

# TEST REPORT

**Applicant:** Gateway Plastic Hardware & Lighting Co., Ltd

**Address of Applicant:** Xinjiang Village intersection, Changfu Road, Changning Town, Boluo County, Huizhou City, Guangdong Province

**Manufacturer 1 /Factory 1:** Gateway Plastic Hardware & Lighting Co., Ltd

**Address of Manufacturer 1/Factory 1:** Xinjiang Village intersection, Changfu Road, Changning Town, Boluo County, Huizhou City, Guangdong Province

**Manufacturer 2 /Factory 2:** GATEWAY LIGHTING (VIETNAM) COMPANY LIMITED

**Address of Manufacturer 2/Factory 2:** Gia Le Industrial Zone, Dong Xuan Commune, DONG HUNG DISTRICT Thai Binh Province

**Equipment Under Test (EUT)**

**Product Name:** Color Chasing String Light

**Model No.:** GW-MS-L24-12RGBW

**Trade Mark:** N/A

**FCC ID:** 2AP9S-MS2022

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.247  
ANSI C63.10:2013

**Date of sample receipt:** December 12, 2022

**Date of Test:** December 12~14, 2022

**Date of report issued:** December 14, 2022

**Test Result :** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Luo

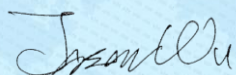
Laboratory Manager

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## 2 Version

| Version No. | Date       | Description |
|-------------|------------|-------------|
| 00          | 2022-12-14 | Original    |
|             |            |             |
|             |            |             |
|             |            |             |
|             |            |             |

Prepared By:

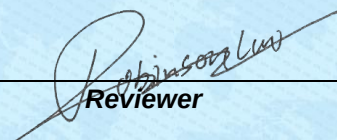


Date:

2022-12-14

Project Engineer

Check By:



Reviewer

Date:

2022-12-14

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## 4 Test Summary

| Test Item                        | Section in CFR 47    | Result |
|----------------------------------|----------------------|--------|
| Antenna requirement              | 15.203/15.247 (b)(4) | Pass   |
| AC Power Line Conducted Emission | 15.207               | Pass   |
| Conducted Peak Output Power      | 15.247 (b)(3)        | Pass   |
| Channel Bandwidth                | 15.247 (a)(2)        | Pass   |
| Power Spectral Density           | 15.247 (e)           | Pass   |
| Band Edge                        | 15.247(d)            | Pass   |
| Spurious Emission                | 15.205/15.209        | Pass   |

Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10:2013.

### Measurement Uncertainty

| No. | Item                             | Measurement Uncertainty  |
|-----|----------------------------------|--------------------------|
| 1   | Radio Frequency                  | $1 \times 10^{-7}$       |
| 2   | Duty cycle                       | 0.37%                    |
| 3   | Occupied Bandwidth               | 3%                       |
| 4   | RF conducted power               | 0.75dB                   |
| 5   | RF power density                 | 3dB                      |
| 6   | Conducted Spurious emissions     | 2.58dB                   |
| 7   | AC Power Line Conducted Emission | 3.44dB (0.15MHz ~ 30MHz) |
| 8   | Radiated Spurious emission test  | 3.1dB (9kHz-30MHz)       |
|     |                                  | 3.8039dB (30MHz-200MHz)  |
|     |                                  | 3.9679dB (200MHz-1GHz)   |
|     |                                  | 4.29dB (1GHz-18GHz)      |
|     |                                  | 3.30dB (18GHz-40GHz)     |

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

## 5 General Information

### 5.1 General Description of EUT

|                      |                                                                                            |
|----------------------|--------------------------------------------------------------------------------------------|
| Product Name:        | Color Chasing String Light                                                                 |
| Model No.:           | GW-MS-L24-12RGBW                                                                           |
| Test sample(s) ID:   | GTSL202212000263-1                                                                         |
| Sample(s) Status:    | Engineer sample                                                                            |
| Serial No.:          | 12RGBW000001                                                                               |
| Hardware Version:    | V1.0                                                                                       |
| Software Version:    | V1.0                                                                                       |
| Operation Frequency: | 2402MHz~2480MHz                                                                            |
| Channel Numbers:     | 40                                                                                         |
| Channel Separation:  | 2MHz                                                                                       |
| Modulation Type:     | GFSK                                                                                       |
| Antenna Type:        | Internal antenna                                                                           |
| Antenna Gain:        | 2.04dBi                                                                                    |
| Power Supply:        | DC 5V (Powered by adapter)                                                                 |
| Adapter:             | Model No.: RKPO-UL0502000DP-1P<br>Input:120V~, 50/60Hz, 0.3A<br>Output: 5V --- 2000mA, 10W |

| Operation Frequency each of channel |           |         |           |         |           |         |           |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1                                   | 2402 MHz  | 11      | 2422 MHz  | 21      | 2442 MHz  | 31      | 2462 MHz  |
| 2                                   | 2404 MHz  | 12      | 2424 MHz  | 22      | 2444 MHz  | 32      | 2464 MHz  |
| 3                                   | 2406 MHz  | 13      | 2426 MHz  | 23      | 2446 MHz  | 33      | 2466 MHz  |
| 4                                   | 2408 MHz  | 14      | 2428 MHz  | 24      | 2448 MHz  | 34      | 2468 MHz  |
| 5                                   | 2410 MHz  | 15      | 2430 MHz  | 25      | 2450 MHz  | 35      | 2470 MHz  |
| 6                                   | 2412 MHz  | 16      | 2432 MHz  | 26      | 2452 MHz  | 36      | 2472 MHz  |
| 7                                   | 2414 MHz  | 17      | 2434 MHz  | 27      | 2454 MHz  | 37      | 2474 MHz  |
| 8                                   | 2416 MHz  | 18      | 2436 MHz  | 28      | 2456 MHz  | 38      | 2476 MHz  |
| 9                                   | 2418 MHz  | 19      | 2438 MHz  | 29      | 2458 MHz  | 39      | 2478 MHz  |
| 10                                  | 2420 MHz  | 20      | 2440 MHz  | 30      | 2460 MHz  | 40      | 2480 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  | 2402MHz   |
| The middle channel  | 2440MHz   |
| The Highest channel | 2480MHz   |

## Output power setting table:

| Test Mode | Set Tx Output Power | Data Rate |
|-----------|---------------------|-----------|
| BLE       | default             | 1Mbps     |

## 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> |                                                |

## 5.2 Description of Support Units

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

## 5.3 Deviation from Standards

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

## 5.4 Abnormalities from Standard Conditions

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

## 5.5 Test Facility

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> <li>● <b>FCC—Registration No.: 381383</b><br/>Designation Number: CN5029<br/>Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.</li> <li>● <b>IC —Registration No.: 9079A</b><br/>CAB identifier: CN0091<br/>The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing</li> <li>● <b>NVLAP (LAB CODE:600179-0)</b><br/>Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 5.6 Test Location

|                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All tests were performed at:                                                                                                                                                                                                                                  |
| <p>Global United Technology Services Co., Ltd.<br/>Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102<br/>Tel: 0755-27798480<br/>Fax: 0755-27798960</p> |

