



## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



**Applicant:** Murata Manufacturing Co., Ltd.  
**Manufacturer:** Murata Manufacturing Co., Ltd.  
**Product Name:** Communication Module  
**Brand Name:** Murata Manufacturing Co., Ltd.  
**Model No.:** LBES0ZZ2LL  
**/ISED HVIN:**  
**Family Model No.:** LBEE0ZZ2KL  
**/ Family ISED HVIN:**  
**Model Difference:** Different functions: LBES0ZZ2LL includes IEEE802.15.4 functionality.  
**ISED PMN:** LBES0ZZ2LL, LBEE0ZZ2KL  
**Report Number:** TERF2410002915E2  
**FCC ID** VPYLBES0ZZ2LL  
**IC ID:** 772C-LBES0ZZ2LL  
**Date of EUT Received:** September 24, 2024  
**Date of Test:** October 4, 2024~October 30, 2024  
**Issue Date:** December 18, 2024

**Approved By**

**Aken Huang**

**We hereby certify that:**

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT comply with FCC rule part §15.247, 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
TERF2410002915E2	00	Original	Dec. 6, 2024	Candice Li	
TERF2410002915E2	01	Modify FVIN of section 1.1	Dec. 18, 2024	Candice Li	*

**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.  
Only the main model LBES0ZZ2LL has IEEE802.15.4. functionality and has been independently tested for this feature. The variants 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:	Communication Module
Brand Name:	Murata Manufacturing Co., Ltd.
Model No.: /ISED HVIN:	LBES0ZZ2LL
Family Model No.: / Family ISED HVIN:	LBEE0ZZ2KL
Model Difference:	Different functions: LBES0ZZ2LL includes IEEE802.15.4. functionality.
Hardware Version:	1.0
Firmware Version:	1.1.1.1
EUT Series No.:	2LL #35 (Conducted) 2LL #116 (Conduction) 2LL #116 / 2LL#82 (Radiated)
Power Supply:	3.3 Vdc, 1.8 Vdc
Test Software (Name/Version)	DUT Labtool Version 2.0.0.17

### 1.2 RF Specification

Radio Technology:	BLE
Frequency Range:	2402 – 2480MHz
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	BLE 1M: 12.99 dBm BLE 2M: 12.98 dBm BLE 125k: 13.15 dBm BLE 500k: 13.25 dBm

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### 1.3 Antenna Designation

#### External Antenna

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Dipole	Molex	146187	2400-2500	3.2
	Molex	145153	2400-2500	3.2
	Molex	219611	2400-2500	2.67
	Unictron	WT32D1-KX	2400-2500	3
	Unictron	AA258	2400-2500	0.9
	Taoglas	FXP830.07.0100C	2400-2500	2.5
	Antenova	SRF2W012	2400-2500	3
	Sansei	STDANTEMD-013	2400-2500	1.9
	Laird	EMF2471A3S	2400-2500	2.2
	Kyocera AVX (KAVX)	1001932FT	2400-2500	2.5
	Kyocera AVX (KAVX)	1001932PT	2400-2500	2.03
	Kyocera AVX (KAVX)	W3P35x8W04	2400-2500	2.3
	Inventek	W2.4-5P-U	2400-2500	<b>3.73</b>

#### Internal Antenna

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Monopole	Murata	Type2LL_Antenna	2400-2500	3.6

#### 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 SAC 2 SAC 3 Conduction 1 Conducted 1 Conducted 2 Conducted 3 Conducted 4 Conducted 5 Conducted 6	TW0027	
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C SAC C SAC D SAC G Conducted A Conducted B Conducted C Conducted D Conducted E Conducted F Conducted G	TW0028	TW3702

**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

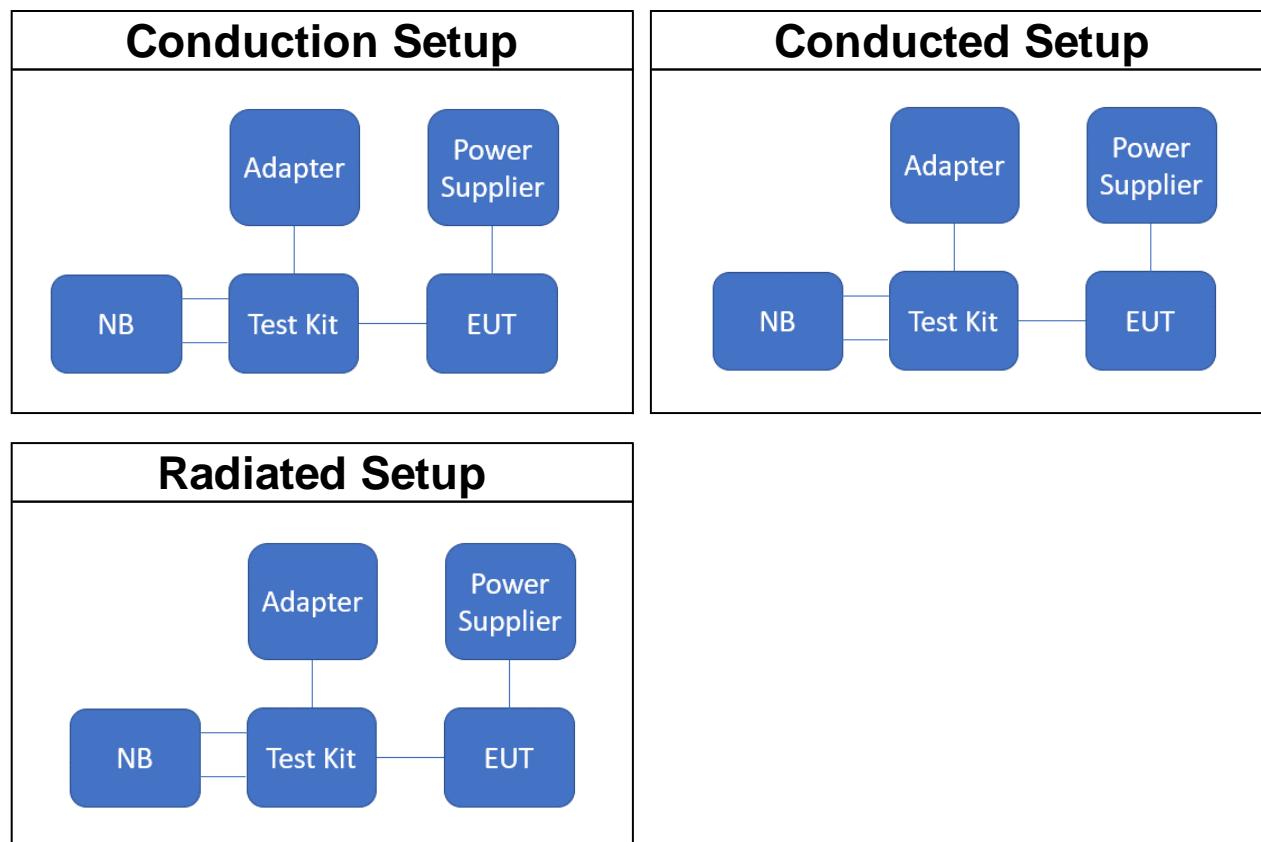
Radiated emission below 30MHz is measured in a 9m\*6m\*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

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.
LAN Cable	TATUNG	IMG_5283	N/A	N/A	N/A
USB cable	ZHUANG SHAN	2725	N/A	N/A	N/A
USB cable	ANKER	N/A	N/A	N/A	N/A
Adapter	ANKER	A2664	N/A	N/A	N/A
Notebook	Lenovo	T470	P0001293	N/A	N/A
Conducted Emission Test Site: Conducted C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Adapter	ANKER	A2664	N/A	N/A	N/A
LAN Cable	TATUNG	IMG_5283	N/A	N/A	N/A
USB cable	ANKER	A8852011	N/A	N/A	N/A
USB cable	ZHUANG SHAN CHUAN	2725	N/A	N/A	N/A
Notebook	Lenovo	T14	P0003332	N/A	N/A
Radiated Emission Test Site: SACC					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
LAN Cable	ELECOM	GM-LDGPAT/BK30	N/A	N/A	N/A
USB cable	ZHUANG SHAN CHUAN	2725	N/A	N/A	N/A
USB cable	ANKER	A8852011	N/A	N/A	N/A
Adapter	ANKER	A2664	N/A	N/A	N/A
Notebook	Lenovo	T14	P0003332	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
§15.247(d) §15.209	RSS-247 §5.5 RSS-Gen §8.9	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d) §15.209	RSS-247 §5.5 RSS-Gen §8.9	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)	CH	Freq. (MHz)	CH	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

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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. The field strength of radiation 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.
4. Investigation has been done on all the possible configurations for searching the worst case.

CONDUCTED TEST				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth LE	0 to 39	0,20,39	GFSK	1
Bluetooth LE	0 to 39	0,20,39	GFSK	2
Bluetooth LE	0 to 39	0,20,39	GFSK	0.125
Bluetooth LE	0 to 39	0,20,39	GFSK	0.5

TRANSMIT RADIATED EMISSION TEST (BELOW 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth LE	0 to 39	20	GFSK	1
TRANSMIT RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth LE	0 to 39	0,20,39	GFSK	1
Bluetooth LE	0 to 39	0,20,39	GFSK	2
Bluetooth LE	0 to 39	0,20,39	GFSK	0.125
Bluetooth LE	0 to 39	0,20,39	GFSK	0.5

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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.
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2024	03/26/2025
EMI Test Receiver	R&S	ESCI	101342	04/29/2024	04/28/2025
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	973	04/22/2024	04/21/2025
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2024	03/26/2025
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 C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
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	PASTERNACK	PE8210	RF155	11/15/2023	11/14/2024
DC Power Supply	HOLA	DP-3003	D7070035	06/14/2024	06/13/2025
Power Meter	Anritsu	ML2496A	2138005	09/25/2024	09/24/2025
Power Sensor	Anritsu	MA2411B	1911395	09/25/2024	09/24/2025
Power Sensor	Anritsu	MA2411B	1911396	09/25/2024	09/24/2025
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	05/24/2024	05/23/2025
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R

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## 6.3 Radiated Measurement

Radiated Emission Test Site: SAC C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
3m Site NSA	SGS	966 chamber C	N/A	03/02/2024	03/01/2025
Active Loop Antenna	COM-POWER	AL-130R	10160105	12/04/2023	12/03/2024
Attenuator	Woken	WATT-218FS-10	RF17	11/15/2023	11/14/2024
Band Rejection Filter	Micro Tronics	BRM50701-01	RF201	11/15/2023	11/14/2024
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-300	11/02/2023	11/01/2024
Coaxial Cable	Huber+Suhner	EMC106-SM-SM-9100	150704	11/15/2023	11/14/2024
Coaxial Cable	Huber+Suhner	RG 214/U	W22.03	11/15/2023	11/14/2024
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	MY17388/4	11/15/2023	11/14/2024
DC Power Supply	HOLA	DP-3003	D7070035	06/14/2024	06/13/2025
EMI Test Receiver	R&S	ESU 40	100363	04/30/2024	04/29/2025
High Pass Filter	Titan Microwave	T04H86002600060S01	210619-2-8	11/15/2023	11/14/2024
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/24/2024	01/23/2025
Horn Antenna	Schwarzbeck	BBHA9170	185	08/15/2024	08/14/2025
Lowpass Filter	Woken	EWT-56-0019	RF173	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC118A45SE	980789	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC184045SEE	980881	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC330	980096	11/15/2023	11/14/2024
Spectrum Analyzer	KEYSIGHT	N9010B	MY63440390	02/16/2024	02/15/2025
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R

**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

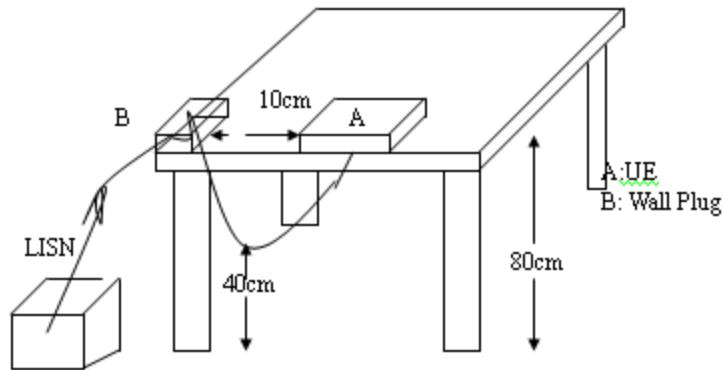
**Note**

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 120-240Vac/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 test data reveals the worst-case results that closest to the limit.

