

**ELECTROMAGNETIC EMISSIONS
COMPLIANCE REPORT**

Applicant: Rombit NV
Meir 30, Antwerp 2000 Belgium

Manufacturer: Rombit NV
Meir 30, Antwerp 2000 Belgium

Product Name: Rombit ONE (gen 2)

Brand Name: Rombit

Model No.: R02U

Family Model No.: R02XU

Model Difference: R02U: Product label without IECEx / ATEX regulatory statements.
R02XU: Product label with IECEx / ATEX regulatory statements.

Report Number: TERF2404001193ER

FCC ID 2AVTBR02

Date of EUT Received: April 25, 2024

Date of Test: April 26, 2024 ~ August 5, 2024

Issue Date: September 23, 2024

Approved By CHUN-CHIEH, CHEN
Chun Chieh Chen

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 §15.519.

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
TERF2404001193ER	00	Original	September 6, 2024	Susan Lin	
TERF2404001193ER	01	Update chapter 7.5	September 23, 2024	Susan Lin	*

Note:

- 1、The remark "*" indicates modification of the report upon requests from certification body.
- 2、Variant information of model numbers is provided by the applicant, test results of this report are applicable to the sample EUT(s) received. And are assessed as electrically identical in RF characteristics, therefore, no further assessment required for the variant(s).

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1 GENERAL INFORMATION

1.1 Product description

Product Name:	Rombit ONE (gen 2)
Brand Name:	Rombit
Model No.:	R02U
Family Model No.:	R02XU
Model Difference:	R02U: Product label without IECEx / ATEX regulatory statements. R02XU: Product label with IECEx / ATEX regulatory statements.
Hardware Version:	1.0
Firmware Version:	1.6
EUT Series No.:	RW02-W1-000046
Power Supply:	3.7Vdc from Battery
Test Software (Name/Version):	Default

1.2 RF Specification

Radio Technology:	Ultra-wideband	
Operating Frequency:	Channel 2: 3774 – 4243.2MHz Channel 5: 6240 – 6739.2MHz	
Channel number:	2 channels	
Modulation type:	BPM-BPSK	
Transmit Power:	Channel 2: -1.62dBm Channel 5: -1.27dBm	
Antenna Designation:	Type	Dielectric Chip Antenna
	Peak Gain	4.16dBi

Note: Antenna information is provided by the applicant.

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1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart F §15.519

ANSI C63.10:2013

KDB 393764 D01 UWB FAQ v02

1.4 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number
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
		SAC 2	
		SAC 3	
		Conduction 1	
		Conducted 1	
		Conducted 2	
		Conducted 3	
		Conducted 4	
		Conducted 5	
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conducted 6	TW0028
		Conduction C	
		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.

1.5 Special Accessories

There is no special accessory used while test was conducted.

1.6 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

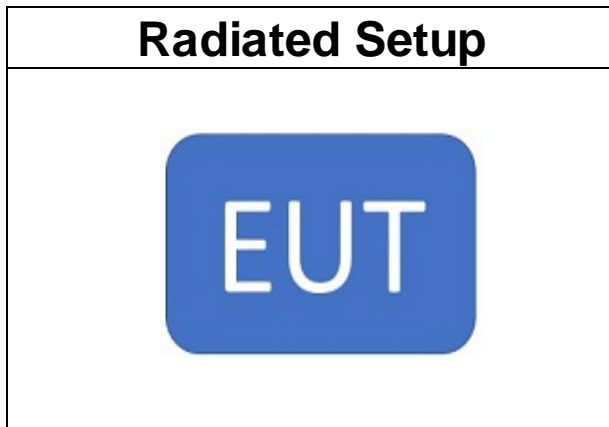
Radiated emission below 30MHz is measured in a 9m*6m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

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.

2.5 Test Configuration



2.6 Control Unit(s)

N/A

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Non applicable
§15.519(b)	UWB bandwidth	Compliant
§15.209 §15.519(c) (d)	Radiated Emission below 960MHz and above 960MHz. Radiated Emissions in GPS bands. Average Emissions of UWB transmissions in a 1MHz Bandwidth	Compliant
§15.519(e)	Peak level of the Emission	Compliant
§15.519(a) (1)	Transmitter Timeout	Compliant

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4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Test frequency 3993.6MHz and 6489.6MHz are chosen for full testing.

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.

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty		
AC Power Line Conducted Emission	+/-	1.54	dB
UWB Bandwidth	+/-	1.38	Hz
Temperature	+/-	0.6	°C
Humidity	+/-	3	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty				
Polarization: Vertical	+/-	1.89	dB	9kHz~30MHz
	+/-	4.15	dB	30MHz - 1000MHz
	+/-	3.43	dB	1GHz - 18GHz
	+/-	3.86	dB	18GHz - 40GHz
Polarization: Horizontal	+/-	1.89	dB	9kHz~30MHz
	+/-	4.02	dB	30MHz - 1000MHz
	+/-	3.43	dB	1GHz - 18GHz
	+/-	3.86	dB	18GHz - 40GHz
Radiated Spurious Emission	+/-	2	dB	33GHz-50GHz
	+/-	1.59	dB	50GHz-60GHz
	+/-	1.7	dB	60GHz-90GHz
	+/-	1.64	dB	90GHz-140GHz
	+/-	3.83	dB	140GHz-220GHz

Note:

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

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency within 150 kHz 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

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

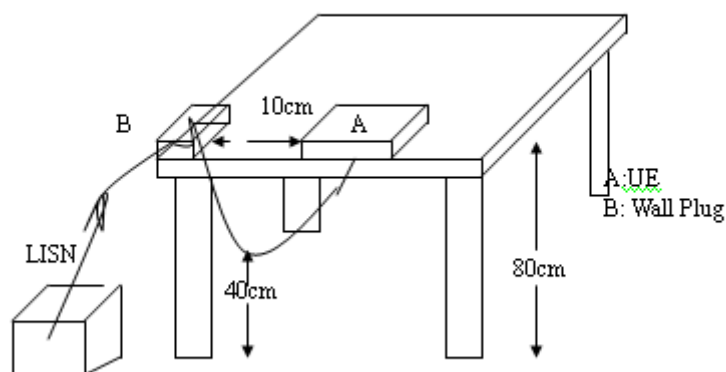
6.2 Measurement Equipment Used

N/A

6.3 EUT Setup:

- The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- The LISN was connected with 120-240Vac/60Hz power source.

6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

- The EUT was placed on a table which is 0.8m above ground plane.

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2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

6.6 Measurement Result

N/A: Powered 3.7Vdc battery.

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7 UWB BANDWIDTH

7.1 Standard Applicable

According to §15.519 (b) The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz

According to §15.503 (d) Ultra-wideband (UWB) transmitter. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth

7.2 Measurement Equipment Used

Radiated Emission Test Site: SAC 2					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWARZBECK	VULB9168	9168-1278	03/04/2024	03/03/2025
Bi-log Antenna	SCHWARZBECK	VULB9168	378	08/09/2023	08/08/2024
Coaxial Cables	EMCI	EMC104-SM-SM-1000+EMC105-SM-SM-1000+EMC105-SM-SM-1500+EMC104-SM-SM-600+EMC105-SM-SM-2000	RX Cable 9K-18G (220236+201211+220906+220237+220909)	08/31/2023	08/30/2024
Coaxial Cables	Huber Suhner	SUCOFLEX 102+SUCOFLEX 106	TX Cable 30M-40G 23051/2+76096/6+22962/2	08/31/2023	08/30/2024
Coaxial Cables	Huber Suhner	SUCOFLEX 102	RX Cable 18G-40G MY2630/2+805062/2	08/31/2023	08/30/2024
EMI Test Receiver	R&S	ESR 7	102525	02/17/2024	02/16/2025
Horn Antenna	RF SPIN	DRH0844	LE2D05A0844	07/03/2023	07/02/2024
Horn Antenna	RF SPIN	DRH0844	LE2D05A0844	07/10/2024	07/09/2025
Horn Antenna	RF SPIN	DRH18-E	210303A18-ES	02/16/2024	02/15/2025
Horn Antenna	SCHWARZBECK	BBHA9120D	603	05/15/2024	05/14/2025
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/28/2023	12/27/2024
Loop Antenna	COM-POWER	AL-130R	10160104	12/04/2023	12/03/2024
Network Analyzer	Anritsu	MS4644A	1216312	12/07/2023	12/06/2024
Pre-Amplifier	EMCI	EMC118A45SEE	980867	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC184045B	980135	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC330N	980826	08/31/2023	08/30/2024
PXA Spectrum Analyzer	Keysight	N9030B	MY61330494	03/22/2024	03/21/2025
Site Cal	SGS	SAC 2	N/A	08/31/2023	08/30/2024
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R

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

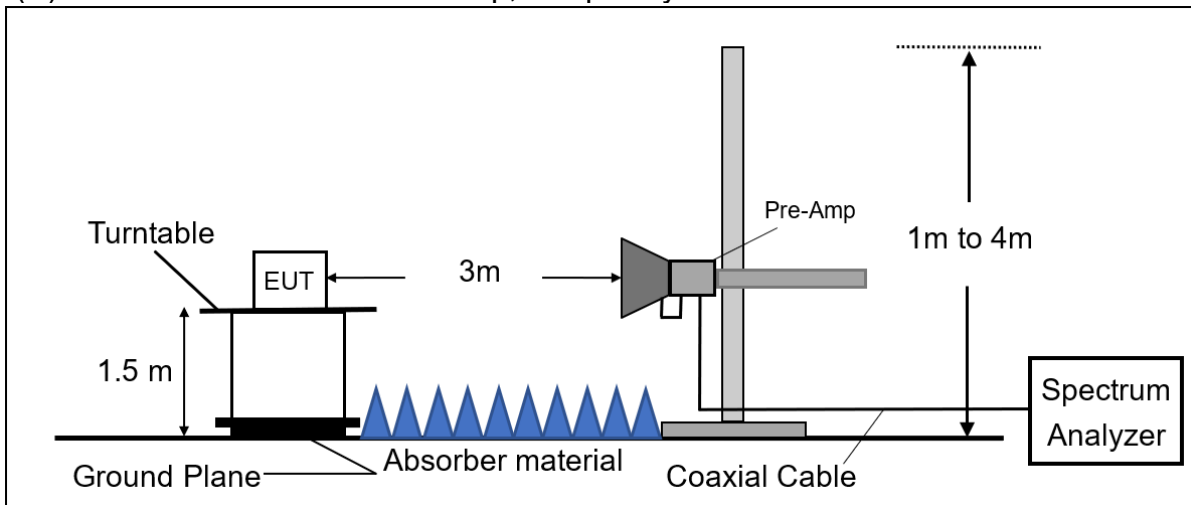
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7.3 Test Setup

(A) Radiated Emission Test Set-Up, Frequency for 3 meter.



7.4 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. RBW = 1MHz, VBW = 3MHz, Span: 1GHz, Detector =peak, Sweep = 2 Seconds.
3. Record the max. Reading as observed from Spectrum.
4. Repeat above procedures until all test default channel measured was complete.

