



# TEST REPORT

Applicant: Qingdao THUNDEROBOT Technology Co., Ltd.  
Address of Applicant: No. 1, Haier Road, Laoshan District, Qingdao  
Manufacturer: Qingdao THUNDEROBOT Technology Co., Ltd.  
Address of Manufacturer: No. 1, Haier Road, Laoshan District, Qingdao  
Factory: Shenzhen Jieruihong Electronics Co., Ltd  
301, Building 3, Building 88, Longwangmiao Industrial Zone, East  
Address of Factory: District, Baishixia Community, Fuyong Street, Bao'an District, Shenzhen  
City  
Product Name: Controller Dongle  
Model No.: GRCNano-ZX2  
Trade Mark: THUNDEROBOT  
FCC ID: 2BFDF-ZX2  
Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249  
Date of Test: Jul.11, 2025-Jul.23, 2025  
Date of report issued: Jul.24, 2025

*Remark:*

*The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full without prior written permission of the company.*

*The report would be invalid without specific stamp of test institute and the signatures of compiler and approver*

## Prepared By

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Authorized Signature



| Report Revision History |             |              |
|-------------------------|-------------|--------------|
| Report No.              | Description | Issue Date   |
| ET-25072381E            | Original    | Jul.24, 2025 |
|                         |             |              |
|                         |             |              |



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## 1 Test Summary

| Test Item                                         | Section in CFR 47     | Result | Test by     |
|---------------------------------------------------|-----------------------|--------|-------------|
| Antenna requirement                               | 15.203                | Pass   | /           |
| AC Power Line Conducted Emission                  | 15.207                | N/A    | /           |
| Field strength of the fundamental signal          | 15.249 (a)            | Pass   | Jason Huang |
| Spurious emissions                                | 15.249 (a) (d)/15.209 | Pass   | Jason Huang |
| Band edge                                         | 15.249 (d)/15.205     | Pass   | Jason Huang |
| 20dB Occupied Bandwidth<br>99% Occupied Bandwidth | 15.215 (c)            | Pass   | Kara Wu     |

### Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10:2013
3. Note: Compliance determination rules
  - 1).The Compliance determination of test results does not take into account measurement uncertainty. Measurement results are determined based on regulatory limitations or requirements specified by the applicant/manufacturer. If measurement uncertainty is taken into account, the applicant/manufacturer will bear all possible risks of non-compliance.
  - 2).The measurement uncertainty please refer to each test result in the "Measurement Uncertainty"

### Measurement Uncertainty

| Test Item                                                                                             | Uncertainty Criterion | Measurement Uncertainty | Notes |
|-------------------------------------------------------------------------------------------------------|-----------------------|-------------------------|-------|
| Duty cycle                                                                                            | ±5%                   | ±0.05%                  | (1)   |
| Occupied Channel Bandwidth                                                                            | ±5%                   | 0.55%                   | (1)   |
| RF output power, conducted                                                                            | ±1.5dB                | ±0.57dB                 | (1)   |
| Power Spectral Density, conducted                                                                     | ±3dB                  | ±0.61dB                 | (1)   |
| Unwanted Emissions, conducted                                                                         | ±3dB                  | ±0.64dB                 | (1)   |
| AC Power Line Conducted Emission                                                                      | ±6dB                  | ± 2.55 dB               | (1)   |
| Radiated emissions Below 1GHz                                                                         | ±6dB                  | ± 4.24 dB               | (1)   |
| Radiated emissions Above 1GHz                                                                         | ±6dB                  | ± 4.26 dB               | (1)   |
| Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%. |                       |                         |       |

## 2 General Information

### 2.1 General Description of EUT

|                      |                                                                                                                                 |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Product Name:        | Controller Dongle                                                                                                               |
| Model No.:           | GRCNano-ZX2                                                                                                                     |
| Model of difference: | N/A                                                                                                                             |
| Test model:          | GRCNano-ZX2                                                                                                                     |
| Sample(s) Status:    | V1.0                                                                                                                            |
| Hardware Version:    | 1.0                                                                                                                             |
| Software Version:    | Gaming Controller                                                                                                               |
| Operation Frequency: | 2402MHz~2480MHz                                                                                                                 |
| Channel numbers:     | 79                                                                                                                              |
| Channel separation:  | 1MHz                                                                                                                            |
| Modulation type:     | GFSK                                                                                                                            |
| Antenna Type:        | PCB Antenna                                                                                                                     |
| Antenna gain:        | -4.97dBi (Note: Antenna information is provided by applicant, Testing lab not responsible for the accuracy of the information.) |
| Battery:             | N/A                                                                                                                             |
| Power supply:        | DC 5V From Notebook computer                                                                                                    |

