# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

| | |
|---|---|
| **EUT Description** | Wireless Electronic Dropper |
| **Applicant:** | Kind Shock Hi-Tech Co., Ltd.<br>No. 298, Anxin 2nd Rd., Annan Dist., Tainan City 709, Taiwan (R.O.C.) |
| **Manufacturer:** | Atech OEM Inc.<br>7F,AAEON Building, No.43,Sec.4,Keelung Rd., Taipei City 10607,Taiwan R.O.C |
| **Brand Name:** | Kind Shock |
| **Model No.:** | Rage Circuit |
| **Report Number:** | TERF2503000857ER |
| **FCC ID** | 2BM6NKSC298 |
| **Date of EUT Received:** | March 4, 2025 |
| **Date of Test:** | March 6, 2025～May 23, 2025 |
| **Issue Date:** | May 26, 2025 |

***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.

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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# Revision History

| Report Number | Revision | Description | Issue Date | Revised By | Remark |
|---|---|---|---|---|---|
| TERF2503000857ER | 00 | Original | May 2, 2025 | Candice Li | |
| TERF2503000857ER | 01 | Modify Date of Test. Add the descriptions and data of 20dB BW in sections 2.5, 2.6, 3, 5 and 10. | May 26, 2025 | Candice Li | * |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Note:**

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

2、 Variant information of main & alternate battery sources is provided by the applicant. Test results of this report are applicable to the sample EUT(s) received.

| | 1st | 2nd |
|---|---|---|
| Battery | Brand: GLOSO CO., LTD.<br>Model No.: LP802030-2S<br>Manufacturer: GLOSO CO., LTD. | Brand: BERON ENERGY<br>Model No.: PA122-03B<br>Manufacturer: Guangdong Beron Energy Technology Co., Ltd. |
| Note | AC 7.4V 450mAh | AC 7.4V 400mAh |

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# 1 GENERAL INFORMATION

## 1.1 Product Description

| | |
|---|---|
| EUT Description | Wireless Electronic Dropper |
| Brand Name: | Kind Shock |
| Model No.: | Rage Circuit |
| Hardware Version: | V1.0 |
| Firmware Version: | V1.0 |
| EUT Series No.: | N/A |
| Power Supply: | 7.4 Vdc from Rechargeable Lithium Ion Battery<br>5 Vdc from Circuit Battery Charger |
| Test Software (Name/Version) | PuTTY to command |

## 1.2 RF Specification

| | |
|---|---|
| Radio Technology: | 2.4GHz Short Range Radio |
| Frequency Range: | 2423 – 2463MHz |
| Channel number: | 5 Channels |
| Modulation type: | GFSK |
| Transmit Power: | 82.69 dBuV/m at 3m (Peak)<br>82.34 dBuV/m at 3m (Avg) |

## 1.3 Antenna Designation

| Antenna Type | Freq. (MHz) | Peak Antenna Gain (dBi) |
|---|---|---|
| Monopole | 2400~2483 | 3.1 |

**Note:** Antenna information is provided by the applicant.

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## 1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.249
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 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 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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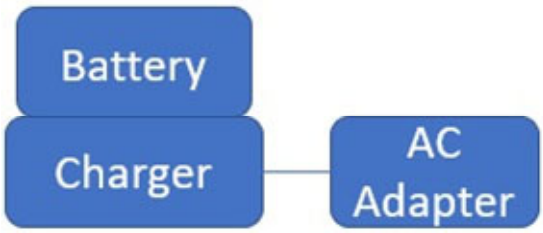
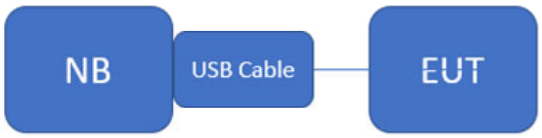
## 2.5 Test Configuration

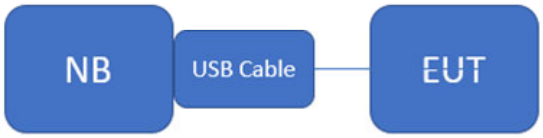
### Conduction Setup




### Conducted Setup




### Radiated Setup




## 2.6 Control Unit(s)

| AC Power-Line Conducted Emission Test Site: Conduction 1 | | | | | |
|---|---|---|---|---|---|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. (mm/dd/yyyy) | CAL DUE. (mm/dd/yyyy) |
| TYPE-C USB Cable | SUNCA | 1Q12508231-KS | N/A | N/A | N/A |
| Charger | Atech | Circuit Charger | N/A | N/A | N/A |
| AC Adapter | Apple | A1385 | N/A | N/A | N/A |

| Conducted Emission Test Site: Conducted 2 | | | | | |
|---|---|---|---|---|---|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. (mm/dd/yyyy) | CAL DUE. (mm/dd/yyyy) |
| USB Cable | FTDI | CH340 | N/A | N/A | N/A |
| Notebook | HP | HSN-Q35C-4 | 5CD2428X45 | N/A | N/A |

| Radiated Emission Test Site: SAC 3 | | | | | |
|---|---|---|---|---|---|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. (mm/dd/yyyy) | CAL DUE. (mm/dd/yyyy) |
| USB Cable | FTDI | CH340 | N/A | N/A | N/A |
| Notebook | HP | HSN-Q35C-4 | 5CD2428X45 | N/A | 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 | Compliant |
| §15.205<br>§15.249(a)(e)<br>§15.209 | Radiated Emission | Compliant |
| §15.215(c) | Emission Bandwidth | Compliant |
| §15.203 | Antenna Requirement | Compliant |

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# 4 DESCRIPTION OF TEST MODES

## 4.1 Operating Frequencies

| Channel | Frequency |
|---|---|
| 23 | 2423 |
| 25 | 2425 |
| 43 | 2443 |
| 50 | 2450 |
| 63 | 2463 |

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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.

| CONDUCTED TEST | | |
|---|---|---|
| MODE | FREQUENCY BAND (MHz) | TEST FREQUENCY (MHz) |
| SRD | 2423 to 2463 | 2423,2443,2463 |

| TRANSMIT RADIATED EMISSION TEST (BELOW 1 GHz) | | |
|---|---|---|
| MODE | FREQUENCY BAND (MHz) | TEST FREQUENCY (MHz) |
| SRD | 2423 to 2463 | 2443 |
| **TRANSMIT RADIATED EMISSION TEST (ABOVE 1 GHz)** | | |
| MODE | FREQUENCY BAND (MHz) | TEST FREQUENCY (MHz) |
| SRD | 2423 to 2463 | 2423,2443,2463 |

**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.

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# 6 MEASUREMENT UNCERTAINTY

| Test Items | Uncertainty | | |
|---|---|---|---|
| AC Power Line Conducted Emission | +/- | 1.54 | dB |
| Emission Bandwidth | +/- | 1.38 | Hz |
| Conducted emission measurement | +/- | 0.77 | dB |
| Temperature | +/- | 0.6 | °C |
| Humidity | +/- | 3 | % |
| DC / AC Power Source | +/- | 1 | % |

| Radiated Spurious Emission Measurement Uncertainty | | | | |
|---|---|---|---|---|
| **Polarization: Vertical** | **+/-** | **1.89** | **dB** | 9kHz~30MHz |
| | **+/-** | **4.1** | **dB** | 30MHz - 1000MHz |
| | **+/-** | **3.37** | **dB** | 1GHz - 18GHz |
| | **+/-** | **3.83** | **dB** | 18GHz - 40GHz |
| **Polarization: Horizontal** | **+/-** | **1.89** | **dB** | 9kHz~30MHz |
| | **+/-** | **4.1** | **dB** | 30MHz - 1000MHz |
| | **+/-** | **3.37** | **dB** | 1GHz - 18GHz |
| | **+/-** | **3.83** | **dB** | 18GHz - 40GHz |
| **Radiated Spurious Emission** | **+/-** | **2** | **dB** | 33GHz-50GHz |
| | **+/-** | **1.59** | **dB** | 50GHz-60GHz |
| | **+/-** | **1.71** | **dB** | 60GHz-90GHz |
| | **+/-** | **1.64** | **dB** | 90GHz-140GHz |
| | **+/-** | **3.84** | **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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# 7 MEASUREMENT EQUIPMENT USED

## 7.1 Emission from AC power line

| AC Power-Line Conducted Emission Test Site: Conduction 1 | | | | | |
|---|---|---|---|---|---|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. (mm/dd/yyyy) | CAL DUE. (mm/dd/yyyy) |
| Coaxial Cables | EMC Instruments Corp. | EMCCFD300-BM-BM-3000 | 161207 | 06/22/2024 | 06/21/2025 |
| EMI Test Receiver | R&S | ESCI 7 | 100759 | 08/28/2024 | 08/27/2025 |
| LISN | SCHWARZBECK | NSLK 8127 | 1040 | 09/07/2024 | 09/06/2025 |
| Pulse Limiter | SCHWARZBECK | VTSD 9561F-N | 793 | 06/22/2024 | 06/21/2025 |
| Test Software | Audix | e3 | Ver. 9.210616 | N.C.R | N.C.R |

## 7.2 Conducted Measurement

| Conducted Emission Test Site: Conducted 2 | | | | | |
|---|---|---|---|---|---|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. (mm/dd/yyyy) | CAL DUE. (mm/dd/yyyy) |
| EXA Spectrum Analyzer | KEYSIGHT | N9010B | MY59071541 | 07/08/2024 | 07/07/2025 |

## 7.3 Radiated Measurement

| Radiated Emission Test Site: SAC 3 | | | | | |
|---|---|---|---|---|---|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. (mm/dd/yyyy) | CAL DUE. (mm/dd/yyyy) |
| 4G High Pass Filter | WI | WHKX4.0 | 22 | 12/11/2024 | 12/10/2025 |
| Attenuator | Mini-Circuits | BW-S10W2+ | 16 | 12/11/2024 | 12/10/2025 |
| Band Reject Filter 2400-2483.5 | EWT | EWT-14-0166 | M2 | 12/11/2024 | 12/10/2025 |
| Bi-log Antenna | SCHWARZBECK | VULB9168 | 378 | 08/09/2024 | 08/08/2025 |
| Coaxial Cables | EMCI+Huber Suhner | EMC107-SM-SM-1000 +SUCOFLEX 104PEA +EMC107-SM-SM-1500 +SUCOFLEX 106 | RX Cable 9K-18G (221110+MY4251/4PEA+221106+76096/6) | 08/30/2024 | 08/29/2025 |
| Coaxial Cables | Huber Suhner | SUCOFLEX 102 | RX Cable 18G-40G MY2630/2+805062/2 | 08/30/2024 | 08/29/2025 |
| EMI Test Receiver | R&S | ESCI 7 | 100759 | 08/28/2024 | 08/27/2025 |
| EXA Spectrum Analyzer | KEYSIGHT | N9010B | MY63440386 | 02/05/2025 | 02/04/2026 |
| Horn Antenna | RF SPIN | DRH0844 | LE2D05A0844 | 07/10/2024 | 07/09/2025 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 1441 | 09/23/2024 | 09/22/2025 |
| Loop Antenna | COM-POWER | AL-130R | 10160104 | 12/19/2024 | 12/18/2025 |
| Pre-Amplifier | EMCI | EMC118A45SEE | 980868 | 08/30/2024 | 08/29/2025 |
| Pre-Amplifier | EMCI | EMC184045SEE | 9080939 | 08/30/2024 | 08/29/2025 |
| Pre-Amplifier | HP | 8447D | 2944A07676 | 08/30/2024 | 08/29/2025 |
| Site Cal | SGS | SAC 3 | N/A | 08/30/2024 | 08/29/2025 |
| 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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# 8 AC POWER LINE CONDUCTED EMISSION TEST

## 8.1 Applicable Standard:

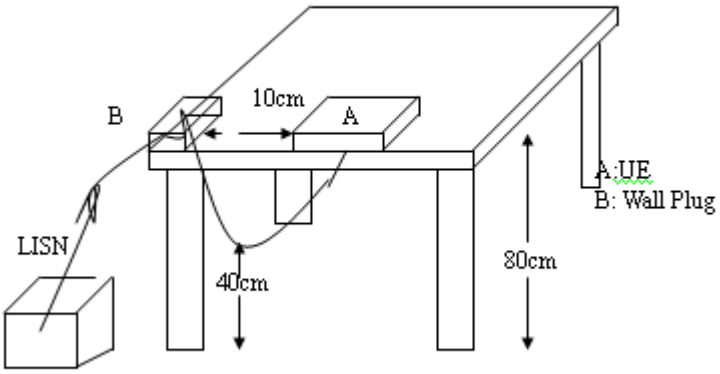
Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

| 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<br>1.The lower limit shall apply at the transition frequencies<br>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

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## 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:

Note1: Refer to next page for measurement data and plots.

