**Shenzhen Global Test Service Co.,Ltd.**
No. 101, Building 1, and No. 101, Building 3, No. 88 Jinkang Road, Jinsha , Kengzi Subdistrict, Pingshan District, Shenzhen , Guangdong ,China

# FCC PART 15 SUBPART C TEST REPORT
## FCC PART 15.247

| | |
|---|---|
| **Report Reference No.....:** | **GTS20260912005-1-01** |
| **FCC ID..... :** | **2BOVA-HX040** |
| Compiled by ( position+printed name+signature)..: | File administrators Peter Xiao |
| Supervised by ( position+printed name+signature)..: | Test Engineer Evan Ouyang |
| Approved by ( position+printed name+signature)..: | Manager Jason Hu |
| Date of issue.....: | Oct.12, 2026 |
| **Representative Laboratory Name.:** | **Shenzhen Global Test Service Co.,Ltd.** |
| Address .....: | No. 101, Building 1, and No. 101, Building 3, No. 88 Jinkang Road, Jinsha , Kengzi Subdistrict, Pingshan District, Shenzhen , Guangdong ,China |
| **Applicant's name.....:** | **Shenzhen Hengxin Cross Border E-commerce Co., Ltd.** |
| Address .....: | 101-11, No.9, Guangyayuan Industrial Zone 1, Wuhe Community, Bantian Street, Longgang District, Shenzhen, China |
| **Test specification .....:** | |
| Standard .....: | **FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz** |
| TRF Originator.....: | Shenzhen Global Test Service Co.,Ltd. |
| Master TRF.....: | Dated 2014-12 |

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| | |
|---|---|
| **Test item description .....:** | **Speaker** |
| Trade Mark .....: | N/A |
| Manufacturer .....: | Dongguan Chuangyizhe Electronics Co., Ltd. |
| Model/Type reference .....: | HX040 |
| List Models .....: | N/A |
| Modulation Type.....: | GFSK, π/4-DQPSK, 8DPSK |
| Operation Frequency.....: | From 2402MHz to 2480MHz |
| Hardware Version .....: | N/A |
| Software Version .....: | N/A |
| Rating .....: | DC 3.7V from battery<br>Recharged by DC 5.0V |
| Result .....: | **PASS** |

# TEST REPORT

| Test Report No. : | GTS20260912005-1-01 | Oct.12, 2026<br>Date of issue |
|---|---|---|

| | | |
|---|---|---|
| Equipment under Test | : | Speaker |
| Model /Type | : | HX040 |
| Listed model | : | N/A |
| **Applicant** | : | **Shenzhen Hengxin Cross Border E-commerce Co., Ltd.** |
| Address | : | 101-11, No.9, Guangyayuan Industrial Zone 1, Wuhe Community, Bantian Street, Longgang District, Shenzhen, China |
| **Manufacturer** | : | **Dongguan Chuangyizhe Electronics Co., Ltd.** |
| Address | : | Building 83, Yi'an Industrial Zone, Yantian Village, Fenggang Town, Dongguan City, Guangdong Province, China |

| **Test Result**: | **PASS** |
|---|---|

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

# Contents

**1. TEST STANDARDS ..... 4**

**2. SUMMARY ..... 5**

2.1. General Remarks ..... 5
2.2. Product Description ..... 5
2.3. Equipment Under Test ..... 6
2.4. Short description of the Equipment under Test (EUT) ..... 6
2.5. EUT operation mode ..... 6
2.6. Block Diagram of Test Setup ..... 6
2.7. Related Submittal(s) / Grant (s) ..... 7
2.8. EUT Exercise Software ..... 7
2.9. Special Accessories ..... 7
2.10. External I/O Cable ..... 7
2.11. Modifications ..... 7

**3. TEST ENVIRONMENT ..... 8**

3.1. Address of the test laboratory ..... 8
3.2. Test Facility ..... 8
3.3. Environmental conditions ..... 8
3.4. Statement of the measurement uncertainty ..... 8
3.5. Summary of measurement results ..... 9
3.6. Equipments Used during the Test ..... 10

**4. TEST CONDITIONS AND RESULTS ..... 11**

4.1. AC Power Conducted Emission ..... 11
4.2. Radiated Emission ..... 13
4.3. Maximum Peak Output Power ..... 18
4.4. 99% and 20dB Bandwidth ..... 19
4.5. Frequency Separation ..... 20
4.6. Conducted Spurious Emissions and Band Edge Compliance of RF Emission ..... 21
4.7. Number of hopping frequency ..... 23
4.8. Time Of Occupancy(Dwell Time) ..... 24
4.9. Pseudorandom Frequency Hopping Sequence ..... 25
4.10. Antenna Requirement ..... 26

**5. TEST SETUP PHOTOS OF THE EUT ..... 27**

**6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT ..... 29**

6.1. External photos of the EUT ..... 29
6.2. Internal photos of the EUT ..... 33

# 1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 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+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024: American National Standard for Testing Unlicensed Wireless Devices
KDB 558074 D01 15.247 Meas Guidance v05r02: Digital Transmission Systems (DTS) and Frequency Hopping measurement procedures

# 2. SUMMARY

## 2.1. General Remarks

| | | |
|---|---|---|
| Date of receipt of test sample | : | Sep.21, 2026 |
| | | |
| Testing commenced on | : | Sep.21, 2026 |
| | | |
| Testing concluded on | : | Oct.10, 2026 |

## 2.2. Product Description

| | |
|---|---|
| Product Name: | Speaker |
| Trade Mark: | N/A |
| Model/Type reference: | HX040 |
| List Model: | N/A |
| Model Declaration | N/A |
| Power supply: | DC 3.7V from battery<br>Recharged by DC 5.0V |
| Hardware Version | N/A |
| Software Version | N/A |
| Sample ID | GTS20260912005-1-S001-1# & GTS20260912005-1-2# |
| Bluetooth | |
| Frequency Range | 2402MHz ~ 2480MHz |
| Channel Number | 79 channels for Bluetooth (DSS)<br>40 channels for Bluetooth (DTS) |
| Channel Spacing | 1MHz for Bluetooth (DSS)<br>2MHz for Bluetooth (DTS) |
| Modulation Type | GFSK, π/4-DQPSK, 8DPSK for Bluetooth (DSS)<br>GFSK for Bluetooth (DTS) |
| Antenna Description | PCB Antenna, 2.34 dBi(Max.) for 2.4G Band |

## 2.3. Equipment Under Test

### Power supply system utilised

| | | | | | |
|---|---|---|---|---|---|
| Power supply voltage | : | ○ | 230V / 50 Hz | ○ | 120V / 60Hz |
| | | ○ | 12 V DC | ○ | 24 V DC |
| | | ● | Other (specified in blank below) | | |

DC 3.7V

## 2.4. Short description of the Equipment under Test (EUT)

This is a Speaker.
For more details, refer to the user's manual of the EUT.

## 2.5. EUT operation mode

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. Channel 00/39/78 was selected to test.

| Mode of Operations | Frequency Range (MHz) | Data Rate (Mbps) |
|---|---|---|
| (BDR/EDR) | 2402 | 1/2/3 |
| | 2441 | 1/2/3 |
| | 2480 | 1/2/3 |
| For Conducted Emission | | |
| Test Mode | TX Mode | |
| For Radiated Emission | | |
| Test Mode | TX Mode | |

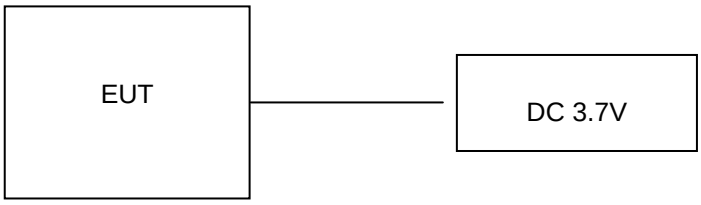
| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---|---|---|---|
| **00** | **2402** | 40 | 2442 |
| 01 | 2403 | 41 | 2443 |
| 02 | 2404 | 42 | 2444 |
| -- | -- | -- | -- |
| -- | -- | -- | -- |
| **38** | 2440 | **78** | **2480** |
| 39 | 2441 | | |

AC conducted emission pre-test at both at AC 120V/60Hz and AC 240V/50Hz modes, recorded worst case(AC 120V/60Hz).

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be TX (1Mbps).

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be TX(1Mbps-MCH).

## 2.6. Block Diagram of Test Setup



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

This submittal(s) (test report) is intended for **FCC ID: 2BOVA-HX040** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.8. EUT Exercise Software

The system enters the engineering mode through the instructions provided by the application (FCC_assist_1.0.2.2), tests under continuous transmission conditions, and changes the test channel.

## 2.9. Special Accessories

| Manufacturer | Description | Model | Serial Number | Certificate |
|---|---|---|---|---|
| Zhuzhou Dachuan ElectronicTechnology Co.,Ltd. | Adapter | DCT06W050100US-C1 | / | SDOC |

Note: The Adapter is only used for auxiliary testing.

## 2.10. External I/O Cable

| I/O Port Description | Quantity | Cable |
|---|---|---|
| Type-C Port | 1 | Non-Shielded, 0.4m |
| AUX Port | 1 | N/A |
| USB Port | 1 | N/A |

## 2.11. Modifications

No modifications were implemented to meet testing criteria.

