ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

FCC Applicant:	DIGIMAX INNOVATIVE PRODUCTS LTD. 2F., No.196, Sec.2, Zhongxing Rd., Xindian Dist. New Taipei City
FCC Manufacturer:	Digisine Energytech Co. Ltd. 2F., No.196, Sec.2, Zhongxing Rd., Xindian Dist. New Taipei City
Product Name:	Hearing Aid
Brand Name:	Mimitakara, Digisine, Digimax
Model No.:	DP-6ELX, UP-6ELX
Model Difference:	For marketing segmentation
Report Number:	TERF2305001287ER
FCC ID	2BBAZ-6ELX
Date of EUT Received:	May 19, 2023
Date of Test:	May 22, 2023～June 27, 2023
Issue Date:	July 24, 2023

Approved By _____
Blue Yang

We hereby certify that:

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

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

Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2305001287ER	00	Original	Jul. 24, 2023	Candice Li	

Note:

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

2、Variant information of model numbers / trademarks is provided by the applicant, test results of this report are applicable to the sample EUT(s) received.
And are assessed as electrically identical in RF characteristics, therefore, no further assessment required for the variant(s).

Contents

1 GENERAL INFORMATION

1.1 Product Description

Product Name:	Hearing Aid
Brand Name:	Mimitakara, Digisine, Digimax
Model No.:	DP-6ELX, UP-6ELX
Model Difference:	For marketing segmentation
Hardware Version:	V1
Firmware Version:	V1
EUT Series No.:	Conducted-D000101 Conduction-L: D000103/R: Z000103 Radiated-D000102
Power Supply:	3.7Vdc from Li-ion Rechargeable Battery
Test Software (Name/Version)	AWBTRDLAB / 1.0.9.22

1.2 RF Specification

Radio Technology:	BT BR+EDR
Channel number:	79 channels
Modulation type:	GFSK + π/4DQPSK + 8DPSK
Transmit Power:	6.32 dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	≦ 0.4s

1.3 Antenna Designation

Antenna Type	Supplier	Antenna Model No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Multilayer Ceramic Antenna	Walsin	RFANT3216120A59F1T	2400~2500	2.93

Note:

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

1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247
FCC KDB 558074 D01 15.247 Meas. Guidance v05r02
ANSI C63.10:2013

1.5 Test Facility

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

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

1.6 Special Accessories

There is no special accessory used while test was conducted.

1.7 Equipment Modifications

There was no modification incorporated into the EUT.

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 a 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 a 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.

2.4 Measurement Results Explanation Example

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

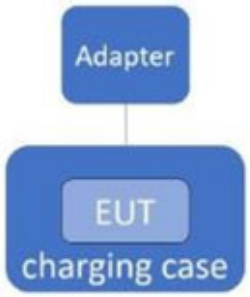
Radiated emission below 30MHz is measured in a 9m*6m*6m semi-ane choic chamber, the measurements correspond to those obtained at an open-field test site.
There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

2.4.2 For all conducted test items:

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

2.5 Test Configuration

Conduction Setup



Conducted Setup

Radiated Setup

2.6 Control Unit(s)

AC Power-Line Conducted Emission Test Site: Conduction 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Adapter	SAMSUNG	EP-TA200	R37R7VBJGP6DK3	N/A	N/A
charging case	Mimitakara	DP-6ELX	N/A	N/A	N/A
USB cable	JUN YU LINK LIMITED	R14A1009I1	N/A	N/A	N/A

Conducted Emission Test Site: Conducted 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	T440P	PC-014TAK	N/A	N/A
Test Kit	SILICON LABS	CP2102	N/A	N/A	N/A

Radiated Emission Test Site: SAC 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	T440P	PC-083PYC 15/10	N/A	N/A
Test Kit	Waveshare	FT232	N/A	N/A	N/A

3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b)(1)	Peak Output Power	Compliant
§15.247(a)(1)	Emission Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	Conducted & Radiated Band Edge and Spurious Emission	Compliant
§15.247(a)(1)	Frequency Separation	Compliant
§15.247(a)(1)(iii)	Number of hopping frequency Time of Occupancy	Compliant
§15.203	Antenna Requirement	Compliant

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	61	2462 MHz
2	2403 MHz	22	2423 MHz	42	2443 MHz	62	2463 MHz
3	2404 MHz	23	2424 MHz	43	2444 MHz	63	2464 MHz
4	2405 MHz	24	2425 MHz	44	2445 MHz	64	2465 MHz
5	2406 MHz	25	2426 MHz	45	2446 MHz	65	2466 MHz
6	2407 MHz	26	2427 MHz	46	2447 MHz	66	2467 MHz
7	2408 MHz	27	2428 MHz	47	2448 MHz	67	2468 MHz
8	2409 MHz	28	2429 MHz	48	2449 MHz	68	2469 MHz
9	2410 MHz	29	2430 MHz	49	2450 MHz	69	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		

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
Peak Output Power, 20dB Band Width, Spurious Emission				
Bluetooth	0 to 78	0,39,78	GFSK	DH5
	0 to 78	0,39,78	π/4-DQPSK	2DH5
	0 to 78	0,39,78	8-DPSK	3DH5
Band Edge				
Bluetooth	0 to 78	0,78	GFSK/8-DPSK	DH5/3DH5
Frequency Separation				
Bluetooth	0 to 78	0,1,2,38,39,40,76,77, 78	GFSK π/4-DQPSK 8-DPSK	DH5 2DH5 3DH5
Number of Hopping Frequency, Hopping Band edge				
Bluetooth	0 to 78	0 to 78	GFSK/8-DPSK	DH5/3DH5
Time of Occupancy(Dwell time)				
Bluetooth	0 to 78	39	GFSK	DH1/DH3/DH5
			π/4-DQPSK	2DH1/2DH3/2DH5
			8-DPSK	3DH1/3DH3/3DH5

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
RADIATED EMISSION TEST (BELOW 1 GHz)				
Bluetooth	0 to 78	39	GFSK	DH5
RADIATED EMISSION TEST (ABOVE 1 GHz)				
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.

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.

6 MEASUREMENT EQUIPMENT USED

6.1 Emission from AC power line

AC Power-Line Conducted Emission Test Site: Conduction 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESR 7	102525	02/18/2023	02/17/2024
Pulse Limiter	SCHWARZBECK	VTSD 9561F-N	793	06/22/2023	06/21/2024
LISN	SCHWARZBECK	NSLK 8127	01040	08/23/2022	08/22/2023
Coaxial Cables	EMC Instruments Corp.	EMCCFD300-BM-BM-3000	161207	06/22/2023	06/21/2024
Test Software	audix	e3	Ver. 9 210322	N.C.R	N.C.R

6.2 Conducted Measurement

Conducted Emission Test Site: Conducted 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
PXA Spectrum Analyzer	Keysight	N9030B	MY61330494	03/20/2023	03/19/2024
Test Software	SGS	Radio Test Software	Ver. 21	N.C.R	N.C.R
Power Meter	Anritsu	ML2496A	2138003	09/29/2022	09/28/2023
Power Sensor	Anritsu	MA2411B	1911393	09/29/2022	09/28/2023
Power Sensor	Anritsu	MA2411B	1911394	09/29/2022	09/28/2023
DC Block	Mini-Circuits	BLK-18-S+	1	12/13/2022	12/12/2023

6.3 Radiated Measurement

Radiated Emission Test Site: SAC 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/30/2022	12/29/2023
Horn Antenna	SCHWARZBECK	BBHA9120D	1441	09/27/2022	09/26/2023
Bi-log Antenna	SCHWARZBECK	VULB9168	378	08/15/2022	08/14/2023
Loop Antenna	ETS.LINDGREN	6502	148045	10/05/2022	10/04/2023
Spectrum Analyzer	Agilent	E4446A	MY51100003	10/28/2022	10/27/2023
EMI Test Receiver	R&S	ESCI 7	100759	08/22/2022	08/21/2023
Pre-Amplifier	EMC Instruments	EMC118A45SEE	980868	12/13/2022	12/12/2023
Pre-Amplifier	EMC Instruments	EMC184045B	980135	10/27/2022	10/26/2023
Pre-Amplifier	HP	8447D	2944A07676	12/13/2022	12/12/2023
Attenuator	Mini-Circuit	BW-S10W2+	4	12/13/2022	12/12/2023
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	12/13/2022	12/12/2023
High Pass Filter	WI	WHKX4.0/18G-10SS	22	12/13/2022	12/12/2023
Coaxial Cable	Huber Suhner	SUCOFLEX 104PEA	MY4251/4PEA	12/13/2022	12/12/2023
Coaxial Cable	EMC Instruments	EMC 107-SM-SM-500	221104	12/13/2022	12/12/2023
Coaxial Cable	EMC Instruments	EMC 107-SM-SM-1000	221103	12/13/2022	12/12/2023
Coaxial Cable	EMC Instruments	EMC 107-SM-SM-1500	221110	12/13/2022	12/12/2023
Coaxial Cable	EMC Instruments	EMC 107-SM-SM-8000	221109	12/13/2022	12/12/2023
Site Cal	SGS	SAC 3	N/A	01/01/2023	12/31/2023
Test Software	audix	e3	Ver. 9 210322	N.C.R	N.C.R

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

7 CONDUCTED EMISSION TEST

7.1 Standard Applicable

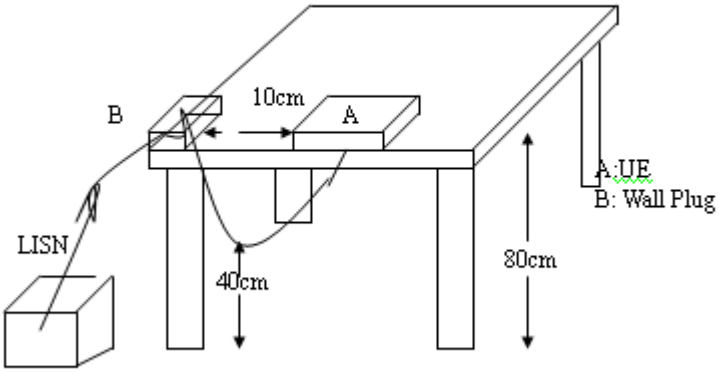
Frequency within 150 kHz to 30MHz shall not exceed the limit table as below.

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

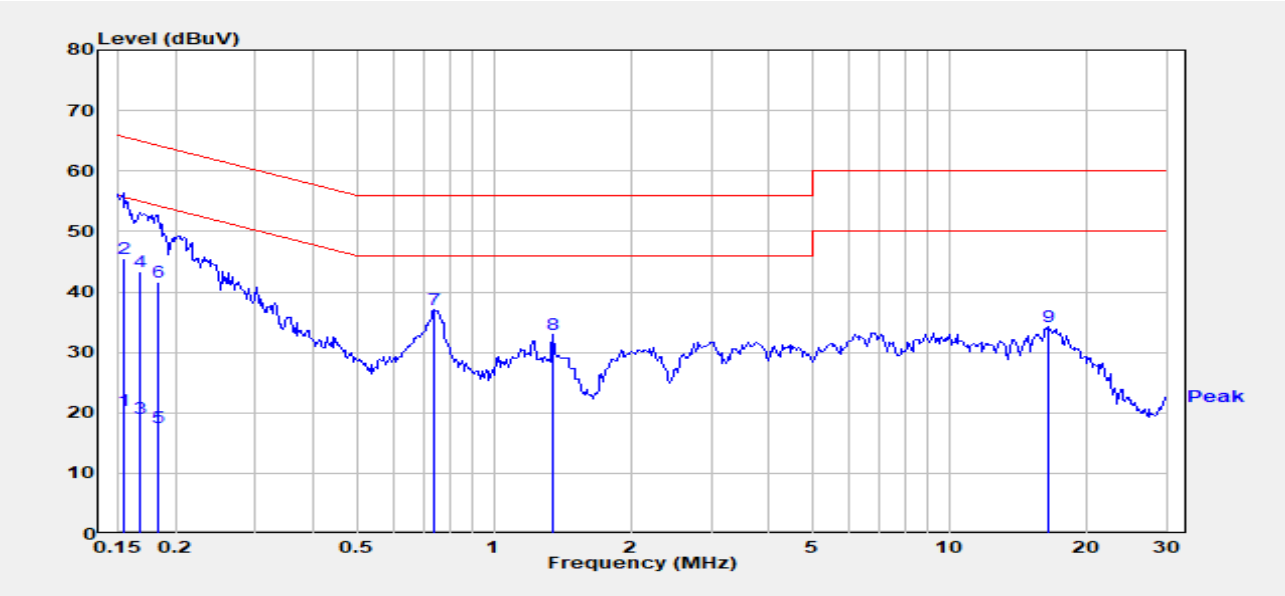
1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

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.

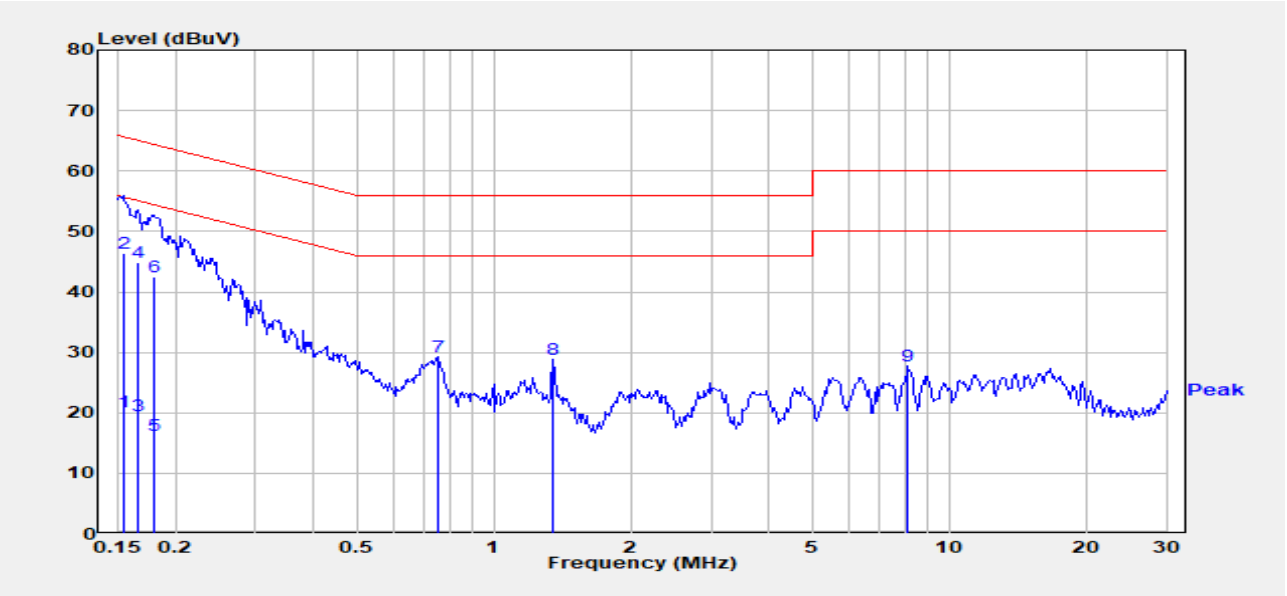
AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:TERF2305001287ER	Test Site	:Conduction 1
Test Mode	:Operation (BT)	Test Date	:2023-06-27
Power	:120V/60Hz	Temp./Humi.	:26.9℃/59%
Probe	:L	Engineer	:Nick Lin



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.153	Average	10.23	10.25	20.48	55.81	-35.33
0.153	QP	35.34	10.25	45.59	65.81	-20.22
0.167	Average	8.79	10.25	19.04	55.11	-36.07
0.167	QP	33.07	10.25	43.32	65.11	-21.79
0.183	Average	7.25	10.25	17.50	54.34	-36.84
0.183	QP	31.45	10.25	41.70	64.34	-22.64
0.741	Peak	26.70	10.31	37.01	56.00	-18.99
1.349	Peak	22.28	10.67	32.95	56.00	-23.05
16.482	Peak	23.50	10.85	34.35	60.00	-25.65

Report Number	:TERF2305001287ER	Test Site	:Conduction 1
Test Mode	:Operation (BT)	Test Date	:2023-06-27
Power	:120V/60Hz	Temp./Humi.	:26.9℃/59%
Probe	:N	Engineer	:Nick Lin



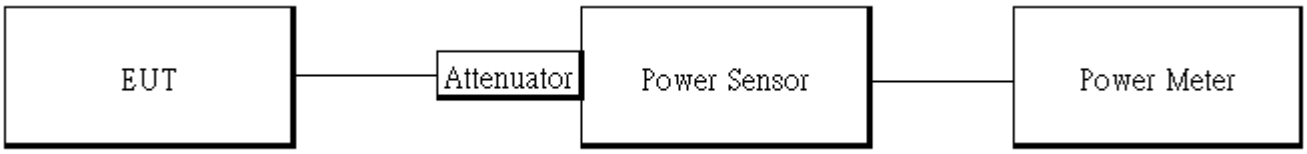
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.153	Average	10.02	10.25	20.27	55.81	-35.54
0.153	QP	36.23	10.25	46.48	65.81	-19.33
0.166	Average	9.16	10.25	19.41	55.17	-35.76
0.166	QP	34.59	10.25	44.84	65.17	-20.33
0.180	Average	6.11	10.25	16.36	54.47	-38.11
0.180	QP	32.27	10.25	42.52	64.47	-21.95
0.752	Peak	18.87	10.32	29.19	56.00	-26.81
1.349	Peak	18.21	10.67	28.88	56.00	-27.12
8.132	Peak	17.10	10.61	27.71	60.00	-32.29

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.

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.

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	default	5.63	3.656	1000
Mid	2441	default	6.18	4.150	1000
High	2480	default	**6.32**	4.285	1000

1M BR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	5.62	3.647	1000
Mid	2441	default	6.12	4.092	1000
High	2480	default	6.29	4.255	1000

2M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	4.66	2.924	125
Mid	2441	default	5.20	3.311	125
High	2480	default	**5.41**	3.475	125

2M EDR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	2.33	1.711	125
Mid	2441	default	2.94	1.969	125
High	2480	default	3.21	2.096	125

3M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	5.09	3.228	125
Mid	2441	default	5.62	3.648	125
High	2480	default	**5.81**	3.811	125

3M EDR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	2.44	1.755	125
Mid	2441	default	2.98	1.988	125
High	2480	default	3.24	2.110	125

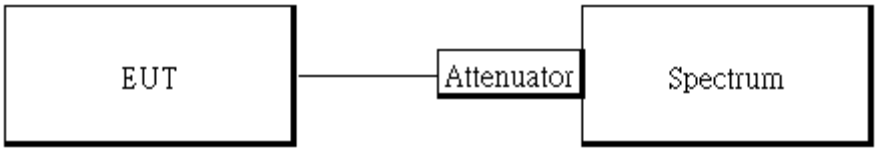
Note: Max. Output include tune up tolerance Power measured by using average detector.

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 % to 5% of OBW,
   VBW = 3 X RBW,
   Span= 2 to 5 times of the OBW,
   Sweep=auto,
   Detector = Peak, and Max hold for 20dB Bandwidth test.
5. Mark the peak frequency and –20dB (upper and lower) frequency
6. Repeat above procedures until all test default channel is completed

9.4 20dB Bandwidth

GFSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	0.9265	0.62
Mid	0.9241	0.62
High	0.9258	0.62

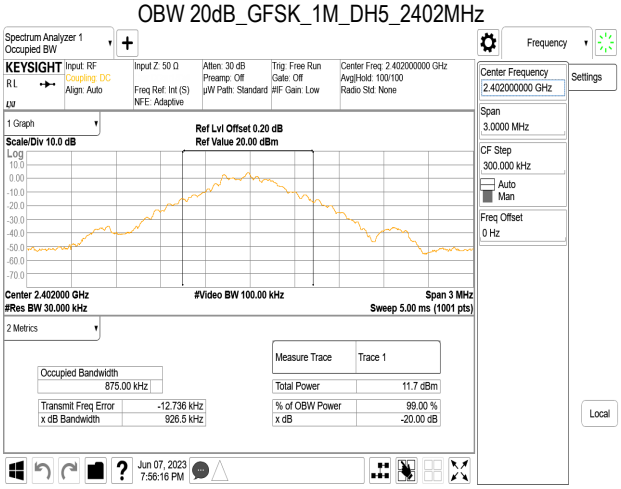
π/4-DQPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.240	0.83
Mid	1.241	0.83
High	1.241	0.83

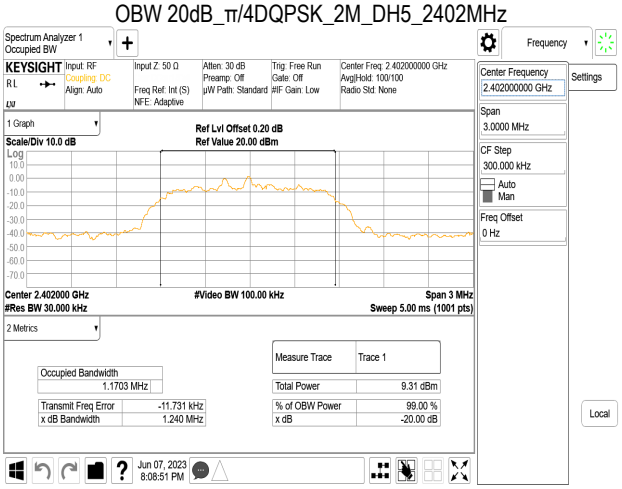
8-DPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.263	0.84
Mid	1.261	0.84
High	1.262	0.84

