

# FCC TEST REPORT

**Product Name** : Wireless mouse  
**Trade mark** : N/A  
**Model No.** : G1018E, G1023E  
**Report Number** : BLA-EMC-201912-A55  
**FCCID** : 2AAVD-G1023E  
**Date of sample receipt** : December 23, 2019  
**Date of Test** : December 23, 2019–December 26, 2019  
**Date of Issue** : January 22, 2020  
**Test Standards** : FCC CFR Title 47 Part 15 Subpart C  
Section 15.249  
**Test result** : PASS

Prepared for:

**Shenzhen Loyal Electronics Co., Ltd**  
**No.5 The First Industrial Area of Shanmen, Songgang, Baoan,**  
**Shenzhen, China**

Prepared by:

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Date:

January 22, 2020



**2 Version**

| Version No. | Date             | Description |
|-------------|------------------|-------------|
| 00          | January 22, 2020 | Original    |
|             |                  |             |
|             |                  |             |

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### 3 Test Summary

| Test Item   | Test Requirement                                   | Test method      | Result |
|---|--|------------------|--------|
| Antenna Requirement   | 47 CFR Part 15 Subpart C Section 15.203            | ANSI C63.10-2013 | PASS   |
| AC Power Line Conducted Emission                                  | 47 CFR Part 15 Subpart C Section 15.207            | ANSI C63.10-2013 | N/A    |
| Field Strength of the Fundamental Signal                          | 47 CFR Part 15 Subpart C Section 15.249 (a)        | ANSI C63.10-2013 | PASS   |
| Spurious Emissions  | 47 CFR Part 15 Subpart C Section 15.249 (a)/15.209 | ANSI C63.10-2013 | PASS   |
| Restricted bands around fundamental frequency (Radiated Emission) | 47 CFR Part 15 Subpart C Section 15.249(a)/15.205  | ANSI C63.10-2013 | PASS   |
| 20dB Occupied Bandwidth   | 47 CFR Part 15 Subpart C Section 15.215 (c)        | ANSI C63.10-2013 | PASS   |

Pass: The EUT complies with the essential requirements in the standard.

N/A: Not Applicable

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## 5 General Information

### 5.1 Client Information

|                          |   |
|--------------------------|---|
| Applicant:               | Shenzhen Loyal Electronics Co.,Ltd  |
| Address of Applicant:    | No.5 The First Industrial Area of Shanmen, Songgang, Baoan, Shenzhen, China |
| Manufacturer:            | Shenzhen Loyal Electronics Co.,Ltd  |
| Address of Manufacturer: | No.5 The First Industrial Area of Shanmen, Songgang, Baoan, Shenzhen, China |
| Factory:                 | Shenzhen Loyal Electronics Co.,Ltd  |
| Address of Factory:      | No.5 The First Industrial Area of Shanmen, Songgang, Baoan, Shenzhen, China |

### 5.2 General Description of EUT

|                                  |                 |
|----------------------------------|-----------------|
| Product Name:                    | Wireless mouse  |
| Mode No.(EUT):                   | G1018E          |
| Add Mode No.:                    | G1023E          |
| Trade Mark:                      | N/A             |
| EUT Supports Radios application: | 2.4GHz Wireless |

### 5.3 Product Specification subjective to this standard

|                     |  |
|---------------------|--|
| Frequency Range:    | 2402 MHz ~ 2480MHz                                       |
| Frequency Band:     | 2.4GHz ISM band  |
| Hardware Version:   | V01  |
| Software Version:   | 1107   |
| Channel Spacing:    | 2MHz   |
| Modulation Type:    | GFSK   |
| Number of Channels: | 40 (declared by the client)                              |
| Sample Type:        | Portable production(mobile production ;fixed production) |
| Antenna Type:       | Internal ANT   |
| Antenna Gain:       | 2.08dBi  |
| Power Supply:       | DC1.5V   |

| Operation Frequency each of channel |           |         |           |         |           |
|-------------------------------------|-----------|---------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency | Channel | Frequency |
| 1CH                                 | 2402 MHz  | 15CH    | 2430 MHz  | 29CH    | 2458 MHz  |
| 2CH                                 | 2404 MHz  | 16CH    | 2432 MHz  | 30CH    | 2460 MHz  |
| 3CH                                 | 2406 MHz  | 17CH    | 2434 MHz  | 31CH    | 2462 MHz  |
| 4CH                                 | 2408 MHz  | 18CH    | 2436 MHz  | 32CH    | 2464 MHz  |
| 5CH                                 | 2410MHz   | 19CH    | 2438 MHz  | 33CH    | 2466 MHz  |
| 6CH                                 | 2412 MHz  | 20CH    | 2440 MHz  | 34CH    | 2468 MHz  |
| 7CH                                 | 2414 MHz  | 21CH    | 2442 MHz  | 35CH    | 2470 MHz  |
| 8CH                                 | 2416 MHz  | 22CH    | 2444 MHz  | 36CH    | 2472 MHz  |
| 9CH                                 | 2418 MHz  | 23CH    | 2446 MHz  | 37CH    | 2474 MHz  |
| 10CH                                | 2420 MHz  | 24CH    | 2448 MHz  | 38CH    | 2476 MHz  |
| 11CH                                | 2422 MHz  | 25CH    | 2450 MHz  | 39CH    | 2478 MHz  |
| 12CH                                | 2424 MHz  | 26CH    | 2452 MHz  | 40CH    | 2480 MHz  |
| 13CH                                | 2426 MHz  | 27CH    | 2454 MHz  |         |           |
| 14CH                                | 2428 MHz  | 28CH    | 2456 MHz  |         |           |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel                   | Frequency |
|---------------------------|-----------|
| The Lowest channel(CH1)   | 2402MHz   |
| The Middle channel(CH20)  | 2440MHz   |
| The Highest channel(CH39) | 2480MHz   |

## 5.4 Test Environment and Mode

| Operating Environment: |   |
|------------------------|---|
| Temperature:           | 24.0 °C   |
| Humidity:              | 52 % RH   |
| Atmospheric Pressure:  | 1008 mbar   |
| Test mode:             |   |
| Transmitting mode:     | Keep the EUT in transmitting mode with modulation.(new battery is used) |

## 5.5 Description of Support Units

*The EUT has been tested independently and or*

*The EUT has been tested with associated equipment below.*

1) support equipment

| Description       | Manufacturer | Model No. | Serial Number | Supplied by |
|-------------------|--------------|-----------|---------------|-------------|
| Notebook computer | Lenovo       | E470C     | PF-10FB5C     | /           |
| /                 | /            | /         | /             | /           |

2) cable

| Cable No. | Description | Manufacturer | Cable Type/Length | Supplied by |
|-----------|-------------|--------------|-------------------|-------------|
| /         | /           | /            | /                 | /           |

## 5.6 Test Location

*All tests were performed at:*

*BlueAsia of Technical Services(Shenzhen) Co., Ltd.*

*IOT Test Centre of BlueAsia*

*No. 448 Bulong Road, Bantian Street, Longgang District, Shenzhen, China*

*Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673*

*No tests were sub-contracted.*

## 5.7 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

### **FCC — Designation No.: CN1252**

BlueAsia of Technical Services(Shenzhen) Co., Ltd has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Designation CN1252.

### **ISED — CAB identifier No.: CN0028**

BlueAsia of Technical Services(Shenzhen) Co., Ltd has been registered by Certification and Engineering Bureau of ISED for radio equipment testing with CAB identifier CN0028

## **5.8 Deviation from Standards**

None.

## **5.9 Abnormalities from Standard Conditions**

None.

## **5.10 Other Information Requested by the Customer**

None.

