

# FCC PART 15C TEST REPORT

For

**AKUVOX (XIAMEN) NETWORKS CO., LTD.**

10/F, No.56, Software Park II, Xiamen, China

**FCC ID: 2AHCR-R28A**

|                                        |                                                                                                                                                                                                                                                       |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Report Type:</b><br>Original Report | <b>Product Name:</b><br>Door Phone                                                                                                                                                                                                                    |
| <b>Report Number:</b> RXM190515053-00A |                                                                                                                                                                                                                                                       |
| <b>Report Date:</b> 2019-08-19         |                                                                                                                                                                                                                                                       |
| <b>Reviewed By:</b>                    | Jerry Zhang<br>EMC Manager <i>Jerry Zhang</i>                                                                                                                                                                                                         |
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**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA\* or any agency of the Federal Government. \* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “\*” .

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## GENERAL INFORMATION

### Product Description for Equipment Under Test (EUT)

|                             |                                            |
|-----------------------------|--------------------------------------------|
| <b>EUT Name:</b>            | Door Phone                                 |
| <b>EUT Model:</b>           | R28A                                       |
| <b>Multiple Model:</b>      | R28V                                       |
| <b>Operation Frequency:</b> | 125 kHz<br>13.56 MHz                       |
| <b>Modulation Type:</b>     | ASK                                        |
| <b>Rated Input Voltage:</b> | DC 12V from the adapter or DC 48V from PoE |
| <b>External Dimension:</b>  | 280mm(L)*130mm(W)*30mm(H) 1000g            |
| <b>Serial Number:</b>       | 190515053                                  |
| <b>EUT Received Date:</b>   | 2019-05-17                                 |

*Note: The series products models R28V is electrically identical with R28A, we selected R28A for fully testing, the details of the difference between them were explained in the attached declaration letter.*

### Objective

This Type approval report is prepared on behalf of AKUVOX (XIAMEN) NETWORKS CO., LTD. in accordance with Part 2, Subpart J, and Part 15, Subparts A and C of the Federal Communications Commission's rules.

The objective is to determine the compliance of the EUT with FCC rules, sec 15.203, 15.205, 15.207, 15.209, 15.215 and 15.225.

### Related Submittal(s)/Grant(s)

N/A

### Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

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

**Measurement Uncertainty**

| Parameter                         | Measurement Uncertainty                                       |
|-----------------------------------|---------------------------------------------------------------|
| Occupied Channel Bandwidth        | $\pm 5\%$                                                     |
| radiated Emissions                | 9kHz~30MHz: 4.12dB<br>30M~200MHz: 4.55 dB, 200M~1GHz: 5.92 dB |
| Temperature                       | $\pm 1^{\circ}\text{C}$                                       |
| Humidity                          | $\pm 5\%$                                                     |
| DC and low frequency voltages     | $\pm 0.4\%$                                                   |
| Duty Cycle                        | 1%                                                            |
| AC Power Lines Conducted Emission | 3.12 dB (150 kHz to 30 MHz)                                   |

**Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured for testing in a test mode

The device operates in 125 kHz and 13.56 MHz simultaneously for RFID detection.

### EUT Exercise Software

No software used in test.

### Support Equipment List and Details

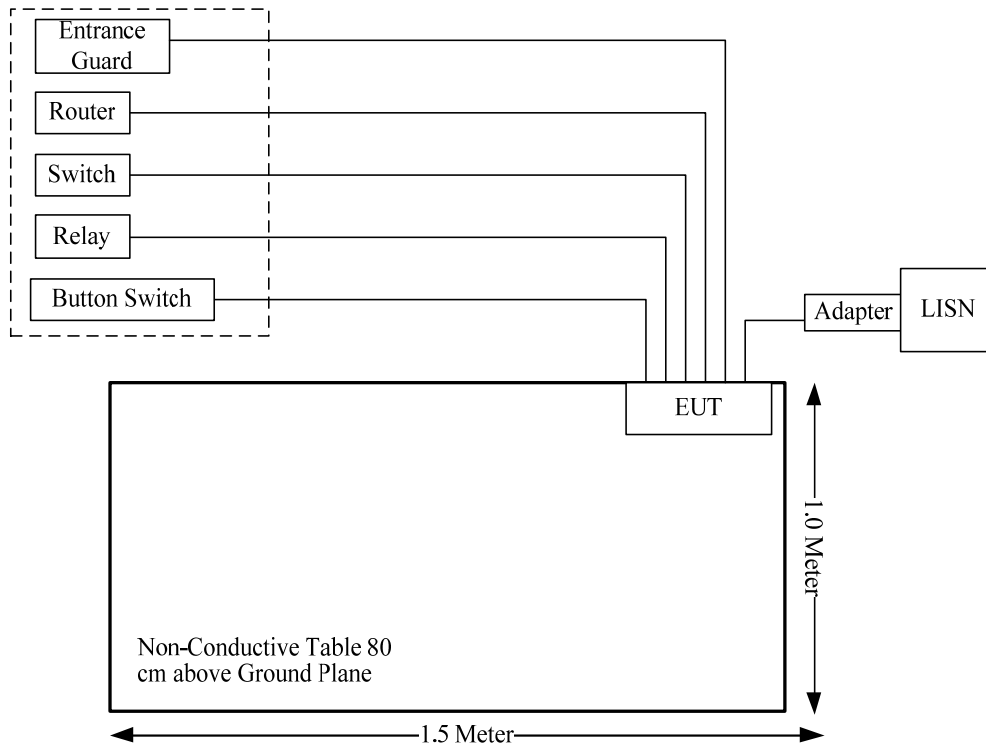
| Manufacturer | Description    | Model        | Serial Number     |
|--------------|----------------|--------------|-------------------|
| Tenda        | PoE            | O2           | N/A               |
| HUAWEI       | Adapter        | HW-120200U6W | N/A               |
| RSD          | Button Switch  | KCD1         | N/A               |
| Lotus        | Entrance Guard | L8MF-W       | N/A               |
| Schneider    | Relay          | RXM2LB2BD    | N/A               |
| TP-LINK      | Switch         | TL-SF1008P   | 114A297001782     |
| Tenda        | Router         | D301         | E3941017710003629 |

