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.:** | **CTL2411067021-WF** | |
| Compiled by:<br>( position+printed name+signature) | Happy Guo<br>(File administrators) | Happy Guo |
| Tested by:<br>( position+printed name+signature) | James Yu<br>(Test Engineer) | James Yu |
| Approved by:<br>( position+printed name+signature) | Ivan Xie<br>(Manager) | Ivan Xie |

| | |
|---|---|
| **Product Name**..... : | Powered Speaker |
| **Model/Type reference**.....: | PS15 CLIP |
| **List Model(s)**.....: | N/A |
| **Trade Mark**..... : | PRV Audio |
| **FCC ID**..... : | **2BL5J-PS15CLIP** |
| **Applicant's name**..... : | **BTG Solutions Inc.** |
| **Address of applicant**.....: | 1893 S.W. 3rd Street, Pompano Beach, FL 33069 |
| **Test Firm**.....: | **Shenzhen CTL Testing Technology Co., Ltd.** |
| **Address of Test Firm**.....: | Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055 |
| **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**..... : | November 21, 2024 |
| **Date of Test Date**.....: | November 21, 2024-December 9, 2024 |
| **Date of Issue**.....: | December 10, 2024 |
| **Result**..... : | **Pass** |

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# TEST REPORT

| Test Report No. : | CTL2411067021-WF | December 10, 2024<br>Date of issue |
|---|---|---|

| | | |
|---|---|---|
| Equipment under Test | : | Powered Speaker |
| Sample No | : | CTL2411067021 |
| Model /Type | : | PS15 CLIP |
| Listed Models | : | N/A |
| **Applicant** | : | **BTG Solutions Inc.** |
| Address | : | 1893 S.W. 3rd Street, Pompano Beach, FL 33069 |
| **Manufacturer** | : | **Shenzhen Trendwoo Tech. Co.,Ltd.** |
| Address | : | Units 3202&3208, 32nd floor, Block C, Phase 2 Galaxy World, Minle community, Minzhi street, Longhua district, Shenzhen, China |

| **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.

# ** Modified History **

| Revisions | Description | Issued Data | Report No. | Remark |
|---|---|---|---|---|
| Version 1.0 | Initial Test Report Release | December 10, 2024 | CTL2411067021-WF | Tracy Qi |
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# 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: 2013: 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 Address of the test laboratory

Shenzhen CTL Testing Technology Co.,Ltd.
Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.10 and CISPR 32/EN 55032 requirements.

### 1.3.2 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 Registration No.: 9618B**

**CAB identifier: CN0041**

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 Registration No.: 9618B.

**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. 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 |
|---|---|---|
| Transmitter power Radiated | ±2.20 dB | (1) |
| Radiated Emission9KHz~30MHz | ±3.66dB | (1) |
| Radiated Emission 30~1000MHz | ±4.10dB | (1) |
| Radiated Emission Above 1GHz | ±4.32dB | (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. GENERAL INFORMATION

## 2.1. Environmental conditions

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

| | |
|---|---|
| Normal Temperature: | 25°C |
| Relative Humidity: | 55 % |
| Air Pressure: | 101 kPa |

## 2.2. General Description of EUT

| | |
|---|---|
| Product Name: | Powered Speaker |
| Model/Type reference: | PS15 CLIP |
| Power supply: | DC 5V/1A<br>DC 3.7V from battery(Battery: 2600mAh) |
| **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: | -0.58dBi |

Note1: For more details, please refer to the user's manual of the EUT.
Note2: Antenna gain provided by the applicant.

## 2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) 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 Middle channel |
| Radiated Emissions and Band Edge | DH5 |
| Maximum Conducted Output Power | DH5/2DH5/3DH5 |
| 20dB Bandwidth | DH5/2DH5/3DH5 |
| Frequency Separation | DH5/2DH5/3DH5 Middle channel |
| Number of hopping frequency | DH5/2DH5/3DH5 |
| Time of Occupancy (Dwell Time) | DH1/DH3/DH5 Middle channel<br>2DH1/2DH3/2DH5 Middle channel<br>3DH1/3DH3/3DH5 Middle channel |
| Out-of-band Emissions | DH5/2DH5/3DH5 |

## 2.4. Equipments Used during the Test

| Conducted Emission | | | | | | |
|---|---|---|---|---|---|---|
| Test Equipment | Manufacturer | Model No. | Serial No. | Previous calibration | Last Cal. | Cal.Due |
| EMI Test Receiver | ROHDE & SCHWARZ | ESCI | 1166.5950.03 | 2023/05/04 | 2024/04/30 | 2025/04/29 |
| LISN | ROHDE & SCHWARZ | ESH2-Z5 | 860014/010 | 2023/05/04 | 2024/04/30 | 2025/04/29 |
| Limitator | ROHDE & SCHWARZ | ESH3-Z2 | 100408 | 2023/05/04 | 2024/04/30 | 2025/04/29 |
| Software: | | | | | | |
| Name of Software: | | | Version: | | | |
| ES-K1 | | | V1.71 | | | |

| Radiated Emission | | | | | | |
|---|---|---|---|---|---|---|
| Test Equipment | Manufacturer | Model No. | Serial No. | Previous calibration | Last Cal. | Cal.Due |
| Active Loop Antenna | Da Ze | ZN30900A | / | 2021/05/13 | 2024/04/30 | 2025/04/29 |
| Double cone logarithmic antenna | Schwarzbeck | VULB 9168 | 824 | / | 2023/02/13 | 2026/02/12 |
| Horn Antenna | Sunol Sciences Corp. | DRH-118 | A062013 | / | 2021/12/23 | 2024/12/22 |
| Horn Antenna | Ocean Microwave | OBH100400 | 26999002 | / | 2021/12/22 | 2024/12/21 |
| Amplifier | MRT-AP01M06 | MRT | S-001 | 2023/05/04 | 2024/04/30 | 2025/04/29 |
| Amplifier | Agilent | 8449B | 3008A02306 | 2023/05/04 | 2024/04/30 | 2025/04/29 |
| Amplifier | Brief&Smart | LNA-4018 | 2104197 | 2023/05/05 | 2024/05/03 | 2025/05/02 |
| EMI Test Receiver | ROHDE & SCHWARZ | ESCI | 1166.5950.03 | 2023/05/04 | 2024/04/30 | 2025/04/29 |
| Spectrum Analyzer | RS | FSP | 1164.4391.38 | 2023/05/05 | 2024/05/03 | 2025/05/02 |
| 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. | Previous calibration | Last Cal. | Cal.Due |
| Spectrum Analyzer | Keysight | N9020A | MY53420874 | 2023/05/04 | 2024/05/01 | 2025/04/30 |
| Temperature/Humidity Meter | Ji Yu | MC501 | / | 2023/05/09 | 2024/05/04 | 2025/05/03 |
| Software: | | | | | | |
| Name of Software: | | | Version: | | | |
| TST-PASS | | | V2.0 | | | |

## 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

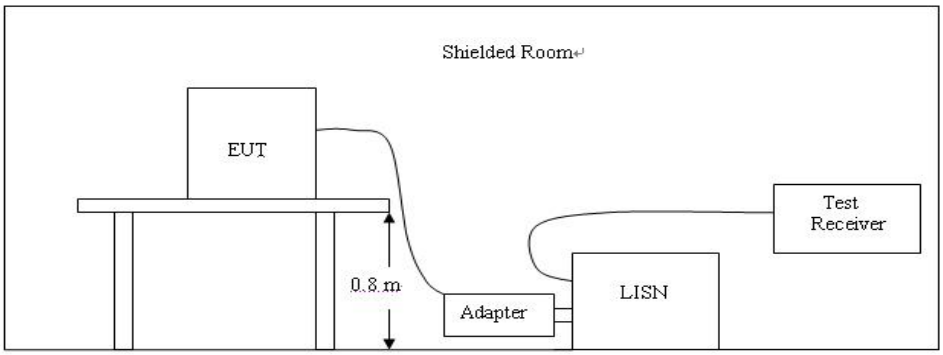
**LIMIT**

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 C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
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.

