

TEST REPORT

Product : seed studio reCamera 2002 Series
Trade mark : Seed Studio
Model/Type reference : See section 4.2
Serial Number : N/A
Report Number : EED32Q81957301
FCC ID : Z4T-RECAMERA2002W
Date of Issue : Dec. 19, 2024
Test Standards : 47 CFR Part 15 Subpart C
Test result : PASS

Prepared for:

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Check No.: 9744271124



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2 Version

| Version No. | Date | Description |
|-------------|---------------|-------------|
| 00 | Dec. 19, 2024 | Original |
| | | |
| | | |

3 Test Summary

| Test Item | Test Requirement | Result |
|---|--|--------|
| Antenna Requirement | 47 CFR Part 15 Subpart C Section 15.203/15.247 (c) | PASS |
| AC Power Line Conducted Emission | 47 CFR Part 15 Subpart C Section 15.207 | PASS |
| DTS Bandwidth | 47 CFR Part 15 Subpart C Section 15.247 (a)(2) | NOTE |
| Maximum Conducted Output Power | 47 CFR Part 15 Subpart C Section 15.247 (b)(3) | NOTE |
| Maximum Power Spectral Density | 47 CFR Part 15 Subpart C Section 15.247 (e) | NOTE |
| Band Edge Measurements | 47 CFR Part 15 Subpart C Section 15.247(d) | NOTE |
| Conducted Spurious Emissions | 47 CFR Part 15 Subpart C Section 15.247(d) | NOTE |
| Radiated Spurious Emission & Restricted bands | 47 CFR Part 15 Subpart C Section 15.205/15.209 | PASS |

Remark:

NOTE: The test data refer to the report of No.RFBECO-WTW-P22120330-3.(The module's FCC ID:TLZ-AM497617)

Company Name and Address shown on Report, the sample(s) and sample Information were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.

Model No.: reCamera 2002w 64GB, reCamera 2002w 8GB, reCamera Core 2002w 64GB, reCamera Core 2002w 8GB

Only the model reCamera Core 2002w 64GB was tested. The following description shows the difference between each model and the reCamera 2002w 64GB.

| Model | EMMC | Difference description |
|--------------------------|------|--|
| reCamera 2002w 64GB | 64GB | Normal |
| reCamera 2002w 8GB | 8GB | The emmc sizes are different |
| reCamera Core 2002w 64GB | 64GB | No lens board and interface board and supporting structural parts |
| reCamera Core 2002w 8GB | 8GB | The emmc sizes are different and no lens board and interface board and supporting structural parts |

4 General Information

4.1 Client Information

| | |
|--------------------------|---|
| Applicant: | Seeed Technology Co., Ltd |
| Address of Applicant: | 9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen |
| Manufacturer: | Seeed Technology Co., Ltd |
| Address of Manufacturer: | 9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen |
| Factory: | Shenzhen Xinxian Technology Co.,Limited |
| Address of Factory: | F5, Building B17, Hengfeng Industrial City, No. 739 Zhoushi Rd, Baoan District, Shenzhen, Guangdong, P.R.C. |

4.2 General Description of EUT

| | | |
|-----------------------|--|---------|
| Product Name: | seeed studio reCamera 2002 Series | |
| Model No.: | reCamera 2002w 64GB, reCamera 2002w 8GB, reCamera Core 2002w 64GB, reCamera Core 2002w 8GB | |
| Test Model No.: | reCamera Core 2002w 64GB | |
| Trade mark: | Seeed Studio | |
| Product Type: | <input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fixed Location | |
| Operation Frequency: | 2402MHz~2480MHz | |
| Modulation Type: | GFSK | |
| Transfer Rate: | <input checked="" type="checkbox"/> 1Mbps <input checked="" type="checkbox"/> 2Mbps | |
| Number of Channel: | 40 | |
| Antenna Type: | PIFA antenna | |
| Antenna Gain: | -1.06dBi | |
| Power Supply: | USB port: | DC 5.0V |
| Test Voltage: | DC 5.0V | |
| Sample Received Date: | Dec. 03, 2024 | |
| Sample tested Date: | Dec. 03, 2024 to Dec. 13, 2024 | |

| Operation Frequency each of channel | | | | | | | |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| 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 |

Note:

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

| Channel | Frequency |
|----------------------------|-----------|
| The lowest channel (CH0) | 2402MHz |
| The middle channel (CH19) | 2440MHz |
| The highest channel (CH39) | 2480MHz |

4.3 Test Configuration

| EUT Test Software Settings: | | | | |
|---|------------|---|---------|----------------|
| Test Software: | | MobaXterm_Personal_22.1.exe | | |
| EUT Power Grade: | | Default (Power level is built-in set parameters and cannot be changed and selected) | | |
| Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT. | | | | |
| Test Mode | Modulation | Rate | Channel | Frequency(MHz) |
| Mode a | GFSK | 1Mbps | CH0 | 2402 |
| Mode b | GFSK | 1Mbps | CH19 | 2440 |
| Mode c | GFSK | 1Mbps | CH39 | 2480 |
| Mode d | GFSK | 2Mbps | CH0 | 2402 |
| Mode e | GFSK | 2Mbps | CH19 | 2440 |
| Mode f | GFSK | 2Mbps | CH39 | 2480 |

4.4 Test Environment

| Operating Environment: | |
|------------------------------|------------|
| Radiated Spurious Emissions: | |
| Temperature: | 22~25.0 °C |
| Humidity: | 50~55 % RH |
| Atmospheric Pressure: | 1010mbar |
| Conducted Emissions: | |
| Temperature: | 22~25.0 °C |
| Humidity: | 50~55 % RH |
| Atmospheric Pressure: | 1010mbar |
| RF Conducted: | |
| Temperature: | 22~25.0 °C |
| Humidity: | 50~55 % RH |
| Atmospheric Pressure: | 1010mbar |

4.5 Description of Support Units

The EUT has been tested with associated equipment below.

1) support equipment

| Description | Manufacturer | Model No. | Certification | Supplied by |
|-------------|--------------|-----------------|---------------|-------------|
| Netbook | HP | DESKTOP-H31GDCQ | FCC&CE | CTI |
| AC adapter | MI | MDY-14-EU | FCC&CE | CTI |

4.6 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax: +86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

4.7 Measurement Uncertainty (95% confidence levels, k=2)

| No. | Item | Measurement Uncertainty |
|-----|---------------------------------|-------------------------|
| 1 | Radio Frequency | 7.9×10^{-8} |
| 2 | RF power, conducted | 0.46dB (30MHz-1GHz) |
| | | 0.55dB (1GHz-40GHz) |
| 3 | Radiated Spurious emission test | 3.3dB (9kHz-30MHz) |
| | | 4.3dB (30MHz-1GHz) |
| | | 4.5dB (1GHz-18GHz) |
| | | 3.4dB (18GHz-40GHz) |
| 4 | Conduction emission | 3.5dB (9kHz to 150kHz) |
| | | 3.1dB (150kHz to 30MHz) |
| 5 | Temperature test | 0.64°C |
| 6 | Humidity test | 3.8% |
| 7 | DC power voltages | 0.026% |

