

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



**Applicant:** ATEN INTERNATIONAL CO., LTD.  
3F, No.125, Sec. 2, Datung Road, Sijhih District, New Taipei  
City 22183, Taiwan (R.O.C.)

**Manufacturer:** ATEN INTERNATIONAL CO., LTD.  
3F, No.125, Sec. 2, Datung Road, Sijhih District, New Taipei  
City 22183, Taiwan (R.O.C.)

**Product Name:** 4K Wireless Presentation Switch

**Brand Name:** ATEN

**Model No.:** Main: VP2021  
Variant: VP2020/VP2030/VP2031

**Model Difference:** Differences in functional and appearance

**Report Number:** TERF2303000789ER

**FCC ID** JYX-VP2021

**Date of EUT Received:** March 31, 2023

**Date of Test:** April 06, 2023~April 27, 2023

**Issue Date:** June 15, 2023

*Blue Yang*  
**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.

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## Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2303000789ER	00	Original	June 15, 2023	Celery Wei	

**Note:**

- 1、The remark "\*" indicates modification of the report upon requests from certification body.
- 2、Variant information of model numbers is provided by the applicant, test results of this report are applicable to the sample EUT(s) received.  
And are assessed as electrically identical in RF characteristics, therefore, no further assessment required for the variant(s).

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## 1 GENERAL INFORMATION

### 1.1 Product Description

Product Name:	4K Wireless Presentation Switch
Brand Name:	ATEN
Model No.:	Main: VP2021 Variant: VP2020/VP2030/VP2031
Model Difference:	Differences in functional and appearance
Hardware Version:	MP
Firmware Version:	N/A
EUT Series No.:	47A101124540065
Power Supply:	12V from AC/DC Adapter
Test Software (Name/Version)	Windows 10

### 1.2 RF Specification

#### WLAN 2.4GHz

Wi-Fi	Frequency Range	Channels	Rated Power (dBm)		Modulation Technology
			Peak	Avg.	
802.11b	2412~2462	11	20.13	17.94	DSSS
802.11g	2412~2462	11	26.34	16.96	OFDM
802.11n20	2412~2462	11	25.76	15.96	OFDM
802.11n40	2422~2452	7	26.22	15.99	OFDM
Modulation type:		CCK, DQPSK, DBPSK for DSSS			
		64QAM, 16QAM, QPSK, BPSK for OFDM			
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:up to 144.4Mbps			
		802.11 n_40MHz:up to 300Mbps			

### 1.3 Antenna Designation

Antenna Type	Freq. (MHz)	Peak Antenna Gain (dBi)	Directional Gain (dBi)
Dipole	2412-2462	2.46	5.47

#### Note:

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

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## 1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

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 2		
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
		Conduction C		
		SAC C		
		SAC D		
		SAC G		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conducted A	TW0028	
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		

**Note:** Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.

## 1.6 Special Accessories

There are no special accessories used while test was conducted.

## 1.7 Equipment Modifications

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

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

### 2.2 EUT Exercise

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

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is 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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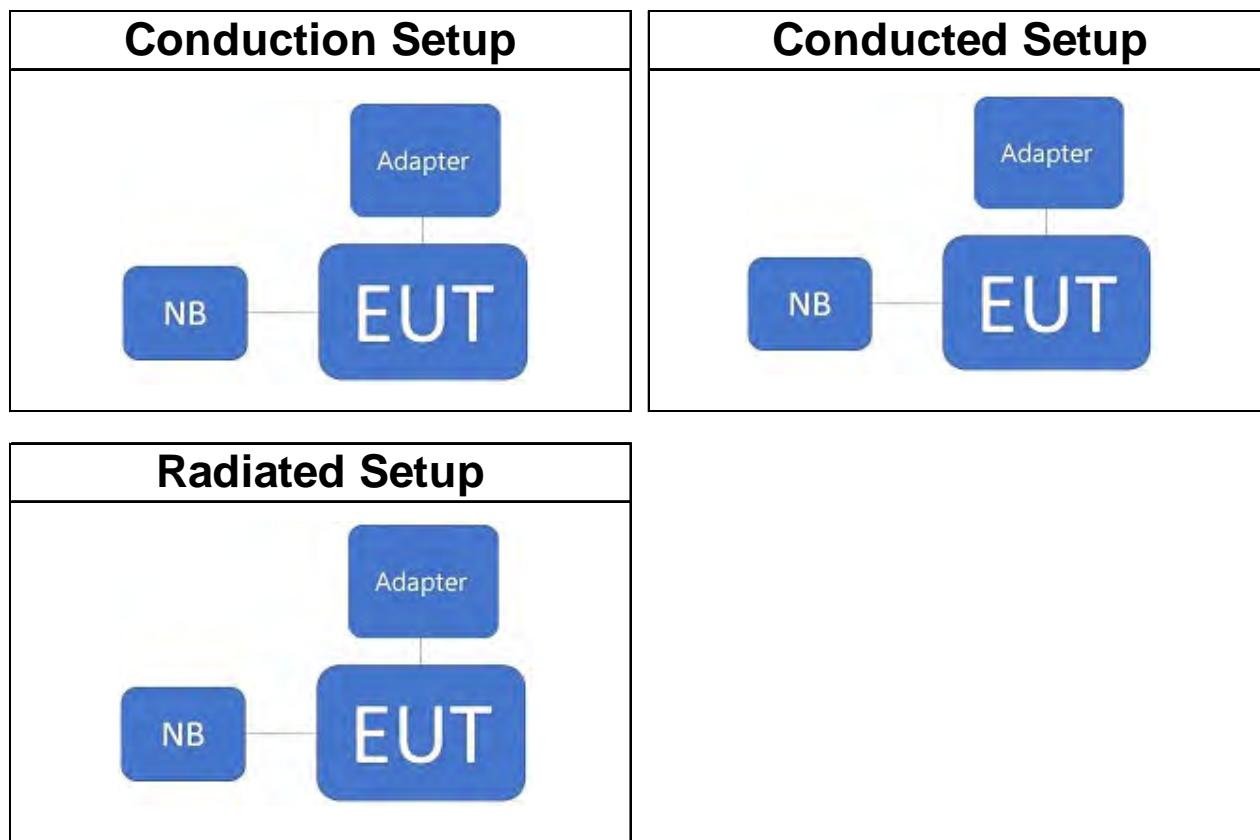
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## 2.4 Measurement Results Explanation Example

### 2.4.1 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



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## 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.
AC/DC Adapter	DELTA	DPS-40AB-11	JABD2243017436	N/A	N/A
Notebook	HP	HSN-Q35C-4	5CD238GDV5	N/A	N/A
Conducted Emission Test Site: Conducted 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	HP	HSN-Q35C-4	5CD238GDV5	N/A	N/A
Radiated Emission Test Site: SAC 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
AC/DC Adapter	DELTA	DPS-40AB-11	JABD2243017436	N/A	N/A
Notebook	HP	HSN-Q35C-4	5CD238GDV5	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	Antenna Requirement	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operatin Frequencies

Modulation of BW 20MHz		Modulation of BW 40MHz	
CHANNEL	FREQUENCY (MHz)	CHANNEL	FREQUENCY (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		
9	2452		
10	2457		
11	2462		

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#### 4.2 The Worst Test Modes and Channel Details

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

The given UE is pre-scanned among below modes.

Modulation		Transmission Chain							Single Transmission Spatial		Multi Transmission Spatial		
<b>v</b>	802.11 b	<b>v</b>	Ch0	<b>v</b>	Ch1		Ch2		Ch3		1TX	<b>v</b>	2TX
<b>v</b>	802.11 g	<b>v</b>	Ch0	<b>v</b>	Ch1		Ch2		Ch3		1TX	<b>v</b>	2TX
<b>v</b>	802.11 n	<b>v</b>	Ch0	<b>v</b>	Ch1		Ch2		Ch3		1TX	<b>v</b>	2TX
	802.11 ac		Ch0		Ch1		Ch2		Ch3		1TX		2TX
	802.11 ax		Ch0		Ch1		Ch2		Ch3		1TX		2TX

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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					
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	3,6,9	OFDM	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	3,6,9	OFDM	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.

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.32 dB
Output Power measurement	+/- 1 dB
Emission Bandwidth	+/- 1.53 Hz
Undesignable radiated emission measurement	+/- 1.68 dB
Peak Power Density	+/- 2.16 dB
Temperature	+/- 0.7 °C
Humidity	+/- 3 %
DC / AC Power Source	+/- 1 %

Radiated Spurious Emission Measurement Uncertainty			
Polarization: Vertical	+/- 2.8 dB	9kHz~30MHz	
	+/- 4.82 dB	30MHz - 1000MHz	
	+/- 4.37 dB	1GHz - 18GHz	
	+/- 4.21 dB	18GHz - 40GHz	
Polarization: Horizontal	+/- 2.8 dB	9kHz~30MHz	
	+/- 4.54 dB	30MHz - 1000MHz	
	+/- 4.37 dB	1GHz - 18GHz	
	+/- 4.21 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.

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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. 9.210322	N.C.R	N.C.R
LISN	SCHWARZBECK	NSLK 8127	1040	08/23/2022	08/22/2023
Coaxial Cables	EMC Instruments Corp.	EMCCFD300-BM-BM-3000	161207	06/22/2022	06/21/2023
EMI Test Receiver	R&S	ESCI 7	100759	08/22/2022	08/21/2023

### 6.2 Conduted Measurement

Conducted Emission Test Site: Conducted 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY59071571	05/19/2022	05/18/2023
Test Software	SGS	Radio Test Software	Ver. 21	N.C.R	N.C.R
Power Meter	Anritsu	ML2496A	1242004	10/26/2022	10/25/2023
Power Sensor	Anritsu	MA2411B	1207365	10/26/2022	10/25/2023
Power Sensor	Anritsu	MA2411B	1207368	10/26/2022	10/25/2023
Attenuator	Mini-Circuit	BW-S10W2+	2	12/13/2022	12/12/2023
DC Block	Mini-Circuits	BLK-18-S+	1	12/13/2022	12/12/2023

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### 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	12/30/2022	12/29/2023
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	12/27/2022	12/26/2023
Loop Antenna	ETS.LINDGREN	6502	148045	10/05/2022	10/04/2023
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/30/2022	12/29/2023
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY60242081	10/06/2022	10/05/2023
Test Software	Audix	e3	Ver. 9.210322	N.C.R	N.C.R
EMI Test Receiver	R&S	ESCI 7	100759	08/22/2022	08/21/2023
Site Cal	SGS	SAC 1	N/A	01/01/2023	12/31/2023
Pre-Amplifier	HP	8447D	2944A09469	12/13/2022	12/12/2023
Pre-Amplifier	HP	8449B	3008A01973	12/13/2022	12/12/2023
Pre-Amplifier	EMCI	EMC184045B	980135	10/27/2022	10/26/2023
Bandreject Filter 2400-2483.5	EWT	EWT-14-0166	M1	12/13/2022	12/12/2023
3.2GHz High Pass Filter	WI	WHKX10-2624-80SS	3	12/13/2022	12/12/2023
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	12/13/2022	12/12/2023
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	12/13/2022	12/12/2023
Coaxial Cable	Huber Suhner	EMC 104-SM-SM-2000	160123	12/13/2022	12/12/2023
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY2630/2	12/13/2022	12/12/2023
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY22962/2	12/13/2022	12/12/2023

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

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## 7 CONDUCTED EMISSION TEST

### 7.1 Standard Applicable

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

Frequency range MHz	Limits (dBuV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

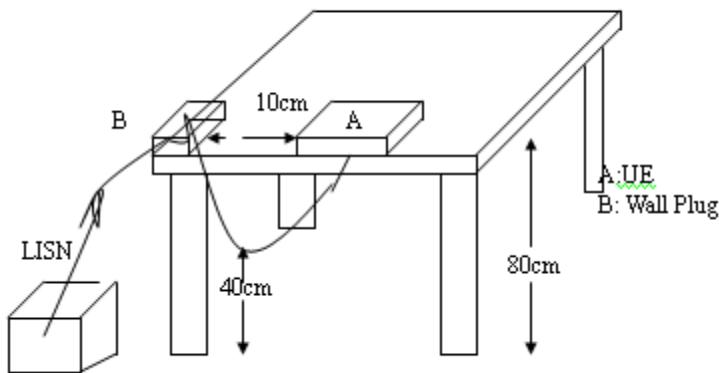
#### Note

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

### 7.2 EUT Setup

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

### 7.3 Test Setup



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## 7.4 Measurement Procedure

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

## 7.5 Measurement Result

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

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

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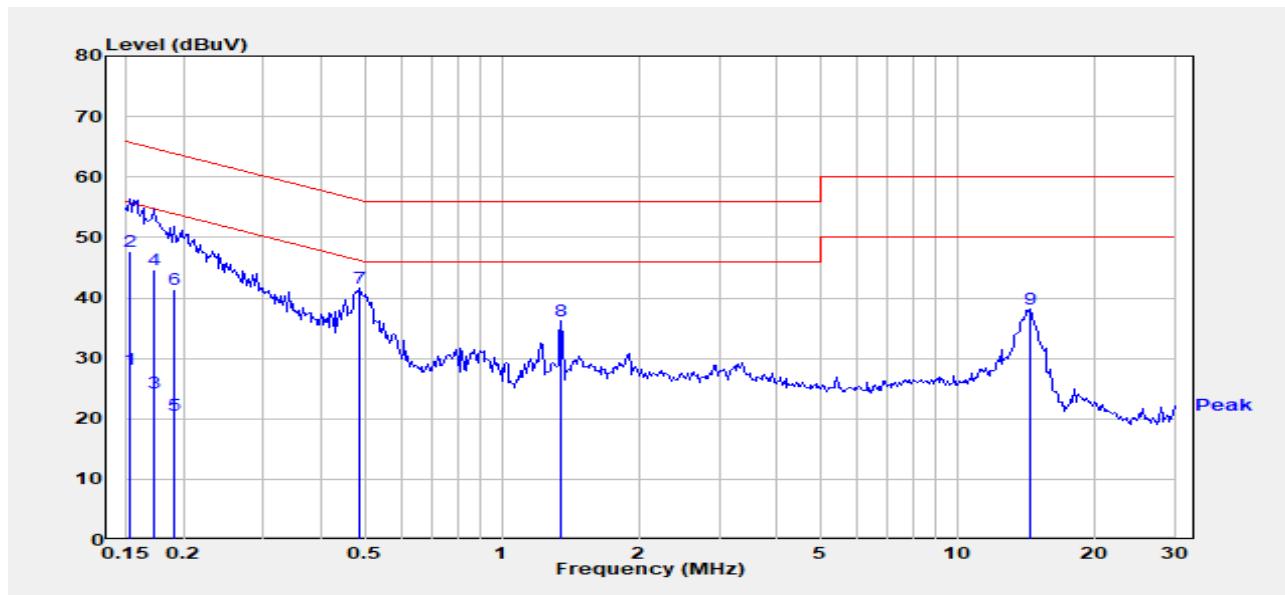
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number :TERF2303000789ER Test Site :Conduction 1  
 Test Mode :WLAN\_2.4G Test Date :2023-04-27  
 Power :120V/60Hz Temp./Humi. :24.9/51  
 Probe :L Engineer :WJ Lin



Freq. MHz	Detector Mode	Spectrum		Factor dB	Actual FS dB $\mu$ V	Limit dB $\mu$ V	Margin dB
		Reading	Level dB $\mu$ V				
0.152	Average	17.95	10.25	28.20	55.87	-27.67	
0.152	QP	37.44	10.25	47.69	65.87	-18.18	
0.172	Average	14.05	10.25	24.30	54.85	-30.55	
0.172	QP	34.42	10.25	44.67	64.85	-20.18	
0.190	Average	10.36	10.25	20.61	54.02	-33.41	
0.190	QP	31.07	10.25	41.32	64.02	-22.70	
0.486	Peak	31.28	10.25	41.53	56.24	-14.71	
1.349	Peak	25.48	10.67	36.15	56.00	-19.85	
14.465	Peak	27.40	10.79	38.20	60.00	-21.80	

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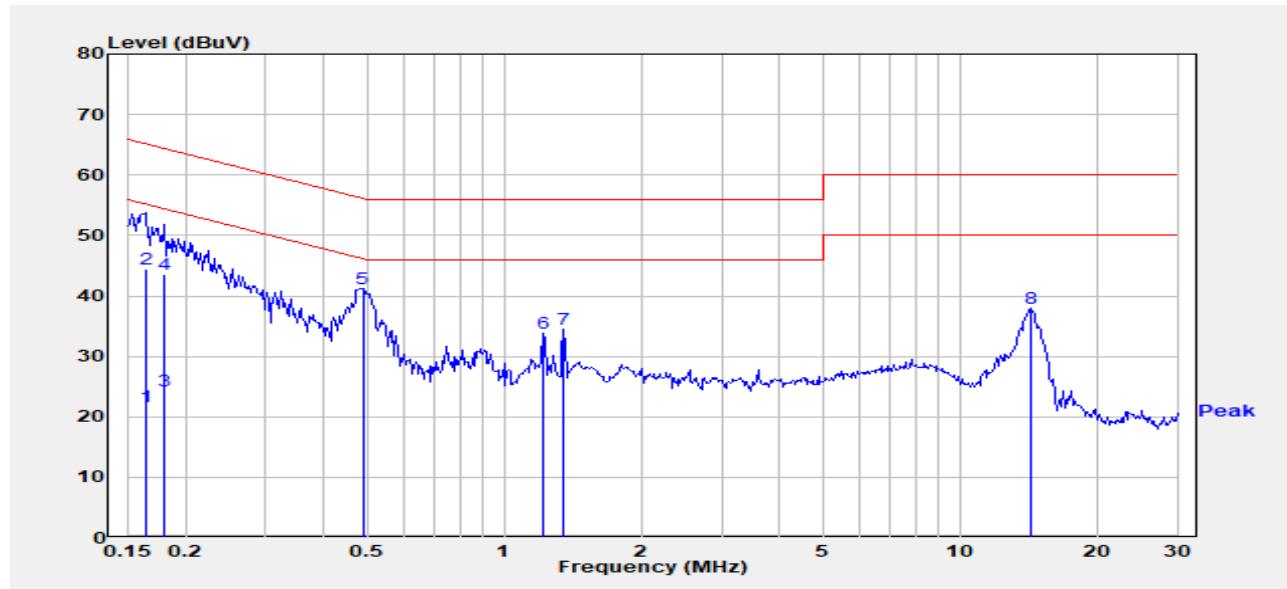
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Report Number :TERF2303000789ER  
 Test Mode :WLAN\_2.4G  
 Power :120V/60Hz  
 Probe :N

Test Site :Conduction 1  
 Test Date :2023-04-27  
 Temp./Humi. :24.9/51  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V	Limit dB $\mu$ V	Margin dB
		Reading	Level dB $\mu$ V				
0.163	Average	11.52	10.25	21.77	55.30	-33.53	
0.163	QP	34.12	10.25	44.37	65.30	-20.93	
0.180	Average	14.05	10.25	24.30	54.47	-30.17	
0.180	QP	33.41	10.25	43.66	64.47	-20.81	
0.489	Peak	31.03	10.25	41.28	56.18	-14.90	
1.220	Peak	23.28	10.57	33.85	56.00	-22.15	
1.349	Peak	23.76	10.67	34.43	56.00	-21.57	
14.354	Peak	27.15	10.73	37.88	60.00	-22.12	

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## 8 PEAK 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 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.

#### 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.

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

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

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

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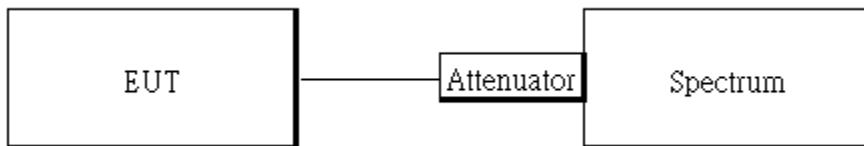
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$G_k$  is the gain in dBi of the kth antenna.

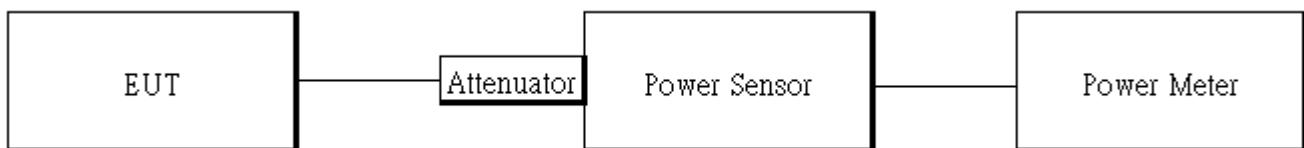
The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

## 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, cable loss is specified below.

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

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## 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	96.91	0.14	0.08	1.00
802.11g	90.29	0.44	0.48	1.00
802.11n_20	91.56	0.38	0.52	1.00
802.11n_40	80.96	0.92	1.06	2.00

## 8.6.2 Duty Cycle test plots

802.11b\_20MHz\_Chain0\_2412MHz



802.11g\_20MHz\_Chain0\_2412MHz



## 802.11n\_40MHz\_Chain0\_2422MHz



802.11g\_20MHz\_Chain0\_2412MHz



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### 8.6.3 Output Power

802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	72	17.45	30.00	PASS
6	2437	1	72	17.44	30.00	PASS
11	2462	1	72	17.63	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	72	14.94	30.00	PASS
6	2437	1	72	14.89	30.00	PASS
11	2462	1	72	14.83	30.00	PASS
802.11b Ch1						
CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	80	16.56	30.00	PASS
6	2437	1	80	16.54	30.00	PASS
11	2462	1	80	16.47	30.00	PASS
802.11b Ch1						
CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	1	80	14.79	30.00	PASS
6	2437	1	80	14.63	30.00	PASS
11	2462	1	80	14.71	30.00	PASS

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## 802.11b\_2TX

CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
				Ch0	Ch1			
1	2412	1	80	18.27	15.56	20.13	30.00	PASS
6	2437	1	80	18.20	15.43	20.04	30.00	PASS
11	2462	1	80	18.34	15.41	20.13	30.00	PASS

## 802.11b\_2TX

CH	Freq. (MHz)	Data Rate	Power set	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
				Ch0	Ch1			
1	2412	1	80	16.07	12.96	17.94	30.00	PASS
6	2437	1	80	15.85	13.14	17.85	30.00	PASS
11	2462	1	80	15.66	12.84	17.63	30.00	PASS

## 802.11g Ch0

CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	55	22.73	30.00	PASS
6	2437	6	55	22.84	30.00	PASS
11	2462	6	55	22.55	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	55	13.95	30.00	PASS
6	2437	6	55	13.93	30.00	PASS
11	2462	6	55	13.82	30.00	PASS

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802.11g Ch1

CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	64	24.64	30.00	PASS
6	2437	6	64	24.59	30.00	PASS
11	2462	6	64	24.43	30.00	PASS

802.11g Ch1

CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	6	64	13.93	30.00	PASS
6	2437	6	64	13.84	30.00	PASS
11	2462	6	64	13.77	30.00	PASS

802.11g\_2TX

CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
				Ch0	Ch1			
1	2412	6	64	24.18	22.27	<b>26.34</b>	30.00	PASS
6	2437	6	64	23.91	22.18	26.14	30.00	PASS
11	2462	6	64	24.01	22.19	26.20	30.00	PASS

802.11g\_2TX

CH	Freq. (MHz)	Data Rate	Power set	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
				Ch0	Ch1			
1	2412	6	64	14.57	12.11	<b>16.96</b>	30.00	PASS
6	2437	6	64	14.34	12.08	16.81	30.00	PASS
11	2462	6	64	14.49	12.04	16.89	30.00	PASS

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802.11n\_HT\_20M Ch0

CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	51	21.56	30.00	PASS
6	2437	MCS0	51	21.73	30.00	PASS
11	2462	MCS0	51	21.57	30.00	PASS

802.11n\_HT\_20M Ch0

CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	51	12.98	30.00	PASS
6	2437	MCS0	51	12.73	30.00	PASS
11	2462	MCS0	51	12.69	30.00	PASS

802.11n\_HT\_20M Ch1

CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	60	22.74	30.00	PASS
6	2437	MCS0	60	22.65	30.00	PASS
11	2462	MCS0	60	22.51	30.00	PASS

802.11n\_HT\_20M Ch1

CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	60	12.92	30.00	PASS
6	2437	MCS0	60	12.68	30.00	PASS
11	2462	MCS0	60	12.62	30.00	PASS

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## 802.11n\_HT20M\_2TX

CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
				Ch0	Ch1			
1	2412	MCS0	60	23.65	21.62	<b>25.76</b>	30.00	PASS
6	2437	MCS0	60	23.39	21.35	25.50	30.00	PASS
11	2462	MCS0	60	23.49	21.49	25.61	30.00	PASS

## 802.11n\_HT20M\_2TX

CH	Freq. (MHz)	Data Rate	Power set	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
				Ch0	Ch1			
1	2412	MCS0	60	13.52	11.34	<b>15.96</b>	30.00	PASS
6	2437	MCS0	60	13.47	11.31	15.91	30.00	PASS
11	2462	MCS0	60	13.55	11.23	15.93	30.00	PASS

## 802.11n\_HT\_40M Ch0

CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	51	22.95	30.00	PASS
6	2437	MCS0	51	22.69	30.00	PASS
9	2452	MCS0	52	22.73	30.00	PASS

## 802.11n\_HT\_40M Ch0

CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	51	12.85	30.00	PASS
6	2437	MCS0	51	12.75	30.00	PASS
9	2452	MCS0	52	12.87	30.00	PASS

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## 802.11n\_HT\_40M Ch1

CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	59	22.79	30.00	PASS
6	2437	MCS0	59	22.67	30.00	PASS
9	2452	MCS0	59	22.84	30.00	PASS

## 802.11n\_HT\_40M Ch1

CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	59	12.78	30.00	PASS
6	2437	MCS0	59	12.65	30.00	PASS
9	2452	MCS0	59	12.77	30.00	PASS

## 802.11n\_HT40M\_2TX

CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
				Ch0	Ch1			
3	2422	MCS0	59	24.03	22.19	<b>26.22</b>	30.00	PASS
6	2437	MCS0	59	23.88	21.97	26.04	30.00	PASS
9	2452	MCS0	59	23.59	21.95	3.01	30.00	PASS

## 802.11n\_HT40M\_2TX

CH	Freq. (MHz)	Data Rate	Power set	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
				Ch0	Ch1			
3	2422	MCS0	59	13.06	10.71	15.97	30.00	PASS
6	2437	MCS0	59	13.18	10.54	<b>15.99</b>	30.00	PASS
9	2452	MCS0	59	13.01	10.41	15.83	30.00	PASS

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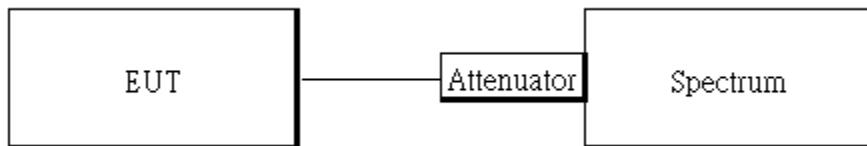
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## 9 EMISSION BANDWIDTH MEASUREMENT

### 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 FCC measurements

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

### 9.4 6dB Bandwidth

#### 802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	<b>10130</b>	$\geq 500$	PASS
2437	<b>10130</b>	$\geq 500$	PASS
2462	<b>10130</b>	$\geq 500$	PASS

#### 802.11b Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	<b>10130</b>	$\geq 500$	PASS
2437	<b>10130</b>	$\geq 500$	PASS
2462	<b>10130</b>	$\geq 500$	PASS