# 3. TEST ENVIRONMENT

## 3.1. Address of the test laboratory

**Shenzhen Global Test Service Co.,Ltd.**
No. 101, Building 1, and No. 101, Building 3, No. 88 Jinkang Road, Jinsha , Kengzi Subdistrict, Pingshan District, Shenzhen , Guangdong ,China.

## 3.2. Test Facility

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

CNAS (No. CNAS L8169)
Shenzhen Global Test Service 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: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.
A2LA (Certificate No. 4758.01)
Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.
Industry Canada Registration Number. is 24189.
FCC Designation Number is CN1401.
FCC Registered Test Site Number is 684561.

## 3.3. Environmental conditions

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

| | |
|---|---|
| Temperature: | 15-35 ° C |
| | |
| Humidity: | 30-60 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

## 3.4. 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 Global Test Service 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 Shenzhen GTS laboratory is reported:

| Test | Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 30~1000MHz | 4.10 dB | (1) |
| Radiated Emission | 1~18GHz | 4.32 dB | (1) |
| Radiated Emission | 18-40GHz | 5.54 dB | (1) |
| Conducted Disturbance | 0.15~30MHz | 3.12 dB | (1) |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 3.5. Summary of measurement results

| Applied Standard: FCC Part 15 Subpart C | | | | |
|---|---|---|---|---|
| FCC Rules | Description of Test | Test Sample | Result | Remark |
| §15.247(b)(1) | Maximum Conducted Output Power | GTS20260912005-1-S001-1# | Compliant | Appendix A |
| §15.247(c) | Frequency Separation | GTS20260912005-1-S001-1# | Compliant | Appendix A |
| §15.247(c) | 99% and 20 dB Bandwidth | GTS20260912005-1-S001-1# | Compliant | Appendix A |
| §15.247(a)(1)(ii) | Number of Hopping Frequency | GTS20260912005-1-S001-1# | Compliant | Appendix A |
| §15.247(a)(1)(iii) | Time Of Occupancy (Dwell Time) | GTS20260912005-1-S001-1# | Compliant | Appendix A |
| §15.209, §15.205 | Conducted Spurious Emissions and Band Edges Test | GTS20260912005-1-S001-1# | Compliant | Appendix A |
| §15.209, §15.247(d) | Radiated Spurious Emissions | GTS20260912005-1-S001-1#<br>GTS20260912005-1-S001-2# | Compliant | Note 1 |
| §15.205 | Emissions at Restricted Band | GTS20260912005-1-S001-1# | Compliant | Appendix A |
| §15.207(a) | AC Conducted Emissions | GTS20260912005-1-S001-2# | Compliant | Note 1 |
| §15.203<br>§15.247(c) | Antenna Requirements | GTS20260912005-1-S001-1# | Compliant | Note 1 |
| §15.247(i)§2.1093 | RF Exposure | / | Compliant | Note 2 |

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed
3. Note 1 – Test results inside test report;
4. Note 2 – Test results in other test report (MPE Report).
5. We tested all test mode and recorded worst case in report

## 3.6. Equipments Used during the Test

| Test Equipment | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Artificial Mains | CYBERTEK | EM5040A | E1850400205 | 2026/06/11 | 2027/06/10 |
| LISN | R&S | ESH2-Z5 | 893606/008 | 2026/06/11 | 2027/06/10 |
| EMI Test Receiver | R&S | ESPI 3 | / | 2026/07/04 | 2027/07/03 |
| Test Receiver | R&S | ESCI 7 | 101102 | 2026/07/04 | 2027/07/03 |
| Spectrum Analyzer | Agilent | N9020A | MY48010425 | 2026/06/12 | 2027/06/11 |
| Spectrum Analyzer | R&S | FSV40-N | 101800 | 2026/06/12 | 2027/06/11 |
| Vector Signal generator | Agilent | N5181A | MY49060502 | 2026/06/11 | 2027/06/10 |
| Signal generator | Agilent | N5182A | MY50141550 | 2026/06/11 | 2027/06/10 |
| Climate Chamber | ESPEC | EL-10KA | A20120523 | 2026/06/12 | 2027/06/11 |
| Controller | EM Electronics | Controller EM 1000 | N/A | N/A | N/A |
| Horn Antenna | Schwarzbeck | BBHA 9120D | 01622 | 2026/07/04 | 2027/07/03 |
| Active Loop Antenna | Beijing Da Ze Technology Co.,Ltd. | ZN30900C | / | 2026/06/13 | 2027/06/12 |
| By-log Antenna | SCHWARZBECK | VULB9163 | 00976 | 2026/07/04 | 2027/07/03 |
| Broadband Horn Antenna | SCHWARZBECK | BBHA 9170 | 791 | 2026/07/04 | 2027/07/03 |
| Amplifier | SKET | LAPA_30M01G-32 | SK20240104001 | 2025/12/23 | 2026/12/22 |
| Amplifier | EMCI | EMC012645SE | 980340 | 2025/12/23 | 2026/12/22 |
| Amplifier | Schwarzbeck | BBV9179 | 9719-025 | 2025/12/01 | 2026/11/30 |
| Temperature/Humidity Meter | HUATU | HTC-1 | / | 2026/06/12 | 2027/06/11 |
| High-Pass Filter | Stest | 1 | / | 2026/07/04 | 2027/07/03 |
| High-Pass Filter | Stest | 2 | / | 2026/07/04 | 2027/07/03 |
| RF Cable(below 1GHz) | HUBER+SUHNER | RG214 | RE01 | 2026/06/12 | 2027/06/11 |
| RF Cable(above 1GHz) | HUBER+SUHNER | RG214 | RE02 | 2026/06/12 | 2027/06/11 |
| Data acquisition card | Agilent | U2531A | TW53323507 | 2026/06/12 | 2027/06/11 |
| Power Sensor | Keysight | E9301A | MY41495308 | 2026/06/11 | 2027/06/10 |
| Control Unit | Tonscend | JS0806-2 | / | 2026/07/07 | 2027/07/06 |
| Control Unit | Tonscend | JS0806-2 | / | 2026/07/07 | 2027/07/06 |
| integrated measuring instrument | R&S | CMW500 | 107519 | 2026/06/12 | 2027/06/11 |
| EMI Test Software | Tonscend | JS1120-1 | Ver 2.6.8.0518 | / | / |
| EMI Test Software | Tonscend | JS1120-3 | Ver 2.5.77.0418 | / | / |
| EMI Test Software | Tonscend | JS32-CE | Ver 2.5 | / | / |
| EMI Test Software | Tonscend | JS32-RE | Ver 2.5.1.8 | / | / |

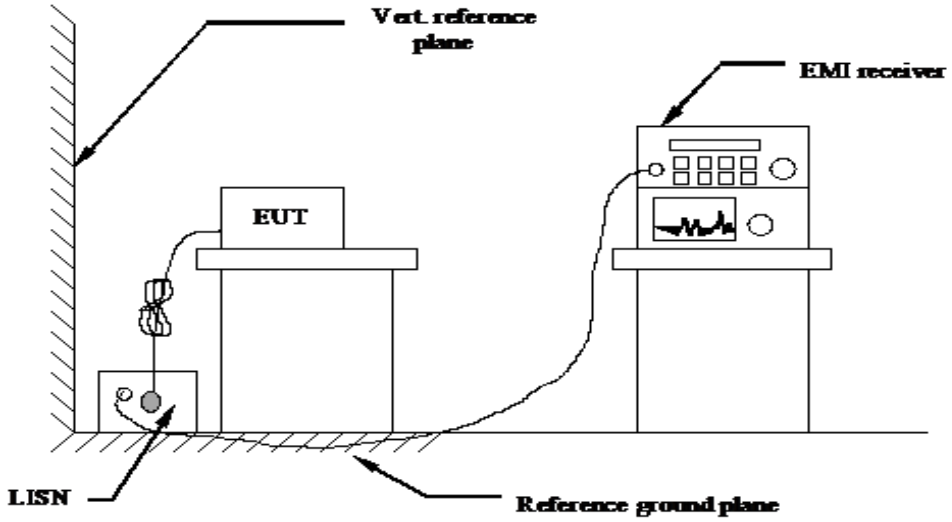
Note:

1. The Cal.Interval was one year.

# 4. TEST CONDITIONS AND RESULTS

## 4.1. AC Power Conducted Emission

**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+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.
2 Support equipment, if needed, was placed as per ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.
4 The EUT received DC 5.0V power, the adapter received AC120V/60Hz or AC 240V/50Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
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.
9 The LISN is more than 40cm away from the vertical reference plane.