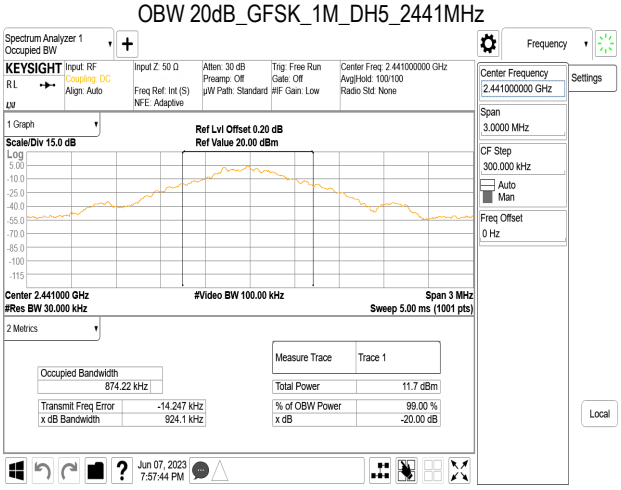
OBW 20dB_GFSK_1M_DH5_2402MHz



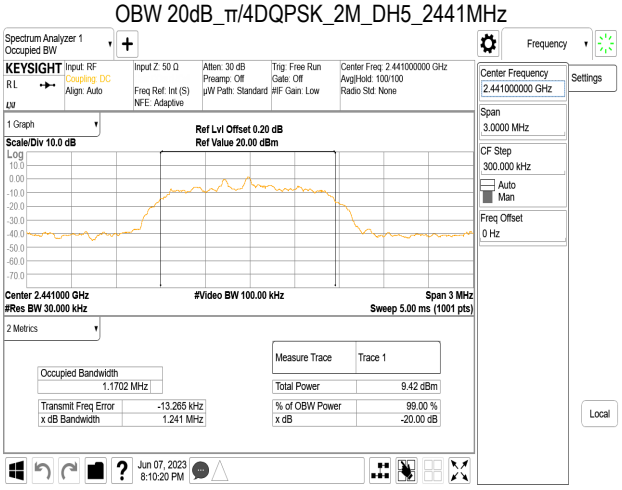
OBW 20dB_π/4DQPSK_2M_DH5_2402MHz



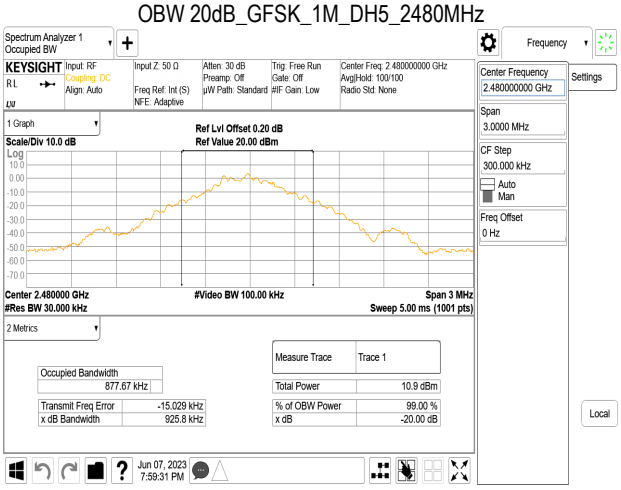
OBW 20dB_GFSK_1M_DH5_2441MHz



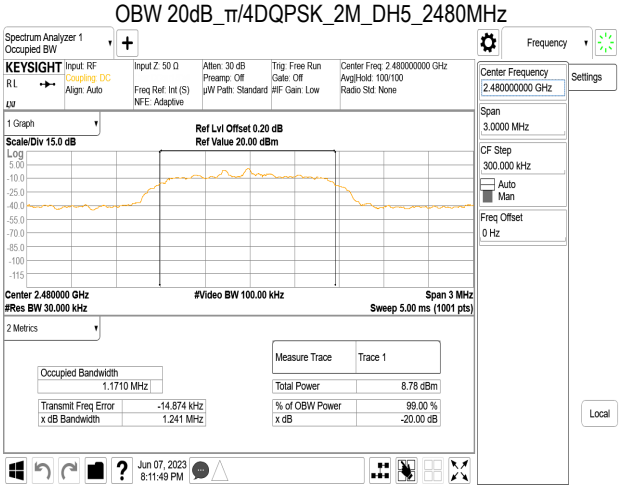
OBW 20dB_π/4DQPSK_2M_DH5_2441MHz



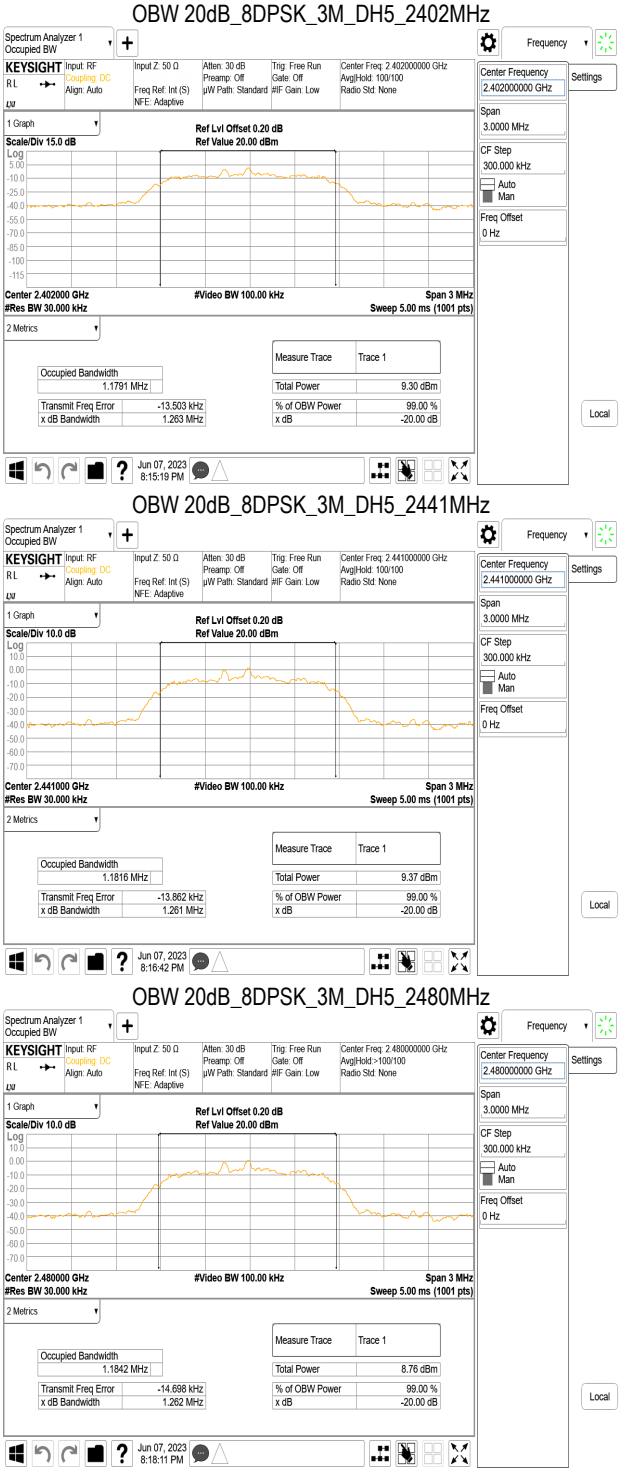
OBW 20dB_GFSK_1M_DH5_2480MHz



OBW 20dB_π/4DQPSK_2M_DH5_2480MHz



OBW 20dB_8DPSK_3M_DH5_2402MHz



OBW 20dB_8DPSK_3M_DH5_2441MHz

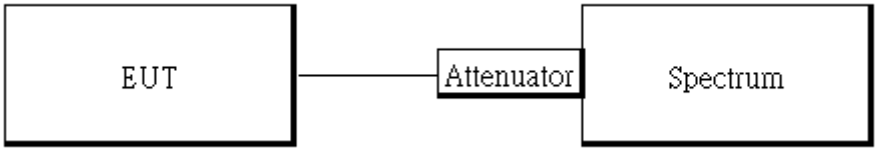
OBW 20dB_8DPSK_3M_DH5_2480MHz

10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

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

10.2 Test Setup



10.3 Measurement Procedure

10.3.1 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.

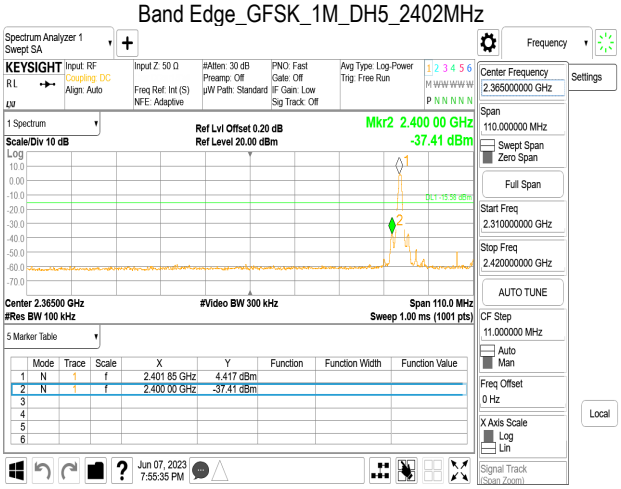
10.3.2 Conducted Spurious Emission:

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.

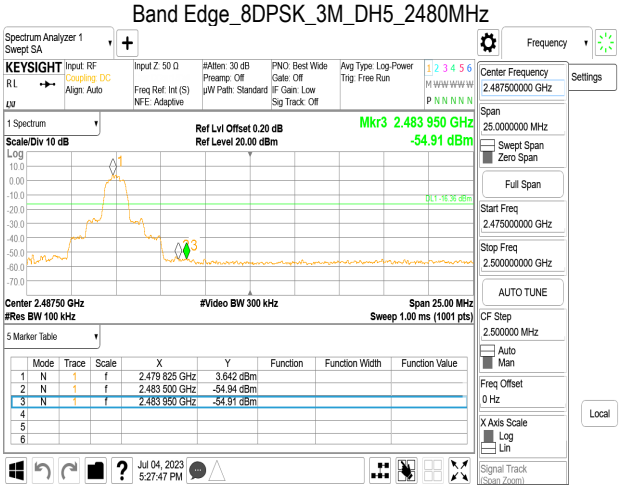
10.4 Measurement Result

See next page for test plots.

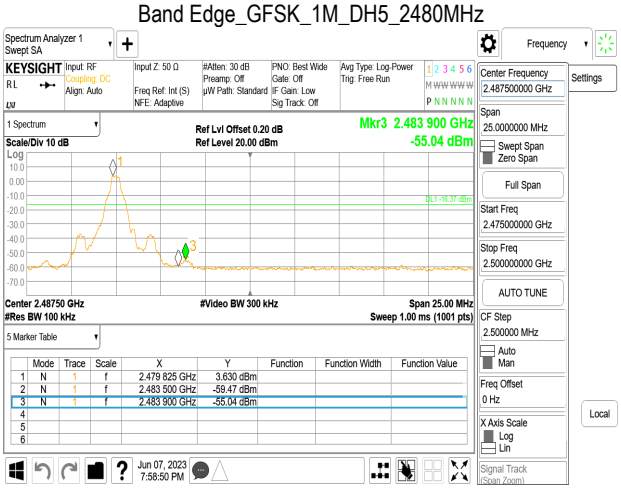
Band Edge_GFSK_1M_DH5_2402MHz



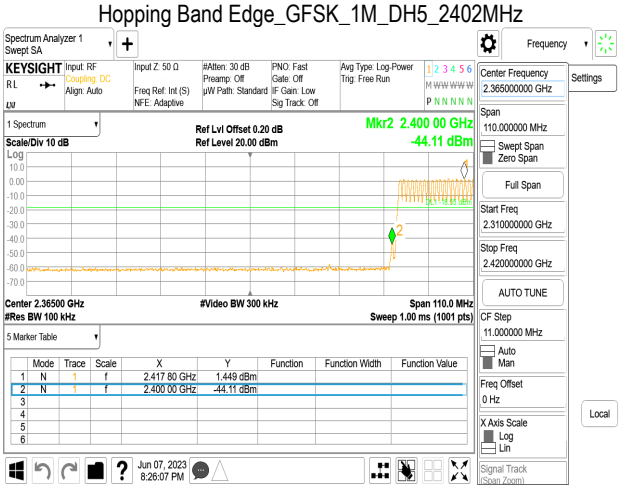
Band Edge_8DPSK_3M_DH5_2480MHz



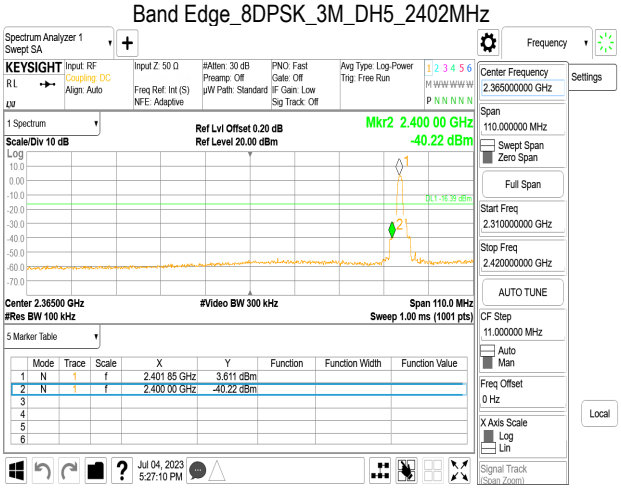
Band Edge_GFSK_1M_DH5_2480MHz



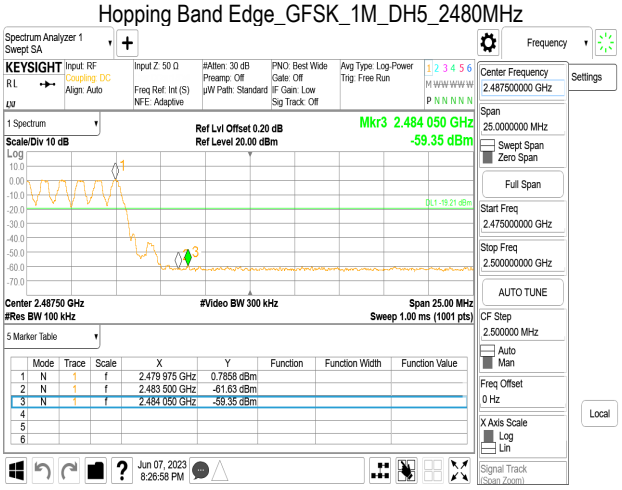
Hopping Band Edge_GFSK_1M_DH5_2402MHz



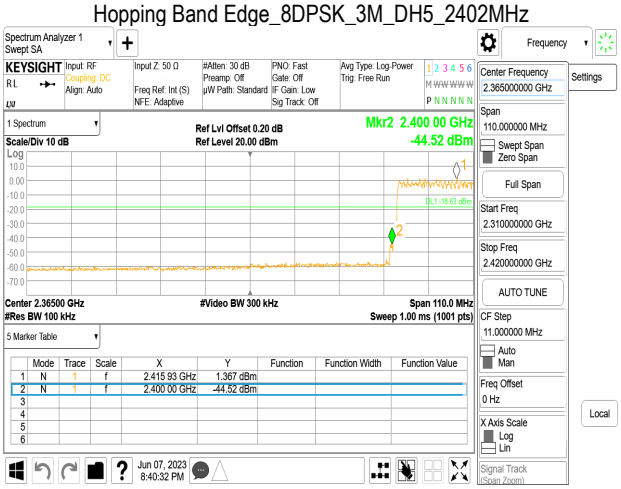
Band Edge_8DPSK_3M_DH5_2402MHz



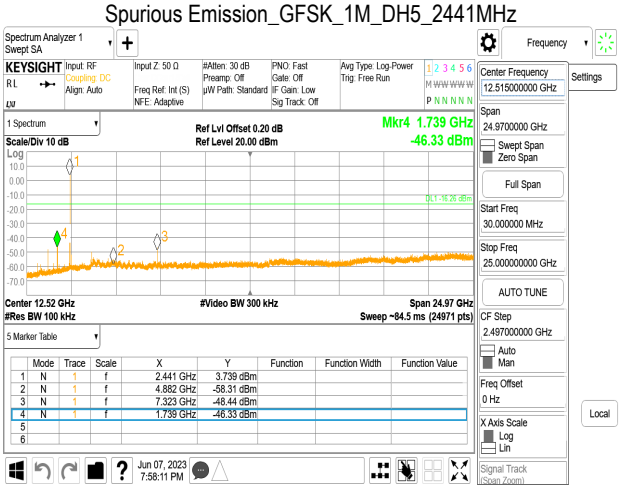
Hopping Band Edge_GFSK_1M_DH5_2480MHz



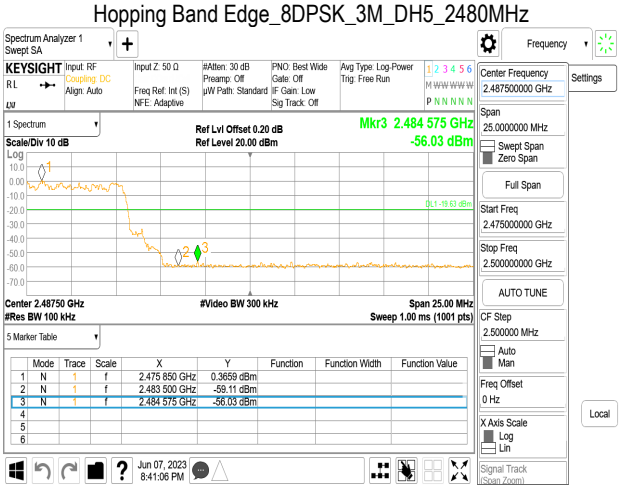
Hopping Band Edge_8DPSK_3M_DH5_2402MHz



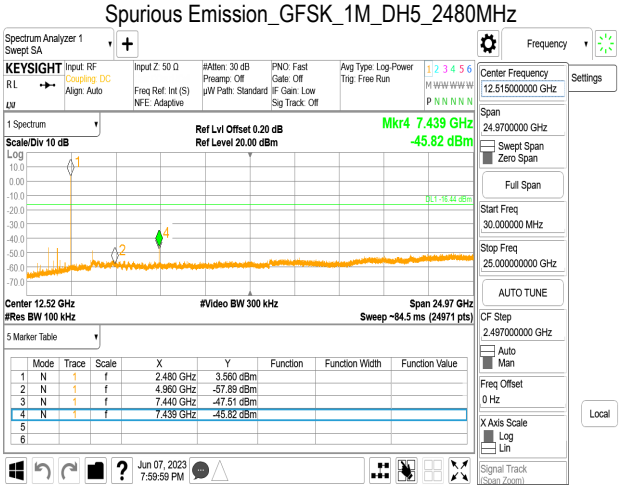
Spurious Emission_GFSK_1M_DH5_2441MHz



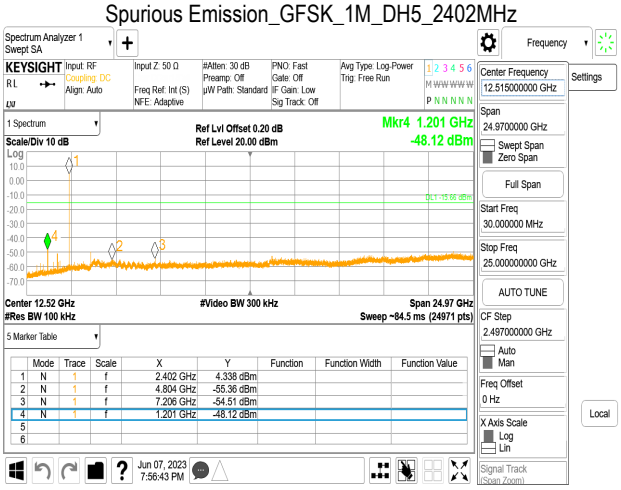
Hopping Band Edge_8DPSK_3M_DH5_2480MHz



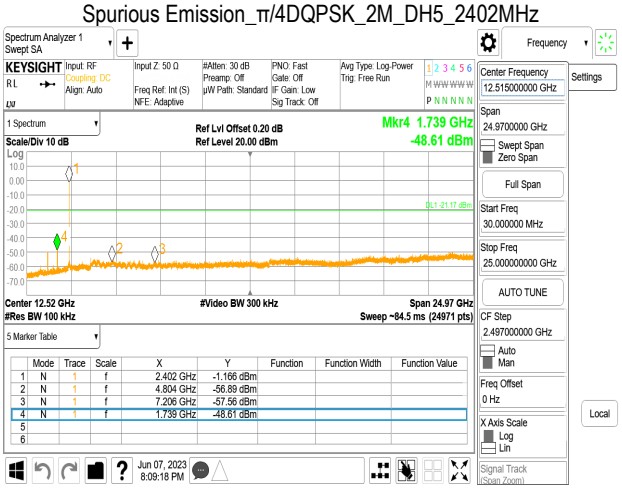
Spurious Emission_GFSK_1M_DH5_2480MHz



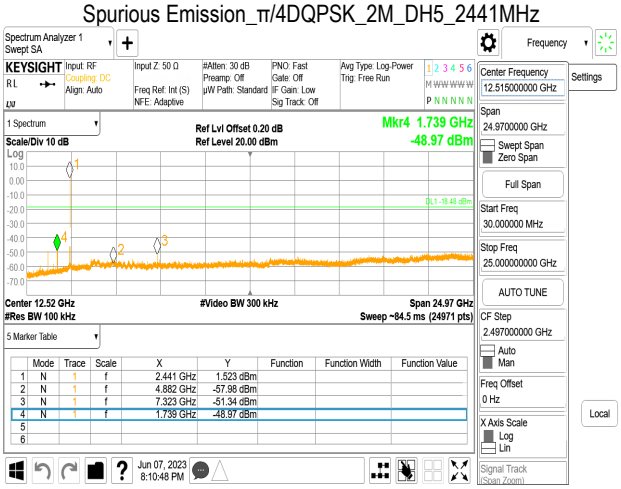
Spurious Emission_GFSK_1M_DH5_2402MHz



Spurious Emission_π/4DQPSK_2M_DH5_2402MHz

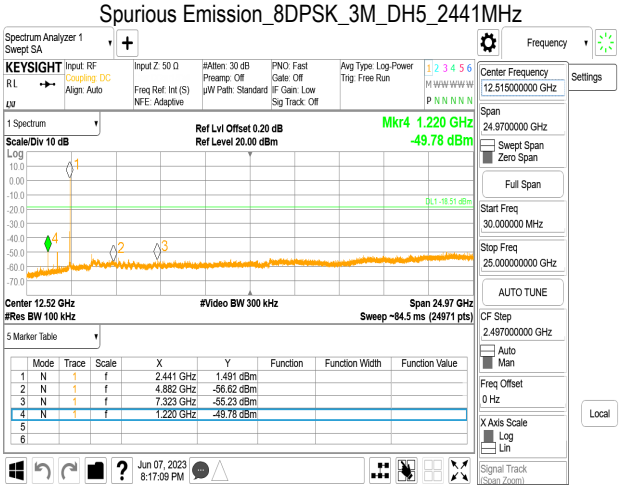


Spurious Emission_π/4DQPSK_2M_DH5_2441MHz



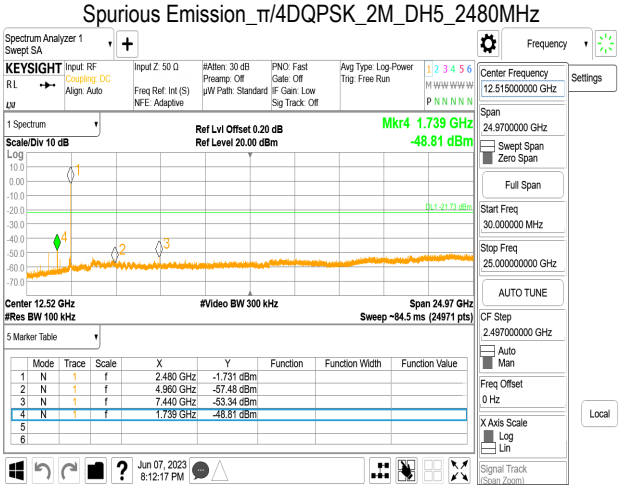
Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
N	1	f	2.441 GHz	1.523 dBm			
N	1	f	4.882 GHz	-57.98 dBm			
N	1	f	7.323 GHz	-51.34 dBm			
N	1	f	1.739 GHz	-48.97 dBm			

