

# FCC Part 15C Test Report

## FCC ID: 2AV8DBB2787

|                  |                                                                                                                                                    |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name:    | Universal FM Transmitter                                                                                                                           |
| Trademark:       | N/A                                                                                                                                                |
| Model Name :     | BB2787                                                                                                                                             |
| Prepared For :   | TELEPHONE EST(HK)CO.,LTD                                                                                                                           |
| Address :        | Room 706, 7F, FuLi tianhe commercial building, Linhe East Road and tianhe district, Guangzhou, China                                               |
| 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:       | Apr. 20, 2020 to May 07, 2020                                                                                                                      |
| Date of Report : | May 08, 2020                                                                                                                                       |
| Report No.:      | BCTC2004001540E                                                                                                                                    |

## VERIFICATION OF COMPLIANCE

**Applicant's name** ..... TELEPHONE EST(HK)CO.,LTD

**Address** ..... Room 706, 7F, FuLi tianhe commercial building, Linhe East Road and tianhe district, Guangzhou, China

**Manufacture's Name**... TELEPHONE EST(HK)CO.,LTD

**Address** ..... Room 706, 7F, FuLi tianhe commercial building, Linhe East Road and tianhe district, Guangzhou, China

### Product description

**Product name** ..... Universal FM Transmitter

**Trademark:** N/A

**Model Name:** BB2787

**Test Standards:** FCC Part15.239  
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.

This report shall not be reproduced except in full, without the written approval of BCTC, this document may be altered or revised by BCTC, personal only, and shall be noted in the revision of the document.

**Test Result**..... **Pass**

**Prepared by(Engineer):**

Cai Fang Zhong

*Cai Fang Zhong*

**Reviewer(Supervisor):**

Eric Yang

*Eric Yang*

**Approved(Manager):**

Zero Zhou



| Table of Contents                                           | Page      |
|-------------------------------------------------------------|-----------|
| <b>1 . SUMMARY OF TEST RESULTS</b>                          | <b>5</b>  |
| 1.1 TEST FACILITY                                           | 6         |
| 1.2 MEASUREMENT UNCERTAINTY                                 | 6         |
| <b>2 . GENERAL INFORMATION</b>                              | <b>7</b>  |
| 2.1 GENERAL DESCRIPTION OF EUT                              | 7         |
| 2.2 DESCRIPTION OF TEST MODES                               | 8         |
| 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED | 8         |
| 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)            | 9         |
| 2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS                      | 10        |
| <b>3 . EMC EMISSION TEST</b>                                | <b>12</b> |
| 3.1 CONDUCTED EMISSION MEASUREMENT                          | 12        |
| 3.1.1 POWER LINE CONDUCTED EMISSION LIMITS                  | 12        |
| 3.1.2 TEST PROCEDURE                                        | 13        |
| 3.1.3 DEVIATION FROM TEST STANDARD                          | 13        |
| 3.1.4 TEST SETUP                                            | 13        |
| 3.1.5 EUT OPERATING CONDITIONS                              | 13        |
| 3.1.6 TEST RESULTS                                          | 13        |
| 3.2 RADIATED EMISSION MEASUREMENT                           | 14        |
| 3.2.1 RADIATED EMISSION LIMITS                              | 14        |
| 3.2.2 TEST PROCEDURE                                        | 15        |
| 3.2.3 TEST SETUP                                            | 16        |
| 3.2.4 EUT OPERATING CONDITIONS                              | 17        |
| 3.2.5 TEST RESULTS                                          | 18        |
| 3.2.6 TEST RESULTS (1GHZ~6GHZ)                              | 21        |
| 3.2.7 FIELD STRENGTH CALCULATION                            | 22        |
| <b>4 . BANDWIDTH TEST</b>                                   | <b>25</b> |
| 4.1 APPLIED PROCEDURES / LIMIT                              | 25        |
| 4.1.1 TEST PROCEDURE                                        | 25        |
| 4.1.2 DEVIATION FROM STANDARD                               | 25        |
| 4.1.3 TEST SETUP                                            | 25        |
| 4.1.4 EUT OPERATION CONDITIONS                              | 25        |
| 4.1.5 TEST RESULTS                                          | 26        |
| <b>5 . BAND EDGE MEASUREMENT</b>                            | <b>28</b> |
| 5.1 APPLICABLE STANDARD                                     | 28        |
| 5.2 TEST PROCEDURE                                          | 28        |
| 5.3 DEVIATION FROM STANDARD                                 | 28        |
| 5.4 TEST SETUP                                              | 28        |

| <b>Table of Contents</b>                                  | <b>Page</b> |
|-----------------------------------------------------------|-------------|
| <b>5.5 EUT OPERATION CONDITIONS</b>                       | <b>28</b>   |
| <b>6 . ANTENNA REQUIREMENT</b>                            | <b>31</b>   |
| <b>6.1 STANDARD REQUIREMENT</b>                           | <b>31</b>   |
| <b>6.2 EUT ANTENNA</b>                                    | <b>31</b>   |
| <b>7 . EUT TEST PHOTO</b>                                 | <b>32</b>   |
| <b>8 . EUT PHOTO</b>                                      | <b>33</b>   |
| <b>APPENDIX-PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS</b> |             |

## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| FCC Part15 (15.239) , Subpart C |                                                     |          |        |
|---------------------------------|-----------------------------------------------------|----------|--------|
| Standard Section                | Test Item                                           | Judgment | Remark |
| 15.207                          | Conducted Emission                                  | N/A      |        |
| 15.209&15.239                   | Fundamental &Radiated Spurious Emission Measurement | PASS     |        |
| 15.239a                         | Occupy Bandwidth                                    | PASS     |        |
| 15.203                          | Antenna Requirement                                 | PASS     |        |
| 15.239a                         | Band Edge Measurement                               | 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 expended 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℃     |

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

|                        |                                   |                  |
|------------------------|-----------------------------------|------------------|
| Equipment              | Universal FM Transmitter          |                  |
| Trade Name             | N/A                               |                  |
| Model Name             | BB2787                            |                  |
| Serial Model           | N/A                               |                  |
| Model Difference       | N/A                               |                  |
| Product Description    | Operation Frequency:              | 88.1-107.9 MHz   |
|                        | Modulation Type:                  | FM               |
|                        | Antenna Type:                     | Internal antenna |
|                        | Antenna Gain:                     | 0dBi             |
| Ratings                | DC 12V                            |                  |
| 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.

