

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



FCC Applicant: Cal-Comp Electronics & Communications Co., Ltd.
3F, No.99, Sec.5, Nanjing E. Rd., Songshan District, Taipei
City 105, Taiwan (R.O.C.)

FCC Manufacturer: Cal-Comp Electronics & Communications Co., Ltd.
3F, No.99, Sec.5, Nanjing E. Rd., Songshan District, Taipei
City 105, Taiwan (R.O.C.)

Product Name: WLAN Module

Brand Name: Cal-Comp

Model No.: W0DR1500F2

Model Difference: N/A

Report Number: ER/2021/40041

FCC ID 2AA2U-W0DR1500F2

Issue Date: May 13, 2021

Date of Test: April 15, 2021~April 29, 2021

Date of EUT Received: March 19, 2021

Approved By CHUN-CHIEH, CHEN
Chun Chieh Chen

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.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Revision History

Report Number	Revision	Description	Issue Date	Revised By
ER/2021/40041	00	Original.	May 13, 2021	Elle Chang

Note:

- 1、Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	WLAN Module
Brand Name:	Cal-Comp
Model No.:	W0DR1500F2
Model Difference:	N/A
Hardware Version:	N/A
Firmware Version:	N/A
EUT Series No.:	Conducted: 00 : 0B : 2E : 60 : 11 : 24 Radiated: W0DR150022011260010000
Power Supply:	3.3Vdc

1.2 RF Specification

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (dBm)	Modulation Technology
b	2412-2462	11	14.65	DSSS
g			21.45	OFDM
n_HT20			HT: 21.47	
n_HT40	2422-2452	7	HT: 21.63	
Modulation type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM			
Transistion 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_HT20MHz: 6.5 – 72.2 Mbps 802.11 n_HT40MHz: 13.5 - 150.0 Mbps			

1.3 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak An- tenna Gain (dBi)
PCB	N/A	W0DR1500F2	2.4GHz	3.10

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1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

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 A	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.				

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1.6 Special Accessories

There are no special accessories used while test was conducted.

1.7 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

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

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is 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 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*9m*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 Configuration of Tested System

Fig. 2-1 Conduction (AC Power Line) Emission & Radiated Emission configuration

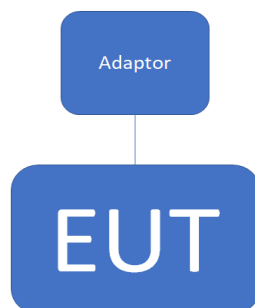


Fig. 2-2 Conducted (Antenna Port) Configuration Emission



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L430	PK-126TN	N/A	N/A
3.	Notebook	Lenovo	L430	R9-WGNK5 13/01	N/A	N/A
4.	Adaptor	N/A	N/A	N/A	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
§15.205 §15.209 §15.247(d)	Radiated & Conducted Band Edge and Spurious Emission	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b/g/n 20M.

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

9 channels are provided for 802.11n 40M

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

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4.2 The Worst Test Modes and Channel Details

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

The given UE is pre-scanned among below modes.

Modulation	Transmission Chain				Single Transmission Spatial	Multiple Transmission Spatial
☒ 802.11 b	☒ Ch0	☐ Ch1	☐ Ch2	☐ Ch3	☒ 1TX	☐ 2TX
☒ 802.11 g	☒ Ch0	☐ Ch1	☐ Ch2	☐ Ch3	☒ 1TX	☐ 2TX
☒ 802.11 n	☒ Ch0	☐ Ch1	☐ Ch2	☐ Ch3	☒ SISO	☐ MIMO

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.

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4.3 Radiated Emission Test:

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
RADIATED EMISSION TEST (BELOW 1 GHz)					
802.11g	1 to 11	6	OFDM	6	Ch0
RADIATED EMISSION TEST (ABOVE 1 GHz)					
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	MCS 0	Ch0
802.11n_HT40	3 to 9	3, 6, 9	OFDM	MCS 0	Ch0
Note: The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for channel Low, Mid and High, the worst case position was reported.					

4.4 Antenna Port Conducted Measurement:

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	MCS 0	Ch0
802.11n_HT40	3 to 9	3, 6, 9	OFDM	MCS 0	Ch0

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.34 dB
Peak Output Power	+/- 1 dB
6dB Bandwidth	+/- 1.54 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.69 dB
Peak Power Density	+/- 1.54 dB
Temperature	+/- 0.4 °C
Humidity	+/- 3.5 %
DC / AC Power Source	DC= +/- 1%, AC= +/- 1%

Radiated Spurious Emission Measurement Uncertainty			
Polarization: Vertical	+/- 2.64 dB	9kHz~30MHz: +/- 2.3dB	
	+/- 4.93 dB	30MHz - 1000MHz: +/- 3.37dB	
	+/- 4.81 dB	1GHz - 18GHz: +/- 4.04dB	
	+/- 4.52 dB	18GHz - 40GHz: +/- 4.04dB	
Polarization: Horizontal	+/- 2.64 dB	9kHz~30MHz: +/- 2.3dB	
	+/- 4.45 dB	30MHz - 1000MHz: +/- 4.22dB	
	+/- 4.81 dB	1GHz - 18GHz: +/- 4.08dB	
	+/- 4.52 dB	18GHz - 40GHz: +/- 4.08dB	

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 CONDUCTED EMISSION TEST

6.1 Standard Applicable

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

Frequency range MHz	Limits dB(uV)	
	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.		