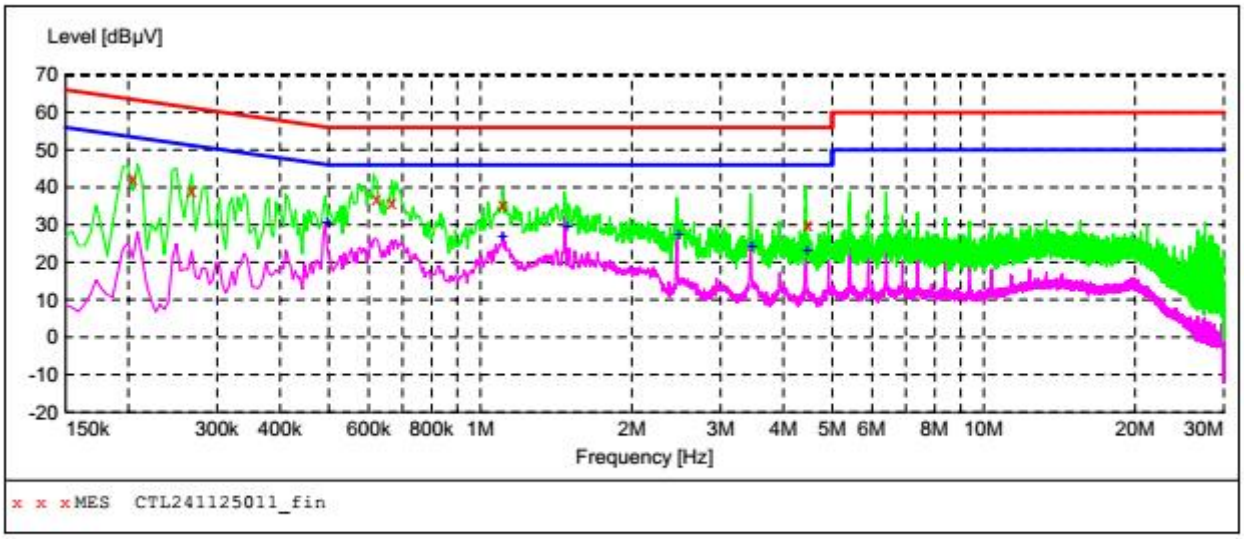
**TEST RESULTS**

Remark: All modes of GFSK, Pi/4 DQPSK, and 8DPSK were test at Low, Middle, and High channel; only the worst result of GFSK Low Channel was reported as below:

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

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

Short Description: 150K-30M Voltage




***MEASUREMENT RESULT: "CTL241125011_fin"***

11/25/2024 10:52AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.204000 | 42.60 | 10.0 | 63 | 20.8 | QP | L1 | GND |
| 0.267000 | 39.20 | 10.0 | 61 | 22.0 | QP | L1 | GND |
| 0.622500 | 36.90 | 10.0 | 56 | 19.1 | QP | L1 | GND |
| 0.667500 | 35.70 | 10.0 | 56 | 20.3 | QP | L1 | GND |
| 1.108500 | 35.40 | 10.1 | 56 | 20.6 | QP | L1 | GND |
| 4.470000 | 30.20 | 10.1 | 56 | 25.8 | QP | L1 | GND |

***MEASUREMENT RESULT: "CTL241125011_fin2"***

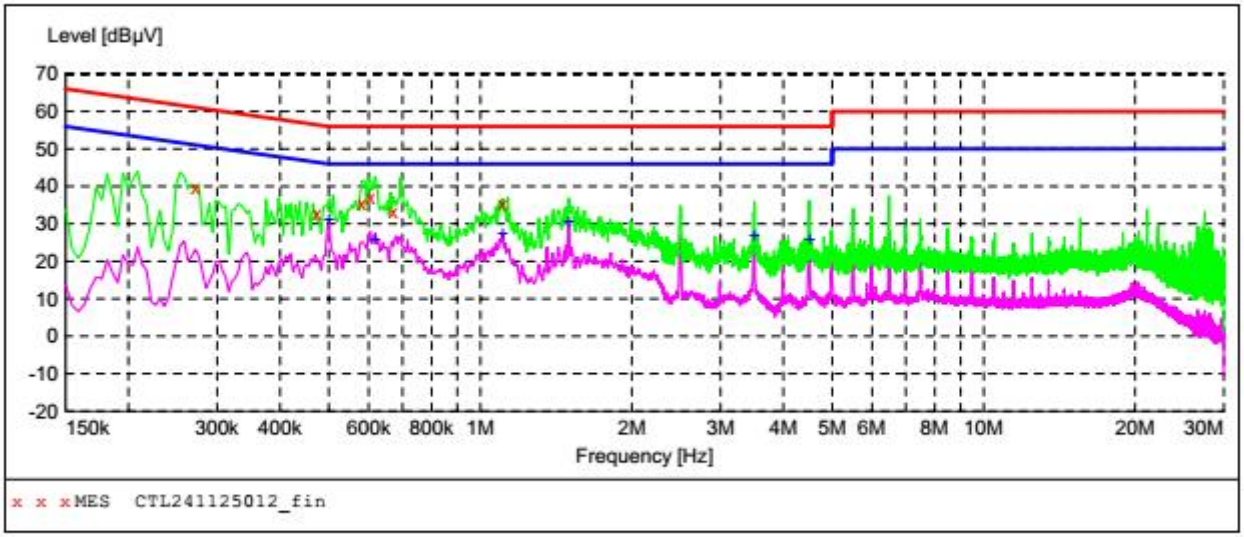
11/25/2024 10:52AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.496500 | 30.70 | 10.0 | 46 | 15.4 | AV | L1 | GND |
| 1.108500 | 27.00 | 10.1 | 46 | 19.0 | AV | L1 | GND |
| 1.491000 | 29.50 | 10.1 | 46 | 16.5 | AV | L1 | GND |
| 2.485500 | 27.60 | 10.1 | 46 | 18.4 | AV | L1 | GND |
| 3.475500 | 24.10 | 10.1 | 46 | 21.9 | AV | L1 | GND |
| 4.470000 | 23.30 | 10.1 | 46 | 22.7 | AV | L1 | GND |

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

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

Short Description: 150K-30M Voltage




***MEASUREMENT RESULT: "CTL241125012_fin"***

11/25/2024 10:55AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.271500 | 39.50 | 10.0 | 61 | 21.6 | QP | N | GND |
| 0.474000 | 32.60 | 10.0 | 56 | 23.8 | QP | N | GND |
| 0.582000 | 35.50 | 10.0 | 56 | 20.5 | QP | N | GND |
| 0.604500 | 36.80 | 10.0 | 56 | 19.2 | QP | N | GND |
| 0.672000 | 33.50 | 10.0 | 56 | 22.5 | QP | N | GND |
| 1.108500 | 35.50 | 10.1 | 56 | 20.5 | QP | N | GND |

***MEASUREMENT RESULT: "CTL241125012_fin2"***

11/25/2024 10:55AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.501000 | 31.00 | 10.0 | 46 | 15.0 | AV | N | GND |
| 0.618000 | 25.90 | 10.0 | 46 | 20.1 | AV | N | GND |
| 1.108500 | 27.20 | 10.1 | 46 | 18.8 | AV | N | GND |
| 1.500000 | 30.60 | 10.1 | 46 | 15.4 | AV | N | GND |
| 3.511500 | 26.60 | 10.1 | 46 | 19.4 | AV | N | GND |
| 4.515000 | 25.80 | 10.1 | 46 | 20.2 | 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.

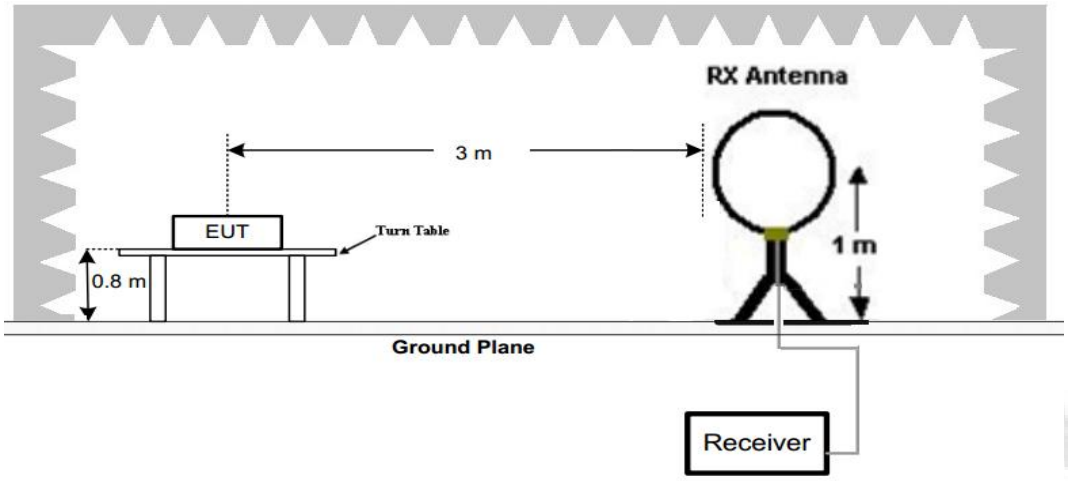
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

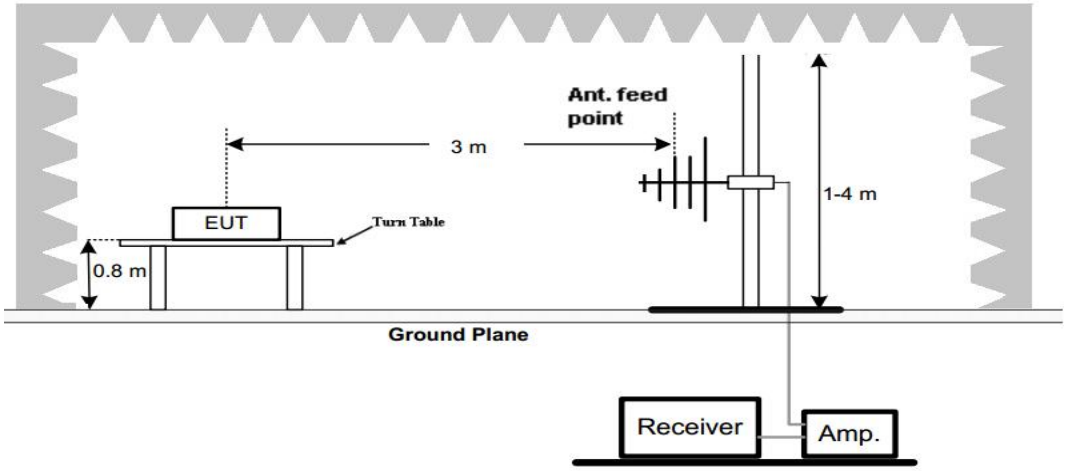
| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 0.009-0.49 | 3 | 20log(2400/F(KHz))+40log(300/3) | 2400/F(KHz) |
| 0.49-1.705 | 3 | 20log(24000/F(KHz))+ 40log(30/3) | 24000/F(KHz) |
| 1.705-30 | 3 | 20log(30)+ 40log(30/3) | 30 |
| 30-88 | 3 | 40.0 | 100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

