



# TEST REPORT

Test item description: Wireless keyboard  
Trademark(s): LEOPOLD  
Model/Type reference: FC220TP  
Applicant's name: LEOPOLD CO., LTD.  
Address: B-dong-306, DaebangTriplaon BusinessTower, 158, Haneulmaeul-ro, Ilsandong-gu, Goyang-si, Gyeonggi-do 10355 South Korea  
Manufacturer: LEOPOLD CO., LTD.  
Address: B-dong-306, DaebangTriplaon BusinessTower, 158, Haneulmaeul-ro, Ilsandong-gu, Goyang-si, Gyeonggi-do 10355 South Korea  
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Sample Received Date: Feb. 06, 2026  
Sample tested Date: Feb. 06, 2026 to Mar. 05, 2026  
Issue Date: Mar. 05, 2026  
Report No.: CTB26020607401RF02  
Test Standards: MIC Public Notice 88:2004, annex 1 and annex 43  
Ordinance Article 2 paragraph 1 item (19)  
Test Results: PASS  
Remark: This is Bluetooth radio test report.  
Compiled by: Reviewed by: Approved by:

Kai Chen

Kai Chen

Martin Feng

Martin Feng



Bin Mei / Director

Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. "\*" indicates the testing items were fulfilled by subcontracted lab. "#" indicates the items are not in CNAS accreditation scope.

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## 1 TEST SUMMARY

### 1 VERSION

| Report No.         | Issue Date   | Description | Approved |
|--------------------|--------------|-------------|----------|
| CTB26020607401RF02 | Mar. 5, 2026 | Original    | Valid    |

**1.2 Test description**

| Part | Rule Section | Description                                         | Result   |
|------|--------------|-----------------------------------------------------|----------|
| 4.1  | 3            | Frequency Error                                     | Complies |
| 4.2  | 4            | Occupied Bandwidth (99%) and Spread-spectrum (90%)  | Complies |
| 4.3  | 5            | Unwanted Emission Intensity                         | Complies |
| 4.4  | 6            | Antenna Power Error                                 | Complies |
| 4.5  | 7            | Limitation of Collateral Emission of Receiver       | Complies |
| 4.6  | 8            | Transmission Antenna Gain(EIRP Antenna Power)       | Complies |
| 4.7  | 9            | Transmission Radiation Angle Width (3dB Beam width) | N/A      |
| 4.8  | 10           | Radio Interference Prevention Capability            | Complies |
| 4.9  | Note 1       | Carrier Sense Capability                            | N/A      |
| 4.10 | Note 2       | Construction Protection Confirmation                | Complies |

Note:

1. "N/A" denotes test is not applicable in this Report.
2. "Note 1" is MIC Notice No.88 Appendix No.43.
3. "Note 2" is MIC Ordinance Regulating Radio Equipment Section 4.17 of Article 49.20.

### 1.3 Measurement uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| Item                                               | Uncertainty        |
|----------------------------------------------------|--------------------|
| Occupancy bandwidth                                | 54.3kHz            |
| Conducted output power Above 1G                    | 0.9dB              |
| Conducted output power below 1G                    | 0.9dB              |
| Power Spectral Density , Conduction                | 0.9dB              |
| Conduction spurious emissions                      | 2.0dB              |
| Out of band emission                               | 2.0dB              |
| 3m chamber Radiated spurious emission(30MHz-1GHz)  | 4.6dB              |
| 3m chamber Radiated spurious emission(1GHz-18GHz)  | 5.1dB              |
| 3m chamber Radiated spurious emission(18GHz-40GHz) | 3.4dB              |
| Frequency Error                                    | 54.3Hz             |
| Adjacent channel power below 1G                    | 2.6dB              |
| Adjacent channel power Above 1G                    | 2.8dB              |
| humidity uncertainty                               | 5.5%               |
| Temperature uncertainty                            | 0.63℃              |
| frequency                                          | $1 \times 10^{-7}$ |

## 2 GENERAL INFORMATION

### 2.1 General description of EUT

Model/Type reference: FC220TP

Model Description: N/A

Bluetooth Version: Bluetooth 5.3

Hardware Version: V1.3

Software Version: V1.03

Operation Frequency: Bluetooth: 2402-2480MHz

Max. RF output power: 1M:2mW  
2M:2mW

Type of Modulation: Bluetooth: GFSK

Antenna installation: PCB antenna

Antenna Gain: 2.41dBi

Ratings: DC 5V charging from adapter  
DC 3.7V by battery

Note: For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

## 2.2 Description of test modes

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

| Operation Frequency List 2.4G Band |                 |         |                 |         |                 |         |                 |
|------------------------------------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|
| Channel                            | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 0                                  | 2402            | 10      | 2422            | 20      | 2442            | 30      | 2462            |
| 1                                  | 2404            | 11      | 2424            | 21      | 2444            | 31      | 2464            |
| 2                                  | 2406            | 12      | 2426            | 22      | 2446            | 32      | 2466            |
| 3                                  | 2408            | 13      | 2428            | 23      | 2448            | 33      | 2468            |
| 4                                  | 2410            | 14      | 2430            | 24      | 2450            | 34      | 2470            |
| 5                                  | 2412            | 15      | 2432            | 25      | 2452            | 35      | 2472            |
| 6                                  | 2414            | 16      | 2434            | 26      | 2454            | 36      | 2474            |
| 7                                  | 2416            | 17      | 2436            | 27      | 2456            | 37      | 2476            |
| 8                                  | 2418            | 18      | 2438            | 28      | 2458            | 38      | 2478            |
| 9                                  | 2420            | 19      | 2440            | 29      | 2460            | 39      | 2480            |

Note: Test performed at the lowest/middle/highest frequencies selected in the list above for EUT supported while working on specified mode.

| Pretest Mode      | Description             |
|-------------------|-------------------------|
| Transmitting mode | Low channel: 2402MHz    |
|                   | Middle channel: 2440MHz |
|                   | High channel: 2480MHz   |
| Receiver mode     | Low channel: 2402MHz    |

## 2.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| Supply Voltage                                                                                                                                                                 |                |                      |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------|---------------|
|                                                                                                                                                                                | supply power V | Rated module power V | Tolerance (%) |
| Normal                                                                                                                                                                         | 3.7            | 3.3                  |               |
| +10%                                                                                                                                                                           | 4.07           | 3.3                  | 0             |
| -10%                                                                                                                                                                           | 3.33           | 3.3                  | 0             |
| Others                                                                                                                                                                         |                |                      |               |
| Temperature (°C)                                                                                                                                                               |                | 20-25                |               |
| Relative humidity                                                                                                                                                              |                | 54 %.                |               |
| ATM Pressure:                                                                                                                                                                  |                | 1010 mbar            |               |
| Note 1: When the input voltage is reduced or increased by 10%, the regulator voltage changes of less than 1%. So the following test items are conducted in the normal voltage. |                |                      |               |

## 2.4 Block diagram showing the configuration of system tested

Transmitting mode



## 2.5 Description of support units (conducted mode)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Item | Test item description | Trademark(s) | Model/Type reference | Note |
|------|-----------------------|--------------|----------------------|------|
| 1    | Wireless keyboard     | LEOPOLD      | FC220TP              | EUT  |
|      |                       |              |                      |      |
|      |                       |              |                      |      |

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. For detachable type I/O cable should be specified the length in cm in 『Length』 column.
3. "YES" is means "shielded" "with core"; "NO" is means "unshielded" "without core".

## 2.6 Measurement equipment list

| No. | Equipment                                 | Manufacturer | Type No.                  | Serial No.   | Firmware Version           | Calibrated until |
|-----|-------------------------------------------|--------------|---------------------------|--------------|----------------------------|------------------|
| 1   | Spectrum Analyzer                         | Agilent      | N9020A                    | MY52090073   | A.14.16                    | 2026/6/27        |
| 2   | Power Sensor                              | Agilent      | U2021XA                   | MY56120032   | /                          | 2026/6/27        |
| 3   | Power Sensor                              | Agilent      | U2021XA                   | MY56120034   | /                          | 2026/6/27        |
| 4   | Communication test set                    | R&S          | CMW500                    | 108058       | V3.5.80                    | 2026/6/27        |
| 5   | Spectrum Analyzer                         | KEYSIGHT     | N9020A                    | MY51289897   | A.14.16                    | 2026/6/27        |
| 6   | Signal Generator                          | Agilent      | N5181A                    | MY50140365   | A.01.60                    | 2026/6/27        |
| 7   | Vector signal generator                   | Agilent      | N5182A                    | MY47420195   | A.01.87                    | 2026/6/27        |
| 8   | Communication test set                    | Agilent      | E5515C                    | MY50102567   | B.19.07<br>(E1962B)        | 2026/6/27        |
| 9   | 2.4 GHz Filter                            | Shenxiang    | MSF2400-24<br>83.5MS-1154 | 20181015001  | /                          | 2026/6/29        |
| 10  | 5 GHz Filter                              | Shenxiang    | MSF5150-58<br>50MS-1155   | 20181015001  | /                          | 2026/6/29        |
| 11  | Filter                                    | Xingbo       | XBLBQ-DZA<br>120          | 190821-1-1   | /                          | 2026/6/29        |
| 12  | BT&WI-FI Automatic test software          | Microwave    | MTS8310                   | Ver. 2.0.0.0 | /                          | /                |
| 13  | Rohde & Schwarz SFU Broadcast Test System | R&S          | SFU                       | 101017       | /                          | 2026/6/27        |
| 14  | Temperature humidity chamber              | Hongjing     | TH-80CH                   | DG-15174     | /                          | 2026/6/27        |
| 15  | 234G Automatic test software              | Microwave    | MTS8200                   | Ver. 2.0.0.0 | /                          | /                |
| 16  | 966 chamber                               | C.R.T.       | 966                       | /            | /                          | 2027/6/21        |
| 17  | Receiver                                  | R&S          | ESPI                      | 100362       | RF_ATTEN_7<br>(104489/003) | 2026/6/27        |
| 18  | Amplifier                                 | HP           | 8447E                     | 2945A02747   | /                          | 2026/6/27        |

|    |                                      |             |            |            |         |           |
|----|--------------------------------------|-------------|------------|------------|---------|-----------|
| 19 | Amplifier                            | Agilent     | 8449B      | 3008A01838 | /       | 2026/6/27 |
| 20 | TRILOG Broadband Antenna             | Schwarzbeck | VULB 9168  | 00869      | /       | 2026/6/27 |
| 21 | Double Ridged Broadband Horn Antenna | Schwarzbeck | BBHA9120D  | 01911      | /       | 2026/6/27 |
| 22 | EMI test software                    | Fala        | EZ-EMC     | FA-03A2 RE | /       | /         |
| 23 | Loop Antenna                         | Schwarzbeck | FMZB 1519B | 1519B-224  | /       | 2026/6/27 |
| 24 | loop antenna                         | ZHINAN      | ZN30900A   | GTS534     | /       | /         |
| 25 | 40G Horn antenna                     | A/H/System  | SAS-574    | 588        | /       | 2026/6/27 |
| 26 | Amplifier                            | AEROFLEX    | Aeroflex   | 097        | /       | 2026/6/27 |
| 27 | Power Meter                          | KEYSIGHT    | N1912AP    | N/A        | A.05.00 | 2026/6/27 |
| 28 | DC power supply                      | Agilent     | E3640A     | MY53050046 | /       | 2026/6/27 |

Remark: Calibration institution "GRG METROLOGY & TEST GROUP Co., LTD."

Remark: Calibration based on Article 24-2, paragraph 4 of the Radio Act method c.

