

**ELECTROMAGNETIC EMISSIONS  
COMPLIANCE REPORT**

**Applicant:** Murata Electronics North America  
2200 Lake Park Drive Smyrna Georgia United States 30080-7604

**Manufacturer:** Murata Electronics North America  
2200 Lake Park Drive Smyrna Georgia United States 30080-7604

**Product Name:** LBES0ZZ2FR

**Brand Name:** Murata Electronics North America

**Model No./ISED HVIN:** LBES0ZZ2FR

**Report Number:** TERF2312003242E2

**FCC ID** HSW2FR

**IC:** 4492A-2FR

**Date of EUT Received:** Dec. 29, 2023

**Date of Test:** Dec. 29, 2023 ~ Jun. 11, 2024

**Issue Date:** Aug. 13, 2024

Approved By

Arno Hsieh

**Arno Hsieh**

**We hereby certify that:**

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

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

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## Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2312003242E2	00	Original.	Aug. 13, 2024	Yami Kuo	

**Note:**

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

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SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan/新北市五股區新北產業園區五工路 134 號

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## 1 GENERAL INFORMATION

### 1.1 Product Description

Product Name:	LBES0ZZ2FR
Brand Name:	Murata Electronics North America
Model No./ISED HVIN:	LBES0ZZ2FR
Hardware Version:	1
Firmware Version:	1
EUT Series No.:	Port 1: NO.2-1 Port 2: NO.3
Power Supply:	3.3Vdc, 1.8Vdc
Test Software (Name/Version)	DutApiSisoApApp_RW610

### 1.2 RF Specification

Radio Technology:	Zigbee
Frequency Range:	2405 – 2480MHz
Channel number:	16 channels
Modulation type:	DSSS
Transmit Power:	Port 1: 20.49 dBm Port 2: 20.61 dBm

### 1.3 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
PCB Monopole	Murata	Type2FR	2400-2500	2.6
Flex Dipole	Molex	146153	2400-2500	3.2

**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  
 RSS-247 issue 3 Aug. 2023  
 RSS-Gen, Issue 5 April 2018, Amendment 2 (February 2021)  
 ANSI C63.10:2013

### 1.5 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 2		
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
	Conducted 6			
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
Conducted F				
Conducted G				

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

### 1.6 Special Accessories

There are no special accessories used while test was conducted.

### 1.7 Equipment Modifications

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

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

### 2.2 EUT Exercise

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

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

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

#### 2.3.2 Conducted Test (RF)

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

#### 2.3.3 Radiated Emissions

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

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## 2.4 Measurement Results Explanation Example

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

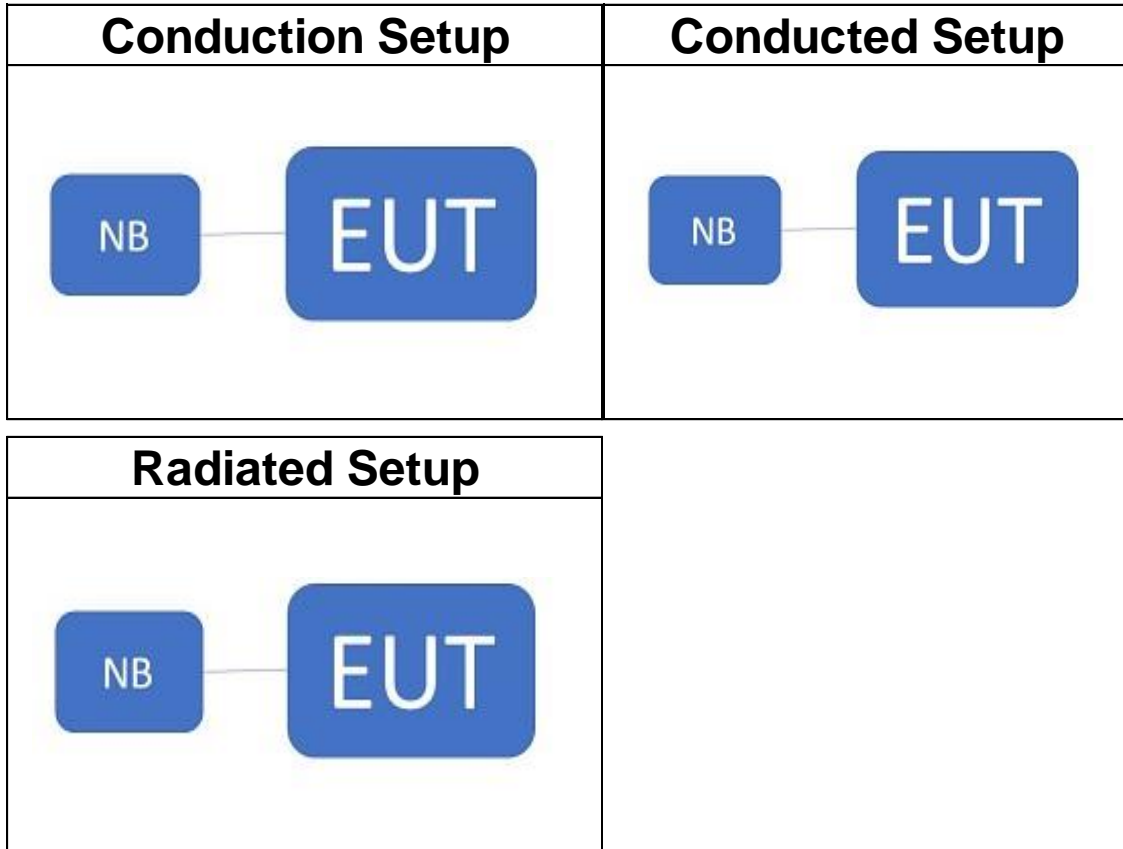
Radiated emission below 30MHz is measured in a 9m\*6m\*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

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

### 2.4.2 For all conducted test items:

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

## 2.5 Test Configuration



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## 2.6 Control Unit(s)

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	L480	P0002332	N/A	N/A
USB Cable	PowerSync	CUBCVARA0010	N/A	N/A	N/A

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	T14	P0003332	N/A	N/A
USB Cable	PowerSync	CUBCVARA0010	N/A	N/A	N/A

Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	L480	P0002332	N/A	N/A
USB Cable	PowerSync	CUBCVARA0010	N/A	N/A	N/A

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### 3 SUMMARY OF TEST RESULTS

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

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operating Frequencies

2400~2483.5 MHz			
CH	Freq. (MHz)	CH	Freq. (MHz)
11	2405	21	2455
12	2410	22	2460
13	2415	23	2465
14	2420	24	2470
15	2425	25	2475
16	2430	26	2480
17	2435		
18	2440		
19	2445		
20	2450		

### 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.

MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION
<b>RADIATED EMISSION TEST (BELOW 1 GHz)</b>			
Zigbee	11 to 16	18	DSSS
<b>RADIATED EMISSION TEST (ABOVE 1 GHz)</b>			
Zigbee	11 to 16	11, 18, 25, 26	DSSS
<p><b>Note:</b> 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.</p>			

<b>ANTENNA PORT CONDUCTED MEASUREMENT</b>			
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION
Zigbee	11 to 26	11, 18, 25, 26	DSSS

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## 5 MEASUREMENT UNCERTAINTY

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

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

**Note:**

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

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## 6 MEASUREMENT EQUIPMENT USED

### 6.1 Emission from AC power line

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	06/19/2023	06/18/2024
EMI Test Receiver	R&S	ESCI	101342	04/24/2023	04/23/2024
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2023	03/26/2024
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2023	03/26/2024
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R

### 6.2 Conducted Measurement

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	05/23/2023	05/22/2024
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	05/24/2024	05/23/2025
Power Meter	Anritsu	ML2496A	2138005	09/25/2023	09/24/2024
Power Sensor	Anritsu	MA2411B	1911395	09/25/2023	09/24/2024
Power Sensor	Anritsu	MA2411B	1911396	09/25/2023	09/24/2024
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R
Attenuator	Woken	WATT-218FS-10	RF18	11/15/2023	11/14/2024
Attenuator	Woken	WATT-218FS-10	RF19	11/15/2023	11/14/2024
DC Block	PASTERNAK	PE8210	RF155	11/15/2023	11/14/2024

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### 6.3 Radiated Measurement

Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-617	12/14/2023	12/13/2024
Horn Antenna	Schwarzbeck	BBHA9120D	1341	05/26/2023	05/25/2024
Loop Antenna	ETS.LINDGREN	6502	143303	05/23/2023	05/22/2024
Horn Antenna	SCHWARZBECK	BBHA9170	185	08/21/2023	08/20/2024
3m Site NSA	SGS	966 chamber D	N/A	04/30/2023	04/29/2024
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/29/2023	03/28/2024
Test Software	audix	e3	E3 20923 SGS Ver.9 ( C )	N.C.R	N.C.R
Pre-Amplifier	EMC Instruments	EMC18405SEE	980881	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC12630SE	980273	11/15/2023	11/14/2024
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	11/15/2023	11/14/2024
Coaxial Cable	Huber+Suhner	EMC106-SM-SM-7200	150703	11/15/2023	11/14/2024

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

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## 7 CONDUCTED EMISSION TEST

### 7.1 Standard Applicable:

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

Frequency range MHz	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

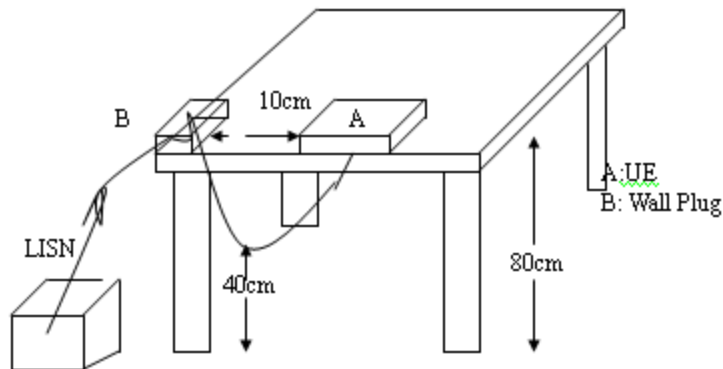
Note

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

### 7.2 EUT Setup:

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

### 7.3 Test Setup



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#### 7.4 Measurement Procedure:

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

#### 7.5 Measurement Result:

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

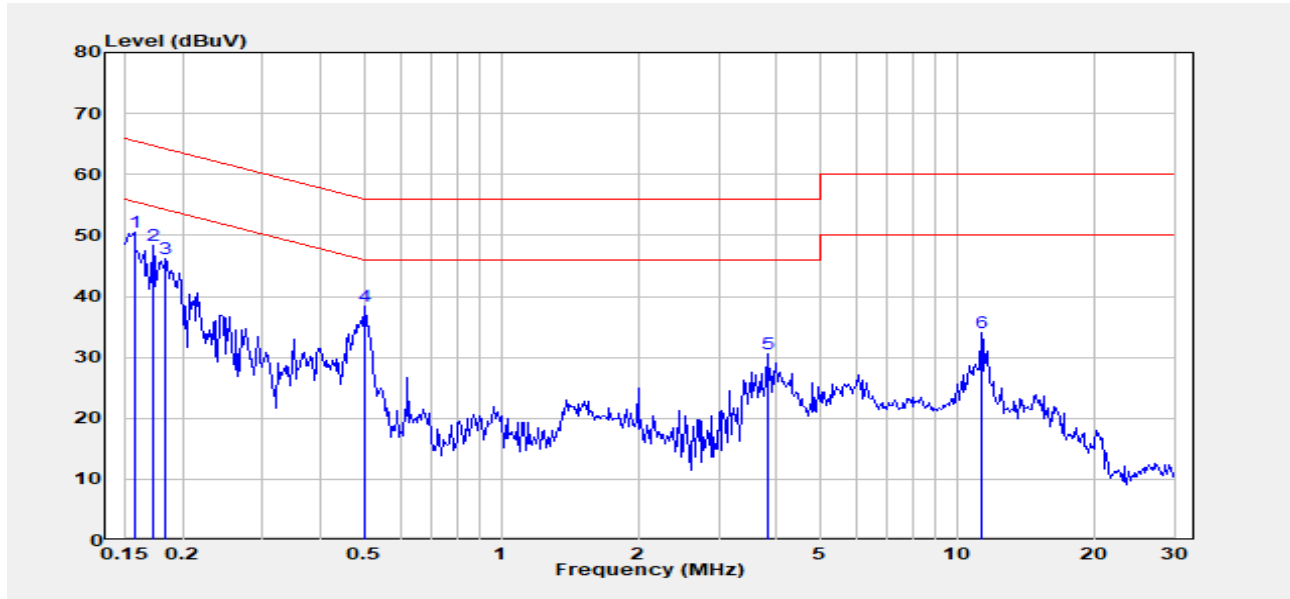
Note2: The \* reveals the worst-case results that closest to the limit.

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### AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:TERF2312003242E2	Test Site	:Conduction C
Test Mode	:Zigbee	Test Date	:2024-01-08
Power	:120V/60Hz	Temp./Humi.	:21.9°C/54%
Probe	:L1	Engineer	:Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.157	Peak	39.78	10.69	50.46	65.65	-15.18
0.172	Peak	37.73	10.69	48.41	64.87	-16.46
0.184	Peak	35.42	10.68	46.11	64.31	-18.20
0.501	Peak	27.67	10.63	38.30	56.00	-17.70
3.844	Peak	19.62	10.90	30.52	56.00	-25.48
11.299	Peak	22.94	11.00	33.95	60.00	-26.05

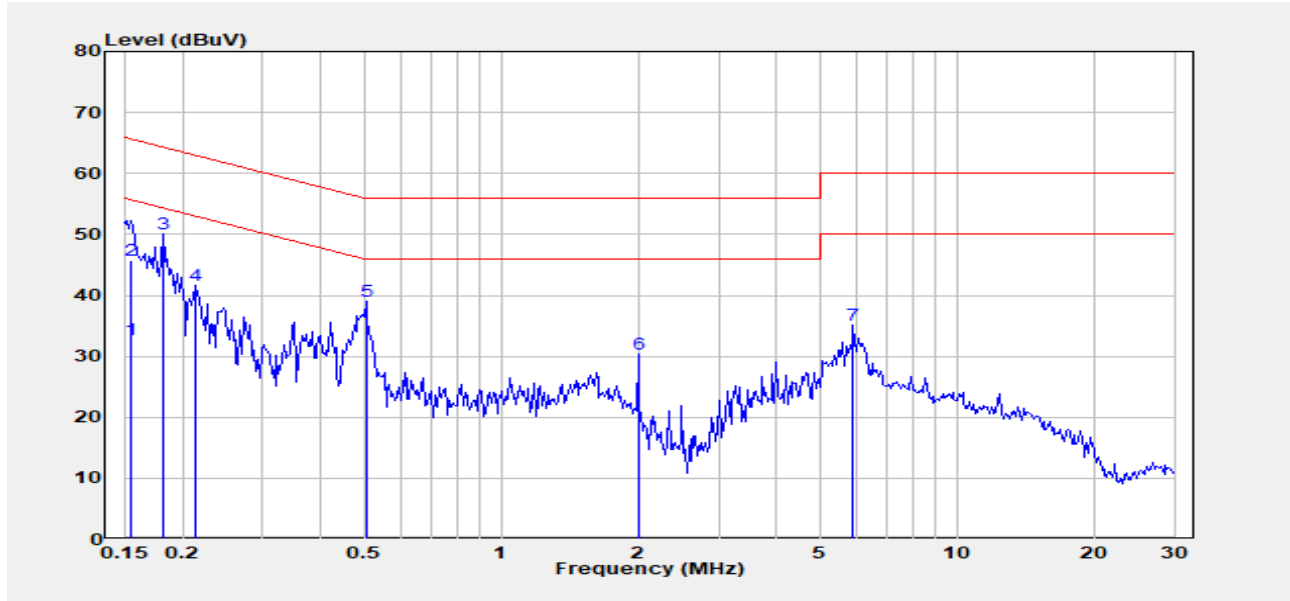
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Report Number	:TERF2312003242E2	Test Site	:Conduction C
Test Mode	:Zigbee	Test Date	:2024-01-08
Power	:120V/60Hz	Temp./Humi.	:21.9°C/54%
Probe	:N	Engineer	:Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V	Limit dB $\mu$ V	Margin dB
0.154	Average	22.10	10.67	32.77	55.79	-23.02
0.154	QP	35.00	10.67	45.67	65.79	-20.12
0.181	Peak	39.39	10.67	50.06	64.45	-14.38
0.214	Peak	30.87	10.67	41.53	63.04	-21.51
0.505	Peak	28.50	10.62	39.11	56.00	-16.89
1.999	Peak	19.56	10.77	30.33	56.00	-25.67
5.927	Peak	24.14	10.98	35.13	60.00	-24.87

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## 8 PEAK OUTPUT POWER MEASUREMENT

### 8.1 Standard Applicable:

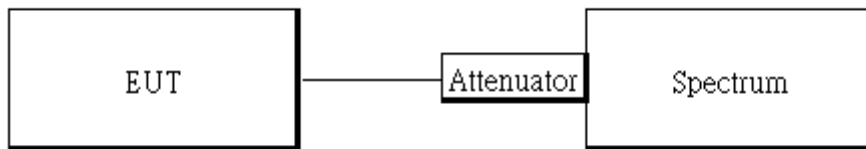
For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt and the e.i.r.p. shall not exceed 4 W.

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

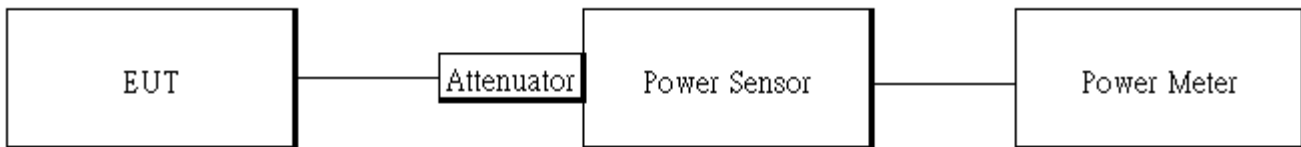
In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

### 8.2 Test Setup

#### 8.2.1 Duty Cycle



#### 8.2.2 Output Power



### 8.3 Measurement Procedure:

#### 8.3.1 Duty Cycle

1. Place the EUT on the table and set it in transmitting mode.
2. Set span = Zero
3. RBW = 8MHz, VBW = 8MHz,
4. Detector = Peak

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### 8.3.2 Output Power

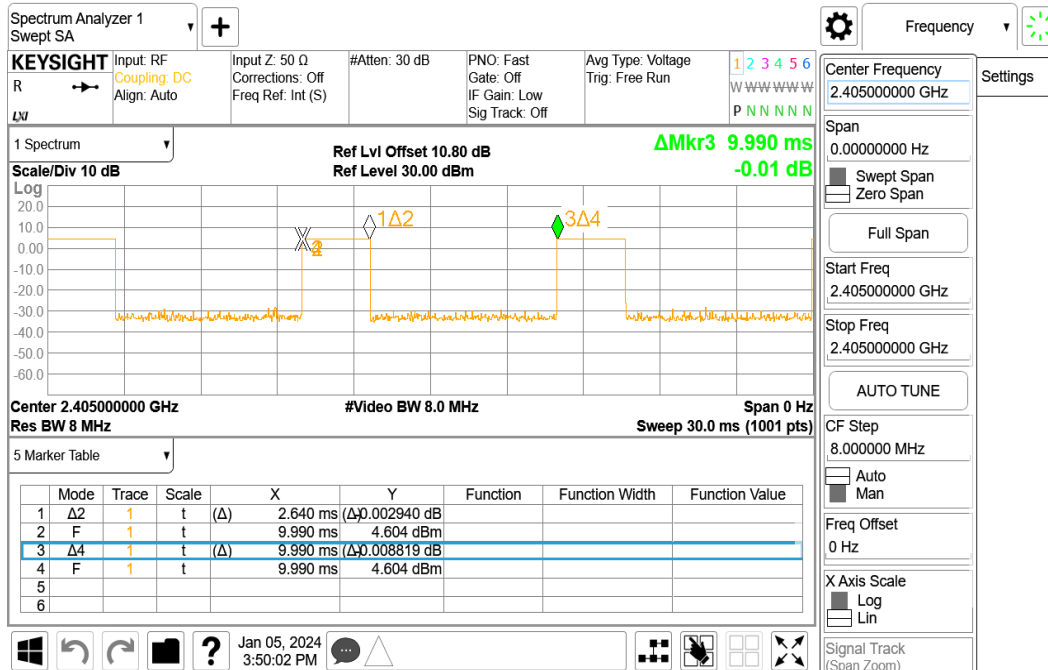
1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.
4. Record the max. Reading as observed from Power Meter.
5. Repeat above procedures until all test default channel measured was complete.