Note2: The test data reveals the worst-case results that closest to the limit.

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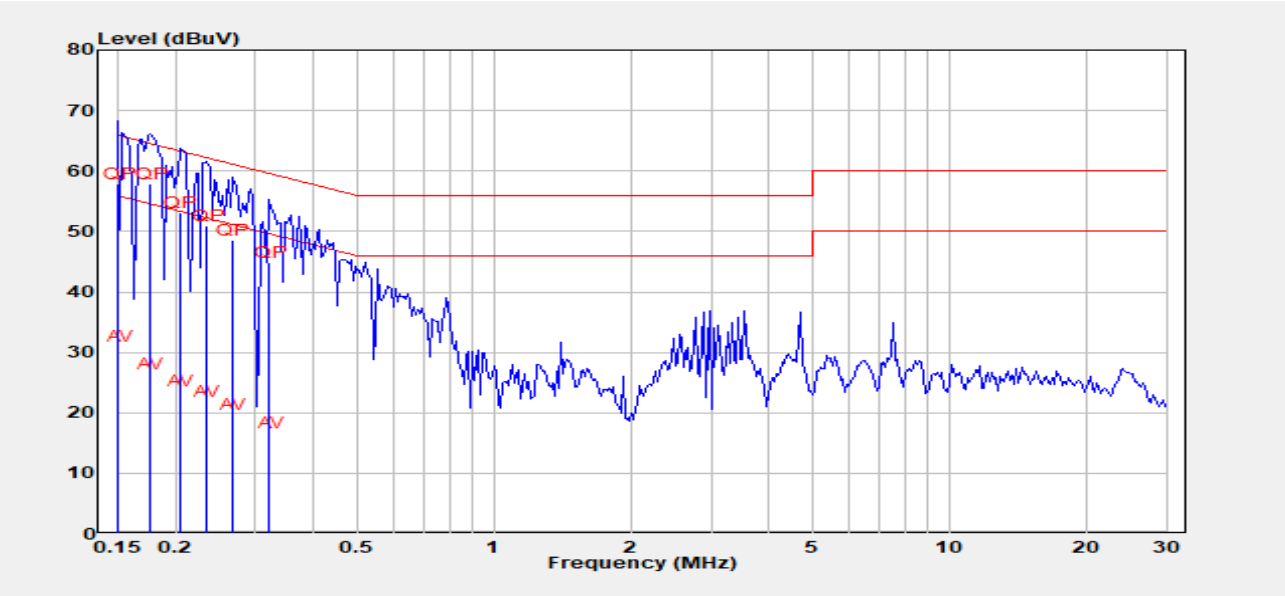
# AC POWER LINE CONDUCTED EMISSION TEST DATA

| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :Conduction 1 |
| Operation Mode | :Charger mode | Test Date | :2025-04-15 |
| Power | :120V/60Hz | Temp./Humi. | :23.5℃/55% |
| Probe | :L | Engineer | :Nick Lin |
| Note: | :1st Battery + Charger | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV | Limit dBμV | Margin dB |
|---|---|---|---|---|---|---|
| 0.150 | Average | 20.83 | 10.13 | 30.96 | 56.00 | -25.04 |
| 0.150 | QP | 47.79 | 10.13 | 57.92 | 66.00 | -8.08 |
| 0.176 | Average | 16.34 | 10.13 | 26.47 | 54.68 | -28.21 |
| 0.176 | QP | 47.73 | 10.13 | 57.86 | 64.68 | -6.82 |
| 0.204 | Average | 13.55 | 10.13 | 23.68 | 53.45 | -29.77 |
| 0.204 | QP | 43.02 | 10.13 | 53.15 | 63.45 | -10.30 |
| 0.234 | Average | 11.72 | 10.13 | 21.85 | 52.30 | -30.45 |
| 0.234 | QP | 40.79 | 10.13 | 50.92 | 62.30 | -11.38 |
| 0.266 | Average | 9.63 | 10.14 | 19.77 | 51.25 | -31.48 |
| 0.266 | QP | 38.44 | 10.14 | 48.58 | 61.25 | -12.67 |
| 0.322 | Average | 6.63 | 10.14 | 16.77 | 49.66 | -32.89 |
| 0.322 | QP | 34.67 | 10.14 | 44.81 | 59.66 | -14.85 |

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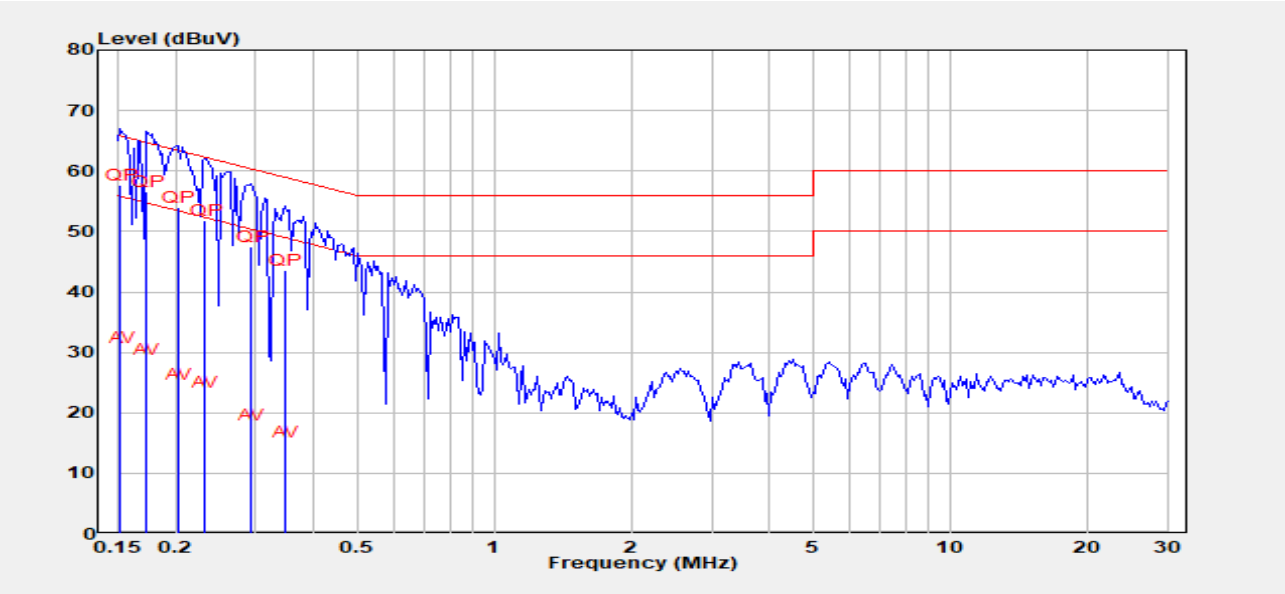
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :Conduction 1 |
| Operation Mode | :Charger mode | Test Date | :2025-04-15 |
| Power | :120V/60Hz | Temp./Humi. | :23.5℃/55% |
| Probe | :N | Engineer | :Nick Lin |
| Note: | :1st Battery + Charger | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV | Limit dBμV | Margin dB |
|---|---|---|---|---|---|---|
| 0.152 | Average | 20.72 | 10.12 | 30.84 | 55.91 | -25.07 |
| 0.152 | QP | 47.54 | 10.12 | 57.66 | 65.91 | -8.25 |
| 0.172 | Average | 18.73 | 10.12 | 28.85 | 54.86 | -26.01 |
| 0.172 | QP | 46.57 | 10.12 | 56.69 | 64.86 | -8.17 |
| 0.202 | Average | 14.54 | 10.12 | 24.66 | 53.54 | -28.88 |
| 0.202 | QP | 43.83 | 10.12 | 53.95 | 63.54 | -9.59 |
| 0.232 | Average | 13.32 | 10.13 | 23.45 | 52.39 | -28.95 |
| 0.232 | QP | 41.68 | 10.13 | 51.81 | 62.39 | -10.59 |
| 0.292 | Average | 7.81 | 10.14 | 17.95 | 50.46 | -32.51 |
| 0.292 | QP | 37.37 | 10.14 | 47.51 | 60.46 | -12.95 |
| 0.346 | Average | 4.93 | 10.14 | 15.07 | 49.05 | -33.97 |
| 0.346 | QP | 33.48 | 10.14 | 43.62 | 59.05 | -15.42 |

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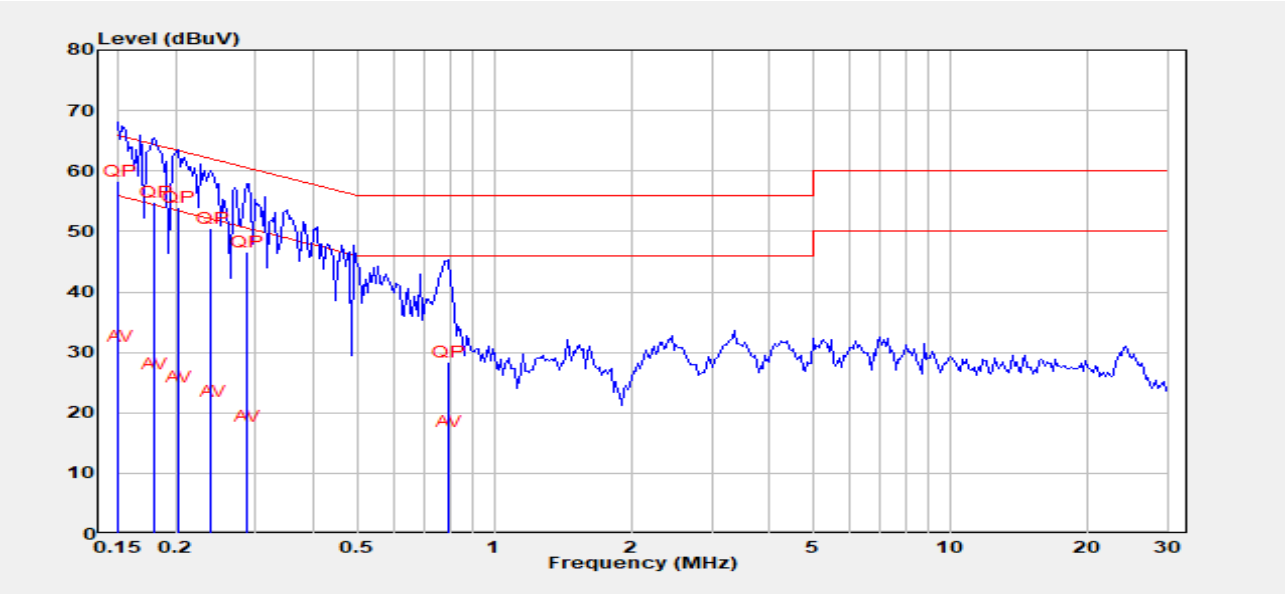
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :Conduction 1 |
| Operation Mode | :Charger mode | Test Date | :2025-04-15 |
| Power | :120V/60Hz | Temp./Humi. | :23.5℃/55% |
| Probe | :L | Engineer | :Nick Lin |
| Note: | :2nd Battery + Charger | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV | Limit dBμV | Margin dB |
|---|---|---|---|---|---|---|
| 0.150 | Average | 20.81 | 10.13 | 30.94 | 56.00 | -25.06 |
| 0.150 | QP | 48.22 | 10.13 | 58.35 | 66.00 | -7.65 |
| 0.180 | Average | 16.24 | 10.13 | 26.37 | 54.50 | -28.13 |
| 0.180 | QP | 44.77 | 10.13 | 54.90 | 64.50 | -9.60 |
| 0.202 | Average | 14.17 | 10.13 | 24.30 | 53.54 | -29.24 |
| 0.202 | QP | 43.77 | 10.13 | 53.90 | 63.54 | -9.64 |
| 0.239 | Average | 11.68 | 10.14 | 21.82 | 52.13 | -30.31 |
| 0.239 | QP | 40.38 | 10.14 | 50.52 | 62.13 | -11.61 |
| 0.286 | Average | 7.71 | 10.14 | 17.85 | 50.63 | -32.78 |
| 0.286 | QP | 36.49 | 10.14 | 46.63 | 60.63 | -14.00 |
| 0.792 | Average | 6.68 | 10.19 | 16.87 | 46.00 | -29.13 |
| 0.792 | QP | 18.19 | 10.19 | 28.38 | 56.00 | -27.62 |

