ACCREDITED
CERTIFICATE #5473.01

Test Report No.:
FCC2020-0027-2

# TEST REPORT

| | | |
|---|---|---|
| **Applicant** | : | Schneider Electric (China) Co., Ltd., Shenzhen Branch |
| **Product Name** | : | Z-WAVE+ AUX SWITCH |
| **Mode No.** | : | SQR50101WHZ,SQR50101LAZ,SQR50101BKZ |


**Vkan Certification & Testing Co., Ltd.**
威凯检测技术有限公司
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| | |
|---|---|
| **Applicant** | **Name :** Schneider Electric (China) Co., Ltd., Shenzhen Branch<br>**Address :** Room 201, Building A, No. 1 Qianwanyi Road, Shengang Cooperation Zone, Qianhai, Shenzhen, China |
| **Manufacturer** | **Name :** Schneider Electric (China) Co., Ltd., Shenzhen Branch<br>**Address :** Room 201, Building A, No. 1 Qianwanyi Road, Shengang Cooperation Zone, Qianhai, Shenzhen, China |
| **Equipment under Test** | **Product Name :** Z-WAVE+ AUX SWITCH<br>**Model No. :** SQR50101WHZ,SQR50101LAZ,SQR50101BKZ<br>**Trade mark :** Schneider Electric,Square D<br>**Serial no. :** —<br>**Sampling :** — |

| | | | |
|---|---|---|---|
| Date of Receipt. | **2020.12.01** | Date of Testing | **2020.12.01~2021.02.02** |

| **Test Specification** | **Test Result** |
|---|---|
| FCC CFR47 Part 15C (2020) Radio Frequency Devices<br>ANSI C63.10 (2013) | PASS |

| | |
|---|---|
| Evaluation of Test Result | The equipment under test was found to comply with the requirements of the standards applied.<br>**Issue Date: 2021.02.03** |

| Tested by: | Reviewed by: | Approved by: |
|---|---|---|
| Xu Zhenfei | Liu Yonghai | Zeng Bo |
| Name Signature | Name Signature | Name Signature |

**Other Aspects: NONE.**

Abbreviations:OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested

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# 1. General Product Information

The model of this application: SQR50101WHZ,SQR50101LAZ,SQR50101BKZ. SQR50101LAZ and SQR50101BKZ have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction with SQR50101WHZ. The difference lies only model number and color. All the tests carried out on model SQR50101WHZ.

## 1.1 General information

| | |
|---|---|
| Product Name | Z-WAVE+ AUX SWITCH |
| Model No. | SQR50101WHZ,SQR50101LAZ,SQR50101BKZ |
| Power Supply | 120 Vac,60Hz |
| Antenna Type | External Antenna |
| Antenna Connector | A permanently attached antenna (meet with the standard FCC Part 15.203 requirement) |
| Antenna Gain | Antenna 1:0.5dBi |
| Wireless Frequency | 908.4 MHz, 908.42 MHz, 916.00 MHz |
| Modulation Type | FSK, GFSK |
| Data rate | 9.6 kbps, 40 kbps, 100 kbps |
| FCC ID | 2AUCU-50101Z |
| Note：<br>1. The information of the EUT is declared by the manufacturer. | |

# 2. Test Sites

## 2.1 Test Facilities

The tests and measurements refer to this report were performed by EMC testing Lab. of Vkan Certification & Testing Co., Ltd.

Add.: No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, 510663, P. R. China

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The EMC testing laboratory has been recognized by CNAS, and authorized by Nemko of Norway since 1997, and accredited by DAkkS of Germany since 2007, and assessed and found eligible to participated in the TDAP of VDE testing and certification Institute since 2004, and registered by FCC since 2001.

## 2.2 Description of Non-standard Method and Deviations

The testing and measurement methods used in this report are applied by all standard methods. Not any non-standard method or deviation from the used standards was used.

## 2.3 List of Test and Measurement Instruments

Refer to **Appendix**.

# 3. Test Configuration

## 3.1 Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

# 4. Summary of measurement results

| Summary of measurements of results | Clause in FCC rules | Verdict | Note |
|---|---|---|---|
| AC Power Line Conducted Emissions | 15.207 | PASS | |
| Radiated Emissions | 15.249(a)(d)(e),15.205,15.209 | PASS | |
| Occupied Bandwidth | 15.215(c) | PASS | |
| Antenna Requirement | 15.203 | PASS | |

# 5. Measurement procedure

## 5.1 AC Power Line Conducted Emission

### Ambient condition:

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23°C ~25°C | 45%~50% | 101.5kPa |

### Method of Measurement:

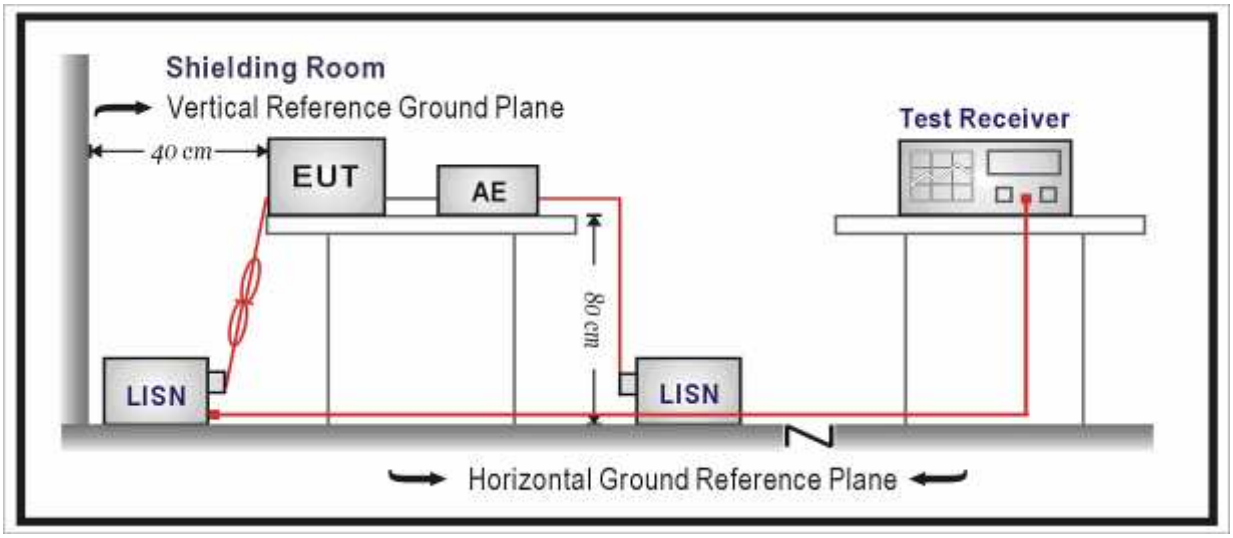
The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.10-2013. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz.The measurement result should include both L line and N line.

The test is in transmitting mode.

### Limits:

| Frequency (MHz) | Conducted Limits(dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 - 0.5 | 66 to 56 * | 56 to 46* |
| 0.5 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |
| Note 1: The lower limit shall apply at the transition frequencies.<br>Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz. | | |

## Test Setup:




Note: AC Power source is used to change the voltage 120V/60Hz.

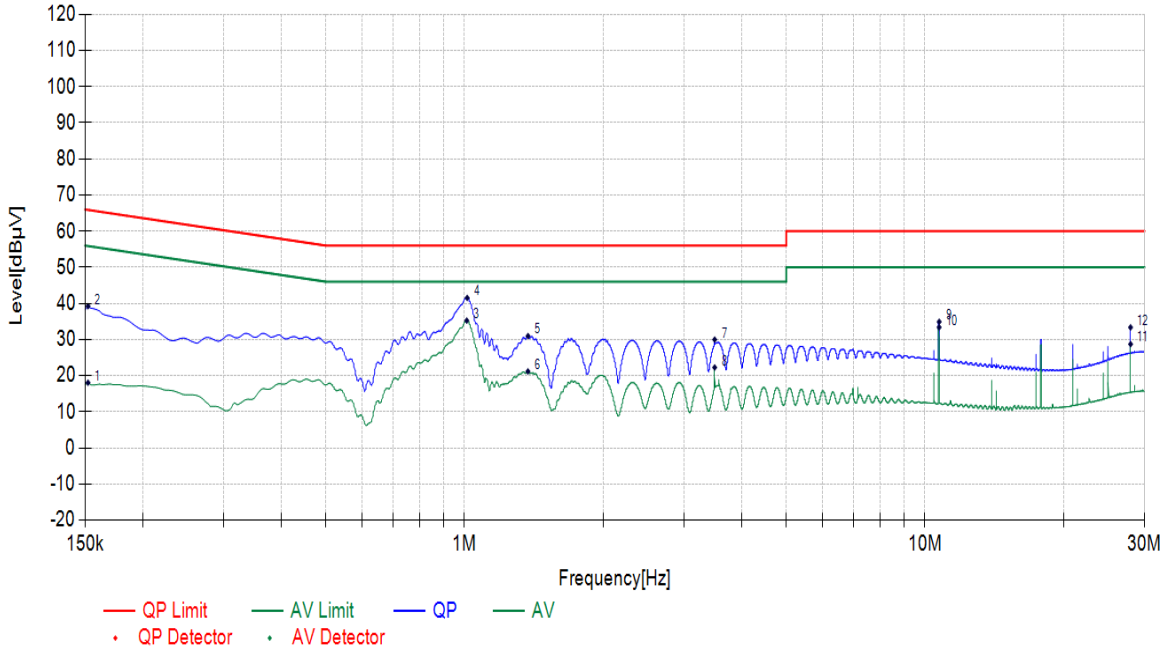
## Measurement Uncertainty：

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96. U= 3.12 dB.

## Test Results:

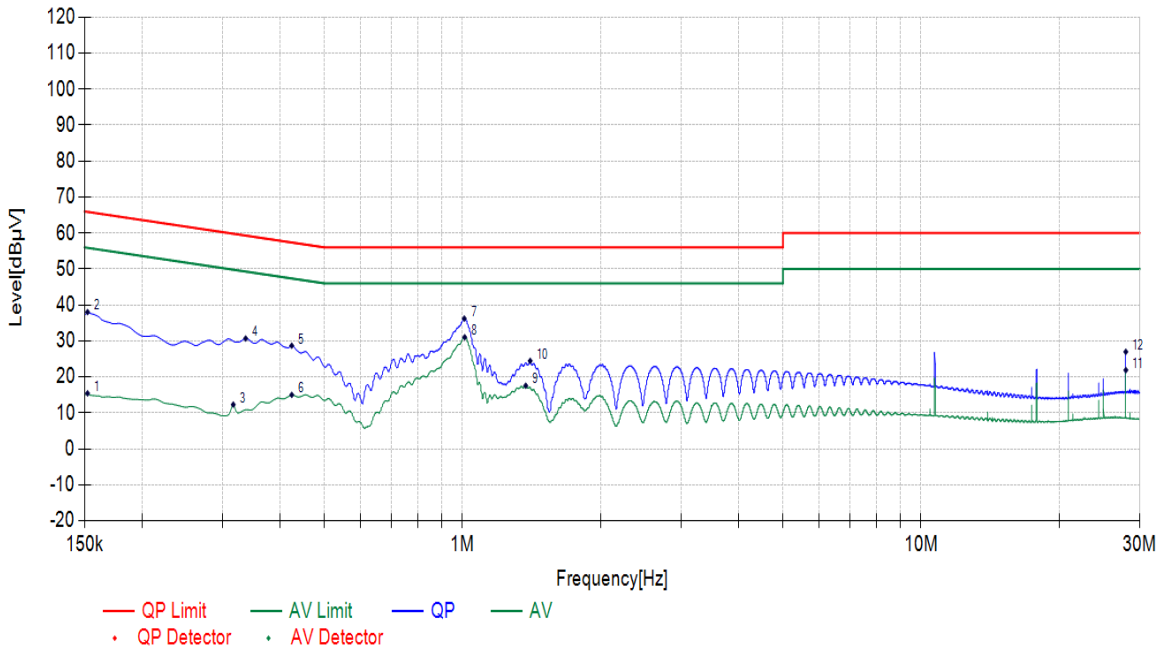
| Test Carrier frequency (MHz) | 908.4 |
|---|---|
| Power port | L |

| Suspected List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBμV] | Level [dBμV] | Limit [dBμV] | Margin [dB] | Detector | Pass/Fail |
| 12 | 27.9645 | 10.59 | 22.76 | 33.35 | 60.00 | 26.65 | QP | PASS |
| 2 | 0.1523 | 10.16 | 29.06 | 39.22 | 65.88 | 26.66 | QP | PASS |
| 7 | 3.4958 | 10.21 | 19.76 | 29.97 | 56.00 | 26.03 | QP | PASS |
| 5 | 1.3740 | 10.18 | 20.78 | 30.96 | 56.00 | 25.04 | QP | PASS |
| 9 | 10.7385 | 10.36 | 24.55 | 34.91 | 60.00 | 25.09 | QP | PASS |
| 4 | 1.0140 | 10.17 | 31.34 | 41.51 | 56.00 | 14.49 | QP | PASS |
| 10 | 10.7385 | 10.36 | 23.02 | 33.38 | 50.00 | 16.62 | AV | PASS |
| 6 | 1.3740 | 10.18 | 10.98 | 21.16 | 46.00 | 24.84 | AV | PASS |
| 3 | 1.0118 | 10.17 | 25.07 | 35.24 | 46.00 | 10.76 | AV | PASS |
| 11 | 27.9645 | 10.59 | 18.12 | 28.71 | 50.00 | 21.29 | AV | PASS |
| 8 | 3.4958 | 10.21 | 12.03 | 22.24 | 46.00 | 23.76 | AV | PASS |
| 1 | 0.1523 | 10.16 | 7.89 | 18.05 | 55.88 | 37.83 | AV | PASS |