5 Equipment List

| Conducted disturbance Test | | | | | |
|---------------------------------|--------------|-----------|---------------|--------------------------|----------------------------|
| Equipment | Manufacturer | Model No. | Serial Number | Cal. date (mm-dd-yyyy) | Cal. Due date (mm-dd-yyyy) |
| Receiver | R&S | ESCI | 100435 | 04-18-2024 | 04-17-2025 |
| Temperature/ Humidity Indicator | Defu | TH128 | / | 04-25-2024 | 04-24-2025 |
| LISN | R&S | ENV216 | 100098 | 09-19-2024 | 09-18-2025 |
| Barometer | changchun | DYM3 | 1188 | --- | --- |
| Test software | Fara | EZ-EMC | EMC-CON 3A1.1 | --- | --- |
| Capacitive voltage probe | Schwarzbeck | CVP 9222C | 00124 | 06-18-2024 | 06-17-2025 |
| ISN | TESEQ | ISN T800 | 30297 | 12/14/2023 12/05/2024 | 12/13/2024 12/04/2025 |

| 3M Semi-anechoic Chamber (2)- Radiated disturbance Test | | | | | |
|---|--------------|-------------|------------------|---------------------------|-------------------------------|
| Equipment | Manufacturer | Model No. | Serial Number | Cal. date (mm-dd-yyyy) | Cal. Due date (mm-dd-yyyy) |
| 3M Chamber & Accessory Equipment | TDK | SAC-3 | --- | 05/22/2022 | 05/21/2025 |
| Receiver | R&S | ESC17 | 100938- 003 | 09/07/2024 | 09/06/2025 |
| Spectrum Analyzer | R&S | FSV40 | 101200 | 07/18/2024 | 07/17/2025 |
| TRILOG Broadband Antenna | schwarzbeck | VULB 9163 | 9163-618 | 05/22/2022 | 05/21/2025 |
| Loop Antenna | Schwarzbeck | FMZB 1519B | 1519B-076 | 04/16/2024 | 04/15/2025 |
| Microwave Preamplifier | Tonscend | EMC051845SE | 980380 | 12/14/2023 12/05/2024 | 12/13/2024 12/04/2025 |
| Horn Antenna | A.H.SYSTEMS | SAS-574 | 374 | 07/02/2023 | 07/01/2026 |
| Horn Antenna | ETS-LINGREN | BBHA 9120D | 9120D- 1869 | 04/16/2024 | 04/15/2025 |
| Preamplifier | Agilent | 11909A | 12-1 | 03/22/2024 | 03/21/2025 |
| Preamplifier | CD | PAP-1840-60 | 6041.6042 | 06/19/2024 | 06/18/2025 |
| Test software | Fara | EZ-EMC | EMEC- 3A1-Pre | --- | --- |
| Cable line | Fulai(7M) | SF106 | 5219/6A | 05/22/2022 | 05/21/2025 |
| Cable line | Fulai(6M) | SF106 | 5220/6A | 05/22/2022 | 05/21/2025 |
| Cable line | Fulai(3M) | SF106 | 5216/6A | 05/22/2022 | 05/21/2025 |
| Cable line | Fulai(3M) | SF106 | 5217/6A | 05/22/2022 | 05/21/2025 |

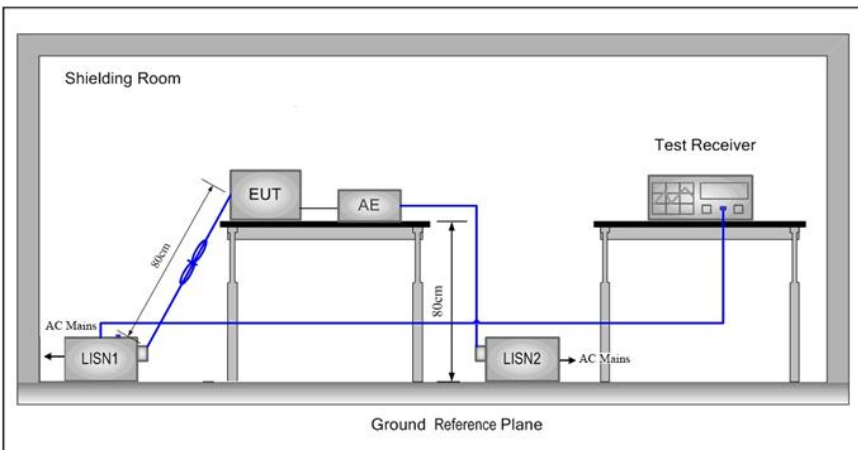
| 3M full-anechoic Chamber | | | | | |
|------------------------------------|--------------|-------------------|---------------|---------------------------|-------------------------------|
| Equipment | Manufacturer | Model No. | Serial Number | Cal. Date (mm-dd-yyyy) | Cal. Due date (mm-dd-yyyy) |
| Fully Anechoic Chamber | TDK | FAC-3 | --- | 01-09-2024 | 01-08-2027 |
| Receiver | Keysight | N9038A | MY57290136 | 01-09-2024 | 01-08-2025 |
| Spectrum Analyzer | Keysight | N9020B | MY57111112 | 01-29-2024 | 01-28-2025 |
| Spectrum Analyzer | Keysight | N9030B | MY57140871 | 01-23-2024 | 01-22-2025 |
| TRILOG Broadband Antenna | Schwarzbeck | VULB 9163 | 9163-1148 | 04-28-2024 | 04-27-2025 |
| Horn Antenna | Schwarzbeck | BBHA 9170 | 9170-832 | 04-16-2024 | 04-15-2025 |
| Horn Antenna | ETS-LINDGREN | 3117 | 57407 | 07-03-2024 | 07-02-2025 |
| Preamplifier | EMCI | EMC001330 | 980563 | 03-08-2024 | 03-07-2025 |
| Preamplifier | Tonscend | TAP-011858 | AP21B806112 | 07-18-2024 | 07-17-2025 |
| Preamplifier | Tonscend | EMC051845SE | 980380 | 12-14-2023 12-05-2024 | 12-13-2024 12-04-2025 |
| Communication test set | R&S | CMW500 | 102898 | 12-14-2023 | 12-13-2024 |
| Temperature/ Humidity Indicator | biaozhi | GM1360 | EE1186631 | 04-07-2024 | 04-06-2025 |
| RSE Automatic test software | JS Tonscend | JS36-RSE | V4.0.0.0 | --- | --- |
| Cable line | Times | SFT205-NMSM-2.50M | 394812-0001 | 01-09-2024 | 01-08-2027 |
| Cable line | Times | SFT205-NMSM-2.50M | 394812-0002 | 01-09-2024 | 01-08-2027 |
| Cable line | Times | SFT205-NMSM-2.50M | 394812-0003 | 01-09-2024 | 01-08-2027 |
| Cable line | Times | SFT205-NMSM-2.50M | 393495-0001 | 01-09-2024 | 01-08-2027 |
| Cable line | Times | EMC104-NMNM-1000 | SN160710 | 01-09-2024 | 01-08-2027 |
| Cable line | Times | SFT205-NMSM-3.00M | 394813-0001 | 01-09-2024 | 01-08-2027 |
| Cable line | Times | SFT205-NMNM-1.50M | 381964-0001 | 01-09-2024 | 01-08-2027 |
| Cable line | Times | SFT205-NMSM-7.00M | 394815-0001 | 01-09-2024 | 01-08-2027 |
| Cable line | Times | HF160-KMKM-3.00M | 393493-0001 | 01-09-2024 | 01-08-2027 |

6 Test results and Measurement Data

6.1 Antenna Requirement

| | |
|--|--|
| Standard requirement: | 47 CFR Part 15C Section 15.203 /247(c) |
| <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> | |
| EUT Antenna: | Please see Internal photos |
| The antenna is PIFA antenna. The best case gain of the antenna is -1.06dBi. | |

