



## FCC PART 15.231

### TEST REPORT

For

### Fuzhou Emax Electronic Co., Ltd.

Building #12-#16, Cangshan Industrial Area, Juyuanzhou, Jinshan District,  
Fuzhou, China.

**FCC ID: WEC-EM2245-F**

|  |   |
|--|---|
| <b>Report Type:</b><br>Original Report       | <b>Product Type:</b><br>WIRELESS COOKING<br>THERMOMETER   |
| <b>Test Engineer:</b> Kevin Hu               | <i>Kevin Hu</i>   |
| <b>Report Number:</b> RXM170324051-00        |   |
| <b>Report Date:</b> 2017-04-24               |   |
| <b>Reviewed By:</b> Henry Ding<br>EMC Leader | <i>Henry Ding</i>   |
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## GENERAL INFORMATION

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

The **Fuzhou Emax Electronic Co., Ltd.**'s product, model number: **EM2245** (**FCC ID: WEC-EM2245-F**) (the "EUT") in this report is a **WIRELESS COOKING THERMOMETER**, which was measured approximately: 12.4 cm (L) × 7.1 cm (W) × 4.0 cm (H), rated input voltage: DC3.0V battery

*\*All measurement and test data in this report was gathered from final production sample, serial number: 170324051 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-03-24, and EUT conformed to test requirement.*

### Objective

This report is prepared on behalf of **Fuzhou Emax Electronic Co., Ltd.** in accordance with Part 2, Subpart J, Part 15, Subparts A, and C of the Federal Communications Commission's rules

The tests were performed in order to determine compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

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

Submitted with the part of a system with FCC ID: WEC-EM2245.

### 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 of the measurements detailed in this Test Report were performed by Bay Area Compliance Laboratories Corp. (Chengdu).

The Bay Area Compliance Laboratories Corp. Chengdu's measurement Uncertainties (calculated for a k=2 Coverage Factor corresponding to approximately 95% Coverage) were as follows:

- For all of the AC Line Conducted Emissions Tests reported herein:  $\pm 3.17$  dB.
- For of all of the Direct Antenna Conducted Emissions Tests reported herein:  $\pm 0.56$  dB.
- For of all of the direct Radiated Emissions Tests reported herein are:
  - 30 MHz to 200 MHz:  $\pm 4.7$  dB;
  - 200 MHz to 1 GHz:  $\pm 6.0$  dB;
  - 1 GHz to 6 GHz:  $\pm 5.13$ dB; and,
  - 6 GHz to 40 GHz:  $\pm 5.47$ dB.

And the uncertainty will not be taken into consideration for all test data recorded in the report.

## **Test Facility**

The test site used by BACL to collect test data is located in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the

requirements of Section 2.948 of the FCC Rules on April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

FINAL

## SYSTEM TEST CONFIGURATION

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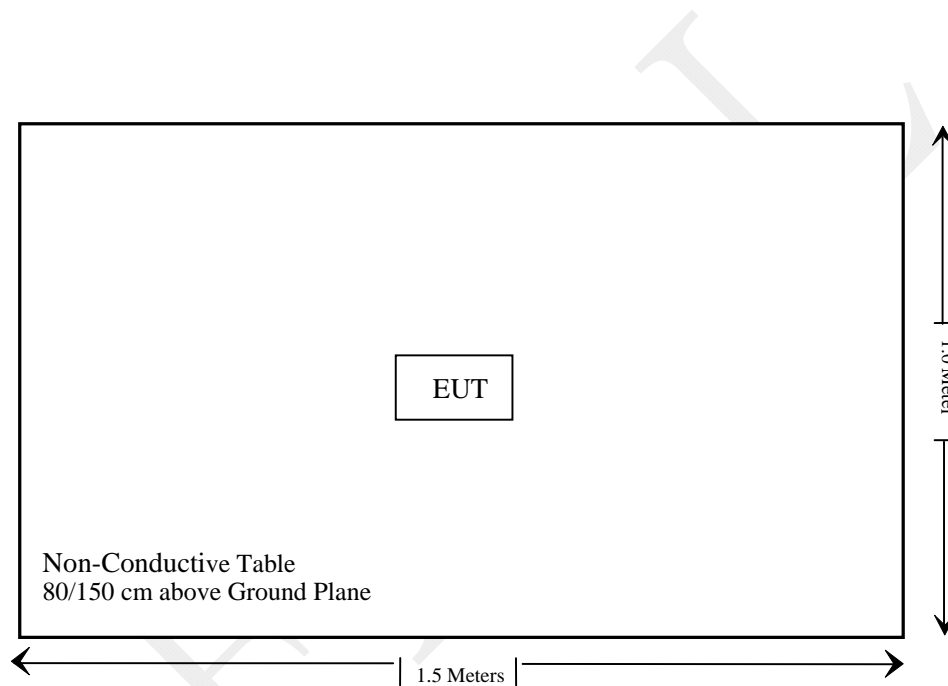
### Justification

The system was configured in testing mode which was provided by manufacturer.

### Equipment Modifications

No modifications were made to the unit tested.