6.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI 7	100759	07/13/2020	07/12/2021
LISN	SCHWARZ-BECK	NSLK 8127	8127-465	04/09/2021	04/08/2022
Coaxial Cables	N/A	Coaxial Cable	161207	12/07/2020	12/06/2021
Test Software	audix	e3	Ver. 6.11- 20180413	N.C.R	N.C.R

6.3 EUT Setup

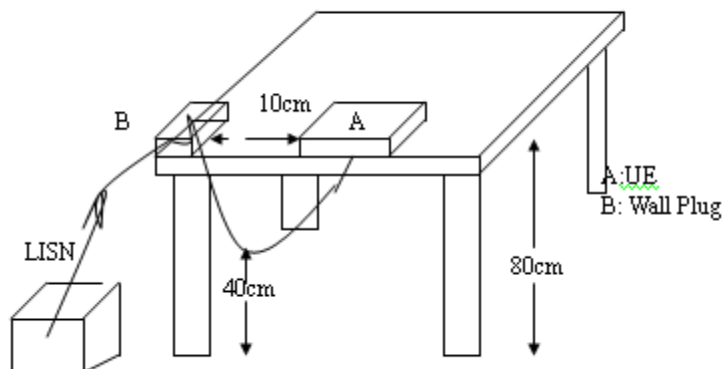
1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 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

6.6 Measurement Result

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

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

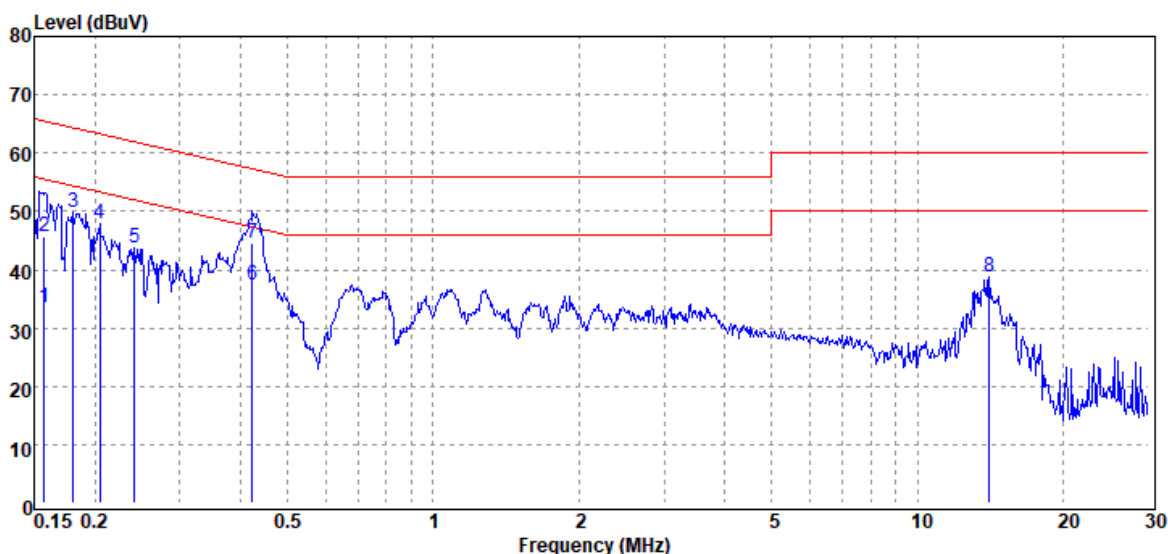
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:ER-2021-40041	Test Site	:Conduction 6F
Test Mode	:Operation (WLAN2.4G)	Test Date	:2021-04-19
Power	:AC 120V/60Hz	Temp./Humi.	:22.1/61
Probe	:L	Engineer	:Nick Lin
Note:	:		



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode		Reading Level		FS		
MHz	PK/QP/AV	dBuV	dB	dBuV	dBuV	dB
0.16	Average	33.42	0.04	33.46	55.60	-22.14
0.16	QP	45.71	0.04	45.75	65.60	-19.85
0.18	Peak	49.82	0.04	49.86	64.46	-14.60
0.21	Peak	47.96	0.04	48.00	63.40	-15.40
0.24	Peak	43.58	0.04	43.62	62.04	-18.42
0.42	Average	37.21	0.12	37.33	47.37	-10.04
0.42	QP	44.35	0.12	44.47	57.37	-12.90
14.06	Peak	38.14	0.73	38.87	60.00	-21.13

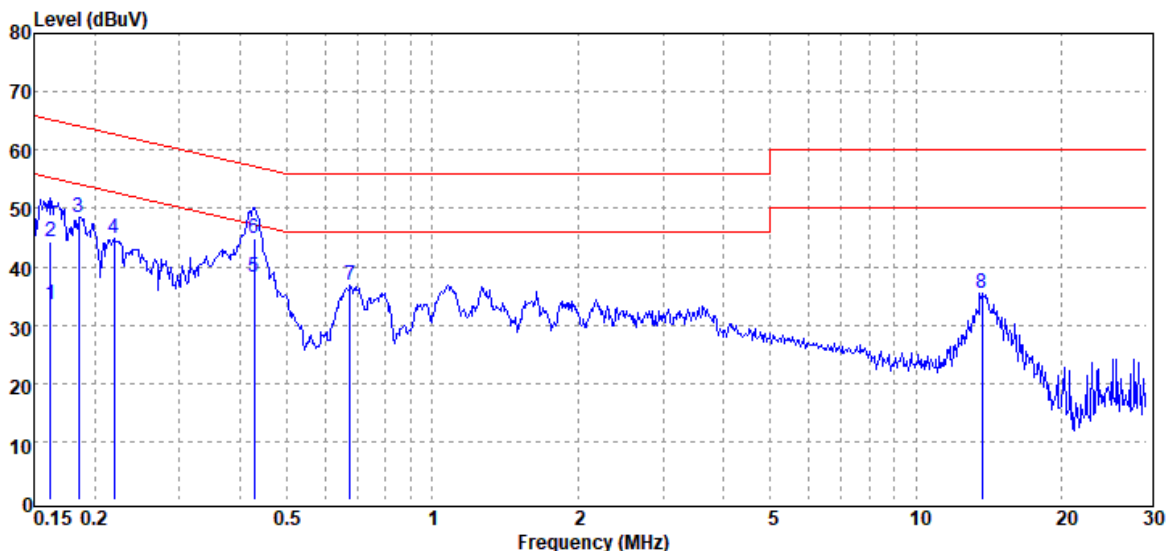
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Report Number :ER-2021-40041
 Test Mode :Operation (WLAN2.4G)
 Power :AC 120V/60Hz
 Probe :N
 Note: :

Test Site :Conduction 6F
 Test Date :2021-04-19
 Temp./Humi. :22.1/61
 Engineer :Nick Lin



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode		Reading Level		FS		
MHz	PK/QP/AV	dBμV	dB	dBμV	dBμV	dB
0.16	Average	33.28	0.10	33.38	55.34	-21.96
0.16	QP	44.27	0.10	44.37	65.34	-20.97
0.19	Peak	48.48	0.10	48.58	64.24	-15.66
0.22	Peak	44.64	0.10	44.74	62.83	-18.09
0.43	Average	37.89	0.18	38.07	47.29	-9.22
0.43	QP	44.66	0.18	44.84	57.29	-12.45
0.68	Peak	36.71	0.18	36.89	56.00	-19.11
13.70	Peak	34.83	0.71	35.54	60.00	-24.46

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7 DUTY CYCLE OF TEST SIGNAL

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.