6.2 Conducted Emissions

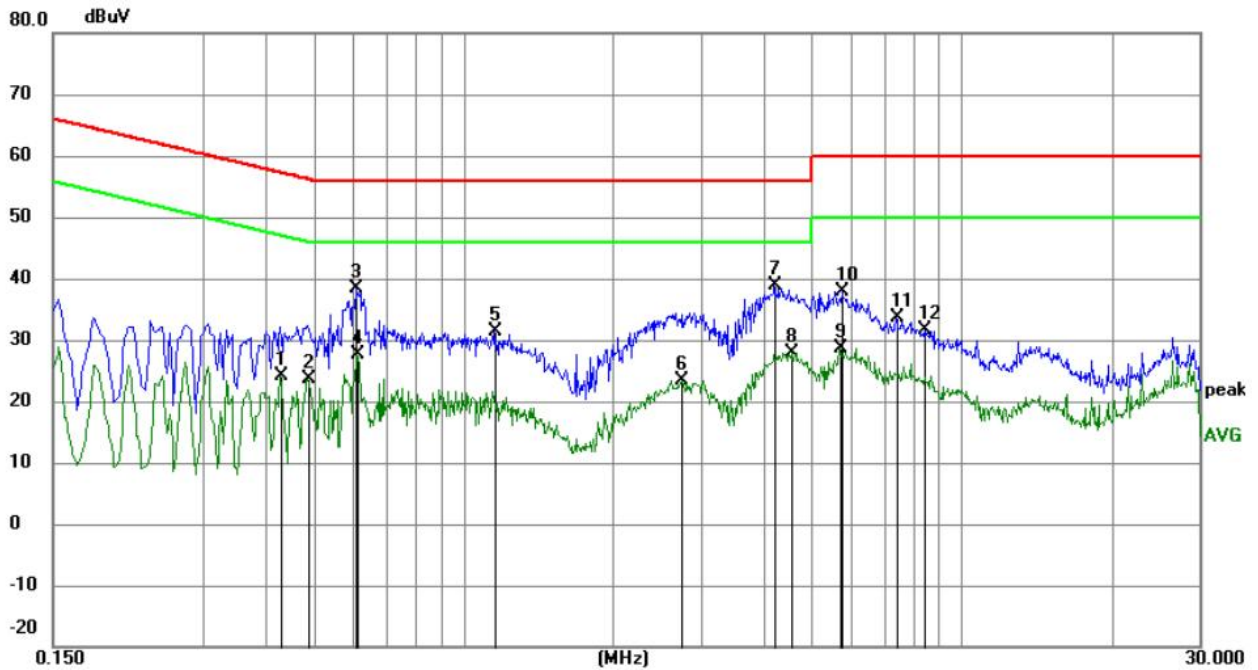
| | | | |
|--|---|--------------|-----------|
| Test Requirement: | 47 CFR Part 15C Section 15.207 | | |
| Test Method: | ANSI C63.10: 2013 | | |
| Test Frequency Range: | 150kHz to 30MHz | | |
| Receiver setup: | RBW=9 kHz, VBW=30 kHz, Sweep time=auto | | |
| Limit: | Frequency range (MHz) | Limit (dBuV) | |
| | | Quasi-peak | Average |
| | 0.15-0.5 | 66 to 56* | 56 to 46* |
| | 0.5-5 | 56 | 46 |
| | 5-30 | 60 | 50 |
| * Decreases with the logarithm of the frequency. | | | |
| Test Setup: |  | | |
| Test Procedure: | <ol style="list-style-type: none"> 1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane. 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement. | | |
| Test Mode: | All modes were tested, only the worst case mode a was recorded in the report. | | |

Test Results:

Pass

Measurement Data

Live line:

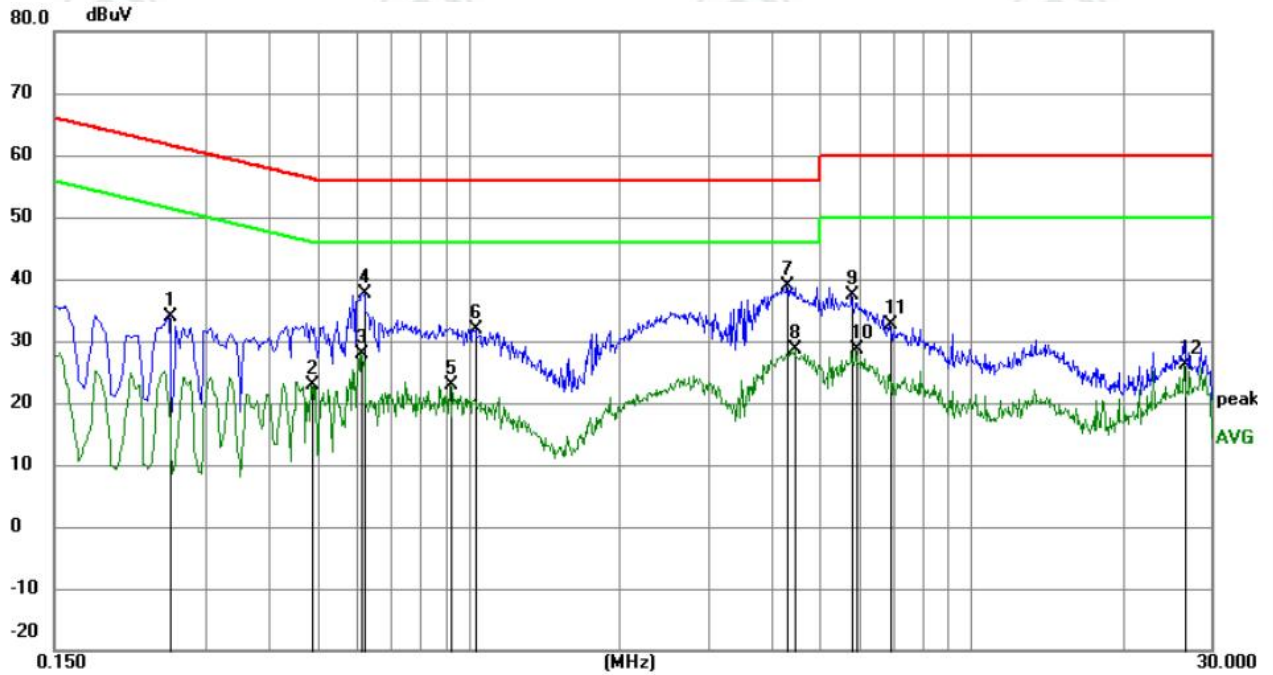


| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV | Limit dBuV | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|--------------|----------|---------|
| 1 | | 0.4290 | 13.93 | 10.09 | 24.02 | 47.27 | -23.25 | AVG | |
| 2 | | 0.4875 | 13.56 | 10.08 | 23.64 | 46.21 | -22.57 | AVG | |
| 3 | | 0.6090 | 28.25 | 10.10 | 38.35 | 56.00 | -17.65 | QP | |
| 4 | | 0.6134 | 17.59 | 10.10 | 27.69 | 46.00 | -18.31 | AVG | |
| 5 | | 1.1535 | 21.08 | 10.18 | 31.26 | 56.00 | -24.74 | QP | |
| 6 | | 2.7465 | 13.34 | 10.14 | 23.48 | 46.00 | -22.52 | AVG | |
| 7 | * | 4.2180 | 28.89 | 10.09 | 38.98 | 56.00 | -17.02 | QP | |
| 8 | | 4.5510 | 17.73 | 10.08 | 27.81 | 46.00 | -18.19 | AVG | |
| 9 | | 5.7120 | 18.64 | 10.05 | 28.69 | 50.00 | -21.31 | AVG | |
| 10 | | 5.7525 | 27.94 | 10.05 | 37.99 | 60.00 | -22.01 | QP | |
| 11 | | 7.3725 | 23.50 | 10.02 | 33.52 | 60.00 | -26.48 | QP | |
| 12 | | 8.4345 | 21.59 | 9.99 | 31.58 | 60.00 | -28.42 | QP | |

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral line:



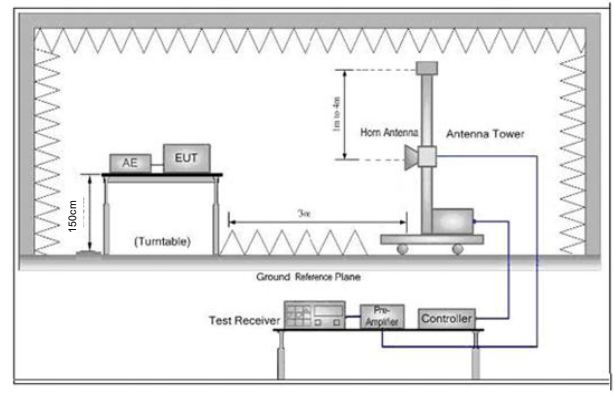
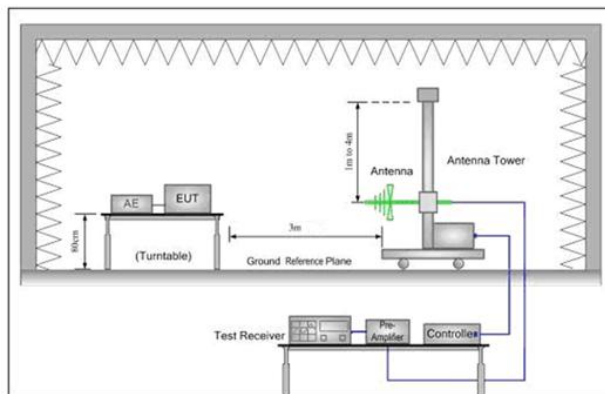
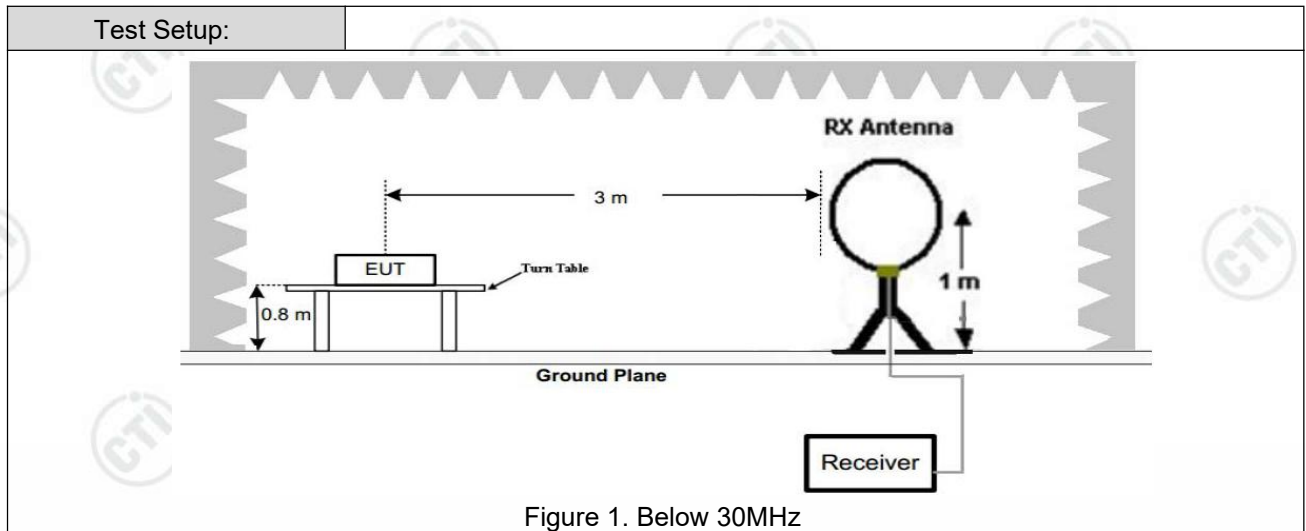
| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV | Limit dBuV | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|--------------|----------|---------|
| 1 | | 0.2535 | 23.69 | 10.17 | 33.86 | 61.64 | -27.78 | QP | |
| 2 | | 0.4875 | 12.92 | 10.08 | 23.00 | 46.21 | -23.21 | AVG | |
| 3 | | 0.6134 | 17.72 | 10.10 | 27.82 | 46.00 | -18.18 | AVG | |
| 4 | | 0.6225 | 27.63 | 10.11 | 37.74 | 56.00 | -18.26 | QP | |
| 5 | | 0.9195 | 12.82 | 10.17 | 22.99 | 46.00 | -23.01 | AVG | |
| 6 | | 1.0320 | 21.73 | 10.18 | 31.91 | 56.00 | -24.09 | QP | |
| 7 | * | 4.3080 | 28.90 | 10.09 | 38.99 | 56.00 | -17.01 | QP | |
| 8 | | 4.4699 | 18.56 | 10.08 | 28.64 | 46.00 | -17.36 | AVG | |
| 9 | | 5.7885 | 27.21 | 10.05 | 37.26 | 60.00 | -22.74 | QP | |
| 10 | | 5.9100 | 18.49 | 10.05 | 28.54 | 50.00 | -21.46 | AVG | |
| 11 | | 6.8865 | 22.63 | 10.03 | 32.66 | 60.00 | -27.34 | QP | |
| 12 | | 26.6100 | 16.29 | 9.81 | 26.10 | 50.00 | -23.90 | AVG | |

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

6.3 Radiated Spurious Emission & Restricted bands

| | | | | | |
|-------------------|---|-------------------------------------|-------------------|------------|-----------------------------|
| Test Requirement: | 47 CFR Part 15C Section 15.209 and 15.205 | | | | |
| Test Method: | ANSI C63.10 2013 | | | | |
| Test Site: | Measurement Distance: 3m (Semi-Anechoic Chamber) | | | | |
| Receiver Setup: | Frequency | Detector | RBW | VBW | Remark |
| | 0.009MHz-0.090MHz | Peak | 10kHz | 30kHz | Peak |
| | 0.009MHz-0.090MHz | Average | 10kHz | 30kHz | Average |
| | 0.090MHz-0.110MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak |
| | 0.110MHz-0.490MHz | Peak | 10kHz | 30kHz | Peak |
| | 0.110MHz-0.490MHz | Average | 10kHz | 30kHz | Average |
| | 0.490MHz -30MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak |
| | 30MHz-1GHz | Quasi-peak | 100 kHz | 300kHz | Quasi-peak |
| | Above 1GHz | Peak | 1MHz | 3MHz | Peak |
| | | Peak | 1MHz | 10kHz | Average |
| Limit: | Frequency | Field strength (microvolt/meter) | Limit (dBuV/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 | 54.0 | Average | 3 |
| | Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device. | | | | |



Test Procedure:

- 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
 - 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- Note: For the radiated emission test above 1GHz:
- Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
 - The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both

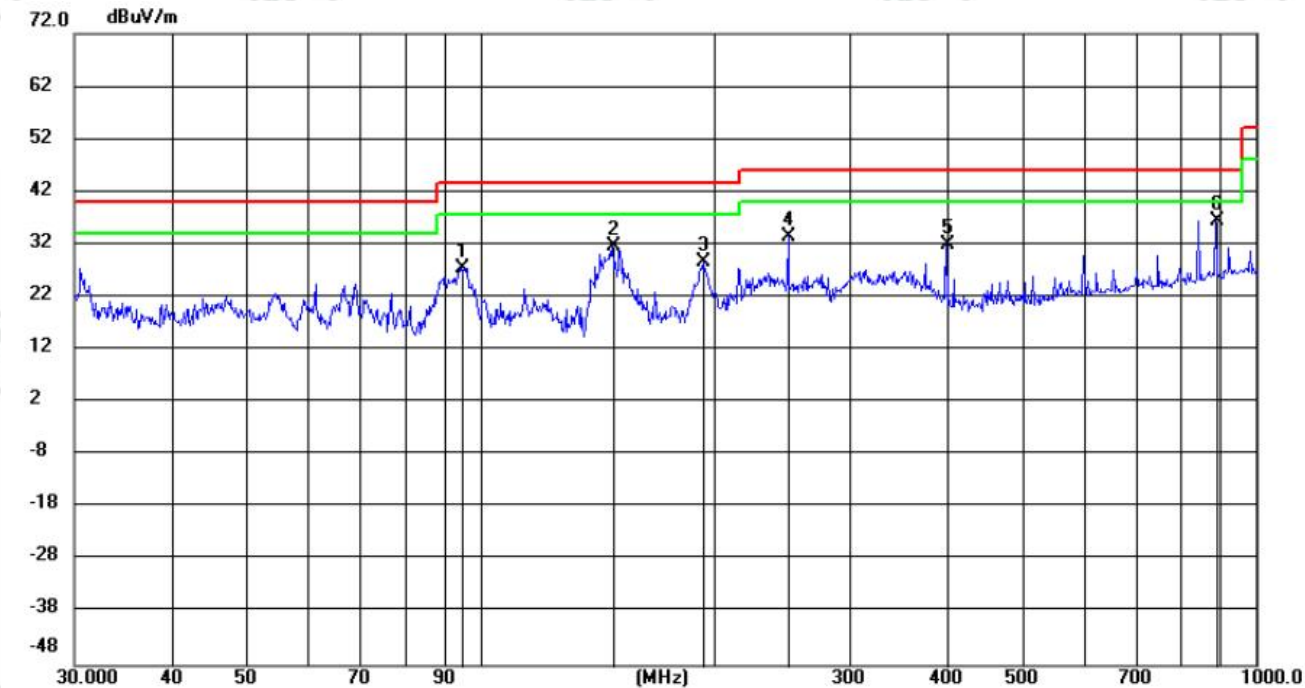
| | |
|---------------|--|
| | <p>horizontal and vertical polarizations of the antenna are set to make the measurement.</p> <p>d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</p> <p>g. Test the EUT in the lowest channel (2402MHz),the middle channel (2440MHz),the Highest channel (2480MHz)</p> <p>h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.</p> <p>i. Repeat above procedures until all frequencies measured was complete.</p> |
| Test Mode: | Refer to clause 5.3 |
| Test Results: | Pass |

Radiated Spurious Emission below 1GHz:

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes, only the worst case highest channel of GFSK 1M was recorded in the report.

