

# FCC TEST REPORT

Client Name : Shenzhen Fingerchip Intelligent Technology Co., Ltd.  
Address : Rm 406-407, Science Research Building, Tsinghua  
Hi-Tech Park, Nanshan District, Shenzhen, Guangdong,  
China  
Product Name : Smart lock  
Date : Jun. 19, 2019

**Shenzhen Anbotech Compliance Laboratory Limited**

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## TEST REPORT

Applicant : Shenzhen Fingerchip Intelligent Technology Co., Ltd.  
Manufacturer : Shenzhen Fingerchip Intelligent Technology Co., Ltd.  
Product Name : Smart lock  
Model No. : E101, E202, E203, E205, E206, E206T, L5, L9, L10, L11, L12, T10  
Trade Mark : PINE WORLD  
Rating(s) : Input: DC 5V, 1A(with DC 6V , "AAA" \* 4 battery inside)  
  
**Test Standard(s) : FCC Part15 Subpart C 2018, Section 15.247**  
**Test Method(s) : ANSI C63.10: 2013, KDB558074 D01 DTS Meas Guidance v05**

The device described above is tested by Shenzhen Anbotech Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotech Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotech Compliance Laboratory Limited.

Date of Receipt

Jun. 04, 2019

Date of Test

Jun. 04~12, 2019

Prepared by

(Engineer / Oliay Yang)

Reviewer

(Supervisor / Snowy Meng)

Approved & Authorized Signer

(Manager / Sally Zhang)

## 1. General Information

### 1.1. Client Information

|              |   |                                                                                                            |
|--------------|---|------------------------------------------------------------------------------------------------------------|
| Applicant    | : | Shenzhen Fingerchip Intelligent Technology Co., Ltd.                                                       |
| Address      | : | Rm 406-407, Science Research Building, Tsinghua Hi-Tech Park, Nanshan District, Shenzhen, Guangdong, China |
| Manufacturer | : | Shenzhen Fingerchip Intelligent Technology Co., Ltd.                                                       |
| Address      | : | Rm 406-407, Science Research Building, Tsinghua Hi-Tech Park, Nanshan District, Shenzhen, Guangdong, China |
| Factory      | : | Shenzhen Fingerchip Intelligent Technology Co., Ltd.                                                       |
| Address      | : | Rm 406-407, Science Research Building, Tsinghua Hi-Tech Park, Nanshan District, Shenzhen, Guangdong, China |

### 1.2. Description of Device (EUT)

|                                                                                                                                    |                      |                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name                                                                                                                       | :                    | Smart lock                                                                                                                                                              |
| Model No.                                                                                                                          | :                    | E101, E202, E203, E205, E206, E206T, L5, L9, L10, L11, L12, T10<br>(Note: All samples are the same except the size and appearance, so we prepare "E101" for test only.) |
| Trade Mark                                                                                                                         | :                    | PINE WORLD                                                                                                                                                              |
| Test Power Supply                                                                                                                  | :                    | AC 240V, 60Hz for adapter/ AC 120V, 60Hz for adapter/ DC 6V by battery                                                                                                  |
| Test Sample No.                                                                                                                    | :                    | 1-2-1(Normal Sample), 1-2-2(Engineering Sample)                                                                                                                         |
| Product Description                                                                                                                | Operation Frequency: | 802.11b/ g/ n(HT20) 2412-2462MHz                                                                                                                                        |
|                                                                                                                                    | Number of Channel:   | 11 Channels for 802.11b/ g/ n(HT20)                                                                                                                                     |
|                                                                                                                                    | Modulation Type:     | 802.11b CCK; 802.11g/n OFDM                                                                                                                                             |
|                                                                                                                                    | Antenna Type:        | PCB Antenna                                                                                                                                                             |
|                                                                                                                                    | Antenna Gain(Peak):  | 3 dBi                                                                                                                                                                   |
| <b>Remark:</b> 1)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. |                      |                                                                                                                                                                         |

### 1.3. Auxiliary Equipment Used During Test

|         |   |                                                                                                                                   |
|---------|---|-----------------------------------------------------------------------------------------------------------------------------------|
| Adapter | : | Manufacturer: ZTE<br>M/N: STC-A2050I1000USBA-C<br>S/N: 201202102100876<br>Input: 100-240V~ 50/60Hz, 0.3A<br>Output: DC 5V, 1000mA |
|---------|---|-----------------------------------------------------------------------------------------------------------------------------------|

#### 1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

##### RADIATED EMISSION TEST (BELOW 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

| Mode    | Available Channel | Test Channel | Modulation Tech. | Modulation Type | Data Rate (Mbps) |
|---------|-------------------|--------------|------------------|-----------------|------------------|
| 802.11b | 1 to 11           | 1            | CCK              | DBPSK           | 1.0              |

For the test results, only the worst case was shown in test report.

##### RADIATED EMISSION TEST (ABOVE 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

| Mode         | Available Channel | Test Channel | Modulation Tech. | Modulation Type | Data Rate (Mbps) |
|--------------|-------------------|--------------|------------------|-----------------|------------------|
| 802.11b      | 1 to 11           | 1, 6, 11     | CCK              | DBPSK           | 1.0              |
| 802.11g      | 1 to 11           | 1, 6, 11     | OFDM             | BPSK            | 6.0              |
| 802.11n HT20 | 1 to 11           | 1, 6, 11     | OFDM             | BPSK            | 6.5              |

##### POWER LINE CONDUCTED EMISSION TEST:

The EUT was tested with the following mode

| EUT configure mode | Test Mode       |
|--------------------|-----------------|
| -                  | Keeping TX mode |

##### BANDEDGE MEASUREMENT:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

| Mode         | Available Channel | Test Channel | Modulation Tech. | Modulation Type | Data Rate (Mbps) |
|--------------|-------------------|--------------|------------------|-----------------|------------------|
| 802.11b      | 1 to 11           | 1, 11        | CCK              | DBPSK           | 1.0              |
| 802.11g      | 1 to 11           | 1, 11        | OFDM             | BPSK            | 6.0              |
| 802.11n HT20 | 1 to 11           | 1, 11        | OFDM             | BPSK            | 6.5              |

### ANTENNA PORT CONDUCTED MEASUREMENT:

This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

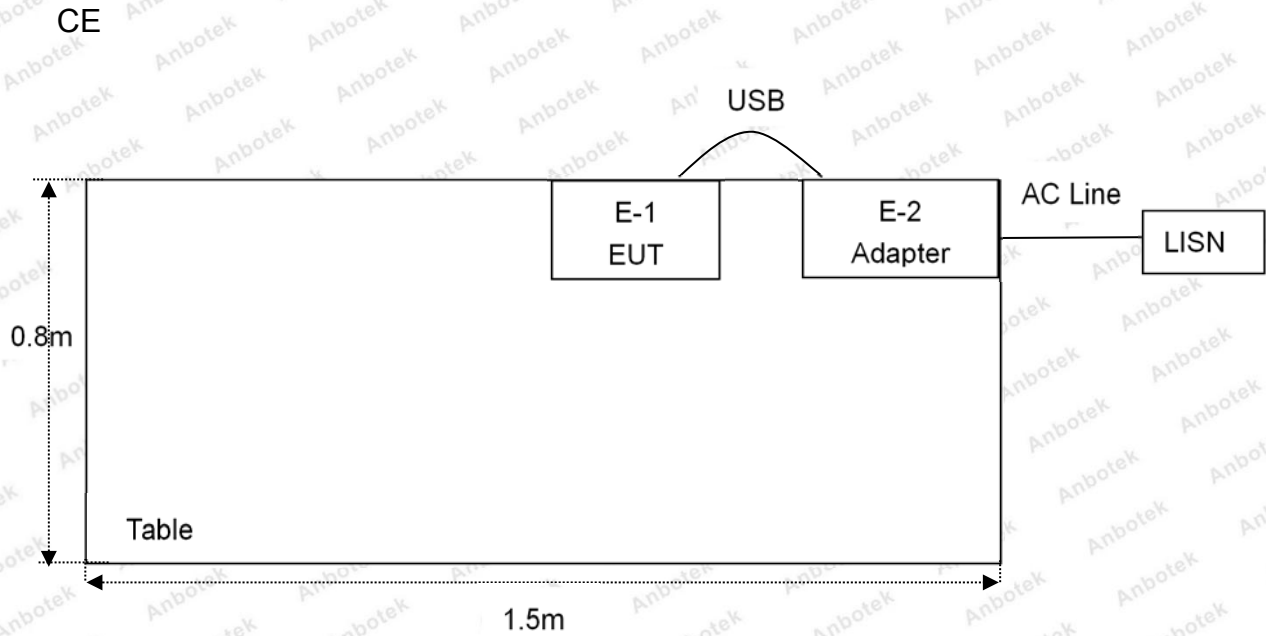
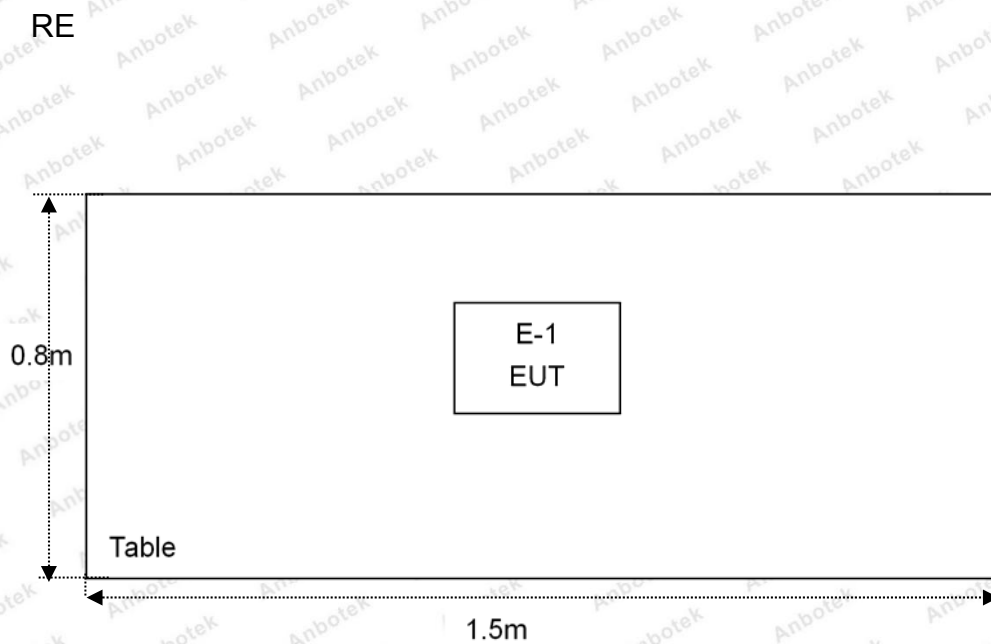
Following channel(s) was (were) selected for the final test as listed below.

| Mode         | Available Channel | Test Channel | Modulation Tech. | Modulation Type | Data Rate (Mbps) |
|--------------|-------------------|--------------|------------------|-----------------|------------------|
| 802.11b      | 1 to 11           | 1, 6, 11     | CCK              | DBPSK           | 1.0              |
| 802.11g      | 1 to 11           | 1, 6, 11     | OFDM             | BPSK            | 6.0              |
| 802.11n HT20 | 1 to 11           | 1, 6, 11     | OFDM             | BPSK            | 6.5              |

### 1.5. List of channels

| Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 01      | 2412        | 04      | 2427        | 07      | 2442        | 10      | 2457        |
| 02      | 2417        | 05      | 2432        | 08      | 2447        | 11      | 2462        |
| 03      | 2422        | 06      | 2437        | 09      | 2452        |         |             |

## 1.6. Description Of Test Setup



### 1.7. Test Equipment List

| Item | Equipment                                   | Manufacturer               | Model No.        | Serial No.    | Last Cal.     | Cal. Interval |
|------|---------------------------------------------|----------------------------|------------------|---------------|---------------|---------------|
| 1.   | L.I.S.N.<br>Artificial Mains<br>Network     | Rohde & Schwarz            | ENV216           | 100055        | Nov. 26, 2018 | 1 Year        |
| 2.   | EMI Test Receiver                           | Rohde & Schwarz            | ESPI3            | 101604        | Nov. 05, 2018 | 1 Year        |
| 3.   | RF Switching Unit                           | Compliance<br>Direction    | RSU-M2           | 38303         | Nov. 05, 2018 | 1 Year        |
| 4.   | Spectrum Analysis                           | Agilent                    | E4407B           | US39390582    | Nov. 05, 2018 | 1 Year        |
| 5.   | MAX Spectrum<br>Analysis                    | Agilent                    | N9020A           | MY51170037    | Nov. 05, 2018 | 1 Year        |
| 6.   | Preamplifier                                | SKET Electronic            | BK1G18G30D       | KD17503       | Nov. 05, 2018 | 1 Year        |
| 7.   | Double Ridged Horn<br>Antenna               | Instruments<br>corporation | GTH-0118         | 351600        | Nov. 20, 2018 | 1 Year        |
| 8.   | Bilog Broadband<br>Antenna                  | Schwarzbeck                | VULB9163         | VULB 9163-289 | Nov. 19, 2018 | 1 Year        |
| 9.   | Loop Antenna                                | Schwarzbeck                | FMZB1519B        | 00053         | Nov. 20, 2018 | 1 Year        |
| 10.  | Horn Antenna                                | A-INFO                     | LB-180400-K<br>F | J211060628    | Nov. 20, 2018 | 1 Year        |
| 11.  | Pre-amplifier                               | SONOMA                     | 310N             | 186860        | Nov. 05, 2018 | 1 Year        |
| 12.  | EMI Test Software<br>EZ-EMC                 | SHURPLE                    | N/A              | N/A           | N/A           | N/A           |
| 13.  | RF Test Control<br>System                   | YIHENG                     | YH3000           | 2017430       | Nov. 05, 2018 | 1 Year        |
| 14.  | Power Sensor                                | DAER                       | RPR3006W         | 15I00041SN045 | Nov. 05, 2018 | 1 Year        |
| 15.  | Power Sensor                                | DAER                       | RPR3006W         | 15I00041SN046 | Nov. 05, 2018 | 1 Year        |
| 16.  | MXA Spectrum<br>Analysis                    | Agilent                    | N9020A           | MY51170037    | Nov. 05, 2018 | 1 Year        |
| 17.  | MXG RF Vector<br>Signal Generator           | Agilent                    | N5182A           | MY48180656    | Nov. 05, 2018 | 1 Year        |
| 18.  | Signal Generator                            | Agilent                    | E4421B           | MY41000743    | Nov. 05, 2018 | 1 Year        |
| 19.  | DC Power Supply                             | LW                         | TPR-6420D        | 374470        | Oct. 31, 2018 | 1 Year        |
| 20.  | Constant<br>Temperature<br>Humidity Chamber | ZHONGJIAN                  | ZJ-KHWS80B       | N/A           | Nov. 01, 2018 | 1 Year        |

## 1.8. Measurement Uncertainty

|                        |   |                          |
|------------------------|---|--------------------------|
| Radiation Uncertainty  | : | Ur = 3.9 dB (Horizontal) |
|                        |   | Ur = 3.8 dB (Vertical)   |
| Conduction Uncertainty | : | Uc = 3.4 dB              |

## 1.9. Description of Test Facility

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

### FCC-Registration No.: 184111

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory 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 our files. Registration No. 184111, July 31, 2017.

### ISED-Registration No.: 8058A-1

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

### Test Location

Shenzhen Anbotech Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

## 2. Summary of Test Results

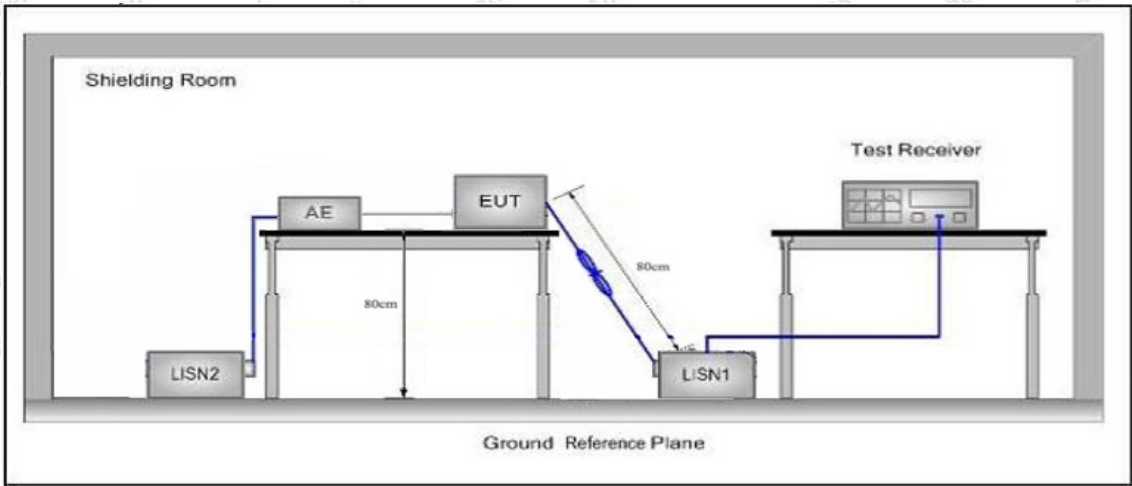
| Standard Section                                            | Test Item                   | Result |
|-------------------------------------------------------------|-----------------------------|--------|
| 15.203/15.247(c)                                            | Antenna Requirement         | PASS   |
| 15.207                                                      | Conducted Emission          | PASS   |
| 15.205/15.209                                               | Spurious Emission           | PASS   |
| 15.247(b)(3)                                                | Conducted Peak Output Power | PASS   |
| 15.247(a)(2)                                                | 6dB Occupied Bandwidth      | PASS   |
| 15.247(e)                                                   | Power Spectral Density      | PASS   |
| 15.247(d)                                                   | Band Edge                   | PASS   |
| <b>Remark:</b> "N/A" is an abbreviation for Not Applicable. |                             |        |

### 3. Conducted Emission Test

#### 3.1. Test Standard and Limit

| Test Standard                                                                                                                            | FCC Part15 Section 15.207 |                                |               |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------|---------------|
| Test Limit                                                                                                                               | Frequency                 | Maximum RF Line Voltage (dBuV) |               |
|                                                                                                                                          |                           | Quasi-peak Level               | Average Level |
|                                                                                                                                          | 150kHz~500kHz             | 66 ~ 56 *                      | 56 ~ 46 *     |
|                                                                                                                                          | 500kHz~5MHz               | 56                             | 46            |
|                                                                                                                                          | 5MHz~30MHz                | 60                             | 50            |
| <b>Remark:</b> (1) *Decreasing linearly with logarithm of the frequency.<br>(2) The lower limit shall apply at the transition frequency. |                           |                                |               |

#### 3.2. Test Setup



#### 3.3. Test Procedure

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

The bandwidth of test receiver (ESCI) set at 9kHz.

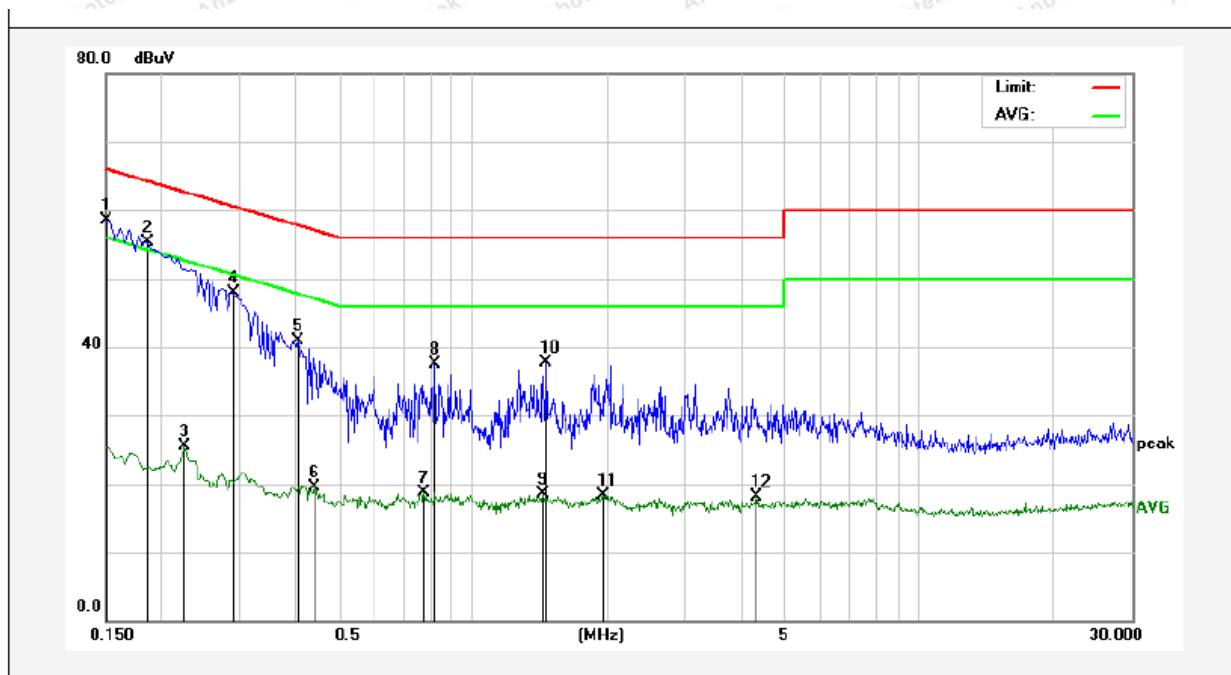
The frequency range from 150kHz to 30MHz is checked.

#### 3.4. Test Data

During the test, pre-scan all modes, and found the 802.11b CH01 which is the worst case, only the worst case is recorded in the report.