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**5.11 Measurement Uncertainty (95% confidence levels, k=2)**

| Test Item                        | Frequency Range | Measurement Uncertainty | Notes |
|----------------------------------|-----------------|-------------------------|-------|
| Radiated Emission                | 9kHz ~ 30MHz    | $\pm 4.34\text{dB}$     | (1)   |
| Radiated Emission                | 30MHz ~ 1000MHz | $\pm 4.24\text{dB}$     | (1)   |
| Radiated Emission                | 1GHz ~ 26.5GHz  | $\pm 4.68\text{dB}$     | (1)   |
| AC Power Line Conducted Emission | 0.15MHz ~ 30MHz | $\pm 3.45\text{dB}$     | (1)   |

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

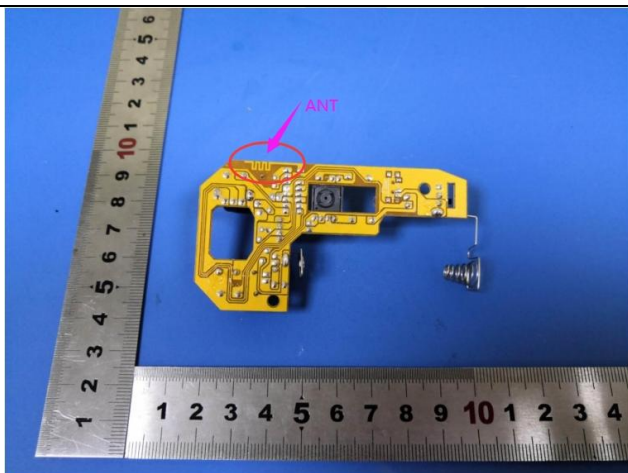
## 6 Equipment List

| Radiated Emission: |                         |                 |           |               |                        |                            |
|--------------------|-------------------------|-----------------|-----------|---------------|------------------------|----------------------------|
| Item               | Test Equipment          | Manufacturer    | Model No. | Serial No.    | Cal.Date<br>(mm-dd-yy) | Cal.Due date<br>(mm-dd-yy) |
| 1                  | 3m SAC                  | SKET            | 9m*6 m*6m | 966           | 06-10-2018             | 06-09-2023                 |
| 2                  | Broadband Antenna       | SCHWARZBECK     | VULB9168  | 00836 P:00227 | 07-14-2019             | 07-13-2020                 |
| 3                  | Horn Antenna            | SCHWARZBECK     | 9120D     | 01892 P:00331 | 07-14-2019             | 07-13-2020                 |
| 4                  | EMI Test Software       | EZ              | EZ        | N/A           | N/A                    | N/A                        |
| 5                  | Pre-amplifier           | SKET            | N/A       | N/A           | 07-19-2019             | 07-18-2020                 |
| 6                  | Spectrum analyzer       | Rohde & Schwarz | FSP40     | 100817        | 05-24-2019             | 05-23-2020                 |
| 7                  | EMI Test Receiver       | Rohde & Schwarz | ESR7      | 101199        | 03-21-2019             | 03-20-2020                 |
| 8                  | Controller              | SKET            | N/A       | N/A           | N/A                    | N/A                        |
| 9                  | Vector Signal Generator | Agilent         | E4438C    | MY45092582    | 05-24-2019             | 05-23-2020                 |
| 10                 | Signal Generator        | Agilent         | E8257D    | MY44320250    | 05-24-2019             | 05-23-2020                 |
| 11                 | Coaxial Cable           | BlueAsia        | BLA-XC-02 | N/A           | N/A                    | N/A                        |
| 12                 | Coaxial Cable           | BlueAsia        | BLA-XC-03 | N/A           | N/A                    | N/A                        |
| 13                 | Coaxial Cable           | BlueAsia        | BLA-XC-01 | N/A           | N/A                    | N/A                        |

| <b>Conducted Emission</b> |                              |                     |                  |                   |                                |                                    |
|---------------------------|------------------------------|---------------------|------------------|-------------------|--------------------------------|------------------------------------|
| <b>Item</b>               | <b>Test Equipment</b>        | <b>Manufacturer</b> | <b>Model No.</b> | <b>Serial No.</b> | <b>Cal.Date<br/>(mm-dd-yy)</b> | <b>Cal.Due date<br/>(mm-dd-yy)</b> |
| 1                         | EMI Test Receiver            | Rohde & Schwarz     | ESPI3            | 101082            | 06-10-2019                     | 06-09-2020                         |
| 2                         | LISN                         | CHASE               | MN2050D          | 1447              | 12-18-2019                     | 12-17-2020                         |
| 3                         | LISN                         | Rohde & Schwarz     | ENV216           | 3560.6550.15      | 07-19-2019                     | 07-18-2020                         |
| 4                         | EMI Test Software            | EZ                  | EZ               | N/A               | N/A                            | N/A                                |
| 5                         | Temperature Humidity Chamber | Mingle              | TH101B           | N/A               | 07-19-2019                     | 07-18-2020                         |
| 6                         | Coaxial Cable                | BlueAsia            | BLA-XC-05        | N/A               | N/A                            | N/A                                |

## 7 Test results and Measurement Data

### 7.1 Antenna Requirement

|   |   |
|---|---|
| <b>Standard requirement:</b>  | 47 CFR Part 15C Section 15.203  |
| 15.203 requirement:<br>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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. |   |
| <b>EUT Antenna:</b>   |  |
| The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.08dBi.  |   |

### 7.2 Conducted Emissions

**Test Requirement:** 47 CFR Part 15C Section 15.207

**Test Method:** ANSI C63.10

**Test Frequency Range:** 150KHz to 30MHz

**Limit:**

| Frequency range (MHz) | Limit (dBμV) |           |
|-----------------------|--------------|-----------|
|                       | Quasi-peak   | Average   |
| 0.15-0.5              | 66 to 56*    | 56 to 46* |
| 0.5-5                 | 56           | 46        |
| 5-30                  | 60           | 50        |

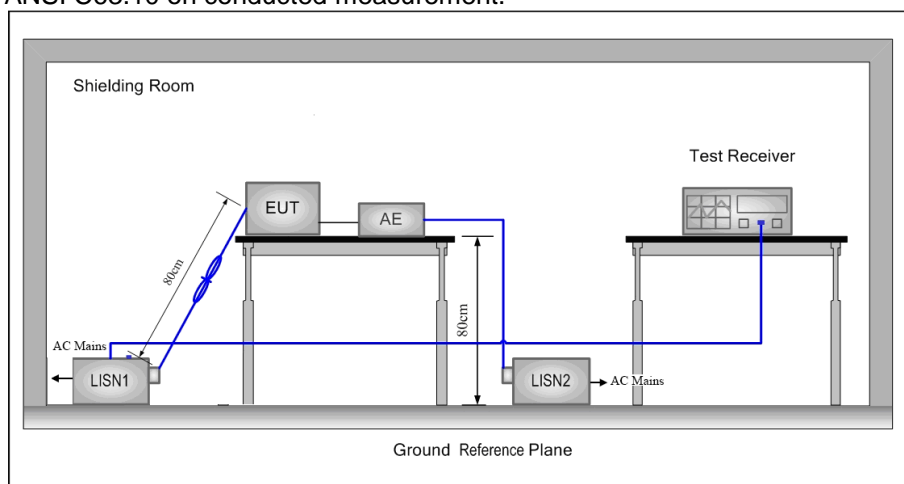
\* Decreases with the logarithm of the frequency.

