

## TEST REPORT

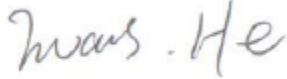
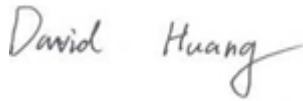
|           |                                                                                                                                 |
|-----------|---------------------------------------------------------------------------------------------------------------------------------|
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|                                     |                                                                                                                         |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Manufacturer or Supplier            | X-Sense Technology Co., Ltd.                                                                                            |
| Address                             | Room 1301, Tower A, Qiaode Technology Park, No. 7 Road, Guangming District, Shenzhen, Guangdong Province, 518000, China |
| Product                             | Wireless Doorbell                                                                                                       |
| Brand Name                          | X-Sense                                                                                                                 |
| Model                               | C2                                                                                                                      |
| Additional Model & Model Difference | DB100 , DB200                                                                                                           |
| Date of tests                       | Oct. 10, 2020~ Dec. 31, 2020                                                                                            |

the tests have been carried out according to the requirements of the following standards:

☒ **FCC Part 15, Subpart C, Section 15.231**

**CONCLUSION: The submitted sample was found to COMPLY with the test requirement**

|                                                                                     |                                                                                                                  |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Tested by Evans He<br>Project Engineer/ EMC Department                              | Approved by David Huang<br>Supervisor / EMC Department                                                           |
|  | <br><br>Date: Jan. 05, 2021 |

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## RELEASE CONTROL RECORD

| ISSUE NO.     | REASON FOR CHANGE | DATE ISSUED   |
|---------------|-------------------|---------------|
| RF2010WSZ0016 | Original release  | Jan. 05, 2021 |

## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.231) |                                |        |                              |
|-----------------------------------------------------------|--------------------------------|--------|------------------------------|
| STANDARD SECTION                                          | TEST TYPE AND LIMIT            | RESULT | REMARK                       |
| §15.203                                                   | Antenna Requirement            | PASS   | No antenna connector is used |
| §15.207 (a)                                               | AC Power Conducted Emission    | N/A    | EUT is powered by battery    |
| §15.209<br>§15.231(b)                                     | Radiated Emission              | PASS   | Compliant                    |
| §15.231 (a)                                               | Deactivation time measurement  | PASS   | Compliant                    |
| §15.231(c)                                                | Emission Bandwidth Measurement | PASS   | Compliant                    |

## 2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| MEASUREMENT        | FREQUENCY     | UNCERTAINTY |
|--------------------|---------------|-------------|
| Radiated emissions | 9KHz ~ 30MHz  | 2.70dB      |
|                    | 30MHz ~ 1GHz  | 2.16dB      |
|                    | 1GHz ~ 18GHz  | 3.74dB      |
|                    | 18GHz ~ 40GHz | 4.66dB      |

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

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

|                            |                                                                |
|----------------------------|----------------------------------------------------------------|
| <b>PRODUCT</b>             | Wireless Doorbell                                              |
| <b>MODEL NO.</b>           | C2                                                             |
| <b>ADDITIONAL MODEL</b>    | DB100, DB200                                                   |
| <b>FCC ID</b>              | 2AU4DDBC                                                       |
| <b>NOMINAL VOLTAGE</b>     | Doorbell: AC 120V / 60Hz<br>Remote Control: DC 3V from Battery |
| <b>MODULATION TYPE</b>     | FSK                                                            |
| <b>OPERATING FREQUENCY</b> | 433.92MHz                                                      |
| <b>NUMBER OF CHANNEL</b>   | 1                                                              |
| <b>ANTENNA TYPE</b>        | Spring Antenna, with 2dBi Gain                                 |
| <b>I/O PORTS</b>           | Refer to the user's manual                                     |

**NOTE:**

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions, but only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 2010WSZ0016) for detailed product photo.
4. Additional models (see about table) are identical with the test model C2 except the color and shipped with different number of receivers.

### 3.2 DESCRIPTION OF TEST MODES

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on X plane for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

| FREQUENCY | TEST MODES   |
|-----------|--------------|
| 433.92MHz | Transmitting |

### 3.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

| EUT<br>CONFIGURE<br>MODE | APPLICABLE TO |         |     |    |    | DESCRIPTION        |
|--------------------------|---------------|---------|-----|----|----|--------------------|
|                          | RE ≥ 1G       | RE < 1G | PLC | EB | DT |                    |
| -                        | √             | √       | -   | √  | √  | DC 3V from Battery |

Where **RE ≥ 1G**: Radiated Emission above 1GHz  
**PLC**: Power Line Conducted Emission  
**DT**: Deactivation Time measurement

**RE < 1G**: Radiated Emission below 1GHz  
**EB**: 20dB Bandwidth measurement

#### RADIATED EMISSION TEST (ABOVE 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|-------------------|----------------|-----------------|
| 1                 | 1              | FSK             |

#### RADIATED EMISSION TEST (BELOW 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|-------------------|----------------|-----------------|
| 1                 | 1              | FSK             |

**EMISSION BANDWIDTH MEASUREMENT:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|-------------------|----------------|-----------------|
| 1                 | 1              | FSK             |

**DEACTIVATION TIME MEASUREMENT:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|-------------------|----------------|-----------------|
| 1                 | 1              | FSK             |

**TEST CONDITION:**

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | TEST VOLTAGE       | TESTED BY   |
|---------------|--------------------------|--------------------|-------------|
| RE $\geq$ 1G  | 23deg. C, 54%RH          | DC 3V from Battery | Aaron Liang |
| RE<1G         | 23deg. C, 54%RH          | DC 3V from Battery | Aaron Liang |
| EB            | 25deg. C, 60%RH          | DC 3V from Battery | Aaron Liang |
| DT            | 25deg. C, 60%RH          | DC 3V from Battery | Aaron Liang |



### 3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C Section 15.231**

**ANSI C63.10-2013**

All test items have been performed and recorded as per the above standards.

