

# **TEST REPORT**

**Applicant:** Quectel Wireless Solutions Co., Ltd.

**EUT Description:** LTE Module with Wi-Fi & Bluetooth

**Model:** SC200U-NA

**Brand:** QUECTEL

**FCC ID:** XMR2025SC200UNA

**Standards:** FCC 47 CFR Part 15 Subpart C

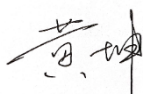
**Date of Receipt:** 2025/01/13

**Date of Test:** 2025/01/13 to 2025/02/26

**Date of Issue:** 2025/02/27

TOWE. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

the results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of the model are manufactured with identical electrical and mechanical components. All sample tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise. without written approval of TOWE, the test report shall not be reproduced except in full.



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**Huang Kun**  
**Approved By:**



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**Chen Chengfu**  
**Reviewed By:**

## Revision History

| Rev. | Issue Date | Description | Revised by   |
|------|------------|-------------|--------------|
| 01   | 2025/02/27 | Original    | Chen Chengfu |

## Summary of Test Results

| Clause | FCC Part           | Test Items                                | Result                  |
|--------|--------------------|---|-------------------------|
| 4.1    | §15.203/15.247(b)  | Antenna Requirement                       | PASS                    |
| 4.2    | §15.207            | AC Power Line Conducted Emission          | N/A                     |
| 4.3    | §15.247 (b)(3)     | Output Power                              | PASS                    |
| 4.4    | §15.247 (a)(2)     | Occupied Bandwidth                        | Reporting purposes only |
| 4.5    | §15.247 (e)        | Power Spectral Density                    | PASS                    |
| 4.6    | §15.247(d)         | Band Edge for Conducted Emissions         | PASS                    |
| 4.7    | §15.247(d)         | Spurious RF Conducted Emissions           | PASS                    |
| 4.8    | §15.205<br>§15.209 | Radiated Spurious emissions and Band Edge | PASS                    |

Test Method: ANSI C63.10:2020, KDB 558074 D01 15.247 Mesa Guidance v05r02.

Remark:

1. Pass is EUT meets standard requirements.
2. The EUT is DC power supply, "N/A" denotes "not applicable".

## Table of Contents

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>General Description .....</b>                  | <b>5</b>  |
| 1.1      | Lab Information.....                              | 5         |
| 1.1.1    | Testing Location .....                            | 5         |
| 1.1.2    | Test Facility / Accreditations .....              | 5         |
| 1.2      | Client Information .....                          | 5         |
| 1.2.1    | Applicant.....                                    | 5         |
| 1.2.2    | Manufacturer.....                                 | 5         |
| 1.3      | Product Information.....                          | 6         |
| <b>2</b> | <b>Test Configuration .....</b>                   | <b>7</b>  |
| 2.1      | Test Channel .....                                | 7         |
| 2.2      | Worst-case configuration and Mode .....           | 8         |
| 2.3      | Support Unit used in test .....                   | 8         |
| 2.4      | Test Environment.....                             | 8         |
| 2.5      | Test RF Cable.....                                | 8         |
| 2.6      | Modifications.....                                | 8         |
| 2.7      | Test Setup Diagram .....                          | 9         |
| 2.7.1    | Conducted Configuration .....                     | 9         |
| 2.7.2    | Radiated Configuration .....                      | 10        |
| <b>3</b> | <b>Equipment and Measurement Uncertainty.....</b> | <b>11</b> |
| 3.1      | Test Equipment List.....                          | 11        |
| 3.2      | Measurement Uncertainty .....                     | 12        |
| <b>4</b> | <b>Test Results.....</b>                          | <b>13</b> |
| 4.1      | Antenna Requirement.....                          | 13        |
| 4.2      | Output Power .....                                | 14        |
| 4.3      | Occupied Bandwidth .....                          | 15        |
| 4.4      | Power Spectral Density .....                      | 16        |
| 4.5      | Band Edge for Conducted Emissions.....            | 17        |
| 4.6      | Spurious RF Conducted Emissions .....             | 18        |
| 4.7      | Radiated Spurious Emissions and Band Edge .....   | 19        |
| <b>5</b> | <b>Test Setup Photos.....</b>                     | <b>21</b> |
|          | Appendix.....                                     | 22        |

# 1 General Description

## 1.1 Lab Information

### 1.1.1 Testing Location

These measurements tests were conducted at the Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. facility located at F401 and F101, Building E, Hongwei Industrial Zone, Liuxian 3rd Road, Bao'an District, Shenzhen, China. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014  
Tel.: +86-755-27212361  
Contact Email: info@towewireless.com

### 1.1.2 Test Facility / Accreditations

#### A2LA (Certificate Number: 7088.01)

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

#### FCC Designation No.: CN1353

Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized as an accredited testing laboratory. Designation Number: CN1353.

#### ISED CAB identifier: CN0152

Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized by ISED as an accredited testing laboratory.  
CAB identifier: CN0152  
Company Number: 31000

## 1.2 Client Information

### 1.2.1 Applicant

|            |   |
|------------|---|
| Applicant: | Quectel Wireless Solutions Co., Ltd.  |
| Address:   | Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233, China. |

### 1.2.2 Manufacturer

|               |   |
|---------------|---|
| Manufacturer: | Quectel Wireless Solutions Co., Ltd.  |
| Address:      | Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233, China. |

### 1.3 Product Information

|   |   |  |  |
|---|---|--|--|
| EUT Description:  | LTE Module with Wi-Fi & Bluetooth   |  |  |
| Model No.:  | SC200U-NA   |  |  |
| Brand:  | QUECTEL   |  |  |
| Hardware Version:   | R1.0  |  |  |
| Software Version:   | SC200UNANAR01A01  |  |  |
| IMEI:   | RF Conducted  | 866034070337823                          |  |
|   | RSE   | 866034070236643                          |  |
| Bluetooth version:  | Bluetooth V5.0  |  |  |
| Support Mode:   | <input checked="" type="checkbox"/> LE 1M PHY:1Mbps                               | <input type="checkbox"/> LE 2M PHY:2Mbps |  |
| Modulation Type:  | GFSK  |  |  |
| Frequency Range:  | 2400 ~ 2483.5MHz  |  |  |
| Channel Frequency:  | 2402 ~ 2480MHz  |  |  |
| Channel Number:   | 40  |  |  |
| Antenna Type:   | <input checked="" type="checkbox"/> External, <input type="checkbox"/> Integrated |  |  |
| Antenna Gain:   | Ant0 (dBi)  |  |  |
|   | 0.47  |  |  |
| Remark: The above EUT's information was declared by applicant, please refer to the specifications or user's manual for more detailed description. |   |  |  |

## 2 Test Configuration

### 2.1 Test Channel

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

Remark:  
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:

| Test Channel              | Test Frequency |
|---------------------------|----------------|
| The Lowest channel(CH0)   | 2402MHz        |
| The Middle channel(CH19)  | 2440MHz        |
| The Highest channel(CH39) | 2480MHz        |

## 2.2 Worst-case configuration and Mode

|                   |   |
|-------------------|---|
| Modulation Type   | LE 1M PHY   |
| Transmitting mode | Keep the EUT was programmed to be in continuously transmitting mode |
| Normal Link       | Keep the EUT operation to normal function.                          |

## 2.3 Support Unit used in test

| Description       | Manufacturer | Model          | Serial Number   |
|-------------------|--------------|----------------|-----------------|
| Adapter           | JingSai      | CLS-050200     | 3749567924      |
| Development Board | Quectel      | SMART-EVB-G5   | P1Q22EL10000299 |
| Development Board | Quectel      | SC200U-NA-TE-A | E1C24LS22000007 |

Remark: all above the information of table are provided by client.

## 2.4 Test Environment

|              |                        |
|--------------|------------------------|
| Temperature: | Normal: 15°C ~ 35°C    |
| Humidity:    | 45-56 % RH Ambient     |
| Voltage:     | DC 3.8V (Module Input) |

Remark: The testing environment is within the scope of the EUT user manual and meets the requirements of the standard testing environment.

