

ELECTROMAGNETIC EMISSIONS
COMPLIANCE REPORT

Applicant: Silex Technology, Inc.
2-3-1 Hikaridai, Seika-cho, Soraku-gun, Kyoto 619-0237, Japan

Manufacturer: Silex Technology, Inc.
2-3-1 Hikaridai, Seika-cho, Soraku-gun, Kyoto 619-0237, Japan

Product Name: Embedded wireless module

Brand Name: Silex Technology

Model No.: SX-PCEAX

Report Number: TERF2304001052ER

FCC ID N6C-PCEAX

IC: 4908A-PCEAX

Date of EUT Received: April 26, 2023

Date of Test: April 27, 2023 ~ June 16, 2023

Issue Date: November 23, 2023

Approved By

Jim Chang

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, ISSED 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
TERF2304001052ER	00	Original	November 03, 2023	Yami Kuo	
TERF2304001052ER	01	Revise the Firm-ware Version	November 23, 2023	Yami Kuo	*

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:	Embedded wireless module
Brand Name:	Silex Technology
Model No.:	SX-PCEAX
Hardware Version:	N/A
Firmware Version:	HY103710
EUT Series No.:	1CBCEC011DAC
Power Supply:	3.3Vdc
Test Software (Name/Version)	QRCT V4.0.210.0

1.2 RF Specification

Radio Technology:	BT BR+EDR
Channel number:	79 channels
Modulation type:	GFSK + $\pi/4$ DQPSK + 8DPSK
Transmit Power:	13.11 dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	$\leq 0.4s$

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1.3 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Monopole	2J antennas	2JZ74	2402 - 2480	4.9
	Taoglas	GW.05.0153	2402 - 2480	3.686

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.
3. As per section F. 2). e). (ii) of FCC KDB 662911 D01

If antenna gains are not equal and each transmit antenna is driven by only one spatial stream, directional gain may be calculated by either of the following formulas.

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

NSS = the number of independent spatial streams of data;

NANT = the total number of antennas

gj,k = 1/20 10Gk if the kth antenna is being fed by spatial stream j, or zero if it is not;

Gk is the gain in dBi of the kth antenna.

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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	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.

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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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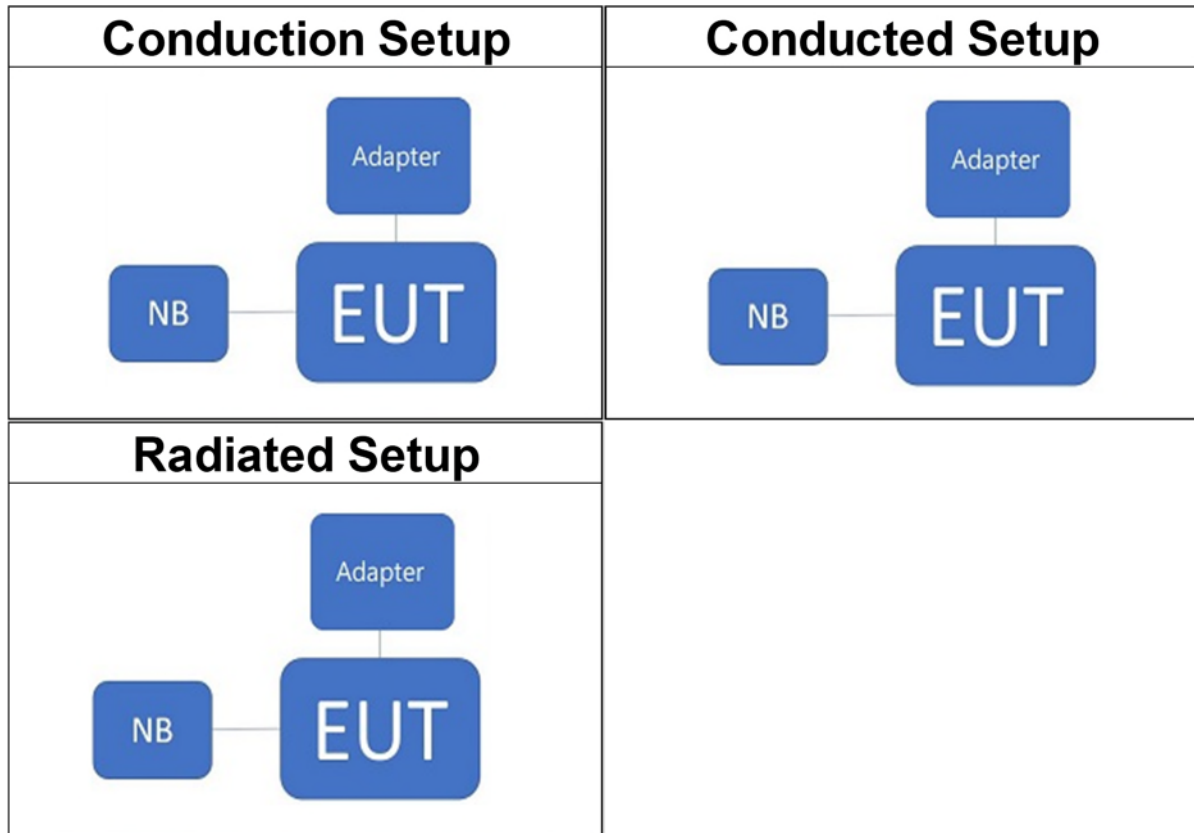
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2.5 Test Configuration



2.6 Control Unit(s)

AC Power-Line Conducted Emission Test Site: Conduction 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	L480	PF-1D07MD 19/08	N/A	N/A
Adapter	EDAC	EA10682N-120	N/A	N/A	N/A
Conducted Emission Test Site: Conducted 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Adapter	EDAC	EA10682N-120	N/A	N/A	N/A
Notebook	Lenovo	T430S	R9-WW5EG 13/0	N/A	N/A
Radiated Emission Test Site: SAC 2					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	L480	PF-1D07MD 19/08	N/A	N/A
Adapter	EDAC	EA10682N-120	N/A	N/A	N/A

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3 SUMMARY OF TEST RESULTS

FCC Rules	ISED Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b)(1)	RSS-247 §5.4 b	Peak Output Power	Compliant
§15.205 §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)(iii)	RSS-247 §5.1 d	Time of Occupancy	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	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		

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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
Peak Output Power				
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
Time of Occupancy(Dwell time)				
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
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.

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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 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R
LISN	SCHWARZBECK	NSLK 8127	1040	08/23/2022	08/22/2023
Coaxial Cables	EMC Instruments Corp.	EMCCFD300-BM-BM-3000	161207	06/22/2022	06/21/2023
Pulse Limiter	SCHWARZBECK	VTSD 9561F-N	793	06/22/2022	06/21/2023
EMI Test Receiver	R&S	ESR 7	102525	02/18/2023	02/17/2024

6.2 Conducted Measurement

Conducted Emission Test Site: Conducted 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY60240503	12/13/2022	12/12/2023
Test Software	SGS	Radio Test Software	Ver. 21	N.C.R	N.C.R
Power Meter	Anritsu	ML2496A	1242004	10/26/2022	10/25/2023
Power Sensor	Anritsu	MA2411B	1207365	10/26/2022	10/25/2023
DC Block	Mini-Circuits	BLK-18-S+	1	12/13/2022	12/12/2023

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6.3 Radiated Measurement

Radiated Emission Test Site: SAC 2					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/30/2022	12/29/2023
Loop Antenna	ETS.LINDGREN	6502	148045	10/05/2022	10/04/2023
Horn Antenna	RF SPIN	DRH18-E	210303A18-ES	02/24/2023	02/23/2024
Bi-log Antenna	SCHWARZBECK	VULB9168	9168-1278	03/09/2023	03/08/2024
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY60242392	12/20/2022	12/19/2023
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R
EMI Test Receiver	R&S	ESR 7	102525	02/18/2023	02/17/2024
Site Cal	SGS	SAC 2	N/A	08/31/2022	08/30/2023
Pre-Amplifier	EMCI	EMC184045B	980135	10/27/2022	10/26/2023
Pre-Amplifier	EMCI	EMC330N	980826	08/31/2022	08/30/2023
Pre-Amplifier	EMCI	EMC118A45SEE	980867	08/31/2022	08/30/2023
Attenuator	Mini-Circuit	BW-S10W2+	2	12/13/2022	12/12/2023
Bandreject Filter 2400-2483.5	EWT	EWT-14-0166	M1	12/13/2022	12/12/2023
4GHz High Pass Filter	WI	WHKX4.0/18G-10SS	WHKX4.0/18G-10SS	12/13/2022	12/12/2023
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY2630/2	12/23/2022	12/22/2023
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY22962/2	12/23/2022	12/22/2023
Coaxial Cables	EMCI	EMCCFD400-NM-NM-10000	RX Cable below 1G (220238)	08/31/2022	08/30/2023
Coaxial Cables	EMCI	EMC104-SM-SM-600	RX Cable below 1G (220237)	08/31/2022	08/30/2023
Coaxial Cables	EMCI	EMC105-SM-SM-2000	RX Cable below 1G (220910)	08/31/2022	08/30/2023
Coaxial Cables	EMCI	EMC104-SM-SM-10000	RX Cable above 1G (220236)	08/31/2022	08/30/2023
Coaxial Cables	EMCI	EMC105-SM-SM-1000	RX Cable above 1G (201211)	08/31/2022	08/30/2023
Coaxial Cables	EMCI	EMC105-SM-SM-1500	RX Cable above 1G (220906)	08/31/2022	08/30/2023
Coaxial Cables	EMCI	EMC105-SM-SM-2000	RX Cable above 1G (220909)	08/31/2022	08/30/2023
Coaxial Cables	EMCI	EMCCFD400-NM-NM-10000	RX Cable below 30M (220238)	08/31/2022	08/30/2023
Coaxial Cables	EMCI	EMC105-SM-SM-2000	RX Cable below 30M (220910)	08/31/2022	08/30/2023

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

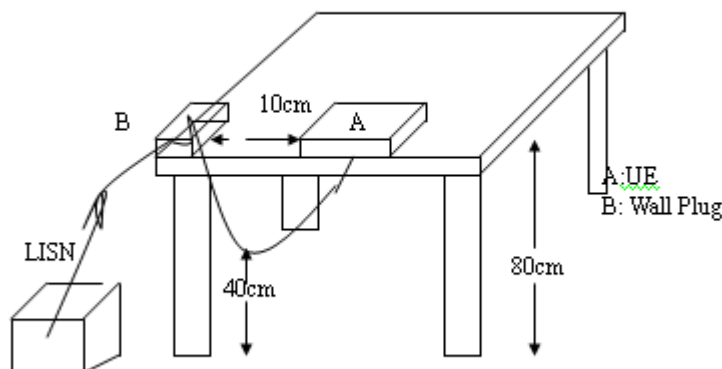
Note

- 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 C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

7.3 Test Setup



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7.4 Measurement Procedure

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

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AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number :TERF2304001052ER

Test Site :Conduction 1

Operation Mode :BT

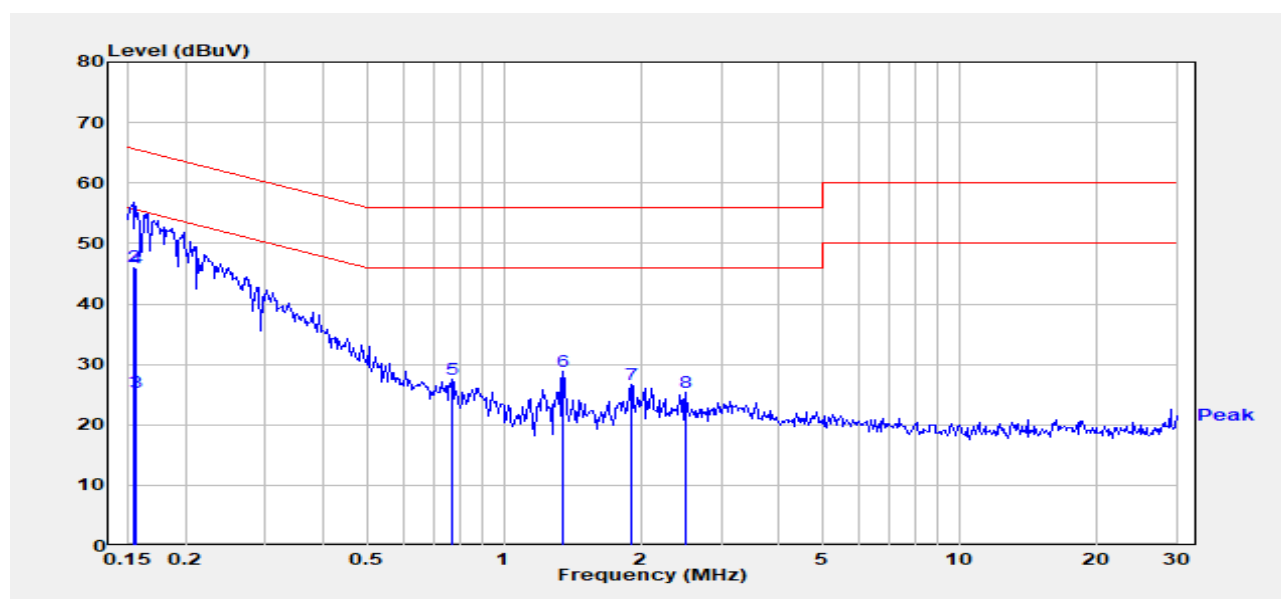
Test Date :2023-06-16

Power :120V/60Hz

Temp./Humi. :24.6°C/65%

Probe :L

Engineer :Ricky Chen



Freq. MHz	Detector Mode	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.153	Average	15.23	10.25	25.48	55.81	-30.33
0.153	QP	35.89	10.25	46.14	65.81	-19.67
0.156	Average	15.13	10.25	25.38	55.68	-30.30
0.156	QP	35.72	10.25	45.97	65.68	-19.71
0.770	Peak	17.15	10.32	27.47	56.00	-28.53
1.349	Peak	18.27	10.67	28.94	56.00	-27.06
1.905	Peak	15.59	11.03	26.62	56.00	-29.38
2.512	Peak	14.40	10.94	25.34	56.00	-30.66

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Report Number :TERF2304001052ER

