

# FCC RF Test Report

For

**Shenzhen Hastech industries Co., Ltd.**

|                       |                                                                                                                     |
|-----------------------|---------------------------------------------------------------------------------------------------------------------|
| Test Standards:       | <u>Part 15C Subpart C §15.247</u>                                                                                   |
| Product Description:  | <u>Bluetooth Keyboard</u>                                                                                           |
| Tested Model:         | <u>HB115</u>                                                                                                        |
| Additional Model No.: | <u>N/A</u>                                                                                                          |
| FCC ID:               | 2AC9LHB115                                                                                                          |
| Classification        | Digital Spread Spectrum (DSS)                                                                                       |
| Report No.:           | <u>EC1910023RF01</u>                                                                                                |
| Tested Date:          | <u>2019-10-14 to 2019-11-11</u>                                                                                     |
| Issued Date:          | <u>2019-11-11</u>                                                                                                   |
| Prepared By:          | <u></u><br>Jerry Wang / Engineer |
| Approved By:          | <u></u><br>Bacon Wu / RF Manager |

**Hunan Ecloud Testing Technology Co., Ltd.**

Building A1, Changsha E Center, No. 18 Xiangtai Avenue, Liuyang Economic and  
Technological Development Zone, Hunan, P.R.C

Tel.: +86-731-89634887 Fax.: +86-731-89634887

[www.hn-ecloud.com](http://www.hn-ecloud.com)

Note: The test results in this report apply exclusively to the tested model / sample. Without written approval of Hunan Ecloud Testing Technology Co., Ltd., the test report shall not be reproduced except in full.

## Report Revise Record

| Report Version | Revise Time | Issued Date | Valid Version | Notes           |
|----------------|-------------|-------------|---------------|-----------------|
| V1.0           | /           | 2019.11.11  | Valid         | Original Report |

## TABLE OF CONTENTS

|                                             |                                                             |           |
|---------------------------------------------|-------------------------------------------------------------|-----------|
| <b>1</b>                                    | <b>TEST LABORATORY .....</b>                                | <b>5</b>  |
| 1.1                                         | Test facility .....                                         | 5         |
| <b>2</b>                                    | <b>GENERAL DESCRIPTION.....</b>                             | <b>6</b>  |
| 2.1                                         | Applicant .....                                             | 6         |
| 2.2                                         | Manufacturer.....                                           | 6         |
| 2.3                                         | General Description Of EUT .....                            | 6         |
| 2.4                                         | Modification of EUT .....                                   | 7         |
| 2.5                                         | Applicable Standards.....                                   | 7         |
| <b>3</b>                                    | <b>TEST CONFIGURATION OF EQUIPMENT UNDER TEST.....</b>      | <b>8</b>  |
| 3.1                                         | Descriptions of Test Mode .....                             | 8         |
| 3.2                                         | Test Mode.....                                              | 9         |
| 3.3                                         | Support Equipment .....                                     | 10        |
| 3.4                                         | Test Setup .....                                            | 10        |
| 3.5                                         | Measurement Results Explanation Example.....                | 12        |
| <b>4</b>                                    | <b>TEST RESULT .....</b>                                    | <b>13</b> |
| 4.1                                         | Conducted Spurious Emission Measurement .....               | 13        |
| 4.2                                         | Radiated Band Edges and Spurious Emission Measurement ..... | 17        |
| 4.3                                         | AC Conducted Emission Measurement.....                      | 47        |
| <b>5</b>                                    | <b>LIST OF MEASURING EQUIPMENT.....</b>                     | <b>50</b> |
| <b>6</b>                                    | <b>UNCERTAINTY OF EVALUATION.....</b>                       | <b>52</b> |
| <b>APPENDIX A. SETUP PHOTOGRAPHS</b>        |                                                             |           |
| <b>APPENDIX B. EUT EXTERNAL PHOTOGRAPHS</b> |                                                             |           |
| <b>APPENDIX C. EUT INTERNAL PHOTOGRAPHS</b> |                                                             |           |

## Summary of Test Result

| FCC Rule  | Description                                        | Limit                 | Result | Remark                                   |
|-----------|----------------------------------------------------|-----------------------|--------|------------------------------------------|
| 15.247(d) | Radiated Band Edges and Radiated Spurious Emission | 15.209(a) & 15.247(d) | Pass   | Under limit<br>5.56 dB at<br>252.13 MHz  |
| 15.207    | AC Conducted Emission                              | 15.207(a)             | Pass   | Under limit<br>30.42 dB at<br>16.928 MHz |

## **1 Test Laboratory**

### **1.1 Test facility**

#### **CNAS ( accreditation number:L11138 )**

Hunan Ecloud Testing Technology Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

#### **FCC (Designation number:CN1244 , Test Firm Registration**

#### **Number:793308 )**

Hunan Ecloud Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

#### **ISED(CAB identifier: CN0012, ISED# :24347)**

Hunan Ecloud Testing Technology Co., Ltd. has been listed on the Wireless Device Testing Laboratories list of innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements.

#### **A2LA (Certificate Number:4895.01)**

Hunan Ecloud Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

## 2 General Description

### 2.1 Applicant

**Shenzhen Hastech industries Co., Ltd.**

G-A1 BLDG, Democracy West Industry Park, Shajing Town, Baoan District, Shenzhen, China

### 2.2 Manufacturer

**Shenzhen Hastech industries Co., Ltd.**

G-A1 BLDG, Democracy West Industry Park, Shajing Town, Baoan District, Shenzhen, China

### 2.3 General Description Of EUT

|                               |                                                                   |
|-------------------------------|-------------------------------------------------------------------|
| <b>Product</b>                | Bluetooth Keyboard                                                |
| <b>Model No.</b>              | HB115                                                             |
| <b>Additional No.</b>         | N/A                                                               |
| <b>Difference Description</b> | N/A                                                               |
| <b>FCC ID</b>                 | 2AC9LHB115                                                        |
| <b>Power Supply</b>           | 5Vdc (From adapter or host equipment)<br>3.7Vdc (Li-ion, polymer) |
| <b>Modulation Technology</b>  | FHSS                                                              |
| <b>Modulation Type</b>        | GFSK                                                              |
| <b>Bluetooth Version</b>      | V 3.0                                                             |
| <b>Operating Frequency</b>    | 2402MHz~2480MHz                                                   |
| <b>Number Of Channel</b>      | 79                                                                |
| <b>Max. Output Power</b>      | Bluetooth BR(1Mbps) : -4.81 dBm (0.0003W)                         |
| <b>Antenna Type</b>           | PCB Antenna type with 0dBi gain                                   |
| <b>I/O Ports</b>              | Refer to user's manual                                            |
| <b>Cable Supplied</b>         | N/A                                                               |

**NOTE:**

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

## 2.4 Modification of EUT

No modifications are made to the EUT during all test items.

## 2.5 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ ANSI C63.10-2013
- ♦ KDB 558074 D01 15.247 Meas Guidance v05r02

### Remark:

1. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

### 3 Test Configuration of Equipment Under Test

#### 3.1 Descriptions of Test Mode

The transmitter has a maximum peak conducted output power as follows:

| Channel | Frequency | Mode | Bluetooth RF Output Power |
|---------|-----------|------|---------------------------|
| Ch00    | 2402MHz   | GFSK | -4.81                     |
| Ch39    | 2441MHz   | GFSK | -4.91                     |
| Ch78    | 2480MHz   | GFSK | -5.51                     |

**Remark:**

1. All the test data for each data rate were verified, but only the worst case was reported.
2. The data rate was set in 1Mbps for all the test items due to the highest RF output power.
  - a. Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.
  - b. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

## 3.2 Test Mode

### 3.2.1 Radiated Emission Test (Below 1GHz)

| Radiated<br>Test Cases | Bluetooth BR 1Mbps GFSK |
|------------------------|-------------------------|
|                        | Mode 1: CH00_2402 MHz   |

- Note : 1. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type. Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.
2. Following channel(s) was (were) selected for the final test as listed above

### 3.2.2 Radiated Emission Test (Above 1GHz)

| Radiated<br>Test Cases | Bluetooth BR 1Mbps GFSK |
|------------------------|-------------------------|
|                        | Mode 1: CH00_2402 MHz   |
|                        | Mode 2: CH39_2441 MHz   |
|                        | Mode 3: CH78_2480 MHz   |

- Note : 1. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.
2. Following channel(s) was (were) selected for the final test as listed above
3. For frequency above 18GHz, the measured value is much lower than the limit, therefore, it is not reflected in the report.

### 3.2.3 Power Line Conducted Emission Test:

| AC<br>Conducted<br>Emission | Mode 1 : Bluetooth Link + USB Cable (Charging from Adapter) |
|-----------------------------|-------------------------------------------------------------|
|-----------------------------|-------------------------------------------------------------|

### 3.3 Support Equipment

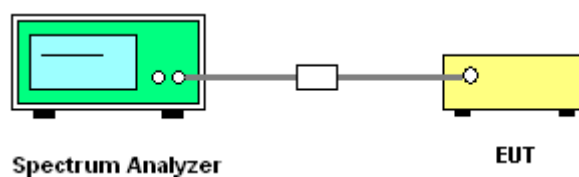
| Item | Equipment      | Trade Name | Model Name   | FCC ID  | Data Cable | Power Cord                                                         |
|------|----------------|------------|--------------|---------|------------|--------------------------------------------------------------------|
| 1.   | AC Adapter     | HUAWEI     | HW-059200CHQ | FCC DOC | N/A        | N/A                                                                |
| 2.   | MicroUSB Cable | N/A        | N/A          | N/A     | N/A        | unshielded 0.8m<br>with magnetic<br>ring                           |
| 3.   | Notebook       | Lenovo     | E470C        | FCC DoC | N/A        | shielded cable<br>DC O/P 1.8 m<br>unshielded AC<br>I/P cable 1.2 m |

### 3.4 Test Setup

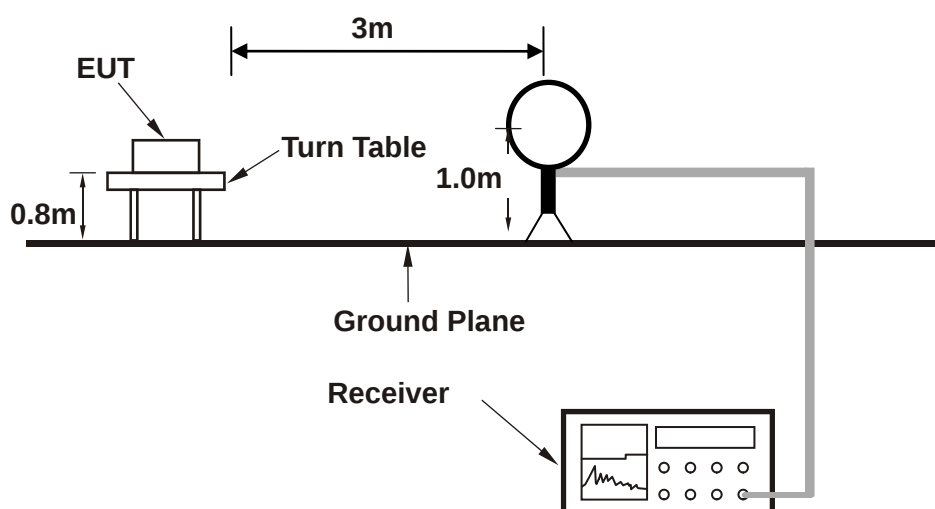
The EUT is continuously communicating to the Bluetooth tester during the tests.

EUT was set in the Hidden menu mode to enable BT communications.

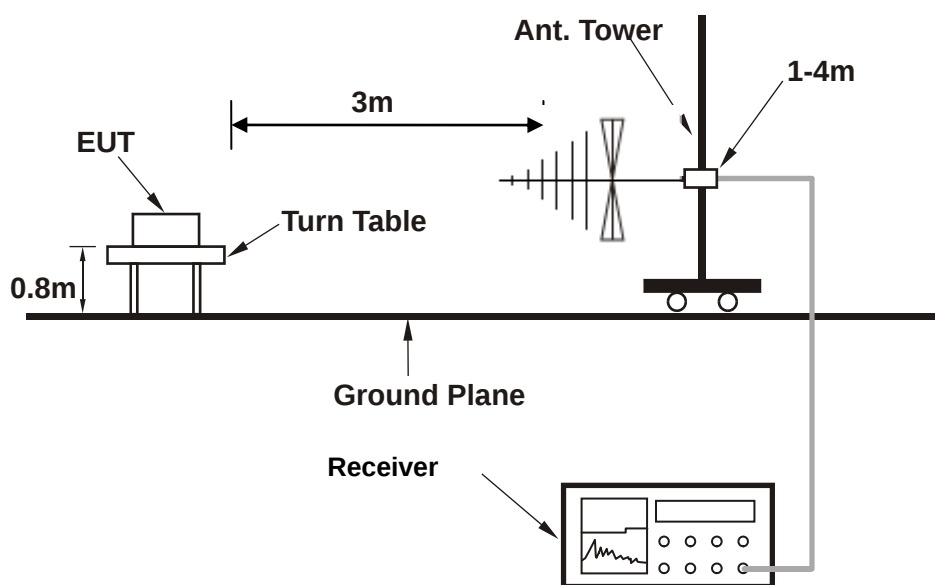
#### Setup diagram for Conducted Test



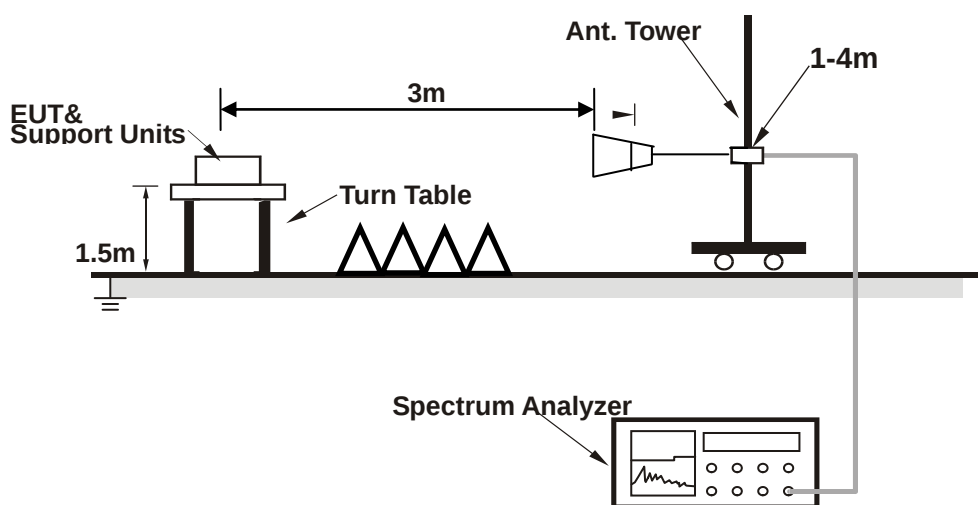
#### Setup diagram for Radiation(9KHz~30MHz) Test



