Shenzhen CTL Testing Technology Co., Ltd.
Tel: +86-755-89486194 E-mail: ctl@ctl-lab.com

# TEST REPORT

## 47 CFR Part 15, Subpart C 15.247

| | | |
|---|---|---|
| **Report Reference No.:** | **CTL2606098042-WF** | |
| Compiled by:<br>(printed name+signature) | Gary Gao | |
| Reviewed by:<br>(printed name+signature) | Happy Guo | |
| Approved by:<br>(printed name+signature) | Ivan Xie | |

| | |
|---|---|
| **Product Name**..... : | ALPHA WORKS AW-W90 |
| **Model/Type reference**..... : | AW-W90 |
| **List Model(s)**..... : | AW-W90BLK, AW-W90BRN, AW-W90ORG |
| **Trade Mark**..... : | ALPHA WORKS |
| **FCC ID**..... : | **2BVBU-AWW90** |
| **Applicant's name**..... : | **ALPHA WORKS GLOBAL COMPANY LIMITED** |
| **Address of applicant**..... : | 157 Nguyen Van Troi Street, Phu Nhuan Ward, Ho Chi Minh City, VIETNAM |
| **Test specification**..... : | |
| Standard..... : | **47 CFR Part 15, Subpart C 15.247:** Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz. |
| TRF Originator..... : | Shenzhen CTL Testing Technology Co., Ltd. |
| Master TRF..... : | Dated 2011-01 |
| **Date of receipt of test item**..... : | June 10, 2026 |
| **Date of Test Date**..... : | June 10, 2026-July 15, 2026 |
| **Date of Issue**..... : | July 17, 2026 |
| **Result**..... : | **Pass** |

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# TEST REPORT

| Test Report No. : | CTL2606098042-WF | July 17, 2026<br>Date of issue |
|---|---|---|

| | | |
|---|---|---|
| Equipment under Test | : | ALPHA WORKS AW-W90 |
| Sample No | : | CTL260609804002, CTL260609804004, CTL260609804006 |
| Model /Type | : | AW-W90 |
| Listed Models | : | AW-W90BLK, AW-W90BRN, AW-W90ORG |
| **Applicant** | : | **ALPHA WORKS GLOBAL COMPANY LIMITED** |
| Address | : | 157 Nguyen Van Troi Street, Phu Nhuan Ward, Ho Chi Minh City, VIETNAM |
| **Manufacturer** | : | **ALPHA WORKS GLOBAL COMPANY LIMITED** |
| Address | : | 157 Nguyen Van Troi Street, Phu Nhuan Ward, Ho Chi Minh City, VIETNAM |

| Test result | Pass * |
|---|---|

*In the configuration tested, the EUT complied with the standards specified page 5.

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.
The device (Product Name: ALPHA WORKS AW-W90) Models Name: AW-W90 , AW-W90BLK, AW-W90BRN, AW-W90ORG have same electrical, PCB and BOM, only the colour and model names are different for marketing requirements.

# ** Modified History **

| Revisions | Description | Issued Data | Report No. | Remark |
|---|---|---|---|---|
| Version 1.0 | Initial Test Report Release | July 17, 2026 | CTL2606098042-WF | Tracy Qi |
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## Table of Contents Page

**1. SUMMARY ..... 5**

1.1. TEST STANDARDS ..... 5
1.2. TEST DESCRIPTION ..... 5
1.3. TEST FACILITY ..... 6
1.4. STATEMENT OF THE MEASUREMENT UNCERTAINTY ..... 6
1.5. AUXILIARY EQUIPMENT INFORMATION ..... 7

**2. GENERAL INFORMATION ..... 8**

2.1. ENVIRONMENTAL CONDITIONS ..... 8
2.2. GENERAL DESCRIPTION OF EUT ..... 8
2.3. DESCRIPTION OF TEST MODES AND TEST FREQUENCY ..... 9
2.4. EQUIPMENTS USED DURING THE TEST ..... 10
2.5. RELATED SUBMITTAL(S) / GRANT (S) ..... 10
2.6. MODIFICATIONS ..... 10

**3. TEST CONDITIONS AND RESULTS ..... 11**

3.1. CONDUCTED EMISSIONS TEST ..... 11
3.2. RADIATED EMISSIONS AND BAND EDGE ..... 14
3.3. MAXIMUM PEAK OUTPUT POWER ..... 28
3.4. 20DB BANDWIDTH ..... 29
3.5. FREQUENCY SEPARATION ..... 30
3.6. NUMBER OF HOPPING FREQUENCY ..... 31
3.7. TIME OF OCCUPANCY (DWELL TIME) ..... 32
3.8. OUT-OF-BAND EMISSIONS ..... 33
3.9. PSEUDORANDOM FREQUENCY HOPPING SEQUENCE ..... 34
3.10. ANTENNA REQUIREMENT ..... 35

**4. TEST SETUP PHOTOS OF THE EUT ..... 35**

**5. PHOTOS OF THE EUT ..... 38**

# 1. SUMMARY

## 1.1. TEST STANDARDS

The tests were performed according to following standards:

47 CFR Part 15, Subpart C 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ANSI C63.10:2020: American National Standard for Testing Unlicensed Wireless Devices

KDB 558074 D01 v05r02: KDB558074 D01 15.247 Meas Guidance v05r02

## 1.2. Test Description

| **47 CFR Part 15, Subpart C 15.247** | | |
|---|---|---|
| 47 CFR Part 15, Subpart C 15.207 | AC Power Conducted Emission | PASS |
| 47 CFR Part 15, Subpart C 15.247(a)(1)(i) | 20dB Bandwidth | PASS |
| 47 CFR Part 15, Subpart C 15.247(d) | Spurious RF Conducted Emission | PASS |
| 47 CFR Part 15, Subpart C 15.247(b) | Maximum Peak Output Power | PASS |
| 47 CFR Part 15, Subpart C 15.247(a) | Pseudorandom Frequency Hopping Sequence | PASS |
| 47 CFR Part 15, Subpart C 15.247(a)(1)(iii) | Number of hopping frequency& Time of Occupancy | PASS |
| 47 CFR Part 15, Subpart C 15.247(a)(1) | Frequency Separation | PASS |
| 47 CFR Part 15, Subpart C 15.205/15.209 | Radiated Emissions | PASS |
| 47 CFR Part 15, Subpart C 15.247(d) | Band Edge Compliance of RF Emission | PASS |
| 47 CFR Part 15, Subpart C 15.203/15.247 (b) | Antenna Requirement | PASS |

## 1.3. Test Facility

### 1.3.1 Test laboratory

| | |
|---|---|
| **Company Name:** | Shenzhen CTL Testing Technology Co., Ltd. |
| **Address 1:** | Zone A.1/F..Warehouse 2.Baisha Technology Park, No.3011,Shahexi Road, Nanshan District,Shenzhen.518055,P.R.C. |
| **Address 2:** | Fl.A1, Bldg.A3, No.2533 GuanGuang Road, Fenghuang Community Fenghuang Street, Guangming District, Shenzhen, Guangdong, PR.C |

### 1.3.2 Test location

All tests were performed at:

| | |
|---|---|
| **Company Name:** | Shenzhen CTL Testing Technology Co., Ltd. |
| ☐ Main location | Zone A.1/F..Warehouse 2.Baisha Technology Park, No.3011,Shahexi Road, Nanshan District,Shenzhen.518055,P.R.C. |
| ☒ Satellite location | Fl.A1, Bldg.A3, No.2533 GuanGuang Road, Fenghuang Community Fenghuang Street, Guangming District, Shenzhen, Guangdong, PR.C |

### 1.3.3 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

**CNAS-Lab Code: L7497**

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

**A2LA-Lab Cert. No. 4343.01**

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

**IC CAB identifier: CN0041**

**Main Company Number :9618B**

**Satellite Company Number:35187**

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Main Company Number:9618B and Satellite Company Number:35187.

**FCC-Registration No.: 399832**

**Designation No.: CN1216**

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation No.: CN1216. Test Firm Registration 399832.

## 1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole

responsibility of continued compliance of the device.
Hereafter the best measurement capability for CTL laboratory is reported:

| Test | Measurement Uncertainty | Notes |
|---|---|---|
| Conducted Emission 0.15-30MHz | ±3.11dB | (1) |
| Radiated Emission 0.009~30MHz | ±3.66dB | (1) |
| Radiated Emission 30~1000MHz | ±4.5dB | (1) |
| Radiated Emission Above 1GHz | ±5.08dB | (1) |
| 20dB Emission Bandwidth | ±1.9% | (1) |
| Carrier Frequency Separation | ±1.9% | (1) |
| Maximum Power Spectral Density Level | ±0.98 dB | (1) |
| Number of Hopping Channel | ±1.9% | (1) |
| Time of Occupancy | ±0.11% | (1) |
| Max Peak Conducted Output Power | ±0.98 dB | (1) |
| Band-edge Spurious Emission | ±1.21dB | (1) |
| Conducted RF Spurious Emission | 9kHz-7GHz:±1.09dB<br>7GHz-26.5GHz: ±3.27dB | (1) |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.
(2) Decision rule for Statement of Conformity: The measurement uncertainty is not taken into account but only measured result.

## 1.5. Auxiliary equipment information

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| HUAWEI | Adapter | HW-100225C00 | HC78E2N4121901 |

Note: This adapter is provided by the laboratory and is only for auxiliary testing. The customer delivered the goods without an adapter.

# 2. GENERAL INFORMATION

## 2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Normal Temperature: | 18°C-28°C |
| Relative Humidity: | 30%-60% |
| Air Pressure: | 965Pa-1030Pa |

## 2.2. General Description of EUT

| | |
|---|---|
| Product Name: | ALPHA WORKS AW-W90 |
| Model/Type reference: | AW-W90 |
| EUT Rated Voltage: | DC 10.8V, charged by AC adapter |
| Test Voltage: | DC 10.8V, charged by AC adapter |
| **Bluetooth** | |
| Version: | Supported BR/EDR |
| Modulation: | GFSK, π/4DQPSK, 8DPSK |
| Operation frequency: | 2402MHz~2480MHz |
| Channel number: | 79 |
| Channel separation: | 1MHz |
| Antenna type: | PCB Antenna |
| Antenna gain: | 0dBi provided by ☒ Applicant ☐ Manufacturer |

Note1: For more details, please refer to the user's manual of the EUT.
Note2:The model AW-W90 is selected as representative model for full tests

## 2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.There are 79 channels provided to the EUT and Channel 00/39/78 were selected to test.

**Operation Frequency：**

| Channel | Frequency (MHz) |
|---|---|
| **00** | **2402** |
| 01 | 2403 |
| ⋮ | ⋮ |
| 38 | 2440 |
| **39** | **2441** |
| 40 | 2442 |
| ⋮ | ⋮ |
| 77 | 2479 |
| **78** | **2480** |

Preliminary tests were performed in each mode and packet length of BT, and found worst case as bellow, finally test were conducted at those mode and recorded in this report.

| Test Items | Worst case |
|---|---|
| Conducted Emissions | DH5 Low channel |
| Radiated Emissions and Band Edge | DH5 |
| Maximum Conducted Output Power | DH5/2DH5/3DH5 |
| 20dB Bandwidth | DH5/2DH5/3DH5 |
| Frequency Separation | DH5/2DH5/3DH5 |
| Number of hopping frequency | DH5/2DH5/3DH5 |
| Time of Occupancy (Dwell Time) | DH1/DH3/DH5<br>2DH1/2DH3/2DH5<br>3DH1/3DH3/3DH5 |
| Out-of-band Emissions | DH5/2DH5/3DH5 |

**RF Cable List and Details**

| RF Cable | RF Cable loss | RF Cable loss provided by |
|---|---|---|
| RG316 | 0.5dB | ☒ Applicant ☐ Manufacturer ☐ Testing Laboratory(CTL) |

| Software Version: FCC_Tool_V3.01 | |
|---|---|
| Test Mode | Power level |
| BT BR | 0 |
| BT EDR | 0 |

## 2.4. Equipments Used during the Test

| Conducted Emission | | | | | |
|---|---|---|---|---|---|
| Test Equipment | Manufacturer | Model No. | Serial No. | Last calibration | Calibration Due |
| EMI Test Receiver | ROHDE & SCHWARZ | ESCI | 1166.5950.03 | 2026/01/05 | 2027/01/04 |
| LISN | ROHDE & SCHWARZ | ESH2-Z5 | 860014/010 | 2026/01/05 | 2027/01/04 |
| Limitator | ROHDE & SCHWARZ | ESH3-Z2 | 100408 | 2026/01/05 | 2027/01/04 |
| Software: | | | | | |
| Name of Software: | | | Version: | | |
| ES-K1 | | | V1.71 | | |

| Radiated Emission | | | | | |
|---|---|---|---|---|---|
| Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal.Due |
| Active Loop Antenna | Da Ze | ZN30900A | / | 2025/07/02 | 2026/07/01 |
| ULTRA-BROADBAND ANTENNA | Sunol Sciences Corp. | JB1 Antenna | A061713 | 2025/07/02 | 2026/07/01 |
| Horn Antenna | Sunol Sciences Corp. | DRH-118 | A062013 | 2026/01/05 | 2027/01/04 |
| Horn Antenna | Ocean Microwave | OBH100400 | 26999002 | 2025/07/03 | 2026/07/02 |
| Amplifier | MRT-AP01M06 | MRT | S-001 | 2025/07/02 | 2026/07/01 |
| Amplifier | Agilent | 8449B | 3008A02306 | 2026/01/05 | 2027/01/04 |
| Amplifier | Brief&Smart | LNA-4018 | 2104197 | 2025/07/03 | 2026/07/02 |
| EMI Test Receiver | ROHDE & SCHWARZ | ESPI | 100434 | 2025/07/02 | 2026/07/01 |
| Spectrum Analyzer | RS | FSP | 1164.4391.38 | 2025/07/03 | 2026/07/02 |
| DC power supply | Agilent | E3632A | MY40015577 | 2025/07/03 | 2026/07/02 |
| Software: | | | | | |
| Name of Software: | | | Version: | | |
| EZ_EMC(Below 1GHz) | | | V1.1.4.2 | | |
| EZ_EMC(Above 1GHz) | | | V1.1.4.2 | | |

| RF Conducted | | | | | |
|---|---|---|---|---|---|
| Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal.Due |
| Spectrum Analyzer | Keysight | N9020A | MY53420874 | 2025/07/03 | 2026/07/02 |
| Temperature/Humidity Meter | Ji Yu | MC501 | / | 2025/07/03 | 2026/07/02 |
| Software: | | | | | |
| Name of Software: | | | Version: | | |
| TST-PASS | | | V2.0.2 | | |

## 2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.247 of the 47 CFR Part 15, Subpart C Rules.

## 2.6. Modifications

No modifications were implemented to meet testing criteria.