**AC Power Conducted Emission Limit**

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

| 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. | | |

**DISTURBANCE Calculation**

The AC mains conducted disturbance is calculated by adding the 10dB Pulse Limiter and Cable Factor and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

**CD (dBuV) = RA (dBuV) + PL (dB) + CL (dB)**

| | |
|---|---|
| Where CD = Conducted Disturbance | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | PL = 10 dB Pulse Limiter Factor |

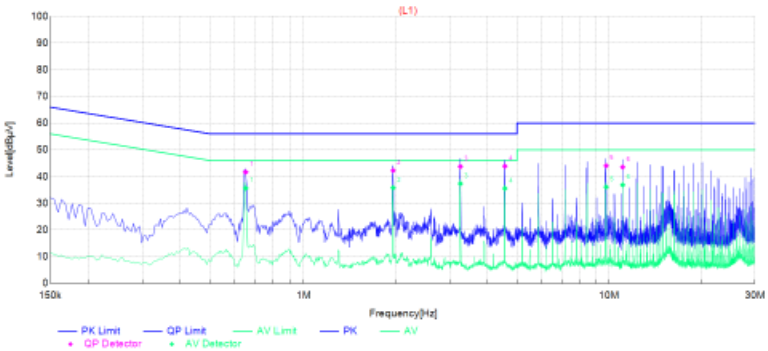
## TEST RESULTS

Remark: We measured Conducted Emission at GFSK, π/4-DQPSK and 8DPSK mode in AC 120V, the worst case was recorded .

| Temperature | 24.7℃ | Humidity | 51% |
|---|---|---|---|
| Test Engineer | Evan Ouyang | Configurations | BT(MCH) |

| Power supply: | AC 120V/60Hz | Polarization | L |
|---|---|---|---|

**Test Graph**




Final Data List

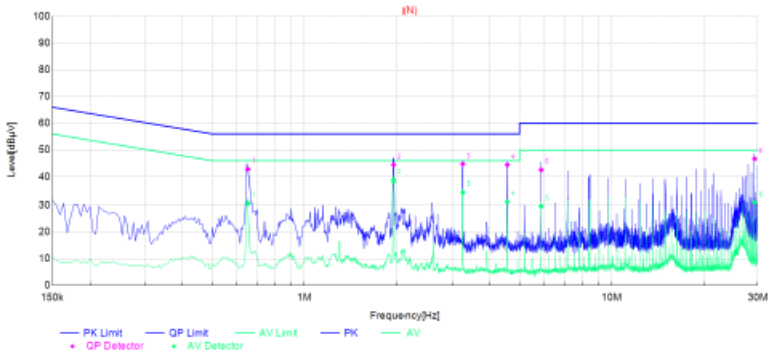
| NO. | Frequency [MHz] | QP Reading [dBμV] | AVG. Reading [dBμV] | Factor [dB] | QP Result [dBμV] | AVG. Result [dBμV] | QP Limit [dBμV] | AVG. Limit [dBμV] | QP Margin [dB] | AVG. Margin [dB] | Line | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.654 | 31.45 | 25.40 | 10.21 | 41.66 | 35.61 | 56.00 | 46.00 | 14.34 | 10.39 | L1 | PASS |
| 2 | 1.959 | 31.99 | 25.49 | 10.27 | 42.26 | 35.76 | 56.00 | 46.00 | 13.74 | 10.24 | L1 | PASS |
| 3 | 3.2595 | 33.39 | 26.99 | 10.35 | 43.74 | 37.34 | 56.00 | 46.00 | 12.26 | 8.66 | L1 | PASS |
| 4 | 4.5645 | 33.52 | 25.18 | 10.35 | 43.87 | 35.53 | 56.00 | 46.00 | 12.13 | 10.47 | L1 | PASS |
| 5 | 9.78 | 33.47 | 25.52 | 10.57 | 44.04 | 36.09 | 60.00 | 50.00 | 15.96 | 13.91 | L1 | PASS |
| 6 | 11.0805 | 32.80 | 26.10 | 10.74 | 43.54 | 36.84 | 60.00 | 50.00 | 16.46 | 13.16 | L1 | PASS |

Note:1. Result (dBμV) = Reading (dBμV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

| Power supply: | AC 120V/60Hz | Polarization | N |
|---|---|---|---|

**Test Graph**




Final Data List

| NO. | Frequency [MHz] | QP Reading [dBμV] | AVG. Reading [dBμV] | Factor [dB] | QP Result [dBμV] | AVG. Result [dBμV] | QP Limit [dBμV] | AVG. Limit [dBμV] | QP Margin [dB] | AVG. Margin [dB] | Line | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.654 | 32.61 | 20.39 | 10.21 | 42.82 | 30.60 | 56.00 | 46.00 | 13.18 | 15.40 | N | PASS |
| 2 | 1.9545 | 34.17 | 28.54 | 10.27 | 44.44 | 38.81 | 56.00 | 46.00 | 11.56 | 7.19 | N | PASS |
| 3 | 3.2595 | 34.39 | 24.35 | 10.35 | 44.74 | 34.70 | 56.00 | 46.00 | 11.26 | 11.30 | N | PASS |
| 4 | 4.56 | 34.11 | 20.88 | 10.36 | 44.47 | 31.24 | 56.00 | 46.00 | 11.53 | 14.76 | N | PASS |
| 5 | 5.865 | 32.09 | 19.11 | 10.47 | 42.56 | 29.58 | 60.00 | 50.00 | 17.44 | 20.42 | N | PASS |
| 6 | 29.3145 | 34.96 | 19.25 | 11.73 | 46.69 | 30.98 | 60.00 | 50.00 | 13.31 | 19.02 | N | PASS |

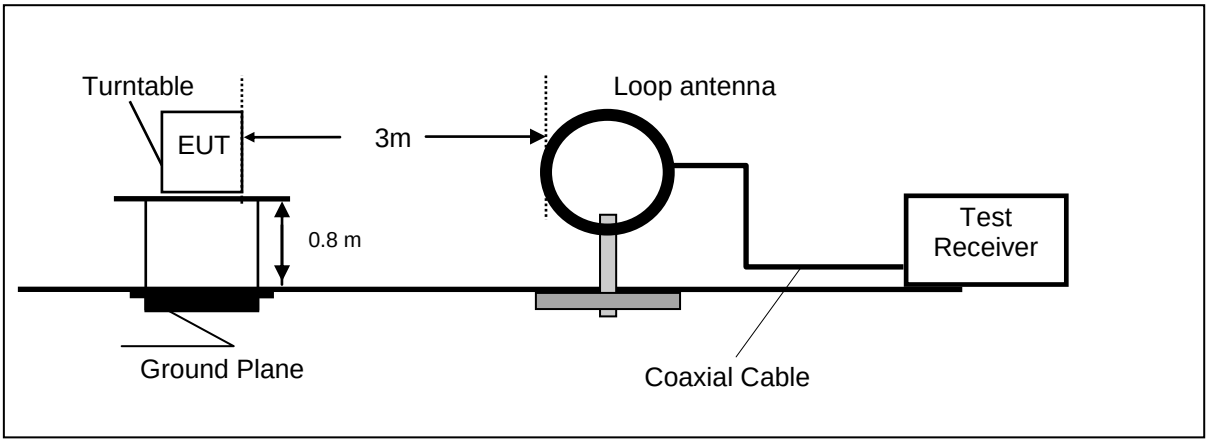
Note:1. Result (dBμV) = Reading (dBμV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

