

## APPLICATION CERTIFICATION FCC Part 15C

On Behalf of  
Head-Direct (Kunshan) Co., LTD

Bluemini Bluetooth Dongle  
Model No.: Bluemini

FCC ID: 2ATP3-BLUEMINI

Prepared for : Head-Direct (Kunshan) Co., LTD  
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Report No. : ATE20200222  
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Date of Report : March 26, 2020

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## Test Report Certification

Applicant : Head-Direct (Kunshan) Co., LTD  
Manufacturer : Head-Direct (Kunshan) Co., LTD  
EUT Description : Bluemini Bluetooth Dongle  
Model No. : Bluemini

Measurement Procedure Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.247**  
**ANSI C63.10: 2013**

The EUT was tested according to DTS test procedure of August 24, 2018 KDB558074 D01 DTS Meas Guidance v05 for compliance to FCC 47CFR 15.247 requirements

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test : March 20-26, 2020

Date of Report : March 26, 2020

Prepared by :

Bob Wang  
(Bob Wang, Engineer)

Approved & Authorized Signer :

Sean Liu  
(Sean Liu, Manager)

## 1. GENERAL INFORMATION

### 1.1. Description of Device (EUT)

Model Number : Bluemini  
 Bluetooth version : V4.2  
 Frequency Range : 2402MHz-2480MHz  
 Number of Channels : 40  
 Antenna Gain(Max) : 3dBi  
 Antenna type : Integral Antenna  
 Modulation mode : GFSK  
 Power supply : DC 3.7V (Powered by Lithium battery) or  
 DC 5.0V (Powered by USB port)  
 Trade Mark : HIFIMAN  
 Applicant : Head-Direct (Kunshan) Co., LTD  
 Address : No.2001, Yingbin West Road, Bacheng Town, Kunshan  
 City, Jiangsu Province, China  
 Manufacturer : Head-Direct (Kunshan) Co., LTD  
 Address : No.2001, Yingbin West Road, Bacheng Town, Kunshan  
 City, Jiangsu Province, China

### 1.2. Carrier Frequency of Channels

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|
| 0       | 2402            | 10      | 2422            | 20      | 2442            | 30      | 2462            |
| 1       | 2404            | 11      | 2424            | 21      | 2444            | 31      | 2464            |
| 2       | 2406            | 12      | 2426            | 22      | 2446            | 32      | 2466            |
| 3       | 2408            | 13      | 2428            | 23      | 2448            | 33      | 2468            |
| 4       | 2410            | 14      | 2430            | 24      | 2450            | 34      | 2470            |
| 5       | 2412            | 15      | 2432            | 25      | 2452            | 35      | 2472            |
| 6       | 2414            | 16      | 2434            | 26      | 2454            | 36      | 2474            |
| 7       | 2416            | 17      | 2436            | 27      | 2456            | 37      | 2476            |
| 8       | 2418            | 18      | 2438            | 28      | 2458            | 38      | 2478            |
| 9       | 2420            | 19      | 2440            | 29      | 2460            | 39      | 2480            |

### 1.3.Special Accessory and Auxiliary Equipment

|                                                  |   |                                                      |
|--------------------------------------------------|---|------------------------------------------------------|
| AC/DC Power Adapter:<br>(provided by laboratory) | : | Model:BEK-QC-001<br>INPUT: 120V~60Hz<br>OUTPUT:5V/1A |
|--------------------------------------------------|---|------------------------------------------------------|

### 1.4.Description of Test Facility

|               |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EMC Lab       | : | Recognition of accreditation by Federal Communications Commission (FCC)<br>The Designation Number is CN1189<br>The Registration Number is 708358<br><br>Listed by Innovation, Science and Economic Development Canada (ISED)<br>The Registration Number is 5077A-2<br><br>Accredited by China National Accreditation Service for Conformity Assessment (CNAS)<br>The Registration Number is CNAS L3193<br><br>Accredited by American Association for Laboratory Accreditation (A2LA)<br>The Certificate Number is 4297.01 |
| Name of Firm  | : | Shenzhen Accurate Technology Co., Ltd.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Site Location | : | 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China                                                                                                                                                                                                                                                                                                                                                                                                 |

### 1.5.Measurement Uncertainty

|                                                                                     |   |               |
|-------------------------------------------------------------------------------------|---|---------------|
| Radiated emission expanded uncertainty<br>(9kHz-30MHz)                              | : | U=2.66dB, k=2 |
| Radiated emission expanded uncertainty<br>(30MHz-1000MHz)                           | : | U=4.28dB, k=2 |
| Radiated emission expanded uncertainty<br>(1G-18GHz)                                | : | U=4.98dB, k=2 |
| Radiated emission expanded uncertainty<br>(18G-26.5GHz)                             | : | U=5.06dB, k=2 |
| Conduction Emission Expanded Uncertainty<br>(Mains ports, 9kHz-30MHz)               | : | U=2.72dB, k=2 |
| Conduction Emission Expanded Uncertainty<br>(Telecommunication ports, 150kHz-30MHz) | : | U=2.94dB, k=2 |
| Power disturbance Expanded Uncertainty                                              | : | U=2.92dB, k=2 |
| Harmonic current expanded uncertainty                                               | : | U=0.512%, k=2 |

## 2. MEASURING DEVICE AND TEST EQUIPMENT

**Table 1: List of Test and Measurement Equipment**

| Kind of equipment                                       | Manufacturer              | Type                                    | S/N       | Calibrated dates | Cal. Interval |
|---------------------------------------------------------|---------------------------|-----------------------------------------|-----------|------------------|---------------|
| EMI Test Receiver                                       | Rohde&Schwarz             | ESCS30                                  | 100307    | Jan. 04, 2020    | One Year      |
| EMI Test Receiver                                       | Rohde&Schwarz             | ESR                                     | 101817    | Jan. 04, 2020    | One Year      |
| Spectrum Analyzer                                       | Rohde&Schwarz             | FSV-40                                  | 101495    | Jan. 04, 2020    | One Year      |
| Pre-Amplifier                                           | Rohde&Schwarz             | CBLU118354<br>0-01                      | 3791      | Jan. 04, 2020    | One Year      |
| Loop Antenna                                            | Schwarzbeck               | FMZB1516                                | 1516131   | Jan. 04, 2020    | One Year      |
| Bilog Antenna                                           | Schwarzbeck               | VULB9163                                | 9163-323  | Jan. 04, 2020    | One Year      |
| Horn Antenna                                            | Schwarzbeck               | BBHA9120D                               | 9120D-655 | Jan. 04, 2020    | One Year      |
| Horn Antenna                                            | Schwarzbeck               | BBHA9170                                | 9170-359  | Jan. 04, 2020    | One Year      |
| LISN                                                    | Schwarzbeck               | NSLK8126                                | 8126431   | Jan. 04, 2020    | One Year      |
| Highpass Filter                                         | Wainwright<br>Instruments | WHKX3.6/18<br>G-10SS                    | N/A       | Jan. 04, 2020    | One Year      |
| Band Reject Filter                                      | Wainwright<br>Instruments | WRCG2400/2<br>485-2375/2510<br>-60/11SS | N/A       | Jan. 04, 2020    | One Year      |
| RF Coaxial Cable<br>(Conducted Emission)                | SUHNER                    | N-2m                                    | No.2      | Jan. 04, 2020    | One Year      |
| RF Coaxial Cable<br>(Radiated Emission)                 | RESENBERGER               | N-12m                                   | No.11     | Jan. 04, 2020    | One Year      |
| RF Coaxial Cable<br>(Radiated Emission)                 | RESENBERGER               | N-0.5m                                  | No.12     | Jan. 04, 2020    | One Year      |
| RF Coaxial Cable<br>(Radiated Emission)                 | SUHNER                    | N-2m                                    | No.13     | Jan. 04, 2020    | One Year      |
| RF Coaxial Cable<br>(Radiated Emission)                 | SUHNER                    | N-0.5m                                  | No.15     | Jan. 04, 2020    | One Year      |
| RF Coaxial Cable<br>(Radiated Emission)                 | SUHNER                    | N-2m                                    | No.16     | Jan. 04, 2020    | One Year      |
| RF Coaxial Cable<br>(Radiated Emission)                 | RESENBERGER               | N-6m                                    | No.17     | Jan. 04, 2020    | One Year      |
| Conducted Emission Measurement Software: ES-K1 V1.71    |                           |                                         |           |                  |               |
| Radiated Emission Measurement Software: EZ_EMV V1.1.4.2 |                           |                                         |           |                  |               |

### 3. OPERATION OF EUT DURING TESTING

#### 3.1.Operating Mode

The mode is used: **Transmitting mode**

Low Channel: 2402MHz

Middle Channel: 2440MHz

High Channel: 2480MHz

Note: The equipment under test (EUT) was tested under new battery.

The Bluetooth has been tested under continuous transmission mode.

Its duty cycle setting is greater than 98%.

#### 3.2.Configuration and peripherals

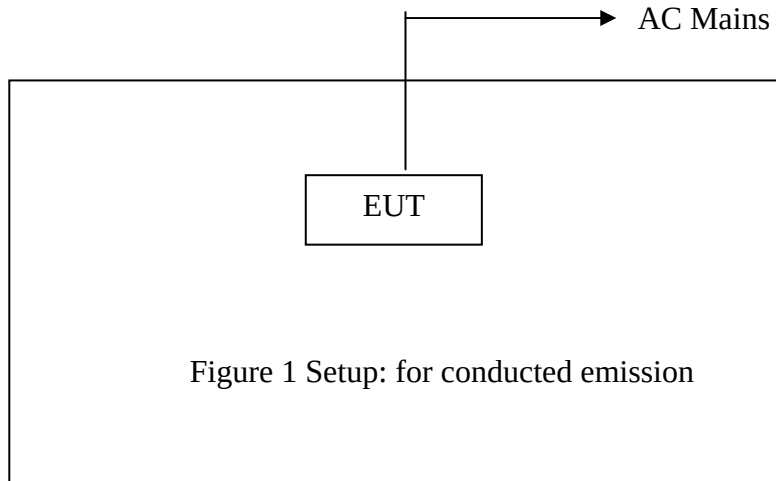


Figure 1 Setup: for conducted emission

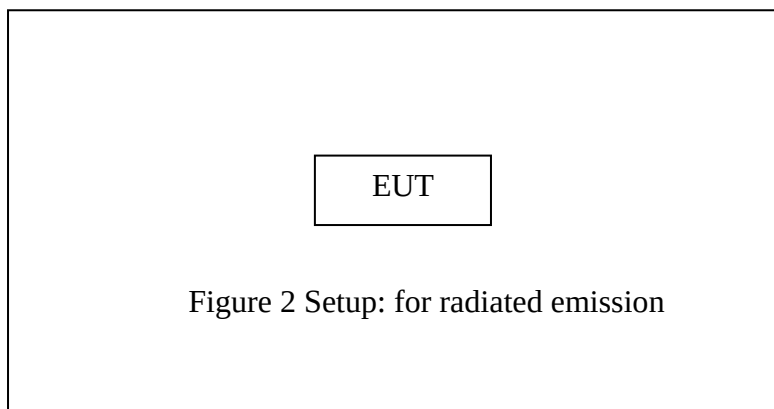


Figure 2 Setup: for radiated emission

#### 4. TEST PROCEDURES AND RESULTS

| FCC Rules                           | Description of Test                   | Result    |
|-------------------------------------|---------------------------------------|-----------|
| Section 15.247(a)(2)                | 6dB Bandwidth Test                    | Compliant |
| Section 15.247(b)(3)                | Maximum Peak Output Power Test        | Compliant |
| Section 15.247(e)                   | Power Spectral Density Test           | Compliant |
| Section 15.247(d)                   | Band Edge Compliance Test             | Compliant |
| Section 15.247(d)<br>Section 15.209 | Radiated Spurious Emission Test       | Compliant |
| Section 15.207                      | AC Power Line Conducted Emission Test | Compliant |
| Section 15.203                      | Antenna Requirement                   | Compliant |

## 5. 6DB BANDWIDTH TEST

### 5.1. Block Diagram of Test Setup



### 5.2. The Requirement For Section 15.247(a)(2)

Section 15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 5.3. EUT Configuration on Test

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

### 5.4. Operating Condition of EUT

5.4.1. Setup the EUT and simulator as shown as Section 5.1.

5.4.2. Turn on the power of all equipment.

5.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

### 5.5. Test Procedure

5.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

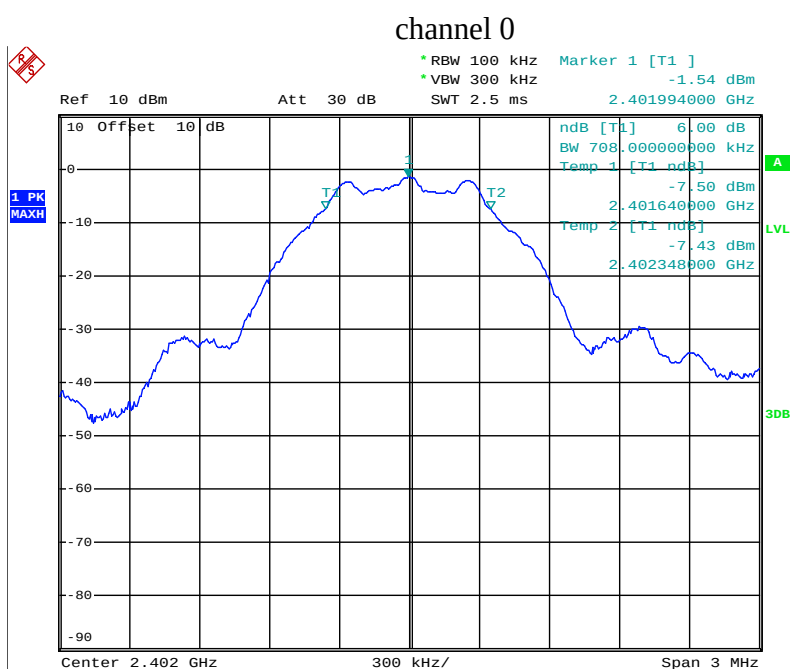
5.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

