Shenzhen CTL Testing Technology Co., Ltd.
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# FCC PART 15 SUBPART C TEST REPORT

| | | |
|---|---|---|
| **Report Reference No.**: | **CTL1605201816-WF** | |
| Compiled by:<br>( position+printed name+signature) | Happy Guo<br>(File administrators) | Happy Guo |
| Tested by:<br>( position+printed name+signature) | Nice Nong<br>(Test Engineer) | Nice Nong |
| Approved by:<br>( position+printed name+signature) | Tracy Qi<br>(Manager) | Tracy Qi |

| | |
|---|---|
| **Product Name**.....: | Bluetooth headphone |
| **Model/Type reference**.....: | HP-6001BT, HP-6002BT, HP-6003BT, HP-6004BT, HP-6005BT, HP-6006BT, HP-6007BT, HP-6008BT, HP-6009BT, HP-6010BT, HP-6101BT, HP-6102BT, HP-6103BT, HP-6104BT, HP-6105BT, HP-6106BT, HP-6107BT, HP-6108BT, HP-6109BT, M1BT, M2BT, HP-8810, CX-05, HP-5100BT, HP-5600, HP-9010, HP-9020, HP-8510 |
| **Trade Mark**.....: | hualipu |
| **FCC ID**.....: | UWO-HUALIPU |
| **Applicant's name**.....: | **SHENZHEN LISAIER TRONICS CO., LTD.** |
| **Address of applicant**.....: | NO.22, Xihu Industrial Park, Xikeng, Henggang Town, Shenzhen, China |
| **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.....: | **FCC Part 15.249:** Operation within the bands 920-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0 - 24.25 GHz. |
| TRF Originator……..: | Shenzhen CTL Testing Technology Co., Ltd. |
| Master TRF……: | Dated 2011-01 |
| **Date of Receipt**.....: | May 22, 2016 |
| **Date of Test Date**.....: | May 22, 2016 – May 31,2016 |
| **Data of Issue**.....: | May 31,2016 |
| **Result**.....: | **PASS** |

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# TEST REPORT

| Test Report No. : | CTL1605201816-WF | May 31,2016<br>Date of issue |
|---|---|---|

| | | |
|---|---|---|
| Equipment under Test | : | Bluetooth headphone |
| Model /Type | : | HP-6001BT, HP-6002BT, HP-6003BT, HP-6004BT, HP-6005BT, HP-6006BT, HP-6007BT, HP-6008BT, HP-6009BT, HP-6010BT, HP-6101BT, HP-6102BT, HP-6103BT, HP-6104BT, HP-6105BT, HP-6106BT, HP-6107BT, HP-6108BT, HP-6109BT, M1BT, M2BT, HP-8810, CX-05, HP-5100BT, HP-5600, HP-9010, HP-9020, HP-8510 |
| **Applicant** | : | **SHENZHEN LISAIER TRONICS CO., LTD.** |
| Address | : | NO.22, Xihu Industrial Park, Xikeng, Henggang Town, Shenzhen, China |
| **Manufacturer** | : | **SHENZHEN LISAIER TRONICS CO., LTD.** |
| Address | : | NO.22, Xihu Industrial Park, Xikeng, Henggang Town, Shenzhen, China |

| | |
|---|---|
| **Test Result** according to the standards on page 4: | **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.

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# Contents


1. TEST STANDARDS ..... 4

2. SUMMARY ..... 5

2.1. Equipment Under Test 5
2.2. Description of the Equipment under Test (EUT) 5
2.3. EUT operation mode 6
2.4. EUT configuration 6
2.5. Related Submittal(s) / Grant (s) 6
2.6. Modifications 6

3. TEST ENVIRONMENT ..... 7

3.1. Address of the test laboratory 7
3.2. Test Facility 7
3.3. Environmental conditions 7
3.4. Configuration of Tested System 7
3.5. Statement of the measurement uncertainty 8
3.6. Equipments Used during the Test 9

4. TEST CONDITIONS AND RESULTS ..... 10

4.1. Conducted Emissions Test 10
4.2. Transmitter Radiated Unwanted Emissions and Bandedge 14
4.3. Occupied Bandwidth Measurement 20

5. ANTENNA REQUIREMENT ..... 24

6. TEST SETUP PHOTOS OF THE EUT ..... 25

7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT ..... 27


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# 1. TEST STANDARDS

The tests were performed according to following standards:

**FCC Rules Part 15.249:** Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

**ANSI C63.10-2013**

**ANSI C63.4-2014**

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# 2. SUMMARY

## 2.1. Equipment Under Test

**Power supply system utilised**

Power supply voltage : o 120V / 60 Hz o 115V / 60Hz
o 12 V DC o 24 V DC
● Other (specified in blank below)

DC 3.7V from battery

## 2.2. Description of the Equipment under Test (EUT)

The **EUT (Bluetooth headphone)** support Bluetooth function.

| | |
|---|---|
| Name of EUT | Bluetooth headphone |
| Model Number | HP-6001BT |
| Antenna Type | Internal |
| BT Operation frequency | 2402MHz-2480MHz |
| BT Modulation Type | GFSK,8DPSK,π/4DQPSK(BT V2.1+EDR) |
| Bluetooth | BT V2.1+EDR |
| Antenna Gain | 0dBi |

Channel List:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 00 | 2402 | 27 | 2429 | 54 | 2456 |
| 01 | 2403 | 28 | 2430 | 55 | 2457 |
| 02 | 2404 | 29 | 2431 | 56 | 2458 |
| 03 | 2405 | 30 | 2432 | 57 | 2459 |
| 04 | 2406 | 31 | 2433 | 58 | 2460 |
| 05 | 2407 | 32 | 2434 | 59 | 2461 |
| 06 | 2408 | 33 | 2435 | 60 | 2462 |
| 07 | 2409 | 34 | 2436 | 61 | 2463 |
| 08 | 2410 | 35 | 2437 | 62 | 2464 |
| 09 | 2411 | 36 | 2438 | 63 | 2465 |
| 10 | 2412 | 37 | 2439 | 64 | 2466 |
| 11 | 2413 | 38 | 2440 | 65 | 2467 |
| 12 | 2414 | 39 | 2441 | 66 | 2468 |
| 13 | 2415 | 40 | 2442 | 67 | 2469 |
| 14 | 2416 | 41 | 2443 | 68 | 2470 |
| 15 | 2417 | 42 | 2444 | 69 | 2471 |
| 16 | 2418 | 43 | 2445 | 70 | 2472 |
| 17 | 2419 | 44 | 2446 | 71 | 2473 |
| 18 | 2420 | 45 | 2447 | 72 | 2474 |
| 19 | 2421 | 46 | 2448 | 73 | 2475 |
| 20 | 2422 | 47 | 2449 | 74 | 2476 |
| 21 | 2423 | 48 | 2450 | 75 | 2477 |
| 22 | 2424 | 49 | 2451 | 76 | 2478 |
| 23 | 2425 | 50 | 2452 | 77 | 2479 |
| 24 | 2426 | 51 | 2453 | 78 | 2480 |
| 25 | 2427 | 52 | 2454 | | |
| 26 | 2428 | 53 | 2455 | | |

For more details, refer to the user's manual of the EUT.
Serial number: Prototype

## 2.3. EUT operation mode

| Test Mode(TM) | Description | Remark |
|---|---|---|
| TM1 | Bottom Channel Transmitting | / |
| TM2 | Middle Channel Transmitting | / |
| TM3 | Top Channel Transmitting | / |
| TM4 | Charging and keeping TX | power by battery |

The field strength of radiation emission was measured in the following position: EUT stand-up position (Y axis), lie-down position (X, Z axis).
The following data show only with the worst case setup.
The worst case of X axis was reported.
Based on client request, all normal using modes of the normal function were tested but only the worst test data of the worst mode is reported by this report.
**Remark:** GFSK,8DPSK,π/4DQPSK mode all have been tested , only the worst case mode GFSK(1Mbps) is reported for conducted and radiated emission test.