## 2.5 Test RF Cable

**For all conducted test items:** The offset level is set spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

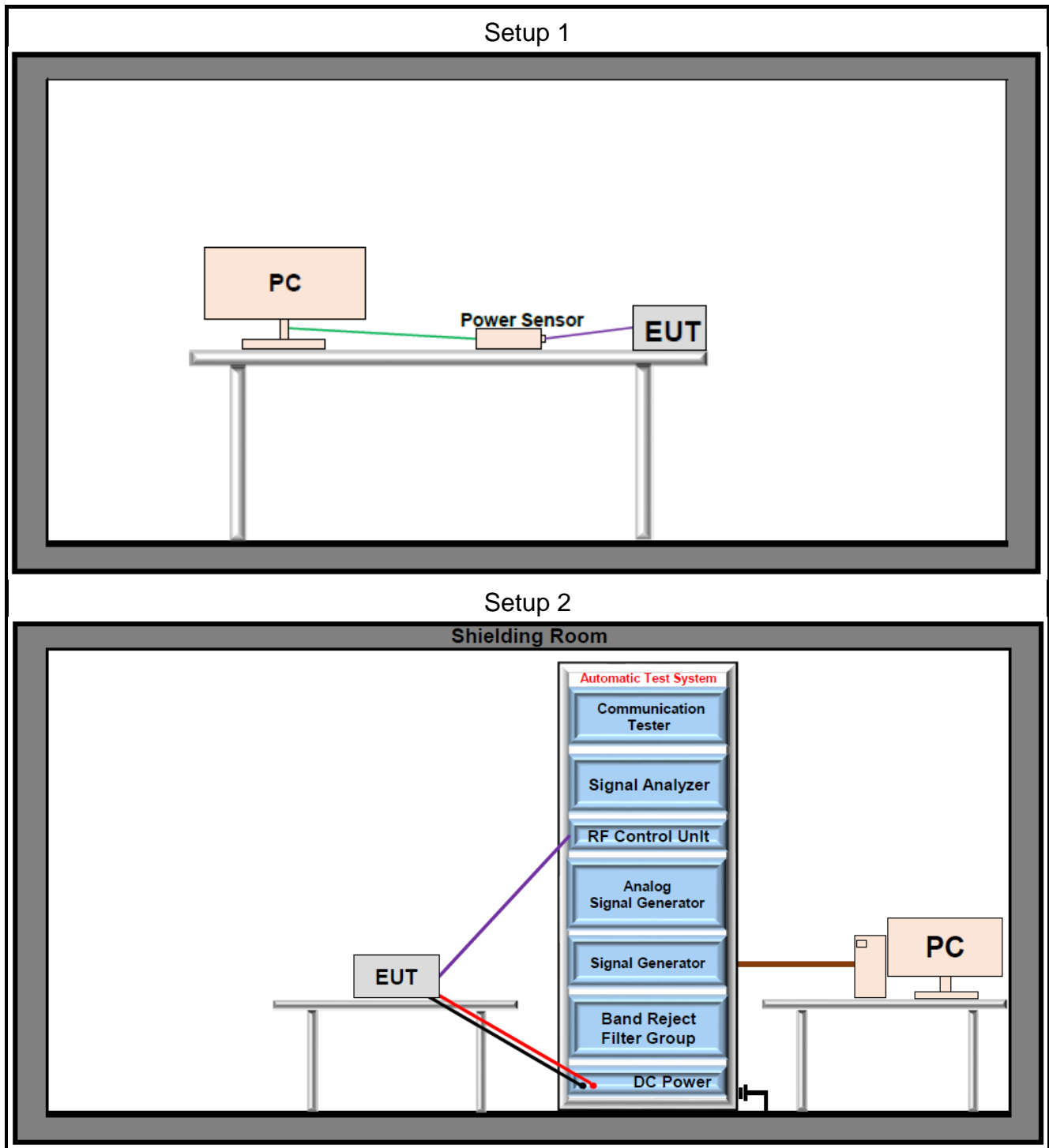
## 2.6 Modifications

No modifications were made during testing.

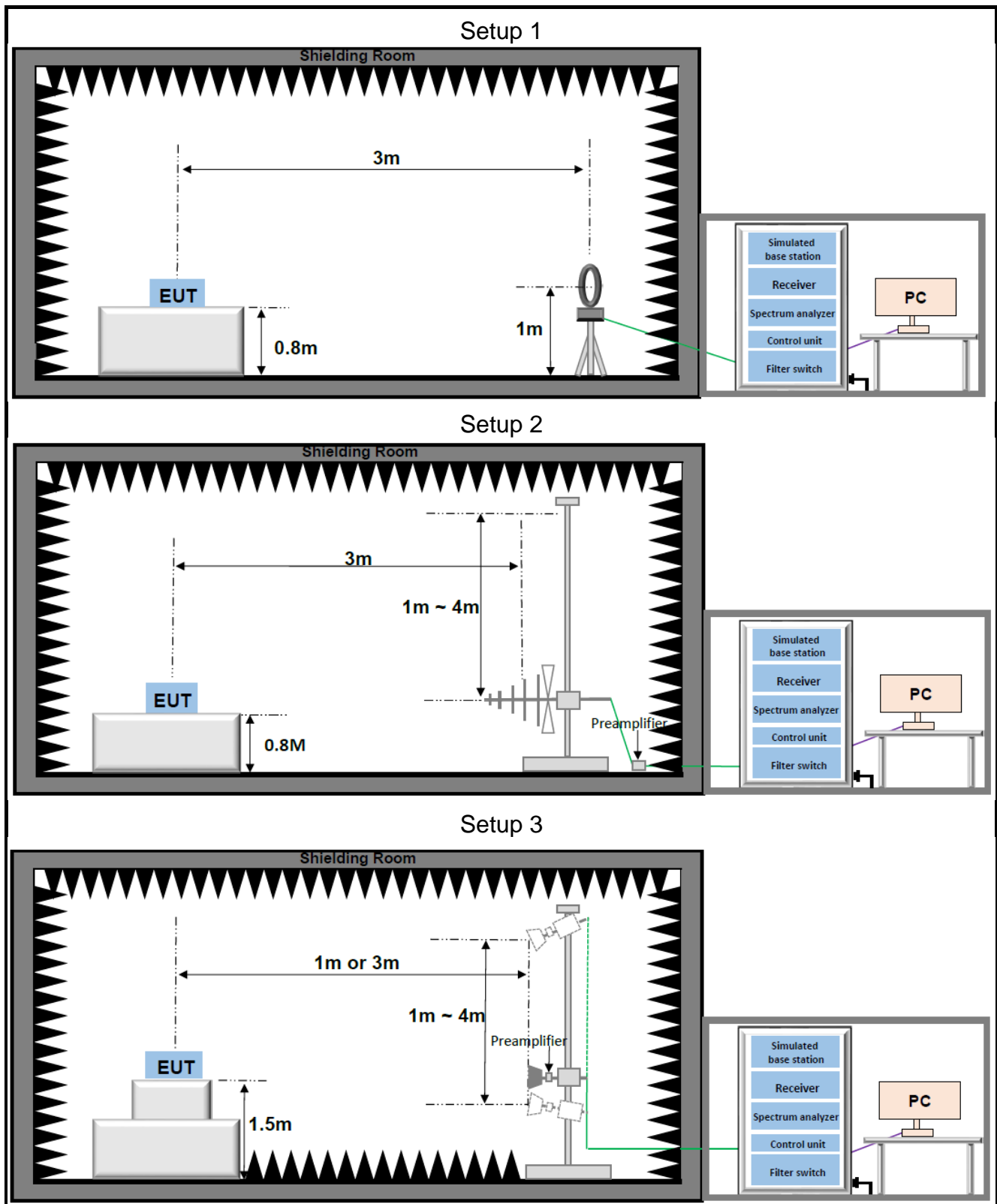


## 2.7 Test Setup Diagram

### 2.7.1 Conducted Configuration



## 2.7.2 Radiated Configuration



### 3 Equipment and Measurement Uncertainty

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, whichever is less, and where applicable is traceable to recognized national standards.

#### 3.1 Test Equipment List

| Description          | Manufacturer | Model    | SN         | Last Due   | Cal Due    |
|----------------------|--------------|----------|------------|------------|------------|
| Signal Analyzer      | Keysight     | N9020A   | US46470429 | 2024/03/25 | 2025/03/24 |
| Power Sensor         | Anritsu      | MA24408A | 12520      | 2024/05/30 | 2025/05/29 |
| Measurement Software | Tonscend     | TS1120-3 | 10659      | N/A        | N/A        |

| Radiated Emission                     |              |             |                |            |            |
|---------------------------------------|--------------|-------------|----------------|------------|------------|
| Description                           | Manufacturer | Model       | SN             | Last Due   | Cal Due    |
| Biconic Logarithmic Periodic Antennas | Schwarzbeck  | VULB9163    | 1643           | 2023/06/25 | 2025/06/24 |
| Double-Ridged Horn Antennas           | Schwarzbeck  | BBHA 9120D  | 2809           | 2023/06/25 | 2025/06/24 |
| Broad-Band Horn Antenna               | Schwarzbeck  | BBHA 9170   | 1290           | 2023/06/25 | 2025/06/24 |
| Loop Antenna                          | Schwarzbeck  | FMZB 1519C  | 1519C-028      | 2023/06/29 | 2025/06/28 |
| Signal Analyzer                       | Keysight     | N9020A      | MY49100252     | 2024/03/25 | 2025/03/24 |
| EXA Signal Analyzer, Multi-touch      | Keysight     | N9010B      | MY63440541     | 2024/05/30 | 2025/05/29 |
| Wideband Radio Communication Tester   | R&S          | CMW500      | 150645         | 2024/03/25 | 2025/03/24 |
| Low Noise Amplifier                   | Tonscend     | TAP9K3G40   | AP23A8060273   | 2023/04/08 | 2025/04/07 |
| Low Noise Amplifier                   | Tonscend     | TAP01018050 | AP22G806258    | 2023/04/08 | 2025/04/07 |
| Low Noise Amplifier                   | Tonscend     | TAP18040048 | AP22G806247    | 2023/04/08 | 2025/04/07 |
| Hygrometer                            | BINGYU       | HTC-1       | N/A            | 2023/06/01 | 2025/05/31 |
| Test Software                         | Tonscend     | TS+         | Version: 5.0.0 | N/A        | N/A        |

### 3.2 Measurement Uncertainty

| Parameter                         | U <sub>lab</sub> |
|-----------------------------------|------------------|
| Frequency Error                   | 679.98Hz         |
| Output Power                      | 0.76dB           |
| Conducted Spurious Emissions      | 2.22dB           |
| Radiated Emissions(9kHz~30MHz)    | 2.40dB           |
| Radiated Emissions(30MHz~1000MHz) | 4.66dB           |
| Radiated Emissions(1GHz~18GHz)    | 5.42dB           |
| Radiated Emissions(18GHz~40GHz)   | 5.46dB           |

Uncertainty figures are valid to a confidence level of 95%

## 4 Test Results

### 4.1 Antenna Requirement

|  |  |
|--|--|
| <b>Standard Applicable:</b>  | 47 CFR Part 15C Section 15.203 /247(b) |
| <p>15.203 requirement: 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>15.247(b) (4) requirement: 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>The antenna gain and type as provided by the manufacturer are as follows:<br/>The antenna Type is Dipole. With maximum gain is 0.47dBi.<br/>Antenna Anti-Replacement Construction: An embedded-in antenna design is used.</p>   |  |

## 4.2 Output Power

### Limits

If With directional antenna gains less than 6 dBi, the limit is 30dBm.

### Test Procedure

ANSI C63.10:2020 Section 11.9.1.2(PKPM1) or 11.9.2.3.2(AVGPM-G)

### Test Settings

1. Set to the maximum power setting and enable the EUT transmit continuously.
2. The power output was measured on the EUT antenna port using RF Cable with attenuator connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.
3. Measure and record the results in the test report.

### Test Setup

Refer to section 2.7.1- Setup 1 for details.

### Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

### Test Result

The detailed test data see: **Appendix**.

## 4.3 Occupied Bandwidth

### Limits

DTSBW: The minimum 6 dB bandwidth shall be at least 500 kHz.

99%BW: None, for reporting purposes only.