### Support Cable List and Details

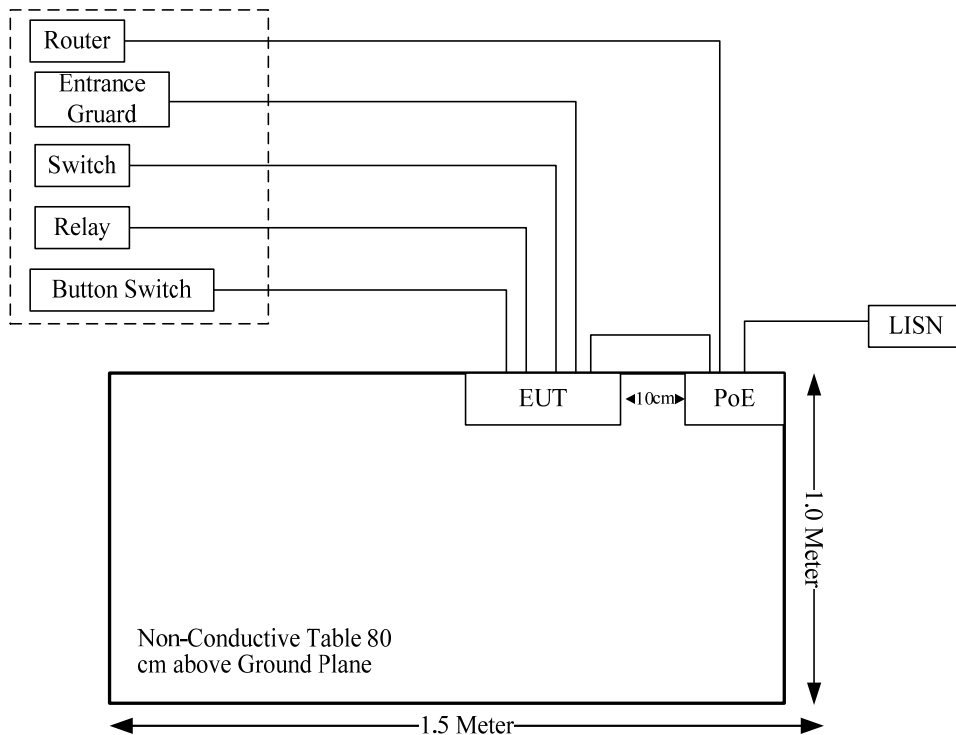
| Cable Description | Shielding Type | Ferrite Core | Length (m) | From Port  | To             |
|-------------------|----------------|--------------|------------|------------|----------------|
| RJ45 Cable        | No             | No           | 5          | EUT or PoE | router         |
| Signal Cable      | No             | No           | 5          | EUT        | Button Switch  |
| Signal Cable      | No             | No           | 5          | EUT        | Entrance Guard |
| RS485 Cable       | No             | No           | 5          | EUT        | Switch         |
| Signal Cable      | No             | No           | 5          | EUT        | Relay          |
| RJ45 Cable        | No             | No           | 1          | EUT        | PoE            |

## Block Diagram of Test Setup

### AC/DC Adapter supply



### PoE supply



**SUMMARY OF TEST RESULTS**

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

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## **FCC§15.203 - ANTENNA REQUIREMENT**

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### **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.

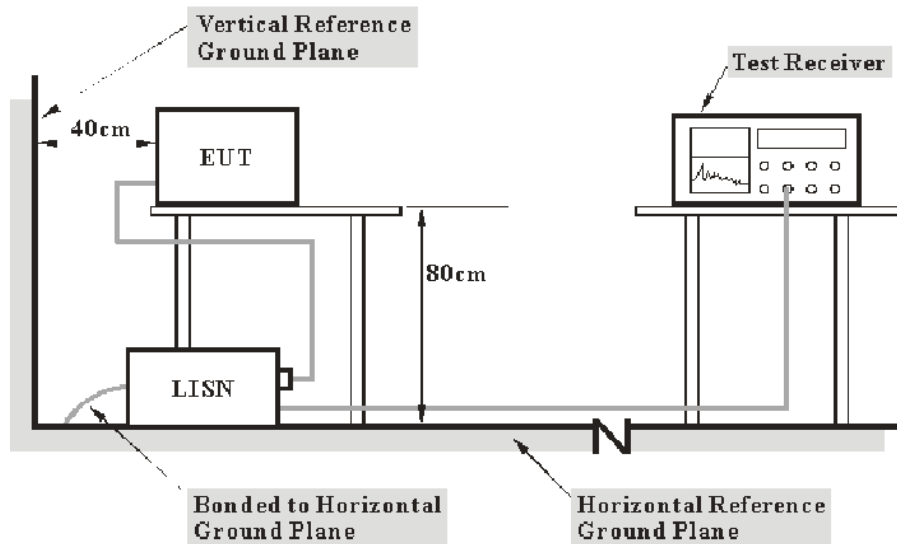
### **Antenna Connected Construction**

The EUT has two integral antenna arrangement, one for 13.56MHz, one for 125kHz, which was permanently attached and fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.

## FCC §15.207 – AC LINE CONDUCTED EMISSION

### 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 limits.

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.

The adapter was connected to the main LISN with an AC 120V/60Hz power source.

### 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 Equipment List and Details

| Manufacturer | Description        | Model     | Serial Number | Calibration Date | Calibration Due Date |
|--------------|--------------------|-----------|---------------|------------------|----------------------|
| Unknown      | Coaxial Cable      | C-NJNJ-50 | C-0200-01     | 2018-09-05       | 2019-09-05           |
| R&S          | Test Software      | EMC32     | Version8.53.0 | N/A              | N/A                  |
| R&S          | Two-line V-network | ENV 216   | 101614        | 2018-12-10       | 2019-12-10           |
| R&S          | EMI Test Receiver  | ESPI      | 100120        | 2019-05-09       | 2020-05-09           |

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

### Test Procedure

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

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

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

According FCC publication number 174176, for a device with a permanent antenna operating at or below 30 MHz, the measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions: (1) perform the AC line conducted tests with the permanent antenna to determine compliance with the Section 15.207 limits outside the transmitter's fundamental emission band; (2) retest with a dummy load in lieu of the permanent antenna to determine compliance with the Section 15.207 limits within the transmitter's fundamental emission band.

### Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

$V_C$ : corrected voltage amplitude

$V_R$ : reading voltage amplitude

$A_C$ : attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

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

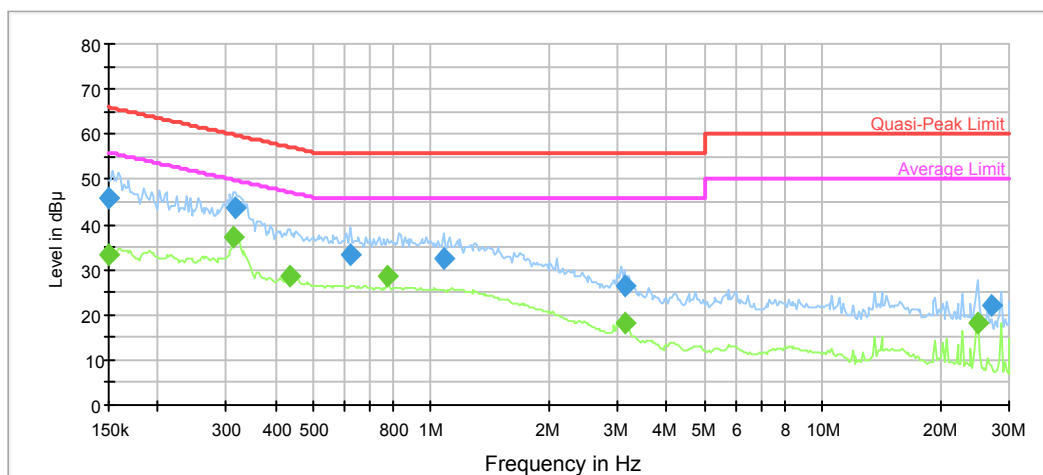
$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