## 2.4. EUT configuration

**The following peripheral devices and interface cables were connected during the measurement:**
o - supplied by the manufacturer

● - supplied by the lab

● Notebook (FCC DOC approved) Manufacturer: DELL
Model No.: PP18L

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

This submittal(s) (test report) is intended for FCC ID: UWO-HUALIPU filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

## 2.6. Modifications

No modifications were implemented to meet testing criteria.

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# 3. TEST ENVIRONMENT

## 3.1. Address of the test laboratory

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

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

## 3.2. Test Facility

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

### IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

### FCC-Registration No.: 970318

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 970318, December 19, 2013.

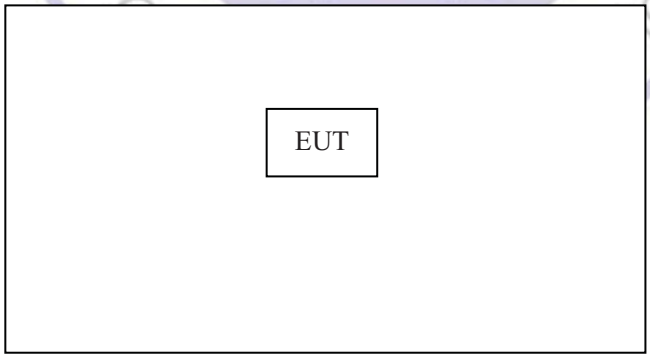
## 3.3. Environmental conditions

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

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

## 3.4. Configuration of Tested System

**Fig. 2-1 Configuration of Tested System**



## 3.5. 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 | Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 30~1000MHz | 4.10dB | (1) |
| Radiated Emission | 1~26.5GHz | 4.32dB | (1) |
| Conducted Disturbance | 0.15~30MHz | 3.20dB | (1) |

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

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## 3.6. Equipments Used during the Test

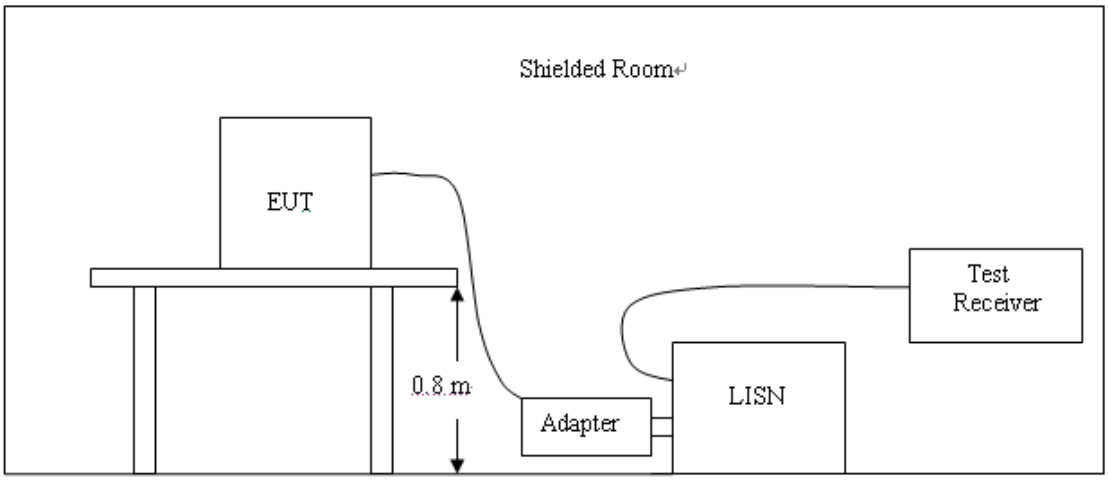
| Test Equipment | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| BilogAntenna | Sunol Sciences Corp. | JB1 | A061713 | 2015/06/02 | 2016/06/01 |
| EMI Test Receiver | R&S | ESCI3 | 103710 | 2015/06/02 | 2016/06/01 |
| Spectrum Analyzer | Agilent | E4407B | MY45108355 | 2016/05/21 | 2017/05/20 |
| Spectrum Analyzer | Agilent | N9020A | US46220290 | 2015/12/10 | 2016/12/09 |
| Controller | EM Electronics | Controller EM 1000 | N/A | 2016/05/21 | 2017/05/20 |
| Horn Antenna | Sunol Sciences Corp. | DRH-118 | A062013 | 2016/05/19 | 2017/05/18 |
| Active Loop Antenna | Daze | ZN30900A | N/A | 2016/05/19 | 2017/05/18 |
| LISN | R&S | ENV216 | 101316 | 2015/06/02 | 2016/06/01 |
| LISN | SCHWARZBECK | NSLK8127 | 8127687 | 2015/06/02 | 2016/06/01 |
| Microwave Preamplifier | HP | 8349B | 3155A00882 | 2016/05/19 | 2017/05/18 |
| Amplifier | HP | 8447D | 3113A07663 | 2016/05/19 | 2017/05/18 |
| Transient Limiter | Com-Power | LIT-153 | 532226 | 2015/06/02 | 2016/06/01 |
| Temperature/Humidity Meter | Gangxing | CTH-608 | 02 | 2016/05/20 | 2017/05/19 |
| Climate Chamber | ESPEC | EL-10KA | A20120523 | 2016/05/20 | 2017/05/19 |
| High-Pass Filter | K&L | 9SH10-2700/X12750-O/O | N/A | 2016/05/20 | 2017/05/19 |
| High-Pass Filter | K&L | 41H10-1375/U12750-O/O | N/A | 2016/05/20 | 2017/05/19 |
| Ultra-Broadband Antenna | ShwarzBeck | BBHA9170 | 25841 | 2016/05/19 | 2017/05/18 |
| The temporary antenna connector | MMCX - SMA | 1547 | 23657478 | 2016/05/20 | 2017/05/19 |
| RF Cable(1-25GHz) | HUBER+SUHNER | RG214 | N/A | 2016/05/20 | 2017/05/19 |
| RF Cable(0-1GHz) | HUBER+SUHNER | RG174 | N/A | 2016/05/20 | 2017/05/19 |

Note:The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

# 4. TEST CONDITIONS AND RESULTS

## 4.1. Conducted Emissions Test

**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.

2 Support equipment, if needed, was placed as per ANSI C63.10.

3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

4 If a EUT received DC power from the USB Port of Notebook PC, the PC's 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.