### Block Diagram of Test Setup



## SUMMARY OF TEST RESULTS

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| FCC Rules                     | Description of Test | Result         |
|-------------------------------|---------------------|----------------|
| §15.203                       | Antenna Requirement | Compliance     |
| §15.207 (a)                   | Conducted Emissions | Not applicable |
| §15.205, §15.209, §15.231 (e) | Radiated Emissions  | Compliance     |
| §15.231 (c)                   | 20dB Bandwidth      | Compliance     |
| §15.231 (e)                   | Transmission Time   | Compliance     |

Not applicable: The EUT is battery operated equipment.

## **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.

**Result:** Compliant.

The EUT has one integral antenna arrangement, which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

FINAL

## FCC §15.205, §15.209, §15.231 (e) - RADIATED EMISSIONS

### Applicable Standard

FCC §15.205, §15.209, §15.231 (e)

(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

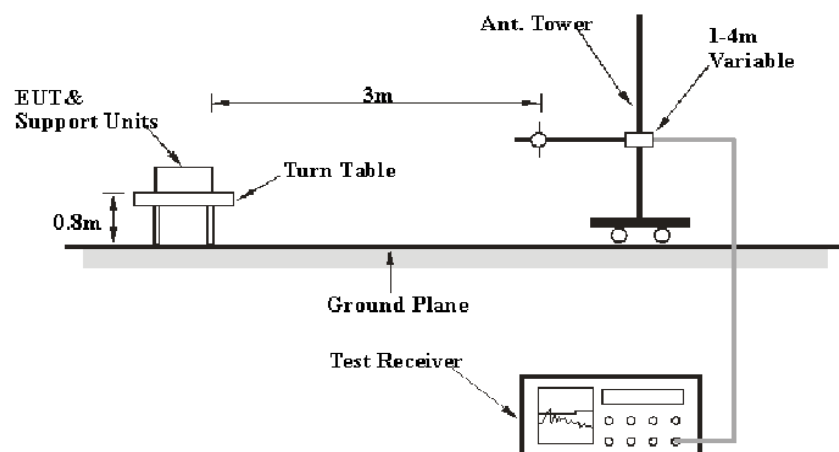
| Fundamental frequency (MHz) | Field strength of fundamental (microvolts/meter) | Field strength of spurious emission (microvolts/meter) |
|-----------------------------|--|--|
| 40.66-40.70                 | 1,000  | 100  |
| 70-130                      | 500  | 50   |
| 130-174                     | 500 to 1,500 <sup>1</sup>                        | 50 to 150 <sup>1</sup>                                 |
| 174-260                     | 1,500  | 150  |
| 260-470                     | 1,500 to 5,000 <sup>1</sup>                      | 150 to 500 <sup>1</sup>                                |
| Above 470                   | 5,000  | 500  |

<sup>1</sup>Linear interpolations.

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

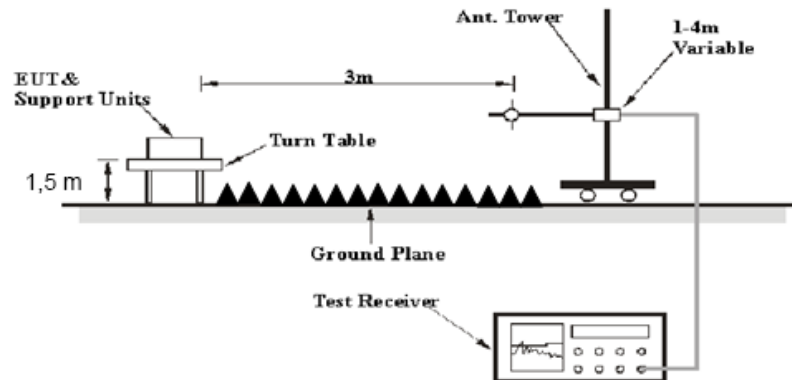
### EUT Setup

Below 1 GHz:





### Above 1 GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

### EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

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

| Frequency Range   | RBW     | Video B/W | IF B/W  | Detector |
|-------------------|---------|-----------|---------|----------|
| 30 MHz – 1000 MHz | 100 kHz | 300 kHz   | 100 kHz | PK       |
| 1 GHz – 5 GHz     | 1 MHz   | 3 MHz     | /       | PK       |

## Test Equipment List and Details

| Manufacturer    | Description           | Model      | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-----------------------|------------|---------------|------------------|----------------------|
| Agilent         | Amplifier             | 8447D      | 2944A10442    | 2016-12-02       | 2017-12-01           |
| Rohde & Schwarz | EMI Test Receiver     | ESCI       | 100028        | 2016-12-02       | 2017-12-01           |
| Sunol Sciences  | Broadband Antenna     | JB3        | A121808       | 2016-04-10       | 2019-04-09           |
| Rohde & Schwarz | Spectrum Analyzer     | FSEM30     | 100018        | 2016-12-02       | 2017-12-01           |
| ETS             | Horn Antenna          | 3115       | 003-6076      | 2016-12-02       | 2017-12-01           |
| Mini-circuits   | Amplifier             | ZVA-183-S+ | 771001215     | 2016-05-20       | 2017-05-19           |
| EMCT            | Semi-Anechoic Chamber | 966        | 966-1         | 2015-04-24       | 2018-04-23           |
| Unknown         | RF Cable (below 1GHz) | Unknown    | NO.1          | 2016-11-10       | 2017-11-09           |
| Unknown         | RF Cable (below 1GHz) | Unknown    | NO.4          | 2016-11-10       | 2017-11-09           |
| Unknown         | RF Cable (above 1GHz) | Unknown    | NO.2          | 2016-11-10       | 2017-11-09           |

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

According to §15.231, Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector

## Corrected Amplitude & Margin Calculation

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

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

## Test Results Summary

According to the data in the following table, the EUT complied with the CFR47 §15.205, §15.209, §15.231 (e).