### 3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together without other necessary accessories or support units.

## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

| FREQUENCIES<br>(MHz) | FIELD STRENGTH<br>(microvolts/meter) | MEASUREMENT DISTANCE<br>(meters) |
|----------------------|--------------------------------------|----------------------------------|
| 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                                |

According to §15.231(b), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental<br>frequency (MHz) | Field strength of fundamental<br>(microvolts/meter) | Field strength of spurious<br>emission (microvolts/meter) |
|--------------------------------|-----------------------------------------------------|-----------------------------------------------------------|
| 40.66–40.70                    | 2,250                                               | 225                                                       |
| 70–130                         | 1,250                                               | 125                                                       |
| 130–174                        | <sup>1</sup> 1,250 to 3,750                         | <sup>1</sup> 125 to 375                                   |
| 174–260                        | 3,750                                               | 375                                                       |
| 260–470                        | <sup>1</sup> 3,750 to 12,500                        | <sup>1</sup> 375 to 1,250                                 |
| Above 470                      | 12,500                                              | 1,250                                                     |

**NOTE:**

- <sup>1</sup> Linear interpolations.
- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

#### 4.1.2 TEST INSTRUMENTS

| Equipment                    | Manufacturer              | Model No. | Serial No.                 | Last Cal.   | Next Cal.   |
|------------------------------|---------------------------|-----------|----------------------------|-------------|-------------|
| EMI Test Receiver            | Rohde&Schwarz             | ESL6      | 1300.5001K06<br>-100262-eQ | Mar. 24, 20 | Mar. 24, 21 |
| Bilog Antenna                | Sunol Sciences            | JB6       | A110712                    | Jul. 21, 20 | Jul. 21, 21 |
| Active Antenna               | CMO-POWER                 | AL-130    | 121031                     | Jun. 30, 20 | Jun. 30, 21 |
| Signal Amplifier             | HP                        | 8447E     | 443008                     | Mar. 24, 20 | Mar. 24, 21 |
| Signal and Spectrum Analyzer | R&S                       | FSV40     | 101094                     | Mar. 19, 20 | Mar. 19, 21 |
| MXA signal analyzer          | Agilent                   | N9020A    | MY49100060                 | Mar. 24, 20 | Mar. 24, 21 |
| Horn Antenna                 | COM-POWER                 | AH-118    | 71259                      | Apr. 17, 20 | Apr. 17, 21 |
| Horn Antenna                 | COM-POWER                 | AH-118    | 71283                      | Jul. 21, 20 | Jul. 21, 21 |
| SHF-EHF Horn                 | Schwarzbeck               | BBHA9170  | BBHA9170147                | May 10, 20  | May 10, 21  |
| SHF-EHF Horn                 | Schwarzbeck               | BBHA9170  | BBHA9170242                | May 10, 20  | May 10, 21  |
| AMPLIFIER                    | EM Electornic Corporation | EM01G26G  | 60613                      | Mar. 24, 20 | Mar. 24, 21 |
| Pre-amplifier                | Rohde&Schwarz             | SCU40     | 100437                     | Oct. 17, 20 | Oct. 16, 21 |
| 3m Semi-anechoic Chamber     | SAEMC                     | 9m*6m*6m  | N/A                        | Oct. 18, 18 | Oct. 17, 21 |
| Test Software                | EZ-EMC                    | ICP-03A1  | N/A                        | N/A         | N/A         |

**NOTE:**

1. The test was performed in 966 Chamber.
2. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 535293.

#### 4.1.3 TEST PROCEDURES

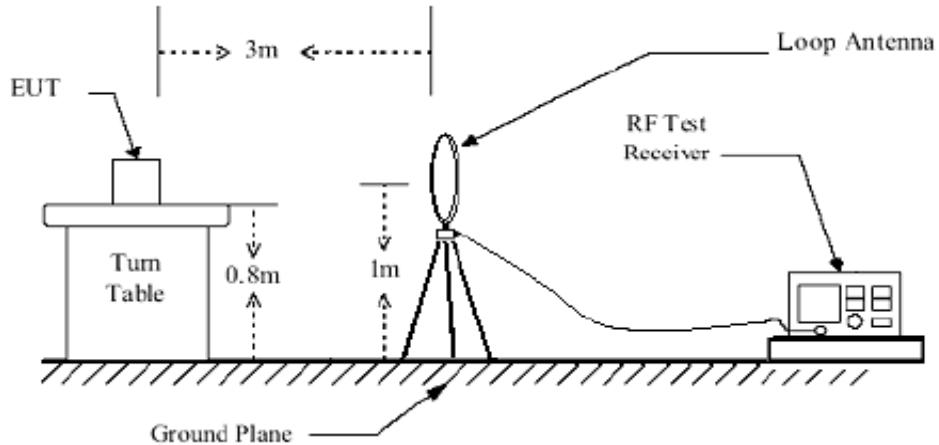
- a. The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position Y, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using new battery. The turntable was rotated to maximize the emission level.
- h. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.