Horizontal:

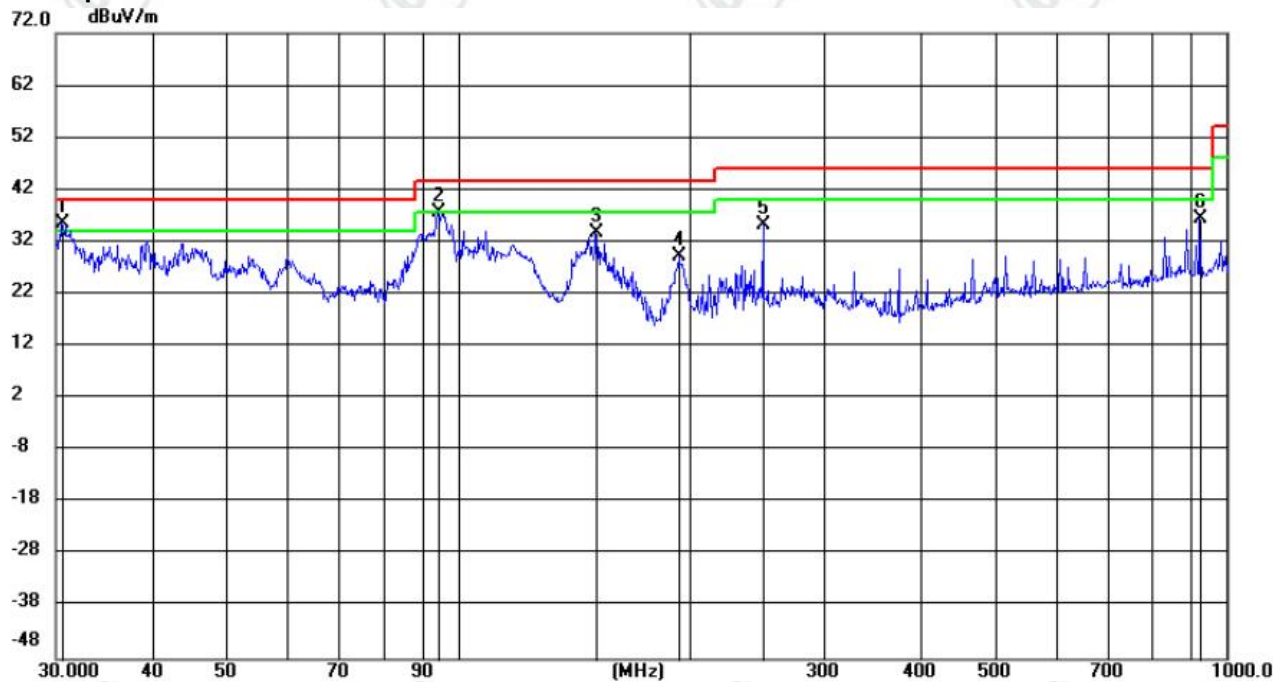
Test Graph



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------------|--------------|--------|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector | cm | degree |
| 1 | | 94.4448 | 15.20 | 12.34 | 27.54 | 43.50 | -15.96 | QP | 200 | 148 |
| 2 | | 148.1290 | 22.63 | 9.17 | 31.80 | 43.50 | -11.70 | QP | 200 | 7 |
| 3 | | 194.0107 | 16.53 | 12.12 | 28.65 | 43.50 | -14.85 | QP | 200 | 7 |
| 4 | | 250.0380 | 19.14 | 14.27 | 33.41 | 46.00 | -12.59 | QP | 200 | 7 |
| 5 | | 400.0108 | 13.92 | 18.04 | 31.96 | 46.00 | -14.04 | QP | 100 | 235 |
| 6 | * | 890.7277 | 10.73 | 25.79 | 36.52 | 46.00 | -9.48 | QP | 100 | 235 |

Vertical:

Test Graph



| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Margin | Antenna | Table | |
|-----|-----|----------|---------|---------|----------|--------|--------|----------|--------|---------|
| | | MHz | Level | Factor | ment | | | Height | Degree | Comment |
| | | | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector | cm | degree |
| 1 | * | 30.5842 | 23.19 | 12.31 | 35.50 | 40.00 | -4.50 | QP | 100 | 7 |
| 2 | ! | 94.3953 | 25.19 | 12.33 | 37.52 | 43.50 | -5.98 | QP | 100 | 126 |
| 3 | | 151.5706 | 24.50 | 9.30 | 33.80 | 43.50 | -9.70 | QP | 100 | 40 |
| 4 | | 193.8407 | 17.06 | 12.11 | 29.17 | 43.50 | -14.33 | QP | 100 | 136 |
| 5 | | 249.9942 | 20.89 | 14.26 | 35.15 | 46.00 | -10.85 | QP | 100 | 104 |
| 6 | | 925.5940 | 10.51 | 26.07 | 36.58 | 46.00 | -9.42 | QP | 100 | 7 |

Radiated Spurious Emission above 1GHz:

During the test, the Radiated Spurious Emission from above 1GHz was performed in all modes, only the worst case BLE 1M was recorded in the report.

| Mode: | | | Bluetooth LE GFSK Transmitting | | | Channel: | | 2402 MHz | |
|-------|-------------|-------------|--------------------------------|----------------|----------------|-------------|--------|----------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 1145.743 | 10.27 | 37.94 | 48.21 | 74.00 | 25.79 | Pass | H | PK |
| 2 | 1562.5708 | 11.12 | 38.10 | 49.22 | 74.00 | 24.78 | Pass | H | PK |
| 3 | 3203.0135 | -14.45 | 60.13 | 45.68 | 74.00 | 28.32 | Pass | H | PK |
| 4 | 4280.0853 | -10.11 | 50.65 | 40.54 | 74.00 | 33.46 | Pass | H | PK |
| 5 | 6409.2273 | -5.59 | 46.63 | 41.04 | 74.00 | 32.96 | Pass | H | PK |
| 6 | 9468.4312 | 2.26 | 43.40 | 45.66 | 74.00 | 28.34 | Pass | H | PK |
| 7 | 1172.0115 | 9.68 | 38.74 | 48.42 | 74.00 | 25.58 | Pass | V | PK |
| 8 | 1608.7072 | 11.72 | 37.94 | 49.66 | 74.00 | 24.34 | Pass | V | PK |
| 9 | 3203.0135 | -14.45 | 59.33 | 44.88 | 74.00 | 29.12 | Pass | V | PK |
| 10 | 4521.1014 | -9.22 | 50.22 | 41.00 | 74.00 | 33.00 | Pass | V | PK |
| 11 | 6730.2487 | -5.89 | 47.08 | 41.19 | 74.00 | 32.81 | Pass | V | PK |
| 12 | 8939.396 | -0.74 | 44.29 | 43.55 | 74.00 | 30.45 | Pass | V | PK |

