

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



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**Product Name:** 2.4G DONGLE

**Brand Name:** Opro9

**Model No.:** FHH128-01-001D

**Model Difference:** N/A

**Report Number:** TERF2206000854ER

**FCC ID** 2AA5C-FHH128D

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

**Date of Test:** June 10, 2022~July 05, 2022

**Issue Date:** July 13, 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 §15.249.

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
TERF2206000854ER	00	Original.	March 10, 2023	Susan Lin	
TERF2206000854ER	01	Update applicant address, antenna type and test configuration	July 05, 2023	Susan Lin	*
TERF2206000854ER	02	Update conduction control unit	July 13, 2023	Susan Lin	*

**Note:**

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

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## 1 GENERAL INFORMATION

### 1.1 Product Description

Product Name:	2.4G DONGLE
Brand Name:	Opro9
Model No.:	FHH128-01-001D
Model Difference:	N/A
Hardware Version:	N/A
Firmware Version:	N/A
EUT Series No.:	FHH12801001DS
Power Supply:	5 Vdc
Test Software (Name/Version):	Default

### 1.2 RF Specification

Radio Technology:	SRD 2.4G
Frequency Range:	2405 – 2470MHz
Channel number:	15 channels
Modulation type:	GFSK
Transmit Power:	74.52 dBuV/m

### 1.3 Antenna Designation

Antenna Type	Freq. (MHz)	Peak Antenna Gain (dBi)
PCB sink antenna	2405-2470	1.5

#### Note:

1. Antenna information is provided by the applicant.

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## 1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.249

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

## 1.6 Special Accessories

There are no special accessories used while test was conducted.

## 1.7 Equipment Modifications

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. 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:

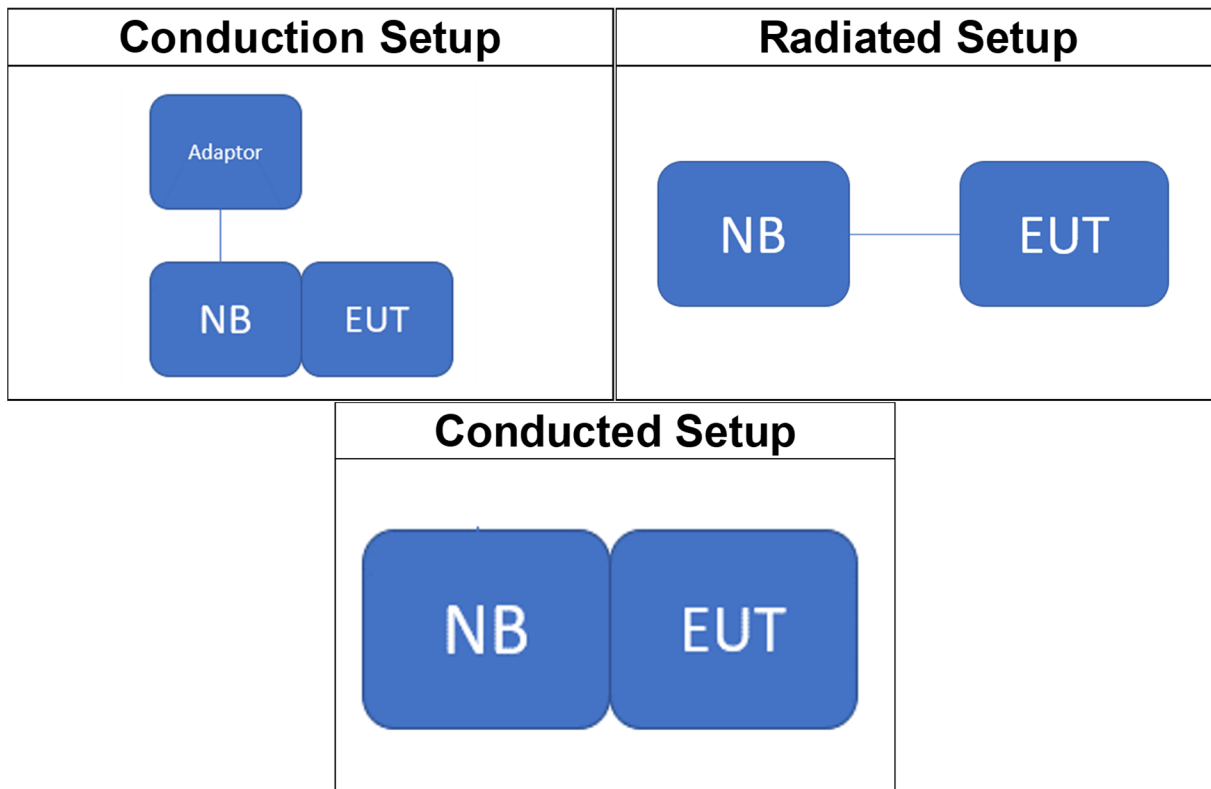
The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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## 2.5 Test Configuration



## 2.6 Control Unit(s)

Conducted Emission Test Site: Conduction 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Software	audix	e3	Ver. 9 210322	N.C.R	N.C.R
Notebook	Lenovo	L480	PF-1EZRAG	N/A	N/A
Adapter	Lenovo	ADLX45YLC3A	N/A	N/A	N/A
Opro9 PlayRemote	Opro9	FHH128-01-001	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	L480	PF-1EZRAG	N/A	N/A
Test Software	Audix	e3	Ver. 9.210322	N.C.R	N.C.R
USB male to female cable	MAGIC	UF3AMAF 018K	N/A	N/A	N/A

Conducted Emission Test Site: Conducted 2					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Software	SGS	Radio Test Software	Ver. 21	N.C.R	N.C.R
Notebook	Lenovo	L440	PF-1S9NT5	N/A	N/A

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result	Note
§15.207(a)	AC Power Line Conducted Emission	Compliant	N
§15.249(a)(e) §15.249(a), 15.209	Radiated Emission	Compliant	
§15.215(c)	Emission Bandwidth	Compliant	N
§15.203	Antenna Requirement	Compliant	N

**Note**

1. N/S Indicates whether item(s) being newly tested [N] or spot checked [S].
2. Items other than newly tested [N] are leveraged from test report TERF2206000857ER.

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operating Frequencies

Channel	Frequency
1	2405
2	2409
3	2413
4	2417
5	2422
6	2426
7	2430
8	2435
9	2440
10	2445
11	2450
12	2455
13	2460
14	2465
15	2470

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## 5 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.

Note: When test before power-on, different signal line connections can transmit different frequency signals.

### RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED FREQUENCY	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
SRD 2.4G	1~15	2435	GFSK	2	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED FREQUENCY	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
SRD 2.4G	1~15	2405, 2435, 2470	GFSK	2	MAIN

**Note:** 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.

### ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED FREQUENCY	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
SRD 2.4G	1~15	2405, 2435, 2470	GFSK	2	MAIN

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## 6 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.34 dB
Emission Bandwidth	+/- 1.53 Hz
Undesignable radiated emission measurement	+/- 1.68 dB
Temperature	+/- 0.4 °C
Humidity	+/- 3.5 %
DC / AC Power Source	+/- 1 %

Radiated Spurious Emission Measurement Uncertainty			
Polarization: Vertical	+/-	2.57 dB	9kHz~30MHz
	+/-	4.85 dB	30MHz - 1000MHz
	+/-	4.45 dB	1GHz - 18GHz
	+/-	4.24 dB	18GHz - 40GHz
Polarization: Horizontal	+/-	2.57 dB	9kHz~30MHz
	+/-	4.37 dB	30MHz - 1000MHz
	+/-	4.45 dB	1GHz - 18GHz
	+/-	4.24 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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## 7 MEASUREMENT EQUIPMENT USED

### 7.1 Emission from 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	02/17/2022	02/16/2023
LISN	SCHWARZBECK	NSLK 8127	01040	08/10/2021	08/09/2022
LISN	SCHWARZBECK	NSLK 8127	01041	10/25/2021	10/24/2022
Coaxial Cables	N/A	Coaxial Cable	161207	12/07/2021	12/06/2022

### 7.2 Conducted Measurement

Conducted Emission Test Site: Conducted 2					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY60242081	09/30/2021	09/29/2022
Power Meter	Anritsu	ML2496A	2132007	11/12/2021	11/11/2022
Power Sensor	Anritsu	MA2411B	1911392	09/21/2021	09/20/2022
DC Block	Mini-Circuits	BLK-18-S+	1	12/14/2021	12/13/2022

### 7.3 Radiated Measurement

Radiated Emission Test Site: SAC 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Horn Antenna	SCHWARZBECK	BBHA9120D	D803	12/20/2021	12/19/2022
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	01/03/2022	01/02/2023
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/16/2021	12/15/2022
Site Cal	SGS	SAC 1	N/A	01/01/2022	12/31/2022
Loop Antenna	ETS.LINDGREN	6502	148045	09/29/2021	09/28/2022
Spectrum Analyzer	Agilent	E4446A	MY51100003	10/26/2021	10/25/2022
EMI Test Receiver	R&S	ESCI 7	100759	08/26/2021	08/25/2022
Pre-Amplifier	EMC Instruments	EMC184045B	980135	10/27/2021	10/26/2022
Pre-Amplifier	HP	8449B	3008A01973	12/16/2021	12/15/2022
Pre-Amplifier	HP	8447D	2944A09469	12/16/2021	12/15/2022
Bandreject Filter 2400-2483.5	EWT	EWT-14-0166	M1	12/14/2021	12/13/2022
3.2GHz High Pass Filter	WI	WHKX10-2624-80SS	3	12/14/2021	12/13/2022
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	EMC 104-SM-SM-2000	160123	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY2630/2	12/16/2021	12/15/2022
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY22962/2	12/16/2021	12/15/2022

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## 8 CONDUCTED EMISSION TEST

### 8.1 Applicable Standard:

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

Frequency range MHz	Limits (dBuV)	
	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

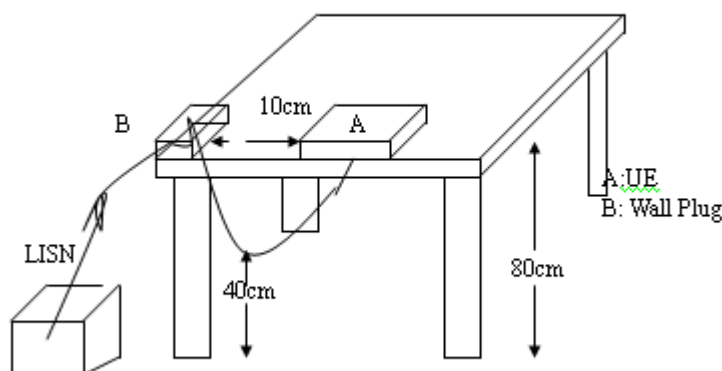
Note

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.

