

# TEST REPORT

Reference No. .... : WTS20S03006774W  
FCC ID ..... : 2APQV-BHP120  
Applicant..... : Brilliant Home Technology Inc  
Address..... : 155 Bovet Rd, Suite 500, San Mateo, California, United States  
Manufacturer ..... : HANK ELECTRONICS CO., LTD.  
Address..... : Floor 2nd-7th, A8, Hongye Industry City, Lezhujiao, Zhoushi Road,  
Baoan District, Shenzhen, China  
Product..... : Smart Plug  
Model(s) ..... : BHP120US-WH1  
Standards..... : FCC CFR47 Part 15 Section 15.247:2019  
Date of Receipt sample .... : 2020-03-04  
Date of Test ..... : 2020-03-04 to 2020-03-11  
Date of Issue..... : 2020-04-01  
Test Result..... : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

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## 2 Revision History

| Test Report No. | Date of Receipt Sample | Date of Test                | Date of Issue | Purpose  | Comment | Approved |
|-----------------|------------------------|-----------------------------|---------------|----------|---------|----------|
| WTS20S03006774W | 2020-03-04             | 2020-03-04 to<br>2020-03-11 | 2020-04-01    | original | -       | Valid    |

### 3 General Information

#### 3.1 General Description of E.U.T.

|                              |                                            |
|------------------------------|--------------------------------------------|
| <b>Product:</b>              | Smart Plug                                 |
| <b>Model(s):</b>             | BHP120US-WH1                               |
| <b>Model difference:</b>     | N/A                                        |
| <b>Operation Frequency:</b>  | 2402-2480MHz, 40 Channels in total for BLE |
| <b>Antenna installation:</b> | PCB Printed Antenna                        |
| <b>Antenna Gain:</b>         | -1.26 dBi                                  |
| <b>Type of Modulation:</b>   | GFSK                                       |

#### 3.2 Details of E.U.T.

|                 |                           |
|-----------------|---------------------------|
| <b>Ratings:</b> | Input: 120V~60Hz Max 10A  |
|                 | Output: 120V~60Hz Max 10A |

#### 3.3 Channel List

Bluetooth LE

| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|
| 0           | 2402            | 1           | 2404            | 2           | 2406            | 3           | 2408            |
| 4           | 2410            | 5           | 2412            | 6           | 2414            | 7           | 2416            |
| 8           | 2418            | 9           | 2420            | 10          | 2422            | 11          | 2424            |
| 12          | 2426            | 13          | 2428            | 14          | 2430            | 15          | 2432            |
| 16          | 2434            | 17          | 2436            | 18          | 2438            | 19          | 2440            |
| 20          | 2442            | 21          | 2444            | 22          | 2446            | 23          | 2448            |
| 24          | 2450            | 25          | 2452            | 26          | 2454            | 27          | 2456            |
| 28          | 2458            | 29          | 2460            | 30          | 2462            | 31          | 2464            |
| 32          | 2466            | 33          | 2468            | 34          | 2470            | 35          | 2472            |
| 36          | 2474            | 37          | 2476            | 38          | 2478            | 39          | 2480            |

### 3.4 Test Mode

Table 2 Tests carried out under FCC part 15.247

| Bluetooth LE Test Items     | Mode         | Data Rate | Channel | TX/RX |
|-----------------------------|--------------|-----------|---------|-------|
| Maximum Peak Output Power   | Bluetooth LE | 1 Mbps    | 0/19/39 | TX    |
| Power Spectral Density      | Bluetooth LE | 1 Mbps    | 0/19/39 | TX    |
| Bandwidth                   | Bluetooth LE | 1 Mbps    | 0/19/39 | TX    |
| Band Edge                   | Bluetooth LE | 1 Mbps    | 0/19/39 | TX    |
| Radiated Spurious Emissions | Bluetooth LE | 1 Mbps    | 0/19/39 | TX    |

**Note:** Parameters set by test software during channel & power tests, the software provided by the customer was used to set the operating channels as well as the output power level. The RF output power set is the power expected by the manufacturer and is going to be fixed on the firmware of the final product.

## 4 Equipment Used during Test

### 4.1 Equipments List

| Conducted Emissions                                     |                                             |                      |              |                 |                       |                      |
|---------------------------------------------------------|---------------------------------------------|----------------------|--------------|-----------------|-----------------------|----------------------|
| Item                                                    | Equipment                                   | Manufacturer         | Model No.    | Serial No.      | Last Calibration Date | Calibration Due Date |
| 1                                                       | EMI Test Receiver                           | R&S                  | ESCI         | 101155          | 2019-09-17            | 2020-09-16           |
| 2                                                       | LISN                                        | SCHWARZBECK          | NSLK 8128    | 8128-259        | 2019-09-17            | 2020-09-16           |
| 3                                                       | Limiter                                     | CYBERTEK             | EM5010       | 261115-001-0024 | 2019-09-17            | 2020-09-16           |
| 4                                                       | Cable                                       | Laplace              | RF300        | -               | 2019-09-17            | 2020-09-16           |
| 3m Semi-anechoic Chamber for Radiation Emissions(SAEMC) |                                             |                      |              |                 |                       |                      |
| Item                                                    | Equipment                                   | Manufacturer         | Model No.    | Serial No.      | Last Calibration Date | Calibration Due Date |
| 1                                                       | Spectrum Analyzer                           | R&S                  | FSP30        | 100091          | 2019-04-19            | 2020-04-18           |
| 2                                                       | Broad-band Horn Antenna(1-18GHz)            | SCHWARZBECK          | BBHA 9120 D  | 667             | 2019-04-19            | 2020-04-18           |
| 3                                                       | Broadband Preamplifier                      | COMPLIANCE DIRECTION | PAP-1G18     | 2004            | 2019-04-19            | 2020-04-18           |
| 4                                                       | Coaxial Cable (above 1GHz)                  | Top                  | 1GHz-18GHz   | EW02014-7       | 2019-04-19            | 2020-04-18           |
| 5                                                       | Spectrum Analyzer                           | R&S                  | FSP40        | 100501          | 2019-09-17            | 2020-09-16           |
| 6                                                       | Broad-band Horn Antenna(18-40GHz)           | SCHWARZBECK          | BBHA 9170    | 335             | 2019-09-17            | 2020-09-16           |
| 7                                                       | Microwave Broadband Preamplifier (18-40GHz) | SCHWARZBECK          | BBV 9721     | 100472          | 2019-09-17            | 2020-09-16           |
| 8                                                       | Cable                                       | Top                  | 18-40GHz     | -               | 2019-09-17            | 2020-09-16           |
| 3m Semi-anechoic Chamber for Radiation Emissions(TDK)   |                                             |                      |              |                 |                       |                      |
| Item                                                    | Equipment                                   | Manufacturer         | Model No.    | Serial No       | Last Calibration Date | Calibration Due Date |
| 1                                                       | Test Receiver                               | R&S                  | ESCI         | 101296          | 2019-04-20            | 2020-04-19           |
| 2                                                       | Trilog Broadband Antenna                    | SCHWARZBECK          | VULB9160     | 9160-3325       | 2019-05-24            | 2020-05-23           |
| 3                                                       | Active Loop Antenna                         | Com-power            | AL-130R      | 10160007        | 2019-04-28            | 2020-04-27           |
| 4                                                       | Amplifier                                   | ANRITSU              | MH648A       | M43381          | 2019-04-19            | 2020-04-18           |
| 5                                                       | Cable                                       | HUBER+SUHNER         | CBL2         | 525178          | 2019-04-20            | 2020-04-19           |
| 6                                                       | Coaxial Cable (below 1GHz)                  | Top                  | TYPE16 (13M) | -               | 2019-09-12            | 2020-09-11           |

| RF Conducted Testing                                                                                                                                                        |                             |                   |               |            |                       |                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------|---------------|------------|-----------------------|----------------------|
| Item                                                                                                                                                                        | Equipment                   | Manufacturer      | Model No.     | Serial No. | Last Calibration Date | Calibration Due Date |
| 1                                                                                                                                                                           | EXG Analog Signal Generator | Malaysia Keysight | FSL6          | MY53050845 | 2019-09-17            | 2020-09-16           |
| 2                                                                                                                                                                           | Coaxial Cable               | Top               | 10Hz-30GHz    | -          | 2019-09-12            | 2020-09-11           |
| 3                                                                                                                                                                           | Antenna Connector*          | Realacc           | 45RSm         | -          | 2019-09-12            | 2020-09-11           |
| 4                                                                                                                                                                           | DC Block                    | Gwave             | GDCB-3G-N-SMA | 140307001  | 2019-09-12            | 2020-09-11           |
| “*”: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list. |                             |                   |               |            |                       |                      |

## 4.2 Measurement Uncertainty

| Parameter                        | Uncertainty                           |
|----------------------------------|---------------------------------------|
| Radio Frequency                  | $\pm 1 \times 10^{-6}$                |
| RF Power                         | $\pm 1.0$ dB                          |
| RF Power Density                 | $\pm 2.2$ dB                          |
| Radiated Spurious Emissions test | $\pm 5.03$ dB (30M~1000MHz)           |
|                                  | $\pm 5.47$ dB (1000M~25000MHz)        |
| Conducted Emissions test         | $\pm 3.64$ dB (AC mains 150KHz~30MHz) |

## 4.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

## 5 Test Facility

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.  
 ISCED CAB identifier: CN0013. Test Firm Registration No.: 7760A.



## 6 Test Summary

| Test Items                                                                   | Test Requirement                    | Result |
|------------------------------------------------------------------------------|-------------------------------------|--------|
| Radiated Spurious Emissions                                                  | 15.247(d)<br>15.205(a)<br>15.209(a) | Pass   |
| Conducted Emissions                                                          | 15.207(a)                           | Pass   |
| Bandwidth                                                                    | 15.247(a)(2)                        | Pass   |
| Maximum Peak Output Power                                                    | 15.247(b)(3),(4)                    | Pass   |
| Power Spectral Density                                                       | 15.247(e)                           | Pass   |
| Band Edge                                                                    | 15.247(d)                           | Pass   |
| Antenna Requirement                                                          | 15.203                              | Pass   |
| RF Exposure                                                                  | 1.1307(b)(1)                        | Pass   |
| Note: Pass=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable. |                                     |        |

## 7 Conducted Emission

Test Requirement: FCC CFR 47 Part 15 Section 15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Class/Severity: Class B

Limit:

| Frequency (MHz) | Conducted Limit (dB $\mu$ V) |           |
|-----------------|------------------------------|-----------|
|                 | Quasi-peak                   | Average   |
| 0.15 to 0.5     | 66 to 56*                    | 56 to 46* |
| 0.5 to 5.0      | 56                           | 46        |
| 5.0 to 30       | 60                           | 50        |

\*Decreases with the logarithm of the frequency.

