



## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



**Applicant:** Quanta Computer Inc.  
 No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City  
 33377, Taiwan

**Manufacturer:** Quanta Computer Inc.  
 No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City  
 33377, Taiwan

**Product Name:** Kitchen Display System

**Brand Name:** Clover

**Model No.:** C700

**Model Difference:** N/A

**Report Number:** TERF2212002686E2

**FCC ID** HFS-C700

**IC:** 1787B-C700

**Date of EUT Received:** December 09, 2022

**Date of Test:** December 09, 2022~December 26, 2022

**Issue Date:** January 12, 2023

*Approved By*

*Arno Hsieh*

### We hereby certify that:

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

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

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## Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2212002686E2	00	Original.	Jan. 12, 2023	Yi-Shan Tsai	

**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

Product Name:	Kitchen Display System
Brand Name:	Clover
Model No.:	C700
Model Difference:	N/A
Hardware Version:	N/A
Firmware Version:	N/A
EUT Series No.:	C070UQ24650075 (Conducted) TE_SP_20221209466 (Conduction、Radiated)
Power Supply:	Adapter 12Vdc
Test Software (Name/Version)	Qualcomm Radio Control ToolKit v4.0

### 1.2 RF Specification

Radio Technology:	BT BR+EDR
Channel number:	79 channels
Modulation type:	GFSK + π/4DQPSK + 8DPSK
Transmit Power:	7.52 dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	≤ 0.4s

### 1.3 Antenna Designation

Antenna Type	Freq. (MHz)	Peak Antenna Gain (dBi)
PIFA	2402~2480	0.51

**Note:** 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 2 Feb. 2017

RSS-Gen, Issue 5 April 2018

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 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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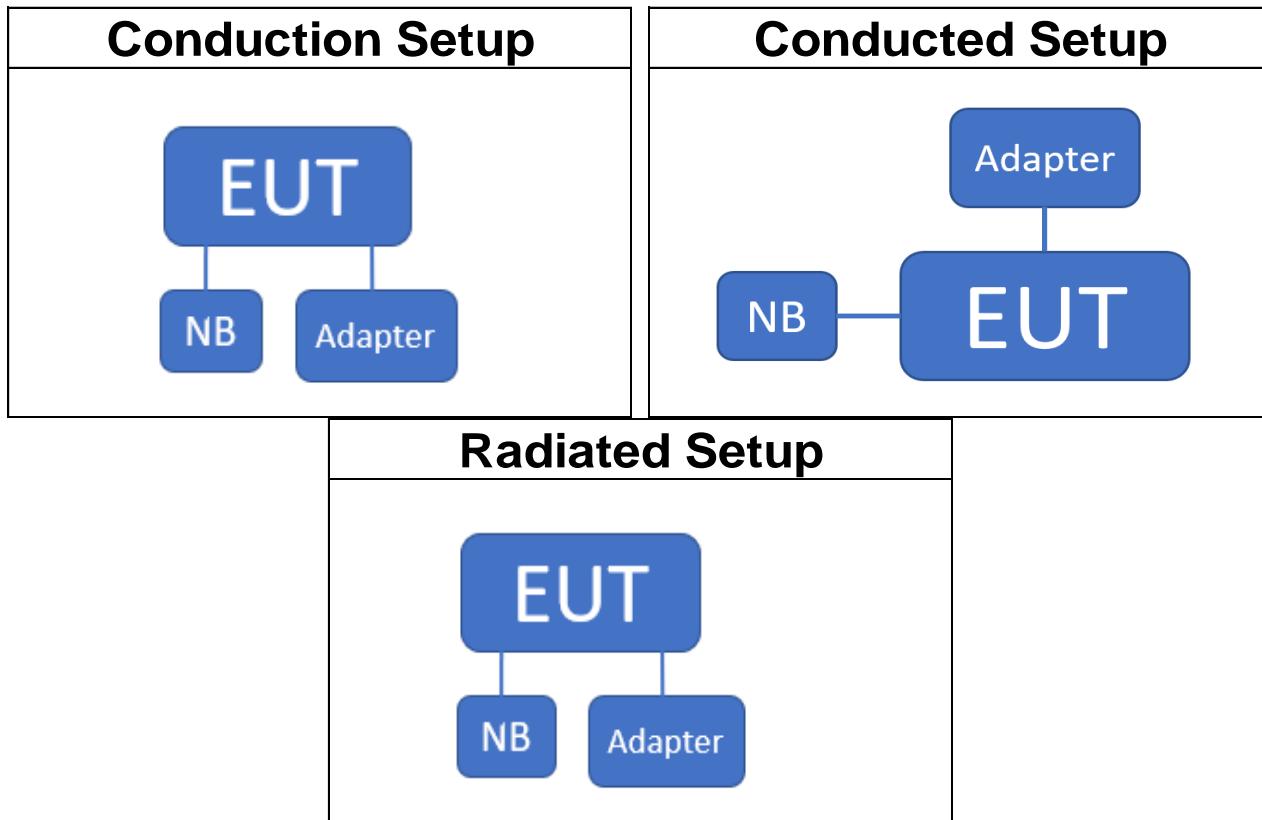
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## 2.5 Test Configuration



## 2.6 Control Unit(s)

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
adapter	clover	FSP040-RHBN3	N/A	N.C.R	N.C.R
Notebook	Lenovo	L430	P0000195	N.C.R	N.C.R
Conducted Emission Test Site: Conducted G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	T470	P0001293	N/A	N/A
Radiated Emission Test Site: SAC G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
adapter	clover	FSP040-RHBN3	N/A	N.C.R	N.C.R
Notebook	Lenovo	L430	P0000195	N.C.R	N.C.R

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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(a)(1)	RSS-247 §5.1 b RSS-Gen §6.7	Emission Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	RSS-247 §5.5 RSS-Gen §8.9 RSS-Gen §8.10	Conducted & Radiated Band Edge and Spurious Emission	Compliant
§15.247(a)(1)	RSS-247 §5.1 b	Frequency Separation	Compliant
§15.247(a)(1)(iii)	RSS-247 §5.1 d	Number of hopping frequency Time of Occupancy	Compliant
§15.203	N/A	Antenna Requirement	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operated in 2400 ~ 2483.5MHz Band

79 channels are provided for Bluetooth

ITEM	FREQUENCY	ITEM	FREQUENCY	ITEM	FREQUENCY	ITEM	FREQUENCY
1	2402 MHz	21	2422 MHz	41	2442 MHz	71	2462 MHz
2	2403 MHz	22	2423 MHz	42	2443 MHz	72	2463 MHz
3	2404 MHz	23	2424 MHz	43	2444 MHz	73	2464 MHz
4	2405 MHz	24	2425 MHz	44	2445 MHz	74	2465 MHz
5	2406 MHz	25	2426 MHz	45	2446 MHz	75	2466 MHz
6	2407 MHz	26	2427 MHz	46	2447 MHz	76	2467 MHz
7	2408 MHz	27	2428 MHz	47	2448 MHz	77	2468 MHz
8	2409 MHz	28	2429 MHz	48	2449 MHz	78	2469 MHz
9	2410 MHz	29	2430 MHz	49	2450 MHz	79	2470 MHz
10	2411 MHz	30	2431 MHz	50	2451 MHz	70	2471 MHz
11	2412 MHz	31	2432 MHz	51	2452 MHz	71	2472 MHz
12	2413 MHz	32	2433 MHz	52	2453 MHz	72	2473 MHz
13	2414 MHz	33	2434 MHz	53	2454 MHz	73	2474 MHz
14	2415 MHz	34	2435 MHz	54	2455 MHz	74	2475 MHz
15	2416 MHz	35	2436 MHz	55	2456 MHz	75	2476 MHz
16	2417 MHz	36	2437 MHz	56	2457 MHz	76	2477 MHz
17	2418 MHz	37	2438 MHz	57	2458 MHz	77	2478 MHz
18	2419 MHz	38	2439 MHz	58	2459 MHz	78	2479 MHz
19	2420 MHz	39	2440 MHz	59	2460 MHz	79	2480 MHz
20	2421 MHz	40	2441 MHz	60	2461 MHz		

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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, 20dB Band Width</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>Band Edge</b>				
Bluetooth	0 to 78	0,78	GFSK/8-DPSK	DH5/3DH5
<b>Frequency Separation</b>				
Bluetooth	0 to 78	0,1,2,38,39,40,76, 77,78	GFSK $\pi/4$ -DQPSK 8-DPSK	DH5 2DH5 3DH5
<b>Number of Hopping Frequency, Hopping Band edge</b>				
Bluetooth	0 to 78	0 to 78	GFSK/8-DPSK	DH5/3DH5
<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>RADIATED EMISSION TEST (BELOW 1 GHz)</b>				
Bluetooth	0 to 78	39	GFSK	DH5
<b>RADIATED EMISSION TEST (ABOVE 1 GHz)</b>				
Bluetooth	0 to 78	0,39,78	GFSK/8-DPSK	DH5/3DH5
<p><b>Note:</b> 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.</p>				

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty		
AC Power Line Conducted Emission	+/-	2.32	dB
Output Power measurement	+/-	1	dB
Emission Bandwidth	+/-	1.53	Hz
Undesignable radiated emission measurement	+/-	1.68	dB
Frequency Separation	+/-	1.53	Hz
Number of hopping frequency	+/-	1.53	Hz
Time of Occupancy	+/-	1.53	Hz
Temperature	+/-	0.7	°C
Humidity	+/-	3	%
DC / AC Power Source	+/-	1	%

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

### Note:

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

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## 6 MEASUREMENT EQUIPMENT USED

### 6.1 Emission from AC power line

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	973	04/13/2022	04/12/2023
Test Software	audix	e3	E3 20923 SGS Ver.9 ( C )	N.C.R	N.C.R
EMI Test Receiver	R&S	ESCI	101342	04/25/2022	04/24/2023
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2022	03/26/2023
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2022	03/26/2023

### 6.2 Conducted Measurement

Conducted Emission Test Site: Conducted G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/08/2022	06/07/2023
Power Meter	Anritsu	ML2496A	1804002	04/27/2022	04/26/2023
Power Sensor	Anritsu	MA2411B	1726105	04/27/2022	04/26/2023
Power Sensor	Anritsu	MA2411B	1726106	04/27/2022	04/26/2023
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R
Attenuator	Woken	WATT-218FS-10	RF22	11/16/2022	11/15/2023
DC Block	PASTERNACK	PE8210	RF158	11/16/2022	11/15/2023

### 6.3 Radiated Measurement

Radiated Emission Test Site: SAC G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	SCHWARZBECK	VULB 9168	1206	02/15/2022	02/14/2023
Horn Antenna	Schwarzbeck	BBHA9170	184	12/15/2022	12/14/2023
Horn Antenna	RF SPIN	DRH18-E	210105A18E	04/08/2022	04/07/2023
Loop Antenna	ETS.LINDGREN	6502	143303	05/06/2022	05/07/2023
3m Site NSA	SGS	966 chamber G	N/A	03/30/2022	03/29/2023
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	07/13/2022	07/14/2023
Pre-Amplifier	EMC Instruments	EMC18405SEE	980881	10/25/2022	10/24/2023
Pre-Amplifier	EMC Instruments	EMC330N	980781	03/15/2022	03/14/2023
Test Software	audix	e3	E3 20923 SGS Ver.9 ( C )	N.C.R	N.C.R
Pre-Amplifier	EMC Instruments	EMC118A45SE	980815	03/15/2022	03/14/2023
Coaxial Cable	EMC Instruments	EMCCFD400-NM-NM-8000-5000-2000	210216、210217、210218	03/15/2022	03/14/2023
Coaxial Cable	EMC Instruments	EMC104-SM-SM-8000-5000-5000	210219、210220、210221	03/15/2022	03/14/2023
Coaxial Cable	EMC Instruments	EMC105-NM-NM-5000-15000	210224、210306	03/15/2022	03/14/2023

**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

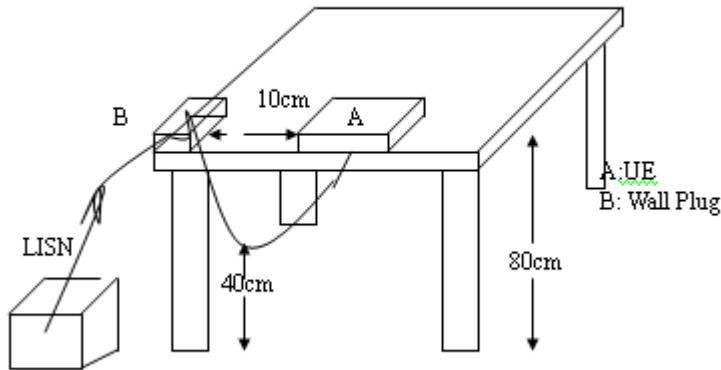
#### Note

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 63.10:2013.
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

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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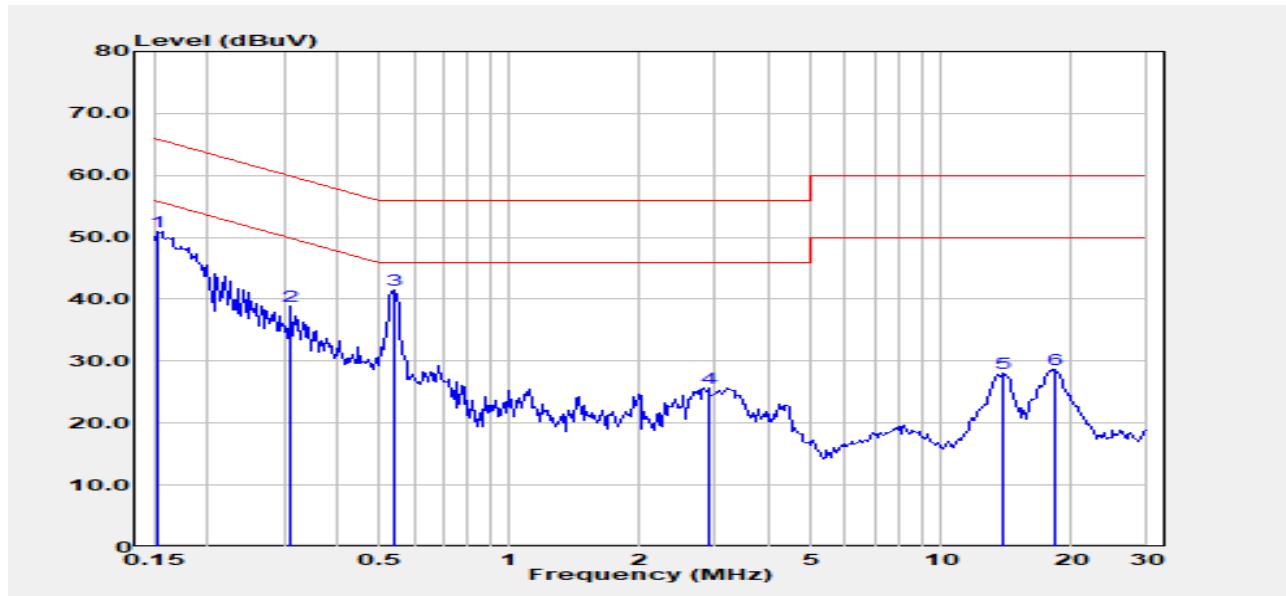
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number :TERF2212002686E2 Test Site :Conduction C  
 Test Mode :BT Test Date :2022-12-20  
 Power :120V/60Hz Temp./Humi. :20.4/63  
 Probe :L1 Engineer :Temo Chen



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
0.153	Peak	40.67	10.30	50.97	65.82	-14.85
0.312	Peak	28.48	10.32	38.80	59.93	-21.13
0.541	Peak	31.16	10.34	41.50	56.00	-14.50
2.884	Peak	14.79	10.96	25.75	56.00	-30.25
13.841	Peak	17.35	10.81	28.16	60.00	-31.84
18.426	Peak	17.86	10.90	28.76	60.00	-31.24