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**802.11g Ch0**

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15690	≥ 500	PASS
2437	<b>15810</b>	≥ 500	PASS
2462	15480	≥ 500	PASS

**802.11g Ch1**

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15830	≥ 500	PASS
2437	15500	≥ 500	PASS
2462	<b>16080</b>	≥ 500	PASS

**802.11n\_HT\_20M Ch0**

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15730	≥ 500	PASS
2437	<b>16060</b>	≥ 500	PASS
2462	15680	≥ 500	PASS

**802.11n\_HT\_20M Ch1**

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16030	≥ 500	PASS
2437	<b>16070</b>	≥ 500	PASS
2462	15800	≥ 500	PASS

**802.11n\_HT\_40M Ch0**

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	<b>35190</b>	≥ 500	PASS
2437	35180	≥ 500	PASS
2452	<b>35190</b>	≥ 500	PASS

**802.11n\_HT\_40M Ch1**

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	<b>35180</b>	≥ 500	PASS
2437	<b>35180</b>	≥ 500	PASS
2452	35160	≥ 500	PASS

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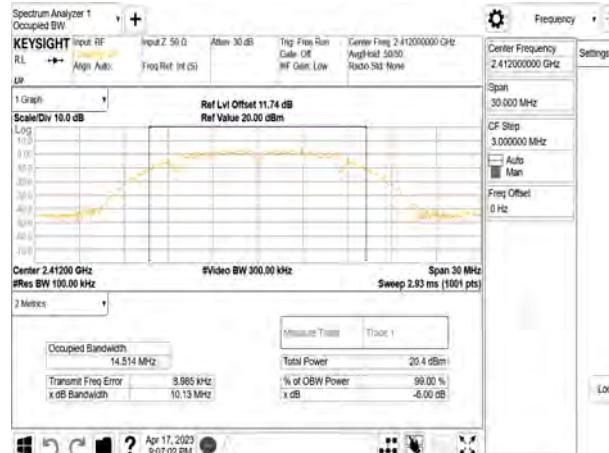
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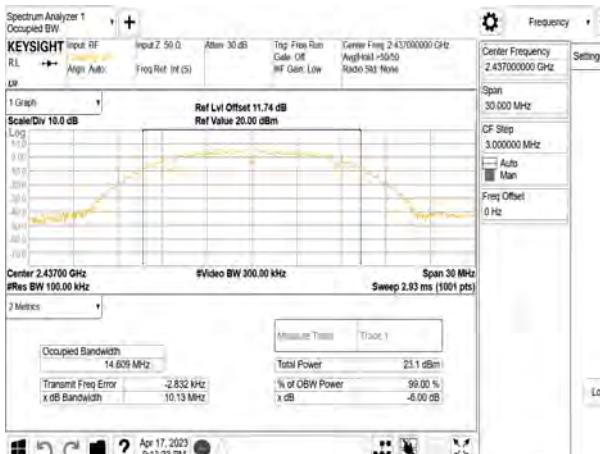
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802.11b\_20MHz\_Chain1\_2412MHz



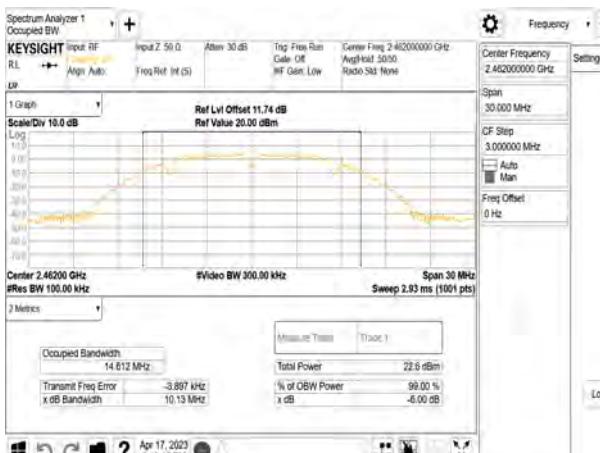
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802.11b\_20MHz\_Chain1\_2437MHz



802.11b\_20MHz\_Chain0\_2462MHz



802.11b\_20MHz\_Chain1\_2462MHz



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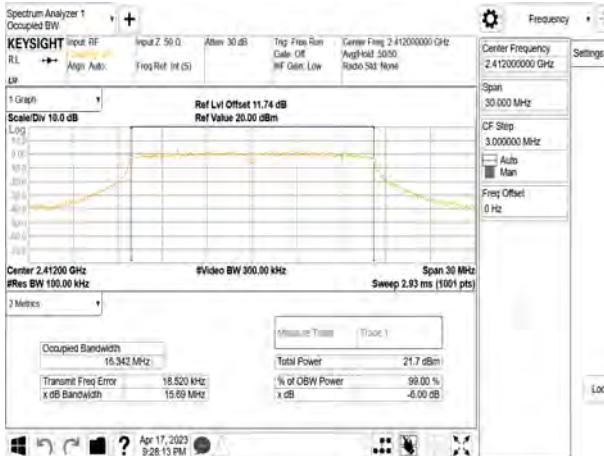
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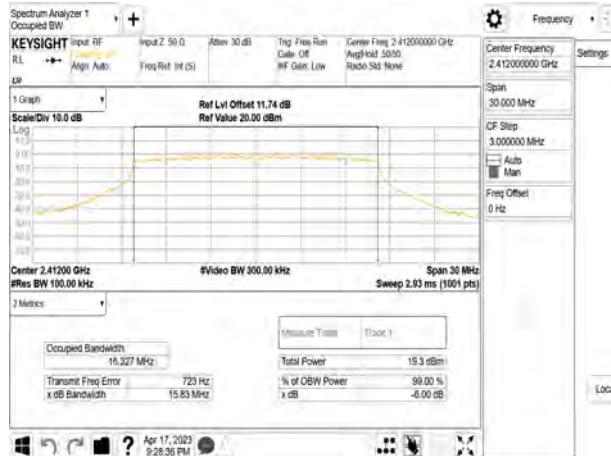
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802.11g\_20MHz\_Chain0\_2412MHz



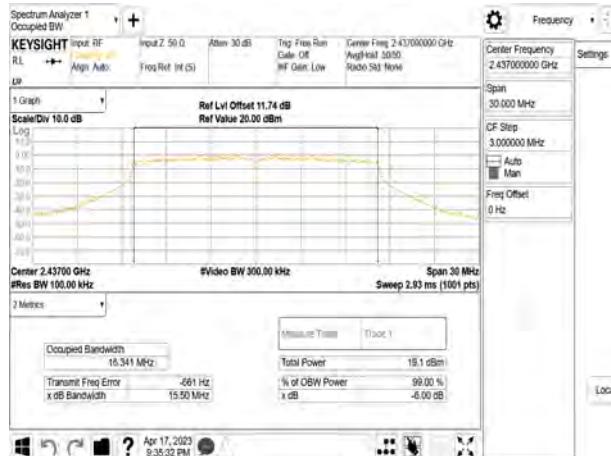
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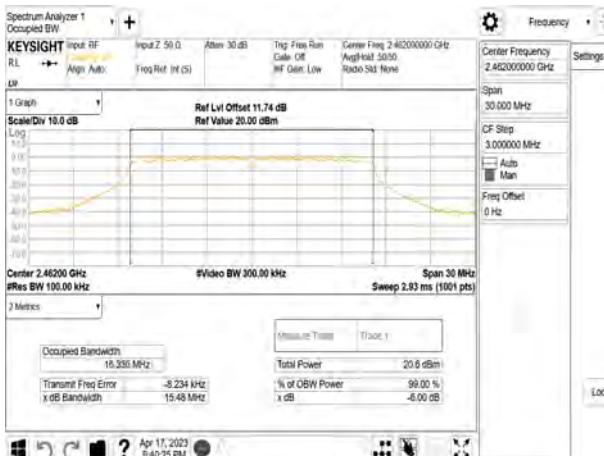
802.11g\_20MHz\_Chain0\_2437MHz



802.11g\_20MHz\_Chain1\_2437MHz



802.11g\_20MHz\_Chain0\_2462MHz



802.11g\_20MHz\_Chain1\_2462MHz



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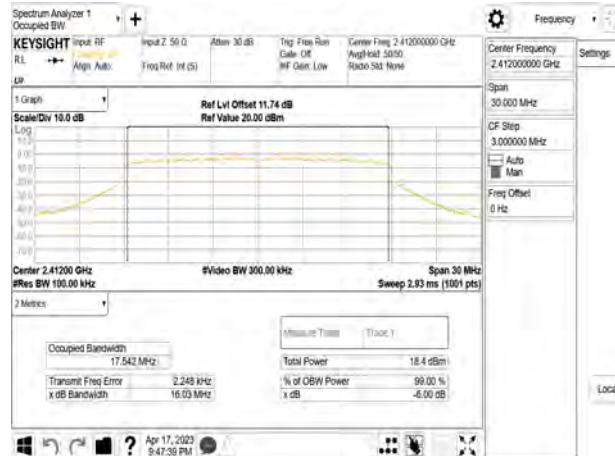
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802.11n\_20MHz\_Chain0\_2412MHz



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



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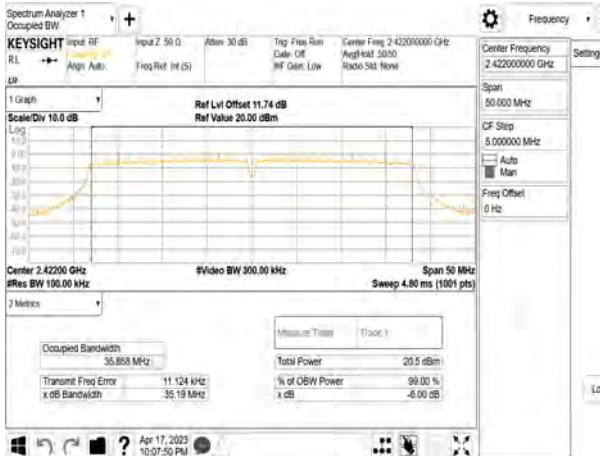
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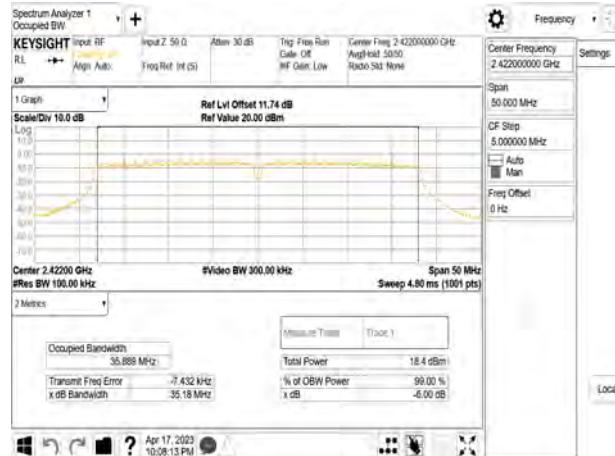
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802.11n\_40MHz\_Chain0\_2422MHz



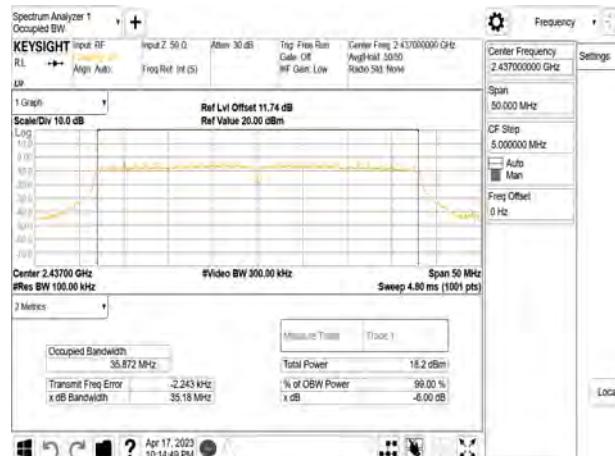
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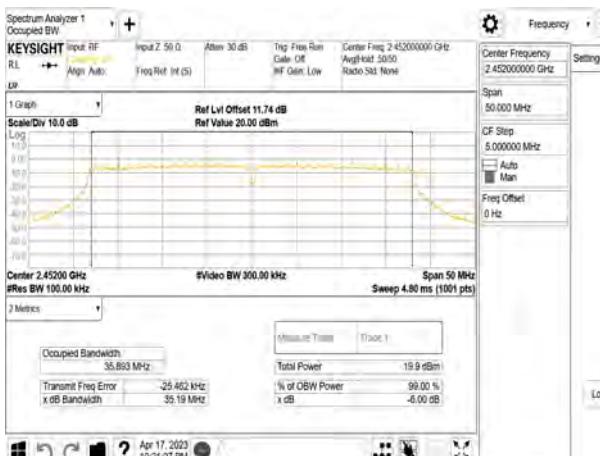
802.11n\_40MHz\_Chain0\_2437MHz



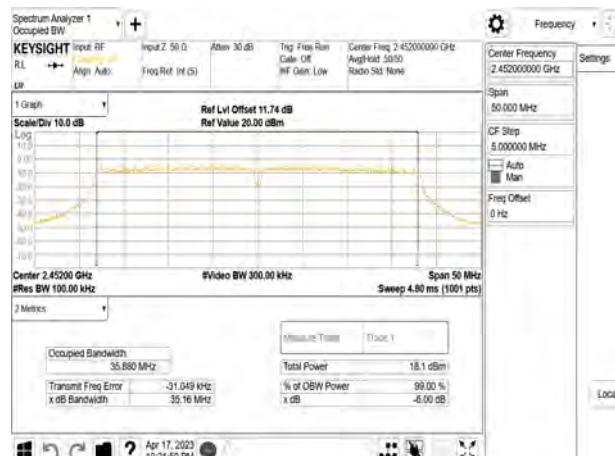
802.11n\_40MHz\_Chain1\_2437MHz



802.11n\_40MHz\_Chain0\_2452MHz



802.11n\_40MHz\_Chain1\_2452MHz



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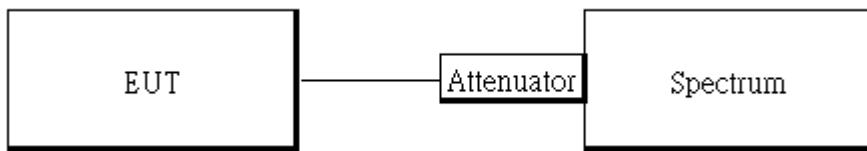
## 10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

### 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.
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.

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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 – 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.
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.

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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.
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.*

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## 10.4 Measurement Result

### 802.11b Ch0

Reference Level of Limit			Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)	Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	6.26	-13.74	2412	3.66	-16.34
2437	6.10	-13.90	2437	3.27	-16.73
2462	5.52	-14.48	2462	2.88	-17.12

### 802.11g Ch0

Reference Level of Limit 802.11g mode			Reference Level of Limit 802.11g mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)	Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	4.15	-15.85	2412	1.58	-18.42
2437	3.15	-16.85	2437	1.31	-18.69
2462	2.62	-17.38	2462	0.62	-19.38

### 802.11n HT\_20M Ch0

Reference Level of Limit 802.11n20 MODE			Reference Level of Limit 802.11ac20 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)	Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	3.07	-16.93	2412	0.56	-19.44
2437	2.69	-17.31	2437	0.30	-19.70
2462	1.51	-18.49	2462	-0.29	-20.29

### 802.11n HT\_40M Ch0

Reference Level of Limit 802.11n40 MODE			Reference Level of Limit 802.11ac40 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)	Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2422	-0.55	-20.55	2422	-2.41	-22.41
2437	-0.54	-20.54	2437	-2.62	-22.62
2452	-1.21	-21.21	2452	-2.73	-22.73

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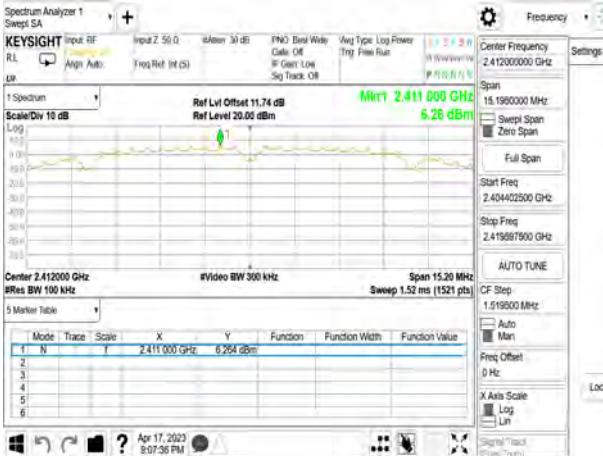
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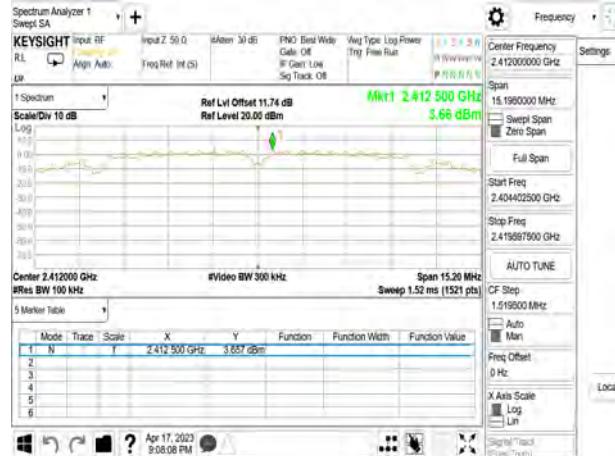
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802.11b\_20MHz\_Chain1\_2412MHz



802.11b\_20MHz\_Chain0\_2437MHz



802.11b\_20MHz\_Chain1\_2437MHz



802.11b\_20MHz\_Chain0\_2462MHz



802.11b\_20MHz\_Chain1\_2462MHz



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802.11g\_20MHz\_Chain1\_2437MHz



802.11g\_20MHz\_Chain1\_2462MHz



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802.11n\_20MHz\_Chain0\_2412MHz



802.11n\_20MHz\_Chain1\_2412MHz



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802.11n\_40MHz\_Chain0\_2422MHz



802.11n\_40MHz\_Chain0\_2437MHz



802.11n\_40MHz\_Chain0\_2452MHz



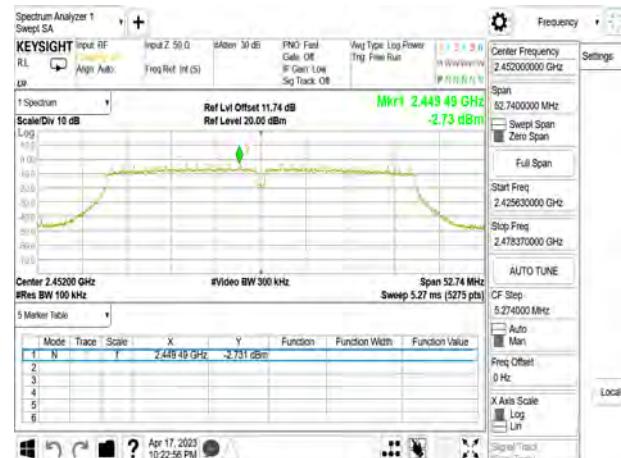
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802.11n\_40MHz\_Chain1\_2437MHz



802.11n\_40MHz\_Chain1\_2452MHz



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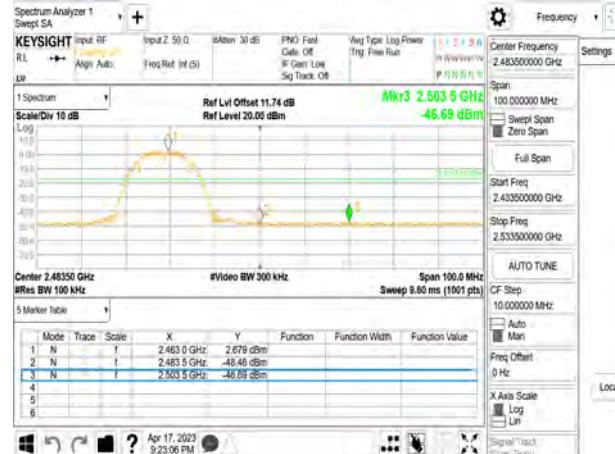
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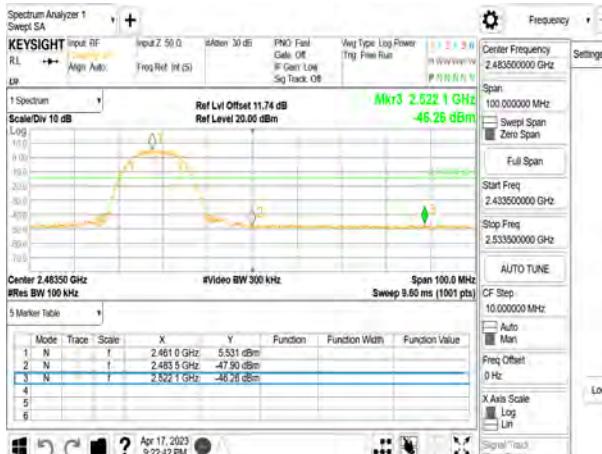
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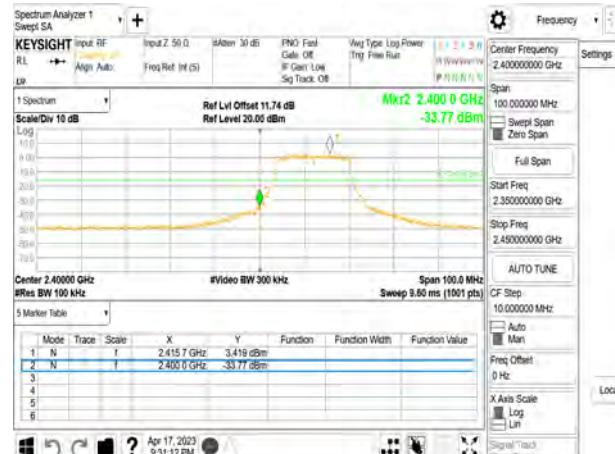
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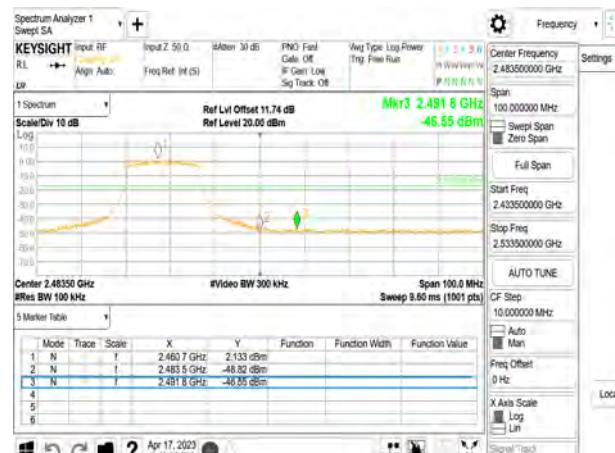
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802.11b\_20MHz\_Chain1\_2412MHz



802.11g\_20MHz\_Chain0\_2462MHz



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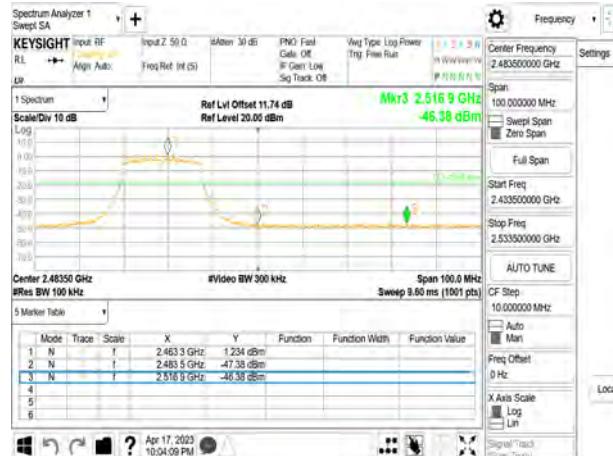
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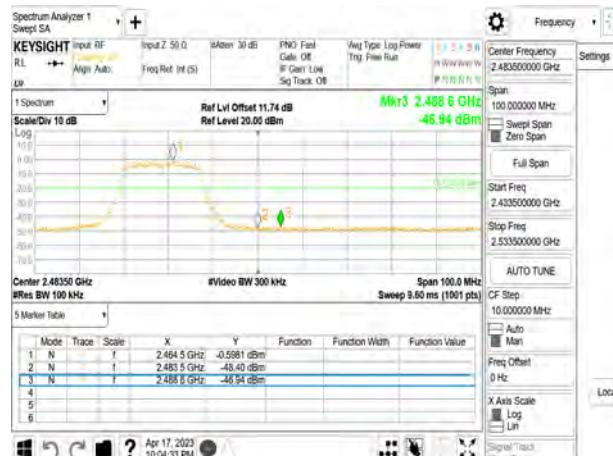
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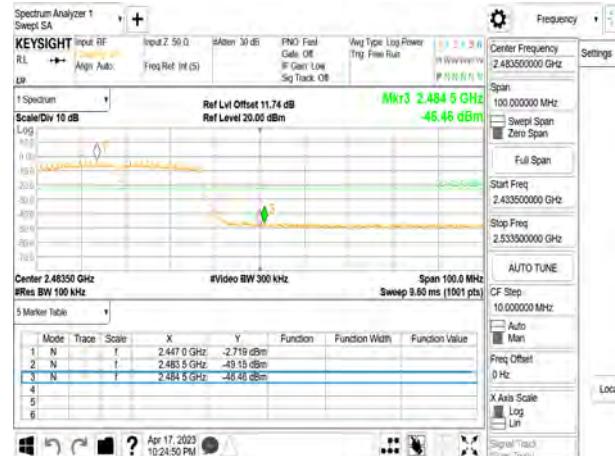
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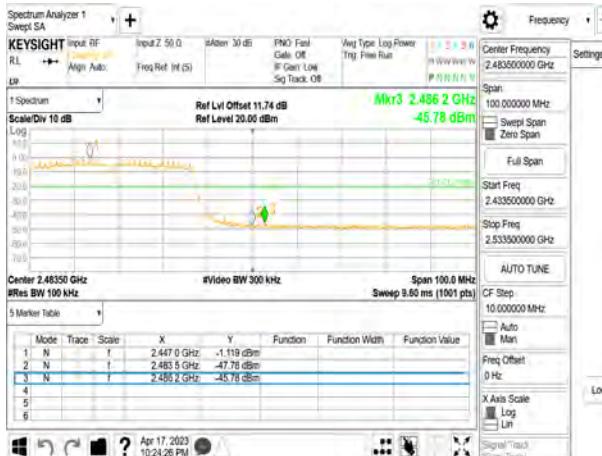
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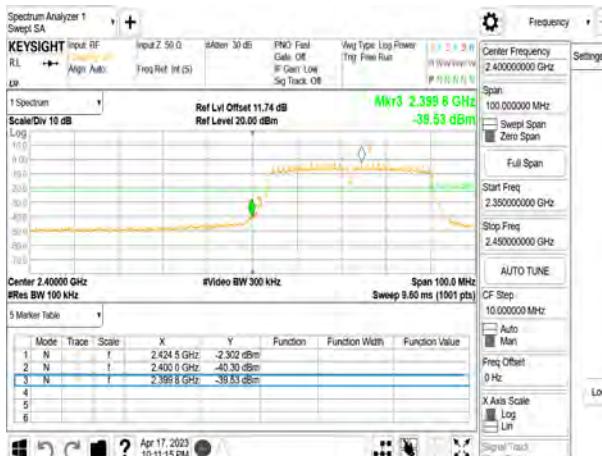
802.11n\_40MHz\_Chain1\_2452MHz