# 3. TEST CONDITIONS AND RESULTS

## 3.1. Conducted Emissions Test

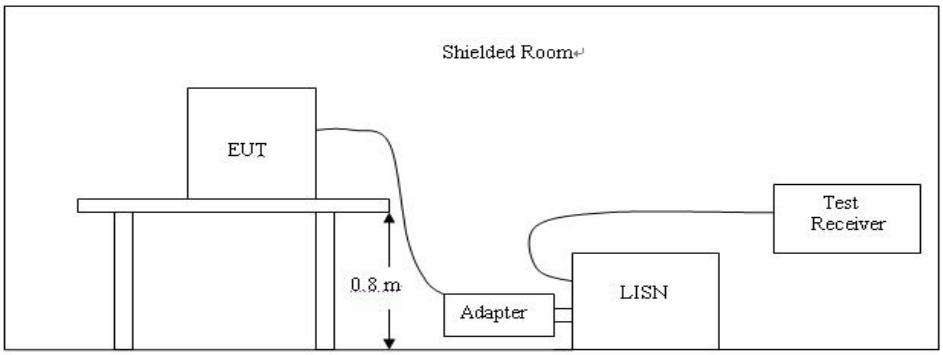
**LIMIT**

FCC CFR Title 47 Part 15 Subpart C Section 15.207

| 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 CONFIGURATION**




**TEST PROCEDURE**

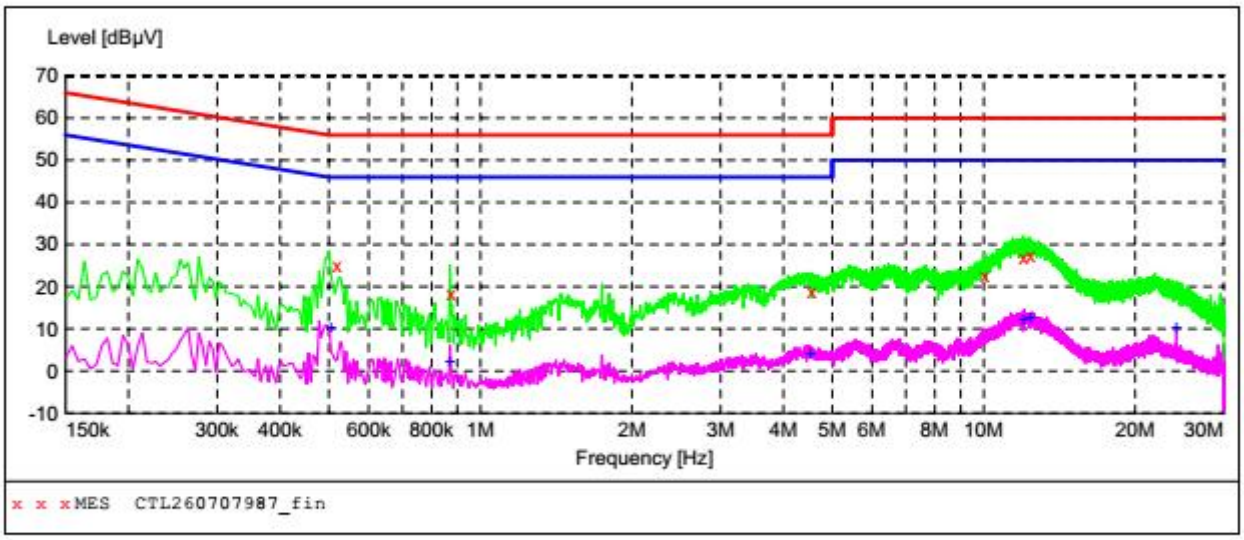
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2020.
2. Support equipment, if needed, was placed as per ANSI C63.10:2020.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2020.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

## TEST RESULTS

| Line: | L |
|---|---|

***SCAN TABLE: "Voltage (9K-30M)FIN"***

Short Description: 150K-30M Voltage




***MEASUREMENT RESULT: "CTL260707987_fin"***

7/7/2026 5:49PM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.519000 | 25.20 | 10.0 | 56 | 30.8 | QP | L1 | GND |
| 0.874500 | 18.40 | 10.0 | 56 | 37.6 | QP | L1 | GND |
| 4.555500 | 18.90 | 10.5 | 56 | 37.1 | QP | L1 | GND |
| 10.054500 | 22.50 | 10.7 | 60 | 37.5 | QP | L1 | GND |
| 11.998500 | 27.00 | 10.8 | 60 | 33.0 | QP | L1 | GND |
| 12.408000 | 27.20 | 10.8 | 60 | 32.8 | QP | L1 | GND |

***MEASUREMENT RESULT: "CTL260707987_fin2"***

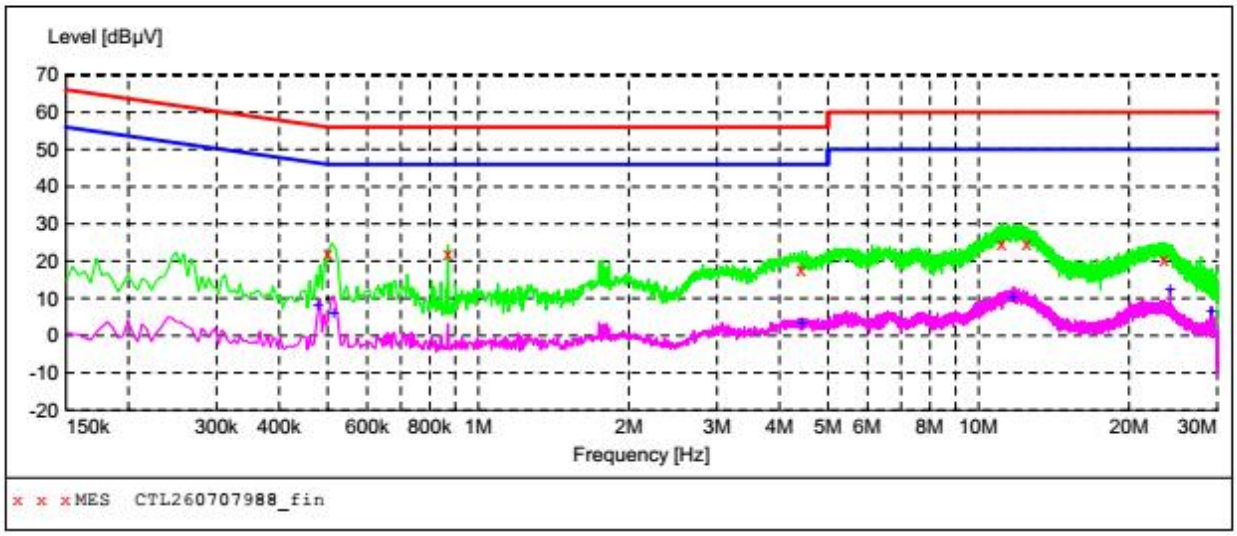
7/7/2026 5:49PM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.505500 | 10.50 | 10.0 | 46 | 35.5 | AV | L1 | GND |
| 0.870000 | 2.00 | 10.0 | 46 | 44.0 | AV | L1 | GND |
| 4.528500 | 4.30 | 10.5 | 46 | 41.7 | AV | L1 | GND |
| 12.003000 | 12.30 | 10.8 | 50 | 37.7 | AV | L1 | GND |
| 12.408000 | 12.50 | 10.8 | 50 | 37.5 | AV | L1 | GND |
| 24.166500 | 10.20 | 11.1 | 50 | 39.8 | AV | L1 | GND |

| Line: | N |
|---|---|

***SCAN TABLE: "Voltage (9K-30M)FIN"***

Short Description: 150K-30M Voltage




***MEASUREMENT RESULT: "CTL260707988_fin"***

7/7/2026 5:52PM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.501000 | 22.10 | 10.0 | 56 | 33.9 | QP | N | GND |
| 0.870000 | 21.90 | 10.0 | 56 | 34.1 | QP | N | GND |
| 4.420500 | 17.70 | 10.5 | 56 | 38.3 | QP | N | GND |
| 11.116500 | 24.60 | 10.8 | 60 | 35.4 | QP | N | GND |
| 12.466500 | 24.50 | 10.8 | 60 | 35.5 | QP | N | GND |
| 23.491500 | 20.50 | 11.0 | 60 | 39.5 | QP | N | GND |

***MEASUREMENT RESULT: "CTL260707988_fin2"***

7/7/2026 5:52PM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.478500 | 8.00 | 9.9 | 46 | 38.4 | AV | N | GND |
| 0.514500 | 6.10 | 10.0 | 46 | 39.9 | AV | N | GND |
| 4.438500 | 3.20 | 10.5 | 46 | 42.8 | AV | N | GND |
| 11.773500 | 10.50 | 10.8 | 50 | 39.5 | AV | N | GND |
| 24.166500 | 12.20 | 11.1 | 50 | 37.8 | AV | N | GND |
| 29.238000 | 6.50 | 11.1 | 50 | 43.5 | AV | N | GND |

## 3.2. Radiated Emissions and Band Edge

**Limit**

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

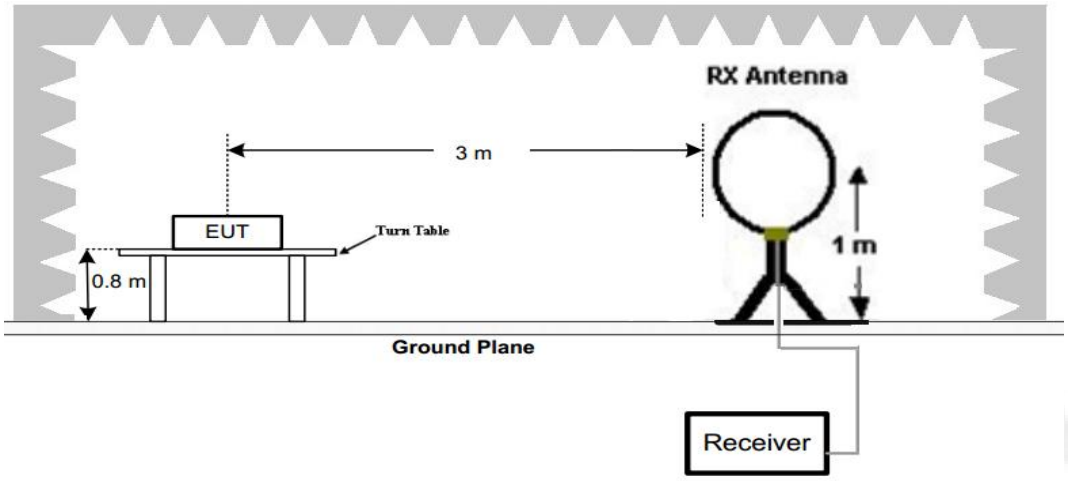
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

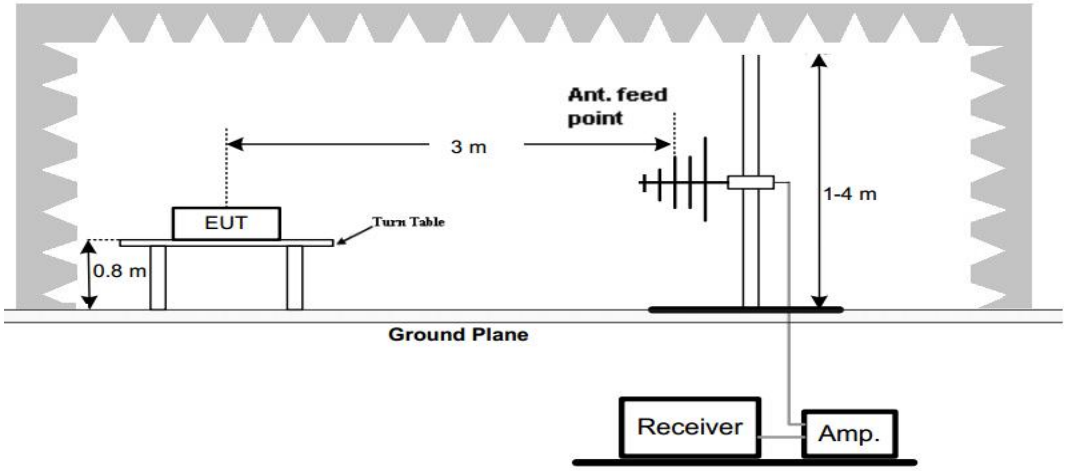
| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 0.009-0.49 | 3 | 20log(2400/F(KHz))+40log(300/3) | 2400/F(KHz) |
| 0.49-1.705 | 3 | 20log(24000/F(KHz))+ 40log(30/3) | 24000/F(KHz) |
| 1.705-30 | 3 | 20log(30)+ 40log(30/3) | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

**TEST CONFIGURATION**

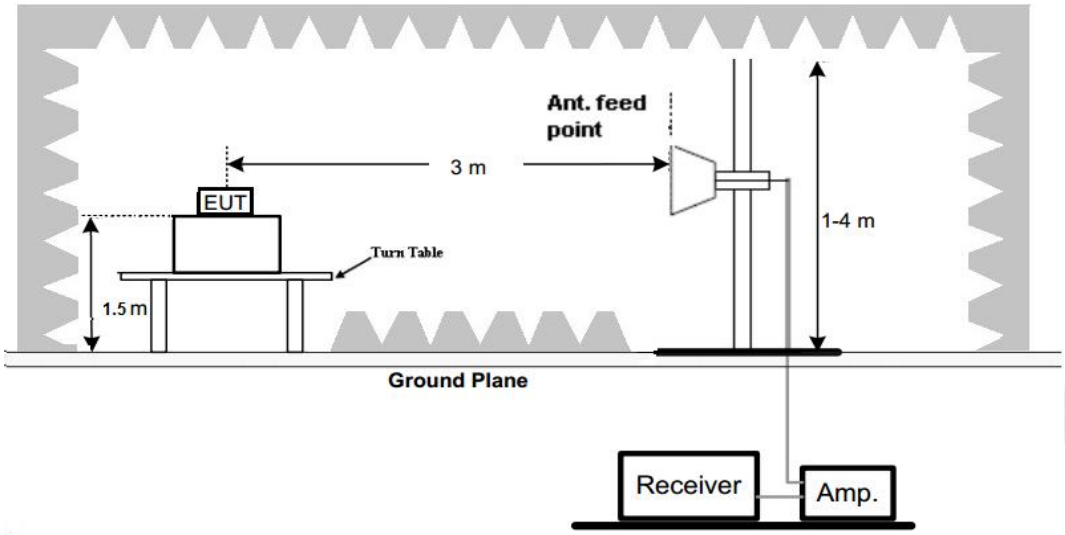
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz




(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz




**Test Procedure**

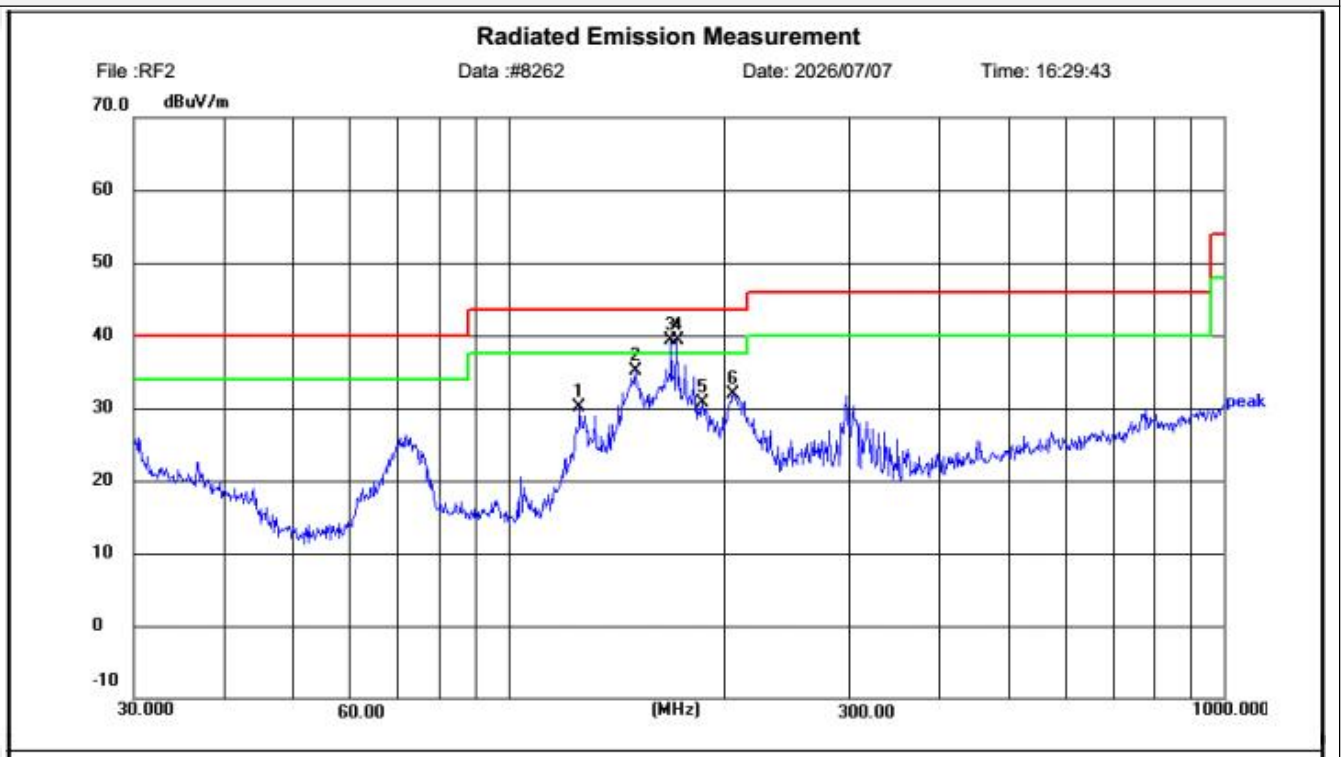
1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

**TEST RESULTS**

Remark:
1. We measured Radiated Emission at GFSK, π/4 DQPSK mode from 9 KHz to 25GHz and recorded worst case at GFSK DH5 mode..
2. For below 1GHz testing recorded worst at GFSK DH5 low channel.
3. For above 1GHz testing recorded worst at GFSK DH5 low channel.
4. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, Found the emission level are attenuated 20dB below the limits from 9 kHz to 30MHz, so it does not recorded in report.