**Conducted Emission Test Data**

Test Site: 1# Shielded Room  
Operating Condition: 802.11b CH01  
Test Specification: AC 240V, 60Hz for adapter  
Comment: Live Line  
Tem.: 23.5°C Hum.: 49%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.1500      | 38.55          | 19.90       | 58.45         | 65.99        | -7.54           | QP       |        |
| 2   | 0.1860      | 35.49          | 19.90       | 55.39         | 64.21        | -8.82           | QP       |        |
| 3   | 0.2260      | 5.67           | 19.89       | 25.56         | 52.59        | -27.03          | AVG      |        |
| 4   | 0.2900      | 28.02          | 19.89       | 47.91         | 60.52        | -12.61          | QP       |        |
| 5   | 0.4060      | 20.91          | 19.94       | 40.85         | 57.73        | -16.88          | QP       |        |
| 6   | 0.4420      | -0.50          | 19.95       | 19.45         | 47.02        | -27.57          | AVG      |        |
| 7   | 0.7780      | -1.31          | 20.06       | 18.75         | 46.00        | -27.25          | AVG      |        |
| 8   | 0.8220      | 17.43          | 20.07       | 37.50         | 56.00        | -18.50          | QP       |        |
| 9   | 1.4340      | -1.68          | 20.13       | 18.45         | 46.00        | -27.55          | AVG      |        |
| 10  | 1.4580      | 17.48          | 20.13       | 37.61         | 56.00        | -18.39          | QP       |        |
| 11  | 1.9540      | -1.85          | 20.14       | 18.29         | 46.00        | -27.71          | AVG      |        |
| 12  | 4.3180      | -2.07          | 20.19       | 18.12         | 46.00        | -27.88          | AVG      |        |

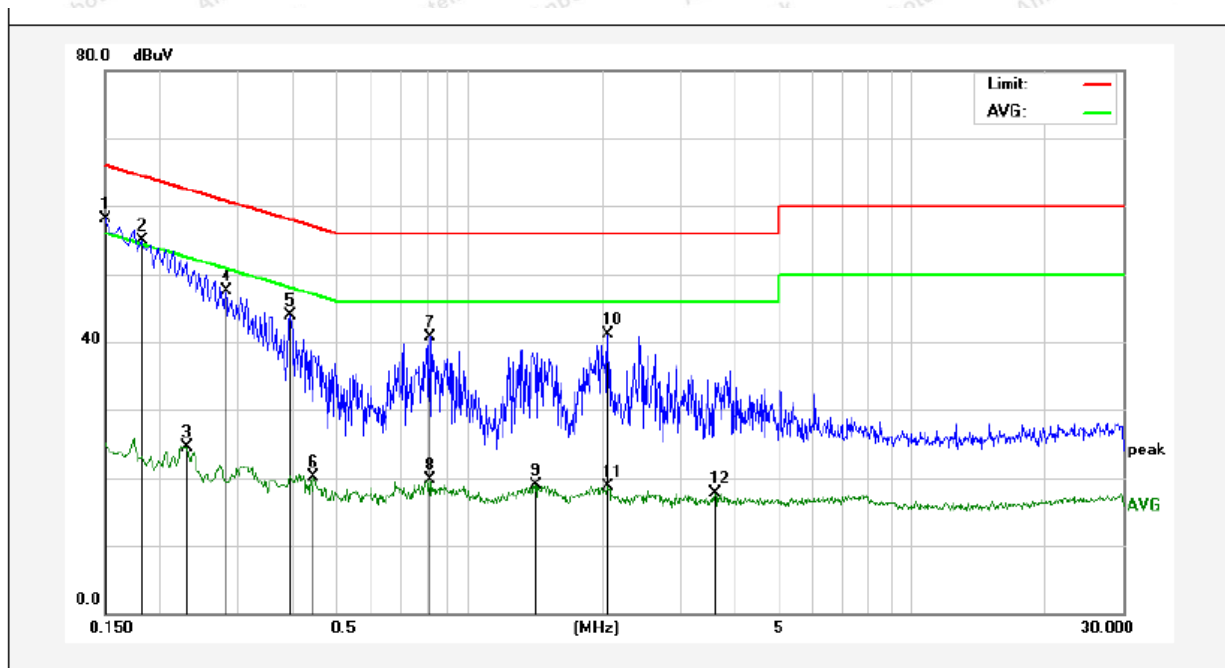
Report No.: SZAWW190604007-01

FCC ID: 2AQ54-E101

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**Conducted Emission Test Data**

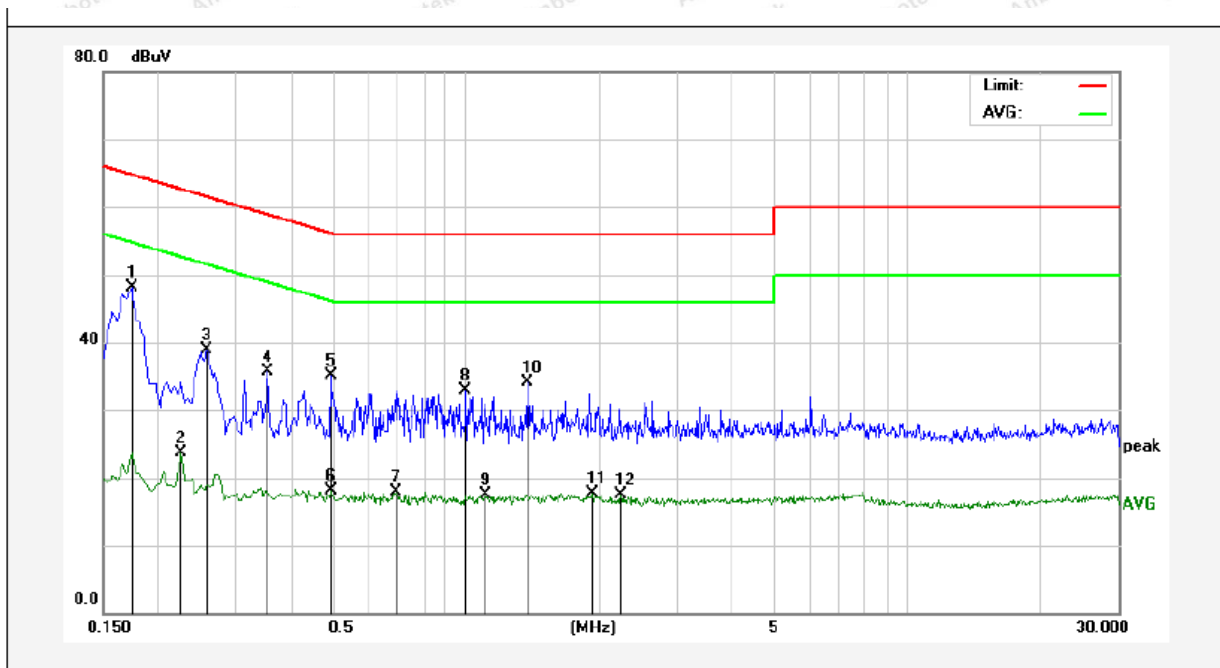
Test Site: 1# Shielded Room  
Operating Condition: 802.11b CH01  
Test Specification: AC 240V, 60Hz for adapter  
Comment: Neutral Line  
Tem.: 23.5°C Hum.: 49%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.1500      | 38.30          | 19.90       | 58.20         | 65.99        | -7.79           | QP       |        |
| 2   | 0.1819      | 35.05          | 19.90       | 54.95         | 64.39        | -9.44           | QP       |        |
| 3   | 0.2300      | 4.71           | 19.89       | 24.60         | 52.45        | -27.85          | AVG      |        |
| 4   | 0.2819      | 27.70          | 19.89       | 47.59         | 60.76        | -13.17          | QP       |        |
| 5   | 0.3940      | 23.97          | 19.93       | 43.90         | 57.98        | -14.08          | QP       |        |
| 6   | 0.4460      | 0.14           | 19.96       | 20.10         | 46.95        | -26.85          | AVG      |        |
| 7   | 0.8139      | 20.71          | 20.07       | 40.78         | 56.00        | -15.22          | QP       |        |
| 8   | 0.8139      | -0.39          | 20.07       | 19.68         | 46.00        | -26.32          | AVG      |        |
| 9   | 1.4180      | -1.26          | 20.13       | 18.87         | 46.00        | -27.13          | AVG      |        |
| 10  | 2.0579      | 20.90          | 20.14       | 41.04         | 56.00        | -14.96          | QP       |        |
| 11  | 2.0579      | -1.40          | 20.14       | 18.74         | 46.00        | -27.26          | AVG      |        |
| 12  | 3.5980      | -2.38          | 20.17       | 17.79         | 46.00        | -28.21          | AVG      |        |

**Conducted Emission Test Data**

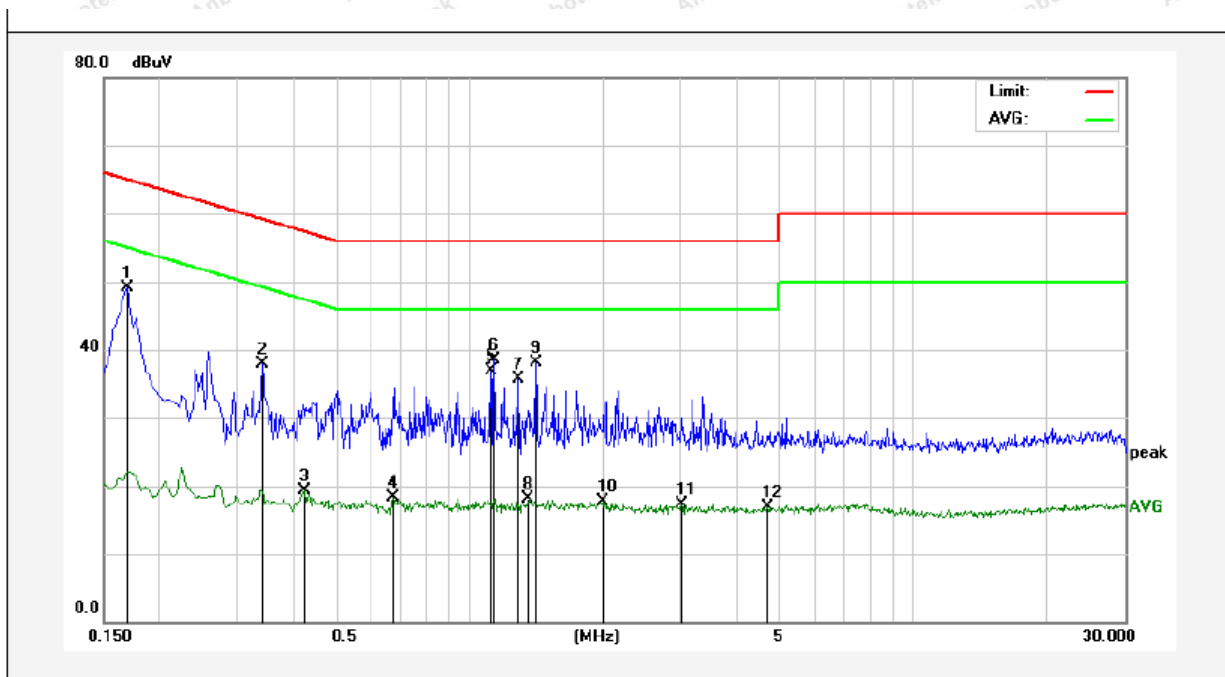
Test Site: 1# Shielded Room  
Operating Condition: 802.11b CH01  
Test Specification: AC 120V, 60Hz for adapter  
Comment: Live Line  
Tem.: 23.5°C Hum.: 49%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-----------------|----------|--------|
| 1   | 0.1740      | 28.11          | 19.90       | 48.01         | 64.76      | -16.75          | QP       |        |
| 2   | 0.2260      | 3.83           | 19.89       | 23.72         | 52.59      | -28.87          | AVG      |        |
| 3   | 0.2580      | 19.00          | 19.89       | 38.89         | 61.49      | -22.60          | QP       |        |
| 4   | 0.3540      | 15.84          | 19.91       | 35.75         | 58.87      | -23.12          | QP       |        |
| 5   | 0.4940      | 15.11          | 19.98       | 35.09         | 56.10      | -21.01          | QP       |        |
| 6   | 0.4940      | -1.86          | 19.98       | 18.12         | 46.10      | -27.98          | AVG      |        |
| 7   | 0.6900      | -2.11          | 20.04       | 17.93         | 46.00      | -28.07          | AVG      |        |
| 8   | 0.9980      | 12.77          | 20.12       | 32.89         | 56.00      | -23.11          | QP       |        |
| 9   | 1.1100      | -2.53          | 20.12       | 17.59         | 46.00      | -28.41          | AVG      |        |
| 10  | 1.3779      | 14.01          | 20.13       | 34.14         | 56.00      | -21.86          | QP       |        |
| 11  | 1.9380      | -2.45          | 20.14       | 17.69         | 46.00      | -28.31          | AVG      |        |
| 12  | 2.2380      | -2.71          | 20.14       | 17.43         | 46.00      | -28.57          | AVG      |        |

**Conducted Emission Test Data**

Test Site: 1# Shielded Room  
Operating Condition: 802.11b CH01  
Test Specification: AC 120V, 60Hz for adapter  
Comment: Neutral Line  
Tem.: 23.5°C Hum.: 49%



| No. | Freq.<br>(MHz) | Reading<br>(dBuV) | Factor<br>(dB) | Result<br>(dBuV) | Limit<br>dBuV | Over Limit<br>(dB) | Detector | Remark |
|-----|----------------|-------------------|----------------|------------------|---------------|--------------------|----------|--------|
| 1   | 0.1700         | 29.19             | 19.90          | 49.09            | 64.96         | -15.87             | QP       |        |
| 2   | 0.3420         | 17.92             | 19.91          | 37.83            | 59.15         | -21.32             | QP       |        |
| 3   | 0.4260         | -0.70             | 19.95          | 19.25            | 47.33         | -28.08             | AVG      |        |
| 4   | 0.6740         | -1.66             | 20.03          | 18.37            | 46.00         | -27.63             | AVG      |        |
| 5   | 1.1220         | 16.78             | 20.12          | 36.90            | 56.00         | -19.10             | QP       |        |
| 6   | 1.1380         | 18.29             | 20.12          | 38.41            | 56.00         | -17.59             | QP       |        |
| 7   | 1.2900         | 15.55             | 20.13          | 35.68            | 56.00         | -20.32             | QP       |        |
| 8   | 1.3619         | -1.99             | 20.13          | 18.14            | 46.00         | -27.86             | AVG      |        |
| 9   | 1.4140         | 17.89             | 20.13          | 38.02            | 56.00         | -17.98             | QP       |        |
| 10  | 1.9940         | -2.44             | 20.14          | 17.70            | 46.00         | -28.30             | AVG      |        |
| 11  | 3.0100         | -2.93             | 20.16          | 17.23            | 46.00         | -28.77             | AVG      |        |
| 12  | 4.6979         | -3.23             | 20.20          | 16.97            | 46.00         | -29.03             | AVG      |        |

## 4. Radiation Spurious Emission and Band Edge

### 4.1. Test Standard and Limit

| Test Standard | FCC Part15 C Section 15.209 and 15.205 |                                  |                |            |                          |
|---------------|----------------------------------------|----------------------------------|----------------|------------|--------------------------|
| Test Limit    | Frequency (MHz)                        | Field strength (microvolt/meter) | Limit (dBuV/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~1000MHz                         | 500                              | 54.0           | Quasi-peak | 3                        |
|               | Above 1000MHz                          | 500                              | 54.0           | Average    | 3                        |
|               |                                        | -                                | 74.0           | Peak       | 3                        |

**Remark:**

(1)The lower limit shall apply at the transition frequency.

(2) 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.

### 4.2. Test Setup

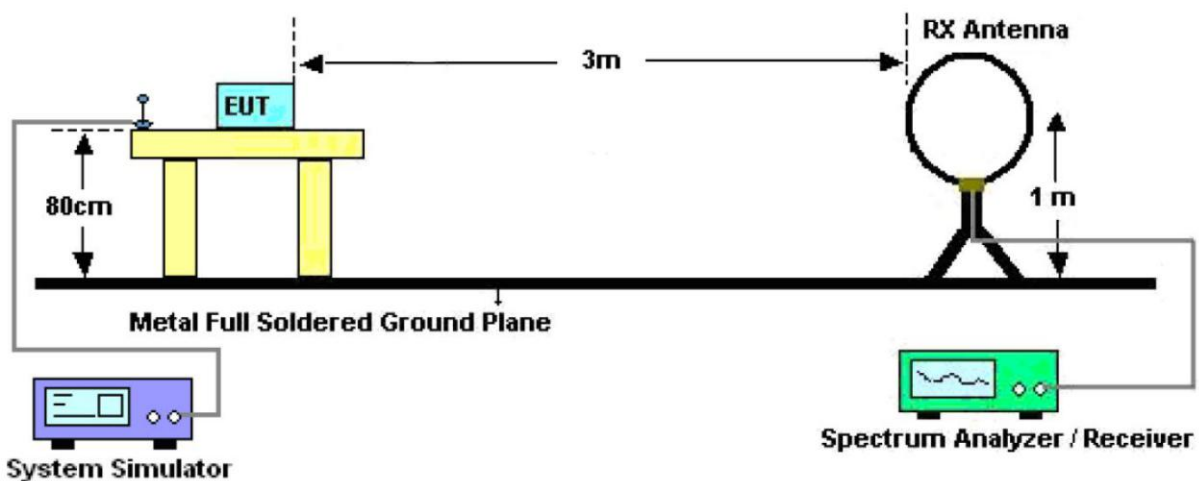


Figure 1. Below 30MHz

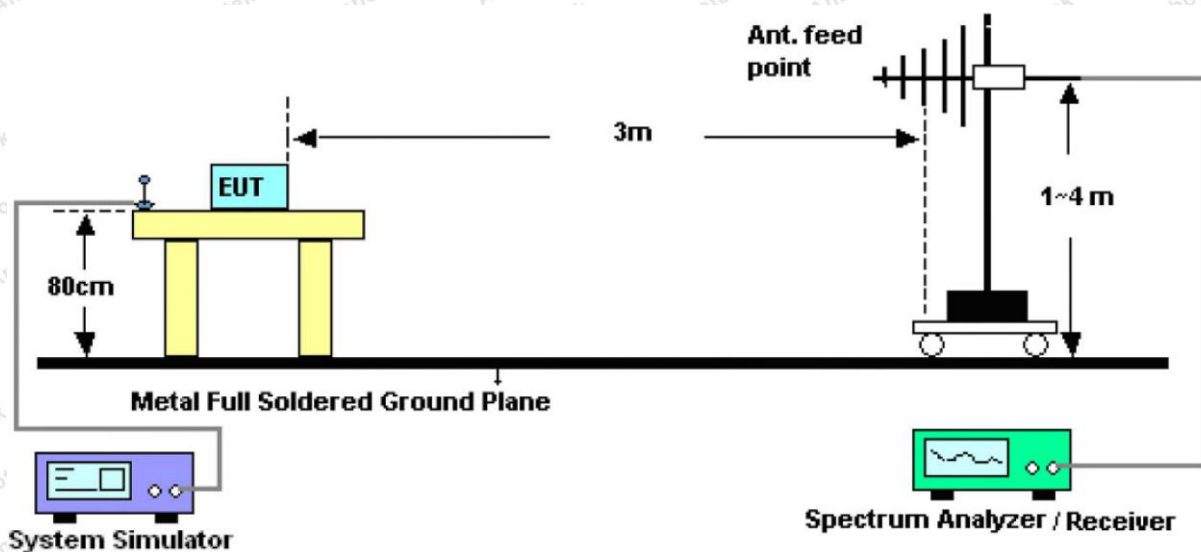


Figure 2. 30MHz to 1GHz

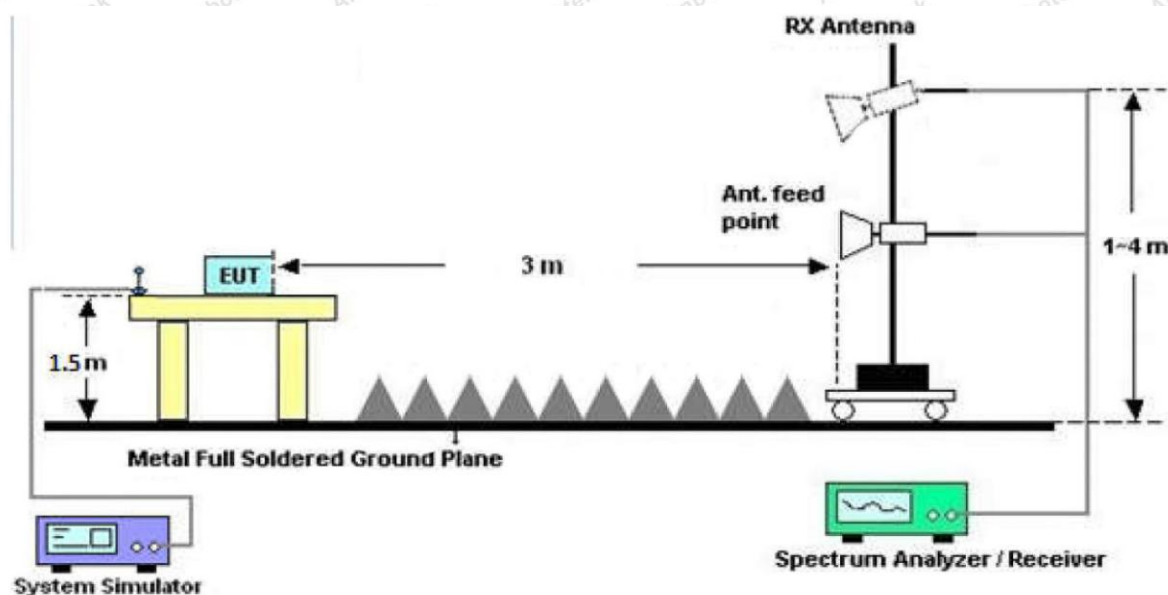


Figure 3. Above 1 GHz

### 4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9\*6\*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW = 1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:

RBW = 9KHz, VBW = 30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 100kHz, VBW = 300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz, Set the spectrum analyzer as:

RBW = 1MHz, VBW = 1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.

RBW = 1MHz, VBW = 10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

#### 4.4. Test Data

##### PASS

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

During the test, pre-scan all modes, and found the 802.11b CH01 which is the worst case, only the worst case is recorded in the report.