| Mode: | | | Bluetooth LE GFSK Transmitting | | | Channel: | | 2440 MHz | |
|-------|-------------|-------------|--------------------------------|----------------|----------------|-------------|--------|----------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 1171.8781 | 9.69 | 38.61 | 48.30 | 74.00 | 25.70 | Pass | H | PK |
| 2 | 1640.7094 | 11.95 | 37.74 | 49.69 | 74.00 | 24.31 | Pass | H | PK |
| 3 | 3253.0169 | -14.04 | 59.95 | 45.91 | 74.00 | 28.09 | Pass | H | PK |
| 4 | 4289.0859 | -9.94 | 50.21 | 40.27 | 74.00 | 33.73 | Pass | H | PK |
| 5 | 6326.2217 | -7.04 | 47.82 | 40.78 | 74.00 | 33.22 | Pass | H | PK |
| 6 | 8314.3543 | -3.26 | 45.30 | 42.04 | 74.00 | 31.96 | Pass | H | PK |
| 7 | 1210.014 | 8.72 | 37.62 | 46.34 | 74.00 | 27.66 | Pass | V | PK |
| 8 | 1614.1743 | 11.75 | 38.06 | 49.81 | 74.00 | 24.19 | Pass | V | PK |
| 9 | 3253.0169 | -14.04 | 59.51 | 45.47 | 74.00 | 28.53 | Pass | V | PK |
| 10 | 4286.0857 | -9.99 | 50.42 | 40.43 | 74.00 | 33.57 | Pass | V | PK |
| 11 | 5670.178 | -9.07 | 49.13 | 40.06 | 74.00 | 33.94 | Pass | V | PK |
| 12 | 8298.3532 | -2.91 | 45.63 | 42.72 | 74.00 | 31.28 | Pass | V | PK |

| Mode: | | | Bluetooth LE GFSK Transmitting | | | Channel: | | 2480 MHz | |
|-------|-------------|-------------|--------------------------------|----------------|----------------|-------------|--------|----------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 1170.1447 | 9.75 | 38.73 | 48.48 | 74.00 | 25.52 | Pass | H | PK |
| 2 | 1674.9783 | 12.46 | 37.77 | 50.23 | 74.00 | 23.77 | Pass | H | PK |
| 3 | 3307.0205 | -13.24 | 60.04 | 46.80 | 74.00 | 27.20 | Pass | H | PK |
| 4 | 4397.0931 | -10.19 | 50.80 | 40.61 | 74.00 | 33.39 | Pass | H | PK |
| 5 | 5752.1835 | -7.25 | 47.90 | 40.65 | 74.00 | 33.35 | Pass | H | PK |
| 6 | 8439.3626 | -2.30 | 45.10 | 42.80 | 74.00 | 31.20 | Pass | H | PK |
| 7 | 1172.0115 | 9.68 | 38.38 | 48.06 | 74.00 | 25.94 | Pass | V | PK |
| 8 | 1640.8427 | 11.95 | 37.85 | 49.80 | 74.00 | 24.20 | Pass | V | PK |
| 9 | 3307.0205 | -13.24 | 59.57 | 46.33 | 74.00 | 27.67 | Pass | V | PK |
| 10 | 4307.0871 | -10.09 | 50.29 | 40.20 | 74.00 | 33.80 | Pass | V | PK |
| 11 | 5952.1968 | -6.55 | 46.77 | 40.22 | 74.00 | 33.78 | Pass | V | PK |
| 12 | 8117.3412 | -3.48 | 45.74 | 42.26 | 74.00 | 31.74 | Pass | V | PK |

Remark:

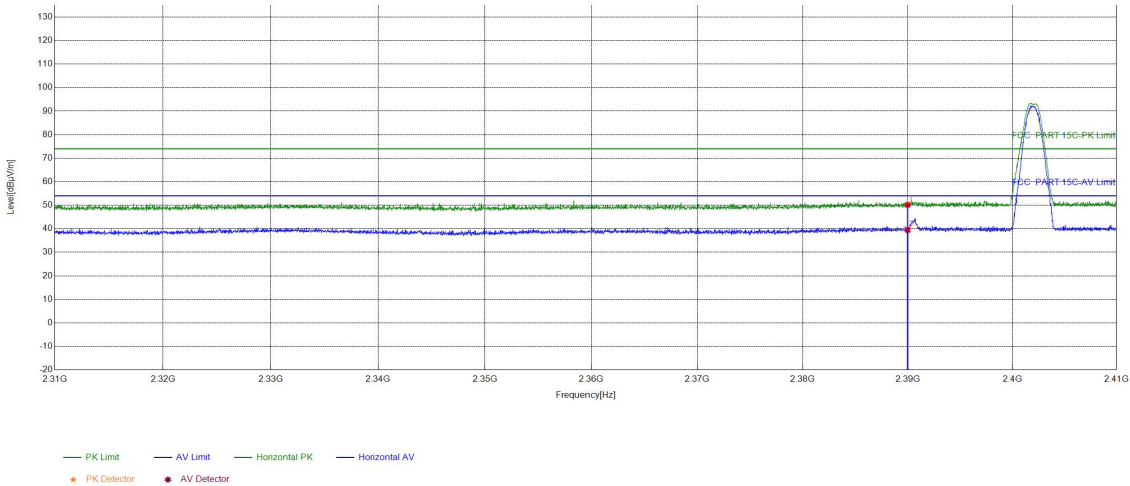
- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
- 2) Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

Restricted bands:

Test plot as follows:

| | | | |
|---------------|--------------------------|----------------|------------|
| EUT_Name | | Test_Model | |
| Test_Mode | BLE 1M GFSK Transmitting | Test_Frequency | 2402MHz |
| Tset_Engineer | Aiden.wang | Test_Date | 2024/12/11 |
| Remark | 23.5°C56.9%\ | | |

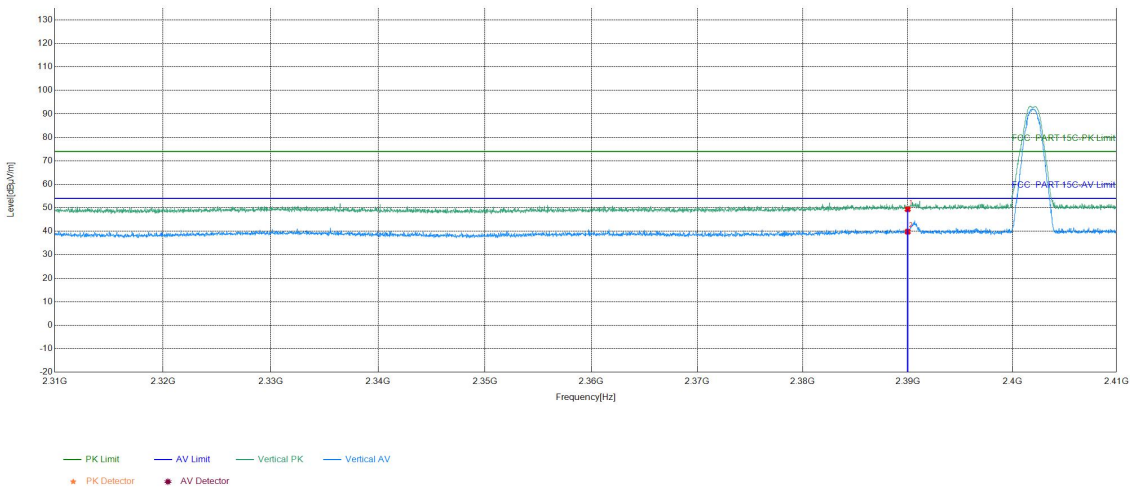
Test Graph



| Suspected List | | | | | | | | | |
|----------------|-------------|-------------|----------------|----------------|----------------|-------------|--------|------------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 2390 | 15.31 | 34.86 | 50.17 | 74.00 | 23.83 | PASS | Horizontal | PK |
| 2 | 2390 | 15.31 | 24.15 | 39.46 | 54.00 | 14.54 | PASS | Horizontal | AV |

| | | | |
|---------------|--------------------------|----------------|------------|
| EUT_Name | | Test_Model | |
| Test_Mode | BLE 1M GFSK Transmitting | Test_Frequency | 2402MHz |
| Tset_Engineer | Aiden.wang | Test_Date | 2024/12/11 |
| Remark | 23.5°C56.9%\ | | |