### 8.2 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.

### 8.3 Test Setup



### 8.4 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

### 8.5 Measurement Result:

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

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

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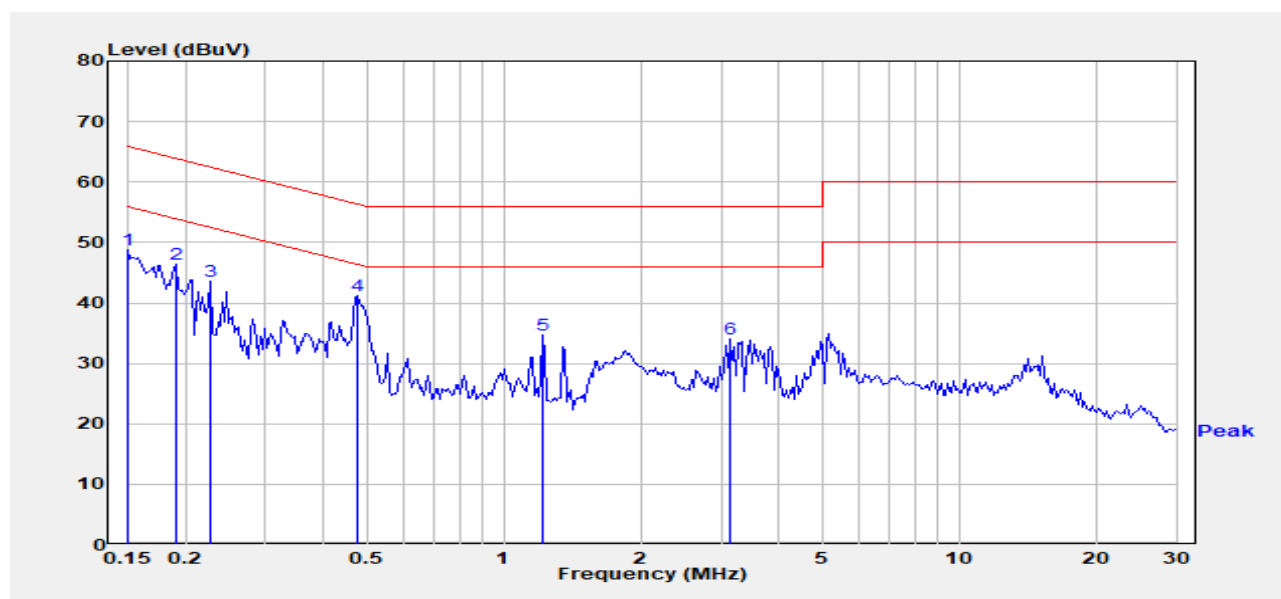
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number :TERF2206000854ER  
Test Mode :Operation Mode (SRD)  
Power :120V/60Hz  
Probe :L  
Note: :

Test Site :Conduction 1  
Test Date :2022-06-20  
Temp./Humi. :24.8/63  
Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V	Limit dB $\mu$ V	Margin dB
0.150	Peak	48.67	0.12	48.79	66.00	-17.21
0.191	Peak	46.38	0.12	46.50	63.98	-17.48
0.227	Peak	43.47	0.11	43.58	62.57	-18.99
0.476	Peak	41.12	0.03	41.15	56.41	-15.26
1.223	Peak	34.54	0.06	34.61	56.00	-21.39
3.140	Peak	33.49	0.57	34.06	56.00	-21.94

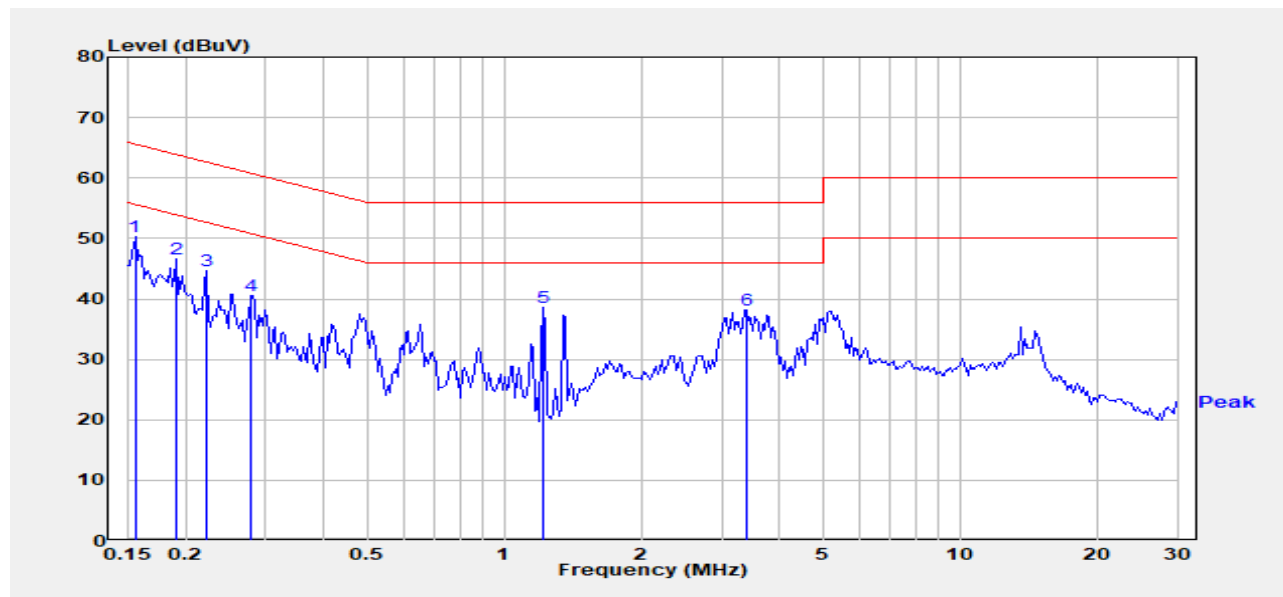
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Report Number :TERF2206000854ER  
 Test Mode :Operation Mode (SRD)  
 Power :120V/60Hz  
 Probe :N  
 Note: :

Test Site :Conduction 1  
 Test Date :2022-06-20  
 Temp./Humi. :24.8/63  
 Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.155	Peak	50.21	0.14	50.35	65.74	-15.38
0.191	Peak	46.34	0.27	46.61	63.98	-17.36
0.222	Peak	44.43	0.26	44.69	62.74	-18.05
0.277	Peak	40.46	0.18	40.63	60.90	-20.26
1.223	Peak	38.57	0.06	38.64	56.00	-17.36
3.417	Peak	38.07	0.17	38.24	56.00	-17.76

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## 9 RADIATED EMISSION TEST

### 9.1 Applicable Standard

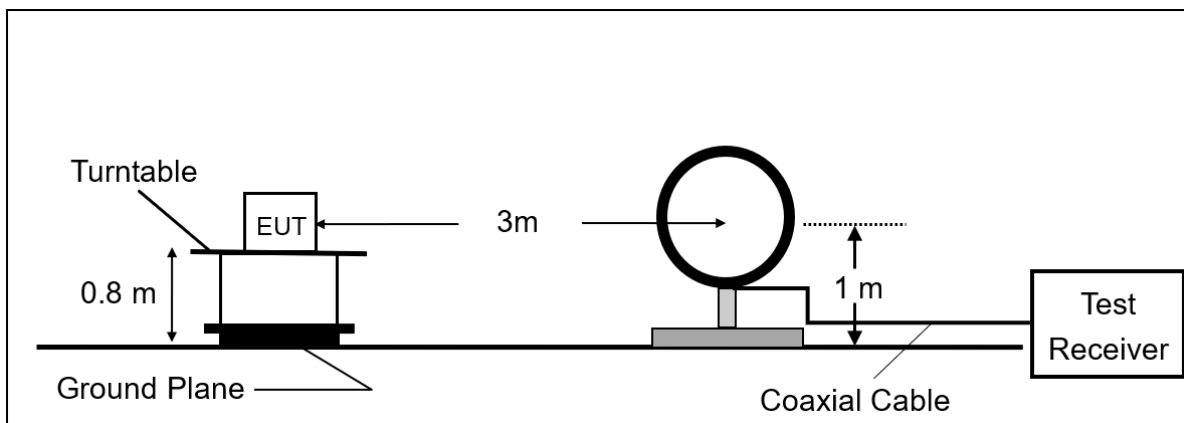
1. Only spurious emissions are permitted in any of the frequency bands listed in §15.205.
2. The field strength of fundamental and harmonic emissions, measured at 3 m, shall not exceed 50 mV/m and 0.5 mV/m respectively.
3. Emissions radiated outside of the specified frequency bands, except for harmonic emissions, shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in §15.209, whichever is less stringent.

### 9.2 Measurement Procedure

1. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

### 9.3 Test Setup

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

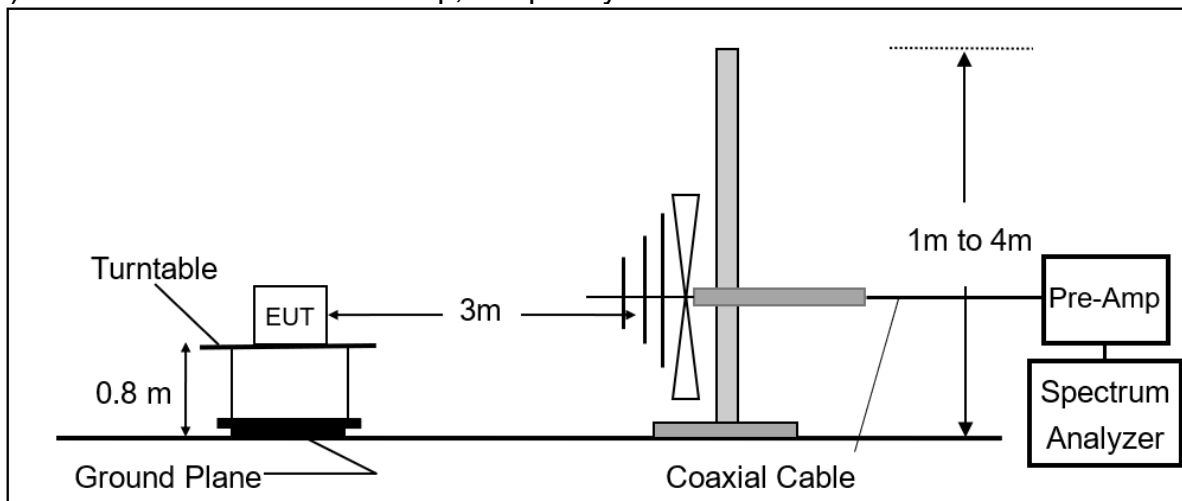


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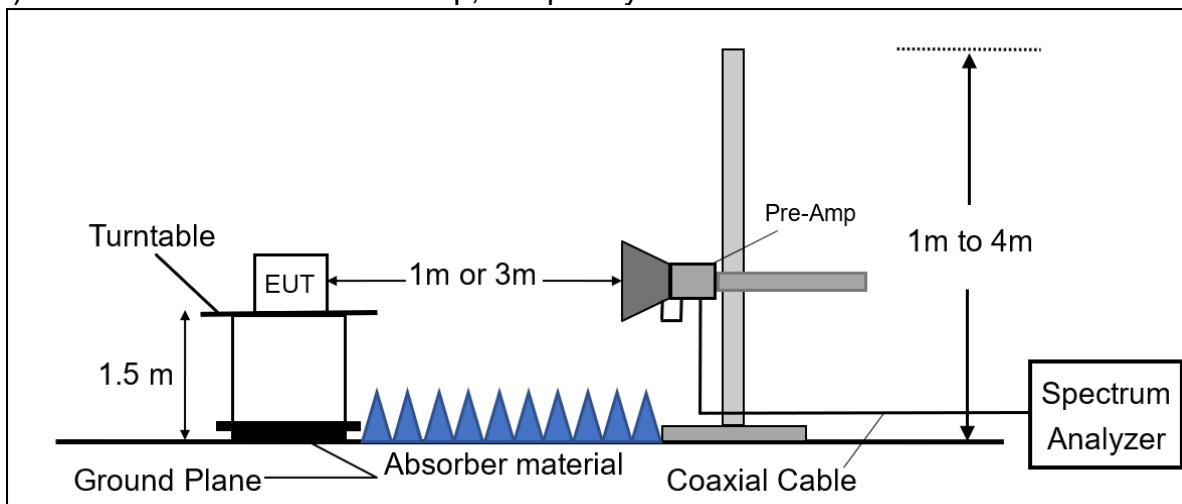
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(B) Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