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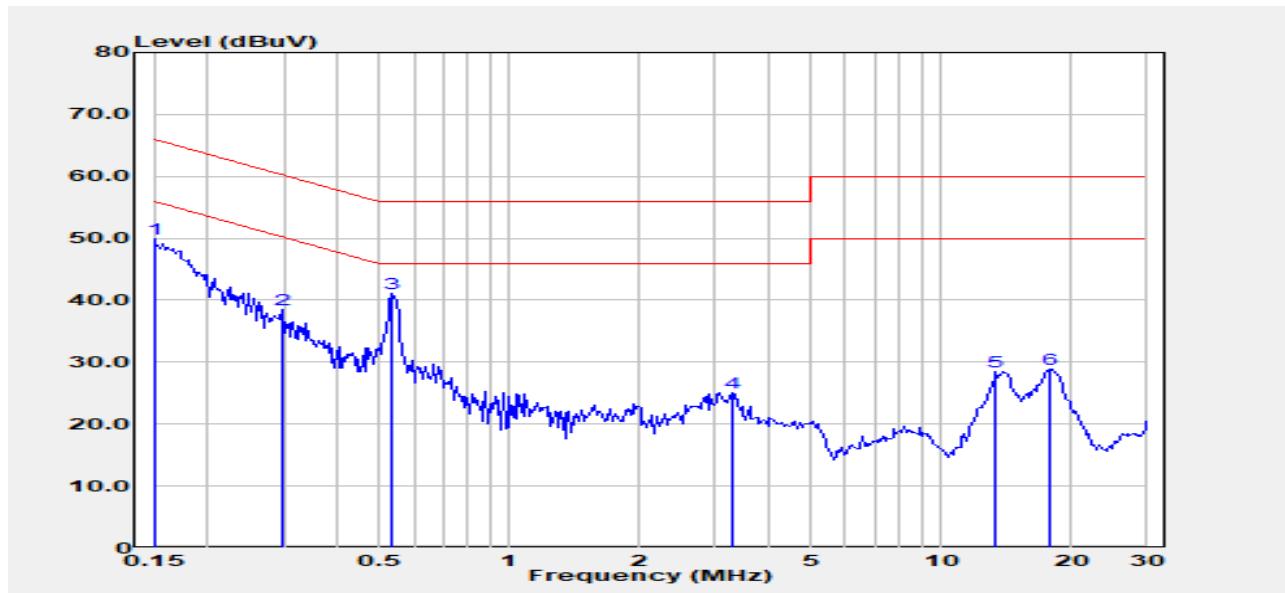
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Report Number :TERF2212002686E2  
 Test Mode :BT  
 Power :120V/60Hz  
 Probe :N

Test Site :Conduction C  
 Test Date :2022-12-20  
 Temp./Humi. :20.4/63  
 Engineer :Temo Chen



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
0.150	Peak	39.66	10.31	49.97	66.00	-16.03
0.299	Peak	28.21	10.31	38.52	60.28	-21.76
0.535	Peak	30.84	10.33	41.16	56.00	-14.84
3.276	Peak	14.25	10.84	25.09	56.00	-30.91
13.408	Peak	17.71	10.76	28.47	60.00	-31.53
17.849	Peak	18.00	10.85	28.85	60.00	-31.15

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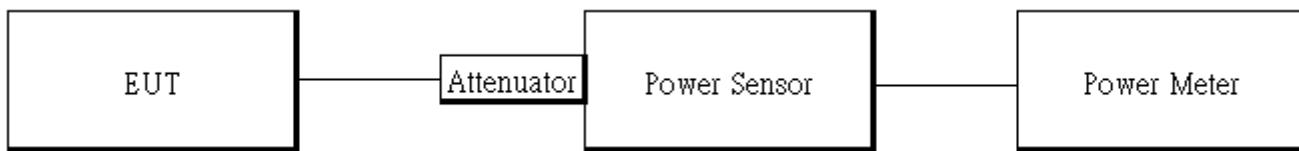
## 8 PEAK OUTPUT POWER MEASUREMENT

### 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 4 W.

### 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. 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 bandwidth)
4. Record the max. reading.
5. Repeat above procedures until all default test channel is completed.

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## 8.4 Peak & Average Power Measurement Result

1M BR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	7.07	5.093	1000
Mid	2441	8	6.96	4.966	1000
High	2480	8	<b>7.52</b>	5.649	1000

1M BR mode (Average):

CH	Freq. (MHz)	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	7.00	5.008	1000
Mid	2441	8	6.95	4.950	1000
High	2480	8	7.30	5.366	1000

2M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	6.54	4.508	125
Mid	2441	8	6.06	4.036	125
High	2480	8	<b>6.73</b>	4.710	125

2M EDR mode (Average):

CH	Freq. (MHz)	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	4.08	2.561	125
Mid	2441	8	3.59	2.288	125
High	2480	8	4.19	2.627	125

3M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	6.91	4.909	125
Mid	2441	8	6.44	4.406	125
High	2480	8	<b>7.16</b>	5.200	125

3M EDR mode (Average):

CH	Freq. (MHz)	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	4.03	2.532	125
Mid	2441	8	3.55	2.267	125
High	2480	8	4.14	2.596	125

\*Note: Max. Output include tune up tolerance Power measured by using average detector.

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## 8.5 EIRP Measurement Result

### 1M BR mode EIRP

Channel	Frequency (MHz)	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	8	7.00	0.51	5.632	4000
Mid	2441	8	6.95	0.51	5.567	4000
High	2480	8	7.30	0.51	6.034	4000

### 2M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	8	4.08	0.51	2.880	4000
Mid	2441	8	3.59	0.51	2.573	4000
High	2480	8	4.19	0.51	2.954	4000

### 3M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	8	4.03	0.51	2.847	4000
Mid	2441	8	3.55	0.51	2.549	4000
High	2480	8	4.14	0.51	2.920	4000

\* Note: EIRP = Average Power + Gain

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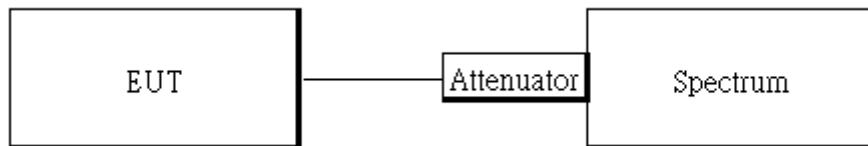
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## 9 EMISSION BANDWIDTH MEASUREMENT

### 9.1 Standard Applicable

For frequency hopping systems operating in the 2400 MHz-2483.5 MHz no limit for 20dB bandwidth.

### 9.2 Test Setup



### 9.3 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 the spectrum analyzer as  
 $RBW = 1\% \text{ to } 5\% \text{ of OBW}$ ,  
 $VBW = 3 \times RBW$ ,  
 $Span = 2 \text{ to } 5 \text{ times of the OBW}$ ,  
 $Sweep = \text{auto}$ ,  
 $\text{Detector} = \text{Peak, and Max hold for 20dB Bandwidth test.}$
5. Mark the peak frequency and  $-20\text{dB}$  (upper and lower) frequency
6. Set the spectrum analyzer as  
 $RBW = 1\% \text{ to } 5\% \text{ of } 99\% \text{ Bandwidth}$ ,  
 $VBW \geq 3 \times RBW$ ,  
 $Span = \text{large enough to capture all products of the modulation process}$ ,  
 $Sweep = \text{auto}$ ,  
 $\text{Detector} = \text{Peak, and Max hold for 99% Bandwidth test.}$
7. Mark the peak frequency and  $99\% \text{dB}$  (upper and lower) frequency
8. Repeat above procedures until all test default channel is completed

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## 9.4 20dB Bandwidth

### GFSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	0.9380	0.63
Mid	0.9393	0.63
High	0.9422	0.63

### $\pi/4$ -DQPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.281	0.85
Mid	1.281	0.85
High	1.280	0.85

### 8-DPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.295	0.86
Mid	1.294	0.86
High	1.294	0.86

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9.5 99% Bandwidth

**GFSK**

CH	99% BW (MHz)
Low	0.84713
Mid	0.84727
High	0.84771

 **$\pi/4$ -DQPSK**

CH	99% BW (MHz)
Low	1.1707
Mid	1.1723
High	1.1713

**8-DPSK**

CH	99% BW (MHz)
Low	1.1761
Mid	1.1762
High	1.1759

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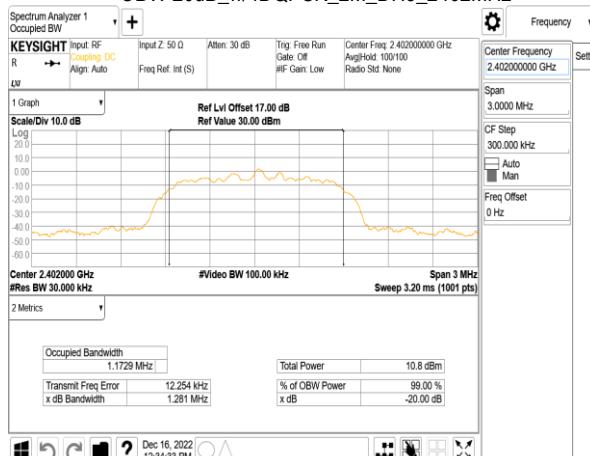
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## OBW 20dB\_GFSK\_1M\_DH5\_2402MHz



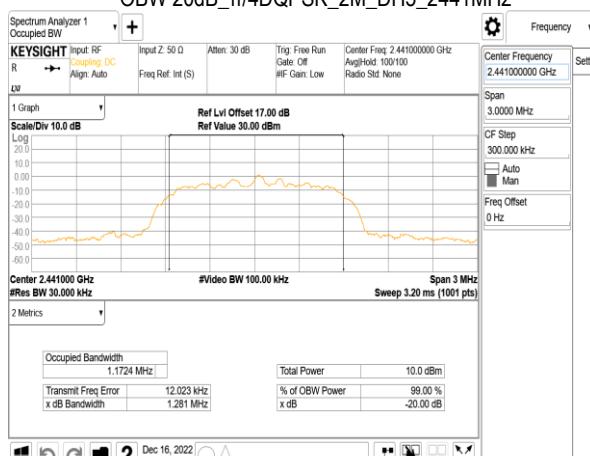
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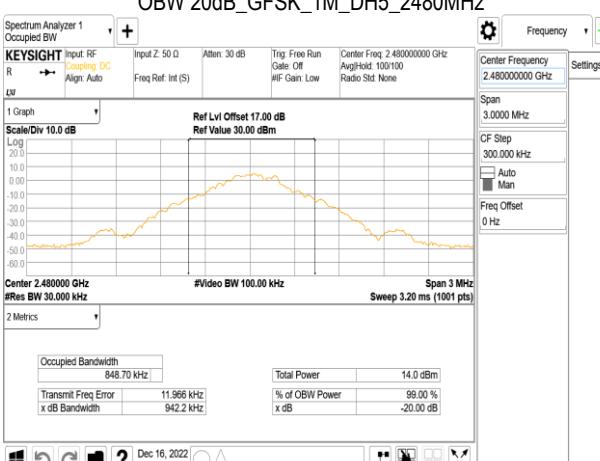
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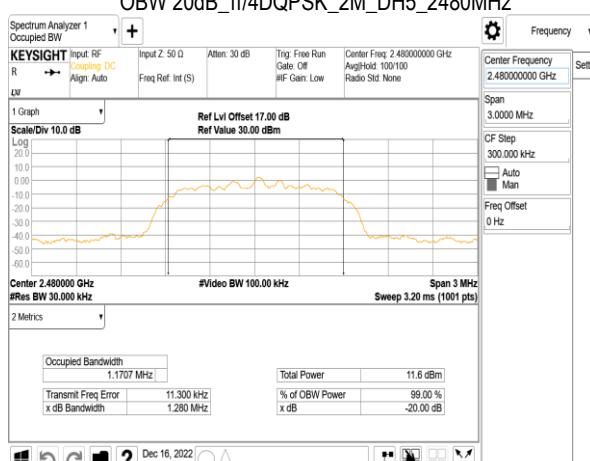
## OBW 20dB\_π/4DQPSK\_2M\_DH5\_2441MHz



## OBW 20dB\_GFSK\_1M\_DH5\_2480MHz



## OBW 20dB\_π/4DQPSK\_2M\_DH5\_2480MHz



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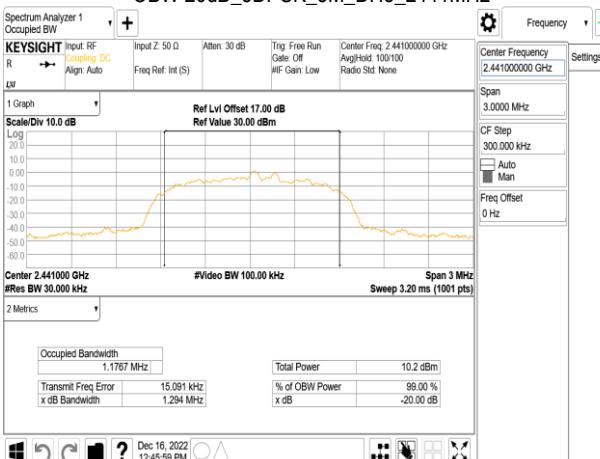
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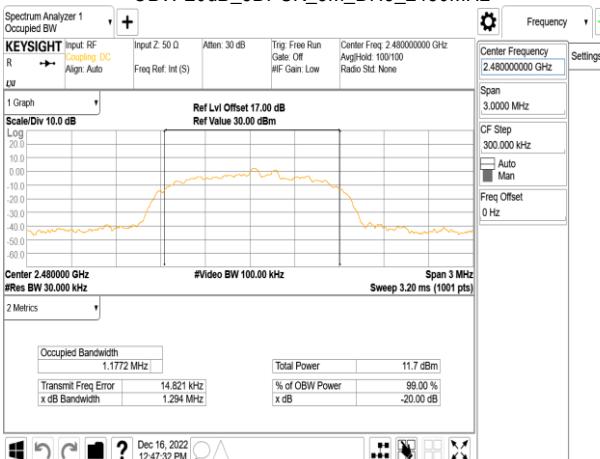
## OBW 20dB\_8DPSK\_3M\_DH5\_2402MHz



## OBW 20dB\_8DPSK\_3M\_DH5\_2441MHz



## OBW 20dB\_8DPSK\_3M\_DH5\_2480MHz



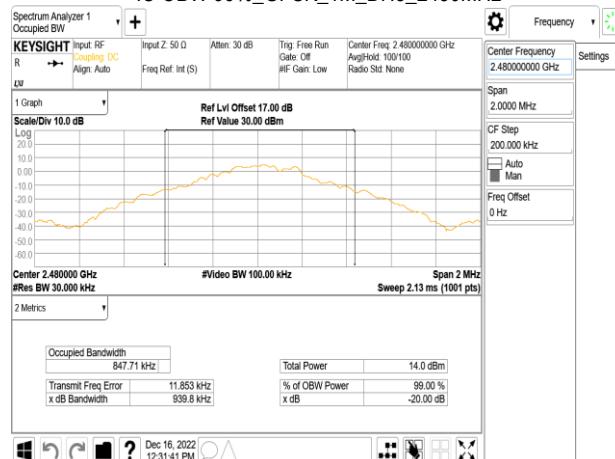
## IC OBW 99%\_GFSK\_1M\_DH5\_2402MHz



## IC OBW 99%\_GFSK\_1M\_DH5\_2441MHz



## IC OBW 99%\_GFSK\_1M\_DH5\_2480MHz



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## IC OBW 99%\_π/4DQPSK\_2M\_DH5\_2402MHz



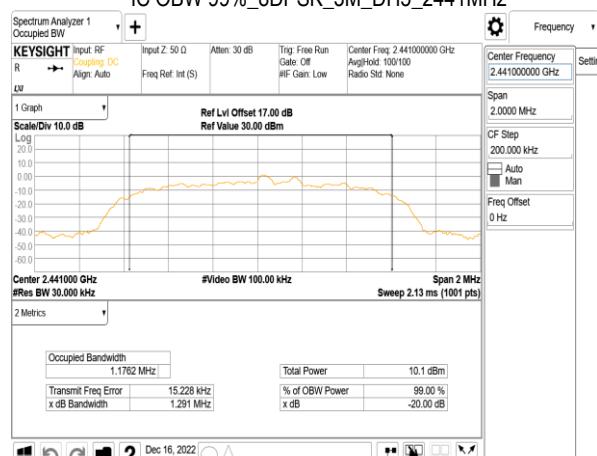
## IC OBW 99%\_8DPSK\_3M\_DH5\_2402MHz



## IC OBW 99%\_π/4DQPSK\_2M\_DH5\_2441MHz



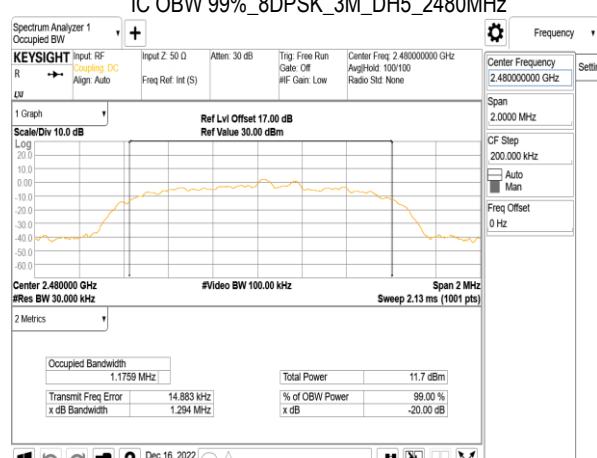
## IC OBW 99%\_8DPSK\_3M\_DH5\_2441MHz



## IC OBW 99%\_π/4DQPSK\_2M\_DH5\_2480MHz



## IC OBW 99%\_8DPSK\_3M\_DH5\_2480MHz



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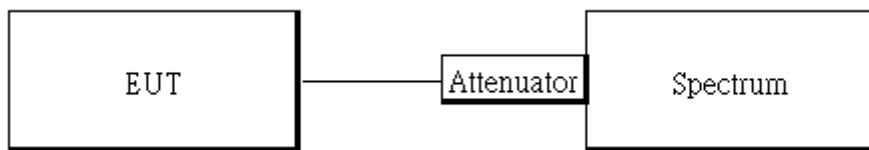


## 10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

### 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 Conducted Band Edge:

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=100 kHz, VBW=300 kHz, Sweep = auto
6. Mark Peak, below 2.4GHz and above 2.4835GHz and record the max. level.
7. Repeat above procedures until all frequency measured were complete.

