



Shenzhen HTT Technology Co., Ltd.

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.225

Report Reference No.....: HTT202202216F02

FCC ID.....: 2A4KZ-A02

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Date of issue.....: Mar. 02, 2022

Testing Laboratory Name: **Shenzhen HTT Technology Co.,Ltd.**

1F, Building B, Huafeng International Robotics Industrial Park,

Address.....: Hangcheng Road, Nanchang Community, Xixiang Street, Bao'an
District, Shenzhen, Guangdong, China

Applicant's name.....: **Zhongshan Kaisen Technology Co., Ltd**

Address: Room 301, No.30, Wansheng Road, Xiaolan Town, Zhongshan City

Test specification

Standard: **FCC Part 15.225**

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Test item description: **Smart door lock**

Trade Mark: N/A

Manufacturer: Zhongshan Kaisen Technology Co., Ltd

Model/Type reference.....: A02

Listed Models: A04, A06, B2, B7, B8, BD1, BD2

Modulation Type: ASK

Operation Frequency.....: 13.56MHz

Rating: DC 4.5-6V,500mA,3W

Result.....: **PASS**

TEST REPORT

Equipment under Test : Smart door lock

Model /Type : A02

Listed Models : A04, A06, B2, B7, B8, BD1, BD2

Applicant : Zhongshan Kaisen Technology Co., Ltd

Address : Room 301, No.30, Wansheng Road, Xiaolan Town, Zhongshan City

Manufacturer : Zhongshan Kaisen Technology Co., Ltd

Address : Room 301, No.30, Wansheng Road, Xiaolan Town, Zhongshan City

| | |
|---------------------|-------------|
| Test Result: | PASS |
|---------------------|-------------|

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.225](#): Operation within the band 13.110–14.010 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

2 SUMMARY

2.1 General Remarks

| | | |
|--------------------------------|---|---------------|
| Date of receipt of test sample | : | Feb. 20, 2022 |
| Testing commenced on | : | Feb. 20, 2022 |
| Testing concluded on | : | Mar. 02, 2022 |

2.2 Product Description

| | |
|--|---|
| Product Name: | Smart door lock |
| Model/Type reference: | A02 |
| Power Supply: | DC 4.5-6V,500mA,3W |
| Adapter Information (Auxiliary test provided by the lab): | Mode: CD122 Input: AC100-240V, 50/60Hz, 500mA Output: DC 5V, 2A |
| Testing sample ID: | HTT202202216-1(Engineer sample) HTT202202216-2(Normal sample) |
| Software version: | V1.0 |
| Hardware version: | V1.0 |
| 13.56MHz RFID | |
| Operation frequency: | 13.56MHz |
| Modulation : | ASK |
| No. of Channel : | 1 |
| Antenna type: | Loop Antenna |
| Antenna gain: | 0.00 dBi |

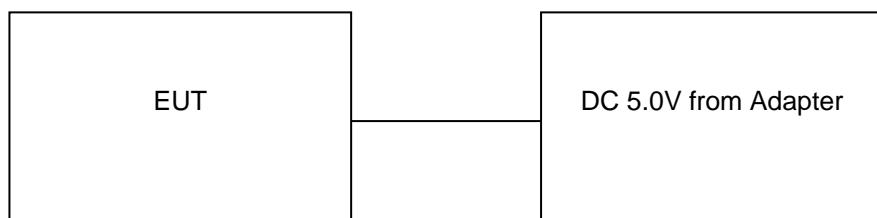
2.3 Equipment Under Test

Power supply system utilised

| | | | | | |
|----------------------|---|----------------------------------|----------------------------------|-----------------------|-------------|
| Power supply voltage | : | <input type="radio"/> | 230V / 50 Hz | <input type="radio"/> | 120V / 60Hz |
| | | <input type="radio"/> | 12 V DC | <input type="radio"/> | 24 V DC |
| | | <input checked="" type="radio"/> | Other (specified in blank below) | | |

DC 5.0V From external circuit

2.4 Block Diagram of Test Setup



2.5 Special Accessories

Follow auxiliary equipment(s) test with EUT that provided by the manufacturer or laboratory is listed as follow:

| Description | Manufacturer | Model | Technical Parameters | Certificate | Provided by |
|-------------|--------------|-------|----------------------|-------------|-------------|
| / | / | / | / | / | / |
| / | / | / | / | / | / |
| / | / | / | / | / | / |

2.6 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for the EUT filing to comply with Section 15.225 of the FCC Part 15, Subpart C Rules.

2.7 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen HTT Technology Co.,Ltd.

1F, Building B, Huafeng International Robotics Industrial Park, Hangcheng Road, Nanchang Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China

3.2 Test Facility

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

FCC-Registration No.: 779513 Designation Number: CN1319

Shenzhen HTT Technology Co.,Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6435.01

Shenzhen HTT Technology Co.,Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfills CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3 Environmental conditions

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

Radiated Emission:

| | |
|-----------------------|--------------|
| Temperature: | 24 ° C |
| | |
| Humidity: | 45 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

AC Power Conducted Emission:

| | |
|-----------------------|--------------|
| Temperature: | 25 ° C |
| | |
| Humidity: | 46 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

Conducted testing:

| | |
|-----------------------|--------------|
| Temperature: | 25 ° C |
| | |
| Humidity: | 44 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