## 2.2 DESCRIPTION OF TEST MODES

| For All Emission |             |
|------------------|-------------|
| Final Test Mode  | Description |
| Mode 1           | CH01        |
| Mode 2           | CH50        |
| Mode 3           | CH100       |

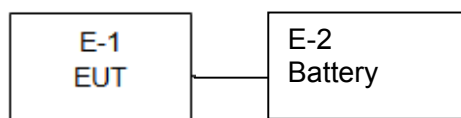
| Channel | Frequency (MHz) |
|---------|-----------------|
| 01      | 88.1            |
| 02      | 88.3            |
| 03      | 88.5            |
| ~       | ~               |
| 98      | 107.5           |
| 99      | 107.7           |
| 100     | 107.9           |

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Spurious emissions



## 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  | Universal FM Transmitter | N/A       | BB2787         | N/A        | EUT       |
| E-2  | Battery                  | N/A       | 12V            | N/A        | Auxiliary |

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.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

## 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        | MY49100060    | Jun. 13, 2019    | Jun. 12, 2020    |
| 16   | Spectrum Analyzer 9kHz-40GHz     | Agilent      | 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          | SCHWARZBEC<br>K | 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 | B1702988-00<br>08 | Jun. 25, 2019    | Jun. 24, 2020    |
| 5    | Software      | Frad            | EZ-EMC     | EMC-CON<br>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    |

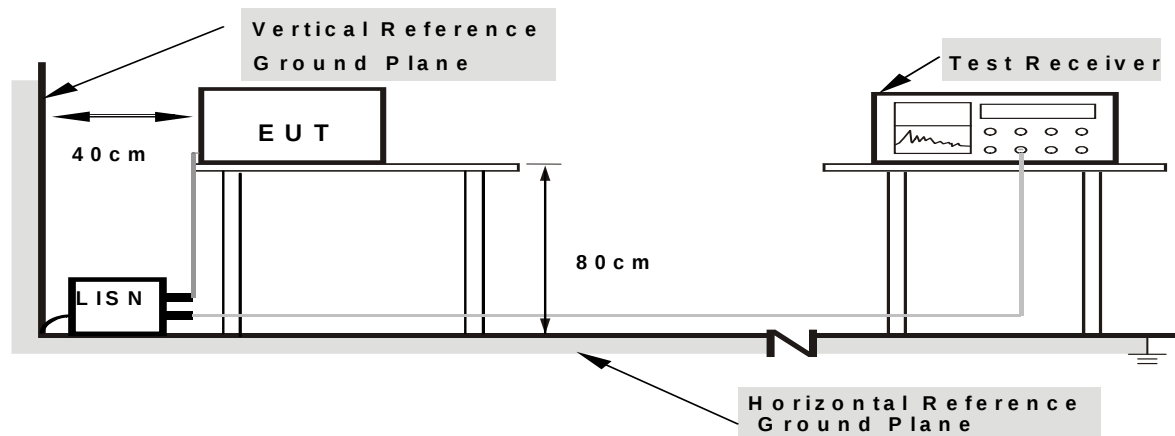
### 3.1.2 TEST PROCEDURE

- 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.
- 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.
- 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.
- LISN at least 80 cm from nearest part of EUT chassis.
- 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 cm 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

NOTE: This EUT is powered by the DC battery only, this test item is not applicable.

### 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 15.209&15.239 limit in the table below has to be followed.

| Frequencies(MHz) | Field Strength(micorvolts/meter) | Measurement Distance(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                            |

#### 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).

#### FUNDAMENTAL AND HARMONICS EMISSION LIMITS

| Fundamental Frequency (MHz) | Field Strength of Fundamental (microvolts/meter) | Field Strength of Spurious Emissions (microvolts/meter) |
|-----------------------------|--------------------------------------------------|---------------------------------------------------------|
| 40.66 - 40.70               | 2,250                                            | 225                                                     |
| 70 - 130                    | 1,250                                            | 125                                                     |
| 130 - 174                   | 1,250 to 3,750 **                                | 125 to 375 **                                           |
| 174 - 260                   | 3,750                                            | 375                                                     |
| 260 - 470                   | 3,750 to 12,500 **                               | 375 to 1,250 **                                         |
| Above 470                   | 12,500                                           | 1,250                                                   |

\*\* linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz,  $\mu\text{V/m}$  at 3 meters =  $56.81818(F) - 6136.3636$ ; for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $41.6667(F) - 7083.3333$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

## FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

| Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz) | Range (MHz)                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Below 1.705                                                                                                                     | 30                                                                              |
| 1.705 – 108                                                                                                                     | 1000                                                                            |
| 108 – 500                                                                                                                       | 2000                                                                            |
| 500 – 1000                                                                                                                      | 5000                                                                            |
| Above 1000                                                                                                                      | 5 <sup>th</sup> harmonic of the highest frequency or 40 GHz, whichever is lower |

| Spectrum Parameter | Setting                                          |
|--------------------|--------------------------------------------------|
| Attenuation        | Auto                                             |
| Start Frequency    | 1000 MHz                                         |
| Stop Frequency     | 10th carrier harmonic                            |
| RBW / VBW setting  | 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