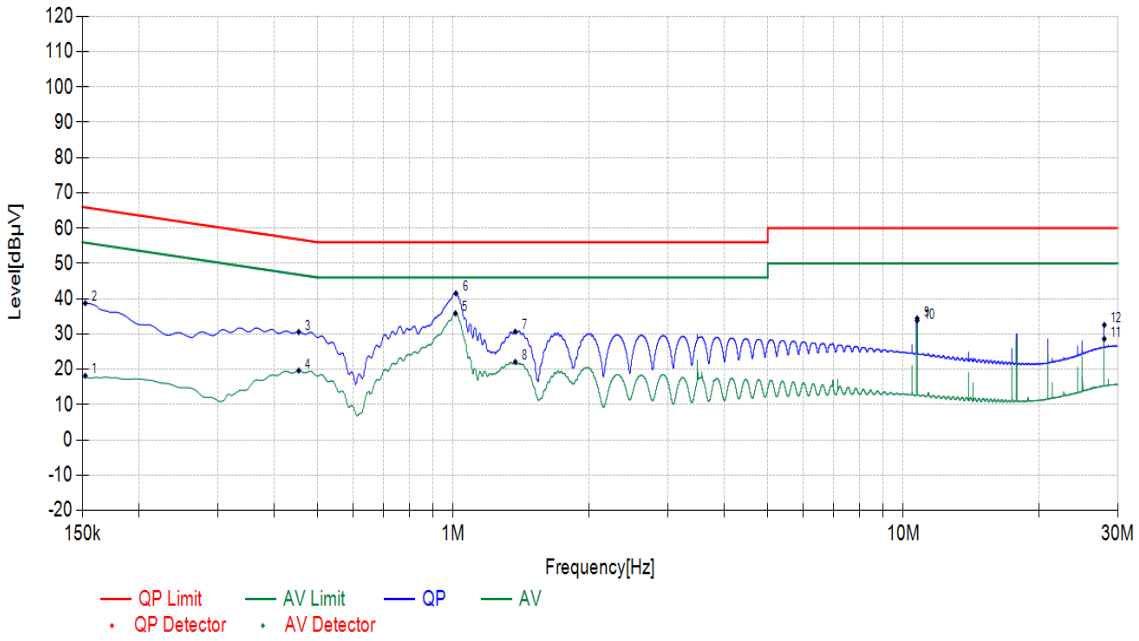
| Test Carrier frequency (MHz) | 908.4 |
|---|---|
| Power port | N |

| Suspected List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBµV] | Level [dBµV] | Limit [dBµV] | Margin [dB] | Detector | Pass/Fail |
| 12 | 27.9645 | 10.67 | 15.70 | 26.97 | 60.00 | 33.03 | QP | PASS |
| 10 | 1.4055 | 10.18 | 14.56 | 24.44 | 56.00 | 31.56 | QP | PASS |
| 7 | 1.0095 | 10.17 | 26.85 | 36.22 | 56.00 | 19.78 | QP | PASS |
| 5 | 0.4245 | 10.15 | 19.53 | 28.68 | 57.36 | 28.68 | QP | PASS |
| 2 | 0.1523 | 10.15 | 27.56 | 38.01 | 65.88 | 27.87 | QP | PASS |
| 4 | 0.3368 | 10.15 | 21.52 | 30.67 | 59.28 | 28.61 | QP | PASS |
| 8 | 1.0118 | 10.17 | 20.84 | 31.01 | 46.00 | 14.99 | AV | PASS |
| 6 | 0.4245 | 10.15 | 4.85 | 15.00 | 47.36 | 32.36 | AV | PASS |
| 3 | 0.3165 | 10.14 | 2.16 | 12.30 | 49.80 | 37.50 | AV | PASS |
| 9 | 1.3740 | 10.18 | 7.36 | 17.54 | 46.00 | 28.46 | AV | PASS |
| 11 | 27.9645 | 10.67 | 11.20 | 21.87 | 50.00 | 28.13 | AV | PASS |
| 1 | 0.1523 | 10.15 | 5.27 | 15.42 | 55.88 | 40.46 | AV | PASS |



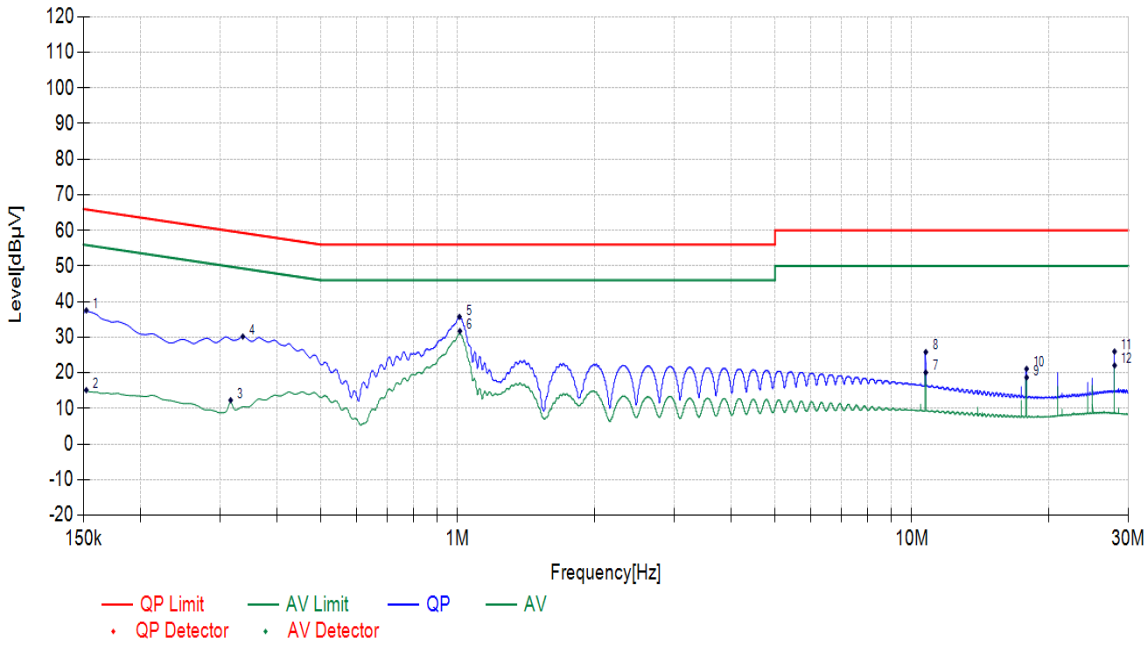
| Test Carrier frequency (MHz) | 908.42 |
|---|---|
| Power port | L |

| Suspected List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBµV] | Level [dBµV] | Limit [dBµV] | Margin [dB] | Detector | Pass/Fail |
| 12 | 27.9645 | 10.59 | 21.96 | 32.55 | 60.00 | 27.45 | QP | PASS |
| 3 | 0.4538 | 10.15 | 20.41 | 30.56 | 56.81 | 26.25 | QP | PASS |
| 6 | 1.0140 | 10.17 | 31.34 | 41.51 | 56.00 | 14.49 | QP | PASS |
| 2 | 0.1523 | 10.16 | 28.56 | 38.72 | 65.88 | 27.16 | QP | PASS |
| 9 | 10.7385 | 10.36 | 24.05 | 34.41 | 60.00 | 25.59 | QP | PASS |
| 7 | 1.3740 | 10.18 | 20.48 | 30.66 | 56.00 | 25.34 | QP | PASS |
| 4 | 0.4538 | 10.15 | 9.47 | 19.62 | 46.81 | 27.19 | AV | PASS |
| 5 | 1.0118 | 10.17 | 25.67 | 35.84 | 46.00 | 10.16 | AV | PASS |
| 11 | 27.9645 | 10.59 | 18.02 | 28.61 | 50.00 | 21.39 | AV | PASS |
| 10 | 10.7385 | 10.36 | 23.42 | 33.78 | 50.00 | 16.22 | AV | PASS |
| 8 | 1.3740 | 10.18 | 11.88 | 22.06 | 46.00 | 23.94 | AV | PASS |
| 1 | 0.1523 | 10.16 | 7.99 | 18.15 | 55.88 | 37.73 | AV | PASS |



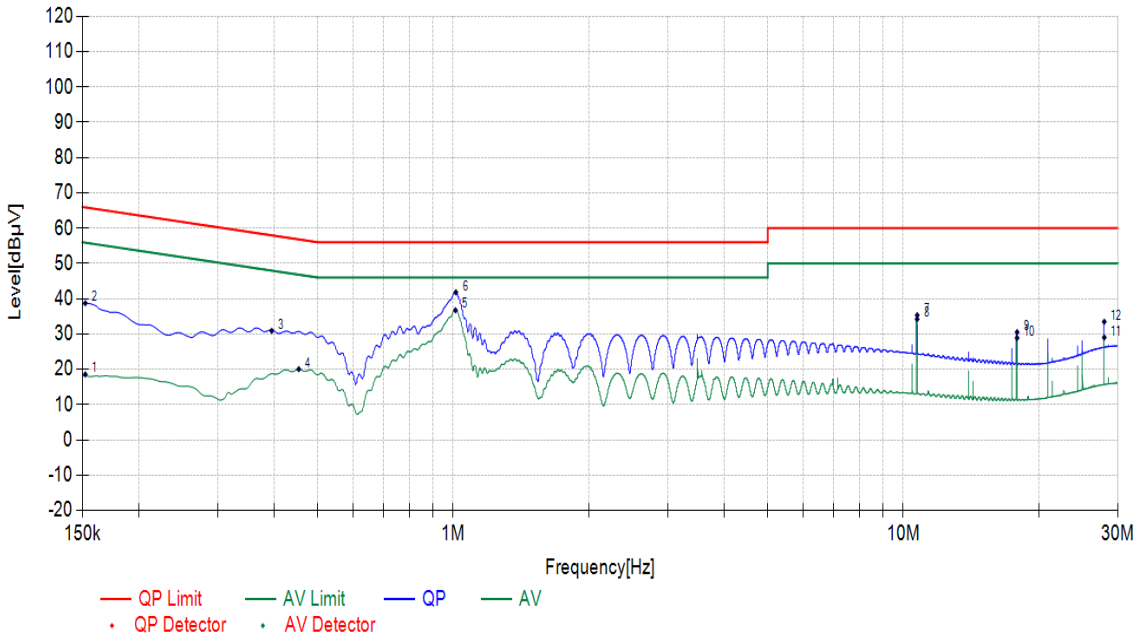
| Test Carrier frequency (MHz) | 908.42 |
|---|---|
| Power port | N |

| Suspected List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBµV] | Level [dBµV] | Limit [dBµV] | Margin [dB] | Detector | Pass/Fail |
| 1 | 0.1523 | 10.15 | 27.36 | 37.51 | 65.88 | 28.37 | QP | PASS |
| 10 | 17.9003 | 10.53 | 10.58 | 21.11 | 60.00 | 38.89 | QP | PASS |
| 11 | 27.9645 | 10.67 | 15.30 | 25.97 | 60.00 | 34.03 | QP | PASS |
| 5 | 1.0095 | 10.17 | 25.55 | 35.72 | 56.00 | 20.28 | QP | PASS |
| 8 | 10.7385 | 10.37 | 15.46 | 25.83 | 60.00 | 34.17 | QP | PASS |
| 4 | 0.3368 | 10.15 | 20.02 | 30.17 | 59.28 | 29.11 | QP | PASS |
| 12 | 27.9645 | 10.67 | 11.40 | 22.07 | 50.00 | 27.93 | AV | PASS |
| 2 | 0.1523 | 10.15 | 4.97 | 15.12 | 55.88 | 40.76 | AV | PASS |
| 3 | 0.3165 | 10.14 | 2.16 | 12.30 | 49.80 | 37.50 | AV | PASS |
| 9 | 17.9003 | 10.53 | 8.16 | 18.69 | 50.00 | 31.31 | AV | PASS |
| 7 | 10.7385 | 10.37 | 9.71 | 20.08 | 50.00 | 29.92 | AV | PASS |
| 6 | 1.0118 | 10.17 | 21.54 | 31.71 | 46.00 | 14.29 | AV | PASS |



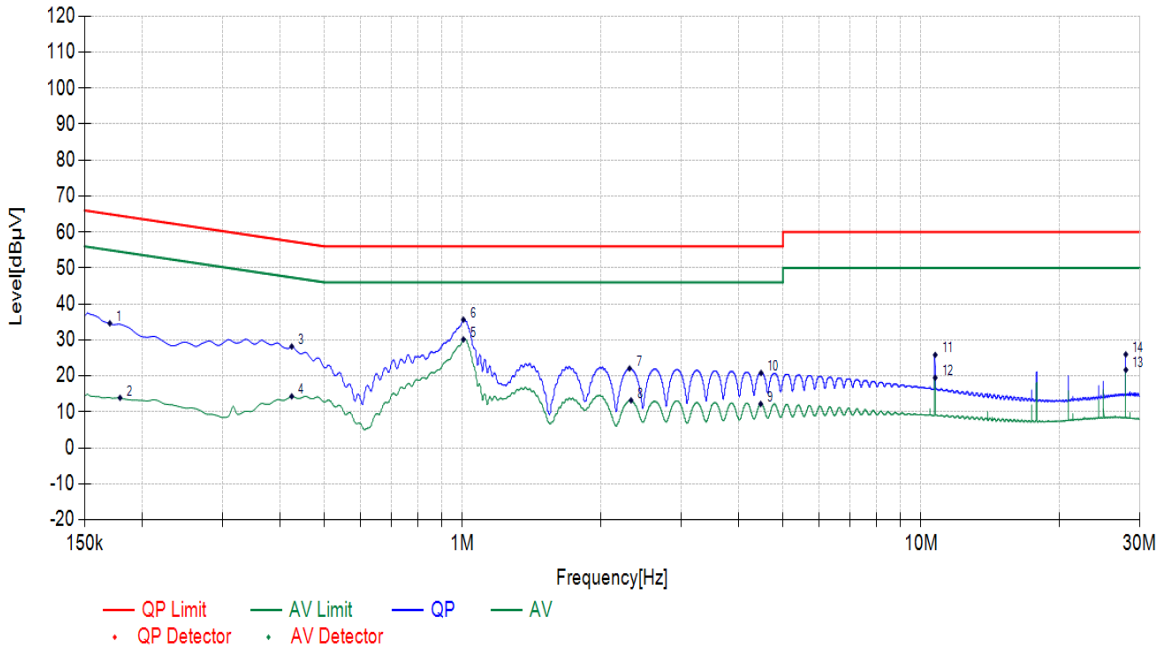
| Test Carrier frequency (MHz) | 916 |
|---|---|
| Power port | L |

| Suspected List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBµV] | Level [dBµV] | Limit [dBµV] | Margin [dB] | Detector | Pass/Fail |
| 12 | 27.9645 | 10.59 | 22.86 | 33.45 | 60.00 | 26.55 | QP | PASS |
| 3 | 0.3953 | 10.15 | 20.73 | 30.88 | 57.95 | 27.07 | QP | PASS |
| 6 | 1.0140 | 10.17 | 31.64 | 41.81 | 56.00 | 14.19 | QP | PASS |
| 2 | 0.1523 | 10.16 | 28.56 | 38.72 | 65.88 | 27.16 | QP | PASS |
| 9 | 17.9003 | 10.50 | 20.01 | 30.51 | 60.00 | 29.49 | QP | PASS |
| 7 | 10.7385 | 10.36 | 24.95 | 35.31 | 60.00 | 24.69 | QP | PASS |
| 4 | 0.4538 | 10.15 | 9.87 | 20.02 | 46.81 | 26.79 | AV | PASS |
| 5 | 1.0118 | 10.17 | 26.57 | 36.74 | 46.00 | 9.26 | AV | PASS |
| 11 | 27.9645 | 10.59 | 18.42 | 29.01 | 50.00 | 20.99 | AV | PASS |
| 10 | 17.9003 | 10.50 | 18.38 | 28.88 | 50.00 | 21.12 | AV | PASS |
| 8 | 10.7385 | 10.36 | 23.82 | 34.18 | 50.00 | 15.82 | AV | PASS |
| 1 | 0.1523 | 10.16 | 8.39 | 18.55 | 55.88 | 37.33 | AV | PASS |



| Test Carrier frequency (MHz) | 916 |
|---|---|
| Power port | N |

| Suspected List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBµV] | Level [dBµV] | Limit [dBµV] | Margin [dB] | Detector | Pass/Fail |
| 14 | 27.9645 | 10.67 | 15.30 | 25.97 | 60.00 | 34.03 | QP | PASS |
| 1 | 0.1703 | 10.14 | 24.47 | 34.61 | 64.95 | 30.34 | QP | PASS |
| 7 | 2.3145 | 10.20 | 11.86 | 22.06 | 56.00 | 33.94 | QP | PASS |
| 10 | 4.4790 | 10.23 | 10.60 | 20.83 | 56.00 | 35.17 | QP | PASS |
| 11 | 10.7385 | 10.37 | 15.46 | 25.83 | 60.00 | 34.17 | QP | PASS |
| 3 | 0.4245 | 10.15 | 18.03 | 28.18 | 57.36 | 29.18 | QP | PASS |
| 6 | 1.0050 | 10.17 | 25.44 | 35.61 | 56.00 | 20.39 | QP | PASS |
| 9 | 4.4700 | 10.23 | 1.97 | 12.20 | 46.00 | 33.80 | AV | PASS |
| 5 | 1.0050 | 10.17 | 19.97 | 30.14 | 46.00 | 15.86 | AV | PASS |
| 2 | 0.1793 | 10.14 | 3.76 | 13.90 | 54.52 | 40.62 | AV | PASS |
| 4 | 0.4245 | 10.15 | 4.15 | 14.30 | 47.36 | 33.06 | AV | PASS |
| 8 | 2.3325 | 10.20 | 2.98 | 13.18 | 46.00 | 32.82 | AV | PASS |



## 5.2 Radiated Emission

### Ambient condition:

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23°C ~25°C | 45%~50% | 101.5kPa |

### Method of Measurement:

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013.The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Set the spectrum analyzer in the following:

Below 1GHz (detector: Peak and Quasi-Peak)

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz(detector: Peak):

(a)PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO

(b)AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded. Then this mode was measured in the following mode: EUT with cradle and EUT without cradle. The worst emission was found in EUT with cradle mode and the worst case was recorded.