**For 30MHz-1GHz**

Horizontal



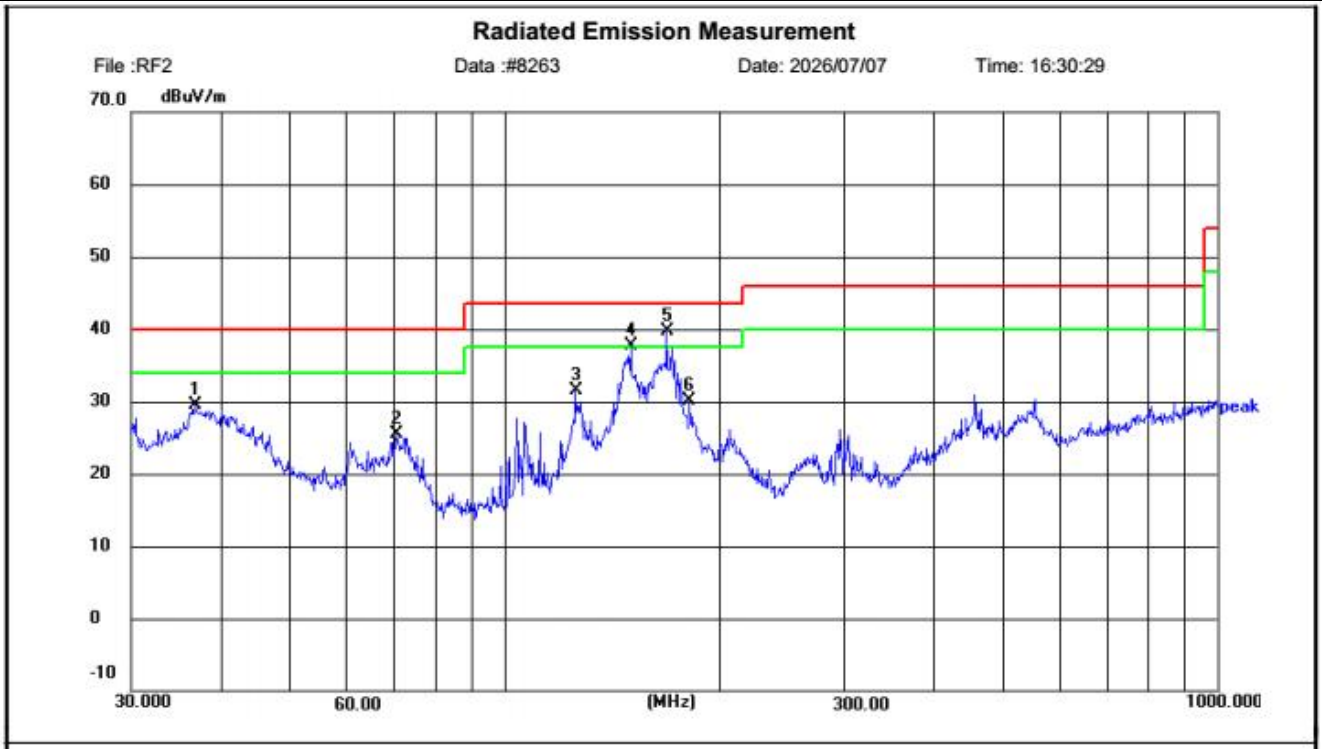

Site LAB Chamber 1
Limit: FCC Part15 Class C_30-1000MHz
EUT:
M/N:
Mode: BT 2402MHz
Note: CTL2606098042-WF

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 125.8863 | 50.70 | -20.65 | 30.05 | 43.50 | 13.45 | peak | 100 | 242 | P | |
| 2 | 150.5377 | 53.21 | -18.01 | 35.20 | 43.50 | 8.30 | peak | 100 | 94 | P | |
| 3 | 169.0053 | 59.02 | -19.79 | 39.23 | 43.50 | 4.27 | peak | 100 | 242 | P | |
| 4 | 171.9946 | 59.41 | -20.19 | 39.22 | 43.50 | 4.28 | peak | 100 | 233 | P | |
| 5 | 187.0956 | 52.07 | -21.29 | 30.78 | 43.50 | 12.72 | peak | 100 | 177 | P | |
| 6 | 206.3975 | 52.85 | -20.90 | 31.95 | 43.50 | 11.55 | peak | 100 | 344 | P | |

Vertical




Site LAB Chamber 1
Limit: FCC Part15 Class C_30-1000MHz
EUT:
M/N:
Mode: BT 2402MHz
Note: CTL2606098042-WF

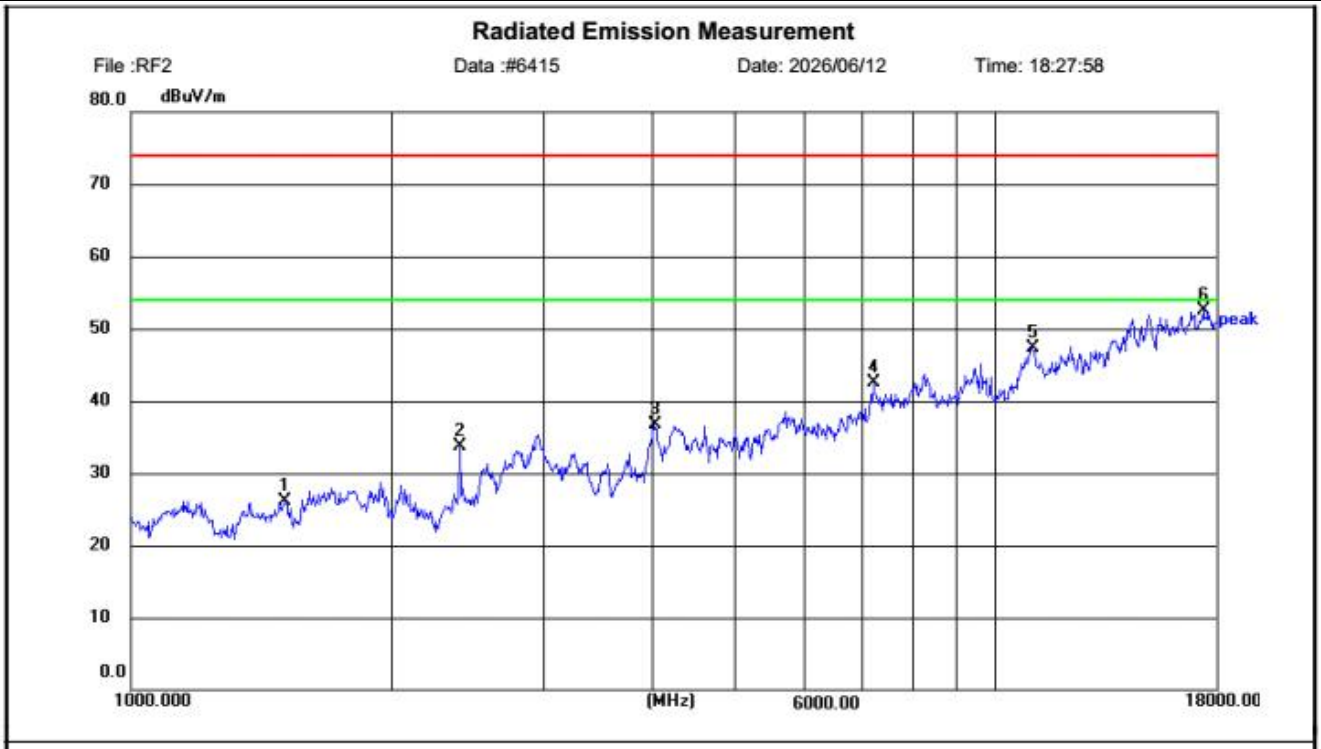
Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 36.8953 | 44.23 | -14.71 | 29.52 | 40.00 | 10.48 | peak | 100 | 190 | P | |
| 2 | 70.5836 | 49.62 | -24.08 | 25.54 | 40.00 | 14.46 | peak | 100 | 209 | P | |
| 3 | 125.8864 | 52.20 | -20.65 | 31.55 | 43.50 | 11.95 | peak | 100 | 227 | P | |
| 4 | 150.5378 | 55.72 | -18.01 | 37.71 | 43.50 | 5.79 | peak | 100 | 190 | P | |
| 5 | 169.0054 | 59.45 | -19.79 | 39.66 | 43.50 | 3.84 | peak | 100 | 209 | P | |
| 6 | 181.9202 | 50.98 | -20.88 | 30.10 | 43.50 | 13.40 | peak | 100 | 190 | P | |

***For 1GHz to 25GHz***

Horizontal




Site LAB Chamber 1
Limit: FCC PART 15C ABOVE 1GHz PK
EUT:
M/N:
Mode: BT 2402MHz TX
Note: CTL2606098042-WF

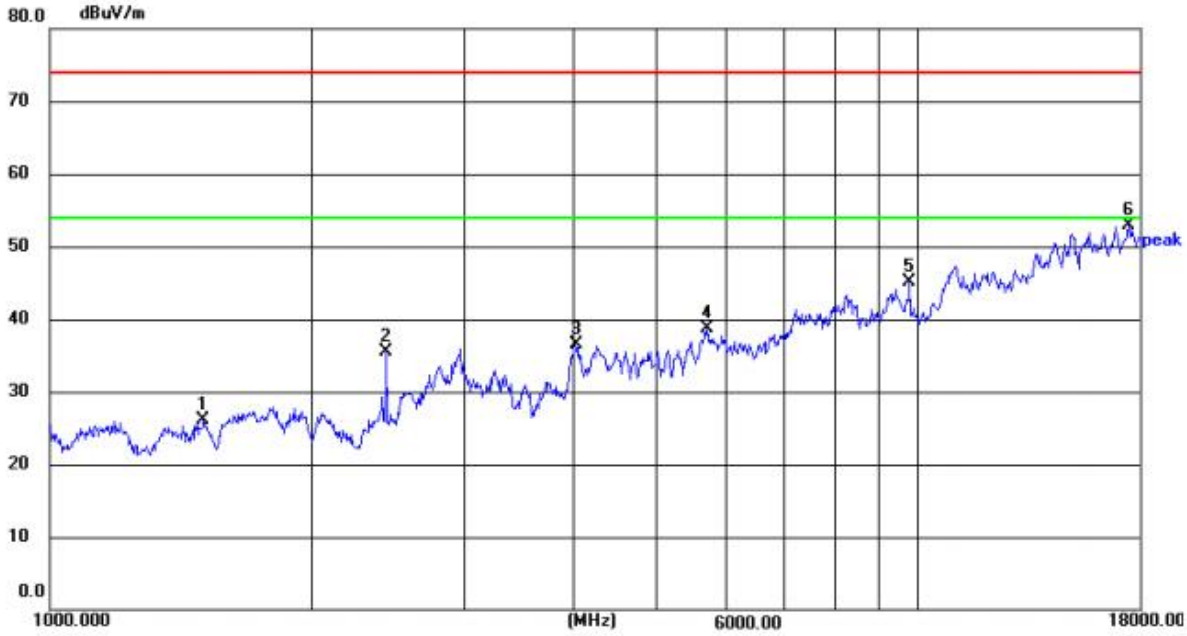
Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1507.470 | 48.12 | -22.10 | 26.02 | 74.00 | 47.98 | peak | 100 | 35 | P | |
| 2 | 2400.753 | 52.15 | -18.53 | 33.62 | 74.00 | 40.38 | peak | 100 | 114 | P | |
| 3 | 4027.554 | 45.63 | -8.93 | 36.70 | 74.00 | 37.30 | peak | 100 | 192 | P | |
| 4 | 7221.150 | 46.61 | -4.09 | 42.52 | 74.00 | 31.48 | peak | 100 | 45 | P | |
| 5 | 11012.253 | 46.20 | 1.11 | 47.31 | 74.00 | 26.69 | peak | 100 | 341 | P | |
| 6 | 17386.383 | 47.31 | 5.10 | 52.41 | 74.00 | 21.59 | peak | 200 | 35 | P | |

**Radiated Emission Measurement**

File :RF2 Data :#6417 Date: 2026/06/12 Time: 18:30:46




Site LAB Chamber 1
Limit: FCC PART 15C ABOVE 1GHz PK
EUT:
M/N:
Mode: BT 2441MHz TX
Note: CTL2606098042-WF

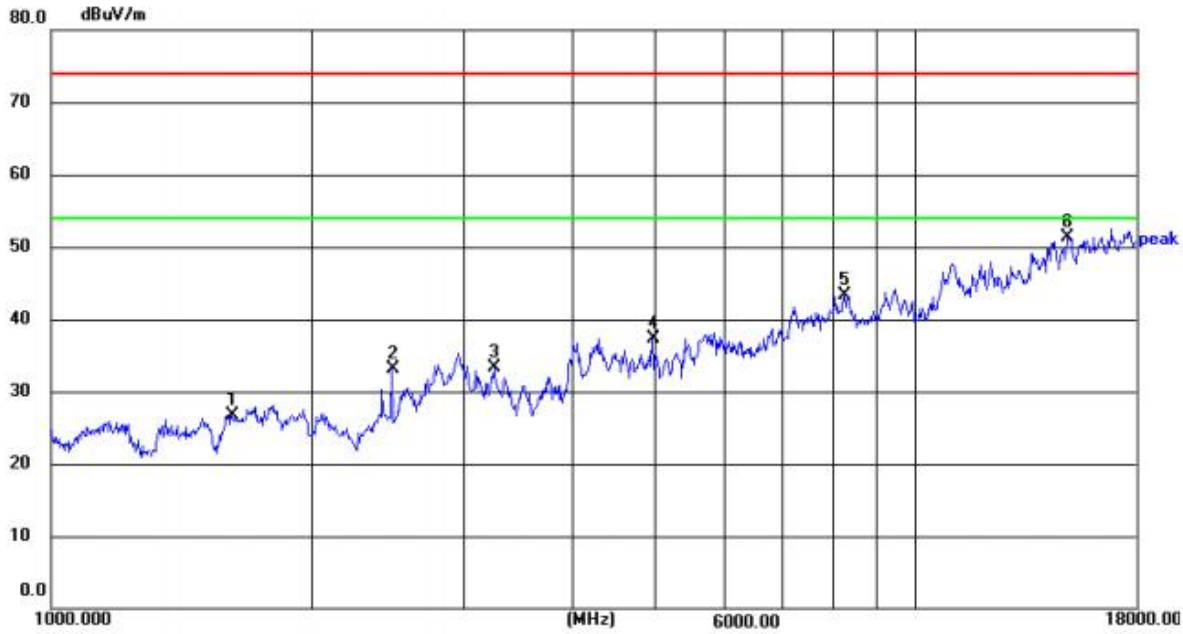
Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1503.119 | 47.90 | -21.81 | 26.09 | 74.00 | 47.91 | peak | 100 | 65 | P | |
| 2 | 2442.751 | 54.32 | -18.73 | 35.59 | 74.00 | 38.41 | peak | 100 | 114 | P | |
| 3 | 4027.554 | 45.37 | -8.93 | 36.44 | 74.00 | 37.56 | peak | 200 | 84 | P | |
| 4 | 5713.856 | 46.08 | -7.30 | 38.78 | 74.00 | 35.22 | peak | 100 | 292 | P | |
| 5 | 9781.602 | 47.93 | -2.90 | 45.03 | 74.00 | 28.97 | peak | 100 | 273 | P | |
| 6 | 17487.180 | 47.88 | 5.02 | 52.90 | 74.00 | 21.10 | peak | 100 | 144 | P | |