**Test Procedure:**

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a  $50\Omega/50\mu\text{H} + 5\Omega$  linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of

equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

**Test Setup:**



**Test Mode:**

Keep the EUT in transmitting mode

**Instruments Used:**

Refer to section 5.11 for details

**Test Results:**

N/A

## 7.3 Radiated Emission

**Test Requirement:** 47 CFR Part 15C Section 15.249 and 15.209

**Test Method:** ANSI C63.10

**Test Site:** Measurement Distance: 3m (Semi-Anechoic Chamber)

**Receiver Setup:**

| Frequency         | Detector   | RBW     | VBW    | Remark     |
|-------------------|------------|---------|--------|------------|
| 0.009MHz-0.090MHz | Peak       | 10kHz   | 30KHz  | Peak       |
| 0.009MHz-0.090MHz | Average    | 10kHz   | 30KHz  | Average    |
| 0.090MHz-0.110MHz | Quasi-peak | 10kHz   | 30KHz  | Quasi-peak |
| 0.110MHz-0.490MHz | Peak       | 10kHz   | 30KHz  | Peak       |
| 0.110MHz-0.490MHz | Average    | 10kHz   | 30KHz  | Average    |
| 0.490MHz -30MHz   | Quasi-peak | 10kHz   | 30kHz  | Quasi-peak |
| 30MHz-1GHz        | Quasi-peak | 100 kHz | 300KHz | Quasi-peak |
| Above 1GHz        | Peak       | 1MHz    | 3MHz   | Peak       |
|                   | Peak       | 1MHz    | 10Hz   | Average    |

**Test Setup:**

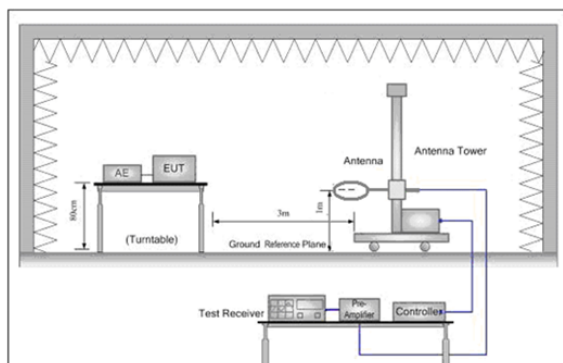


Figure 1. Below 30MHz

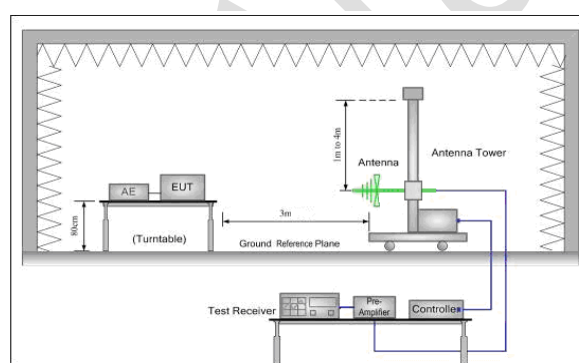


Figure 2. 30MHz to 1GHz

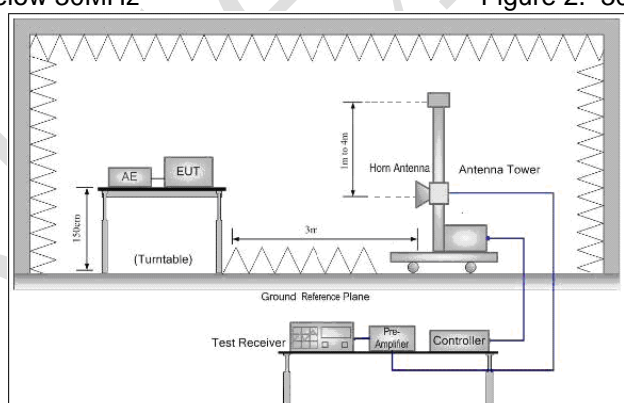


Figure 3. Above 1GHz

**Test Procedure:**

### Below 1GHz test procedure as below:

The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.

The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

#### Above 1GHz test procedure as below:

Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter( Above 18GHz the distance is 1 meter and table is 1.5 meter).

Test the EUT in the lowest channel ,middle channel, the Highest channel

The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.

Repeat above procedures until all frequencies measured was complete.

#### Limit:

(Spurious Emissions)

| Frequency         | Field strength (microvolt/meter) | Limit (dB $\mu$ V/m ) | Remark     | Measurement distance (m) |
|-------------------|----------------------------------|-----------------------|------------|--------------------------|
| 0.009MHz-0.490MHz | 2400/F (kHz)                     | -                     | -          | 300                      |
| 0.490MHz-1.705MHz | 24000/F (kHz)                    | -                     | -          | 30                       |
| 1.705MHz-30MHz    | 30                               | -                     | -          | 30                       |
| 30MHz-88MHz       | 100                              | 40.0                  | Quasi-peak | 3                        |
| 88MHz-216MHz      | 150                              | 43.5                  | Quasi-peak | 3                        |
| 216MHz-960MHz     | 200                              | 46.0                  | Quasi-peak | 3                        |
| 960MHz-1GHz       | 500                              | 54.0                  | Quasi-peak | 3                        |
| Above 1GHz        | 500                              | 54.0                  | Average    | 3                        |

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

#### Limit:

(Field strength of the fundamental signal)

| Frequency         | Limit (dB $\mu$ V/m @3m) | Remark        |
|-------------------|--------------------------|---------------|
| 2400MHz-2483.5MHz | 94.0                     | Average Value |
|                   | 114.0                    | Peak Value    |

**Instruments Used:** Refer to section 5.11 for details

**Exploratory Test Mode:** Transmitting mode

**Final Test Mode:** Pretest the EUT at Transmitting mode

**Test Results:** Pass

**Measurement Data**
**Field Strength Of The Fundamental Signal**

Peak value:

| Frequency (MHz) | Reading Level (dBuV) | Correct Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Over Limit (dB) | Antenna Polaxis |
|-----------------|----------------------|---------------------|----------------|----------------|-----------------|-----------------|
| 2402            | 96.34                | -3.83               | 92.51          | 114.00         | -21.49          | H               |
| 2402            | 86.23                | -4.17               | 82.06          | 114.00         | -31.94          | V               |
| 2440            | 92.27                | -3.62               | 88.65          | 114.00         | -25.35          | H               |
| 2440            | 85.22                | -3.98               | 81.24          | 114.00         | -32.76          | V               |
| 2480            | 92.86                | -3.40               | 89.46          | 114.00         | -24.54          | H               |
| 2480            | 85.44                | -3.79               | 81.65          | 114.00         | -32.35          | V               |

Average value:

| Frequency (MHz) | Reading Level (dBuV) | Correct Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Over Limit (dB) | Antenna Polaxis |
|-----------------|----------------------|---------------------|----------------|----------------|-----------------|-----------------|
| 2402            | 75.36                | -3.83               | 71.53          | 94.00          | -22.47          | H               |
| 2402            | 62.94                | -4.17               | 58.77          | 94.00          | -35.23          | V               |
| 2440            | 70.07                | -3.62               | 66.45          | 94.00          | -27.55          | H               |
| 2440            | 63.52                | -3.98               | 59.54          | 94.00          | -34.46          | V               |
| 2480            | 76.35                | -3.40               | 72.95          | 94.00          | -21.05          | H               |
| 2480            | 67.36                | -3.79               | 63.57          | 94.00          | -30.43          | V               |