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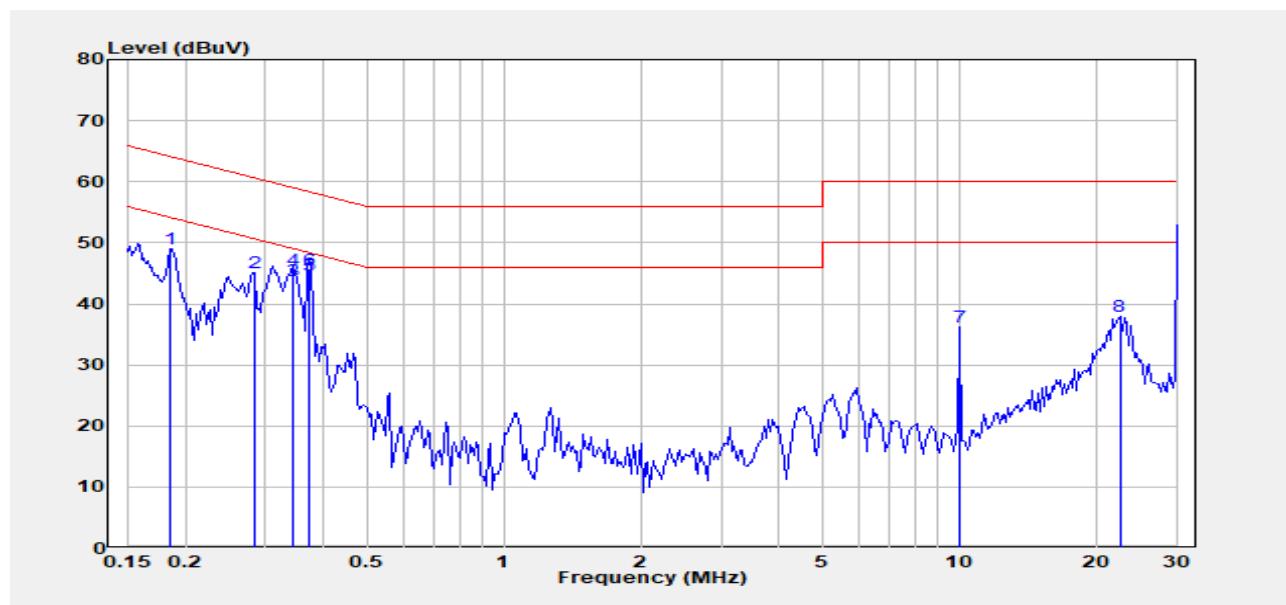
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number :TERF2410002915E2  
 Test Mode :BLE  
 Power :120V/60Hz  
 Probe :L1

Test Site :Conduction C  
 Test Date :2024-10-18  
 Temp./Humi :23.4°C/60%  
 Engineer :Howard 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
0.185	Peak	38.43	10.65	49.08	64.24	-15.16
0.283	Peak	34.51	10.64	45.14	60.72	-15.58
0.343	Average	33.20	10.63	43.83	49.13	-5.31
0.343	QP	35.00	10.63	45.63	59.13	-13.51
0.373	Average	34.10	10.62	44.72	48.43	-3.71
0.373	QP	34.90	10.62	45.52	58.43	-12.91
10.072	Peak	25.30	10.96	36.26	60.00	-23.74
22.535	Peak	26.76	11.22	37.98	60.00	-22.02

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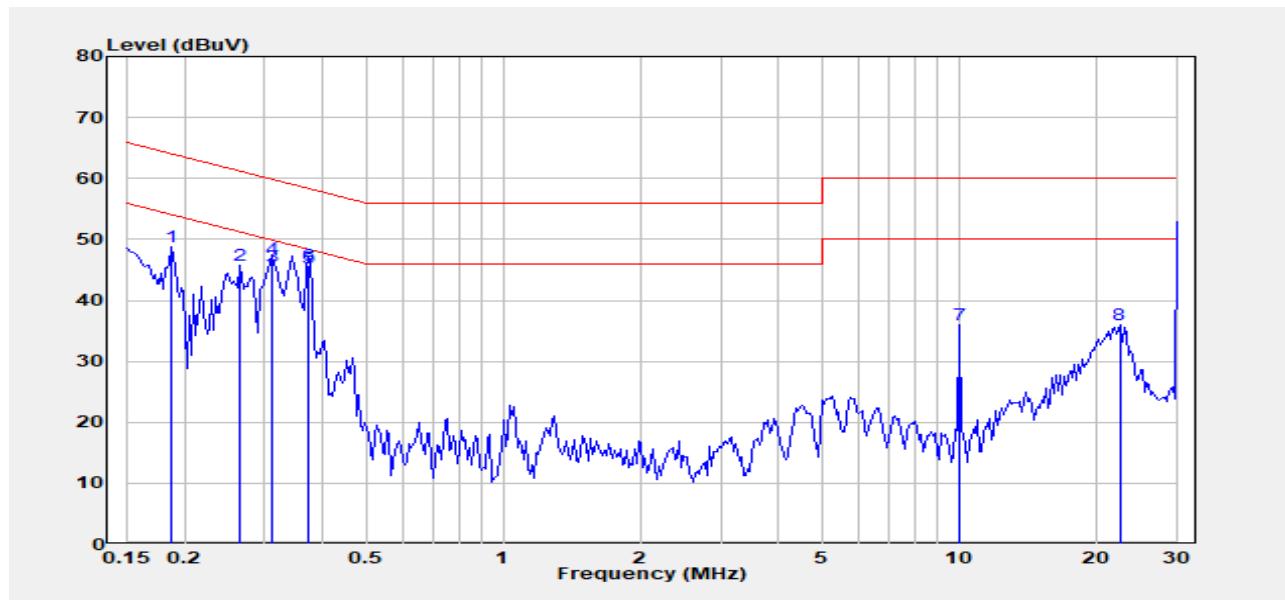
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Report Number :TERF2410002915E2  
 Test Mode :BLE  
 Power :120V/60Hz  
 Probe :N

Test Site :Conduction C  
 Test Date :2024-10-18  
 Temp./Humi :23.4°C/60%  
 Engineer :Howard 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
0.187	Peak	38.16	10.65	48.82	64.15	-15.34
0.263	Peak	35.00	10.64	45.64	61.34	-15.70
0.312	Average	34.80	10.63	45.43	49.93	-4.50
0.312	QP	36.10	10.63	46.73	59.93	-13.20
0.373	Average	34.70	10.62	45.32	48.43	-3.11
0.373	QP	35.20	10.62	45.82	58.43	-12.61
10.072	Peak	25.01	10.95	35.96	60.00	-24.04
22.535	Peak	24.65	11.23	35.88	60.00	-24.12

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## 8 PEAK OUTPUT POWER MEASUREMENT

### 8.1 Standard Applicable:

#### 8.1.1 Duty Cycle

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

#### 8.1.2 FCC

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

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

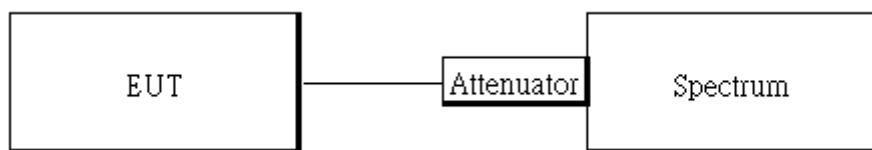
In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

#### 8.1.3 ISED

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.

### 8.2 Test Setup

#### 8.2.1 Duty Cycle



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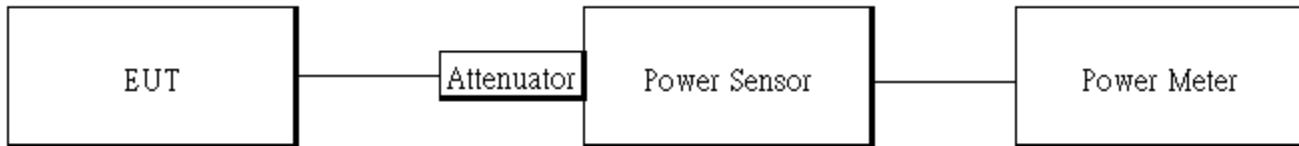
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## 8.2.2 Output Power



## 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

### 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.

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## 8.4 Duty Factor:

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
BLE 1M	62.40	2.05	2.56	3.00
BLE 2M	33.60	4.74	4.76	5.00
BLE 125k	82.40	0.84	0.32	1.00
BLE 500k	42.78	3.69	0.94	1.00

BLE\_1M\_LowCH00-2402



BLE\_125k\_LowCH00-2402



BLE\_2M\_LowCH00-2402



BLE\_500k\_LowCH00-2402



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## 8.5 Output Power:

### 8.5.1 Peak & Avg

BLE 1M mode:

CH	Frequency (MHz)	Power Setting	Peak Output Power (dBm)	Required Limit (dBm)
0	2402	13	<b>12.99</b>	30
20	2442	13	12.93	30
39	2480	13	12.98	30
CH	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Required Limit (dBm)
0	2402	13	12.96	30
20	2442	13	12.90	30
39	2480	13	12.94	30

\*Note:

1. Measured by power meter, cable loss 10.27 dB + Duty cycle factor has been offset to the power meter for Avg. power and cable loss has been offset for Peak power measurement.

BLE 2M mode:

CH	Frequency (MHz)	Power Setting	Peak Output Power (dBm)	Required Limit (dBm)
0	2402	13	<b>12.98</b>	30
20	2442	13	12.91	30
39	2480	13	12.85	30
CH	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Required Limit (dBm)
0	2402	13	12.84	30
20	2442	13	12.79	30
39	2480	13	12.75	30

\*Note:

1. Measured by power meter, cable loss 10.27 dB + Duty cycle factor has been offset to the power meter for Avg. power and cable loss has been offset for Peak power measurement.