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



## 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	

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

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## 9.5 Measurement Result

### 9.5.1 Field Strength of the Fundamental Signal

Report Number :TERF2206000857ER

Test Site :SAC 1

Operation Mode :SRD

Test Date :2022-07-01

Test Frequency :2405 MHz

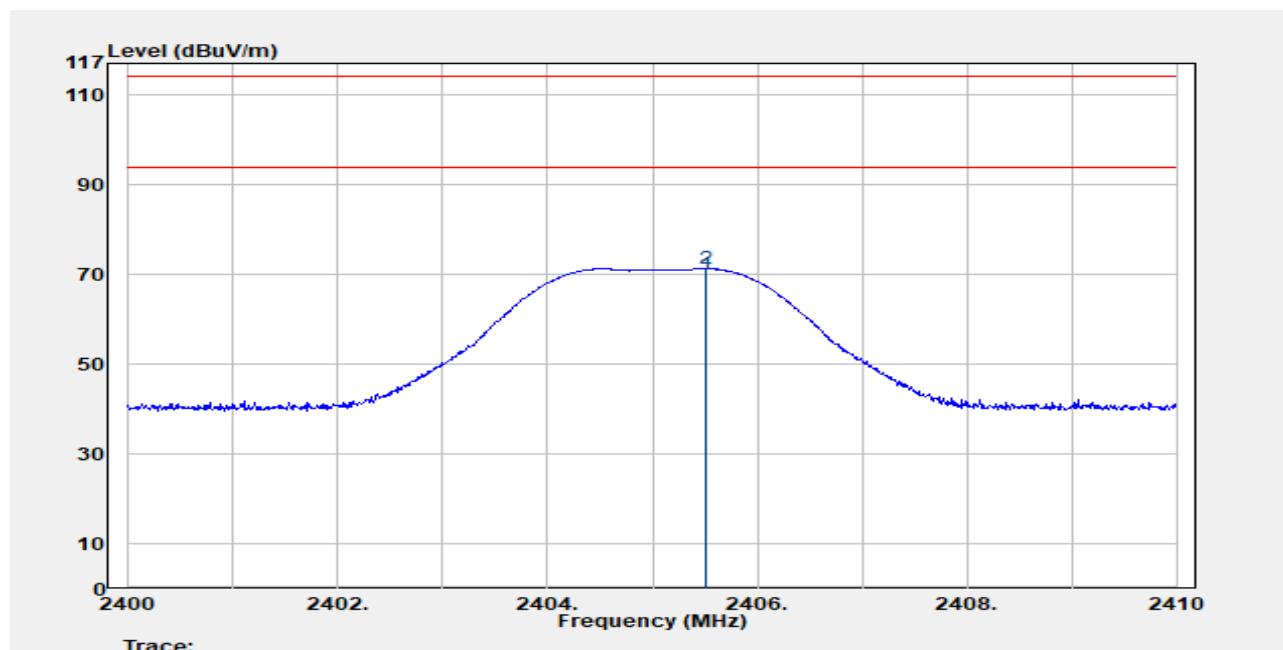
Temp./Humi. :24.8/59

Test Mode :Main

Antenna Pol. :Vertical

EUT Pol :H Plane

Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2405.51	Average	69.59	0.57	70.16	94.00	-23.84
2405.51	Peak	70.80	0.57	71.37	114.00	-42.63

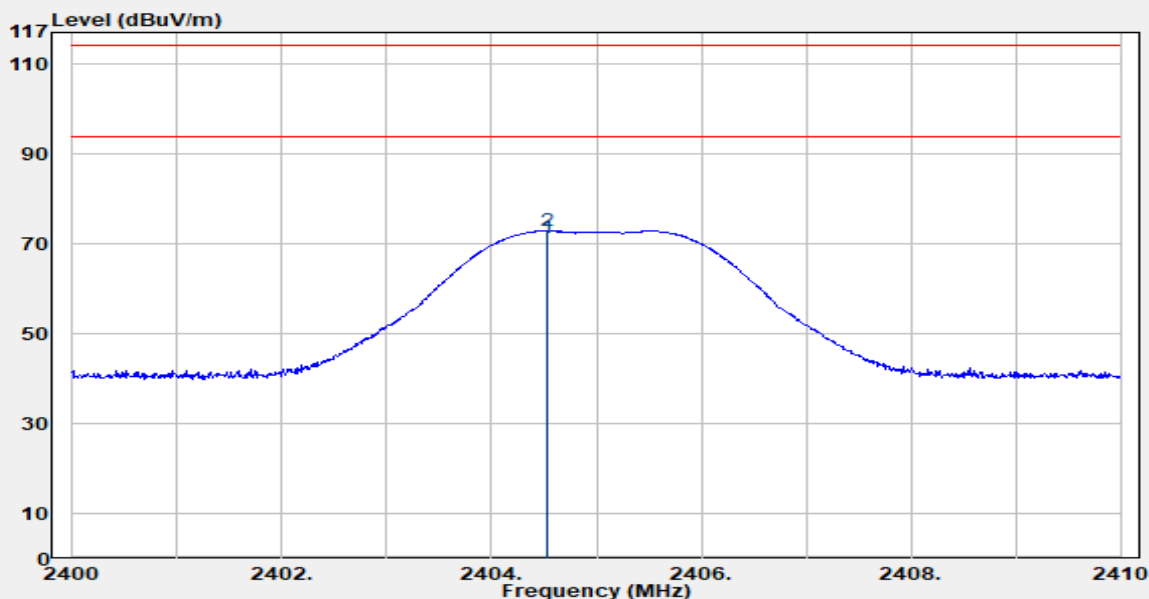
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Report Number :TERF2206000857ER  
 Operation Mode :SRD  
 Test Frequency :2405 MHz  
 Test Mode :Main  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2022-07-01  
 Temp./Humi. :24.8/59  
 Antenna Pol. :Horizontal  
 Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2404.53	Average	70.87	0.58	71.45	94.00	-22.55
2404.53	Peak	72.34	0.58	72.92	114.00	-41.08

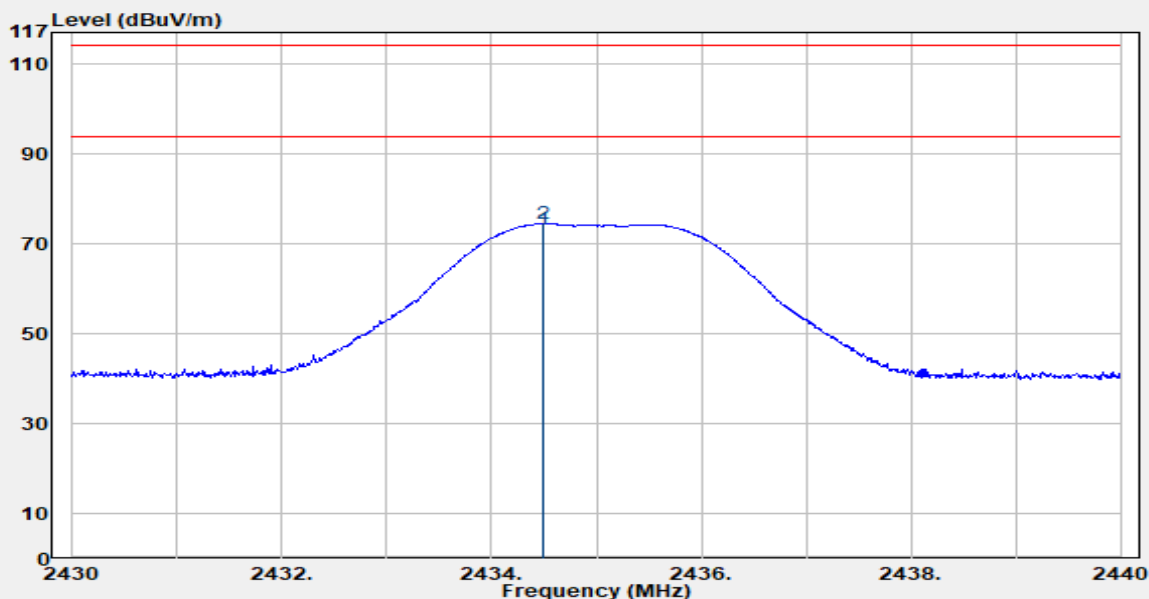
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Report Number :TERF2206000857ER  
Operation Mode :SRD  
Test Frequency :2435 MHz  
Test Mode :Main  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2022-07-01  
Temp./Humi. :24.8/59  
Antenna Pol. :Vertical  
Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
2434.49	Average	72.82	0.35	73.17	94.00	-20.83
2434.49	Peak	74.17	0.35	74.52	114.00	-39.48

