



# RF TEST REPORT

Report No.: SHATBL2509005W02

**Applicant** : Fujian Iselected E-commerce Co., Ltd.  
**Product Name** : 2.4GHz & Bluetooth Wireless Mouse  
**Brand Name** : Philips  
**Model Name** : SPK7407  
**Series Model** : N/A  
**FCC ID** : 2BMNP-SPK7407  
**Test Standard** : FCC CFR Title 47 Part 15 Subpart C Section 15.247  
**Date of Receipt** : Sep.03, 2025  
**Date of Test** : Sep.03, 2025~Sep.26, 2025  
**Date of Issue** : Sep.26, 2025

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## REVISION HISTORY

| Rev. | Issue Date   | Report No.       | Effect Page | Contents        |
|------|--------------|------------------|-------------|-----------------|
| 00   | Sep.26, 2025 | SHATBL2509005W02 | ALL         | Initial Release |

## DECLARATION OF REPORT

1. The device has been tested by ATBL, and the test results show that the equipment under test (EUT) is in compliance with the requirements of 47 CFR 15.247. And it is applicable only to the tested sample identified in the report.
2. This report shall not be reproduced except in full, without the written approval of ATBL, this document only be altered or revised by ATBL, personal only, and shall be noted in the revision of the document.
3. The general information of EUT in this report is provided by the customer or manufacture, ATBL is only responsible for the test data but not for the information provided by the customer or manufacture.
4. The results in this report is only apply to the sample as tested under conditions. The customer or manufacturer is responsible for ensuring that the additional production units of this model have the same electrical and mechanical components.
5. In this report, '☐' indicates that EUT does not support content after '☐', and '☑' indicates that it supports content after '☑'

## SUMMARY OF TEST RESULT

| Report Section | Standard Section                     | Test Item                                      | Judgment    | Remark |
|----------------|--------------------------------------|------------------------------------------------|-------------|--------|
| 3.1            | 47 CFR 15.247(b)(3)                  | Maximum Peak Conducted Output Power            | PASS        | --     |
| 3.2            | --                                   | Duty Cycle                                     | Report only | --     |
| 3.3            | 47 CFR 15.247(a)(2)                  | 6dB Bandwidth                                  | PASS        | --     |
|                | --                                   | 99% Bandwidth                                  | Report only | --     |
| 3.4            | 47 CFR 15.247(e)                     | Power Spectral Density                         | PASS        | --     |
| 3.5            | 47 CFR 15.247(d)                     | Conducted Band Edge                            | PASS        | --     |
| 3.6            | 47 CFR 15.247(d)                     | Conducted Spurious Emission                    | PASS        | --     |
| 3.7            | 47 CFR 15.247(d)/15.209(a)/15.205(a) | Radiated Spurious Emission and Restricted Band | PASS        | --     |
| 3.8            | 47 CFR 15.207(a)                     | AC Power-Line Conducted Emission               | N/A         | --     |
| 3.9            | 47 CFR 15.203                        | Antenna Requirements                           | PASS        | --     |

Note: 'N/A' denotes test is not applicable in this Test Report.

## 1. GENERAL DESCRIPTION

### 1.1. Applicant

Name : Fujian Iselected E-commerce Co., Ltd.  
Address : 15th Floor, Building A, Aofeng Plaza, No. 2 Aofeng Road, Taijiang District,  
Fuzhou City, Fujian Province, China

### 1.2. Manufacturer

Name : MMD (Shanghai) Electronic Technology Co., Ltd.  
Address : Room107, Building 17, No. 525 Yuanjiang Road, Minhang District, Shanghai, China

### 1.3. Factory

Name : Dongguan Lingjie Electronics Technology Co.,Ltd  
Address : No.23, Zhenxing North Road, Xiegang Town, Dongguan City,  
Guangdong Province,China

#### 1.4. General Information of EUT

| General Information    |                                                                    |
|------------------------|--------------------------------------------------------------------|
| Equipment Name         | 2.4GHz & Bluetooth Wireless Mouse                                  |
| Brand Name             | Philips                                                            |
| Model Name             | SPK7407                                                            |
| Series Model           | N/A                                                                |
| Model Difference       | N/A                                                                |
| Antenna Type           | PCB Antenna                                                        |
| Antenna Gain           | 1.8dBi                                                             |
| Sample No              | 202509020005001                                                    |
| Power Source           | DC 1.5V From Battery                                               |
| Adapter                | N/A                                                                |
| Battery                | Rated Voltage:1.5V<br>Charge Limit Voltage:N/A<br>Capacity:2400mAh |
| Hardware version       | VER1.0                                                             |
| Software version       | BK6.0                                                              |
| Connecting I/O Port(s) | Refer to the remark below.                                         |

Remark:

The above information of EUT was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

### 1.5. Equipment Specification

| Equipment Specification           |                                                          |                  |
|-----------------------------------|----------------------------------------------------------|------------------|
| Frequency Range                   | 2402MHz - 2480MHz                                        |                  |
| Number of Channels                | 40CH                                                     |                  |
| Carrier Frequency of Each Channel | 2402 + n*2 MHz; n = 0 ~ 39                               |                  |
| Maximum Output Power To Antenna   | <input checked="" type="checkbox"/> Bluetooth LE(1Mbps): | 1.04dBm (1.27mW) |
|                                   | <input type="checkbox"/> Bluetooth LE(2Mbps):            | N/A              |
| Type of Modulation                | Bluetooth LE:                                            | GFSK             |

### 1.6. Modification of EUT

No modifications are made to the EUT during all test items.

### 1.7. Laboratory Information

|                     |   |                                                                                                                                                                     |
|---------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Company Name        | : | Shanghai ATBL Technology Co., Ltd.                                                                                                                                  |
| Address             | : | 5-6/F., Unit 1, No 8, Free Trade One Life Science and Sci-Tech Industrial Park No. 160, Basheng Road, Pudong New District Shanghai City, People's Republic of China |
| Telephone           | : | +86(0)21-51298625                                                                                                                                                   |
| FCC-Registration No | : | 485917                                                                                                                                                              |
| Designation Number  | : | CN1306                                                                                                                                                              |
| A2LA-Lab Cert. No.  | : | 6184.01                                                                                                                                                             |

### 1.8. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

47 CFR Part 15 Subpart C §15.247

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10-2020

Remark:

All test items were verified and recorded according to the standards and without any deviation during the test.

## 2. TEST CONFIGURATION OF EUT

### 2.1. Carrier Frequency Channel

| Frequency Band  | Channel   | Frequency MHz | Channel   | Frequency MHz | Channel   | Frequency MHz |
|-----------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 2402 - 2480 MHz | <b>00</b> | <b>2402</b>   | 14        | 2430          | 28        | 2458          |
|                 | 01        | 2404          | 15        | 2432          | 29        | 2460          |
|                 | 02        | 2406          | 16        | 2434          | 30        | 2462          |
|                 | 03        | 2408          | 17        | 2436          | 31        | 2464          |
|                 | 04        | 2410          | 18        | 2438          | 32        | 2466          |
|                 | 05        | 2412          | <b>19</b> | <b>2440</b>   | 33        | 2468          |
|                 | 06        | 2414          | 20        | 2442          | 34        | 2470          |
|                 | 07        | 2416          | 21        | 2444          | 35        | 2472          |
|                 | 08        | 2418          | 22        | 2446          | 36        | 2474          |
|                 | 09        | 2420          | 23        | 2448          | 37        | 2476          |
|                 | 10        | 2422          | 24        | 2450          | 38        | 2478          |
|                 | 11        | 2424          | 25        | 2452          | <b>39</b> | <b>2480</b>   |
|                 | 12        | 2426          | 26        | 2454          | --        | --            |
|                 | 13        | 2428          | 27        | 2456          | --        | --            |

Remark:

Low Channel: **CH 00\_2402 MHz**; Middle Channel: **CH 19\_2440 MHz**; High Channel: **CH 39\_2480 MHz**.

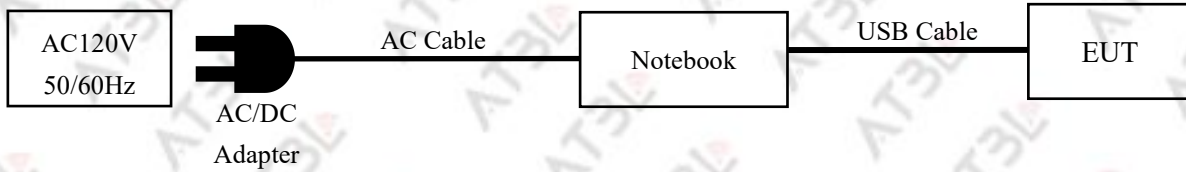
### 2.2. Test Modes

The table below is showing all test modes to demonstrate in compliance with the standard.

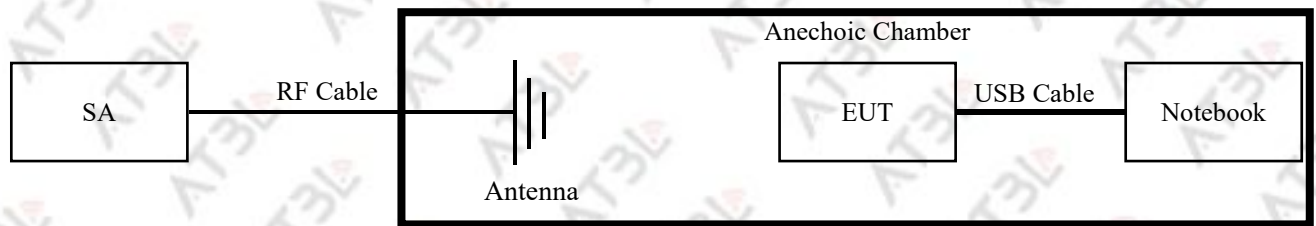
| Summary Table of Test Modes          |                                                         |                                              |
|--------------------------------------|---------------------------------------------------------|----------------------------------------------|
| Test Item                            | Data Rate / Modulation                                  |                                              |
|                                      | <input checked="" type="checkbox"/> Bluetooth LE(1Mbps) | <input type="checkbox"/> Bluetooth LE(2Mbps) |
| For Conducted and Radiated Test      | Mode 1: CH00_2402 MHz                                   | Mode 4: CH01_2404 MHz                        |
|                                      | Mode 2: CH19_2440 MHz                                   | Mode 5: CH19_2440 MHz                        |
|                                      | Mode 3: CH39_2480 MHz                                   | Mode 6: CH38_2478 MHz                        |
| For AC Power-line Conducted Emission | N/A                                                     |                                              |

## 2.3. Block Diagram of Test System

### 2.3.1. For AC Power-Line Conducted Emission



### 2.3.2. For Radiated Spurious Emission



### 2.3.3. For Conducted Test



## 2.4. Description of Support Units

| NO. | Unit             | Brand  | Model | Description |
|-----|------------------|--------|-------|-------------|
| 1   | Laptop           | Lenovo | T480  | /           |
| 2   | USB serial cable | /      | /     | /           |

## 2.5. Test Software and Power Level

During the test, the channel and power control software provided by the customer is used to control the operation channel and output power level.