| Operation Frequency each of channel |           |         |           |         |           |         |           |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 00                                  | 2402 MHz  | 20      | 2422 MHz  | 40      | 2442 MHz  | 60      | 2462 MHz  |
| 01                                  | 2403 MHz  | 21      | 2423 MHz  | 41      | 2443 MHz  | 61      | 2463 MHz  |
| 02                                  | 2404 MHz  | 22      | 2424 MHz  | 42      | 2444 MHz  | 62      | 2464 MHz  |
| 03                                  | 2405 MHz  | 23      | 2425 MHz  | 43      | 2445 MHz  | 63      | 2465 MHz  |
| 04                                  | 2406 MHz  | 24      | 2426 MHz  | 44      | 2446 MHz  | 64      | 2466 MHz  |
| 05                                  | 2407 MHz  | 25      | 2427 MHz  | 45      | 2447 MHz  | 65      | 2467 MHz  |
| 06                                  | 2408 MHz  | 26      | 2428 MHz  | 46      | 2448 MHz  | 66      | 2468 MHz  |
| 07                                  | 2409 MHz  | 27      | 2429 MHz  | 47      | 2449 MHz  | 67      | 2469 MHz  |
| 08                                  | 2410 MHz  | 28      | 2430 MHz  | 48      | 2450 MHz  | 68      | 2470 MHz  |
| 09                                  | 2411 MHz  | 29      | 2431 MHz  | 49      | 2451 MHz  | 69      | 2471 MHz  |
| 10                                  | 2412 MHz  | 30      | 2432 MHz  | 50      | 2452 MHz  | 70      | 2472 MHz  |
| 11                                  | 2413 MHz  | 31      | 2433 MHz  | 51      | 2453 MHz  | 71      | 2473 MHz  |
| 12                                  | 2414 MHz  | 32      | 2434 MHz  | 52      | 2454 MHz  | 72      | 2474 MHz  |
| 13                                  | 2415 MHz  | 33      | 2435 MHz  | 53      | 2455 MHz  | 73      | 2475 MHz  |
| 14                                  | 2416 MHz  | 34      | 2436 MHz  | 54      | 2456 MHz  | 74      | 2476 MHz  |
| 15                                  | 2417 MHz  | 35      | 2437 MHz  | 55      | 2457 MHz  | 75      | 2477 MHz  |
| 16                                  | 2418 MHz  | 36      | 2438 MHz  | 56      | 2458 MHz  | 76      | 2478 MHz  |
| 17                                  | 2419 MHz  | 37      | 2439 MHz  | 57      | 2459 MHz  | 77      | 2479 MHz  |
| 18                                  | 2420 MHz  | 38      | 2440 MHz  | 58      | 2460 MHz  | 78      | 2480 MHz  |
| 19                                  | 2421 MHz  | 39      | 2441 MHz  | 59      | 2461 MHz  | /       | /         |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel             | Frequency |
|---------------------|-----------|
| The lowest channel  | 2402 MHz  |
| The middle channel  | 2441 MHz  |
| The Highest channel | 2480 MHz  |

## 2.2 Test mode

|                                                                                                                                                                                                                                              |                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| Transmitting mode                                                                                                                                                                                                                            | Keep the EUT in continuously transmitting mode. |
| <i>Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i> |                                                 |

## 2.3 Description of Support Units

| No. | Description       | Manufacturer | Model       | Serial Number |
|-----|-------------------|--------------|-------------|---------------|
| 1   | NOTEBOOK COMPUTER | DELL         | VOSTRO 3520 | /             |

## 2.4 Deviation from Standards

|       |
|-------|
| None. |
|-------|

## 2.5 Abnormalities from Standard Conditions

|       |
|-------|
| None. |
|-------|

## 2.6 Test Facility

|                             |                                            |
|-----------------------------|--------------------------------------------|
| Test laboratory:            | Shenzhen ETR Standard Technology Co., Ltd. |
| CNAS Registration Number:   | L11864                                     |
| A2LA Certificate Number:    | 6640.01                                    |
| FCC Designation Number:     | CN1326                                     |
| FCC Test Firm Registration: | 183064                                     |

## 2.7 Test Location

|                              |                                                                                                                           |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| All tests were performed at: |                                                                                                                           |
| Laboratory location:         | No.103, No.10, Phase I, Zone 3, Xinxing Industrial Park, Xinhe, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China |
| Telephone:                   | +86 755 85259392                                                                                                          |

## 2.8 Additional Instructions

|                   |                |
|-------------------|----------------|
| Test Software     | bt_tool_v1.1.0 |
| Power level setup | Default        |

### 3 Test Instruments list

| Item | Equipment name           | Manufacturer        | Model                      | Serial No.   | Calibration date | Due date  |
|------|--------------------------|---------------------|----------------------------|--------------|------------------|-----------|
| 1    | EMI Test Receiver        | Rohde&schwarz       | ESCI7                      | 100605       | 2025.3.06        | 2026.3.05 |
| 2    | EMI Test Receiver        | Rohde&schwarz       | ESCI3                      | 102696       | 2025.3.06        | 2026.3.05 |
| 3    | Loop Antenna             | schwarabeck         | FMZB 1519 B                | FMZB 1519 B  | 2024.3.22        | 2026.3.21 |
| 4    | Broadband antenna        | schwarabeck         | VULB9168                   | 1064         | 2024.3.26        | 2026.3.25 |
| 5    | Horn antenna             | schwarabeck         | BBHA9120D                  | 9120D-1145   | 2024.3.22        | 2026.3.21 |
| 6    | amplifier                | EMtrace             | RP01A                      | 50117        | 2025.3.06        | 2026.3.05 |
| 7    | AMN                      | schwarabeck         | NSLK8127                   | 8127483      | 2025.3.06        | 2026.3.05 |
| 8    | AMN                      | ETS                 | 3186/2NM                   | 1132         | 2025.3.06        | 2026.3.05 |
| 9    | 10dB attenuator          | HUBER+SUHN<br>R     | 10dB                       | /            | 2025.3.06        | 2026.3.05 |
| 10   | amplifier                | Space-Dtronics      | EWLAN0118G-P40             | 19113001     | 2025.3.06        | 2026.3.05 |
| 11   | Filter                   | Xingbo              | XBLBQ-GTA19                | 210410-3-1   | 2025.3.06        | 2026.3.05 |
| 12   | Spectrum analyzer        | KEYSIGHT            | N9020A                     | MY55370280   | 2025.3.06        | 2026.3.05 |
| 13   | Power control box        | MWRFTtest           | MW100-PSB                  | MW201020JYT  | 2025.3.06        | 2026.3.05 |
| 14   | Power Sensor             | Keysight            | U2021XA                    | MY54111006   | 2025.3.06        | 2026.3.05 |
| 15   | amplifier                | SKET                | LNPA_1840-50<br>(18-40GHz) | SK2019040302 | 2025.3.06        | 2026.3.05 |
| 16   | Horn antenna             | schwarabeck         | BBHA 9170                  | 946          | 2024.3.22        | 2026.3.21 |
| 17   | Spectrum analyzer        | Rohde&schwarz       | FSU40                      | 1166.1660K43 | 2025.3.06        | 2026.3.05 |
| 18   | Temp. & Humidity Chamber | Jiecheng Instrument | QA-LP-80                   | 20160705001  | 2025.3.07        | 2026.3.06 |