**Radiated Emission Measurement**

File :RF2 Data :#6419 Date: 2026/06/12 Time: 18:34:43



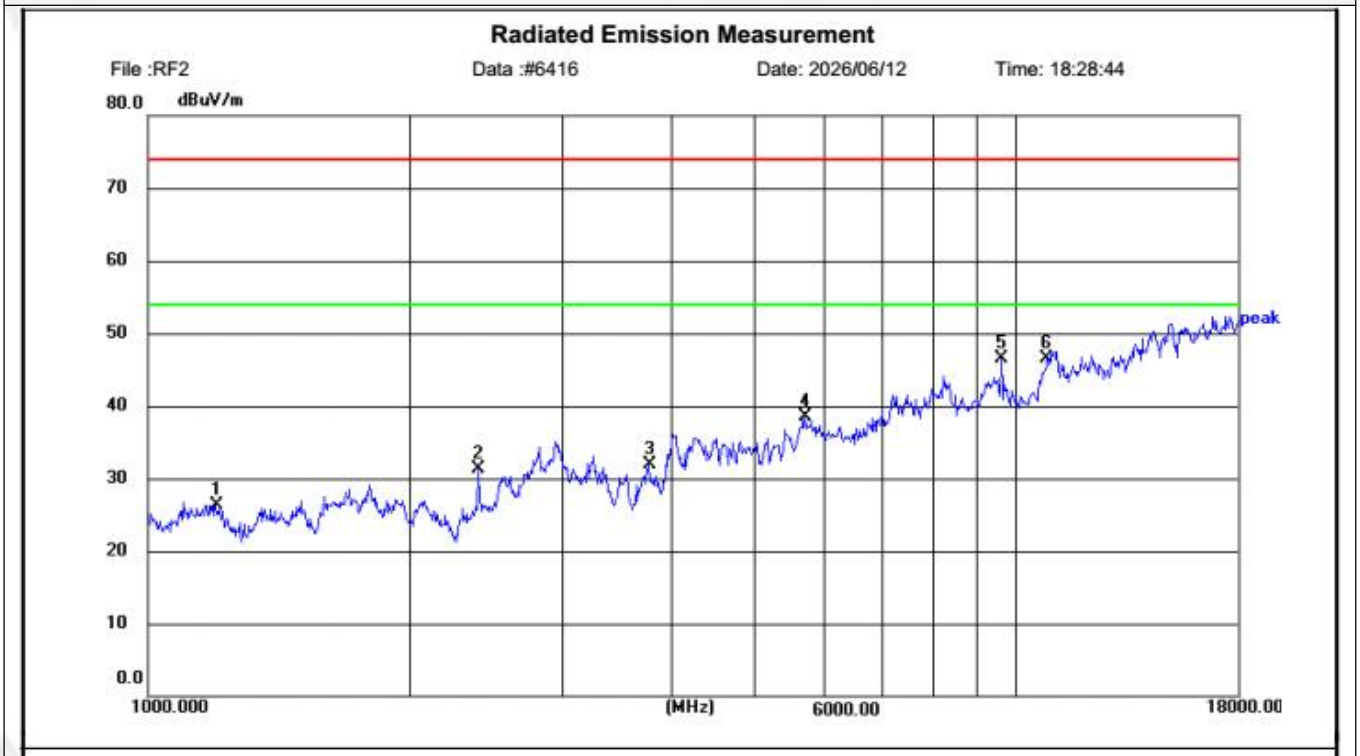

Site LAB Chamber 1
Limit: FCC PART 15C ABOVE 1GHz PK
EUT:
M/N:
Mode: BT 2480MHz TX
Note: CTL2606098042-WF

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1615.754 | 48.90 | -22.27 | 26.63 | 74.00 | 47.37 | peak | 100 | 351 | P | |
| 2 | 2478.310 | 51.74 | -18.63 | 33.11 | 74.00 | 40.89 | peak | 100 | 114 | P | |
| 3 | 3252.005 | 46.79 | -13.50 | 33.29 | 74.00 | 40.71 | peak | 100 | 6 | P | |
| 4 | 4959.307 | 47.03 | -9.73 | 37.30 | 74.00 | 36.70 | peak | 100 | 321 | P | |
| 5 | 8271.879 | 47.67 | -4.35 | 43.32 | 74.00 | 30.68 | peak | 200 | 341 | P | |
| 6 | 15003.422 | 48.15 | 3.24 | 51.39 | 74.00 | 22.61 | peak | 100 | 6 | P | |

Vertical

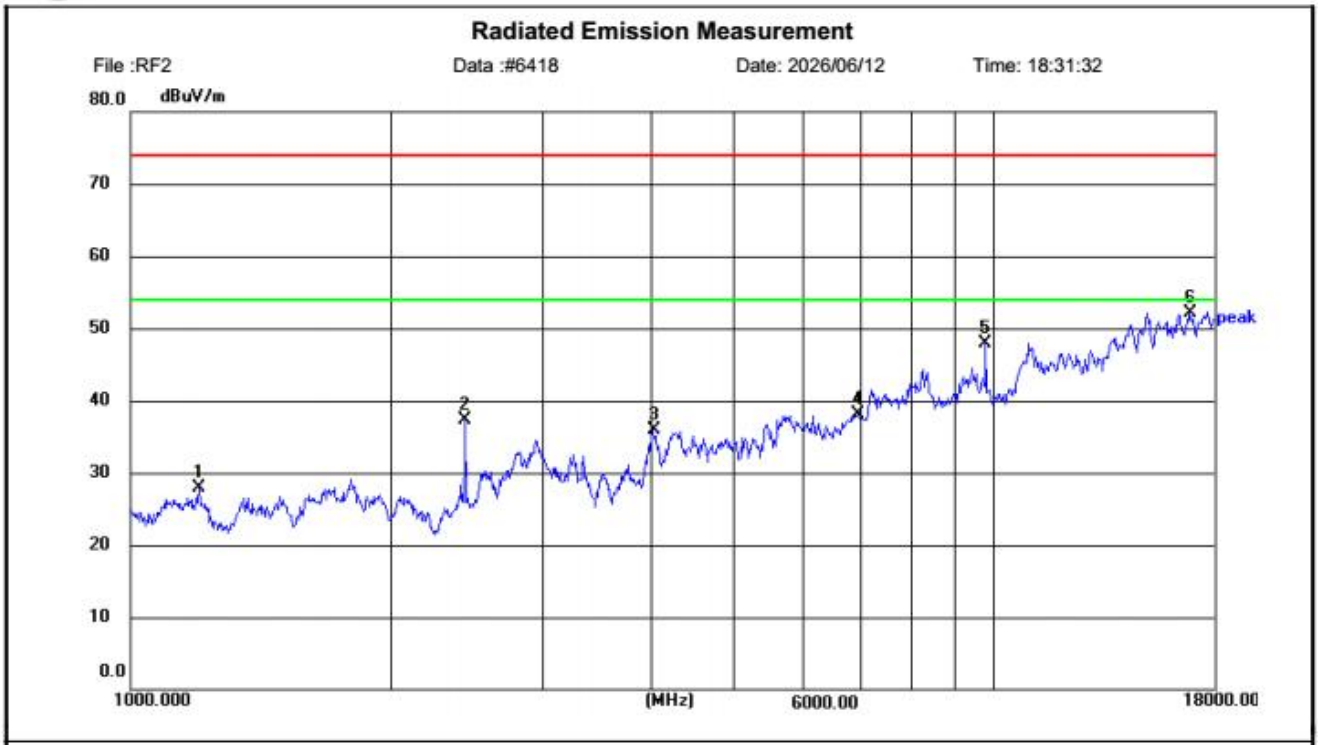



Site LAB Chamber 1
Limit: FCC PART 15C ABOVE 1GHz PK
EUT:
M/N:
Mode: BT 2402MHz TX
Note: CTL2606098042-WF

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1196.264 | 48.57 | -22.28 | 26.29 | 74.00 | 47.71 | peak | 100 | 207 | P | |
| 2 | 2400.753 | 49.74 | -18.53 | 31.21 | 74.00 | 42.79 | peak | 100 | 128 | P | |
| 3 | 3768.514 | 44.52 | -12.58 | 31.94 | 74.00 | 42.06 | peak | 100 | 356 | P | |
| 4 | 5713.856 | 45.87 | -7.30 | 38.57 | 74.00 | 35.43 | peak | 100 | 315 | P | |
| 5 | 9613.430 | 50.17 | -3.74 | 46.43 | 74.00 | 27.57 | peak | 100 | 138 | P | |
| 6 | 10854.250 | 47.42 | -0.94 | 46.48 | 74.00 | 27.52 | peak | 200 | 345 | P | |

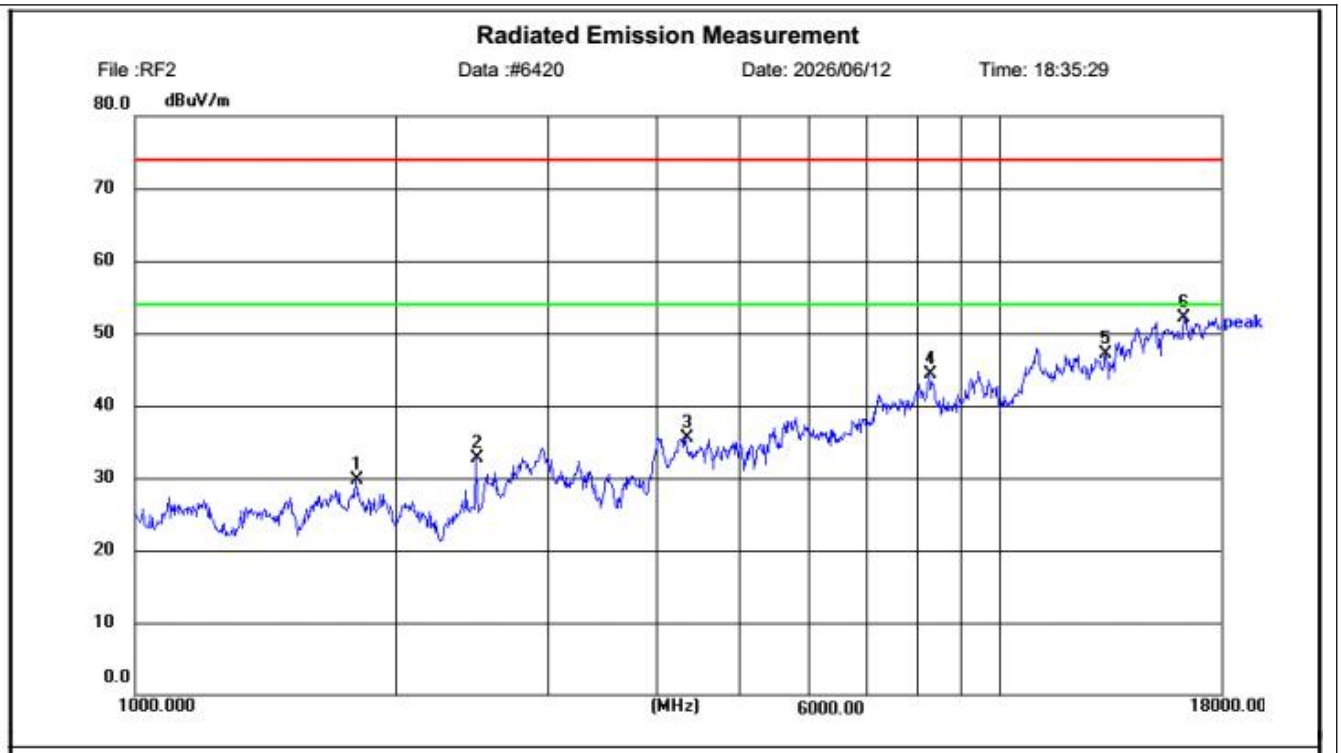



Site LAB Chamber 1
Limit: FCC PART 15C ABOVE 1GHz PK
EUT:
M/N:
Mode: BT 2441MHz TX
Note: CTL2606098042-WF

Polarization: ***Vertical***
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1199.726 | 50.08 | -22.24 | 27.84 | 74.00 | 46.16 | peak | 100 | 8 | P | |
| 2 | 2442.751 | 55.96 | -18.73 | 37.23 | 74.00 | 36.77 | peak | 100 | 97 | P | |
| 3 | 4027.554 | 44.80 | -8.93 | 35.87 | 74.00 | 38.13 | peak | 100 | 8 | P | |
| 4 | 6954.851 | 44.80 | -6.68 | 38.12 | 74.00 | 35.88 | peak | 100 | 157 | P | |
| 5 | 9781.602 | 50.88 | -2.90 | 47.98 | 74.00 | 26.02 | peak | 200 | 137 | P | |
| 6 | 16842.294 | 47.71 | 4.45 | 52.16 | 74.00 | 21.84 | peak | 100 | 147 | P | |




Site LAB Chamber 1
Limit: FCC PART 15C ABOVE 1GHz PK
EUT:
M/N:
Mode: BT 2480MHz TX
Note: CTL2606098042-WF

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1798.127 | 51.42 | -21.62 | 29.80 | 74.00 | 44.20 | peak | 100 | 28 | P | |
| 2 | 2478.310 | 51.30 | -18.63 | 32.67 | 74.00 | 41.33 | peak | 100 | 98 | P | |
| 3 | 4329.355 | 46.38 | -10.80 | 35.58 | 74.00 | 38.42 | peak | 100 | 356 | P | |
| 4 | 8271.880 | 48.64 | -4.35 | 44.29 | 74.00 | 29.71 | peak | 200 | 187 | P | |
| 5 | 13249.931 | 46.00 | 1.19 | 47.19 | 74.00 | 26.81 | peak | 100 | 257 | P | |
| 6 | 16315.231 | 47.56 | 4.45 | 52.01 | 74.00 | 21.99 | peak | 100 | 237 | P | |

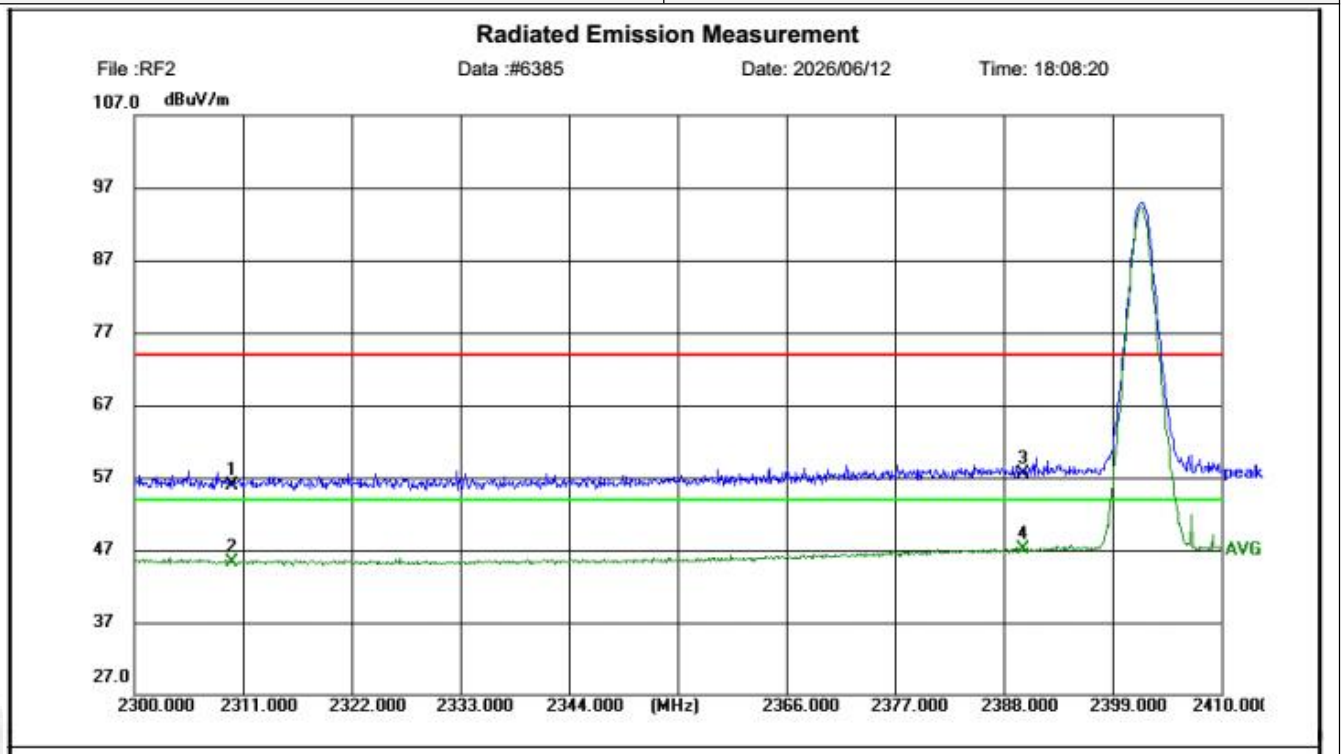
REMARKS:

1. 18GHz-26GHz not recorded for no spurious point have a margin of less than 20 dB with respect to the limits.
2. PK detector measurement value is lower than the average limit. Therefore, there is no need to test AV detector measurements.
3. While performing the testing, the notch filter is used for avoiding test instrument overload.