**The RBW/VBW for 150KHz to 30MHz: 9KHz**

**CONDUCTED POWER LINE EMISSION LIMIT**

For unintentional device, according to § 15.207(a) Line Conducted Emission Limits is as following：

| Frequency (MHz) | Maximum RF Line Voltage (dBμV) | | | |
|---|---|---|---|---|
| | CLASS A | | CLASS B | |
| | Q.P. | Ave. | Q.P. | Ave. |
| 0.15 - 0.50 | 79 | 66 | 66-56* | 56-46* |
| 0.50 - 5.00 | 73 | 60 | 56 | 46 |
| 5.00 - 30.0 | 73 | 60 | 60 | 50 |

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

**TEST RESULTS**

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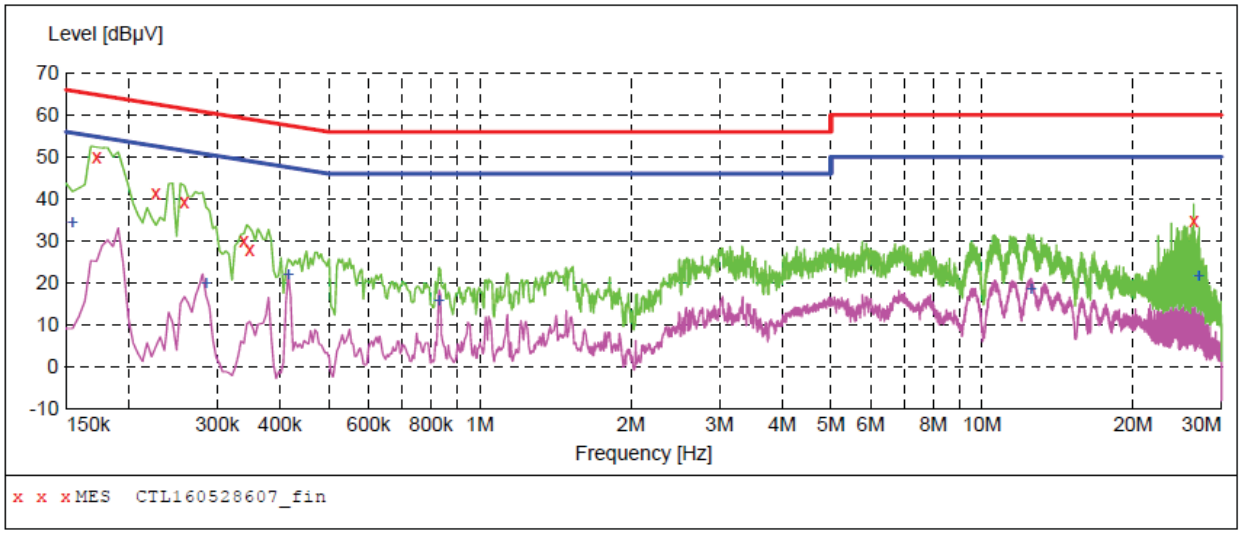
***SCAN TABLE: "Voltage (9K-30M)FIN"***

Short Description: 150K-30M Voltage




***MEASUREMENT RESULT: "CTL160528607_fin"***

5/28/2016 11:48AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.172501 | 50.10 | 10.2 | 65 | 14.7 | QP | N | GND |
| 0.226501 | 41.40 | 10.2 | 63 | 21.2 | QP | N | GND |
| 0.258001 | 39.20 | 10.2 | 62 | 22.3 | QP | N | GND |
| 0.339001 | 30.00 | 10.2 | 59 | 29.2 | QP | N | GND |
| 0.348001 | 27.90 | 10.2 | 59 | 31.1 | QP | N | GND |
| 26.412001 | 34.90 | 11.2 | 60 | 25.1 | QP | N | GND |

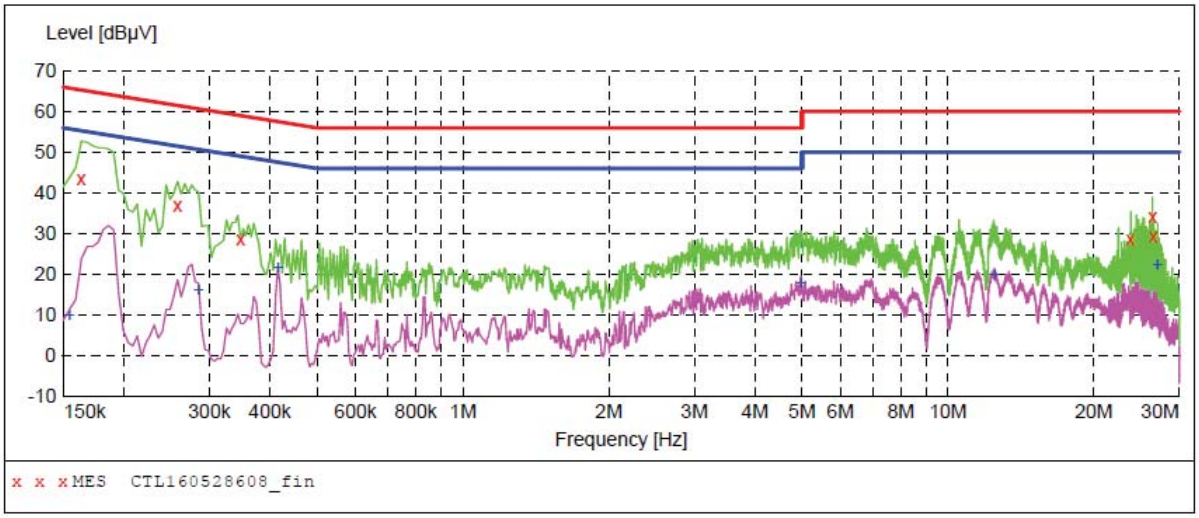
***MEASUREMENT RESULT: "CTL160528607_fin2"***

5/28/2016 11:48AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.154501 | 34.60 | 10.2 | 56 | 21.2 | AV | N | GND |
| 0.285001 | 19.80 | 10.2 | 51 | 30.9 | AV | N | GND |
| 0.415501 | 22.00 | 10.2 | 48 | 25.5 | AV | N | GND |
| 0.829501 | 15.80 | 10.2 | 46 | 30.2 | AV | N | GND |
| 12.534001 | 18.70 | 10.6 | 50 | 31.3 | AV | N | GND |
| 27.015001 | 21.80 | 11.2 | 50 | 28.2 | AV | N | GND |

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

Short Description: 150K-30M Voltage




***MEASUREMENT RESULT: "CTL160528608_fin"***

5/28/2016 11:51AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.163501 | 43.40 | 10.2 | 65 | 21.9 | QP | L1 | GND |
| 0.258001 | 36.80 | 10.2 | 62 | 24.7 | QP | L1 | GND |
| 0.348001 | 28.50 | 10.2 | 59 | 30.5 | QP | L1 | GND |
| 23.824501 | 28.50 | 11.1 | 60 | 31.5 | QP | L1 | GND |
| 26.412001 | 34.00 | 11.2 | 60 | 26.0 | QP | L1 | GND |
| 26.533501 | 29.40 | 11.2 | 60 | 30.6 | QP | L1 | GND |

***MEASUREMENT RESULT: "CTL160528608_fin2"***

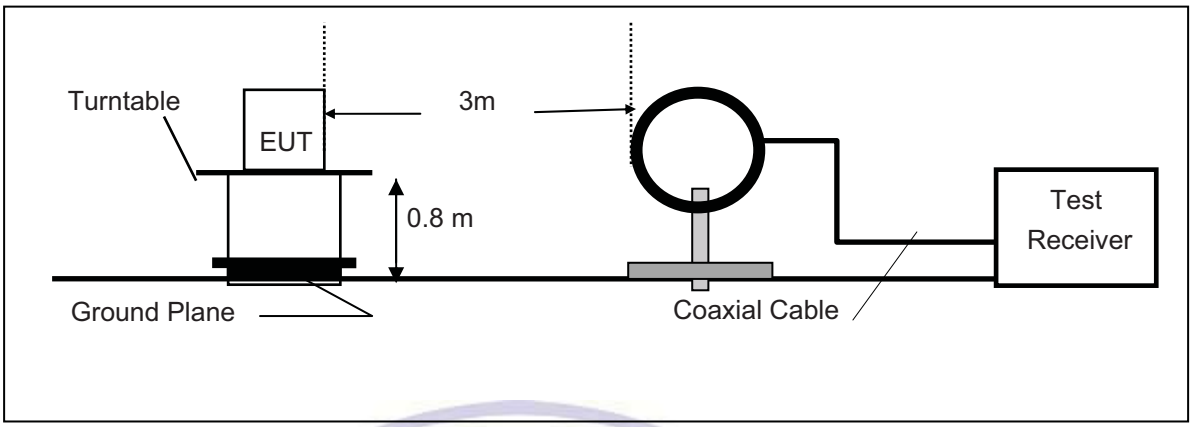
5/28/2016 11:51AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.154501 | 9.90 | 10.2 | 56 | 45.9 | AV | L1 | GND |
| 0.285001 | 16.00 | 10.2 | 51 | 34.7 | AV | L1 | GND |
| 0.415501 | 21.80 | 10.2 | 48 | 25.7 | AV | L1 | GND |
| 4.974001 | 17.80 | 10.4 | 46 | 28.2 | AV | L1 | GND |
| 12.471001 | 19.90 | 10.6 | 50 | 30.1 | AV | L1 | GND |
| 27.015001 | 22.30 | 11.2 | 50 | 27.7 | AV | L1 | GND |