Note: the calibration interval of the above test instruments is 12 or 24 months and the calibrations are traceable to international system unit (SI).

| Software Name           | Manufacturer | Model    | Version           |
|-------------------------|--------------|----------|-------------------|
| RF test software        | MWRFTtest    | MTS 8310 | V2.0.0.0          |
| Conducted test software | EZ-EMC       | Farad    | Ver.EMC-CON 3A1.1 |
| Radiated test software  | EZ-EMC       | Farad    | Ver.FA-03A2 RE    |

## 4 Test results and Measurement Data

### 4.1 Antenna requirement

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Standard requirement:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>FCC part 15.203 requirement:</b><br>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, 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. |
| <b>EUT Antenna:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| The antenna is PCB antenna, the best case gain of the antenna is -4.97dBi, reference to the appendix II for details.                                                                                                                                                                                                                                                                                                                                                                      |

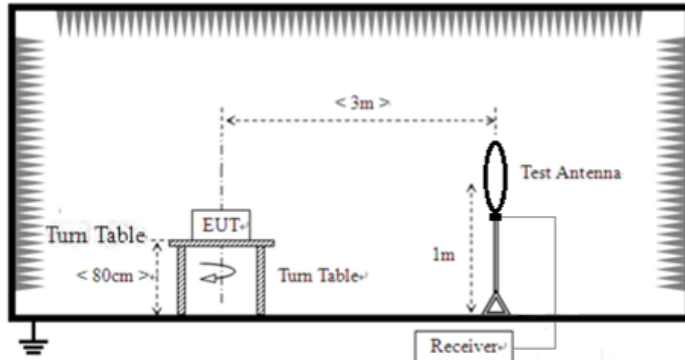
## 4.2 Conducted Emissions

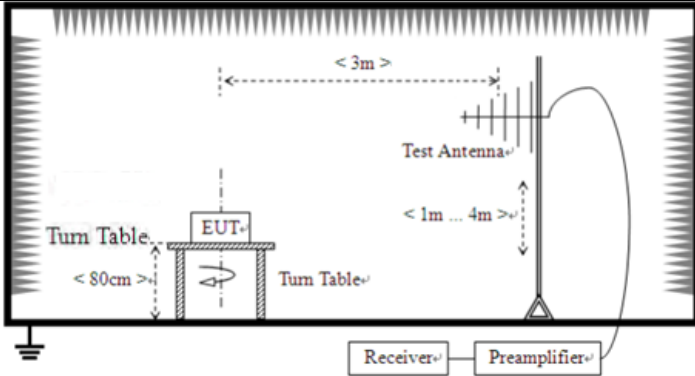
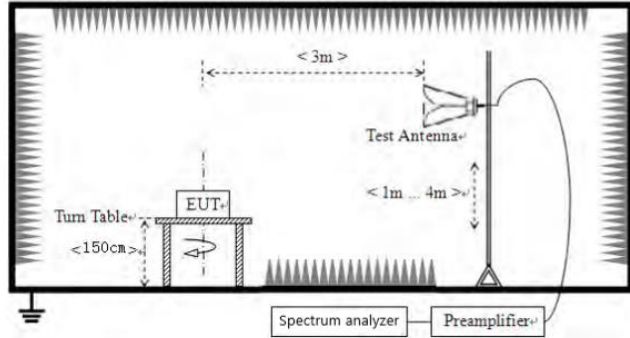
|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |              |   |           |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|---|-----------|
| Test Requirement:                                | FCC Part15 C Section 15.207,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |              |   |           |
| Test Method:                                     | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |              |   |           |
| Test Frequency Range:                            | 150KHz to 30MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |              |   |           |
| Class / Severity:                                | Class B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |              |   |           |
| Receiver setup:                                  | RBW=9KHz, VBW=30KHz, Sweep time=auto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |   |              |   |           |
| Limit:                                           | Frequency range (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   | Limit (dBuV) |   |           |
|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   | Quasi-peak   |   | Average   |
|                                                  | 0.15-0.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   | 66 to 56*    |   | 56 to 46* |
|                                                  | 0.5-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   | 56           |   | 46        |
|                                                  | 5-30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |   | 60           |   | 50        |
| * Decreases with the logarithm of the frequency. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |              |   |           |
| Test setup:                                      | <div><div><div>Reference Plane</div><div>40cm</div><div><div>LISN</div><div><div>AUX Equipment</div><div>E.U.T</div></div><div>LISN</div></div><div>80cm</div><div><div>Filter</div><div>AC power</div></div><div>EMI Receiver</div></div><div>Test table/Insulation plane</div></div> <div>Remark:<br/>E.U.T: Equipment Under Test<br/>LISN: Line Impedance Stabilization Network<br/>Test table height=0.8m</div>                                                                                                                                                                                                                                                                                                         |   |              |   |           |
| Test procedure:                                  | <div>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</div> <div>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</div> <div>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</div> |   |              |   |           |
| Test Instruments:                                | Refer to section 3.0 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |              |   |           |
| Test mode:                                       | Refer to section 2.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |              |   |           |
| Test environment:                                | Temp.:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | / | Humid.:      | / | Press.: / |
| Test voltage:                                    | /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |              |   |           |
| Test results:                                    | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |              |   |           |

