

# FCC Part 15C Test Report

## FCC ID: 2ATM74102

|                  |  |
|------------------|--|
| Product Name:    | Smart Sprinkler Controller   |
| Trademark:       | N/A  |
| Model Name :     | YS4102-UC<br>YS4102-UA   |
| Prepared For :   | YoSmart Inc.   |
| Address :        | 17165 Von Karman Avenue, Suite 105, Irvine CA, 92614, USA  |
| Prepared By :    | Shenzhen BCTC Testing Co., Ltd.  |
| Address :        | BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China |
| Test Date:       | Dec. 30, 2019 – Jan. 08, 2020  |
| Date of Report : | Jan. 08, 2020  |
| Report No.:      | BCTC1912002810E  |

## TEST RESULT CERTIFICATION

**Applicant's name** ..... : YoSmart Inc.  
**Address** ..... : 17165 Von Karman Avenue, Suite 105, Irvine CA, 92614, USA  
**Manufacture's Name**..... : YoSmart Inc.  
**Address** ..... : 17165 Von Karman Avenue, Suite 105, Irvine CA, 92614, USA

### Product description

**Product name** ..... : Smart Sprinkler Controller  
**Model and/or type reference** : N/A  
**Serial Model** ..... : YS4102-UC  
YS4102-UA  
**Test Standards**..... : FCC Part15.249  
ANSI C63.10-2013

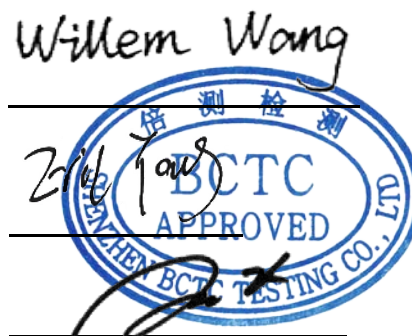
This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Prepared by(Engineer): Willem Wang

Reviewer(Supervisor): Eric Yang

Approved(Manager): Zero Zhou



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## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| FCC Part15 (15.249) , Subpart C |  |          |        |
|---------------------------------|--|----------|--------|
| Standard Section                | Test Item  | Judgment | Remark |
| 15.207                          | Conducted Emission                                   | PASS     |        |
| 15.215                          | 20dB Bandwidth                                       | PASS     |        |
| 15.249                          | Fundamental & Radiated Spurious Emission Measurement | PASS     |        |
| 15.205                          | Band Edge Emission                                   | PASS     |        |
| 15.203                          | Antenna Requirement                                  | PASS     |        |

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report

## 1.1 TEST FACILITY

Shenzhen BCTC Testing Co., Ltd.

Add. : BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 712850

IC Registered No.: 23583

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| No. | Item   | Uncertainty |
|-----|--|-------------|
| 1   | 3m chamber Radiated spurious emission(30MHz-1GHz)  | U=4.3dB     |
| 2   | 3m chamber Radiated spurious emission(1GHz-18GHz)  | U=4.5dB     |
| 3   | 3m chamber Radiated spurious emission(18GHz-40GHz) | U=3.34dB    |
| 4   | Conducted Adjacent channel power                   | U=1.38dB    |
| 5   | Conducted output power uncertainty Above 1G        | U=1.576dB   |
| 6   | Conducted output power uncertainty below 1G        | U=1.28dB    |
| 7   | humidity uncertainty                               | U=5.3%      |
| 8   | Temperature uncertainty                            | U=0.59 °C   |

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

|                        |  |                    |
|------------------------|--|--------------------|
| Equipment              | Smart Sprinkler Controller   |                    |
| Trade Name             | N/A  |                    |
| Model Name             | YS4102-UC  |                    |
| Serial Model           | YS4102-UA  |                    |
| Model Difference       | All the model are the same circuit and RF module, except model names .   |                    |
| Product Description    | The EUT is a Smart Sprinkler Controller  |                    |
|                        | Operation Frequency:   | 910.3MHz           |
|                        | Modulation Type:   | ASK                |
|                        | Number Of Channel  | 1CH                |
|                        | Antenna Designation:   | Please see Note 3. |
|                        | Antenna Gain (dBi)   | 1dBi               |
|                        | Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual. |                    |
| Channel List           | Please refer to the Note 2.  |                    |
| Power                  | AC 24V   |                    |
| Connecting I/O Port(s) | Please 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.

| Channel List for 910.3MHz |                 |
|---------------------------|-----------------|
| Channel                   | Frequency (MHz) |
| 01                        | 910.3           |

3.

Table for Filed Antenna

| An. | Brand | Model Name | Antenna Type   | Connector | Gain (dBi) | NOTE |
|-----|-------|------------|----------------|-----------|------------|------|
| A   | N/A   | N/A        | Spring antenna | N/A       | 1          |      |

## 2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| For Radiated Emission |             |
|-----------------------|-------------|
| Final Test Mode       | Description |
| Mode 1                | TX Mode     |

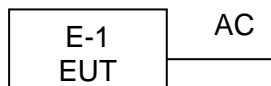
Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

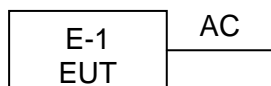


## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

### Conducted Emission Test



### Radiated Spurious Emission Test



## 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Item | Equipment                  | Mfr/Brand | Model/Type No. | Series No. | Note |
|------|----------------------------|-----------|----------------|------------|------|
| E-1  | Smart Sprinkler Controller | N/A       | YS4102-UC      | N/A        | EUT  |
|      |                            |           |                |            |      |

### Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

## 2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

### Radiation Test equipment

| Item | Equipment                        | Manufacturer | Type No.      | Serial No.    | Last calibration | Calibrated until |
|------|----------------------------------|--------------|---------------|---------------|------------------|------------------|
| 1    | Spectrum Analyzer (9kHz-26.5GHz) | Agilent      | E4407B        | MY45109572    | Jun. 13, 2019    | Jun. 12, 2020    |
| 2    | Test Receiver (9kHz-7GHz)        | R&S          | ESR7          | 101154        | Jun. 13, 2019    | Jun. 12, 2020    |
| 3    | Bilog Antenna (30MHz-3GHz)       | SCHWARZBECK  | VULB9163      | VULB9163-942  | Jun. 22, 2019    | Jun. 21, 2020    |
| 4    | Horn Antenna (1GHz-18GHz)        | SCHWARZBECK  | BBHA9120D     | 1541          | Jun. 22, 2019    | Jun. 21, 2020    |
| 5    | Horn Antenna (18GHz-40GHz)       | SCHWARZBECK  | BBHA9170      | 822           | Jun. 22, 2019    | Jun. 21, 2020    |
| 6    | Amplifier (9kHz-6GHz)            | SCHWARZBECK  | BBV9744       | 9744-0037     | Jun. 25, 2019    | Jun. 24, 2020    |
| 7    | Amplifier (0.5GHz-18GHz)         | SCHWARZBECK  | BBV9718       | 9718-309      | Jun. 25, 2019    | Jun. 24, 2020    |
| 8    | Amplifier (18GHz-40GHz)          | MITEQ        | TTA1840-35-HG | 2034381       | Jun. 17, 2019    | Jun. 16, 2020    |
| 9    | Loop Antenna (9kHz-30MHz)        | SCHWARZBECK  | FMZB1519B     | 014           | Jul. 02, 2019    | Jul. 01, 2020    |
| 10   | RF cables1 (9kHz-30MHz)          | Huber+Suhnar | 9kHz-30MHz    | B1702988-0008 | Jun. 25, 2019    | Jun. 24, 2020    |
| 11   | RF cables2 (30MHz-1GHz)          | Huber+Suhnar | 30MHz-1GHz    | 1486150       | Jun. 25, 2019    | Jun. 24, 2020    |
| 12   | RF cables3 (1GHz-40GHz)          | Huber+Suhnar | 1GHz-40GHz    | 1607106       | Jun. 25, 2019    | Jun. 24, 2020    |
| 13   | Power Metter                     | Keysight     | E4419B        | \             | Jun. 17, 2019    | Jun. 16, 2020    |
| 14   | Power Sensor (AV)                | Keysight     | E9 300A       | \             | Jun. 17, 2019    | Jun. 16, 2020    |
| 15   | Signal Analyzer 20kHz-26.5GHz    | KEYSIGHT     | N9020A        | MY4910.30060  | Jun. 13, 2019    | Jun. 12, 2020    |
| 16   | Spectrum Analyzer 9kHz-40GHz     | Aglient      | FSP40         | 100363        | Jun. 13, 2019    | Jun. 12, 2020    |
| 17   | D.C. Power Supply                | LongWei      | TPR-6405D     | \             | \                | \                |
| 18   | Software                         | Frad         | EZ-EMC        | FA-03A2 RE    | \                | \                |