## Test Data

### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23.8 °C   |
| Relative Humidity: | 44.7 %    |
| ATM Pressure:      | 100.7 kPa |

The testing was performed by Kevin Hu on 2017-04-14.

Test mode: Transmitting

### Field Strength (Peak)

| Frequency<br>(MHz)              | Receiver<br>Reading<br>(dBμV) | Rx Antenna     |                | Cable<br>loss<br>(dB) | Amplifier<br>Gain<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | 15.231(e)         |                |
|---------------------------------|-------------------------------|----------------|----------------|-----------------------|---------------------------|------------------------------------|-------------------|----------------|
|                                 |                               | Polar<br>(H/V) | Factor<br>(dB) |                       |                           |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| Operating Frequency: 433.92 MHz |                               |                |                |                       |                           |                                    |                   |                |
| 433.92                          | 58.91                         | H              | 16.87          | 1.55                  | 0.00                      | 77.33                              | 92.87             | 15.54          |
| 433.92                          | 59.51                         | V              | 16.87          | 1.55                  | 0.00                      | 77.93                              | 92.87             | 14.94          |
| 867.84                          | 58.98                         | H              | 22.41          | 2.33                  | 28.26                     | 55.46                              | 72.87             | 17.41          |
| 867.84                          | 59.49                         | V              | 22.41          | 2.33                  | 28.26                     | 55.97                              | 72.87             | 16.90          |
| 1301.76                         | 52.79                         | H              | 23.58          | 2.40                  | 26.52                     | 52.25                              | 72.87             | 20.62          |
| 1301.76                         | 55.47                         | V              | 23.58          | 2.40                  | 26.52                     | 54.93                              | 72.87             | 17.94          |
| 1735.68                         | 50.74                         | H              | 24.48          | 2.85                  | 26.56                     | 51.51                              | 72.87             | 21.36          |
| 1735.68                         | 54.92                         | V              | 24.48          | 2.85                  | 26.56                     | 55.69                              | 72.87             | 17.18          |
| 2169.6                          | 47.34                         | H              | 24.32          | 3.03                  | 26.84                     | 47.85                              | 72.87             | 25.02          |
| 2169.6                          | 50.51                         | V              | 24.32          | 3.03                  | 26.84                     | 51.02                              | 72.87             | 21.85          |
| 2603.52                         | 40.52                         | H              | 23.41          | 3.08                  | 26.79                     | 40.22                              | 72.87             | 32.65          |
| 2603.52                         | 43.82                         | V              | 23.41          | 3.08                  | 26.79                     | 43.52                              | 72.87             | 29.35          |

### Field Strength (Average)

| Frequency<br>(MHz)             | Peak<br>Measurement<br>@ 3m<br>(dBμV/m) | Polar<br>(H/V) | Duty Cycle<br>Correction<br>Factor<br>(dB) | Average<br>Amp.<br>(dBμV/m) | 15.231(e)         |                |
|--------------------------------|---|----------------|--|-----------------------------|-------------------|----------------|
|                                |   |                |  |                             | Limit<br>(dBμV/m) | Margin<br>(dB) |
| Operating Frequency:433.92 MHz |   |                |  |                             |                   |                |
| 433.92                         | 77.33                                   | H              | -5.55                                      | 71.78                       | 72.87             | 1.09           |
| 433.92                         | 77.93                                   | V              | -5.55                                      | 72.38                       | 72.87             | 0.49           |
| 867.84                         | 55.46                                   | H              | -5.55                                      | 49.91                       | 52.87             | 2.96           |
| 867.84                         | 55.97                                   | V              | -5.55                                      | 50.42                       | 52.87             | 2.45           |
| 1301.76                        | 52.25                                   | H              | -5.55                                      | 46.7                        | 52.87             | 6.17           |
| 1301.76                        | 54.93                                   | V              | -5.55                                      | 49.38                       | 52.87             | 3.49           |
| 1735.68                        | 51.51                                   | H              | -5.55                                      | 45.96                       | 52.87             | 6.91           |
| 1735.68                        | 55.69                                   | V              | -5.55                                      | 50.14                       | 52.87             | 2.73           |
| 2169.6                         | 47.85                                   | H              | -5.55                                      | 42.3                        | 52.87             | 10.57          |
| 2169.6                         | 51.02                                   | V              | -5.55                                      | 45.47                       | 52.87             | 7.4            |
| 2603.52                        | 40.22                                   | H              | -5.55                                      | 34.67                       | 52.87             | 18.2           |
| 2603.52                        | 43.52                                   | V              | -5.55                                      | 37.97                       | 52.87             | 14.9           |

Note:

Calculate Average value based on duty cycle correction factor.