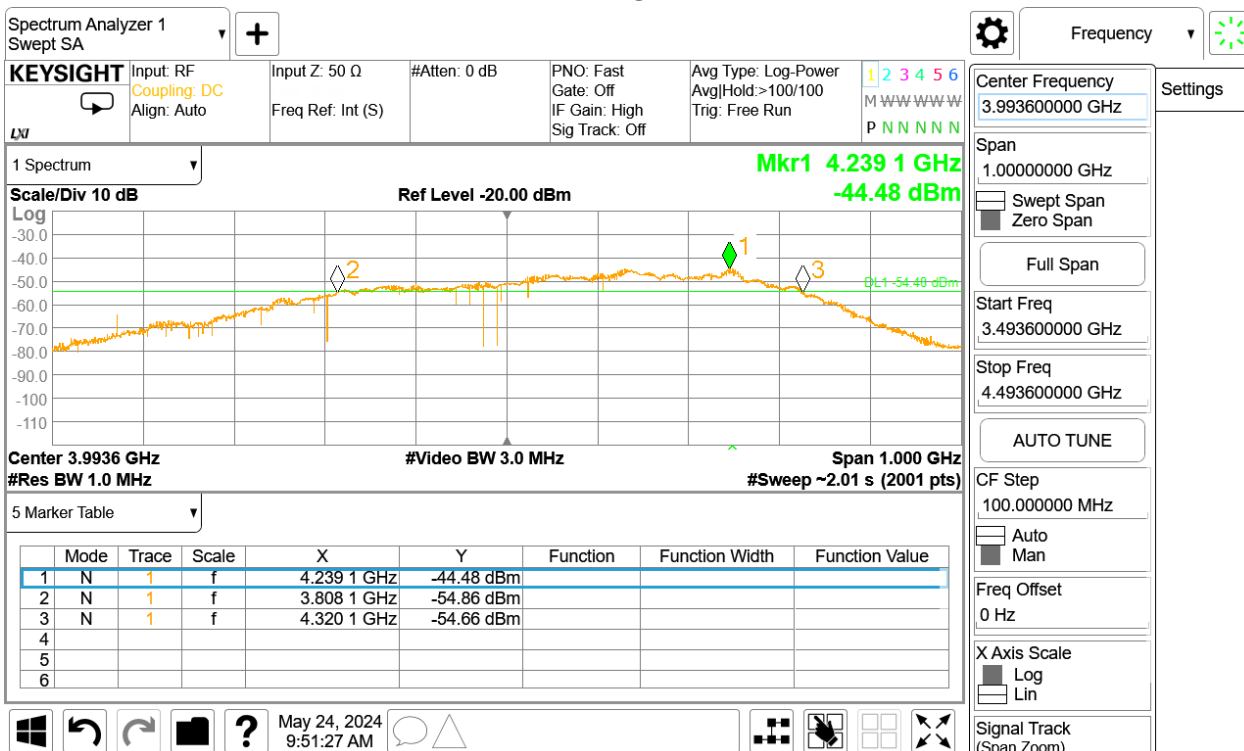
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7.5 Measurement Result:

Channel	Center Frequency (MHz)	Mark point	Mark Frequency (MHz)	UWB Bandwidth (MHz)	Limit (MHz)
2	3993.6	fM(Peak)	4239.1	512	≥ 500
		fL(lower -10 dB)	3808.1		
		fH(upper -10 dB)	4320.1		
5	6489.6	fM(Peak)	6517.6	614.5	≥ 500
		fL(lower -10 dB)	6197.6		
		fH(upper -10 dB)	6812.1		

Ch2 OBW

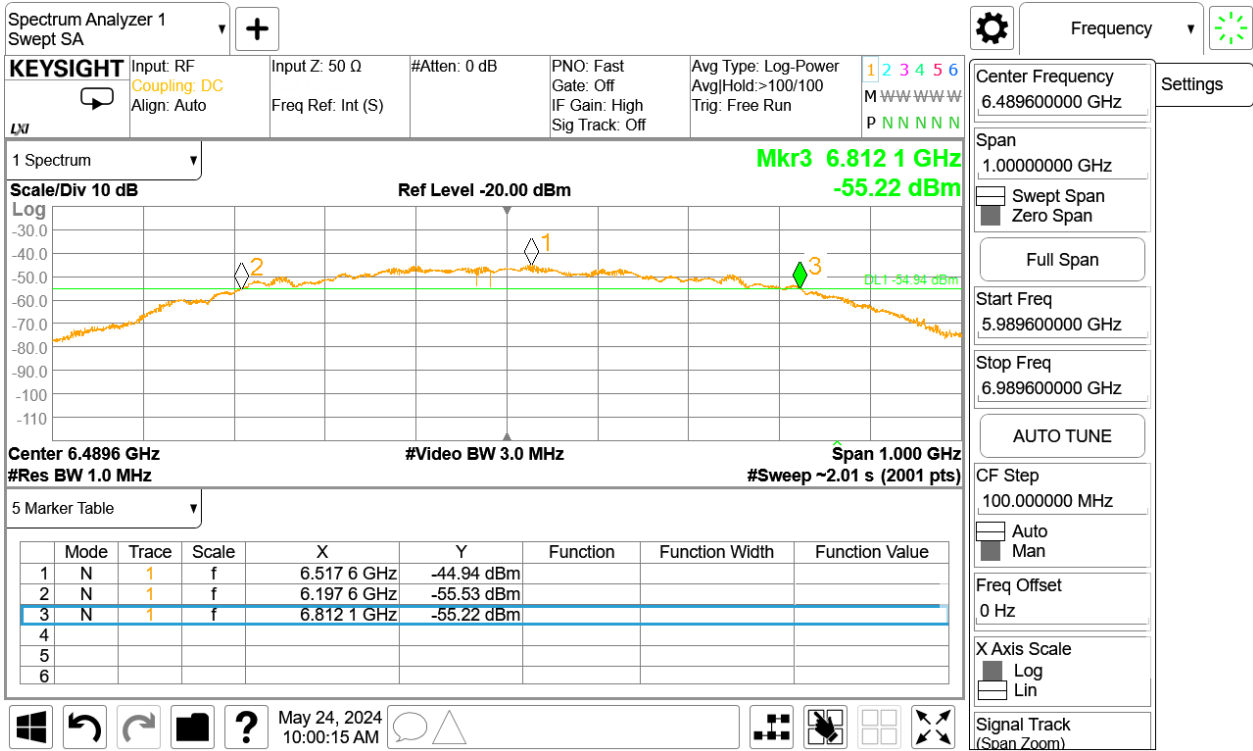


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Ch5 OBW



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8 RADIATED EMISSION AND PEAK LEVEL OF THE EMISSION

8.1 Standard Applicable

According to §15.519(c), The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in § 15.209. The radiated emissions above

960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	– 75.3
1610–1990	– 63.3
1990–3100	– 61.3
3100–10600	– 41.3
Above 10600	– 61.3

§15.519 (d), In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	– 85.3
1559–1610	– 85.3

§15.519 (e), There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_m . That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in § 15.521.

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8.2 Measurement Equipment Used

Radiated Emission Test Site: SAC 2					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWARZBECK	VULB9168	9168-1278	03/04/2024	03/03/2025
Bi-log Antenna	SCHWARZBECK	VULB9168	378	08/09/2023	08/08/2024
Coaxial Cables	EMCI	EMC104-SM-SM-1000+EMC105-SM-SM-1000+EMC105-SM-SM-1500+EMC104-SM-SM-600+EMC105-SM-SM-2000	RX Cable 9K-18G (220236+201211+220906+220237+220909)	08/31/2023	08/30/2024
Coaxial Cables	Huber Suhner	SUCOFLEX 102+SUCOFLEX 106	TX Cable 30M-40G 23051/2+76096/6+22962/2	08/31/2023	08/30/2024
Coaxial Cables	Huber Suhner	SUCOFLEX 102	RX Cable 18G-40G MY2630/2+805062/2	08/31/2023	08/30/2024
EMI Test Receiver	R&S	ESR 7	102525	02/17/2024	02/16/2025
Horn Antenna	RF SPIN	DRH0844	LE2D05A0844	07/03/2023	07/02/2024
Horn Antenna	RF SPIN	DRH0844	LE2D05A0844	07/10/2024	07/09/2025
Horn Antenna	RF SPIN	DRH18-E	210303A18-ES	02/16/2024	02/15/2025
Horn Antenna	SCHWARZBECK	BBHA9120D	603	05/15/2024	05/14/2025
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/28/2023	12/27/2024
Loop Antenna	COM-POWER	AL-130R	10160104	12/04/2023	12/03/2024
Network Analyzer	Anritsu	MS4644A	1216312	12/07/2023	12/06/2024
Pre-Amplifier	EMCI	EMC118A45SEE	980867	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC184045B	980135	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC330N	980826	08/31/2023	08/30/2024
PXA Spectrum Analyzer	Keysight	N9030B	MY61330494	03/22/2024	03/21/2025
Site Cal	SGS	SAC 2	N/A	08/31/2023	08/30/2024
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R

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

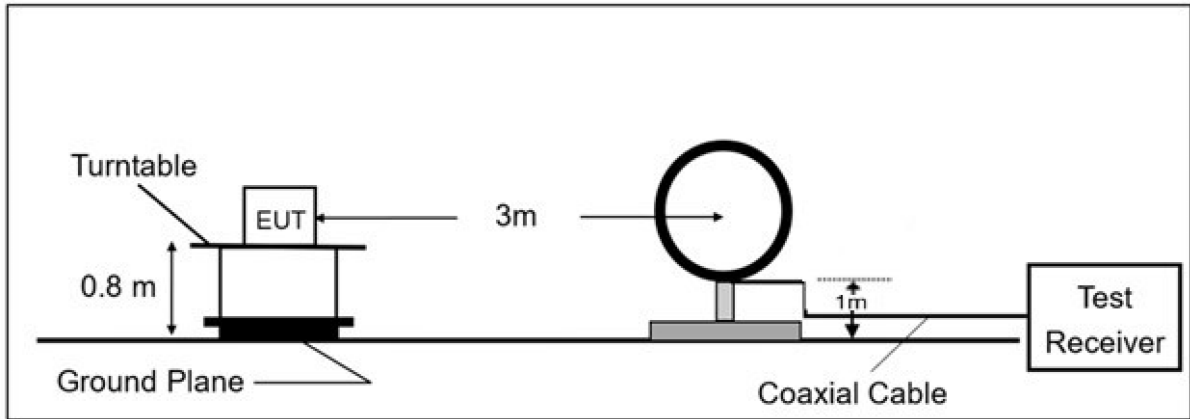
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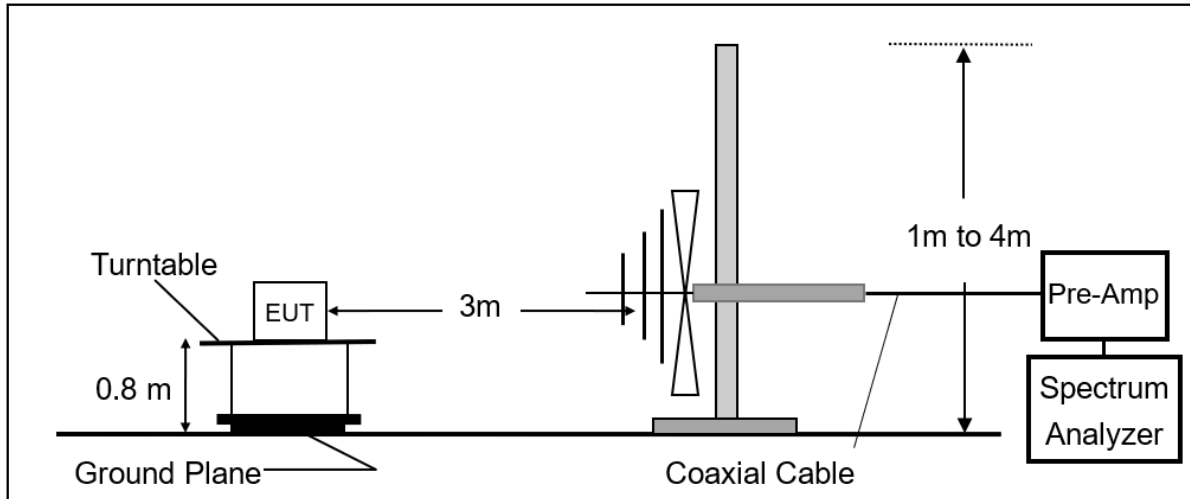
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8.3 Test Setup