## Conduction Test equipment

| Item | Equipment     | Manufacturer | Type No.   | Serial No.    | Last calibration | Calibrated until |
|------|---------------|--------------|------------|---------------|------------------|------------------|
| 1    | Test Receiver | R&S          | ESR3       | 102075        | Jun. 13, 2019    | Jun. 12, 2020    |
| 2    | LISN          | SCHWARZBECK  | NSLK8127   | 8127739       | Jun. 13, 2019    | Jun. 12, 2020    |
| 3    | LISN          | R&S          | ENV216     | 101375        | Jun. 13, 2019    | Jun. 12, 2020    |
| 4    | RF cables     | Huber+Suhnar | 9kHz-30MHz | B1702988-0008 | Jun. 25, 2019    | Jun. 24, 2020    |
| 5    | Software      | Frad         | EZ-EMC     | EMC-CON 3A1   | \                | \                |

### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

| FREQUENCY (MHz) | Limit (dBuV) |           | Standard |
|-----------------|--------------|-----------|----------|
|                 | Quasi-peak   | Average   |          |
| 0.15 -0.5       | 66 - 56 *    | 56 - 46 * | FCC      |
| 0.50 -5.0       | 56.00        | 46.00     | FCC      |
| 5.0 -30.0       | 60.00        | 50.00     | FCC      |

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

| Receiver Parameters | Setting  |
|---------------------|----------|
| Attenuation         | 10 dB    |
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

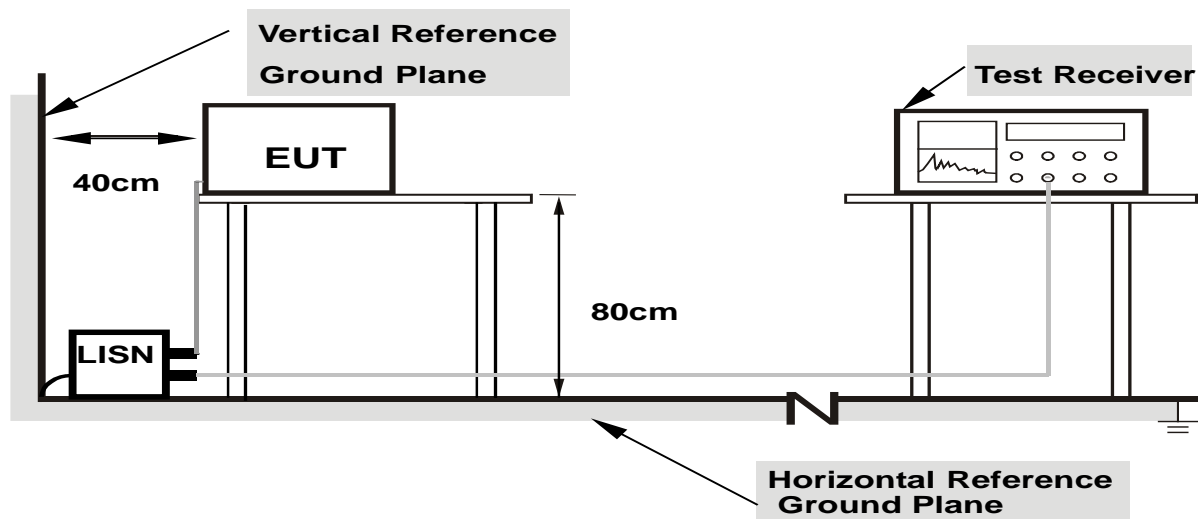
##### 3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

##### 3.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.1.4 TEST SETUP



**Note: 1.Support units were connected to second LISN.**

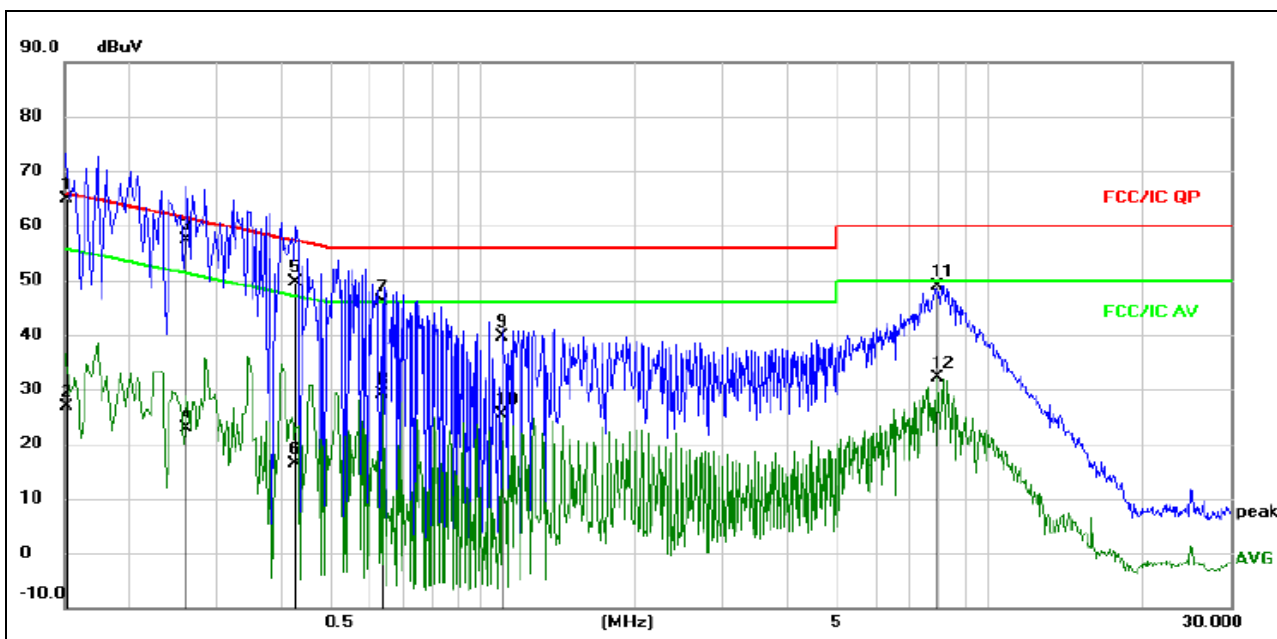
**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

### 3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

### 3.1.6 TEST RESULTS

|                |        |                    |        |
|----------------|--------|--------------------|--------|
| Temperature :  | 26℃    | Relative Humidity: | 54%    |
| Pressure :     | 101kPa | Phase :            | L      |
| Test Voltage : | AC 24V | Test Mode :        | Mode 1 |