Base on Transmission duration time >100ms, test performed with 25ms per time to count total on pulse:

**0-25ms:** trigger time: 0ms, trigger level: 50.5dBμV, total 31 pulse: 3 pulse type 4, 11 pulse type 3 and 17 pulse Type 2.

**25-50ms:** trigger time: 25ms, trigger level: 50.5dBμV, total 30 pulse: 4 pulse type 4, 7 pulse type 3, 18 pulse type 2 and 1 pulse type 1.

**50-75ms:** trigger time: 50ms, trigger level: 50.5dBμV, total 33 pulse: 2 pulse type 4, 10 pulse type 3, 20 pulse type 2 and 1 pulse type 1.

**75-100ms:** trigger time: 50ms, trigger level: 50.5dBμV, total 30 pulse: 2 pulse type 4, 10 pulse type 3 pulse and 20 pulse type 2.

**Pulse Type 1: 100μs**

**Pulse Type 2: 300μs**

**Pulse Type 3: 560μs**

**Pulse Type 4: 800μs**

Duty cycle

= $T_{ON}/100ms$

= $[(3+4+2+2)*0.8+(11+7++10+10)*0.56+(17+18+20+20)*0.3+(1+1)*0.1]/100$

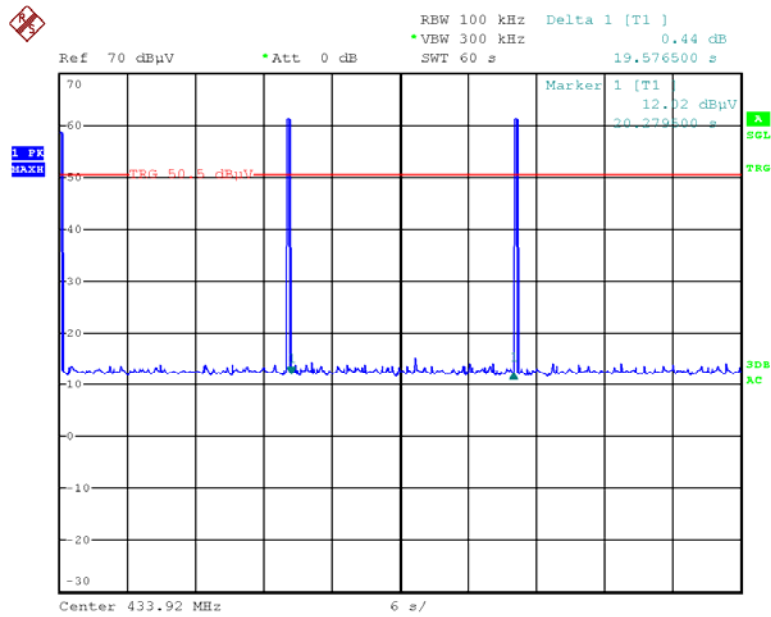
=52.78%

Duty cycle correction factor =  $20*\log(\text{duty cycle}) = -5.55 \text{ dB}$

Average= Peak+ Duty cycle correction factor

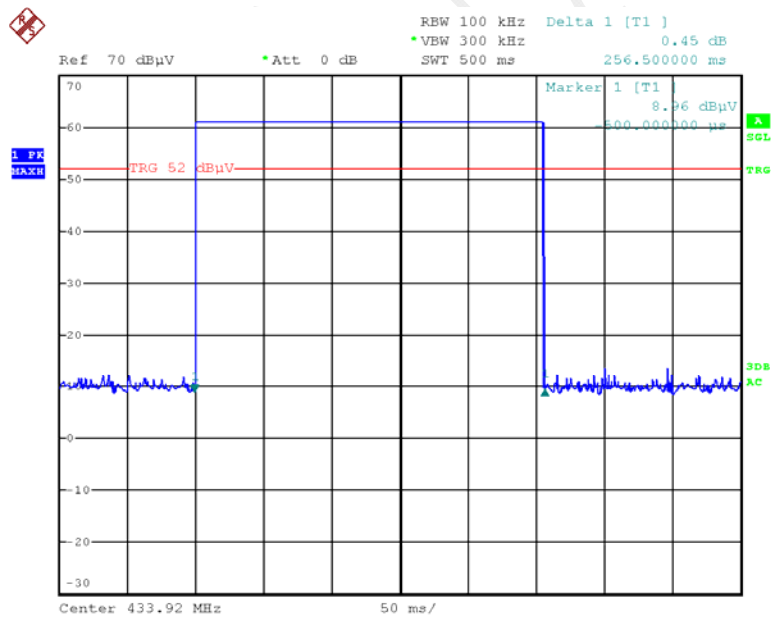
Please refer to following plot.