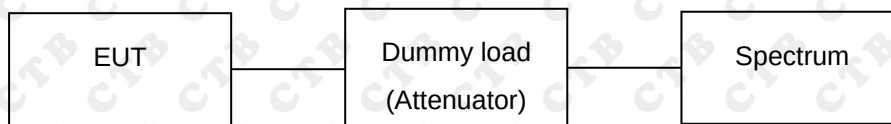
### 3 TEST CONDITIONS AND RESULTS

#### 3.1 Frequency error

##### 3.1.1 Limit

| Item            | Limits   |
|-----------------|----------|
| Frequency Error | +/-50ppm |

##### 3.1.2 Test configuration



##### 3.1.3 Test procedure

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

EUT Condition: non-modulation

Spectrum Condition:

Frequency: test frequency

Span: 1000 kHz

RBW: 10 kHz

VBW: 10 kHz

Sweep time: Auto

Detector mode: Positive peak

Indication mode: max hold

## 3.1.4 Test results

**1M:**

| Test voltage<br>(V) | Frequency<br>(MHz) | Read (MHz) | Deviation<br>(MHz) | Tolerance<br>(ppm) | Limit<br>(ppm) | Result |
|---------------------|--------------------|------------|--------------------|--------------------|----------------|--------|
| Normal<br>Voltage   | 2402               | 2402.04    | 0.04               | 16.653             | +/-50.00       | Pass   |
|                     | 2440               | 2440.04    | 0.04               | 16.393             |                |        |
|                     | 2480               | 2480.041   | 0.041              | 16.532             |                |        |

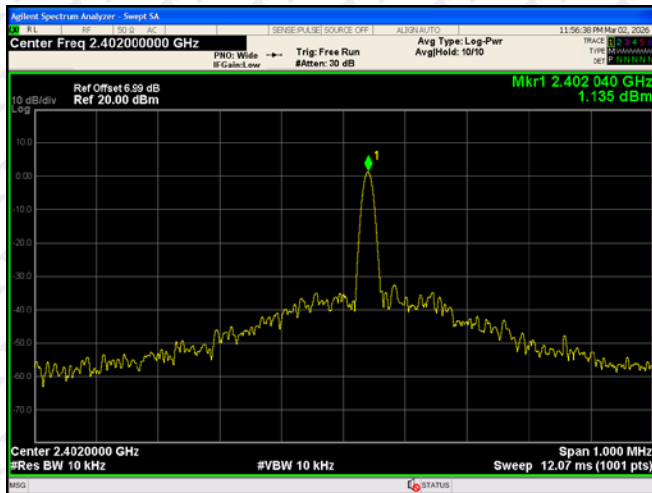
**2M:**

| Test voltage<br>(V) | Frequency<br>(MHz) | Read (MHz) | Deviation<br>(MHz) | Tolerance<br>(ppm) | Limit<br>(ppm) | Result |
|---------------------|--------------------|------------|--------------------|--------------------|----------------|--------|
| Normal<br>Voltage   | 2402               | 2402.04    | 0.04               | 16.653             | +/-50.00       | Pass   |
|                     | 2440               | 2440.04    | 0.04               | 16.393             |                |        |
|                     | 2480               | 2480.041   | 0.041              | 16.532             |                |        |

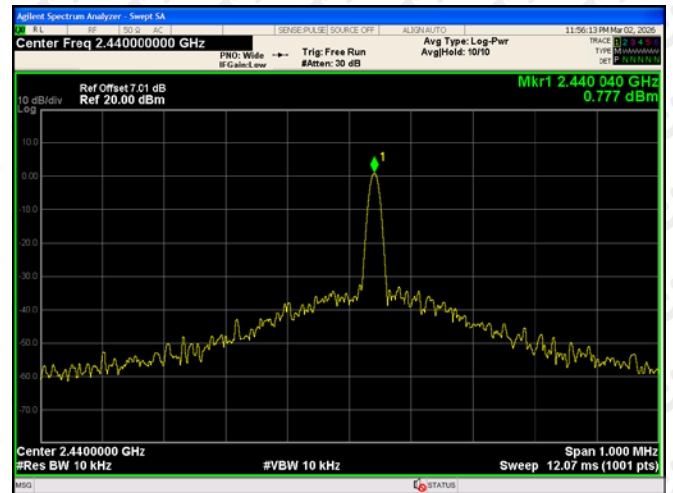
Note: Below test graph is the worst data.

1M:

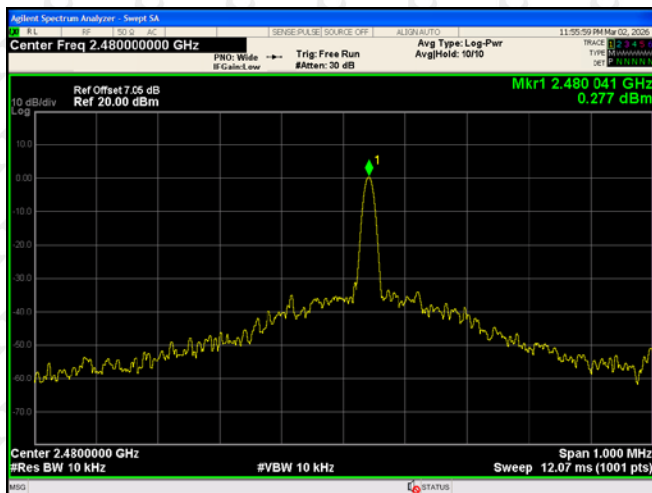
## Normal Voltage



2402MHz



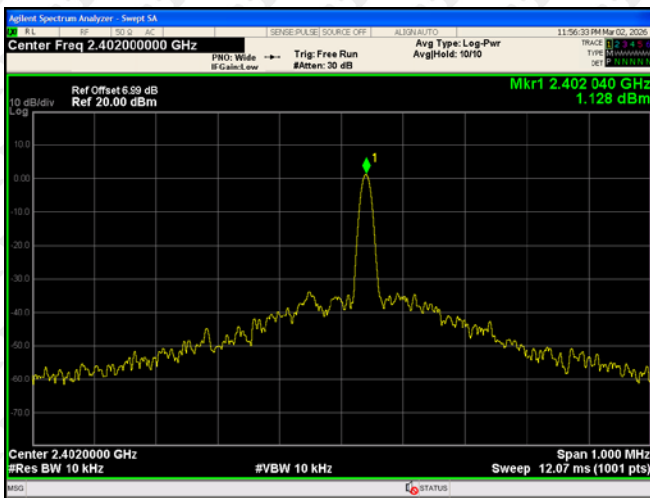
2440MHz



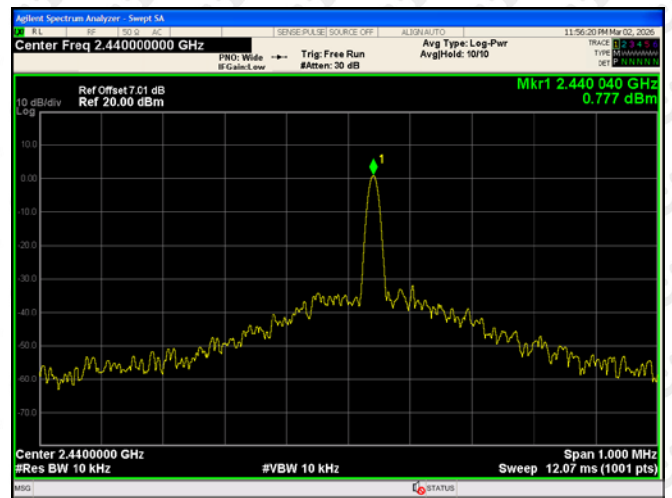
2480MHz

2M:

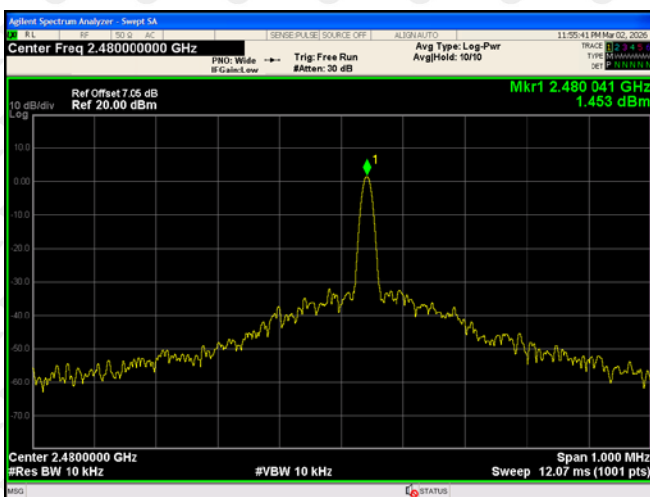
## Normal Voltage



2402MHz



2440MHz



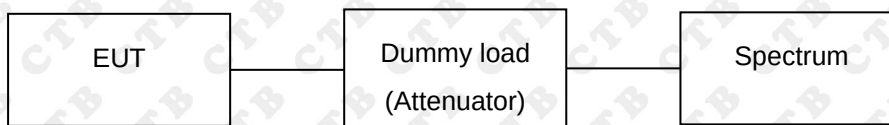
2480MHz

### 3.2 Antenna output power and output power tolerance

#### 3.2.1 Limit

| Item                  | Limits                                                                                                                                                                |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Antenna Power Density | $\leq 3\text{mW/MHz}$ (FH form 2427 - 2470.75MHz)<br>$\leq 10\text{mW/MHz}$ (OFDM, DS-SS, OFDM, DS-SS, OFDM, DS-SS)<br>$\leq 10\text{mW}$ (Other from 2400~2483.5MHz) |
| Antenna Power Error   | +20% (Base on manufacturer declare antenna power density)                                                                                                             |

#### 3.2.2 Test configuration



#### 3.2.3 Test procedure

##### Step 1:

Connect the UUT to the spectrum analyzer as TEST CONFIGURATION and use the following settings:

- Centre Frequency: The centre frequency of the channel under test.
- RBW: 1 MHz
- VBW: 1 MHz
- Span: Wide enough to cover the complete power envelope of the signal of the UUT.
- Detector: Peak
- Trace Mode: Max Hold

##### Step 2:

When the trace is complete, find the peak value of the power envelope and record the frequency.

##### Step 3:

Make the following changes to the settings of the spectrum analyzer:

- Centre Frequency: Equal to the frequency recorded in step 2.
- Span: 0 MHz
- RBW: 1 MHz
- VBW: 1 MHz
- Detector: RMS
- Trace Mode: Max Hold

## 3.2.4 Test results

## 1M:

| Test voltage   | Channel (MHz) | Average burst power(dBm) | Output power (mW) | Limit (mW) | Rated output power (mW) | Tolerance (%) | Limit | Result |
|----------------|---------------|--------------------------|-------------------|------------|-------------------------|---------------|-------|--------|
| Normal Voltage | 2402          | 2.13                     | 1.633             | 10         | 2                       | -18.347       | 20%   | Pass   |
|                | 2440          | 1.943                    | 1.564             | 10         | 2                       | -21.789       |       |        |
|                | 2480          | 1.549                    | 1.429             | 10         | 2                       | -28.572       |       |        |

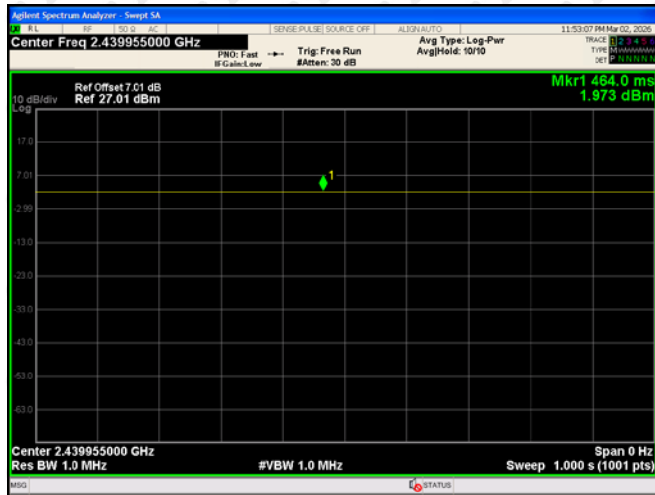
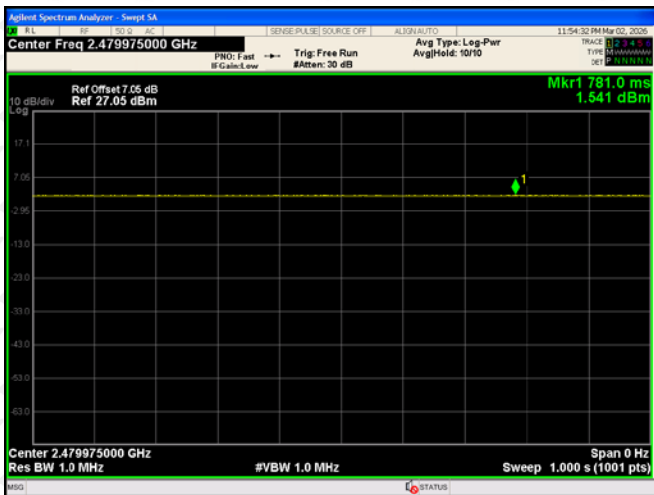
## 2M:

| Test voltage   | Channel (MHz) | Average burst power(dBm) | Output power (mW) | Limit (mW) | Rated output power (mW) | Tolerance (%) | Limit | Result |
|----------------|---------------|--------------------------|-------------------|------------|-------------------------|---------------|-------|--------|
| Normal Voltage | 2402          | 2.141                    | 1.637             | 10         | 2                       | -18.140       | 20%   | Pass   |
|                | 2440          | 1.973                    | 1.575             | 10         | 2                       | -21.246       |       |        |
|                | 2480          | 1.541                    | 1.426             | 10         | 2                       | -28.703       |       |        |

1M:



2M:

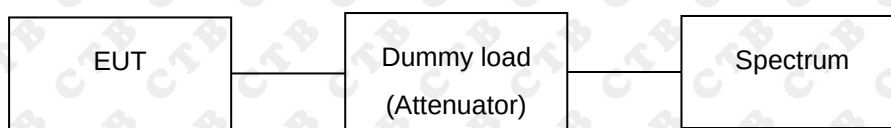
| Test condition:                                                                    | Normal Voltage | Test graph                                                                         |
|------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------|
|   |                |  |
| 2402MHz                                                                            |                | 2440MHz                                                                            |
|  |                |                                                                                    |
| 2480MHz                                                                            |                |                                                                                    |

### 3.3 Occupied bandwidth and spreading bandwidth

#### 3.3.1 Limit

| Item                | Limits                                                                        |
|---------------------|-------------------------------------------------------------------------------|
| Occupied Bandwidth: | FH $\leq$ 83.5 MHz; OFDM $\leq$ 40MHz, DS $\leq$ 26 MHz; Others $\leq$ 26 MHz |

#### 3.3.2 Test configuration



#### 3.3.3 Test procedure

1. Setting of SA is following as fellow:

RBW: 300 kHz

VBW: 300 kHz

Sweep time: Auto

Sweep Mode: Continuous sweep

Detect mode: Positive peak

Trace mode: Max hold

- EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 99% of occupied bandwidth to measure occupied bandwidth.
- EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 90% of occupied bandwidth to measure spread bandwidth.
- Spread Factor=Spread Bandwidth/modulation rate. The modulation rate: MR=1.375Mbps for 2.4g

## 3.3.4 Test results

1M:

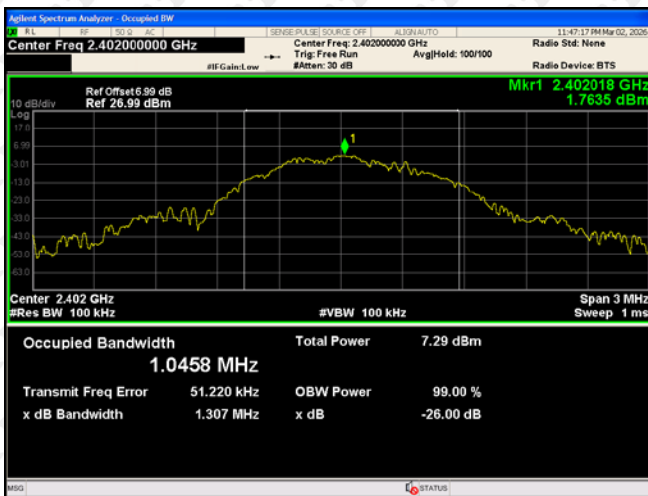
| Test voltage (V) | Channel (MHz) | Occupy 99% Bandwidth (MHz) | Limit (MHz) | Result |
|------------------|---------------|----------------------------|-------------|--------|
| Normal Voltage   | 2402          | 1.0458                     | <26         | Pass   |
|                  | 2440          | 1.0382                     |             |        |
|                  | 2480          | 1.0215                     |             |        |

2M:

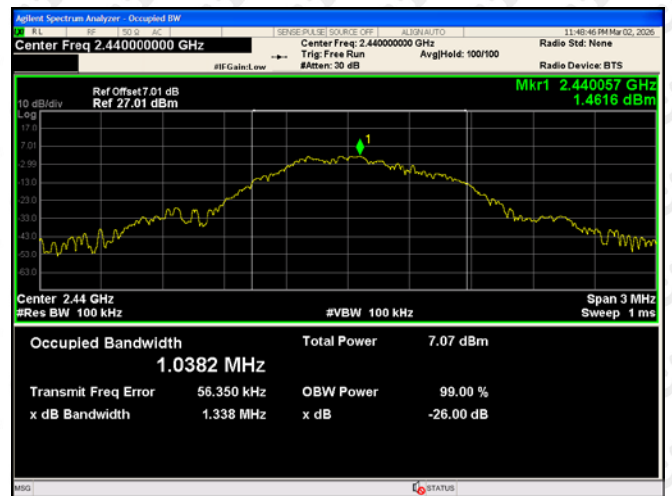
| Test voltage (V) | Channel (MHz) | Occupy 99% Bandwidth (MHz) | Limit (MHz) | Result |
|------------------|---------------|----------------------------|-------------|--------|
| Normal Voltage   | 2402          | 2.0158                     | <26         | Pass   |
|                  | 2440          | 2.0481                     |             |        |
|                  | 2480          | 2.0587                     |             |        |

1M:

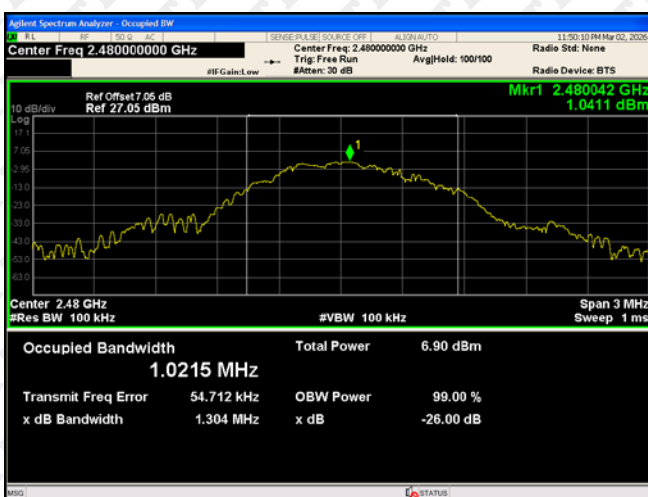
### Normal Voltage: 99% Bandwidth



2402MHz



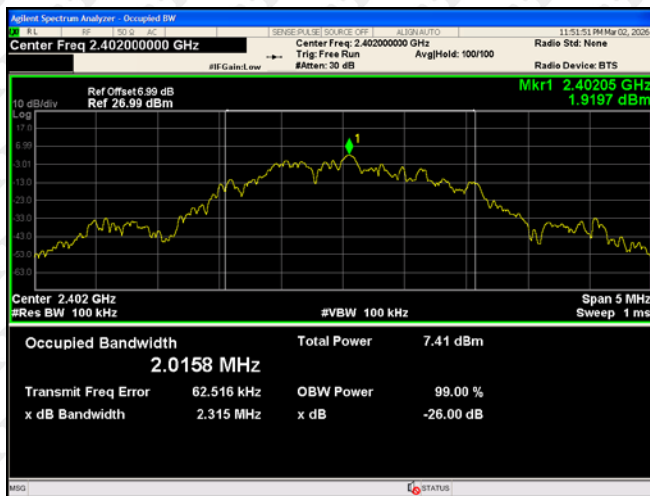
2440MHz



2480MHz

2M:

### Normal Voltage: 99% Bandwidth



2402MHz



2440MHz



2480MHz

1M:

| Test voltage (V) | Channel (MHz) | Spread 90% Bandwidth(MHz) | Spread Factor | Spread Bandwidth Limit (MHz) | Spread Factor Limit | Result |
|------------------|---------------|---------------------------|---------------|------------------------------|---------------------|--------|
| Normal Voltage   | 2402          | 0.6377                    | N/A           | >0.5                         | N/A                 | Pass   |
|                  | 2440          | 0.6529                    |               |                              |                     |        |
|                  | 2480          | 0.6111                    |               |                              |                     |        |

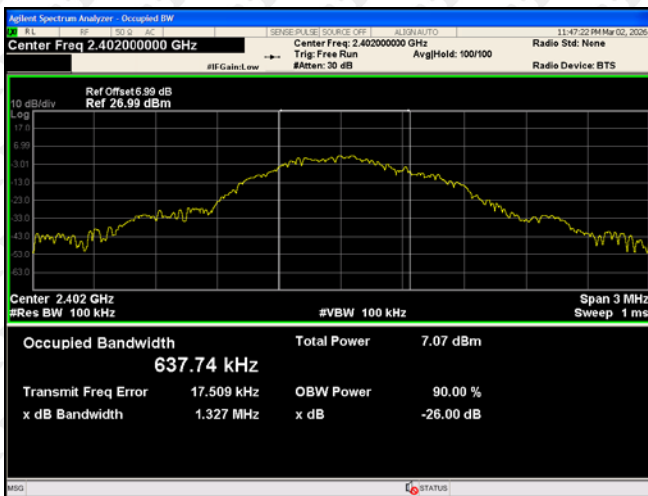
2M:

| Test voltage (V) | Channel (MHz) | Spread 90% Bandwidth(MHz) | Spread Factor | Spread Bandwidth Limit (MHz) | Spread Factor Limit | Result |
|------------------|---------------|---------------------------|---------------|------------------------------|---------------------|--------|
| Normal Voltage   | 2402          | 1.2380                    | N/A           | >0.5                         | N/A                 | Pass   |
|                  | 2440          | 1.1928                    |               |                              |                     |        |
|                  | 2480          | 1.1971                    |               |                              |                     |        |

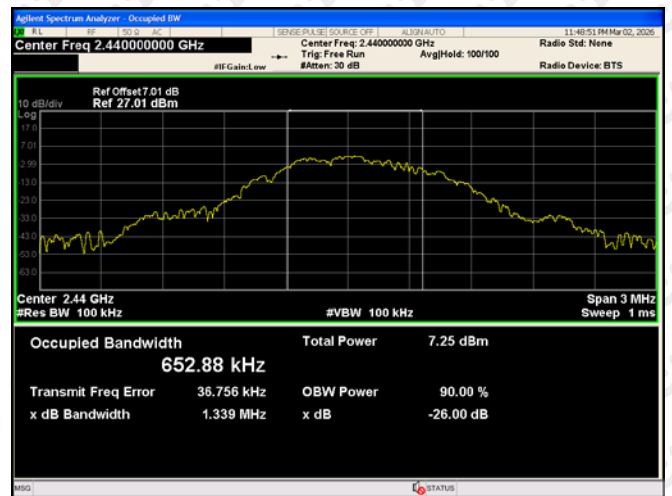
Note: N/A means not applicable to this modulation type.

1M:

### Normal Voltage: 90% Bandwidth



2402MHz



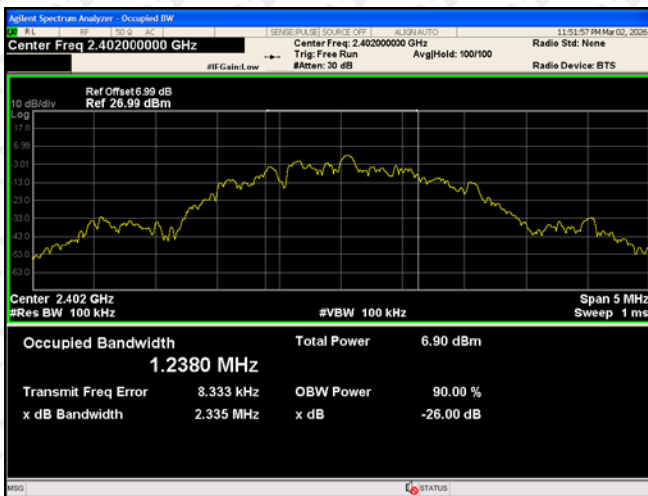
2440MHz



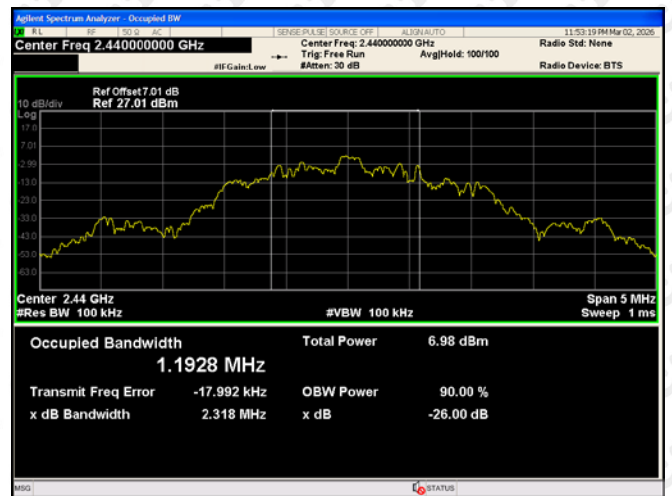
2480MHz

2M:

### Normal Voltage: 90% Bandwidth



2402MHz



2440MHz



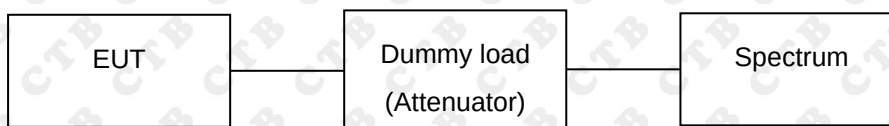
2480MHz

### 3.4 Unwanted emission strength

#### 3.4.1 Limit

| Item                 | Limits                                                                     |
|----------------------|----------------------------------------------------------------------------|
| TX Spurious Emission | $\leq 2.5 \mu\text{W/MHz}$ ( $30\text{MHz} \leq f \leq 1000\text{MHz}$ )   |
|                      | $\leq 2.5 \mu\text{W/MHz}$ ( $1000\text{MHz} < f \leq 2387\text{MHz}$ )    |
|                      | $\leq 25 \mu\text{W/MHz}$ ( $2387\text{MHz} < f \leq 2400\text{MHz}$ )     |
|                      | $\leq 25 \mu\text{W/MHz}$ ( $2483.5\text{MHz} \leq f < 2496.5\text{MHz}$ ) |
|                      | $\leq 2.5 \mu\text{W/MHz}$ ( $2496.5\text{MHz} \leq f < 12500\text{MHz}$ ) |

#### 3.4.2 Test configuration



#### 3.4.3 Test procedure

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

EUT Condition: modulation

Spectrum Condition:

Frequency: 30MHz-12.5GHz

RBW: 100 kHz (30MHz-1GHz), 1MHz (1GHz-12.5GHz)

VBW: 100 kHz (30MHz-1GHz), 1MHz (1GHz-12.5GHz)

Sweep time: Auto

Detector mode: Positive peak

Indication mode: max hold

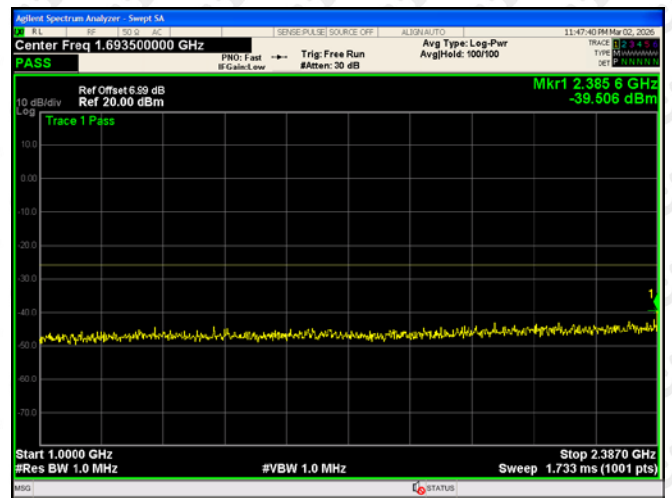
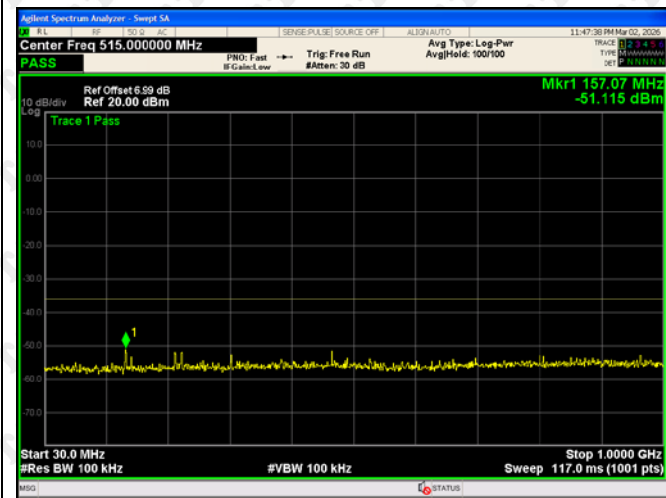
## 3.4.4 Test results

| Test mode | Test Channel | Test freq. range        | Emission Frequency (MHz) | Test result (dBm/MHz) | Test result (uW/MHz) | limits (uW/MHz) | Result |
|-----------|--------------|-------------------------|--------------------------|-----------------------|----------------------|-----------------|--------|
| 1M        | Low          | 30MHz≤f≤1000MHz         | 157.07                   | -51.12                | 0.077                | 2.5             | PASS   |
|           |              | 1000MHz < f≤2387MHz     | 2385.61                  | -39.51                | 0.112                | 2.5             | PASS   |
|           |              | 2387MHz < f≤2400MHz     | 2399.87                  | -32.56                | 0.555                | 25              | PASS   |
|           |              | 2483.5MHz≤f < 2496.5MHz | 2495.3                   | -42.15                | 0.061                | 25              | PASS   |
|           |              | 2496.5MHz≤f < 12750MHz  | 4803.54                  | -36.09                | 0.246                | 2.5             | PASS   |
|           | Middle       | 30MHz≤f≤1000MHz         | 480.08                   | -49.85                | 0.010                | 2.5             | PASS   |
|           |              | 1000MHz < f≤2387MHz     | 2234.43                  | -42.33                | 0.058                | 2.5             | PASS   |
|           |              | 2387MHz < f≤2400MHz     | 2391.99                  | -41.65                | 0.068                | 25              | PASS   |
|           |              | 2483.5MHz≤f < 2496.5MHz | 2494.42                  | -42.42                | 0.057                | 25              | PASS   |
|           |              | 2496.5MHz≤f < 12750MHz  | 4885.57                  | -35.62                | 0.274                | 2.5             | PASS   |
|           | High         | 30MHz≤f≤1000MHz         | 157.07                   | -48.93                | 0.013                | 2.5             | PASS   |
|           |              | 1000MHz < f≤2387MHz     | 2047.19                  | -42.44                | 0.057                | 2.5             | PASS   |
|           |              | 2387MHz < f≤2400MHz     | 2392.45                  | -42.54                | 0.056                | 25              | PASS   |
|           |              | 2483.5MHz≤f < 2496.5MHz | 2488.18                  | -35.45                | 0.285                | 25              | PASS   |
|           |              | 2496.5MHz≤f < 12750MHz  | 3398.81                  | -32.21                | 0.601                | 2.5             | PASS   |

| Test mode | Test Channel | Test freq. range        | Emission Frequency (MHz) | Test result (dBm/MHz) | Test result (uW/MHz) | limits (uW/MHz) | Result |
|-----------|--------------|-------------------------|--------------------------|-----------------------|----------------------|-----------------|--------|
| 2M        | Low          | 30MHz≤f≤1000MHz         | 322.94                   | -50.38                | 0.092                | 2.5             | PASS   |
|           |              | 1000MHz < f≤2387MHz     | 2337.07                  | -42.3                 | 0.059                | 2.5             | PASS   |
|           |              | 2387MHz < f≤2400MHz     | 2400                     | -22.31                | 5.875                | 25              | PASS   |
|           |              | 2483.5MHz≤f < 2496.5MHz | 2484.98                  | -43.1                 | 0.049                | 25              | PASS   |
|           |              | 2496.5MHz≤f < 12750MHz  | 5757.11                  | -34.09                | 0.390                | 2.5             | PASS   |
|           | Middle       | 30MHz≤f≤1000MHz         | 245.34                   | -49.5                 | 0.011                | 2.5             | PASS   |
|           |              | 1000MHz < f≤2387MHz     | 2377.29                  | -42.96                | 0.051                | 2.5             | PASS   |
|           |              | 2387MHz < f≤2400MHz     | 2392.38                  | -42.04                | 0.063                | 25              | PASS   |
|           |              | 2483.5MHz≤f < 2496.5MHz | 2491.52                  | -42.63                | 0.055                | 25              | PASS   |
|           |              | 2496.5MHz≤f < 12750MHz  | 4885.57                  | -35.53                | 0.280                | 2.5             | PASS   |
|           | High         | 30MHz≤f≤1000MHz         | 157.07                   | -48.72                | 0.013                | 2.5             | PASS   |
|           |              | 1000MHz < f≤2387MHz     | 2353.71                  | -42.89                | 0.051                | 2.5             | PASS   |
|           |              | 2387MHz < f≤2400MHz     | 2396.87                  | -42.85                | 0.052                | 25              | PASS   |
|           |              | 2483.5MHz≤f < 2496.5MHz | 2487.7                   | -35.59                | 0.276                | 25              | PASS   |
|           |              | 2496.5MHz≤f < 12750MHz  | 4957.34                  | -35.24                | 0.299                | 2.5             | PASS   |

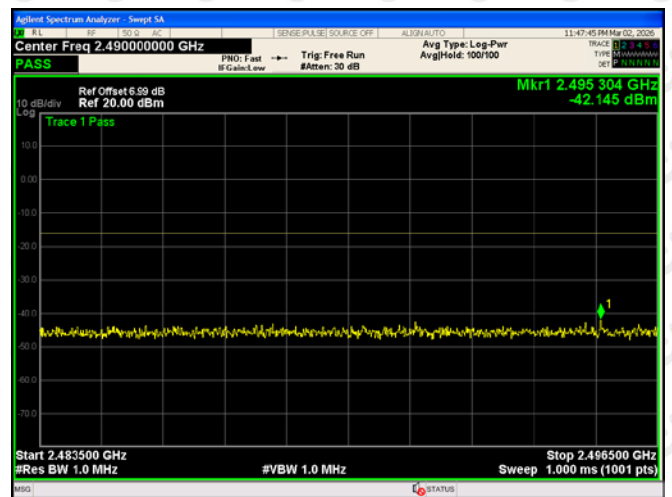
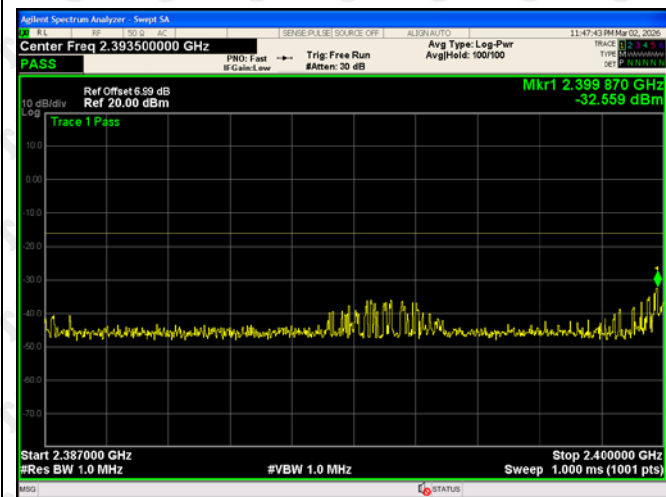
1M:

Test channel: 2402MHz



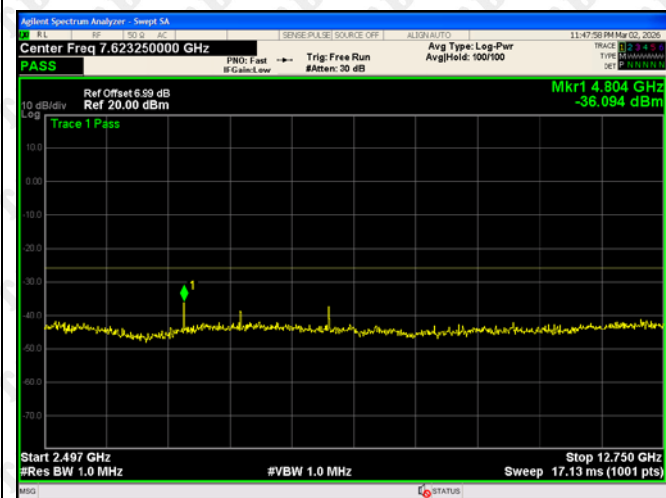
30MHz~1GHz

1GHz~2.387GHz



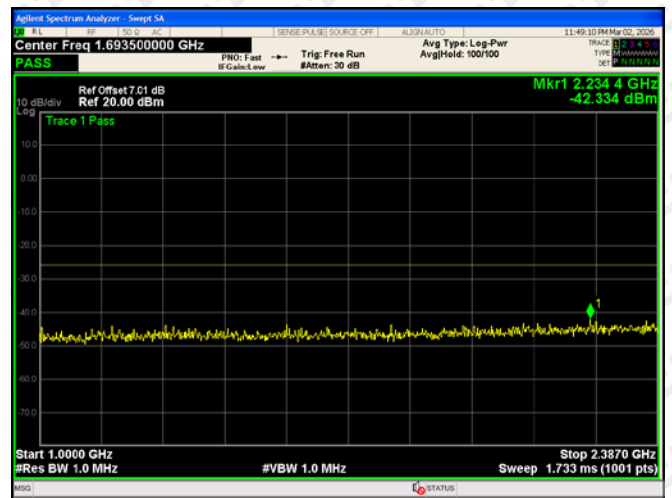
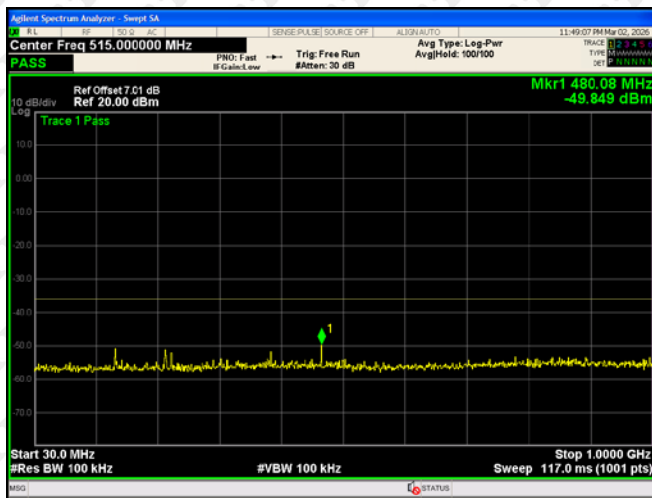
2.387GHz~2.4 GHz

