

**ELECTROMAGNETIC EMISSIONS  
COMPLIANCE REPORT**

**EUT Description:** Wireless module installed in Speaker  
**Applicant:** Murata Manufacturing Co., Ltd.  
1-10-1, Higashikotari, Nagaokakyo-shi, Kyoto 617-8555 Japan  
**Manufacturer:** Murata Manufacturing Co., Ltd.  
1-10-1, Higashikotari, Nagaokakyo-shi, Kyoto 617-8555 Japan  
**Brand Name:** muRata  
**Model No.:** LBEE5ZZ1XL  
**/ISED HVIN:** LBEE5ZZ1XL  
**ISED PMN:** LBEE5ZZ1XL  
**FCC Host Model:** EX383  
**ISED HMN:** EX383  
**Report Number:** TERF2503001059E2  
**FCC ID** VPYLBEE5ZZ1XL  
**IC:** 772C-LBEE5ZZ1XL  
**Date of EUT Received:** February 5, 2025  
**Date of Test:** April 23, 2025~June 25, 2025  
**Issue Date:** August 1, 2025

*Vito Pei*  
**Approved By** \_\_\_\_\_

**Vito Pei**

**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
TERF2503001059E2	00	Original	August 1, 2025	Susan Lin	

**Note:**

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

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## 1 GENERAL INFORMATION

### 1.1 Product Description

EUT Description:	Wireless module installed in Speaker
Brand Name:	muRata
Model No.: /ISED HVIN:	LBEE5ZZ1XL
FCC Host Model:	EX383
ISED HMN:	EX383
Hardware Version:	Palma MADH v404B - PSU v404A
Firmware Version:	SDOS 2.1.0-rc2
EUT Series No.:	U04A30007PL50, U03A30007PL50
Power Supply:	110VAC from power cord
Test Software (Name/Version):	Dut Labtool v2.0.0.91

### 1.2 RF Specification

Radio Technology:	BT BR+EDR
Channel number:	79 channels
Modulation type:	GFSK + $\pi/4$ DQPSK + 8DPSK
Transmit Power:	5.77 dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	$\leq 0.4s$

### 1.3 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Folded Monopole	DEVIALET	Dual Antenna PALMA v103 BT	2402~2480	5

**Note:**

1. The antenna information is provided by the applicant, and the laboratory shall not be held liable for the accuracy, completeness, or reliability of any applicant-supplied data.

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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.

Temperature:	22.3~22.7	°C	Relative Humidity:	58~61	%
Test site	Conducted C		Test Start:	04/28/2025	
Test Engineer:	Joey You		Test Done:	06/25/2025	

## 1.6 Special Accessories

There is no special accessory 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.

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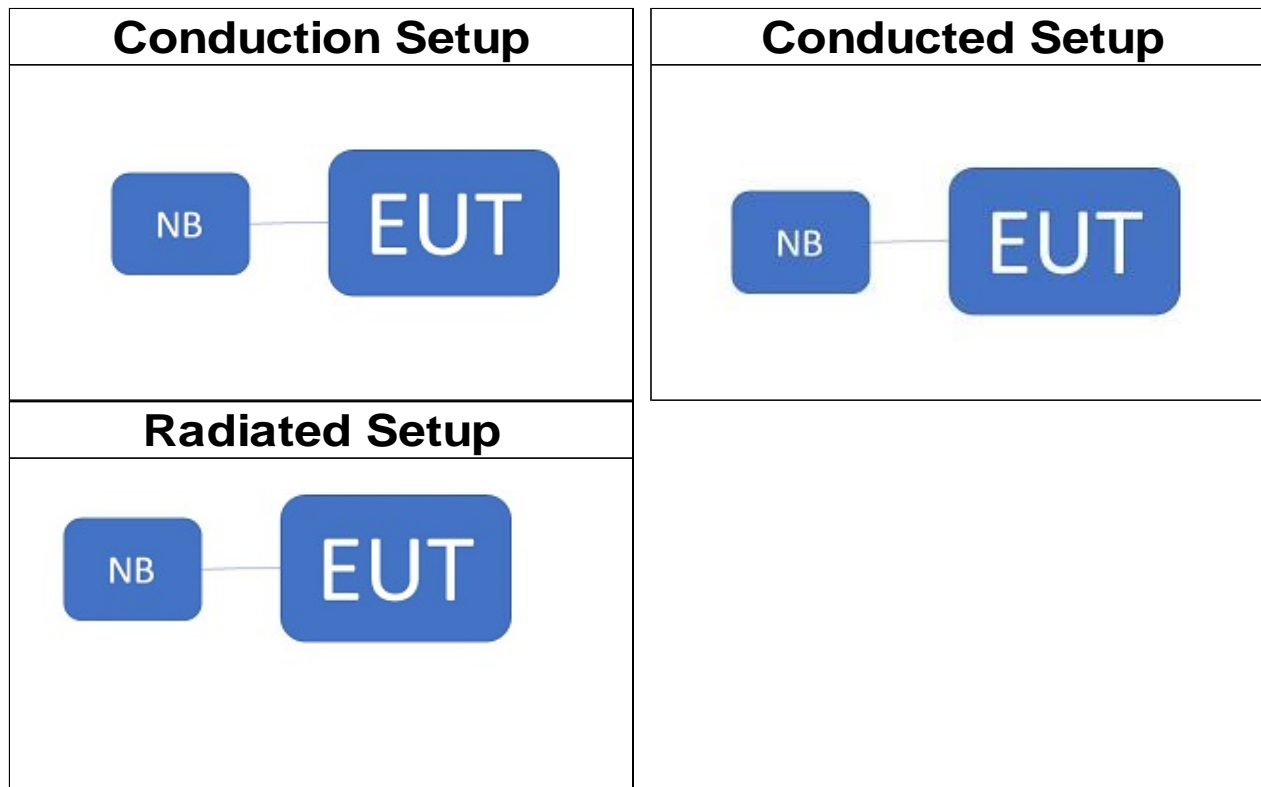
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## 2.5 Test Configuration



## 2.6 Control Unit(s)

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Notebook	HP	HSN-Q35C-4	P0003859	N/A	N/A
LAN Cable	TATUNG	RJ-KT6-305	2420000052713	N/A	N/A
Power Line	Well Shin	WS-001	N/A	N/A	N/A
Conducted Emission Test Site: Conducted C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
LAN Cale	TATUNG	RJ-KT6-305	N/A	N/A	N/A
Notebook	Lenovo	T14	P0003332	N/A	N/A
Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Notebook	HP	HSN-Q35C-4	P0003859	N/A	N/A
LAN Cable	TATUNG	RJ-KT6-305	2420000052713	N/A	N/A
Power Line	Well Shin	WS-001	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)(1)	RSS-247 §5.4 b	Peak Output Power	Compliant
§15.247(d) §15.209	RSS-247 §5.5 RSS-Gen §8.9	Radiated Band Edge and Spurious Emission	Compliant
§15.247(a)(1)(iii)	RSS-247 §5.1 d	Number of hopping frequency Time of Occupancy	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operated in 2400 ~ 2483.5MHz Band

2400~2483.5 MHz							
CH	Freq. (MHz)	CH	Freq. (MHz)	CH	Freq. (MHz)	CH	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

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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 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.
- 4 Investigation has been done on all the possible configurations for searching the worst case.

ANTNNA PORT CONDUCTED TEST				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
<b>Peak Output Power</b>				
Bluetooth	0 to 78	0,39,78	GFSK	DH5
	0 to 78	0,39,78	$\pi/4$ -DQPSK	2DH5
	0 to 78	0,39,78	8-DPSK	3DH5
<b>Time of Occupancy(Dwell time)</b>				
Bluetooth	0 to 78	39	GFSK	DH1/DH3/DH5
			$\pi/4$ -DQPSK	2DH1/2DH3/2DH5
			8-DPSK	3DH1/3DH3/3DH5
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
<b>TRANSMIT RADIATED EMISSION TEST (BELOW 1 GHz)</b>				
Bluetooth	0 to 78	39	GFSK	DH5
<b>TRANSMIT RADIATED EMISSION TEST (ABOVE 1 GHz)</b>				
Bluetooth	0 to 78	0,39,78	GFSK,8-DPSK	DH5,3DH5
Note: The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for channel Low, Mid and High, the worst case position was reported.				

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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
Frequency Separation	+/- 1.48 Hz
Number of hopping frequency	+/- 1.48 Hz
Time of Occupancy	+/- 1.48 Hz
Temperature	+/- 0.6 °C
Humidity	+/- 3 %
DC / AC Power Source	+/- 1 %

Radiated Spurious Emission Measurement Uncertainty			
Polarization: Vertical	+/-	1.89 dB	9kHz~30MHz
	+/-	4.1 dB	30MHz - 1000MHz
	+/-	3.37 dB	1GHz - 18GHz
	+/-	3.83 dB	18GHz - 40GHz
Polarization: Horizontal	+/-	1.89 dB	9kHz~30MHz
	+/-	4.1 dB	30MHz - 1000MHz
	+/-	3.37 dB	1GHz - 18GHz
	+/-	3.83 dB	18GHz - 40GHz
Radiated Spurious Emission	+/-	2 dB	33GHz-50GHz
	+/-	1.59 dB	50GHz-60GHz
	+/-	1.71 dB	60GHz-90GHz
	+/-	1.64 dB	90GHz-140GHz
	+/-	3.84 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. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2025	03/26/2026
EMI Test Receiver	Anritsu	N9038A	MY52260216	11/20/2024	11/19/2025
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	06/26/2024	06/25/2025
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2025	03/26/2026
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. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Attenuator	Woken	WATT-218FS-10	RF18	11/14/2024	11/13/2025
Attenuator	Woken	WATT-218FS-10	RF19	11/14/2024	11/13/2025
DC Block	PASTERNAK	PE8210	RF35	11/14/2024	11/13/2025
Power Meter	Anritsu	ML2496A	1512003	09/04/2024	09/03/2025
Power Sensor	Anritsu	MA2411B	1339378	09/04/2024	09/03/2025
Power Sensor	Anritsu	MA2411B	1339379	09/04/2024	09/03/2025
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	05/24/2024	05/23/2025
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	06/03/2025	06/02/2026
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 D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Active Loop Antenna	COM-POWER	AL-130R	10160105	12/11/2024	12/10/2025
Attenuator	Woken	WATT-218FS-10	RF17	11/14/2024	11/13/2025
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-617	12/17/2024	12/16/2025
Coaxial Cable	EMCI+Huber Suhner	RG 214/U+EMC104- SM-SM- 500+SUCOFLEX 104+16+EMC105- SM-SM- 11000+EMC106- SM-SM-2300	W22.01+W21.01+1 50707+MY969/4+1 6+190825+150702	11/14/2024	11/13/2025
High Pass Filter	Titan Microwave	T04H30001800070 S01	RF188	11/14/2024	11/13/2025
Horn Antenna	Schwarzbeck	BBHA9120D	1341	05/29/2025	05/28/2026
Pre-Amplifier	EMC Instruments	EMC12630SE	980273	11/14/2024	11/13/2025
Pre-Amplifier	EMC Instruments	EMC184045SEE	980881	11/14/2024	11/13/2025
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/14/2024	11/13/2025
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	10/16/2024	10/15/2025
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 within 150 kHz to 30MHz shall not exceed the limit table as below.

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

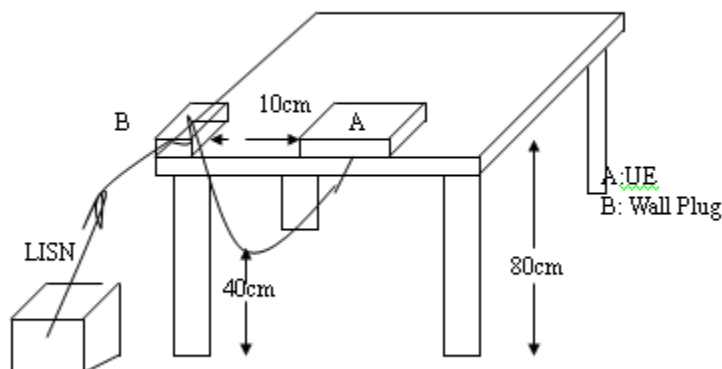
Note

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

### 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



### 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 frequency measured were complete.

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## 7.5 Measurement Result

Level = Read Level + Factor

Factor = (LISN, ISN, or current probe)Factor + Cable Loss +Attenuator

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

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

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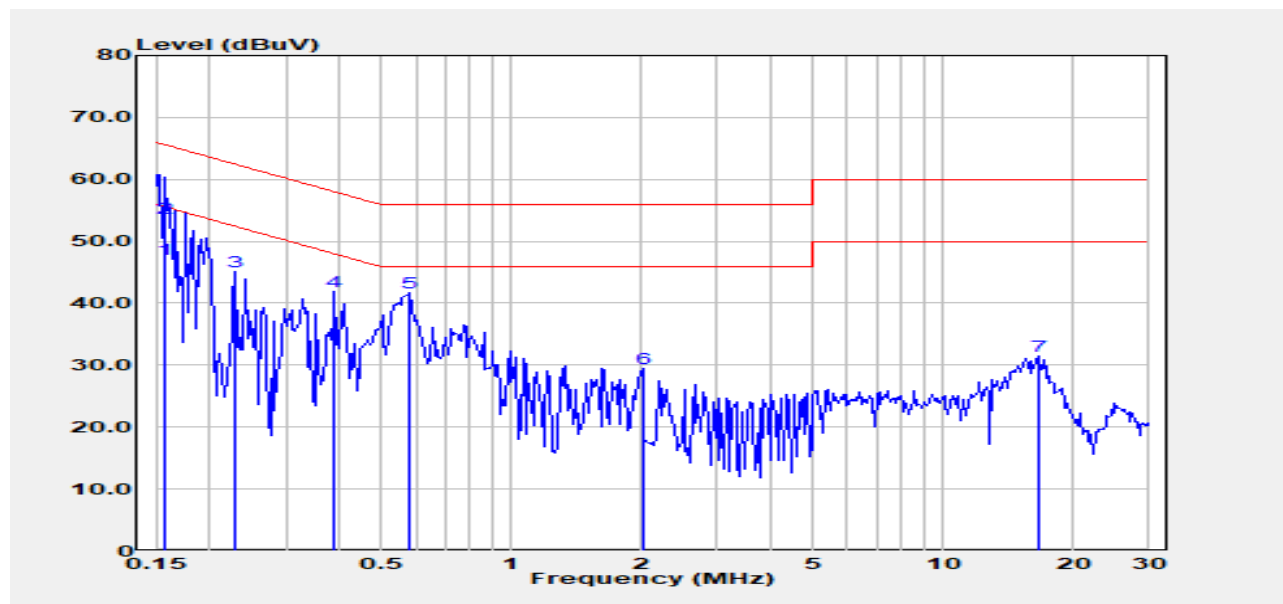
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:TERF2503001059E2	Test Site	:Conduction C
Test Mode	:BT	Test Date	:2025-06-06
Power	:120V/60Hz	Temp./Humi.	:25°C/65%
Probe	:L1	Engineer	:Temo Chen



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS		
	PK/QP/AV	dBuV	dB	dBuV	dBuV	dB
0.156	Average	36.40	10.65	47.05	55.65	-8.60
0.156	QP	43.10	10.65	53.75	65.65	-11.90
0.229	Peak	34.48	10.64	45.12	62.48	-17.36
0.389	Peak	31.28	10.62	41.90	58.08	-16.18
0.582	Peak	31.07	10.63	41.71	56.00	-14.29
2.012	Peak	18.69	10.77	29.46	56.00	-26.54
16.573	Peak	20.30	11.11	31.41	60.00	-28.59