**TEST CONFIGURATION**

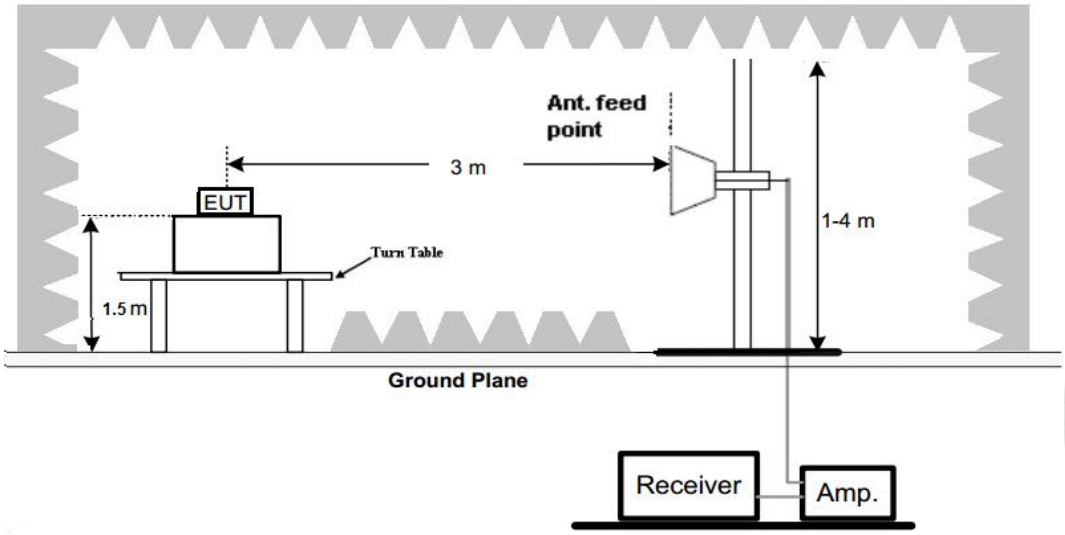
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz




(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 and 8DPSK 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. 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.

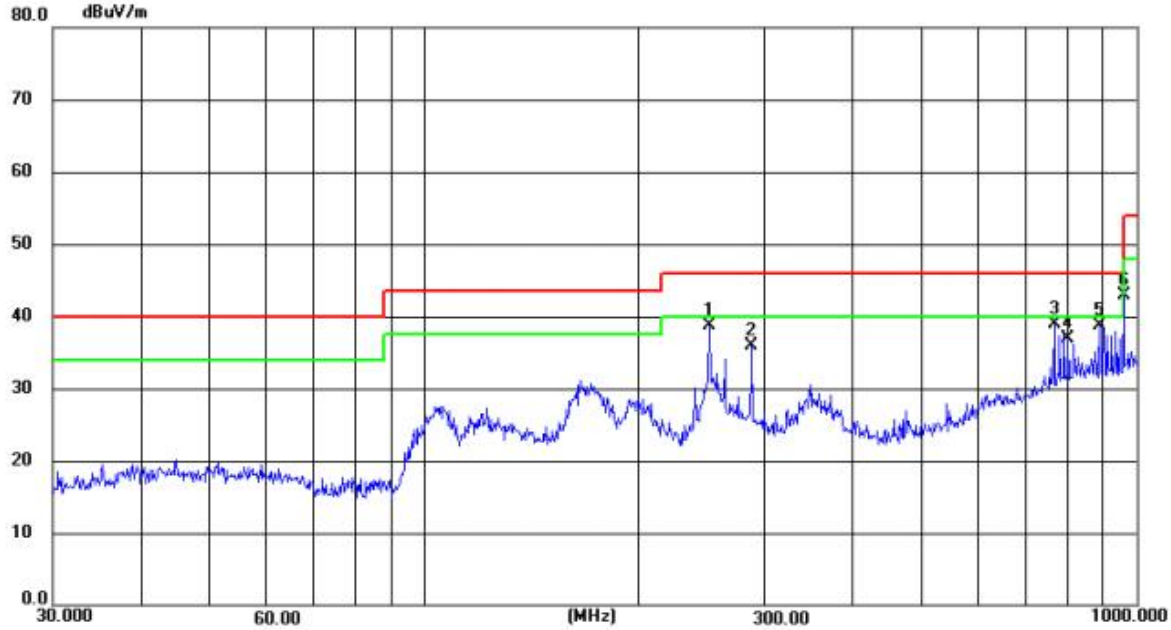
**For 30MHz-1GHz**

Horizontal

Shenzhen CTL Testing Technology Co., Ltd
Tel: +86-755-89486194

**Radiated Emission Measurement**

File :RF_11 Data :#1473 Date: 2024/11/25 Time: 19:16:02




Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_30-1000MHz
EUT:
M/N: PS15 CLIP
Mode: BT 2402MHz
Note: BTG Solutions Inc.

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 | 252.0627 | 25.58 | 13.12 | 38.70 | 46.00 | 7.30 | peak | 100 | 331 | P | |
| 2 | 287.9904 | 21.86 | 14.12 | 35.98 | 46.00 | 10.02 | peak | 100 | 9 | P | |
| 3 | 768.0745 | 14.01 | 24.82 | 38.83 | 46.00 | 7.17 | peak | 100 | 331 | P | |
| 4 | 804.2501 | 11.26 | 25.65 | 36.91 | 46.00 | 9.09 | peak | 100 | 29 | P | |
| 5 | 888.3883 | 12.42 | 26.24 | 38.66 | 46.00 | 7.34 | peak | 100 | 352 | P | |
| 6 | 960.0560 | 15.67 | 27.23 | 42.90 | 54.00 | 11.10 | peak | 100 | 279 | P | |

Vertical

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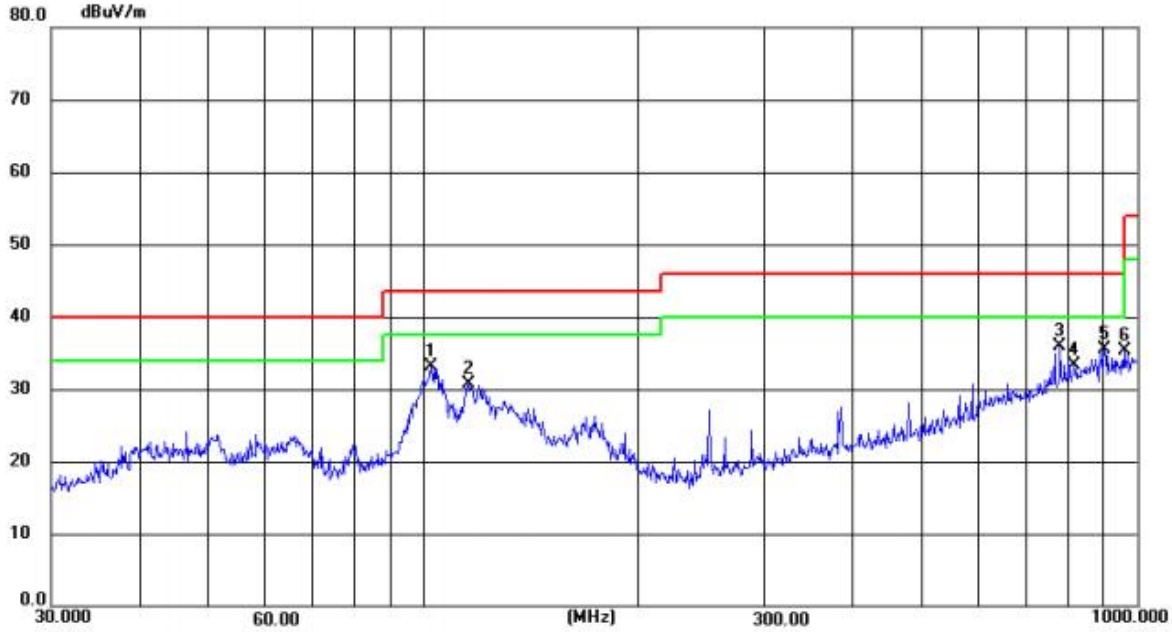
**Radiated Emission Measurement**

File :RF_11 Data :#1474 Date: 2024/11/25 Time: 19:17:05




Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_30-1000MHz
EUT:
M/N: PS15 CLIP
Mode: BT 2402MHz
Note: BTG Solutions Inc.