#### 10.3.2 Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows ANSI C63.10:2013.
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

See next page for test plots.

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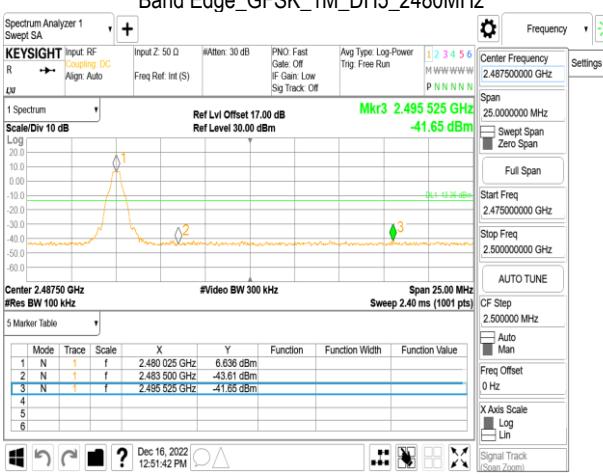
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## Band Edge\_GFSK\_1M\_DH5\_2402MHz



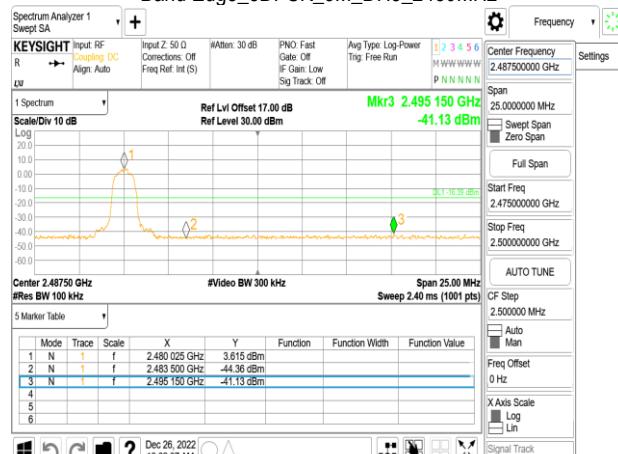
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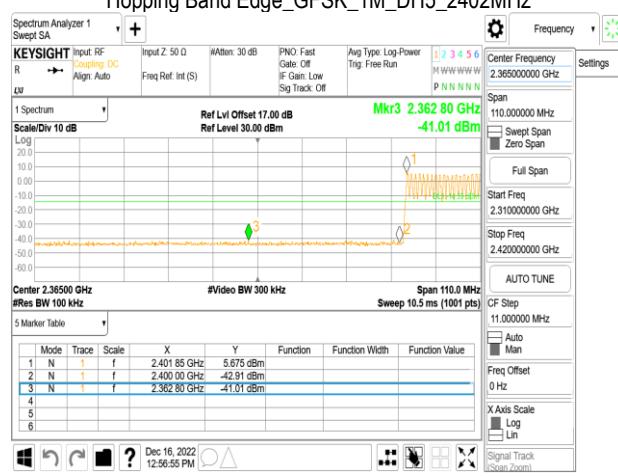
## Band Edge\_8DPSK\_3M\_DH5\_2402MHz



## Band Edge\_8DPSK\_3M\_DH5\_2480MHz



## Hopping Band Edge\_GFSK\_1M\_DH5\_2402MHz

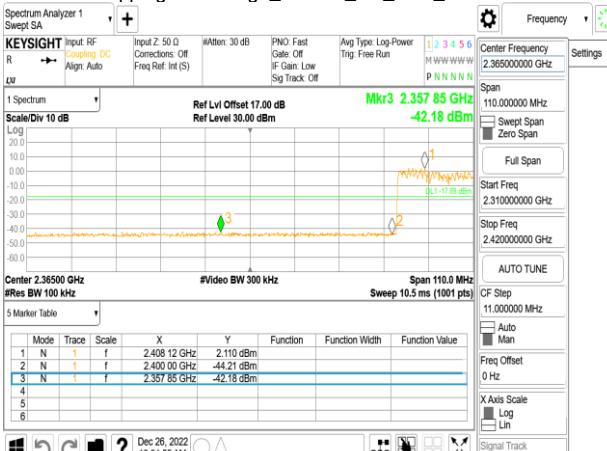


## Hopping Band Edge\_GFSK\_1M\_DH5\_2480MHz





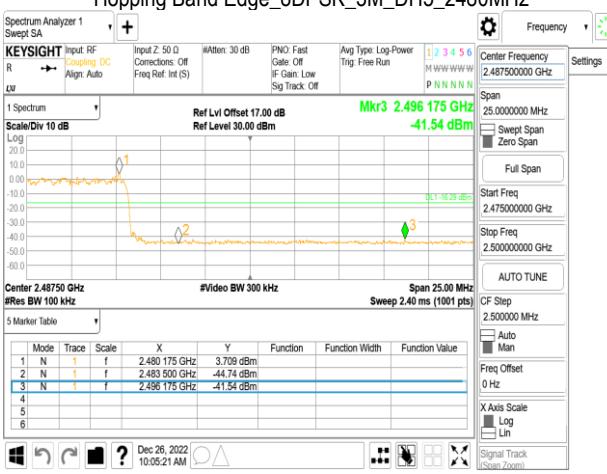
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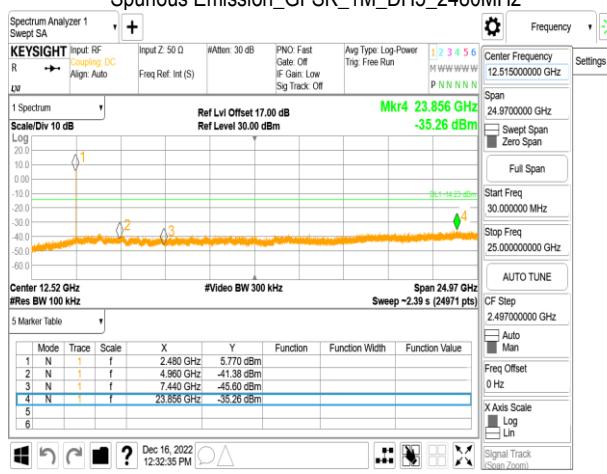
## Spurious Emission\_GFSK\_1M\_DH5\_2441MHz



## Hopping Band Edge\_8DPSK\_3M\_DH5\_2480MHz



## Spurious Emission\_GFSK\_1M\_DH5\_2480MHz



## Spurious Emission\_GFSK\_1M\_DH5\_2402MHz



## Spurious Emission\_π/4DQPSK\_2M\_DH5\_2402MHz



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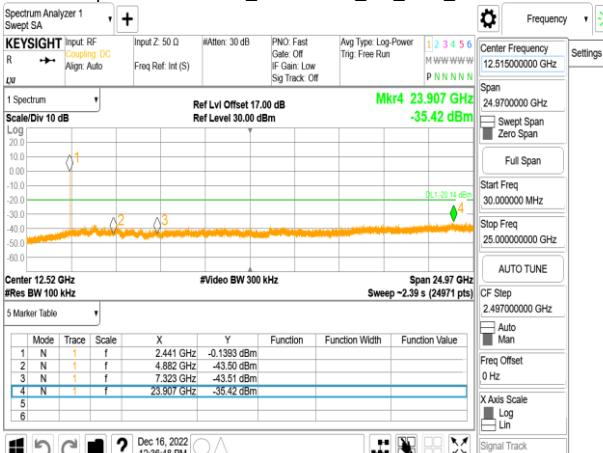
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## Spurious Emission\_π/4DQPSK\_2M\_DH5\_2441MHz



## Spurious Emission\_π/4DQPSK\_2M\_DH5\_2480MHz



## Spurious Emission\_8DPSK\_3M\_DH5\_2402MHz



## Spurious Emission\_8DPSK\_3M\_DH5\_2441MHz



## Spurious Emission\_8DPSK\_3M\_DH5\_2480MHz



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## 11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 11.1 Standard Applicable

#### 11.1.1 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.

#### 11.1.2 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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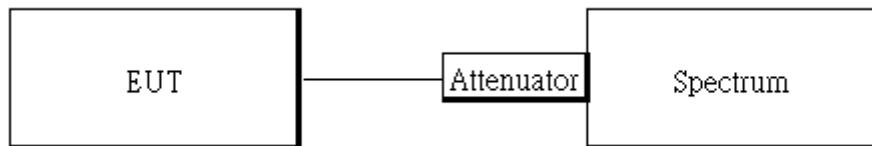
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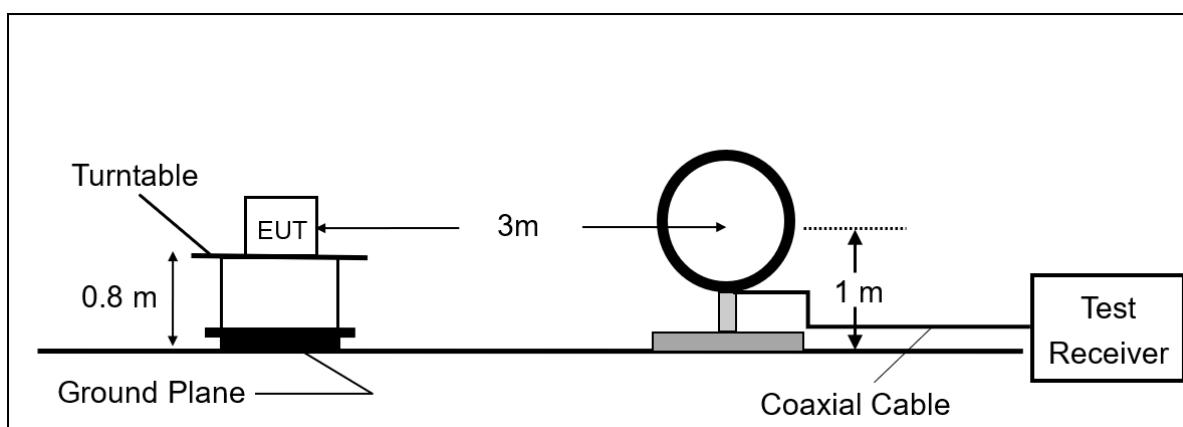
## 11.2 Test Setup

### 11.2.1 Duty Cycle Correction Factor

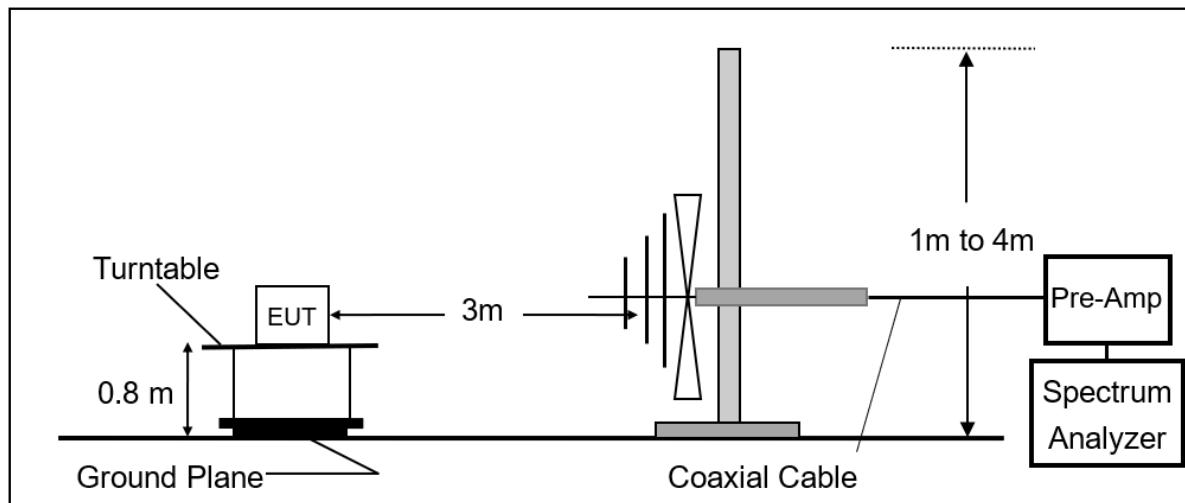


### 11.2.2 Radiated Emission

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



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

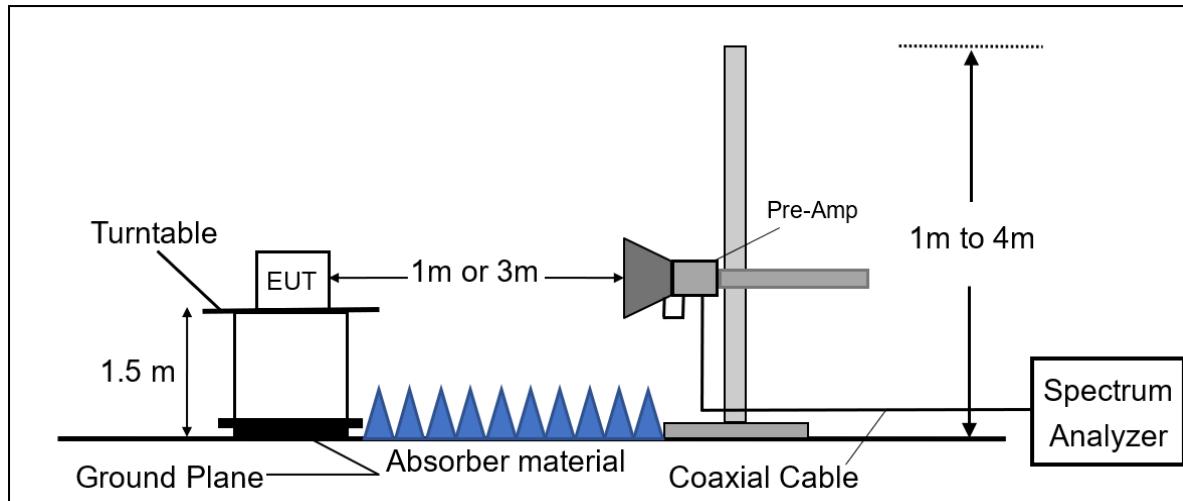


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## (C) Radiated Emission Test Set-Up, Frequency Above 1 GHz.



## 11.3 Measurement Procedure

### 11.3.1 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.

### 11.3.2 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 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.

#### 11.4 Field Strength Calculation

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

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

Where  $FS$  = Field Strength

$CL$  = Cable Attenuation Factor (Cable Loss)

$RA$  = Reading Amplitude

$AG$  = Amplifier Gain

$AF$  = Antenna Factor

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

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( $dB$ )

Average value( $dB\mu V/m$ ) = Peak Actual  $FS(dB\mu V/m)$  + Duty Cycle Correction Factor( $dB$ )

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

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

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) & RSS-GEN §6.13.2 was not reported.