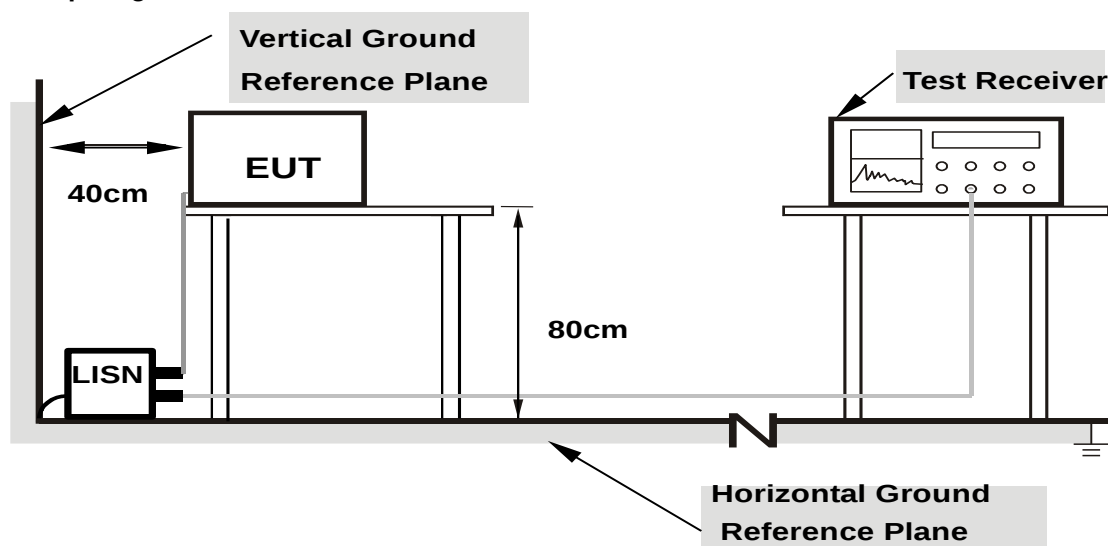
### Setup diagram for Radiation(Below 1G) Test



### Setup diagram for Radiation(Above1G) Test



Setup diagram for AC Conducted Emission Test



**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**

### 3.5 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 5 dB and 10dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 5 + 10 = 15 \text{ (dB)} \end{aligned}$$

**For all radiated test items:**

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

## 4 Test Result

### 4.1 Conducted Spurious Emission Measurement

#### 4.1.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

#### 4.1.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

#### 4.1.3 Test Result of Conducted Spurious Emission

| Test Mode :     |         | Transmitting   |  | Temperature :       | 24~26°C |         |
|-----------------|---------|----------------|--|---------------------|---------|---------|
| Test Engineer : |         | Victorique Gao |  | Relative Humidity : | 50~53%  |         |
| Mode            | Channel | Pref [dBm]     |  | Puw[dBm]            |         | Verdict |
| GFSK            | LCH     | -1.344         |  | <Limit              |         | PASS    |
| GFSK            | MCH     | 0.785          |  | <Limit              |         | PASS    |
| GFSK            | HCH     | 1.387          |  | <Limit              |         | PASS    |

# Conducted Spurious Emission Polt

## GFSK\_LCH\_Graphs

Pref

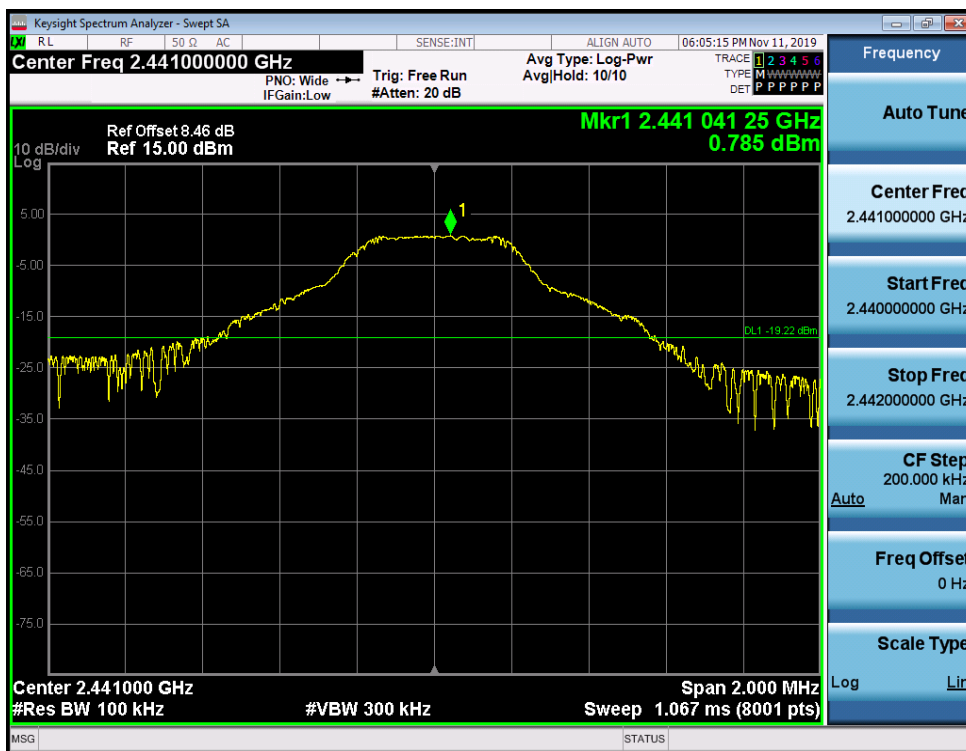


Puw



## GFSK\_MCH\_Graphs

Pref

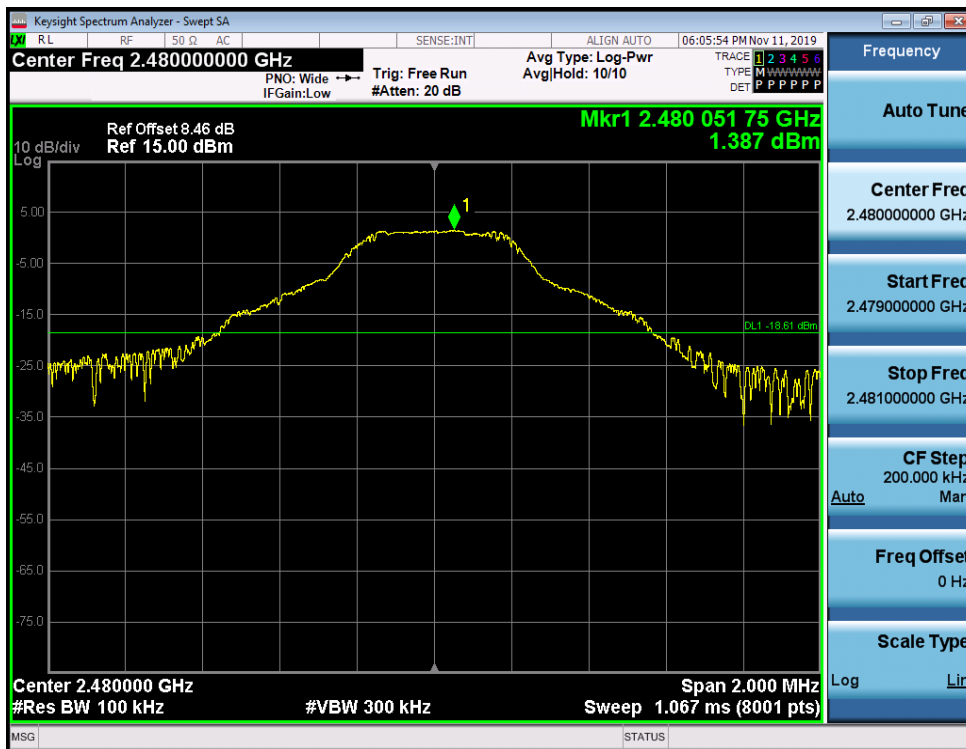


Puw



## GFSK\_HCH\_Graphs

Pref



Puw



## 4.2 Radiated Band Edges and Spurious Emission Measurement

### 4.2.1 Limit of Radiated Band Edges and Spurious Emission

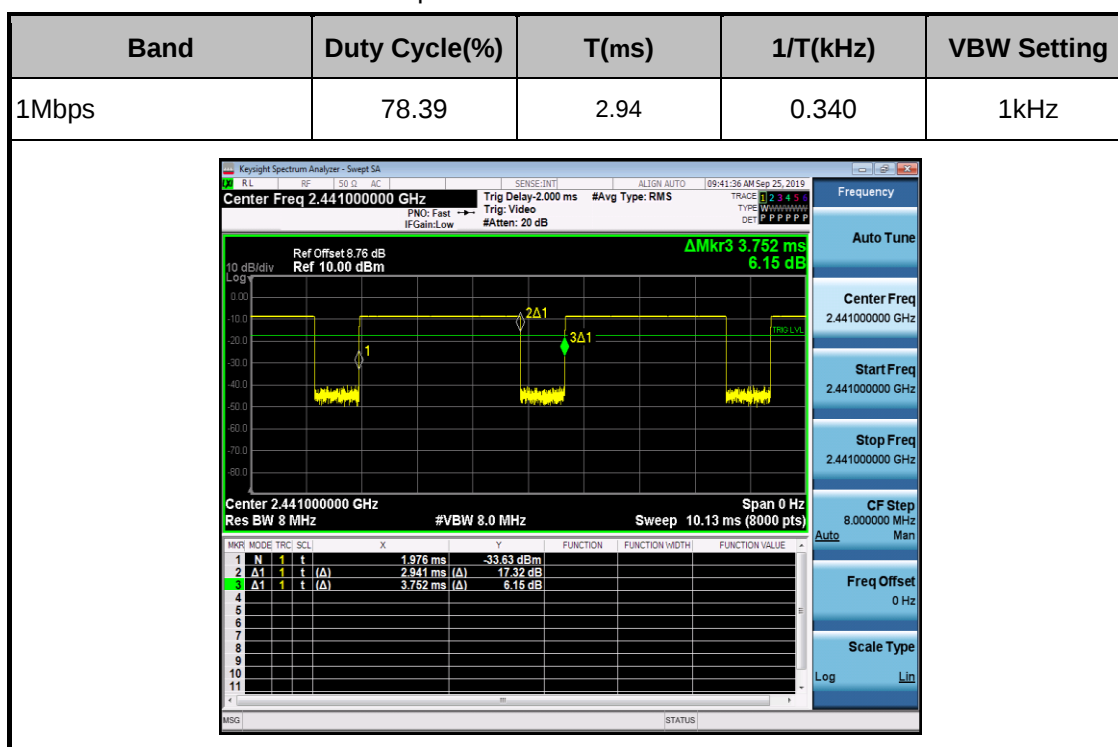
In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as 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                                |

Note: The frequency range from 9KHz to 10th harmonic (25GHz) are checked, and no any emissions were found from 18GHz to 25GHz, So the radiated emissions from 18GHz to 25GHz were not record.

## 4.2.2 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The measurement distance is 3 meter.
3. 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. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1$  GHz, RBW=1MHz for  $f > 1$  GHz ; VBW =3 \* RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
  - (3) For average measurement:  
VBW = 10 Hz, when duty cycle is no less than 98 percent.  
VBW  $\geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

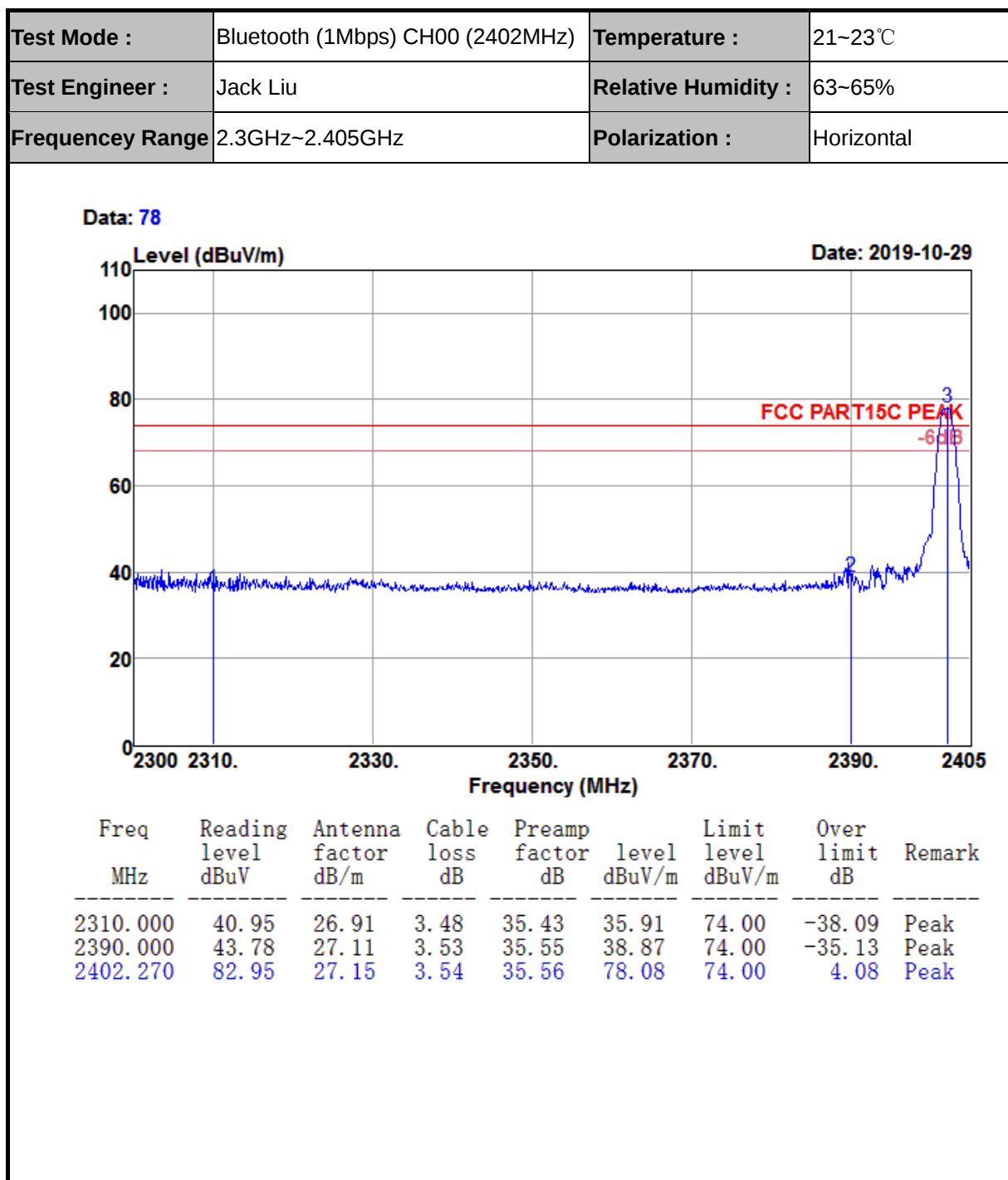


6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

### 4.2.3 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

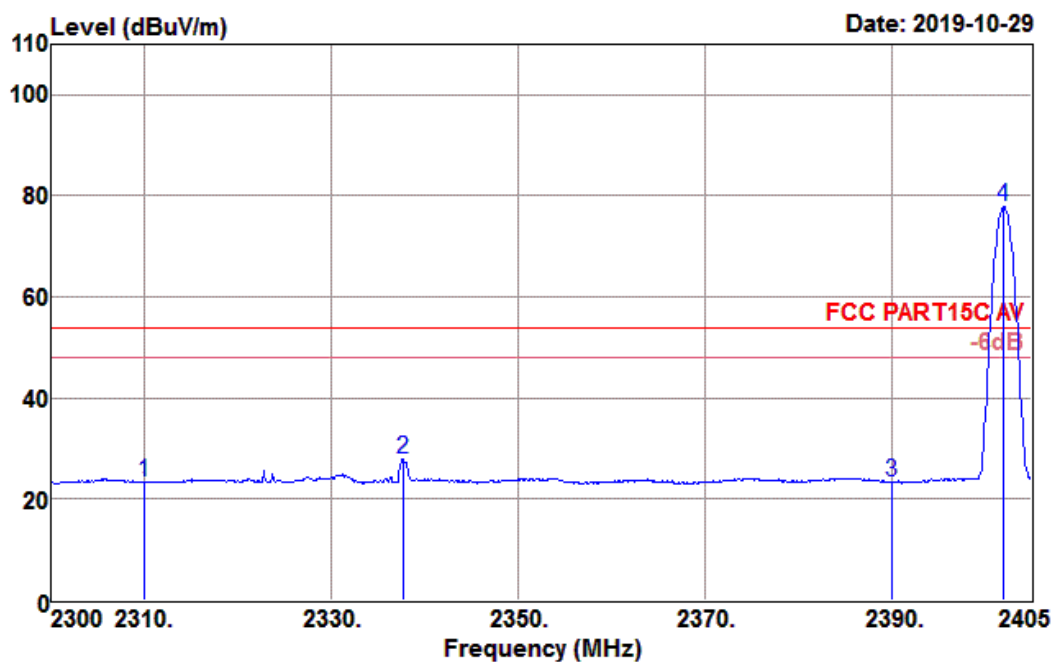
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