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 | 102.5841 | 21.66 | 11.43 | 33.09 | 43.50 | 10.41 | peak | 100 | 237 | P | |
| 2 | 115.6750 | 18.11 | 12.63 | 30.74 | 43.50 | 12.76 | peak | 100 | 351 | P | |
| 3 | 780.2905 | 10.72 | 25.21 | 35.93 | 46.00 | 10.07 | peak | 100 | 154 | P | |
| 4 | 816.3255 | 7.27 | 25.97 | 33.24 | 46.00 | 12.76 | peak | 100 | 164 | P | |
| 5 | 900.1474 | 8.82 | 26.62 | 35.44 | 46.00 | 10.56 | peak | 100 | 195 | P | |
| 6 | 960.0560 | 8.03 | 27.23 | 35.26 | 54.00 | 18.74 | peak | 100 | 101 | P | |

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

Horizontal

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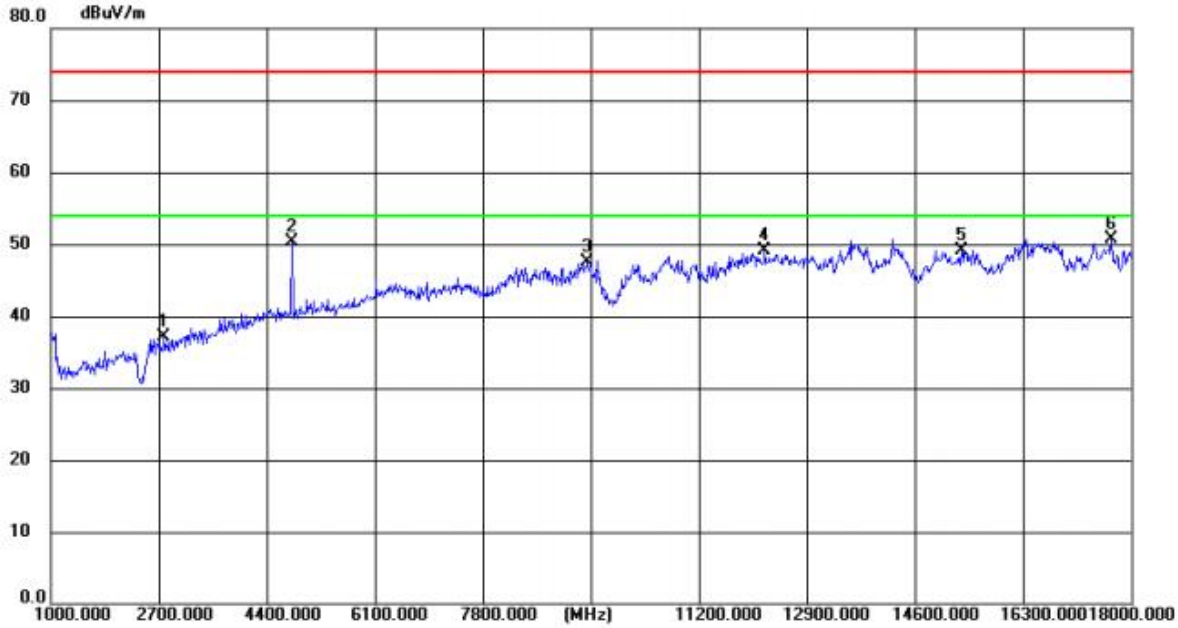
**Radiated Emission Measurement**

File :RF_11 Data :#1585 Date: 2024/11/26 Time: 21:13:26




Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_Above 1GHz_PK
EUT:
M/N: PS15 CLIP
Mode: BT 2402MHz
Note: BTG Solutions Inc.

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 | 2795.625 | 52.17 | -15.08 | 37.09 | 74.00 | 36.91 | peak | 150 | 356 | P | |
| 2 | 4803.750 | 58.31 | -8.09 | 50.22 | 74.00 | 23.78 | peak | 150 | 262 | P | |
| 3 | 9453.250 | 47.30 | 0.26 | 47.56 | 74.00 | 26.44 | peak | 150 | 137 | P | |
| 4 | 12237.000 | 46.90 | 2.20 | 49.10 | 74.00 | 24.90 | peak | 150 | 2 | P | |
| 5 | 15335.250 | 45.40 | 3.71 | 49.11 | 74.00 | 24.89 | peak | 150 | 325 | P | |
| 6 | 17694.000 | 41.60 | 9.14 | 50.74 | 74.00 | 23.26 | peak | 150 | 32 | P | |

Vertical

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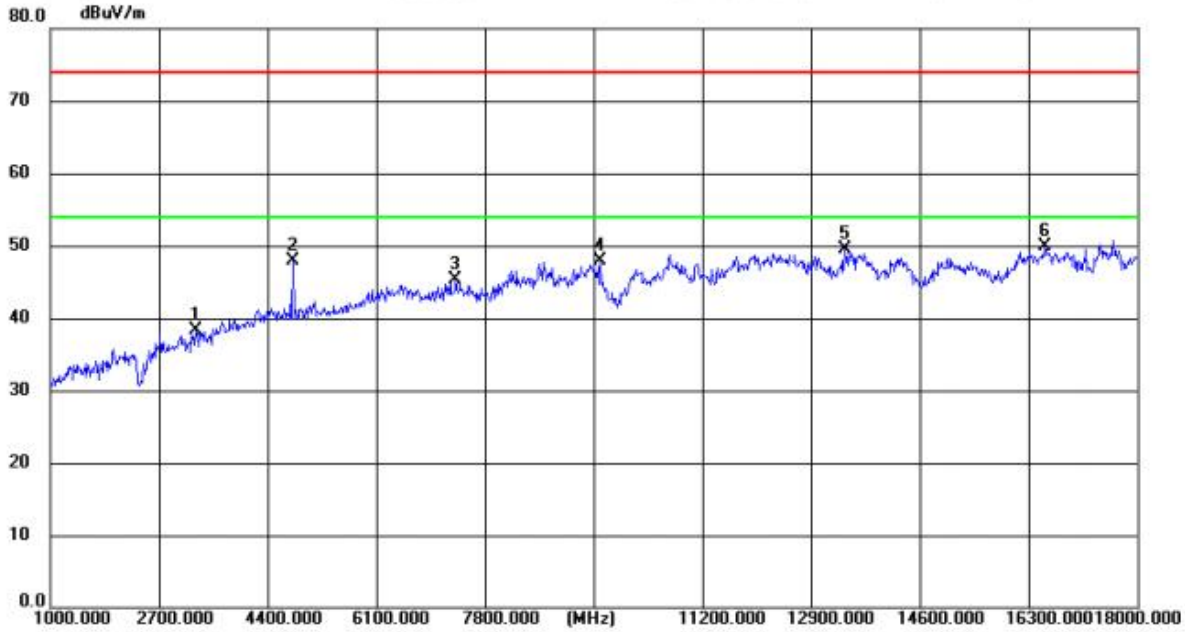
**Radiated Emission Measurement**

File :RF_11 Data :#1586 Date: 2024/11/26 Time: 21:14:29




Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_Above 1GHz_PK
EUT:
M/N: PS15 CLIP
Mode: BT 2402MHz
Note: BTG Solutions Inc.

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 | 3290.750 | 51.04 | -12.76 | 38.28 | 74.00 | 35.72 | peak | 150 | 160 | P | |
| 2 | 4803.750 | 56.05 | -8.09 | 47.96 | 74.00 | 26.04 | peak | 150 | 327 | P | |
| 3 | 7353.750 | 48.18 | -2.87 | 45.31 | 74.00 | 28.69 | peak | 150 | 88 | P | |
| 4 | 9608.375 | 47.40 | 0.45 | 47.85 | 74.00 | 26.15 | peak | 150 | 306 | P | |
| 5 | 13439.750 | 45.80 | 3.68 | 49.48 | 74.00 | 24.52 | peak | 150 | 88 | P | |
| 6 | 16565.625 | 43.61 | 6.25 | 49.86 | 74.00 | 24.14 | peak | 150 | 338 | P | |

REMARKS:

1. 18GHz-26GHz not recorded for no spurious point have a margin of less than 6 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.

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

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

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

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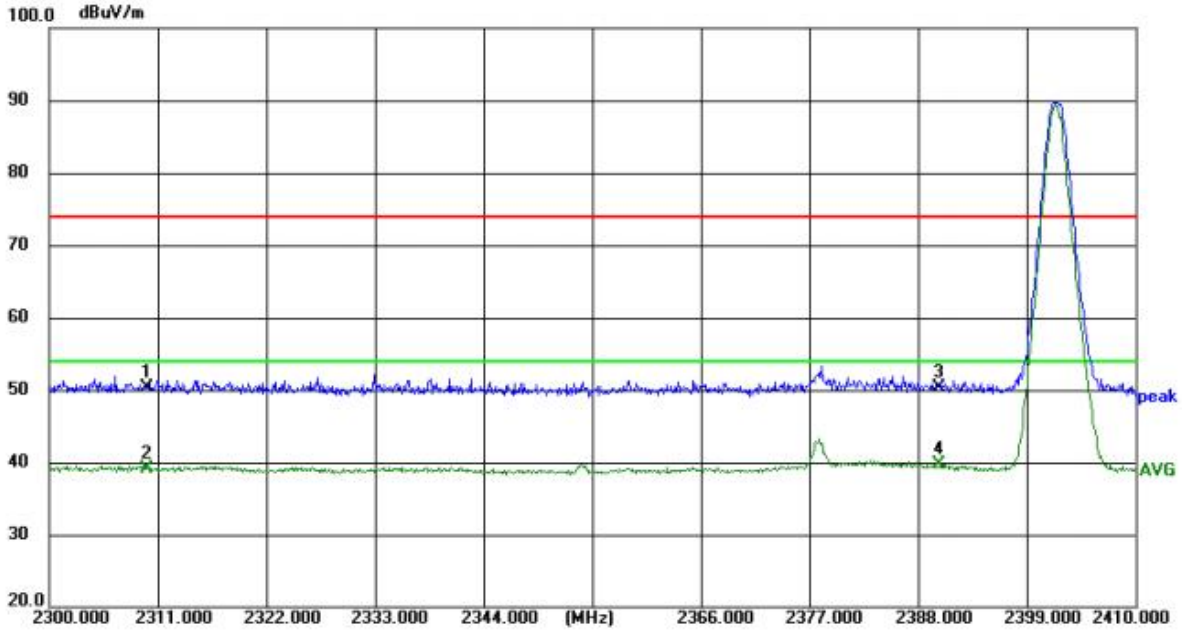
**Radiated Emission Measurement**

File :RF_11 Data :#1597 Date: 2024/11/26 Time: 21:39:06




Site LAB Chamber 2
Limit: FCC Part 15 C
EUT:
M/N: PS15 CLIP
Mode: BT 2402MHz
Note: BTG Solutions Inc.