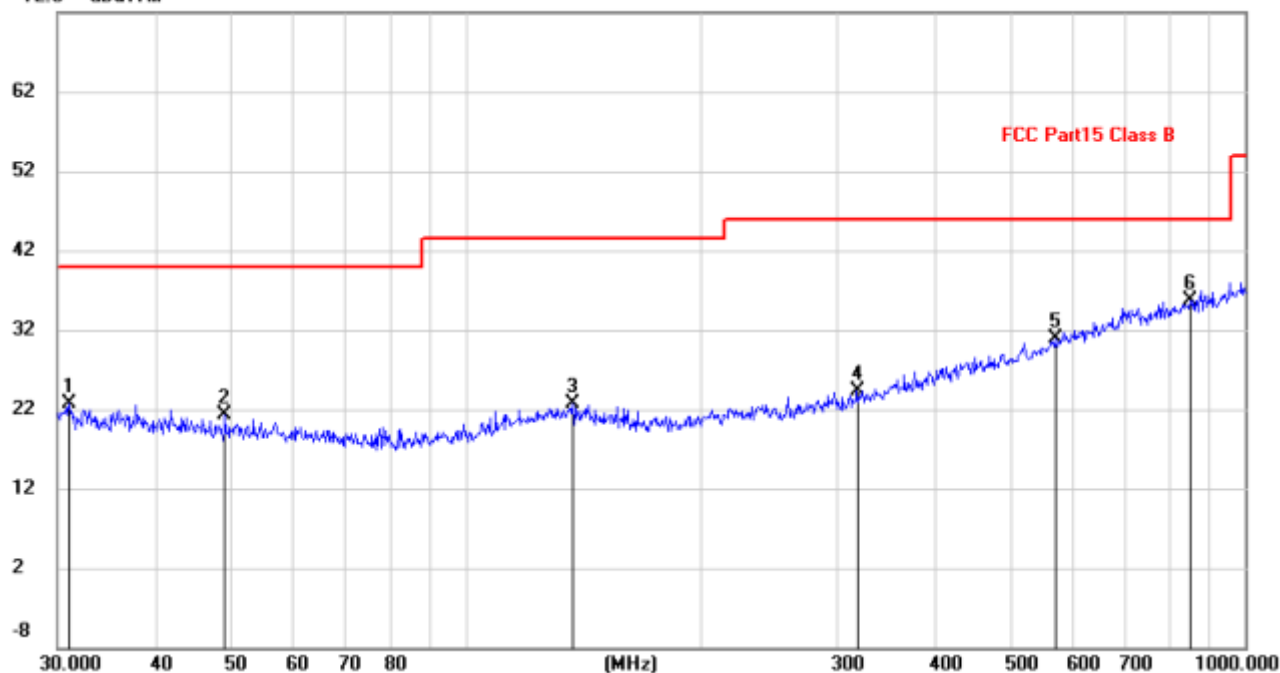
NOTE: RBW 3MHz VBW 10MHz , PK detector is for PK value ,RMS detector is for AV value。



**Spurious Emissions**
**30MHz~1GHz (QP)**
**Test mode:** Transmitting

Horizontal:

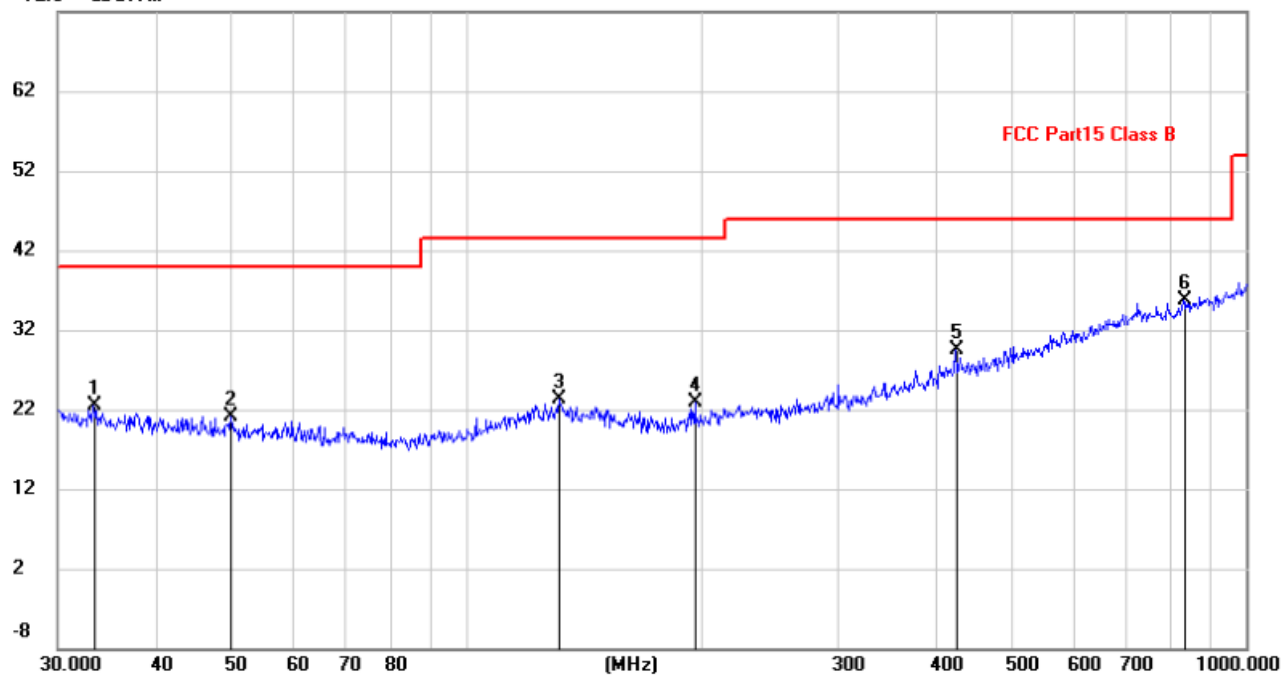
72.0 dBuV/m



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|----------|
| 1   |     | 31.0706      | 0.15                     | 22.64                   | 22.79                      | 40.00           | -17.21     | QP       |
| 2   |     | 49.1865      | -3.19                    | 24.47                   | 21.28                      | 40.00           | -18.72     | QP       |
| 3   |     | 137.4202     | -0.60                    | 23.22                   | 22.62                      | 43.50           | -20.88     | QP       |
| 4   |     | 317.7011     | 0.00                     | 24.36                   | 24.36                      | 46.00           | -21.64     | QP       |
| 5   |     | 570.6100     | 0.43                     | 30.57                   | 31.00                      | 46.00           | -15.00     | QP       |
| 6   | *   | 851.0353     | 0.96                     | 34.75                   | 35.71                      | 46.00           | -10.29     | QP       |

**Vertical:**

72.0 dBuV/m



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit  | Over   |          |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|
|     |     | MHz      | dBuV          | dB             | dBuV/m       | dBuV/m | dB     | Detector |
| 1   |     | 33.3279  | -0.37         | 22.96          | 22.59        | 40.00  | -17.41 | QP       |
| 2   |     | 50.0566  | -3.47         | 24.48          | 21.01        | 40.00  | -18.99 | QP       |
| 3   |     | 131.7577 | 0.32          | 23.04          | 23.36        | 43.50  | -20.14 | QP       |
| 4   |     | 196.5098 | 2.65          | 20.18          | 22.83        | 43.50  | -20.67 | QP       |
| 5   |     | 423.5403 | 2.05          | 27.54          | 29.59        | 46.00  | -16.41 | QP       |
| 6   | *   | 830.4002 | 1.29          | 34.51          | 35.80        | 46.00  | -10.20 | QP       |

| <b>Above 1GHz</b> |                      |                     |                |                |                 |                 |
|-------------------|----------------------|---------------------|----------------|----------------|-----------------|-----------------|
| Test mode:        | Transmitting         | Test channel:       | Lowest         | Remark:        | Peak            |                 |
| Frequency (MHz)   | Reading Level (dBuV) | Correct Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Over Limit (dB) | Antenna Polaxis |
| 4804.00           | 57.93                | 2.38                | 60.31          | 74.00          | -13.69          | H               |
| 7206.00           | 51.24                | 7.58                | 58.82          | 74.00          | -15.18          | H               |
| 9608.00           | 50.06                | 7.62                | 57.68          | 74.00          | -16.32          | H               |
| 4804.00           | 54.74                | 2.38                | 57.12          | 74.00          | -16.88          | V               |
| 7206.00           | 50.58                | 7.58                | 58.16          | 74.00          | -15.84          | V               |
| 9608.00           | 48.73                | 7.62                | 56.35          | 74.00          | -17.65          | V               |