### 8.4 Duty Factor:

#### Port 1

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
Zigbee	26.43	5.78	0.38	1.00

Zigbee\_LowCH11-2405



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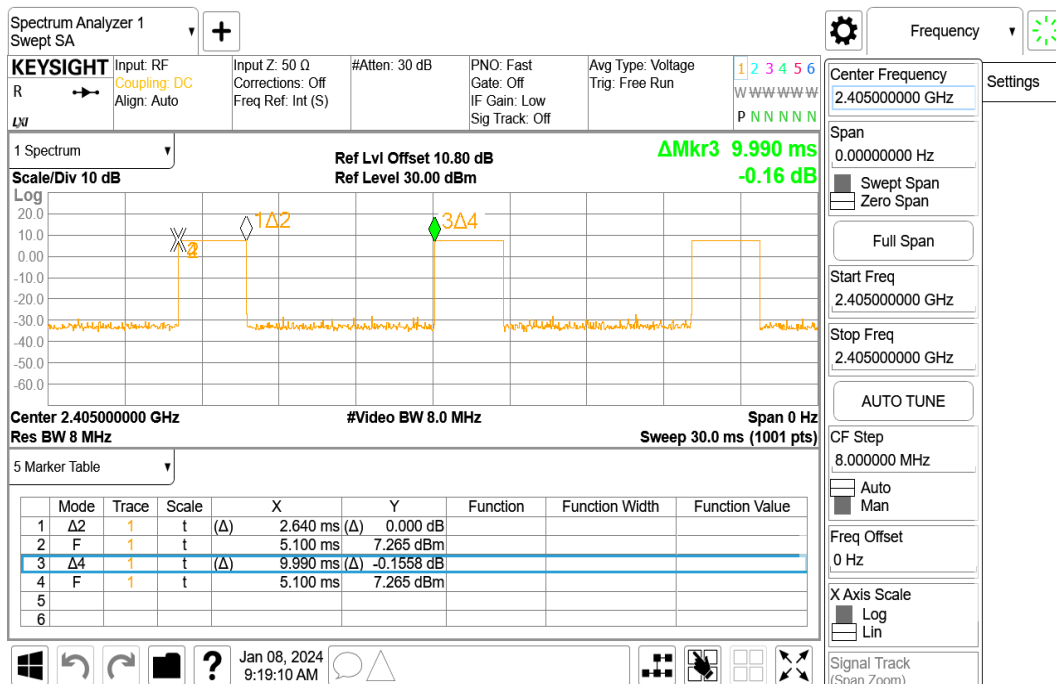
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Port 2

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
Zigbee	26.43	5.78	0.38	1.00

Zigbee\_LowCH11-2405



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8.5 Output Power:

8.5.1 Peak & Avg

Port 1

Zigbee mode:

CH	Frequency (MHz)	Power set	Peak Output Power (dBm)	Required Limit (dBm)
Low	2405	14	<b>20.49</b>	30
Mid	2440	14	20.07	30
High	2475	14	19.54	30
High	2480	14	3.25	30
CH	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Required Limit (dBm)
Low	2405	14	13.47	30
Mid	2440	14	13.21	30
High	2475	14	12.70	30
High	2480	14	-3.77	30

**\*Note:**

**1. Measured by power meter, cable loss 10.8 dB + Duty cycle factor has been offsetted to the power meter for Avg. power and cable loss has been offsetted for Peak power measurement.**

Port 2

Zigbee mode:

CH	Frequency (MHz)	Power set	Peak Output Power (dBm)	Required Limit (dBm)
Low	2405	12	18.82	30
Mid	2440	14	<b>20.61</b>	30
High	2475	14	20.45	30
High	2480	14	5.38	30
CH	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Required Limit (dBm)
Low	2405	12	11.88	30
Mid	2440	14	13.79	30
High	2475	14	13.57	30
High	2480	14	-1.45	30

**\*Note:**

**1. Measured by power meter, cable loss 10.8 dB + Duty cycle factor has been offsetted to the power meter for Avg. power and cable loss has been offsetted for Peak power measurement.**

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8.5.2 EIRP

Port 1

EIRP Zigbee mode

CH	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit
Low	2405	14	13.47	3.20	16.67	4W= 36 dBm
Mid	2440	14	13.21	3.20	16.41	4W= 36 dBm
High	2475	14	12.70	3.20	15.90	4W= 36 dBm
High	2480	14	-3.77	3.20	-0.57	4W= 36 dBm

\* **Note:** EIRP = Average Power + Gain

Port 2

EIRP Zigbee mode

CH	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit
Low	2405	12	11.88	3.00	14.88	4W= 36 dBm
Mid	2440	14	13.79	3.00	16.79	4W= 36 dBm
High	2475	14	13.57	3.00	16.57	4W= 36 dBm
High	2480	14	-1.45	3.00	1.55	4W= 36 dBm

\* **Note:** EIRP = Average Power + Gain

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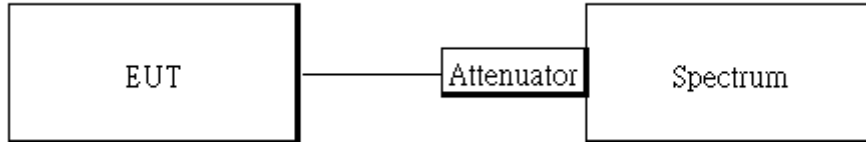
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## 9 EMISSION BANDWIDTH MEASUREMENT

### 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.

#### 9.3.2 ISED measurements

1. The testing follows the Measurement Procedure of the RSS-Gen section 6.7.
2. Set the spectrum analyzer as  
 RBW= 1 % to 5% of 99% and -6dB Bandwidth ,  
 VBW ≥ 3 X RBW,  
 Span= large enough to capture all products of the modulation process  
 Sweep=auto, Detector = Peak, and Max hold.
3. Mark the upper and lower frequencies of 99% and -6dB.
4. Repeat above procedures until all test default channel is completed.

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9.4 Measurement Result:

Port 1

Zigbee mode

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2405	1.17	$\geq 0.5$	PASS
2440	1.176	$\geq 0.5$	PASS
2480	1.179	$\geq 0.5$	PASS

Zigbee mode

Frequency (MHz)	99%Bandwidth (MHz)
2405	2.2144
2440	2.2068
2480	2.1785

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Port 2

Zigbee mode

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2405	1.159	$\geq 0.5$	PASS
2440	1.177	$\geq 0.5$	PASS
2480	1.214	$\geq 0.5$	PASS

Zigbee mode

Frequency (MHz)	99%Bandwidth (MHz)
2405	2.2156
2440	2.2173
2480	2.1819

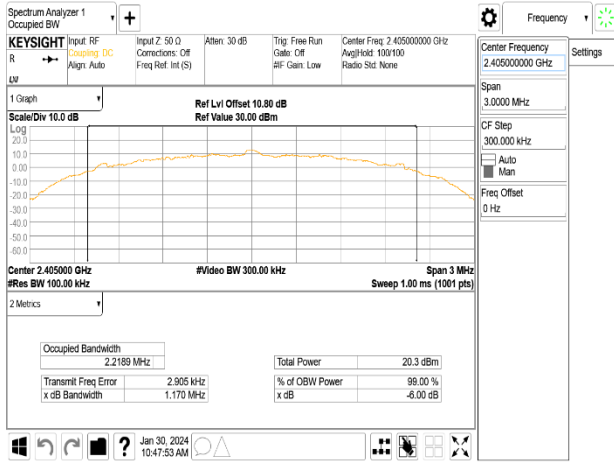
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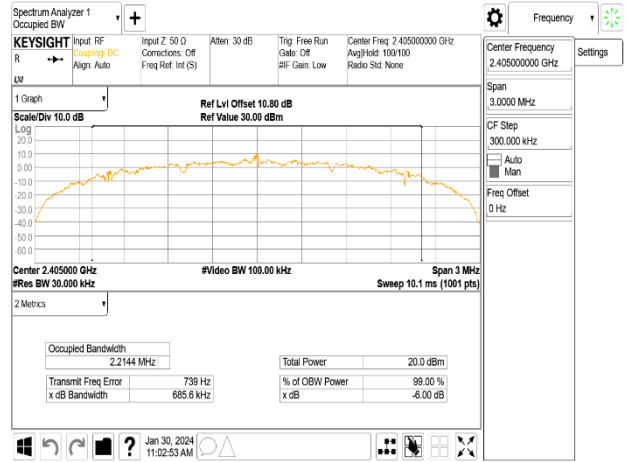
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Port 1

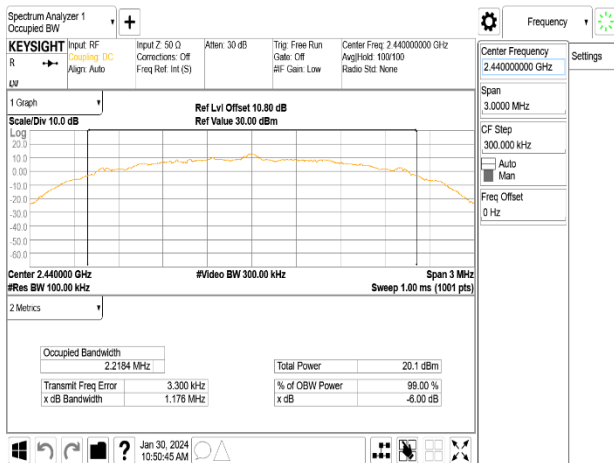
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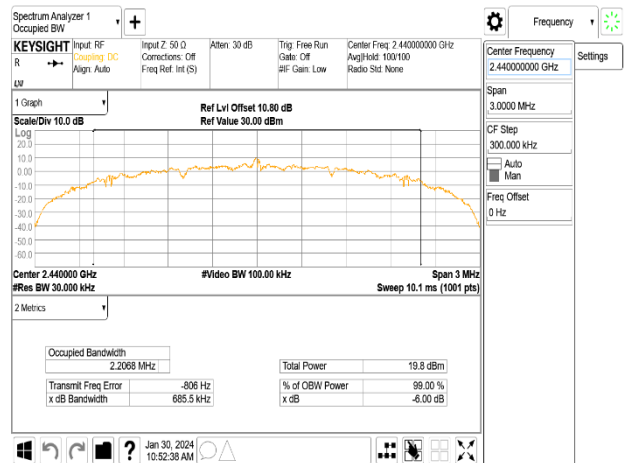
IC OBW\_Zigbee\_LowCH11-2405MHz



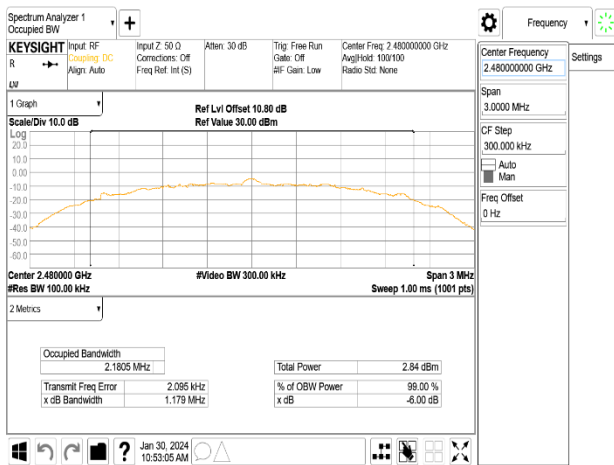
OBW\_Zigbee\_MidCH18-2440MHz



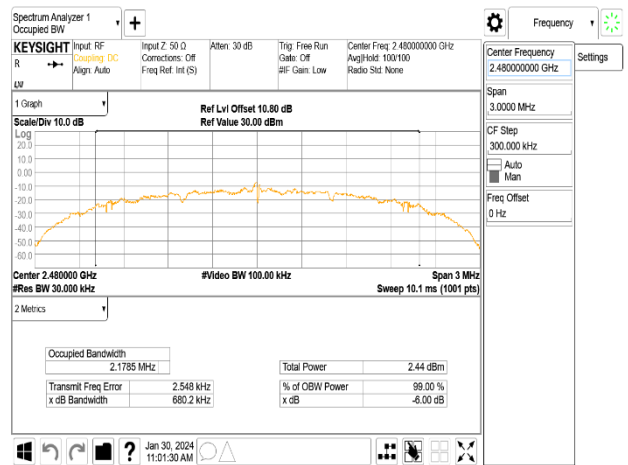
IC OBW\_Zigbee\_MidCH18-2440MHz



OBW\_Zigbee\_HighCH26-2480MHz



IC OBW\_Zigbee\_HighCH26-2480MHz



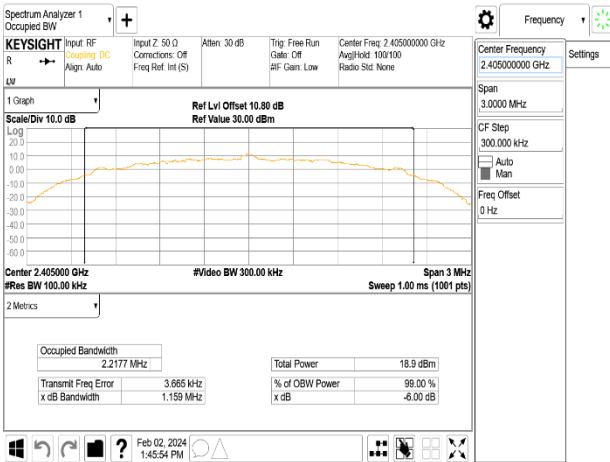
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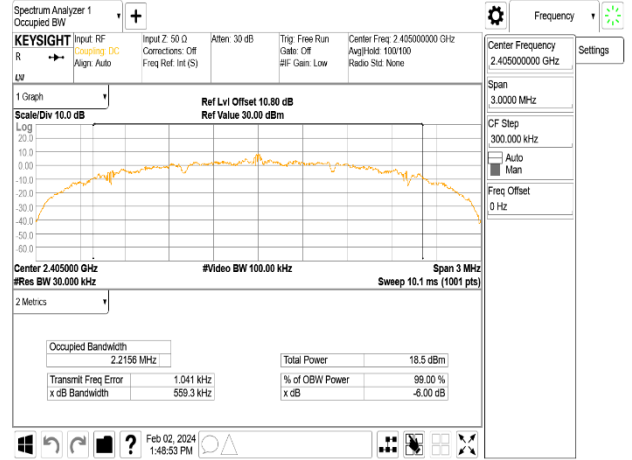
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## Port 2

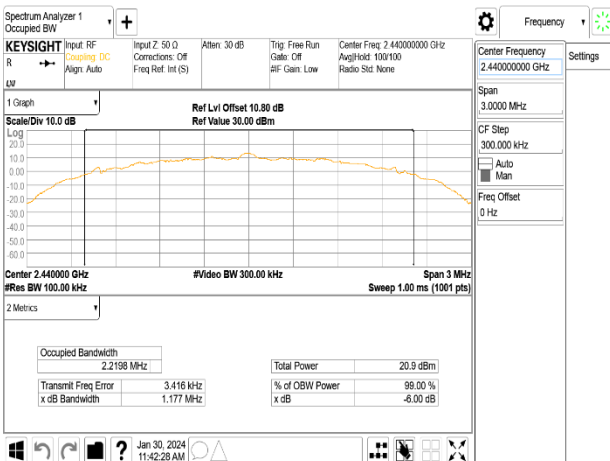
OBW\_Zigbee\_LowCH11-2405MHz



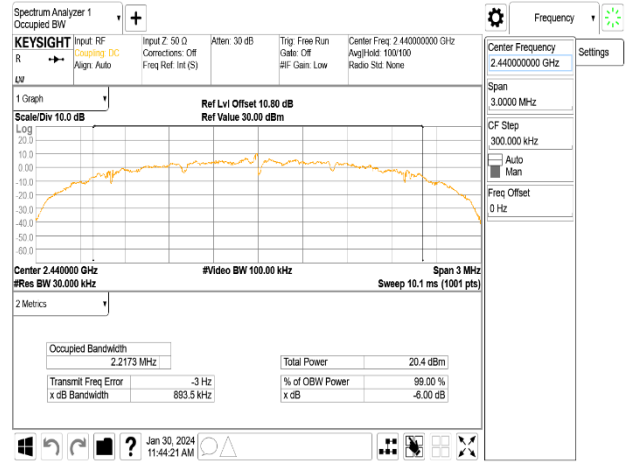
IC OBW\_Zigbee\_LowCH11-2405MHz



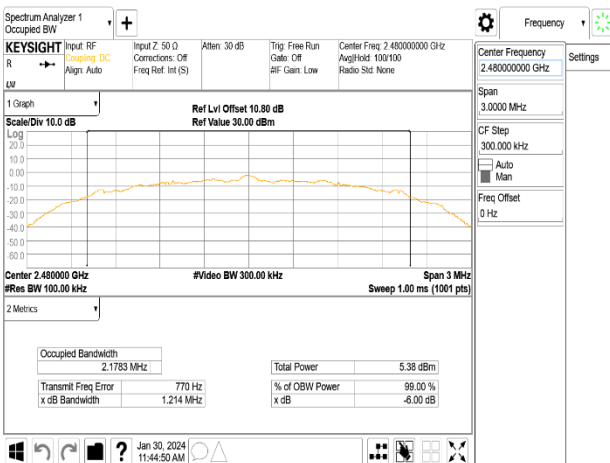
OBW\_Zigbee\_MidCH18-2440MHz



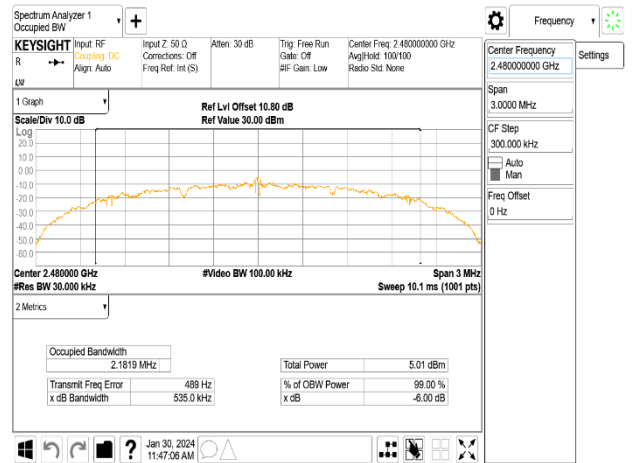
IC OBW\_Zigbee\_MidCH18-2440MHz



OBW\_Zigbee\_HighCH26-2480MHz



IC OBW\_Zigbee\_HighCH26-2480MHz



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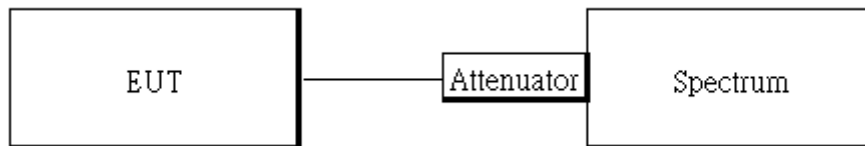
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## 10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

### 10.1 Standard Applicable

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

### 10.2 Test Setup



### 10.3 Measurement Procedure

#### 10.3.1 Reference Level of Emission Limit:

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

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### 10.3.2 Conducted Band Edge:

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

### 10.3.3 Conducted Spurious Emission:

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

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## 10.4 Measurement Result

### Port 1

#### Zigbee\_Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2405	12.93	-7.07
2440	12.57	-7.43
2480	-4.62	-24.62

**\*Note:**

- 1.cable loss as 10.8dB that offsets in the spectrum
- 2.Refer to next page for plots.

### Port 2

#### Zigbee\_Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2405	11.37	-8.63
2440	13.41	-6.59
2480	-2.02	-22.02

**\*Note:**

- 1.cable loss as 10.8dB that offsets in the spectrum
- 2.Refer to next page for plots.