802.11n\_40MHz\_Chain0\_2452MHz



802.11n\_40MHz\_Chain1\_2422MHz



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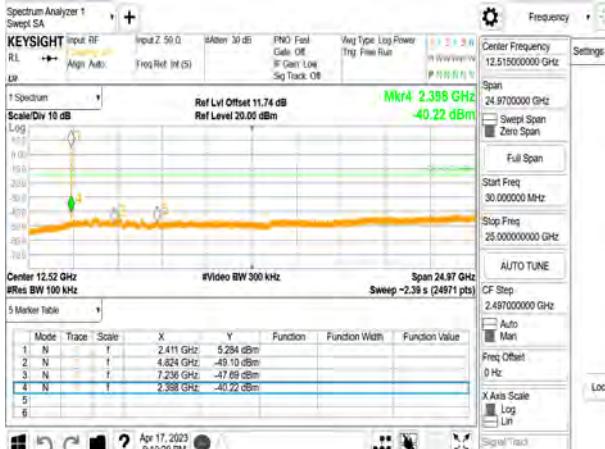
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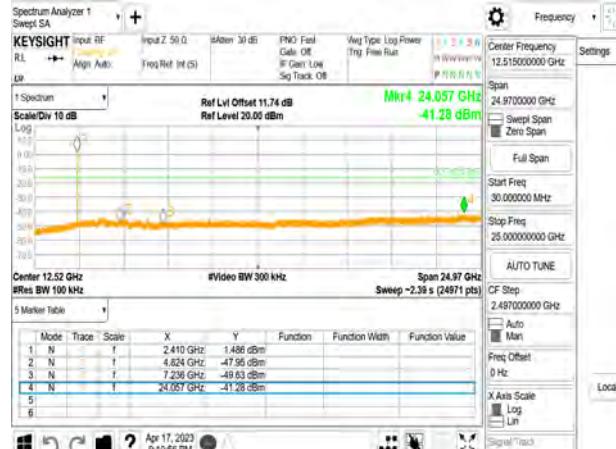
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802.11b\_20MHz\_Chain0\_2412MHz



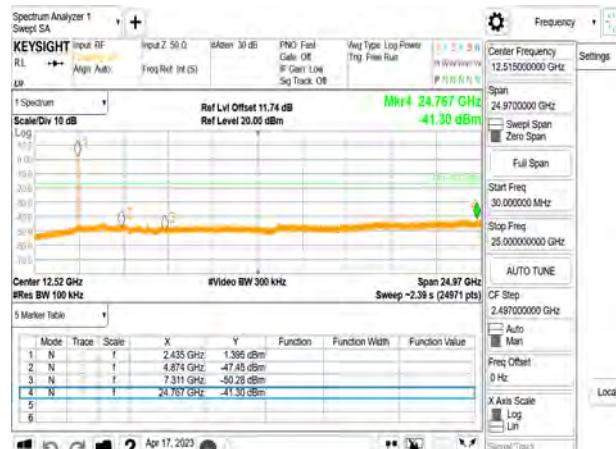
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802.11b\_20MHz\_Chain0\_2437MHz



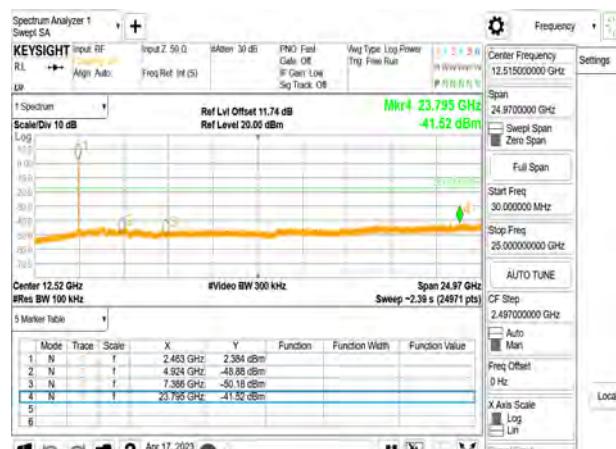
802.11b\_20MHz\_Chain1\_2437MHz



802.11b\_20MHz\_Chain0\_2462MHz



802.11b\_20MHz\_Chain1\_2462MHz



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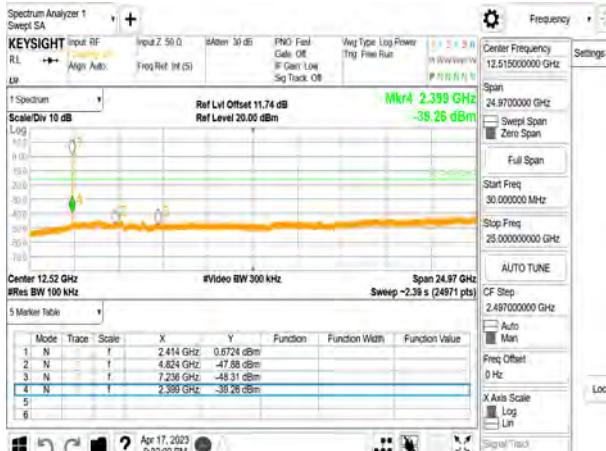
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802.11g\_20MHz\_Chain0\_2412MHz



802.11g\_20MHz\_Chain0\_2437MHz



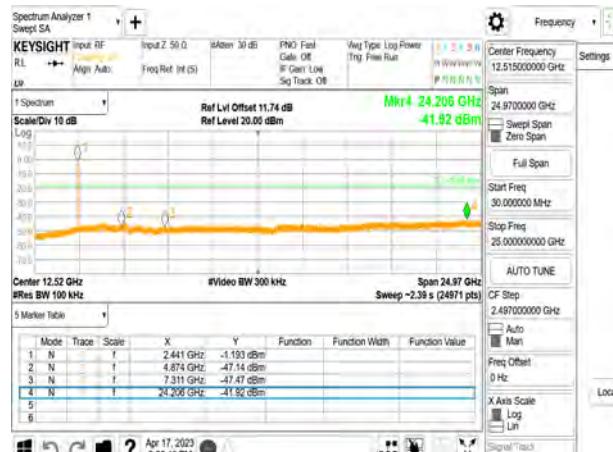
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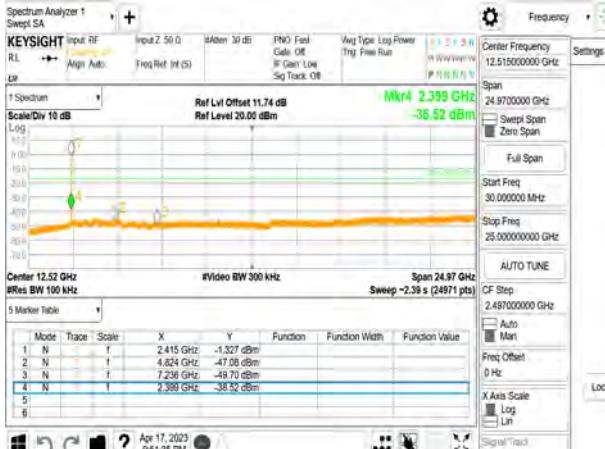
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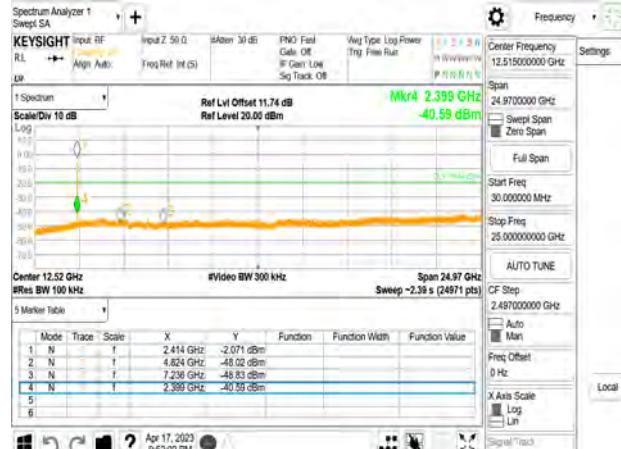
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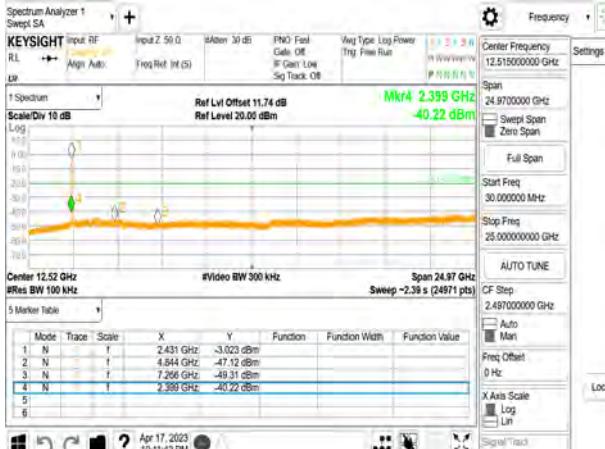
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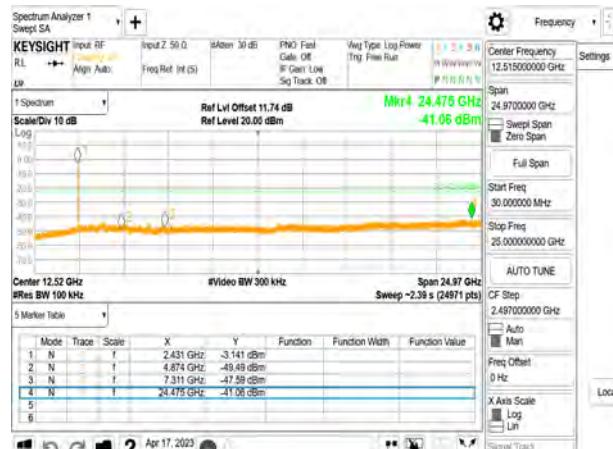
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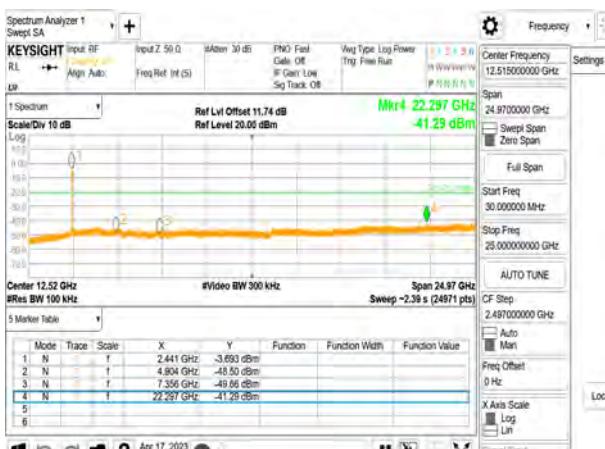
802.11n\_40MHz\_Chain0\_2437MHz



802.11n\_40MHz\_Chain1\_2437MHz



802.11n\_40MHz\_Chain0\_2452MHz



802.11n\_40MHz\_Chain1\_2452MHz



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## 11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 11.1 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 must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**Note:**

1. The lower limit shall apply at the transition frequencies.

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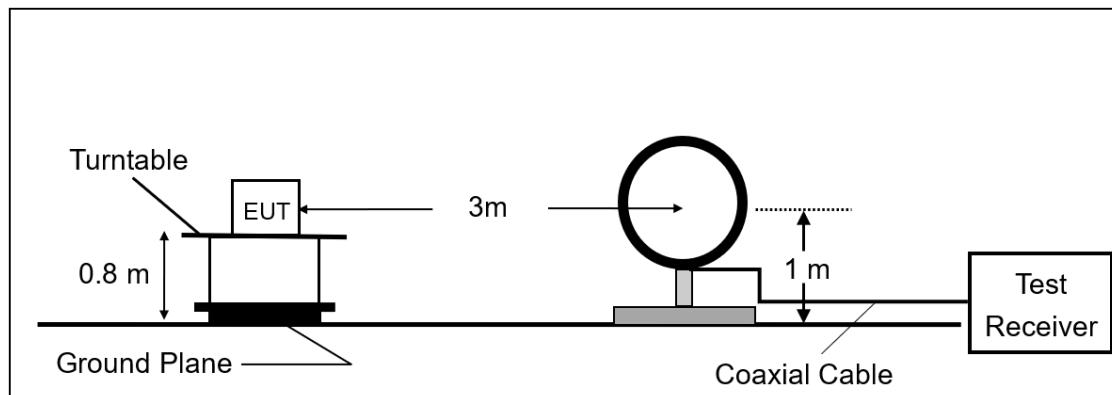
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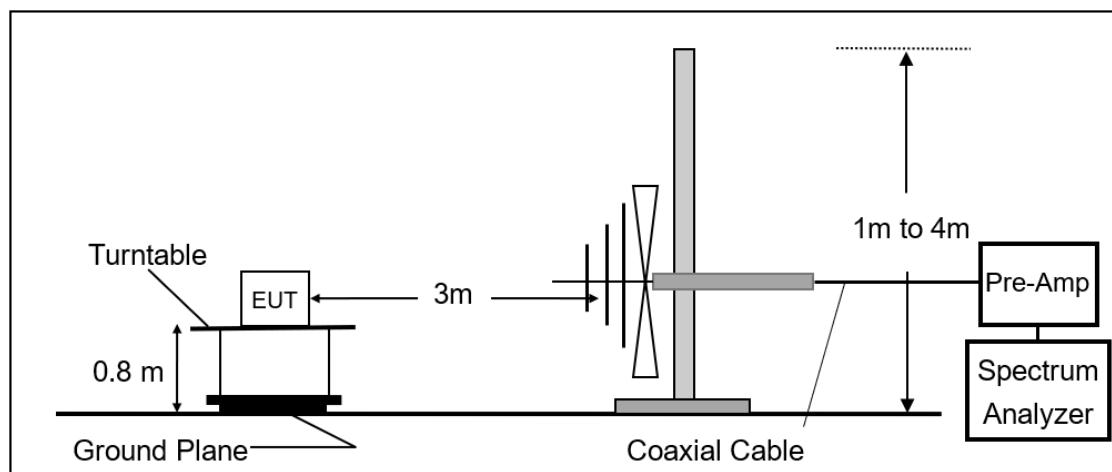
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## 11.2 Test Setup

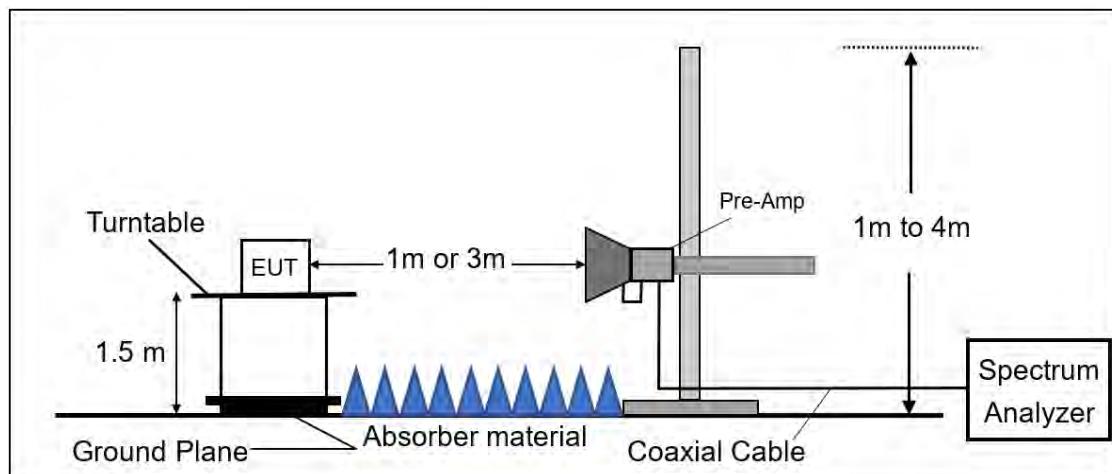
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



(C) Radiated Emission Test Set-Up, Frequency Above 1GHz.



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### 11.3 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz.
6. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW  $\geq$  1/T (Duty cycle < 98%) for Average Emission Measurements at frequency above 1 GHz.
9. When 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.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
12. Repeat above procedures until all default test channel measured were complete.

### 11.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

**Where**  $FS$  = Field Strength

$CL$  = Cable Attenuation Factor (Cable Loss)

$RA$  = Reading Amplitude

$AG$  = Amplifier Gain

$AF$  = Antenna Factor

*The limit of the emission level is expressed in dBuV/m, which converts  $20 \cdot \log(uV/m)$*

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*Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)*

*Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)*

## 11.5 Test Results of Radiated Spurious Emissions from 9 kHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

## 11.6 Measurement Result

### Note:

1. Refer to next page spectrum analyzer data chart and tabular data sheets.
2. Measurements are completed at peak and average level, the mark of average is the highest emission in restricted bands

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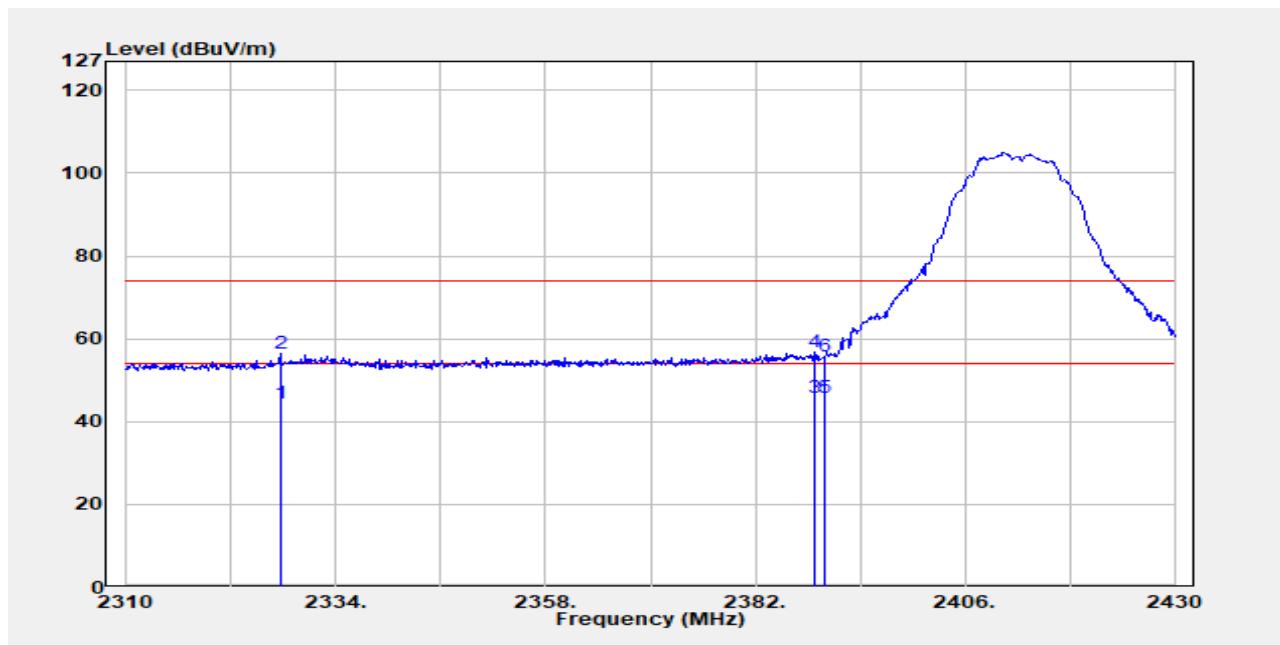
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## 11.6.1 Radiated Band Edge Measurement Result

Report Number	:TERF2303000789ER	Test Site	:SAC 1
Operation Mode	:802.11b	Test Date	:2023-04-17
Test Frequency	:2412 MHz	Temp./Humi.	:23.6/64
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:WJ Lin



Freq. MHz	Detector Mode	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual	Limit	Margin dB
				FS dB $\mu$ V/m	@3m dB $\mu$ V/m	
2327.640	Average	43.75	0.52	44.27	54.00	-9.73
2327.640	Peak	55.92	0.52	56.44	74.00	-17.56
2388.840	Average	45.14	0.60	45.74	54.00	-8.26
2388.840	Peak	56.34	0.60	56.95	74.00	-17.05
2390.000	Average	45.19	0.60	45.79	54.00	-8.21
2390.000	Peak	55.02	0.60	55.62	74.00	-18.38

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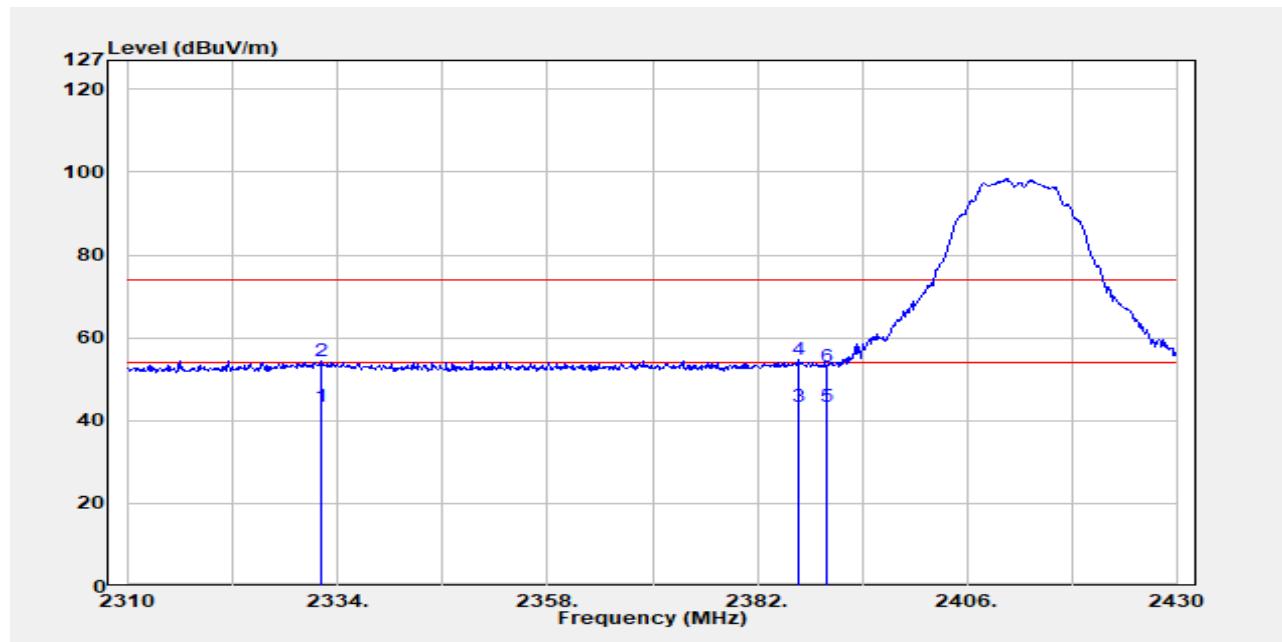
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Report Number :TERF2303000789ER  
 Operation Mode :802.11b  
 Test Frequency :2412 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Horizontal  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2331.960	Average	42.94	0.54	43.48	54.00	-10.52
2331.960	Peak	53.97	0.54	54.51	74.00	-19.49
2386.800	Average	42.80	0.61	43.41	54.00	-10.59
2386.800	Peak	53.99	0.61	54.59	74.00	-19.41
2390.000	Average	42.69	0.60	43.29	54.00	-10.71
2390.000	Peak	52.48	0.60	53.09	74.00	-20.91

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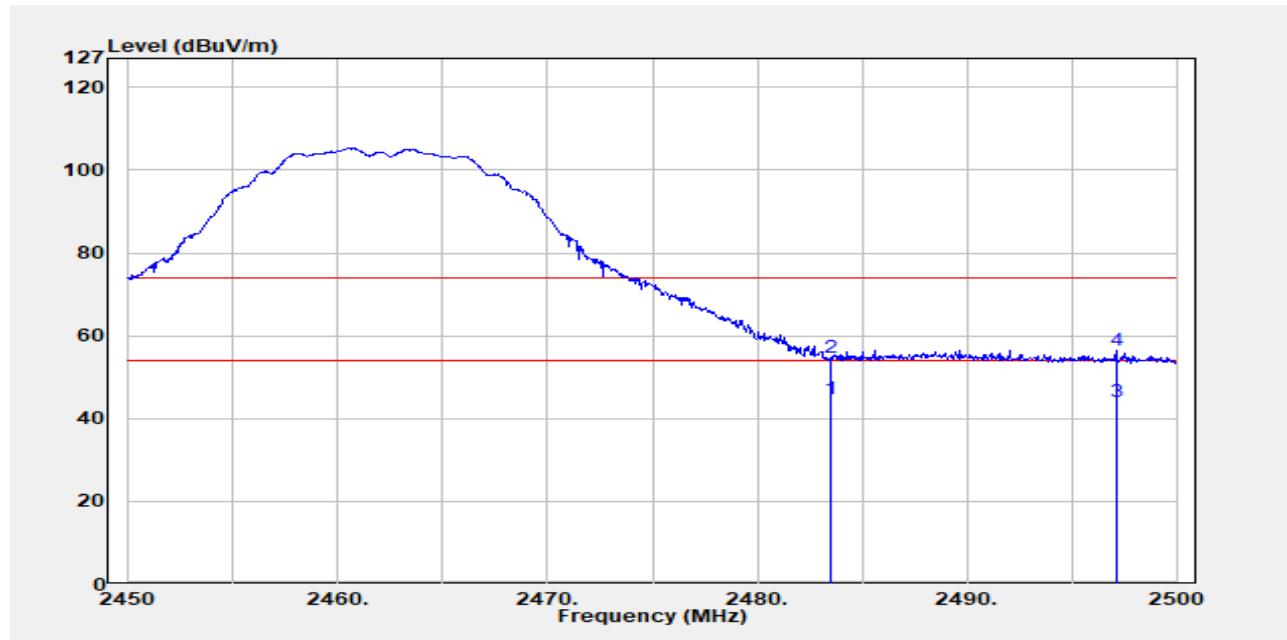
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Report Number :TERF2303000789ER  
 Operation Mode :802.11b  
 Test Frequency :2462 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Vertical  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	44.67	0.21	44.88	54.00	-9.12
2483.500	Peak	54.54	0.21	54.75	74.00	-19.25
2497.150	Average	43.75	0.34	44.09	54.00	-9.91
2497.150	Peak	56.14	0.34	56.47	74.00	-17.53