7.1 Measurement Procedure:

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

7.2 Duty Cycle:

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11b	98.98	0.04	0.08	0.01
802.11g	98.29	0.07	0.48	0.01
802.11n_20	92.62	0.33	0.52	1.00
802.11n_40	90.51	0.43	1.06	2.00

Duty Cycle Factor: $10 * \log(1/0.9898) = 0.04$

Duty Cycle Factor: $10 * \log(1/0.9829) = 0.07$

Duty Cycle Factor: $10 * \log(1/0.9262) = 0.33$

Duty Cycle Factor: $10 * \log(1/0.9051) = 0.43$

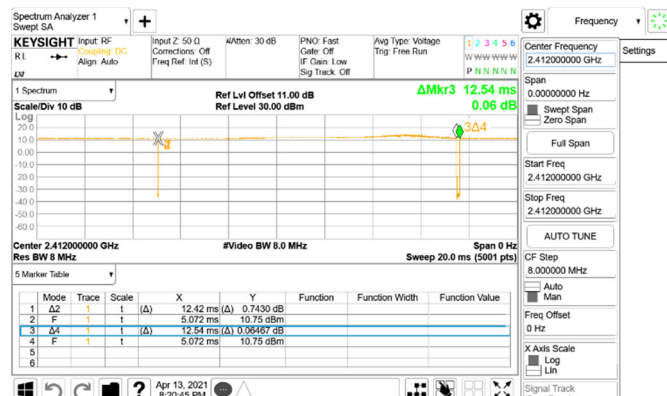
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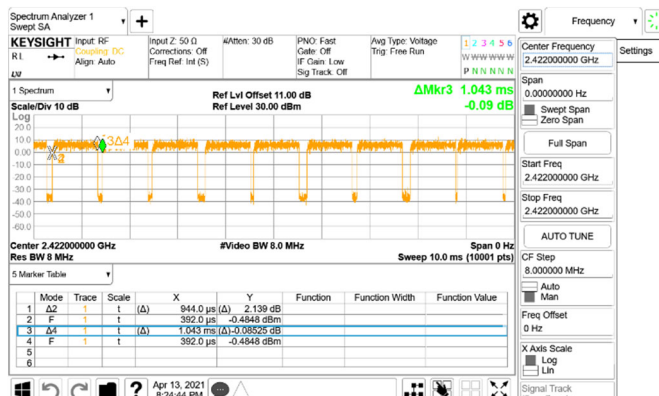
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7.3 Duty Cycle test plots

Duty Cycle_802.11b_20MHz_Chain0_2412MHz



Duty Cycle_802.11n_40MHz_Chain0_2422MHz



Duty Cycle_802.11g_20MHz_Chain0_2412MHz



Duty Cycle_802.11n_20MHz_Chain0_2412MHz



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8 PEAK OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

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.

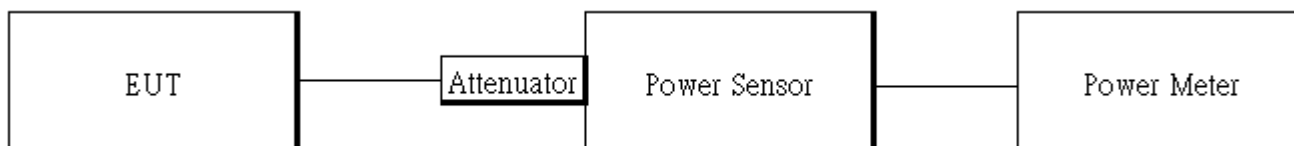
In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

8.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1242004	11/06/2020	11/05/2021
Power Sensor	Anritsu	MA2411B	1207365	11/06/2020	11/05/2021
Power Sensor	Anritsu	MA2411B	1207368	11/06/2020	11/05/2021
Attenuator	Mini-Circuit	BW-S10W2+	2	12/16/2020	12/15/2021

8.3 Test Set-up

Power Meter:



8.4 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 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.

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8.5 Measurement Result

802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	20	14.65	30.00	PASS
6	2437	1	20	14.21	30.00	PASS
11	2462	1	22	14.58	30.00	PASS
802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	1	20	11.89	30.00	PASS
6	2437	1	20	11.60	30.00	PASS
11	2462	1	22	11.91	30.00	PASS
802.11g Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	32	21.45	30.00	PASS
6	2437	6	32	20.66	30.00	PASS
11	2462	6	36	21.24	30.00	PASS
802.11g Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	6	32	11.75	30.00	PASS
6	2437	6	32	11.61	30.00	PASS
11	2462	6	36	11.69	30.00	PASS

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802.11n_HT20M Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	32	21.47	30.00	PASS
6	2437	MCS0	32	20.76	30.00	PASS
11	2462	MCS0	36	21.18	30.00	PASS
802.11n_HT20M Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	32	12.14	30.00	PASS
6	2437	MCS0	32	11.92	30.00	PASS
11	2462	MCS0	36	12.10	30.00	PASS

802.11n_HT40M Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	32	21.63	30.00	PASS
6	2437	MCS0	32	21.18	30.00	PASS
9	2452	MCS0	36	21.46	30.00	PASS
802.11n_HT40M Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	32	12.16	30.00	PASS
6	2437	MCS0	32	12.04	30.00	PASS
9	2452	MCS0	36	12.28	30.00	PASS

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

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9 EMISSION BANDWIDTH MEASUREMENT