### Test Procedure

ANSI C63.10:2020 Section 11.8.2 and 6.9.3

### Test Settings

1. Set to the maximum power setting and enable the EUT transmit continuously.
2. The transmitter output is connected to a spectrum analyzer:
3. RBW = 100kHz(DTS)
4. RBW = 1% - 5%(99%BW)
5. VBW = 3 times the RBW
6. Sweep = Auto
7. Detector = Peak
8. Trace = Max hold
9. The trace was allowed to stabilize
10. Measure and record the results in the test report.

### Test Notes

DTS: The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X= 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.

### Test Setup

Refer to section 2.7.1- Setup 2 for details.

### Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

### Test Result

The detailed test data see: **Appendix**.

## 4.4 Power Spectral Density

### Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### Test Procedure

ANSI C63.10:2020 Section 11.10.2(PKPSD)

### Test Settings

1. Set to the maximum power setting and enable the EUT transmit continuously
2. The transmitter output is connected to a spectrum analyzer
3.  $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$   
(If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.)
4.  $\text{VBW} \geq 3$  times RBW
5. Span = 1.5 times the DTS bandwidth
6. Sweep = Auto
7. Detector = Peak
8. Trace = Max hold
9. The trace was allowed to stabilize
10. Measure and record the results in the test report.

### Test Setup

Refer to section 2.7.1- Setup 2 for details.

### Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

### Test Result

The detailed test data see: **Appendix**.



## 4.5 Band Edge for Conducted Emissions

### Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 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, provided the transmitter demonstrates compliance with the peak conducted power limits.

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph 15.247(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### Test Procedure

ANSI C63.10:2020 Section 11.11.3

### Test Settings

1. Set to the maximum power setting and enable the EUT transmit continuously
2. The transmitter output is connected to a spectrum analyzer
3. RBW = 100kHz
4. VBW = 300kHz
5. Point  $\geq 2 \times \text{span/RBW}$
6. Sweep = Auto
7. Detector = Peak
8. Trace = Max hold
9. The trace was allowed to stabilize
10. Measure and record the results in the test report

### Test Setup

Refer to section 2.7.1- Setup 2 for details.

### Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

### Test Result

The detailed test data see: **Appendix**.

## 4.6 Spurious RF Conducted Emissions

### Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 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, provided the transmitter demonstrates compliance with the peak conducted power limits.

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph 15.247(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### Test Procedure

ANSI C63.10:2020 Section 11.11.3

### Test Settings

1. Set to the maximum power setting and enable the EUT transmit continuously.
2. Activate frequency hopping function if necessary.
3. The transmitter output is connected to a spectrum analyzer
4. The spectrum from 30MHz - 26.5GHz
5. RBW = 100kHz
6. VBW = 300kHz
7. Sweep = Auto
8. Detector = Peak
9. Trace = Max hold
10. The trace was allowed to stabilize
11. Measure and record the results in the test report

### Test Setup

Refer to section 2.7.1- Setup 2 for details.

### Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

### Test Result

The detailed test data see: **Appendix**.

## 4.7 Radiated Spurious Emissions and Band Edge

### Limits

Spurious emissions are permitted in an of the frequency bands:

| MHz               | MHz                 | MHz                   | MHz             | GHz          | GHz           |
|-------------------|---------------------|-----------------------|-----------------|--------------|---------------|
| 0.090 - 0.110     | 12.29 - 12.293      | 149.9 - 150.05        | 1660 - 1710     | 4.5 - 5.15   | 14.47 - 14.5  |
| 0.495 - 0.505     | 12.51975 - 12.52025 | 156.52475 - 156.52525 | 1718.8 - 1722.2 | 5.35 - 5.46  | 15.35 - 16.2  |
| 2.1735 - 2.1905   | 12.5767 - 12.57725  | 156.7 - 156.9         | 2200 - 2300     | 7.25 - 7.75  | 17.7 - 21.4   |
| 4.125 - 128       | 13.36 - 13.41       | 162.0125 - 167.17     | 2310 - 2390     | 8.025 - 8.5  | 22.01 - 23.12 |
| 4.17725 - 4.17775 | 16.42 - 16.423      | 167.72 - 173.2        | 2483.5 - 2500   | 9.0 - 9.2    | 23.6 - 24.0   |
| 4.20725 - 4.20775 | 16.69475 - 16.69525 | 240 - 285             | 2655 - 2900     | 9.3 - 9.5    | 31.2 - 31.8   |
| 6.215 - 6.218     | 1680425 - 1680475   | 322 - 335.4           | 3260 - 3267     | 10.6 - 12.7  | 36.43 - 36.5  |
| 6.26775 - 6.26825 | 25.5 - 25.67        | 399.9 - 410           | 3332 - 3339     | 13.25 - 13.4 |               |
| 6.31175 - 6.31225 | 37.5 - 38.25        | 608 - 614             | 3345.8 - 3358   |              |               |
| 8.291 - 8.294     | 73 - 74.6           | 960 - 1240            | 3600 - 4400     |              |               |
| 8.362 - 8.366     | 74.8 - 75.2         | 1300 - 1427           |                 |              |               |
| 8.37625 - 8.38675 | 108 - 121.94        | 1435 - 1626.5         |                 |              |               |
| 8.41425 - 8.41475 | 123 - 138           | 1645.5 - 1646.5       |                 |              |               |

Radiated disturbance of an intentional radiator:

| Frequency         | Field strength (μV/m) | Limit (dBμV/m) | Remark     | Measurement distance (m) |
|-------------------|-----------------------|----------------|------------|--------------------------|
| 0.009MHz-0.490MHz | 2400/F(kHz)           | -              | -          | 300                      |
| 0.490MHz-1.705MHz | 24000/F(kHz)          | -              | -          | 30                       |
| 1.705MHz-30MHz    | 30                    | -              | -          | 30                       |
| 30MHz-88MHz       | 100                   | 40.0           | Quasi-peak | 3                        |
| 88MHz-216MHz      | 150                   | 43.5           | Quasi-peak | 3                        |
| 216MHz-960MHz     | 200                   | 46.0           | Quasi-peak | 3                        |
| 960MHz-1GHz       | 500                   | 54.0           | Quasi-peak | 3                        |
| Above 1GHz        | 500                   | 74.0           | Peak       | 3                        |
|                   |                       | 54.0           | Average    |                          |

### Test Procedure

ANSI C63.10:2020 Section 6.4 & 6.5 & 6.6

### Test Settings

- For radiated emissions measurements performed at frequencies less than or equal to 1GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80cm above the reference ground plane.
- For radiated emissions measurements performed at frequencies above 1GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80cm above the ground plane.
- Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The measurement antenna shall be varied from 1m to 4m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e, field strength or received power), when orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25cm.
- For each suspected emission, the EUT was ranged its worst case and then tune the antenna tower(from 1~4m) and turntable(from 0~360°) find the maximum reading. Preamplifier and a high pass filter are used for the test in order get better signal level comply with the guidelines.
- Set to the maximum power setting and enable the EUT transmit continuously.
- The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
- spectrum analyzer setting:  
Measurements Below 1000MHz: RBW = 120 kHz; VBW ≥ 300 kHz; Detector = Peak  
Measurements Above 1000MHz: RBW = 1 MHz; VBW ≥ 3 MHz; Detector = Peak

Average Measurements Above 1000MHz:

RBW = 1 MHz, VBW  $\geq$  1/T, with peak detector for average measurements.

8. The field strength is calculated by adding the Antenna Factor, Cable Factor. The basic equation with a sample calculation is as follows:

Level = Reading(dB $\mu$ V) + AF(dB/m) + Factor(dB):

AF = Antenna Factor(dB/m)

Factor = Cable Factor(dB) - Preamplifier gain(dB)

Margin = Limit(dB $\mu$ V/m) – Level(dB $\mu$ V/m)

9. Repeat above procedures until all frequencies measured was complete.  
10. Measure and record the results in the test report.

### **Test Notes**

1. Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.
2. Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. the disturbance between 9kHz to 30MHz, 30MHz-1GHz and 18GHz to 40GHz was very low. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be recorded, so only the harmonics had been displayed.
3. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

### **Test Setup**

Refer to section 2.7.2 for details.

### **Measuring Instruments**

The measuring equipment is listed in the section 3.1 of this test report.

### **Test Result**

The detailed test data see: **Appendix**.

## 5 Test Setup Photos

The detailed test data see: **Appendix-C BTWIFI Setup Photos**

# Appendix

## DTS Bandwidth Test Result

| TestMode | Antenna | Frequency[MHz] | DTS BW [MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|----------|---------|----------------|--------------|----------|----------|------------|---------|
| BLE_1M   | Ant0    | 2402           | 0.676        | 2401.656 | 2402.332 | 0.5        | PASS    |
| BLE_1M   | Ant0    | 2440           | 0.668        | 2439.664 | 2440.332 | 0.5        | PASS    |
| BLE_1M   | Ant0    | 2480           | 0.656        | 2479.672 | 2480.328 | 0.5        | PASS    |

## Test Graphs



## Occupied Channel Bandwidth Test Result

| TestMode | Antenna | Frequency[MHz] | OCB [MHz] | FL[MHz]   | FH[MHz]   | Limit[MHz] | Verdict |
|----------|---------|----------------|-----------|-----------|-----------|------------|---------|
| BLE_1M   | Ant0    | 2402           | 1.0382    | 2401.4921 | 2402.5303 | ---        | ---     |
| BLE_1M   | Ant0    | 2440           | 1.0375    | 2439.4919 | 2440.5294 | ---        | ---     |
| BLE_1M   | Ant0    | 2480           | 1.0249    | 2479.4914 | 2480.5163 | ---        | ---     |

## Test Graphs



**Maximum conducted output power****Test Result Peak**

| TestMode | Antenna | Frequency[MHz] | Conducted Peak Power[dBm] | Conducted Limit[dBm] | Verdict |
|----------|---------|----------------|---------------------------|----------------------|---------|
| BLE_1M   | Ant0    | 2402           | 0.421                     | ≤30                  | PASS    |
| BLE_1M   | Ant0    | 2440           | -0.261                    | ≤30                  | PASS    |
| BLE_1M   | Ant0    | 2480           | -0.118                    | ≤30                  | PASS    |

