# FCC TEST REPORT

For

AtGames Digital Media Inc.

Legends Ultimate Home Arcade

Test Model: HA8800

List Model No.: Please refer to page 6

| | | |
|---|---|---|
| Prepared for | : | AtGames Digital Media Inc. |
| Address | : | 2228 E Maple Ave,El Segundo, CA 90245, USA |
| Prepared by | : | Shenzhen LCS Compliance Testing Laboratory Ltd. |
| Address | : | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China |
| Tel | : | (+86)755-82591330 |
| Fax | : | (+86)755-82591332 |
| Web | : | www.LCS-cert.com |
| Mail | : | webmaster@LCS-cert.com |
| Date of receipt of test sample | : | December 31, 2019 |
| Number of tested samples | : | 1 |
| Serial number | : | Prototype |
| Date of Test | : | December 31, 2019 ~ January 10, 2020 |
| Date of Report | : | January 14, 2020 |

# FCC TEST REPORT
# FCC CFR 47 PART 15 C(15.247)

| | | |
|---|---|---|
| **Report Reference No. .....** | **:** | **LCS191217060AEB** |
| Date of Issue ..... | : | January 14, 2020 |
| **Testing Laboratory Name.....** | **:** | **Shenzhen LCS Compliance Testing Laboratory Ltd.** |
| Address ..... | : | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China |
| Testing Location/ Procedure ..... | : | Full application of Harmonised standards ■<br>Partial application of Harmonised standards □<br>Other standard testing method □ |
| **Applicant's Name .....** | **:** | **AtGames Digital Media Inc.** |
| Address ..... | : | 2228 E Maple Ave,El Segundo, CA 90245, USA |
| **Test Specification** | | |
| Standard ..... | : | FCC CFR 47 PART 15 C(15.247) |
| **Test Report Form No.....** | **:** | LCSEMC-1.0 |
| TRF Originator..... | : | Shenzhen LCS Compliance Testing Laboratory Ltd. |
| Master TRF..... | : | Dated 2011-03 |



| | | |
|---|---|---|
| **EUT Description. .....** | **:** | **Legends Ultimate Home Arcade** |
| Trade Mark ..... | : | N/A |
| Test Model..... | : | HA8800 |
| Ratings ..... | : | Input: AC100-240V, 50/60Hz 2A<br>Output: DC12V/5A |
| Result ..... | : | **Positive** |

| **Compiled by:** | **Supervised by:** | **Approved by:** |
|---|---|---|
| Jayden Zhuo/ File administrators | Jin Wang / Technique principal | Gavin Liang/ Manager |

# FCC -- TEST REPORT

| | |
|---|---|
| **Test Report No. :** **LCS191217060AEB** | January 14, 2020<br>Date of issue |

| | |
|---|---|
| Test Model..... | : HA8800 |
| EUT..... | : Legends Ultimate Home Arcade |
| **Applicant.....** | **: AtGames Digital Media Inc.** |
| Address..... | : 2228 E Maple Ave,El Segundo, CA 90245, USA |
| Telephone..... | : |
| Fax..... | : |
| **Manufacturer.....** | **: AtGames Digital Media Inc.** |
| Address..... | : 2228 E Maple Ave,El Segundo, CA 90245, USA |
| Telephone..... | : |
| Fax..... | : |
| **Factory.....** | **: AtGames Digital Media Inc.** |
| Address..... | : 2228 E Maple Ave,El Segundo, CA 90245, USA |
| Telephone..... | : |
| Fax..... | : |

| | |
|---|---|
| **Test Result** | **Positive** |

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.

# Revision History

| Revision | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 000 | January 14, 2020 | Initial Issue | Gavin Liang |
| | | | |
| | | | |

# TABLE OF CONTENTS

Description ..... Page

# 1. GENERAL INFORMATION

## 1.1. Description of Device (EUT)

| | | |
|---|---|---|
| EUT | : | Legends Ultimate Home Arcade |
| Test Model | : | HA8800 |
| Model Number | : | HA8800S,HA8800B,HA8800C;HA8800D,HA8801,HA8801S,HA8801B, HA8801C,HA8801D,HA8802,HA8802S,HA8802B,HA8802C;HA8803, HA8803S,HA8803B,HA8803C,HA8804,HA8804S,HA8804B,HA8804C, HA8805,HA8805S,HA8805B,HA8805C,HA8810,HA8810S,HA8810B, HA8810C,HA8810D,HA8811,HA8811S,HA8811B,HA8811C,HA8812, HA8812S,HA8812B,HA8812C,HA8813,HA8813S,HA8813B,HA8813C, HA8814,HA8814S,HA8814B,HA8814C,HA8815,HA8815S,HA8815B, HA8815C,HA8820,HA8820S,HA8820B,HA8820C,HA2800,HA2800S, HA2800B,HA2800C,HA2800D,HA2801,HA2801S,HA2801B,HA2801C, HA2801D |
| Model Declaration | : | PCB board, structure and internal of these model(s) are the same, Only the model name is different for these models. |
| Power Supply | : | Input: AC100-240V, 50/60Hz 2A<br>Output: DC12V/5A |
| Hardware Version | : | HA8800-V2.2 |
| Software Version | : | HA8800_Wifi_V2.0 |
| Bluetooth | : | |
| Frequency Range | : | 2402-2480MHz |
| Channel Number | : | 79 channels for Bluetooth V4.1 (BDR/EDR)<br>40 channels for Bluetooth V4.1 (BT LE) |
| Channel Spacing | : | 1MHz for Bluetooth V4.1 (BDR/EDR)<br>2MHz for Bluetooth V4.1 (BT LE) |
| Modulation Type | : | GFSK, π/4-DQPSK, 8-DPSK for Bluetooth V4.1 (BDR/EDR)<br>GFSK for Bluetooth V4.1 (BT LE) |
| Bluetooth Version | : | V4.1 |
| WIFI(2.4G Band) | : | |
| Frequency Range | : | 2412-2462MHz |
| Channel Spacing | : | 5MHz |
| Channel Number | : | 11 channels for 20MHz bandwidth(2412~2462MHz)<br>7 channels for 40MHz bandwidth(2422~2452MHz) |
| Modulation Type | : | IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK);<br>IEEE 802.11g/n: OFDM(64QAM, 16QAM, QPSK, BPSK) |
| WIFI (5.2G Band) | : | |
| Frequency Range | : | 5180-5240MHz |
| Channel Number | : | 4 channels for 20MHz bandwidth(5180-5240MHz)<br>2 channels for 40MHz bandwidth(5190~5230MHz)<br>1 channels for 80MHz bandwidth(5210MHz) |
| Modulation Type | : | IEEE 802.11a/n/ac: OFDM(64QAM, 16QAM, QPSK, BPSK) |
| WIFI (5.8G Band) | : | |
| Frequency Range | : | 5745-5825MHz |
| Channel Number | : | 5 channels for 20MHz bandwidth(5745-5825MHz)<br>2 channels for 40MHz bandwidth(5755~5795MHz)<br>1 channels for 80MHz bandwidth(5775MHz) |