The test is in transmitting mode.

## Limits:

Limit in restricted band(Part 15.209)

| Frequency (MHz) | Measurement Distance (m) | Field strength(uV/m) | Level (dBuV/m) |
|---|---|---|---|
| 0.009–0.490 | 300 | 2400/F(kHz) | / |
| 0.490–1.705 | 30 | 24000/F(kHz) | / |
| 1.705–30.0 | 30 | 30 | / |
| 30 - 88 | 3 | 100 | 40 |
| 88 - 216 | 3 | 150 | 43.5 |
| 216 - 960 | 3 | 200 | 46 |
| Above 960-1000 | 3 | 500 | 54 |
| Note 1: The lower limit shall apply at the transition frequency.<br>Note 2: Distance refers to the distance in meters between the measuring instrument Antenna and the closed point of any part of the device or system.<br>Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m) | | | |

Limit in radiated emission measurement (Part 15.209)

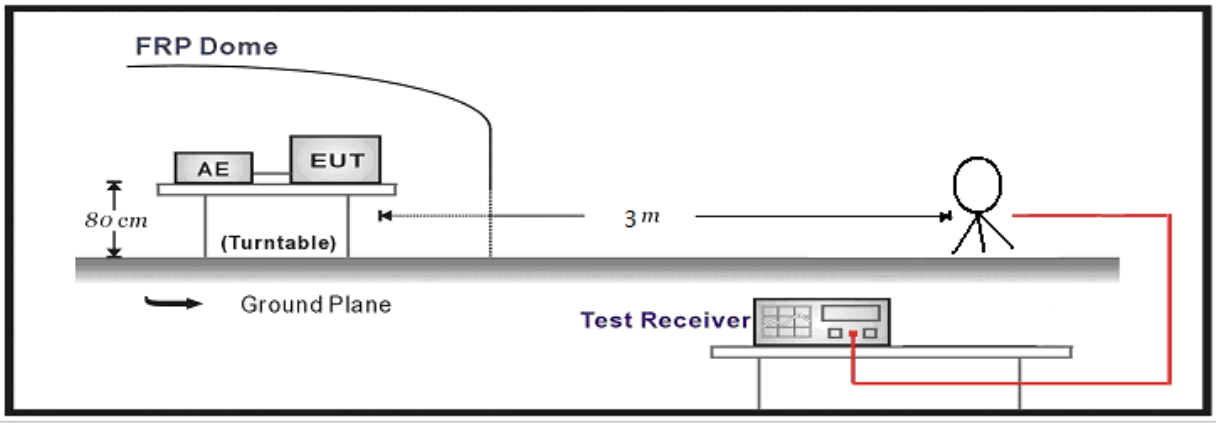
| Frequency(MHz) | Field strength(dBuV/m) @3m | |
|---|---|---|
| Above 1000 | 74(peak) | 54(average) |

Limit in radiated emission measurement (Part 15.249)

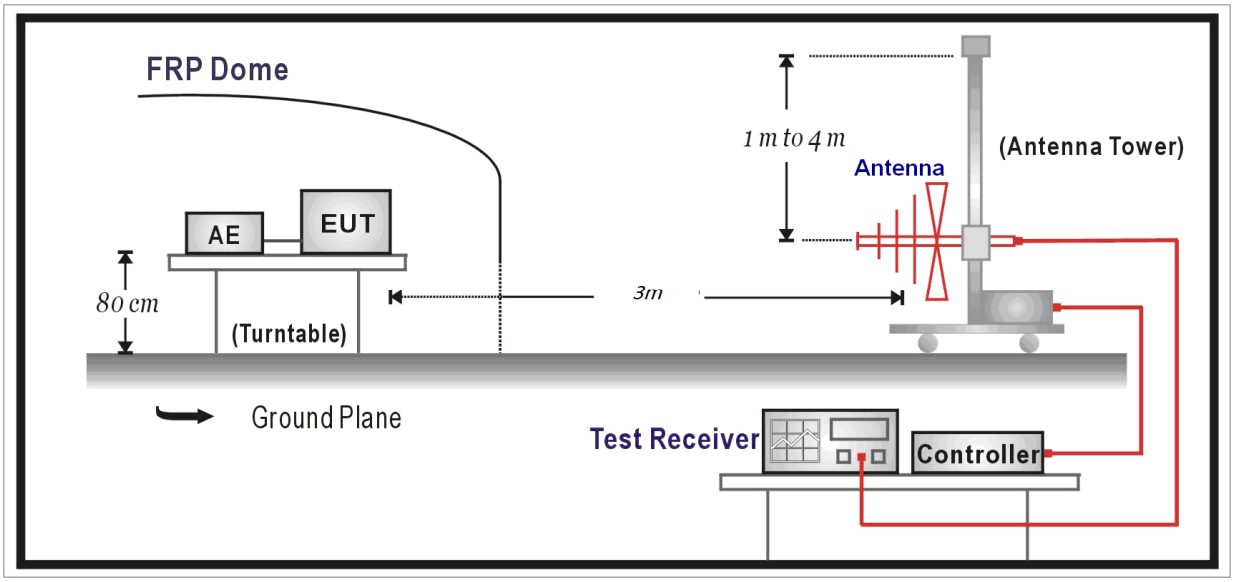
| Frequency(MHz) | Field strength(dBuV/m) @3m | |
|---|---|---|
| | (millivolts/meter) | (dBuV/m) |
| 902-928 MHz fundamental | 50 | 94 |
| 902-928 MHz harmonics | 500 | / |

## Test Setup:

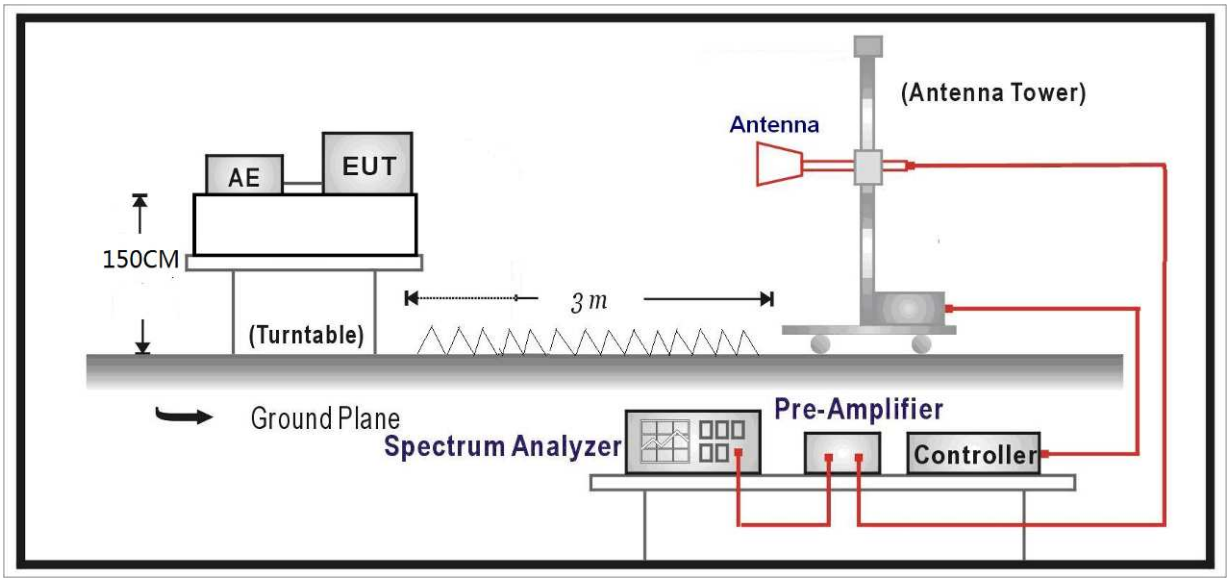
Below 30MHz Test Setup:




Below 1GHz Test Setup:



Above 1GHz Test Setup:




## Measurement Uncertainty：

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96.

| Frequency | Uncertainty |
|---|---|
| above 1G | 4.10 dB |
| below 1G | 4.84 dB |

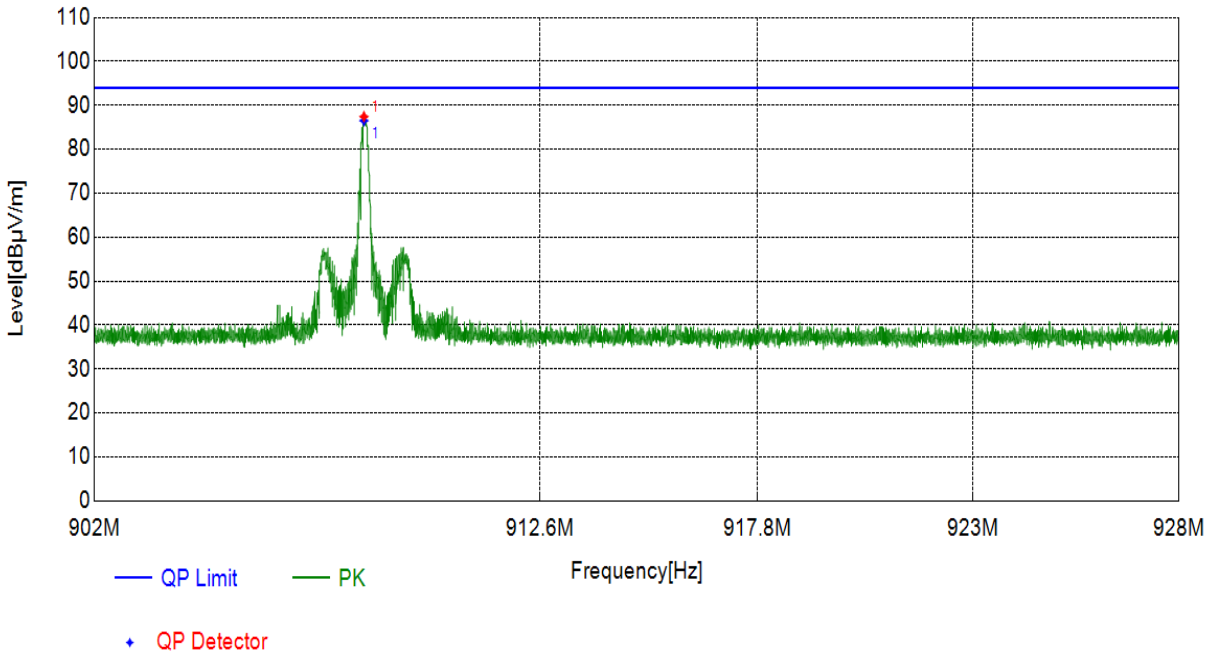
## Test Results:

## Fundamental Field Strength：

| Test Carrier frequency (MHz) | 908.4 |
|---|---|
| Polarity | Horizontal |

| **Suspected List** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBμV/m] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
| 908.3960 | Horizontal | 31.87 | 55.67 | 87.44 | 94.00 | 6.56 | PK | 100 | 50 | PASS |

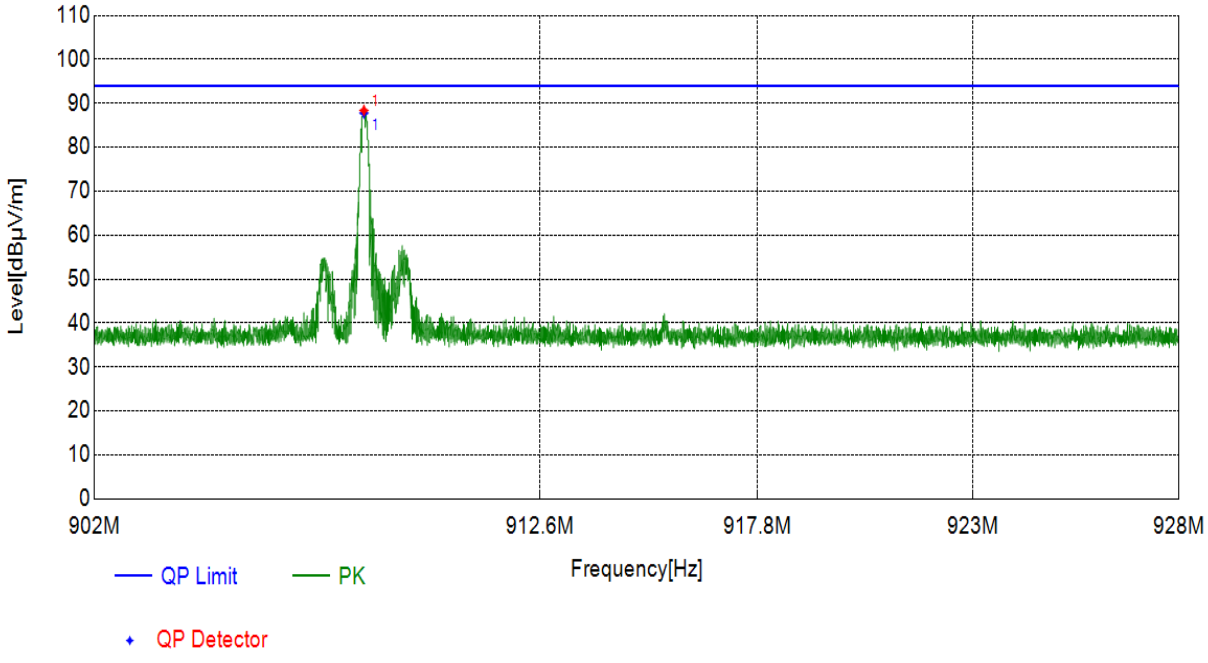
| **Final Data List** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | QP Value [dBμV/m] | QP Limit [dBμV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Pass/Fail |
| 908.3960 | Horizontal | 31.87 | 86.60 | 94.00 | 7.50 | 100 | 50 | PASS |



| | |
|---|---|
| Test Carrier frequency (MHz) | 908.4 |
| Polarity | Vertical |

| **Suspected List** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
| 908.3960 | Vertical | 31.87 | 56.72 | 88.39 | 94.00 | 5.61 | PK | 100 | 50 | PASS |