3.4 Test Description

| FCC PART 15 .225 | | |
|----------------------------|-------------------------------|------|
| FCC Part 15.207 | AC Power Conducted Emission | PASS |
| FCC Part 2.1049 | 20dB Bandwidth | PASS |
| FCC Part 15.225(a) (b) (c) | In-band Emissions | PASS |
| FCC Part 15.225(d)/15.207 | Out-of-band Emissions | PASS |
| FCC Part 15.225(e) | Frequency Stability Tolerance | PASS |

3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen HTT Technology Co.,Ltd.quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CAT laboratory is reported:

| Test | Range | Measurement Uncertainty | Notes |
|-----------------------|------------|-------------------------|-------|
| Radiated Emission | 30~1000MHz | 4.06 dB | (1) |
| Radiated Emission | 1~18GHz | 5.14 dB | (1) |
| Radiated Emission | 18-40GHz | 5.38 dB | (1) |
| Conducted Disturbance | 0.15~30MHz | 2.14 dB | (1) |

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

3.6 Equipments Used during the Test

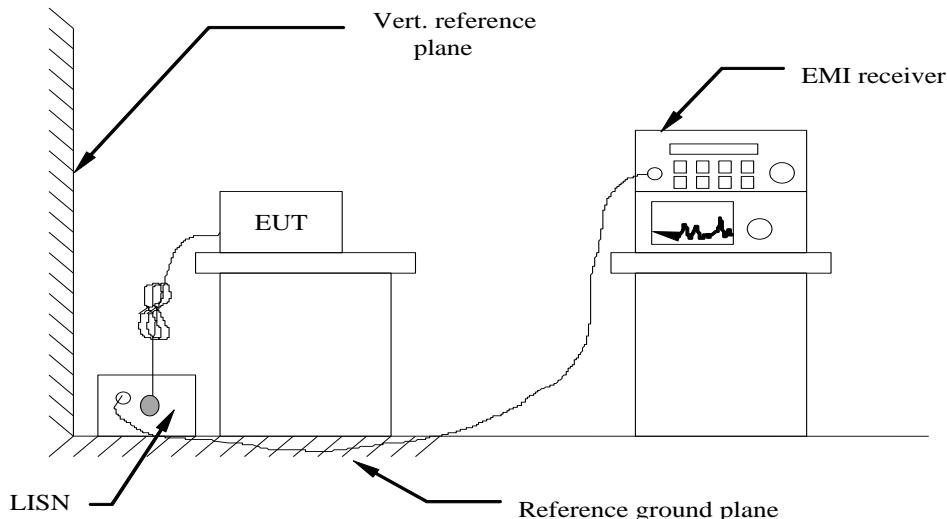
| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
|------|----------------------------------|-------------------------------------|--------------------|---------------|---------------------|-------------------------|
| 1 | 3m Semi- Anechoic Chamber | Shenzhen C.R.T technology co., LTD | 9*6*6 | HTT-E028 | Aug. 10 2020 | Aug. 09 2024 |
| 2 | Control Room | Shenzhen C.R.T technology co., LTD | 4.8*3.5*3.0 | HTT-E030 | Aug. 10 2020 | Aug. 09 2024 |
| 3 | EMI Test Receiver | Rohde&Schwarz | ESCI7 | HTT-E022 | May 21 2021 | May 20 2022 |
| 4 | Spectrum Analyzer | Rohde&Schwarz | FSP | HTT-E037 | May 21 2021 | May 20 2022 |
| 5 | Coaxial Cable | ZDecl | ZT26-NJ-NJ-0.6M | HTT-E018 | May 21 2021 | May 20 2022 |
| 6 | Coaxial Cable | ZDecl | ZT26-NJ-SMAJ-2M | HTT-E019 | May 21 2021 | May 20 2022 |
| 7 | Coaxial Cable | ZDecl | ZT26-NJ-SMAJ-0.6M | HTT-E020 | May 21 2021 | May 20 2022 |
| 8 | Coaxial Cable | ZDecl | ZT26-NJ-SMAJ-8.5M | HTT-E021 | May 21 2021 | May 20 2022 |
| 9 | Composite logarithmic antenna | Schwarzbeck | VULB 9168 | HTT-E017 | Aug. 22 2021 | Aug. 21 2022 |
| 10 | Horn Antenna | Schwarzbeck | BBHA9120D | HTT-E016 | Aug. 22 2021 | Aug. 21 2022 |
| 11 | Loop Antenna | Zhinan | ZN30900C | HTT-E039 | Aug. 22 2021 | Aug. 21 2022 |
| 12 | Horn Antenna | Beijing Hangwei Dayang | OBH100400 | HTT-E040 | Aug. 22 2021 | Aug. 21 2022 |
| 13 | low frequency Amplifier | Sonoma Instrument | 310 | HTT-E015 | May 21 2021 | May 20 2022 |
| 14 | high-frequency Amplifier | HP | 8449B | HTT-E014 | May 21 2021 | May 20 2022 |
| 15 | Variable frequency power supply | Shenzhen Anbiao Instrument Co., Ltd | ANB-10VA | HTT-082 | May 21 2021 | May 20 2022 |
| 16 | EMI Test Receiver | Rohde & Schwarz | ESCS30 | HTT-E004 | May 21 2021 | May 20 2022 |
| 17 | Artificial Mains | Rohde & Schwarz | ESH3-Z5 | HTT-E006 | May 21 2021 | May 20 2022 |
| 18 | Artificial Mains | Rohde & Schwarz | ENV-216 | HTT-E038 | May 21 2021 | May 20 2022 |
| 19 | Cable Line | Robinson | Z302S-NJ-BNCJ-1.5M | HTT-E001 | May 21 2021 | May 20 2022 |
| 20 | Attenuator | Robinson | 6810.17A | HTT-E007 | May 21 2021 | May 20 2022 |
| 21 | Variable frequency power supply | Shenzhen Yanghong Electric Co., Ltd | YF-650 (5KVA) | HTT-E032 | May 21 2021 | May 20 2022 |
| 22 | Control Room | Shenzhen C.R.T technology co., LTD | 8*4*3.5 | HTT-E029 | May 21 2021 | May 20 2022 |
| 23 | DC power supply | Agilent | E3632A | HTT-E023 | May 21 2021 | May 20 2022 |
| 24 | EMI Test Receiver | Agilent | N9020A | HTT-E024 | May 21 2021 | May 20 2022 |
| 25 | Analog signal generator | Agilent | N5181A | HTT-E025 | May 21 2021 | May 20 2022 |
| 26 | Vector signal generator | Agilent | N5182A | HTT-E026 | May 21 2021 | May 20 2022 |
| 27 | Power sensor | Keysight | U2021XA | HTT-E027 | May 21 2021 | May 20 2022 |
| 28 | Temperature and humidity meter | Shenzhen Anbiao Instrument Co., Ltd | TH10R | HTT-074 | May 21 2021 | May 20 2022 |
| 29 | Radiated Emission Test Software | Farad | EZ-EMC | N/A | N/A | N/A |
| 30 | Conducted Emission Test Software | Farad | EZ-EMC | N/A | N/A | N/A |
| 31 | RF Test Software | panshanrf | TST | N/A | N/A | N/A |