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FCC ID: 2AQ54-E101

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## Test Results (30~1000MHz)

Job No.: SZAWW190102009-01

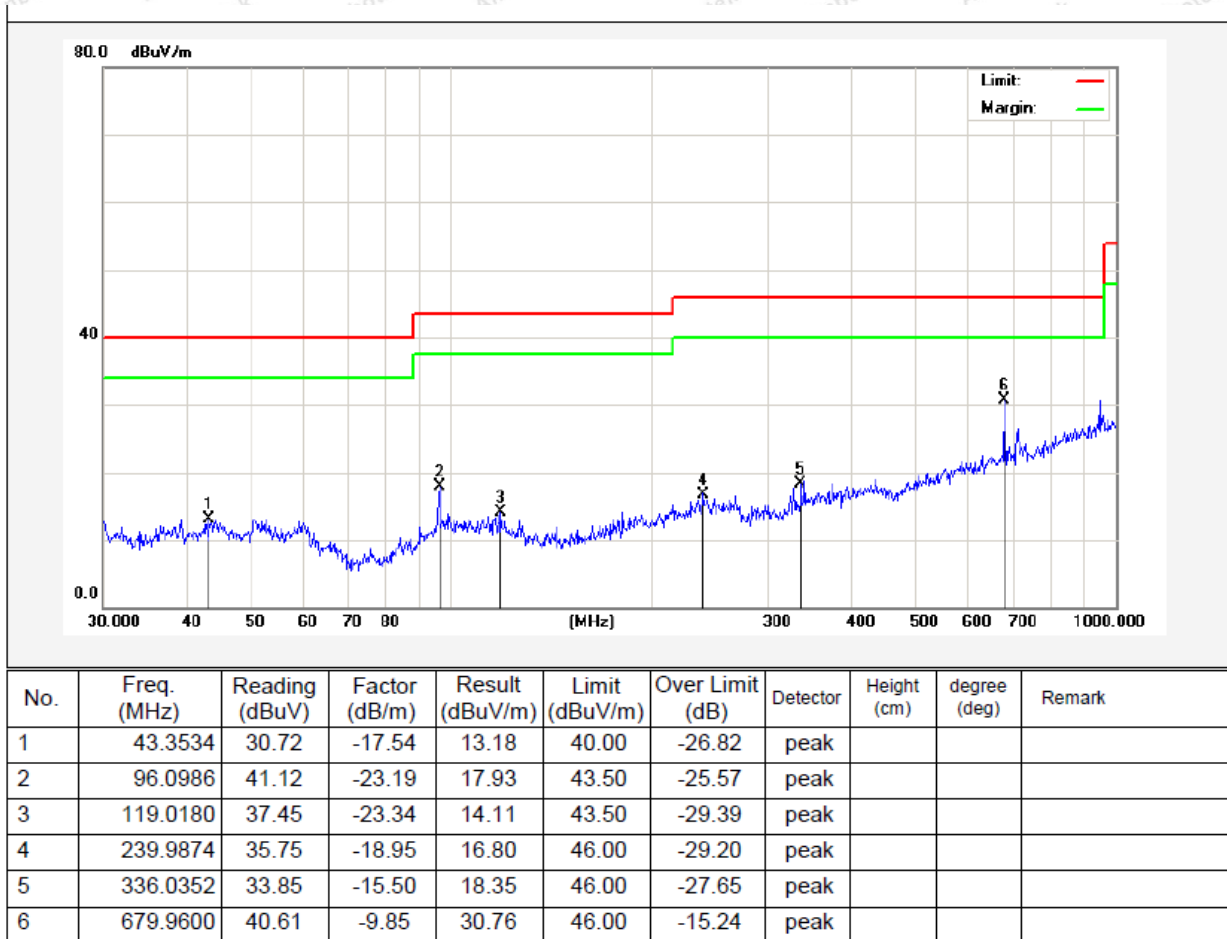
Temp.(°C)/Hum.(%RH): 23.7°C / 51%RH

Standard: FCC PART 15C

Power Source: DC 6V by battery

Test Mode: 802.11b CH01

Polarization: Horizontal



Report No.: SZAWW190604007-01

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Test Results (30~1000MHz)

Job No.: SZAWW190102009-01

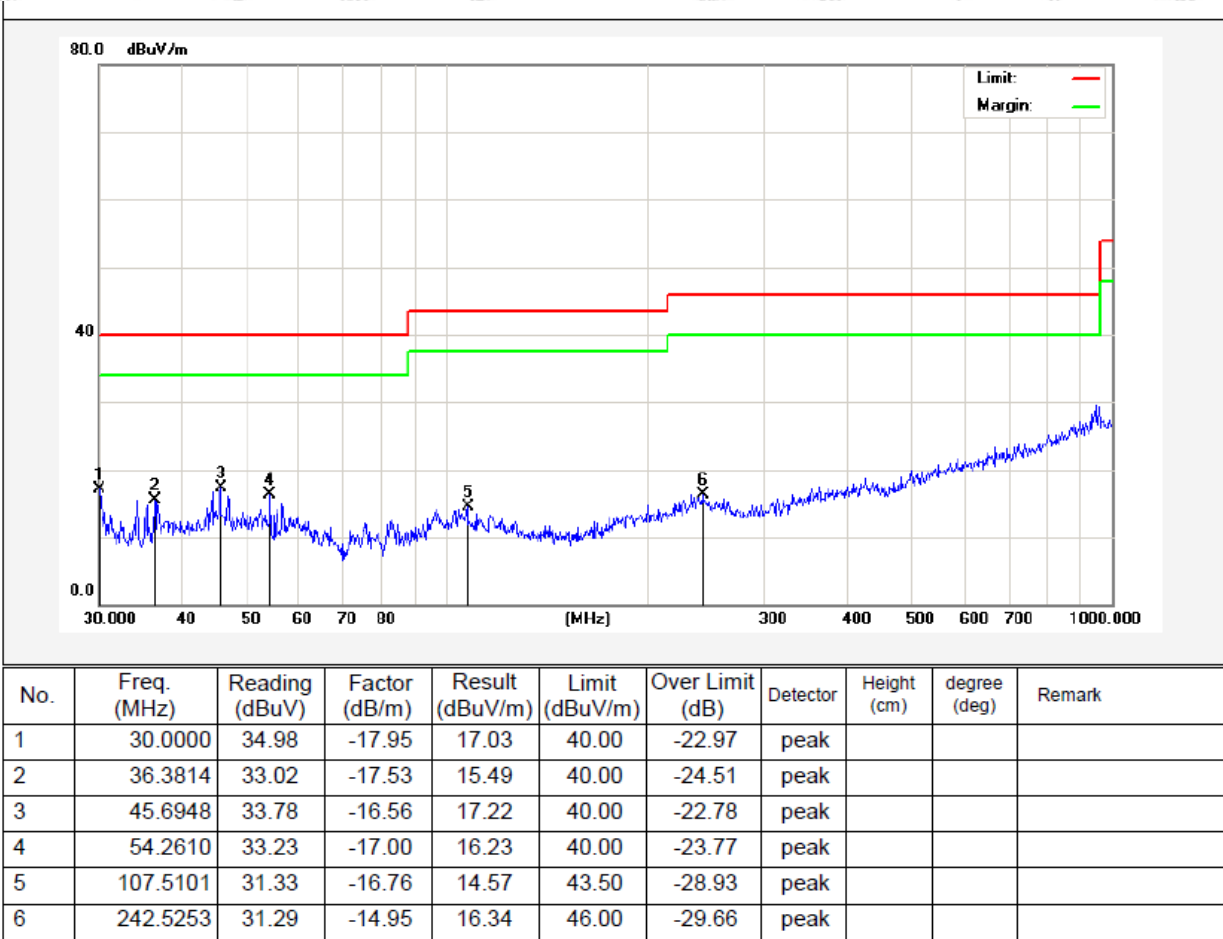
Temp.(°C)/Hum.(%RH): 23.7°C / 51%RH

Standard: FCC PART 15C

Power Source: DC 6V by battery

Test Mode: 802.11b CH01

Polarization: Vertical



**Test Results (Above 1000MHz)**

| Test Mode: 802.11b Mode |                   |                       |                 |                    | Test channel: Lowest |                |                 |      |
|-------------------------|-------------------|-----------------------|-----------------|--------------------|----------------------|----------------|-----------------|------|
| Peak Value              |                   |                       |                 |                    |                      |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4824.00                 | 40.47             | 34.13                 | 6.61            | 34.09              | 47.12                | 74.00          | -26.88          | V    |
| 7236.00                 | 34.33             | 37.14                 | 7.74            | 34.51              | 44.70                | 74.00          | -29.30          | V    |
| 9648.00                 | 32.79             | 39.35                 | 9.26            | 34.80              | 46.60                | 74.00          | -27.40          | V    |
| 12060.00                | *                 |                       |                 |                    |                      | 74.00          |                 | V    |
| 14472.00                | *                 |                       |                 |                    |                      | 74.00          |                 | V    |
| 16884.00                | *                 |                       |                 |                    |                      | 74.00          |                 | V    |
| 4824.00                 | 39.11             | 34.13                 | 6.61            | 34.09              | 45.76                | 74.00          | -28.24          | H    |
| 7236.00                 | 34.06             | 37.14                 | 7.74            | 34.51              | 44.43                | 74.00          | -29.57          | H    |
| 9648.00                 | 32.37             | 39.35                 | 9.26            | 34.80              | 46.18                | 74.00          | -27.82          | H    |
| 12060.00                | *                 |                       |                 |                    |                      | 74.00          |                 | H    |
| 14472.00                | *                 |                       |                 |                    |                      | 74.00          |                 | H    |
| 16884.00                | *                 |                       |                 |                    |                      | 74.00          |                 | H    |
| Average Value           |                   |                       |                 |                    |                      |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4824.00                 | 29.54             | 34.13                 | 6.61            | 34.09              | 36.19                | 54.00          | -17.81          | V    |
| 7236.00                 | 23.19             | 37.14                 | 7.74            | 34.51              | 33.56                | 54.00          | -20.44          | V    |
| 9648.00                 | 23.14             | 39.35                 | 9.26            | 34.80              | 36.95                | 54.00          | -17.05          | V    |
| 12060.00                | *                 |                       |                 |                    |                      | 54.00          |                 | V    |
| 14472.00                | *                 |                       |                 |                    |                      | 54.00          |                 | V    |
| 16884.00                | *                 |                       |                 |                    |                      | 54.00          |                 | V    |
| 4824.00                 | 28.64             | 34.13                 | 6.61            | 34.09              | 35.29                | 54.00          | -18.71          | H    |
| 7236.00                 | 22.64             | 37.14                 | 7.74            | 34.51              | 33.01                | 54.00          | -20.99          | H    |
| 9648.00                 | 22.11             | 39.35                 | 9.26            | 34.80              | 35.92                | 54.00          | -18.08          | H    |
| 12060.00                | *                 |                       |                 |                    |                      | 54.00          |                 | H    |
| 14472.00                | *                 |                       |                 |                    |                      | 54.00          |                 | H    |
| 16884.00                | *                 |                       |                 |                    |                      | 54.00          |                 | H    |

**Test Results (Above 1000MHz)**

| Test Mode: 802.11b Mode |                   |                       |                 |                    | Test channel: Middle |                |                 |      |
|-------------------------|-------------------|-----------------------|-----------------|--------------------|----------------------|----------------|-----------------|------|
| Peak Value              |                   |                       |                 |                    |                      |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4874.00                 | 39.50             | 34.35                 | 6.67            | 34.09              | 46.43                | 74.00          | -27.57          | V    |
| 7311.00                 | 34.38             | 37.21                 | 7.77            | 34.53              | 44.83                | 74.00          | -29.17          | V    |
| 9748.00                 | 33.80             | 39.45                 | 9.33            | 34.80              | 47.78                | 74.00          | -26.22          | V    |
| 12185.00                | *                 |                       |                 |                    |                      | 74.00          |                 | V    |
| 14622.00                | *                 |                       |                 |                    |                      | 74.00          |                 | V    |
| 17059.00                | *                 |                       |                 |                    |                      | 74.00          |                 | V    |
| 4874.00                 | 39.95             | 34.35                 | 6.67            | 34.09              | 46.88                | 74.00          | -27.12          | H    |
| 7311.00                 | 33.01             | 37.21                 | 7.77            | 34.53              | 43.46                | 74.00          | -30.54          | H    |
| 9748.00                 | 33.68             | 39.45                 | 9.33            | 34.80              | 47.66                | 74.00          | -26.34          | H    |
| 12185.00                | *                 |                       |                 |                    |                      | 74.00          |                 | H    |
| 14622.00                | *                 |                       |                 |                    |                      | 74.00          |                 | H    |
| 17059.00                | *                 |                       |                 |                    |                      | 74.00          |                 | H    |
| Average Value           |                   |                       |                 |                    |                      |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4874.00                 | 30.34             | 34.35                 | 6.67            | 34.09              | 37.27                | 54.00          | -16.73          | V    |
| 7311.00                 | 22.69             | 37.21                 | 7.77            | 34.53              | 33.14                | 54.00          | -20.86          | V    |
| 9748.00                 | 23.05             | 39.45                 | 9.33            | 34.80              | 37.03                | 54.00          | -16.97          | V    |
| 12185.00                | *                 |                       |                 |                    |                      | 54.00          |                 | V    |
| 14622.00                | *                 |                       |                 |                    |                      | 54.00          |                 | V    |
| 17059.00                | *                 |                       |                 |                    |                      | 54.00          |                 | V    |
| 4874.00                 | 30.06             | 34.35                 | 6.67            | 34.09              | 36.99                | 54.00          | -17.01          | H    |
| 7311.00                 | 22.10             | 37.21                 | 7.77            | 34.53              | 32.55                | 54.00          | -21.45          | H    |
| 9748.00                 | 23.40             | 39.45                 | 9.33            | 34.80              | 37.38                | 54.00          | -16.62          | H    |
| 12185.00                | *                 |                       |                 |                    |                      | 54.00          |                 | H    |
| 14622.00                | *                 |                       |                 |                    |                      | 54.00          |                 | H    |
| 17059.00                | *                 |                       |                 |                    |                      | 54.00          |                 | H    |

**Test Results (Above 1000MHz)**

| Test Mode: 802.11b Mode |                   |                       |                 |                    | Test channel: Highest |                |                 |      |
|-------------------------|-------------------|-----------------------|-----------------|--------------------|-----------------------|----------------|-----------------|------|
| Peak Value              |                   |                       |                 |                    |                       |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4924.00                 | 45.13             | 34.57                 | 6.74            | 34.09              | 52.35                 | 74.00          | -21.65          | V    |
| 7386.00                 | 35.12             | 37.29                 | 7.80            | 34.55              | 45.66                 | 74.00          | -28.34          | V    |
| 9848.00                 | 37.14             | 39.55                 | 9.41            | 34.81              | 51.29                 | 74.00          | -22.71          | V    |
| 12310.00                | *                 |                       |                 |                    |                       | 74.00          |                 | V    |
| 14772.00                | *                 |                       |                 |                    |                       | 74.00          |                 | V    |
| 17234.00                | *                 |                       |                 |                    |                       | 74.00          |                 | V    |
| 4924.00                 | 44.40             | 34.57                 | 6.74            | 34.09              | 51.62                 | 74.00          | -22.38          | H    |
| 7386.00                 | 34.00             | 37.29                 | 7.80            | 34.55              | 44.54                 | 74.00          | -29.46          | H    |
| 9848.00                 | 33.30             | 39.55                 | 9.41            | 34.81              | 47.45                 | 74.00          | -26.55          | H    |
| 12310.00                | *                 |                       |                 |                    |                       | 74.00          |                 | H    |
| 14772.00                | *                 |                       |                 |                    |                       | 74.00          |                 | H    |
| 17234.00                | *                 |                       |                 |                    |                       | 74.00          |                 | H    |
| Average Value           |                   |                       |                 |                    |                       |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4924.00                 | 36.03             | 34.57                 | 6.74            | 34.09              | 43.25                 | 54.00          | -10.75          | V    |
| 7386.00                 | 25.03             | 37.29                 | 7.80            | 34.55              | 35.57                 | 54.00          | -18.43          | V    |
| 9848.00                 | 25.64             | 39.55                 | 9.41            | 34.81              | 39.79                 | 54.00          | -14.21          | V    |
| 12310.00                | *                 |                       |                 |                    |                       | 54.00          |                 | V    |
| 14772.00                | *                 |                       |                 |                    |                       | 54.00          |                 | V    |
| 17234.00                | *                 |                       |                 |                    |                       | 54.00          |                 | V    |
| 4924.00                 | 34.75             | 34.57                 | 6.74            | 34.09              | 41.97                 | 54.00          | -12.03          | H    |
| 7386.00                 | 23.39             | 37.29                 | 7.80            | 34.55              | 33.93                 | 54.00          | -20.07          | H    |
| 9848.00                 | 22.56             | 39.55                 | 9.41            | 34.81              | 36.71                 | 54.00          | -17.29          | H    |
| 12310.00                | *                 |                       |                 |                    |                       | 54.00          |                 | H    |
| 14772.00                | *                 |                       |                 |                    |                       | 54.00          |                 | H    |
| 17234.00                | *                 |                       |                 |                    |                       | 54.00          |                 | H    |

Remark:

1. During the test, pre-scan the 802.11b,g,n(HT20N) mode, and found the 802.11b mode is worse case , the report only record this mode.
2. Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
3. “\*”, means this data is the too weak instrument of signal is unable to test.

**Radiated Band Edge:**

| Test Mode: 802.11b Mode |                   |                       |                 |                    | Test channel: Lowest |                |                 |      |
|-------------------------|-------------------|-----------------------|-----------------|--------------------|----------------------|----------------|-----------------|------|
| Peak Value              |                   |                       |                 |                    |                      |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2390.00                 | 52.50             | 29.15                 | 3.41            | 34.01              | 51.05                | 74.00          | -22.95          | H    |
| 2400.00                 | 61.80             | 29.16                 | 3.43            | 34.01              | 60.38                | 74.00          | -13.62          | H    |
| 2390.00                 | 54.24             | 29.15                 | 3.41            | 34.01              | 52.79                | 74.00          | -21.21          | V    |
| 2400.00                 | 63.82             | 29.16                 | 3.43            | 34.01              | 62.40                | 74.00          | -11.60          | V    |
| Average Value           |                   |                       |                 |                    |                      |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2390.00                 | 39.02             | 29.15                 | 3.41            | 34.01              | 37.57                | 54.00          | -16.43          | H    |
| 2400.00                 | 47.40             | 29.16                 | 3.43            | 34.01              | 45.98                | 54.00          | -8.02           | H    |
| 2390.00                 | 40.90             | 29.15                 | 3.41            | 34.01              | 39.45                | 54.00          | -14.55          | V    |
| 2400.00                 | 48.59             | 29.16                 | 3.43            | 34.01              | 47.17                | 54.00          | -6.83           | V    |

| Test Mode: 802.11b Mode |                   |                       |                 |                    | Test channel: Highest |                |                 |      |
|-------------------------|-------------------|-----------------------|-----------------|--------------------|-----------------------|----------------|-----------------|------|
| Peak Value              |                   |                       |                 |                    |                       |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2483.50                 | 53.52             | 29.28                 | 3.53            | 34.03              | 52.30                 | 74.00          | -21.70          | H    |
| 2500.00                 | 49.08             | 29.30                 | 3.56            | 34.03              | 47.91                 | 74.00          | -26.09          | H    |
| 2483.50                 | 55.95             | 29.28                 | 3.53            | 34.03              | 54.73                 | 74.00          | -19.27          | V    |
| 2500.00                 | 51.75             | 29.30                 | 3.56            | 34.03              | 50.58                 | 74.00          | -23.42          | V    |
| Average Value           |                   |                       |                 |                    |                       |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2483.50                 | 39.51             | 29.28                 | 3.53            | 34.03              | 38.29                 | 54.00          | -15.71          | H    |
| 2500.00                 | 35.45             | 29.30                 | 3.56            | 34.03              | 34.28                 | 54.00          | -19.72          | H    |
| 2483.50                 | 41.53             | 29.28                 | 3.53            | 34.03              | 40.31                 | 54.00          | -13.69          | V    |
| 2500.00                 | 37.36             | 29.30                 | 3.56            | 34.03              | 36.19                 | 54.00          | -17.81          | V    |

Remark:

1. Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

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**Radiated Band Edge:**

| Test Mode: 802.11g Mode |                   |                       |                 |                    | Test channel: Lowest |                |                 |      |
|-------------------------|-------------------|-----------------------|-----------------|--------------------|----------------------|----------------|-----------------|------|
| Peak Value              |                   |                       |                 |                    |                      |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2390.00                 | 51.37             | 27.53                 | 5.47            | 33.92              | 50.45                | 74.00          | -23.55          | H    |
| 2400.00                 | 60.29             | 27.55                 | 5.49            | 29.93              | 63.40                | 74.00          | -10.60          | H    |
| 2390.00                 | 53.03             | 27.53                 | 5.47            | 33.92              | 52.11                | 74.00          | -21.89          | V    |
| 2400.00                 | 62.01             | 27.55                 | 5.49            | 29.93              | 65.12                | 74.00          | -8.88           | V    |
| Average Value           |                   |                       |                 |                    |                      |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2390.00                 | 38.21             | 27.53                 | 5.47            | 33.92              | 37.29                | 54.00          | -16.71          | H    |
| 2400.00                 | 46.48             | 27.55                 | 5.49            | 29.93              | 49.59                | 54.00          | -4.41           | H    |
| 2390.00                 | 40.01             | 27.53                 | 5.47            | 33.92              | 39.09                | 54.00          | -14.91          | V    |
| 2400.00                 | 47.58             | 27.55                 | 5.49            | 29.93              | 50.69                | 54.00          | -3.31           | V    |

| Test Mode: 802.11g Mode |                   |                       |                 |                    | Test channel: Highest |                |                 |      |
|-------------------------|-------------------|-----------------------|-----------------|--------------------|-----------------------|----------------|-----------------|------|
| Peak Value              |                   |                       |                 |                    |                       |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2483.50                 | 51.91             | 29.28                 | 3.53            | 34.03              | 50.69                 | 74.00          | -23.31          | H    |
| 2500.00                 | 47.82             | 29.30                 | 3.56            | 34.03              | 46.65                 | 74.00          | -27.35          | H    |
| 2483.50                 | 54.11             | 29.28                 | 3.53            | 34.03              | 52.89                 | 74.00          | -21.11          | V    |
| 2500.00                 | 50.28             | 29.30                 | 3.56            | 34.03              | 49.11                 | 74.00          | -24.89          | V    |
| Average Value           |                   |                       |                 |                    |                       |                |                 |      |
| Frequency (MHz)         | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2483.50                 | 38.54             | 29.28                 | 3.53            | 34.03              | 37.32                 | 54.00          | -16.68          | H    |
| 2500.00                 | 34.69             | 29.30                 | 3.56            | 34.03              | 33.52                 | 54.00          | -20.48          | H    |
| 2483.50                 | 40.46             | 29.28                 | 3.53            | 34.03              | 39.24                 | 54.00          | -14.76          | V    |
| 2500.00                 | 36.56             | 29.30                 | 3.56            | 34.03              | 35.39                 | 54.00          | -18.61          | V    |

Remark:

1. Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

**Radiated Band Edge:**

| Test Mode: 802.11n20 Mode |                   |                       |                 |                    | Test channel: Lowest |                |                 |      |
|---------------------------|-------------------|-----------------------|-----------------|--------------------|----------------------|----------------|-----------------|------|
| Peak Value                |                   |                       |                 |                    |                      |                |                 |      |
| Frequency (MHz)           | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2390.00                   | 51.16             | 27.53                 | 5.47            | 33.92              | 50.24                | 74.00          | -23.76          | H    |
| 2400.00                   | 60.01             | 27.55                 | 5.49            | 29.93              | 63.12                | 74.00          | -10.88          | H    |
| 2390.00                   | 52.81             | 27.53                 | 5.47            | 33.92              | 51.89                | 74.00          | -22.11          | V    |
| 2400.00                   | 61.68             | 27.55                 | 5.49            | 29.93              | 64.79                | 74.00          | -9.21           | V    |
| Average Value             |                   |                       |                 |                    |                      |                |                 |      |
| Frequency (MHz)           | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2390.00                   | 38.06             | 27.53                 | 5.47            | 33.92              | 37.14                | 54.00          | -16.86          | H    |
| 2400.00                   | 46.31             | 27.55                 | 5.49            | 29.93              | 49.42                | 54.00          | -4.58           | H    |
| 2390.00                   | 39.85             | 27.53                 | 5.47            | 33.92              | 38.93                | 54.00          | -15.07          | V    |
| 2400.00                   | 47.39             | 27.55                 | 5.49            | 29.93              | 50.50                | 54.00          | -3.50           | V    |

| Test Mode: 802.11n20 Mode |                   |                       |                 |                    | Test channel: Highest |                |                 |      |
|---------------------------|-------------------|-----------------------|-----------------|--------------------|-----------------------|----------------|-----------------|------|
| Peak Value                |                   |                       |                 |                    |                       |                |                 |      |
| Frequency (MHz)           | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2483.50                   | 51.61             | 29.28                 | 3.53            | 34.03              | 50.39                 | 74.00          | -23.61          | H    |
| 2500.00                   | 47.59             | 29.30                 | 3.56            | 34.03              | 46.42                 | 74.00          | -27.58          | H    |
| 2483.50                   | 53.77             | 29.28                 | 3.53            | 34.03              | 52.55                 | 74.00          | -21.45          | V    |
| 2500.00                   | 50.01             | 29.30                 | 3.56            | 34.03              | 48.84                 | 74.00          | -25.16          | V    |
| Average Value             |                   |                       |                 |                    |                       |                |                 |      |
| Frequency (MHz)           | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2483.50                   | 38.36             | 29.28                 | 3.53            | 34.03              | 37.14                 | 54.00          | -16.86          | H    |
| 2500.00                   | 34.55             | 29.30                 | 3.56            | 34.03              | 33.38                 | 54.00          | -20.62          | H    |
| 2483.50                   | 40.26             | 29.28                 | 3.53            | 34.03              | 39.04                 | 54.00          | -14.96          | V    |
| 2500.00                   | 36.41             | 29.30                 | 3.56            | 34.03              | 35.24                 | 54.00          | -18.76          | V    |