**Test Results Summary**

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

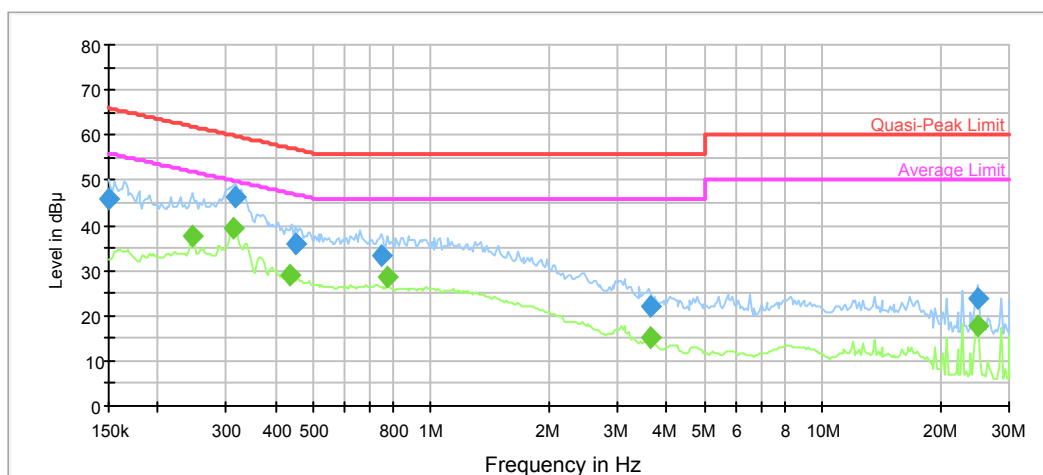
**Test Data****Environmental Conditions**

|                           |            |
|---------------------------|------------|
| <b>Temperature:</b>       | 29.1℃      |
| <b>Relative Humidity:</b> | 51%        |
| <b>ATM Pressure:</b>      | 99.7kPa    |
| <b>Test by:</b>           | Lily Xie   |
| <b>Test Date:</b>         | 2019-07-10 |

**Test mode: Transmitting***Test Mode: AC/DC Adapter supply***AC 120V, 60 Hz, Line:**

| Frequency (MHz) | Quasi Peak (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|-------------------|-----------------|------|------------|-------------|--------------|
| 0.150000        | 45.8              | 9.000           | L1   | 11.2       | 19.2        | 66.0         |
| 0.316369        | 43.5              | 9.000           | L1   | 10.1       | 16.3        | 59.8         |
| 0.622369        | 33.3              | 9.000           | L1   | 9.8        | 22.7        | 56.0         |
| 1.075780        | 32.4              | 9.000           | L1   | 9.8        | 23.6        | 56.0         |
| 3.119684        | 26.4              | 9.000           | L1   | 9.8        | 29.6        | 56.0         |
| 26.961902       | 22.3              | 9.000           | L1   | 9.8        | 35.7        | 60.0         |

| Frequency (MHz) | Average (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|-----------------|------|------------|-------------|--------------|
| 0.150000        | 33.1           | 9.000           | L1   | 11.2       | 22.9        | 56.0         |
| 0.313237        | 37.3           | 9.000           | L1   | 10.1       | 12.6        | 49.9         |
| 0.434989        | 28.5           | 9.000           | L1   | 9.9        | 18.7        | 47.2         |
| 0.774673        | 28.6           | 9.000           | L1   | 9.8        | 17.4        | 46.0         |
| 3.119684        | 18.1           | 9.000           | L1   | 9.8        | 27.9        | 46.0         |
| 25.063636       | 18.3           | 9.000           | L1   | 9.8        | 31.7        | 50.0         |

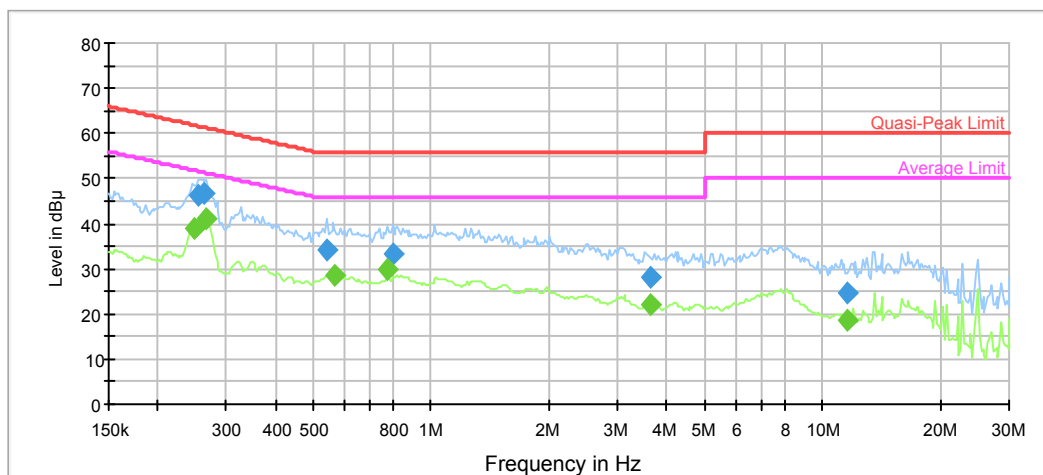
**AC120 V, 60 Hz, Neutral:**

| Frequency (MHz) | Quasi Peak (dB $\mu$ V) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dB $\mu$ V) |
|-----------------|-------------------------|-----------------|------|------------|-------------|--------------------|
| 0.150000        | 45.8                    | 9.000           | N    | 11.2       | 20.2        | 66.0               |
| 0.316369        | 46.4                    | 9.000           | N    | 10.1       | 10.4        | 59.8               |
| 0.452652        | 35.7                    | 9.000           | N    | 9.9        | 20.1        | 56.8               |
| 0.744445        | 33.2                    | 9.000           | N    | 9.8        | 22.8        | 56.0               |
| 3.621856        | 22.2                    | 9.000           | N    | 9.8        | 33.8        | 56.0               |
| 24.961021       | 23.7                    | 9.000           | N    | 9.8        | 36.3        | 60.0               |

| Frequency (MHz) | Average (dB $\mu$ V) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dB $\mu$ V) |
|-----------------|----------------------|-----------------|------|------------|-------------|--------------------|
| 0.244252        | 37.8                 | 9.000           | N    | 11.2       | 14.2        | 52.0               |
| 0.313237        | 39.4                 | 9.000           | N    | 10.1       | 10.5        | 49.9               |
| 0.434989        | 29.1                 | 9.000           | N    | 9.9        | 18.1        | 47.2               |
| 0.774673        | 28.6                 | 9.000           | N    | 9.8        | 17.4        | 46.0               |
| 3.621856        | 15.0                 | 9.000           | N    | 9.8        | 31.0        | 46.0               |
| 24.961921       | 17.5                 | 9.000           | N    | 9.8        | 32.5        | 50.0               |