Transmission period: 19.5765s



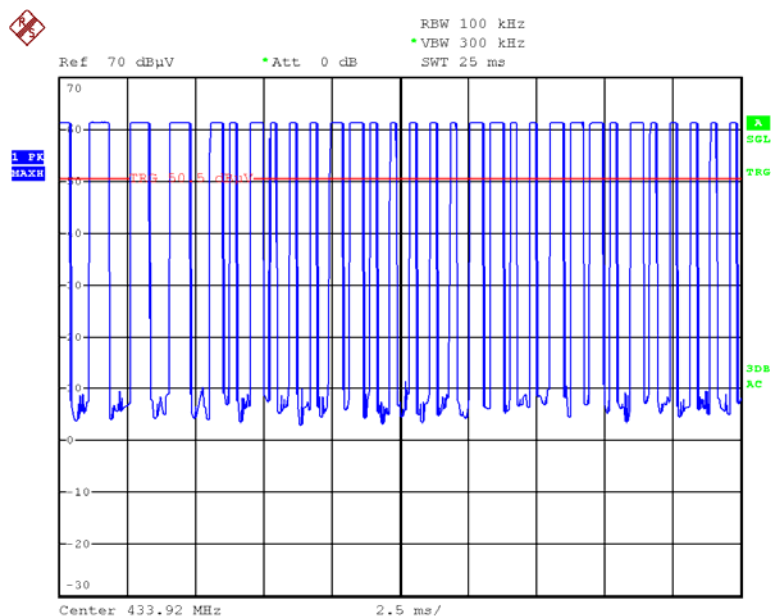
Date: 14.APR.2017 20:35:05

Transmission duration: 256.5ms>100ms



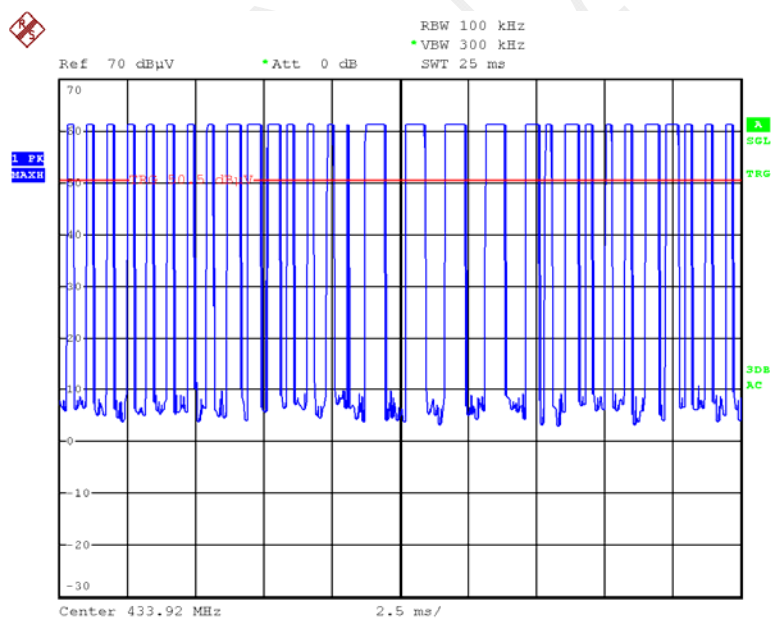
Date: 14.APR.2017 20:30:23

0-25ms



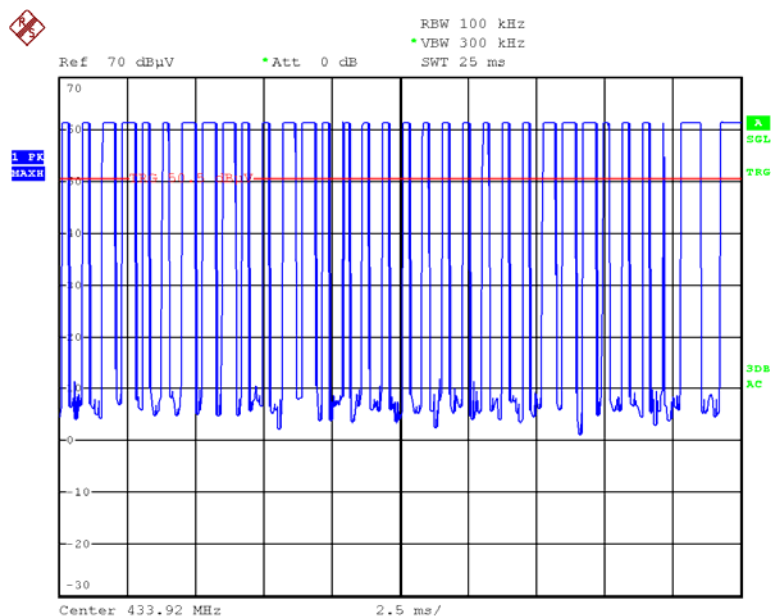
Date: 14.APR.2017 20:36:59

25-50ms



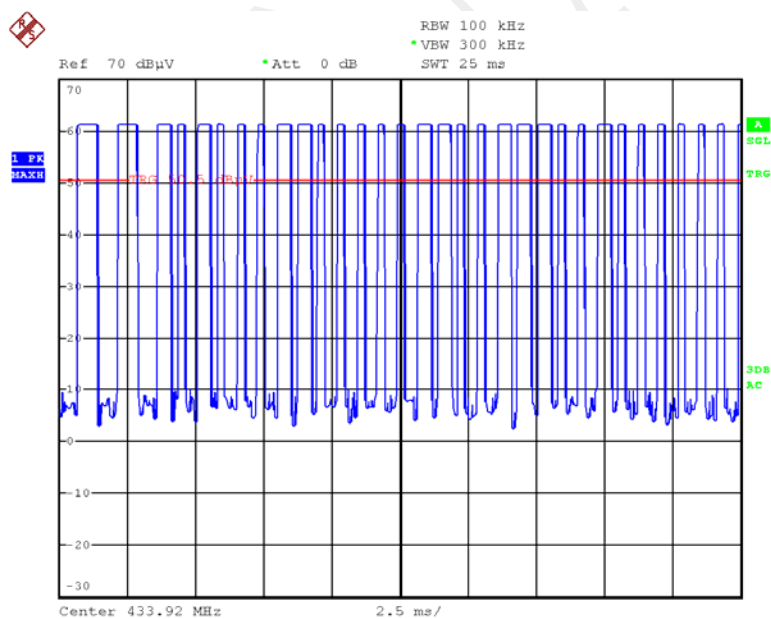
Date: 14.APR.2017 20:38:10

### 50-75ms



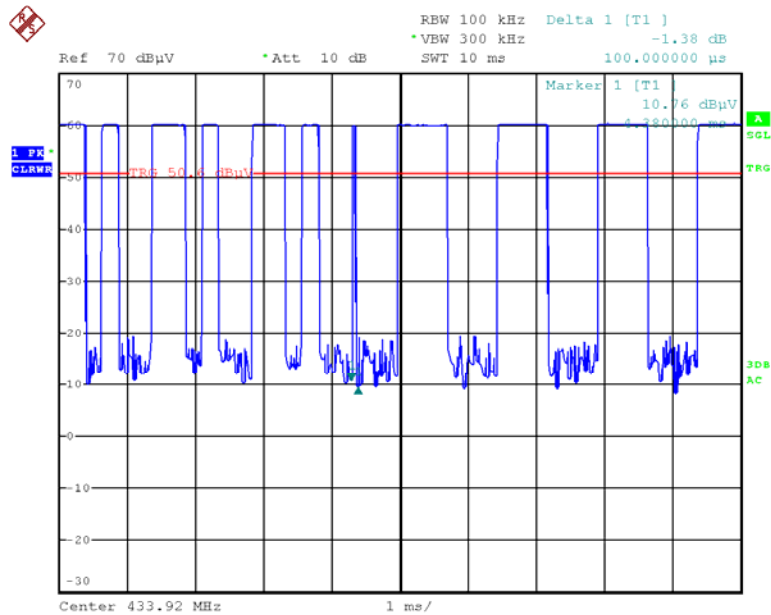
Date: 14.APR.2017 20:38:41

### 75-100ms



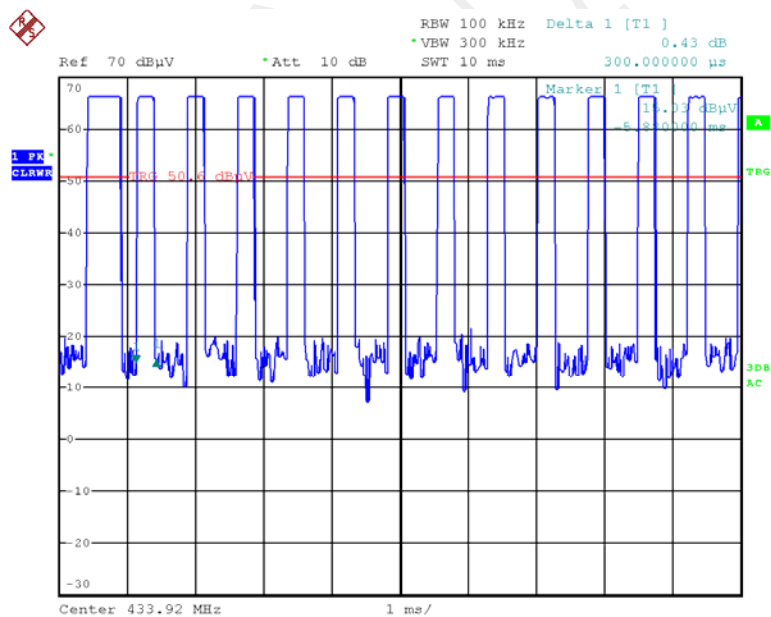
Date: 14.APR.2017 20:39:10

### Pulse Type 1



Date: 14.APR.2017 21:52:40

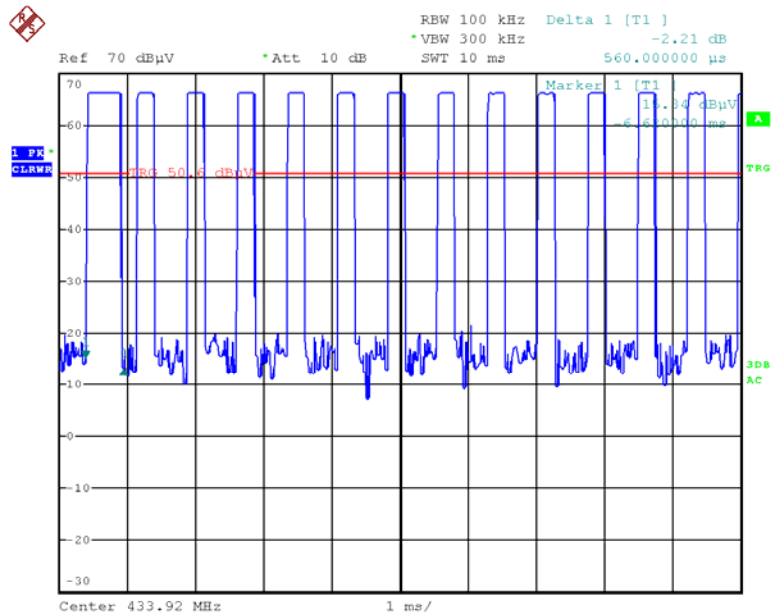