Operation Mode :BT

Power :120V/60Hz

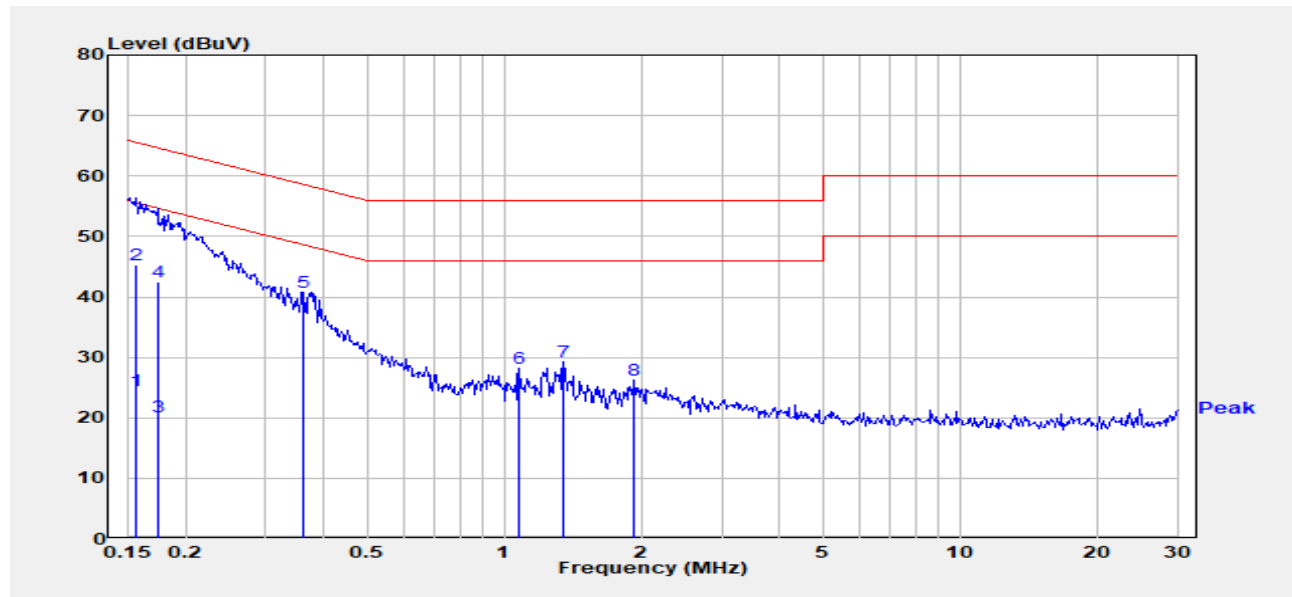
Probe :N

Test Site :Conduction 1

Test Date :2023-06-16

Temp./Humi. :24.6°C/65%

Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.156	Average	14.23	10.25	24.48	55.68	-31.20
0.156	QP	35.16	10.25	45.41	65.68	-20.27
0.174	Average	9.87	10.25	20.12	54.79	-34.67
0.174	QP	32.14	10.25	42.39	64.79	-22.40
0.363	Peak	30.50	10.25	40.75	58.67	-17.91
1.079	Peak	17.69	10.44	28.13	56.00	-27.87
1.349	Peak	18.65	10.67	29.32	56.00	-26.68
1.935	Peak	15.10	11.05	26.15	56.00	-29.85

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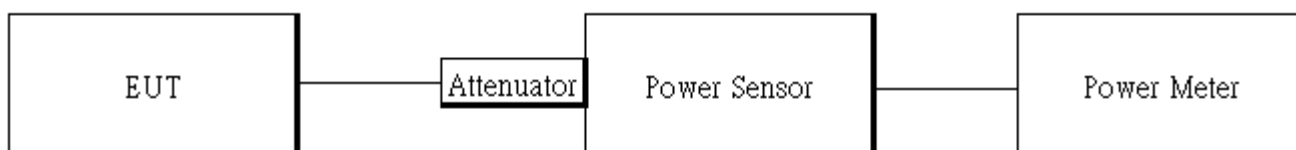
8 PEAK OUTPUT POWER MEASUREMENT

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 $\geq$ 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	10	13.11	20.464	1000
Mid	2441	10	12.70	18.621	1000
High	2480	10	12.84	19.231	1000

1M BR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	10	12.94	19.679	1000
Mid	2441	10	12.51	17.824	1000
High	2480	10	12.64	18.365	1000

2M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	10	12.50	17.783	125
Mid	2441	10	12.08	16.144	125
High	2480	10	12.08	16.144	125

2M EDR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	10	10.16	10.375	125
Mid	2441	10	9.72	9.376	125
High	2480	10	9.69	9.311	125

3M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	10	12.90	19.498	125
Mid	2441	10	12.51	17.824	125
High	2480	10	12.66	18.450	125

3M EDR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	10	10.09	10.209	125
Mid	2441	10	9.60	9.120	125
High	2480	10	9.80	9.550	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	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	10	12.94	4.90	60.814	4000
Mid	2441	10	12.51	4.90	55.081	4000
High	2480	10	12.64	4.90	56.754	4000

2M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	10	10.16	4.90	32.063	4000
Mid	2441	10	9.72	4.90	28.973	4000
High	2480	10	9.69	4.90	28.774	4000

3M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	10	10.09	4.90	31.550	4000
Mid	2441	10	9.60	4.90	28.184	4000
High	2480	10	9.80	4.90	29.512	4000

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

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9 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

9.1 Standard Applicable

9.1.1 Duty Cycle Correction Factor

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

9.1.2 Spurious Emission

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 and RSS-Gen §8.9 Table 5 and 6 limit as below.

And according to §15.33(a) (1) & RSS-Gen §6.13.2.a, for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

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

Note:

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

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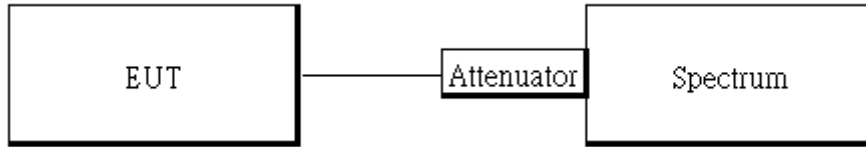
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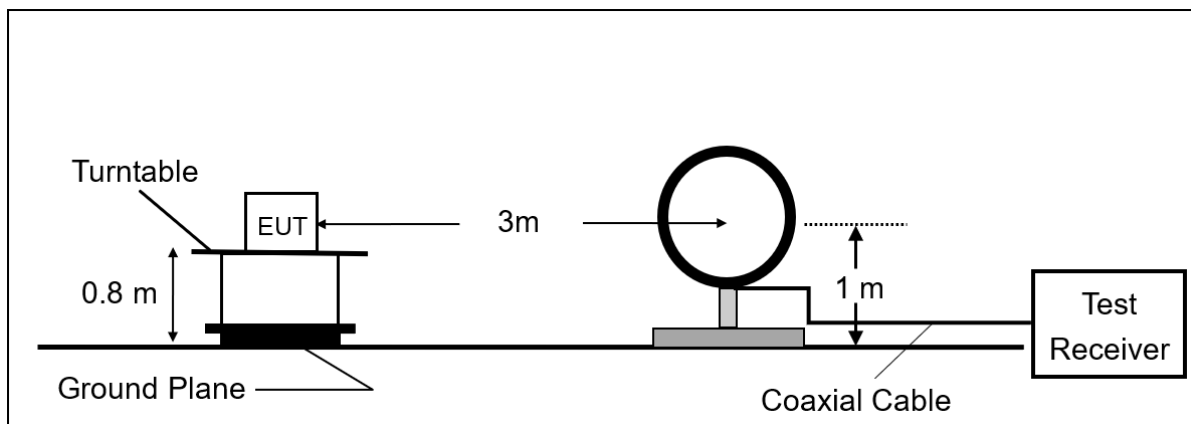
9.2 Test Setup

9.2.1 Duty Cycle Correction Factor

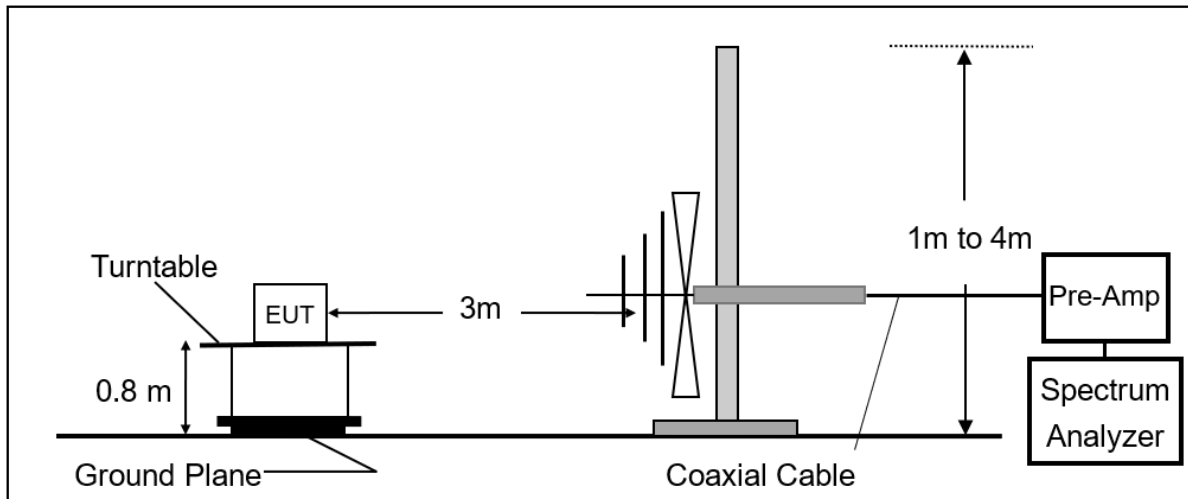


9.2.2 Radiated Emission

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



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



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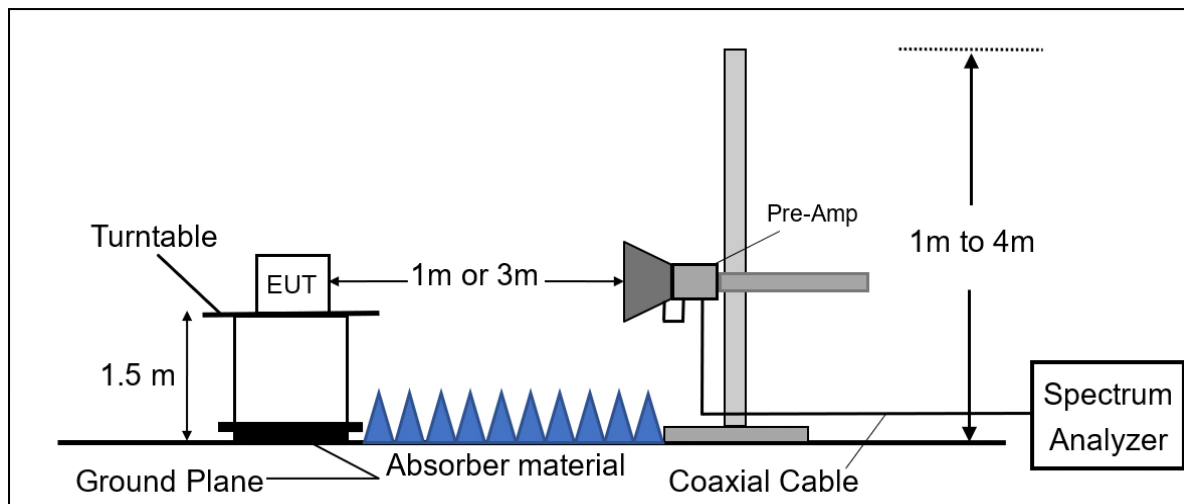
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(C) Radiated Emission Test Set-Up, Frequency Above 1 GHz.



9.3 Measurement Procedure

9.3.1 Duty Cycle Correction Factor

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

9.3.2 Radiated Emission

1. The testing follows the Measurement Procedure of ANSI C63.10:2013.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz.
6. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.

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7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements at frequency above 1 GHz.
8. According to C63.10:2013 Section 7.5 Procedure for determining the average value of pulsed emissions with duty cycle correction factor $20 \log (T_{on}/100ms)$.
9. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
12. Repeat above procedures until all default test channel measured were complete.

9.4 Field Strength Calculation

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

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

Where *FS* = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

The limit of the emission level is expressed in dBuV/m, which converts $20 \cdot \log(uV/m)$

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

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

9.5 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz

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

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9.6 Measurement Result:

9.6.1 Duty Cycle Correction Factor

Bluetooth 1M			
Time ON of 100ms:	5.600	ms	
Duty Cycle=5.6ms / 100m	0.056	%	
Duty Cycle correction factor=20 LOG 0.056=	-25.04	dB	
Bluetooth 3M			
Time ON of 100ms:	5.800	ms	
Duty Cycle=5.8ms / 100m	0.058	%	
Duty Cycle correction factor=20 LOG 0.058=	-24.73	dB	

9.6.2 Duty Cycle test plot

BR



EDR



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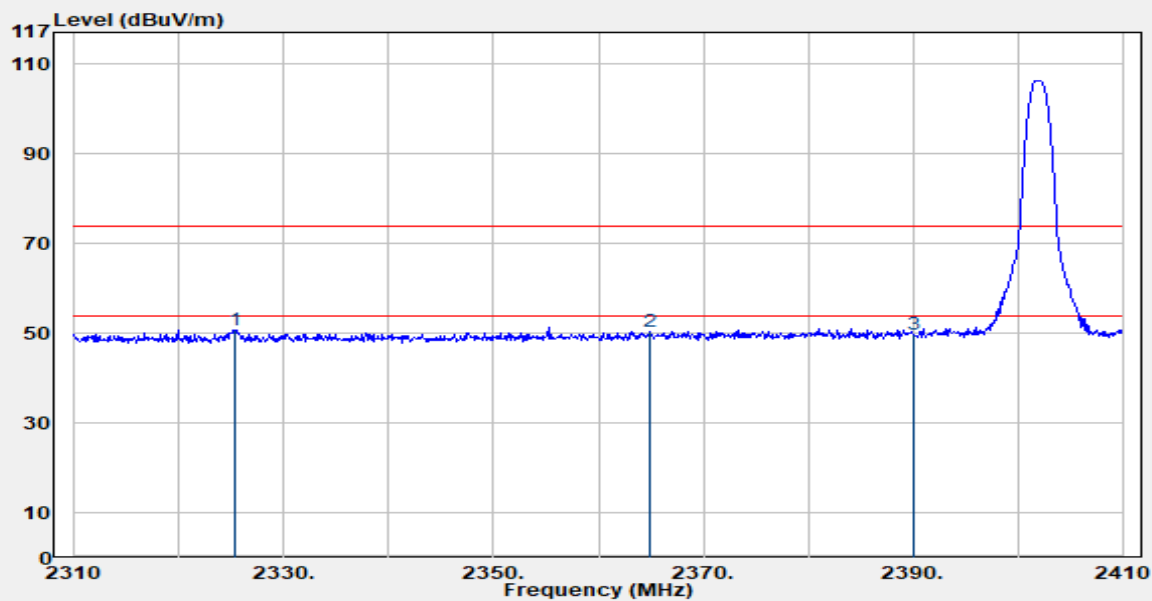
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9.6.3 Bandedge Result

Report Number :TERF2304001052ER
 Operation Mode :BR
 Test Frequency :2402 MHz
 Test Mode :Bandedge
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Vertical
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2325.300	Peak	55.20	-4.36	50.84	74.00	-23.16
2364.900	Peak	54.75	-4.31	50.44	74.00	-23.56
2390.000	Peak	54.04	-4.17	49.87	74.00	-24.13

