



FCC PART 15.225

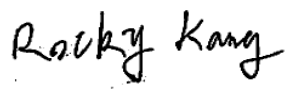
TEST REPORT

For

Vanstone Electronic (Beijing) Co.,Ltd.

Room 4-18, No.25, Landianchang South Road, Haidian, Beijing, 100097, China

FCC ID: OWLA90

| | |
|---|---|
| Report Type: Original Report | Product Type: Smart POS Terminal |
| Report Number: <u>RGMA181217002-00E</u> | |
| Report Date: <u>201-03-25</u> | |
| Reviewed By: <u>RF Engineer</u> | Rocky Kang  |
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The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

| | |
|----------------------|--|
| Product | Smart POS Terminal |
| Model | A90 |
| Frequency Range | 13.56 MHz |
| Transmit Power | 72.86 dB μ V/m@3m |
| Modulation Technique | ASK |
| Voltage Range | DC 3.8 V from rechargeable Li-pol battery or DC 5V from adapter |
| Date of Test | 2019-03-22 |
| Sample serial number | 00021000001 |
| Received date | 2018-12-17 |
| Sample/EUT Status | Good condition |
| Adapter information | Model:TPA-46050200UU Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5.0V, 2000mA |

Objective

This Type approval report is prepared on behalf of *Vanstone Electronic (Beijing) Co.,Ltd.* in accordance with Part 2- Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The objective is to determine the compliance of the EUT with FCC rules, section 15.203, 15.205, 15.207, 15.209 and 15.225.

Related Submittal(s)/Grant(s)

Part 15.247 DSS & DTS and Part 22H /24E / 27 PCB submissions with FCC ID: OWLA90.

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.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

| Parameter | | Uncertainty |
|------------------------------------|------------|-------------|
| Occupied Channel Bandwidth | | ±5% |
| AC Power Lines Conducted Emissions | | ±1.95dB |
| Radiated Emissions | Below 1GHz | ±4.75dB |
| | Above 1GHz | ±4.88dB |
| Temperature | | ±1 °C |
| Humidity | | ±6% |
| Supply voltages | | ±0.4% |

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

EUT Exercise Software

No Exercise Software was used.

Equipment Modifications

No modification on the EUT.

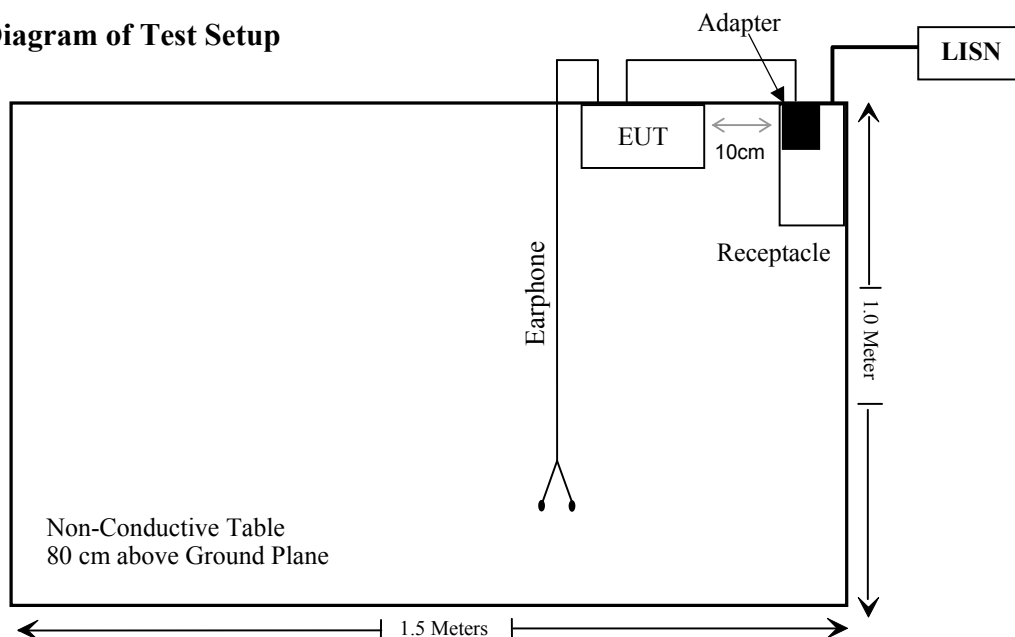
Local Support Equipment

| Manufacturer | Description | Model | Serial Number |
|--------------|-------------|-------|---------------|
| N/A | N/A | N/A | N/A |