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Report Number :TERF2503001059E2

Test Site :Conduction C

Test Mode :BT

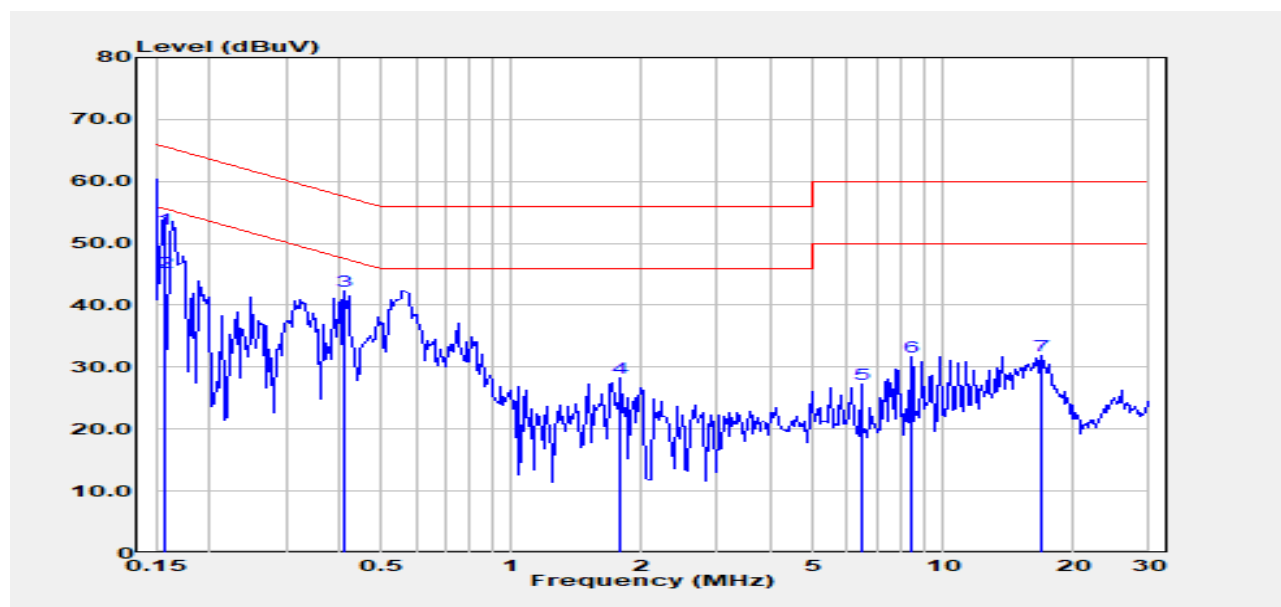
Test Date :2025-06-06

Power :120V/60Hz

Temp./Humi. :25°C/65%

Probe :N

Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV	Limit dBuV	Margin dB
0.156	Average	41.70	10.66	52.36	55.65	-3.29
0.156	QP	34.60	10.66	45.26	65.65	-20.39
0.410	Peak	31.67	10.61	42.28	57.64	-15.36
1.790	Peak	17.52	10.74	28.25	56.00	-27.75
6.454	Peak	16.25	10.94	27.19	60.00	-32.81
8.412	Peak	20.70	10.95	31.64	60.00	-28.36
16.928	Peak	20.86	11.11	31.97	60.00	-28.03

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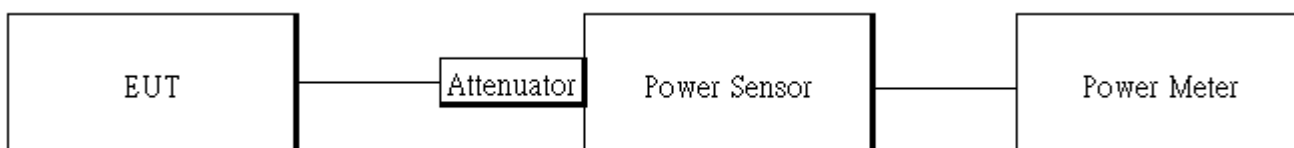
## 8 PEAK OUTPUT POWER MEASUREMENT

### 8.1 Standard Applicable

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, The Limit: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: The Limit: 0.125 Watts. The power limit for 1Mbps is 1watt, and 2Mbps, 3Mbps and AFH mode are 0.125 watts.

The e.i.r.p. shall not exceed 4W.

### 8.2 Test Setup



### 8.3 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10 Measurement Guidelines.
3. Duty cycle of test signal is < 98 %, duty factor shall be considered.
4. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB band-width)
5. Record the max. reading.
6. Repeat above procedures until all default test channel is completed.

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## 8.4 Peak & Average Power Measurement Result

Mode	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )
DH5	77.20	1.12
2DH5	77.20	1.12
3DH5	77.20	1.12

1M BR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	5	5.77	3.776	1000
39	2441	5	5.65	3.673	1000
78	2480	5	5.56	3.597	1000

1M BR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	5	5.66	3.685	1000
39	2441	5	5.55	3.592	1000
78	2480	5	5.45	3.511	1000

2M EDR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	5	4.95	3.126	125
39	2441	5	4.81	3.027	125
78	2480	5	4.60	2.884	125

2M EDR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	5	2.50	1.780	125
39	2441	5	2.39	1.735	125
78	2480	5	2.31	1.704	125

3M EDR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	5	5.01	3.170	125
39	2441	5	4.88	3.076	125
78	2480	5	4.63	2.904	125

3M EDR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	5	2.59	1.817	125
39	2441	5	2.49	1.776	125
78	2480	5	2.43	1.751	125

\*Note: Avg. output power has been calculated with duty factor.

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## 8.5 EIRP Measurement Result

### 1M BR mode EIRP

Channel	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
0	2402	5	5.66	5.00	11.652	4000
39	2441	5	5.55	5.00	11.360	4000
78	2480	5	5.45	5.00	11.102	4000

### 2M EDR mode EIRP

Channel	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
0	2402	5	2.50	5.00	5.628	4000
39	2441	5	2.39	5.00	5.488	4000
78	2480	5	2.31	5.00	5.387	4000

### 3M EDR mode EIRP

Channel	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
0	2402	5	2.59	5.00	5.746	4000
39	2441	5	2.49	5.00	5.615	4000
78	2480	5	2.43	5.00	5.538	4000

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

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## 9 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 9.1 Standard Applicable

#### 9.1.1 Duty Cycle Correction Factor

According to 15. 35(c) and RSS-Gen §8.2, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification.

#### 9.1.2 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:**

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

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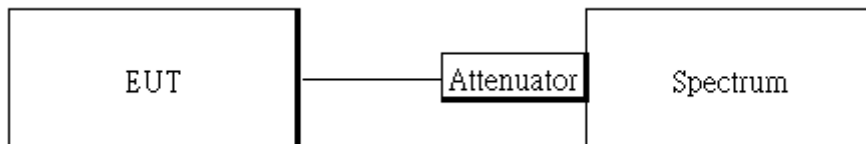
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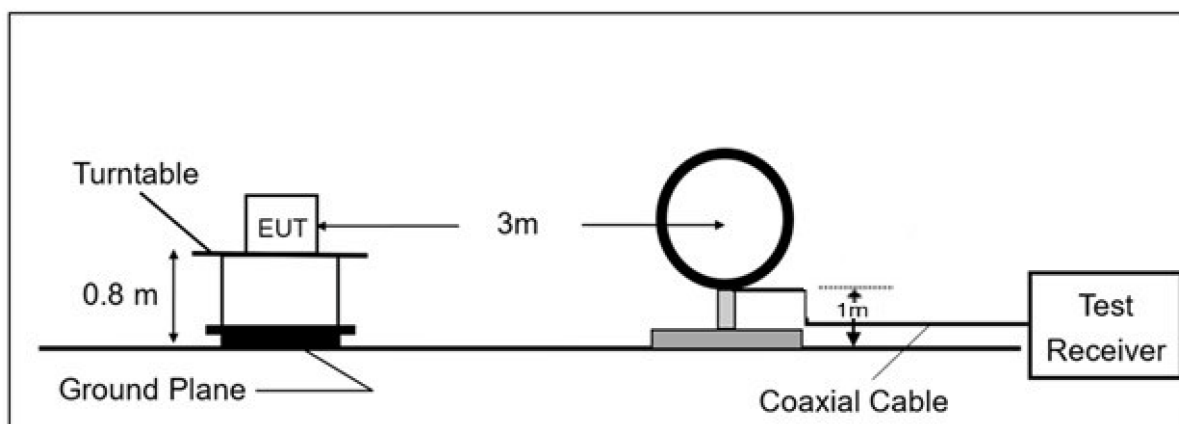
## 9.2 Test Setup

### 9.2.1 Duty Cycle Correction Factor

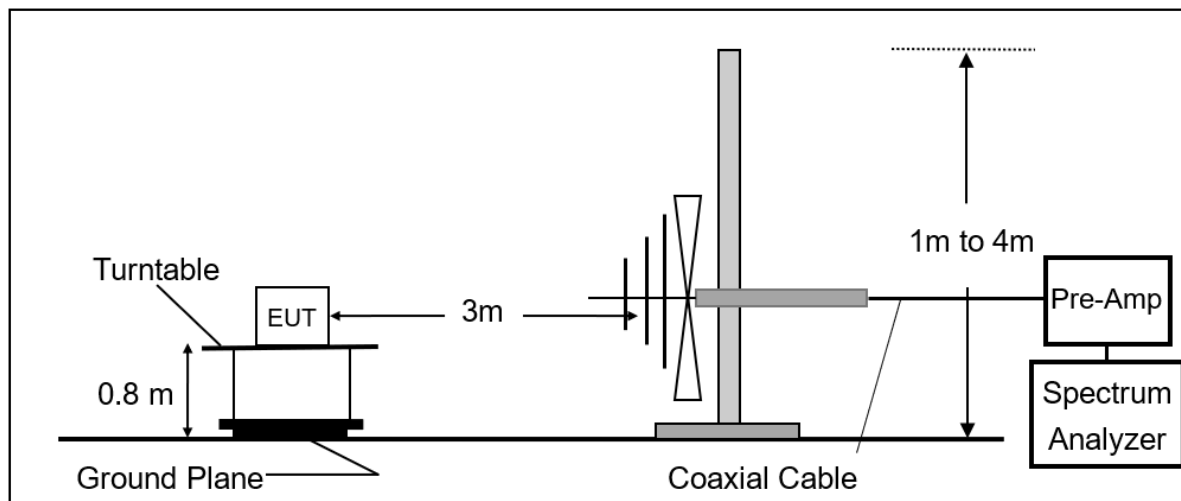


### 9.2.2 Radiated Emission

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



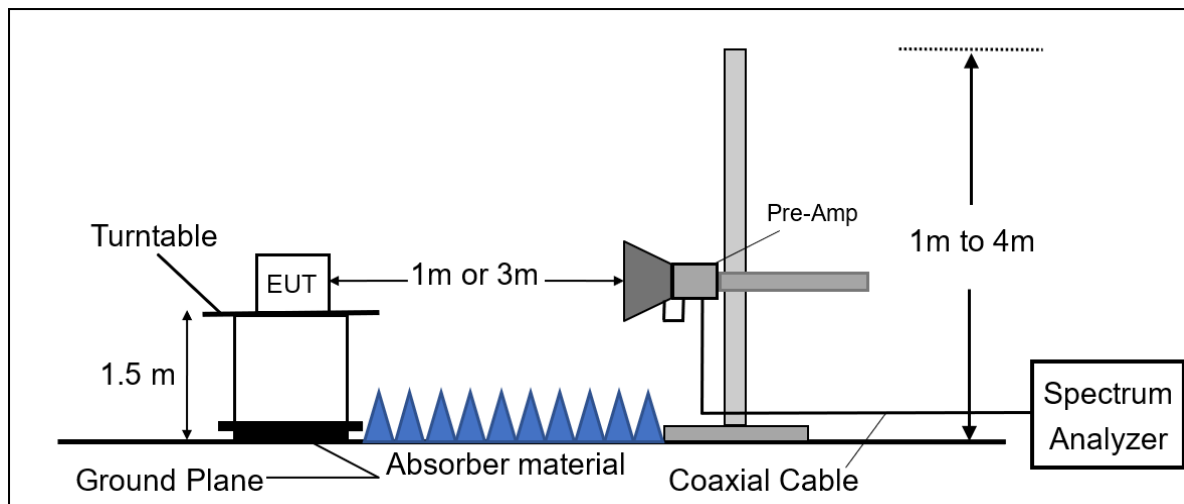
(B) Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



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



## 9.3 Measurement Procedure

### 9.3.1 Duty Cycle Correction Factor

1. Adjust and configure any EUT switches, controls, or input data streams to ensure that the EUT is transmitting or encoded to obtain the “worst-case” pulse ON time.
2. The testing follows ANSI C63.10:2013.
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 center frequency of spectrum analyzer = operating frequency.
5. Set the spectrum analyzer as RBW, VBW=1MHz, 3MHz, Span = 0Hz , Detector = Peak, Adjust Sweep=100ms.
6. Repeat above procedures until all frequency of the interest measured were complete.

### 9.3.2 Radiated Emission

1. The testing follows the Measurement Procedure of ANSI C63.10:2013.
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.

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7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz, Detector= Peak for Maximum Emission Measurements at frequency above 1 GHz.
8. According to C63.10:2013 Section 7.5 Procedure for determining the average value of pulsed emissions with duty cycle correction factor  $20 \log (T_{on}/100ms)$ .
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.