## 6 Test Instruments list

| Radiated Emission: |                                     |                                |                             |               |                     |                         |
|--------------------|-------------------------------------|--------------------------------|-----------------------------|---------------|---------------------|-------------------------|
| Item               | Test Equipment                      | Manufacturer                   | Model No.                   | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                  | 3m Semi- Anechoic Chamber           | ZhongYu Electron               | 9.2(L)*6.2(W)* 6.4(H)       | GTS250        | July 02, 2020       | July 01, 2025           |
| 2                  | Control Room                        | ZhongYu Electron               | 6.2(L)*2.5(W)* 2.4(H)       | GTS251        | N/A                 | N/A                     |
| 3                  | EMI Test Receiver                   | Rohde & Schwarz                | ESU26                       | GTS203        | April 22, 2022      | April 21, 2023          |
| 4                  | BiConiLog Antenna                   | SCHWARZBECK<br>MESS-ELEKTRONIK | VULB9168                    | GTS640        | March 21, 2022      | March 20, 2023          |
| 5                  | Double -ridged waveguide horn       | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA 9120 D                 | GTS208        | June 12, 2022       | June 11, 2023           |
| 6                  | Horn Antenna                        | ETS-LINDGREN                   | 3160                        | GTS217        | June 23, 2022       | June 22, 2023           |
| 7                  | EMI Test Software                   | AUDIX                          | E3                          | N/A           | N/A                 | N/A                     |
| 8                  | Coaxial Cable                       | GTS                            | N/A                         | GTS213        | April 22, 2022      | April 21, 2023          |
| 9                  | Coaxial Cable                       | GTS                            | N/A                         | GTS211        | April 22, 2022      | April 21, 2023          |
| 10                 | Coaxial cable                       | GTS                            | N/A                         | GTS210        | April 22, 2022      | April 21, 2023          |
| 11                 | Coaxial Cable                       | GTS                            | N/A                         | GTS212        | April 22, 2022      | April 21, 2023          |
| 12                 | Amplifier(100kHz-3GHz)              | HP                             | 8347A                       | GTS204        | April 22, 2022      | April 21, 2023          |
| 13                 | Amplifier (18-26GHz)                | Rohde & Schwarz                | AFS33-18002<br>650-30-8P-44 | GTS218        | June 23, 2022       | June 22, 2023           |
| 14                 | Band filter                         | Amindeon                       | 82346                       | GTS219        | June 23, 2022       | June 22, 2023           |
| 15                 | Power Meter                         | Anritsu                        | ML2495A                     | GTS540        | June 23, 2022       | June 22, 2023           |
| 16                 | Power Sensor                        | Anritsu                        | MA2411B                     | GTS541        | June 23, 2022       | June 22, 2023           |
| 17                 | Wideband Radio Communication Tester | Rohde & Schwarz                | CMW500                      | GTS575        | April 22, 2022      | April 21, 2023          |
| 18                 | Splitter                            | Agilent                        | 11636B                      | GTS237        | June 23, 2022       | June 22, 2023           |
| 19                 | Loop Antenna                        | ZHINAN                         | ZN30900A                    | GTS534        | Nov. 29, 2022       | Nov. 28, 2023           |
| 20                 | Broadband Preamplifier              | SCHWARZBECK                    | BBV9718                     | GTS535        | April 22, 2022      | April 21, 2023          |
| 21                 | Breitband hornantenna               | SCHWARZBECK                    | BBHA 9170                   | GTS579        | Oct. 16, 2022       | Oct. 15, 2023           |
| 22                 | Amplifier                           | TDK                            | PA-02-02                    | GTS574        | Oct. 16, 2022       | Oct. 15, 2023           |
| 23                 | Amplifier                           | TDK                            | PA-02-03                    | GTS576        | Oct. 16, 2022       | Oct. 15, 2023           |
| 24                 | PSA Series Spectrum Analyzer        | Rohde & Schwarz                | FSP                         | GTS578        | June 23, 2022       | June 22, 2023           |
| 25                 | Amplifier(1GHz-26.5GHz)             | HP                             | 8449B                       | GTS601        | April 22, 2022      | April 21, 2023          |

| Conducted Emission |                           |                         |                      |               |                     |                         |
|--------------------|---------------------------|-------------------------|----------------------|---------------|---------------------|-------------------------|
| Item               | Test Equipment            | Manufacturer            | Model No.            | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                  | Shielding Room            | ZhongYu Electron        | 7.3(L)x3.1(W)x2.9(H) | GTS252        | May 14, 2022        | May 13, 2025            |
| 2                  | EMI Test Receiver         | R&S                     | ESCI 7               | GTS552        | April 24, 2022      | April 23, 2023          |
| 3                  | Coaxial Switch            | ANRITSU CORP            | MP59B                | GTS225        | June 23, 2022       | June 22, 2023           |
| 4                  | ENV216 2-L-V-NETZNACHB.DE | ROHDE&SCHWARZ           | ENV216               | GTS226        | April 22, 2022      | April 21, 2023          |
| 5                  | Coaxial Cable             | GTS                     | N/A                  | GTS227        | N/A                 | N/A                     |
| 6                  | EMI Test Software         | AUDIX                   | E3                   | N/A           | N/A                 | N/A                     |
| 7                  | Thermo meter              | JINCHUANG               | GSP-8A               | GTS639        | April 28, 2022      | April 27, 2023          |
| 8                  | Absorbing clamp           | Elektronik-Feinmechanik | MDS21                | GTS229        | April 15, 2022      | April 14, 2023          |
| 9                  | ISN                       | SCHWARZBECK             | NTFM 8158            | GTS565        | April 22, 2022      | April 21, 2023          |
| 10                 | High voltage probe        | SCHWARZBECK             | TK9420               | GTS537        | April 22, 2022      | April 21, 2023          |

| RF Conducted Test: |                                                |              |                  |            |                     |                         |
|--------------------|------------------------------------------------|--------------|------------------|------------|---------------------|-------------------------|
| Item               | Test Equipment                                 | Manufacturer | Model No.        | Serial No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                  | MXA Signal Analyzer                            | Agilent      | N9020A           | GTS566     | April 22, 2022      | April 21, 2023          |
| 2                  | EMI Test Receiver                              | R&S          | ESCI 7           | GTS552     | April 22, 2022      | April 21, 2023          |
| 3                  | Spectrum Analyzer                              | Agilent      | E4440A           | GTS536     | April 22, 2022      | April 21, 2023          |
| 4                  | MXG vector Signal Generator                    | Agilent      | N5182A           | GTS567     | April 22, 2022      | April 21, 2023          |
| 5                  | ESG Analog Signal Generator                    | Agilent      | E4428C           | GTS568     | April 22, 2022      | April 21, 2023          |
| 6                  | USB RF Power Sensor                            | DARE         | RPR3006W         | GTS569     | April 22, 2022      | April 21, 2023          |
| 7                  | RF Switch Box                                  | Shongyi      | RFSW3003328      | GTS571     | April 22, 2022      | April 21, 2023          |
| 8                  | Programmable Constant Temp & Humi Test Chamber | WEWON        | WHTH-150L-40-880 | GTS572     | April 22, 2022      | April 21, 2023          |

| General used equipment: |                                 |              |           |               |                     |                         |
|-------------------------|---------------------------------|--------------|-----------|---------------|---------------------|-------------------------|
| Item                    | Test Equipment                  | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                       | Humidity/ Temperature Indicator | KTJ          | TA328     | GTS243        | April 25, 2022      | April 24, 2023          |
| 2                       | Barometer                       | KUMAO        | SF132     | GTS647        | July 26, 2022       | July 25, 2023           |

## 7 Test results and Measurement Data

### 7.1 Antenna requirement

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| <b>Standard requirement:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | FCC Part15 C Section 15.203 /247(b)(4) |
| <p><b>15.203 requirement:</b></p> <p>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.</p> <p><b>15.247(b)(4) requirement:</b></p> <p>(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p> |                                        |
| <p><b>E.U.T Antenna:</b></p> <p><i>The antenna is Internal antenna, the best case gain of the is 2.04dBi, reference to the appendix II for details</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |

## 7.2 Conducted Emissions

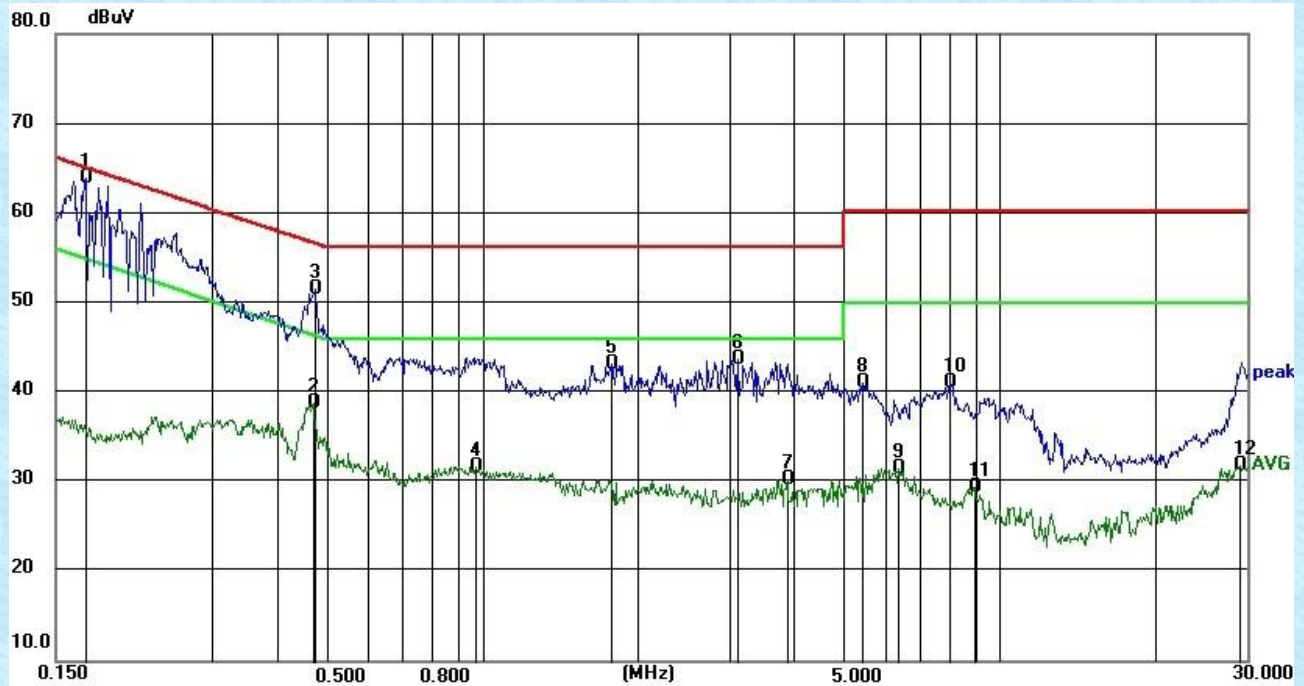
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|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------|-----|-----------|----------|
| 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><p style="text-align: center;"><b>Reference Plane</b></p><p>Remark:<br/>E.U.T: Equipment Under Test<br/>LISN: Line Impedance Stabilization Network<br/>Test table height=0.8m</p></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |              |     |           |          |
| Test procedure:                                  | <div><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 C63.10:2009 on conducted measurement.</div></div> |       |              |     |           |          |
| Test Instruments:                                | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |              |     |           |          |
| Test mode:                                       | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |              |     |           |          |
| Test environment:                                | Temp.:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 25 °C | Humid.:      | 52% | Press.:   | 1012mbar |
| Test voltage:                                    | AC 120V, 60Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |              |     |           |          |
| Test results:                                    | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |              |     |           |          |

Remark: Both high and low voltages have been tested to show only the worst low voltage test data.

## Measurement data

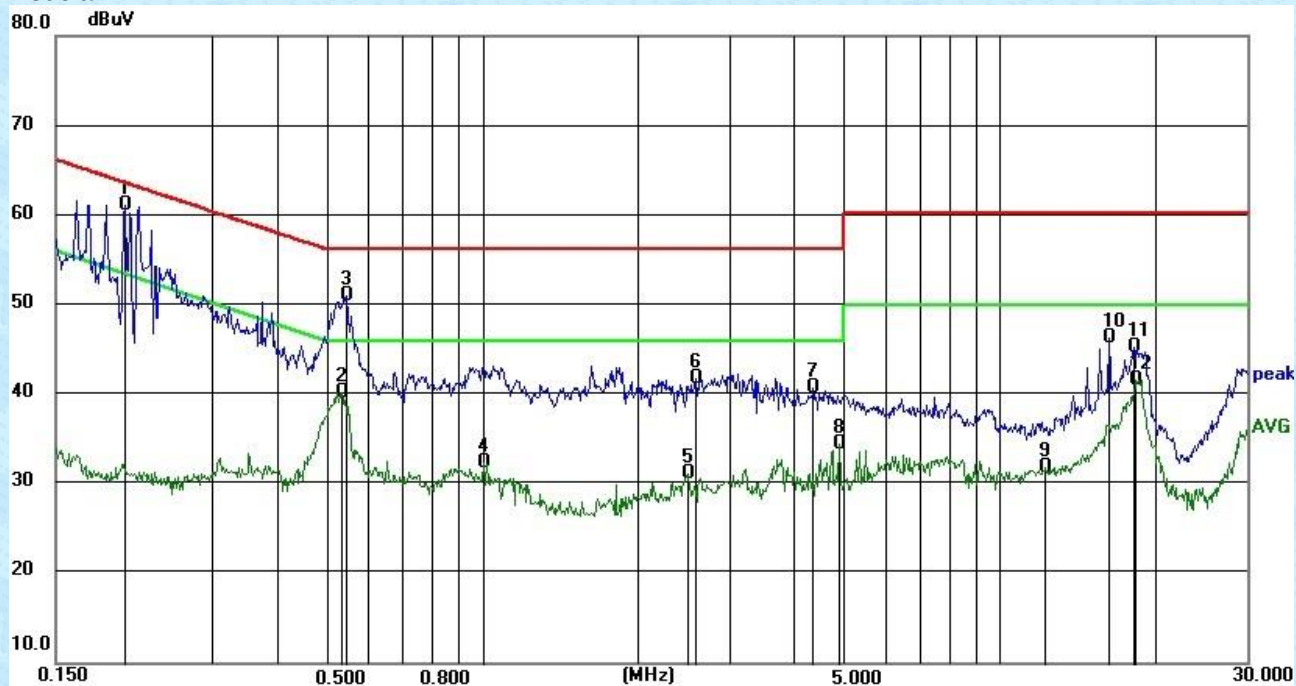
Pre-scan all test modes, found worst case at 2402MHz, and so only show the test result of 2402MHz

### Line:



| Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----------------|----------------|-------------|--------------|--------------|-------------|--------|
| 0.1711          | 53.91          | 10.00       | 63.91        | 64.91        | 1.00        | QP     |
| 0.4711          | 28.82          | 10.02       | 38.84        | 46.49        | 7.65        | AVG    |
| 0.4761          | 41.53          | 10.03       | 51.56        | 56.41        | 4.85        | QP     |
| 0.9735          | 21.58          | 10.15       | 31.73        | 46.00        | 14.27       | AVG    |
| 1.7802          | 32.74          | 10.46       | 43.20        | 56.00        | 12.80       | QP     |
| 3.1065          | 33             | 10.66       | 43.66        | 56.00        | 12.34       | QP     |
| 3.8807          | 19.66          | 10.66       | 30.32        | 46.00        | 15.68       | AVG    |
| 5.4184          | 30.36          | 10.68       | 41.04        | 60.00        | 18.96       | QP     |
| 6.3520          | 20.89          | 10.70       | 31.59        | 50.00        | 18.41       | AVG    |
| 8.0198          | 30.22          | 10.85       | 41.07        | 60.00        | 18.93       | QP     |
| 8.9161          | 18.37          | 11.06       | 29.43        | 50.00        | 20.57       | AVG    |
| 29.0609         | 12.62          | 19.16       | 31.78        | 50.00        | 18.22       | AVG    |