### 7.1 E.U.T. Operation

Operating Environment :

Temperature: 23.1 °C

Humidity: 53.5 % RH

Atmospheric Pressure: 101.4kPa

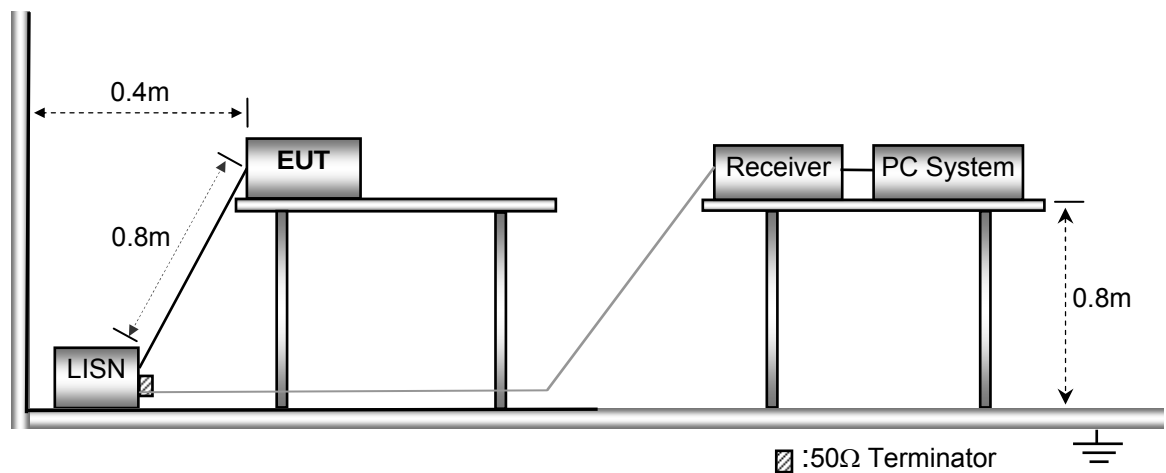
Test Voltage: AC 120V, 60Hz

EUT Operation :

The test was performed in Transmitting mode, the worst test data (Low channel) were shown in the report.

### 7.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.

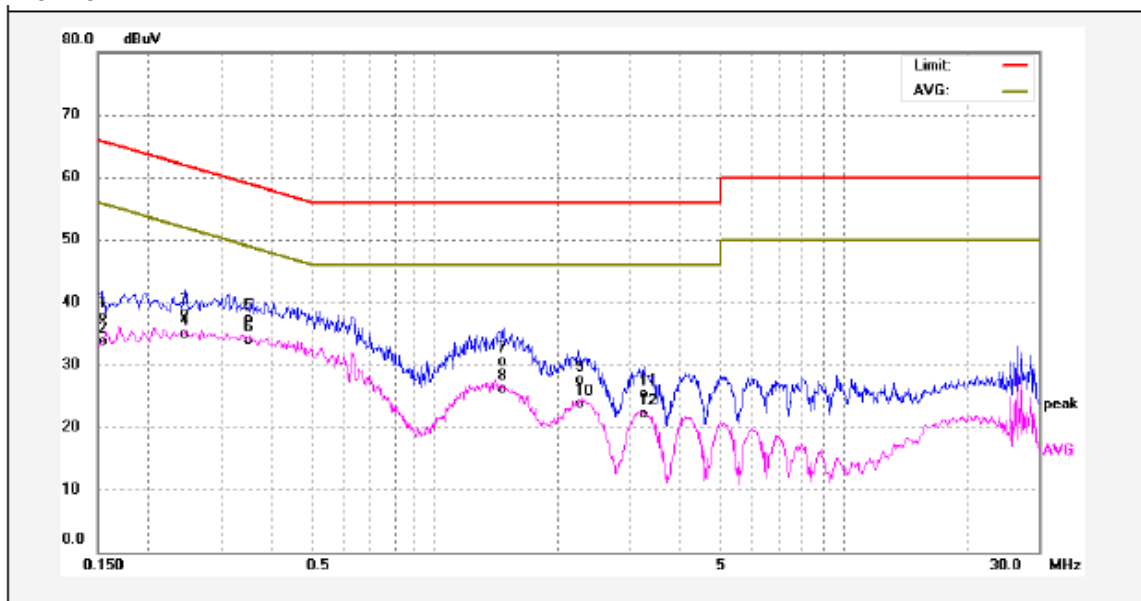


### 7.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

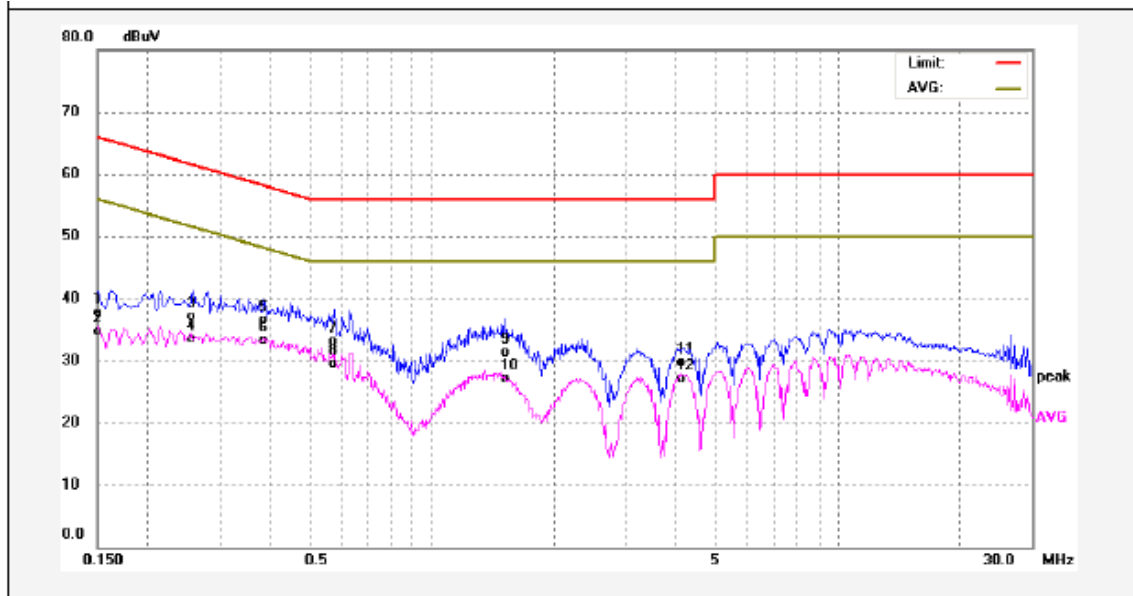
### 7.4 Conducted Emission Test Result

Live line:



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-------------|----------|--------|
| 1   | 0.1539      | 27.81          | 9.97        | 37.78         | 65.78        | -28.00      | QP       |        |
| 2   | 0.1539      | 23.74          | 9.97        | 33.71         | 55.78        | -22.07      | AVG      |        |
| 3   | 0.2460      | 28.26          | 9.99        | 38.25         | 61.89        | -23.64      | QP       |        |
| 4   | 0.2460      | 24.85          | 9.99        | 34.84         | 51.89        | -17.05      | AVG      |        |
| 5   | 0.3580      | 27.19          | 10.02       | 37.21         | 58.77        | -21.56      | QP       |        |
| 6   | 0.3580      | 23.89          | 10.02       | 33.91         | 48.77        | -14.86      | AVG      |        |
| 7   | 1.4780      | 20.40          | 10.14       | 30.54         | 56.00        | -25.46      | QP       |        |
| 8   | 1.4780      | 16.04          | 10.14       | 26.18         | 46.00        | -19.82      | AVG      |        |
| 9   | 2.2580      | 17.37          | 10.13       | 27.50         | 56.00        | -28.50      | QP       |        |
| 10  | 2.2580      | 13.54          | 10.13       | 23.67         | 46.00        | -22.33      | AVG      |        |
| 11  | 3.2420      | 15.05          | 10.18       | 25.23         | 56.00        | -30.77      | QP       |        |
| 12  | 3.2420      | 11.94          | 10.18       | 22.12         | 46.00        | -23.88      | AVG      |        |

Neutral line:



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Margin (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-------------|----------|--------|
| 1   | 0.1500      | 27.78          | 9.97        | 37.75         | 65.99      | -28.24      | QP       |        |
| 2   | 0.1500      | 24.82          | 9.97        | 34.79         | 55.99      | -21.20      | AVG      |        |
| 3   | 0.2580      | 27.14          | 9.99        | 37.13         | 61.49      | -24.36      | QP       |        |
| 4   | 0.2580      | 23.59          | 9.99        | 33.58         | 51.49      | -17.91      | AVG      |        |
| 5   | 0.3860      | 26.49          | 10.04       | 36.53         | 58.15      | -21.62      | QP       |        |
| 6   | 0.3860      | 23.17          | 10.04       | 33.21         | 48.15      | -14.94      | AVG      |        |
| 7   | 0.5780      | 23.07          | 10.08       | 33.15         | 56.00      | -22.85      | QP       |        |
| 8   | 0.5780      | 19.45          | 10.08       | 29.53         | 46.00      | -16.47      | AVG      |        |
| 9   | 1.5060      | 21.26          | 10.14       | 31.40         | 56.00      | -24.60      | QP       |        |
| 10  | 1.5060      | 17.04          | 10.14       | 27.18         | 46.00      | -18.82      | AVG      |        |
| 11  | 4.1740      | 19.54          | 10.20       | 29.74         | 56.00      | -26.26      | QP       |        |
| 12  | 4.1740      | 17.00          | 10.20       | 27.20         | 46.00      | -18.80      | AVG      |        |

## 8 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

| Frequency<br>(MHz) | Field Strength        |                 | Field Strength Limit at 3m Measurement Dist |                                       |
|--------------------|-----------------------|-----------------|---------------------------------------------|---------------------------------------|
|                    | uV/m                  | Distance<br>(m) | uV/m                                        | dBuV/m                                |
| 0.009 ~ 0.490      | $2400/F(\text{kHz})$  | 300             | $10000 * 2400/F(\text{kHz})$                | $20\log^{(2400/F(\text{kHz}))} + 80$  |
| 0.490 ~ 1.705      | $24000/F(\text{kHz})$ | 30              | $100 * 24000/F(\text{kHz})$                 | $20\log^{(24000/F(\text{kHz}))} + 40$ |
| 1.705 ~ 30         | 30                    | 30              | $100 * 30$                                  | $20\log^{(30)} + 40$                  |
| 30 ~ 88            | 100                   | 3               | 100                                         | $20\log^{(100)}$                      |
| 88 ~ 216           | 150                   | 3               | 150                                         | $20\log^{(150)}$                      |
| 216 ~ 960          | 200                   | 3               | 200                                         | $20\log^{(200)}$                      |
| Above 960          | 500                   | 3               | 500                                         | $20\log^{(500)}$                      |

### 8.1 EUT Operation

Operating Environment :

Temperature: 22.8 °C

Humidity: 52.6 % RH

Atmospheric Pressure: 101.5kPa

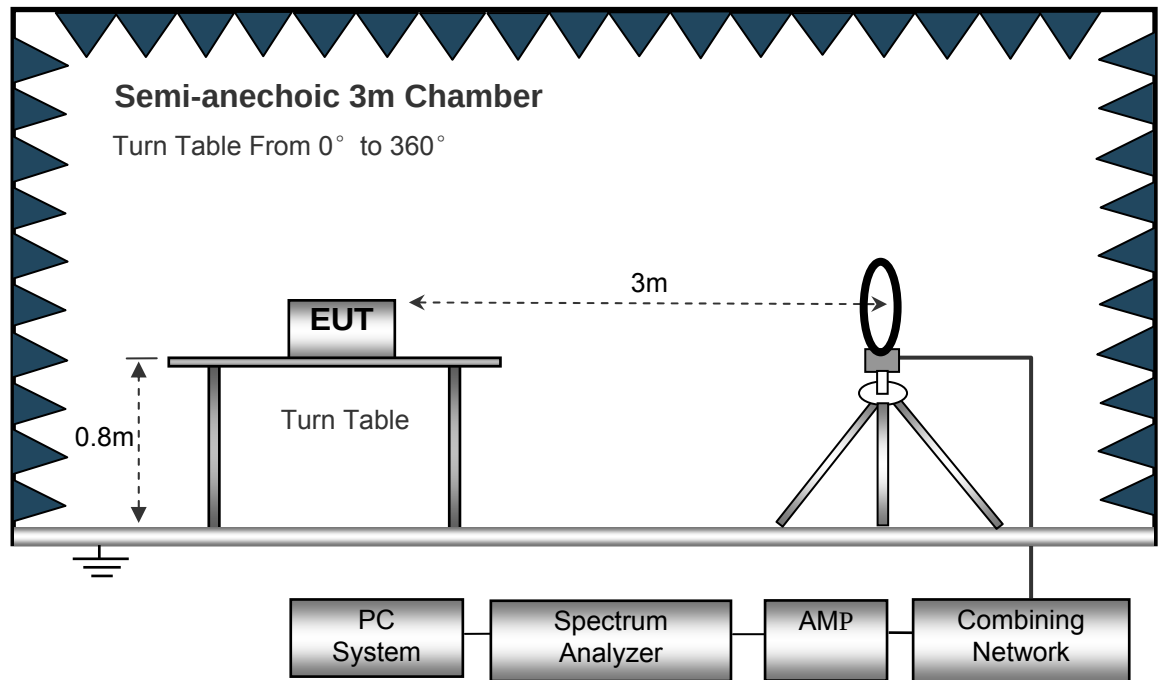
EUT Operation :

The test was performed in Transmitting mode, the worst test data were shown in the report.