#### 9.4 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(dB/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Average value(dBμV/m)=Peak Actual FS(dBμV/m)+ Duty Cycle Correction Factor(dB)

Duty Cycle Correction Factor(dB) =  $20 \log (T_{on}/100 \text{ ms})$

#### 9.5 Test Results of Radiated Spurious Emissions form 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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## 9.6 Measurement Result:

### 9.6.1 Duty Cycle Correction Factor

#### Bluetooth 1M

Time ON of 100ms: 5.800 ms  
Duty Cycle=5.8ms / 100ms= 0.058  
Duty Cycle correction factor=20 LOG 0.058 = -24.73 dB

#### Bluetooth 3M

Time ON of 100ms: 5.700 ms  
Duty Cycle=5.7ms / 100ms= 0.057  
Duty Cycle correction factor=20 LOG 0.057 = -24.88 dB

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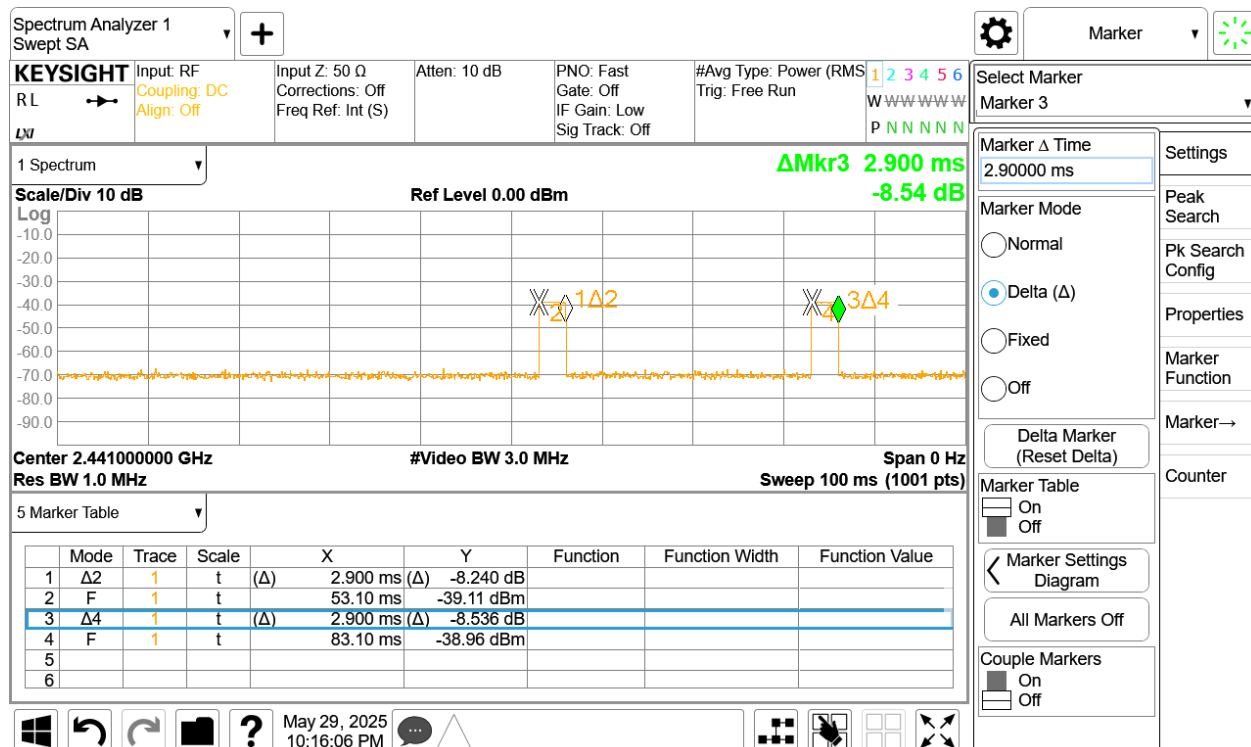
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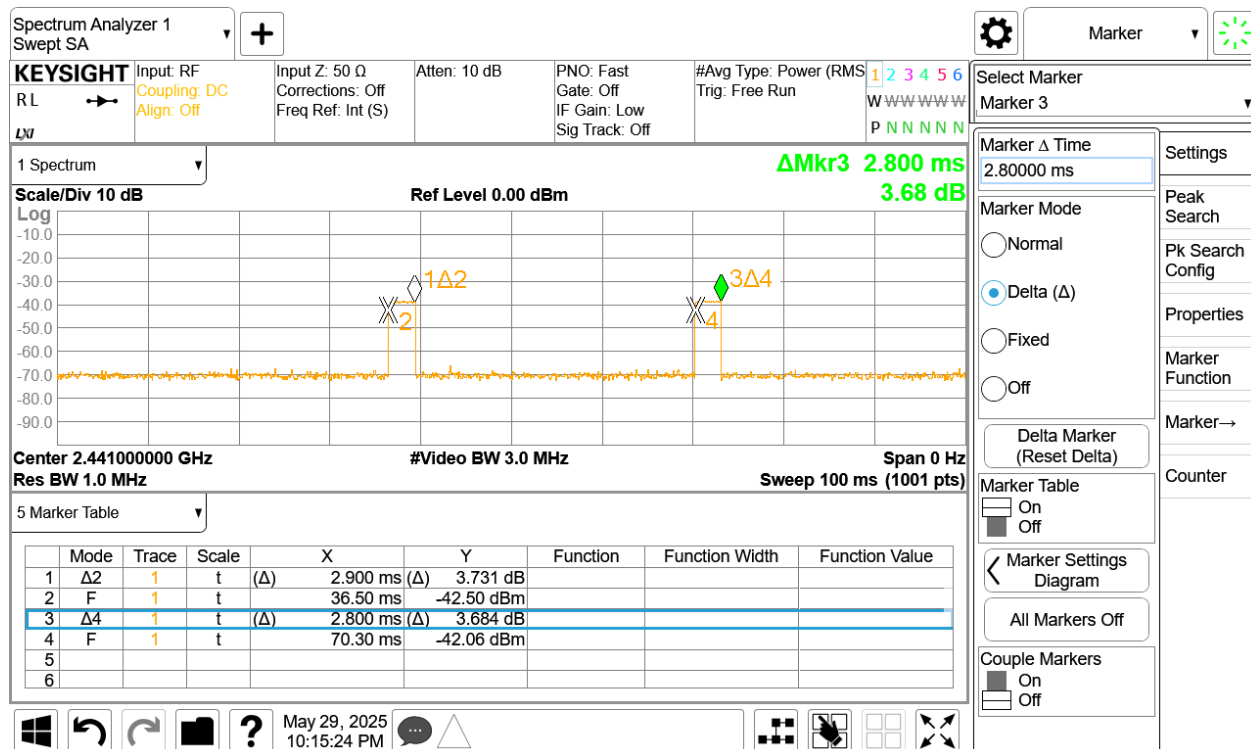
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## 9.6.2 Duty Cycle test plot

BR



EDR



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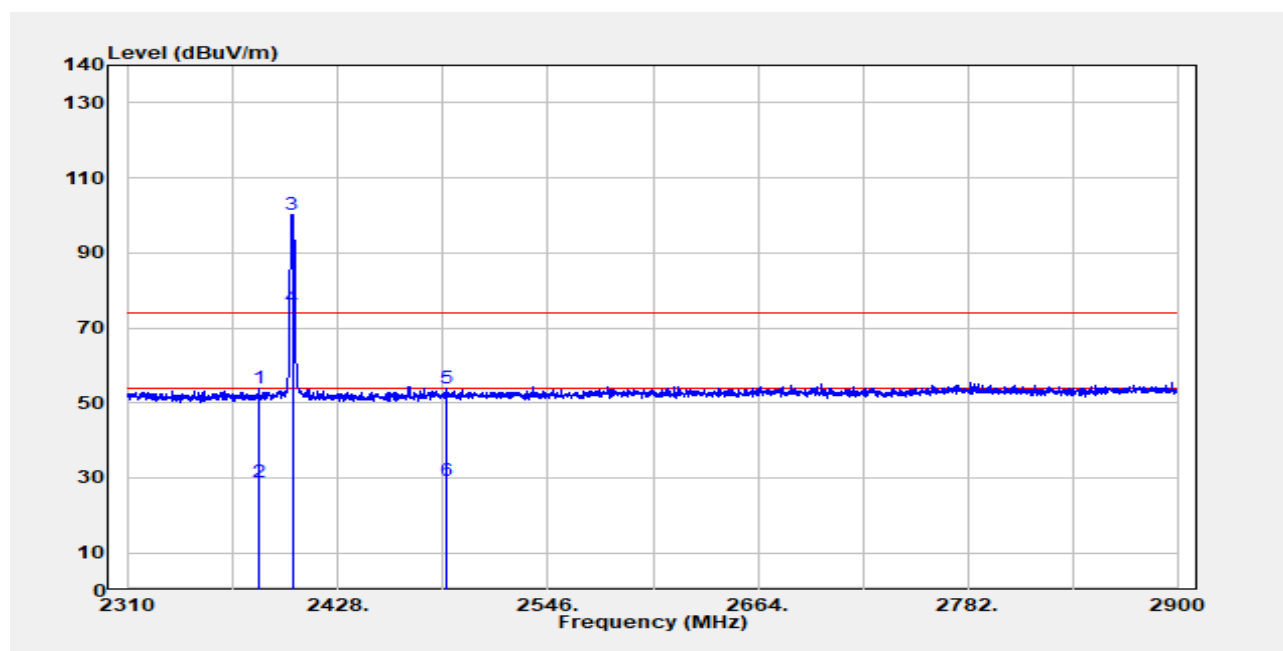
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## 9.6.3 Bandedge Result

Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2382.99	Peak	50.81	2.88	53.69	74.00	-20.31
2382.99	Average	-	-	28.96	54.00	-25.04
2402.00	Peak	97.33	2.96	100.29	-	-
2402.00	Average	-	-	75.56	-	-
2489.22	Peak	50.90	2.99	53.89	74.00	-20.11
2489.22	Average	-	-	29.16	54.00	-24.84

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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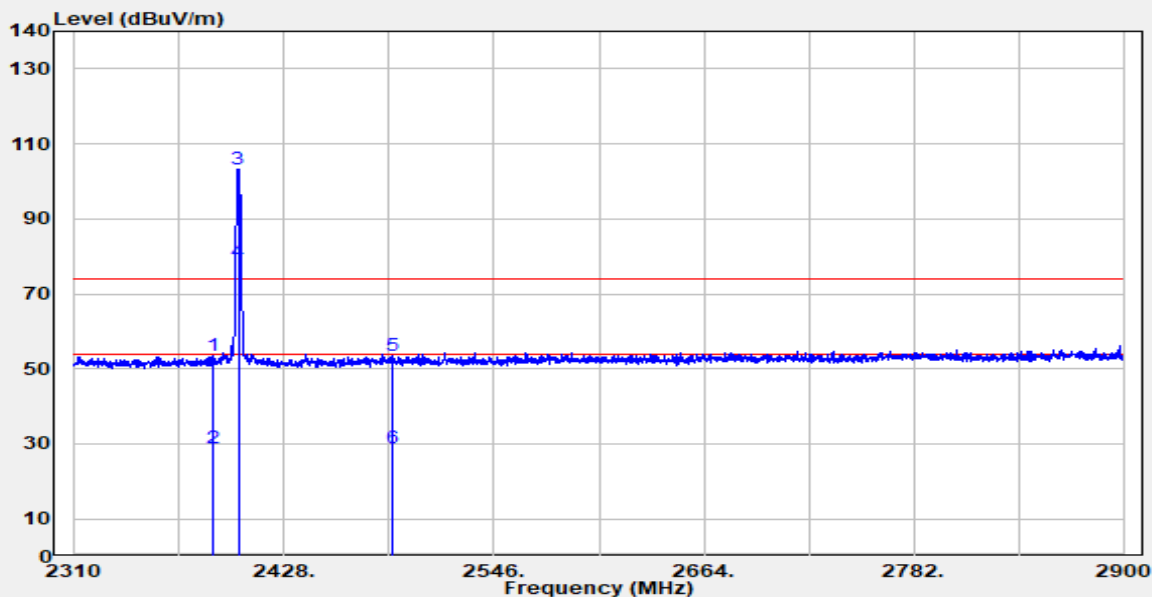
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Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2388.10	Peak	50.51	2.93	53.44	74.00	-20.56
2388.10	Average	-	-	28.71	54.00	-25.29
2402.00	Peak	100.37	2.96	103.33	-	-
2402.00	Average	-	-	78.60	-	-
2488.24	Peak	50.56	2.99	53.55	74.00	-20.45
2488.24	Average	-	-	28.82	54.00	-25.18

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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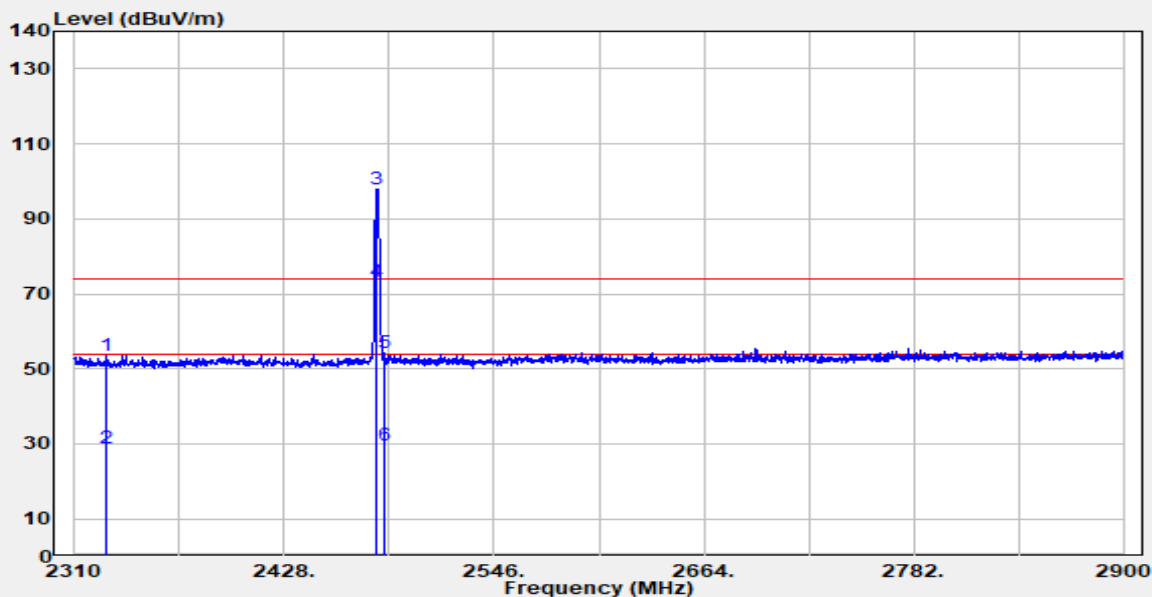
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Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
2327.90	Peak	50.45	2.98	53.43	74.00	-20.57
2327.90	Average	-	-	28.70	54.00	-25.30
2480.00	Peak	94.83	2.97	97.80	-	-
2480.00	Average	-	-	73.07	-	-
2484.11	Peak	51.16	2.98	54.14	74.00	-19.86
2484.11	Average	-	-	29.41	54.00	-24.59

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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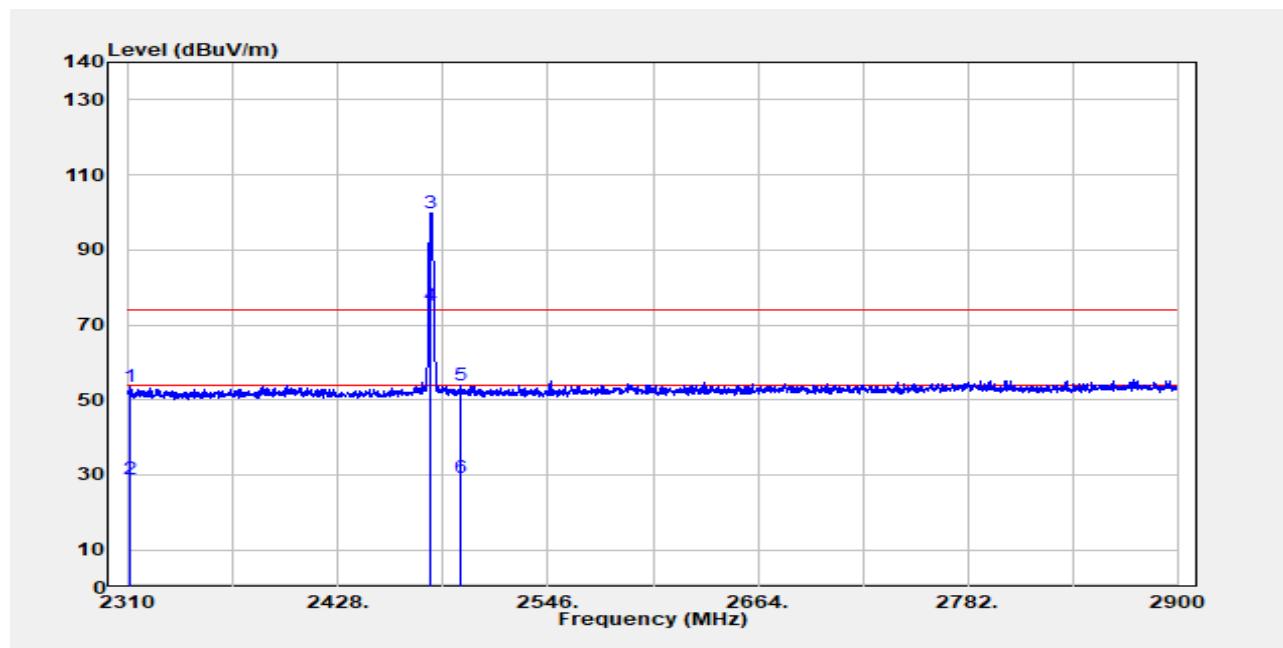
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Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2310.20	Peak	50.58	3.10	53.68	74.00	-20.32
2310.20	Average	-	-	28.95	54.00	-25.05
2480.00	Peak	96.98	2.97	99.95	-	-
2480.00	Average	-	-	75.22	-	-
2496.70	Peak	50.94	3.01	53.95	74.00	-20.05
2496.70	Average	-	-	29.22	54.00	-24.78