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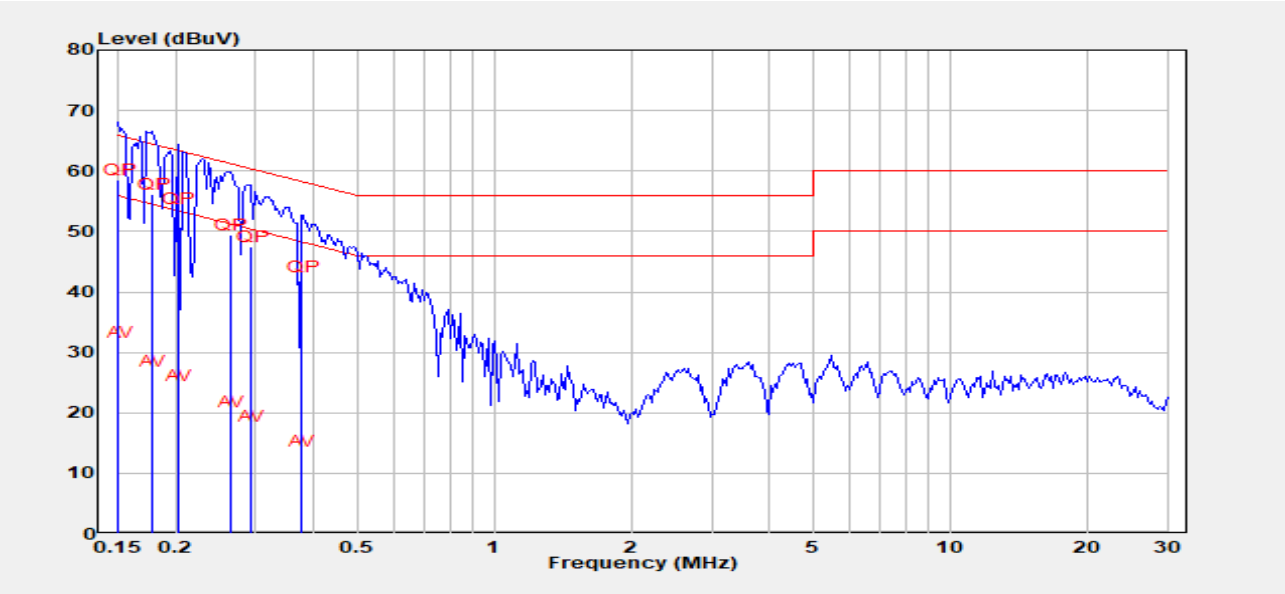
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :Conduction 1 |
| Operation Mode | :Charger mode | Test Date | :2025-04-15 |
| Power | :120V/60Hz | Temp./Humi. | :23.5℃/55% |
| Probe | :N | Engineer | :Nick Lin |
| Note: | :2nd Battery + Charger | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV | Limit dBμV | Margin dB |
|---|---|---|---|---|---|---|
| 0.150 | Average | 21.54 | 10.12 | 31.66 | 56.00 | -24.34 |
| 0.150 | QP | 48.33 | 10.12 | 58.45 | 66.00 | -7.55 |
| 0.178 | Average | 16.82 | 10.12 | 26.94 | 54.59 | -27.65 |
| 0.178 | QP | 46.02 | 10.12 | 56.14 | 64.59 | -8.45 |
| 0.202 | Average | 14.33 | 10.12 | 24.45 | 53.54 | -29.09 |
| 0.202 | QP | 43.68 | 10.12 | 53.80 | 63.54 | -9.74 |
| 0.263 | Average | 10.03 | 10.13 | 20.16 | 51.34 | -31.17 |
| 0.263 | QP | 39.27 | 10.13 | 49.40 | 61.34 | -11.93 |
| 0.292 | Average | 7.63 | 10.14 | 17.77 | 50.46 | -32.69 |
| 0.292 | QP | 37.28 | 10.14 | 47.42 | 60.46 | -13.04 |
| 0.377 | Average | 3.44 | 10.15 | 13.59 | 48.34 | -34.76 |
| 0.377 | QP | 32.28 | 10.15 | 42.43 | 58.34 | -15.92 |

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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

### 9.2.1 Radiated Emission

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. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz.
5. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.
6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements at frequency above 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Emission Measurements at frequency above 1 GHz.
8. 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.
9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
11. Repeat above procedures until all default test channel measured were complete.

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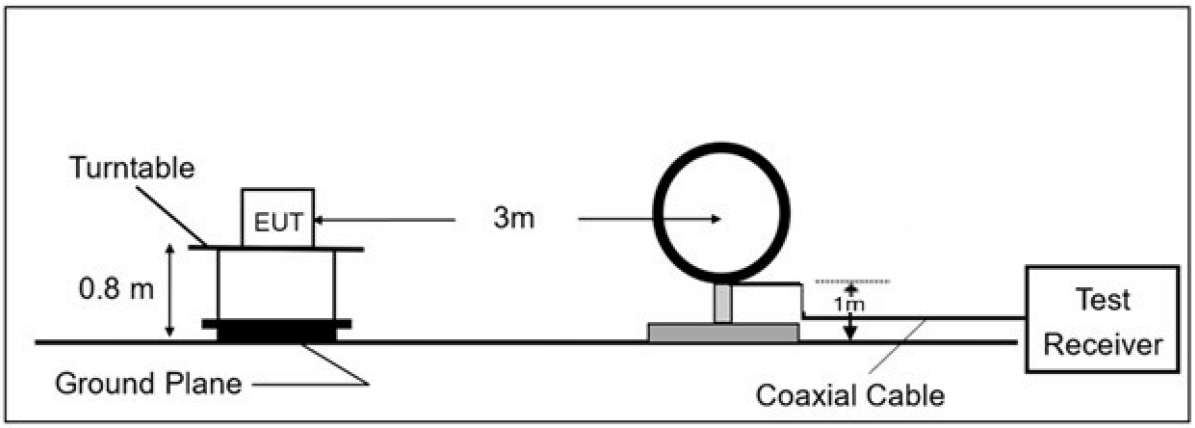
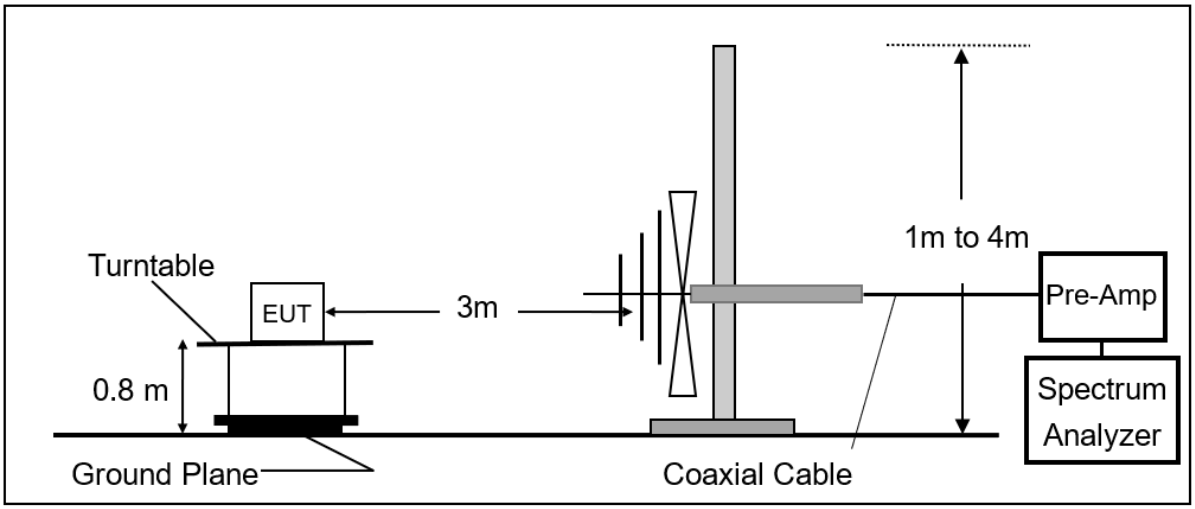
## 9.3 Test Setup

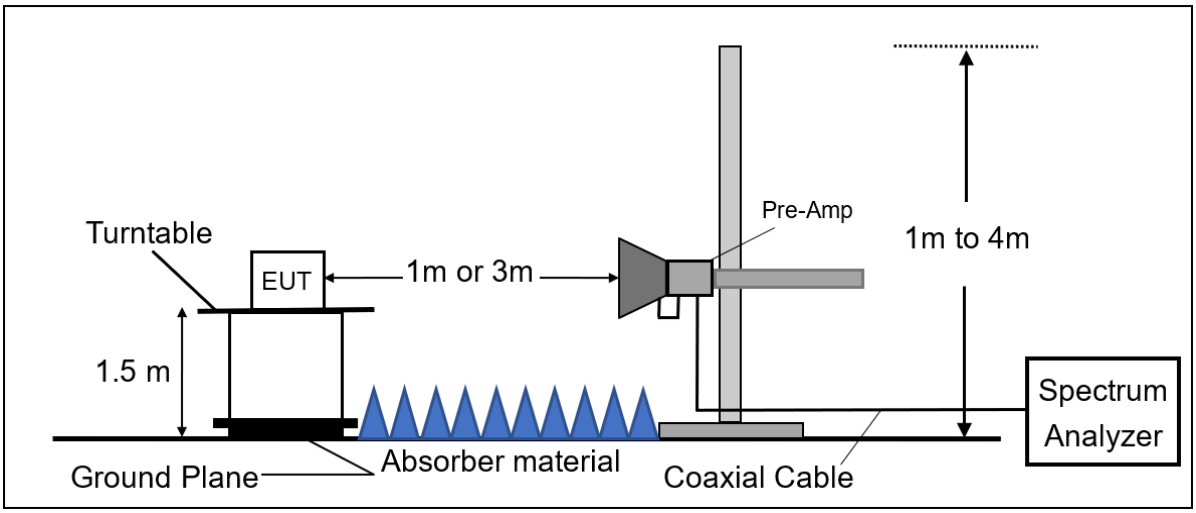
### 9.3.1 Radiated Emission Test Set-Up, Frequency Below 30MHz.