5.5.3. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

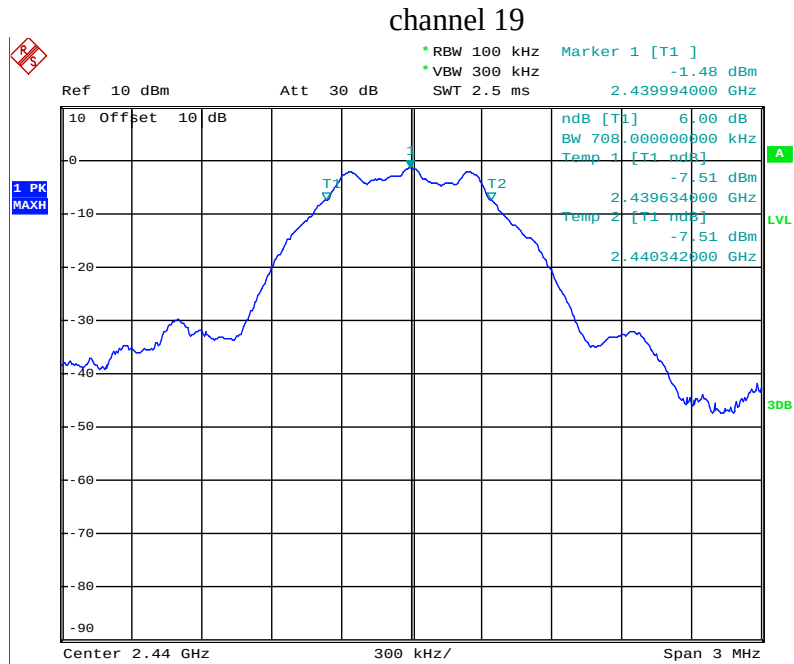
## 5.6.Test Result

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit(MHz) | Result |
|---------|-----------------|----------------------|--------------------|--------|
| 0       | 2402            | 0.708                | 0.5                | Pass   |
| 19      | 2440            | 0.708                | 0.5                | Pass   |
| 39      | 2480            | 0.702                | 0.5                | Pass   |

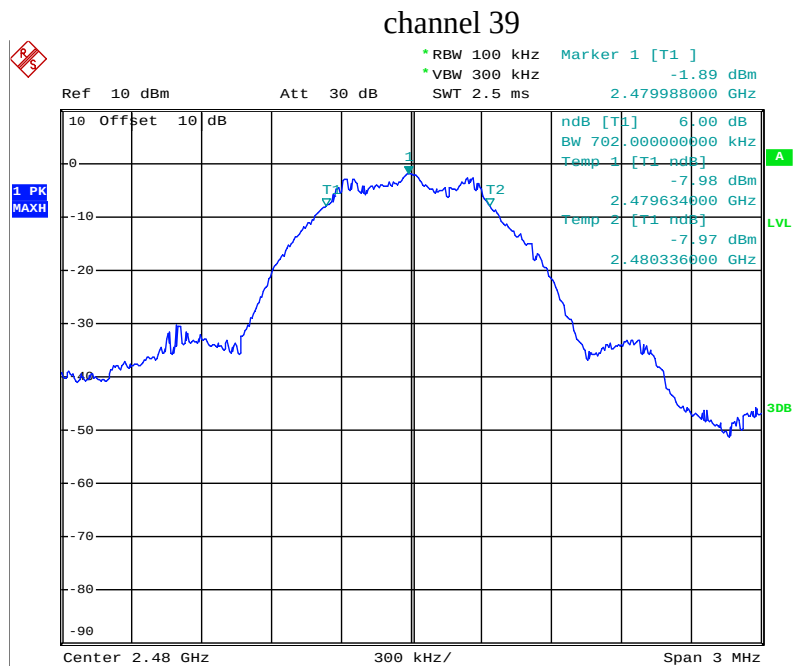
The spectrum analyzer plots are attached as below.



Date: 26.MAR.2020 09:43:34



Date: 26.MAR.2020 09:43:05



Date: 26.MAR.2020 09:41:54

## 6. MAXIMUM PEAK OUTPUT POWER TEST

### 6.1. Block Diagram of Test Setup



### 6.2. The Requirement For Section 15.247(b)(3)

Section 15.247(b)(3): For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

### 6.3. EUT Configuration on Test

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

### 6.4. Operating Condition of EUT

6.4.1. Setup the EUT and simulator as shown as Section 6.1.

6.4.2. Turn on the power of all equipment.

6.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

### 6.5. Test Procedure

6.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

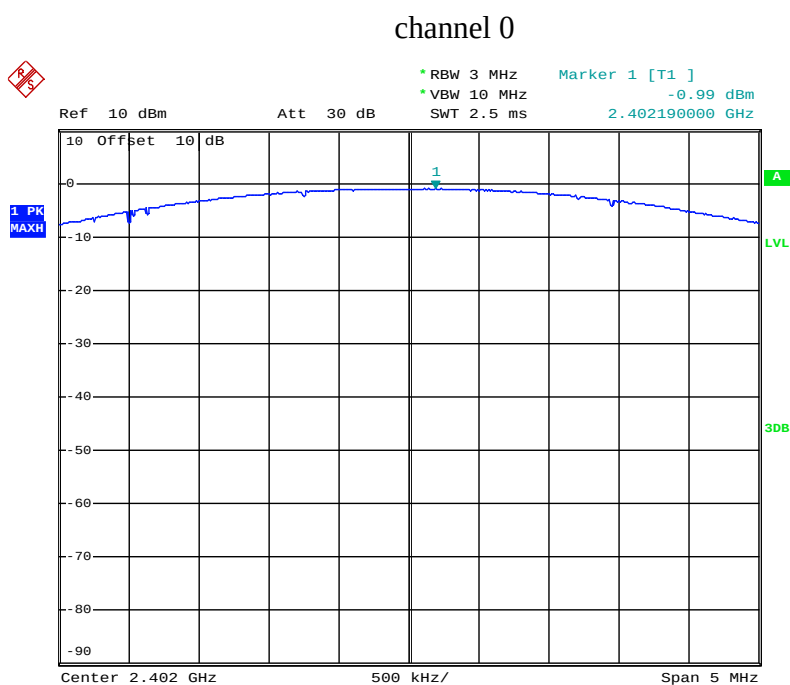
6.5.2. Set RBW of spectrum analyzer to 3 MHz and VBW to 10MHz.

6.5.3. Measurement the maximum peak output power.

## 6.6.Test Result

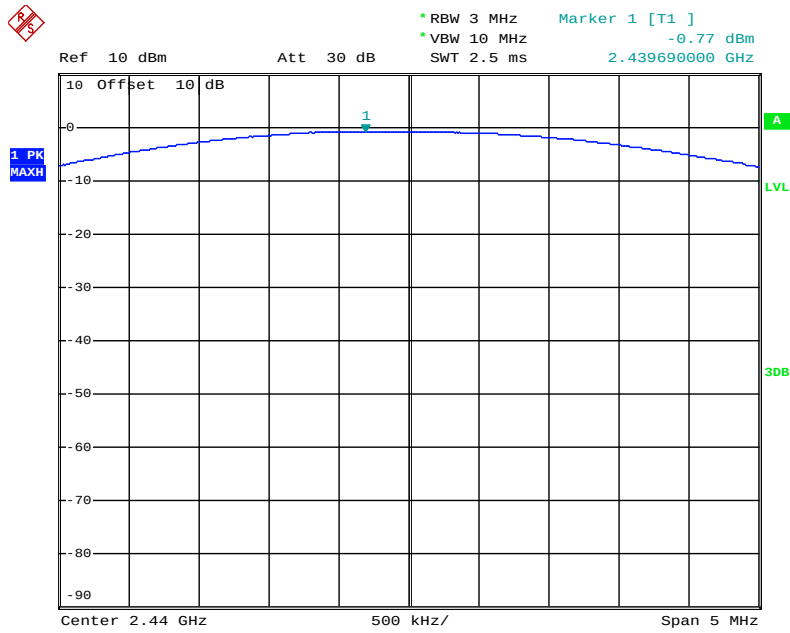
| Channel | Frequency (MHz) | Peak Power Output (dBm) | Peak Power Limit (dBm) | Result |
|---------|-----------------|-------------------------|------------------------|--------|
| 0       | 2402            | -0.99                   | 30                     | Pass   |
| 19      | 2440            | -0.77                   | 30                     | Pass   |
| 39      | 2480            | -1.54                   | 30                     | Pass   |

The spectrum analyzer plots are attached as below.



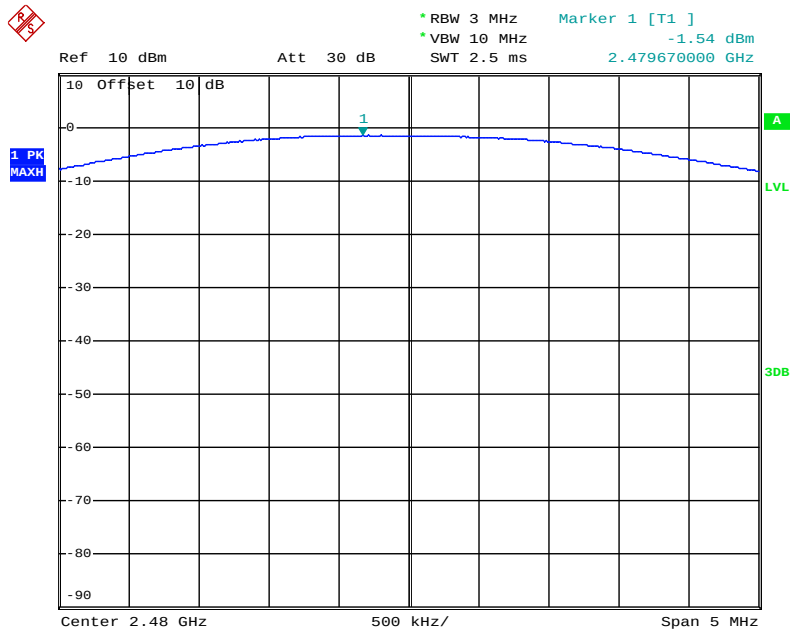
Date: 26.MAR.2020 09:35:06

## channel 19



Date: 26.MAR.2020 09:34:26

## channel 39



Date: 26.MAR.2020 09:35:30

## 7. POWER SPECTRAL DENSITY TEST

### 7.1. Block Diagram of Test Setup



### 7.2. The Requirement For Section 15.247(e)

Section 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 7.3. EUT Configuration on Test

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

### 7.4. Operating Condition of EUT

7.4.1. Setup the EUT and simulator as shown as Section 7.1.

7.4.2. Turn on the power of all equipment.

7.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

## 7.5.Test Procedure

7.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

7.5.2.Measurement Procedure PKPSD:

7.5.3.This procedure must be used if maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit, and is optional if the maximum (average) conducted output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
4. Set the VBW  $\geq 3 \times \text{RBW}$ .
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3kHz) and repeat.

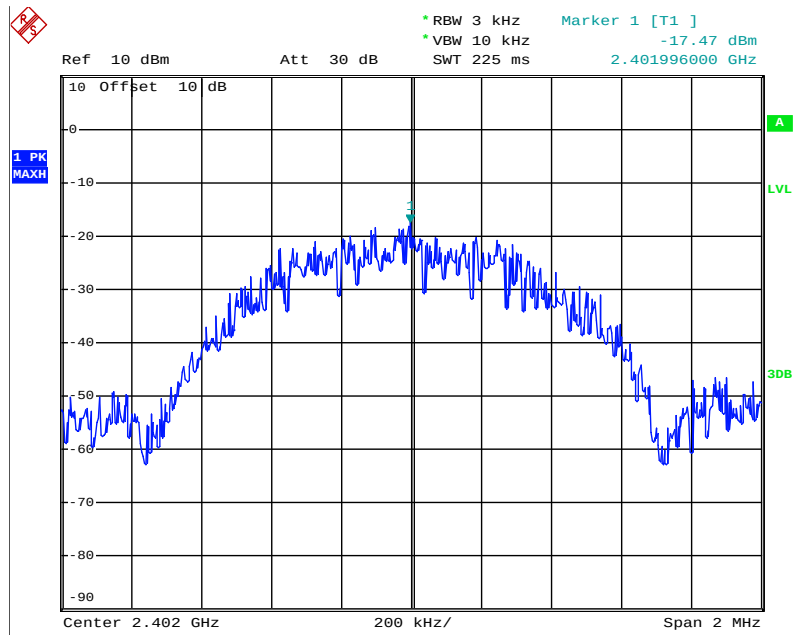
7.5.4.Measurement the maximum power spectral density.

## 7.6.Test Result

| Channel | Frequency (MHz ) | PSD (dBm/3KHz) | Limit (dBm/3KHz) | Result |
|---------|------------------|----------------|------------------|--------|
| 0       | 2402             | -17.47         | 8                | Pass   |
| 19      | 2440             | -16.53         | 8                | Pass   |
| 39      | 2480             | -18.19         | 8                | Pass   |

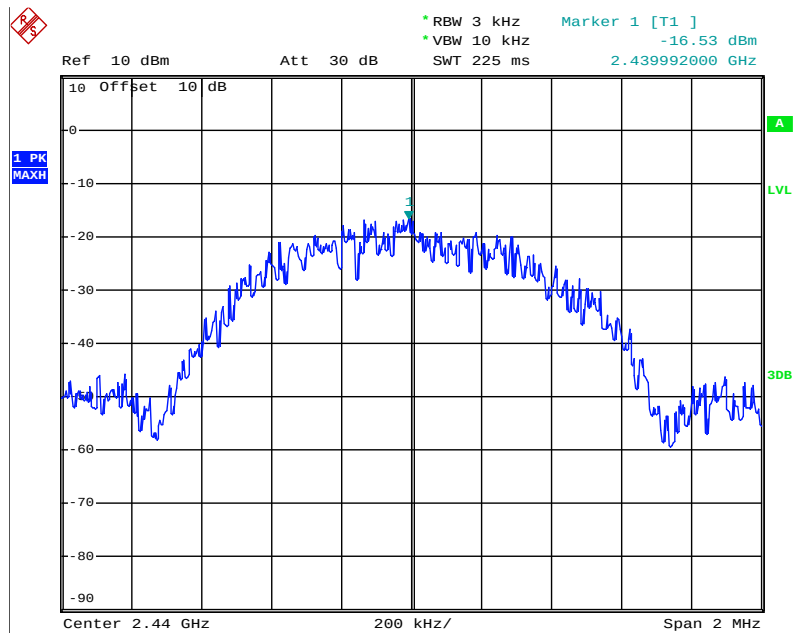
The spectrum analyzer plots are attached as below.