| | | |
|---|---|---|
| Modulation Type | : | IEEE 802.11a/n/ac: OFDM(64QAM, 16QAM, QPSK, BPSK) |
| 2.4G Function | : | |
| Frequency Range | : | 2407- 2469MHz<br>(2407 MHz, 2413 MHz, 2420 MHz, 2426 MHz, 2431 MHz, 2436 MHz, 2439 MHz ,2442 MHz, 2447 MHz, 2449 MHz, 2452 MHz, 2454 MHz, 2459 MHz, 2462 MHz, 2467 MHz, 2469 MHz) |
| Channel Number | : | 16 |
| Modulation Type | : | GFSK |
| Antenna Description | : | |
| | | One External Antenna(ANT0), for Bluetooth, 2.4G WLAN, 5.2G WLAN and 5.8G WLAN 2.0dBi (Max.)<br>One PCB Antenna(ANT1) used for 2.4G Function TX/RX, 2.0dBi(max.)<br>One PCB Antenna(ANT2) used for 2.4G Function TX/RX, 2.0dBi(max.) |

## 1.2. Host System Configuration List and Details

| Manufacturer | Description | Model | Serial Number | Certificate |
|---|---|---|---|---|
| -- | -- | -- | -- | -- |

## 1.3. External I/O Cable

| I/O Port Description | Quantity | Cable |
|---|---|---|
| Charge Port | 1 | N/A |

## 1.4. Description of Test Facility

FCC Registration Number is 254912.
Industry Canada Registration Number is 9642A-1.
EMSD Registration Number is ARCB0108.
UL Registration Number is 100571-492.
TUV SUD Registration Number is SCN1081.
TUV RH Registration Number is UA 50296516-001.
NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier: CN0071.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

## 1.5. 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 LCS 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.

## 1.6. Measurement Uncertainty

| Test Item | | Frequency Range | Uncertainty | Note |
|---|---|---|---|---|
| Radiation Uncertainty | : | 9KHz~30MHz | ±3.10dB | (1) |
| | | 30MHz~200MHz | ±2.96dB | (1) |
| | | 200MHz~1000MHz | ±3.10dB | (1) |
| | | 1GHz~26.5GHz | ±3.80dB | (1) |
| | | 26.5GHz~40GHz | ±3.90dB | (1) |
| Conduction Uncertainty | : | 150kHz~30MHz | ±1.63dB | (1) |
| Power disturbance | : | 30MHz~300MHz | ±1.60dB | (1) |

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

## 1.7. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

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

AC conducted emission pre-test at both power adapter and charge from PC modes, recorded worst case.

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, which was determined to be BT LE mode (Low Channel).

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 BT LE mode(Low Channel).

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

BT LE: 1 Mbps, GFSK.

V4.1 (BT LE)

| Frequency Band | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|---|---|---|---|---|
| 2402~2480MHz | 0 | 2402 | 20 | 2442 |
| | 1 | 2404 | -- | -- |
| | 2 | 2406 | -- | -- |
| | -- | -- | 37 | 2476 |
| | -- | -- | 38 | 2478 |
| | 19 | 2440 | 39 | 2480 |

# 2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

## 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure KDB558074 D01 DTS Meas. Guidance v04 is required to be used for this kind of FCC 15.247 digital modulation device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

## 2.3. General Test Procedures

### 2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

### 2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

# 3. SYSTEM TEST CONFIGURATION

## 3.1. Justification

The system was configured for testing in a continuous transmits condition. The duty cycle is 100% and the average correction factor is 0.

## 3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (Secure CRT and MPTool) provided by applicant.

## 3.3. Special Accessories

| No. | Equipment | Manufacturer | Model No. | Serial No. | Length | shielded/ unshielded | Notes |
|---|---|---|---|---|---|---|---|
| 1 | -- | -- | -- | -- | -- | -- | -- |
| 2 | -- | -- | -- | -- | -- | -- | -- |

## 3.4. Block Diagram/Schematics

Please refer to the related document

## 3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

## 3.6. Test Setup

Please refer to the test setup photo.