**Test Result Average**

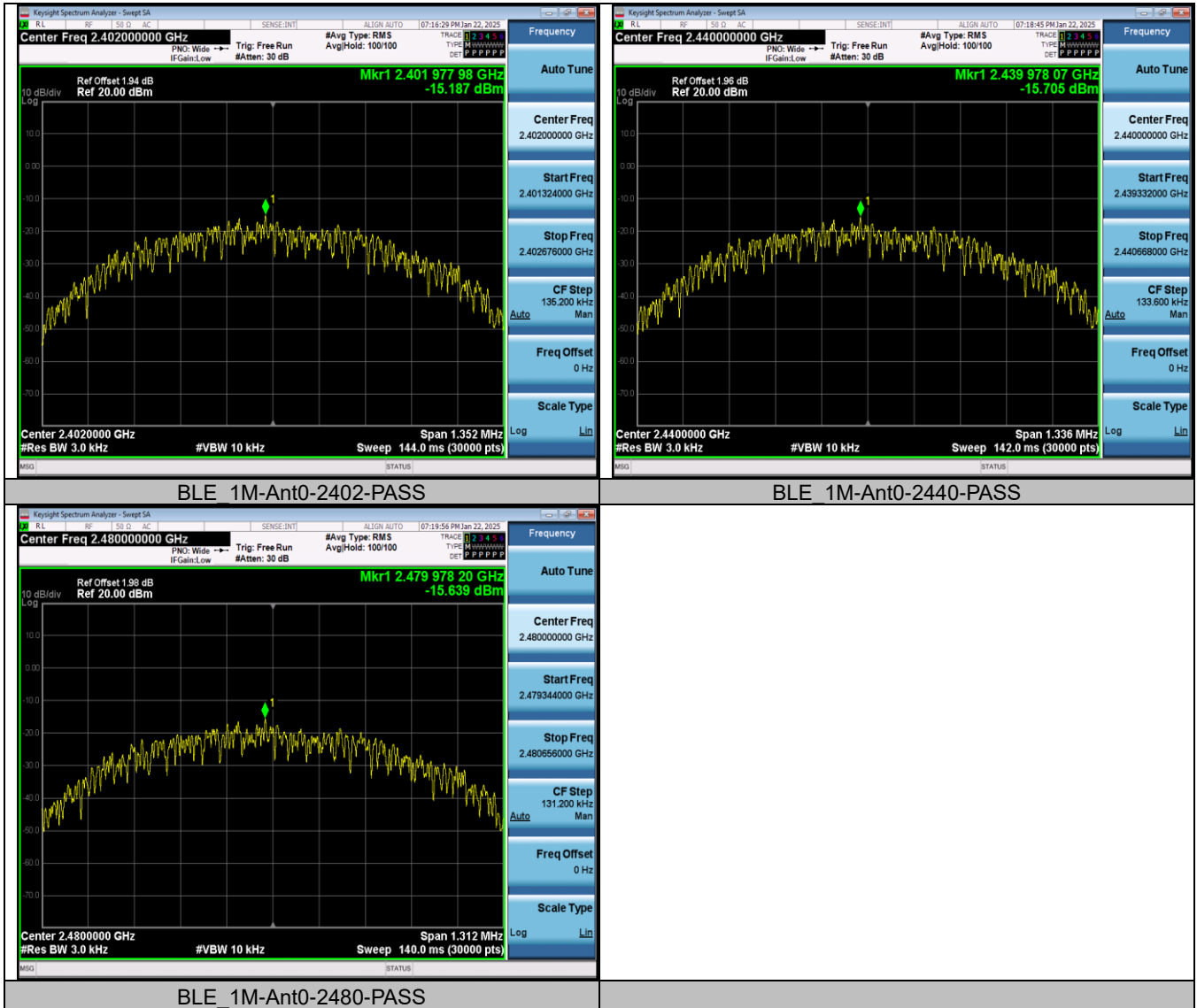
| TestMode | Antenna | Frequency[MHz] | Conducted Average Power[dBm] | Conducted Limit[dBm] | Verdict |
|----------|---------|----------------|------------------------------|----------------------|---------|
| BLE_1M   | Ant0    | 2402           | -0.225                       | ≤30                  | PASS    |
| BLE_1M   | Ant0    | 2440           | -0.884                       | ≤30                  | PASS    |
| BLE_1M   | Ant0    | 2480           | -0.827                       | ≤30                  | PASS    |



## Maximum power spectral density Test Result

| TestMode | Antenna | Frequency[MHz] | Result[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|----------|---------|----------------|------------------|-----------------|---------|
| BLE_1M   | Ant0    | 2402           | -15.19           | ≤8.00           | PASS    |
| BLE_1M   | Ant0    | 2440           | -15.71           | ≤8.00           | PASS    |
| BLE_1M   | Ant0    | 2480           | -15.64           | ≤8.00           | PASS    |

## Test Graphs

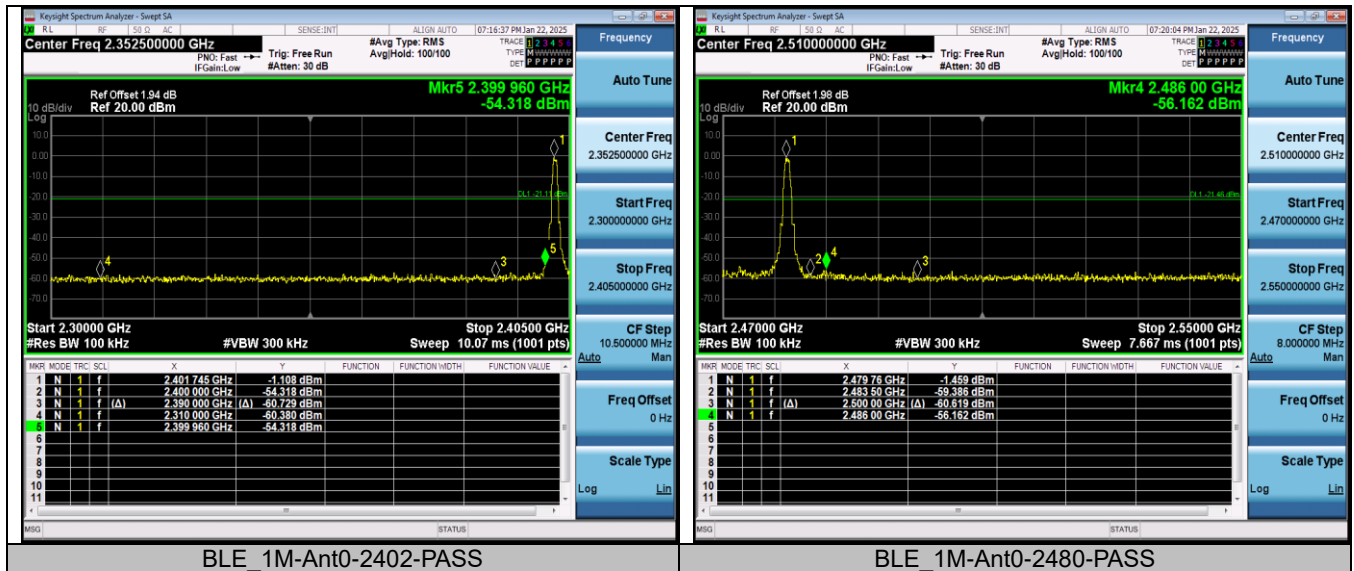


## Band edge measurements

### Test Result

| TestMode | Antenna | ChName | Frequency[MHz] | RefLevel[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|--------|----------------|---------------|-------------|------------|---------|
| BLE_1M   | Ant0    | Low    | 2402           | -1.11         | -54.32      | ≤-21.11    | PASS    |
| BLE_1M   | Ant0    | High   | 2480           | -1.46         | -56.16      | ≤-21.46    | PASS    |