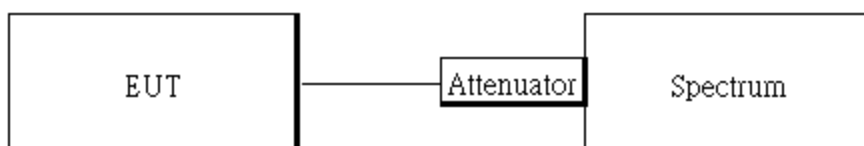
9.1 Standard Applicable

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

9.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY59071571	06/27/2020	06/26/2021
DC Block	Mini-Circuits	BLK-18-S+	1	12/16/2020	12/15/2021

9.3 Test Set-up



9.4 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

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9.5 6dB Bandwidth

802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	9035.00	> 500	PASS
2437	9056.00	> 500	PASS
2462	9077.00	> 500	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16390.00	> 500	PASS
2437	16380.00	> 500	PASS
2462	16410.00	> 500	PASS

802.11_n_HT20 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17590.00	> 500	PASS
2437	17570.00	> 500	PASS
2462	17590.00	> 500	PASS

802.11_n_HT40 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	35880.00	> 500	PASS
2437	35980.00	> 500	PASS
2452	36110.00	> 500	PASS

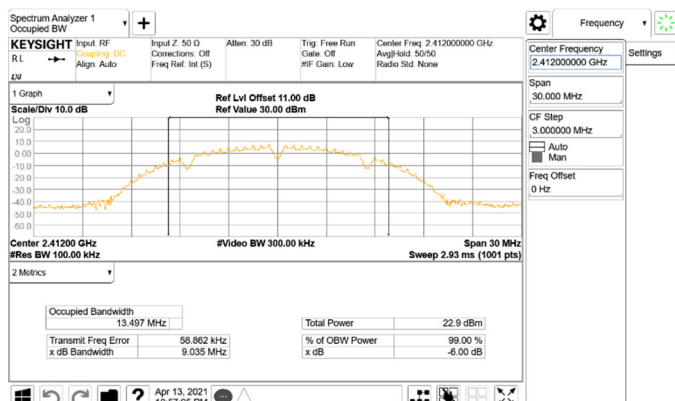
**Refer to next page for plots*

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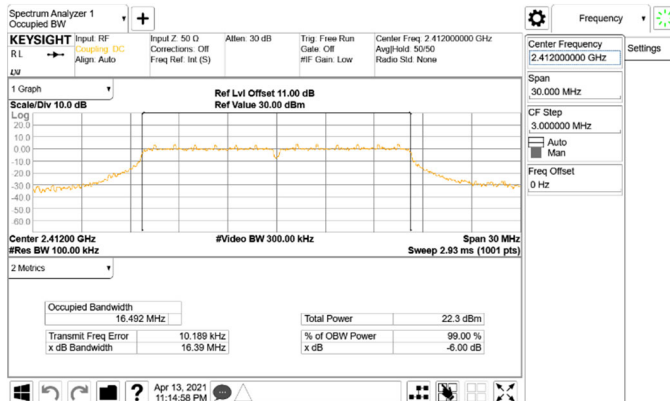
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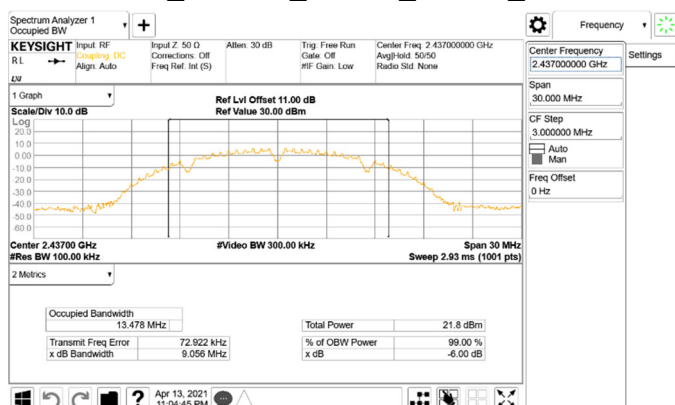
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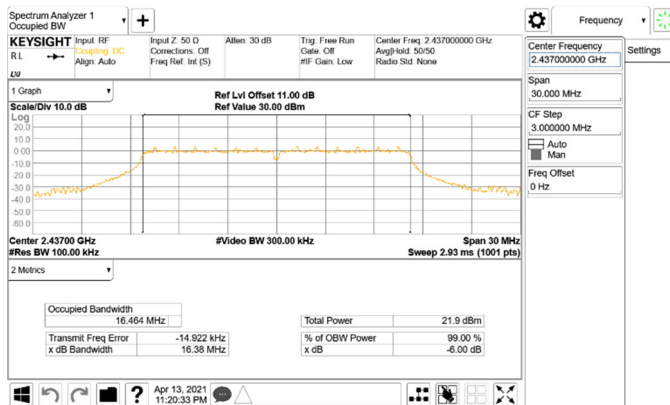
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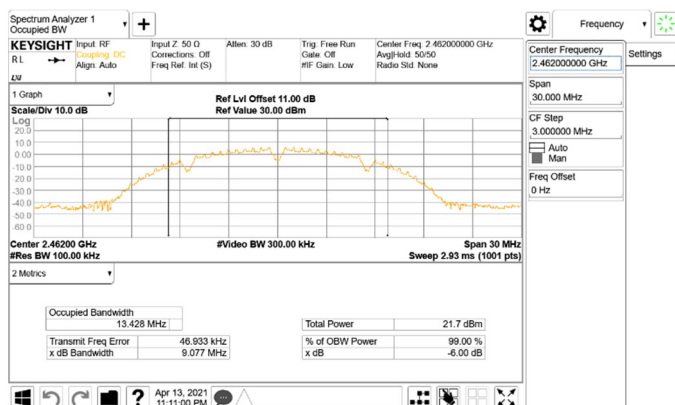
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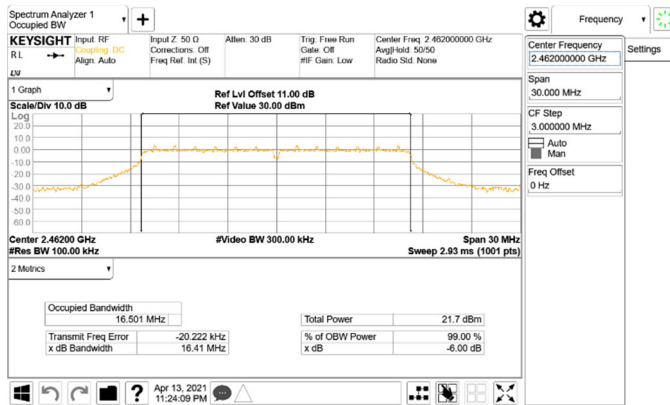
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OBW 6dB_802.11b_20MHz_Chain0_2462MHz