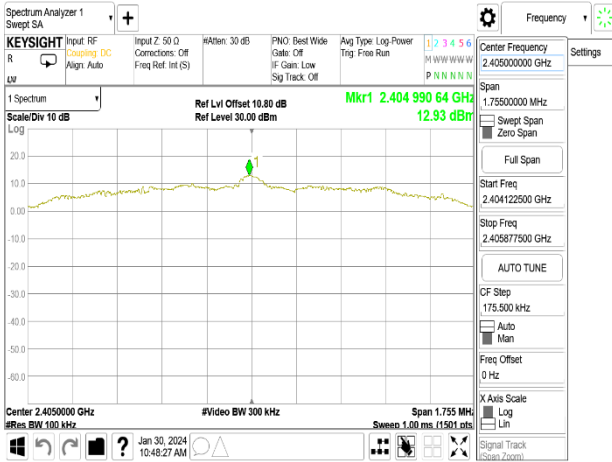
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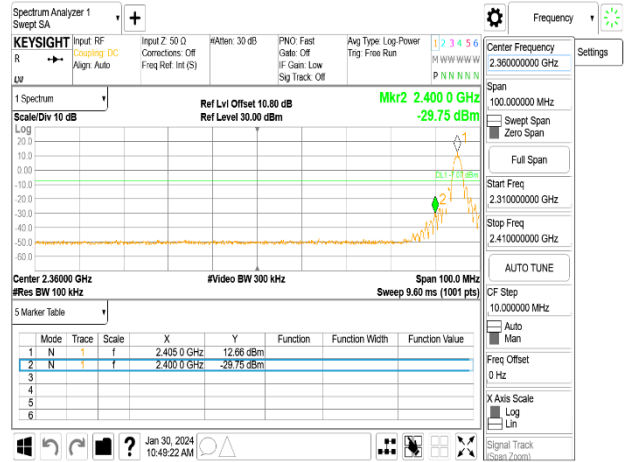
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## Port 1

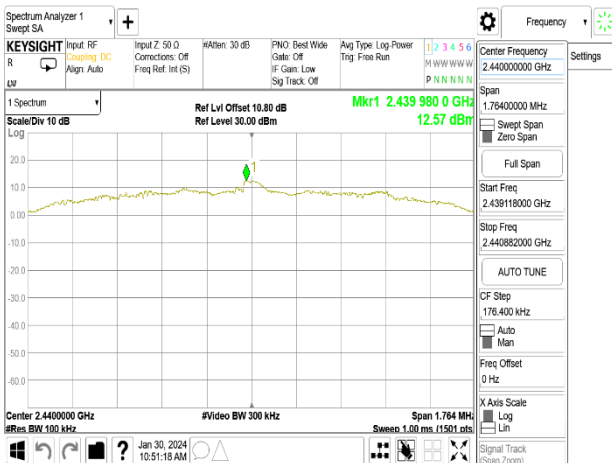
Reference Level\_Zigbee\_LowCH11-2405MHz



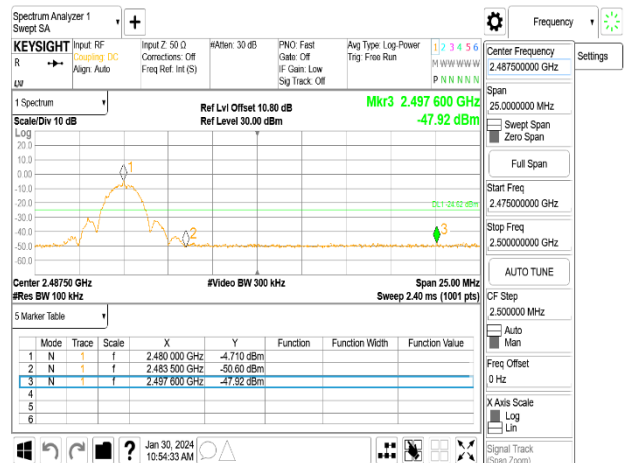
Band Edge\_Zigbee\_LowCH11-2405MHz



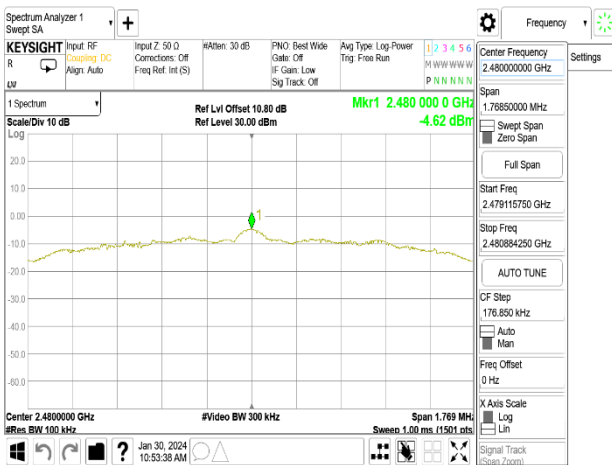
Reference Level\_Zigbee\_MidCH18-2440MHz



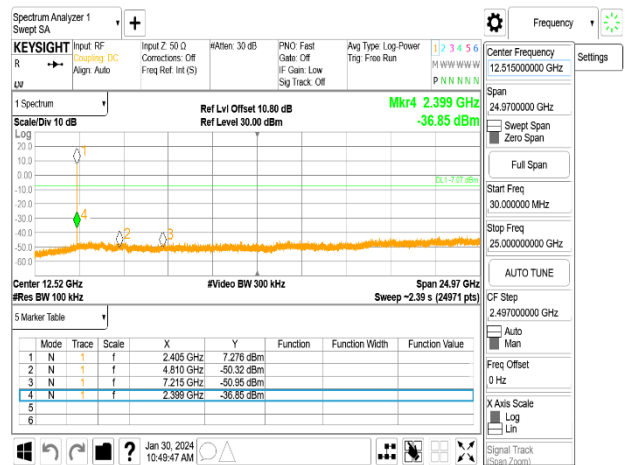
Band Edge\_Zigbee\_HighCH26-2480MHz



Reference Level\_Zigbee\_HighCH26-2480MHz



Spurious Emission\_Zigbee\_LowCH11-2405MHz

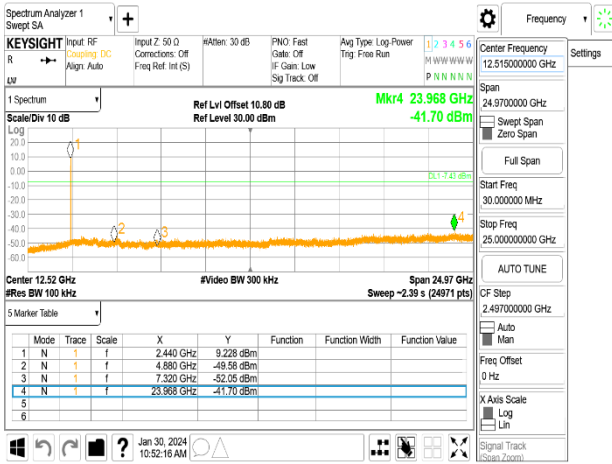


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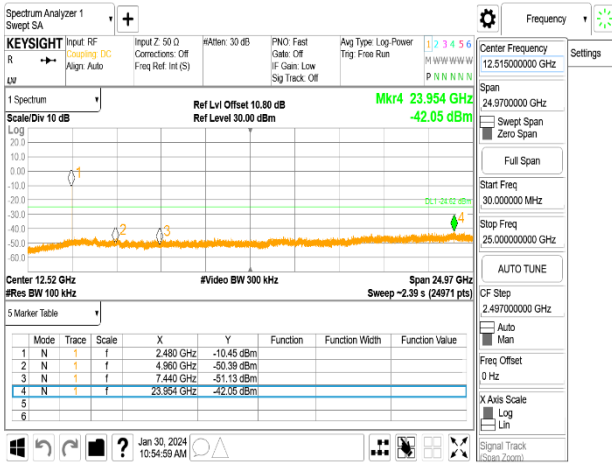
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Spurious Emission\_Zigbee\_MidCH18-2440MHz



Spurious Emission\_Zigbee\_HighCH26-2480MHz



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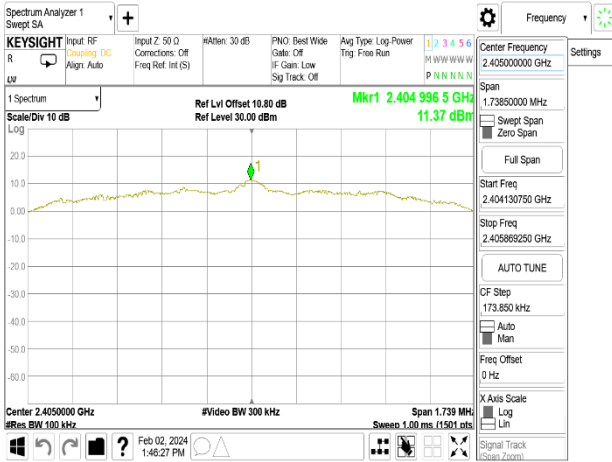
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## Port 2

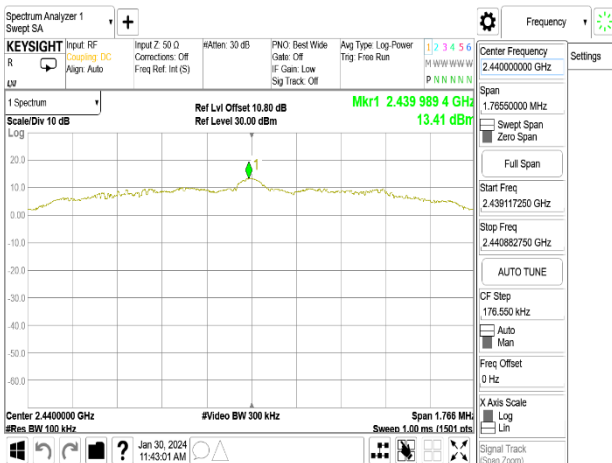
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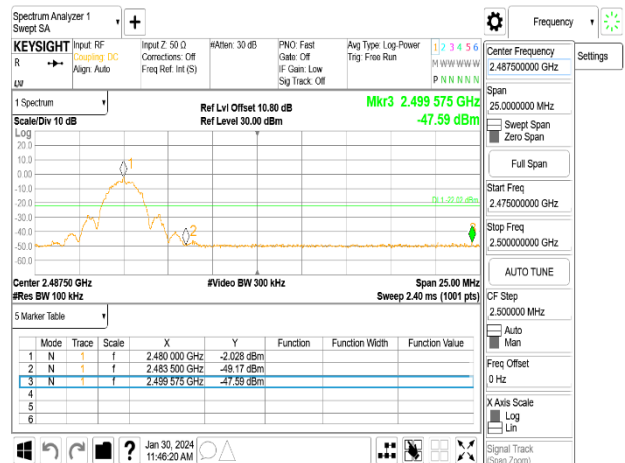
Band Edge\_Zigbee\_LowCH11-2405MHz



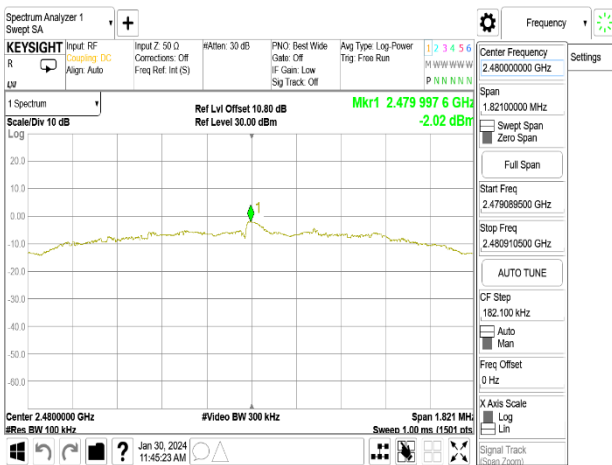
Reference Level\_Zigbee\_MidCH18-2440MHz



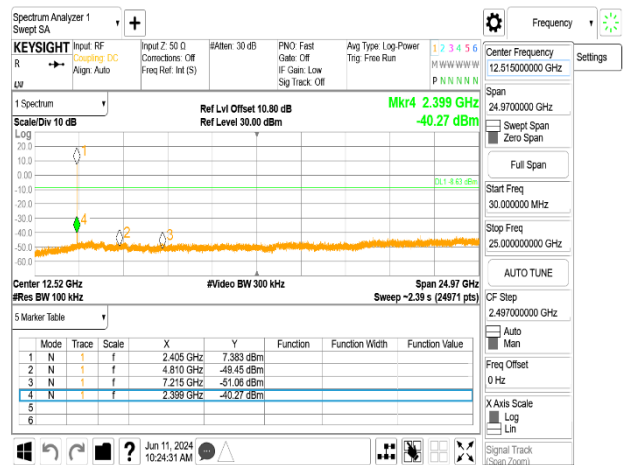
Band Edge\_Zigbee\_HighCH26-2480MHz



Reference Level\_Zigbee\_HighCH26-2480MHz



Spurious Emission\_Zigbee\_LowCH11-2405MHz

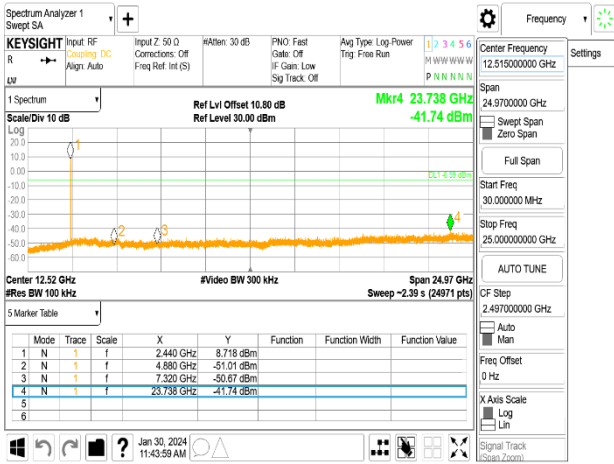


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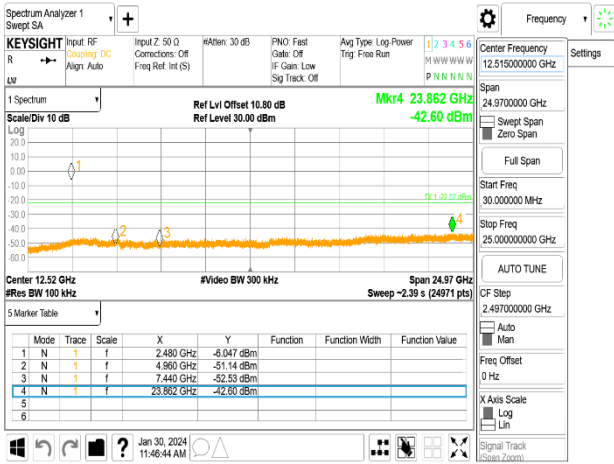
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Spurious Emission\_Zigbee\_MidCH18-2440MHz



Spurious Emission\_Zigbee\_HighCH28-2480MHz



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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 and RSS-Gen §8.9 Table 5 and 6 limit as below.

And according to §15.33(a) (1) & RSS-Gen §6.13.2.a 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.

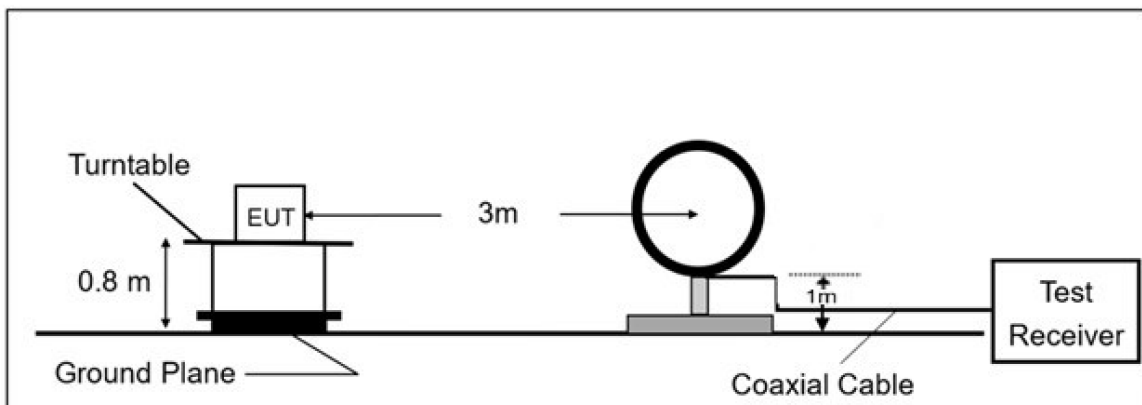
Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**Note:**

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

### 11.2 Test Setup

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

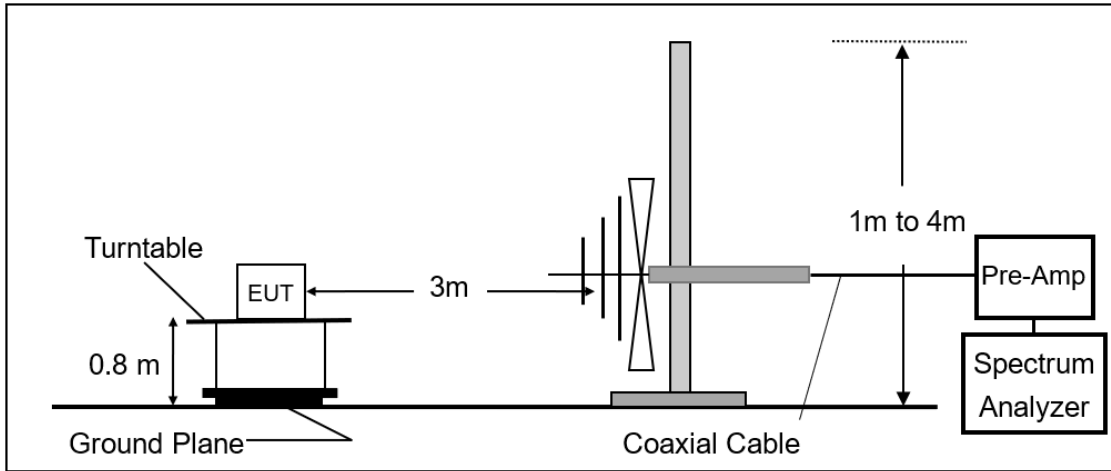


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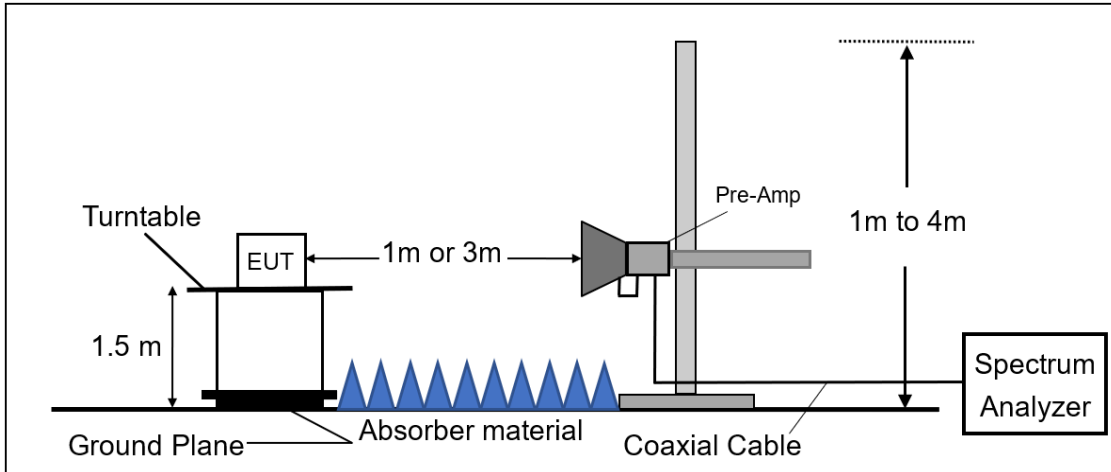
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(B) Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



(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 ≥ 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. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
12. Repeat above procedures until all default test channel measured were complete.

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## 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  $20 \cdot \log(uV/m)$*

*Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)*

*Factor(dB) = Antenna Factor(dBμV/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: Refer to next page spectrum analyzer data chart and tabular data sheets.