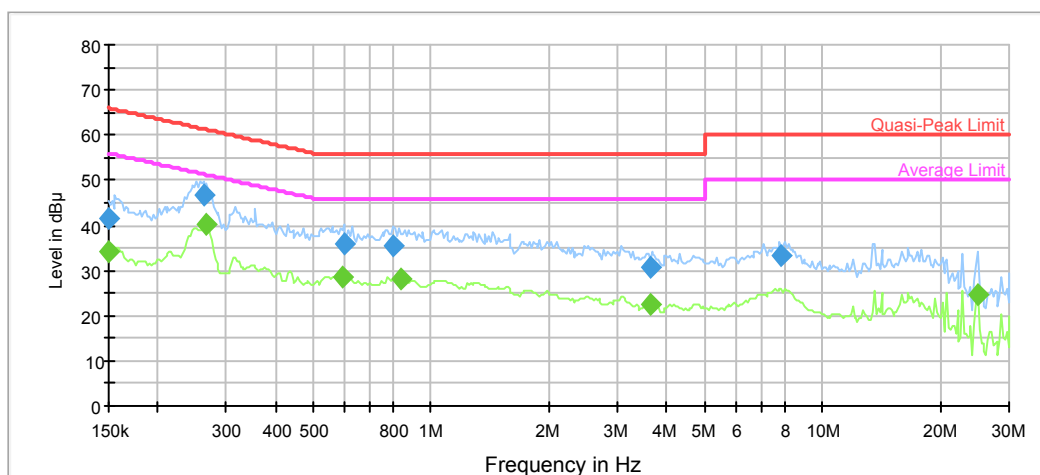
Test Mode: PoE Power supply

AC 120V, 60 Hz, Line:



| Frequency (MHz) | Quasi Peak (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|-------------------|-----------------|------|------------|-------------|--------------|
| 0.254170        | 46.1              | 9.000           | L1   | 10.3       | 15.5        | 61.6         |
| 0.261872        | 46.6              | 9.000           | L1   | 10.3       | 14.7        | 61.4         |
| 0.541438        | 34.0              | 9.000           | L1   | 9.9        | 22.0        | 56.0         |
| 0.798146        | 33.3              | 9.000           | L1   | 9.8        | 22.7        | 56.0         |
| 3.621856        | 28.0              | 9.000           | L1   | 9.8        | 28.0        | 56.0         |
| 11.601974       | 24.7              | 9.000           | L1   | 9.8        | 35.3        | 60.0         |

| Frequency (MHz) | Average (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|-----------------|------|------------|-------------|--------------|
| 0.249162        | 39.0           | 9.000           | L1   | 10.3       | 12.8        | 51.8         |
| 0.267135        | 40.9           | 9.000           | L1   | 10.3       | 10.3        | 51.2         |
| 0.569057        | 28.5           | 9.000           | L1   | 9.8        | 17.5        | 46.0         |
| 0.774673        | 29.6           | 9.000           | L1   | 9.8        | 16.4        | 46.0         |
| 3.621856        | 21.9           | 9.000           | L1   | 9.8        | 24.1        | 46.0         |
| 11.601974       | 18.8           | 9.000           | L1   | 9.8        | 31.2        | 50.0         |

**AC120 V, 60 Hz, Neutral:**

| Frequency (MHz) | Quasi Peak (dB $\mu$ V) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dB $\mu$ V) |
|-----------------|-------------------------|-----------------|------|------------|-------------|--------------------|
| 0.150000        | 41.3                    | 9.000           | N    | 11.2       | 24.7        | 66.0               |
| 0.261872        | 46.7                    | 9.000           | N    | 10.3       | 14.7        | 61.4               |
| 0.598084        | 35.8                    | 9.000           | N    | 9.8        | 20.2        | 56.0               |
| 0.798146        | 35.4                    | 9.000           | N    | 9.8        | 20.6        | 56.0               |
| 3.621856        | 30.5                    | 9.000           | N    | 9.8        | 25.5        | 56.0               |
| 7.870427        | 33.3                    | 9.000           | N    | 9.8        | 26.7        | 60.0               |

| Frequency (MHz) | Average (dB $\mu$ V) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dB $\mu$ V) |
|-----------------|----------------------|-----------------|------|------------|-------------|--------------------|
| 0.150000        | 34.1                 | 9.000           | N    | 11.2       | 21.9        | 56.0               |
| 0.267135        | 40.1                 | 9.000           | N    | 10.3       | 11.1        | 51.2               |
| 0.592163        | 28.5                 | 9.000           | N    | 9.8        | 17.5        | 46.0               |
| 0.838859        | 28.2                 | 9.000           | N    | 9.8        | 17.8        | 46.0               |
| 3.621856        | 22.4                 | 9.000           | N    | 9.8        | 23.6        | 46.0               |
| 24.987412       | 24.5                 | 9.000           | N    | 9.8        | 25.5        | 50.0               |

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

### **Applicable Standard**

FCC Part 15.205, 15.209, 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.

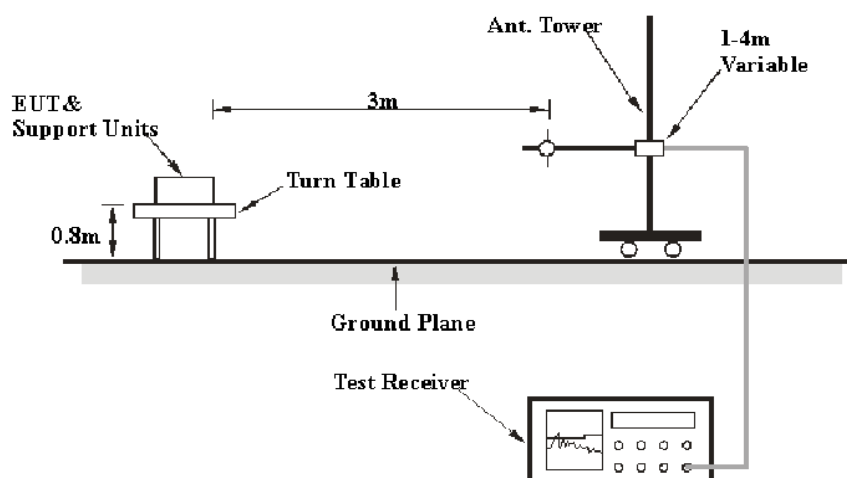
As per FCC Part 15.209

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| <b>Frequency (MHz)</b> | <b>Field strength (microvolts/meter)</b> | <b>Measurement distance (meters)</b> |
|------------------------|------------------------------------------|--------------------------------------|
| 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                                    |

\*\*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

## EUT Setup



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

The spacing between the peripherals was 10 cm.

## EMI Test Receiver Setup

The system was investigated from 9 kHz to 1 GHz.