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## 11.6 Measurement Result:

### 11.6.1 Duty Cycle Correction Factor

BR		
Time ON of 100ms:	8.700	ms
Duty Cycle=8.7ms / 100m	0.087	%
Duty Cycle correction factor=20 LOG 0.087=	-21.21	dB
EDR		
Time ON of 100ms:	8.700	ms
Duty Cycle=8.7ms / 100m	0.087	%
Duty Cycle correction factor=20 LOG 0.087=	-21.21	dB

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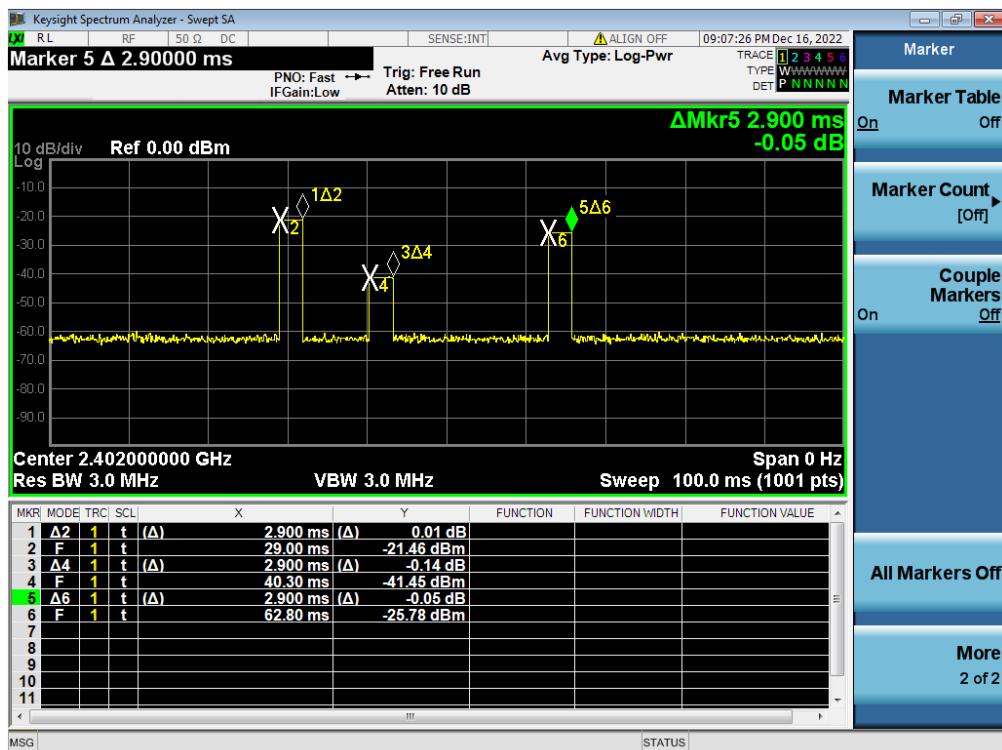
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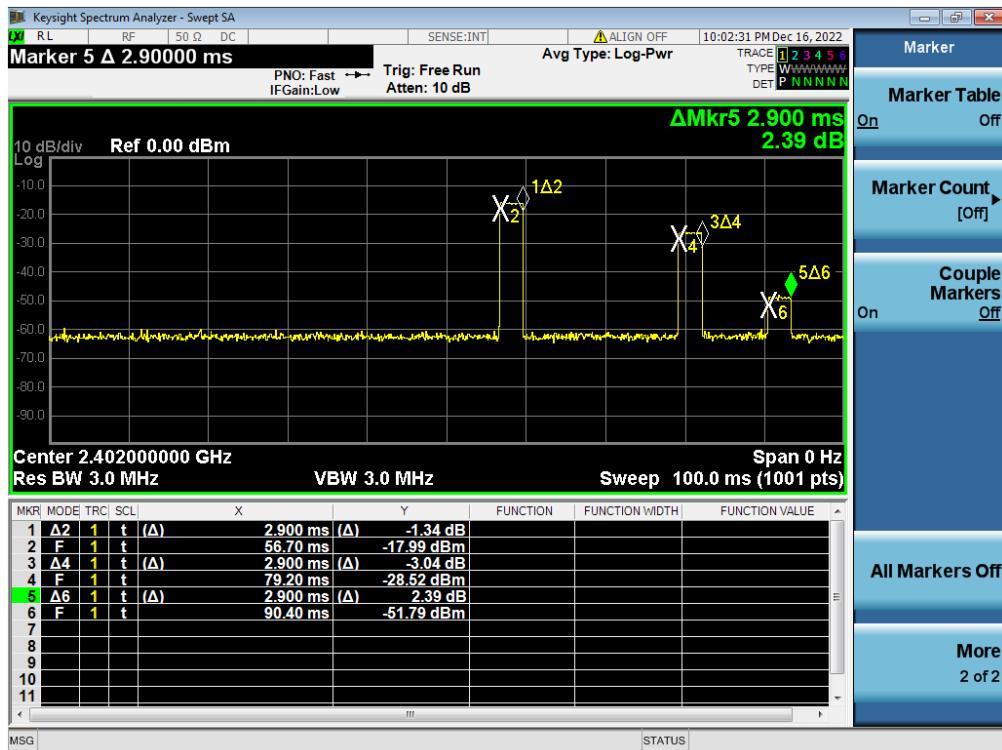


## 11.6.2 Duty Cycle test plot

BR



EDR



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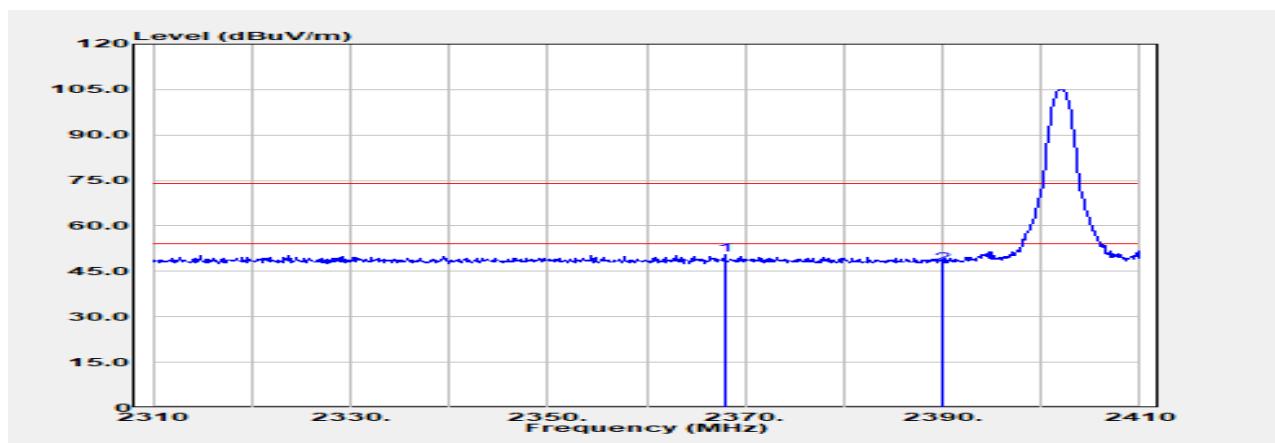
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### 11.6.3 Bandedge Result

Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2367.900	Peak	54.21	-3.67	50.54	74.00	-23.46
2390.000	Peak	51.43	-3.80	47.63	74.00	-26.37
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2367.900	Average	50.54	-21.21	29.33	54.00	-24.67
2390.000	Average	47.63	-21.21	26.42	54.00	-27.58

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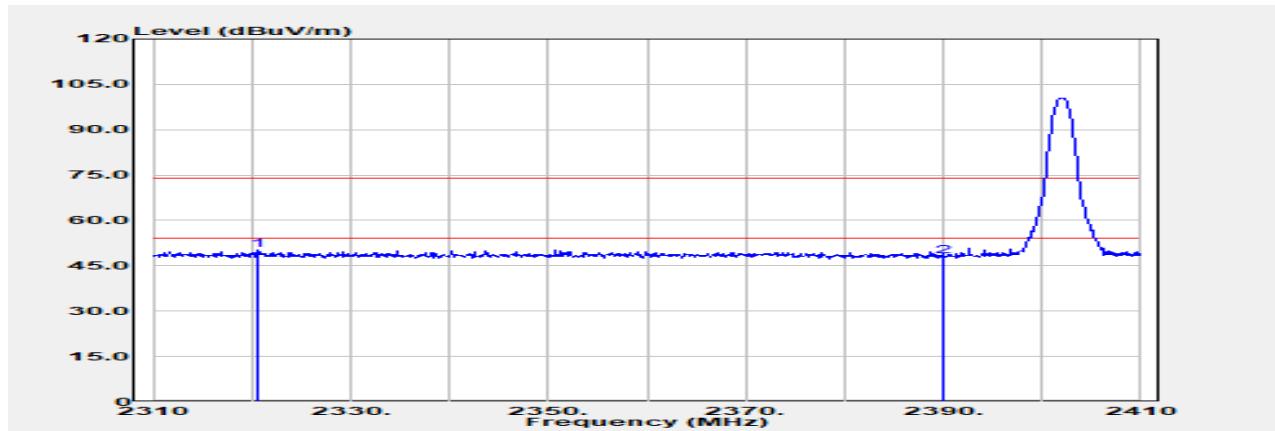
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Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2320.700	Peak	53.90	-3.62	50.28	74.00	-23.72
2390.000	Peak	51.83	-3.80	48.03	74.00	-25.97
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2320.700	Average	50.28	-21.21	29.07	54.00	-24.93
2390.000	Average	48.03	-21.21	26.82	54.00	-27.18

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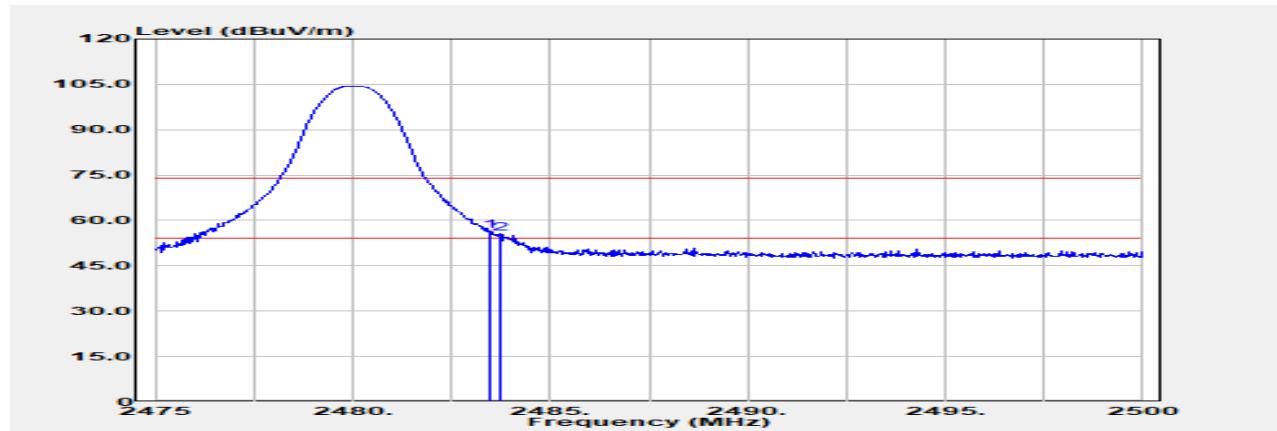
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Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Peak	60.25	-3.82	56.44	74.00	-17.56
2483.750	Peak	59.38	-3.82	55.56	74.00	-18.44
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2483.500	Average	56.44	-21.21	35.23	54.00	-18.77
2483.750	Average	55.56	-21.21	34.35	54.00	-19.65

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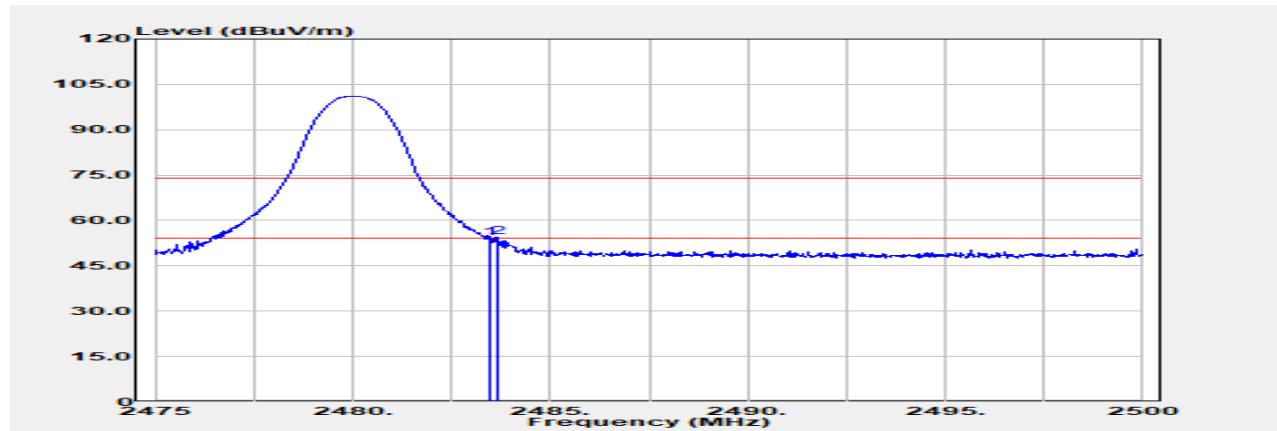
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Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Peak	57.94	-3.82	54.12	74.00	-19.88
2483.650	Peak	58.16	-3.82	54.35	74.00	-19.65
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2483.500	Average	54.12	-21.21	32.91	54.00	-21.09
2483.650	Average	54.35	-21.21	33.14	54.00	-20.86

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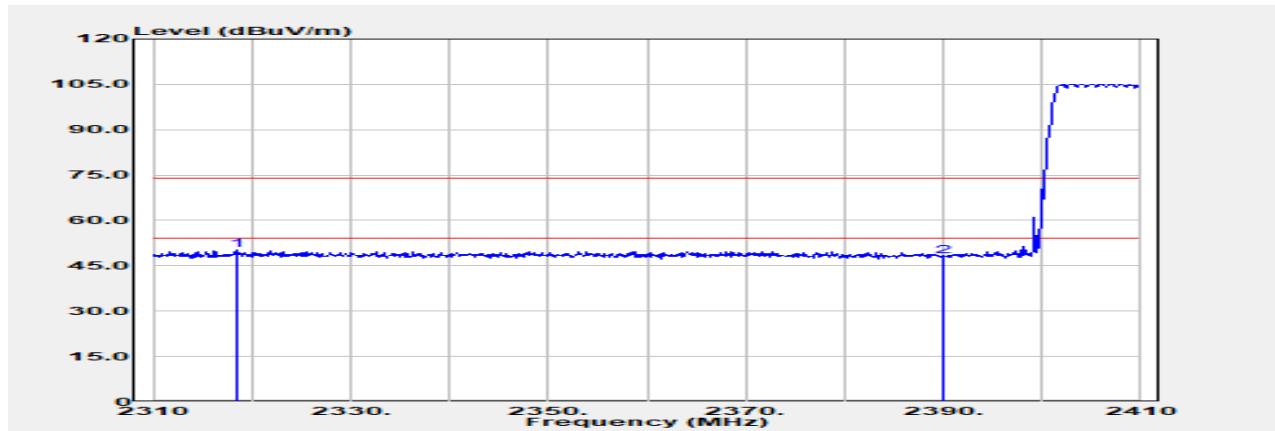
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Member of SGS Group

Report Number :TERF2212002686E2  
 Operation Mode :BR Hopping  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2318.400	Peak	53.79	-3.62	50.17	74.00	-23.83
2390.000	Peak	51.95	-3.80	48.15	74.00	-25.85
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2318.400	Average	50.17	-21.21	28.96	54.00	-25.04
2390.000	Average	48.15	-21.21	26.94	54.00	-27.06

