# EMC TEST REPORT

| | |
|---|---|
| Product Name: | Automotive OBD universal speedometer |
| FCC ID: | 2BMTJ-P22 |
| Trade mark: | N/A |
| Model No.: | P22, P3, G19, M23, M22, G20, X3, X2, X1, G3 |
| S/N: | / |
| Report No.: | CTB241009036EX |
| Applicant: | Dongguan Shengbaili Trading Co., Ltd |
| Address: | Room 301, No. 150 Yinjing Road, Fenggang Town, Dongguan City, Guangdong Province |
| Manufacturer: | Dongguan Shengbaili Trading Co., Ltd |
| Address: | Room 301, No. 150 Yinjing Road, Fenggang Town, Dongguan City, Guangdong Province |
| Prepared by: | Shenzhen CTB Testing Technology Co., Ltd. |
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| Date of Receipt: | Sep. 18, 2024 |
| Date of Test(s): | Sep. 18, 2024 ~ Oct. 09, 2024 |
| Date of Issue: | Oct. 09, 2024 |
| Test Standard(s): | CFR47, FCC Part 15 Subpart B, ANSI C63.4: 2014 |
| Test Result: | Pass |

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

| Compiled by: | Reviewed by: | Approved by: |
|---|---|---|
| Michael Niu | Bin Mei | Rita Xiao |

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

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## 1. Description of version

| Report No. | Issue Date | Description | Approved |
|---|---|---|---|
| CTB241009036EX | Oct. 09, 2024 | Original | Valid |

## 2. Test summary

Test procedures according to the technical standards:

| Standard | Test Item | Test Result |
|---|---|---|
| §15.107 | Conducted Emission | PASS |
| §15.109 | Radiated Emission | PASS |

## 3. Measurement uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %

| Test Item | Frequency | Expanded Uncertainty ($U_{Lab}$) |
|---|---|---|
| Conducted Emission | 150 kHz to 30 MHz | ±3.1 dB |
| Radiated Emission | 30 MHz to 1000 MHz | ±4.1 dB |
| Radiated Emission | 1000 MHz to 6000 MHz | ±4.8 dB |

## 4. General information

### 4.1. Description of EUT

| | |
|---|---|
| Product name | Automotive OBD universal speedometer |
| Trade mark | N/A |
| Model No. | P22 |
| Serial Model No. | P3, G19, M23, M22, G20, X3, X2, X1, G3 |
| Model Difference | All the model are the same circuit and RF module, only the model names are different. Test sample model: P22 |
| Configuration | ☒ Table-top ☐ Floor-standing |
| The highest frequency of the internal sources of the EUT | ☐ below 1.705 MHz, the measurement shall only be made up to 30 MHz.<br>☒ between 1.705 MHz and 108 MHz, the measurement shall only be made up to 1 GHz.<br>☐ between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.<br>☐ between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.<br>☐ above 1 GHz, the measurement shall be made up to 5th harmonic of the highest frequency or 40 GHz, whichever is lower. |

**Note:** The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

### 4.2. Description of accessory device

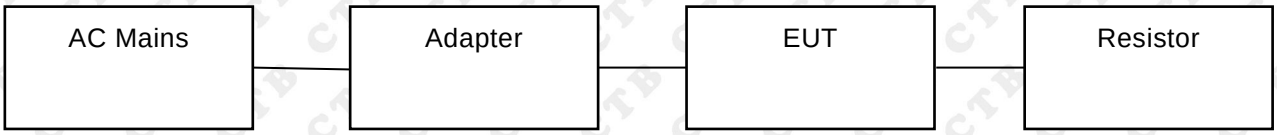
| No. | Device Type | Brand | Model | Specification | Note |
|---|---|---|---|---|---|
| 1 | Adapter | JIYIN | JY-05100C | Input: 100-240V~50/60Hz<br>Output:5V 2A | AE |

Remark: " Shenzhen CTB Testing Technology Co., Ltd."