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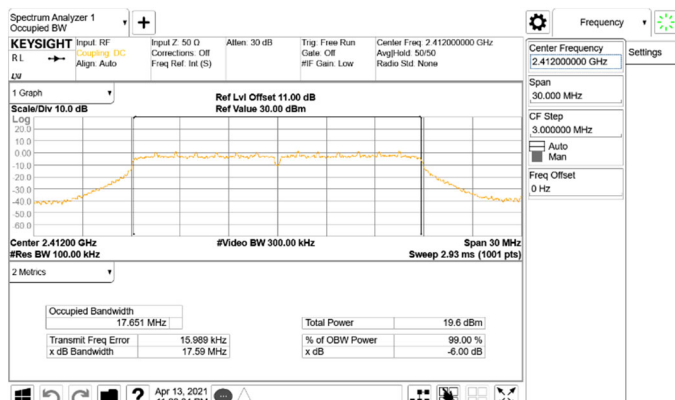


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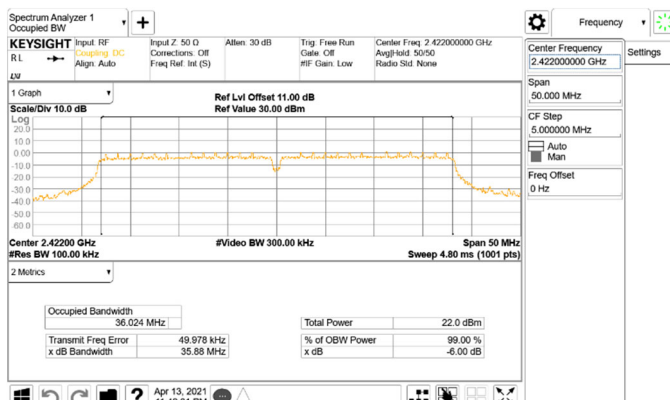
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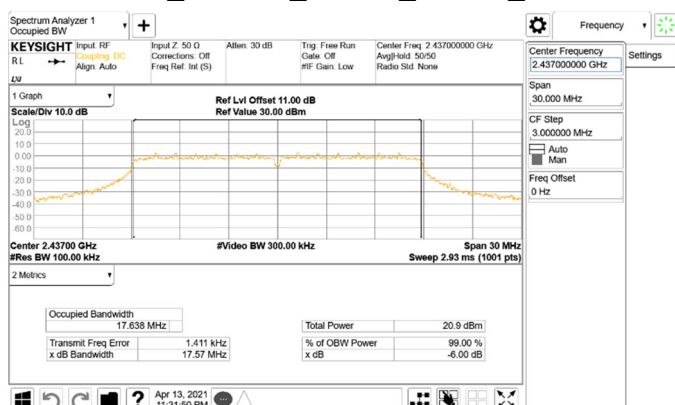
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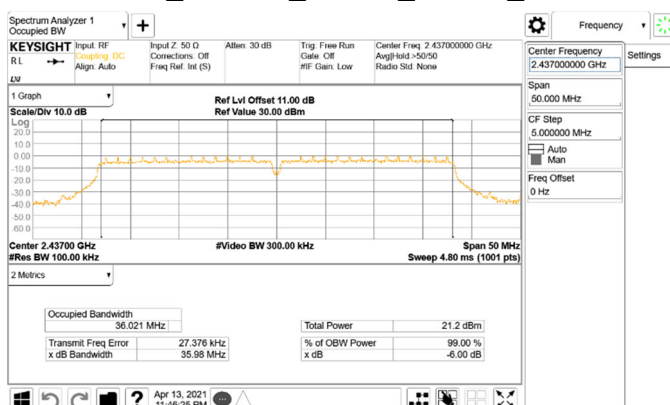
OBW 6dB_802.11n_40MHz_Chain0_2422MHz



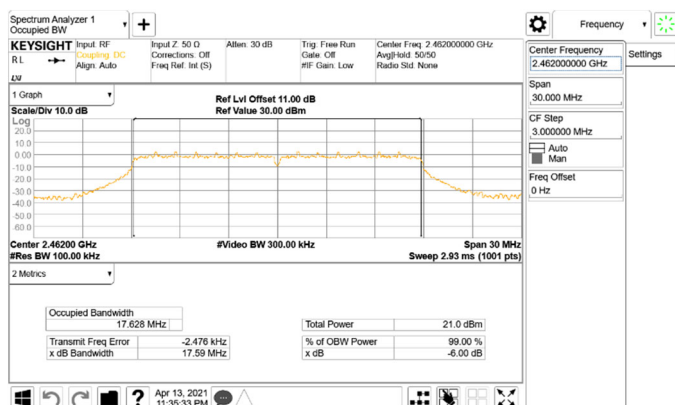
OBW 6dB_802.11n_20MHz_Chain0_2437MHz



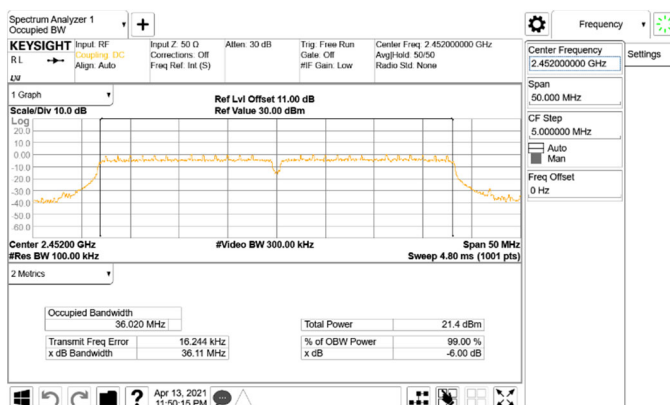
OBW 6dB_802.11n_40MHz_Chain0_2437MHz



OBW 6dB_802.11n_20MHz_Chain0_2462MHz



OBW 6dB_802.11n_40MHz_Chain0_2452MHz



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10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