**NOTE:**

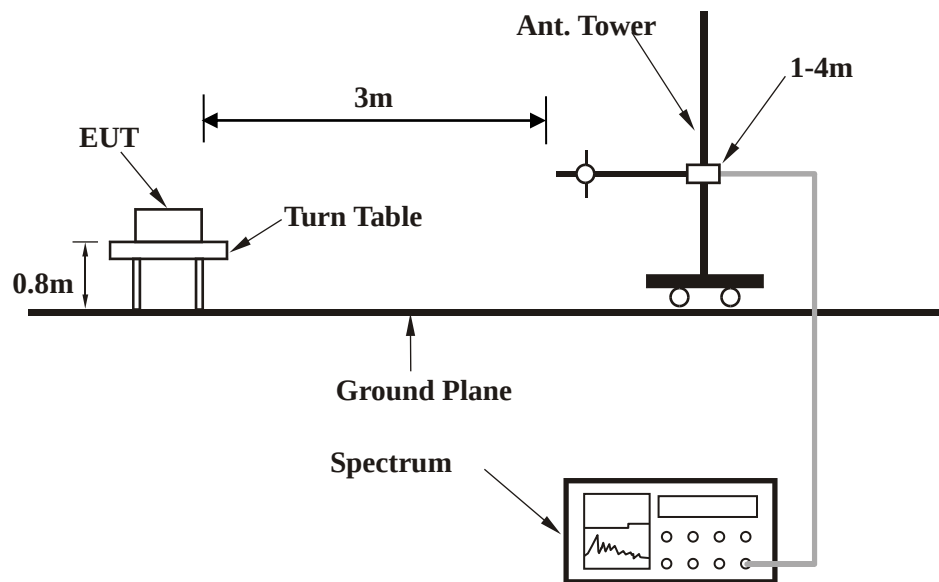
1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3.  $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
4.  $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$
5.  $\text{Margin value} = \text{Emission level} - \text{Limit value.}$
6.  $\text{Fundamental AV value} = \text{PK Emission} + \text{AV Factor.}$

#### 4.1.4 TEST SETUP

##### Below 30MHz test setup

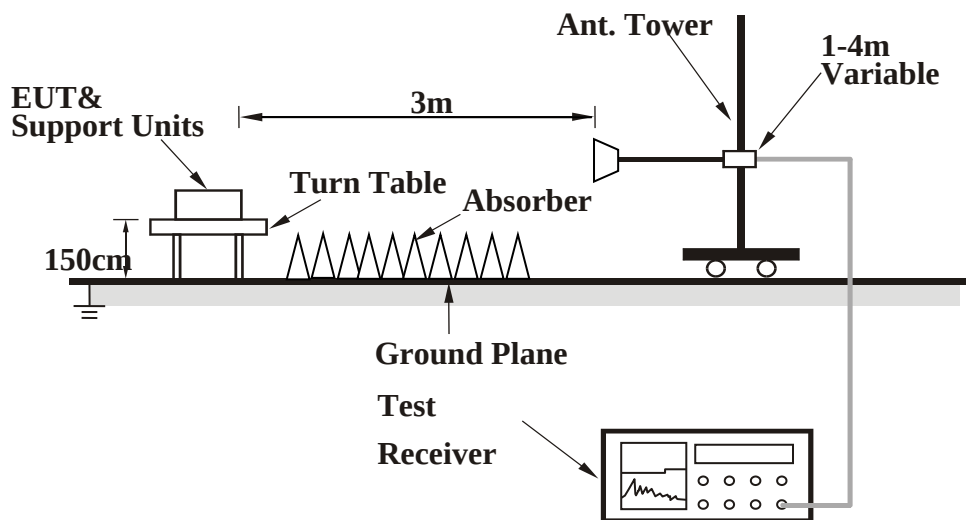


##### Below 1GHz test setup



**Note:** For the actual test configuration, please refer to the attached file (Test Setup Photo).

### Above 1GHz test setup



**Note:** For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.5 DEVIATION FROM TEST STANDARD

No deviation.