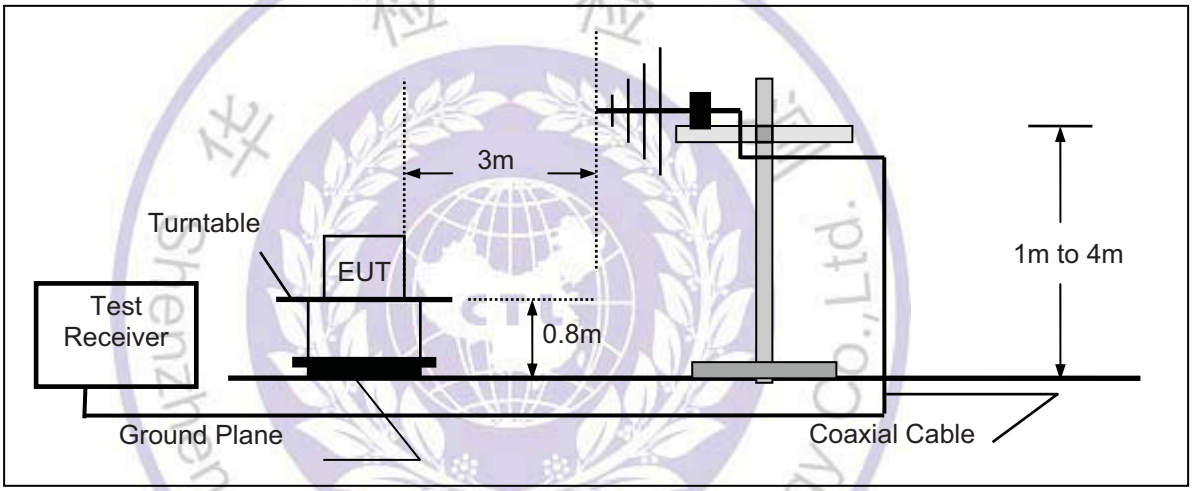
## 4.2. Transmitter Radiated Unwanted Emissions and Bandedge

**TEST CONFIGURATION**

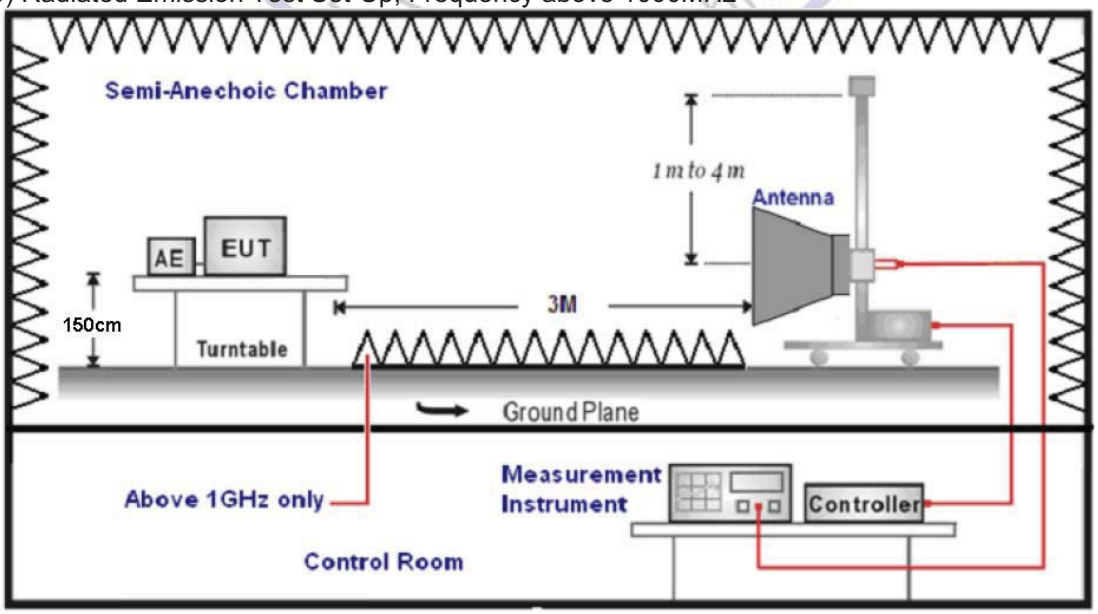
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz




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




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



## 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 | |

## RADIATION LIMIT

For unintentional device, according to § 15.209(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

## TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane below 1GHz and 1.5m above ground plane above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. For the radiated emission test above 1GHz: Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until the measurements for all frequencies are complete.
8. Based on the Frequency Generator in the device include 16MHz.The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

Note:

Three axes are chosen for pretest, the X axis is the worst mode for final test.

For battery operated equipment, the equipment tests shall be performed using a fully-charged battery.

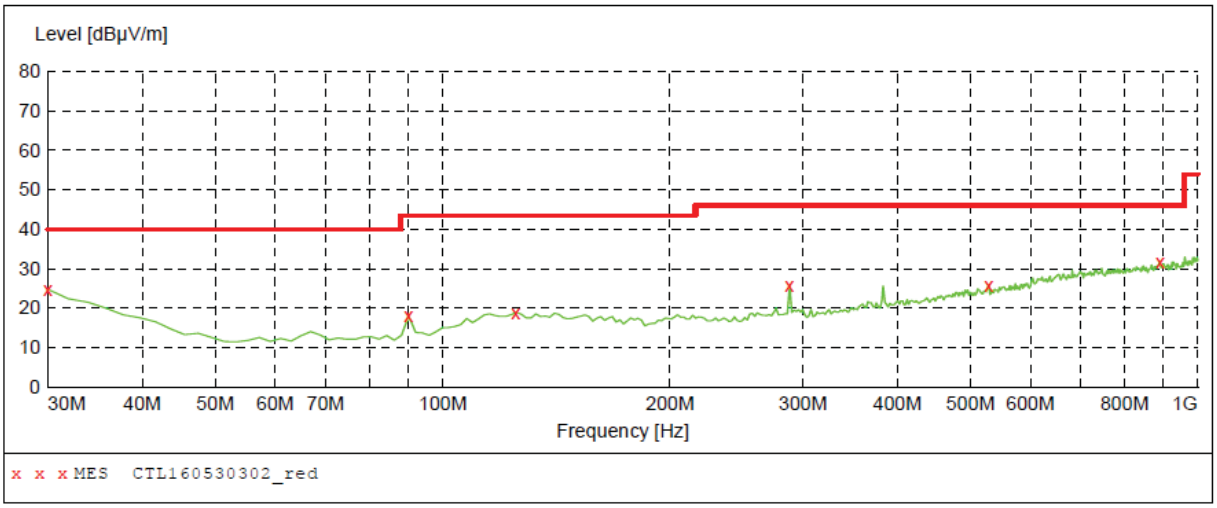
## TEST RESULTS

**All the test modes (TM1, TM2, TM3 and TM4) completed for test. The worst case of Radiated Emission is TM1; the test data of this mode was reported.**