### 4.2.4 Test Result of Radiated Spurious at Band Edges



|                 |                                  |                     |            |
|-----------------|----------------------------------|---------------------|------------|
| Test Mode :     | Bluetooth (1Mbps) CH00 (2402MHz) | Temperature :       | 21~23℃     |
| Test Engineer : | Jerry Wang                       | Relative Humidity : | 63~65%     |
| Frequency Range | 2.3GHz~2.405GHz                  | Polarization :      | Horizontal |

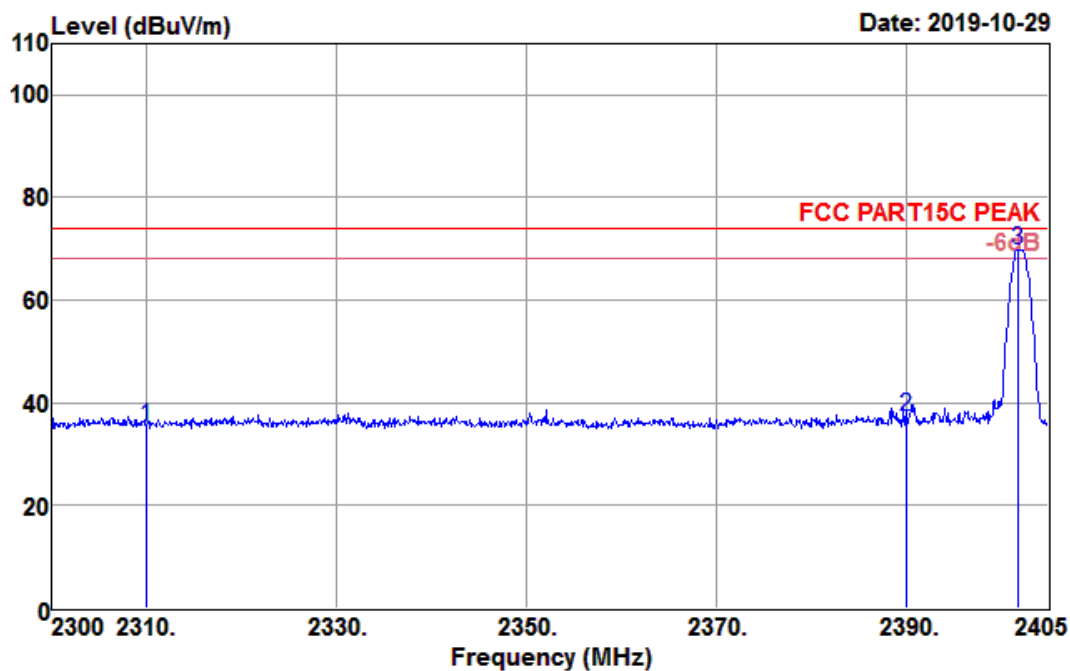
Data: 79



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|---------|
| 2310.000    | 28.41                    | 26.91                     | 3.48                | 35.43                  | 23.37           | 54.00                    | -30.63              | Average |
| 2337.695    | 33.05                    | 26.98                     | 3.50                | 35.47                  | 28.06           | 54.00                    | -25.94              | Average |
| 2390.000    | 28.29                    | 27.11                     | 3.53                | 35.55                  | 23.38           | 54.00                    | -30.62              | Average |
| 2402.060    | 82.72                    | 27.15                     | 3.54                | 35.56                  | 77.85           | 54.00                    | 23.85               | Average |

|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH00 (2402MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 2.3GHz~2.405GHz                  | Polarization :      | Vertical |

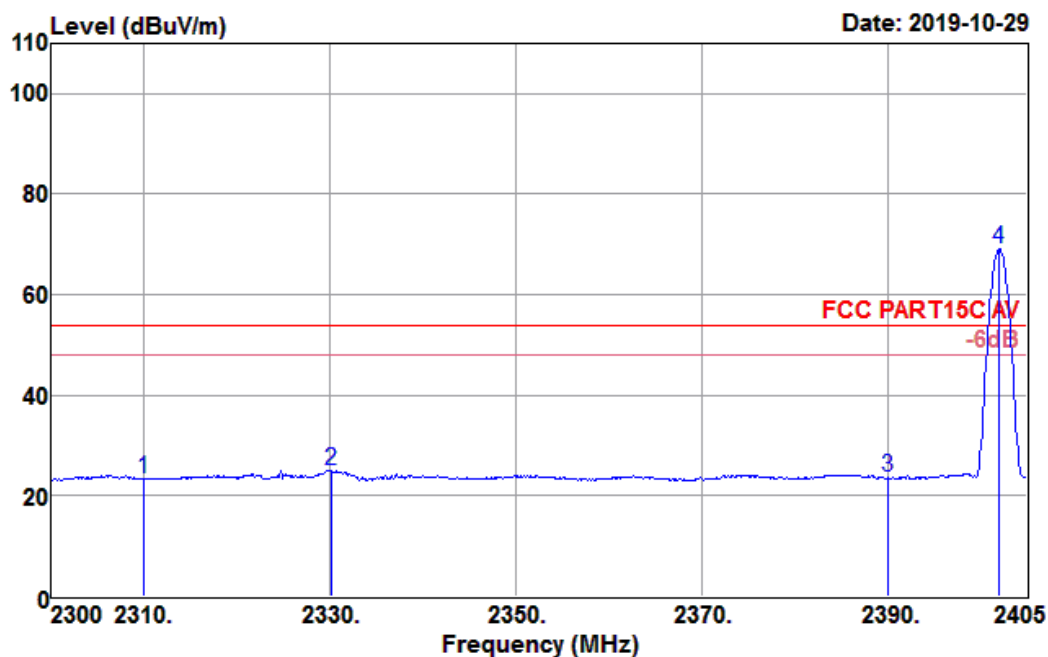
Data: 81



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|--------|
| 2310.000    | 40.54                    | 26.91                     | 3.48                | 35.43                  | 35.50           | 74.00                    | -38.50              | Peak   |
| 2390.000    | 42.24                    | 27.11                     | 3.53                | 35.55                  | 37.33           | 74.00                    | -36.67              | Peak   |
| 2401.850    | 74.80                    | 27.14                     | 3.54                | 35.56                  | 69.92           | 74.00                    | -4.08               | Peak   |

|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH00 (2402MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 2.3GHz~2.405GHz                  | Polarization :      | Vertical |

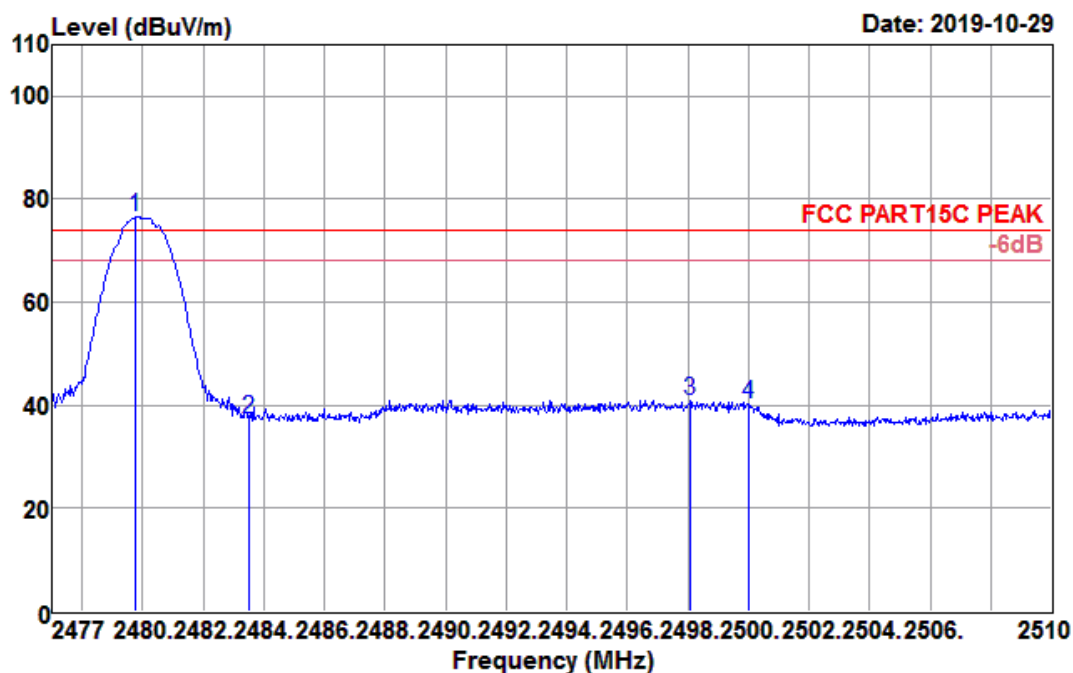
Data: 82



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|---------|
| 2310.000    | 28.45                    | 26.91                     | 3.48                | 35.43                  | 23.41           | 54.00                    | -30.59              | Average |
| 2330.135    | 30.08                    | 26.96                     | 3.49                | 35.46                  | 25.07           | 54.00                    | -28.93              | Average |
| 2390.000    | 28.48                    | 27.11                     | 3.53                | 35.55                  | 23.57           | 54.00                    | -30.43              | Average |
| 2402.060    | 73.97                    | 27.15                     | 3.54                | 35.56                  | 69.10           | 54.00                    | 15.10               | Average |

|                 |                                  |                     |            |
|-----------------|----------------------------------|---------------------|------------|
| Test Mode :     | Bluetooth (1Mbps) CH78 (2480MHz) | Temperature :       | 21~23℃     |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%     |
| Frequency Range | 2.477GHz~2.510GHz                | Polarization :      | Horizontal |

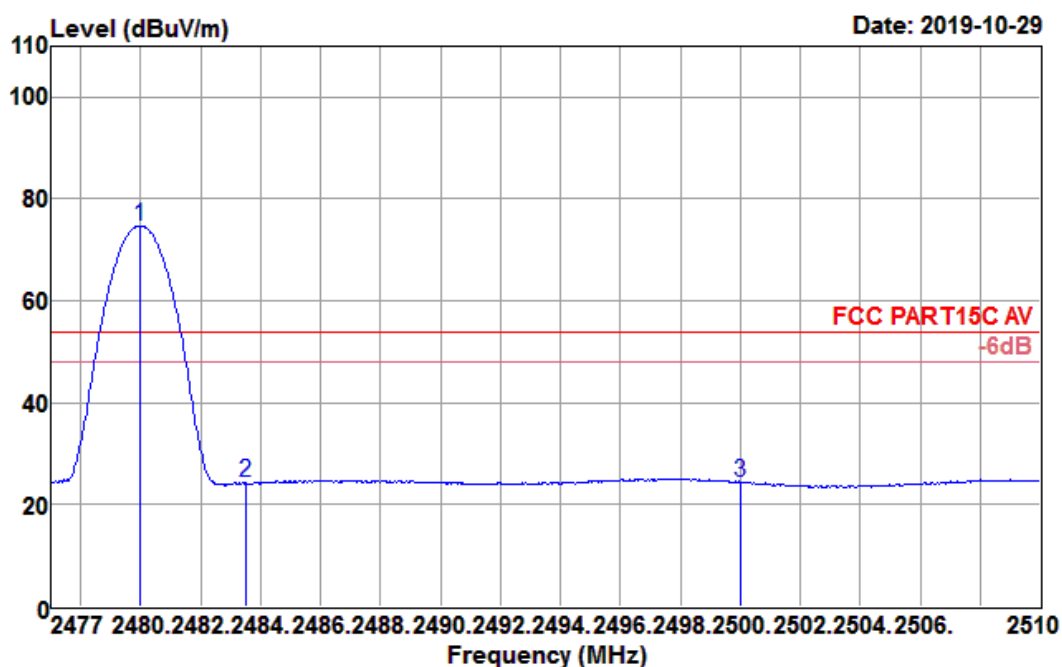
Data: 65



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|--------|
| 2479.772    | 81.20                    | 27.35                     | 3.59                | 35.67                  | 76.47           | 74.00                    | 2.47                | Peak   |
| 2483.500    | 42.17                    | 27.36                     | 3.59                | 35.68                  | 37.44           | 74.00                    | -36.56              | Peak   |
| 2498.087    | 45.74                    | 27.40                     | 3.60                | 35.70                  | 41.04           | 74.00                    | -32.96              | Peak   |
| 2500.000    | 45.01                    | 27.40                     | 3.60                | 35.70                  | 40.31           | 74.00                    | -33.69              | Peak   |

|                 |                                  |                     |            |
|-----------------|----------------------------------|---------------------|------------|
| Test Mode :     | Bluetooth (1Mbps) CH78 (2480MHz) | Temperature :       | 21~23℃     |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%     |
| Frequency Range | 2.477GHz~2.510GHz                | Polarization :      | Horizontal |

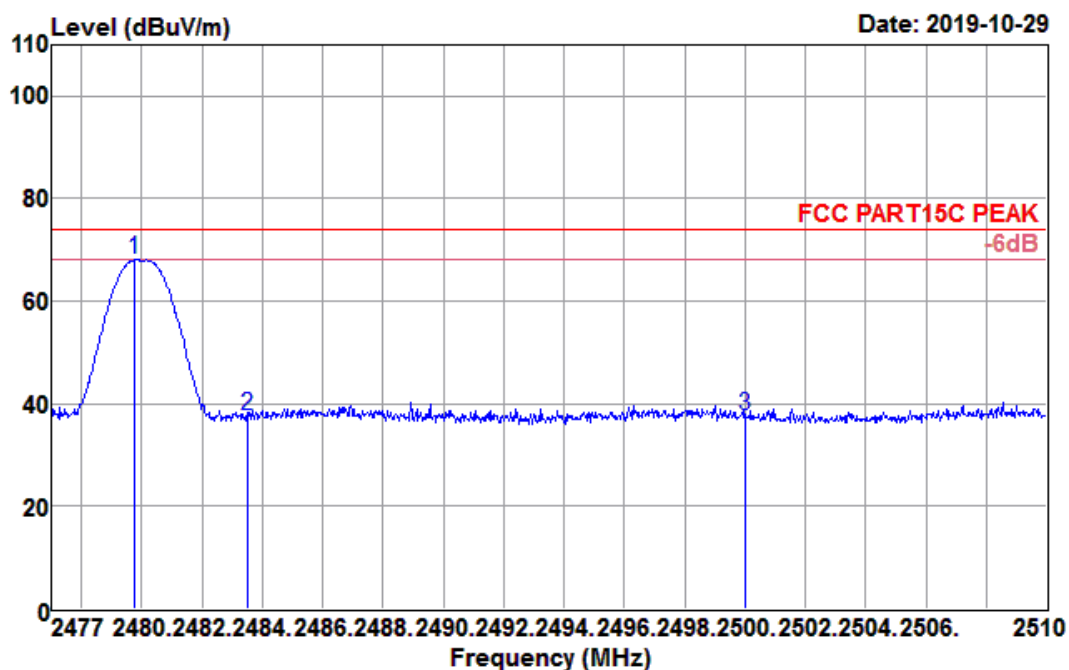
Data: 66



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|---------|
| 2480.003    | 79.47                    | 27.35                     | 3.59                | 35.67                  | 74.74           | 54.00                    | 20.74               | Average |
| 2483.500    | 29.03                    | 27.36                     | 3.59                | 35.68                  | 24.30           | 54.00                    | -29.70              | Average |
| 2500.000    | 29.13                    | 27.40                     | 3.60                | 35.70                  | 24.43           | 54.00                    | -29.57              | Average |

|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH78 (2480MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 2.477GHz~2.510GHz                | Polarization :      | Vertical |