## Neutral:

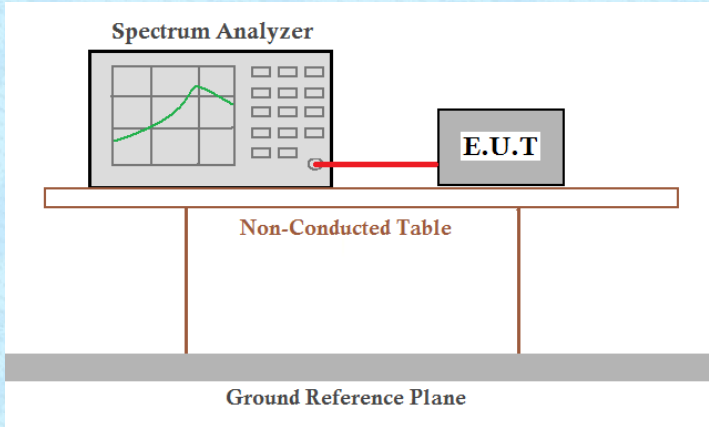


| Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----------------|----------------|-------------|--------------|--------------|-------------|--------|
| 0.2038          | 51.05          | 10.02       | 61.07        | 63.45        | 2.38        | QP     |
| 0.5349          | 30.14          | 10.03       | 40.17        | 46.00        | 5.83        | AVG    |
| 0.5463          | 40.91          | 10.03       | 50.94        | 56.00        | 5.06        | QP     |
| 1.0040          | 22.22          | 10.15       | 32.37        | 46.00        | 13.63       | AVG    |
| 2.5000          | 20.48          | 10.59       | 31.07        | 46.00        | 14.93       | AVG    |
| 2.5807          | 31.15          | 10.59       | 41.74        | 56.00        | 14.26       | QP     |
| 4.3605          | 30.09          | 10.71       | 40.80        | 56.00        | 15.20       | QP     |
| 4.8996          | 23.81          | 10.72       | 34.53        | 46.00        | 11.47       | AVG    |
| 12.2530         | 20.52          | 11.36       | 31.88        | 50.00        | 18.12       | AVG    |
| 16.2256         | 34.69          | 11.58       | 46.27        | 60.00        | 13.73       | QP     |
| 18.1352         | 32.57          | 12.66       | 45.23        | 60.00        | 14.77       | QP     |
| 18.3277         | 28.78          | 12.85       | 41.63        | 50.00        | 8.37        | AVG    |

### Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

## 7.3 Conducted Peak Output Power

|                   |                                                                                    |
|-------------------|------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (b)(3)                                                 |
| Test Method:      | ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02                     |
| Limit:            | 30dBm                                                                              |
| Test setup:       |  |
| Test Instruments: | Refer to section 6.0 for details                                                   |
| Test mode:        | Refer to section 5.2 for details                                                   |
| Test results:     | Pass                                                                               |

### Measurement Data

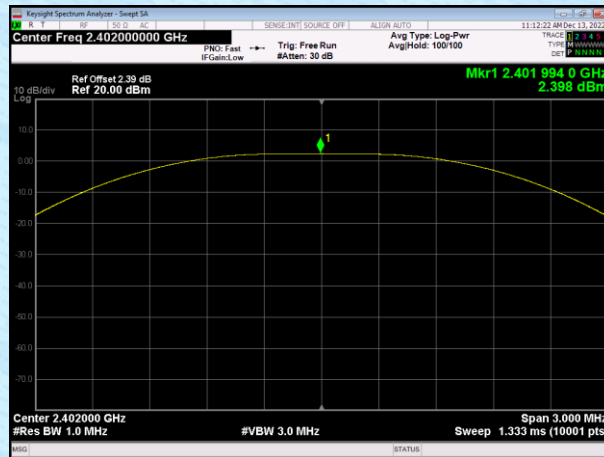
#### Duty Cycle:

| Test channel | Frequency (MHz) | Duty cycle (%) | Duty Factor |
|--------------|-----------------|----------------|-------------|
| Lowest       | 2402            | 100            | 0           |
| Middle       | 2440            | 100            | 0           |
| Highest      | 2480            | 100            | 0           |

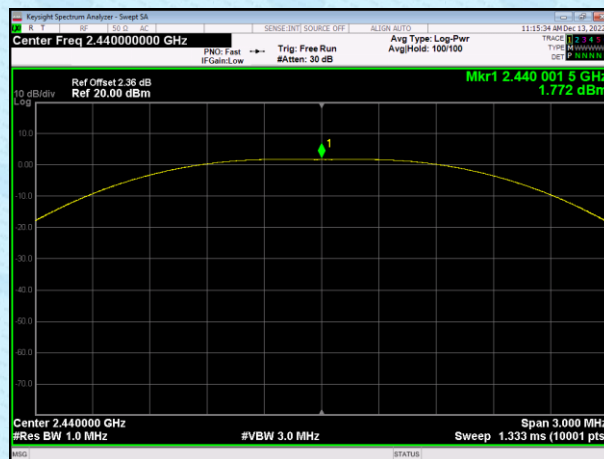
| Test channel | Peak Output Power (dBm) | EIRP (dBm) | Output Power Limit(dBm) | EIRP Limit(dBm) | Result |
|--------------|-------------------------|------------|-------------------------|-----------------|--------|
| Lowest       | 2.398                   | 4.438      | 30.00                   | 36.00           | Pass   |
| Middle       | 1.772                   | 3.812      | 30.00                   | 36.00           | Pass   |
| Highest      | 3.525                   | 5.565      | 30.00                   | 36.00           | Pass   |

Test plot as follows:

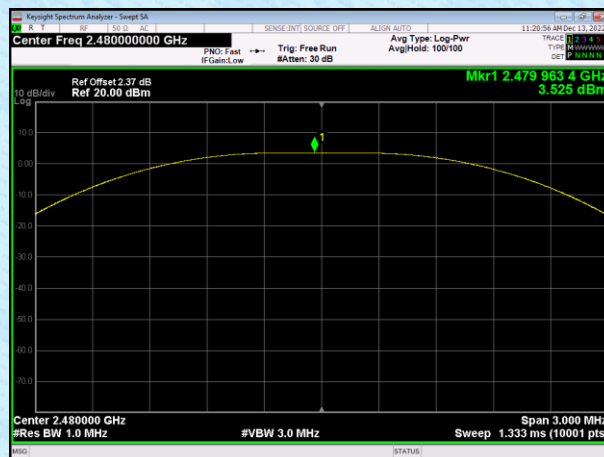
Lowest channel



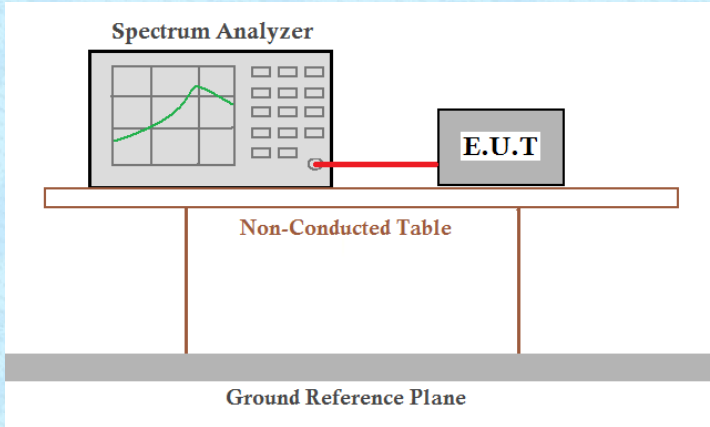
Middle channel



Highest channel



## 7.4 Channel Bandwidth & 99% Occupancy Bandwidth

|                   |                                                                                                                                                                                                                                                                                                                       |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(2)                                                                                                                                                                                                                                                                                    |
| Test Method:      | ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02                                                                                                                                                                                                                                                        |
| Limit:            | >500kHz                                                                                                                                                                                                                                                                                                               |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                      |
| Test mode:        | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                      |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                  |