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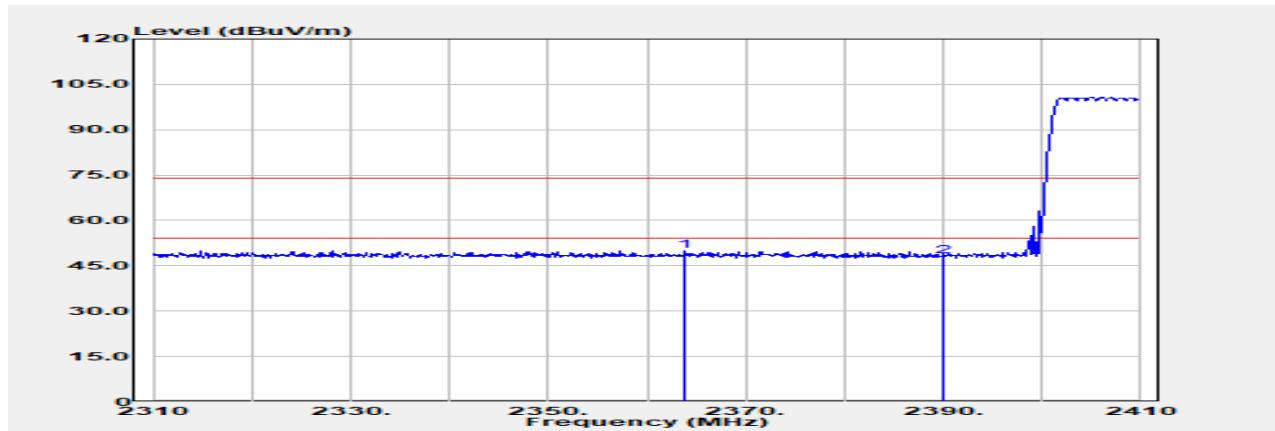
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Report Number :TERF2212002686E2  
 Operation Mode :BR Hopping  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2363.900	Peak	53.56	-3.64	49.92	74.00	-24.08
2390.000	Peak	51.91	-3.80	48.11	74.00	-25.89
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2363.900	Average	49.92	-21.21	28.71	54.00	-25.29
2390.000	Average	48.11	-21.21	26.90	54.00	-27.10

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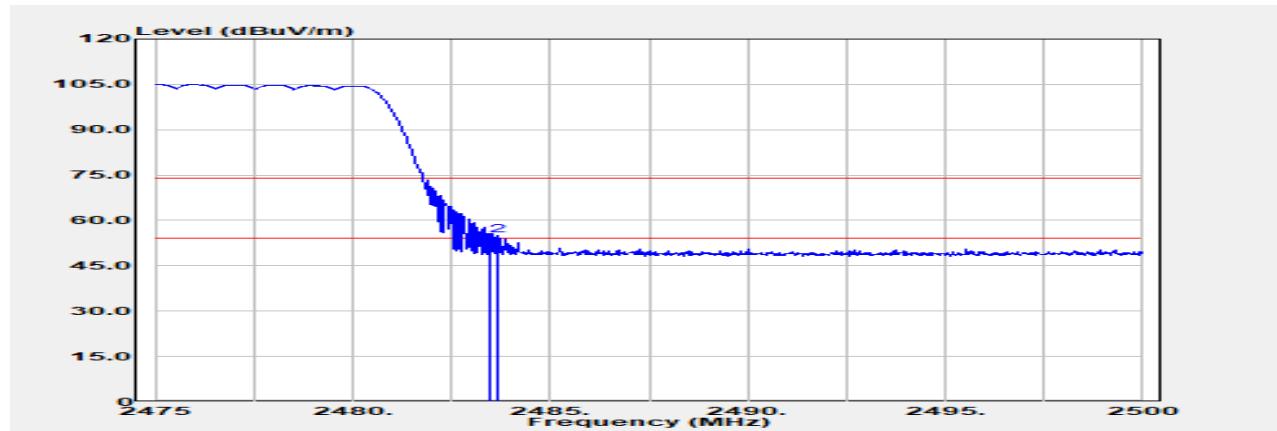
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Member of SGS Group

Report Number :TERF2212002686E2  
 Operation Mode :BR Hopping  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Peak	53.49	-3.82	49.68	74.00	-24.32
2483.650	Peak	58.90	-3.82	55.08	74.00	-18.92
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2483.500	Average	49.68	-21.21	28.47	54.00	-25.53
2483.650	Average	55.08	-21.21	33.87	54.00	-20.13

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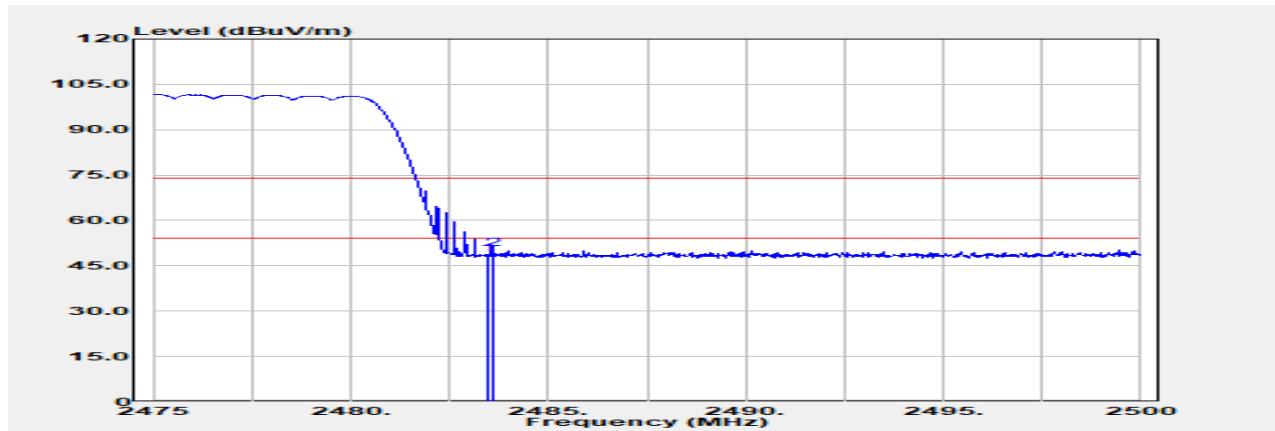
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Report Number :TERF2212002686E2  
 Operation Mode :BR Hopping  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Peak	52.56	-3.82	48.74	74.00	-25.26
2483.625	Peak	54.20	-3.82	50.38	74.00	-23.62
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2483.500	Average	48.74	-21.21	27.53	54.00	-26.47
2483.500	Average	48.74	-21.21	27.53	54.00	-26.47

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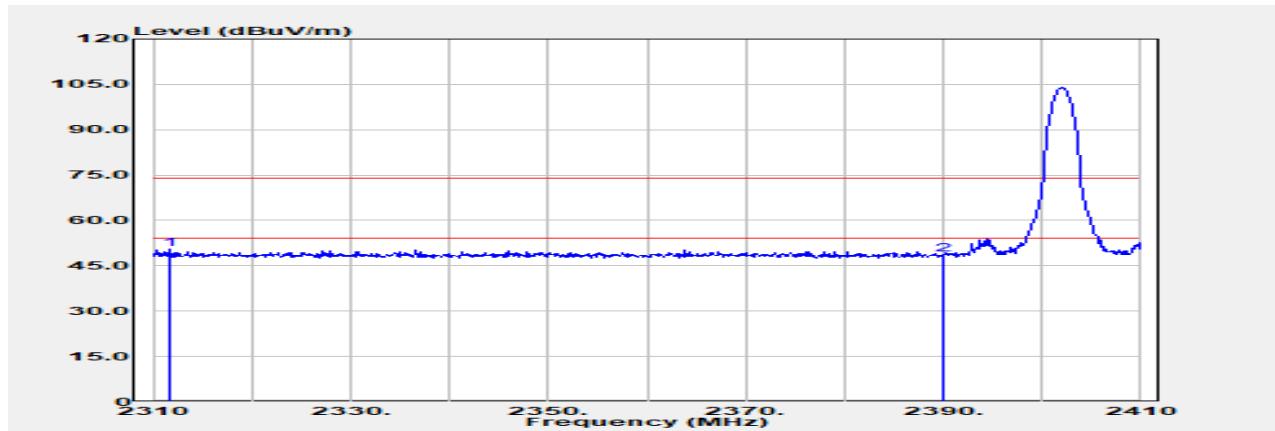
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2311.700	Peak	54.24	-3.61	50.63	74.00	-23.37
2390.000	Peak	52.57	-3.80	48.77	74.00	-25.23
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2311.700	Average	50.63	-21.21	29.42	54.00	-24.58
2390.000	Average	48.77	-21.21	27.56	54.00	-26.44

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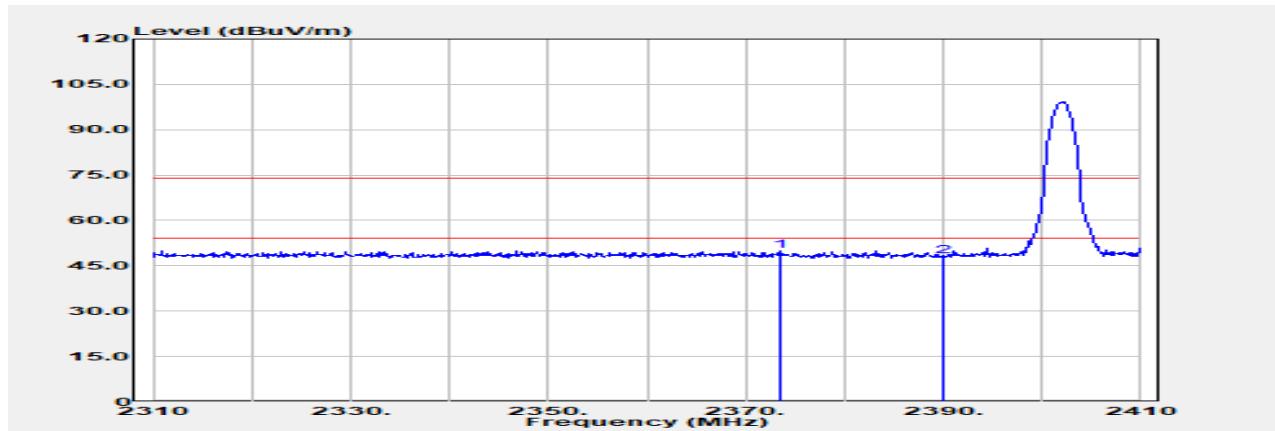
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2373.500	Peak	53.63	-3.71	49.92	74.00	-24.08
2390.000	Peak	51.79	-3.80	47.99	74.00	-26.01
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2373.500	Average	49.92	-21.21	28.71	54.00	-25.29
2390.000	Average	47.99	-21.21	26.78	54.00	-27.22

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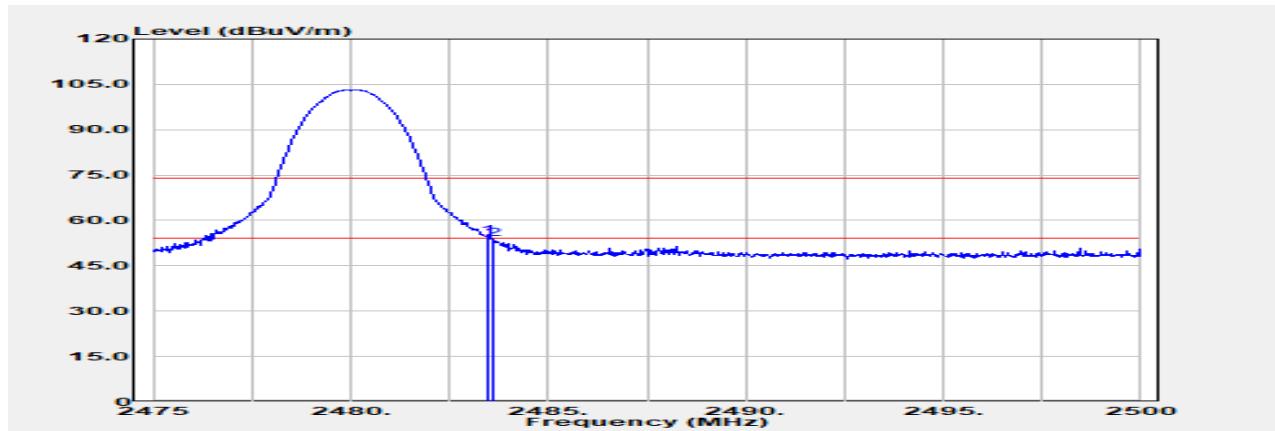
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Peak	58.66	-3.82	54.84	74.00	-19.16
2483.625	Peak	57.76	-3.82	53.94	74.00	-20.06
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2483.500	Average	54.84	-21.21	33.63	54.00	-20.37
2483.625	Average	53.94	-21.21	32.73	54.00	-21.27

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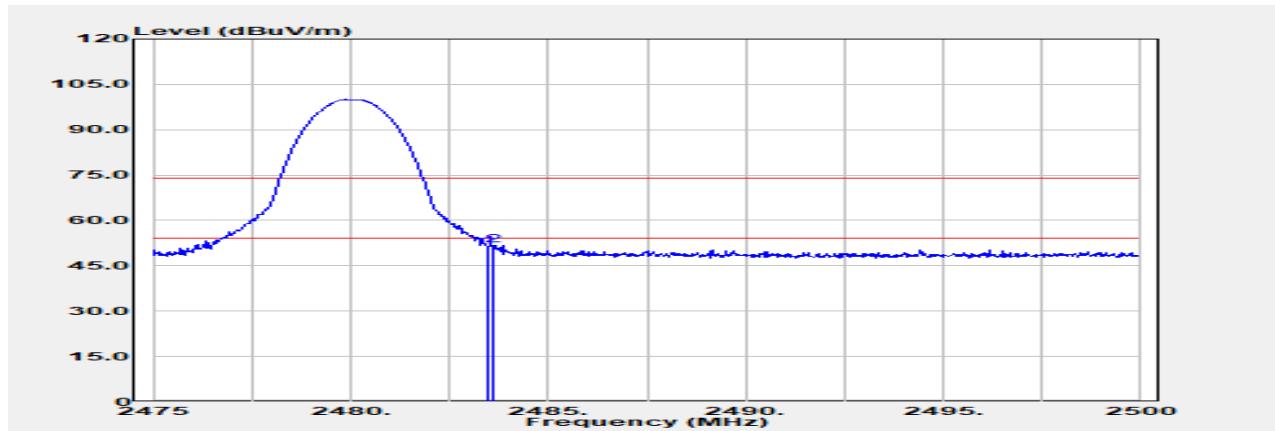
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Peak	54.82	-3.82	51.00	74.00	-23.00
2483.625	Peak	55.59	-3.82	51.77	74.00	-22.23
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2483.500	Average	51.00	-21.21	29.79	54.00	-24.21
2483.625	Average	51.77	-21.21	30.56	54.00	-23.44

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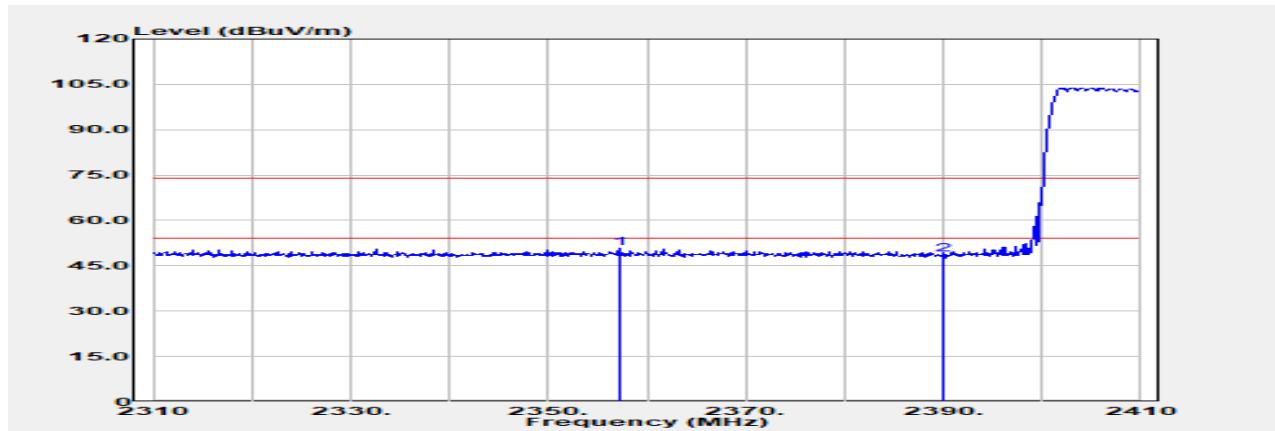
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M Hopping  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2357.200	Peak	54.30	-3.61	50.68	74.00	-23.32
2390.000	Peak	52.66	-3.80	48.86	74.00	-25.14
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2357.200	Average	50.68	-21.21	29.47	54.00	-24.53
2390.000	Average	48.86	-21.21	27.65	54.00	-26.35