***Results of Band Edges Test (Radiated)***

Note：GFSK, Pi/4 DQPSK, 8DPSK all have been tested, only worse case GFSK is reported.

| CH00 | Horizontal |
|---|---|



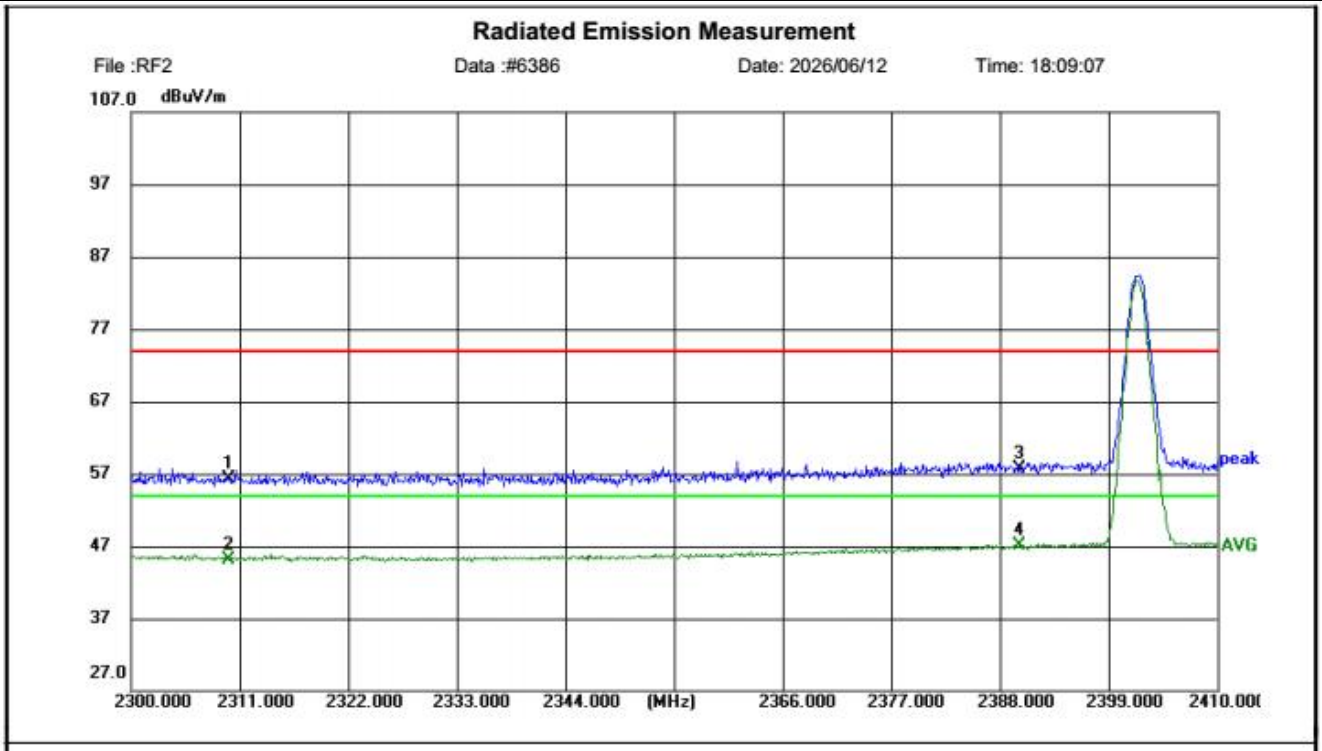

Site LAB Chamber 1
Limit: FCC PART 15C
EUT:
M/N:
Mode: BT 2402MHz
Note: CTL2606098042-WF

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2310.000 | 24.27 | 31.55 | 55.82 | 74.00 | 18.18 | peak | 150 | 160 | P | |
| 2 | 2310.000 | 13.83 | 31.55 | 45.38 | 54.00 | 8.62 | AVG | 150 | 160 | P | |
| 3 | 2390.000 | 24.55 | 32.99 | 57.54 | 74.00 | 16.46 | peak | 150 | 160 | P | |
| 4 | 2390.000 | 14.05 | 32.99 | 47.04 | 54.00 | 6.96 | AVG | 150 | 160 | P | |

| CH00 | Vertical |
|---|---|



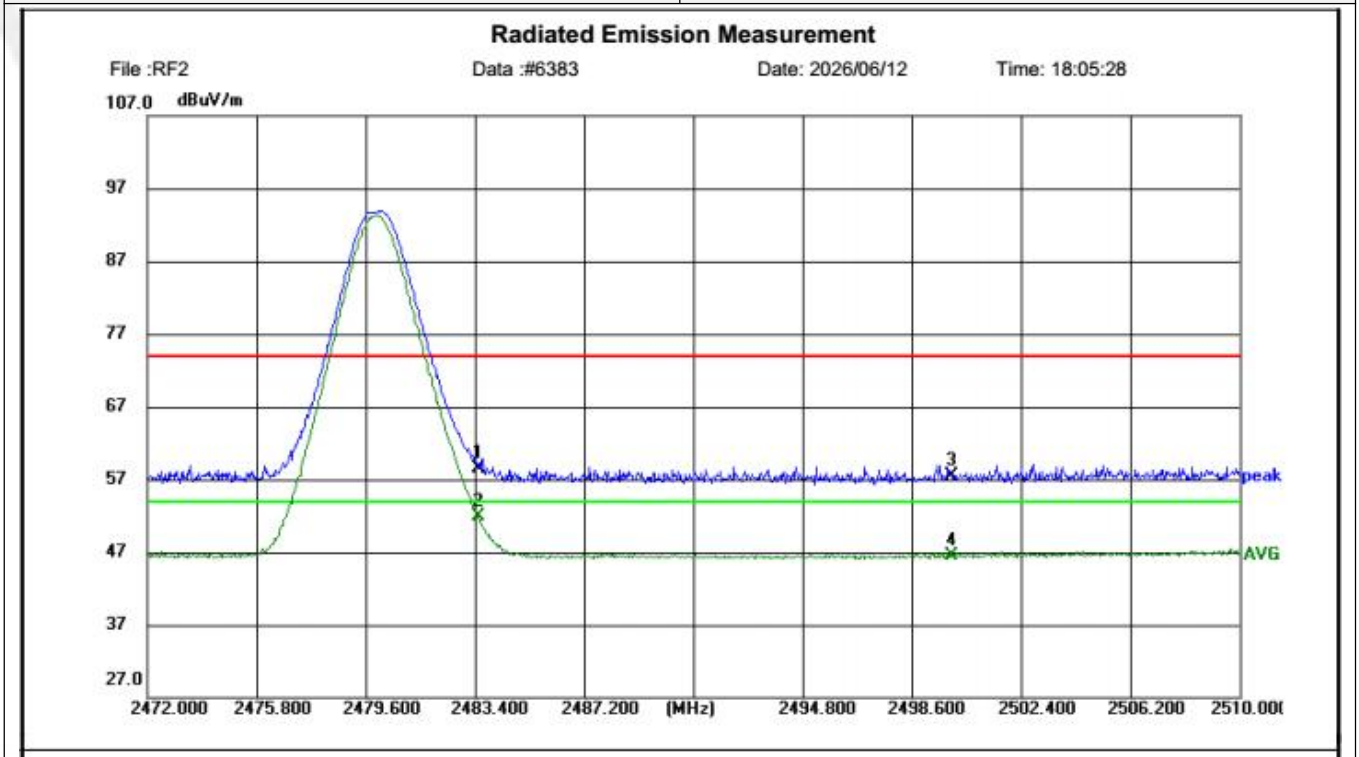

Site LAB Chamber 1
Limit: FCC PART 15C
EUT:
M/N:
Mode: BT 2402MHz
Note: CTL2606098042-WF

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2310.000 | 24.67 | 31.55 | 56.22 | 74.00 | 17.78 | peak | 150 | 355 | P | |
| 2 | 2310.000 | 13.59 | 31.55 | 45.14 | 54.00 | 8.86 | AVG | 150 | 355 | P | |
| 3 | 2390.000 | 24.75 | 32.99 | 57.74 | 74.00 | 16.26 | peak | 150 | 277 | P | |
| 4 | 2390.000 | 14.08 | 32.99 | 47.07 | 54.00 | 6.93 | AVG | 150 | 277 | P | |

| CH78 | Horizontal |
|---|---|



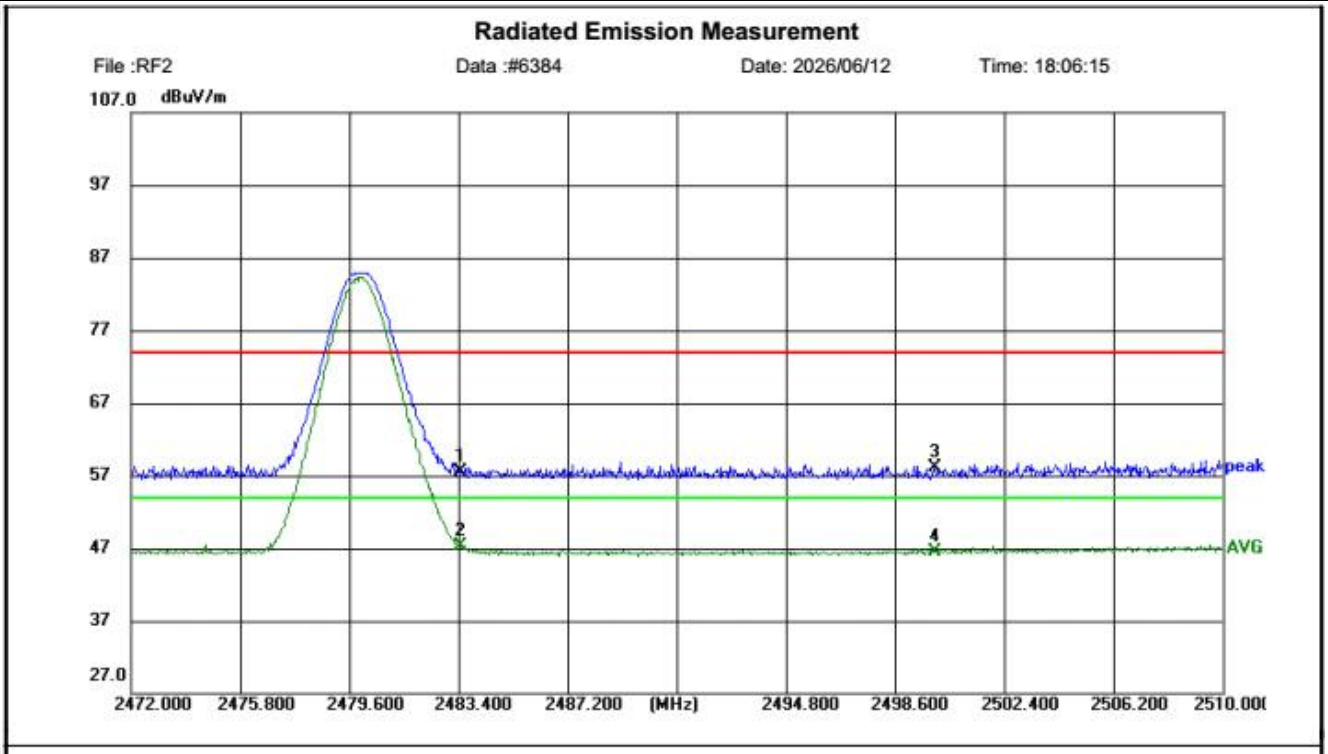

Site LAB Chamber 1
Limit: FCC PART 15C
EUT:
M/N:
Mode: BT 2480MHz
Note: CTL2606098042-WF

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 25.52 | 33.03 | 58.55 | 74.00 | 15.45 | peak | 150 | 299 | P | |
| 2 | 2483.500 | 18.81 | 33.03 | 51.84 | 54.00 | 2.16 | AVG | 150 | 299 | P | |
| 3 | 2500.000 | 24.51 | 33.07 | 57.58 | 74.00 | 16.42 | peak | 150 | 98 | P | |
| 4 | 2500.000 | 13.39 | 33.07 | 46.46 | 54.00 | 7.54 | AVG | 150 | 98 | P | |

| CH78 | Vertical |
|---|---|




Site LAB Chamber 1
Limit: FCC PART 15C
EUT:
M/N:
Mode: BT 2480MHz
Note: CTL2606098042-WF

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 24.53 | 33.03 | 57.56 | 74.00 | 16.44 | peak | 150 | 309 | P | |
| 2 | 2483.500 | 14.32 | 33.03 | 47.35 | 54.00 | 6.65 | AVG | 150 | 309 | P | |
| 3 | 2500.000 | 25.06 | 33.07 | 58.13 | 74.00 | 15.87 | peak | 150 | 14 | P | |
| 4 | 2500.000 | 13.35 | 33.07 | 46.42 | 54.00 | 7.58 | AVG | 150 | 14 | P | |

## 3.3. Maximum Peak Output Power

**Limit**

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt.

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

**Test Procedure**

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

a) Set the RBW > 20 dB bandwidth of the emission being measured.

b) Set VBW ⩾ RBW.

c) Set span Approximately five times the 20 dB bandwidth, centered on a hopping channel.

d) Sweep time = Auto.

e) Detector=Peak.

f) Trace mode=Max hold.

g) Allow trace to fully stabilize.

h) Use peak marker function to determine the peak amplitude level..

**Test Configuration**

**Test Results**

Raw data reference to Section 2 of document No. CTL2606098042-WF_Bluetooth_Appendix.

## 3.4. 20dB Bandwidth

**Limit**

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

**Test Procedure**

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW= 1% to 5% of the OBW, VBW= approximately 3×RBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

**Test Configuration**

**Test Results**

Raw data reference to Section 1 of document No. CTL2606098042-WF_Bluetooth_Appendix.

## 3.5. Frequency Separation

**LIMIT**

According to 15.247(a)(1),frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

**TEST PROCEDURE**

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with300 KHz RBW and 300 KHz VBW.

**TEST CONFIGURATION**

**TEST RESULTS**

Raw data reference to Section 3 of document No. CTL2606098042-WF_Bluetooth_Appendix.

## 3.6. Number of hopping frequency

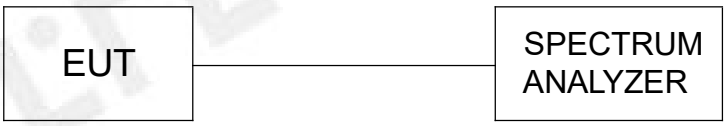
**Limit**

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

**Test Procedure**

The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 2400MHz to 2483.5MHz with 300 KHz RBW and 300 KHz VBW.

**Test Configuration**




**Test Results**

Raw data reference to Section 4 of document No. CTL2606098042-WF_Bluetooth_Appendix.

## 3.7. Time of Occupancy (Dwell Time)

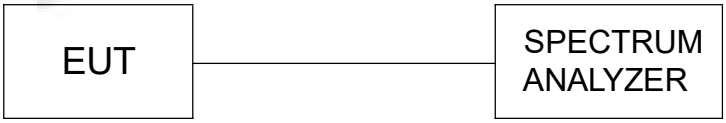
**Limit**

The average time of occupancy on any channel shall not be greater than 400 milliseconds within a period of 400 milliseconds multiplied by the number of hopping channels employed.

**Test Procedure**

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency, RBW shall be⩽channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel, VBW=RBW, Span 0Hz.

**Test Configuration**




**Test Results**

Raw data reference to Section 5 of document No. CTL2606098042-WF_Bluetooth_Appendix.

## 3.8. Out-of-band Emissions

**Limit**

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 con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

**Test Procedure**

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector , and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

**Test Configuration**

**Test Results**

Raw data reference to Section 6 of document No. CTL2606098042-WF_Bluetooth_Appendix.

## 3.9. Pseudorandom Frequency Hopping Sequence

**TEST APPLICABLE**

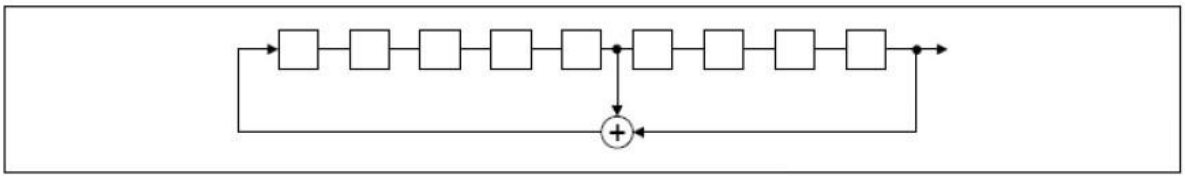
**For 47 CFR Part 15C section 15.247 (a) (1) requirement:**

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

**EUT Pseudorandom Frequency Hopping Sequence Requirement**

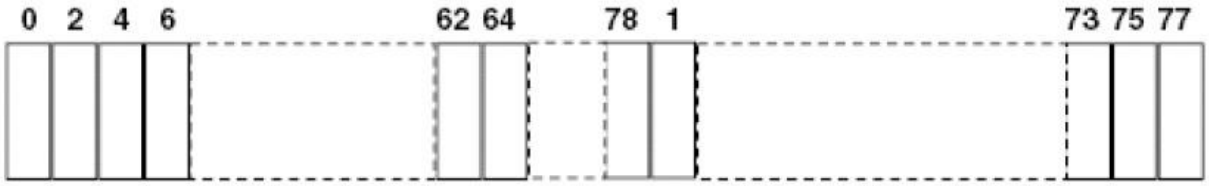
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



*Linear Feedback Shift Register for Generation of the PRBS sequence*

An example of pseudorandom frequency hopping sequence as follows:




Each frequency used equally one the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

## 3.10. Antenna Requirement

**Standard Applicable**

For intentional device, according to FCC 47 CFR Section 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.