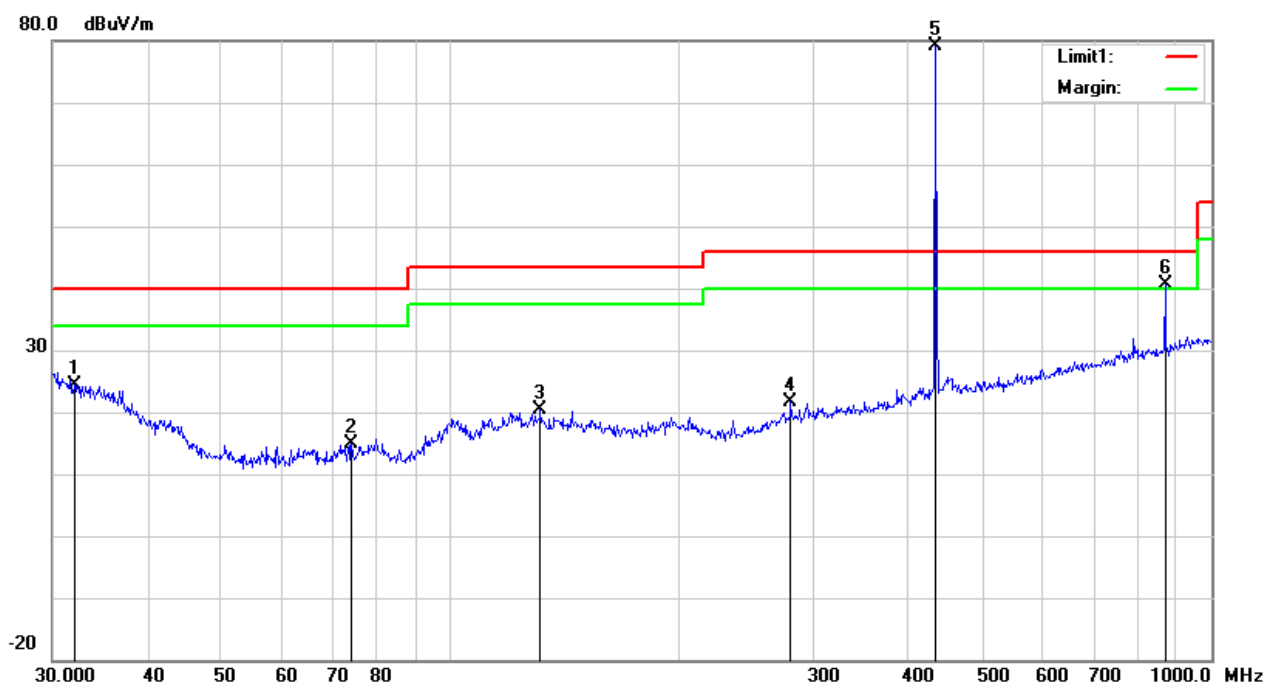
#### 4.1.6 EUT OPERATING CONDITIONS

- Placed the EUT on the testing table.
- Enable EUT under transmission condition continuously at specific channel frequency.

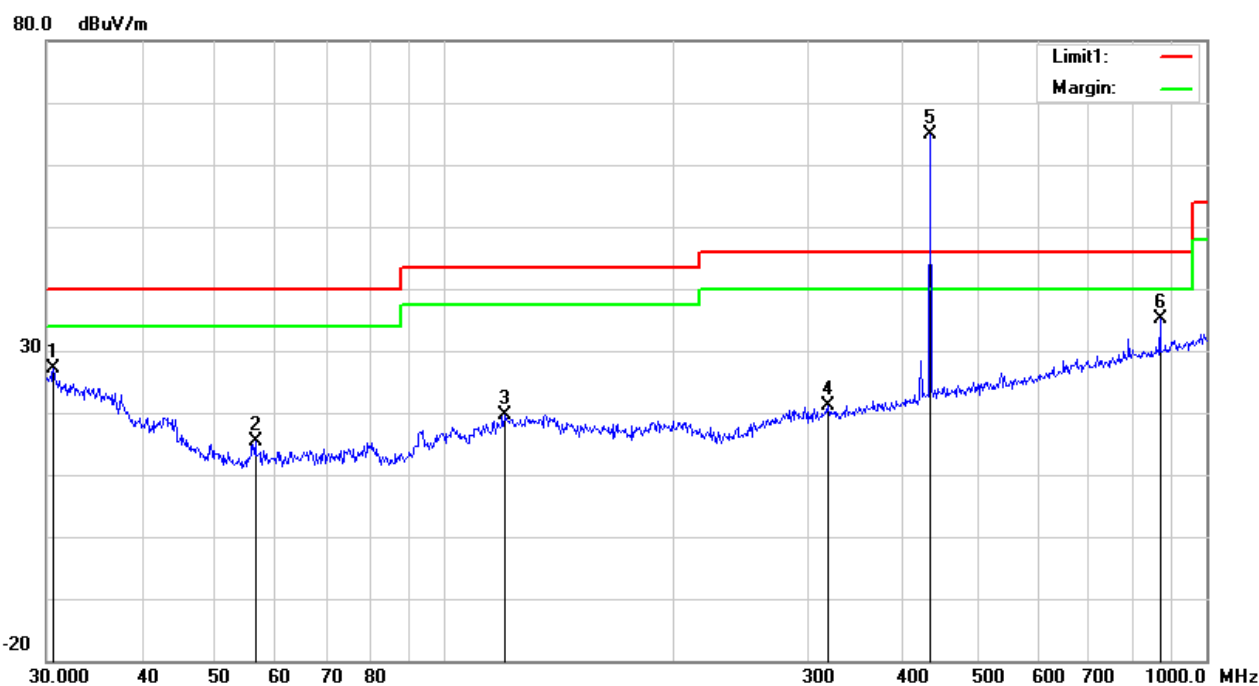
#### 4.1.7 TEST RESULTS

##### BELOW 1GHz WORST-CASE DATA:

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 m |                    |                     |                 |              |               |                    |                   |                |                |               |
|-----------------------------------------------------|--------------------|---------------------|-----------------|--------------|---------------|--------------------|-------------------|----------------|----------------|---------------|
| No.                                                 | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Ant_F<br>(dB/m) | PA_G<br>(dB) | Cab_L<br>(dB) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Height<br>(cm) | Degree<br>(°) |
| 1                                                   | 32.0668            | 25.73               | 19.75           | 21.63        | 0.63          | 24.48              | 40.00             | -15.52         | 100            | 268           |
| 2                                                   | 74.1351            | 27.80               | 7.73            | 21.62        | 0.88          | 14.79              | 40.00             | -25.21         | 200            | 38            |
| 3                                                   | 131.2965           | 27.69               | 13.27           | 21.67        | 1.15          | 20.44              | 43.50             | -23.06         | 100            | 263           |
| 4                                                   | 280.0238           | 28.61               | 13.36           | 21.95        | 1.67          | 21.69              | 46.00             | -24.31         | 100            | 284           |
| 5                                                   | *433.92            | 82.63               | 16.45           | 22.01        | 1.99          | 79.06              | 100.82            | -21.76         | 200            | 228           |
| 6                                                   | *433.92            | -                   | -               | -            | -             | 79.06              | 80.82             | -1.76          | 200            | 228           |
| 7                                                   | 8667.84            | 37.20               | 22.09           | 21.59        | 2.82          | 40.52              | 80.82             | -40.3          | 200            | 152           |
| 8                                                   | 8667.84            | -                   | -               | -            | -             | 40.52              | 60.82             | -20.3          | 200            | 152           |



| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 m |                    |                     |                 |              |               |                    |                   |                |                |               |
|---------------------------------------------------|--------------------|---------------------|-----------------|--------------|---------------|--------------------|-------------------|----------------|----------------|---------------|
| No.                                               | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Ant_F<br>(dB/m) | PA_G<br>(dB) | Cab_L<br>(dB) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Height<br>(cm) | Degree<br>(°) |
| 1                                                 | 30.6379            | 27.45               | 20.75           | 21.63        | 0.62          | 27.19              | 40.00             | -12.81         | 100            | 128           |
| 2                                                 | 56.3948            | 28.75               | 7.36            | 21.62        | 0.78          | 15.27              | 40.00             | -24.73         | 100            | 16            |
| 3                                                 | 119.8556           | 27.25               | 12.82           | 21.65        | 1.11          | 19.53              | 43.50             | -23.97         | 200            | 4             |
| 4                                                 | 318.8170           | 27.47               | 13.90           | 21.99        | 1.78          | 21.16              | 46.00             | -24.84         | 300            | 340           |
| 5                                                 | *433.92            | 68.36               | 16.45           | 22.01        | 1.99          | 64.79              | 100.82            | -36.03         | 100            | 281           |
| 6                                                 | *433.92            | -                   | -               | -            | -             | 64.79              | 80.82             | -16.03         | 100            | 281           |
| 7                                                 | 867.84             | 31.79               | 22.09           | 21.59        | 2.82          | 35.11              | 80.82             | -45.71         | 100            | 19            |
| 8                                                 | 867.84             | -                   | -               | -            | -             | 35.11              | 60.82             | -25.71         | 100            | 19            |





**NOTE:**

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) at frequency below 1GHz.
2. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB)
4. Margin value = Emission level – Limit value.
5. " \* ": Fundamental frequency.
6. " # ": Harmonic frequency
7. Fundamental AV value =PK Emission +20\*log(duty cycle)Where the duty factor is calculated from following formula:20 log (Duty cycle) = 20Log(100%)=0dB, Please see page 17~19 for plotted duty.
8. The emission levels of other frequencies were less than 20dB margin against the limit.
9. 9KHz~30MHz have been test and test data more than 20dB margin.

10.

**ABOVE 1GHz WORST-CASE DATA:**

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3M</b> |             |                          |                  |                         |                |             |                     |                      |
|---------------------------------------------------------------|-------------|--------------------------|------------------|-------------------------|----------------|-------------|---------------------|----------------------|
| No.                                                           | Freq. (MHz) | Correction Factor (dB/m) | Raw Value (dBuV) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) |
| 1                                                             | 1301.76 PK  | -18.36                   | 53.17            | 34.81                   | 74             | -39.19      | 133                 | 74                   |
| 2                                                             | 1301.76 AV  | -                        | -                | 34.81                   | 54             | -19.19      | 133                 | 74                   |
| 3                                                             | 1735.68 PK  | -17.49                   | 55.22            | 37.73                   | 74             | -36.27      | 134                 | 50                   |
| 4                                                             | 1735.68 AV  | -                        | -                | 37.73                   | 54             | -16.27      | 134                 | 50                   |
| 5                                                             | 2169.60 PK  | -15.12                   | 56.61            | 41.49                   | 74             | -32.51      | 125                 | 25                   |
| 6                                                             | 2169.60 AV  | -                        | -                | 41.49                   | 54             | -12.51      | 125                 | 25                   |
| 7                                                             | 2603.52 PK  | -13.5                    | 64.14            | 50.64                   | 74             | -23.36      | 136                 | 332                  |
| 8                                                             | 2603.52 AV  | -                        | -                | 50.64                   | 54             | -3.36       | 136                 | 332                  |
| 9                                                             | 3037.44 PK  | -12.93                   | 59.85            | 46.92                   | 74             | -27.08      | 160                 | 243                  |
| 10                                                            | 3037.44 AV  | -                        | -                | 46.92                   | 54             | -7.08       | 160                 | 243                  |
| <b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3M</b>   |             |                          |                  |                         |                |             |                     |                      |
| No.                                                           | Freq. (MHz) | Correction Factor (dB/m) | Raw Value (dBuV) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) |
| 1                                                             | 1301.76 PK  | -18.36                   | 52.85            | 34.49                   | 74             | -39.51      | 140                 | 199                  |
| 2                                                             | 1301.76 AV  | -                        | -                | 34.49                   | 54             | -19.51      | 140                 | 199                  |
| 3                                                             | 1735.68 PK  | -17.49                   | 55.39            | 37.9                    | 74             | -36.1       | 150                 | 144                  |
| 4                                                             | 1735.68 AV  | -                        | -                | 37.9                    | 54             | -16.1       | 150                 | 144                  |
| 5                                                             | 2169.60 PK  | -15.12                   | 57.4             | 42.28                   | 74             | -31.72      | 141                 | 120                  |
| 6                                                             | 2169.60 AV  | -                        | -                | 42.28                   | 54             | -11.72      | 141                 | 120                  |
| 7                                                             | 2603.52 PK  | -13.5                    | 58.9             | 45.4                    | 74             | -28.6       | 171                 | 200                  |
| 8                                                             | 2603.52 AV  | -                        | -                | 45.4                    | 54             | -8.6        | 171                 | 200                  |
| 9                                                             | 3037.44 PK  | -12.93                   | 57.96            | 45.03                   | 74             | -28.97      | 110                 | 151                  |
| 10                                                            | 3037.44 AV  | -                        | -                | 45.03                   | 54             | -8.97       | 110                 | 151                  |