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

| Frequency Range   | RBW     | Video B/W | Measurement |
|-------------------|---------|-----------|-------------|
| 9 kHz – 150 kHz   | 200 Hz  | 1 kHz     | QP/Average  |
| 150 kHz – 30 MHz  | 9 kHz   | 30 kHz    | QP/Average  |
| 30 MHz – 1000 MHz | 120 kHz | 300 kHz   | QP          |

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

If the maximized peak measured value complies with the limit, then it is unnecessary to perform an QP/Average measurement

### Corrected Amplitude & Margin Calculation

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

$$\text{Corr. Ampl.} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Limit} - \text{Corr. Ampl.}$$

### Test Equipment List and Details

| Manufacturer   | Description       | Model     | Serial Number | Calibration Date | Calibration Due Date |
|----------------|-------------------|-----------|---------------|------------------|----------------------|
| R&S            | EMI Test Receiver | ESR3      | 102453        | 2019-06-26       | 2020-06-26           |
| Farad          | Test Software     | EZ-EMC    | V1.1.4.2      | N/A              | N/A                  |
| EMCO           | Passive Loop      | 6512      | 9706-1206     | 2017-03-05       | 2020-03-04           |
| Unknown        | Coaxial Cable     | C-NJNJ-50 | C-0400-01     | 2018-09-05       | 2019-09-05           |
| Unknown        | Coaxial Cable     | C-NJNJ-50 | C-0075-01     | 2018-09-05       | 2019-09-05           |
| Unknown        | Coaxial Cable     | C-NJNJ-50 | C-1400-01     | 2019-05-06       | 2020-05-06           |
| Sunol Sciences | Antenna           | JB3       | A060611-1     | 2017-11-10       | 2020-11-10           |
| HP             | Amplifier         | 8447D     | 2727A05902    | 2018-09-05       | 2019-09-05           |

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

### Test Results Summary

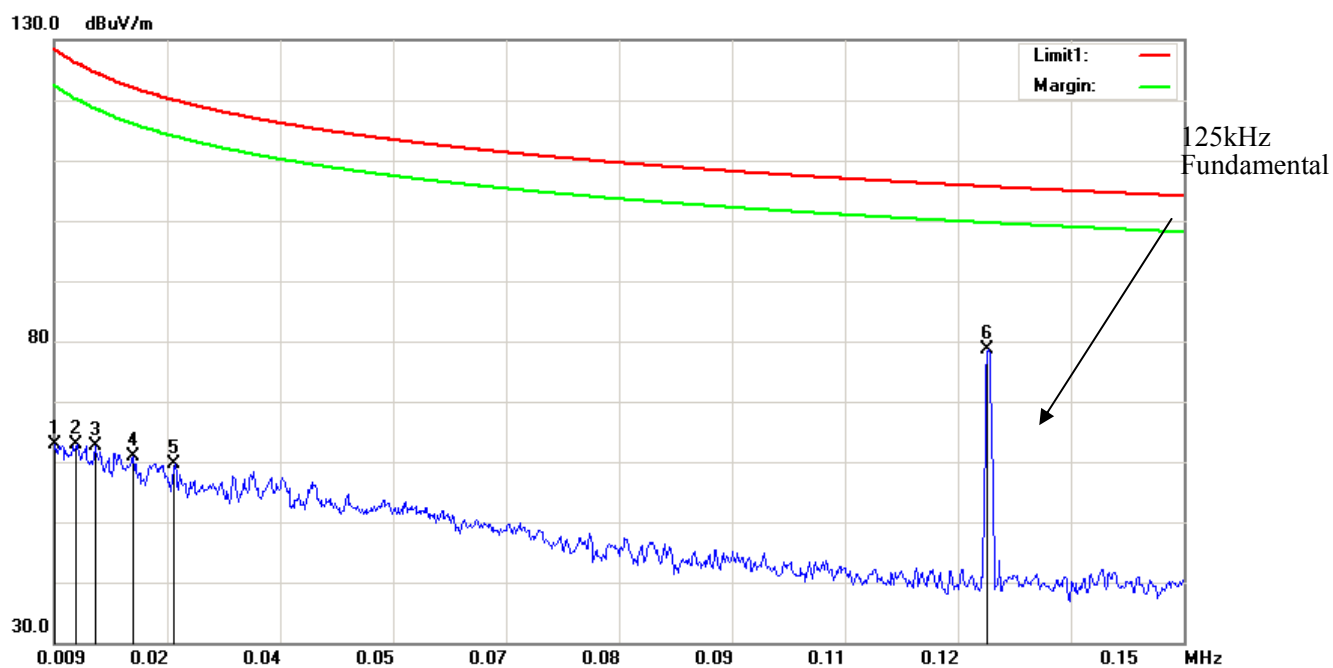
According to the data in the following table, the EUT complied with the FCC Part 15.209&15.225.

**Test Data****Environmental Conditions**

|                           |            |
|---------------------------|------------|
| <b>Temperature:</b>       | 24.2 °C    |
| <b>Relative Humidity:</b> | 53 %       |
| <b>ATM Pressure:</b>      | 100.3 kPa  |
| <b>Tester:</b>            | Tyler Pan  |
| <b>Test Date:</b>         | 2019-06-28 |

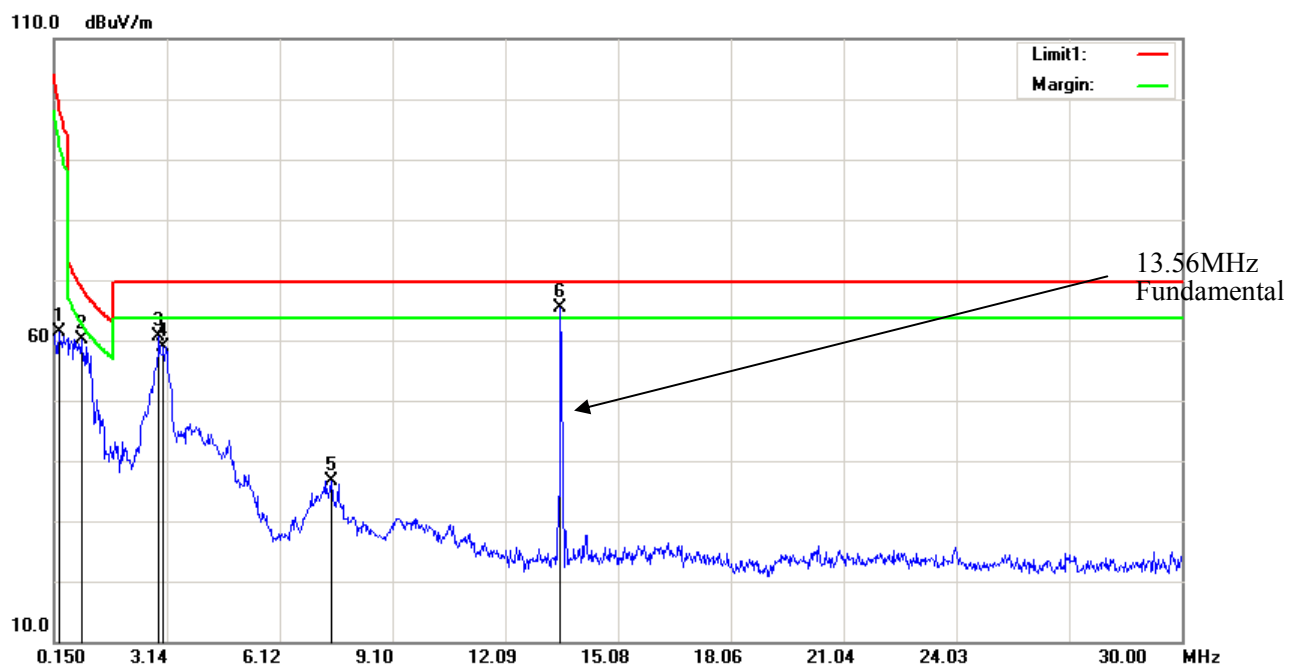
*Test mode: Transmitting(AC/DC Adapter supply was the worst)*

1) 9 kHz~150 kHz:



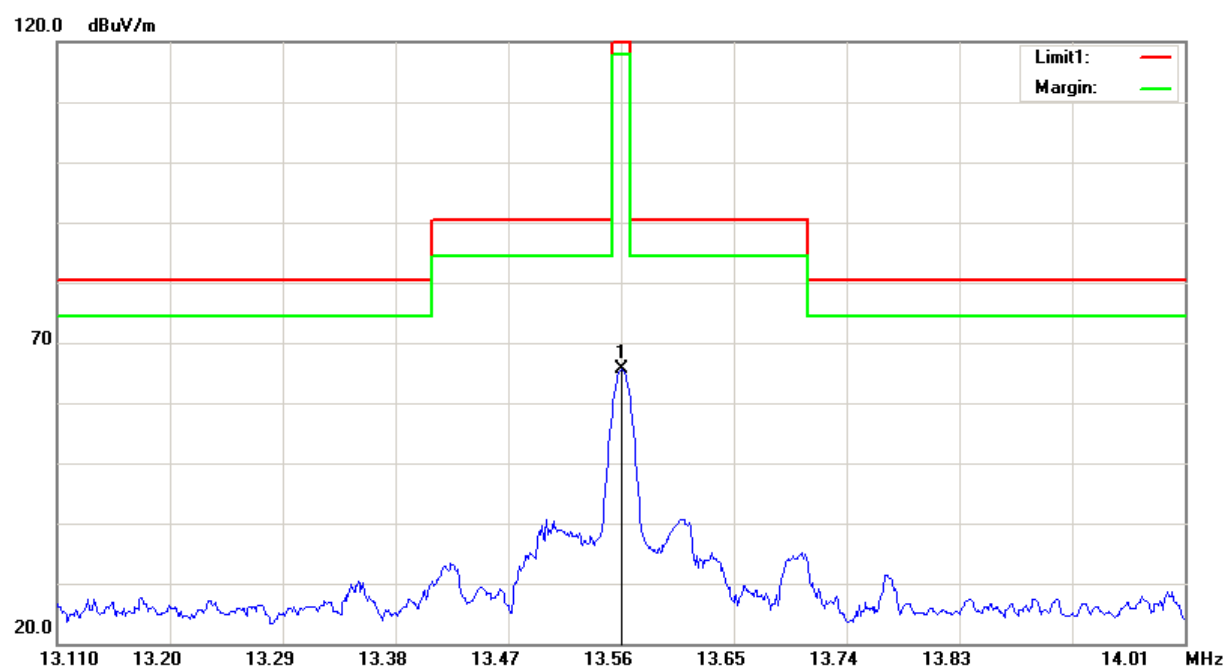
| Frequency (MHz) | Receiver Reading (dBμV) | Detector | Correction Factor (dB/m) | Cord. Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|-------------------------|----------|--------------------------|---------------------|----------------|-------------|
| 0.0091          | -25.81                  | peak     | 88.67                    | 62.86               | 128.42         | 65.56       |
| 0.0117          | -24.45                  | peak     | 87.26                    | 62.81               | 126.24         | 63.43       |
| 0.0140          | -22.68                  | peak     | 85.35                    | 62.67               | 124.68         | 62.01       |
| 0.0190          | -20.36                  | peak     | 81.21                    | 60.85               | 122.03         | 61.18       |
| 0.0240          | -19.36                  | peak     | 79.02                    | 59.66               | 120.00         | 60.34       |
| 0.1255          | 13.35                   | peak     | 65.36                    | 78.71               | 105.63         | 26.92       |

150 kHz~30 MHz:



| Frequency (MHz) | Receiver Reading (dBμV) | Detector | Correction Factor (dB/m) | Cord. Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|-------------------------|----------|--------------------------|---------------------|----------------|-------------|
| 0.2692          | 28.98                   | peak     | 32.40                    | 61.38               | 99.00          | 37.62       |
| 0.8662          | 37.26                   | peak     | 22.85                    | 60.11               | 68.85          | 8.74        |
| 2.9260          | 47.37                   | peak     | 13.33                    | 60.70               | 69.54          | 8.84        |
| 3.0455          | 45.93                   | peak     | 13.05                    | 58.98               | 69.54          | 10.56       |
| 7.4931          | 27.07                   | peak     | 9.59                     | 36.66               | 69.54          | 32.88       |

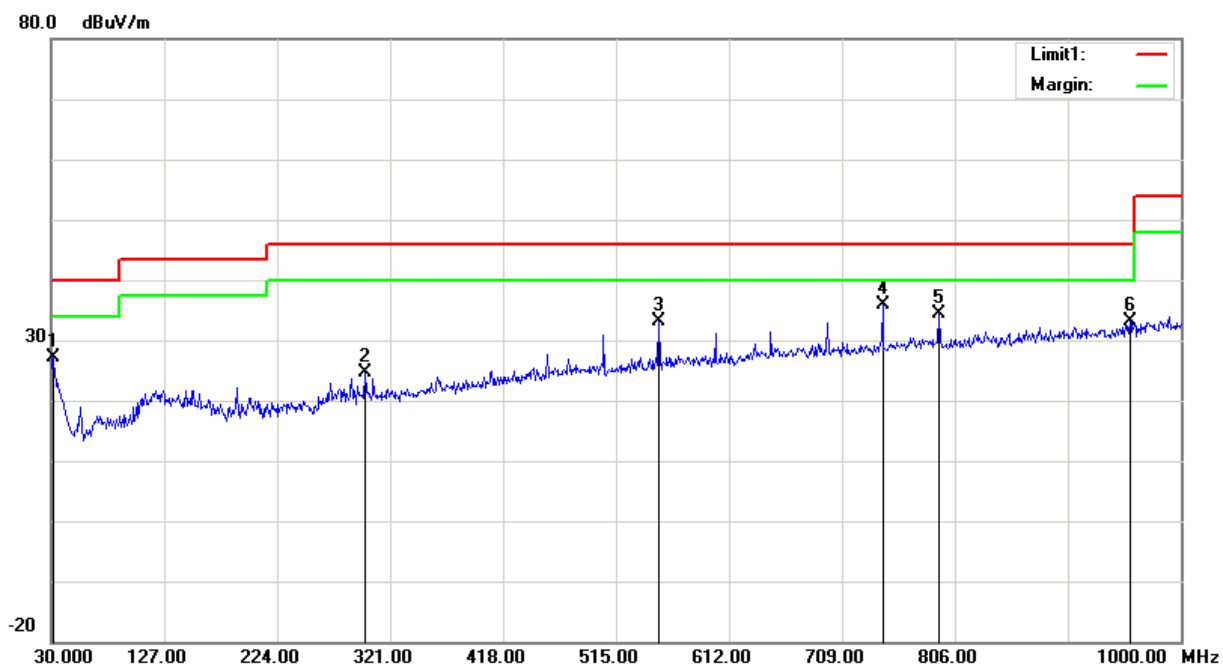
Fundamental:



| Frequency (MHz) | Receiver Reading (dBμV) | Detector | Correction Factor (dB/m) | Cord. Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|-------------------------|----------|--------------------------|---------------------|----------------|-------------|
| 13.5610         | 56.27                   | peak     | 9.36                     | 65.63               | 124.00         | 58.37       |