2.4835GHz~2.4965GHz



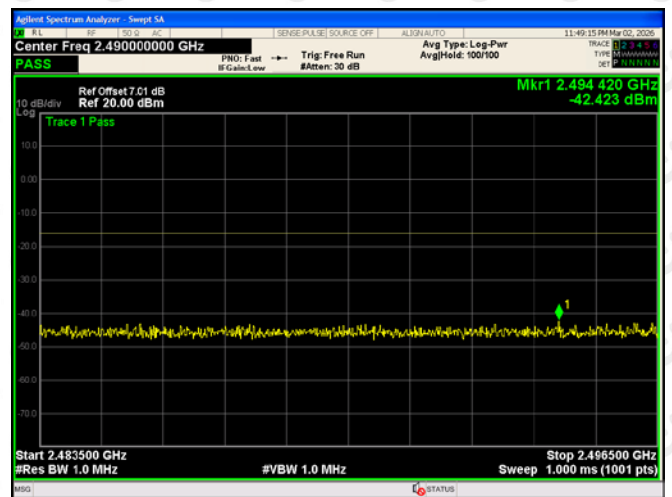
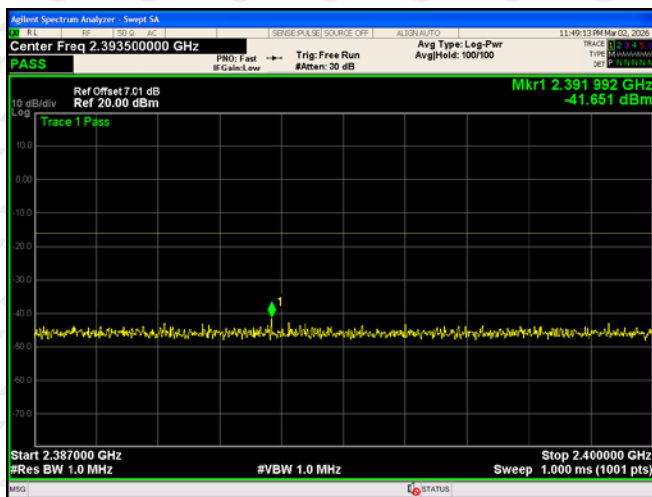
2.4965GHz~12.5GHz

Test channel: 2440MHz



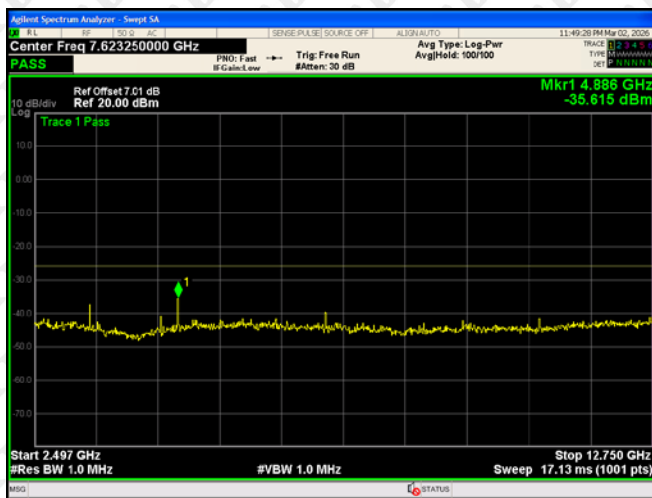
30MHz~1GHz

1GHz~2.387GHz



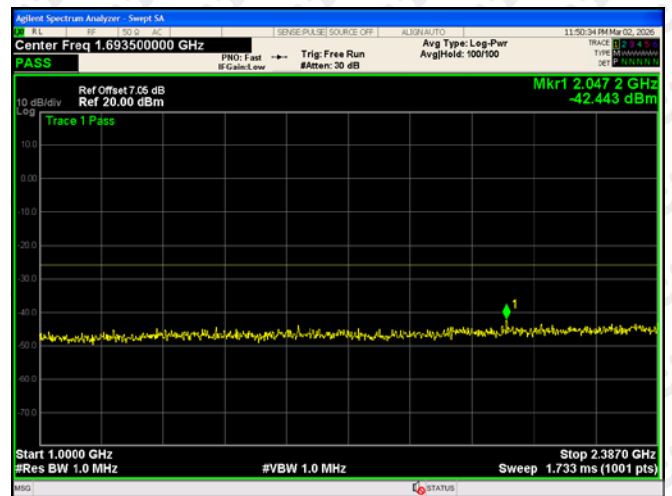
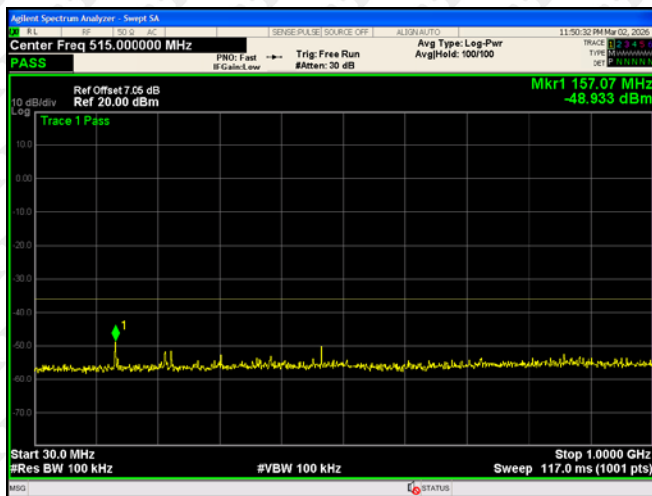
2.387GHz~2.4 GHz

2.4835GHz~2.4965GHz



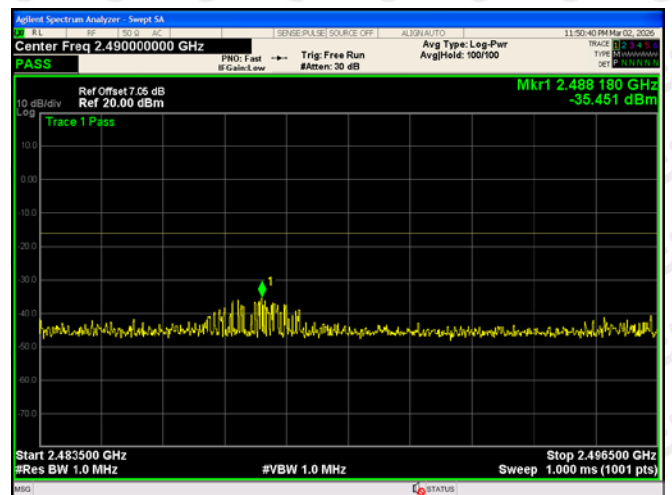
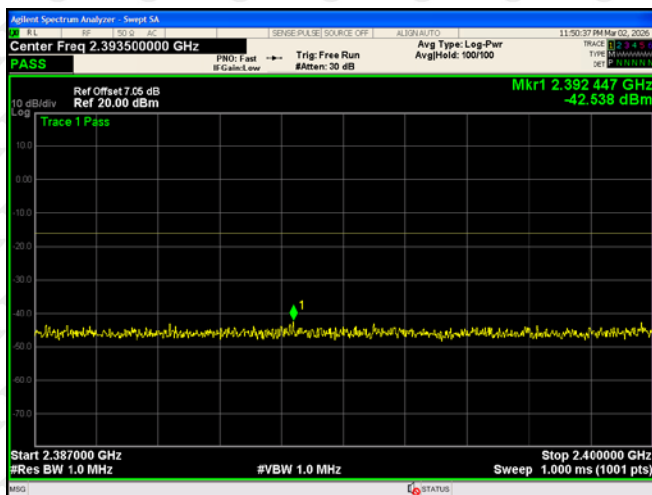
2.4965GHz~12.5GHz

Test channel: 2480MHz



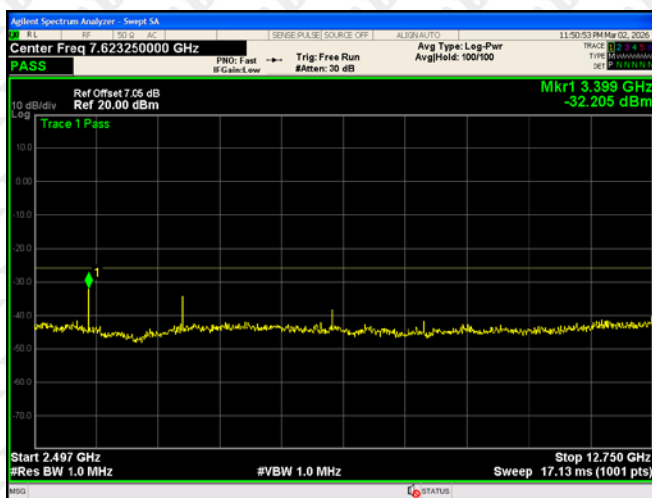
30MHz~1GHz

1GHz~2.387GHz



2.387GHz~2.4 GHz

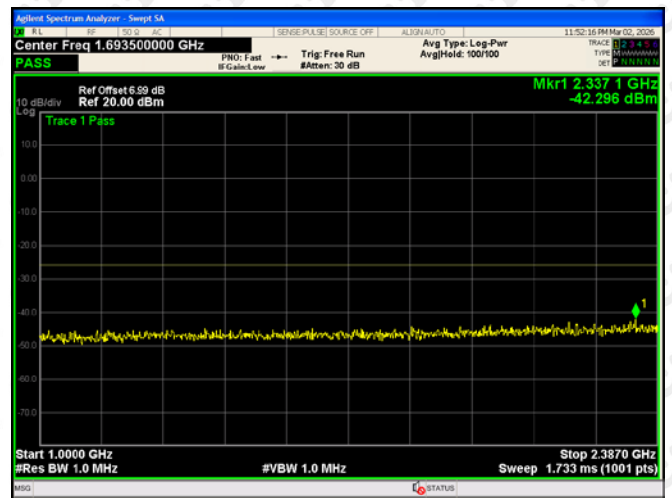
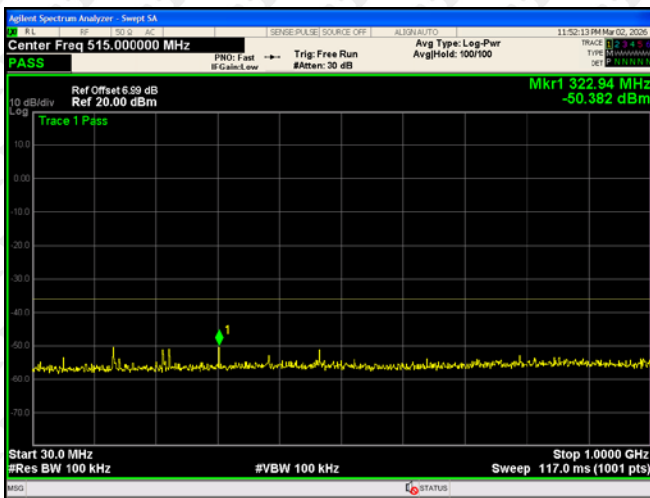
2.4835GHz~2.4965GHz