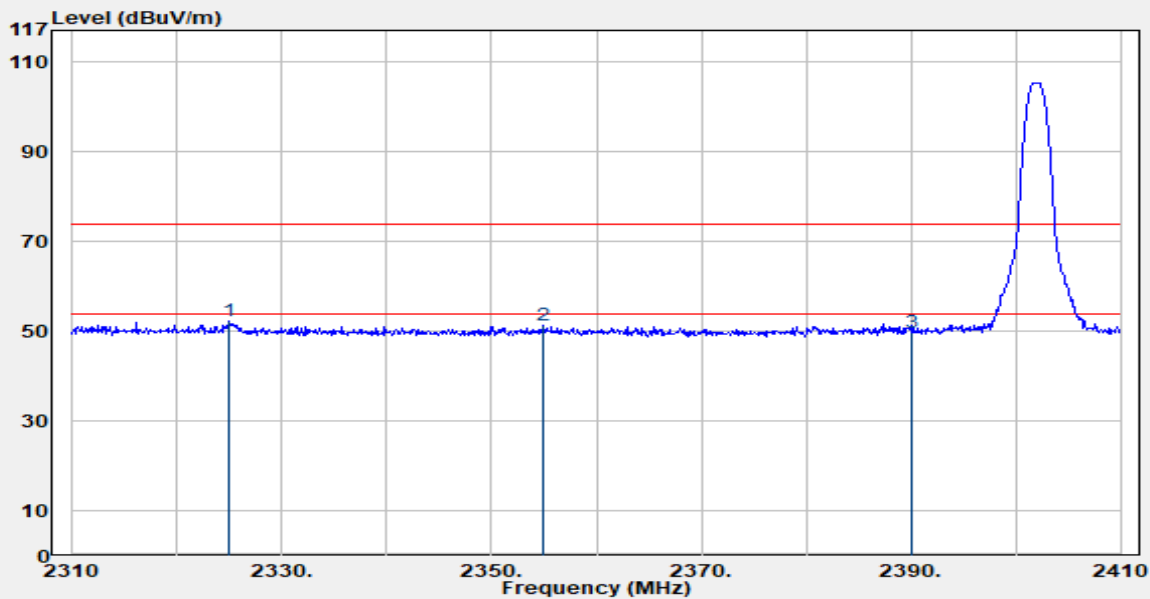
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBμV/m)	Average Limit@3m (dBμV/m)	Margin (dB)
2325.300	Average	50.84	-25.04	25.80	54.00	-28.20
2364.900	Average	50.44	-25.04	25.40	54.00	-28.60
2390.000	Average	49.87	-25.04	24.83	54.00	-29.17

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Report Number :TERF2304001052ER
Operation Mode :BR
Test Frequency :2402 MHz
Test Mode :Bandedge
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Horizontal
Engineer :Ricky Chen



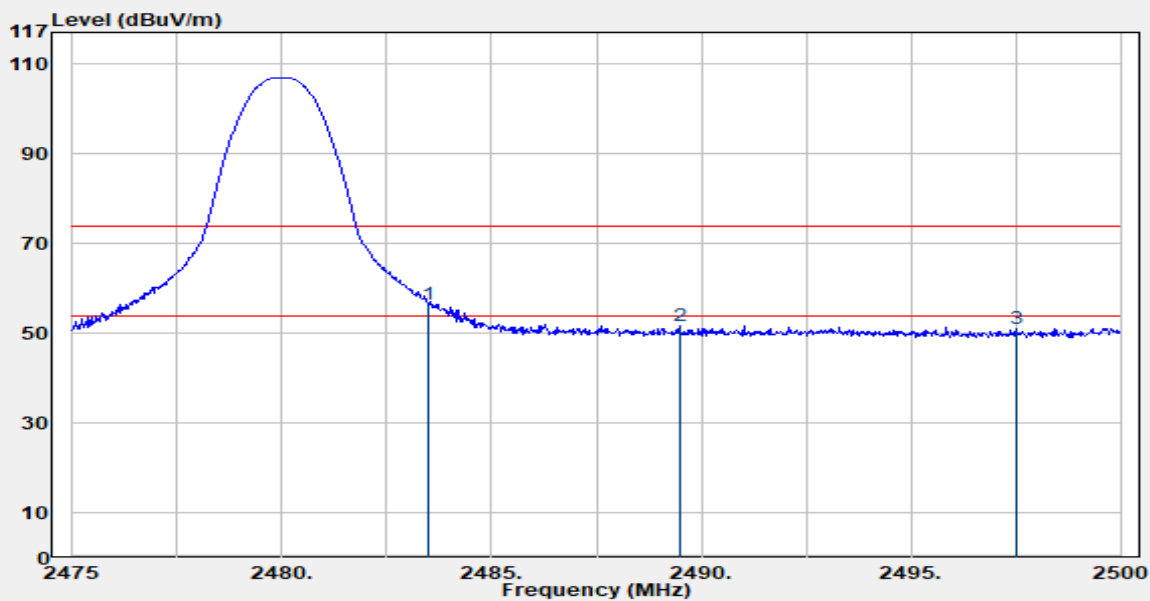
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2325.000	Peak	56.67	-4.36	52.31	74.00	-21.69
2355.000	Peak	55.61	-4.36	51.25	74.00	-22.75
2390.000	Peak	53.85	-4.17	49.69	74.00	-24.31
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBμV/m)	Average Limit@3m (dBμV/m)	Margin (dB)
2325.000	Average	52.31	-25.04	27.27	54.00	-26.73
2355.000	Average	51.25	-25.04	26.21	54.00	-27.79
2390.000	Average	49.69	-25.04	24.65	54.00	-29.35

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Report Number :TERF2304001052ER
 Operation Mode :BR
 Test Frequency :2480 MHz
 Test Mode :Bandedge
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Vertical
 Engineer :Ricky Chen



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	60.78	-4.26	56.53	74.00	-17.47
2489.475	Peak	55.81	-4.21	51.60	74.00	-22.40
2497.500	Peak	55.29	-4.15	51.14	74.00	-22.86

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	56.53	-25.04	31.49	54.00	-22.51
2489.475	Average	51.60	-25.04	26.56	54.00	-27.44
2497.500	Average	51.14	-25.04	26.10	54.00	-27.90

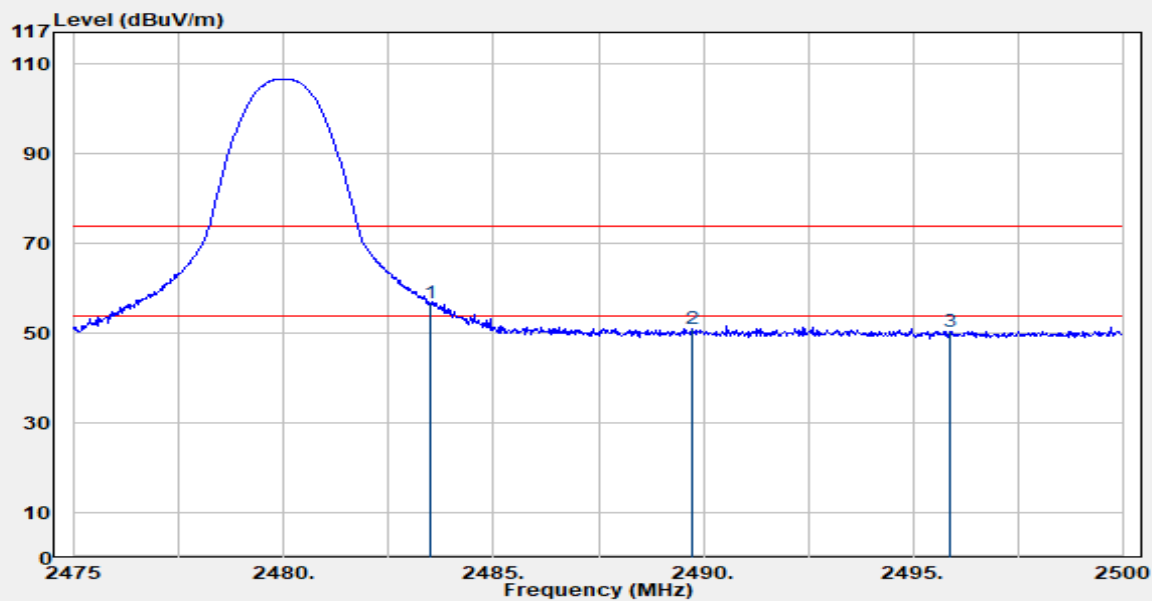
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Operation Mode :BR
Test Frequency :2480 MHz
Test Mode :Bandedge
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Horizontal
Engineer :Ricky Chen



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	61.04	-4.26	56.78	74.00	-17.22
2489.725	Peak	55.29	-4.21	51.08	74.00	-22.92
2495.875	Peak	54.68	-4.16	50.52	74.00	-23.48
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)
2483.500	Average	56.78	-25.04	31.74	54.00	-22.26
2489.725	Average	51.08	-25.04	26.04	54.00	-27.96
2495.875	Average	50.52	-25.04	25.48	54.00	-28.52

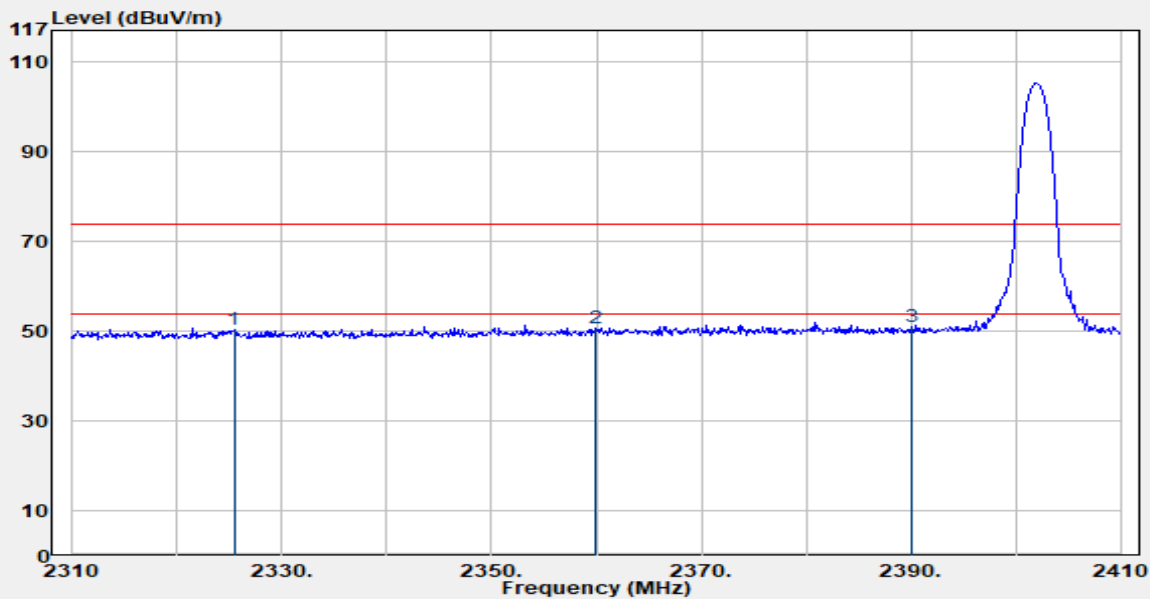
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Report Number :TERF2304001052ER
Operation Mode :EDR 3M
Test Frequency :2402 MHz
Test Mode :Bandedge
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Vertical
Engineer :Ricky Chen



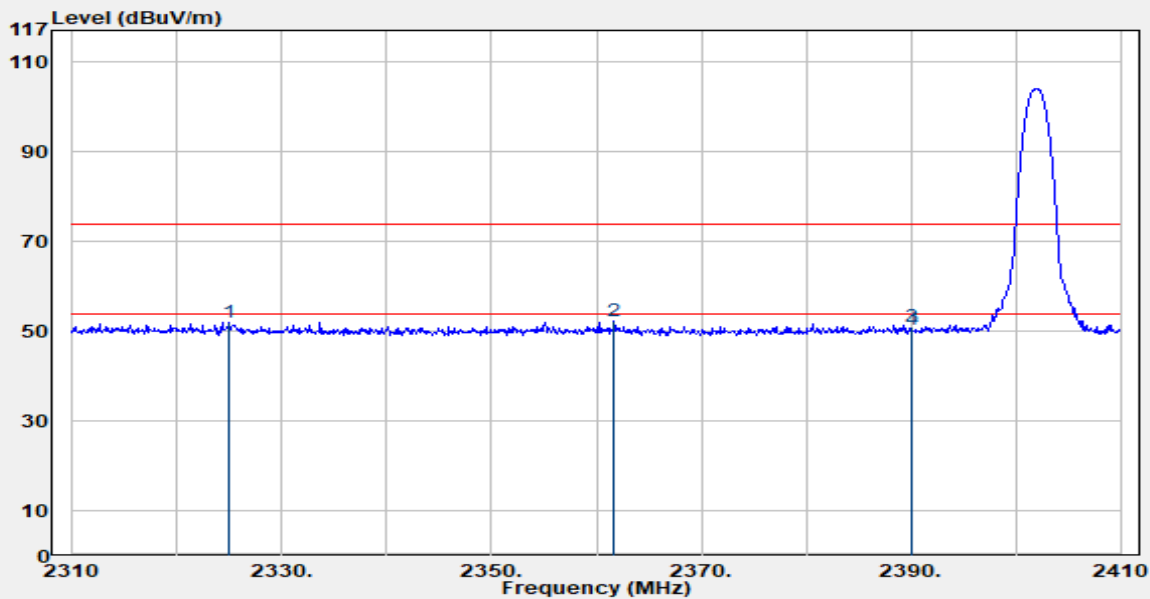
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2325.400	Peak	54.72	-4.36	50.37	74.00	-23.63
2359.900	Peak	55.10	-4.33	50.76	74.00	-23.24
2390.000	Peak	55.23	-4.17	51.06	74.00	-22.94
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBμV/m)	Average Limit@3m (dBμV/m)	Margin (dB)
2325.400	Average	50.37	-24.73	25.64	54.00	-28.36
2359.900	Average	50.76	-24.73	26.03	54.00	-27.97
2390.000	Average	51.06	-24.73	26.33	54.00	-27.67

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Report Number :TERF2304001052ER
 Operation Mode :EDR 3M
 Test Frequency :2402 MHz
 Test Mode :Bandedge
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Horizontal
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2325.000	Peak	56.32	-4.36	51.97	74.00	-22.03
2361.700	Peak	56.54	-4.32	52.21	74.00	-21.79
2390.000	Peak	54.61	-4.17	50.44	74.00	-23.56
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)
2325.000	Average	51.97	-24.73	27.24	54.00	-26.76
2361.700	Average	52.21	-24.73	27.48	54.00	-26.52
2390.000	Average	50.44	-24.73	25.71	54.00	-28.29