External I/O Cable

| Cable Description | Length (m) | From Port | To |
|-----------------------------------|------------|-----------|---------|
| Un-shielding Detachable USB Cable | 1.0 | EUT | Adapter |

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|----------------------------|----------------------------|------------|
| §15.203 | Antenna Requirement | Compliance |
| §15.207 | AC Line Conducted Emission | Compliance |
| §15.225 §15.209 §15.205 | Radiated Emission Test | Compliance |
| §15.225(e) | Frequency Stability | Compliance |
| §15.215(c) | 20dB Emission Bandwidth | Compliance |

TEST EQUIPMENT LIST

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---------------------------------|--------------------------------|---------------------|------------------------|------------------|----------------------|
| Conducted Emissions Test | | | | | |
| Rohde & Schwarz | EMI Test Receiver | ESCS30 | 100176 | 2018-07-11 | 2019-07-11 |
| Rohde & Schwarz | LISN | ENV216 | 3560.6650.12-101613-Yb | 2018-12-21 | 2019-12-21 |
| Rohde & Schwarz | Transient Limiter | ESH3Z2 | DE25985 | 2018-11-12 | 2019-11-12 |
| Rohde & Schwarz | CE Test software | EMC 32 | V8.53.0 | NCR | NCR |
| Unknown | Conducted Emission Cable | 78652 | UF A210B-1-0720-504504 | 2018-11-12 | 2019-11-12 |
| Radiated Emission Test | | | | | |
| COM-POWER | Pre-amplifier | PA-122 | 181919 | 2018-11-12 | 2019-11-12 |
| Rohde & Schwarz | EMI Test Receiver | ESR | 1316.3003K03-101746-zn | 2018-07-11 | 2019-07-11 |
| Sunol Sciences | Broadband Antenna | JB1 | A040904-1 | 2017-12-22 | 2020-12-21 |
| ETS | Passive Loop Antenna | 6512 | 00029604 | 2018-03-07 | 2021-03-06 |
| Sonoma Instrument | Amplifier | 310N | 186238 | 2018-11-12 | 2019-11-12 |
| UTiFLEX MICRO-C0AX | RF Cable | UFA147A-2362-100100 | MFR64639-231029-003 | 2018-07-11 | 2021-07-10 |
| Ducommun Technologies | RF Cable | 104PEA | 218124002 | 2018-11-12 | 2019-11-12 |
| Fluke | Digital Multimeter | 287 | 19000011 | 2018-04-12 | 2019-04-12 |
| Long Wei | DC Power Supply | TPR-6420D | 398363 | NCR | NCR |
| ESPEC | Temperature & Humidity Chamber | EL-10KA | 9107726 | 2018-12-21 | 2019-12-21 |

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Antenna Connected Construction

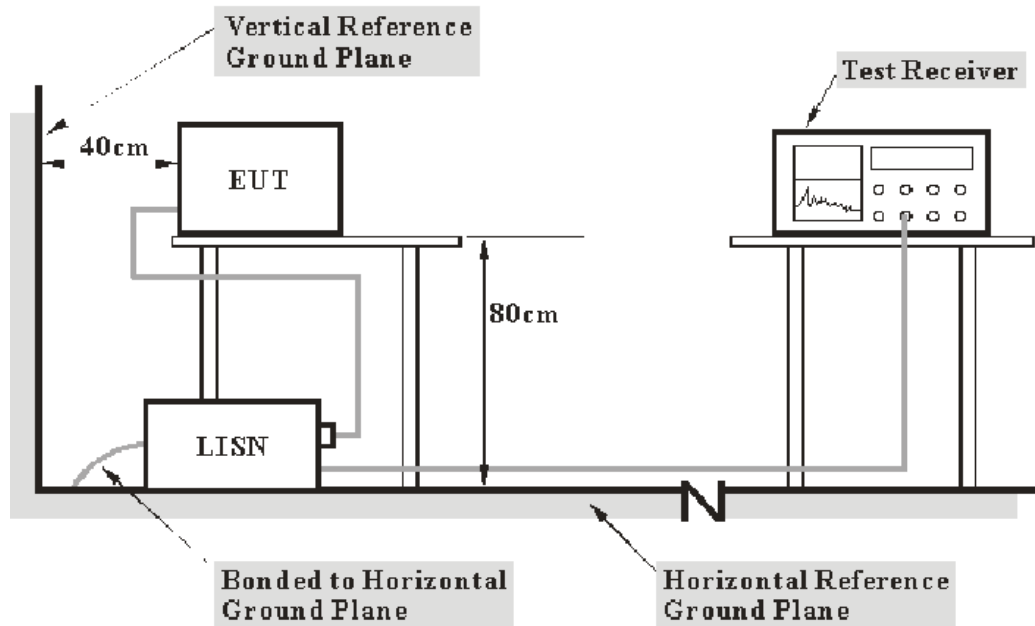
The EUT has an internal antenna arrangement, which was permanently attached, fulfill the requirement of this section. Please refer to EUT photos for details.