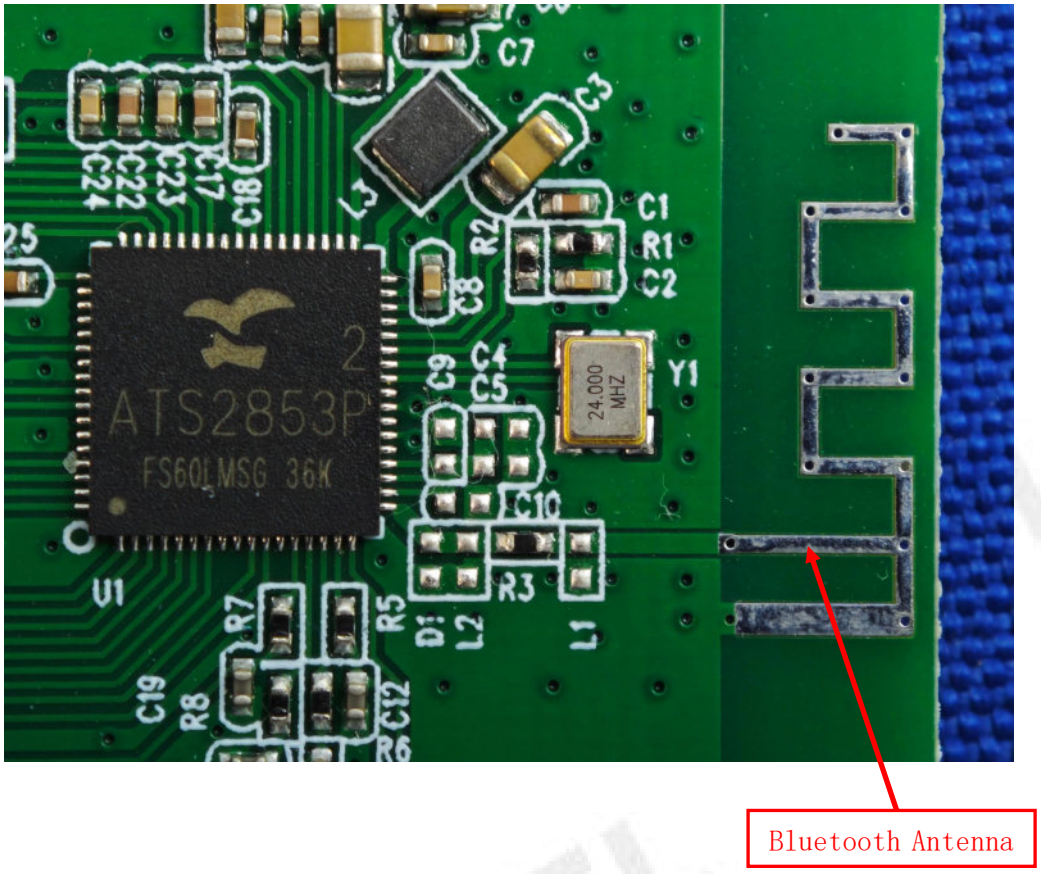
And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

**Refer to statement below for compliance**

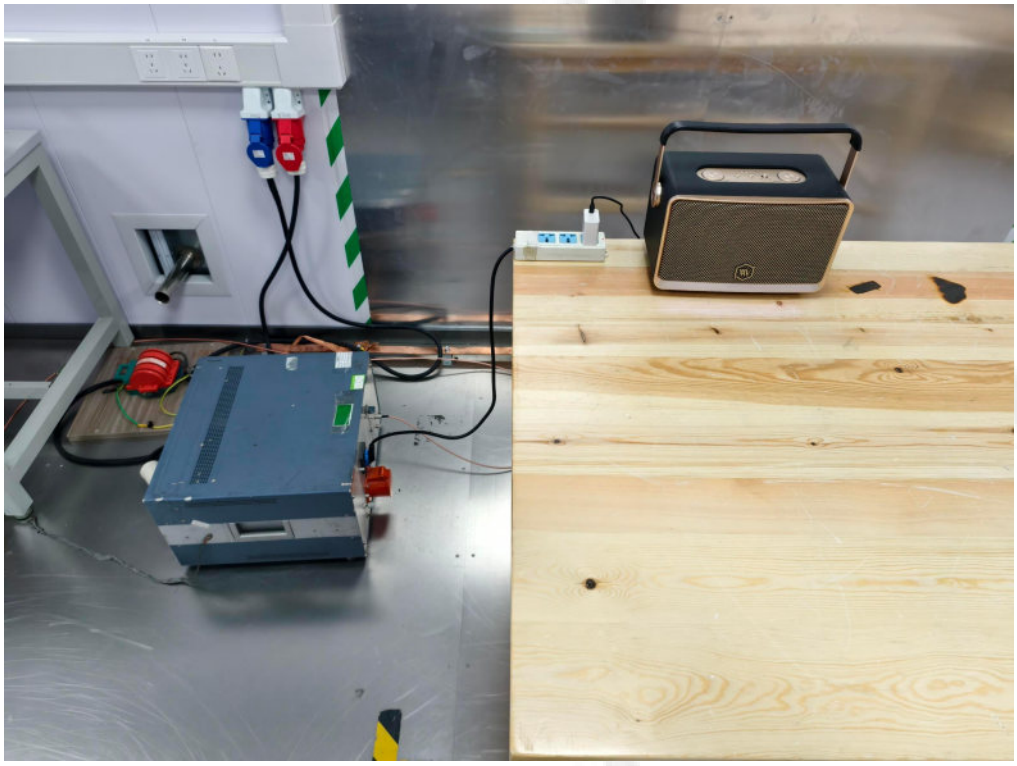
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

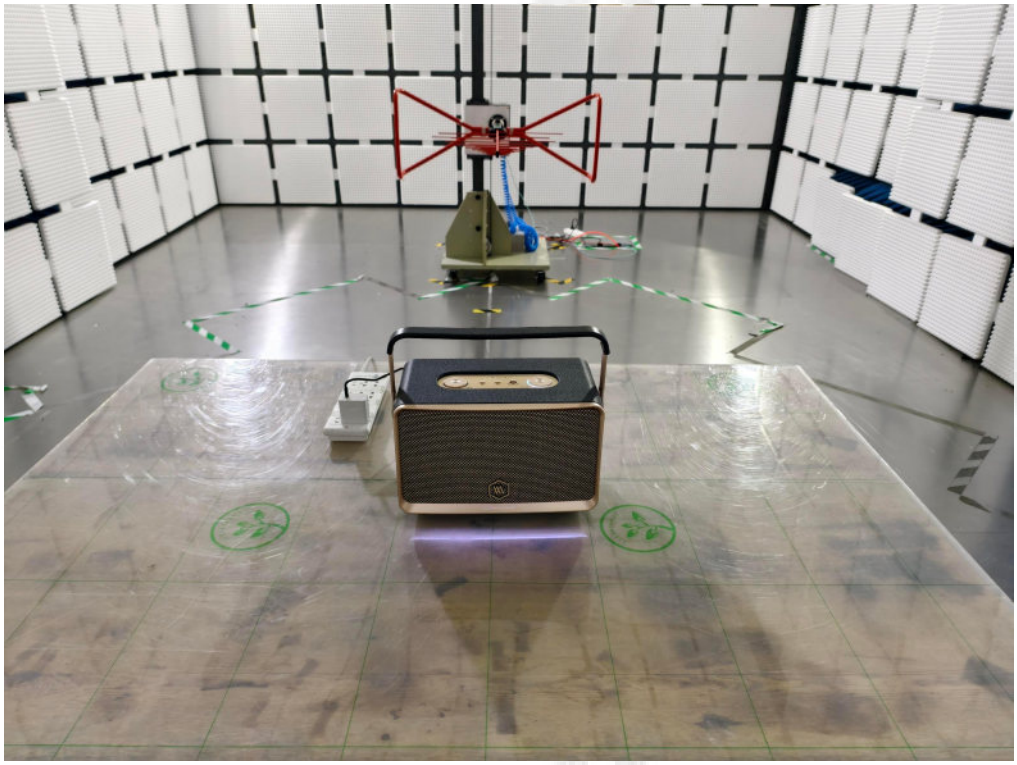
**Antenna Connected Construction**

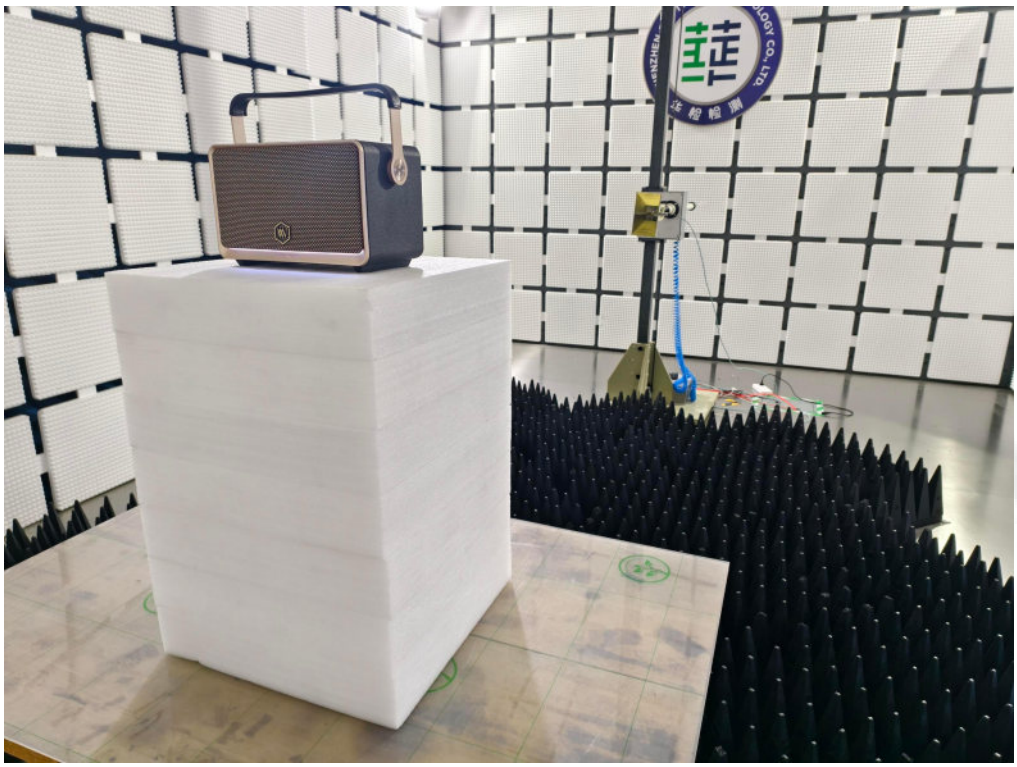
The maximum gain of antenna was 0dBi.