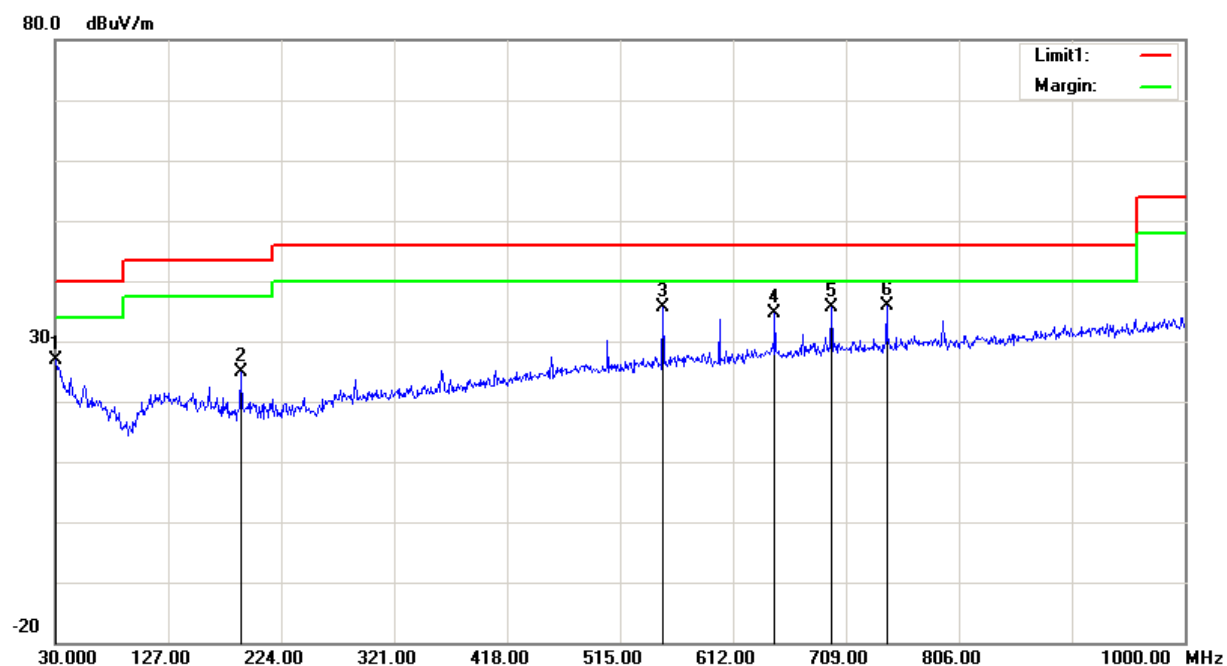
## 2) Above 30 MHz

## Horizontal



| Frequency (MHz) | Receiver Reading (dB $\mu$ V) | Detector | Correction Factor (dB/m) | Cord. Amp. (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
|-----------------|-------------------------------|----------|--------------------------|---------------------------|----------------------|-------------|
| 31.9400         | 27.03                         | peak     | 0.19                     | 27.22                     | 40.00                | 12.78       |
| 299.6600        | 28.50                         | peak     | -3.83                    | 24.67                     | 46.00                | 21.33       |
| 551.8600        | 32.88                         | peak     | 0.35                     | 33.23                     | 46.00                | 12.77       |
| 743.9200        | 32.33                         | peak     | 3.56                     | 35.89                     | 46.00                | 10.11       |
| 792.4200        | 29.99                         | peak     | 4.34                     | 34.33                     | 46.00                | 11.67       |
| 956.3500        | 32.12                         | peak     | 0.89                     | 33.01                     | 46.00                | 12.99       |

## Vertical



| Frequency (MHz) | Receiver Reading (dB $\mu$ V) | Detector | Correction Factor (dB/m) | Cord. Amp. (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
|-----------------|-------------------------------|----------|--------------------------|---------------------------|----------------------|-------------|
| 30.0000         | 25.28                         | peak     | 1.72                     | 27.00                     | 40.00                | 13.00       |
| 189.0800        | 32.00                         | peak     | -7.17                    | 24.83                     | 43.50                | 18.67       |
| 551.8600        | 35.16                         | peak     | 0.35                     | 35.51                     | 46.00                | 10.49       |
| 647.8900        | 32.48                         | peak     | 2.15                     | 34.63                     | 46.00                | 11.37       |
| 696.3900        | 32.74                         | peak     | 2.89                     | 35.63                     | 46.00                | 10.37       |
| 743.9200        | 32.43                         | peak     | 3.56                     | 35.99                     | 46.00                | 10.01       |

## 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 adapter under test was connected to an external power.

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 power supply Source connected to the EUT or EUT adapter. Test the frequency output in the extremity voltage.

### Test Equipment List and Details

| Manufacturer   | Description                              | Model     | Serial Number | Calibration Date | Calibration Due Date |
|----------------|------------------------------------------|-----------|---------------|------------------|----------------------|
| R&S            | EMI Test Receiver                        | ESR3      | 102453        | 2019-06-26       | 2020-06-26           |
| EMCO           | Passive Loop                             | 6512      | 9706-1206     | 2017-03-05       | 2020-03-04           |
| Unknown        | Coaxial Cable                            | C-NJNJ-50 | C-0400-01     | 2018-09-05       | 2019-09-05           |
| HP             | Amplifier                                | 8447D     | 2727A05902    | 2018-09-05       | 2019-09-05           |
| UNI-T          | Multimeter                               | UT39A     | M130199938    | 2018-07-24       | 2019-07-24           |
| ESPEC          | Constant temperature and humidity Tester | ESX-4CA   | 018 463       | 2019-03-26       | 2020-03-26           |
| Schneider      | AC Power Supply                          | YF6005    | 005           | N/A              | N/A                  |
| Pro instrument | DC Power Supply                          | pps3300   | N/A           | N/A              | N/A                  |

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

### Test Data

#### Environmental Conditions

|                    |            |
|--------------------|------------|
| Temperature:       | 24.2 °C    |
| Relative Humidity: | 53 %       |
| ATM Pressure:      | 100.3 kPa  |
| Tester:            | Tyler Pan  |
| Test Date:         | 2019-06-28 |

Test Mode: Transmitting

Test Result: Pass

POE adapter:

| $f_0 = 13.56 \text{ MHz}$ |                 |                    |                 |       |
|---------------------------|-----------------|--------------------|-----------------|-------|
| Temperature               | Voltage         | Measured frequency | Frequency Error | Limit |
| °C                        | V <sub>AC</sub> | MHz                | Hz              | Hz    |
| -20                       | 120V            | 13.560614          | 614             | ±1356 |
| -10                       |                 | 13.560613          | 613             | ±1356 |
| 0                         |                 | 13.560607          | 607             | ±1356 |
| 10                        |                 | 13.560615          | 615             | ±1356 |
| 20                        |                 | 13.560609          | 609             | ±1356 |
| 25                        |                 | 13.560608          | 608             | ±1356 |
| 30                        |                 | 13.560615          | 615             | ±1356 |
| 40                        |                 | 13.560611          | 611             | ±1356 |
| 50                        |                 | 13.560619          | 619             | ±1356 |
| 25                        | 102             | 13.560627          | 627             | ±1356 |
| 25                        | 138             | 13.560614          | 614             | ±1356 |

DC Port input:

| $f_0 = 13.56 \text{ MHz}$ |                 |                    |                 |       |
|---------------------------|-----------------|--------------------|-----------------|-------|
| Temperature               | Voltage         | Measured frequency | Frequency Error | Limit |
| °C                        | V <sub>DC</sub> | MHz                | Hz              | Hz    |
| -20                       | 12V             | 13.56008           | 80              | ±1356 |
| -10                       |                 | 13.56007           | 70              | ±1356 |
| 0                         |                 | 13.56011           | 110             | ±1356 |
| 10                        |                 | 13.56012           | 120             | ±1356 |
| 20                        |                 | 13.56013           | 130             | ±1356 |
| 25                        |                 | 13.56007           | 70              | ±1356 |
| 30                        |                 | 13.56006           | 60              | ±1356 |
| 40                        |                 | 13.56008           | 80              | ±1356 |
| 50                        |                 | 13.56009           | 90              | ±1356 |
| 25                        | 9.0             | 13.56012           | 120             | ±1356 |
| 25                        | 15.0            | 13.56012           | 120             | ±1356 |

Note: Operation voltage range declared by manufacturer.