# 4. SUMMARY OF TEST RESULTS

| Applied Standard: FCC Part 15 Subpart C | | | |
|---|---|---|---|
| FCC Rules | Description of Test | Result | Remark |
| §15.247(b) | Maximum Conducted Output Power | Compliant | Note 1 |
| §15.209, §15.247(d) | Radiated Spurious Emissions | Compliant | Note 1 |
| §15.207(a) | Conducted Emissions | Compliant | Note 1 |
| §15.247(i)§2.1091 | RF Exposure | Compliant | Note 2 |

*Remark:*
*1. Note 1 – Test results inside test report;*
*2. Note 2 – Test results in other test report (RF Exposure Evaluation);*

# 5. TEST RESULT

## 5.1. Maximum Conducted Output Power Measurement

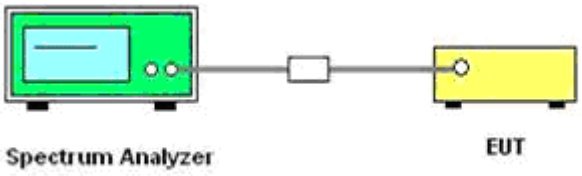
### 5.1.1. Standard Applicable

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

### 5.1.2. Test Procedures

The transmitter output (antenna port) was connected to the spectrum analyzer.
According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power 9.1.1.
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.
a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ 3 × RBW.
c) Set span ≥ 3 x RBW
d) Sweep time = auto couple.
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.

### 5.1.3. Test Setup Layout

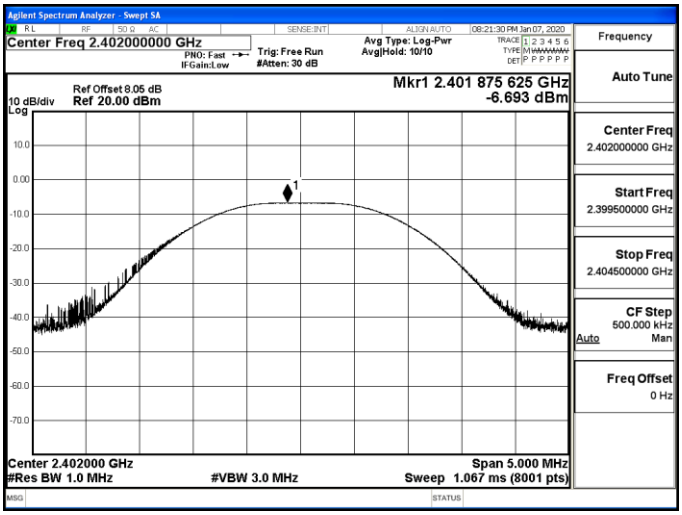
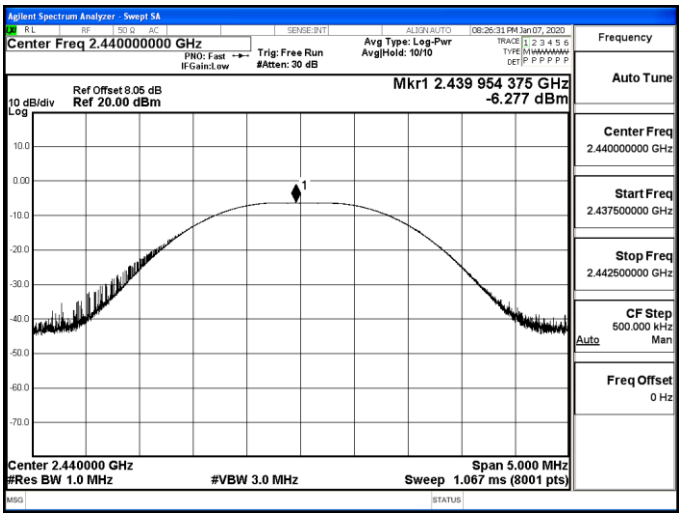
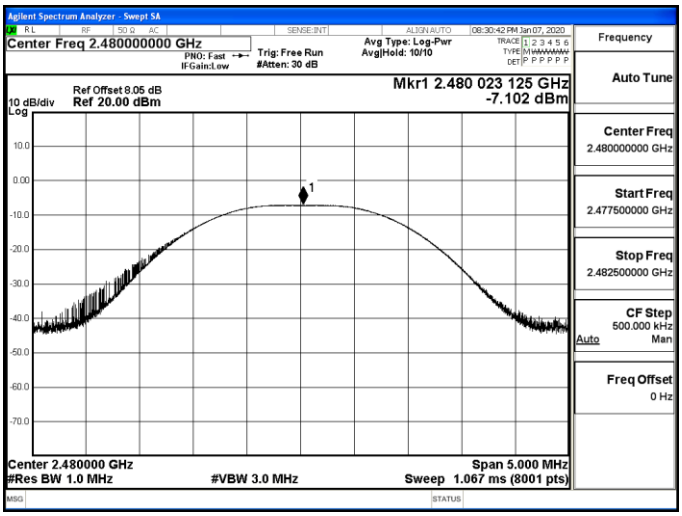



### 5.1.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

### 5.1.5. Test Result of Maximum Conducted Output Power

| Mode | Channel | Conduct Peak Power[dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|
| BT LE | LCH | -6.693 | 30 | PASS |
| BT LE | MCH | -6.277 | 30 | PASS |
| BT LE | HCH | -7.102 | 30 | PASS |

| Maximum Peak Output Power | |
|---|---|
|  | |
| Channel 0 / 2402 MHz | |
|  | |
| Channel 19 / 2440 MHz | |
|  | |
| Channel 39 / 2480 MHz | |