Note: The Cal.Interval was one year.

4 TEST CONDITIONS AND RESULTS

4.1 AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- 4 The EUT received DC 12V power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

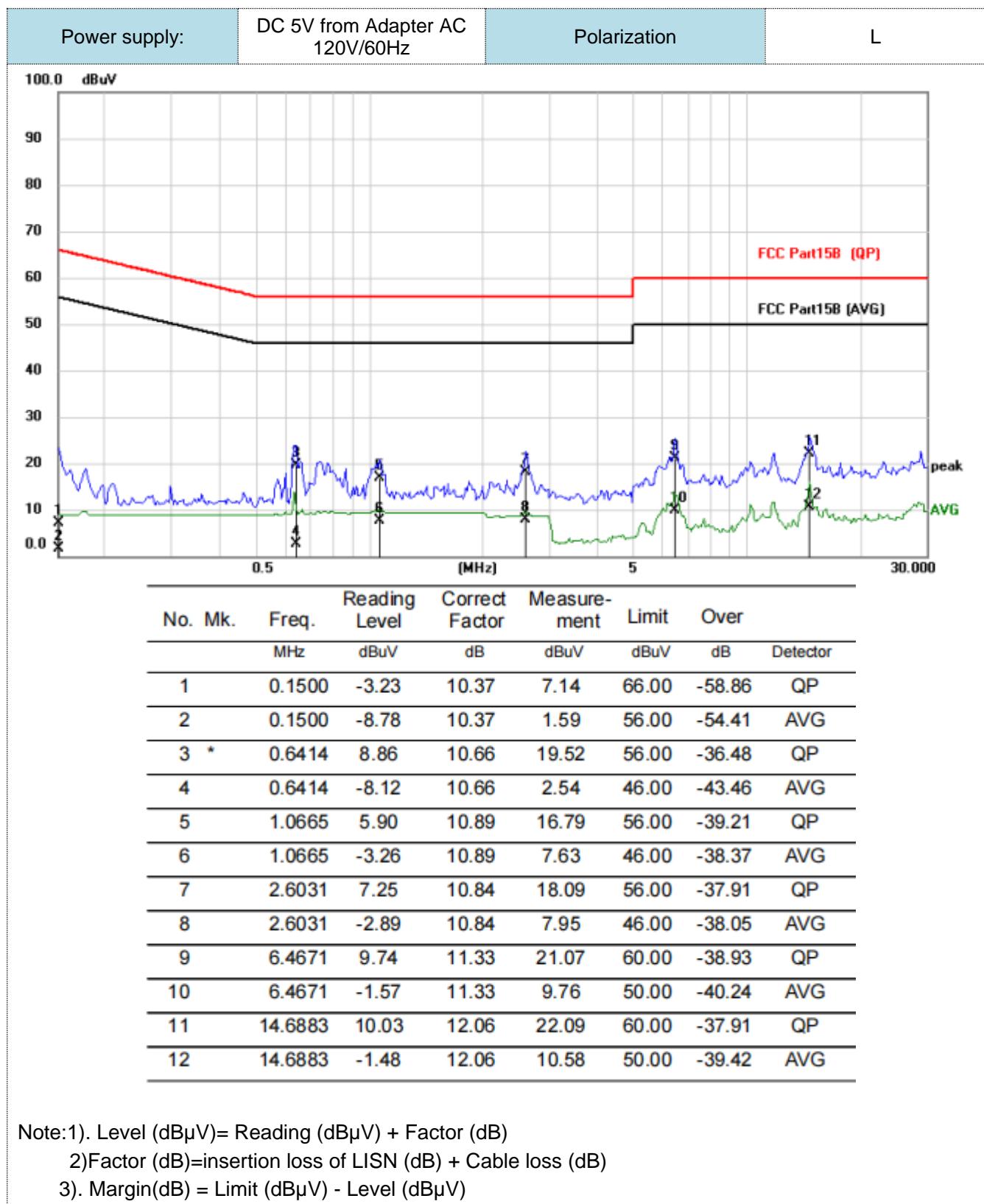
| Frequency range (MHz) | Limit (dBuV) | |
|-----------------------|--------------|-----------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

