



Shenzhen GUOREN Certification Technology Service Co., Ltd.

101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community,  
Fenghuang Street, Guangming District, Shenzhen, China

## FCC PART 15 SUBPART C TEST REPORT

### FCC PART 15.247

Report Reference No..... : GRCTR221202015-01

FCC ID..... : 2A7EH-F1

Compiled by

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Date of issue..... : Feb. 10, 2023

Testing Laboratory Name..... : Shenzhen GUOREN Certification Technology Service Co., Ltd.

Address..... : 101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

Applicant's name..... : Shenzhen Sanjiang Lechuang Technology Co., Ltd.

Address..... : Area 401B, 4th Floor, Building A7, No. 416, Xuegang North Road, Qinghu Community, Longhua Street, Longhua District, Shenzhen, Guangdong, China

Test specification..... :

Standard..... : FCC Part 15.247

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Test item description..... : VANTRUE Falcon 1 4K+1080P Dual Dashcam

Trade Mark..... : /

Manufacturer..... : Shenzhen Sanjiang Lechuang Technology Co., Ltd.

Model/Type reference..... : F1

Listed Models ..... : F1 Lite, F2

Modulation Type..... : CCK/DSSS/ OFDM

Operation Frequency..... : From 2412 - 2462MHz

Rating..... : DC 12V

Result..... : **PASS**

## TEST REPORT

Equipment under Test : VANTRUE Falcon 1 4K+1080P Dual Dashcam

Model /Type : F1

Listed Models : F1 Lite, F2

Applicant : **Shenzhen Sanjiang Lechuang Technology Co., Ltd.**

Address : Area 401B, 4th Floor, Building A7, No. 416, Xuegang North Road,  
Qinghu Community, Longhua Street, Longhua District, Shenzhen,  
Guangdong, China

Manufacturer : **Shenzhen Sanjiang Lechuang Technology Co., Ltd.**

Address : Area 401B, 4th Floor, Building A7, No. 416, Xuegang North Road,  
Qinghu Community, Longhua Street, Longhua District, Shenzhen,  
Guangdong, China

|                     |             |
|---------------------|-------------|
| <b>Test Result:</b> | <b>PASS</b> |
|---------------------|-------------|

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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# **1 TEST STANDARDS**

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB558074 D01 v05r02](#): Guidance for Compliance Measurements on Digital Transmission Systems (DTS) ,Frequency Hopping Spread Spectrum System(HFSS), and Hybrid System Devices Operating Under §15.247 of The FCC rules.

## 2 SUMMARY

### 2.1 General Remarks

|                                |   |               |
|--------------------------------|---|---------------|
| Date of receipt of test sample | : | Dec. 26, 2022 |
| Testing commenced on           | : | Dec. 26, 2022 |
| Testing concluded on           | : | Feb. 10, 2023 |

### 2.2 Product Description

|                                                                                                                                                                                                                                                       |                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Product Name:                                                                                                                                                                                                                                         | VANTRUE Falcon 1 4K+1080P Dual Dashcam                                                                                            |
| Model/Type reference:                                                                                                                                                                                                                                 | F1                                                                                                                                |
| Listed Models                                                                                                                                                                                                                                         | F1 Lite, F2(The products are identical in interior structure, electrical circuits and components, just model names is different.) |
| Power supply:                                                                                                                                                                                                                                         | DC 12V                                                                                                                            |
| testing sample ID:                                                                                                                                                                                                                                    | GRCTS221202015-1# (Engineer sample),<br>GRCTS221202015-2# (Normal sample)                                                         |
| Firmware Version.....                                                                                                                                                                                                                                 | V1.0                                                                                                                              |
| Hardware Version.....                                                                                                                                                                                                                                 | V1.0                                                                                                                              |
| <b>WIFI :</b>                                                                                                                                                                                                                                         |                                                                                                                                   |
| Supported type:                                                                                                                                                                                                                                       | 802.11b/802.11g/802.11n(H20) /802.11n(H40)                                                                                        |
| Modulation:                                                                                                                                                                                                                                           | 802.11b: DSSS<br>802.11g/802.11n(H20) /802.11n(H40): OFDM                                                                         |
| Operation frequency:                                                                                                                                                                                                                                  | 802.11b/802.11g/802.11n(H20): 2412MHz~2462MHz<br>802.11n(H40): 2422MHz~2452MHz                                                    |
| Channel number:                                                                                                                                                                                                                                       | 802.11b/802.11g/802.11n(H20): 11<br>802.11n(H40): 7                                                                               |
| Channel separation:                                                                                                                                                                                                                                   | 5MHz                                                                                                                              |
| Antenna type:                                                                                                                                                                                                                                         | FPC antenna                                                                                                                       |
| Antenna gain* ( Supplied by the customer ) :                                                                                                                                                                                                          | 3.54 dBi                                                                                                                          |
| Remark:*When the information provided by the customer was used to calculate test results, if the information provided by the customer is not accurate, shenzhen GUOREN Certification Technology Service Co., Ltd. does not assume any responsibility. |                                                                                                                                   |

### 2.3 Short description of the Equipment under Test (EUT)

This is a VANTRUE Falcon 1 4K+1080P Dual Dashcam.  
For more details, refer to the user's manual of the EUT.