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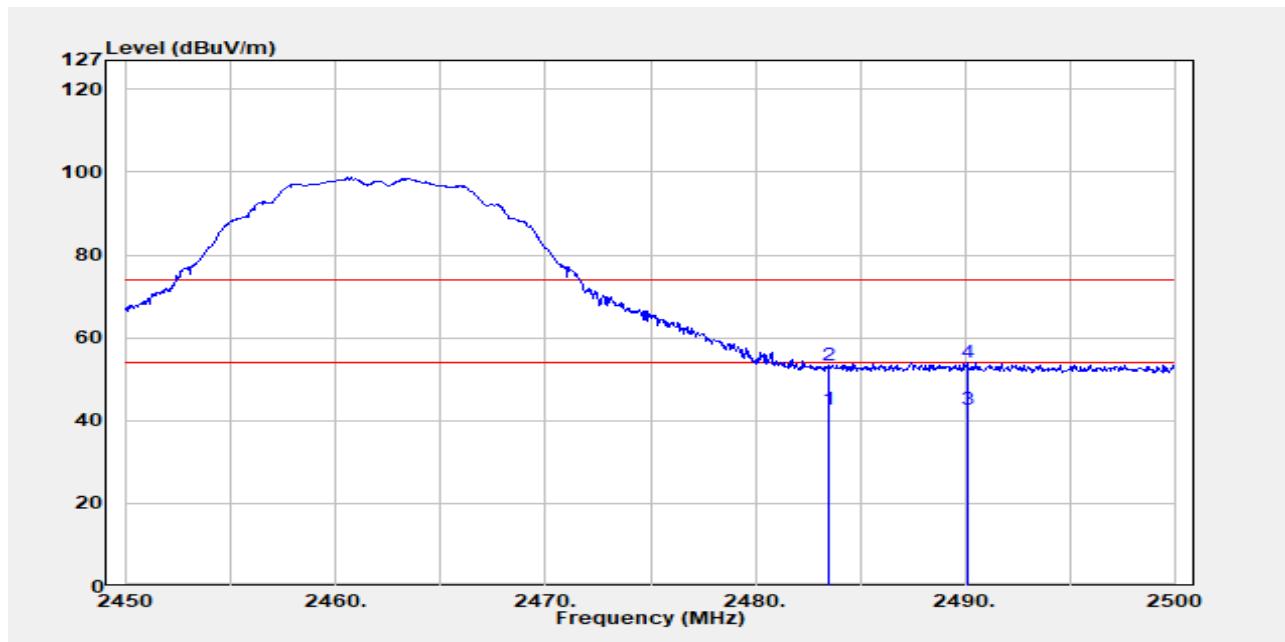
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 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Horizontal  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	42.45	0.21	42.66	54.00	-11.34
2483.500	Peak	53.17	0.21	53.38	74.00	-20.62
2490.100	Average	42.49	0.27	42.76	54.00	-11.24
2490.100	Peak	53.89	0.27	54.16	74.00	-19.84

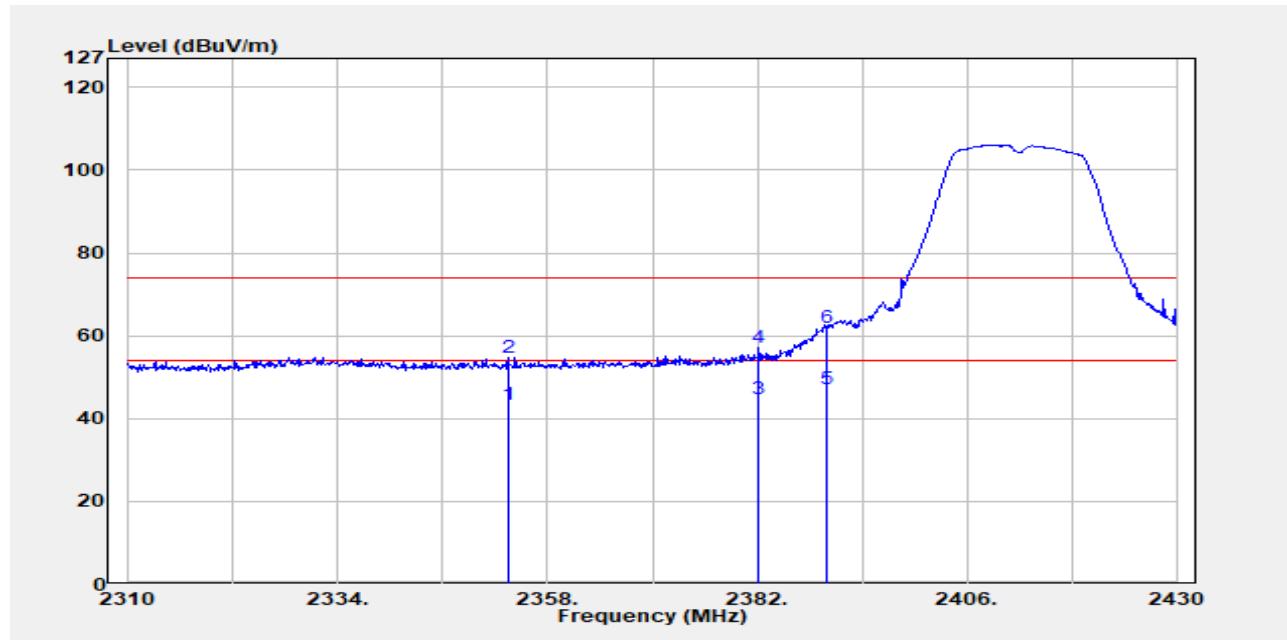
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Report Number :TERF2303000789ER  
 Operation Mode :802.11g  
 Test Frequency :2412 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Vertical  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2353.440	Average	42.74	0.63	43.37	54.00	-10.63
2353.440	Peak	54.19	0.63	54.82	74.00	-19.18
2382.120	Average	44.18	0.61	44.79	54.00	-9.21
2382.120	Peak	56.40	0.61	57.01	74.00	-16.99
2390.000	Average	46.70	0.60	47.30	54.00	-6.70
2390.000	Peak	61.26	0.60	61.86	74.00	-12.14

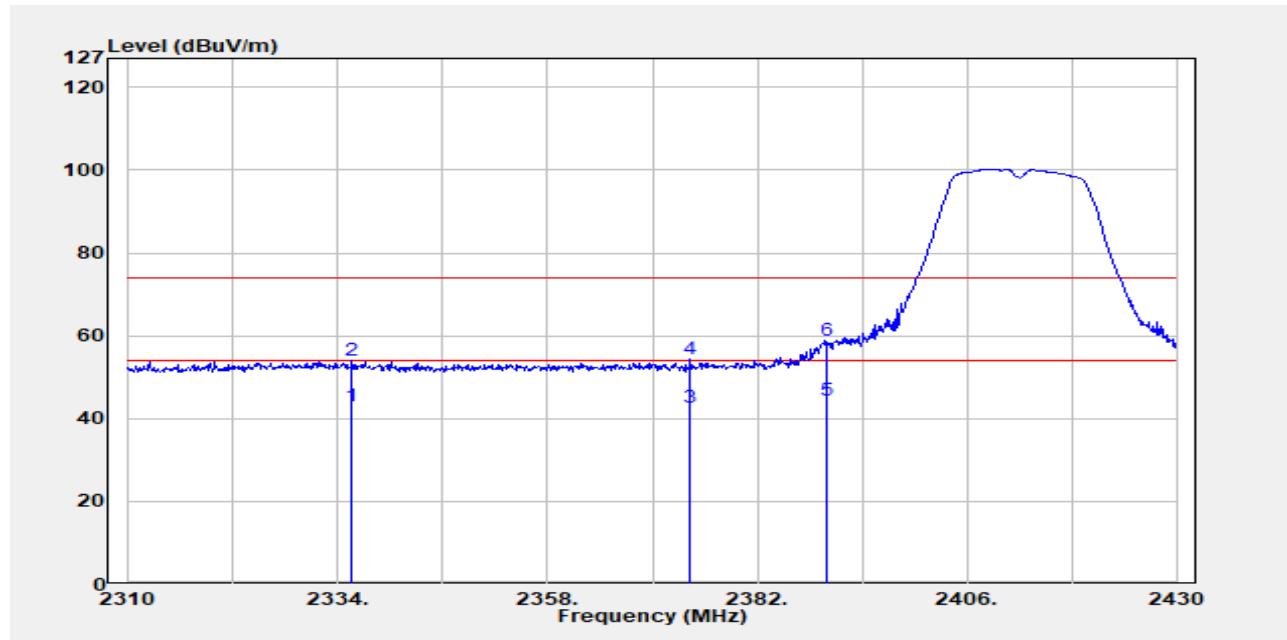
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 Temp./Humi. :23.6/64  
 Antenna Pol. :Horizontal  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2335.560	Average	42.44	0.56	43.00	54.00	-11.00
2335.560	Peak	53.46	0.56	54.02	74.00	-19.98
2374.320	Average	42.21	0.61	42.82	54.00	-11.18
2374.320	Peak	53.76	0.61	54.38	74.00	-19.62
2390.000	Average	43.92	0.60	44.52	54.00	-9.48
2390.000	Peak	58.31	0.60	58.92	74.00	-15.08

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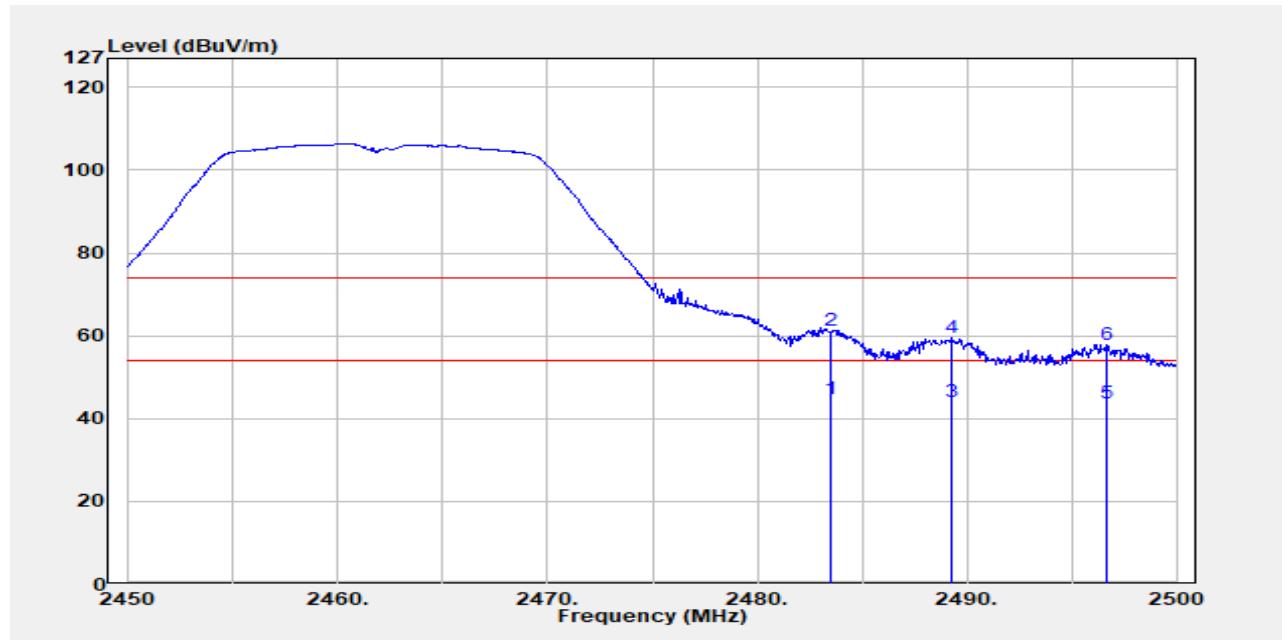
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 Test Frequency :2462 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Vertical  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	44.49	0.21	44.70	54.00	-9.30
2483.500	Peak	61.19	0.21	61.41	74.00	-12.59
2489.300	Average	43.94	0.27	44.21	54.00	-9.79
2489.300	Peak	59.44	0.27	59.71	74.00	-14.29
2496.650	Average	43.37	0.33	43.70	54.00	-10.30
2496.650	Peak	57.63	0.33	57.96	74.00	-16.04

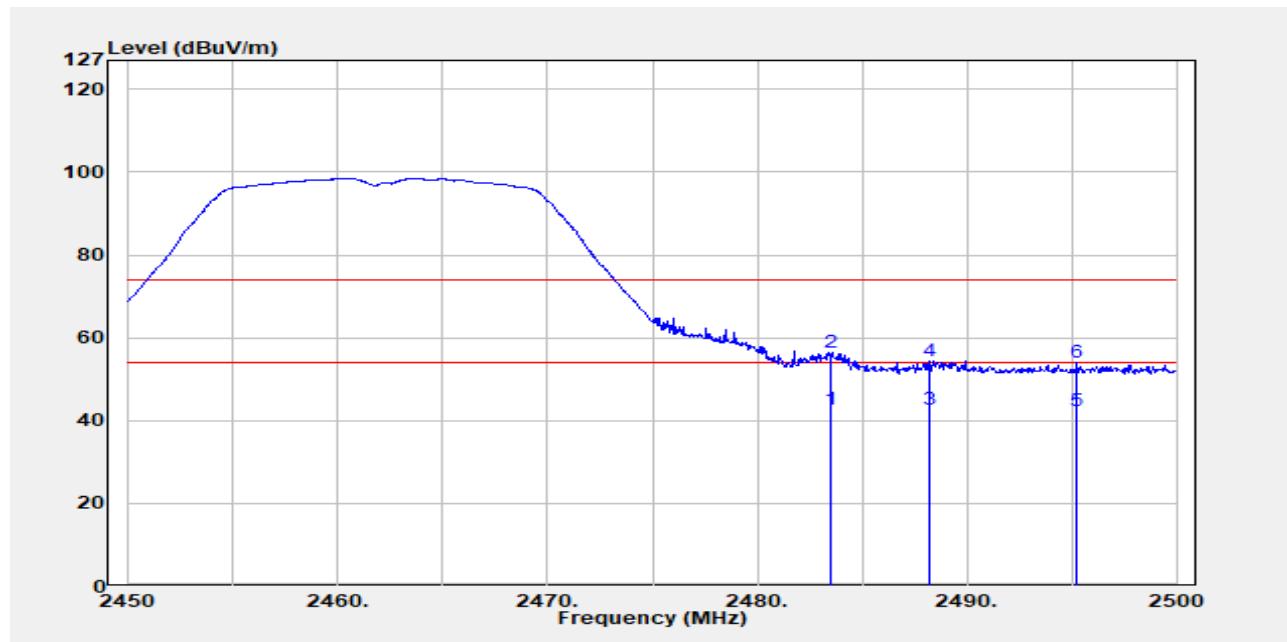
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Report Number :TERF2303000789ER  
Operation Mode :802.11g  
Test Frequency :2462 MHz  
Test Mode :Bandedge  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2023-04-17  
Temp./Humi. :23.6/64  
Antenna Pol. :Horizontal  
Engineer :WJ Lin



Freq. MHz	Detector Mode	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	42.38	0.21	42.59	54.00	-11.41
2483.500	Peak	56.11	0.21	56.33	74.00	-17.67
2488.250	Average	42.26	0.26	42.52	54.00	-11.48
2488.250	Peak	54.16	0.26	54.42	74.00	-19.58
2495.250	Average	42.12	0.32	42.44	54.00	-11.56
2495.250	Peak	53.69	0.32	54.01	74.00	-19.99

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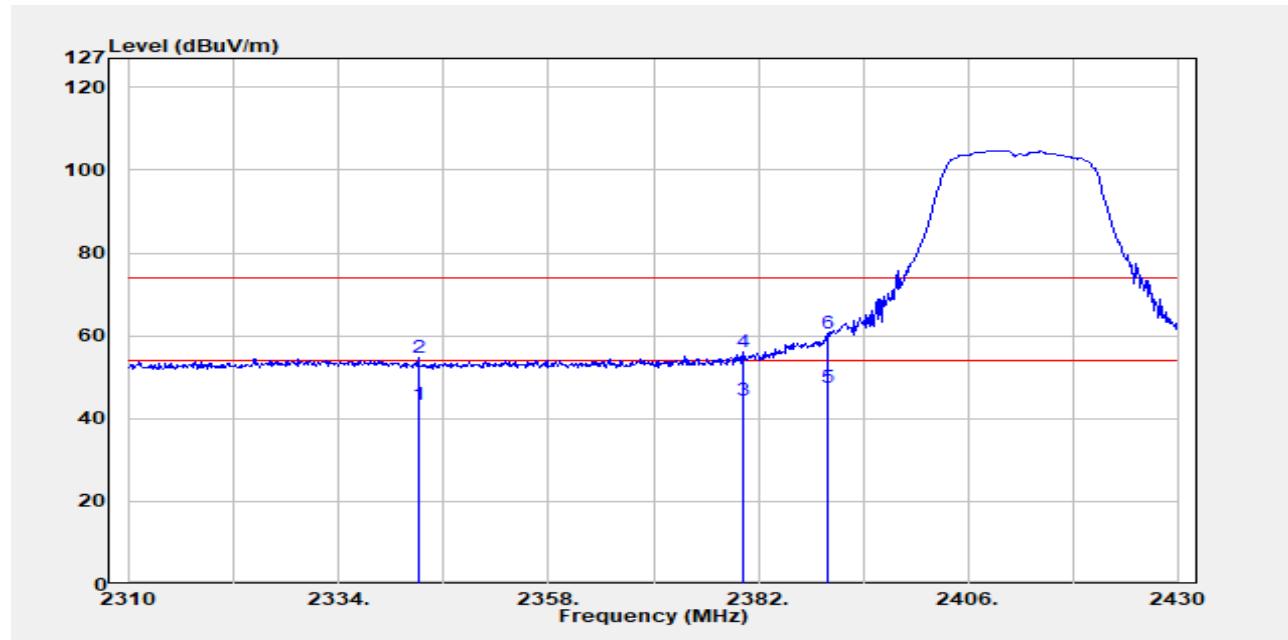
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Report Number :TERF2303000789ER  
 Operation Mode :802.11n20  
 Test Frequency :2412 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Vertical  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2343.120	Average	42.63	0.60	43.23	54.00	-10.77
2343.120	Peak	54.07	0.60	54.67	74.00	-19.33
2380.320	Average	43.91	0.61	44.52	54.00	-9.48
2380.320	Peak	55.46	0.61	56.07	74.00	-17.93
2390.000	Average	46.74	0.60	47.34	54.00	-6.66
2390.000	Peak	59.88	0.60	60.48	74.00	-13.52

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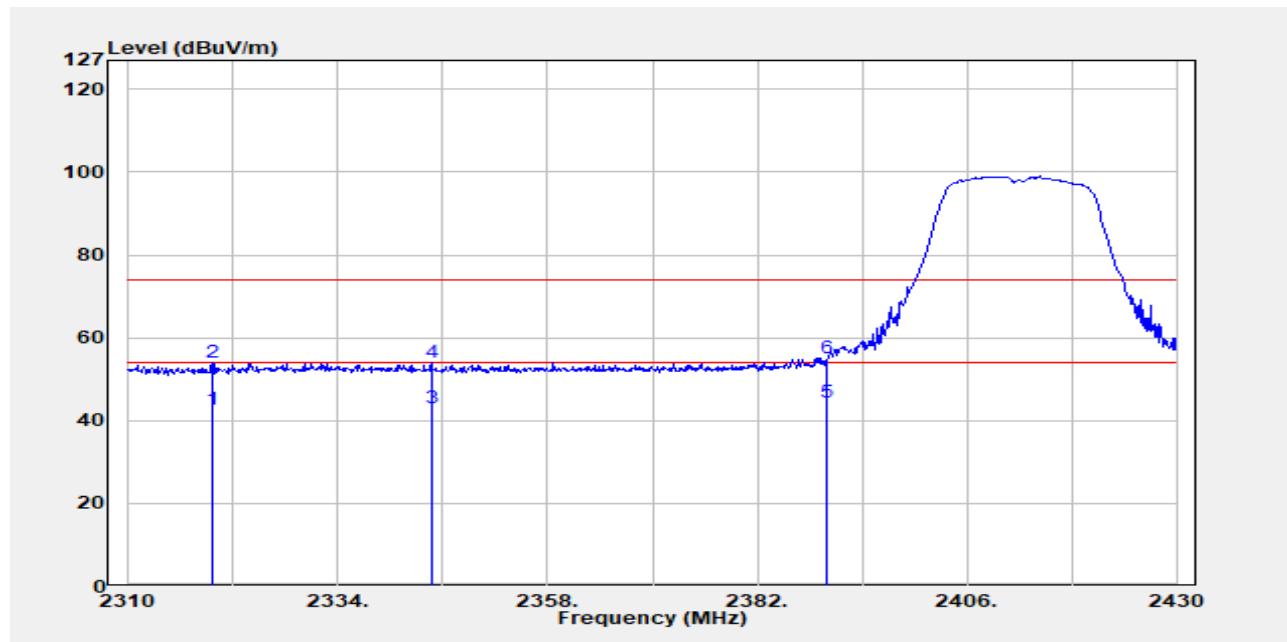
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Report Number :TERF2303000789ER  
 Operation Mode :802.11n20  
 Test Frequency :2412 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Horizontal  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual	Limit @3m	Margin dB
				FS dB $\mu$ V/m	dB $\mu$ V/m	
2319.600	Average	42.08	0.48	42.56	54.00	-11.44
2319.600	Peak	53.67	0.48	54.15	74.00	-19.85
2344.680	Average	42.25	0.60	42.86	54.00	-11.15
2344.680	Peak	53.49	0.60	54.09	74.00	-19.91
2390.000	Average	43.64	0.60	44.24	54.00	-9.76
2390.000	Peak	54.50	0.60	55.11	74.00	-18.89

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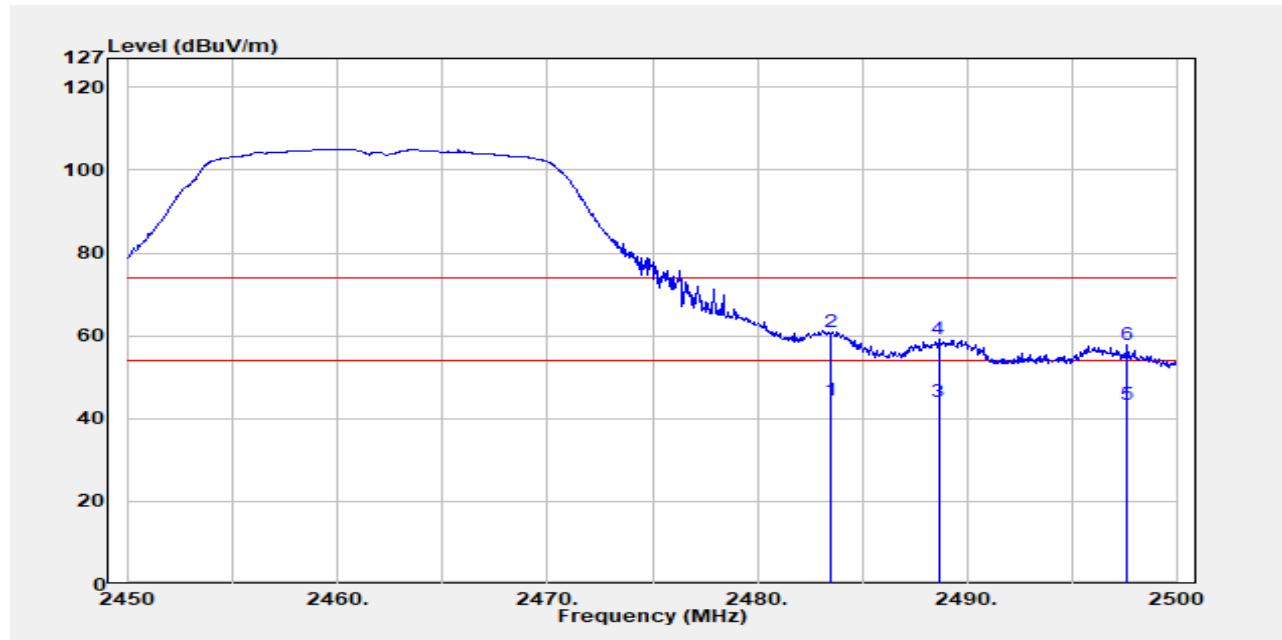
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Report Number :TERF2303000789ER  
 Operation Mode :802.11n20  
 Test Frequency :2462 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Vertical  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	44.06	0.21	44.27	54.00	-9.73
2483.500	Peak	60.79	0.21	61.00	74.00	-13.00
2488.650	Average	43.76	0.26	44.02	54.00	-9.98
2488.650	Peak	58.87	0.26	59.13	74.00	-14.87
2497.650	Average	43.13	0.34	43.47	54.00	-10.53
2497.650	Peak	57.33	0.34	57.67	74.00	-16.33

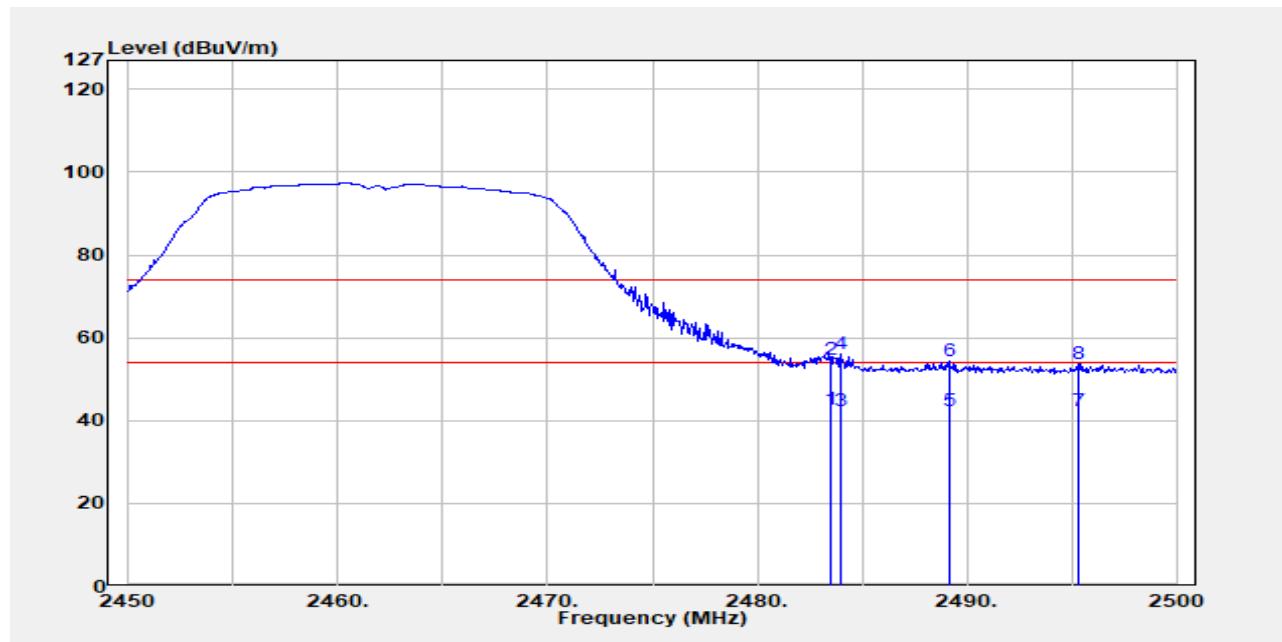
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Report Number :TERF2303000789ER  
 Operation Mode :802.11n20  
 Test Frequency :2462 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Horizontal  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	42.30	0.21	42.51	54.00	-11.49
2483.500	Peak	54.46	0.21	54.68	74.00	-19.32
2483.950	Average	42.26	0.22	42.48	54.00	-11.52
2483.950	Peak	55.82	0.22	56.04	74.00	-17.96
2489.150	Average	42.18	0.26	42.44	54.00	-11.56
2489.150	Peak	54.27	0.26	54.54	74.00	-19.46
2495.300	Average	42.08	0.32	42.40	54.00	-11.60
2495.300	Peak	53.42	0.32	53.74	74.00	-20.26