Spurious Emission_8DPSK_3M_DH5_2441MHz



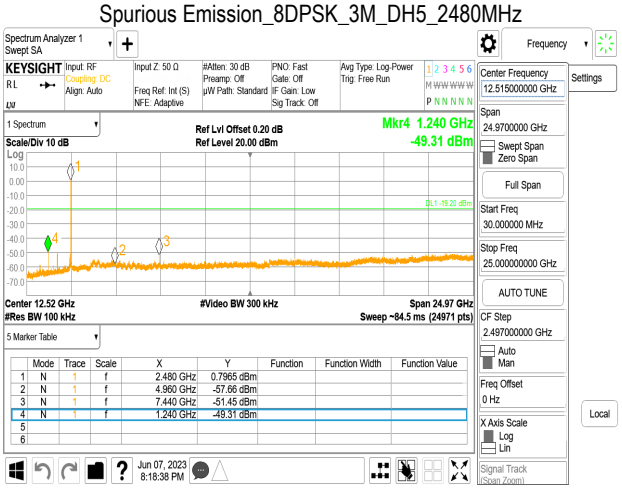
Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
N	1	f	2.441 GHz	1.491 dBm			
N	1	f	4.882 GHz	-56.62 dBm			
N	1	f	7.323 GHz	-55.23 dBm			
N	1	f	1.220 GHz	-49.78 dBm			

Spurious Emission_π/4DQPSK_2M_DH5_2480MHz



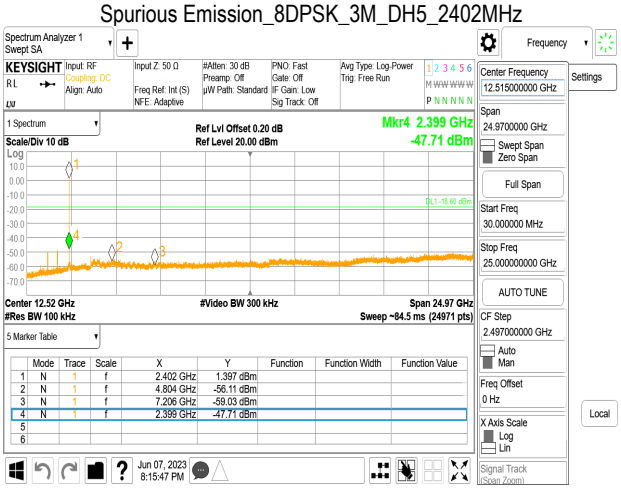
Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
N	1	f	2.480 GHz	-1.731 dBm			
N	1	f	4.960 GHz	-57.48 dBm			
N	1	f	7.440 GHz	-53.34 dBm			
N	1	f	1.739 GHz	-48.81 dBm			

Spurious Emission_8DPSK_3M_DH5_2480MHz



Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
N	1	f	2.480 GHz	0.7965 dBm			
N	1	f	4.960 GHz	-57.66 dBm			
N	1	f	7.440 GHz	-51.45 dBm			
N	1	f	1.240 GHz	-49.31 dBm			

Spurious Emission_8DPSK_3M_DH5_2402MHz



Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
N	1	f	2.402 GHz	1.397 dBm			
N	1	f	4.804 GHz	-56.11 dBm			
N	1	f	7.206 GHz	-59.03 dBm			
N	1	f	2.399 GHz	-47.71 dBm			

11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

11.1 Standard Applicable

11.1.1 Duty Cycle Correction Factor

According to 15. 35(c), 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 limit as below.
And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

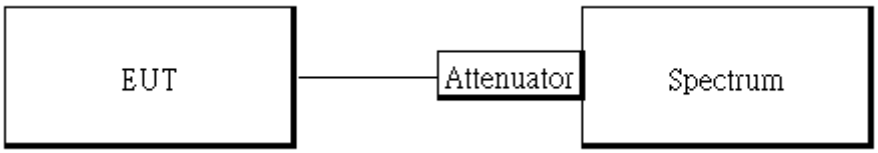
Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

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

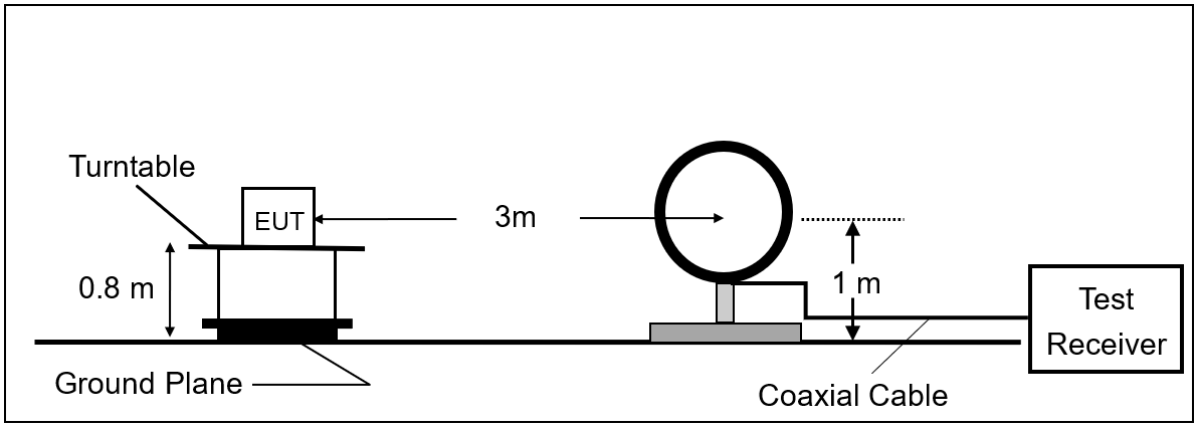
11.2 Test Setup

11.2.1 Duty Cycle Correction Factor

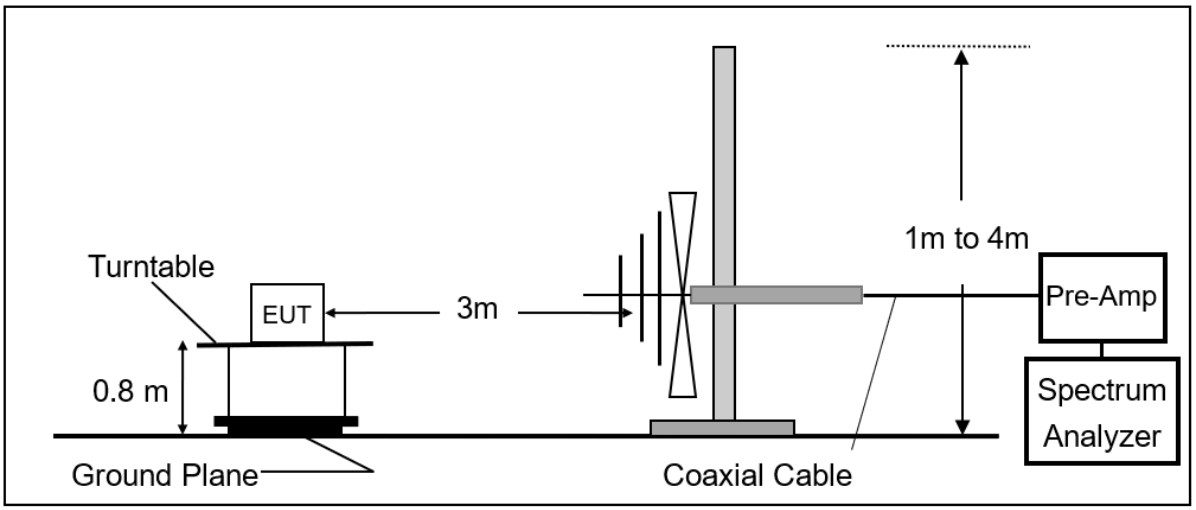


11.2.2 Radiated Emission

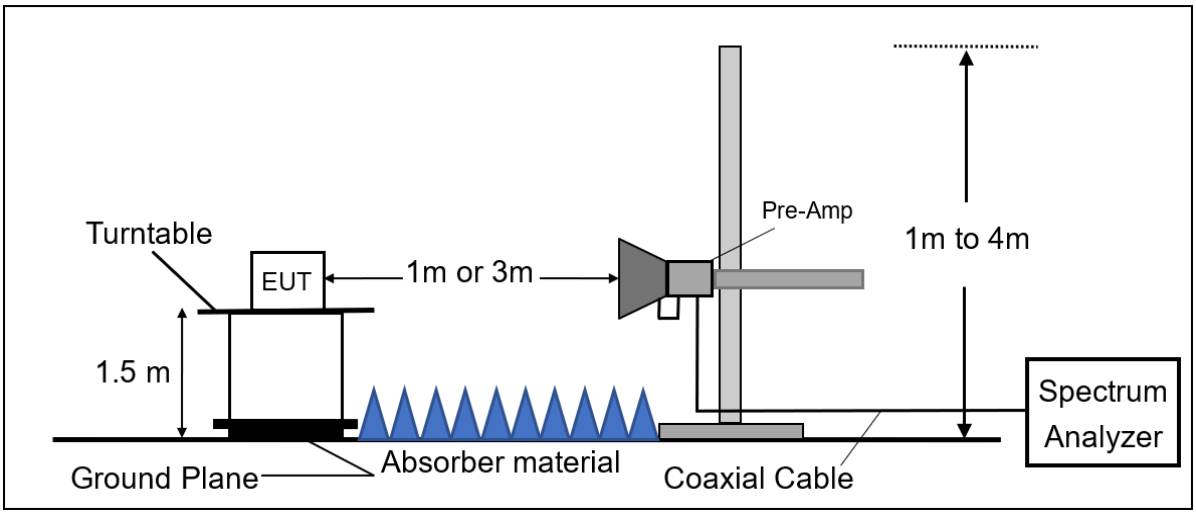
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



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



(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.

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 dBuV/m, which converts 20*log(uV/m)*

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)
Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Average value(dBμV/m)=Peak Actual FS(dBμV/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 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) was not reported.

11.6 Measurement Result:

11.6.1 Duty Cycle Correction Factor

Bluetooth 1M

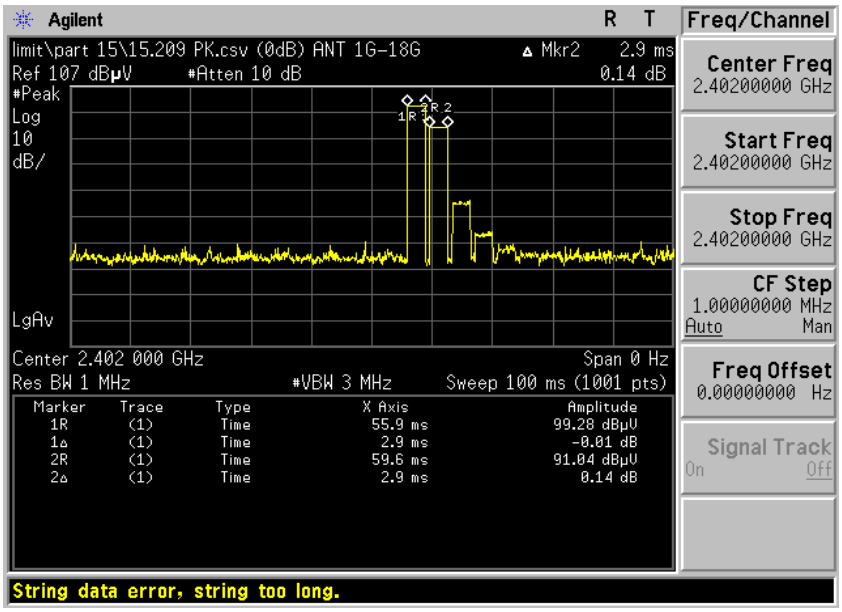
Time ON of 100ms:	5.800	ms
Duty Cycle=5.8ms / 100ms:	0.058	%
Duty Cycle correction factor=20 LOG 0.058=	-24.73	dB

Bluetooth 3M

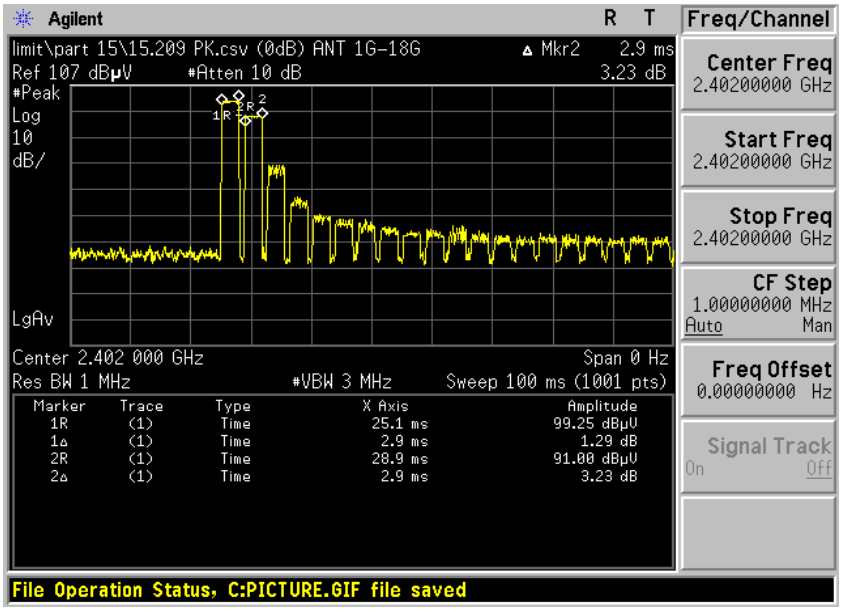
Time ON of 100ms:	5.800	ms
Duty Cycle=5.8ms / 100ms:	0.058	%
Duty Cycle correction factor=20 LOG 0.058=	-24.73	dB

11.6.2 Duty Cycle test plot

BR

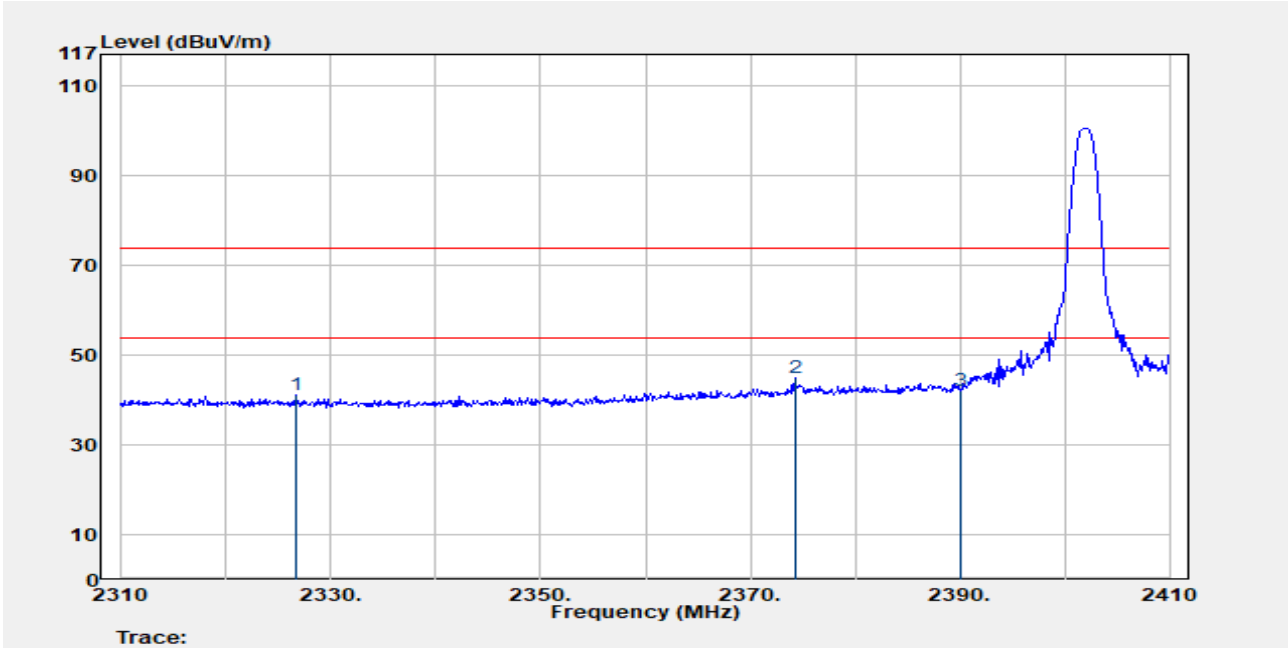


EDR



11.6.3 Bandedge Result

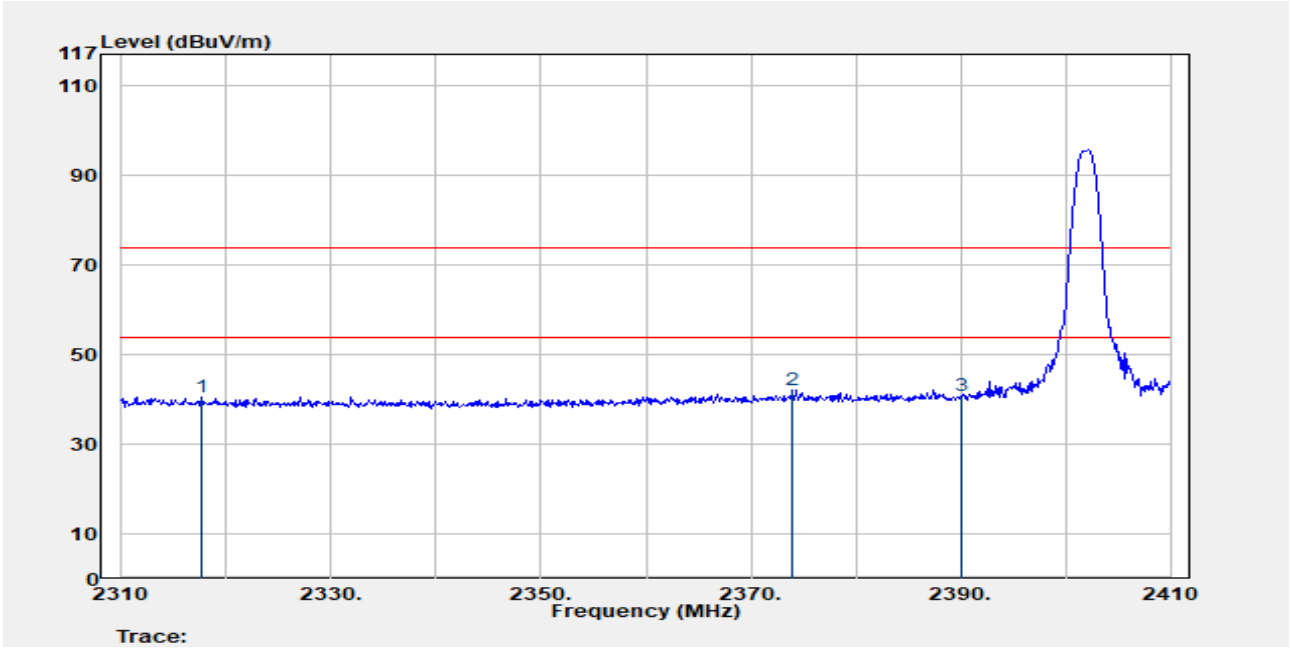
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2326.700	Peak	45.76	-4.45	41.31	74.00	-32.69
2374.300	Peak	49.28	-4.37	44.91	74.00	-29.09
2390.000	Peak	46.55	-4.25	42.30	74.00	-31.70

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)
2326.700	Average	41.31	-24.73	16.58	54.00	-37.42
2374.300	Average	44.91	-24.73	20.18	54.00	-33.82
2390.000	Average	42.30	-24.73	17.57	54.00	-36.43

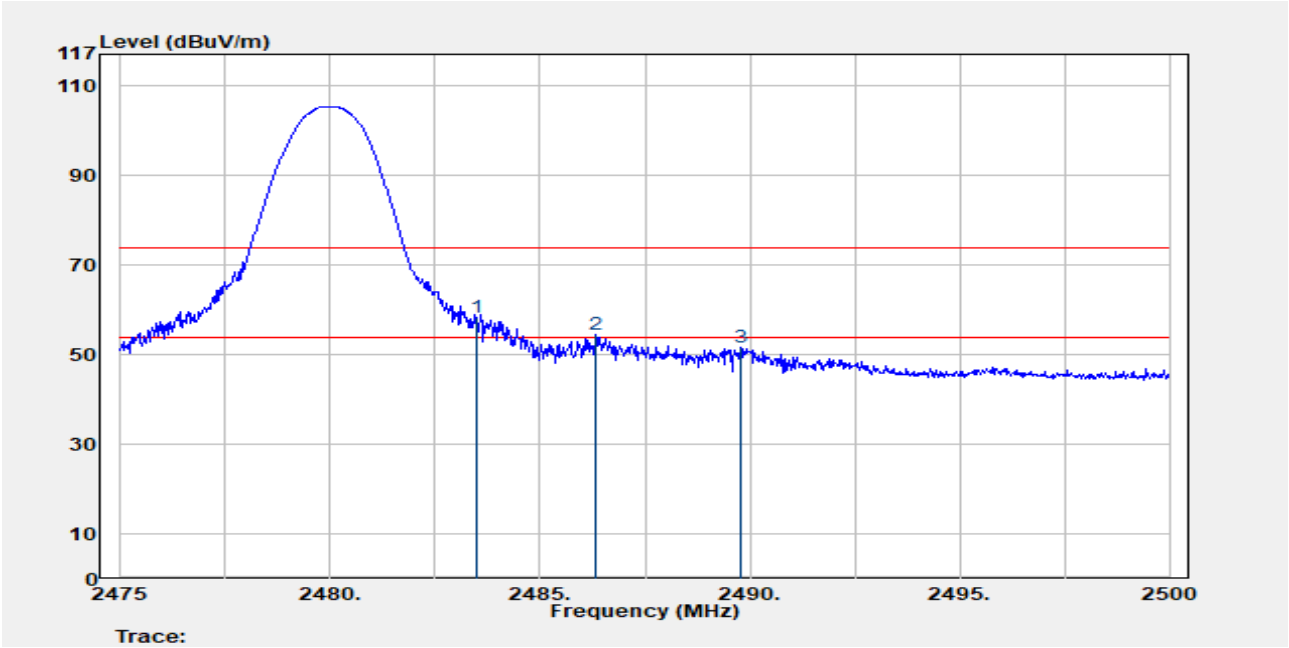
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2317.600	Peak	45.02	-4.41	40.61	74.00	-33.39
2374.000	Peak	46.67	-4.37	42.30	74.00	-31.70
2390.000	Peak	45.23	-4.25	40.98	74.00	-33.02