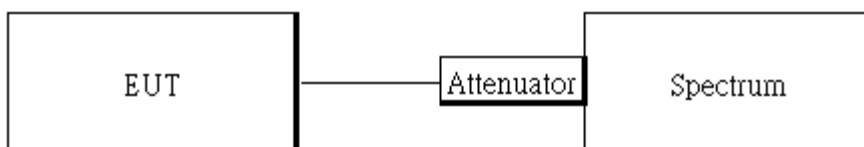
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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 Measurement Equipment Used

Conducted Emission Test Site: Conducted 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY59071571	06/27/2020	06/26/2021
DC Block	Mini-Circuits	BLK-18-S+	1	12/16/2020	12/15/2021

10.3 Test SET-UP



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10.4 Measurement Procedure

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.

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 – 20dBm
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.

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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.

10.5 Measurement Result

Reference Level of Limit 802.11b mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	6.76	-13.24
2437	6.61	-13.39
2462	5.94	-14.06

Reference Level of Limit 802.11g mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	4.04	-15.96
2437	3.59	-16.41
2462	3.24	-16.76

Reference Level of Limit 802.11n20 mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	1.25	-18.75
2437	2.52	-17.48
2462	2.51	-17.49

Reference Level of Limit 802.11n40 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2422	1.1	-18.90
2437	0.09	-19.91
2452	0.02	-19.98