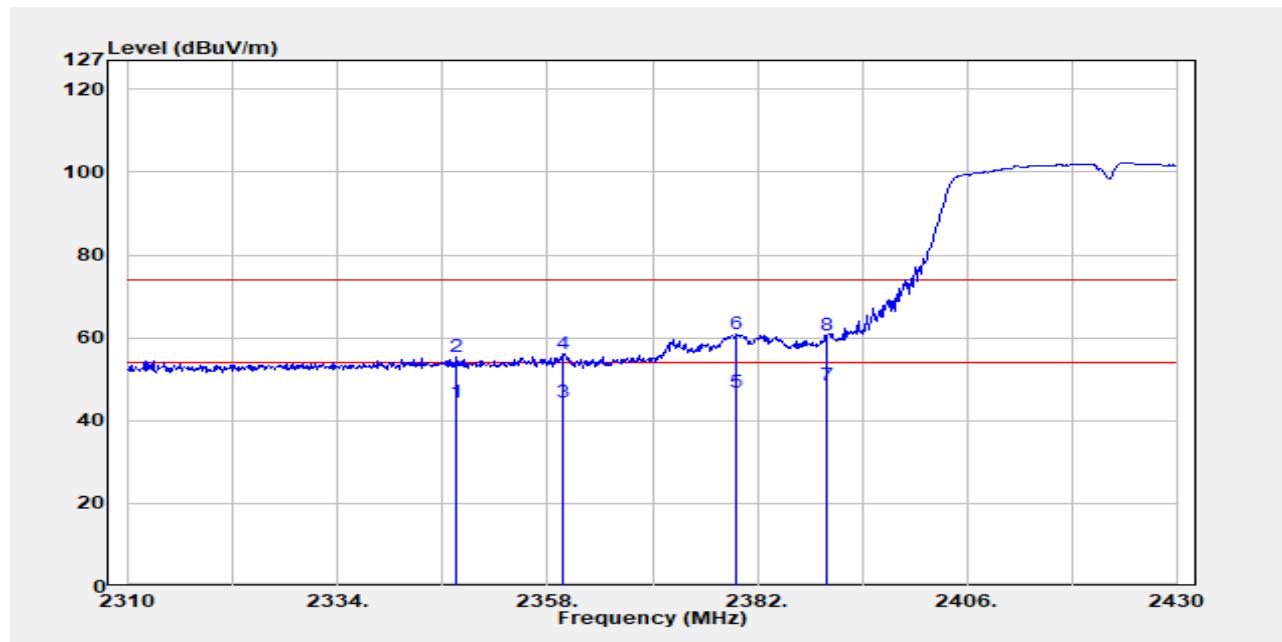
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Report Number :TERF2303000789ER  
 Operation Mode :802.11n40  
 Test Frequency :2422 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Vertical  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2347.560	Average	43.67	0.62	44.29	54.00	-9.71
2347.560	Peak	54.79	0.62	55.41	74.00	-18.59
2359.800	Average	43.70	0.62	44.32	54.00	-9.68
2359.800	Peak	55.53	0.62	56.15	74.00	-17.85
2379.600	Average	46.06	0.61	46.67	54.00	-7.33
2379.600	Peak	60.27	0.61	60.88	74.00	-13.12
2390.000	Average	47.95	0.60	48.55	54.00	-5.45
2390.000	Peak	59.92	0.60	60.52	74.00	-13.48

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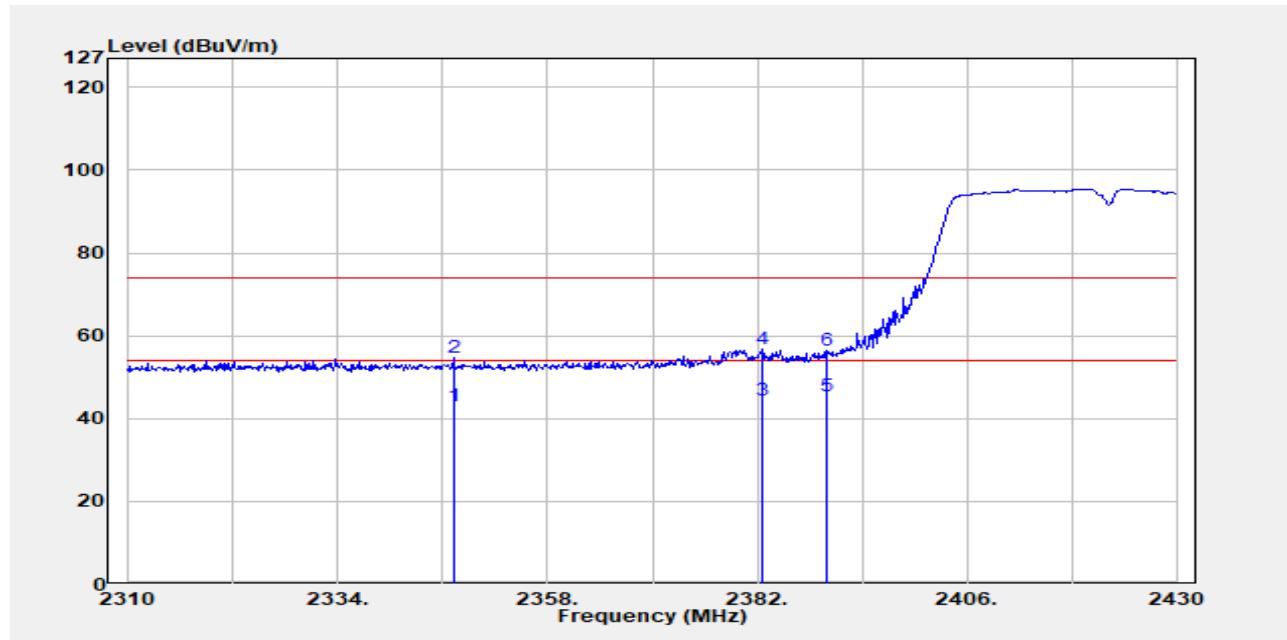
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Report Number	:TERF2303000789ER	Test Site	:SAC 1
Operation Mode	:802.11n40	Test Date	:2023-04-17
Test Frequency	:2422 MHz	Temp./Humi.	:23.6/64
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2347.200	Average	42.51	0.62	43.13	54.00	-10.87
2347.200	Peak	54.23	0.62	54.85	74.00	-19.15
2382.600	Average	43.78	0.61	44.39	54.00	-9.61
2382.600	Peak	56.05	0.61	56.66	74.00	-17.34
2390.000	Average	44.87	0.60	45.47	54.00	-8.53
2390.000	Peak	55.69	0.60	56.29	74.00	-17.71

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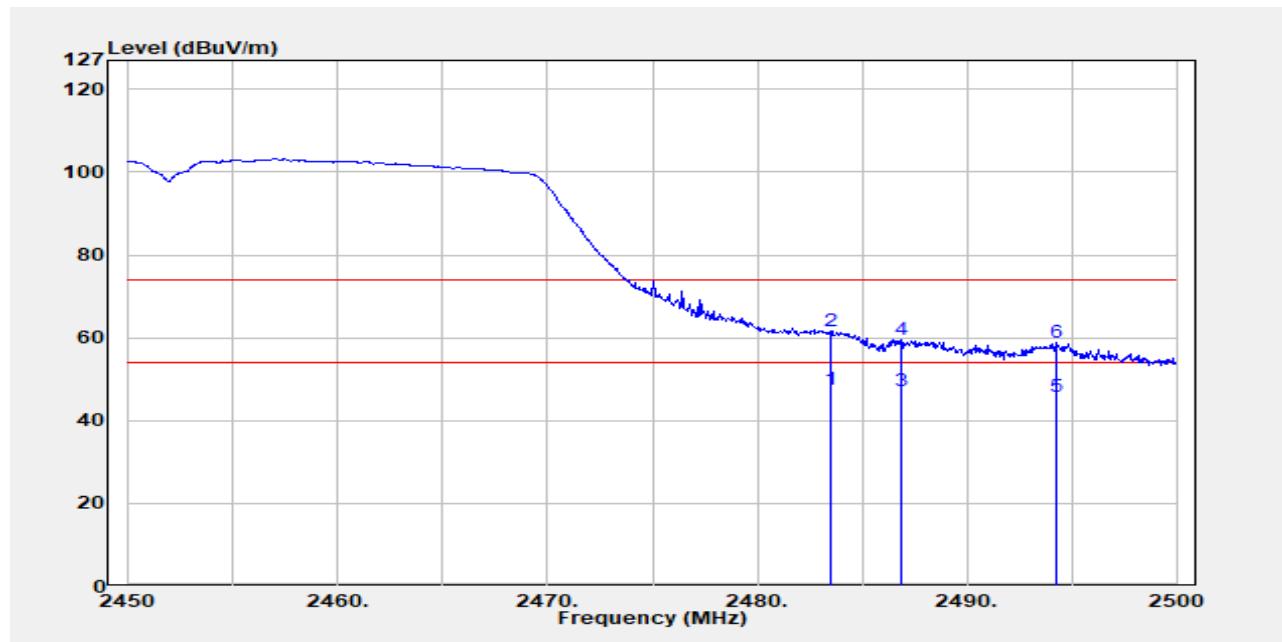
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Report Number :TERF2303000789ER  
 Operation Mode :802.11n40  
 Test Frequency :2452 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Vertical  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	47.13	0.21	47.34	54.00	-6.66
2483.500	Peak	61.36	0.21	61.57	74.00	-12.43
2486.900	Average	46.86	0.24	47.10	54.00	-6.90
2486.900	Peak	59.19	0.24	59.43	74.00	-14.57
2494.300	Average	45.63	0.31	45.94	54.00	-8.06
2494.300	Peak	58.58	0.31	58.90	74.00	-15.10

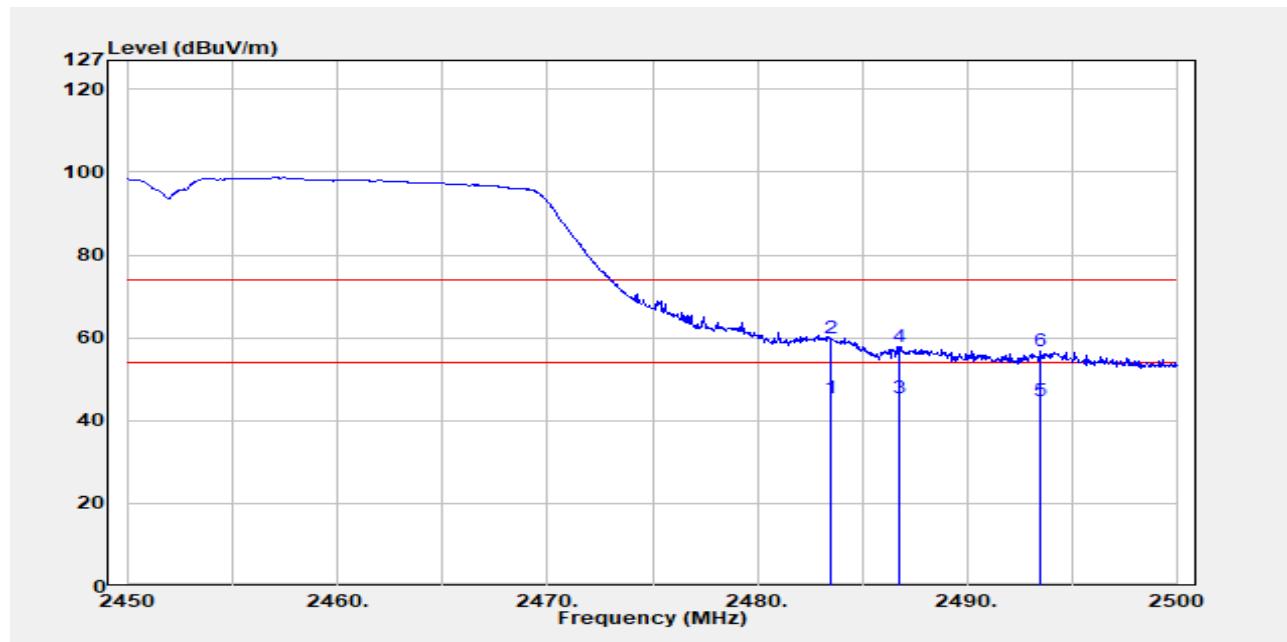
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Report Number :TERF2303000789ER  
 Operation Mode :802.11n40  
 Test Frequency :2452 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-17  
 Temp./Humi. :23.6/64  
 Antenna Pol. :Horizontal  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	45.32	0.21	45.53	54.00	-8.47
2483.500	Peak	59.64	0.21	59.86	74.00	-14.14
2486.750	Average	45.24	0.24	45.48	54.00	-8.52
2486.750	Peak	57.62	0.24	57.86	74.00	-16.14
2493.550	Average	44.56	0.30	44.86	54.00	-9.14
2493.550	Peak	56.43	0.30	56.73	74.00	-17.27

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台灣檢驗科技股份有限公司

t (886-2) 2299-3279

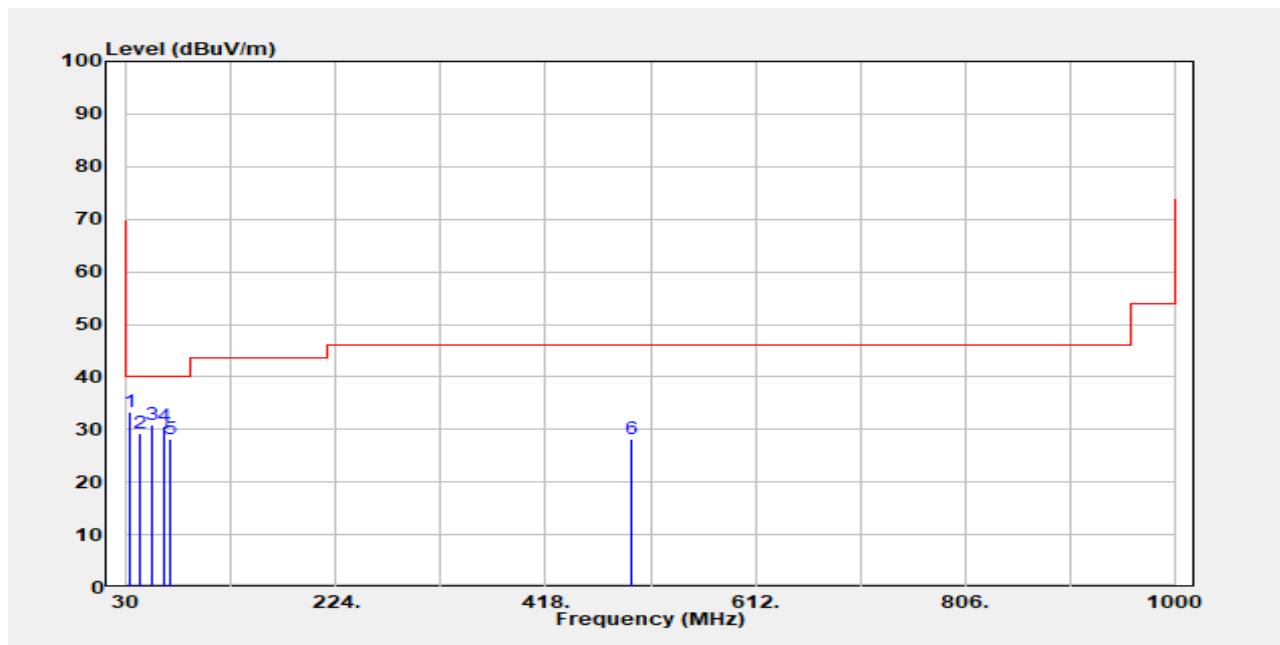
f (886-2) 2298-0488

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## 11.6.2 Spurious Emission:

Report Number	:TERF2303000789ER	Test Site	:SAC 1
Operation Mode	:802.11g	Test Date	:2023-04-20
Test Frequency	:2437 MHz	Temp./Humi.	:23.6/63
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:WJ Lin



Freq. MHz	Detector Mode	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual	Limit	Margin dB
				FS dB $\mu$ V/m	@3m dB $\mu$ V/m	
33.880	QP	40.90	-7.65	33.25	40.00	-6.75
42.610	Peak	41.69	-12.31	29.38	40.00	-10.62
53.280	Peak	47.88	-16.99	30.90	40.00	-9.10
63.950	Peak	48.89	-18.17	30.72	40.00	-9.28
69.770	Peak	46.32	-18.25	28.07	40.00	-11.93
496.570	Peak	33.21	-5.15	28.05	46.00	-17.95

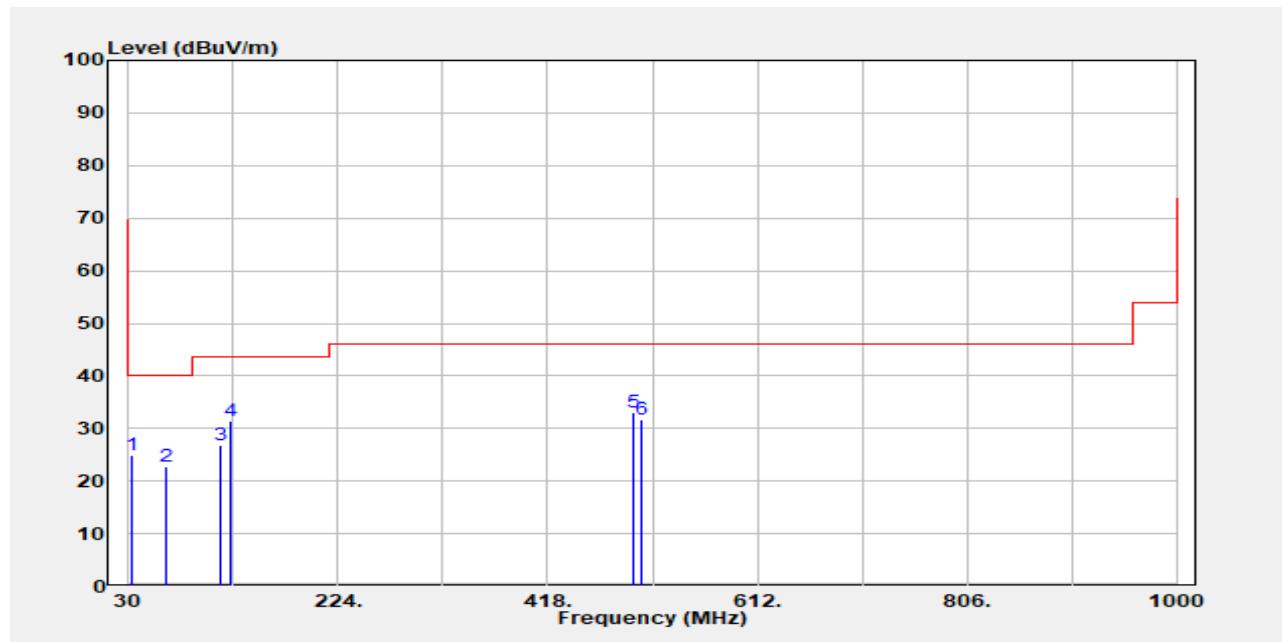
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Report Number :TERF2303000789ER  
 Operation Mode :802.11g  
 Test Frequency :2437 MHz  
 Test Mode :Tx  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-20  
 Temp./Humi. :23.6/63  
 Antenna Pol. :Horizontal  
 Engineer :WJ Lin

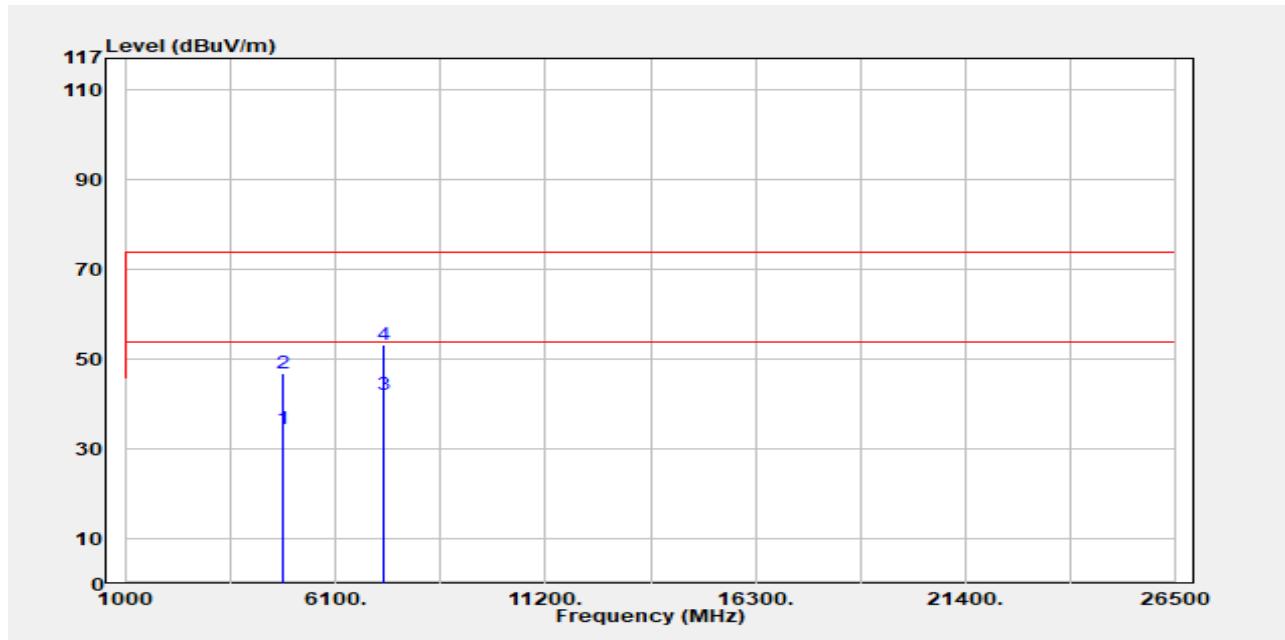


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual	Limit	Margin dB
				FS dB $\mu$ V/m	@3m dB $\mu$ V/m	
32.910	Peak	32.21	-7.24	24.98	40.00	-15.02
63.950	Peak	40.83	-18.17	22.67	40.00	-17.33
114.390	Peak	38.74	-11.85	26.89	43.50	-16.61
124.090	Peak	43.15	-11.76	31.38	43.50	-12.12
496.570	Peak	38.22	-5.15	33.06	46.00	-12.94
504.330	Peak	36.90	-5.17	31.73	46.00	-14.27

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Report Number :TERF2303000789ER Test Site :SAC 1  
Operation Mode :802.11b Test Date :2023-04-19  
Test Frequency :2412 MHz Temp./Humi. :23.6/63  
Test Mode :Tx Antenna Pol. :Vertical  
EUT Pol :H Plane Engineer :WJ Lin

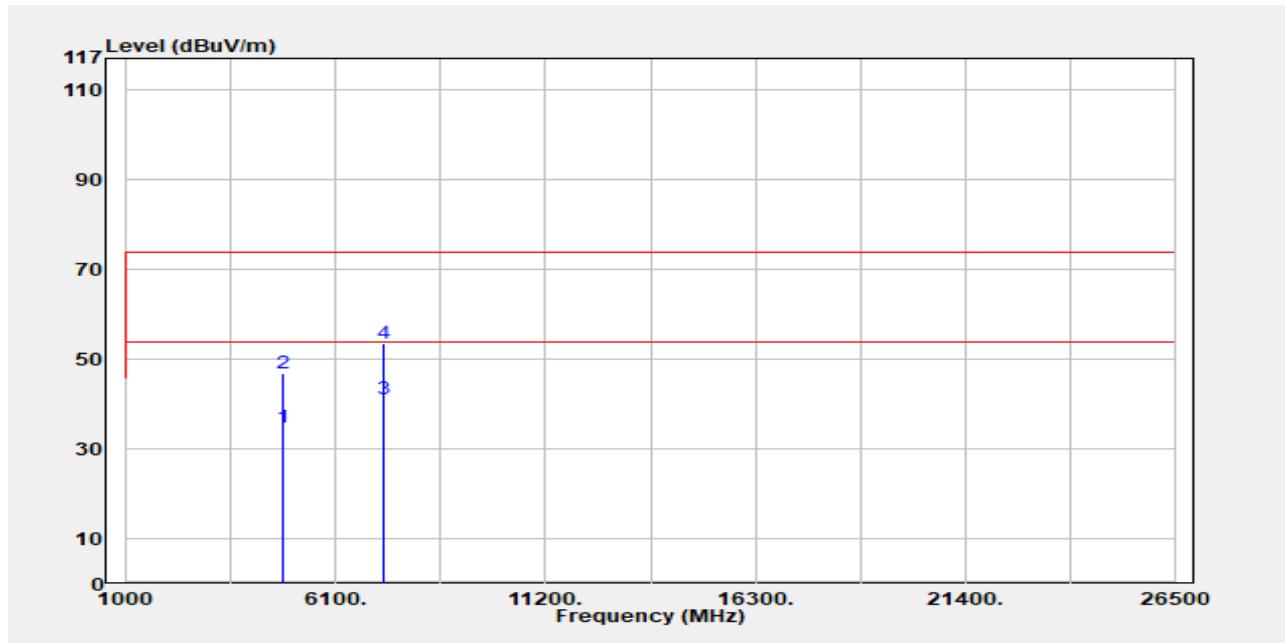


Freq. MHz	Detector Mode	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4824.000	Average	26.74	7.95	34.69	54.00	-19.31
4824.000	Peak	39.10	7.95	47.05	74.00	-26.95
7236.000	Average	26.96	15.18	42.14	54.00	-11.86
7236.000	Peak	37.97	15.18	53.15	74.00	-20.85

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Report Number :TERF2303000789ER Test Site :SAC 1  
Operation Mode :802.11b Test Date :2023-04-19  
Test Frequency :2412 MHz Temp./Humi. :23.6/63  
Test Mode :Tx Antenna Pol. :Horizontal  
EUT Pol :H Plane Engineer :WJ Lin

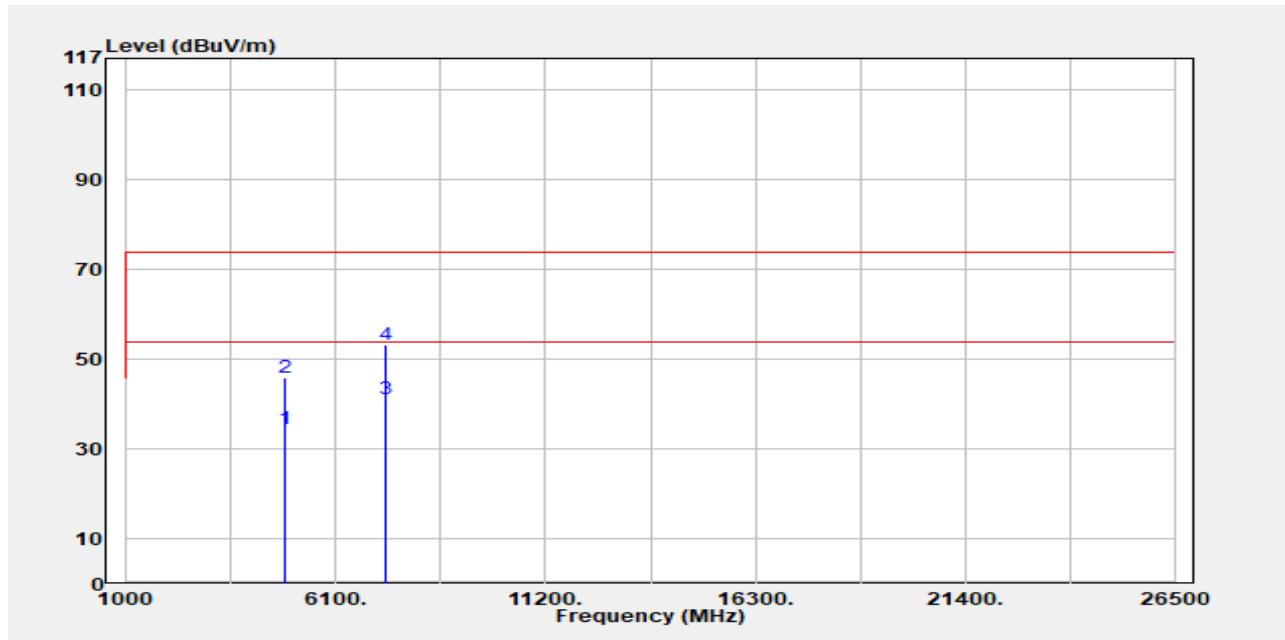


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4824.000	Average	26.89	7.95	34.84	54.00	-19.16
4824.000	Peak	38.94	7.95	46.89	74.00	-27.11
7236.000	Average	26.03	15.18	41.21	54.00	-12.79
7236.000	Peak	38.41	15.18	53.59	74.00	-20.41