FCC §15.207 – AC LINE CONDUCTED EMISSION

Applicable Standard

FCC§15.207

EUT Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | IF B/W |
|------------------|--------|
| 150 kHz – 30 MHz | 9 kHz |

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

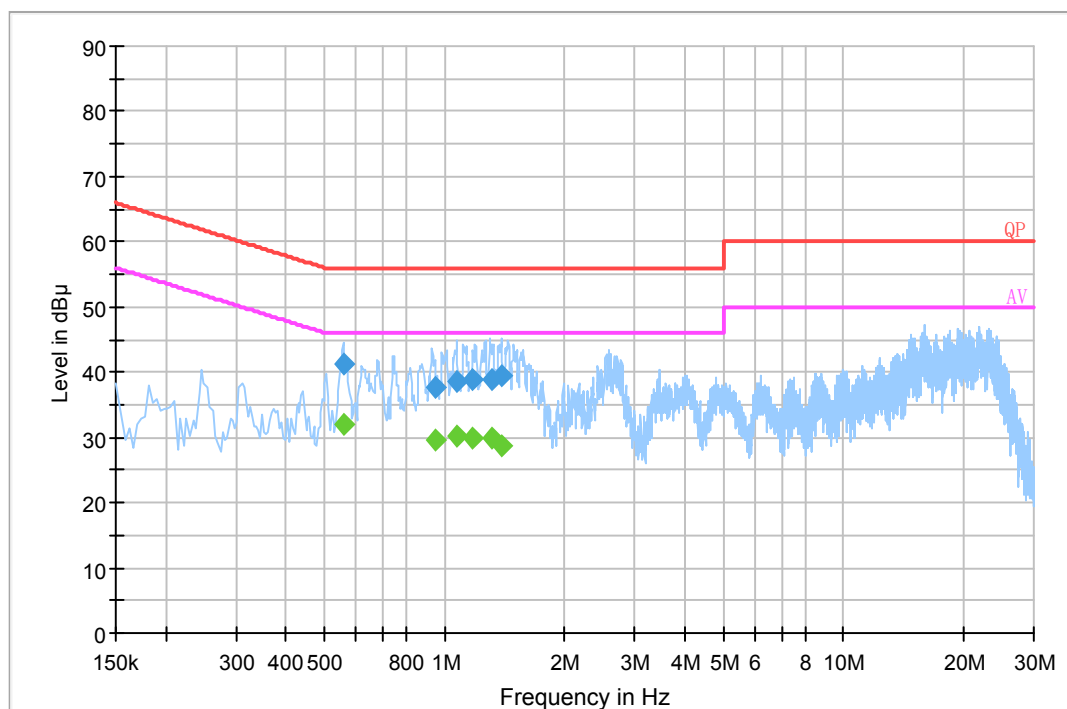
Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 25 °C |
| Relative Humidity: | 50 % |
| ATM Pressure: | 101.0 kPa |