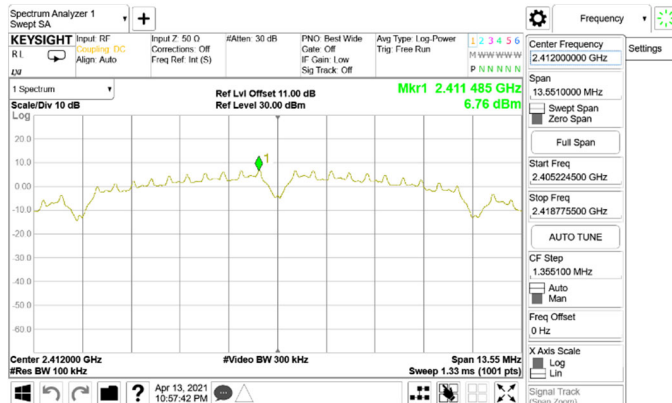
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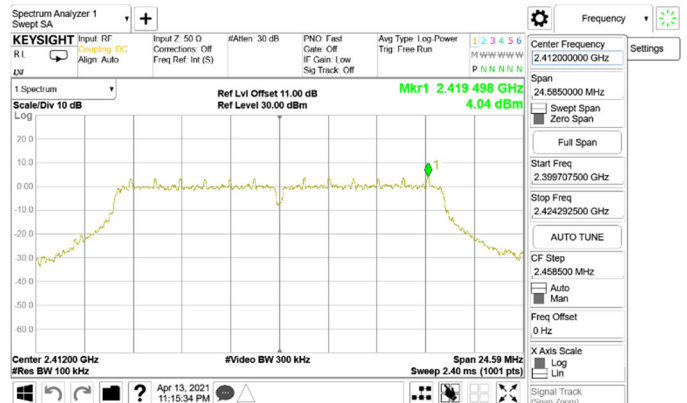
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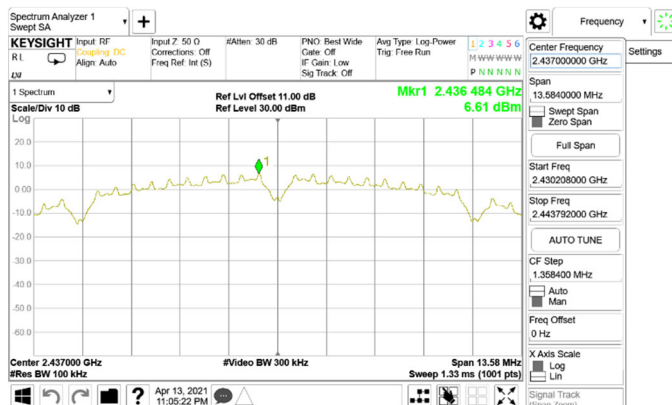
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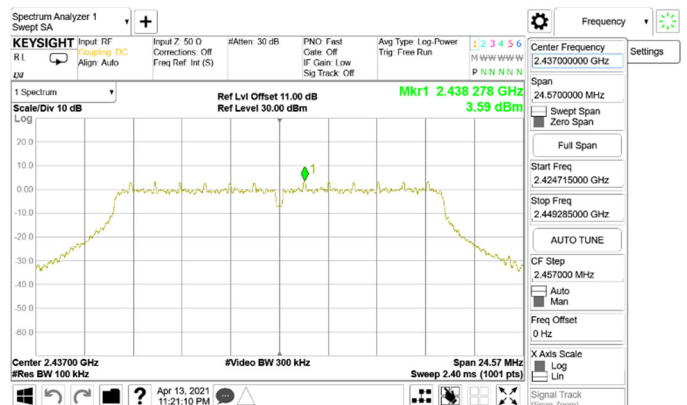
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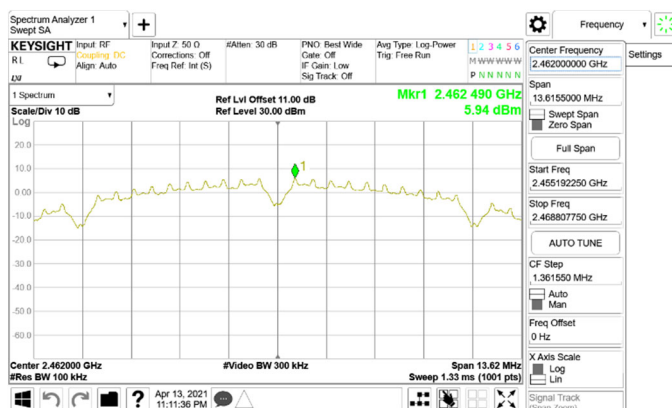
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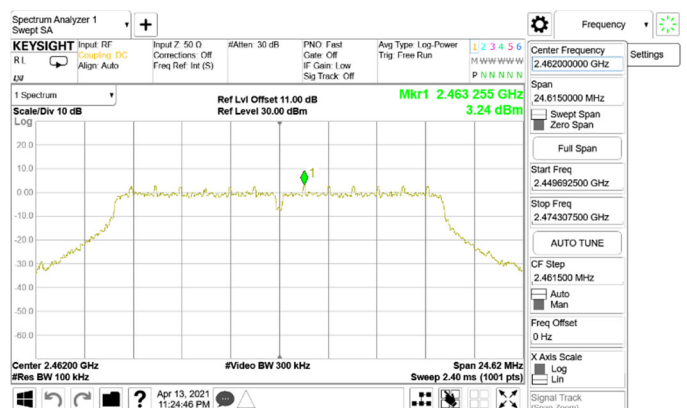
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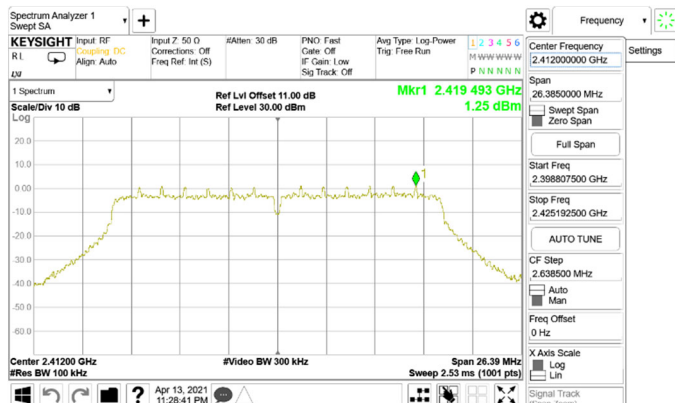
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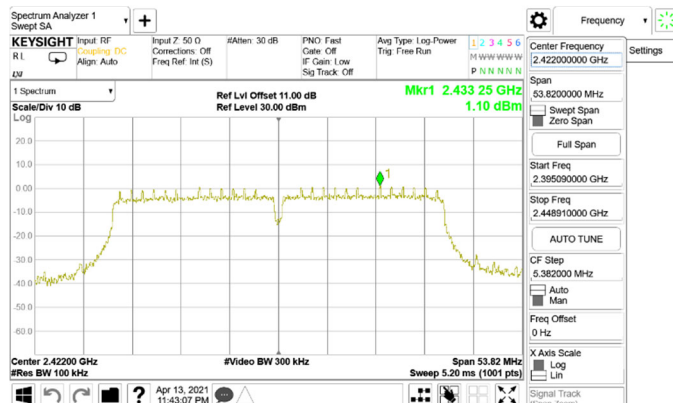
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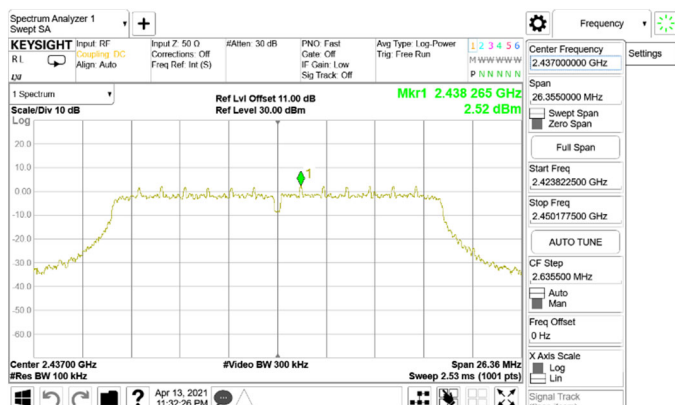
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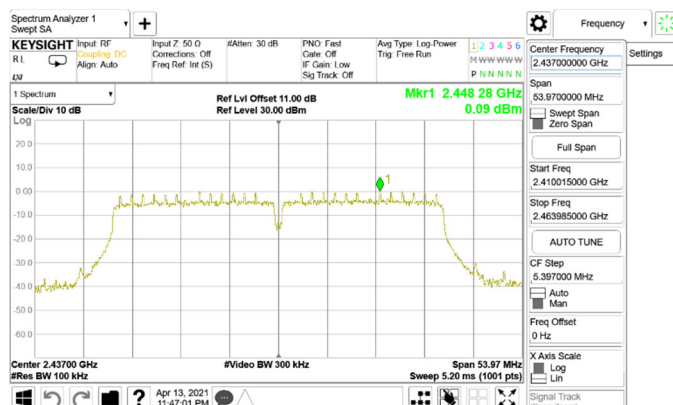
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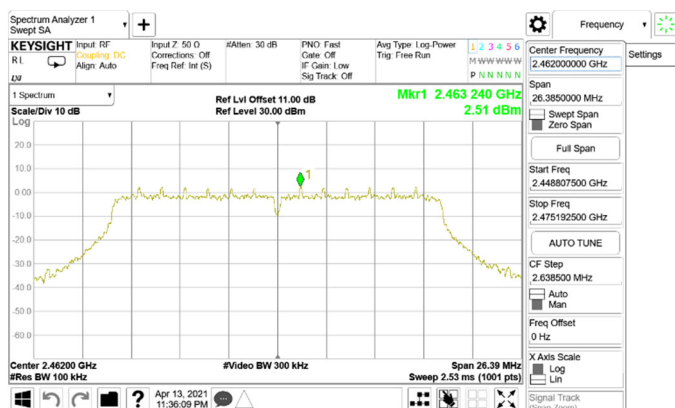
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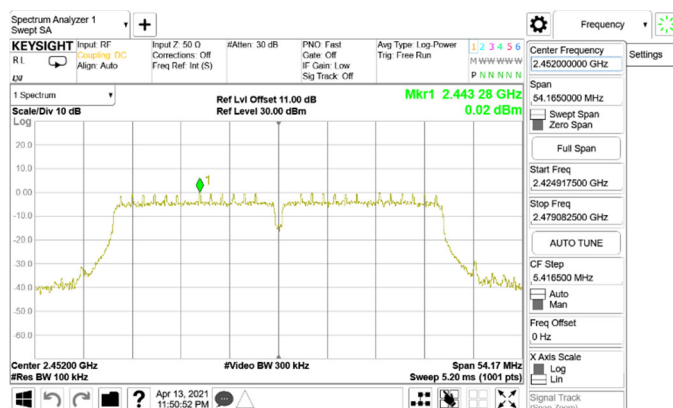
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Reference level_802.11n_20MHz_Chain0_2462MHz