Below 1GHz Test Results:

***SWEEP TABLE: "test (30M-1G)"***

| Short Description: | | | Field Strength | | |
|---|---|---|---|---|---|
| Start Frequency | Stop Frequency | Detector | Meas. Time | IF Bandw. | Transducer |
| 30.0 MHz | 1.0 GHz | MaxPeak | 300.0 ms | 120 kHz | JB1 |




***MEASUREMENT RESULT: "CTL160530302_red"***

5/30/2016 9:36AM

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Det. | Height cm | Azimuth deg | Polarization |
|---|---|---|---|---|---|---|---|---|
| 30.000000 | 24.70 | 20.8 | 40.0 | 15.3 | --- | 0.0 | 0.00 | VERTICAL |
| 90.140000 | 18.00 | 9.4 | 43.5 | 25.5 | --- | 0.0 | 0.00 | VERTICAL |
| 125.060000 | 18.90 | 14.6 | 43.5 | 24.6 | --- | 0.0 | 0.00 | VERTICAL |
| 288.020000 | 25.80 | 15.2 | 46.0 | 20.2 | --- | 0.0 | 0.00 | VERTICAL |
| 528.580000 | 25.90 | 20.4 | 46.0 | 20.1 | --- | 0.0 | 0.00 | VERTICAL |
| 891.360000 | 31.80 | 25.8 | 46.0 | 14.2 | --- | 0.0 | 0.00 | VERTICAL |

Remark：

(1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.

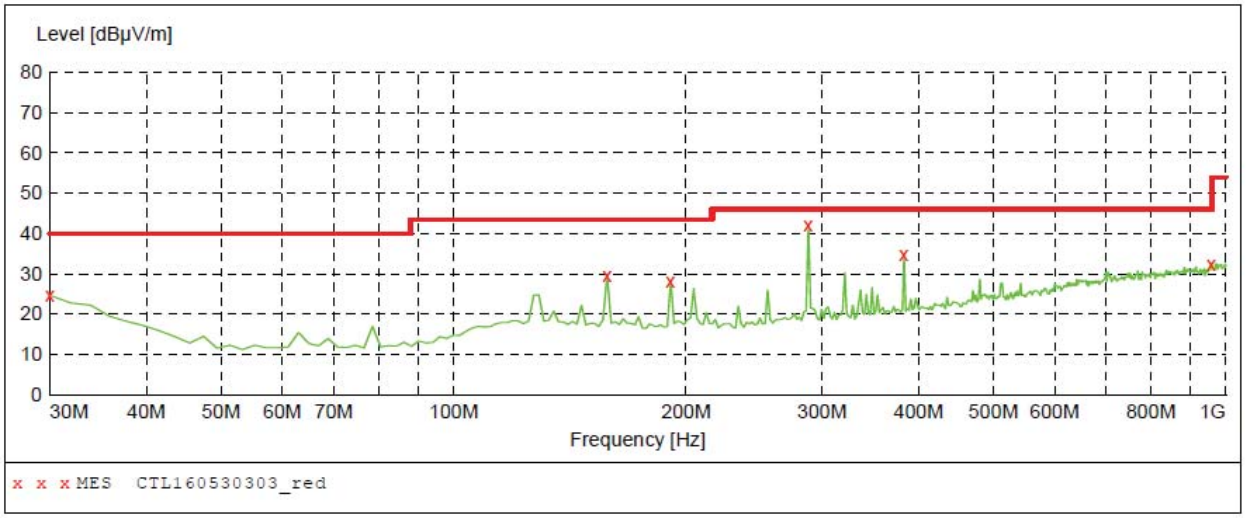
(2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

***SWEEP TABLE: "test (30M-1G)"***

Short Description: Field Strength

| Start Frequency | Stop Frequency | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|
| 30.0 MHz | 1.0 GHz | MaxPeak | 300.0 ms | 120 kHz | JB1 |




***MEASUREMENT RESULT: "CTL160530303_red"***

5/30/2016 9:38AM

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Det. | Height cm | Azimuth deg | Polarization |
|---|---|---|---|---|---|---|---|---|
| 30.000000 | 24.60 | 20.8 | 40.0 | 15.4 | --- | 0.0 | 0.00 | HORIZONTAL |
| 158.040000 | 29.70 | 13.7 | 43.5 | 13.8 | --- | 0.0 | 0.00 | HORIZONTAL |
| 191.020000 | 28.30 | 13.2 | 43.5 | 15.2 | --- | 0.0 | 0.00 | HORIZONTAL |
| 288.020000 | 42.20 | 15.2 | 46.0 | 3.8 | --- | 0.0 | 0.00 | HORIZONTAL |
| 383.080000 | 34.70 | 17.7 | 46.0 | 11.3 | --- | 0.0 | 0.00 | HORIZONTAL |
| 957.320000 | 32.40 | 26.6 | 46.0 | 13.6 | --- | 0.0 | 0.00 | HORIZONTAL |

Remark：

(1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.

(2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

## Above 1 GHz Test Results:

Note: Horizontal and Vertical all have been tested， only worse case Vertical is reported.

| Frequency | Emission | | Limit | Margin | Raw | Antenna Factor | Cable | Pre-amplifier | Correction |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Level | | (dBuV/m) | (dB) | Value | (dB/m) | Factor | (dB) | Factor |
| | (dBuV/m) | | | | (dBuV) | | (dB) | | (dB/m) |
| 2402.00 | 97.19 | PK | 114 | 16.81 | 99.15 | 28.78 | 4.61 | 35.36 | -1.96 |
| 2402.00 | 86.04 | AV | 94 | 7.96 | 88.00 | 28.78 | 4.61 | 35.36 | -1.96 |
| 2390.00 | 68.97 | PK | 74 | 5.03 | 71.01 | 28.72 | 4.60 | 35.36 | -2.04 |
| 2390.00 | 49.05 | AV | 54 | 4.95 | 51.09 | 28.72 | 4.60 | 35.36 | -2.04 |
| 2400.00 | 70.38 | PK | 74 | 3.62 | 72.35 | 28.78 | 4.61 | 35.36 | -1.97 |
| 2400.00 | 50.15 | AV | 54 | 3.85 | 52.12 | 28.78 | 4.61 | 35.36 | -1.97 |
| 4804.00 | 68.02 | PK | 74 | 5.98 | 63.51 | 33.49 | 6.91 | 35.89 | 4.51 |
| 4804.00 | 50.61 | AV | 54 | 3.39 | 46.10 | 33.49 | 6.91 | 35.89 | 4.51 |
| 6038.00 | 66.03 | PK | 74 | 7.97 | 57.84 | 35.15 | 7.65 | 34.61 | 8.19 |
| 6038.00 | 46.84 | AV | 54 | 7.16 | 38.65 | 35.15 | 7.65 | 34.61 | 8.19 |
| 7206.00 | 65.05 | PK | 74 | 8.95 | 53.94 | 36.95 | 9.18 | 35.03 | 11.11 |
| 7206.00 | 46.10 | AV | 54 | 7.90 | 34.99 | 36.95 | 9.18 | 35.03 | 11.11 |