Remark:

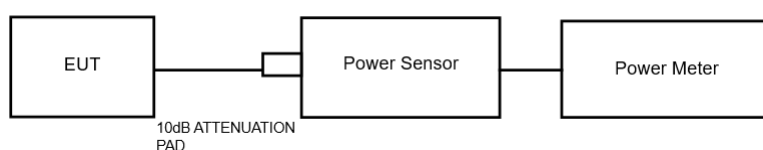
1. Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

## 5. Maximum Peak Output Power Test

### 5.1. Test Standard and Limit

|               |                                    |
|---------------|------------------------------------|
| Test Standard | FCC Part15 C Section 15.247 (b)(3) |
| Test Limit    | 30dBm                              |

### 5.2. Test Setup



### 5.3. Test Procedure

1. The Transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the power value.
3. Repeat above procedures on all channels needed to be tested.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

### 5.4. Test Data

|              |   |                        |
|--------------|---|------------------------|
| Test Item    | : | Max. peak output power |
| Test Voltage | : | DC 6V by battery       |
| Test Result  | : | PASS                   |

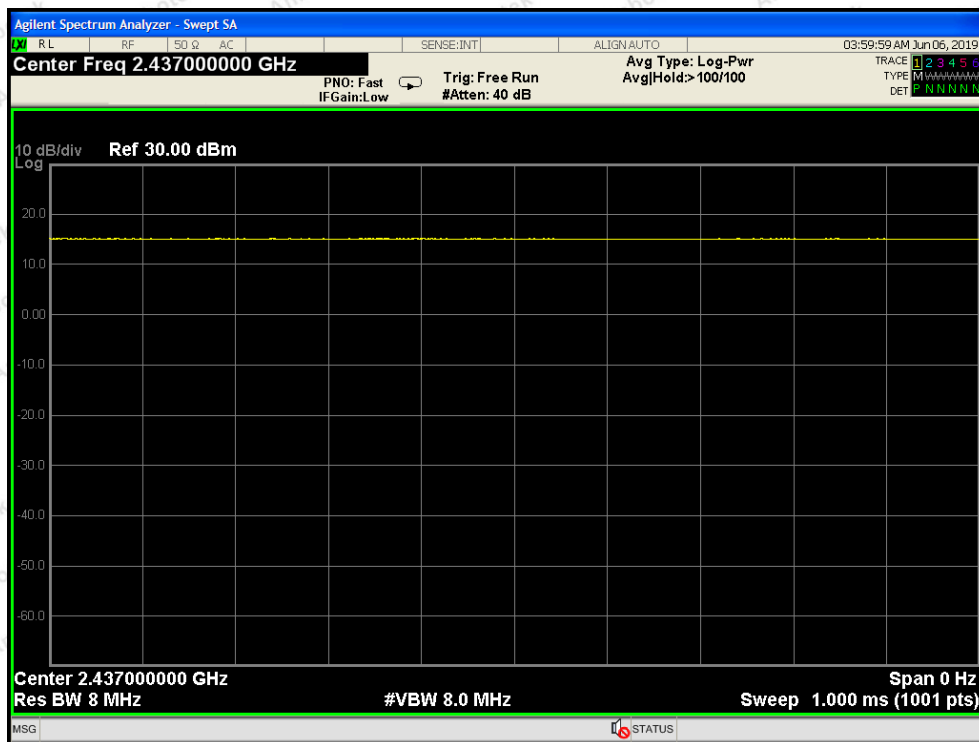
|             |   |                  |
|-------------|---|------------------|
| Test Mode   | : | CH Low ~ CH High |
| Temperature | : | 24℃              |
| Humidity    | : | 55%RH            |

| Test Channel               | Frequency (MHz) | Maximum Peak Conducted Output Power (PK) (dBm) | Limit dBm | Results |
|----------------------------|-----------------|------------------------------------------------|-----------|---------|
| <b>TX 802.11b Mode</b>     |                 |                                                |           |         |
| CH01                       | 2412            | 14.45                                          | 30        | PASS    |
| CH06                       | 2437            | 13.62                                          | 30        | PASS    |
| CH11                       | 2462            | 14.89                                          | 30        | PASS    |
| <b>TX 802.11g Mode</b>     |                 |                                                |           |         |
| CH01                       | 2412            | 13.71                                          | 30        | PASS    |
| CH06                       | 2437            | 14.45                                          | 30        | PASS    |
| CH11                       | 2462            | 15.61                                          | 30        | PASS    |
| <b>TX 802.11n(20) Mode</b> |                 |                                                |           |         |
| CH01                       | 2412            | 13.25                                          | 30        | PASS    |
| CH06                       | 2437            | 14.27                                          | 30        | PASS    |
| CH11                       | 2462            | 16.04                                          | 30        | PASS    |

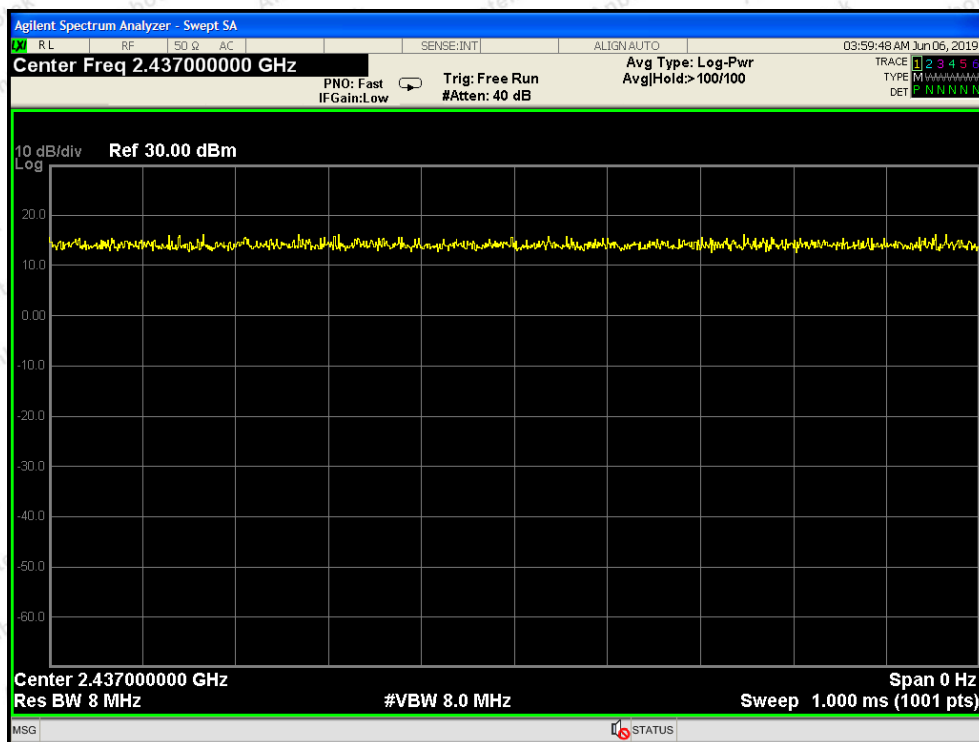
**Note: For power test the duty cycle is 100% in continuous transmitting mode.**

**Please see the plot of next page**

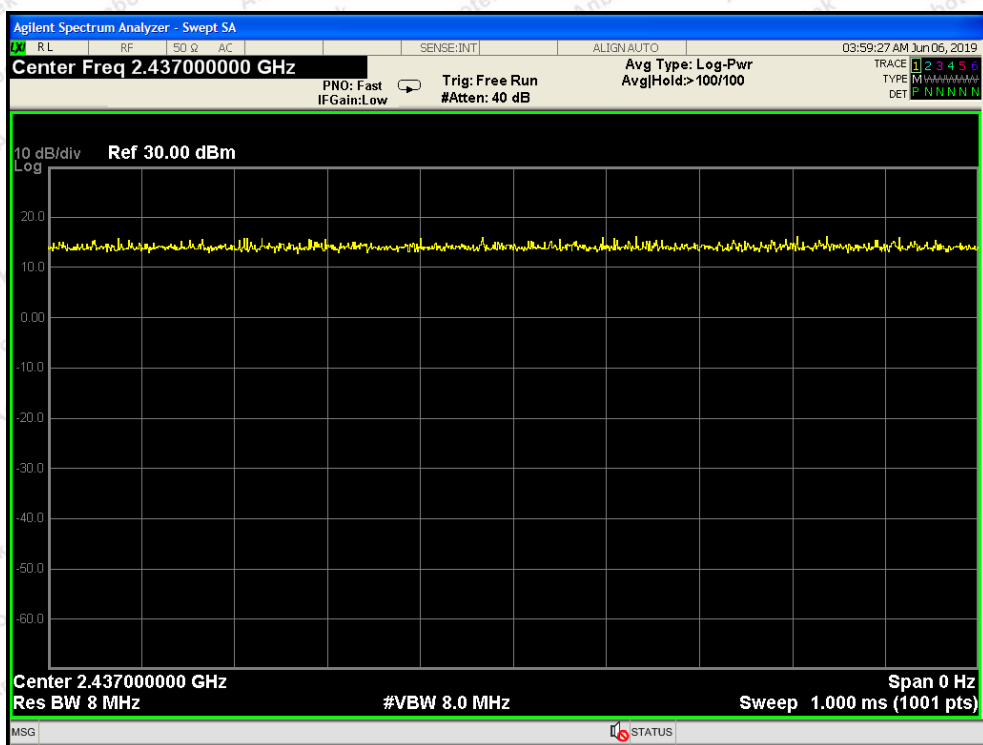
### Duty Cycle



802.11b mode



802.11g mode



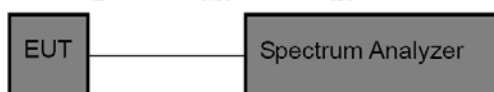
802.11n(HT20) mode

## 6. 6DB Occupy Bandwidth Test

### 6.1. Test Standard and Limit

|               |                                    |
|---------------|------------------------------------|
| Test Standard | FCC Part15 C Section 15.247 (a)(2) |
| Test Limit    | >500kHz                            |

### 6.2. Test Setup



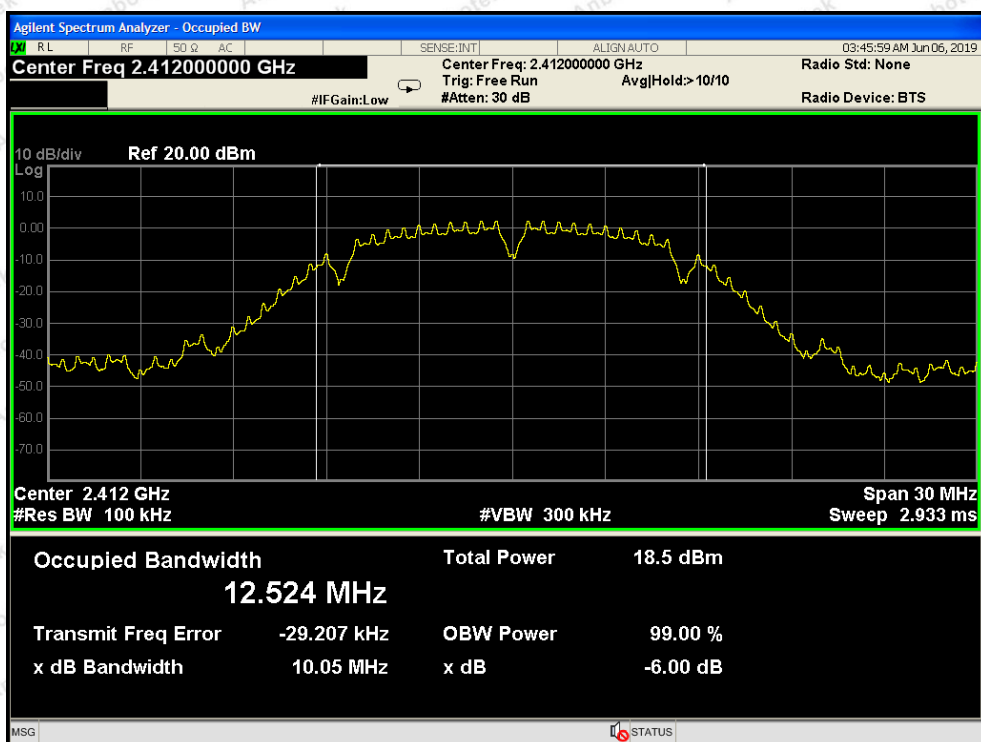
### 6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:  
RBW= 100kHz, VBW≥3\*RBW =300kHz  
Detector= Peak  
Trace mode= Max hold.  
Sweep- auto couple.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

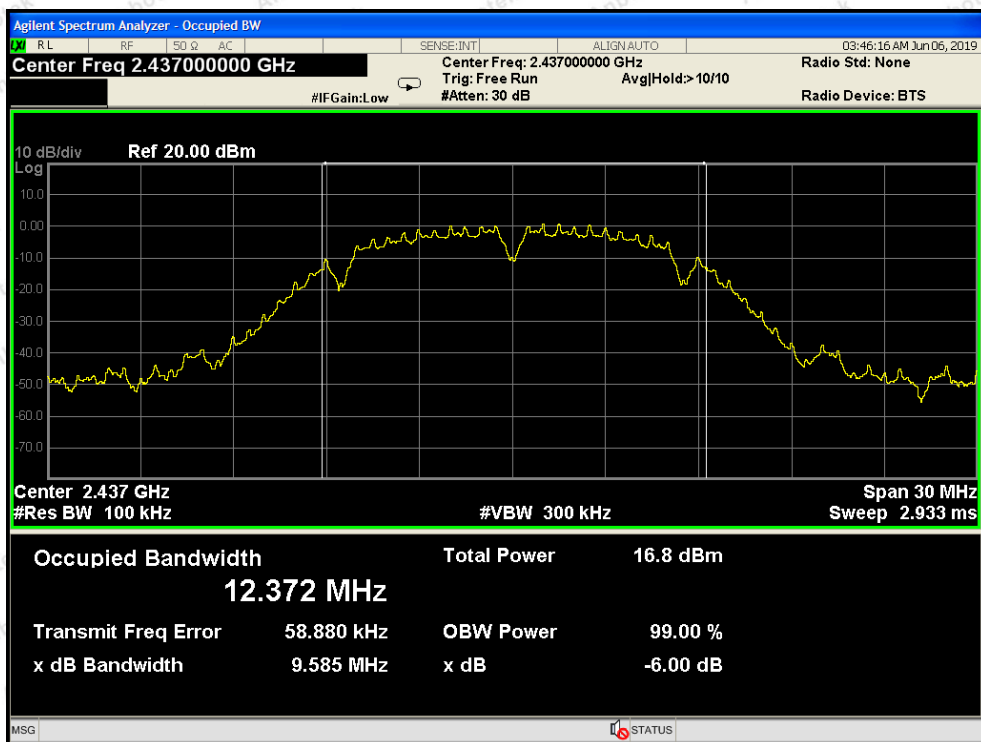
### 6.4. Test Data

|              |                    |             |                    |
|--------------|--------------------|-------------|--------------------|
| Test Item    | : 6dB Bandwidth    | Test Mode   | : CH Low ~ CH High |
| Test Voltage | : DC 6V by battery | Temperature | : 24℃              |
| Test Result  | : PASS             | Humidity    | : 55%RH            |

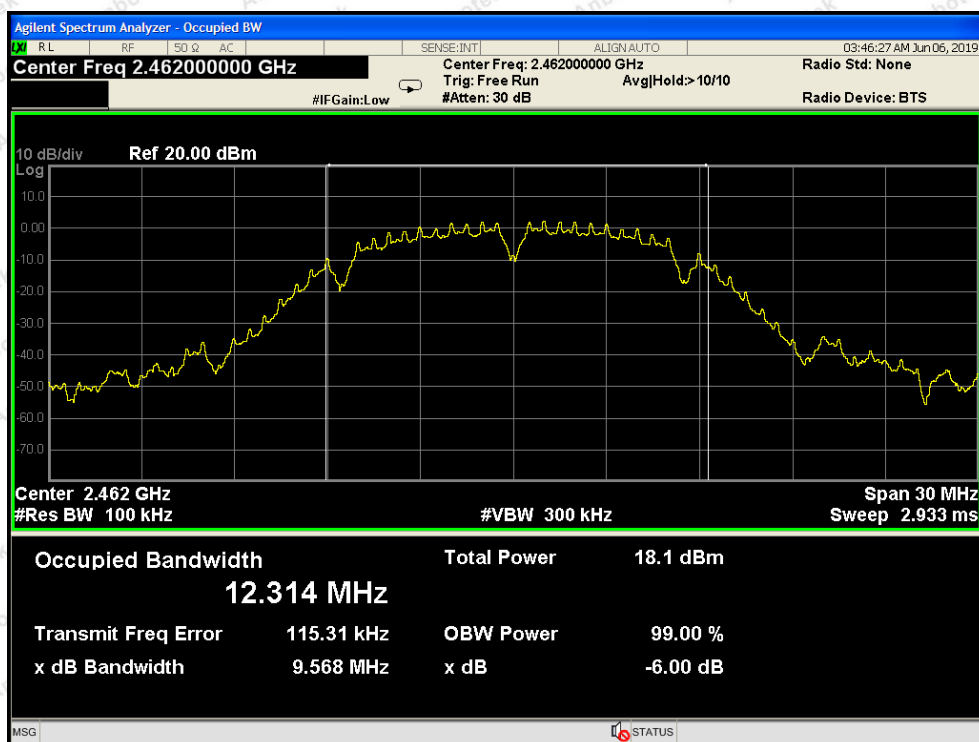
| Mode      | Channel | Frequency (MHz) | Bandwidth (MHz) | Limit (kHz) | Results |
|-----------|---------|-----------------|-----------------|-------------|---------|
| 802.11b   | Low     | 2412            | 10.05           | >500        | PASS    |
|           | Middle  | 2437            | 9.585           |             | PASS    |
|           | High    | 2462            | 9.568           |             | PASS    |
| 802.11g   | Low     | 2412            | 15.16           | >500        | PASS    |
|           | Middle  | 2437            | 15.34           |             | PASS    |
|           | High    | 2462            | 15.66           |             | PASS    |
| 802.11n20 | Low     | 2412            | 15.17           | >500        | PASS    |
|           | Middle  | 2437            | 15.10           |             | PASS    |
|           | High    | 2462            | 15.97           |             | PASS    |