| Test mode:      | Transmitting         | Test channel:       | Lowest         | Remark:        | Average         |                 |
|-----------------|----------------------|---------------------|----------------|----------------|-----------------|-----------------|
| Frequency (MHz) | Reading Level (dBuV) | Correct Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Over Limit (dB) | Antenna Polaxis |
| 4804.00         | 46.53                | 2.38                | 48.91          | 54.00          | -5.09           | H               |
| 7206.00         | 39.24                | 7.58                | 46.82          | 54.00          | -7.18           | H               |
| 9608.00         | 40.05                | 7.62                | 47.67          | 54.00          | -6.33           | H               |
| 4804.00         | 38.77                | 2.38                | 41.15          | 54.00          | -12.85          | V               |
| 7206.00         | 38.56                | 7.58                | 46.14          | 54.00          | -7.86           | V               |
| 9608.00         | 39.21                | 7.62                | 46.83          | 54.00          | -7.17           | V               |

| Test mode:      | Transmitting         | Test channel:       | Middle         | Remark:        | Peak            |                 |
|-----------------|----------------------|---------------------|----------------|----------------|-----------------|-----------------|
| Frequency (MHz) | Reading Level (dBuV) | Correct Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Over Limit (dB) | Antenna Polaxis |
| 4880.00         | 58.06                | 0.17                | 58.23          | 74.00          | -15.77          | H               |
| 7320.00         | 53.26                | 7.60                | 60.36          | 74.00          | -13.14          | H               |
| 9760.00         | 50.71                | 7.62                | 58.33          | 74.00          | -15.67          | H               |
| 4880.00         | 56.38                | 0.17                | 56.55          | 74.00          | -17.45          | V               |
| 7320.00         | 51.42                | 7.60                | 59.02          | 74.00          | -14.98          | V               |
| 9760.00         | 50.11                | 7.62                | 57.73          | 74.00          | -16.27          | V               |

| Test mode:      | Transmitting         | Test channel:       | Middle         | Remark:        | Average         |                 |
|-----------------|----------------------|---------------------|----------------|----------------|-----------------|-----------------|
| Frequency (MHz) | Reading Level (dBuV) | Correct Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Over Limit (dB) | Antenna Polaxis |
| 4880.00         | 44.71                | 0.17                | 44.88          | 54.00          | -9.12           | H               |
| 7320.00         | 40.34                | 7.60                | 47.94          | 54.00          | -6.06           | H               |
| 9760.00         | 38.65                | 7.62                | 46.27          | 54.00          | -7.73           | H               |
| 4880.00         | 40.02                | 0.17                | 40.19          | 54.00          | -13.81          | V               |
| 7320.00         | 39.36                | 7.60                | 46.96          | 54.00          | -7.04           | V               |
| 9760.00         | 38.23                | 7.62                | 45.85          | 54.00          | -8.15           | V               |

| Test mode:      | Transmitting         | Test channel:       | Highest        | Remark:        | Peak            |                 |
|-----------------|----------------------|---------------------|----------------|----------------|-----------------|-----------------|
| Frequency (MHz) | Reading Level (dBuV) | Correct Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Over Limit (dB) | Antenna Polaxis |
| 4960.00         | 58.18                | 1.04                | 59.22          | 74.00          | -14.78          | H               |
| 7440.00         | 53.03                | 7.55                | 60.58          | 74.00          | -13.42          | H               |
| 9920.00         | 51.44                | 7.63                | 59.07          | 74.00          | -14.93          | H               |
| 4960.00         | 55.93                | 1.04                | 56.97          | 74.00          | -17.03          | V               |
| 7440.00         | 52.04                | 7.55                | 59.59          | 74.00          | -14.41          | V               |
| 9920.00         | 50.17                | 7.63                | 57.80          | 74.00          | -16.20          | V               |

| Test mode:      | Transmitting         | Test channel:       | Highest        | Remark:        | Average         |                 |
|-----------------|----------------------|---------------------|----------------|----------------|-----------------|-----------------|
| Frequency (MHz) | Reading Level (dBuV) | Correct Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Over Limit (dB) | Antenna Polaxis |
| 4960.00         | 46.37                | 1.04                | 47.41          | 54.00          | -6.59           | H               |
| 7440.00         | 41.64                | 7.55                | 49.19          | 54.00          | -4.81           | H               |
| 9920.00         | 40.23                | 7.63                | 47.86          | 54.00          | -6.14           | H               |
| 4960.00         | 43.05                | 1.04                | 44.09          | 54.00          | -9.91           | V               |
| 7440.00         | 40.25                | 7.55                | 47.80          | 54.00          | -6.20           | V               |
| 9920.00         | 38.87                | 7.63                | 46.50          | 54.00          | -7.50           | V               |

Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  
*Final Test Level = Receiver Reading + Correct Factor*  
*Correct Factor = Antenna Factor + Cable Factor - Preamplifier Factor*
- 2) Scan from 9kHz to 25GHz, The disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported .

## 7.4 Restricted bands around fundamental frequency

**Test Requirement:** 47 CFR Part 15C Section 15.209 and 15.205

**Test Method:** ANSI C63.10

**Test Site:** Measurement Distance: 3m (Semi-Anechoic Chamber)

**Test Setup:**

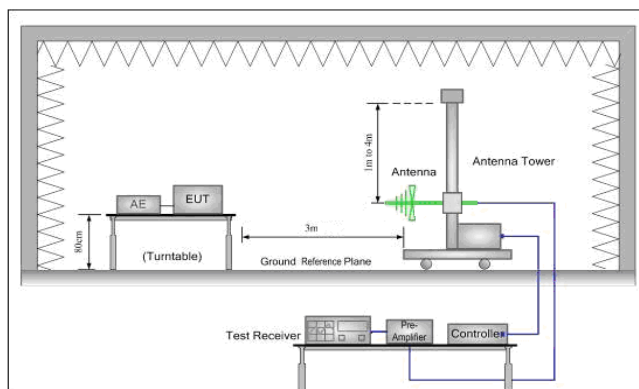


Figure 1. 30MHz to 1GHz

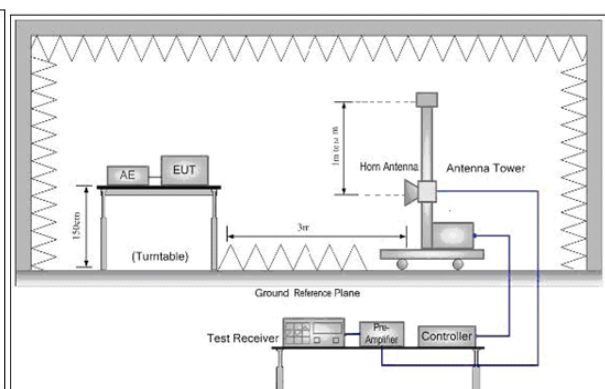


Figure 2. Above 1 GHz

**Test Procedure:**

### Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

### Above 1GHz test procedure as below:

- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter( Above 18GHz the distance is 1 meter and table is 1.5 meter).
- Test the EUT in the lowest channel,,the Highest channel
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
- Repeat above procedures until all frequencies measured was complete.