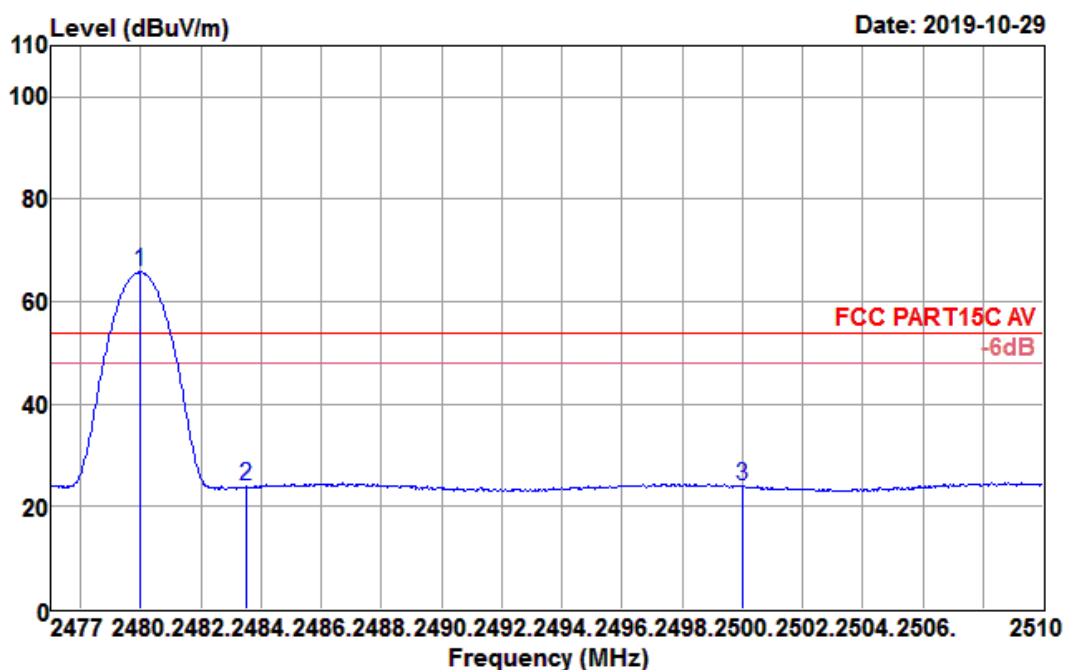
Data: 62



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamplifier<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------------|-----------------|--------------------------|---------------------|--------|
| 2479.772    | 72.77                    | 27.35                     | 3.59                | 35.67                        | 68.04           | 74.00                    | -5.96               | Peak   |
| 2483.500    | 42.34                    | 27.36                     | 3.59                | 35.68                        | 37.61           | 74.00                    | -36.39              | Peak   |
| 2500.000    | 42.47                    | 27.40                     | 3.60                | 35.70                        | 37.77           | 74.00                    | -36.23              | Peak   |

|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH78 (2480MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 2.477GHz~2.510GHz                | Polarization :      | Vertical |

Data: 63

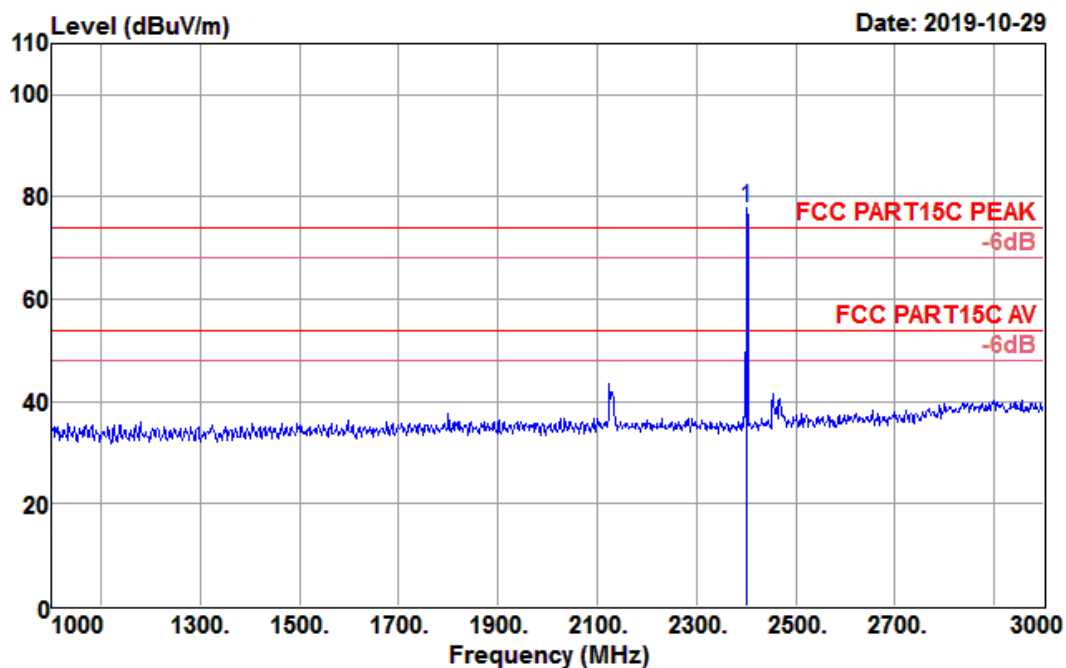


| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|---------|
| 2480.003    | 70.50                    | 27.35                     | 3.59                | 35.67                  | 65.77           | 54.00                    | 11.77               | Average |
| 2483.500    | 28.60                    | 27.36                     | 3.59                | 35.68                  | 23.87           | 54.00                    | -30.13              | Average |
| 2500.000    | 28.66                    | 27.40                     | 3.60                | 35.70                  | 23.96           | 54.00                    | -30.04              | Average |

#### 4.2.5 Test Result of Radiated Spurious Emission (1GHz ~ 10<sup>th</sup> Harmonic)

|                 |                                  |                     |            |
|-----------------|----------------------------------|---------------------|------------|
| Test Mode :     | Bluetooth (1Mbps) CH00 (2402MHz) | Temperature :       | 21~23℃     |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%     |
| Frequency Range | 1GHz~3GHz                        | Polarization :      | Horizontal |

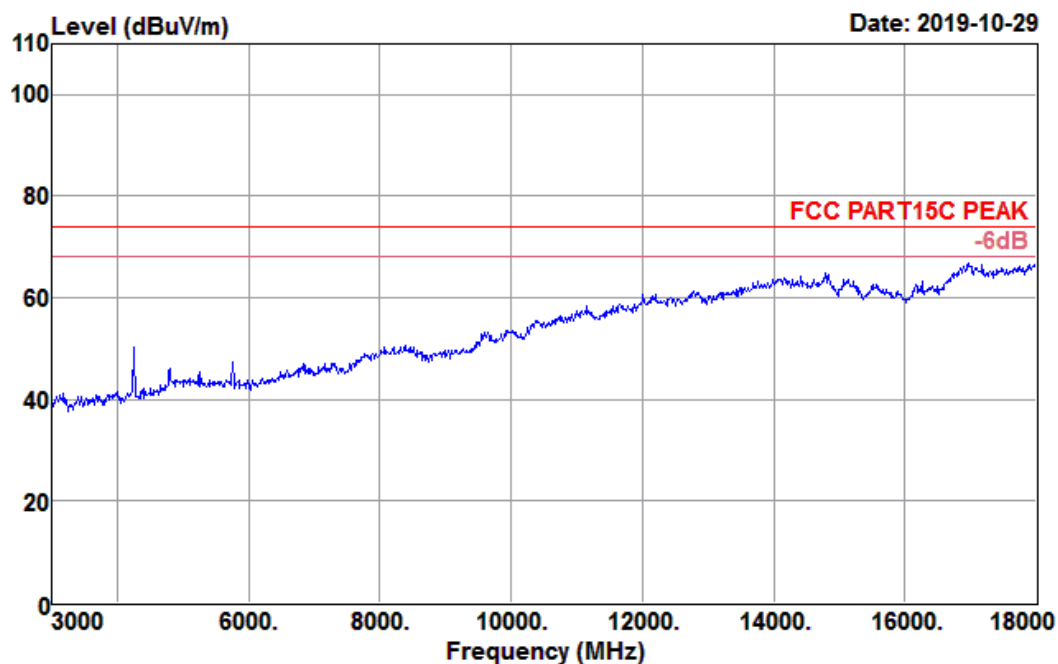
Data: 80



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|--------|
| 2402.000    | 82.90                    | 27.15                     | 3.54                | 35.56                  | 78.03           | 74.00                    | 4.03                | Peak   |

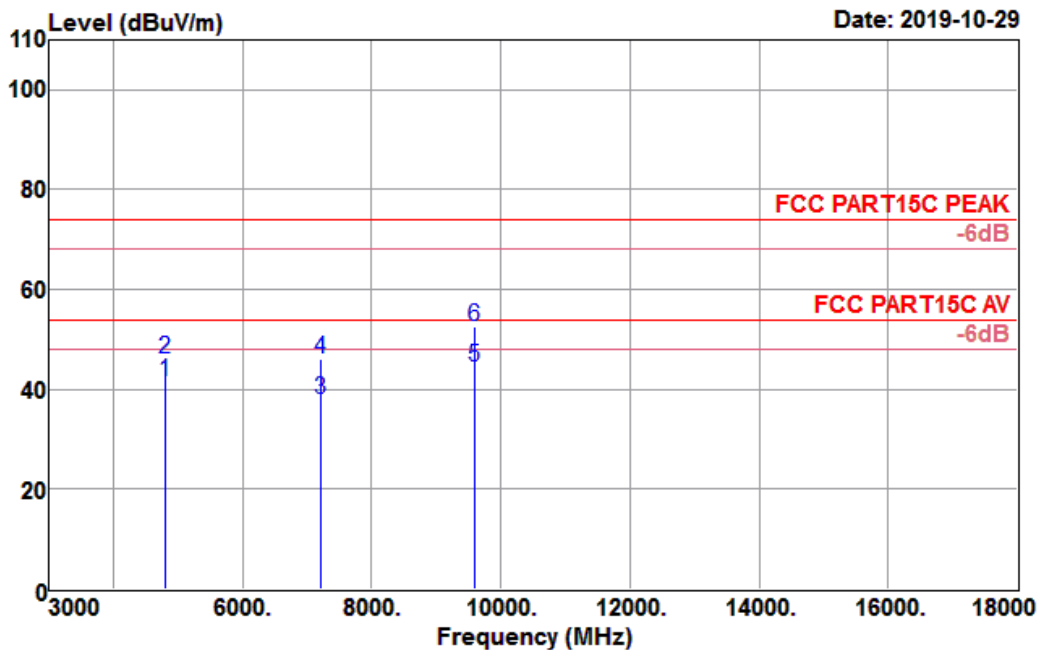
|                 |                                  |                     |            |
|-----------------|----------------------------------|---------------------|------------|
| Test Mode :     | Bluetooth (1Mbps) CH00 (2402MHz) | Temperature :       | 21~23℃     |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%     |
| Frequency Range | 3GHz~18GHz                       | Polarization :      | Horizontal |

Data: 76



Data: 77

Date: 2019-10-29

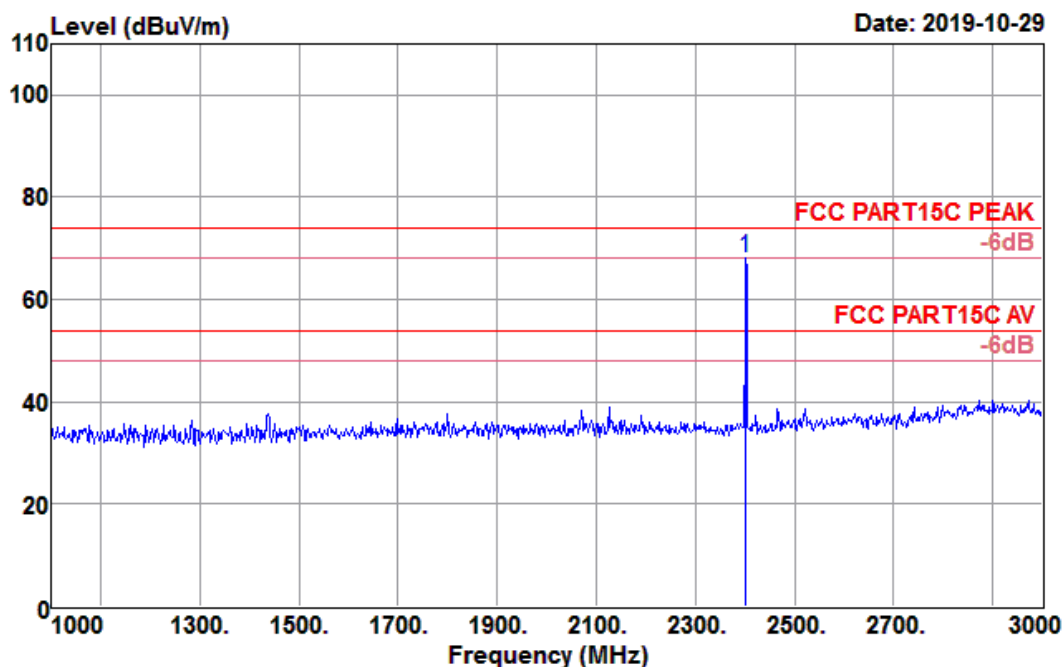


| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|---------|
| 4804.000    | 39.56                    | 31.23                     | 5.57                | 34.86                  | 41.50           | 54.00                    | -12.50              | Average |
| 4804.000    | 44.19                    | 31.23                     | 5.57                | 34.86                  | 46.13           | 74.00                    | -27.87              | Peak    |
| 7206.000    | 31.00                    | 35.87                     | 7.63                | 36.40                  | 38.10           | 54.00                    | -15.90              | Average |
| 7206.000    | 39.12                    | 35.87                     | 7.63                | 36.40                  | 46.22           | 74.00                    | -27.78              | Peak    |
| 9608.000    | 32.76                    | 37.79                     | 10.29               | 36.40                  | 44.44           | 54.00                    | -9.56               | Average |
| 9608.000    | 41.04                    | 37.79                     | 10.29               | 36.40                  | 52.72           | 74.00                    | -21.28              | Peak    |

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH00 (2402MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 1GHz~3GHz                        | Polarization :      | Vertical |