### Pulse Type 2



Date: 14.APR.2017 21:23:53

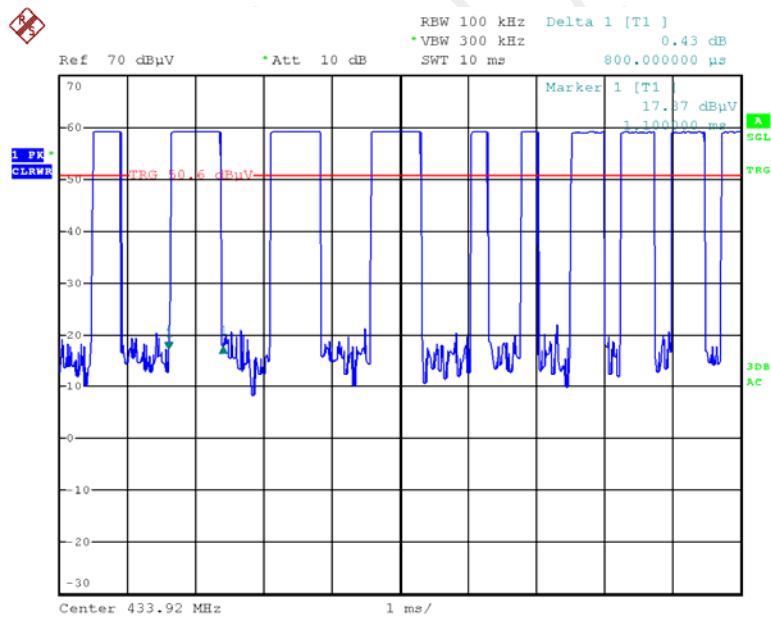


### Pulse Type 3



Date: 14.APR.2017 21:23:31

### Pulse Type 4



Date: 14.APR.2017 21:01:59

## FCC §15.231(c) – 20 dB BANDWIDTH TESTING

### Requirement

Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### Test Equipment List and Details

| Manufacturer    | Description       | Model | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-------------------|-------|---------------|------------------|----------------------|
| Agilent         | Amplifier         | 8447D | 2944A10442    | 2016-12-02       | 2017-12-01           |