## 2.6. EUT Operating Conditions

For AC power-line conducted emission, the EUT was connected under the large package sizes transmission.

For radiated spurious emission and conducted test, the engineering test program was provided and make the EUT to continuous transmit/receive.

## 2.7. Equipment List

### 2.7.1. For AC Power-Line Conducted Emission

| Kind of Equipment      | Manufacturer | Type No.                  | Serial No. | equipment number | Calibrated until | Calibrated due until | Cal. Interval |
|------------------------|--------------|---------------------------|------------|------------------|------------------|----------------------|---------------|
| EMI Test Receiver      | R&S          | ESPI                      | 100679     | SHATBL-E012      | 2025.03.17       | 2026.03.16           | 1 year        |
| LISN                   | R&S          | ENV216                    | 101300     | SHATBL-E013      | 2025.03.17       | 2026.03.16           | 1 year        |
| LISN                   | R&S          | ENV216                    | 100333     | SHATBL-E041      | 2025.03.17       | 2026.03.16           | 1 year        |
| CE Cable               | Chuangcexing | 2M                        | EMI0014    | SHATBL-E014      | N/A              | N/A                  | N/A           |
| Temperature & Humidity | Deli         | Deli                      | EMI0015    | SHATBL-E015      | 2025.08.01       | 2026.07.31           | 1 year        |
| Testing Software       | FALA         | EZ-EMC(Ver.EMC-CON 3A1.1) | EMI0044    | SHATBL-E044      | N/A              | N/A                  | N/A           |

### 2.7.2. For Radiated Spurious Emission

| Kind of Equipment                   | Manufacturer | Type No.        | Serial No.       | equipment number | Calibrated until | Calibrated due until | Cal. Interval |
|-------------------------------------|--------------|-----------------|------------------|------------------|------------------|----------------------|---------------|
| Signal analyzer                     | Agilent      | N9020A          | MY50200811       | SHATBL-E017      | 2025.03.17       | 2026.03.16           | 1 year        |
| Amplifier                           | JPT          | JPA0118-55-303A | 1910001800055000 | SHATBL-E006      | 2025.03.24       | 2026.03.23           | 1 year        |
| Amplifier                           | JPT          | JPA-10M1G32     | 21010100035001   | SHATBL-E005      | 2025.03.17       | 2026.03.16           | 1 year        |
| Antenna/Turntable Controller        | Brilliant    | N/A             | N/A              | SHATBL-E007      | N/A              | N/A                  | N/A           |
| Loop Antenna(9kHz-30MHz)            | Daze         | ZN30900C        | 20077            | SHATBL-E042      | 2025.05.13       | 2026.05.12           | 1 year        |
| Bilog Antenna                       | SCHWARZBECK  | VULB 9168       | 01174            | SHATBL-E008      | 2025.05.20       | 2026.05.19           | 1 year        |
| Broad-band Horn Antenna             | SCHWARZBECK  | BBHA 9120D      | 02334            | SHATBL-E009      | 2025.05.20       | 2026.05.19           | 1 year        |
| Horn Antenna                        | COM-POWER    | AH-1840         | 10100008         | SHATBL-E043      | 2025.07.27       | 2026.07.26           | 1 year        |
| Thermometer                         | DeLi         | N/A             | N/A              | SHATBL-E015      | 2025.08.01       | 2026.07.31           | 1 year        |
| Test Software                       | FALA         | EMC-RI(Ver.4A2) | N/A              | N/A              | N/A              | N/A                  | N/A           |
| Wideband radio communication tester | R&S          | CMW500          | 101331           | SHATBL-W044      | 2025.07.28       | 2026.07.27           | 1 year        |
| Spectrum analyzer                   | R&S          | FSV40-N         | 101761           | SHATBL-W036      | 2025.07.28       | 2026.07.27           | 1 year        |

### 2.7.3. For Conducted Test

| Kind of Equipment                   | Manufacturer | Type No.     | Serial No.     | equipment number | Calibrated until | Calibrated due until | Cal. Interval |
|-------------------------------------|--------------|--------------|----------------|------------------|------------------|----------------------|---------------|
| Power sensor                        | DARE         | RPR3006 W    | 16I00054S N016 | SHATBL-W008      | 2025.07.28       | 2026.07.27           | 1 year        |
| Adjustable Attenuator               | Agilent      | 8494B        | MY421440 15    | SHATBL-W009      | 2025.07.28       | 2026.07.27           | 1 year        |
| Adjustable Attenuator               | Agilent      | 8496B        | MY421437 76    | SHATBL-W010      | 2025.07.28       | 2026.07.27           | 1 year        |
| Environmental Test Chamber          | KSON         | THS-B6C -150 | 9159K          | SHATBL-W019      | 2025.03.17       | 2026.03.16           | 1 year        |
| Signal analyzer                     | Keysight     | N9020A       | MY505101 36    | SHATBL-W003      | 2025.07.18       | 2026.07.17           | 1 year        |
| Vector signal generator             | Agilent      | N5182A       | MY481807 64    | SHATBL-W043      | 2025.07.18       | 2026.07.17           | 1 year        |
| Analog signal generator             | Keysight     | N5182B       | MY573001 96    | SHATBL-W005      | 2025.07.18       | 2026.07.17           | 1 year        |
| Wideband radio communication tester | R&S          | CMW500       | 101331         | SHATBL-W007      | 2025.07.28       | 2026.07.27           | 1 year        |
| Switch Box                          | Cesheng      | smu 1003     | WCS20221 215   | SHATBL-W046      | 2025.03.19       | 2026.03.18           | 1 year        |
| Thermometer                         | DeLi         | N/A          | N/A            | SHATBL-W011      | 2025.08.01       | 2026.07.31           | 1 year        |
| Test Software                       | Cesheng      | WCS-WC N     | N/A            | SHATBL-W021      | N/A              | N/A                  | N/A           |

Remark:

Calibration duration for above equipments is 1 year.

## 2.8. 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 %.

| No. | Item                               | Uncertainty          |
|-----|------------------------------------|----------------------|
| 1   | RF output power, conducted         | $\pm 0.958\text{dB}$ |
| 2   | Conducted spurious emissions       | $\pm 2.988\text{dB}$ |
| 3   | All emissions, radiated 30MHz-1GHz | $\pm 2.50\text{dB}$  |
| 4   | All emissions, radiated 1GHz-18GHz | $\pm 3.51\text{dB}$  |
| 5   | Occupied bandwidth                 | $\pm 23.20\text{Hz}$ |
| 6   | Power spectral density             | $\pm 0.886\text{dB}$ |

### 3. TEST RESULT

#### 3.1. Maximum Peak Conducted Output Power

##### 3.1.1. Limit

47 CFR 15.247(b)(3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

47 CFR 15.247(b)(4): If transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values by the amount in dB that the directional gain of the antenna exceeds 6dBi.

47 CFR 15.247(c)(1)(i): Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

##### 3.1.2. Test Procedure

ANSI C63.10-2020 clause 11.9.1: The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

1. Use the following spectrum analyzer settings:

- ① Set VBW  $\geq [3 \times \text{RBW}]$ .
- ② Set span  $\geq [3 \times \text{RBW}]$ .
- ③ Sweep time = No faster than coupled (auto) time
- ④ Detector = peak.
- ⑤ Trace mode = max-hold.

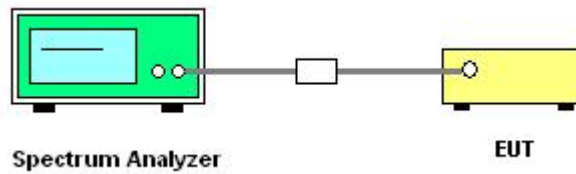
2. Allow trace to fully stabilize.

3. Use peak marker function to determine the peak amplitude level.

##### Remark:

A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

### 3.1.3. Test Setup



### 3.1.4. Test Result of Maximum Peak Conducted Output Power

Please refer to the Appendix A1.

### 3.2. Duty Cycle

#### 3.2.1. Limit

There is no limit requirement for Duty Cycle.

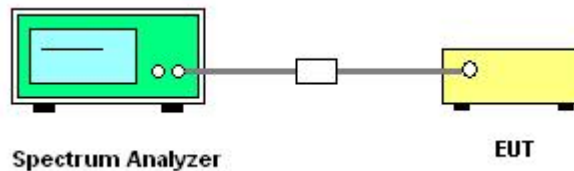
#### 3.2.2. Test Procedure

ANSI C63.10-2020 clause 11.6: Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

1. A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.
2. The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:

- ① Set the center frequency of the instrument to the center frequency of the transmission.
- ② Set  $RBW \geq OBW$  if possible; otherwise, set RBW to the largest available value.
- ③ Set  $VBW \geq RBW$ . Set detector = peak or average.
- ④ The zero-span measurement method shall not be used unless both RBW and VBW are  $> 50/T$  and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if  $T \leq 16.7 \mu s$ .)

#### 3.2.3. Test Setup



#### 3.2.4. Test Result of Duty Cycle

Please refer to the Appendix A2.

### 3.3. 6dB Bandwidth and 99% Bandwidth

#### 3.3.1. Limit

47 CFR 15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

There is no limit requirement for 99% Bandwidth.

#### 3.3.2. Test Procedure

1. The testing of 6dB Bandwidth follows ANSI C63.10-2020 clause 11.8.1: The steps for the first option are as follows:

- ① Set RBW=shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.
- ② Set the VBW  $\geq [3 \times \text{RBW}]$ .
- ③ Detector = peak.
- ④ Trace mode = max hold.
- ⑤ Sweep = No faster than coupled (auto) time.
- ⑥ Allow the trace to stabilize.
- ⑦ Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

2. The testing of 99% Bandwidth follows ANSI C63.10-2020 clause 6.9.3: The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

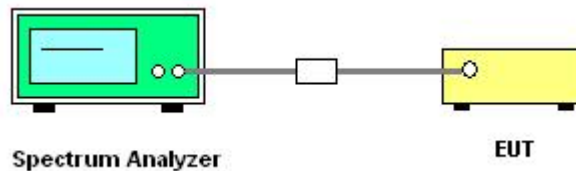
- ① The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- ② The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be at least three times the RBW, unless otherwise specified by the applicable requirement.
- ③ Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than  $[10 \log (\text{OBW}/\text{RBW})]$  below the reference level. Specific guidance is given in ANSI C63.10-2020 clause 4.1.5.2.
- ④ Step a) through step c) might require iteration to adjust within the specified range.
- ⑤ Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- ⑥ Use the 99% power bandwidth function of the instrument (if available) and report the

measured bandwidth.

⑦ If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

⑧ The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

### 3.3.3. Test Setup



### 3.3.4. Test Result of 6dB Bandwidth and 99% Bandwidth

Please refer to the Appendix A3.