2.4965GHz~12.5GHz

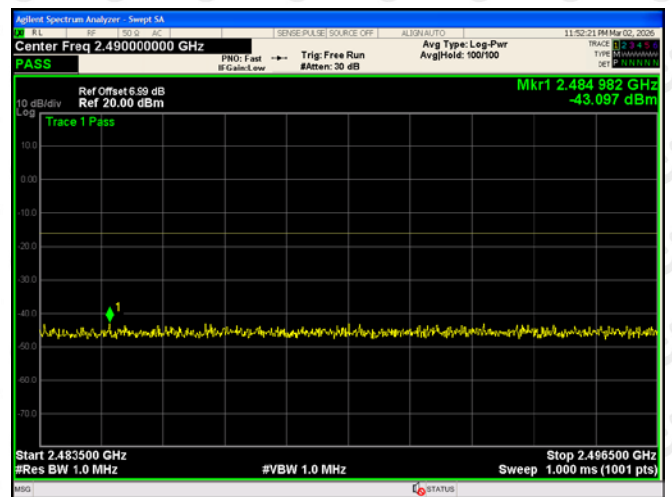
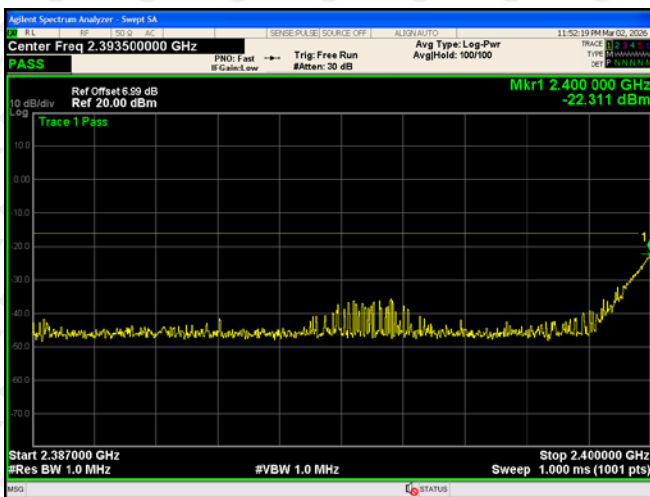
2M:

Test channel: 2402MHz



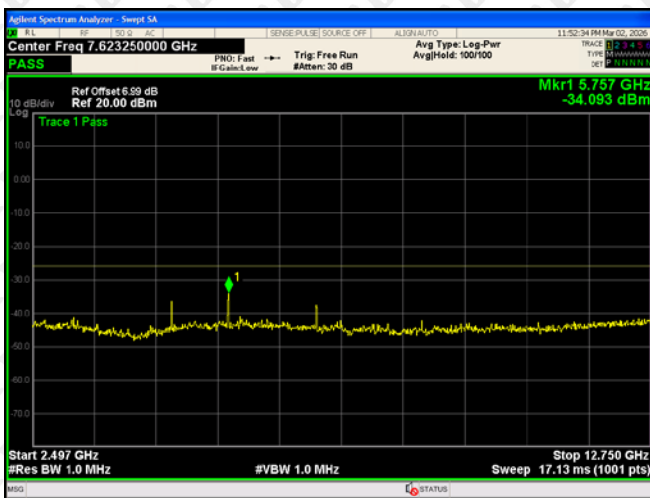
30MHz~1GHz

1GHz~2.387GHz



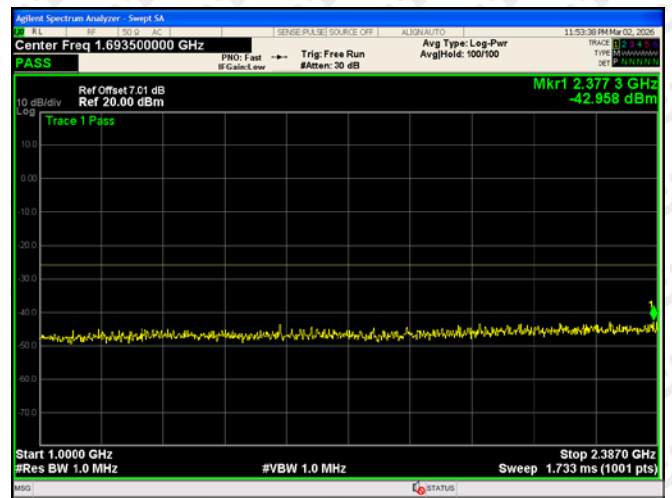
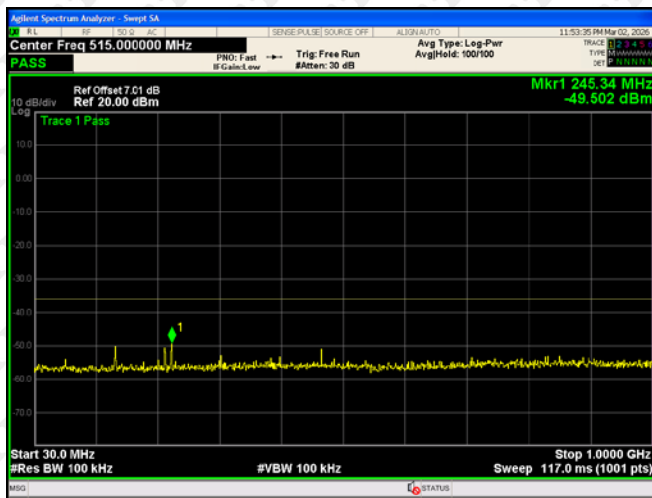
2.387GHz~2.4 GHz

2.4835GHz~2.4965GHz



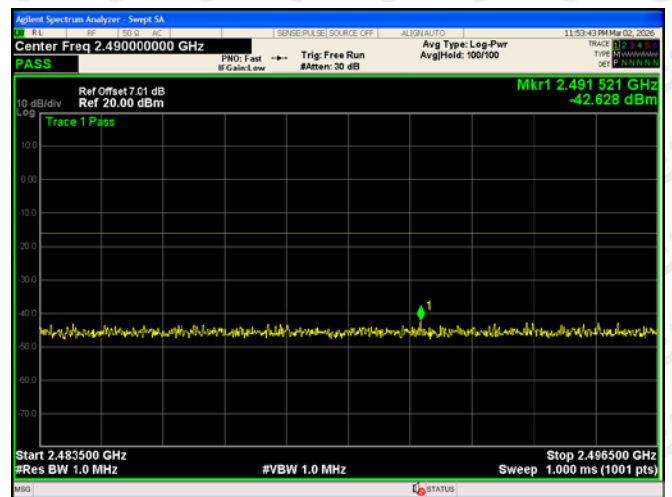
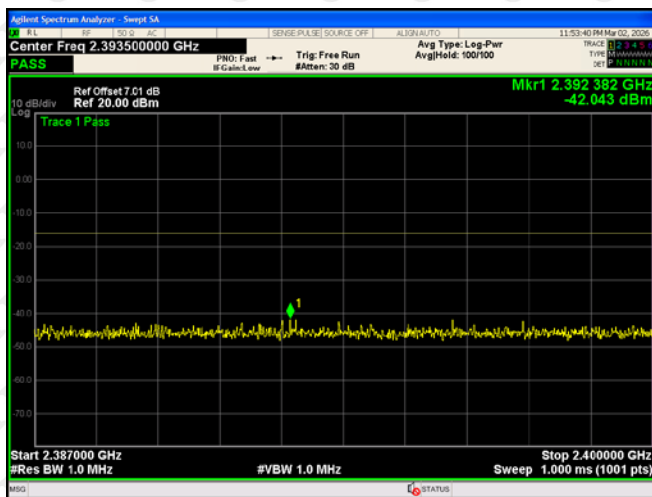
2.4965GHz~12.5GHz

Test channel: 2440MHz



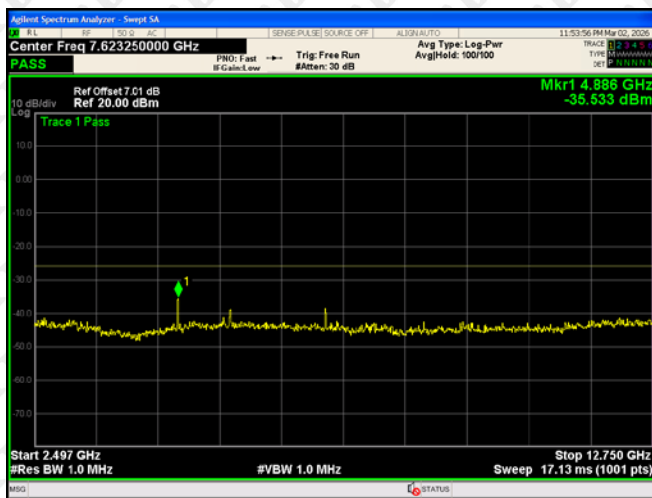
30MHz~1GHz

1GHz~2.387GHz



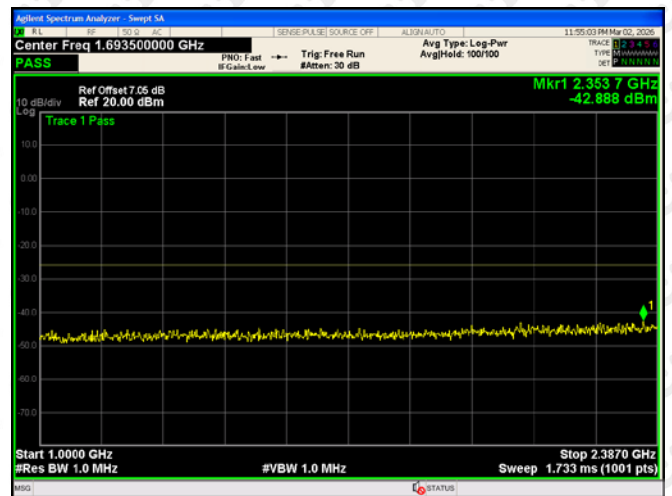
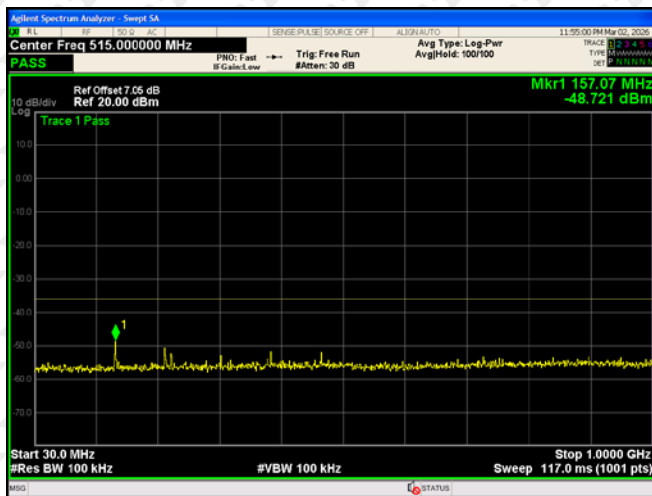
2.387GHz~2.4 GHz

2.4835GHz~2.4965GHz



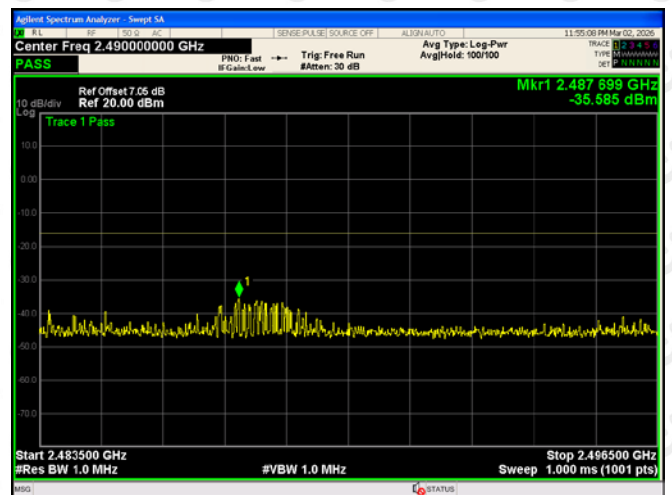
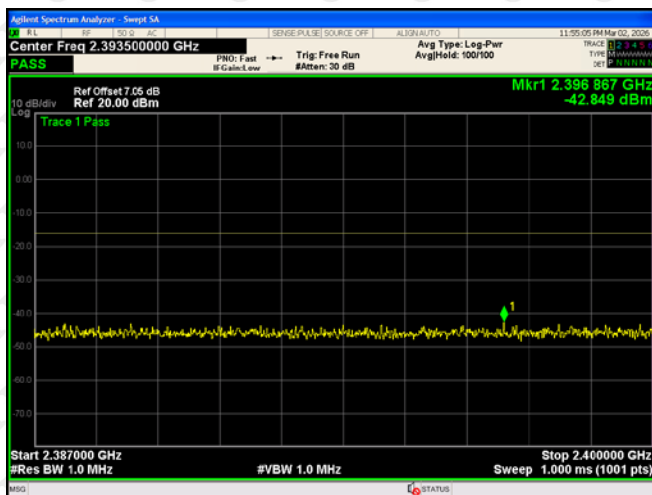
2.4965GHz~12.5GHz