## channel 0



Date: 26.MAR.2020 09:38:05

## channel 19



Date: 26.MAR.2020 09:37:29

Ref 10 dBm Att 30 dB RBW 3 kHz VBW 10 kHz SWT 225 ms Marker 1 [T1] -18.19 dBm 2.479996000 GHz  
 10 Offset 10 dB  
 1 PK MAXH  
 LVL  
 3DB  
 Center 2.48 GHz 200 kHz/ Span 2 MHz

Date: 26.MAR.2020 09:36:20

## 8. BAND EDGE COMPLIANCE TEST

### 8.1. Block Diagram of Test Setup



### 8.2. The Requirement For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

### 8.3. EUT Configuration on Test

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

### 8.4. Operating Condition of EUT

8.4.1. Setup the EUT and simulator as shown as Section 8.1.

8.4.2. Turn on the power of all equipment.

8.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2480MHz TX frequency to transmit.

## 8.5. Test Procedure

### Conducted Band Edge:

8.5.1. The transmitter output was connected to the spectrum analyzer via a low loss cable.

8.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

### Radiate Band Edge:

8.5.3. The EUT is placed on a turntable, which is 0.1m above the ground plane and worked at highest radiated power.

8.5.4. The turntable was rotated for 360 degrees to determine the position of maximum emission level.

8.5.5. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

8.5.6. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

8.5.7. RBW=1MHz, VBW=1MHz

8.5.8. The band edges was measured and recorded.

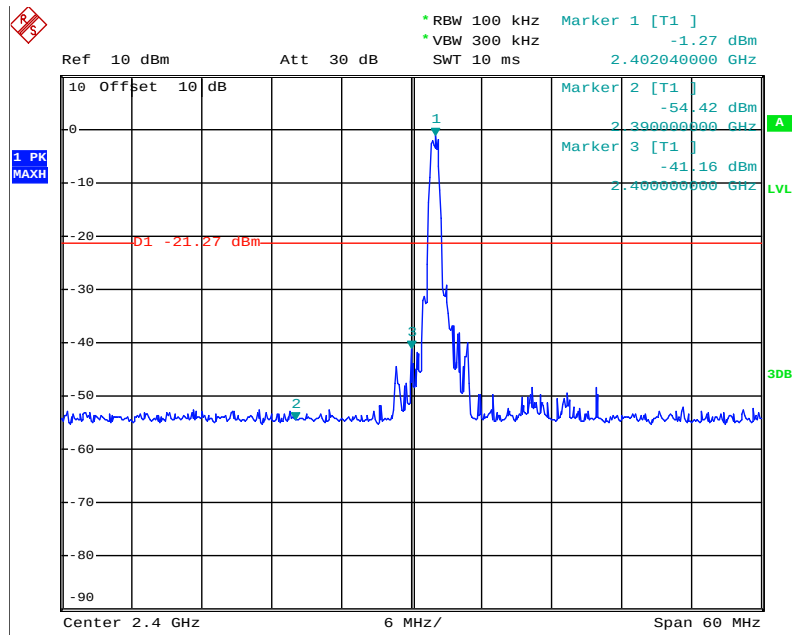
## 8.6. Test Result

### Conducted Band Edge Result

| Channel | Frequency | Delta peak to band emission | Limit(dBc) | Result |
|---------|-----------|-----------------------------|------------|--------|
| 0       | 2.402GHz  | 42.43                       | > 20       | Pass   |
| 39      | 2.480GHz  | 56.98                       | > 20       | Pass   |

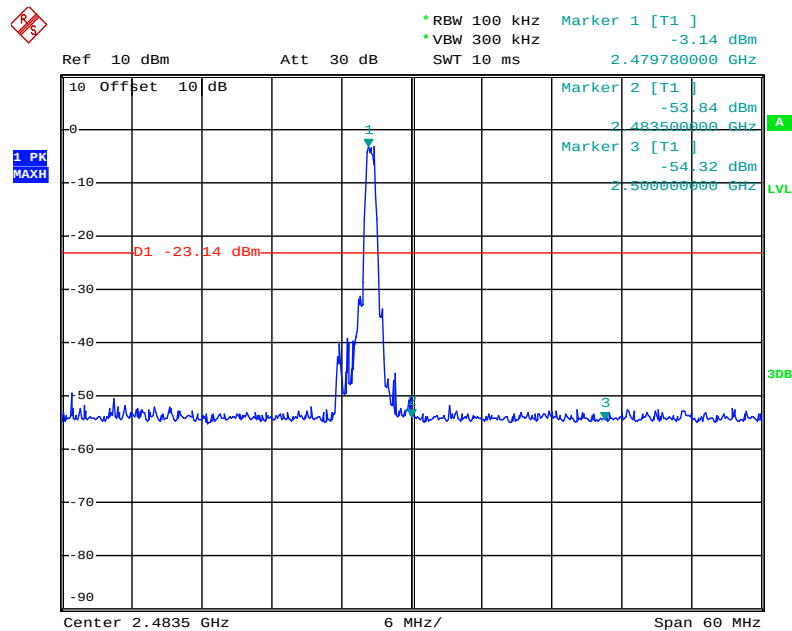
The spectrum analyzer plots are attached as below.

## channel 0



Date: 26.MAR.2020 09:39:09

## channel 39



Date: 26.MAR.2020 09:40:25

## Radiated Band Edge Result



**ACCURATE TECHNOLOGY CO., LTD.**

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,  
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber

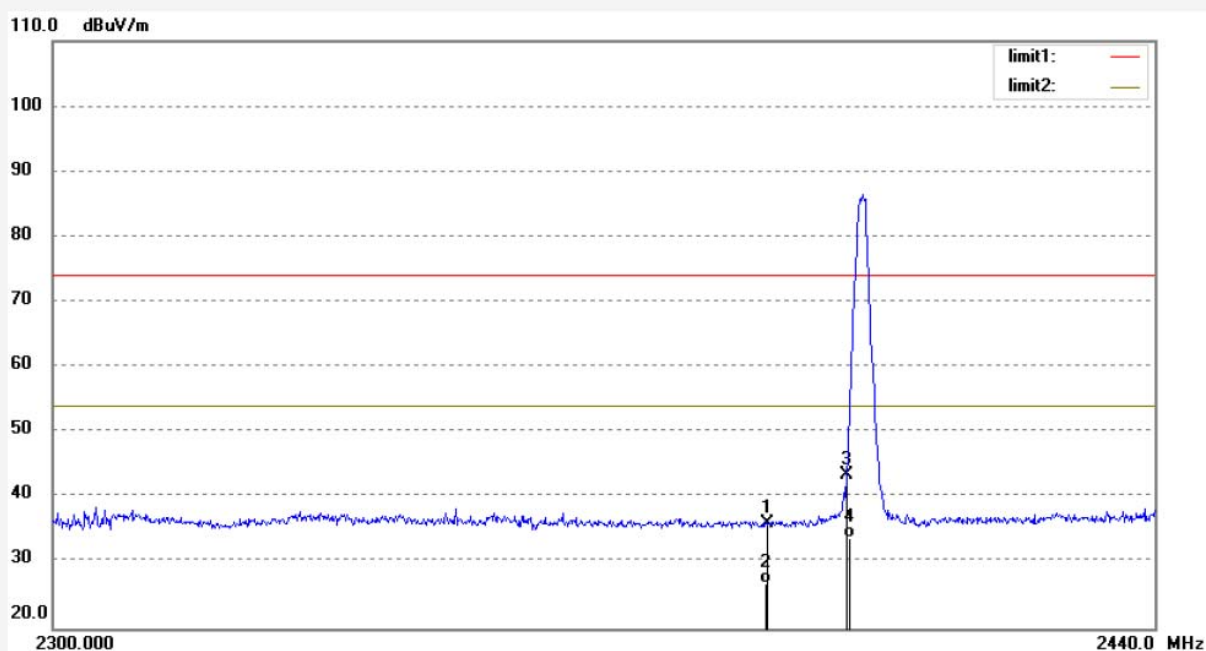
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #94  
Standard: FCC PK  
Test item: Radiation Test  
Temp.( C)/Hum.(%) 25 C / 55 %  
EUT: Bluemini Bluetooth Dongle  
Mode: TX2402MHz  
Model: Bluemini  
Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Vertical  
Power Source: DC 3.7V  
Date: 20/03/20/  
Time: 15/52/44  
Engineer Signature:  
Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 2390.000    | 42.34            | -6.32       | 36.02           | 74.00          | -37.98      | peak     | 150         | 82            |        |
| 2   | 2390.000    | 33.21            | -6.32       | 26.89           | 54.00          | -27.11      | AVG      | 150         | 215           |        |
| 3   | 2400.000    | 49.84            | -6.27       | 43.57           | 74.00          | -30.43      | peak     | 150         | 66            |        |
| 4   | 2400.000    | 40.10            | -6.27       | 33.83           | 54.00          | -20.17      | AVG      | 150         | 146           |        |



## ACCURATE TECHNOLOGY CO., LTD.

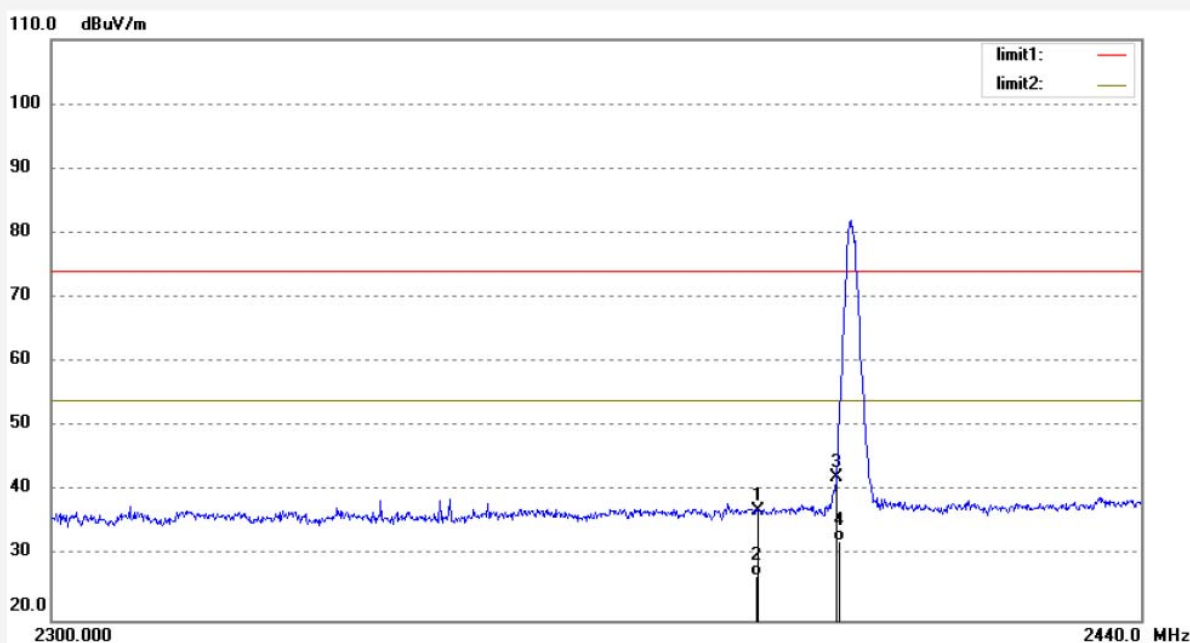
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,  
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber  
Tel:+86-0755-26503290  
Fax:+86-0755-26503396

Job No.: emc #95  
Standard: FCC PK  
Test item: Radiation Test  
Temp.( C)/Hum.(%) 25 C / 55 %  
EUT: Bluemini Bluetooth Dongle  
Mode: TX2402MHz  
Model: Bluemini  
Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Horizontal  
Power Source: DC 3.7V  
Date: 20/03/20/  
Time: 15/52/51  
Engineer Signature:  
Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 2390.000    | 43.34            | -6.32       | 37.02           | 74.00          | -36.98      | peak     | 200         | 41            |        |
| 2   | 2390.000    | 33.24            | -6.32       | 26.92           | 54.00          | -27.08      | AVG      | 200         | 22            |        |
| 3   | 2400.000    | 48.34            | -6.27       | 42.07           | 74.00          | -31.93      | peak     | 200         | 321           |        |
| 4   | 2400.000    | 38.46            | -6.27       | 32.19           | 54.00          | -21.81      | AVG      | 200         | 109           |        |



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F1,Bldg,A,Changyuan New Material Port Keyuan Rd,  
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Report No.: ATE20200222

Page 25 of 49

Site: 1# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #86

Standard: FCC PK

Test item: Radiation Test

Temp.( C)/Hum.(%) 25 C / 55 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2480MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Vertical