Remark:

1. Dongle is powered by a peripheral (laptop) DC 5V power supply

### 4.3 Radiated Emission measurement

|                                                      |                                                                                                                                                                                                                                                                |            |                    |        |                  |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------|--------|------------------|
| Test Requirement:                                    | FCC Part15 C Section 15.209 & 15.249 (a) &(d).                                                                                                                                                                                                                 |            |                    |        |                  |
| Test Method:                                         | ANSI C63.10: 2013                                                                                                                                                                                                                                              |            |                    |        |                  |
| Test Frequency Range:                                | 9kHz to 25GHz                                                                                                                                                                                                                                                  |            |                    |        |                  |
| Test site:                                           | Measurement Distance: 3m                                                                                                                                                                                                                                       |            |                    |        |                  |
| Receiver setup:                                      | Frequency                                                                                                                                                                                                                                                      | Detector   | RBW                | VBW    | Remark           |
|                                                      | 9kHz-150kHz                                                                                                                                                                                                                                                    | Quasi-peak | 200Hz              | 300Hz  | Quasi-peak Value |
|                                                      | 150kHz-30MHz                                                                                                                                                                                                                                                   | Quasi-peak | 9kHz               | 10kHz  | Quasi-peak Value |
|                                                      | 30MHz-1GHz                                                                                                                                                                                                                                                     | Quasi-peak | 120KHz             | 300KHz | Quasi-peak Value |
|                                                      | Above 1GHz                                                                                                                                                                                                                                                     | Peak       | 1MHz               | 3MHz   | Peak Value       |
|                                                      |                                                                                                                                                                                                                                                                | Peak       | 1MHz               | 10Hz   | Average Value    |
| Limit:<br>(Field strength of the fundamental signal) | Frequency                                                                                                                                                                                                                                                      |            | Limit (dBuV/m @3m) |        | Remark           |
|                                                      | 2400MHz-2483.5MHz                                                                                                                                                                                                                                              |            | 94.00              |        | Average Value    |
|                                                      |                                                                                                                                                                                                                                                                |            | 114.00             |        | Peak Value       |
| Limit:<br>(Spurious Emissions)                       | Frequency                                                                                                                                                                                                                                                      |            | Limit (uV/m)       |        | Remark           |
|                                                      | 0.009MHz-0.490MHz                                                                                                                                                                                                                                              |            | 2400/F(kHz) @300m  |        | Quasi-peak Value |
|                                                      | 0.490MHz-1.705MHz                                                                                                                                                                                                                                              |            | 24000/F(kHz) @30m  |        | Quasi-peak Value |
|                                                      | 1.705MHz-30.0MHz                                                                                                                                                                                                                                               |            | 30 @30m            |        | Quasi-peak Value |
|                                                      | 30MHz-88MHz                                                                                                                                                                                                                                                    |            | 100 @3m            |        | Quasi-peak Value |
|                                                      | 88MHz-216MHz                                                                                                                                                                                                                                                   |            | 150 @3m            |        | Quasi-peak Value |
|                                                      | 216MHz-960MHz                                                                                                                                                                                                                                                  |            | 200 @3m            |        | Quasi-peak Value |
|                                                      | 960MHz-1GHz                                                                                                                                                                                                                                                    |            | 500 @3m            |        | Quasi-peak Value |
|                                                      | Above 1GHz                                                                                                                                                                                                                                                     |            | 500 @3m            |        | Average Value    |
|                                                      |                                                                                                                                                                                                                                                                |            | 5000 @3m           |        | Peak Value       |
| Limit:<br>(band edge)                                | Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation. |            |                    |        |                  |
| Test setup:                                          | For radiated emissions from 9kHz to 30MHz                                                                                                                                                                                                                      |            |                    |        |                  |
|                                                      | <div></div>                                                                                                                                                                |            |                    |        |                  |
|                                                      | For radiated emissions from 30MHz to1GHz                                                                                                                                                                                                                       |            |                    |        |                  |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |         |         |          |         |          |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|----------|---------|----------|
|                   | <div></div> <p>For radiated emissions above 1GHz</p> <div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |         |         |         |          |         |          |
| Test Procedure:   | <div><div><div>1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</div><div>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</div><div>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</div><div>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</div><div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div><div>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</div></div></div> |         |         |         |          |         |          |
| Test Instruments: | Refer to section 3.0 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |         |         |          |         |          |
| Test mode:        | Refer to section 2.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |         |         |          |         |          |
| Test environment: | <table><tr><td>Temp.:</td><td>22.1 °C</td><td>Humid.:</td><td>53%</td><td>Press.:</td><td>1012mbar</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Temp.:  | 22.1 °C | Humid.: | 53%      | Press.: | 1012mbar |
| Temp.:            | 22.1 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Humid.: | 53%     | Press.: | 1012mbar |         |          |
| Test voltage:     | DC 5V From Notebook computer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |         |         |         |          |         |          |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |         |         |          |         |          |