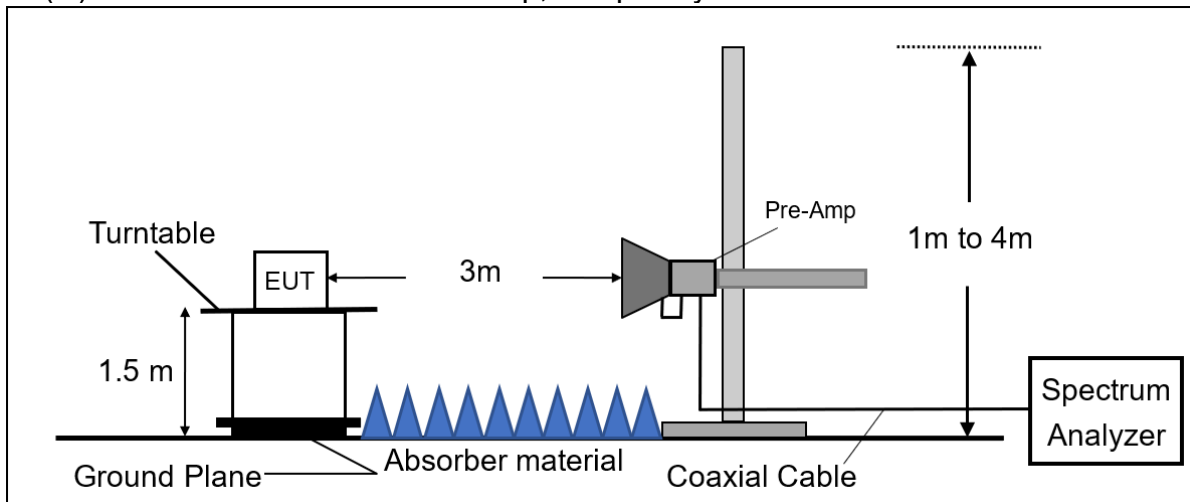
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



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



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



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8.4 Measurement Procedure

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 for 100 kHz to 30MHz, 30 MHz to 960MHz, 960MHz to 1GHz radiated emissions.
5. Set the spectrum analyzer as RBW=200 Hz and VBW=2 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency 100kHz~30MHz.
6. Set the spectrum analyzer as RBW=50 MHz, VBW=50 MHz of Peak Detector for the Peak level of the Emission Measurement.
7. Set the spectrum analyzer as RBW=1 kHz, VBW=3 kHz of RMS Detector for the Radiated Emission in GPS bands Measurement.
8. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz of Peak Detector (PK) at frequency 30MHz~960MHz for Radiated Spurious Emission Measurement.
9. Use receiver mode as RBW=120 kHz of Quasi-peak (QP) at frequency 30MHz~960MHz for Radiated Spurious Emission Measurement.
10. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz of RMS Detector at frequency 960 MHz~40 GHz for Radiated Spurious Emission Measurement.
11. 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.
12. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
13. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode.
14. Sweep the frequency to determine spurious emission as seen on spectrum from span of, 960MHz to 1GHz, 1GHz to 10GHz, 10GHz to 18GHz, 18GHz to 40GHz.
15. Via Software, combine 4 spans of frequency range into one plot.
16. Repeat above procedures until all default test channel measured were complete.

Note:

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

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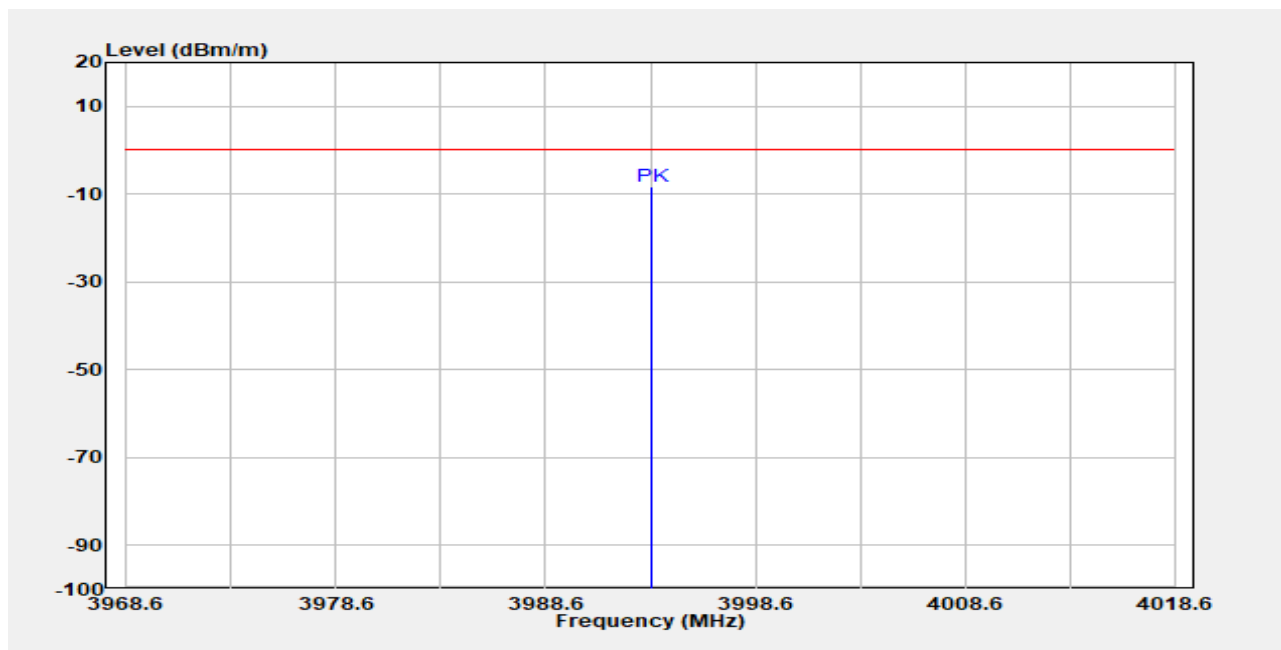
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8.5 Measurement Result

Peak level of the Emission Measurement Result

Report Number	:TERF2404001193ER	Test Site	:SAC 2
Operation Mode	:UWB Ch2	Test Date	:2024-06-14
Test Frequency	:3993.6 MHz	Temp./Humi.	:25.4°C/55%
Test Mode	:Main	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBm/50MHz	Factor dB	Actual EIRP dBm/50MHz	Limit dBm/50MHz	Margin dB
3993.600	Peak	-8.16	-0.26	-8.41	0.00	-8.41

If RBW set be lower than 50 MHz Test Limit= 0 dBm+20 log (RBW/50) dBm

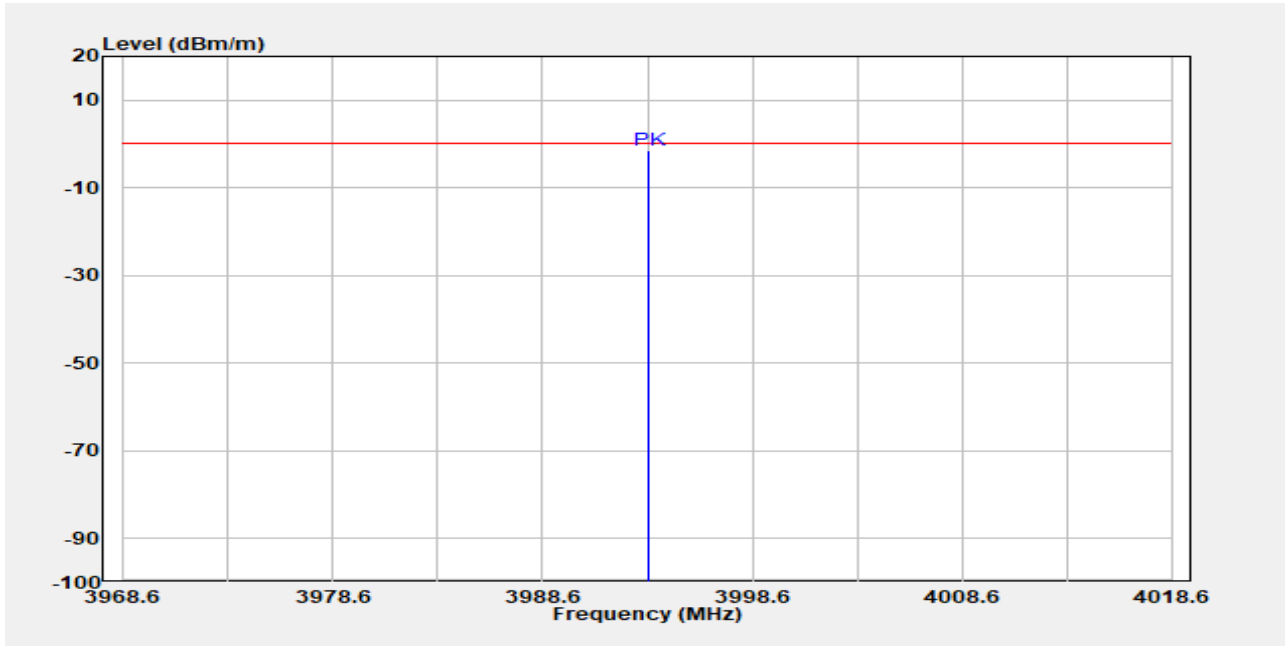
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch2
 Test Frequency :3993.6 MHz
 Test Mode :Main
 EUT Pol :E2 Plane

Test Site :SAC 2
 Test Date :2024-06-14
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Horizontal
 Engineer :Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBm/50MHz	Factor dB	Actual EIRP dBm/50MHz	Limit dBm/50MHz	Margin dB
3993.600	Peak	-1.36	-0.26	-1.62	0.00	-1.62