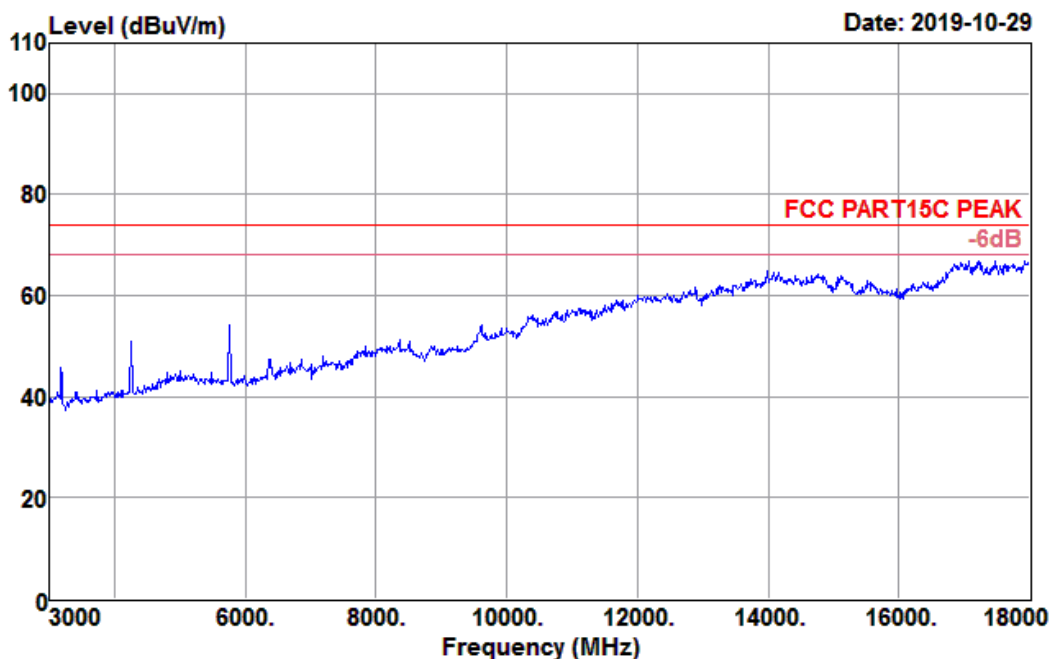
Data: 83



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|--------|
| 2402.000    | 72.95                    | 27.15                     | 3.54                | 35.56                  | 68.08           | 74.00                    | -5.92               | Peak   |

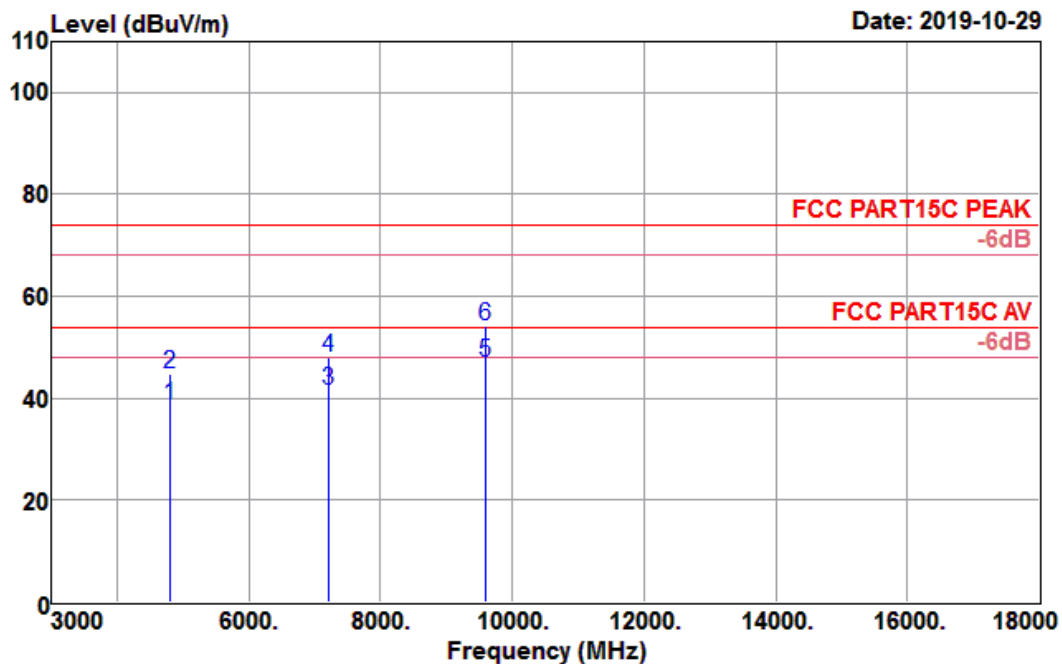
|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH00 (2402MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 3GHz~18GHz                       | Polarization :      | Vertical |

Data: 74



Data: 75

Date: 2019-10-29

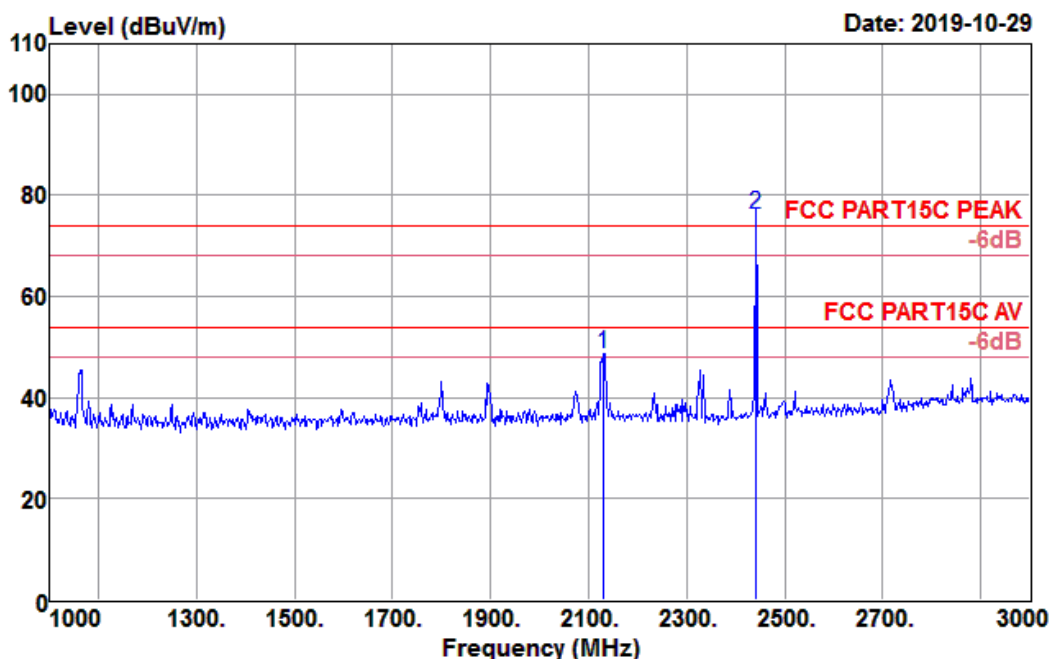


| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|---------|
| 4804.000    | 36.66                    | 31.23                     | 5.57                | 34.86                  | 38.60           | 54.00                    | -15.40              | Average |
| 4804.000    | 42.97                    | 31.23                     | 5.57                | 34.86                  | 44.91           | 74.00                    | -29.09              | Peak    |
| 7206.000    | 34.32                    | 35.87                     | 7.63                | 36.40                  | 41.42           | 54.00                    | -12.58              | Average |
| 7206.000    | 40.86                    | 35.87                     | 7.63                | 36.40                  | 47.96           | 74.00                    | -26.04              | Peak    |
| 9608.000    | 35.37                    | 37.79                     | 10.29               | 36.40                  | 47.05           | 54.00                    | -6.95               | Average |
| 9608.000    | 42.41                    | 37.79                     | 10.29               | 36.40                  | 54.09           | 74.00                    | -19.91              | Peak    |

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

|                 |                                  |                     |            |
|-----------------|----------------------------------|---------------------|------------|
| Test Mode :     | Bluetooth (1Mbps) CH39 (2441MHz) | Temperature :       | 21~23℃     |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%     |
| Frequency Range | 1GHz~3GHz                        | Polarization :      | Horizontal |

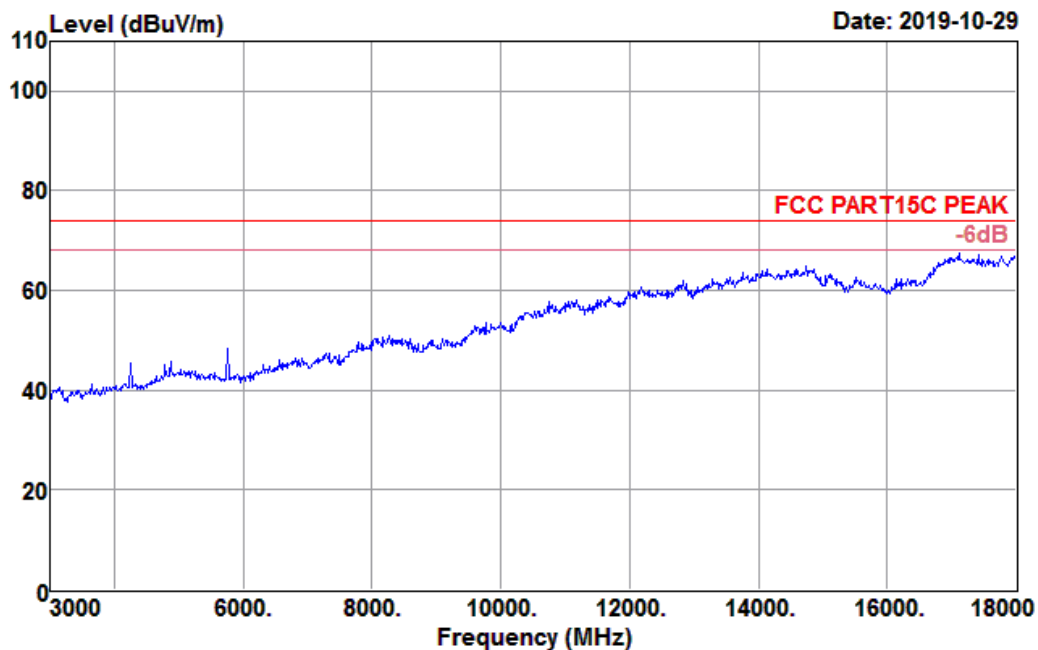
Data: 69



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|--------|
| 2130.000    | 54.23                    | 26.44                     | 3.31                | 35.18                  | 48.80           | 74.00                    | -25.20              | Peak   |
| 2441.000    | 80.99                    | 27.25                     | 3.56                | 35.62                  | 76.18           | 74.00                    | 2.18                | Peak   |

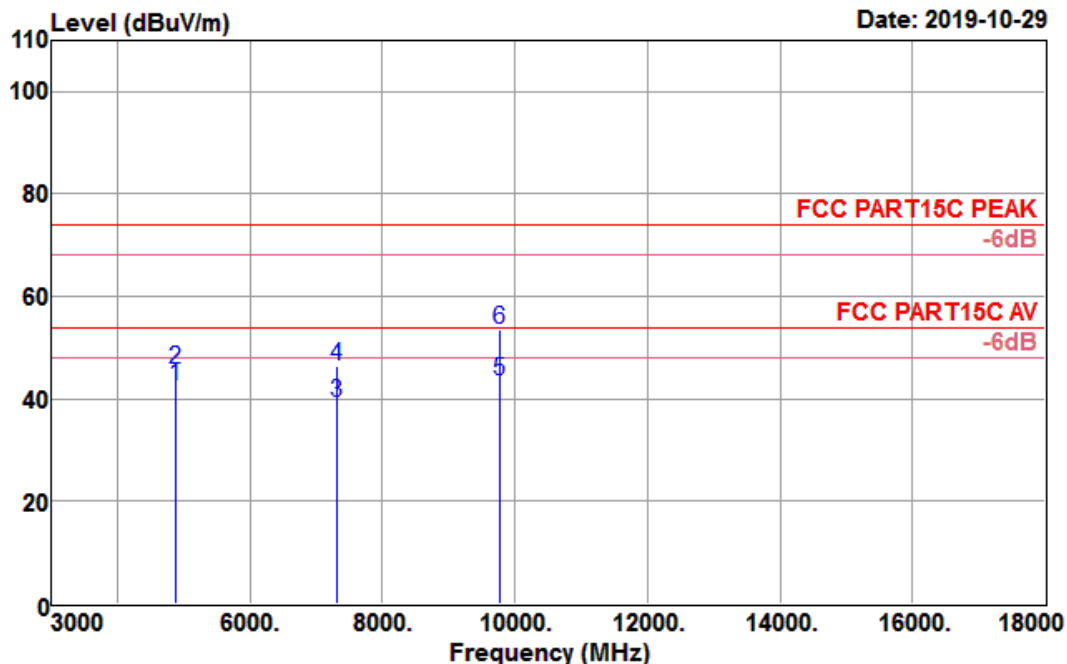
|                 |                                  |                     |            |
|-----------------|----------------------------------|---------------------|------------|
| Test Mode :     | Bluetooth (1Mbps) CH39 (2441MHz) | Temperature :       | 21~23℃     |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%     |
| Frequency Range | 3GHz~18GHz                       | Polarization :      | Horizontal |

Data: 70



Data: 71

Date: 2019-10-29

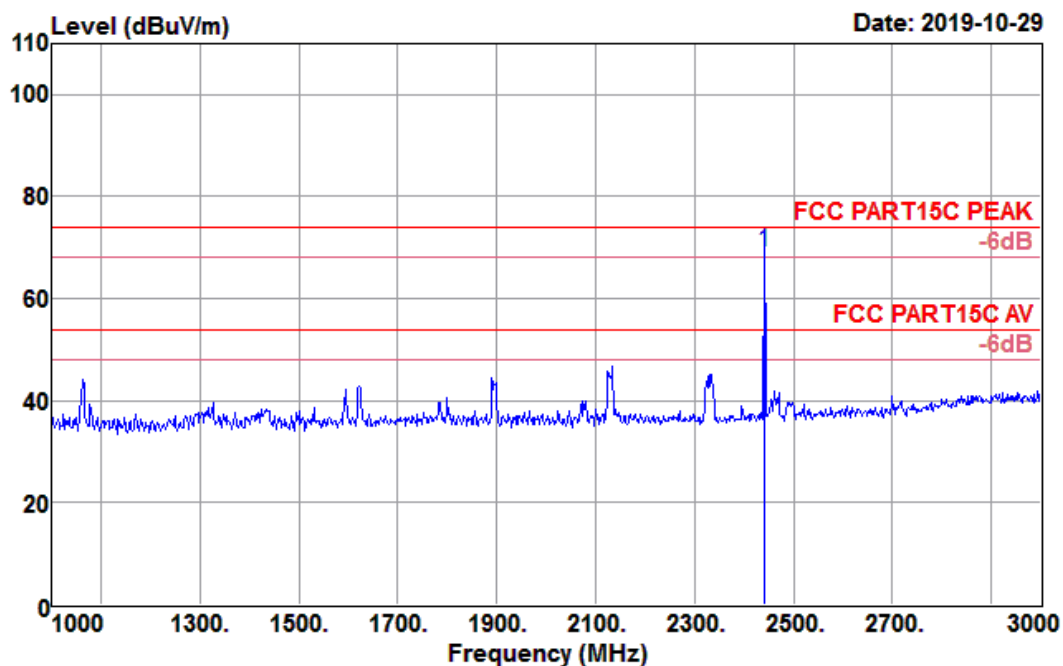


| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|---------|
| 4882.000    | 40.25                    | 31.42                     | 5.55                | 34.79                  | 42.43           | 54.00                    | -11.57              | Average |
| 4882.000    | 43.59                    | 31.42                     | 5.55                | 34.79                  | 45.77           | 74.00                    | -28.23              | Peak    |
| 7323.000    | 32.00                    | 36.14                     | 7.52                | 36.40                  | 39.26           | 54.00                    | -14.74              | Average |
| 7323.000    | 39.23                    | 36.14                     | 7.52                | 36.40                  | 46.49           | 74.00                    | -27.51              | Peak    |
| 9764.000    | 31.07                    | 38.08                     | 10.75               | 36.40                  | 43.50           | 54.00                    | -10.50              | Average |
| 9764.000    | 41.01                    | 38.08                     | 10.75               | 36.40                  | 53.44           | 74.00                    | -20.56              | Peak    |