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 | 40.53 | 9.69 | 50.22 | 74.00 | 23.78 | peak | 150 | 358 | P | |
| 2 | 2310.000 | 29.32 | 9.69 | 39.01 | 54.00 | 14.99 | AVG | 150 | 358 | P | |
| 3 | 2390.000 | 40.46 | 9.77 | 50.23 | 74.00 | 23.77 | peak | 150 | 360 | P | |
| 4 | 2390.000 | 29.86 | 9.77 | 39.63 | 54.00 | 14.37 | AVG | 150 | 360 | P | |

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

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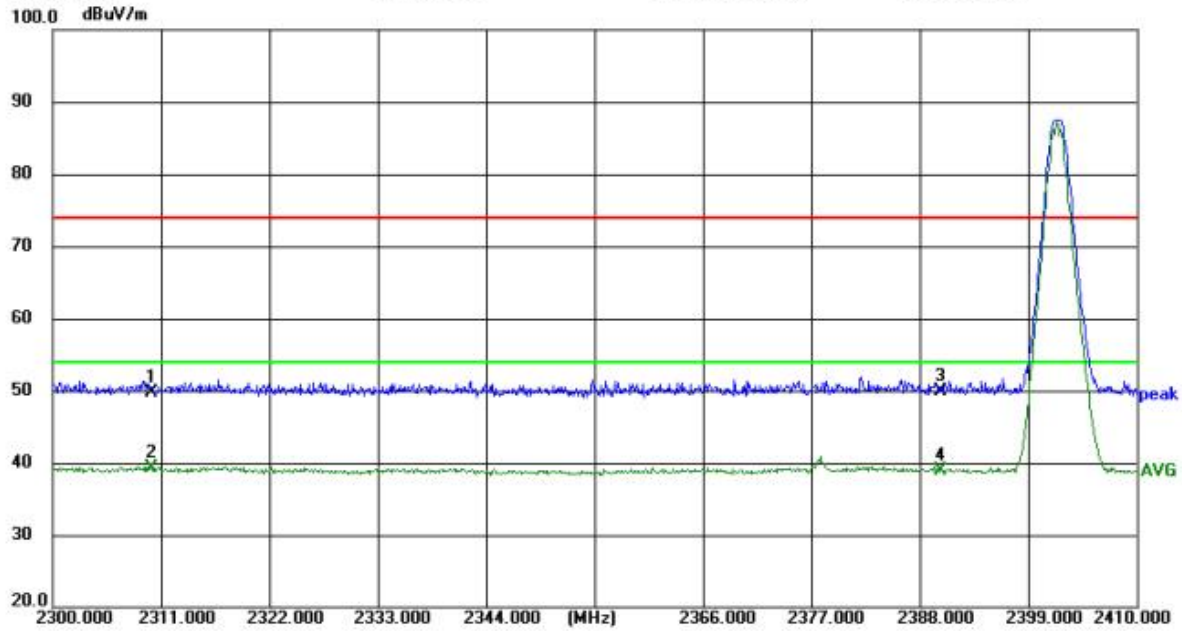
**Radiated Emission Measurement**

File :RF_11 Data :#1598 Date: 2024/11/26 Time: 21:40:12




Site LAB Chamber 2
Limit: FCC Part 15 C
EUT:
M/N: PS15 CLIP
Mode: BT 2402MHz
Note: BTG Solutions Inc.

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 | 40.09 | 9.69 | 49.78 | 74.00 | 24.22 | peak | 150 | 358 | P | |
| 2 | 2310.000 | 29.69 | 9.69 | 39.38 | 54.00 | 14.62 | AVG | 150 | 358 | P | |
| 3 | 2390.000 | 40.05 | 9.77 | 49.82 | 74.00 | 24.18 | peak | 150 | 234 | P | |
| 4 | 2390.000 | 29.07 | 9.77 | 38.84 | 54.00 | 15.16 | AVG | 150 | 234 | P | |

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

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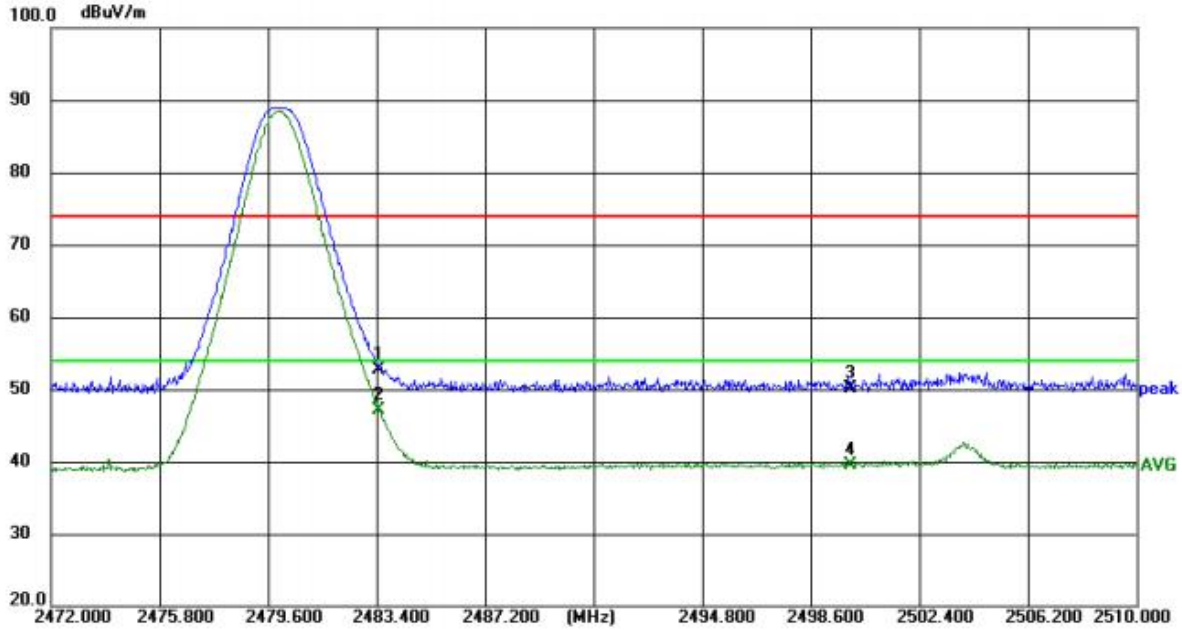
**Radiated Emission Measurement**

File :RF_11 Data :#1599 Date: 2024/11/26 Time: 21:42:53




Site LAB Chamber 2
Limit: FCC Part 15 C
EUT:
M/N: PS15 CLIP
Mode: BT 2480MHz
Note: BTG Solutions Inc.

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 | 42.79 | 9.93 | 52.72 | 74.00 | 21.28 | peak | 150 | 172 | P | |
| 2 | 2483.500 | 37.26 | 9.93 | 47.19 | 54.00 | 6.81 | AVG | 150 | 172 | P | |
| 3 | 2500.000 | 40.15 | 10.00 | 50.15 | 74.00 | 23.85 | peak | 150 | 141 | P | |
| 4 | 2500.000 | 29.58 | 10.00 | 39.58 | 54.00 | 14.42 | AVG | 150 | 141 | P | |