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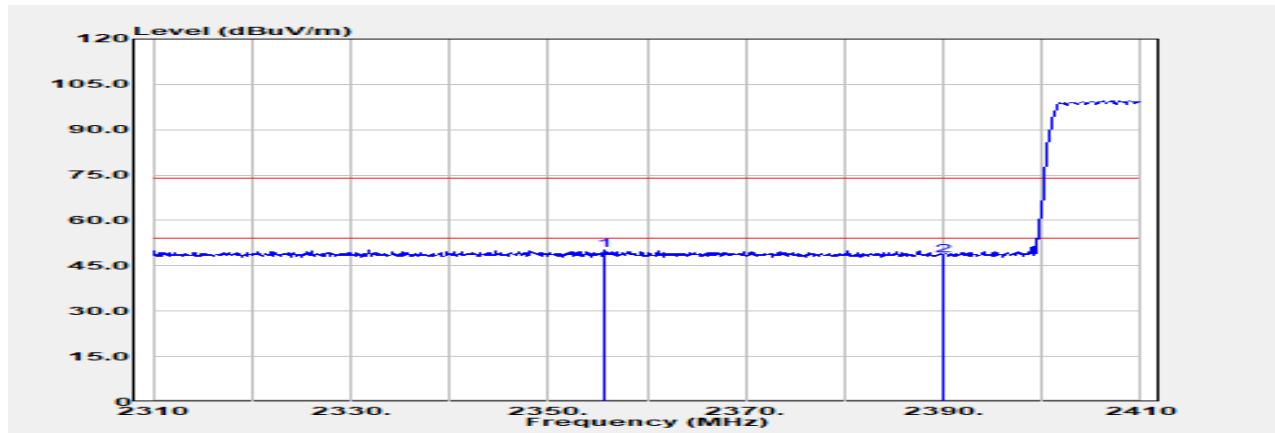
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M Hopping  
 Test Frequency :2402 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2355.800	Peak	53.99	-3.61	50.37	74.00	-23.63
2390.000	Peak	52.15	-3.80	48.35	74.00	-25.65
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2355.800	Average	50.37	-21.21	29.16	54.00	-24.84
2390.000	Average	48.35	-21.21	27.14	54.00	-26.86

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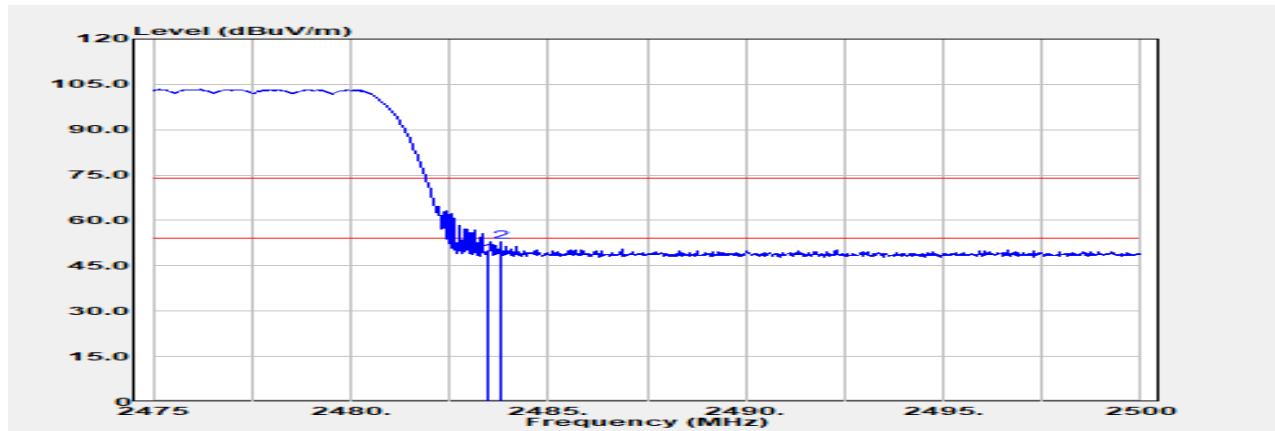
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M Hopping  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Peak	52.53	-3.82	48.71	74.00	-25.29
2483.800	Peak	56.62	-3.82	52.80	74.00	-21.20
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2483.500	Average	48.71	-21.21	27.50	54.00	-26.50
2483.800	Average	52.80	-21.21	31.59	54.00	-22.41

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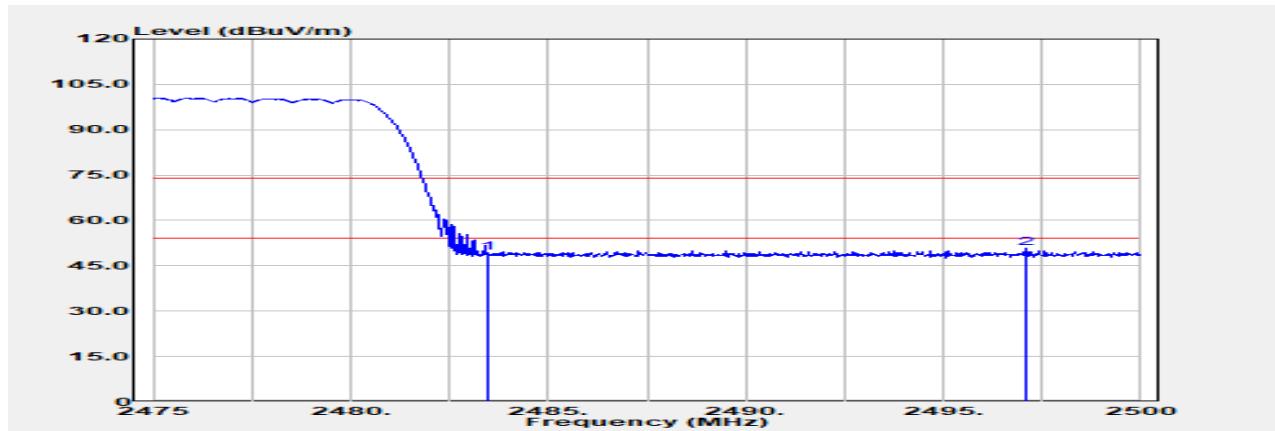
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M Hopping  
 Test Frequency :2480 MHz  
 Test Mode :Bandedge  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Peak	53.07	-3.82	49.25	74.00	-24.75
2497.125	Peak	54.57	-3.76	50.81	74.00	-23.19
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
2483.500	Average	49.25	-21.21	28.04	54.00	-25.96
2497.125	Average	50.81	-21.21	29.60	54.00	-24.40

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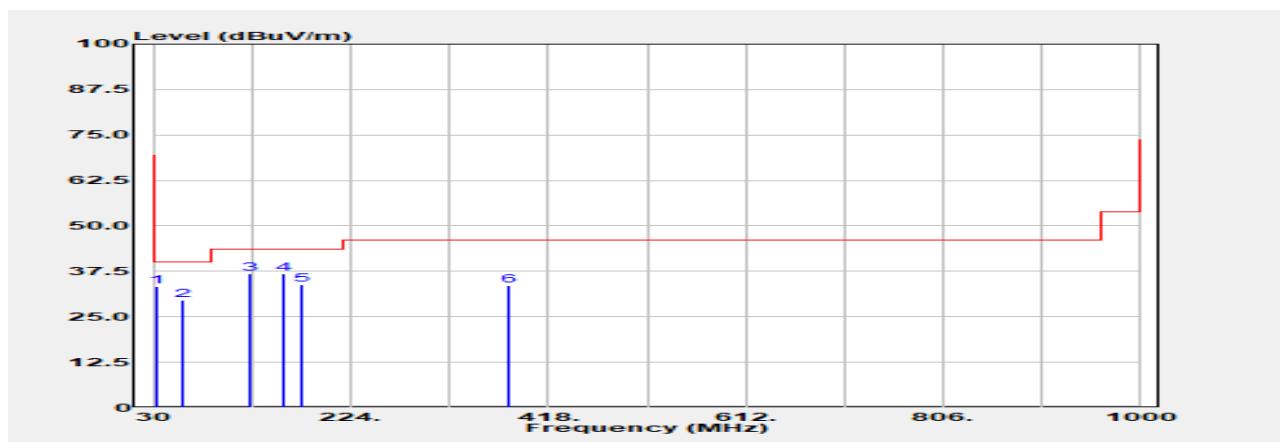
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**11.6.4 Radiated Spurious Emission**

Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-22  
 Temp./Humi. :19.6/49  
 Antenna Pol. :VERTICAL  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AVG	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
33.880	QP	47.50	-14.22	33.28	40.00	-6.72
59.100	QP	43.30	-13.61	29.69	40.00	-10.31
124.090	QP	51.90	-15.03	36.87	43.50	-6.63
159.010	Peak	50.13	-13.18	36.96	43.50	-6.54
176.470	Peak	47.99	-14.07	33.92	43.50	-9.58
378.230	Peak	43.91	-10.39	33.51	46.00	-12.49

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Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-22  
 Temp./Humi. :19.6/49  
 Antenna Pol. :HORIZONTAL  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AVG	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
59.100	QP	33.80	-13.61	20.19	40.00	-19.81
122.150	QP	46.40	-15.06	31.34	43.50	-12.16
332.640	Peak	48.54	-11.59	36.95	46.00	-9.05
379.200	Peak	46.40	-10.37	36.03	46.00	-9.97
724.520	Peak	36.57	-2.51	34.06	46.00	-11.94
974.780	Peak	30.73	0.09	30.82	54.00	-23.18

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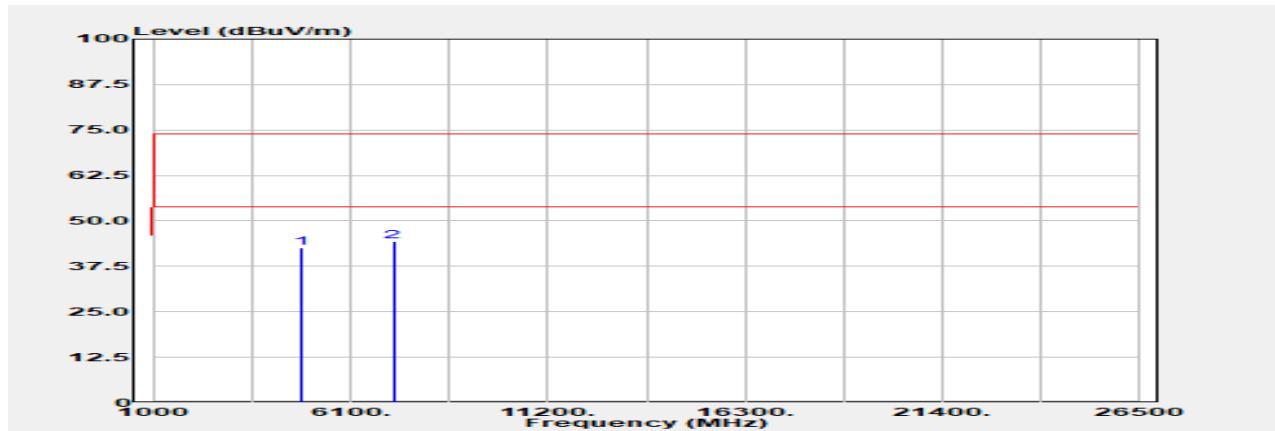
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Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2402 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4804.000	Peak	39.18	3.44	42.61	74.00	-31.39
7206.000	Peak	37.13	7.31	44.43	74.00	-29.57
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4804.000	Average	42.61	-21.21	21.40	54.00	-32.60
7206.000	Average	44.43	-21.21	23.22	54.00	-30.78

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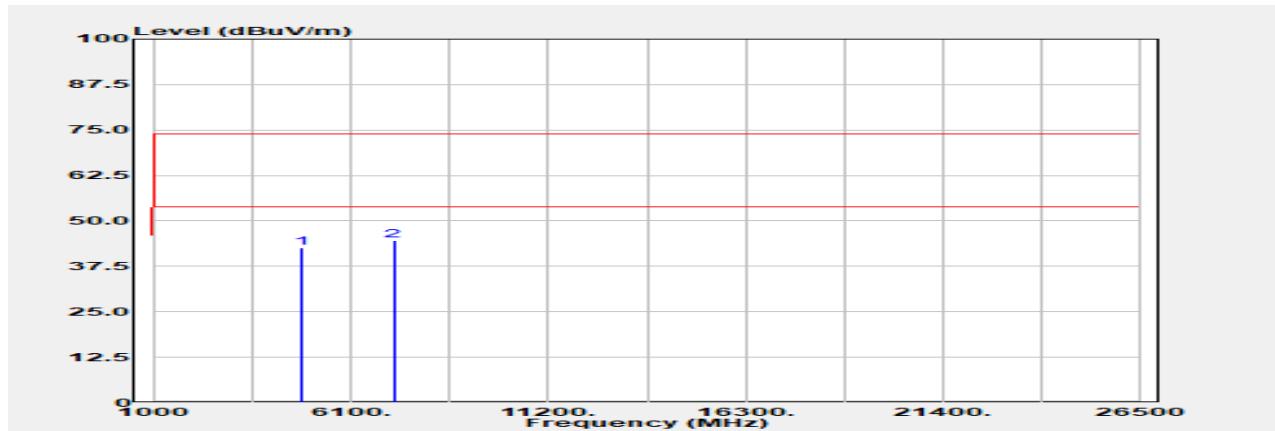
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Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2402 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4804.000	Peak	39.12	3.44	42.55	74.00	-31.45
7206.000	Peak	37.31	7.31	44.61	74.00	-29.39
Freq. MHz	Detector Mode AV	Peak Actual FS (dB <sub>uV/m</sub> )	Duty Cycle Factor (dB)	Average Value (dB <sub>uV/m</sub> )	Average Limit@3m (dB <sub>uV/m</sub> )	Margin (dB)
4804.000	Average	42.55	-21.21	21.34	54.00	-32.66
7206.000	Average	44.61	-21.21	23.40	54.00	-30.60

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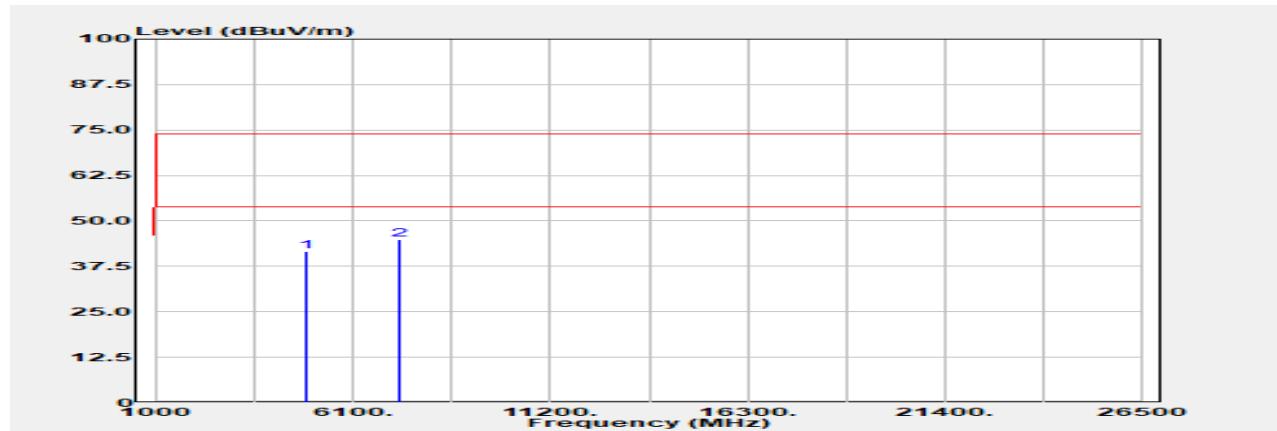
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Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4882.000	Peak	38.09	3.55	41.64	74.00	-32.36
7323.000	Peak	37.09	7.66	44.75	74.00	-29.25
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4882.000	Average	41.64	-21.21	20.43	54.00	-33.57
7323.000	Average	44.75	-21.21	23.54	54.00	-30.46