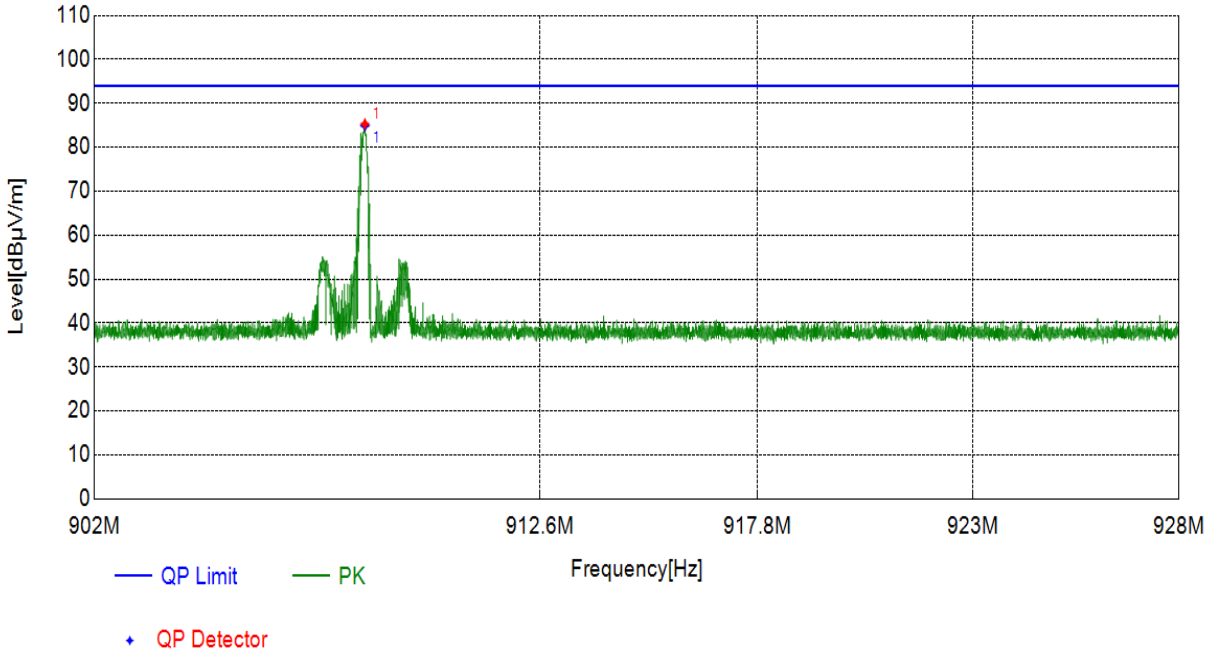
| **Final Data List** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Pass/Fail |
| 908.3960 | Vertical | 31.87 | 87.87 | 94.00 | 6.23 | 100 | 50 | PASS |



| | |
|---|---|
| Test Carrier frequency (MHz) | 908.42 |
| Polarity | Horizontal |

| Suspected List | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
| 908.4184 | Horizontal | 31.87 | 53.55 | 85.32 | 94.00 | 8.68 | PK | 100 | 150 | PASS |

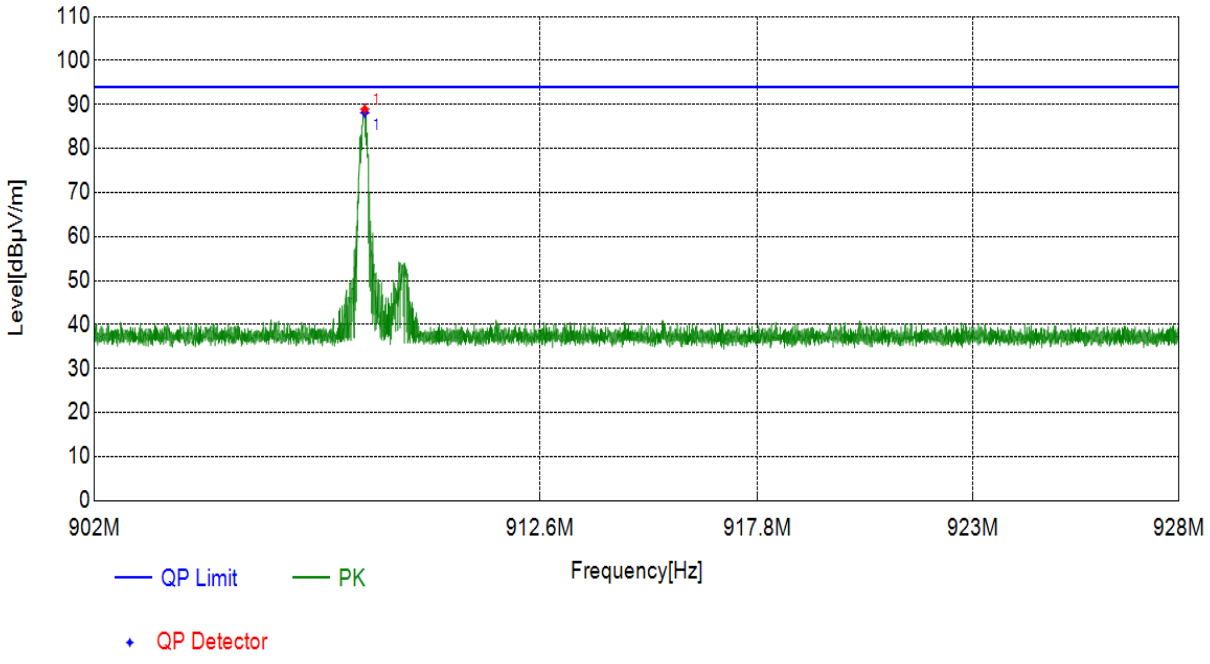
| Final Data List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Pass/Fail |
| 908.4184 | Horizontal | 31.87 | 84.98 | 94.00 | 9.12 | 100 | 150 | PASS |



| | |
|---|---|
| Test Carrier frequency (MHz) | 908.42 |
| Polarity | Vertical |

| Suspected List | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
| 908.4158 | Vertical | 31.87 | 57.08 | 88.96 | 94.00 | 5.05 | PK | 100 | 20 | PASS |

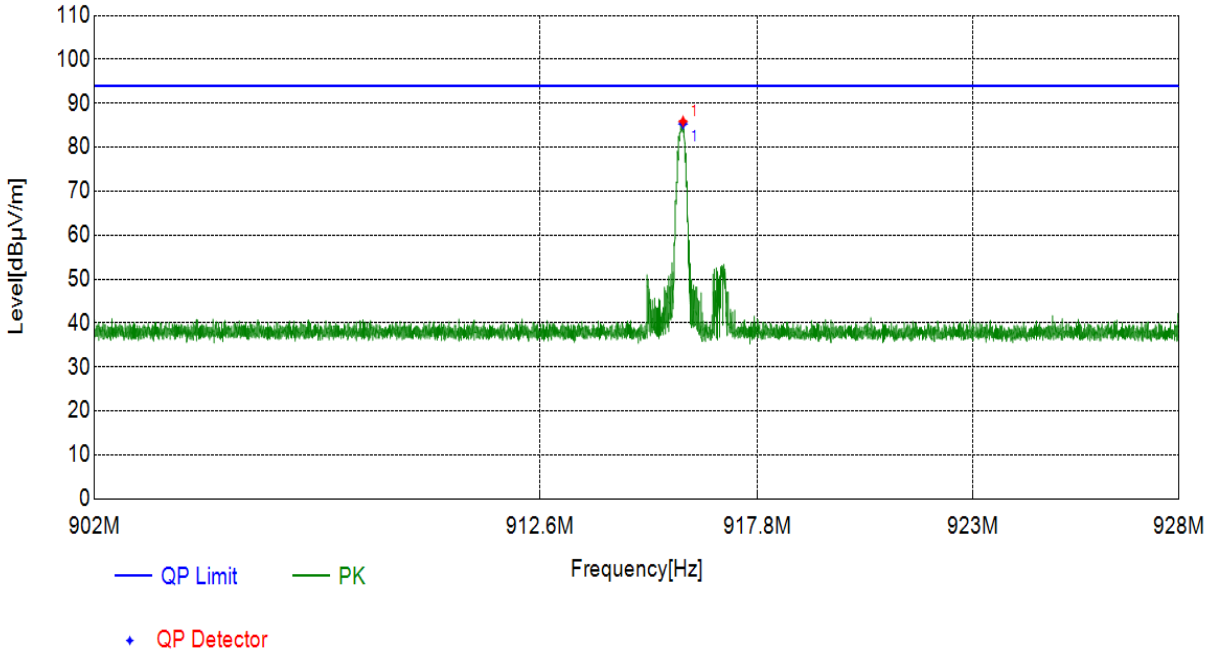
| Final Data List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Pass/Fail |
| 908.4158 | Vertical | 31.87 | 88.23 | 94.00 | 5.87 | 100 | 20 | PASS |



| | |
|---|---|
| Test Carrier frequency (MHz) | 916 |
| Polarity | Horizontal |

| Suspected List | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
| 916.0206 | Horizontal | 31.85 | 54.14 | 85.89 | 94.00 | 8.11 | PK | 100 | 70 | PASS |

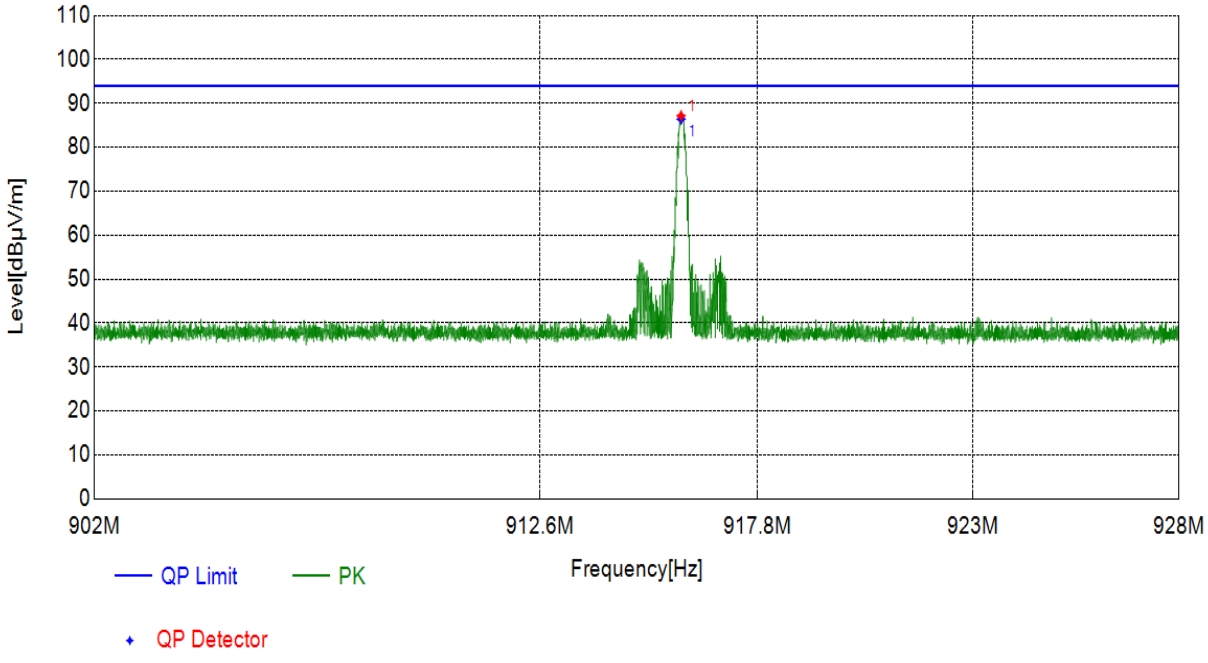
| Final Data List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Pass/Fail |
| 916.0206 | Horizontal | 31.85 | 85.42 | 94.00 | 8.68 | 100 | 70 | PASS |



| Test Carrier frequency (MHz) | 916 |
|---|---|
| Polarity | Vertical |

| Suspected List | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
| 915.9738 | Vertical | 31.85 | 55.42 | 87.17 | 94.00 | 6.83 | PK | 100 | 90 | PASS |

| Final Data List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Pass/Fail |
| 915.9738 | Vertical | 31.85 | 86.49 | 94.00 | 7.61 | 100 | 90 | PASS |

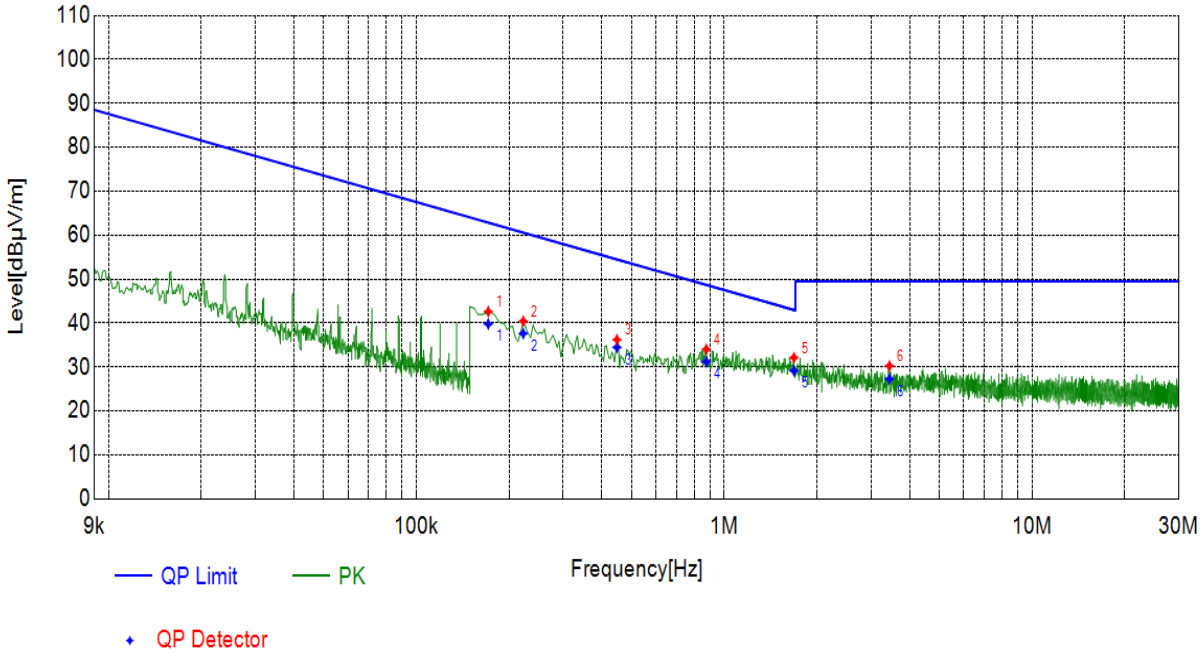


SPURIOUS EMISSIONS 9KHz~30MHz：

| Radiated Emission | 9KHz-30MHz |
|---|---|
| Polarity | X axis |

| Suspected List | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBμV/m] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
| 0.1713 | X axis | 20.40 | 22.20 | 42.60 | 62.85 | 20.25 | PK | 100 | 150 | PASS |
| 0.2225 | X axis | 20.37 | 20.06 | 40.43 | 60.57 | 20.14 | PK | 100 | 90 | PASS |
| 0.4485 | X axis | 20.41 | 15.80 | 36.21 | 54.47 | 18.26 | PK | 100 | 250 | PASS |
| 0.8750 | X axis | 20.59 | 13.43 | 34.02 | 48.68 | 14.66 | PK | 100 | 320 | PASS |
| 1.6854 | X axis | 20.73 | 11.39 | 32.12 | 43.00 | 10.88 | PK | 100 | 40 | PASS |
| 3.4425 | X axis | 20.99 | 9.25 | 30.24 | 49.50 | 19.26 | PK | 100 | 0 | PASS |

| Final Data List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | QP Value [dBμV/m] | QP Limit [dBμV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Pass/Fail |
| 0.1713 | X axis | 20.40 | 39.78 | 62.85 | 23.07 | 100 | 150 | PASS |
| 0.2225 | X axis | 20.37 | 37.61 | 60.57 | 22.96 | 100 | 90 | PASS |
| 0.4485 | X axis | 20.41 | 34.47 | 54.47 | 20.00 | 100 | 250 | PASS |
| 0.8750 | X axis | 20.59 | 31.21 | 48.68 | 17.47 | 100 | 320 | PASS |
| 1.6854 | X axis | 20.73 | 29.14 | 43.00 | 13.86 | 100 | 40 | PASS |
| 3.4425 | X axis | 20.99 | 27.26 | 49.50 | 22.24 | 100 | 0 | PASS |