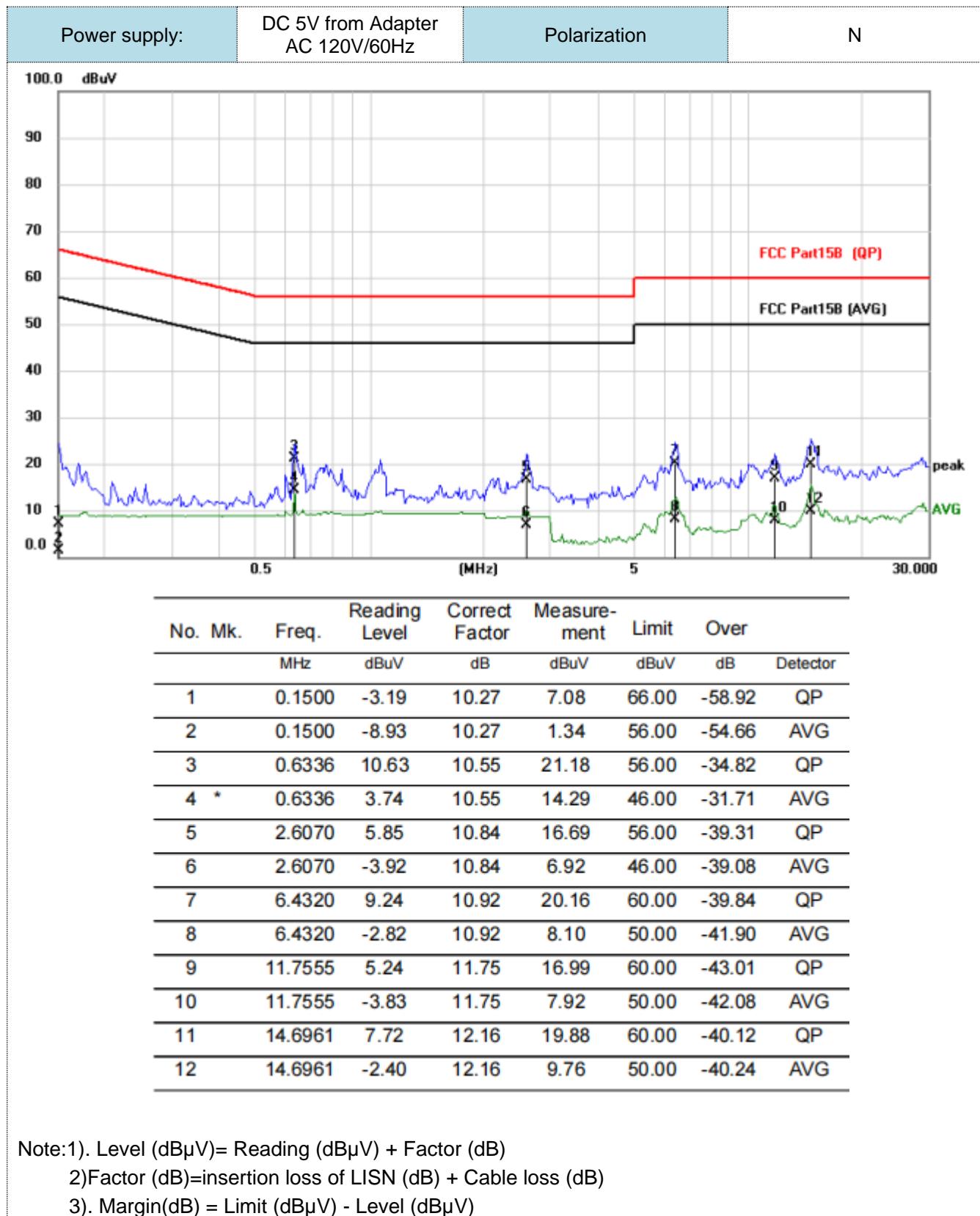
* Decreases with the logarithm of the frequency.

TEST RESULTS

Remark:

1. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below::