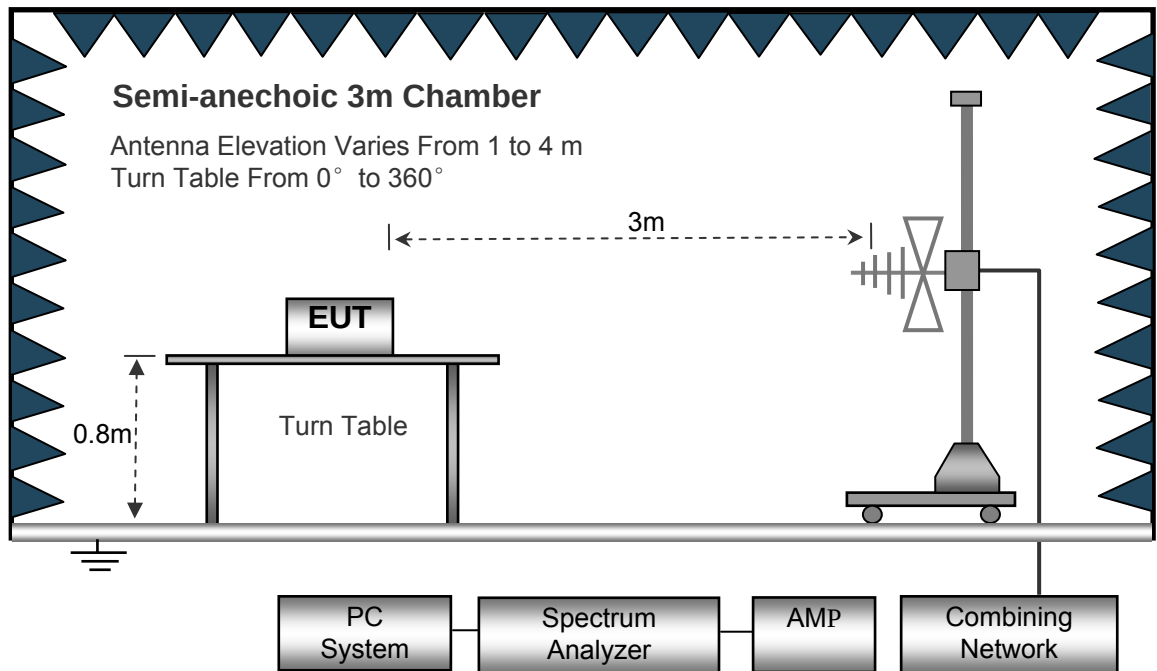
## 8.2 Test Setup

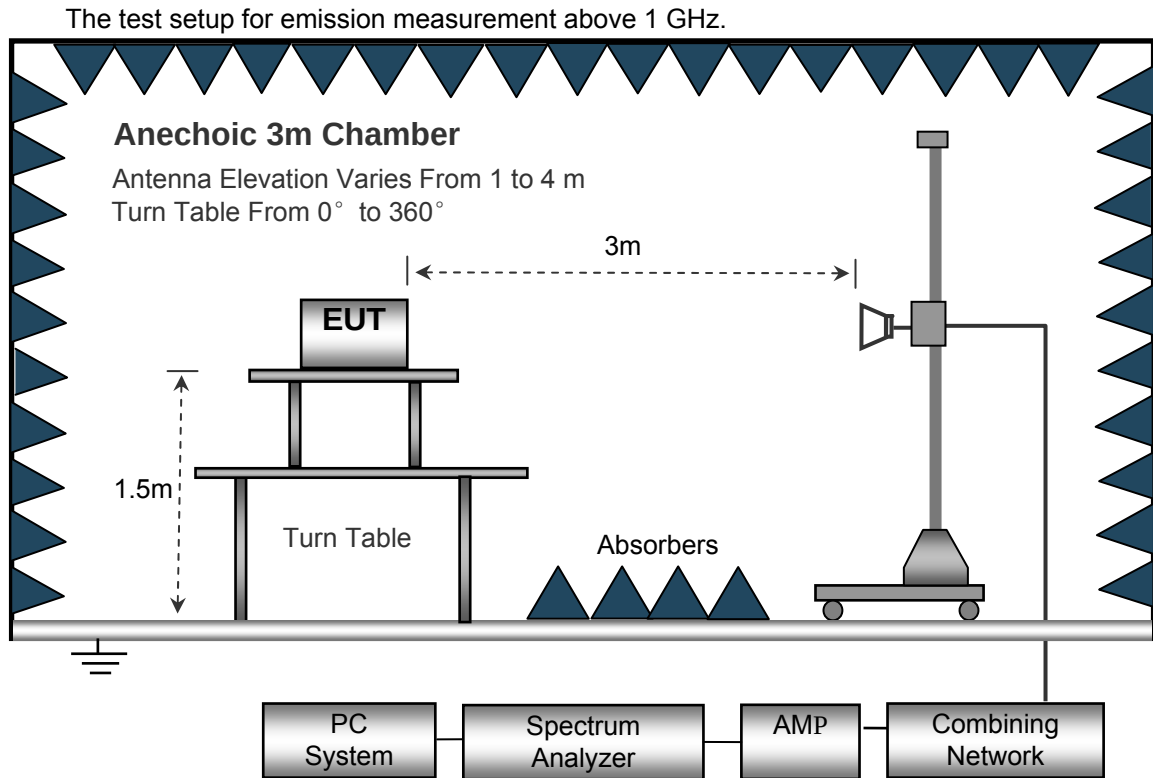
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10:2013.

The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.





**8.3 Spectrum Analyzer Setup**

|                           |        |
|---------------------------|--------|
| Below 30MHz               |        |
| Sweep Speed .....         | Auto   |
| IF Bandwidth.....         | 10kHz  |
| Video Bandwidth.....      | 10kHz  |
| Resolution Bandwidth..... | 10kHz  |
| 30MHz ~ 1GHz              |        |
| Sweep Speed .....         | Auto   |
| Detector .....            | PK     |
| Resolution Bandwidth..... | 100kHz |
| Video Bandwidth.....      | 300kHz |
| Above 1GHz                |        |
| Sweep Speed .....         | Auto   |
| Detector .....            | PK     |
| Resolution Bandwidth..... | 1MHz   |
| Video Bandwidth.....      | 3MHz   |
| Detector .....            | Ave.   |
| Resolution Bandwidth..... | 1MHz   |
| Video Bandwidth.....      | 10Hz   |

## 8.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X, Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), the worst condition was tested putting the eut in X axis, so the worst data were shown as follow.

## 8.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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 maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$



## 8.6 Summary of Test Results

### Test Frequency: 9 kHz ~ 25 GHz

Only the worst case GFSK mode and the worst frequency test data were recorded in the report, other frequency are attenuated more than 20 dB below the permissible value and not reported.

| Frequency                | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | Limit          | Margin |
|--------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|----------------|--------|
|                          |                  |             |                  | Height     | Polar |                  |                     |                |        |
| (MHz)                    | (dB $\mu$ V)     | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dB $\mu$ V/m)      | (dB $\mu$ V/m) | (dB)   |
| GFSK Low Channel 2402MHz |                  |             |                  |            |       |                  |                     |                |        |
| 35.13                    | 33.75            | QP          | 161              | 1.9        | H     | -11.07           | 22.68               | 40.00          | -17.32 |
| 35.13                    | 41.71            | QP          | 298              | 1.2        | V     | -11.07           | 30.64               | 40.00          | -9.36  |
| 4804.00                  | 54.96            | PK          | 94               | 1.7        | V     | -1.06            | 53.90               | 74.00          | -20.10 |
| 4804.00                  | 43.43            | Ave         | 94               | 1.7        | V     | -1.06            | 42.37               | 54.00          | -11.63 |
| 7206.00                  | 52.87            | PK          | 193              | 1.8        | H     | 1.33             | 54.20               | 74.00          | -19.80 |
| 7206.00                  | 43.05            | Ave         | 193              | 1.8        | H     | 1.33             | 44.38               | 54.00          | -9.62  |
| 2346.75                  | 42.79            | PK          | 304              | 1.7        | V     | -13.19           | 29.60               | 74.00          | -44.40 |
| 2346.75                  | 35.90            | Ave         | 304              | 1.7        | V     | -13.19           | 22.71               | 54.00          | -31.29 |
| 2358.02                  | 43.68            | PK          | 40               | 1.9        | H     | -13.14           | 30.54               | 74.00          | -43.46 |
| 2358.02                  | 33.15            | Ave         | 40               | 1.9        | H     | -13.14           | 20.01               | 54.00          | -33.99 |
| 2490.91                  | 43.66            | PK          | 160              | 2.0        | V     | -13.08           | 30.58               | 74.00          | -43.42 |
| 2490.91                  | 32.95            | Ave         | 160              | 2.0        | V     | -13.08           | 19.87               | 54.00          | -34.13 |

| Frequency                   | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | Limit    | Margin |
|-----------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|----------|--------|
|                             |                  |             |                  | Height     | Polar |                  |                     |          |        |
| (MHz)                       | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m) | (dB)   |
| GFSK Middle Channel 2440MHz |                  |             |                  |            |       |                  |                     |          |        |
| 35.13                       | 32.54            | QP          | 243              | 1.0        | H     | -11.07           | 21.47               | 40.00    | -18.53 |
| 35.13                       | 40.40            | QP          | 180              | 1.2        | V     | -11.07           | 29.33               | 40.00    | -10.67 |
| 4880.00                     | 53.90            | PK          | 121              | 1.4        | V     | -0.62            | 53.28               | 74.00    | -20.72 |
| 4880.00                     | 43.46            | Ave         | 121              | 1.4        | V     | -0.62            | 42.84               | 54.00    | -11.16 |
| 7320.00                     | 52.29            | PK          | 68               | 1.9        | H     | 2.21             | 54.50               | 74.00    | -19.50 |
| 7320.00                     | 43.64            | Ave         | 68               | 1.9        | H     | 2.21             | 45.85               | 54.00    | -8.15  |
| 2311.80                     | 46.14            | PK          | 63               | 1.1        | V     | -13.19           | 32.95               | 74.00    | -41.05 |
| 2311.80                     | 33.78            | Ave         | 63               | 1.1        | V     | -13.19           | 20.59               | 54.00    | -33.41 |
| 2378.98                     | 43.24            | PK          | 314              | 1.8        | H     | -13.14           | 30.10               | 74.00    | -43.90 |
| 2378.98                     | 32.59            | Ave         | 314              | 1.8        | H     | -13.14           | 19.45               | 54.00    | -34.55 |
| 2496.13                     | 43.39            | PK          | 18               | 1.3        | V     | -13.08           | 30.31               | 74.00    | -43.69 |
| 2496.13                     | 32.37            | Ave         | 18               | 1.3        | V     | -13.08           | 19.29               | 54.00    | -34.71 |