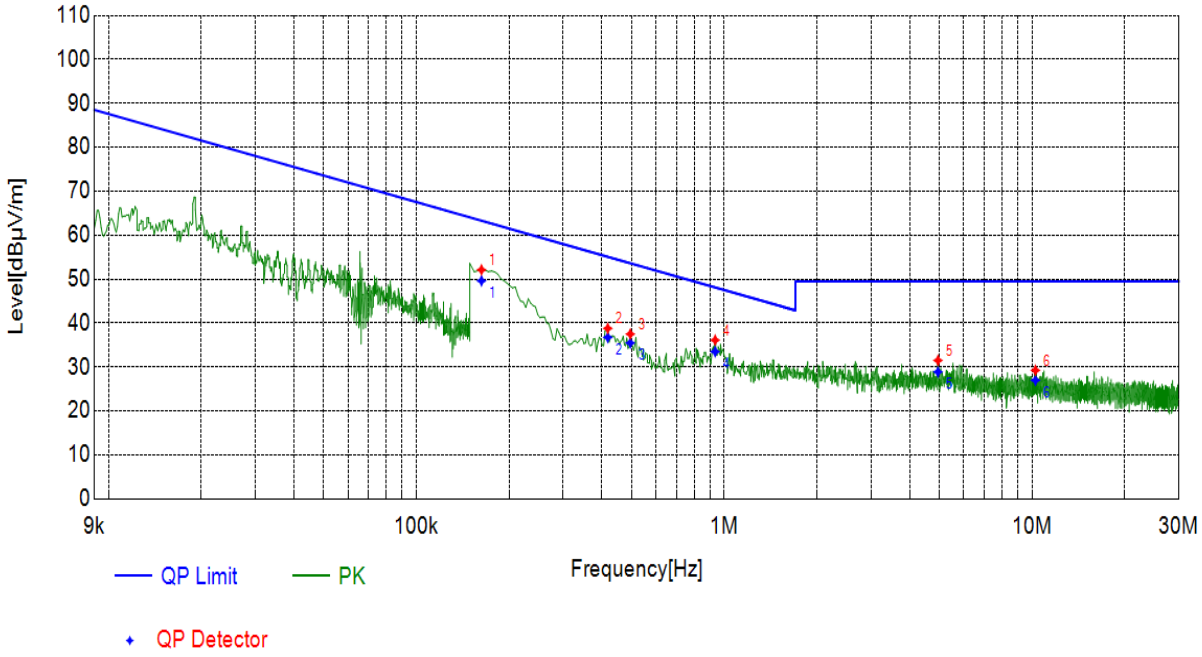

| | |
|---|---|
| Radiated Emission | 9KHz-30MHz |
| Polarity | Y axis |

**Suspected List**

| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.1628 | Y axis | 20.41 | 31.70 | 52.11 | 63.29 | 11.18 | PK | 100 | 270 | PASS |
| 0.4187 | Y axis | 20.32 | 18.46 | 38.78 | 55.07 | 16.29 | PK | 100 | 300 | PASS |
| 0.4955 | Y axis | 20.56 | 16.94 | 37.50 | 53.60 | 16.10 | PK | 100 | 320 | PASS |
| 0.9347 | Y axis | 20.56 | 15.55 | 36.11 | 48.11 | 12.00 | PK | 100 | 90 | PASS |
| 4.9480 | Y axis | 21.13 | 10.36 | 31.49 | 49.50 | 18.01 | PK | 100 | 270 | PASS |
| 10.2578 | Y axis | 20.95 | 8.29 | 29.24 | 49.50 | 20.26 | PK | 100 | 230 | PASS |

**Final Data List**

| Frequency [MHz] | Polarity | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Pass/Fail |
|---|---|---|---|---|---|---|---|---|
| 0.1628 | Y axis | 20.41 | 49.61 | 63.29 | 13.68 | 100 | 270 | PASS |
| 0.4187 | Y axis | 20.32 | 36.75 | 55.07 | 18.32 | 100 | 300 | PASS |
| 0.4955 | Y axis | 20.56 | 35.47 | 53.60 | 18.13 | 100 | 320 | PASS |
| 0.9347 | Y axis | 20.56 | 33.49 | 48.11 | 14.62 | 100 | 90 | PASS |
| 4.9480 | Y axis | 21.13 | 28.87 | 49.50 | 20.63 | 100 | 270 | PASS |
| 10.2578 | Y axis | 20.95 | 26.98 | 49.50 | 22.52 | 100 | 230 | PASS |




Note: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

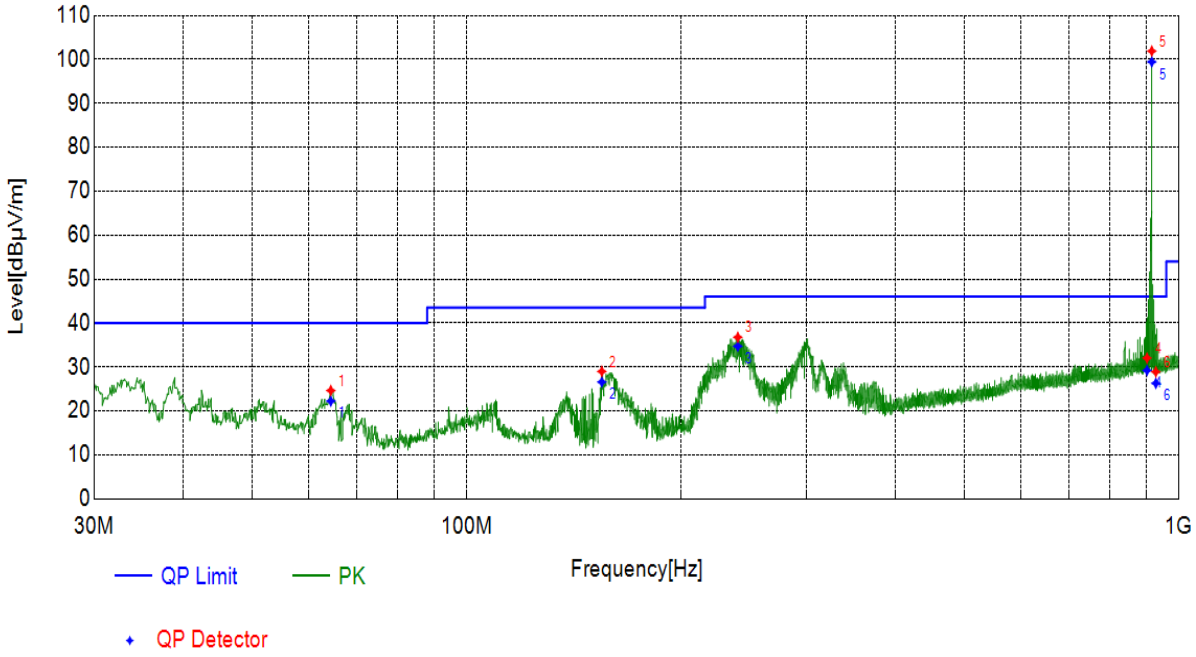
3. All the modes had been tested, but only the worst data recorded in the report.

SPURIOUS EMISSIONS 30MHz~1GHz：

| Radiated Emission | 30MHz-1GHz |
|---|---|
| Polarity | Horizontal |
| Channel | Worst-Case HIGH channel |

| Suspected List | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBμV/m] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
| 64.4384 | Horizontal | 17.41 | 7.24 | 24.65 | 40.00 | 15.35 | PK | 100 | 225 | PASS |
| 154.7545 | Horizontal | 15.90 | 13.09 | 28.99 | 43.52 | 14.53 | PK | 100 | 249 | PASS |
| 240.2200 | Horizontal | 20.01 | 16.76 | 36.77 | 46.02 | 9.25 | PK | 100 | 359 | PASS |
| 902.0202 | Horizontal | 31.88 | 0.15 | 32.03 | 46.02 | 13.99 | PK | 100 | 220 | PASS |
| 916.0866 | Horizontal | 31.85 | 70.04 | 101.89 | 46.02 | -55.87 | PK | 100 | 46 | Fundamental |
| 928.0188 | Horizontal | 31.84 | -2.93 | 28.91 | 46.02 | 17.11 | PK | 100 | 55 | PASS |

| Final Data List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | QP Value [dBμV/m] | QP Limit [dBμV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Pass/Fail |
| 64.4384 | Horizontal | 17.41 | 22.24 | 40.00 | 17.76 | 171 | 225 | PASS |
| 154.7545 | Horizontal | 15.90 | 26.58 | 43.52 | 16.94 | 103 | 249 | PASS |
| 240.2200 | Horizontal | 20.01 | 34.72 | 46.02 | 11.30 | 148 | 359 | PASS |
| 902.0202 | Horizontal | 31.88 | 29.22 | 46.02 | 16.80 | 100 | 220 | PASS |
| 916.0866 | Horizontal | 31.85 | 99.44 | 46.02 | -53.42 | 110 | 46 | Fundamental |
| 928.0188 | Horizontal | 31.84 | 26.29 | 46.02 | 19.73 | 130 | 55 | PASS |


110
100
90
80
70
60
50
40
30
20
10
0
Level[dBµV/m]
30M
100M
1G
Frequency[Hz]
QP Limit
PK
QP Detector

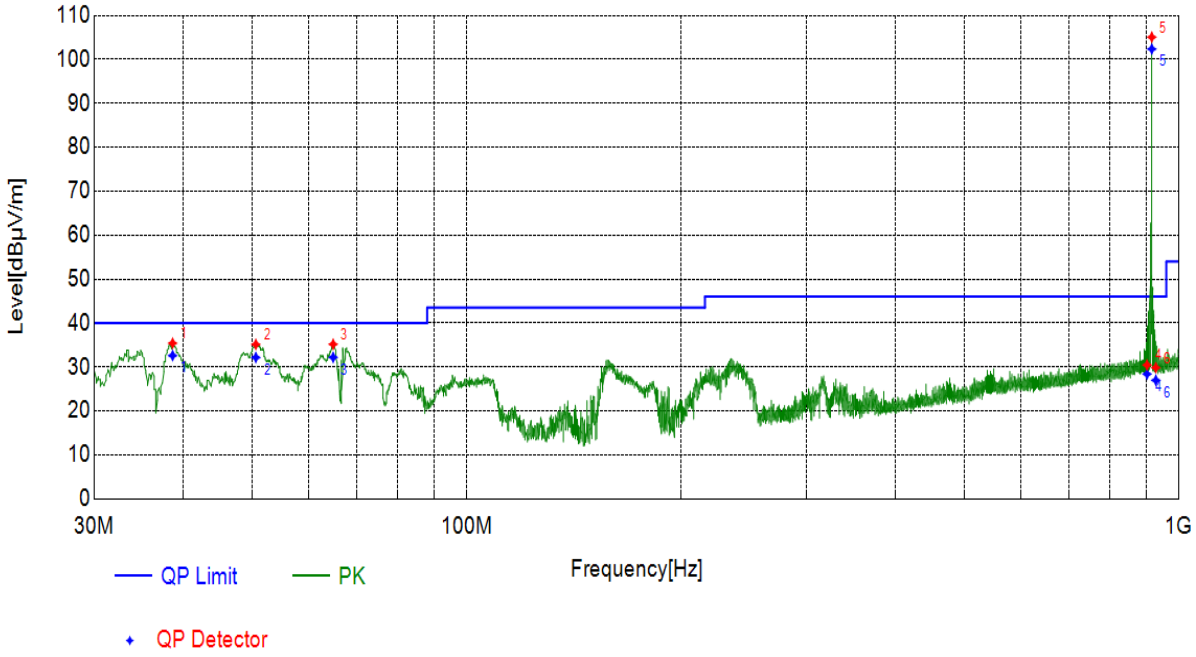
| | |
|---|---|
| Radiated Emission | 30MHz-1GHz |
| Polarity | Vertical |
| Channel | Worst-Case HIGH channel |

**Suspected List**

| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
|---|---|---|---|---|---|---|---|---|---|---|
| 38.6339 | Vertical | 21.18 | 14.23 | 35.41 | 40.00 | 4.59 | PK | 100 | 107 | PASS |
| 50.5661 | Vertical | 20.44 | 14.70 | 35.14 | 40.00 | 4.86 | PK | 100 | 290 | PASS |
| 64.9235 | Vertical | 17.31 | 17.86 | 35.17 | 40.00 | 4.83 | PK | 100 | 201 | PASS |
| 902.0202 | Vertical | 31.88 | -1.42 | 30.46 | 46.02 | 15.56 | PK | 100 | 163 | PASS |
| 916.0866 | Vertical | 31.85 | 73.22 | 105.07 | 46.02 | -59.05 | PK | 100 | 177 | Fundamental |
| 928.0188 | Vertical | 31.84 | -1.99 | 29.85 | 46.02 | 16.17 | PK | 100 | 154 | PASS |

**Final Data List**

| Frequency [MHz] | Polarity | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Pass/Fail |
|---|---|---|---|---|---|---|---|---|
| 38.6339 | Vertical | 21.18 | 32.60 | 40.00 | 7.40 | 174 | 107 | PASS |
| 50.5661 | Vertical | 20.44 | 32.17 | 40.00 | 7.83 | 131 | 290 | PASS |
| 64.9235 | Vertical | 17.31 | 32.20 | 40.00 | 7.80 | 108 | 201 | PASS |
| 902.0202 | Vertical | 31.88 | 28.39 | 46.02 | 17.63 | 100 | 163 | PASS |
| 916.0866 | Vertical | 31.85 | 102.36 | 46.02 | -56.34 | 150 | 177 | Fundamental |
| 928.0188 | Vertical | 31.84 | 26.98 | 46.02 | 19.04 | 170 | 154 | PASS |




Note: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

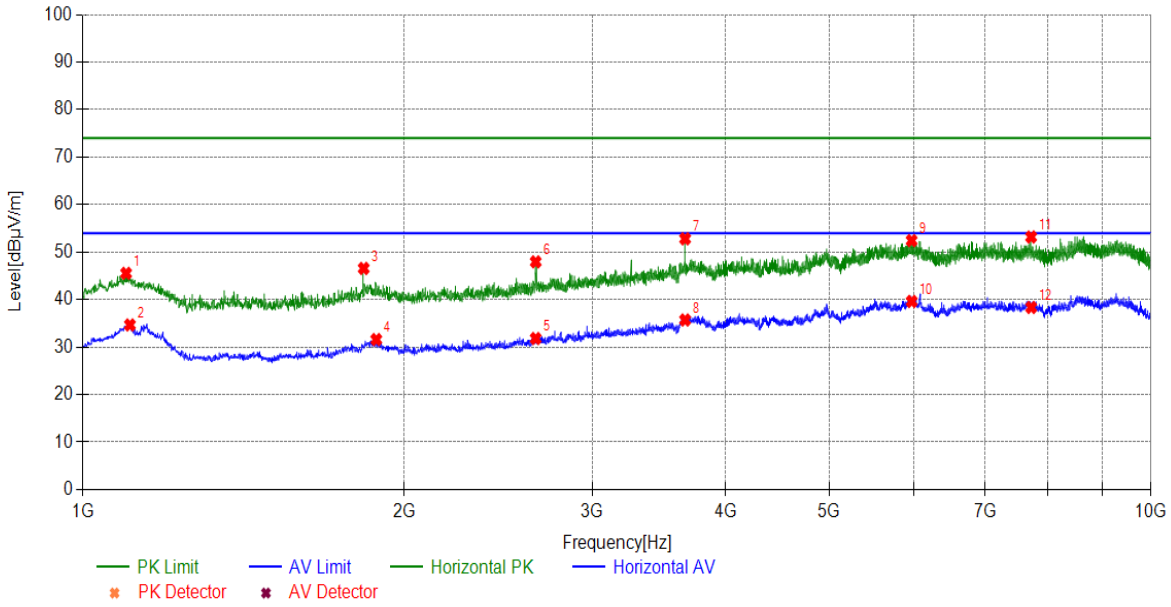
3. All the modes had been tested, but only the worst data recorded in the report.