If RBW set be lower than 50 MHz Test Limit= 0 dBm+20 log (RBW/50) dBm

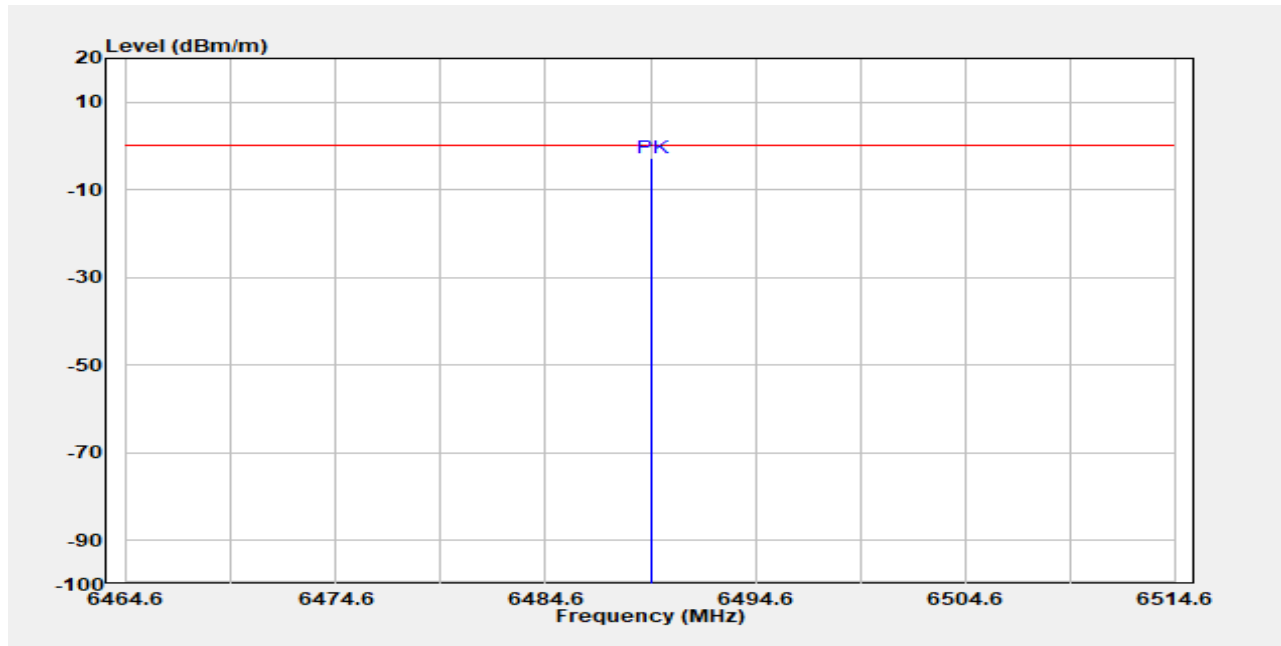
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch5
 Test Frequency :6489.6 MHz
 Test Mode :Main
 EUT Pol :E2 Plane

Test Site :SAC 2
 Test Date :2024-06-14
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Vertical
 Engineer :Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBm/50MHz	Factor dB	Actual EIRP dBm/50MHz	Limit dBm/50MHz	Margin dB
6489.600	Peak	-8.91	6.27	-2.64	0.00	-2.64

If RBW set be lower than 50 MHz Test Limit= 0 dBm+20 log (RBW/50) dBm

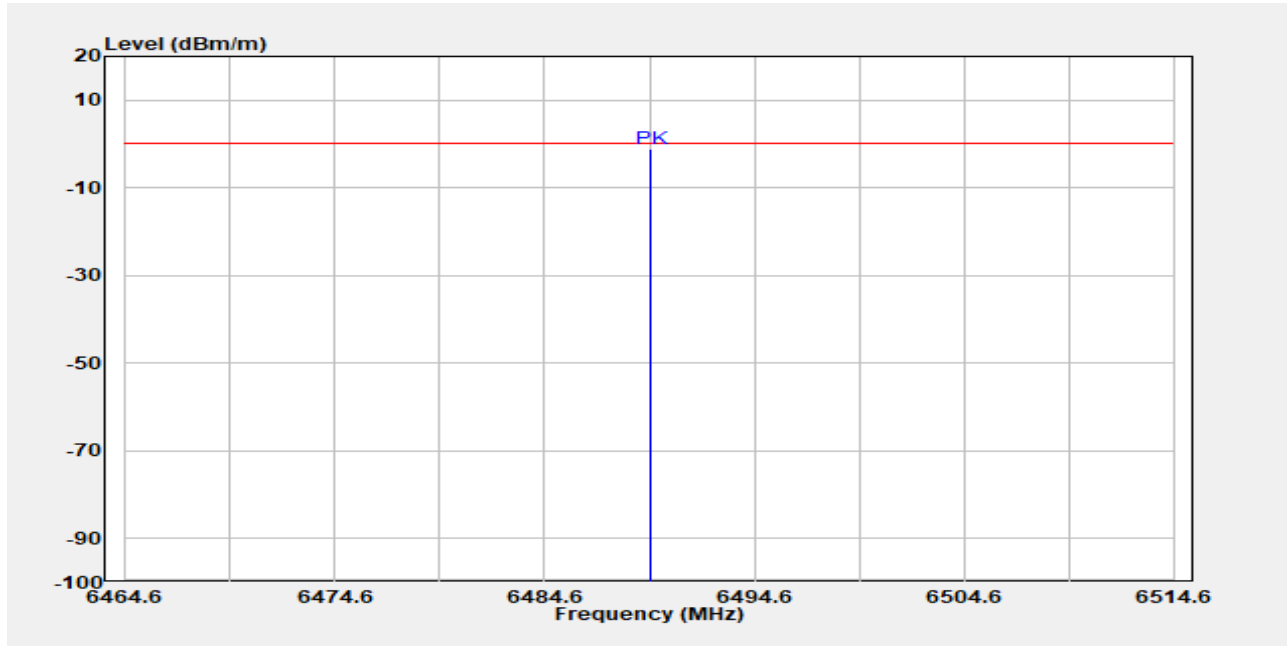
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Report Number :TERF2404001193ER
Operation Mode :UWB Ch5
Test Frequency :6489.6 MHz
Test Mode :Main
EUT Pol :E2 Plane

Test Site :SAC 2
Test Date :2024-06-14
Temp./Humi. :25.4°C/55%
Antenna Pol. :Horizontal
Engineer :Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBm/50MHz	Factor dB	Actual EIRP dBm/50MHz	Limit dBm/50MHz	Margin dB
6489.600	Peak	-7.54	6.27	-1.27	0.00	-1.27

If RBW set be lower than 50 MHz Test Limit= 0 dBm+20 log (RBW/50) dBm

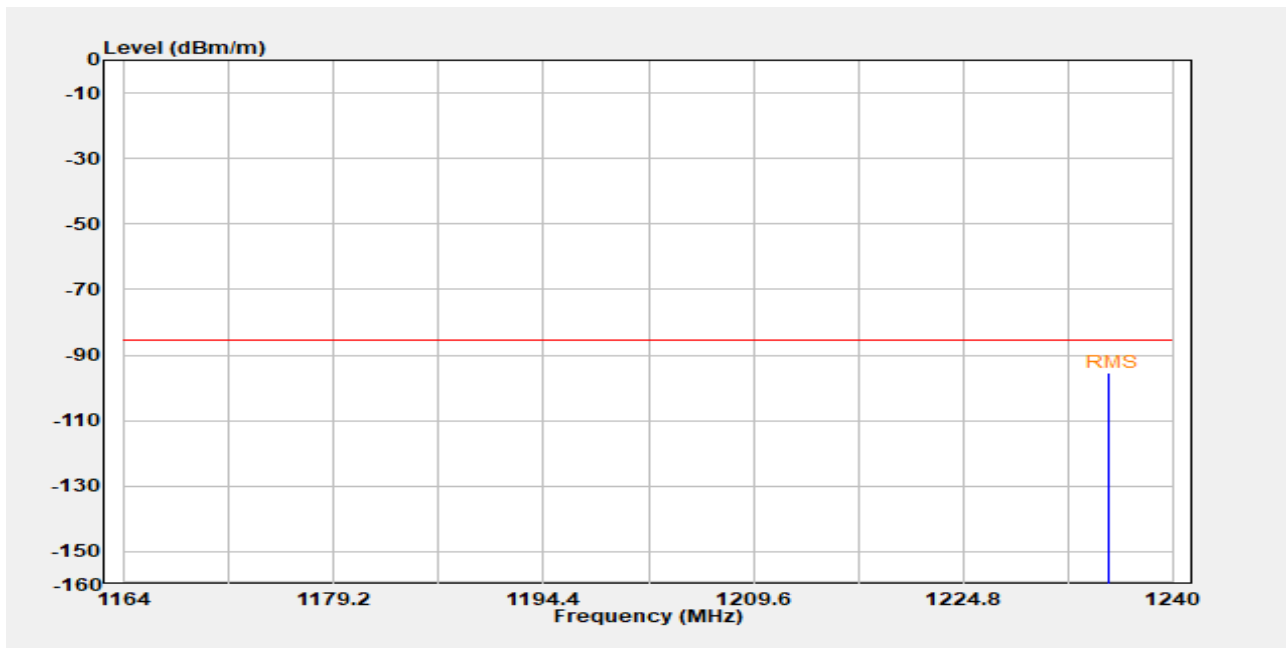
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8.6 Radiated Emission in GPS bands Measurement Result

Report Number	:TERF2404001193ER	Test Site	:SAC 2
Operation Mode	:UWB Ch2	Test Date	:2024-05-20
Test Mode	:GPS	Temp./Humi.	:25.4°C/55%
EUT Pol	:E2 Plane	Antenna Pol.	:Vertical
Test Frequency	:1164MHz-1240MHz	Engineer	:Bob Chao



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
1235.440	-95.40	-98.82	7.15	-3.73	-85.30	-10.10

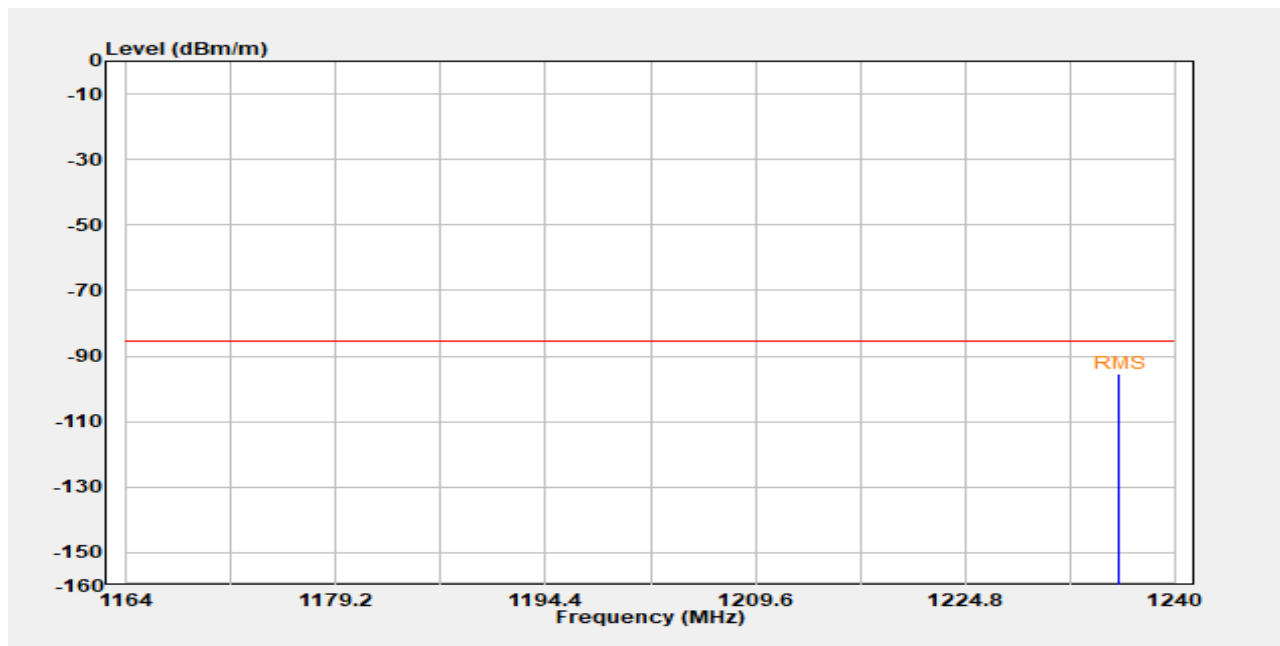
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch2
 Test Mode :GPS
 EUT Pol :E2 Plane
 Test Frequency :1164MHz-1240MHz