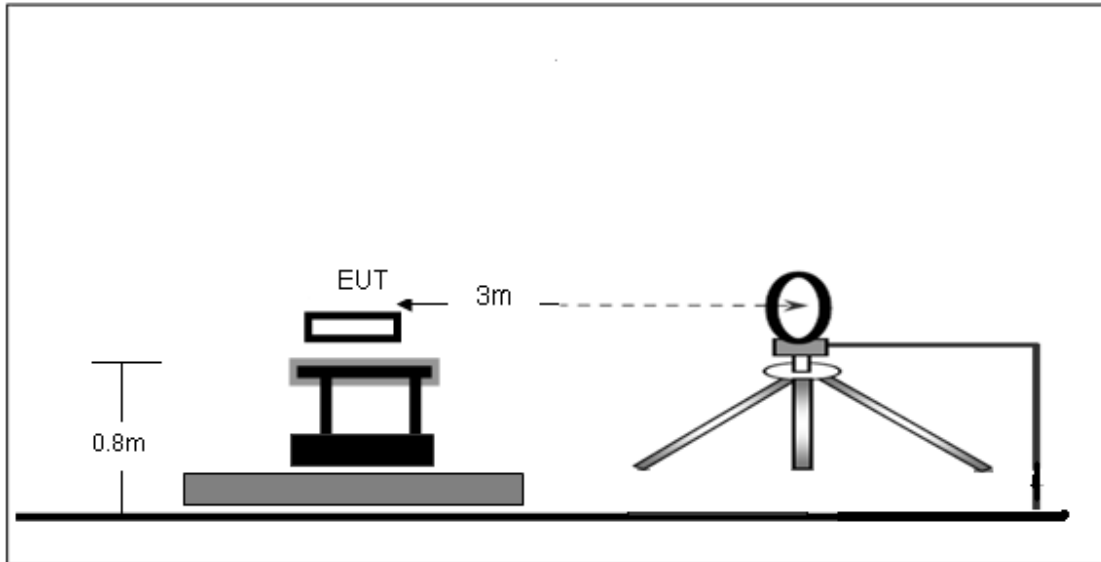
- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m; above 1GHz, the height was 1.5m, 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:

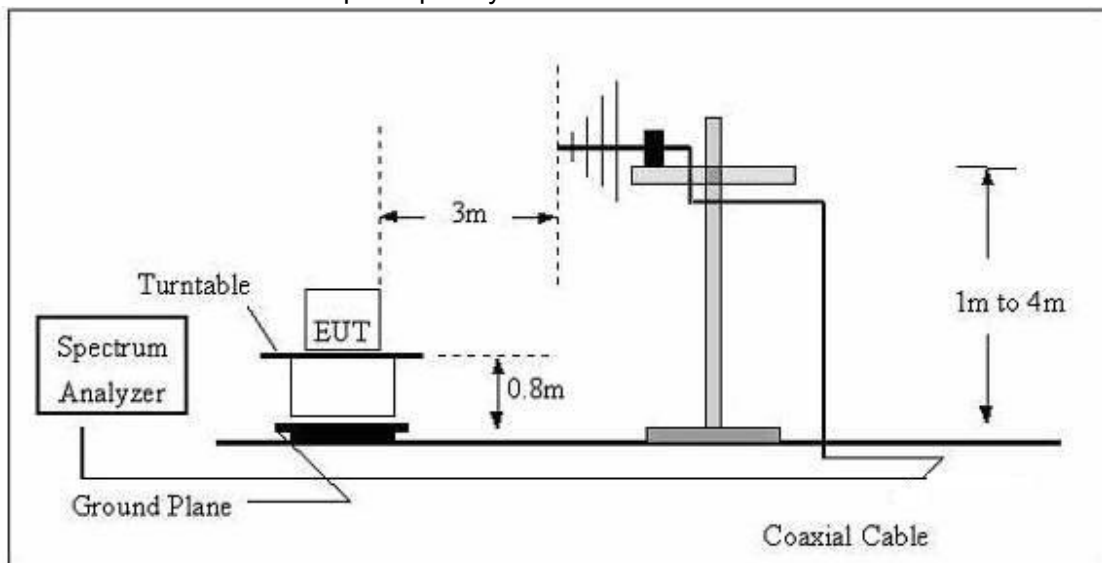
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case was X axis and the emissions were reported

### 3.2.3 TEST SETUP

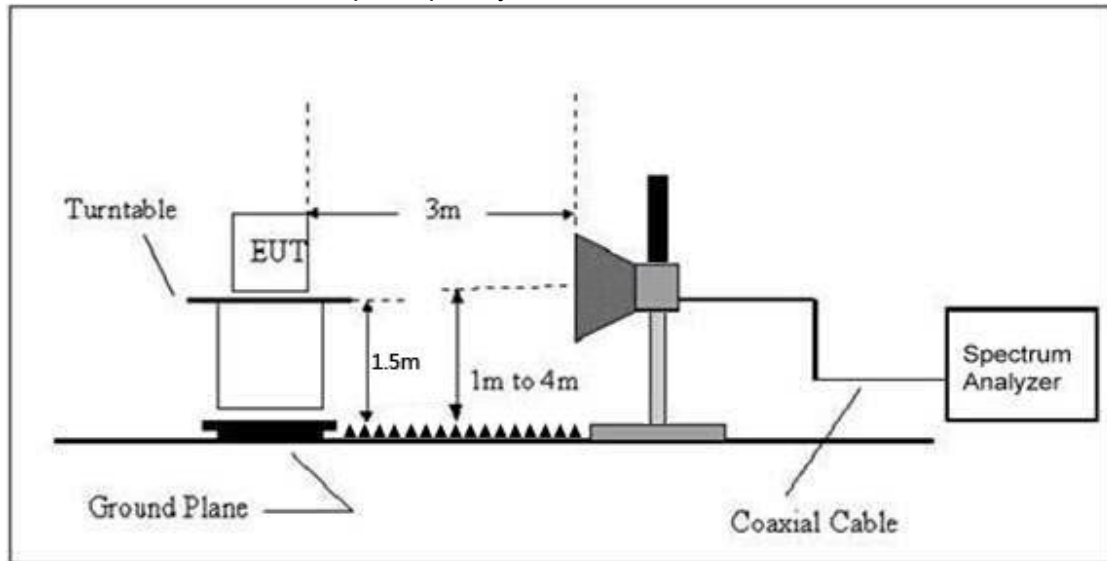
#### (A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



**3.2.4 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.

### 3.2.5 TEST RESULTS

Radiated Spurious Emission (Below 9KHz – 30MHz )

|                |         |                     |     |
|----------------|---------|---------------------|-----|
| Temperature :  | 26 °C   | Relative Humidity : | 54% |
| Pressure :     | 101 kPa | Polarization :      | --- |
| Test Voltage : | DC 12V  |                     |     |
| Test Mode :    | TX Mode |                     |     |