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

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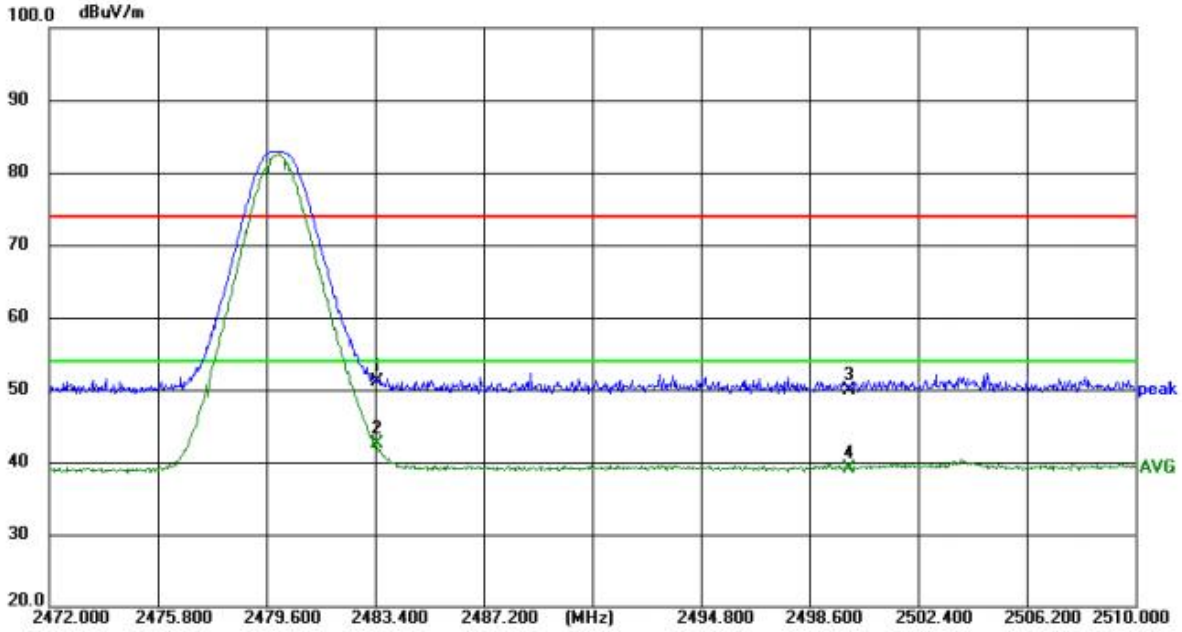
**Radiated Emission Measurement**

File :RF_11 Data :#1600 Date: 2024/11/26 Time: 21:43:59




Site LAB Chamber 2
Limit: FCC Part 15 C
EUT:
M/N: PS15 CLIP
Mode: BT 2480MHz
Note: BTG Solutions Inc.

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 | 41.10 | 9.93 | 51.03 | 74.00 | 22.97 | peak | 150 | 155 | P | |
| 2 | 2483.500 | 32.51 | 9.93 | 42.44 | 54.00 | 11.56 | AVG | 150 | 155 | P | |
| 3 | 2500.000 | 40.00 | 10.00 | 50.00 | 74.00 | 24.00 | peak | 150 | 30 | P | |
| 4 | 2500.000 | 29.15 | 10.00 | 39.15 | 54.00 | 14.85 | AVG | 150 | 30 | 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. CTL2411067021-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 30 KHz RBW and 91 KHz VBW.

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. CTL2411067021-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. CTL2411067021-WF_Bluetooth_Appendix.

## 3.6. Number of hopping frequency

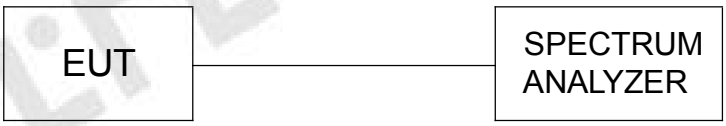
**Limit**

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. CTL2411067021-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 with 910 KHz RBW and 910 KHz VBW, Span 0Hz.

**Test Configuration**

**Test Results**

Raw data reference to Section 5 of document No. CTL2411067021-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. CTL2411067021-WF_Bluetooth_Appendix.

## 3.9. Pseudorandom Frequency Hopping Sequence

**TEST APPLICABLE**

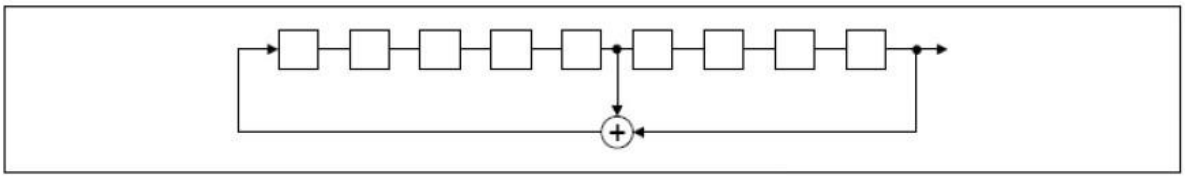
**For 47 CFR Part 15C section 15.247 (a) (1) requirement:**

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**

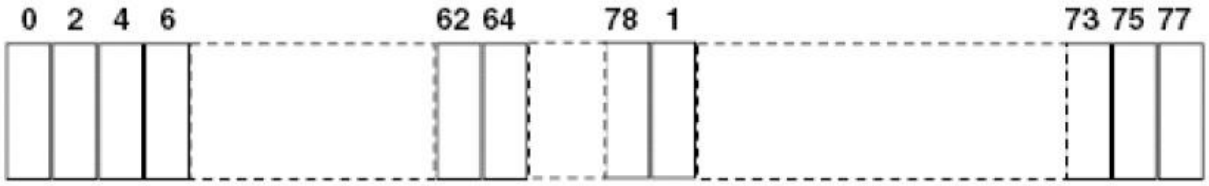
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: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

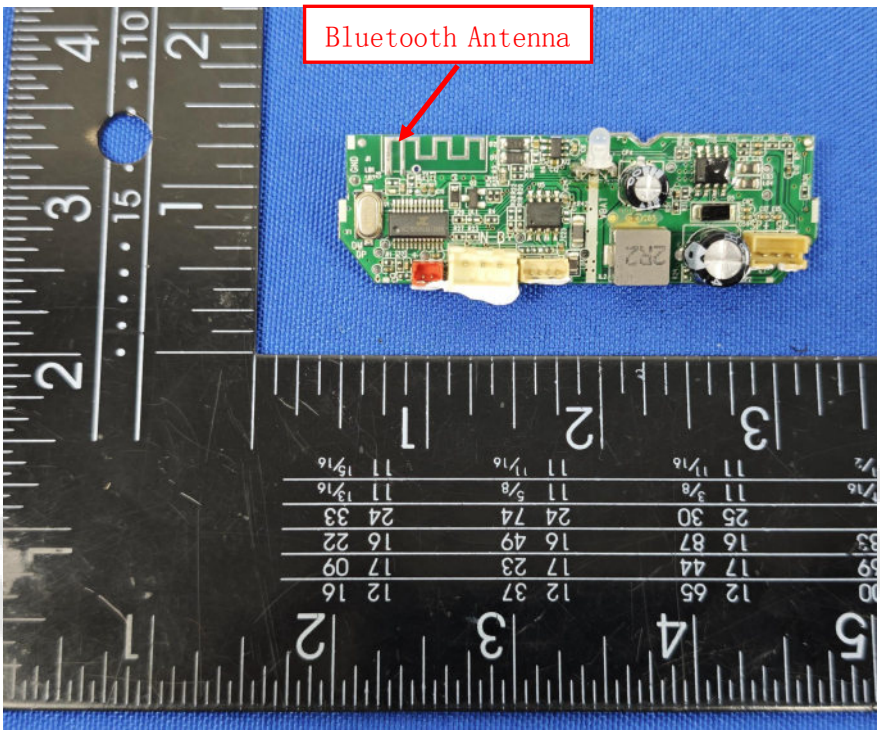
And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

**Refer to statement below for compliance**

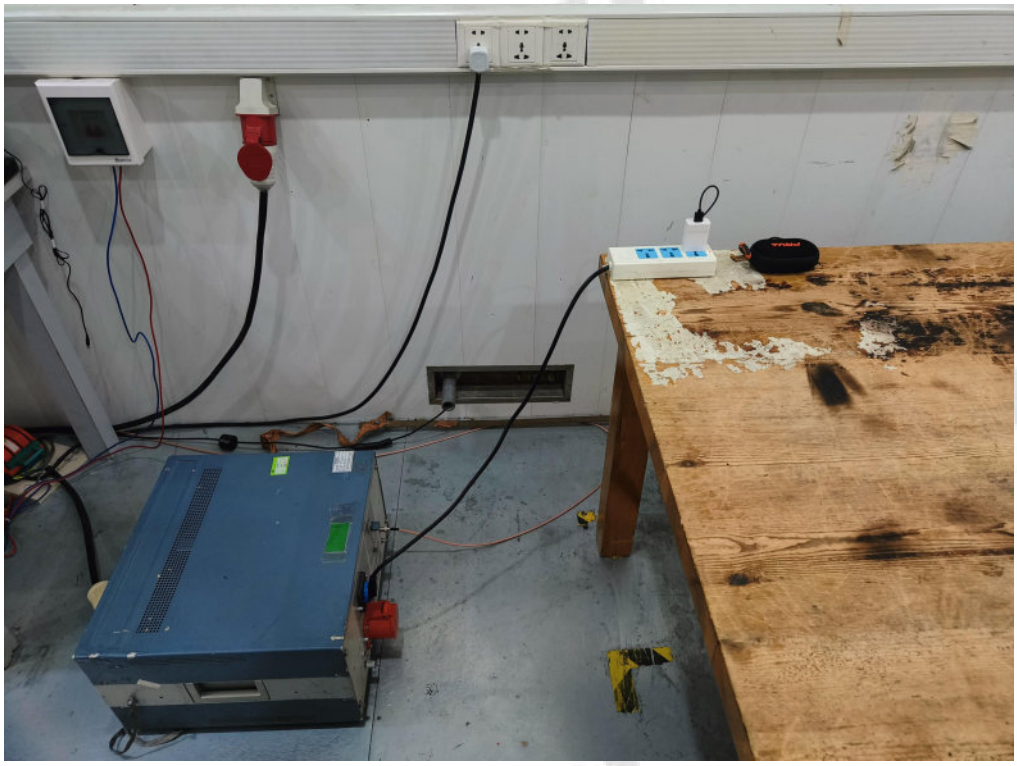
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