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## BLE 125k mode(Payload S=8):

CH	Frequency (MHz)	Power Setting	Peak Output Power (dBm)	Required Limit (dBm)
0	2402	13	13.15	30
20	2442	13	13.11	30
39	2480	13	13.02	30
CH	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Required Limit (dBm)
0	2402	13	12.89	30
20	2442	13	12.98	30
39	2480	13	12.82	30

## \*Note:

1. Measured by power meter, cable loss 10.27 dB + Duty cycle factor has been offset to the power meter for Avg. power and cable loss has been offset for Peak power measurement.

## BLE 500k mode(Payload S=2):

CH	Frequency (MHz)	Power Setting	Peak Output Power (dBm)	Required Limit (dBm)
0	2402	10	13.25	30
20	2442	10	13.18	30
39	2480	10	13.09	30
CH	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Required Limit (dBm)
0	2402	10	13.00	30
20	2442	10	12.93	30
39	2480	10	12.83	30

## \*Note:

1. Measured by power meter, cable loss 10.27 dB + Duty cycle factor has been offset to the power meter for Avg. power and cable loss has been offset for Peak power measurement.

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## 8.5.2 EIRP

### EIRP BLE 1M mode

CH	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit
0	2402	13	12.96	3.73	16.69	4W= 36 dBm
20	2442	13	12.90	3.73	16.63	4W= 36 dBm
39	2480	13	12.94	3.73	16.67	4W= 36 dBm

\* Note: EIRP = Average Power + Gain

### EIRP BLE 2M mode

CH	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit
0	2402	13	12.84	3.73	16.57	4W= 36 dBm
20	2442	13	12.79	3.73	16.52	4W= 36 dBm
39	2480	13	12.75	3.73	16.48	4W= 36 dBm

\* Note: EIRP = Average Power + Gain

### EIRP BLE 125k mode(Payload S=8)

CH	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit
0	2402	13	12.89	3.73	16.62	4W= 36 dBm
20	2442	13	12.98	3.73	16.71	4W= 36 dBm
39	2480	13	12.82	3.73	16.55	4W= 36 dBm

\* Note: EIRP = Average Power + Gain

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## EIRP BLE 500k mode(Payload S=2)

CH	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit	
0	2402	10	13.00	3.73	16.73	4W=	36 dBm
20	2442	10	12.93	3.73	16.66	4W=	36 dBm
39	2480	10	12.83	3.73	16.56	4W=	36 dBm

\* Note: EIRP = Average Power + Gain

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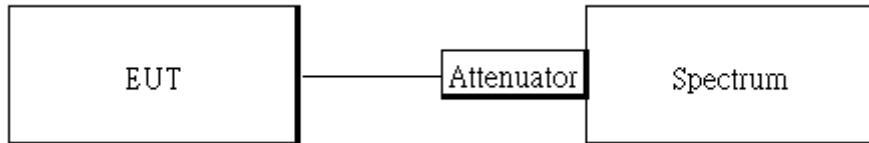
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## 9 EMISSION BANDWIDTH MEASUREMENT

### 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 6dB BW measurements

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

#### 9.3.2 99% BW 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%,  
 VBW  $\geq$  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%.
4. Repeat above procedures until all test default channel is completed.

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## 9.4 Measurement Result:

### 9.4.1 6dB BW measurements

#### BLE 1M mode

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2402	0.7208	$\geq 0.5$	PASS
2442	0.7252	$\geq 0.5$	PASS
2480	0.7229	$\geq 0.5$	PASS

#### BLE 2M mode

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2402	1.171	$\geq 0.5$	PASS
2442	1.17	$\geq 0.5$	PASS
2480	1.173	$\geq 0.5$	PASS

#### BLE 125k mode(Payload S=8)

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2402	0.6682	$\geq 0.5$	PASS
2442	0.6672	$\geq 0.5$	PASS
2480	0.6669	$\geq 0.5$	PASS

#### BLE 500k mode(Payload S=2)

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2402	0.671	$\geq 0.5$	PASS
2442	0.6738	$\geq 0.5$	PASS
2480	0.6746	$\geq 0.5$	PASS

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## OBW\_BLE 1M\_LowCH00-2402MHz



## OBW\_BLE 2M\_LowCH00-2402MHz



## OBW\_BLE 1M\_MidCH20-2442MHz



## OBW\_BLE 2M\_MidCH20-2442MHz



## OBW\_BLE 1M\_HighCH39-2480MHz



## OBW\_BLE 2M\_HighCH39-2480MHz



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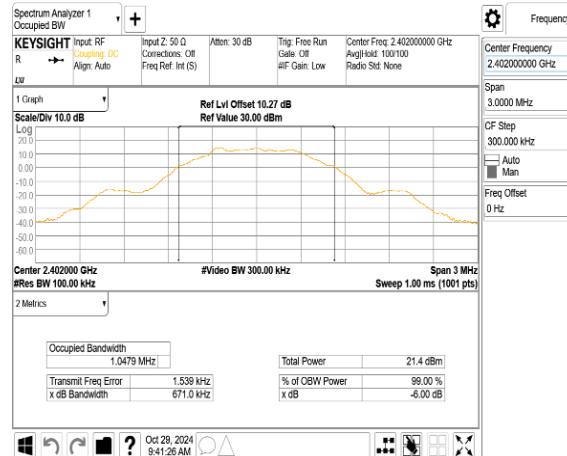
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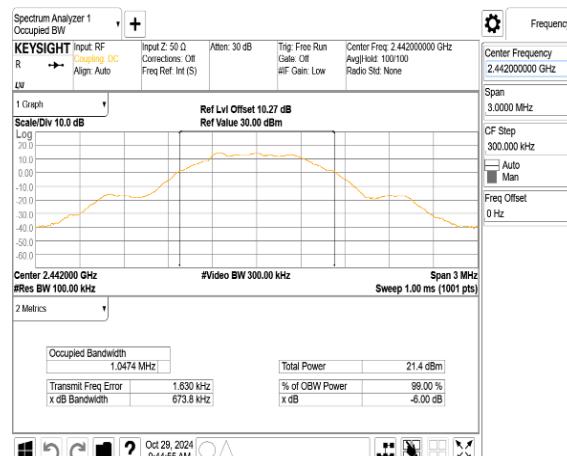
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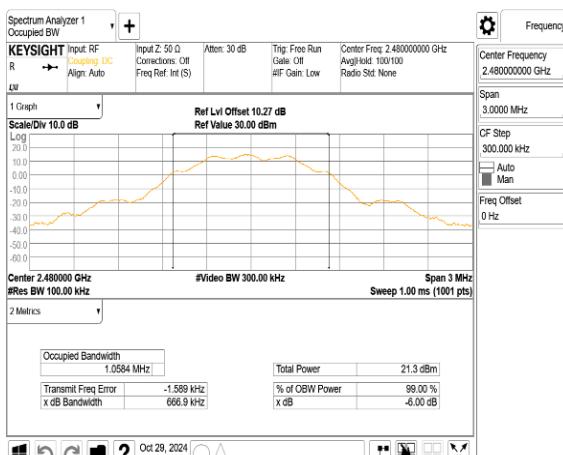
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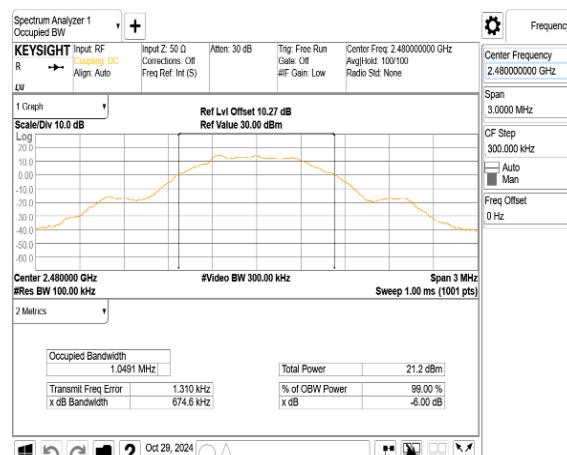
OBW\_BLE 500k\_MidCH20-2442MHz



OBW\_BLE 125k\_HighCH39-2480MHz



OBW\_BLE 500k\_HighCH39-2480MHz



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## 9.4.2 99% Bandwidth

### BLE 1M mode

Frequency (MHz)	99%Bandwidth (MHz)
2402	1.0333
2442	1.032
2480	1.0339

### BLE 2M mode

Frequency (MHz)	99%Bandwidth (MHz)
2402	2.0527
2442	2.0561
2480	2.0595

### BLE 125k mode(Payload S=8)

Frequency (MHz)	99%Bandwidth (MHz)
2402	1.0563
2442	1.0562
2480	1.0581

### BLE 500k mode(Payload S=2)

Frequency (MHz)	99%Bandwidth (MHz)
2402	1.0213
2442	1.0216
2480	1.0221

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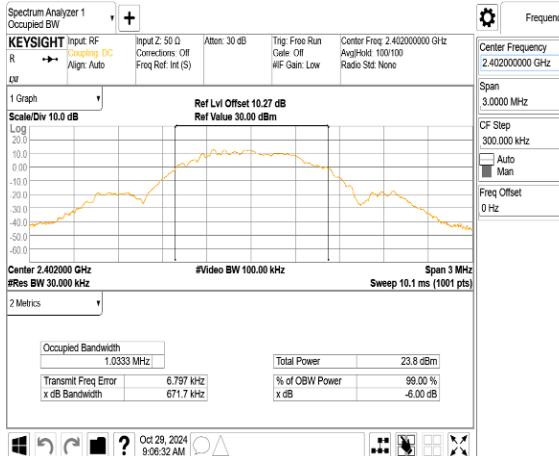
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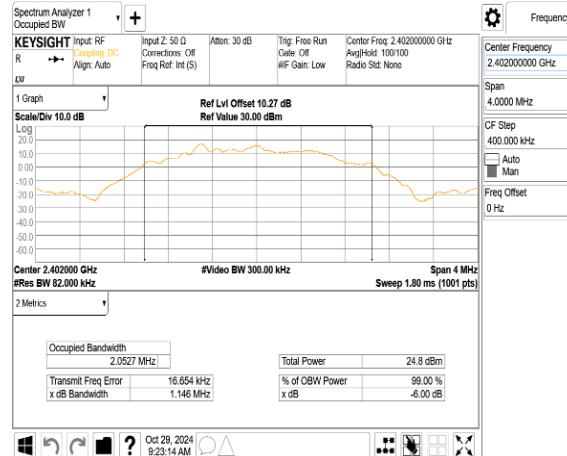
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## IC OBW\_BLE 1M\_LowCH00-2402MHz