Test Site :SAC 2
 Test Date :2024-05-20
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Horizontal
 Engineer :Bob Chao



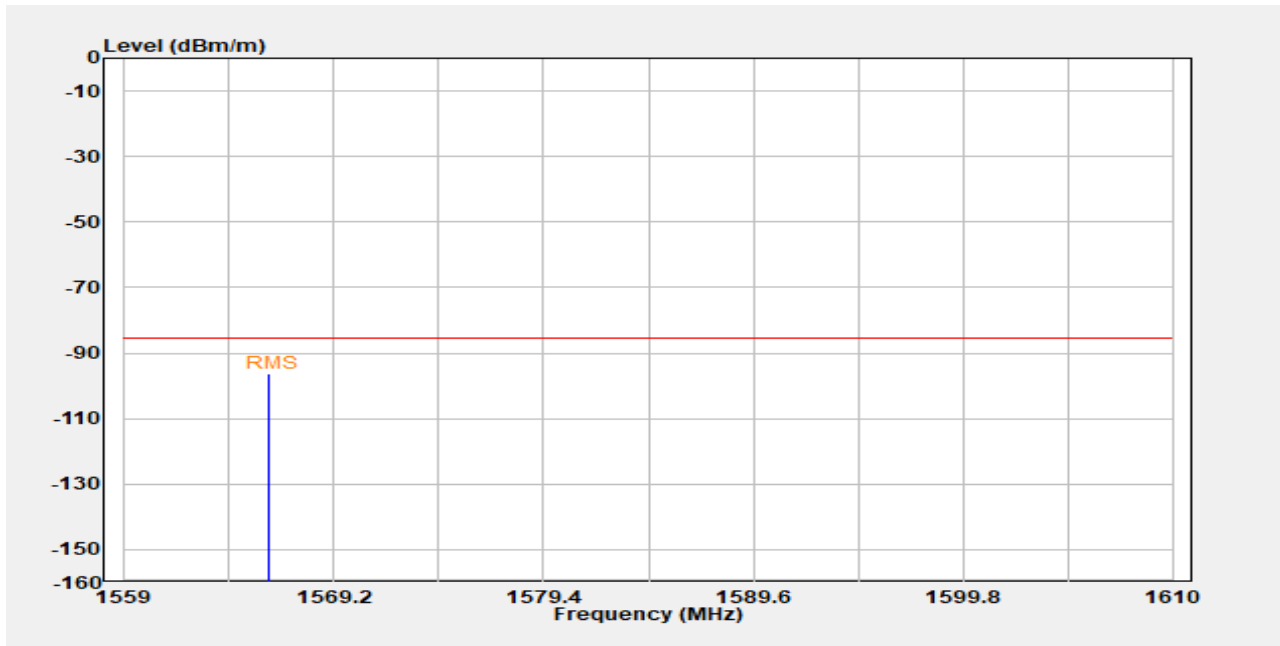
Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
1235.896	-95.35	-98.77	7.16	-3.73	-85.30	-10.05

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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch2
 Test Mode :GPS
 EUT Pol :E2 Plane
 Test Frequency :1559MHz-1610MHz

Test Site :SAC 2
 Test Date :2024-05-20
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Vertical
 Engineer :Bob Chao



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
1566.038	-96.22	-101.10	9.10	-4.22	-85.30	-10.92

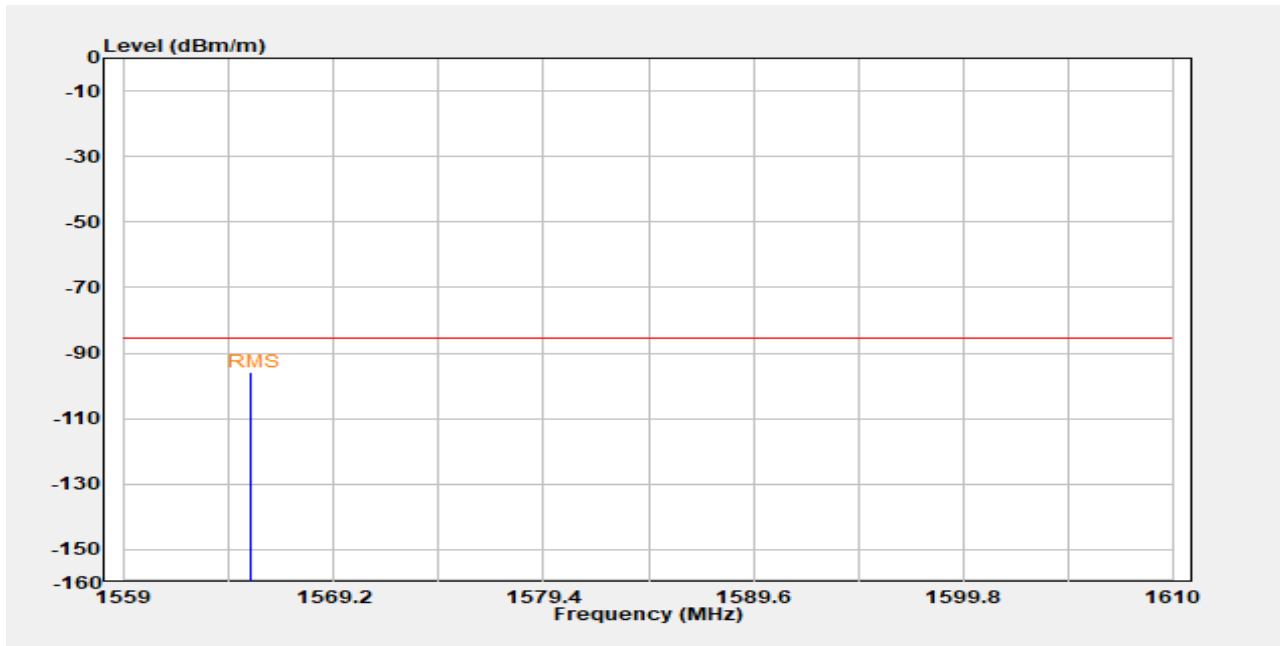
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch2
 Test Mode :GPS
 EUT Pol :E2 Plane
 Test Frequency :1559MHz-1610MHz

Test Site :SAC 2
 Test Date :2024-05-20
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Horizontal
 Engineer :Bob Chao



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
1565.171	-95.98	-100.86	9.10	-4.22	-85.30	-10.68

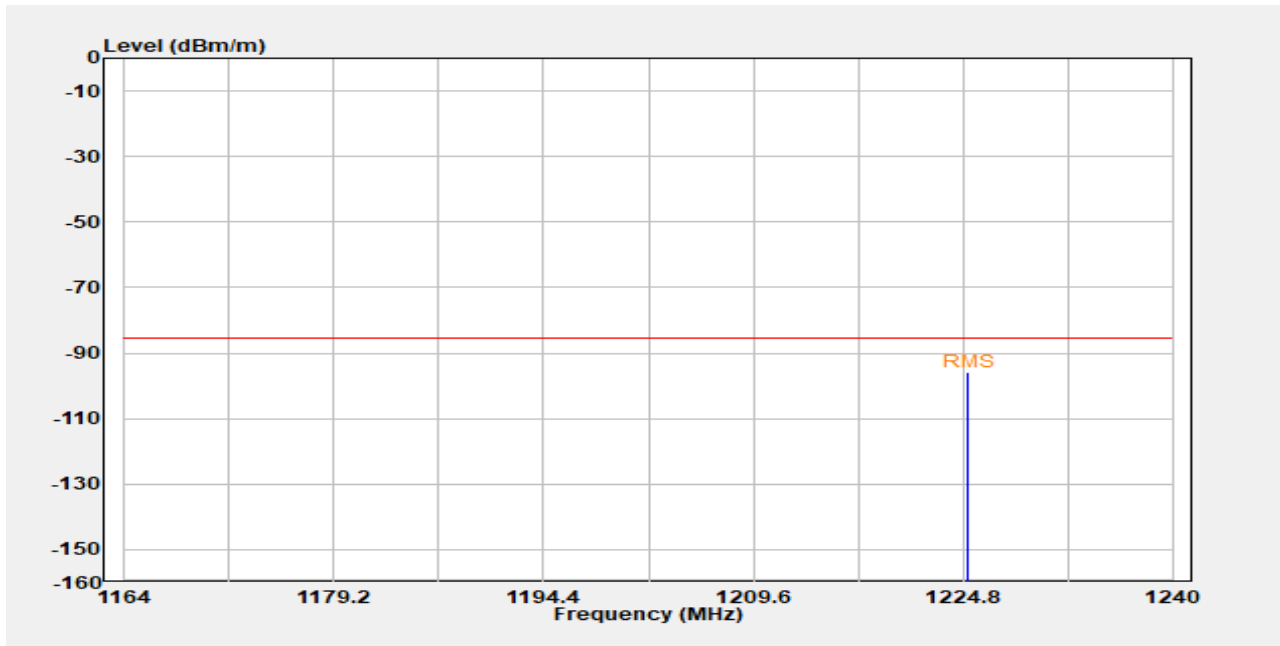
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch5
 Test Mode :GPS
 EUT Pol :E2 Plane
 Test Frequency :1164MHz-1240MHz

Test Site :SAC 2
 Test Date :2024-05-20
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Vertical
 Engineer :Bob Chao



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
1225.104	-95.75	-99.08	7.05	-3.72	-85.30	-10.45

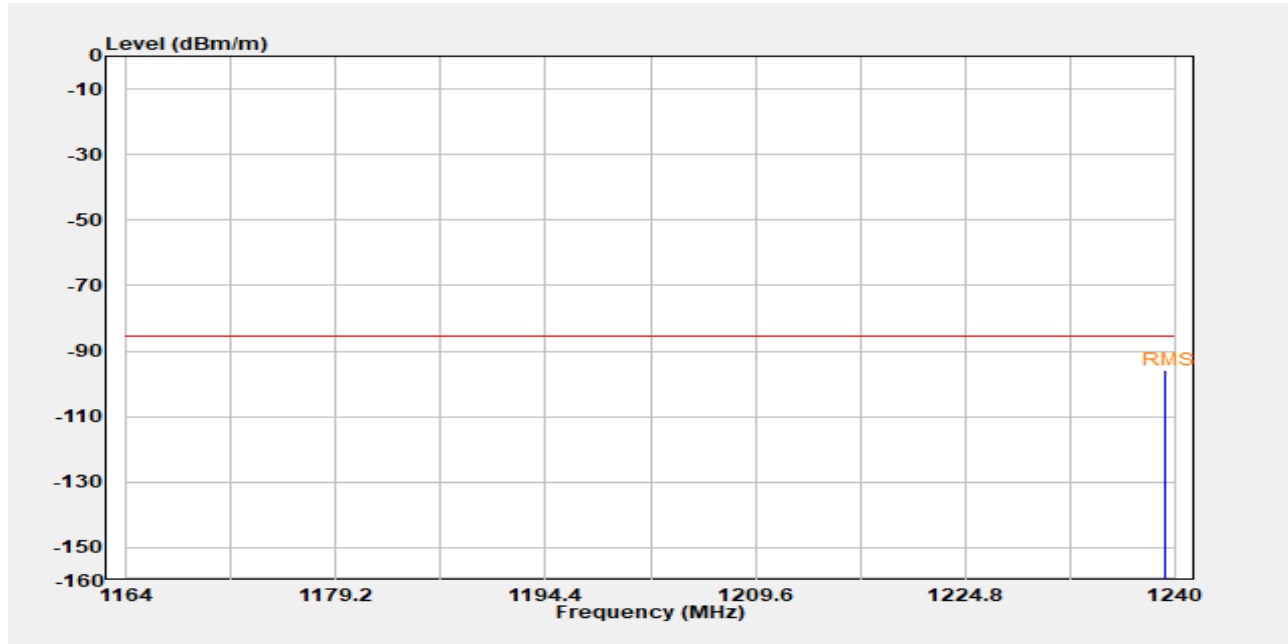
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Report Number :TERF2404001193ER
Operation Mode :UWB Ch5
Test Mode :GPS
EUT Pol :E2 Plane
Test Frequency :1164MHz-1240MHz