**NOTE:**

- 1 The resolution bandwidth of test receiver/spectrum analyzer is 1MHz for Peak detection (PK) at frequency above 1GHz.
- 2 Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
- 3 Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB)
- 4 Margin value = Emission level – Limit value.
- 5 The emission levels of other frequencies were less than 20dB margin against the limit.
- 6 Fundamental AV value =PK Emission +20\*log(duty cycle)Where the duty factor is calculated from following formula: 20 log (Duty cycle) = 20Log(100%)=0dB, Please see page 17~19 for plotted duty.

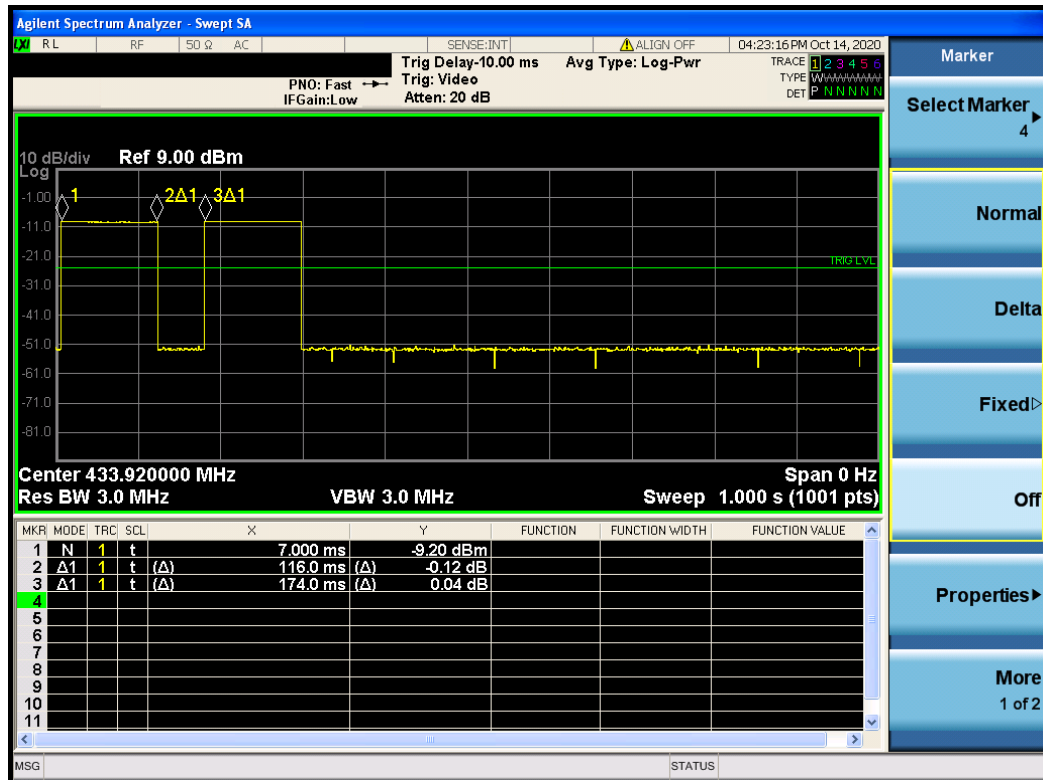
### Duty Cycle:

Ton = 100ms (pulse rain is 100ms instead of 116ms)

Tp = 100ms (pulse rain is 100ms instead of 174ms)

Duty Cycle = Ton / Tp \* 100% = 100/100 \* 100%= 100%

Factor = 20Log(Duty Cycle)=20Log(100%)=0dB





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## 4.2 20dB BANDWIDTH MEASUREMENT

### 4.2.1 LIMITS OF 20dB BANDWIDTH MEASUREMENT

According to FCC 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.

$$\text{Limit} = \text{Fundamental Frequency} \times 0.25\% = 433.92\text{MHz} \times 0.25\% = 1084.75 \text{ kHz}$$