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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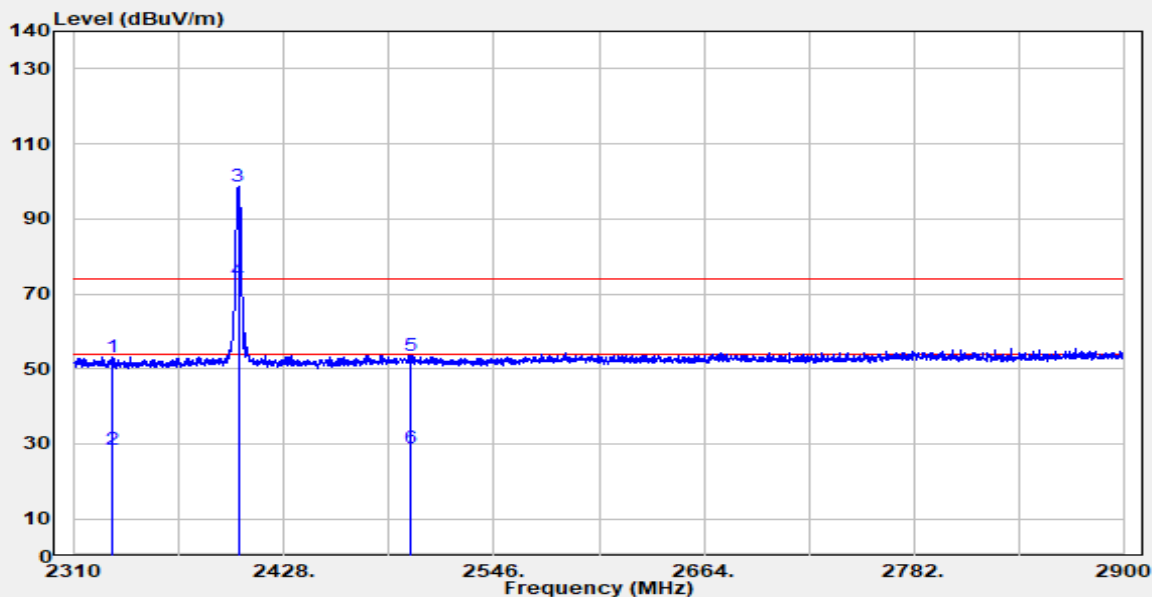
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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2331.05	Peak	50.35	2.94	53.29	74.00	-20.71
2331.05	Average	-	-	28.41	54.00	-25.59
2402.00	Peak	95.64	2.96	98.60	-	-
2402.00	Average	-	-	73.72	-	-
2499.45	Peak	50.65	3.02	53.67	74.00	-20.33
2499.45	Average	-	-	28.79	54.00	-25.21

Average Duty Cycle Factor=-24.88 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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.

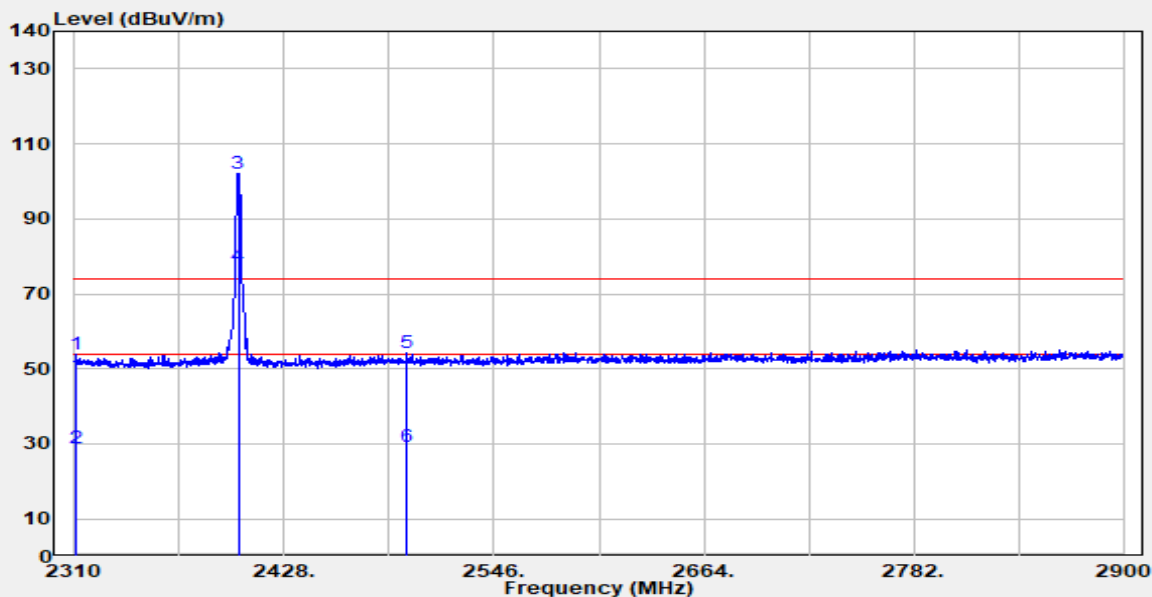
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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2311.18	Peak	50.61	3.10	53.71	74.00	-20.29
2311.18	Average	-	-	28.83	54.00	-25.17
2402.00	Peak	99.27	2.96	102.23	-	-
2402.00	Average	-	-	77.35	-	-
2496.70	Peak	51.24	3.01	54.25	74.00	-19.75
2496.70	Average	-	-	29.37	54.00	-24.63

Average Duty Cycle Factor=-24.88 (dB)

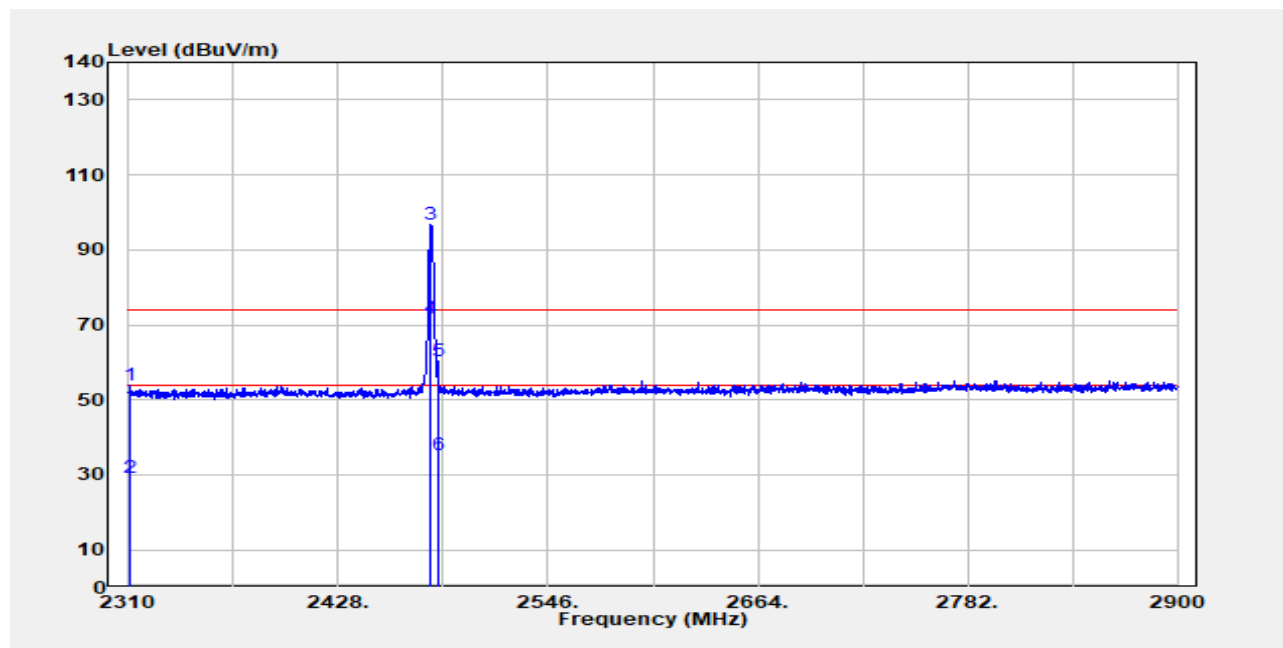
Average Level= Peak Level+ Duty Cycle Factor

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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2310.98	Peak	50.85	3.10	53.95	74.00	-20.05
2310.98	Average	-	-	29.07	54.00	-24.93
2480.00	Peak	93.63	2.97	96.60	-	-
2480.00	Average	-	-	71.72	-	-
2483.72	Peak	57.28	2.98	60.26	74.00	-13.74
2483.72	Average	-	-	35.38	54.00	-18.62

Average Duty Cycle Factor=-24.88 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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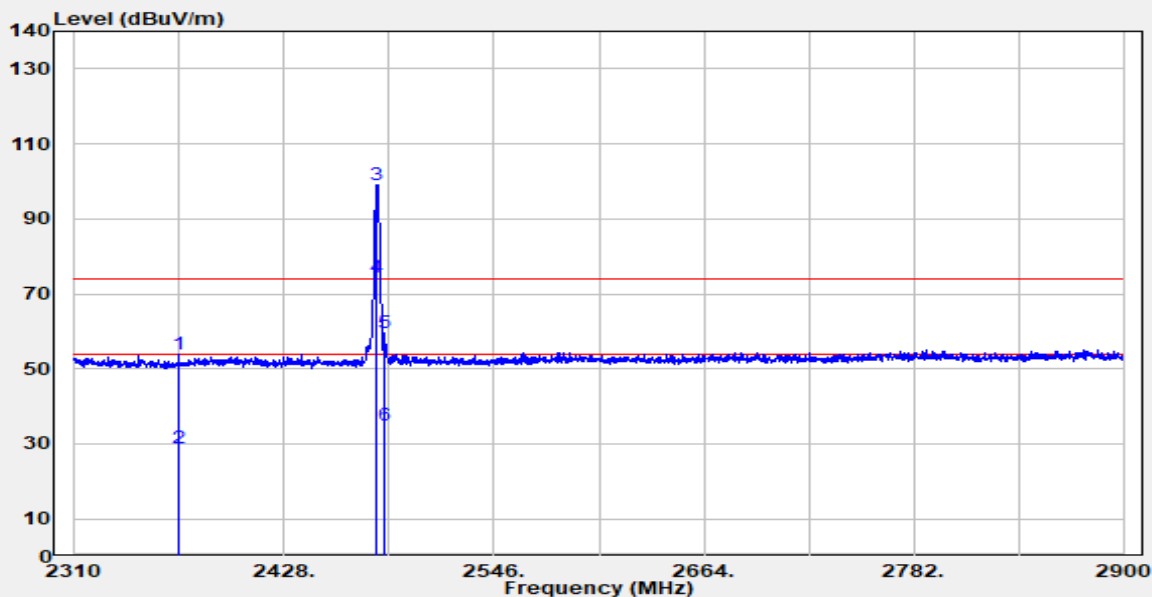
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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
2368.23	Peak	50.91	2.84	53.75	74.00	-20.25
2368.23	Average	-	-	28.87	54.00	-25.13
2480.00	Peak	96.18	2.97	99.15	-	-
2480.00	Average	-	-	74.27	-	-
2483.72	Peak	56.69	2.98	59.67	74.00	-14.33
2483.72	Average	-	-	34.79	54.00	-19.21

Average Duty Cycle Factor=-24.88 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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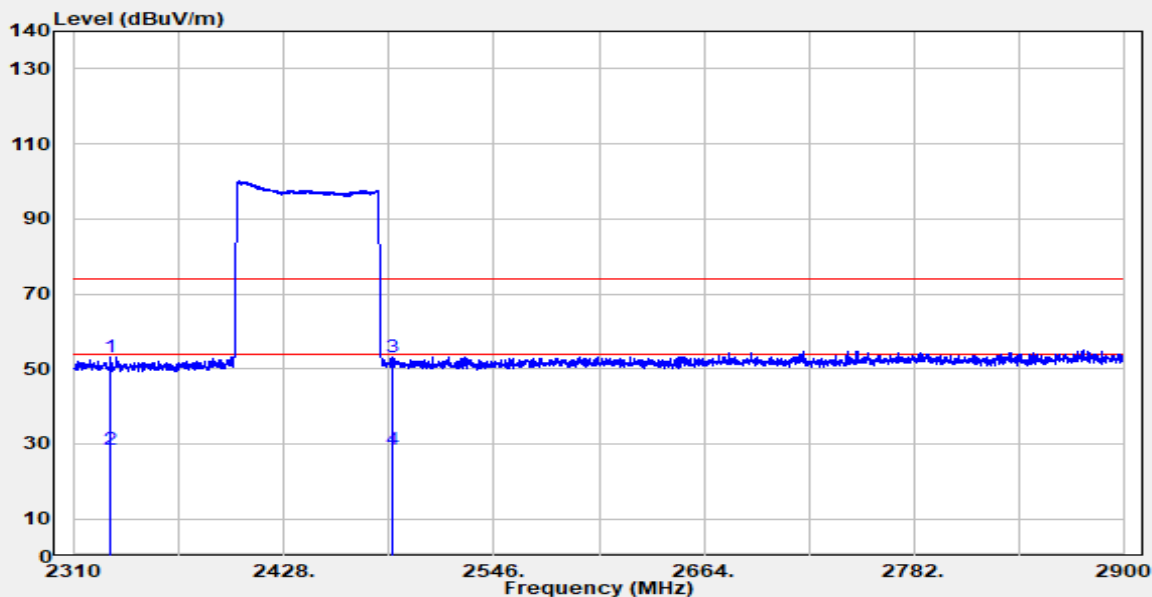
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Report Number :TERF2503001059E2  
 Operation Mode :BR Hopping  
 Test Frequency :2402~2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2330.07	Peak	50.28	2.94	53.22	74.00	-20.78
2330.07	Average	-	-	28.49	54.00	-25.51
2488.83	Peak	50.26	2.99	53.25	74.00	-20.75
2488.83	Average	-	-	28.52	54.00	-25.48