#### 4.3.1 Field Strength of The Fundamental Signal

##### Peak value:

| Frequency (MHz) | Read Level (dBuV/m) | Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|---------------------|-------------|----------------|---------------------|-----------------|--------------|
| 2402.00         | 106.06              | -14.43      | 91.63          | 114.00              | -22.37          | Vertical     |
| 2402.00         | 103.89              | -14.43      | 89.46          | 114.00              | -24.54          | Horizontal   |
| 2441.00         | 104.12              | -14.29      | 89.83          | 114.00              | -24.17          | Vertical     |
| 2441.00         | 102.49              | -14.29      | 88.20          | 114.00              | -25.80          | Horizontal   |
| 2480.00         | 107.09              | -14.13      | 92.96          | 114.00              | -21.04          | Vertical     |
| 2480.00         | 108.33              | -14.13      | 94.20          | 114.00              | -19.80          | Horizontal   |

##### Average value:

| Frequency (MHz) | Read Level (dBuV/m) | Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|---------------------|-------------|----------------|---------------------|-----------------|--------------|
| 2402.00         | 84.33               | -14.43      | 69.90          | 94.00               | -24.10          | Vertical     |
| 2402.00         | 84.55               | -14.43      | 70.12          | 94.00               | -23.88          | Horizontal   |
| 2441.00         | 84.48               | -14.29      | 70.19          | 94.00               | -23.81          | Vertical     |
| 2441.00         | 82.04               | -14.29      | 67.75          | 94.00               | -26.25          | Horizontal   |
| 2480.00         | 85.80               | -14.13      | 71.67          | 94.00               | -22.33          | Vertical     |
| 2480.00         | 82.84               | -14.13      | 68.71          | 94.00               | -25.29          | Horizontal   |