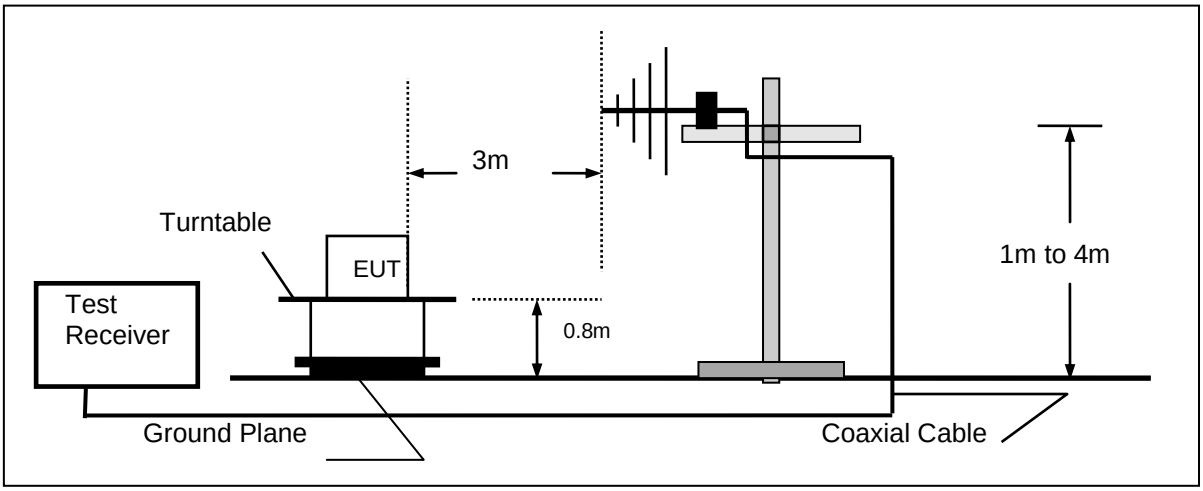
## 4.2. Radiated Emission

**TEST CONFIGURATION**

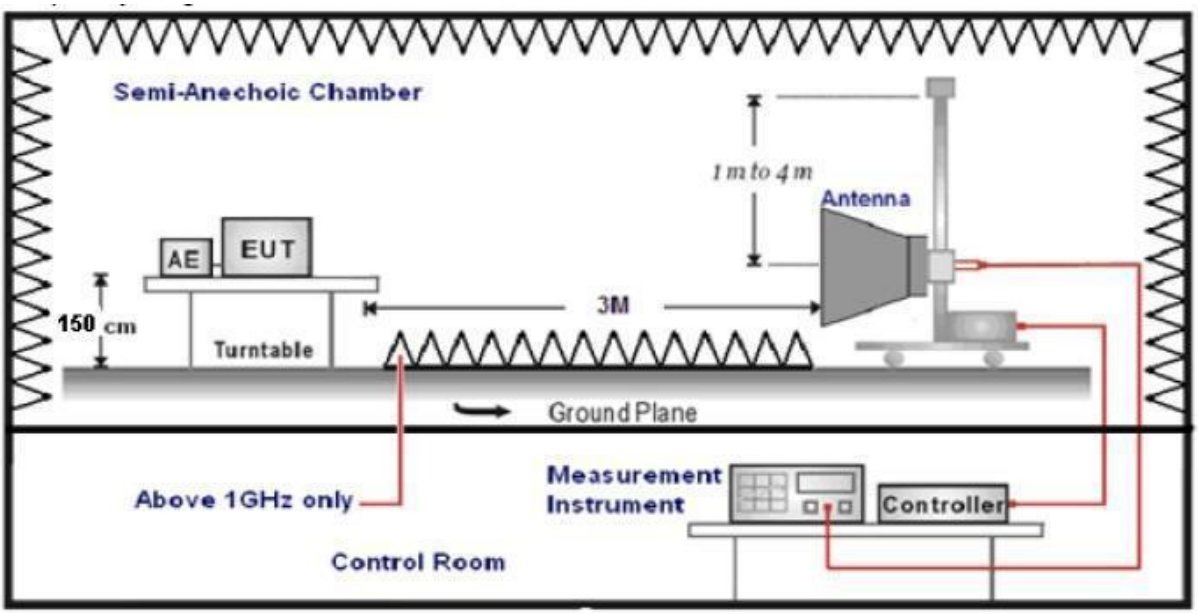
Frequency range 9 KHz – 30MHz




Frequency range 30MHz – 1000MHz




Frequency range above 1GHz-25GHz



**TEST PROCEDURE**

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
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 minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type | Test Distance |
|---|---|---|
| 9KHz-30MHz | Active Loop Antenna | 3 |
| 30MHz-1GHz | Ultra-Broadband Antenna | 3 |
| 1GHz-18GHz | Double Ridged Horn Antenna | 3 |
| 18GHz-25GHz | Horn Anternna | 1 |

7. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting | Detector |
|---|---|---|
| 9KHz-150KHz | RBW=200Hz/VBW=3KHz,Sweep time=Auto | QP |
| 150KHz-30MHz | RBW=9KHz/VBW=100KHz,Sweep time=Auto | QP |
| 30MHz-1GHz | RBW=120KHz/VBW=1000KHz,Sweep time=Auto | QP |
| 1GHz-40GHz | Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto<br>Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto | Peak |

**Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

**FS = RA + AF + CL - AG**

| | |
|---|---|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | AG = Amplifier Gain |
| AF = Antenna Factor | |

Transd=AF +CL-AG

**RADIATION LIMIT**

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.
The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

| 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 RESULTS**
Remark: We measured Radiated Emission at GFSK, π/4-DQPSK and 8DPSK mode from 9KHz to 25GHz and the worst case was recorded.

| | | | |
|---|---|---|---|
| Temperature | 24.4℃ | Humidity | 48% |
| Test Engineer | Evan Ouyang | Configurations | BT(MCH) |

**For 9 KHz~30MHz**

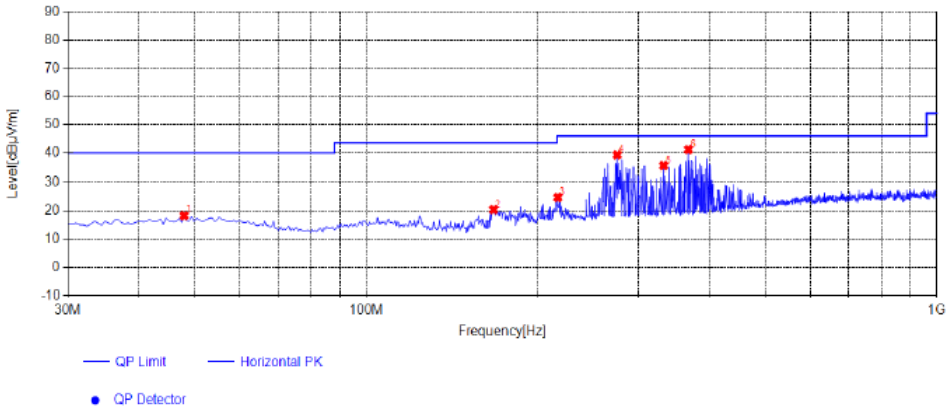
| Freq. (MHz) | Level (dBuV) | Over Limit (dB) | Over Limit (dBuV) | Remark |
|---|---|---|---|---|
| - | - | - | - | See Note |

Note:
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

**For 30MHz-1GHz**

## Horizontal

**Test Graph**




**Suspected List**

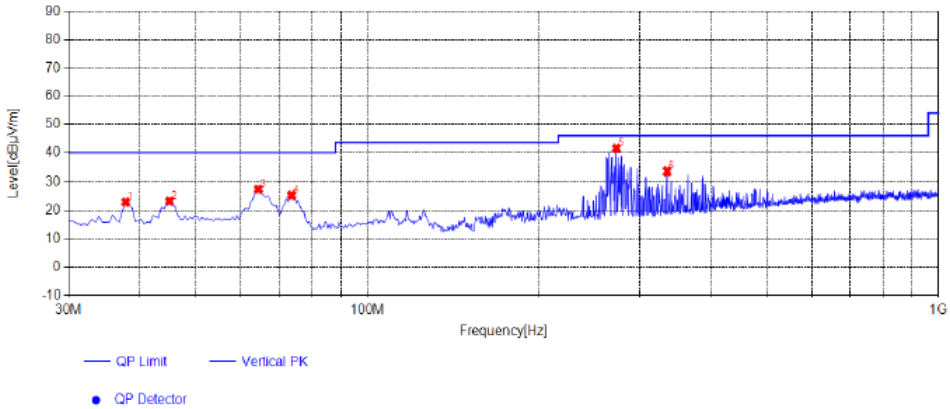
| NO. | Frequency [MHz] | Reading [dBµV/m] | Factor [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Detector | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 47.945 | 29.33 | -11.09 | 18.24 | 40.00 | 21.76 | 100 | 12 | PK | Horizonta | PASS |
| 2 | 167.255 | 33.16 | -12.81 | 20.35 | 43.50 | 23.15 | 100 | 323 | PK | Horizonta | PASS |
| 3 | 216.725 | 34.38 | -9.70 | 24.68 | 46.00 | 21.32 | 100 | 12 | PK | Horizonta | PASS |
| 4 | 275.41 | 47.09 | -7.84 | 39.25 | 46.00 | 6.75 | 100 | 12 | PK | Horizonta | PASS |
| 5 | 332.155 | 42.09 | -6.60 | 35.49 | 46.00 | 10.51 | 100 | 4 | PK | Horizonta | PASS |
| 6 | 367.075 | 46.98 | -5.82 | 41.16 | 46.00 | 4.84 | 100 | 1 | PK | Horizonta | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

## Vertical

**Test Graph**




**Suspected List**

| NO. | Frequency [MHz] | Reading [dBµV/m] | Factor [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Detector | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 37.76 | 35.01 | -12.08 | 22.93 | 40.00 | 17.07 | 100 | 125 | PK | Vertical | PASS |
| 2 | 45.035 | 34.64 | -11.38 | 23.26 | 40.00 | 16.74 | 100 | 251 | PK | Vertical | PASS |
| 3 | 64.435 | 39.98 | -12.48 | 27.50 | 40.00 | 12.50 | 100 | 3 | PK | Vertical | PASS |
| 4 | 73.65 | 39.43 | -14.08 | 25.35 | 40.00 | 14.65 | 100 | 307 | PK | Vertical | PASS |
| 5 | 272.985 | 49.35 | -7.86 | 41.49 | 46.00 | 4.51 | 100 | 166 | PK | Vertical | PASS |
| 6 | 335.065 | 40.13 | -6.53 | 33.60 | 46.00 | 12.40 | 100 | 352 | PK | Vertical | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

**For 1GHz to 25GHz**

GFSK /Channel 0 / 2402 MHz(Worst Case)

| Freq. MHz | Reading dBuV | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuV/m | Limit dBuV/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4804.00 | 50.88 | 32.44 | 30.25 | 7.95 | 61.02 | 74.00 | -12.98 | Peak | Horizontal |
| 4804.00 | 36.70 | 32.44 | 30.25 | 7.95 | 46.84 | 54.00 | -7.16 | Average | Horizontal |
| 4804.00 | 53.79 | 32.44 | 30.25 | 7.95 | 63.93 | 74.00 | -10.07 | Peak | Vertical |
| 4804.00 | 34.96 | 32.44 | 30.25 | 7.95 | 45.10 | 54.00 | -8.90 | Average | Vertical |