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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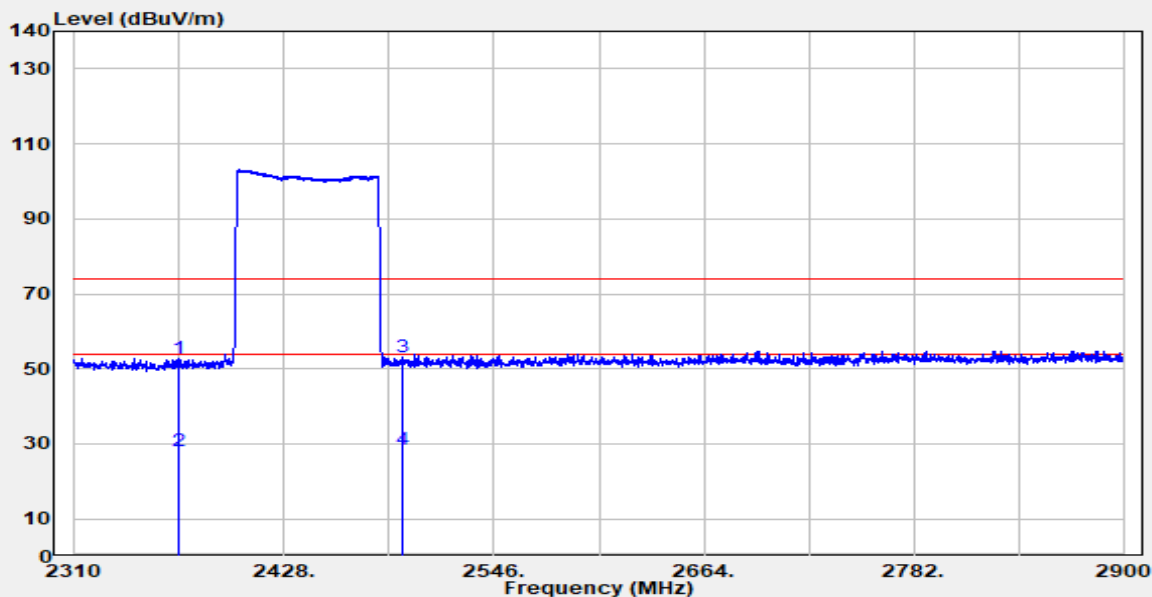
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Report Number :TERF2503001059E2  
 Operation Mode :BR Hopping  
 Test Frequency :2402~2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
2368.43	Peak	50.07	2.84	52.91	74.00	-21.09
2368.43	Average	-	-	28.18	54.00	-25.82
2493.95	Peak	50.25	3.01	53.26	74.00	-20.74
2493.95	Average	-	-	28.53	54.00	-25.47

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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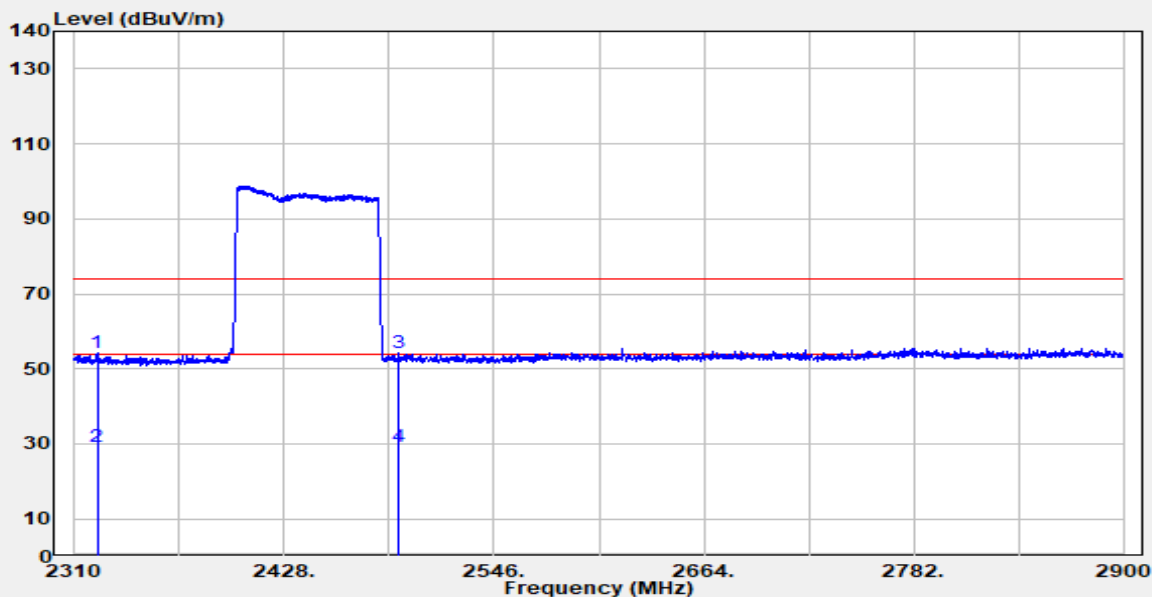
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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M Hopping  
 Test Frequency :2402~2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2322.59	Peak	51.18	3.08	54.26	74.00	-19.74
2322.59	Average	-	-	29.38	54.00	-24.62
2492.57	Peak	51.22	3.00	54.22	74.00	-19.78
2492.57	Average	-	-	29.34	54.00	-24.66

Average Duty Cycle Factor=-24.88 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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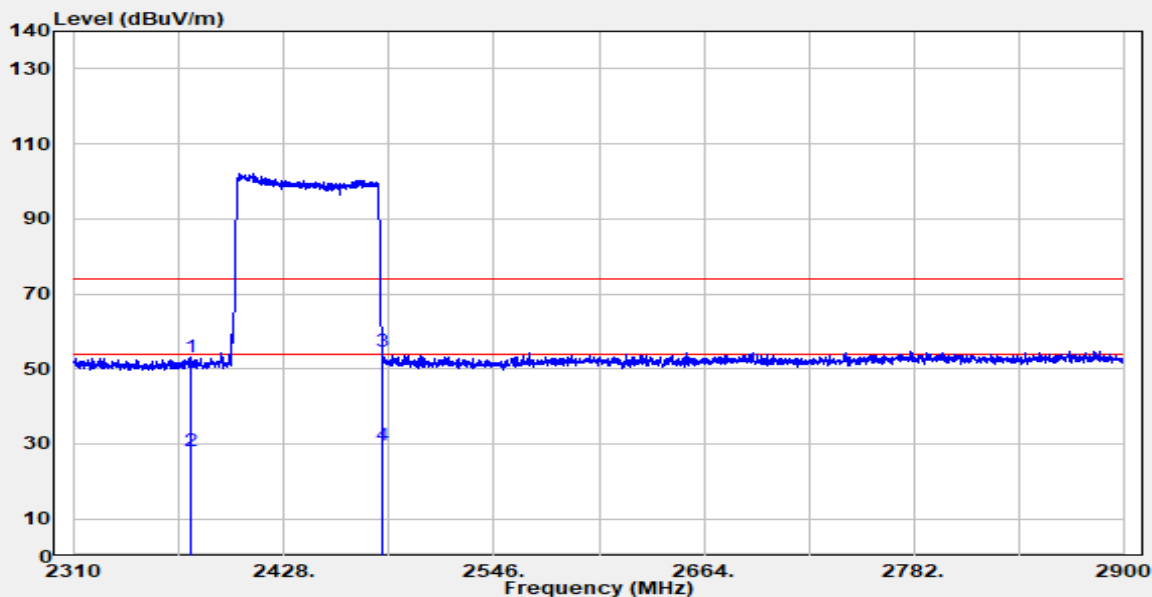
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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M Hopping  
 Test Frequency :2402~2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2374.92	Peak	50.13	2.83	52.96	74.00	-21.04
2374.92	Average	-	-	28.08	54.00	-25.92
2483.52	Peak	51.47	2.98	54.45	74.00	-19.55
2483.52	Average	-	-	29.57	54.00	-24.43

Average Duty Cycle Factor=-24.88 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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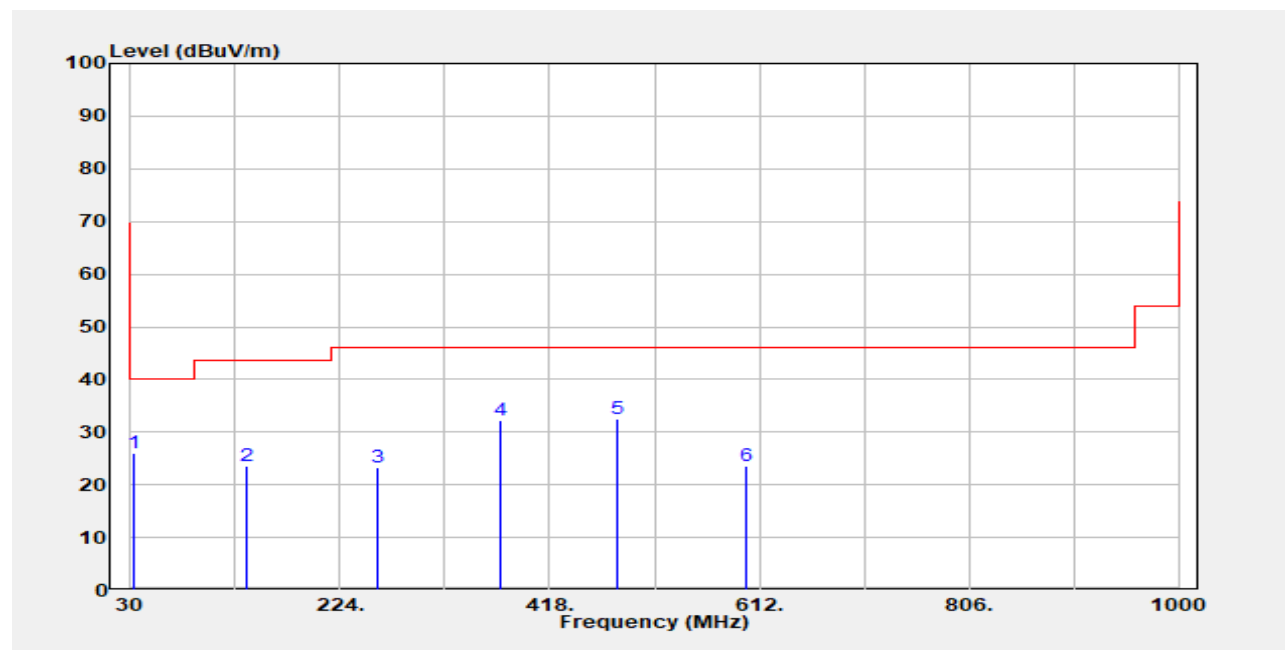
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## 9.6.4 Radiated Spurious Emission

Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-06-19  
 Temp./Humi. :24.5°C/56%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
33.88	QP	45.31	-19.20	26.11	40.00	-13.89
136.70	Peak	41.09	-17.55	23.54	43.50	-19.96
258.92	Peak	41.00	-17.63	23.37	46.00	-22.63
372.41	Peak	46.52	-14.22	32.30	46.00	-13.70
481.05	Peak	44.34	-11.73	32.61	46.00	-13.39
600.36	QP	32.90	-9.34	23.56	46.00	-22.44

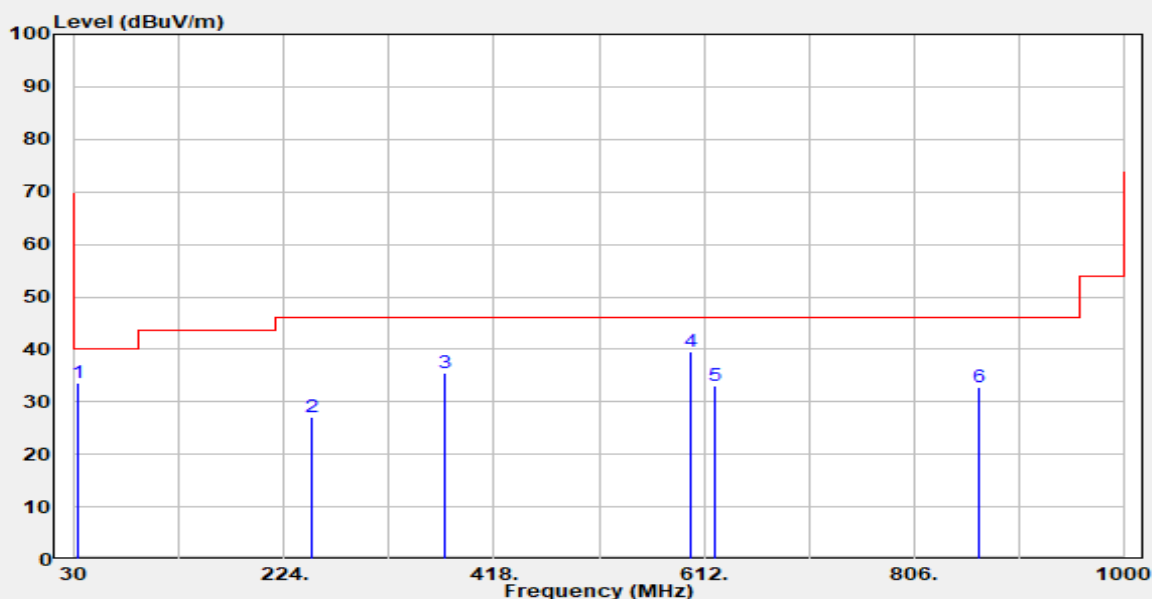
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Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-06-19  
 Temp./Humi. :24.5°C/56%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
32.91	Peak	52.95	-19.31	33.64	40.00	-6.36
250.19	Peak	45.02	-17.93	27.09	46.00	-18.91
372.41	Peak	49.67	-14.22	35.45	46.00	-10.55
600.36	Peak	49.00	-9.34	39.66	46.00	-6.34
621.70	Peak	42.20	-9.04	33.16	46.00	-12.84
866.14	Peak	38.81	-5.90	32.91	46.00	-13.09

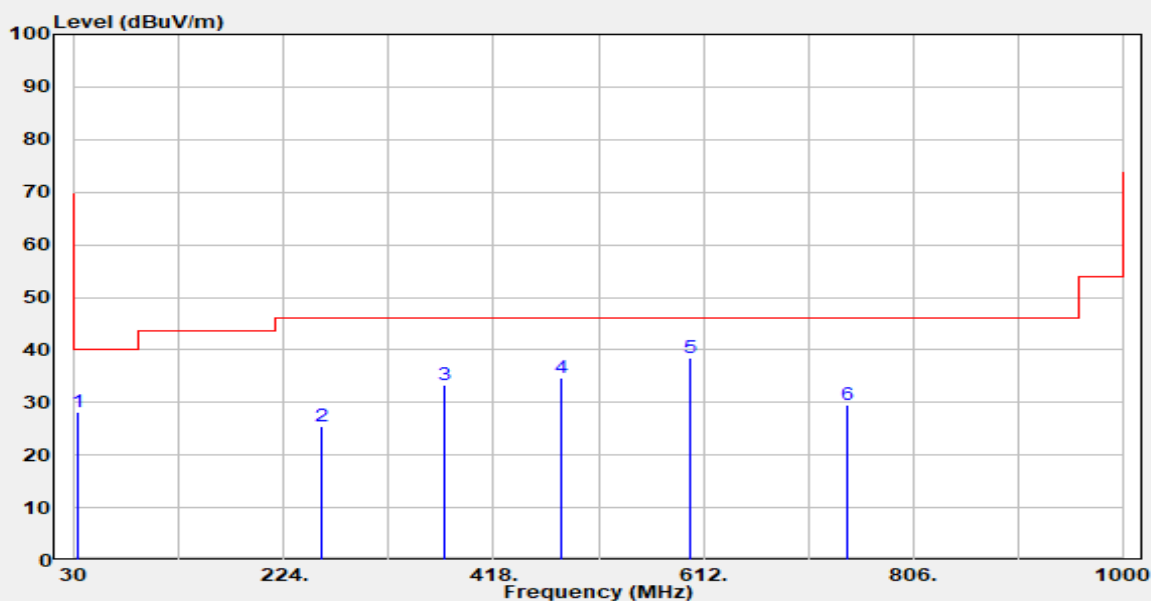
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Report Number :TERF2503001059E2  
Operation Mode :EDR 3M  
Test Frequency :2441 MHz  
Test Mode :Tx  
EUT Pol :E2 Plane