### Test Graphs

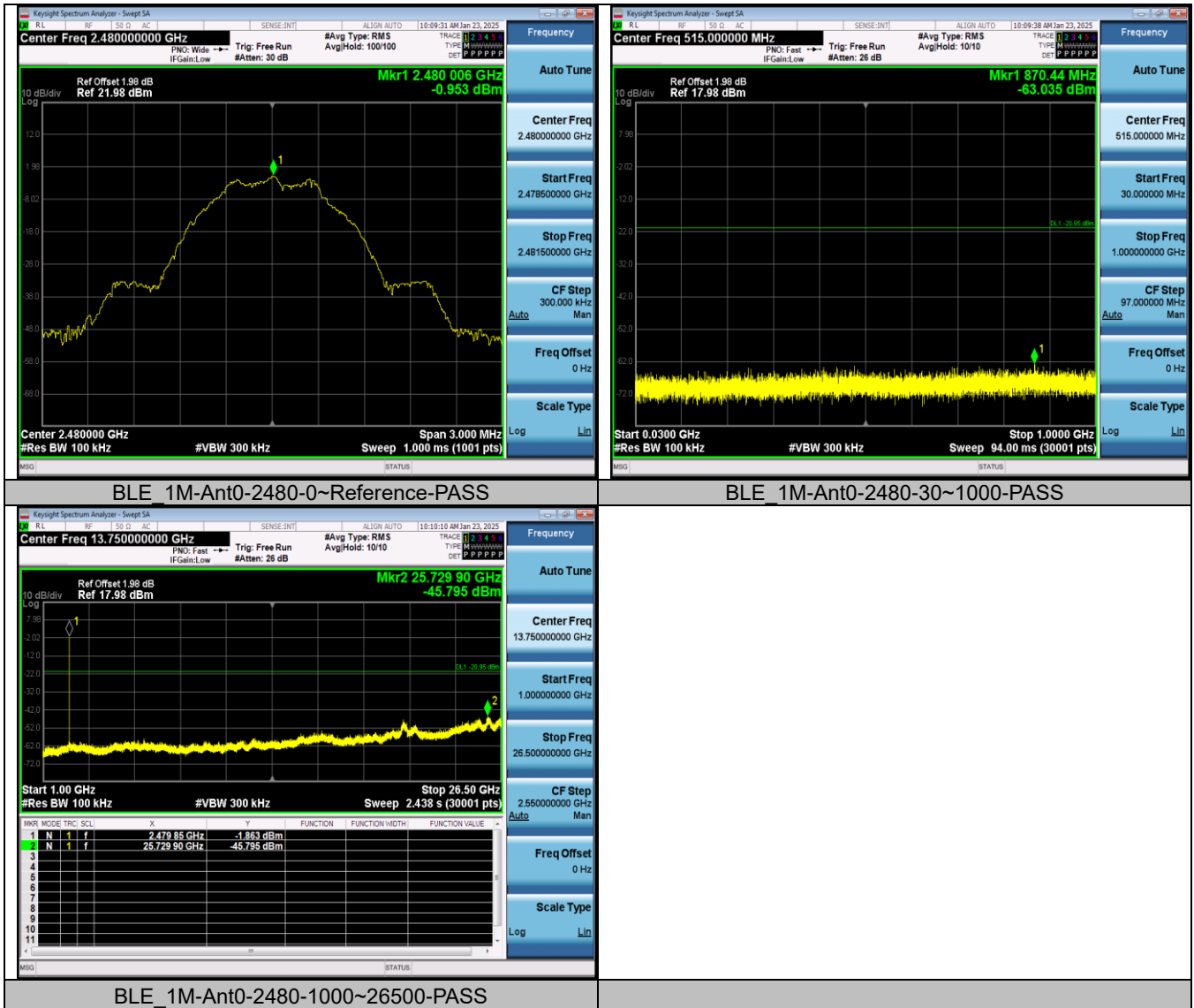


## Conducted Spurious Emission Test Result

| TestMode | Antenna | Frequency[MHz] | FreqRange<br>[MHz] | RefLevel<br>[dBm] | Result[dBm] | Limit[dBm]    | Verdict |
|----------|---------|----------------|--------------------|-------------------|-------------|---------------|---------|
| BLE_1M   | Ant0    | 2402           | 0~Reference        | -0.53             | -0.53       | ---           | PASS    |
| BLE_1M   | Ant0    | 2402           | 30~1000            | -0.53             | -63.69      | $\leq -20.53$ | PASS    |
| BLE_1M   | Ant0    | 2402           | 1000~26500         | -0.53             | -45.79      | $\leq -20.53$ | PASS    |
| BLE_1M   | Ant0    | 2440           | 0~Reference        | -1.31             | -1.31       | ---           | PASS    |
| BLE_1M   | Ant0    | 2440           | 30~1000            | -1.31             | -62.78      | $\leq -21.31$ | PASS    |
| BLE_1M   | Ant0    | 2440           | 1000~26500         | -1.31             | -45.57      | $\leq -21.31$ | PASS    |
| BLE_1M   | Ant0    | 2480           | 0~Reference        | -0.95             | -0.95       | ---           | PASS    |
| BLE_1M   | Ant0    | 2480           | 30~1000            | -0.95             | -63.04      | $\leq -20.95$ | PASS    |
| BLE_1M   | Ant0    | 2480           | 1000~26500         | -0.95             | -45.8       | $\leq -20.95$ | PASS    |

## Test Graphs

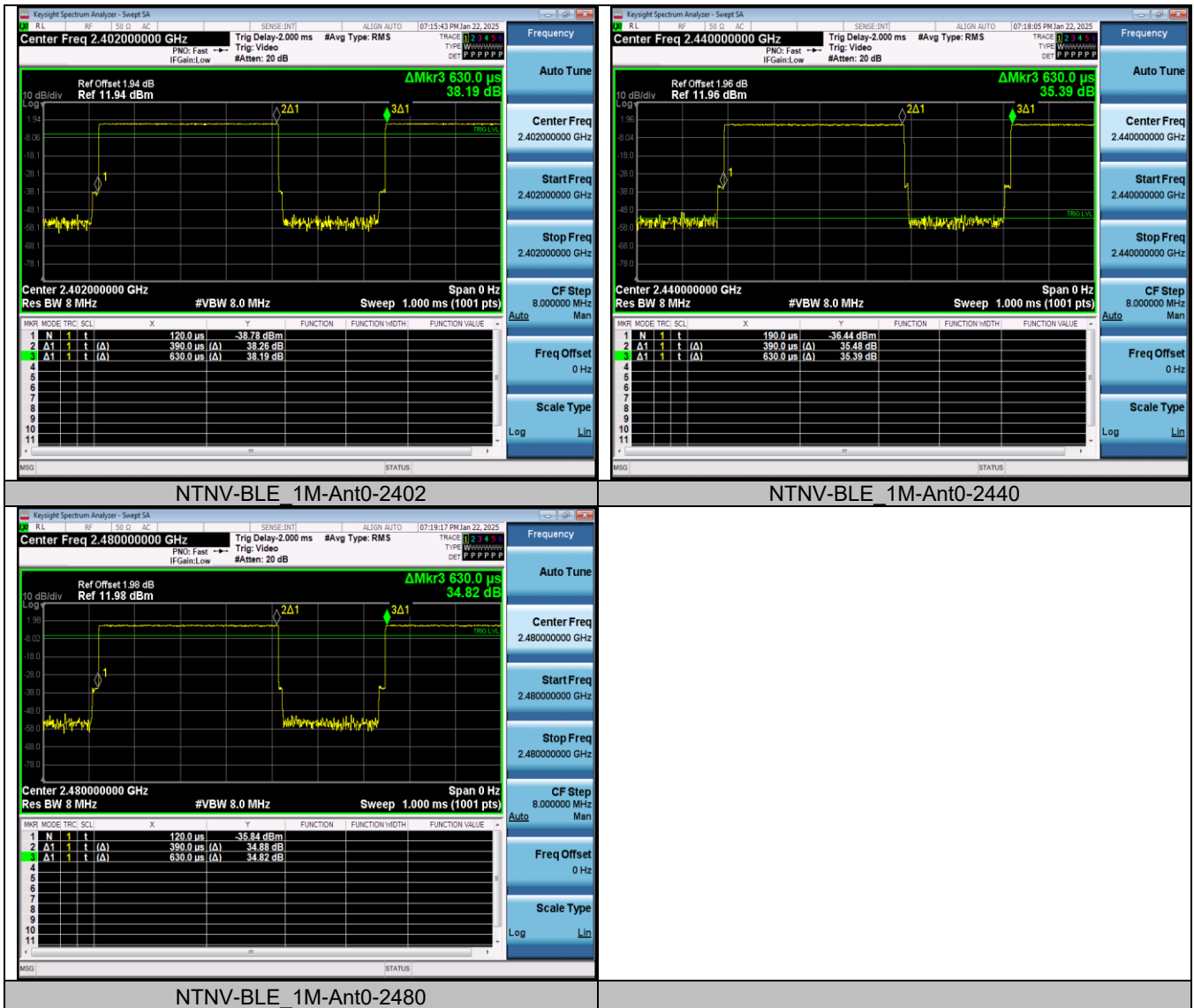




## Duty Cycle Test Result

| TestMode | Antenna | Frequency[MHz] | ON Time<br>[ms] | Period<br>[ms] | Duty Cycle<br>[%] | Duty Cycle<br>Factor[dB] |
|----------|---------|----------------|-----------------|----------------|-------------------|--------------------------|
| BLE_1M   | Ant0    | 2402           | 0.39            | 0.63           | 61.90             | 2.08                     |
| BLE_1M   | Ant0    | 2440           | 0.39            | 0.63           | 61.90             | 2.08                     |
| BLE_1M   | Ant0    | 2480           | 0.39            | 0.63           | 61.90             | 2.08                     |

## Test Graphs

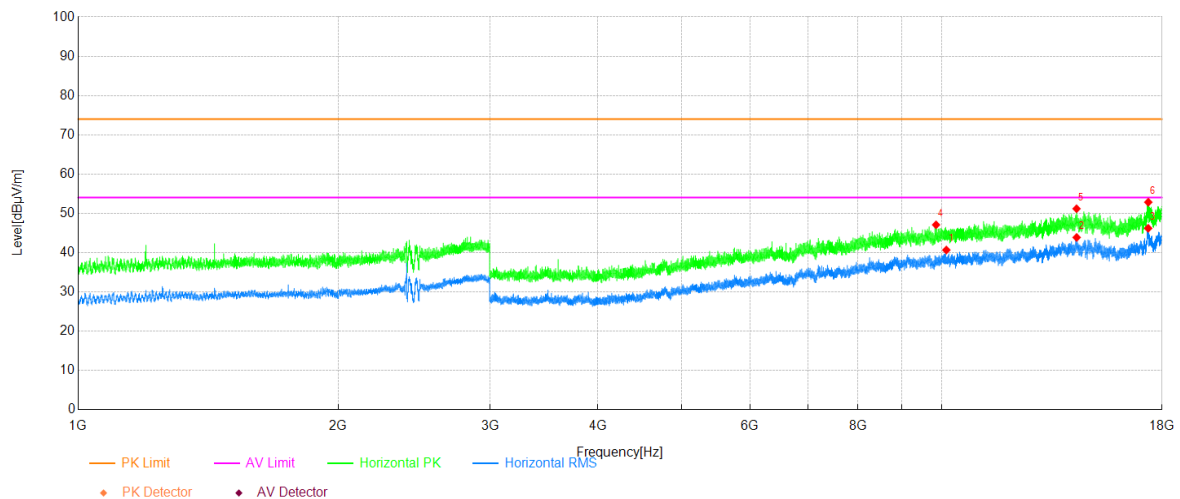


## Radiated Spurious Emissions

### Test Result

| Project Information |                 |           |             |
|---------------------|-----------------|-----------|-------------|
| Mode:               | BLE             | Band:     | -           |
| Bandwidth           | -               | Channel   | 39          |
| IMEI:               | 866034070236643 | Engineer: | Shen Zhuang |
| Remark:             |                 |           |             |