### 3.4. Power Spectral Density

#### 3.4.1. Limit

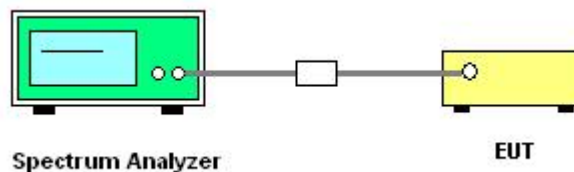
47 CFR 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

#### 3.4.2. Test Procedure

ANSI C63.10-2020 clause 11.10.2: The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to  $3\text{ kHz} < \text{RBW} \leq 100\text{ kHz}$ .
4. Set the VBW  $\geq [3 \times \text{RBW}]$ .
5. Detector = peak.
6. Sweep time = No faster than coupled (auto) time.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

#### 3.4.3. Test Setup



#### 3.4.4. Test Result of Power Spectral Density

Please refer to the Appendix A4.

### 3.5. Conducted Band Edge

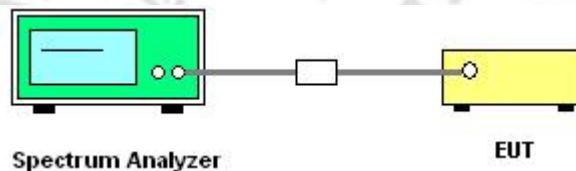
#### 3.5.1. Limit

47 CFR 15.247(d): 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.

#### 3.5.2. Test Procedure

1. The testing follows ANSI C63.10-2020 clause 11.12.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Conducted Band Edge measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the 100 kHz bandwidth within the band that contains the highest level of the desired power when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
4. Measure and record the results in the test report.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

#### 3.5.3. Test Setup



#### 3.5.4. Test Result of Conducted Band Edge

Please refer to the Appendix A5.

### 3.6. Conducted Spurious Emission

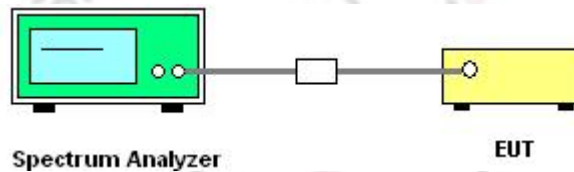
#### 3.6.1. Limit

47 CFR 15.247(d): 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.

#### 3.6.2. Test Procedure

1. The testing follows ANSI C63.10-2020 clause 7.8.8.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

#### 3.6.3. Test Setup



#### 3.6.4. Test Result of Conducted Spurious Emission

Please refer to the Appendix A6.

### 3.7. Radiated Spurious Emission and Restricted Band

#### 3.7.1. Limit

47 CFR 15.247(d): 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.

47 CFR 15.205(a): Only spurious emissions are permitted in any of the frequency bands listed below:

| Frequency (MHz) | Frequency (MHz)   | Frequency (MHz)     | Frequency (MHz) | Frequency (GHz) |
|-----------------|-------------------|---------------------|-----------------|-----------------|
| 0.090-0.110     | 12.29-12.293      | 149.9-150.05        | 1660-1710       | 8.025-8.5       |
| 0.495-0.505     | 12.51975-12.52025 | 156.52475-156.52525 | 1718.8-1722.2   | 9.0-9.2         |
| 2.1735-2.1905   | 12.57675-12.57725 | 156.7-156.9         | 2200-2300       | 9.3-9.5         |
| 4.125-4.128     | 13.36-13.41       | 162.0125-167.17     | 2310-2390       | 10.6-12.7       |
| 4.17725-4.17775 | 16.42-16.423      | 167.72-173.2        | 2483.5-2500     | 13.25-13.4      |
| 4.20725-4.20775 | 16.69475-16.69525 | 240-285             | 2690-2900       | 14.47-14.5      |
| 6.215-6.218     | 16.80425-16.80475 | 322-335.4           | 3260-3267       | 15.35-16.2      |
| 6.26775-6.26825 | 25.5-25.67        | 399.9-410           | 3332-3339       | 17.7-21.4       |
| 6.31175-6.31225 | 37.5-38.25        | 608-614             | 3345.8-3358     | 22.01-23.12     |
| 8.291-8.294     | 73-74.6           | 960-1240            | 3600-4400       | 23.6-24.0       |
| 8.362-8.366     | 74.8-75.2         | 1300-1427           | 4500-5150       | 31.2-31.8       |
| 8.37625-8.38675 | 108-121.94        | 1435-1626.5         | 5350-5460       | 36.43-36.5      |
| 8.41425-8.41475 | 123-138           | 1645.5-1646.5       | 7250-7750       | Above 38.6      |

47 CFR 15.209(a): The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

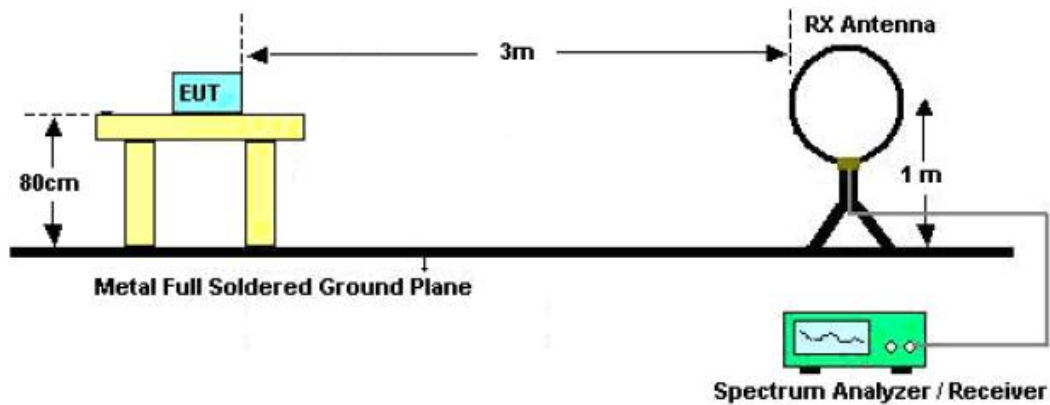
| Frequency (MHz) | Field strength (microvolts/meter) | Measurement distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009-0.490     | 2400/F(kHz)                       | 300                           |
| 0.490-1.705     | 24000/F(kHz)                      | 30                            |
| 1.705-30.0      | 30                                | 30                            |
| 30-88           | 100                               | 3                             |
| 88-216          | 150                               | 3                             |
| 216-960         | 200                               | 3                             |
| Above 960       | 500                               | 3                             |

### 3.7.2. Test Procedure

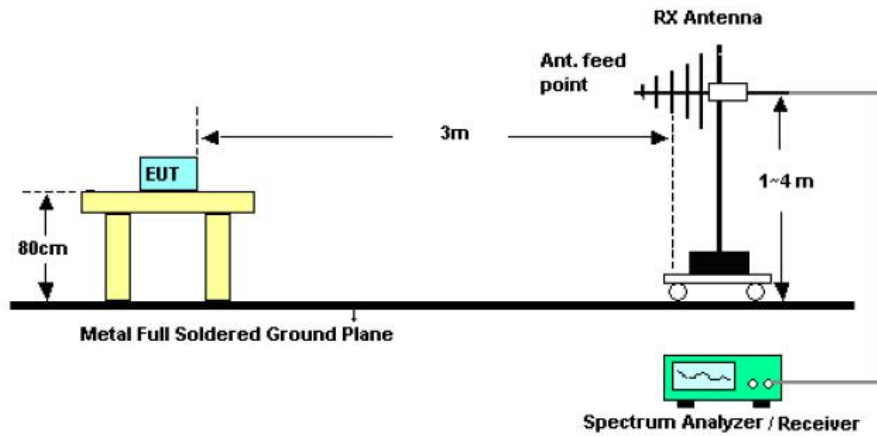
1. The testing follows ANSI C63.10-2020 clause 11.11 & 11.12.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Pre-amp Factor = Level.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
  - ① Span shall wide enough to fully capture the emission being measured;
  - ② When frequency < 1 GHz:
    - Set RBW=100 kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - ③ When frequency ≥ 1 GHz:
    - Set RBW = 1 MHz; VBW = 3 MHz for peak measurement;
    - Set RBW = 1 MHz; VBW = 10 Hz, when duty cycle is no less than 98 percent or VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### 3.7.3. Test Setup

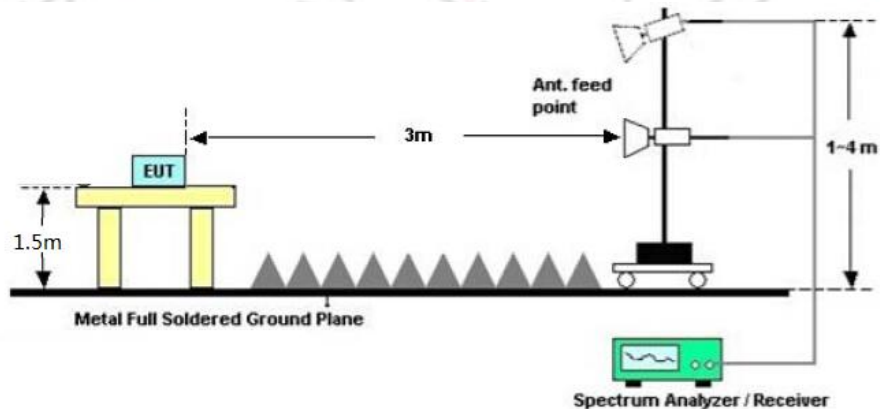
#### 3.7.3.1. For radiated emissions below 30MHz



#### 3.7.3.2. For radiated emissions from 30MHz to 1GHz



#### 3.7.3.3. For radiated emissions above 1GHz



#### 3.7.4. Test Result of Radiated Spurious Emission and Restricted Band

Note:

For 9 kHz ~ 30 MHz

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

For 1 GHz ~ 18GHz:

1.The all data rate modes had been test, but only worse test data was recorded in the test report.

2.In frequency ranges 18 ~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report. No any other emissions level which are attenuated less than 20dB below the limit. No recording in the test report.

3.We used the filter to test and the main frequency was filtered out.

Please refer to the Appendix A7.