### Measurement Data

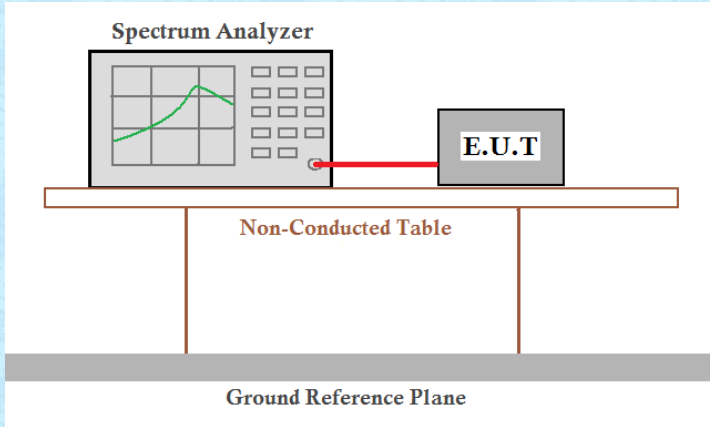
| Test channel | Channel Bandwidth (MHz) | Limit(kHz) | Result |
|--------------|-------------------------|------------|--------|
| Lowest       | 0.669                   | >500       | Pass   |
| Middle       | 0.637                   |            |        |
| Highest      | 0.653                   |            |        |

| Test channel | 99% Bandwidth (MHz) | Result |
|--------------|---------------------|--------|
| Lowest       | 1.032               | Pass   |
| Middle       | 1.032               |        |
| Highest      | 1.031               |        |

Test plot as follows:



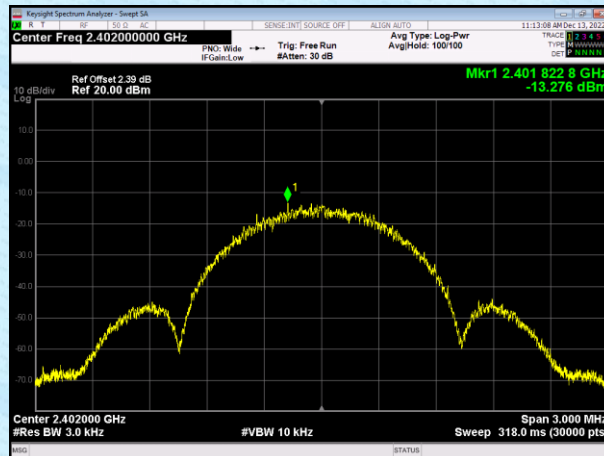
## 7.5 Power Spectral Density

|                   |                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (e)                                                                                                                                                                                                                                                                                                                            |
| Test Method:      | ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02                                                                                                                                                                                                                                                                                             |
| Limit:            | 8dBm/3kHz                                                                                                                                                                                                                                                                                                                                                  |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                                                           |
| Test mode:        | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                                                           |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                       |

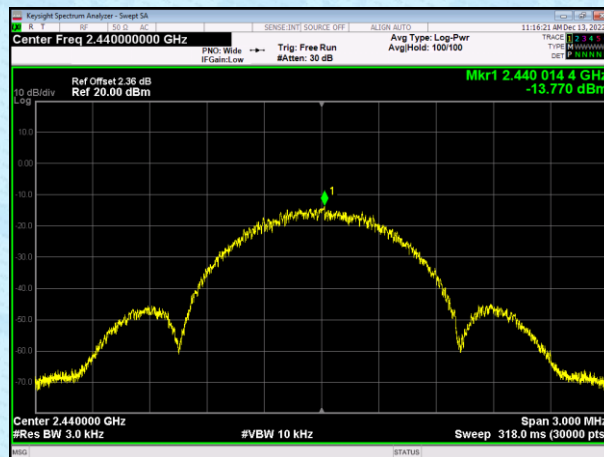
### Measurement Data

| Test channel | Power Spectral Density (dBm/3kHz) | Limit(dBm/3kHz) | Result |
|--------------|-----------------------------------|-----------------|--------|
| Lowest       | -13.276                           | 8.00            | Pass   |
| Middle       | -13.77                            |                 |        |
| Highest      | -12.502                           |                 |        |

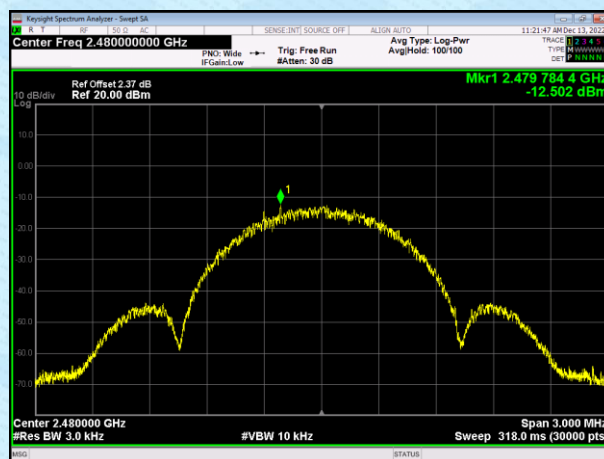
Test plot as follows:



Lowest channel



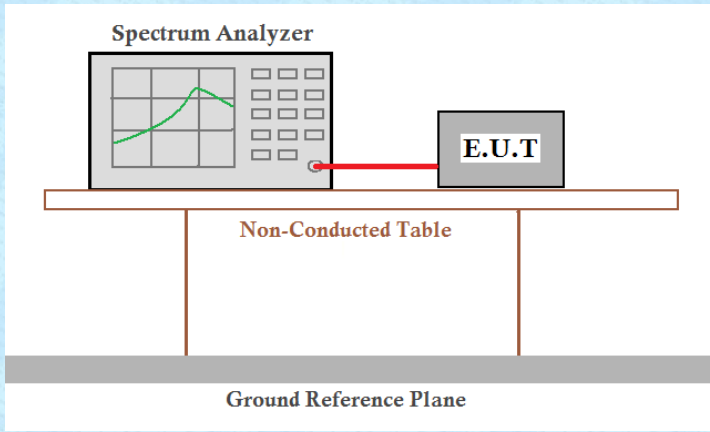
Middle channel



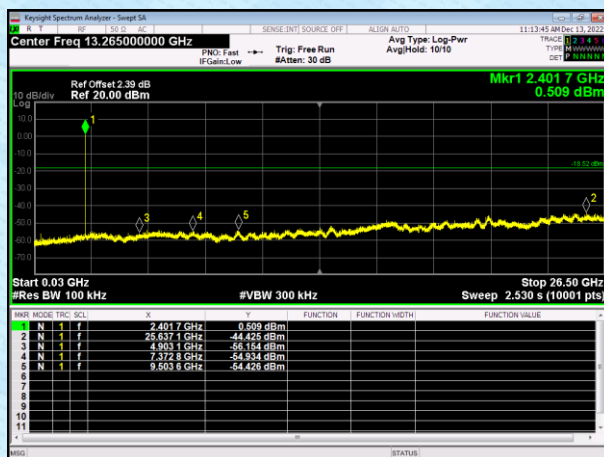
Highest channel

## 7.6 Spurious Emission in Non-restricted & restricted Bands

### 7.6.1 Conducted Emission Method

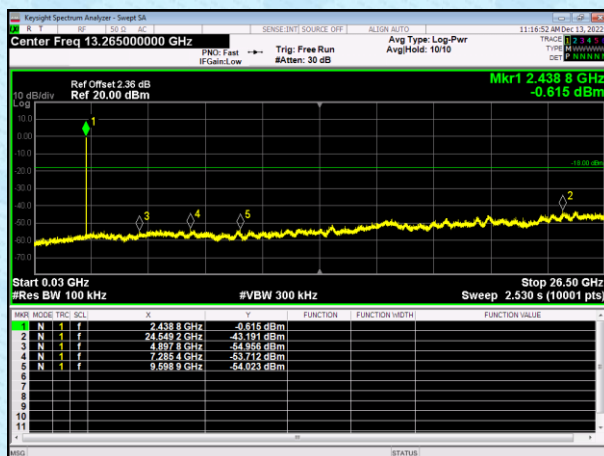
|                   |                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (d)                                                                                                                                                                                                                                                                                                                                                         |
| Test Method:      | ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02                                                                                                                                                                                                                                                                                                                          |
| Limit:            | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>                             |
| Test Instruments: | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                                                                                        |
| Test mode:        | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                                                                                        |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                    |

Test plot as follows:  
Lowest channel



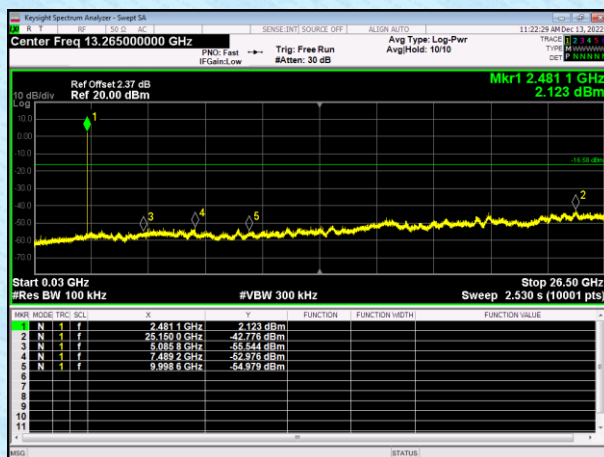
30MHz~26.5GHz

Middle channel



30MHz~26.5GHz

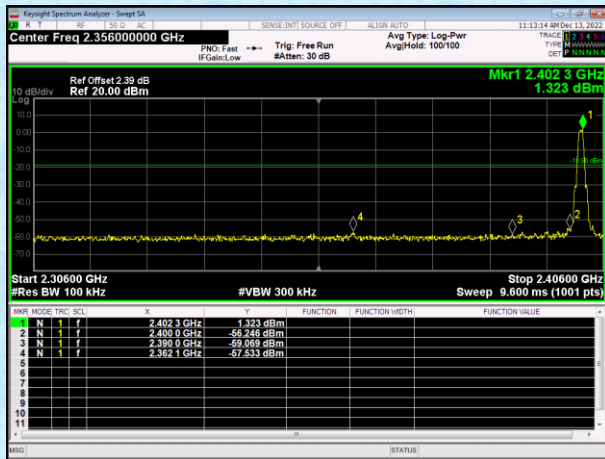
Highest channel



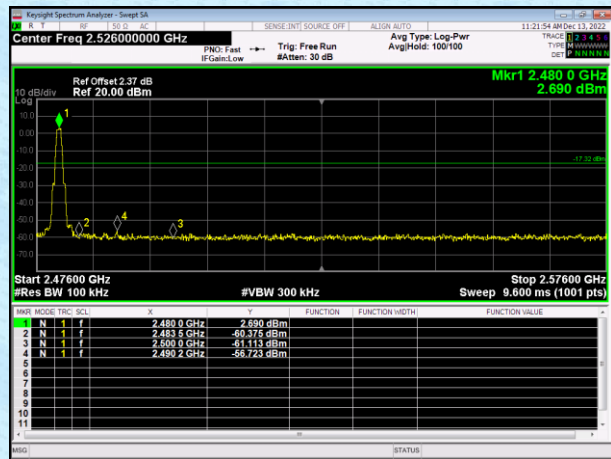
30MHz~26.5GHz

Test plot as follows:

Global United Technology Services Co., Ltd.  
No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone,  
Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102  
Telephone: +86 (0) 755 2779 8480 Fax: +86 (0) 755 2779 8960

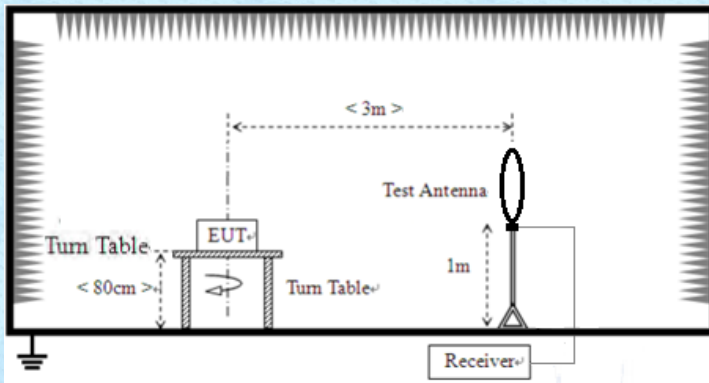


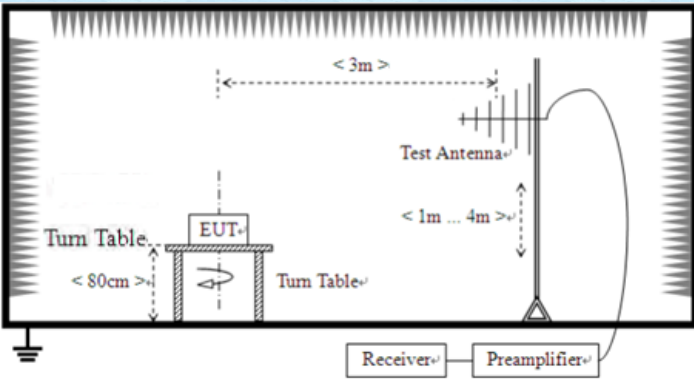
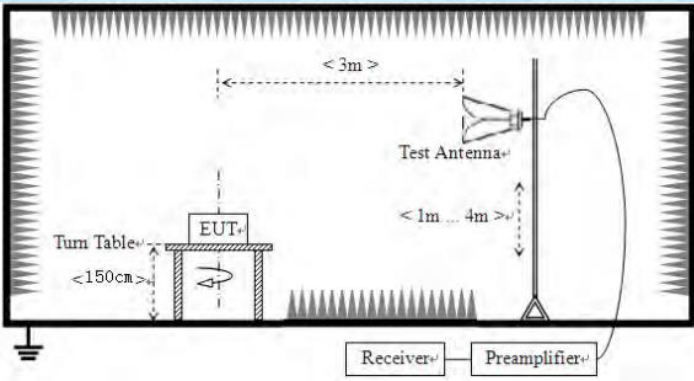
Lowest channel