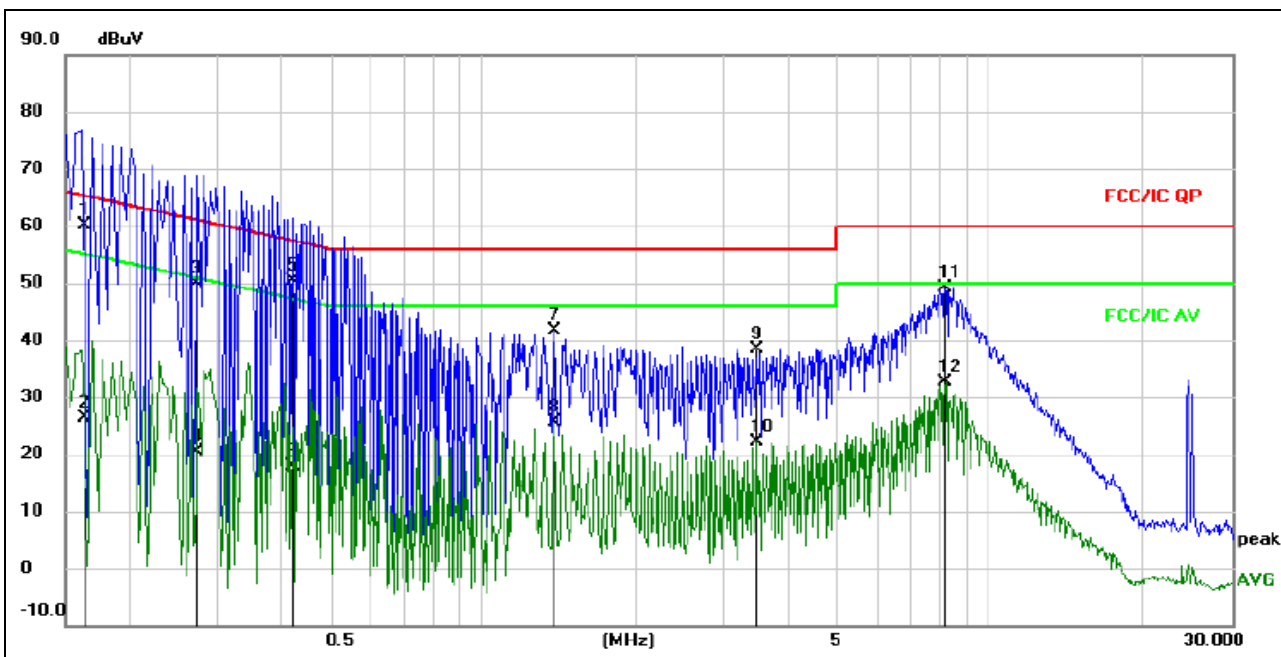


Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------|--------------------------|---------------|------------|----------|---------|
| 1   | *   | 0.1520       | 55.34                    | 9.52              | 64.86                    | 65.89         | -1.03      | QP       |         |
| 2   |     | 0.1520       | 17.34                    | 9.52              | 26.86                    | 55.89         | -29.03     | AVG      |         |
| 3   |     | 0.2620       | 47.78                    | 9.53              | 57.31                    | 61.37         | -4.06      | QP       |         |
| 4   |     | 0.2620       | 13.29                    | 9.53              | 22.82                    | 51.37         | -28.55     | AVG      |         |
| 5   |     | 0.4300       | 40.12                    | 9.53              | 49.65                    | 57.25         | -7.60      | QP       |         |
| 6   |     | 0.4300       | 6.80                     | 9.53              | 16.33                    | 47.25         | -30.92     | AVG      |         |
| 7   |     | 0.6340       | 36.25                    | 9.88              | 46.13                    | 56.00         | -9.87      | QP       |         |
| 8   |     | 0.6340       | 19.19                    | 9.88              | 29.07                    | 46.00         | -16.93     | AVG      |         |
| 9   |     | 1.0940       | 30.12                    | 9.57              | 39.69                    | 56.00         | -16.31     | QP       |         |
| 10  |     | 1.0940       | 15.86                    | 9.57              | 25.43                    | 46.00         | -20.57     | AVG      |         |
| 11  |     | 7.8940       | 39.23                    | 9.71              | 48.94                    | 60.00         | -11.06     | QP       |         |
| 12  |     | 7.8940       | 22.49                    | 9.71              | 32.20                    | 50.00         | -17.80     | AVG      |         |

|                |        |                    |        |
|----------------|--------|--------------------|--------|
| Temperature :  | 26°C   | Relative Humidity: | 54%    |
| Pressure :     | 101kPa | Phase :            | N      |
| Test Voltage : | AC24V  | Test Mode :        | Mode 1 |



Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

| No. | Mk. | Freq.  | Reading Level | Correct Factor | Measurement | Limit | Over   | Detector | Comment |
|-----|-----|--------|---------------|----------------|-------------|-------|--------|----------|---------|
|     |     | MHz    | dBuV          |                | dBuV        | dBuV  | dB     |          |         |
| 1   | *   | 0.1640 | 50.75         | 9.50           | 60.25       | 65.26 | -5.01  | QP       |         |
| 2   |     | 0.1640 | 16.83         | 9.50           | 26.33       | 55.26 | -28.93 | AVG      |         |
| 3   |     | 0.2730 | 40.45         | 9.55           | 50.00       | 61.03 | -11.03 | QP       |         |
| 4   |     | 0.2730 | 10.87         | 9.55           | 20.42       | 51.03 | -30.61 | AVG      |         |
| 5   |     | 0.4220 | 40.94         | 9.52           | 50.46       | 57.41 | -6.95  | QP       |         |
| 6   |     | 0.4220 | 8.26          | 9.52           | 17.78       | 47.41 | -29.63 | AVG      |         |
| 7   |     | 1.3820 | 31.94         | 9.58           | 41.52       | 56.00 | -14.48 | QP       |         |
| 8   |     | 1.3820 | 15.93         | 9.58           | 25.51       | 46.00 | -20.49 | AVG      |         |
| 9   |     | 3.4540 | 28.72         | 9.69           | 38.41       | 56.00 | -17.59 | QP       |         |
| 10  |     | 3.4540 | 12.45         | 9.69           | 22.14       | 46.00 | -23.86 | AVG      |         |
| 11  |     | 8.2299 | 39.37         | 9.71           | 49.08       | 60.00 | -10.92 | QP       |         |
| 12  |     | 8.2299 | 22.90         | 9.71           | 32.61       | 50.00 | -17.39 | AVG      |         |

### 3.2 RADIATED EMISSION MEASUREMENT

#### 3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies<br>(MHz) | Field Strength<br>(micorvolts/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                                |

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency | Field strength of fundamental<br>(millivolts/meter) | Field strength of harmonics<br>(microvolts/meter) |
|-----------------------|---|---|
| 902-928 MHz           | 50  | 500   |
| 2400-2483.5 MHz       | 50  | 500   |
| 5725-5875 MHz         | 50  | 500   |
| 24.0-24.25 GHz        | 250   | 2500  |

#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| FREQUENCY (MHz) | Limit (dBuV/m) (at 3M) |         |
|-----------------|------------------------|---------|
|                 | PEAK                   | AVERAGE |
| Above 1000      | 74                     | 54      |

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).



| Spectrum Parameter                    | Setting  |
|---------------------------------------|--|
| Attenuation                           | Auto   |
| Start Frequency                       | 1000 MHz   |
| Stop Frequency                        | 10th carrier harmonic                            |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |

| Receiver Parameter     | Setting                          |
|------------------------|----------------------------------|
| Attenuation            | Auto                             |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP    |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP    |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