| Rohde & Schwarz | EMI Test Receiver | ESCI  | 100028        | 2016-12-02       | 2017-12-01           |
| Sunol Sciences  | Broadband Antenna | JB3   | A121808       | 2016-04-10       | 2019-04-09           |

\* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

### Test Procedure

With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

### Test Data

#### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23.8 °C   |
| Relative Humidity: | 44.7 %    |
| ATM Pressure:      | 100.7 kPa |

The testing was performed by Kevin Hu on 2017-04-14.

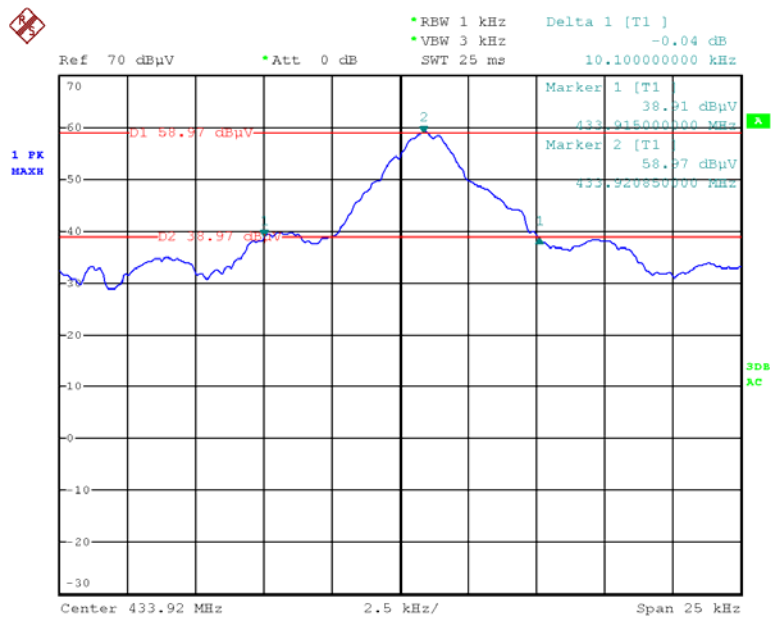
Test Mode: Transmitting

Please refer to following table and plot.