Channel 39 / 2441 MHz

| Freq. MHz | Reading dBuV | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuV/m | Limit dBuV/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4882.00 | 50.40 | 32.52 | 30.31 | 8.12 | 60.73 | 74.00 | -13.27 | Peak | Horizontal |
| 4882.00 | 37.60 | 32.52 | 30.31 | 8.12 | 47.93 | 54.00 | -6.07 | Average | Horizontal |
| 4882.00 | 51.70 | 32.52 | 30.31 | 8.12 | 62.03 | 74.00 | -11.97 | Peak | Vertical |
| 4882.00 | 35.12 | 32.52 | 30.31 | 8.12 | 45.45 | 54.00 | -8.55 | Average | Vertical |

Channel 78 / 2480 MHz

| Freq. MHz | Reading dBuV | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuV/m | Limit dBuV/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4960.00 | 50.81 | 32.68 | 30.27 | 7.88 | 61.10 | 74.00 | -12.90 | Peak | Horizontal |
| 4960.00 | 35.19 | 32.68 | 30.27 | 7.88 | 45.48 | 54.00 | -8.52 | Average | Horizontal |
| 4960.00 | 48.70 | 32.68 | 30.27 | 7.88 | 58.99 | 74.00 | -15.01 | Peak | Vertical |
| 4960.00 | 31.58 | 32.68 | 30.27 | 7.88 | 41.87 | 54.00 | -12.13 | Average | Vertical |

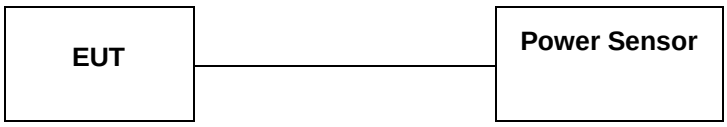
Notes:

1). Measuring frequencies from 9 KHz~10$^{th}$ harmonic or 26.5GHz (which is less), No emission found between lowest internal used/generated frequency to 30MHz.
2). Radiated emissions measured in frequency range from 9 KHz~10$^{th}$ harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.
3). Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4). Measured= Reading- Pre. Fac.+ Ant. Fac.+ Cab. Loss
5). Margin = Measured- Limit

**NOTE: All the modes have been tested and recorded worst mode in the report.**

## 4.3. Maximum Peak Output Power

**TEST CONFIGURATION**




**TEST PROCEDURE**

According to ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024 Maximum peak conducted output power for HFSS devices:
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the HFSS bandwidth and shall utilize a fast-responding diode detector.
The maximum Average conducted output power may be measured using a wideband RF power meter with a thermocouple derector or equivalent. The power meter shall have a video bandwidth that is greater than or equal to the HFSS bandwidth and shall utilize a fast-responding diode detector.

**LIMIT**

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

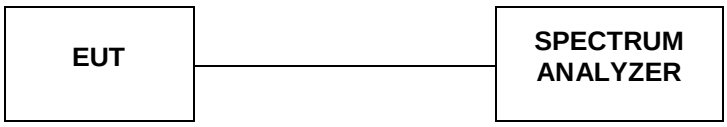
**TEST RESULTS**

For reporting purpose only.

Please refer to Appendix A.3.

## 4.4. 99% and 20dB Bandwidth

**TEST CONFIGURATION**




**TEST PROCEDURE**

20dB Bandwidth:
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=30KHz and VBW=100KHz.
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

99% Bandwidth:
According to section 6.9.3 of ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024, for the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

1.The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. Set RBW = 1%~5% OBW; VBW≥3*RBW (for occupied bandwidth measurement).
3. Measured the 6dB bandwidth and 99% occupied bandwidth by related function of the spectrum analyzer.

**LIMIT**

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

**TEST RESULTS**

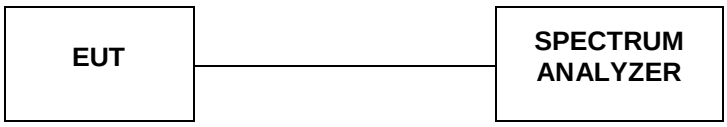
For reporting purpose only.

Please refer to Appendix A.1.

Please refer to Appendix A.2.

## 4.5. Frequency Separation

**TEST CONFIGURATION**




**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=100KHz and VBW=300KHz.

**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 RESULTS**

For reporting purpose only.

Please refer to Appendix A.4.

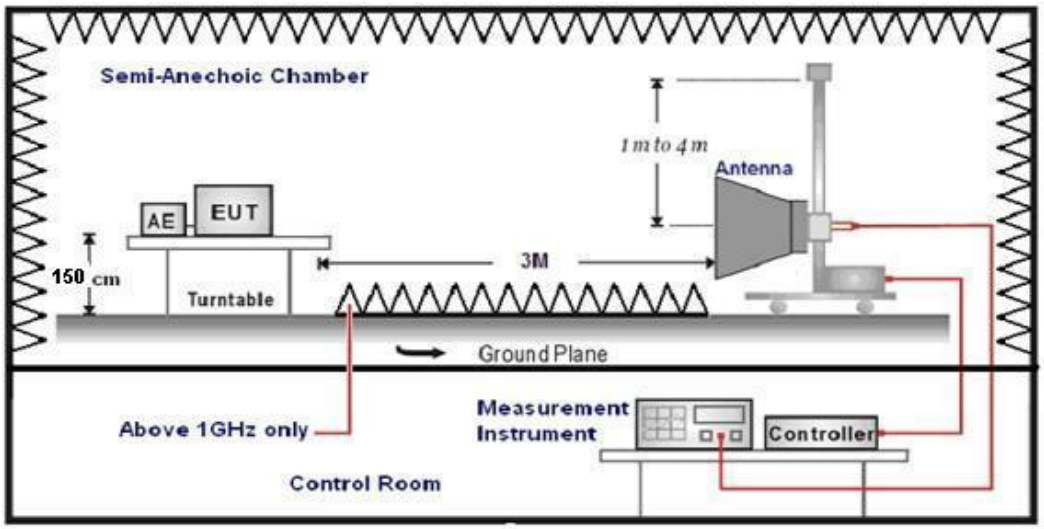
## 4.6. Conducted Spurious Emissions and Band Edge Compliance of RF Emission

**TEST REQUIREMENT**

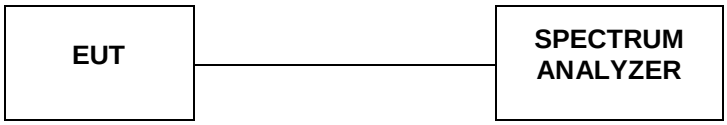
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies 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. 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) (see §15.205(c)).

**TEST CONFIGURATION**

**For Radiated**




**For Conducted**




**TEST PROCEDURE**

1. The EUT was placed on a 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 distance between test antenna and EUT was 3 meter:
6. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting | Detector |
|---|---|---|
| 1GHz-40GHz | Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto<br>Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto | Peak |

**LIMIT**

Below -20dB of the highest emission level in operating band.
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)

**TEST RESULTS**

Remark: we measured all conditions(DH1,DH3,DH5) and recorded worst case at DH1.

### 4.6.1 For Radiated Bandedge Measurement

For reporting purpose only.

Please refer to Appendix A.9.

### 4.6.2 For Conducted Bandedge Measurement

For reporting purpose only.

Please refer to Appendix A.7.

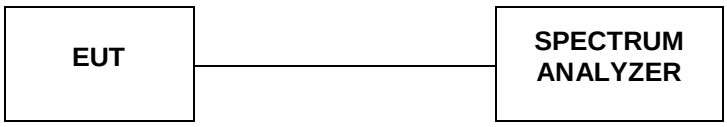
### 4.6.3 For Conducted Spurious Emissions Measurement

For reporting purpose only.

Please refer to Appendix A.8.

## 4.7. Number of hopping frequency

**TEST CONFIGURATION**




**TEST PROCEDURE**

The transmitter output was connected to the spectrum analyzer through an attenuator.Set spectrum analyzer start 2400MHz to 2483.5MHz with RBW=100KHz and VBW=300KHz.

**LIMIT**

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

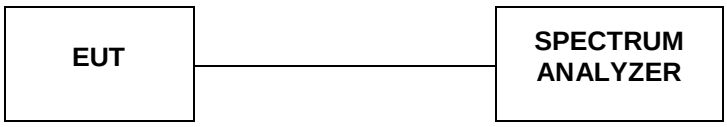
**TEST RESULTS**

For reporting purpose only.

Please refer to Appendix A.6.

## 4.8. Time Of Occupancy(Dwell Time)

**TEST CONFIGURATION**




**TEST PROCEDURE**

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with RBW=1MHz and VBW=3MHz,Span=0Hz.

**LIMIT**

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

**TEST RESULTS**

For reporting purpose only.

Please refer to Appendix A.5.