4. About the Fundamental emission test result please refer to section 5.2-Fundamental Field Strength.

SPURIOUS EMISSIONS 1GHz~10GHz：

| | |
|---|---|
| Radiated Emission | 1GHz~10GHz |
| Polarity | Horizontal |
| Channel | Worst-Case HIGH channel |

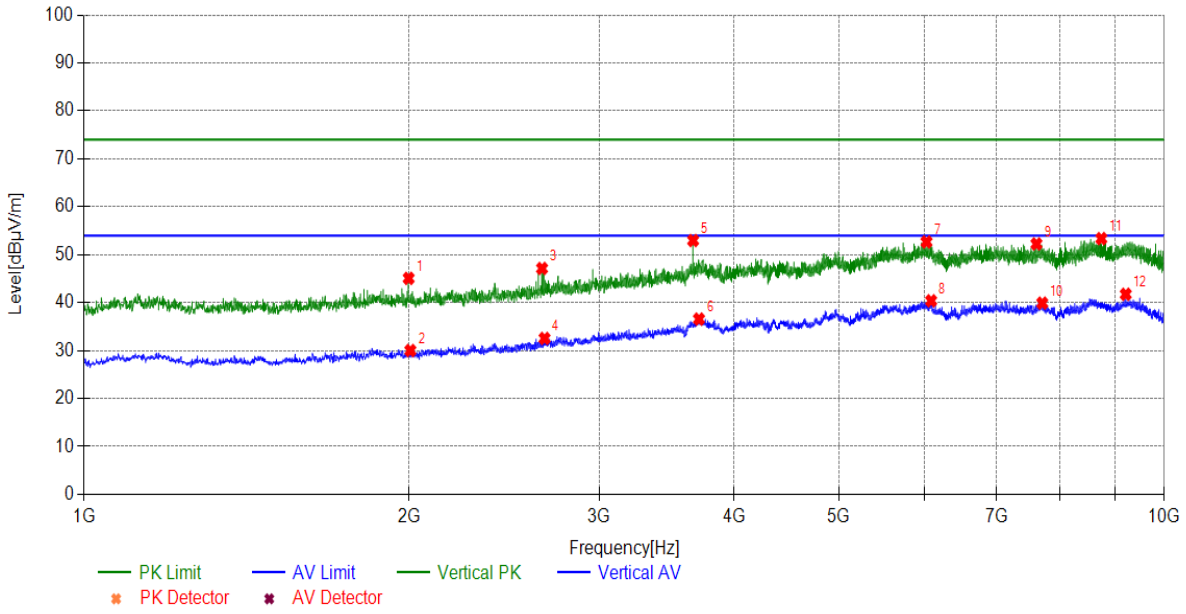
| Suspected List | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBμV/m] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
| 1098.10 | Horizon | -12.64 | 58.17 | 45.53 | 74.00 | 28.47 | PK | 100 | 200 | PASS |
| 2655.26 | Horizon | -8.12 | 56.06 | 47.94 | 74.00 | 26.06 | PK | 100 | 352 | PASS |
| 7725.47 | Horizon | 1.56 | 51.62 | 53.18 | 74.00 | 20.82 | PK | 100 | 104 | PASS |
| 3664.26 | Horizon | -4.44 | 57.24 | 52.80 | 74.00 | 21.20 | PK | 100 | 252 | PASS |
| 5971.19 | Horizon | -1.11 | 53.53 | 52.42 | 74.00 | 21.58 | PK | 100 | 205 | PASS |
| 1832.58 | Horizon | -10.92 | 57.48 | 46.56 | 74.00 | 27.44 | PK | 100 | 166 | PASS |
| 1882.98 | Horizon | -10.76 | 42.34 | 31.58 | 54.00 | 22.42 | AV | 100 | 18 | PASS |
| 1107.11 | Horizon | -12.61 | 47.27 | 34.66 | 54.00 | 19.34 | AV | 100 | 65 | PASS |
| 2655.26 | Horizon | -8.12 | 39.92 | 31.80 | 54.00 | 22.20 | AV | 100 | 18 | PASS |
| 5972.09 | Horizon | -1.11 | 40.72 | 39.61 | 54.00 | 14.39 | AV | 100 | 23 | PASS |
| 3664.26 | Horizon | -4.44 | 40.14 | 35.70 | 54.00 | 18.30 | AV | 100 | 18 | PASS |
| 7726.37 | Horizon | 1.56 | 36.78 | 38.34 | 54.00 | 15.66 | AV | 100 | 357 | PASS |



| | |
|---|---|
| Radiated Emission | 1GHz~10GHz |
| Polarity | Vertical |
| Channel | Worst-Case HIGH channel |

**Suspected List**

| Frequency [MHz] | Polarity | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Detector | Height [cm] | Angle deg | Pass/Fail |
|---|---|---|---|---|---|---|---|---|---|---|
| 1998.19 | Vertical | -10.35 | 55.42 | 45.07 | 74.00 | 28.93 | PK | 100 | 346 | PASS |
| 7617.46 | Vertical | 1.54 | 50.70 | 52.24 | 74.00 | 21.76 | PK | 100 | 317 | PASS |
| 8747.07 | Vertical | 2.74 | 50.61 | 53.35 | 74.00 | 20.65 | PK | 100 | 260 | PASS |
| 3664.26 | Vertical | -4.44 | 57.40 | 52.96 | 74.00 | 21.04 | PK | 100 | 307 | PASS |
| 2655.26 | Vertical | -8.12 | 55.25 | 47.13 | 74.00 | 26.87 | PK | 100 | 217 | PASS |
| 6026.10 | Vertical | -1.05 | 53.71 | 52.66 | 74.00 | 21.34 | PK | 100 | 346 | PASS |
| 2669.66 | Vertical | -8.05 | 40.58 | 32.53 | 54.00 | 21.47 | AV | 100 | 341 | PASS |
| 2005.40 | Vertical | -10.32 | 40.32 | 30.00 | 54.00 | 24.00 | AV | 100 | 346 | PASS |
| 9214.22 | Vertical | 3.53 | 38.21 | 41.74 | 54.00 | 12.26 | AV | 100 | 346 | PASS |
| 6085.50 | Vertical | -1.05 | 41.43 | 40.38 | 54.00 | 13.62 | AV | 100 | 346 | PASS |
| 7712.87 | Vertical | 1.56 | 38.34 | 39.90 | 54.00 | 14.10 | AV | 100 | 346 | PASS |
| 3710.17 | Vertical | -4.36 | 40.93 | 36.57 | 54.00 | 17.43 | AV | 100 | 346 | PASS |



Note: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

3. All the modes had been tested, but only the worst data recorded in the report.

4. About the Fundamental emission test result please refer to section 5.2-Fundamental Field Strength.

## 5.3 Occupied Bandwidth

### Ambient condition:

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23°C ~25°C | 45%~50% | 101.5kPa |

### Method of Measurement:

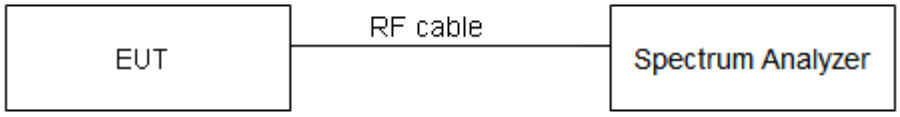
Tests are performed in accordance with ANSI C63.10-2013.

The 20 dB and 99% bandwidth of the fundamental frequency remain inside the band of operation of 902-928 MHz.The EUT was connected to the spectrum analyzer and z-wave test set via a power splitter with a known loss. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 10 kHz and VBW is set to 30 kHz on spectrum analyzer.

### Limits:

No specific occupied bandwidth requirements in part 15.215(c).

### Test Setup:



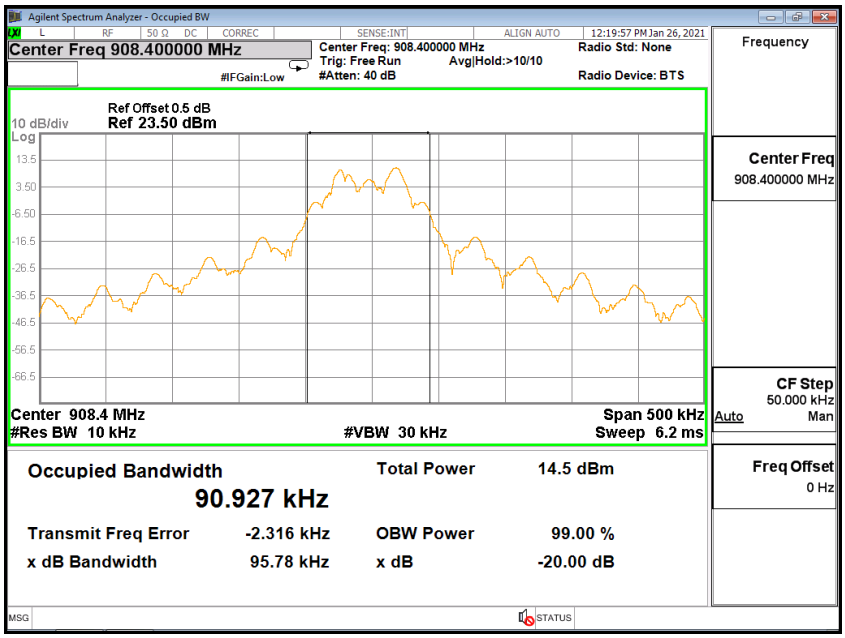

### Measurement Uncertainty：

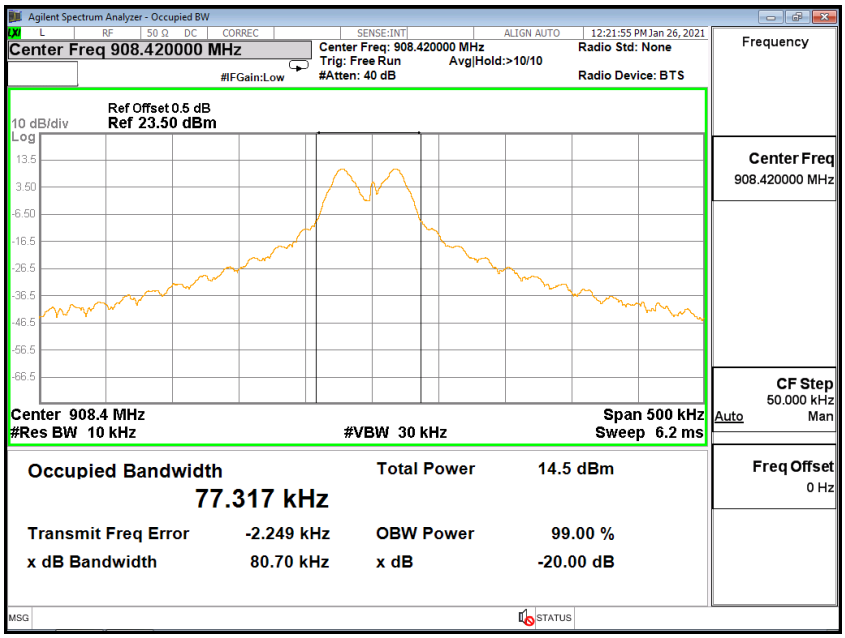
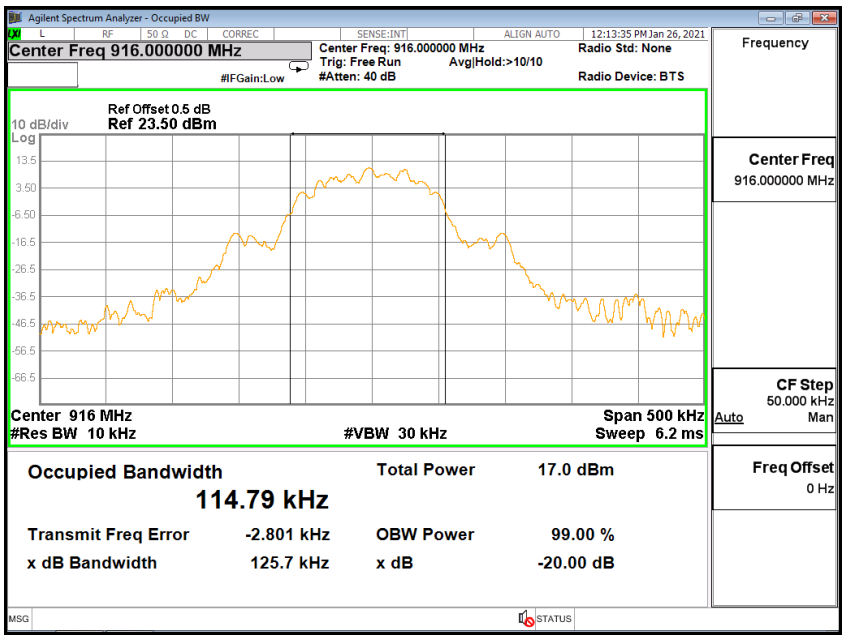
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

## Test Results:

| Mode | Frequency (MHz) | Rate (kbps) | 20dB Bandwidth(kHz) | 99% Bandwidth(kHz) |
|---|---|---|---|---|
| z-wave | 908.4 | 40 | 95.78 | 90.927 |
| | 908.42 | 9.6 | 80.70 | 77.317 |
| | 916 | 100 | 125.7 | 114.79 |

## Test Graphs:

| | |
|---|---|
| Carrier frequency (MHz): 908.4 (40kbps) |  |

| | |
|---|---|
| Carrier frequency (MHz): 908.42 (9.6kbps) |  |
| Carrier frequency (MHz): 916(100kbps) |  |