| Frequency                 | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | Limit    | Margin |
|---------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|----------|--------|
|                           |                  |             |                  | Height     | Polar |                  |                     |          |        |
| (MHz)                     | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m) | (dB)   |
| GFSK High Channel 2480MHz |                  |             |                  |            |       |                  |                     |          |        |
| 35.13                     | 34.01            | QP          | 357              | 1.8        | H     | -11.07           | 22.94               | 40.00    | -17.06 |
| 35.13                     | 39.47            | QP          | 200              | 1.1        | V     | -11.07           | 28.40               | 40.00    | -11.60 |
| 4960.00                   | 52.92            | PK          | 274              | 1.5        | V     | -0.24            | 52.68               | 74.00    | -21.32 |
| 4960.00                   | 42.33            | Ave         | 274              | 1.5        | V     | -0.24            | 42.09               | 54.00    | -11.91 |
| 7440.00                   | 51.94            | PK          | 118              | 1.1        | H     | 2.84             | 54.78               | 74.00    | -19.22 |
| 7440.00                   | 42.93            | Ave         | 118              | 1.1        | H     | 2.84             | 45.77               | 54.00    | -8.23  |
| 2338.41                   | 45.57            | PK          | 326              | 1.3        | V     | -13.19           | 32.38               | 74.00    | -41.62 |
| 2338.41                   | 34.41            | Ave         | 326              | 1.3        | V     | -13.19           | 21.22               | 54.00    | -32.78 |
| 2361.07                   | 44.61            | PK          | 146              | 1.7        | H     | -13.14           | 31.47               | 74.00    | -42.53 |
| 2361.07                   | 33.49            | Ave         | 146              | 1.7        | H     | -13.14           | 20.35               | 54.00    | -33.65 |
| 2494.63                   | 44.12            | PK          | 230              | 1.9        | V     | -13.08           | 31.04               | 74.00    | -42.96 |
| 2494.63                   | 33.84            | Ave         | 230              | 1.9        | V     | -13.08           | 20.76               | 54.00    | -33.24 |

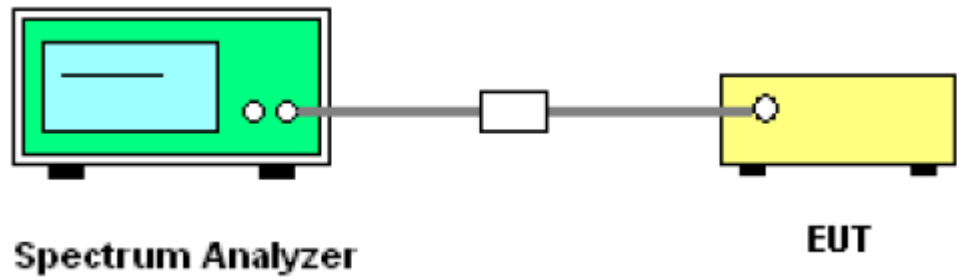
## 9 Band Edge Measurement

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC CFR47 Part 15 Section 15.247                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Test Method:      | 558074 D01 15.247 Meas Guidance v05r02, ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Test Limit:       | Regulation 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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)). |
| Test Mode:        | Transmitting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

### 9.1 Test Produce

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

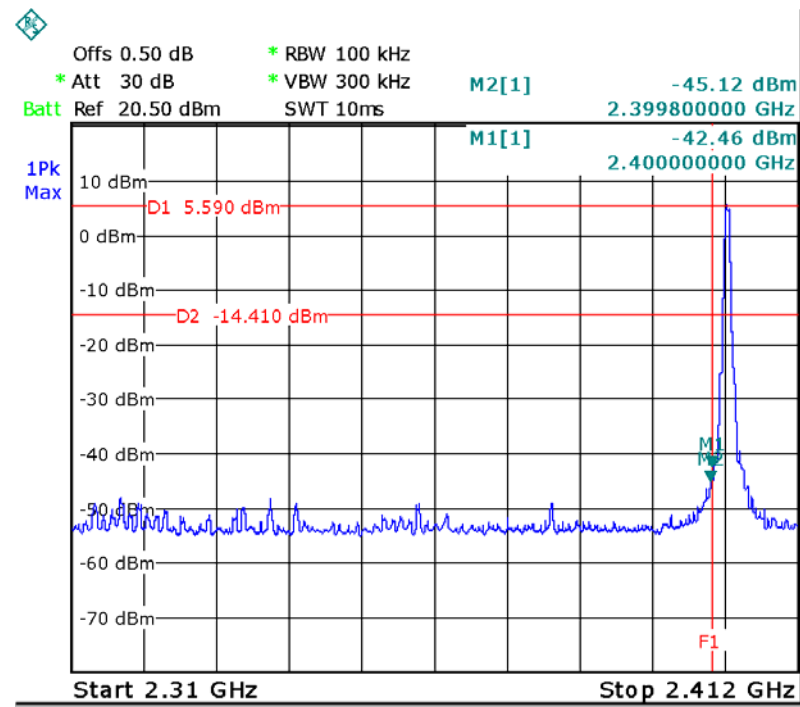
9.2 Test Setup



9.3 Test Result

Test result plots shown as follows:

Bluetooth LE: Band edge-left side





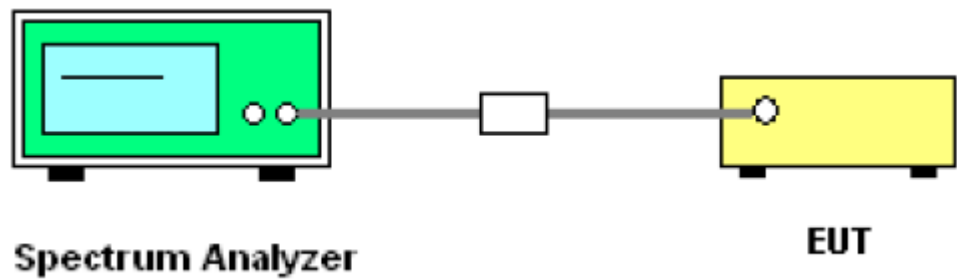
10 Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247  
Test Method: 558074 D01 15.247 Meas Guidance v05r02, ANSI C63.10:2013

10.1 Test Procedure:

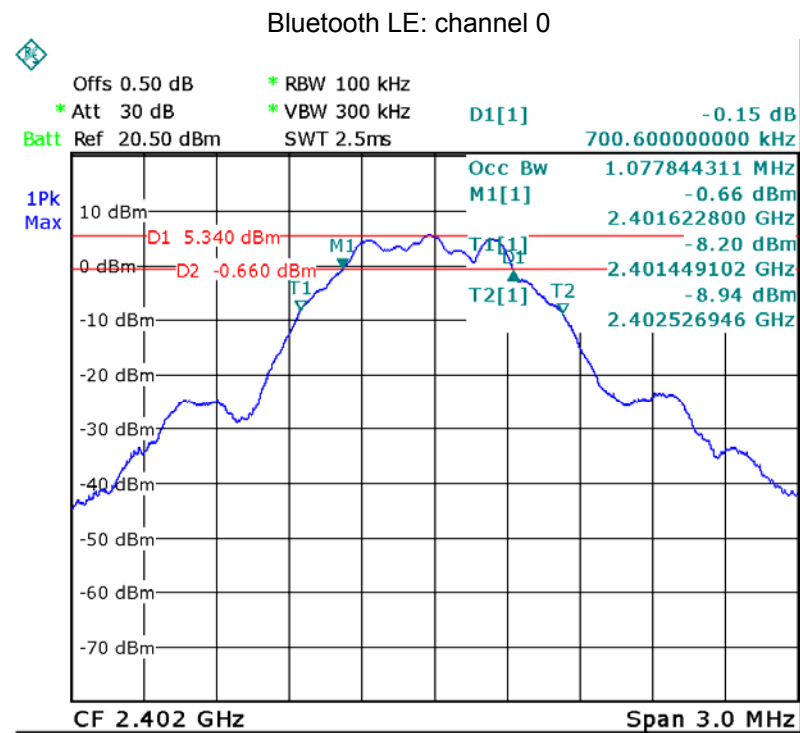
- 1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
- 2. Set the spectrum analyzer: RBW = 100 kHz, VBW = 300 kHz

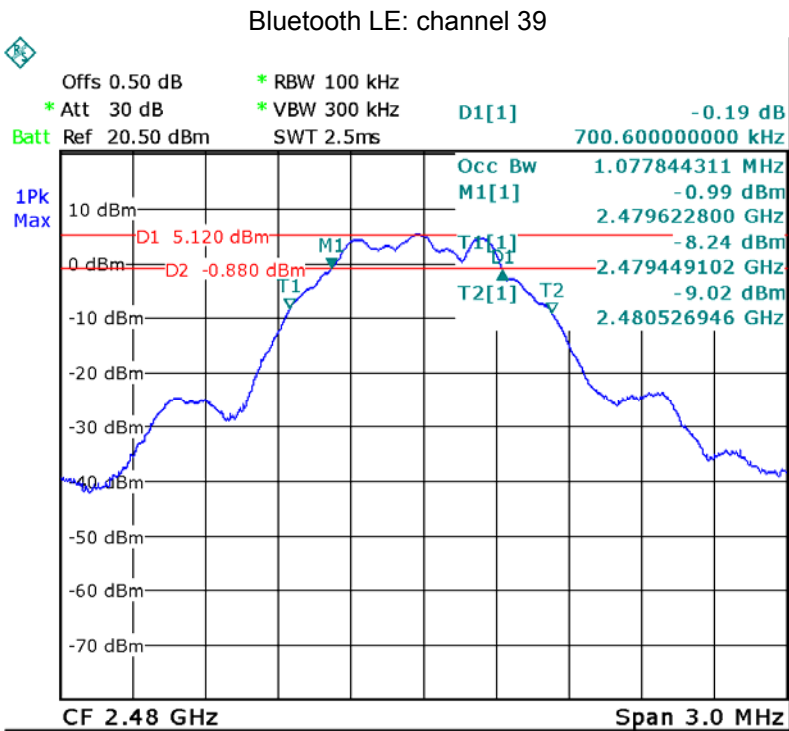
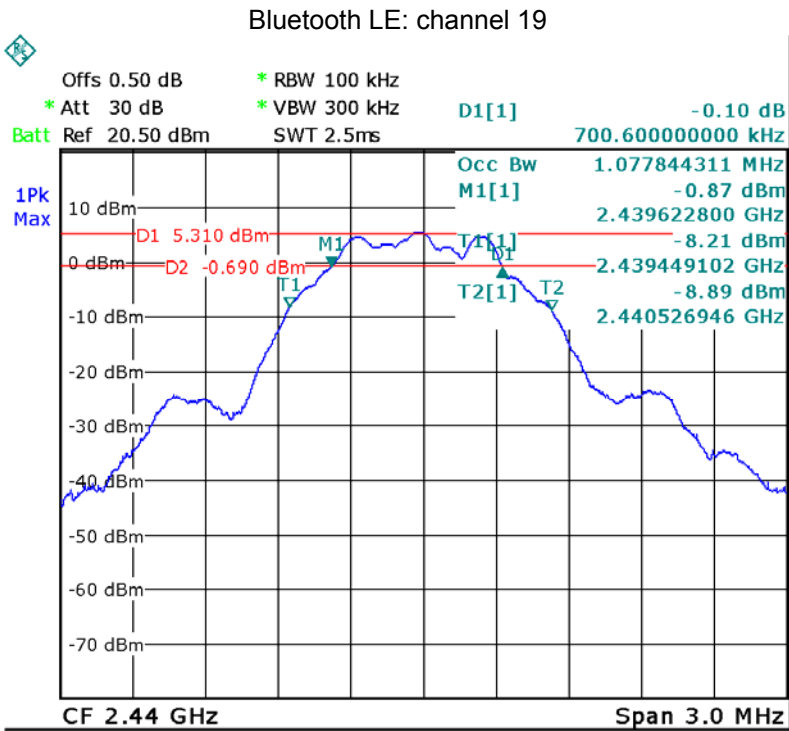
10.2 Test Setup



10.3 Test Result:

| Operation mode | Test Channel | 6dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|----------------|--------------|---------------------|---------------------|
| Bluetooth LE   | Channel 0    | 0.701               | 1.078               |
|                | Channel 19   | 0.701               | 1.078               |
|                | Channel 39   | 0.701               | 1.078               |







## 11 Maximum Peak Output Power

Test Requirement:

FCC CFR47 Part 15 Section 15.247

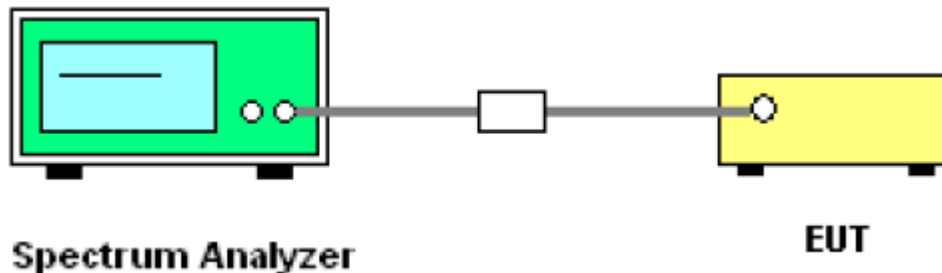
Test Method:

558074 D01 15.247 Meas Guidance v05r02, ANSI C63.10:2013

### 11.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

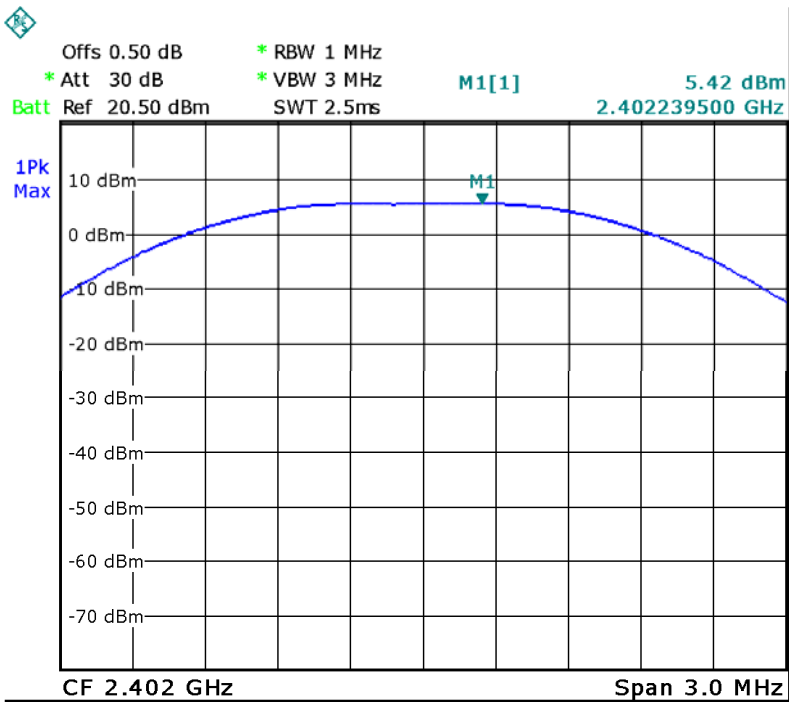
### 11.2 Test Setup



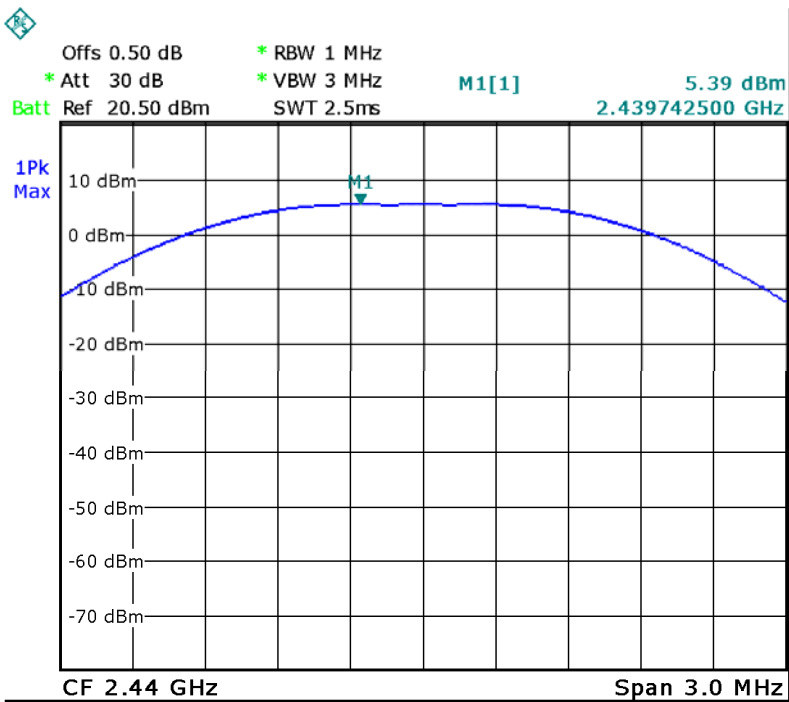
### 11.3 Test Result:

| Operation mode | Test Channel | Maximum Peak Output Power (dBm) | Limit    |
|----------------|--------------|---------------------------------|----------|
| Bluetooth LE   | Channel 0    | 5.42                            | 1W/30dBm |
|                | Channel 19   | 5.39                            | 1W/30dBm |
|                | Channel 39   | 5.21                            | 1W/30dBm |

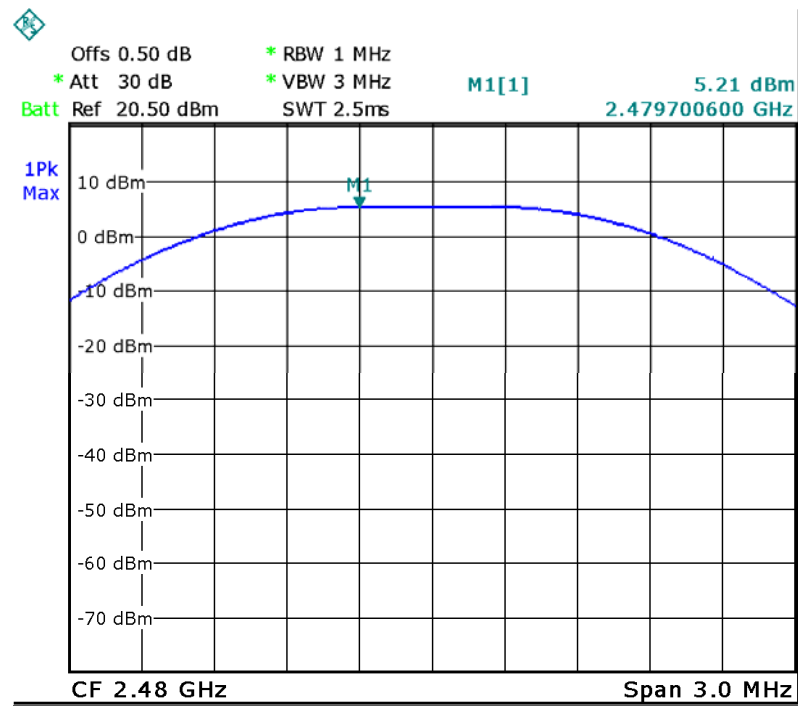
Bluetooth LE: channel 0



Bluetooth LE: channel 19



Bluetooth LE: channel 39



## 12 Power Spectral density

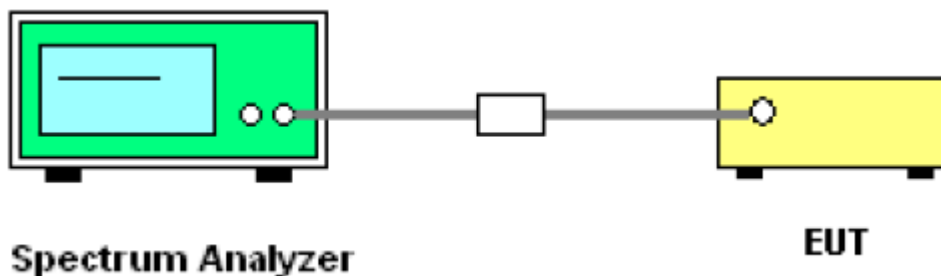
Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 15.247 Meas Guidance v05r02, ANSI C63.10:2013

### 12.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

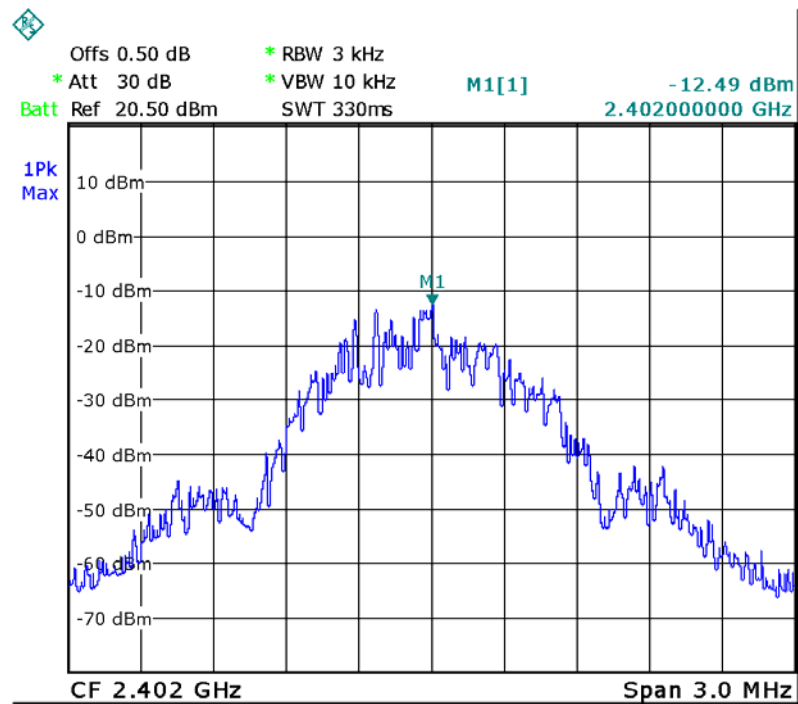
### 12.2 Test Setup



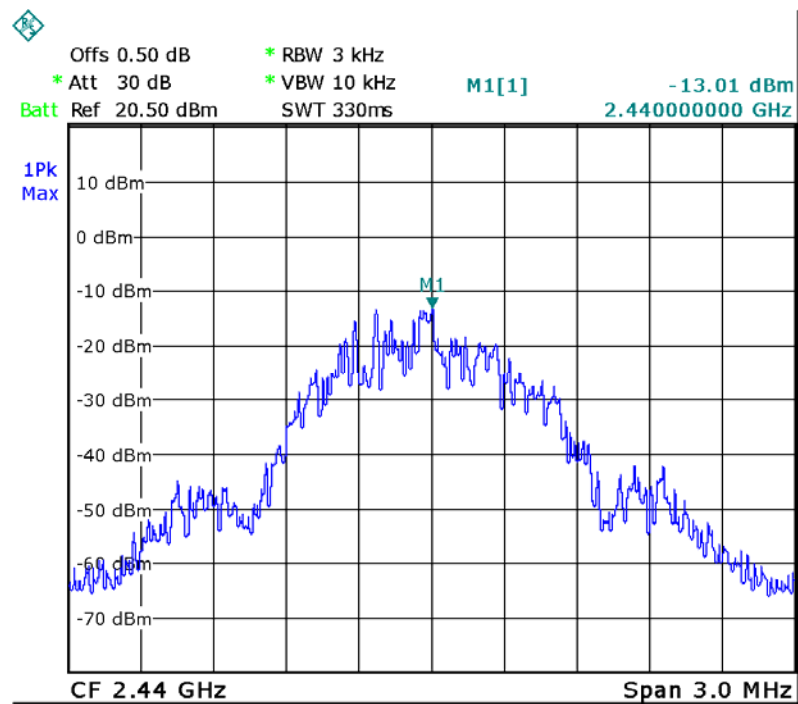
### 12.3 Test Result:

| Operation mode | Test Channel | Power Spectral<br>(dBm per 3kHz) | Limit         |
|----------------|--------------|----------------------------------|---------------|
| Bluetooth LE   | Channel 0    | -12.49                           | 8dBm per 3kHz |
|                | Channel 19   | -13.01                           | 8dBm per 3kHz |
|                | Channel 39   | -13.46                           | 8dBm per 3kHz |

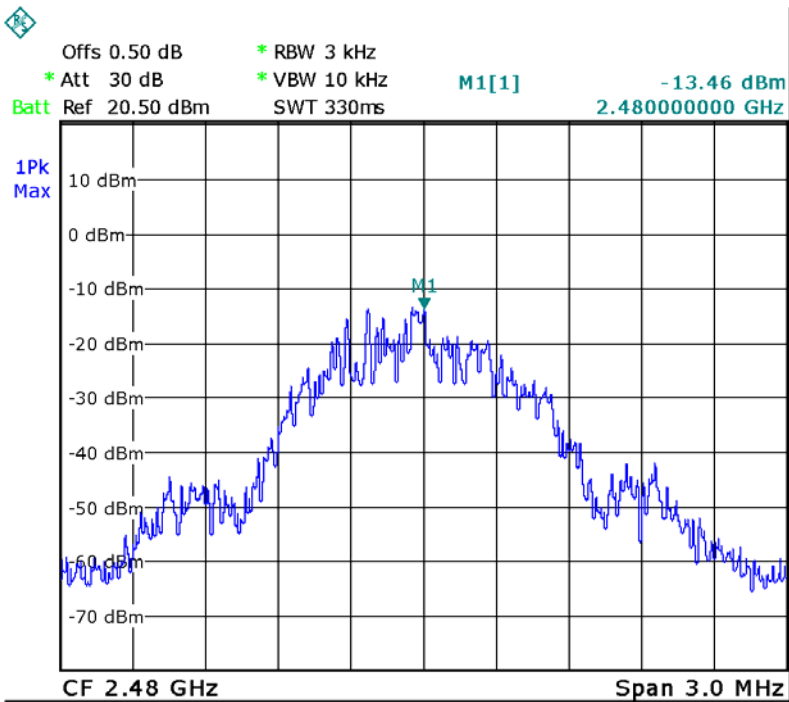
Bluetooth LE: channel 0



Bluetooth LE: channel 19



Bluetooth LE: channel 39



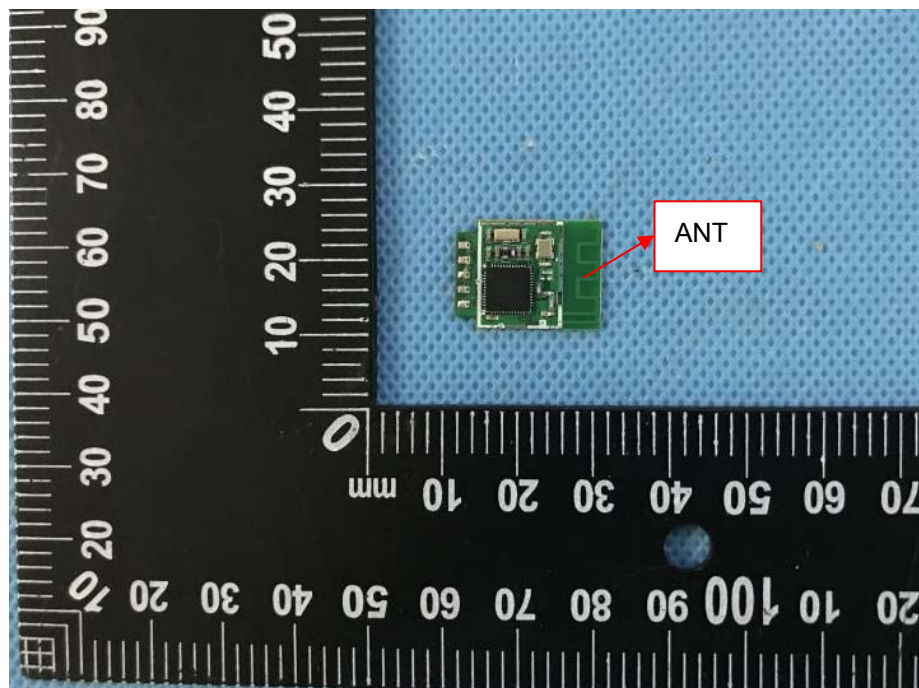
## 13 Antenna Requirement

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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR 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.

Result:

The EUT has a PCB Printed Antenna for Bluetooth Antenna, meets the requirements of FCC 15.203.



## 14 FCC ID: 2APQV-BHP120 RF Exposure Report

Test Requirement: FCC Part 1.1307

Evaluation Method FCC Part2.1093 & KDB 447498 D01 General RF Exposure Guidance v06

### 14.1 Requirements

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

### 14.2 The procedures / limit

#### (A) Limits for Occupational / Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-3.0               | 614                               | 1.63                              | (100)*                                   | 6                                                                |
| 3.0-30                | 1842 / f                          | 4.89 / f                          | (900 / f)*                               | 6                                                                |
| 30-300                | 61.4                              | 0.163                             | 1.0                                      | 6                                                                |
| 300-1500              |                                   |                                   | F/300                                    | 6                                                                |
| 1500-100,000          |                                   |                                   | 5                                        | 6                                                                |

#### (B) Limits for General Population / Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-1.34              | 614                               | 1.63                              | (100)*                                   | 30                                                               |
| 1.34-30               | 824/f                             | 2.19/f                            | (180/f)*                                 | 30                                                               |
| 30-300                | 27.5                              | 0.073                             | 0.2                                      | 30                                                               |
| 300-1500              |                                   |                                   | F/1500                                   | 30                                                               |
| 1500-100,000          |                                   |                                   | 1.0                                      | 30                                                               |

Note: f = frequency in MHz; \*Plane-wave equivalent power density



### 14.3 MPE Calculation Method

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = output power to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

From the peak EUT RF output power, the minimum mobile separation distance, R=20cm, as well as the gain of the used antenna, the RF power density can be obtained

| Antenna Gain (dBi) | Antenna Gain (numeric) | Max. conducted Output Power (dBm) | Max. conducted Output Power (mW) | Power Density (mW/cm <sup>2</sup> ) | Limit of Power Density (mW/cm <sup>2</sup> ) | Result     |
|--------------------|------------------------|-----------------------------------|----------------------------------|-------------------------------------|----------------------------------------------|------------|
| -1.26              | 0.75                   | 5.42                              | 3.48                             | 0.000520                            | 1                                            | Compliance |

### 14.4 Result: Compliance

No SAR measurement is required.