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

**NOTE:**

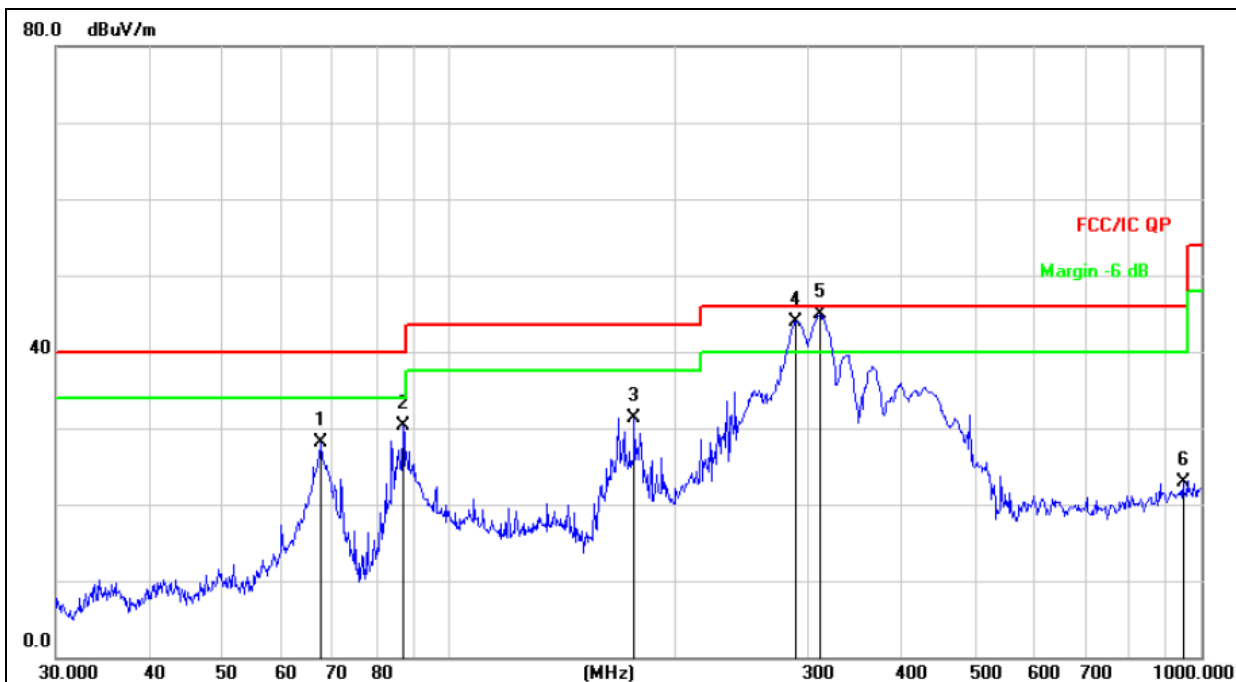
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

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

## Radiated Spurious Emission (Between 30MHz – 1GHz)

|                |        |                     |                 |
|----------------|--------|---------------------|-----------------|
| Temperature :  | 26 °C  | Relative Humidity : | 54%             |
| Pressure :     | 101kPa | Phase :             | H               |
| Test Voltage : | DC 12V | Test Mode :         | Mode 1(88.1MHz) |

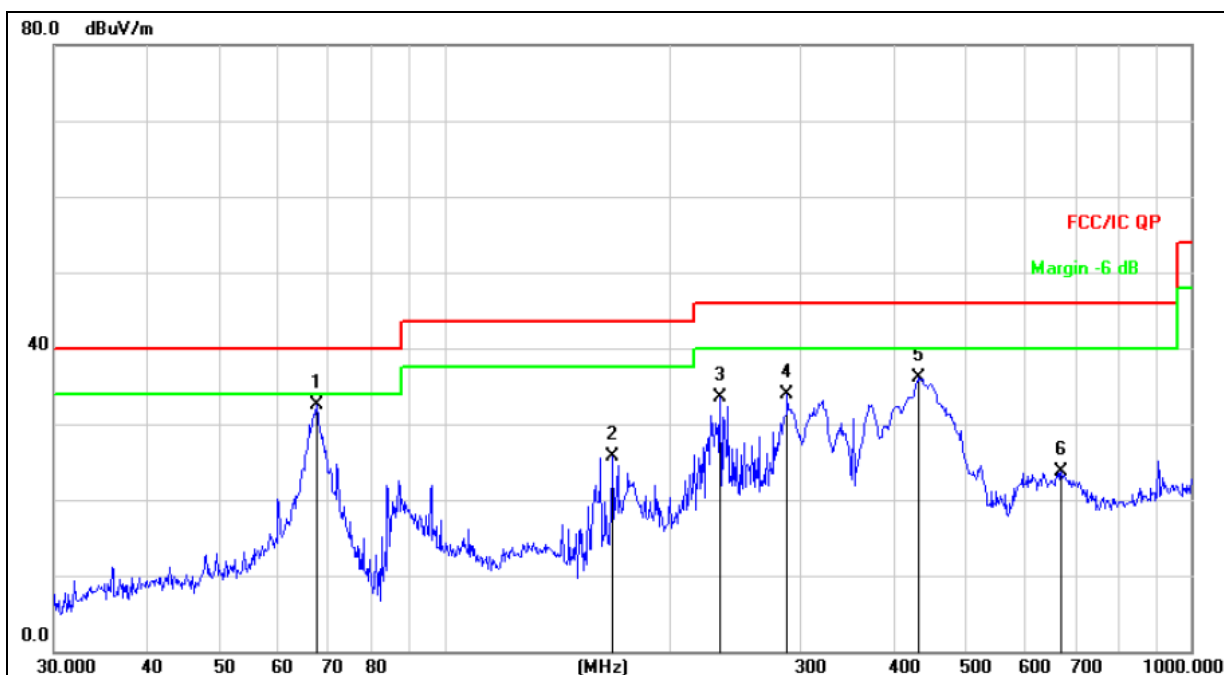


Remark:

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

| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit | Over   |          |
|-----|-----|----------|---------------|----------------|--------------|-------|--------|----------|
|     |     | MHz      | dBuV          | dB             | dBuV/m       | dB/m  | dB     | Detector |
| 1   |     | 67.4382  | 45.70         | -17.61         | 28.09        | 40.00 | -11.91 | QP       |
| 2   |     | 86.8068  | 49.21         | -18.84         | 30.37        | 40.00 | -9.63  | QP       |
| 3   |     | 176.2686 | 49.21         | -17.82         | 31.39        | 43.50 | -12.11 | QP       |
| 4   | !   | 289.0021 | 57.85         | -13.94         | 43.91        | 46.00 | -2.09  | QP       |
| 5   | *   | 311.0867 | 58.11         | -13.30         | 44.81        | 46.00 | -1.19  | QP       |
| 6   |     | 945.4399 | 23.98         | -1.15          | 22.83        | 46.00 | -23.17 | QP       |

|                |        |                     |                 |
|----------------|--------|---------------------|-----------------|
| Temperature :  | 26 °C  | Relative Humidity : | 54%             |
| Pressure :     | 101kPa | Phase :             | V               |
| Test Voltage : | DC12V  | Test Mode :         | Mode 1(88.1MHz) |



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   |          |
|-----|-----|----------|---------------|----------------|-------------|-------|--------|----------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dB/m  | dB     | Detector |
| 1   | *   | 67.4382  | 50.11         | -17.61         | 32.50       | 40.00 | -7.50  | QP       |
| 2   |     | 167.8243 | 44.12         | -18.36         | 25.76       | 43.50 | -17.74 | QP       |
| 3   |     | 234.1684 | 48.94         | -15.51         | 33.43       | 46.00 | -12.57 | QP       |
| 4   |     | 287.9904 | 47.92         | -13.97         | 33.95       | 46.00 | -12.05 | QP       |
| 5   |     | 432.5457 | 46.39         | -10.36         | 36.03       | 46.00 | -9.97  | QP       |
| 6   |     | 670.4893 | 29.84         | -6.13          | 23.71       | 46.00 | -22.29 | QP       |

### 3.2.6 TEST RESULTS (1GHZ~6GHZ)

| Polar<br>(H/V) | Frequency | Meter<br>Reading | Pre-amplifier | Cable<br>Loss | Antenna<br>Factor | Emission<br>Level | Limits   | Margin | Detector<br>Type |
|----------------|-----------|------------------|---------------|---------------|-------------------|-------------------|----------|--------|------------------|
|                | (MHz)     | (dBuV)           | (dB)          | (dB)          | (dB)              | (dBuV/m)          | (dBuV/m) | (dB)   |                  |
| V              | 1057.20   | 52.23            | 35.91         | 8.11          | 29.36             | 53.79             | 74.00    | -20.21 | PK               |
| V              | 1057.20   | 43.49            | 35.91         | 8.11          | 29.36             | 45.05             | 54.00    | -8.95  | AV               |
| V              | 1176.00   | 49.49            | 35.66         | 9.63          | 34.21             | 57.67             | 74.00    | -16.33 | PK               |
| V              | 1176.00   | 40.85            | 35.66         | 9.63          | 34.21             | 49.03             | 54.00    | -4.97  | AV               |
| V              | 1294.80   | 53.80            | 35.91         | 8.11          | 29.36             | 55.36             | 74.00    | -18.64 | PK               |
| V              | 1294.80   | 43.06            | 35.91         | 8.11          | 29.36             | 44.62             | 54.00    | -9.38  | AV               |
| H              | 1145.30   | 52.28            | 35.83         | 8.32          | 29.51             | 54.28             | 74.00    | -19.72 | PK               |
| H              | 1145.30   | 43.13            | 35.83         | 8.32          | 29.51             | 45.13             | 54.00    | -8.87  | AV               |
| H              | 1274.00   | 49.93            | 35.72         | 9.71          | 34.62             | 58.54             | 74.00    | -15.46 | PK               |
| H              | 1274.00   | 40.83            | 35.72         | 9.71          | 34.62             | 49.44             | 54.00    | -4.56  | AV               |
| H              | 1402.70   | 51.85            | 35.83         | 8.32          | 29.51             | 53.85             | 74.00    | -20.15 | PK               |
| H              | 1402.70   | 43.41            | 35.83         | 8.32          | 29.51             | 45.41             | 54.00    | -8.59  | AV               |

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,

Margin= Emission Level - Limit

2. If peak below the average limit, the average emission was no test.

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

### 3.2.7 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 : | DC 12V |                     |            |
| Test Mode :    | Mode 1 |                     |            |

| Frequency | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 88.1      | 36.07         | -18.55 | 17.52          | 68.00    | -50.48 | Peak          |
| 88.1      | 30.16         | -18.55 | 11.61          | 48.00    | -36.39 | Average       |

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 : | DC 12V |                     |          |
| Test Mode :    | Mode 1 |                     |          |

| Frequency | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 88.1      | 36.43         | -18.55 | 17.88          | 68.00    | -50.12 | Peak          |
| 88.1      | 30.17         | -18.55 | 11.62          | 48.00    | -36.38 | Average       |

Remark:

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

All interfaces was connected, and TX mode

|                |        |                     |            |
|----------------|--------|---------------------|------------|
| Temperature :  | 26°C   | Relative Humidity : | 54%        |
| Pressure :     | 101kPa | Polarization :      | Horizontal |
| Test Voltage : | DC 12V |                     |            |
| Test Mode :    | Mode 2 |                     |            |

| Frequency                                                                                                     | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|---------------------------------------------------------------------------------------------------------------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)                                                                                                         | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 98.1                                                                                                          | 40.16         | -16.68 | 23.48          | 68.00    | -44.52 | Peak          |
| 98.1                                                                                                          | 33.53         | -16.68 | 16.85          | 48.00    | -31.15 | Average       |
| Remark:<br>Factor = Antenna Factor + Cable Loss – Pre-amplifier.<br>All interfaces was connected, and TX mode |               |        |                |          |        |               |

|                |        |                     |          |
|----------------|--------|---------------------|----------|
| Temperature :  | 26°C   | Relative Humidity : | 54%      |
| Pressure :     | 101kPa | Polarization :      | Vertical |
| Test Voltage : | DC 12V |                     |          |
| Test Mode :    | Mode 2 |                     |          |

| Frequency                                                                                                     | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|---------------------------------------------------------------------------------------------------------------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)                                                                                                         | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 98.1                                                                                                          | 42.06         | -16.68 | 25.38          | 68.00    | -42.62 | Peak          |
| 98.1                                                                                                          | 35.72         | -16.68 | 19.04          | 48.00    | -28.96 | 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 :      | Horizontal |
| Test Voltage : | DC 12V |                     |            |
| Test Mode :    | Mode 3 |                     |            |

| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Detector Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|---------------|
| 107.9              | 46.34                   | -16.79         | 29.55                      | 68.00              | -38.45         |               |
| 107.9              | 40.16                   | -16.79         | 23.37                      | 48.00              | -24.63         | Average       |