**FCC §15.215(c) – 20 dB EMISSION BANDWIDTH****Applicable Standard**

Per FCC §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**

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 Equipment List and Details**

| Manufacturer | Description       | Model     | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-------------------|-----------|---------------|------------------|----------------------|
| R&S          | EMI Test Receiver | ESR3      | 102453        | 2019-06-26       | 2020-06-26           |
| EMCO         | Passive Loop      | 6512      | 9706-1206     | 2017-03-05       | 2020-03-04           |
| Unknown      | Coaxial Cable     | C-NJNJ-50 | C-0400-01     | 2018-09-05       | 2019-09-05           |
| HP           | Amplifier         | 8447D     | 2727A05902    | 2018-09-05       | 2019-09-05           |

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

**Test Data****Environmental Conditions**

|                           |                       |
|---------------------------|-----------------------|
| <b>Temperature:</b>       | 24.0 °C~24.2 °C       |
| <b>Relative Humidity:</b> | 50 %~53 %             |
| <b>ATM Pressure:</b>      | 100.1 kPa~100.3 kPa   |
| <b>Tester:</b>            | Tyler Pan             |
| <b>Test Date:</b>         | 2019-06-27~2019-08-09 |

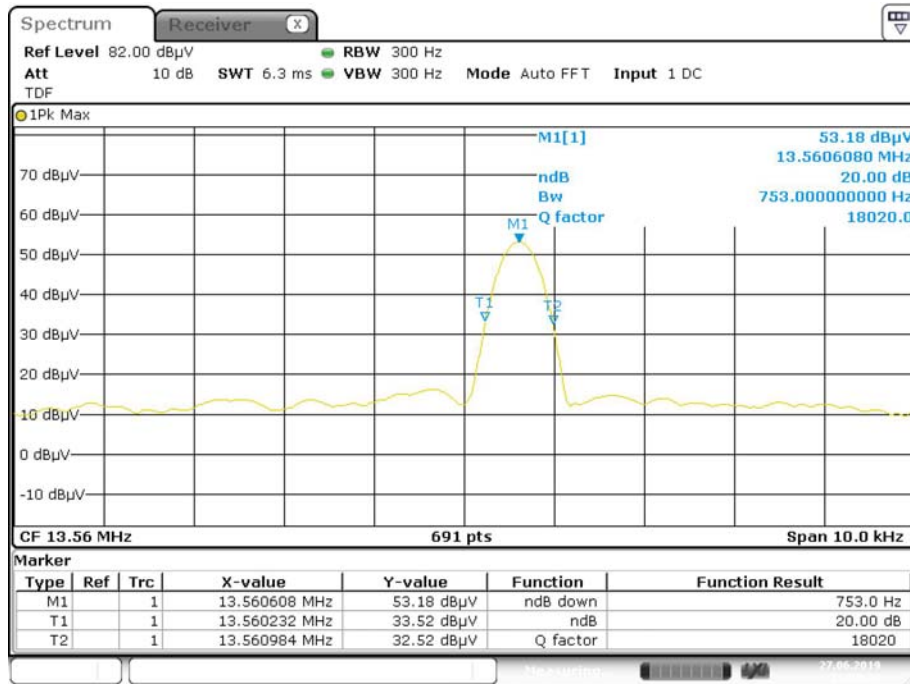
**Test Result:** Compliance.

Please refer to following tables and plots

| Test Frequency (MHz) | 20 dB Bandwidth (kHz) |
|----------------------|-----------------------|
| 13.56                | 0.753                 |
| 0.125                | 0.832                 |

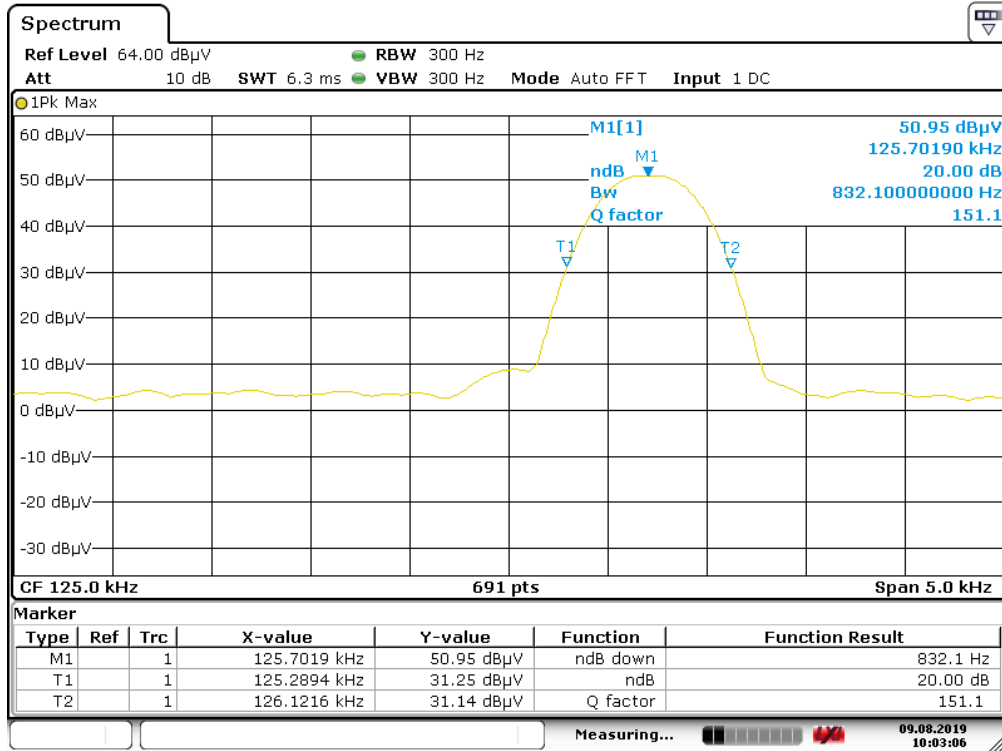
Test Mode: Transmitting

### 20 dB Emission Bandwidth-13.56 MHz



Date: 27.JUN.2019 21:58:21

# 20 dB Emission Bandwidth-125 kHz



Date: 9.AUG.2019 10:03:06

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