**Limit(band edge):**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

| Frequency     | Limit (dBμV/m @3m) | Remark           |
|---------------|--------------------|------------------|
| 30MHz-88MHz   | 40.0               | Quasi-peak Value |
| 88MHz-216MHz  | 43.5               | Quasi-peak Value |
| 216MHz-960MHz | 46.0               | Quasi-peak Value |
| 960MHz-1GHz   | 54.0               | Quasi-peak Value |
| Above 1GHz    | 54.0               | Average Value    |
|               | 74.0               | Peak Value       |

**Instruments Used:** Refer to section 5.11 for details

**Exploratory Test Mode:** Transmitting mode

Pretest the EUT at Transmitting mode

**Final Test Mode:**

**Test Results:** Pass

**Band edge test data (Radiated Emission)**

| Test channel:   | Lowest            |                       |                | Remark:             |                 | Peak         |
|-----------------|-------------------|-----------------------|----------------|---------------------|-----------------|--------------|
| Frequency (MHz) | Read Level (dBμV) | Correct factor (dB/m) | Level (dBμV/m) | Limit Line (dBμV/m) | Over Limit (dB) | Polarization |
| 2310.00         | 46.65             | -4.20                 | 42.45          | 74.00               | -31.55          | Horizontal   |
| 2390.00         | 48.54             | -3.88                 | 44.66          | 74.00               | -29.34          | Horizontal   |
| 2400.00         | 56.42             | -3.83                 | 52.59          | 74.00               | -21.41          | Horizontal   |
| 2310.00         | 45.08             | -4.49                 | 40.59          | 74.00               | -33.41          | Vertical     |
| 2390.00         | 49.64             | -4.21                 | 45.43          | 74.00               | -28.57          | Vertical     |
| 2400.00         | 57.34             | -4.17                 | 53.17          | 74.00               | -20.83          | Vertical     |

| Test channel:   | Lowest            |                       |                | Remark:             |                 | Average      |
|-----------------|-------------------|-----------------------|----------------|---------------------|-----------------|--------------|
| Frequency (MHz) | Read Level (dBμV) | Correct factor (dB/m) | Level (dBμV/m) | Limit Line (dBμV/m) | Over Limit (dB) | Polarization |
| 2310.00         | 32.69             | -4.20                 | 28.49          | 54.00               | -25.51          | Horizontal   |
| 2390.00         | 32.73             | -3.88                 | 28.85          | 54.00               | -25.15          | Horizontal   |
| 2400.00         | 45.23             | -3.83                 | 41.40          | 54.00               | -12.60          | Horizontal   |
| 2310.00         | 32.84             | -4.49                 | 28.35          | 54.00               | -25.65          | Vertical     |
| 2390.00         | 32.12             | -4.21                 | 27.91          | 54.00               | -26.09          | Vertical     |
| 2400.00         | 46.19             | -4.17                 | 42.02          | 54.00               | -11.98          | Vertical     |

| Test channel:   | Highest           |                       |                | Remark:             |                 | Peak         |
|-----------------|-------------------|-----------------------|----------------|---------------------|-----------------|--------------|
| Frequency (MHz) | Read Level (dBuV) | Correct factor (dB/m) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2483.50         | 71.72             | -3.38                 | 68.34          | 74.00               | -5.66           | Horizontal   |
| 2500.00         | 54.93             | -3.30                 | 51.63          | 74.00               | -22.37          | Horizontal   |
| 2483.50         | 64.00             | -3.77                 | 60.23          | 74.00               | -13.77          | Vertical     |
| 2500.00         | 48.82             | -3.70                 | 45.12          | 74.00               | -28.88          | Vertical     |

| Test channel:   | Highest           |                       |                | Remark:             |                 | Average      |
|-----------------|-------------------|-----------------------|----------------|---------------------|-----------------|--------------|
| Frequency (MHz) | Read Level (dBuV) | Correct factor (dB/m) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2483.50         | 55.36             | -3.38                 | 51.98          | 54.00               | -2.02           | Horizontal   |
| 2500.00         | 33.10             | -3.30                 | 29.80          | 54.00               | -24.20          | Horizontal   |
| 2483.50         | 48.23             | -3.77                 | 44.46          | 54.00               | -9.54           | Vertical     |
| 2500.00         | 32.67             | -3.70                 | 28.97          | 54.00               | -25.03          | Vertical     |

**Note:**

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

*Final Test Level = Receiver Reading + Correct Factor*

*Correct Factor = Antenna Factor + Cable Factor - Preamplifier Factor*

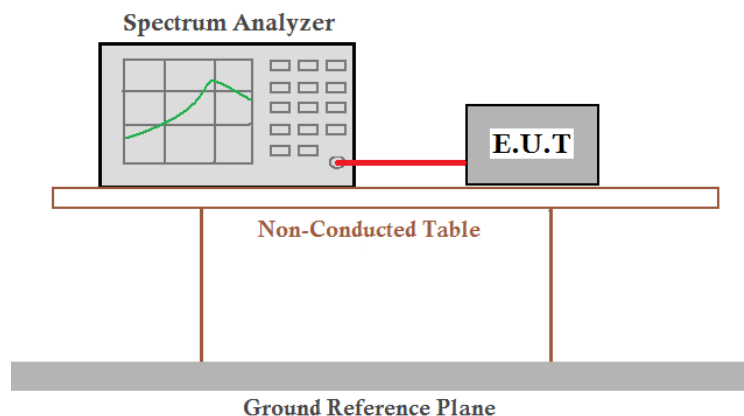


## 7.5 20dB Bandwidth

**Test Requirement:** 47 CFR Part 15C Section 15.215

**Test Method:** ANSI C63.10

**Test Setup:**



**Instruments Used:** Refer to section 5.11 for details

**Exploratory Test Mode:** Transmitting mode  
Pretest the EUT at Transmitting mode

**Final Test Mode:**

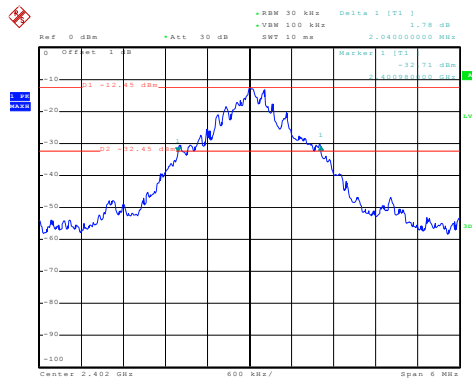
**Limit:** N/A  
**Test Results:** Pass

### Measurement Data

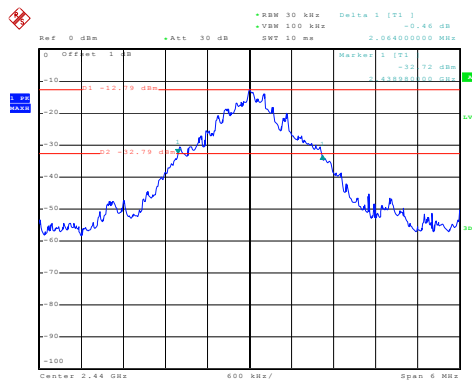
| Test channel | 20dB bandwidth (MHz) | Results |
|--------------|----------------------|---------|
| Lowest       | 2.04                 | Pass    |
| Middle       | 2.06                 | Pass    |
| Highest      | 2.08                 | Pass    |

Test plot as follows:

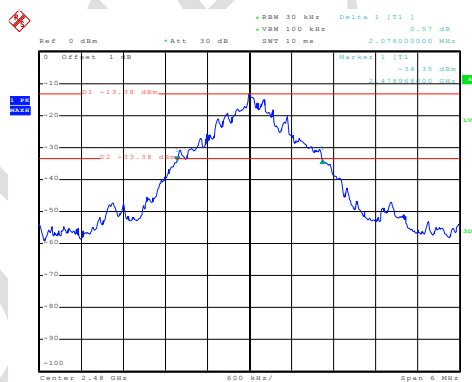
Test channel: Lowest



Test channel: Middle



Test channel: Highest

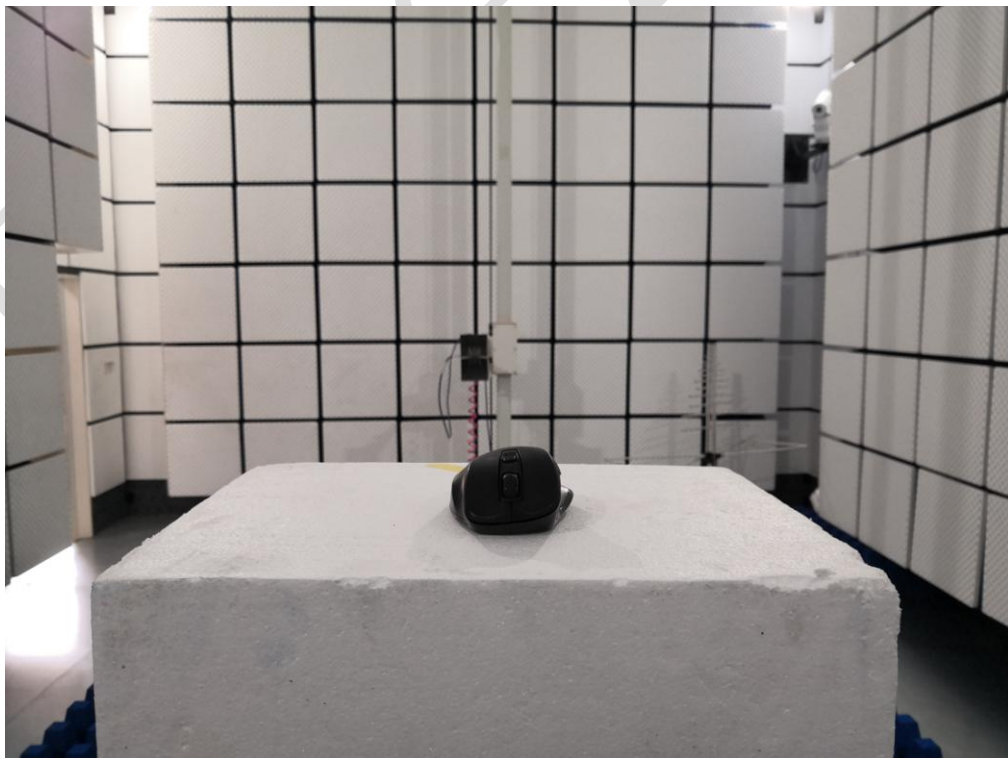


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## APPENDIX 1 PHOTOGRAPHS OF TEST SETUP



**Radiated emission Test Setup-2 (30MHz~1GHz)**



**Radiated spurious emission Test Setup-3(Above 1GHz)**

## APPENDIX 2 PHOTOGRAPHS OF EUT



View of Product-1(model: G1018E& G1023E)



View of Product-2(model: G1018E& G1023E)

Test model No.: G1018E



View of Product-1(G1018E)



View of Product-2 (G1018E)





View of Product-3(G1018E)



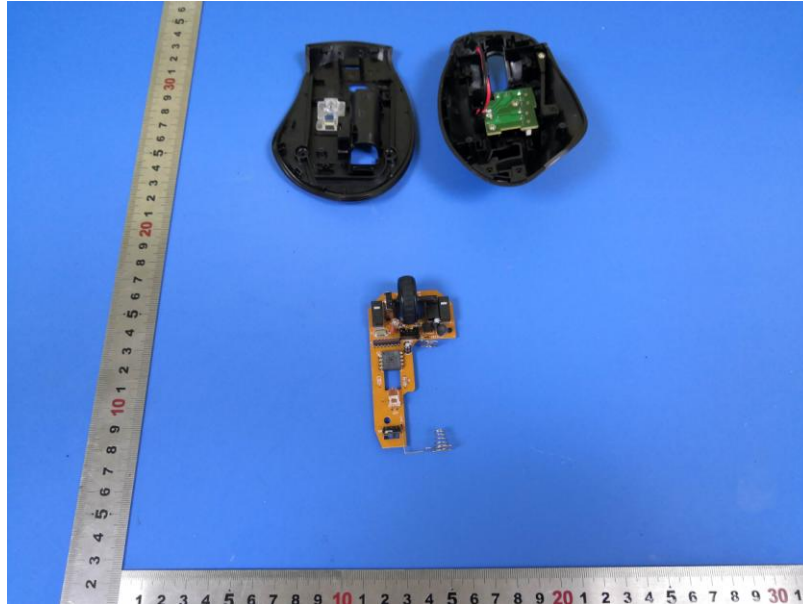
View of Product-4(G1018E)



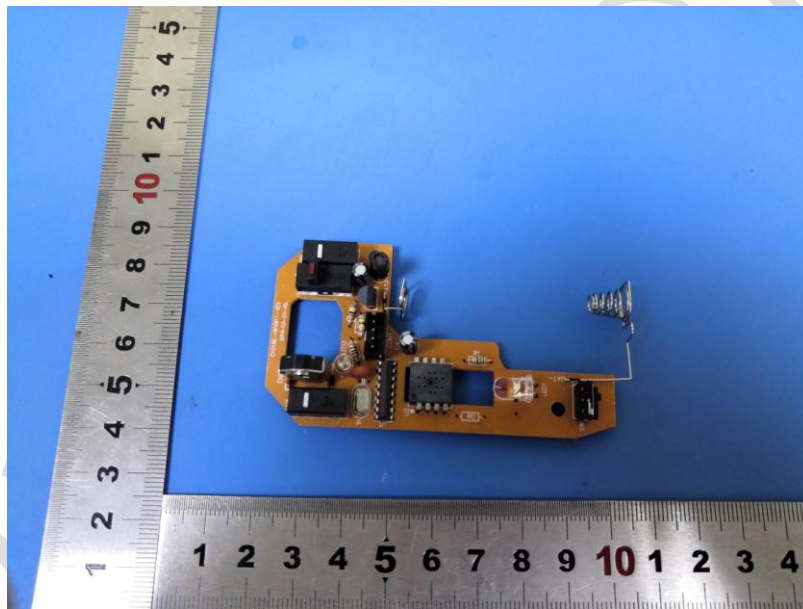
View of Product-5(G1018E)



View of Product-6(G1018E)

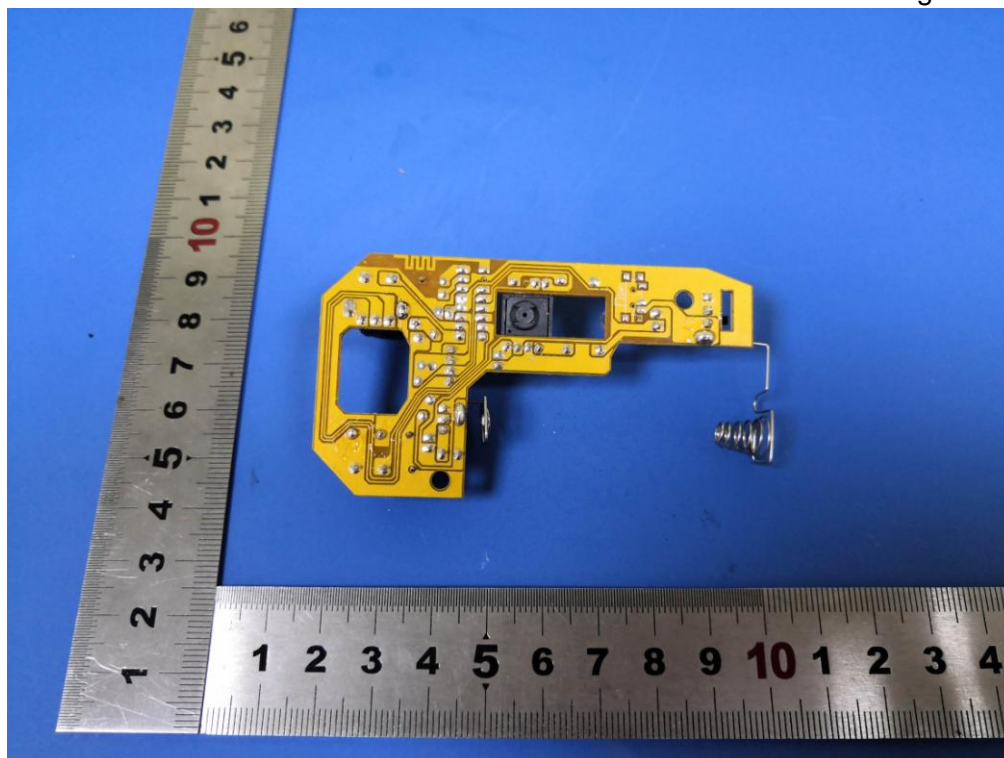


View of Product-7(G1018E)