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH39 (2441MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 1GHz~3GHz                        | Polarization :      | Vertical |

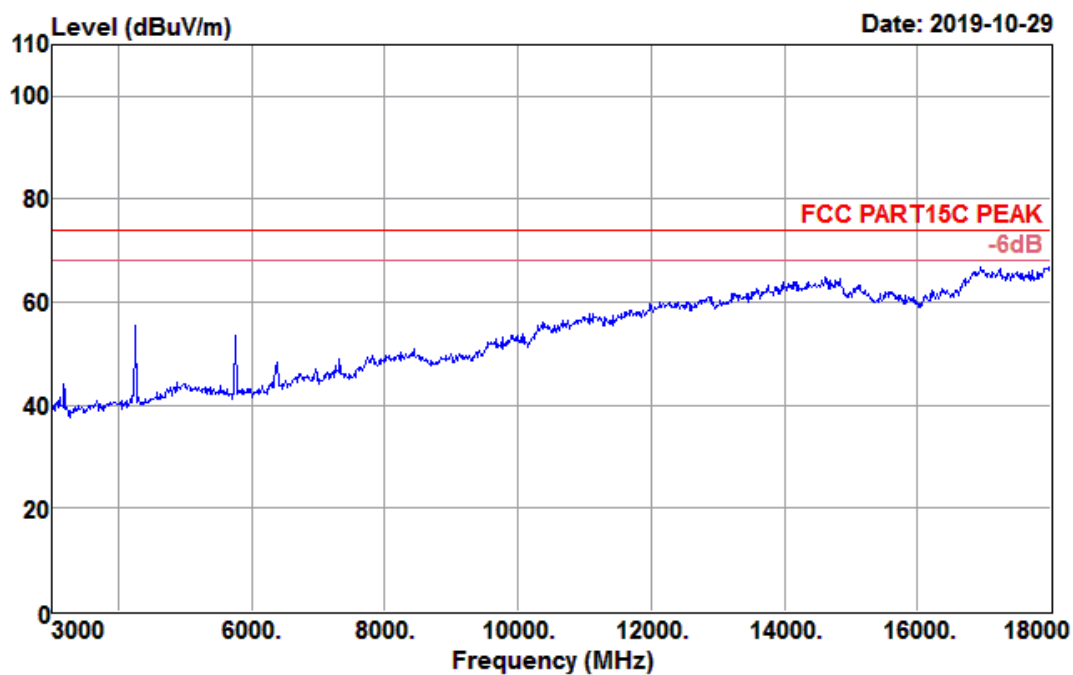
Data: 68



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|--------|
| 2441.000    | 73.97                    | 27.25                     | 3.56                | 35.62                  | 69.16           | 74.00                    | -4.84               | Peak   |

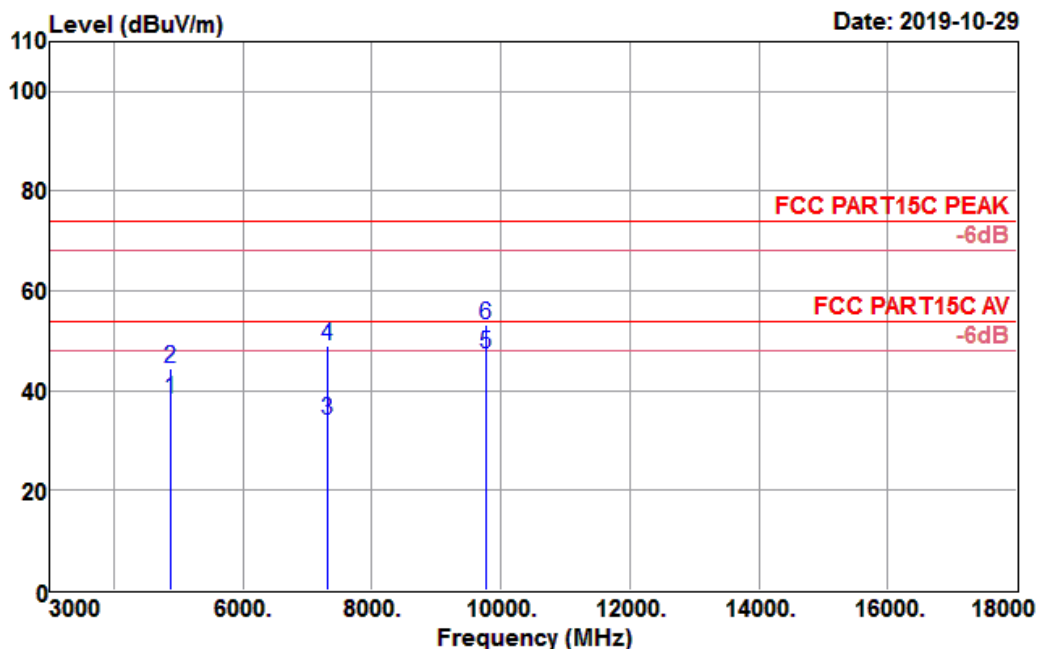
|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH39 (2441MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 3GHz~18GHz                       | Polarization :      | Vertical |

Data: 72



Data: 73

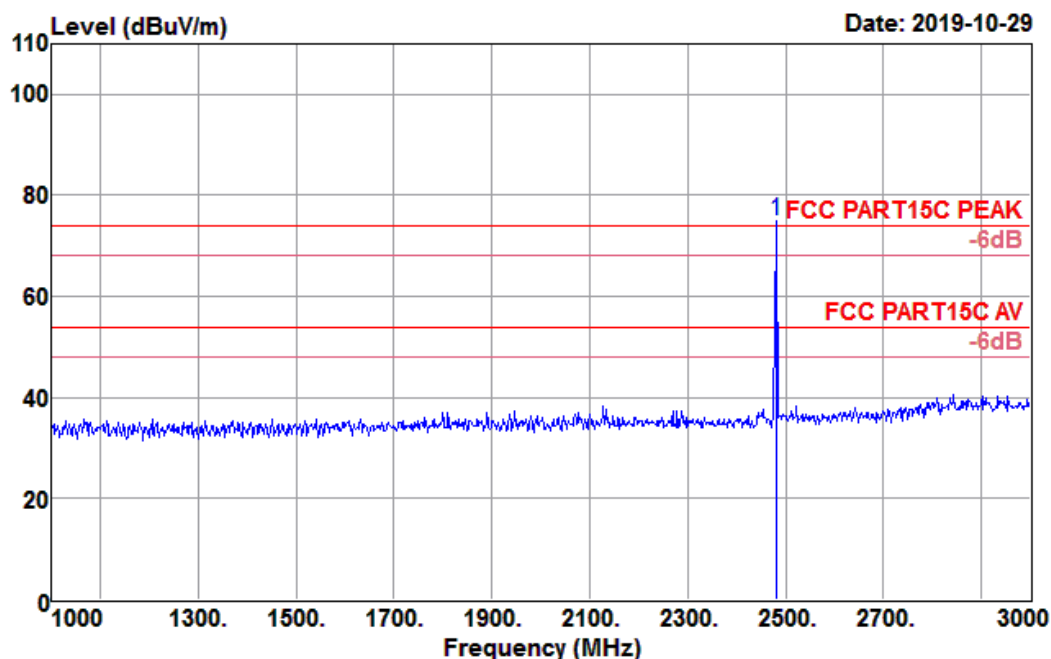
Date: 2019-10-29



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

|                 |                                  |                     |            |
|-----------------|----------------------------------|---------------------|------------|
| Test Mode :     | Bluetooth (1Mbps) CH78 (2480MHz) | Temperature :       | 21~23℃     |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%     |
| Frequency Range | 1GHz~3GHz                        | Polarization :      | Horizontal |

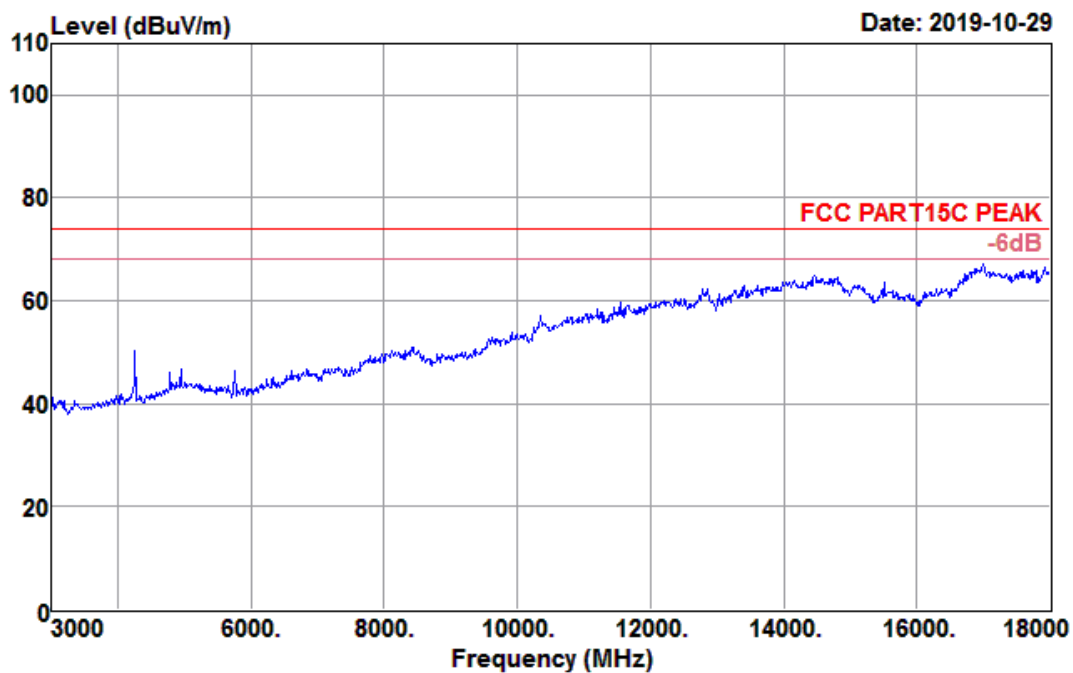
Data: 67



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|--------|
| 2480.000    | 79.76                    | 27.35                     | 3.59                | 35.67                  | 75.03           | 74.00                    | 1.03                | Peak   |

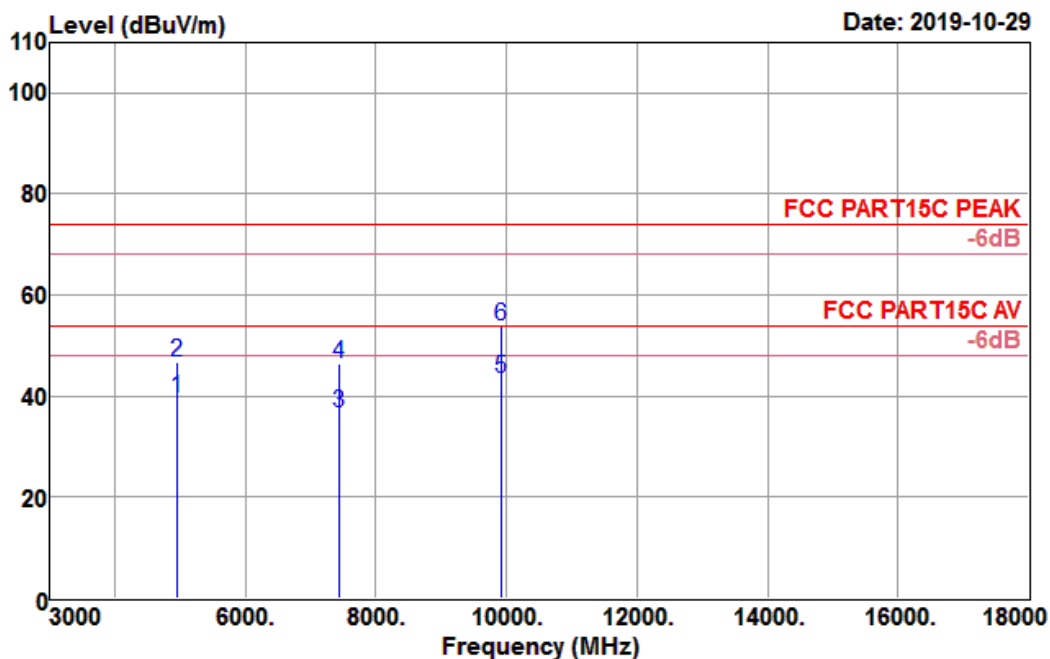
|                 |                                  |                     |            |
|-----------------|----------------------------------|---------------------|------------|
| Test Mode :     | Bluetooth (1Mbps) CH78 (2480MHz) | Temperature :       | 21~23℃     |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%     |
| Frequency Range | 3GHz~18GHz                       | Polarization :      | Horizontal |

Data: 58



Data: 59

Date: 2019-10-29

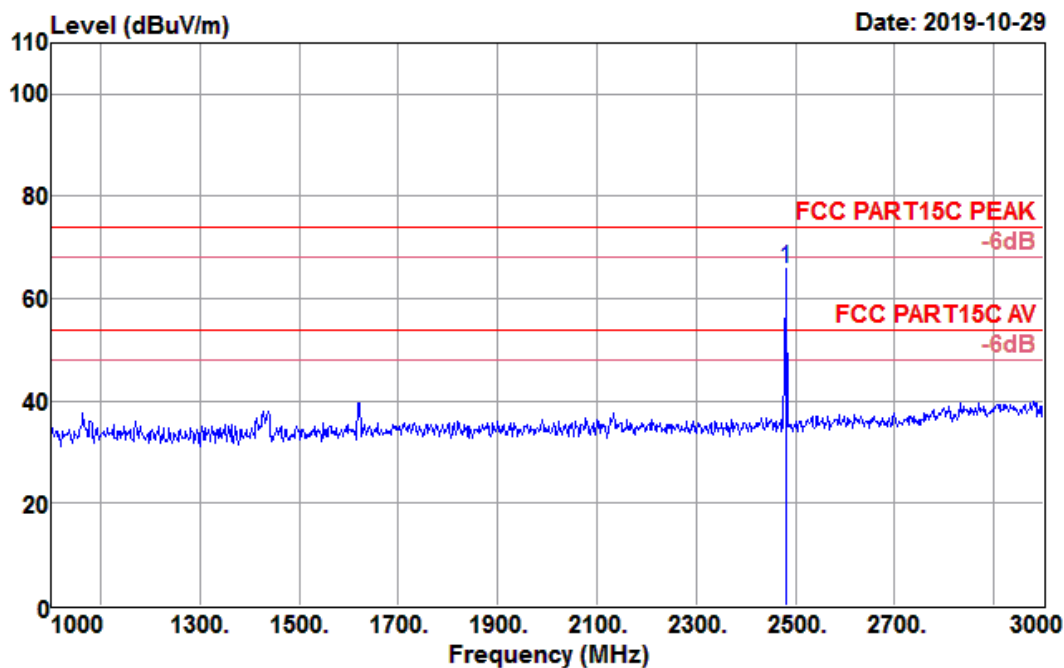


| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|---------|
| 4960.000    | 37.36                    | 31.60                     | 5.52                | 34.73                  | 39.75           | 54.00                    | -14.25              | Average |
| 4960.000    | 44.23                    | 31.60                     | 5.52                | 34.73                  | 46.62           | 74.00                    | -27.38              | Peak    |
| 7440.000    | 29.24                    | 36.41                     | 7.56                | 36.40                  | 36.81           | 54.00                    | -17.19              | Average |
| 7440.000    | 38.82                    | 36.41                     | 7.56                | 36.40                  | 46.39           | 74.00                    | -27.61              | Peak    |
| 9920.000    | 30.36                    | 38.36                     | 11.17               | 36.40                  | 43.49           | 54.00                    | -10.51              | Average |
| 9920.000    | 40.90                    | 38.36                     | 11.17               | 36.40                  | 54.03           | 74.00                    | -19.97              | Peak    |