## IC OBW\_BLE 2M\_LowCH00-2402MHz



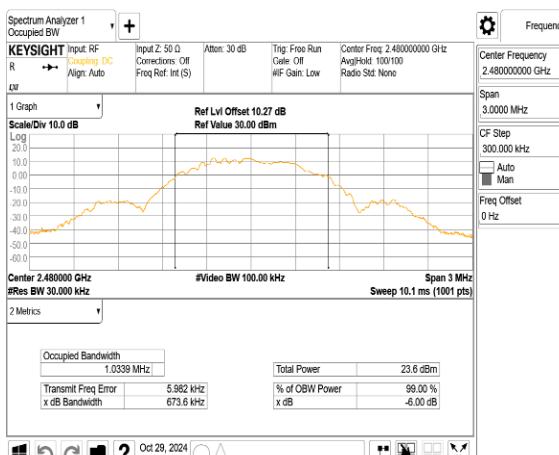
## IC OBW\_BLE 1M\_MidCH20-2442MHz



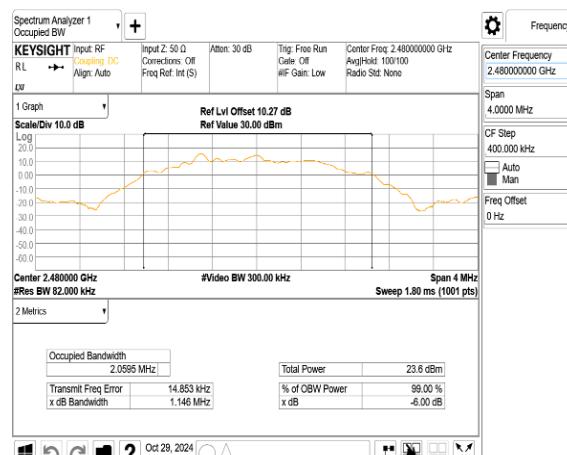
## IC OBW\_BLE 2M\_MidCH20-2442MHz



## IC OBW\_BLE 1M\_HighCH39-2480MHz



## IC OBW\_BLE 2M\_HighCH39-2480MHz



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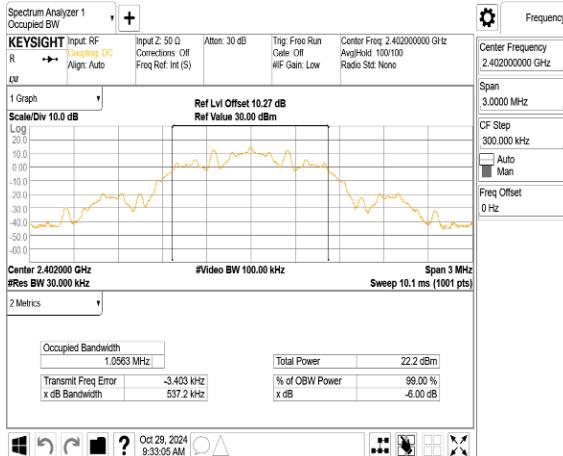
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## IC OBW\_BLE 125k\_LowCH00-2402MHz



## IC OBW\_BLE 500k\_LowCH00-2402MHz



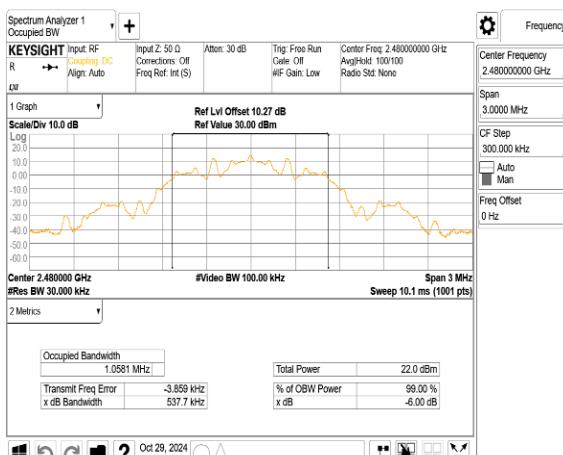
## IC OBW\_BLE 125k\_MidCH20-2442MHz



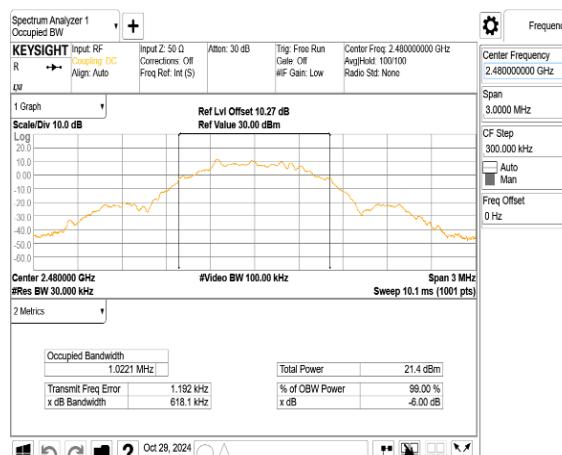
## IC OBW\_BLE 500k\_MidCH20-2442MHz



## IC OBW\_BLE 125k\_HighCH39-2480MHz



## IC OBW\_BLE 500k\_HighCH39-2480MHz



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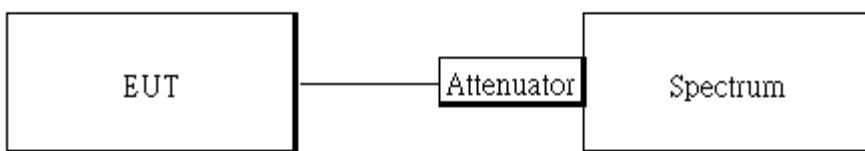
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## 10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

### 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.

#### 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.

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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 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

BLE 1M\_Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	17.05	-2.95
2442	17.07	-2.93
2480	16.82	-3.18

\*Note:

- 1.cable loss as 10.27dB that offsets in the spectrum
- 2.Refer to next page for plots.

BLE 2M\_Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	17.39	-2.61
2442	17.40	-2.60
2480	16.18	-3.82

\*Note:

- 1.cable loss as 10.27dB that offsets in the spectrum
- 2.Refer to next page for plots.

BLE 125k(Payload S=8)\_Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	15.34	-4.66
2442	15.32	-4.68
2480	15.09	-4.91

\*Note:

- 1.cable loss as 10.27dB that offsets in the spectrum
- 2.Refer to next page for plots.

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### BLE 500k(Payload S=2)\_Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	14.78	-5.22
2442	14.78	-5.22
2480	14.59	-5.41

**\*Note:**

1. **cable loss as 10.27dB that offsets in the spectrum**
2. **Refer to next page for plots.**

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## Reference Level\_BLE 1M\_LowCH00-2402MHz



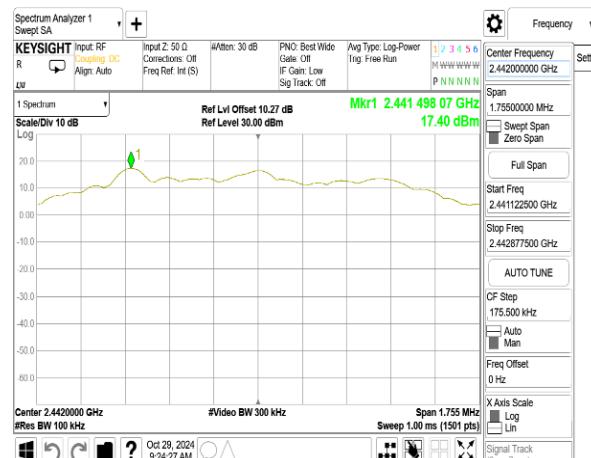
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## Reference Level\_BLE 1M\_MidCH20-2442MHz



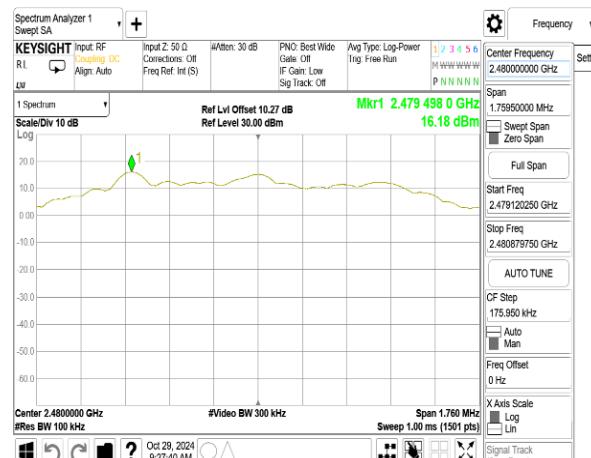
## Reference Level\_BLE 2M\_MidCH20-2442MHz



## Reference Level\_BLE 1M\_HighCH39-2480MHz



## Reference Level\_BLE 2M\_HighCH39-2480MHz



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## Reference Level\_BLE 125k\_LowCH00-2402MHz



## Reference Level\_BLE 500k\_LowCH00-2402MHz



## Reference Level\_BLE 125k\_MidCH20-2442MHz



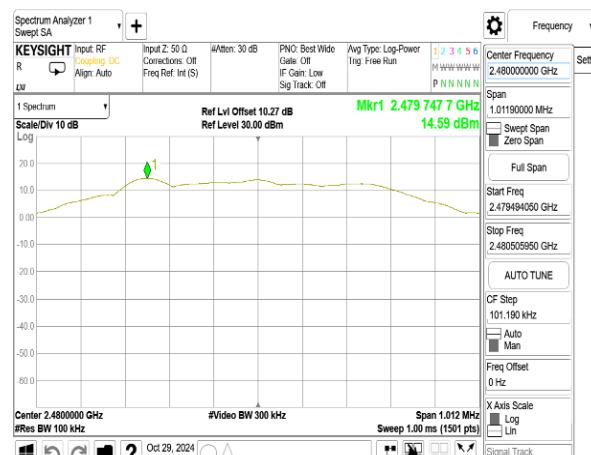
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## Reference Level\_BLE 125k\_HighCH39-2480MHz



## Reference Level\_BLE 500k\_HighCH39-2480MHz



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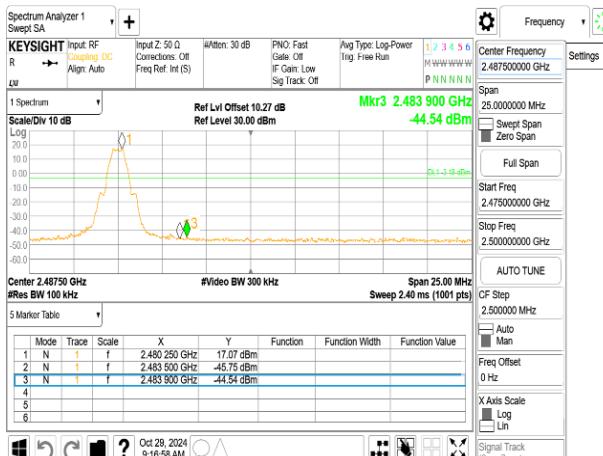
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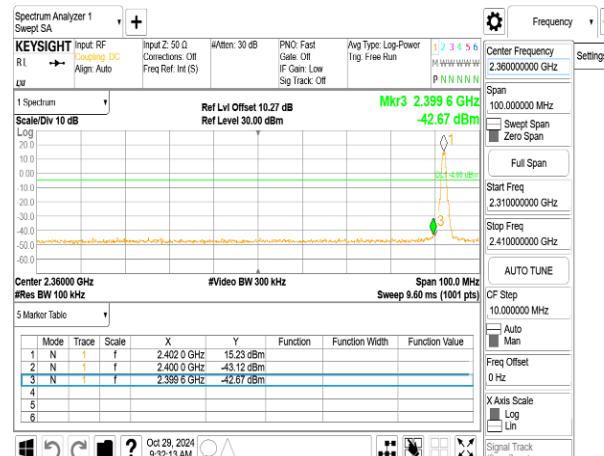
## Band Edge\_BLE 2M\_HighCH39-2480MHz