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)
2317.600	Average	40.61	-24.73	15.88	54.00	-38.12
2374.000	Average	42.30	-24.73	17.57	54.00	-36.43
2390.000	Average	40.98	-24.73	16.25	54.00	-37.75

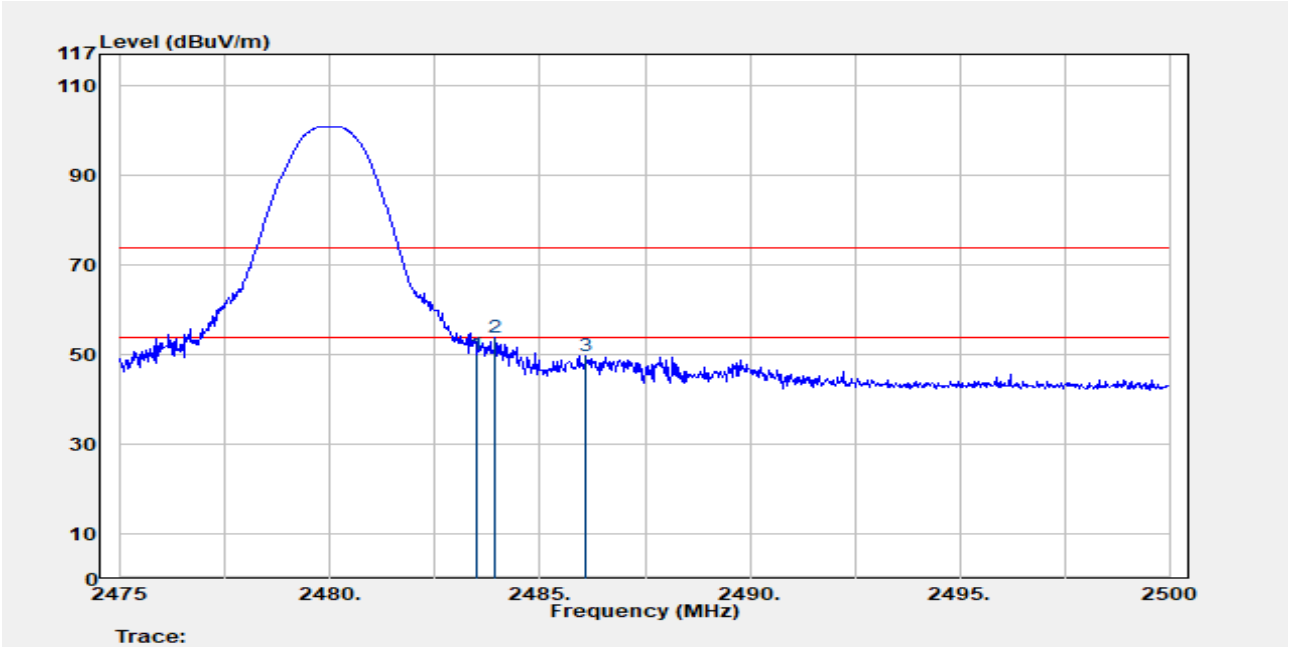
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2483.500	Peak	63.14	-4.64	58.49	74.00	-15.51
2486.325	Peak	59.11	-4.63	54.48	74.00	-19.52
2489.775	Peak	56.28	-4.62	51.66	74.00	-22.34

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	58.49	-24.73	33.76	54.00	-20.24
2486.325	Average	54.48	-24.73	29.75	54.00	-24.25
2489.775	Average	51.66	-24.73	26.93	54.00	-27.07

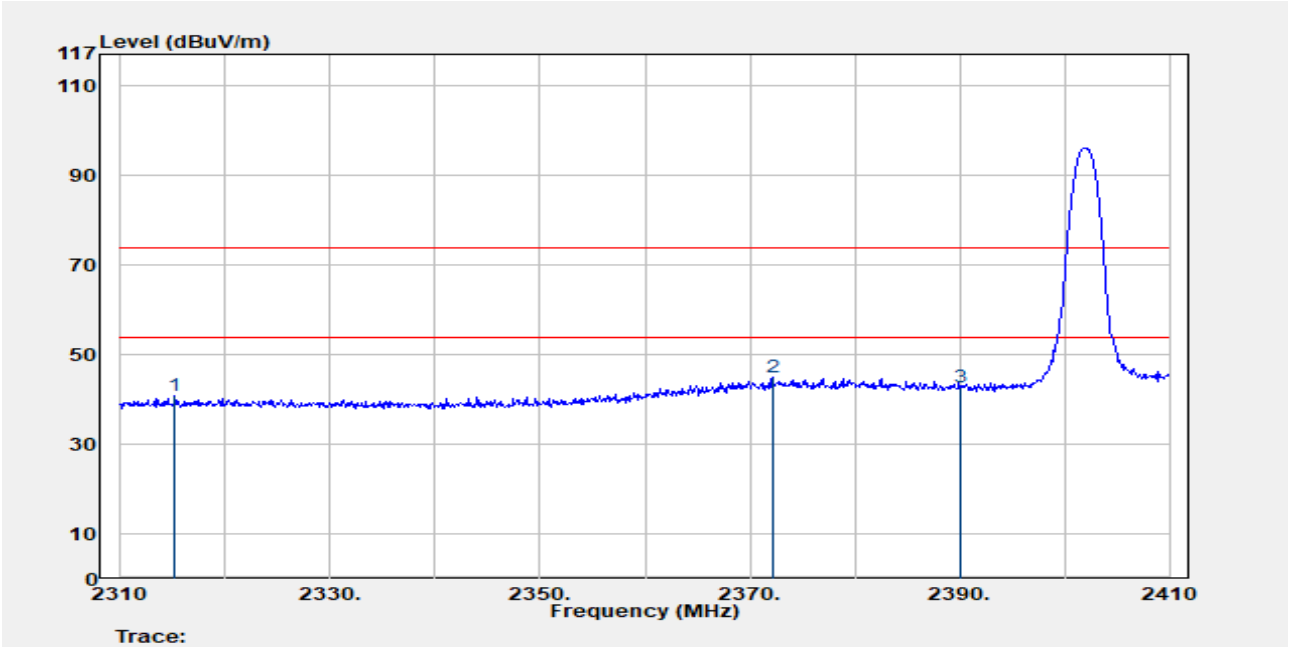
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2483.500	Peak	54.84	-4.64	50.20	74.00	-23.80
2483.925	Peak	58.39	-4.64	53.75	74.00	-20.25
2486.100	Peak	54.52	-4.63	49.88	74.00	-24.12

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	50.20	-24.73	25.47	54.00	-28.53
2483.925	Average	53.75	-24.73	29.02	54.00	-24.98
2486.100	Average	49.88	-24.73	25.15	54.00	-28.85

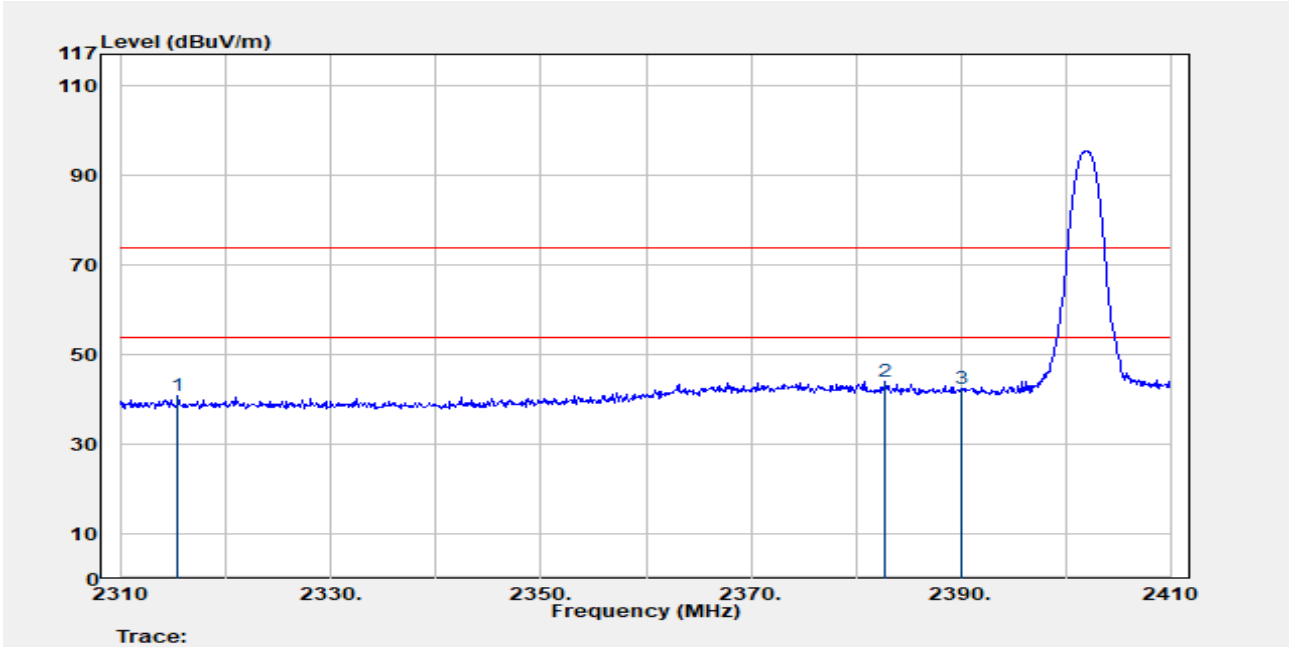
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2315.200	Peak	45.40	-4.40	41.00	74.00	-33.00
2372.200	Peak	49.37	-4.38	44.99	74.00	-29.01
2390.000	Peak	47.04	-4.25	42.79	74.00	-31.21

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)
2315.200	Average	41.00	-24.73	16.27	54.00	-37.73
2372.200	Average	44.99	-24.73	20.26	54.00	-33.74
2390.000	Average	42.79	-24.73	18.06	54.00	-35.94

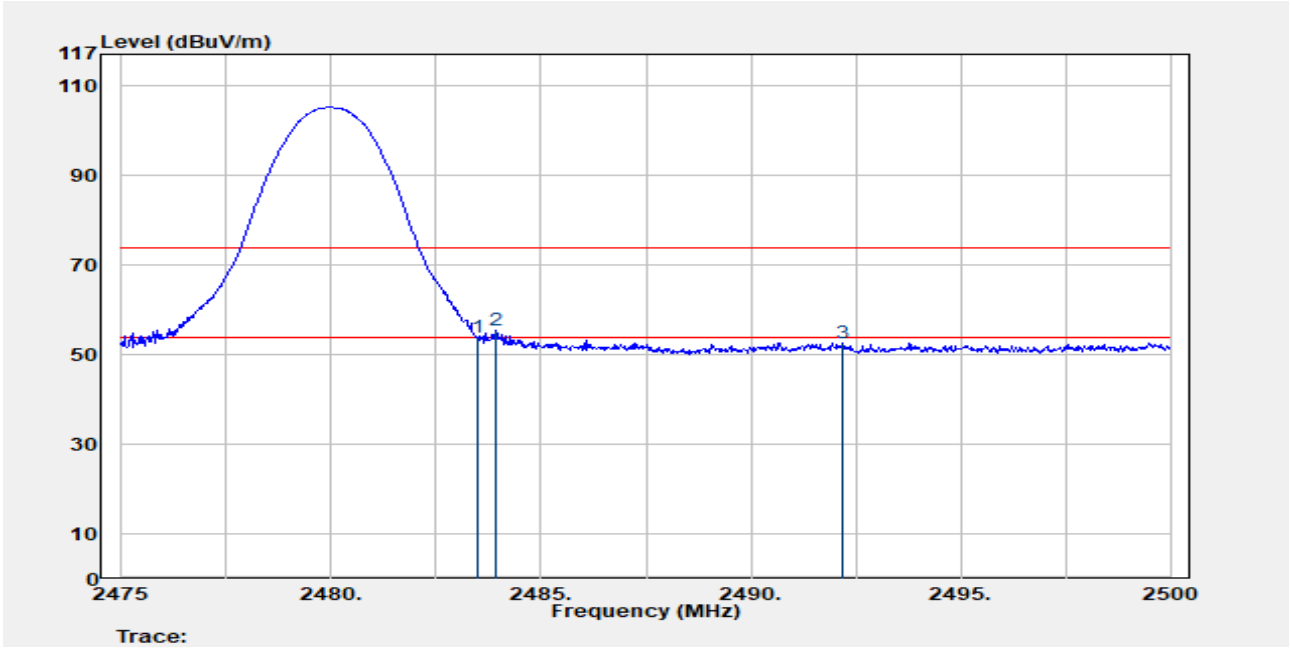
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2315.400	Peak	45.22	-4.41	40.81	74.00	-33.19
2382.800	Peak	48.28	-4.31	43.97	74.00	-30.03
2390.000	Peak	46.81	-4.25	42.55	74.00	-31.45

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)
2315.400	Average	40.81	-24.73	16.08	54.00	-37.92
2382.800	Average	43.97	-24.73	19.24	54.00	-34.76
2390.000	Average	42.55	-24.73	17.82	54.00	-36.18

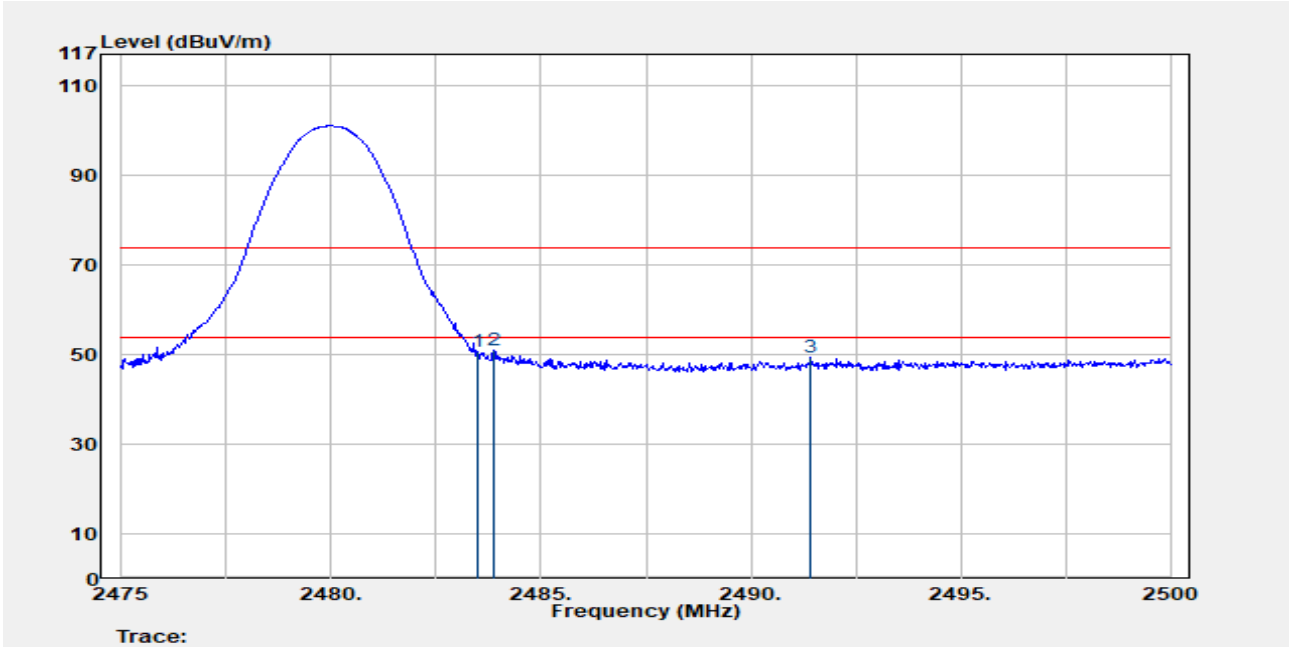
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2483.500	Peak	58.57	-4.64	53.93	74.00	-20.07
2483.900	Peak	59.99	-4.64	55.35	74.00	-18.65
2492.200	Peak	57.34	-4.61	52.72	74.00	-21.28

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	53.93	-24.73	29.20	54.00	-24.80
2483.900	Average	55.35	-24.73	30.62	54.00	-23.38
2492.200	Average	52.72	-24.73	27.99	54.00	-26.01

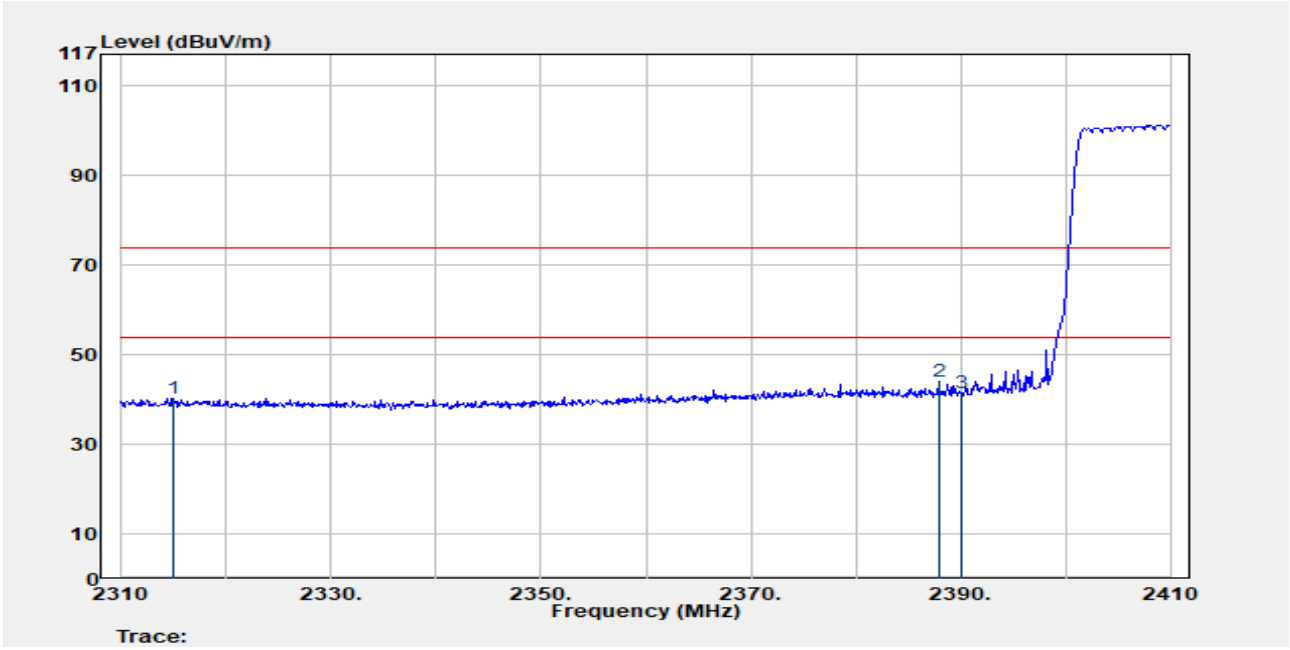
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2483.500	Peak	55.43	-4.64	50.79	74.00	-23.21
2483.875	Peak	55.76	-4.64	51.12	74.00	-22.88
2491.425	Peak	54.04	-4.62	49.43	74.00	-24.57

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	50.79	-24.73	26.06	54.00	-27.94
2483.875	Average	51.12	-24.73	26.39	54.00	-27.61
2491.425	Average	49.43	-24.73	24.70	54.00	-29.30

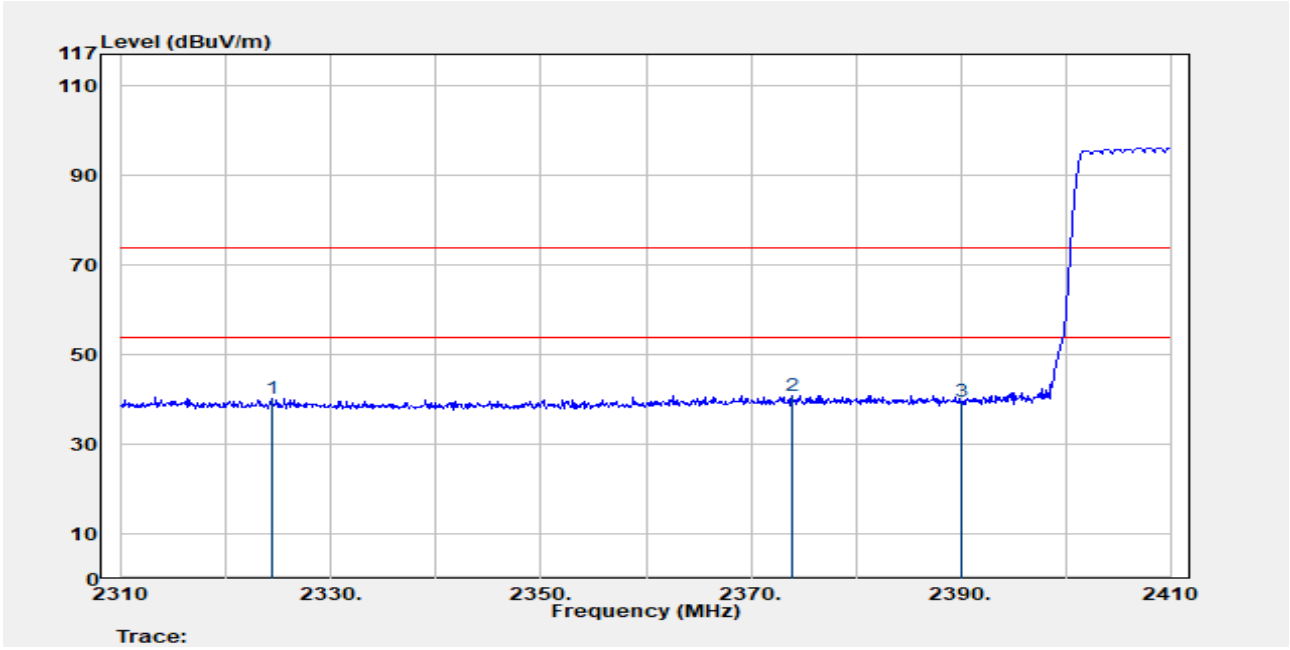
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR Hopping	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2314.900	Peak	44.72	-4.40	40.32	74.00	-33.68
2387.900	Peak	48.41	-4.27	44.14	74.00	-29.86
2390.000	Peak	45.67	-4.25	41.42	74.00	-32.58