### Test Graph

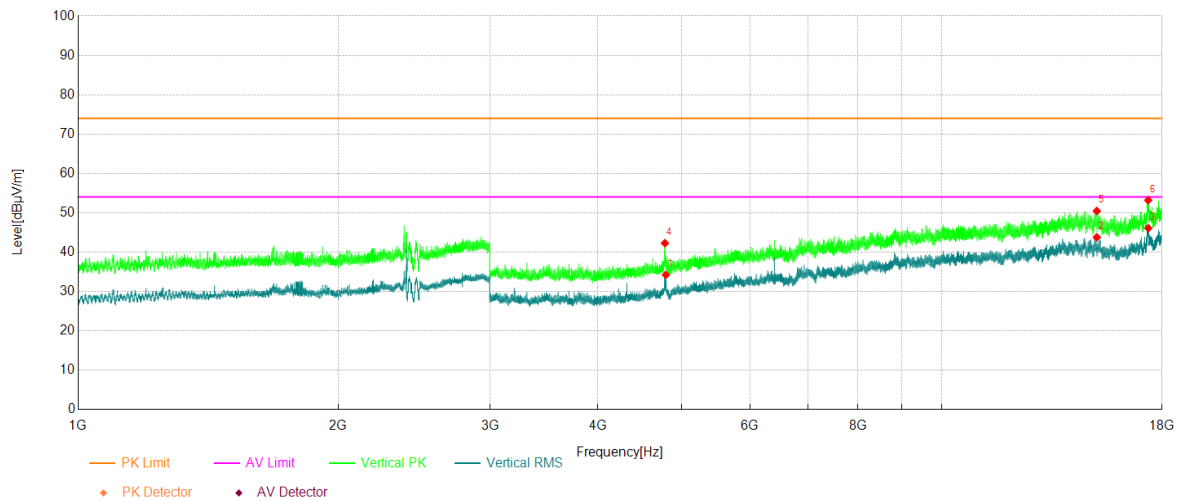


### Data List

| NO. | Freq. [MHz] | Reading [dBuV] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity   | Verdict |
|-----|-------------|----------------|-------------|----------------|----------------|-------------|------------|---------|
| 1   | 10127.00    | 37.45          | 3.21        | 40.66          | 54.00          | 13.34       | Horizontal | PASS    |
| 2   | 14336.00    | 34.86          | 9.00        | 43.86          | 54.00          | 10.14       | Horizontal | PASS    |
| 3   | 17348.00    | 33.43          | 12.77       | 46.20          | 54.00          | 7.80        | Horizontal | PASS    |
| 4   | 9852.50     | 43.76          | 3.31        | 47.07          | 74.00          | 26.93       | Horizontal | PASS    |
| 5   | 14331.00    | 42.29          | 8.88        | 51.17          | 74.00          | 22.83       | Horizontal | PASS    |
| 6   | 17351.50    | 40.03          | 12.80       | 52.83          | 74.00          | 21.17       | Horizontal | PASS    |

| Project Information |                 |           |             |
|---------------------|-----------------|-----------|-------------|
| Mode:               | BLE             | Band:     | -           |
| Bandwidth           | -               | Channel   | 39          |
| IMEI:               | 866034070236643 | Engineer: | Shen Zhuang |
| Remark:             |                 |           |             |

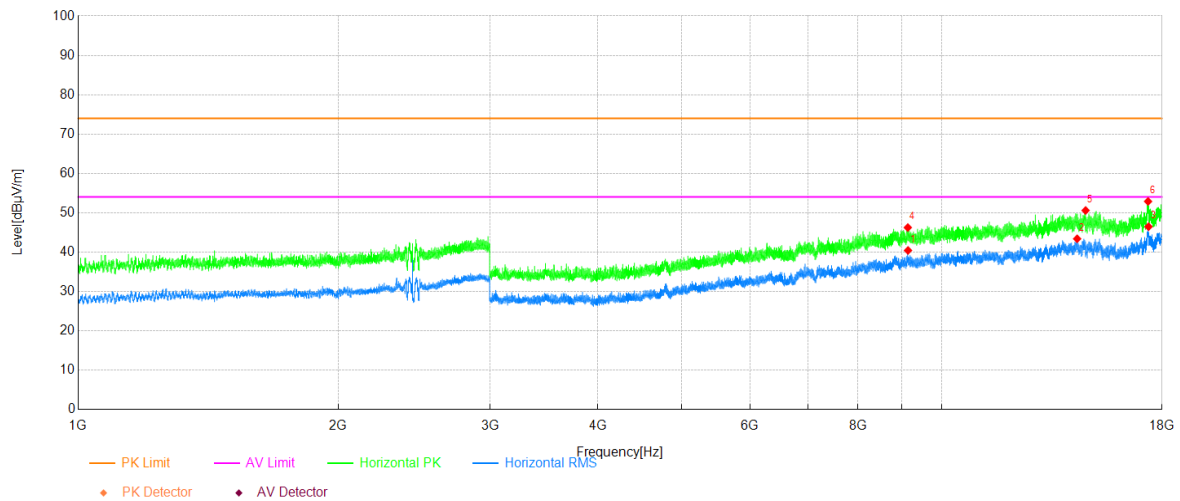
### Test Graph



| Data List |             |                |             |                |                |             |          |         |
|-----------|-------------|----------------|-------------|----------------|----------------|-------------|----------|---------|
| NO.       | Freq. [MHz] | Reading [dBμV] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity | Verdict |
| 1         | 4793.00     | 41.81          | -7.59       | 34.22          | 54.00          | 19.78       | Vertical | PASS    |
| 2         | 15124.50    | 35.04          | 8.72        | 43.76          | 54.00          | 10.24       | Vertical | PASS    |
| 3         | 17353.50    | 33.37          | 12.72       | 46.09          | 54.00          | 7.91        | Vertical | PASS    |
| 4         | 4781.00     | 49.97          | -7.70       | 42.27          | 74.00          | 31.73       | Vertical | PASS    |
| 5         | 15124.00    | 41.73          | 8.73        | 50.46          | 74.00          | 23.54       | Vertical | PASS    |
| 6         | 17349.50    | 40.34          | 12.84       | 53.18          | 74.00          | 20.82       | Vertical | PASS    |



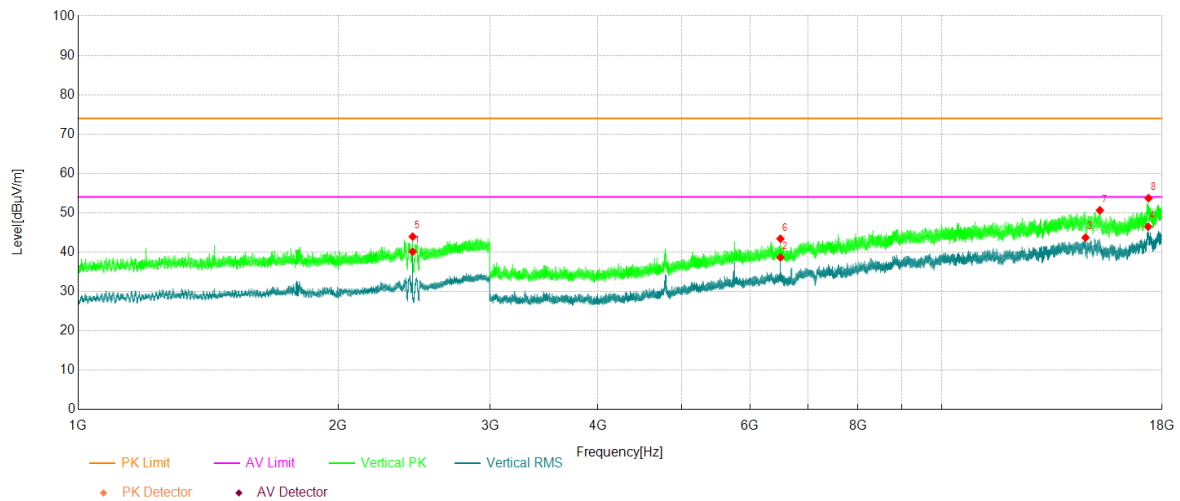
| Project Information |                 |           |             |
|---------------------|-----------------|-----------|-------------|
| Mode:               | BLE             | Band:     | -           |
| Bandwidth           | -               | Channel   | 19          |
| IMEI:               | 866034070236643 | Engineer: | Shen Zhuang |
| Remark:             |                 |           |             |

**Test Graph**

| Data List |             |                |             |                |                |             |            |         |
|-----------|-------------|----------------|-------------|----------------|----------------|-------------|------------|---------|
| NO.       | Freq. [MHz] | Reading [dBμV] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity   | Verdict |
| 1         | 9142.50     | 37.38          | 3.05        | 40.43          | 54.00          | 13.57       | Horizontal | PASS    |
| 2         | 14353.50    | 34.11          | 9.28        | 43.39          | 54.00          | 10.61       | Horizontal | PASS    |
| 3         | 17361.50    | 34.05          | 12.41       | 46.46          | 54.00          | 7.54        | Horizontal | PASS    |
| 4         | 9137.50     | 43.33          | 2.91        | 46.24          | 74.00          | 27.76       | Horizontal | PASS    |
| 5         | 14681.00    | 41.53          | 9.06        | 50.59          | 74.00          | 23.41       | Horizontal | PASS    |
| 6         | 17342.50    | 40.37          | 12.51       | 52.88          | 74.00          | 21.12       | Horizontal | PASS    |

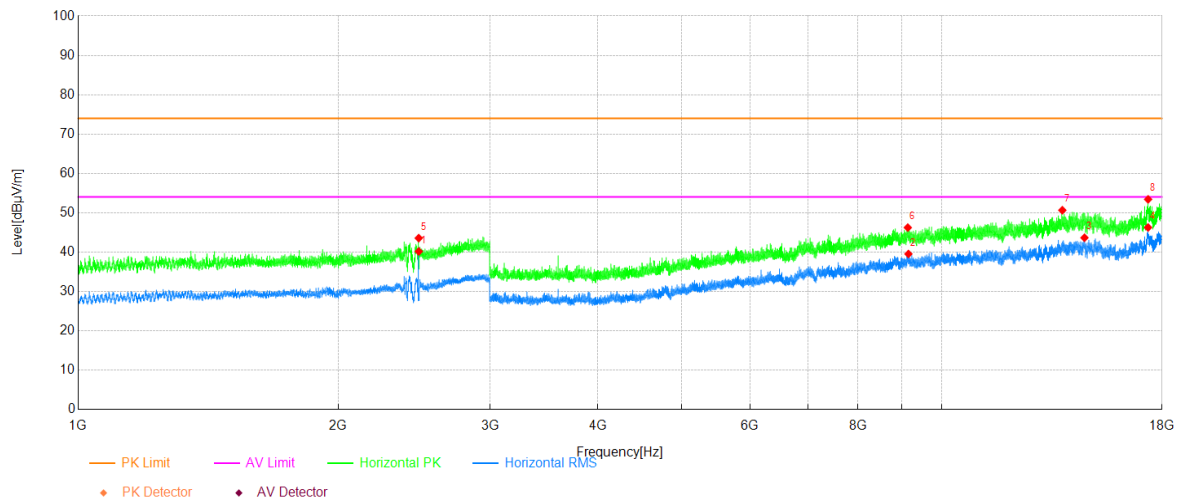
| Project Information |                 |           |             |
|---------------------|-----------------|-----------|-------------|
| Mode:               | BLE             | Band:     | -           |
| Bandwidth           | -               | Channel   | 19          |
| IMEI:               | 866034070236643 | Engineer: | Shen Zhuang |
| Remark:             |                 |           |             |