Highest channel

## 7.6.2 Radiated Emission Method

|                       |                                                                                      |              |        |         |                      |
|-----------------------|--------------------------------------------------------------------------------------|--------------|--------|---------|----------------------|
| Test Requirement:     | FCC Part15 C Section 15.209 and 15.205                                               |              |        |         |                      |
| Test Method:          | ANSI C63.10:2013                                                                     |              |        |         |                      |
| Test Frequency Range: | 9kHz to 26.5GHz                                                                      |              |        |         |                      |
| Test site:            | Measurement Distance: 3m                                                             |              |        |         |                      |
| Receiver setup:       | Frequency                                                                            | Detector     | RBW    | VBW     | Value                |
|                       | 9kHz-150kHz                                                                          | Quasi-peak   | 200Hz  | 600Hz   | Quasi-peak           |
|                       | 150kHz-30MHz                                                                         | Quasi-peak   | 9kHz   | 30kHz   | Quasi-peak           |
|                       | 30MHz-1GHz                                                                           | Quasi-peak   | 120kHz | 300kHz  | Quasi-peak           |
|                       | Above 1GHz                                                                           | Peak         | 1MHz   | 3MHz    | Peak                 |
|                       |                                                                                      | Peak         | 1MHz   | 10Hz    | Average              |
| Limit:                | Frequency                                                                            | Limit (uV/m) |        | Value   | Measurement Distance |
|                       | 0.009MHz-0.490MHz                                                                    | 2400/F(kHz)  |        | QP      | 300m                 |
|                       | 0.490MHz-1.705MHz                                                                    | 24000/F(kHz) |        | QP      | 30m                  |
|                       | 1.705MHz-30MHz                                                                       | 30           |        | QP      | 30m                  |
|                       | 30MHz-88MHz                                                                          | 100          |        | QP      | 3m                   |
|                       | 88MHz-216MHz                                                                         | 150          |        | QP      |                      |
|                       | 216MHz-960MHz                                                                        | 200          |        | QP      |                      |
|                       | 960MHz-1GHz                                                                          | 500          |        | QP      |                      |
|                       | Above 1GHz                                                                           | 500          |        | Average |                      |
|                       |                                                                                      | 5000         |        | Peak    |                      |
| Test setup:           | For radiated emissions from 9kHz to 30MHz                                            |              |        |         |                      |
|                       |  |              |        |         |                      |

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          | <p>For radiated emissions from 30MHz to 1GHz</p>  <p>For radiated emissions above 1GHz</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>Test Procedure:</p>   | <ol style="list-style-type: none"> <li>1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>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.</li> <li>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.</li> <li>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.</li> <li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>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.</li> </ol> |
| <p>Test Instruments:</p> | <p>Refer to section 6.0 for details</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                   |                                  |       |         |     |         |          |
|-------------------|----------------------------------|-------|---------|-----|---------|----------|
| Test mode:        | Refer to section 5.2 for details |       |         |     |         |          |
| Test environment: | Temp.:                           | 26 °C | Humid.: | 54% | Press.: | 1012mbar |
| Test voltage:     | AC 120V, 60Hz                    |       |         |     |         |          |
| Test results:     | Pass                             |       |         |     |         |          |

## Measurement data:

### Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.
2. Both high and low voltages have been tested to show only the worst low voltage test data.