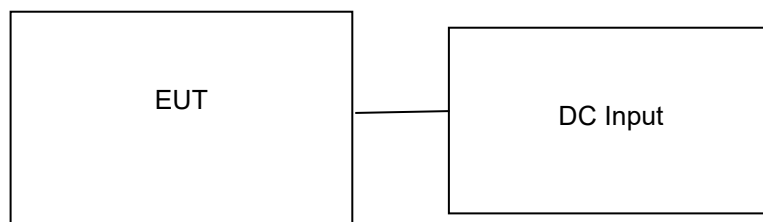
## 2.4 EUT operation mode

The Applicant provides communication tools software(RtlBluetoothMP) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) for testing meet KDB558074 test requirement.

IEEE 802.11b/g/n H20/n H40: Thirteen channels are provided to the EUT.

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---------|----------------|---------|----------------|
| 1       | 2412           | 8       | 2447           |
| 2       | 2417           | 9       | 2452           |
| 3       | 2422           | 10      | 2457           |
| 4       | 2427           | 11      | 2462           |
| 5       | 2432           |         |                |
| 6       | 2437           |         |                |
| 7       | 2442           |         |                |

## 2.5 Block Diagram of Test Setup



## 2.6 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.7 Modifications

No modifications were implemented to meet testing criteria.

### **3 TEST ENVIRONMENT**

#### **3.1 Address of the test laboratory**

**Shenzhen GUOREN Certification Technology Service Co., Ltd.**

101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

#### **3.2 Test Facility**

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

**FCC-Registration No.: 920798 Designation Number: CN1304**

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

**A2LA-Lab Cert. No.: 6202.01**

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

**ISED#: 27264 CAB identifier: CN0115**

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

**CNAS-Lab Code: L15631**

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories for the Competence of Testing and Calibration Laboratories.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

#### **3.3 Environmental conditions**

During the measurement the environmental conditions were within the listed ranges:

|                     |              |
|---------------------|--------------|
| Normal Temperature: | 15-35 °C     |
| Relative Humidity   | 30-60 %      |
| Air Pressure        | 950-1050mbar |

### 3.4 Test Description

|                                 |                                |      |
|---------------------------------|--------------------------------|------|
| FCC PART 15.247                 |                                |      |
| FCC Part 15.207                 | AC Power Conducted Emission    | N/A  |
| FCC Part 15.247(a)(2)           | 6dB Bandwidth                  | PASS |
| FCC Part 15.247(d)              | Spurious RF Conducted Emission | PASS |
| FCC Part 15.247(b)              | Maximum Conducted Output Power | PASS |
| FCC Part 15.247(e)              | Power Spectral Density         | PASS |
| FCC Part 15.109/ 15.205/ 15.209 | Radiated Emissions             | PASS |
| FCC Part 15.247(d)              | Band Edge                      | PASS |
| FCC Part 15.203/15.247 (b)      | Antenna Requirement            | PASS |

#### Data Rate Used:

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

| Test Items                                                                                                                                                                               | Mode            | Data Rate | Channel |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------|---------|
| Maximum Peak Conducted Output Power<br>Power Spectral Density<br>6dB Bandwidth<br>Spurious RF conducted emission<br>Radiated Emission 9KHz~1GHz&<br>Radiated Emission 1GHz~10th Harmonic | 11b/DSSS        | 1 Mbps    | 1/6/11  |
|                                                                                                                                                                                          | 11g/OFDM        | 6 Mbps    | 1/6/11  |
|                                                                                                                                                                                          | 11n(20MHz)/OFDM | 6.5Mbps   | 1/6/11  |
|                                                                                                                                                                                          | 11n(40MHz)/OFDM | 13.5Mbps  | 3/6/9   |
| Band Edge                                                                                                                                                                                | 11b/DSSS        | 1 Mbps    | 1/11    |
|                                                                                                                                                                                          | 11g/OFDM        | 6 Mbps    | 1/11    |
|                                                                                                                                                                                          | 11n(20MHz)/OFDM | 6.5Mbps   | 1/11    |
|                                                                                                                                                                                          | 11n(40MHz)/OFDM | 13.5Mbps  | 3/6/9   |

### 3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen GUOREN Certification Technology Service Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GUOREN Certification Technology Service Co., Ltd.:

| Test                  | Range      | Measurement Uncertainty | Notes |
|-----------------------|------------|-------------------------|-------|
| Radiated Emission     | 30~1000MHz | 4.06 dB                 | (1)   |
| Radiated Emission     | 1~18GHz    | 5.14 dB                 | (1)   |
| Radiated Emission     | 18-40GHz   | 5.38 dB                 | (1)   |
| Conducted Disturbance | 0.15~30MHz | 2.14 dB                 | (1)   |