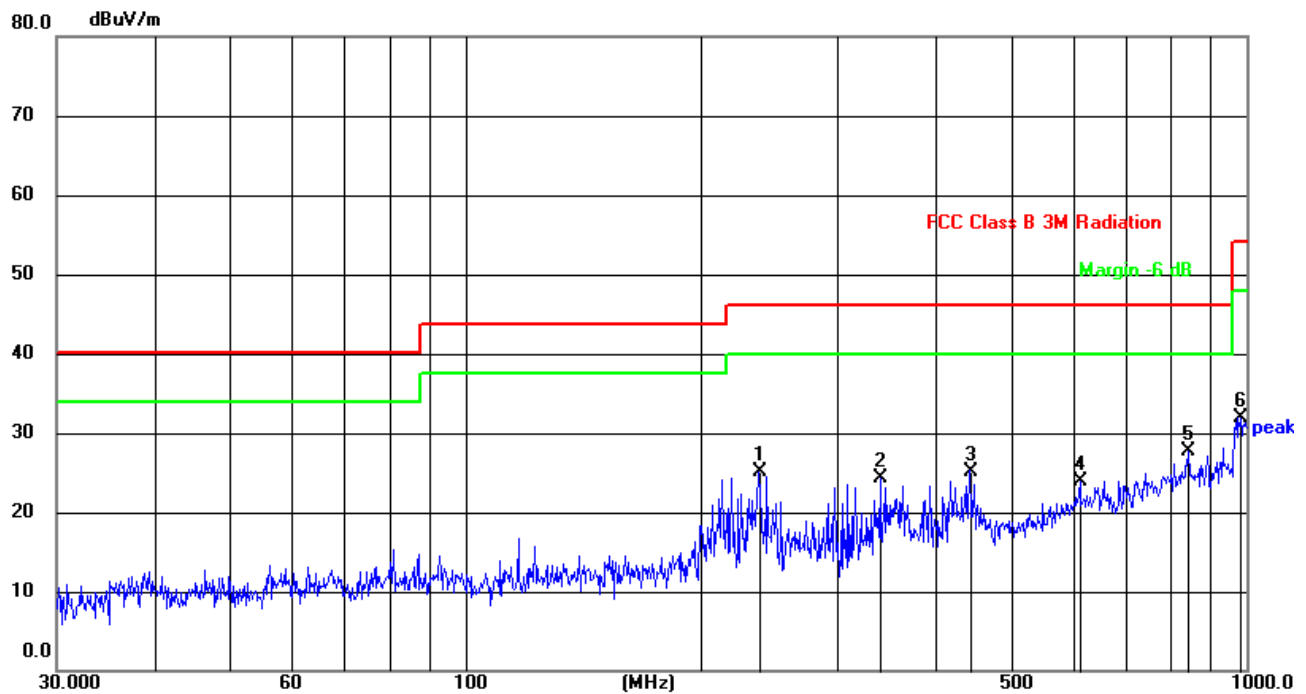
#### 4.3.2 Spurious emissions

##### ■ Below 30MHz

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

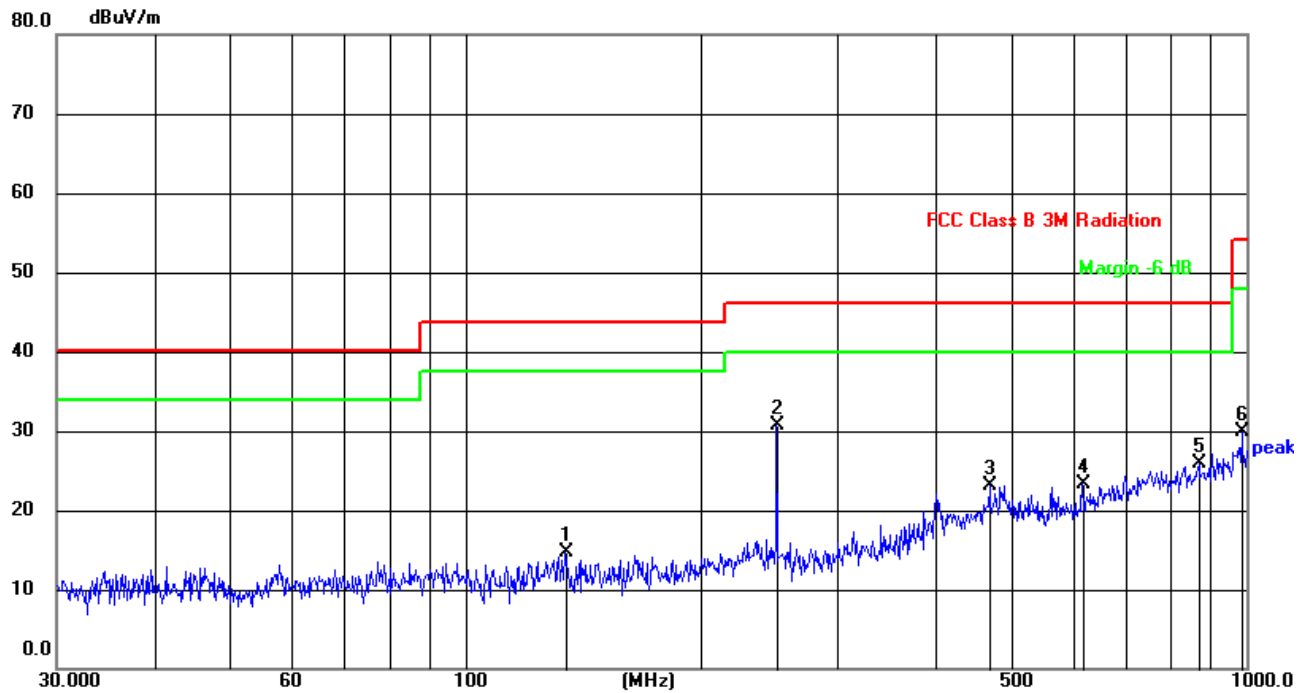
##### ■ Below 1GHz

Horizontal:



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1   | 237.4760        | 43.55          | -18.43        | 25.12          | 46.00          | -20.88      | QP       |
| 2   | 339.5888        | 41.52          | -17.26        | 24.26          | 46.00          | -21.74      | QP       |
| 3   | 441.7426        | 40.25          | -15.05        | 25.20          | 46.00          | -20.80      | QP       |
| 4   | 612.0642        | 33.78          | -9.92         | 23.86          | 46.00          | -22.14      | QP       |
| 5   | 842.1296        | 34.81          | -7.10         | 27.71          | 46.00          | -18.29      | QP       |
| 6   | 982.6200        | 37.59          | -5.61         | 31.98          | 54.00          | -22.02      | QP       |

Vertical:



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1   | 134.0882        | 33.62          | -19.01        | 14.61          | 43.50          | -28.89      | QP       |
| 2   | 250.3012        | 48.91          | -18.25        | 30.66          | 46.00          | -15.34      | QP       |
| 3   | 468.8762        | 37.53          | -14.43        | 23.10          | 46.00          | -22.90      | QP       |
| 4   | 616.3718        | 34.14          | -10.81        | 23.33          | 46.00          | -22.67      | QP       |
| 5   | 869.1302        | 32.22          | -6.41         | 25.81          | 46.00          | -20.19      | QP       |
| 6   | 986.0717        | 33.67          | -3.85         | 29.82          | 54.00          | -24.18      | QP       |

# ■ Above 1GHz

|               |                |
|---------------|----------------|
| Test channel: | Lowest channel |
|---------------|----------------|

## Peak value:

| Frequency (MHz) | Read Level (dBuV/m) | Correction Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|---------------------|------------------------|----------------|---------------------|-----------------|--------------|
| 4804.00         | 65.48               | -9.88                  | 55.60          | 74.00               | -18.40          | Horizontal   |
| 7206.00         | 56.45               | -4.17                  | 52.28          | 74.00               | -21.72          | Horizontal   |
| 9608.00         | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 12010.00        | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 4804.00         | 66.95               | -9.88                  | 57.07          | 74.00               | -16.93          | Vertical     |
| 7206.00         | 57.58               | -4.17                  | 53.41          | 74.00               | -20.60          | Vertical     |
| 9608.00         | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |
| 12010.00        | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |

## Average value:

| Frequency (MHz) | Read Level (dBuV/m) | Correction Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|---------------------|------------------------|----------------|---------------------|-----------------|--------------|
| 4804.00         | 54.35               | -9.88                  | 44.47          | 54.00               | -9.53           | Horizontal   |
| 7206.00         | 45.68               | -4.17                  | 41.51          | 54.00               | -12.49          | Horizontal   |
| 9608.00         | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 12010.00        | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 4804.00         | 55.44               | -9.88                  | 45.56          | 54.00               | -8.44           | Vertical     |
| 7206.00         | 45.56               | -4.17                  | 41.39          | 54.00               | -12.61          | Vertical     |
| 9608.00         | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |
| 12010.00        | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |

## Remark:

1. Final Level =Receiver Read level +Correction Factor(Antenna Factor + Cable Loss – Preamplifier Factor )
2. The emission levels of other frequencies are more than 20 dB below the limit and not show in test report.
3. “\*”, means this data is the too weak instrument of signal is unable to test.

|               |                |
|---------------|----------------|
| Test channel: | Middle channel |
|---------------|----------------|

**Peak value:**

| Frequency (MHz) | Read Level (dBuV/m) | Correction Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|---------------------|------------------------|----------------|---------------------|-----------------|--------------|
| 4882.00         | 66.58               | -9.79                  | 56.79          | 74.00               | -17.21          | Horizontal   |
| 7323.00         | 61.38               | -3.83                  | 57.55          | 74.00               | -16.45          | Horizontal   |
| 9764.00         | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 12205.00        | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 4882.00         | 65.33               | -9.79                  | 55.54          | 74.00               | -18.46          | Vertical     |
| 7323.00         | 61.30               | -3.83                  | 57.47          | 74.00               | -16.53          | Vertical     |
| 9764.00         | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |
| 12205.00        | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |

**Average value:**

| Frequency (MHz) | Read Level (dBuV/m) | Correction Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|---------------------|------------------------|----------------|---------------------|-----------------|--------------|
| 4882.00         | 55.26               | -9.79                  | 45.47          | 54.00               | -8.53           | Horizontal   |
| 7323.00         | 48.95               | -3.83                  | 45.12          | 54.00               | -8.88           | Horizontal   |
| 9764.00         | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 12205.00        | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 4882.00         | 57.88               | -9.79                  | 48.09          | 54.00               | -5.91           | Vertical     |
| 7323.00         | 47.95               | -3.83                  | 44.12          | 54.00               | -9.88           | Vertical     |
| 9764.00         | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |
| 12205.00        | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |

**Remark:**

1. Final Level = Receiver Read level + Correction Factor (Antenna Factor + Cable Loss – Preamplifier Factor )
2. The emission levels of other frequencies are more than 20 dB below the limit and not show in test report.
3. “\*”, means this data is the too weak instrument of signal is unable to test.

|               |                 |
|---------------|-----------------|
| Test channel: | Highest channel |
|---------------|-----------------|

**Peak value:**

| Frequency (MHz) | Read Level (dBuV/m) | Correction Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|---------------------|------------------------|----------------|---------------------|-----------------|--------------|
| 4960.00         | 71.44               | -9.68                  | 61.76          | 74.00               | -12.24          | Horizontal   |
| 7440.00         | 60.96               | -3.50                  | 57.46          | 74.00               | -16.54          | Horizontal   |
| 9920.00         | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 12400.00        | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 4960.00         | 73.05               | -9.68                  | 63.37          | 74.00               | -10.63          | Vertical     |
| 7440.00         | 60.05               | -3.50                  | 56.55          | 74.00               | -17.45          | Vertical     |
| 9920.00         | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |
| 12400.00        | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |

**Average value:**

| Frequency (MHz) | Read Level (dBuV/m) | Correction Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|---------------------|------------------------|----------------|---------------------|-----------------|--------------|
| 4960.00         | 56.52               | -9.68                  | 46.84          | 54.00               | -7.16           | Horizontal   |
| 7440.00         | 48.37               | -3.50                  | 44.87          | 54.00               | -9.13           | Horizontal   |
| 9920.00         | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 12400.00        | ---                 | ---                    | ---            | ---                 | ---             | Horizontal   |
| 4960.00         | 56.59               | -9.68                  | 46.91          | 54.00               | -7.09           | Vertical     |
| 7440.00         | 48.72               | -3.50                  | 45.22          | 54.00               | -8.78           | Vertical     |
| 9920.00         | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |
| 12400.00        | ---                 | ---                    | ---            | ---                 | ---             | Vertical     |

**Remark:**

1. *Final Level = Receiver Read level + Correction Factor (Antenna Factor + Cable Loss – Preamplifier Factor)*
2. *The emission levels of other frequencies are more than 20 dB below the limit and not show in test report.*
3. *“---”, means this data is too weak instrument of signal is unable to test.*

### 4.3.3 Bandedge emissions

All of the restriction bands were tested, and only the data of worst case was exhibited.

|               |                |
|---------------|----------------|
| Test channel: | Lowest channel |
|---------------|----------------|

Peak value:

| Frequency (MHz) | Read Level (dBuV/m) | Correction Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|---------------------|------------------------|----------------|---------------------|-----------------|--------------|
| 2390.00         | 59.35               | -14.50                 | 44.85          | 74.00               | -29.15          | Horizontal   |
| 2400.00         | 69.06               | -14.45                 | 54.61          | 74.00               | -19.39          | Horizontal   |
| 2390.00         | 60.78               | -14.50                 | 46.28          | 74.00               | -27.72          | Vertical     |
| 2400.00         | 69.90               | -14.45                 | 55.45          | 74.00               | -18.55          | Vertical     |

Average value:

| Frequency (MHz) | Read Level (dBuV/m) | Correction Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|---------------------|------------------------|----------------|---------------------|-----------------|--------------|
| 2390.00         | 46.27               | -14.50                 | 31.77          | 54.00               | -22.23          | Horizontal   |
| 2400.00         | 55.14               | -14.45                 | 40.69          | 54.00               | -13.31          | Horizontal   |
| 2390.00         | 45.94               | -14.50                 | 31.44          | 54.00               | -22.56          | Vertical     |
| 2400.00         | 55.99               | -14.45                 | 41.54          | 54.00               | -12.46          | Vertical     |

|               |                 |
|---------------|-----------------|
| Test channel: | Highest channel |
|---------------|-----------------|

Peak value:

| Frequency (MHz) | Read Level (dBuV/m) | Correction Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|---------------------|------------------------|----------------|---------------------|-----------------|--------------|
| 2483.50         | 64.80               | -14.13                 | 50.67          | 74.00               | -23.33          | Horizontal   |
| 2500.00         | 56.17               | -14.06                 | 42.11          | 74.00               | -31.89          | Horizontal   |
| 2483.50         | 64.79               | -14.13                 | 50.66          | 74.00               | -23.34          | Vertical     |
| 2500.00         | 54.69               | -14.06                 | 40.63          | 74.00               | -33.37          | Vertical     |