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 : | DC 12V |                     |          |
| Test Mode :    | Mode 3 |                     |          |

| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Detector Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|---------------|
| 107.9              | 42.35                   | -16.79         | 25.56                      | 68.00              | -42.44         |               |
| 107.9              | 36.13                   | -16.79         | 19.34                      | 48.00              | -28.66         | Average       |

Remark:

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

All interfaces was connected, and TX mode

## 4. BANDWIDTH TEST

### 4.1 APPLIED PROCEDURES / LIMIT

According to 15.209&15.239 requirement:

The bandwidth of the emission shall not exceed 200 kHz.

| Spectrum Parameter | Setting                                       |
|--------------------|-----------------------------------------------|
| Attenuation        | Auto                                          |
| Span Frequency     | > Measurement Bandwidth or Channel Separation |
| RB                 | 30kHz                                         |
| VB                 | $\geq$ RBW                                    |
| Detector           | Peak                                          |
| Trace              | Max Hold                                      |
| Sweep Time         | Auto                                          |

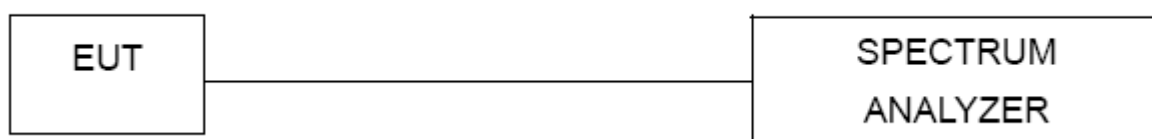
#### 4.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW= 30kHz, VBW $\geq$  RBW, Sweep time = Auto.

#### 4.1.2 DEVIATION FROM STANDARD

No deviation.