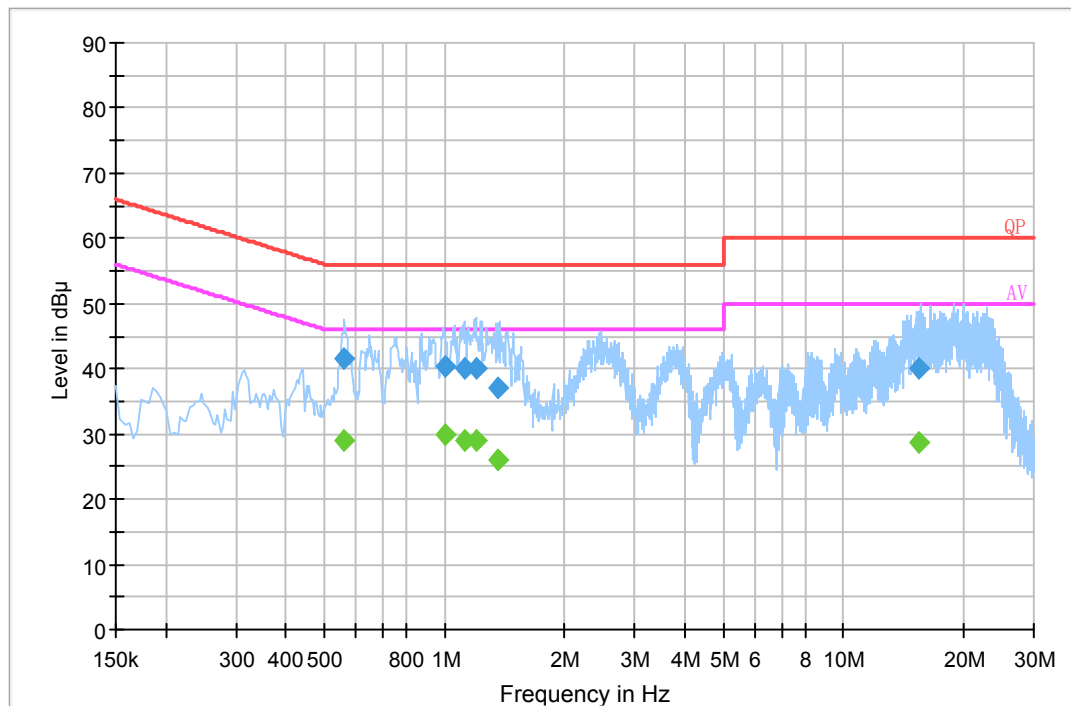
The testing was performed by Haiguo Li on 2019-03-22.

EUT operation mode: Transmitting & charging

AC 120 V/60 Hz, Line:



| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.561630 | 41.1 | 20.0 | 56.0 | 14.9 | QP |
| 0.943950 | 37.7 | 20.0 | 56.0 | 18.3 | QP |
| 1.069890 | 38.5 | 20.1 | 56.0 | 17.5 | QP |
| 1.176090 | 38.7 | 20.0 | 56.0 | 17.3 | QP |
| 1.314470 | 38.8 | 20.0 | 56.0 | 17.2 | QP |
| 1.393150 | 39.4 | 20.1 | 56.0 | 16.6 | QP |
| 0.561630 | 32.0 | 20.0 | 46.0 | 14.0 | Ave. |
| 0.943950 | 29.6 | 20.0 | 46.0 | 16.4 | Ave. |
| 1.069890 | 30.2 | 20.1 | 46.0 | 15.8 | Ave. |
| 1.176090 | 30.0 | 20.0 | 46.0 | 16.0 | Ave. |
| 1.314470 | 29.8 | 20.0 | 46.0 | 16.2 | Ave. |
| 1.393150 | 28.7 | 20.1 | 46.0 | 17.3 | Ave. |

AC 120V/60 Hz, Neutral:

| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.561570 | 41.6 | 20.0 | 56.0 | 14.4 | QP |
| 1.007030 | 40.4 | 20.1 | 56.0 | 15.6 | QP |
| 1.117230 | 40.0 | 20.0 | 56.0 | 16.0 | QP |
| 1.196030 | 40.1 | 20.0 | 56.0 | 15.9 | QP |
| 1.365450 | 37.1 | 20.1 | 56.0 | 18.9 | QP |
| 15.458590 | 40.2 | 20.2 | 60.0 | 19.8 | QP |
| 0.561570 | 29.0 | 20.0 | 46.0 | 17.0 | Ave. |
| 1.007030 | 29.9 | 20.1 | 46.0 | 16.1 | Ave. |
| 1.117230 | 28.9 | 20.0 | 46.0 | 17.1 | Ave. |
| 1.196030 | 29.0 | 20.0 | 46.0 | 17.0 | Ave. |
| 1.365450 | 26.1 | 20.1 | 46.0 | 19.9 | Ave. |
| 15.458590 | 28.7 | 20.2 | 50.0 | 21.3 | Ave. |

Note:

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

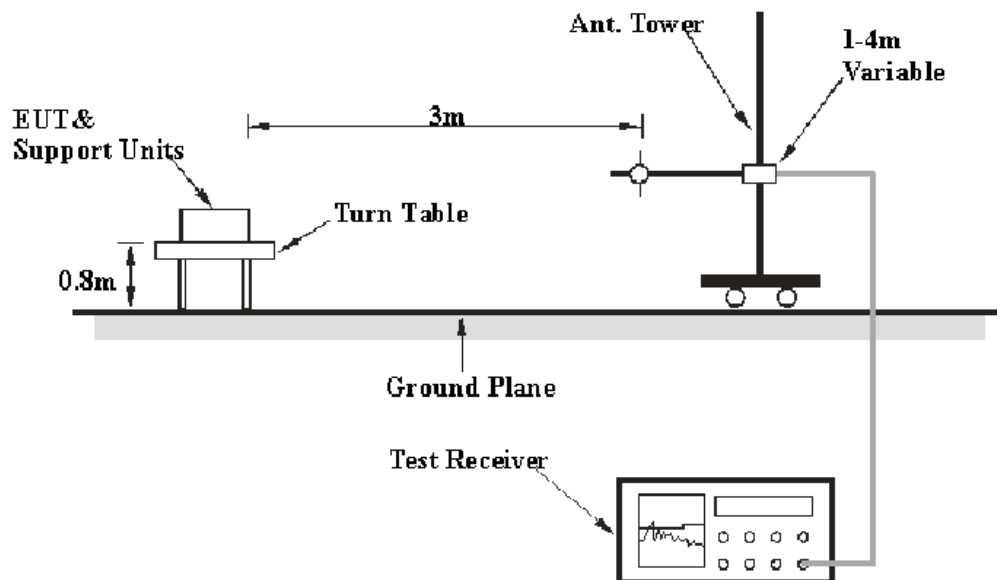
FCC§15.225, §15.205 & §15.209 - RADIATED EMISSIONS TEST

Applicable Standard

As per FCC Part 15.225

- (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.

EUT Setup



Note: Antenna is set up at 1m during test for below 30MHz.

The radiated emission tests were performed in the 3-meter chamber a test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part Subpart C limits.

EMI Test Receiver Setup

According to FCC Rules, 47 CFR 15.33, the EUT emissions were investigated up to 1000 MHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

| Frequency Range | RBW | Video B/W | IF B/W | Detector |
|-------------------|---------|-----------|--------|----------|
| 9 kHz – 150 kHz | 300 Hz | 1 kHz | / | QP |
| 150 kHz – 30 MHz | 10 kHz | 30 kHz | / | QP |
| 30 MHz – 1000 MHz | 100 kHz | 300 kHz | / | QP |

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\begin{aligned}\text{Corrected Factor} &= \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain} \\ \text{Corrected Amplitude} &= \text{Meter Reading} + \text{Corrected Factor}\end{aligned}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.209.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 26 °C |
| Relative Humidity: | 56 % |
| ATM Pressure: | 101.0 kPa |

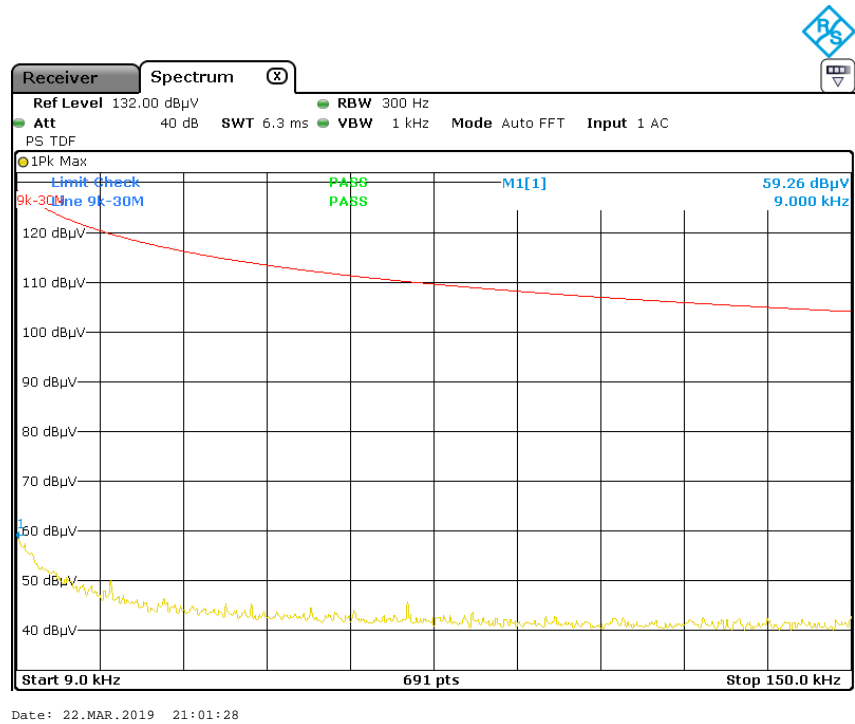
The testing was performed by Shawn Xiao on 2019-03-22.