### 4.2.2 TEST INSTRUMENTS

| Equipment                                   | Manufacturer | Model No.     | Serial No.   | Last Cal.   | Next Cal.   |
|---------------------------------------------|--------------|---------------|--------------|-------------|-------------|
| Wireless Connectivity Tester                | R&S          | CMW270        | 1201.0002K75 | Dec. 28, 19 | Dec. 27, 20 |
| Wireless Connectivity Tester                | R&S          | CMW270        | 1201.0002K75 | Dec. 27, 20 | Dec. 26, 21 |
| MXA VEXTOR SIGNAL                           | Agilent      | n5182a        | MY50140530   | Mar. 24, 20 | Mar. 24, 21 |
| MXA signal analyzer                         | Agilent      | n9020a        | MY49100060   | Mar. 24, 20 | Mar. 24, 21 |
| RF Control Unit                             | Tonscend     | JS0806-2      | 188060112    | Mar. 24, 20 | Mar. 24, 21 |
| Signal Generation                           | Agilent      | E4421B        | US40051152   | Dec. 18, 19 | Dec. 17, 20 |
| Signal Generation                           | Agilent      | E4421B        | US40051152   | Dec. 17, 20 | Dec. 16, 21 |
| DC Power Supply                             | Agilent      | E3640A        | MY40004013   | Mar. 30, 20 | Mar. 30, 21 |
| Programmable Temperature & Humidity Chamber | Hongjin      | HYC-TH-225 DH | DG-180746    | Mar. 24, 20 | Mar. 24, 21 |
| Test System                                 | Tonscend     | JS 1120-3     | N/A          | N/A         | N/A         |
| Power Splitter                              | Weinschel    | 1580-1        | TL177        | Mar. 27, 20 | Mar. 27, 21 |

#### NOTE:

1. The test was performed in RF Oven room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

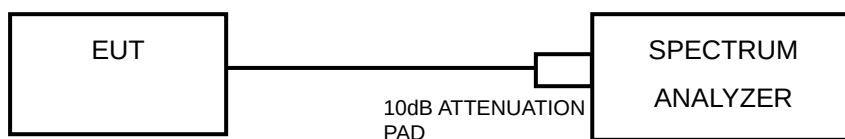
#### 4.2.3 TEST PROCEDURE

The spectrum analyzer was receiving the maximum emission level. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.2.5 TEST SETUP



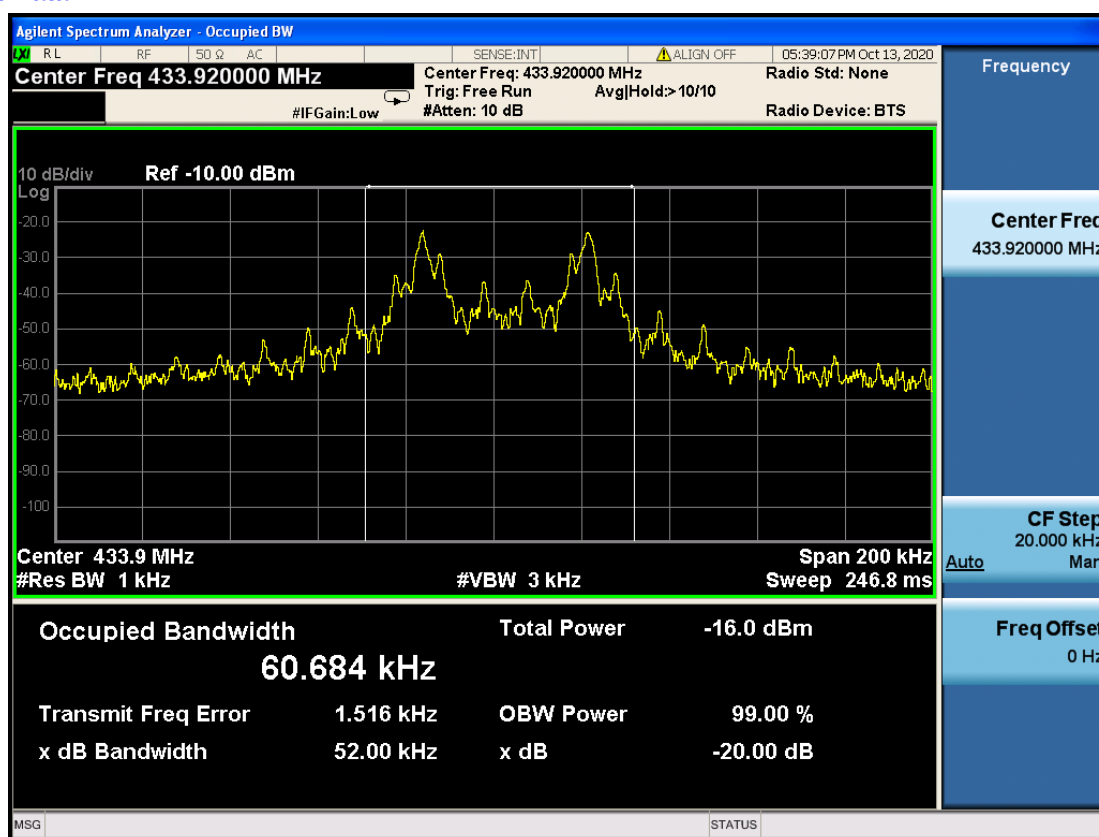
#### 4.2.6 EUT OPERATING CONDITIONS

- a) Turned on the power of all equipment.
- b) EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

#### 4.2.7 TEST RESULTS

| FREQUENCY (MHz) | 20dB BANDWIDTH (kHz) | MAXIMUM LIMIT (kHz) | PASS/FAIL |
|-----------------|----------------------|---------------------|-----------|
| 433.92          | 52.00                | 1084.75             | PASS      |

