

# Test Report

## FCC ID: 2AKL5-KMU208

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name:    | UHF Instrument Microphone                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Trademark:       | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Model Name :     | KM-U208<br>KM-U307, KM-U308, KM-U209, KM-U208A, KM-U307A, KM-U308A,<br>KM-U209A, KM-U208B, KM-U307B, KM-U308B, KM-U209B, KM-U208C,<br>KM-U307C, KM-U308C, KM-U209C, KM-U208C-1, KM-U307-1,<br>KM-U308-1, KM-U209-1, KM-U208C-2, KM-U307-2, KM-U308-2,<br>KM-U209-2, KM-U208C-3, KM-U307-3, KM-U308-3, KM-U209-3,<br>KM-U208C-4, KM-U307-4, KM-U308-4, KM-U209-4, KM-U208C-5,<br>KM-U307-5, KM-U308-5, KM-U209-5, KM-U208C-6, KM-U307-6,<br>KM-U308-6, KM-U209-6 |
| Prepared For :   | SHENZHEN JHC ELECTRONICS CO.,LTD                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Address :        | Floor 1-3, Building No.5, Tongqing Road Yanghelang, Tongxin Community,<br>Baolong Street, Longgang District, Shenzhen, China                                                                                                                                                                                                                                                                                                                                    |
| Prepared By :    | Shenzhen BCTC Testing Co., Ltd.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Address :        | BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan<br>1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen,<br>China                                                                                                                                                                                                                                                                                                        |
| Test Date:       | Jan . 07, 2020 to Jun. 11, 2020                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Date of Report : | Jun. 11, 2020                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Report No.:      | BCTC2001000973E                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**TEST RESULT CERTIFICATION**

**Applicant's name** ..... SHENZHEN JHC ELECTRONICS CO,LTD  
**Address** ..... Floor 1-3, Building No.5, Tongqing Road Yanghelang, Tongxin  
Community, Baolong Street, Longgang District, Shenzhen, China  
**Manufacture's Name**..... SHENZHEN JHC ELECTRONICS CO,LTD  
**Address** ..... Floor 1-3, Building No.5, Tongqing Road Yanghelang, Tongxin  
Community, Baolong Street, Longgang District, Shenzhen, China

**Product description**

**Product name**..... UHF Instrument Microphone  
**Trademark** ..... N/A  
**Model and/or type reference** . KM-U208  
KM-U307, KM-U308, KM-U209, KM-U208A, KM-U307A,  
KM-U308A, KM-U209A, KM-U208B, KM-U307B, KM-U308B,  
KM-U209B, KM-U208C, KM-U307C, KM-U308C, KM-U209C,  
KM-U208C-1, KM-U307-1, KM-U308-1, KM-U209-1,  
KM-U208C-2, KM-U307-2, KM-U308-2, KM-U209-2,  
KM-U208C-3, KM-U307-3, KM-U308-3, KM-U209-3,  
KM-U208C-4, KM-U307-4, KM-U308-4, KM-U209-4,  
KM-U208C-5, KM-U307-5, KM-U308-5, KM-U209-5,  
KM-U208C-6, KM-U307-6, KM-U308-6, KM-U209-6

**Standards** ..... FCC Part 15.236

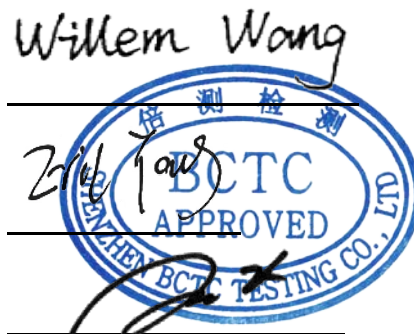
This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Prepared by(Engineer): Willem Wang

Reviewer(Supervisor): Eric Yang

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## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| FCC Part15 (15.236) , Subpart C |                             |          |        |
|---------------------------------|-----------------------------|----------|--------|
| Standard Section                | Test Item                   | Judgment | Remark |
| 15.207                          | Conducted Emission          | PASS     |        |
| 15.236(d)(2)                    | Output Power Measurement    | PASS     |        |
| 15.236(f)(2)                    | Occupied Bandwidth Emission | PASS     |        |
| 15.236(g)                       | Necessary Bandwidth         | PASS     |        |
| 15.236(g)                       | Radiated Spurious Emission  | PASS     |        |
| 15.236(f)(3)                    | Frequency Tolerance         | PASS     |        |

## 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 °C   |

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Equipment              | UHF Instrument Microphone                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |
| Trade Name             | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |
| Model Name             | KM-U208<br>KM-U307, KM-U308, KM-U209, KM-U208A, KM-U307A,<br>KM-U308A, KM-U209A, KM-U208B, KM-U307B, KM-U308B,<br>KM-U209B, KM-U208C, KM-U307C, KM-U308C, KM-U209C,<br>KM-U208C-1, KM-U307-1, KM-U308-1, KM-U209-1,<br>KM-U208C-2, KM-U307-2, KM-U308-2, KM-U209-2,<br>KM-U208C-3, KM-U307-3, KM-U308-3, KM-U209-3,<br>KM-U208C-4, KM-U307-4, KM-U308-4, KM-U209-4,<br>KM-U208C-5, KM-U307-5, KM-U308-5, KM-U209-5,<br>KM-U208C-6, KM-U307-6, KM-U308-6, KM-U209-6 |                    |
| Model Difference       | All the model are the same circuit and RF module, only for model name and color.                                                                                                                                                                                                                                                                                                                                                                                   |                    |
| Product Description    | The EUT is a UHF Instrument Microphone                                                                                                                                                                                                                                                                                                                                                                                                                             |                    |
|                        | Operation Frequency:                                                                                                                                                                                                                                                                                                                                                                                                                                               | 658-661MHz         |
|                        | Modulation Type:                                                                                                                                                                                                                                                                                                                                                                                                                                                   | FM                 |
|                        | Number Of Channel                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4CH                |
|                        | Antenna Designation:                                                                                                                                                                                                                                                                                                                                                                                                                                               | Please see Note 3. |
| Channel List           | Please refer to the Note 2.                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |
| Power Source           | DC 3.7V                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |
| Connecting I/O Port(s) | Please refer to the User's Manual                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |
| Hardware Version:      | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |
| Software Version:      | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.

| Channel List |                 |         |                 |         |                 |
|--------------|-----------------|---------|-----------------|---------|-----------------|
| Channel      | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 01           | 658             | 02      | 659             | 03      | 660             |
| 04           | 661             |         |                 |         |                 |

3.

Table for Internal Antenna

| Ant. | Brand | Model Name | Antenna Type     | Gain (dBi) |
|------|-------|------------|------------------|------------|
| 1    | N/A   | N/A        | Internal antenna | -0.05      |

## 2.2 DESCRIPTION OF TEST MODES

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

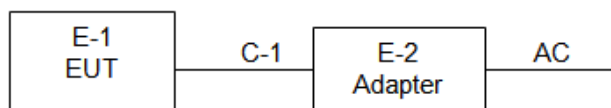
| For All Mode | Description | Modulation Type  |
|--------------|-------------|------------------|
| Mode 1       | CH01        | FM(Transmitting) |
| Mode 2       | CH02        |                  |
| Mode 3       | CH04        |                  |
| Mode 4       | Charging    |                  |

Note:

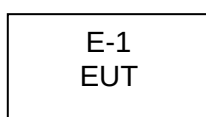
- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) Fully-charged battery is used during the test

## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission Test



Radiated Spurious Emission





## 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.

| No. | Device Type               | Brand | Model   | Series No. | Data Cable |
|-----|---------------------------|-------|---------|------------|------------|
| E-1 | UHF Instrument Microphone | N/A   | KM-U208 | N/A        | EUT        |
| E-2 | Adapter                   | N/A   | BCTC005 | N/A        | Auxiliary  |

| Item | Shielded Type | Ferrite Core | Length | Note                 |
|------|---------------|--------------|--------|----------------------|
| C-1  | NO            | NO           | 0.5M   | USB cable unshielded |

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        | 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          | 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    |

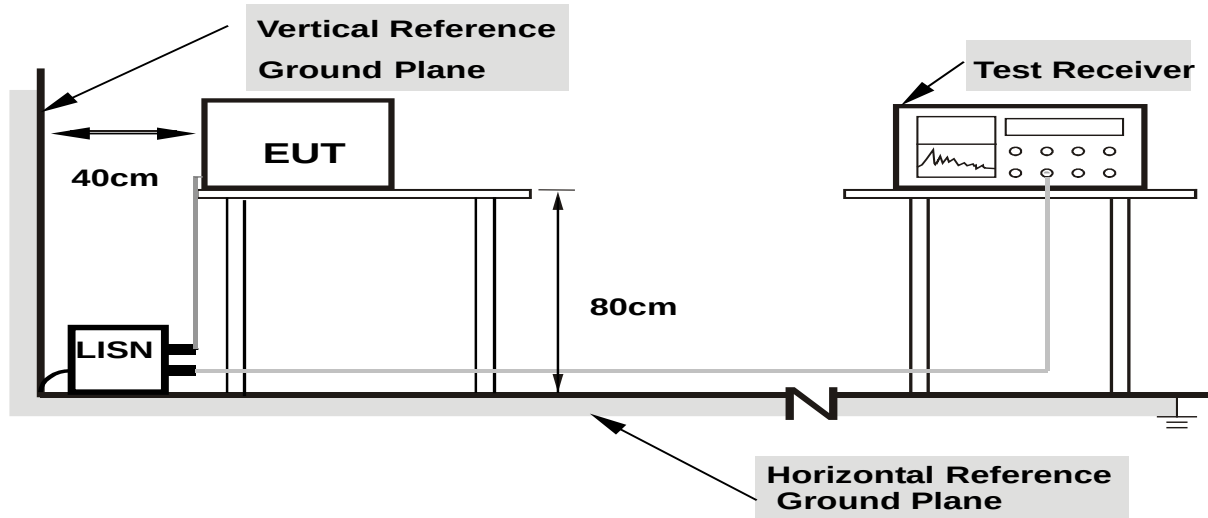
##### 3.1.2 TEST PROCEDURE

- 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.

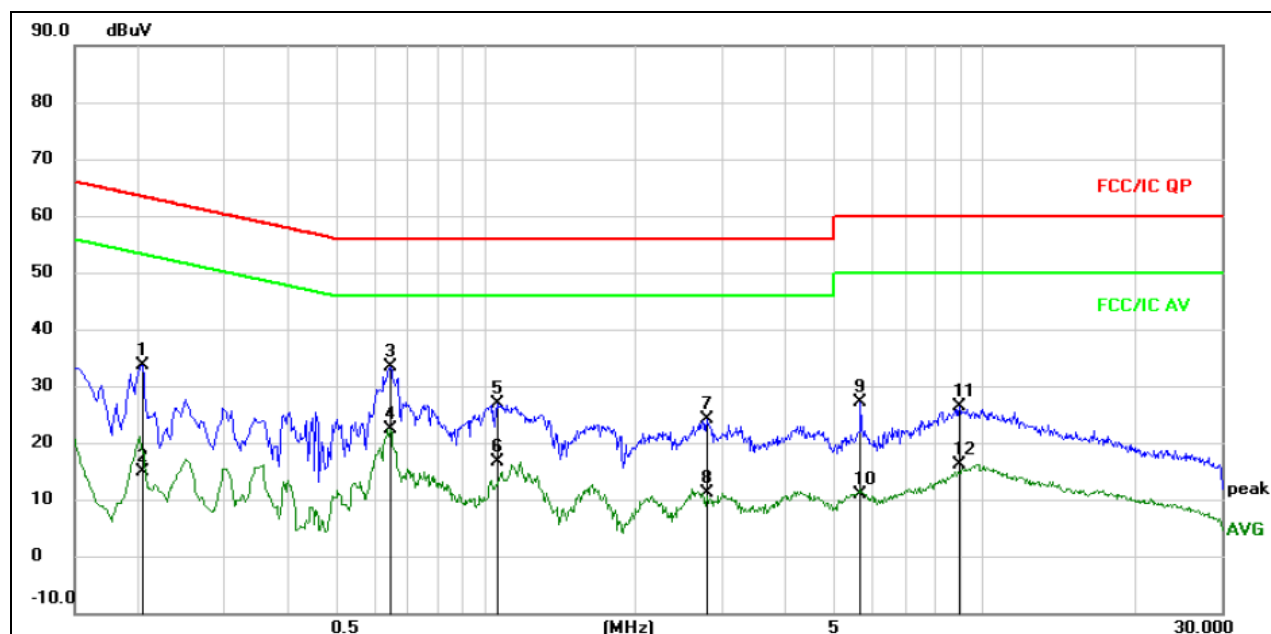
**2.**Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

### 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 °C       | Relative Humidity : | 54%    |
| Pressure :     | 101kPa      | Phase :             | L      |
| Test Voltage : | AC120V 60Hz | Test Mode :         | Mode 4 |

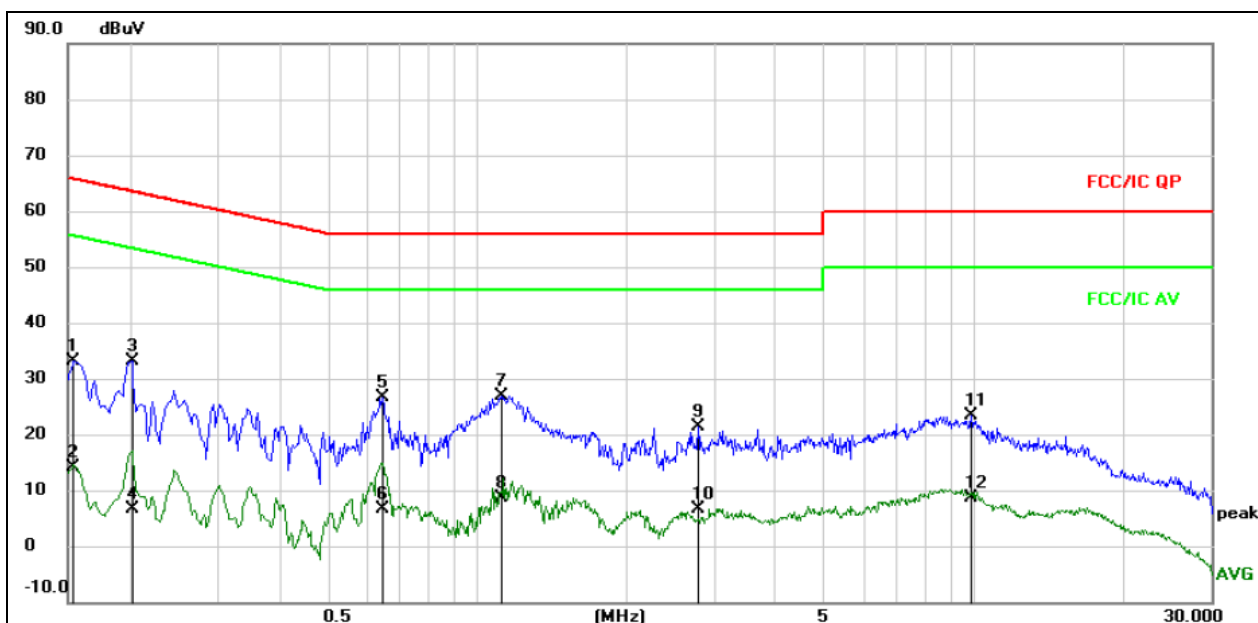


Remark:

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   |     | 0.2060       | 24.12                    | 9.47              | 33.59                    | 63.37         | -29.78     | QP       |         |
| 2   |     | 0.2060       | 5.32                     | 9.47              | 14.79                    | 53.37         | -38.58     | AVG      |         |
| 3   | *   | 0.6460       | 23.51                    | 9.84              | 33.35                    | 56.00         | -22.65     | QP       |         |
| 4   |     | 0.6460       | 12.59                    | 9.84              | 22.43                    | 46.00         | -23.57     | AVG      |         |
| 5   |     | 1.0620       | 17.24                    | 9.57              | 26.81                    | 56.00         | -29.19     | QP       |         |
| 6   |     | 1.0620       | 7.01                     | 9.57              | 16.58                    | 46.00         | -29.42     | AVG      |         |
| 7   |     | 2.7860       | 14.39                    | 9.64              | 24.03                    | 56.00         | -31.97     | QP       |         |
| 8   |     | 2.7860       | 1.40                     | 9.64              | 11.04                    | 46.00         | -34.96     | AVG      |         |
| 9   |     | 5.6660       | 17.46                    | 9.77              | 27.23                    | 60.00         | -32.77     | QP       |         |
| 10  |     | 5.6660       | 1.15                     | 9.77              | 10.92                    | 50.00         | -39.08     | AVG      |         |
| 11  |     | 8.9340       | 16.65                    | 9.70              | 26.35                    | 60.00         | -33.65     | QP       |         |
| 12  |     | 8.9340       | 6.40                     | 9.70              | 16.10                    | 50.00         | -33.90     | AVG      |         |

|                |             |                     |        |
|----------------|-------------|---------------------|--------|
| Temperature :  | 26 °C       | Relative Humidity : | 54%    |
| Pressure :     | 101kPa      | Phase :             | N      |
| Test Voltage : | AC120V 60Hz | Test Mode :         | Mode 4 |



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          |                | dBuV         | dBuV  | dB     | Detector | Comment |
| 1   |     | 0.1539 | 23.56         | 9.52           | 33.08        | 65.79 | -32.71 | QP       |         |
| 2   |     | 0.1539 | 4.54          | 9.52           | 14.06        | 55.79 | -41.73 | AVG      |         |
| 3   |     | 0.2020 | 23.60         | 9.46           | 33.06        | 63.53 | -30.47 | QP       |         |
| 4   |     | 0.2020 | -2.83         | 9.46           | 6.63         | 53.53 | -46.90 | AVG      |         |
| 5   |     | 0.6460 | 16.87         | 9.84           | 26.71        | 56.00 | -29.29 | QP       |         |
| 6   |     | 0.6460 | -3.19         | 9.84           | 6.65         | 46.00 | -39.35 | AVG      |         |
| 7   | *   | 1.1180 | 17.24         | 9.57           | 26.81        | 56.00 | -29.19 | QP       |         |
| 8   |     | 1.1180 | -0.86         | 9.57           | 8.71         | 46.00 | -37.29 | AVG      |         |
| 9   |     | 2.7860 | 11.86         | 9.64           | 21.50        | 56.00 | -34.50 | QP       |         |
| 10  |     | 2.7860 | -3.02         | 9.64           | 6.62         | 46.00 | -39.38 | AVG      |         |
| 11  |     | 9.8780 | 13.73         | 9.69           | 23.42        | 60.00 | -36.58 | QP       |         |
| 12  |     | 9.8780 | -1.10         | 9.69           | 8.59         | 50.00 | -41.41 | AVG      |         |

## 3.2 RADIATED SPURIOUS EMISSIONS

### 3.2.1 TEST REQUIREMENT

According to FCC 15.236(g), Emission within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in Section 8.3 of ETSI EN 300 422-1 V1.4.2(2011-08). Emissions outside this band shall comply with the limit specified at the edges of the ETSI mask.

**Table 3: Limits for spurious emissions**

| State     | Frequency                                                                           |                                      |                                |
|-----------|-------------------------------------------------------------------------------------|--------------------------------------|--------------------------------|
|           | 47 MHz to 74 MHz<br>87,5 MHz to 137 MHz<br>174 MHz to 230 MHz<br>470 MHz to 862 MHz | Other Frequencies<br>below 1 000 MHz | Frequencies above<br>1 000 MHz |
| Operation | 4 nW                                                                                | 250 nW                               | 1 $\mu$ W                      |
| Standby   | 2 nW                                                                                | 2 nW                                 | 20 nW                          |

| 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 |

| Spectrum Parameter                    | Setting                                          |
|---------------------------------------|--------------------------------------------------|
| Attenuation                           | Auto                                             |
| Start Frequency                       | 1000 MHz                                         |
| Stop Frequency                        | 12750MHz                                         |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |



### 3.2.2 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 25GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-chamber test. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8m; 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.
- d. 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.
- e. 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.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.
- g. For the radiated emission test above 1GHz:  
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.  
The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

Note:

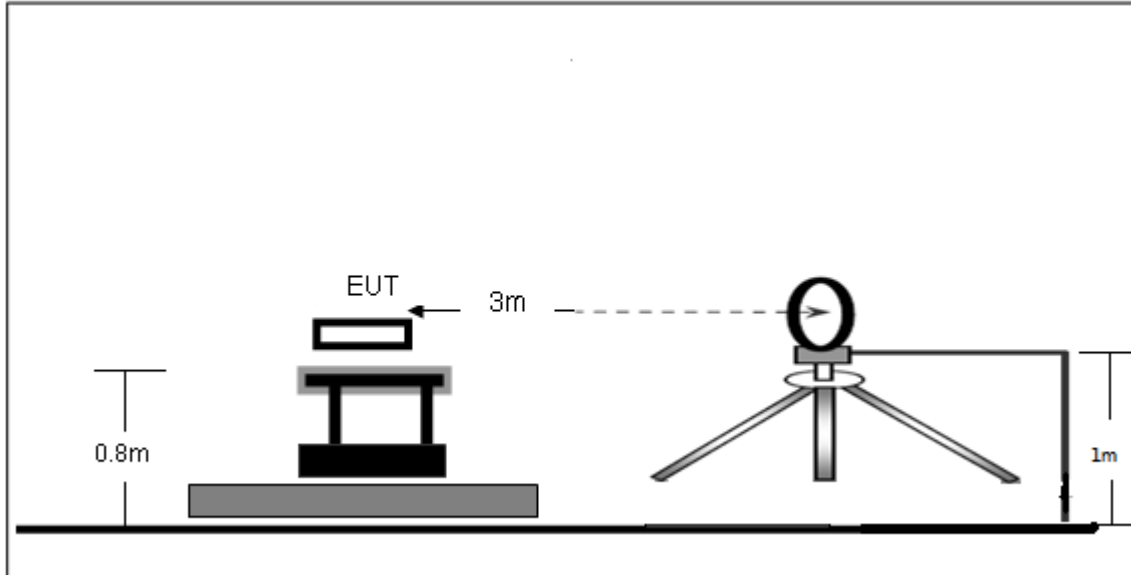
Both horizontal and vertical antenna polarities were tested  
and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.2.3 DEVIATION FROM TEST STANDARD

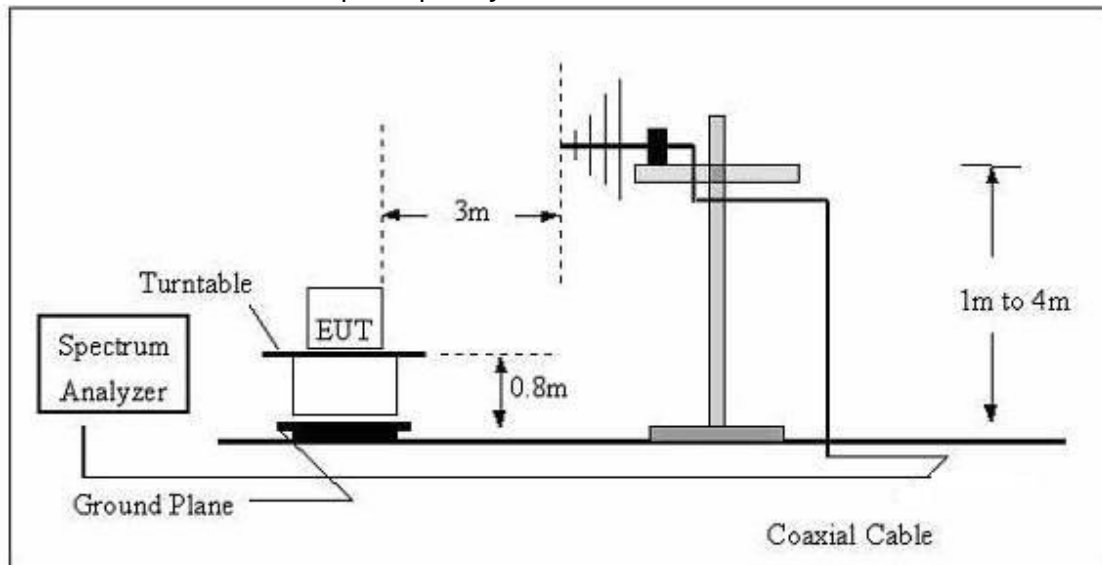
No deviation

### 3.2.4 TEST SETUP

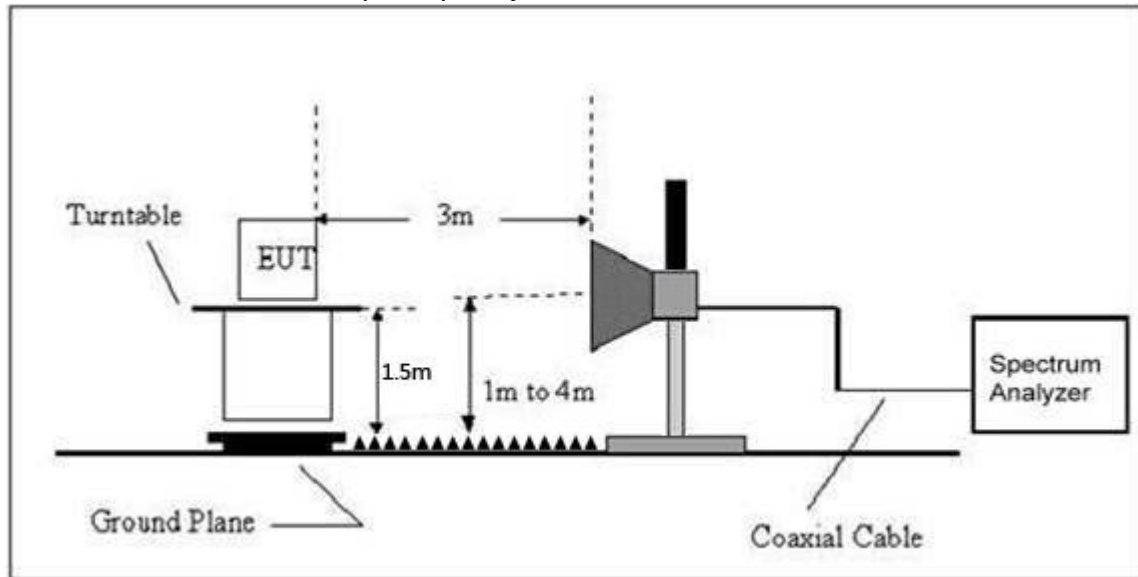
#### (A) Radiated Emission Test-Up Frequency Below 30MHz



#### (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:    | 101 kPa | Test Voltage :     | DC 3.7V |
| Test Mode :  | Mode 1  | Polarization :     | --      |

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

#### NOTE:

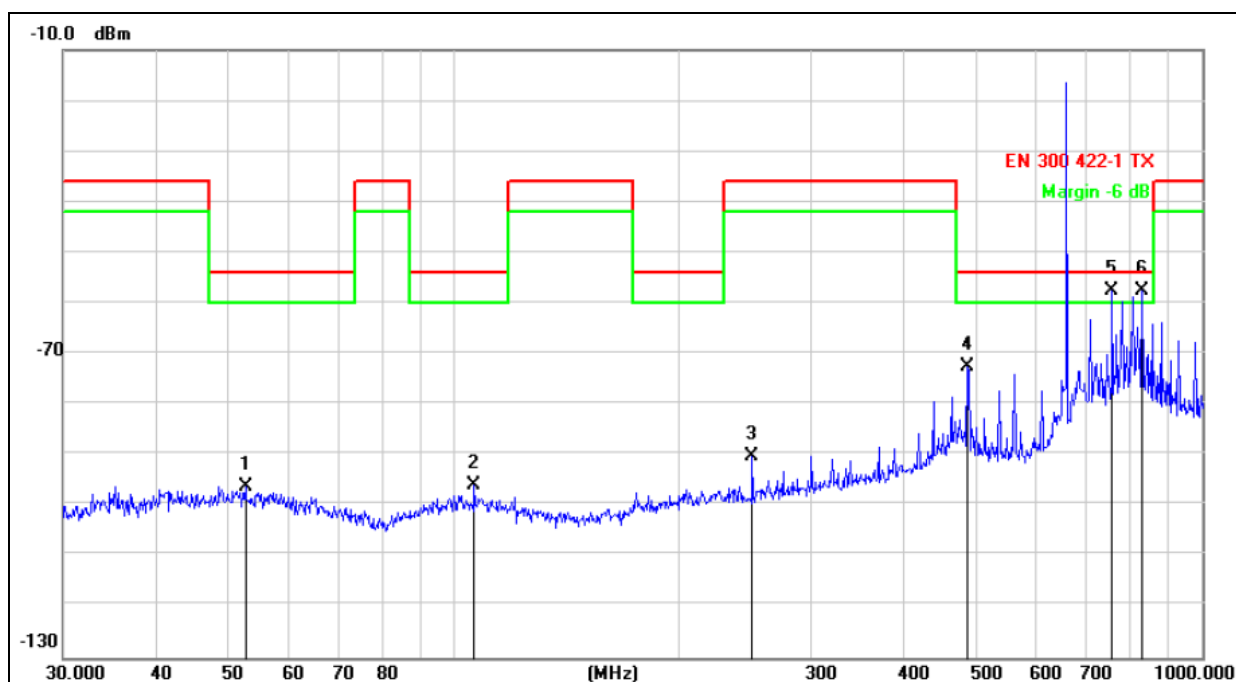
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

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

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

|                |         |                     |            |
|----------------|---------|---------------------|------------|
| Temperature :  | 26℃     | Relative Humidity : | 54%        |
| Pressure :     | 101 kPa | Polarization :      | Horizontal |
| Test Voltage : | DC 3.7V |                     |            |
| Test Mode :    | Mode 1  |                     |            |



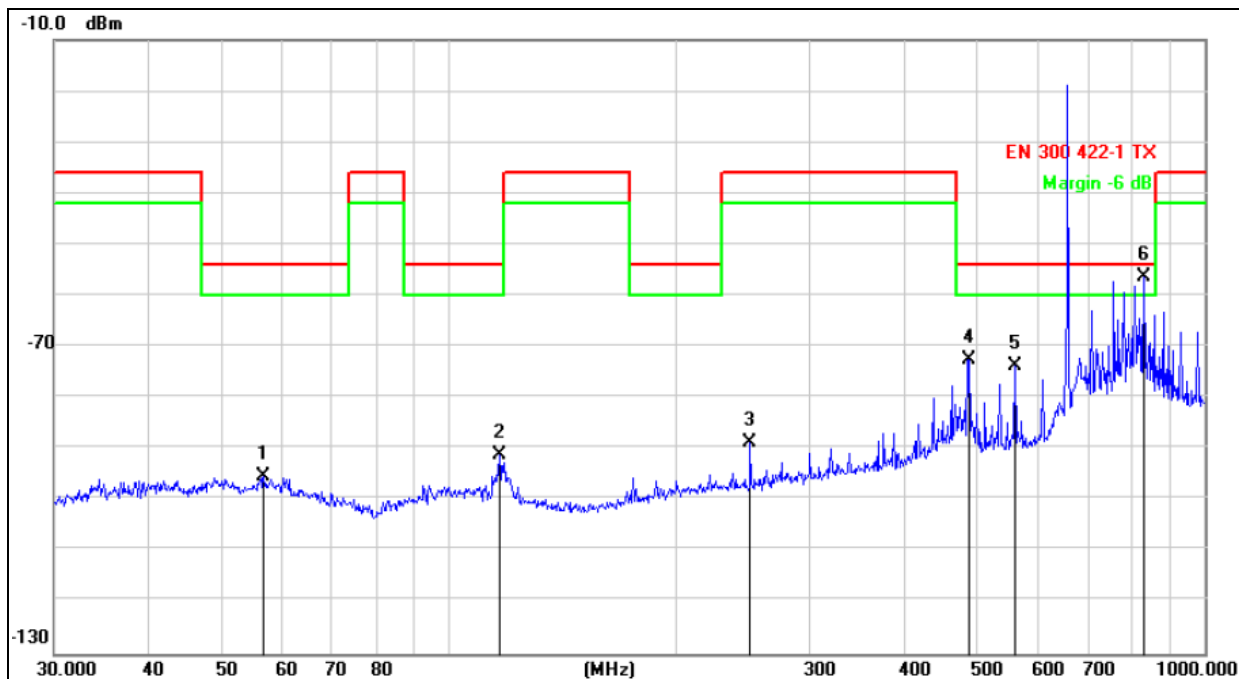
Remark:

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

Exceeding the limit is the main wave.

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBm | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBm | Limit<br>dB | Over<br>dB | Detector |
|-----|-----|--------------|-------------------------|-------------------------|-------------------------|-------------|------------|----------|
| 1   |     | 52.5753      | -81.10                  | -15.12                  | -96.22                  | -54.00      | -42.22     | QP       |
| 2   |     | 106.3850     | -79.25                  | -16.69                  | -95.94                  | -54.00      | -41.94     | QP       |
| 3   |     | 250.3012     | -75.21                  | -15.14                  | -90.35                  | -36.00      | -54.35     | QP       |
| 4   |     | 485.6093     | -63.23                  | -9.24                   | -72.47                  | -54.00      | -18.47     | QP       |
| 5   | *   | 758.0408     | -53.37                  | -4.23                   | -57.60                  | -54.00      | -3.60      | QP       |
| 6   | !   | 830.4002     | -54.69                  | -2.96                   | -57.65                  | -54.00      | -3.65      | QP       |

|                |         |                     |          |
|----------------|---------|---------------------|----------|
| Temperature :  | 26℃     | Relative Humidity : | 54%      |
| Pressure :     | 101kPa  | Polarization :      | Vertical |
| Test Voltage : | DC 3.7V |                     |          |
| Test Mode :    | Mode 1  |                     |          |



Remark:

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

Exceeding the limit is the main wave.

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBm | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBm | Limit<br>dB | Over<br>dB | Detector |
|-----|-----|--------------|-------------------------|-------------------------|-------------------------|-------------|------------|----------|
| 1   |     | 56.7917      | -79.65                  | -15.57                  | -95.22                  | -54.00      | -41.22     | QP       |
| 2   |     | 116.5401     | -73.77                  | -17.35                  | -91.12                  | -54.00      | -37.12     | QP       |
| 3   |     | 250.3012     | -73.75                  | -15.14                  | -88.89                  | -36.00      | -52.89     | QP       |
| 4   |     | 487.3151     | -63.31                  | -9.20                   | -72.51                  | -54.00      | -18.51     | QP       |
| 5   |     | 560.6928     | -66.42                  | -7.43                   | -73.85                  | -54.00      | -19.85     | QP       |
| 6   | *   | 830.4002     | -53.48                  | -2.96                   | -56.44                  | -54.00      | -2.44      | QP       |

Remark:

Test all the modes and only worst case was reported.

## 3.2.8 TEST RESULTS (1GHz~12.75GHz)

| Frequency | Receiver Reading | Turn table Angle | RX Antenna |       | Correct | Absolute Level | Result |        |
|-----------|------------------|------------------|------------|-------|---------|----------------|--------|--------|
|           |                  |                  | Height     | Polar | Factor  |                | Limit  | Margin |
| (MHz)     | (dBm)            | Degree           | (m)        | (H/V) | (dBm)   | (dBm)          | (dBm)  | (dB)   |
| CH01      |                  |                  |            |       |         |                |        |        |
| 1316.00   | -48.25           | 26               | 1.9        | H     | -9.42   | -57.67         | -30    | -27.67 |
| 1316.00   | -49.36           | 340              | 1.9        | V     | -9.42   | -58.78         | -30    | -28.78 |
| 1974.00   | -47.59           | 236              | 1.0        | H     | -6.42   | -54.01         | -30    | -24.01 |
| 1974.00   | -48.39           | 89               | 1.6        | V     | -6.42   | -54.81         | -30    | -24.81 |
| 2632.00   | -51.22           | 6                | 1.5        | H     | -6.94   | -58.16         | -30    | -28.16 |
| 2632.00   | -54.51           | 219              | 1.3        | V     | -6.94   | -61.45         | -30    | -31.45 |
| CH02      |                  |                  |            |       |         |                |        |        |
| 1318.00   | -47.88           | 240              | 1.4        | H     | -9.41   | -57.29         | -30    | -27.29 |
| 1318.00   | -48.63           | 144              | 1.6        | V     | -9.41   | -58.04         | -30    | -28.04 |
| 1977.00   | -47.44           | 240              | 1.2        | H     | -6.40   | -53.84         | -30    | -23.84 |
| 1977.00   | -49.34           | 49               | 1.9        | V     | -6.40   | -55.74         | -30    | -25.74 |
| 2636.00   | -50.73           | 290              | 1.5        | H     | -6.95   | -57.68         | -30    | -27.68 |
| 2636.00   | -55.21           | 217              | 1.5        | V     | -6.95   | -62.16         | -30    | -32.16 |
| CH04      |                  |                  |            |       |         |                |        |        |
| 1322.00   | -48.62           | 257              | 1.4        | H     | -9.39   | -58.01         | -30    | -28.01 |
| 1322.00   | -49.82           | 39               | 1.5        | V     | -9.39   | -59.21         | -30    | -29.21 |
| 1983.00   | -47.46           | 202              | 1.4        | H     | -6.38   | -53.84         | -30    | -23.84 |
| 1983.00   | -48.24           | 224              | 1.6        | V     | -6.38   | -54.62         | -30    | -24.62 |
| 2644.00   | -50.85           | 123              | 1.1        | H     | -6.96   | -57.81         | -30    | -27.81 |
| 2644.00   | -54.44           | 77               | 1.3        | V     | -6.96   | -61.40         | -30    | -31.40 |

Remark:

Absolute Level = Receiver Reading + Factor

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

## 4. RF OUTPUT POWER

### 4.1 TEST REQUIREMENT:

| FCC Part15 (15.236) , Subpart C |           |       |                       |        |
|---------------------------------|-----------|-------|-----------------------|--------|
| Section                         | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.236                          | EIRP      | 20mW  | 657-663               | PASS   |

#### 4.1.1 TEST PROCEDURE

1. The maximum peak output power was measured with a Spectrum Analyzer connected to the antenna terminal while EUT was operating in unmodulated situation.
2. Power was supplied to the battery input connector a power supply. The power supply was set for +3.7VDC. The Spectrum Analyzer was connected at antenna terminal to measure RF power of the carrier.
3. A Multimeter was connected in series with final RF Stage to measure the current; A Multimeter was used to measure final RF Stage supply voltage. Then the voltage v.s. current of the final RF Stage can be showed.

#### 4.1.2 DEVIATION FROM STANDARD

No deviation.

#### 4.1.3 TEST SETUP



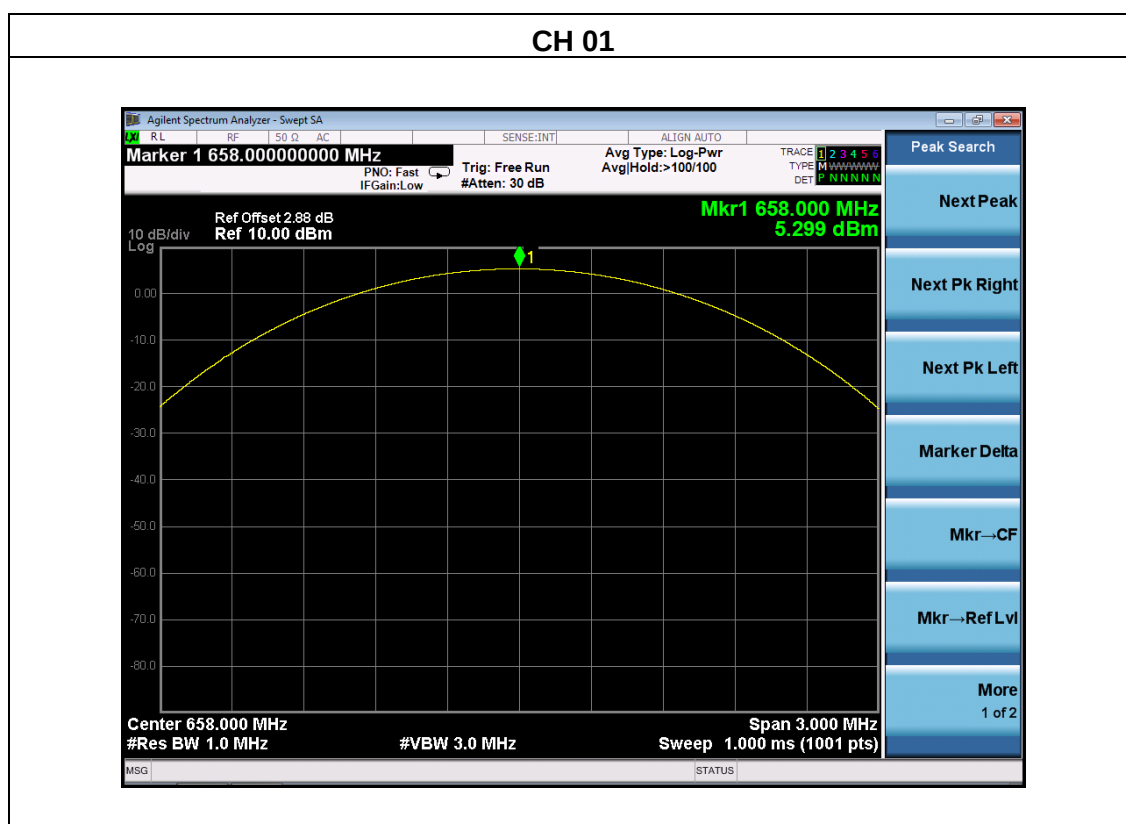
#### 4.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

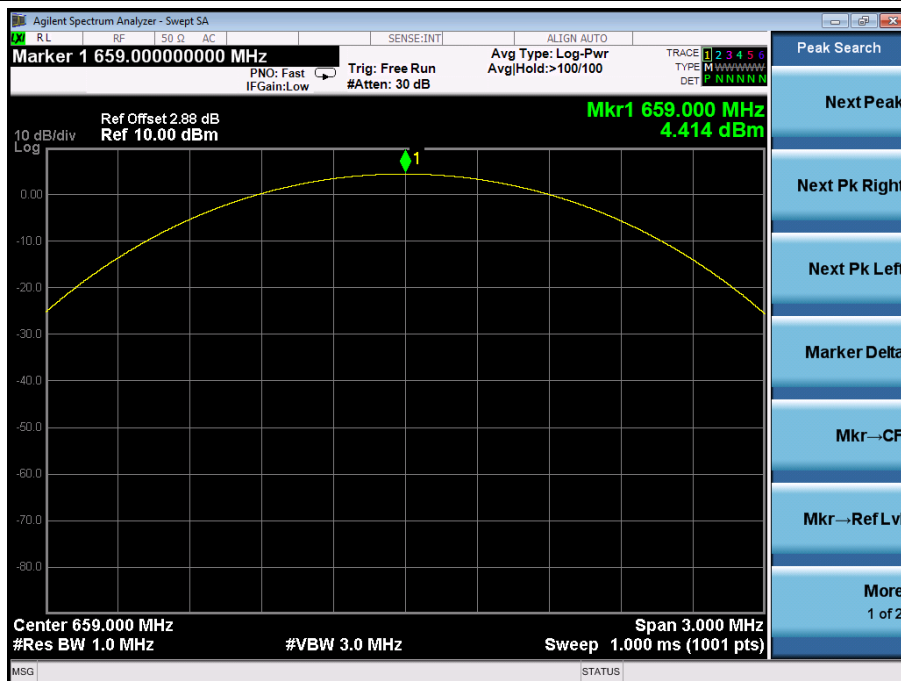


#### 4.1.5 TEST RESULTS

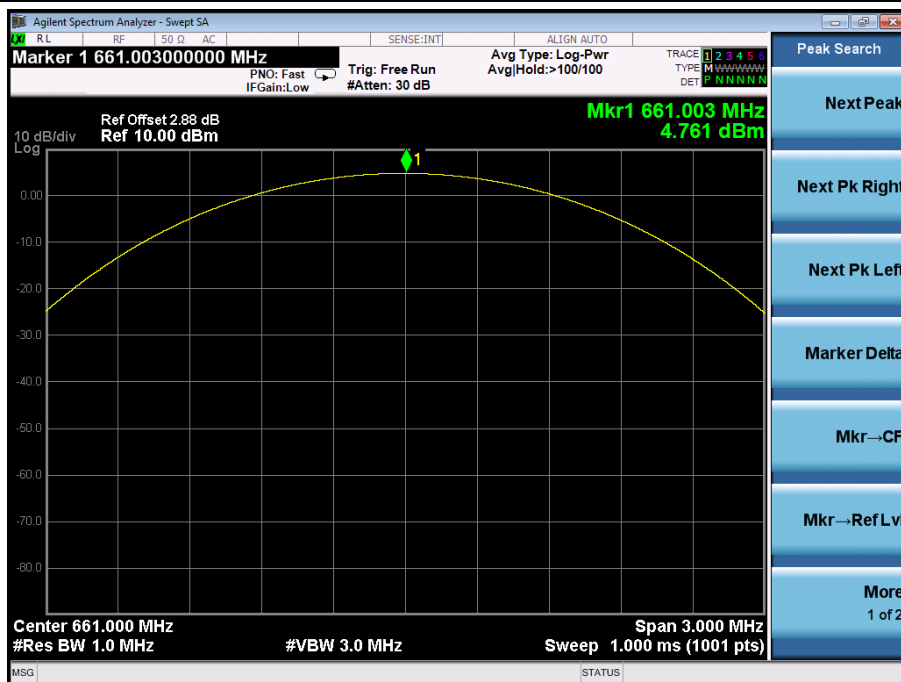
| Channel | Frequency (MHz) | Conducted power (dBm) | Antenna gain(dBi) | EIRP (dBm) | Limit (dBm) |
|---------|-----------------|-----------------------|-------------------|------------|-------------|
| 01      | 658             | 5.30                  | -0.05             | 5.25       | 13          |
| 02      | 659             | 4.41                  | -0.05             | 4.36       | 13          |
| 04      | 661             | 4.76                  | -0.05             | 4.71       | 13          |



## CH 02



## CH 04



## 5. BANDWIDTH TEST & EMISSION MASK

### 5.1 APPLIED PROCEDURES / LIMIT

According to FCC 15.236(f), The operating frequency within a permissible band of operation as defined in paragraph (c) must comply with the following requirements.

- (1) The frequency selection shall be offset from the upper or lower band limits by 25 kHz or an integral multiple thereof.
- (2) One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200 kHz.

Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in Section 8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08) (incorporated by reference, see §15.38). Emissions outside this band shall comply with the limit specified at the edges of the ETSI mask

#### 5.1.1 TEST PROCEDURE

According to TIA-603 for additional Test Set-Up procedures, the occupied bandwidth of emission was measured with a Spectrum Analyzer connected to the antenna terminal while EUT was operating in 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. Then mark the 99% Occupied Bandwidth and record it..

Emission Mask test procedure:

Necessary Bandwidth (BN) for Analogue Systems

Method of Measurement

The arrangement of test equipment as shown in figure B.1 shall be used. Note that the noise meter conforms to (quasi peak) without weighting filter (flat).

With the Low Frequency (LF) audio signal generator set to 500 Hz, the audio input level to the EUT shall be adjusted to 8 dB below the limiting threshold (-8 dB (lim)) as declared by the manufacturer. The corresponding audio output level from the demodulator shall be measured and recorded.

The input impedance of the noise meter shall be sufficiently high to avoid more than 0,1 dB change in input level when the meter is switched between input and output. The audio input level shall be increased by 20 dB, i.e. to +12 dB (lim), and the corresponding change in output level shall be measured.

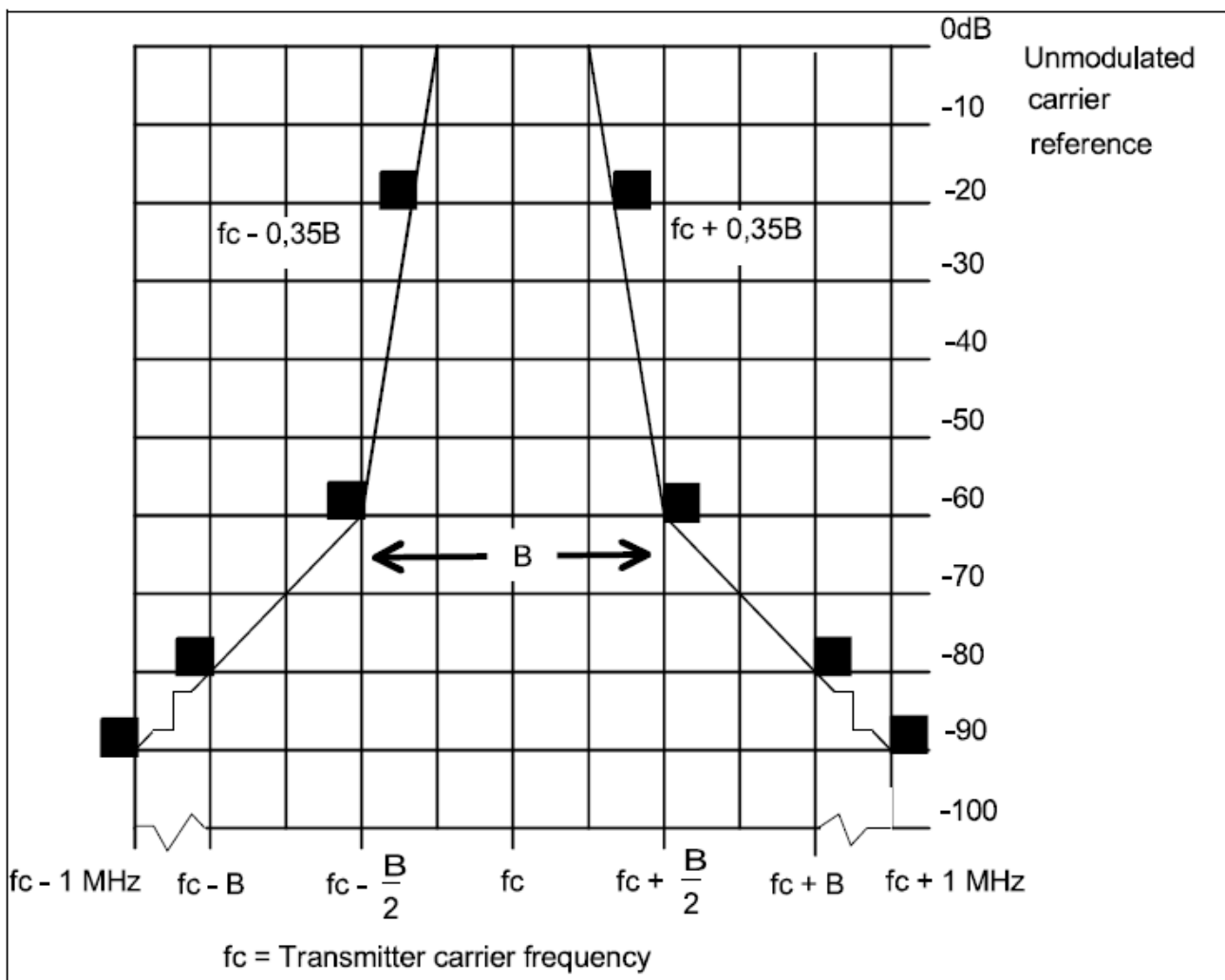
It shall be checked that the audio output level has increased by  $\leq 10$  dB.

If this condition is not met, the initial audio input level shall be increased from -8 dB (lim) in 1 dB steps until the above condition is fulfilled, and the input level recorded in the test report. This level replaces the value derived from the manufacturer's declaration and is defined as -8 dB (lim).

If the transmitter incorporates more than one audio input, e.g. stereo systems, the second and subsequent channels shall be simultaneously driven from the same noise source, attenuated to a level of -6 dB (lim).

The transmitter RF output spectrum shall be measured, using a spectrum analyser with the following settings:

|                             |                                         |
|-----------------------------|-----------------------------------------|
| centre frequency:           | fc: Transmitter (Tx) nominal frequency; |
| dispersion (Span):          | fc - 1 MHz to fc + 1 MHz;               |
| Resolution BandWidth (RBW): | 1 kHz;                                  |
| Video BandWidth (VBW):      | 1 kHz;                                  |
| detector:                   | Peak hold.                              |



### 5.1.2 DEVIATION FROM STANDARD

No deviation.

### 5.1.3 TEST SETUP



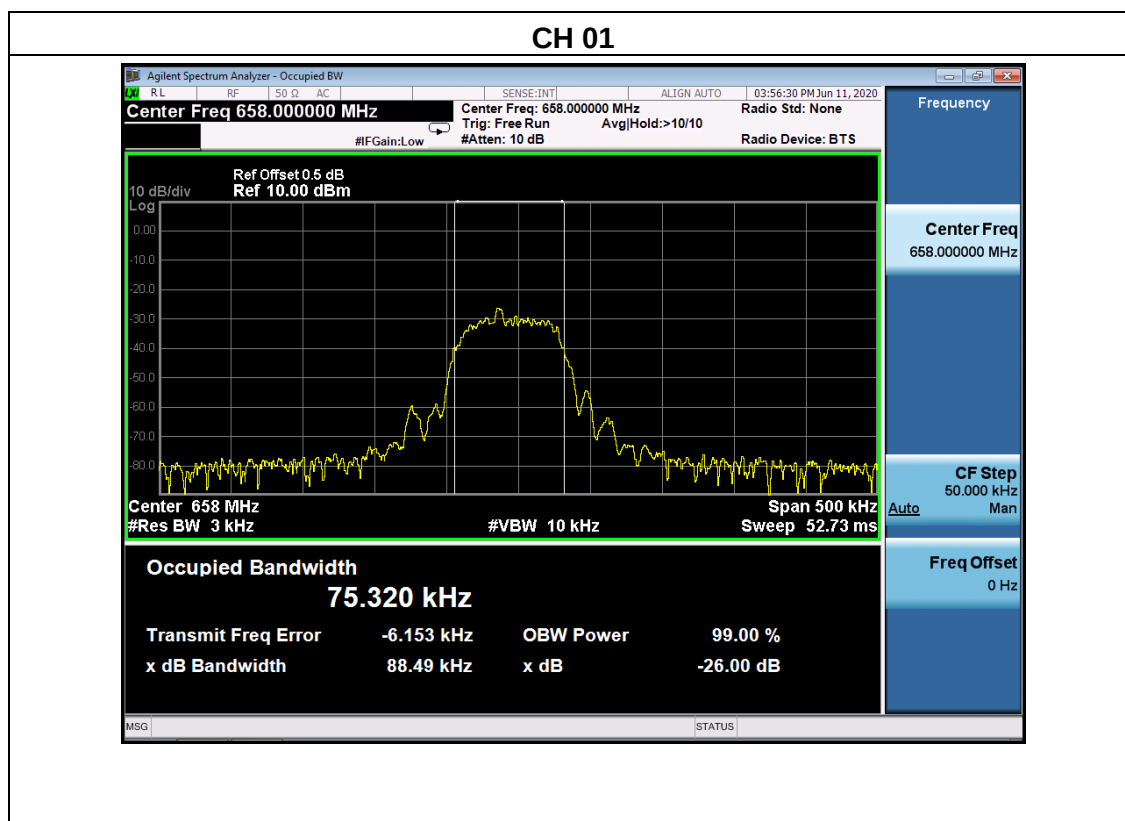
### 5.1.4 EUT OPERATION CONDITIONS

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

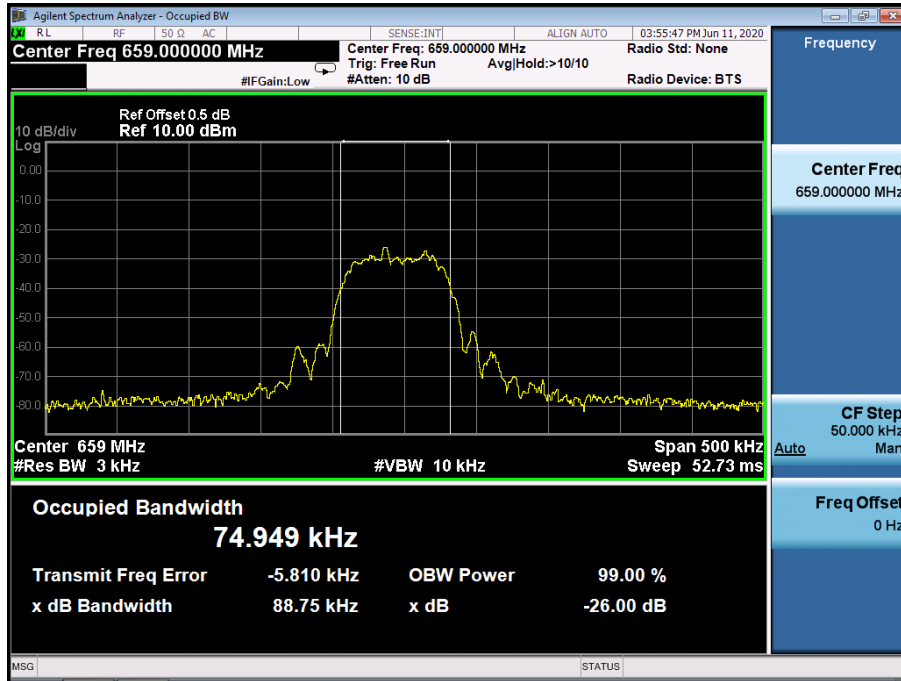
|               |      |                     |         |
|---------------|------|---------------------|---------|
| Temperature : | 26°C | Relative Humidity : | 54%     |
| Test Mode :   | FM   | Test Voltage :      | DC 3.7V |

| Frequency (MHz) | -26dB bandwidth (KHz) | 99% Bandwidth (kHz) | Limit (kHz) | Result |
|-----------------|-----------------------|---------------------|-------------|--------|
| 658             | 88.49                 | 75.320              | 200         | Pass   |
| 659             | 88.75                 | 79.949              | 200         | Pass   |
| 661             | 87.77                 | 75.446              | 200         | Pass   |

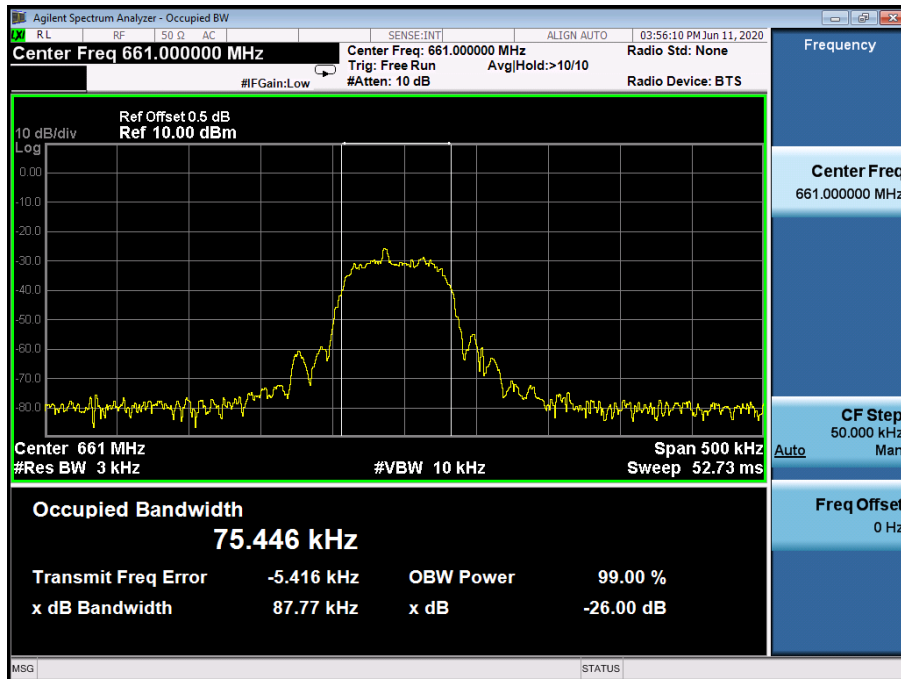




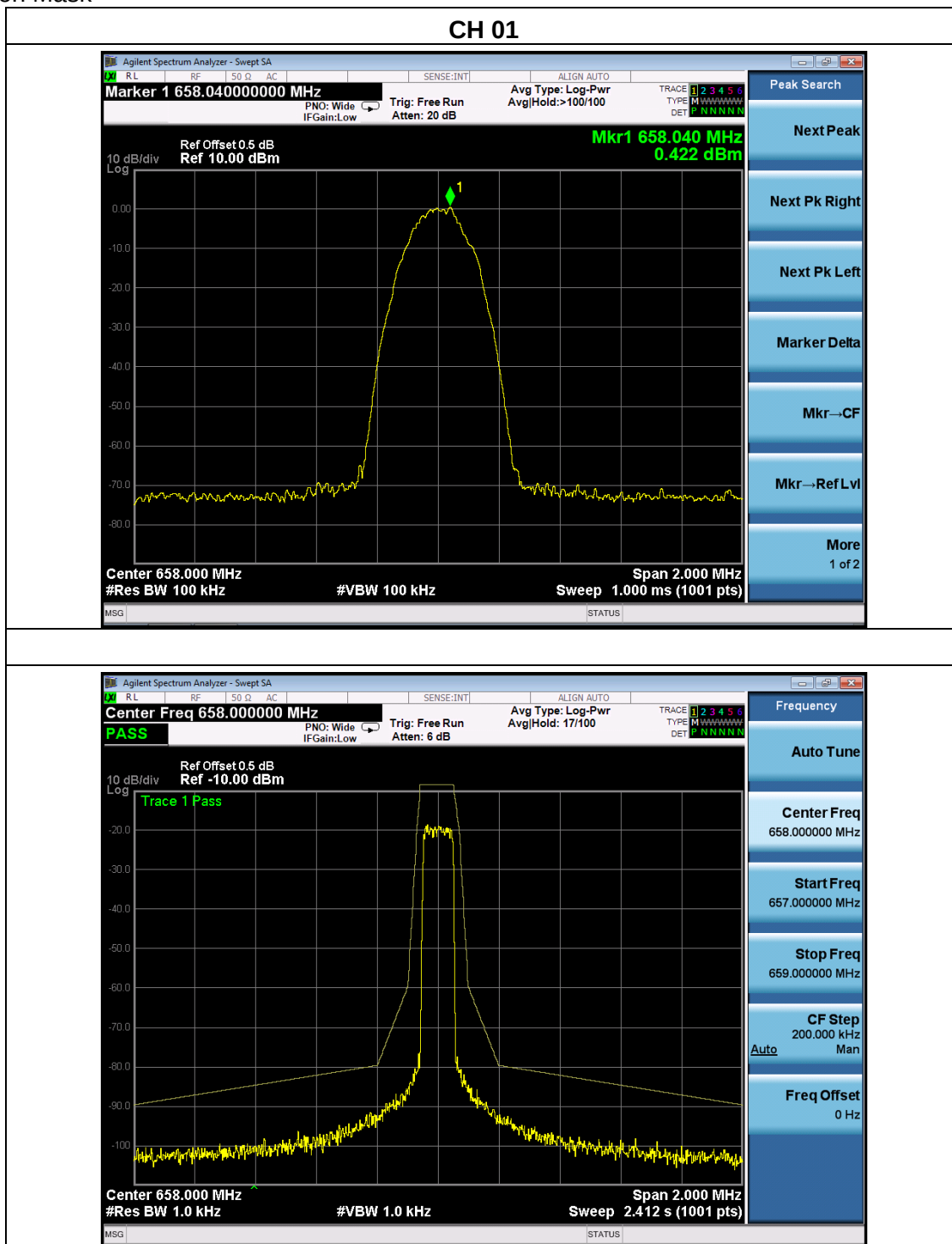
## CH 02



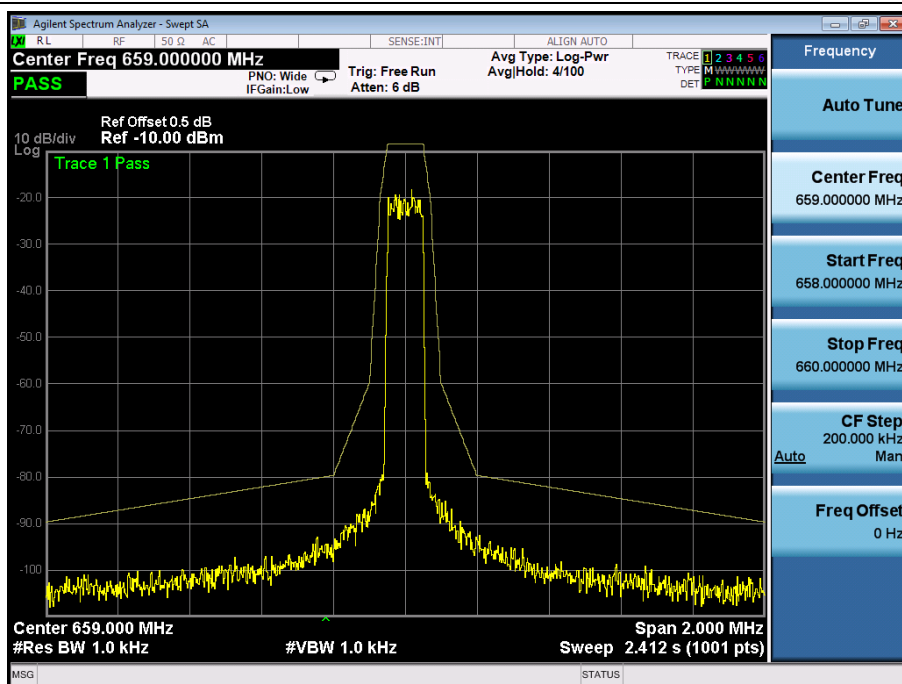
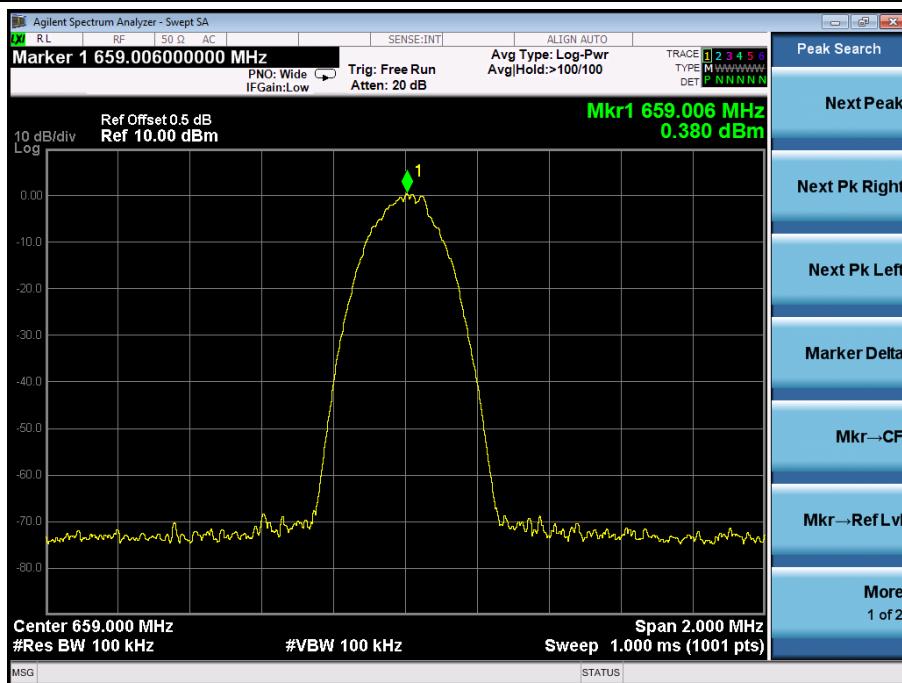
## CH 04



## Emission Mask

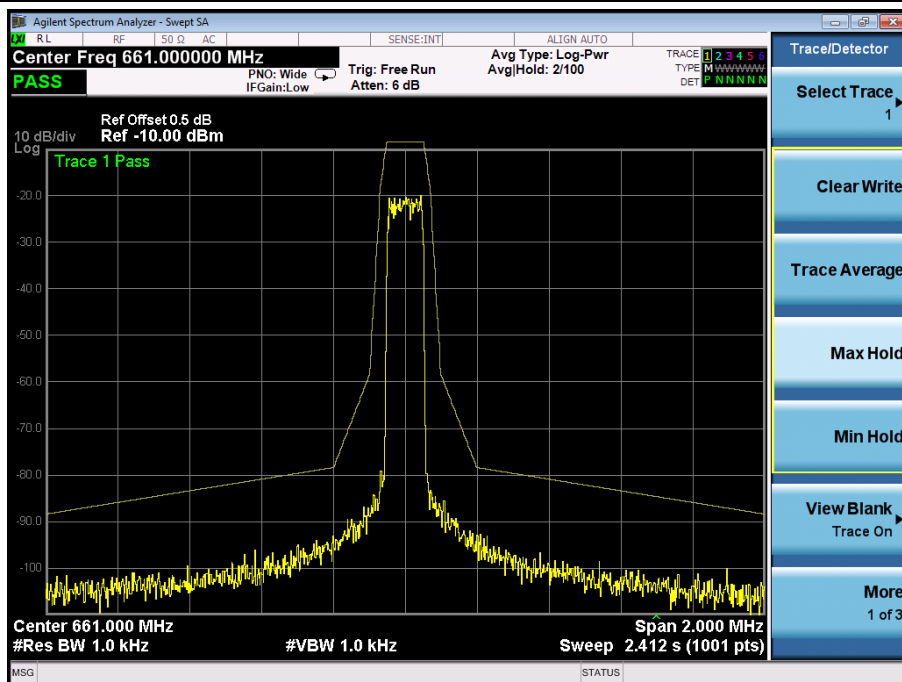
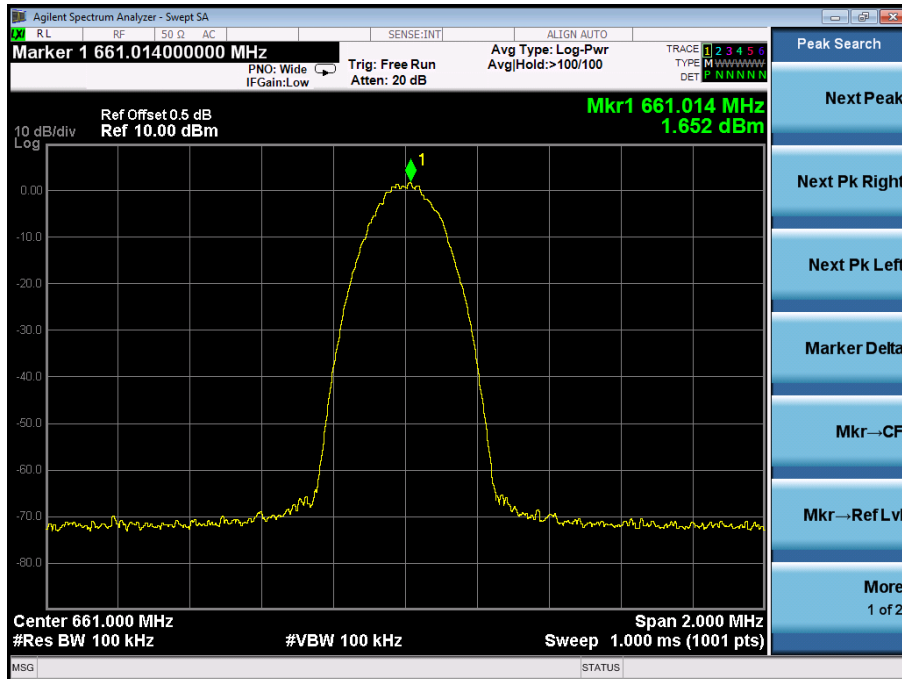








CH 04



## 6. FREQUENCY STABILITY

### 6.1 APPLICABLE STANDARD

According to FCC 15.236(f)(3), The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.005\%$  of the operating frequency over a temperature variation of  $-20$  degrees to  $+50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. Battery operated equipment shall be tested using a new battery.

### 6.2 TEST PROCEDURE

- 1, Setup the configuration of the ambient temperature form  $-20^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  with sufficient time. And measure the different power of the EUT with an artificial power from highest to end point voltage.
- 2, Set frequency counter center frequency to the right frequency needs to be measured.

### 6.3 DEVIATION FROM STANDARD

No deviation.

### 7.4 TEST SETUP



### 7.5 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.

### 7.6 TEST RESULTS

| Test conditions            |                          | Frequency Error |
|----------------------------|--------------------------|-----------------|
|                            |                          | 658 MHz         |
| T <sub>nom</sub> (20°C)    | V <sub>min</sub> (3.15V) | 657.9941        |
|                            | V <sub>max</sub> (4.26V) | 657.9944        |
| T(-20°C)                   | V <sub>nom</sub> (3.7V)  | 657.9943        |
| T(-10°C)                   | V <sub>nom</sub> (3.7V)  | 657.9944        |
| T(0°C)                     | V <sub>nom</sub> (3.7V)  | 657.9945        |
| T(10°C)                    | V <sub>nom</sub> (3.7V)  | 657.9944        |
| T <sub>nom</sub> (20°C)    | V <sub>nom</sub> (3.7V)  | 657.9942        |
| T(30°C)                    | V <sub>nom</sub> (3.7V)  | 657.9946        |
| T(40°C)                    | V <sub>nom</sub> (3.7V)  | 657.9944        |
| T(50°C)                    | V <sub>nom</sub> (3.7V)  | 657.9943        |
| T <sub>nom</sub> (20°C)    | V <sub>min</sub> (3.15V) | 657.9942        |
|                            | V <sub>max</sub> (4.26V) | 657.9944        |
| Max. frequency error (ppm) |                          | -8.97           |
| Limit (ppm)                |                          | ±50ppm          |
| End Point                  |                          | DC 3.7V         |

| Test conditions            |                          | Frequency Error |
|----------------------------|--------------------------|-----------------|
|                            |                          | 659 MHz         |
| T <sub>nom</sub> (20°C)    | V <sub>min</sub> (3.15V) | 658.9942        |
|                            | V <sub>max</sub> (4.26V) | 658.9946        |
| T(-20°C)                   | V <sub>nom</sub> (3.7V)  | 658.9945        |
| T(-10°C)                   | V <sub>nom</sub> (3.7V)  | 658.9944        |
| T(0°C)                     | V <sub>nom</sub> (3.7V)  | 658.9944        |
| T(10°C)                    | V <sub>nom</sub> (3.7V)  | 658.9943        |
| T <sub>nom</sub> (20°C)    | V <sub>nom</sub> (3.7V)  | 658.9943        |
| T(30°C)                    | V <sub>nom</sub> (3.7V)  | 658.9945        |
| T(40°C)                    | V <sub>nom</sub> (3.7V)  | 658.9944        |
| T(50°C)                    | V <sub>nom</sub> (3.7V)  | 658.9946        |
| T <sub>nom</sub> (20°C)    | V <sub>min</sub> (3.15V) | 658.9942        |
|                            | V <sub>max</sub> (4.26V) | 658.9943        |
| Max. frequency error (ppm) |                          | -8.80           |
| Limit (ppm)                |                          | ±50ppm          |
| End Point                  |                          | DC 3.7V         |

| Test conditions            |                          | Frequency Error |
|----------------------------|--------------------------|-----------------|
|                            |                          | 661 MHz         |
| T <sub>nom</sub> (20°C)    | V <sub>min</sub> (3.15V) | 660.9941        |
|                            | V <sub>max</sub> (4.26V) | 660.9945        |
| T(-20°C)                   | V <sub>nom</sub> (3.7V)  | 660.9944        |
| T(-10°C)                   | V <sub>nom</sub> (3.7V)  | 660.9943        |
| T(0°C)                     | V <sub>nom</sub> (3.7V)  | 660.9943        |
| T(10°C)                    | V <sub>nom</sub> (3.7V)  | 660.9942        |
| T <sub>nom</sub> (20°C)    | V <sub>nom</sub> (3.7V)  | 660.9945        |
| T(30°C)                    | V <sub>nom</sub> (3.7V)  | 660.9946        |
| T(40°C)                    | V <sub>nom</sub> (3.7V)  | 660.9944        |
| T(50°C)                    | V <sub>nom</sub> (3.7V)  | 660.9943        |
| T <sub>nom</sub> (20°C)    | V <sub>min</sub> (3.15V) | 660.9942        |
|                            | V <sub>max</sub> (4.26V) | 660.9943        |
| Max. frequency error (ppm) |                          | -8.93           |
| Limit (ppm)                |                          | ±50ppm          |
| End Point                  |                          | DC 3.7V         |

## **7. ANTENNA REQUIREMENT**

### **7.1 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.

### **7.2 EUT ANTENNA**

The EUT antenna is Internal antenna, fulfill the requirement of this section.

## 8. EUT TEST PHOTO

### Radiated Measurement Photos





## Conducted emissions



## 9. EUT PHOTO





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