Power Source: DC 3.7V

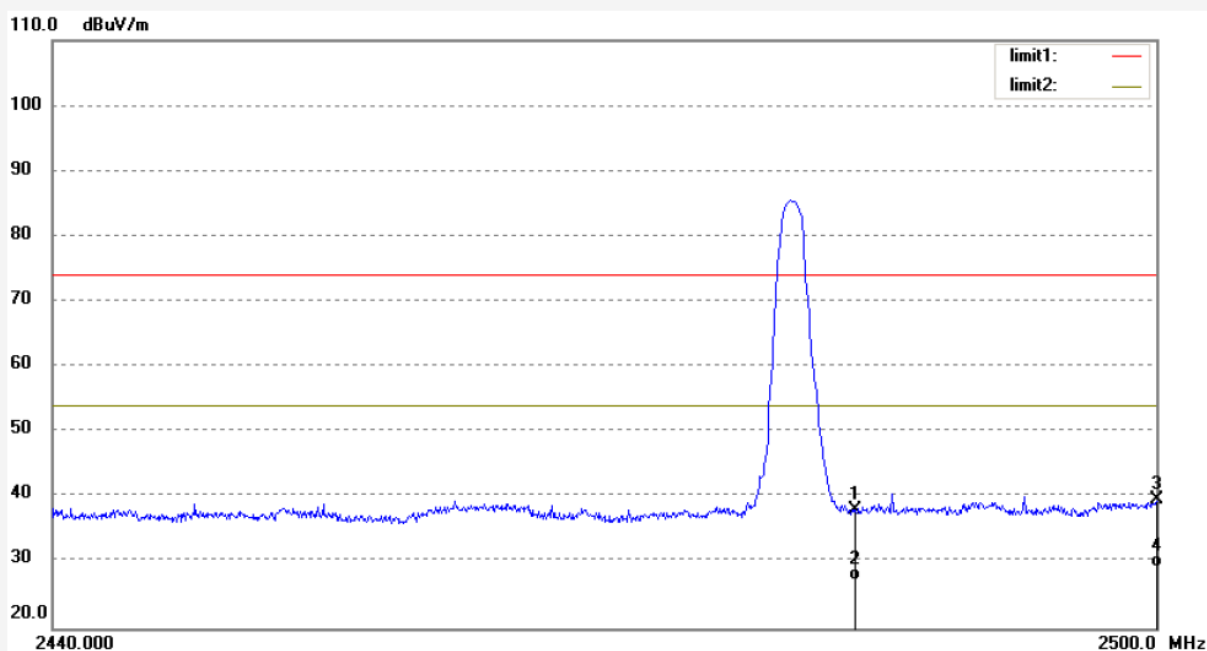
Date: 20/03/20/

Time: 15/47/39

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 2483.500    | 43.99            | -5.89       | 38.10           | 74.00          | -35.90      | peak     | 150         | 105           |        |
| 2   | 2483.500    | 33.24            | -5.89       | 27.35           | 54.00          | -26.65      | AVG      | 150         | 62            |        |
| 3   | 2500.000    | 45.47            | -5.81       | 39.66           | 74.00          | -34.34      | peak     | 150         | 118           |        |
| 4   | 2500.000    | 35.12            | -5.81       | 29.31           | 54.00          | -24.69      | AVG      | 150         | 163           |        |



## ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,  
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #87

Standard: FCC PK

Test item: Radiation Test

Temp.( C)/Hum.(%) 25 C / 55 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2480MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Horizontal

Power Source: DC 3.7V

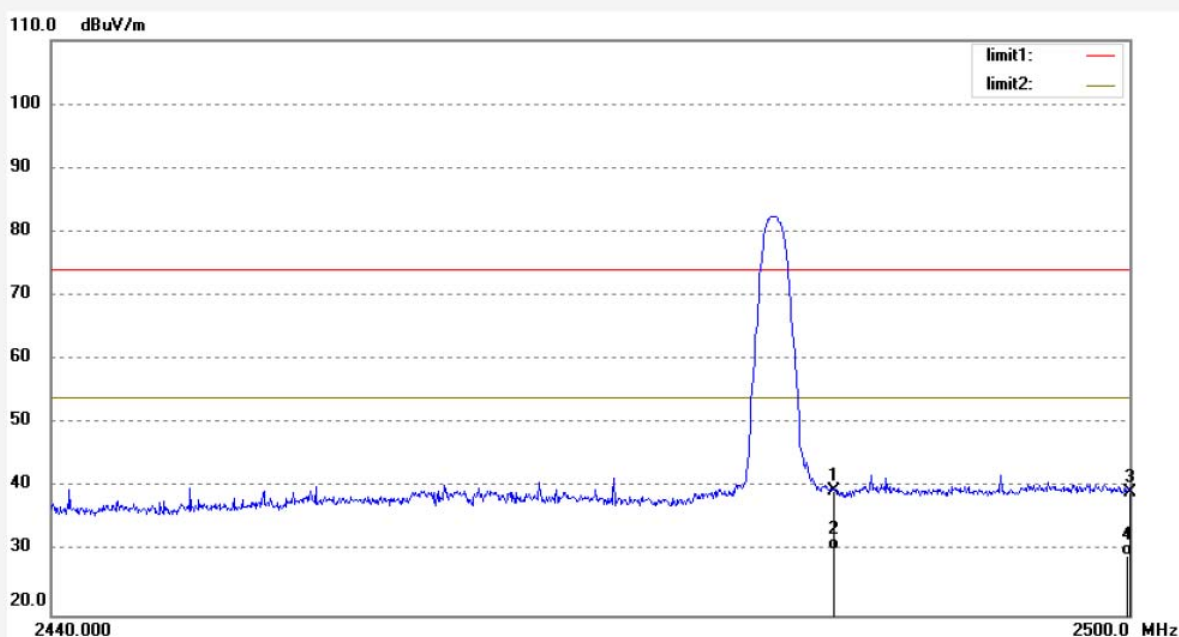
Date: 20/03/20/

Time: 15/47/55

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 2483.500    | 45.29            | -5.89       | 39.40           | 74.00          | -34.60      | peak     | 200         | 92            |        |
| 2   | 2483.500    | 36.12            | -5.89       | 30.23           | 54.00          | -23.77      | AVG      | 200         | 115           |        |
| 3   | 2500.000    | 45.15            | -5.81       | 39.34           | 74.00          | -34.66      | peak     | 200         | 62            |        |
| 4   | 2500.000    | 35.12            | -5.81       | 29.31           | 54.00          | -24.69      | AVG      | 200         | 103           |        |

Note:

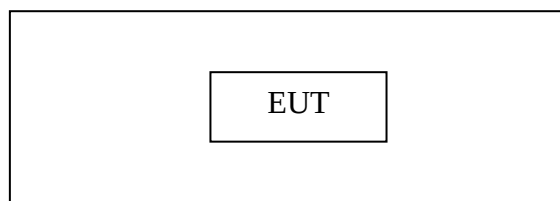
1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

## 9. RADIATED SPURIOUS EMISSION TEST

### 9.1. Block Diagram of Test Setup

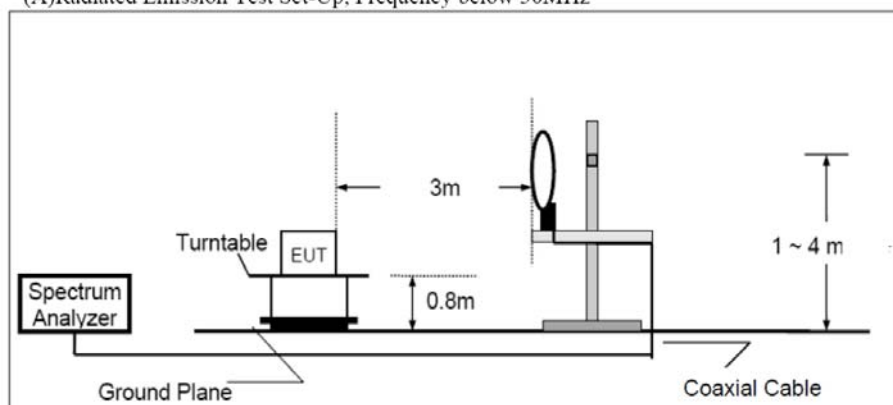
#### 9.1.1. Block diagram of connection between the EUT and peripherals



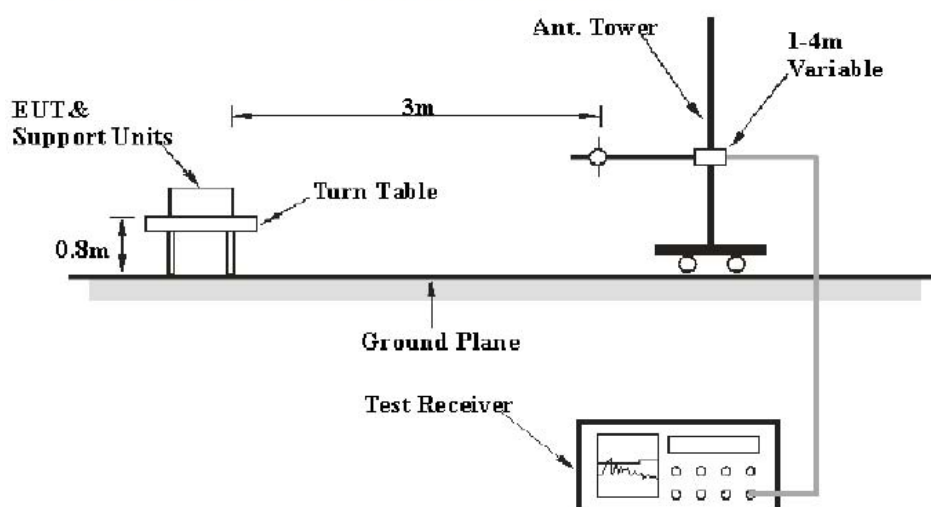
Setup: Transmitting mode

#### 9.1.2. Semi-Anechoic Chamber Test Setup Diagram

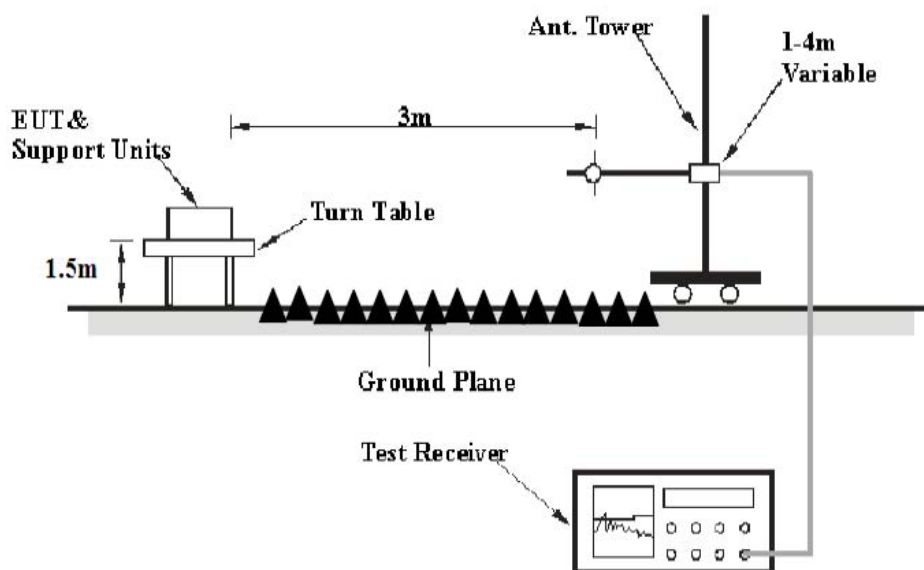
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency 30MHz-1GHz



(C) Radiated Emission Test Set-Up, Frequency above 1GHz



## 9.2.The Limit For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

### 9.3. Restricted bands of operation

#### 9.3.1.FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                      | MHz                 | MHz           | GHz              |
|--------------------------|---------------------|---------------|------------------|
| 0.090-0.110              | 16.42-16.423        | 399.9-410     | 4.5-5.15         |
| <sup>1</sup> 0.495-0.505 | 16.69475-16.69525   | 608-614       | 5.35-5.46        |
| 2.1735-2.1905            | 16.80425-16.80475   | 960-1240      | 7.25-7.75        |
| 4.125-4.128              | 25.5-25.67          | 1300-1427     | 8.025-8.5        |
| 4.17725-4.17775          | 37.5-38.25          | 1435-1626.5   | 9.0-9.2          |
| 4.20725-4.20775          | 73-74.6             | 1645.5-1646.5 | 9.3-9.5          |
| 6.215-6.218              | 74.8-75.2           | 1660-1710     | 10.6-12.7        |
| 6.26775-6.26825          | 108-121.94          | 1718.8-1722.2 | 13.25-13.4       |
| 6.31175-6.31225          | 123-138             | 2200-2300     | 14.47-14.5       |
| 8.291-8.294              | 149.9-150.05        | 2310-2390     | 15.35-16.2       |
| 8.362-8.366              | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4        |
| 8.37625-8.38675          | 156.7-156.9         | 2690-2900     | 22.01-23.12      |
| 8.41425-8.41475          | 162.0125-167.17     | 3260-3267     | 23.6-24.0        |
| 12.29-12.293             | 167.72-173.2        | 3332-3339     | 31.2-31.8        |
| 12.51975-12.52025        | 240-285             | 3345.8-3358   | 36.43-36.5       |
| 12.57675-12.57725        | 322-335.4           | 3600-4400     | ( <sup>2</sup> ) |
| 13.36-13.41              |                     |               |                  |

<sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510

<sup>2</sup>Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

### 9.4.Configuration of EUT on Test

The equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

## 9.5. Operating Condition of EUT

9.5.1. Setup the EUT and simulator as shown as Section 9.1.

9.5.2. Turn on the power of all equipment.

9.5.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

## 9.6. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground (Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground (Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

The bandwidth of test receiver is set at 9 kHz in below 30MHz. and set at 120 kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The final measurement in band 9-90 kHz, 110-490 kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector. The field strength is calculated by adding the antenna factor, and cable loss, and subtracting the amplifier gain from the measured reading.

### 9.7.Data Sample

| Frequency (MHz) | Reading (dB $\mu$ v) | Factor (dB/m) | Result (dB $\mu$ v/m) | Limit (dB $\mu$ v/m) | Margin (dB) | Remark |
|-----------------|----------------------|---------------|-----------------------|----------------------|-------------|--------|
| X.XX            | 43.85                | -22.22        | 21.63                 | 43.5                 | -21.87      | QP     |

Frequency(MHz) = Emission frequency in MHz

Reading(dB $\mu$ v) = Uncorrected Analyzer/Receiver reading

Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain

Result(dB $\mu$ v/m) = Reading(dB $\mu$ v) + Factor(dB/m)

Limit (dB $\mu$ v/m) = Limit stated in standard

Margin (dB) = Result(dB $\mu$ v/m) - Limit (dB $\mu$ v/m)

QP = Quasi-peak Reading

Calculation Formula:

Margin(dB) = Result (dB $\mu$ V/m)–Limit(dB $\mu$ V/m)

Result(dB $\mu$ V/m)= Reading(dB $\mu$ V)+ Factor(dB/m)

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit.