## Band Edge\_BLE 1M\_HighCH39-2480MHz



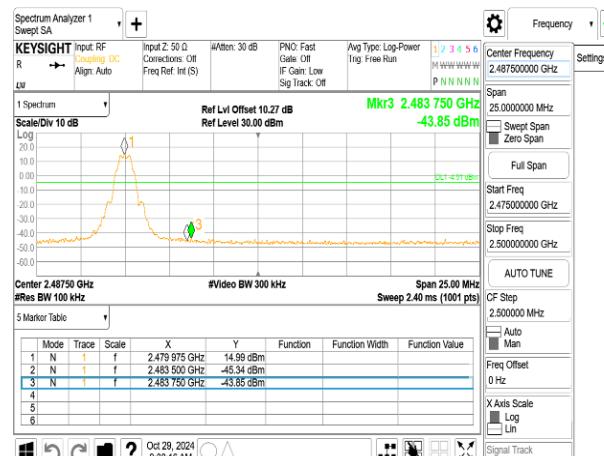
## Band Edge\_BLE 125k\_LowCH00-2402MHz



## Band Edge\_BLE 2M\_LowCH00-2402MHz



## Band Edge\_BLE 125k\_HighCH39-2480MHz



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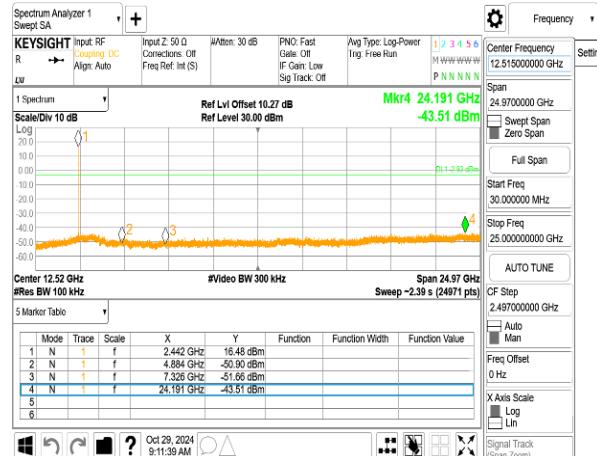
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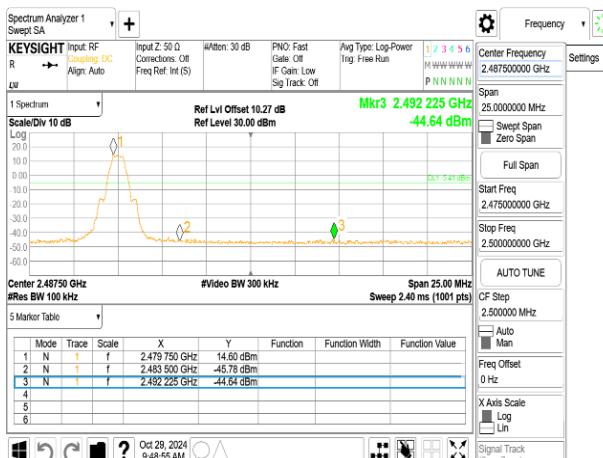
## Band Edge\_BLE 500k\_LowCH00-2402MHz



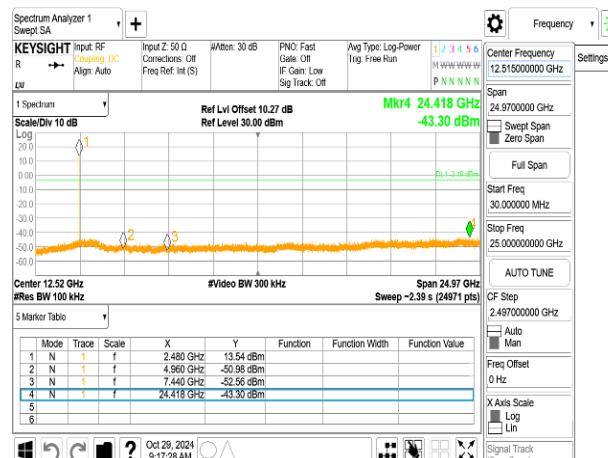
## Spurious Emission\_BLE 1M\_MidCH20-2442MHz



## Band Edge\_BLE 500k\_HighCH39-2480MHz



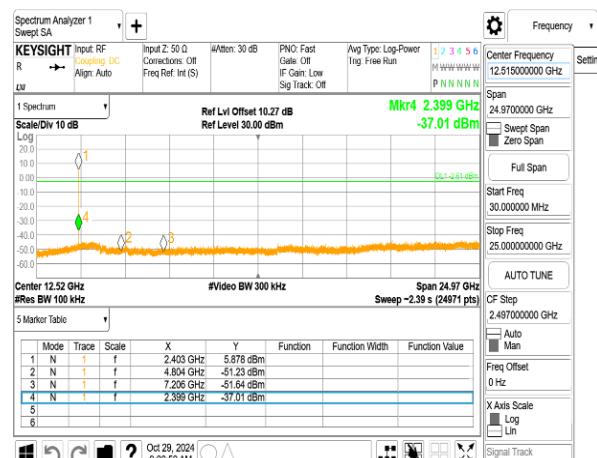
## Spurious Emission\_BLE 1M\_HighCH39-2480MHz



## Spurious Emission\_BLE 1M\_LowCH00-2402MHz



## Spurious Emission\_BLE 2M\_LowCH00-2402MHz



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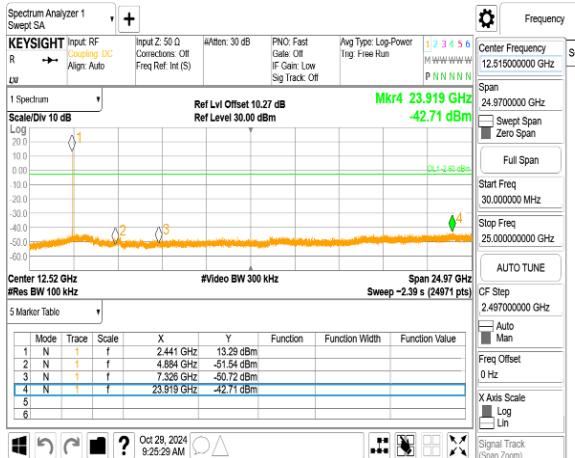
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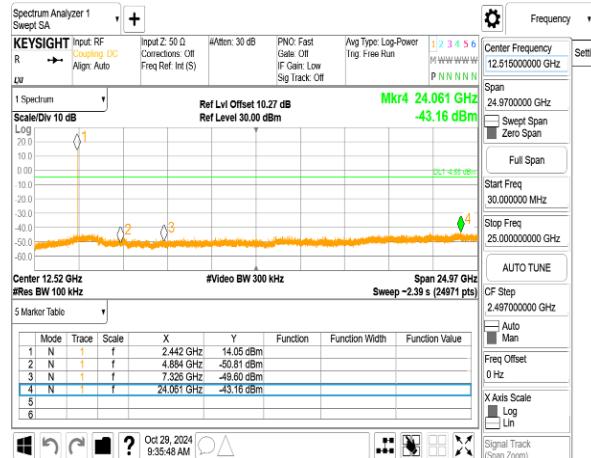
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## Spurious Emission\_BLE 2M\_MidCH20-2442MHz



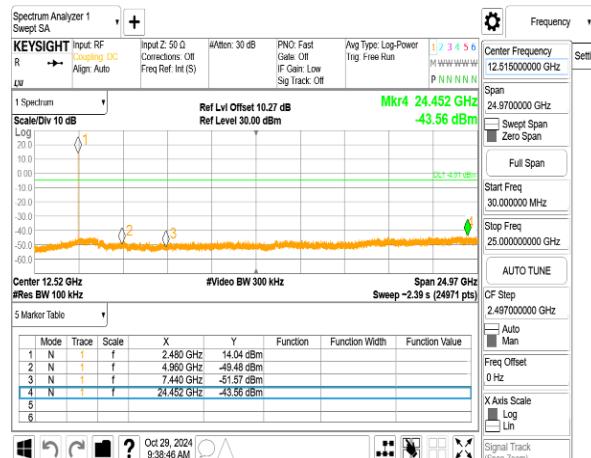
## Spurious Emission\_BLE 125k\_MidCH20-2442MHz



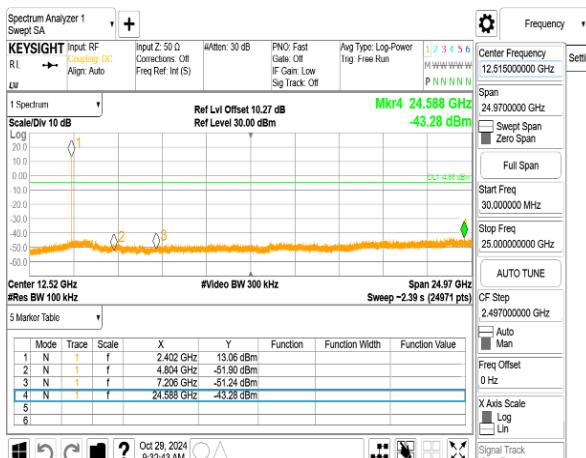
## Spurious Emission\_BLE 2M\_HighCH39-2480MHz



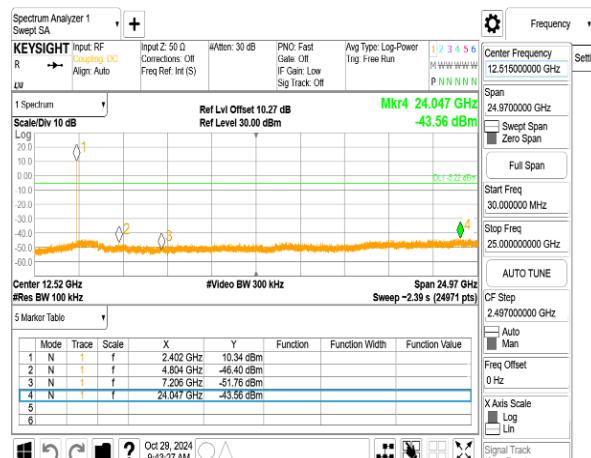
## Spurious Emission\_BLE 125k\_HighCH39-2480MHz



## Spurious Emission\_BLE 125k\_LowCH00-2402MHz



## Spurious Emission\_BLE 500k\_LowCH00-2402MHz



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## Spurious Emission\_BLE 500k\_MidCH20-2442MHz



## Spurious Emission\_BLE 500k\_HighCH39-2480MHz



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## 11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### Spurious Emission

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:** The lower limit shall apply at the transition frequencies.