4.2 Radiated Emission

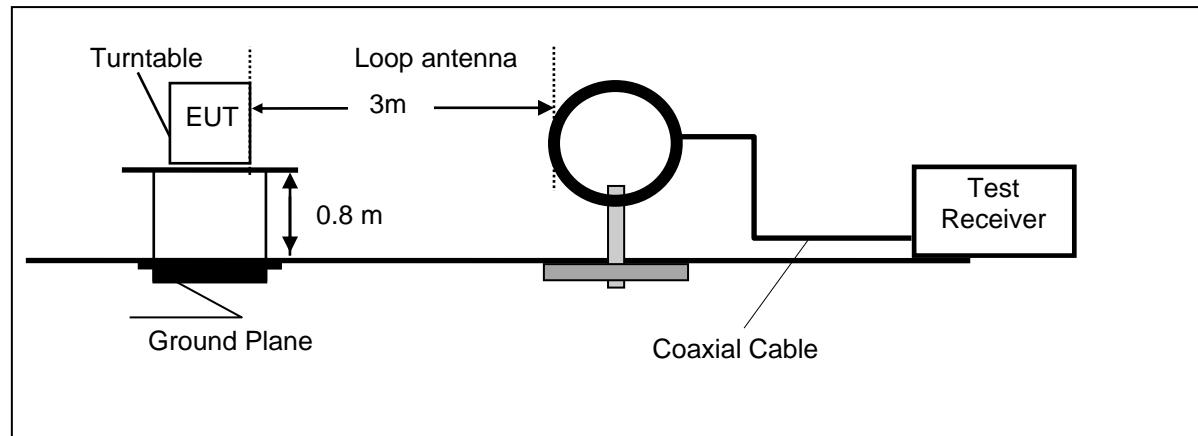
LIMIT

- a The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.
- b Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- c Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- d The field strength of any emissions appearing outside of the 13.110– 14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

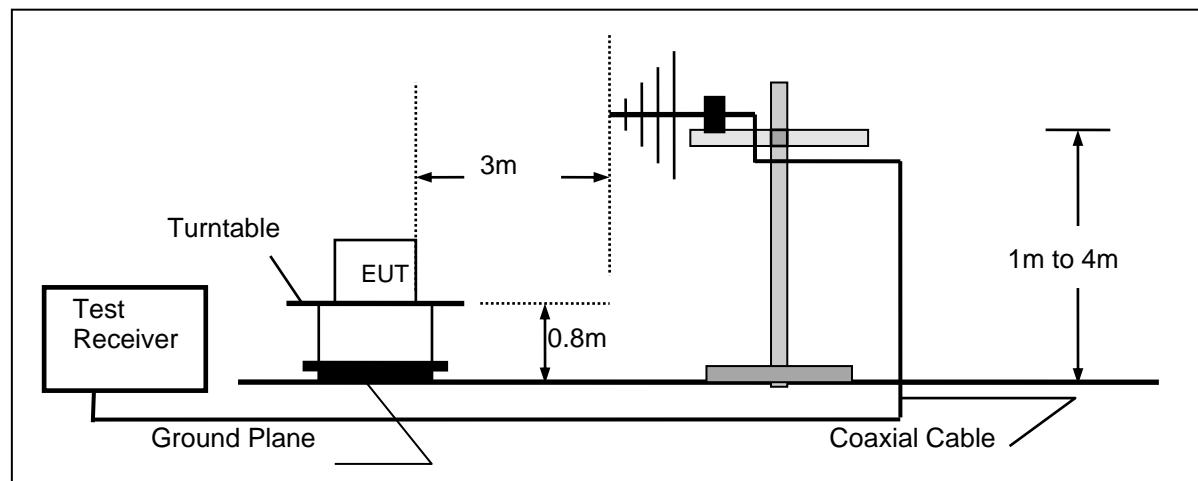
| Frequency (MHz) | Distance (Meters) | Radiated (dBuV/m) | Radiated (μ V/m) |
|-----------------|-------------------|--|-----------------------|
| 0.009-0.49 | 3 | $20\log(2400/F(\text{KHz}))+40\log(300/3)$ | $2400/F(\text{KHz})$ |
| 0.49-1.705 | 3 | $20\log(24000/F(\text{KHz}))+40\log(30/3)$ | $24000/F(\text{KHz})$ |
| 1.705-13.110 | 3 | 69.54 | 30 |
| 13.110-13.410 | 3 | 80.50 | 106 |
| 13.410-13.553 | 3 | 90.47 | 334 |
| 13.553-13.567 | 3 | 124.00 | 15848 |
| 13.567-13.710 | 3 | 90.47 | 334 |
| 13.710-14.010 | 3 | 80.50 | 106 |
| 14.010-30.0 | 3 | 69.54 | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

TEST CONFIGURATION

Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 1GHz.
6. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type | Test Distance |
|----------------------|-------------------------|---------------|
| 9KHz-30MHz | Active Loop Antenna | 3 |
| 30MHz-1GHz | Ultra-Broadband Antenna | 3 |

7. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting | Detector |
|----------------------|--|----------|
| 9KHz-150KHz | RBW=200Hz/VBW=3KHz,Sweep time=Auto | QP |
| 150KHz-30MHz | RBW=9KHz/VBW=100KHz,Sweep time=Auto | QP |
| 30MHz-1GHz | RBW=120KHz/VBW=1000KHz,Sweep time=Auto | QP |