### 3.8. AC Power-Line Conducted Emission

#### 3.8.1. Limit

47 CFR 15.207(a): For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table:

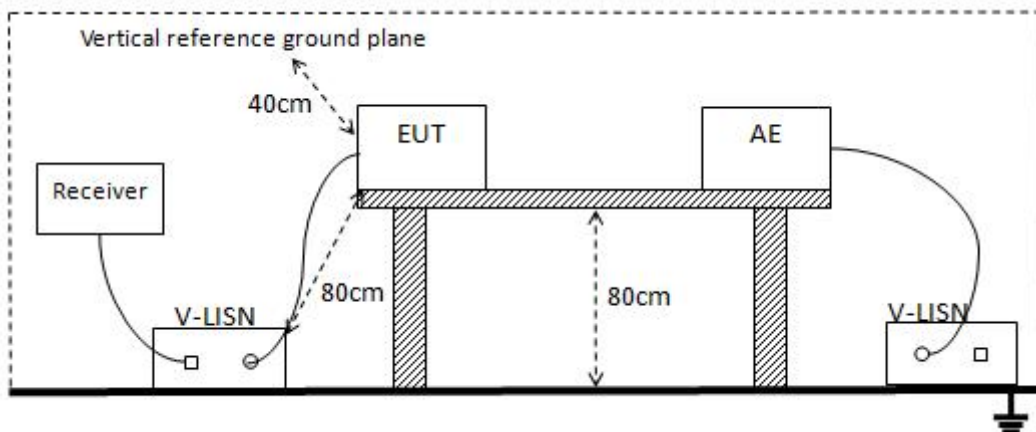
| Frequency of emission (MHz) | Conducted limit (dBμV) |           |
|-----------------------------|------------------------|-----------|
|                             | Quasi-peak             | Average   |
| 0.15-0.5                    | 66 to 56*              | 56 to 46* |
| 0.5-5                       | 56                     | 46        |
| 5-30                        | 60                     | 50        |

\*Decreases with the logarithm of the frequency.

#### 3.8.2. Test Procedure

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

#### 3.8.3. Test Setup



#### 3.8.4. Test Result of AC Power-Line Conducted Emission

Note: EUT is only power by battery, So it is not applicable for this test.

### **3.9. Antenna Requirement**

#### **3.9.1. Standard Requirement**

According to 47 CFR 15.203, 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.

#### **3.9.2. EUT Antenna**

The antenna used for the EUT is PCB Antenna, which meets the antenna requirements.

## **4. TEST SETUP PHOTOGRAPHS**

Please refer to the Appendix F.

## **5. EXTERNAL PHOTOS OF THE EUT**

External Please refer to the Appendix G.

Internal Please refer to the Appendix H.

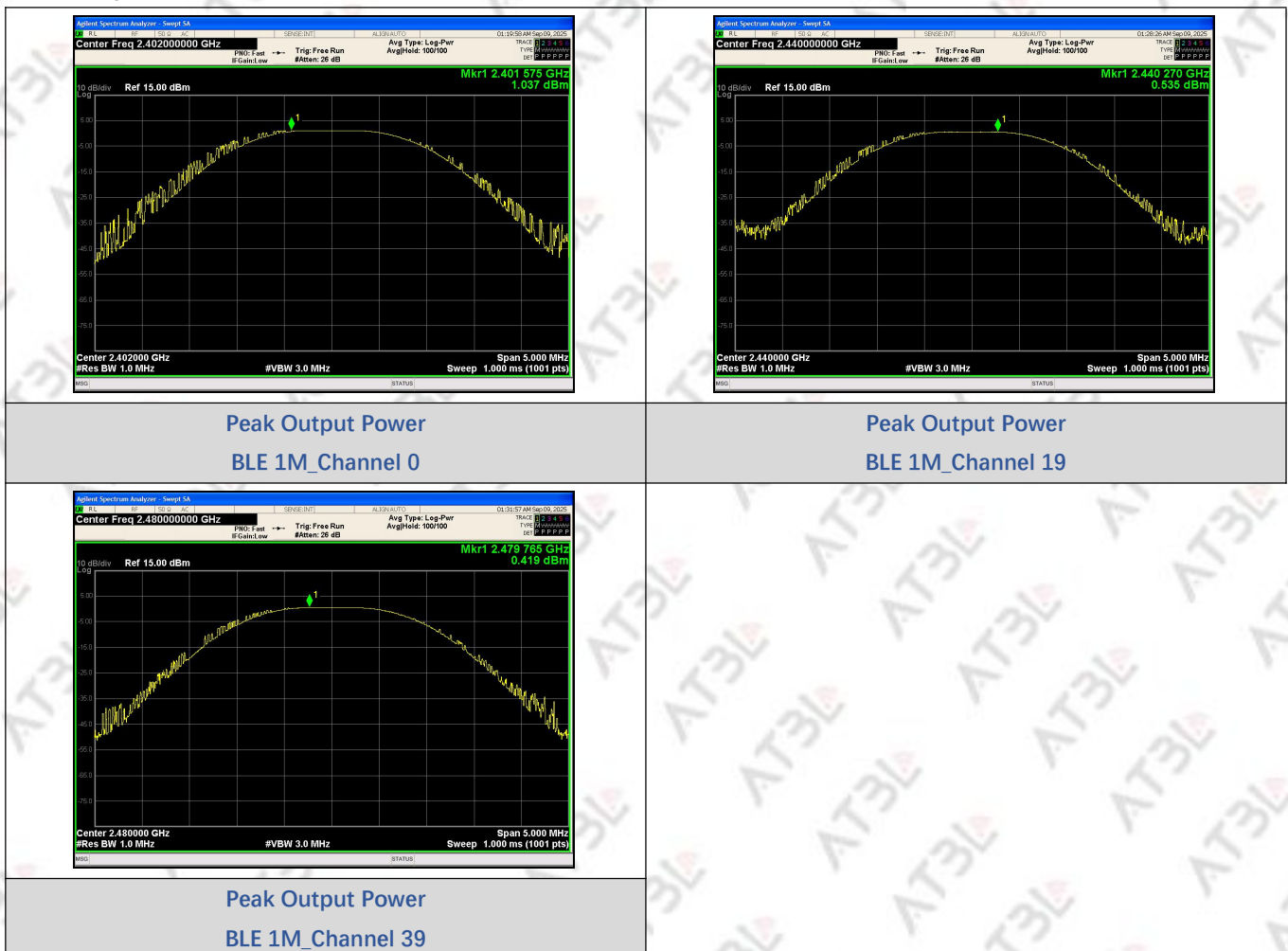
## 6.Appendix A of data

### A1.Conducted Peak Output Power

#### Test Result

| Mode   | Channel | Peak Output Power (dBm) | Peak Output Power (mW) | Limit (dBm) | Result |
|--------|---------|-------------------------|------------------------|-------------|--------|
| BLE 1M | 0       | 1.04                    | 1.27                   | ≤30         | PASS   |
|        | 19      | 0.54                    | 1.13                   | ≤30         | PASS   |
|        | 39      | 0.42                    | 1.1                    | ≤30         | PASS   |

#### Test Graphs

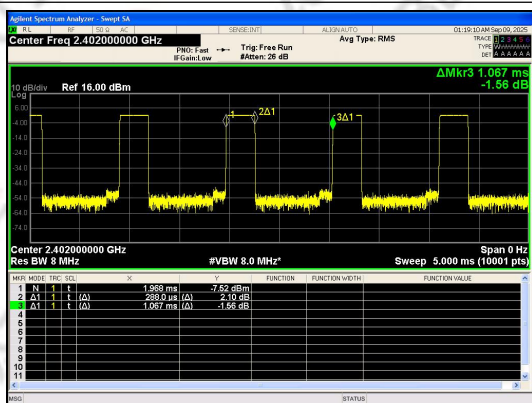


## A2.Duty Cycle

### Test Result

| Mode   | Channel | On Time (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle (linear) | Duty Cycle Factor (dB) |
|--------|---------|--------------|-------------|----------------|---------------------|------------------------|
| BLE 1M | 0       | 0.288        | 1.067       | 26.99          | 0.2699              | 5.688                  |
|        | 19      | 0.288        | 1.067       | 26.99          | 0.2699              | 5.688                  |
|        | 39      | 0.288        | 1.066       | 27.00          | 0.2700              | 5.6864                 |

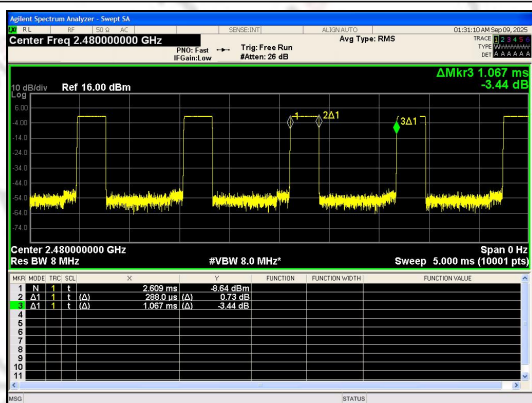
### Test Graphs



BLE 1M\_Channel 0



BLE 1M\_Channel 19



BLE 1M\_Channel 39

## A3.6dB Bandwidth and 99% Bandwidth

Test Result for 6dB Bandwidth:

| Mode   | Channel | Center Frequency (MHz) | 6 dB Bandwidth (MHz) | Limit (MHz) | Result |
|--------|---------|------------------------|----------------------|-------------|--------|
| BLE 1M | 0       | 2402                   | 0.6393               | ≥0.5        | PASS   |
|        | 19      | 2440                   | 0.6417               |             | PASS   |
|        | 39      | 2480                   | 0.6395               |             | PASS   |

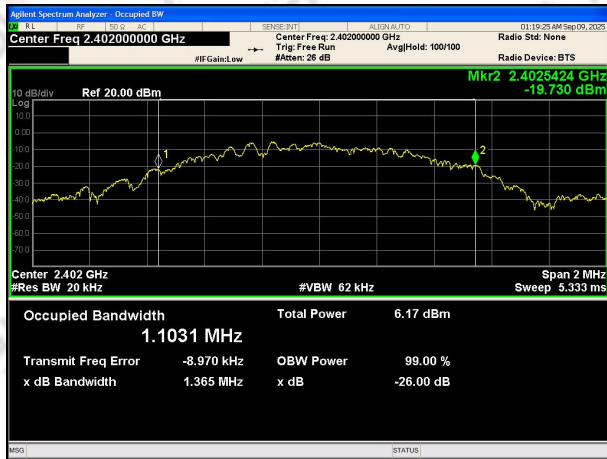
## Test Graphs



Test Result for 99% Bandwidth:

| Mode   | Channel | Center Frequency (MHz) | 99% BW (MHz) |
|--------|---------|------------------------|--------------|
| BLE 1M | 0       | 2402                   | 1.1031       |
|        | 19      | 2440                   | 1.0650       |
|        | 39      | 2480                   | 1.0607       |