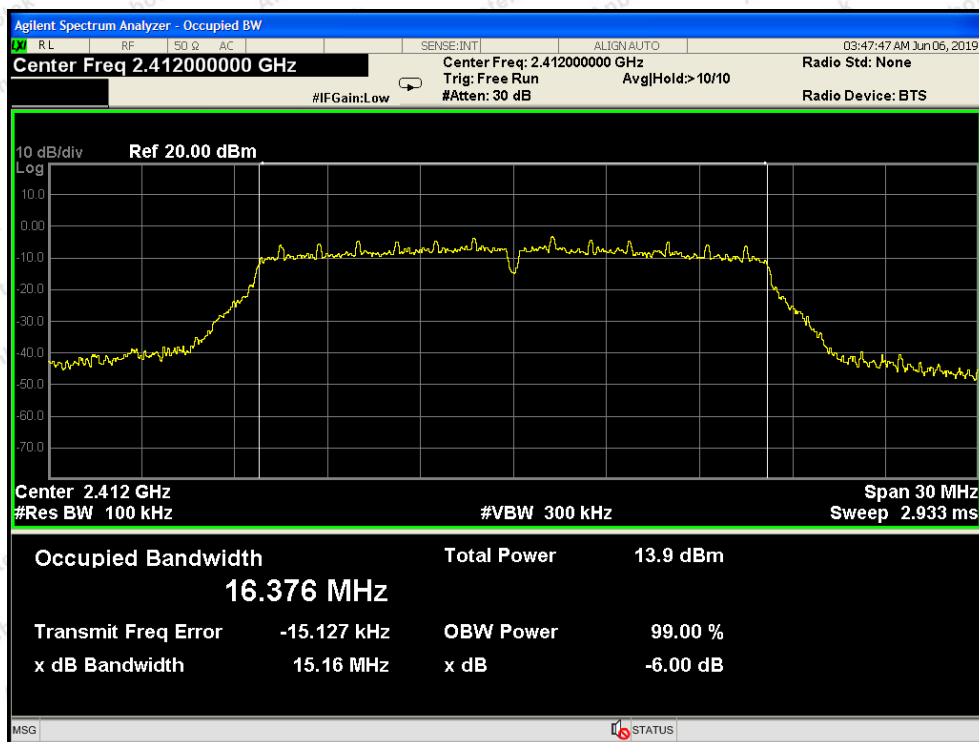
802.11b mode : Lowest



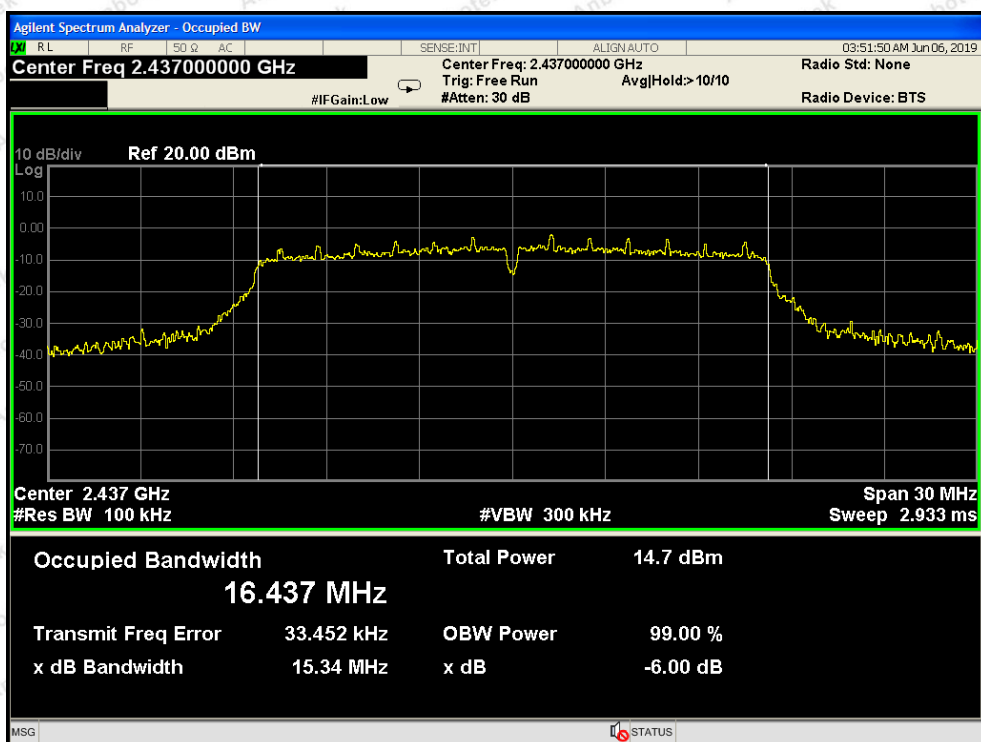
802.11b mode : Middle



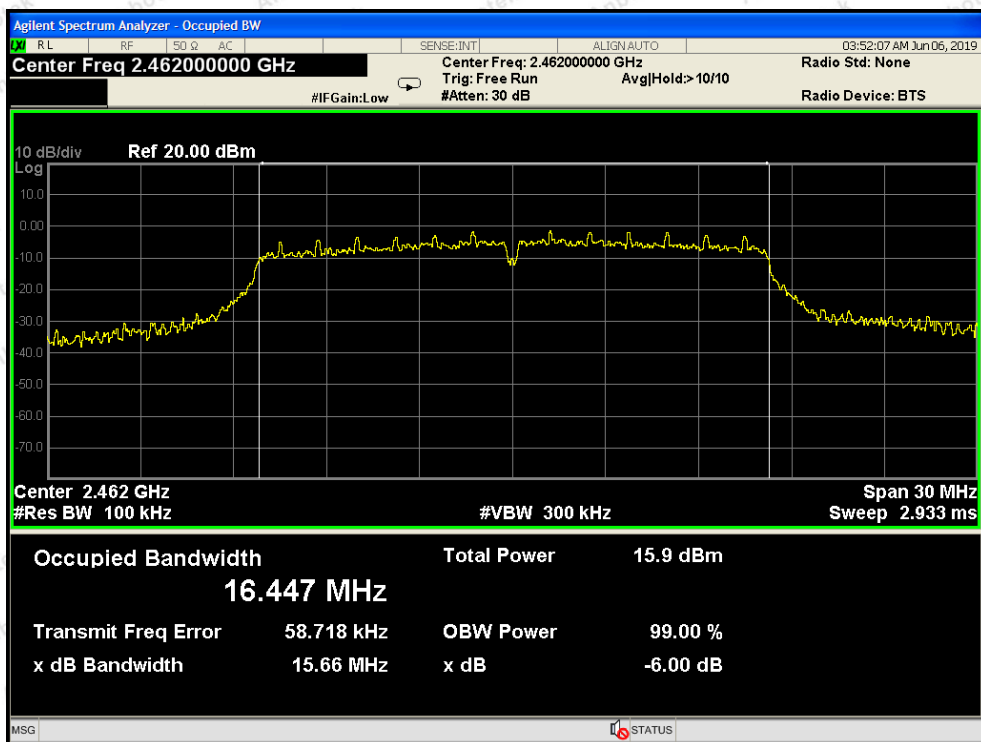
802.11b mode : Highest



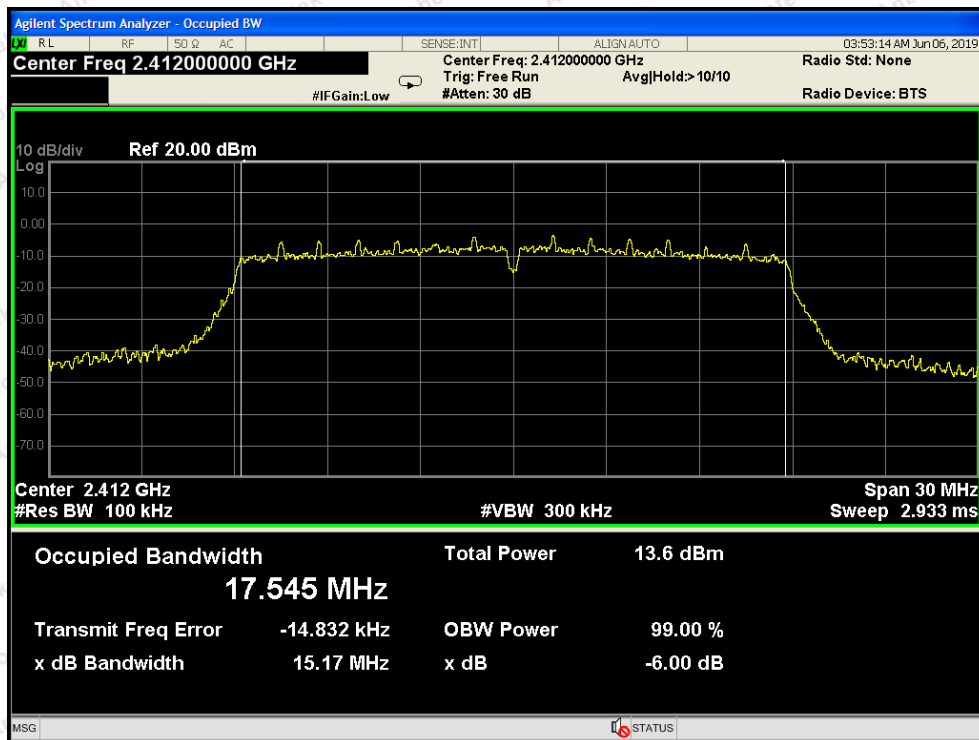
802.11g mode : Lowest



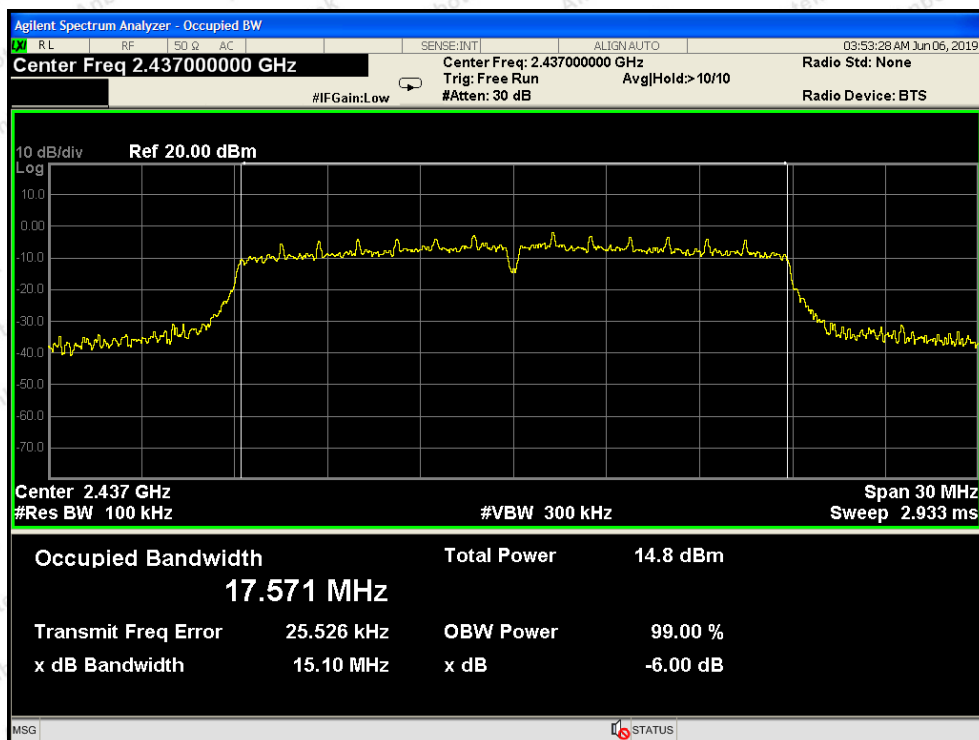
802.11g mode : Middle



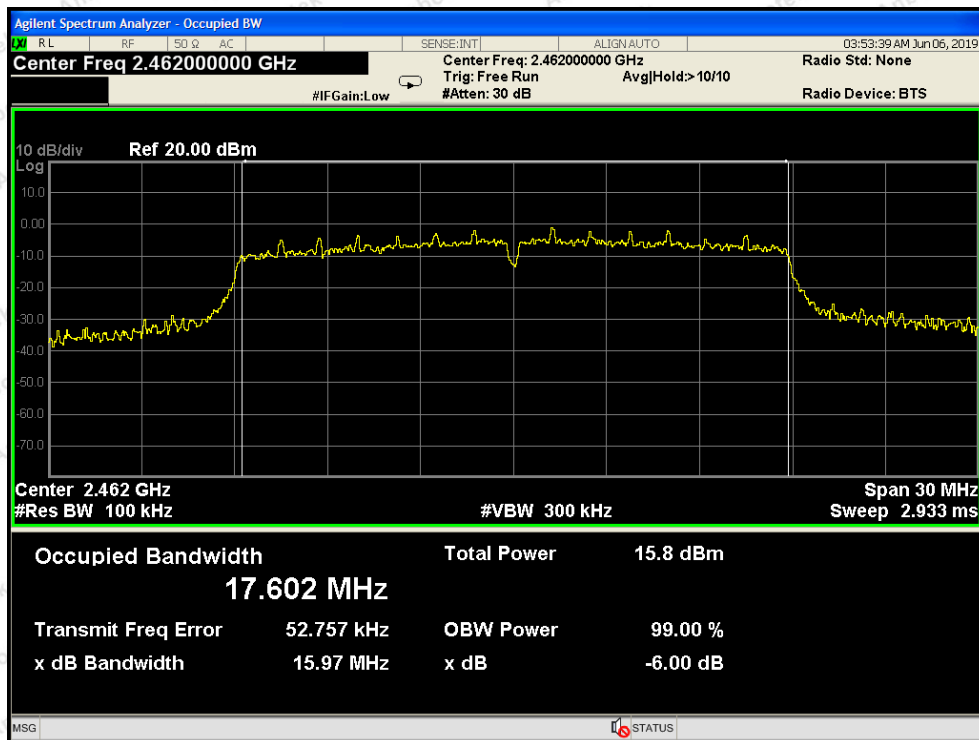
802.11g mode : Highest



802.11n20 mode : Lowest



802.11n20 mode : Middle



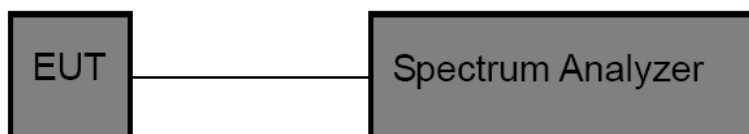
802.11n20 mode : Highest

## 7. Power Spectral Density Test

### 7.1. Test Standard and Limit

|               |                      |
|---------------|----------------------|
| Test Standard | FCC Part15 C Section |
| Test Limit    | 8dBm/3KHz            |

### 7.2. Test Setup



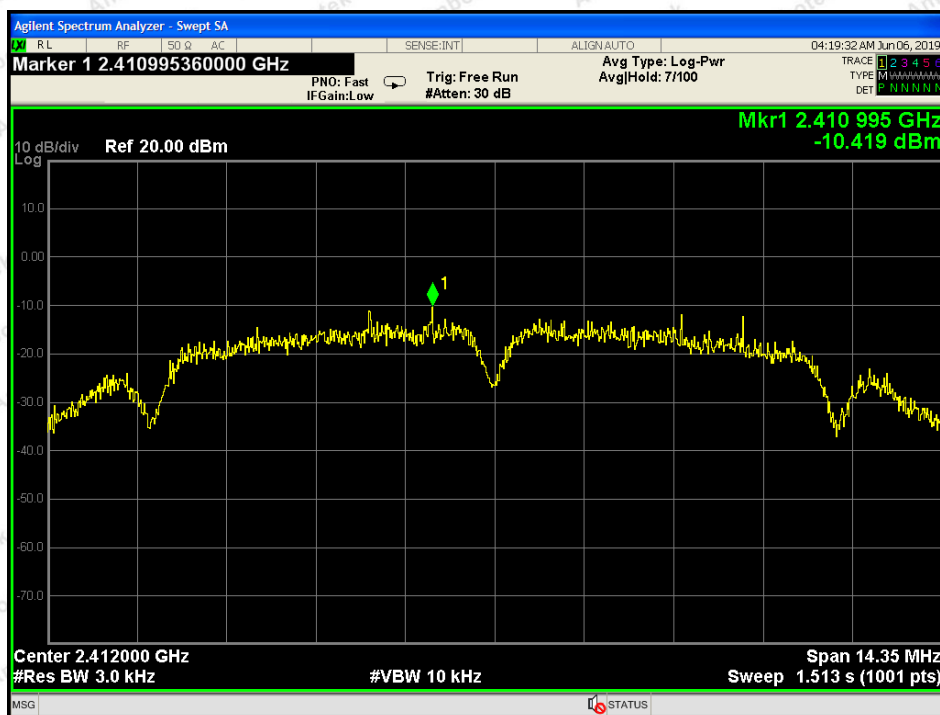
### 7.3. Test Procedure

1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 1.5xDTS BW
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

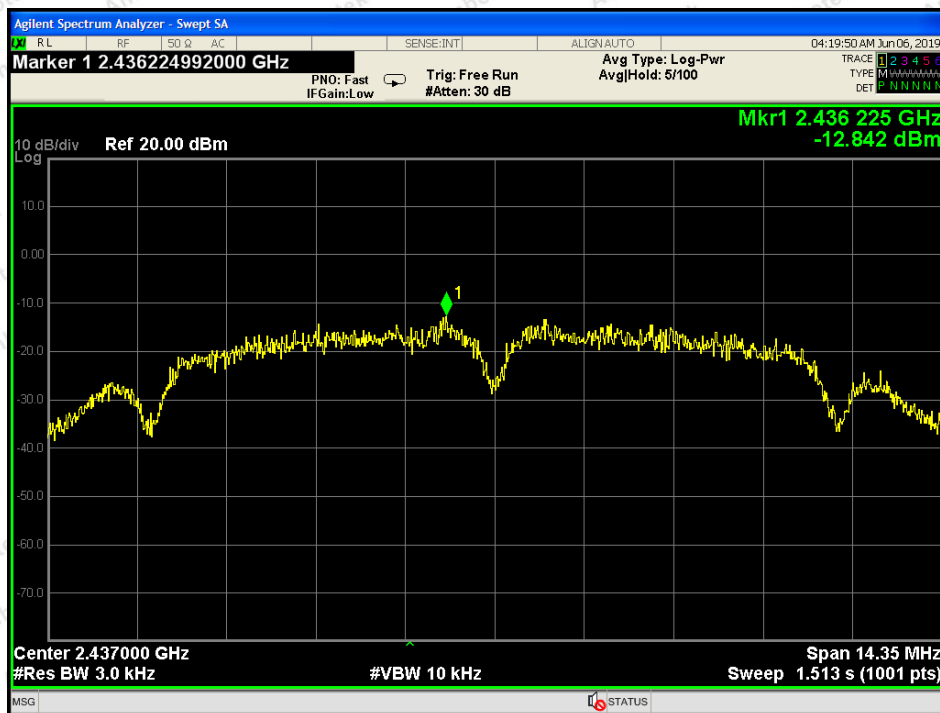
### 7.4. Test Data

|              |                          |             |                    |
|--------------|--------------------------|-------------|--------------------|
| Test Item    | : Power Spectral Density | Test Mode   | : CH Low ~ CH High |
| Test Voltage | : DC 6V by battery       | Temperature | : 24℃              |
| Test Result  | : PASS                   | Humidity    | : 55%RH            |

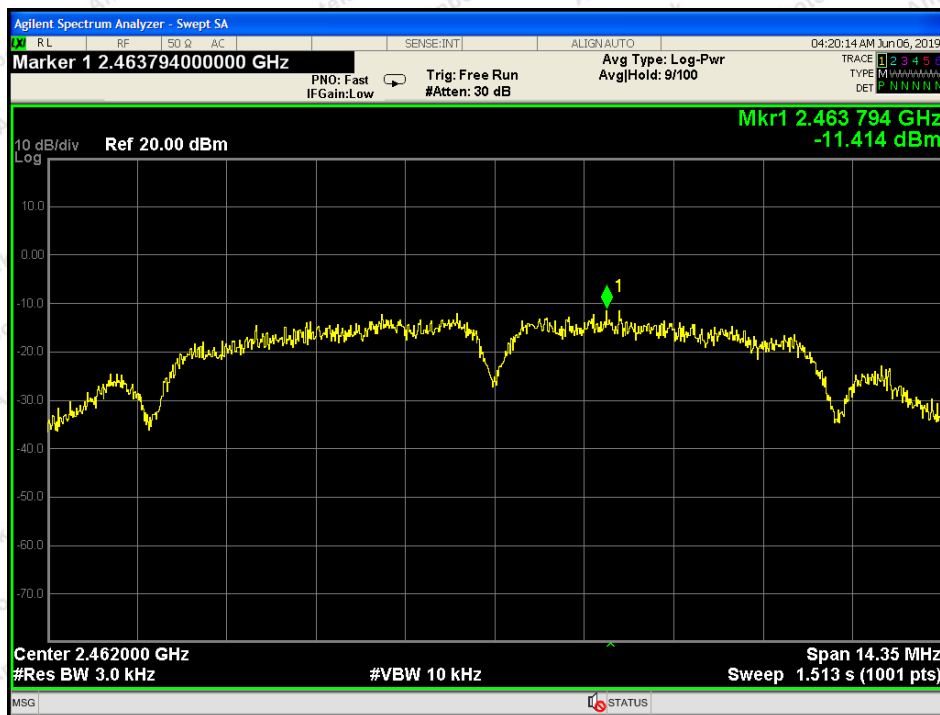
| Mode      | Channel | Frequency (MHz) | PSD (dBm/3KHz) | Limit (dBm/3KHz) | Results |
|-----------|---------|-----------------|----------------|------------------|---------|
| 802.11b   | Low     | 2412            | -10.419        | 8.00             | PASS    |
|           | Middle  | 2437            | -12.842        | 8.00             | PASS    |
|           | High    | 2462            | -11.414        | 8.00             | PASS    |
| 802.11g   | Low     | 2412            | -18.028        | 8.00             | PASS    |
|           | Middle  | 2437            | -17.162        | 8.00             | PASS    |
|           | High    | 2462            | -16.181        | 8.00             | PASS    |
| 802.11n20 | Low     | 2412            | -19.154        | 8.00             | PASS    |
|           | Middle  | 2437            | -17.724        | 8.00             | PASS    |
|           | High    | 2462            | -15.598        | 8.00             | PASS    |