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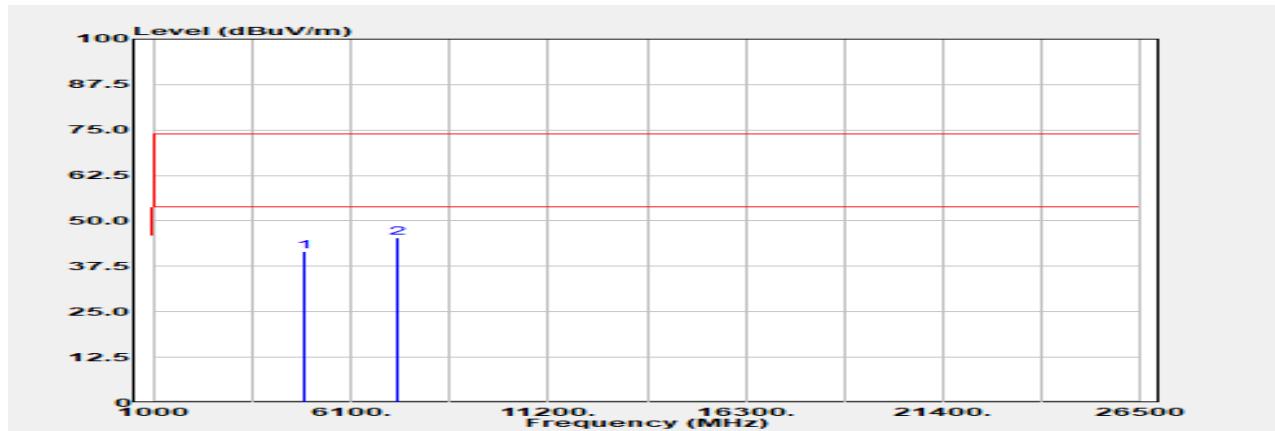
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Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4882.000	Peak	37.93	3.55	41.48	74.00	-32.52
7323.000	Peak	37.64	7.66	45.30	74.00	-28.70
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dB $\mu$ V/m)	Average Limit@3m (dB $\mu$ V/m)	Margin (dB)
4882.000	Average	41.48	-21.21	20.27	54.00	-33.73
7323.000	Average	45.30	-21.21	24.09	54.00	-29.91

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Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB <sub>u</sub> V	Factor dB	Actual FS dB <sub>u</sub> V/m	Limit @3m dB <sub>u</sub> V/m	Margin dB
4960.000	Peak	38.46	3.58	42.04	74.00	-31.96
7440.000	Peak	38.11	8.19	46.30	74.00	-27.70
Freq. MHz	Detector Mode AV	Peak Actual FS (dB <sub>u</sub> V/m)	Duty Cycle Factor (dB)	Average Value (dB <sub>u</sub> V/m)	Average Limit@3m (dB <sub>u</sub> V/m)	Margin (dB)
4960.000	Average	42.04	-21.21	20.83	54.00	-33.17
7440.000	Average	46.30	-21.21	25.09	54.00	-28.91

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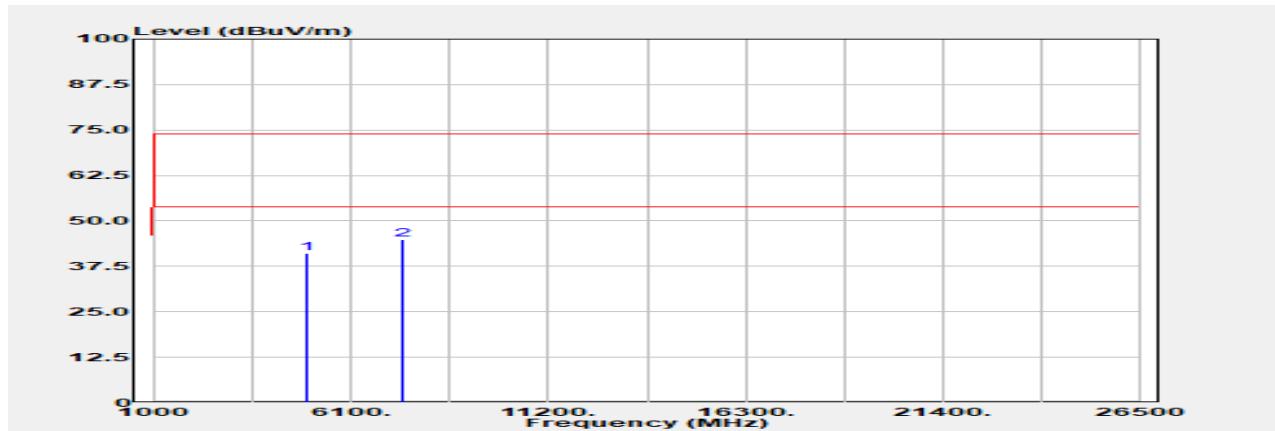
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Report Number :TERF2212002686E2  
 Operation Mode :BR  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4960.000	Peak	37.51	3.58	41.09	74.00	-32.91
7440.000	Peak	36.73	8.19	44.92	74.00	-29.08
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4960.000	Average	41.09	-21.21	19.88	54.00	-34.12
7440.000	Average	44.92	-21.21	23.71	54.00	-30.29

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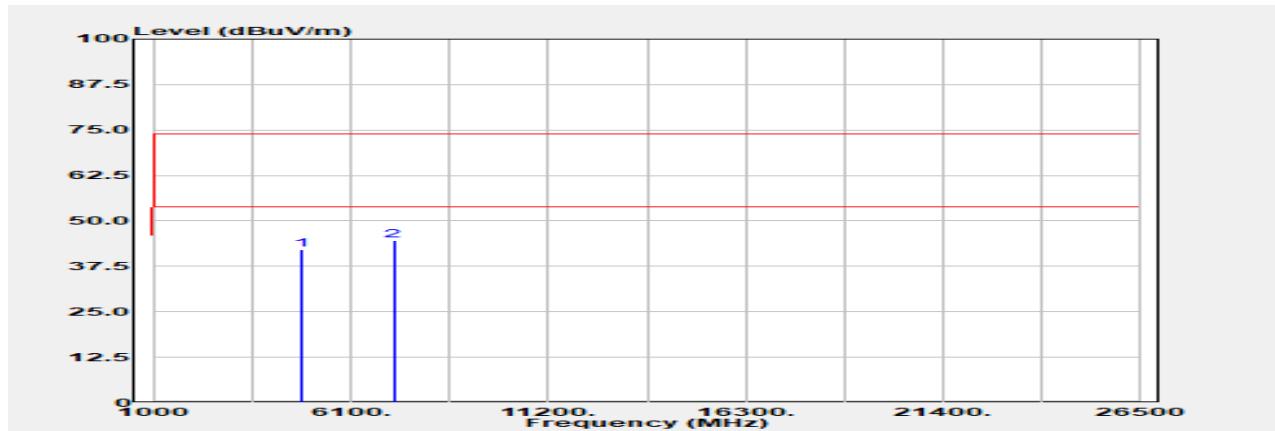
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M  
 Test Frequency :2402 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4804.000	Peak	38.73	3.44	42.17	74.00	-31.83
7206.000	Peak	37.18	7.31	44.49	74.00	-29.51
Freq. MHz	Detector Mode AV	Peak Actual FS (dB <sub>uV/m</sub> )	Duty Cycle Factor (dB)	Average Value (dB <sub>uV/m</sub> )	Average Limit@3m (dB <sub>uV/m</sub> )	Margin (dB)
4804.000	Average	42.17	-21.21	20.96	54.00	-33.04
7206.000	Average	44.49	-21.21	23.28	54.00	-30.72

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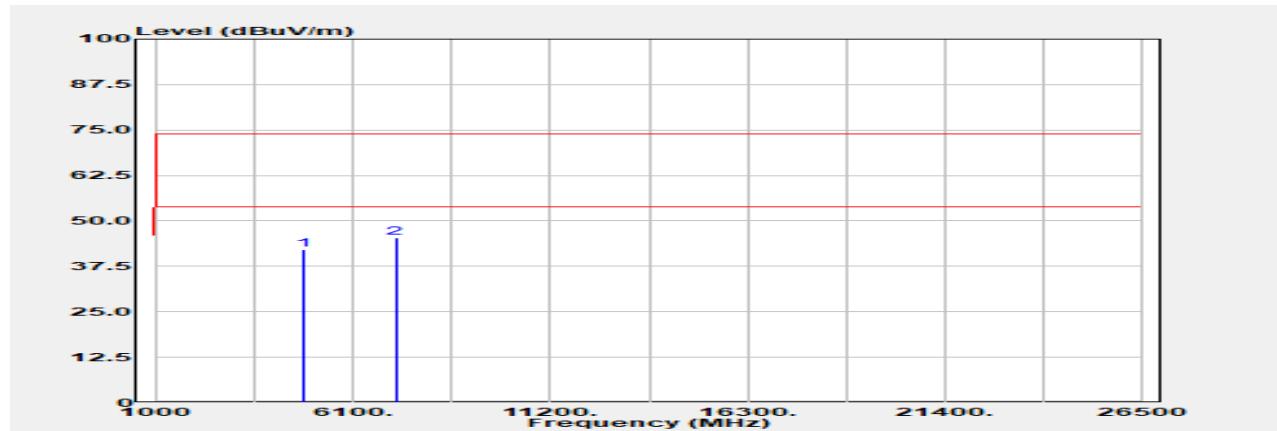
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M  
 Test Frequency :2402 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB <sub>u</sub> V	Factor dB	Actual FS dB <sub>u</sub> V/m	Limit @3m dB <sub>u</sub> V/m	Margin dB
4804.000	Peak	38.56	3.44	42.00	74.00	-32.00
7206.000	Peak	37.97	7.31	45.27	74.00	-28.73
Freq. MHz	Detector Mode AV	Peak Actual FS (dB <sub>u</sub> V/m)	Duty Cycle Factor (dB)	Average Value (dB <sub>u</sub> V/m)	Average Limit@3m (dB <sub>u</sub> V/m)	Margin (dB)
4804.000	Average	42.00	-21.21	20.79	54.00	-33.21
7206.000	Average	45.27	-21.21	24.06	54.00	-29.94

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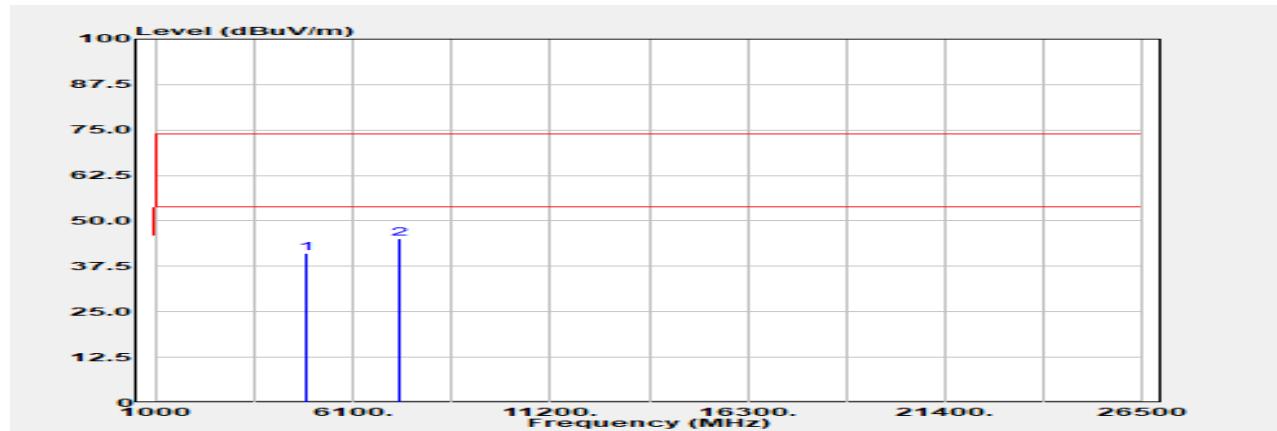
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4882.000	Peak	37.47	3.55	41.02	74.00	-32.98
7323.000	Peak	37.55	7.66	45.21	74.00	-28.79
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4882.000	Average	41.02	-21.21	19.81	54.00	-34.19
7323.000	Average	45.21	-21.21	24.00	54.00	-30.00

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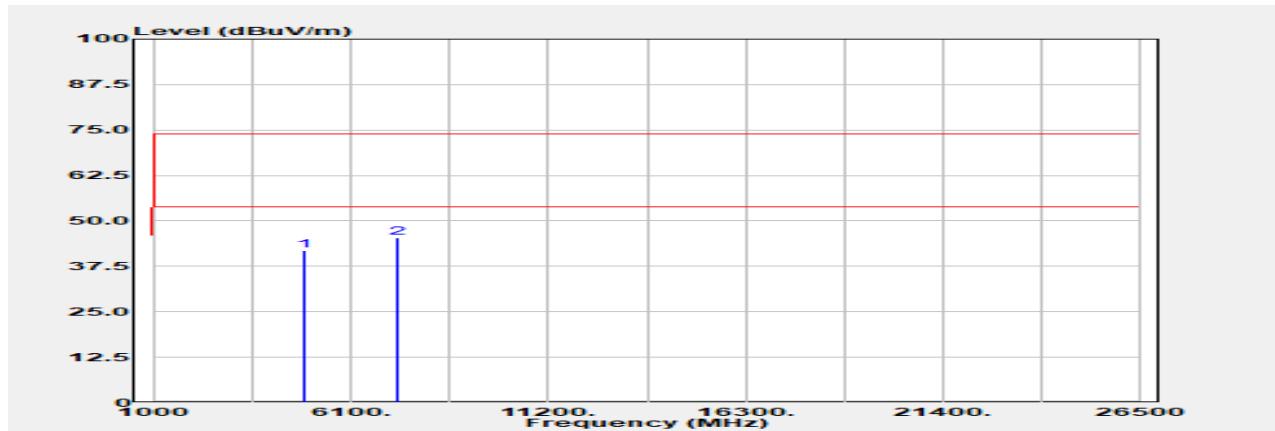
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M  
 Test Frequency :2441 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4882.000	Peak	38.35	3.55	41.90	74.00	-32.10
7323.000	Peak	37.61	7.66	45.28	74.00	-28.72
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dB $\mu$ V/m)	Average Limit@3m (dB $\mu$ V/m)	Margin (dB)
4882.000	Average	41.90	-21.21	20.69	54.00	-33.31
7323.000	Average	45.28	-21.21	24.07	54.00	-29.93

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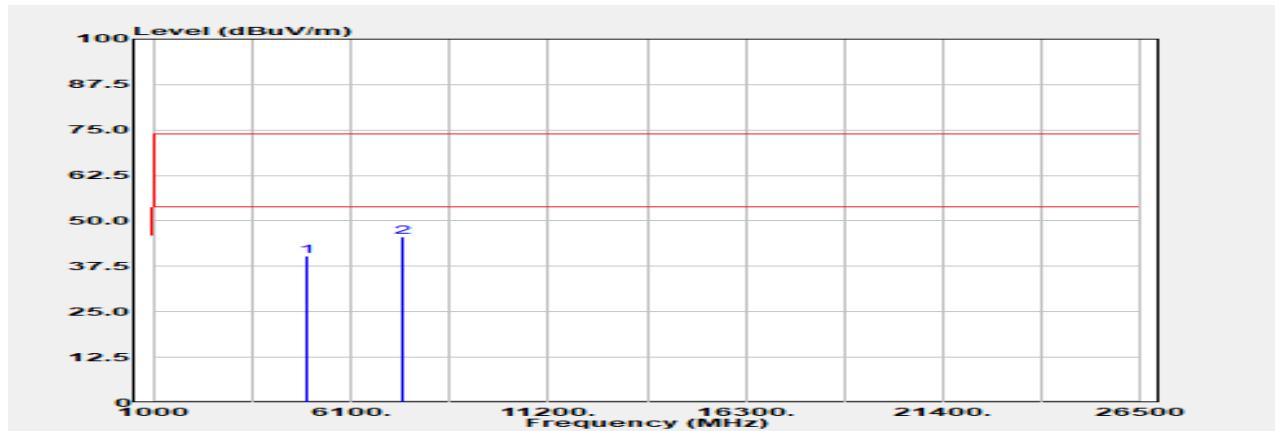
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Vertical  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB <sub>u</sub> V	Factor dB	Actual FS dB <sub>u</sub> V/m	Limit @3m dB <sub>u</sub> V/m	Margin dB
4960.000	Peak	36.85	3.58	40.43	74.00	-33.57
7440.000	Peak	37.36	8.19	45.55	74.00	-28.45
Freq. MHz	Detector Mode AV	Peak Actual FS (dB <sub>u</sub> V/m)	Duty Cycle Factor (dB)	Average Value (dB <sub>u</sub> V/m)	Average Limit@3m (dB <sub>u</sub> V/m)	Margin (dB)
4960.000	Average	40.43	-21.21	19.22	54.00	-34.78
7440.000	Average	45.55	-21.21	24.34	54.00	-29.66