Test channel: 2480MHz



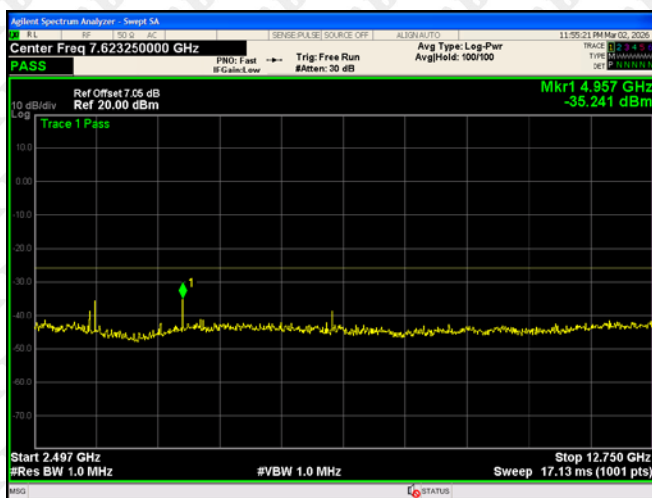
30MHz~1GHz

1GHz~2.387GHz



2.387GHz~2.4 GHz

2.4835GHz~2.4965GHz



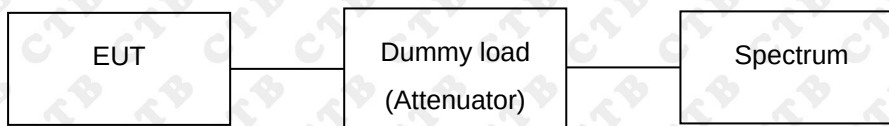
2.4965GHz~12.5GHz

### 3.5 Secondary radiated emission strength

#### 3.5.1 Limit

| Item                  | Limits                                      |
|-----------------------|---------------------------------------------|
| RX Spurious Emission: | $\leq 4\text{nW}$ ( $f < 1\text{GHz}$ )     |
|                       | $\leq 20\text{nW}$ ( $1\text{GHz} \leq f$ ) |

#### 3.5.2 Test configuration



#### 3.5.3 Test procedure

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

EUT Condition: modulation

Spectrum Condition:

Frequency: 30MHz-12.75GHz

RBW: 100 KHz (30MHz-1GHz), 1MHz (1GHz-12.75GHz)

VBW:100 KHz (30MHz-1GHz), 1MHz (1GHz-12.75GHz)

Sweep time: Auto

Detector mode: Positive peak

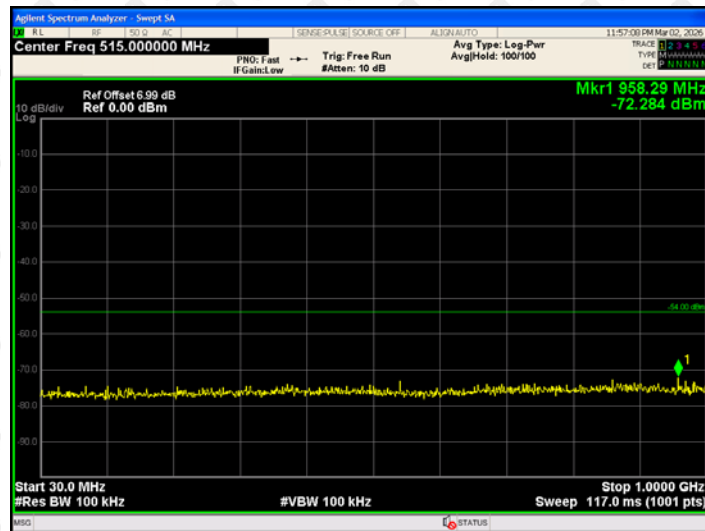
Indication mode: max hold

#### 3.5.4 Test results

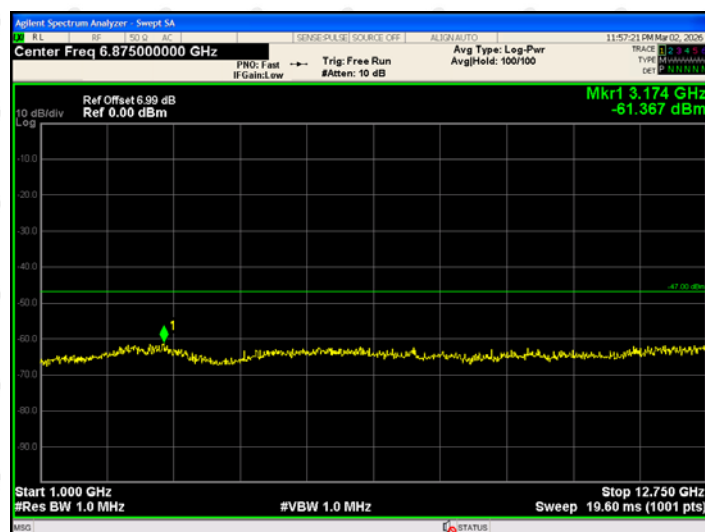
1M:

| Test Channel | Test freq. range                          | Emission Frequency (MHz) | Test result dBm | Test result nW | Limit nW | Result |
|--------------|-------------------------------------------|--------------------------|-----------------|----------------|----------|--------|
| L            | $30\text{MHz} \leq f \leq 1000\text{MHz}$ | 958.29                   | -72.28          | 0.059          | 4        | PASS   |
|              | $1000\text{MHz} < f \leq 12750\text{MHz}$ | 3173.75                  | -61.37          | 0.729          | 20       | PASS   |

30MHz~1GHz

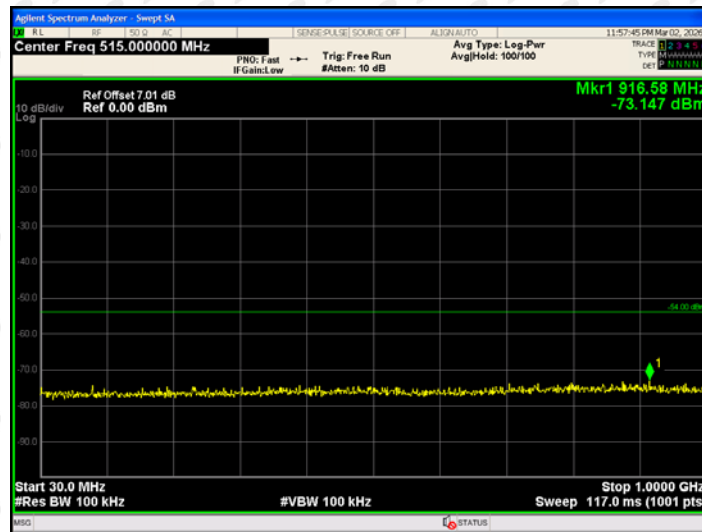


1GHz~12.75GHz

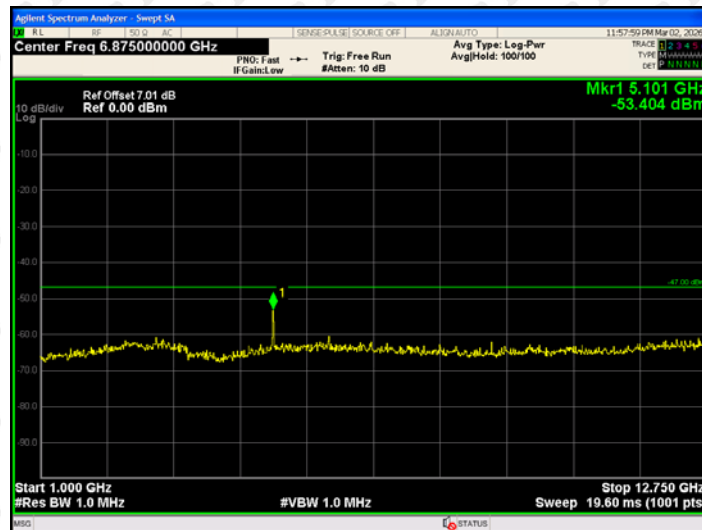


| Test Channel | Test freq. range   | Emission Frequency (MHz) | Test result dBm | Test result nW | Limit nW | Result |
|--------------|--------------------|--------------------------|-----------------|----------------|----------|--------|
| M            | 30MHz≤f≤1000MHz    | 916.58                   | -73.15          | 0.048          | 4        | PASS   |
|              | 1000MHz<f≤12750MHz | 5100.75                  | -53.4           | 4.571          | 20       | PASS   |

30MHz~1GHz

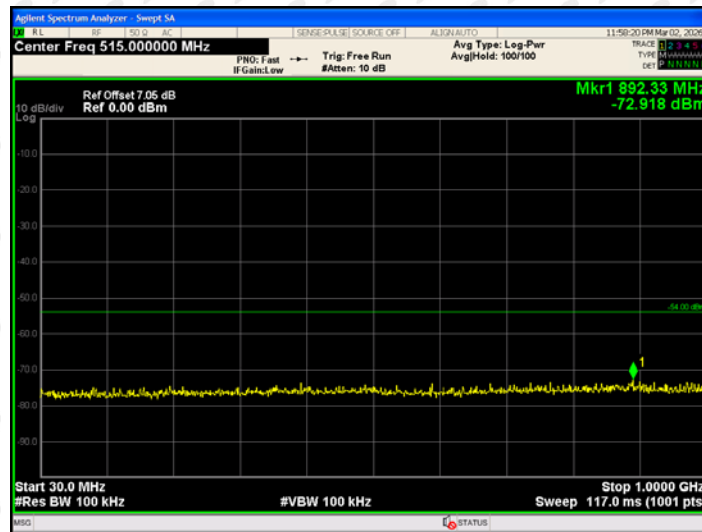


1GHz~12.75GHz



| Test Channel | Test freq. range   | Emission Frequency (MHz) | Test result dBm | Test result nW | Limit nW | Result |
|--------------|--------------------|--------------------------|-----------------|----------------|----------|--------|
| H            | 30MHz≤f≤1000MHz    | 892.33                   | -72.92          | 0.051          | 4        | PASS   |
|              | 1000MHz<f≤12750MHz | 5218.25                  | -59.38          | 1.153          | 20       | PASS   |

30MHz~1GHz



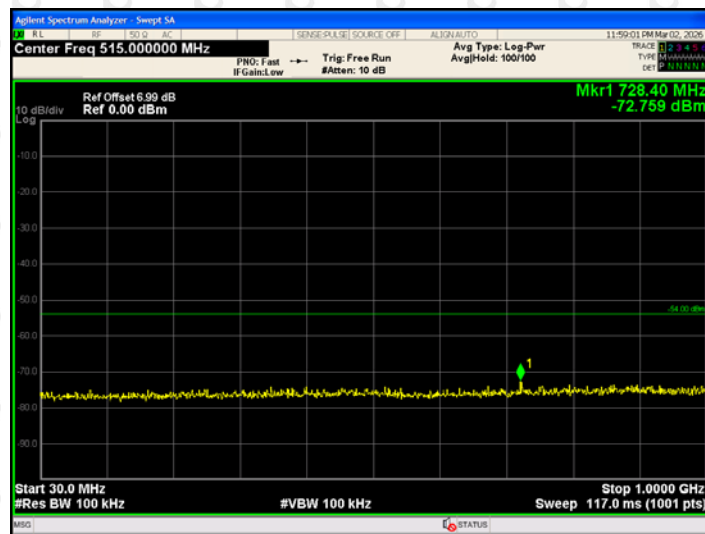
1GHz~12.75GHz



2M:

| Test Channel | Test freq. range   | Emission Frequency (MHz) | Test result dBm | Test result nW | Limit nW | Result |
|--------------|--------------------|--------------------------|-----------------|----------------|----------|--------|
| L            | 30MHz≤f≤1000MHz    | 728.4                    | -72.76          | 0.053          | 4        | PASS   |
|              | 1000MHz<f≤12750MHz | 2574.5                   | -61.06          | 0.783          | 20       | PASS   |