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)
2314.900	Average	40.32	-24.73	15.59	54.00	-38.41
2387.900	Average	44.14	-24.73	19.41	54.00	-34.59
2390.000	Average	41.42	-24.73	16.69	54.00	-37.31

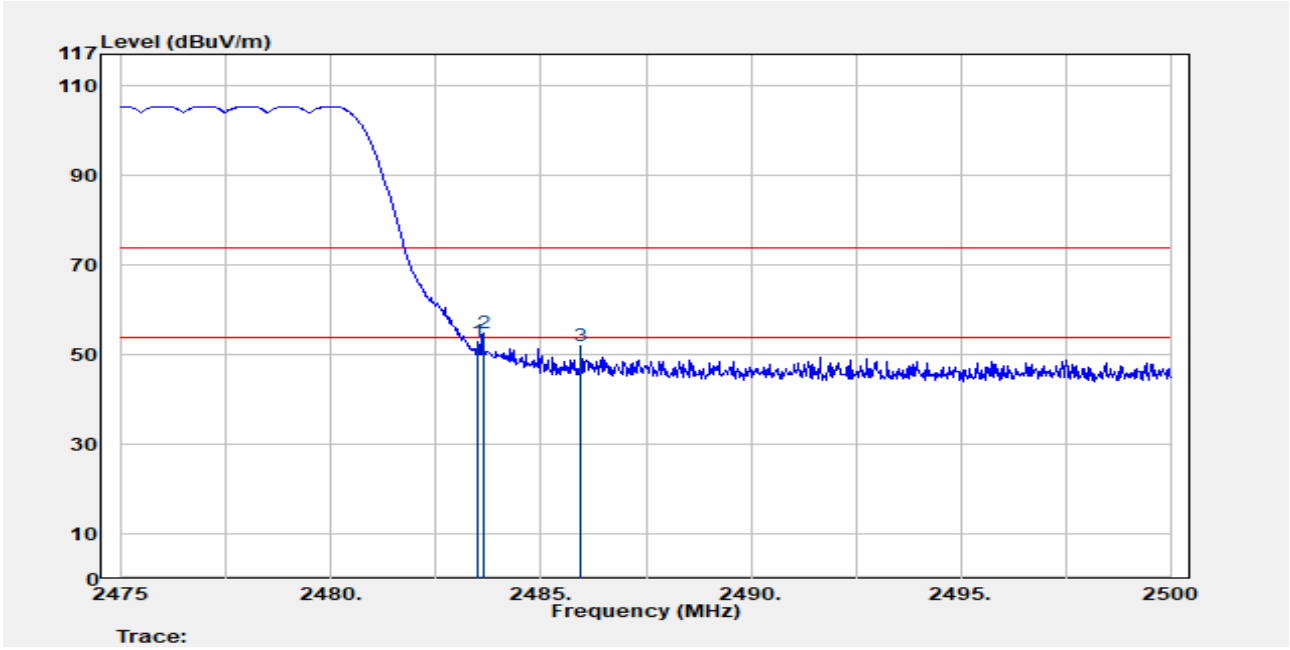
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR Hopping	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2324.300	Peak	44.84	-4.44	40.40	74.00	-33.60
2373.900	Peak	45.41	-4.37	41.04	74.00	-32.96
2390.000	Peak	43.92	-4.25	39.66	74.00	-34.34

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)
2324.300	Average	40.40	-24.73	15.67	54.00	-38.33
2373.900	Average	41.04	-24.73	16.31	54.00	-37.69
2390.000	Average	39.66	-24.73	14.93	54.00	-39.07

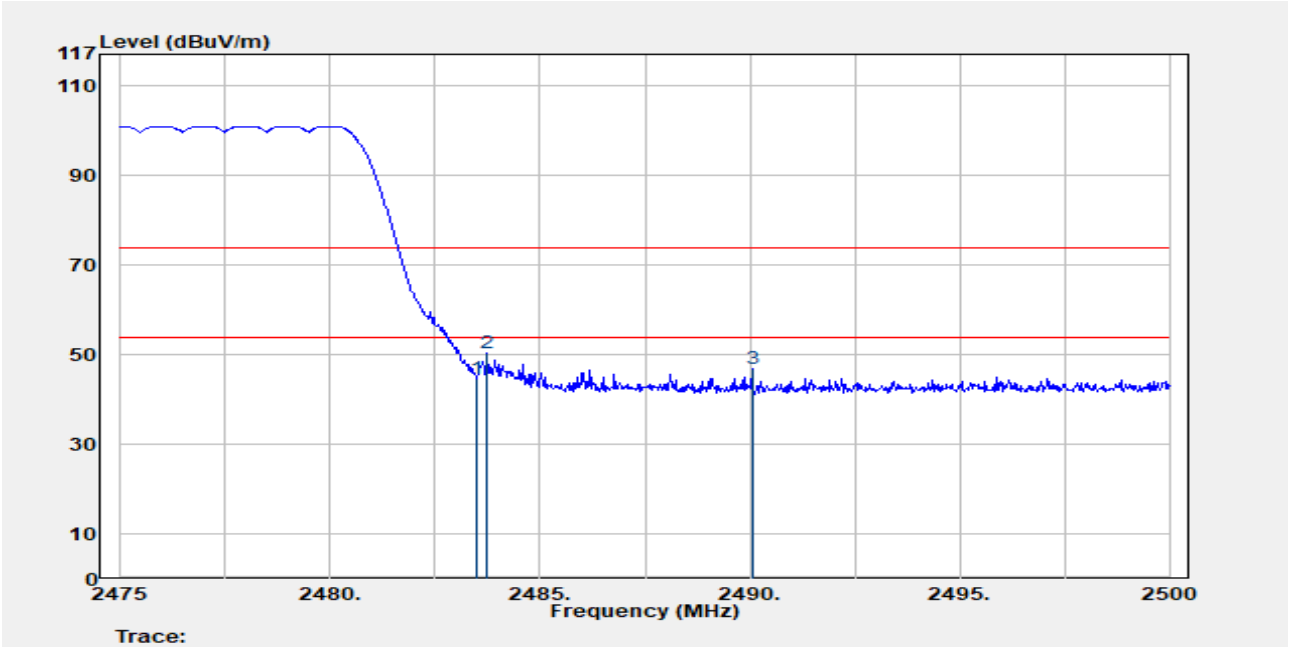
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR Hopping	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2483.500	Peak	57.53	-4.64	52.89	74.00	-21.11
2483.625	Peak	59.58	-4.64	54.94	74.00	-19.06
2485.950	Peak	56.73	-4.63	52.09	74.00	-21.91

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	52.89	-24.73	28.16	54.00	-25.84
2483.625	Average	54.94	-24.73	30.21	54.00	-23.79
2485.950	Average	52.09	-24.73	27.36	54.00	-26.64

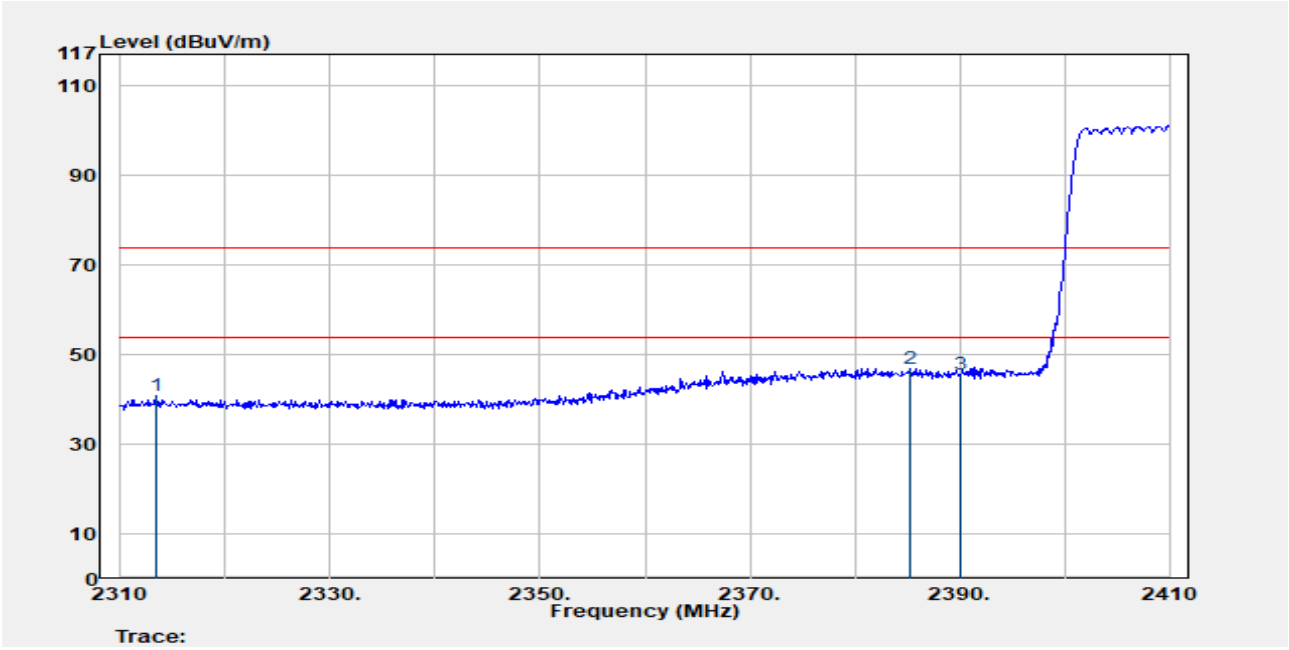
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR Hopping	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2483.500	Peak	49.46	-4.64	44.82	74.00	-29.18
2483.750	Peak	55.05	-4.64	50.40	74.00	-23.60
2490.050	Peak	51.54	-4.62	46.92	74.00	-27.08

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	44.82	-24.73	20.09	54.00	-33.91
2483.750	Average	50.40	-24.73	25.67	54.00	-28.33
2490.050	Average	46.92	-24.73	22.19	54.00	-31.81

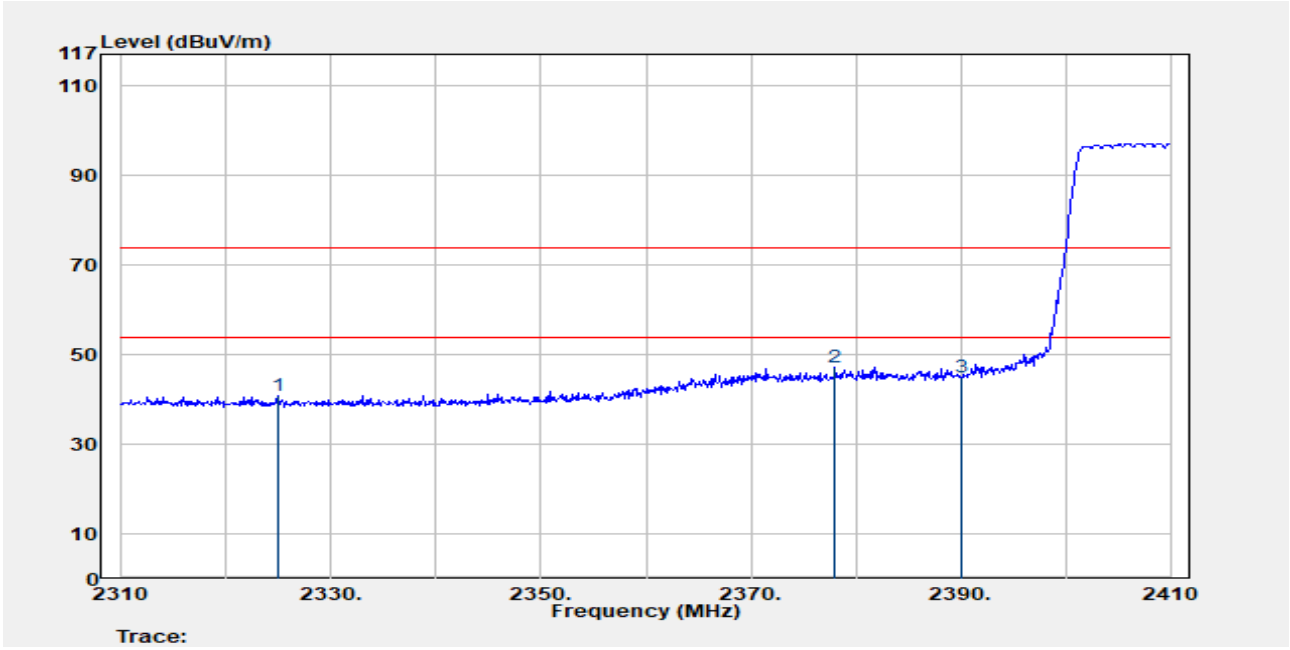
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M Hopping	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2313.300	Peak	45.24	-4.40	40.84	74.00	-33.16
2385.200	Peak	51.34	-4.29	47.05	74.00	-26.95
2390.000	Peak	49.77	-4.25	45.52	74.00	-28.48

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)
2313.300	Average	40.84	-24.73	16.11	54.00	-37.89
2385.200	Average	47.05	-24.73	22.32	54.00	-31.68
2390.000	Average	45.52	-24.73	20.79	54.00	-33.21

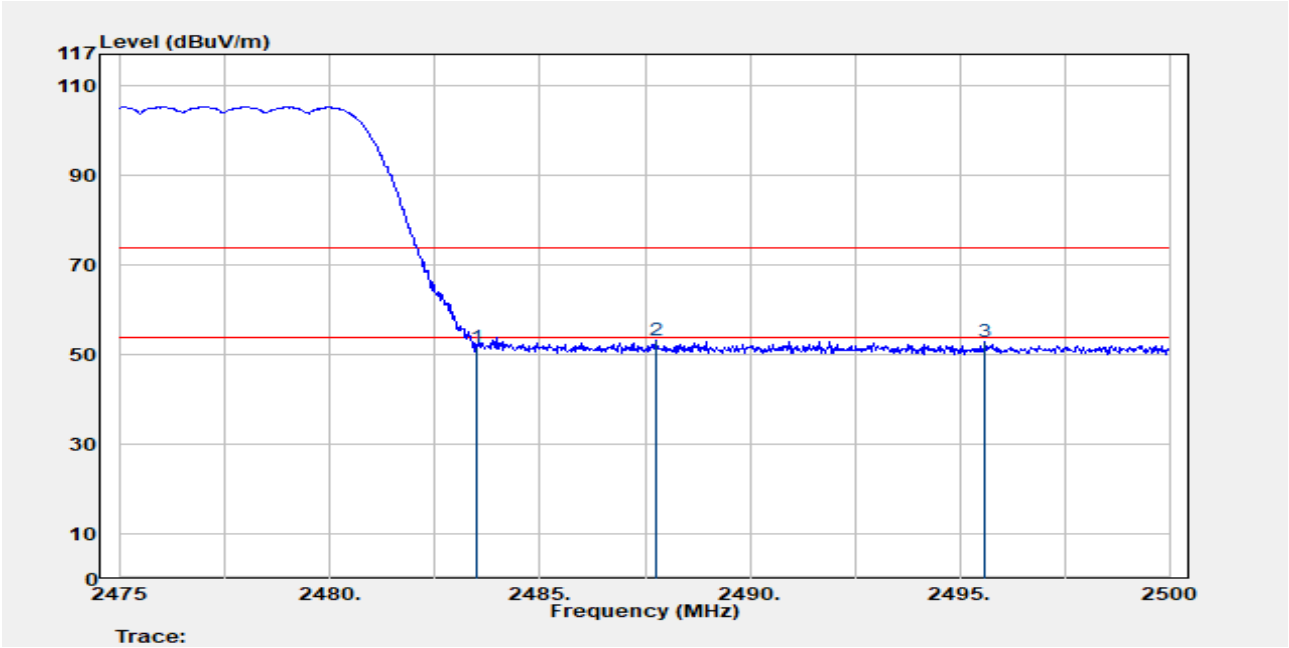
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M Hopping	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2324.900	Peak	45.27	-4.45	40.83	74.00	-33.17
2378.000	Peak	51.59	-4.34	47.25	74.00	-26.75
2390.000	Peak	49.20	-4.25	44.94	74.00	-29.06

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)
2324.900	Average	40.83	-24.73	16.10	54.00	-37.90
2378.000	Average	47.25	-24.73	22.52	54.00	-31.48
2390.000	Average	44.94	-24.73	20.21	54.00	-33.79

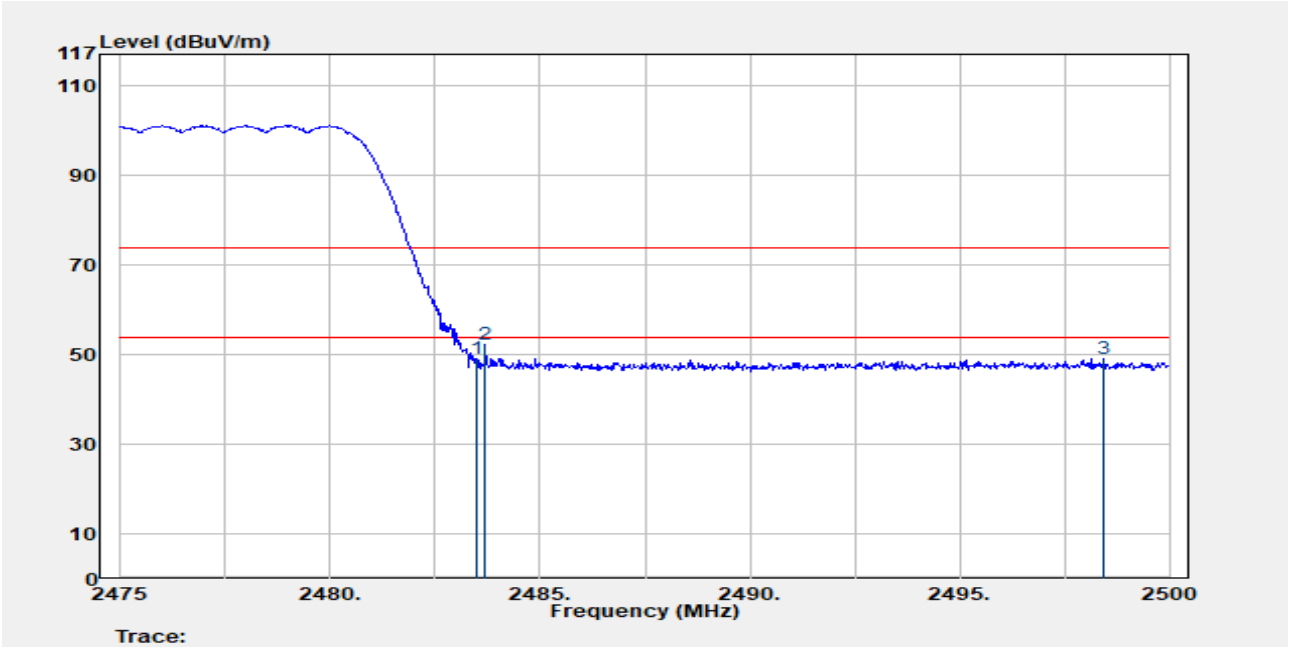
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M Hopping	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2483.500	Peak	56.39	-4.64	51.75	74.00	-22.25
2487.775	Peak	57.85	-4.63	53.22	74.00	-20.78
2495.600	Peak	57.48	-4.60	52.88	74.00	-21.12

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	51.75	-24.73	27.02	54.00	-26.98
2487.775	Average	53.22	-24.73	28.49	54.00	-25.51
2495.600	Average	52.88	-24.73	28.15	54.00	-25.85

Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M Hopping	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin

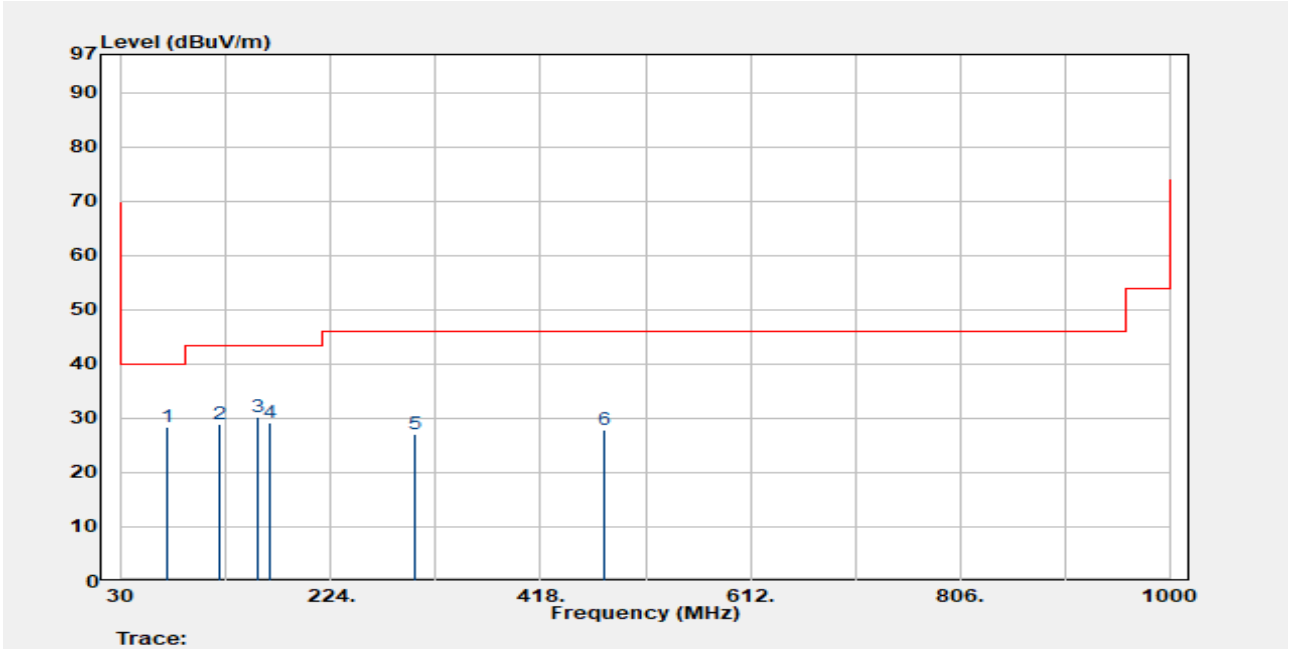


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2483.500	Peak	53.65	-4.64	49.01	74.00	-24.99
2483.700	Peak	56.82	-4.64	52.18	74.00	-21.82
2498.450	Peak	53.83	-4.59	49.23	74.00	-24.77