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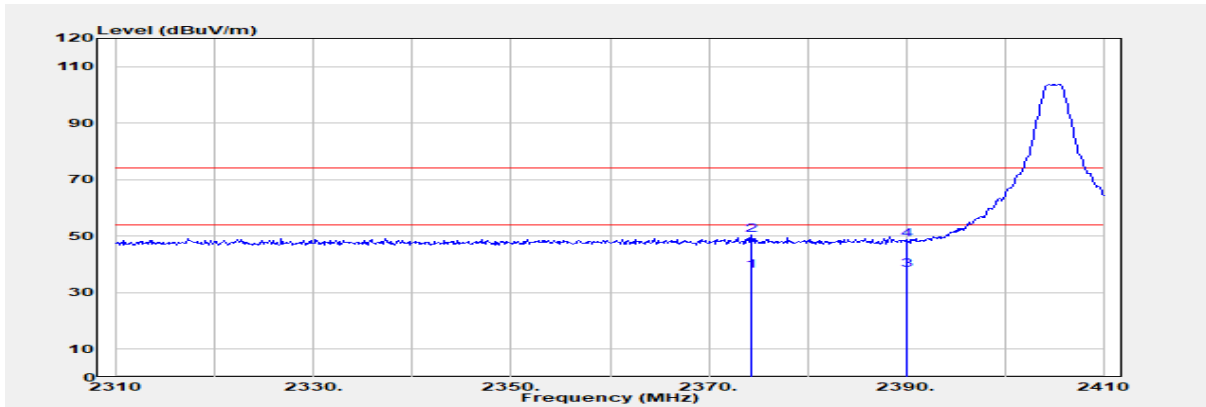
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SGS Taiwan Ltd. | No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan/新北市五股區新北產業園區五工路 134 號

### 11.6.1 Radiated Band Edge Measurement Result

#### Port 1 (Dipole)

Report Number	:TERF2312003242E2	Test Site	:SAC D
Operation Mode	:Zigbee	Test Date	:2024-01-31
Test Frequency	:2405 MHz	Temp./Humi.	:23.2°C/63%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2374.320	Average	42.28	-4.68	37.60	54.00	-16.40
2374.320	Peak	55.18	-4.68	50.50	74.00	-23.50
2390.000	Average	42.70	-4.58	38.11	54.00	-15.89
2390.000	Peak	53.23	-4.58	48.65	74.00	-25.35

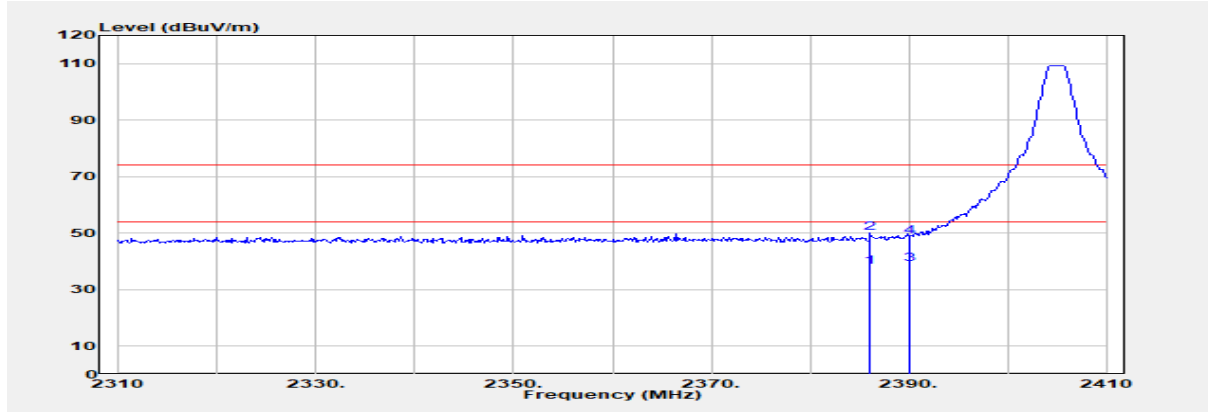
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-31  
 Temp./Humi. :23.2°C/63%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2386.080	Average	42.80	-4.61	38.20	54.00	-15.80
2386.080	Peak	54.64	-4.61	50.03	74.00	-23.97
2390.000	Average	43.46	-4.58	38.88	54.00	-15.12
2390.000	Peak	53.37	-4.58	48.79	74.00	-25.21

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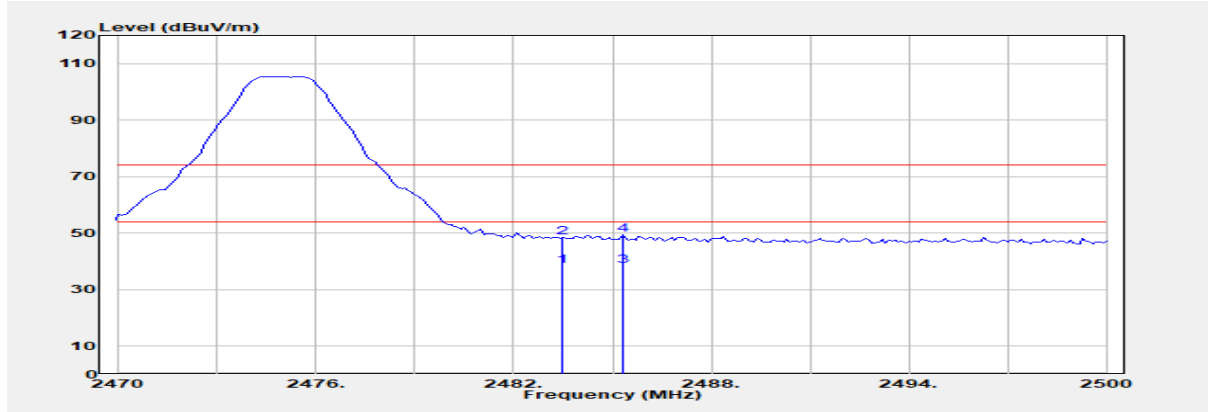
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-31  
 Temp./Humi. :23.2°C/63%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	43.78	-5.30	38.48	54.00	-15.52
2483.500	Peak	53.68	-5.30	48.37	74.00	-25.63
2485.300	Average	43.68	-5.32	38.37	54.00	-15.63
2485.300	Peak	54.68	-5.32	49.36	74.00	-24.64

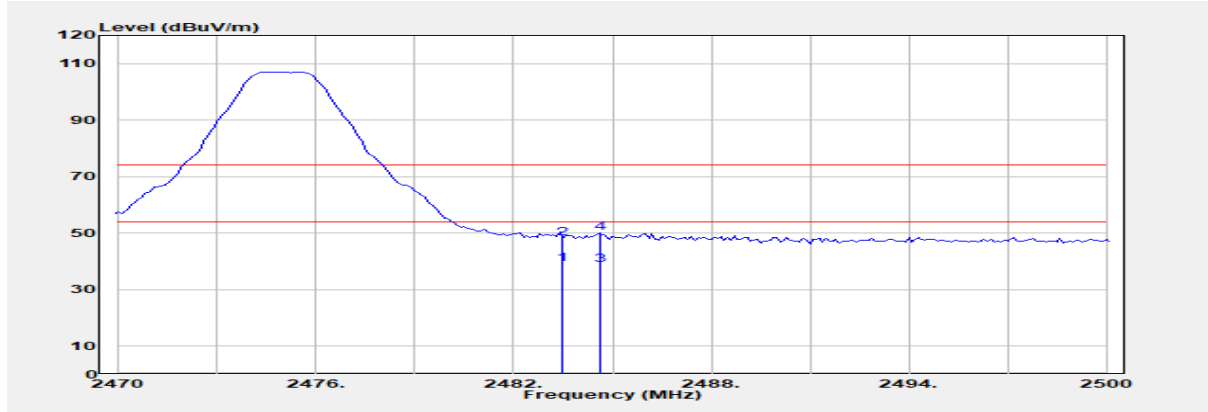
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-31  
 Temp./Humi. :23.2°C/63%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	44.42	-5.30	39.12	54.00	-14.88
2483.500	Peak	53.55	-5.30	48.25	74.00	-25.75
2484.600	Average	44.17	-5.31	38.86	54.00	-15.14
2484.600	Peak	55.29	-5.31	49.98	74.00	-24.02

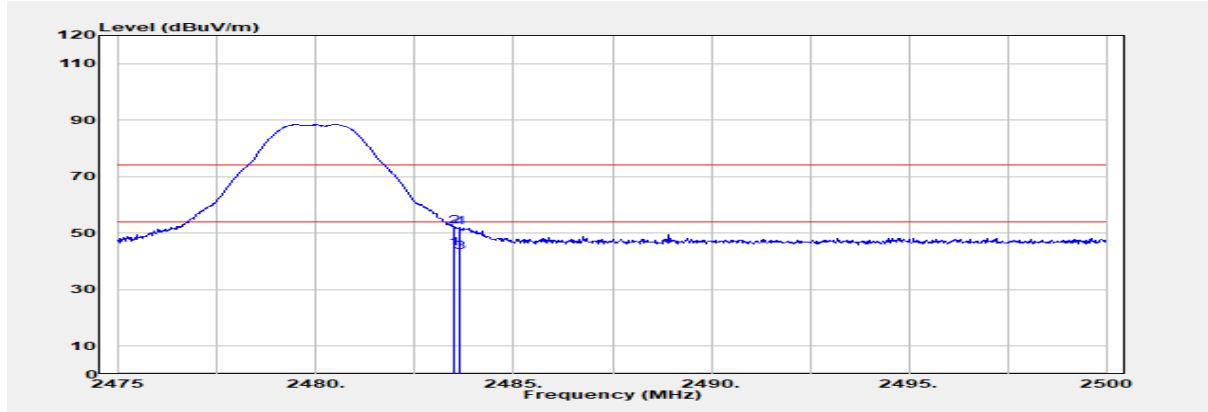
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-02-01  
 Temp./Humi. :22.9°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	49.76	-5.30	44.46	54.00	-9.54
2483.500	Peak	57.51	-5.30	52.21	74.00	-21.79
2483.650	Average	48.49	-5.31	43.18	54.00	-10.82
2483.650	Peak	57.27	-5.31	51.97	74.00	-22.03

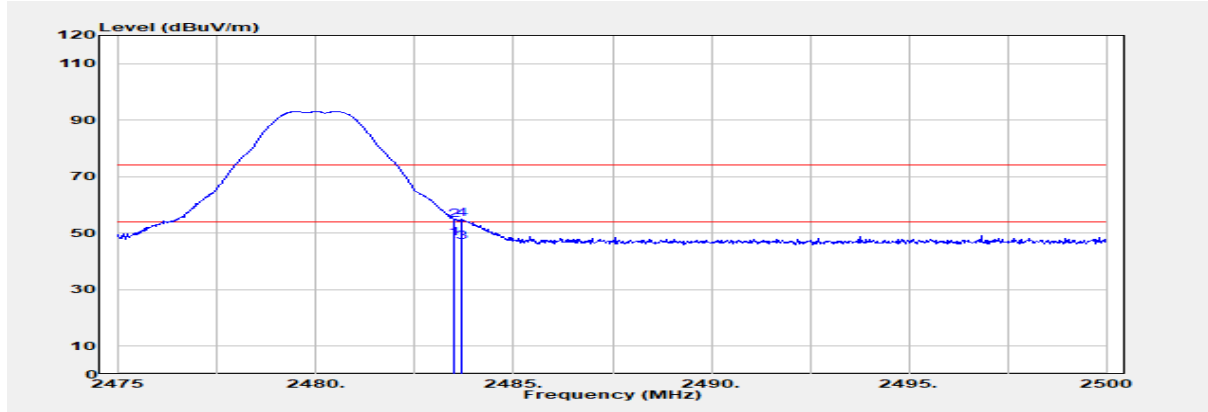
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-02-01  
 Temp./Humi. :22.9°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	53.59	-5.30	48.28	54.00	-5.72
2483.500	Peak	60.00	-5.30	54.70	74.00	-19.30
2483.675	Average	52.06	-5.31	46.76	54.00	-7.24
2483.675	Peak	60.33	-5.31	55.02	74.00	-18.98

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.

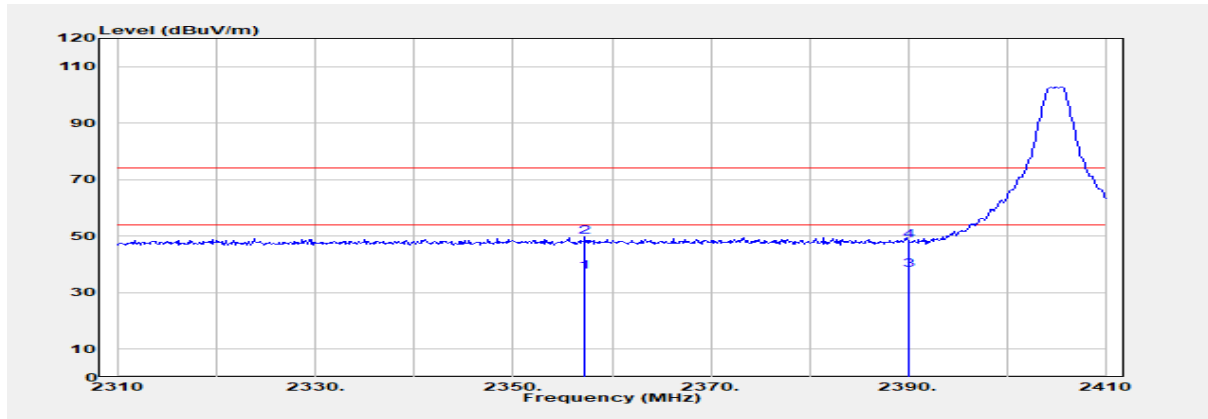
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Port 1 (monopole)

Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



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
2357.280	Average	42.33	-4.79	37.54	54.00	-16.46
2357.280	Peak	54.41	-4.79	49.62	74.00	-24.38
2390.000	Average	42.58	-4.58	37.99	54.00	-16.01
2390.000	Peak	53.11	-4.58	48.52	74.00	-25.48

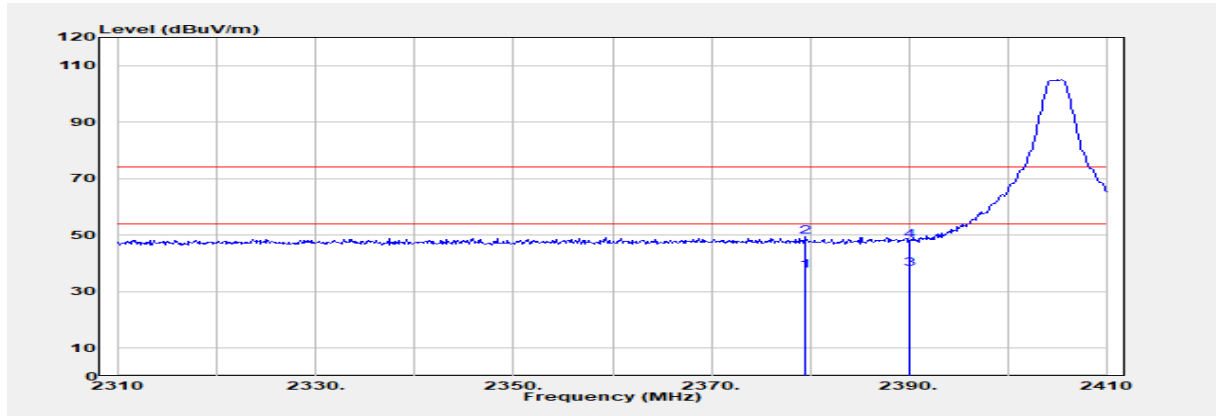
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



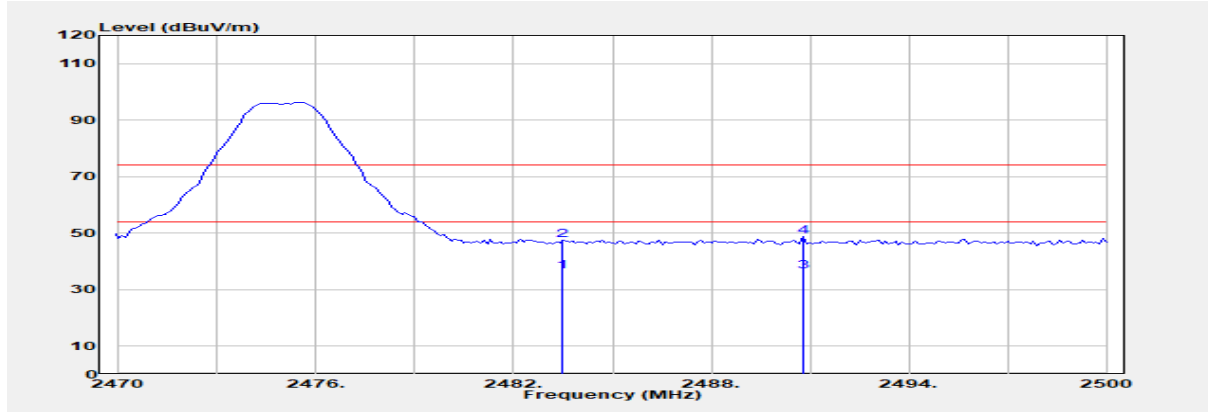
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2379.480	Average	42.07	-4.65	37.42	54.00	-16.58
2379.480	Peak	54.01	-4.65	49.36	74.00	-24.64
2390.000	Average	42.76	-4.58	38.18	54.00	-15.82
2390.000	Peak	52.81	-4.58	48.23	74.00	-25.77

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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	41.76	-5.30	36.46	54.00	-17.54
2483.500	Peak	52.87	-5.30	47.56	74.00	-26.44
2490.800	Average	41.68	-5.36	36.32	54.00	-17.68
2490.800	Peak	54.09	-5.36	48.73	74.00	-25.27

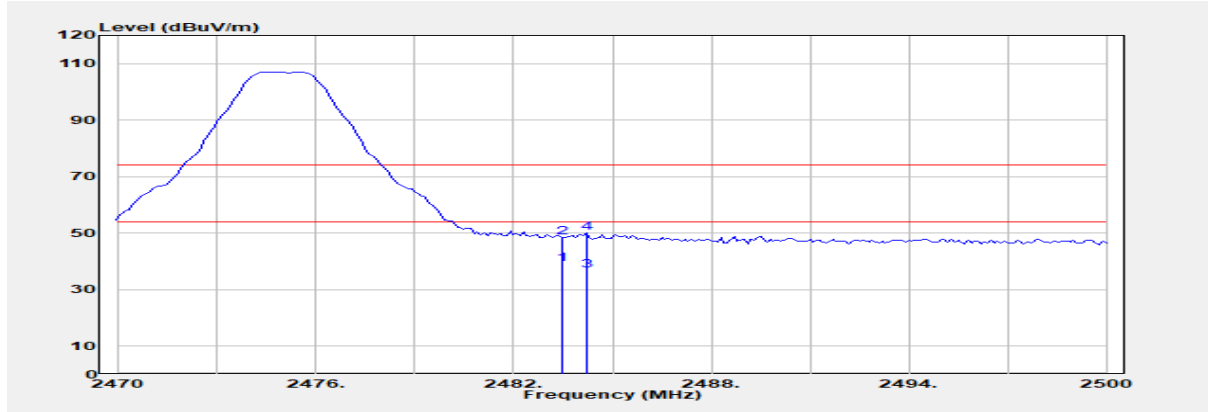
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	44.25	-5.30	38.95	54.00	-15.05
2483.500	Peak	53.74	-5.30	48.44	74.00	-25.56
2484.200	Average	42.06	-5.31	36.75	54.00	-17.25
2484.200	Peak	55.26	-5.31	49.95	74.00	-24.05

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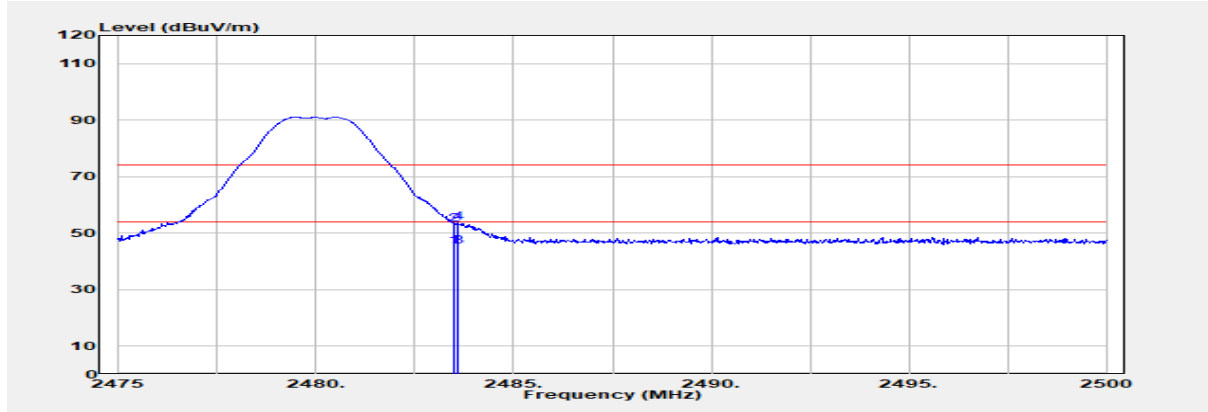
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