| Frequency | Emission | | Limit | Margin | Raw | Antenna Factor | Cable | Pre-amplifier | Correction |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Level | | (dBuV/m) | (dB) | Value | (dB/m) | Factor | (dB) | Factor |
| | (dBuV/m) | | | | (dBuV) | | (dB) | | (dB/m) |
| 2441.00 | 96.58 | PK | 114 | 17.42 | 98.44 | 28.85 | 4.66 | 35.37 | -1.86 |
| 2441.00 | 87.34 | AV | 94 | 6.66 | 89.20 | 28.85 | 4.66 | 35.37 | -1.86 |
| 3200.00 | 66.01 | PK | 74 | 7.99 | 64.65 | 31.24 | 5.47 | 35.35 | 1.36 |
| 3200.00 | 46.97 | AV | 54 | 7.03 | 45.61 | 31.24 | 5.47 | 35.35 | 1.36 |
| 3658.00 | 64.97 | PK | 74 | 9.03 | 61.62 | 32.38 | 6.01 | 35.04 | 3.35 |
| 3658.00 | 48.18 | AV | 54 | 5.82 | 44.83 | 32.38 | 6.01 | 35.04 | 3.35 |
| 4882.00 | 67.91 | PK | 74 | 6.09 | 61.55 | 33.60 | 6.95 | 34.19 | 6.36 |
| 4882.00 | 49.16 | AV | 54 | 4.84 | 42.80 | 33.60 | 6.95 | 34.19 | 6.36 |
| 6147.00 | 66.02 | PK | 74 | 7.98 | 57.67 | 35.20 | 7.82 | 34.66 | 8.35 |
| 6147.00 | 46.66 | AV | 54 | 7.34 | 38.31 | 35.20 | 7.82 | 34.66 | 8.35 |
| 7323.00 | 65.09 | PK | 74 | 8.91 | 53.39 | 37.46 | 9.23 | 35.00 | 11.70 |
| 7323.00 | 46.14 | AV | 54 | 7.86 | 34.44 | 37.46 | 9.23 | 35.00 | 11.70 |

| Frequency | Emission | | Limit | Margin | Raw | Antenna Factor | Cable | Pre-amplifier | Correction |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Level | | (dBuV/m) | (dB) | Value | (dB/m) | Factor | (dB) | Factor |
| | (dBuV/m) | | | | (dBuV) | | (dB) | | (dB/m) |
| 2480.00 | 96.32 | PK | 114 | 17.68 | 98.07 | 28.92 | 4.70 | 35.38 | -1.75 |
| 2480.00 | 88.74 | AV | 94 | 5.26 | 90.49 | 28.92 | 4.70 | 35.38 | -1.75 |
| 2483.50 | 63.02 | PK | 74 | 10.98 | 64.76 | 28.93 | 4.70 | 35.38 | -1.74 |
| 2483.50 | 46.51 | AV | 54 | 7.49 | 48.25 | 28.93 | 4.70 | 35.38 | -1.74 |
| 3720.00 | 62.96 | PK | 74 | 11.04 | 59.76 | 32.77 | 6.08 | 35.65 | 3.20 |
| 3720.00 | 45.12 | AV | 54 | 8.88 | 41.92 | 32.77 | 6.08 | 35.65 | 3.20 |
| 4960.00 | 68.04 | PK | 74 | 5.96 | 61.34 | 33.84 | 7.00 | 34.14 | 6.70 |
| 4960.00 | 50.18 | AV | 54 | 3.82 | 43.48 | 33.84 | 7.00 | 34.14 | 6.70 |
| 6200.00 | 64.22 | PK | 74 | 9.78 | 55.82 | 35.19 | 7.90 | 34.69 | 8.40 |
| 6200.00 | 46.74 | AV | 54 | 7.26 | 38.34 | 35.19 | 7.90 | 34.69 | 8.40 |
| 7440.00 | 66.81 | PK | 74 | 7.19 | 54.86 | 37.64 | 9.28 | 34.97 | 11.95 |
| 7440.00 | 45.95 | AV | 54 | 8.05 | 34.00 | 37.64 | 9.28 | 34.97 | 11.95 |

**Note:** above 10GHz up to 25GHz was verified, and no any emission was found except system noise floor.

Remark: RBW=1MHz VBW =3MHz peak detector for PK value, RMS detector for AV value
For fundamental frequency, RBW=3MHz VBW =3MHz peak detector for PK value, RMS detector for AV value

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## 4.3. Occupied Bandwidth Measurement

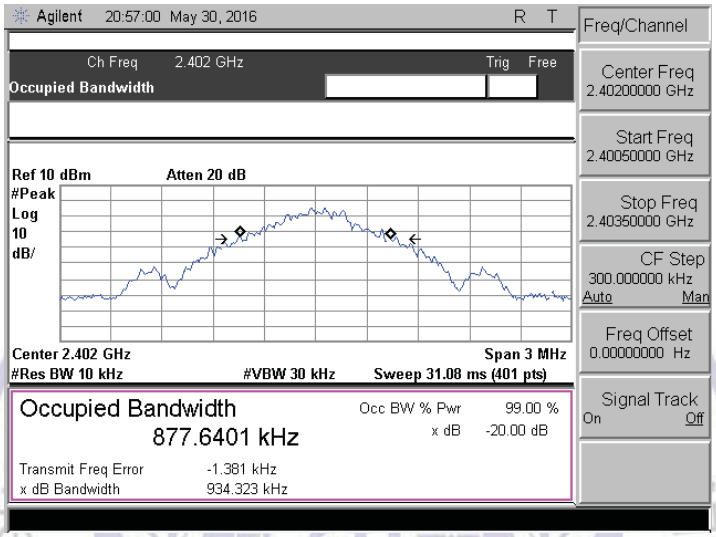
**Measurement Procedure**

1. Set EUT as normal operation.
2. RBW ⩾ 1% of the 20 dB bandwidth, VBW⩾RBW.
3. The useful conducted emission from the EUT was detected by the spectrum analyser with peak detector.