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Report Number :TERF2303000789ER Test Site :SAC 1  
Operation Mode :802.11b Test Date :2023-04-19  
Test Frequency :2437 MHz Temp./Humi. :23.6/63  
Test Mode :Tx Antenna Pol. :Vertical  
EUT Pol :H Plane Engineer :WJ Lin



Freq. MHz	Detector Mode	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4874.000	Average	26.78	7.76	34.54	54.00	-19.46
4874.000	Peak	38.30	7.76	46.06	74.00	-27.94
7311.000	Average	26.12	15.23	41.35	54.00	-12.65
7311.000	Peak	38.02	15.23	53.25	74.00	-20.75

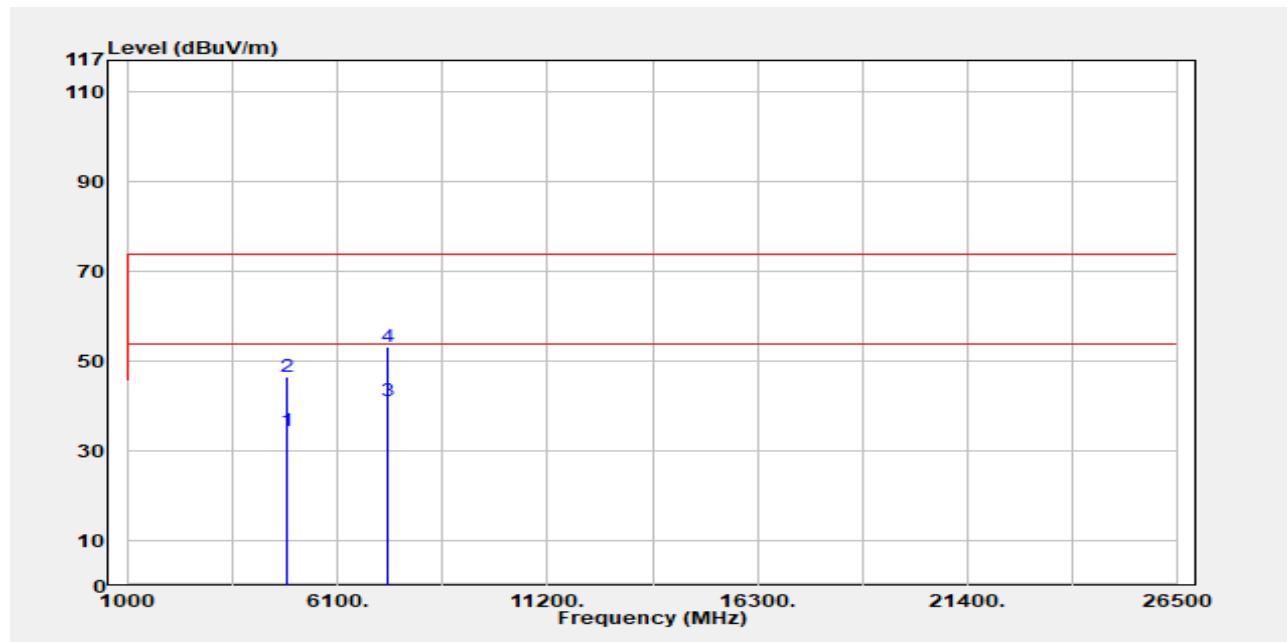
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Report Number :TERF2303000789ER  
Operation Mode :802.11b  
Test Frequency :2437 MHz  
Test Mode :Tx  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Horizontal  
Engineer :WJ Lin



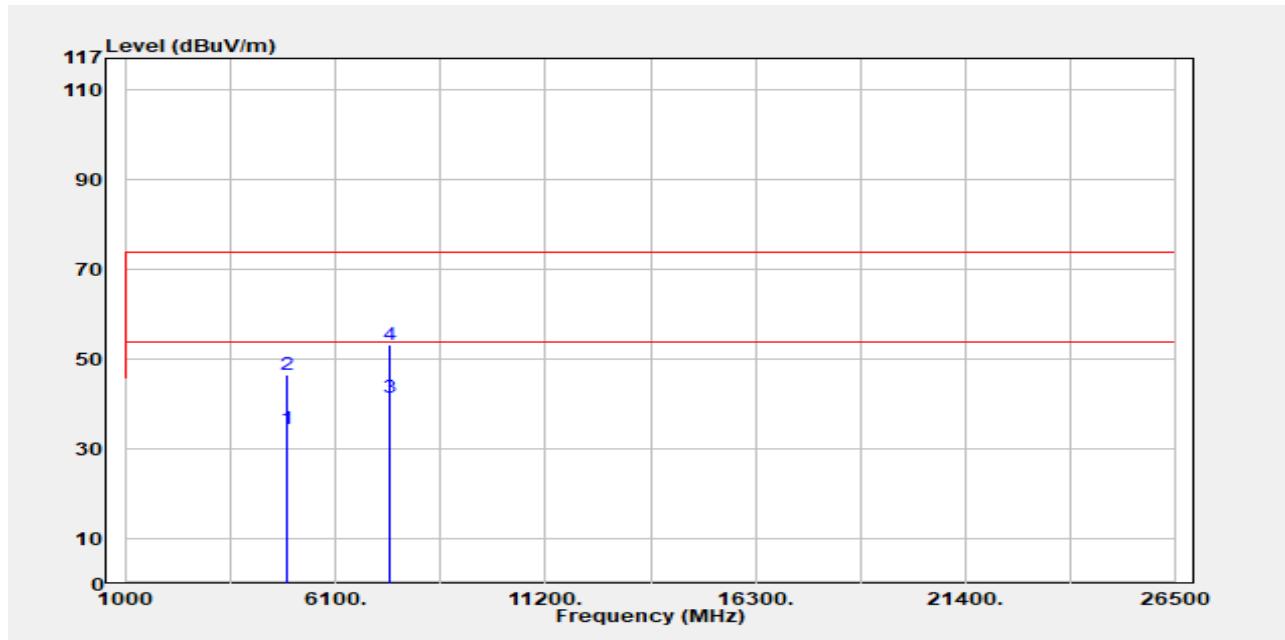
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4874.000	Average	26.78	7.76	34.54	54.00	-19.46
4874.000	Peak	38.98	7.76	46.74	74.00	-27.26
7311.000	Average	25.86	15.23	41.09	54.00	-12.91
7311.000	Peak	38.00	15.23	53.23	74.00	-20.77

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Report Number :TERF2303000789ER  
Operation Mode :802.11b  
Test Frequency :2462 MHz  
Test Mode :Tx  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Vertical  
Engineer :WJ Lin

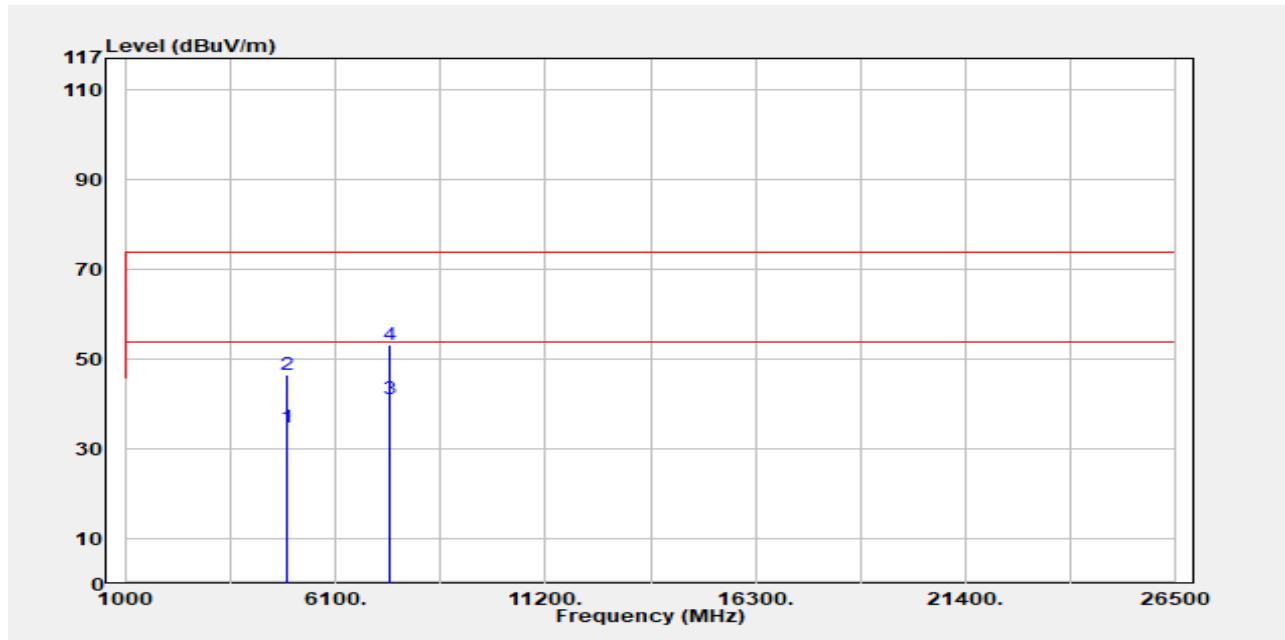


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4924.000	Average	26.84	7.83	34.67	54.00	-19.33
4924.000	Peak	38.80	7.83	46.63	74.00	-27.37
7386.000	Average	26.25	15.33	41.58	54.00	-12.42
7386.000	Peak	37.88	15.33	53.21	74.00	-20.79

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Report Number :TERF2303000789ER Test Site :SAC 1  
Operation Mode :802.11b Test Date :2023-04-19  
Test Frequency :2462 MHz Temp./Humi. :23.6/63  
Test Mode :Tx Antenna Pol. :Horizontal  
EUT Pol :H Plane Engineer :WJ Lin



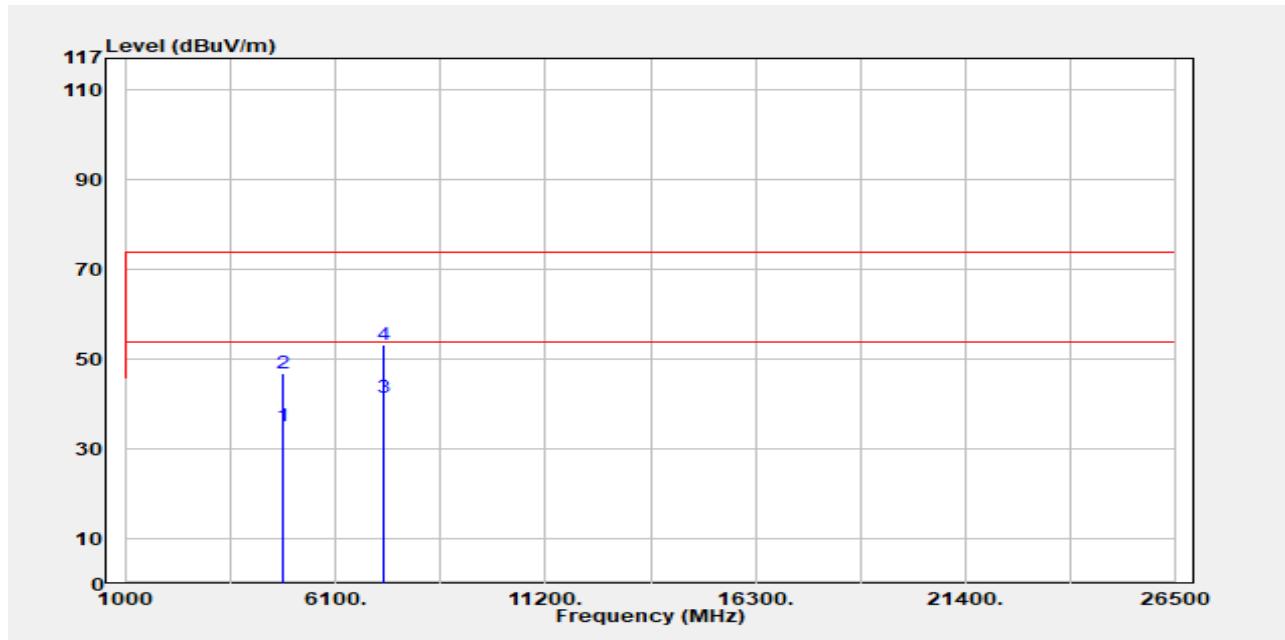
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4924.000	Average	26.89	7.83	34.72	54.00	-19.28
4924.000	Peak	38.86	7.83	46.69	74.00	-27.31
7386.000	Average	25.88	15.33	41.21	54.00	-12.79
7386.000	Peak	37.87	15.33	53.20	74.00	-20.80

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Report Number :TERF2303000789ER Test Site :SAC 1  
Operation Mode :802.11g Test Date :2023-04-19  
Test Frequency :2412 MHz Temp./Humi. :23.6/63  
Test Mode :Tx Antenna Pol. :Vertical  
EUT Pol :H Plane Engineer :WJ Lin



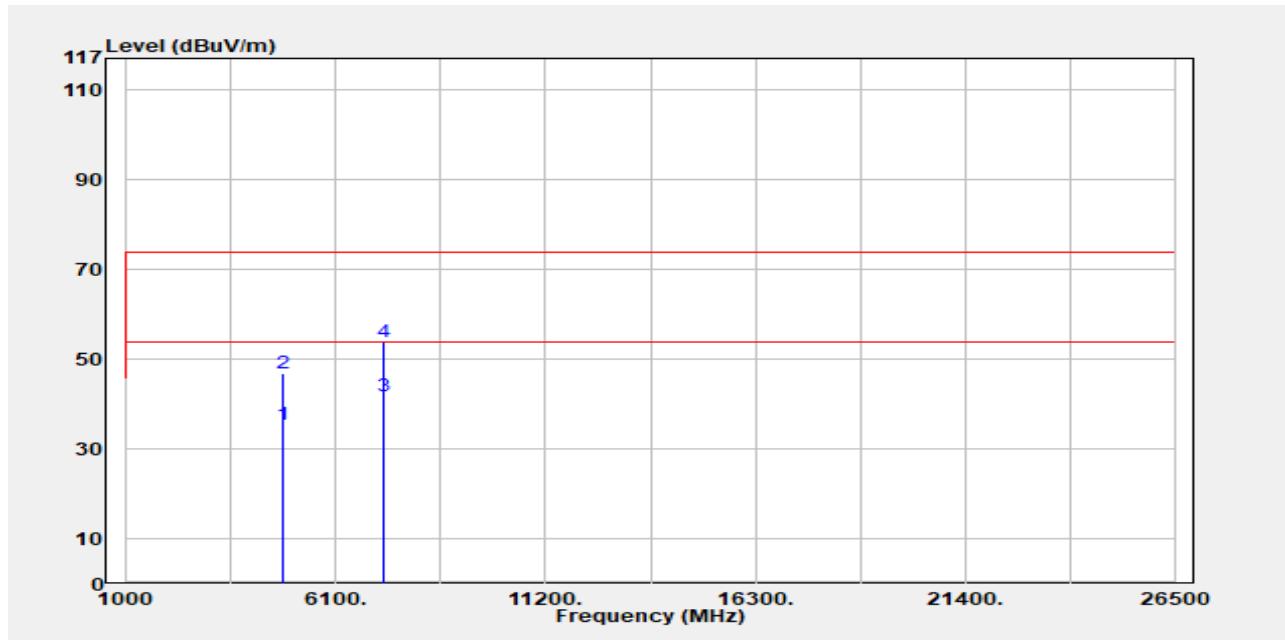
Freq. MHz	Detector Mode	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4824.000	Average	27.24	7.95	35.19	54.00	-18.81
4824.000	Peak	39.00	7.95	46.95	74.00	-27.05
7236.000	Average	26.39	15.18	41.57	54.00	-12.43
7236.000	Peak	37.97	15.18	53.15	74.00	-20.85

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Report Number :TERF2303000789ER Test Site :SAC 1  
Operation Mode :802.11g Test Date :2023-04-19  
Test Frequency :2412 MHz Temp./Humi. :23.6/63  
Test Mode :Tx Antenna Pol. :Horizontal  
EUT Pol :H Plane Engineer :WJ Lin

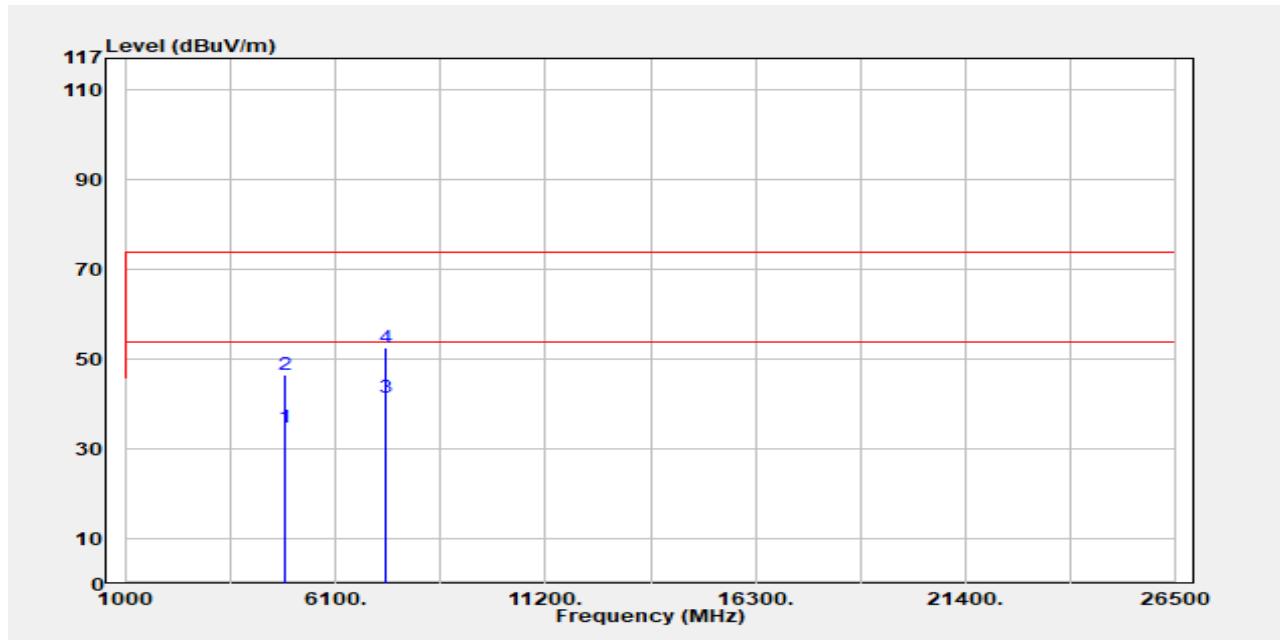


Freq. MHz	Detector Mode	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4824.000	Average	27.44	7.95	35.39	54.00	-18.61
4824.000	Peak	38.88	7.95	46.83	74.00	-27.17
7236.000	Average	26.52	15.18	41.70	54.00	-12.30
7236.000	Peak	38.78	15.18	53.96	74.00	-20.04

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Report Number :TERF2303000789ER  
Operation Mode :802.11g  
Test Frequency :2437 MHz  
Test Mode :Tx  
EUT Pol :H Plane  
Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Vertical  
Engineer :WJ Lin

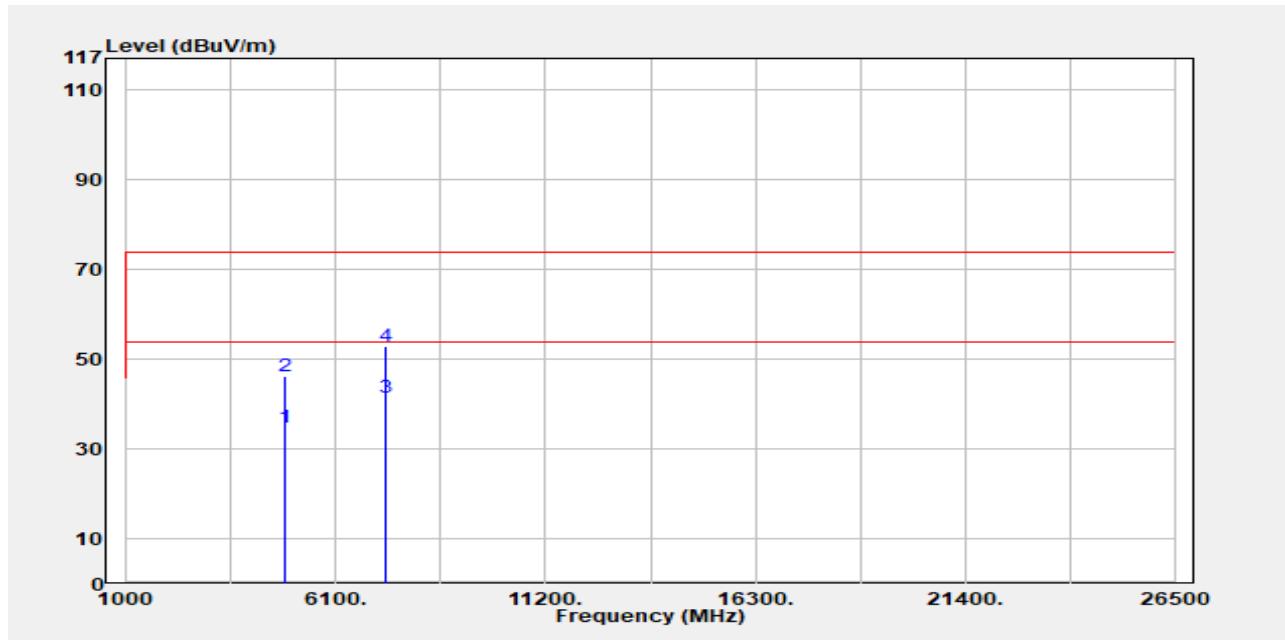


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4874.000	Average	26.98	7.76	34.74	54.00	-19.26
4874.000	Peak	38.98	7.76	46.74	74.00	-27.26
7311.000	Average	26.36	15.23	41.59	54.00	-12.41
7311.000	Peak	37.27	15.23	52.50	74.00	-21.50

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Report Number :TERF2303000789ER Test Site :SAC 1  
Operation Mode :802.11g Test Date :2023-04-19  
Test Frequency :2437 MHz Temp./Humi. :23.6/63  
Test Mode :Tx Antenna Pol. :Horizontal  
EUT Pol :H Plane Engineer :WJ Lin



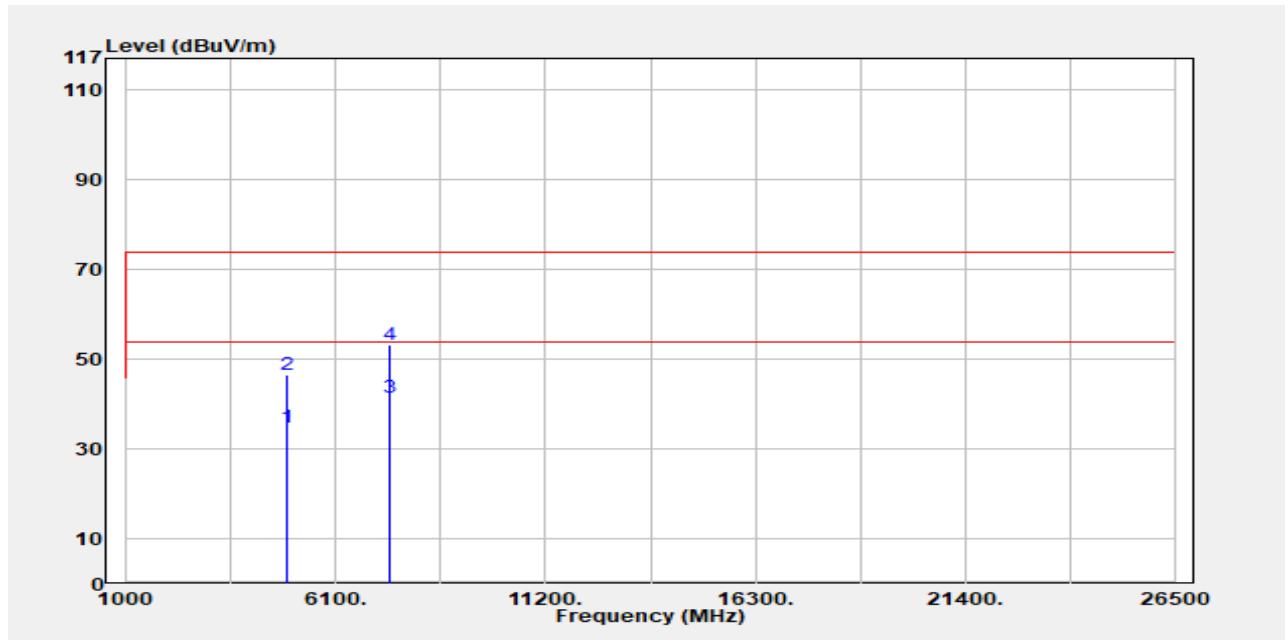
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4874.000	Average	27.11	7.76	34.87	54.00	-19.13
4874.000	Peak	38.57	7.76	46.33	74.00	-27.67
7311.000	Average	26.31	15.23	41.54	54.00	-12.46
7311.000	Peak	37.88	15.23	53.11	74.00	-20.89

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Report Number :TERF2303000789ER Test Site :SAC 1  
Operation Mode :802.11g Test Date :2023-04-19  
Test Frequency :2462 MHz Temp./Humi. :23.6/63  
Test Mode :Tx Antenna Pol. :Vertical  
EUT Pol :H Plane Engineer :WJ Lin



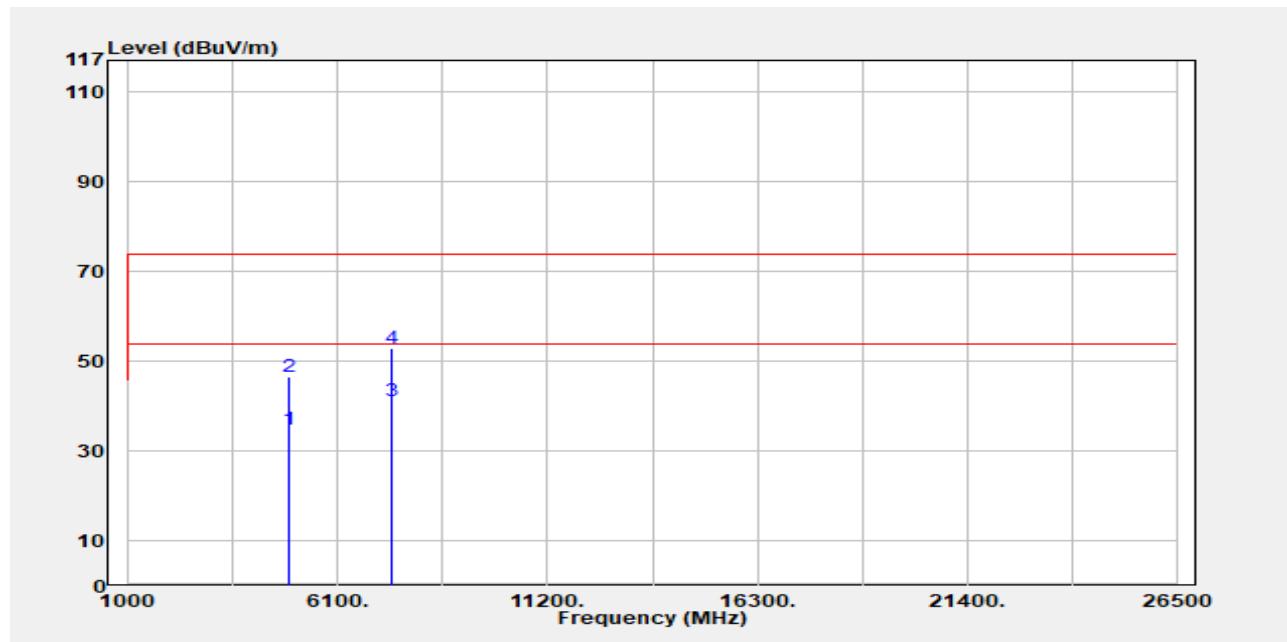
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4924.000	Average	27.08	7.83	34.91	54.00	-19.09
4924.000	Peak	38.79	7.83	46.62	74.00	-27.38
7386.000	Average	26.15	15.33	41.48	54.00	-12.52
7386.000	Peak	38.07	15.33	53.40	74.00	-20.60