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	50.60	-5.30	45.30	54.00	-8.70
2483.500	Peak	58.42	-5.30	53.12	74.00	-20.88
2483.600	Average	50.60	-5.31	45.30	54.00	-8.70
2483.600	Peak	59.04	-5.31	53.73	74.00	-20.27

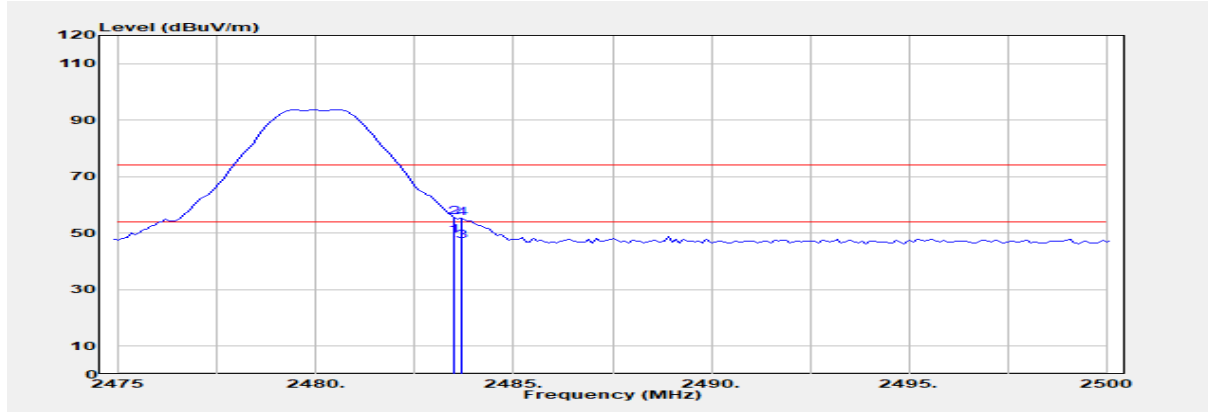
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	54.38	-5.30	49.08	54.00	-4.92
2483.500	Peak	60.92	-5.30	55.62	74.00	-18.38
2483.700	Average	52.44	-5.31	47.14	54.00	-6.86
2483.700	Peak	60.57	-5.31	55.26	74.00	-18.74

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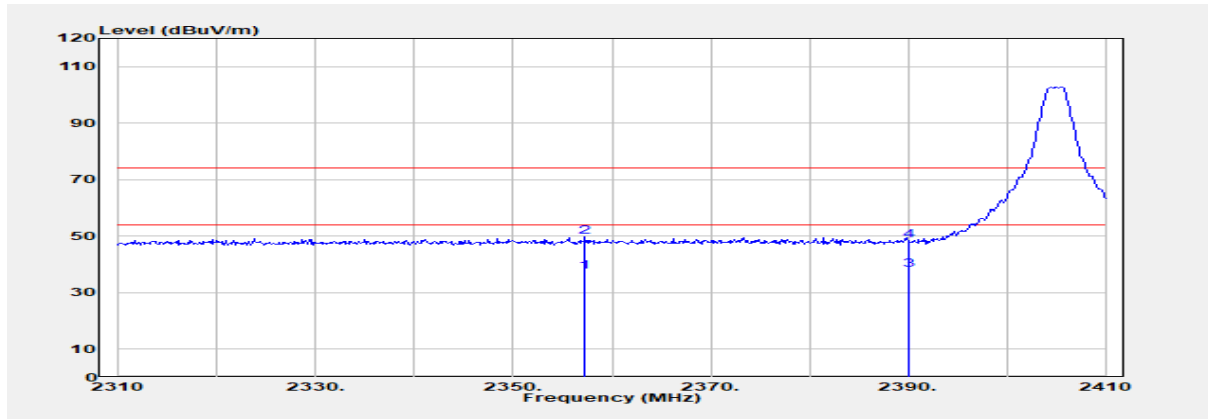
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**Port 2 (Dipole)**

Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2357.280	Average	42.33	-4.79	37.54	54.00	-16.46
2357.280	Peak	54.41	-4.79	49.62	74.00	-24.38
2390.000	Average	42.58	-4.58	37.99	54.00	-16.01
2390.000	Peak	53.11	-4.58	48.52	74.00	-25.48

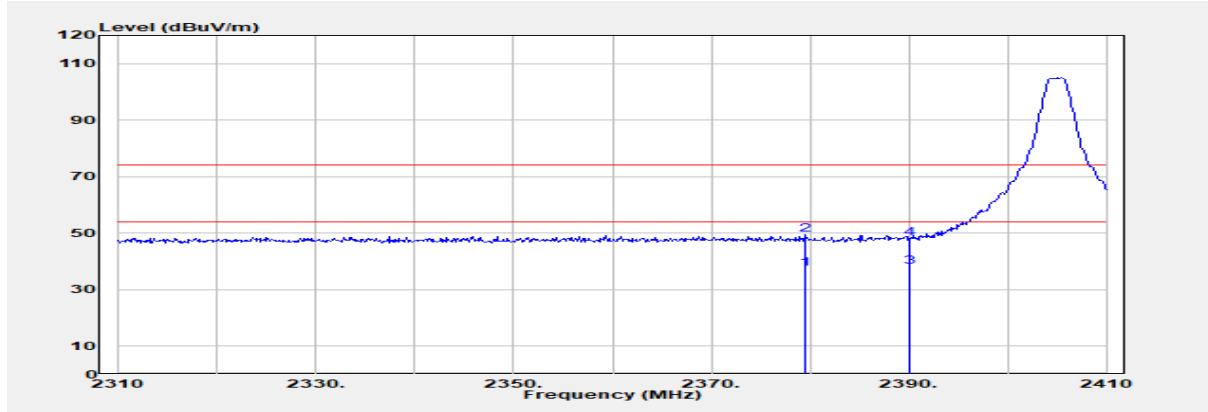
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2379.480	Average	42.07	-4.65	37.42	54.00	-16.58
2379.480	Peak	54.01	-4.65	49.36	74.00	-24.64
2390.000	Average	42.76	-4.58	38.18	54.00	-15.82
2390.000	Peak	52.81	-4.58	48.23	74.00	-25.77

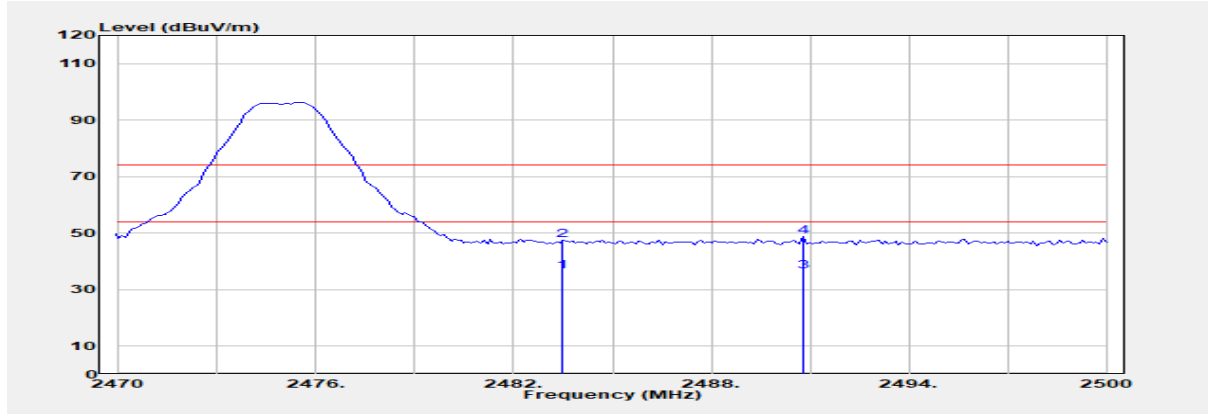
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	41.76	-5.30	36.46	54.00	-17.54
2483.500	Peak	52.87	-5.30	47.56	74.00	-26.44
2490.800	Average	41.68	-5.36	36.32	54.00	-17.68
2490.800	Peak	54.09	-5.36	48.73	74.00	-25.27

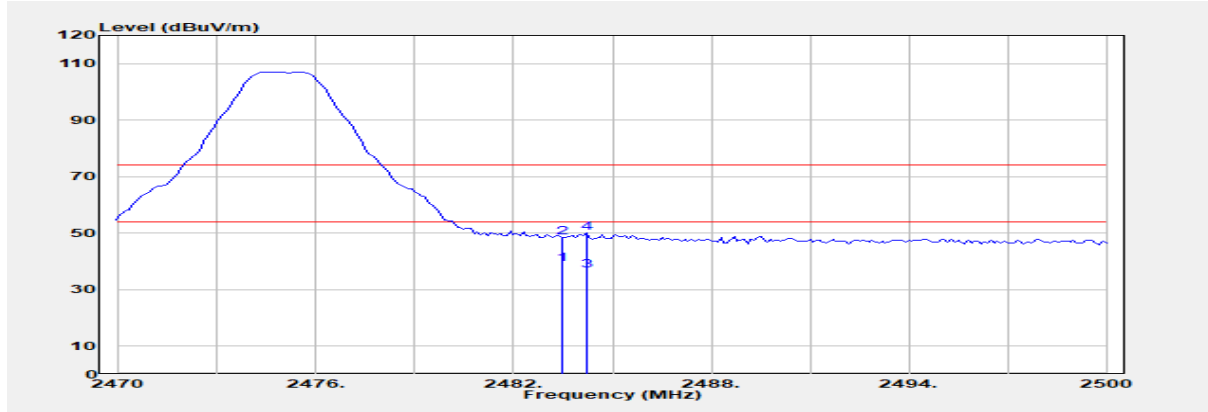
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	44.25	-5.30	38.95	54.00	-15.05
2483.500	Peak	53.74	-5.30	48.44	74.00	-25.56
2484.200	Average	42.06	-5.31	36.75	54.00	-17.25
2484.200	Peak	55.26	-5.31	49.95	74.00	-24.05

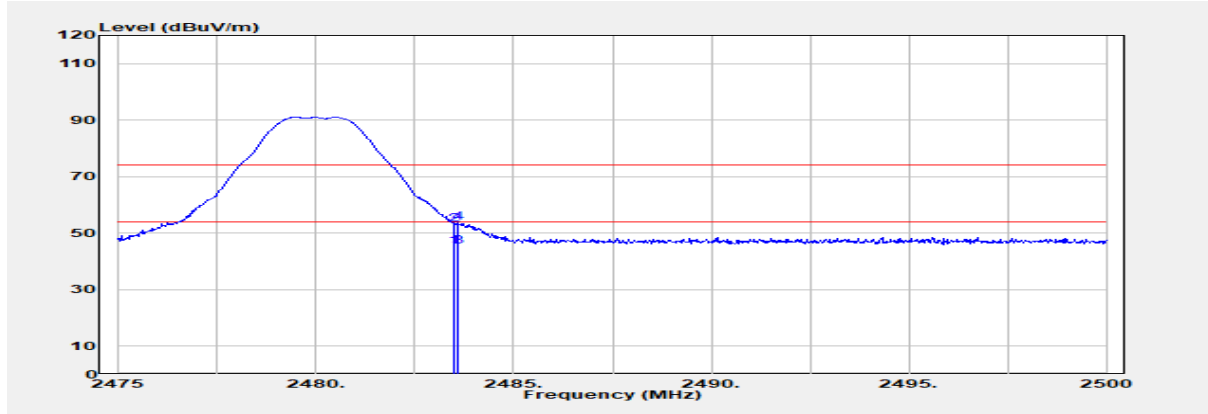
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



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	50.60	-5.30	45.30	54.00	-8.70
2483.500	Peak	58.42	-5.30	53.12	74.00	-20.88
2483.600	Average	50.60	-5.31	45.30	54.00	-8.70
2483.600	Peak	59.04	-5.31	53.73	74.00	-20.27

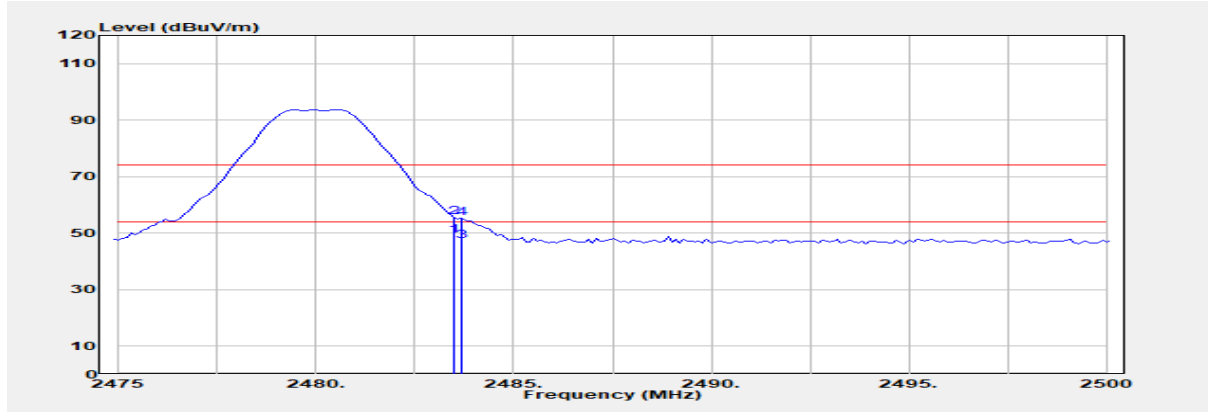
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3°C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



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	54.38	-5.30	49.08	54.00	-4.92
2483.500	Peak	60.92	-5.30	55.62	74.00	-18.38
2483.700	Average	52.44	-5.31	47.14	54.00	-6.86
2483.700	Peak	60.57	-5.31	55.26	74.00	-18.74

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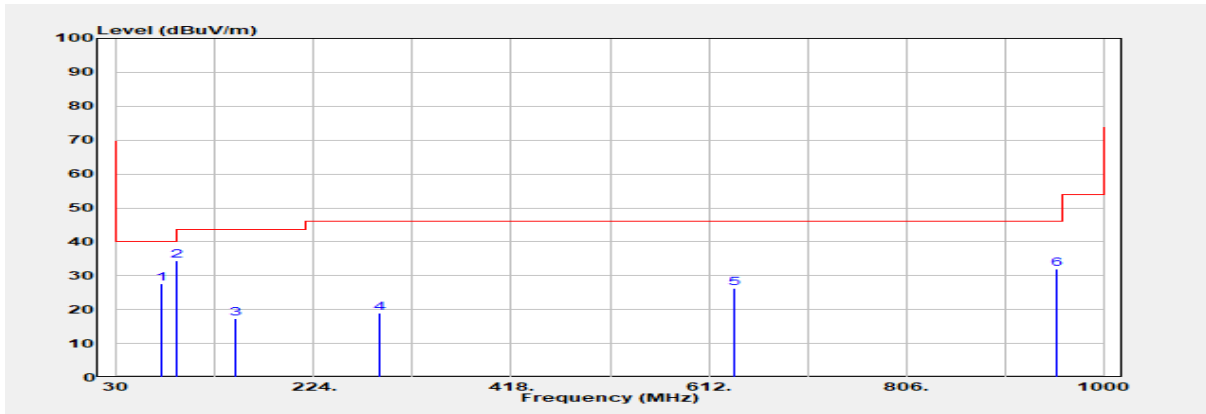
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### 11.6.2 Radiated Spurious Emission

#### Port 1 (Dipole)

Report Number	:TERF2312003242E2	Test Site	:SAC D
Operation Mode	:Zigbee	Test Date	:2024-01-31
Test Frequency	:2440 MHz	Temp./Humi.	:23.2 °C/63%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
74.620	Peak	48.21	-20.57	27.64	40.00	-12.36
89.170	Peak	57.14	-22.76	34.39	43.50	-9.11
147.370	Peak	33.48	-16.03	17.45	43.50	-26.05
288.020	Peak	34.88	-15.96	18.91	46.00	-27.09
637.220	Peak	34.47	-8.28	26.19	46.00	-19.81
954.410	Peak	36.03	-4.06	31.97	46.00	-14.03

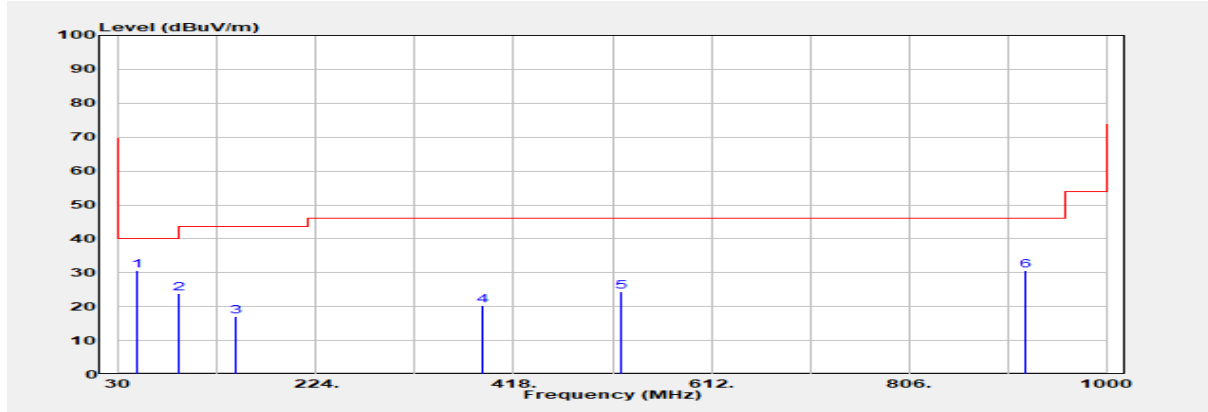
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-31  
 Temp./Humi. :23.2 °C/63%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
47.460	Peak	47.33	-16.83	30.51	40.00	-9.49
89.170	Peak	46.72	-22.76	23.96	43.50	-19.54
145.430	Peak	33.57	-16.37	17.20	43.50	-26.30
386.960	Peak	33.88	-13.53	20.35	46.00	-25.65
523.730	Peak	35.02	-10.64	24.38	46.00	-21.62
921.430	Peak	35.09	-4.37	30.72	46.00	-15.28

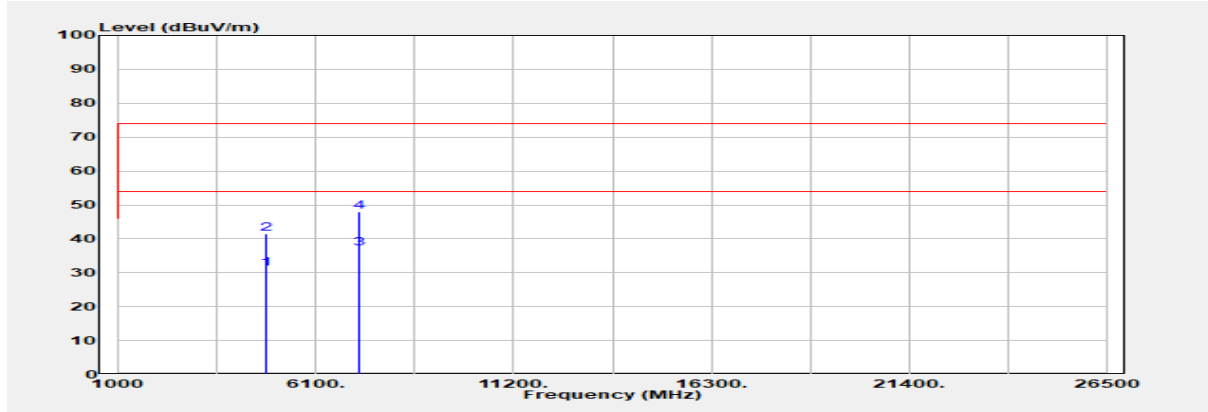
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-31  
 Temp./Humi. :23.2 °C/63%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4810.000	Average	30.08	1.02	31.10	54.00	-22.90
4810.000	Peak	40.37	1.02	41.38	74.00	-32.62
7215.000	Average	28.91	8.23	37.14	54.00	-16.86
7215.000	Peak	39.83	8.23	48.06	74.00	-25.94