### 3.2.2 TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

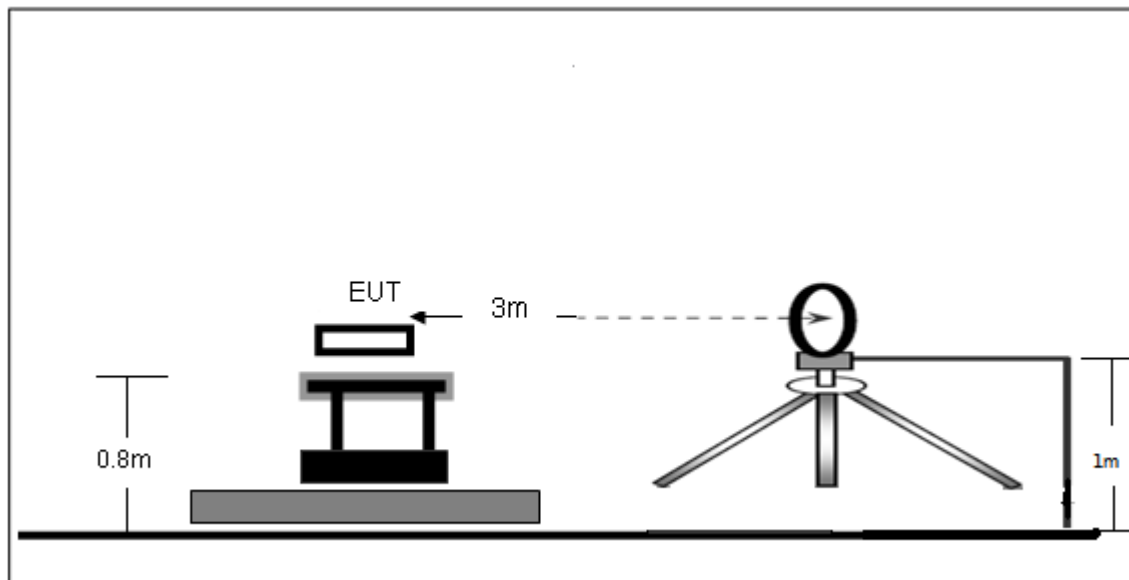
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.2.3 DEVIATION FROM TEST STANDARD

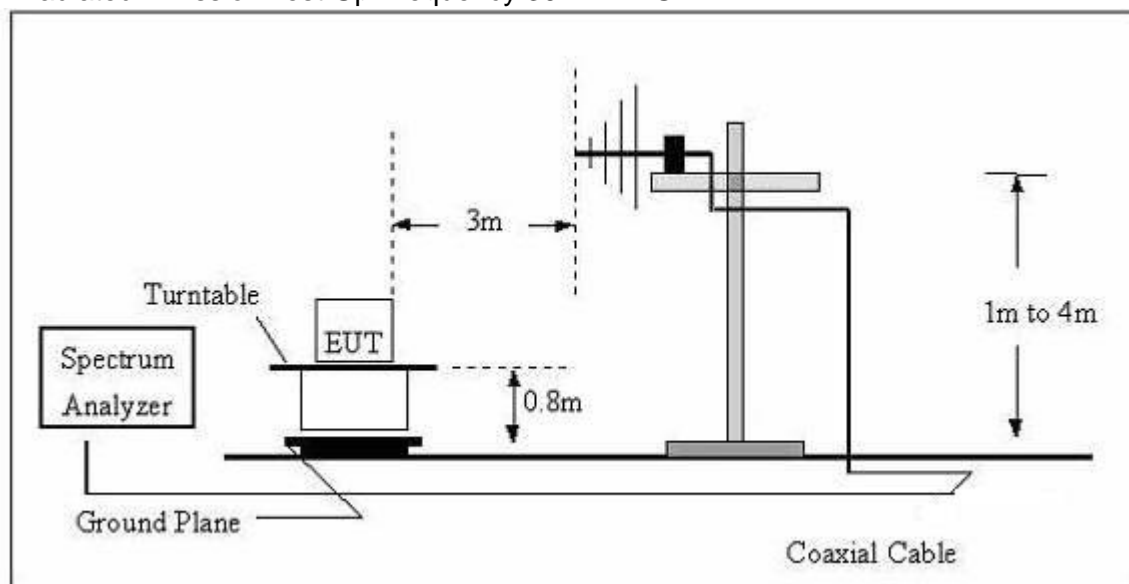
No deviation

### 3.2.4 TEST SETUP

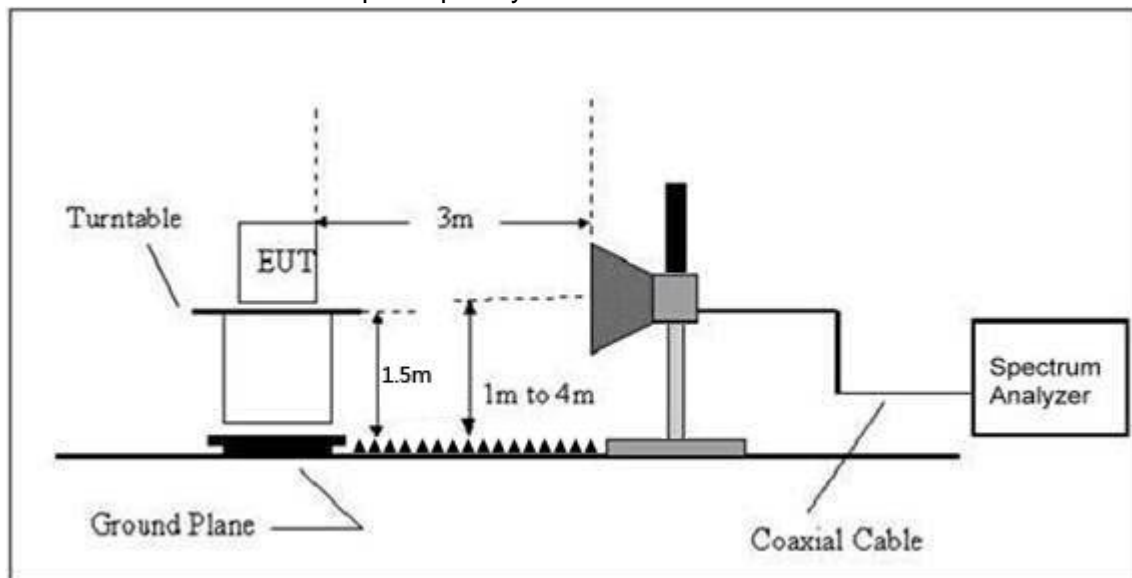
#### (A) Radiated Emission Test-Up Frequency Below 30MHz



#### (B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



### 3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

### 3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

|              |        |                    |        |
|--------------|--------|--------------------|--------|
| Temperature: | 26℃    | Relative Humidity: | 54%    |
| Pressure:    | 101kPa | Test Voltage :     | AC 24V |
| Test Mode :  | Mode 1 | Polarization :     | --     |

| Freq. | Reading  | Limit    | Margin | State |
|-------|----------|----------|--------|-------|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB)   | P/F   |
| --    | --       | --       | --     | PASS  |
| --    | --       | --       | --     | PASS  |