## 15 Photographs –Model BHP120US-WH1 Test Setup Photos

### 15.1 Photograph-Conducted Emissions Test Setup Photos

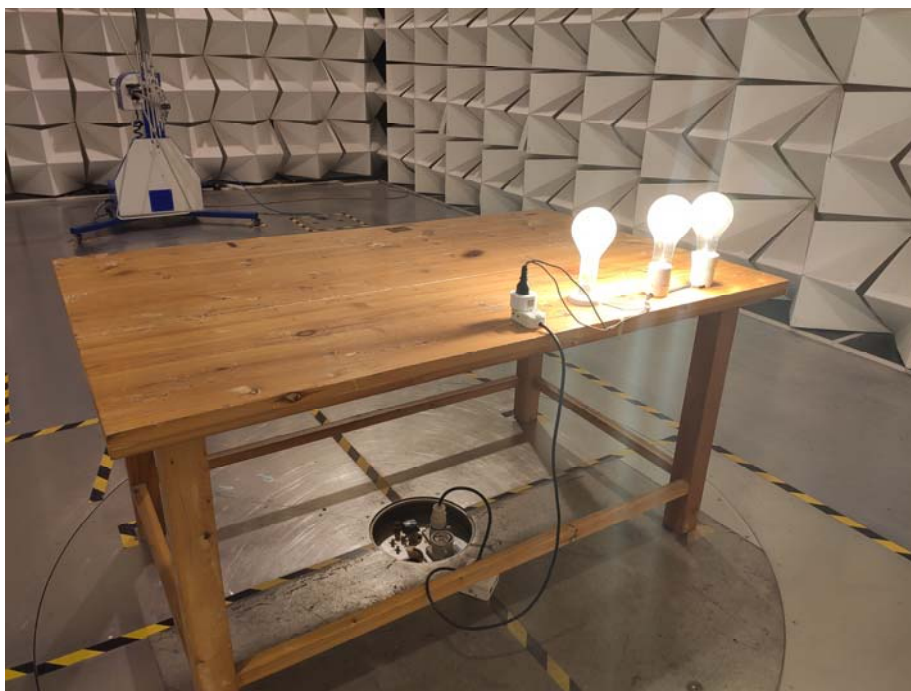


### 15.2 Photograph – Radiation Spurious Emission Test Setup Photos

9 kHz to 30 MHz



From 30 MHz to 1GHz

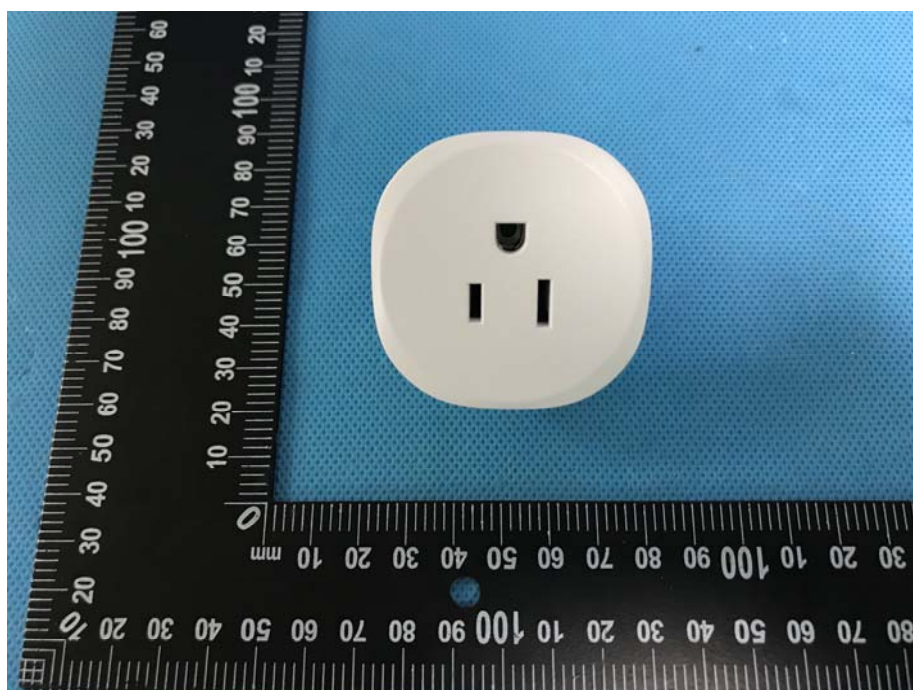
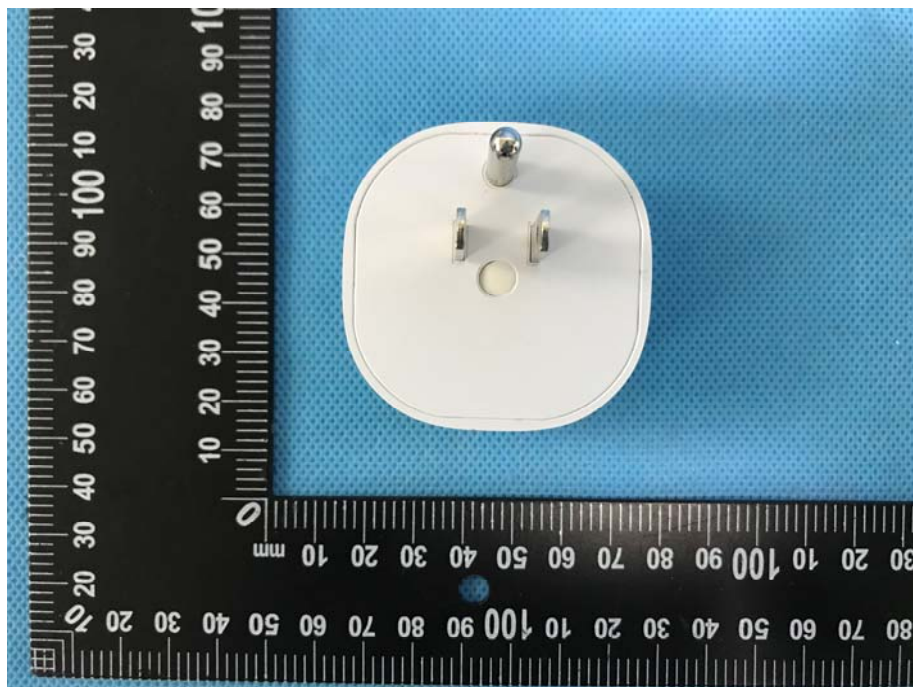


Above 1GHz

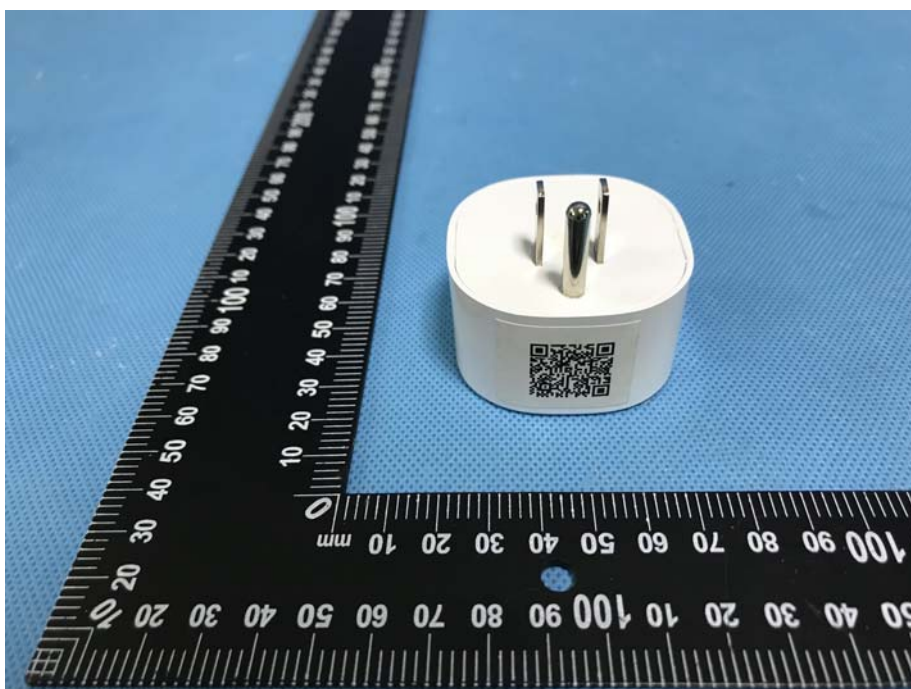


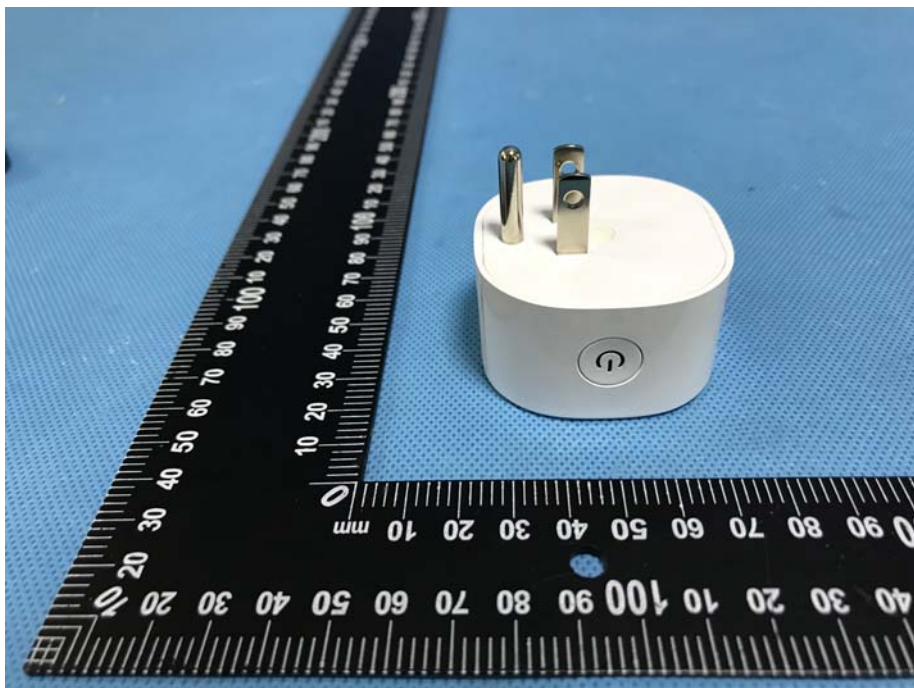
## 16 Photographs - Constructional Details

### 16.1 Model BHP120US-WH1 - External Photos

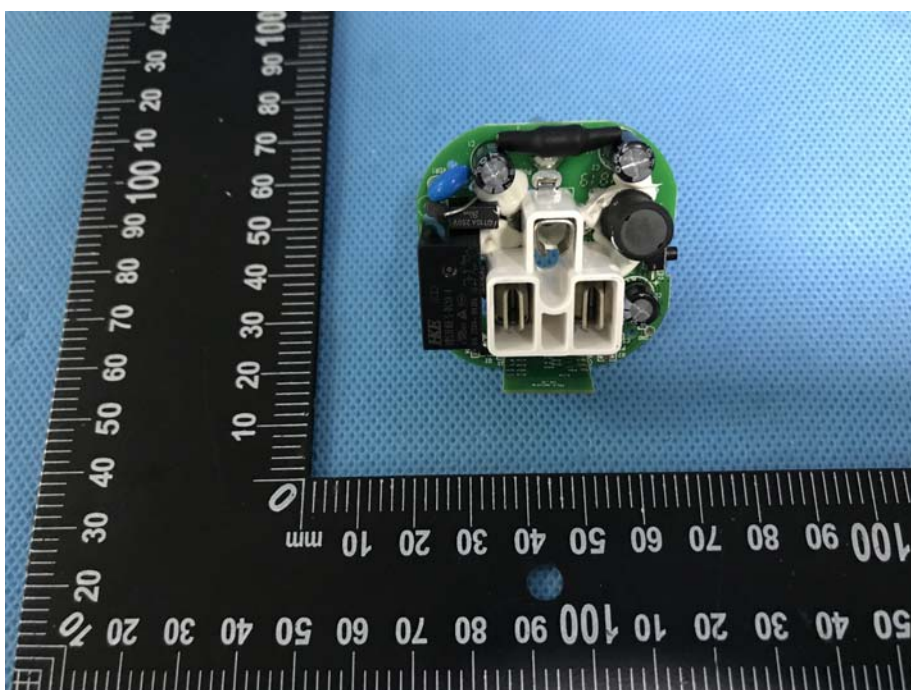
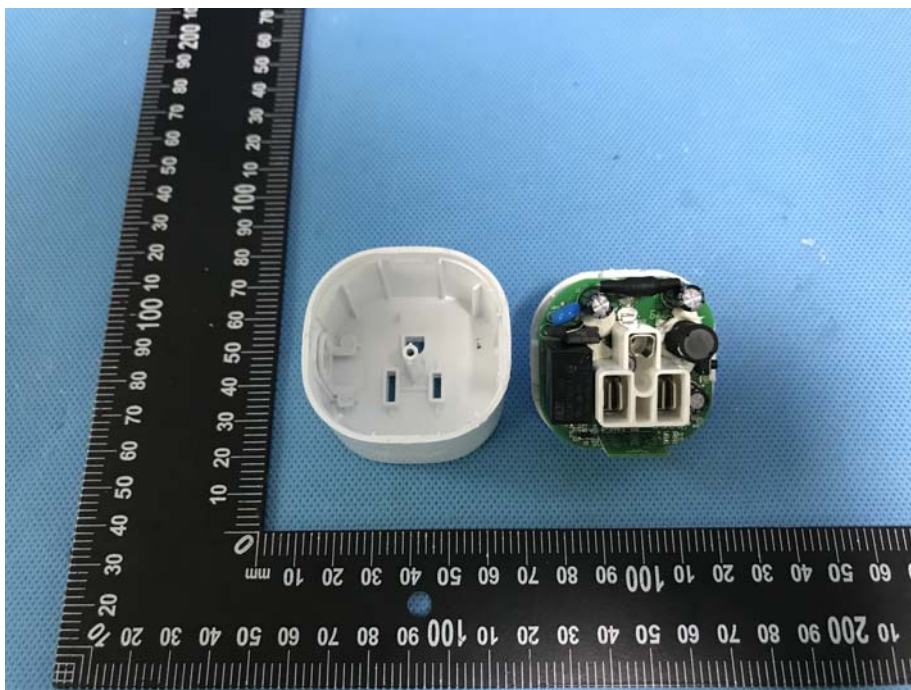