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

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

$$Transd=AF + CL - AG$$

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

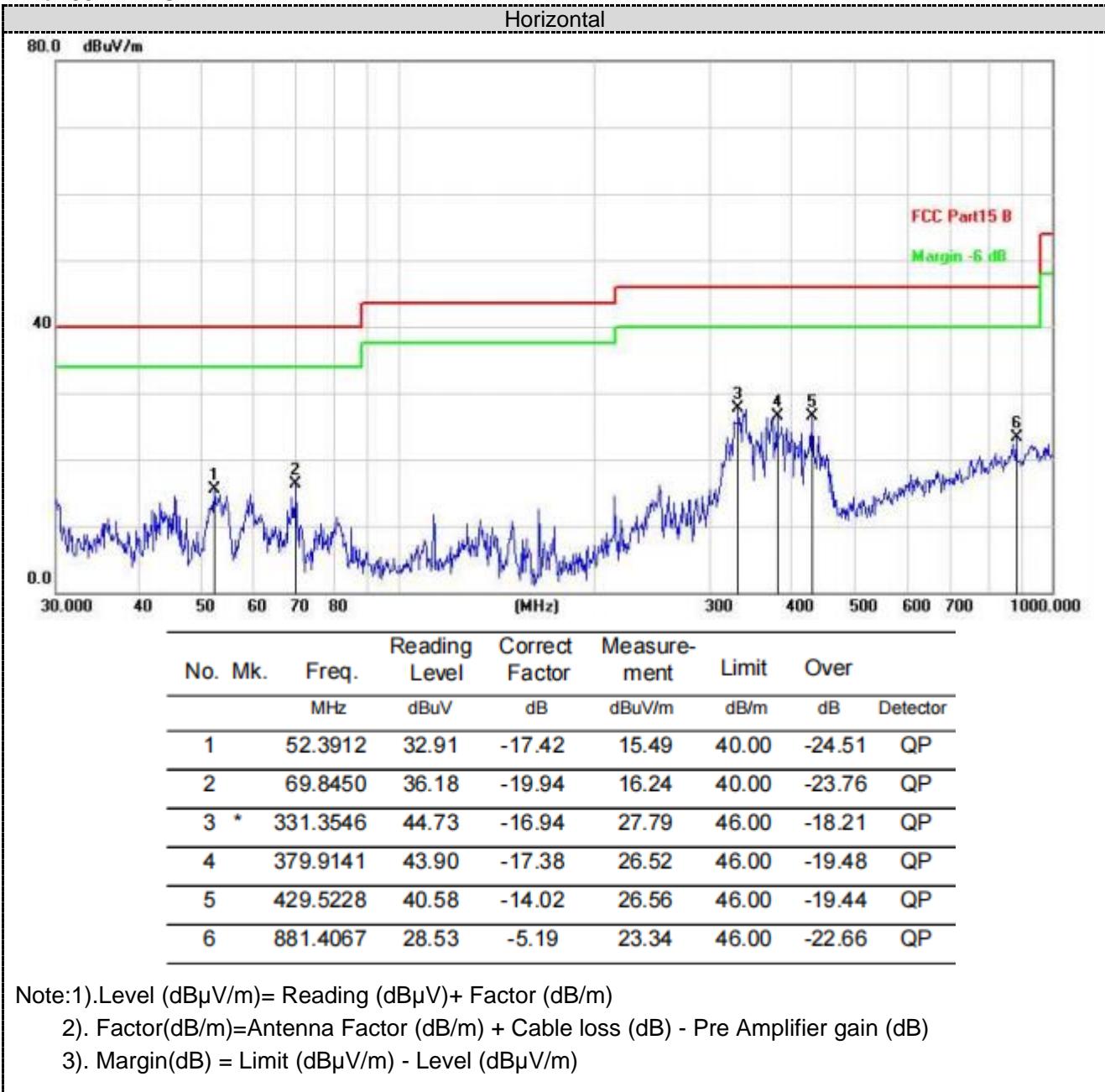
| Frequency (MHz) | Distance (Meters) | Radiated (dB μ V/m) | Radiated (μ V/m) |
|-----------------|-------------------|--|-----------------------|
| 0.009-0.49 | 3 | $20\log(2400/F(\text{KHz}))+40\log(300/3)$ | $2400/F(\text{KHz})$ |
| 0.49-1.705 | 3 | $20\log(24000/F(\text{KHz}))+40\log(30/3)$ | $24000/F(\text{KHz})$ |
| 1.705-30 | 3 | $20\log(30)+40\log(30/3)$ | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