**Measurement Results**

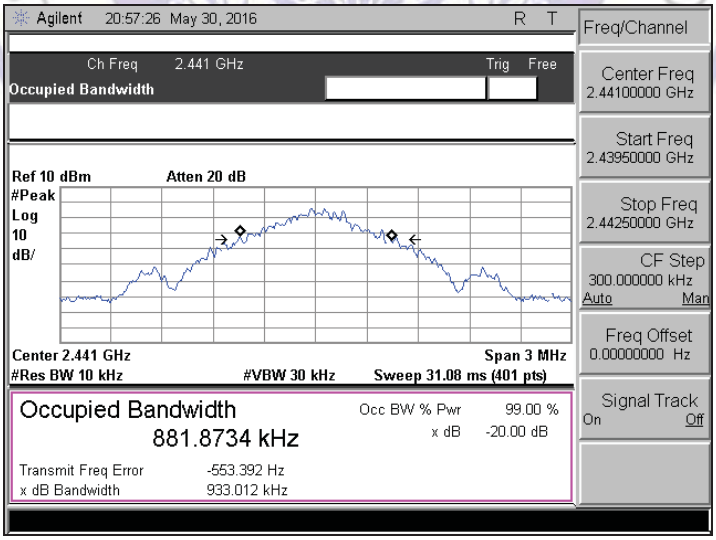
**GFSK:**

**2402MHz**



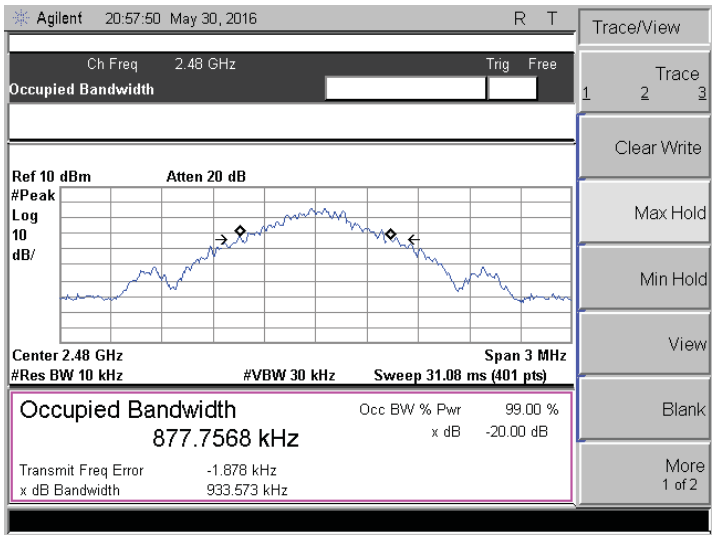

20dB Bandwidth: 934.323 KHz

**2441MHz**




20dB Bandwidth: 933.012 KHz

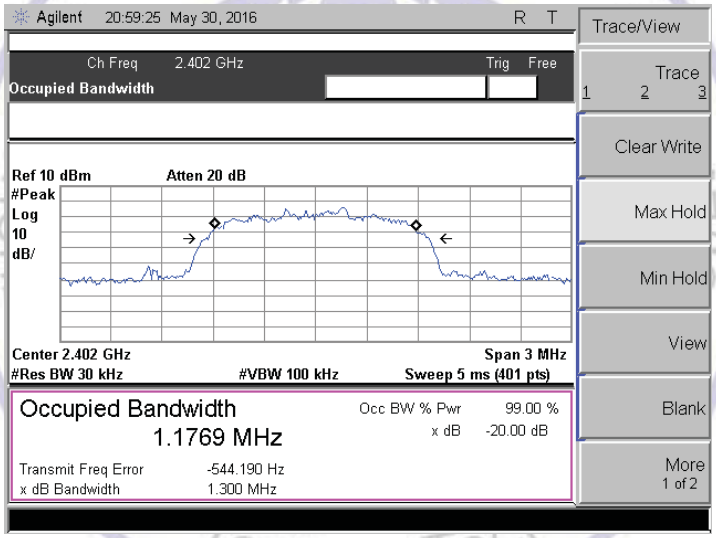
**2480MHz**




20dB Bandwidth: 933.573 KHz

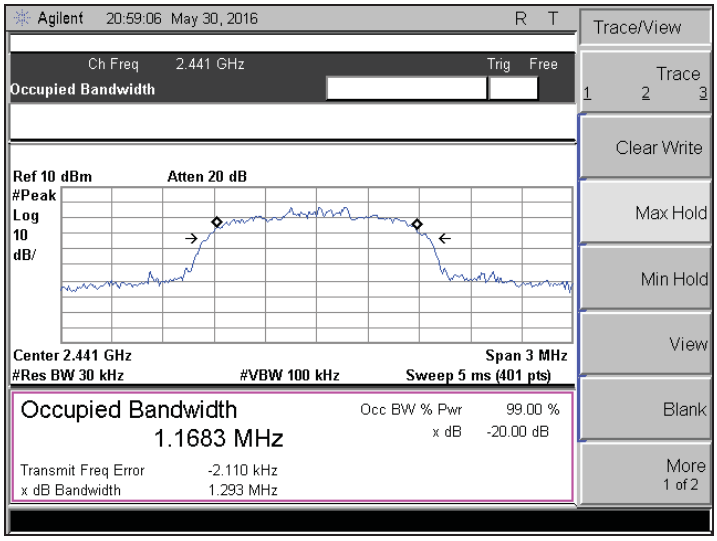
**π/4DQPSK mode:**

**2402MHz**



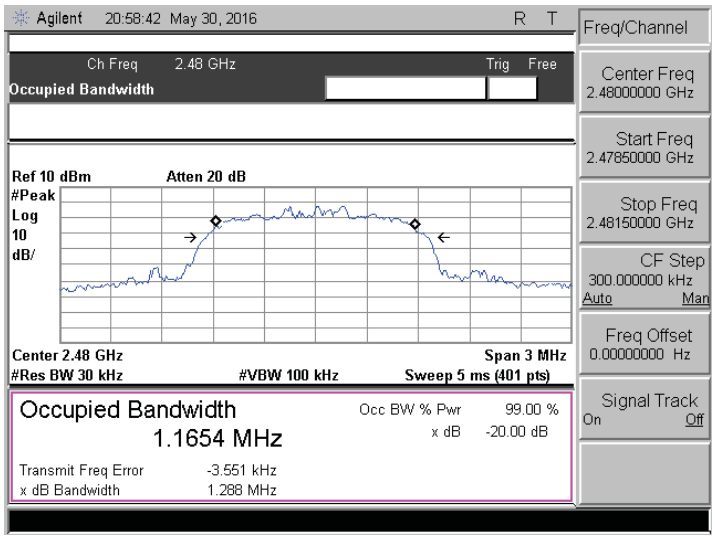

20dB Bandwidth: 1300 KHz

**2441MHz**




20dB Bandwidth: 1293 KHz

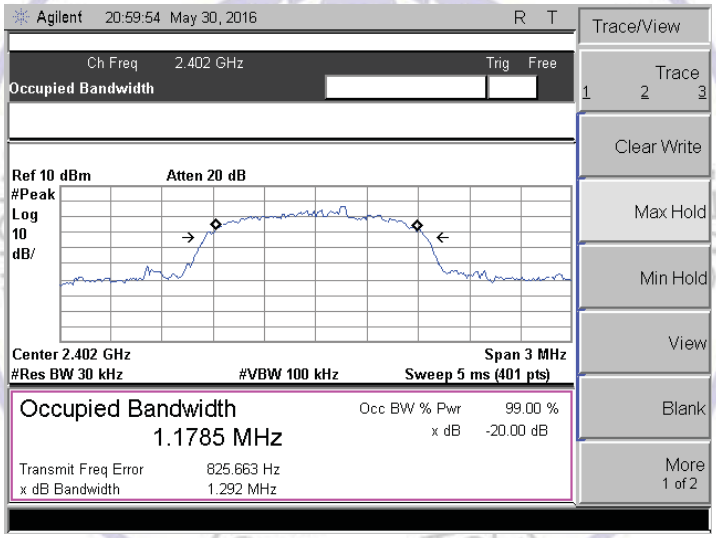
**2480MHz**




20dB Bandwidth: 1288 KHz

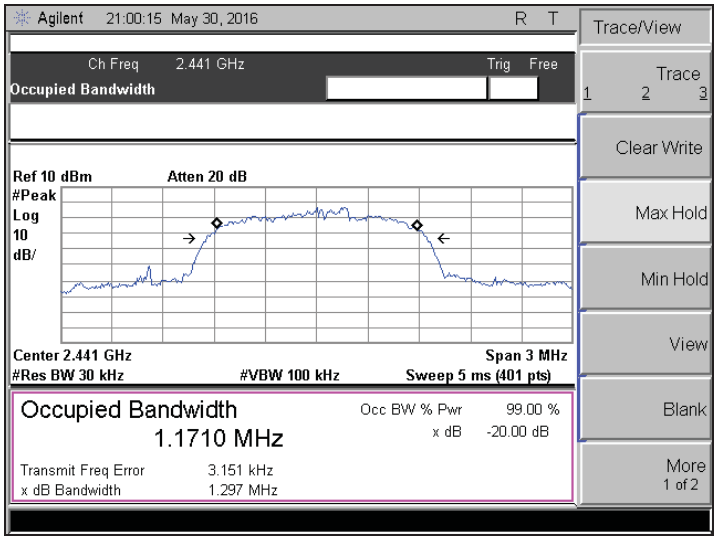
**8DPSK mode:**

**2402MHz**



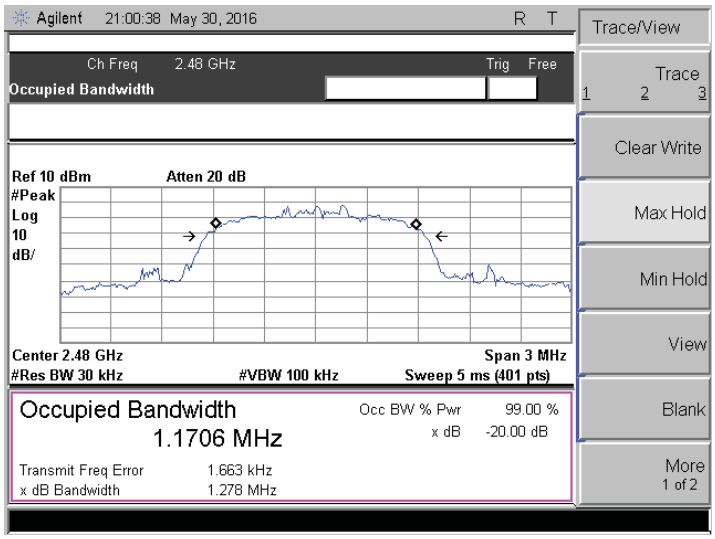

20dB Bandwidth: 1292 KHz

**2441MHz**




20dB Bandwidth: 1297 KHz

**2480MHz**




20dB Bandwidth: 1278 KHz

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# 5. 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.