## 5.4 Antenna Measurement

### Limits:

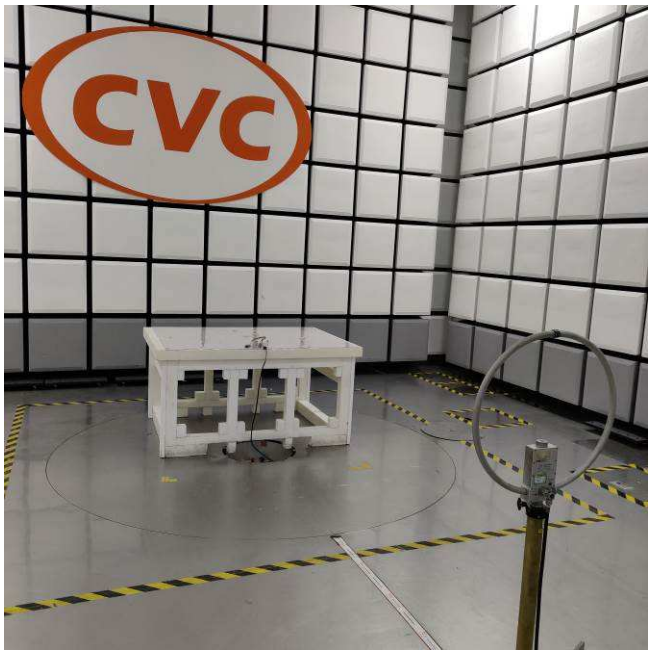
For intentional device,according to 15.203,an intentional radiaror shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

### Antenna Description:

See section1 – antenna information

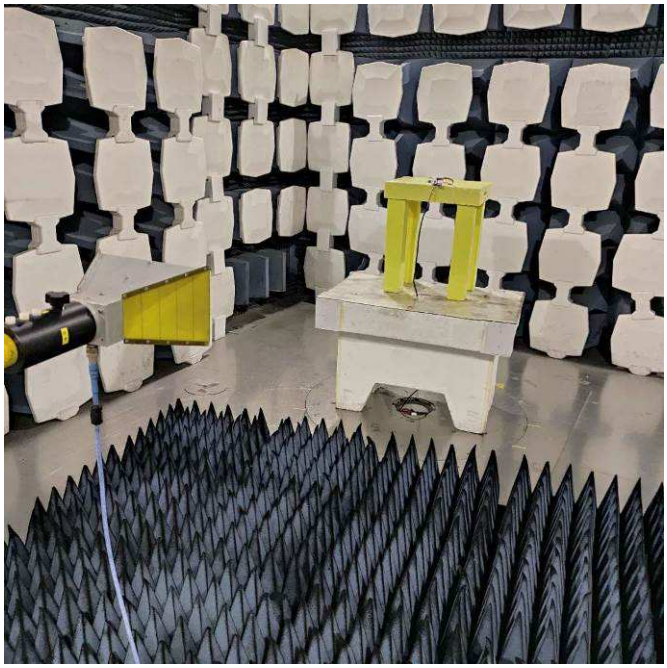
# 6. Test Setup Photograph

(1) Radiated spurious emission Test Setup-1(9KHz~30MHz)




(2) Radiated spurious emission Test Setup-2(Below 1GHz)

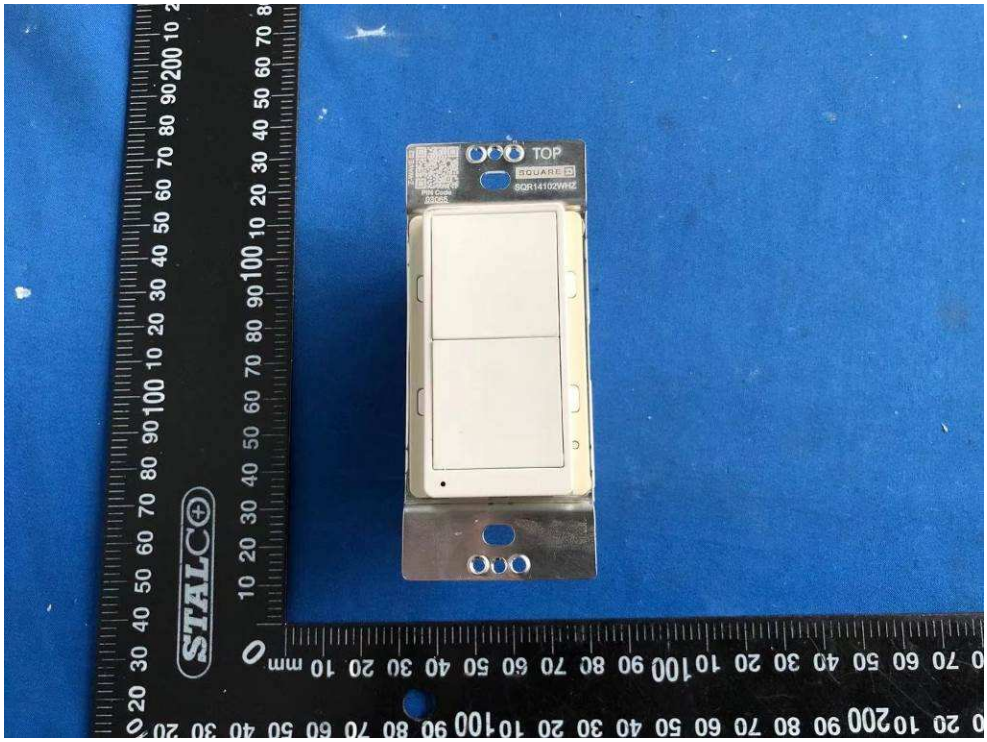
(3) Radiated spurious emission Test Setup-3(Above 1GHz)