## Test Graphs



BLE 1M\_Channel 0



BLE 1M\_Channel 19



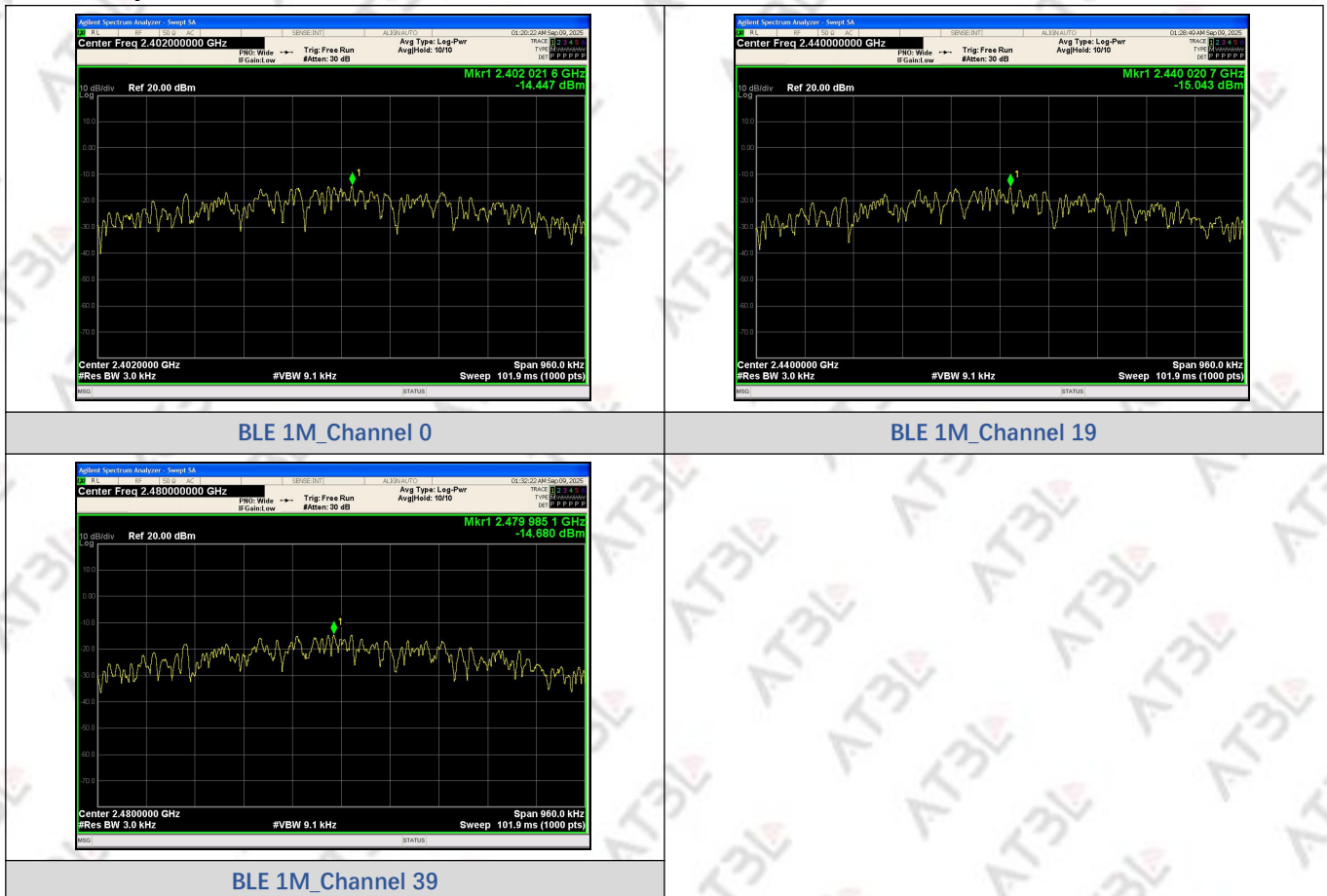
BLE 1M\_Channel 39

## A4.Power Spectral Density

### Test Result

| Mode   | Channel | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|--------|---------|----------------|------------------|--------|
| BLE 1M | 0       | -14.450        | ≤8               | PASS   |
|        | 19      | -15.040        |                  | PASS   |
|        | 39      | -14.680        |                  | PASS   |

### Test Graphs

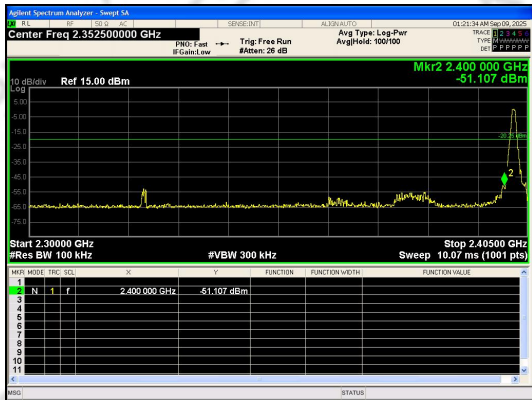
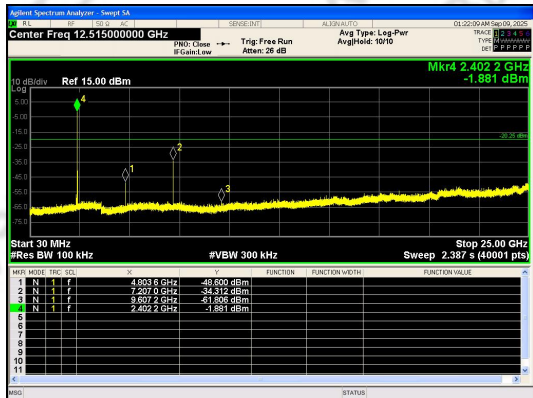


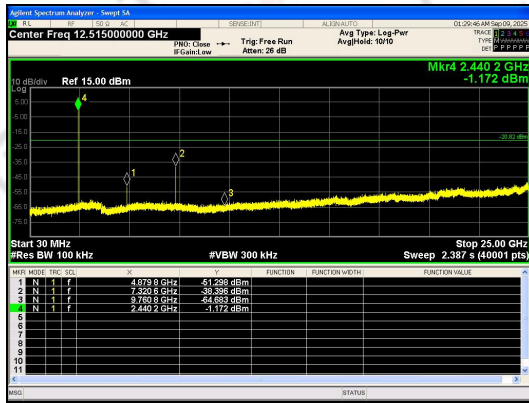
## A5.Conducted Band Edge and Spurious Emission

### Test Result

| Mode   | Channel | OOB Emission Frequency (MHz) | OOB Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result |
|--------|---------|------------------------------|--------------------------|-------------|-----------------|--------|
| BLE 1M | 0       | 2400.00                      | -51.110                  | -20.25      | -30.860         | PASS   |
|        |         | 4803.64                      | -48.600                  | -20.25      | -28.350         | PASS   |
|        |         | 7207.00                      | -34.312                  | -20.25      | -14.062         | PASS   |
|        |         | 9607.24                      | -61.806                  | -20.25      | -41.556         | PASS   |
|        | 19      | 4879.80                      | -51.298                  | -20.82      | -30.478         | PASS   |
|        |         | 7320.62                      | -38.396                  | -20.82      | -17.576         | PASS   |
|        |         | 9760.81                      | -64.683                  | -20.82      | -43.863         | PASS   |
|        | 39      | 2483.50                      | -57.930                  | -20.78      | -37.150         | PASS   |
|        |         | 4960.33                      | -53.815                  | -20.78      | -33.035         | PASS   |
|        |         | 7439.22                      | -37.605                  | -20.78      | -16.825         | PASS   |
|        |         | 9921.87                      | -62.665                  | -20.78      | -41.885         | PASS   |

### Test Graphs

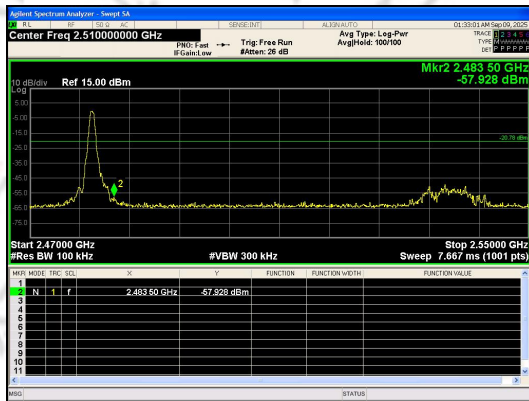
|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| In-Band Reference Level<br>BLE 1M_Channel 0                                         | Out Of Band Emission<br>BLE 1M_Channel 0                                             |
|  |  |
| 30.0 MHz - 25000.0 MHz<br>BLE 1M_Channel 0                                          | In-Band Reference Level<br>BLE 1M_Channel 19                                         |



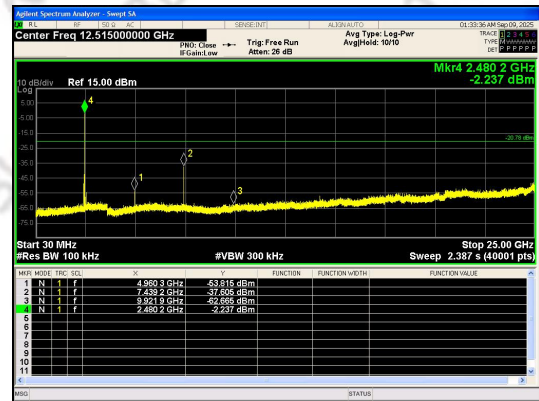
30.0 MHz - 25000.0 MHz  
BLE 1M\_Channel 19



In-Band Reference Level  
BLE 1M\_Channel 39



Out Of Band Emission  
BLE 1M\_Channel 39



30.0 MHz - 25000.0 MHz  
BLE 1M\_Channel 39

## A6.Radiated Spurious Emission and Restricted Band

### Test Result

#### Test Result for Radiated Spurious Emission:

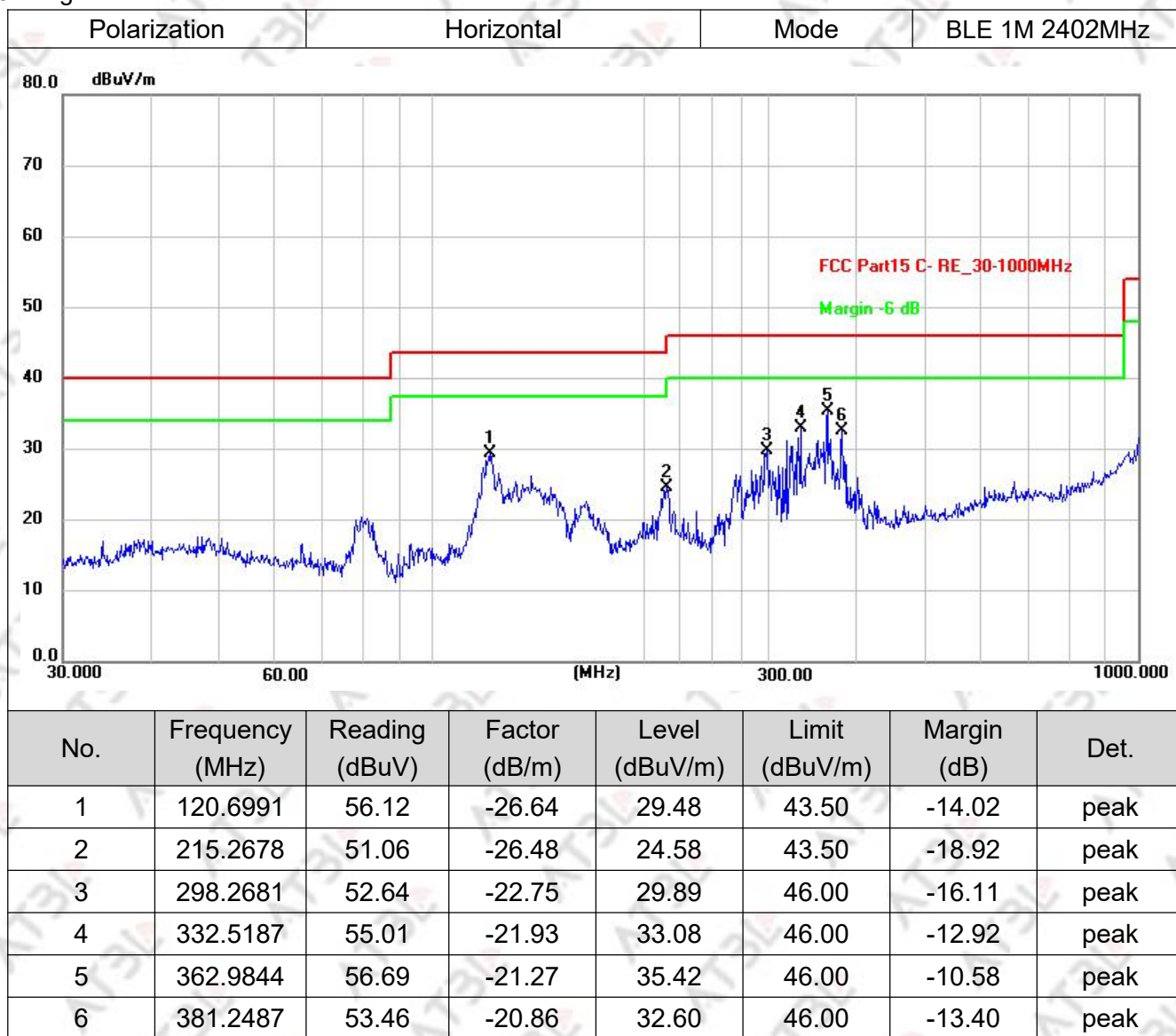
For 9 kHz ~ 30 MHz

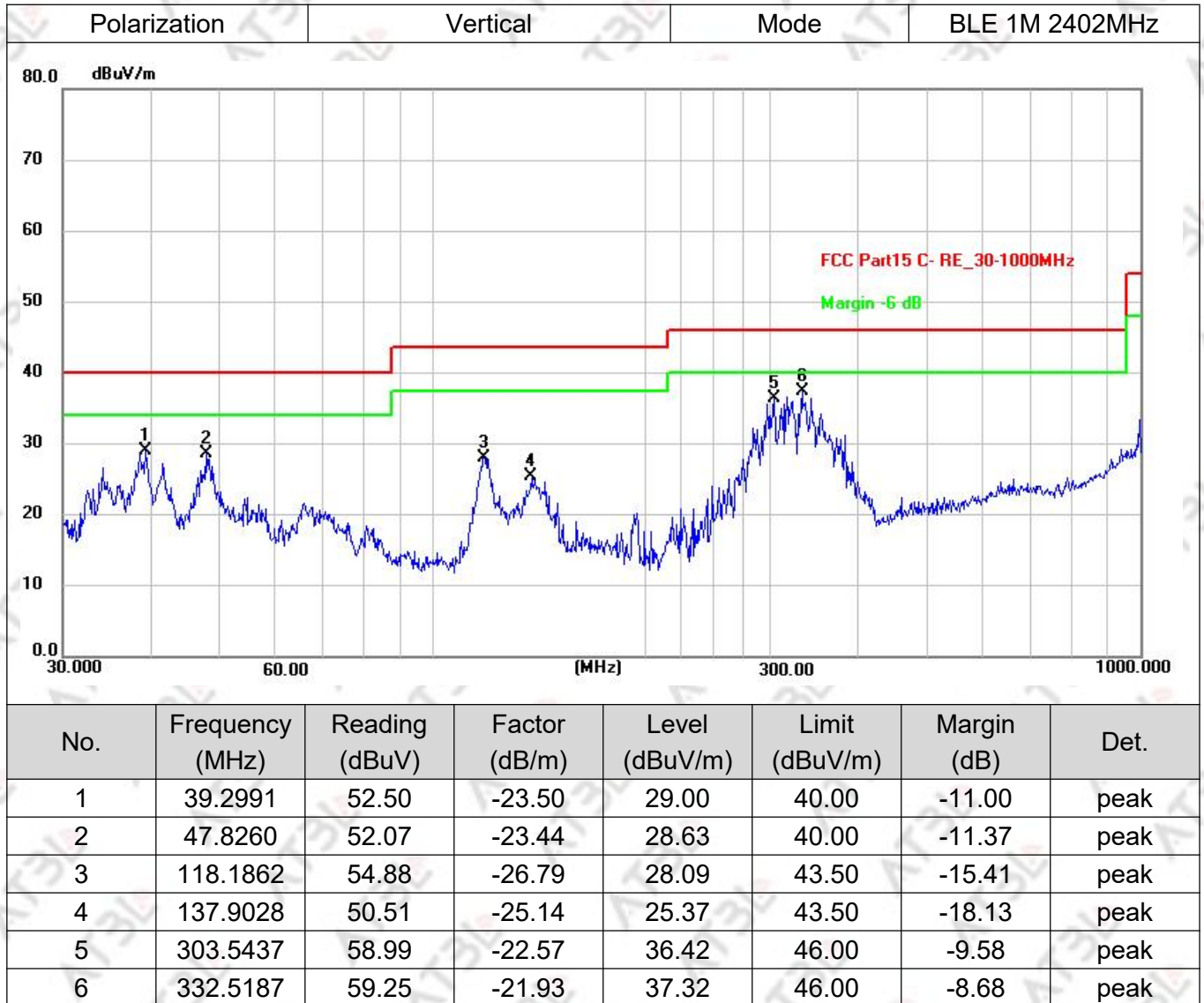
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

For 30 MHz ~ 1 GHz:

Note:

- 1.All modes have been tested, only worst case(BLE 1M 2402MHz )mode was recorded in the test report.
- 2.Emission Level = Reading Value + Correction Factor.
- 3.Correction Factor= Antenna Factor+ Cable Factor-Amplifier Gain.
- 4.The emission levels of other frequencies were less than 20dB margin against the limit.
- 5.Margin value = Emission level-Limit value.