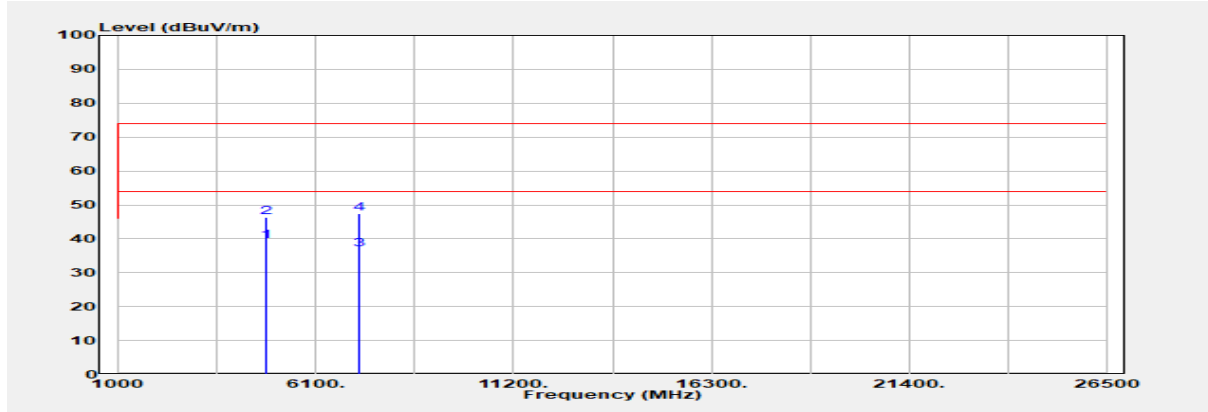
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-31  
 Temp./Humi. :23.2 °C/63%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4810.000	Average	38.41	1.02	39.42	54.00	-14.58
4810.000	Peak	45.24	1.02	46.25	74.00	-27.75
7215.000	Average	28.57	8.23	36.80	54.00	-17.20
7215.000	Peak	39.23	8.23	47.46	74.00	-26.54

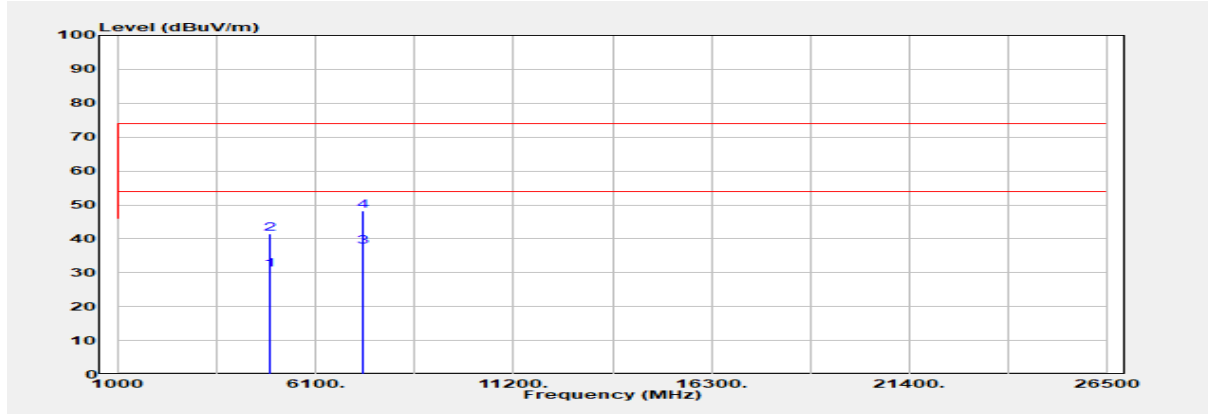
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-02-01  
 Temp./Humi. :23.2 °C/63%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4880.000	Average	29.77	1.00	30.77	54.00	-23.23
4880.000	Peak	40.50	1.00	41.50	74.00	-32.50
7320.000	Average	28.50	9.04	37.54	54.00	-16.46
7320.000	Peak	39.08	9.04	48.12	74.00	-25.88

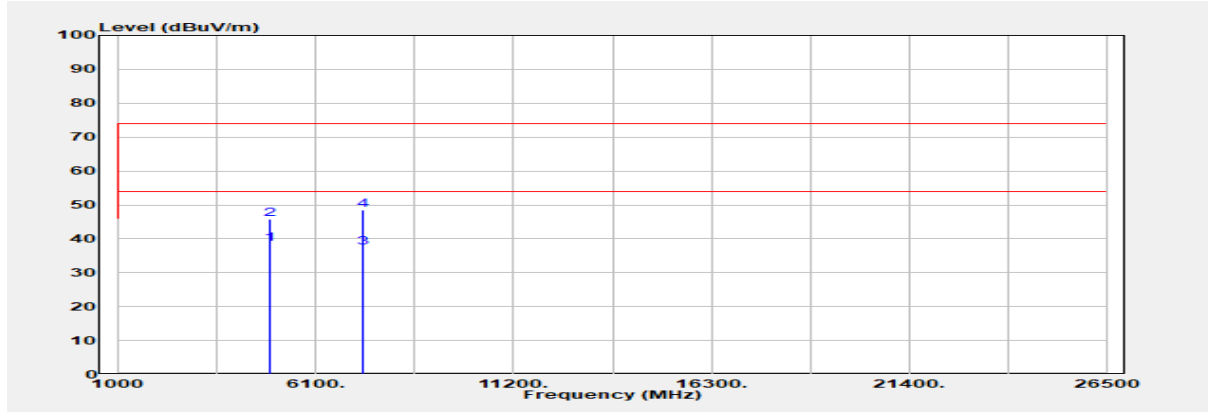
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-02-01  
 Temp./Humi. :23.2 °C/63%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4880.000	Average	37.49	1.00	38.49	54.00	-15.51
4880.000	Peak	44.78	1.00	45.78	74.00	-28.22
7320.000	Average	28.40	9.04	37.43	54.00	-16.57
7320.000	Peak	39.34	9.04	48.38	74.00	-25.62

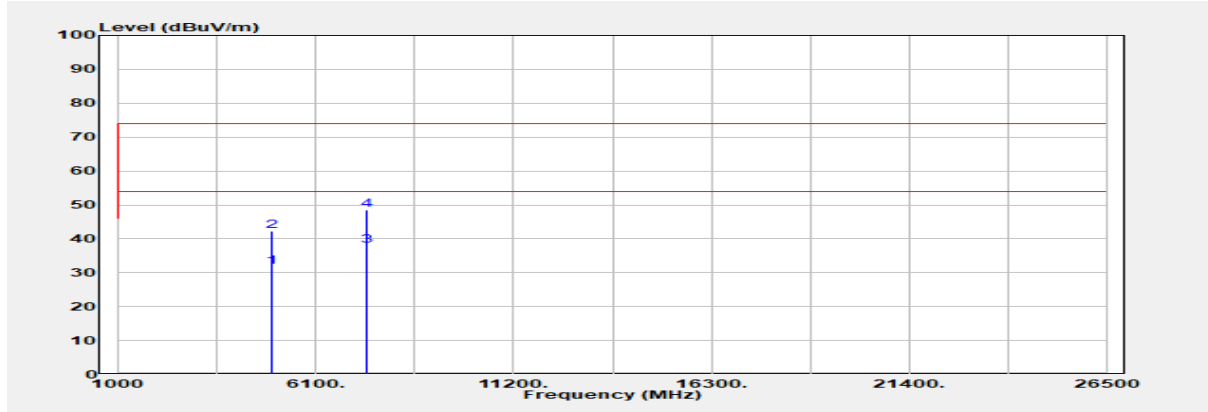
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-02-01  
 Temp./Humi. :23.2 °C/63%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4950.000	Average	29.99	1.76	31.74	54.00	-22.26
4950.000	Peak	40.54	1.76	42.29	74.00	-31.71
7425.000	Average	28.19	9.75	37.94	54.00	-16.06
7425.000	Peak	38.66	9.75	48.41	74.00	-25.59

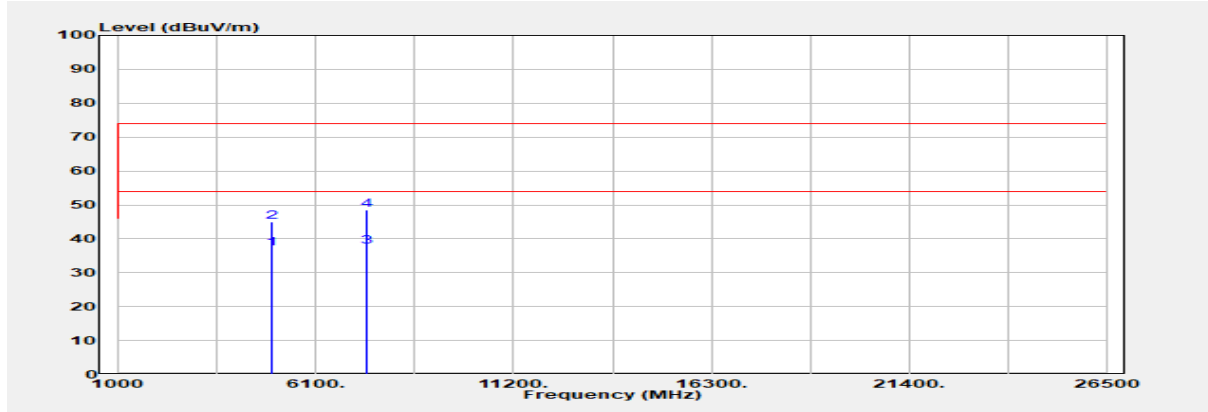
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-02-01  
 Temp./Humi. :23.2 °C/63%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4950.000	Average	35.48	1.76	37.23	54.00	-16.77
4950.000	Peak	43.21	1.76	44.97	74.00	-29.03
7425.000	Average	27.98	9.75	37.73	54.00	-16.27
7425.000	Peak	38.64	9.75	48.39	74.00	-25.61

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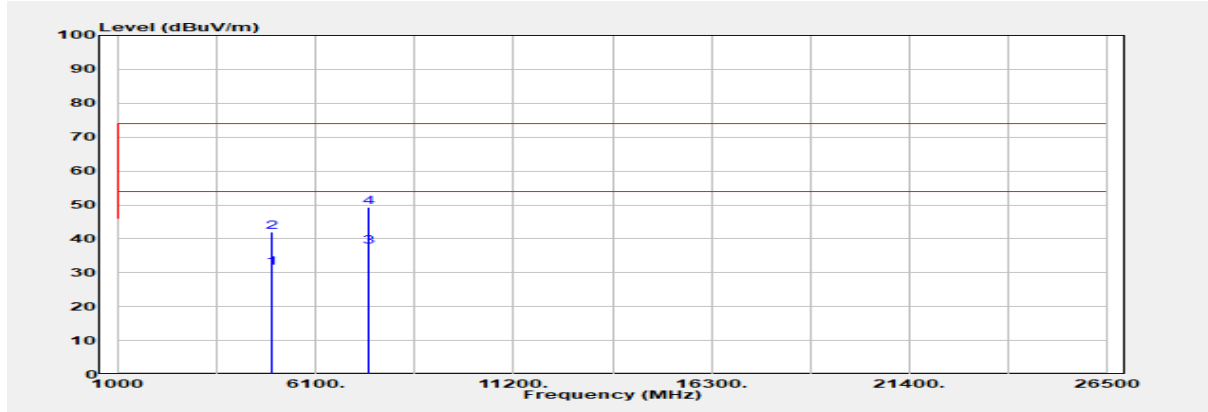
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-02-01  
 Temp./Humi. :23.2 °C/63%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



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
4960.000	Average	29.57	1.87	31.43	54.00	-22.57
4960.000	Peak	40.26	1.87	42.13	74.00	-31.87
7440.000	Average	27.72	9.98	37.70	54.00	-16.30
7440.000	Peak	39.25	9.98	49.23	74.00	-24.77

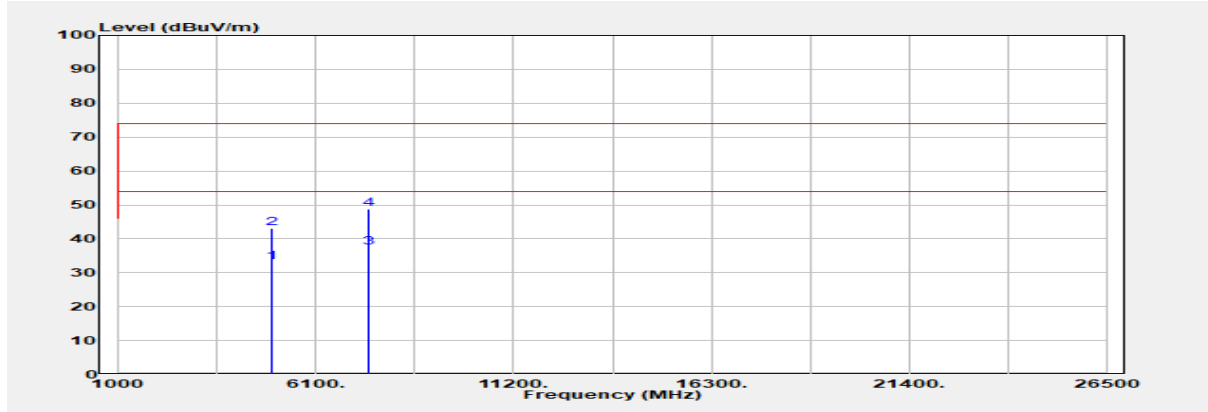
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-02-01  
 Temp./Humi. :23.2 °C/63%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



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
4960.000	Average	31.24	1.87	33.11	54.00	-20.89
4960.000	Peak	41.12	1.87	42.99	74.00	-31.01
7440.000	Average	27.49	9.98	37.47	54.00	-16.53
7440.000	Peak	38.86	9.98	48.85	74.00	-25.15

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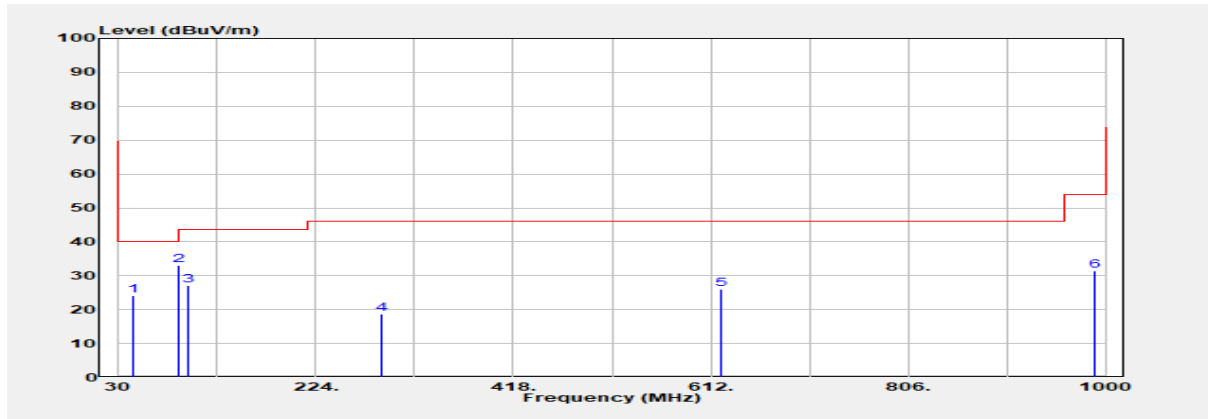
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Port 1 (monopole)

Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-10  
 Temp./Humi. :22.2°C/51%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
44.550	Peak	41.20	-16.97	24.23	40.00	-15.77
89.170	Peak	55.95	-22.76	33.20	43.50	-10.30
98.870	Peak	49.20	-22.22	26.98	43.50	-16.52
288.020	Peak	34.58	-15.96	18.61	46.00	-27.39
622.670	Peak	34.29	-8.15	26.14	46.00	-19.86
990.300	Peak	35.59	-4.13	31.46	54.00	-22.54

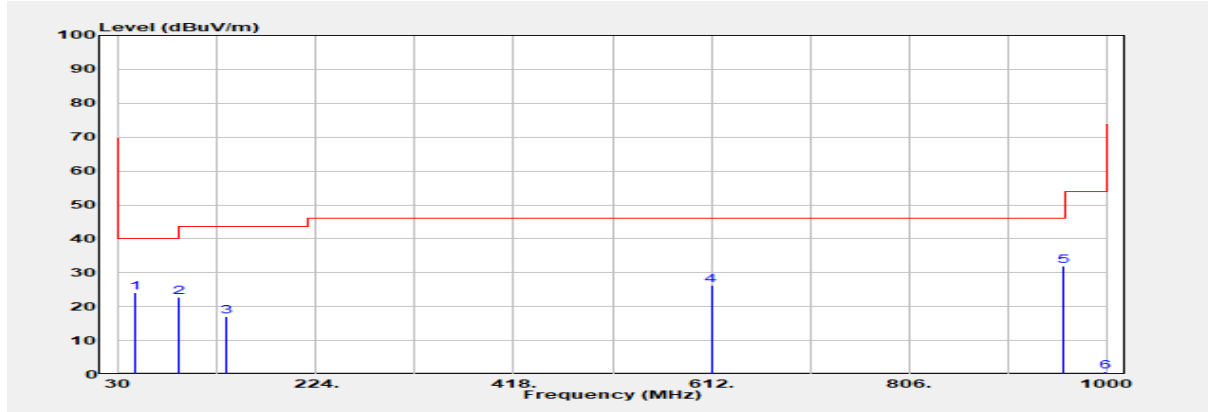
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-10  
 Temp./Humi. :22.2°C/51%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
45.520	Peak	40.90	-16.90	24.00	40.00	-16.00
89.170	Peak	45.40	-22.76	22.64	43.50	-20.86
135.730	Peak	34.07	-17.10	16.97	43.50	-26.53
612.000	Peak	34.72	-8.43	26.29	46.00	-19.71
958.290	Peak	35.85	-3.98	31.87	46.00	-14.13
999.030	Peak	534.19	-533.28	0.92	54.00	-53.08

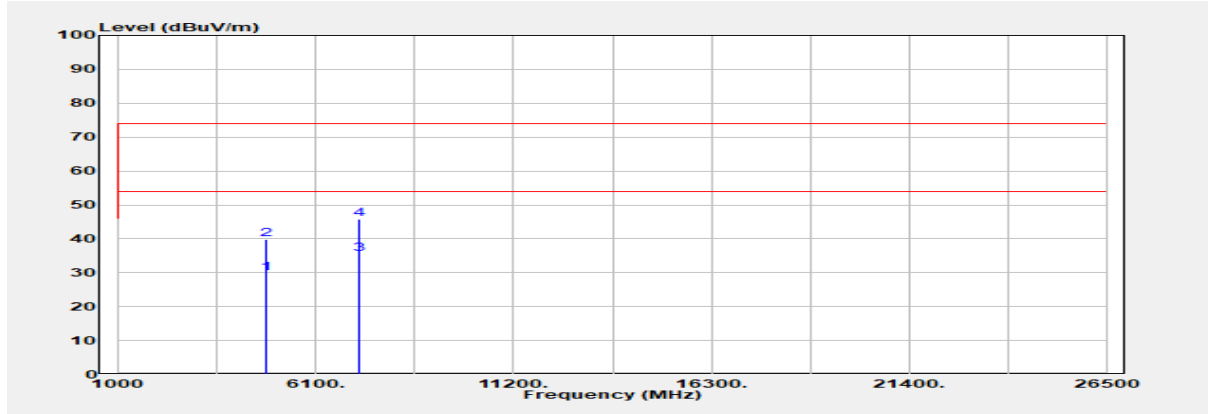
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-10  
 Temp./Humi. :22.2°C/51%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4810.000	Average	28.78	1.02	29.80	54.00	-24.20
4810.000	Peak	38.95	1.02	39.97	74.00	-34.03
7215.000	Average	27.29	8.23	35.52	54.00	-18.48
7215.000	Peak	37.61	8.23	45.84	74.00	-28.16