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	49.01	-24.73	24.28	54.00	-29.72
2483.700	Average	52.18	-24.73	27.45	54.00	-26.55
2498.450	Average	49.23	-24.73	24.50	54.00	-29.50

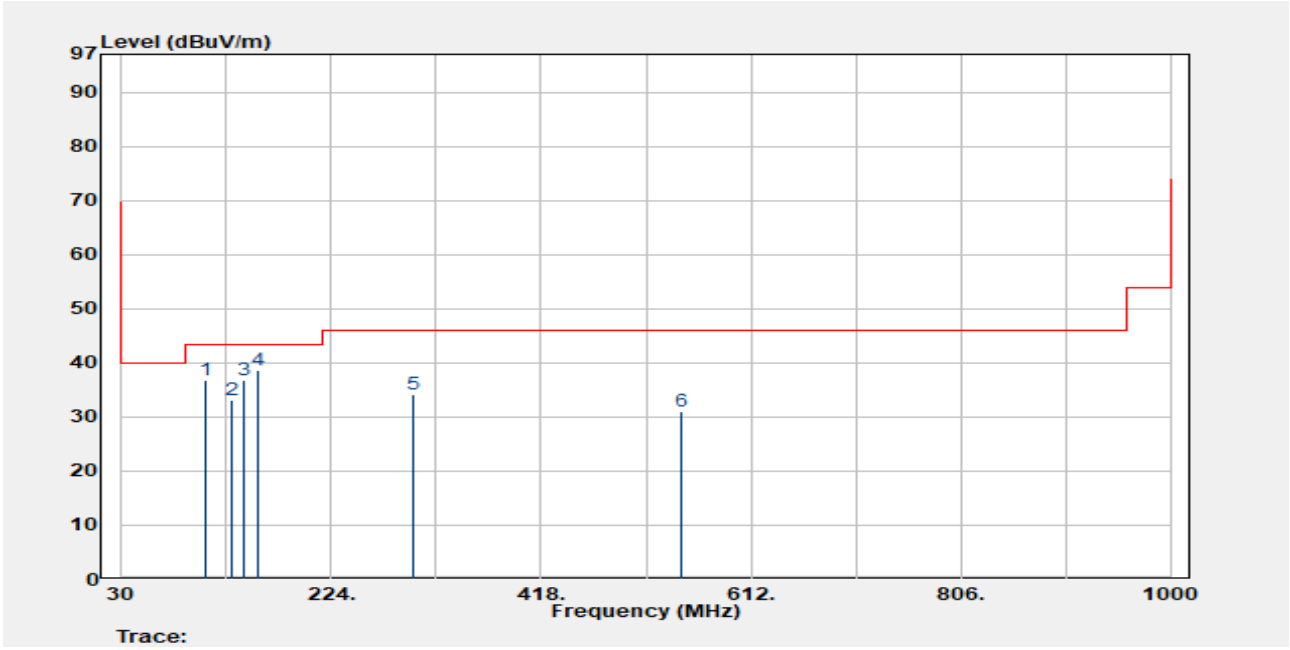
11.6.4 Radiated Spurious Emission

Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2441 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



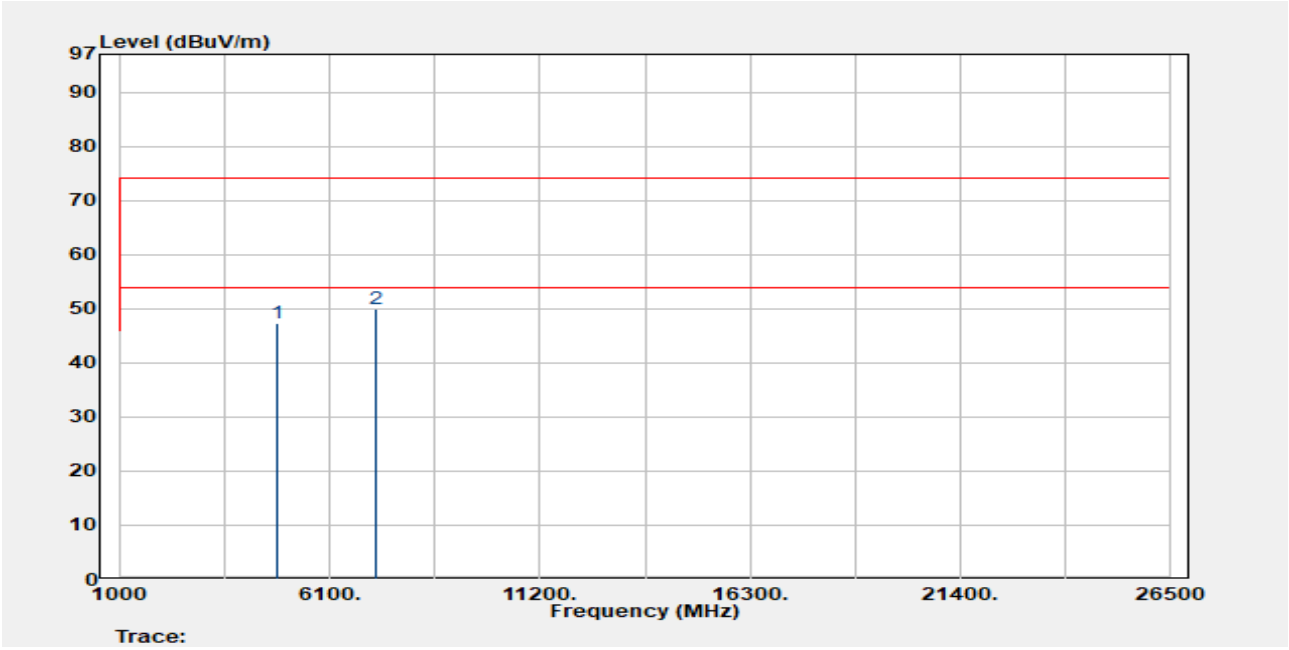
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
71.710	Peak	39.55	-11.03	28.52	40.00	-11.48
120.210	Peak	39.56	-10.58	28.98	43.50	-14.52
156.100	Peak	38.45	-8.17	30.28	43.50	-13.22
167.740	Peak	37.69	-8.42	29.27	43.50	-14.23
301.600	Peak	34.25	-7.07	27.18	46.00	-18.82
477.170	Peak	31.35	-3.61	27.74	46.00	-18.26

Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2441 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
107.600	Peak	48.42	-11.74	36.68	43.50	-6.82
131.850	QP	42.63	-9.58	33.05	43.50	-10.45
143.490	QP	45.01	-8.31	36.70	43.50	-6.80
156.100	QP	46.94	-8.17	38.77	43.50	-4.73
299.660	Peak	41.19	-7.12	34.07	46.00	-11.93
547.980	Peak	33.26	-2.25	31.01	46.00	-14.99

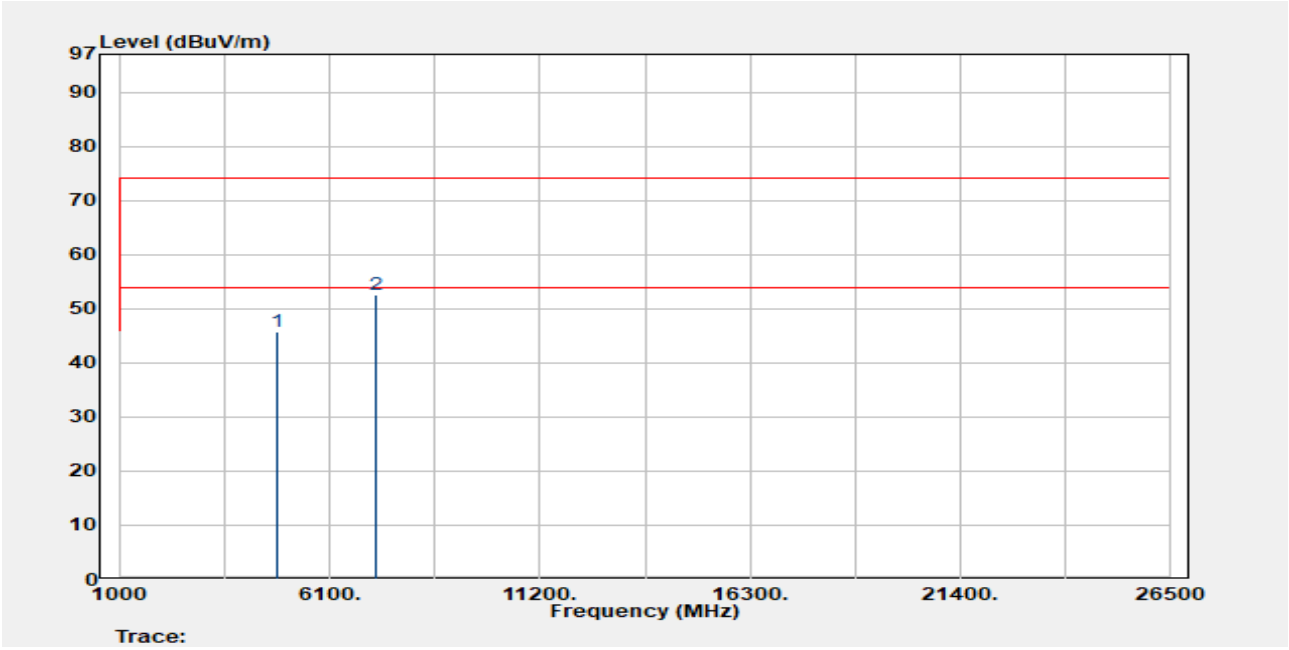
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4804.000	Peak	47.73	-0.36	47.37	74.00	-26.63
7206.000	Peak	44.13	5.94	50.07	74.00	-23.93

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)
4804.000	Average	47.37	-24.73	22.64	54.00	-31.36
7206.000	Average	50.07	-24.73	25.34	54.00	-28.66

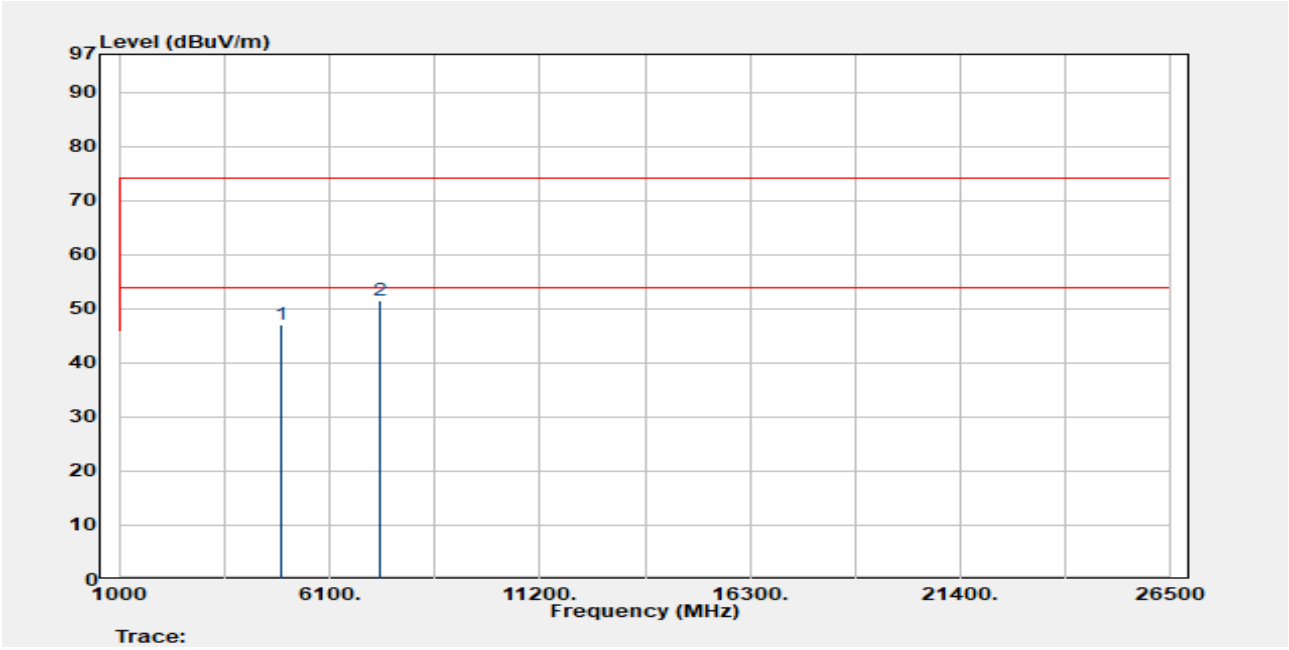
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4804.000	Peak	46.23	-0.36	45.87	74.00	-28.13
7206.000	Peak	46.59	5.94	52.53	74.00	-21.47

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)
4804.000	Average	45.87	-24.73	21.14	54.00	-32.86
7206.000	Average	52.53	-24.73	27.80	54.00	-26.20

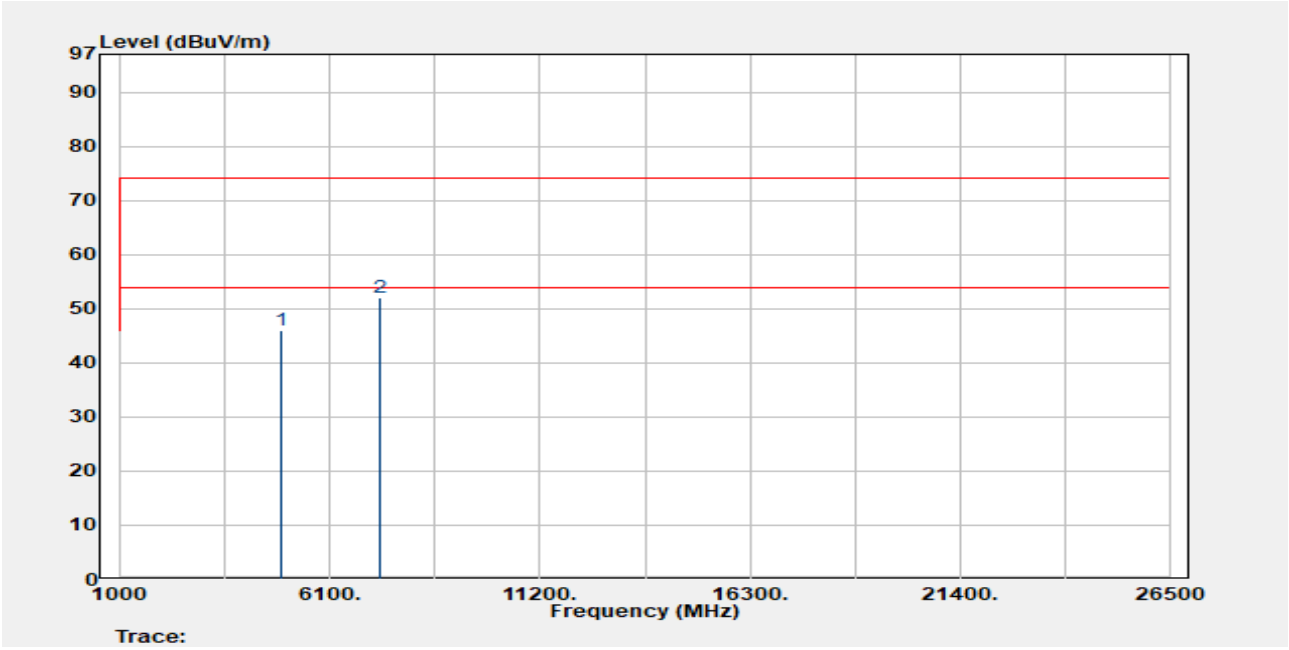
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2441 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4882.000	Peak	47.35	-0.29	47.06	74.00	-26.94
7323.000	Peak	45.78	5.84	51.62	74.00	-22.38

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)
4882.000	Average	47.06	-24.73	22.33	54.00	-31.67
7323.000	Average	51.62	-24.73	26.89	54.00	-27.11

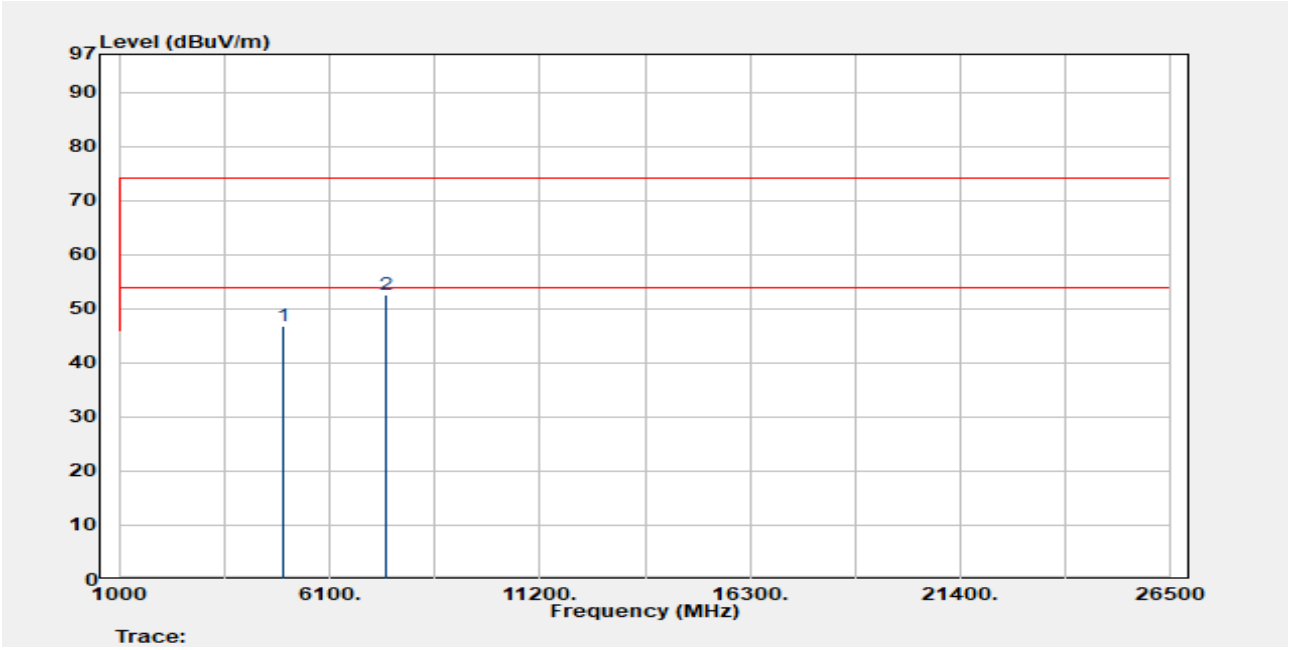
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2441 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4882.000	Peak	46.37	-0.29	46.08	74.00	-27.92
7323.000	Peak	46.13	5.84	51.97	74.00	-22.03

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)
4882.000	Average	46.08	-24.73	21.35	54.00	-32.65
7323.000	Average	51.97	-24.73	27.24	54.00	-26.76

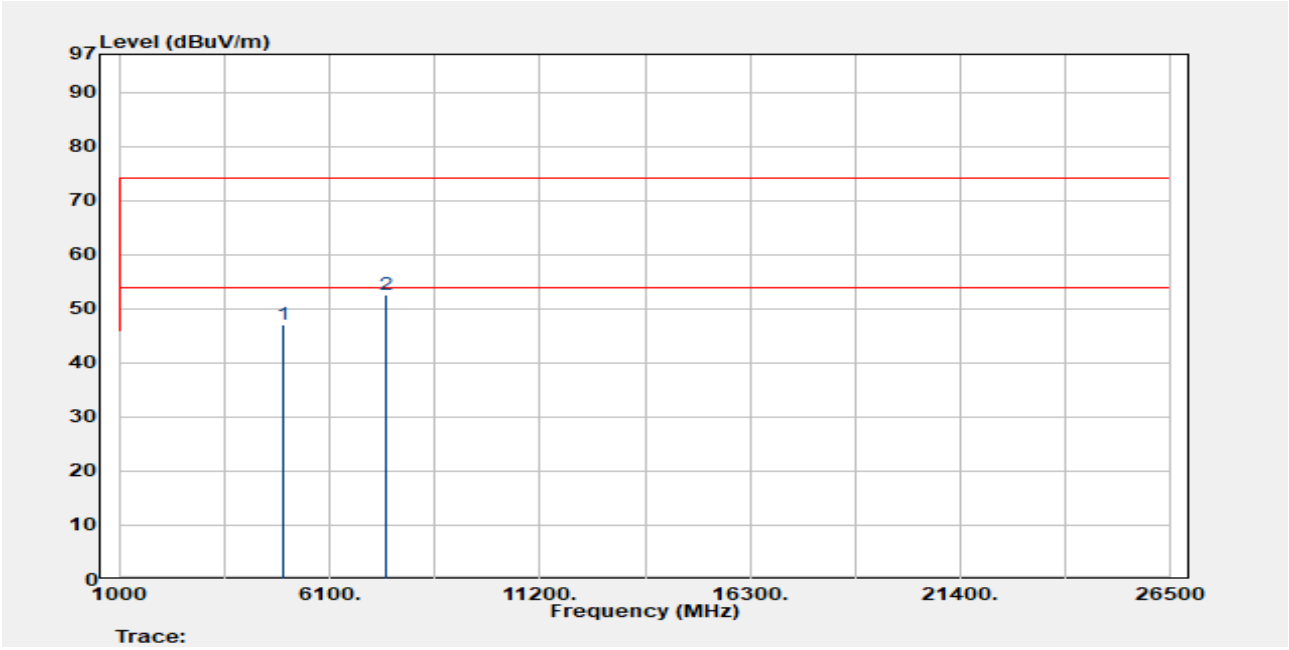
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4960.000	Peak	46.96	-0.27	46.69	74.00	-27.31
7440.000	Peak	46.16	6.48	52.64	74.00	-21.36

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)
4960.000	Average	46.69	-24.73	21.96	54.00	-32.04
7440.000	Average	52.64	-24.73	27.91	54.00	-26.09