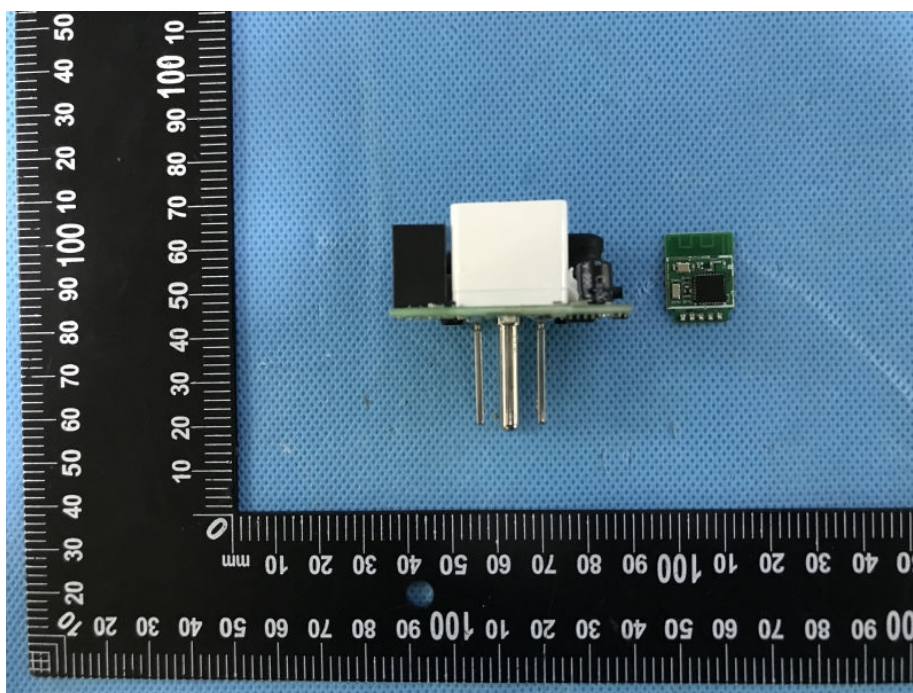
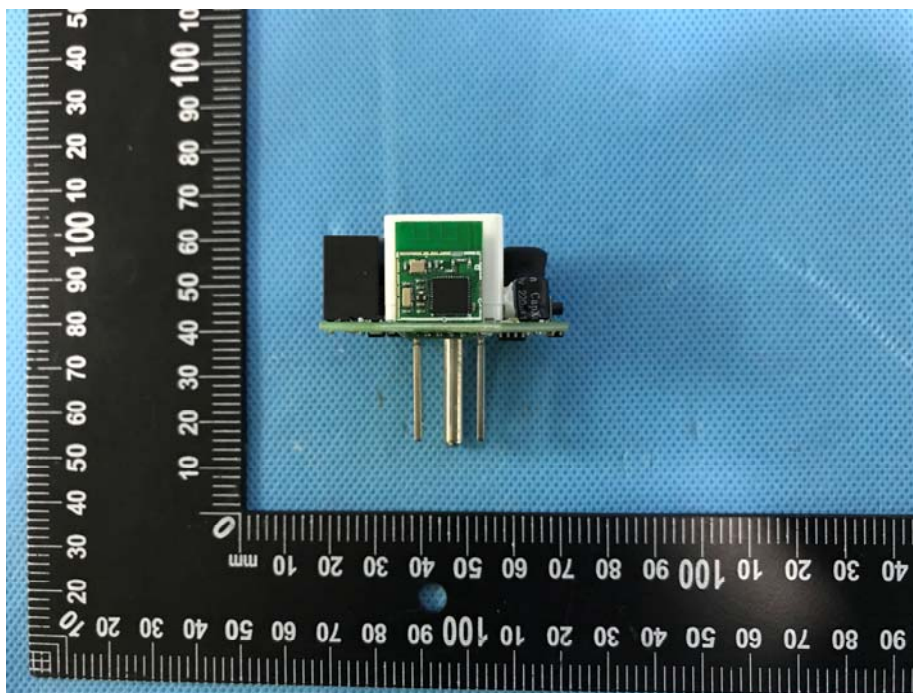




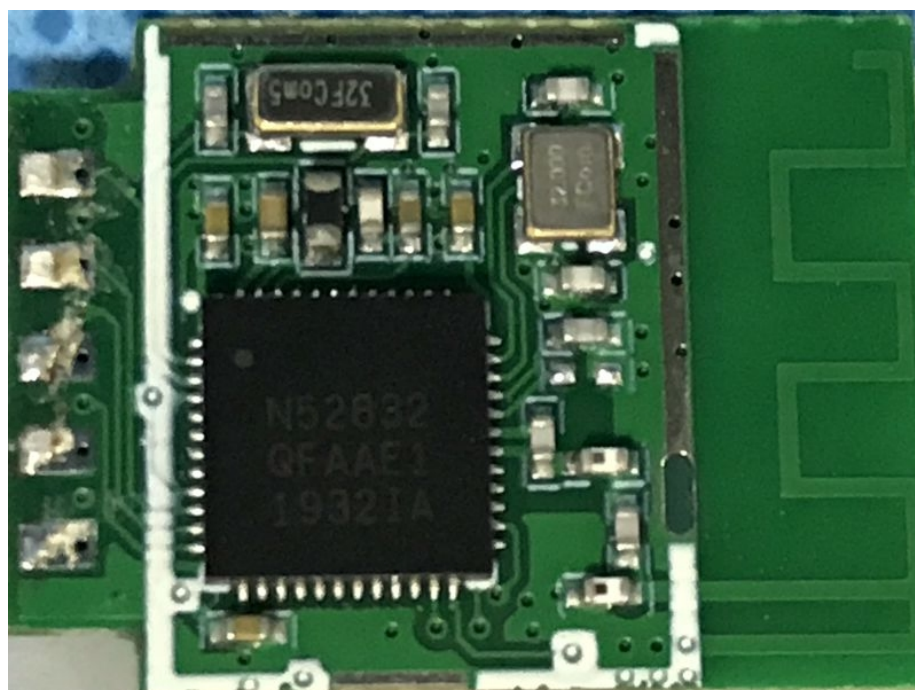
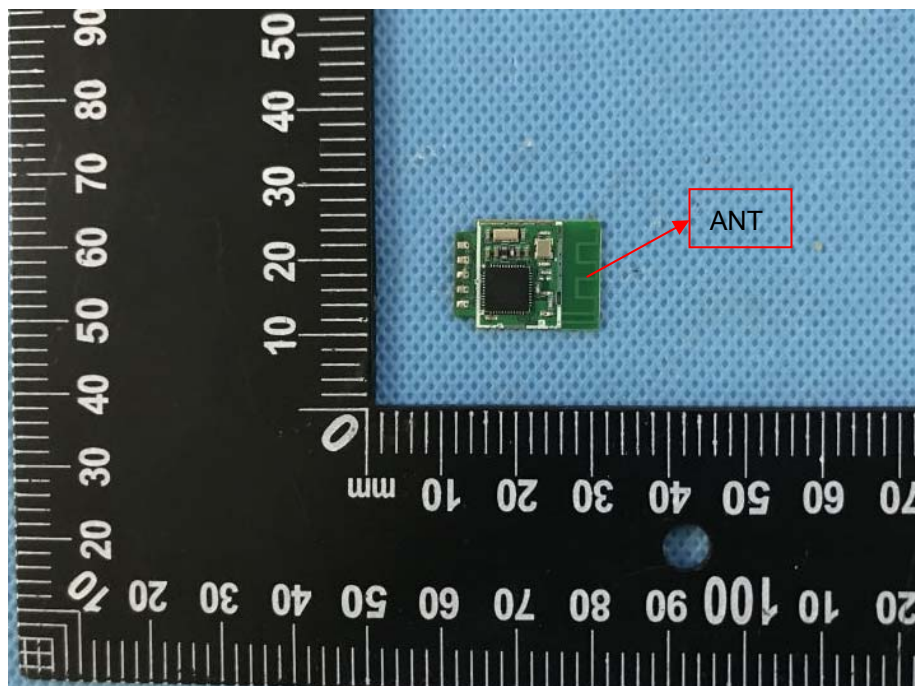
## 16.2 Model BHP120US-WH1 - Internal Photos

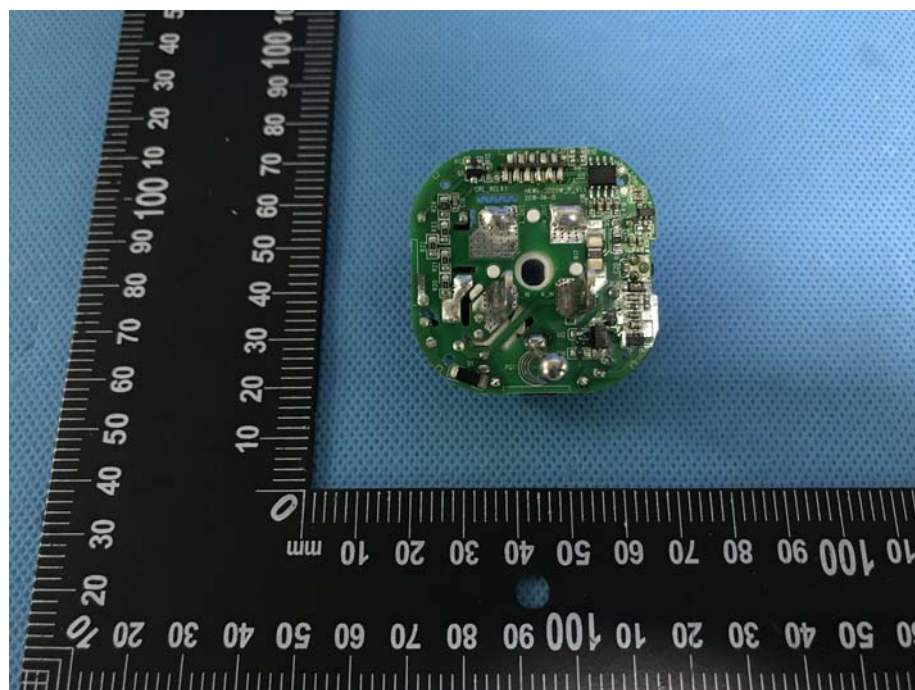
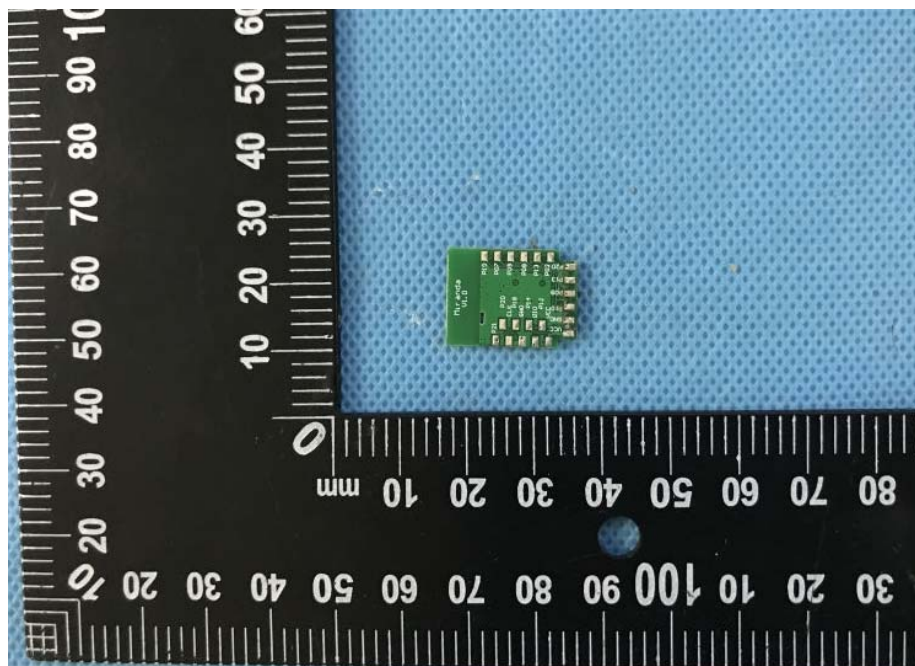












=====End of Report=====