### 9.8.Test Result

**Pass.**

Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 3th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9kHz to 30MHz and 18 to 26.5GHz.

The spectrum analyzer plots are attached as below.

## Below 1GHz



### ACCURATE TECHNOLOGY CO., LTD.

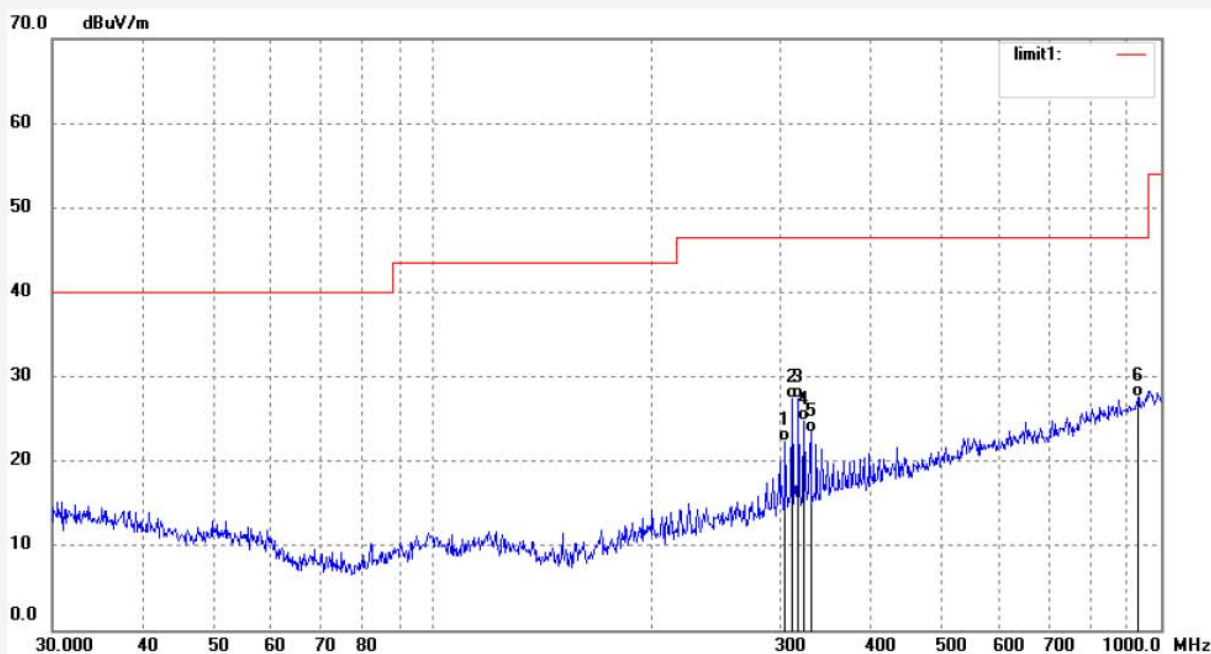
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,  
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber  
Tel:+86-0755-26503290  
Fax:+86-0755-26503396

Job No.: emc #104  
Standard: FCC Class B 3M Radiated  
Test item: Radiation Test  
Temp.( C)/Hum.(%) 23 C / 48 %  
EUT: Bluemini Bluetooth Dongle  
Mode: TX2402MHz  
Model: Bluemini  
Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Horizontal  
Power Source: DC 3.7V  
Date: 2020/03/24  
Time: 17:23:13  
Engineer Signature:  
Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 304.6099    | 32.58            | -10.21      | 22.37           | 46.50          | -24.13      | QP       | 200         | 302           |        |
| 2   | 311.0867    | 37.31            | -9.99       | 27.32           | 46.50          | -19.18      | QP       | 200         | 213           |        |
| 3   | 317.7010    | 37.22            | -9.81       | 27.41           | 46.50          | -19.09      | QP       | 200         | 63            |        |
| 4   | 323.3204    | 34.40            | -9.61       | 24.79           | 46.50          | -21.71      | QP       | 200         | 126           |        |
| 5   | 330.1949    | 32.79            | -9.34       | 23.45           | 46.50          | -23.05      | QP       | 200         | 201           |        |
| 6   | 929.0081    | 26.80            | 0.82        | 27.62           | 46.50          | -18.88      | QP       | 200         | 103           |        |



## ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,  
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #105

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.( C)/Hum.(%) 23 C / 48 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2402MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Vertical

Power Source: DC 3.7V

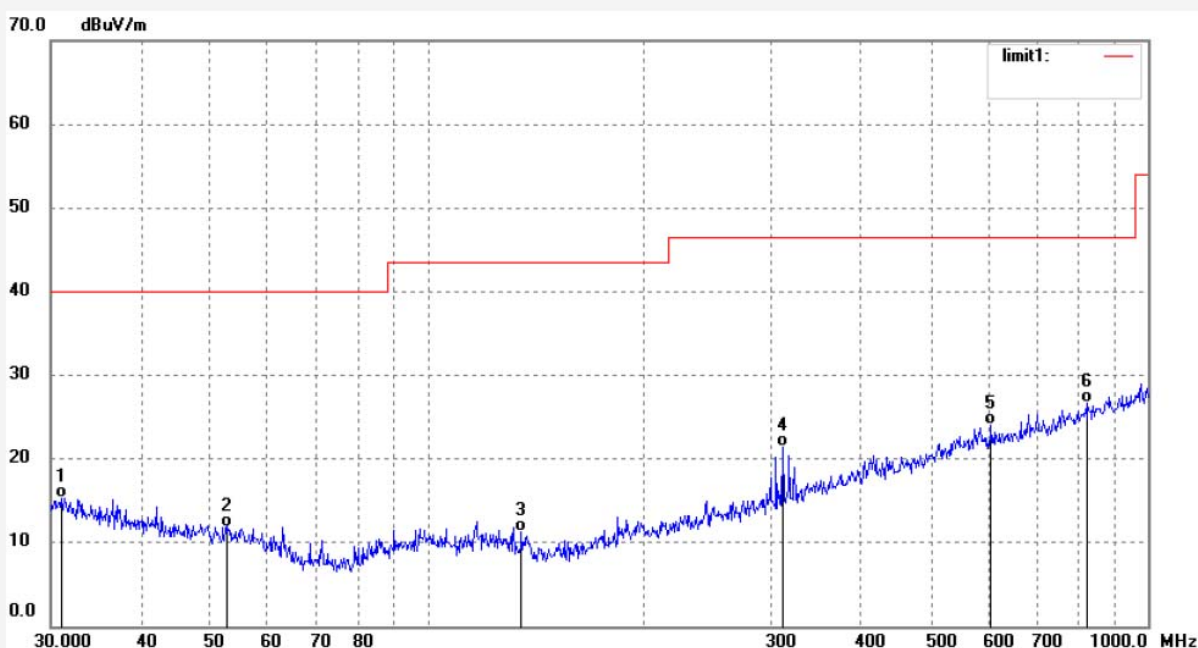
Date: 2020/03/24

Time: 17:23:37

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 31.0705     | 25.53            | -10.25      | 15.28           | 40.00          | -24.72      | QP       | 100         | 103           |        |
| 2   | 52.7599     | 25.71            | -13.81      | 11.90           | 40.00          | -28.10      | QP       | 100         | 201           |        |
| 3   | 135.0319    | 26.41            | -15.08      | 11.33           | 43.50          | -32.17      | QP       | 100         | 82            |        |
| 4   | 311.0867    | 31.46            | -9.99       | 21.47           | 46.50          | -25.03      | QP       | 100         | 61            |        |
| 5   | 605.6592    | 27.96            | -3.90       | 24.06           | 46.50          | -22.44      | QP       | 100         | 221           |        |
| 6   | 824.5968    | 27.29            | -0.58       | 26.71           | 46.50          | -19.79      | QP       | 100         | 163           |        |



## ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,  
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #106

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.( C)/Hum.(%) 23 C / 48 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2440MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Vertical

Power Source: DC 3.7V

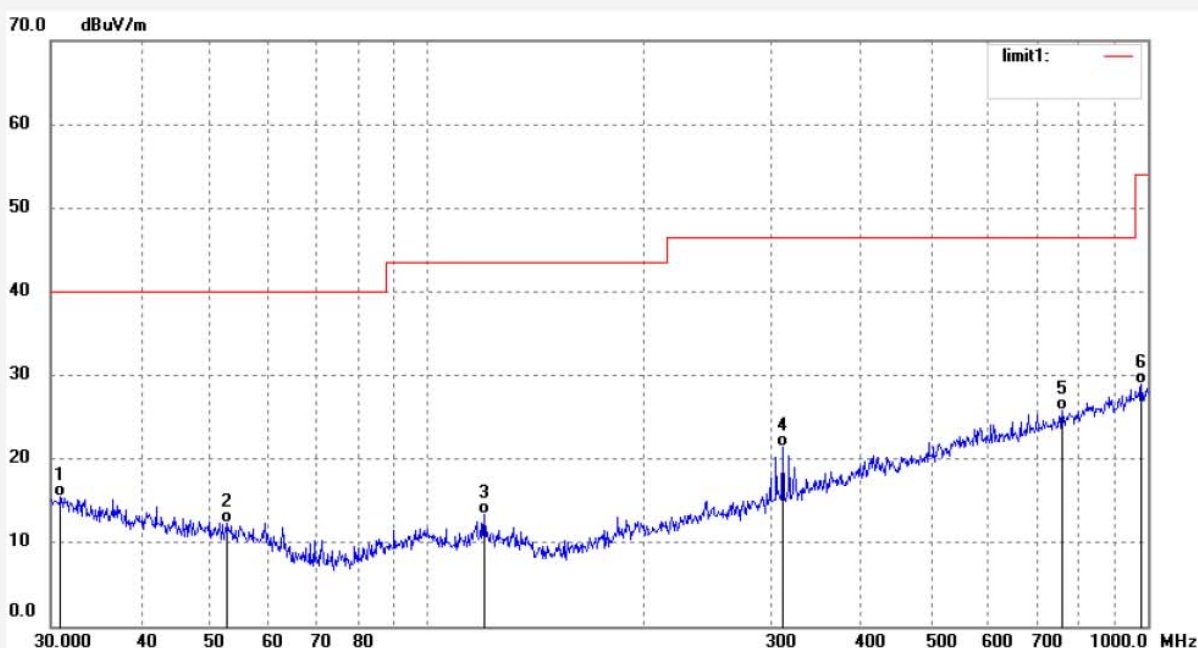
Date: 2020/03/24

Time: 17:23:48

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 30.9618     | 25.75            | -10.21      | 15.54           | 40.00          | -24.46      | QP       | 100         | 216           |        |
| 2   | 52.7599     | 26.15            | -13.81      | 12.34           | 40.00          | -27.66      | QP       | 100         | 89            |        |
| 3   | 119.8555    | 27.50            | -14.15      | 13.35           | 43.50          | -30.15      | QP       | 100         | 221           |        |
| 4   | 311.0867    | 31.46            | -9.99       | 21.47           | 46.50          | -25.03      | QP       | 100         | 30            |        |
| 5   | 760.7036    | 27.65            | -1.86       | 25.79           | 46.50          | -20.71      | QP       | 100         | 123           |        |
| 6   | 979.1803    | 27.39            | 1.59        | 28.98           | 54.00          | -25.02      | QP       | 100         | 102           |        |

Job No.: emc #107

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.( C)/Hum.(%) 23 C / 48 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2440MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Horizontal

Power Source: DC 3.7V

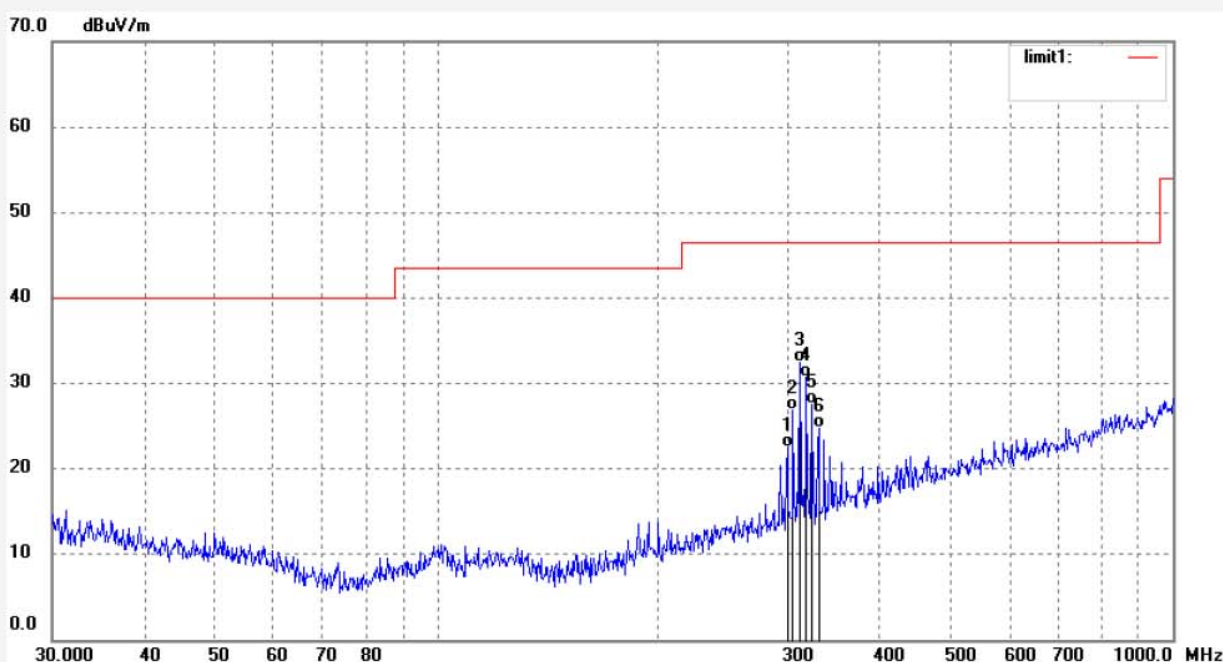
Date: 2020/03/24

Time: 17:23:59

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 299.3158    | 32.73            | -10.29      | 22.44           | 46.50          | -24.06      | QP       | 200         | 146           |        |
| 2   | 304.6099    | 37.07            | -10.21      | 26.86           | 46.50          | -19.64      | QP       | 200         | 306           |        |
| 3   | 311.0867    | 42.38            | -9.99       | 32.39           | 46.50          | -14.11      | QP       | 200         | 216           |        |
| 4   | 317.7010    | 40.54            | -9.81       | 30.73           | 46.50          | -15.77      | QP       | 200         | 22            |        |
| 5   | 323.3204    | 37.15            | -9.61       | 27.54           | 46.50          | -18.96      | QP       | 200         | 108           |        |
| 6   | 330.1949    | 34.02            | -9.34       | 24.68           | 46.50          | -21.82      | QP       | 200         | 81            |        |



## ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,  
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #108

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.( C)/Hum.(%) 23 C / 48 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2480MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Horizontal

Power Source: DC 3.7V

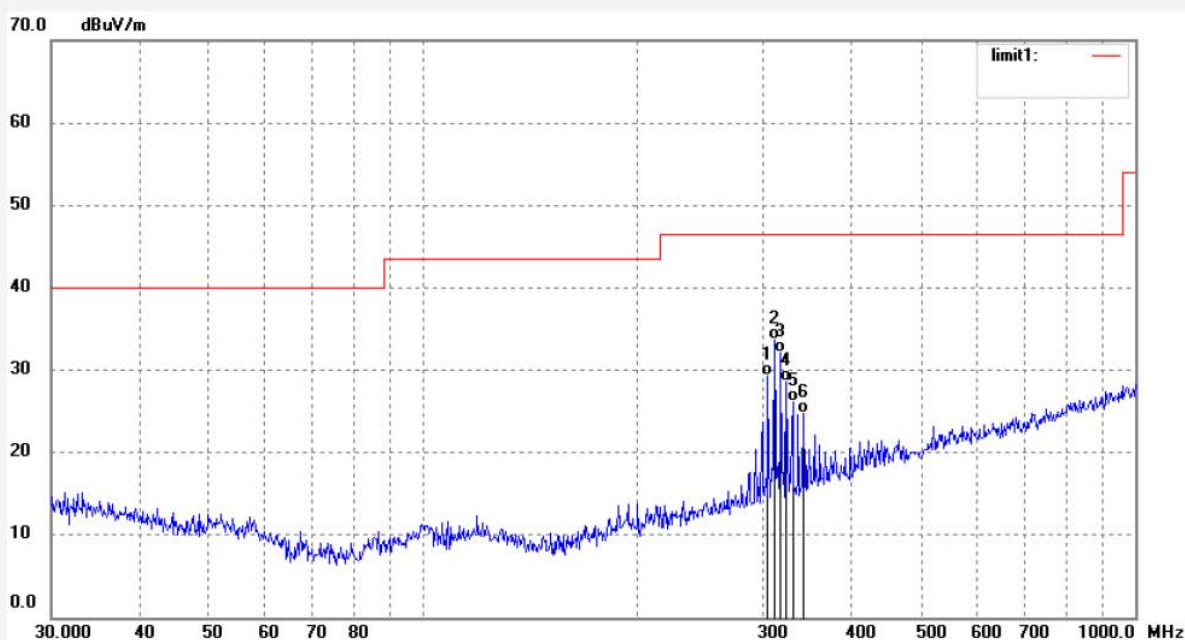
Date: 2020/03/24

Time: 17:24:09

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 304.6099    | 39.59            | -10.21      | 29.38           | 46.50          | -17.12      | QP       | 200         | 298           |        |
| 2   | 311.0867    | 43.70            | -9.99       | 33.71           | 46.50          | -12.79      | QP       | 200         | 118           |        |
| 3   | 317.7010    | 41.91            | -9.81       | 32.10           | 46.50          | -14.40      | QP       | 200         | 201           |        |
| 4   | 323.3204    | 38.16            | -9.61       | 28.55           | 46.50          | -17.95      | QP       | 200         | 96            |        |
| 5   | 330.1949    | 35.44            | -9.34       | 26.10           | 46.50          | -20.40      | QP       | 200         | 215           |        |
| 6   | 341.9786    | 33.68            | -9.00       | 24.68           | 46.50          | -21.82      | QP       | 200         | 103           |        |



## ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,  
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #109

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.( C)/Hum.(%) 23 C / 48 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2480MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Vertical

Power Source: DC 3.7V

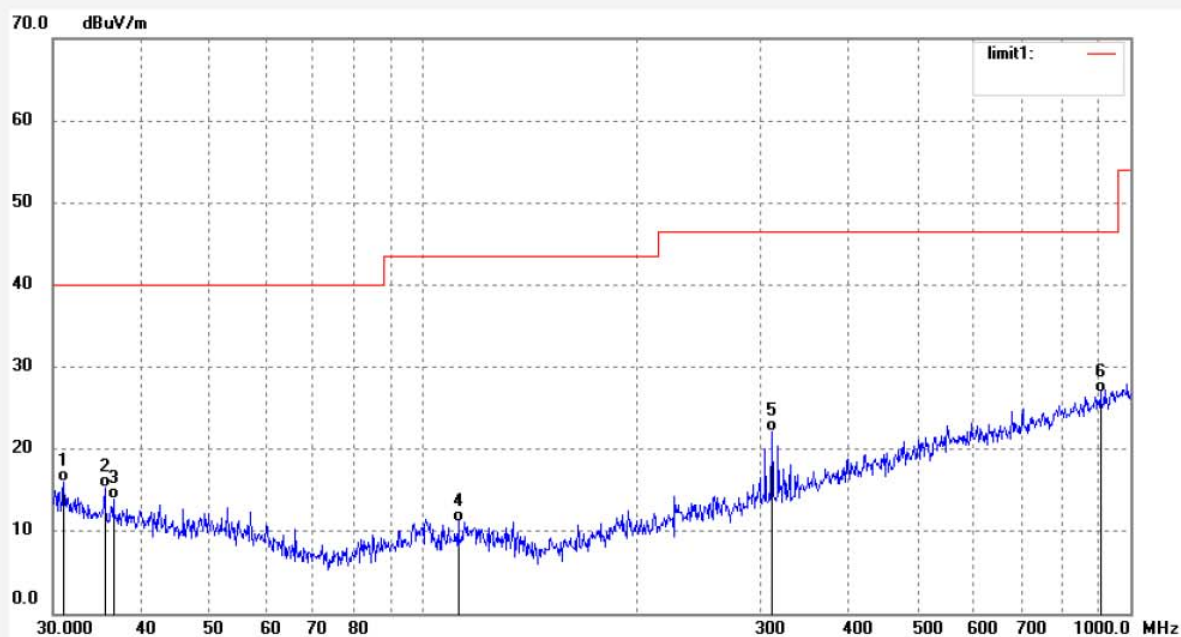
Date: 2020/03/24

Time: 17:24:31

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 31.0705     | 26.28            | -10.25      | 16.03           | 40.00          | -23.97      | QP       | 100         | 145           |        |
| 2   | 35.4992     | 26.90            | -11.53      | 15.37           | 40.00          | -24.63      | QP       | 100         | 92            |        |
| 3   | 36.5091     | 25.67            | -11.75      | 13.92           | 40.00          | -26.08      | QP       | 100         | 126           |        |
| 4   | 112.1304    | 25.78            | -14.58      | 11.20           | 43.50          | -32.30      | QP       | 100         | 163           |        |
| 5   | 311.0867    | 32.13            | -9.99       | 22.14           | 46.50          | -24.36      | QP       | 100         | 62            |        |
| 6   | 906.4823    | 26.62            | 0.33        | 26.95           | 46.50          | -19.55      | QP       | 100         | 126           |        |

## Above 1GHz



### ACCURATE TECHNOLOGY CO., LTD.

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Site: 1# Chamber

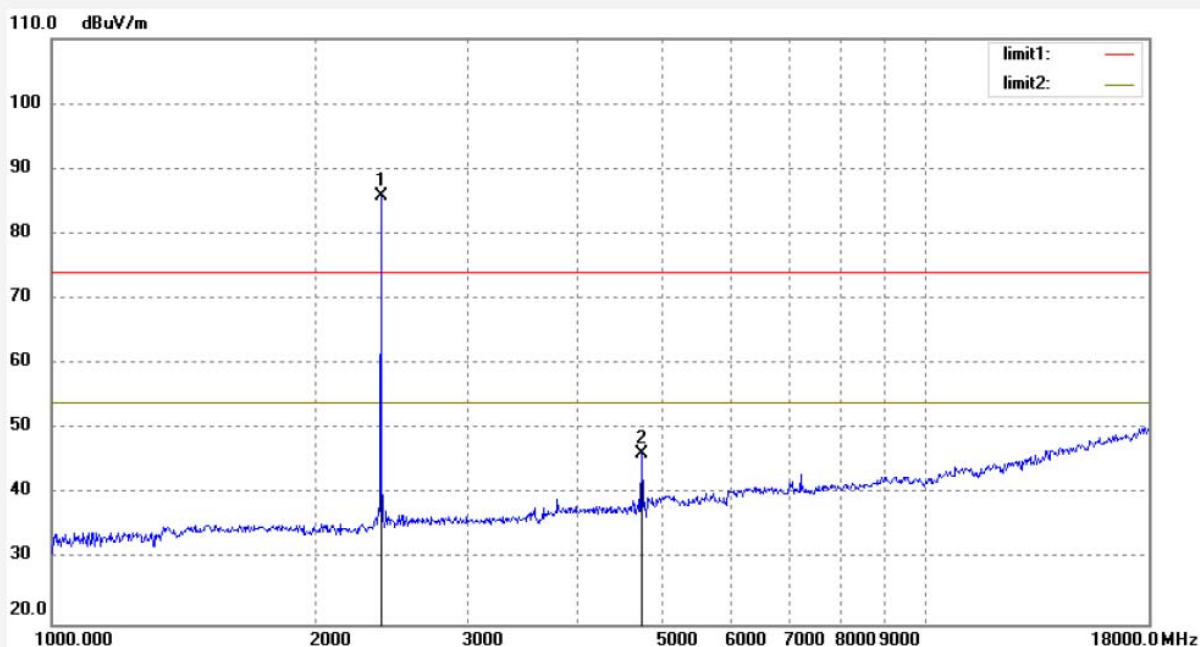
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #93  
Standard: FCC PK  
Test item: Radiation Test  
Temp.( C)/Hum.(%) 25 C / 55 %  
EUT: Bluemini Bluetooth Dongle  
Mode: TX2402MHz  
Model: Bluemini  
Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Vertical  
Power Source: DC 3.7V  
Date: 20/03/20/  
Time: 15/51/36  
Engineer Signature:  
Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 2402.000    | 92.10            | -6.37       | 85.73           |                |             | peak     | 150         | 96            |        |
| 2   | 4804.000    | 45.61            | 0.70        | 46.31           | 74.00          | -27.69      | peak     | 150         | 211           |        |



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Site: 1# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #92

Standard: FCC PK

Test item: Radiation Test

Temp.( C)/Hum.(%) 25 C / 55 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2402MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Horizontal

Power Source: DC 3.7V

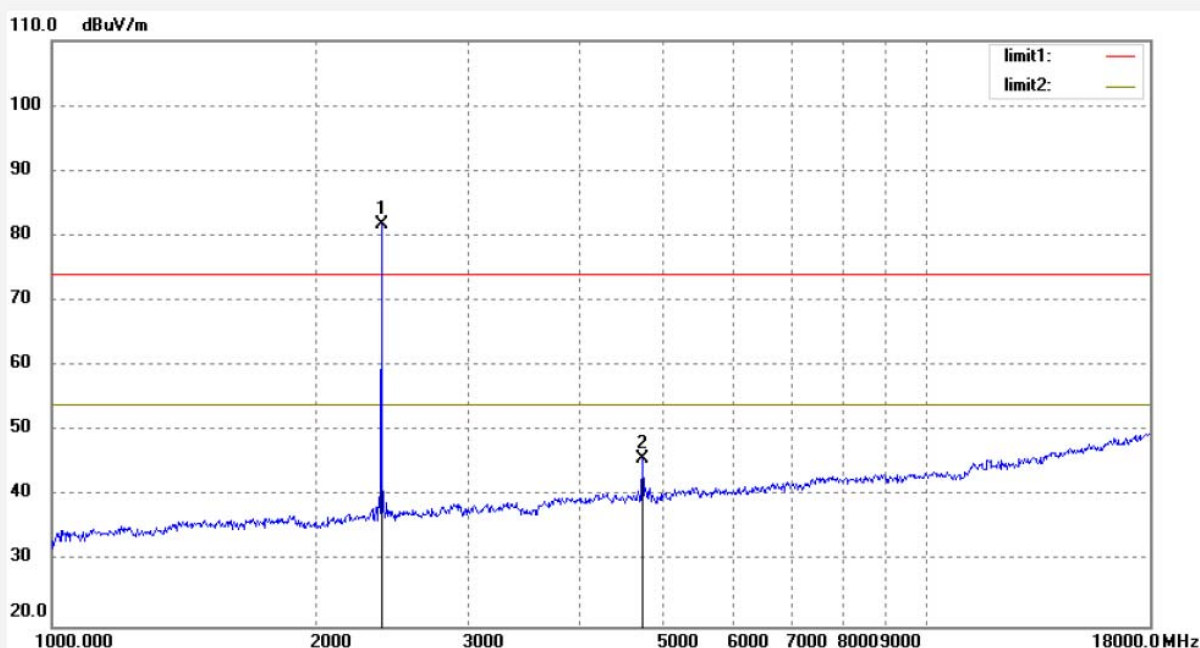
Date: 20/03/20/

Time: 15/51/25

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 2402.000    | 88.10            | -6.37       | 81.73           |                |             | peak     | 200         | 321           |        |
| 2   | 4804.000    | 45.11            | 0.70        | 45.81           | 74.00          | -28.19      | peak     | 200         | 106           |        |



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Science & Industry Park,Nanshan Shenzhen,P.R.China

Report No.: ATE20200222

Page 40 of 49

Site: 1# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #91

Standard: FCC PK

Test item: Radiation Test

Temp.( C)/Hum.(%) 25 C / 55 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2440MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Horizontal

Power Source: DC 3.7V

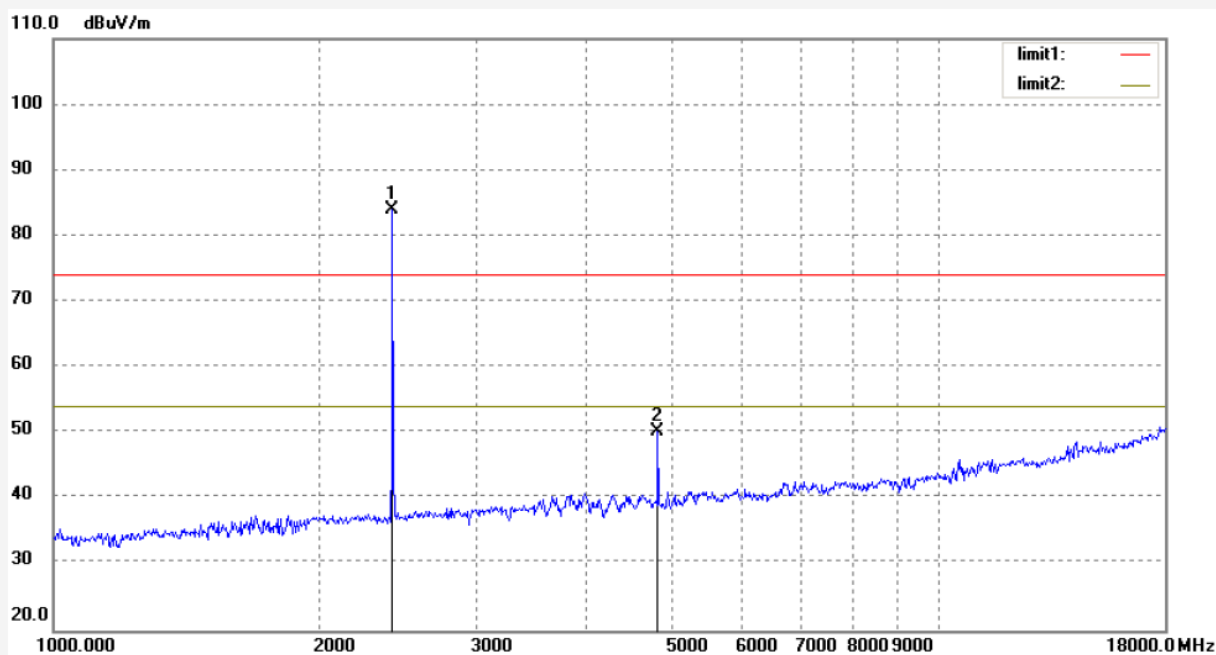
Date: 20/03/20/

Time: 15/50/18

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq.<br>(MHz) | Reading<br>(dBuV/m) | Factor<br>(dB) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Detector | Height<br>(cm) | Degree<br>(deg.) | Remark |
|-----|----------------|---------------------|----------------|--------------------|-------------------|----------------|----------|----------------|------------------|--------|
| 1   | 2440.000       | 90.17               | -6.20          | 83.97              |                   |                | peak     | 200            | 41               |        |
| 2   | 4880.000       | 49.26               | 1.07           | 50.33              | 74.00             | -23.67         | peak     | 200            | 108              |        |

Job No.: emc #90

Standard: FCC PK

Test item: Radiation Test

Temp.( C)/Hum.(%) 25 C / 55 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2440MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Vertical

Power Source: DC 3.7V

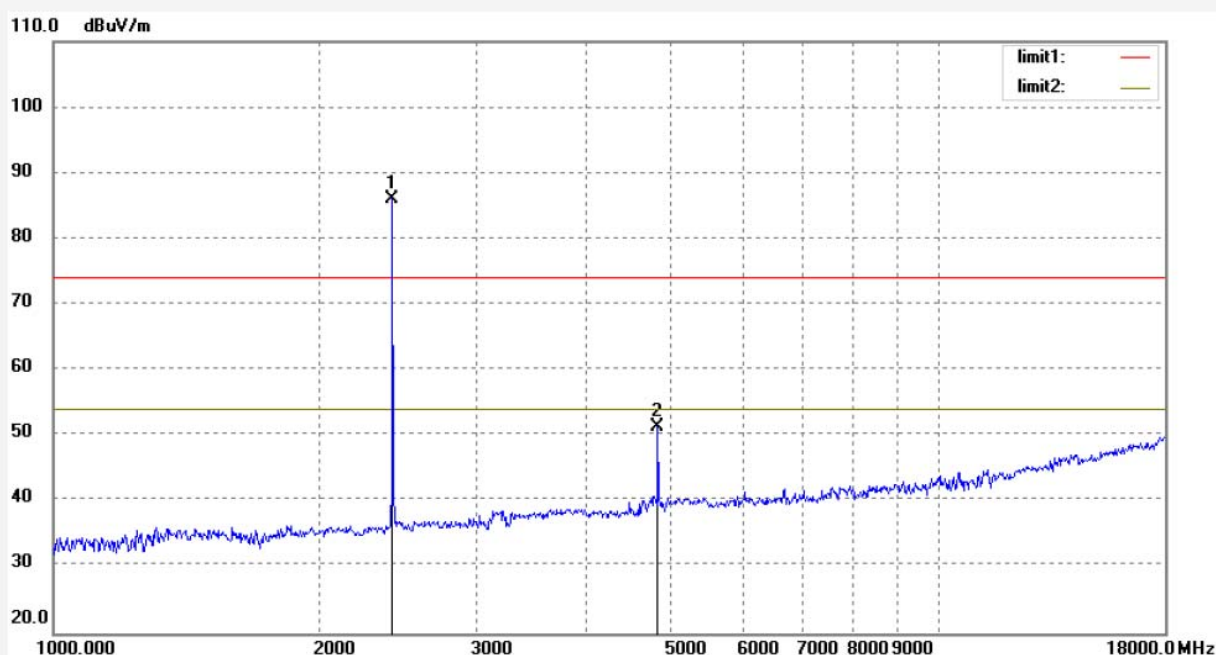
Date: 20/03/20/

Time: 15/50/12

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 2440.000    | 92.17            | -6.20       | 85.97           |                |             | peak     | 150         | 52            |        |
| 2   | 4880.000    | 50.26            | 1.07        | 51.33           | 74.00          | -22.67      | peak     | 150         | 104           |        |



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Site: 1# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #89

Standard: FCC PK

Test item: Radiation Test

Temp.( C)/Hum.(%) 25 C / 55 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2480MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Vertical

Power Source: DC 3.7V

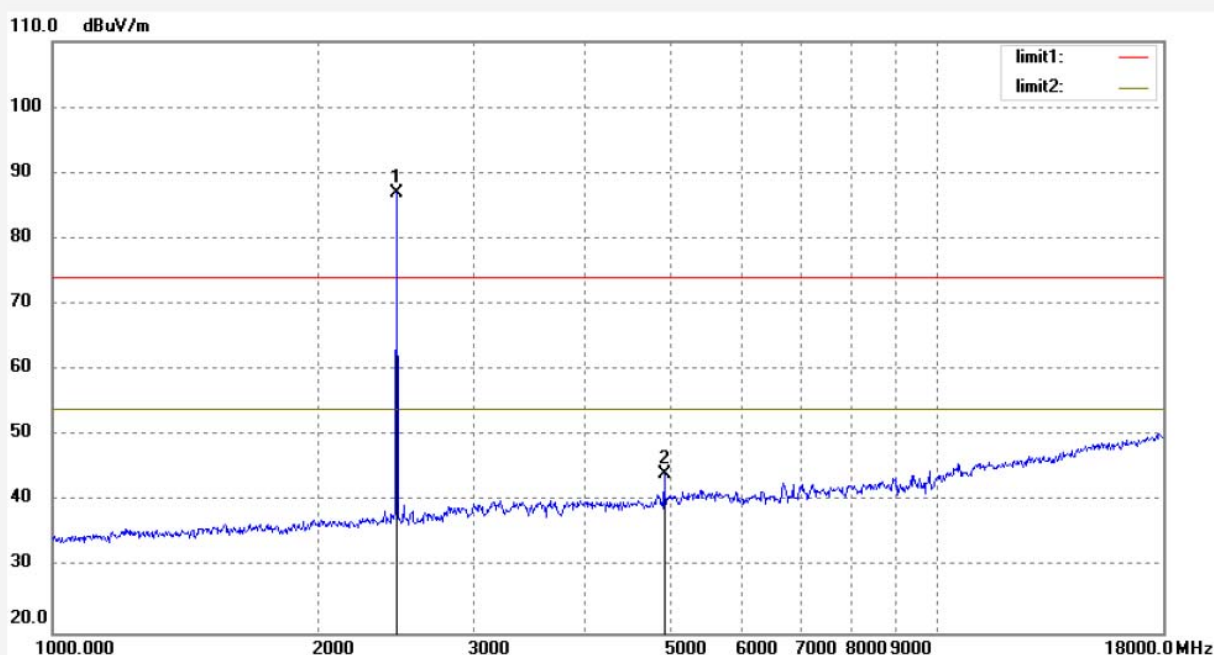
Date: 20/03/20/

Time: 15/49/18

Engineer Signature:

Distance: 3m

Note: Report NO.:ATE20200222



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 2480.000    | 92.96            | -6.04       | 86.92           |                |             | peak     | 150         | 63            |        |
| 2   | 4960.000    | 42.59            | 1.50        | 44.09           | 74.00          | -29.91      | peak     | 150         | 106           |        |



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Site: 1# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: emc #88

Standard: FCC PK

Test item: Radiation Test

Temp.( C)/Hum.(%) 25 C / 55 %

EUT: Bluemini Bluetooth Dongle

Mode: TX2480MHz

Model: Bluemini

Manufacturer: Head-Direct(Kunshan)Co.,LTD

Polarization: Horizontal

Power Source: DC 3.7V

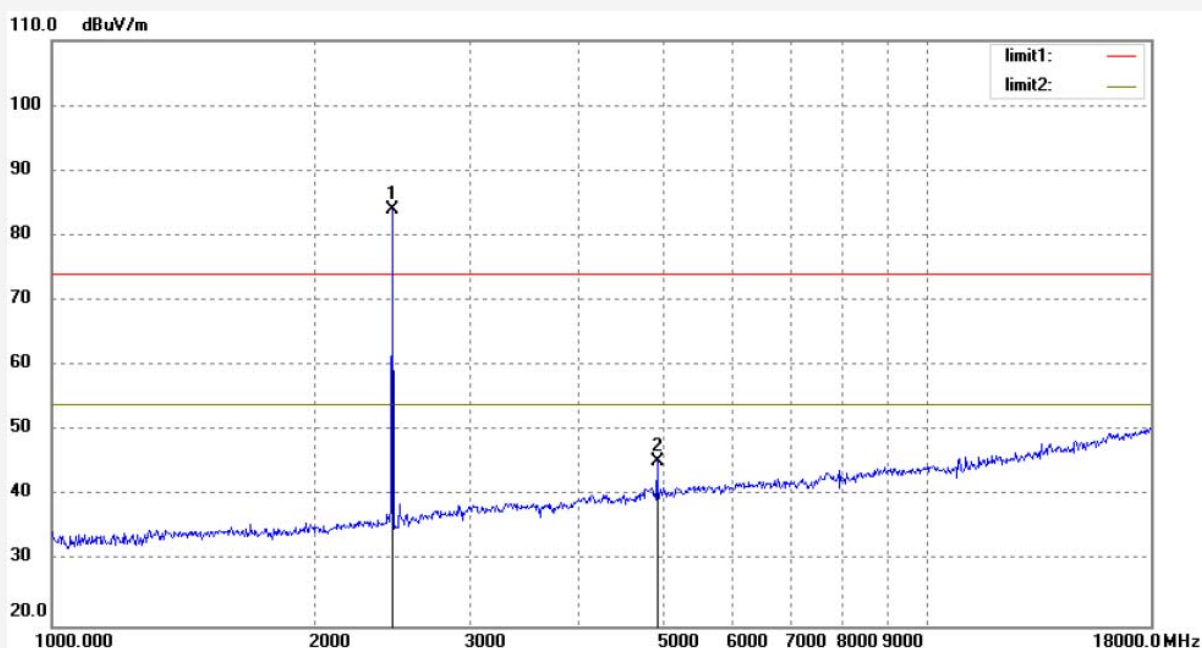
Date: 20/03/20/

Time: 15/49/04

Engineer Signature:

Distance: 3m

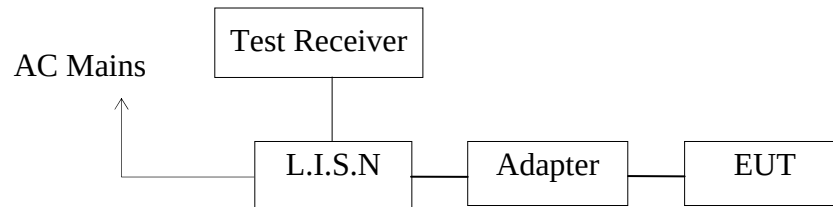
Note: Report NO.:ATE20200222



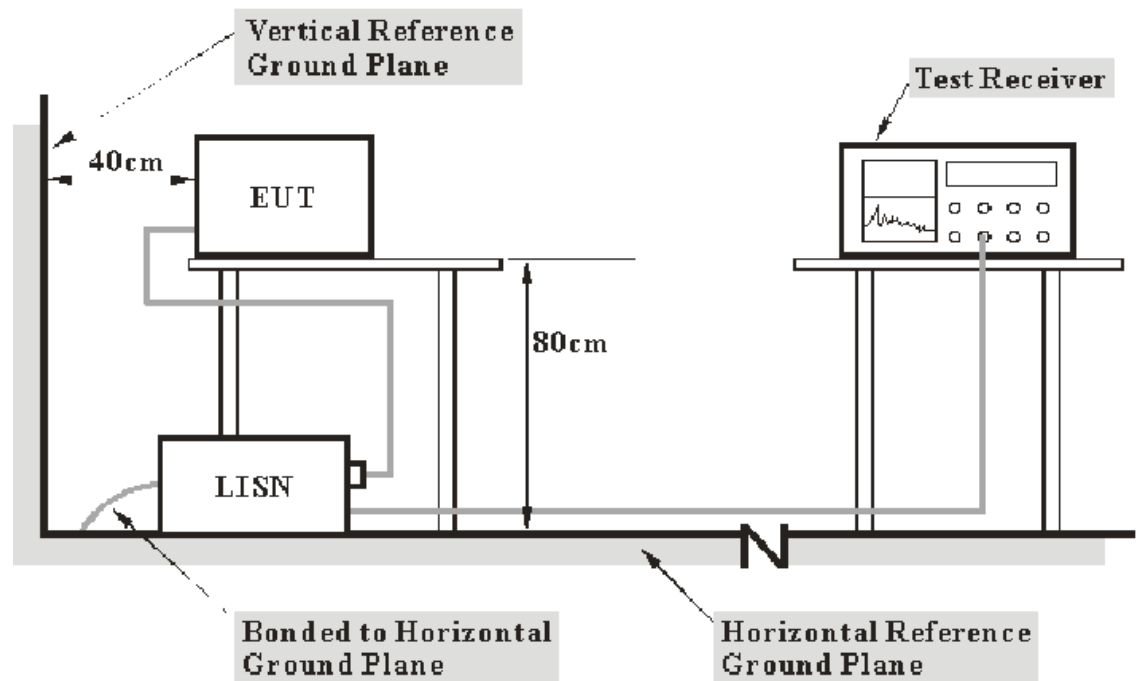
| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|-------------|---------------|--------|
| 1   | 2480.000    | 89.96            | -6.04       | 83.92           |                |             | peak     | 200         | 216           |        |
| 2   | 4960.000    | 43.90            | 1.50        | 45.40           | 74.00          | -28.60      | peak     | 200         | 92            |        |