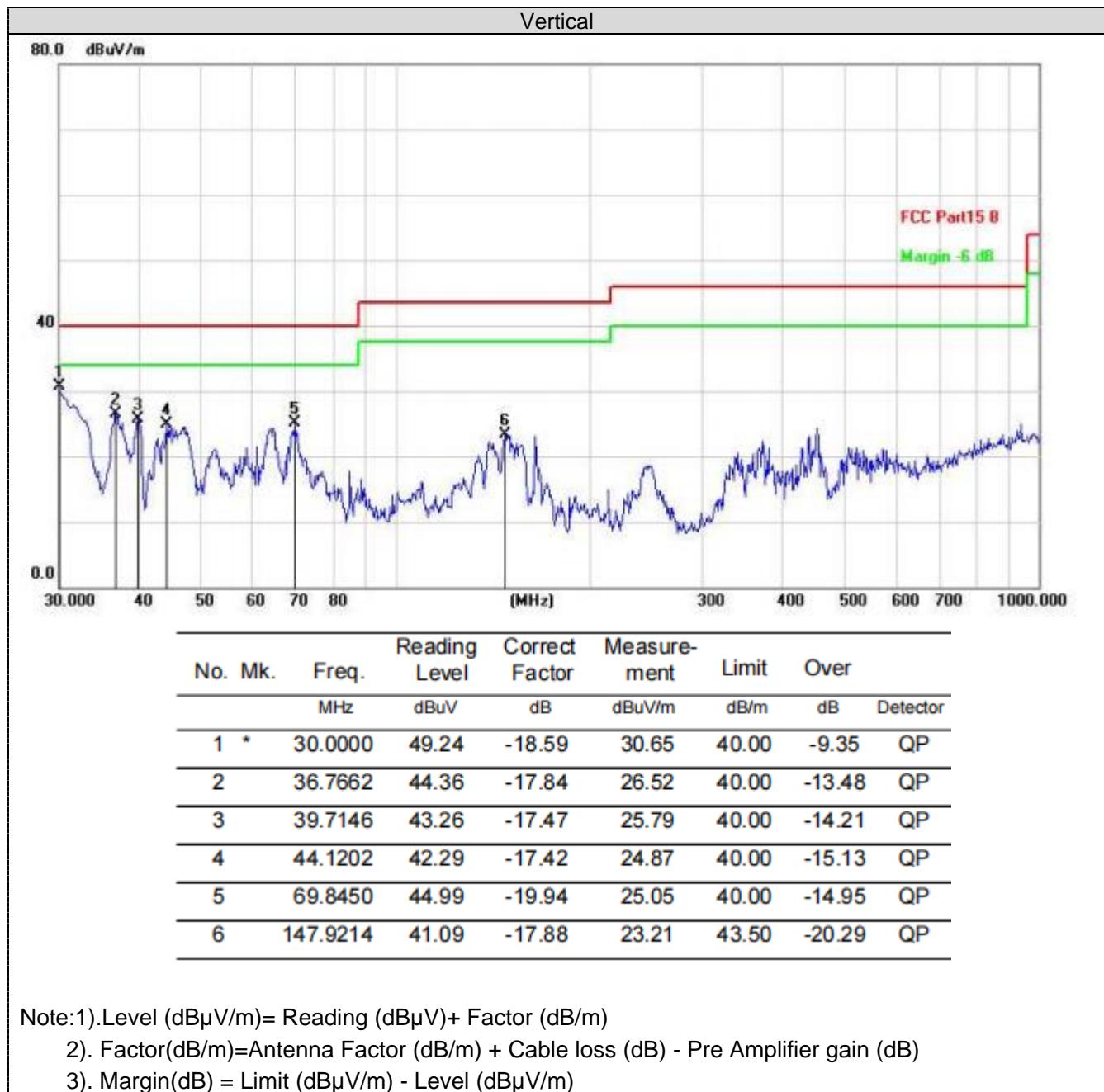
TEST RESULTS

Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. We measured Radiated Emission at GFSK, $\pi/4$ DQPSK and 8DPSK mode from 9 KHz to 25GHz and recorded worst case at GFSK DH5 mode.
3. For below 1GHz testing recorded worst at GFSK DH5 middle channel.
4. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

For 30MHz-1GHz





In-band Emissions

| Frequency(MHz): | | | 13.56 | | | Polarity: | | HORIZONTAL | |
|-----------------|-----------------|-------------------------|----------|----------------|-------------|------------------|-----------------------|-------------------|--------------------------|
| No. | Frequency (MHz) | Emission Level (dBuV/m) | Detector | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Correction Factor (dB/m) |
| 1 | 13.15 | 54.21 | PK | 80.50 | 26.29 | 49.42 | 5.31 | -0.52 | 4.79 |
| 2 | 13.55 | 76.46 | PK | 90.47 | 14.01 | 71.63 | 5.35 | -0.52 | 4.83 |
| 3 | 13.56 | 105.04 | PK | 124.00 | 18.96 | 100.21 | 5.35 | -0.52 | 4.83 |
| 4 | 13.57 | 77.17 | PK | 90.47 | 13.30 | 72.34 | 5.35 | -0.52 | 4.83 |
| 5 | 13.75 | 55.05 | PK | 80.50 | 25.45 | 50.17 | 5.40 | -0.52 | 4.88 |

| Frequency(MHz): | | | 13.56 | | | Polarity: | | VERTICAL | |
|-----------------|-----------------|-------------------------|----------|----------------|-------------|------------------|-----------------------|-------------------|--------------------------|
| No. | Frequency (MHz) | Emission Level (dBuV/m) | Detector | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Correction Factor (dB/m) |
| 1 | 13.15 | 55.00 | PK | 80.50 | 25.50 | 50.21 | 5.31 | -0.52 | 4.79 |
| 2 | 13.55 | 77.59 | PK | 90.47 | 12.88 | 72.76 | 5.35 | -0.52 | 4.83 |
| 3 | 13.56 | 108.11 | PK | 124.00 | 15.89 | 103.28 | 5.35 | -0.52 | 4.83 |
| 4 | 13.57 | 78.10 | PK | 90.47 | 12.37 | 73.27 | 5.35 | -0.52 | 4.83 |
| 5 | 13.75 | 55.13 | PK | 80.50 | 25.37 | 50.25 | 5.40 | -0.52 | 4.88 |

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)
3. Margin value = Limit value- Emission level.
4. The other emission levels were very low against the limit.