### Test Graph



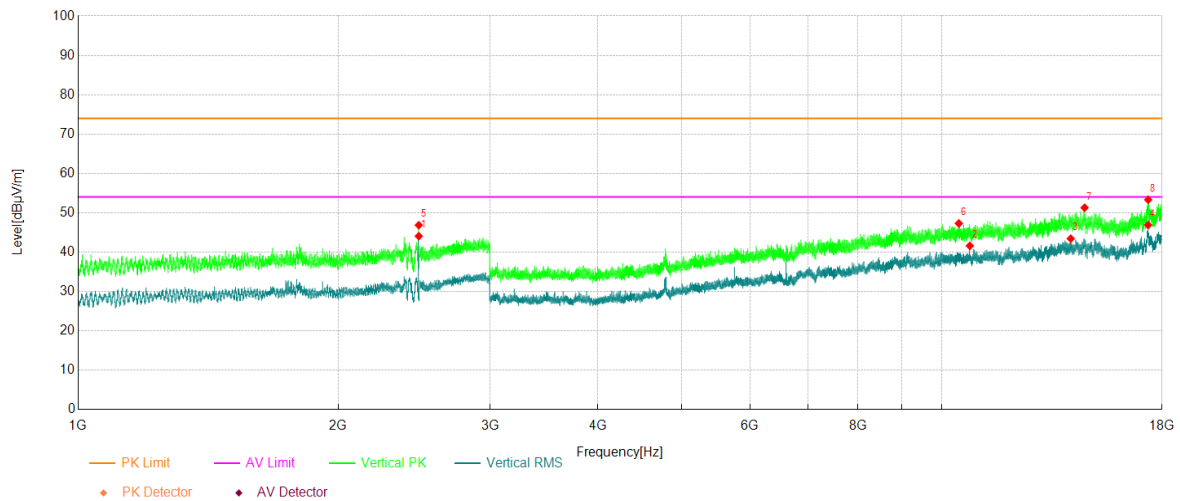
| Data List |             |                |             |                |                |             |          |         |
|-----------|-------------|----------------|-------------|----------------|----------------|-------------|----------|---------|
| NO.       | Freq. [MHz] | Reading [dBμV] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity | Verdict |
| 1         | 2440.00     | 37.81          | 2.29        | 40.10          | -              | -           | Vertical | NA      |
| 2         | 6507.00     | 41.87          | -3.23       | 38.64          | 54.00          | 15.36       | Vertical | PASS    |
| 3         | 14677.50    | 34.53          | 9.16        | 43.69          | 54.00          | 10.31       | Vertical | PASS    |
| 4         | 17347.50    | 33.73          | 12.75       | 46.48          | 54.00          | 7.52        | Vertical | PASS    |
| 5         | 2440.20     | 41.66          | 2.29        | 43.95          | -              | -           | Vertical | NA      |
| 6         | 6506.50     | 46.62          | -3.22       | 43.40          | 74.00          | 30.60       | Vertical | PASS    |
| 7         | 15251.00    | 41.30          | 9.33        | 50.63          | 74.00          | 23.37       | Vertical | PASS    |
| 8         | 17364.50    | 41.42          | 12.29       | 53.71          | 74.00          | 20.29       | Vertical | PASS    |

| Project Information |                 |           |             |
|---------------------|-----------------|-----------|-------------|
| Mode:               | BLE             | Band:     | -           |
| Bandwidth           | -               | Channel   | 39          |
| IMEI:               | 866034070236643 | Engineer: | Shen Zhuang |
| Remark:             |                 |           |             |

**Test Graph**

| Data List |             |                |             |                |                |             |            |         |
|-----------|-------------|----------------|-------------|----------------|----------------|-------------|------------|---------|
| NO.       | Freq. [MHz] | Reading [dBμV] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity   | Verdict |
| 1         | 2480.20     | 37.80          | 2.37        | 40.17          | -              | -           | Horizontal | NA      |
| 2         | 9153.00     | 36.30          | 3.23        | 39.53          | 54.00          | 14.47       | Horizontal | PASS    |
| 3         | 14636.50    | 34.05          | 9.60        | 43.65          | 54.00          | 10.35       | Horizontal | PASS    |
| 4         | 17341.00    | 33.81          | 12.45       | 46.26          | 54.00          | 7.74        | Horizontal | PASS    |
| 5         | 2479.80     | 41.19          | 2.37        | 43.56          | -              | -           | Horizontal | NA      |
| 6         | 9137.50     | 43.32          | 2.91        | 46.23          | 74.00          | 27.77       | Horizontal | PASS    |
| 7         | 13797.50    | 42.77          | 7.88        | 50.65          | 74.00          | 23.35       | Horizontal | PASS    |
| 8         | 17343.50    | 40.85          | 12.56       | 53.41          | 74.00          | 20.59       | Horizontal | PASS    |

| Project Information |                 |           |             |
|---------------------|-----------------|-----------|-------------|
| Mode:               | BLE             | Band:     | -           |
| Bandwidth           | -               | Channel   | 39          |
| IMEI:               | 866034070236643 | Engineer: | Shen Zhuang |
| Remark:             |                 |           |             |

**Test Graph**

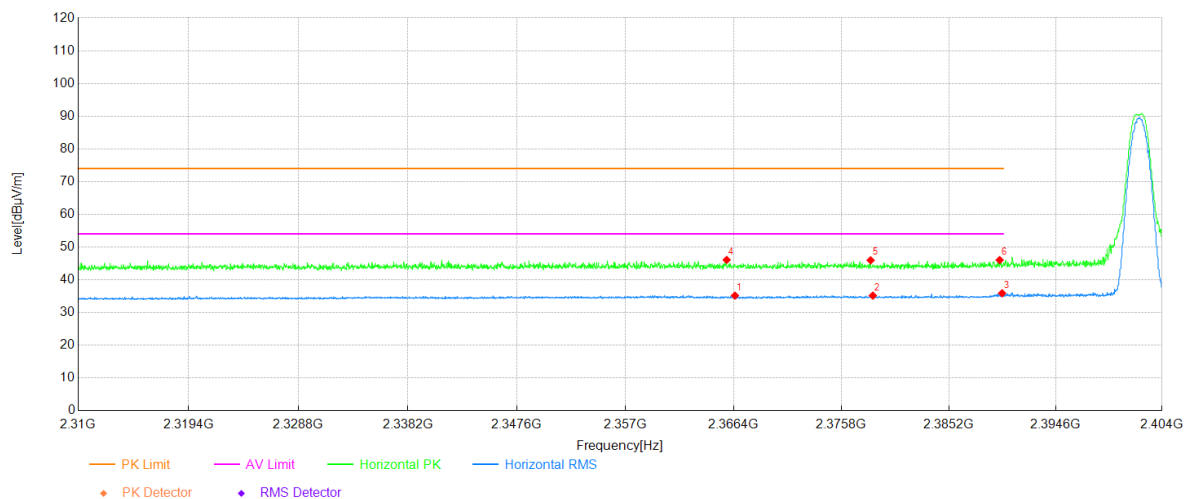
| Data List |             |                |             |                |                |             |          |         |
|-----------|-------------|----------------|-------------|----------------|----------------|-------------|----------|---------|
| NO.       | Freq. [MHz] | Reading [dBμV] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity | Verdict |
| 1         | 2480.20     | 41.69          | 2.37        | 44.06          | -              | -           | Vertical | NA      |
| 2         | 10782.00    | 37.28          | 4.32        | 41.60          | 54.00          | 12.40       | Vertical | PASS    |
| 3         | 14110.50    | 35.27          | 8.15        | 43.42          | 54.00          | 10.58       | Vertical | PASS    |
| 4         | 17346.00    | 34.20          | 12.68       | 46.88          | 54.00          | 7.12        | Vertical | PASS    |
| 5         | 2480.20     | 44.48          | 2.37        | 46.85          | -              | -           | Vertical | NA      |
| 6         | 10470.00    | 43.14          | 4.15        | 47.29          | 74.00          | 26.71       | Vertical | PASS    |
| 7         | 14640.50    | 41.58          | 9.70        | 51.28          | 74.00          | 22.72       | Vertical | PASS    |
| 8         | 17348.00    | 40.53          | 12.77       | 53.30          | 74.00          | 20.70       | Vertical | PASS    |