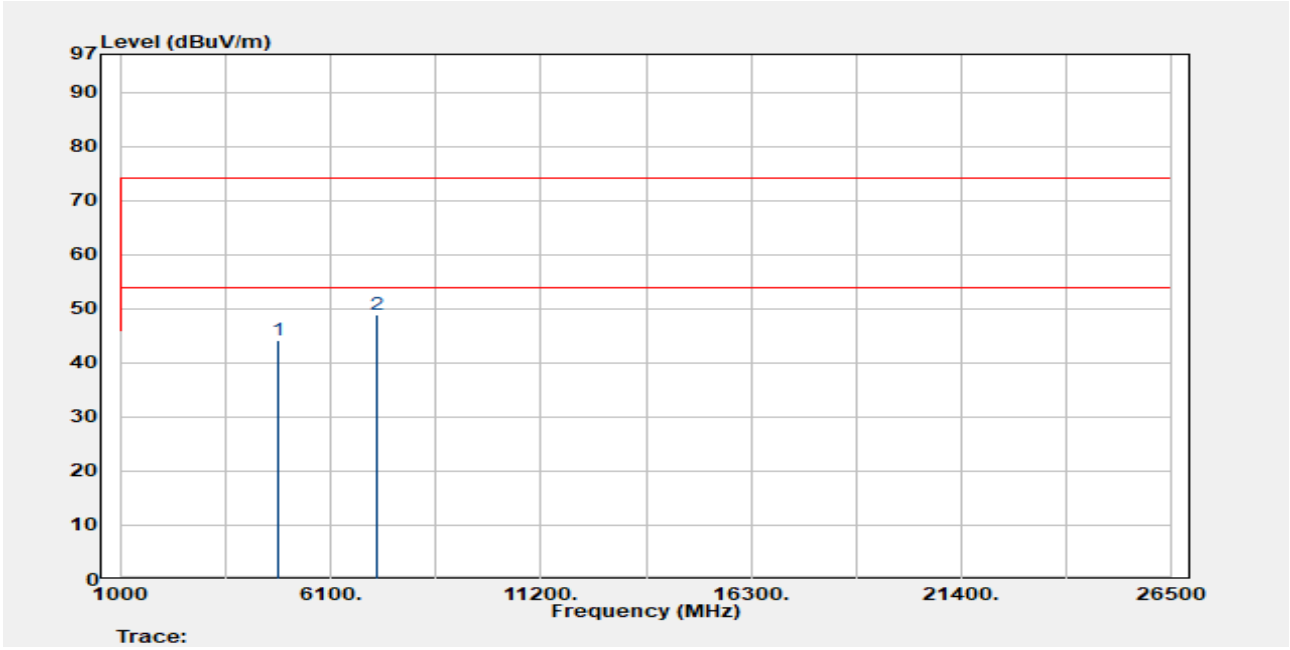
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:BR	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4960.000	Peak	47.45	-0.27	47.18	74.00	-26.82
7440.000	Peak	46.16	6.48	52.64	74.00	-21.36

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)
4960.000	Average	47.18	-24.73	22.45	54.00	-31.55
7440.000	Average	52.64	-24.73	27.91	54.00	-26.09

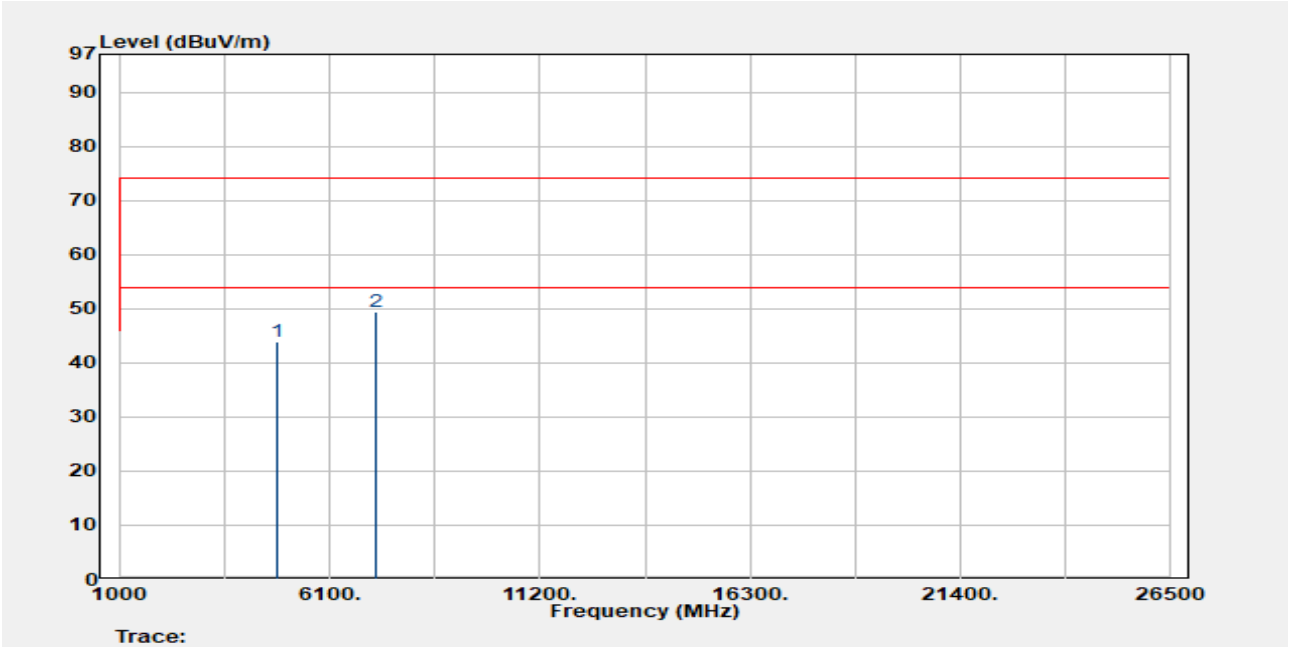
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4804.000	Peak	44.65	-0.36	44.29	74.00	-29.71
7206.000	Peak	42.89	5.94	48.83	74.00	-25.17

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)
4804.000	Average	44.29	-24.73	19.56	54.00	-34.44
7206.000	Average	48.83	-24.73	24.10	54.00	-29.90

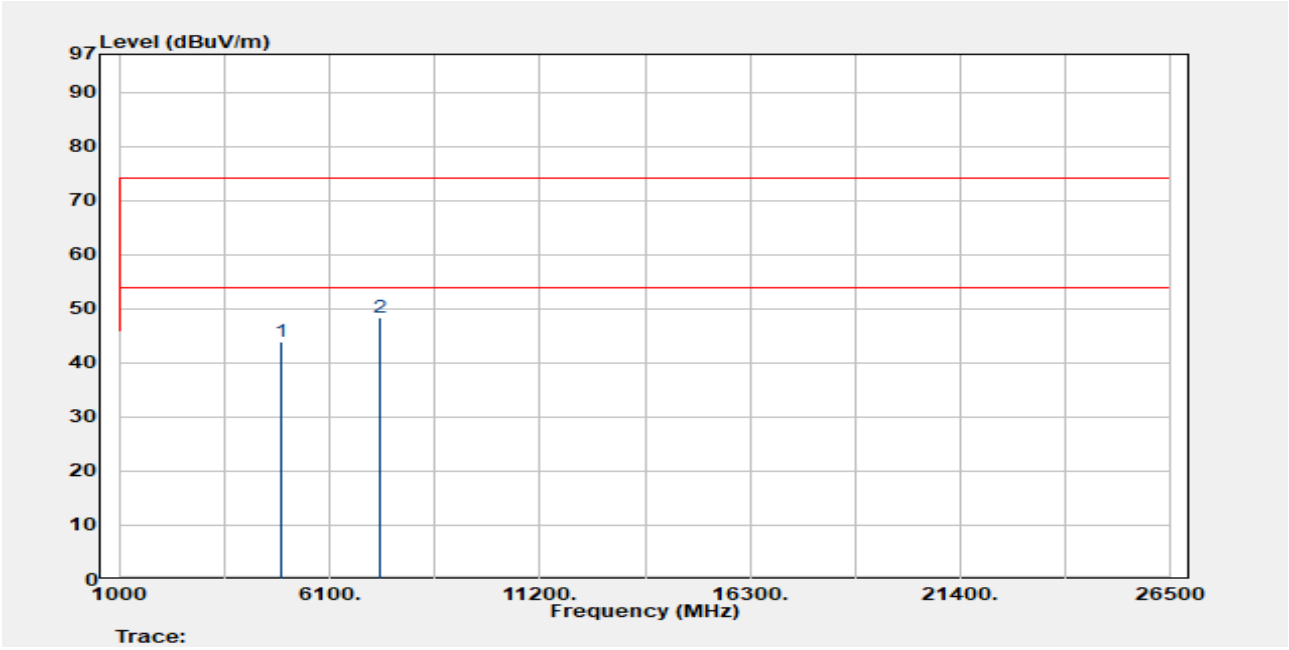
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M	Test Date	:2023-06-13
Test Frequency	:2402 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4804.000	Peak	44.19	-0.36	43.83	74.00	-30.17
7206.000	Peak	43.52	5.94	49.46	74.00	-24.54

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)
4804.000	Average	43.83	-24.73	19.10	54.00	-34.90
7206.000	Average	49.46	-24.73	24.73	54.00	-29.27

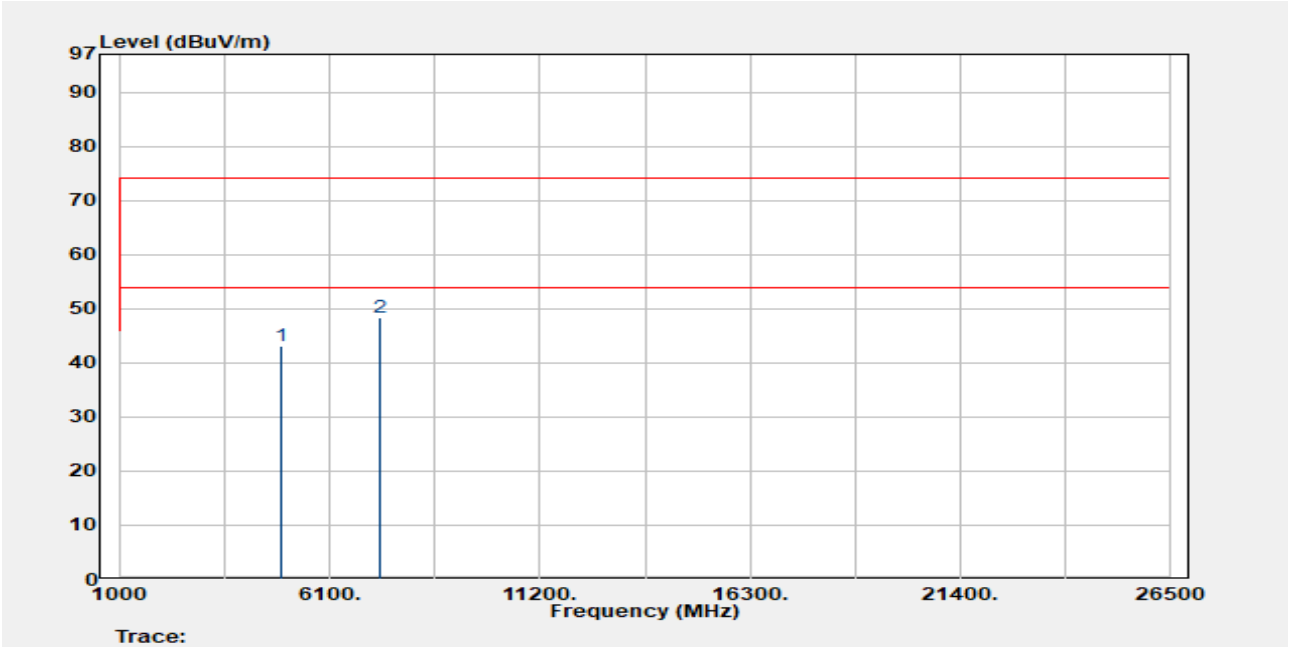
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M	Test Date	:2023-06-13
Test Frequency	:2441 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4882.000	Peak	44.22	-0.29	43.93	74.00	-30.07
7323.000	Peak	42.54	5.84	48.38	74.00	-25.62

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)
4882.000	Average	43.93	-24.73	19.20	54.00	-34.80
7323.000	Average	48.38	-24.73	23.65	54.00	-30.35

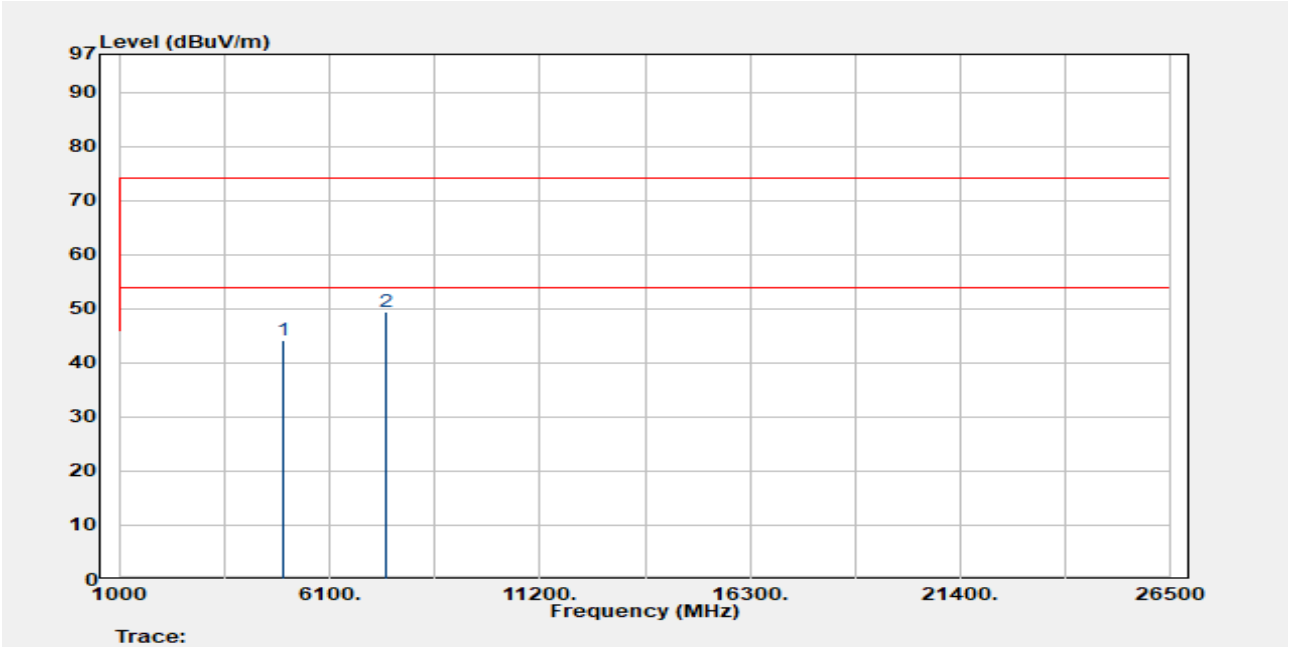
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M	Test Date	:2023-06-13
Test Frequency	:2441 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4882.000	Peak	43.34	-0.29	43.05	74.00	-30.95
7323.000	Peak	42.44	5.84	48.28	74.00	-25.72

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)
4882.000	Average	43.05	-24.73	18.32	54.00	-35.68
7323.000	Average	48.28	-24.73	23.55	54.00	-30.45

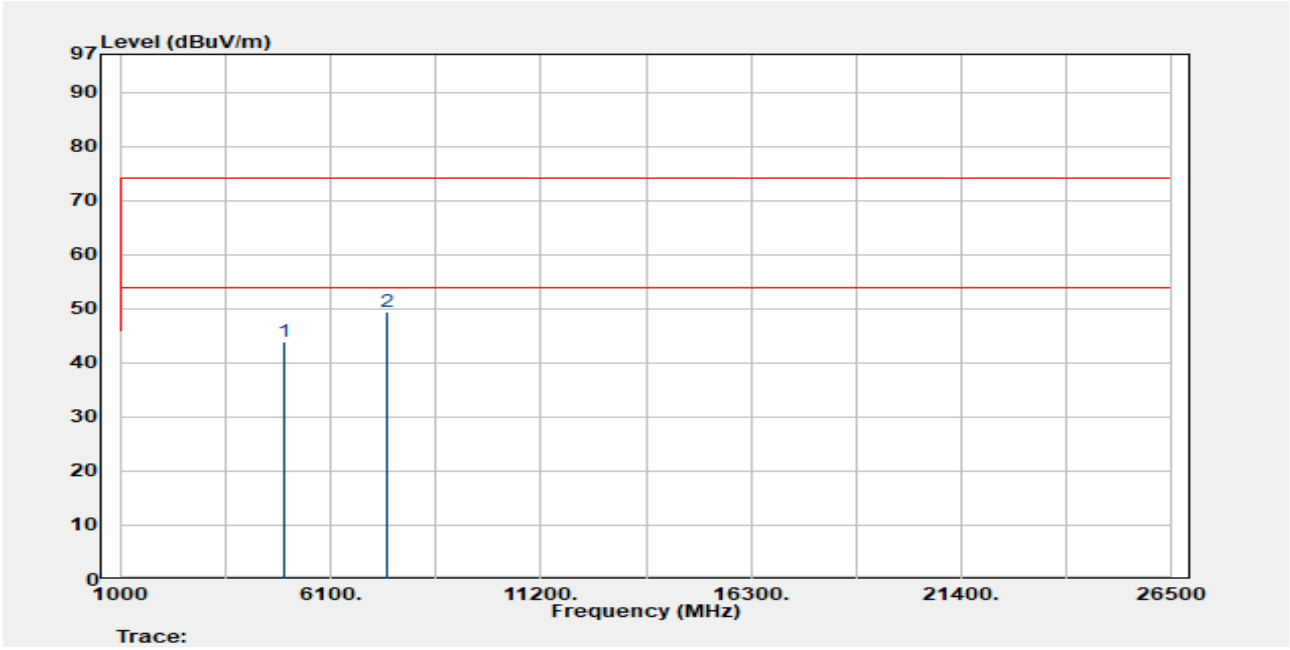
Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4960.000	Peak	44.34	-0.27	44.07	74.00	-29.93
7440.000	Peak	42.86	6.48	49.34	74.00	-24.66

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)
4960.000	Average	44.07	-24.73	19.34	54.00	-34.66
7440.000	Average	49.34	-24.73	24.61	54.00	-29.39

Report Number	:TERF2305001287ER	Test Site	:SAC 3
Operation Mode	:EDR 3M	Test Date	:2023-06-13
Test Frequency	:2480 MHz	Temp./Humi.	:24.8℃/62%
Test Mode	:Tx	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4960.000	Peak	44.09	-0.27	43.82	74.00	-30.18
7440.000	Peak	42.94	6.48	49.42	74.00	-24.58

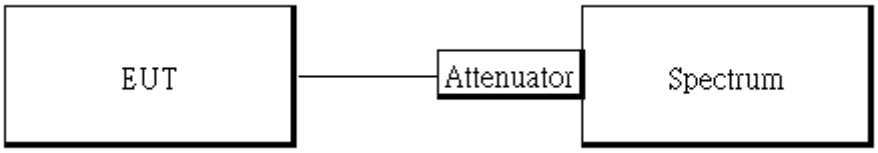
Freq. MHz	Detector Mode AV	Peak Actual FS (dBµV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4960.000	Average	43.82	-24.73	19.09	54.00	-34.91
7440.000	Average	49.42	-24.73	24.69	54.00	-29.31

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*20dB bandwidth of the hopping channel, whichever is greater.

12.2 Test Setup



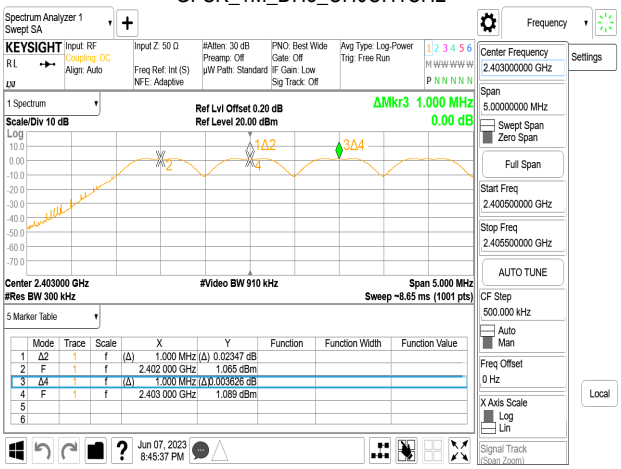
12.3 Measurement Procedure

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 ≥ 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.