## 10. POWER LINE CONDUCTED EMISSION TEST

### 10.1. Block Diagram of Test Setup



### 10.2. Test System Setup



- Note: 1. Support units were connected to second LISN.  
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

### 10.3.Test Limits

| Frequency<br>(MHz)                                                                                       | Limit dB( $\mu$ V) |               |
|----------------------------------------------------------------------------------------------------------|--------------------|---------------|
|                                                                                                          | Quasi-peak Level   | Average Level |
| 0.15 - 0.50                                                                                              | 66.0 – 56.0 *      | 56.0 – 46.0 * |
| 0.50 - 5.00                                                                                              | 56.0               | 46.0          |
| 5.00 - 30.00                                                                                             | 60.0               | 50.0          |
| NOTE1: The lower limit shall apply at the transition frequencies.                                        |                    |               |
| NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz. |                    |               |

### 10.4.Configuration of EUT on Test

The equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

### 10.5.Operating Condition of EUT

10.5.1.Setup the EUT and simulator as shown as Section 10.1.

10.5.2.Turn on the power of all equipment.

10.5.3.Let the EUT work in test mode and measure it.

### 10.6.Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Measurement.

The bandwidth of test receiver is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

### 10.7.Data Sample

| Frequency (MHz) | Transducer value (dB) | QuasiPeak Level (dBμV) | Average Level (dBμV) | QuasiPeak Limit (dBμV) | Average Limit (dBμV) | QuasiPeak Margin (dB) | Average Margin (dB) | Remark (Pass/Fail) |
|-----------------|-----------------------|------------------------|----------------------|------------------------|----------------------|-----------------------|---------------------|--------------------|
| X.XX            | 10.5                  | 51.1                   | 34.2                 | 56.0                   | 46.0                 | 4.9                   | 11.8                | Pass               |

Frequency(MHz) = Emission frequency in MHz

Transducer value(dB) = Insertion loss of LISN + Cable Loss

Level(dBμV) = Quasi-peak Reading/Average Reading + Transducer value

Limit (dBμV) = Limit stated in standard

Calculation Formula:

Margin = Limit (dBμV) - Level (dBμV)

### 10.8.Test Result

**Pass.**

The frequency range from 150kHz to 30MHz is checked.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

Emissions attenuated more than 20 dB below the permissible value are not reported.

All data was recorded in the Quasi-peak and average detection mode.

The spectral diagrams are attached as below.

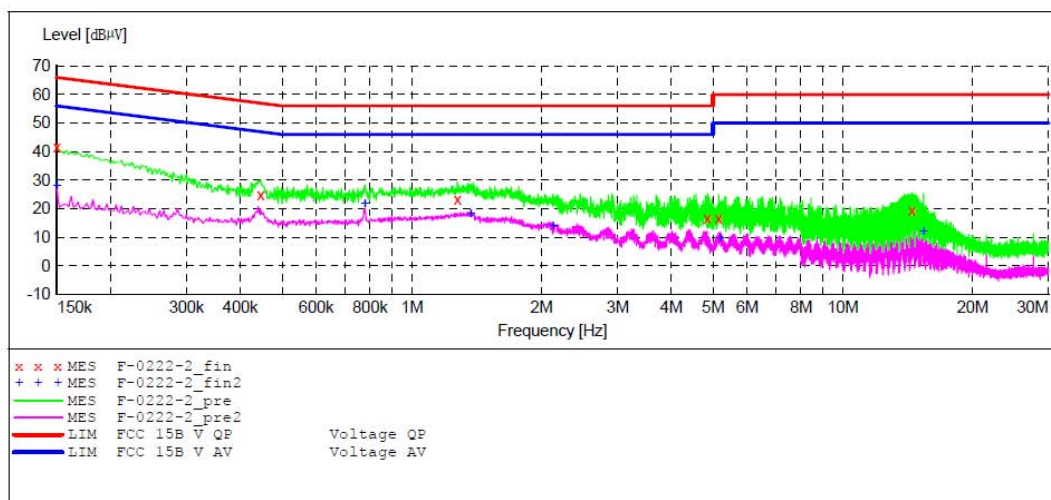
ACCURATE TECHNOLOGY CO.,LTD

## CONDUCTED EMISSION STANDARD FCC PART 15B

EUT: Bluemini Bluetooth Dongle M/N:Bluemini  
 Manufacturer: Head-Direct (Kunshan) Co.,LTD  
 Operating Condition: BT Communication  
 Test Site: 1#Shielding Room  
 Operator: Frank  
 Test Specification: L 120V /60Hz  
 Comment: Report NO.:ATE20200222  
 Start of Test: 2020-3-20 / 14:59:44

### SCAN TABLE: "V 150K-30MHz fin"

Short Description: \_SUB\_STD\_VTERM2 1.70  
 Start Stop Step Detector Meas. IF Transducer  
 Frequency Frequency Width Time Bandw.  
 150.0 kHz 30.0 MHz 4.5 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008  
 Average



### MEASUREMENT RESULT: "F-0222-2\_fin"

2020-3-20 15:01

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.150000         | 41.60         | 10.8         | 66            | 24.4         | QP       | L1   | GND |
| 0.446000         | 24.90         | 11.0         | 57            | 32.0         | QP       | L1   | GND |
| 1.276000         | 23.10         | 11.2         | 56            | 32.9         | QP       | L1   | GND |
| 4.855000         | 16.70         | 11.4         | 56            | 39.3         | QP       | L1   | GND |
| 5.155000         | 16.70         | 11.4         | 60            | 43.3         | QP       | L1   | GND |
| 14.490000        | 19.30         | 11.6         | 60            | 40.7         | QP       | L1   | GND |

### MEASUREMENT RESULT: "F-0222-2\_fin2"

2020-3-20 15:01

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.150000         | 27.80         | 10.8         | 56            | 28.2         | AV       | L1   | GND |
| 0.778000         | 21.60         | 11.1         | 46            | 24.4         | AV       | L1   | GND |
| 1.370000         | 18.20         | 11.2         | 46            | 27.8         | AV       | L1   | GND |
| 2.130000         | 13.80         | 11.3         | 46            | 32.2         | AV       | L1   | GND |
| 5.190000         | 9.60          | 11.4         | 50            | 40.4         | AV       | L1   | GND |
| 15.395000        | 12.00         | 11.7         | 50            | 38.0         | AV       | L1   | GND |

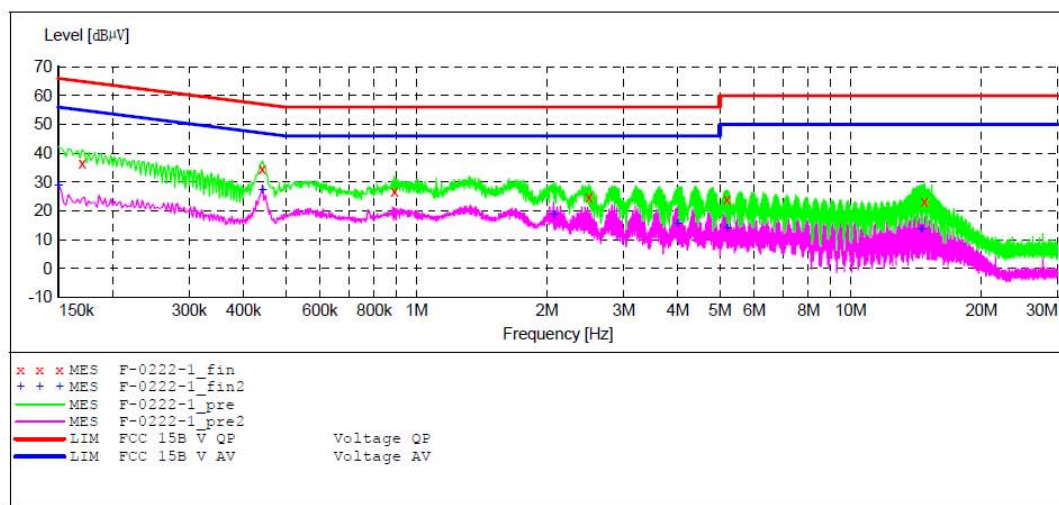
ACCURATE TECHNOLOGY CO., LTD

## CONDUCTED EMISSION STANDARD FCC PART 15B

EUT: Bluemini Bluetooth Dongle M/N: Bluemini  
 Manufacturer: Head-Direct (Kunshan) Co., LTD  
 Operating Condition: BT Communication  
 Test Site: 1#Shielding Room  
 Operator: Frank  
 Test Specification: N 120V /60Hz  
 Comment: Report NO.: ATE20200222  
 Start of Test: 2020-3-20 / 14:57:08

### SCAN TABLE: "V 150K-30MHz fin"

Short Description: \_SUB\_STD\_VTERM2 1.70  
 Start Stop Step Detector Meas. IF Transducer  
 Frequency Frequency Width Time Bandw.  
 150.0 kHz 30.0 MHz 4.5 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008  
 Average



### MEASUREMENT RESULT: "F-0222-1\_fin"

2020-3-20 14:58

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.170000         | 36.60         | 10.8         | 65            | 28.4         | QP       | N    | GND |
| 0.442000         | 34.60         | 11.0         | 57            | 22.4         | QP       | N    | GND |
| 0.890000         | 26.90         | 11.1         | 56            | 29.1         | QP       | N    | GND |
| 2.500000         | 24.80         | 11.3         | 56            | 31.2         | QP       | N    | GND |
| 5.195000         | 24.00         | 11.4         | 60            | 36.0         | QP       | N    | GND |
| 14.805000        | 23.30         | 11.6         | 60            | 36.7         | QP       | N    | GND |

### MEASUREMENT RESULT: "F-0222-1\_fin2"

2020-3-20 14:58

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.150000         | 28.90         | 10.8         | 56            | 27.1         | AV       | N    | GND |
| 0.442000         | 27.30         | 11.0         | 47            | 19.7         | AV       | N    | GND |
| 2.070000         | 18.50         | 11.3         | 46            | 27.5         | AV       | N    | GND |
| 3.995000         | 15.60         | 11.4         | 46            | 30.4         | AV       | N    | GND |
| 5.195000         | 13.90         | 11.4         | 50            | 36.1         | AV       | N    | GND |
| 14.550000        | 13.70         | 11.6         | 50            | 36.3         | AV       | N    | GND |

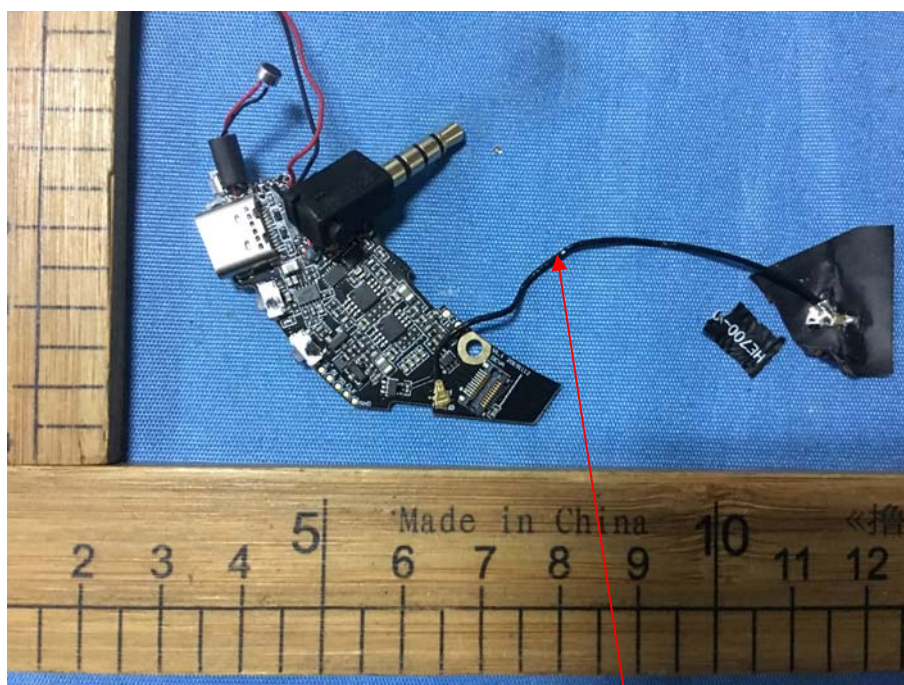
## 11.ANTENNA REQUIREMENT

### 11.1.The Requirement

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

### 11.2.Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Max Antenna gain of EUT is 3dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



Antenna

\*\*\*\*\* End of Test Report \*\*\*\*\*