#### NOTE:

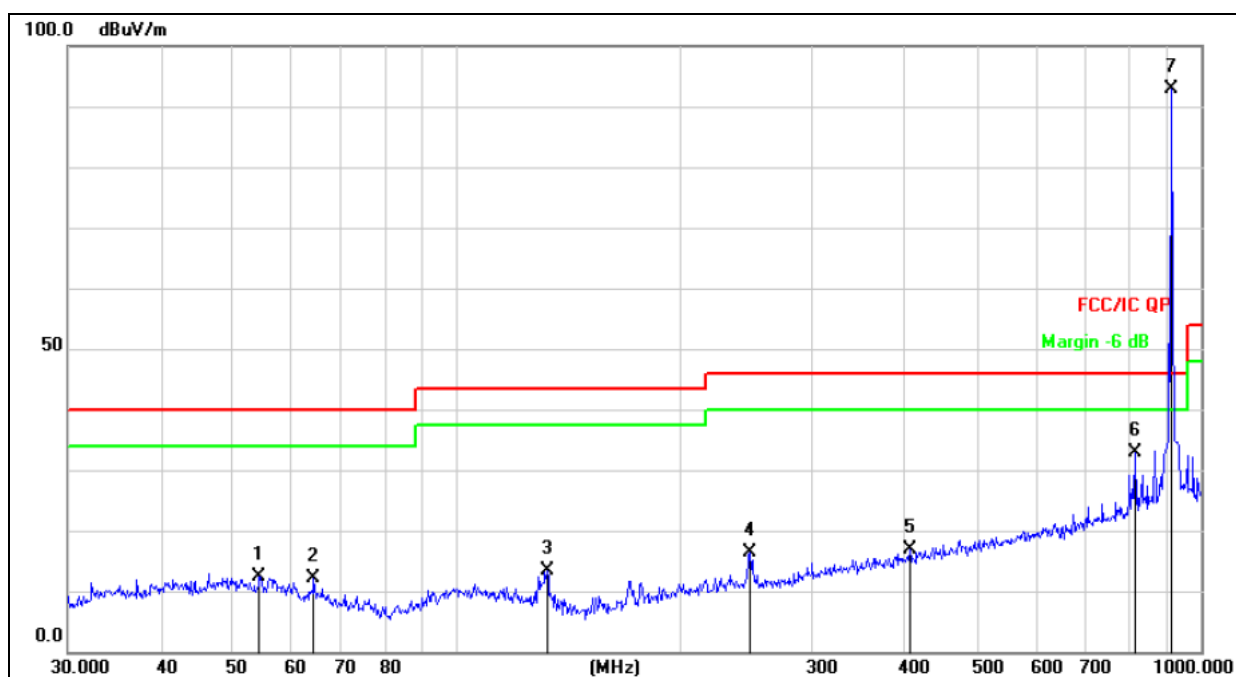
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

### 3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

|                |        |                     |            |
|----------------|--------|---------------------|------------|
| Temperature :  | 26°C   | Relative Humidity : | 54%        |
| Pressure :     | 101kPa | Polarization :      | Horizontal |
| Test Voltage : | AC 24V |                     |            |
| Test Mode :    | Mode 1 |                     |            |



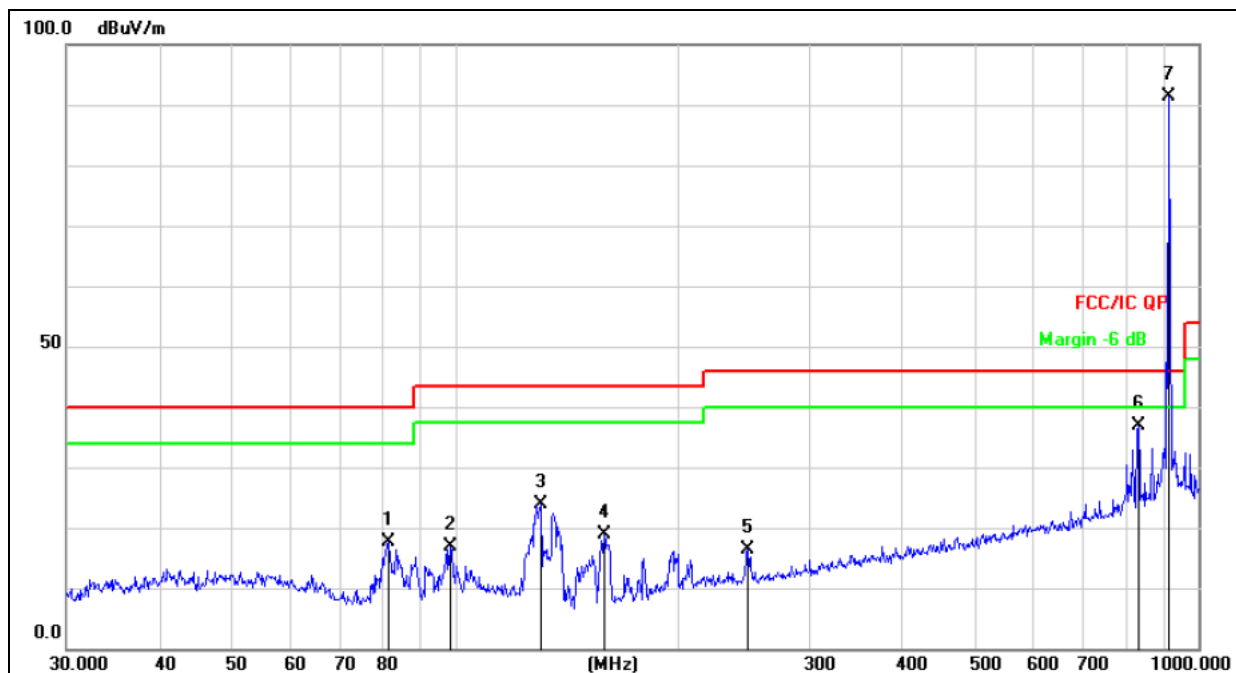
| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Detector Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|---------------|
|                    |                         |                |                            |                    |                |               |
| 54.2610            | 27.59                   | -15.30         | 12.29                      | 40.00              | -27.71         | QP            |
| 64.2074            | 29.00                   | -16.87         | 12.13                      | 40.00              | -27.87         | QP            |
| 132.2206           | 31.63                   | -18.36         | 13.27                      | 43.50              | -30.23         | QP            |
| 247.6819           | 31.59                   | -15.20         | 16.39                      | 46.00              | -29.61         | QP            |
| 406.0880           | 27.81                   | -10.95         | 16.86                      | 46.00              | -29.14         | QP            |
| 815.9678           | 36.16                   | -3.28          | 32.88                      | 46.00              | -13.12         | QP            |
| 912.8619           | 94.32                   | -1.40          | 92.92                      | 94.00              | -1.08          | QP            |

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

All interfaces was connected, and TX mode

|                |        |                     |          |
|----------------|--------|---------------------|----------|
| Temperature :  | 26℃    | Relative Humidity : | 54%      |
| Pressure :     | 101kPa | Polarization :      | Vertical |
| Test Voltage : | AC 24V |                     |          |
| Test Mode :    | Mode 1 |                     |          |



| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Detector Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|---------------|
| 81.2116            | 37.74                   | -20.13         | 17.61                      | 40.00              | -22.39         |               |
| 98.4865            | 33.51                   | -16.56         | 16.95                      | 43.50              | -26.55         | QP            |
| 130.3788           | 42.03                   | -18.24         | 23.79                      | 43.50              | -19.71         | QP            |
| 158.6676           | 37.72                   | -18.95         | 18.77                      | 43.50              | -24.73         | QP            |
| 247.6819           | 31.59                   | -15.20         | 16.39                      | 46.00              | -29.61         | QP            |
| 830.4002           | 39.82                   | -2.96          | 36.86                      | 46.00              | -9.14          | QP            |
| 912.8619           | 92.82                   | -1.40          | 91.42                      | 94.00              | -2.58          | QP            |