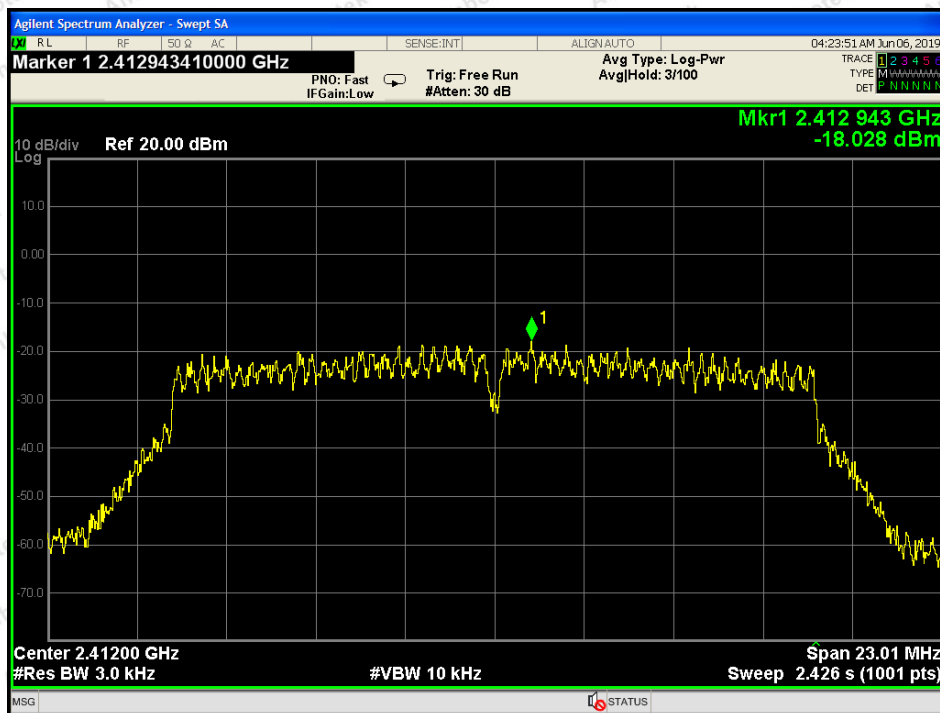
802.11b mode : Lowest



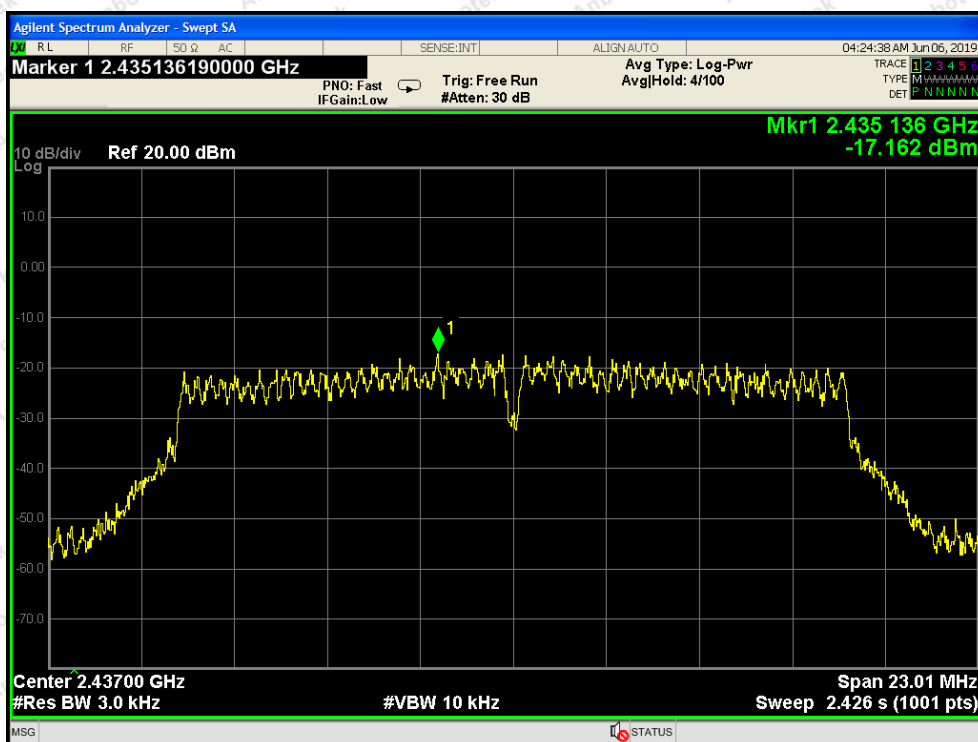
802.11b mode : Middle



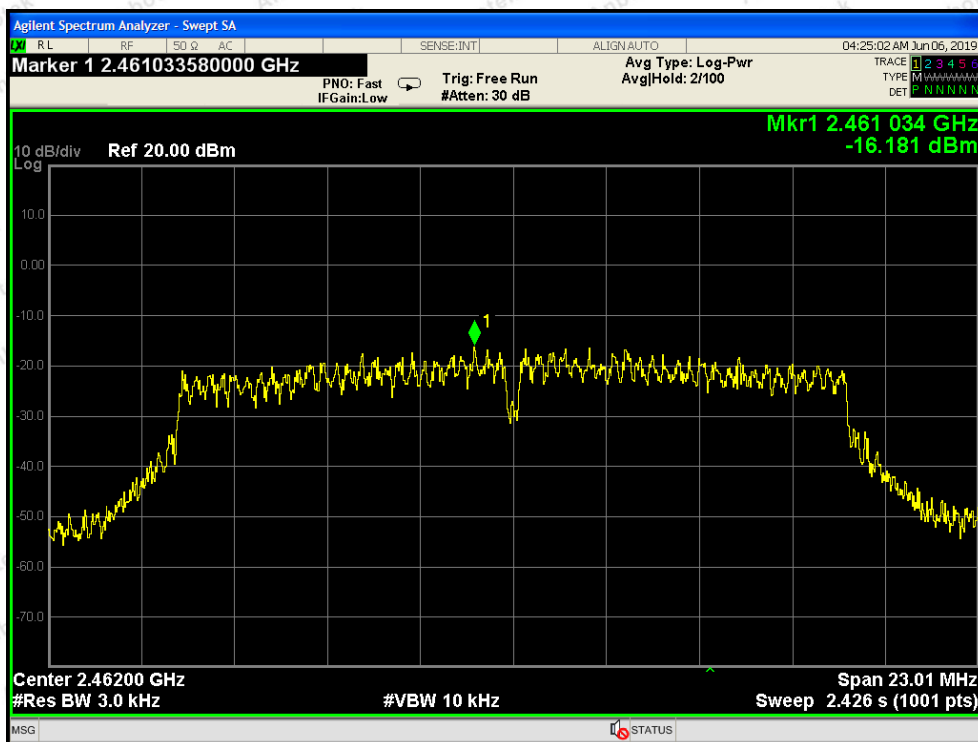
802.11b mode : Highest



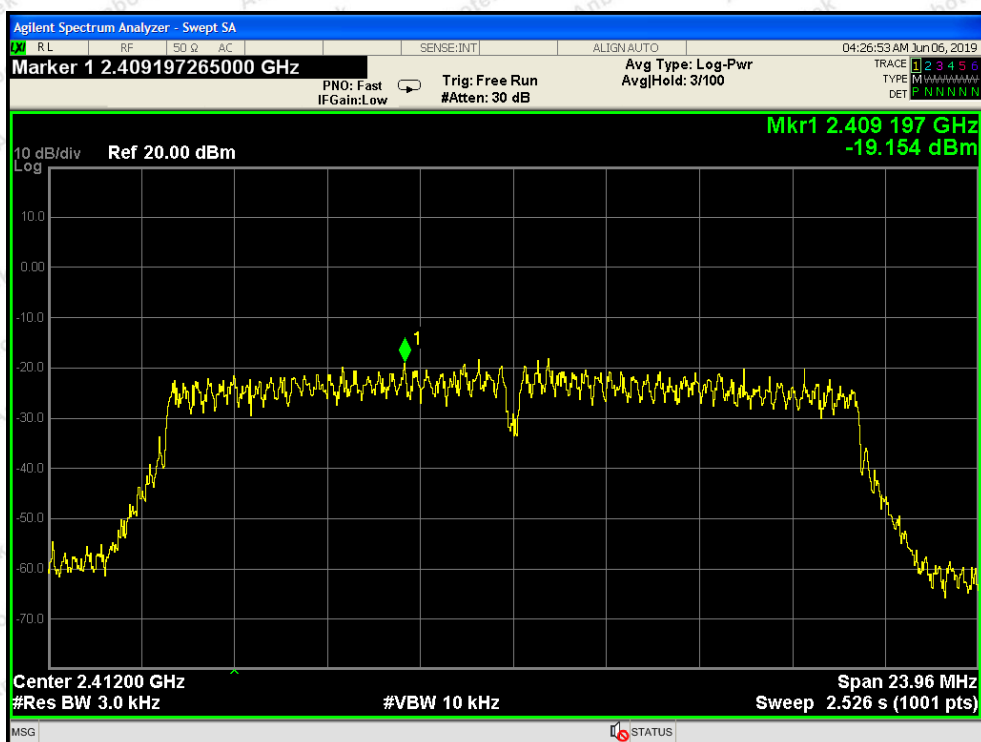
802.11g mode : Lowest



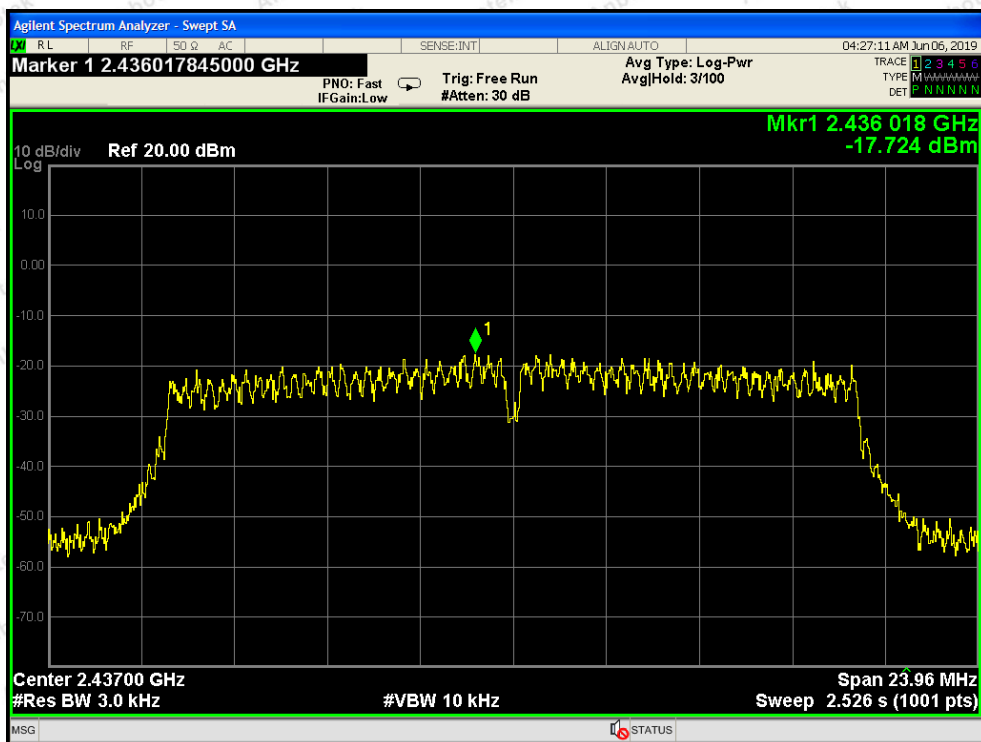
802.11g mode : Middle



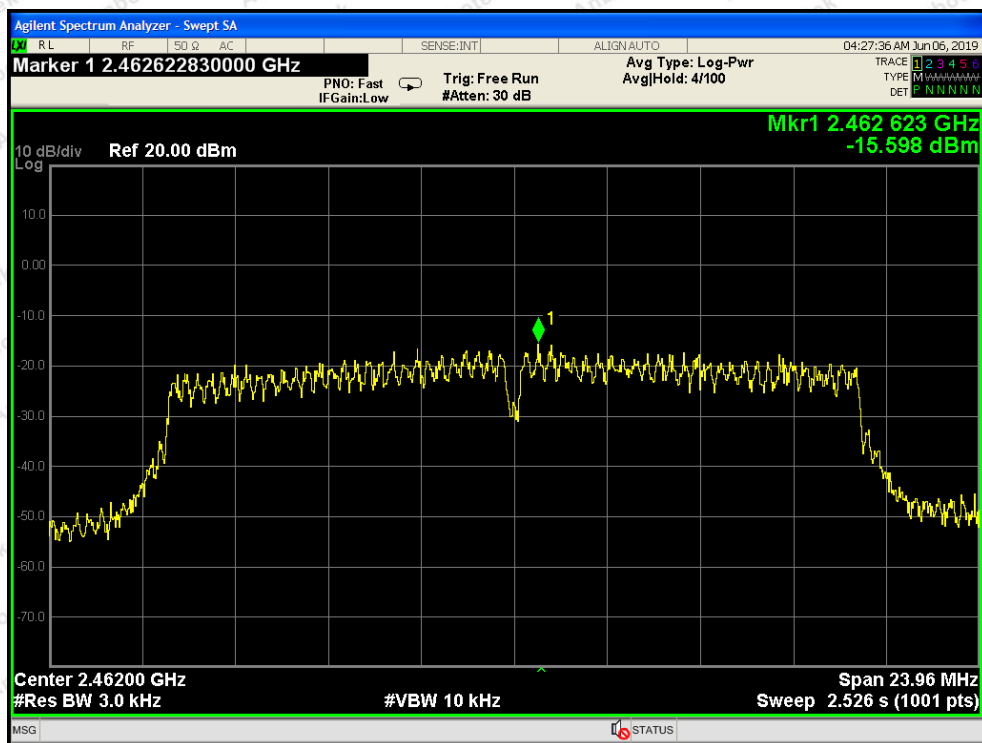
802.11g mode : Highest



802.11n20 mode : Lowest



802.11n20 mode : Middle



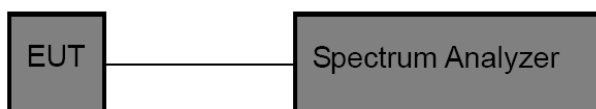
802.11n20 mode : Highest

## 8. 100kHz Bandwidth of Frequency Band Edge Requirement

### 8.1. Test Standard and Limit

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Standard | FCC Part15 C Section 15.247 (d)                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Test Limit    | in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, 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). |

### 8.2. Test Setup



### 8.3. Test Procedure

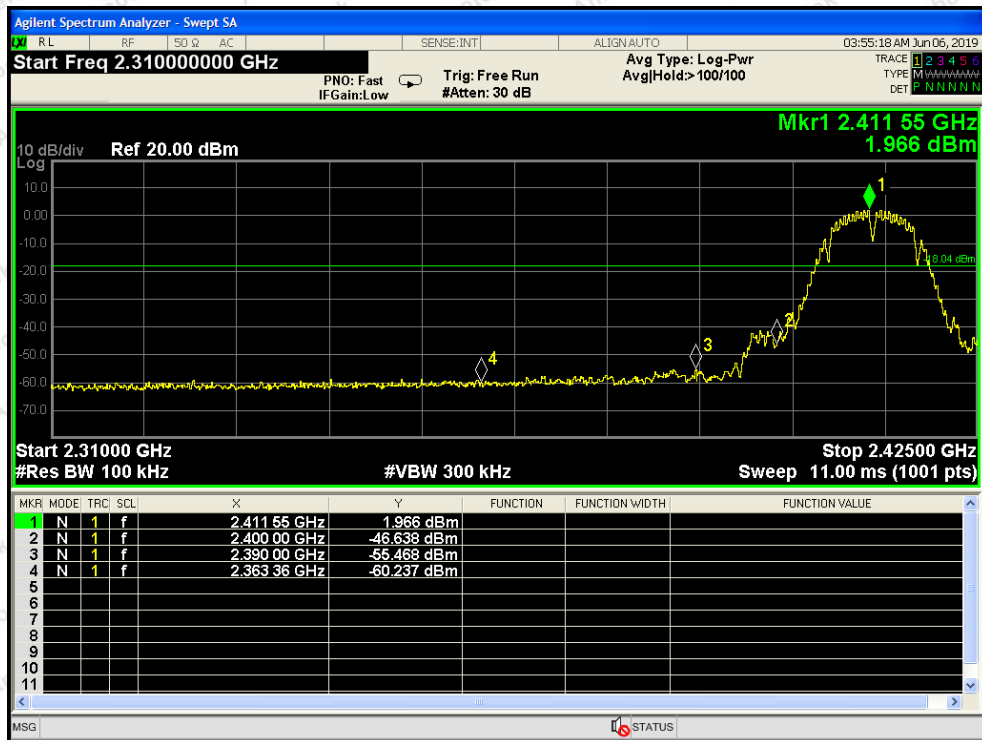
Using the following spectrum analyzer setting:

1. Set the RBW = 100KHz.
2. Set the VBW = 300KHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

### 8.4. Test Data

|              |                    |             |                    |
|--------------|--------------------|-------------|--------------------|
| Test Item    | : Band edge        | Test Mode   | : CH Low ~ CH High |
| Test Voltage | : DC 6V by battery | Temperature | : 24°C             |
| Test Result  | : PASS             | Humidity    | : 55%RH            |

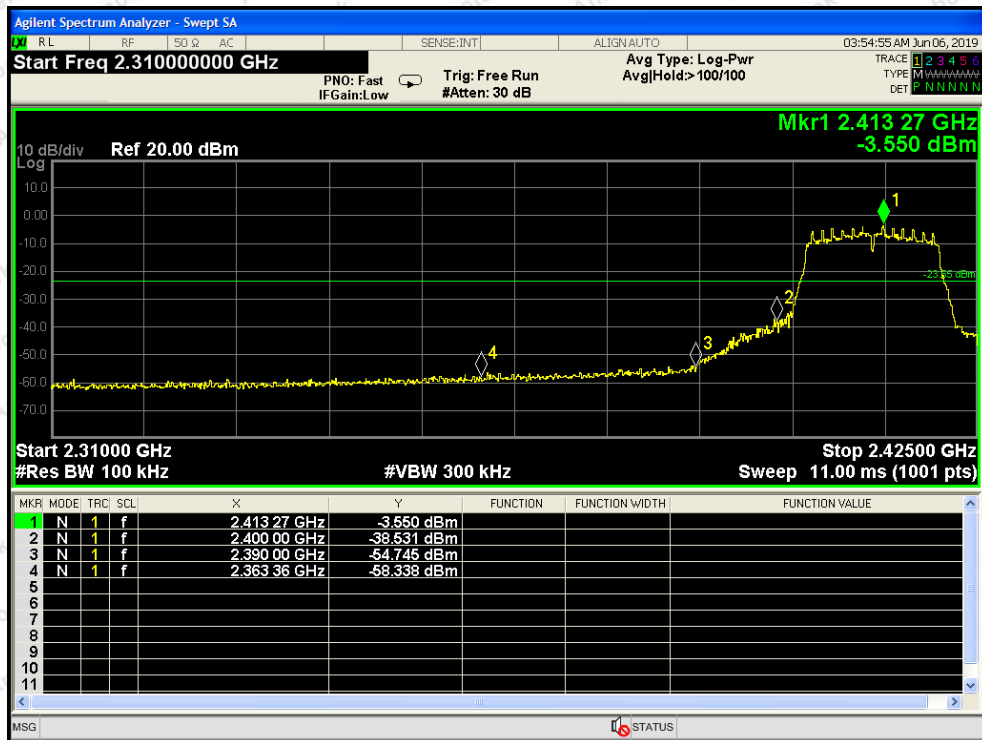
| Mode      | Frequency Band (MHz) | Delta Peak to Band Emission (dBc) | Limit (dBc) | Results |
|-----------|----------------------|-----------------------------------|-------------|---------|
| 802.11b   | 2412                 | 48.604                            | >20         | PASS    |
|           | 2462                 | 58.526                            | >20         | PASS    |
| 802.11g   | 2412                 | 34.981                            | >20         | PASS    |
|           | 2462                 | 40.277                            | >20         | PASS    |
| 802.11n20 | 2412                 | 35.580                            | >20         | PASS    |
|           | 2462                 | 36.156                            | >20         | PASS    |