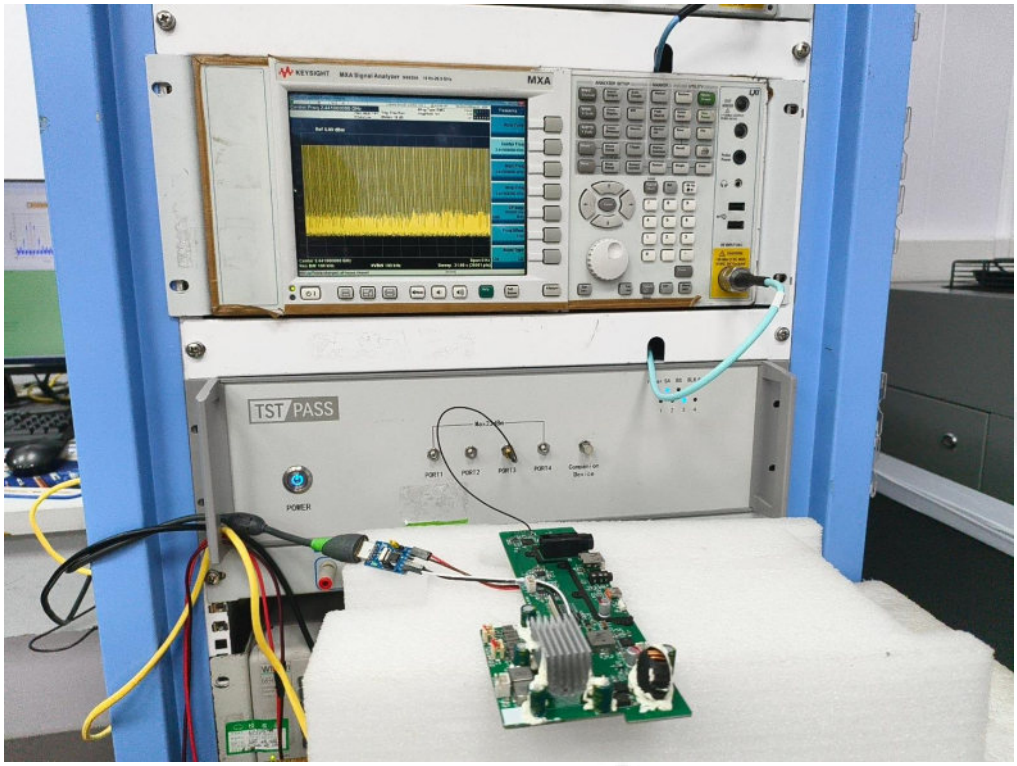


# 4. Test Setup Photos of the EUT



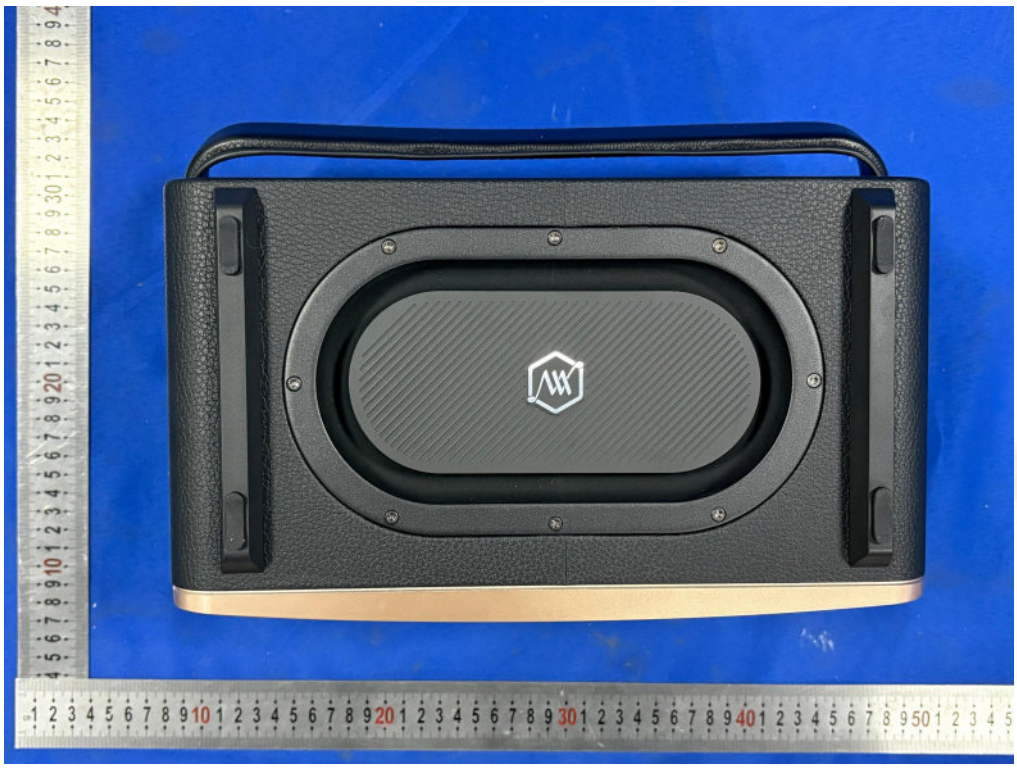


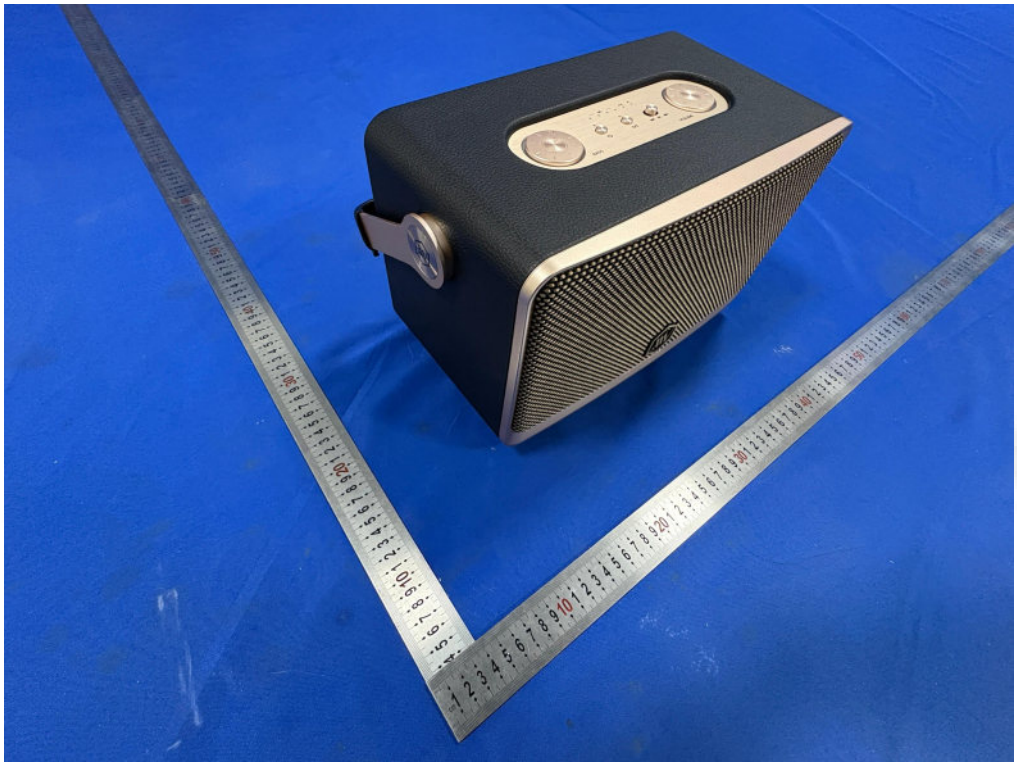


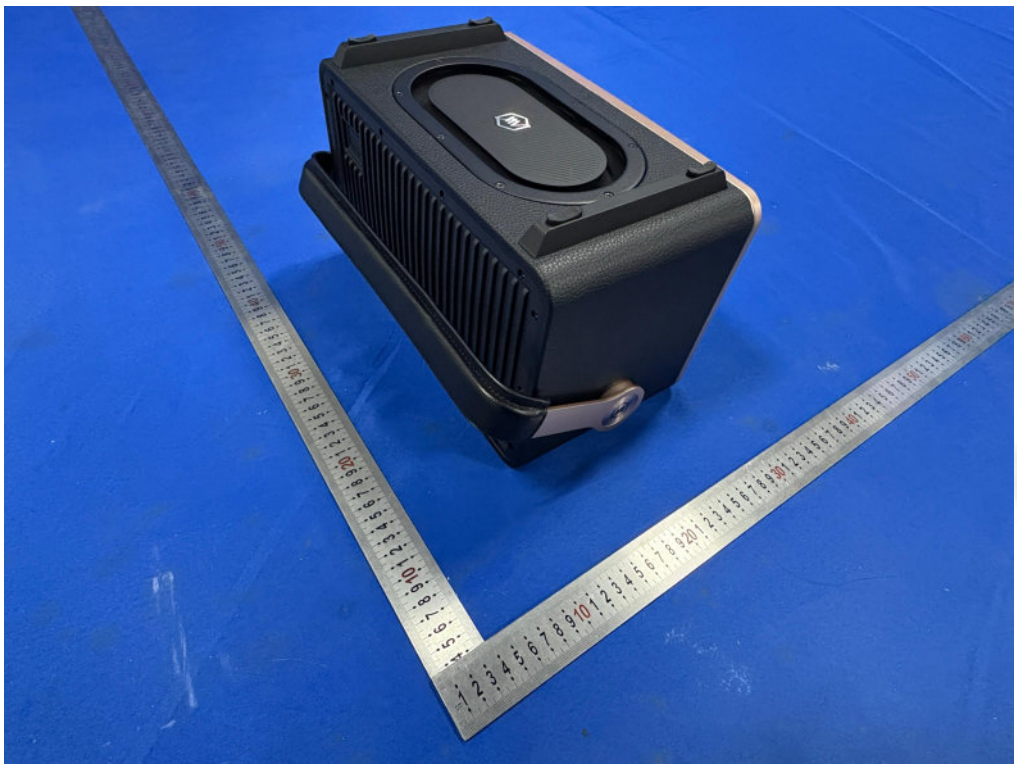

KEYSIGHT
MXA
TST PASS
POWER

# 5. Photos of the EUT

**External Photos of EUT**

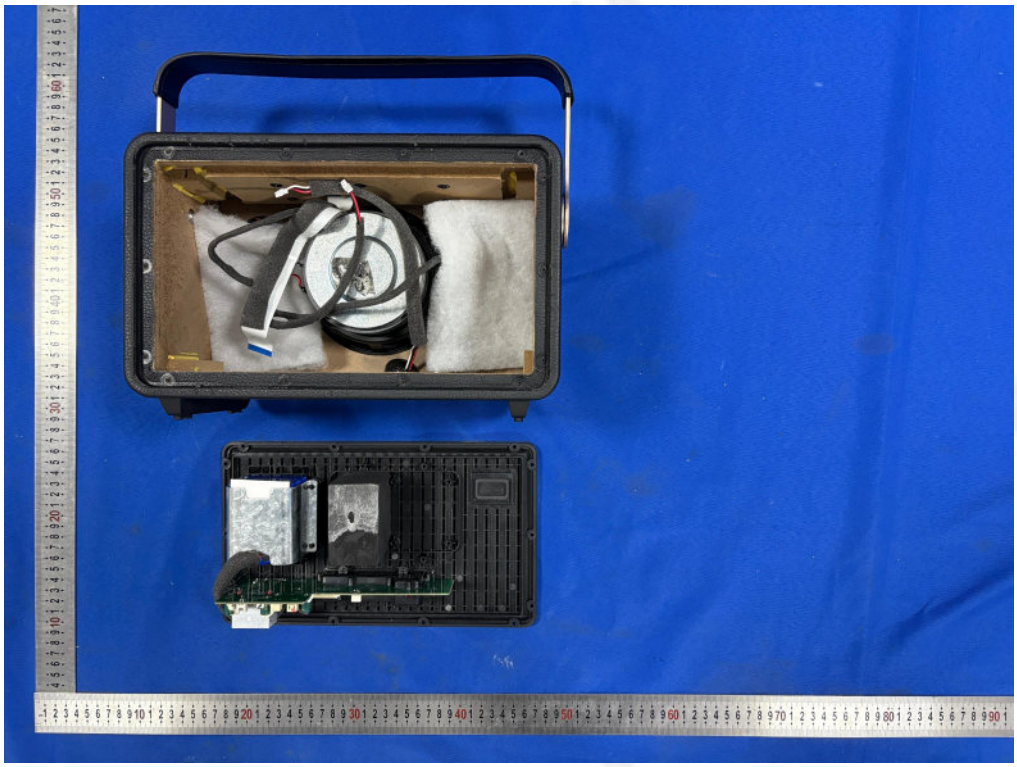


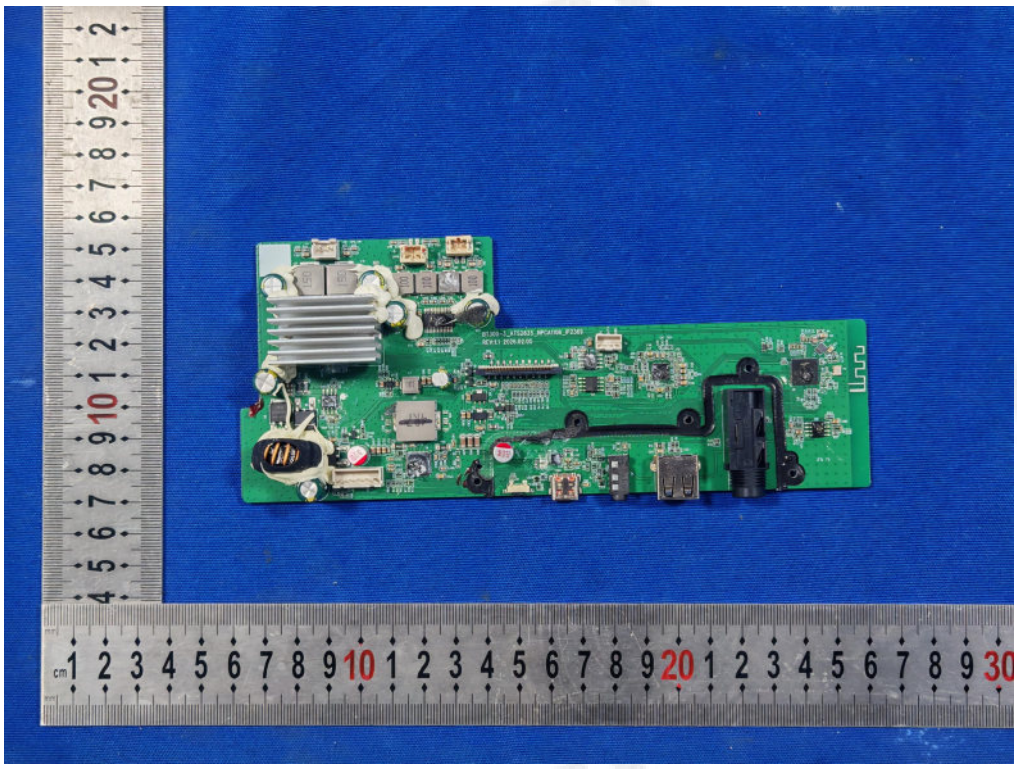


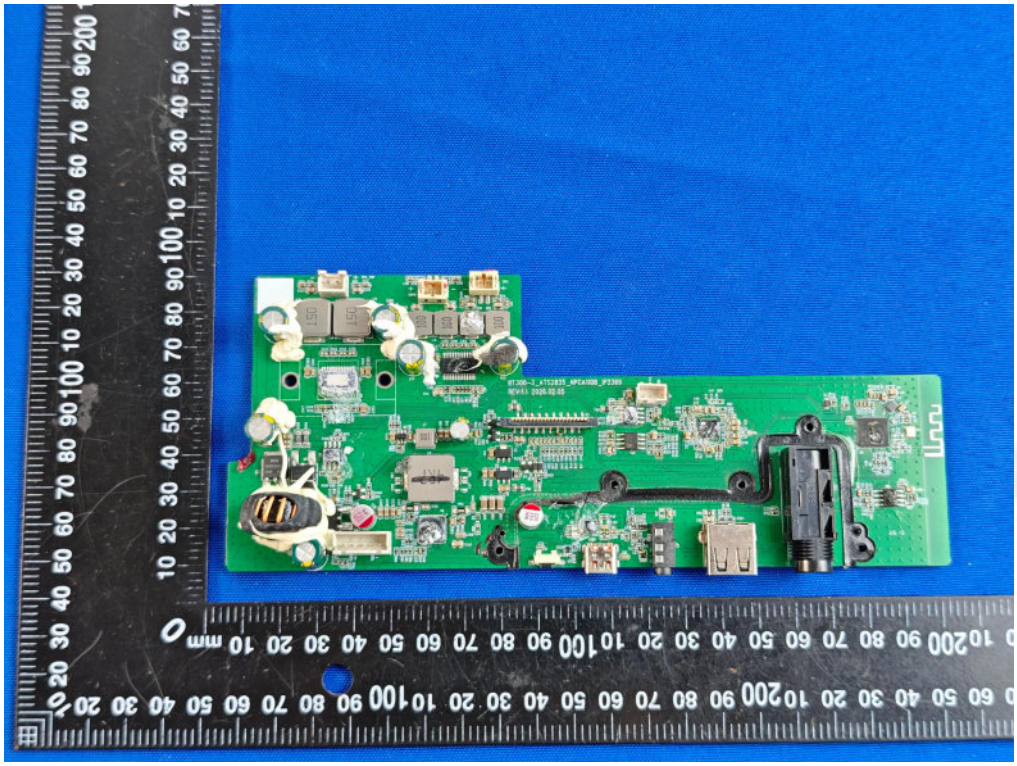


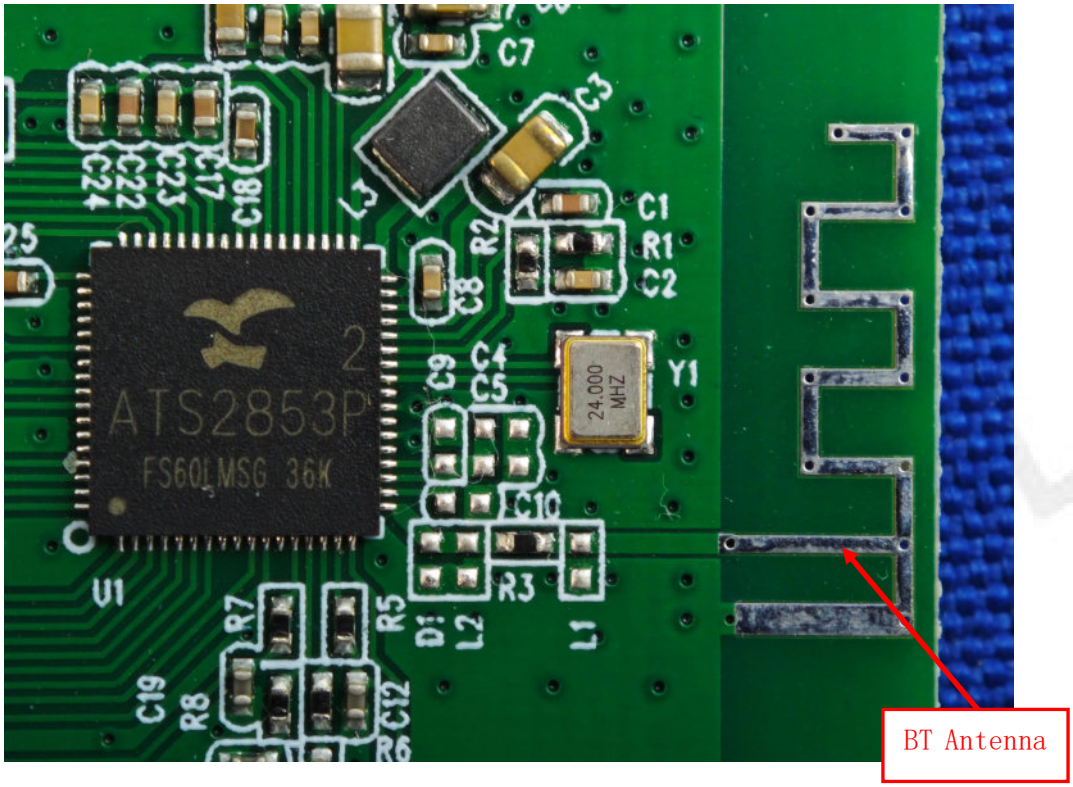
AUX
USB
MIC

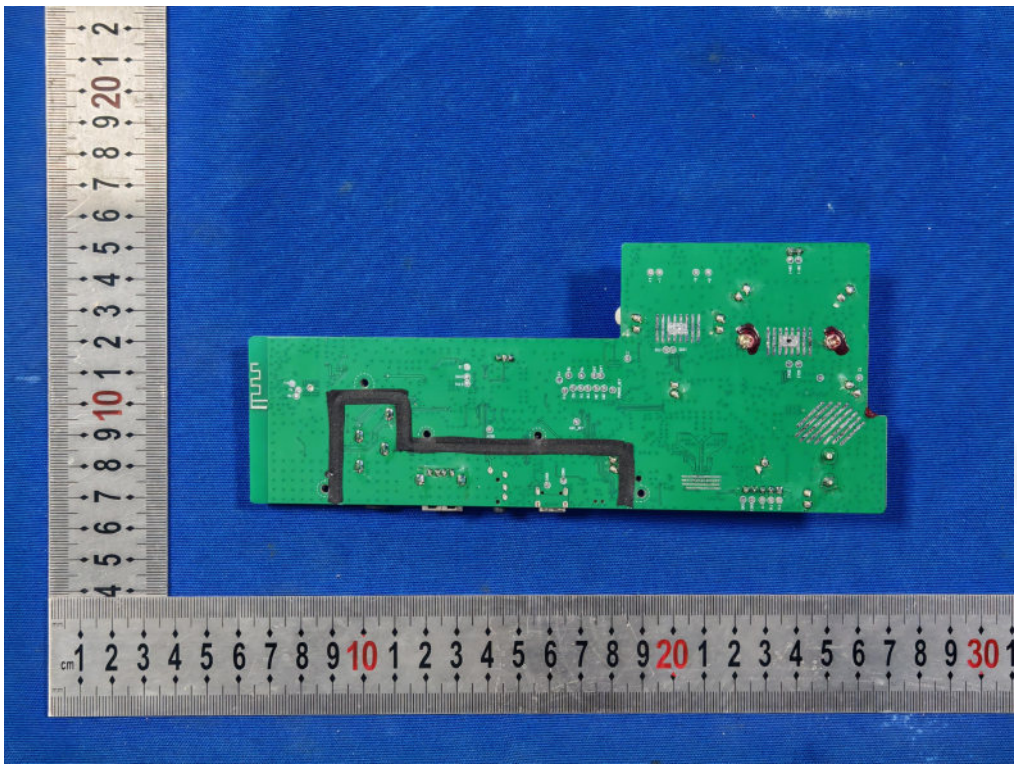