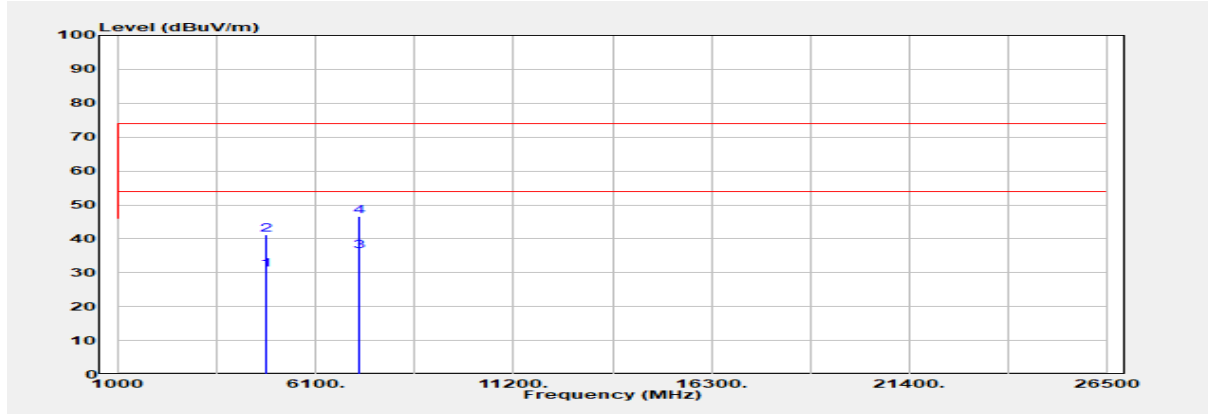
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-10  
 Temp./Humi. :22.2°C/51%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4810.000	Average	29.91	1.02	30.93	54.00	-23.07
4810.000	Peak	40.19	1.02	41.21	74.00	-32.79
7215.000	Average	28.21	8.23	36.44	54.00	-17.56
7215.000	Peak	38.50	8.23	46.73	74.00	-27.27

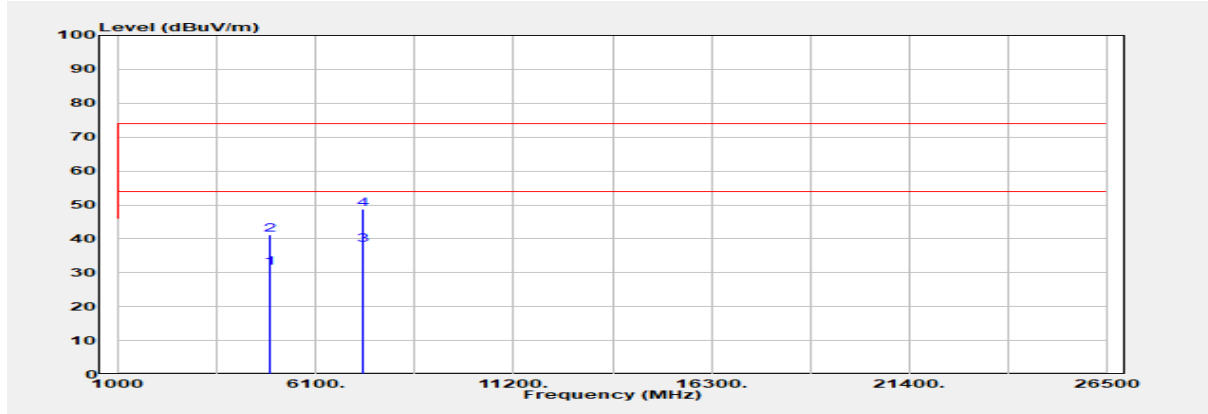
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-10  
 Temp./Humi. :22.2°C/51%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4880.000	Average	30.30	1.00	31.31	54.00	-22.69
4880.000	Peak	40.31	1.00	41.31	74.00	-32.69
7320.000	Average	29.22	9.04	38.25	54.00	-15.75
7320.000	Peak	39.68	9.04	48.72	74.00	-25.28

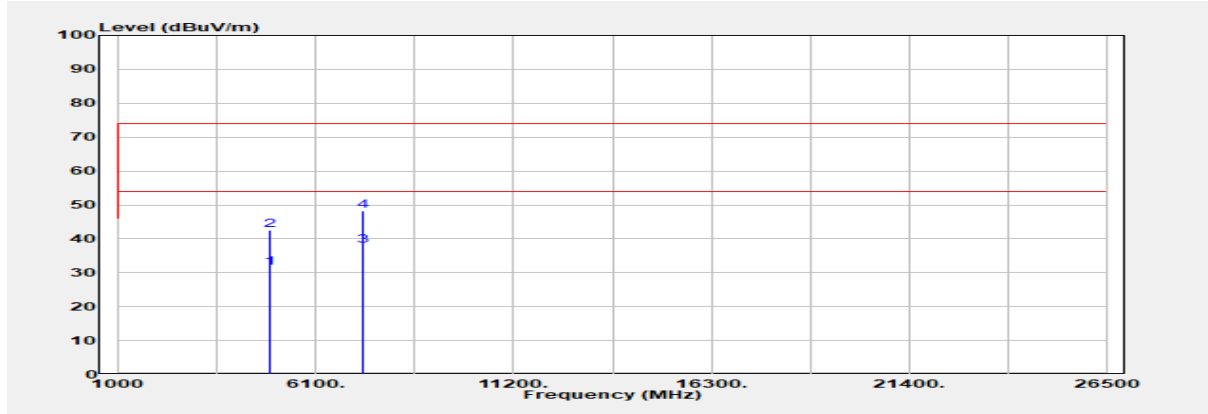
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-10  
 Temp./Humi. :22.2°C/51%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4880.000	Average	30.53	1.00	31.54	54.00	-22.46
4880.000	Peak	41.61	1.00	42.61	74.00	-31.39
7320.000	Average	28.81	9.04	37.84	54.00	-16.16
7320.000	Peak	39.14	9.04	48.18	74.00	-25.82

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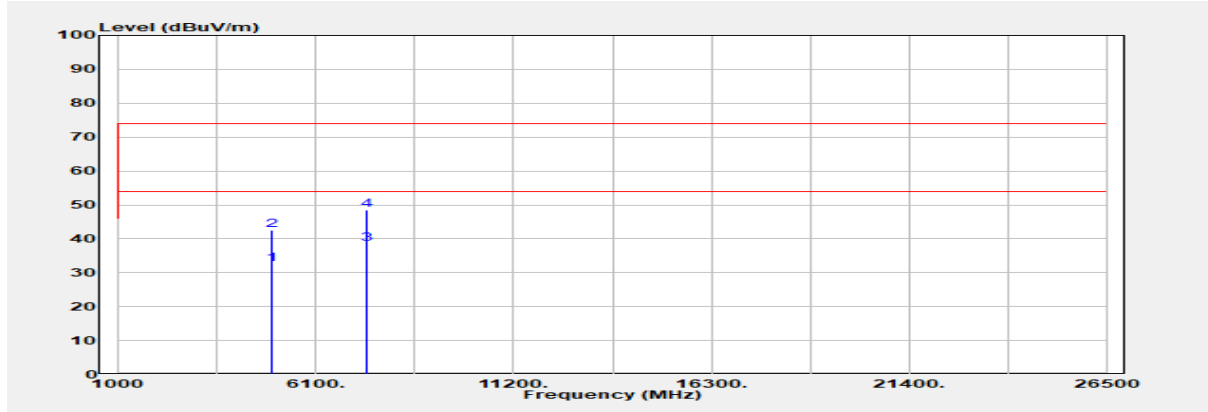
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-10  
 Temp./Humi. :22.2°C/51%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4950.000	Average	30.64	1.76	32.40	54.00	-21.60
4950.000	Peak	40.69	1.76	42.44	74.00	-31.56
7425.000	Average	28.71	9.75	38.46	54.00	-15.54
7425.000	Peak	38.67	9.75	48.42	74.00	-25.58

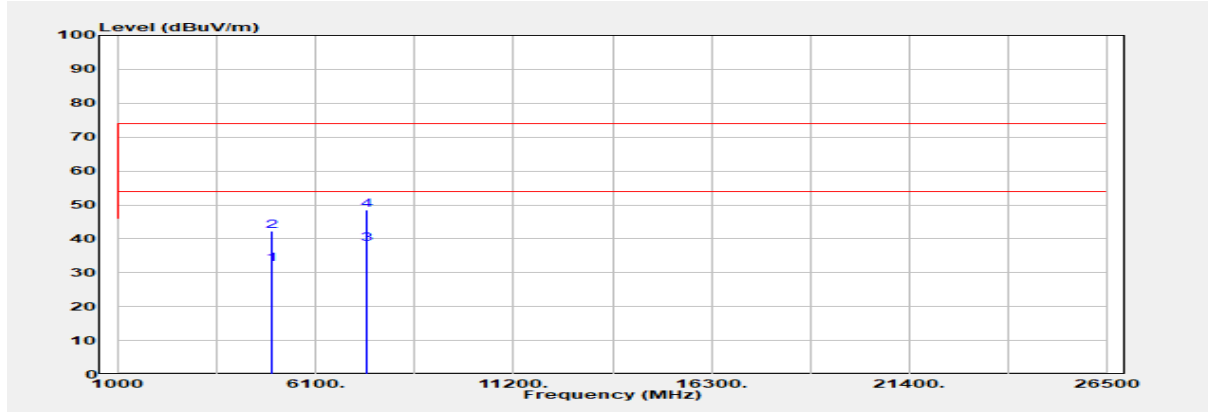
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-10  
 Temp./Humi. :22.2°C/51%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



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
4950.000	Average	30.67	1.76	32.43	54.00	-21.57
4950.000	Peak	40.49	1.76	42.24	74.00	-31.76
7425.000	Average	28.80	9.75	38.55	54.00	-15.45
7425.000	Peak	38.85	9.75	48.60	74.00	-25.40

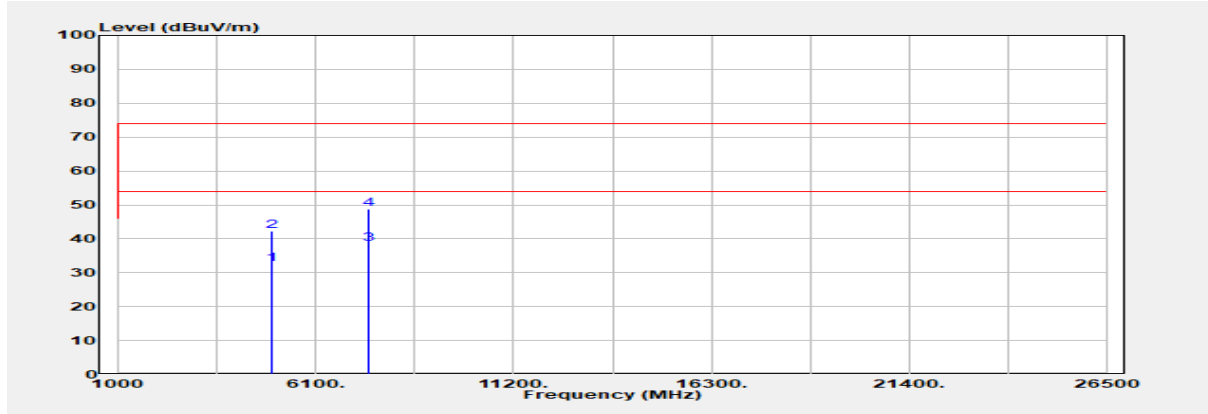
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-10  
 Temp./Humi. :22.2°C/51%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



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
4960.000	Average	30.70	1.87	32.56	54.00	-21.44
4960.000	Peak	40.36	1.87	42.22	74.00	-31.78
7440.000	Average	28.43	9.98	38.41	54.00	-15.59
7440.000	Peak	38.67	9.98	48.66	74.00	-25.34

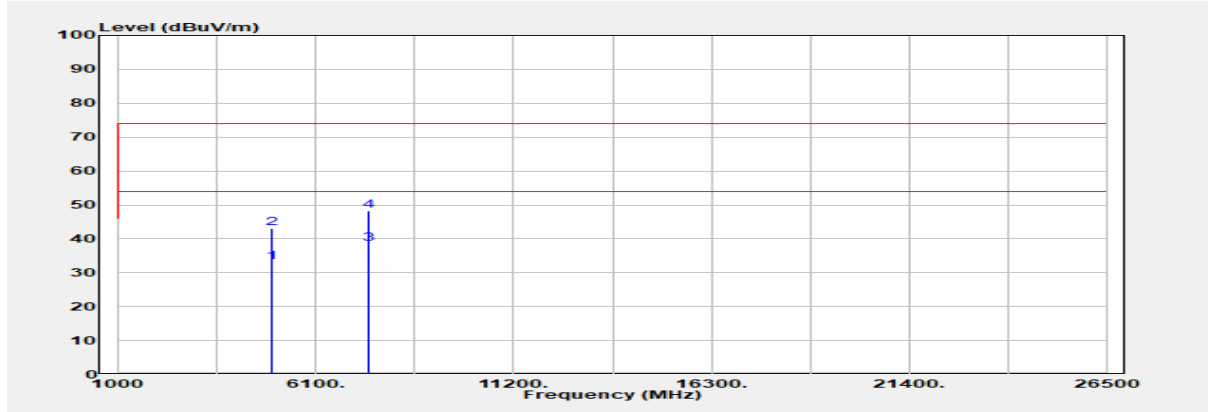
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-10  
 Temp./Humi. :22.2°C/51%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.000	Average	31.31	1.87	33.18	54.00	-20.82
4960.000	Peak	41.11	1.87	42.98	74.00	-31.02
7440.000	Average	28.56	9.98	38.54	54.00	-15.46
7440.000	Peak	38.33	9.98	48.31	74.00	-25.69

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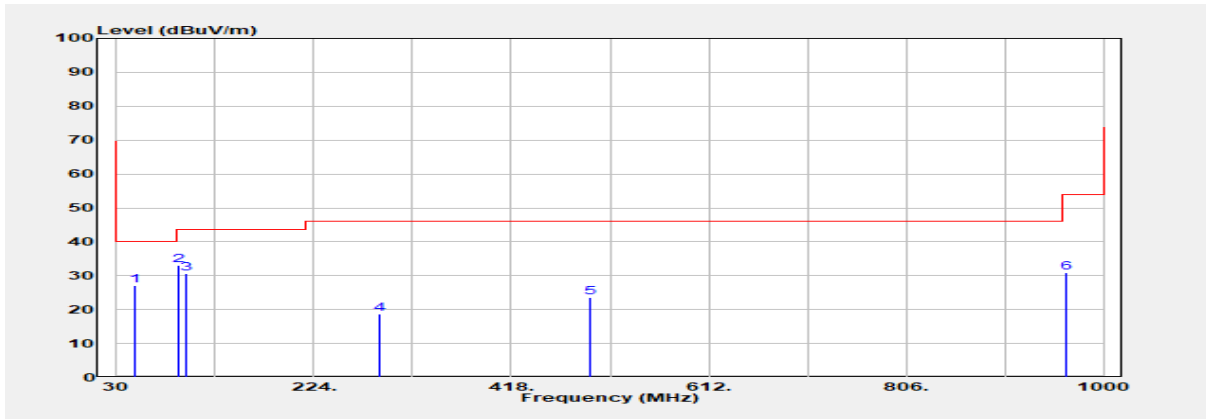
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Port 2 (Dipole)

Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3 °C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
47.460	Peak	43.89	-16.83	27.06	40.00	-12.94
90.140	Peak	55.86	-22.67	33.18	43.50	-10.32
98.870	Peak	52.75	-22.22	30.53	43.50	-12.97
288.020	Peak	34.61	-15.96	18.64	46.00	-27.36
494.630	Peak	35.12	-11.56	23.57	46.00	-22.43
964.110	Peak	34.88	-4.12	30.76	54.00	-23.24

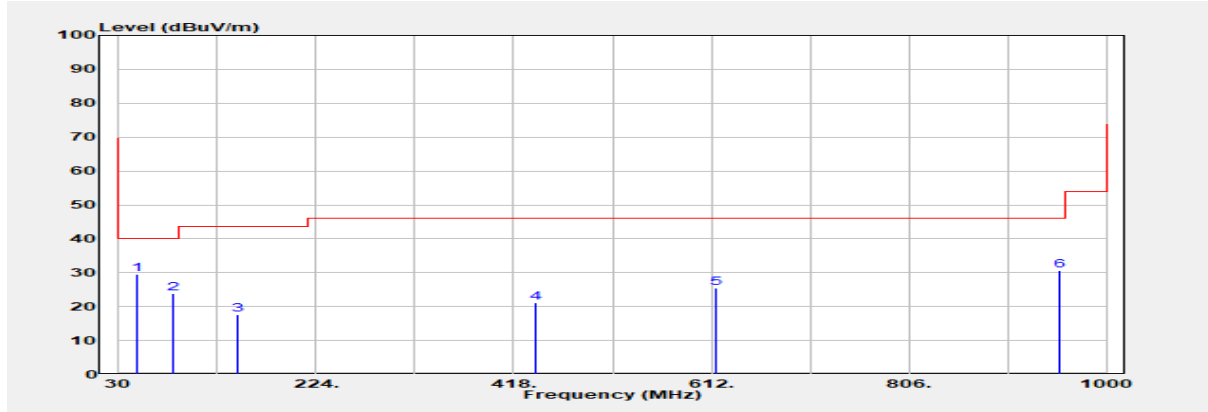
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3 °C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
47.460	Peak	46.48	-16.83	29.65	40.00	-10.35
83.350	Peak	46.06	-22.31	23.75	40.00	-16.25
147.370	Peak	33.67	-16.03	17.64	43.50	-25.86
440.310	Peak	33.11	-11.98	21.13	46.00	-24.87
615.880	Peak	33.78	-8.22	25.56	46.00	-20.44
953.440	Peak	34.75	-4.08	30.67	46.00	-15.33

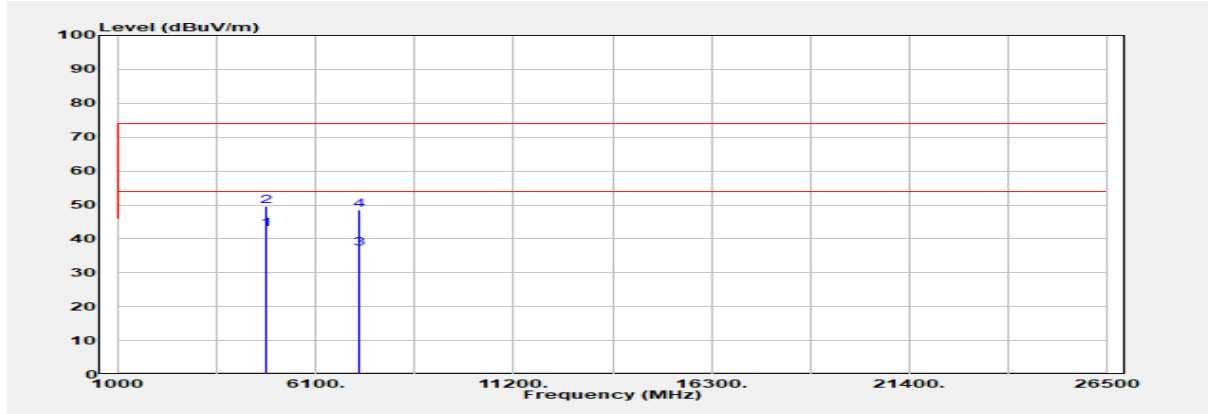
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3 °C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4810.000	Average	41.88	1.02	42.89	54.00	-11.11
4810.000	Peak	48.50	1.02	49.52	74.00	-24.48
7215.000	Average	28.99	8.23	37.22	54.00	-16.78
7215.000	Peak	40.25	8.23	48.48	74.00	-25.52