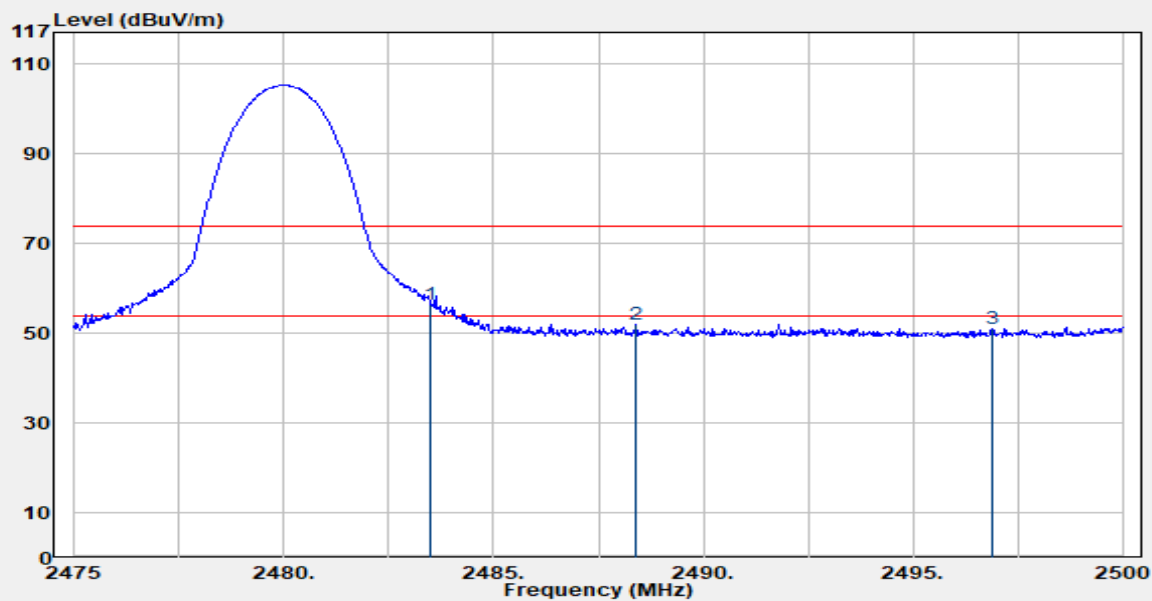
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Report Number :TERF2304001052ER
Operation Mode :EDR 3M
Test Frequency :2480 MHz
Test Mode :Bandedge
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Vertical
Engineer :Ricky Chen



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	60.58	-4.26	56.32	74.00	-17.68
2488.400	Peak	56.08	-4.22	51.86	74.00	-22.14
2496.875	Peak	55.12	-4.15	50.97	74.00	-23.03
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBμV/m)	Average Limit@3m (dBμV/m)	Margin (dB)
2483.500	Average	56.32	-24.73	31.59	54.00	-22.41
2488.400	Average	51.86	-24.73	27.13	54.00	-26.87
2496.875	Average	50.97	-24.73	26.24	54.00	-27.76

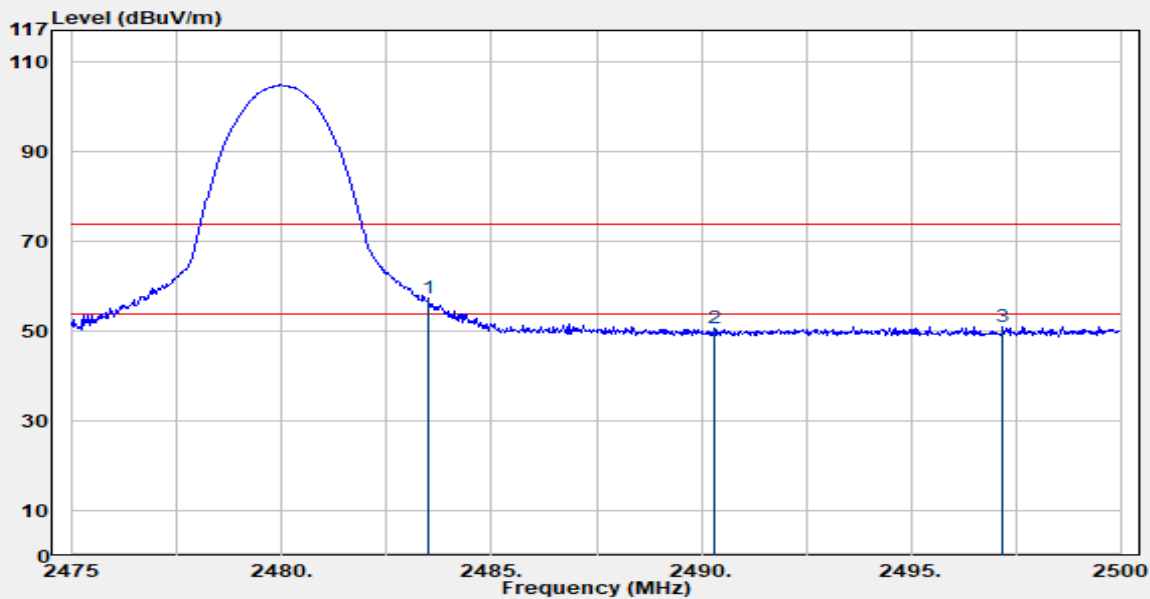
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Report Number :TERF2304001052ER
Operation Mode :EDR 3M
Test Frequency :2480 MHz
Test Mode :Bandedge
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Horizontal
Engineer :Ricky Chen



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	61.57	-4.26	57.31	74.00	-16.69
2490.325	Peak	54.86	-4.20	50.66	74.00	-23.34
2497.200	Peak	55.34	-4.15	51.19	74.00	-22.81
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBμV/m)	Average Limit@3m (dBμV/m)	Margin (dB)
2483.500	Average	57.31	-24.73	32.58	54.00	-21.42
2490.325	Average	50.66	-24.73	25.93	54.00	-28.07
2497.200	Average	51.19	-24.73	26.46	54.00	-27.54

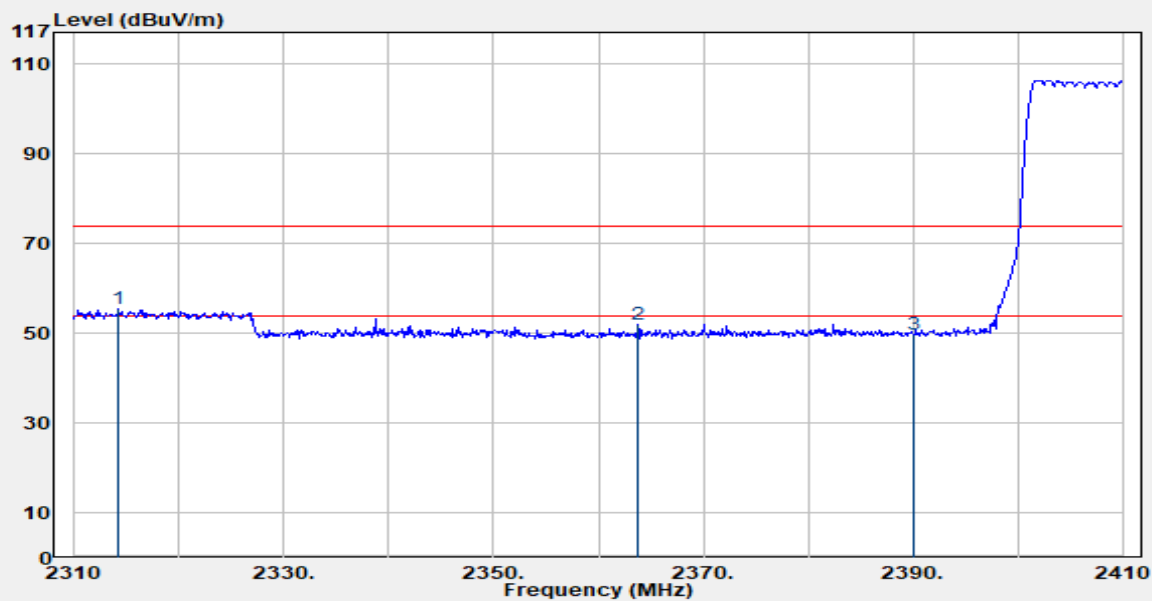
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Report Number :TERF2304001052ER
Operation Mode :BR Hopping
Test Frequency :2402 MHz
Test Mode :Bandedge
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Vertical
Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2314.200	Peak	59.92	-4.34	55.58	74.00	-18.42
2363.800	Peak	56.23	-4.31	51.92	74.00	-22.08
2390.000	Peak	54.00	-4.17	49.83	74.00	-24.17
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)
2314.200	Average	55.58	-25.04	30.54	54.00	-23.46
2363.800	Average	51.92	-25.04	26.88	54.00	-27.12
2390.000	Average	49.83	-25.04	24.79	54.00	-29.21

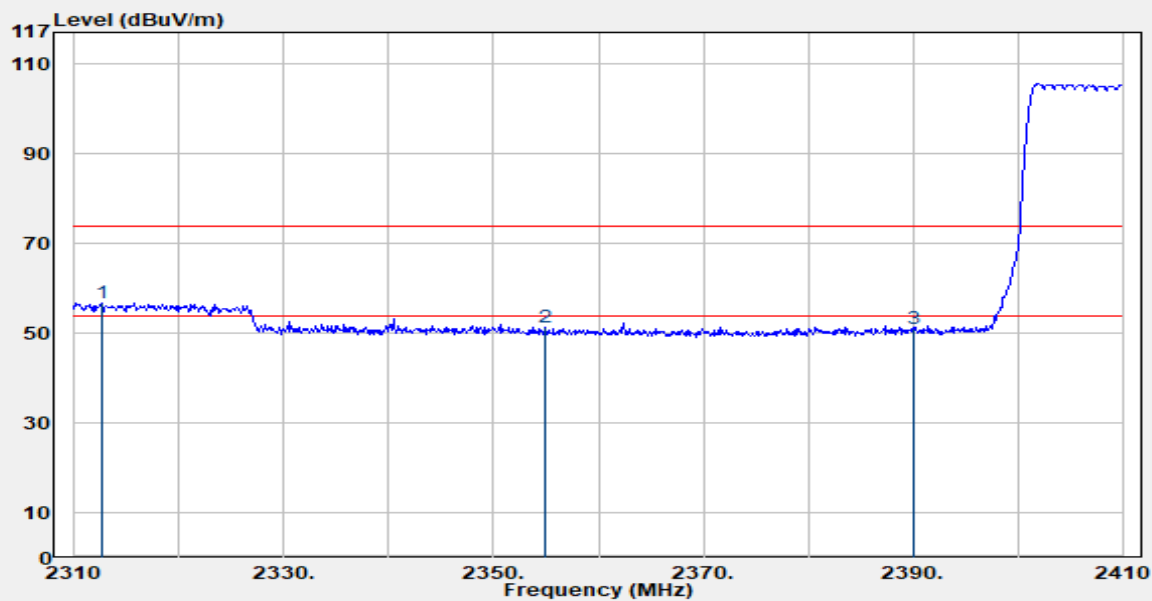
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Report Number :TERF2304001052ER
 Operation Mode :BR Hopping
 Test Frequency :2402 MHz
 Test Mode :Bandedge
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Horizontal
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2312.600	Peak	61.00	-4.34	56.67	74.00	-17.33
2355.000	Peak	55.61	-4.36	51.25	74.00	-22.75
2390.000	Peak	55.32	-4.17	51.16	74.00	-22.84
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)
2312.600	Average	56.67	-25.04	31.63	54.00	-22.37
2355.000	Average	51.25	-25.04	26.21	54.00	-27.79
2390.000	Average	51.16	-25.04	26.12	54.00	-27.88

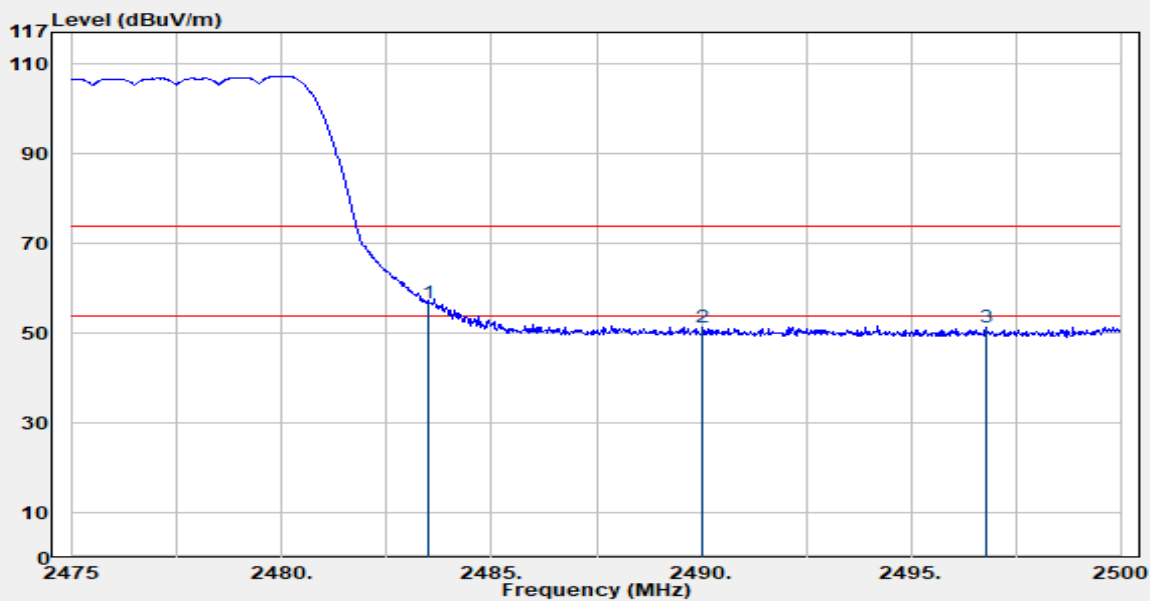
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Report Number :TERF2304001052ER
 Operation Mode :BR Hopping
 Test Frequency :2480 MHz
 Test Mode :Bandedge
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Vertical
 Engineer :Ricky Chen



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	60.94	-4.26	56.68	74.00	-17.32
2490.025	Peak	55.42	-4.21	51.22	74.00	-22.78
2496.800	Peak	55.64	-4.15	51.49	74.00	-22.51

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	56.68	-25.04	31.64	54.00	-22.36
2490.025	Average	51.22	-25.04	26.18	54.00	-27.82
2496.800	Average	51.49	-25.04	26.45	54.00	-27.55