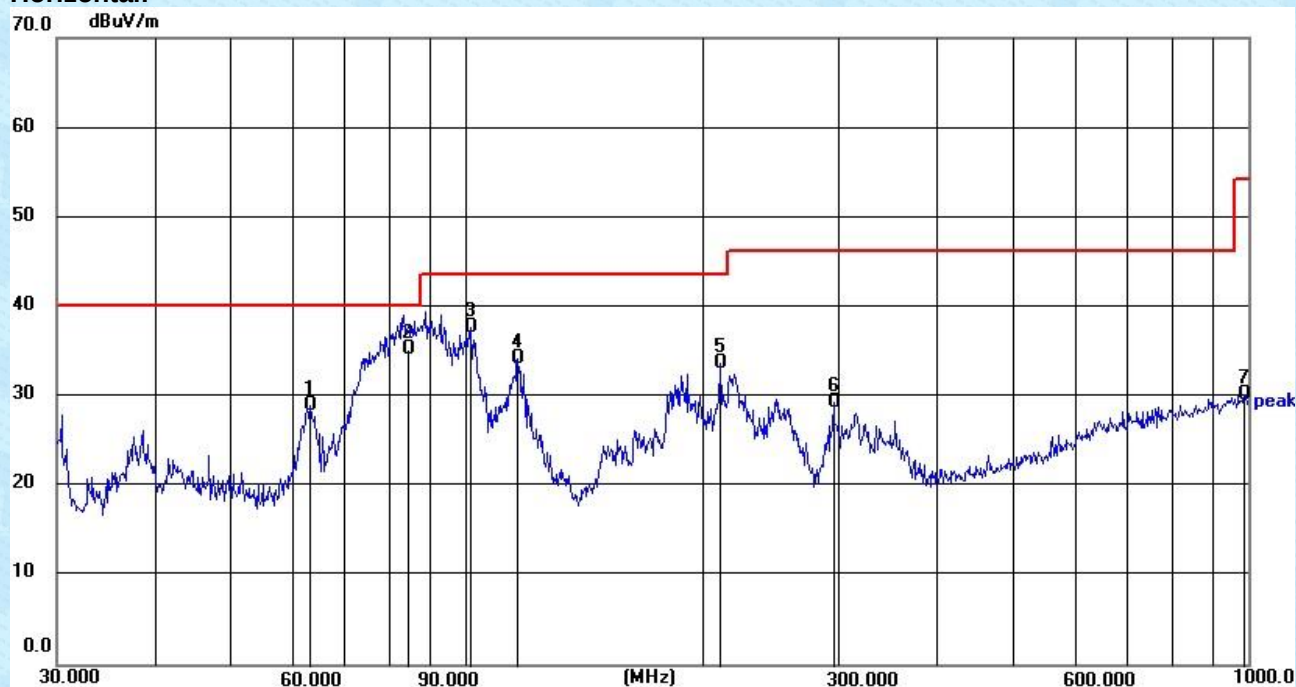
### ■ 9kHz~30MHz

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

## Below 1GHz

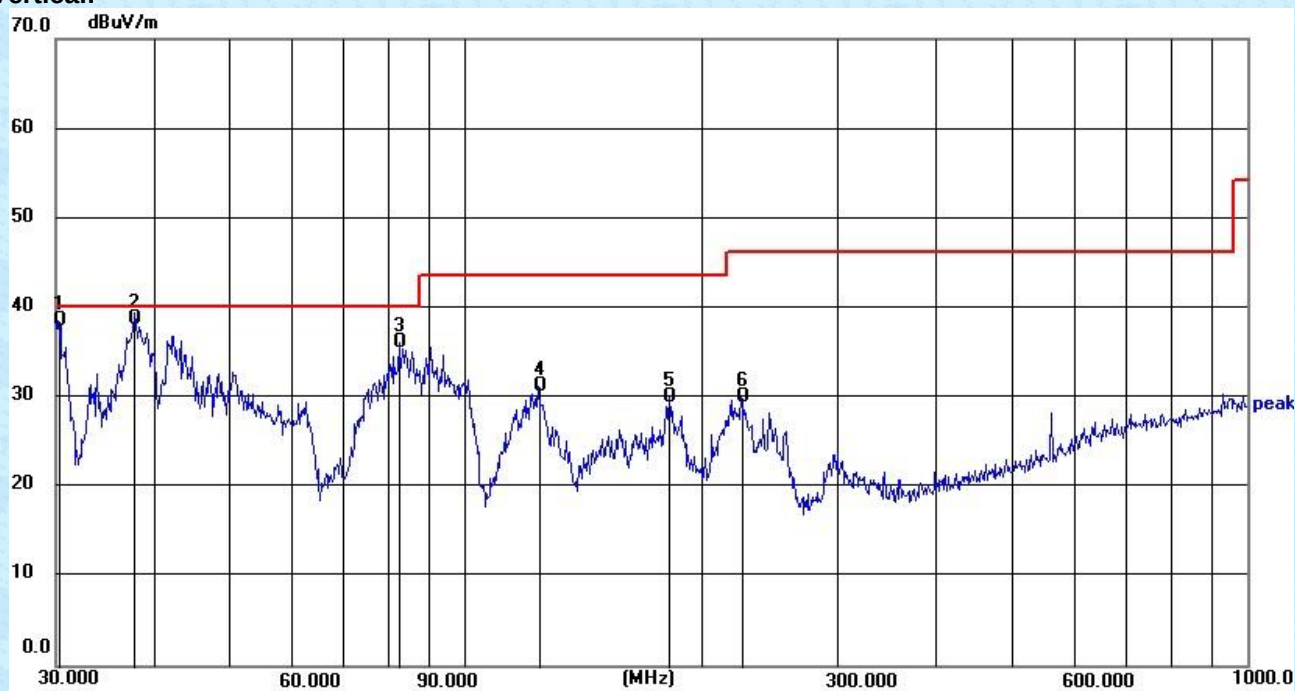
Pre-scan all test modes, found worst case at 2480MHz, and so only show the test result of 2480MHz

### Horizontal:



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|--------|
| 1   | 63.3132         | 15.68          | 13.32         | 29.00          | 40.00          | 11.00       | QP     |
| 2   | 84.4054         | 24.33          | 10.91         | 35.24          | 40.00          | 4.76        | QP     |
| 3   | 101.6443        | 25.52          | 12.11         | 37.63          | 43.50          | 5.87        | QP     |
| 4   | 116.5400        | 20.50          | 13.67         | 34.17          | 43.50          | 9.33        | QP     |
| 5   | 211.5261        | 21.42          | 12.22         | 33.64          | 43.50          | 9.86        | QP     |
| 6   | 295.1467        | 14.65          | 14.65         | 29.30          | 46.00          | 16.70       | QP     |
| 7   | 989.5353        | 5.59           | 24.70         | 30.29          | 54.00          | 23.71       | QP     |

## Vertical:



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|--------|
| 1   | 30.2111         | 25.72          | 12.88         | 38.60          | 40.00          | 1.40        | QP     |
| 2   | 37.8121         | 25.15          | 13.56         | 38.71          | 40.00          | 1.29        | QP     |
| 3   | 82.3588         | 25.29          | 10.85         | 36.14          | 40.00          | 3.86        | QP     |
| 4   | 124.1330        | 16.95          | 14.29         | 31.24          | 43.50          | 12.26       | QP     |
| 5   | 182.5592        | 16.73          | 13.23         | 29.96          | 43.50          | 13.54       | QP     |
| 6   | 225.3080        | 17.36          | 12.75         | 30.11          | 46.00          | 15.89       | QP     |

### Remark:

1. An initial pre-scan was performed on the Horizontal and Vertical with peak detector.
2. Quasi-Peak measurement were performed at the frequencies with maximized peak emission.
3. Level = Reading + Factor
4. Factor = Antenna Gain + Cable Loss – Amplifier Gain

## Unwanted Emissions in non-restricted Frequency Bands

### Above 1GHz

|            |     |               |        |
|------------|-----|---------------|--------|
| Test mode: | BLE | Test channel: | Lowest |
|------------|-----|---------------|--------|

#### Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4804            | 42.87             | 31.62                 | 8.58            | 32.11              | 50.96          | 74                  | -23.04          | Vertical     |
| 7206            | 34.14             | 35.89                 | 11.63           | 31.92              | 49.74          | 74                  | -24.26          | Vertical     |
| 4804            | 42.7              | 31.62                 | 8.58            | 32.11              | 50.79          | 74                  | -23.21          | Horizontal   |
| 7206            | 32.89             | 35.89                 | 11.63           | 31.92              | 48.49          | 74                  | -25.51          | Horizontal   |

|            |     |               |        |
|------------|-----|---------------|--------|
| Test mode: | BLE | Test channel: | Middle |
|------------|-----|---------------|--------|

#### Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4880            | 42.07             | 31.92                 | 8.71            | 32.11              | 50.59          | 74                  | -23.41          | Vertical     |
| 7320            | 32.53             | 36.42                 | 11.8            | 31.93              | 48.82          | 74                  | -25.18          | Vertical     |
| 4880            | 42.01             | 31.92                 | 8.71            | 32.11              | 50.53          | 74                  | -23.47          | Horizontal   |
| 7320            | 32.17             | 36.42                 | 11.8            | 31.93              | 48.46          | 74                  | -25.54          | Horizontal   |

|            |     |               |         |
|------------|-----|---------------|---------|
| Test mode: | BLE | Test channel: | Highest |
|------------|-----|---------------|---------|

#### Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4960            | 42.62             | 31.96                 | 8.75            | 32.3               | 51.03          | 74                  | -22.97          | Vertical     |
| 7440            | 33.82             | 36.54                 | 11.83           | 31.92              | 50.27          | 74                  | -23.73          | Vertical     |
| 4960            | 42.73             | 31.96                 | 8.75            | 32.3               | 51.14          | 74                  | -22.86          | Horizontal   |
| 7440            | 32.33             | 36.54                 | 11.83           | 31.92              | 48.78          | 74                  | -25.22          | Horizontal   |

|            |     |               |        |
|------------|-----|---------------|--------|
| Test mode: | BLE | Test channel: | Lowest |
|------------|-----|---------------|--------|

**Peak value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 2310            | 47.62             | 27.14                 | 6.19            | 42.04              | 38.91          | 74                  | -35.09          | Horizontal   |
| 2390            | 55.17             | 27.37                 | 6.31            | 42.11              | 46.74          | 74                  | -27.26          | Horizontal   |
| 2310            | 49.25             | 27.14                 | 6.19            | 42.04              | 40.54          | 74                  | -33.46          | Vertical     |
| 2390            | 53.78             | 27.37                 | 6.31            | 42.11              | 45.35          | 74                  | -28.65          | Vertical     |

|            |     |               |         |
|------------|-----|---------------|---------|
| Test mode: | BLE | Test channel: | Highest |
|------------|-----|---------------|---------|

**Peak value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 2483.5          | 52.54             | 27.66                 | 6.45            | 42.01              | 44.64          | 74                  | -29.36          | Horizontal   |
| 2500            | 47.95             | 27.7                  | 6.47            | 42                 | 40.12          | 74                  | -33.88          | Horizontal   |
| 2483.5          | 54.94             | 27.66                 | 6.45            | 42.01              | 47.04          | 74                  | -26.96          | Vertical     |
| 2500            | 49.53             | 27.7                  | 6.47            | 42                 | 41.7           | 74                  | -32.3           | Vertical     |

**Remark.**

1.  $Level = Reading\ Level + Antenna\ factor + Cable\ Loss - Amplifier\ factor$
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

## 8 Test Setup Photo

Reference to the **appendix I** for details.

## 9 EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----