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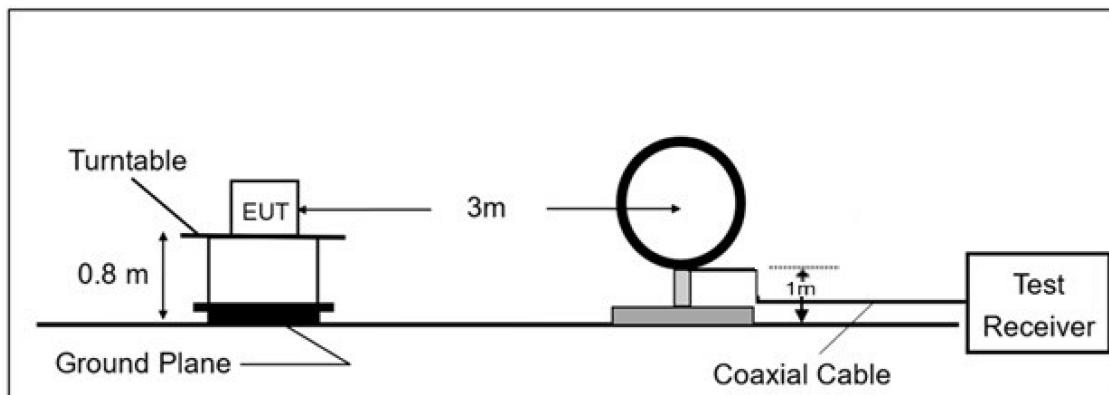
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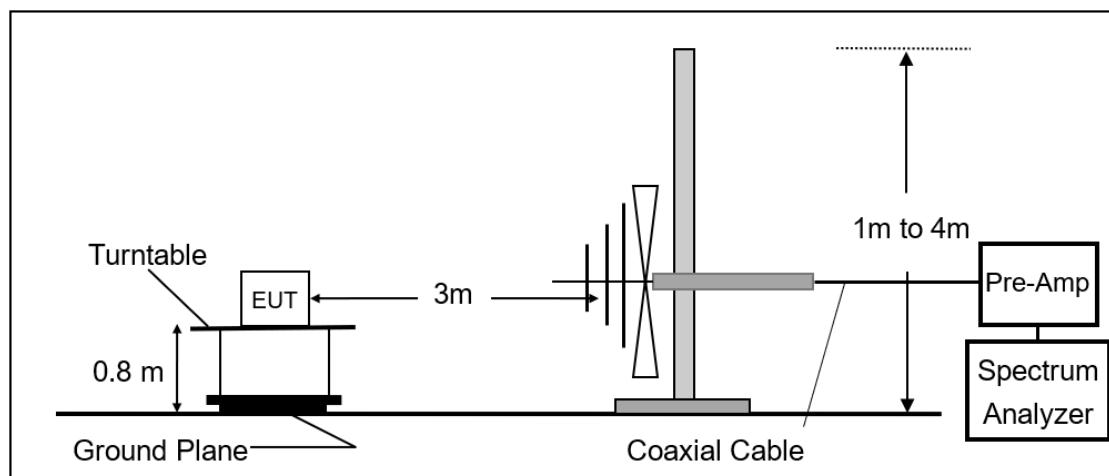
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## 11.1 Test Setup

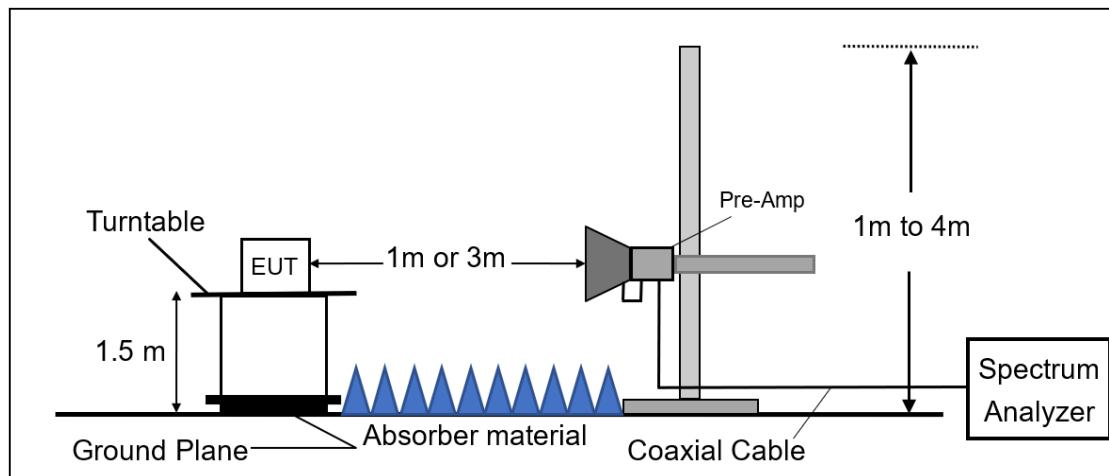
### (A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



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



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



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## 11.2 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.

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### 11.3 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  $dB\mu V/m$ , which converts  $20 * \log(\mu V/m)$

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( $dB$ )

### 11.4 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) & RSS-GEN §6.13.2 was not reported.

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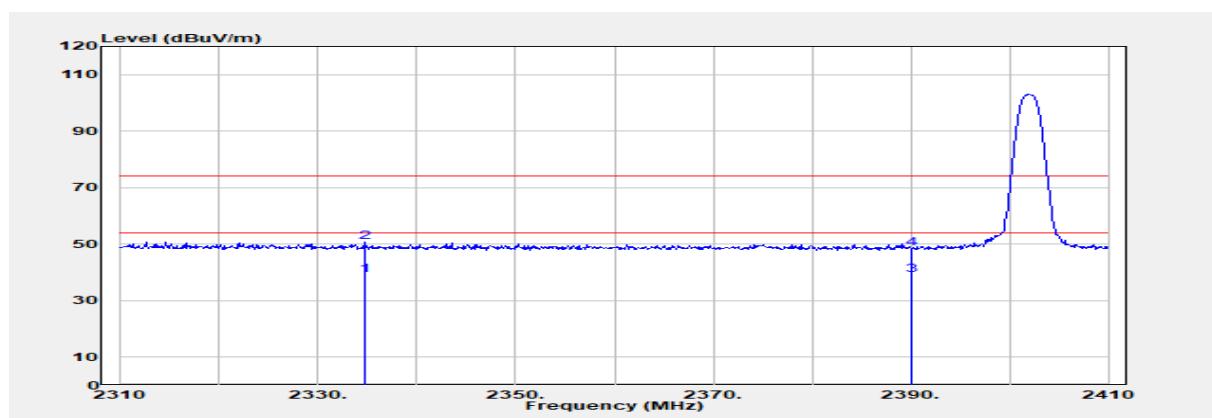
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### 11.4.1 Radiated Band Edge Measurement Result

#### External Antenna

Report Number :TERF2410002915E2  
 Operation Mode :BLE 1M  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Vertical  
 Engineer :Alex Li



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
2334.800	Average	42.96	-3.83	39.13	54.00	-14.87
2334.800	Peak	54.65	-3.83	50.82	74.00	-23.18
2390.000	Average	43.40	-4.25	39.15	54.00	-14.85
2390.000	Peak	52.85	-4.25	48.60	74.00	-25.40

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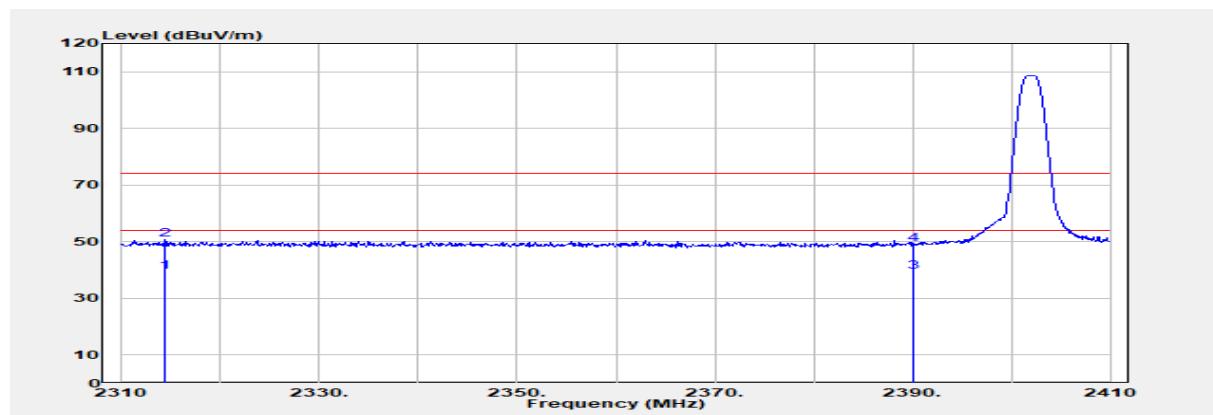
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 1M  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Horizontal  
 Engineer :Alex Li



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
2314.300	Average	43.20	-3.71	39.49	54.00	-14.51
2314.300	Peak	54.57	-3.71	50.86	74.00	-23.14
2390.000	Average	43.71	-4.25	39.47	54.00	-14.53
2390.000	Peak	53.48	-4.25	49.23	74.00	-24.77

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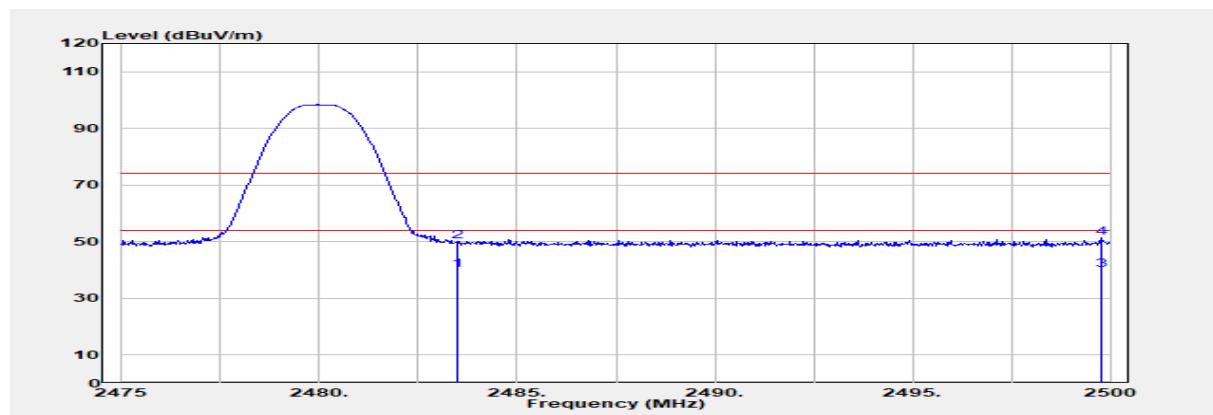
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 1M  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Vertical  
 Engineer :Alex Li



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	43.89	-3.82	40.07	54.00	-13.93
2483.500	Peak	53.79	-3.82	49.97	74.00	-24.03
2499.775	Average	43.77	-3.65	40.12	54.00	-13.88
2499.775	Peak	54.94	-3.65	51.29	74.00	-22.71

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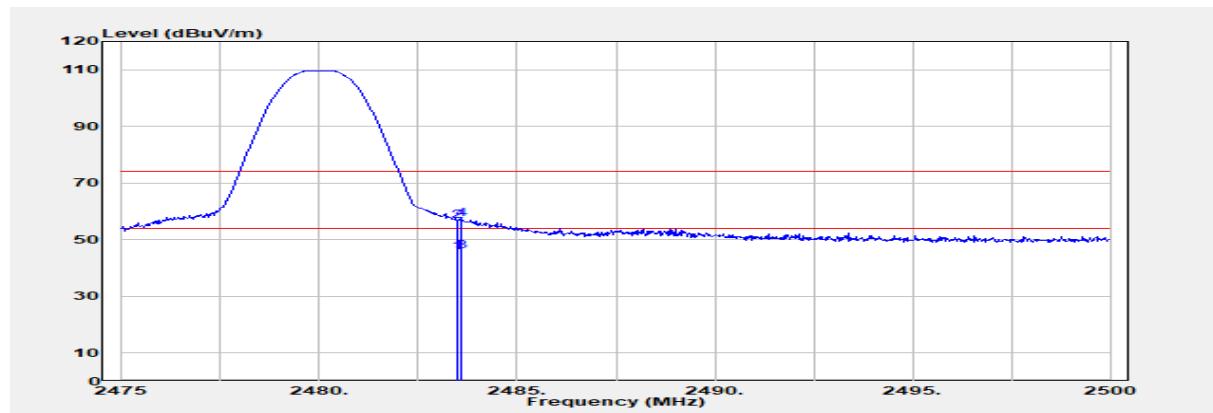
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 1M  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Horizontal  
 Engineer :Alex Li



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	49.50	-3.82	45.68	54.00	-8.32
2483.500	Peak	60.33	-3.82	56.51	74.00	-17.49
2483.600	Average	49.56	-3.82	45.74	54.00	-8.26
2483.600	Peak	61.19	-3.82	57.38	74.00	-16.62

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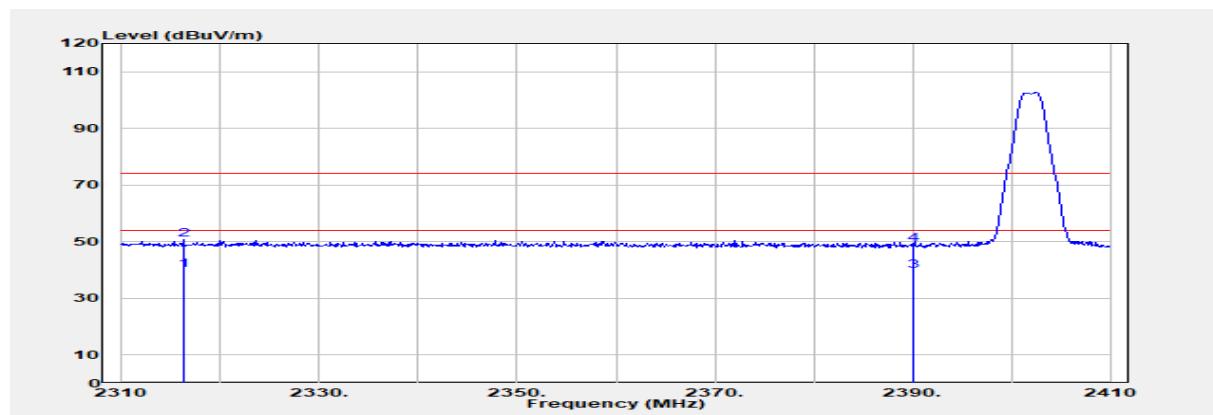
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 2M  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Vertical  
 Engineer :Alex Li



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
2316.200	Average	43.58	-3.72	39.85	54.00	-14.15
2316.200	Peak	54.48	-3.72	50.76	74.00	-23.24
2390.000	Average	43.78	-4.25	39.53	54.00	-14.47
2390.000	Peak	53.31	-4.25	49.07	74.00	-24.93

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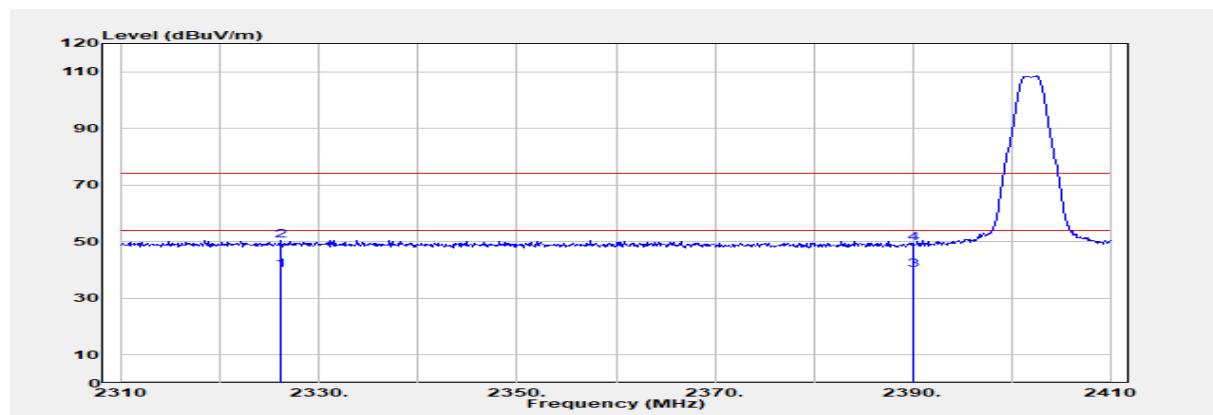
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 2M  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Horizontal  
 Engineer :Alex Li



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
2326.000	Average	43.90	-3.78	40.12	54.00	-13.88
2326.000	Peak	54.28	-3.78	50.50	74.00	-23.50
2390.000	Average	44.27	-4.25	40.02	54.00	-13.98
2390.000	Peak	53.61	-4.25	49.36	74.00	-24.64

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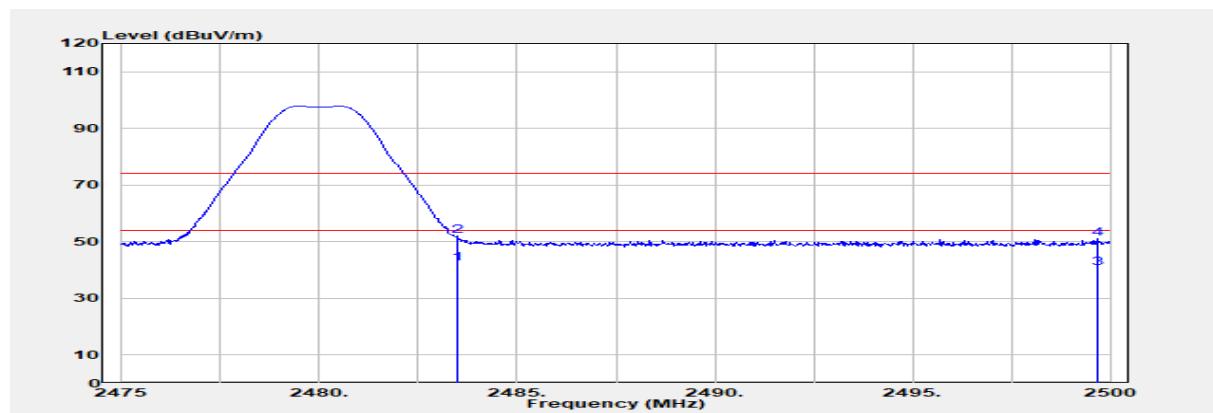
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 2M  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Vertical  
 Engineer :Alex Li



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	46.15	-3.82	42.33	54.00	-11.67
2483.500	Peak	55.78	-3.82	51.96	74.00	-22.04
2499.675	Average	44.15	-3.65	40.49	54.00	-13.51
2499.675	Peak	54.86	-3.65	51.21	74.00	-22.79

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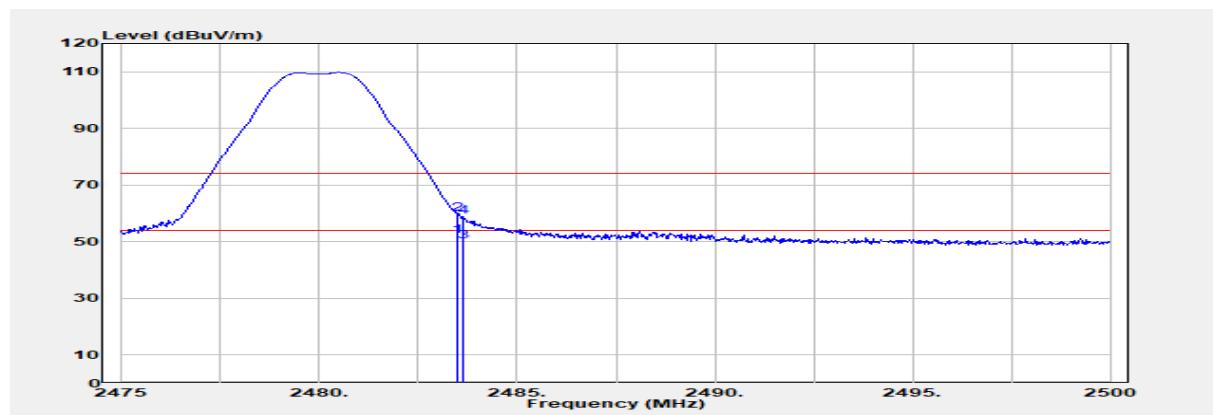
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 2M  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Horizontal  
 Engineer :Alex Li



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	55.78	-3.82	51.96	54.00	-2.04
2483.500	Peak	63.57	-3.82	59.75	74.00	-14.25
2483.625	Average	53.80	-3.82	49.98	54.00	-4.02
2483.625	Peak	62.56	-3.82	58.74	74.00	-15.26

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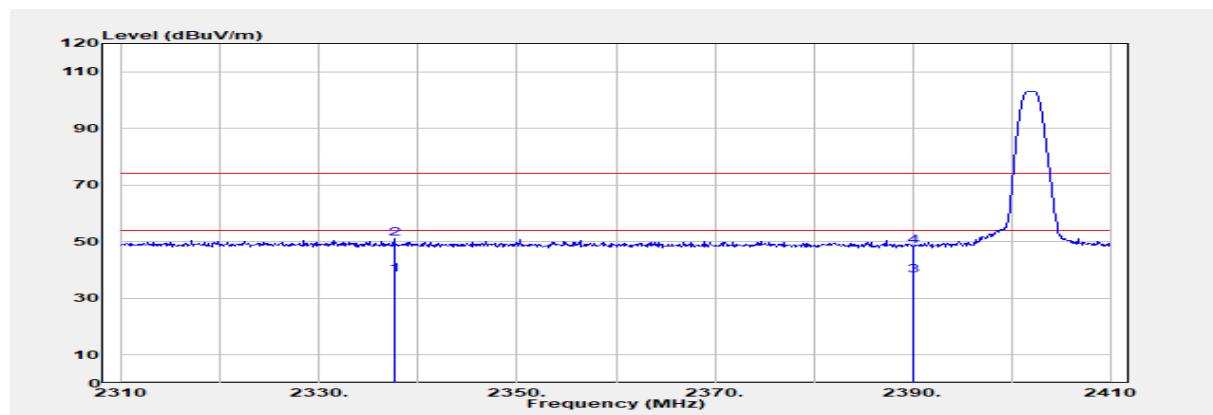
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 125K  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Vertical  
 Engineer :Alex Li