Test Site :SAC 2
Test Date :2024-05-20
Temp./Humi. :25.4°C/55%
Antenna Pol. :Horizontal
Engineer :Bob Chao



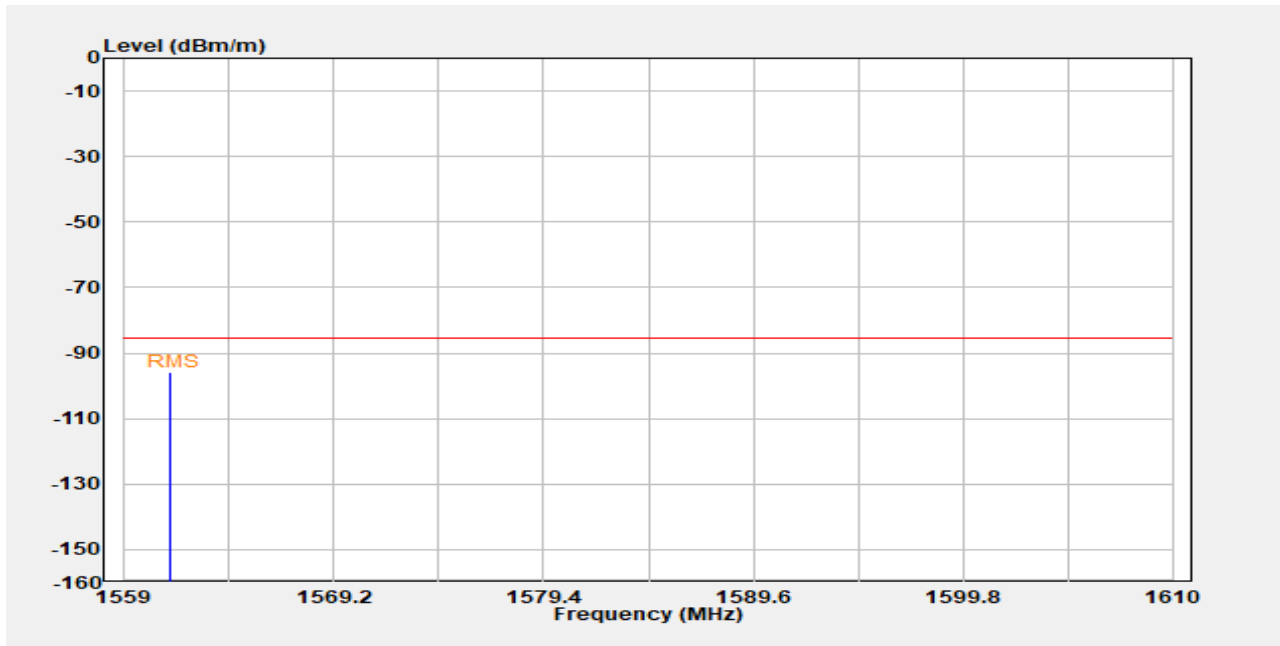
Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
1239.392	-95.62	-99.08	7.19	-3.74	-85.30	-10.32

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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch5
 Test Mode :GPS
 EUT Pol :E2 Plane
 Test Frequency :1559MHz-1610MHz

Test Site :SAC 2
 Test Date :2024-05-20
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Vertical
 Engineer :Bob Chao



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
1561.244	-95.68	-100.56	9.10	-4.21	-85.30	-10.38

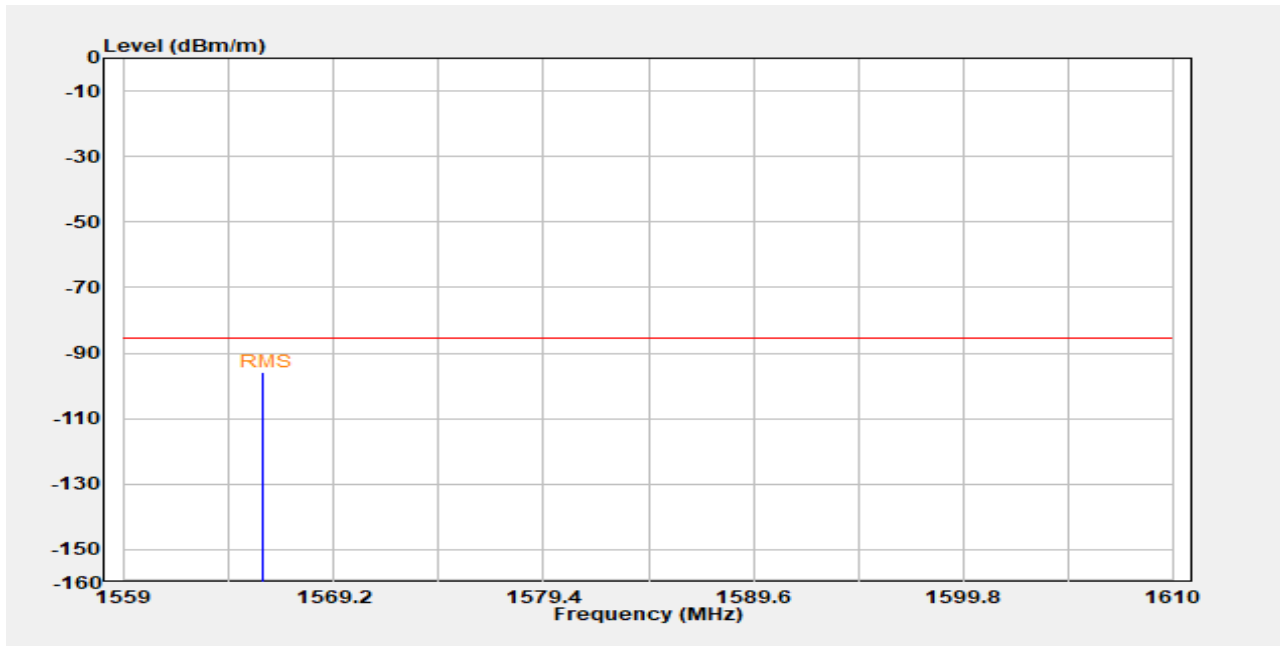
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch5
 Test Mode :GPS
 EUT Pol :E2 Plane
 Test Frequency :1559MHz-1610MHz

Test Site :SAC 2
 Test Date :2024-05-20
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Horizontal
 Engineer :Bob Chao



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
1565.732	-95.80	-100.68	9.10	-4.22	-85.30	-10.50

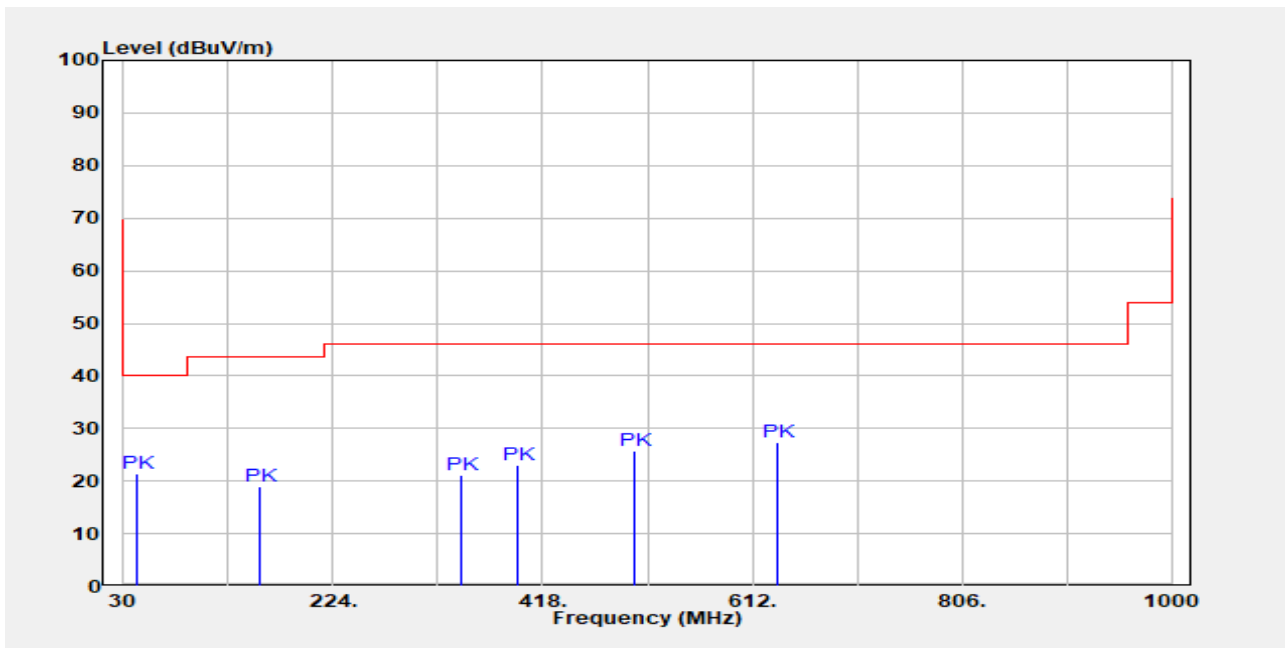
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8.7 Radiated Spurious Emission Measurement Result

Report Number	:TERF2404001193ER	Test Site	:SAC 2
Operation Mode	:UWB Ch2	Test Date	:2024-05-21
Test Frequency	:3993.6 MHz	Temp./Humi.	:25.4°C/55%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
42.610	Peak	34.20	-12.77	21.42	40.00	-18.58
156.100	Peak	32.04	-12.96	19.08	43.50	-24.42
343.310	Peak	32.18	-11.02	21.16	46.00	-24.84
394.720	Peak	32.73	-9.65	23.08	46.00	-22.92
503.360	Peak	32.70	-6.90	25.79	46.00	-20.21
635.280	Peak	31.76	-4.36	27.40	46.00	-18.60