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

All interfaces was connected, and TX mode

### 3.2.8 TEST RESULTS (ABOVE 1000 MHZ)

Normal Voltage 910.3MHz

| Polar<br>(H/V)  | Frequency | Meter<br>Reading | Factor | Emission<br>Level | Limits   | Margin | Detector<br>Type |
|---|-----------|------------------|--------|-------------------|----------|--------|------------------|
|   | (MHz)     | (dBuV)           | (dB)   | (dBuV/m)          | (dBuV/m) | (dB)   |                  |
| V   | 1820.60   | 59.74            | -3.57  | 56.12             | 74       | -17.88 | Pk               |
| V   | 1820.60   | 48.25            | -3.57  | 44.74             | 54       | -9.26  | AV               |
| V   | 2730.90   | 58.72            | -3.84  | 54.85             | 74       | -19.15 | Pk               |
| V   | 2730.90   | 48.15            | -3.84  | 44.32             | 54       | -9.68  | AV               |
| V   | 3641.20   | 58.18            | -4.59  | 53.56             | 74       | -20.44 | Pk               |
| V   | 3641.20   | 48.83            | -4.59  | 44.21             | 54       | -9.79  | AV               |
| H   | 1820.60   | 61.82            | -3.62  | 58.14             | 74       | -15.86 | Pk               |
| H   | 1820.60   | 49.25            | -3.62  | 45.63             | 54       | -8.37  | AV               |
| H   | 2730.90   | 61.67            | -3.93  | 57.76             | 74       | -16.24 | Pk               |
| H   | 2730.90   | 50.41            | -3.93  | 46.52             | 54       | -7.48  | AV               |
| H   | 3641.20   | 60.25            | -3.57  | 56.66             | 74       | -17.34 | Pk               |
| H   | 3641.20   | 48.16            | -3.57  | 44.64             | 54       | -9.36  | AV               |
| <b>Remark:</b><br>Absolute Level= ReadingLevel+ Factor, Margin= Limit- Absolute Level<br>Other harmonics emissions are lower than 20dB below the allowable limit. |           |                  |        |                   |          |        |                  |

### 3.2.9 FIELD STRENGTH CALCULATION

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

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

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

Test Result:

|                |        |                     |            |
|----------------|--------|---------------------|------------|
| Temperature :  | 26℃    | Relative Humidity : | 54%        |
| Pressure :     | 101kPa | Polarization :      | Horizontal |
| Test Voltage : | AC 24V |                     |            |
| Test Mode :    | Mode 1 |                     |            |

| Frequency<br>(MHz)  | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Detector Type |
|---|-------------------------|----------------|----------------------------|--------------------|----------------|---------------|
| 910.3   | 96.33                   | -1.4           | 94.93                      | 114.00             | -19.07         |               |
| 910.3   | 91.08                   | -1.4           | 89.68                      | 94.00              | -4.32          | Average       |
| Remark:<br>Factor = Antenna Factor + Cable Loss – Pre-amplifier.<br>All interfaces was connected, and TX mode |                         |                |                            |                    |                |               |

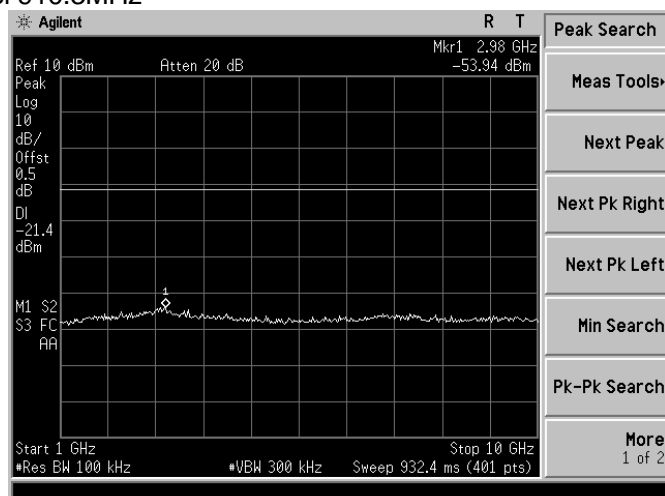
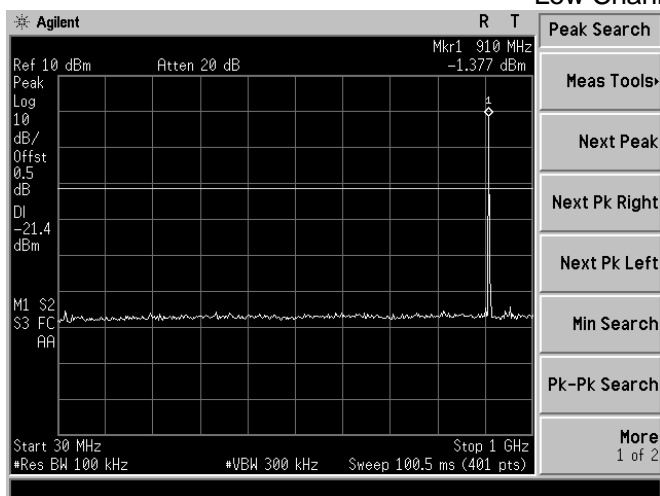
|                |        |                     |          |
|----------------|--------|---------------------|----------|
| Temperature :  | 26℃    | Relative Humidity : | 54%      |
| Pressure :     | 101kPa | Polarization :      | Vertical |
| Test Voltage : | AC 24V |                     |          |
| Test Mode :    | Mode 1 |                     |          |

| Frequency<br>(MHz)  | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Detector Type |
|---|-------------------------|----------------|----------------------------|--------------------|----------------|---------------|
| 910.3   | 93.14                   | -1.4           | 91.74                      | 114.00             | -22.26         |               |
| 910.3   | 87.97                   | -1.4           | 86.57                      | 94.00              | -7.43          | Average       |
| Remark:<br>Factor = Antenna Factor + Cable Loss – Pre-amplifier.<br>All interfaces was connected, and TX mode |                         |                |                            |                    |                |               |



## CONDUCTED EMISSION MEASUREMENT

Low Channel 910.3MHz



#### **4. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE APPLICABLE STANDARD**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation

#### **TEST PROCEDURE**

- a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- c) i) VBW for Peak, Quasi-peak, or Average Detector Function:  $3 \times \text{RBW}$
- d) Repeat above procedures until all measured frequencies were complete.

Note:

Both horizontal and vertical antenna polarities were tested  
and performed pretest to three orthogonal axis. The worst case emissions were reported

#### **4.1 DEVIATION FROM STANDARD**

No deviation.