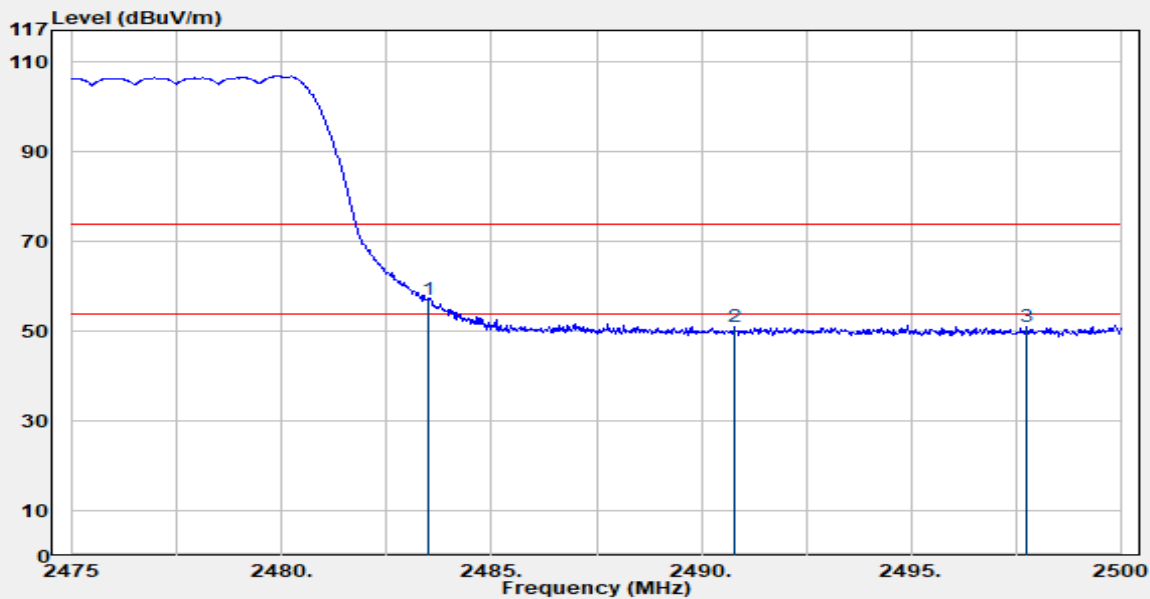
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Report Number :TERF2304001052ER
Operation Mode :BR Hopping
Test Frequency :2480 MHz
Test Mode :Bandedge
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Horizontal
Engineer :Ricky Chen



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	61.27	-4.26	57.01	74.00	-16.99
2490.775	Peak	55.36	-4.20	51.16	74.00	-22.84
2497.775	Peak	55.18	-4.15	51.03	74.00	-22.97
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBμV/m)	Average Limit@3m (dBμV/m)	Margin (dB)
2483.500	Average	57.01	-25.04	31.97	54.00	-22.03
2490.775	Average	51.16	-25.04	26.12	54.00	-27.88
2497.775	Average	51.03	-25.04	25.99	54.00	-28.01

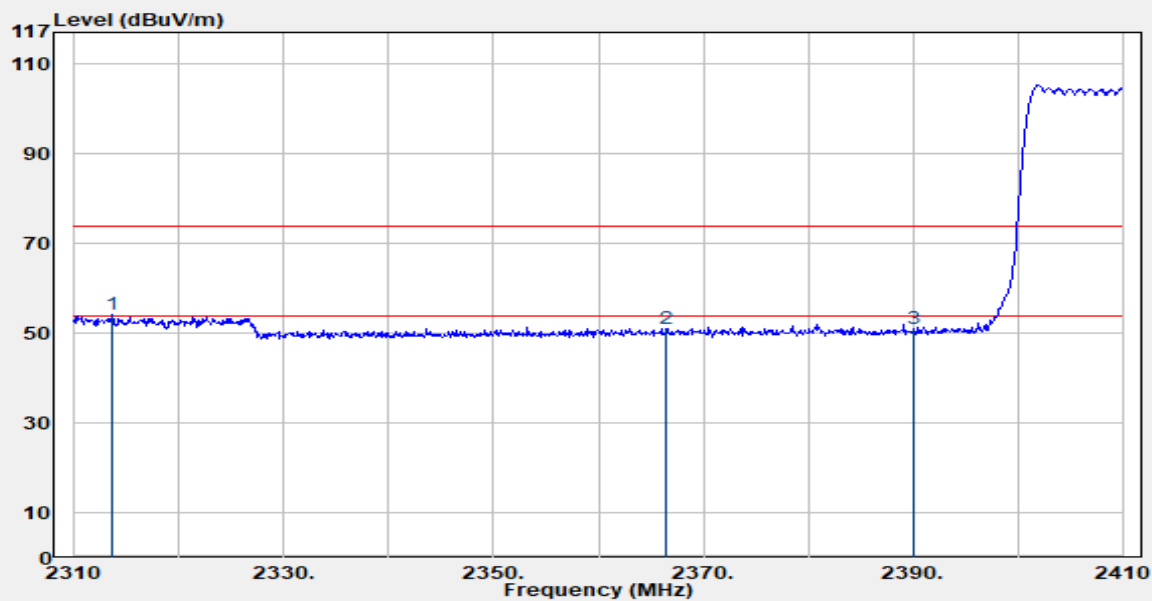
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Report Number :TERF2304001052ER
 Operation Mode :EDR 3M Hopping
 Test Frequency :2402 MHz
 Test Mode :Bandedge
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Vertical
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2313.500	Peak	58.50	-4.34	54.16	74.00	-19.84
2366.500	Peak	55.34	-4.30	51.05	74.00	-22.95
2390.000	Peak	55.23	-4.17	51.06	74.00	-22.94

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)
2313.500	Average	54.16	-24.73	29.43	54.00	-24.57
2366.500	Average	51.05	-24.73	26.32	54.00	-27.68
2390.000	Average	51.06	-24.73	26.33	54.00	-27.67

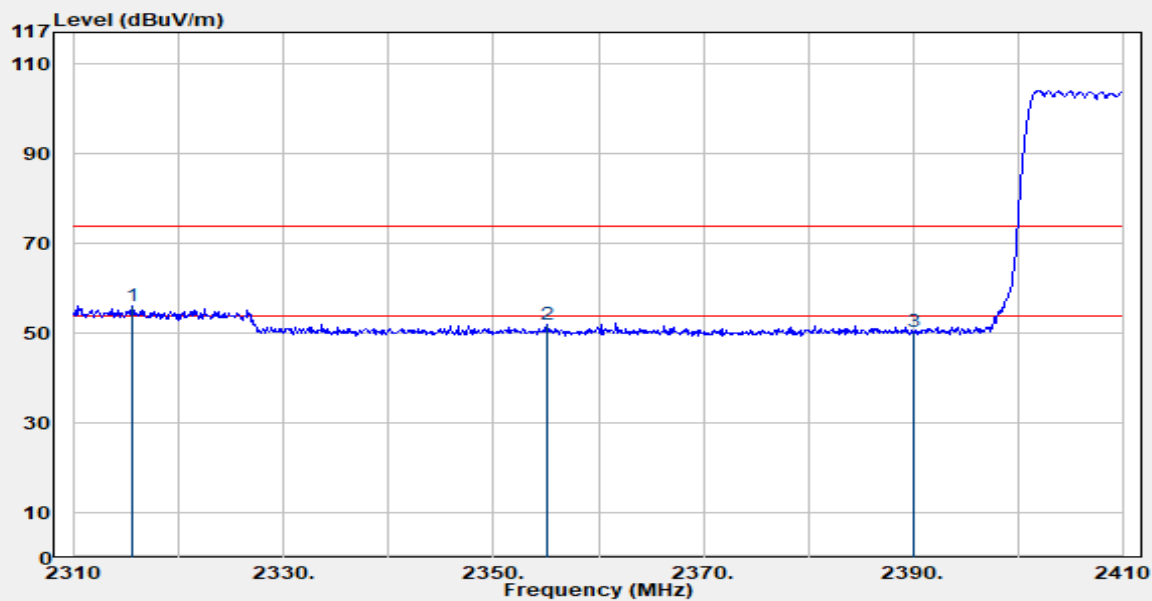
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Report Number :TERF2304001052ER
Operation Mode :EDR 3M Hopping
Test Frequency :2402 MHz
Test Mode :Bandedge
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Horizontal
Engineer :Ricky Chen



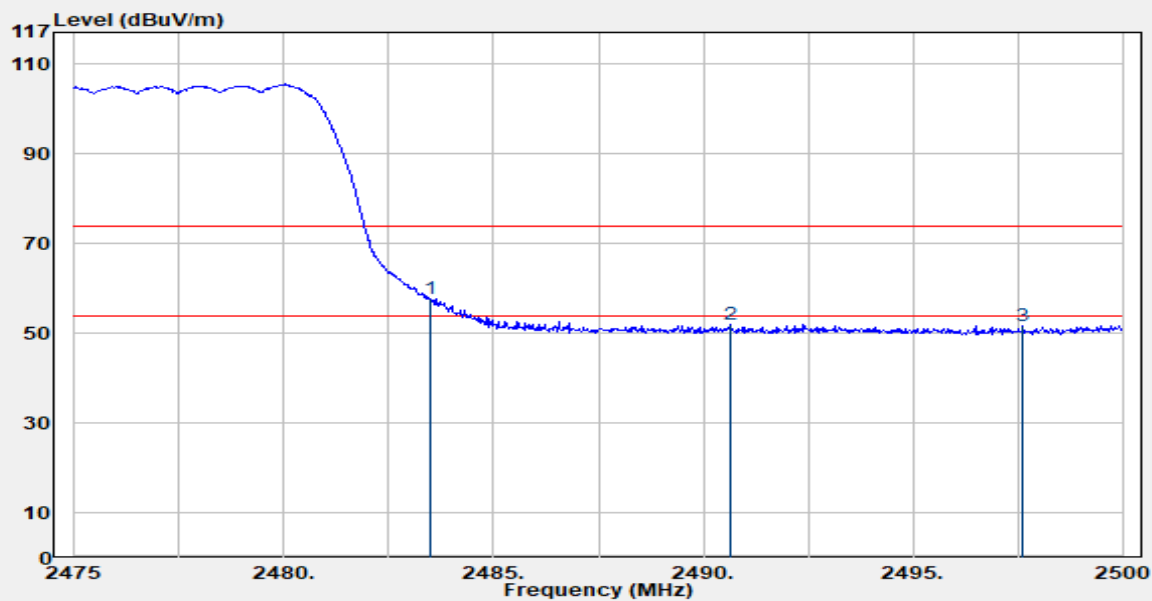
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2315.500	Peak	60.33	-4.34	55.99	74.00	-18.01
2355.100	Peak	56.44	-4.36	52.08	74.00	-21.92
2390.000	Peak	54.61	-4.17	50.44	74.00	-23.56
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBμV/m)	Average Limit@3m (dBμV/m)	Margin (dB)
2315.500	Average	55.99	-24.73	31.26	54.00	-22.74
2355.100	Average	52.08	-24.73	27.35	54.00	-26.65
2390.000	Average	50.44	-24.73	25.71	54.00	-28.29

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Report Number :TERF2304001052ER
Operation Mode :EDR 3M Hopping
Test Frequency :2480 MHz
Test Mode :Bandedge
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Vertical
Engineer :Ricky Chen



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	61.90	-4.26	57.64	74.00	-16.36
2490.650	Peak	56.11	-4.20	51.91	74.00	-22.09
2497.625	Peak	55.69	-4.15	51.54	74.00	-22.46
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	57.64	-24.73	32.91	54.00	-21.09
2490.650	Average	51.91	-24.73	27.18	54.00	-26.82
2497.625	Average	51.54	-24.73	26.81	54.00	-27.19

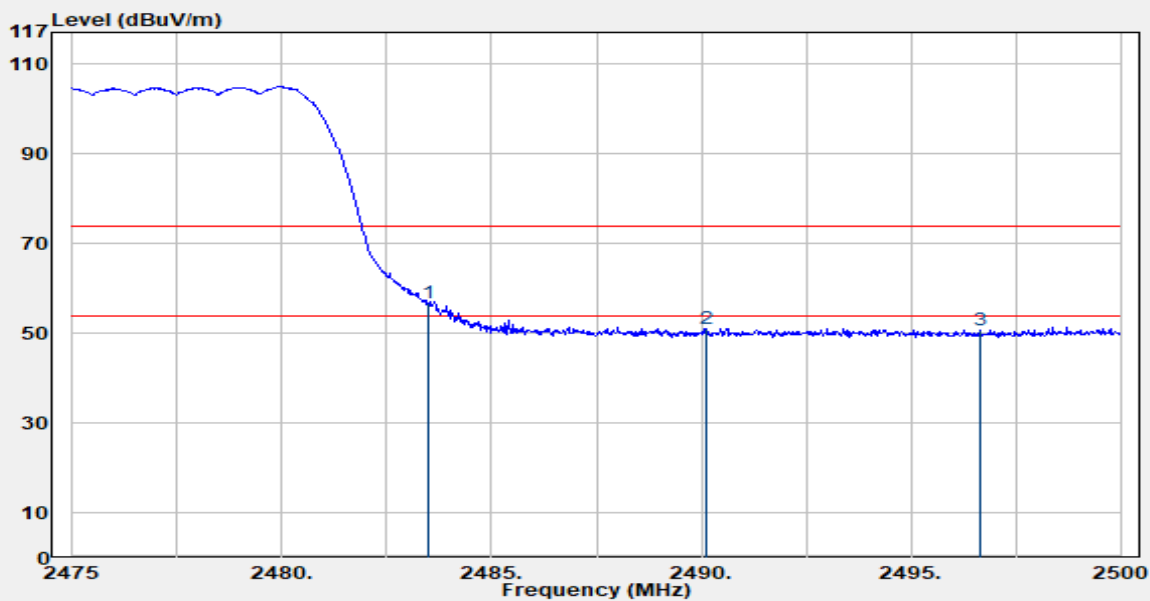
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Report Number :TERF2304001052ER
 Operation Mode :EDR 3M Hopping
 Test Frequency :2480 MHz
 Test Mode :Bandedge
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Horizontal
 Engineer :Ricky Chen



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	61.02	-4.26	56.76	74.00	-17.24
2490.125	Peak	55.30	-4.21	51.09	74.00	-22.91
2496.650	Peak	55.00	-4.16	50.85	74.00	-23.15

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	56.76	-24.73	32.03	54.00	-21.97
2490.125	Average	51.09	-24.73	26.36	54.00	-27.64
2496.650	Average	50.85	-24.73	26.12	54.00	-27.88