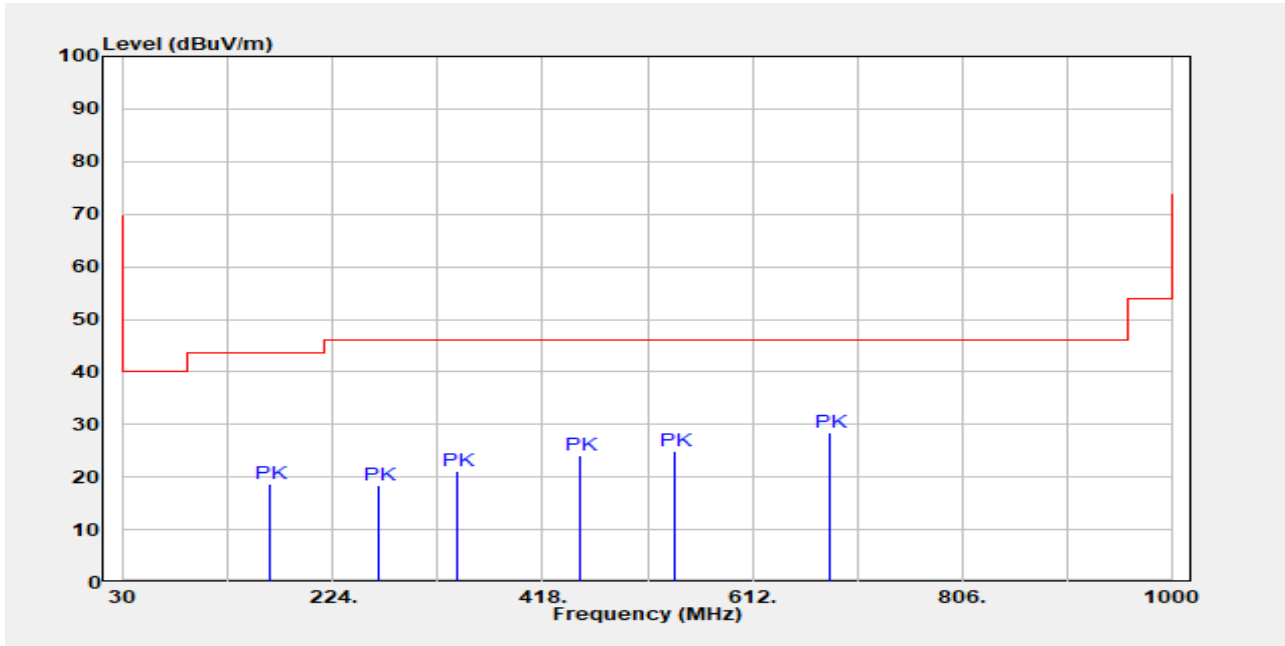
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch2
 Test Frequency :3993.6 MHz
 Test Mode :Tx
 EUT Pol :E2 Plane

Test Site :SAC 2
 Test Date :2024-05-21
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Horizontal
 Engineer :Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
164.830	Peak	32.03	-13.25	18.78	43.50	-24.72
265.710	Peak	31.30	-12.93	18.36	46.00	-27.64
338.460	Peak	32.18	-11.03	21.15	46.00	-24.85
452.920	Peak	32.07	-8.01	24.06	46.00	-21.94
540.220	Peak	31.70	-6.81	24.90	46.00	-21.10
683.780	Peak	31.98	-3.40	28.59	46.00	-17.42

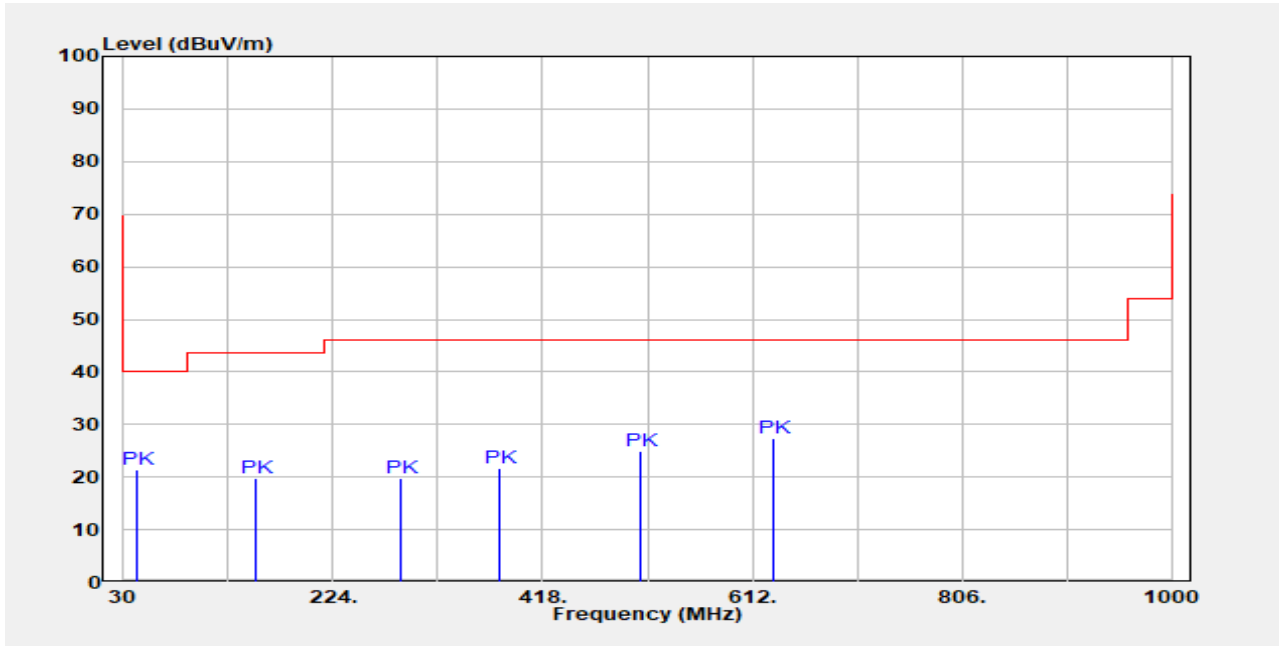
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch5
 Test Frequency :6489.6 MHz
 Test Mode :Tx
 EUT Pol :E2 Plane

Test Site :SAC 2
 Test Date :2024-05-21
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Vertical
 Engineer :Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
42.610	Peak	34.27	-12.77	21.50	40.00	-18.50
152.220	Peak	32.80	-12.95	19.85	43.50	-23.65
286.080	Peak	31.98	-12.25	19.74	46.00	-26.26
377.260	Peak	31.82	-10.09	21.74	46.00	-24.26
509.180	Peak	31.85	-6.80	25.05	46.00	-20.95
631.400	Peak	31.79	-4.43	27.37	46.00	-18.63

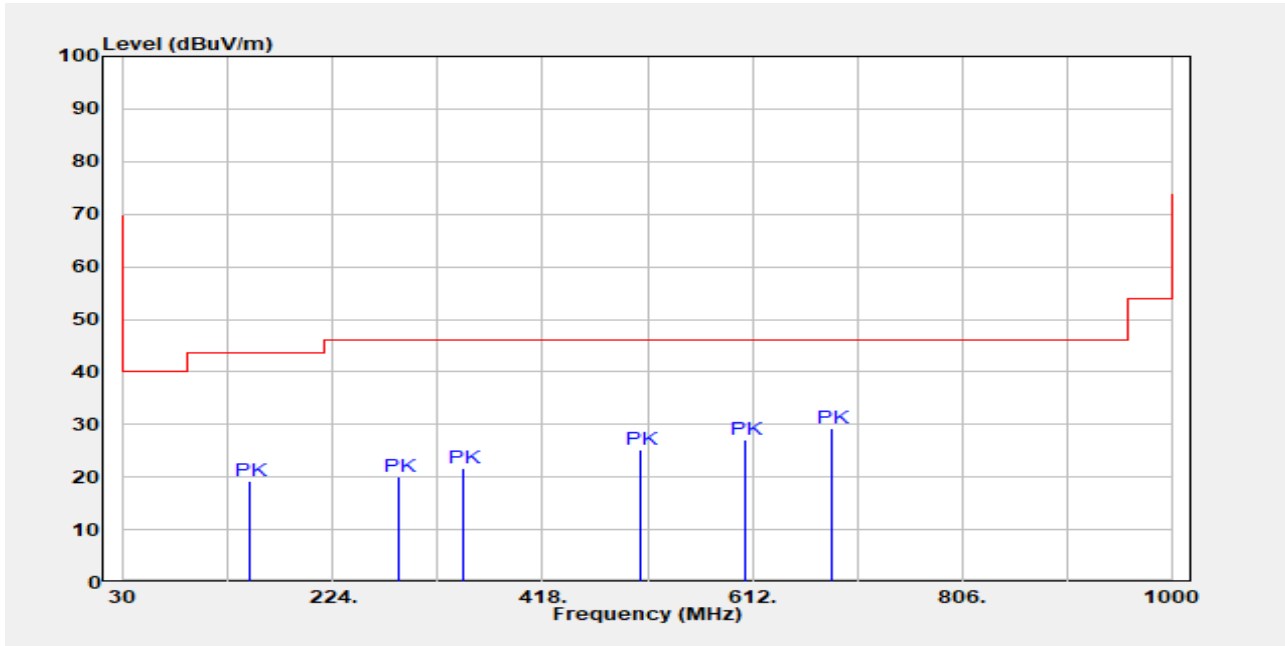
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch5
 Test Frequency :6489.6 MHz
 Test Mode :Tx
 EUT Pol :E2 Plane

Test Site :SAC 2
 Test Date :2024-05-21
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Horizontal
 Engineer :Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
146.400	Peak	32.35	-12.99	19.36	43.50	-24.14
285.110	Peak	32.38	-12.25	20.13	46.00	-25.87
344.280	Peak	32.81	-11.03	21.78	46.00	-24.22
509.180	Peak	31.89	-6.80	25.09	46.00	-20.91
606.180	Peak	31.62	-4.49	27.13	46.00	-18.87
684.750	Peak	32.61	-3.38	29.23	46.00	-16.77

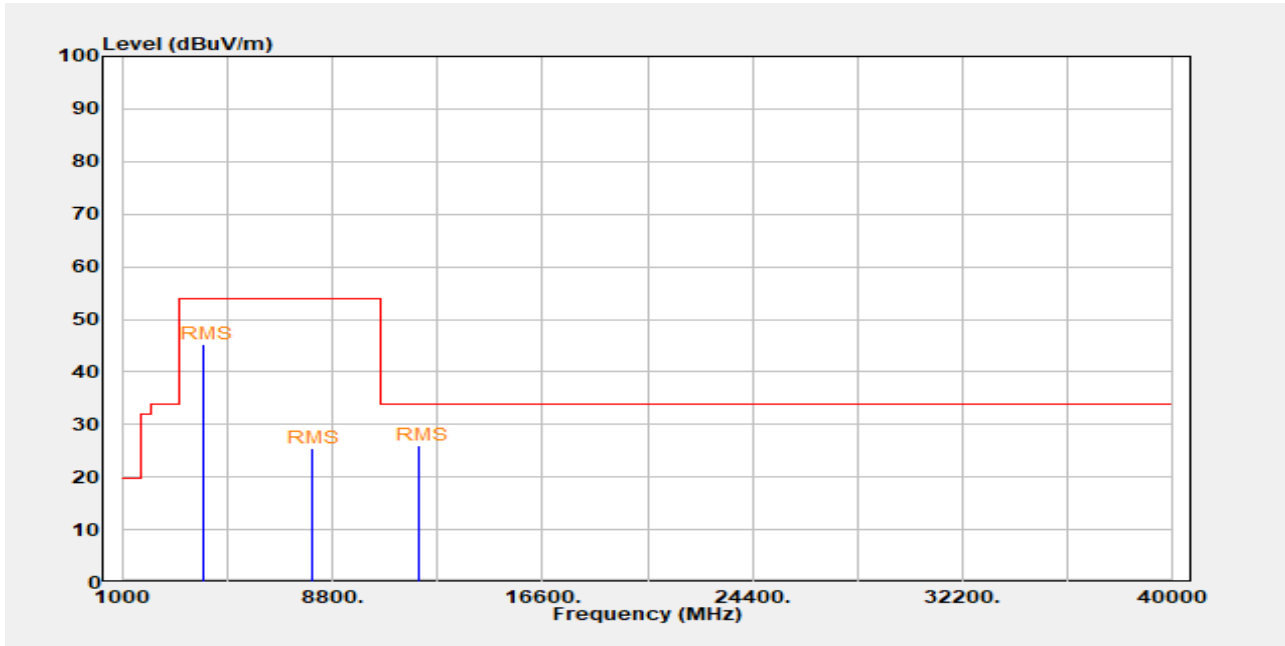
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch2
 Test Frequency :3993.6 MHz
 Test Mode :Tx
 EUT Pol :E2 Plane