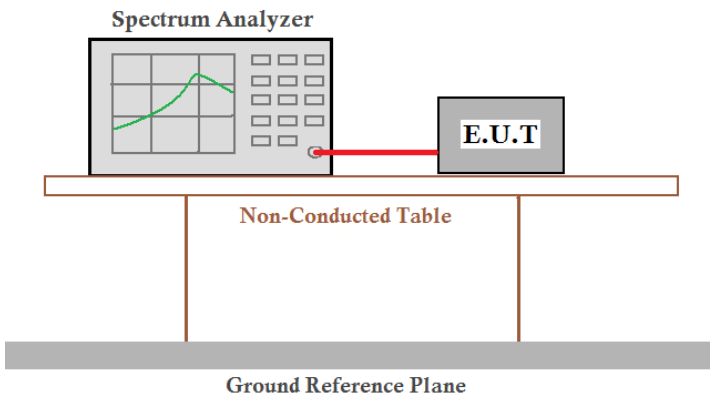
Average value:

| Frequency (MHz) | Read Level (dBuV/m) | Correction Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|---------------------|------------------------|----------------|---------------------|-----------------|--------------|
| 2483.50         | 51.75               | -14.13                 | 37.62          | 54.00               | -16.38          | Horizontal   |
| 2500.00         | 44.36               | -14.06                 | 30.30          | 54.00               | -23.70          | Horizontal   |
| 2483.50         | 50.53               | -14.13                 | 36.40          | 54.00               | -17.60          | Vertical     |
| 2500.00         | 45.70               | -14.06                 | 31.64          | 54.00               | -22.36          | Vertical     |

Remark:

1. *Final Level = Receiver Read level + Correction Factor ( Antenna Factor + Cable Loss – Preamplifier Factor )*

#### 4.4 20dB Bandwidth and 99% bandwidth

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Test Requirement : | § 15.215 (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. |               |
| Test Method :      | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |
| Limit:             | /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |
| Test setup:        |                                                                                                                                                                                                                                                                                                                                                                                                       |               |
| Test Instruments:  | Refer to section 3.0 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |
| Test mode:         | Refer to section 2.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |
| Test environment:  | Temp.: 22.1°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Humid.: 53%RH |
| Test voltage:      | DC 5V From Notebook computer                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |
| Test results:      | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |

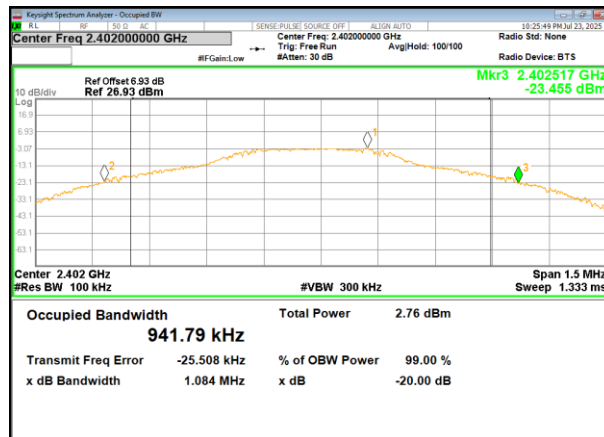
#### Measurement Data

| Test channel | 20dB bandwidth(MHz) | Result |
|--------------|---------------------|--------|
| Lowest       | 1.084               | Pass   |
| Middle       | 1.109               |        |
| Highest      | 1.093               |        |

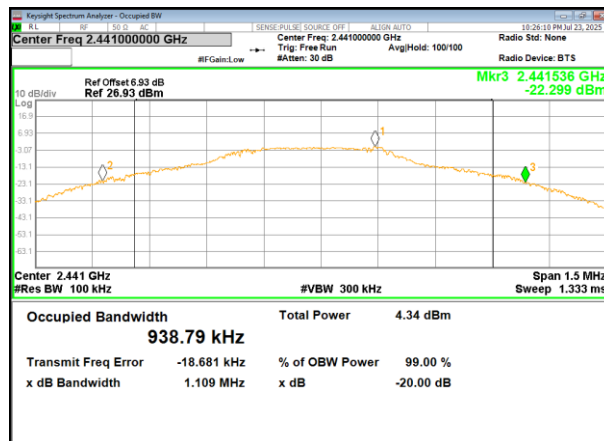
  

| Test channel | 99% bandwidth(MHz) | Result |
|--------------|--------------------|--------|
| Lowest       | 0.94179            | Pass   |
| Middle       | 0.93879            |        |
| Highest      | 0.93073            |        |

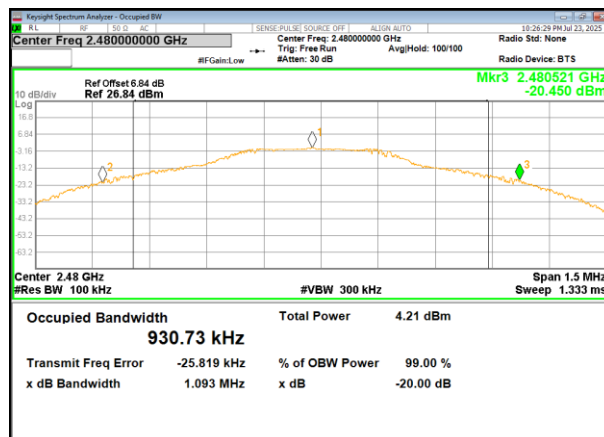
Test plot as follows:



Lowest channel



Middle channel



Highest channel



## **5 Test Setup Photo**

Reference to the file No.: ET-25072381SP for details.

## **6 EUT Constructional Details**

Reference to the file No.: ET-25072381EP and ET-25072381IP for details

-----End-----