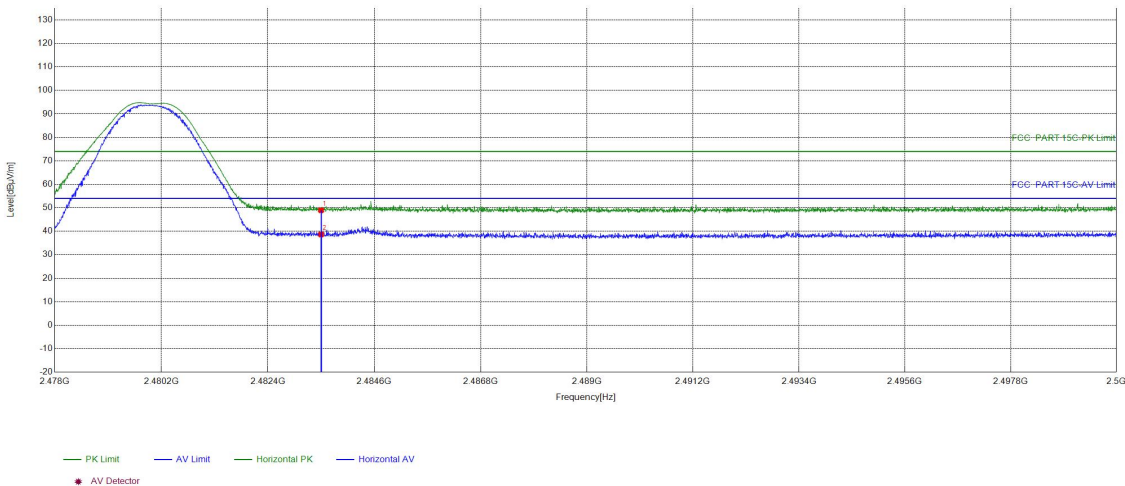
Test Graph



| Suspected List | | | | | | | | | |
|----------------|-------------|-------------|----------------|----------------|----------------|-------------|--------|----------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 2390 | 15.31 | 34.07 | 49.38 | 54.00 | 4.62 | PASS | Vertical | PK |
| 2 | 2390 | 15.31 | 24.51 | 39.82 | 54.00 | 14.18 | PASS | Vertical | AV |

| | | | |
|---------------|--------------------------|----------------|------------|
| EUT_Name | | Test_Model | |
| Test_Mode | BLE 1M GFSK Transmitting | Test_Frequency | 2480MHz |
| Tset_Engineer | Aiden.wang | Test_Date | 2024/12/11 |
| Remark | 23.5°C56.9%\ | | |

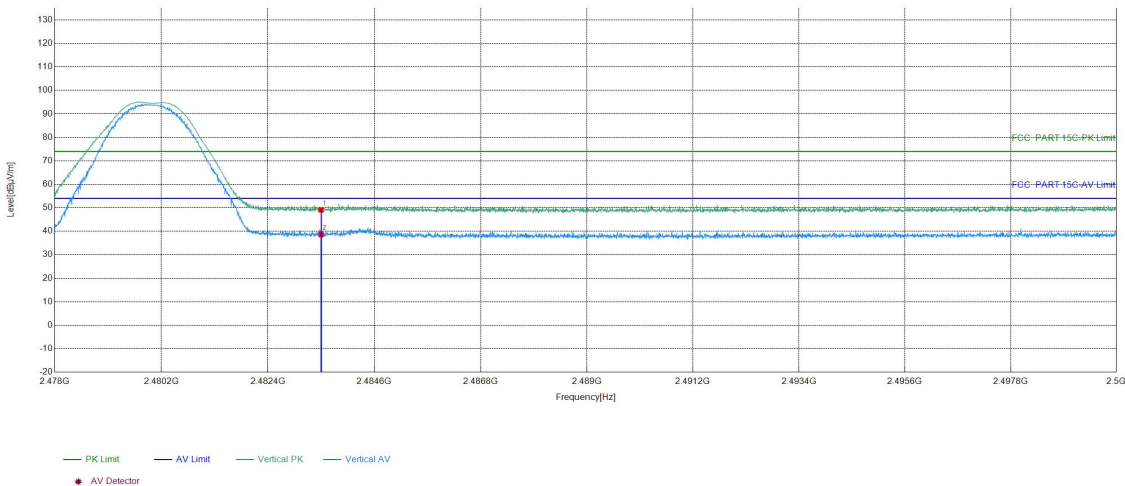
Test Graph



| Suspected List | | | | | | | | | |
|----------------|-------------|-------------|----------------|----------------|----------------|-------------|--------|------------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 2483.5 | 15.16 | 33.79 | 48.95 | 74.00 | 25.05 | PASS | Horizontal | PK |
| 2 | 2483.5 | 15.16 | 23.49 | 38.65 | 54.00 | 15.35 | PASS | Horizontal | AV |

| | | | |
|---------------|--------------------------|----------------|------------|
| EUT_Name | | Test_Model | |
| Test_Mode | BLE 1M GFSK Transmitting | Test_Frequency | 2480MHz |
| Tset_Engineer | Aiden.wang | Test_Date | 2024/12/11 |
| Remark | 23.5°C56.9%\ | | |

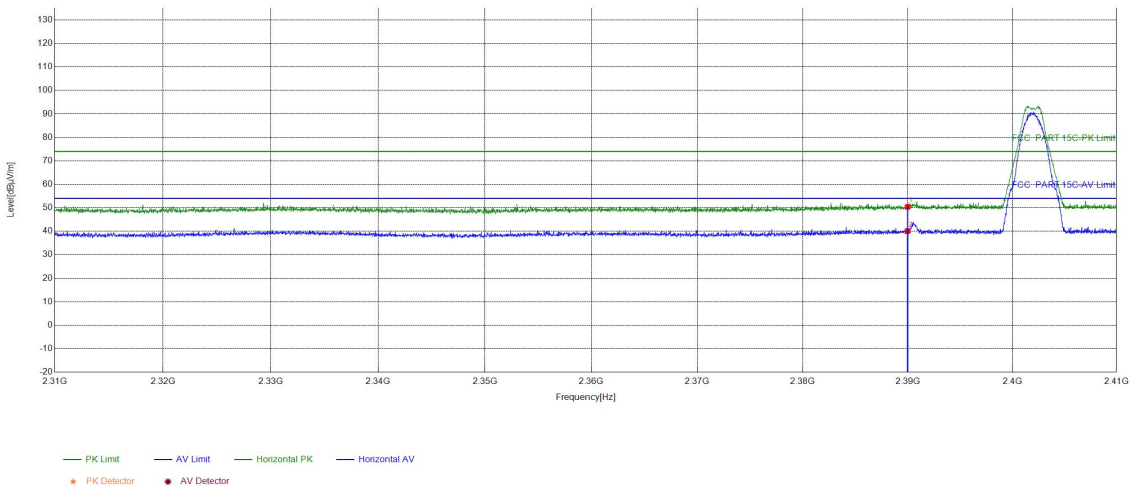
Test Graph



| Suspected List | | | | | | | | | |
|----------------|-------------|-------------|----------------|----------------|----------------|-------------|--------|----------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 2483.5 | 15.16 | 33.96 | 49.12 | 74.00 | 24.88 | PASS | Vertical | PK |
| 2 | 2483.5 | 15.16 | 23.48 | 38.64 | 54.00 | 15.36 | PASS | Vertical | AV |

| | | | |
|---------------|--------------------------|----------------|------------|
| EUT_Name | | Test_Model | |
| Test_Mode | BLE 2M GFSK Transmitting | Test_Frequency | 2402MHz |
| Tset_Engineer | Aiden.wang | Test_Date | 2024/12/11 |
| Remark | 23.5°C56.9%\ | | |