Test Site :SAC 2
 Test Date :2024-05-23
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Vertical
 Engineer :Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
3993.600	RMS	52.91	-7.57	45.35	53.90	-8.55
7987.200	RMS	28.73	-3.27	25.47	53.90	-28.43
11980.800	RMS	30.20	-4.24	25.96	33.90	-7.94

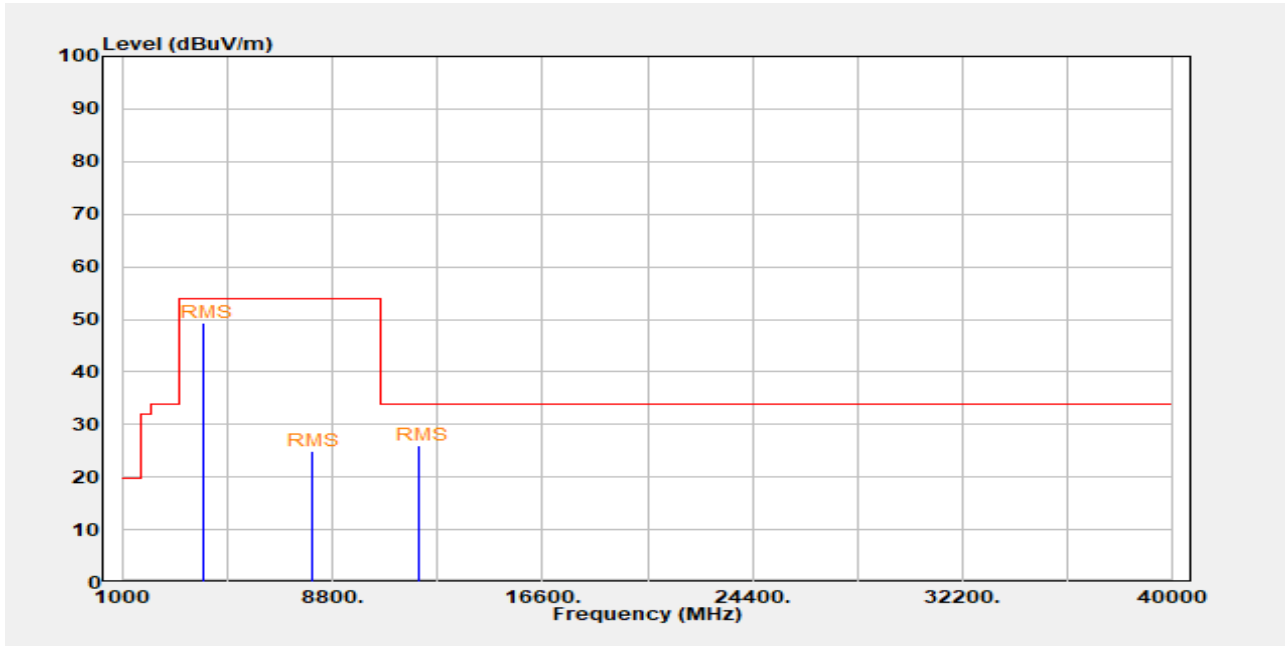
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch2
 Test Frequency :3993.6 MHz
 Test Mode :Tx
 EUT Pol :E2 Plane

Test Site :SAC 2
 Test Date :2024-05-23
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Horizontal
 Engineer :Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
3993.600	RMS	56.92	-7.57	49.36	53.90	-4.54
7987.200	RMS	28.29	-3.27	25.02	53.90	-28.88
11980.800	RMS	30.19	-4.24	25.96	33.90	-7.94

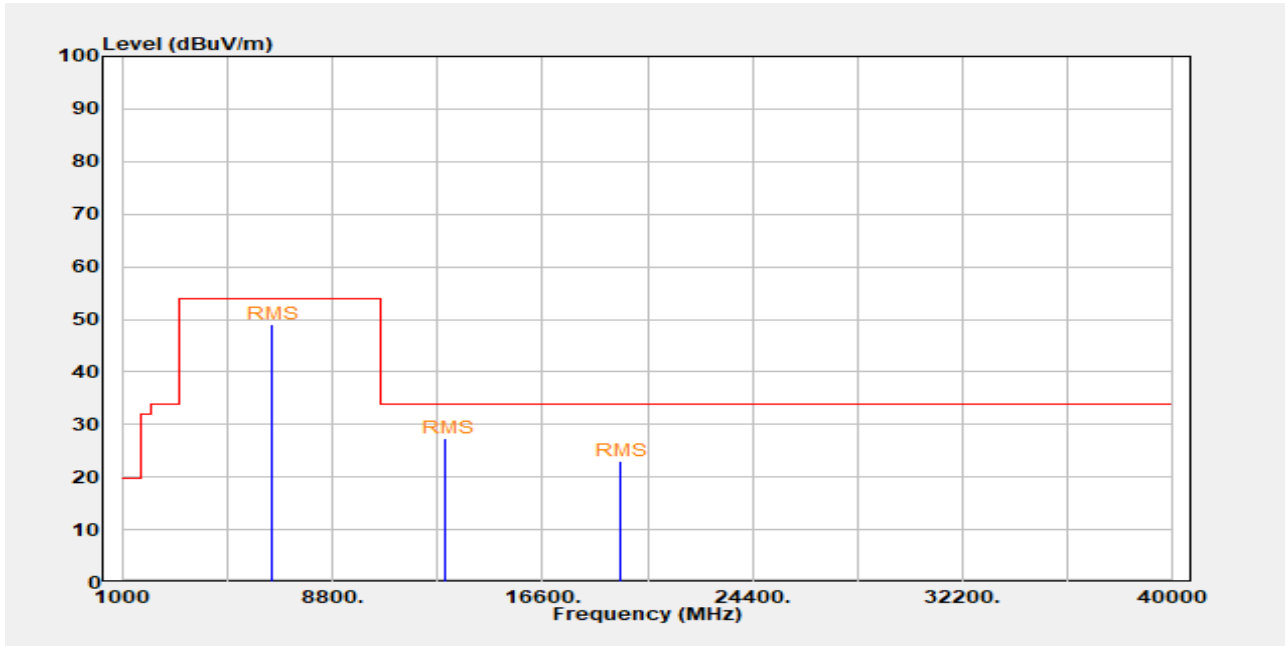
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch5
 Test Frequency :6489.6 MHz
 Test Mode :Tx
 EUT Pol :E2 Plane

Test Site :SAC 2
 Test Date :2024-05-23
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Vertical
 Engineer :Bob Chao



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
6489.600	RMS	52.18	-3.14	49.04	53.90	-4.86
12979.200	RMS	30.89	-3.65	27.24	33.90	-6.66
19468.800	RMS	24.60	-1.54	23.06	33.90	-10.84

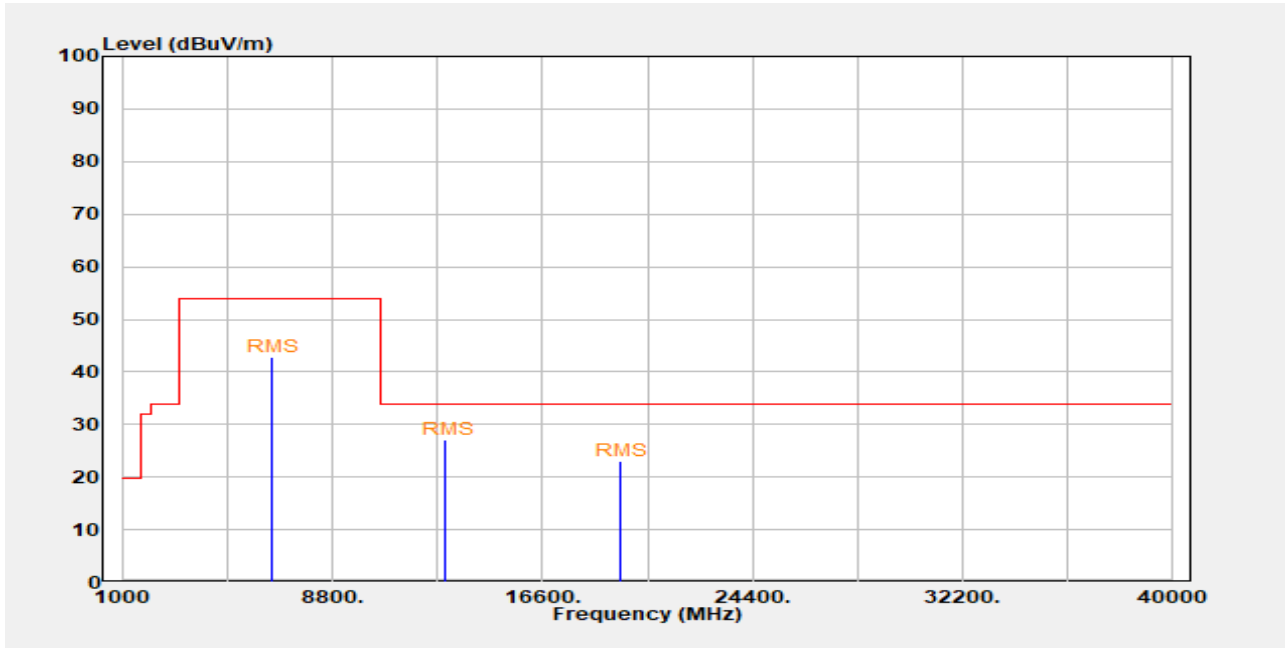
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Report Number :TERF2404001193ER
 Operation Mode :UWB Ch5
 Test Frequency :6489.6 MHz
 Test Mode :Tx
 EUT Pol :E2 Plane

Test Site :SAC 2
 Test Date :2024-05-23
 Temp./Humi. :25.4°C/55%
 Antenna Pol. :Horizontal
 Engineer :Bob Chao



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
6489.600	RMS	45.99	-3.14	42.85	53.90	-11.05
12979.200	RMS	30.84	-3.65	27.19	33.90	-6.71
19468.800	RMS	24.52	-1.54	22.98	33.90	-10.92

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9 TRANSMITTER TIMEOUT

9.1 Standard Applicable

According to §15.519(a) (1), A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

According to RSS-220 5.3.1 (b), The device is to transmit only when it is sending information to an associated receiver. The device shall cease transmission of information within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB device at least every 10 seconds or the UWB device shall cease transmitting any information other than periodic signals used for the establishment or re-establishment of a communication link with an associated receiver.

9.2 Measurement Equipment Used

Refer to section 7.2 for details.

9.3 Test Setup

Refer to section 7.3 for details.

9.4 Measurement Procedure

The Transmitter Timeout was measured with a spectrum analyzer connected to the EUT antenna.

9.5 Measurement Result

Note: Refer to next page spectrum analyzer data chart.

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Transmitter Timeout Measurement Result

Frequency (MHz)	Transmission time (seconds)	Limit (seconds)
3993.6	3.33	≤10
6489.6	3.06	

The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgment from the associated receiver that its transmission is being received.

Ch2 (3993.6MHz)



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Ch5 (6489.6MHz)



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10 ANTENNA REQUIREMENT

10.1 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.

10.2 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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