



FCC Part 15B Test Report

Report No. : TBR-C-202406-0198-16
Applicant : Heltec Automation Technology Co., Ltd
Equipment Under Test (EUT)
EUT Name : Wireless mini shell
Model No. : HT-CT62
Series Model No. : HT-CT62B, HT-CT62S, HT-RA62, HT-RF62, HT-AT62, HT-ST62, HT-S362, HT-GT62, HT-UW62, HT-WH62, HT-WP62, HT-DE01
Brand Name : Heltec Automation
Receipt Date : 2024-07-24
Test Date : 2024-07-24 to 2024-08-28
Issue Date : 2024-08-29
Standards : FCC 47 CFR Part 15 Subpart B
Conclusions : **PASS**

In the configuration tested, the EUT complied with the standards specified above
The EUT technically complies with the FCC requirements.

Tested By : Marvin
Reviewed By : Wade LV
Approved By : Ivan Su



This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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Revision History

| Report No. | Version | Description | Issued Date |
|----------------------|---------|-------------------------|-------------|
| TBR-C-202406-0198-16 | Rev.01 | Initial issue of report | 2024-08-29 |
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1. General Information

1.1 Client Information

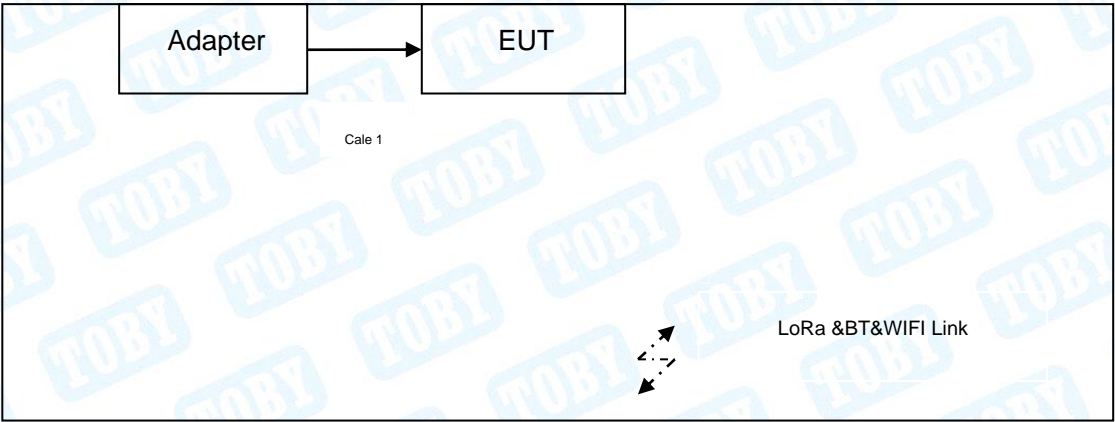
| | | |
|---------------------|---|---|
| Applicant | : | Heltec Automation Technology Co., Ltd |
| Address | : | 1f, No.54,56,58, Zirui North Street, Gaoxin District, Chengdu, China. |
| Manufacturer | : | Heltec Automation Technology Co., Ltd |
| Address | : | 1f, No.54,56,58, Zirui North Street, Gaoxin District, Chengdu, China. |

1.2 General Description of EUT (Equipment Under Test)

| | | |
|---|---|--|
| EUT Name | : | Wireless mini shell |
| Model(s) | : | HT-CT62, HT-CT62B, HT-CT62S, HT-RA62, HT-RF62, HT-AT62, HT-ST62, HT-S362, HT-GT62, HT-UW62, HT-WH62, HT-WP62, HT-DE01 |
| Model Difference | : | All these models are identical in the same PCB, layout and electrical circuit, the only difference is Different sales areas, different name. |
| Fx | : | 2.4GHz |
| Power Rating | : | USB INPUT: DC 5V |
| Software Version | : | HRI-3641.V1.0 |
| Hardware Version | : | HRI-3641.V1.0 |
| Equipment | : | <input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B |
| <p>Class A Equipment: the Equipment is not intended primarily for use in a residential environment.</p> <p>Class B Equipment: the Equipment is intended primarily for use in a residential environment.</p> <p>Fx: Highest frequency generated or used in the device or on which the device operates or tunes (MHz).</p> | | |



1.3 Block Diagram Showing The Configuration of System Tested



1.4 Description of Support Units

| Equipment Information | | | | |
|--|---------------|--------------|--------------|----------|
| Name | Model | S/N | Manufacturer | Used “√” |
| Adapter | ---- | ---- | HUAWEI | √ |
| Cable Information | | | | |
| Number | Shielded Type | Ferrite Core | Length | Note |
| Cable1 | ---- | ---- | 0.5M | ---- |
| Note: The cable is provided by the applicant and the adapter is provided by Toby test lab. | | | | |



1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

| For Conducted Test | |
|--------------------|------------------------|
| Final Test Mode | Description |
| Mode 1 | Adapter + Working Mode |
| Mode 2 | LoRa Link |
| Mode 3 | BT Link |
| Mode 4 | 2.4G WIFI Link |
| Mode 4 | |
| Final Test Mode | Description |
| Mode 1 | Adapter + Working Mode |
| Mode 2 | LoRa Link |
| Mode 3 | BT Link |
| Mode 4 | 2.4G WIFI Link |

1.6 Test standards

The objective is to determine compliance with FCC Part 15, Subpart B, and section 15.107, 15.109 rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.



1.7 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1/F., Building 6, Rundongsheng Industrial Zone, Longzhu, Xixiang, Bao'an District, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.FCC Accredited Test Site Number: 854351. Designation Number: CN1223.

IC Registration No.: (11950A)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A. CAB identifier: CN0056.

1.8 Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, 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 | Parameters | Expanded Uncertainty (U_{Lab}) | Expanded Uncertainty (U_{Cispr}) |
|--------------------|---|---------------------------------------|---|
| Conducted Emission | Level Accuracy: 9kHz~150kHz 150kHz to 30MHz | ± 3.50 dB ± 3.10 dB | ± 4.0 dB ± 3.6 dB |
| Radiated Emission | Level Accuracy: Above 1000MHz | ± 4.50 dB | N/A |
| Radiated Emission | Level Accuracy: 30MHz to 1000 MHz | ± 4.40 dB | ± 5.2 dB |



2. Test Software

| Test Item | Test Software | Manufacturer | Version No. |
|--------------------|---------------|--------------|-------------|
| Conducted Emission | EZ-EMC | EZ | CDI-03A2 |
| Radiation Emission | EZ-EMC | EZ | FA-03A2RE |
| Radiation Emission | EZ-EMC | EZ | FA-03A2RE+ |

3. Test Summary

| Test Items | Test Requirement | Test Method | Result |
|---|-----------------------------------|--------------------|--------|
| Conducted Emission | FCC 47 CFR Part 15 Section 15.107 | ANSI C63.4-2014 | Pass |
| Radiated Emission | FCC 47 CFR Part 15 Section 15.109 | ANSI C63.4-2014 | Pass |
| Note: N/A is an abbreviation for Not Applicable. | | | |



4. Test Equipment Used and Test Site

| Test Site | | | | |
|-------------|------------------------|--------------|-----------------|------|
| No. | Test Site | Manufacturer | Specification | Used |
| TB-EMCSR001 | Shielding Chamber #1 | YIHENG | 7.5*4.0*3.0 (m) | √ |
| TB-EMCSR002 | Shielding Chamber #2 | YIHENG | 8.0*4.0*3.0 (m) | X |
| TB-EMCCA001 | 3m Anechoic Chamber #A | ETS | 9.0*6.0*6.0 (m) | X |
| TB-EMCCB002 | 3m Anechoic Chamber #B | YIHENG | 9.0*6.0*6.0 (m) | √ |

| Conducted Emission Test | | | | | |
|----------------------------------|----------------------------------|-------------|-------------|---------------|---------------|
| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Due Date |
| EMI Test Receiver | Rohde & Schwarz | ESCI | 100321 | Jun. 17, 2024 | Jun. 16, 2025 |
| RF Switching Unit | Compliance Direction Systems Inc | RSU-A4 | 34403 | Jun. 17, 2024 | Jun. 16, 2025 |
| AMN | SCHWARZBECK | NNBL 8226-2 | 8226-2/164 | Jun. 17, 2024 | Jun. 16, 2025 |
| LISN | Rohde & Schwarz | ENV216 | 101131 | Jun. 17, 2024 | Jun. 16, 2025 |
| Radiation Emission Test (B Site) | | | | | |
| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Due Date |
| Spectrum Analyzer | Agilent | N9020A | MY49100060 | Aug. 30, 2023 | Aug. 29, 2024 |
| Spectrum Analyzer | Rohde & Schwarz | FSV40-N | 102197 | Jun. 17, 2024 | Jun. 16, 2025 |
| EMI Test Receiver | Rohde & Schwarz | ESU-8 | 100472/008 | Feb. 23, 2024 | Feb. 22, 2025 |
| Bilog Antenna | SCHWARZBECK | VULB 9168 | 1225 | Nov. 13, 2023 | Nov. 12, 2025 |
| Horn Antenna | SCHWARZBECK | BBHA 9120 D | 2463 | Jun. 14, 2024 | Jun. 13, 2026 |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | 1118 | Feb. 27, 2024 | Feb. 26, 2026 |
| Loop Antenna | SCHWARZBECK | FMZB 1519 B | 1519B-059 | Jun. 14, 2024 | Jun. 13, 2026 |
| HF Amplifier | Tonscend | TAP9E6343 | AP21C806117 | Aug. 30, 2023 | Aug. 29, 2024 |
| HF Amplifier | Tonscend | TAP051845 | AP21C806141 | Aug. 30, 2023 | Aug. 29, 2024 |
| HF Amplifier | Tonscend | TAP0184050 | AP21C806129 | Aug. 30, 2023 | Aug. 29, 2024 |



5. Label Requirements & Statement Requirements

☒ Class B

Label Requirements

Class B digital device subject to certification by the FCC shall carry a warning label which includes the following statement:

***** WARNING *****

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

☐ Class A

Statement Requirements

The operator's manual for a Class A digital device shall contain the following statements or their equivalent:

***** WARNING *****

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Notice: The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equivalent.

If the EUT was tested with special shielded cables the operator's manual for such product shall also contain the following statements or their equivalent:

Shielded interface cables and/or AC power cord, if any, must be used in order to comply with the emission limits.



6. Conducted Emission Test

6.1 Test Standard and Limit

6.1.1 Test Standard

FCC Part 15.107

6.1.2 Test Limit

Conducted Emission Test Limit (Class A)

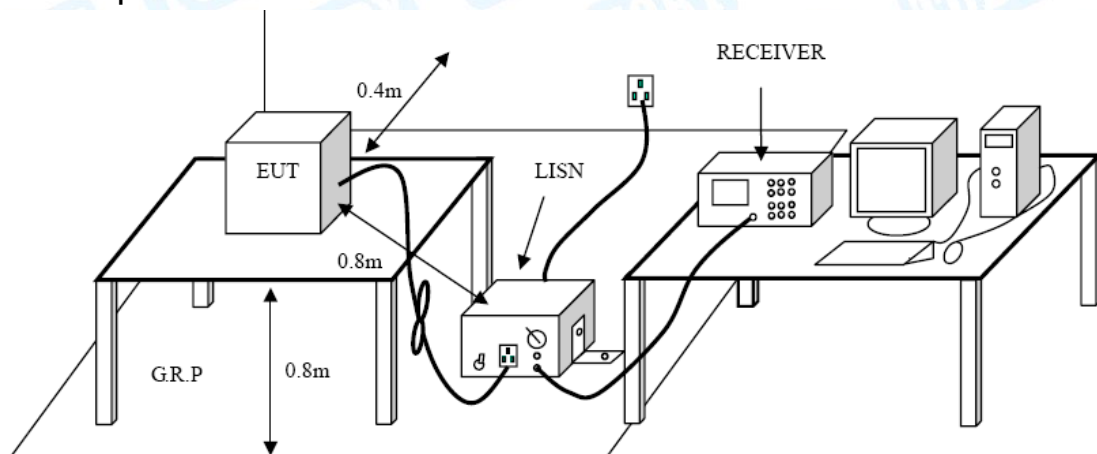
| Frequency (MHz) | Maximum RF Line Voltage (dB μ V) | |
|--------------------|--------------------------------------|---------------|
| | Quasi-peak Level | Average Level |
| 0.15~0.50 | 79 | 66 |
| 0.50~30 | 73 | 60 |

Conducted Emission Test Limit (Class B)

| Frequency (MHz) | Maximum RF Line Voltage (dB μ V) | |
|--------------------|--------------------------------------|---------------|
| | Quasi-peak Level | Average Level |
| 0.15~0.5 | 66 ~ 56 * | 56 ~ 46 * |
| 0.50~5 | 56 | 46 |
| 5~30 | 60 | 50 |

*decreasing linearly with logarithm of the frequency

6.2 Test Setup



6.3 Test Procedure

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- The bandwidth of EMI test receiver is set at 9 kHz, and the test frequency band is from 0.15MHz to 30MHz.

6.4 Deviation From Test Standard

No deviation

6.5 EUT Operating Mode

Please refer to the description of test mode.

6.6 Test Data

Please refer to the Attachment A.



7. Radiated Emission Test

7.1 Test Standard and Limit

7.1.1 Test Standard

FCC Part 15.109

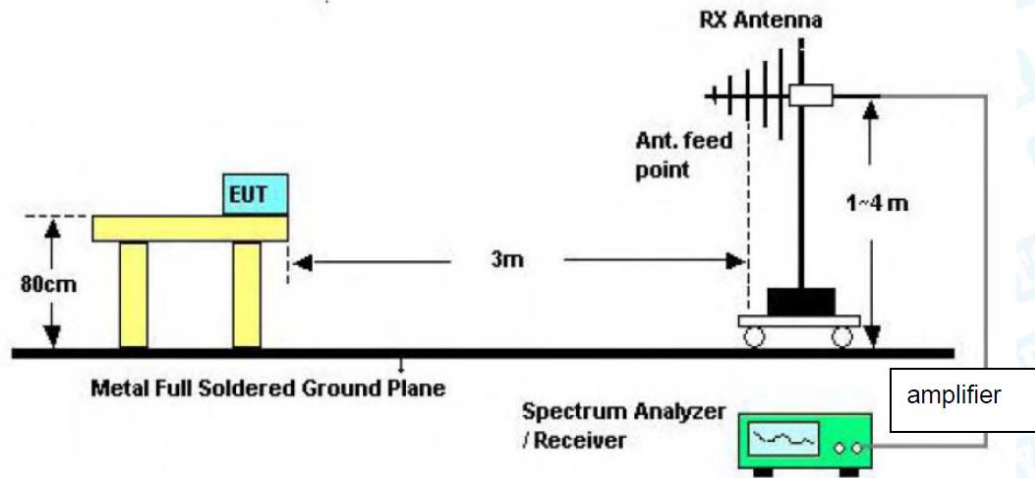
7.1.2 Test Limit

| Radiated Emission Test Limit (Class A) | |
|--|------------------------------------|
| Frequency MHz | Field Strengths Limits dB(μV/m) |
| 30 ~ 88 | 49.0 |
| 88 ~ 216 | 53.5 |
| 216 ~ 960 | 56.4 |
| Above 960 | 59.5 |
| Radiated Emission Test Limit (Class B) | |
| Frequency MHz | Field Strengths Limits dB(μV/m) |
| 30 ~ 88 | 40.0 |
| 88 ~ 216 | 43.5 |
| 216 ~ 960 | 46.0 |
| Above 960 | 54.0 |
| * The lower limit shall apply at the transition frequency. | |
| * The test distance is 3m. | |

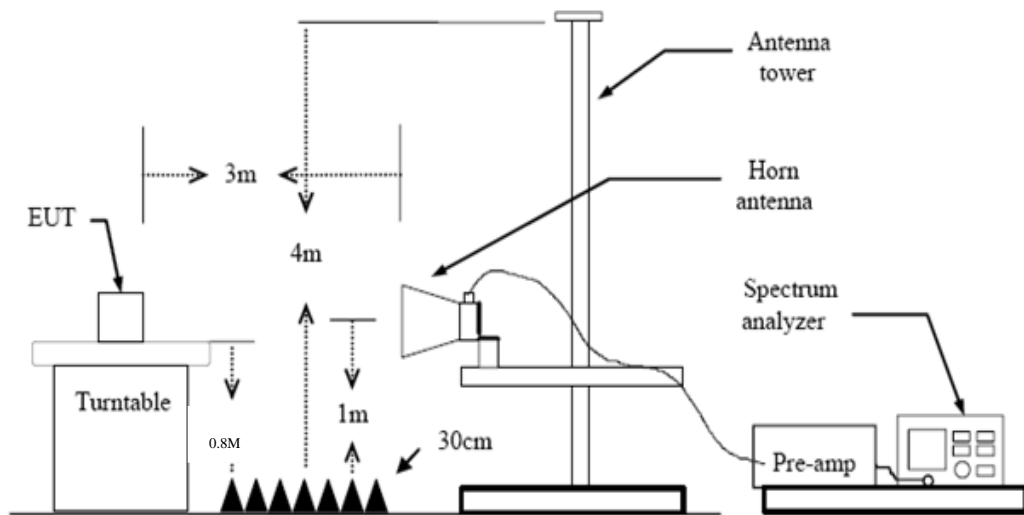
| Frequency (MHz) | Class A Radiated Limit (dBµV/m)- Distance of 3 metres | | | | | | | | | | | | | |
|--|--|---------------|---|---|-----------------|------------------------------|---------------------|-------|-------------------|-------|-----------------|-------|-------------|--|
| | Linear Average Detector | Peak Detector | | | | | | | | | | | | |
| > 1000 | 59.5 | 79.5 | | | | | | | | | | | | |
| Frequency (MHz) | Class B Radiated Limit (dBµV/m)-Distance of 3 metres | | | | | | | | | | | | | |
| | Linear Average Detector | Peak Detector | | | | | | | | | | | | |
| > 1000 | 54 | 74 | | | | | | | | | | | | |
| Note: | | | | | | | | | | | | | | |
| <table><tr><th>Highest Frequency Generated or Used in Device</th><th>Upper Frequency of Radiated Measurement</th></tr><tr><td>Below 1.705 MHz</td><td>No radiated testing required</td></tr><tr><td>1.705 MHz – 108 MHz</td><td>1 GHz</td></tr><tr><td>108 MHz – 500 MHz</td><td>2 GHz</td></tr><tr><td>500 MHz – 1 GHz</td><td>5 GHz</td></tr><tr><td>Above 1 GHz</td><td>5th harmonic of the highest frequency or 40 GHz, whichever is lower.</td></tr></table> | | | Highest Frequency Generated or Used in Device | Upper Frequency of Radiated Measurement | Below 1.705 MHz | No radiated testing required | 1.705 MHz – 108 MHz | 1 GHz | 108 MHz – 500 MHz | 2 GHz | 500 MHz – 1 GHz | 5 GHz | Above 1 GHz | 5 th harmonic of the highest frequency or 40 GHz, whichever is lower. |
| Highest Frequency Generated or Used in Device | Upper Frequency of Radiated Measurement | | | | | | | | | | | | | |
| Below 1.705 MHz | No radiated testing required | | | | | | | | | | | | | |
| 1.705 MHz – 108 MHz | 1 GHz | | | | | | | | | | | | | |
| 108 MHz – 500 MHz | 2 GHz | | | | | | | | | | | | | |
| 500 MHz – 1 GHz | 5 GHz | | | | | | | | | | | | | |
| Above 1 GHz | 5 th harmonic of the highest frequency or 40 GHz, whichever is lower. | | | | | | | | | | | | | |



7.2 Test Setup



Below 1000MHz Test Setup



Above 1GHz Test Setup

7.3 Test Procedure

The EUT was placed on the top of a rotating table which is 0.8 meters above the ground. EUT is set 3.0 meters away from the receiving antenna that mounted on a antenna tower. The table was rotated 360 degrees to determine the position of the highest radiation, the antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

Measurements shall be made with a quasi-peak measuring receiver in the frequency range 30MHz to 1000MHz. If the Peak Mode measured value compliance with and lower than quasi-peak mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. Measurements shall be made with a Peak and AVG measuring receiver in the frequency range Above 1000MHz.



7.4 Deviation From Test Standard

No deviation

7.5 EUT Operating Mode

Please refer to the description of test mode.

7.6 Test Data

Please refer to the Attachment B.



8. Photographs--Constructional Details

Photo 1 Appearance of EUT

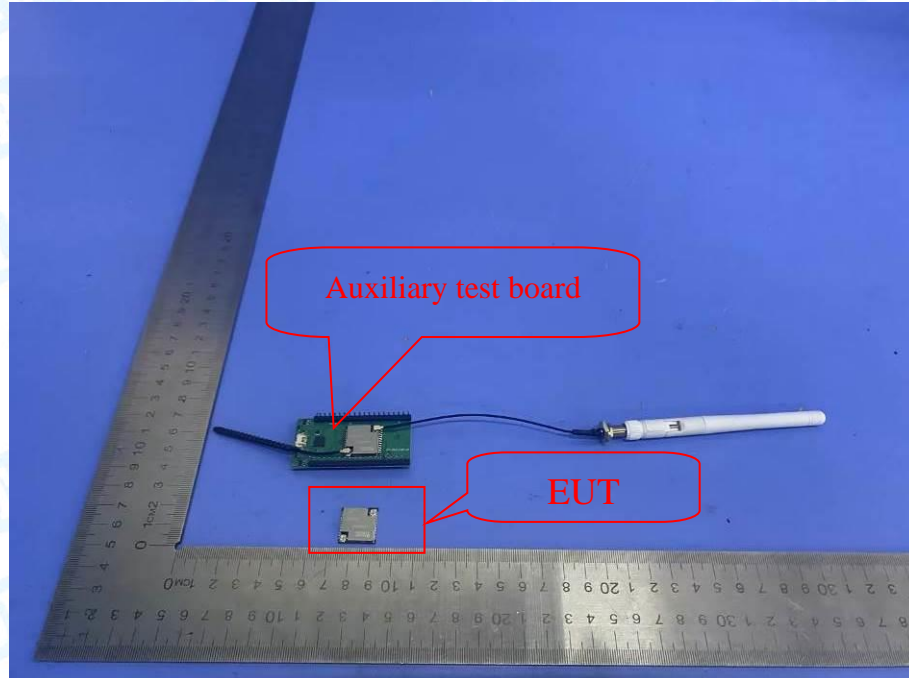


Photo 2 Appearance of EUT

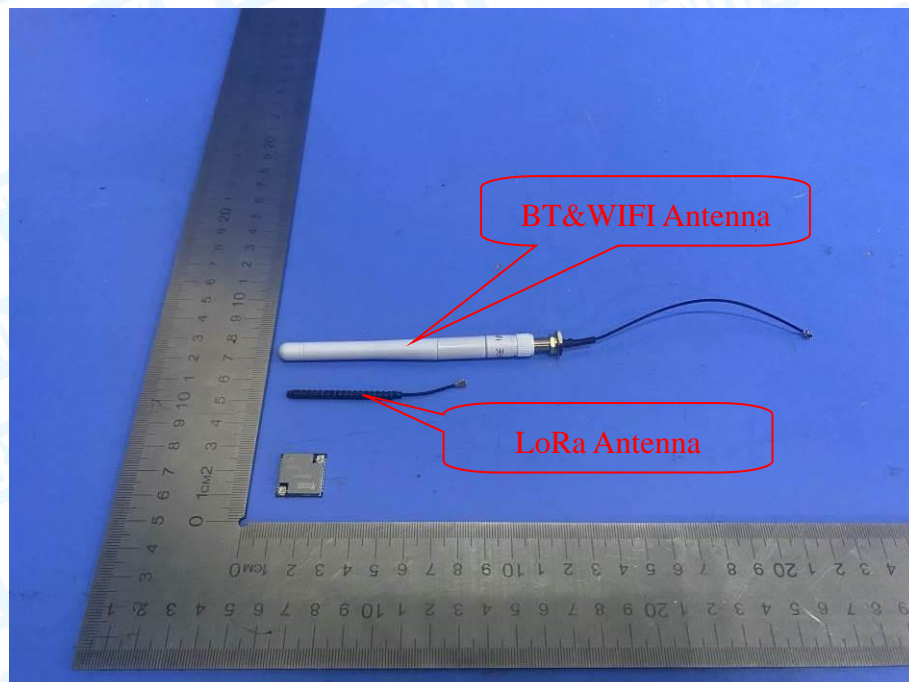


Photo 3 Appearance of EUT



Photo 4 Appearance of EUT

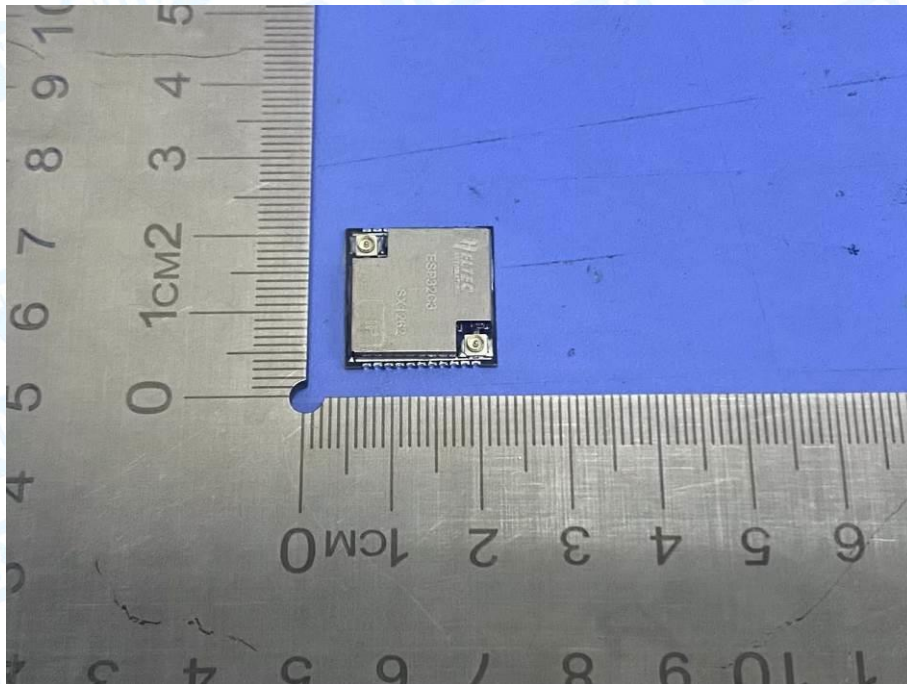


Photo 5 Appearance of EUT

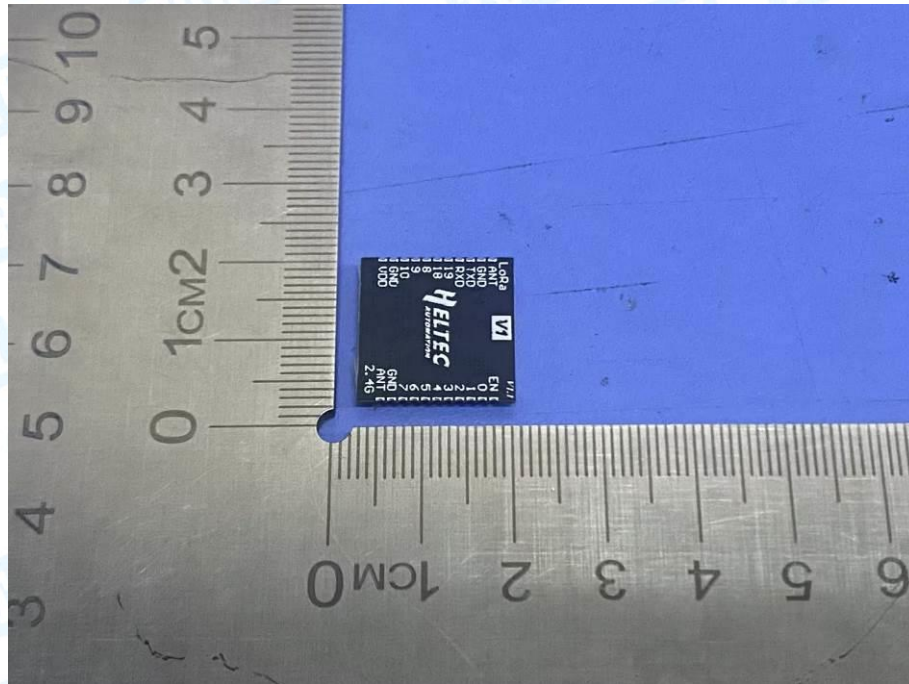


Photo 6 Internal of EUT

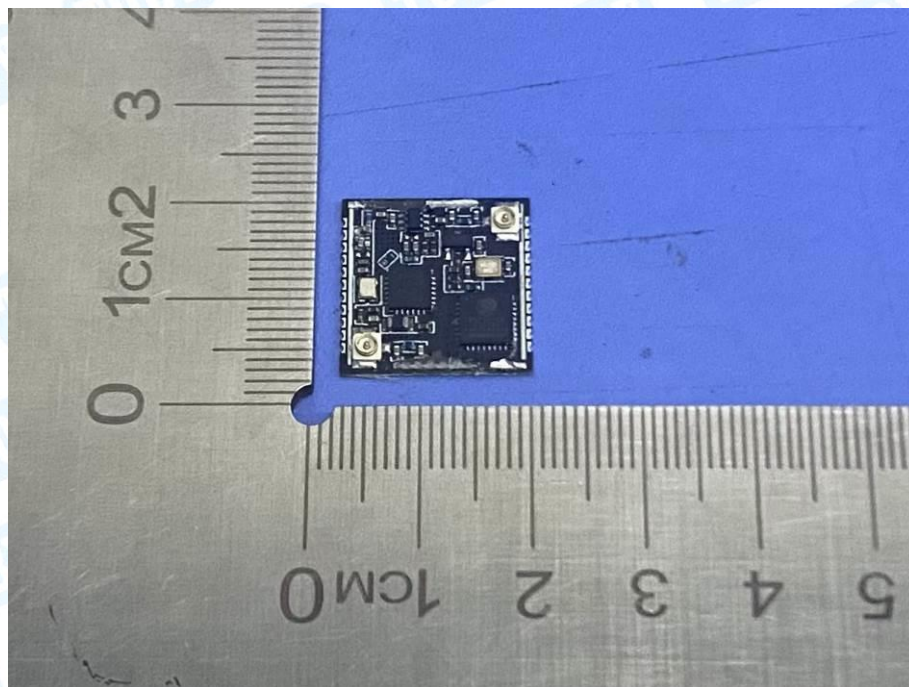


Photo 7 Internal of EUT

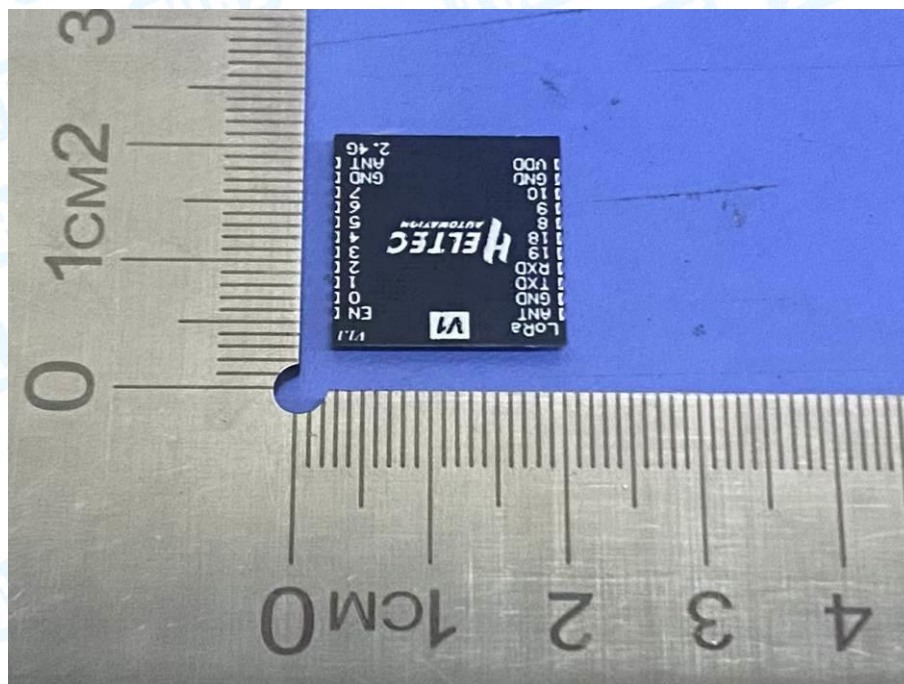
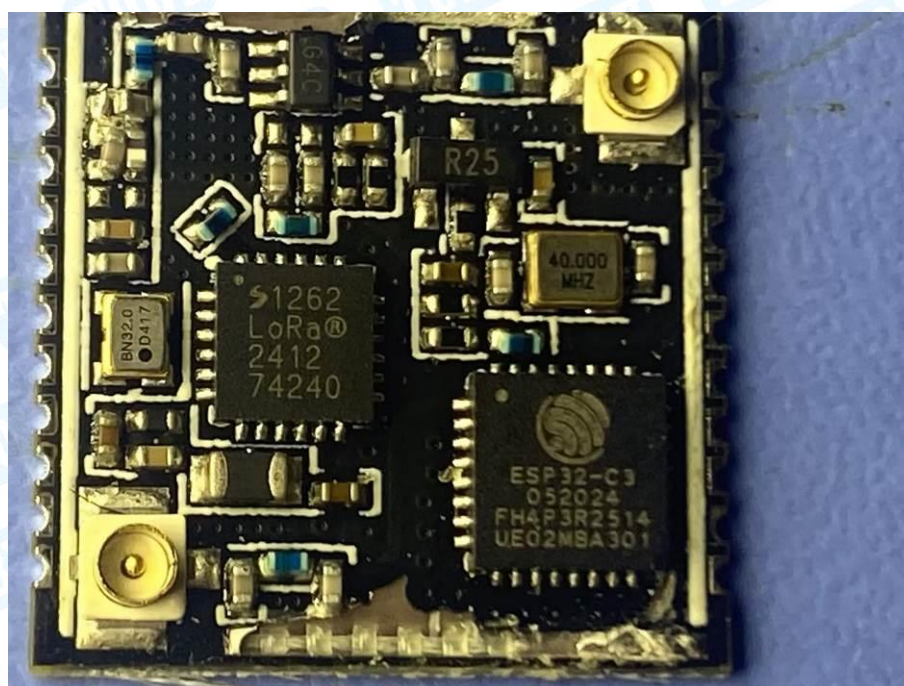


Photo 8 Internal of EUT

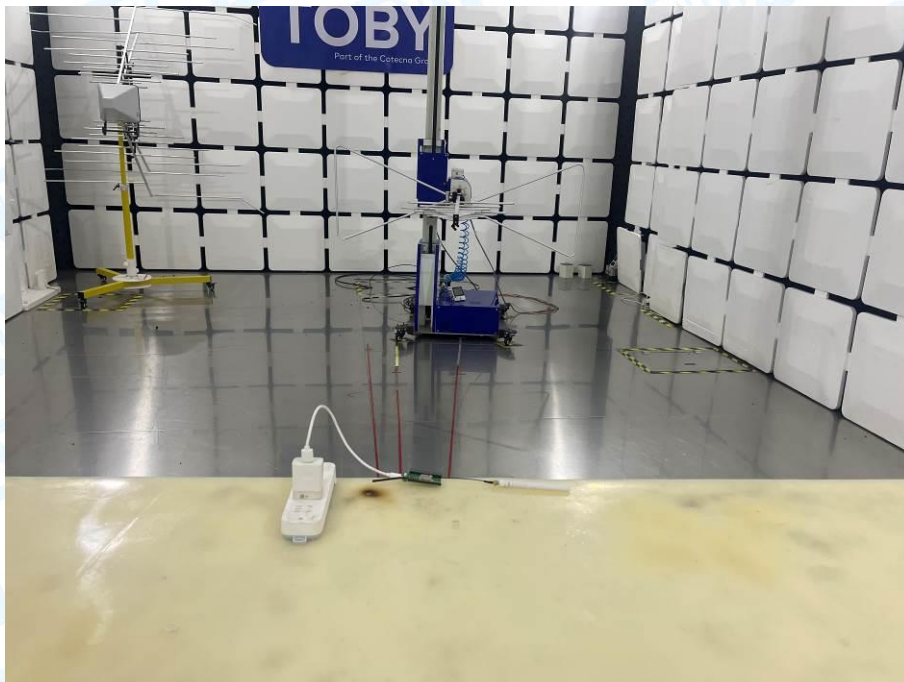


9. Photographs--Test Setup

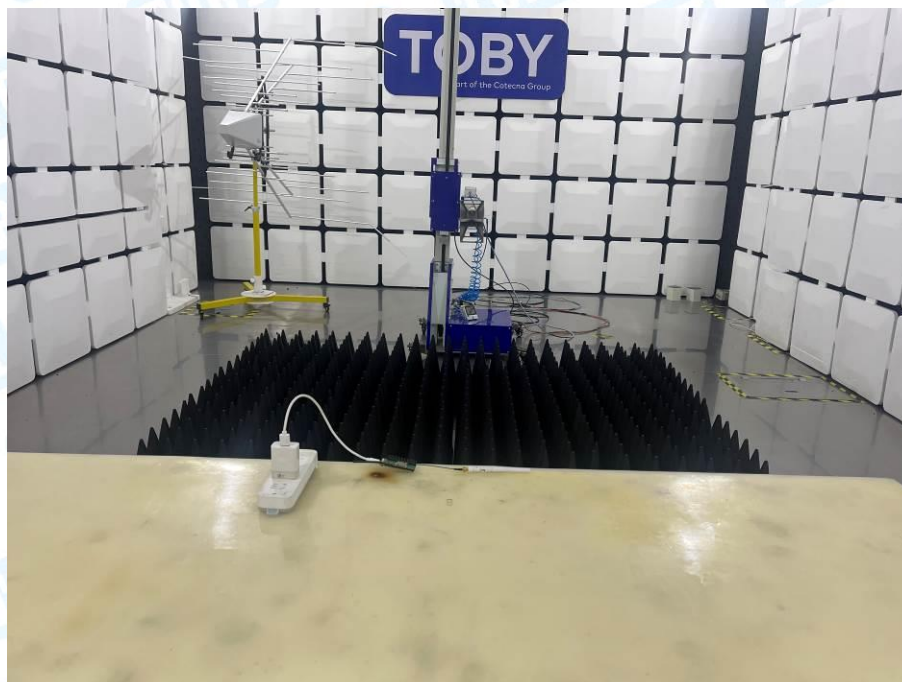
Conducted Emission Test Setup



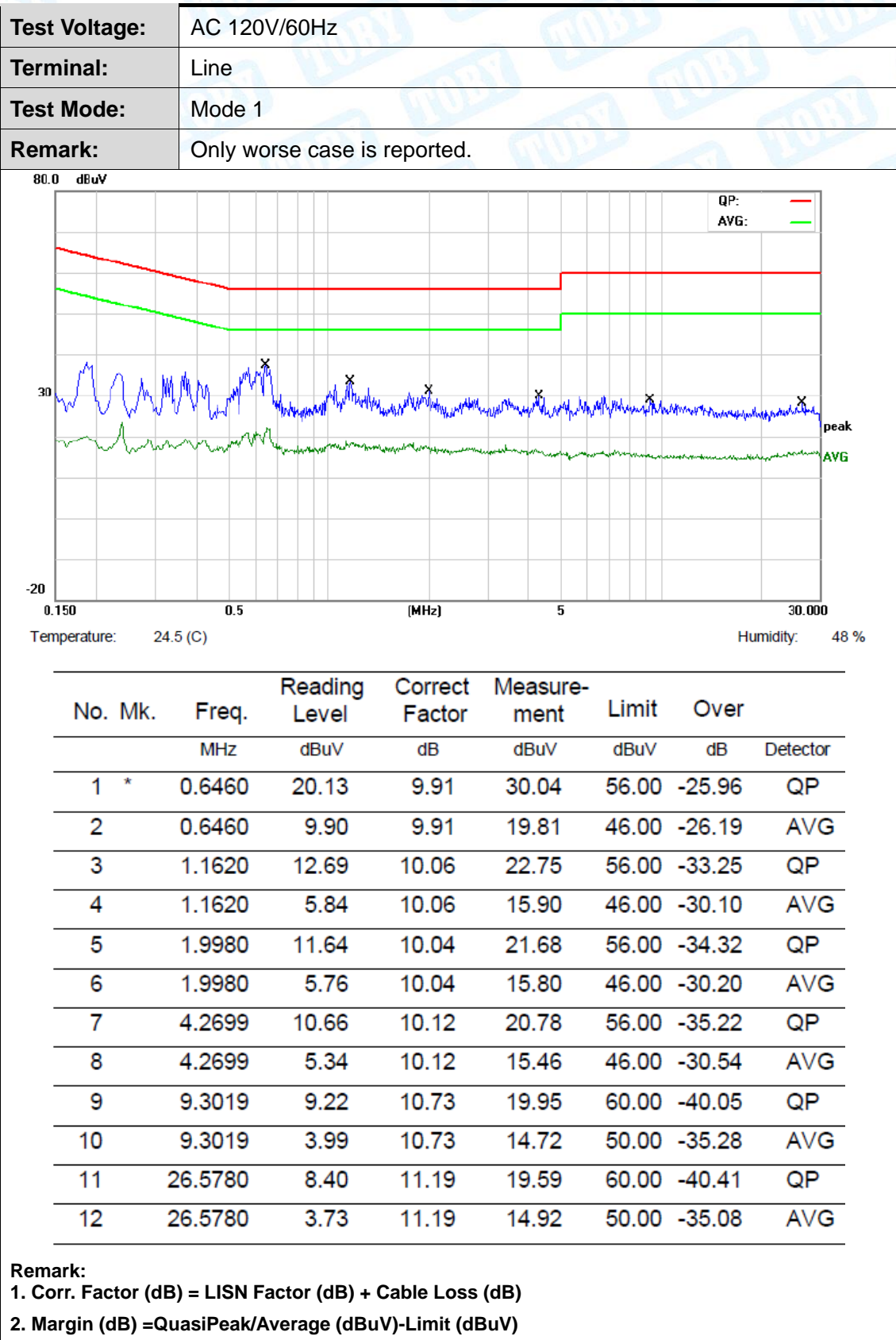
Radiated Emission Test Setup-Below 1GHz



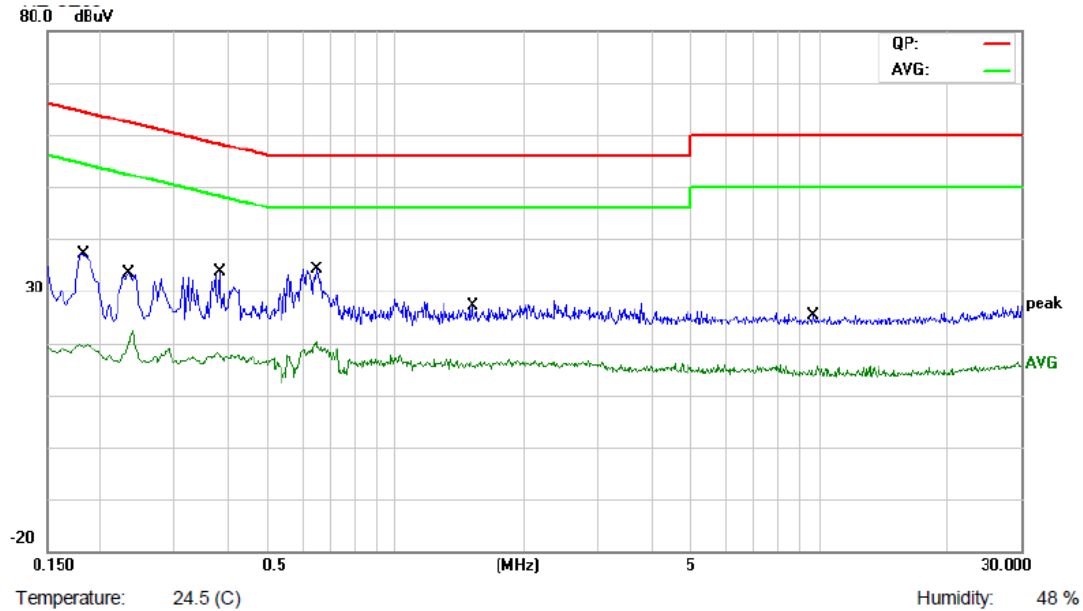
Radiated Emission Test Setup-Above 1GHz



Attachment A--Conducted Emission Test Data



| | |
|---------------|------------------------------|
| Test Voltage: | AC 120V/60Hz |
| Terminal: | Neutral |
| Test Mode: | Mode 1 |
| Remark: | Only worse case is reported. |



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV | Limit dBuV | Over dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|
| 1 | | 0.1819 | 20.28 | 10.08 | 30.36 | 64.39 | -34.03 | QP |
| 2 | | 0.1819 | 7.36 | 10.08 | 17.44 | 54.39 | -36.95 | AVG |
| 3 | | 0.2340 | 18.09 | 10.02 | 28.11 | 62.30 | -34.19 | QP |
| 4 | | 0.2340 | 10.34 | 10.02 | 20.36 | 52.30 | -31.94 | AVG |
| 5 | | 0.3820 | 15.09 | 9.93 | 25.02 | 58.23 | -33.21 | QP |
| 6 | | 0.3820 | 6.40 | 9.93 | 16.33 | 48.23 | -31.90 | AVG |
| 7 | | 0.6540 | 20.01 | 9.92 | 29.93 | 56.00 | -26.07 | QP |
| 8 | * | 0.6540 | 10.54 | 9.92 | 20.46 | 46.00 | -25.54 | AVG |
| 9 | | 1.5180 | 9.36 | 10.05 | 19.41 | 56.00 | -36.59 | QP |
| 10 | | 1.5180 | 4.77 | 10.05 | 14.82 | 46.00 | -31.18 | AVG |
| 11 | | 9.7018 | 9.32 | 10.78 | 20.10 | 60.00 | -39.90 | QP |
| 12 | | 9.7018 | 4.02 | 10.78 | 14.80 | 50.00 | -35.20 | AVG |

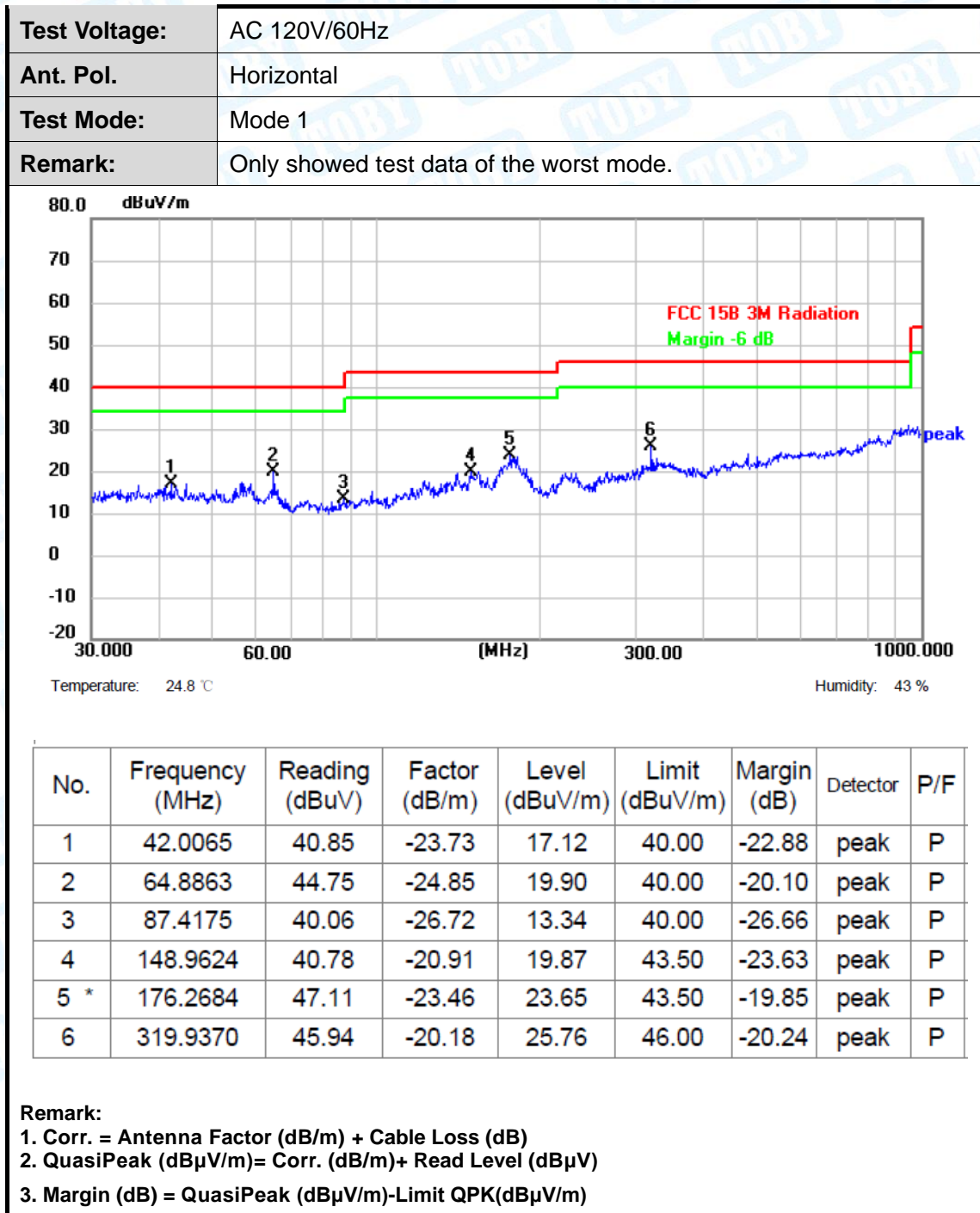
Remark:

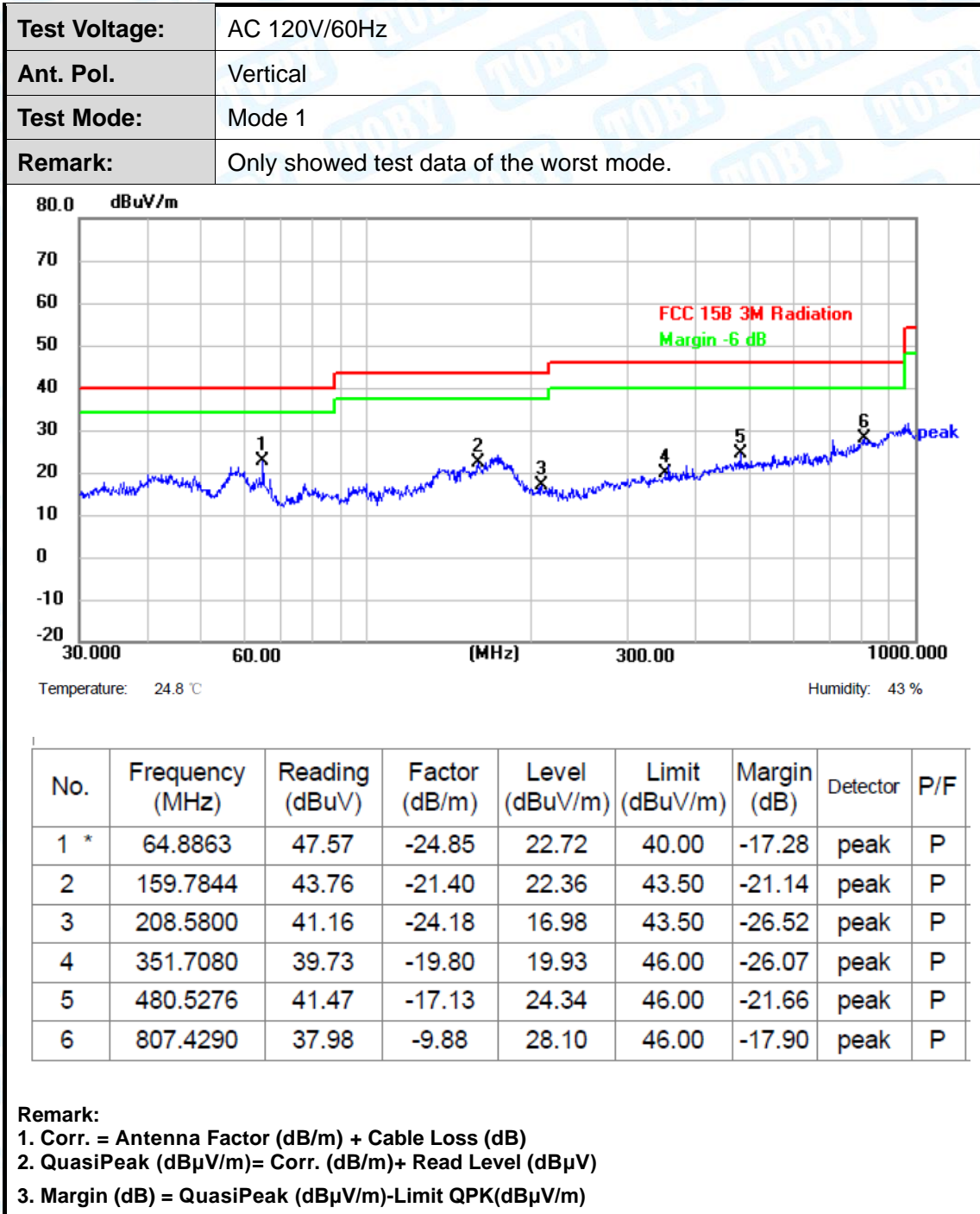
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = QuasiPeak/Average (dBuV) - Limit (dBuV)



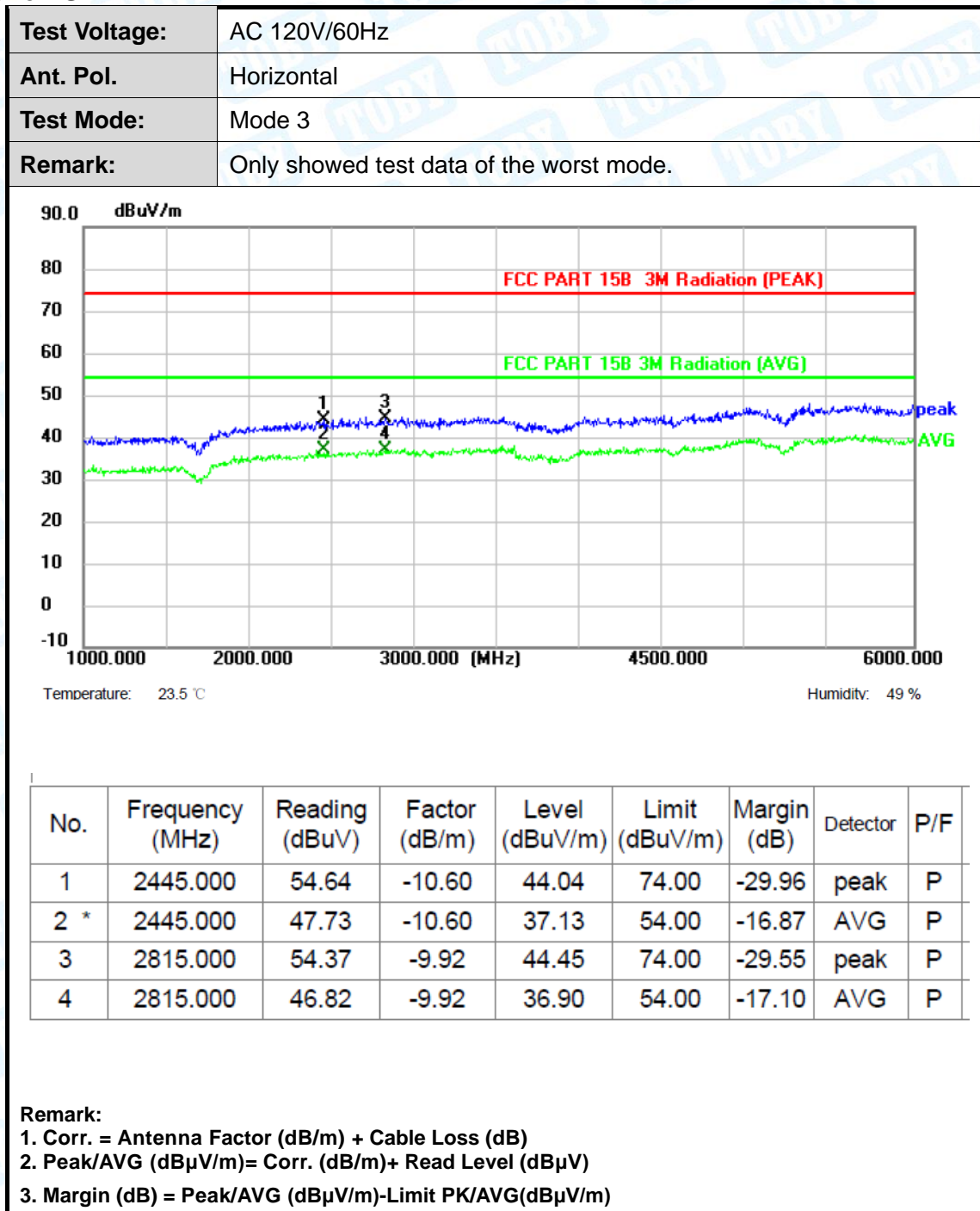
Attachment B--Radiated Emission Test Data

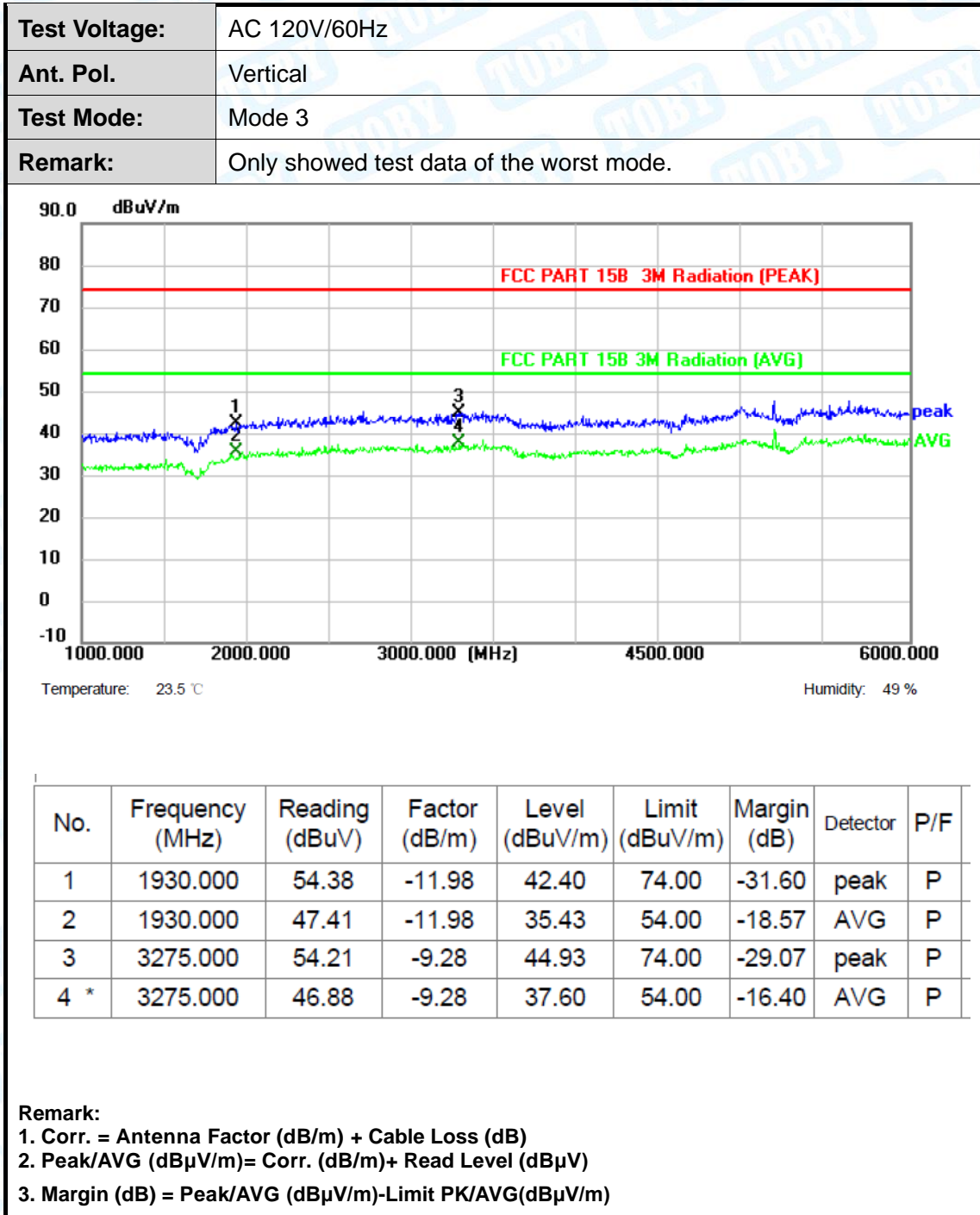
----Below 1G





---- Above 1G





-----END OF THE REPORT-----