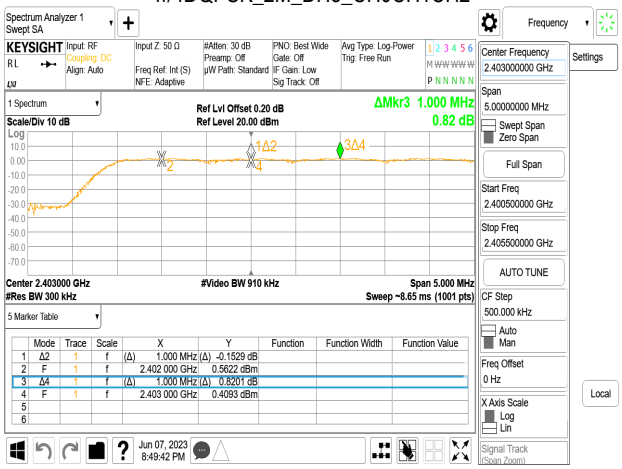
12.4 Measurement Result

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

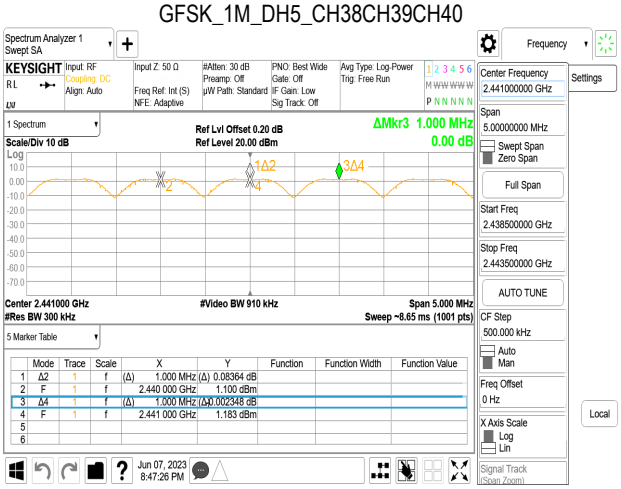
GFSK_1M_DH5_CH0CH1CH2



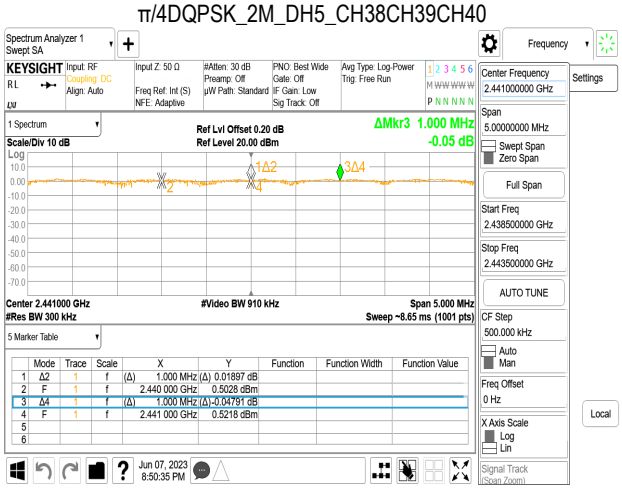
π/4DQPSK_2M_DH5_CH0CH1CH2



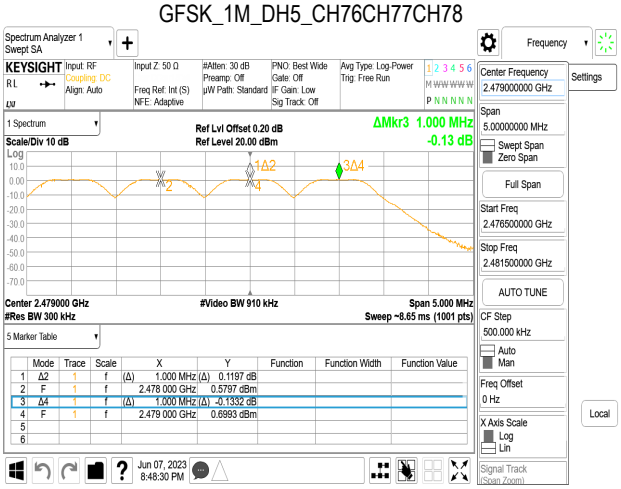
GFSK_1M_DH5_CH38CH39CH40



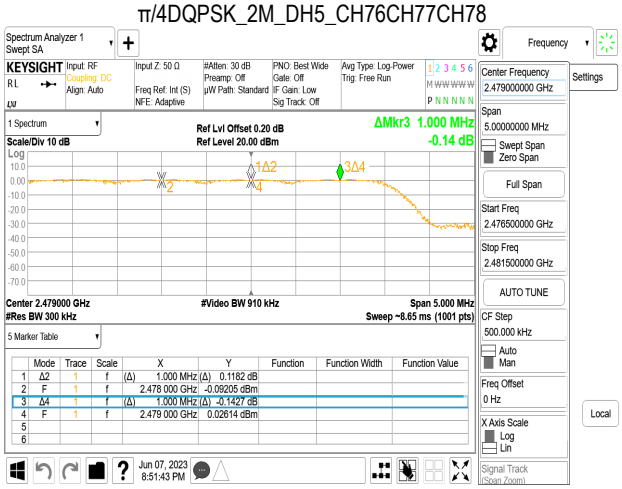
π/4DQPSK_2M_DH5_CH38CH39CH40



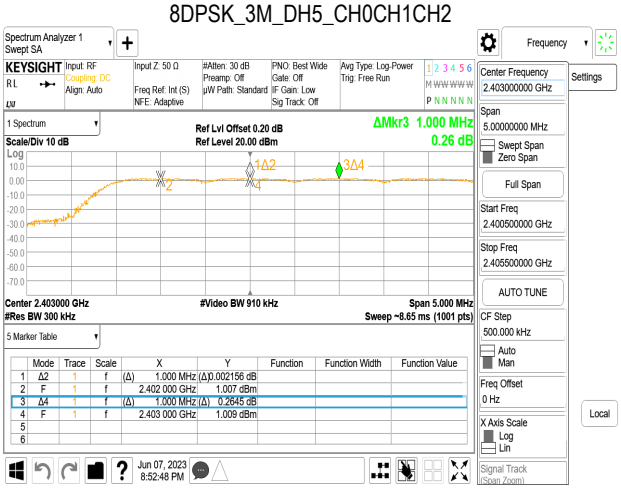
GFSK_1M_DH5_CH76CH77CH78



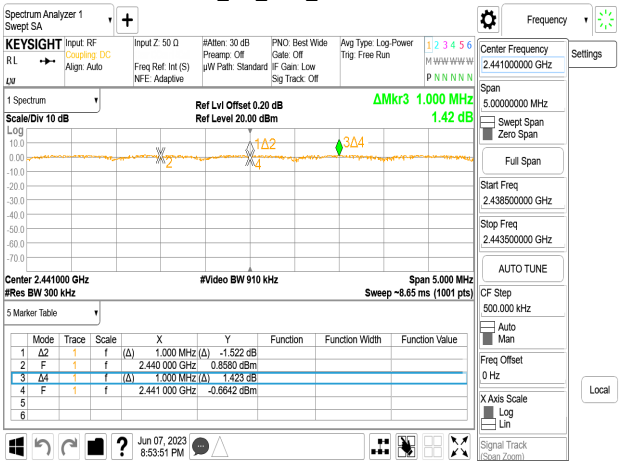
π/4DQPSK_2M_DH5_CH76CH77CH78



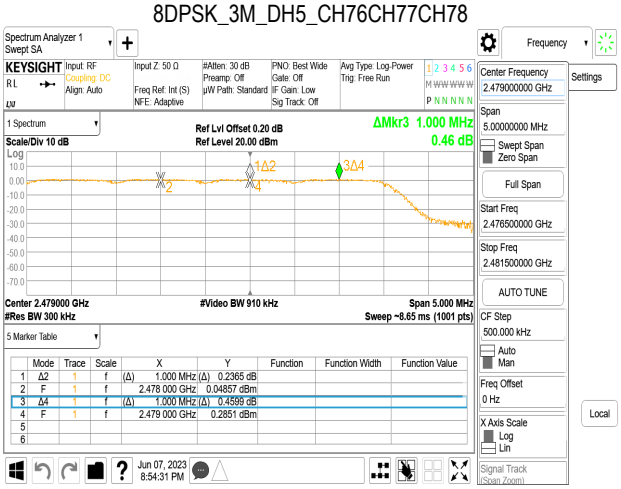
8DPSK_3M_DH5_CH0CH1CH2



8DPSK_3M_DH5_CH38CH39CH40



8DPSK_3M_DH5_CH76CH77CH78

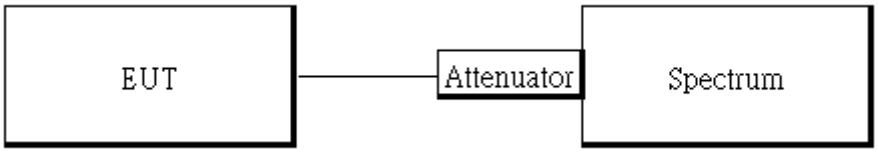


13 NUMBER OF HOPPING FREQUENCY

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

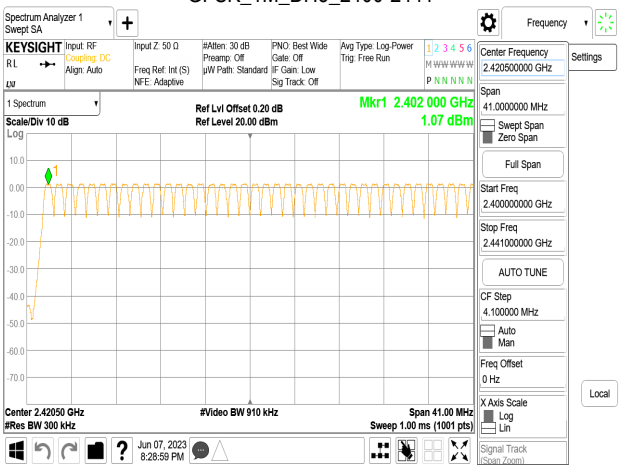
1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
5. Set the spectrum analyzer as RBW = 30% of the channel spacing, VBW ≥ RBW., Detector = Peak
6. Max hold, view and count how many channel in the band.

13.4 Measurement Result

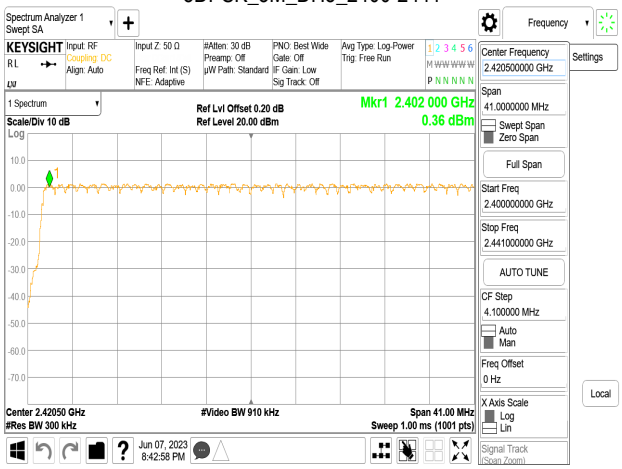
Tabular Data of Total Channel Number

	Channel Number	**Limit**
2.4 GHz – 2.441 GHz	**40**	**>15**
2.441 GHz – 2.4835 GHz	**39**	
2.4 GHz ~2.4835 GHz	**(40+39) = 79**	

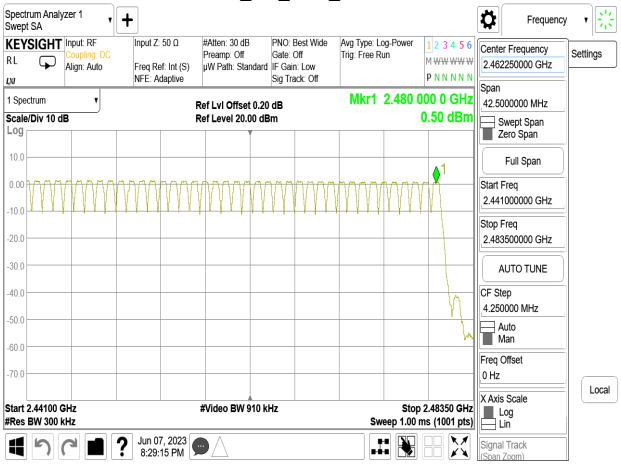
GFSK_1M_DH5_2400-2441



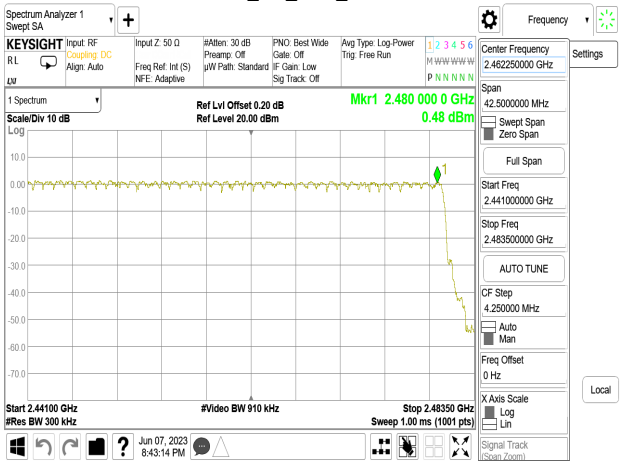
8DPSK_3M_DH5_2400-2441



GFSK_1M_DH5_2441-2480



8DPSK_3M_DH5_2441-2480

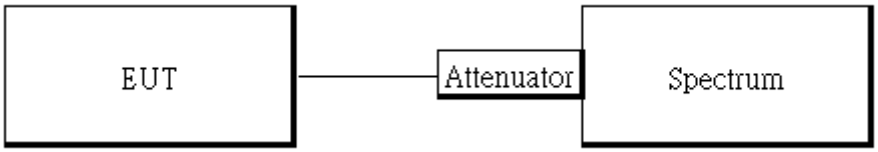


14 TIME OF OCCUPANCY (DWELL TIME)

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.

14.4 Measurement Result

GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
Mid	DH1	152.00	400
	DH3	280.00	400
	DH5	316.80	400

π/4 DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
Mid	2DH1	156.80	400
	2DH3	281.60	400
	2DH5	318.40	400

8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
Mid	3DH1	156.80	400
	3DH3	281.60	400
	3DH5	318.40	400

GFSK (1Mbps):

CH Mid	DH1 time slot	=	0.475	*	(1600/2/79)	*	31.6	=	152.00	(ms)
	DH3 time slot	=	1.750	*	(1600/4/79)	*	31.6	=	280.00	(ms)
	DH5 time slot	=	2.970	*	(1600/6/79)	*	31.6	=	316.80	(ms)

π/4 -DQPSK (2Mbps):

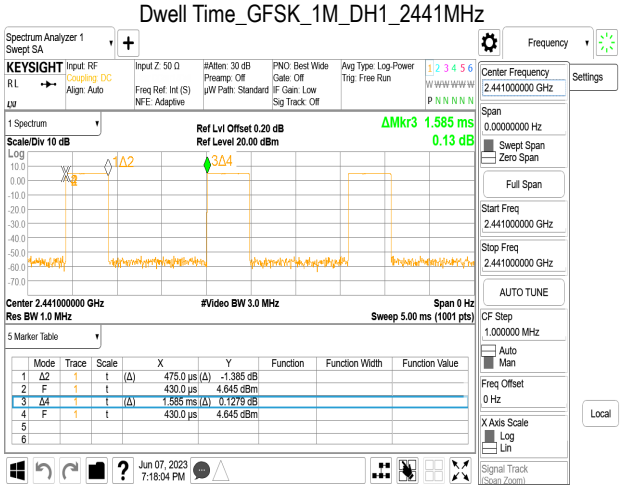
CH Mid	2DH1 time slot	=	0.490	*	(1600/2/79)	*	31.6	=	156.80	(ms)
	2DH3 time slot	=	1.760	*	(1600/4/79)	*	31.6	=	281.60	(ms)
	2DH5 time slot	=	2.985	*	(1600/6/79)	*	31.6	=	318.40	(ms)

8-DPSK (3Mbps):

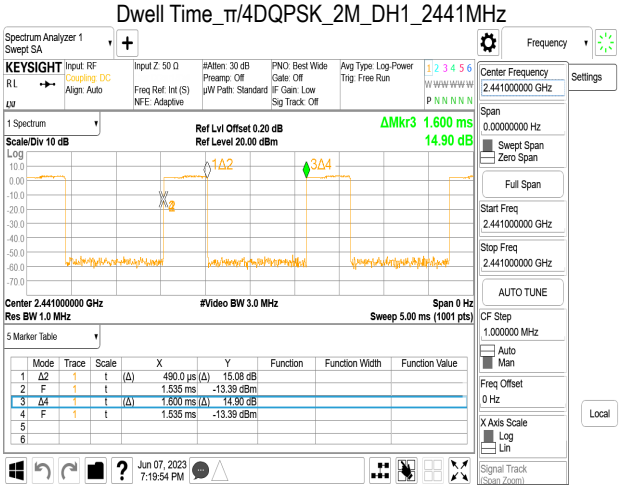
CH Mid	3DH1 time slot	=	0.490	*	(1600/2/79)	*	31.6	=	156.80	(ms)
	3DH3 time slot	=	1.760	*	(1600/4/79)	*	31.6	=	281.60	(ms)
	3DH5 time slot	=	2.985	*	(1600/6/79)	*	31.6	=	318.40	(ms)

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

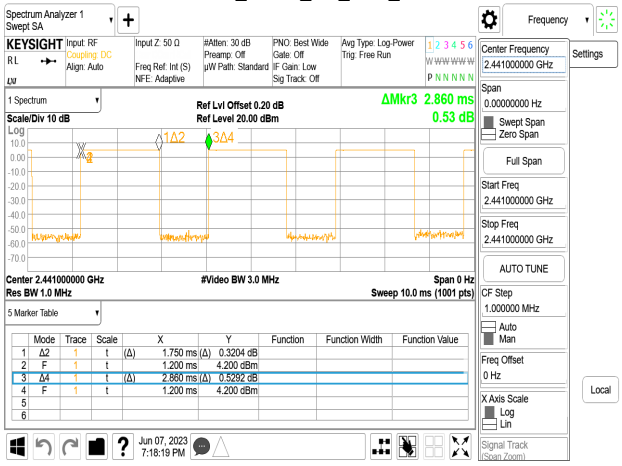
Dwell Time_GFSK_1M_DH1_2441MHz



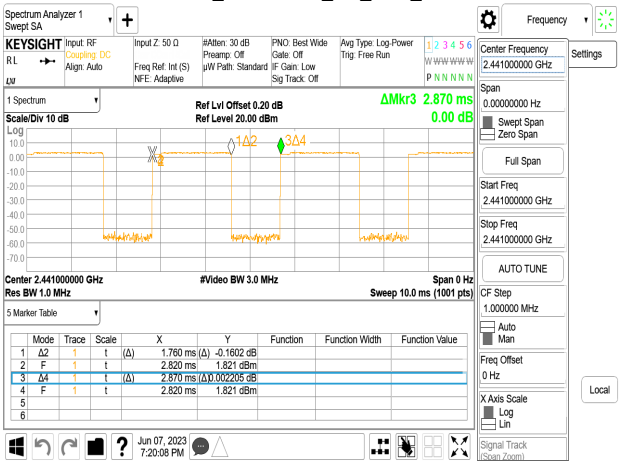
Dwell Time_π/4DQPSK_2M_DH1_2441MHz



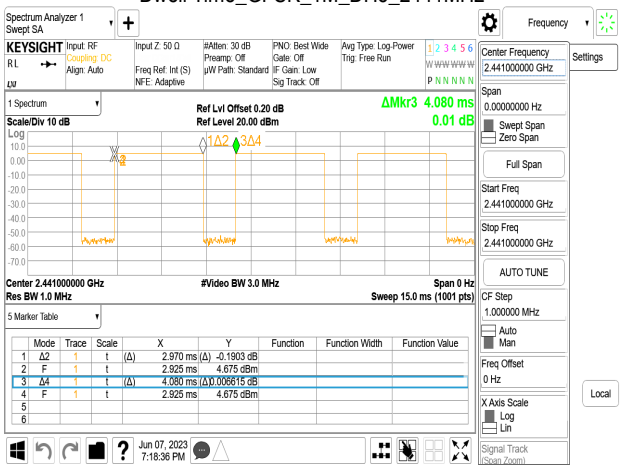
Dwell Time_GFSK_1M_DH3_2441MHz



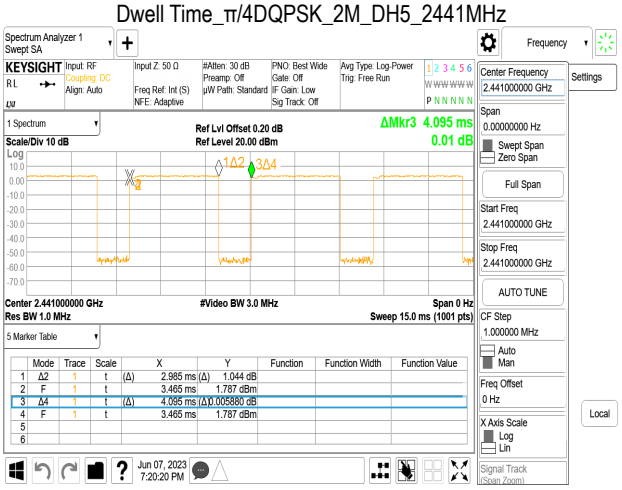
Dwell Time_π/4DQPSK_2M_DH3_2441MHz



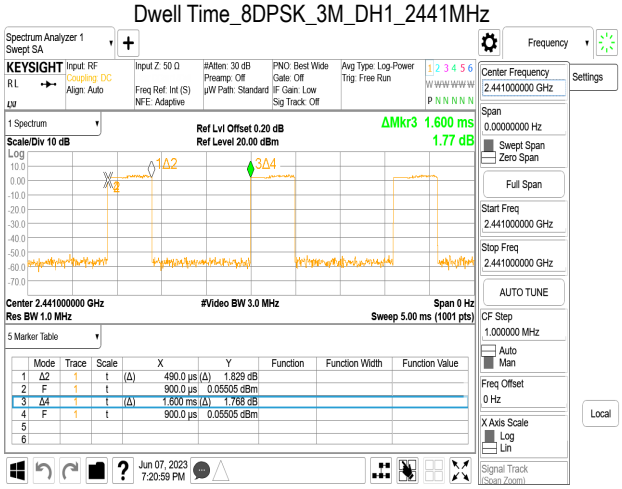
Dwell Time_GFSK_1M_DH5_2441MHz



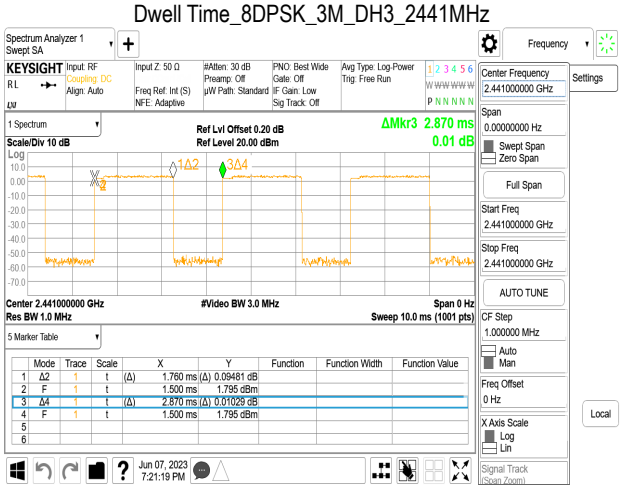
Dwell Time_π/4DQPSK_2M_DH5_2441MHz



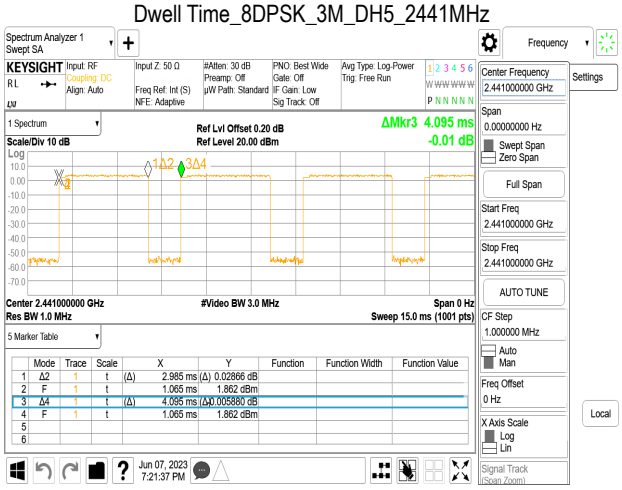
Dwell Time_8DPSK_3M_DH1_2441MHz



Dwell Time_8DPSK_3M_DH3_2441MHz



Dwell Time_8DPSK_3M_DH5_2441MHz



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 ~