#### Test Data:



### 4.3 DEACTIVATION TIME MEASUREMENT

#### 4.3.1 LIMITS OF DEACTIVATION TIME MEASUREMENT

15.231 (a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

15.231 (a)(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

#### 4.3.2 TEST INSTRUMENTS

| Equipment                                   | Manufacturer | Model No.     | Serial No.   | Last Cal.   | Next Cal.   |
|---------------------------------------------|--------------|---------------|--------------|-------------|-------------|
| Wireless Connectivity Tester                | R&S          | CMW270        | 1201.0002K75 | Dec. 28, 19 | Dec. 27, 20 |
| Wireless Connectivity Tester                | R&S          | CMW270        | 1201.0002K75 | Dec. 27, 20 | Dec. 26, 21 |
| MXA VEXTOR SIGNAL                           | Agilent      | n5182a        | MY50140530   | Mar. 24, 20 | Mar. 24, 21 |
| MXA signal analyzer                         | Agilent      | n9020a        | MY49100060   | Mar. 24, 20 | Mar. 24, 21 |
| RF Control Unit                             | Tonscend     | JS0806-2      | 188060112    | Mar. 24, 20 | Mar. 24, 21 |
| Signal Generation                           | Agilent      | E4421B        | US40051152   | Dec. 18, 19 | Dec. 17, 20 |
| Signal Generation                           | Agilent      | E4421B        | US40051152   | Dec. 17, 20 | Dec. 16, 21 |
| DC Power Supply                             | Agilent      | E3640A        | MY40004013   | Mar. 30, 20 | Mar. 30, 21 |
| Programmable Temperature & Humidity Chamber | Hongjin      | HYC-TH-225 DH | DG-180746    | Mar. 24, 20 | Mar. 24, 21 |
| Test System                                 | Tonscend     | JS 1120-3     | N/A          | N/A         | N/A         |
| Power Splitter                              | Weinschel    | 1580-1        | TL177        | Mar. 27, 20 | Mar. 27, 21 |

**NOTE:** 1. The test was performed in RF Oven room.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

#### 4.3.3 TEST PROCEDURE

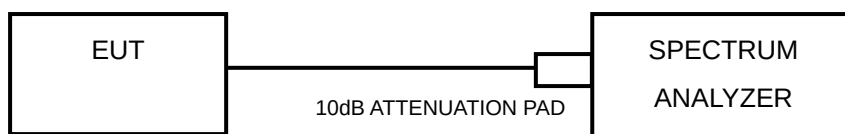
With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer set the center frequency, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the transmission duration was measured and recorded.



#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.3.5 TEST SETUP



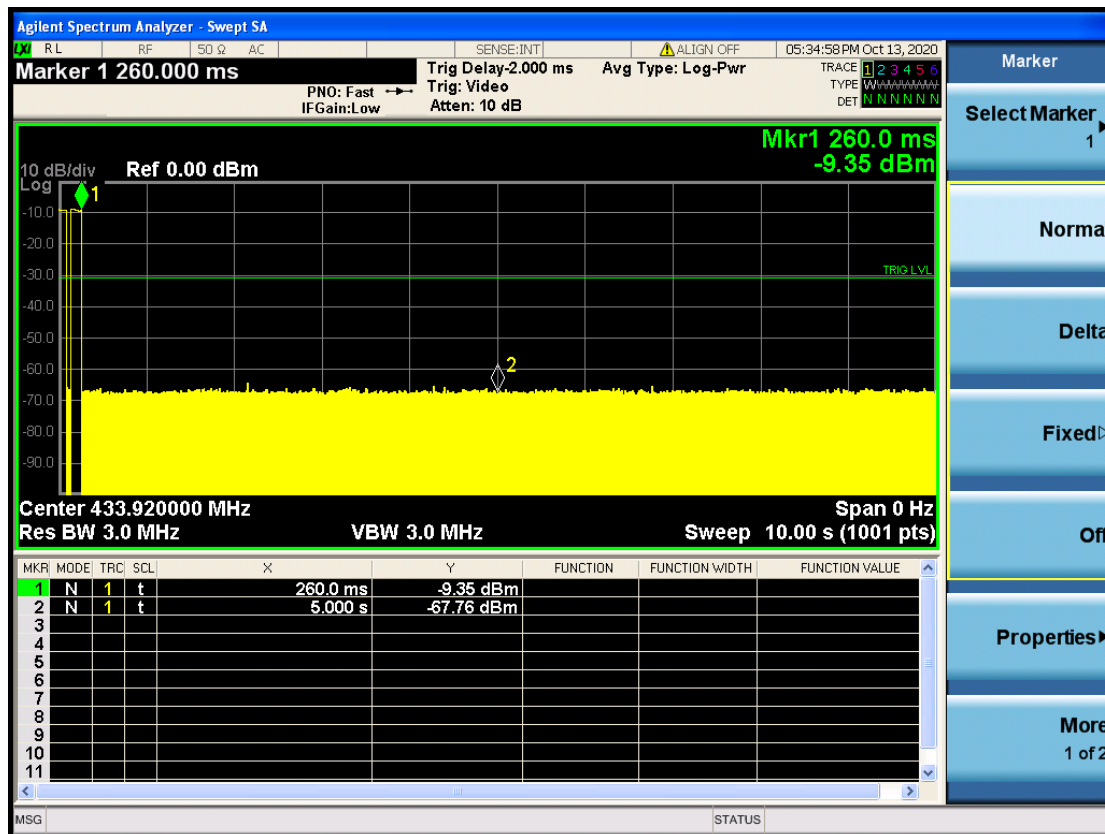
#### 4.3.6 EUT OPERATING CONDITIONS

- c) Turned on the power of all equipment.
- d) EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

#### 4.3.7 TEST RESULTS

| FREQUENCY (MHz) | MEASUREMENT RESULT (sec) | MAXIMUM LIMIT (sec) | PASS/FAIL |
|-----------------|--------------------------|---------------------|-----------|
| 433.92          | 0.26                     | 5                   | PASS      |

The plots of test results are attached as below.



## 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

## 6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---