802.11b mode : Lowest



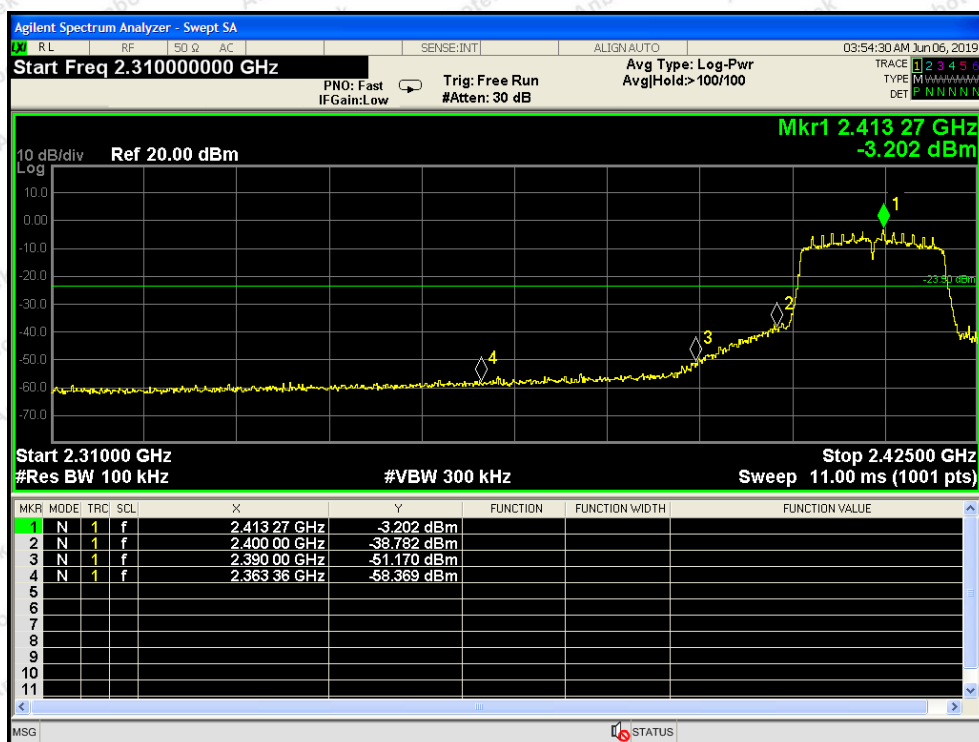
802.11b mode : Highest



802.11g mode : Lowest



802.11g mode : Highest

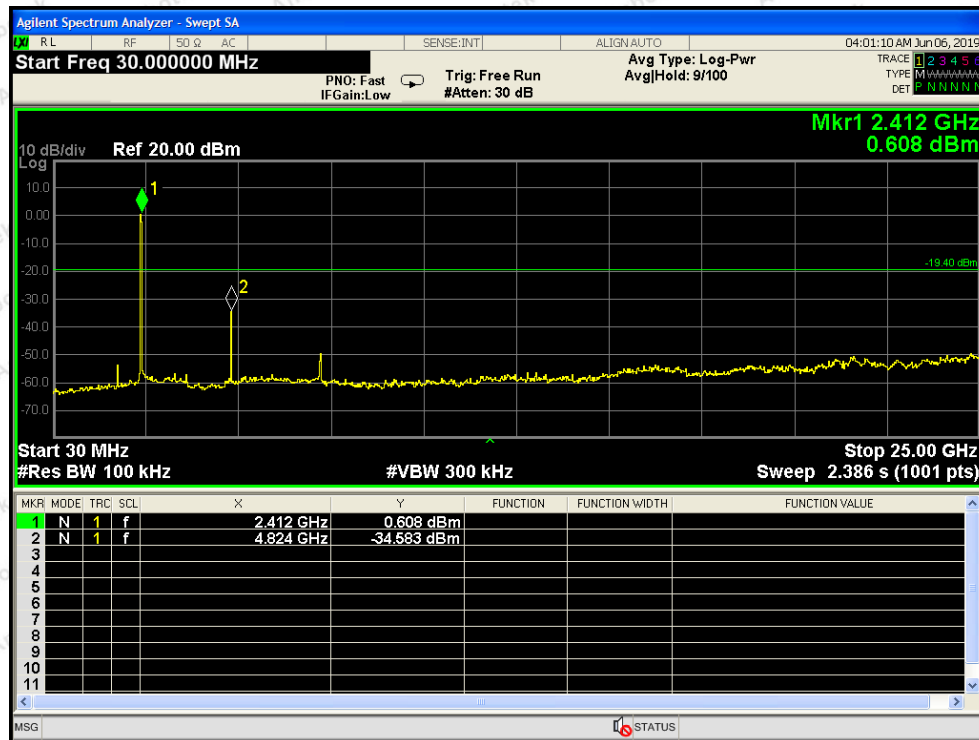


802.11n20 mode : Lowest

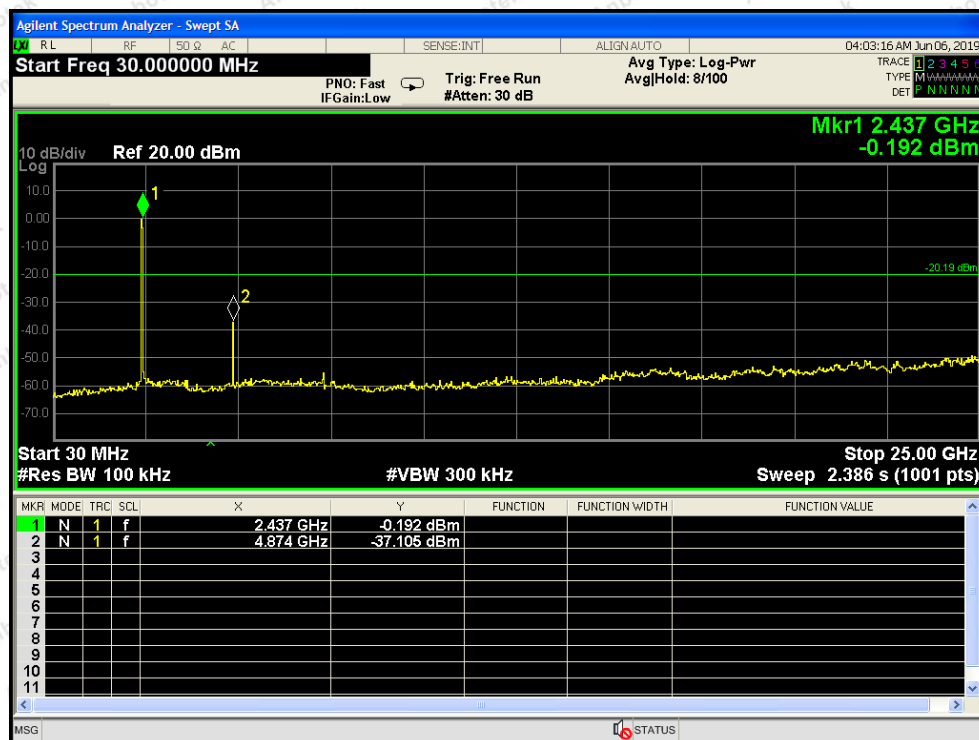


802.11n20 mode : Highest

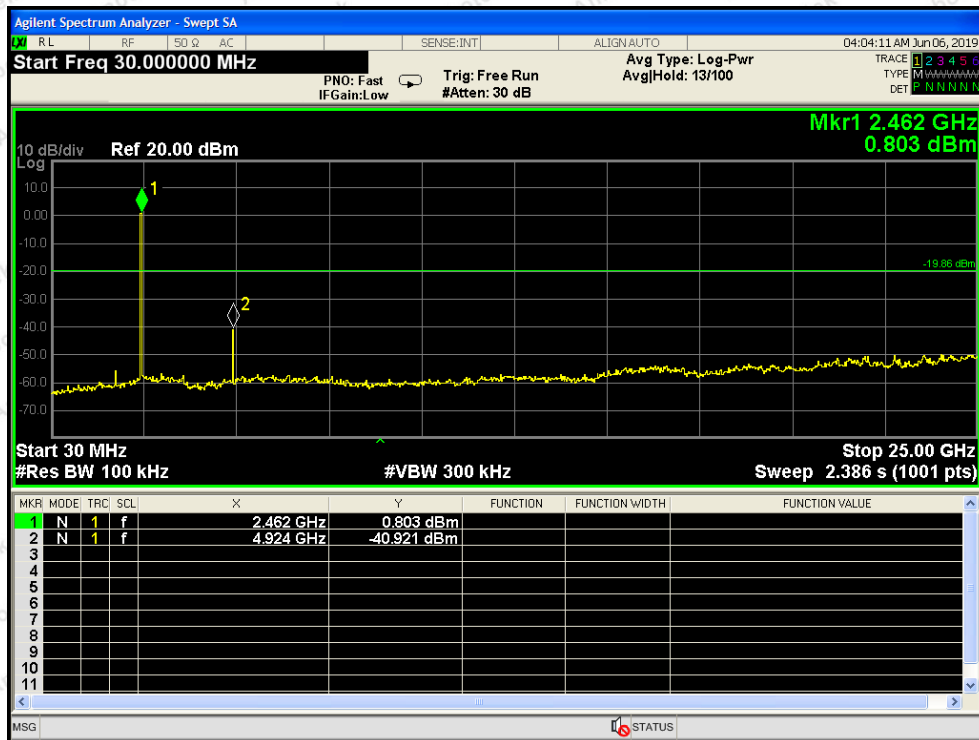
Conducted Emission Method



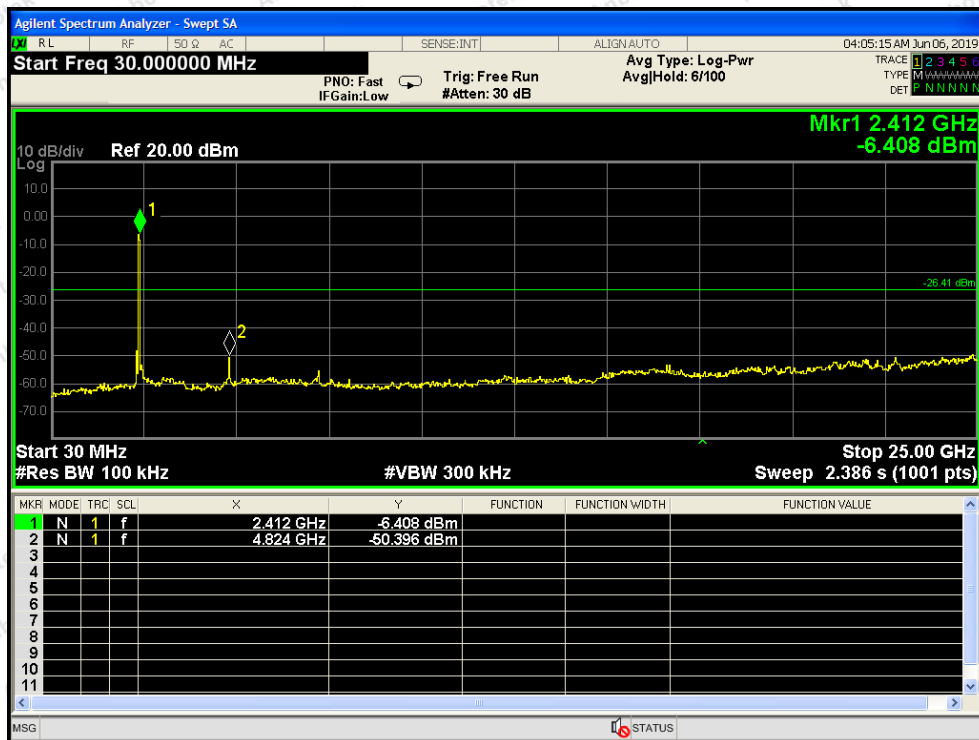
802.11b mode : Lowest



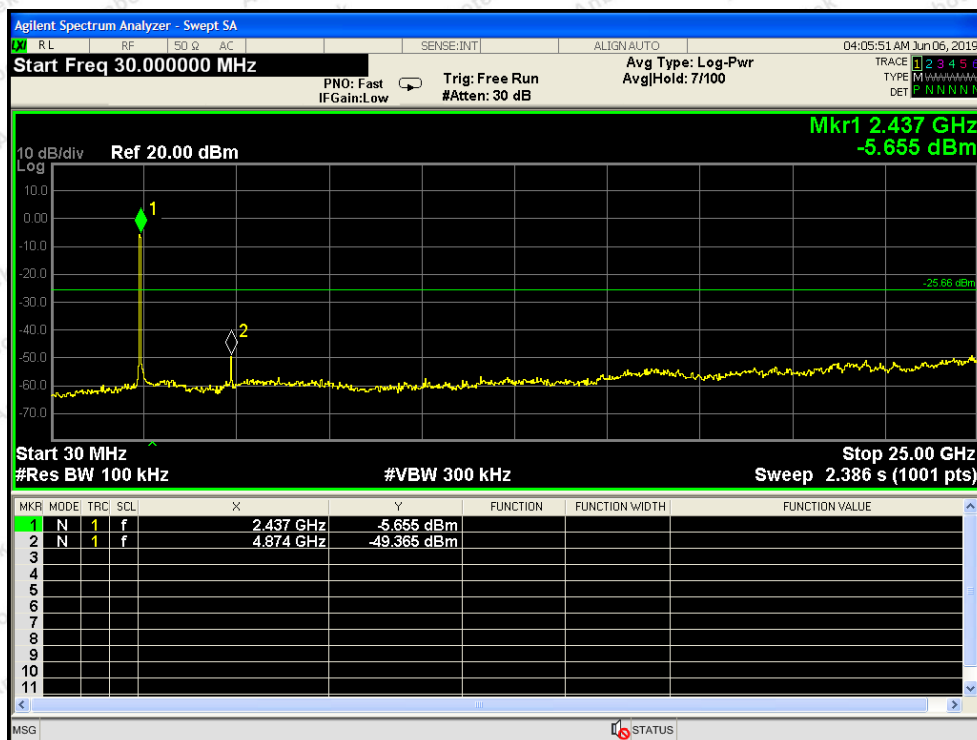
802.11b mode : Middle



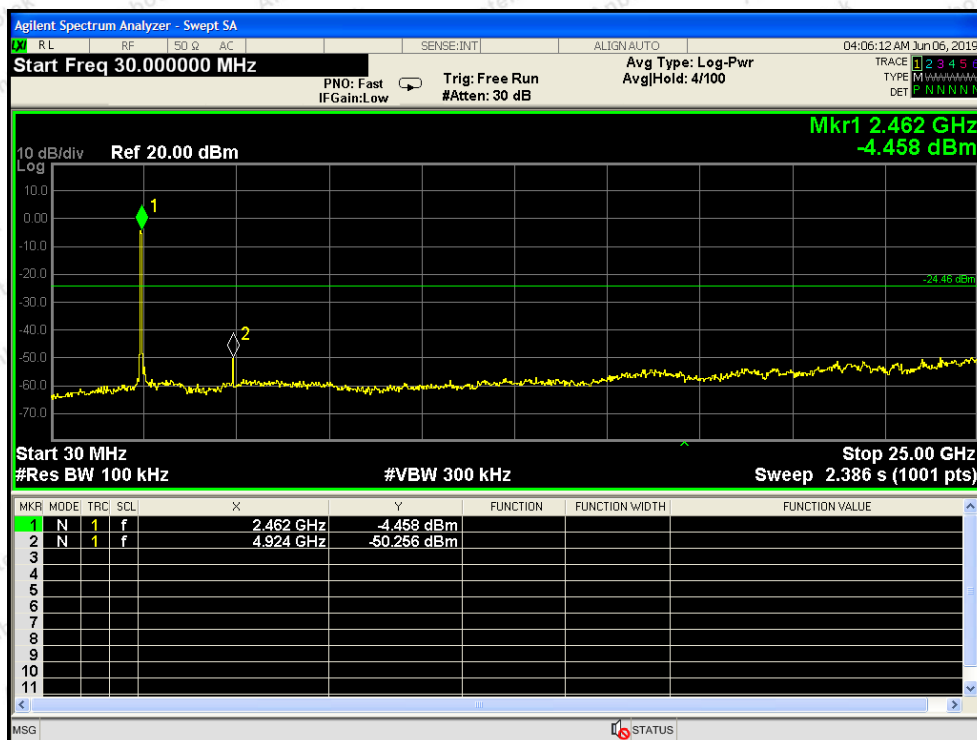
802.11b mode : Highest



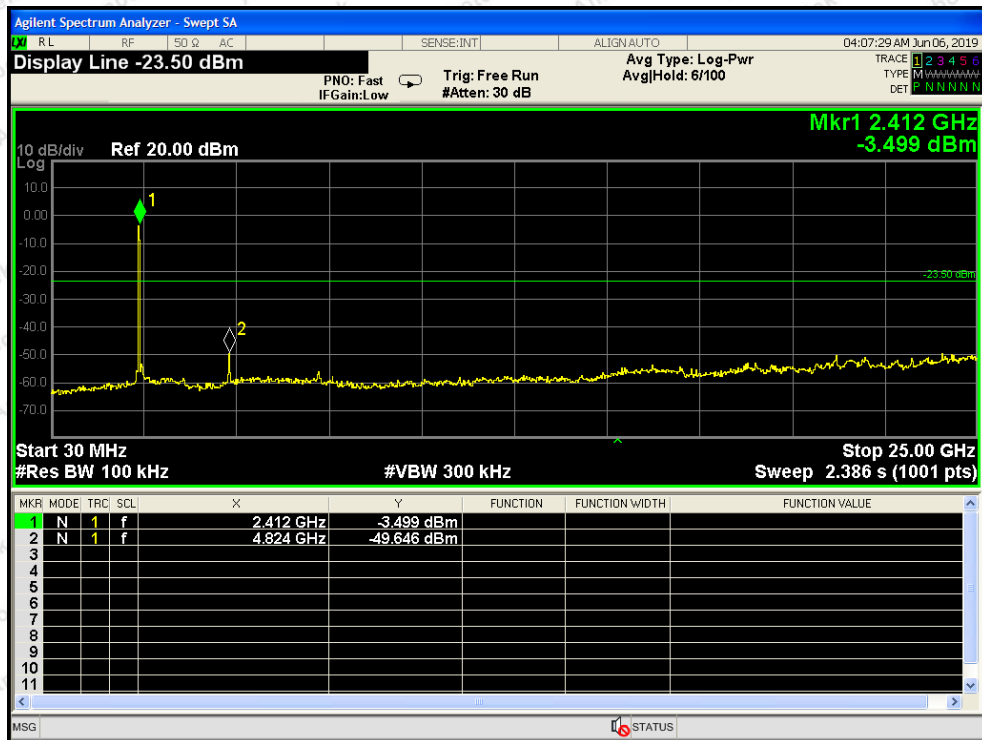
802.11g mode : Lowest



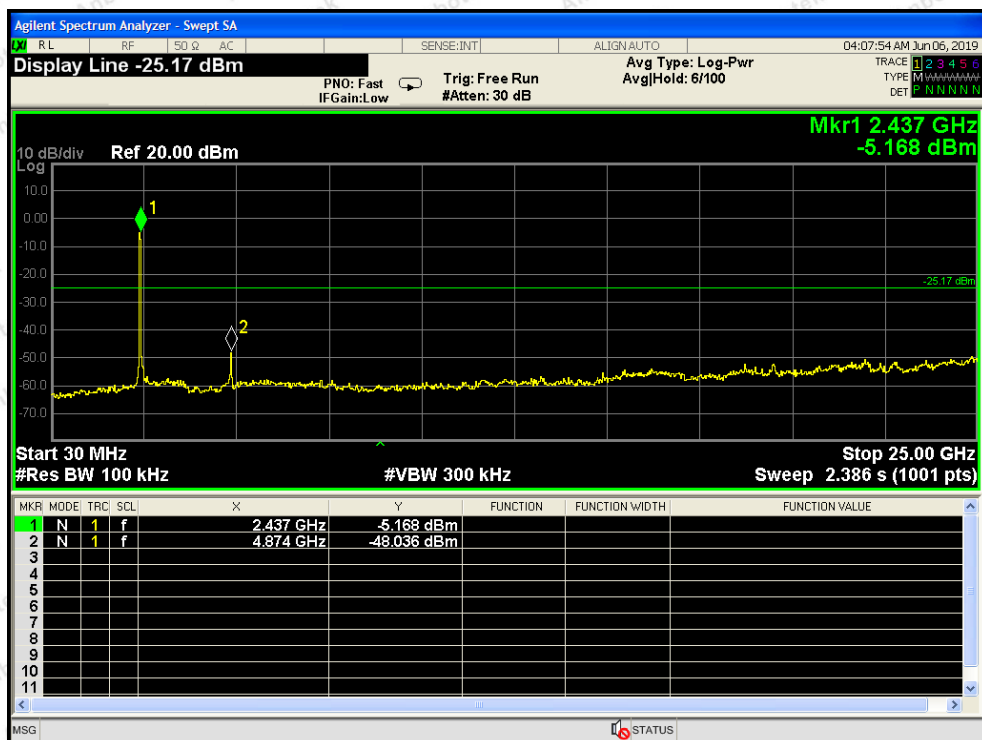
802.11g mode : Middle



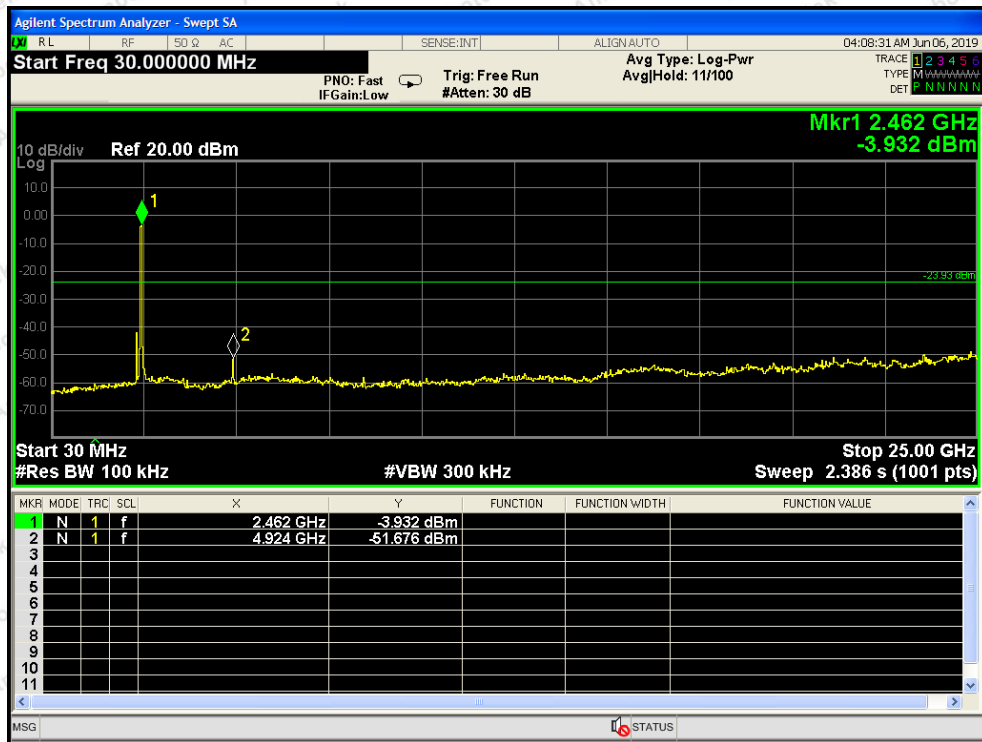
802.11g mode : Highest



802.11n20 mode : Lowest



802.11n20 mode : Middle



802.11n20 mode : Highest

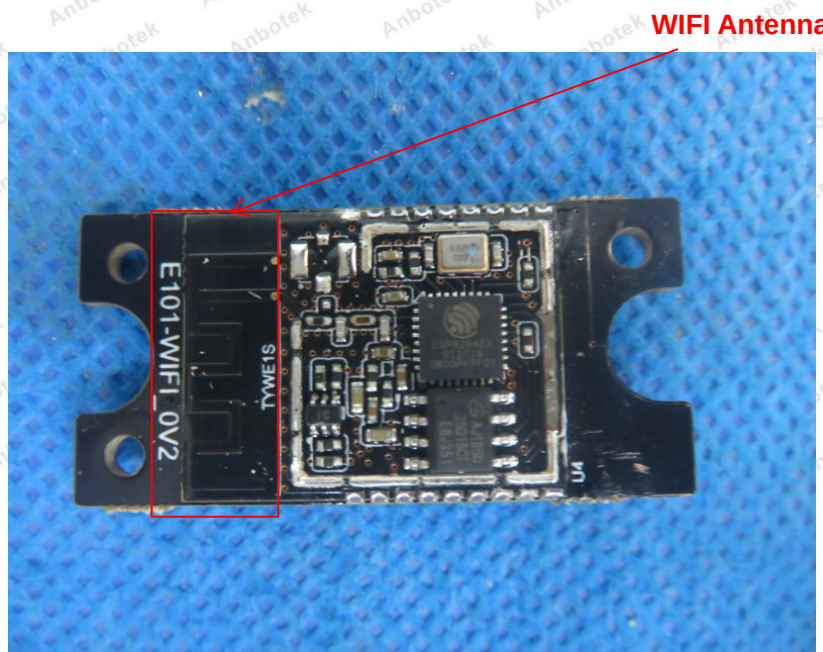
## 9. Antenna Requirement

### 9.1. Test Standard and Requirement

| Test Standard | FCC Part15 Section 15.203 /247(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Requirement   | <p>1) 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.</p> <p>2) 15.247(c) (1)(i) requirement:<br/>Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.</p> |

### 9.2. Antenna Connected Construction

The antenna is a PCB Antenna which permanently attached, and the best case gain of the antenna is 3 dBi It complies with the standard requirement.



## APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Power Line Conducted Emission Test



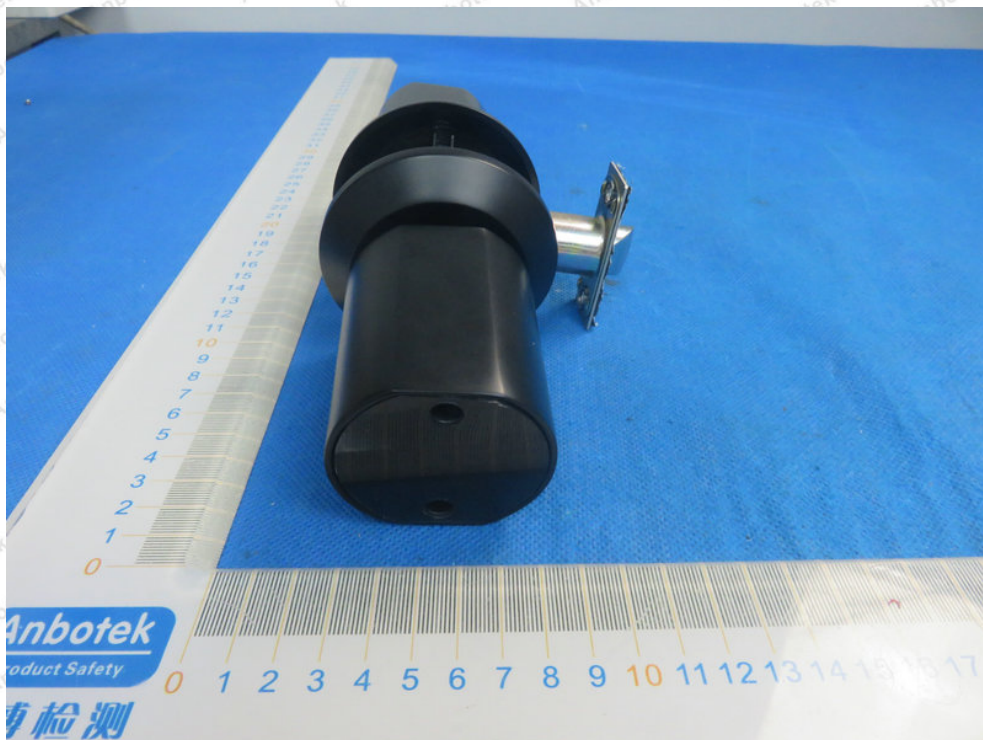
Photo of Radiation Emission Test

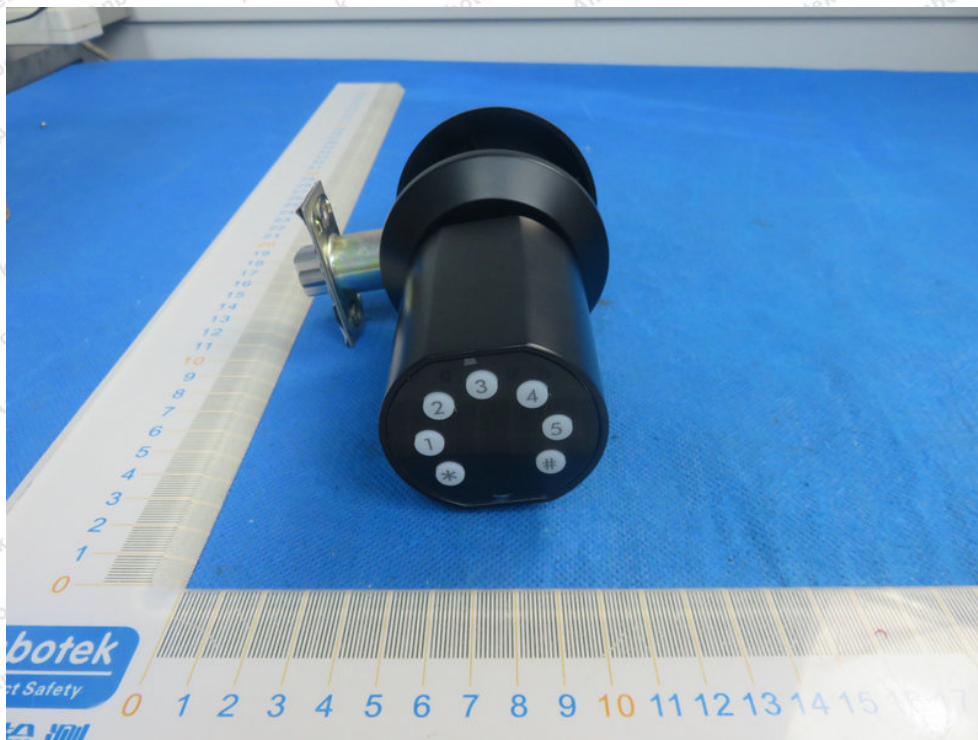




## APPENDIX II -- EXTERNAL PHOTOGRAPH

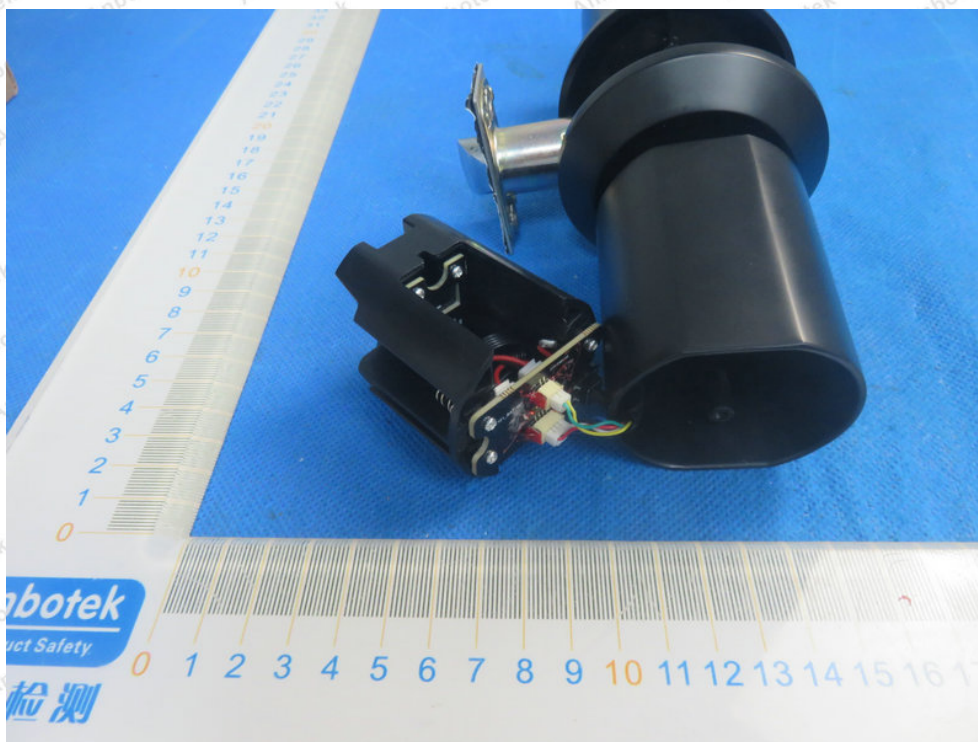


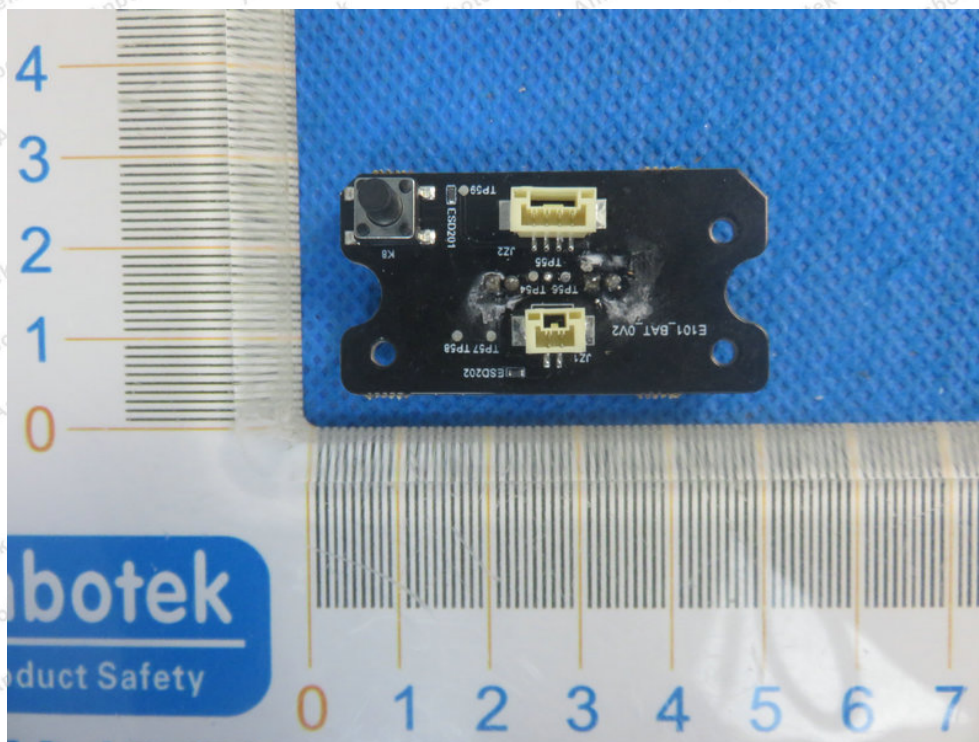
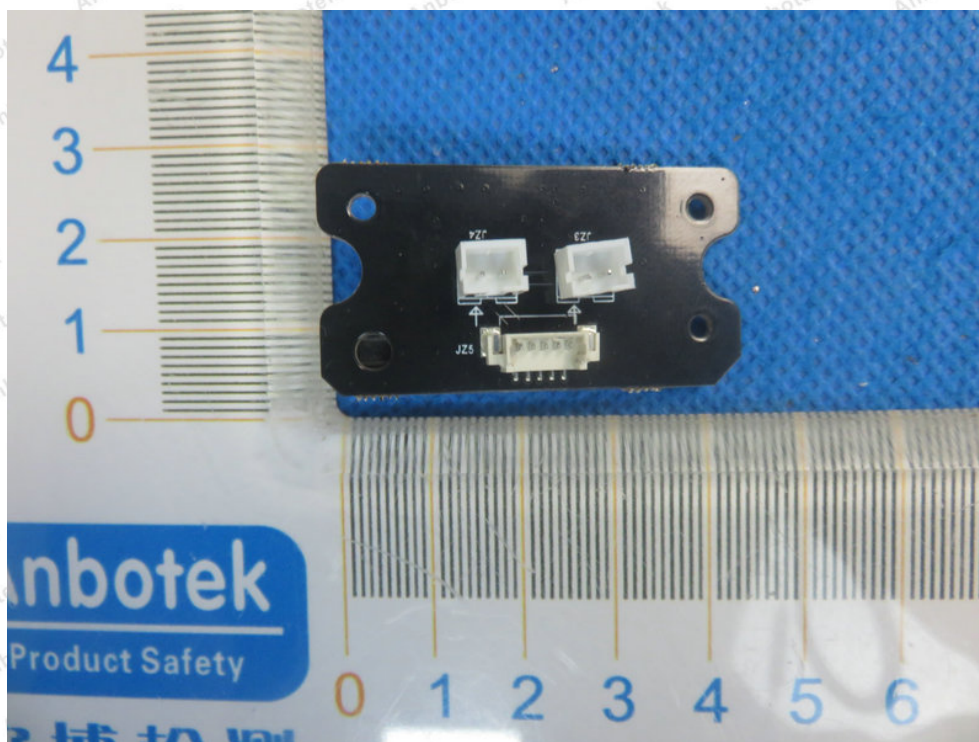


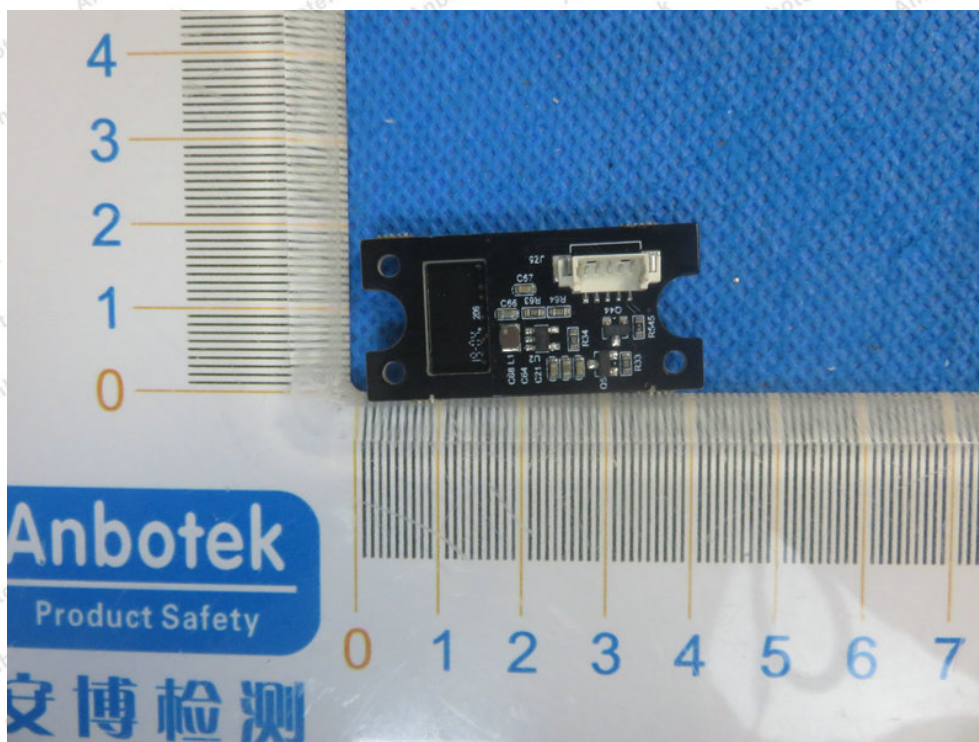


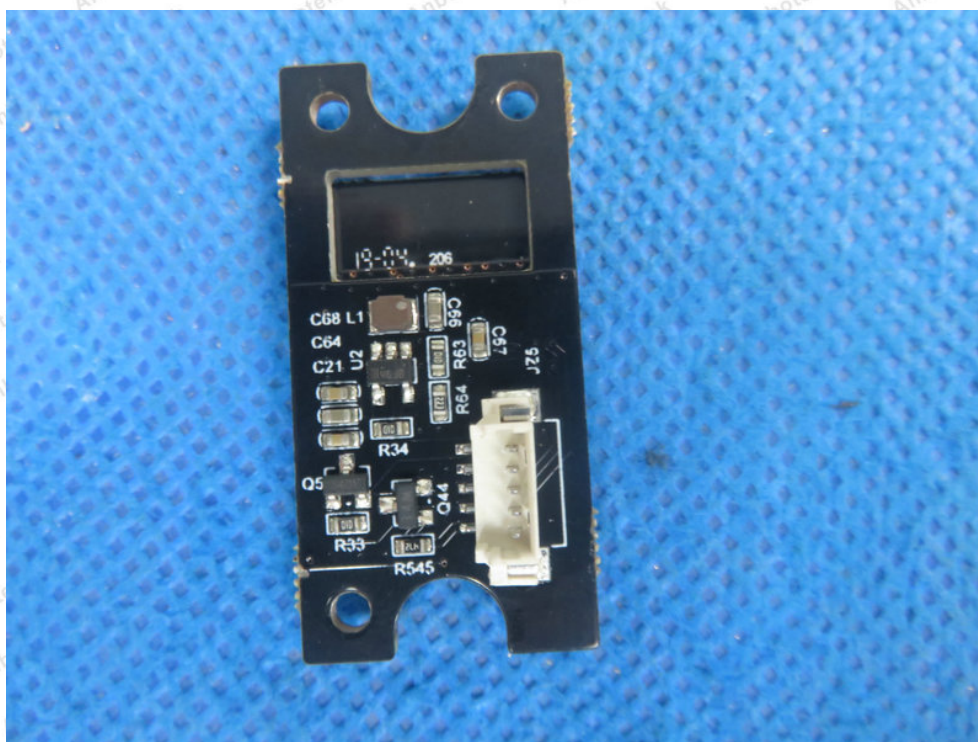
## APPENDIX III -- INTERNAL PHOTOGRAPH

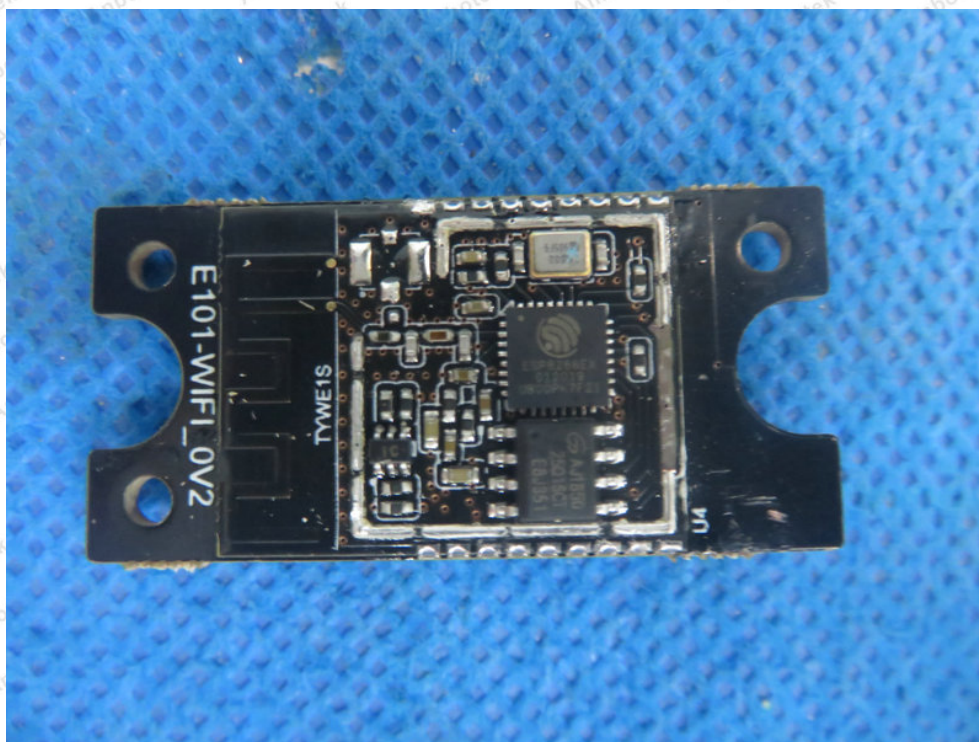


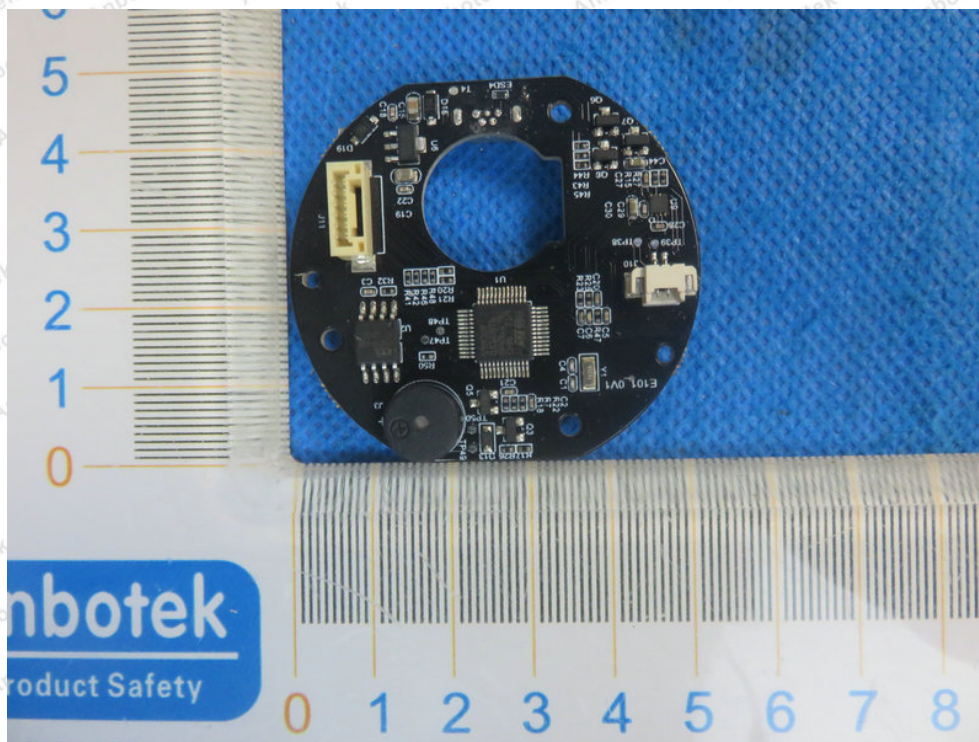
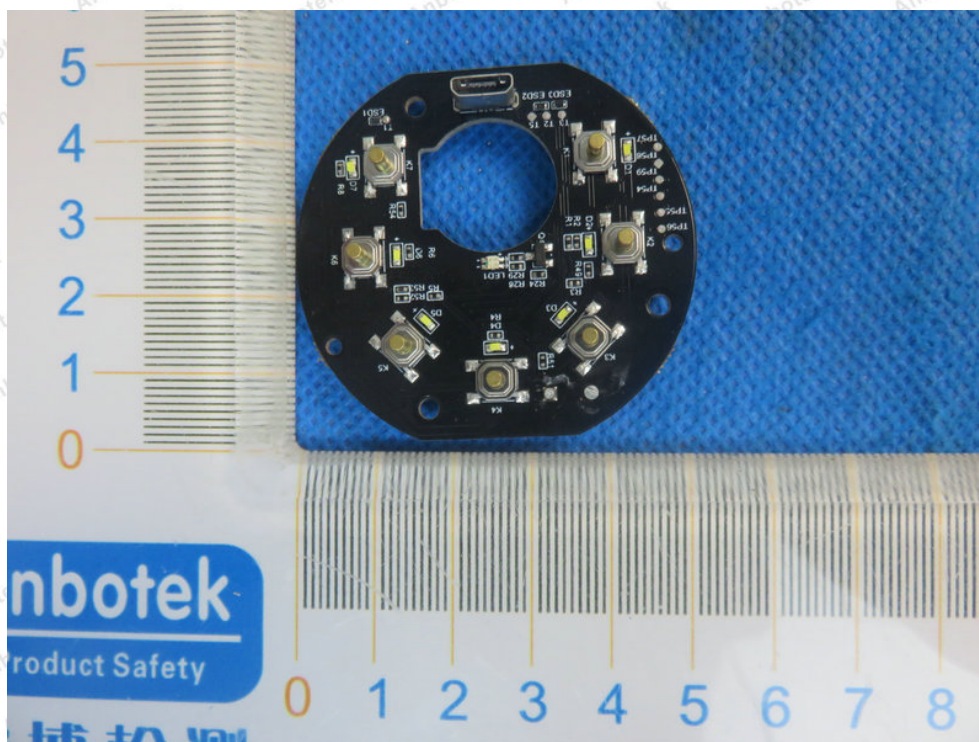


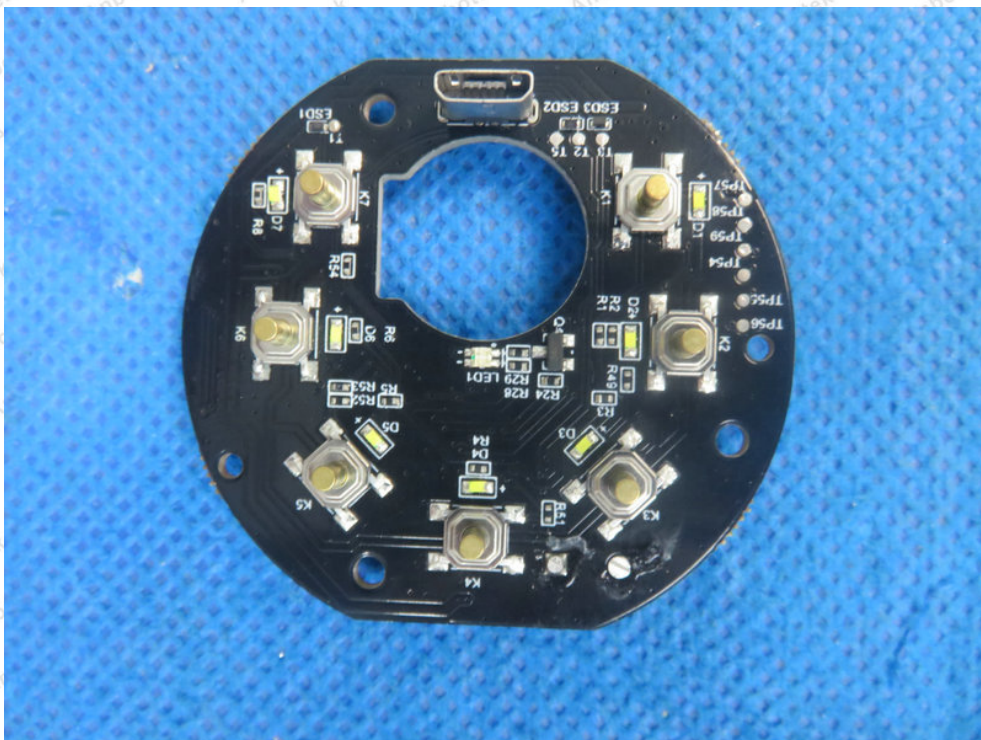
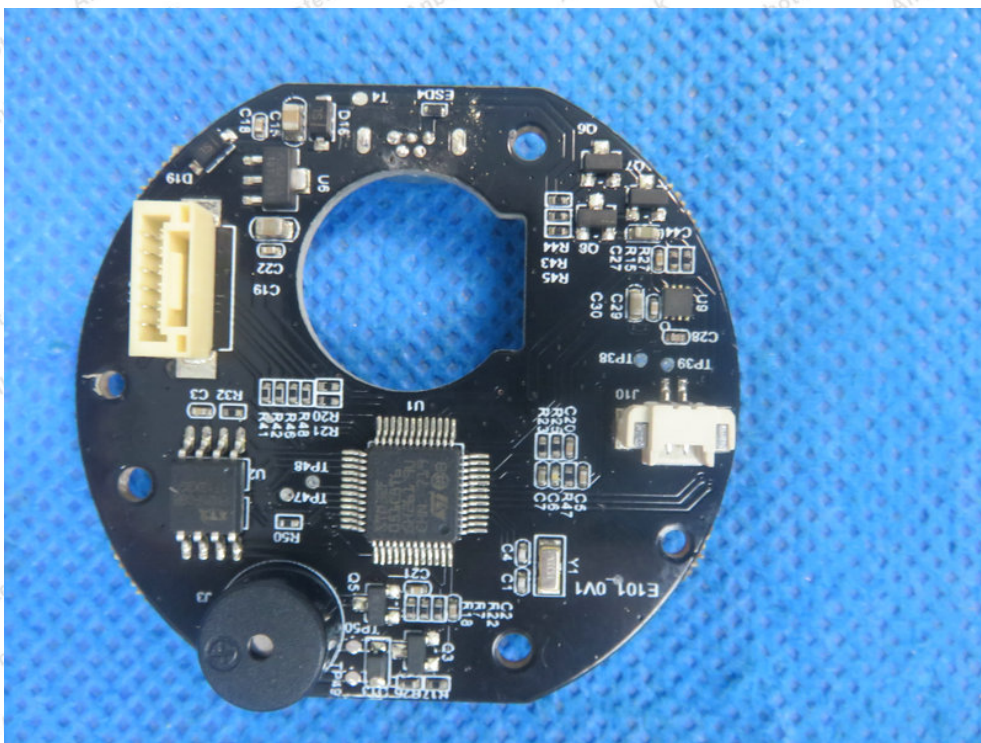












----- End of Report -----