### 9.3.2 Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.




### 9.3.3 Radiated Emission Test Set-Up, Frequency Above 1GHz.

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## 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(dB/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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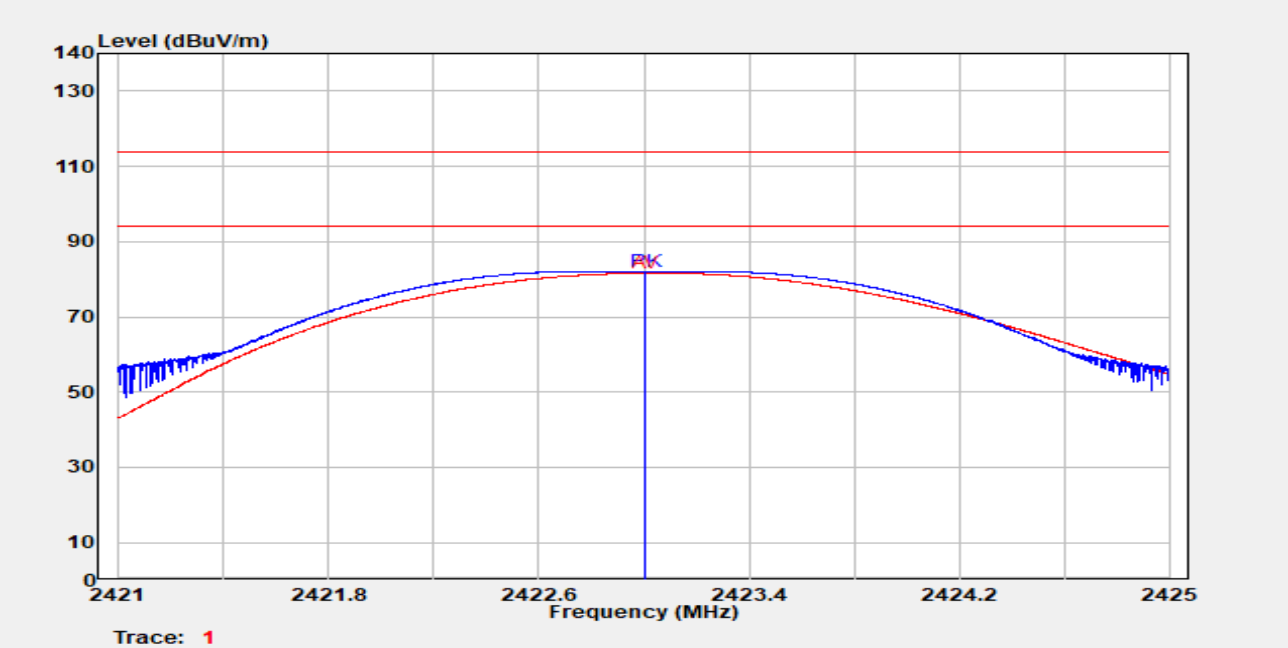
## 9.5 Measurement Result

### 9.5.1 Field Strength of the Fundamental Signal

| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2423 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Main | Antenna Pol. | :Vertical |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2423.00 | Peak | 86.63 | -4.61 | 82.02 | 114.00 | -31.98 |
| 2423.00 | Average | 86.29 | -4.61 | 81.68 | 94.00 | -12.32 |

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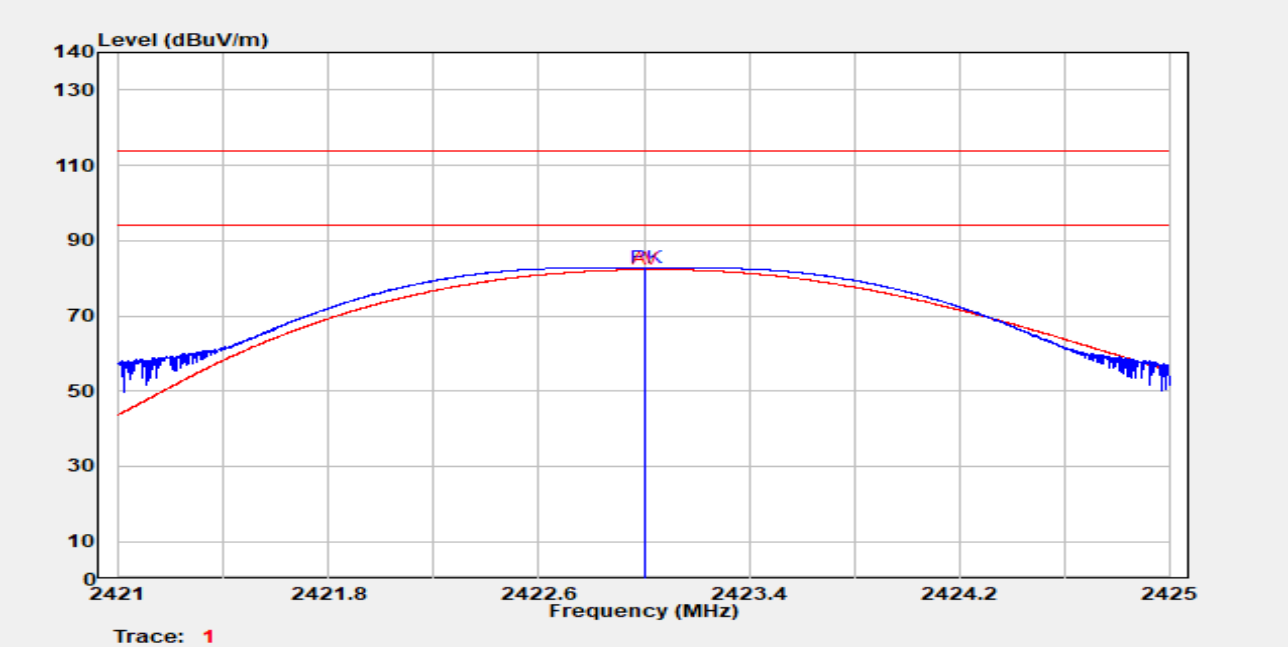
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2423 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Main | Antenna Pol. | :Horizontal |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2423.00 | Peak | 87.30 | -4.61 | 82.69 | 114.00 | -31.31 |
| 2423.00 | Average | 86.95 | -4.61 | 82.34 | 94.00 | -11.66 |

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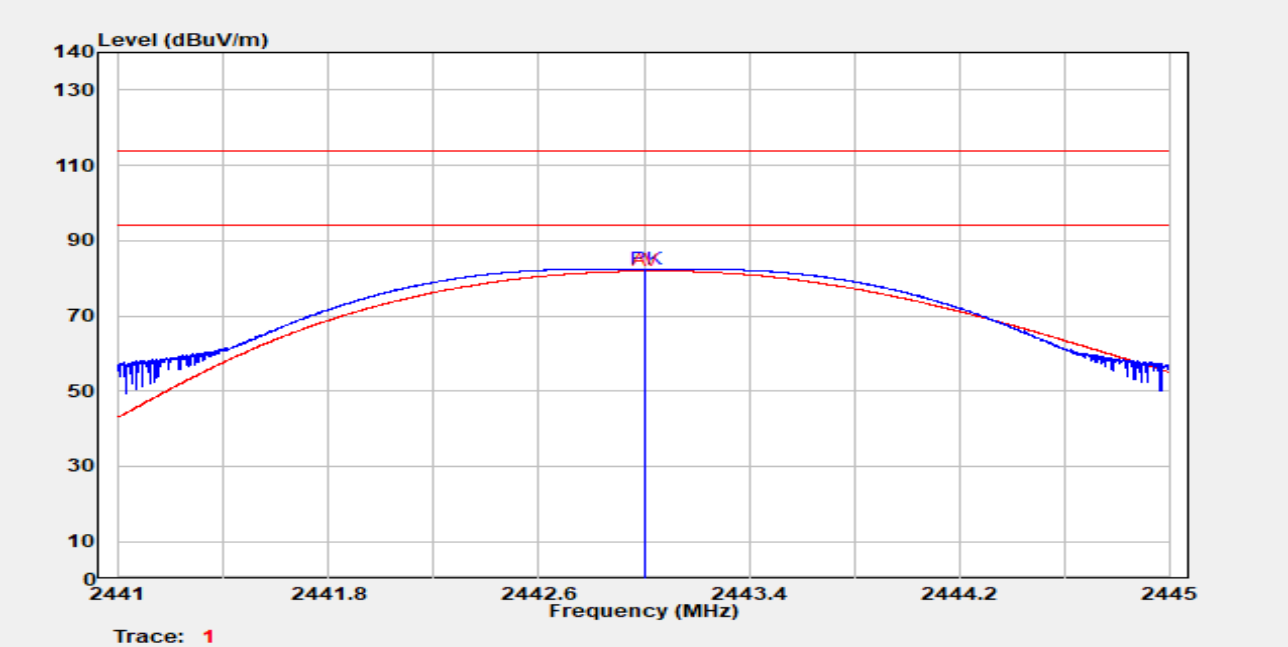
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2443 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Main | Antenna Pol. | :Vertical |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2443.00 | Peak | 86.98 | -4.68 | 82.30 | 114.00 | -31.70 |
| 2443.00 | Average | 86.62 | -4.68 | 81.94 | 94.00 | -12.06 |

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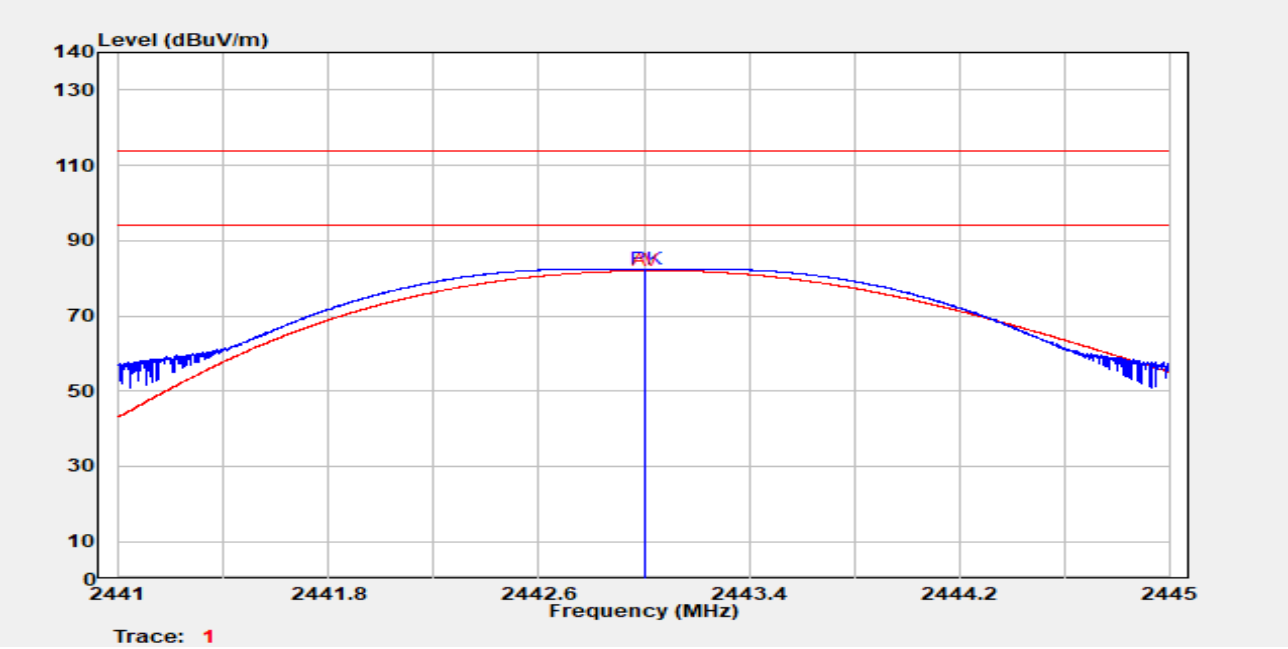
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2443 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Main | Antenna Pol. | :Horizontal |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2443.00 | Peak | 87.07 | -4.68 | 82.39 | 114.00 | -31.61 |
| 2443.00 | Average | 86.70 | -4.68 | 82.02 | 94.00 | -11.98 |

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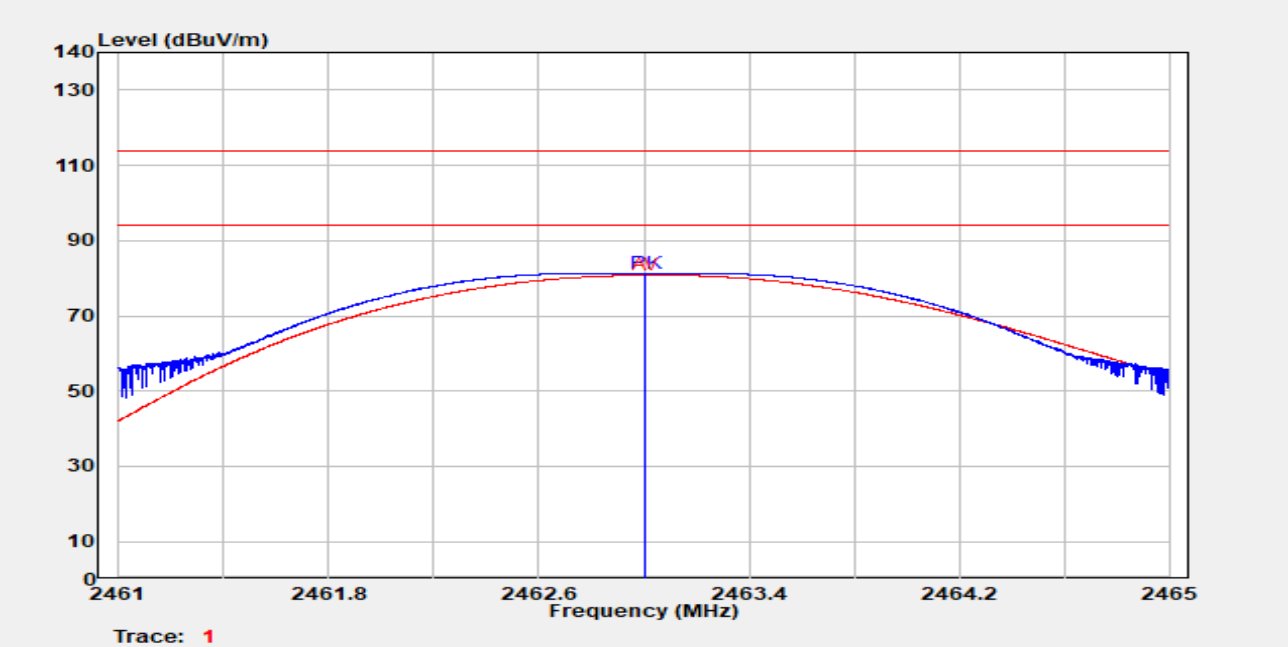
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2463 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Main | Antenna Pol. | :Vertical |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2463.00 | Peak | 85.93 | -4.71 | 81.22 | 114.00 | -32.78 |
| 2463.00 | Average | 85.57 | -4.71 | 80.86 | 94.00 | -13.14 |