30MHz~1GHz

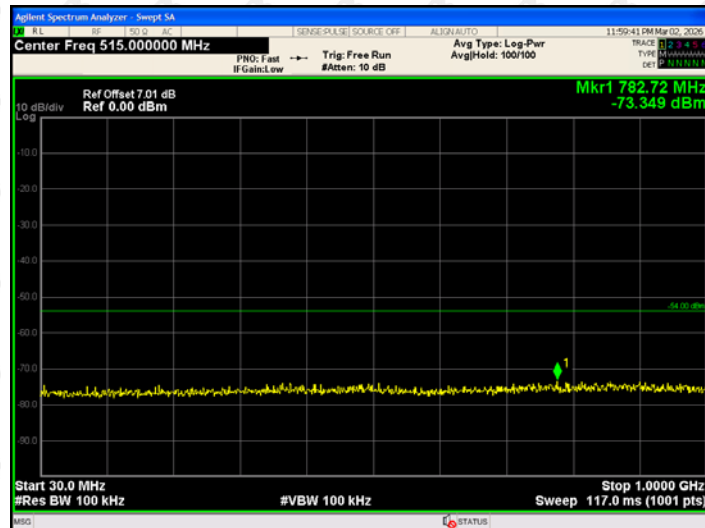


1GHz~12.75GHz

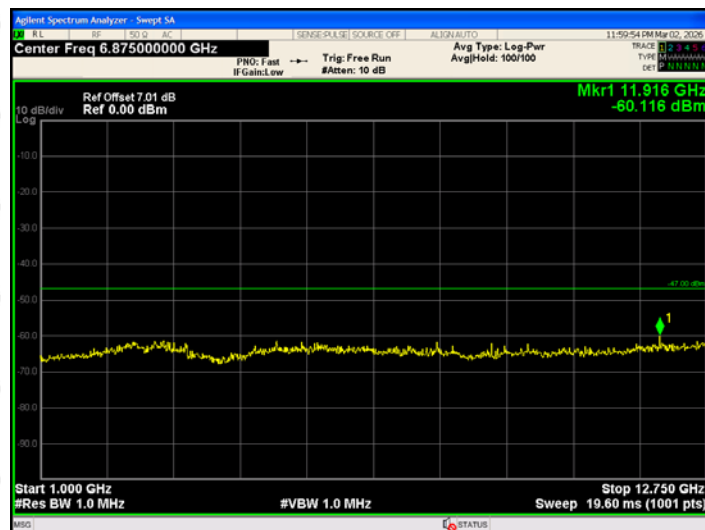


| Test Channel | Test freq. range   | Emission Frequency (MHz) | Test result dBm | Test result nW | Limit nW | Result |
|--------------|--------------------|--------------------------|-----------------|----------------|----------|--------|
| M            | 30MHz≤f≤1000MHz    | 782.72                   | -73.35          | 0.046          | 4        | PASS   |
|              | 1000MHz<f≤12750MHz | 11915.75                 | -60.12          | 0.973          | 20       | PASS   |

### 30MHz~1GHz

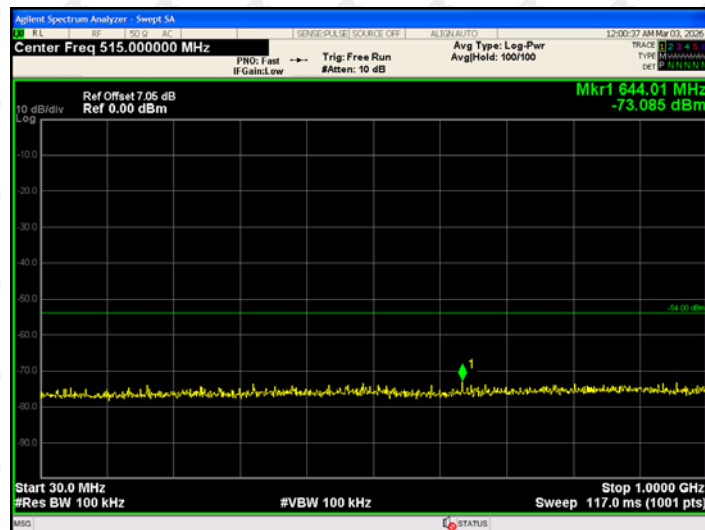


### 1GHz~12.75GHz

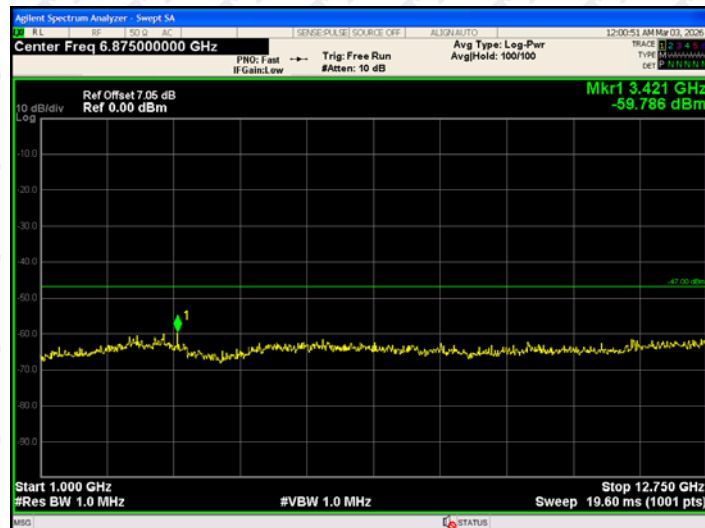


| Test Channel | Test freq. range   | Emission Frequency (MHz) | Test result dBm | Test result nW | Limit nW | Result |
|--------------|--------------------|--------------------------|-----------------|----------------|----------|--------|
| H            | 30MHz≤f≤1000MHz    | 644.01                   | -73.08          | 0.049          | 4        | PASS   |
|              | 1000MHz<f≤12750MHz | 3420.5                   | -59.79          | 1.050          | 20       | PASS   |

### 30MHz~1GHz



### 1GHz~12.75GHz



### 3.6 Transmission Antenna Gain (EIRP Antenna Power) Measurement

#### 3.6.1 Limit

| Ltem                                                                              | Limits                                                                                                             |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| EIRP Power Density                                                                | $\leq 12.14 \text{ dBm/MHz}$ (OFDM.DS from 2400-2483.5MHz)<br>$\leq 12.14 \text{ dBm}$ (Other from 2400-2483.5MHz) |
| Remark: This test item will not be applied to Antenna gain is lower than 2.14dBi. |                                                                                                                    |

#### 3.6.2 Test Procedure

1. Set EUT ad measuring antenna at the same height and roughly facing aech other.
2. Move the measuring antenna height up and down within  $\pm 50 \text{ cm}$  of EUT height and swing it to find the maximum output of the measuring antenna. The output level at the spectrum analyzer is read sa "E".
3. Remove the EUT from the turn table and put the replacing antenna facing to measuring antenna at same height. Set the standard signal generator (SSG) at same frequency and transmit on then receive the signal.
4. Swing the replacing antenna give a maximum receiving level.
5. Move the measuring antenna height up and down within  $\pm 50 \text{ cm}$  of replacing antenna height and swing it to find the maximum receiving level.
6. Set SSG output power at Pt to give the equivalent output level of "E" or caluate Pt with SSG output which gives the nearest of "E" and difference ( $\pm 1 \text{ dB}$ ).Record the Pt.
7. Calculate EIRP by the formula below  $\text{EIRP} = G_t - L + P_t$   
 $G_t$ : gain of replacing antenna (dBi)  
 $L$ : feeder loss between SSG and replacing antenna  
 $P_t$ : Output power of the SSG
8. If the antenna for the EUT has circular polarization. Sum of V-field and H-field will be result if measuring antenna is linear polarization.

#### 3.6.3 Test results

1M:

| Test voltage   | Test modulation | Output power (dBm/MHz) | Gain (dBi) | EIRP (dBm/MHz) | Result |
|----------------|-----------------|------------------------|------------|----------------|--------|
| Normal Voltage | GFSK            | 2.13                   | 2.41       | 5.07           | Pass   |
|                |                 | 1.943                  | 2.41       | 4.883          |        |
|                |                 | 1.549                  | 2.41       | 4.489          |        |

2M:

| Test voltage   | Test modulation | Output power<br>(dBm/MHz) | Gain<br>(dBi) | EIRP<br>(dBm/MHz) | Result |
|----------------|-----------------|---------------------------|---------------|-------------------|--------|
| Normal Voltage | GFSK            | 2.141                     | 2.41          | 4.54              | Pass   |
|                |                 | 1.973                     | 2.41          | 4.353             |        |
|                |                 | 1.541                     | 2.41          | 3.959             |        |

### 3.7 Construction protection method

#### 3.7.1 Requirement

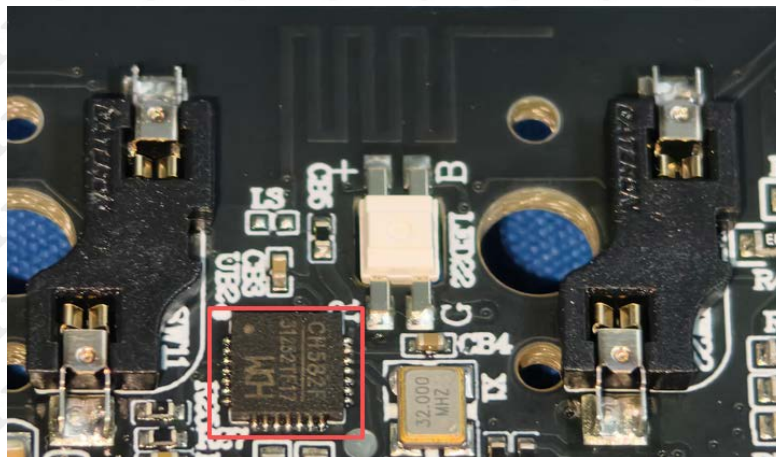
The high-frequency section and modulation section of the radio equipment except for the antenna system shall not be capable of being opened easily

#### 3.7.2 Confirmation method

|                                     |                                                                                                                                                                    |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/>            | Sealed with special screws.                                                                                                                                        |
| <input type="checkbox"/>            | Plastic chassis is being welded using ultrasonic wavs.                                                                                                             |
| <input type="checkbox"/>            | Chassis is glued using a special adhesive.                                                                                                                         |
| <input type="checkbox"/>            | Metal covers are spot-fused.                                                                                                                                       |
| <input type="checkbox"/>            | Cover is specially interlocked.                                                                                                                                    |
| <input type="checkbox"/>            | RF and Modulation components are covered with shielding case and this shielding case is soldered.                                                                  |
| <input type="checkbox"/>            | Shield case is welded ant RF and modulations parts, and ID-ROM is welded using BGA Method.                                                                         |
| <input type="checkbox"/>            | Shield case is welded ant RF and modulations parts, and ID-ROM is glued at its lead with a special adhesive.                                                       |
| <input type="checkbox"/>            | Shield case is welded ant RF and modulations parts, and ID-ROM is glued with a non-transparent laminating agent.                                                   |
| <input checked="" type="checkbox"/> | Other: All RF and modulation section packet in one IC, and IC is welded using BGA Method, and RF module is welded on the main board,end-User can't open it easily. |

#### 3.7.3 The photos of construction protection

The red circle is welding point.



### 3.8 Interference prevention function

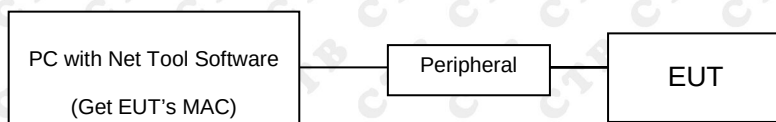
#### 3.8.1 Limit

| Item                | Limits         |
|---------------------|----------------|
| Identification code | $\geq 48$ bits |

#### 3.8.2 Measuring ID code software

| Item        | Limits   |
|-------------|----------|
| MAC IP List | MAC Scan |

#### 3.8.3 Test setup



#### 3.8.4 Test procedure

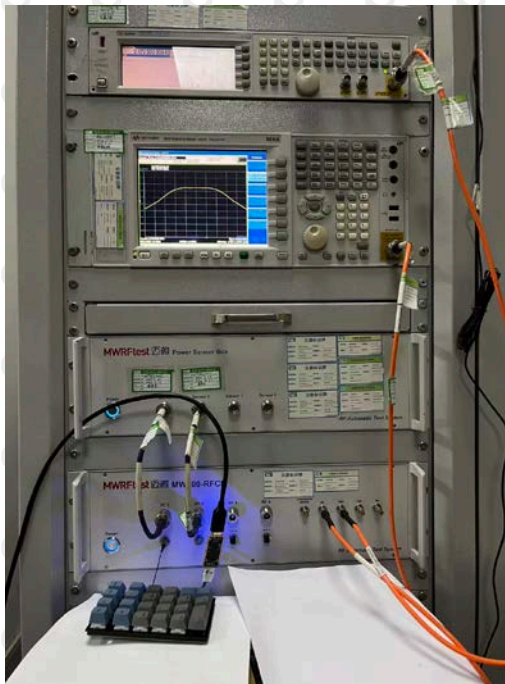
1. In the case that the EUT has the function of automatically transmitting the identification code:
  - a. Transmit the predetermined identification codes form EUT.
  - b. Check the transmitted identification codes with the demodulator.
2. In the case of receiving the identification code:
  - a. Transmit the predetermined identification codes form the counterpart.
  - b. Check if communication is normal.
  - c. Transmit the signals other than predetermined ID codes form the counterpart.
  - d. check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

#### 3.8.5 Test result

PASS

Bluetooth Device Address: 2222C88A0249

#### 4 TEST SETUP PHOTOS OF EUT



\*\*\*\*\* END OF REPORT \*\*\*\*\*