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

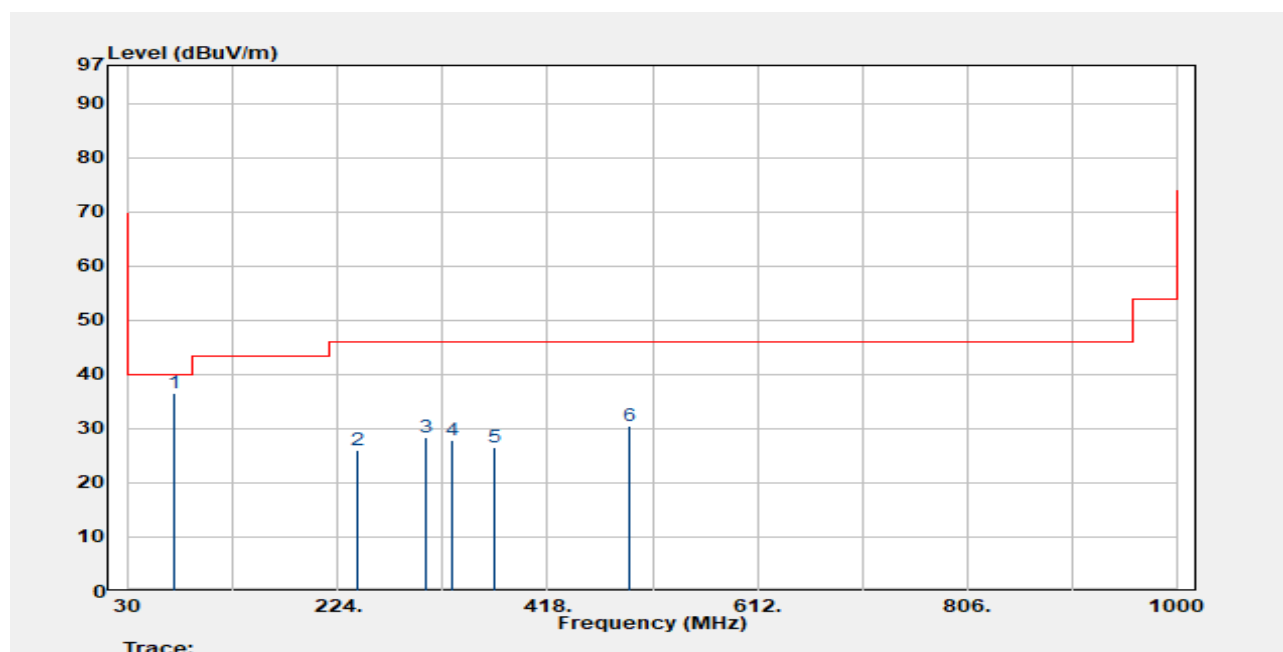
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9.6.4 Radiated Spurious Emission

Report Number :TERF2304001052ER
 Operation Mode :BR
 Test Frequency :2441 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Vertical
 Engineer :Ricky Chen



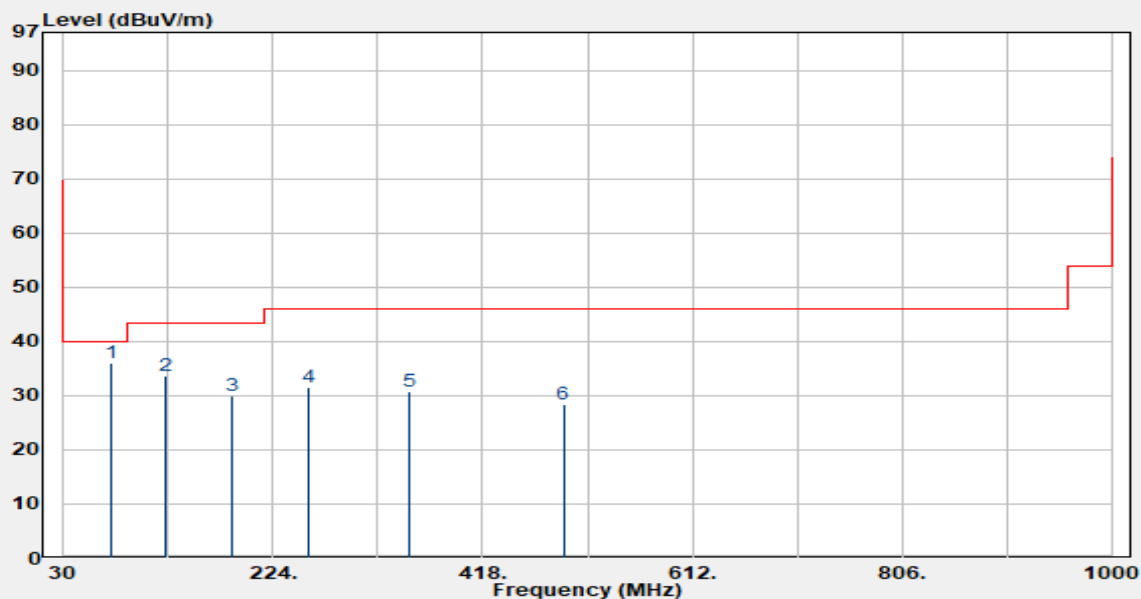
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
72.680	QP	51.63	-15.22	36.41	40.00	-3.59
242.430	Peak	39.71	-13.78	25.92	46.00	-20.08
304.510	Peak	40.53	-12.26	28.27	46.00	-17.73
328.760	Peak	39.13	-11.29	27.83	46.00	-18.17
369.500	Peak	36.78	-10.30	26.48	46.00	-19.52
493.660	Peak	37.93	-7.53	30.41	46.00	-15.59

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Report Number :TERF2304001052ER
 Operation Mode :BR
 Test Frequency :2441 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Horizontal
 Engineer :Ricky Chen



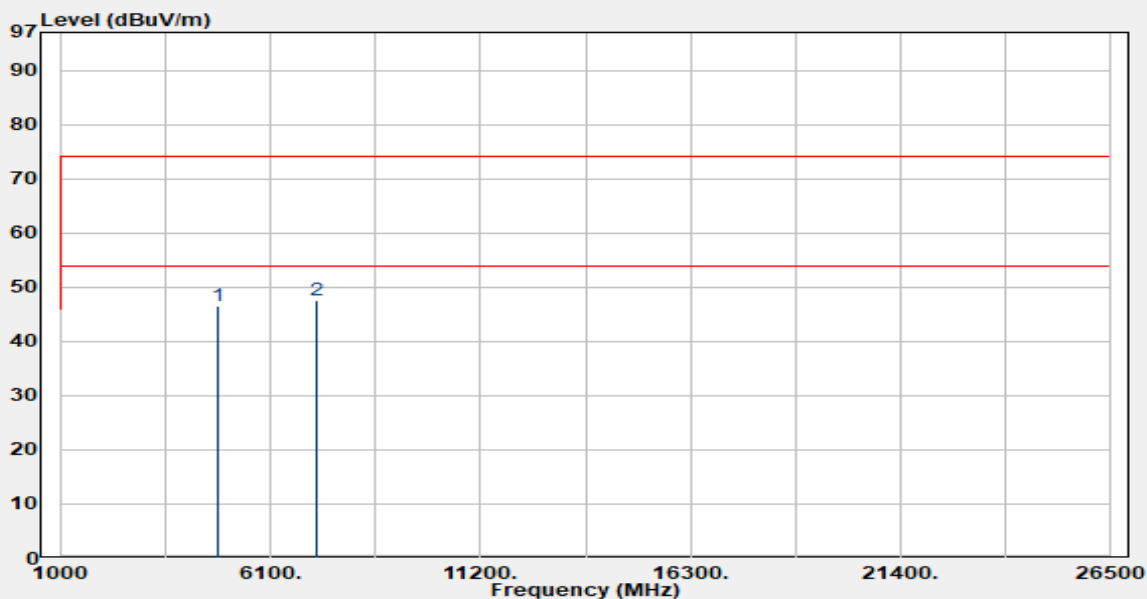
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
73.650	Peak	51.72	-15.64	36.08	40.00	-3.92
124.090	Peak	48.69	-14.92	33.77	43.50	-9.73
186.170	Peak	45.04	-14.95	30.09	43.50	-13.41
256.980	Peak	45.06	-13.56	31.49	46.00	-14.51
350.100	Peak	41.87	-11.14	30.73	46.00	-15.27
492.690	Peak	35.78	-7.50	28.28	46.00	-17.72

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Report Number :TERF2304001052ER
 Operation Mode :BR
 Test Frequency :2402 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Vertical
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.000	Peak	44.47	2.10	46.57	74.00	-27.43
7206.000	Peak	39.92	7.56	47.47	74.00	-26.53

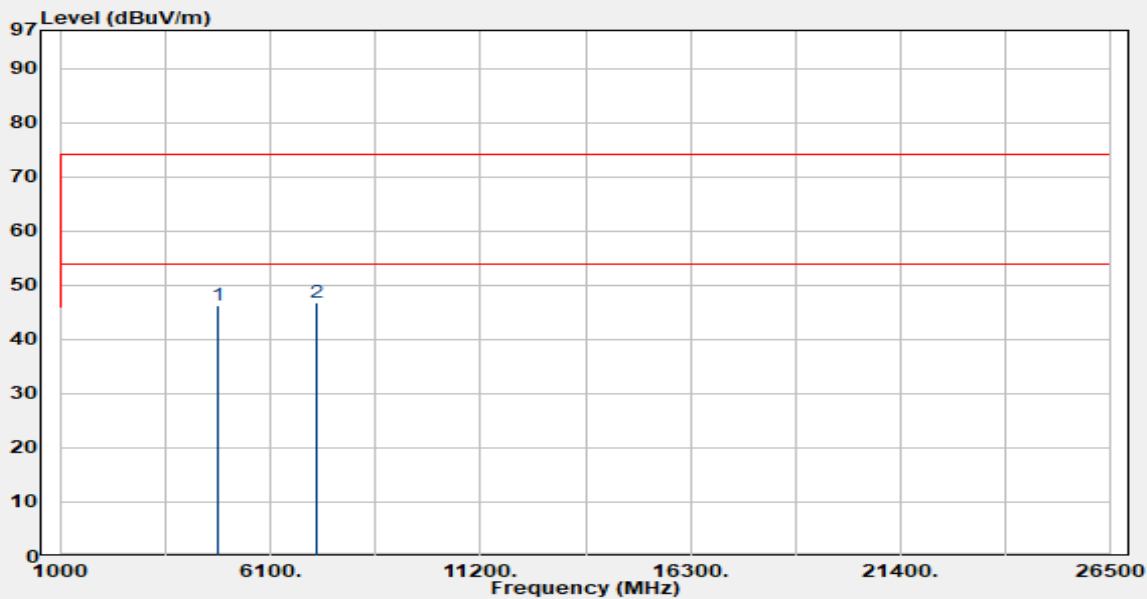
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4804.000	Average	46.57	-25.04	21.53	54.00	-32.47
7206.000	Average	47.47	-25.04	22.43	54.00	-31.57

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Report Number :TERF2304001052ER
 Operation Mode :BR
 Test Frequency :2402 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Horizontal
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.000	Peak	44.18	2.10	46.28	74.00	-27.72
7206.000	Peak	39.26	7.56	46.82	74.00	-27.18

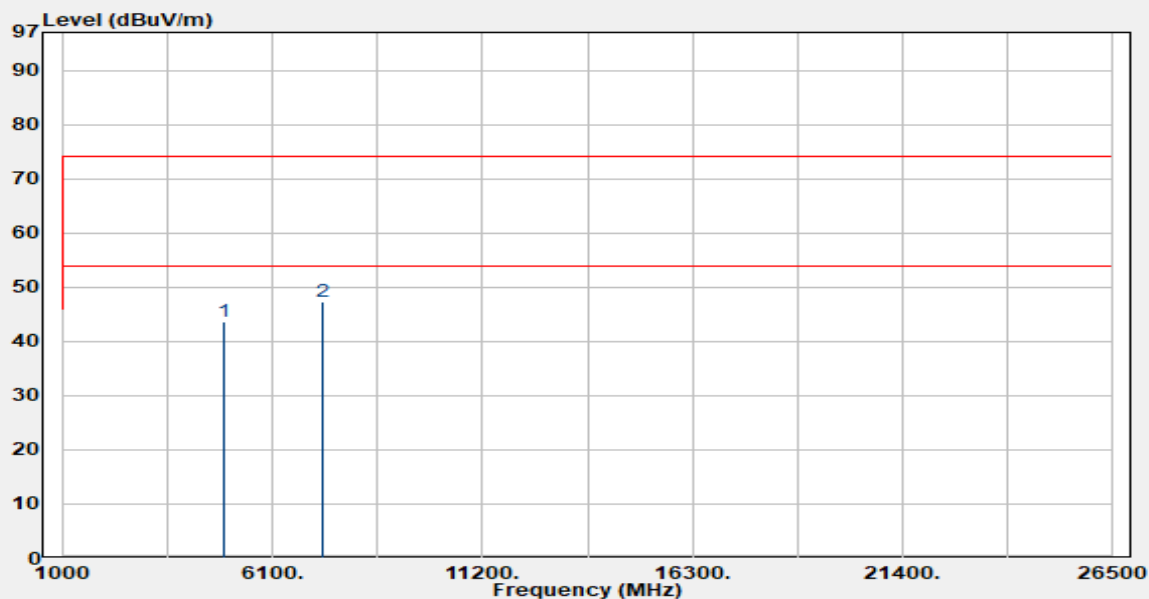
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4804.000	Average	46.28	-25.04	21.24	54.00	-32.76
7206.000	Average	46.82	-25.04	21.78	54.00	-32.22

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Report Number :TERF2304001052ER
 Operation Mode :BR
 Test Frequency :2441 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Vertical
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4882.000	Peak	40.87	2.66	43.52	74.00	-30.48
7323.000	Peak	39.51	7.70	47.21	74.00	-26.79

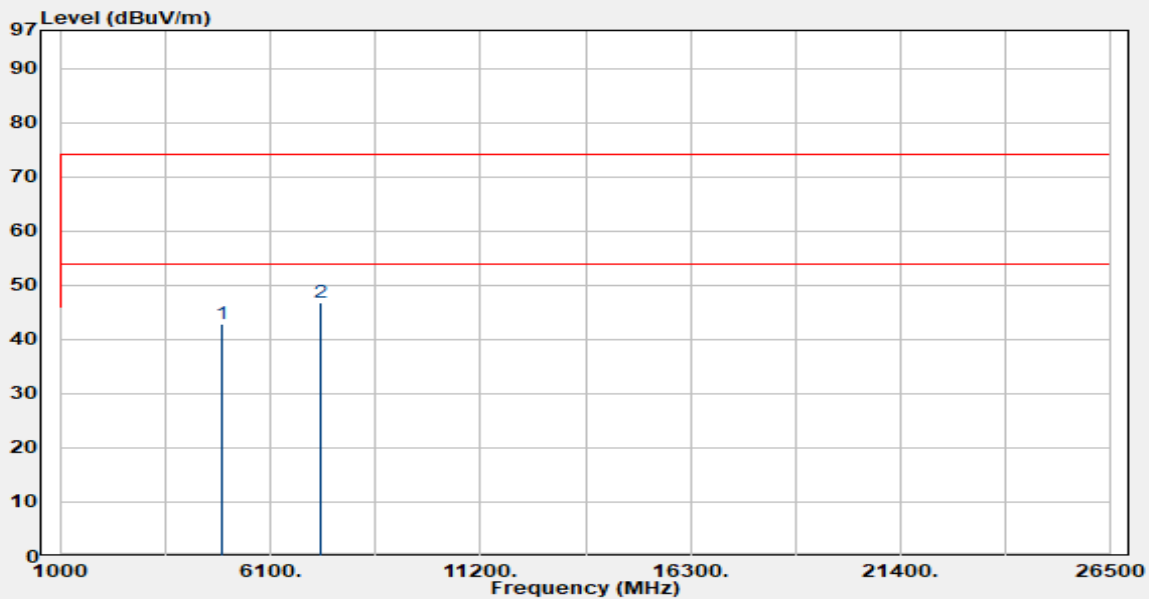
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4882.000	Average	43.52	-25.04	18.48	54.00	-35.52
7323.000	Average	47.21	-25.04	22.17	54.00	-31.83