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH78 (2480MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 1GHz~3GHz                        | Polarization :      | Vertical |

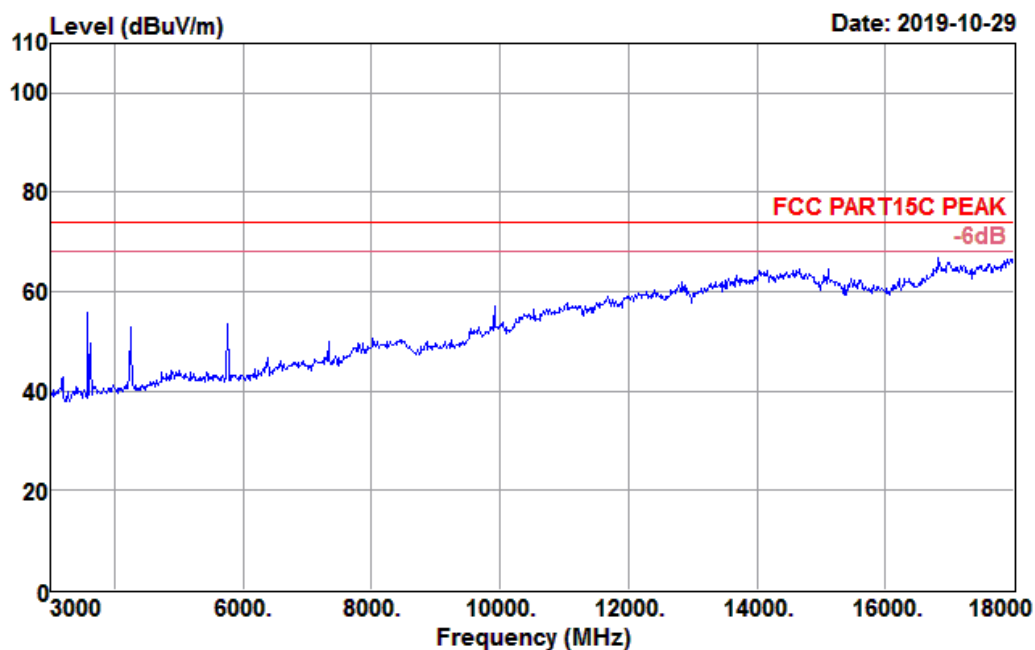
Data: 64



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamplifier<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------------|-----------------|--------------------------|---------------------|--------|
| 2480.000    | 70.64                    | 27.35                     | 3.59                | 35.67                        | 65.91           | 74.00                    | -8.09               | Peak   |

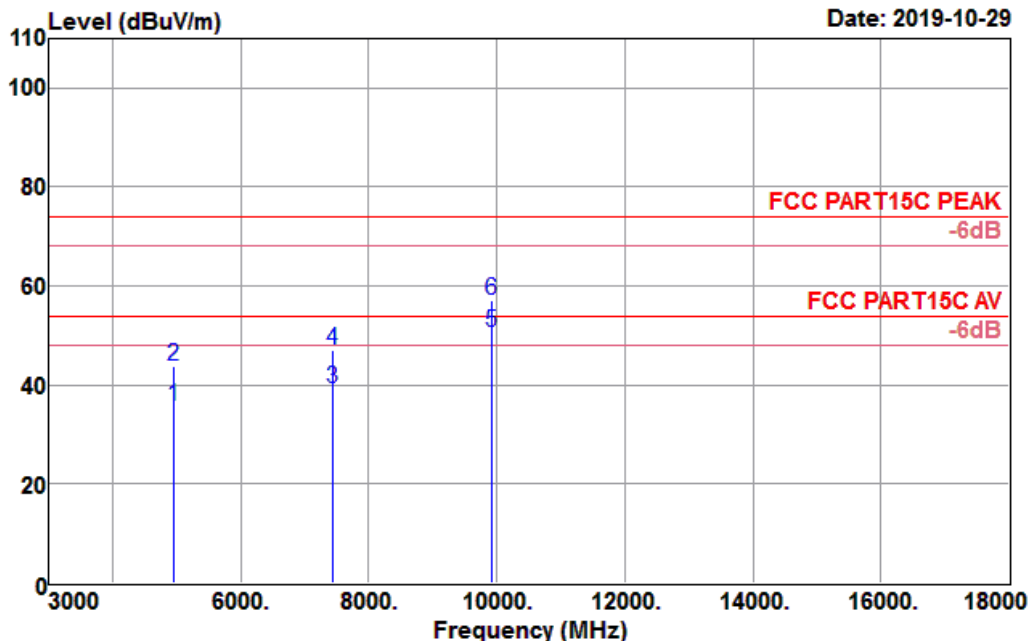
|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH78 (2480MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 3GHz~18GHz                       | Polarization :      | Vertical |

Data: 60



Data: 61

Date: 2019-10-29



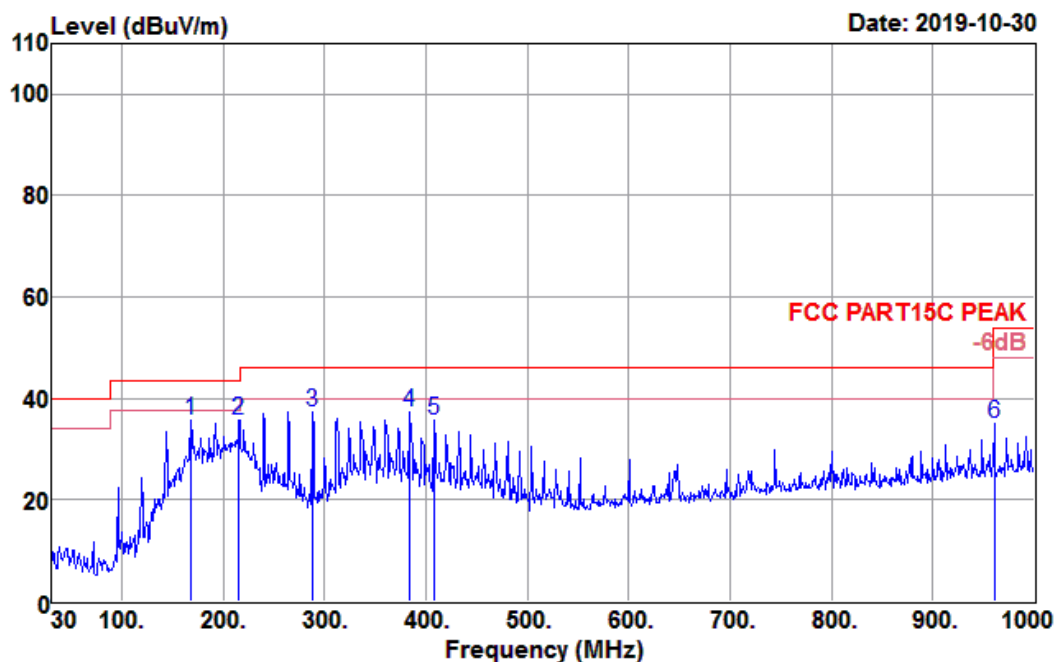
| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamplifier<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------------|-----------------|--------------------------|---------------------|---------|
| 4960.000    | 33.42                    | 31.60                     | 5.52                | 34.73                        | 35.81           | 54.00                    | -18.19              | Average |
| 4960.000    | 41.49                    | 31.60                     | 5.52                | 34.73                        | 43.88           | 74.00                    | -30.12              | Peak    |
| 7440.000    | 31.77                    | 36.41                     | 7.56                | 36.40                        | 39.34           | 54.00                    | -14.66              | Average |
| 7440.000    | 39.57                    | 36.41                     | 7.56                | 36.40                        | 47.14           | 74.00                    | -26.86              | Peak    |
| 9920.000    | 37.41                    | 38.36                     | 11.17               | 36.40                        | 50.54           | 54.00                    | -3.46               | Average |
| 9920.000    | 43.84                    | 38.36                     | 11.17               | 36.40                        | 56.97           | 74.00                    | -17.03              | Peak    |

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

#### 4.2.6 Test Result of Radiated Spurious Emission (30MHz ~ 1GHz)

|                 |                                  |                     |            |
|-----------------|----------------------------------|---------------------|------------|
| Test Mode :     | Bluetooth (1Mbps) CH00 (2402MHz) | Temperature :       | 21~23℃     |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%     |
| Frequency Range | 30MHz~1GHz                       | Polarization :      | Horizontal |

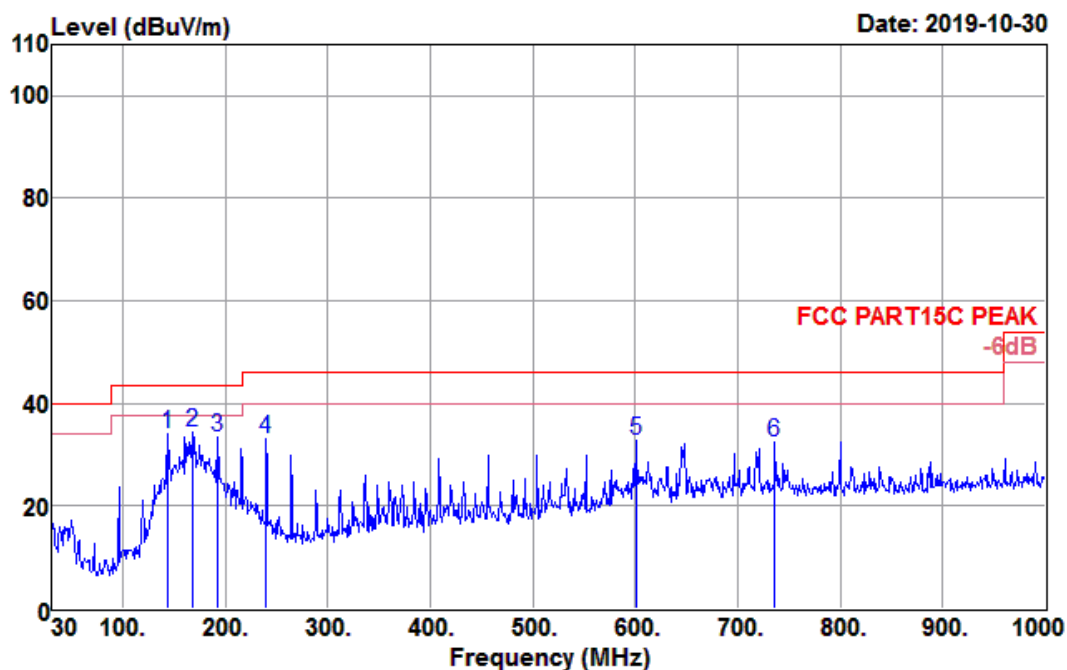
Data: 85



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|--------|
| 167.740     | 52.63                    | 13.41                     | 2.23                | 32.63                  | 35.64           | 43.50                    | -7.86               | Peak   |
| 215.270     | 54.73                    | 11.36                     | 2.43                | 32.66                  | 35.86           | 43.50                    | -7.64               | Peak   |
| 288.020     | 53.47                    | 13.94                     | 2.74                | 32.69                  | 37.46           | 46.00                    | -8.54               | Peak   |
| 384.050     | 51.45                    | 15.48                     | 3.19                | 32.78                  | 37.34           | 46.00                    | -8.66               | Peak   |
| 408.300     | 49.34                    | 16.05                     | 3.26                | 32.81                  | 35.84           | 46.00                    | -10.16              | Peak   |
| 960.230     | 37.26                    | 24.40                     | 5.17                | 31.76                  | 35.07           | 54.00                    | -18.93              | Peak   |

|                 |                                  |                     |          |
|-----------------|----------------------------------|---------------------|----------|
| Test Mode :     | Bluetooth (1Mbps) CH00 (2402MHz) | Temperature :       | 21~23℃   |
| Test Engineer : | Jack Liu                         | Relative Humidity : | 63~65%   |
| Frequency Range | 30MHz~1GHz                       | Polarization :      | Vertical |

Data: 84



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV/m | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|-----------------|--------------------------|---------------------|--------|
| 143.490     | 50.41                    | 14.17                     | 2.13                | 32.62                  | 34.09           | 43.50                    | -9.41               | Peak   |
| 167.740     | 51.40                    | 13.41                     | 2.23                | 32.63                  | 34.41           | 43.50                    | -9.09               | Peak   |
| 191.990     | 52.77                    | 11.00                     | 2.31                | 32.65                  | 33.43           | 43.50                    | -10.07              | Peak   |
| 239.520     | 50.79                    | 12.58                     | 2.50                | 32.67                  | 33.20           | 46.00                    | -12.80              | Peak   |
| 600.360     | 41.52                    | 20.01                     | 3.95                | 32.60                  | 32.88           | 46.00                    | -13.12              | Peak   |
| 736.160     | 38.26                    | 21.92                     | 4.45                | 32.19                  | 32.44           | 46.00                    | -13.56              | Peak   |