*Remark:*
*1) Test results including cable loss.*

## 5.2. Radiated Emissions Measurement

### 5.2.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| \1\ 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293. | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | (\2\) |
| 13.36-13.41 | | | |

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

### 5.2.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (Emission in restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average |
| RB / VB (Emission in non-restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average |

| Receiver Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG |
| Start ~ Stop Frequency | 150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB/VB 120kHz/1MHz for QP |

5.2.3. Test Procedures

**1) Sequence of testing 9 kHz to 30 MHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

**Final measurement:**

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

**2) Sequence of testing 30 MHz to 1 GHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

**Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

**3) Sequence of testing 1 GHz to 18 GHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

**Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

**4) Sequence of testing above 18 GHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

**Premeasurement:**

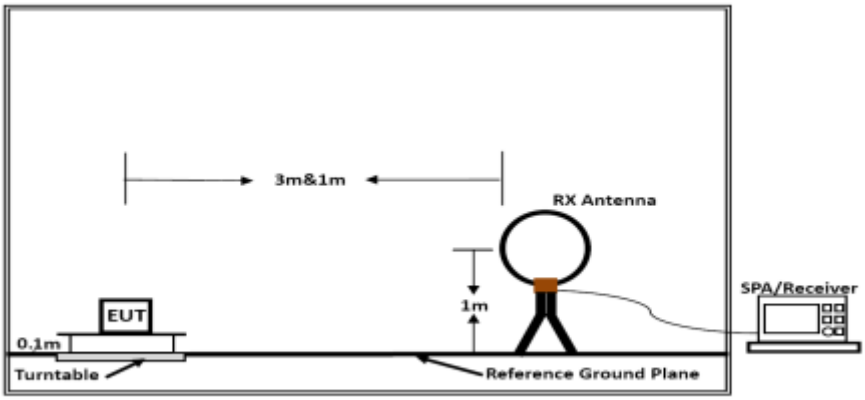
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

**Final measurement:**

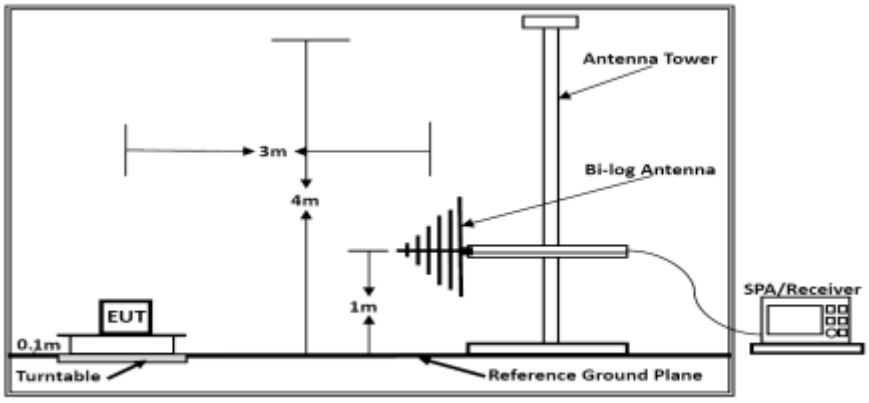
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

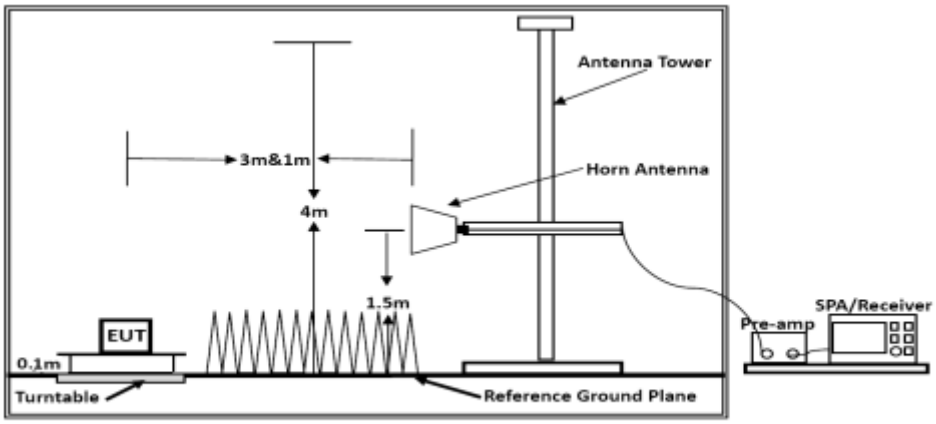
5.2.4. Test Setup Layout




Below 30MHz




Below 1GHz




Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1.5m]) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6. Results of Radiated Emissions (9 KHz~30MHz)

| Temperature | 23.6℃ | Humidity | 53.8% |
|---|---|---|---|
| Test Engineer | Diamond Lu | Configurations | BT LE |

| 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.

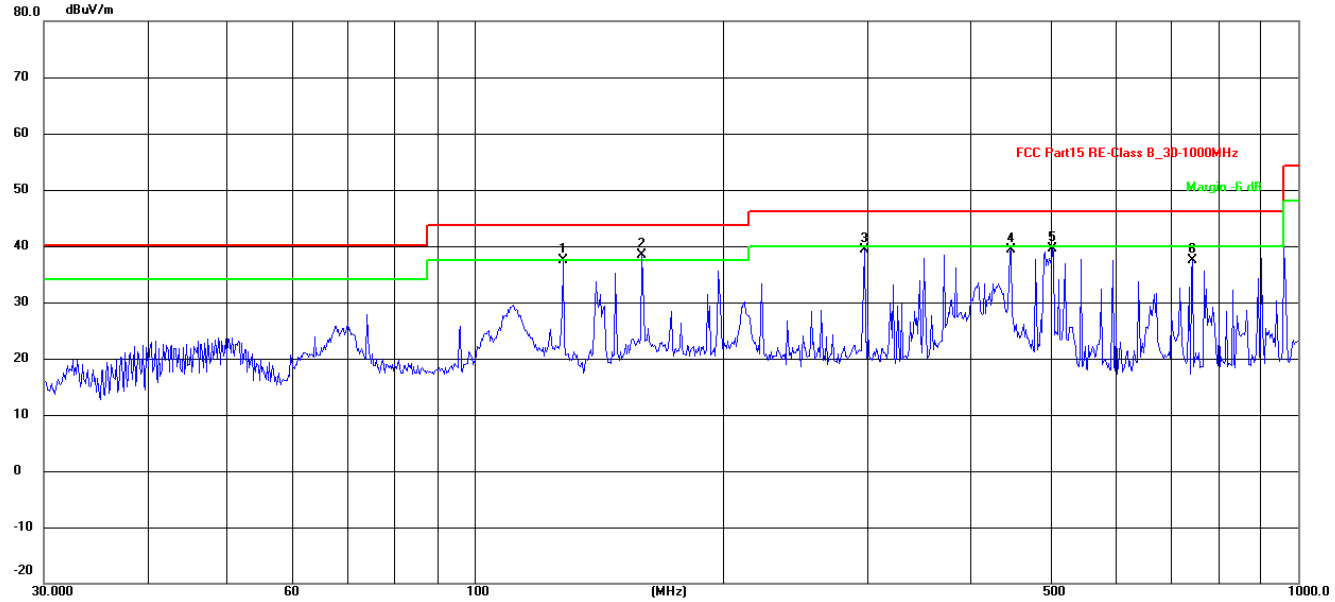
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

5.2.7. Results of Radiated Emissions (30MHz~1GHz)

| Temperature | 23.7℃ | Humidity | 53.8% |
|---|---|---|---|
| Test Engineer | Diamond Lu | Configurations | BT LE (Low Channel) |

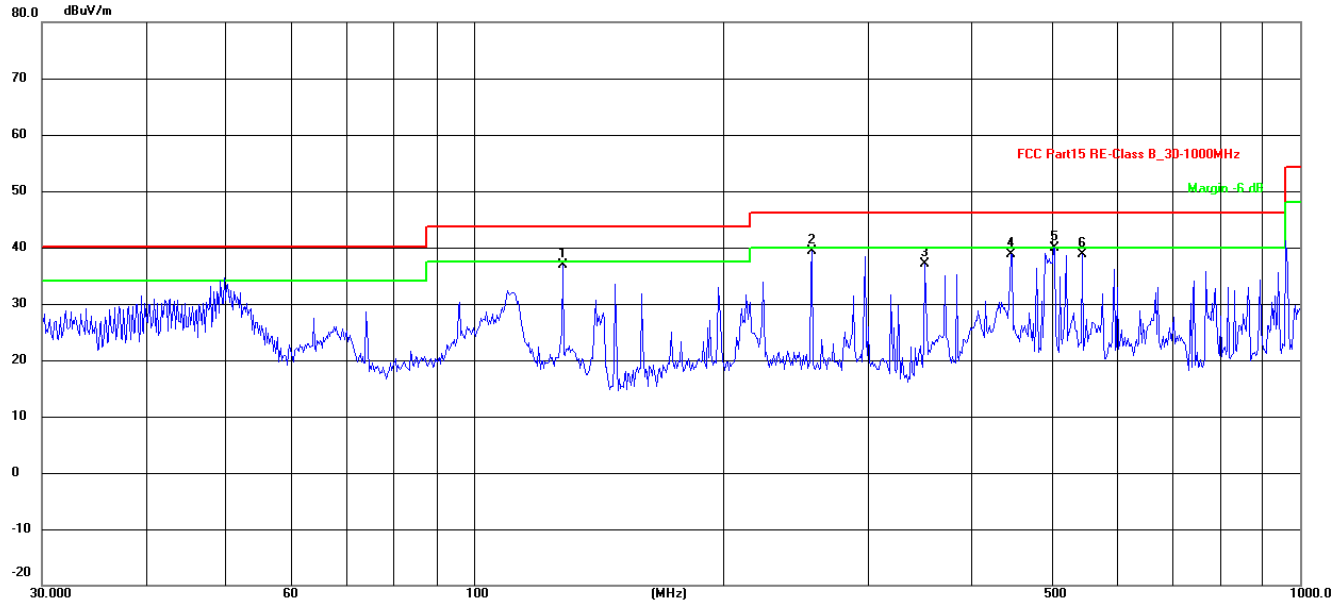
*Test result for BT LE (Low Channel)*

*Horizontal*




| No. | | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. | Height (cm) | Azimuth (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 128.1125 | 57.91 | -20.45 | 37.46 | 43.50 | -6.04 | QP | | | |
| 2 * | | 159.7844 | 58.84 | -20.46 | 38.38 | 43.50 | -5.12 | QP | | | |
| 3 | | 297.2238 | 54.14 | -14.87 | 39.27 | 46.00 | -6.73 | QP | | | |
| 4 | | 447.9821 | 50.53 | -11.20 | 39.33 | 46.00 | -6.67 | QP | | | |
| 5 | | 502.9395 | 49.65 | -10.07 | 39.58 | 46.00 | -6.42 | QP | | | |
| 6 | | 744.8659 | 43.27 | -5.80 | 37.47 | 46.00 | -8.53 | QP | | | |

*Vertical*




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. | Height (cm) | Azimuth (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 128.1125 | 57.28 | -20.45 | 36.83 | 43.50 | -6.67 | QP | | | |
| 2 | 256.5210 | 55.09 | -15.78 | 39.31 | 46.00 | -6.69 | QP | | | |
| 3 | 351.7078 | 50.43 | -13.44 | 36.99 | 46.00 | -9.01 | QP | | | |
| 4 | 446.4139 | 50.01 | -11.23 | 38.78 | 46.00 | -7.22 | QP | | | |
| 5 * | 504.7062 | 50.02 | -10.03 | 39.99 | 46.00 | -6.01 | QP | | | |
| 6 | 545.1825 | 47.78 | -9.05 | 38.73 | 46.00 | -7.27 | QP | | | |

*Note:*

*1). Pre-scan all modes and recorded the worst case results in this report (BT LE (Low Channel)).*

*2). Emission level (dBuV/m) = 20 log Emission level (uV/m).*

*3). Corrected Reading: Antenna Factor + Cable Loss + Read Level = Level.*

5.2.8. Results for Radiated Emissions (1 – 26 GHz)

*BT LE*

*Channel 0 / 2402 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. |
|---|---|---|---|---|---|---|---|---|---|
| 4804.00 | 56.15 | 33.06 | 35.04 | 3.94 | 58.11 | 74.00 | -15.89 | Peak | Horizontal |
| 4804.00 | 41.10 | 33.06 | 35.04 | 3.94 | 43.06 | 54.00 | -10.94 | Average | Horizontal |
| 4804.00 | 50.56 | 33.06 | 35.04 | 3.94 | 52.52 | 74.00 | -21.48 | Peak | Vertical |
| 4804.00 | 40.06 | 33.06 | 35.04 | 3.94 | 42.02 | 54.00 | -11.98 | Average | Vertical |

*Channel 19 / 2440 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. |
|---|---|---|---|---|---|---|---|---|---|
| 4880.00 | 58.34 | 33.16 | 35.15 | 3.96 | 60.31 | 74.00 | -13.69 | Peak | Horizontal |
| 4880.00 | 37.89 | 33.16 | 35.15 | 3.96 | 39.86 | 54.00 | -14.14 | Average | Horizontal |
| 4880.00 | 52.72 | 33.16 | 35.15 | 3.96 | 54.69 | 74.00 | -19.31 | Peak | Vertical |
| 4880..00 | 38.54 | 33.16 | 35.15 | 3.96 | 40.51 | 54.00 | -13.49 | Average | Vertical |

*Channel 39 / 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 | 53.06 | 33.26 | 35.14 | 3.98 | 55.16 | 74.00 | -18.84 | Peak | Horizontal |
| 4960.00 | 43.00 | 33.26 | 35.14 | 3.98 | 45.10 | 54.00 | -8.90 | Average | Horizontal |
| 4960.00 | 49.21 | 33.26 | 35.14 | 3.98 | 51.31 | 74.00 | -22.69 | Peak | Vertical |
| 4960.00 | 36.84 | 33.26 | 35.14 | 3.98 | 38.94 | 54.00 | -15.06 | Average | Vertical |

*Notes:*

*1). Measuring frequencies from 9 KHz~10$^{th}$ harmonic (ex. 26GHz), No emission found between lowest internal used/generated frequency to 30 MHz.*

*2). Radiated emissions measured in frequency range from 9 KHz~10$^{th}$ harmonic (ex. 26GHz) were made with an instrument using Peak detector mode.*

*3). 18~25GHz at least have 20dB margin. No recording in the test report.*

*4). Measured = Reading + Ant. Fac - Pre. Fac + Cab.Los.*

## 5.3. AC Power Line Conducted Emissions

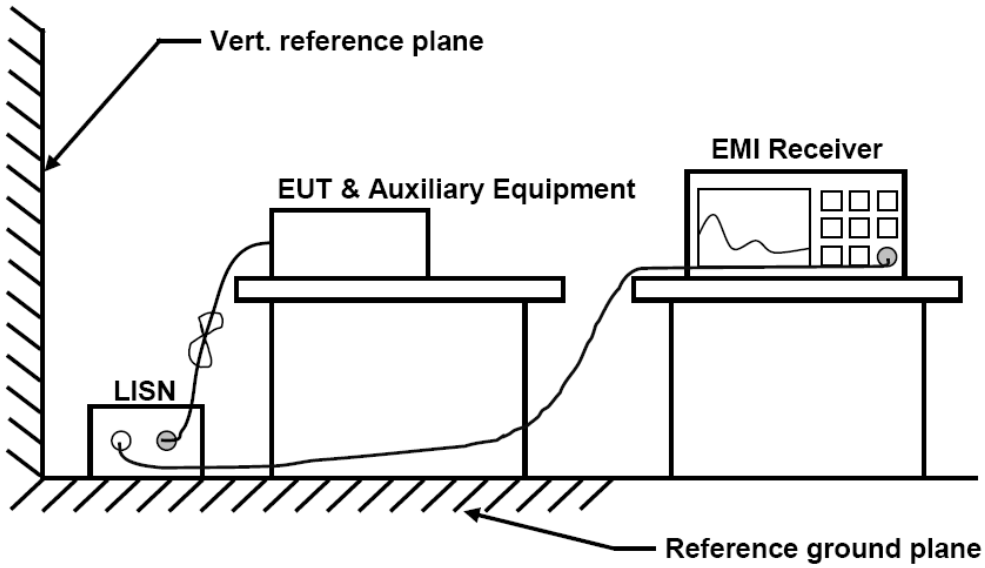
### 5.3.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

| Frequency Range (MHz) | Limits (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

* Decreasing linearly with the logarithm of the frequency

### 5.3.2 Block Diagram of Test Setup



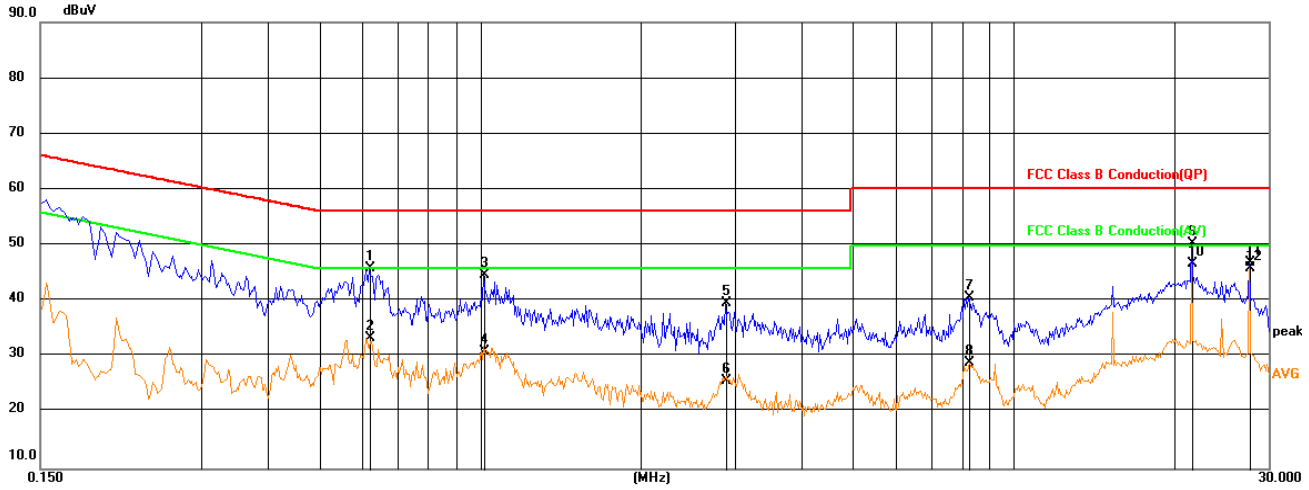

### 5.7.3 Test Results

PASS

The test data please refer to following page.

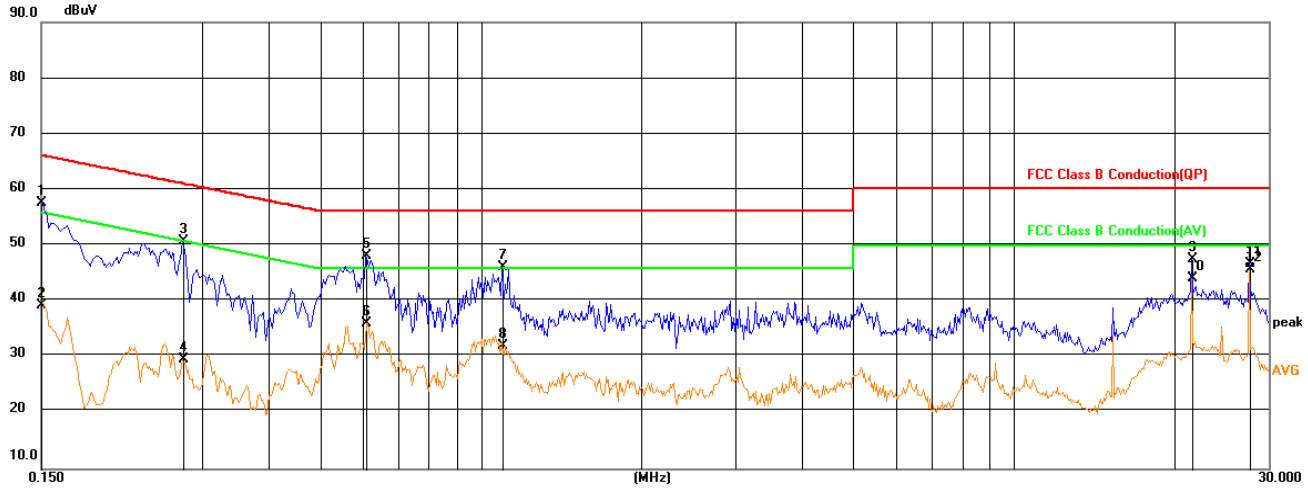
***AC Conducted Emission of charge from power adapter mode @ AC 120V/60Hz (worst case)***

*Line*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dB) | (dBuV) | (dBuV) | (dB) | |
| 1 | 0.6219 | 26.76 | 19.20 | 45.96 | 56.00 | -10.04 | QP |
| 2 | 0.6219 | 14.23 | 19.20 | 33.43 | 46.00 | -12.57 | AVG |
| 3 | 1.0181 | 25.43 | 19.26 | 44.69 | 56.00 | -11.31 | QP |
| 4 | 1.0181 | 11.81 | 19.26 | 31.07 | 46.00 | -14.93 | AVG |
| 5 | 2.8995 | 20.25 | 19.47 | 39.72 | 56.00 | -16.28 | QP |
| 6 | 2.8995 | 6.31 | 19.47 | 25.78 | 46.00 | -20.22 | AVG |
| 7 | 8.2725 | 21.00 | 19.65 | 40.65 | 60.00 | -19.35 | QP |
| 8 | 8.2725 | 9.30 | 19.65 | 28.95 | 50.00 | -21.05 | AVG |
| 9 | 21.5069 | 30.18 | 20.29 | 50.47 | 60.00 | -9.53 | QP |
| 10 | 21.5069 | 26.55 | 20.29 | 46.84 | 50.00 | -3.16 | AVG |
| 11 | 27.6493 | 26.90 | 20.15 | 47.05 | 60.00 | -12.95 | QP |
| 12 | 27.6493 | 25.79 | 20.15 | 45.94 | 50.00 | -4.06 | AVG |