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Report Number :TERF2304001052ER
 Operation Mode :BR
 Test Frequency :2441 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Horizontal
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4882.000	Peak	40.16	2.66	42.81	74.00	-31.19
7323.000	Peak	39.06	7.70	46.76	74.00	-27.24

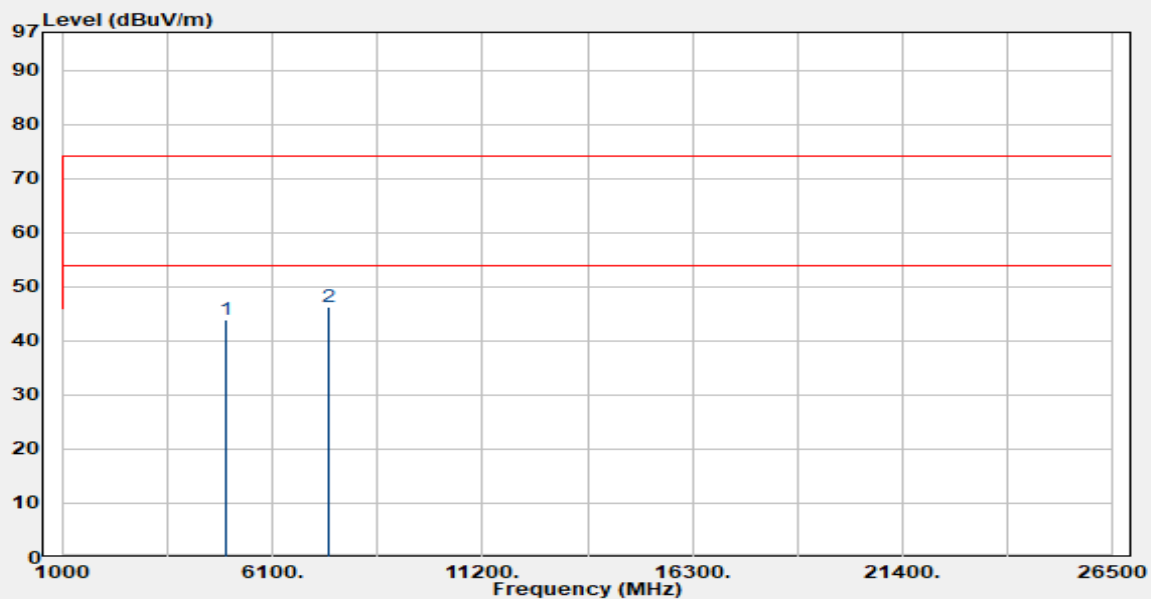
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4882.000	Average	42.81	-25.04	17.77	54.00	-36.23
7323.000	Average	46.76	-25.04	21.72	54.00	-32.28

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Report Number :TERF2304001052ER
Operation Mode :BR
Test Frequency :2480 MHz
Test Mode :Tx
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3℃/59%
Antenna Pol. :Vertical
Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.000	Peak	41.17	2.80	43.97	74.00	-30.03
7440.000	Peak	38.35	7.97	46.33	74.00	-27.67

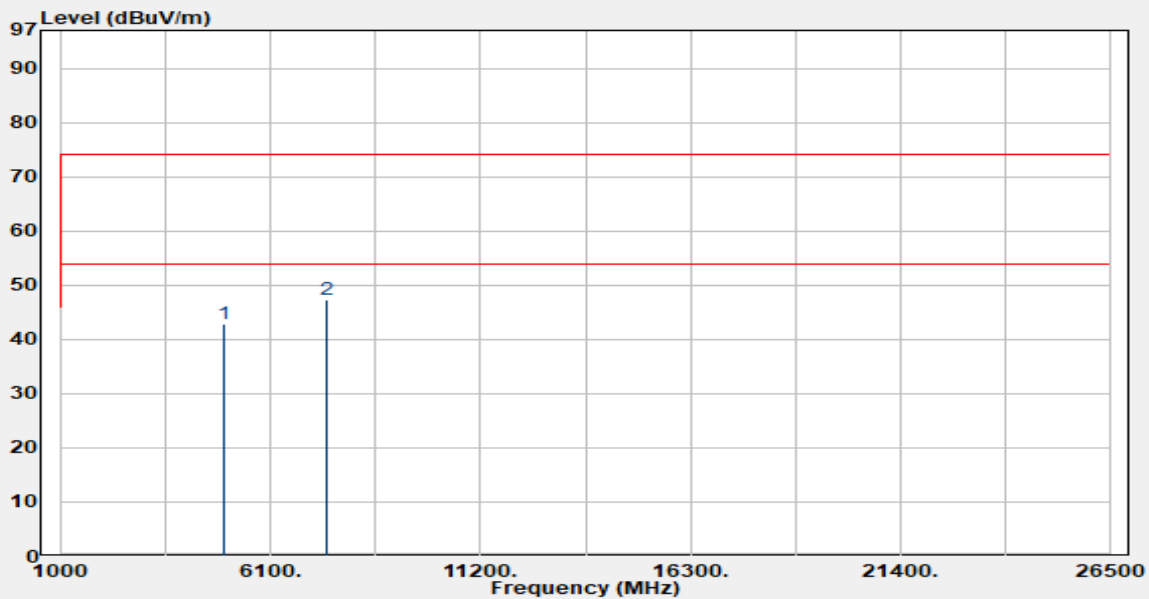
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4960.000	Average	43.97	-25.04	18.93	54.00	-35.07
7440.000	Average	46.33	-25.04	21.29	54.00	-32.71

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Report Number :TERF2304001052ER
 Operation Mode :BR
 Test Frequency :2480 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Horizontal
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.000	Peak	40.15	2.80	42.95	74.00	-31.05
7440.000	Peak	39.22	7.97	47.19	74.00	-26.81

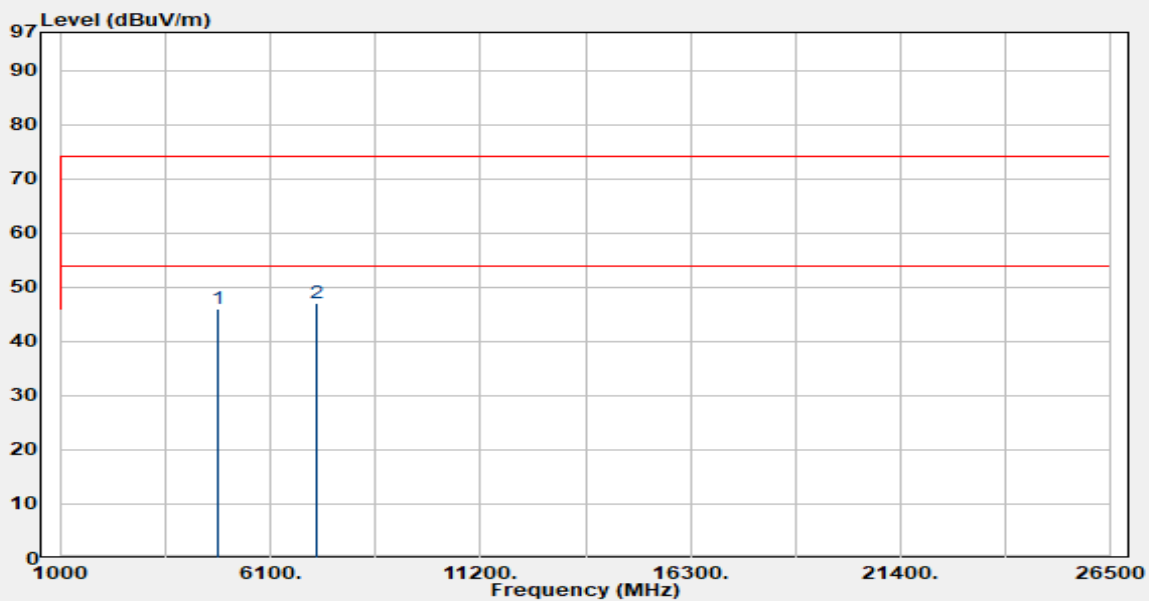
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4960.000	Average	42.95	-25.04	17.91	54.00	-36.09
7440.000	Average	47.19	-25.04	22.15	54.00	-31.85

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Report Number :TERF2304001052ER
 Operation Mode :EDR 3M
 Test Frequency :2402 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Vertical
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.000	Peak	44.03	2.10	46.13	74.00	-27.87
7206.000	Peak	39.41	7.56	46.97	74.00	-27.03

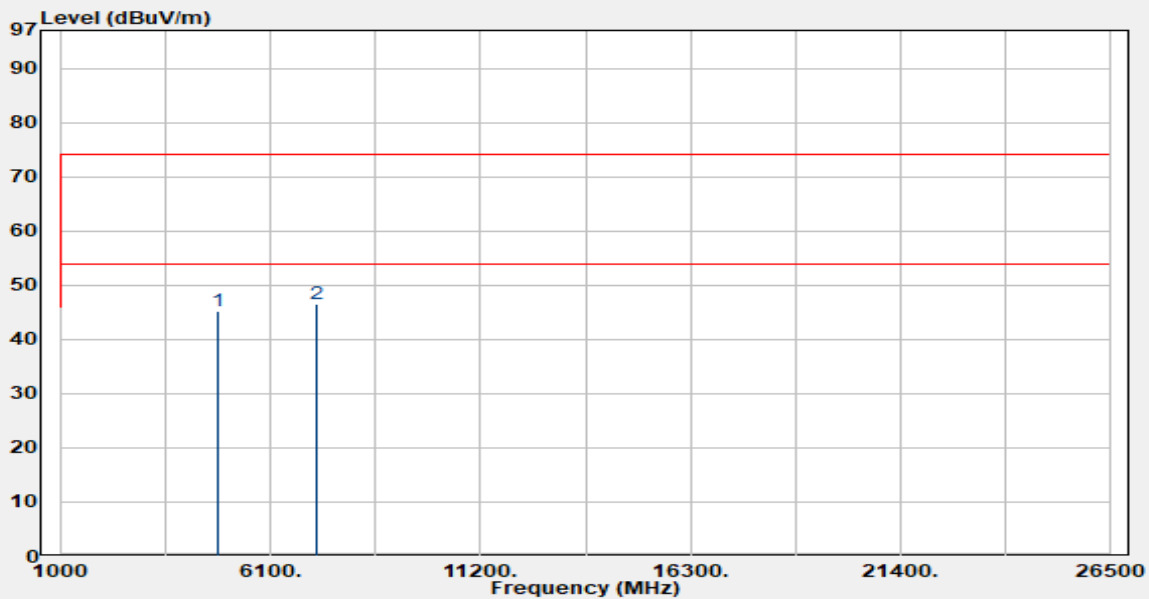
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4804.000	Average	46.13	-24.73	21.40	54.00	-32.60
7206.000	Average	46.97	-24.73	22.24	54.00	-31.76

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Report Number :TERF2304001052ER
 Operation Mode :EDR 3M
 Test Frequency :2402 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Horizontal
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.000	Peak	43.10	2.10	45.20	74.00	-28.80
7206.000	Peak	39.01	7.56	46.56	74.00	-27.44

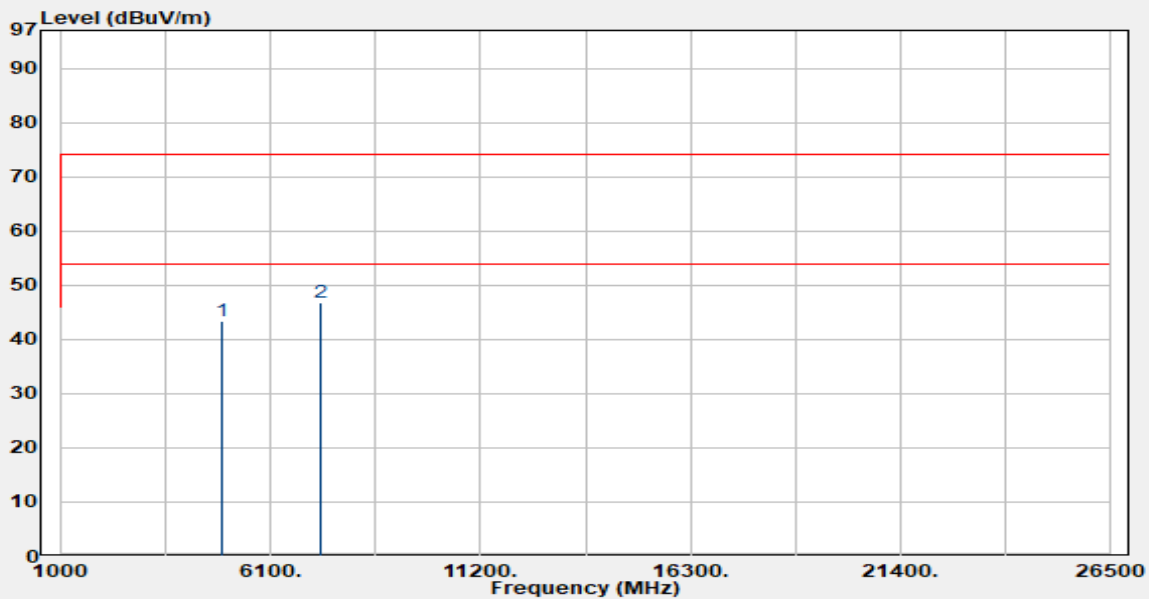
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4804.000	Average	45.20	-24.73	20.47	54.00	-33.53
7206.000	Average	46.56	-24.73	21.83	54.00	-32.17

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Report Number :TERF2304001052ER
Operation Mode :EDR 3M
Test Frequency :2441 MHz
Test Mode :Tx
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Vertical
Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4882.000	Peak	40.83	2.66	43.48	74.00	-30.52
7323.000	Peak	39.22	7.70	46.92	74.00	-27.08