## 4.9. Pseudorandom Frequency Hopping Sequence

**TEST APPLICABLE**

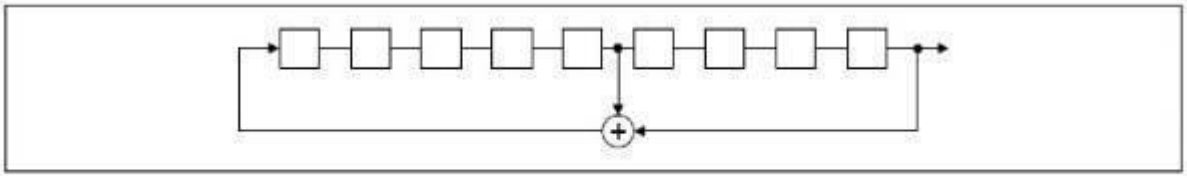
**For 47 CFR Part 15C section 15.247 (a)(1) requirement:**

Frequency hopping systems shall have hopping channel carrier fre-quencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier fre-quencies 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 chan-nel frequencies that are selected at the system hopping rate from a pseudo ran-domly ordered list of hopping fre-quencies. Each frequency must be used equally on the average by each trans-mitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

**EUT Pseudorandom Frequency Hopping Sequence Requirement**

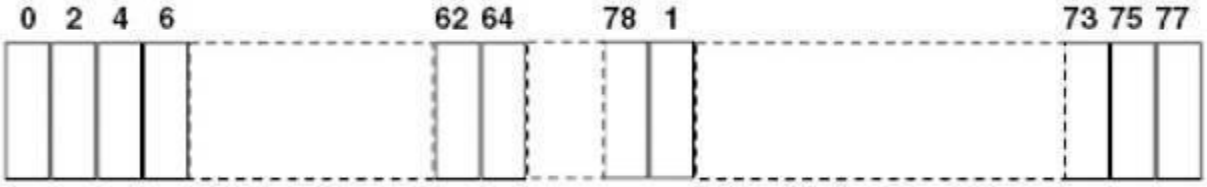
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage.And the result is fed back to the input of the frist stage.The sequence begins with the frist one of 9 consecutive ones,for example:the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

## 4.10. 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 (c), 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.

**Test Result**

The antenna used for this product is PCB Antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 2.34dBi.