**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 antenna used in this product is an internal Antenna, The directional gains of antenna used for transmitting is 0 dBi.

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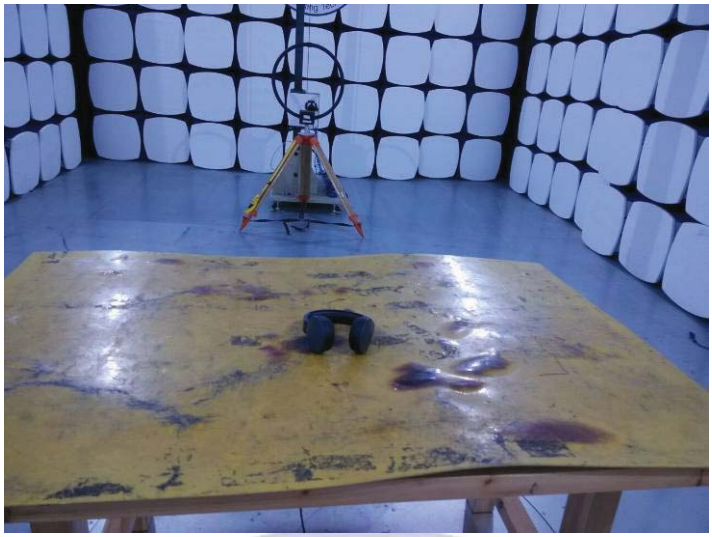
# 6. Test Setup Photos of the EUT



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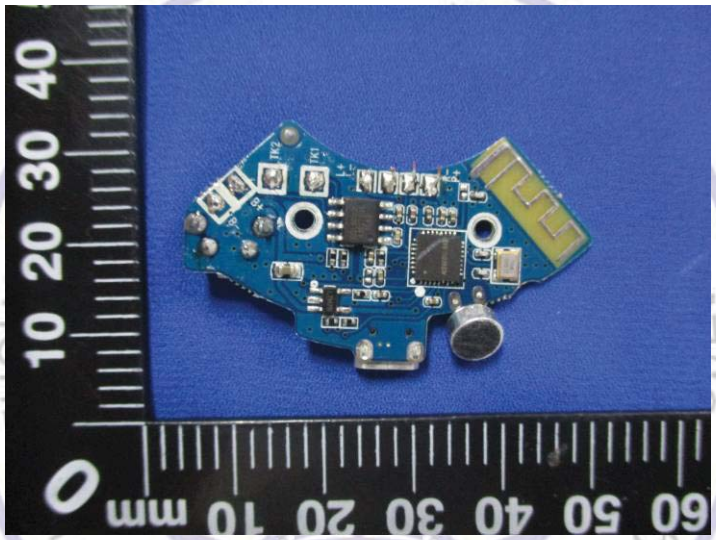
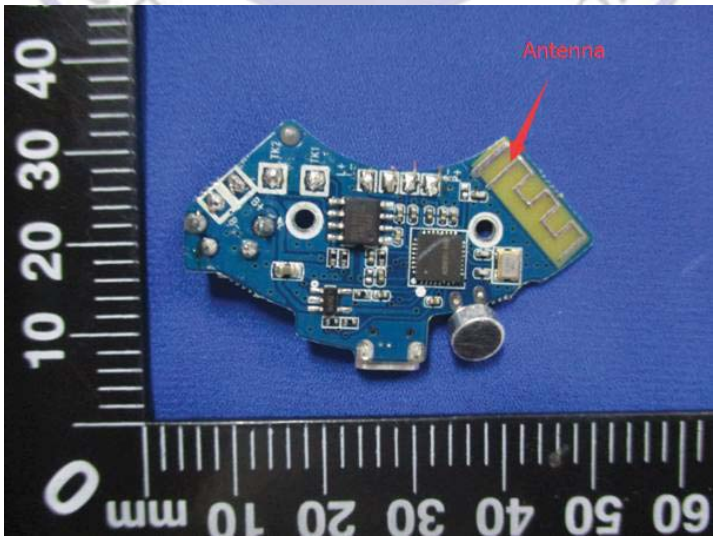
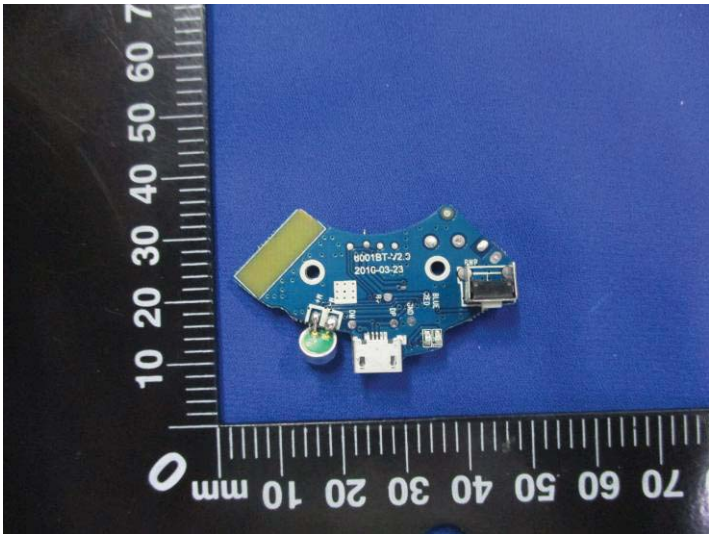
# 7. External and Internal Photos of the EUT

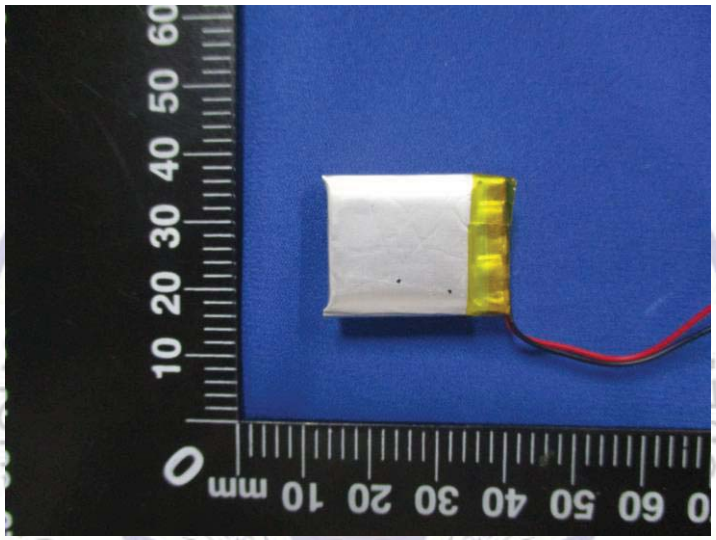
## External Photos of EUT

## Internal Photos of EUT







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

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