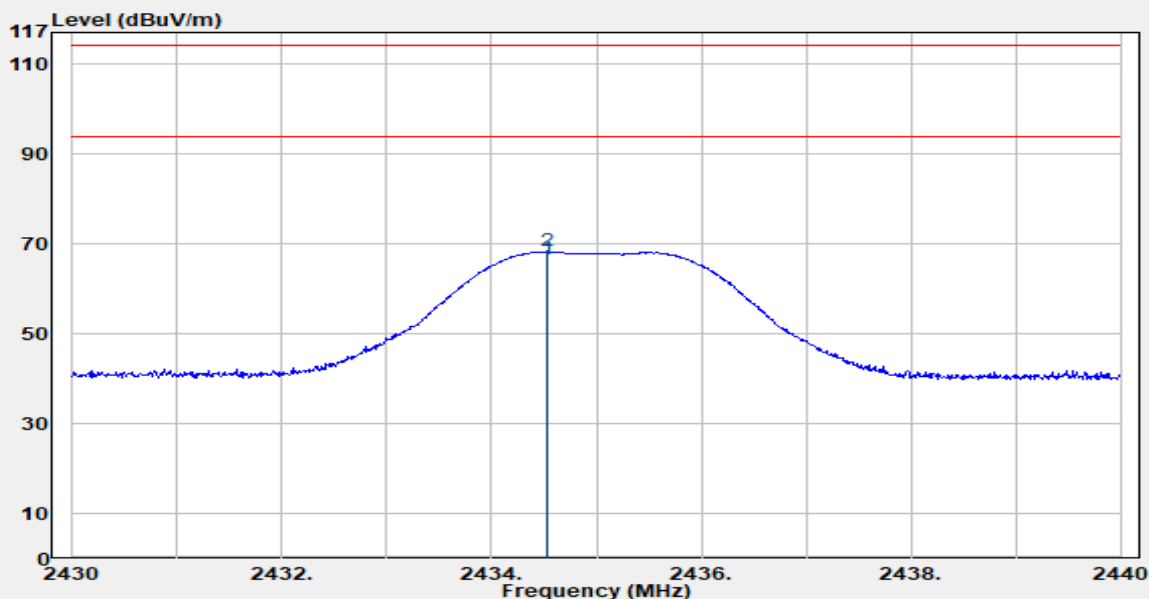
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Report Number :TERF2206000857ER  
 Operation Mode :SRD  
 Test Frequency :2435 MHz  
 Test Mode :Main  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2022-07-01  
 Temp./Humi. :24.8/59  
 Antenna Pol. :Horizontal  
 Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
2434.53	Average	66.30	0.35	66.65	94.00	-27.35
2434.53	Peak	68.03	0.35	68.37	114.00	-45.63

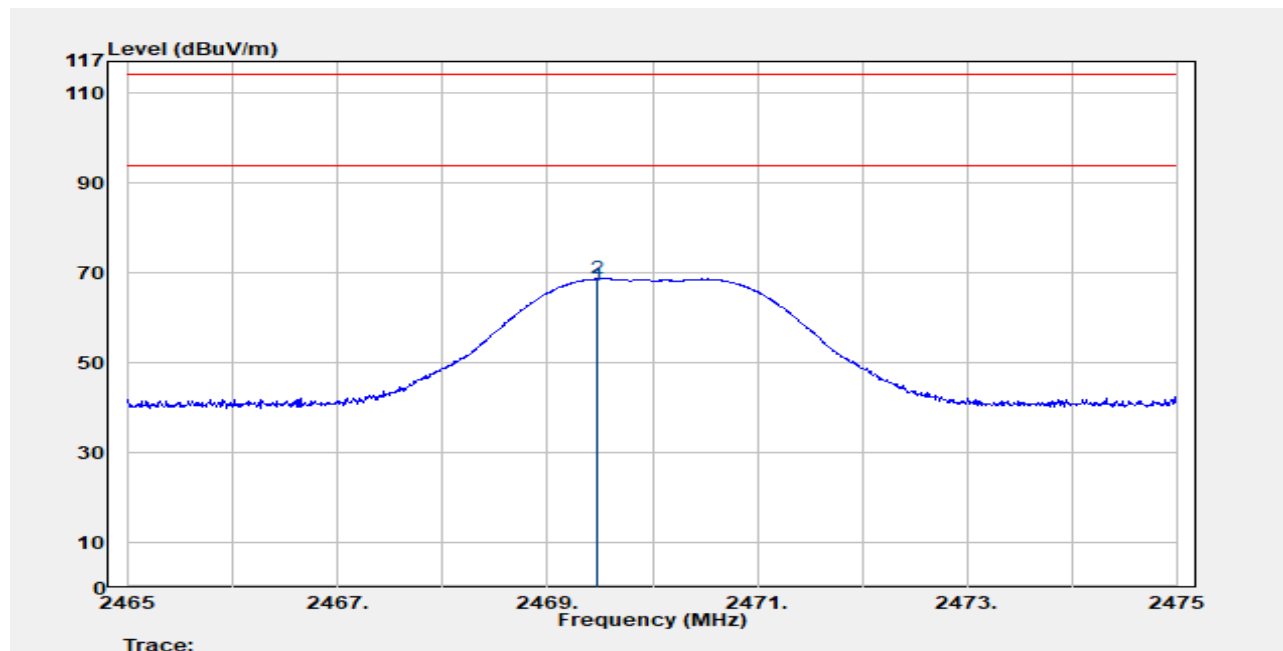
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Report Number :TERF2206000857ER  
Operation Mode :SRD  
Test Frequency :2470 MHz  
Test Mode :Main  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2022-07-01  
Temp./Humi. :24.8/59  
Antenna Pol. :Vertical  
Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2469.48	Average	66.98	0.34	67.32	94.00	-26.68
2469.48	Peak	68.41	0.34	68.75	114.00	-45.25

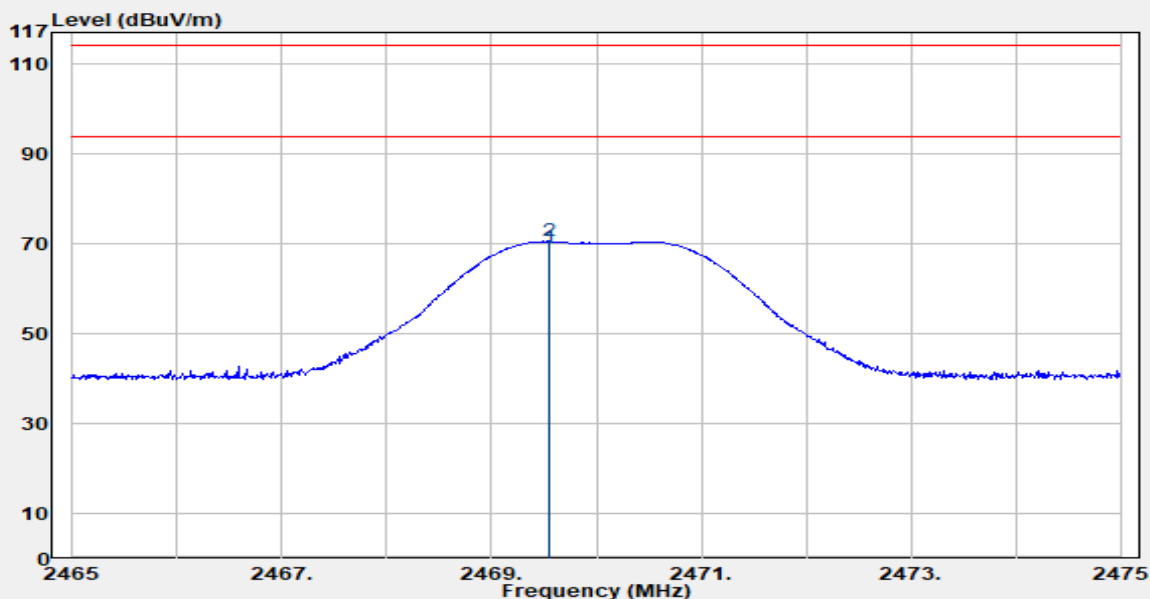
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Report Number :TERF2206000857ER  
Operation Mode :SRD  
Test Frequency :2470 MHz  
Test Mode :Main  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2022-07-01  
Temp./Humi. :24.8/59  
Antenna Pol. :Horizontal  
Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
2469.55	Average	68.92	0.34	69.26	94.00	-24.74
2469.55	Peak	70.25	0.34	70.59	114.00	-43.41

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## 9.5.2 Restricted bands around fundamental frequency

Report Number :TERF2206000857ER

Test Site :SAC 1

Operation Mode :SRD

Test Date :2022-07-01

Test Frequency :2405 MHz

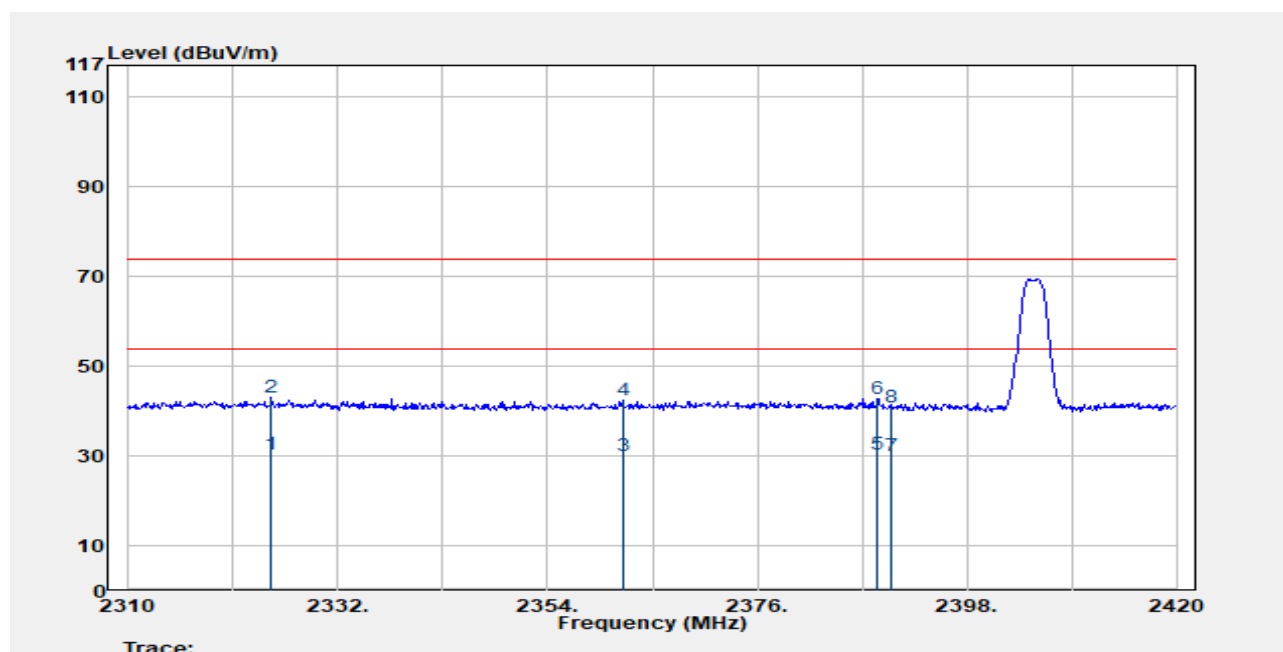
Temp./Humi. :24.8/59

Test Mode :Bandedge

Antenna Pol. :Vertical

EUT Pol :H Plane

Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2324.96	Average	30.06	0.51	30.57	54.00	-23.43
2324.96	Peak	42.69	0.51	43.20	74.00	-30.80
2361.92	Average	29.68	0.55	30.23	54.00	-23.77
2361.92	Peak	41.92	0.55	42.47	74.00	-31.53
2388.65	Average	29.69	0.60	30.29	54.00	-23.71
2388.65	Peak	42.28	0.60	42.88	74.00	-31.12
2390.00	Average	29.55	0.60	30.15	54.00	-23.85
2390.00	Peak	40.37	0.60	40.97	74.00	-33.03