Reference to the **Internal photos.**

# 5. TEST SETUP PHOTOS OF THE EUT

Photo of Radiated Emissions Measurement

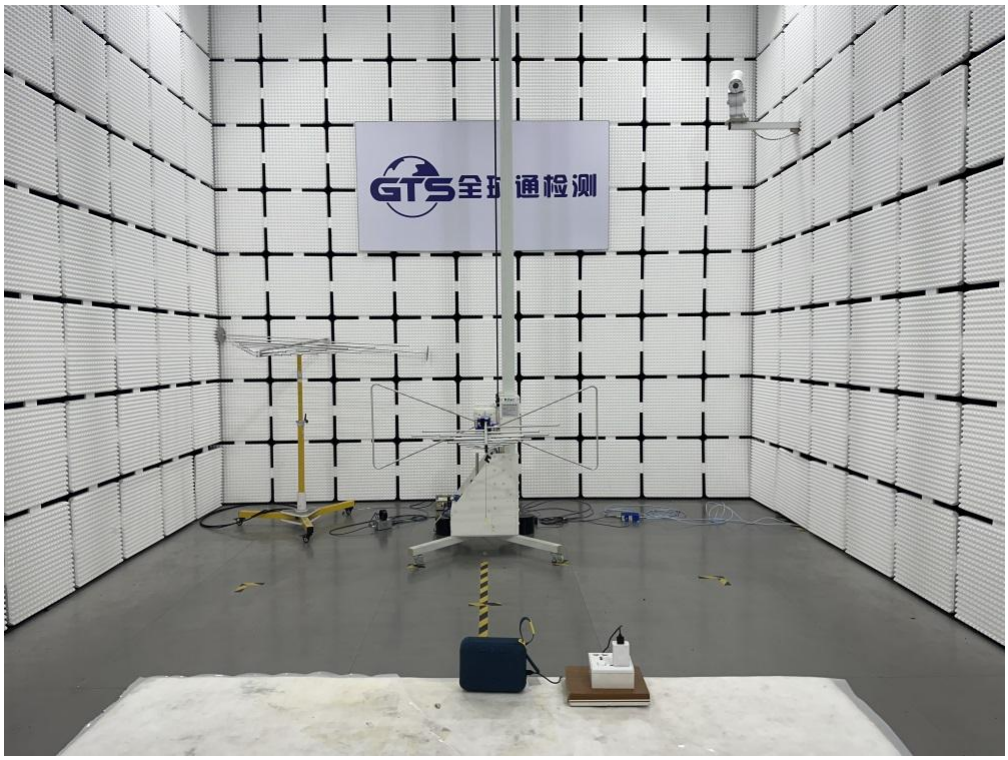



Fig. 1

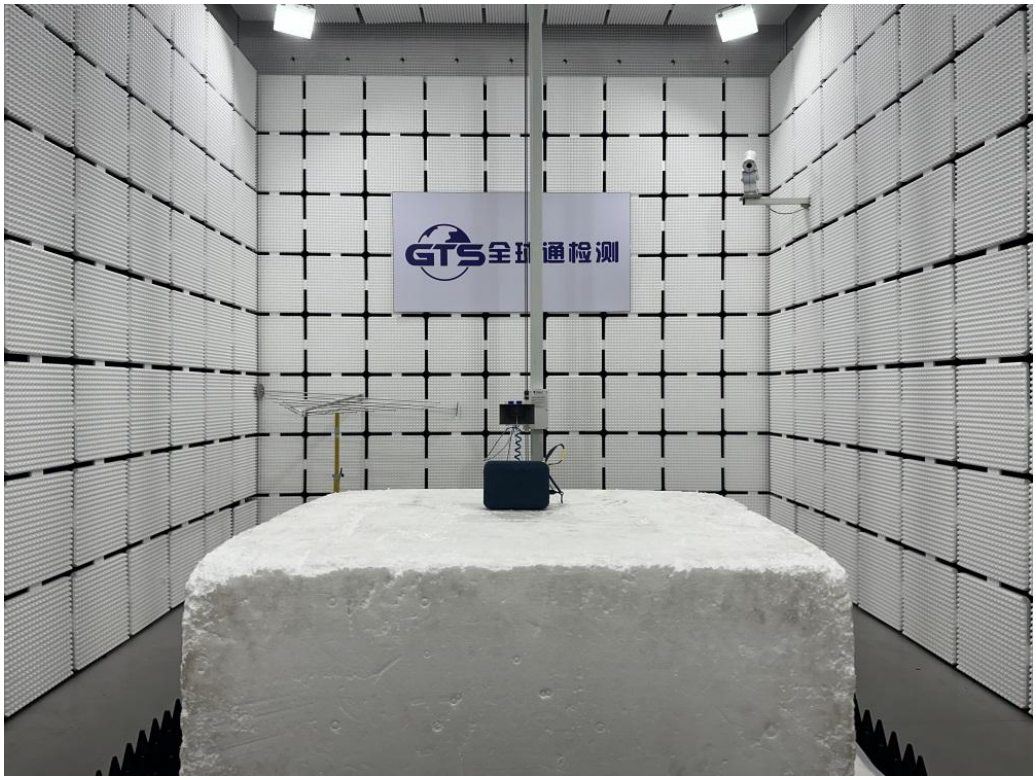



Fig. 2

Photo of Conducted Emission Measurement

Fig. 3

# 6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

## 6.1. External photos of the EUT

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

## 6.2. Internal photos of the EUT

Fig. 8