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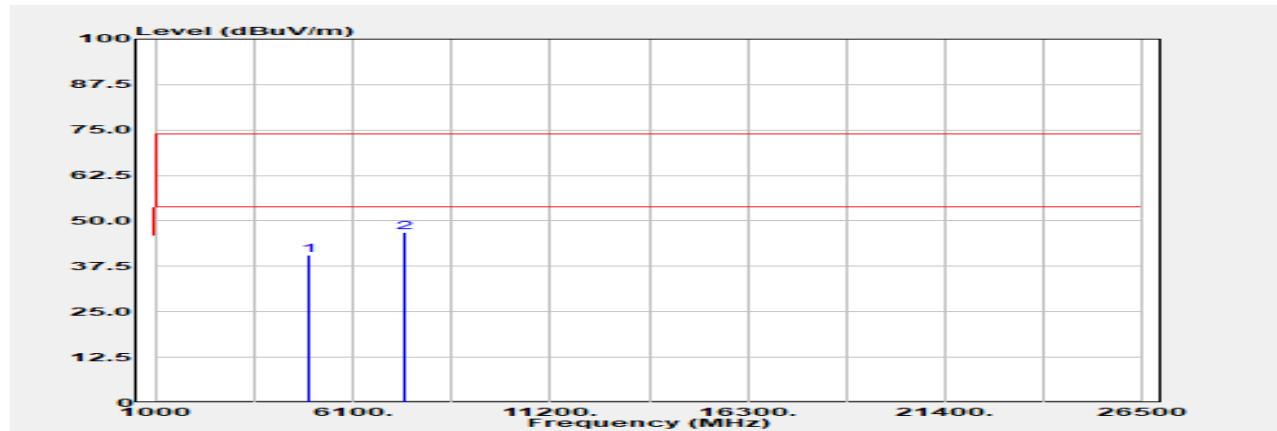
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Report Number :TERF2212002686E2  
 Operation Mode :EDR 3M  
 Test Frequency :2480 MHz  
 Test Mode :Tx  
 EUT Pol :E2 Plane

Test Site :SAC G Chamber  
 Test Date :2022-12-16  
 Temp./Humi. :20.6/62  
 Antenna Pol. :Horizontal  
 Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4960.000	Peak	37.06	3.58	40.64	74.00	-33.36
7440.000	Peak	38.55	8.19	46.74	74.00	-27.26
Freq. MHz	Detector Mode AV	Peak Actual FS (dB $\mu$ V/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4960.000	Average	40.64	-21.21	19.43	54.00	-34.57
7440.000	Average	46.74	-21.21	25.53	54.00	-28.47

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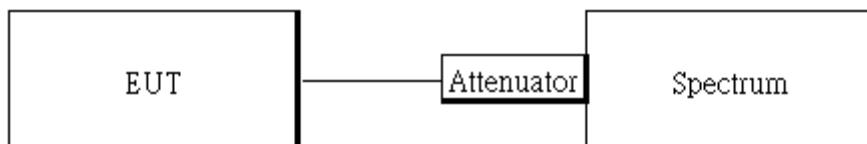
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## 12 FREQUENCY SEPARATION

### 12.1 Standard Applicable

Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the  $2/3 \times 20$  dB bandwidth of the hopping channel, whichever is greater.

### 12.2 Test Setup



### 12.3 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 = middle of hopping channel.
5. Set the RBW approximately 30% of the channel spacing,  $VBW \geq RBW$ .
6. Adjust Span to Wide enough to capture the peaks of two adjacent channels.
7. Sweep = auto.
8. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

### 12.4 Measurement Result

Channel separation (MHz)	Limit	Result
1	$\geq 25$ kHz or 2/3 times 20dB bandwidth	PASS

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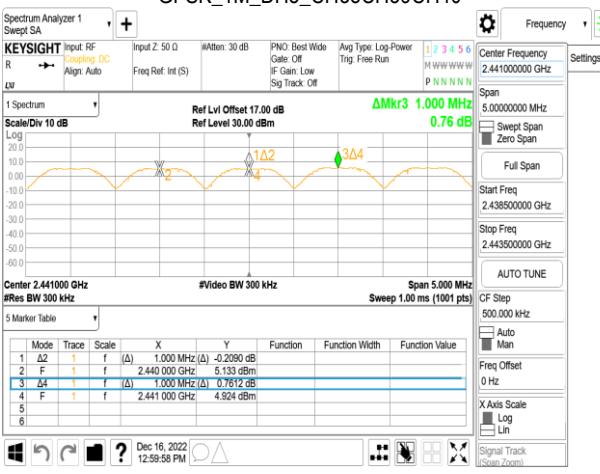
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π/4DQPSK\_2M\_DH5\_CH0CH1CH2



GFSK\_1M\_DH5\_CH38CH39CH40



π/4DQPSK\_2M\_DH5\_CH38CH39CH40



GFSK\_1M\_DH5\_CH76CH77CH78



π/4DQPSK\_2M\_DH5\_CH76CH77CH78



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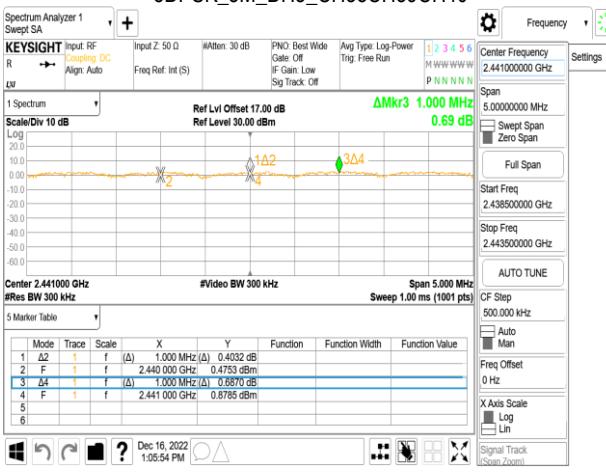
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8DPSK\_3M\_DH5\_CH0CH1CH2



8DPSK\_3M\_DH5\_CH38CH39CH40



8DPSK\_3M\_DH5\_CH76CH77CH78



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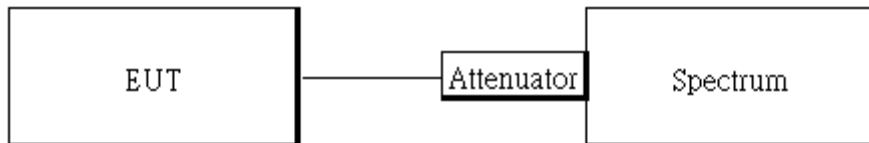
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## 13 NUMBER OF HOPPING FREQUENCY

### 13.1 Standard Applicable

Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

### 13.2 Test Setup



### 13.3 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 spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
5. Set the spectrum analyzer as RBW = 30% of the channel spacing, VBW  $\geq$  RBW., Detector = Peak
6. Max hold, view and count how many channel in the band.

### 13.4 Measurement Result

Tabular Data of Total Channel Number

	<i>Channel Number</i>	<i>Limit</i>
<b>2.4 GHz – 2.441 GHz</b>	<b>40</b>	<b>&gt;15</b>
<b>2.441 GHz – 2.4835 GHz</b>	<b>39</b>	
<b>2.4 GHz ~2.4835 GHz</b>	<b>(40+39) = 79</b>	

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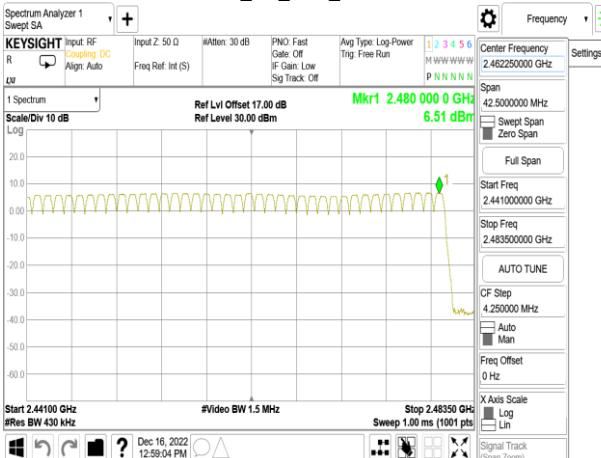
GFSK\_1M\_DH5\_2400-2441



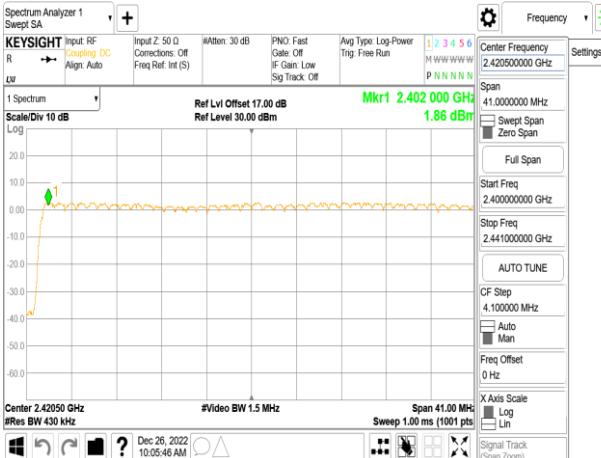
8DPSK\_3M\_DH5\_2441-2480



GFSK\_1M\_DH5\_2441-2480



8DPSK\_3M\_DH5\_2400-2441



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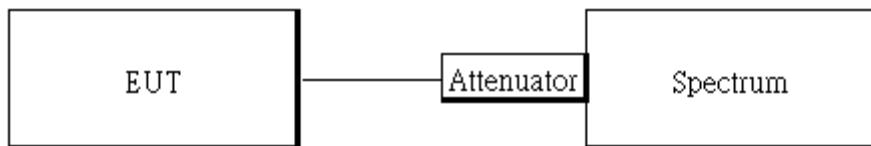
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## 14 TIME OF OCCUPANCY (DWELL TIME)

### 14.1 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.

### 14.2 Test Setup



### 14.3 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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#### 14.4 Measurement Result

##### GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	VBW setting (kHz)
Mid	DH1	123.20	400ms	3.00
	DH3	262.40	400ms	1.00
	DH5	307.20	400ms	1.00

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

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	VBW setting (kHz)
Mid	2DH1	123.20	400ms	3.00
	2DH3	262.40	400ms	1.00
	2DH5	308.80	400ms	1.00

##### 8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	VBW setting (kHz)
Mid	3DH1	124.80	400ms	3.00
	3DH3	262.40	400ms	1.00
	3DH5	308.80	400ms	1.00

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### GFSK (1Mbps):

CH Mid	DH1 time slot =	0.385	*	(1600/2/79)	*	31.6	=	123.20	(ms)
	DH3 time slot =	1.640	*	(1600/4/79)	*	31.6	=	262.40	(ms)
	DH5 time slot =	2.880	*	(1600/6/79)	*	31.6	=	307.20	(ms)

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

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

### 8-DPSK (3Mbps):

CH Mid	3DH1 time slo =	0.390	*	(1600/2/79)	*	31.6	=	124.80	(ms)
	3DH3 time slo =	1.640	*	(1600/4/79)	*	31.6	=	262.40	(ms)
	3DH5 time slo =	2.895	*	(1600/6/79)	*	31.6	=	308.80	(ms)

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

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## Dwell Time\_GFSK\_1M\_DH1\_2441MHz



## Dwell Time\_GFSK\_1M\_DH3\_2441MHz



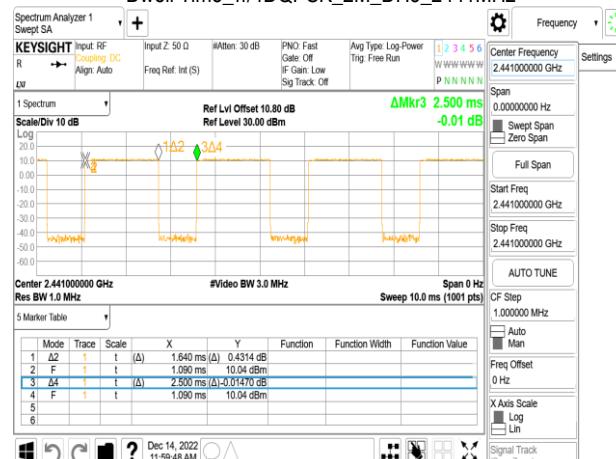
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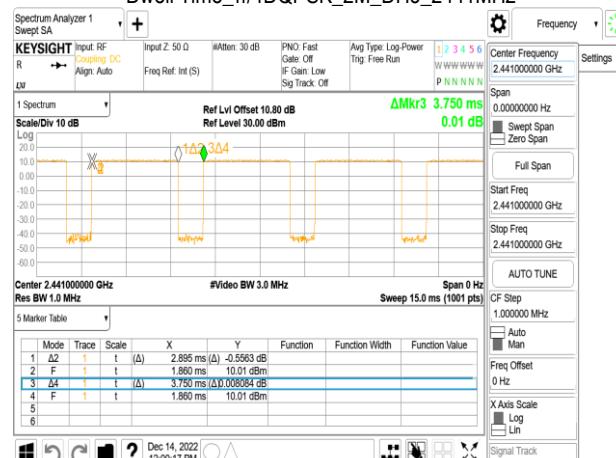
## Dwell Time\_π/4DQPSK\_2M\_DH1\_2441MHz



## Dwell Time\_π/4DQPSK\_2M\_DH3\_2441MHz



## Dwell Time\_π/4DQPSK\_2M\_DH5\_2441MHz



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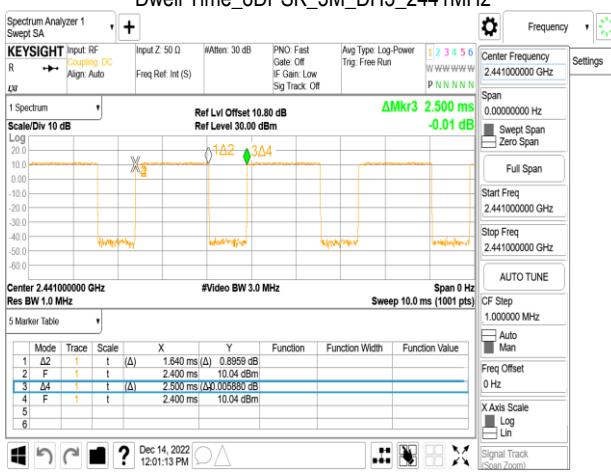
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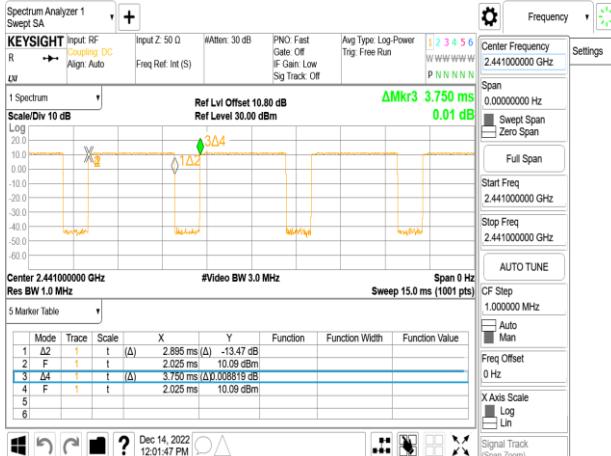
## Dwell Time\_8DPSK\_3M\_DH1\_2441MHz



## Dwell Time\_8DPSK\_3M\_DH3\_2441MHz



## Dwell Time\_8DPSK\_3M\_DH5\_2441MHz



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## 15 ANTENNA REQUIREMENT

### 15.1 Standard Applicable

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

### 15.2 Antenna Connected Construction

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

*~ End of Report ~*

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