Out-of-band Emissions

| Frequency(MHz): | | | 13.56 | | | Polarity: | | HORIZONTAL | |
|-----------------|-----------------|-------------------------|----------|----------------|-------------|------------------|-----------------------|-------------------|--------------------------|
| No. | Frequency (MHz) | Emission Level (dBuV/m) | Detector | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Correction Factor (dB/m) |
| 1 | 27.12 | 41.25 | PK | 69.54 | 28.29 | 33.54 | 7.36 | 0.35 | 7.71 |
| 2 | 40.68 | 33.18 | PK | 40.00 | 6.82 | 24.29 | 8.27 | 0.62 | 8.89 |
| 3 | 54.24 | 29.65 | PK | 40.00 | 10.35 | 20.42 | 8.42 | 0.81 | 9.23 |
| 4 | 67.80 | 28.28 | PK | 40.00 | 11.72 | 18.57 | 8.69 | 1.02 | 9.71 |

| Frequency(MHz): | | | 13.56 | | | Polarity: | | VERTICAL | |
|-----------------|-----------------|-------------------------|----------|----------------|-------------|------------------|-----------------------|-------------------|--------------------------|
| No. | Frequency (MHz) | Emission Level (dBuV/m) | Detector | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Correction Factor (dB/m) |
| 1 | 27.12 | 39.45 | PK | 69.54 | 30.09 | 31.74 | 7.36 | 0.35 | 7.71 |
| 2 | 40.68 | 34.62 | PK | 40.00 | 5.38 | 25.73 | 8.27 | 0.62 | 8.89 |
| 3 | 54.24 | 28.51 | PK | 40.00 | 11.49 | 19.28 | 8.42 | 0.81 | 9.23 |
| 4 | 67.80 | 28.34 | PK | 40.00 | 11.66 | 18.63 | 8.69 | 1.02 | 9.71 |

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)
3. Margin value = Limit value- Emission level.
4. The other emission levels were very low against the limit.

4.3 20dB Bandwidth

Limit

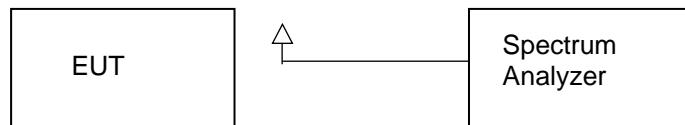
No limit for 20dB bandwidth.

Test Procedure

The 20dB bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

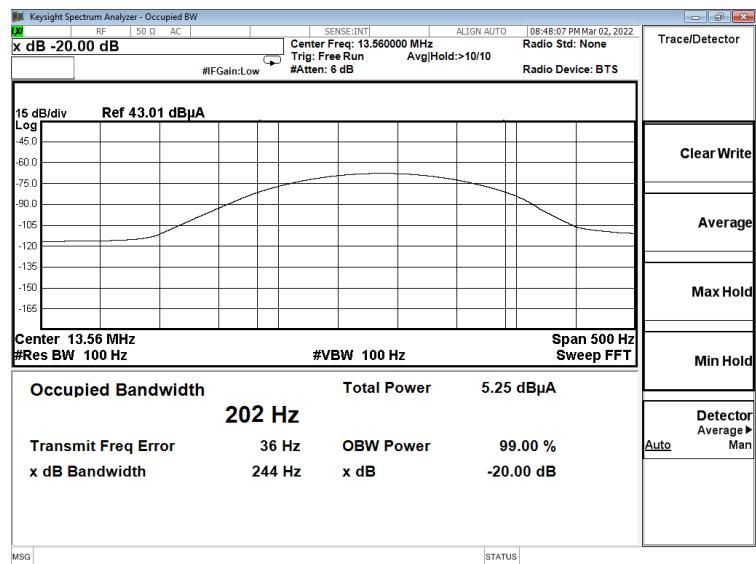
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

Test Configuration



Test Results

| Modulation | Frequency(MHz) | 20dB bandwidth (KHz) | Result |
|------------|----------------|----------------------|--------|
| ASK | 13.56MHz | 0.244 | Pass |

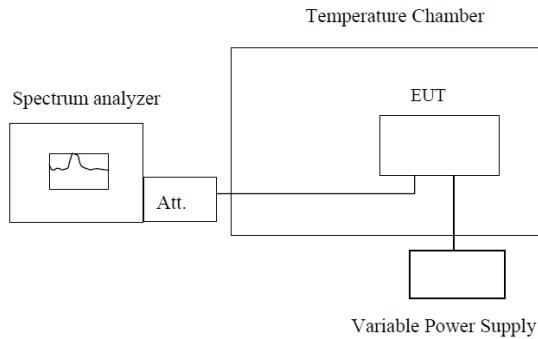


4.4 Frequency Stability

LIMIT

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

TEST PROCEDURE

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to -20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.
7. Reduce the input voltage to specified extreme voltage variation (+/- 15%) or endpoint, record the maximum frequency change.

TEST RESULTS

| Reference Frequency: 13.56MHz | | | | |
|-------------------------------|------------------|----------------|-------------------------|---------------|
| Voltage (V) | Temperature (°C) | Frequency (Hz) | Frequency Deviation(Hz) | Deviation (%) |
| 5.0 | +20(Ref) | 13.560084 | 84 | 0.000501% |
| | -20 | 13.560111 | 111 | 0.000826% |
| | -10 | 13.560098 | 98 | 0.000907% |
| | 0 | 13.560121 | 121 | 0.000804% |
| | +10 | 13.560156 | 156 | 0.001364% |
| | +20 | 13.560137 | 137 | 0.000745% |
| | +25 | 13.560162 | 162 | 0.001173% |
| | +30 | 13.560141 | 141 | 0.000944% |
| | +40 | 13.560159 | 159 | 0.001224% |
| | +50 | 13.560078 | 78 | 0.000583% |
| 5.75 | +20 | 13.560143 | 143 | 0.000988% |
| 4.25 | +20 | 13.560165 | 165 | 0.000501% |

5 Test Setup Photos of the EUT

Reference to the **appendix I** for details

6 Photos of the EUT

Reference to the **appendix II** for details.

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