

# FCC RF Test Report

APPLICANT : ARS Global Guiding, Inc.  
EQUIPMENT : ARS2 DEVICE  
BRAND NAME : ARS2 Device  
MODEL NAME : ARS2  
FCC ID : YA2ARS2  
STANDARD : FCC Part 15 Subpart C §15.239

The product was received on Oct. 18, 2011 and completely tested on Apr. 10, 2012. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.

Reviewed by:



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Jones Tsai / Manager



**SPORTON INTERNATIONAL (KUNSHAN) INC.**  
**No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.**



## **TABLE OF CONTENTS**

|                                                           |           |
|-----------------------------------------------------------|-----------|
| <b>REVISION HISTORY.....</b>                              | <b>3</b>  |
| <b>SUMMARY OF TEST RESULT .....</b>                       | <b>4</b>  |
| <b>1 GENERAL DESCRIPTION .....</b>                        | <b>5</b>  |
| 1.1 Applicant.....                                        | 5         |
| 1.2 Manufacturer.....                                     | 5         |
| 1.3 Feature of Equipment Under Test .....                 | 5         |
| 1.4 Testing Site.....                                     | 6         |
| 1.5 Applied Standards .....                               | 6         |
| <b>2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST .....</b> | <b>7</b>  |
| 2.1 Test Mode.....                                        | 7         |
| 2.2 Ancillary Equipment List .....                        | 7         |
| 2.3 Connection Diagram of Test System.....                | 8         |
| 2.4 RF Utility .....                                      | 8         |
| <b>3 TEST RESULT.....</b>                                 | <b>9</b>  |
| 3.1 200 kHz Bandwidth of Frequency Band Edges .....       | 9         |
| 3.2 20dBc and Field Strength .....                        | 16        |
| 3.3 Radiated Emission Measurement.....                    | 23        |
| 3.4 AC Conducted Emission Measurement.....                | 32        |
| 3.5 Antenna Requirements.....                             | 36        |
| <b>4 LIST OF MEASURING EQUIPMENT .....</b>                | <b>37</b> |
| <b>5 UNCERTAINTY OF EVALUATION.....</b>                   | <b>38</b> |
| <b>APPENDIX A. PHOTOGRAPHS OF EUT</b>                     |           |
| <b>APPENDIX B. SETUP PHOTOGRAPHS</b>                      |           |



## REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION             | ISSUED DATE   |
|------------|---------|-------------------------|---------------|
| FR1O1803C  | Rev. 01 | Initial issue of report | Apr. 13, 2012 |
|            |         |                         |               |
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|            |         |                         |               |
|            |         |                         |               |
|            |         |                         |               |



## SUMMARY OF TEST RESULT

| Report Section | FCC Rule   | Description                               | Limit      | Result | Remark                                        |
|----------------|------------|-------------------------------------------|------------|--------|-----------------------------------------------|
| 3.1            | 15.239 (a) | 200 kHz Bandwidth of Frequency Band Edges | 200 kHz    | Pass   | -                                             |
| 3.2            | 15.239 (b) | 20dBc and Field Strength                  | 48 dBuV/m  | Pass   | -                                             |
| 3.3            | 15.239 (c) | Radiated Emission Measurement             | 15.209 (a) | Pass   | The worst is under limit 0.54 dB at 55.11 MHz |
| 3.4            | 15.207     | AC Conducted Emission                     | 15.207(a)  | Pass   | Under limit 5.68 dB at 17.75 MHz              |
| 3.5            | 15.203     | Antenna Requirement                       | N/A        | Pass   | -                                             |



# 1 General Description

## 1.1 Applicant

**ARS Global Guiding, Inc.**

2674 East Walnut Street, Pasadena, California, United States, 91107

## 1.2 Manufacturer

**ARS Global Guiding, Inc.**

2674 East Walnut Street, Pasadena, California, United States, 91107

## 1.3 Feature of Equipment Under Test

| Product Feature & Specification    |                                                           |
|------------------------------------|-----------------------------------------------------------|
| Equipment                          | ARS2 DEVICE                                               |
| Brand Name                         | ARS2 Device                                               |
| Model Name                         | ARS2                                                      |
| FCC ID                             | YA2ARS2                                                   |
| Frequency Range                    | 88.1 MHz ~ 107.9 MHz                                      |
| Number of Channels                 | 100                                                       |
| Carrier Frequency of each channel  | $88.1 + n * 200 \text{ kHz}$ , $n = 0 \sim 99$            |
| Channel Spacing                    | 200 kHz                                                   |
| Maximum Fundamental Field Strength | 59.56 dBuV/m at 3m (Peak)<br>46.81 dBuV/m at 3m (Average) |
| Antenna Type                       | Wire Antenna                                              |
| HW Version                         | ARS2-V5.0                                                 |
| SW Version                         | ARS2-2.03.08                                              |
| Type of Modulation                 | FSK                                                       |
| EUT Stage                          | Production Unit                                           |

**Remark:**

1. For other wireless features of this EUT, test report will be issued separately.
2. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Testing Site

|                    |                                                                                                                  |           |
|--------------------|------------------------------------------------------------------------------------------------------------------|-----------|
| Test Site          | SPORTON INTERNATIONAL (KUNSHAN) INC.                                                                             |           |
| Test Site Location | No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.<br>TEL: +86-0512-5790-0158<br>FAX: +86-0512-5790-0958 |           |
| Test Site No.      | Sporton Site No.                                                                                                 |           |
|                    | CO01-KS                                                                                                          | 03CH01-KS |

## 1.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.239
- ♦ ANSI C63.4-2003

### Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B (Verification), recorded in a separate test report.



## **2 Test Configuration of Equipment Under Test**

### **2.1 Test Mode**

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiated emission (30 MHz to 3000MHz).

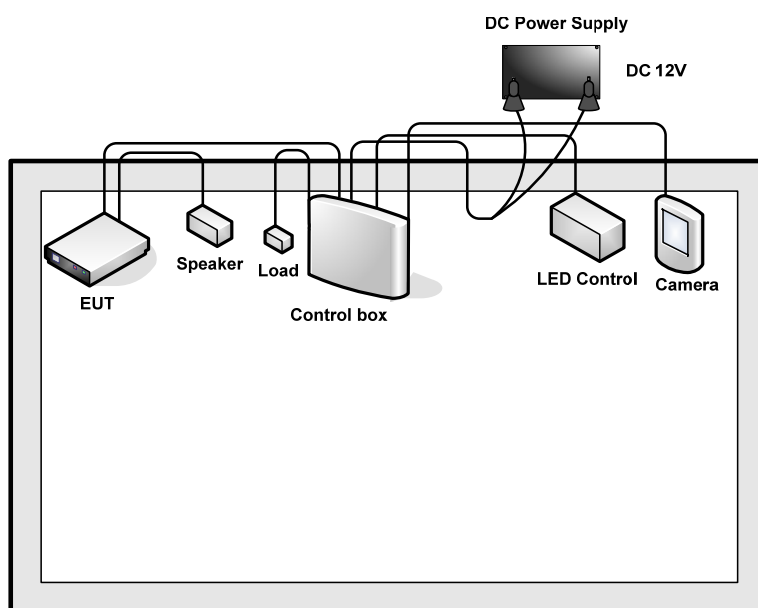
The following tables are showing the test modes as the worst cases and recorded in this report.

| <b>Test Cases</b>             |                                                                                                        |
|-------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>Test Item</b>              | <b>802.11b</b>                                                                                         |
| <b>Radiated TCs</b>           | Mode 1 : FM Tx Mode for 88.1MHz<br>Mode 2 : FM Tx Mode for 98.0MHz<br>Mode 3 : FM Tx Mode for 107.9MHz |
| <b>Conducted Emission TCs</b> | FM Tx Mode for 98.0MHz                                                                                 |

### **2.2 Ancillary Equipment List**

N/A

## 2.3 Connection Diagram of Test System



## 2.4 RF Utility

The programmed RF utility is installed in EUT to provide channel selection and the application type by playing music via iPod. RF Utility can send transmitting signal for all testing.



### 3 Test Result

#### 3.1 200 kHz Bandwidth of Frequency Band Edges

##### 3.1.1 Limit of 200 kHz Bandwidth

The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

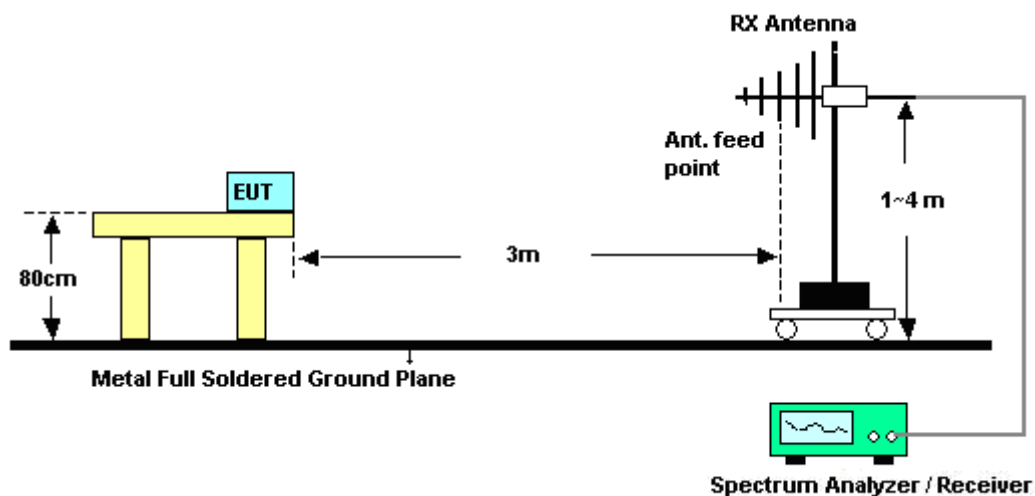
##### 3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

##### 3.1.3 Test Procedures

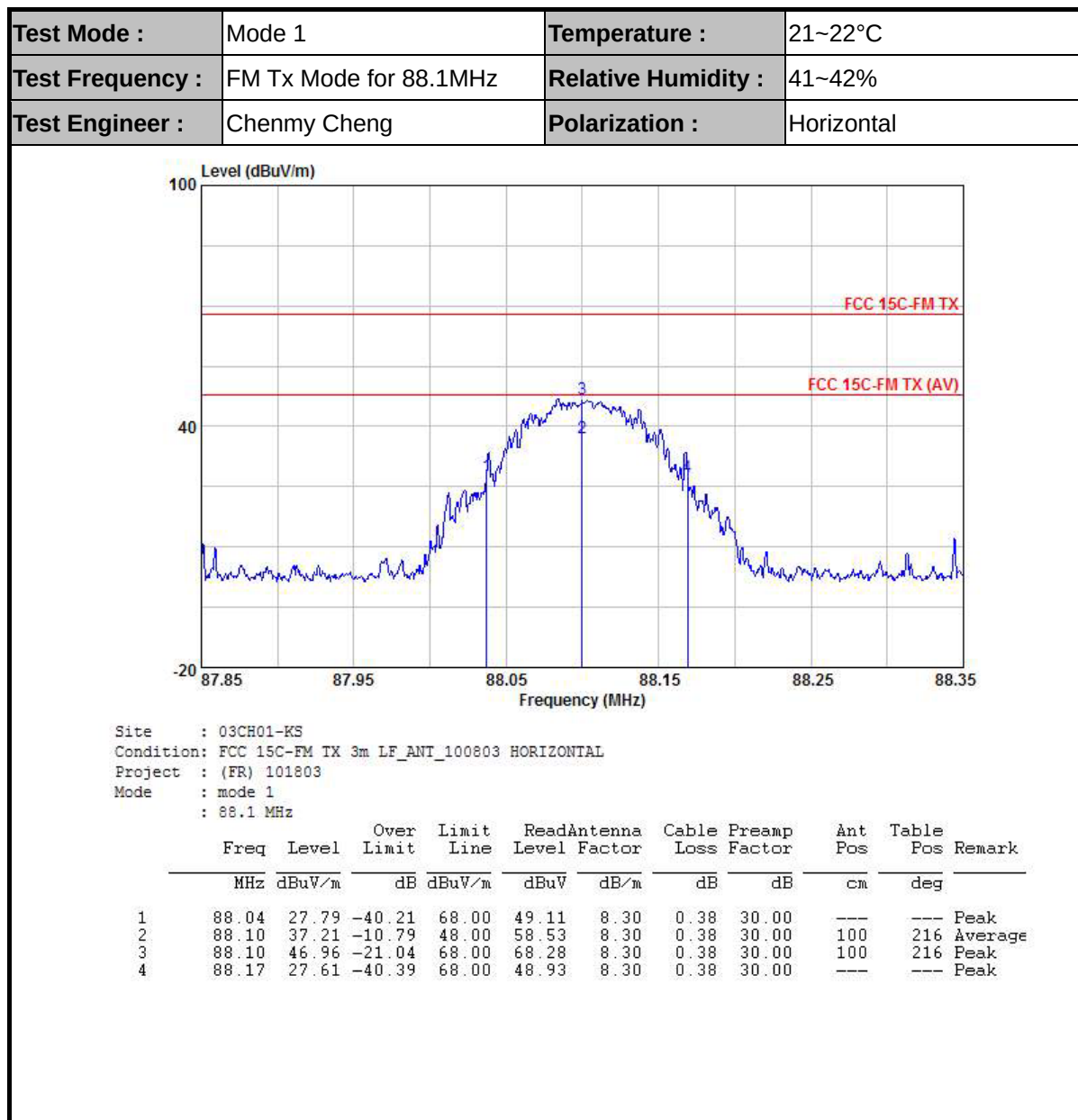
1. Set both RBW/VBW=30 kHz/100 kHz for peak measurement in the radiated measurement.
2. The band edges was measured and recorded.