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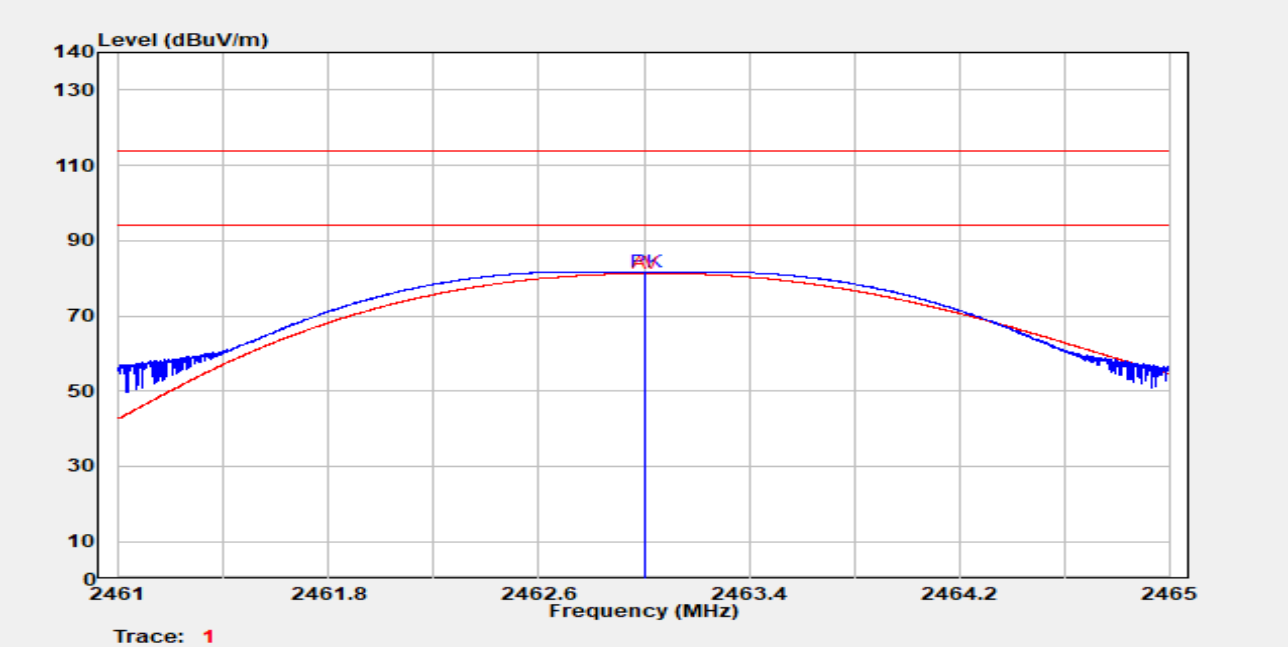
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2463 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Main | Antenna Pol. | :Horizontal |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2463.00 | Peak | 86.42 | -4.71 | 81.71 | 114.00 | -32.29 |
| 2463.00 | Average | 85.99 | -4.71 | 81.28 | 94.00 | -12.72 |

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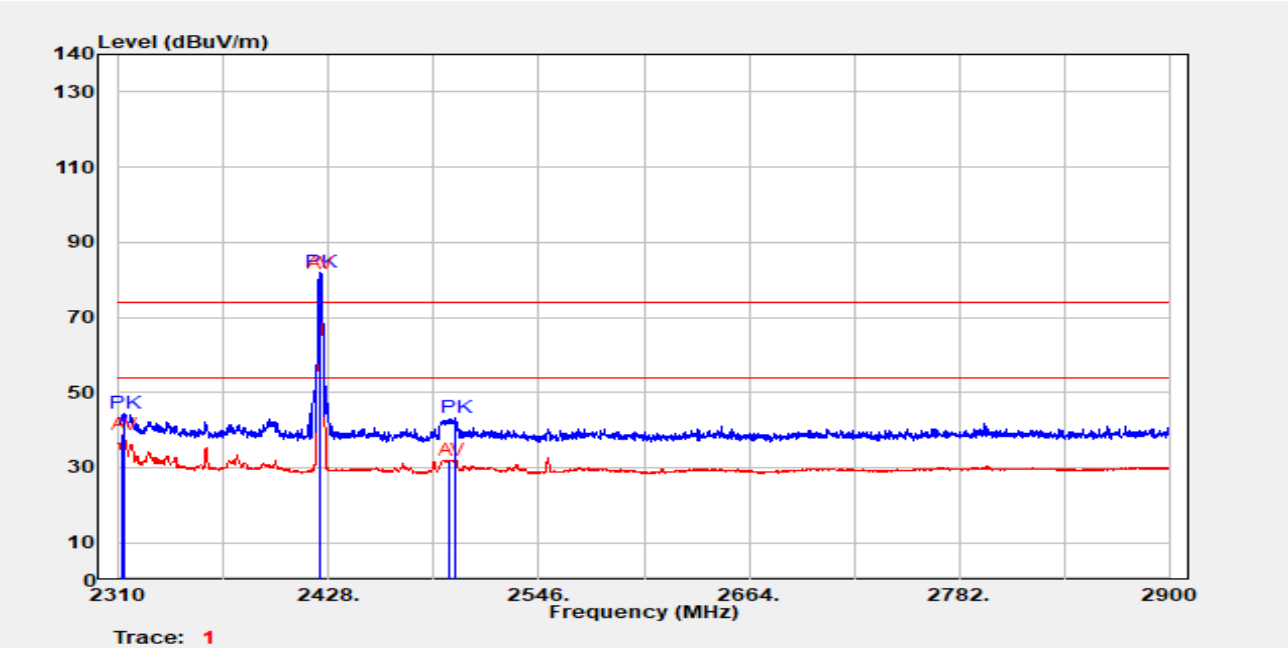
### 9.5.2 Restricted bands around fundamental frequency

| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2423 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Bandedge | Antenna Pol. | :Vertical |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2312.36 | Average | 42.99 | -4.32 | 38.67 | 54.00 | -15.33 |
| 2312.56 | Peak | 48.61 | -4.33 | 44.28 | 74.00 | -29.72 |
| 2423.00 | Peak | 86.67 | -4.61 | 82.06 | - | - |
| 2423.00 | Average | 86.23 | -4.61 | 81.62 | - | - |
| 2496.11 | Average | 36.76 | -4.71 | 32.05 | 54.00 | -21.95 |
| 2498.67 | Peak | 48.05 | -4.70 | 43.35 | 74.00 | -30.65 |

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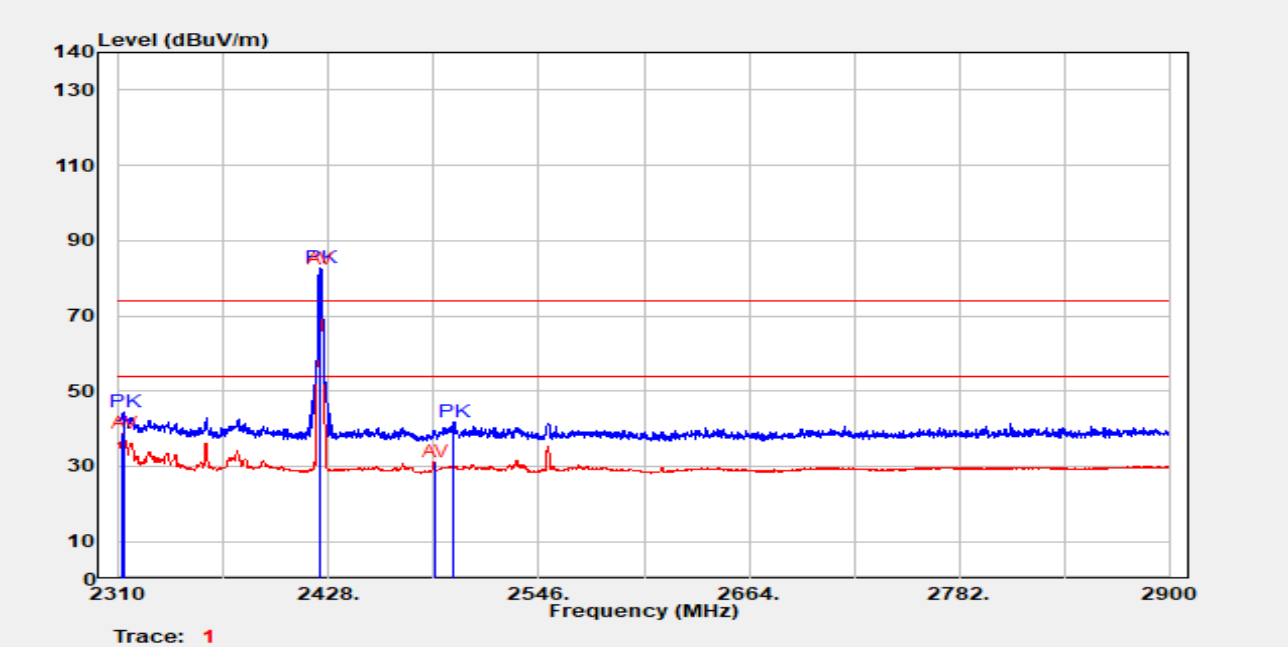
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2423 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Bandedge | Antenna Pol. | :Horizontal |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2312.36 | Average | 42.98 | -4.32 | 38.66 | 54.00 | -15.34 |
| 2313.15 | Peak | 48.86 | -4.33 | 44.53 | 74.00 | -29.47 |
| 2423.00 | Peak | 87.38 | -4.61 | 82.77 | - | - |
| 2423.00 | Average | 86.89 | -4.61 | 82.28 | - | - |
| 2487.06 | Average | 35.93 | -4.71 | 31.22 | 54.00 | -22.78 |
| 2498.27 | Peak | 46.57 | -4.70 | 41.87 | 74.00 | -32.13 |