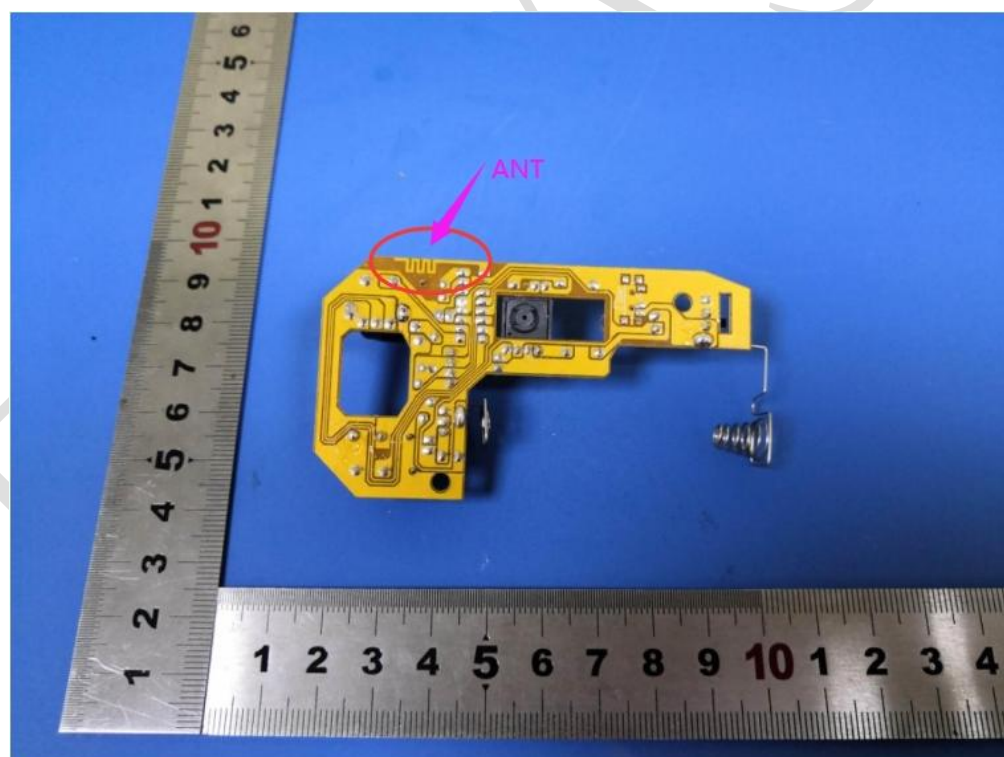


View of Product-8(G1018E)





View of Product-9(G1018E)



View of Product-10(G1018E)

## PHOTOGRAPHS OF G1023E



View of Product-1(G1023E)



View of Product-2(G1023E)



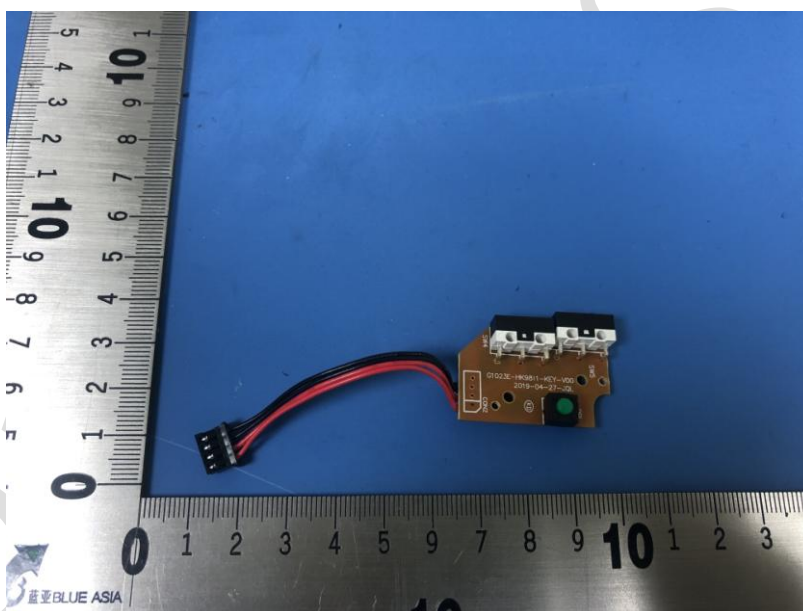
View of Product-3(G1023E)



View of Product-4(G1023E)

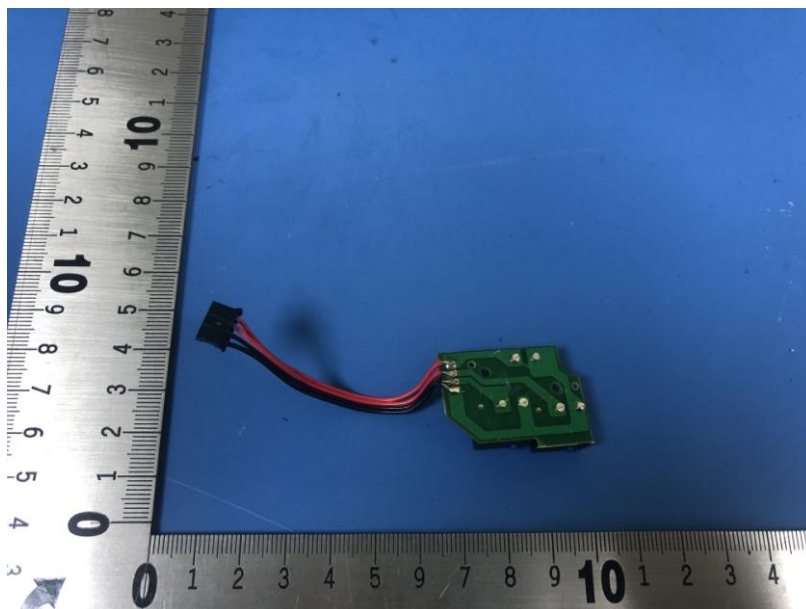


View of Product-5(G1023E)

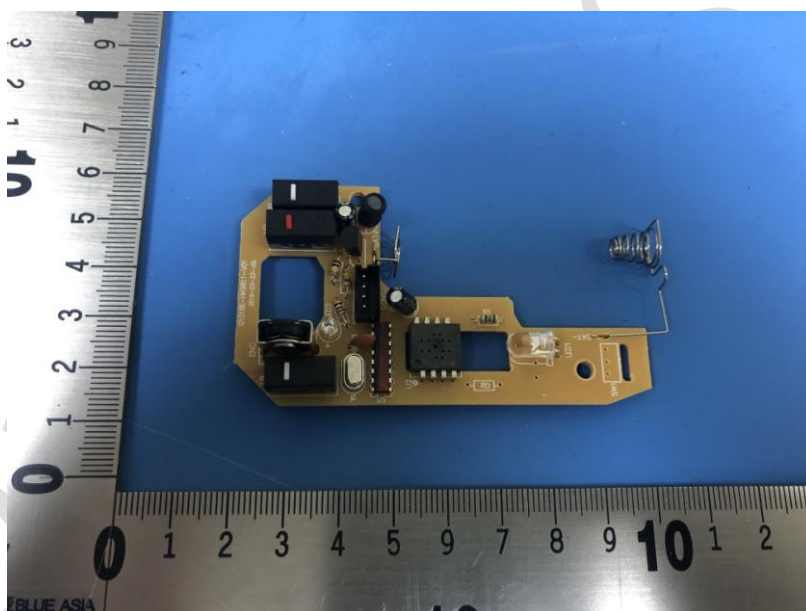


View of Product-6(G1023E)





View of Product-7(G1023E)



View of Product-8(G1023E)



View of Product-9(G1023E)

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

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