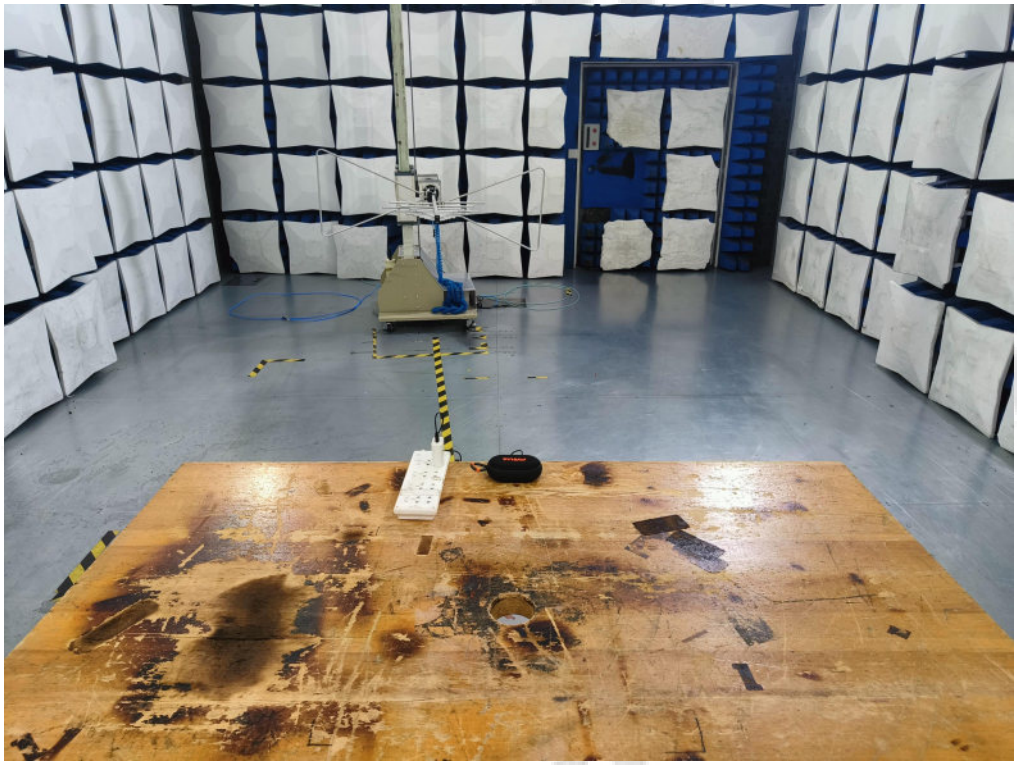
**Antenna Connected Construction**

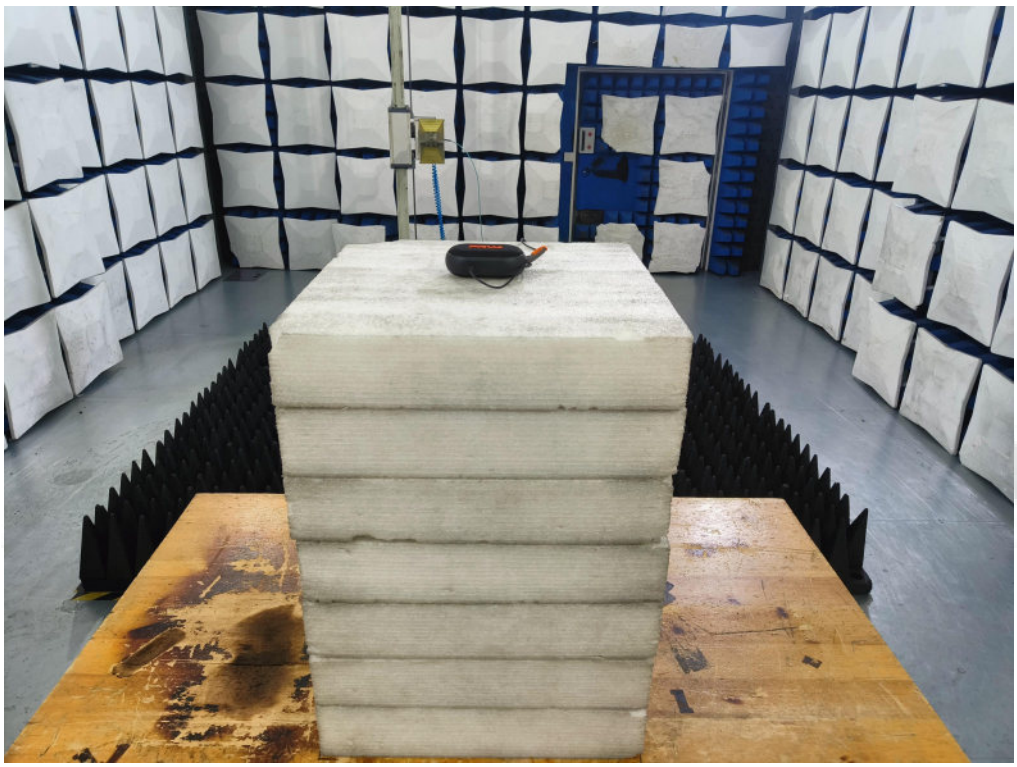
The maximum gain of antenna was -0.58dBi.