## Radiated Band Edge

## Test Result

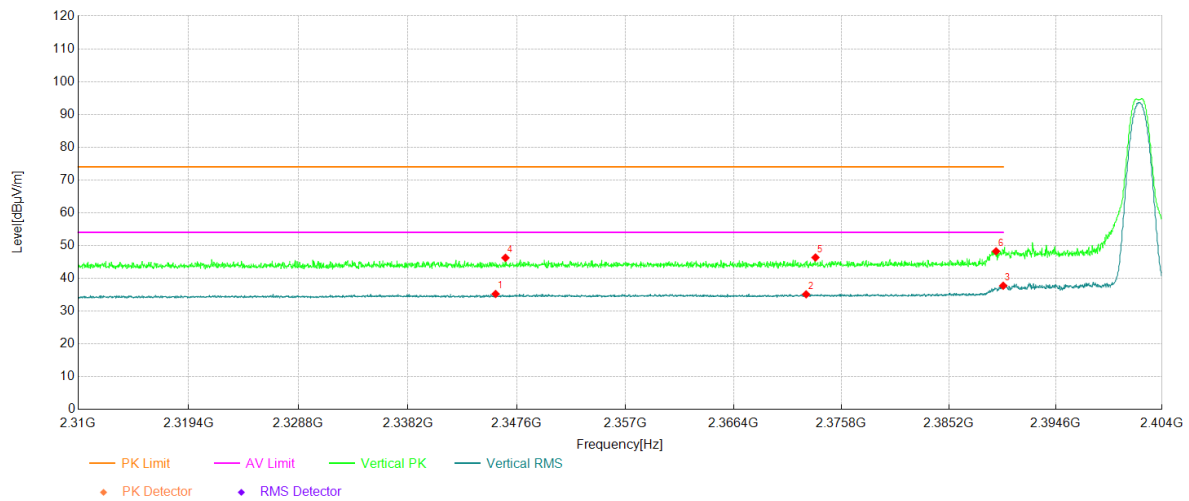
| Project Information |                 |           |             |
|---------------------|-----------------|-----------|-------------|
| Mode:               | BLE(1MHz)       | Band:     | -           |
| Bandwidth           | -               | Channel   | 0           |
| IMEI:               | 866034070236643 | Engineer: | Shen zhuang |
| Remark:             |                 |           |             |

## Test Graph



| Data List |             |                |             |                |                |             |            |         |
|-----------|-------------|----------------|-------------|----------------|----------------|-------------|------------|---------|
| NO.       | Freq. [MHz] | Reading [dBuV] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity   | Verdict |
| 1         | 2366.51     | 33.72          | 1.44        | 35.16          | 54.00          | 18.84       | Horizontal | PASS    |
| 2         | 2378.55     | 33.72          | 1.44        | 35.16          | 54.00          | 18.84       | Horizontal | PASS    |
| 3         | 2389.90     | 34.45          | 1.43        | 35.88          | 54.00          | 18.12       | Horizontal | PASS    |
| 4         | 2365.79     | 44.63          | 1.44        | 46.07          | 74.00          | 27.93       | Horizontal | PASS    |
| 5         | 2378.36     | 44.52          | 1.44        | 45.96          | 74.00          | 28.04       | Horizontal | PASS    |
| 6         | 2389.68     | 44.58          | 1.43        | 46.01          | 74.00          | 27.99       | Horizontal | PASS    |

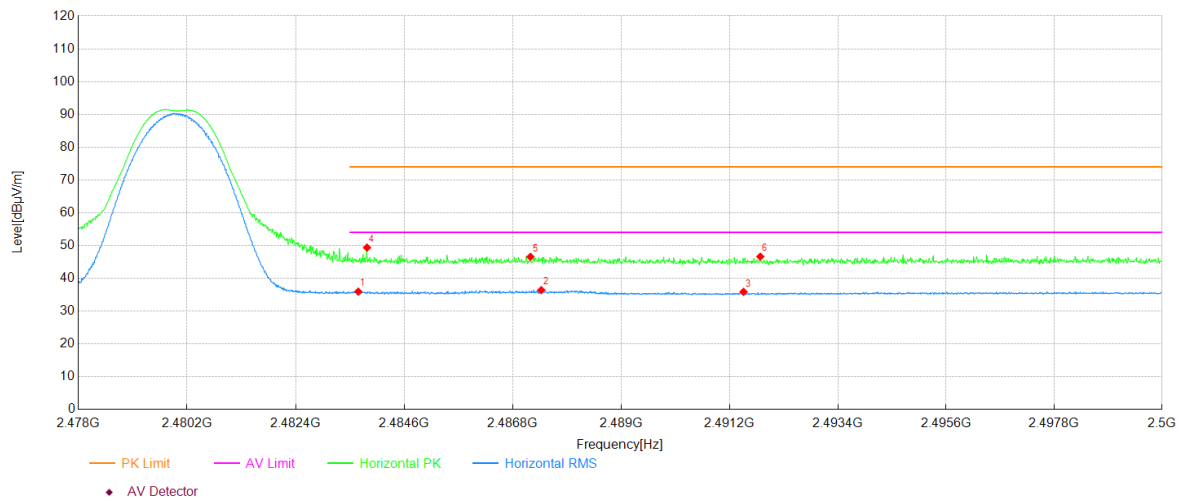
| Project Information |                 |           |             |
|---------------------|-----------------|-----------|-------------|
| Mode:               | BLE             | Band:     | -           |
| Bandwidth           | -               | Channel   | 0           |
| IMEI:               | 866034070236643 | Engineer: | Shen zhuang |
| Remark:             |                 |           |             |

**Test Graph**

| Data List |             |                |             |                |                |             |          |         |
|-----------|-------------|----------------|-------------|----------------|----------------|-------------|----------|---------|
| NO.       | Freq. [MHz] | Reading [dBμV] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity | Verdict |
| 1         | 2345.76     | 33.82          | 1.41        | 35.23          | 54.00          | 18.77       | Vertical | PASS    |
| 2         | 2372.72     | 33.68          | 1.44        | 35.12          | 54.00          | 18.88       | Vertical | PASS    |
| 3         | 2389.99     | 36.31          | 1.43        | 37.74          | 54.00          | 16.26       | Vertical | PASS    |
| 4         | 2346.61     | 44.84          | 1.42        | 46.26          | 74.00          | 27.74       | Vertical | PASS    |
| 5         | 2373.53     | 44.92          | 1.44        | 46.36          | 74.00          | 27.64       | Vertical | PASS    |
| 6         | 2389.36     | 46.82          | 1.43        | 48.25          | 74.00          | 25.75       | Vertical | PASS    |

| Project Information |                 |           |             |
|---------------------|-----------------|-----------|-------------|
| Mode:               | BLE             | Band:     | -           |
| Bandwidth           | -               | Channel   | 39          |
| IMEI:               | 866034070236643 | Engineer: | Shen zhuang |
| Remark:             |                 |           |             |

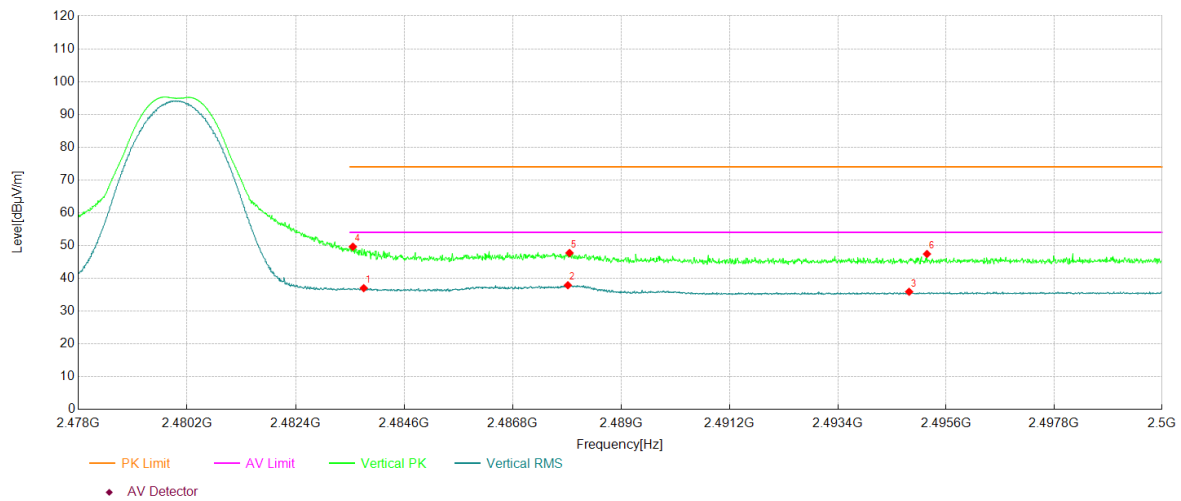
### Test Graph



### Data List

| NO. | Freq. [MHz] | Reading [dBuV] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity   | Verdict |
|-----|-------------|----------------|-------------|----------------|----------------|-------------|------------|---------|
| 1   | 2483.67     | 34.09          | 1.86        | 35.95          | 54.00          | 18.05       | Horizontal | PASS    |
| 2   | 2487.38     | 34.51          | 1.90        | 36.41          | 54.00          | 17.59       | Horizontal | PASS    |
| 3   | 2491.48     | 33.93          | 1.95        | 35.88          | 54.00          | 18.12       | Horizontal | PASS    |
| 4   | 2483.84     | 47.51          | 1.87        | 49.38          | 74.00          | 24.62       | Horizontal | PASS    |
| 5   | 2487.16     | 44.66          | 1.90        | 46.56          | 74.00          | 27.44       | Horizontal | PASS    |
| 6   | 2491.82     | 44.68          | 1.95        | 46.63          | 74.00          | 27.37       | Horizontal | PASS    |

| Project Information |                 |           |             |
|---------------------|-----------------|-----------|-------------|
| Mode:               | BLE             | Band:     | -           |
| Bandwidth           | -               | Channel   | 39          |
| IMEI:               | 866034070236643 | Engineer: | Shen zhuang |
| Remark:             |                 |           |             |

**Test Graph**

| Data List |             |                |             |                |                |             |          |         |
|-----------|-------------|----------------|-------------|----------------|----------------|-------------|----------|---------|
| NO.       | Freq. [MHz] | Reading [dBμV] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity | Verdict |
| 1         | 2483.78     | 35.14          | 1.87        | 37.01          | 54.00          | 16.99       | Vertical | PASS    |
| 2         | 2487.92     | 35.99          | 1.90        | 37.89          | 54.00          | 16.11       | Vertical | PASS    |
| 3         | 2494.85     | 33.92          | 1.98        | 35.90          | 54.00          | 18.10       | Vertical | PASS    |
| 4         | 2483.56     | 47.79          | 1.85        | 49.64          | 74.00          | 24.36       | Vertical | PASS    |
| 5         | 2487.95     | 45.84          | 1.90        | 47.74          | 74.00          | 26.26       | Vertical | PASS    |
| 6         | 2495.21     | 45.45          | 1.98        | 47.43          | 74.00          | 26.57       | Vertical | PASS    |

~The End~