Test Site :SAC D  
Test Date :2025-06-19  
Temp./Humi. :24.5°C/56%  
Antenna Pol. :Vertical  
Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
33.88	QP	47.44	-19.20	28.24	40.00	-11.76
258.92	Peak	43.00	-17.63	25.37	46.00	-20.63
372.41	Peak	47.52	-14.22	33.30	46.00	-12.70
481.05	Peak	46.34	-11.73	34.61	46.00	-11.39
600.36	Peak	47.69	-9.34	38.35	46.00	-7.65
745.86	Peak	36.61	-6.96	29.65	46.00	-16.35

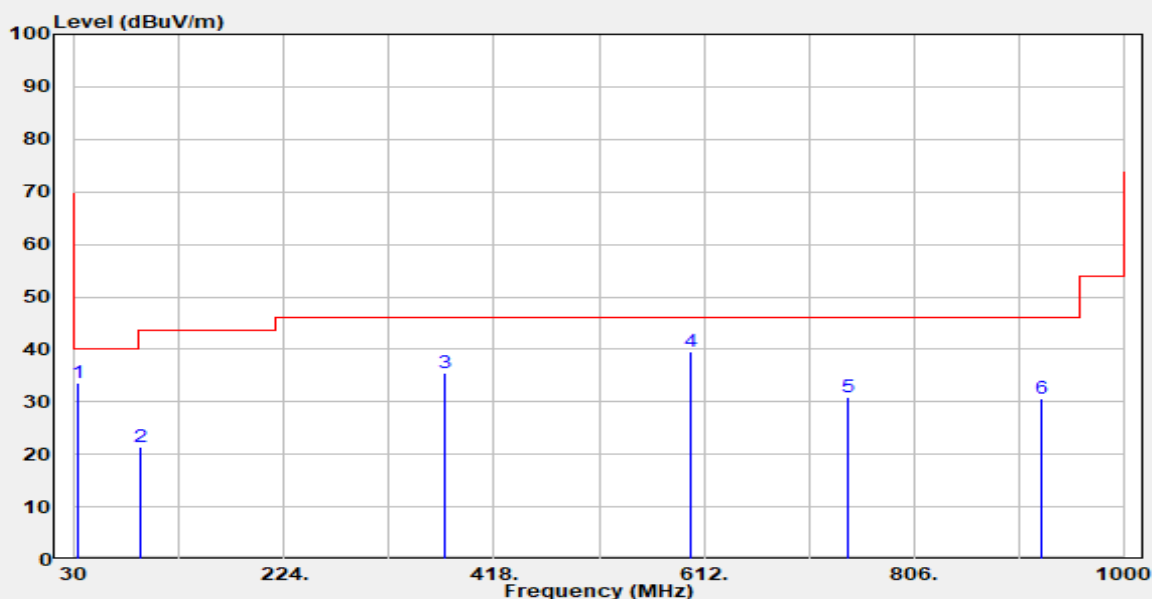
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Report Number :TERF2503001059E2  
Operation Mode :EDR 3M  
Test Frequency :2441 MHz  
Test Mode :Tx  
EUT Pol :E2 Plane

Test Site :SAC D  
Test Date :2025-06-19  
Temp./Humi. :24.5°C/56%  
Antenna Pol. :Horizontal  
Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
32.91	Peak	52.95	-19.31	33.64	40.00	-6.36
91.11	Peak	44.65	-23.20	21.45	43.50	-22.05
372.41	Peak	49.67	-14.22	35.45	46.00	-10.55
600.36	Peak	49.00	-9.34	39.66	46.00	-6.34
744.89	Peak	37.94	-6.96	30.98	46.00	-15.02
924.34	Peak	35.48	-4.84	30.64	46.00	-15.36

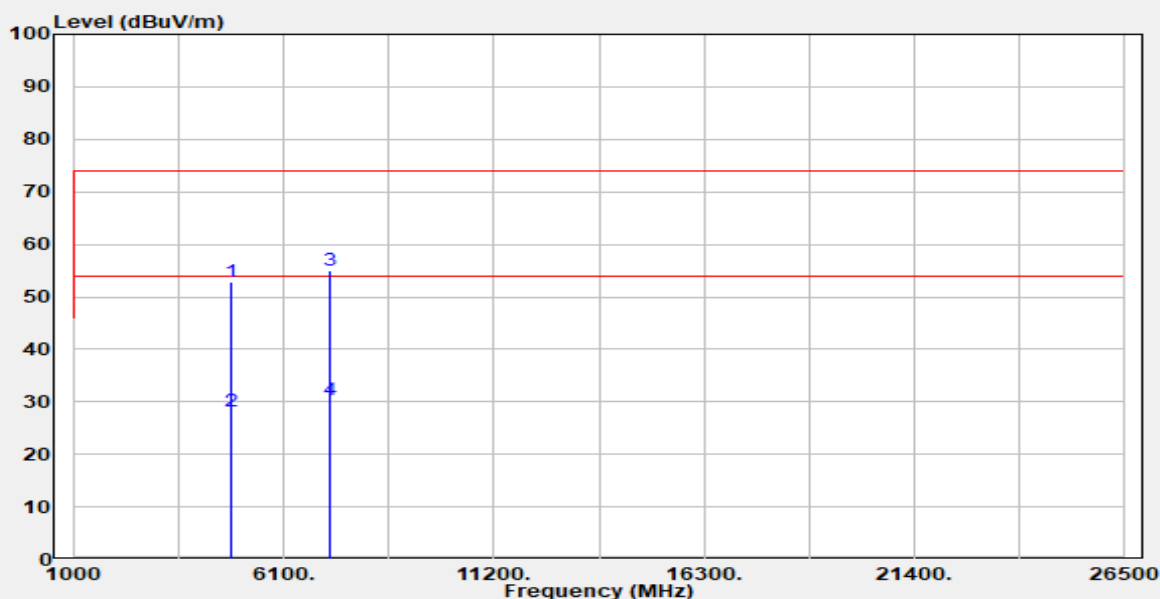
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Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2402 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.00	Peak	43.45	9.47	52.92	74.00	-21.08
4804.00	Average	-	-	28.19	54.00	-25.81
7206.00	Peak	38.35	16.80	55.15	74.00	-18.85
7206.00	Average	-	-	30.42	54.00	-23.58

Average Duty Cycle Factor=-24.73 (dB)

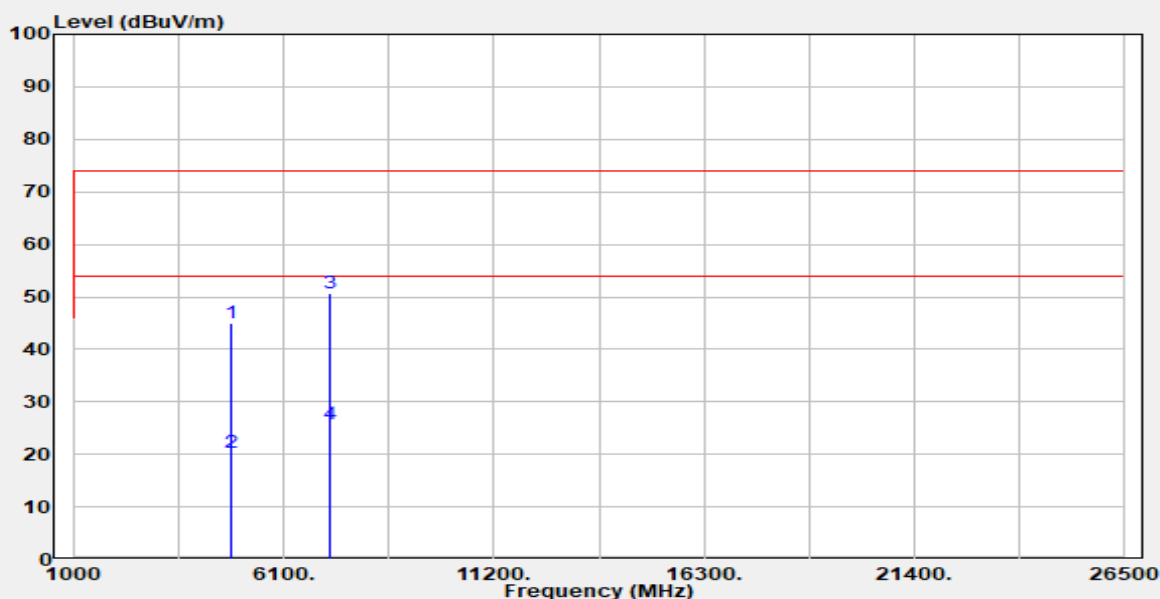
Average Level= Peak Level+ Duty Cycle Factor

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Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2402 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.00	Peak	35.50	9.47	44.97	74.00	-29.03
4804.00	Average	-	-	20.24	54.00	-33.76
7206.00	Peak	33.77	16.80	50.57	74.00	-23.43
7206.00	Average	-	-	25.84	54.00	-28.16

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

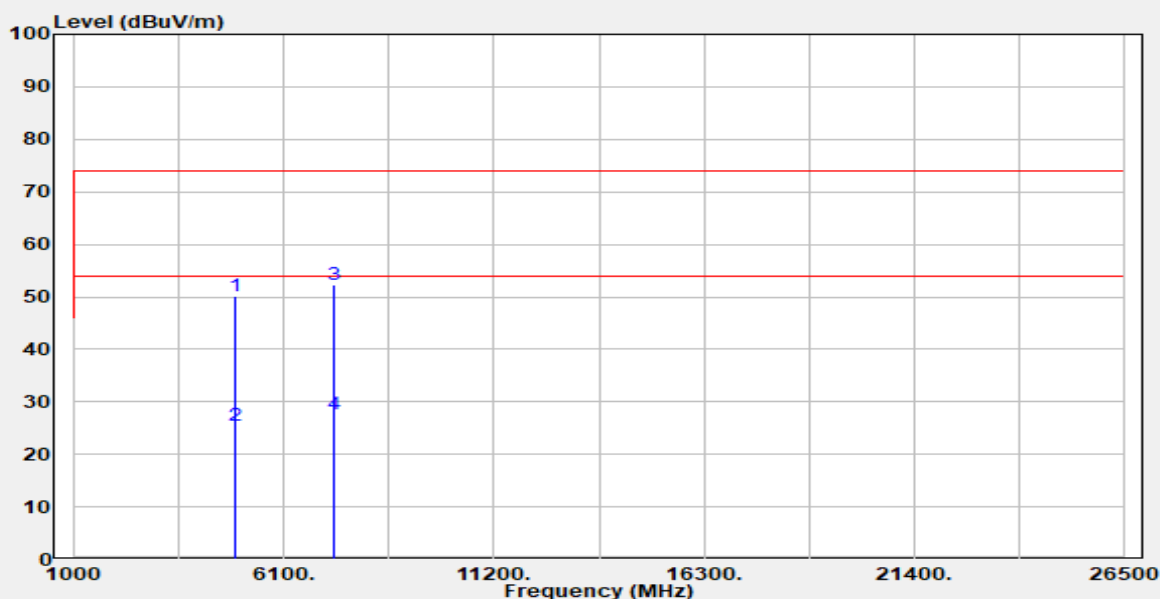
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Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4882.00	Peak	40.55	9.54	50.09	74.00	-23.91
4882.00	Average	-	-	25.36	54.00	-28.64
7323.00	Peak	34.85	17.44	52.29	74.00	-21.71
7323.00	Average	-	-	27.56	54.00	-26.44

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

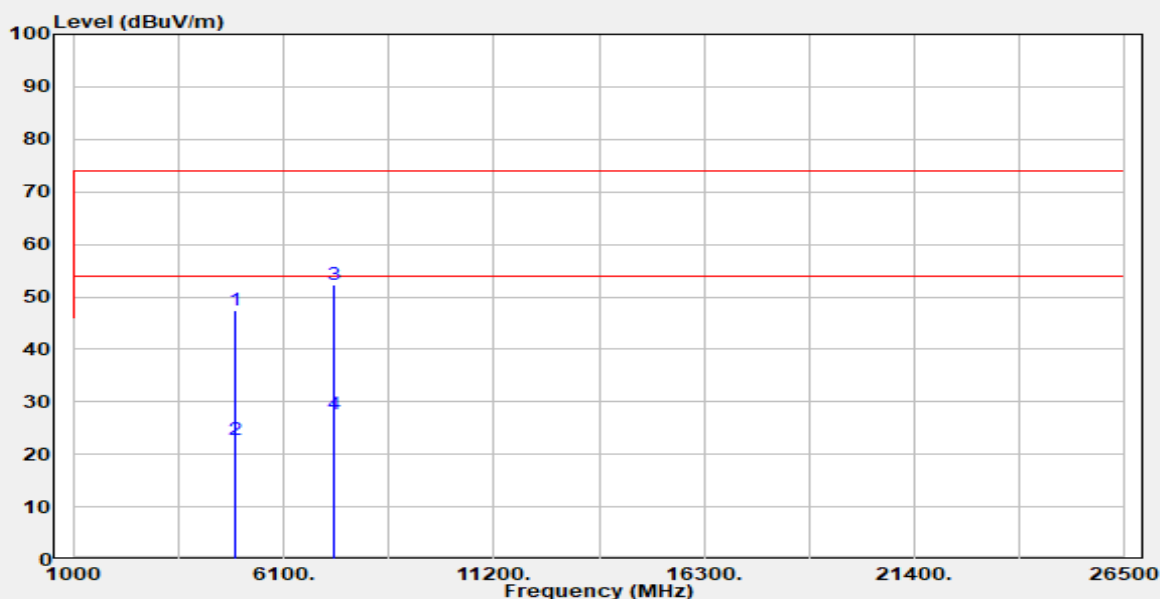
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Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4882.00	Peak	37.86	9.54	47.40	74.00	-26.60
4882.00	Average	-	-	22.67	54.00	-31.33
7323.00	Peak	34.94	17.44	52.38	74.00	-21.62
7323.00	Average	-	-	27.65	54.00	-26.35