Test mode: Transmitting

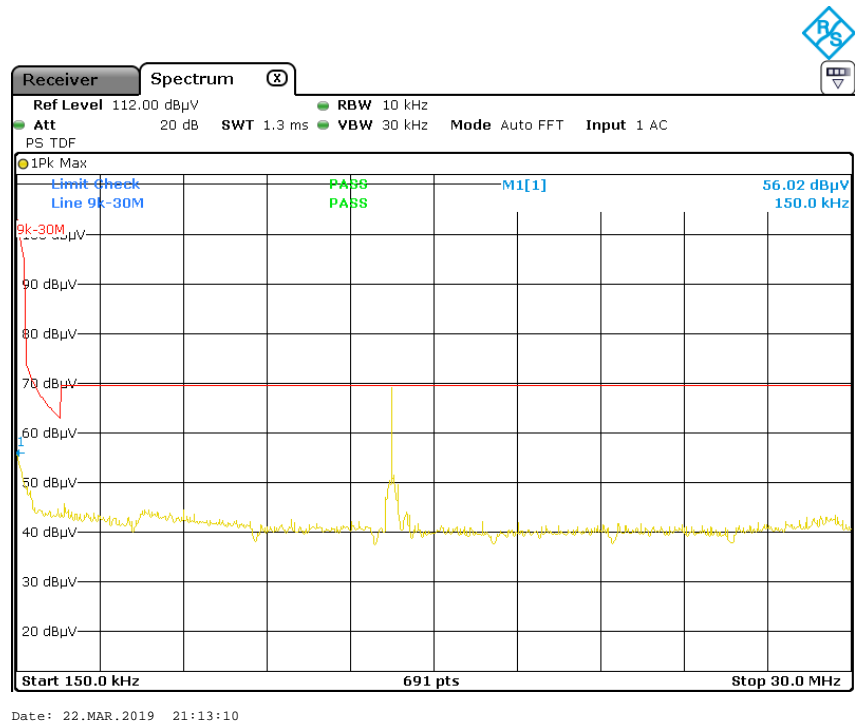
1) Spurious Emissions (9 kHz~30 MHz):

| Indicated | | Table Angle Degree | Antenna Height (m) | Detector | Correction Factor | | | Corrected Amplitude (dBμV/m) @3m | FCC part 15.225 | |
|-------------|----------------------------------|--------------------|--------------------|----------|-------------------|-----------------|--------------------|----------------------------------|--------------------|--------|
| Freq. (MHz) | Corrected Amplitude (dBμV/m) @3m | | | | Ant. Factor (dB) | Cable Loss (dB) | Pre-Amp. Gain (dB) | | Limit (dBμV/m) @3m | Result |
| 0.009 | 20.56 | 0 | 1 | PK | 68.8 | 0.1 | 30.2 | 59.26 | 128.25 | Pass |
| 0.15 | 25.72 | 0 | 1 | PK | 60.4 | 0.1 | 30.2 | 56.02 | 104.08 | Pass |