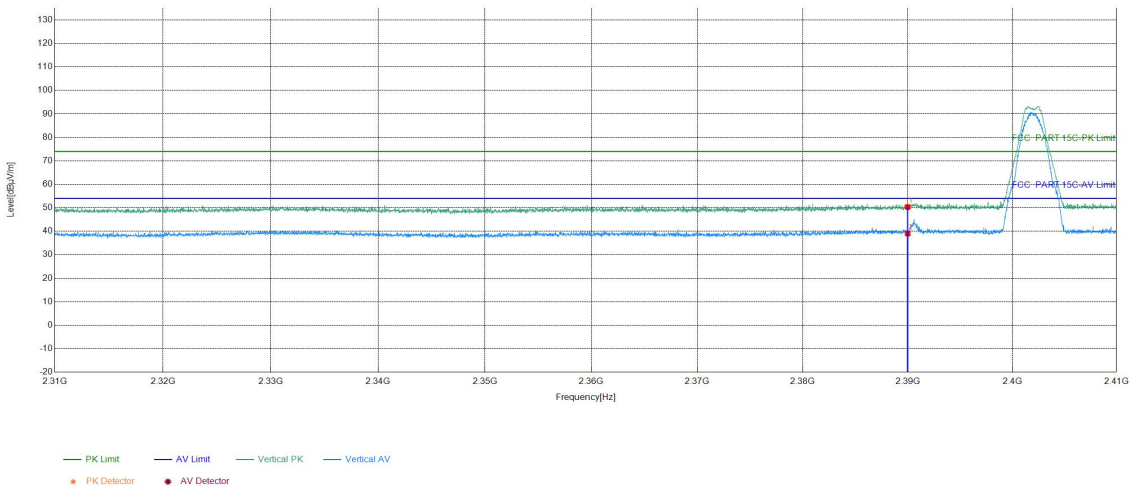
Test Graph



| Suspected List | | | | | | | | | |
|----------------|-------------|-------------|----------------|----------------|----------------|-------------|--------|------------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 2390 | 15.31 | 35.08 | 50.39 | 74.00 | 23.61 | PASS | Horizontal | PK |
| 2 | 2390 | 15.31 | 24.79 | 40.10 | 54.00 | 13.90 | PASS | Horizontal | AV |

| | | | |
|---------------|--------------------------|----------------|------------|
| EUT_Name | | Test_Model | |
| Test_Mode | BLE 2M GFSK Transmitting | Test_Frequency | 2402MHz |
| Tset_Engineer | Aiden.wang | Test_Date | 2024/12/11 |
| Remark | 23.5°C56.9%\ | | |

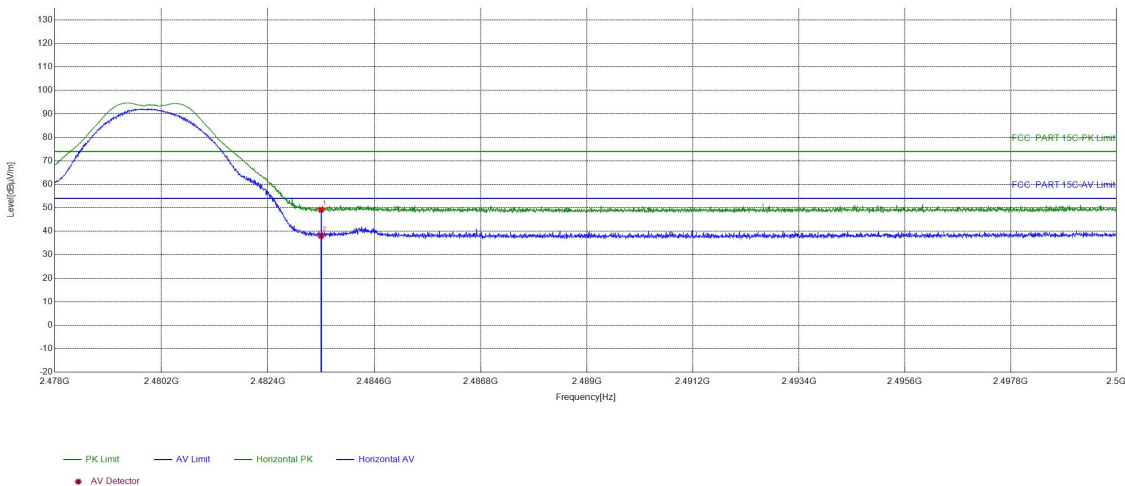
Test Graph



| Suspected List | | | | | | | | | |
|----------------|-------------|-------------|----------------|----------------|----------------|-------------|--------|----------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 2390 | 15.31 | 35.02 | 50.33 | 74.00 | 23.67 | PASS | Vertical | PK |
| 2 | 2390 | 15.31 | 23.72 | 39.03 | 54.00 | 14.97 | PASS | Vertical | AV |

| | | | |
|---------------|--------------------------|----------------|------------|
| EUT_Name | | Test_Model | |
| Test_Mode | BLE 2M GFSK Transmitting | Test_Frequency | 2480MHz |
| Tset_Engineer | Aiden.wang | Test_Date | 2024/12/11 |
| Remark | 23.5°C56.9%\ | | |

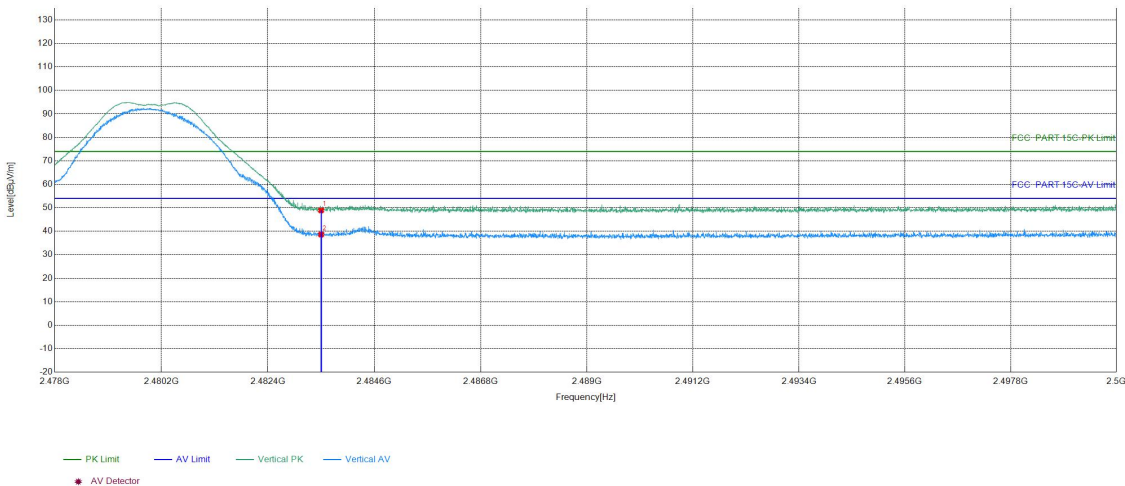
Test Graph



| Suspected List | | | | | | | | | |
|----------------|-------------|-------------|----------------|----------------|----------------|-------------|--------|------------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 2483.5 | 15.16 | 34.04 | 49.20 | 74.00 | 24.80 | PASS | Horizontal | PK |
| 2 | 2483.5 | 15.16 | 22.88 | 38.04 | 54.00 | 15.96 | PASS | Horizontal | AV |

| | | | |
|---------------|--------------------------|----------------|------------|
| EUT_Name | | Test_Model | |
| Test_Mode | BLE 2M GFSK Transmitting | Test_Frequency | 2480MHz |
| Tset_Engineer | Aiden.wang | Test_Date | 2024/12/11 |
| Remark | 23.5°C56.9%\ | | |

Test Graph



| Suspected List | | | | | | | | | |
|----------------|-------------|-------------|----------------|----------------|----------------|-------------|--------|----------|--------|
| NO | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Result | Polarity | Remark |
| 1 | 2483.5 | 15.16 | 33.73 | 48.89 | 74.00 | 25.11 | PASS | Vertical | PK |
| 2 | 2483.5 | 15.16 | 23.45 | 38.61 | 54.00 | 15.39 | PASS | Vertical | AV |

Note:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading -Correct Factor
Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor