



FCC TEST REPORT

For

Man & Machine Inc.

Cmouse wireless

Test Model: CM/BTWI/W5

Prepared for : Man & Machine Inc.
Address : 3706 West Street, Landover, MD 20785 USA

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
Address : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei,
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Date of receipt of test sample : October 10, 2024
Number of tested samples : 2
Sample No. : A250326018-1, A250326018-2
Serial number : Prototype
Date of Test : October 10, 2024 ~ April 10, 2025
Date of Report : April 11, 2025



**FCC TEST REPORT**
FCC CFR 47 PART 15 C(15.247)**Report Reference No.** : **LCSA01225021EA**

Date of Issue : April 11, 2025

Testing Laboratory Name : **Shenzhen LCS Compliance Testing Laboratory Ltd.**Address : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei,
Shajing Street, Baoan District, Shenzhen, 518000, ChinaTesting Location/ Procedure : Full application of Harmonised standards ■
Partial application of Harmonised standards □
Other standard testing method □**Applicant's Name** : **Man & Machine Inc.**

Address : 3706 West Street, Landover, MD 20785 USA

Test Specification

Standard : FCC CFR 47 PART 15 C(15.247)

Test Report Form No. : TRF-4-E-145 A/0

TRF Originator : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF : Dated 2011-03

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EUT Description : **Cmouse wireless**

Trade Mark : N/A

Test Model : CM/BTWI/W5

Ratings : Input: DC 5V
DC 3.7V by Rechargeable Li-ion Battery, 500mAhResult : **Positive****Compiled by:**

Jack Liu/Administrator

Supervised by:

Cary Luo/ Technique principal

Approved by:

Gavin Liang/ Manager



**FCC -- TEST REPORT**

| | | |
|--------------------------|-----------------------|--|
| Test Report No. : | LCSA01225021EA | <u>April 11, 2025</u> Date of issue |
|--------------------------|-----------------------|--|

| | |
|--------------------------|---|
| Test Model..... | : CM/BTWI/W5 |
| EUT..... | : Cmouse wireless |
| Applicant..... | : Man & Machine Inc. |
| Address..... | : 3706 West Street, Landover, MD 20785 USA |
| Telephone..... | : / |
| Fax..... | : / |
| Manufacturer..... | : DONGGUAN NEWMEN ELECTRONICS TECHNOLOGY CO.,LTD |
| Address..... | : No.5 Xifa Road, Lin Village, Tangxia Town, Dongguan City, Guangdong Province 523710, P.R.China |
| Telephone..... | : / |
| Fax..... | : / |
| Factory..... | : DONGGUAN NEWMEN ELECTRONICS TECHNOLOGY CO.,LTD |
| Address..... | : No.5 Xifa Road, Lin Village, Tangxia Town, Dongguan City, Guangdong Province 523710, P.R.China |
| 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.



Shenzhen LCS Compliance Testing Laboratory Ltd.
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Scan code to check authenticity



Revision History

| Report Version | Issue Date | Revision Content | Revised By |
|---|----------------|------------------|------------|
| 000 | April 11, 2025 | Initial Issue | --- |
| | | | |
| At the customer's request, the revised report was submitted to LCSA01225021EA applicant by quoting the test data of LCSA10094107EA original report. The Product PCB has changed, and the AC Power line conducted emissions and Radiation parts were re-tested. | | | |





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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

| | |
|---------------------|--|
| EUT | : Cmouse wireless |
| Test Model | : CM/BTWI/W5 |
| Ratings | : Input:DC 5V DC 3.7V by Rechargeable Li-ion Battery, 500mAh |
| Hardware Version | : V1.1 |
| Software Version | : V1.1 |
| Bluetooth | : |
| Frequency Range | : 2402MHz~2480MHz |
| Channel Number | : 40 channels for Bluetooth V5.2 (DTS) |
| Channel Spacing | : 2MHz for Bluetooth V5.2 (DTS) |
| Modulation Type | : GFSK for Bluetooth V5.2 (DTS) |
| Bluetooth Version | : V5.2 |
| Antenna Description | : PCB Antenna, -1.66dBi(Max.) |
| 2.4G | : |
| Frequency Range | : 2403MHz-2480MHz (2403, 2407, 2414, 2419, 2422, 2426, 2436, 2439, 2441, 2445, 2453, 2459, 2463, 2466, 2473, 2480 (Unit: MHz)) |
| Channel Number | : 16 channels |
| Modulation Type | : GFSK |
| Antenna Description | : PCB Antenna, -1.66dBi(Max.) |

Note: For a more detailed antenna description, please refer to the antenna specifications or the antenna report provided by the customer.





1.2. Support equipment List

| Manufacturer | Description | Model | Serial Number | Certificate |
|---------------------------------------|---------------|----------------|---------------|-------------|
| SHENZHEN TIANYIN ELECTRONICS CO., LTD | Power Adapter | TPA-46050200UU | --- | FCC |

Note: The adapter is supplied by lab and only use tested.

1.3. External I/O Cable

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

1.4. Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

Test Firm Registration Number: 254912.

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 | $\pm 3.10\text{dB}$ | (1) |
| | : | 30MHz~200MHz | $\pm 2.96\text{dB}$ | (1) |
| | : | 200MHz~1000MHz | $\pm 3.10\text{dB}$ | (1) |
| | : | 1GHz~26.5GHz | $\pm 3.80\text{dB}$ | (1) |
| | : | 26.5GHz~40GHz | $\pm 3.90\text{dB}$ | (1) |
| Conduction Uncertainty | : | 150kHz~30MHz | $\pm 1.63\text{dB}$ | (1) |
| Power disturbance | : | 30MHz~300MHz | $\pm 1.60\text{dB}$ | (1) |
| Output power | : | 1GHz-40GHz | $\pm 0.57\text{dB}$ | (1) |
| Power Spectral Density | : | 1GHz-40GHz | $\pm 1.2\text{dB}$ | (1) |
| Occupied Channel Bandwidth | : | 1GHz-40GHz | $\pm 5\%$ | (1) |
| Conducted RF Spurious Emission | : | 9kHz-40GHz | $\pm 1.80\text{dB}$ | (1) |
| Emissions in Restricted Bands | : | 1GHz-40GHz | $\pm 2.47\text{dB}$ | (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 Y 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 power adapter modes, recorded worst case.

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was determined to be BT LE mode (1Mbps-Middle Channel).

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was determined to be BT LE mode (1Mbps-Middle 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.

BT LE: 2 Mbps, GFSK.

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 15.247 Meas Guidance v05r02 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 below 1GHz and 1.5 m above ground plane above 1GHz. 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.

2.4. Test Sample

The application provides 2 samples to meet requirement;

| Sample Number | Description |
|------------------------|---------------------------------------|
| Sample 1(A250326018-1) | Engineer sample – continuous transmit |
| Sample 2(A250326018-2) | Normal sample – Intermittent transmit |





3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software provided by application.

3.3. Special Accessories

N/A.

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 | Test Sample | Result | Remark |
| § 15.247(b)(1) | Maximum Peak Conducted Output Power | Sample 1 | Compliant | Note 1 |
| §15.209, §15.247(d) | Radiated Spurious Emissions | Sample 1 Sample 2 | Compliant | Note 1 |
| §15.207(a) | Conducted Emissions | Sample 2 | Compliant | Note 1 |
| §15.247(i)§1.1310 §15.247(i)§2.1093 | RF Exposure | N/A | 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. Radiated Emissions Measurement

5.1.1. 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 |

5.1.2. 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 | 10 th 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 |

5.1.3. 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 1.0 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 ($\pm 45^\circ$) 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 ($\pm 45^\circ$) 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.

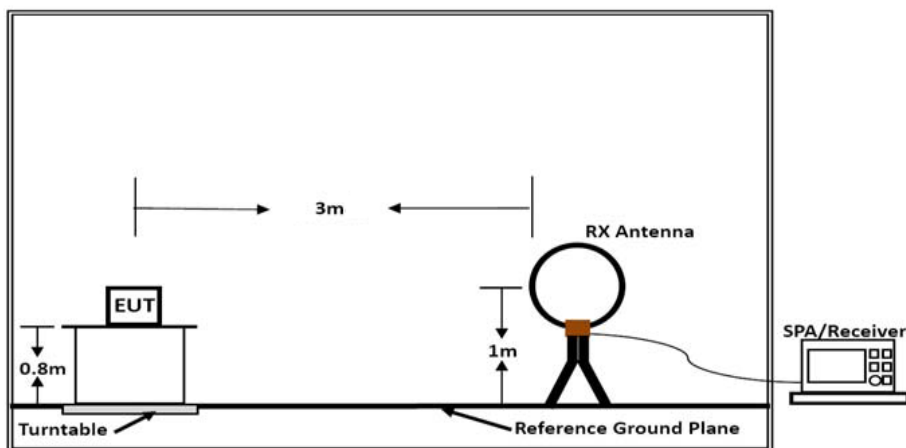
Final measurement:

- 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.

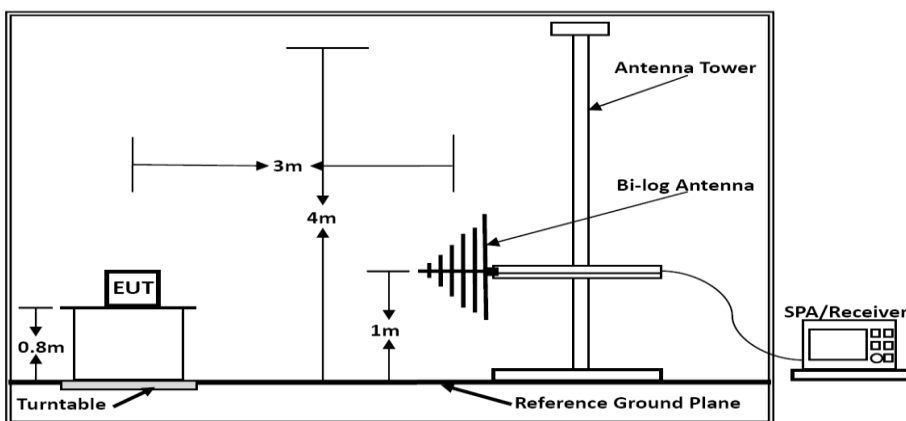




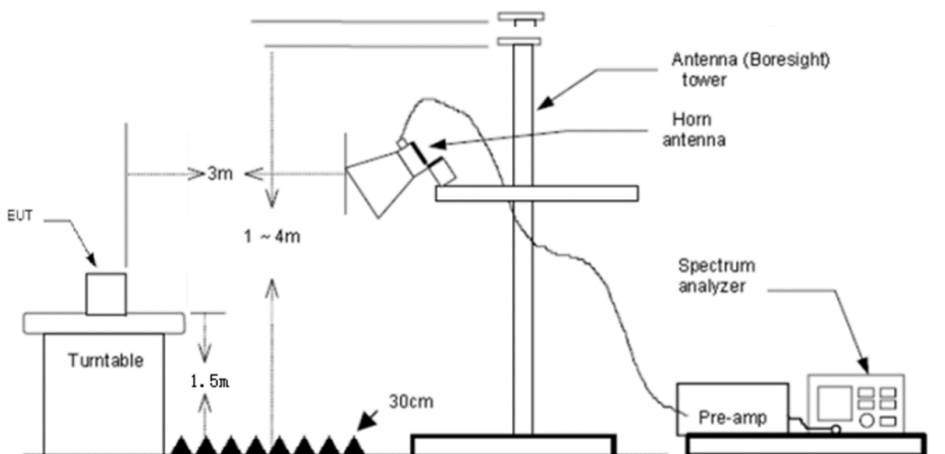
5.1.4. Test Setup Layout



Below 30MHz



Below 1GHz



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





5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.6. 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:

$$\text{FS (dBuV/m)} = \text{RA (dBuV)} + \text{AF (dB/m)} + \text{CL (dB)} - \text{AG (dB)}$$

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

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

| | | | |
|---------------|---------|----------------|---------------|
| Temperature | 23.8°C | Humidity | 52.1% |
| Test Engineer | Jay Luo | Configurations | BT LE, 1 Mbps |

| 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.

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

| | | | |
|---------------|---------|----------------|---------------|
| Temperature | 23.8°C | Humidity | 52.1% |
| Test Engineer | Jay Luo | Configurations | BT LE, 1 Mbps |

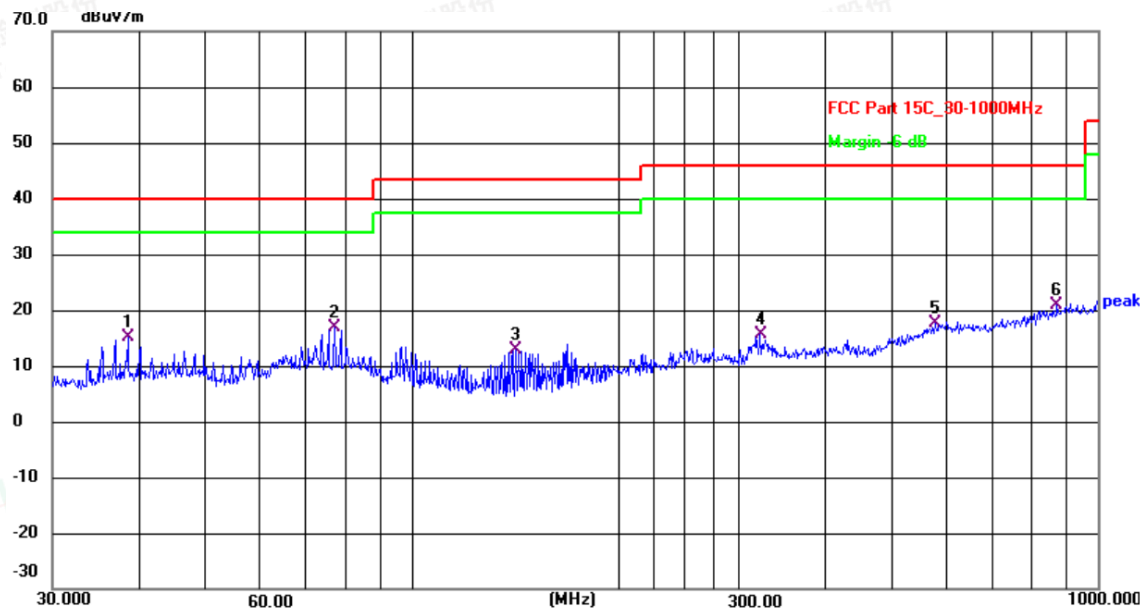
PASS.

The test data please refer to following page.





Horizontal

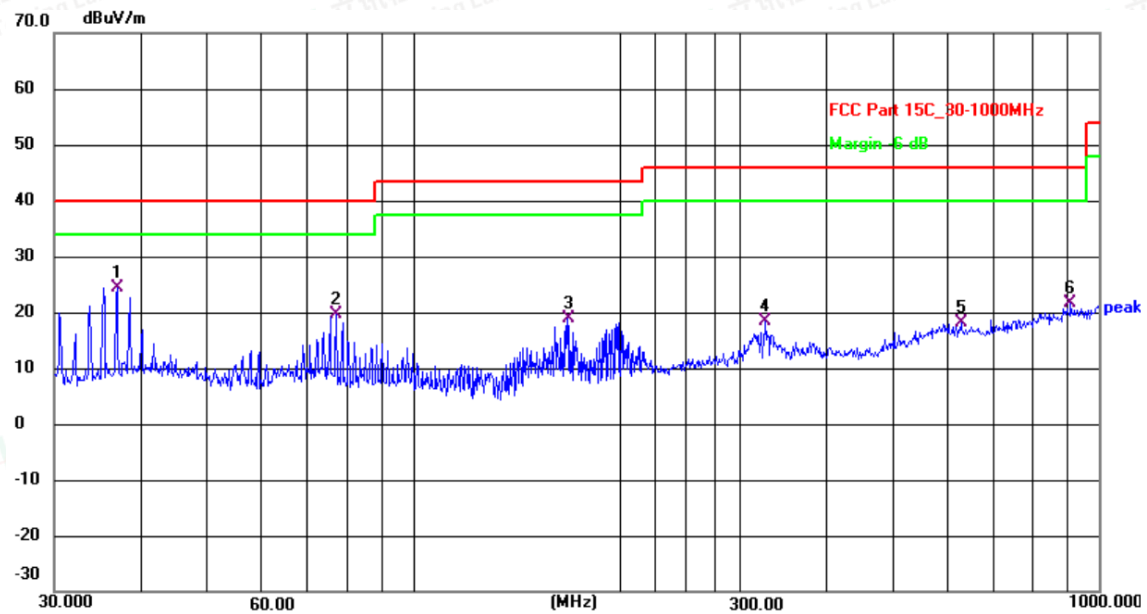


| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1 | 38.6160 | 32.29 | -17.11 | 15.18 | 40.00 | -24.82 | QP |
| 2 | 77.3210 | 36.56 | -19.74 | 16.82 | 40.00 | -23.18 | QP |
| 3 | 141.8262 | 33.42 | -20.57 | 12.85 | 43.50 | -30.65 | QP |
| 4 | 322.1885 | 30.88 | -15.32 | 15.56 | 46.00 | -30.44 | QP |
| 5 | 578.6700 | 28.35 | -10.73 | 17.62 | 46.00 | -28.38 | QP |
| 6 | 872.1832 | 29.05 | -8.28 | 20.77 | 46.00 | -25.23 | QP |





Vertical



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1 | 37.0248 | 42.09 | -17.69 | 24.40 | 40.00 | -15.60 | QP |
| 2 | 77.3210 | 39.29 | -19.77 | 19.52 | 40.00 | -20.48 | QP |
| 3 | 167.8242 | 38.33 | -19.56 | 18.77 | 43.50 | -24.73 | QP |
| 4 | 326.7395 | 32.62 | -14.24 | 18.38 | 46.00 | -27.62 | QP |
| 5 | 629.4772 | 29.22 | -11.07 | 18.15 | 46.00 | -27.85 | QP |
| 6 | 909.6666 | 29.80 | -8.15 | 21.65 | 46.00 | -24.35 | QP |

Note:

- 1). Pre-scan all modes and recorded the worst case results in this report BT LE mode (1Mbps-Middle Channel).
- 2). Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 3). Level = Reading + Factor, Margin = Level – Limit, Factor = Antenna Factor + Cable Loss - Preamp Factor





5.1.9. Results for Radiated Emissions (1 GHz~26.5GHz)

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

worst mode: BT LE, 1 Mbps

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 | 55.29 | 33.06 | 35.04 | 3.94 | 57.25 | 74.00 | -16.75 | Peak | Horizontal |
| 4804.00 | 44.35 | 33.06 | 35.04 | 3.94 | 46.31 | 54.00 | -7.69 | Average | Horizontal |
| 4804.00 | 57.17 | 33.06 | 35.04 | 3.94 | 59.13 | 74.00 | -14.87 | Peak | Vertical |
| 4804.00 | 43.18 | 33.06 | 35.04 | 3.94 | 45.14 | 54.00 | -8.86 | 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 | 55.73 | 33.16 | 35.15 | 3.96 | 57.70 | 74.00 | -16.30 | Peak | Horizontal |
| 4880.00 | 44.37 | 33.16 | 35.15 | 3.96 | 46.34 | 54.00 | -7.66 | Average | Horizontal |
| 4880.00 | 60.56 | 33.16 | 35.15 | 3.96 | 62.53 | 74.00 | -11.47 | Peak | Vertical |
| 4880.00 | 44.65 | 33.16 | 35.15 | 3.96 | 46.62 | 54.00 | -7.38 | 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 | 60.40 | 33.26 | 35.14 | 3.98 | 62.50 | 74.00 | -11.50 | Peak | Horizontal |
| 4960.00 | 43.73 | 33.26 | 35.14 | 3.98 | 45.83 | 54.00 | -8.17 | Average | Horizontal |
| 4960.00 | 53.94 | 33.26 | 35.14 | 3.98 | 56.04 | 74.00 | -17.96 | Peak | Vertical |
| 4960.00 | 44.72 | 33.26 | 35.14 | 3.98 | 46.82 | 54.00 | -7.18 | Average | Vertical |

Notes:

- 1). Pre-scan all modes and recorded the worst case results in this report BT LE mode (1Mbps-Middle Channel).
- 2). Measuring frequencies from 9 KHz~10th harmonic or 26.5GHz (which is less), at least have 20dB margin found between lowest internal used/generated frequency to 30MHz.
- 3). Radiated emissions measured in frequency range from 9 KHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.
- 4). Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5). Measured Level = Reading Level + Factor, Margin = Measured Level – Limit,
Factor = Antenna Factor + Cable Loss - Preamp Factor





5.2. AC Power line conducted emissions

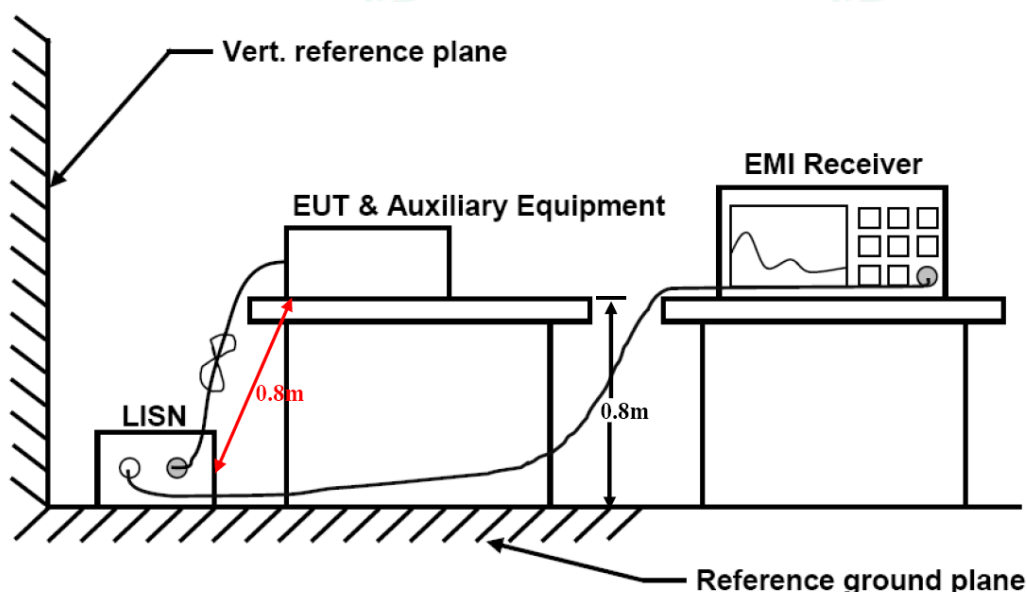
5.2.1 Standard Applicable

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

5.2.2 Block Diagram of Test Setup



5.2.3 Disturbance Calculation

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

$$CD \text{ (dB}\mu\text{V)} = RA \text{ (dB}\mu\text{V)} + PL \text{ (dB)} + CL \text{ (dB)}$$

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

5.2.4 Test Results

| | | | |
|---------------|---------|----------------|---------------|
| Temperature | 22.5°C | Humidity | 53.7% |
| Test Engineer | Jay Luo | Configurations | BT LE, 1 Mbps |

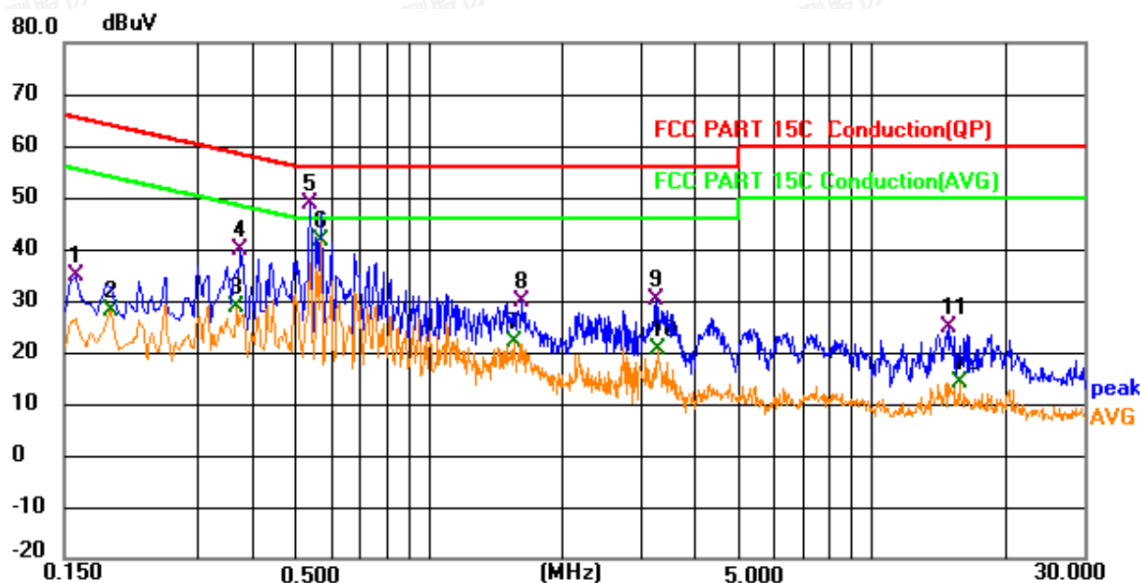
PASS.

The test data please refer to following page.





Line

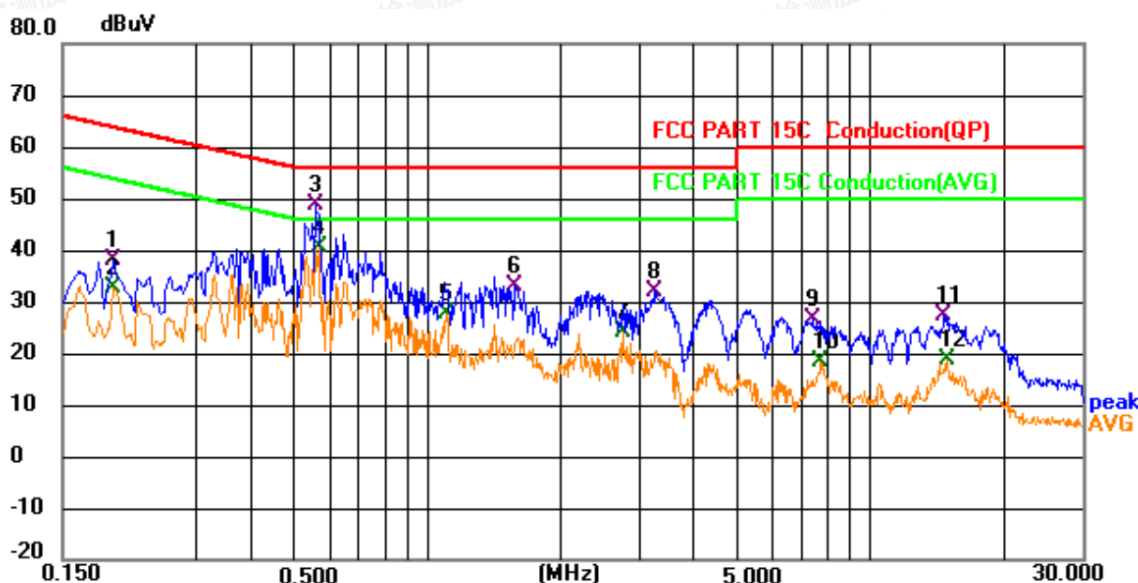


| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Margin | | |
|-----|-----|--------|---------|---------|----------|-------|--------|----------|---------|
| | | MHz | dBuV | dB | ment | dBuV | dB | Detector | Comment |
| 1 | | 0.159 | 14.91 | 19.84 | 34.75 | 65.52 | -30.77 | QP | |
| 2 | | 0.191 | 8.47 | 19.69 | 28.16 | 53.99 | -25.83 | AVG | |
| 3 | | 0.366 | 8.79 | 19.94 | 28.73 | 48.59 | -19.86 | AVG | |
| 4 | | 0.375 | 20.01 | 19.97 | 39.98 | 58.39 | -18.41 | QP | |
| 5 | | 0.537 | 28.96 | 19.73 | 48.69 | 56.00 | -7.31 | QP | |
| 6 | * | 0.569 | 21.94 | 19.62 | 41.56 | 46.00 | -4.44 | AVG | |
| 7 | | 1.558 | 2.81 | 19.04 | 21.85 | 46.00 | -24.15 | AVG | |
| 8 | | 1.626 | 10.84 | 19.02 | 29.86 | 56.00 | -26.14 | QP | |
| 9 | | 3.241 | 11.08 | 19.22 | 30.30 | 56.00 | -25.70 | QP | |
| 10 | | 3.282 | 1.22 | 19.21 | 20.43 | 46.00 | -25.57 | AVG | |
| 11 | | 14.901 | 4.96 | 19.95 | 24.91 | 60.00 | -35.09 | QP | |
| 12 | | 15.725 | -5.71 | 19.83 | 14.12 | 50.00 | -35.88 | AVG | |





Neutral



| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Margin | | |
|-----|-----|--------|---------|---------|----------|-------|--------|----------|---------|
| | | MHz | Level | Factor | ment | | | Detector | Comment |
| | | | dBuV | dB | dBuV | dBuV | dB | | |
| 1 | | 0.195 | 18.13 | 19.75 | 37.88 | 63.83 | -25.95 | QP | |
| 2 | | 0.195 | 12.89 | 19.75 | 32.64 | 53.83 | -21.19 | AVG | |
| 3 | | 0.559 | 29.46 | 19.42 | 48.88 | 56.00 | -7.12 | QP | |
| 4 | * | 0.569 | 21.11 | 19.43 | 40.54 | 46.00 | -5.46 | AVG | |
| 5 | | 1.104 | 8.68 | 18.83 | 27.51 | 46.00 | -18.49 | AVG | |
| 6 | | 1.581 | 13.91 | 19.00 | 32.91 | 56.00 | -23.09 | QP | |
| 7 | | 2.751 | 5.13 | 19.03 | 24.16 | 46.00 | -21.84 | AVG | |
| 8 | | 3.268 | 12.94 | 18.99 | 31.93 | 56.00 | -24.07 | QP | |
| 9 | | 7.391 | 6.93 | 19.74 | 26.67 | 60.00 | -33.33 | QP | |
| 10 | | 7.688 | -1.38 | 19.84 | 18.46 | 50.00 | -31.54 | AVG | |
| 11 | | 14.617 | 7.45 | 19.72 | 27.17 | 60.00 | -32.83 | QP | |
| 12 | | 14.865 | -0.87 | 19.73 | 18.86 | 50.00 | -31.14 | AVG | |

***Note: 1).Pre-scan all modes and recorded the worst case results in this report BT LE mode (1Mbps-Middle Channel).

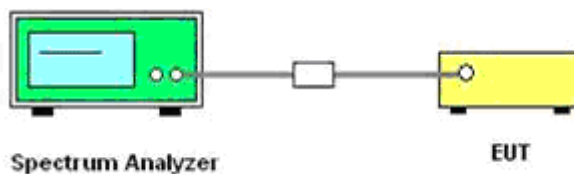
2). Measurement = Reading + Correct Factor, Margin = Measurement – Limit,
Correct Factor=Lisn Factor+Cable Factor+Insertion loss of Pulse Limiter.





5.3. Maximum Peak Conducted Output Power Measurement

5.3.1 Block Diagram of Test Setup



5.3.2 Limit

According to §15.247(b)(1), For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

5.3.3 Test Procedure

The transmitter output is connected to the spectrum.

5.3.4. Test Procedures

- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW ≥ RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.

5.3.5 Test Results

PASS





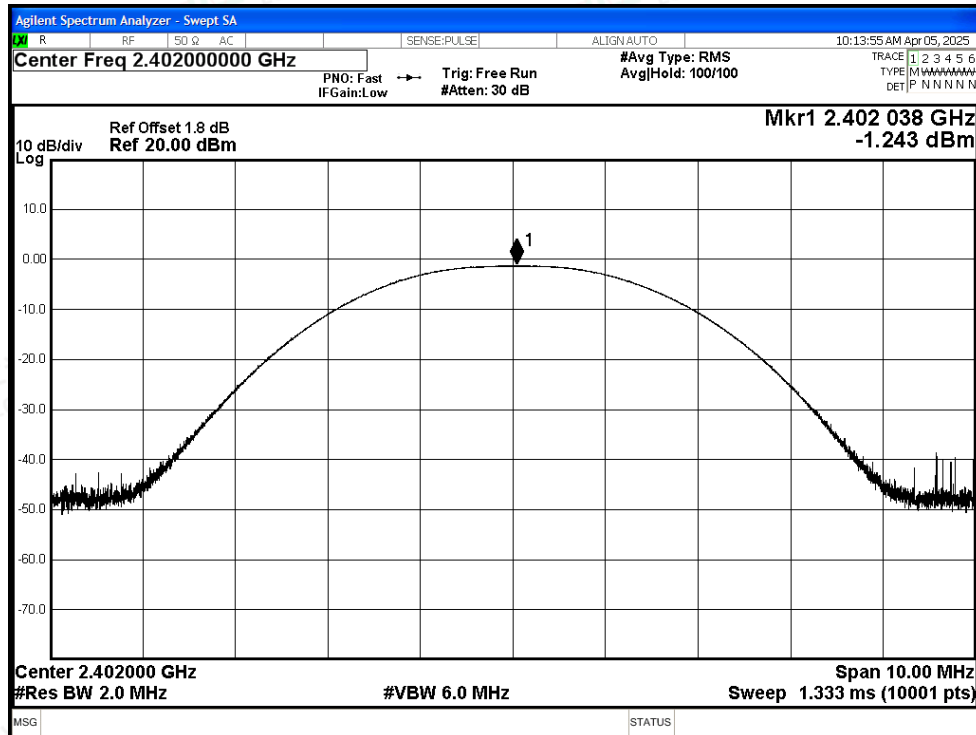
| Condition | Mode | Frequency (MHz) | Antenna | Conducted Power (dBm) | Duty Factor (dB) | Total Power (dBm) | Limit (dBm) | Verdict |
|-----------|--------|-----------------|---------|-----------------------|------------------|-------------------|-------------|---------|
| NVNT | BLE 1M | 2402 | Ant | -1.24 | 0 | -1.24 | 30 | Pass |
| NVNT | BLE 1M | 2440 | Ant | -1.82 | 0 | -1.82 | 30 | Pass |
| NVNT | BLE 1M | 2480 | Ant | -1.01 | 0 | -1.01 | 30 | Pass |
| NVNT | BLE 2M | 2402 | Ant | -1.36 | 0 | -1.36 | 30 | Pass |
| NVNT | BLE 2M | 2440 | Ant | -1.9 | 0 | -1.9 | 30 | Pass |
| NVNT | BLE 2M | 2480 | Ant | -1.08 | 0 | -1.08 | 30 | Pass |



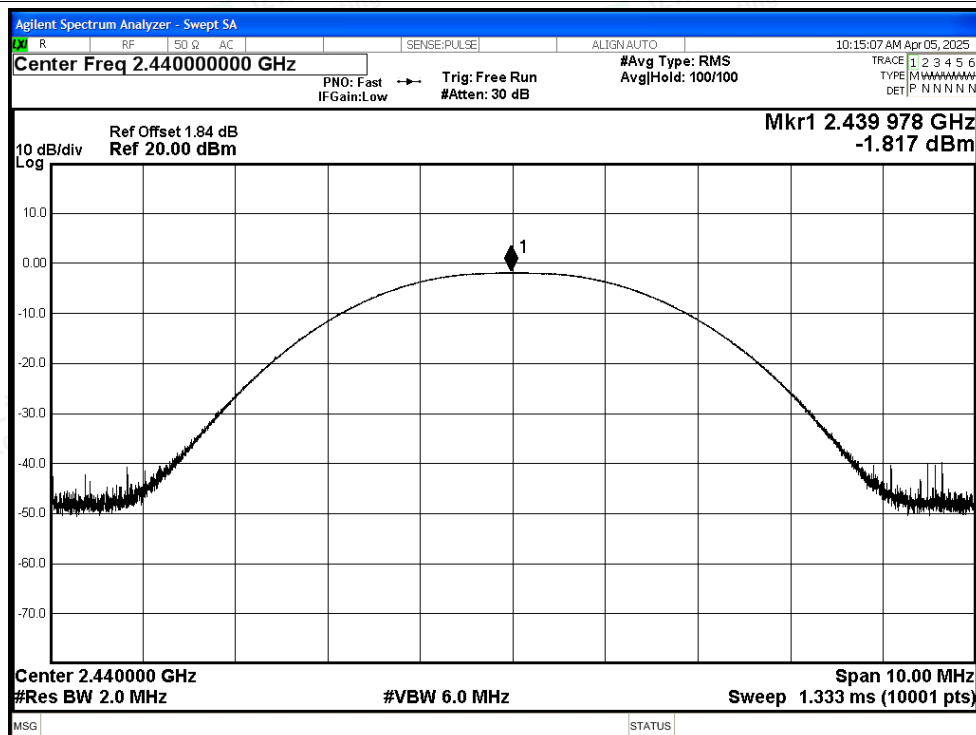


Test Graphs

Power NVNT BLE 1M 2402MHz Ant



Power NVNT BLE 1M 2440MHz Ant

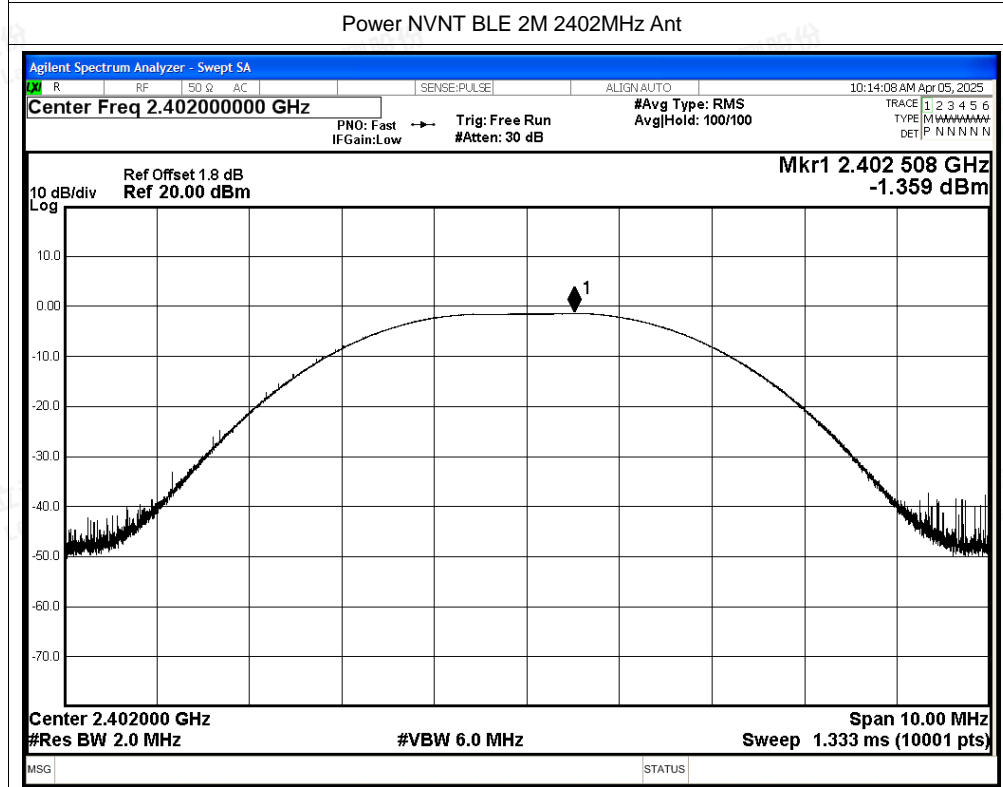
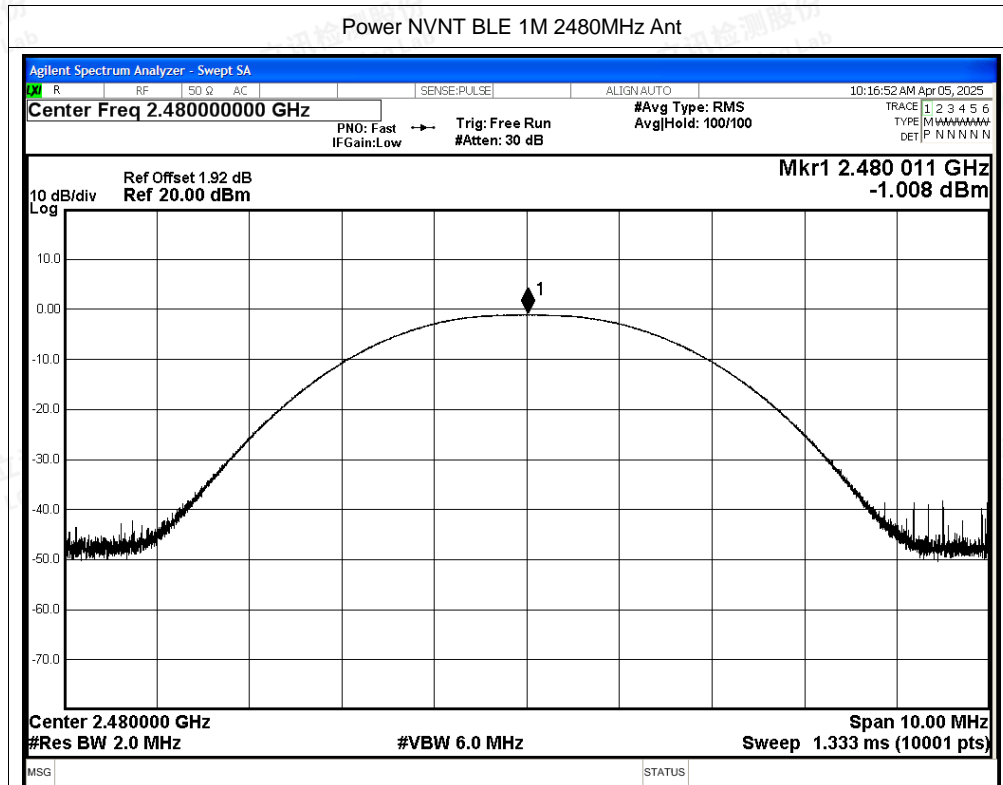


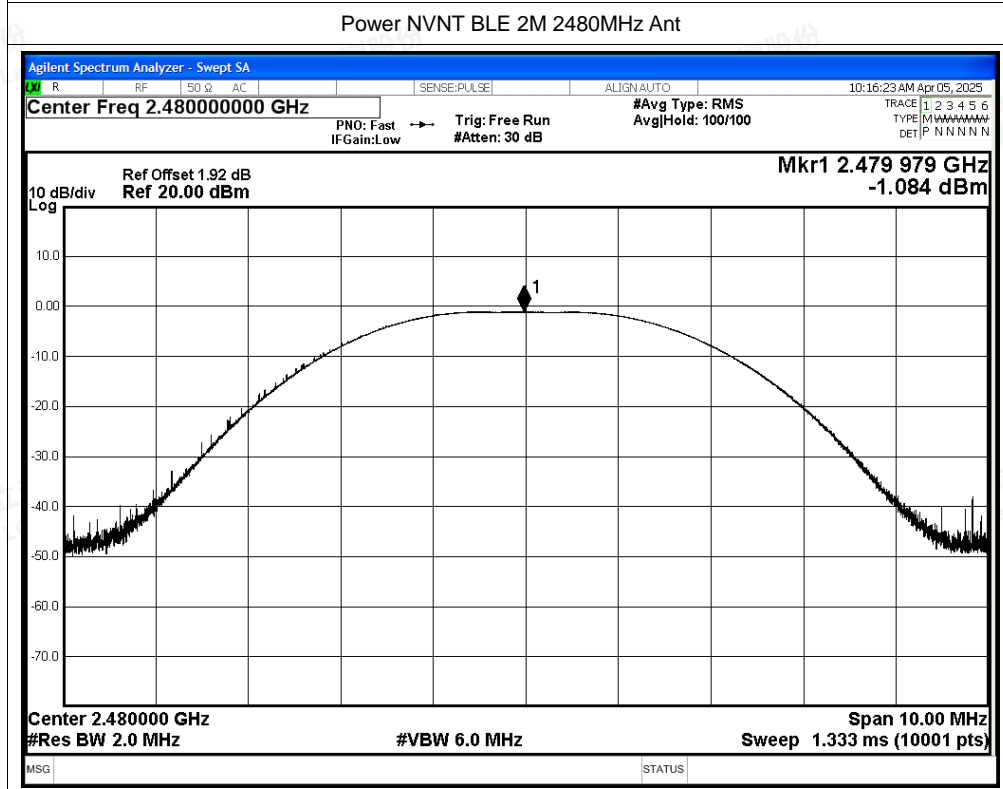
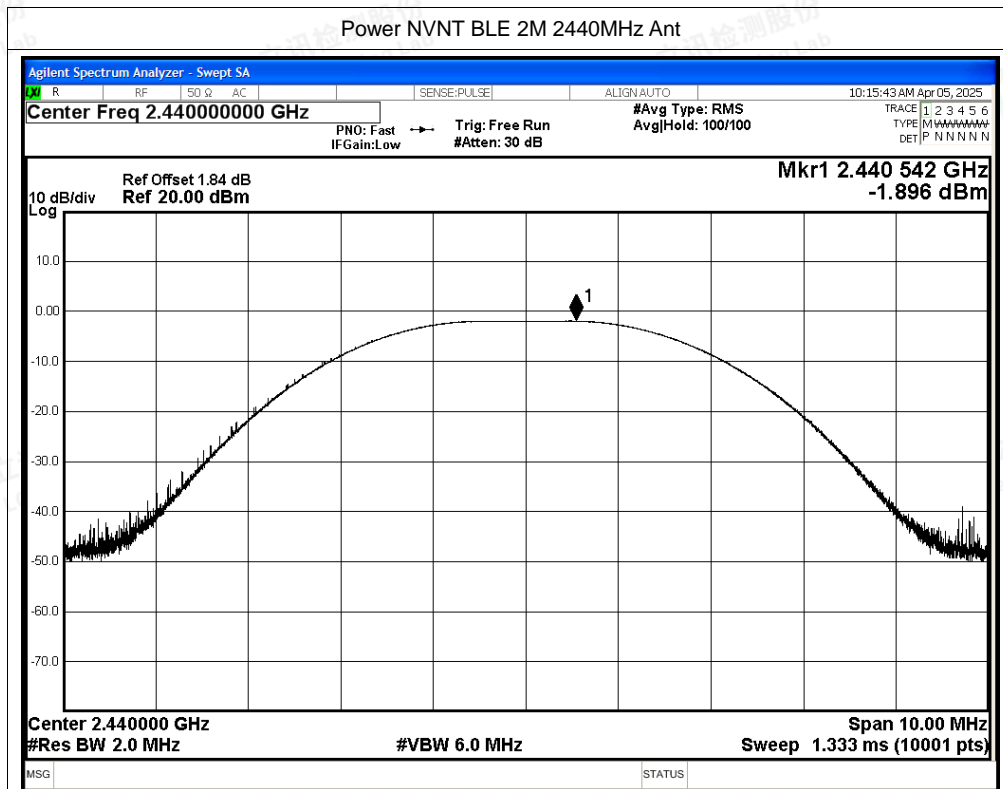
Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity







Remark:

1. Test results including cable loss;
2. Measured output power at difference Packet Type for each mode and recorded worst case for each mode.





6. LIST OF MEASURING EQUIPMENTS

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Date | Due Date |
|------|--------------------------|----------------|-------------|-----------------|------------|------------|
| 1 | Power Meter | R&S | NRVS | 100444 | 2024-06-06 | 2025-06-05 |
| 2 | Power Sensor | R&S | NRV-Z81 | 100458 | 2024-06-06 | 2025-06-05 |
| 3 | Power Sensor | R&S | NRV-Z32 | 10057 | 2024-06-06 | 2025-06-05 |
| 4 | Test Software | Tonscend | JS1120-2 | / | N/A | N/A |
| 5 | RF Control Unit | Tonscend | JS0806-2 | N/A | 2024-06-06 | 2025-06-05 |
| 6 | MXA Signal Analyzer | Agilent | N9020A | MY50510140 | 2024-10-08 | 2025-10-07 |
| 7 | DC Power Supply | Agilent | E3642A | N/A | 2024-10-08 | 2025-10-07 |
| 8 | EMI Test Software | AUDIX | E3 | / | N/A | N/A |
| 9 | 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 2024-06-06 | 2025-06-05 |
| 10 | Positioning Controller | Max-Full | MF7802BS | MF780208586 | N/A | N/A |
| 11 | Active Loop Antenna | SCHWARZBECK | FMZB 1519B | 00005 | 2024-07-13 | 2027-07-12 |
| 12 | By-log Antenna | SCHWARZBECK | VULB9163 | 9163-470 | 2024-08-03 | 2027-08-02 |
| 13 | Horn Antenna | SCHWARZBECK | BBHA 9120D | 9120D-1925 | 2024-07-13 | 2027-07-12 |
| 14 | Broadband Horn Antenna | SCHWARZBECK | BBHA 9170 | 791 | 2024-07-13 | 2027-07-12 |
| 15 | Broadband Preamplifier | SCHWARZBECK | BBV9719 | 9719-025 | 2024-07-30 | 2025-07-29 |
| 16 | EMI Test Receiver | R&S | ESR 7 | 101181 | 2024-06-06 | 2025-06-05 |
| 17 | RS SPECTRUM ANALYZER | R&S | FSP40 | 100503 | 2024-06-06 | 2025-06-05 |
| 18 | Low-frequency amplifier | SchwarzZBECK | BBV9745 | 00253 | 2024-10-08 | 2025-10-07 |
| 19 | High-frequency amplifier | JS Denki Pte | PA0118-43 | JSPA21009 | 2024-10-08 | 2025-10-07 |
| 20 | 6dB Attenuator | / | 100W/6dB | 1172040 | 2024-06-06 | 2025-06-05 |
| 21 | 3dB Attenuator | / | 2N-3dB | / | 2024-10-08 | 2025-10-07 |
| 22 | EMI Test Receiver | R&S | ESPI | 101940 | 2024-06-06 | 2025-06-05 |
| 23 | Artificial Mains | R&S | ENV216 | 101288 | 2024-06-06 | 2025-06-05 |
| 24 | 10dB Attenuator | SCHWARZBECK | MTS-IMP-136 | 261115-001-0032 | 2024-06-06 | 2025-06-05 |
| 25 | EMI Test Software | Farad | EZ | / | N/A | N/A |
| 26 | Antenna Mast | Max-Full | MFA-515BSN | 1308572 | N/A | N/A |
| 27 | Pulse Limiter | R&S | ESH3-Z2 | 102750-NB | 2024-06-06 | 2025-06-05 |





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-----