#### **4.2 TEST SETUP**

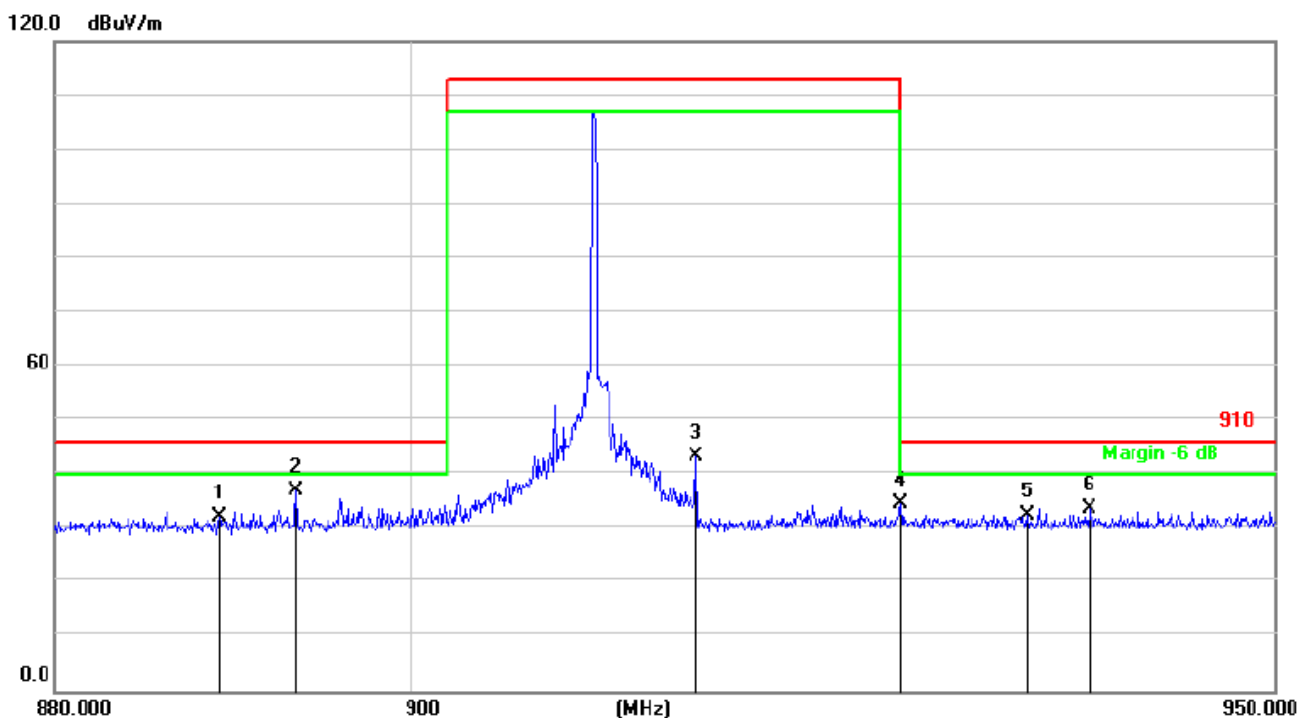
#### **4.3 EUT OPERATION CONDITIONS**

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

#### **4.4 TEST RESULTS**

|               |         |                     |        |
|---------------|---------|---------------------|--------|
| Temperature : | 26 °C   | Relative Humidity : | 54%    |
| Pressure :    | 101 kPa | Test Voltage :      | AC 24V |
| Test Mode :   | TX Mode |                     |        |

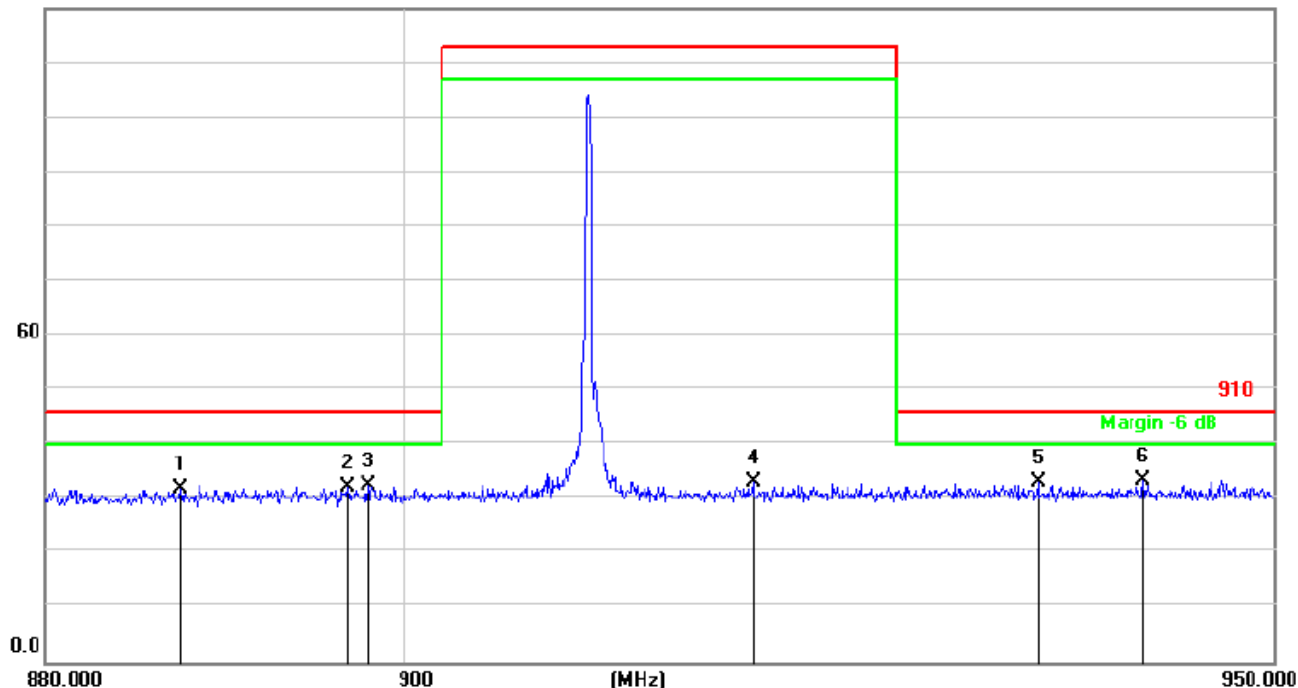
### 910.3MHz Horizontal



| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|----------------------|-----------------|----------------|-------------|--------|
| 1   | 889.1700        | 34.01            | -1.72                | 32.29           | 46.00          | -13.71      | peak   |
| 2   | 893.4400        | 38.64            | -1.63                | 37.01           | 46.00          | -8.99       | peak   |
| 3   | 916.1900        | 44.58            | -1.37                | 43.21           | 113.0          | -69.79      | peak   |
| 4   | 928.0200        | 36.07            | -1.28                | 34.79           | 46.00          | -11.21      | peak   |
| 5   | 935.4400        | 33.70            | -1.22                | 32.48           | 46.00          | -13.52      | peak   |
| 6   | 939.1500        | 34.94            | -1.19                | 33.75           | 46.00          | -12.25      | peak   |

### 910.3MHz Vertical

120.0 dBuV/m



| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|----------------------|-----------------|----------------|-------------|--------|
| 1   | 887.4900        | 33.70            | -1.76                | 31.94           | 46.00          | -14.06      | peak   |
| 2   | 896.7300        | 33.81            | -1.57                | 32.24           | 46.00          | -13.76      | peak   |
| 3   | 897.9200        | 34.21            | -1.54                | 32.67           | 46.00          | -13.33      | peak   |
| 4   | 919.6900        | 34.60            | -1.35                | 33.25           | 113.0          | -79.75      | peak   |
| 5   | 936.2100        | 34.28            | -1.22                | 33.06           | 46.00          | -12.94      | peak   |
| 6   | 942.3700        | 34.72            | -1.17                | 33.55           | 46.00          | -12.45      | peak   |

## 5. BANDWIDTH TEST

### 5.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.249) , Subpart C |           |                       |        |
|---------------------------------|-----------|-----------------------|--------|
| Section                         | Test Item | Frequency Range (MHz) | Result |
| 15.249                          | Bandwidth | 902~928               | PASS   |

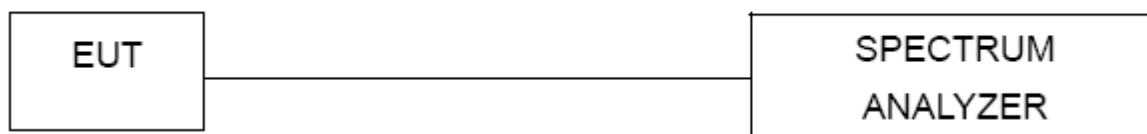
#### 5.1.1 TEST PROCEDURE

1. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

#### 5.1.2 DEVIATION FROM STANDARD

No deviation.