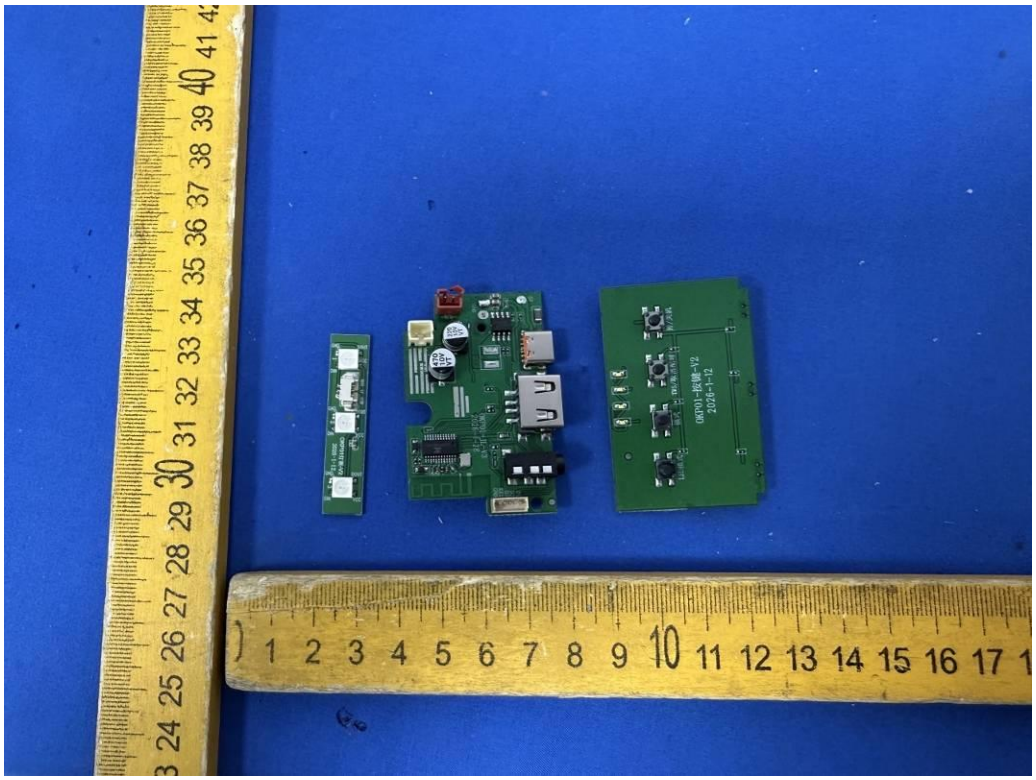


Fig. 9

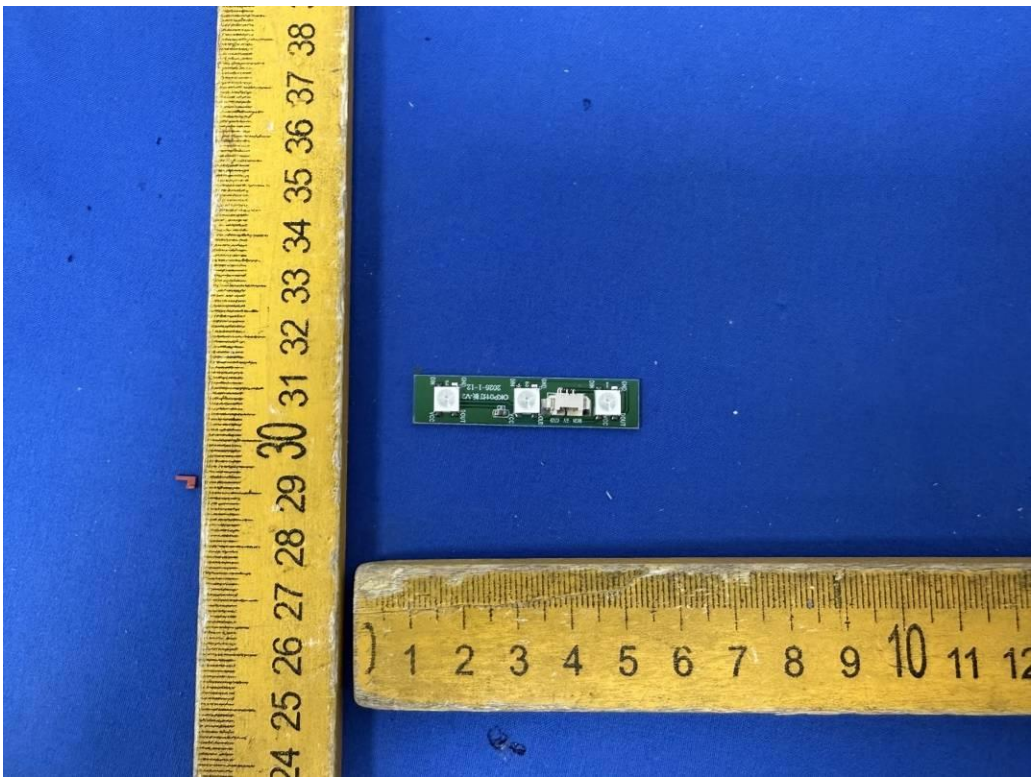


Fig. 10

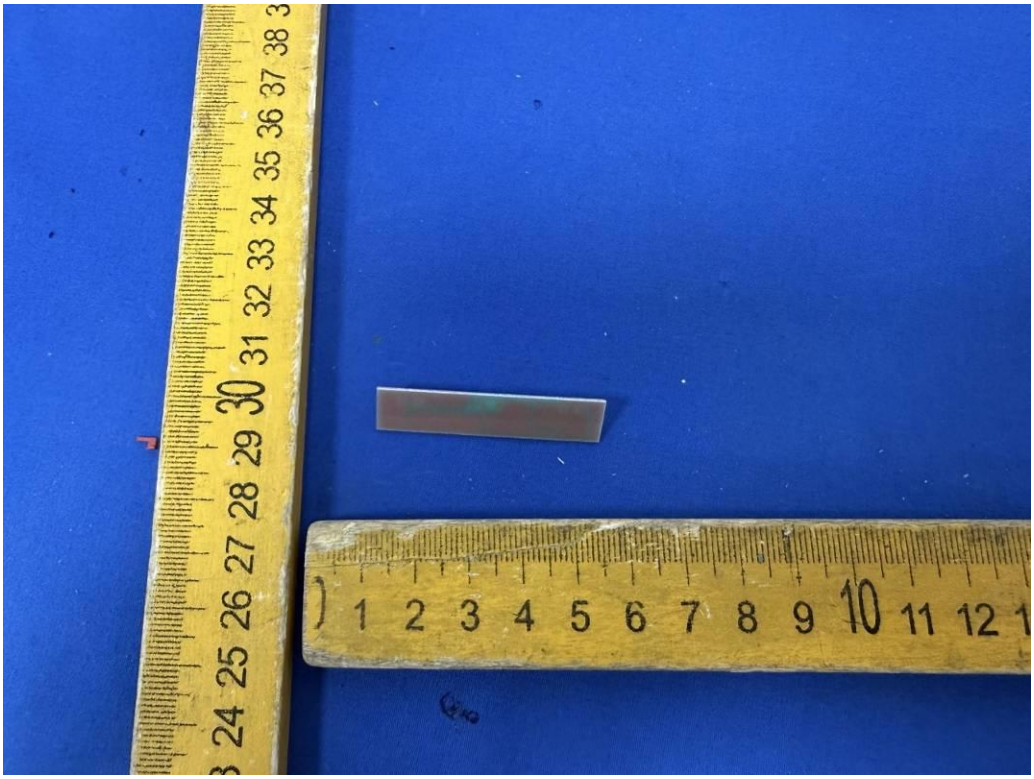


Fig. 11

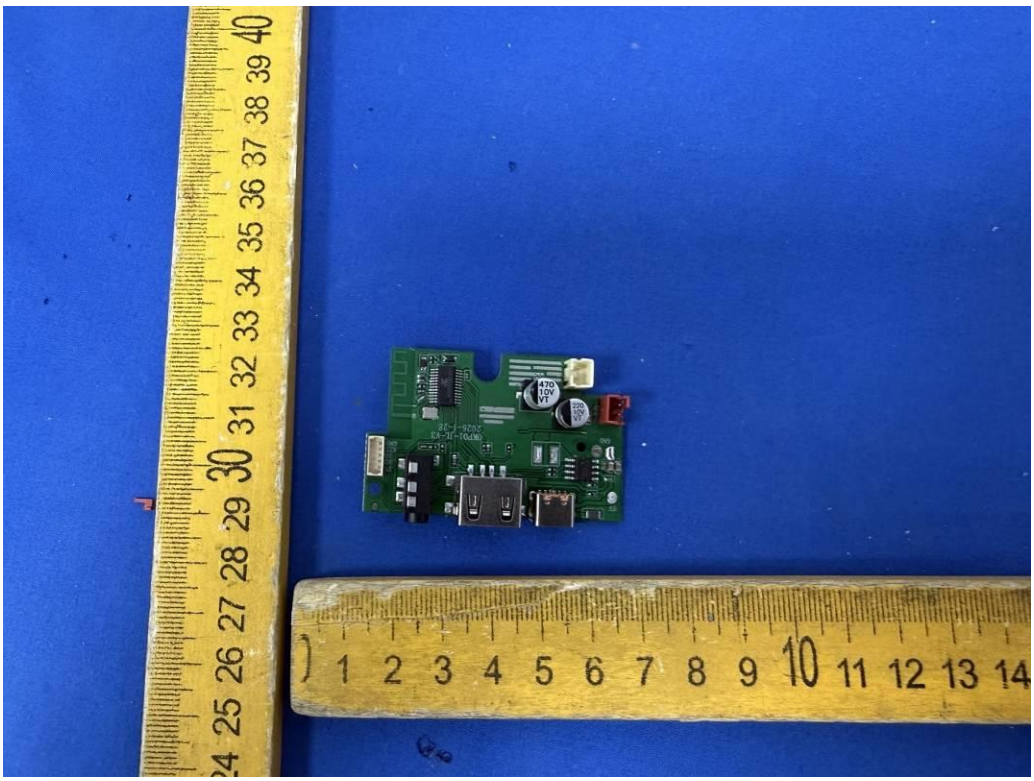


Fig. 12

Fig. 13

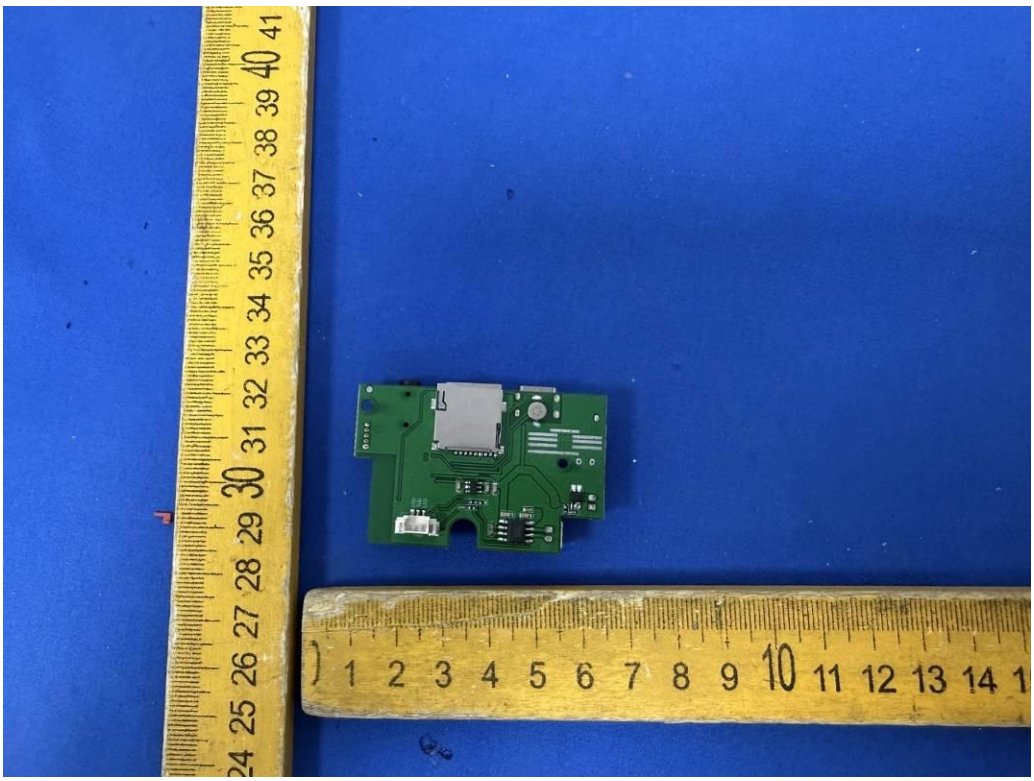


Fig. 14

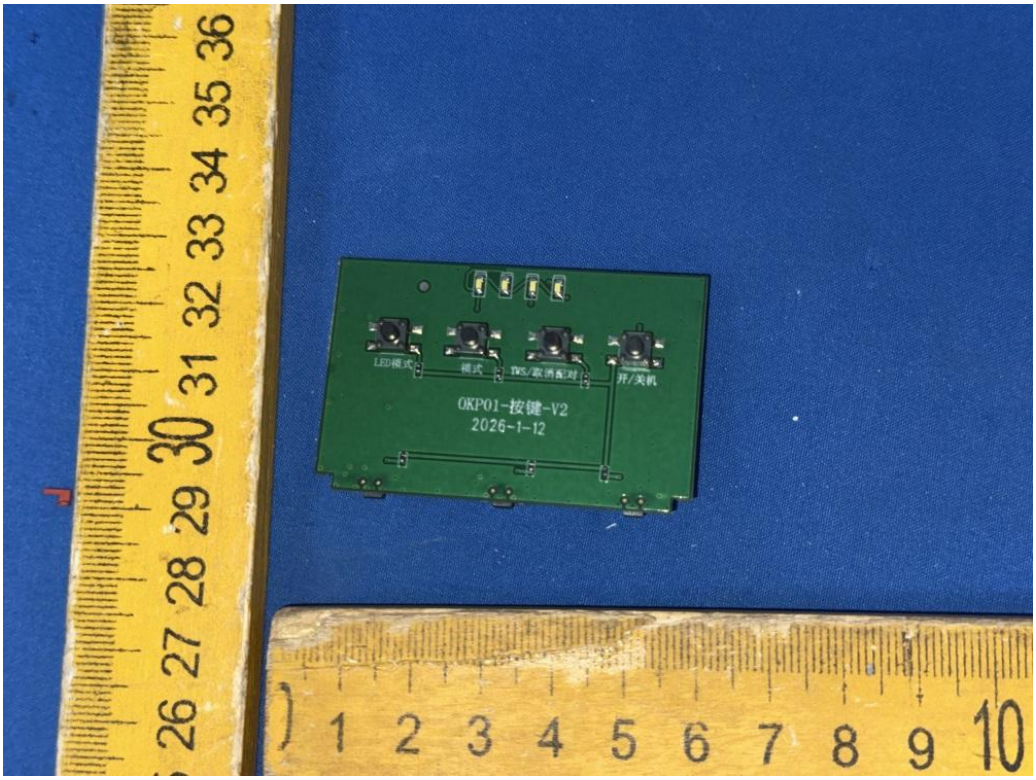



Fig. 15

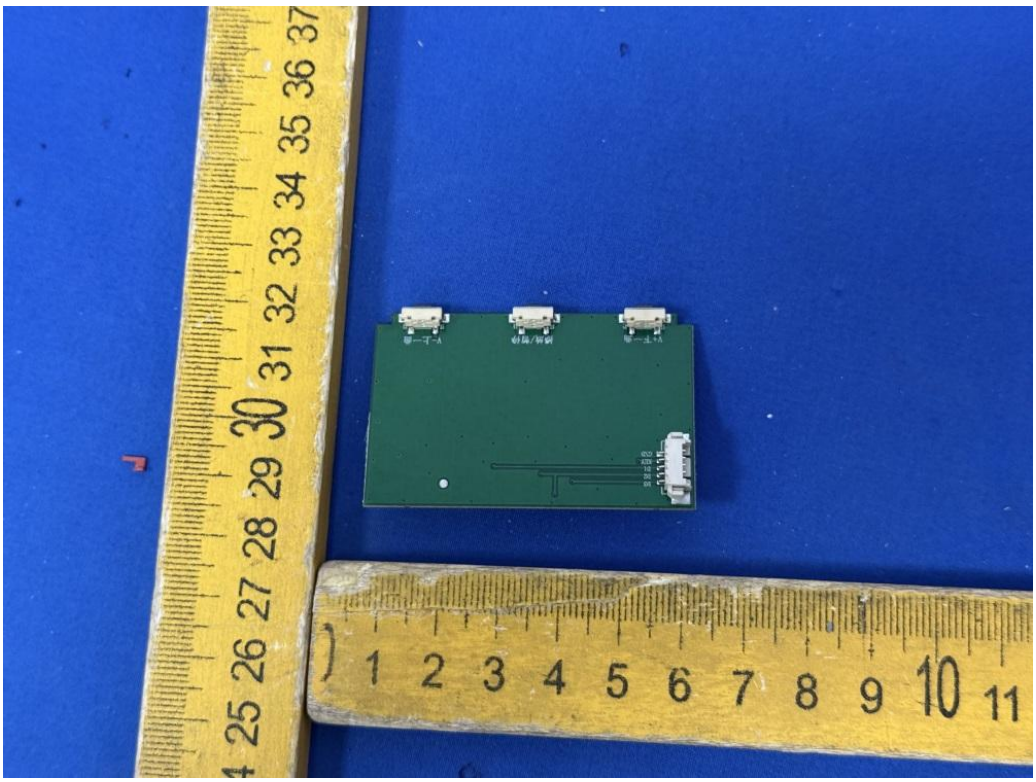


Fig. 16

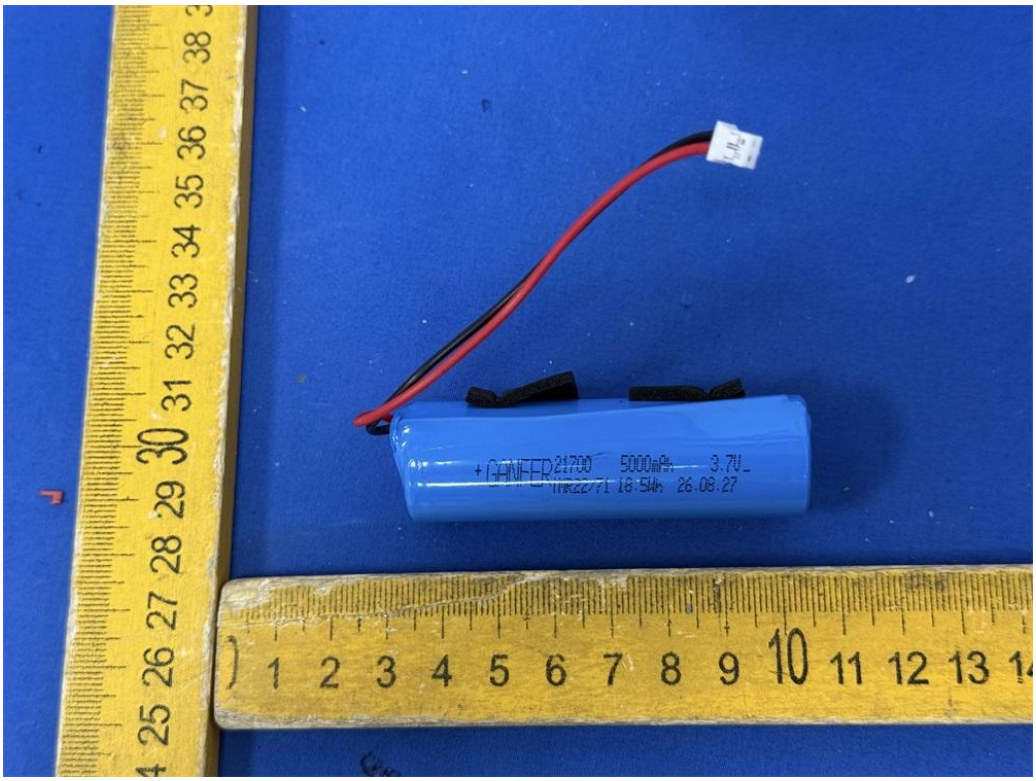



Fig. 17

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