### 4.3. Test conditions

Temperature: 15-25℃
Relative Humidity: 30-60 %
Atmospheric pressure: 800hPa-1060hPa

### 4.4. Block diagram of EUT configuration




### 4.5. Operating condition of EUT

| Operating condition | Mode 1 | Working | Test Voltage | / |
|---|---|---|---|---|
| Note:This test covers all possible operating modes of the device, only the worst data are list in report. The worst data are shows (*)is the nearest standard limit which were recorded in this report. | | | | |

## 5. List of Test and Measurement Instruments

| Continuous disturbance | | | | | | |
|---|---|---|---|---|---|---|
| No. | Equipment | Manufacturer | Model No. | Serial No. | Firmware version | Calibrated until |
| 1 | 843 Shield Room | C/ R/ T | 843 | / | / | 2027/6/21 |
| 2 | AMN | ROHDE&SCHWARZ | ESH3-Z5 | 831551852 | / | 2025/6/30 |
| 3 | Pulse limiter | ROHDE&SCHWARZ | ESH3Z2 | 357881052 | / | 2025/6/28 |
| 4 | EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI | 100428 | V4.42.SP3 | 2025/6/30 |
| 5 | Coaxial cable | ZDECL | Z302S | 18091904 | / | 2025/6/30 |
| 6 | ISN | Schwarzbeck | NTFM8158 | 183 | / | 2025/6/30 |
| 7 | Voltage sensor | Schwarzbeck | TK 9420 | 01189 | / | 2024/11/16 |
| 8 | EZ-EMC | Frad | EMC-con3A1.1 | / | / | / |
| 9 | Current Probe | FCC | F-52B | 199453 | / | 2025/5/27 |
| 10 | Communication test set | R&S | CMW500 | 108058 | B.19.07 (E1962B) | 2025/6/28 |
| 11 | Communication test set | Agilent | E5515C | MY50102567 | V3.5.80 | 2025/6/28 |

| Radiated emission(No.1 Chamber) | | | | | | |
|---|---|---|---|---|---|---|
| No. | Equipment | Manufacturer | Model No. | Serial No. | Firmware version | Calibrated until |
| 1 | 966 Chamber | C/ R/ T | 966 | / | / | 2027/6/21 |
| 2 | Double Ridged Broadband Horn Antenna | Schwarzbeck | BBHA 9120 D | 01911 | / | 2025/7/06 |
| 3 | TRILOG Broadband Antenna | Schwarzbeck | VULB 9168 | 00869 | / | 2025/6/29 |
| 4 | Amplifier | Agilent | 8449B | 3008A01838 | / | 2025/6/30 |
| 5 | Amplifier | HP | 8447E | 2945A02747 | / | 2025/6/28 |
| 6 | loop antenna | Schwarzbeck | FMZB 1519B | 1519B-224 | / | 2025/6/29 |
| 7 | EMI TEST RECEIVER | ROHDE&SCHWARZ | ESPI | 100362 | RF_ATTEN_7 (104489/003) | 2025/6/28 |
| 8 | Spectrum Analyzer | KEYSIGHT | N9020A | MY51289897 | A.14.16 | 2025/6/28 |
| 9 | Coaxial cable | ETS | RFC-SNS-100-NMS-80 | / | / | 2025/6/28 |
| 10 | Coaxial cable | ETS | RFC-SN-100-NMS-20 | / | / | 2025/6/28 |
| 11 | Coaxial cable | ETS | RFC-SNS-100-SMS-20 | / | / | 2025/6/28 |
| 12 | Coaxial cable | ETS | RFC-NNS-100-NMS-300 | / | / | 2025/6/28 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13 | EMI test software | Frad | EZ-EMC | Ver/ FA-03A2 RE | / | / |
| 14 | Communication test set | R&S | CMW500 | 108058 | B.19.07 (E1962B) | 2025/6/28 |
| 15 | Communication test set | Agilent | E5515C | MY50102567 | V3.5.80 | 2025/6/28 |

## 6. Conducted Emission

### 6.1. Limit

Except for Class A devices:

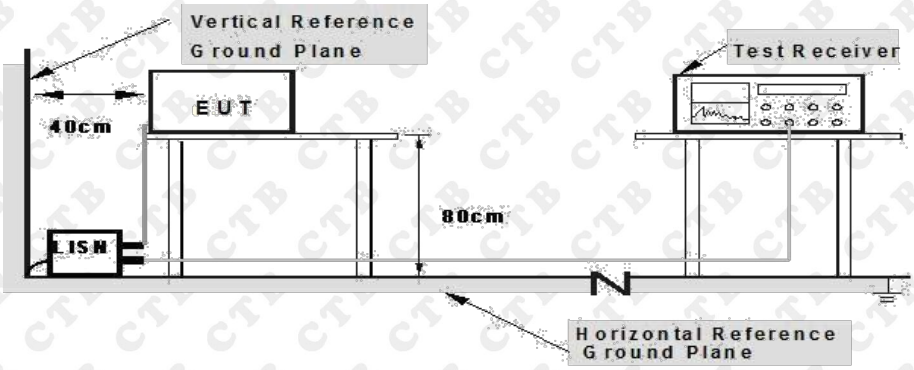
| Frequency of emission (MHz) | Conducted limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

**Note:** Decreases with the logarithm of the frequency.

For Class A devices:

| Frequency of emission (MHz) | Conducted limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 79 | 66 |
| 0.5-30 | 73 | 60 |

### 6.2. Test setup




Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

The setup of EUT is according with ANSI C63.4 measurement procedure. Specification used with FCC Part 15 limits.

### 6.3. EMI test receiver setup

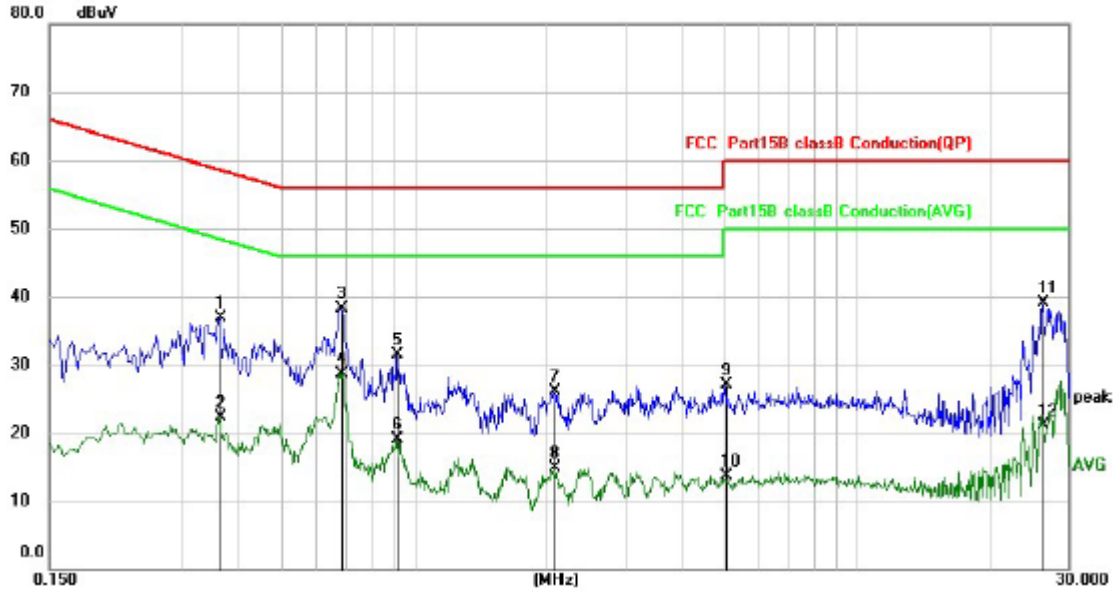
| | |
|---|---|
| Frequency Range | 9kHz-30MHz |
| Resolution Bandwidth | 200Hz (9kHz-150kHz)<br>9kHz (150kHz-30MHz) |

### 6.4. Test procedure

1. Measurement was performed in shielded room, and instruments used were followed clause 4 of ANSI C63.4.
2. Detailed test procedure was following clause 7 of ANSI C63.4.
3. Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9 kHz.

### 6.5. Test results

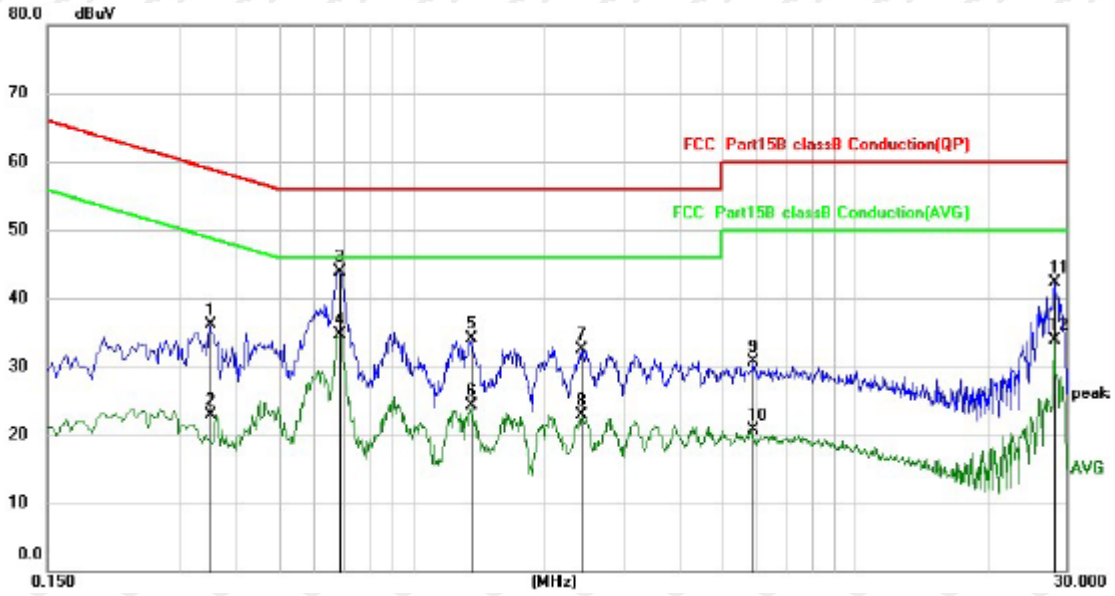
| | | | |
|---|---|---|---|
| Temperature: | 23℃ | Relative Humidity: | 54 % |
| Pressure: | 101kPa | Phase : | Line |
| Test Voltage : | AC 120V/60Hz | Test Mode: | Mode 1 |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | | 0.3660 | 26.36 | 10.59 | 36.95 | 58.59 | -21.64 | QP |
| 2 | | 0.3660 | 11.76 | 10.59 | 22.35 | 48.59 | -26.24 | AVG |
| 3 | | 0.6860 | 27.70 | 10.70 | 38.40 | 56.00 | -17.60 | QP |
| 4 | * | 0.6860 | 18.06 | 10.70 | 28.76 | 46.00 | -17.24 | AVG |
| 5 | | 0.9140 | 20.66 | 10.88 | 31.54 | 56.00 | -24.46 | QP |
| 6 | | 0.9140 | 8.18 | 10.88 | 19.06 | 46.00 | -26.94 | AVG |
| 7 | | 2.0660 | 14.58 | 11.59 | 26.17 | 56.00 | -29.83 | QP |
| 8 | | 2.0660 | 3.27 | 11.59 | 14.86 | 46.00 | -31.14 | AVG |
| 9 | | 5.0459 | 14.81 | 12.26 | 27.07 | 60.00 | -32.93 | QP |
| 10 | | 5.0459 | 1.46 | 12.26 | 13.72 | 50.00 | -36.28 | AVG |
| 11 | | 26.2580 | 25.06 | 14.14 | 39.20 | 60.00 | -20.80 | QP |
| 12 | | 26.2580 | 6.90 | 14.14 | 21.04 | 50.00 | -28.96 | AVG |

Note: Result=Reading + Factor
Over Limit=Result - Limit

| | | | |
|---|---|---|---|
| Temperature: | 23℃ | Relative Humidity: | 54 % |
| Pressure: | 101kPa | Phase : | Neutral |
| Test Voltage : | AC 120V/60Hz | Test Mode: | Mode 1 |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | | 0.3500 | 25.49 | 10.61 | 36.10 | 58.96 | -22.86 | QP |
| 2 | | 0.3500 | 12.27 | 10.61 | 22.88 | 48.96 | -26.08 | AVG |
| 3 | | 0.6860 | 33.17 | 10.70 | 43.87 | 56.00 | -12.13 | QP |
| 4 | * | 0.6860 | 23.99 | 10.70 | 34.69 | 46.00 | -11.31 | AVG |
| 5 | | 1.3619 | 23.02 | 11.18 | 34.20 | 56.00 | -21.80 | QP |
| 6 | | 1.3619 | 13.06 | 11.18 | 24.24 | 46.00 | -21.76 | AVG |
| 7 | | 2.4100 | 20.82 | 11.67 | 32.49 | 56.00 | -23.51 | QP |
| 8 | | 2.4100 | 11.18 | 11.67 | 22.85 | 46.00 | -23.15 | AVG |
| 9 | | 5.8900 | 18.10 | 12.55 | 30.65 | 60.00 | -29.35 | QP |
| 10 | | 5.8900 | 8.23 | 12.55 | 20.78 | 50.00 | -29.22 | AVG |
| 11 | | 28.2140 | 27.93 | 14.32 | 42.25 | 60.00 | -17.75 | QP |
| 12 | | 28.2140 | 19.53 | 14.32 | 33.85 | 50.00 | -16.15 | AVG |

Note: Result=Reading + Factor
Over Limit=Result – Limit

## 7. Radiated emissions

### 7.1. Limit

Except for Class A devices (at 3m):

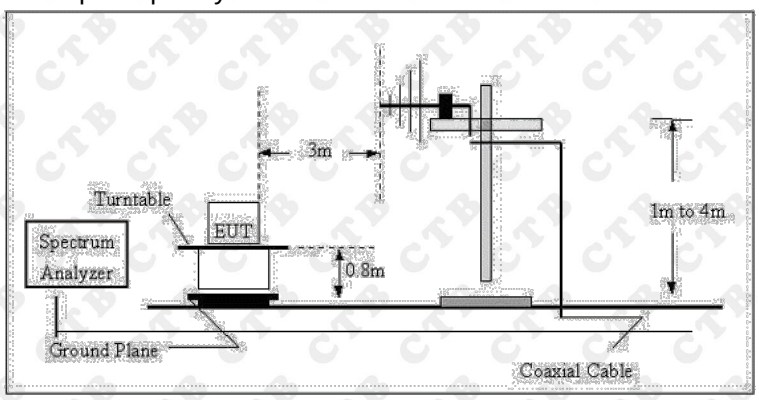
| Frequency of emission (MHz) | Field strength (microvolts/meter) | |
|---|---|---|
| | (microvolts/meter) | (dBμV/m) |
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

For Class A devices (at 10m):

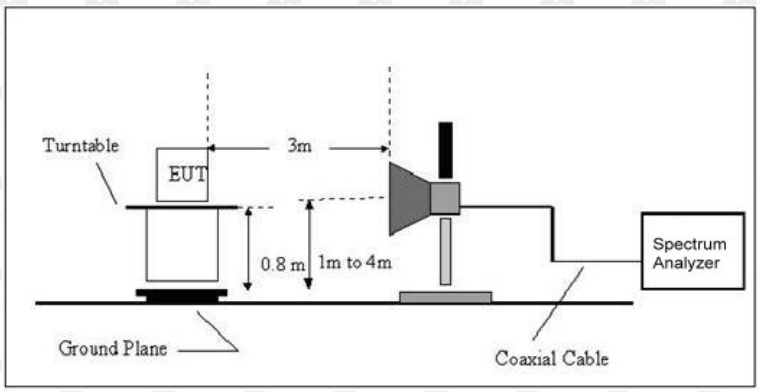
| Frequency of emission (MHz) | Field strength (microvolts/meter) | |
|---|---|---|
| | (microvolts/meter) | (dBμV/m) |
| 30-88 | 90 | 39 |
| 88-216 | 150 | 43.5 |
| 216-960 | 210 | 46.4 |
| Above 960 | 300 | 49.5 |

### 7.2. Test setup

Radiated Emission Test Set-Up Frequency Below 1 GHz




Radiated Emission Test Set-Up Frequency Above 1GHz




The radiated tests were performed in 3 meter Charmber test site, using the setup accordance with the ANSI C63.4:2014.

### 7.3. EMI test receiver setup and spectrum analyzer setup

During the radiated emission test, the EMI test receiver and Spectrum Analyzer were set with the following configurations:

| Frequency Range | RBW | Video B/W | IF B/W | Detector |
|---|---|---|---|---|
| 30MHz-1000MHz | 100kHz | 300kHz | 120kHz | QP |
| Above 1GHz | 1MHz | 3MHz | / | PK |
| | 1MHz | 10Hz | / | AVG |

### 7.4. Test procedure

1. The measurement was performed in a semi-anechoic chamber, and instruments used were followed clause 4 of ANSI C63.4

2. Detailed test procedure was following clause 8 of ANSI C63.4.

### 7.5. Corrected Amplitude & Margin Calculation

1. The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

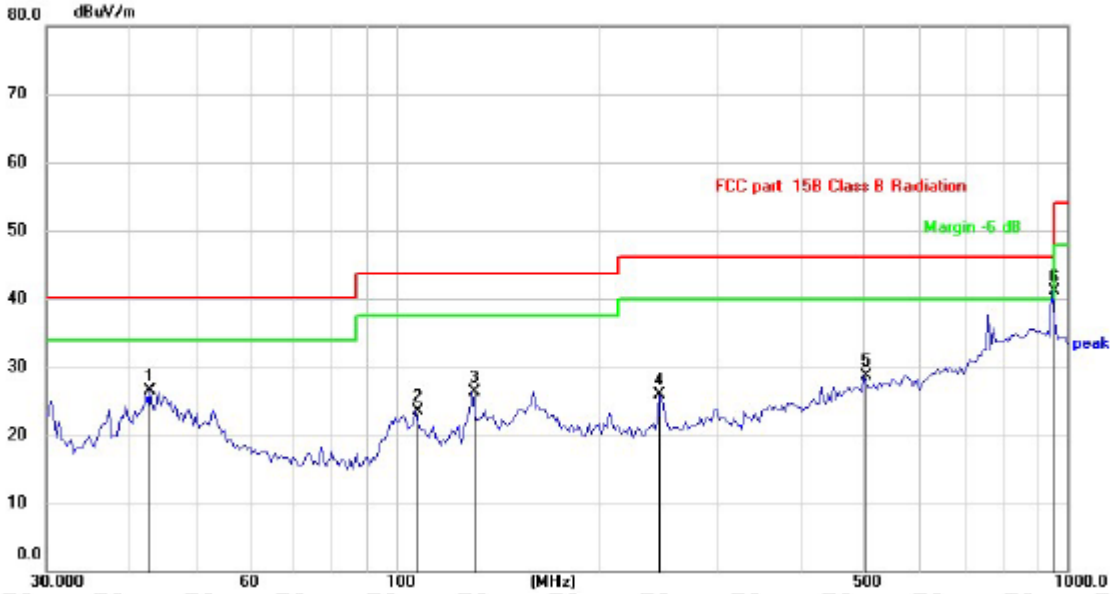
   **Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain**

2. The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

   **Margin = Limit – Corrected Amplitude**

### 7.6. Test results

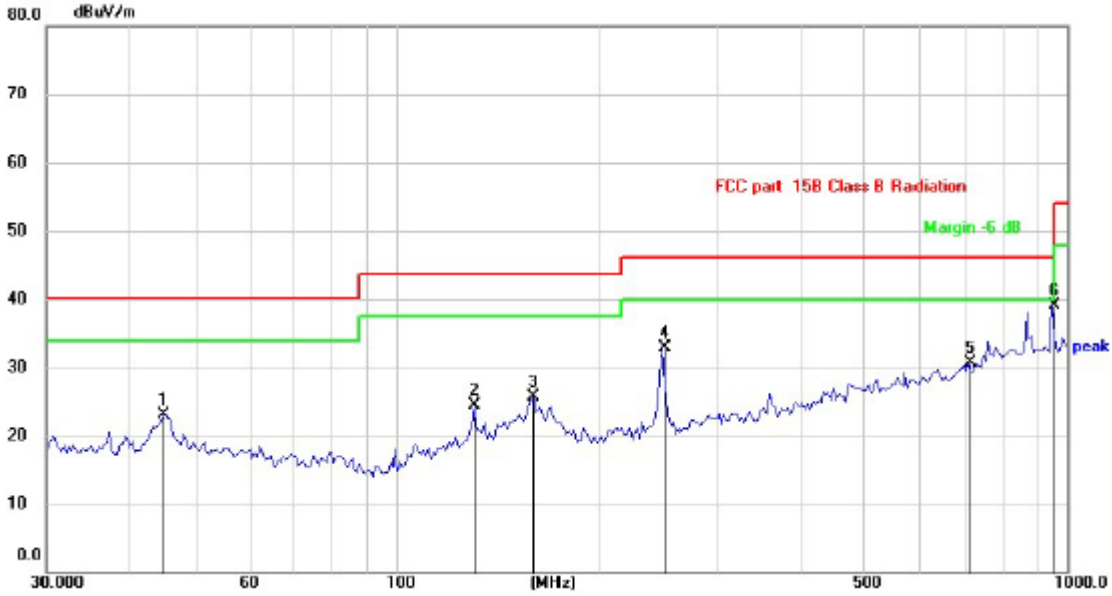
| | | | |
|---|---|---|---|
| Temperature: | 23℃ | Relative Humidity: | 54 % |
| Pressure: | 101kPa | Polarization : | Horizontal |
| Test Voltage : | AC 120V/60Hz | Test Mode: | Mode 1 |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dB/m | dB | Detector |
| 1 | | 42.9750 | 33.23 | -6.82 | 26.41 | 40.00 | -13.59 | QP |
| 2 | | 106.9461 | 31.31 | -7.90 | 23.41 | 43.50 | -20.09 | QP |
| 3 | | 129.6950 | 31.76 | -5.38 | 26.38 | 43.50 | -17.12 | QP |
| 4 | | 248.1165 | 29.70 | -3.85 | 25.85 | 46.00 | -20.15 | QP |
| 5 | | 500.3011 | 26.66 | 2.14 | 28.80 | 46.00 | -17.20 | QP |
| 6 | * | 948.7610 | 32.48 | 8.60 | 41.08 | 46.00 | -4.92 | QP |

Note: Result=Reading+Factor
Over Limit=Result-Limit

| | | | |
|---|---|---|---|
| Temperature: | 23℃ | Relative Humidity: | 54 % |
| Pressure: | 101kPa | Polarization : | Vertical |
| Test Voltage : | AC 120V/60Hz | Test Mode: | Mode 1 |

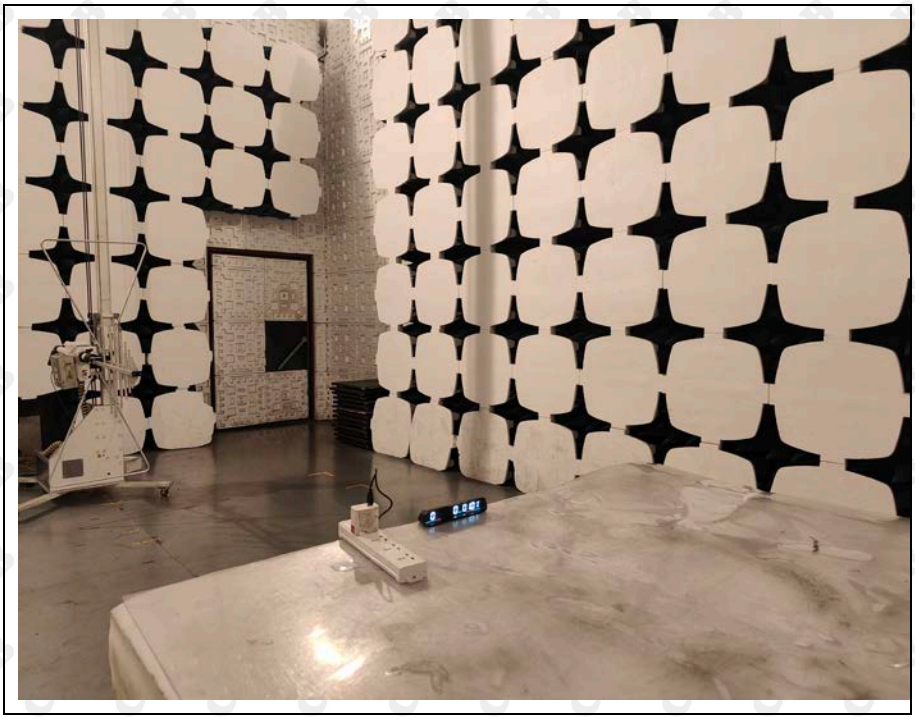



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dB/m | dB | Detector |
| 1 | | 44.9006 | 29.83 | -6.76 | 23.07 | 40.00 | -16.93 | QP |
| 2 | | 130.8369 | 29.81 | -5.29 | 24.52 | 43.50 | -18.98 | QP |
| 3 | | 160.0648 | 26.56 | -0.84 | 25.72 | 43.50 | -17.78 | QP |
| 4 | | 250.3012 | 36.75 | -3.80 | 32.95 | 46.00 | -13.05 | QP |
| 5 | | 710.4268 | 25.11 | 5.61 | 30.72 | 46.00 | -15.28 | QP |
| 6 | * | 948.7610 | 30.60 | 8.60 | 39.20 | 46.00 | -6.80 | QP |

Note: Result=Reading+Factor
Over Limit=Result-Limit

## 8. Photographs of test setup

**RE**



**CE**

***End of report***