| Channel Frequency (MHz ) | 20 dB Bandwidth (kHz) | Limit (kHz) | Result |
|--------------------------|-----------------------|-------------|--------|
| 433.92                   | 10.1                  | 1084.8      | Pass   |

**Note:** Limit = 0.25% \* Center Frequency = 0.25%\*433.92 MHz = 1084.8 kHz

### 20 dB Bandwidth



Date: 14.APR.2017 20:22:10

## FCC §15.231(e) - DEACTIVATION TESTING

### Applicable Standard

Per 15.231(e)

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

### Test Equipment List and Details

| Manufacturer    | Description       | Model | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-------------------|-------|---------------|------------------|----------------------|
| Agilent         | Amplifier         | 8447D | 2944A10442    | 2016-12-02       | 2017-12-01           |
| Rohde & Schwarz | EMI Test Receiver | ESCI  | 100028        | 2016-12-02       | 2017-12-01           |
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### Test Data

#### Environmental Conditions

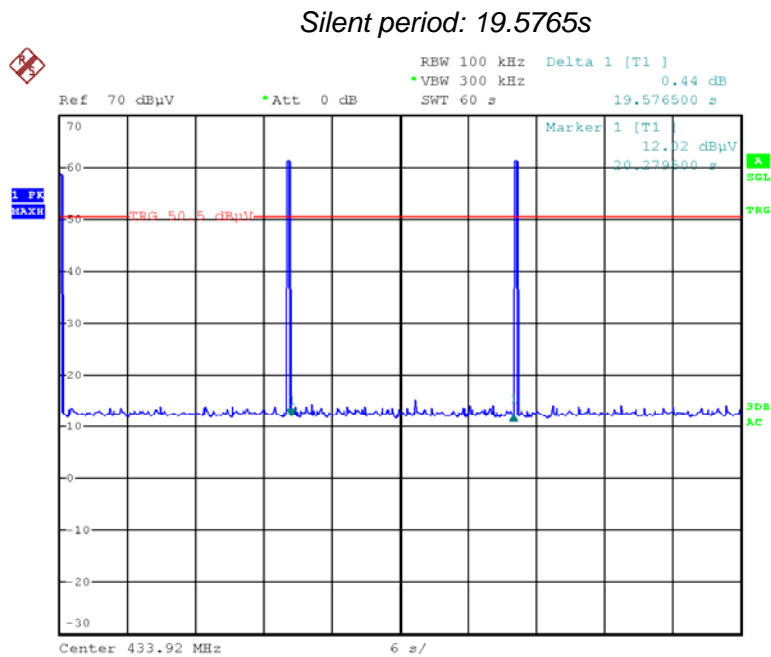
|                    |           |
|--------------------|-----------|
| Temperature:       | 23.8 °C   |
| Relative Humidity: | 44.7 %    |
| ATM Pressure:      | 100.7 kPa |

The testing was performed by Kevin Hu on 2017-04-14.

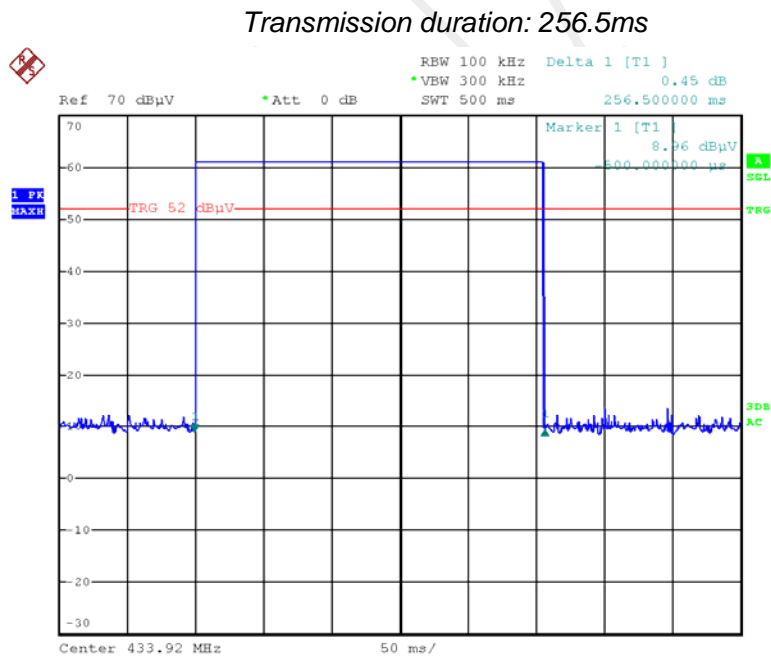
Test Mode: Transmitting

Test Result: Compliance. Please refer to following plot.

| Transmission duration (s) | Transmission duration Limit (s) | Silent Time (s) | Silent Time/ Transmission duration | Silent Time/ Transmission duration Limit | Result |
|---------------------------|---------------------------------|-----------------|------------------------------------|--|--------|
| 0.2565                    | 1                               | 19.5765         | 76.32                              | >30                                      | Pass   |



Date: 14.APR.2017 20:35:05



Date: 14.APR.2017 20:30:23

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