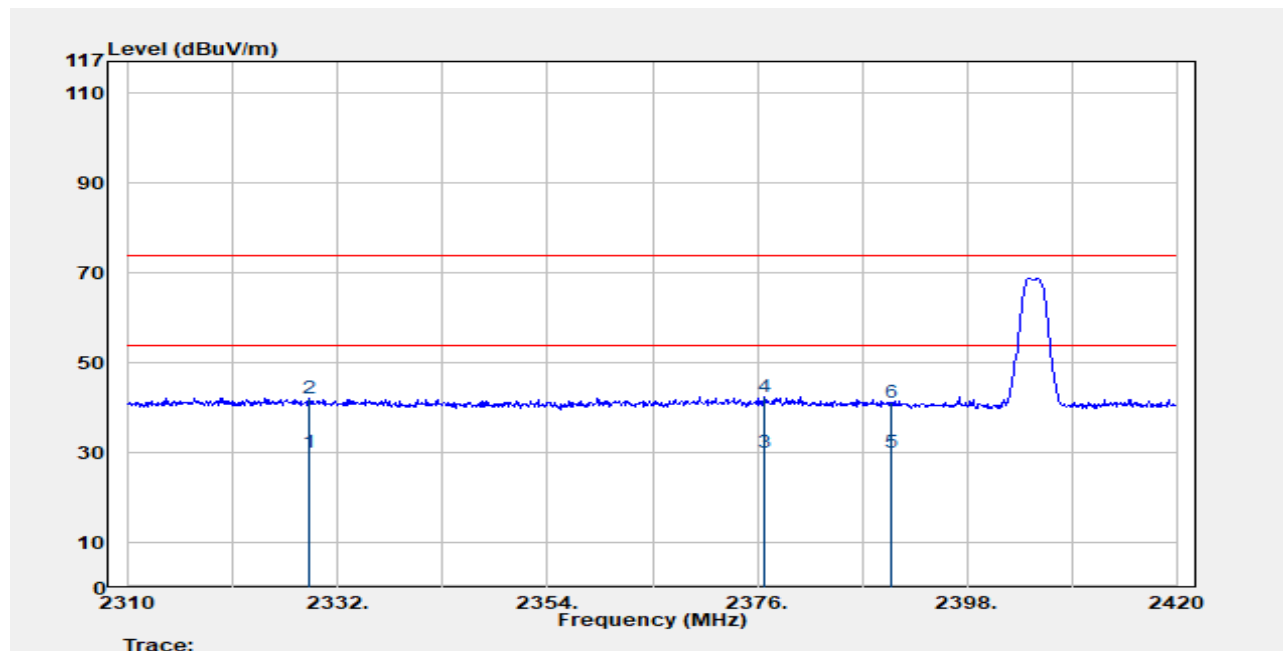
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Report Number :TERF2206000857ER  
 Operation Mode :SRD  
 Test Frequency :2405 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2022-07-01  
 Temp./Humi. :24.8/59  
 Antenna Pol. :Horizontal  
 Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2329.03	Average	29.72	0.51	30.23	54.00	-23.77
2329.03	Peak	41.53	0.51	42.05	74.00	-31.95
2376.66	Average	29.70	0.58	30.28	54.00	-23.72
2376.66	Peak	41.98	0.58	42.56	74.00	-31.44
2390.00	Average	29.41	0.60	30.01	54.00	-23.99
2390.00	Peak	40.53	0.60	41.13	74.00	-32.87

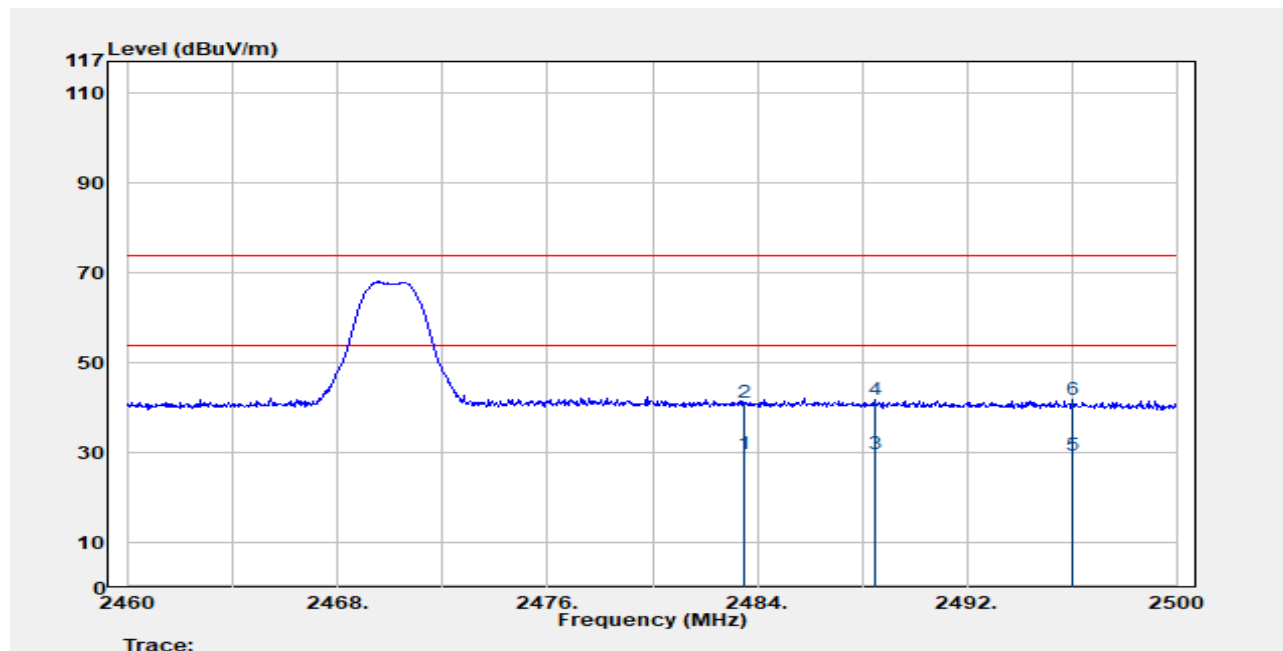
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Report Number :TERF2206000857ER  
 Operation Mode :SRD  
 Test Frequency :2470 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2022-07-01  
 Temp./Humi. :24.8/59  
 Antenna Pol. :Vertical  
 Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.50	Average	29.47	0.43	29.90	54.00	-24.10
2483.50	Peak	40.74	0.43	41.17	74.00	-32.83
2488.52	Average	29.40	0.46	29.86	54.00	-24.14
2488.52	Peak	41.46	0.46	41.92	74.00	-32.08
2496.04	Average	29.11	0.50	29.61	54.00	-24.39
2496.04	Peak	41.22	0.50	41.72	74.00	-32.28

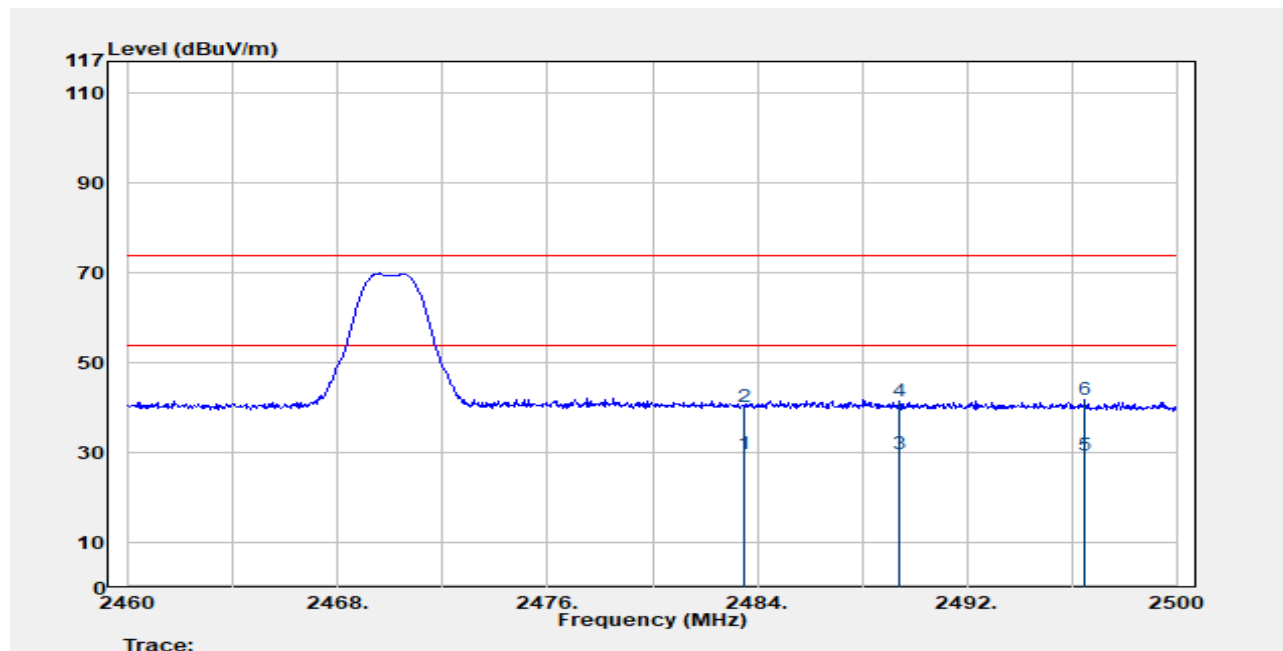
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Report Number :TERF2206000857ER  
 Operation Mode :SRD  
 Test Frequency :2470 MHz  
 Test Mode :Bandedge  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2022-07-01  
 Temp./Humi. :24.8/59  
 Antenna Pol. :Horizontal  
 Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.50	Average	29.47	0.43	29.90	54.00	-24.10
2483.50	Peak	39.76	0.43	40.18	74.00	-33.82
2489.40	Average	29.23	0.46	29.69	54.00	-24.31
2489.40	Peak	41.22	0.46	41.68	74.00	-32.32
2496.52	Average	29.03	0.50	29.53	54.00	-24.47
2496.52	Peak	41.37	0.50	41.87	74.00	-32.13