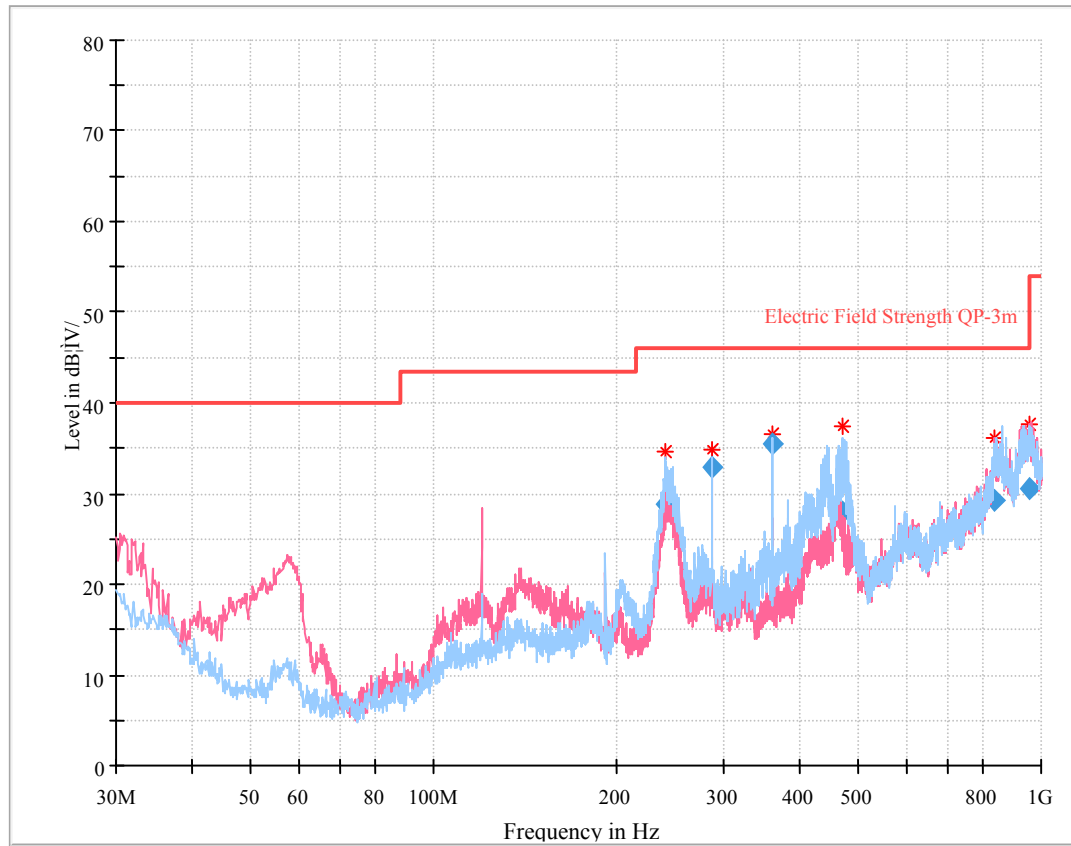
9 kHz~150 kHz



150 kHz~30 MHz



2) Spurious Emissions (30 MHz~1GHz):



| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna height (cm) | Antenna Polarity | Turntable position (degree) | Correction Factor (dB/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|------------------------------|---------------------|------------------|-----------------------------|--------------------------|----------------|-------------|
| 240.640750 | 28.83 | 125.0 | H | 99.0 | -14.1 | 46.00 | 17.17 |
| 288.010000 | 32.80 | 114.0 | H | 208.0 | -11.4 | 46.00 | 13.20 |
| 359.989000 | 35.44 | 105.0 | H | 71.0 | -10.7 | 46.00 | 10.56 |
| 470.965750 | 28.03 | 108.0 | H | 108.0 | -7.8 | 46.00 | 17.97 |
| 837.593500 | 29.21 | 202.0 | V | 184.0 | 5.7 | 46.00 | 16.79 |
| 957.735125 | 30.48 | 400.0 | V | 71.0 | 9.4 | 46.00 | 15.52 |

Note:

- 1) Correction Factor = Antenna factor(Rx) + Cable Loss – Amplifier factor
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

3) Inband:

| Indicated | | | Table Angle Degree | Antenna Height (m) | Detector | Correction Factor | | | Corrected Amplitude (dBμV/m) @3m | FCC part 15.225 | |
|-----------------------|------------------|----------------------------------|--------------------|--------------------|----------|-------------------|-----------------|--------------------|----------------------------------|--------------------|--------|
| Frequency Range (MHz) | Mark Point (MHz) | Corrected Amplitude (dBμV/m) @3m | | | | Ant. Factor (dB) | Cable Loss (dB) | Pre-Amp. Gain (dB) | | Limit (dBμV/m) @3m | Result |
| 13.110-13.410 | 13.398 | 33.12 | 0 | 1.2 | QP | 32.0 | 0.2 | 30.2 | 35.12 | 80.5 | Pass |
| 13.410-13.553 | 13.544 | 35.21 | 0 | 1.3 | QP | 32.0 | 0.2 | 30.2 | 37.21 | 90.5 | Pass |
| 13.553-13.567 | 13.561 | 70.86 | 0 | 1 | QP | 32.0 | 0.2 | 30.2 | 72.86 | 124 | Pass |
| 13.567-13.710 | 13.568 | 34.16 | 0 | 1.2 | QP | 32.0 | 0.2 | 30.2 | 36.16 | 90.5 | Pass |
| 13.710-14.010 | 13.876 | 32.34 | 0 | 1.1 | QP | 32.0 | 0.2 | 30.2 | 34.34 | 80.5 | Pass |

FCC§15.225(e) - FREQUENCY STABILITY

Applicable Standard

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. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to PC, then to an external AC power supply and inductive antenna was connected to a Spectrum Analyzer. The EUT was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Spectrum Analyzer.