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Report Number :TERF2303000789ER  
Operation Mode :802.11g  
Test Frequency :2462 MHz  
Test Mode :Tx  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Horizontal  
Engineer :WJ Lin



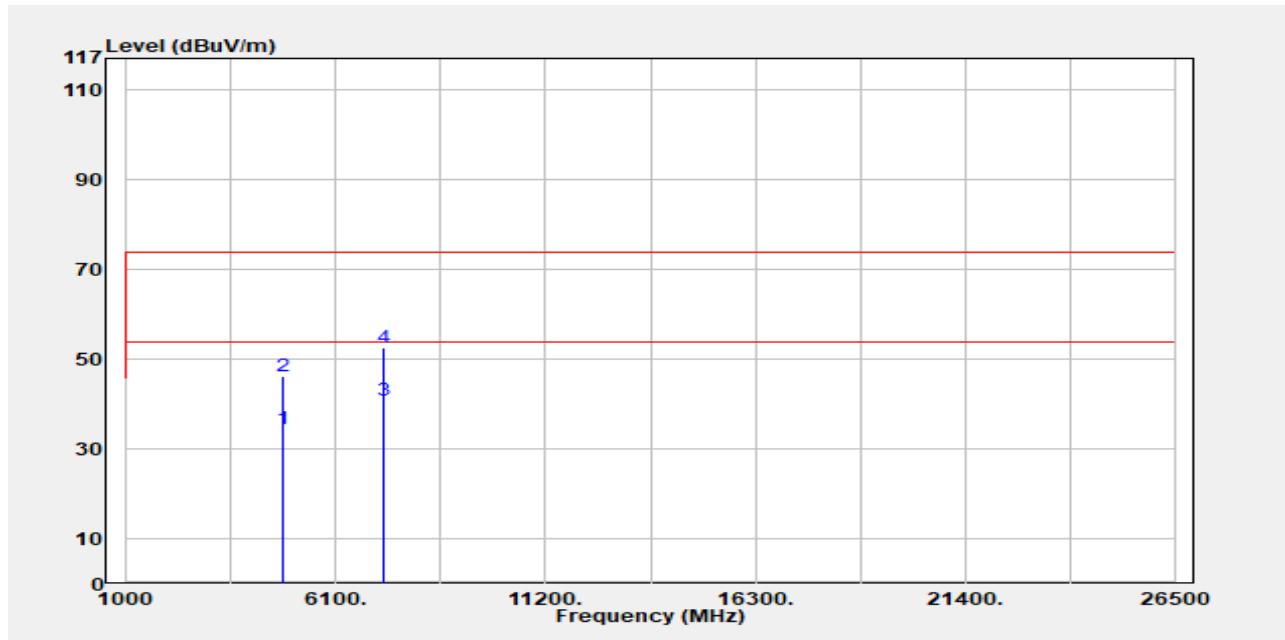
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4924.000	Average	27.16	7.83	34.99	54.00	-19.01
4924.000	Peak	38.72	7.83	46.55	74.00	-27.45
7386.000	Average	26.02	15.33	41.35	54.00	-12.65
7386.000	Peak	37.65	15.33	52.98	74.00	-21.02

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Report Number :TERF2303000789ER  
 Operation Mode :802.11n20  
 Test Frequency :2412 MHz  
 Test Mode :Tx  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-19  
 Temp./Humi. :23.6/63  
 Antenna Pol. :Vertical  
 Engineer :WJ Lin



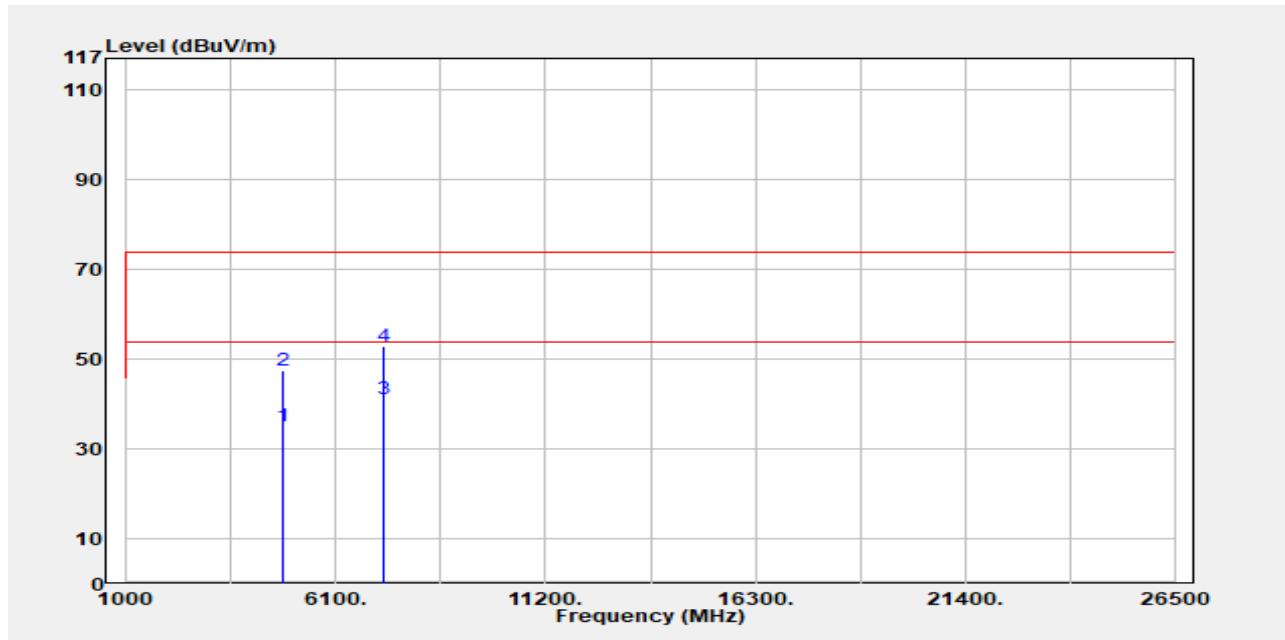
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual	Limit @3m	Margin
				FS dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.000	Average	26.52	7.95	34.47	54.00	-19.53
4824.000	Peak	38.31	7.95	46.26	74.00	-27.74
7236.000	Average	25.64	15.18	40.82	54.00	-13.18
7236.000	Peak	37.48	15.18	52.66	74.00	-21.34

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Report Number :TERF2303000789ER  
Operation Mode :802.11n20  
Test Frequency :2412 MHz  
Test Mode :Tx  
EUT Pol :H Plane  
Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Horizontal  
Engineer :WJ Lin



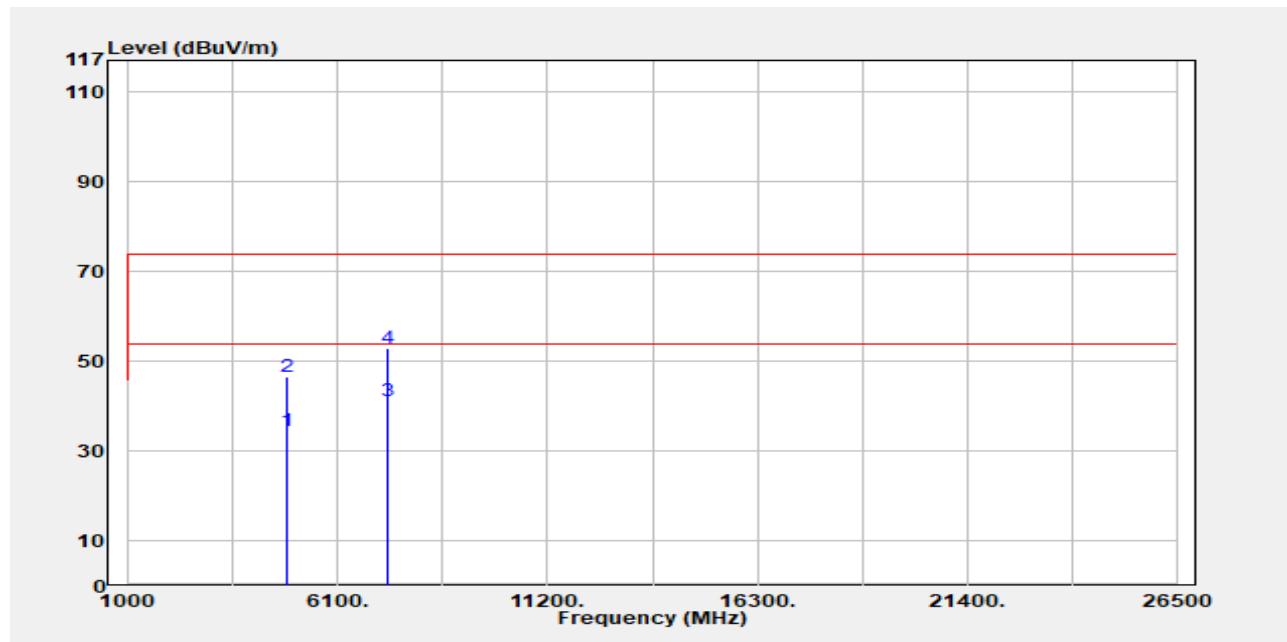
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4824.000	Average	27.10	7.95	35.05	54.00	-18.95
4824.000	Peak	39.48	7.95	47.43	74.00	-26.57
7236.000	Average	26.18	15.18	41.36	54.00	-12.64
7236.000	Peak	37.63	15.18	52.81	74.00	-21.19

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Report Number :TERF2303000789ER  
Operation Mode :802.11n20  
Test Frequency :2437 MHz  
Test Mode :Tx  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Vertical  
Engineer :WJ Lin

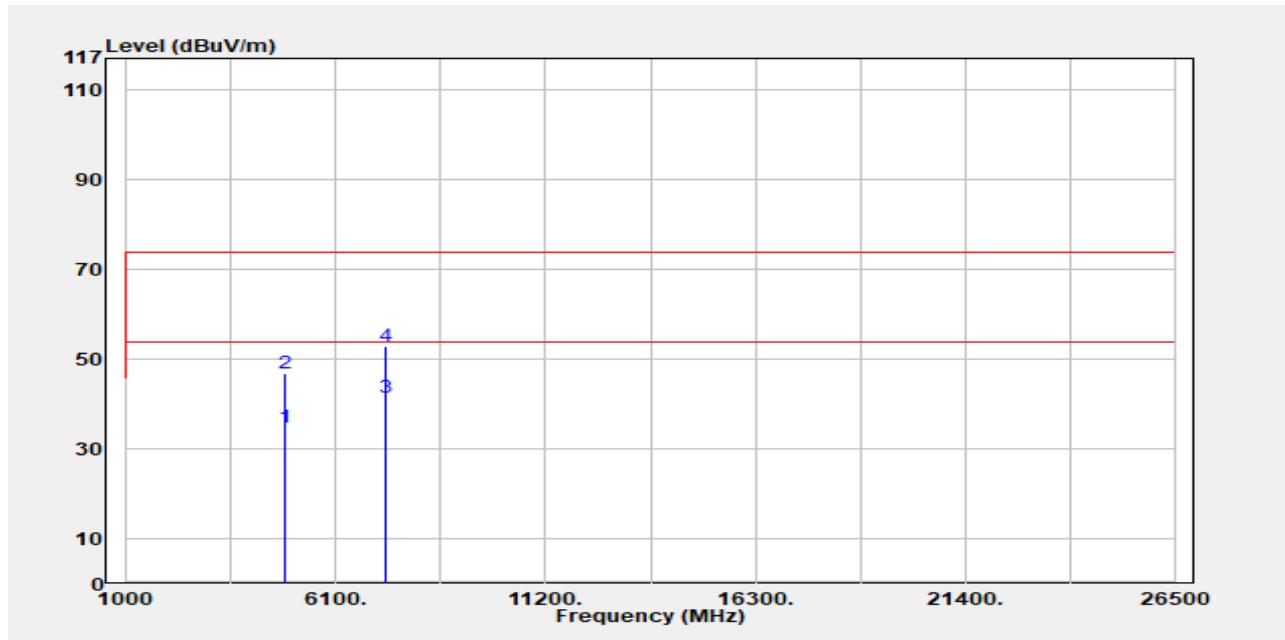


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4874.000	Average	26.94	7.76	34.70	54.00	-19.30
4874.000	Peak	38.94	7.76	46.70	74.00	-27.30
7311.000	Average	26.02	15.23	41.25	54.00	-12.75
7311.000	Peak	37.88	15.23	53.11	74.00	-20.89

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Report Number :TERF2303000789ER  
Operation Mode :802.11n20  
Test Frequency :2437 MHz  
Test Mode :Tx  
EUT Pol :H Plane  
Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Horizontal  
Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4874.000	Average	27.12	7.76	34.88	54.00	-19.12
4874.000	Peak	39.21	7.76	46.97	74.00	-27.03
7311.000	Average	26.16	15.23	41.39	54.00	-12.61
7311.000	Peak	37.75	15.23	52.98	74.00	-21.02

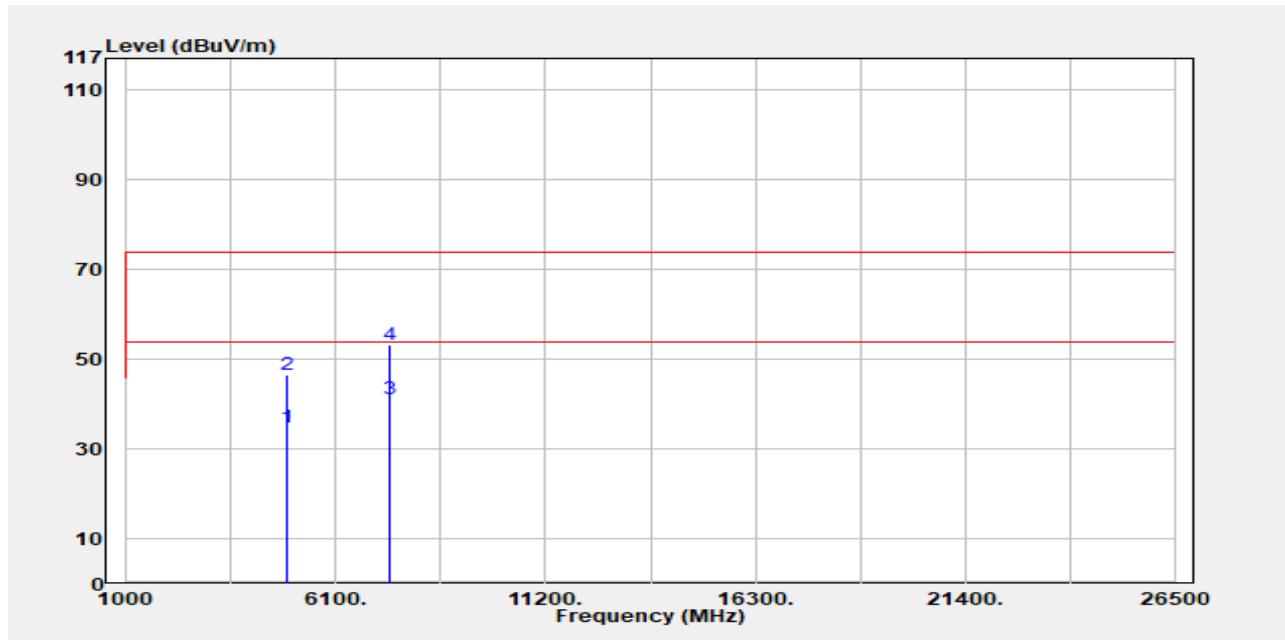
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Report Number :TERF2303000789ER  
 Operation Mode :802.11n20  
 Test Frequency :2462 MHz  
 Test Mode :Tx  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-19  
 Temp./Humi. :23.6/63  
 Antenna Pol. :Vertical  
 Engineer :WJ Lin



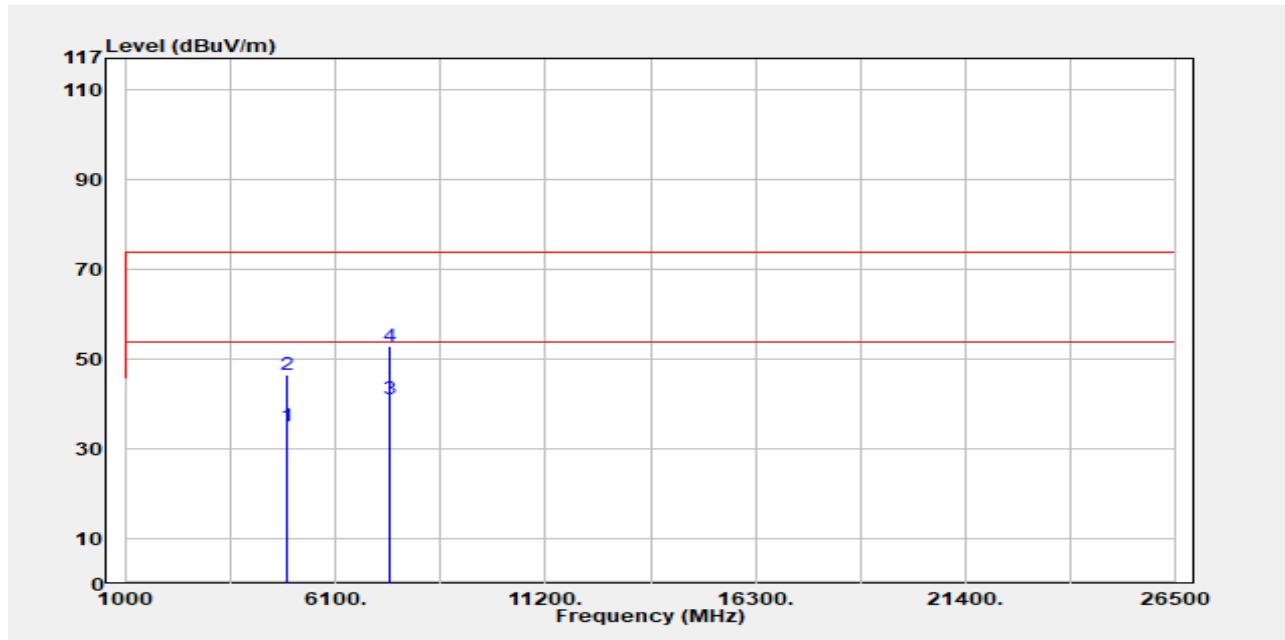
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4924.000	Average	27.05	7.83	34.88	54.00	-19.12
4924.000	Peak	38.71	7.83	46.54	74.00	-27.46
7386.000	Average	25.93	15.33	41.26	54.00	-12.74
7386.000	Peak	37.82	15.33	53.15	74.00	-20.85

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Report Number :TERF2303000789ER  
Operation Mode :802.11n20  
Test Frequency :2462 MHz  
Test Mode :Tx  
EUT Pol :H Plane  
Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Horizontal  
Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4924.000	Average	27.28	7.83	35.11	54.00	-18.89
4924.000	Peak	38.68	7.83	46.51	74.00	-27.49
7386.000	Average	25.92	15.33	41.25	54.00	-12.75
7386.000	Peak	37.76	15.33	53.09	74.00	-20.91

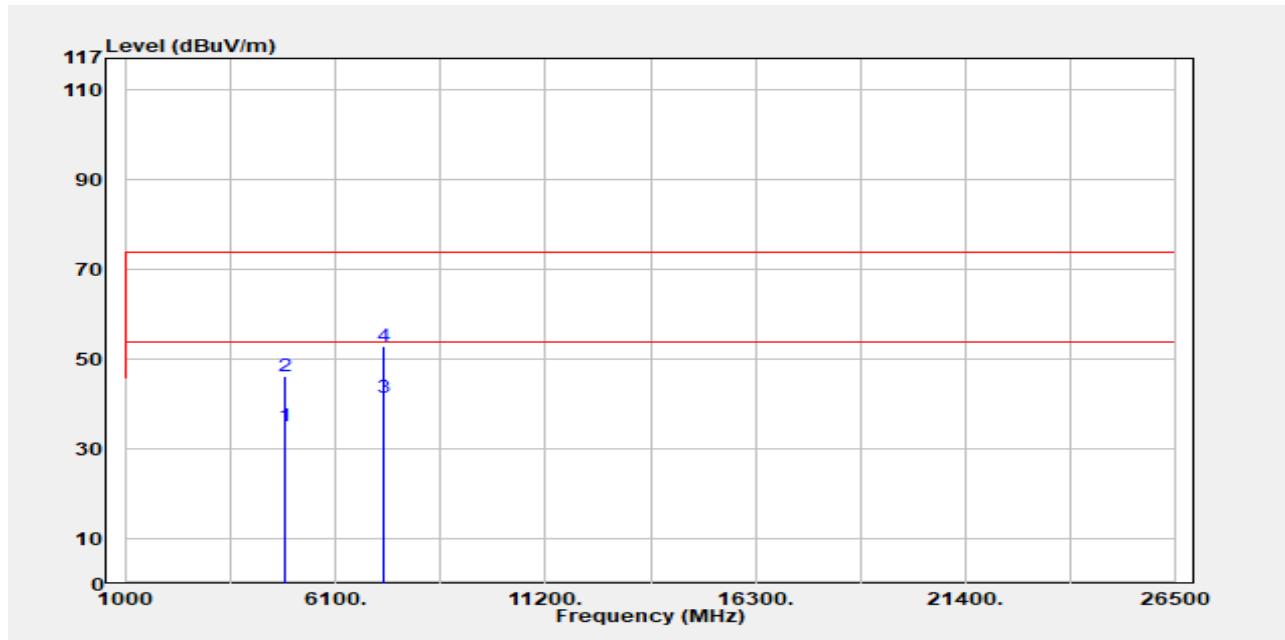
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Report Number :TERF2303000789ER  
 Operation Mode :802.11n40  
 Test Frequency :2422 MHz  
 Test Mode :Tx  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-19  
 Temp./Humi. :23.6/63  
 Antenna Pol. :Vertical  
 Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
					Margin dB	
4844.000	Average	27.03	8.03	35.06	54.00	-18.94
4844.000	Peak	38.35	8.03	46.38	74.00	-27.62
7266.000	Average	26.36	15.07	41.43	54.00	-12.57
7266.000	Peak	38.00	15.07	53.07	74.00	-20.93

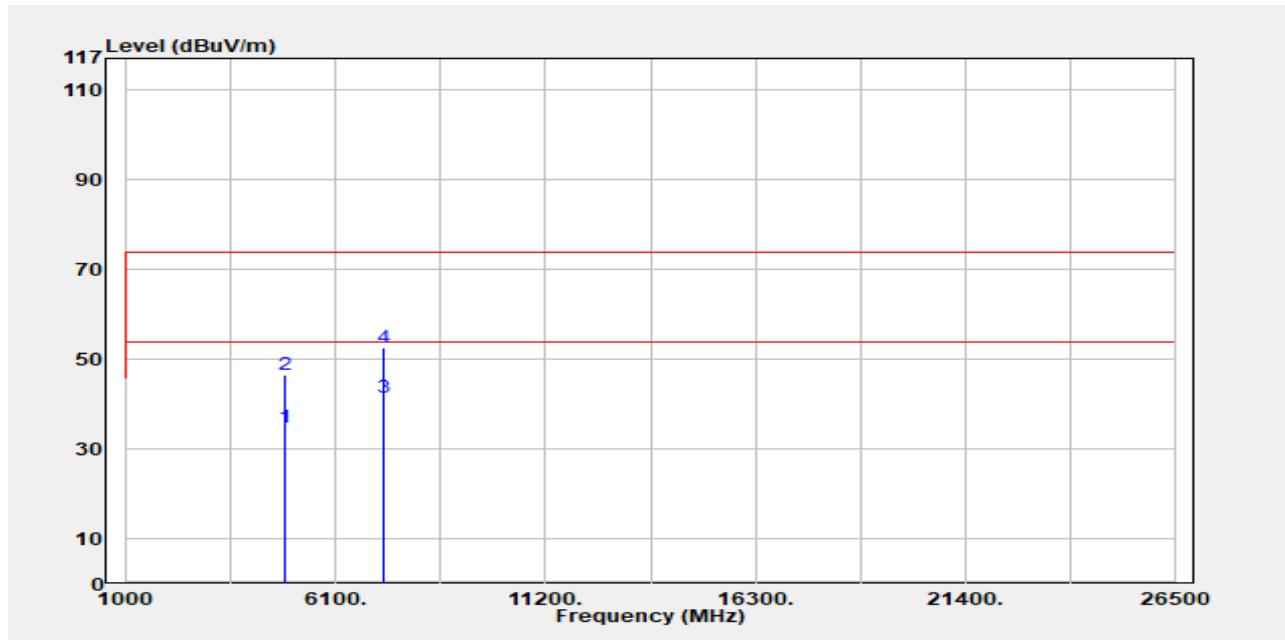
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Report Number :TERF2303000789ER  
 Operation Mode :802.11n40  
 Test Frequency :2422 MHz  
 Test Mode :Tx  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2023-04-19  
 Temp./Humi. :23.6/63  
 Antenna Pol. :Horizontal  
 Engineer :WJ Lin

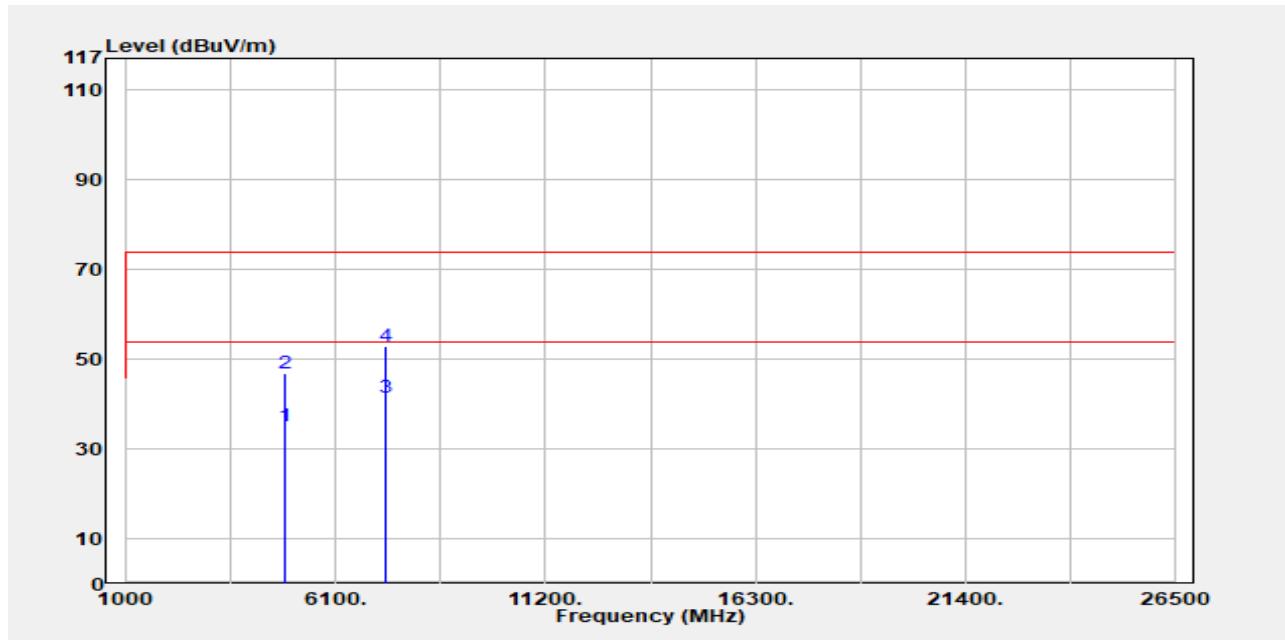


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4844.000	Average	26.99	8.03	35.02	54.00	-18.98
4844.000	Peak	38.48	8.03	46.51	74.00	-27.49
7266.000	Average	26.32	15.07	41.39	54.00	-12.61
7266.000	Peak	37.52	15.07	52.59	74.00	-21.41