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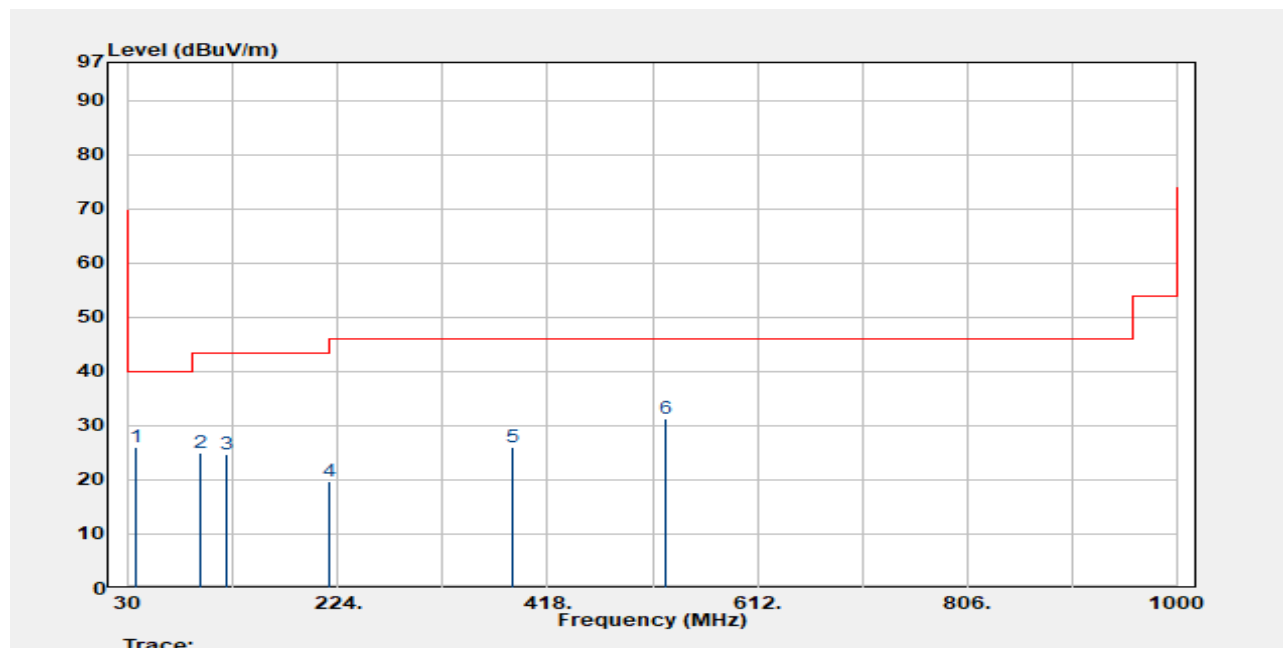
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## 9.5.3 Radiated Spurious Emission Measurement Result

Report Number :TERF2206000857ER  
 Operation Mode :SRD  
 Test Frequency :2435 MHz  
 Test Mode :Tx  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2022-07-01  
 Temp./Humi. :24.8/59  
 Antenna Pol. :Vertical  
 Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
36.79	Peak	35.27	-9.13	26.14	40.00	-13.86
95.96	Peak	38.84	-13.93	24.90	43.50	-18.60
120.21	Peak	36.48	-11.70	24.78	43.50	-18.72
216.24	Peak	33.56	-13.81	19.75	46.00	-26.25
385.02	Peak	33.36	-7.45	25.91	46.00	-20.09
526.64	Peak	36.55	-5.38	31.17	46.00	-14.83

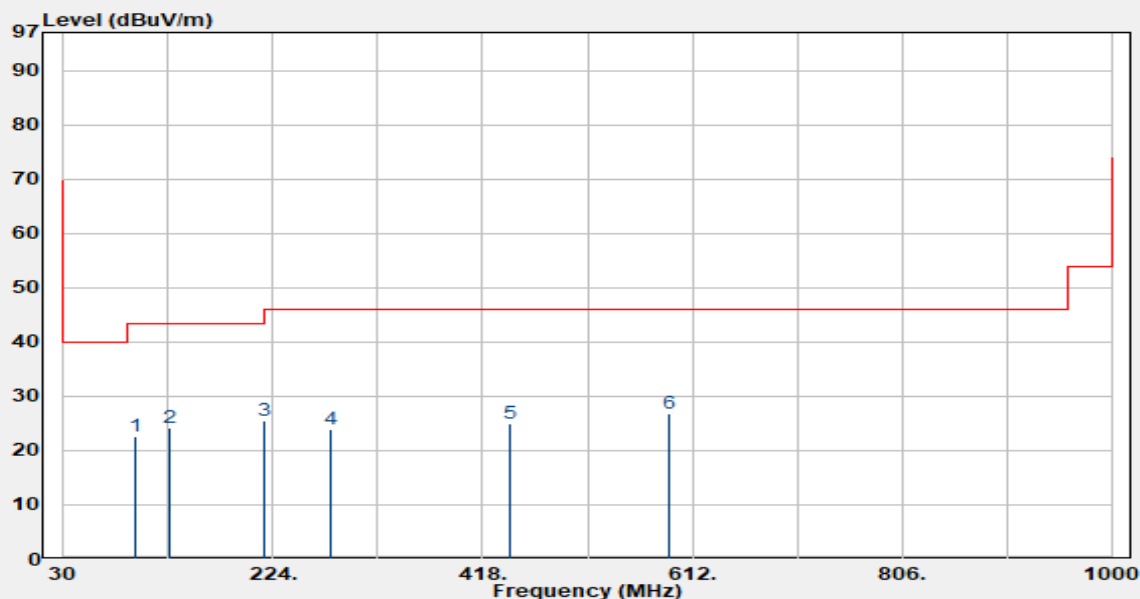
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Report Number :TERF2206000857ER  
 Operation Mode :SRD  
 Test Frequency :2435 MHz  
 Test Mode :Tx  
 EUT Pol :H Plane

Test Site :SAC 1  
 Test Date :2022-07-01  
 Temp./Humi. :24.8/59  
 Antenna Pol. :Horizontal  
 Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
95.96	Peak	36.57	-13.93	22.64	43.50	-20.86
127.97	Peak	36.04	-11.79	24.25	43.50	-19.25
216.24	Peak	39.24	-13.81	25.43	46.00	-20.57
277.35	Peak	33.60	-9.70	23.90	46.00	-22.10
443.22	Peak	31.26	-6.34	24.92	46.00	-21.08
589.69	Peak	31.00	-4.14	26.86	46.00	-19.14

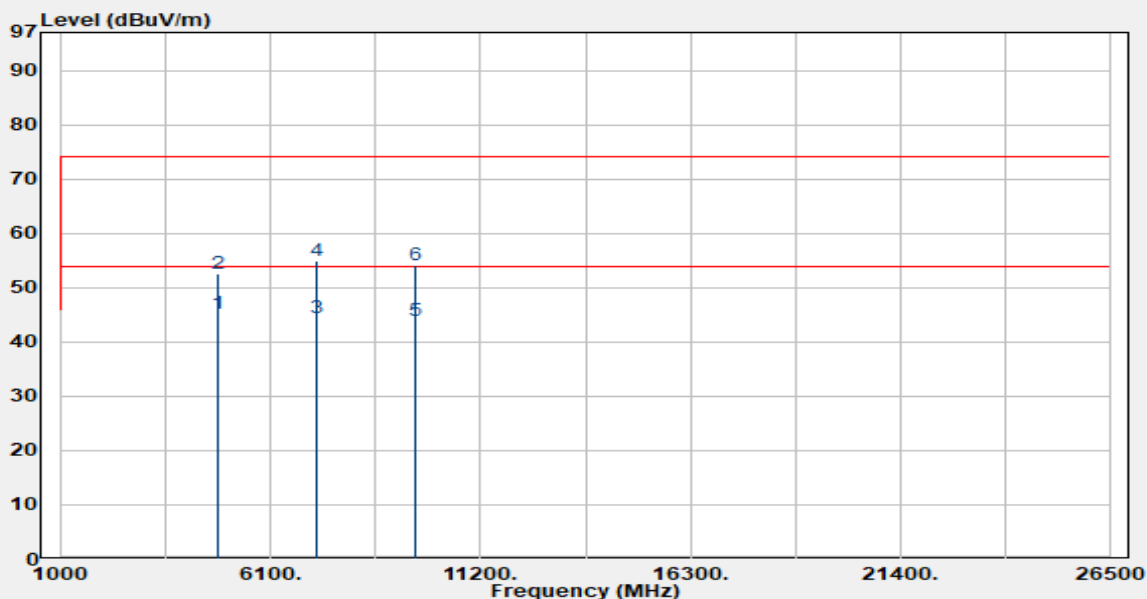
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Report Number :TERF2206000857ER  
Operation Mode :SRD  
Test Frequency :2405 MHz  
Test Mode :Tx  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2022-07-01  
Temp./Humi. :24.8/59  
Antenna Pol. :Vertical  
Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4810.00	Average	36.98	8.12	45.10	54.00	-8.90
4810.00	Peak	44.34	8.12	52.46	74.00	-21.54
7215.00	Average	29.37	15.08	44.45	54.00	-9.55
7215.00	Peak	39.86	15.08	54.94	74.00	-19.06
9620.00	Average	26.37	17.54	43.91	54.00	-10.09
9620.00	Peak	36.56	17.54	54.10	74.00	-19.90

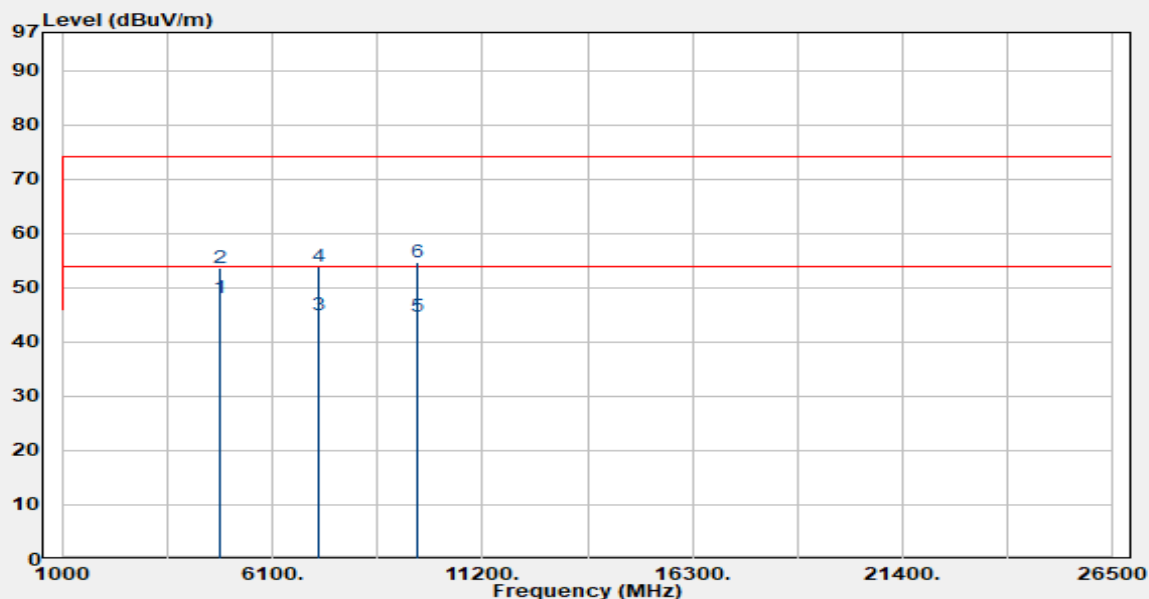
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Report Number :TERF2206000857ER  
Operation Mode :SRD  
Test Frequency :2405 MHz  
Test Mode :Tx  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2022-07-01  
Temp./Humi. :24.8/59  
Antenna Pol. :Horizontal  
Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4810.00	Average	39.88	8.12	48.00	54.00	-6.00
4810.00	Peak	45.58	8.12	53.70	74.00	-20.30
7215.00	Average	29.95	15.08	45.03	54.00	-8.97
7215.00	Peak	38.81	15.08	53.89	74.00	-20.11
9620.00	Average	27.05	17.54	44.59	54.00	-9.41
9620.00	Peak	37.27	17.54	54.81	74.00	-19.19

