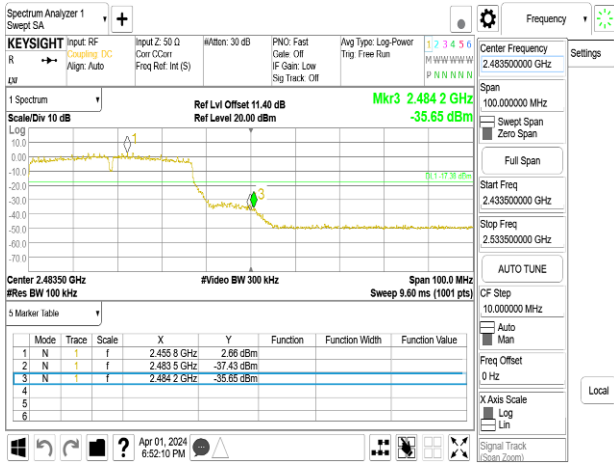
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802.11n_40MHz_Chain0_2422MHz



802.11n_40MHz_Chain0_2452MHz

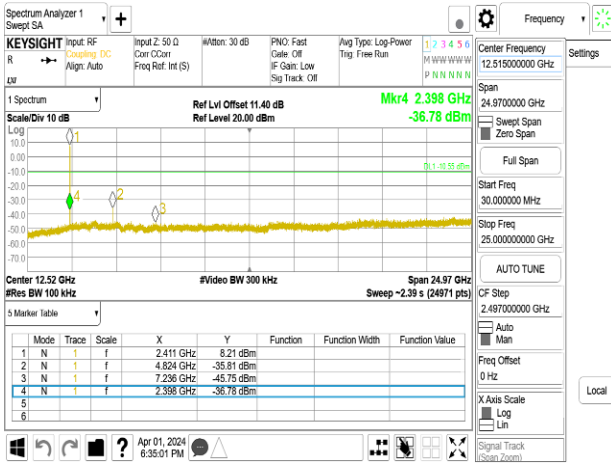


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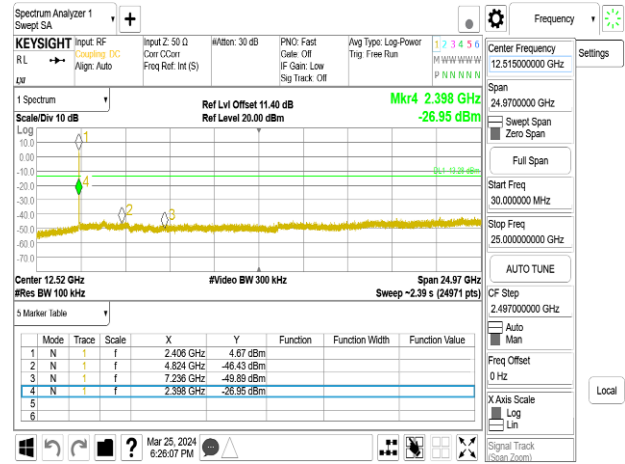
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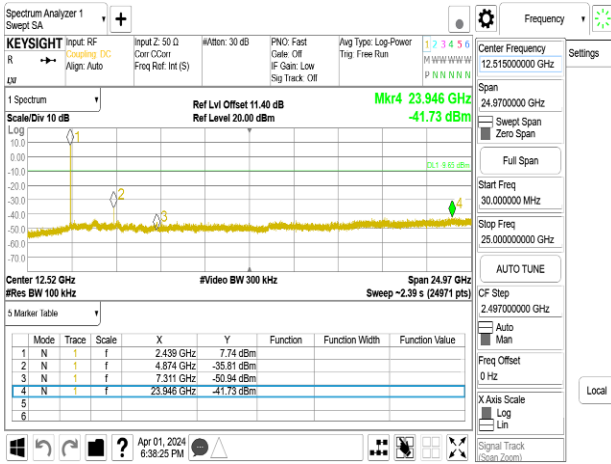
802.11b_20MHz_Chain0_2412MHz



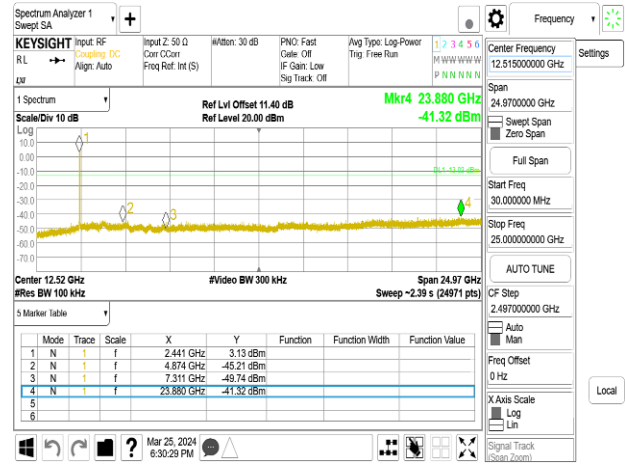
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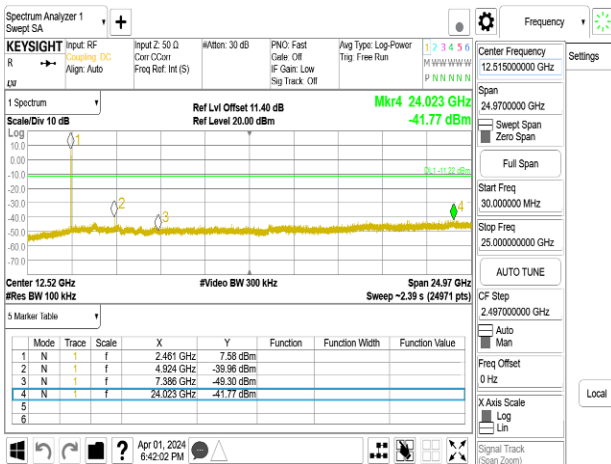
802.11b_20MHz_Chain0_2437MHz



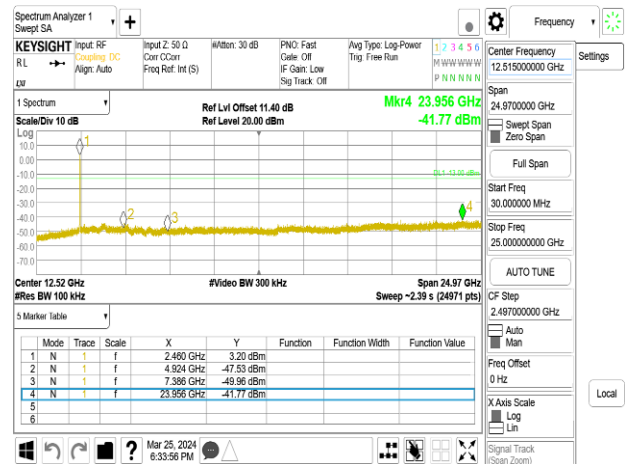
802.11g_20MHz_Chain0_2437MHz



802.11b_20MHz_Chain0_2462MHz



802.11g_20MHz_Chain0_2462MHz



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