## 4.3 AC Conducted Emission Measurement

### 4.3.1 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.

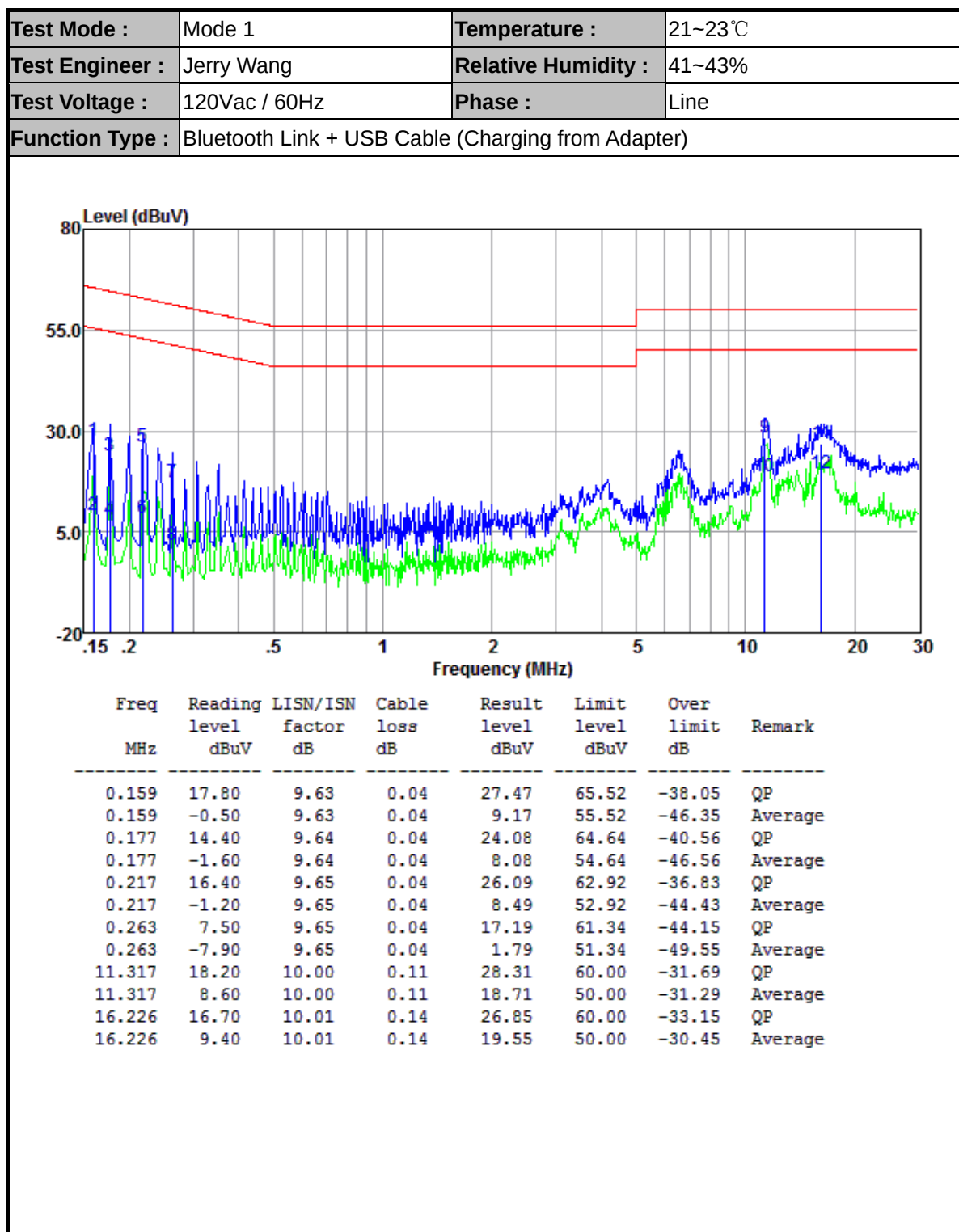
| Frequency of emission (MHz) | Conducted limit (dB $\mu$ V) |           |
|-----------------------------|------------------------------|-----------|
|                             | Quasi-peak                   | Average   |
| 0.15-0.5                    | 66 to 56*                    | 56 to 46* |
| 0.5-5                       | 56                           | 46        |
| 5-30                        | 60                           | 50        |

\*Decreases with the logarithm of the frequency.

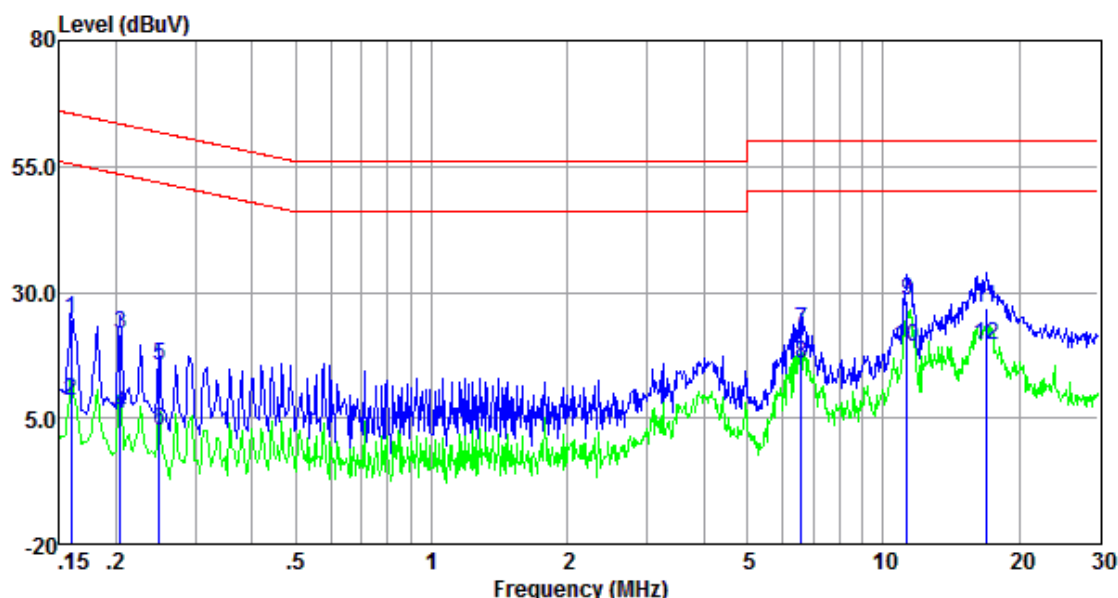
### 4.3.2 Test Procedures

7. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
8. Connect EUT to the power mains through a line impedance stabilization network (LISN).
9. All the support units are connecting to the other LISN.
10. The LISN provides 50 ohm coupling impedance for the measuring instrument.
11. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
12. Both sides of AC line were checked for maximum conducted interference.
13. The frequency range from 150 kHz to 30 MHz was searched.
14. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

### 4.3.3 Test Result of AC Conducted Emission



|                 |                                                    |                     |         |
|-----------------|----------------------------------------------------|---------------------|---------|
| Test Mode :     | Mode 1                                             | Temperature :       | 21~23℃  |
| Test Engineer : | Jerry Wang                                         | Relative Humidity : | 41~43%  |
| Test Voltage :  | 120Vac / 60Hz                                      | Phase :             | Neutral |
| Function Type : | Bluetooth Link + USB Cable (Charging from Adapter) |                     |         |



| Freq<br>MHz | Reading<br>level<br>dBuV | LISN/ISN<br>factor<br>dB | Cable<br>loss<br>dB | Result<br>level<br>dBuV | Limit<br>level<br>dBuV | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|--------------------------|---------------------|-------------------------|------------------------|---------------------|---------|
| 0.159       | 15.10                    | 9.59                     | 0.04                | 24.73                   | 65.52                  | -40.79              | QP      |
| 0.159       | -1.20                    | 9.59                     | 0.04                | 8.43                    | 55.52                  | -47.09              | Average |
| 0.204       | 11.90                    | 9.61                     | 0.04                | 21.55                   | 63.45                  | -41.90              | QP      |
| 0.204       | -3.70                    | 9.61                     | 0.04                | 5.95                    | 53.45                  | -47.50              | Average |
| 0.249       | 5.70                     | 9.62                     | 0.04                | 15.36                   | 61.78                  | -46.42              | QP      |
| 0.249       | -7.20                    | 9.62                     | 0.04                | 2.46                    | 51.78                  | -49.32              | Average |
| 6.592       | 12.39                    | 9.80                     | 0.09                | 22.28                   | 60.00                  | -37.72              | QP      |
| 6.592       | 5.89                     | 9.80                     | 0.09                | 15.78                   | 50.00                  | -34.22              | Average |
| 11.317      | 18.49                    | 9.88                     | 0.11                | 28.48                   | 60.00                  | -31.52              | QP      |
| 11.317      | 8.99                     | 9.88                     | 0.11                | 18.98                   | 50.00                  | -31.02              | Average |
| 16.928      | 16.90                    | 9.93                     | 0.15                | 26.98                   | 60.00                  | -33.02              | QP      |
| 16.928      | 9.50                     | 9.93                     | 0.15                | 19.58                   | 50.00                  | -30.42              | Average |

## 5 List of Measuring Equipment

| Instrument                 | Manufacturer | Model No.  | Serial No. | Calibration Date | Due Date  | Remark    |
|----------------------------|--------------|------------|------------|------------------|-----------|-----------|
| Spectrum Analyzer          | Keysight     | N9010A     | MY56070788 | 2019/1/23        | 2020/1/22 | Conducted |
| Power Sensor               | Keysight     | U2021XA    | MY56510025 | 2019/1/23        | 2020/1/22 | Conducted |
| Power Sensor               | Keysight     | U2021XA    | MY57030005 | 2019/1/23        | 2020/1/22 | Conducted |
| Power Sensor               | Keysight     | U2021XA    | MY56510018 | 2019/1/23        | 2020/1/22 | Conducted |
| Power Sensor               | Keysight     | U2021XA    | MY56480002 | 2019/1/23        | 2020/1/22 | Conducted |
| Thermal Chamber            | Sanmtest     | SMC-408-CD | 2435       | 2019/05/09       | 2020/5/08 | Conducted |
| Base Station               | R&S          | CMW 270    | 101231     | 2019/1/23        | 2020/1/22 | Conducted |
| Signal Generator (Blocker) | Keysight     | N5171B     | MY56200661 | 2019/1/23        | 2020/1/22 | Conducted |

| Instrument        | Manufacturer  | Model No.     | Serial No. | Calibration Date | Due Date  | Remark    |
|-------------------|---------------|---------------|------------|------------------|-----------|-----------|
| Spectrum Analyzer | R&S           | FSV 40        | 101433     | 2019/2/18        | 2020/2/17 | Radiation |
| Amplifier         | Sonoma        | 310           | 363917     | 2019/1/22        | 2020/1/21 | Radiation |
| Amplifier         | Schwarzbeck   | BBV 9718      | 327        | 2019/1/22        | 2020/1/21 | Radiation |
| Amplifier         | Narda         | TTA1840-35-HG | 2034380    | 2019/05/15       | 2020/5/14 | Radiation |
| Broadband Antenna | Schwarzbeck   | VULB 9168     | 9168-757   | 2017-03-03       | 2020/3/02 | Radiation |
| Horn Antenna      | Schwarzbeck   | BBHA 9120 D   | 1677       | 2017-03-03       | 2020/3/02 | Radiation |
| Horn Antenna      | COM-POWER     | AH-1840       | 101117     | 2018-06-20       | 2021/6/19 | Radiation |
| Test Software     | Auidx         | E3            | 6.111221a  | N/A              | N/A       | Radiation |
| Filter            | Micro-Tronics | BRM 50702     | G266       | N/A              | N/A       | Radiation |

| Instrument        | Manufacturer | Model No. | Serial No. | Calibration Date | Due Date   | Remark    |
|-------------------|--------------|-----------|------------|------------------|------------|-----------|
| LISN              | R&S          | ENV216    | 102125     | 2019-01-22       | 2020-01-21 | Conducted |
| LISN              | R&S          | ENV432    | 101327     | 2019-01-22       | 2020-01-21 | Conducted |
| EMI Test Receiver | R&S          | ESR3      | 102143     | 2019-01-23       | 2020-01-22 | Conducted |
| EMI Test Software | Audix        | E3        | N/A        | N/A              | N/A        | Conducted |

N/A: No Calibration Required

## 6 Uncertainty of Evaluation

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

| MEASUREMENT         | FREQUENCY     | UNCERTAINTY |
|---------------------|---------------|-------------|
| Conducted emissions | 9kHz~30MHz    | 2.60dB      |
| Radiated emission   | 30MHz ~ 1GMHz | 5.05dB      |
|                     | 1GHz ~ 18GHz  | 5.06 dB     |
|                     | 18GHz ~ 40GHz | 3.65dB      |

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

## APPENDIX A. SETUP PHOTOGRAPHS

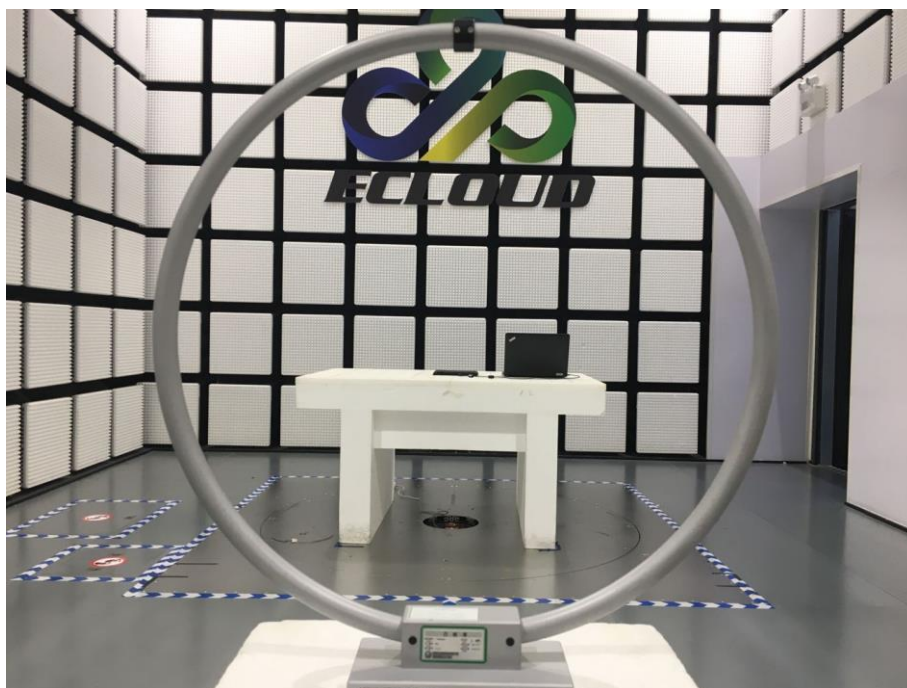


Fig. 1 Radiated emission setup photo(Below 30MHz)



Fig. 2 Radiated emission setup photo(30MHz-1GHz)

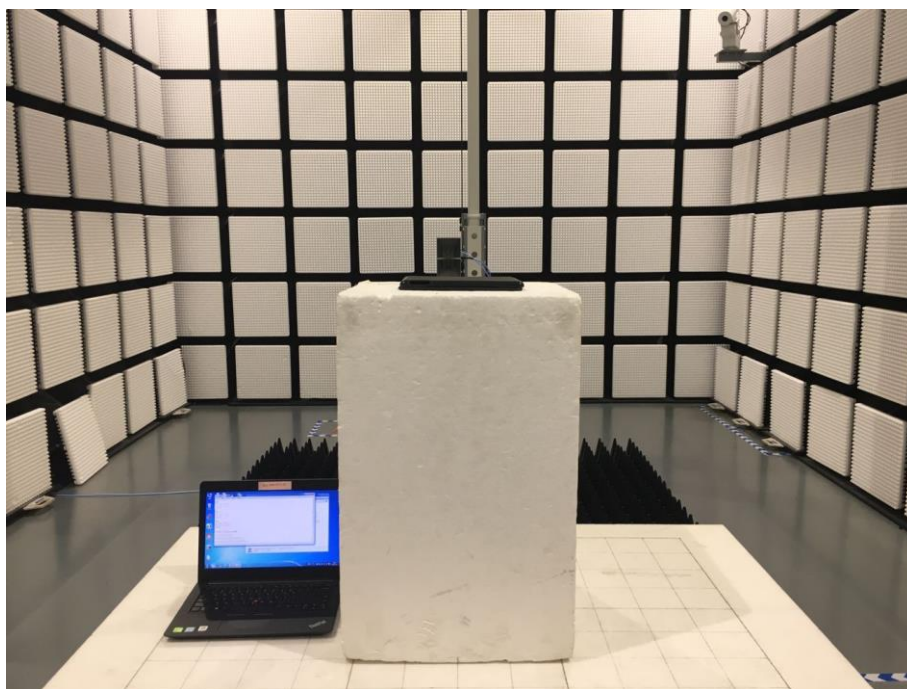


Fig. 3 Radiated emission setup photo(Above 1GHz)



Fig. 4 Conducted emission setup photo



Fig. 5 AC Power Line Conducted emission setup photo