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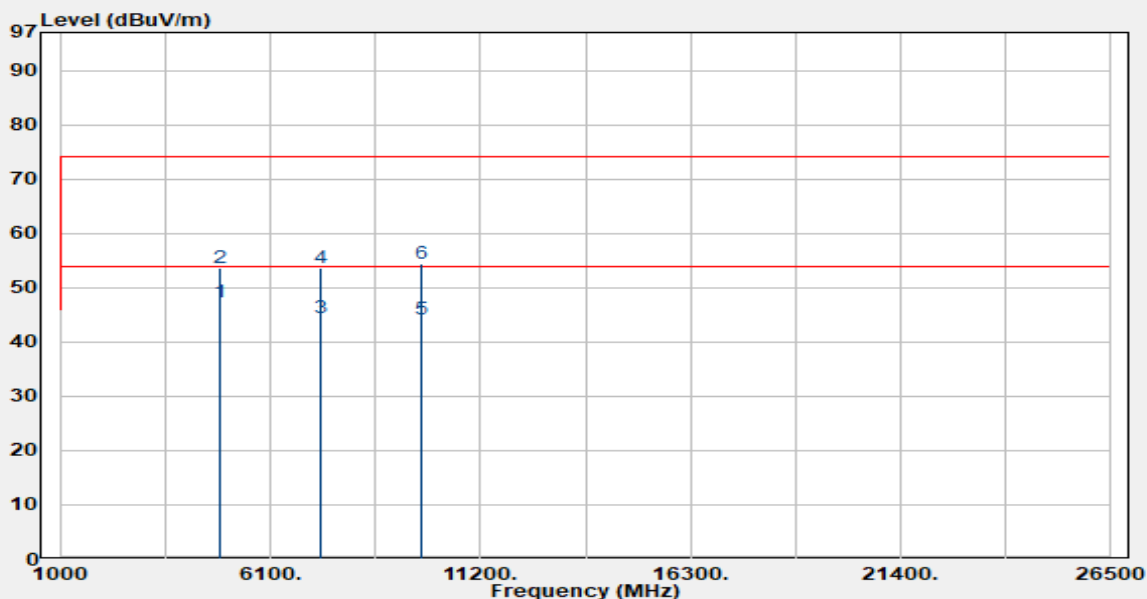
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Report Number :TERF2206000857ER  
Operation Mode :SRD  
Test Frequency :2435 MHz  
Test Mode :Tx  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2022-07-01  
Temp./Humi. :24.8/59  
Antenna Pol. :Vertical  
Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4870.00	Average	39.28	7.96	47.24	54.00	-6.76
4870.00	Peak	45.60	7.96	53.56	74.00	-20.44
7305.00	Average	29.19	15.31	44.50	54.00	-9.50
7305.00	Peak	38.27	15.31	53.58	74.00	-20.42
9740.00	Average	26.32	17.76	44.08	54.00	-9.92
9740.00	Peak	36.59	17.76	54.35	74.00	-19.65

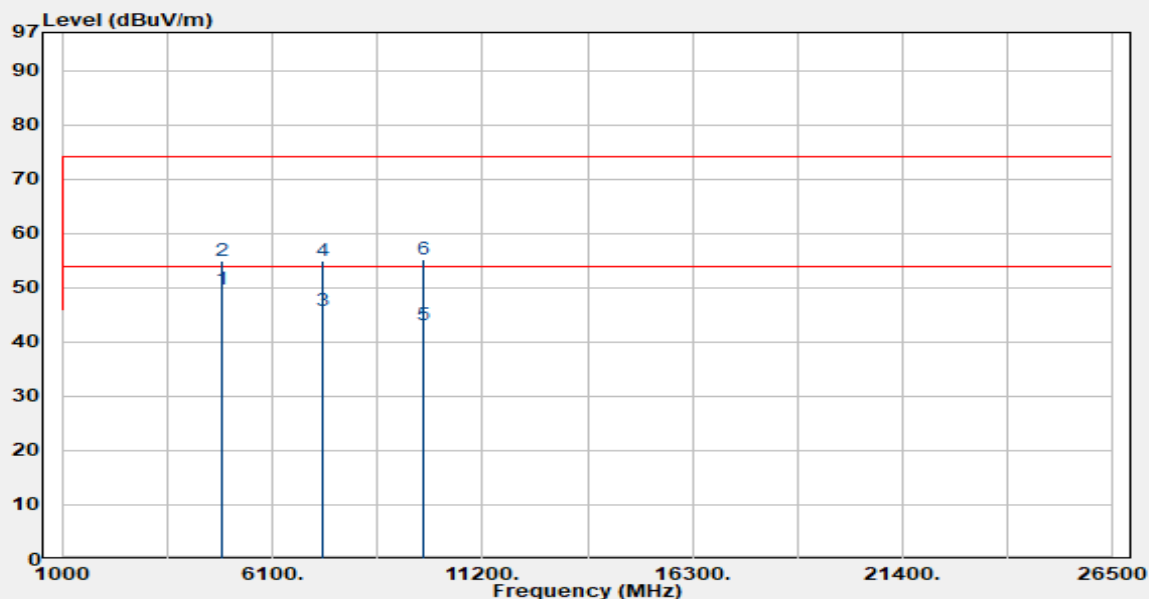
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Report Number :TERF2206000857ER  
Operation Mode :SRD  
Test Frequency :2435 MHz  
Test Mode :Tx  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2022-07-01  
Temp./Humi. :24.8/59  
Antenna Pol. :Horizontal  
Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
4870.00	Average	41.65	7.96	49.61	54.00	-4.39
4870.00	Peak	46.92	7.96	54.88	74.00	-19.12
7305.00	Average	30.41	15.31	45.72	54.00	-8.28
7305.00	Peak	39.60	15.31	54.91	74.00	-19.09
9740.00	Average	25.40	17.76	43.16	54.00	-10.84
9740.00	Peak	37.38	17.76	55.14	74.00	-18.86

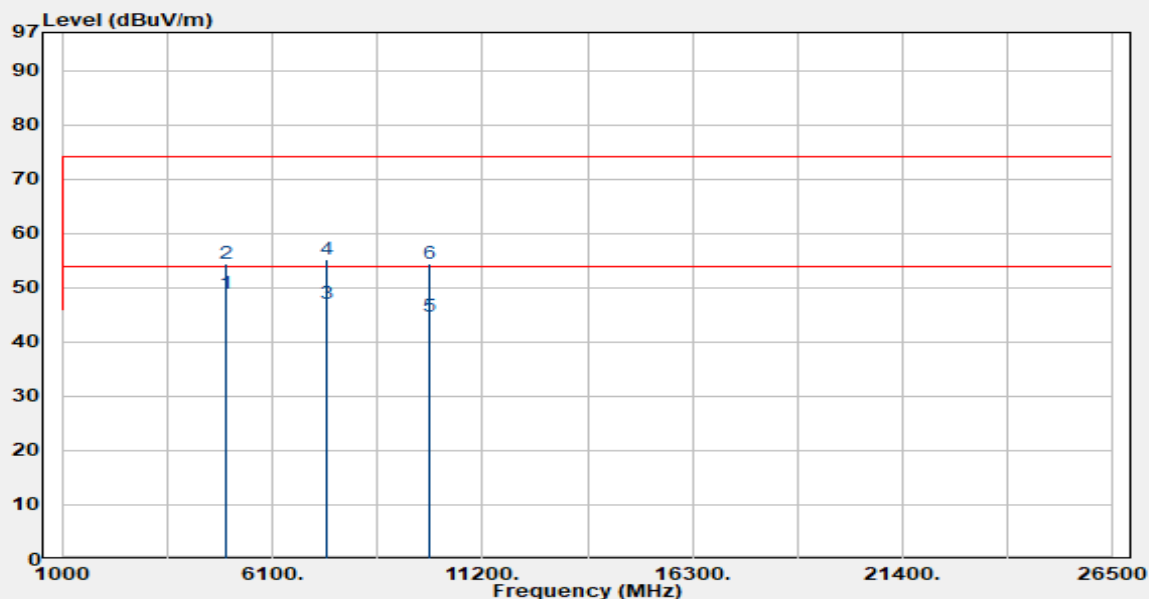
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Report Number :TERF2206000857ER  
Operation Mode :SRD  
Test Frequency :2470 MHz  
Test Mode :Tx  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2022-07-01  
Temp./Humi. :24.8/59  
Antenna Pol. :Vertical  
Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4940.00	Average	40.61	8.18	48.79	54.00	-5.21
4940.00	Peak	46.24	8.18	54.42	74.00	-19.58
7410.00	Average	32.00	15.16	47.16	54.00	-6.84
7410.00	Peak	40.09	15.16	55.25	74.00	-18.75
9880.00	Average	26.46	18.18	44.64	54.00	-9.36
9880.00	Peak	36.26	18.18	54.44	74.00	-19.56