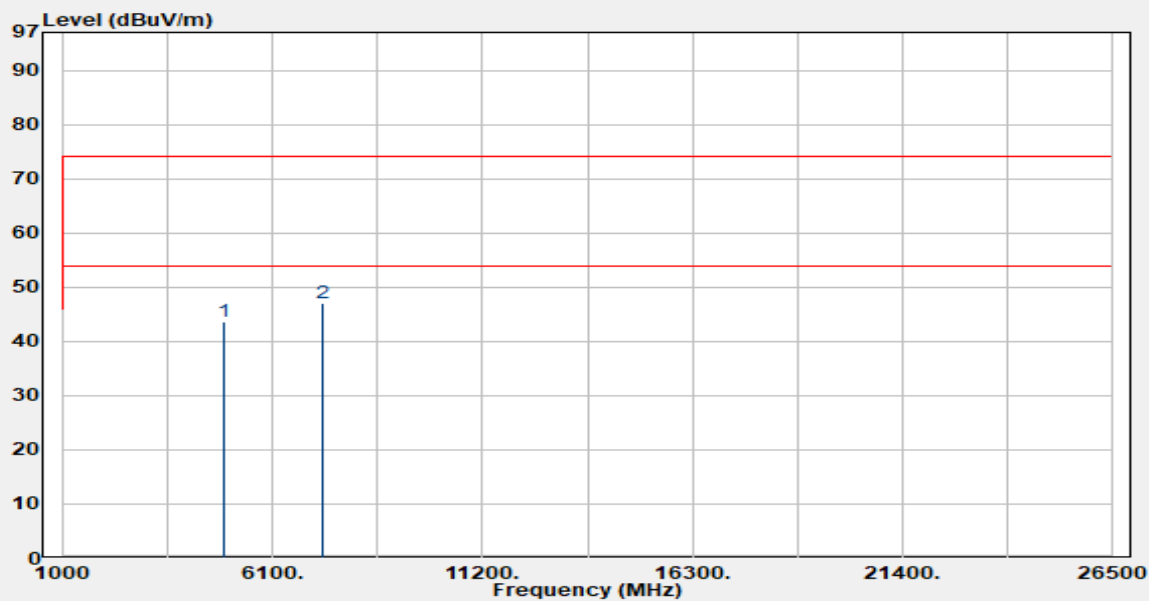
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4882.000	Average	43.48	-24.73	18.75	54.00	-35.25
7323.000	Average	46.92	-24.73	22.19	54.00	-31.81

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Report Number :TERF2304001052ER
 Operation Mode :EDR 3M
 Test Frequency :2441 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Horizontal
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4882.000	Peak	40.91	2.66	43.56	74.00	-30.44
7323.000	Peak	39.47	7.70	47.17	74.00	-26.83

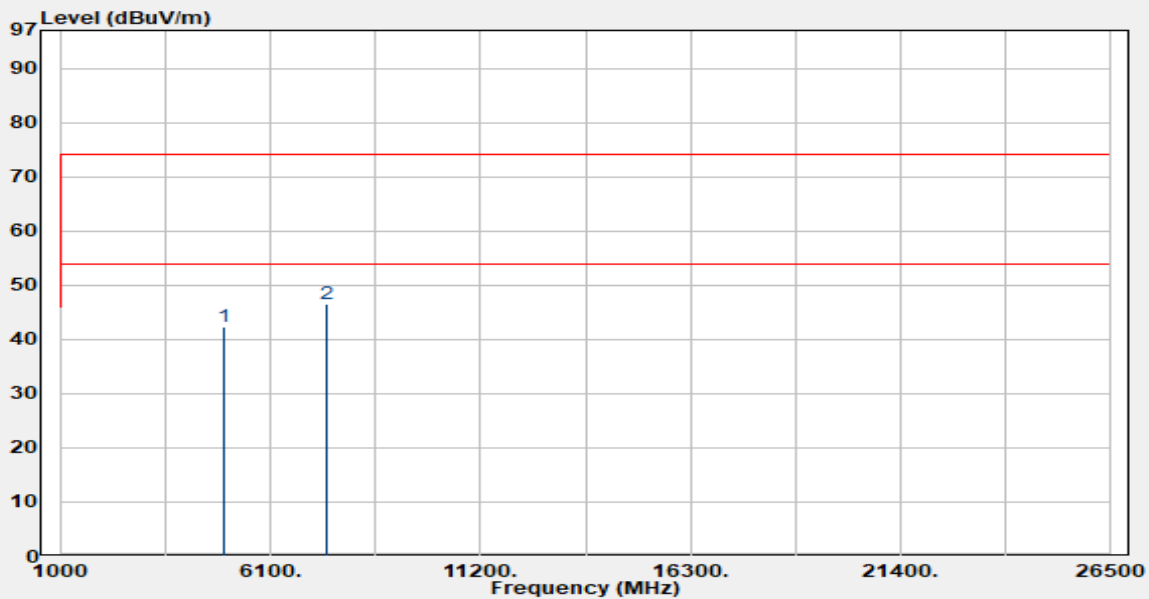
Freq. MHz	Detector Mode AV	Peak Actual FS (dBμV/m)	Duty Cycle Factor (dB)	Average Value (dBuV/m)	Average Limit@3m (dBuV/m)	Margin (dB)
4882.000	Average	43.56	-24.73	18.83	54.00	-35.17
7323.000	Average	47.17	-24.73	22.44	54.00	-31.56

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Report Number :TERF2304001052ER
Operation Mode :EDR 3M
Test Frequency :2480 MHz
Test Mode :Tx
EUT Pol :H Plane

Test Site :SAC 2
Test Date :2023-05-10
Temp./Humi. :24.3°C/59%
Antenna Pol. :Vertical
Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4960.000	Peak	39.55	2.80	42.35	74.00	-31.65
7440.000	Peak	38.43	7.97	46.40	74.00	-27.60

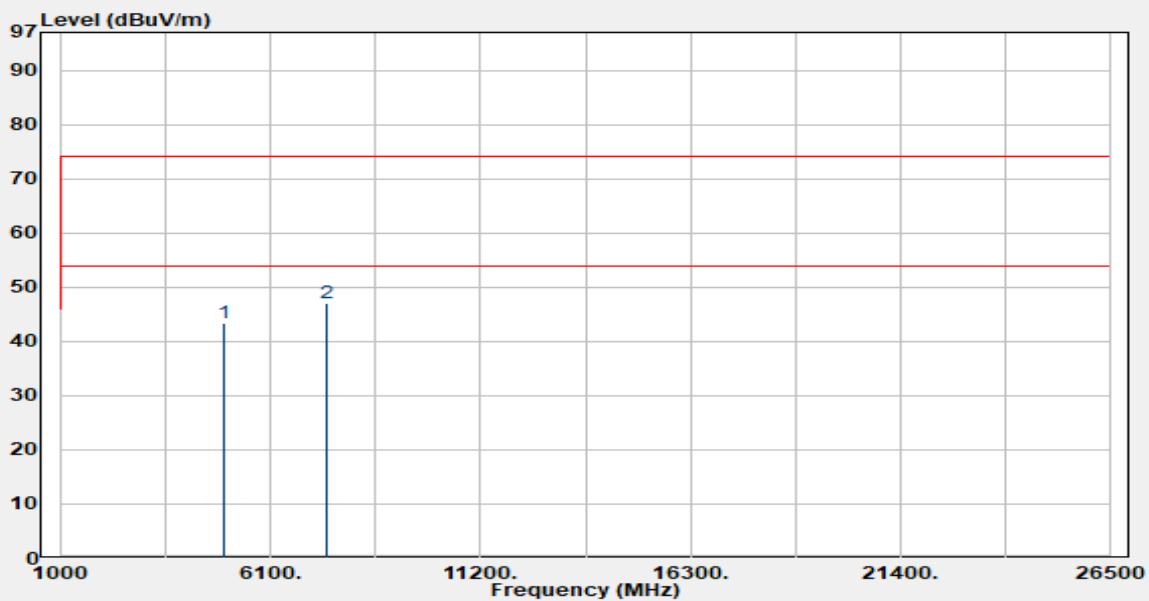
Freq. MHz	Detector Mode AV	Peak Actual FS (dB μ V/m)	Duty Cycle Factor (dB)	Average Value (dB μ V/m)	Average Limit@3m (dB μ V/m)	Margin (dB)
4960.000	Average	42.35	-24.73	17.62	54.00	-36.38
7440.000	Average	46.40	-24.73	21.67	54.00	-32.33

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Report Number :TERF2304001052ER
 Operation Mode :EDR 3M
 Test Frequency :2480 MHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC 2
 Test Date :2023-05-10
 Temp./Humi. :24.3°C/59%
 Antenna Pol. :Horizontal
 Engineer :Ricky Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.000	Peak	40.53	2.80	43.33	74.00	-30.67
7440.000	Peak	38.96	7.97	46.94	74.00	-27.06

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)
4960.000	Average	43.33	-24.73	18.60	54.00	-35.40
7440.000	Average	46.94	-24.73	22.21	54.00	-31.79

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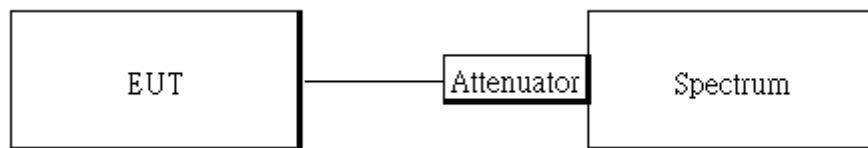
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10 TIME OF OCCUPANCY (DWELL TIME)

10.1 Standard Applicable

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

10.2 Test Setup



10.3 Measurement Procedure

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

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

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

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

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

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

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

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台灣檢驗科技股份有限公司

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10.4 Measurement Result

GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
Mid	DH1	121.60	400ms
	DH3	262.40	400ms
	DH5	307.20	400ms

 $\pi/4$ DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
Mid	2DH1	124.80	400ms
	2DH3	262.40	400ms
	2DH5	307.20	400ms

8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
Mid	3DH1	123.20	400ms
	3DH3	262.40	400ms
	3DH5	307.20	400ms

GFSK (1Mbps):

CH Mid	DH1 time slot	=	0.380	*	(1600/2/79)	*	31.6	=	121.60 (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 slot	=	0.390	*	(1600/2/79)	*	31.6	=	124.80 (ms)
	2DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	2DH5 time slot	=	2.880	*	(1600/6/79)	*	31.6	=	307.20 (ms)

8-DPSK (3Mbps):

CH Mid	3DH1 time slot	=	0.385	*	(1600/2/79)	*	31.6	=	123.20 (ms)
	3DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	3DH5 time slot	=	2.880	*	(1600/6/79)	*	31.6	=	307.20 (ms)

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

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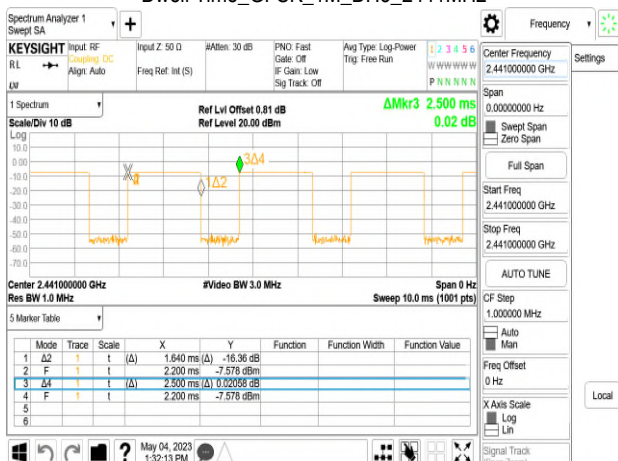
Dwell Time_GFSK_1M_DH1_2441MHz



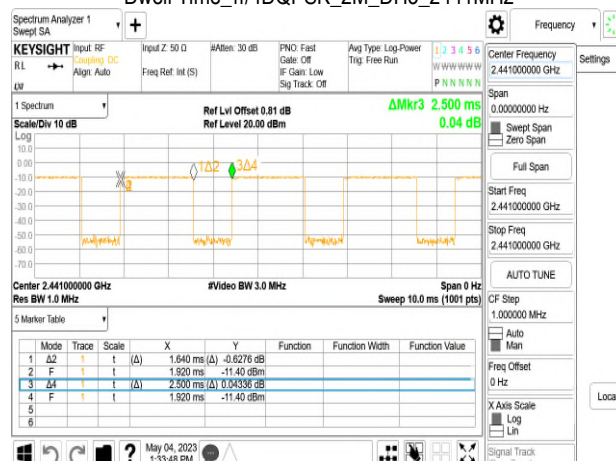
Dwell Time_π/4DQPSK_2M_DH1_2441MHz



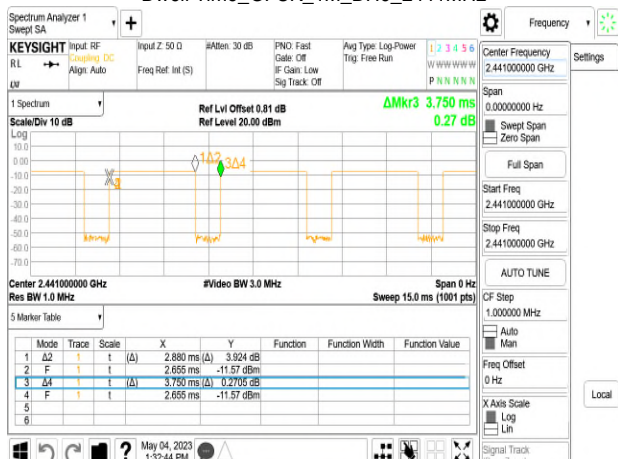
Dwell Time_GFSK_1M_DH3_2441MHz



Dwell Time_π/4DQPSK_2M_DH3_2441MHz



Dwell Time_GFSK_1M_DH5_2441MHz



Dwell Time_π/4DQPSK_2M_DH5_2441MHz

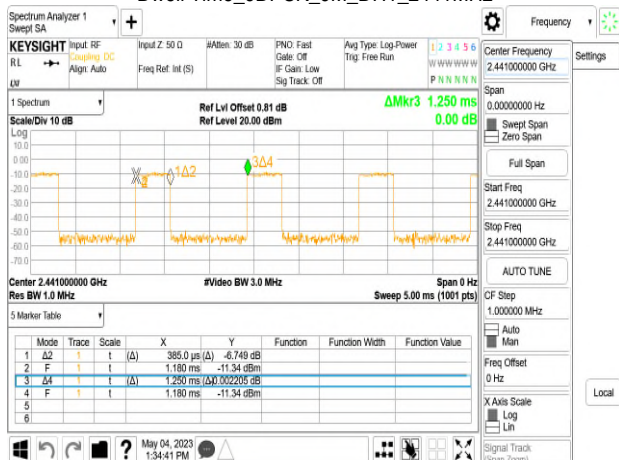


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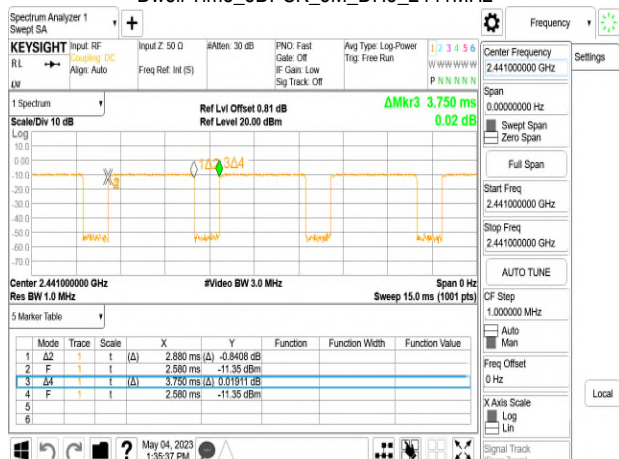
Dwell Time_8DPSK_3M_DH1_2441MHz



Dwell Time_8DPSK_3M_DH3_2441MHz



Dwell Time_8DPSK_3M_DH5_2441MHz



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~ End of Report ~

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