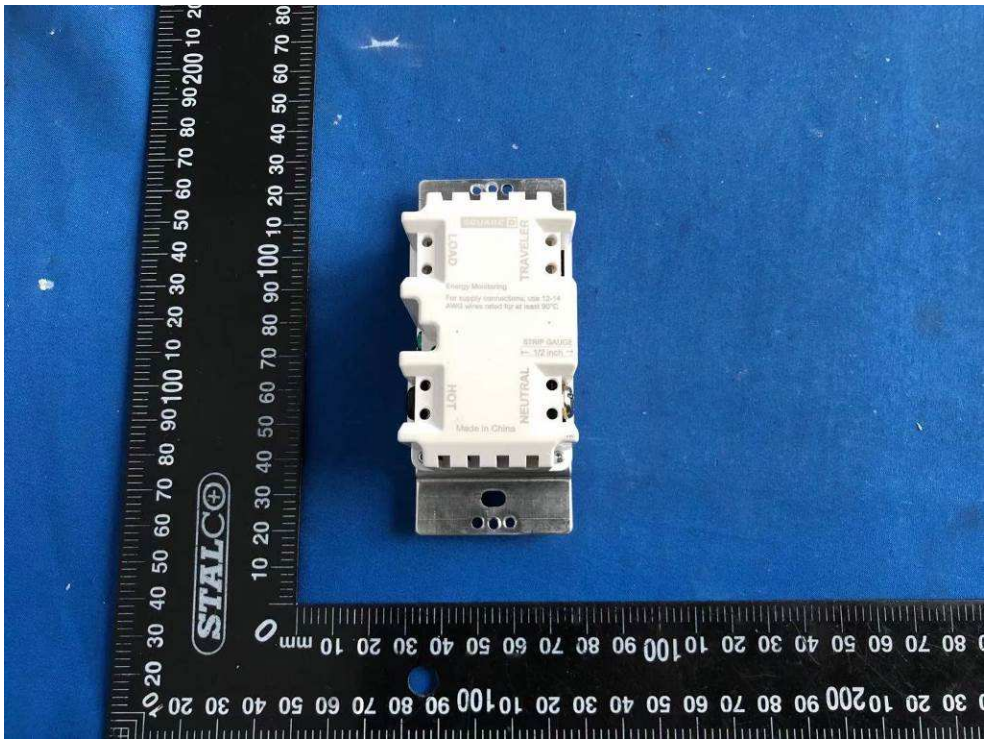
(4) Conducted Emission Test Setup

# 7. EUT Photograph

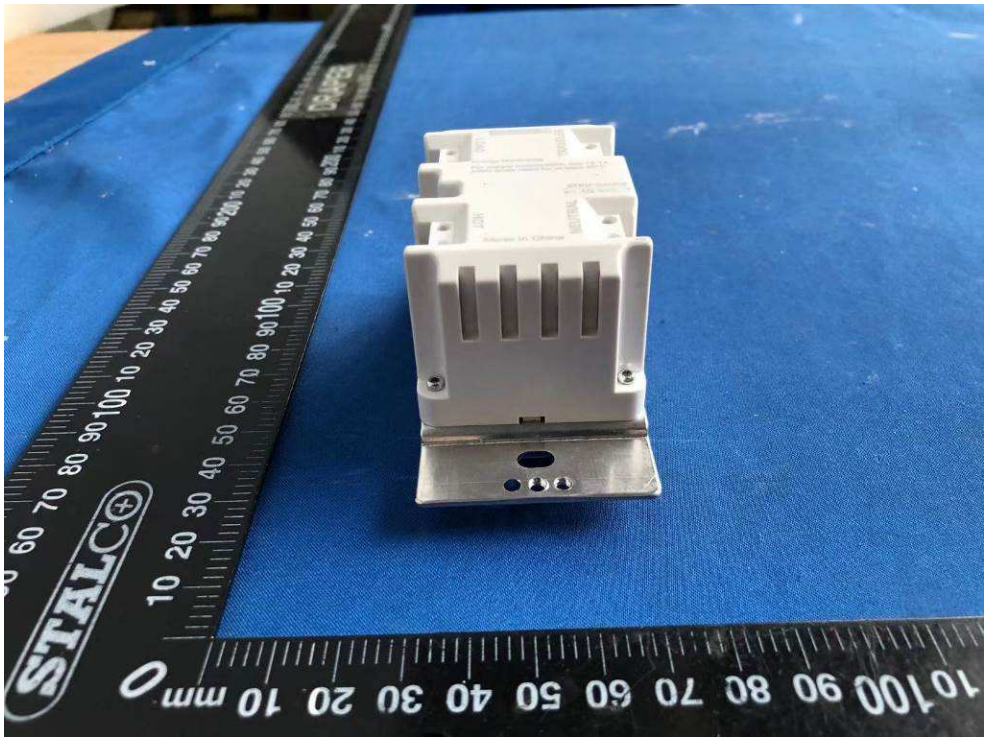
(1) EUT Photo



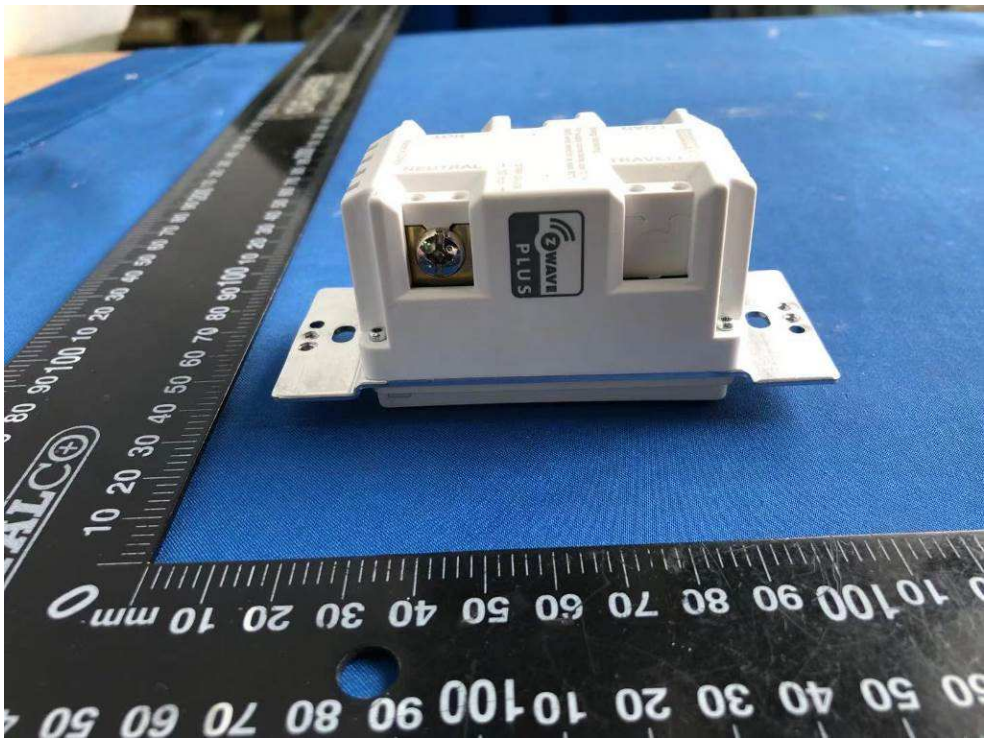

(2) EUT Photo



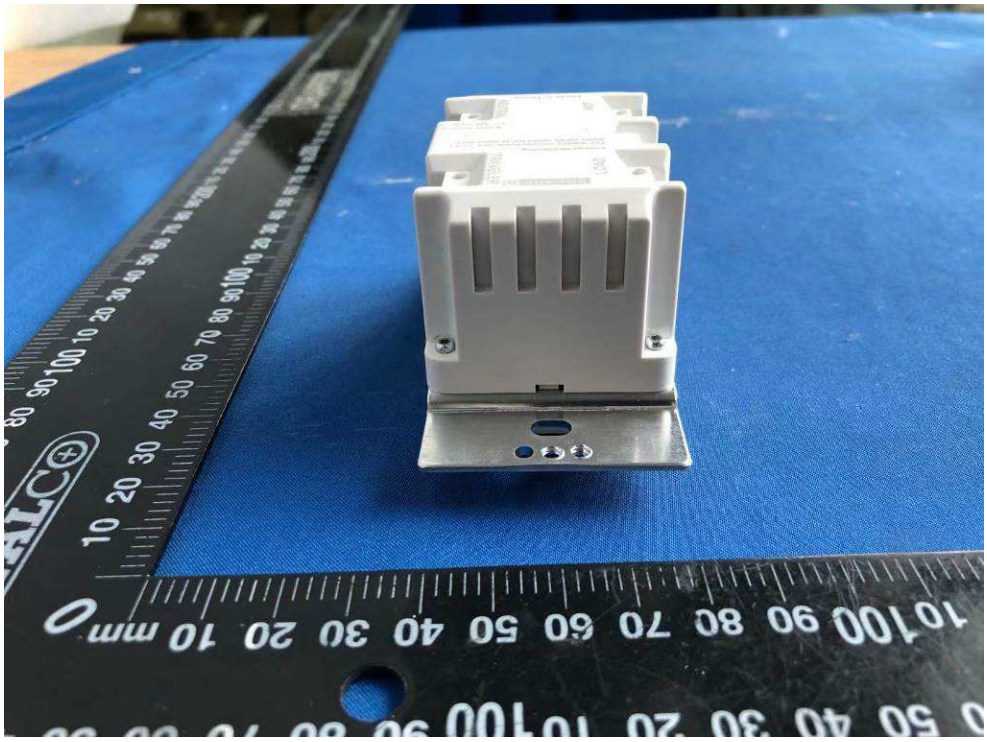
(3) EUT Photo



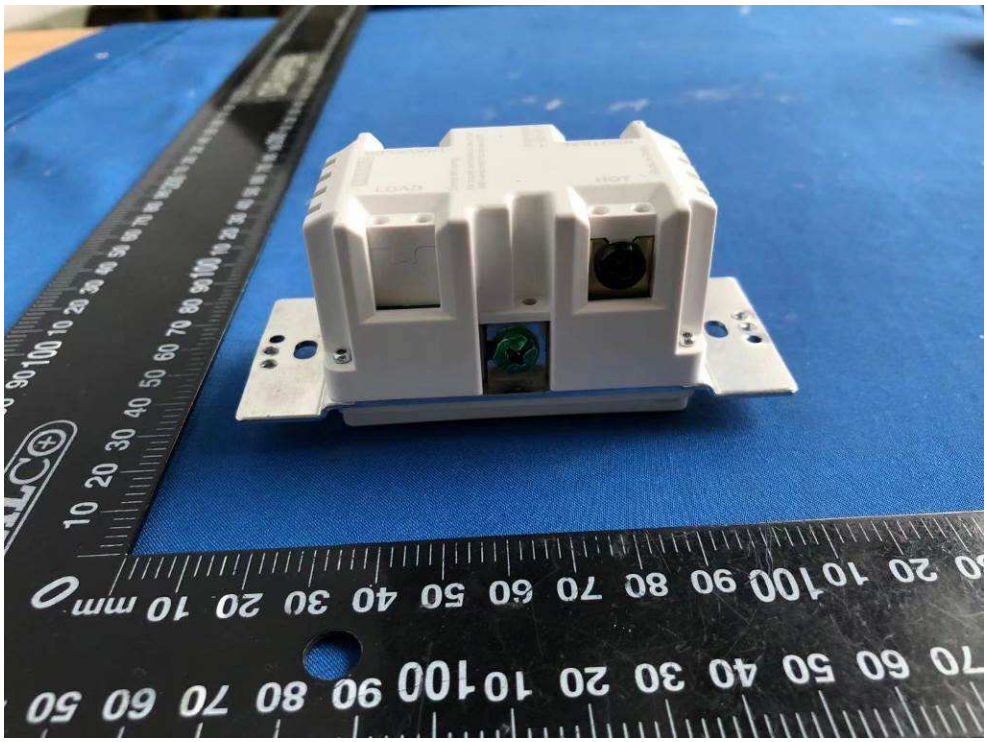

(4) EUT Photo



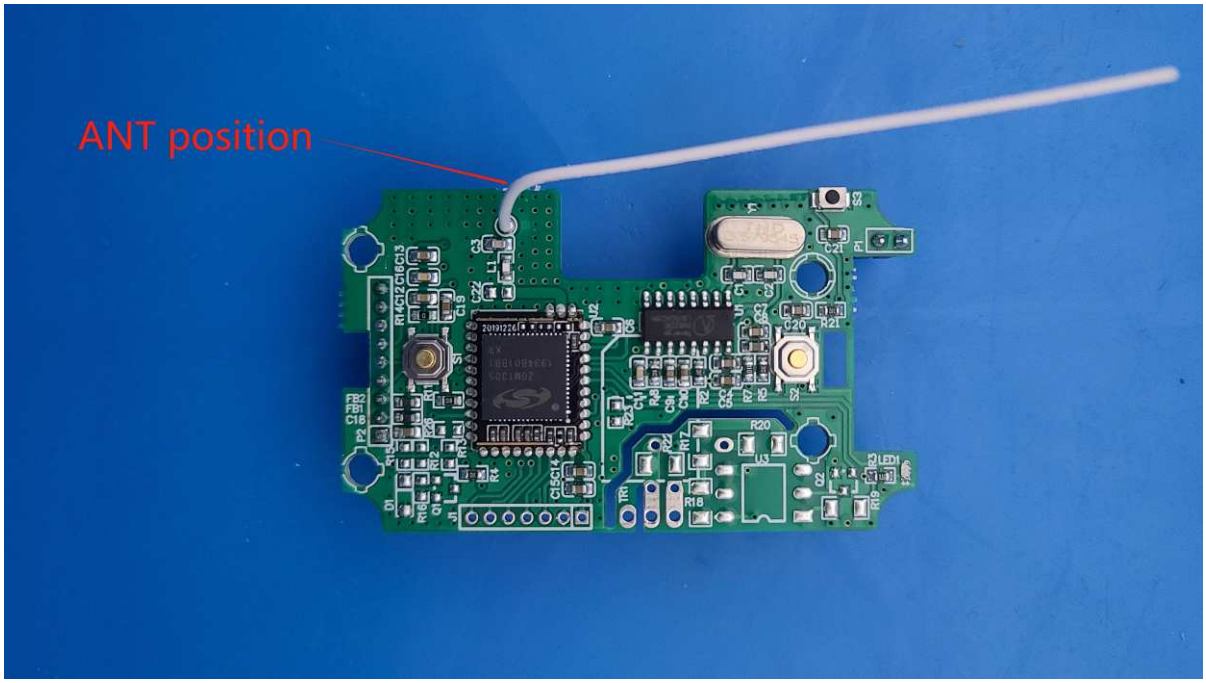
(5) EUT Photo



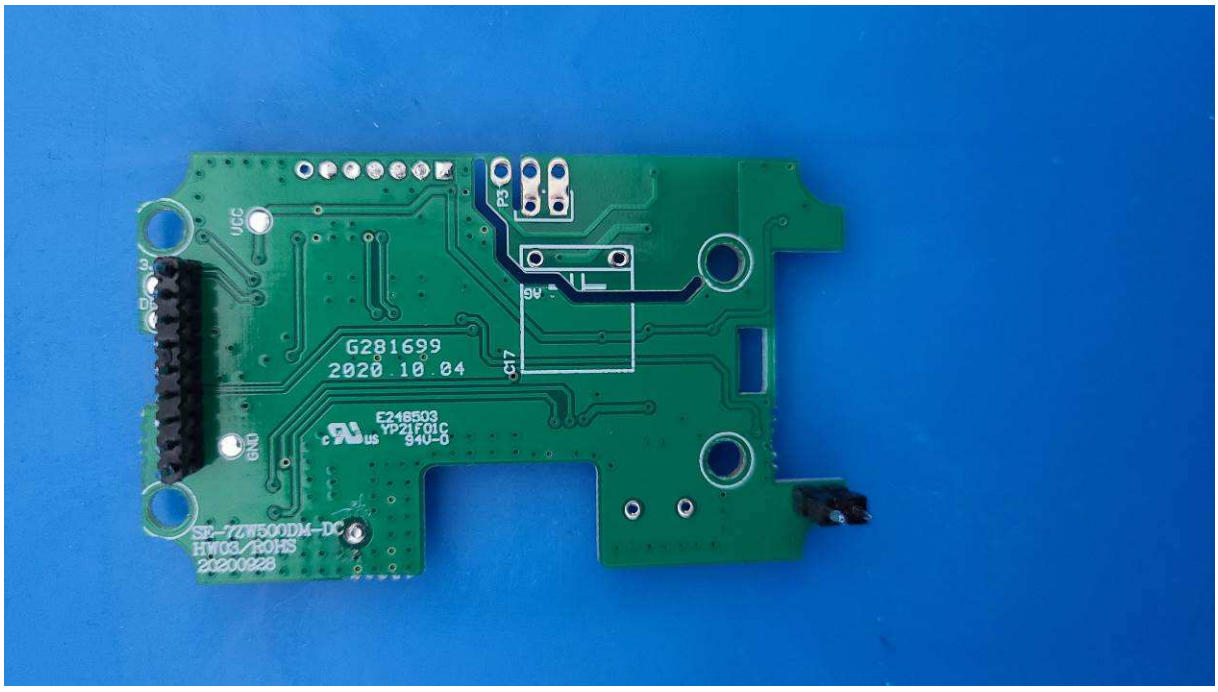
(6) EUT Photo



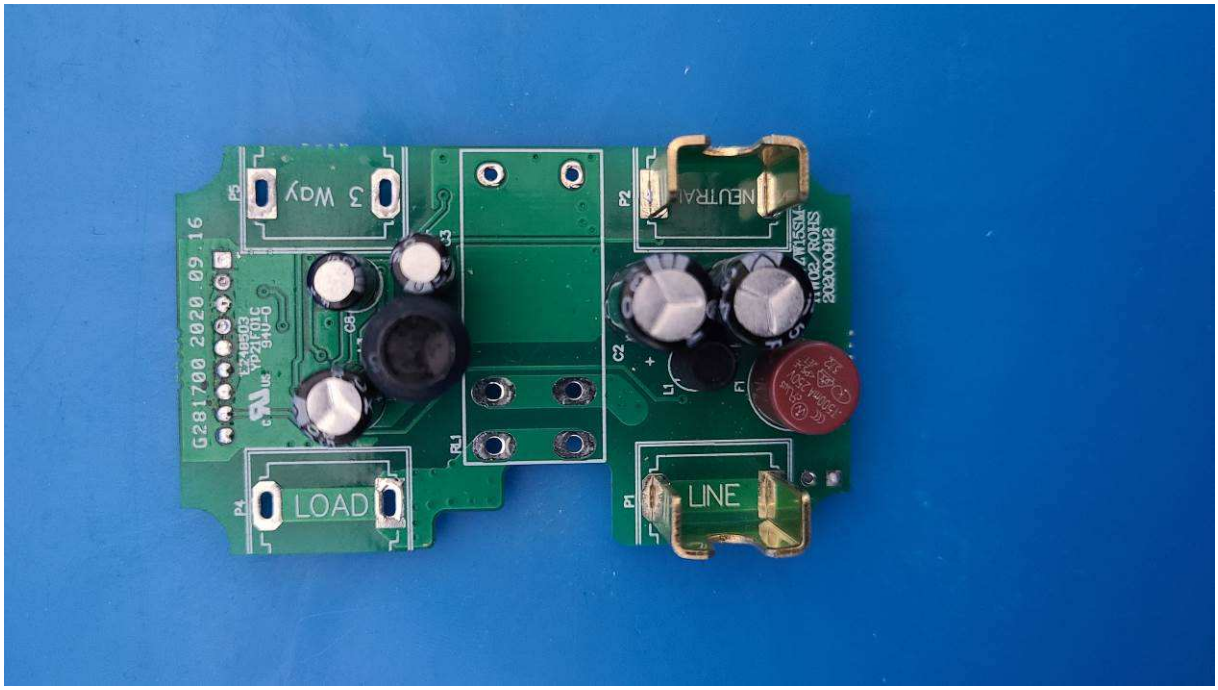
(7) EUT Photo



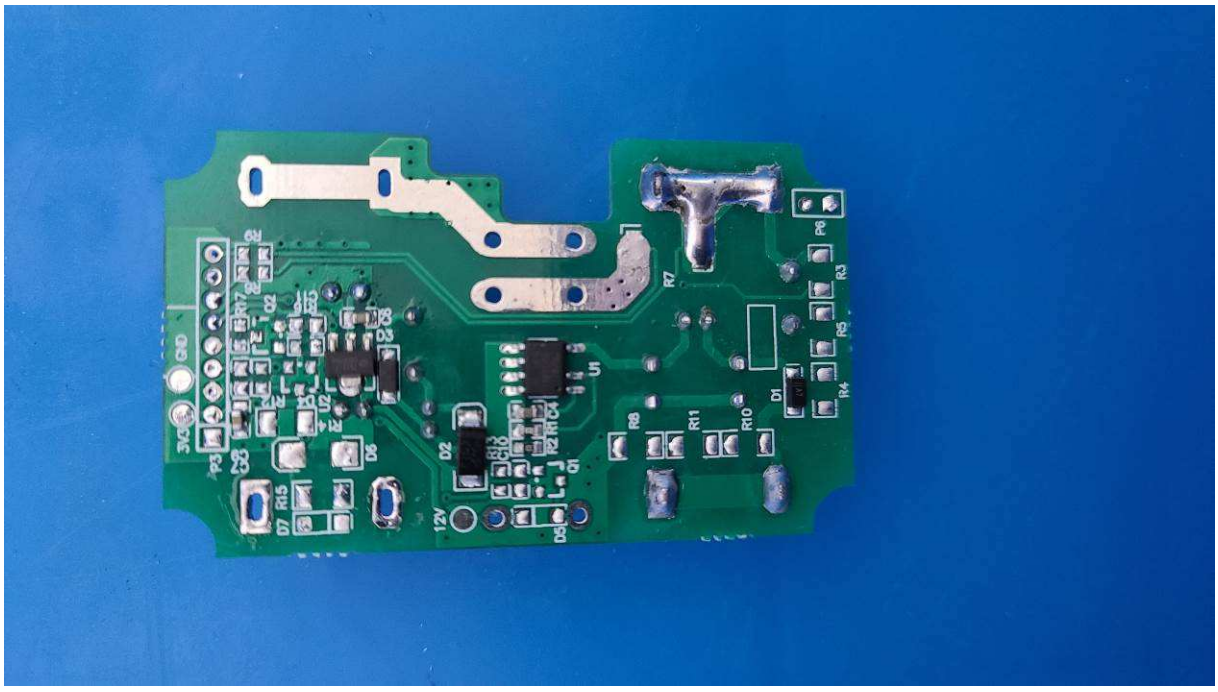

(8) EUT Photo



(9) EUT Photo




(10) EUT Photo



# 8. Appendix

| Equipment list | Type/Mode | Equipment No. | Manufacturer | Cal. Due |
|---|---|---|---|---|
| EMI Test Receiver | ESI26 | EM-0087 | R&S | 2021-03-15 |
| EMI Test Receiver | ESR3 | VGDY-0705 | R&S | 2021-03-15 |
| LISN | NSLK 8127 | VGDY-0150 | SCHWARZBECK | 2021-09-04 |
| LISN | NSLK 8128 | VGDY-0149 | SCHWARZBECK | 2021-09-04 |
| Impedance Stabilization Network | NTFM8131 | EM-000498 | SCHWARZBECK | 2021-06-09 |
| Voltage Probe | TK9420 | VGDY-0128 | SCHWARZBECK | 2021-03-11 |
| Power Divider | 4901.17.B | DB-0016 | HUBER+SUHNER | 2021-11-08 |
| Shielding Room(#1) | GP1A | WKNF-0001 | LEINING | 2024-08-08 |
| Shielding Room(#2) | GP1A | WKNF-0006 | LEINING | 2024-08-08 |
| EMI Test Receiver | N9038A-508 | EM-000397 | Agilent | 2021-03-15 |
| EMI Test Receiver | ESR7 | VGDY-0956 | R&S | 2021-03-11 |
| Broadband Antenna(3m) | VULB 9163 | EM-000342 | SCHWARZBECK | 2021-07-11 |
| Broadband Antenna(5m) | VULB 9163 | EM-000382 | SCHWARZBECK | 2021-05-10 |
| Loop Antenna | HLA 6121 | EM-000546 | TESEQ | 2021-06-28 |
| Waveguide Horn Antenna | BBHA9120B | EM-000383 | SCHWARZBECK | 2021-03-15 |
| Waveguide Horn Antenna | HF906 | WKNA-0024-8 | R&S | 2021-03-15 |
| Semi-Anechoic Chamber(3m) | FACT-4 | WKNA-0024 | ETS | 2024-12-12 |
| Semi-Anechoic Chamber(5m) | SAC-5 | EM-000557 | COMTEST | 2024-11-02 |
| Spectrum analyzer | N9030A | EM-000395 | Agilent | 2021-06-08 |

The End