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

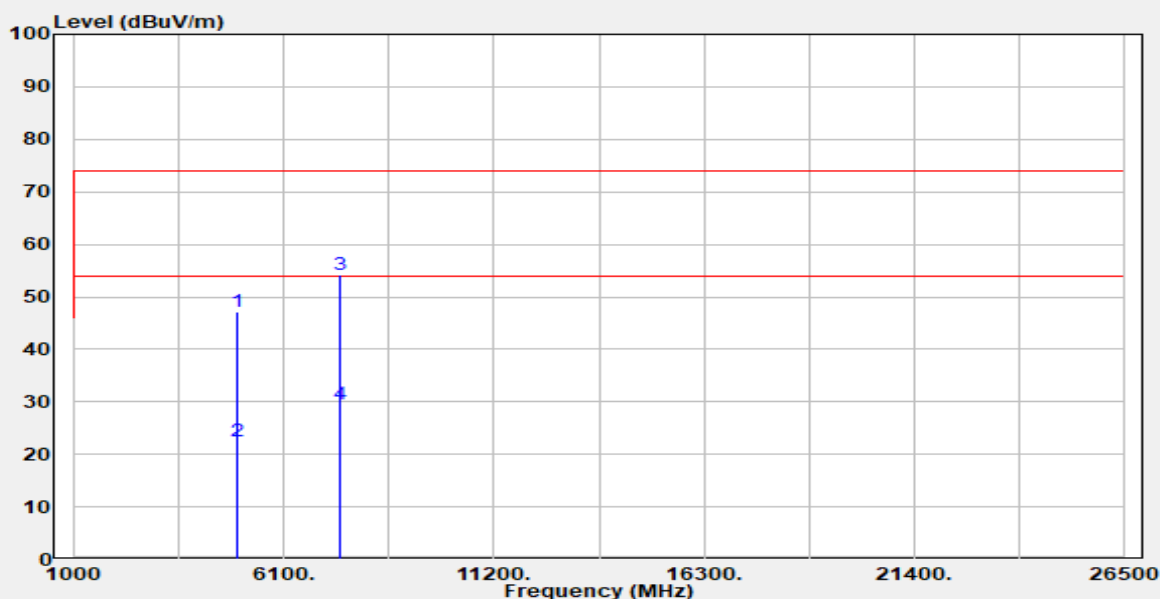
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Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.00	Peak	37.37	9.91	47.28	74.00	-26.72
4960.00	Average	-	-	22.55	54.00	-31.45
7440.00	Peak	36.47	17.73	54.20	74.00	-19.80
7440.00	Average	-	-	29.47	54.00	-24.53

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

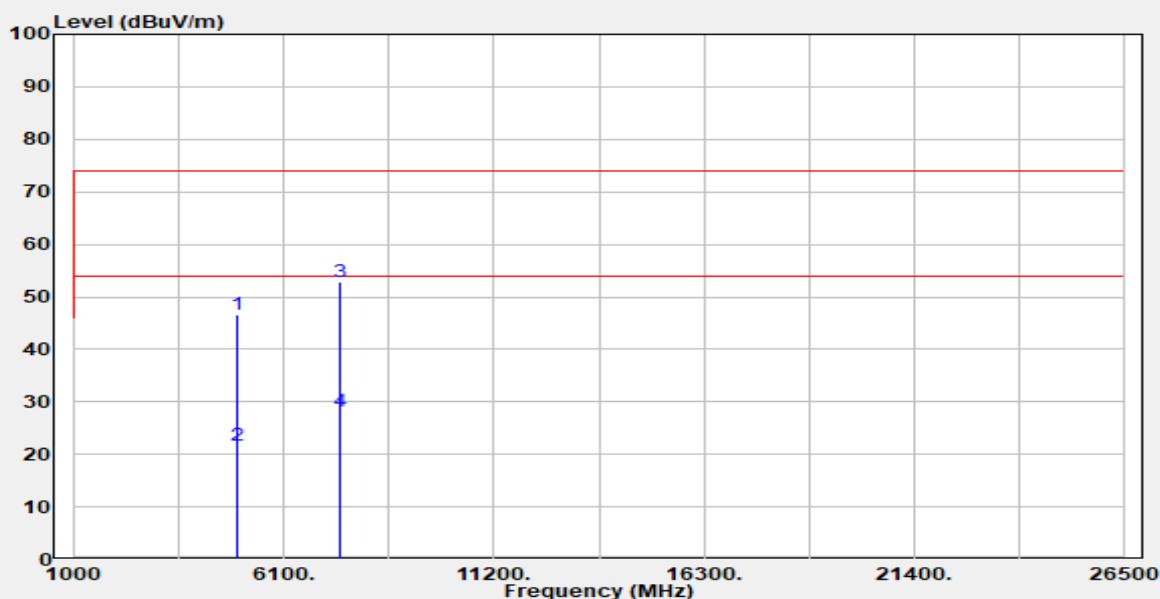
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Report Number :TERF2503001059E2  
 Operation Mode :BR  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.00	Peak	36.60	9.91	46.51	74.00	-27.49
4960.00	Average	-	-	21.78	54.00	-32.22
7440.00	Peak	35.16	17.73	52.89	74.00	-21.11
7440.00	Average	-	-	28.16	54.00	-25.84

Average Duty Cycle Factor=-24.73 (dB)

Average Level= Peak Level+ Duty Cycle Factor

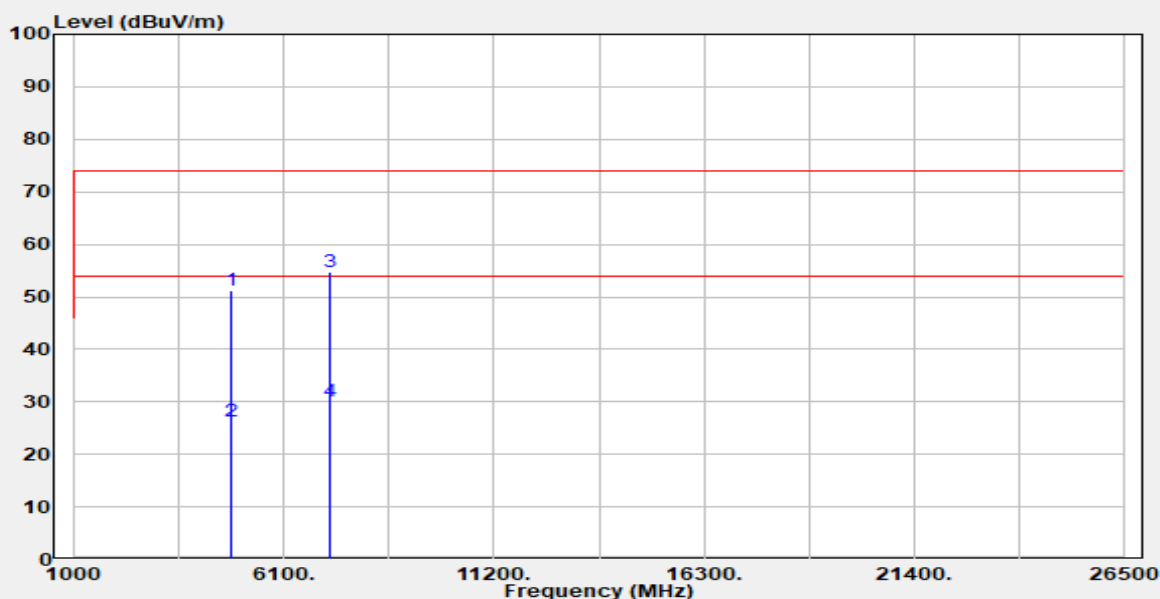
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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M  
 Test Frequency :2402 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.00	Peak	41.80	9.47	51.27	74.00	-22.73
4804.00	Average	-	-	26.39	54.00	-27.61
7206.00	Peak	38.05	16.80	54.85	74.00	-19.15
7206.00	Average	-	-	29.97	54.00	-24.03

Average Duty Cycle Factor=-24.88 (dB)

Average Level= Peak Level+ Duty Cycle Factor

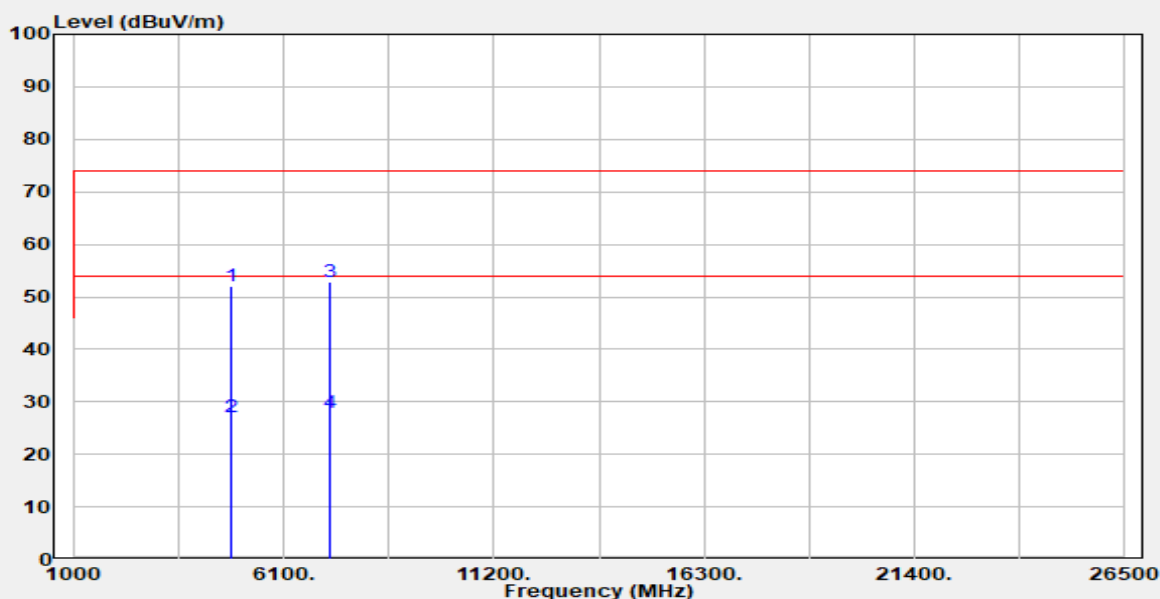
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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M  
 Test Frequency :2402 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.00	Peak	42.58	9.47	52.05	74.00	-21.95
4804.00	Average	-	-	27.17	54.00	-26.83
7206.00	Peak	36.01	16.80	52.81	74.00	-21.19
7206.00	Average	-	-	27.93	54.00	-26.07

Average Duty Cycle Factor=-24.88 (dB)

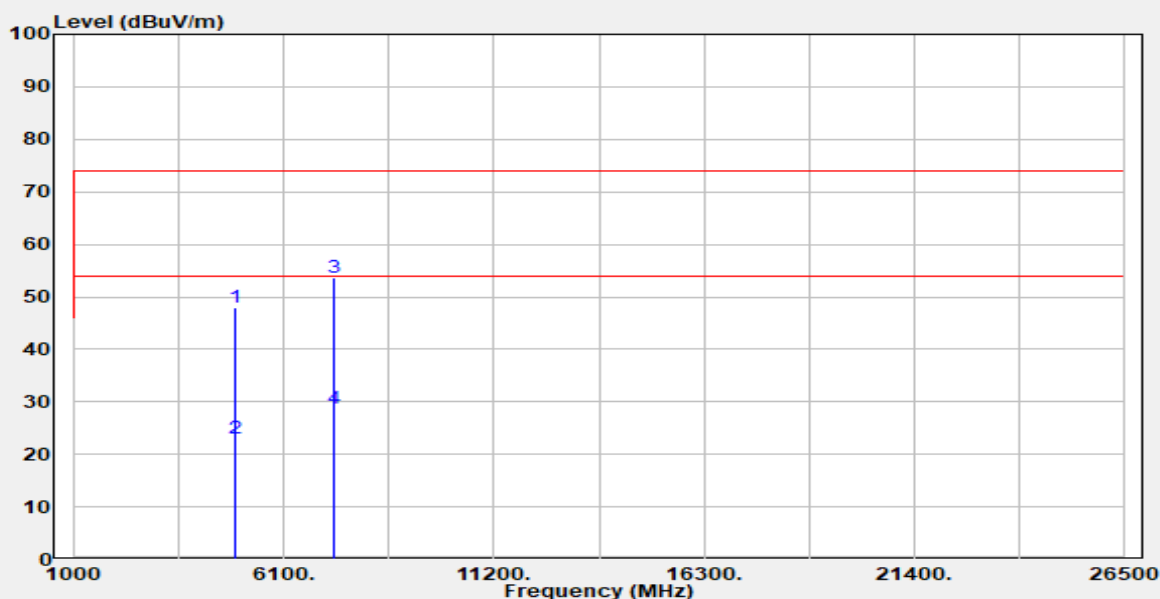
Average Level= Peak Level+ Duty Cycle Factor

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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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4882.00	Peak	38.31	9.54	47.85	74.00	-26.15
4882.00	Average	-	-	22.97	54.00	-31.03
7323.00	Peak	36.18	17.44	53.62	74.00	-20.38
7323.00	Average	-	-	28.74	54.00	-25.26

Average Duty Cycle Factor=-24.88 (dB)

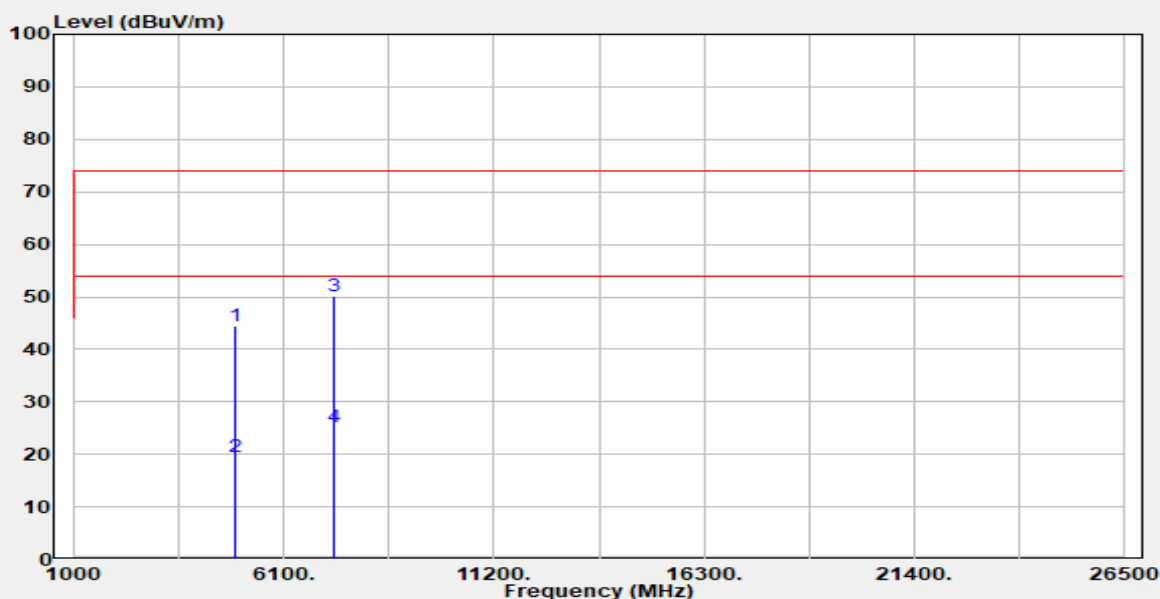
Average Level= Peak Level+ Duty Cycle Factor

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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4882.00	Peak	34.90	9.54	44.44	74.00	-29.56
4882.00	Average	-	-	19.56	54.00	-34.44
7323.00	Peak	32.75	17.44	50.19	74.00	-23.81
7323.00	Average	-	-	25.31	54.00	-28.69

Average Duty Cycle Factor=-24.88 (dB)