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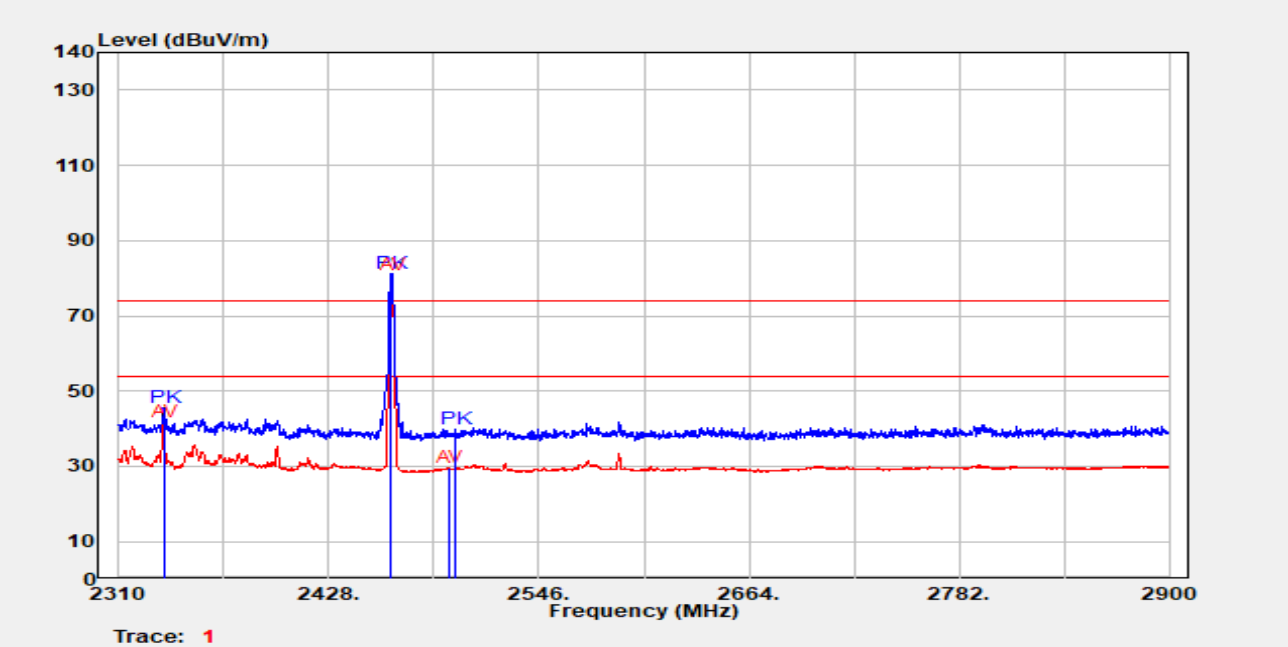
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2463 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Bandedge | Antenna Pol. | :Vertical |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2335.18 | Average | 45.95 | -4.39 | 41.56 | 54.00 | -12.44 |
| 2335.38 | Peak | 50.08 | -4.39 | 45.69 | 74.00 | -28.31 |
| 2463.00 | Peak | 85.97 | -4.71 | 81.26 | - | - |
| 2463.00 | Average | 85.57 | -4.71 | 80.86 | - | - |
| 2495.32 | Average | 34.33 | -4.71 | 29.62 | 54.00 | -24.38 |
| 2498.86 | Peak | 44.50 | -4.70 | 39.80 | 74.00 | -34.20 |

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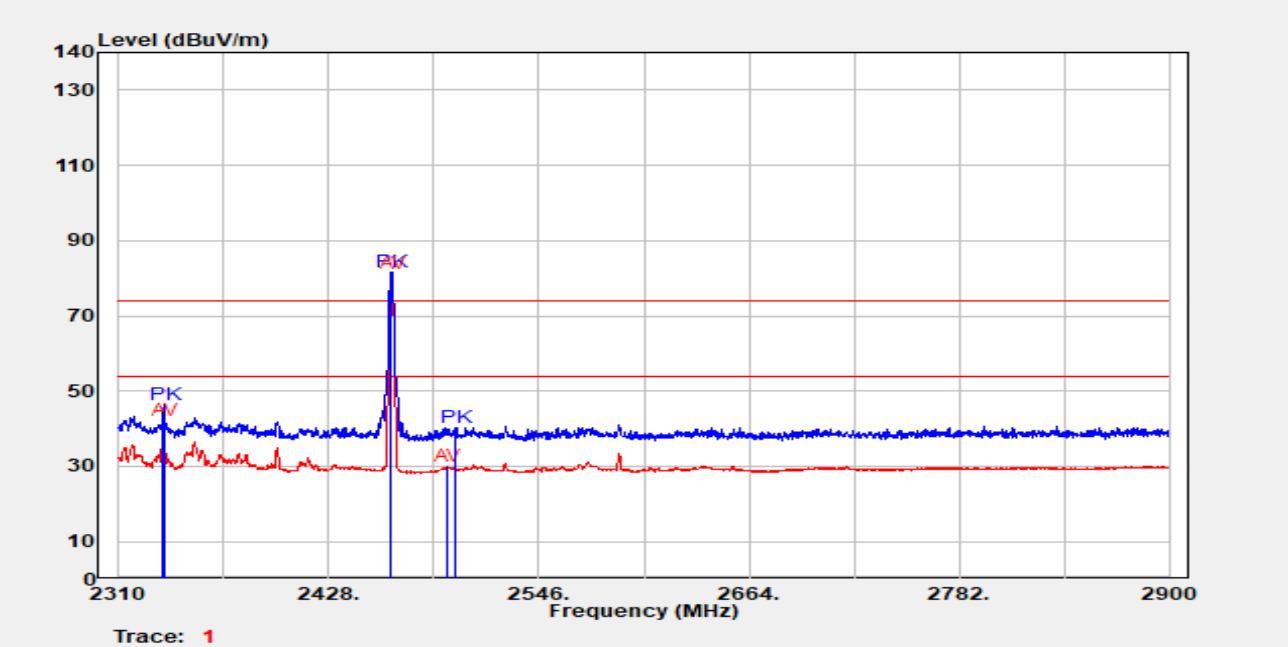
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2463 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Bandedge | Antenna Pol. | :Horizontal |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2334.99 | Average | 46.36 | -4.38 | 41.98 | 54.00 | -12.02 |
| 2335.38 | Peak | 50.54 | -4.39 | 46.15 | 74.00 | -27.85 |
| 2463.00 | Peak | 86.43 | -4.71 | 81.72 | - | - |
| 2463.00 | Average | 85.97 | -4.71 | 81.26 | - | - |
| 2494.54 | Average | 34.53 | -4.70 | 29.83 | 54.00 | -24.17 |
| 2499.45 | Peak | 44.89 | -4.70 | 40.19 | 74.00 | -33.81 |

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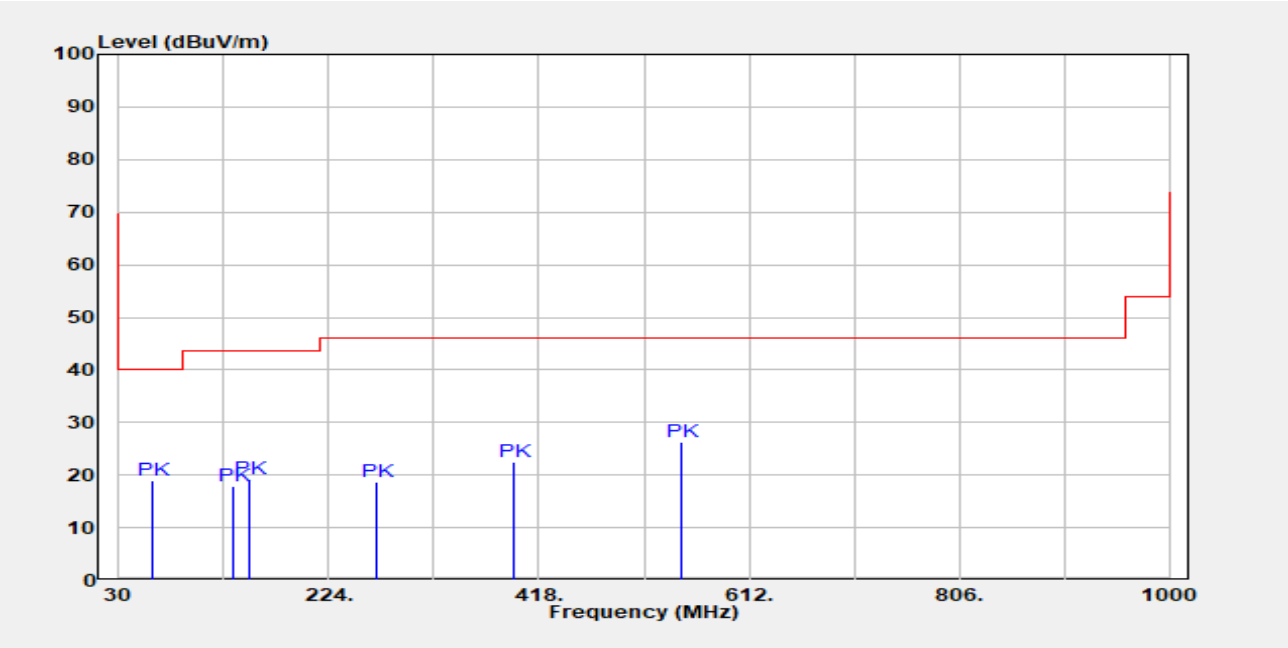
### 9.5.3 Radiated Spurious Emission Measurement Result

| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2443 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Tx | Antenna Pol. | :Vertical |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 61.04 | Peak | 28.09 | -9.18 | 18.91 | 40.00 | -21.09 |
| 135.73 | Peak | 27.21 | -9.34 | 17.87 | 43.50 | -25.63 |
| 151.25 | Peak | 27.46 | -8.21 | 19.25 | 43.50 | -24.25 |
| 267.65 | Peak | 26.55 | -7.98 | 18.57 | 46.00 | -27.43 |
| 394.72 | Peak | 27.85 | -5.33 | 22.52 | 46.00 | -23.48 |
| 549.92 | Peak | 28.74 | -2.57 | 26.17 | 46.00 | -19.83 |

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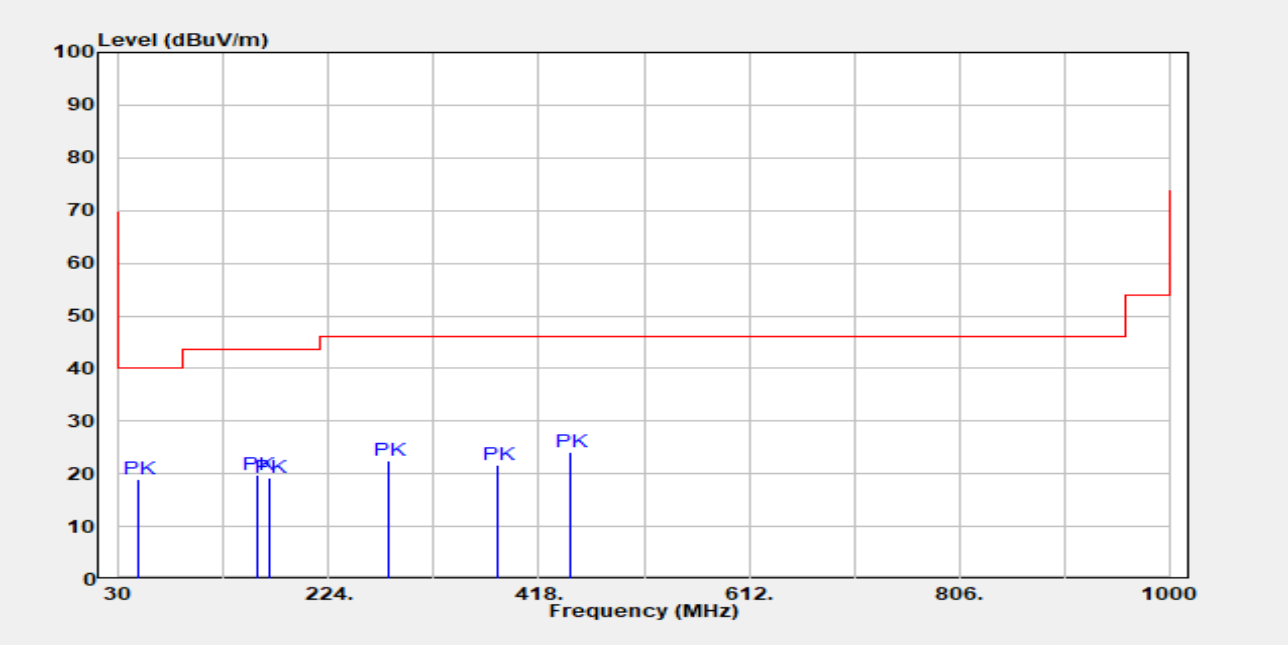
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-15 |
| Test Frequency | :2443 | Temp./Humi. | :22.7℃/59% |
| Test Mode | :Tx | Antenna Pol. | :Horizontal |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 47.46 | Peak | 27.78 | -8.77 | 19.01 | 40.00 | -20.99 |
| 157.07 | Peak | 27.96 | -8.20 | 19.76 | 43.50 | -23.74 |
| 168.71 | Peak | 27.94 | -8.74 | 19.20 | 43.50 | -24.30 |
| 279.29 | Peak | 29.95 | -7.57 | 22.38 | 46.00 | -23.62 |
| 379.20 | Peak | 27.21 | -5.59 | 21.62 | 46.00 | -24.38 |
| 447.10 | Peak | 28.18 | -3.99 | 24.19 | 46.00 | -21.81 |

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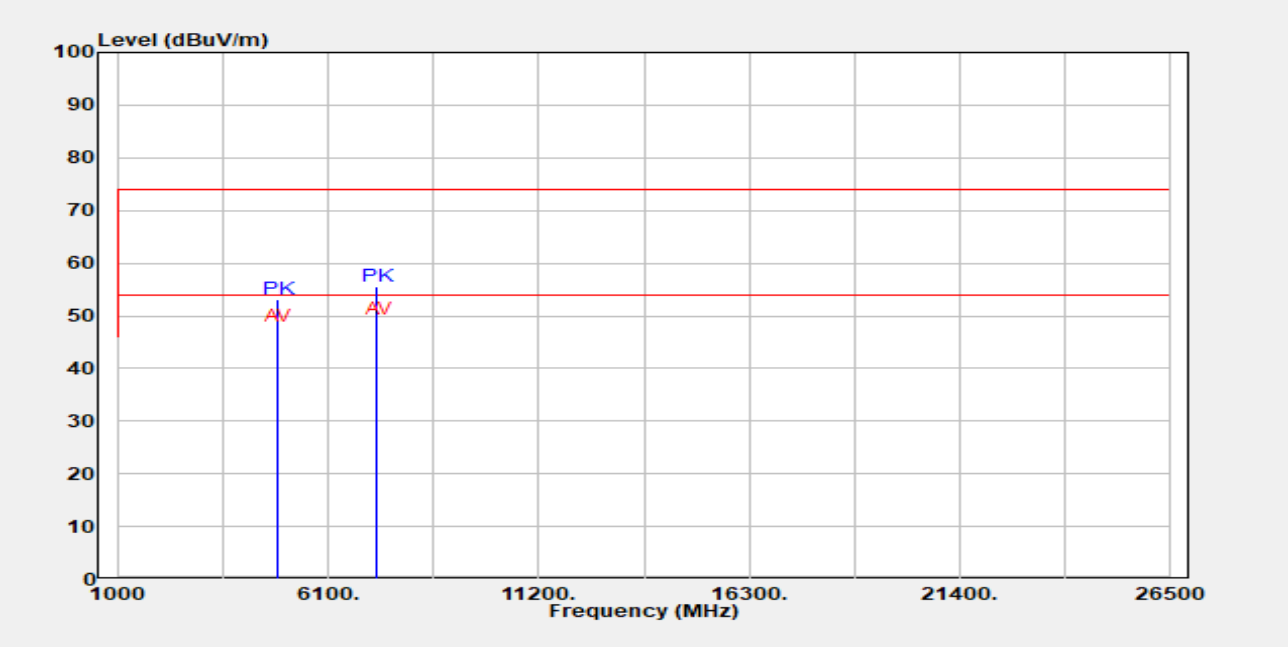
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-07 |
| Test Frequency | :2423 | Temp./Humi. | :20.5℃/59% |
| Test Mode | :Tx | Antenna Pol. | :Vertical |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4846.00 | Peak | 52.90 | 0.17 | 53.07 | 74.00 | -20.93 |
| 4846.00 | Average | 47.82 | 0.17 | 47.99 | 54.00 | -6.01 |
| 7269.00 | Peak | 49.99 | 5.52 | 55.51 | 74.00 | -18.49 |
| 7269.00 | Average | 43.71 | 5.52 | 49.23 | 54.00 | -4.77 |

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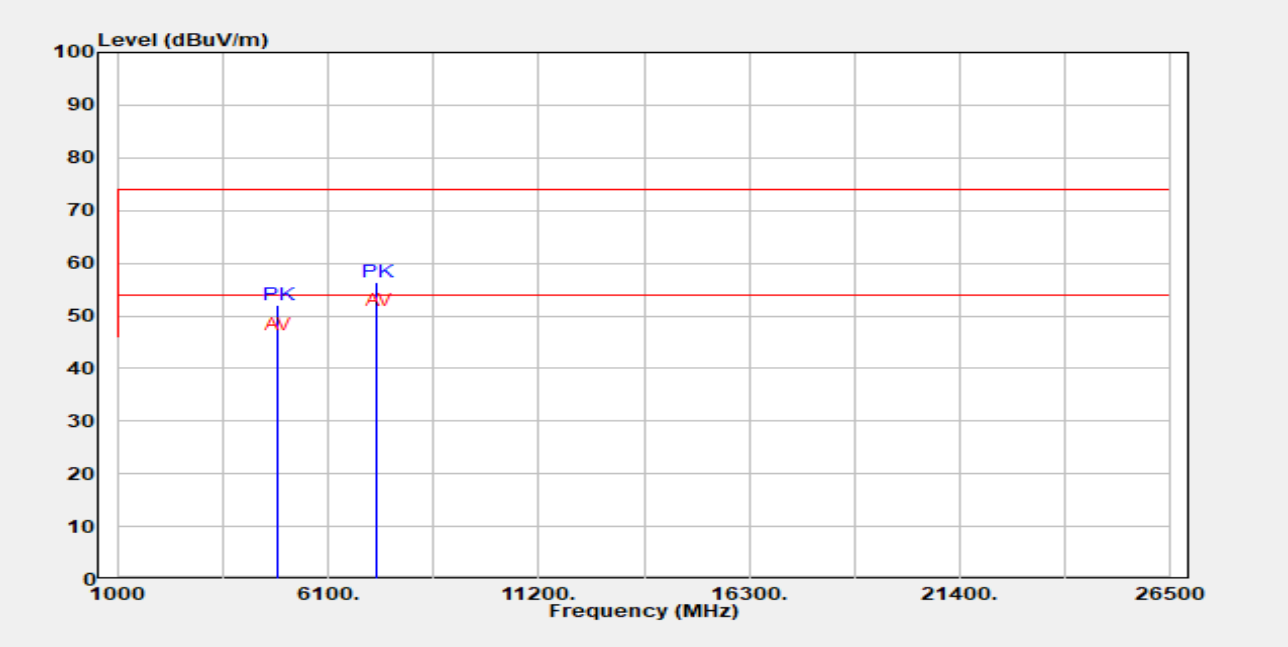
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-07 |
| Test Frequency | :2423 | Temp./Humi. | :20.5℃/59% |
| Test Mode | :Tx | Antenna Pol. | :Horizontal |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4846.00 | Peak | 51.82 | 0.17 | 51.99 | 74.00 | -22.01 |
| 4846.00 | Average | 46.15 | 0.17 | 46.32 | 54.00 | -7.68 |
| 7269.00 | Peak | 50.96 | 5.52 | 56.48 | 74.00 | -17.52 |
| 7269.00 | Average | 45.50 | 5.52 | 51.02 | 54.00 | -2.98 |

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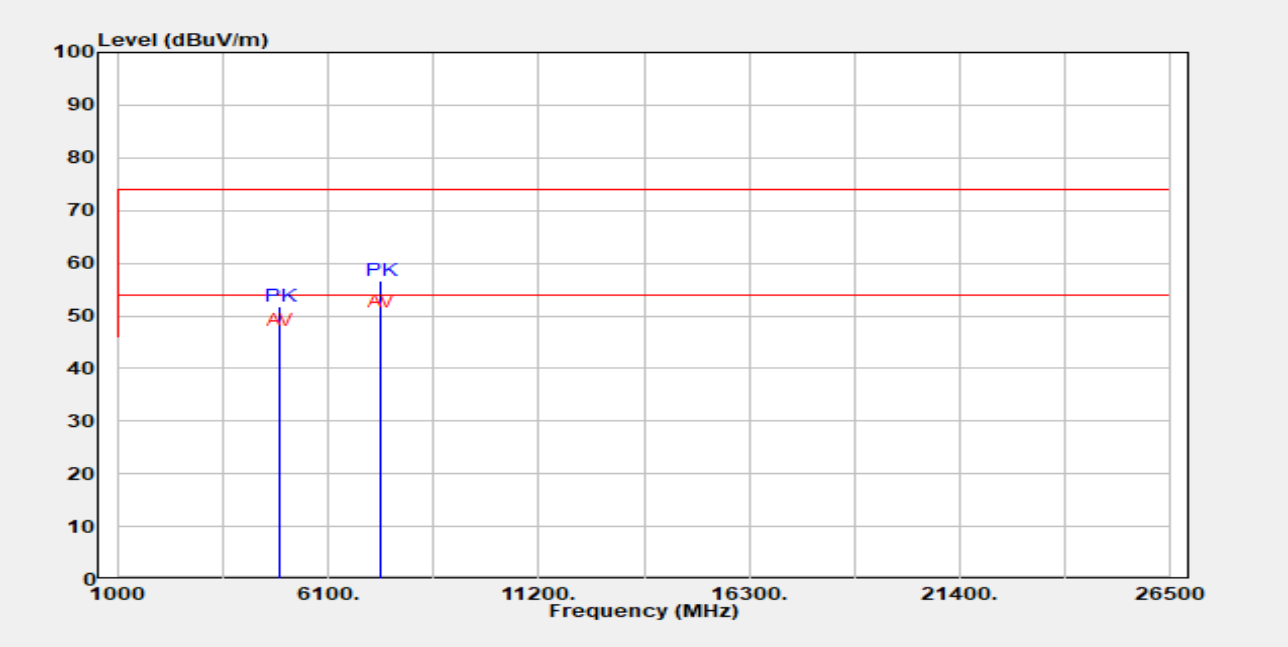
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-07 |
| Test Frequency | :2443 | Temp./Humi. | :20.5℃/59% |
| Test Mode | :Tx | Antenna Pol. | :Vertical |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4886.00 | Peak | 51.43 | 0.21 | 51.64 | 74.00 | -22.36 |
| 4886.00 | Average | 46.86 | 0.21 | 47.07 | 54.00 | -6.93 |
| 7329.00 | Peak | 50.97 | 5.56 | 56.53 | 74.00 | -17.47 |
| 7329.00 | Average | 45.05 | 5.56 | 50.61 | 54.00 | -3.39 |

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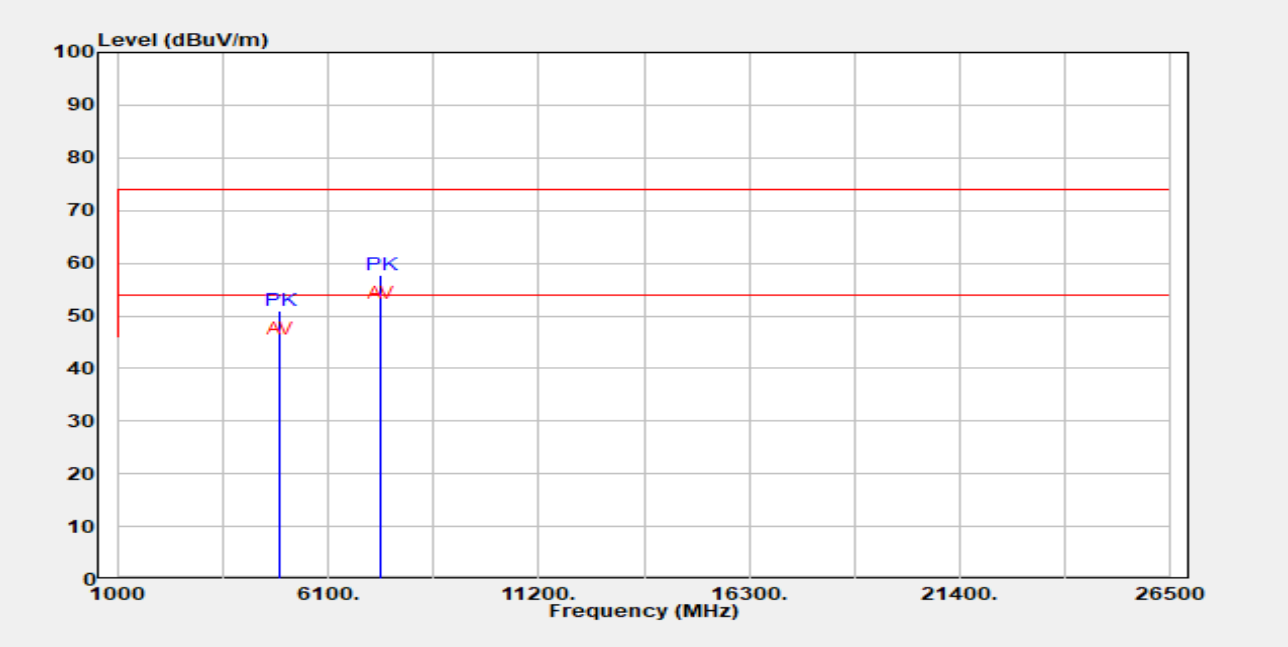
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-07 |
| Test Frequency | :2443 | Temp./Humi. | :20.5℃/59% |
| Test Mode | :Tx | Antenna Pol. | :Horizontal |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4886.00 | Peak | 50.76 | 0.21 | 50.97 | 74.00 | -23.03 |
| 4886.00 | Average | 45.41 | 0.21 | 45.62 | 54.00 | -8.38 |
| 7329.00 | Peak | 52.19 | 5.56 | 57.75 | 74.00 | -16.25 |
| 7329.00 | Average | 46.68 | 5.56 | 52.24 | 54.00 | -1.76 |

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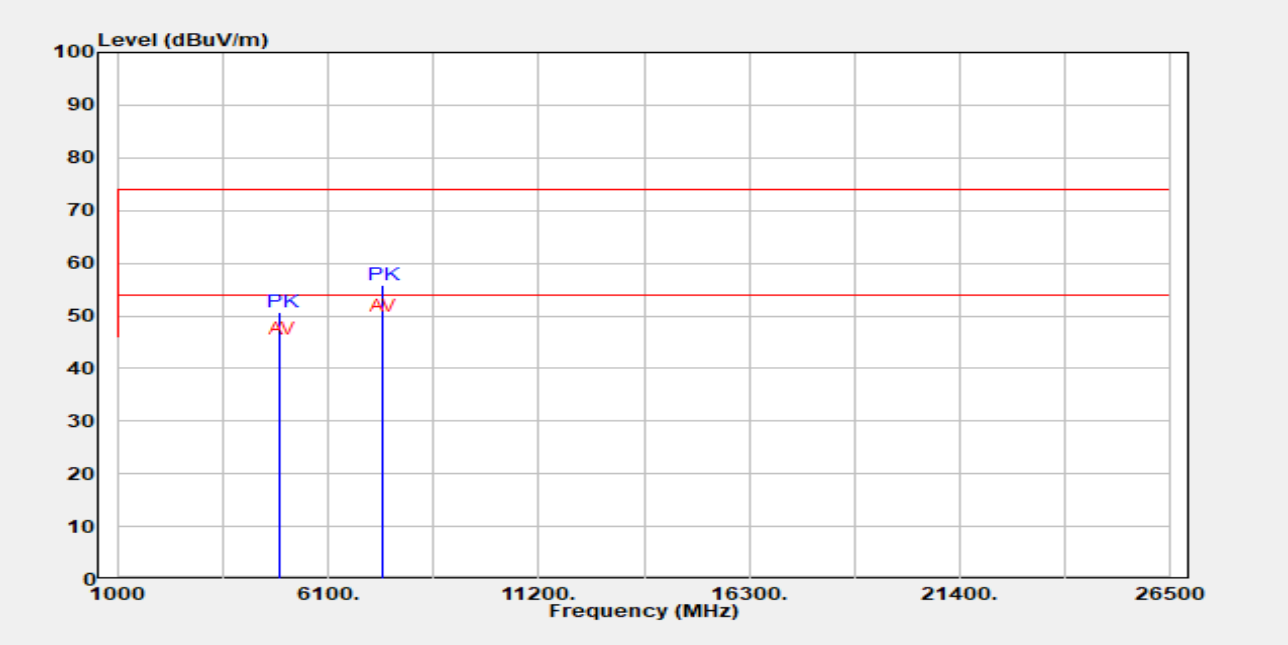
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-07 |
| Test Frequency | :2463 | Temp./Humi. | :20.5℃/59% |
| Test Mode | :Tx | Antenna Pol. | :Vertical |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4926.00 | Peak | 50.28 | 0.31 | 50.59 | 74.00 | -23.41 |
| 4926.00 | Average | 45.24 | 0.31 | 45.55 | 54.00 | -8.45 |
| 7389.00 | Peak | 50.38 | 5.50 | 55.88 | 74.00 | -18.12 |
| 7389.00 | Average | 44.37 | 5.50 | 49.87 | 54.00 | -4.13 |

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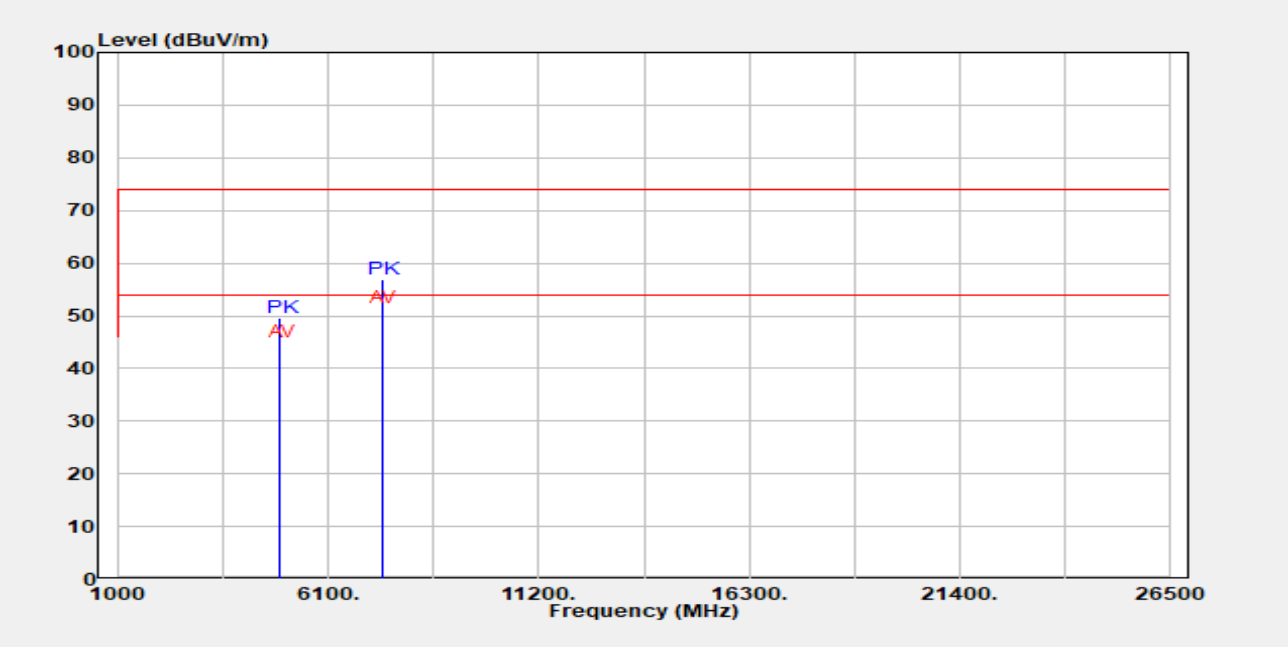
| | | | |
|---|---|---|---|
| Report Number | :TERF2503000857ER | Test Site | :SAC 3 |
| Operation Mode | :SRD | Test Date | :2025-04-07 |
| Test Frequency | :2463 | Temp./Humi. | :20.5℃/59% |
| Test Mode | :Tx | Antenna Pol. | :Horizontal |
| EUT Pol | :E2 Plane | Engineer | :Nick Lin |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4926.00 | Peak | 49.25 | 0.31 | 49.56 | 74.00 | -24.44 |
| 4926.00 | Average | 44.67 | 0.31 | 44.98 | 54.00 | -9.02 |
| 7389.00 | Peak | 51.48 | 5.50 | 56.98 | 74.00 | -17.02 |
| 7389.00 | Average | 46.08 | 5.50 | 51.58 | 54.00 | -2.42 |

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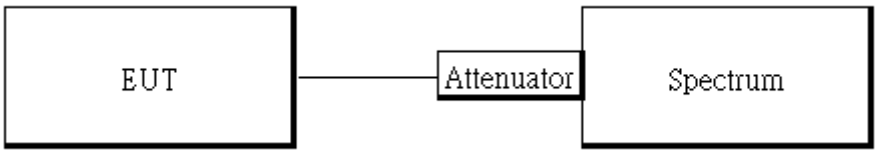
# 10 EMISSION BANDWIDTH MEASUREMENT

## 10.1 Applicable Standard:

The 20 dB and 99% bandwidth shall be specified in operating frequency band.

## 10.2 Test Set-up




## 10.3 Measurement Procedure

1. Placed the EUT on the testing table.
2. Set the EUT under transmission condition continuously at specific channel frequency.
3. Set SPA Center Frequency = fundamental frequency, RBW=1% to 5% OBW, VBW=3 x RBW, Span = large enough to capture all products of the modulation process.
4. Measured the spectrum width with power higher than 20dB below carrier and turn on the 99% bandwidth function, max reading.

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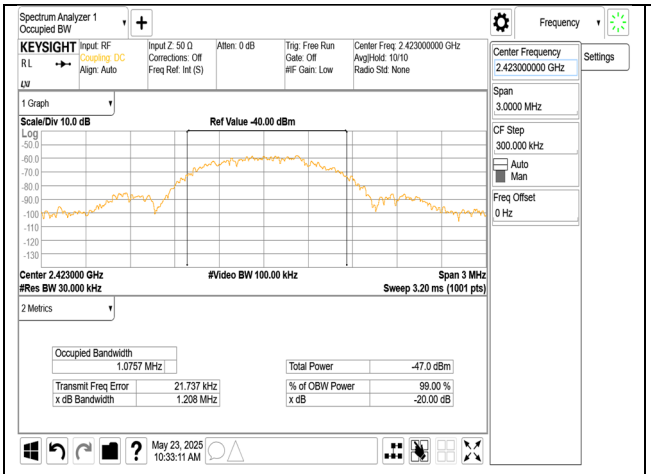
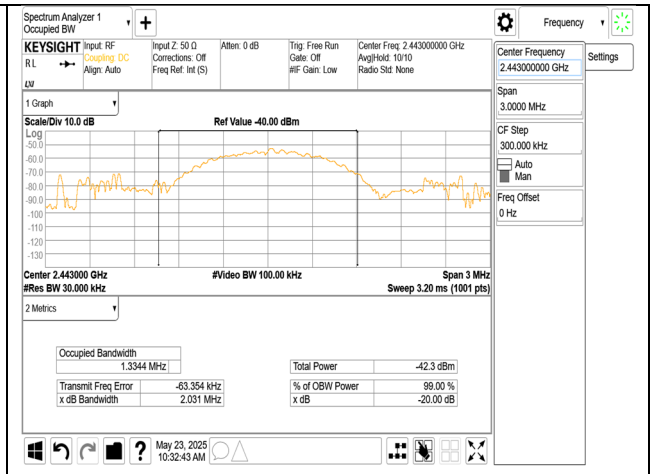
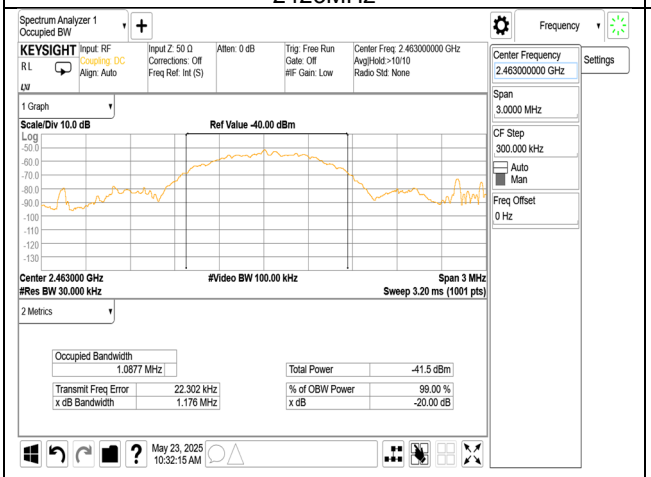
## 10.4 Measurement Result




2423MHz




2443MHz




2463MHz

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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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