# 4. Test Setup Photos of the EUT





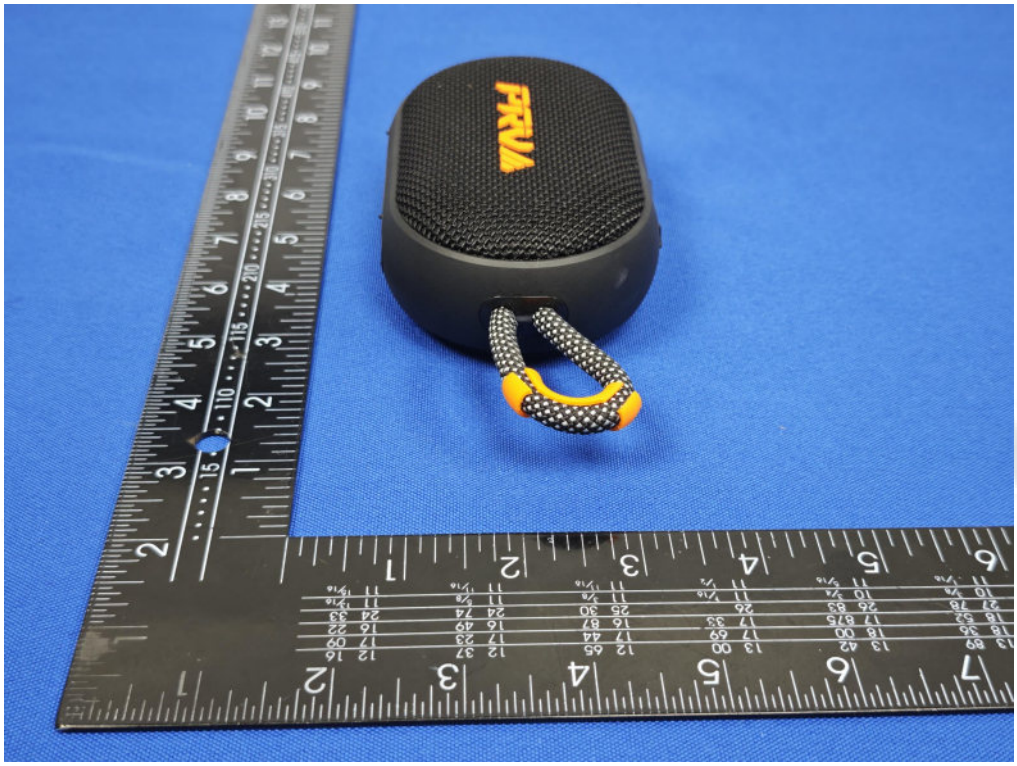


# 5. Photos of the EUT

**External Photos of EUT**

FRIA

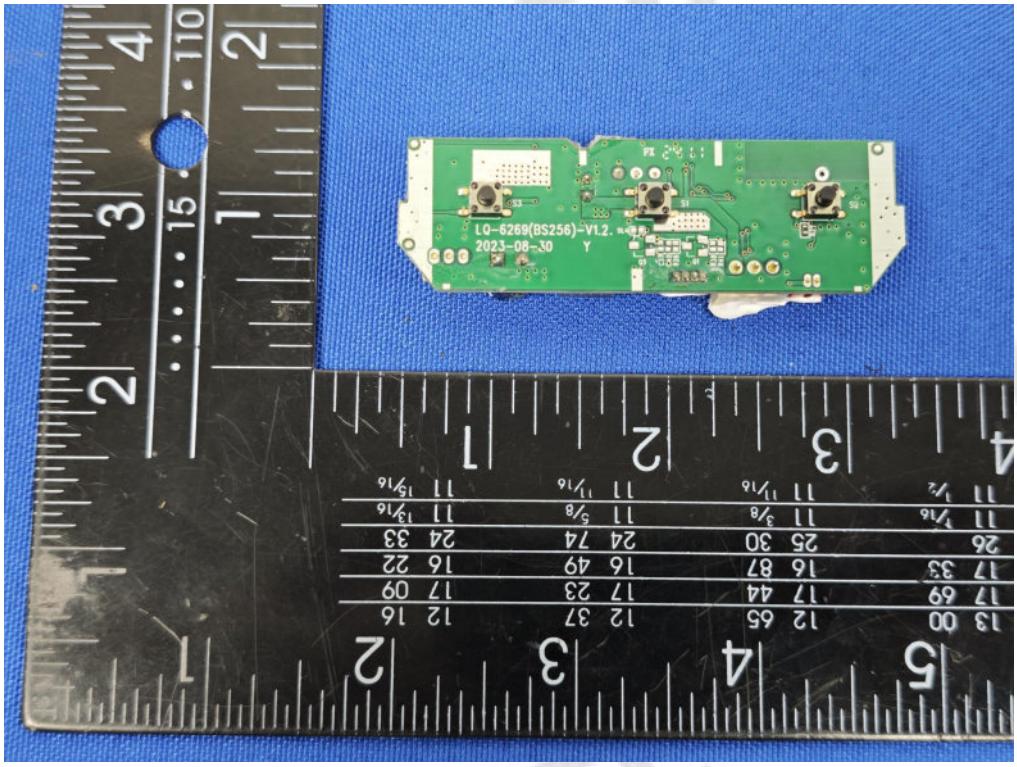
PRUA

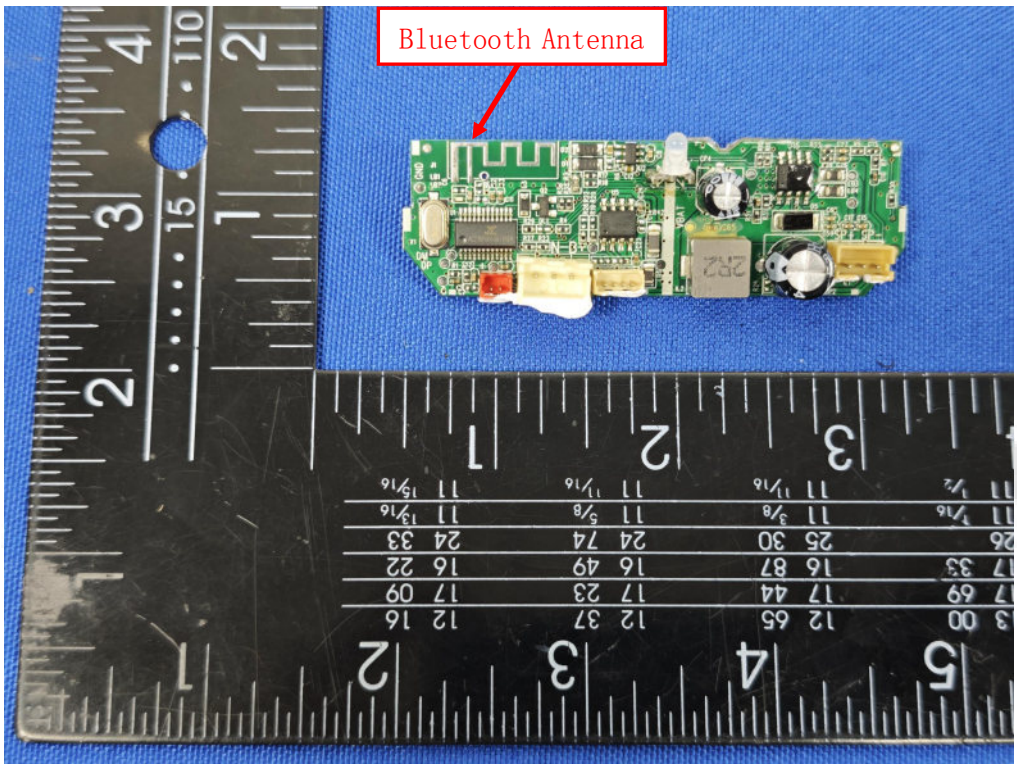

PRUA

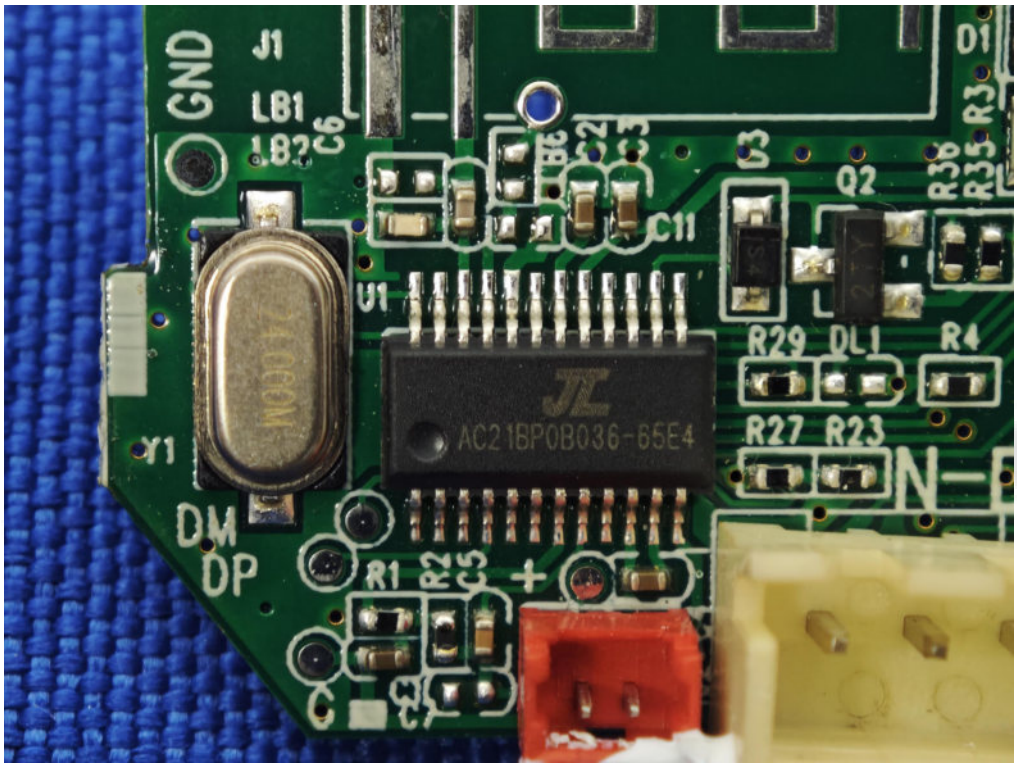
PRVA

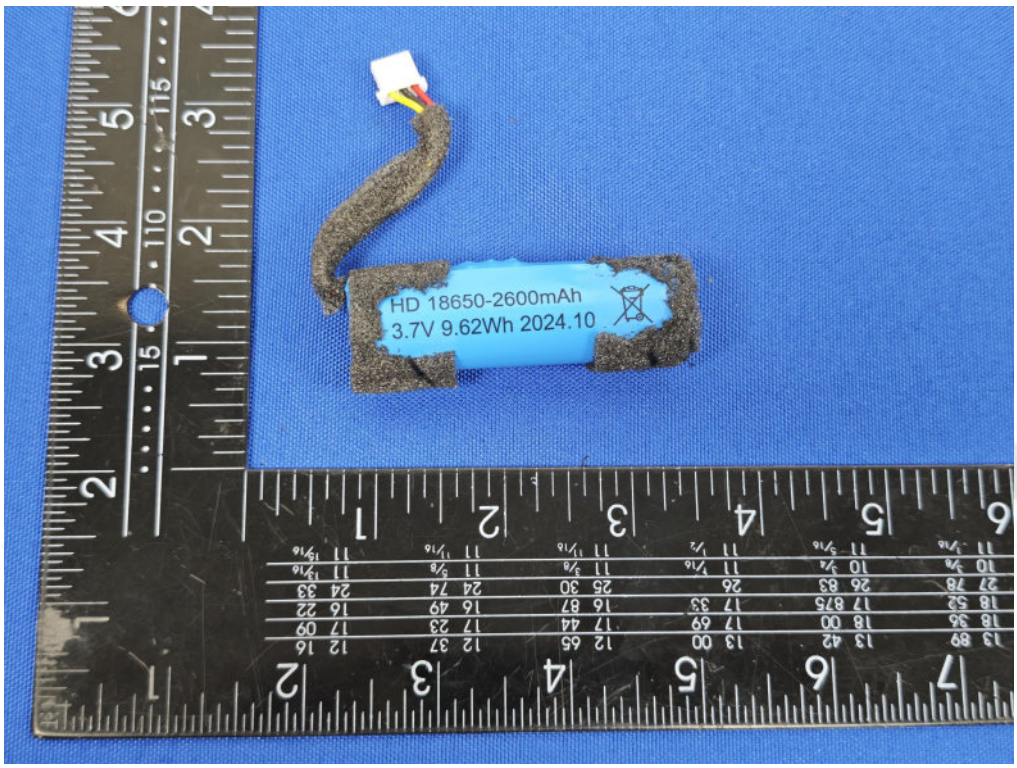
Model: PS15 CLIP
Battery: 2600mAh
Input: 5V⎓1A
IPX7 Waterproof
FCC ID: 2BL5J-PS15CLIP
Made in China
USB IN

## Internal Photos of EUT




Bluetooth Antenna


GND
J1
LB1
C6
D1
R3
R36
R35
Q2
C11
U1
R29
DL1
R4
R27
R23
AC21BP0B036-65E4
Y1
DM
DP
R1




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