## Internal Photos of EUT

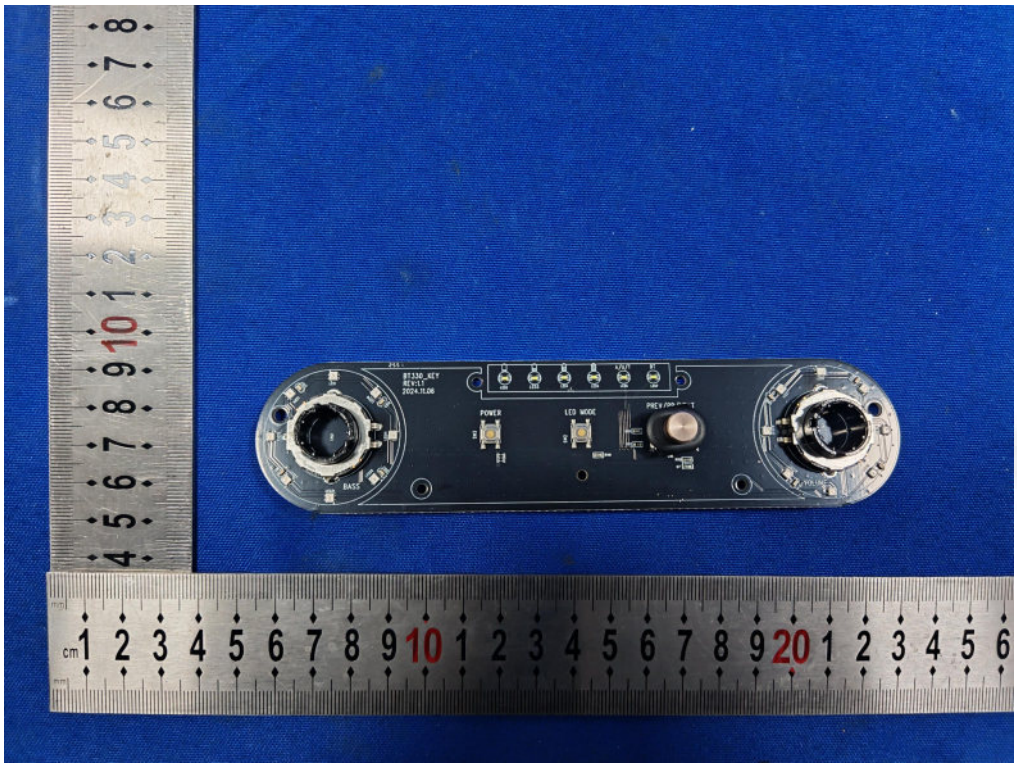


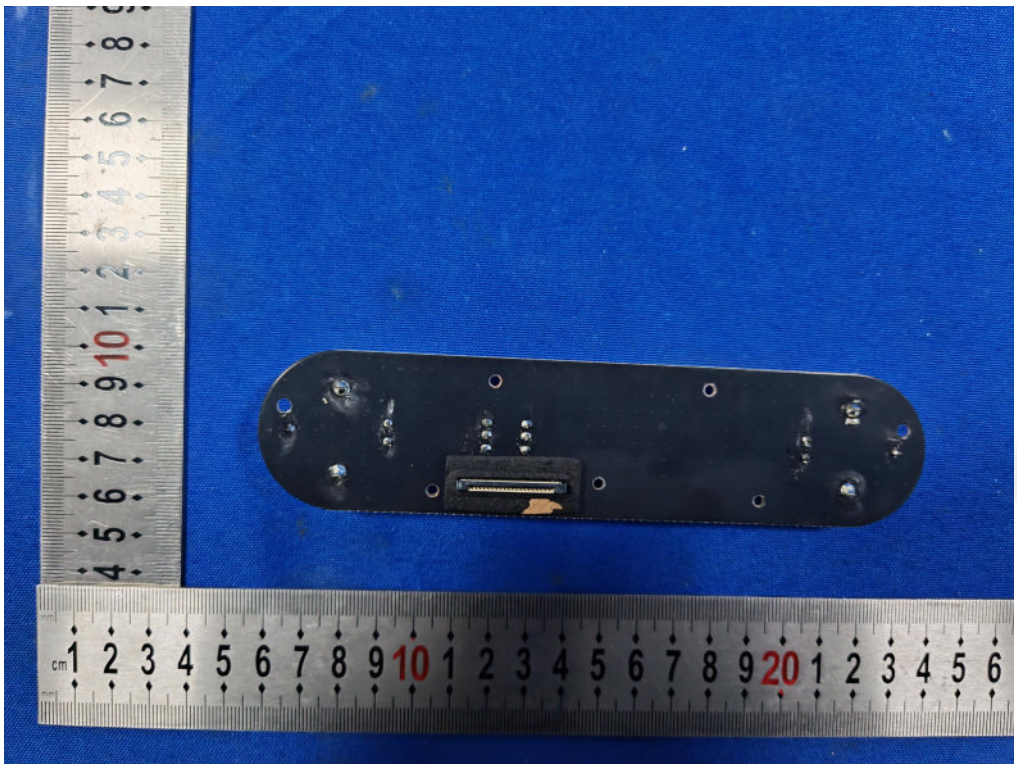


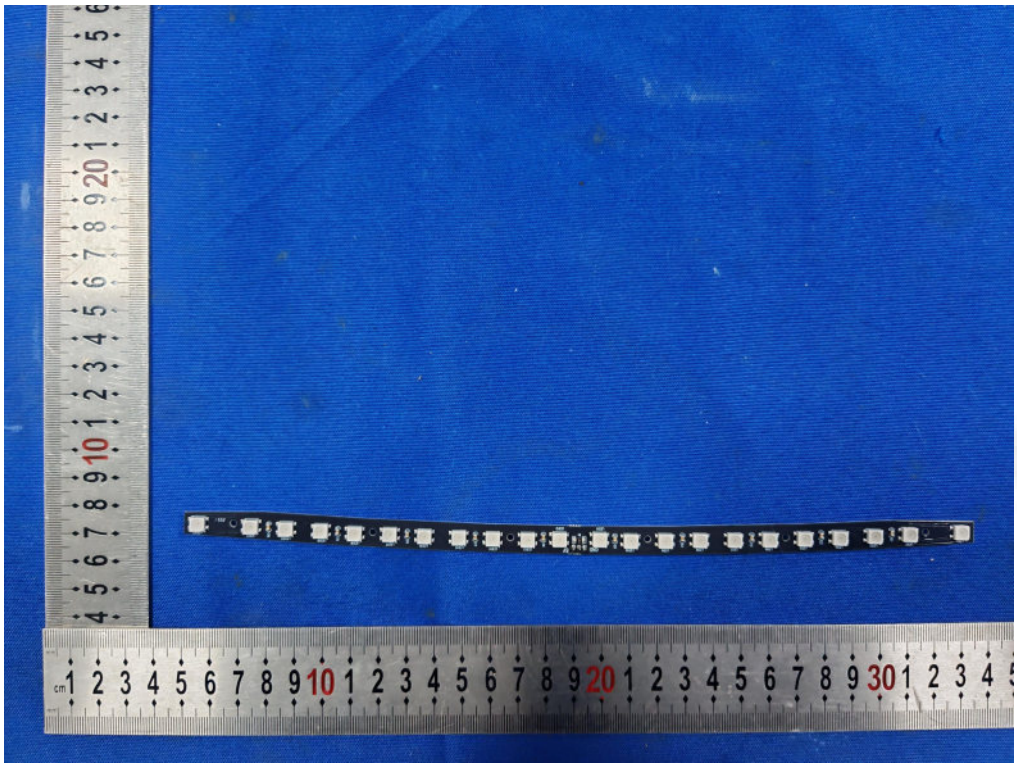


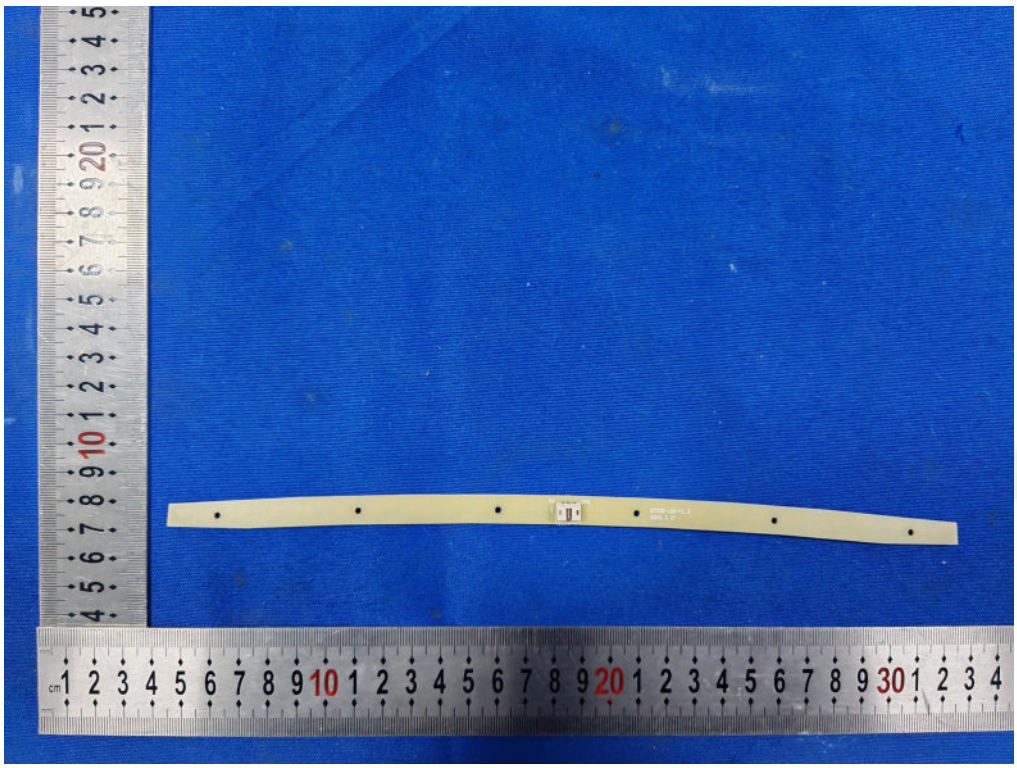

C7
C3
C24
C22
C23
C17
C18
L3
C1
R1
C2
R2
C8
C4
C5
C9
Y1
24.000 MHZ
ATS2853P
FS601MSG 36K
C10
R3
U1
R7
R5
D1
L2
L1
C19
R8
C12
R6
BT Antenna

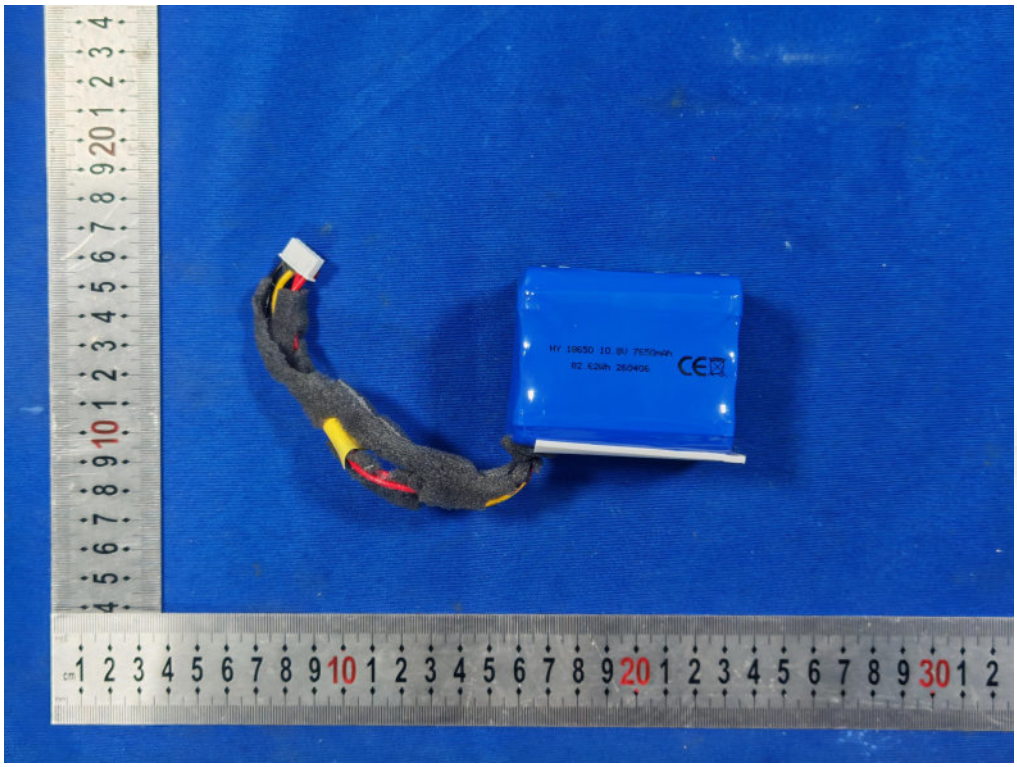


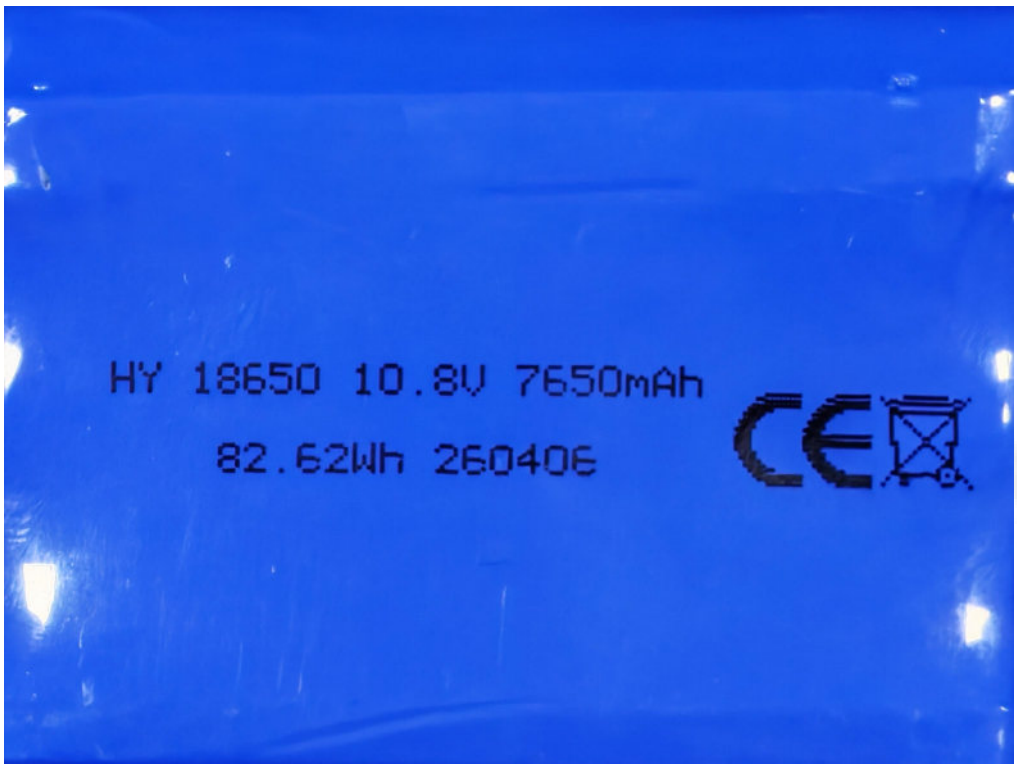

POWER
LED MODE
BASS












********** End of Report **********