#### 4.1.3 TEST SETUP



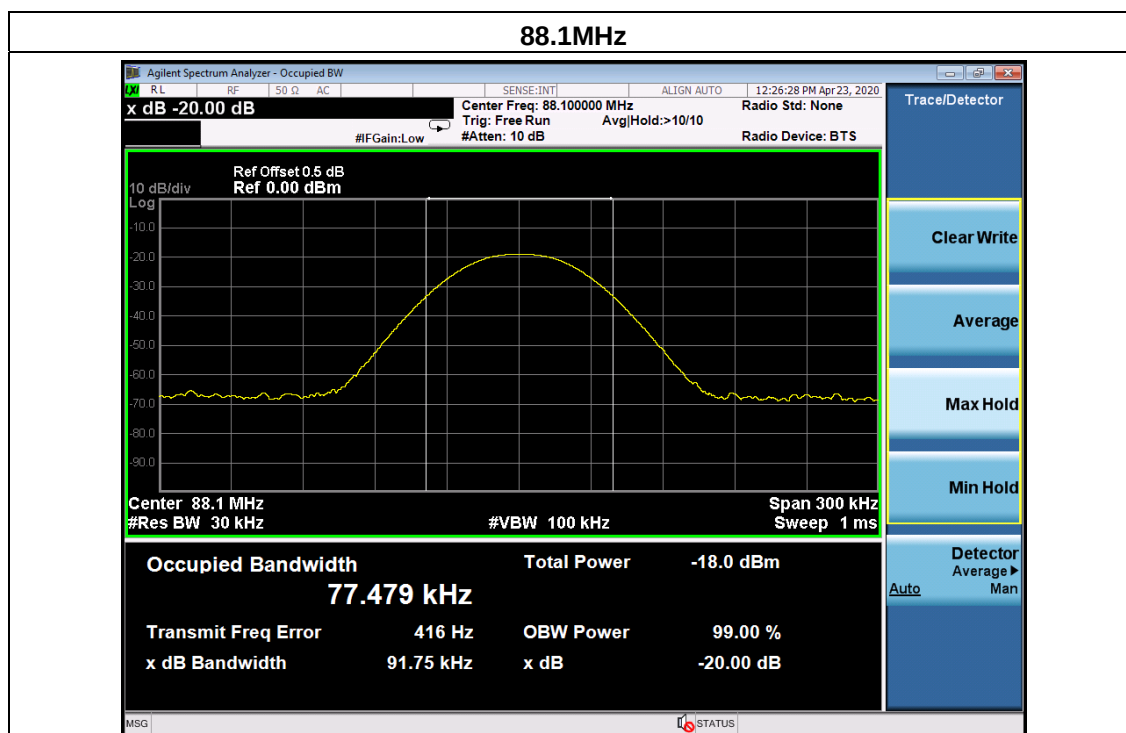
#### 4.1.4 EUT OPERATION CONDITIONS

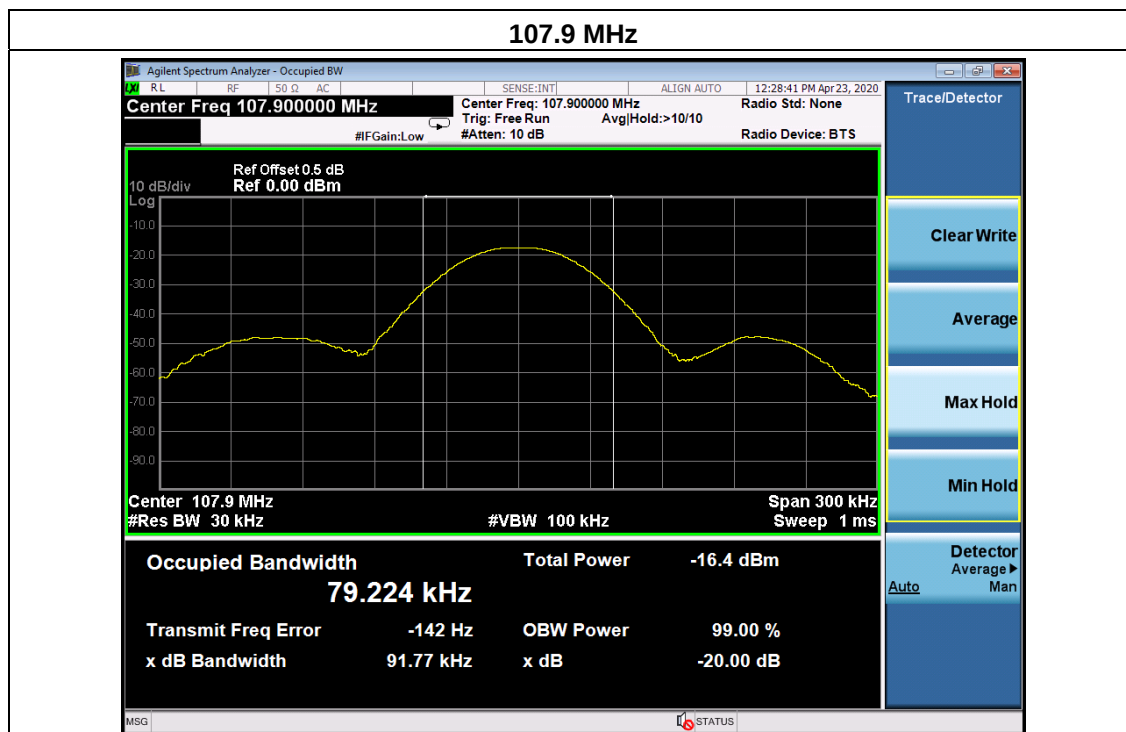
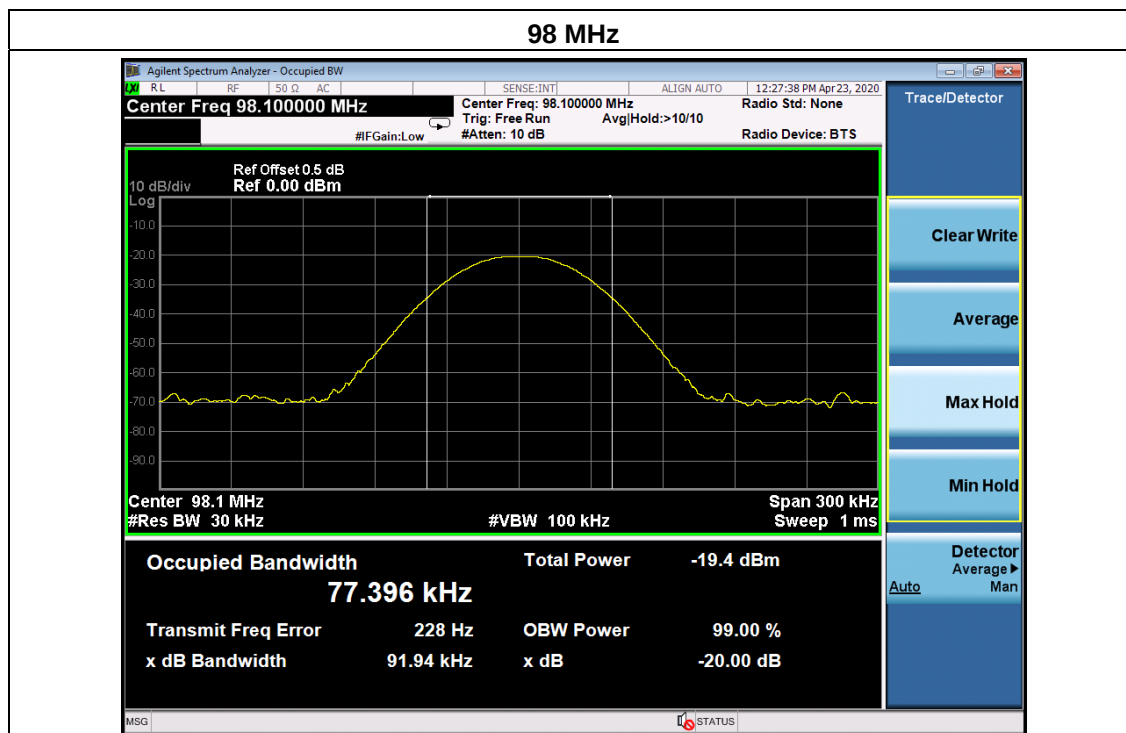
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

#### 4.1.5 TEST RESULTS

|               |         |                     |        |
|---------------|---------|---------------------|--------|
| Temperature : | 26 °C   | Relative Humidity : | 54%    |
| Pressure :    | 101kPa  | Test Voltage :      | DC 12V |
| Test Mode :   | TX Mode |                     |        |

| Frequency | Occupied Bandwidth (kHz) | Limit (KHz) | Result |
|-----------|--------------------------|-------------|--------|
| 88.1MHz   | 77.479                   | 200         | PASS   |
| 98 MHz    | 77.396                   | 200         | PASS   |
| 107.9 MHz | 79.224                   | 200         | PASS   |





## 5. BAND EDGE MEASUREMENT

### 5.1 APPLICABLE STANDARD

FCC Part15 Paragraph 15.209&15.239

Outside the 200kHz band(as well as outside the 88-108MHz band), the general field strength limits listed in RSS-Gen apply.

### 5.2 TEST PROCEDURE

Using the following spectrum analyzer setting:

- a) Set the RBW = 3KHz.
- b) Set the VBW = 10KHz.
- c) Sweep time = auto couple.
- d) Detector function = peak.
- e) Trace mode = max hold.
- f) Allow trace to fully stabilize.

### 5.3 DEVIATION FROM STANDARD

No deviation.