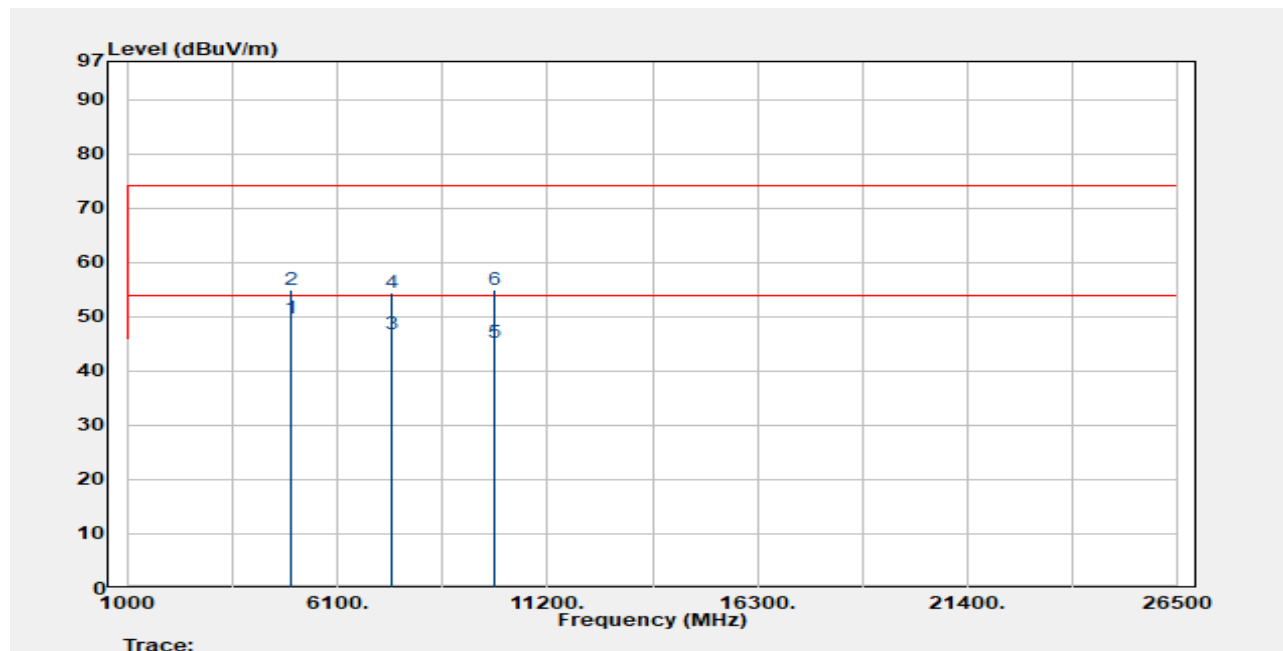
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Report Number :TERF2206000857ER  
Operation Mode :SRD  
Test Frequency :2470 MHz  
Test Mode :Tx  
EUT Pol :H Plane

Test Site :SAC 1  
Test Date :2022-07-01  
Temp./Humi. :24.8/59  
Antenna Pol. :Horizontal  
Engineer :Jack Liu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4940.00	Average	41.43	8.18	49.61	54.00	-4.39
4940.00	Peak	46.87	8.18	55.05	74.00	-18.95
7410.00	Average	31.61	15.16	46.77	54.00	-7.23
7410.00	Peak	39.33	15.16	54.49	74.00	-19.51
9880.00	Average	27.08	18.18	45.26	54.00	-8.74
9880.00	Peak	36.84	18.18	55.02	74.00	-18.98

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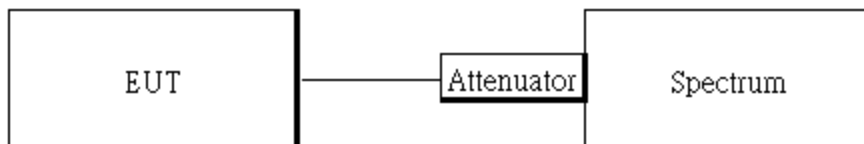
## 10 EMISSION BANDWIDTH

### 10.1 Applicable Standard

§2.1049 (h) & 15.215(c)

- (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

### 10.2 Test Setup



### 10.3 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as  
RBW=1% of the approximate emission bandwidth,  
VBW = 3 times RBW,  
Span= 2 to 5 times of the OBW.  
Sweep=auto  
Detector = Peak, and Max hold
4. Turn on the -20 dB Bandwidth function, max reading.

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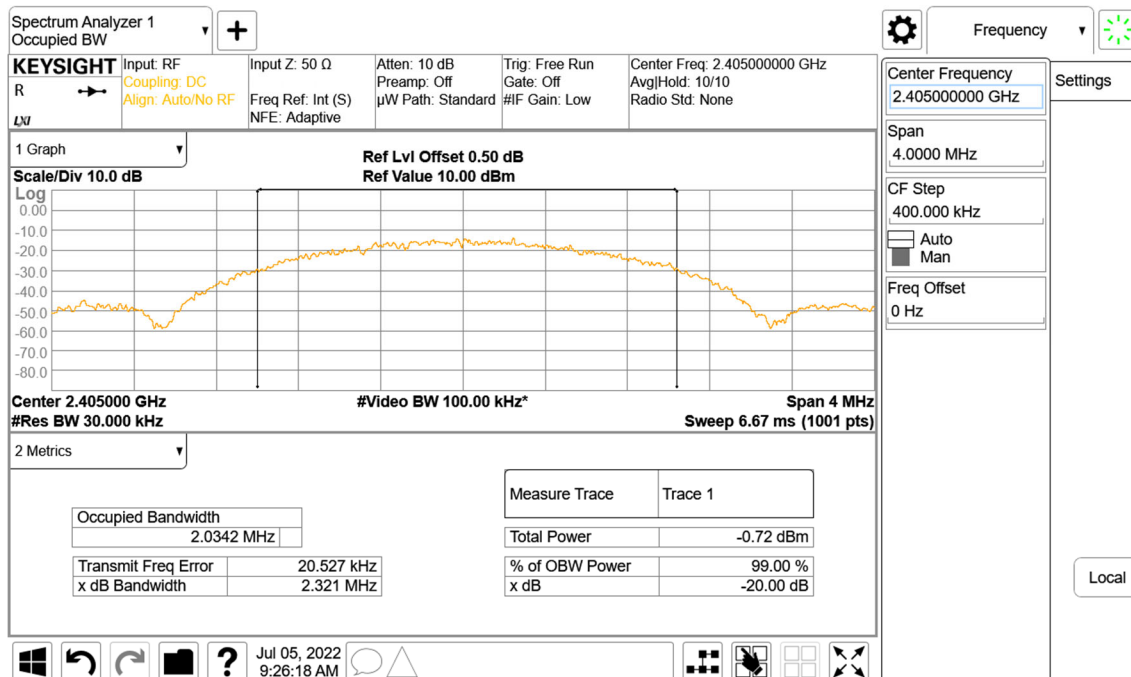
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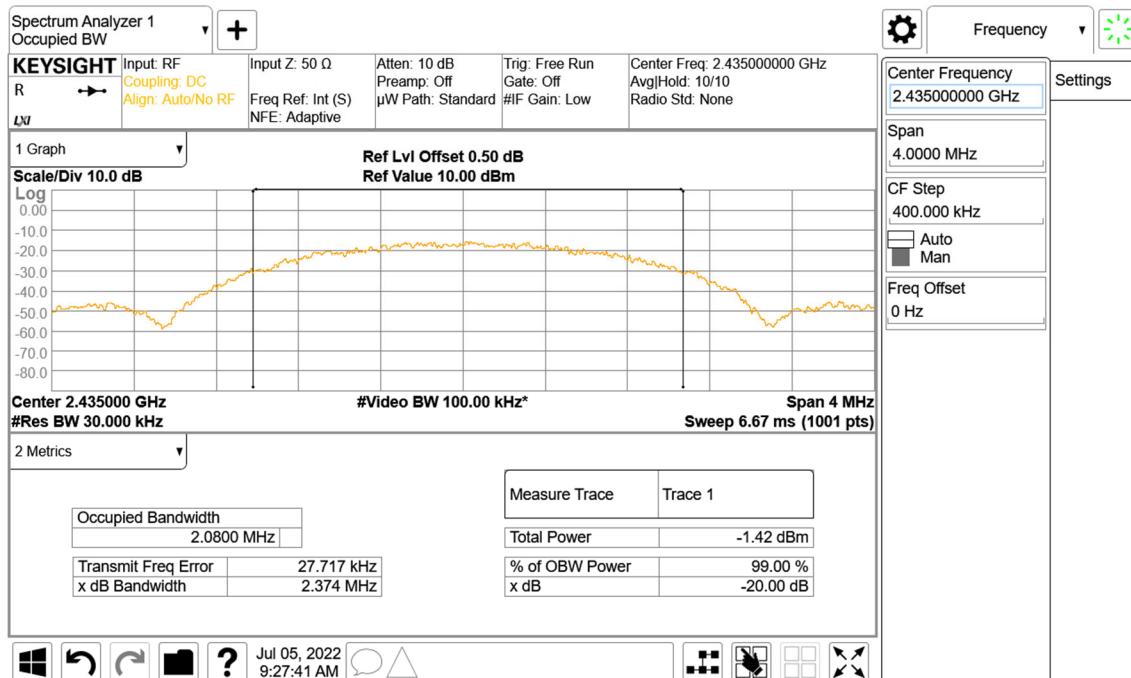
## 10.4 Measurement Results:

Frequency (MHz)	20dB Bandwidth (MHz)
2405	2.321
2435	2.374
2470	2.290

## CH Low



## CH Mid

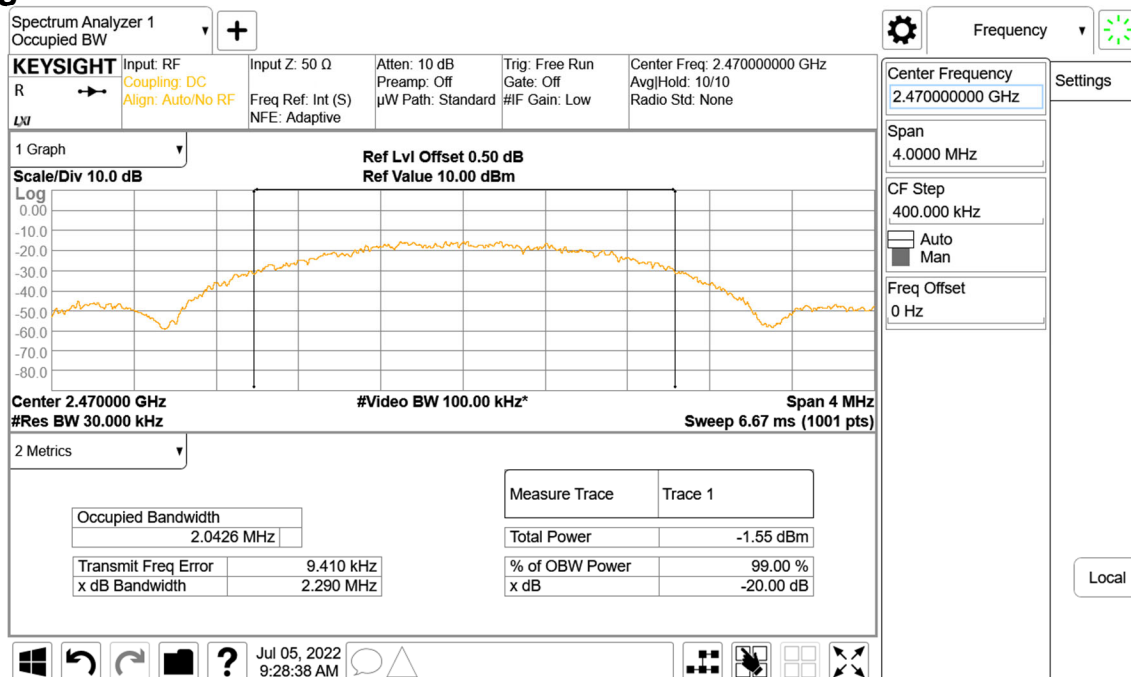


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## CH High



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## 11 ANTENNA REQUIREMENT

### 11.1 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.

### 11.2 Antenna Connected Construction:

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

*~ End of Report ~*

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