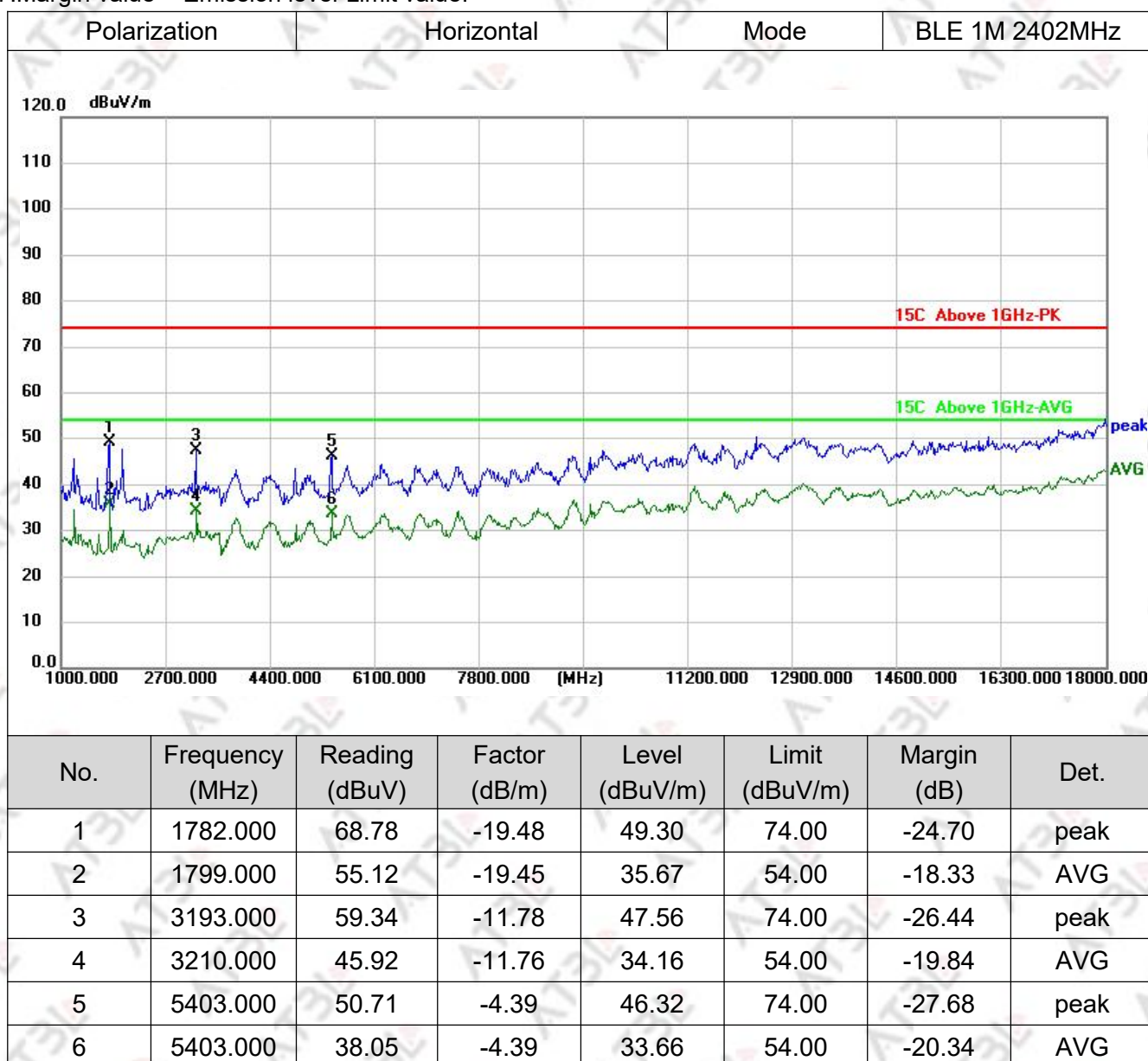


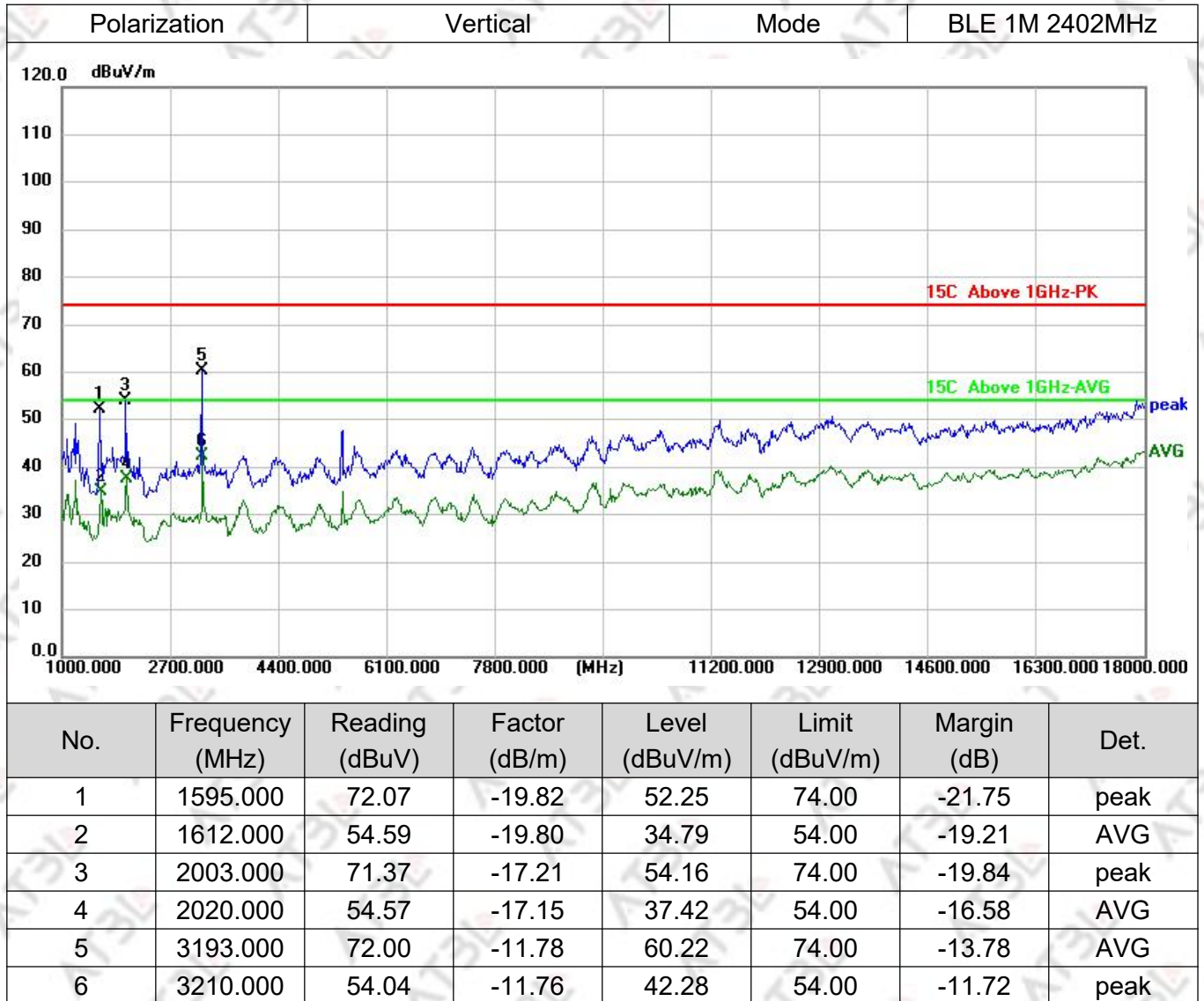


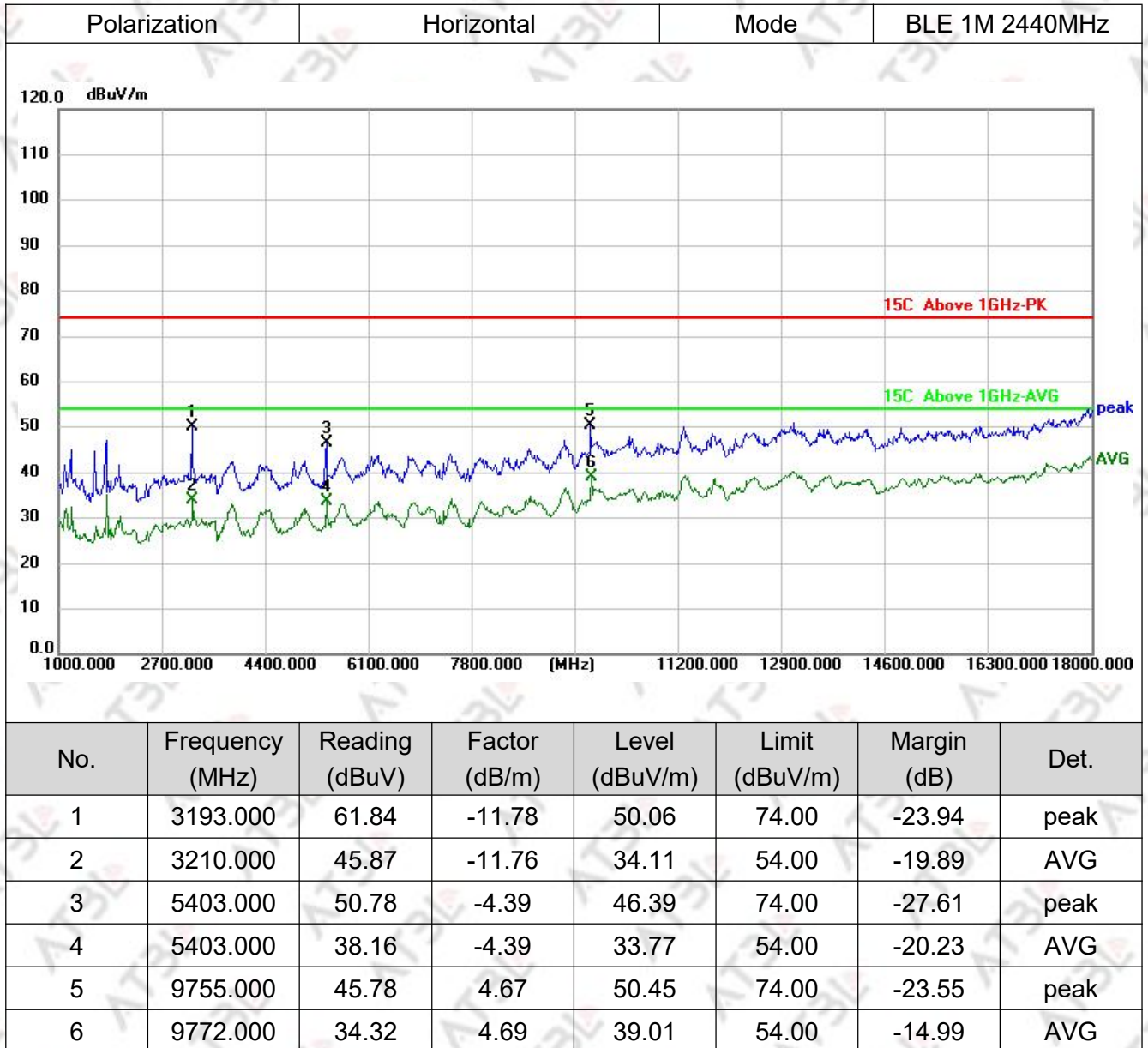
For 1 GHz ~ 18GHz:

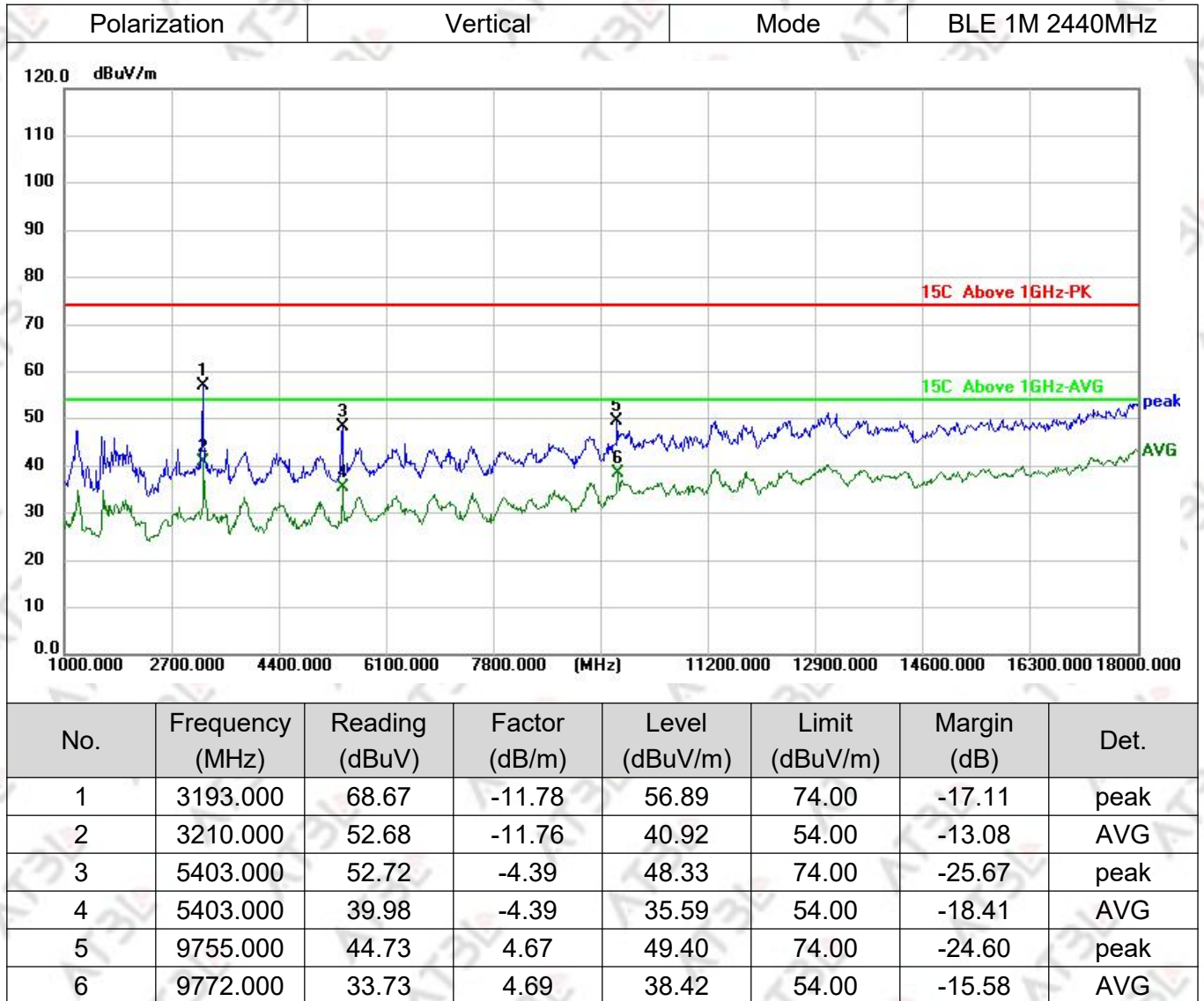
Note:

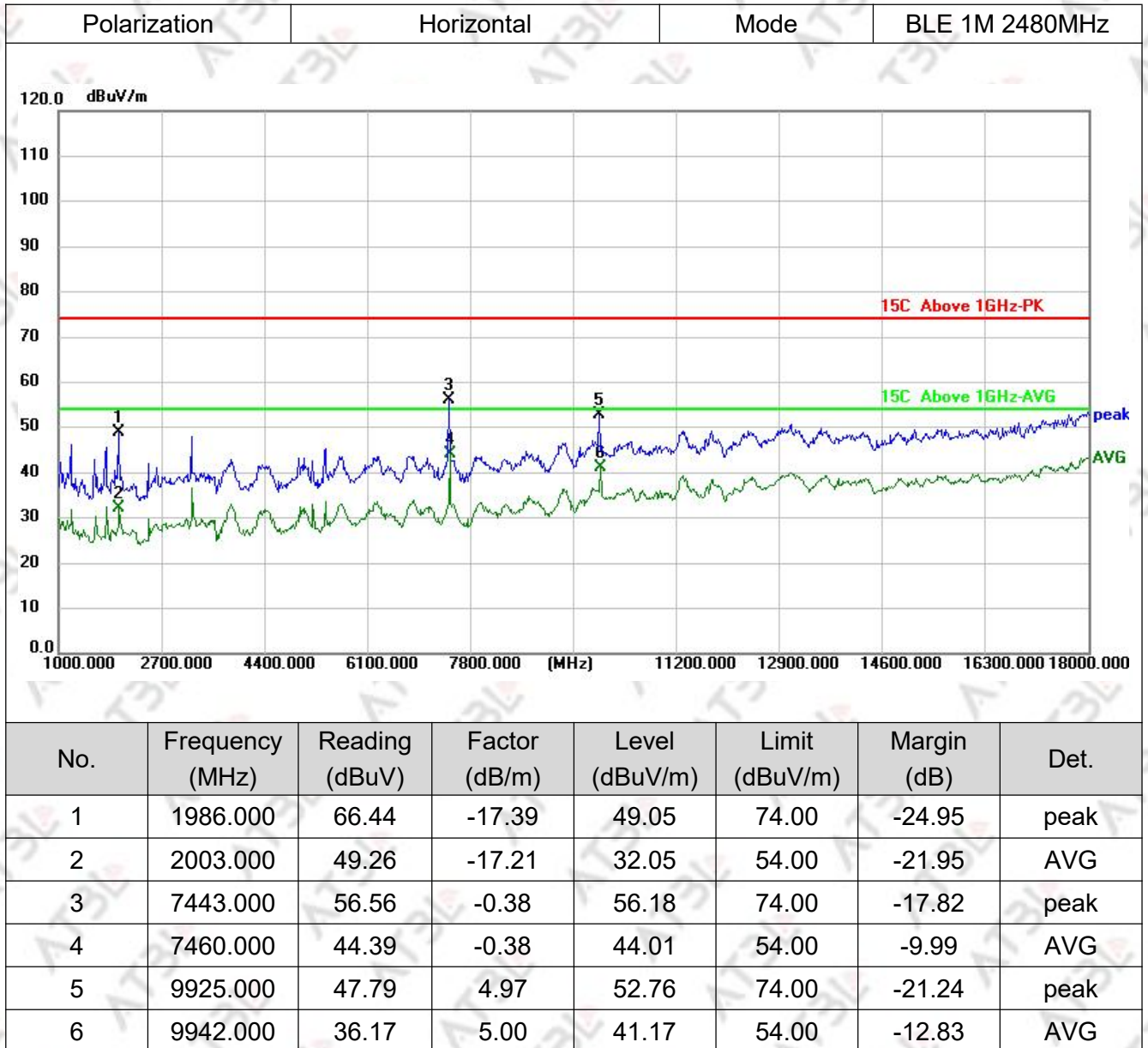
- 1.The all data rate modes had been test, but only worse test data was recorded in the test report.
- 2.In frequency ranges 18 ~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report. No any other emissions level which are attenuated less than 20dB below the limit. No recording in the test report.
- 3.We used the filter to test and the main frequency was filtered out.
- 4.Emission Level= Reading Value+ Correction Factor.
- 5.Correction Factor= Antenna Factor+ Cable Factor-Amplifier Gain.
- 6.The emission levels of other frequencies were less than 20dB margin against the limit.
- 7.Margin value = Emission level-Limit value.

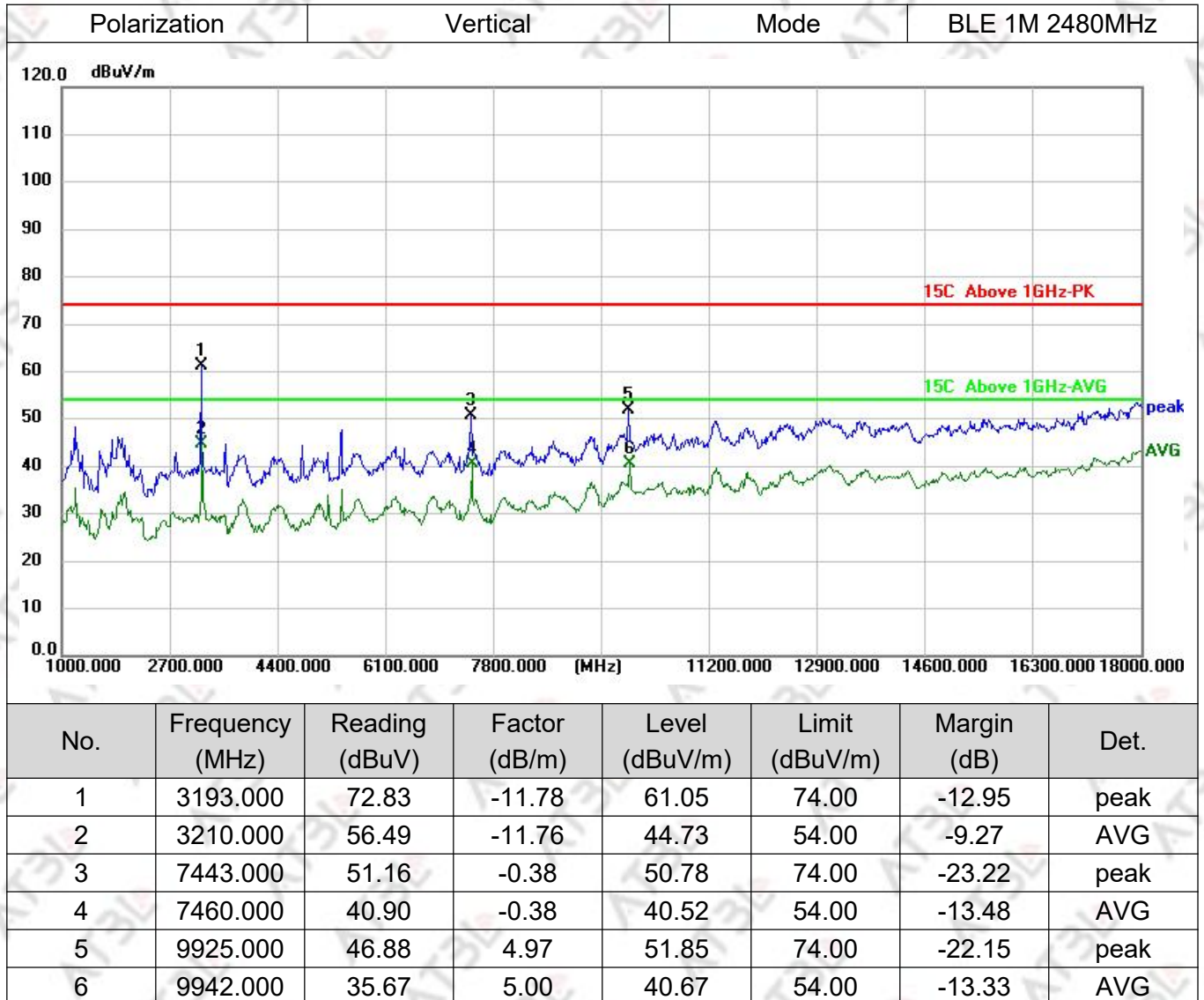












**Test Result of Restricted Band:**

Note:

- 1.All data rate modes had been test, only worst case mode was recorded in the test report.
- 2.Emission Level= Reading Value+ Correction Factor.
- 3.Correction Factor= Antenna Factor+ Cable Factor-Amplifier Gain.
- 4.Margin value = Emission level-Limit value.

| Test Mode: BLE1M                                             |                |             |                |                |             |          |        |
|--------------------------------------------------------------|----------------|-------------|----------------|----------------|-------------|----------|--------|
| Test Channel: Lowest channel, Test Polarization: Vertical    |                |             |                |                |             |          |        |
| Frequency (MHz)                                              | Reading (dBμV) | Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Result |
| 2310.000                                                     | 55.51          | -16.09      | 39.42          | 74.00          | -34.58      | peak     | Pass   |
| 2310.000                                                     | 45.24          | -16.09      | 29.15          | 54.00          | -24.85      | AVG      | Pass   |
| 2390.000                                                     | 59.98          | -15.88      | 44.10          | 74.00          | -29.90      | peak     | Pass   |
| 2390.000                                                     | 46.21          | -15.88      | 30.33          | 54.00          | -23.67      | AVG      | Pass   |
| Test Channel: Lowest channel, Test Polarization: Horizontal  |                |             |                |                |             |          |        |
| Frequency (MHz)                                              | Reading (dBμV) | Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Result |
| 2310.000                                                     | 54.94          | -16.09      | 38.85          | 74.00          | -35.15      | peak     | Pass   |
| 2310.000                                                     | 44.16          | -16.09      | 28.07          | 54.00          | -25.93      | AVG      | Pass   |
| 2390.000                                                     | 54.92          | -15.88      | 39.04          | 74.00          | -34.96      | peak     | Pass   |
| 2390.000                                                     | 44.34          | -15.88      | 28.46          | 54.00          | -25.54      | AVG      | Pass   |
| Test Channel: Highest channel, Test Polarization: Vertical   |                |             |                |                |             |          |        |
| Frequency (MHz)                                              | Reading (dBμV) | Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Result |
| 2483.500                                                     | 57.73          | -15.30      | 42.43          | 74.00          | -31.57      | peak     | Pass   |
| 2483.500                                                     | 45.39          | -15.30      | 30.09          | 54.00          | -23.91      | AVG      | Pass   |
| 2500.000                                                     | 55.54          | -15.19      | 40.35          | 74.00          | -33.65      | peak     | Pass   |
| 2500.000                                                     | 45.23          | -15.19      | 30.04          | 54.00          | -23.96      | AVG      | Pass   |
| Test Channel: Highest channel, Test Polarization: Horizontal |                |             |                |                |             |          |        |
| Frequency (MHz)                                              | Reading (dBμV) | Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Result |
| 2483.500                                                     | 61.28          | -15.30      | 45.98          | 74.00          | -28.02      | peak     | Pass   |
| 2483.500                                                     | 48.01          | -15.30      | 32.71          | 54.00          | -21.29      | AVG      | Pass   |
| 2500.000                                                     | 54.39          | -15.19      | 39.20          | 74.00          | -34.80      | peak     | Pass   |
| 2500.000                                                     | 43.94          | -15.19      | 28.75          | 54.00          | -25.25      | AVG      | Pass   |

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