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Report Number :TERF2303000789ER  
Operation Mode :802.11n40  
Test Frequency :2437 MHz  
Test Mode :Tx  
EUT Pol :H Plane  
Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Vertical  
Engineer :WJ Lin

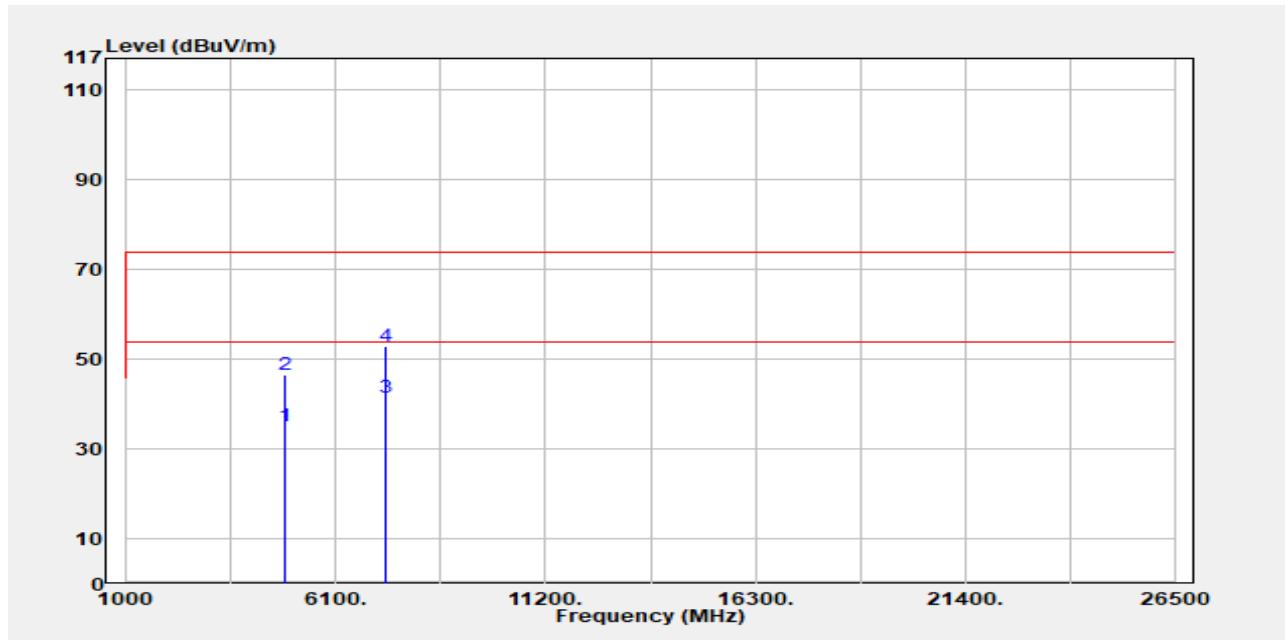


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4874.000	Average	27.42	7.76	35.18	54.00	-18.82
4874.000	Peak	39.12	7.76	46.88	74.00	-27.12
7311.000	Average	26.44	15.23	41.67	54.00	-12.33
7311.000	Peak	37.80	15.23	53.03	74.00	-20.97

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Operation Mode :802.11n40  
Test Frequency :2437 MHz  
Test Mode :Tx  
EUT Pol :H Plane  
Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Horizontal  
Engineer :WJ Lin



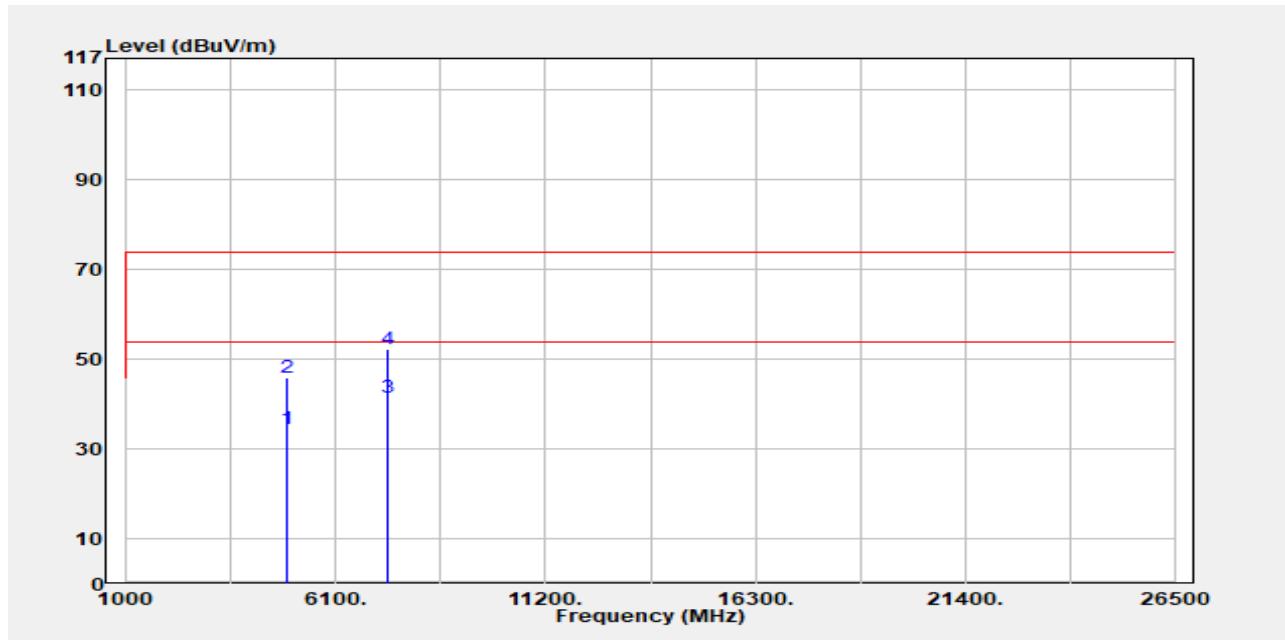
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4874.000	Average	27.48	7.76	35.24	54.00	-18.76
4874.000	Peak	38.96	7.76	46.72	74.00	-27.28
7311.000	Average	26.43	15.23	41.66	54.00	-12.34
7311.000	Peak	37.86	15.23	53.09	74.00	-20.91

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Report Number :TERF2303000789ER  
Operation Mode :802.11n40  
Test Frequency :2452 MHz  
Test Mode :Tx  
EUT Pol :H Plane  
Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Vertical  
Engineer :WJ Lin



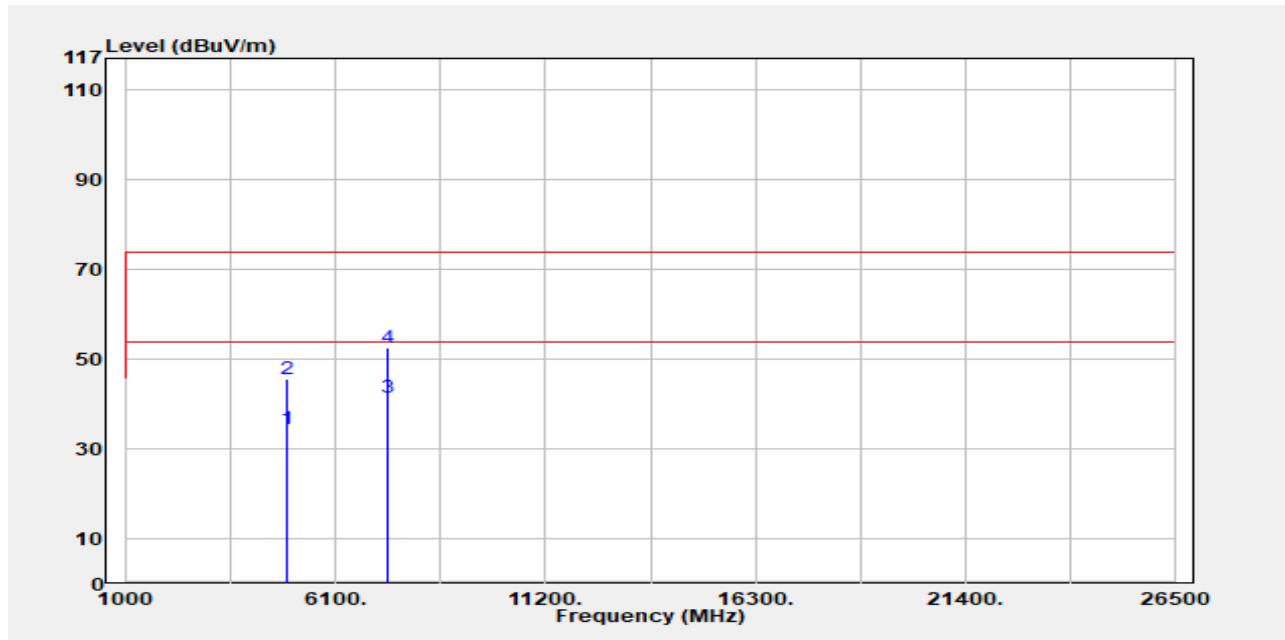
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4904.000	Average	27.11	7.60	34.71	54.00	-19.29
4904.000	Peak	38.46	7.60	46.06	74.00	-27.94
7356.000	Average	26.18	15.37	41.55	54.00	-12.45
7356.000	Peak	37.06	15.37	52.44	74.00	-21.56

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Report Number :TERF2303000789ER  
Operation Mode :802.11n40  
Test Frequency :2452 MHz  
Test Mode :Tx  
EUT Pol :H Plane  
Test Site :SAC 1  
Test Date :2023-04-19  
Temp./Humi. :23.6/63  
Antenna Pol. :Horizontal  
Engineer :WJ Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4904.000	Average	27.10	7.60	34.70	54.00	-19.30
4904.000	Peak	38.18	7.60	45.78	74.00	-28.22
7356.000	Average	26.04	15.37	41.41	54.00	-12.59
7356.000	Peak	37.38	15.37	52.75	74.00	-21.25

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## 12 POWER SPECTRAL DENSITY

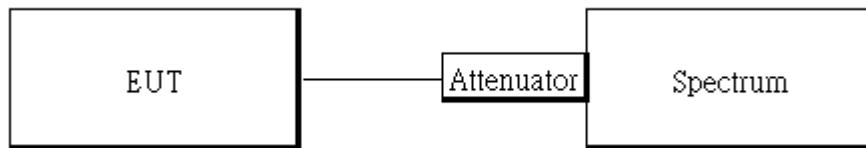
### 12.1 Standard Applicable

Per Part 15.247 (e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### 12.2 Test Setup



### 12.3 Measurement Procedure

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 = 3 kHz & VBW = 10 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.

#### Note:

*For the 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.*

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## 12.4 As per FCC KDB 662911 D01

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.

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

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

$g_{j,k}$  = / 20 10Gk 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.

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## 12.5 Power spectral density

POWER DENSITY 802.11b					
Freq. (MHz)	Ch0 PSD	Ch1 PSD	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-6.86	-10.41	-5.27	8.00	PASS
2437	-7.95	-10.79	-6.13	8.00	PASS
2462	-8.99	-10.71	-6.76	8.00	PASS

POWER DENSITY 802.11g					
Freq. (MHz)	Ch0 PSD	Ch1 PSD	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-11.1	-13.45	-9.11	8.00	PASS
2437	-11.91	-12.98	-9.40	8.00	PASS
2462	-12.57	-13.87	-10.16	8.00	PASS

POWER DENSITY 802.11n HT20					
Freq. (MHz)	Ch0 PSD	Ch1 PSD	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-11.89	-14.09	-9.84	8.00	PASS
2437	-11.42	-14.48	-9.68	8.00	PASS
2462	-12.3	-14.51	-10.26	8.00	PASS

POWER DENSITY 802.11n HT40					
Freq. (MHz)	Ch0 PSD	Ch1 PSD	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2422	-13.85	-17.13	-12.18	8.00	PASS
2437	-14.83	-17.15	-12.83	8.00	PASS
2452	-15.73	-16.95	-13.29	8.00	PASS

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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



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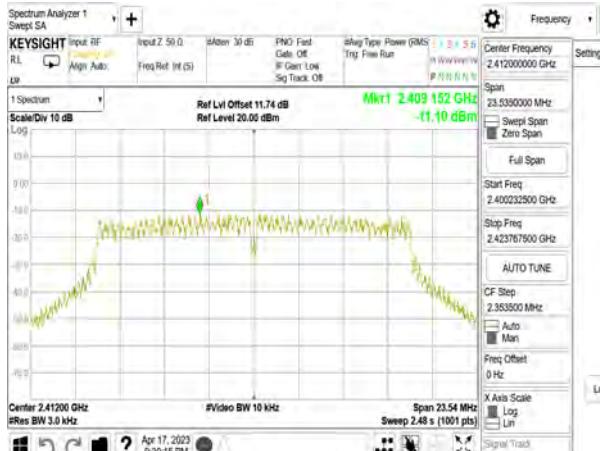
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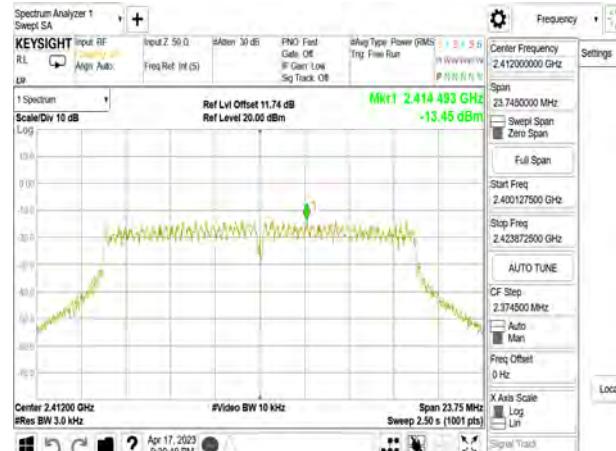
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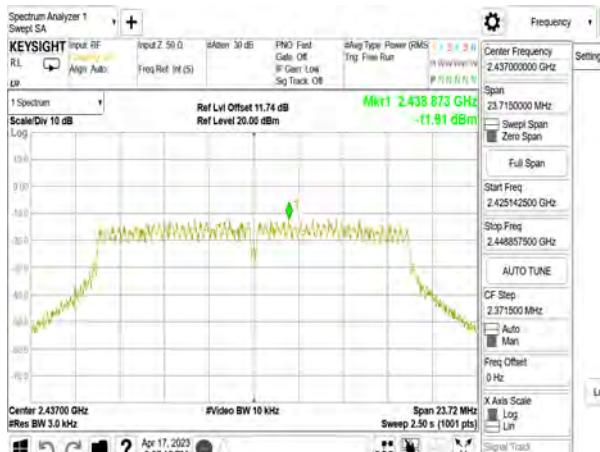
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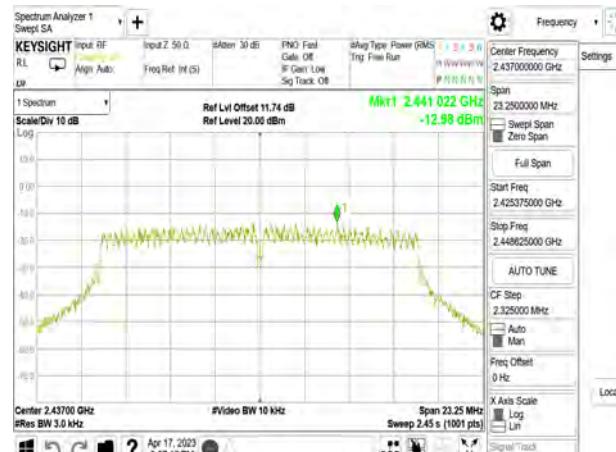
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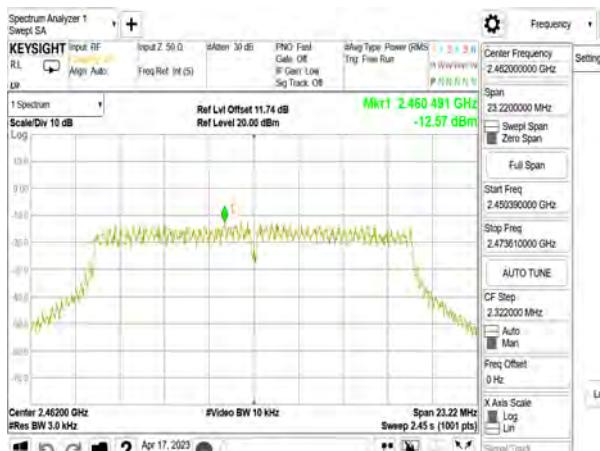
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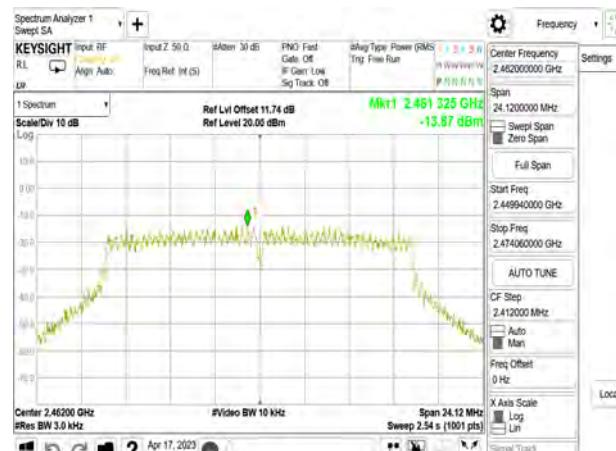
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802.11g\_20MHz\_Chain0\_2462MHz



802.11g\_20MHz\_Chain1\_2462MHz



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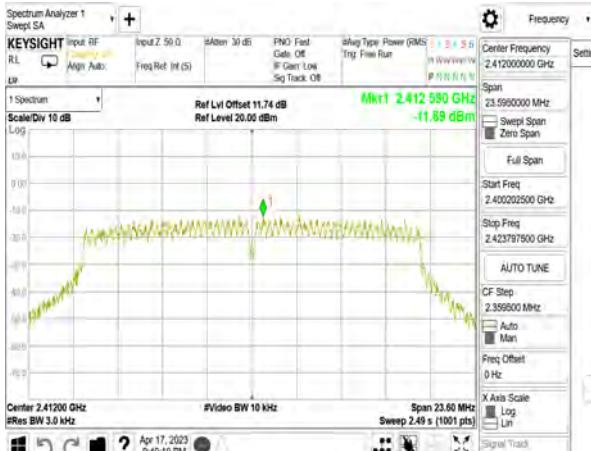
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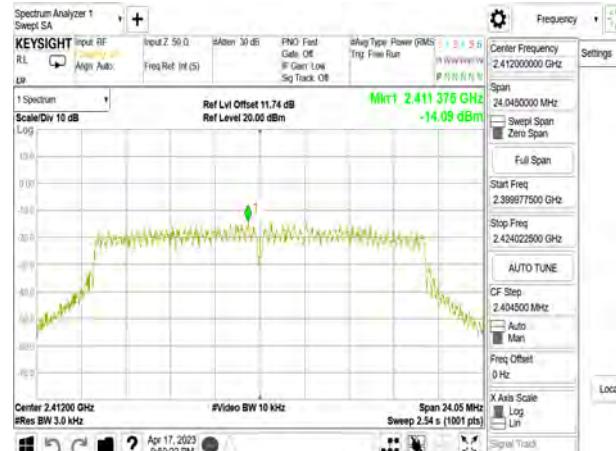
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802.11n\_20MHz\_Chain0\_2412MHz



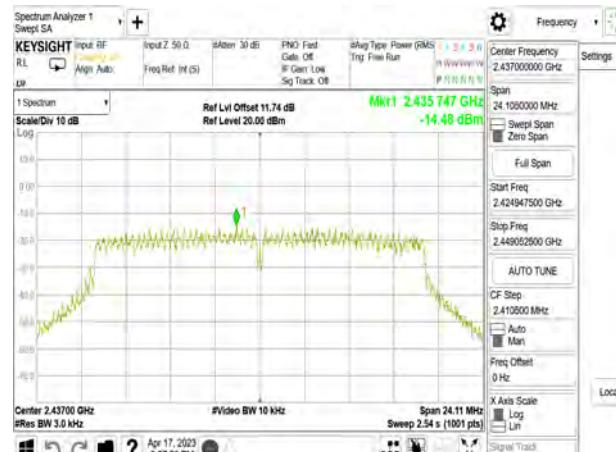
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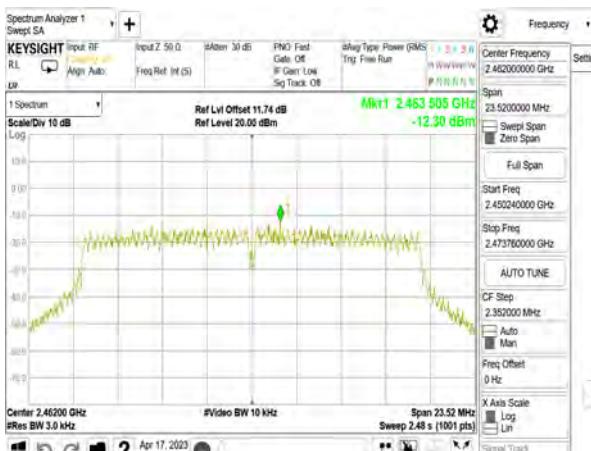
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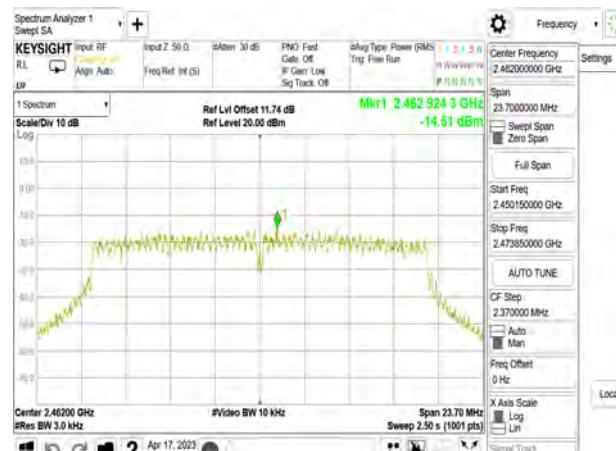
802.11n\_20MHz\_Chain1\_2437MHz



802.11n\_20MHz\_Chain0\_2462MHz



802.11n\_20MHz\_Chain1\_2462MHz



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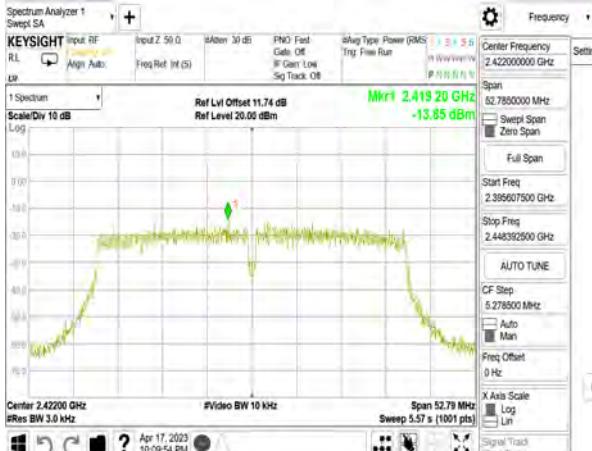
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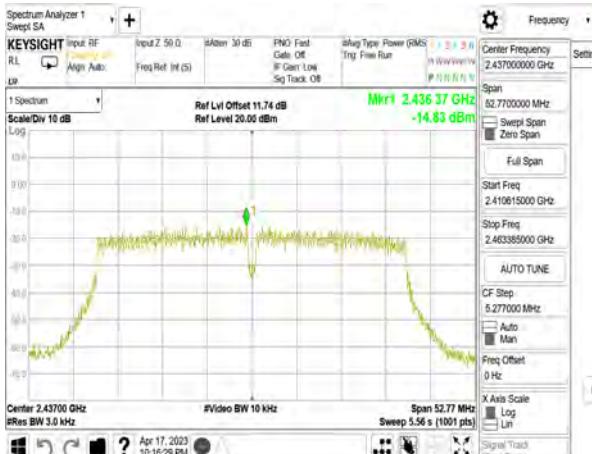
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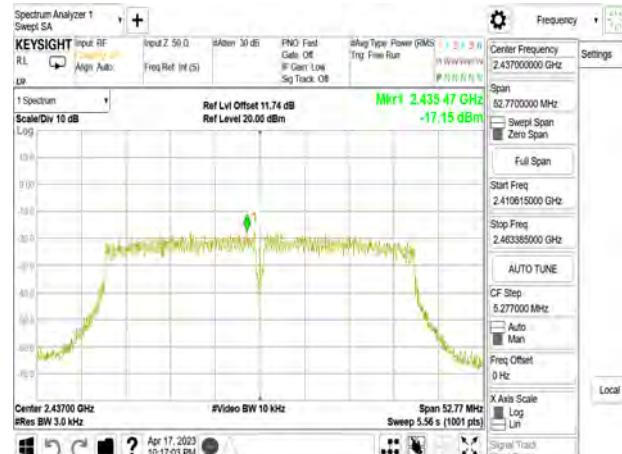
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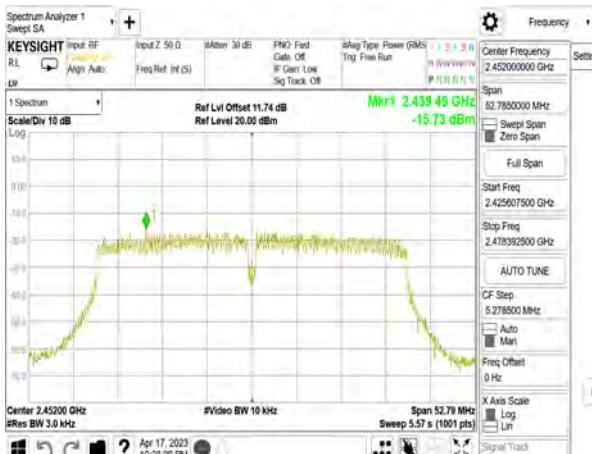
802.11n\_40MHz\_Chain0\_2437MHz



802.11n\_40MHz\_Chain1\_2437MHz



802.11n\_40MHz\_Chain0\_2452MHz



802.11n\_40MHz\_Chain1\_2452MHz



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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## 13 ANTENNA REQUIREMENT

### 13.1 Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

### 13.2 Antenna Connected Construction

The antenna complies with this requirement and no consideration of replacement. Please see EUT photo for details.

*~ End of Report ~*

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