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
2337.600	Average	42.09	-3.85	38.24	54.00	-15.76
2337.600	Peak	54.89	-3.85	51.04	74.00	-22.96
2390.000	Average	42.29	-4.25	38.04	54.00	-15.96
2390.000	Peak	52.78	-4.25	48.53	74.00	-25.47

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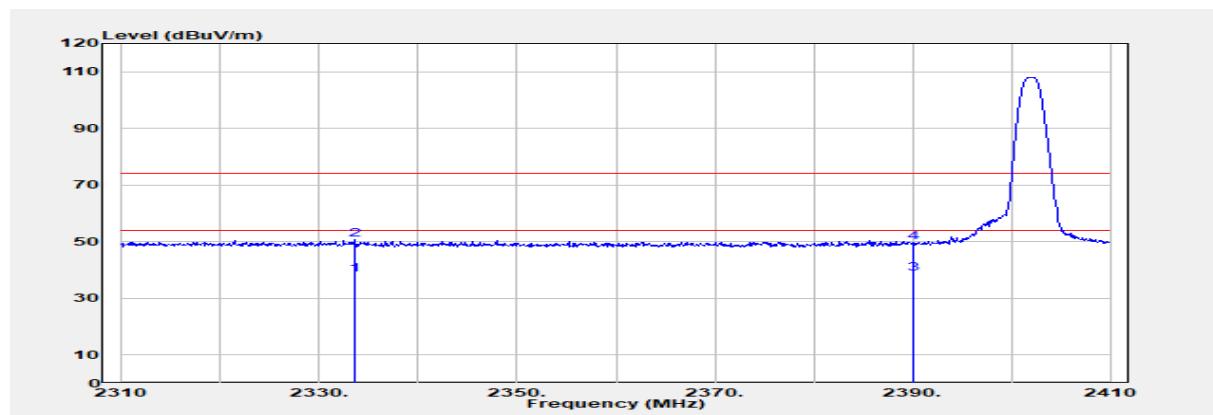
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 125K  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Horizontal  
 Engineer :Alex Li



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
2333.600	Average	42.19	-3.82	38.37	54.00	-15.63
2333.600	Peak	54.59	-3.82	50.77	74.00	-23.23
2390.000	Average	42.86	-4.25	38.61	54.00	-15.39
2390.000	Peak	53.97	-4.25	49.72	74.00	-24.28

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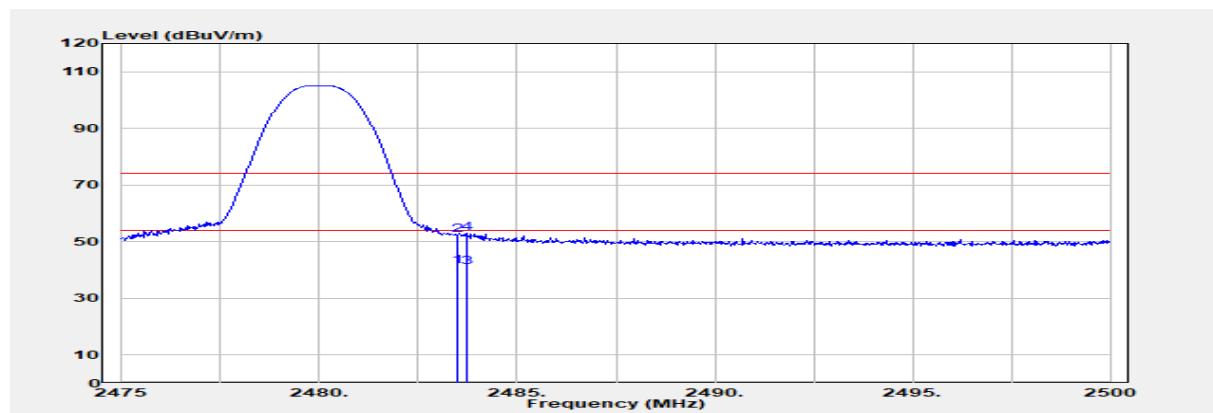
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 125K  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Vertical  
 Engineer :Alex Li



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	45.18	-3.82	41.36	54.00	-12.64
2483.500	Peak	56.07	-3.82	52.25	74.00	-21.75
2483.725	Average	44.92	-3.82	41.10	54.00	-12.90
2483.725	Peak	56.67	-3.82	52.85	74.00	-21.15

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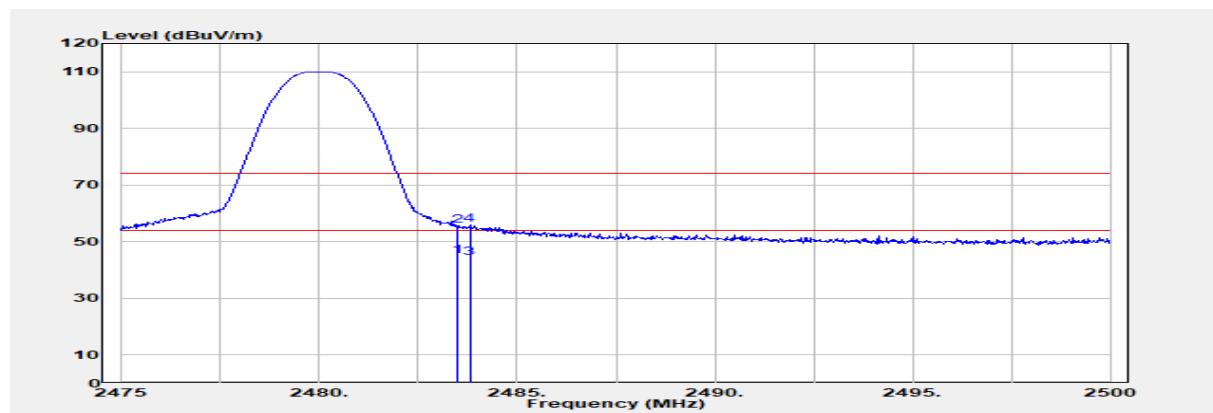
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 125K  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Horizontal  
 Engineer :Alex Li



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	48.70	-3.82	44.88	54.00	-9.12
2483.500	Peak	59.43	-3.82	55.61	74.00	-18.39
2483.800	Average	48.10	-3.82	44.28	54.00	-9.72
2483.800	Peak	59.76	-3.82	55.94	74.00	-18.06

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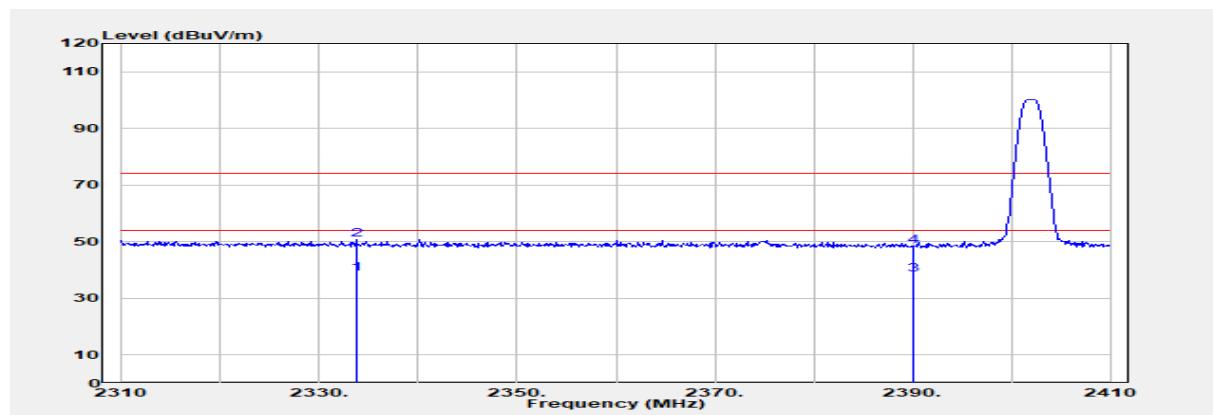
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 500K  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Vertical  
 Engineer :Alex Li



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
2333.700	Average	42.43	-3.83	38.60	54.00	-15.40
2333.700	Peak	54.52	-3.83	50.70	74.00	-23.30
2390.000	Average	42.47	-4.25	38.22	54.00	-15.78
2390.000	Peak	52.58	-4.25	48.34	74.00	-25.66

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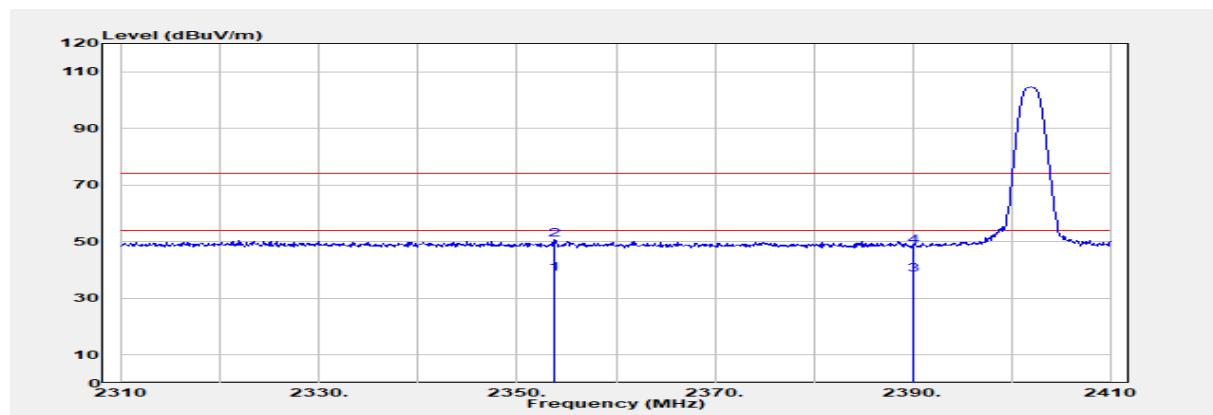
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Report Number :TERF2410002915E2  
 Operation Mode :BLE 500K  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC C  
 Test Date :2024-10-08  
 Temp./Humi. :23.3°C/67%  
 Antenna Pol. :Horizontal  
 Engineer :Alex Li



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
2353.700	Average	42.64	-3.95	38.69	54.00	-15.31
2353.700	Peak	54.56	-3.95	50.61	74.00	-23.39
2390.000	Average	42.76	-4.25	38.51	54.00	-15.49
2390.000	Peak	52.77	-4.25	48.53	74.00	-25.47

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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