*Neutral*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dB) | (dBuV) | (dBuV) | (dB) | |
| 1 | 0.1507 | 38.58 | 19.14 | 57.72 | 65.96 | -8.24 | QP |
| 2 | 0.1507 | 20.08 | 19.14 | 39.22 | 55.96 | -16.74 | AVG |
| 3 | 0.2760 | 31.56 | 19.25 | 50.81 | 60.94 | -10.13 | QP |
| 4 | 0.2760 | 10.39 | 19.25 | 29.64 | 50.94 | -21.30 | AVG |
| 5 | 0.6088 | 28.92 | 19.19 | 48.11 | 56.00 | -7.89 | QP |
| 6 | 0.6088 | 17.00 | 19.19 | 36.19 | 46.00 | -9.81 | AVG |
| 7 | 1.0987 | 26.82 | 19.26 | 46.08 | 56.00 | -9.92 | QP |
| 8 | 1.0987 | 12.81 | 19.26 | 32.07 | 46.00 | -13.93 | AVG |
| 9 | 21.5069 | 27.58 | 20.07 | 47.65 | 60.00 | -12.35 | QP |
| 10 | 21.5069 | 24.02 | 20.07 | 44.09 | 50.00 | -5.91 | AVG |
| 11 | 27.6493 | 26.66 | 20.13 | 46.79 | 60.00 | -13.21 | QP |
| 12 | 27.6493 | 25.62 | 20.13 | 45.75 | 50.00 | -4.25 | AVG |

****Note: Pre-scan all modes and recorded the worst case results in this report.*

# 6. LIST OF MEASURING EQUIPMENTS

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 1 | Power Meter | R&S | NRVS | 100444 | 2019-06-11 | 2020-06-10 |
| 2 | Power Sensor | R&S | NRV-Z81 | 100458 | 2019-06-11 | 2020-06-10 |
| 3 | Power Sensor | R&S | NRV-Z32 | 10057 | 2019-06-11 | 2020-06-10 |
| 4 | Test Software | Tonscend | JS1120-2 | / | N/A | N/A |
| 5 | RF Control Unit | Tonscend | JS0806-2 | N/A | 2019-06-11 | 2020-06-10 |
| 6 | MXA Signal Analyzer | Agilent | N9020A | MY50510140 | 2019-11-22 | 2020-11-21 |
| 7 | DC Power Supply | Agilent | E3642A | N/A | 2019-11-14 | 2020-11-13 |
| 8 | EMI Test Software | AUDIX | E3 | / | N/A | N/A |
| 9 | 3m Full Anechoic Chamber | MRDIANZI | FAC-3M | MR009 | 2019-09-27 | 2020-09-26 |
| 10 | Positioning Controller | MF | MF-7082 | N/A | 2019-06-12 | 2020-06-11 |
| 11 | Active Loop Antenna | SCHWARZBECK | FMZB 1519B | 00005 | 2019-07-25 | 2020-07-24 |
| 12 | By-log Antenna | SCHWARZBECK | VULB9163 | 9163-470 | 2019-07-25 | 2020-07-24 |
| 13 | Horn Antenna | SCHWARZBECK | BBHA 9120D | 9120D-1925 | 2019-07-01 | 2020-06-30 |
| 14 | Broadband Horn Antenna | SCHWARZBECK | BBHA 9170 | 791 | 2017-09-21 | 2020-09-20 |
| 15 | Broadband Preamplifier | SCHWARZBECK | BBV 9719 | 9719-025 | 2019-06-17 | 2020-06-16 |
| 16 | EMI Test Receiver | R&S | ESR 7 | 101181 | 2019-06-12 | 2020-06-11 |
| 17 | RS SPECTRUM ANALYZER | R&S | FSP40 | 100503 | 2019-11-14 | 2020-11-13 |
| 18 | Broadband Preamplifier | / | BP-01M18G | P190501 | 2019-07-01 | 2020-06-30 |
| 19 | RF Cable-R03m | Jye Bao | RG142 | CB021 | 2019-06-12 | 2020-06-11 |
| 20 | RF Cable-HIGH | SUHNER | SUCOFLEX 106 | 03CH03-HY | 2019-06-12 | 2020-06-11 |
| 21 | 6dB Attenuator | / | 100W/6dB | 1172040 | 2019-06-11 | 2020-06-10 |
| 22 | 3dB Attenuator | / | 2N-3dB | / | 2019-06-11 | 2020-06-10 |
| 23 | EMI Test Receiver | R&S | ESPI | 101840 | 2019-06-11 | 2020-06-10 |
| 24 | Artificial Mains | R&S | ENV216 | 101288 | 2019-06-12 | 2020-06-11 |
| 25 | 10dB Attenuator | SCHWARZBECK | MTS-IMP-136 | 261115-001-0032 | 2019-06-11 | 2020-06-10 |
| Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD. | | | | | | |

# 7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

# 8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

# 9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

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