##### 3.1.4 Test Setup





### 3.1.5 Test Result of 200 kHz Bandwidth of Frequency Band Edges

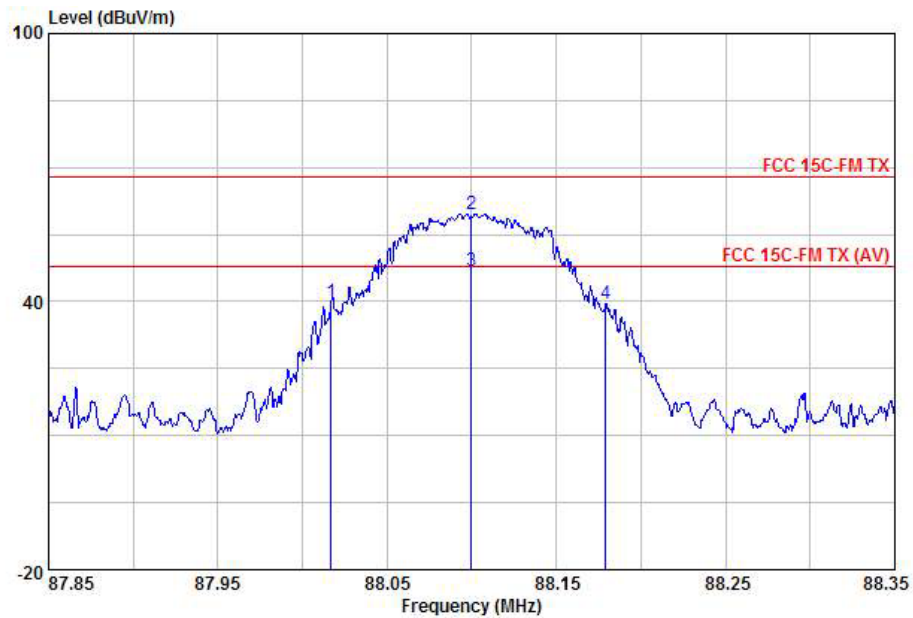




## FCC RF Test Report

Report No. : FR101803C

|                  |                        |                     |          |
|------------------|------------------------|---------------------|----------|
| Test Mode :      | Mode 1                 | Temperature :       | 21~22°C  |
| Test Frequency : | FM Tx Mode for 88.1MHz | Relative Humidity : | 41~42%   |
| Test Engineer :  | Chenmy Cheng           | Polarization :      | Vertical |



Site : 03CH01-KS  
Condition: FCC 15C-FM TX 3m LF\_ANT\_100803 VERTICAL  
Project : (FR) 101803  
Mode : mode 1  
: 88.1 MHz

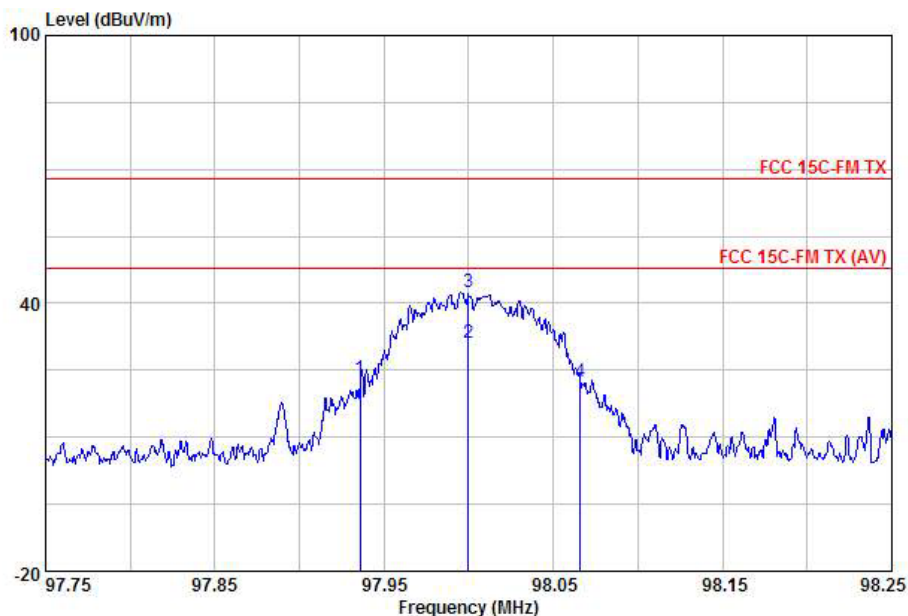
|   | Freq  | Level  | Over<br>Limit | Limit<br>Line | ReadAntenna<br>Level Factor | Cable<br>Loss | Preamp<br>Factor | Ant<br>Pos | Table<br>Pos | Remark |         |
|---|-------|--------|---------------|---------------|-----------------------------|---------------|------------------|------------|--------------|--------|---------|
|   | MHz   | dBuV/m | dB            | dBuV/m        | dBuV                        | dB/m          | dB               | dB         | cm           | deg    |         |
| 1 | 88.02 | 39.94  | -28.06        | 68.00         | 61.26                       | 8.30          | 0.38             | 30.00      | ---          | ---    | Peak    |
| 2 | 88.10 | 59.56  | -8.44         | 68.00         | 80.88                       | 8.30          | 0.38             | 30.00      | 200          | 103    | Peak    |
| 3 | 88.10 | 46.81  | -1.19         | 48.00         | 68.13                       | 8.30          | 0.38             | 30.00      | 200          | 103    | Average |
| 4 | 88.18 | 39.65  | -28.35        | 68.00         | 60.97                       | 8.30          | 0.38             | 30.00      | ---          | ---    | Peak    |



## FCC RF Test Report

Report No. : FR101803C

|                  |                        |                     |            |
|------------------|------------------------|---------------------|------------|
| Test Mode :      | Mode 2                 | Temperature :       | 21~22°C    |
| Test Frequency : | FM Tx Mode for 98.0MHz | Relative Humidity : | 41~42%     |
| Test Engineer :  | Chenmy Cheng           | Polarization :      | Horizontal |



Site : 03CH01-KS  
Condition: FCC 15C-FM TX 3m LF\_ANT\_100803 HORIZONTAL  
Project : (FR) 101803  
Mode : mode 2  
: 98 MHz

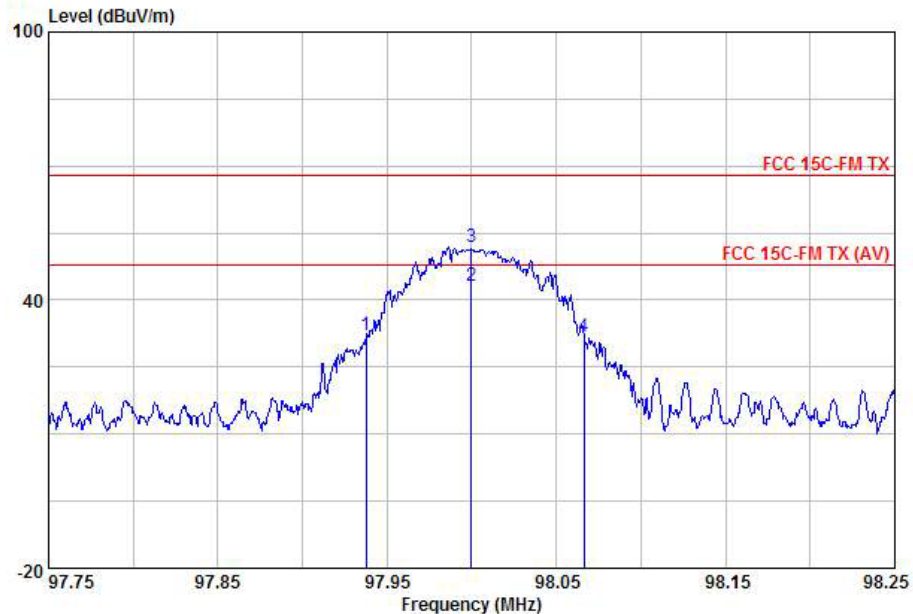
|   | Freq  | Level  | Over   | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table | Remark    |
|---|-------|--------|--------|--------|-------------|-------|--------|-------|-------|-----------|
|   | MHz   | dBuV/m | dB     | dBuV/m | Level       | Loss  | Factor | Pos   | Pos   |           |
|   |       |        |        |        | dBuV        | dB/m  | dB     | dB    | cm    | deg       |
| 1 | 97.94 | 23.19  | -44.81 | 68.00  | 42.60       | 10.15 | 0.41   | 29.97 | ---   | Peak      |
| 2 | 98.00 | 31.18  | -16.82 | 48.00  | 50.59       | 10.15 | 0.41   | 29.97 | 200   | 0 Average |
| 3 | 98.00 | 42.36  | -25.64 | 68.00  | 61.77       | 10.15 | 0.41   | 29.97 | 200   | 0 Peak    |
| 4 | 98.07 | 22.57  | -45.43 | 68.00  | 41.98       | 10.15 | 0.41   | 29.97 | ---   | Peak      |



## FCC RF Test Report

Report No. : FR101803C

|                  |                        |                     |          |
|------------------|------------------------|---------------------|----------|
| Test Mode :      | Mode 2                 | Temperature :       | 21~22°C  |
| Test Frequency : | FM Tx Mode for 98.0MHz | Relative Humidity : | 41~42%   |
| Test Engineer :  | Chenmy Cheng           | Polarization :      | Vertical |



Site : 03CH01-KS  
Condition: FCC 15C-FM TX 3m LF\_ANT\_100803 VERTICAL  
Project : (FR) 101803  
Mode : mode 2  
: 98 MHz

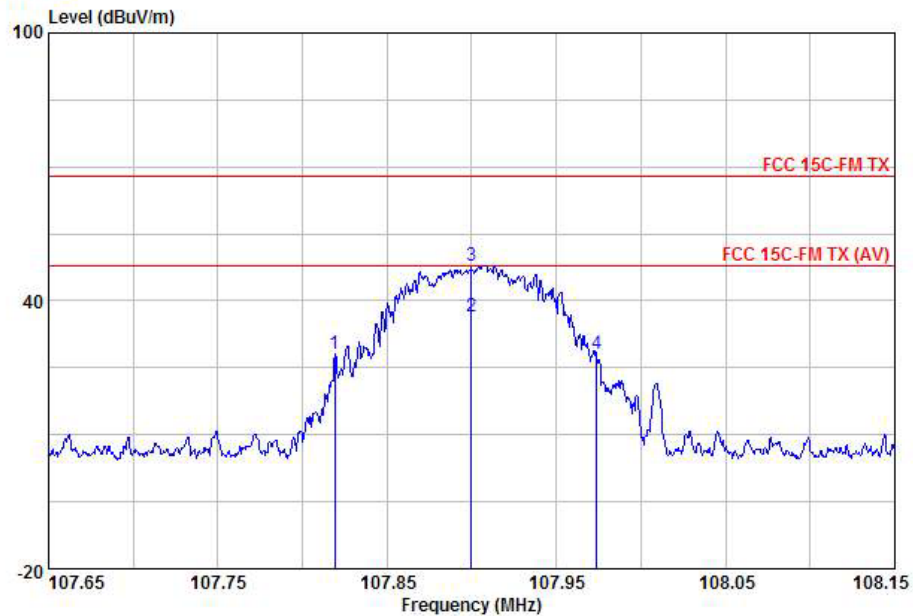
|   | Freq  | Level  | Over   | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table |             |
|---|-------|--------|--------|--------|-------------|-------|--------|-------|-------|-------------|
|   | MHz   | dBuV/m | Limit  | Line   | Level       | Loss  | Factor | Pos   | Pos   | Remark      |
|   |       |        | dB     | dBuV/m | dBuV        | dB    |        | cm    | deg   |             |
| 1 | 97.94 | 32.10  | -35.90 | 68.00  | 51.51       | 10.15 | 0.41   | 29.97 | ---   | Peak        |
| 2 | 98.00 | 43.17  | -4.83  | 48.00  | 62.58       | 10.15 | 0.41   | 29.97 | 100   | 162 Average |
| 3 | 98.00 | 51.73  | -16.27 | 68.00  | 71.14       | 10.15 | 0.41   | 29.97 | 100   | 162 Peak    |
| 4 | 98.07 | 31.88  | -36.12 | 68.00  | 51.29       | 10.15 | 0.41   | 29.97 | ---   | Peak        |



## FCC RF Test Report

Report No. : FR101803C

|                  |                         |                     |            |
|------------------|-------------------------|---------------------|------------|
| Test Mode :      | Mode 3                  | Temperature :       | 21~22°C    |
| Test Frequency : | FM Tx Mode for 107.9MHz | Relative Humidity : | 41~42%     |
| Test Engineer :  | Chenmy Cheng            | Polarization :      | Horizontal |



Site : 03CH01-KS  
Condition: FCC 15C-FM TX 3m LF\_ANT\_100803 HORIZONTAL  
Project : (FR) 101803  
Mode : mode 3  
: 107.9 MHz

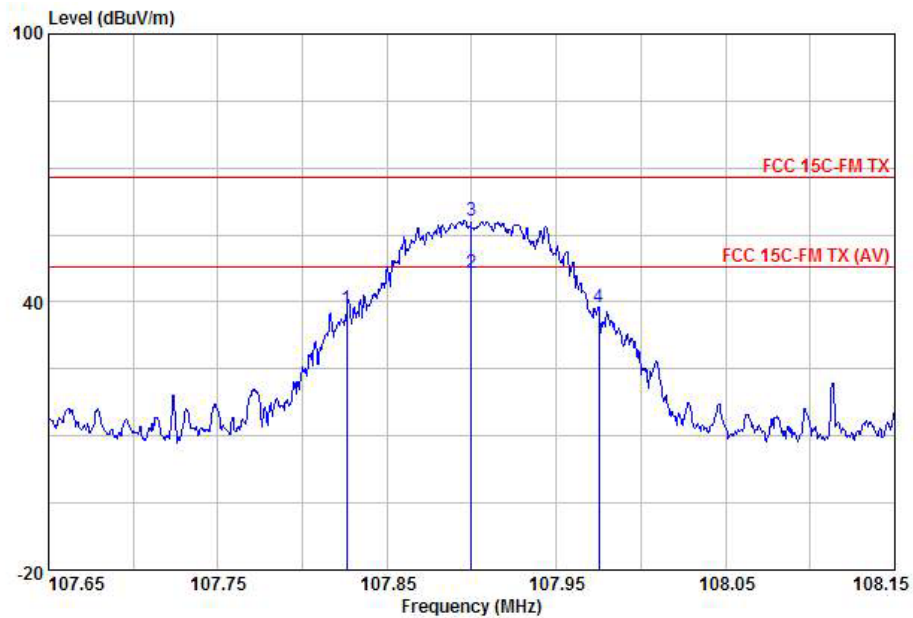
|   | Freq   | Level  | Over<br>Limit | Limit<br>Line | ReadAntenna<br>Level Factor | Cable<br>Loss | Preamp<br>Factor | Ant<br>Pos | Table<br>Pos | Remark |
|---|--------|--------|---------------|---------------|-----------------------------|---------------|------------------|------------|--------------|--------|
|   | MHz    | dBuV/m | dB            | dBuV/m        | dBuV                        | dB/m          | dB               | dB         | cm           | deg    |
| 1 | 107.82 | 28.03  | -39.97        | 68.00         | 46.00                       | 11.56         | 0.43             | 29.96      | ---          | ---    |
| 2 | 107.90 | 36.63  | -11.37        | 48.00         | 54.60                       | 11.56         | 0.43             | 29.96      | 100          | 109    |
| 3 | 107.90 | 47.96  | -20.04        | 68.00         | 65.93                       | 11.56         | 0.43             | 29.96      | 100          | 109    |
| 4 | 107.97 | 28.17  | -39.83        | 68.00         | 46.14                       | 11.56         | 0.43             | 29.96      | ---          | ---    |



## FCC RF Test Report

Report No. : FR101803C

|                  |                         |                     |          |
|------------------|-------------------------|---------------------|----------|
| Test Mode :      | Mode 3                  | Temperature :       | 21~22°C  |
| Test Frequency : | FM Tx Mode for 107.9MHz | Relative Humidity : | 41~42%   |
| Test Engineer :  | Chenmy Cheng            | Polarization :      | Vertical |



Site : 03CH01-KS  
Condition: FCC 15C-FM TX 3m LF\_ANT\_100803 VERTICAL  
Project : (FR) 101803  
Mode : mode 3  
: 107.9 MHz

|   | Freq   | Level  | Over<br>Limit | Limit<br>Line | ReadAntenna<br>Level Factor | Cable<br>Loss | Preamp<br>Factor | Ant<br>Pos | Table<br>Pos | Remark |         |
|---|--------|--------|---------------|---------------|-----------------------------|---------------|------------------|------------|--------------|--------|---------|
|   | MHz    | dBuV/m | dB            | dBuV/m        | dBuV                        | dB/m          | dB               | dB         | cm           | deg    |         |
| 1 | 107.83 | 38.53  | -29.47        | 68.00         | 56.50                       | 11.56         | 0.43             | 29.96      | ---          | ---    | Peak    |
| 2 | 107.90 | 46.54  | -1.46         | 48.00         | 64.51                       | 11.56         | 0.43             | 29.96      | 200          | 181    | Average |
| 3 | 107.90 | 58.25  | -9.75         | 68.00         | 76.22                       | 11.56         | 0.43             | 29.96      | 200          | 181    | Peak    |
| 4 | 107.98 | 38.98  | -29.02        | 68.00         | 56.95                       | 11.56         | 0.43             | 29.96      | ---          | ---    | Peak    |

## 3.2 20dBc and Field Strength

### 3.2.1 Limit of 20dBc and Field Strength

The field strength of any emissions within the permitted 200 kHz shall not exceed 48 dBuV/m at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

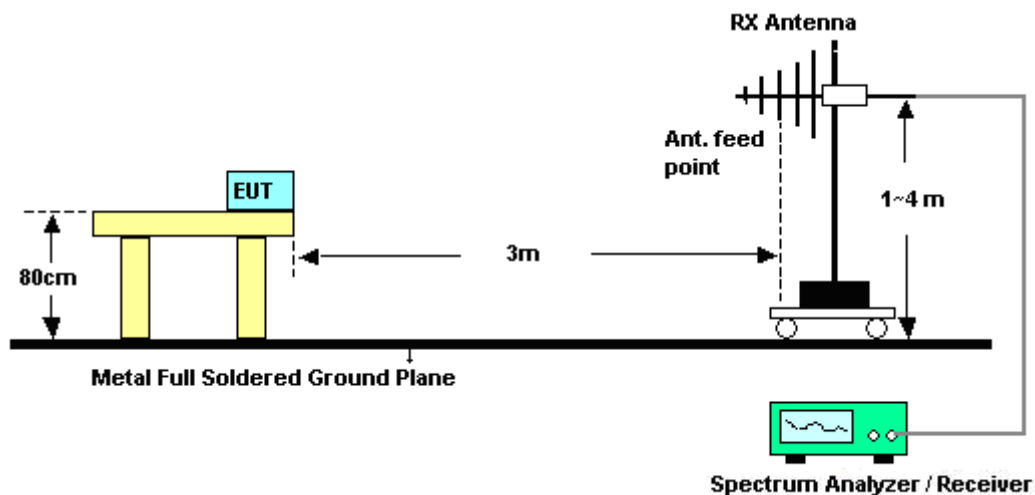
### 3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

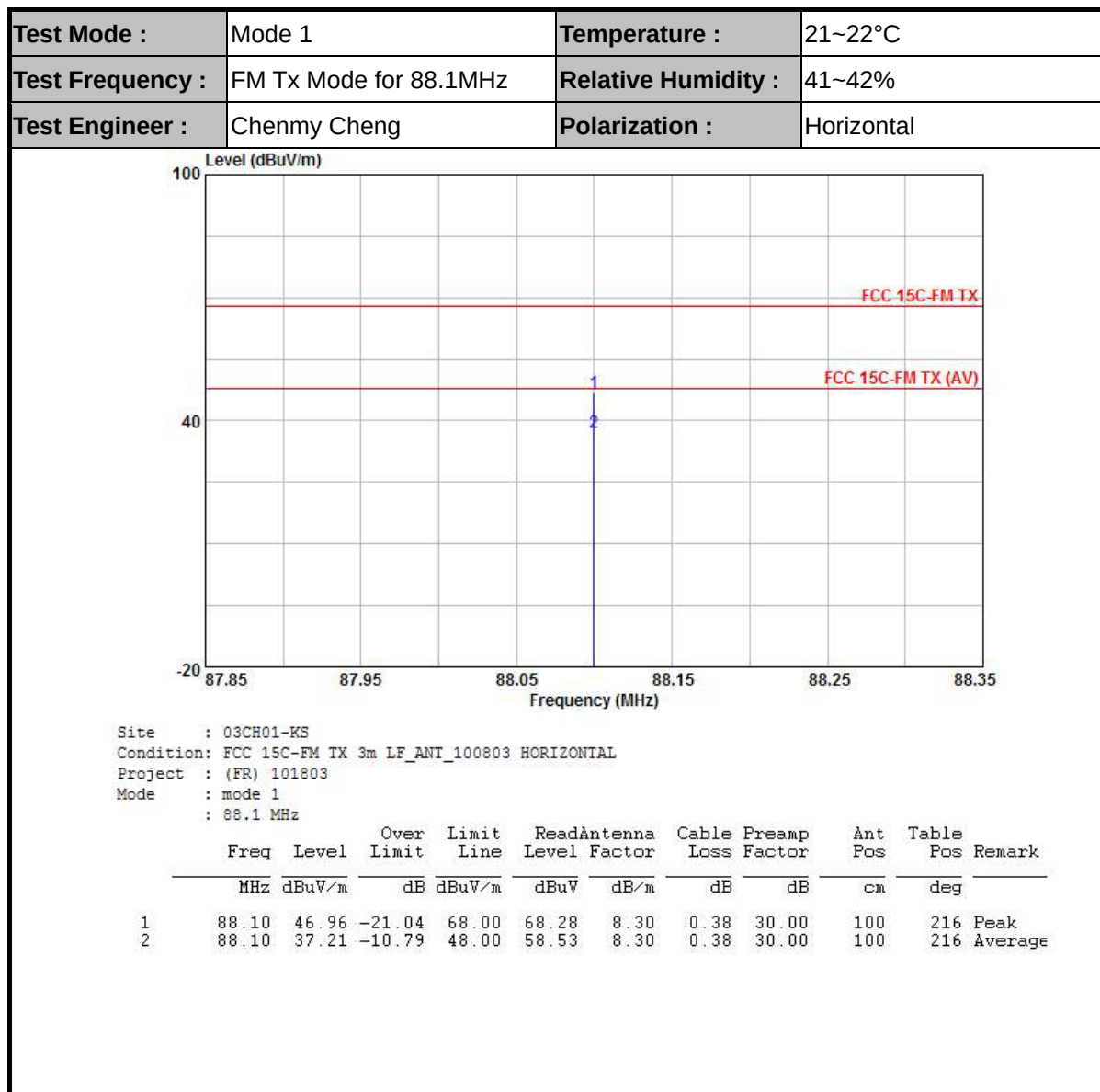
### 3.2.3 Test Procedures

1. Set both RBW/VBW=30 kHz/100 kHz for peak and average measurement in the radiated measurement.
2. The field strength was measured and recorded.

### 3.2.4 Test Setup





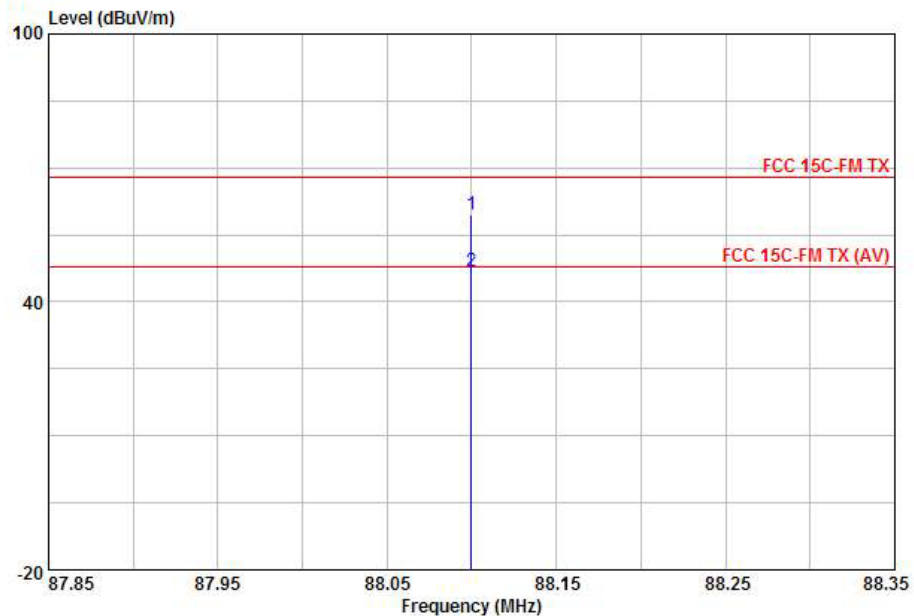
**3.2.5 Test Result of 20dBc and Field Strength**



## FCC RF Test Report

Report No. : FR101803C

|                  |                        |                     |          |
|------------------|------------------------|---------------------|----------|
| Test Mode :      | Mode 1                 | Temperature :       | 21~22°C  |
| Test Frequency : | FM Tx Mode for 88.1MHz | Relative Humidity : | 41~42%   |
| Test Engineer :  | Chenmy Cheng           | Polarization :      | Vertical |



Site : 03CH01-KS  
Condition: FCC 15C-FM TX 3m LF\_ANT\_100803 VERTICAL  
Project : (FR) 101803  
Mode : mode 1  
: 88.1 MHz

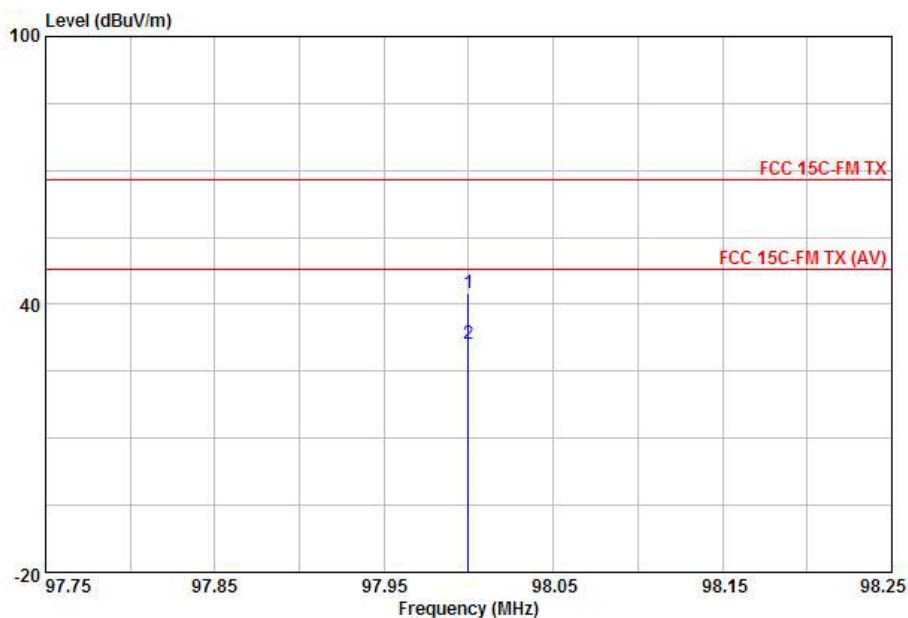
|   | Freq  | Level  | Over  | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table |             |
|---|-------|--------|-------|--------|-------------|-------|--------|-------|-------|-------------|
|   | MHz   | dBuV/m | Limit | Line   | Level       | Loss  | Factor | Pos   | Pos   | Remark      |
|   |       |        | dB    | dBuV/m | dBuV        | dB/m  | dB     | dB    | cm    | deg         |
| 1 | 88.10 | 59.56  | -8.44 | 68.00  | 80.88       | 8.30  | 0.38   | 30.00 | 200   | 103 Peak    |
| 2 | 88.10 | 46.81  | -1.19 | 48.00  | 68.13       | 8.30  | 0.38   | 30.00 | 200   | 103 Average |



# FCC RF Test Report

Report No. : FR101803C

|                  |                        |                     |            |
|------------------|------------------------|---------------------|------------|
| Test Mode :      | Mode 2                 | Temperature :       | 21~22°C    |
| Test Frequency : | FM Tx Mode for 98.0MHz | Relative Humidity : | 41~42%     |
| Test Engineer :  | Chenmy Cheng           | Polarization :      | Horizontal |



Site : 03CH01-KS  
Condition: FCC 15C-FM TX 3m LF\_ANT\_100803 HORIZONTAL  
Project : (FR) 101803  
Mode : mode 2  
: 98 MHz

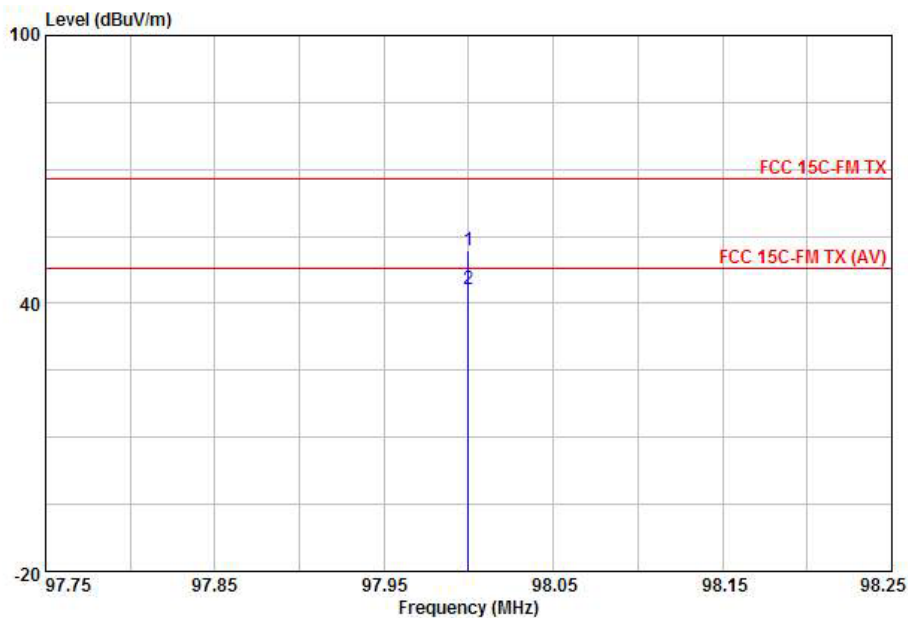
|   | Freq  | Level  | Over   | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table | Remark    |
|---|-------|--------|--------|--------|-------------|-------|--------|-------|-------|-----------|
|   | MHz   | dBuV/m | dB     | dBuV/m | Level       | Loss  | Factor | Pos   | Pos   |           |
|   |       |        |        |        | dBuV        | dB    |        | cm    | deg   |           |
| 1 | 98.00 | 42.36  | -25.64 | 68.00  | 61.77       | 10.15 | 0.41   | 29.97 | 200   | 0 Peak    |
| 2 | 98.00 | 31.18  | -16.82 | 48.00  | 50.59       | 10.15 | 0.41   | 29.97 | 200   | 0 Average |



## FCC RF Test Report

Report No. : FR101803C

|                  |                        |                     |          |
|------------------|------------------------|---------------------|----------|
| Test Mode :      | Mode 2                 | Temperature :       | 21~22°C  |
| Test Frequency : | FM Tx Mode for 98.0MHz | Relative Humidity : | 41~42%   |
| Test Engineer :  | Chenmy Cheng           | Polarization :      | Vertical |



Site : 03CH01-KS  
Condition: FCC 15C-FM TX 3m LF\_ANT\_100803 VERTICAL  
Project : (FR) 101803  
Mode : mode 2  
: 98 MHz

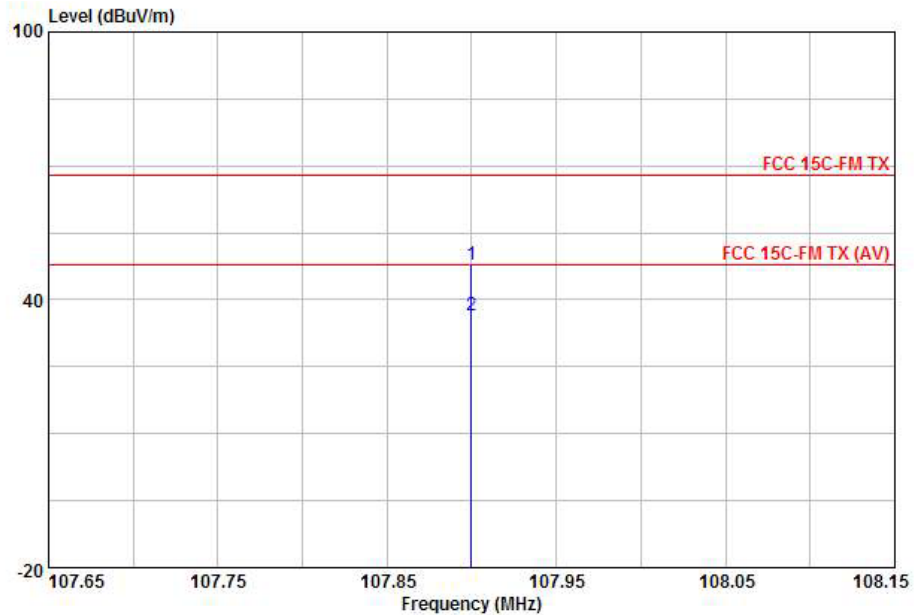
|   | Freq  | Level  | Over   | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table |             |
|---|-------|--------|--------|--------|-------------|-------|--------|-------|-------|-------------|
|   | MHz   | dBuV/m | Limit  | Line   | Level       | Loss  | Factor | Pos   | Pos   | Remark      |
|   |       |        | dB     | dBuV/m | dBuV        | dB/m  | dB     | dB    | cm    | deg         |
| 1 | 98.00 | 51.73  | -16.27 | 68.00  | 71.14       | 10.15 | 0.41   | 29.97 | 100   | 162 Peak    |
| 2 | 98.00 | 43.17  | -4.83  | 48.00  | 62.58       | 10.15 | 0.41   | 29.97 | 100   | 162 Average |



# FCC RF Test Report

Report No. : FR101803C

|                  |                         |                     |            |
|------------------|-------------------------|---------------------|------------|
| Test Mode :      | Mode 3                  | Temperature :       | 21~22°C    |
| Test Frequency : | FM Tx Mode for 107.9MHz | Relative Humidity : | 41~42%     |
| Test Engineer :  | Chenmy Cheng            | Polarization :      | Horizontal |



Site : 03CH01-KS  
Condition: FCC 15C-FM TX 3m LF\_ANT\_100803 HORIZONTAL  
Project : (FR) 101803  
Mode : mode 3  
: 107.9 MHz

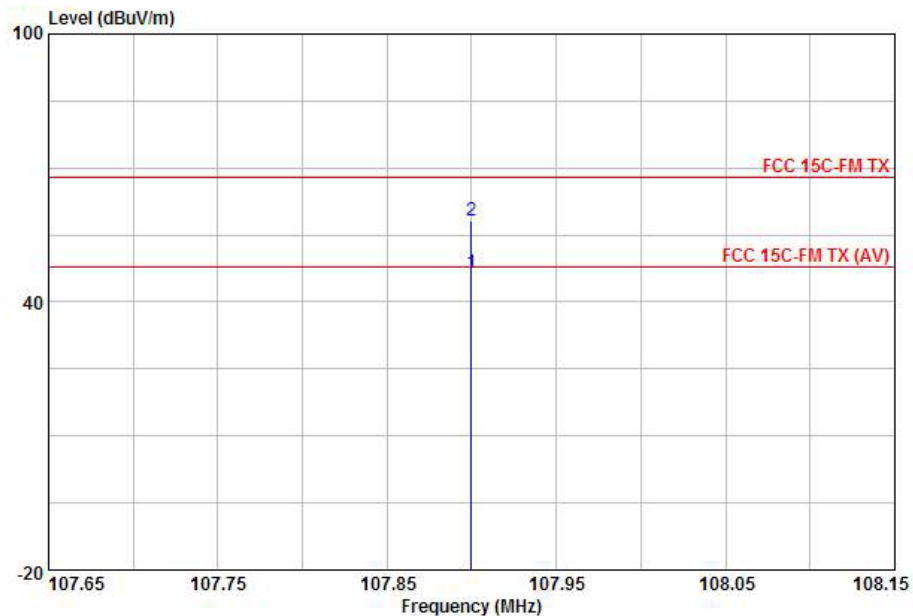
|   | Freq   | Level  | Over   | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table | Remark      |
|---|--------|--------|--------|--------|-------------|-------|--------|-------|-------|-------------|
|   | MHz    | dBuV/m | Limit  | Line   | Level       | Loss  | Factor | Pos   | Pos   |             |
|   |        |        | dB     | dBuV/m | dBuV        | dB    | dB     | cm    | deg   |             |
| 1 | 107.90 | 47.96  | -20.04 | 68.00  | 65.93       | 11.56 | 0.43   | 29.96 | 100   | 109 Peak    |
| 2 | 107.90 | 36.63  | -11.37 | 48.00  | 54.60       | 11.56 | 0.43   | 29.96 | 100   | 109 Average |



## FCC RF Test Report

Report No. : FR101803C

|                  |                         |                     |          |
|------------------|-------------------------|---------------------|----------|
| Test Mode :      | Mode 3                  | Temperature :       | 21~22°C  |
| Test Frequency : | FM Tx Mode for 107.9MHz | Relative Humidity : | 41~42%   |
| Test Engineer :  | Chenmy Cheng            | Polarization :      | Vertical |



Site : 03CH01-KS  
Condition: FCC 15C-FM TX 3m LF\_ANT\_100803 VERTICAL  
Project : (FR) 101803  
Mode : mode 3  
: 107.9 MHz

|   | Freq   | Level  | Over  | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table |             |
|---|--------|--------|-------|--------|-------------|-------|--------|-------|-------|-------------|
|   | MHz    | dBuV/m | Limit | Line   | Level       | Loss  | Factor | Pos   | Pos   | Remark      |
|   |        |        | dB    | dBuV/m | dBuV        | dB/m  | dB     | dB    | cm    | deg         |
| 1 | 107.90 | 46.54  | -1.46 | 48.00  | 64.51       | 11.56 | 0.43   | 29.96 | 200   | 181 Average |
| 2 | 107.90 | 58.25  | -9.75 | 68.00  | 76.22       | 11.56 | 0.43   | 29.96 | 200   | 181 Peak    |

### 3.3 Radiated Emission Measurement

#### 3.3.1 Limit of Radiated Emission

Radiated emissions shall not exceed the field strength levels specified in the FCC section 15.209 limits as below.

| Frequency<br>(MHz) | Field Strength<br>(microvolts/meter) | Measurement Distance<br>(meters) |
|--------------------|--------------------------------------|----------------------------------|
| 0.009 – 0.490      | 2400/F(kHz)                          | 300                              |
| 0.490 – 1.705      | 24000/F(kHz)                         | 30                               |
| 1.705 – 30.0       | 30                                   | 30                               |
| 30 – 88            | 100                                  | 3                                |
| 88 – 216           | 150                                  | 3                                |
| 216 - 960          | 200                                  | 3                                |
| Above 960          | 500                                  | 3                                |

#### 3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

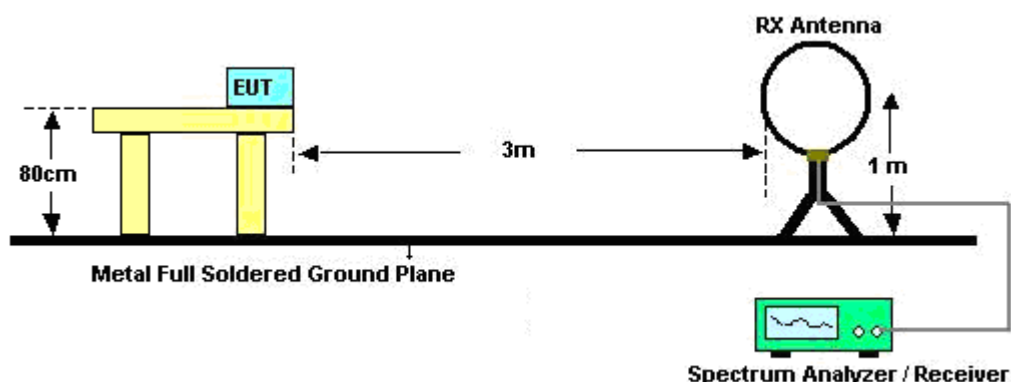
#### 3.3.3 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. For testing below 1GHz, If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the quasi-peak method and reported.

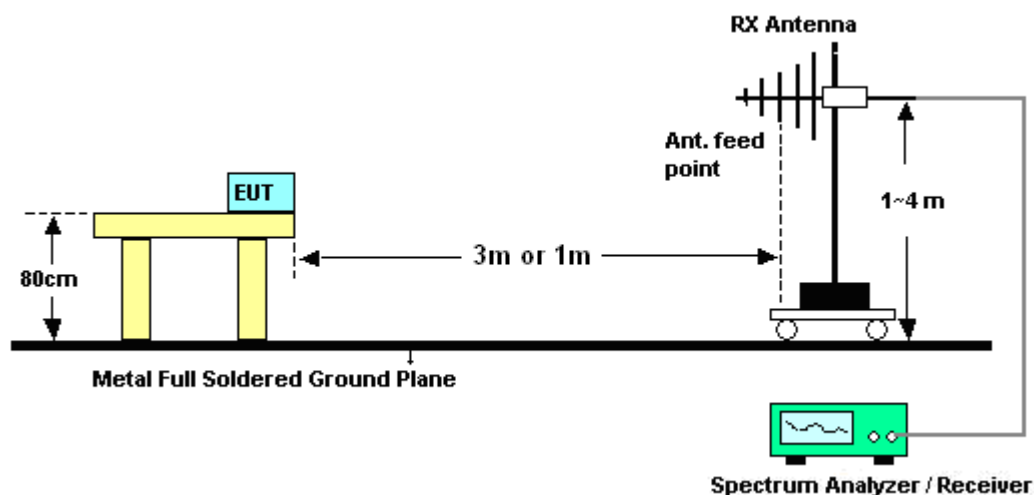
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

### 3.3.4 Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz





**3.3.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)**

|                        |              |                            |         |
|------------------------|--------------|----------------------------|---------|
| <b>Test Engineer :</b> | Chenmy Cheng | <b>Temperature :</b>       | 21~22°C |
|                        |              | <b>Relative Humidity :</b> | 41~42%  |

| <b>Frequency<br/>(MHz)</b> | <b>Level<br/>(dBuV)</b> | <b>Over Limit<br/>(dB)</b> | <b>Limit Line<br/>(dBuV)</b> | <b>Remark</b> |
|----------------------------|-------------------------|----------------------------|------------------------------|---------------|
| -                          | -                       | -                          | -                            | See Note      |

**Note:**

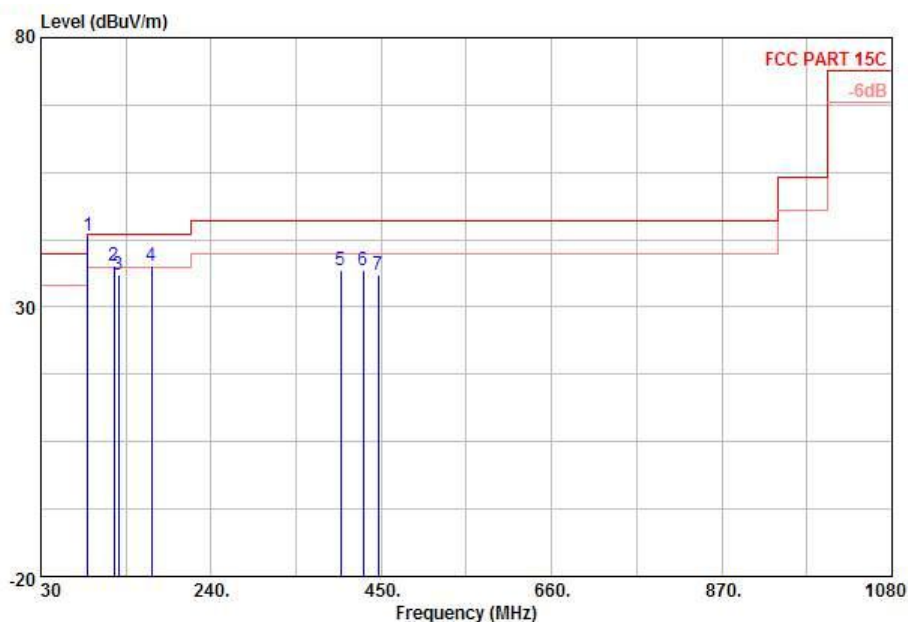
The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

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

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

3.3.6 Test Result of Radiated Emission (30 MHz ~10<sup>th</sup> Harmonic)

|                  |                                          |                     |            |
|------------------|------------------------------------------|---------------------|------------|
| Test Mode :      | Mode 1                                   | Temperature :       | 21~22°C    |
| Test Frequency : | FM Tx Mode for 88.1MHz                   | Relative Humidity : | 41~42%     |
| Test Engineer :  | Chenmy Cheng                             | Polarization :      | Horizontal |
| Remark :         | #1 is FM Tx signal which can be ignored. |                     |            |



Site : 03CH01-KS  
Condition: FCC PART 15C 3m LF\_ANT\_100803 HORIZONTAL  
Project : (FR) 101803  
Mode : mode 1  
: 88.1 MHz

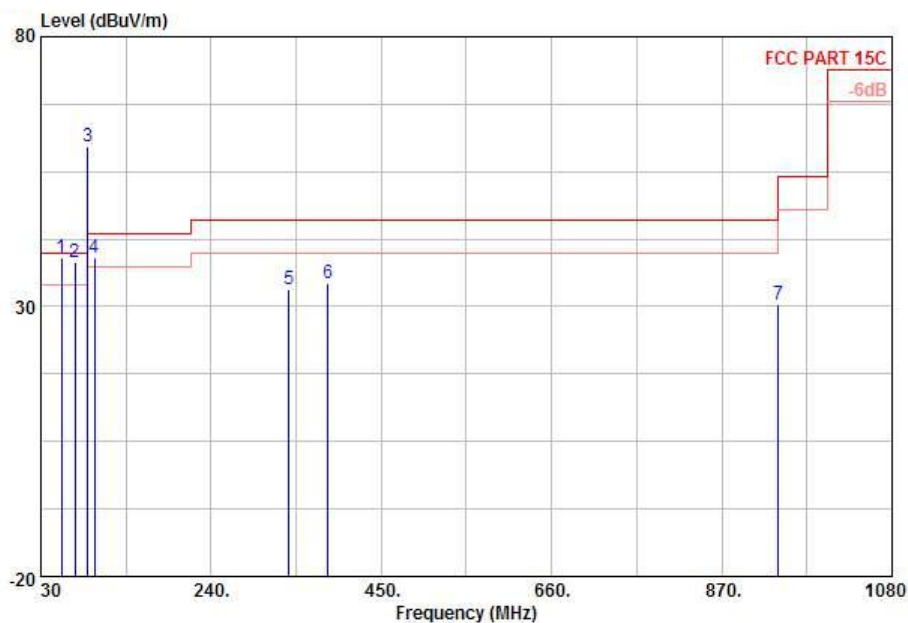
|   | Freq   | Level  | Over   | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table |        |
|---|--------|--------|--------|--------|-------------|-------|--------|-------|-------|--------|
|   | MHz    | dBUV/m | Limit  | Line   | Level       | Loss  | Factor | Pos   | Pos   | Remark |
|   |        |        | dB     | dBUV/m | dBuV        |       |        | cm    | deg   |        |
| 1 | 88.10  | 43.21  |        |        | 64.53       | 8.30  | 0.38   | 30.00 | ---   | Peak   |
| 2 | 120.18 | 37.77  | -5.73  | 43.50  | 55.49       | 11.80 | 0.45   | 29.97 | 100   | Peak   |
| 3 | 125.85 | 35.96  | -7.54  | 43.50  | 53.74       | 11.74 | 0.46   | 29.98 | ---   | Peak   |
| 4 | 166.35 | 37.66  | -5.84  | 43.50  | 57.73       | 9.31  | 0.54   | 29.92 | ---   | Peak   |
| 5 | 400.10 | 36.96  | -9.04  | 46.00  | 49.95       | 16.00 | 0.84   | 29.83 | ---   | Peak   |
| 6 | 427.40 | 36.93  | -9.07  | 46.00  | 49.68       | 16.18 | 0.88   | 29.81 | ---   | Peak   |
| 7 | 446.30 | 35.97  | -10.03 | 46.00  | 48.58       | 16.28 | 0.90   | 29.79 | ---   | Peak   |



## FCC RF Test Report

Report No. : FR101803C

|                  |                                          |                     |          |
|------------------|------------------------------------------|---------------------|----------|
| Test Mode :      | Mode 1                                   | Temperature :       | 21~22°C  |
| Test Frequency : | FM Tx Mode for 88.1MHz                   | Relative Humidity : | 41~42%   |
| Test Engineer :  | Chenmy Cheng                             | Polarization :      | Vertical |
| Remark :         | #3 is FM Tx signal which can be ignored. |                     |          |



Site : 03CH01-KS  
Condition: FCC PART 15C 3m LF\_ANT\_100803 VERTICAL  
Project : (FR) 101803  
Mode : mode 1  
: 88.1 MHz

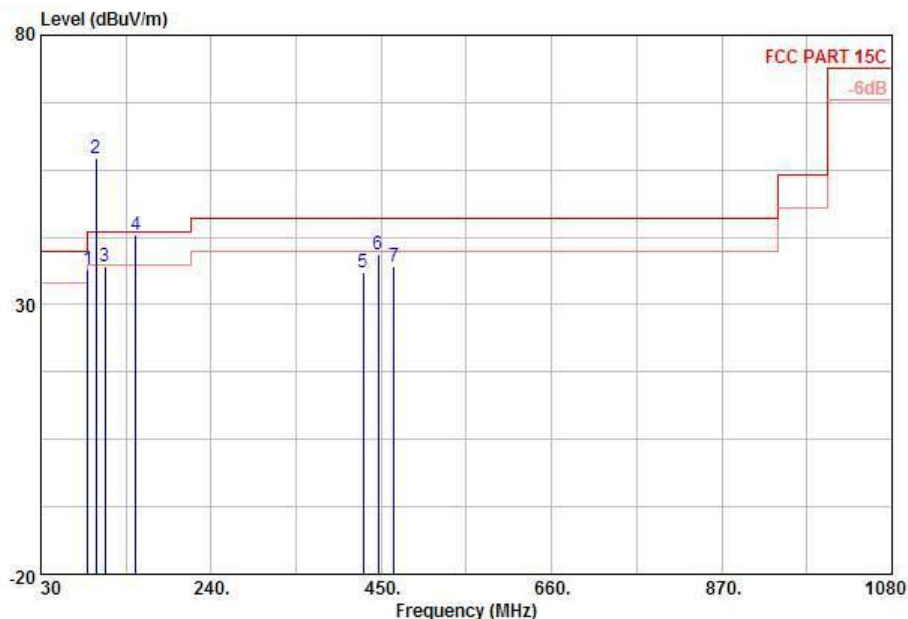
|   | Freq   | Level  | Over   | Limit  | ReadAntenna | Cable  | Preamp | Ant    | Table | Remark |
|---|--------|--------|--------|--------|-------------|--------|--------|--------|-------|--------|
|   | MHz    | dBuV/m | Limit  | Line   | Level       | Factor | Loss   | Factor | Pos   | Pos    |
|   |        |        | dB     | dBuV/m | dBuV        | dB/m   | dB     | dB     | cm    | deg    |
| 1 | 55.11  | 39.16  | -0.84  | 40.00  | 62.80       | 6.20   | 0.29   | 30.13  | 100   | 151    |
| 2 | 71.85  | 38.33  | -1.67  | 40.00  | 62.60       | 5.46   | 0.34   | 30.07  | 100   | 32     |
| 3 | 88.10  | 59.63  |        |        | 80.95       | 8.30   | 0.38   | 30.00  | ---   | ---    |
| 4 | 95.88  | 39.07  | -4.43  | 43.50  | 58.73       | 9.91   | 0.40   | 29.97  | ---   | ---    |
| 5 | 335.70 | 33.09  | -12.91 | 46.00  | 48.09       | 14.14  | 0.80   | 29.94  | ---   | ---    |
| 6 | 384.00 | 34.26  | -11.74 | 46.00  | 47.70       | 15.59  | 0.83   | 29.86  | ---   | ---    |
| 7 | 939.80 | 30.43  | -15.57 | 46.00  | 37.94       | 20.69  | 1.33   | 29.53  | ---   | ---    |



# FCC RF Test Report

Report No. : FR101803C

|                  |                                          |                     |            |
|------------------|------------------------------------------|---------------------|------------|
| Test Mode :      | Mode 2                                   | Temperature :       | 21~22°C    |
| Test Frequency : | FM Tx Mode for 98.0MHz                   | Relative Humidity : | 41~42%     |
| Test Engineer :  | Chenmy Cheng                             | Polarization :      | Horizontal |
| Remark :         | #2 is FM Tx signal which can be ignored. |                     |            |



Site : 03CH01-KS  
Condition: FCC PART 15C 3m LF\_ANT\_100803 HORIZONTAL  
Project : (FR) 101803  
Mode : mode 2  
: 98MHz

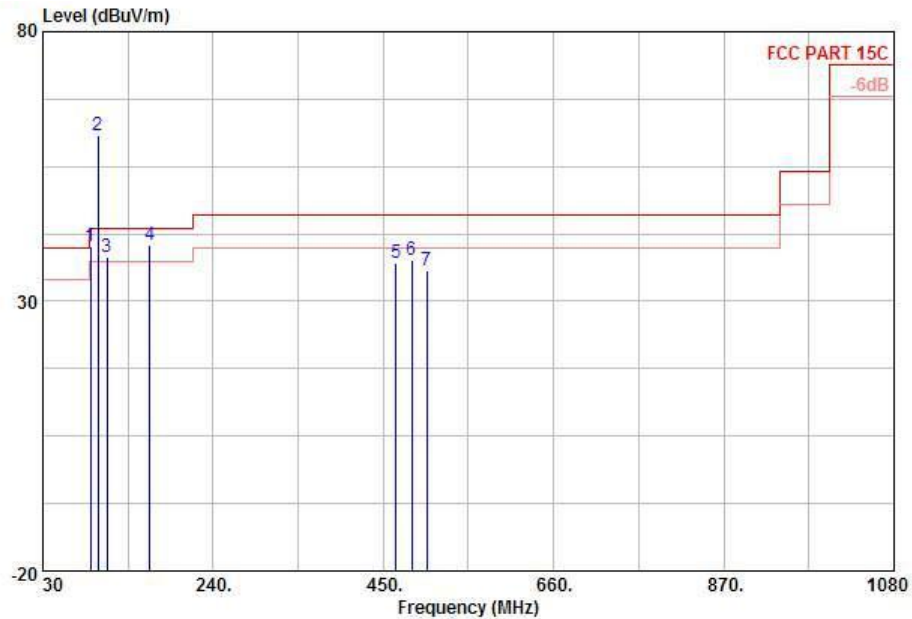
|   | Freq   | Level  | Over  | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table | Remark |
|---|--------|--------|-------|--------|-------------|-------|--------|-------|-------|--------|
|   | MHz    | dBuV/m | Limit | Line   | Level       | Loss  | Factor | Pos   | Pos   |        |
|   |        |        | dB    | dBuV/m | dBuV        | dB/m  | dB     | cm    | deg   |        |
| 1 | 87.78  | 36.48  | -3.52 | 40.00  | 57.80       | 8.30  | 0.38   | 30.00 | 200   | 208 QP |
| 2 | 98.00  | 57.09  |       |        | 76.50       | 10.15 | 0.41   | 29.97 | ---   | Peak   |
| 3 | 109.11 | 37.16  | -6.34 | 43.50  | 54.90       | 11.80 | 0.43   | 29.97 | 200   | 331 QP |
| 4 | 147.18 | 42.93  | -0.57 | 43.50  | 62.20       | 10.21 | 0.50   | 29.98 | 200   | 100 QP |
| 5 | 427.40 | 36.04  | -9.96 | 46.00  | 48.79       | 16.18 | 0.88   | 29.81 | ---   | Peak   |
| 6 | 446.30 | 39.28  | -6.72 | 46.00  | 51.89       | 16.28 | 0.90   | 29.79 | ---   | Peak   |
| 7 | 465.20 | 37.03  | -8.97 | 46.00  | 49.35       | 16.53 | 0.92   | 29.77 | ---   | Peak   |



## FCC RF Test Report

Report No. : FR101803C

|                  |                                          |                     |          |
|------------------|------------------------------------------|---------------------|----------|
| Test Mode :      | Mode 2                                   | Temperature :       | 21~22°C  |
| Test Frequency : | FM Tx Mode for 98.0MHz                   | Relative Humidity : | 41~42%   |
| Test Engineer :  | Chenmy Cheng                             | Polarization :      | Vertical |
| Remark :         | #2 is FM Tx signal which can be ignored. |                     |          |



Site : 03CH01-KS  
Condition: FCC PART 15C 3m LF\_ANT\_100803 VERTICAL  
Project : (FR) 101803  
Mode : mode 2  
: 98MHz

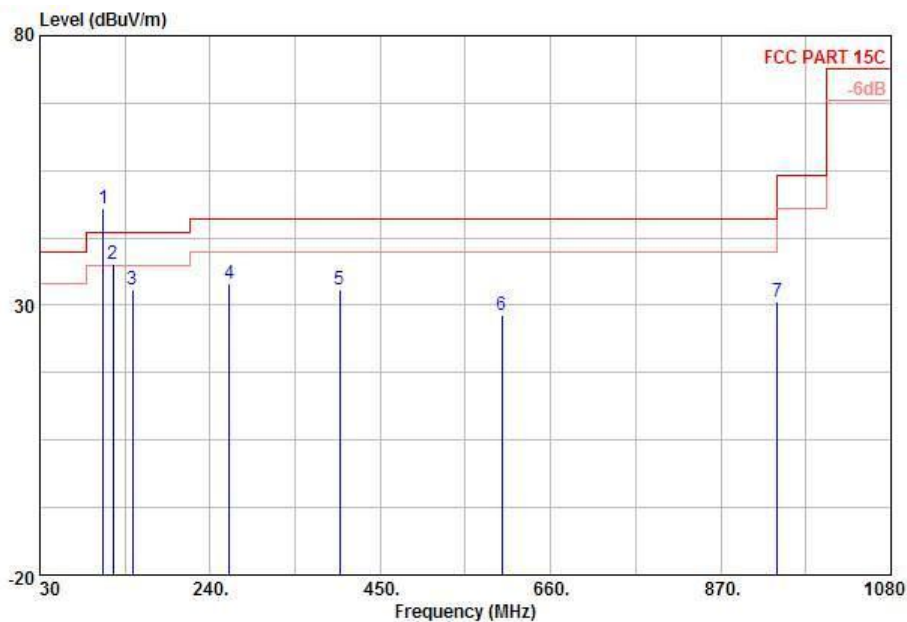
|   | Freq   | Level  | Over   | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table | Remark |
|---|--------|--------|--------|--------|-------------|-------|--------|-------|-------|--------|
|   | MHz    | dBuV/m | Limit  | Line   | Level       | Loss  | Factor | Pos   | Pos   |        |
|   |        |        | dB     | dBuV/m | dBuV        | dB/m  | dB     | dB    | cm    | deg    |
| 1 | 88.59  | 40.16  | -3.34  | 43.50  | 61.48       | 8.30  | 0.38   | 30.00 | ---   | Peak   |
| 2 | 98.00  | 60.73  |        |        | 80.14       | 10.15 | 0.41   | 29.97 | ---   | Peak   |
| 3 | 109.38 | 38.16  | -5.34  | 43.50  | 55.90       | 11.80 | 0.43   | 29.97 | 100   | 0 QP   |
| 4 | 161.49 | 40.49  | -3.01  | 43.50  | 60.36       | 9.53  | 0.53   | 29.93 | ---   | Peak   |
| 5 | 465.20 | 37.03  | -8.97  | 46.00  | 49.35       | 16.53 | 0.92   | 29.77 | ---   | Peak   |
| 6 | 484.80 | 37.76  | -8.24  | 46.00  | 49.60       | 16.97 | 0.94   | 29.75 | ---   | Peak   |
| 7 | 503.70 | 35.74  | -10.26 | 46.00  | 47.25       | 17.26 | 0.96   | 29.73 | ---   | Peak   |



# FCC RF Test Report

Report No. : FR101803C

|                  |                                          |                     |            |
|------------------|------------------------------------------|---------------------|------------|
| Test Mode :      | Mode 3                                   | Temperature :       | 21~22°C    |
| Test Frequency : | FM Tx Mode for 107.9MHz                  | Relative Humidity : | 41~42%     |
| Test Engineer :  | Chenmy Cheng                             | Polarization :      | Horizontal |
| Remark :         | #1 is FM Tx signal which can be ignored. |                     |            |



Site : 03CH01-KS  
Condition: FCC PART 15C 3m LF\_ANT\_100803 HORIZONTAL  
Project : (FR) 101803  
Mode : mode 3  
: 107.9 MHz

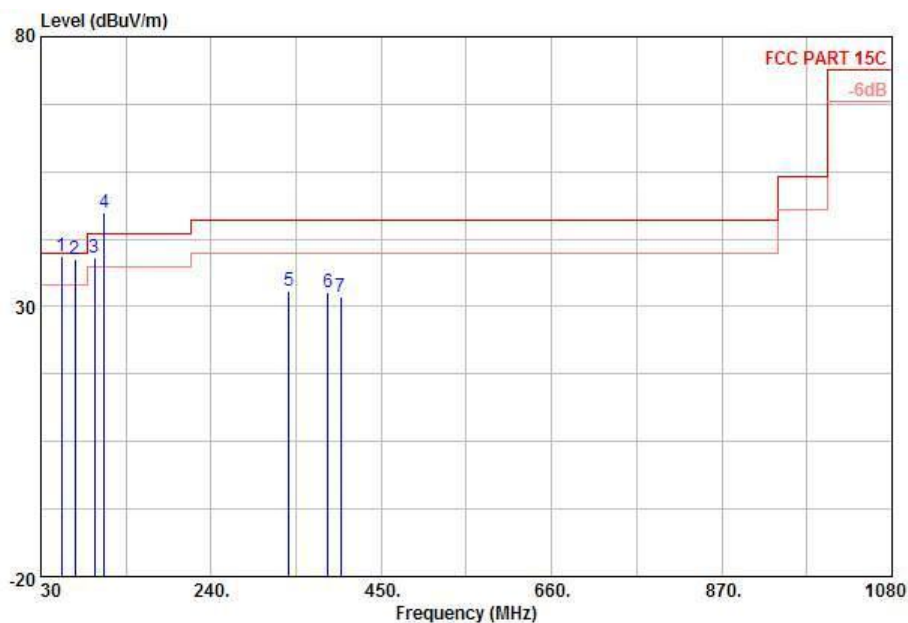
|     | Freq   | Level  | Over   | Limit  | ReadAntenna | Cable | Preamp | Ant   | Table | Remark   |
|-----|--------|--------|--------|--------|-------------|-------|--------|-------|-------|----------|
|     | MHz    | dBuV/m | Limit  | Line   | Level       | Loss  | Factor | Pos   | Pos   |          |
|     |        |        | dB     | dBuV/m | dBuV        |       | dB     | cm    | deg   |          |
| 1 X | 107.90 | 47.90  |        |        | 65.87       | 11.56 | 0.43   | 29.96 | ---   | Peak     |
| 2 ! | 119.91 | 37.62  | -5.88  | 43.50  | 55.34       | 11.80 | 0.45   | 29.97 | 100   | 201 Peak |
| 3   | 143.94 | 32.82  | -10.68 | 43.50  | 51.76       | 10.55 | 0.50   | 29.99 | ---   | Peak     |
| 4   | 264.09 | 34.01  | -11.99 | 46.00  | 50.97       | 12.23 | 0.68   | 29.87 | ---   | Peak     |
| 5   | 400.10 | 33.02  | -12.98 | 46.00  | 46.01       | 16.00 | 0.84   | 29.83 | ---   | Peak     |
| 6   | 600.30 | 28.27  | -17.73 | 46.00  | 38.22       | 18.60 | 1.07   | 29.62 | ---   | Peak     |
| 7   | 939.80 | 30.79  | -15.21 | 46.00  | 38.30       | 20.69 | 1.33   | 29.53 | ---   | Peak     |



# FCC RF Test Report

Report No. : FR101803C

|                  |                                          |                     |          |
|------------------|------------------------------------------|---------------------|----------|
| Test Mode :      | Mode 3                                   | Temperature :       | 21~22°C  |
| Test Frequency : | FM Tx Mode for 107.9MHz                  | Relative Humidity : | 41~42%   |
| Test Engineer :  | Chenmy Cheng                             | Polarization :      | Vertical |
| Remark :         | #4 is FM Tx signal which can be ignored. |                     |          |



Site : 03CH01-KS  
Condition: FCC PART 15C 3m LF\_ANT\_100803 VERTICAL  
Project : (FR) 101803  
Mode : mode 3  
: 107.9 MHz

|   | Freq   | Level  | Over   | Limit  | ReadAntenna | Cable  | Preamp | Ant    | Table | Remark |
|---|--------|--------|--------|--------|-------------|--------|--------|--------|-------|--------|
|   | MHz    | dBuV/m | Limit  | Line   | Level       | Factor | Loss   | Factor | Pos   | Pos    |
|   |        |        | dB     | dBuV/m | dBuV        | dB/m   | dB     | dB     | cm    | deg    |
| 1 | 55.11  | 39.46  | -0.54  | 40.00  | 63.10       | 6.20   | 0.29   | 30.13  | 100   | 122 QP |
| 2 | 71.85  | 38.65  | -1.35  | 40.00  | 62.92       | 5.46   | 0.34   | 30.07  | 100   | 198 QP |
| 3 | 95.88  | 39.00  | -4.50  | 43.50  | 58.66       | 9.91   | 0.40   | 29.97  | ---   | Peak   |
| 4 | 107.90 | 47.39  |        |        | 65.36       | 11.56  | 0.43   | 29.96  | ---   | Peak   |
| 5 | 335.70 | 32.86  | -13.14 | 46.00  | 47.86       | 14.14  | 0.80   | 29.94  | ---   | Peak   |
| 6 | 384.00 | 32.52  | -13.48 | 46.00  | 45.96       | 15.59  | 0.83   | 29.86  | ---   | Peak   |
| 7 | 400.10 | 31.73  | -14.27 | 46.00  | 44.72       | 16.00  | 0.84   | 29.83  | ---   | Peak   |

### **3.4 AC Conducted Emission Measurement**

#### **3.4.1 Limit of AC Conducted Emission**

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

| Frequency of Emission<br>(MHz) | Conducted Limit (dBuV) |           |
|--------------------------------|------------------------|-----------|
|                                | Quasi-Peak             | Average   |
| 0.15-0.5                       | 66 to 56*              | 56 to 46* |
| 0.5-5                          | 56                     | 46        |
| 5-30                           | 60                     | 50        |

\*Decreases with the logarithm of the frequency.

#### **3.4.2 Measuring Instruments**

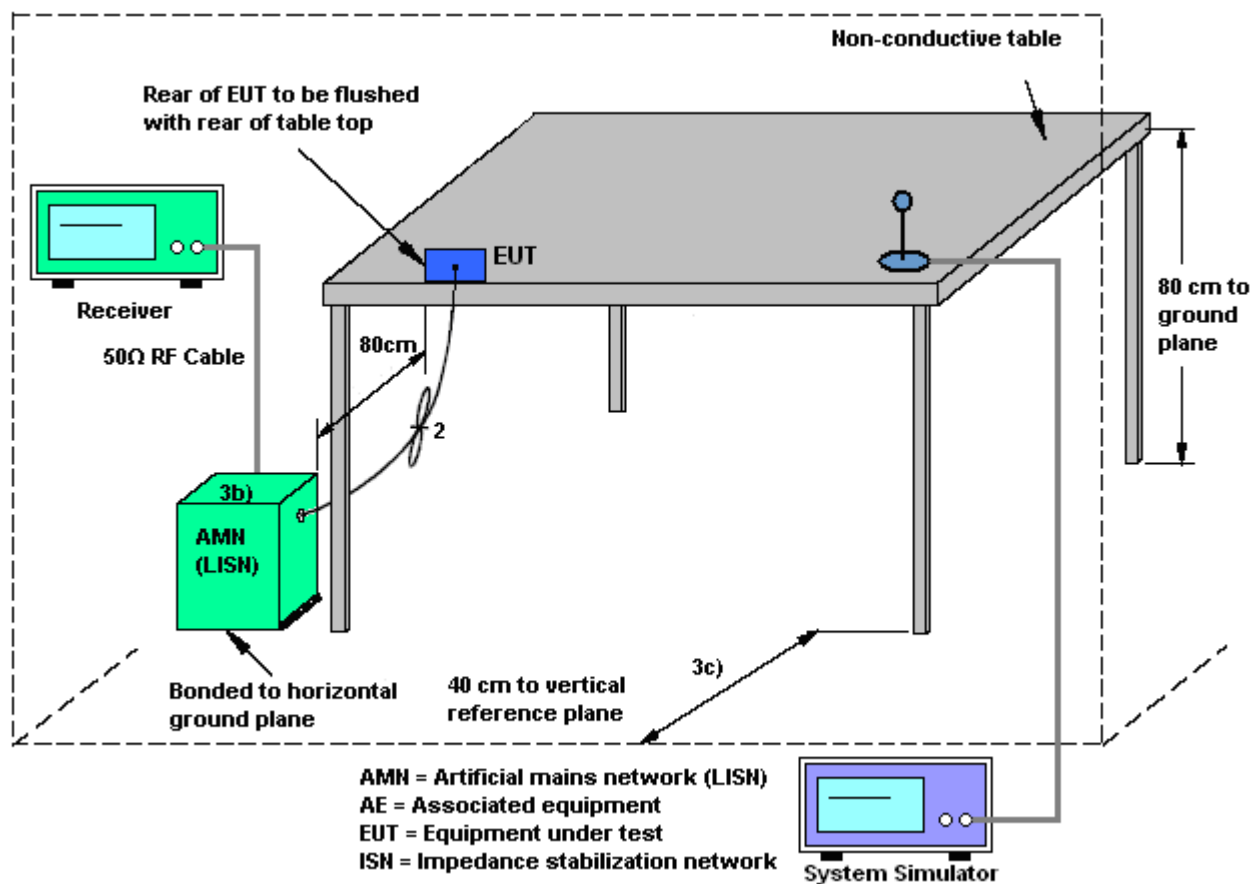
See list of measuring instruments of this test report.

#### **3.4.3 Test Procedures**

1. The testing follows the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

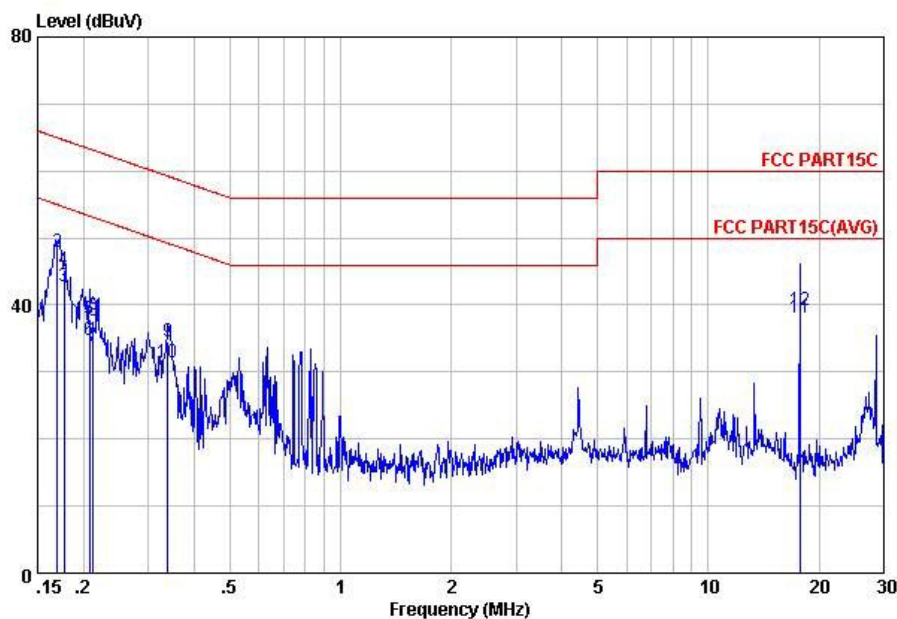


### 3.4.4 Test Setup



**3.4.5 Test Result of AC Conducted Emission**

|                 |                                                                                 |                     |        |
|-----------------|---------------------------------------------------------------------------------|---------------------|--------|
| Test Mode :     | Mode 1                                                                          | Temperature :       | 19~20℃ |
| Test Engineer : | Tom Wang                                                                        | Relative Humidity : | 39~40% |
| Test Voltage :  | 120Vac / 60Hz                                                                   | Phase :             | Line   |
| Function Type : | FM Tx Mode for 98.0MHz                                                          |                     |        |
| Remark :        | All emissions not reported here are more than 10 dB below the prescribed limit. |                     |        |



Site : C001-KS  
Condition: FCC PART15C DC LISN-100807 LINE  
Project : (FR) 101803  
mode : Mode 1

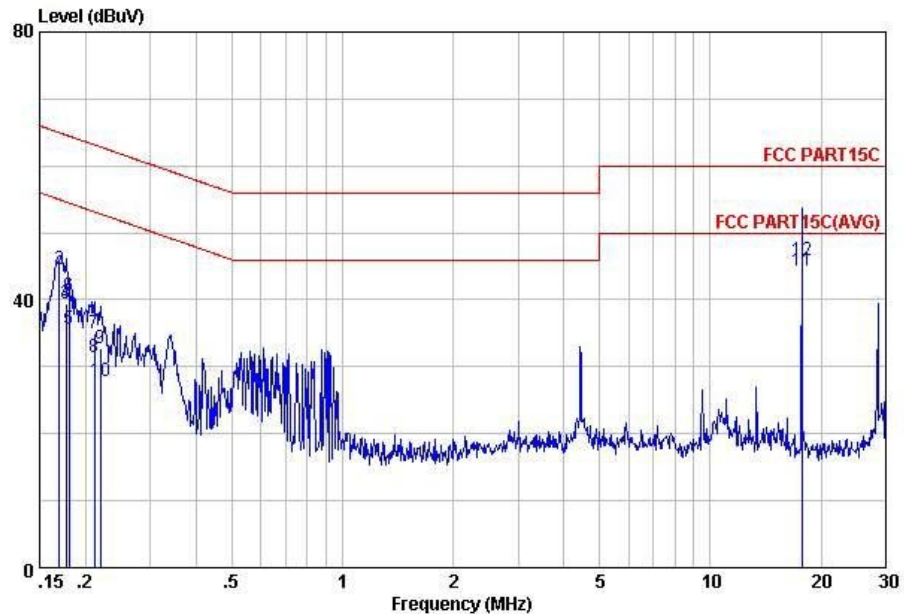
|    | Freq  | Level | Over   | Limit | Read  | LISN   | Cable |         |
|----|-------|-------|--------|-------|-------|--------|-------|---------|
|    | MHz   | dBuV  | Limit  | Line  | Level | Factor | Loss  | Remark  |
|    |       |       | dB     | dBuV  | dBuV  | dB     | dB    |         |
| 1  | 0.17  | 46.72 | -8.27  | 54.99 | 37.10 | -0.52  | 10.14 | Average |
| 2  | 0.17  | 48.02 | -16.97 | 64.99 | 38.40 | -0.52  | 10.14 | QP      |
| 3  | 0.18  | 42.75 | -11.89 | 54.64 | 33.09 | -0.49  | 10.15 | Average |
| 4  | 0.18  | 45.15 | -19.49 | 64.64 | 35.49 | -0.49  | 10.15 | QP      |
| 5  | 0.21  | 37.92 | -25.40 | 63.32 | 28.21 | -0.44  | 10.15 | QP      |
| 6  | 0.21  | 34.82 | -18.50 | 53.32 | 25.11 | -0.44  | 10.15 | Average |
| 7  | 0.21  | 33.83 | -19.27 | 53.10 | 24.10 | -0.42  | 10.15 | Average |
| 8  | 0.21  | 37.69 | -25.41 | 63.10 | 27.96 | -0.42  | 10.15 | QP      |
| 9  | 0.34  | 34.48 | -24.74 | 59.22 | 24.50 | -0.20  | 10.18 | QP      |
| 10 | 0.34  | 31.38 | -17.84 | 49.22 | 21.40 | -0.20  | 10.18 | Average |
| 11 | 17.75 | 38.12 | -11.88 | 50.00 | 27.80 | -0.22  | 10.54 | Average |
| 12 | 17.75 | 39.22 | -20.78 | 60.00 | 28.90 | -0.22  | 10.54 | QP      |



# FCC RF Test Report

Report No. : FR101803C

|                 |                                                                                 |                     |         |
|-----------------|---------------------------------------------------------------------------------|---------------------|---------|
| Test Mode :     | Mode 1                                                                          | Temperature :       | 19~20°C |
| Test Engineer : | Tom Wang                                                                        | Relative Humidity : | 39~40%  |
| Test Voltage :  | 120Vac / 60Hz                                                                   | Phase :             | Neutral |
| Function Type : | FM Tx Mode for 98.0MHz                                                          |                     |         |
| Remark :        | All emissions not reported here are more than 10 dB below the prescribed limit. |                     |         |



Site : C001-KS  
Condition: FCC PART15C DC LISN-100807 NEUTRAL  
Project : (FR) 101803  
mode : Mode 1

|    | Freq  | Level | Over   | Limit | Read  | LISN   | Cable | Remark  |
|----|-------|-------|--------|-------|-------|--------|-------|---------|
|    | MHz   | dBuV  | Limit  | Line  | Level | Factor | Loss  |         |
|    |       |       | dB     | dBuV  | dBuV  | dB     | dB    |         |
| 1  | 0.17  | 43.32 | -11.67 | 54.99 | 33.70 | -0.52  | 10.14 | Average |
| 2  | 0.17  | 44.62 | -20.37 | 64.99 | 35.00 | -0.52  | 10.14 | QP      |
| 3  | 0.18  | 39.45 | -25.19 | 64.64 | 29.79 | -0.49  | 10.15 | QP      |
| 4  | 0.18  | 39.44 | -15.20 | 54.64 | 29.78 | -0.49  | 10.15 | Average |
| 5  | 0.18  | 35.66 | -18.80 | 54.46 | 25.99 | -0.48  | 10.15 | Average |
| 6  | 0.18  | 40.66 | -23.80 | 64.46 | 30.99 | -0.48  | 10.15 | QP      |
| 7  | 0.21  | 35.03 | -28.11 | 63.14 | 25.31 | -0.43  | 10.15 | QP      |
| 8  | 0.21  | 31.53 | -21.61 | 53.14 | 21.81 | -0.43  | 10.15 | Average |
| 9  | 0.22  | 32.75 | -30.08 | 62.83 | 23.00 | -0.40  | 10.15 | QP      |
| 10 | 0.22  | 27.95 | -24.88 | 52.83 | 18.20 | -0.40  | 10.15 | Average |
| 11 | 17.75 | 44.32 | -5.68  | 50.00 | 34.00 | -0.22  | 10.54 | Average |
| 12 | 17.75 | 45.92 | -14.08 | 60.00 | 35.60 | -0.22  | 10.54 | QP      |



## **3.5 Antenna Requirements**

### **3.5.1 Standard Applicable**

The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

### **3.5.2 Antenna Connected Construction**

The antennas type used in this product is Wire Antenna and it is considered to meet antenna requirement.



## 4 List of Measuring Equipment

| Instrument                | Manufacturer | Model No. | Serial No.       | Characteristics | Calibration Date | Test Date     | Due Date      | Remark                |
|---------------------------|--------------|-----------|------------------|-----------------|------------------|---------------|---------------|-----------------------|
| EMI Receiver              | R&S          | ESCI7     | 100768           | 9kHz~7GHz       | Jun. 02, 2011    | Mar. 17, 2012 | Jun. 01, 2012 | Conduction (CO01-KS)  |
| LISN                      | MessTec      | AN3016    | 60103            | 9kHz~30MHz      | Dec. 30, 2011    | Mar. 17, 2012 | Dec. 29, 2012 | Conduction (CO01-KS)  |
| LISN                      | MessTec      | AN3016    | 60105            | 9kHz~30MHz      | Dec. 30, 2011    | Mar. 17, 2012 | Dec. 29, 2012 | Conduction (CO01-KS)  |
| AC Power Source           | Chroma       | 61602     | ABP00000<br>0811 | N/A             | Nov. 16, 2011    | Mar. 17, 2012 | Nov. 15, 2012 | Conduction (CO01-KS)  |
| EMI Test Receiver         | R&S          | ESCI      | 100534           | 9kHz~3GHz       | Nov. 16, 2011    | Apr. 10, 2012 | Nov. 15, 2012 | Radiation (03CH01-KS) |
| Spectrum Analyzer         | R&S          | FSP40     | 100319           | 9kHz~40GHz      | Dec. 30, 2011    | Apr. 10, 2012 | Dec. 29, 2012 | Radiation (03CH01-KS) |
| Bilog Antenna             | SCHAFFNER    | CBL6112D  | 23182            | 25MHz~2GHz      | Dec. 08, 2011    | Apr. 10, 2012 | Dec. 07, 2012 | Radiation (03CH01-KS) |
| Loop Antenna              | R&S          | HFH2-Z2   | 860004/00        | 9 kHz~30 MHz    | Jul. 28, 2011    | Apr. 10, 2012 | Jul. 27, 2012 | Radiation (03CH01-KS) |
| Double Ridge Horn Antenna | EMCO         | 3117      | 00075959         | 1GHz~18GHz      | Jan. 06, 2012    | Apr. 10, 2012 | Jan. 05, 2013 | Radiation (03CH01-KS) |
| Amplifier                 | Wireless     | FPA-6592G | 060004           | 30MHz~2GHz      | Dec. 30, 2011    | Apr. 10, 2012 | Dec. 29, 2012 | Radiation (03CH01-KS) |
| Amplifier                 | Agilent      | 8449B     | 3008A023<br>70   | 1GHz~26.5GHz    | Dec. 30, 2011    | Apr. 10, 2012 | Dec. 29, 2012 | Radiation (03CH01-KS) |
| Active Horn Antenna       | com-power    | AHA-118   | 701023           | 1GHz~18GHz      | Nov. 07, 2011    | Apr. 10, 2012 | Nov. 06, 2012 | Radiation (03CH01-KS) |
| SHF-EHF Horn              | Schwarzbeck  | BBHA 9170 | BBHA1702<br>49   | 15GHz -40GHz    | Oct. 11, 2011    | Apr. 10, 2012 | Oct. 10, 2012 | Radiation (03CH01-KS) |

## 5 Uncertainty of Evaluation

### Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

| Contribution                                                                             | Uncertainty of $X_i$ |                          | $u(X_i)$ |
|------------------------------------------------------------------------------------------|----------------------|--------------------------|----------|
|                                                                                          | dB                   | Probability Distribution |          |
| Receiver Reading                                                                         | 0.10                 | Normal (k=2)             | 0.05     |
| Cable Loss                                                                               | 0.10                 | Normal (k=2)             | 0.05     |
| AMN Insertion Loss                                                                       | 2.50                 | Rectangular              | 0.63     |
| Receiver Specification                                                                   | 1.50                 | Rectangular              | 0.43     |
| Site Imperfection                                                                        | 1.39                 | Rectangular              | 0.80     |
| Mismatch                                                                                 | +0.34 / -0.35        | U-Shape                  | 0.24     |
| <b>Combined Standard Uncertainty <math>U_c(y)</math></b>                                 | <b>1.13</b>          |                          |          |
| <b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b> | <b>2.26</b>          |                          |          |

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

| Contribution                                                                             | Uncertainty of $X_i$ |                          | $u(X_i)$ |
|------------------------------------------------------------------------------------------|----------------------|--------------------------|----------|
|                                                                                          | dB                   | Probability Distribution |          |
| Receiver Reading                                                                         | 0.41                 | Normal (k=2)             | 0.21     |
| Antenna Factor Calibration                                                               | 0.83                 | Normal (k=2)             | 0.42     |
| Cable Loss Calibration                                                                   | 0.25                 | Normal (k=2)             | 0.13     |
| Pre-Amplifier Gain Calibration                                                           | 0.27                 | Normal (k=2)             | 0.14     |
| RCV/SPA Specification                                                                    | 2.50                 | Rectangular              | 0.72     |
| Antenna Factor Interpolation for Frequency                                               | 1.00                 | Rectangular              | 0.29     |
| Site Imperfection                                                                        | 1.43                 | Rectangular              | 0.83     |
| Mismatch                                                                                 | +0.39 / -0.41        | U-Shape                  | 0.28     |
| <b>Combined Standard Uncertainty <math>U_c(y)</math></b>                                 | <b>1.27</b>          |                          |          |
| <b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b> | <b>2.54</b>          |                          |          |

**Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)**

| Contribution                                                                                                                         | Uncertainty of $X_i$ |                          | $u(X_i)$ | $C_i$ | $C_i * u(X_i)$ |
|--------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------|----------|-------|----------------|
|                                                                                                                                      | dB                   | Probability Distribution |          |       |                |
| Receiver Reading                                                                                                                     | $\pm 0.10$           | Normal (k=2)             | 0.10     | 1     | 0.10           |
| Antenna Factor Calibration                                                                                                           | $\pm 1.70$           | Normal (k=2)             | 0.85     | 1     | 0.85           |
| Cable Loss Calibration                                                                                                               | $\pm 0.50$           | Normal (k=2)             | 0.25     | 1     | 0.25           |
| Receiver Correction                                                                                                                  | $\pm 2.00$           | Rectangular              | 1.15     | 1     | 1.15           |
| Antenna Factor Directional                                                                                                           | $\pm 1.50$           | Rectangular              | 0.87     | 1     | 0.87           |
| Site Imperfection                                                                                                                    | $\pm 2.80$           | Triangular               | 1.14     | 1     | 1.14           |
| Mismatch<br>Receiver VSWR $\Gamma_1 = 0.197$<br>Antenna VSWR $\Gamma_2 = 0.194$<br>Uncertainty = $20\text{Log}(1-\Gamma_1*\Gamma_2)$ | +0.34 / -0.35        | U-Shape                  | 0.244    | 1     | 0.244          |
| <b>Combined Standard Uncertainty<br/><math>U_c(y)</math></b>                                                                         | <b>2.36</b>          |                          |          |       |                |
| <b>Measuring Uncertainty for a<br/>Level of Confidence of 95%<br/>(<math>U = 2U_c(y)</math>)</b>                                     | <b>4.72</b>          |                          |          |       |                |



## **Appendix A. Photographs of EUT**

Please refer to Sporton report number EP1O1803 as below.