Average Level= Peak Level+ Duty Cycle Factor

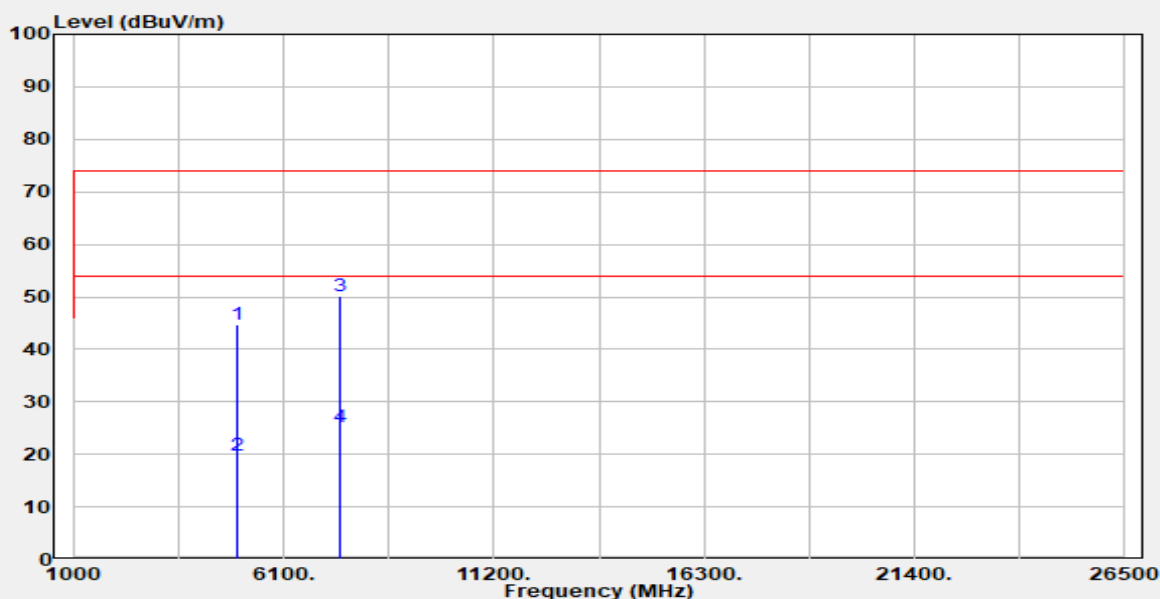
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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.00	Peak	34.85	9.91	44.76	74.00	-29.24
4960.00	Average	-	-	19.88	54.00	-34.12
7440.00	Peak	32.43	17.73	50.16	74.00	-23.84
7440.00	Average	-	-	25.28	54.00	-28.72

Average Duty Cycle Factor=-24.88 (dB)

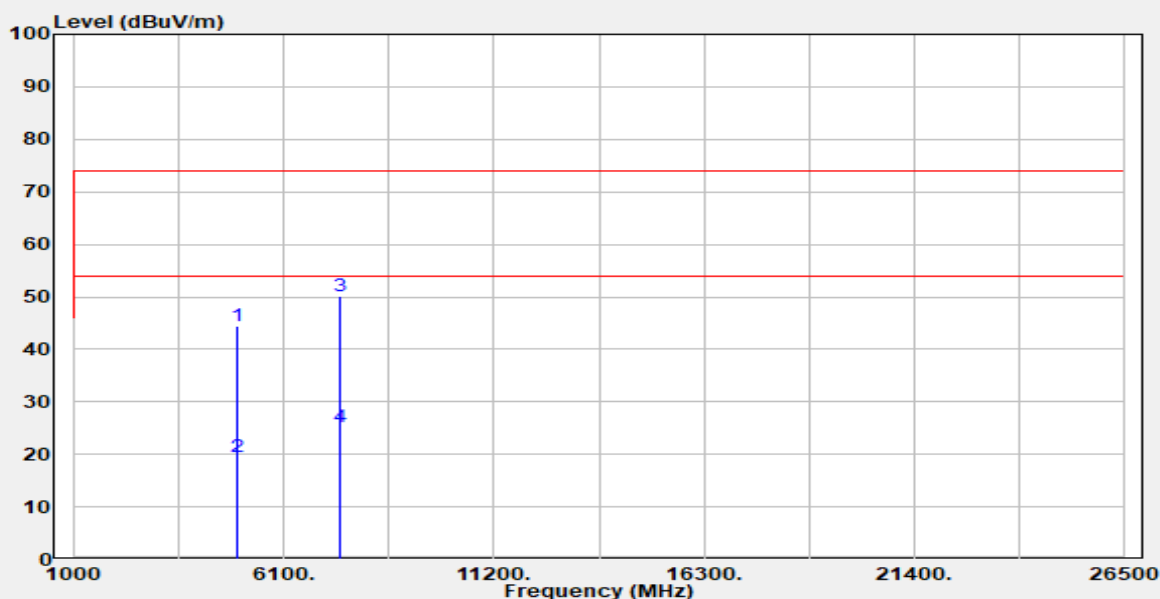
Average Level= Peak Level+ Duty Cycle Factor

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Report Number :TERF2503001059E2  
 Operation Mode :EDR 3M  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC D  
 Test Date :2025-05-29  
 Temp./Humi. :20.8°C/59%  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.00	Peak	34.60	9.91	44.51	74.00	-29.49
4960.00	Average	-	-	19.63	54.00	-34.37
7440.00	Peak	32.48	17.73	50.21	74.00	-23.79
7440.00	Average	-	-	25.33	54.00	-28.67

Average Duty Cycle Factor=-24.88 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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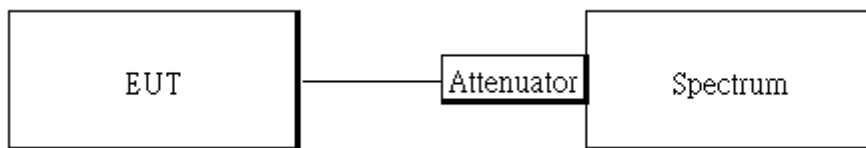
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## 10 TIME OF OCCUPANCY (DWELL TIME)

### 10.1 Standard Applicable

Frequency hopping systems operating in the 2400MHz-2483.5MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

### 10.2 Test Setup



### 10.3 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013.
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 center frequency of spectrum analyzer = operating frequency.
5. Set the spectrum analyzer as RBW, VBW=1MHz, 3MHz, Span = 0Hz, Detector = Peak, Adjust Sweep = 2~8ms.
6. Repeat above procedures until all frequency of the interest measured were complete.

Formula Deduced: time occupancy of one time slot X Hopping rate / total slot in one channel / total channel that hops X period of working channels.

Where, standard hopping rate is 1600 hops/s, slot in one channel for DH1, DH3, and DH5 is 2, 4, and 6, respectively.

DH1 consists of single time slot of the uplink, and one slot of the downlink Total Slot: 2

DH3 consists of three time slot of the uplink, and one slot of the downlink. Total Slot: 4

DH5 consists of five time slot of the uplink, and one slot of the downlink. Total Slot: 6

Note: the result of the complete test default channel at 1Mbps is recorded on the test report, 2Mbps, and 3Mbps only records the measurement result at middle channel that reveals no much deviation.

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## 10.4 Measurement Result

### GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
39	DH1	124.80	400
	DH3	262.40	400
	DH5	308.80	400

### $\pi/4$ DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
39	2DH1	123.20	400
	2DH3	262.40	400
	2DH5	308.80	400

### 8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
39	3DH1	123.20	400
	3DH3	262.40	400
	3DH5	308.80	400

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### GFSK (1Mbps):

CH Mid	DH1 time slot	=	0.390	*	(1600/2/79)	*	31.6	=	124.80 (ms)
	DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	DH5 time slot	=	2.895	*	(1600/6/79)	*	31.6	=	308.80 (ms)

### $\pi/4$ -DQPSK (2Mbps):

CH Mid	2DH1 time slot	=	0.385	*	(1600/2/79)	*	31.6	=	123.20 (ms)
	2DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	2DH5 time slot	=	2.895	*	(1600/6/79)	*	31.6	=	308.80 (ms)

### 8-DPSK (3Mbps):

CH Mid	3DH1 time slot	=	0.385	*	(1600/2/79)	*	31.6	=	123.20 (ms)
	3DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	3DH5 time slot	=	2.895	*	(1600/6/79)	*	31.6	=	308.80 (ms)

A period time = 0.4 (s) \* 79 = 31.6 (s)

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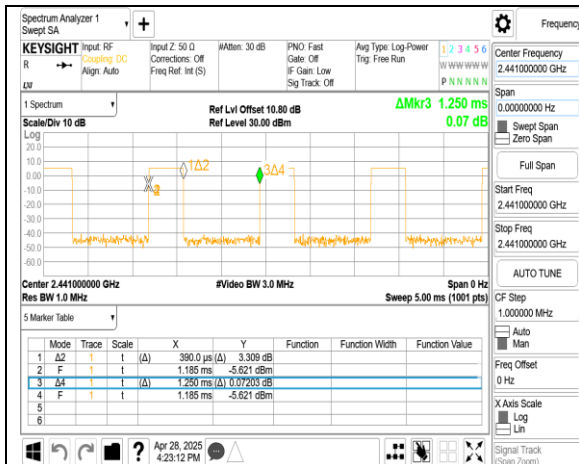
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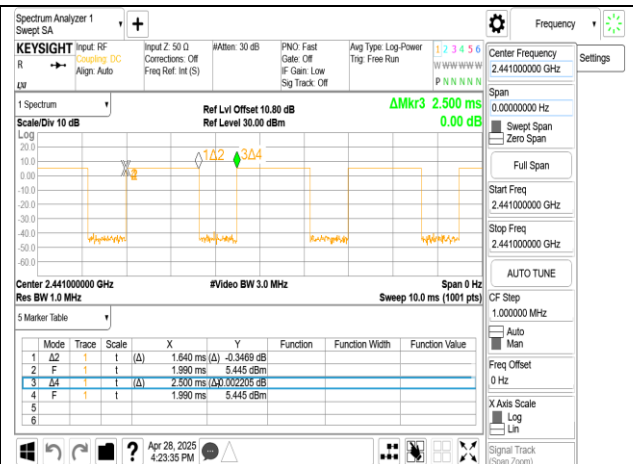
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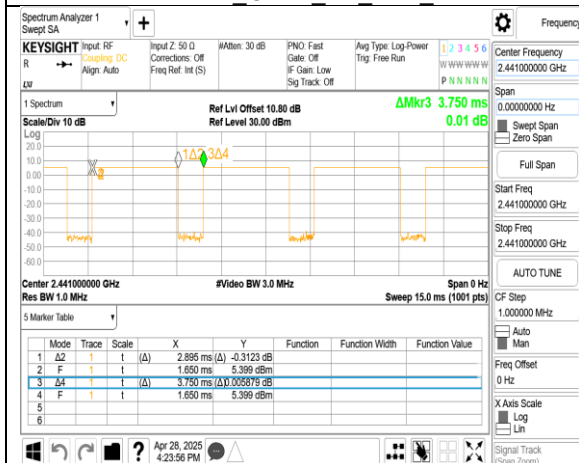
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Dwell Time GFSK 1M DH1 2441MHz



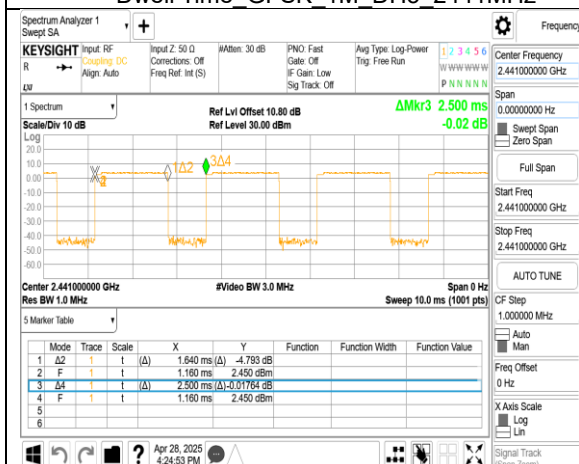
Dwell Time GFSK 1M DH3 2441MHz



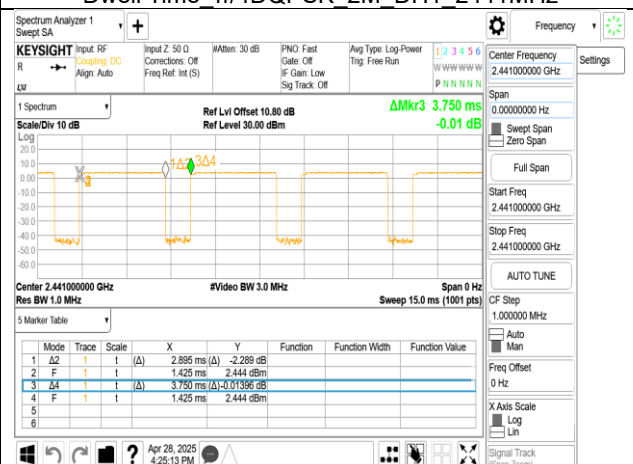
Dwell Time GFSK 1M DH5 2441MHz



Dwell Time  $\pi/4$ QPSK 2M DH1 2441MHz



Dwell Time  $\pi/4$ QPSK 2M DH3 2441MHz

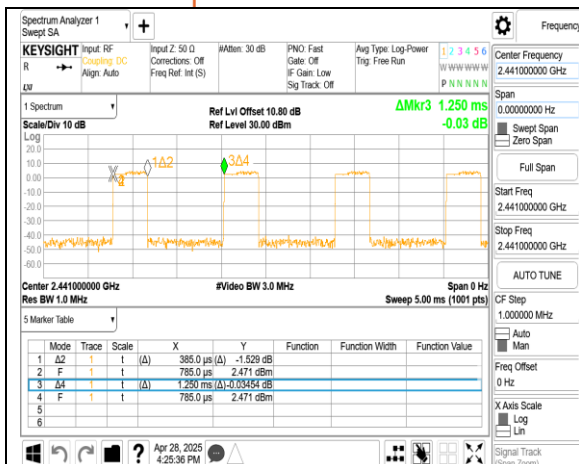


Dwell Time  $\pi/4$ QPSK 2M DH5 2441MHz

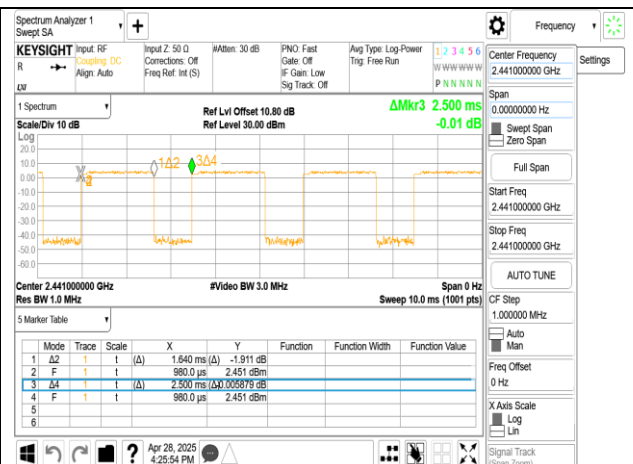
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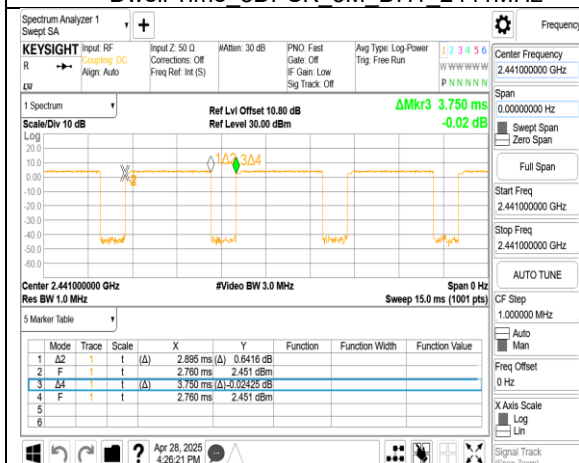
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Dwell Time\_8DPSK\_3M\_DH1\_2441MHz



Dwell Time\_8DPSK\_3M\_DH3\_2441MHz



Dwell Time\_8DPSK\_3M\_DH5\_2441MHz

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~ End of Report ~

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