#### 5.1.3 TEST SETUP



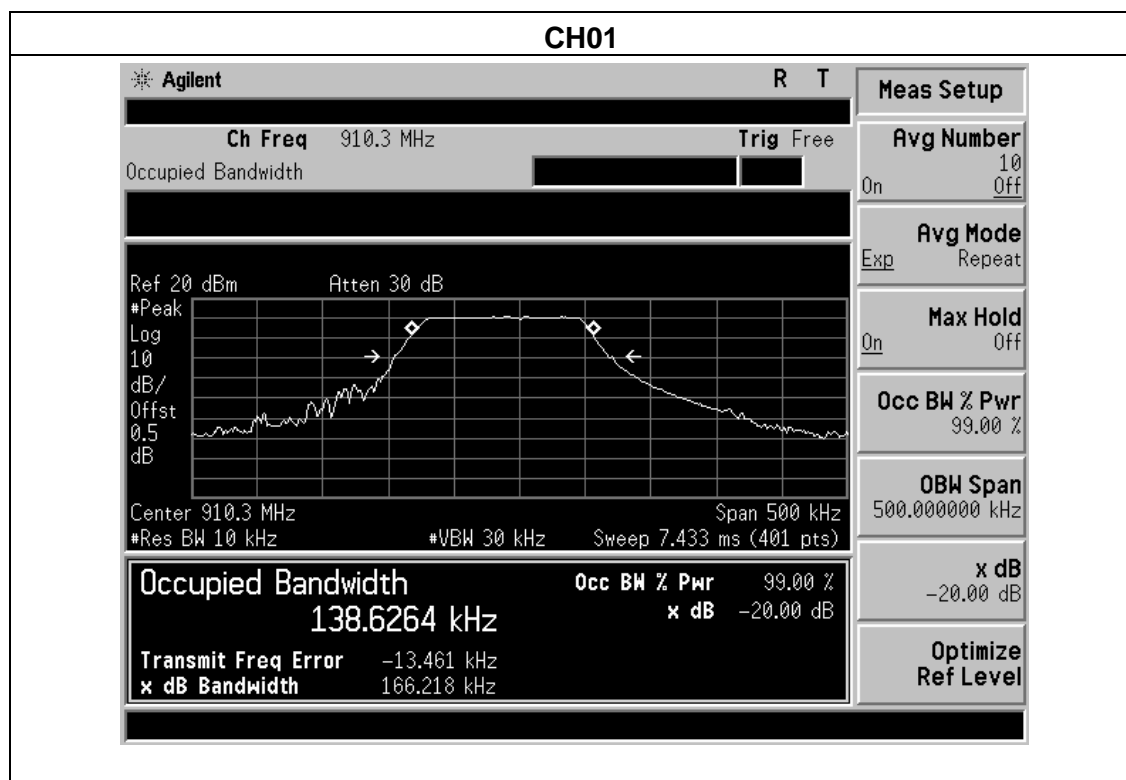
#### 5.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

### 5.1.5 TEST RESULTS

|               |         |                     |        |
|---------------|---------|---------------------|--------|
| Temperature : | 26°C    | Relative Humidity : | 54%    |
| Pressure :    | 101kPa  | Test Voltage :      | AC 24V |
| Test Mode :   | TX Mode |                     |        |

| Channel | Frequency (MHz) | 20dB bandwidth (MHz) |
|---------|-----------------|----------------------|
| 01      | 910.3           | 0.166                |



## **6. ANTENNA REQUIREMENT**

### **6.1 STANDARD REQUIREMENT**

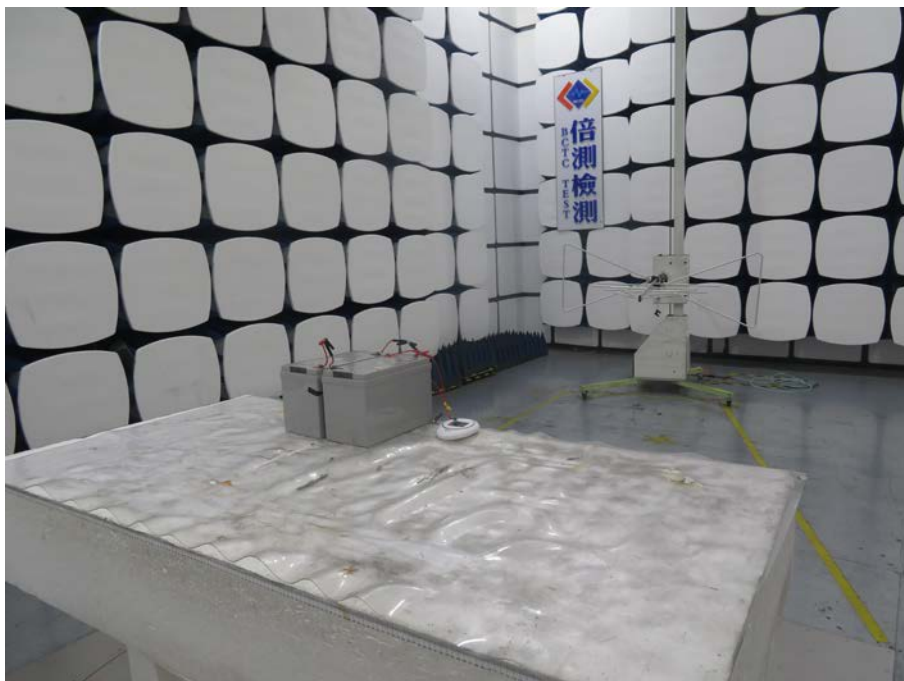
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### **6.2 EUT ANTENNA**

The EUT antenna is Spring antenna. It comply with the standard requirement.

## 7. EUT TEST PHOTO

### Radiated Measurement Photos

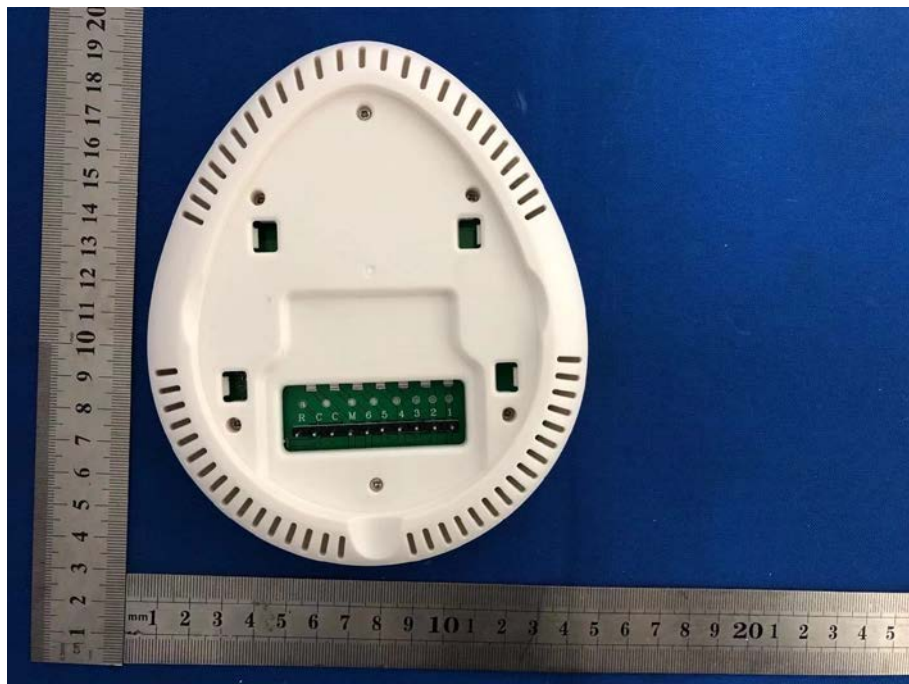




## Conducted emissions



## 8. PHOTO OF THE EUT



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