Frequency Stability vs. Voltage: An external variable AC power supply Source. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the end point. The output frequency was recorded for each voltage.

Test Data

Environmental Conditions

| | |
|---------------------------|-----------|
| Temperature: | 26 °C |
| Relative Humidity: | 56 % |
| ATM Pressure: | 101.0 kPa |

The testing was performed by Shawn Xiao on 2019-03-22.

Test Mode: Transmitting

Test Result: Pass

| Voltage Supply (V _{DC}) | Temperature (°C) | Measured Frequency (MHz) | Frequency Error (%) | Part 15.225 Limit |
|-----------------------------------|------------------|--------------------------|---------------------|-------------------|
| 3.8V | -20 | 13.560582 | 0.00429% | $\pm 0.01\%$ |
| | -10 | 13.560624 | 0.00460% | $\pm 0.01\%$ |
| | 0 | 13.560500 | 0.00369% | $\pm 0.01\%$ |
| | 10 | 13.560070 | 0.00051% | $\pm 0.01\%$ |
| | 20 | 13.560695 | 0.00513% | $\pm 0.01\%$ |
| | 30 | 13.560726 | 0.00536% | $\pm 0.01\%$ |
| | 40 | 13.560831 | 0.00613% | $\pm 0.01\%$ |
| | 50 | 13.560766 | 0.00565% | $\pm 0.01\%$ |
| 3.5V | 20 | 13.561071 | 0.00790% | $\pm 0.01\%$ |
| 4.35V | 20 | 13.560789 | 0.00582% | $\pm 0.01\%$ |

FCC§15.215(c) - 20dB EMISSION BANDWIDTH

Requirement

Per 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the table of the chamber, Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

Test Data**Environmental Conditions**

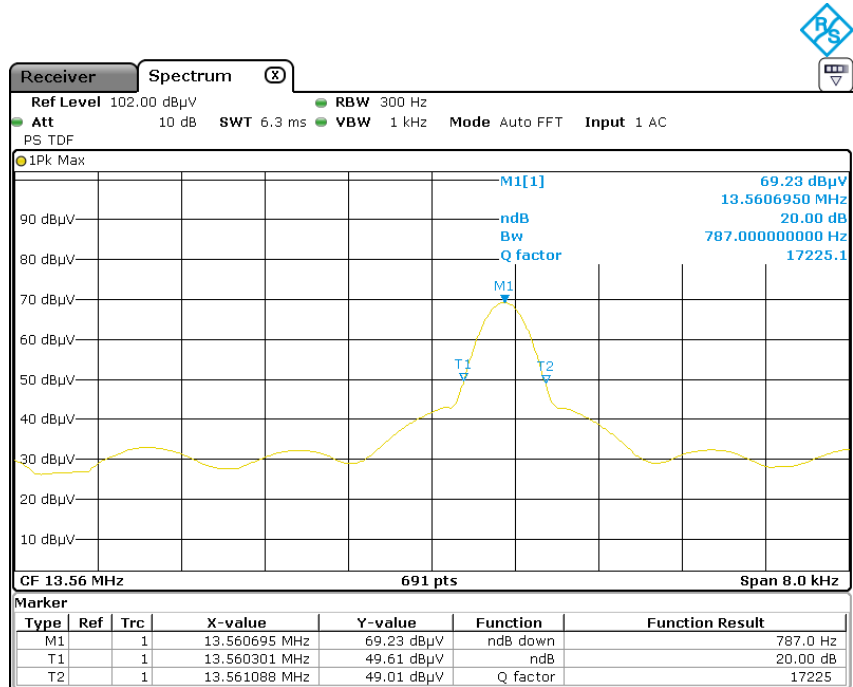
| | |
|---------------------------|-----------|
| Temperature: | 26 °C |
| Relative Humidity: | 56 % |
| ATM Pressure: | 101.0 kPa |

The testing was performed by Shawn Xiao on 2019-03-22.

Test Mode: Transmitting

Test Result: Pass

20 dB Emission Bandwidth



Date: 22.MAR.2019 21:16:10

***** END OF REPORT *****