### 5.4 TEST SETUP

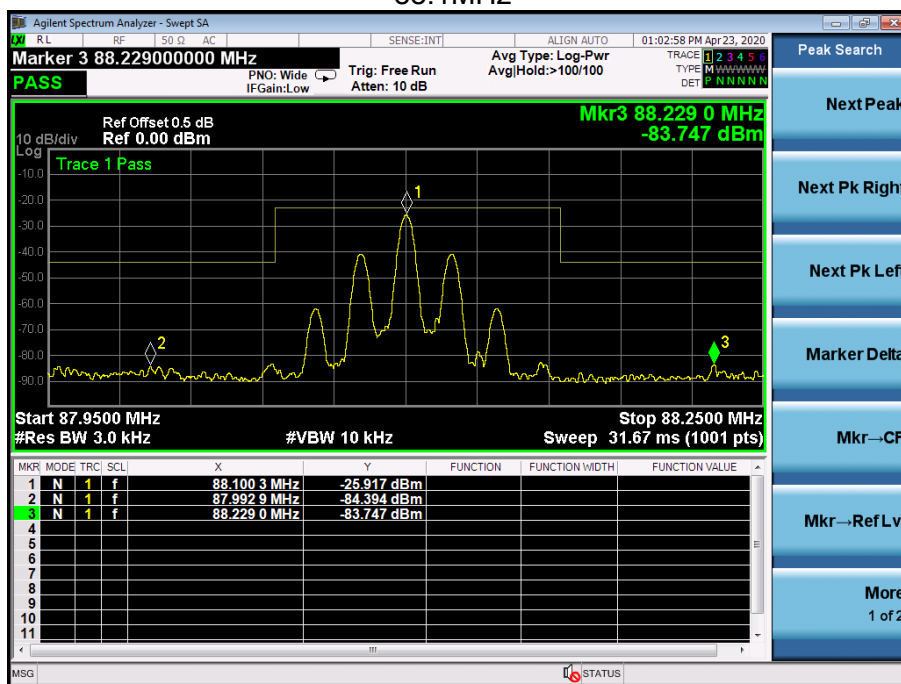


### 5.5 EUT OPERATION CONDITIONS

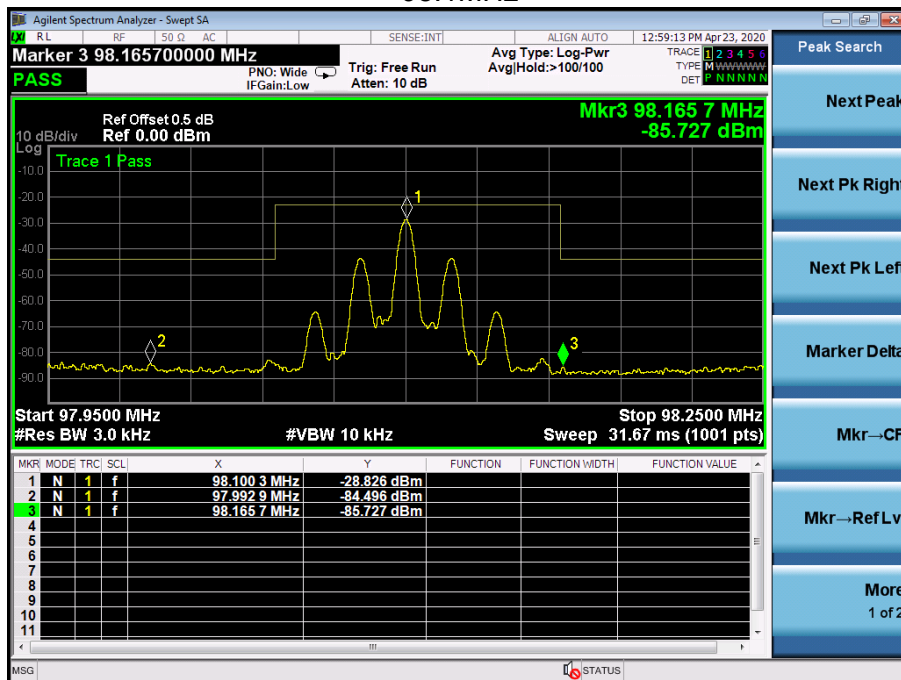
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

### 5.6 TEST RESULTS

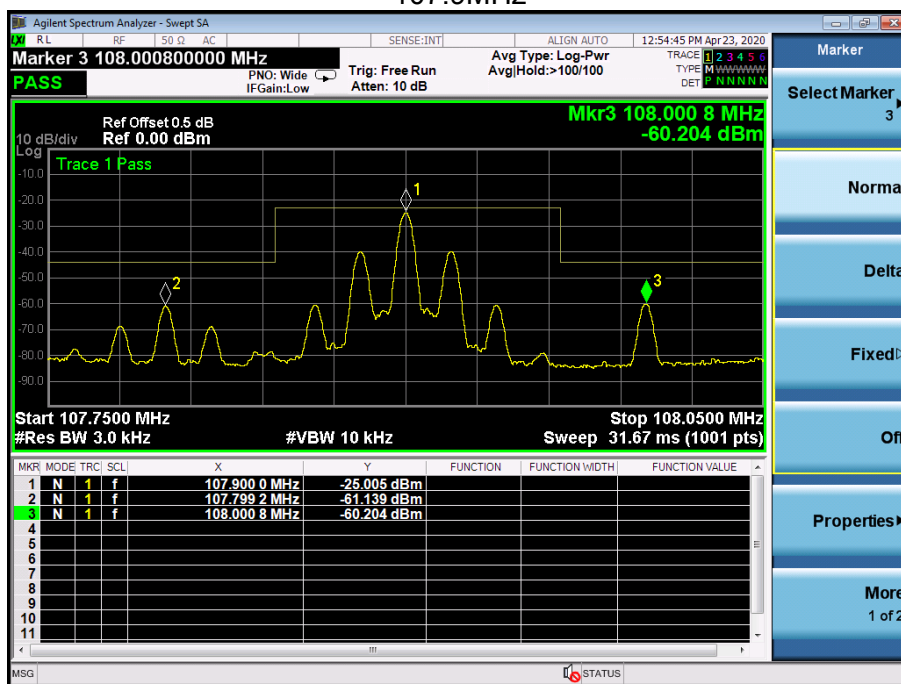
### 88.1MHz



### 98.1MHz



107.9MHz



## **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 the Internal Antenna. It comply with the standard requirement.

## 7. EUT TEST PHOTO

### Radiated Measurement Photos



## 8. EUT PHOTO



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