Reference level_802.11n_40MHz_Chain0_2452MHz



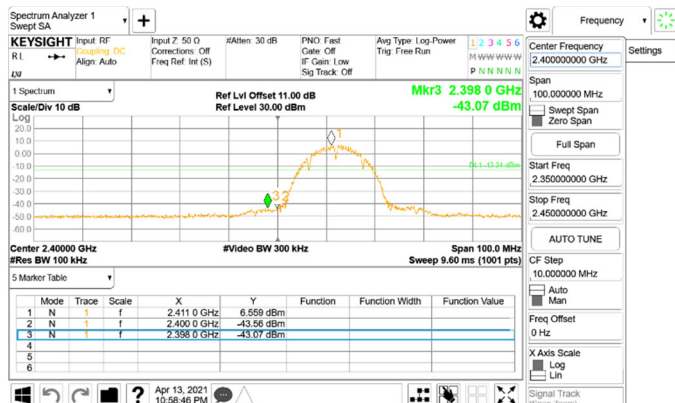
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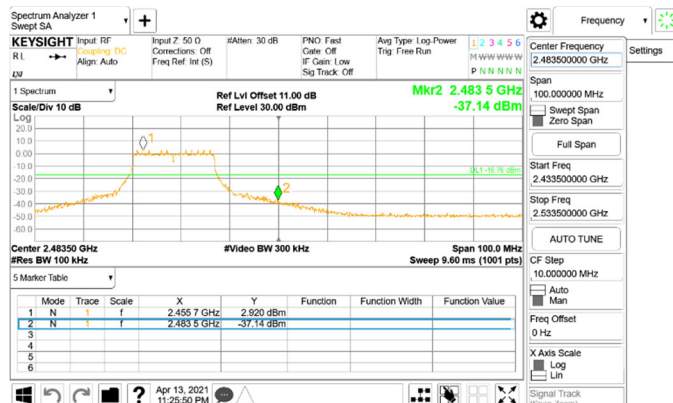
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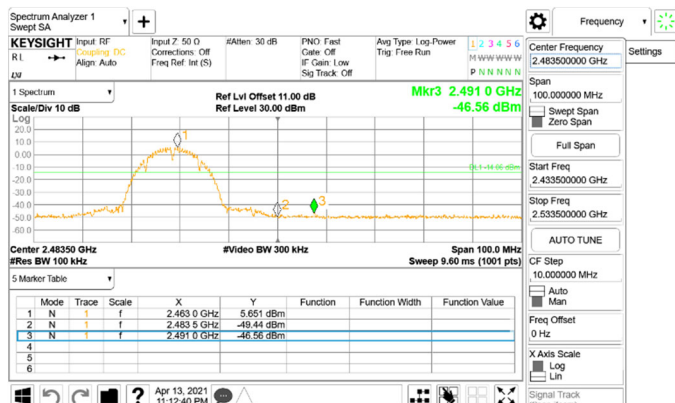
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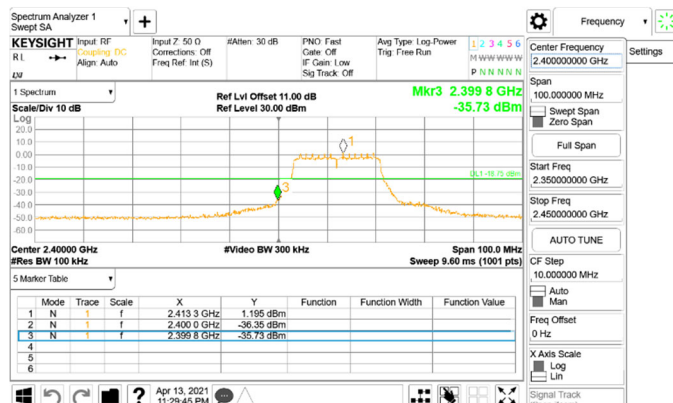
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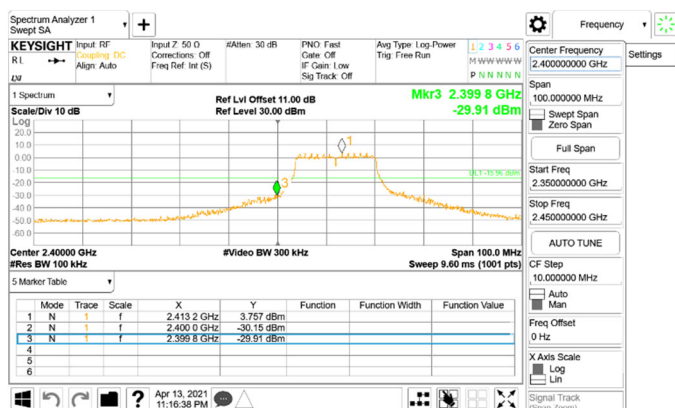
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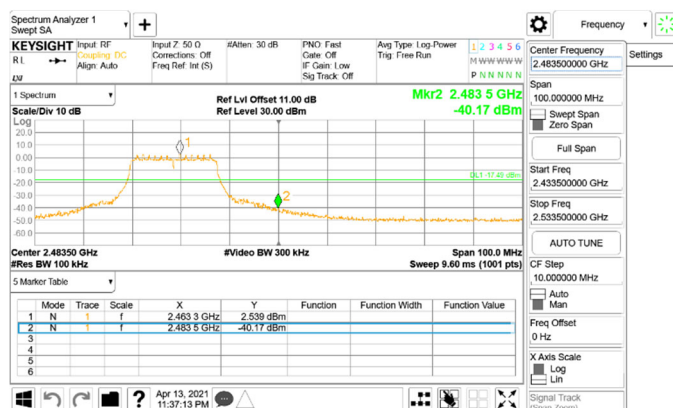
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