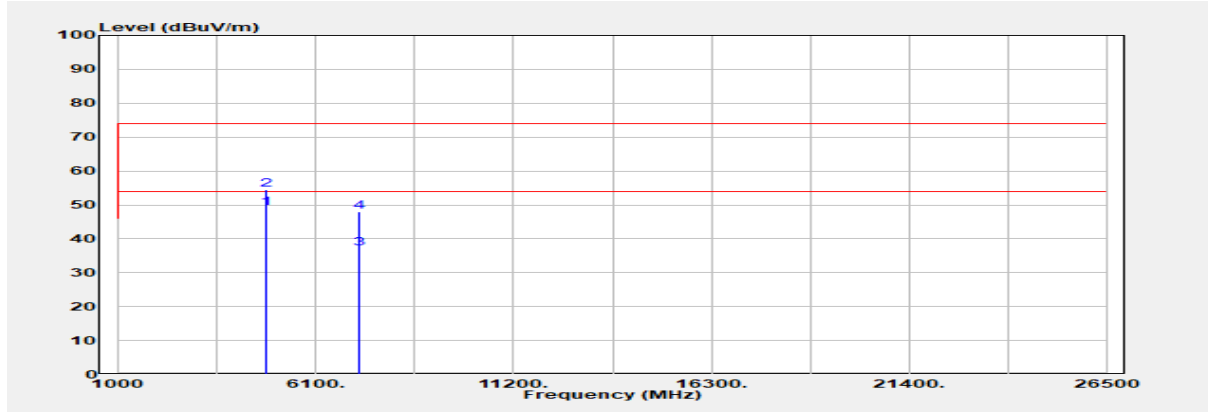
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2405 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3 °C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4810.000	Average	48.08	1.02	49.10	54.00	-4.90
4810.000	Peak	53.42	1.02	54.44	74.00	-19.56
7215.000	Average	28.94	8.23	37.17	54.00	-16.83
7215.000	Peak	39.66	8.23	47.89	74.00	-26.11

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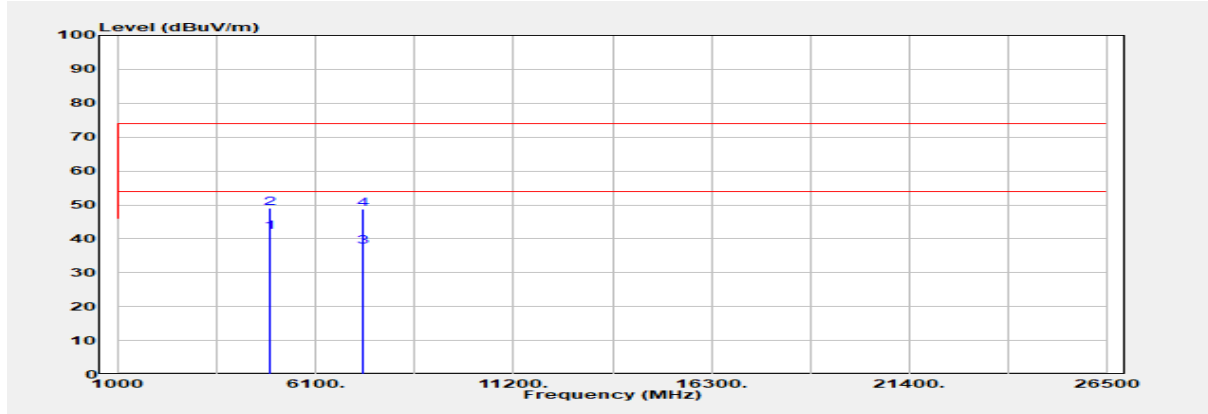
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3 °C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4880.000	Average	41.00	1.00	42.00	54.00	-12.00
4880.000	Peak	48.17	1.00	49.17	74.00	-24.83
7320.000	Average	28.55	9.04	37.59	54.00	-16.41
7320.000	Peak	39.65	9.04	48.69	74.00	-25.31

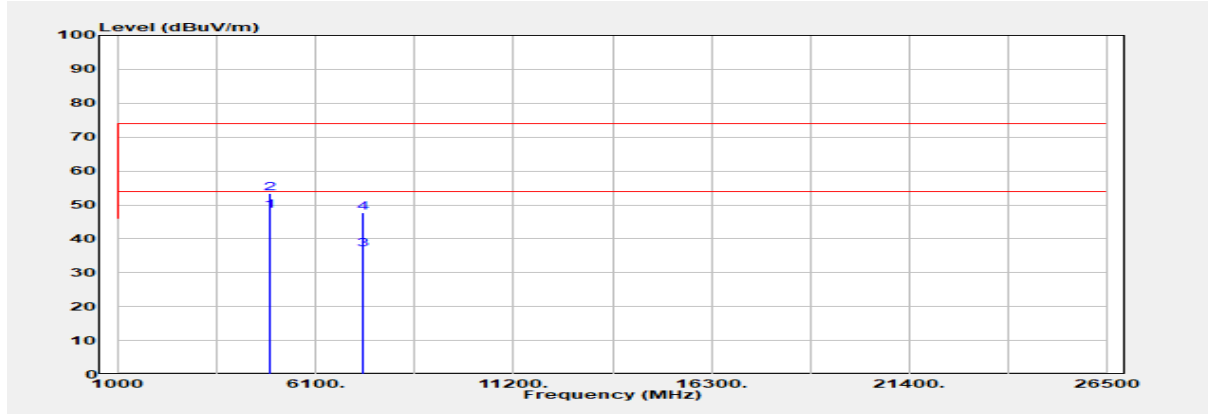
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2440 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3 °C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4880.000	Average	47.24	1.00	48.25	54.00	-5.75
4880.000	Peak	52.50	1.00	53.50	74.00	-20.50
7320.000	Average	27.91	9.04	36.94	54.00	-17.06
7320.000	Peak	38.72	9.04	47.75	74.00	-26.25

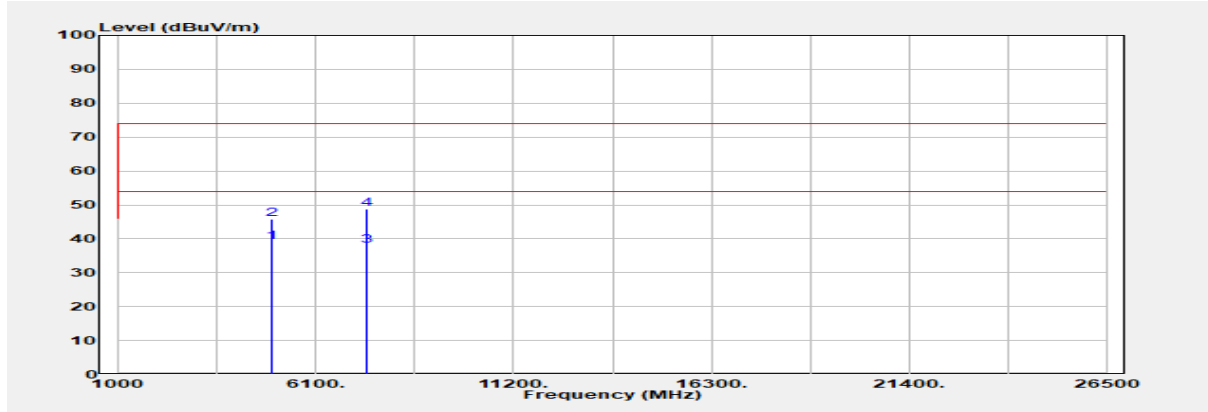
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3 °C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



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
4950.000	Average	37.26	1.76	39.02	54.00	-14.98
4950.000	Peak	43.96	1.76	45.71	74.00	-28.29
7425.000	Average	28.31	9.75	38.06	54.00	-15.94
7425.000	Peak	38.93	9.75	48.68	74.00	-25.32

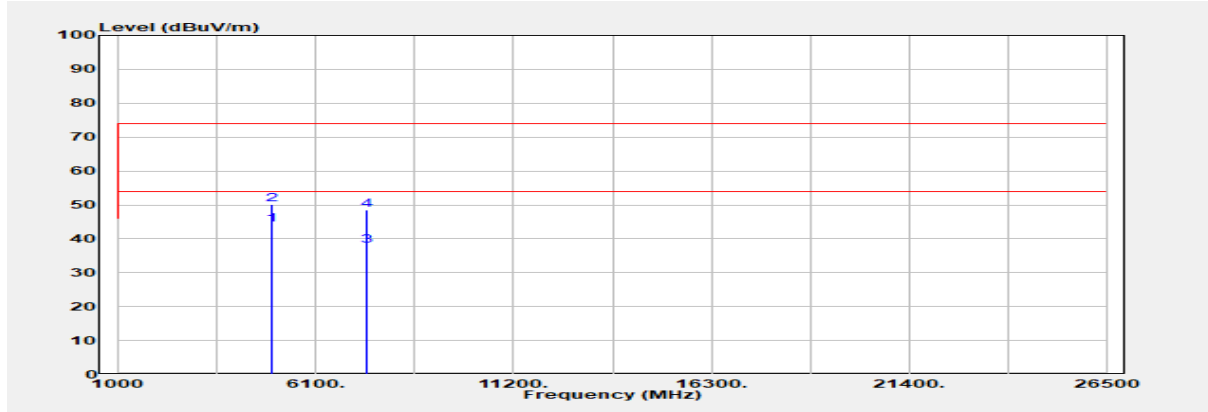
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2475 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3 °C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4950.000	Average	42.43	1.76	44.18	54.00	-9.82
4950.000	Peak	48.49	1.76	50.25	74.00	-23.75
7425.000	Average	28.23	9.75	37.98	54.00	-16.02
7425.000	Peak	38.70	9.75	48.45	74.00	-25.55

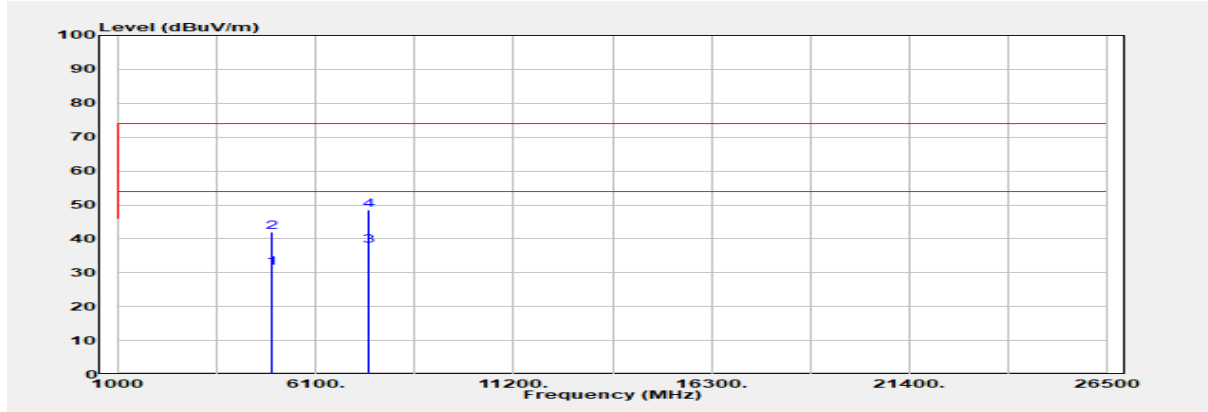
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3 °C/55%  
 Antenna Pol. :Vertical  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.000	Average	29.62	1.87	31.49	54.00	-22.51
4960.000	Peak	40.26	1.87	42.13	74.00	-31.87
7440.000	Average	27.97	9.98	37.95	54.00	-16.05
7440.000	Peak	38.55	9.98	48.54	74.00	-25.46

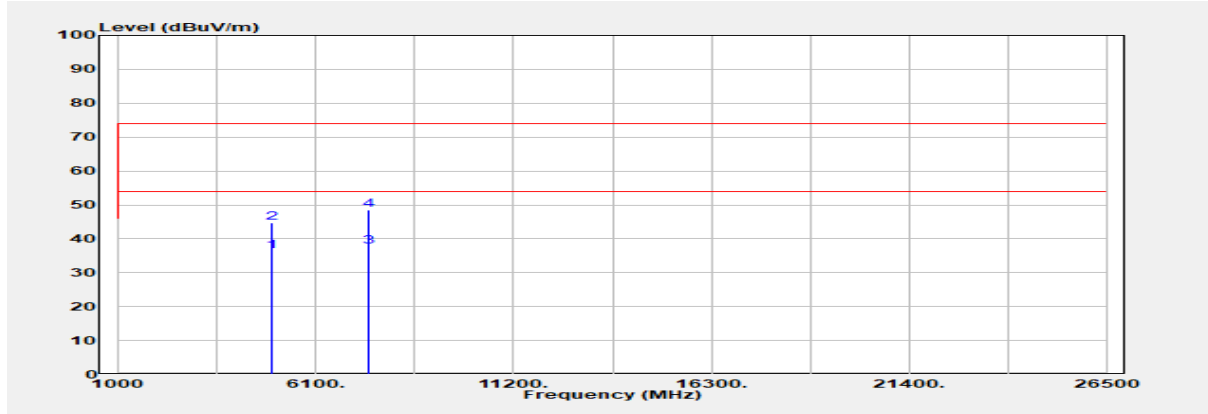
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Report Number :TERF2312003242E2  
 Operation Mode :Zigbee  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2024-01-30  
 Temp./Humi. :24.3 °C/55%  
 Antenna Pol. :Horizontal  
 Engineer :Sam Huang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.000	Average	34.48	1.87	36.35	54.00	-17.65
4960.000	Peak	42.76	1.87	44.62	74.00	-29.38
7440.000	Average	27.78	9.98	37.77	54.00	-16.23
7440.000	Peak	38.63	9.98	48.62	74.00	-25.38

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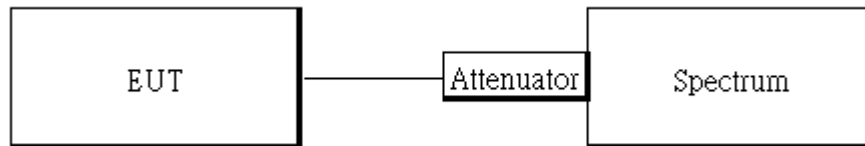
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## 12 POWER SPECTRAL DENSITY

### 12.1 Standard Applicable:

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.

### 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. & the VBW = 10 kHz
5. For defining Restricted Band Edge Limit:  
Set the RBW = 100kHz & VBW = 300 kHz.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level.

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**12.4 Measurement Result:**

**Port 1**

**Zigbee mode**

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2405	-1.890	8	PASS
2440	-1.850	8	PASS
2480	-19.220	8	PASS

**\*Note:**

*1.cable loss as 10.8dB that offsets in the spectrum*

**Port 2**

**Zigbee mode**

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2405	-3.670	8	PASS
2440	-1.930	8	PASS
2480	-16.610	8	PASS

**\*Note:**

*1.cable loss as 10.8dB that offsets in the spectrum*

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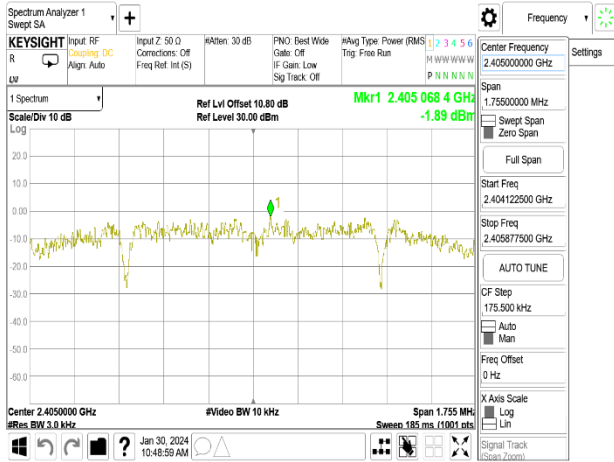
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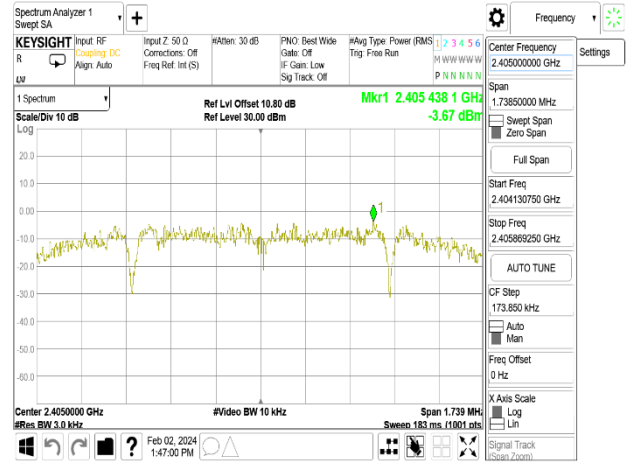
## Port 1

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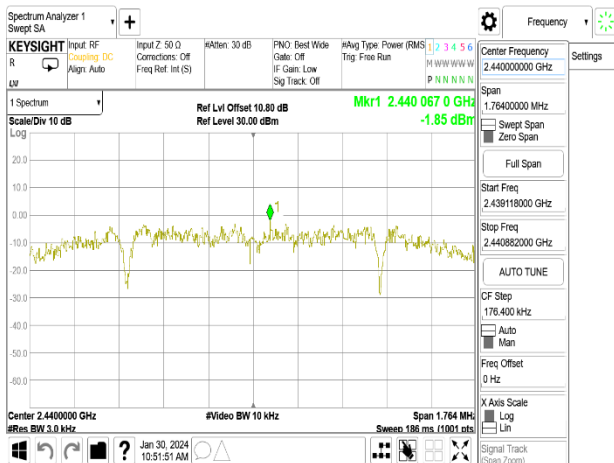


## Port 2

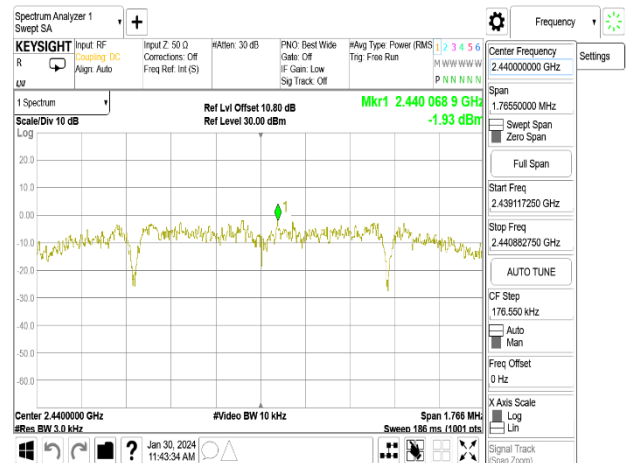
PSD\_Zigbee\_LowCH11-2405MHz



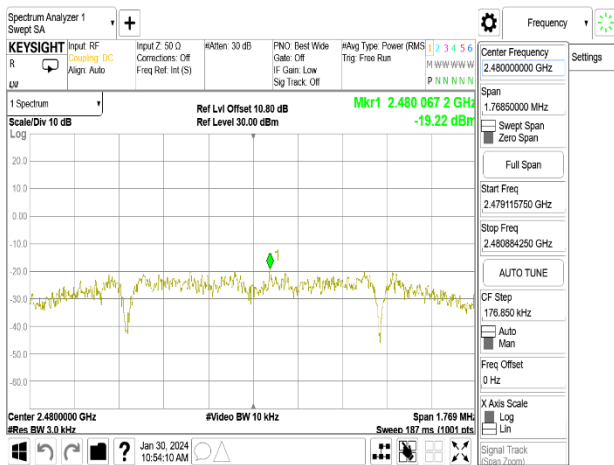
PSD\_Zigbee\_MidCH18-2440MHz



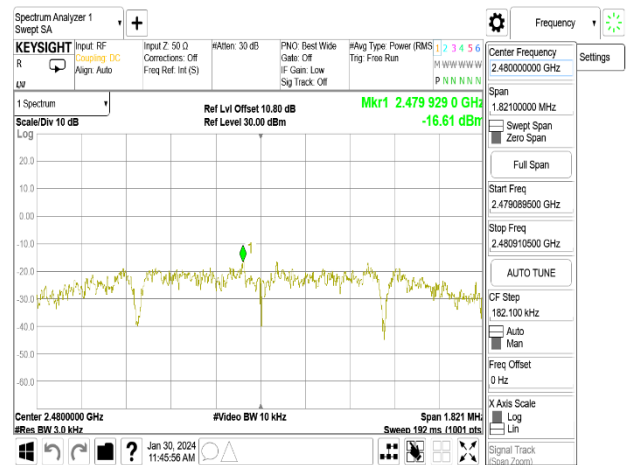
PSD\_Zigbee\_MidCH18-2440MHz



PSD\_Zigbee\_HighCH26-2480MHz



PSD\_Zigbee\_HighCH26-2480MHz



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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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