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

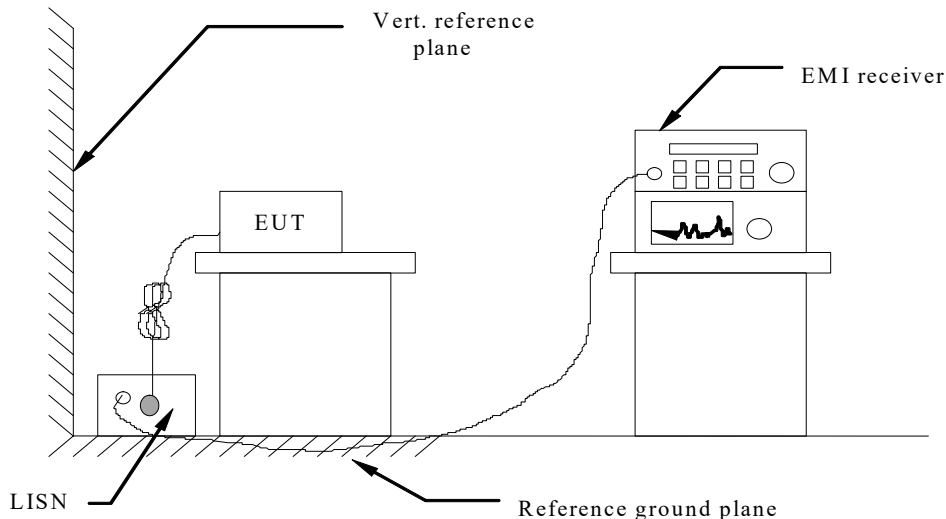
### 3.6 Equipments Used during the Test

| Test Equipment             | Manufacturer           | Model No.   | Equipment No. | Calibration Date | Calibration Due Date |
|----------------------------|------------------------|-------------|---------------|------------------|----------------------|
| LISN                       | R&S                    | ENV216      | GRCTEE009     | 2022/10/12       | 2023/10/11           |
| LISN                       | R&S                    | ENV216      | GRCTEE010     | 2022/10/12       | 2023/10/11           |
| EMI Test Receiver          | R&S                    | ESPI        | GRCTEE017     | 2022/10/12       | 2023/10/11           |
| EMI Test Receiver          | R&S                    | ESCI        | GRCTEE008     | 2022/10/12       | 2023/10/11           |
| Spectrum Analyzer          | Agilent                | N9020A      | GRCTEE002     | 2022/10/12       | 2023/10/11           |
| Spectrum Analyzer          | R&S                    | FSP         | GRCTEE003     | 2022/10/12       | 2023/10/11           |
| Vector Signal generator    | Agilent                | N5181A      | GRCTEE007     | 2022/10/12       | 2023/10/11           |
| Analog Signal Generator    | R&S                    | SML03       | GRCTEE006     | 2022/10/12       | 2023/10/11           |
| Climate Chamber            | QIYA                   | LCD-9530    | GRCTES016     | 2022/10/12       | 2023/10/11           |
| Ultra-Broadband Antenna    | Schwarzbeck            | VULB9163    | GRCTEE018     | 2020/10/25       | 2023/10/24           |
| Horn Antenna               | Schwarzbeck            | BBHA 9120D  | GRCTEE019     | 2020/10/25       | 2023/10/24           |
| Loop Antenna               | Zhinan                 | ZN30900C    | GRCTEE020     | 2020/10/25       | 2023/10/24           |
| Horn Antenna               | Beijing Hangwei Dayang | OBH100400   | GRCTEE049     | 2021/1/18        | 2024/1/17            |
| Amplifier                  | Schwarzbeck            | BBV 9745    | GRCTEE021     | 2022/10/12       | 2023/10/11           |
| Amplifier                  | Taiwan chengyi         | EMC051845B  | GRCTEE022     | 2022/10/12       | 2023/10/11           |
| Temperature/Humidity Meter | Huaguan                | HG-308      | GRCTES037     | 2022/10/12       | 2023/10/11           |
| Directional coupler        | NARDA                  | 4226-10     | GRCTEE004     | 2022/10/12       | 2023/10/11           |
| High-Pass Filter           | XingBo                 | XBLBQ-GTA18 | GRCTEE053     | 2022/10/12       | 2023/10/11           |
| High-Pass Filter           | XingBo                 | XBLBQ-GTA27 | GRCTEE054     | 2022/10/12       | 2023/10/11           |
| Automated filter bank      | Tonscend               | JS0806-F    | GRCTEE055     | 2022/10/12       | 2023/10/11           |
| Power Sensor               | Agilent                | U2021XA     | GRCTEE070     | 2022/10/12       | 2023/10/11           |
| EMI Test Software          | ROHDE & SCHWARZ        | ESK1-V1.71  | GRCTEE060     | N/A              | N/A                  |
| EMI Test Software          | Fera                   | EZ-EMC      | GRCTEE061     | N/A              | N/A                  |

## 4 TEST CONDITIONS AND RESULTS

### 4.1 AC Power Conducted Emission

#### TEST CONFIGURATION



#### TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- 4 The EUT received power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

#### AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following:

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

\* Decreases with the logarithm of the frequency.

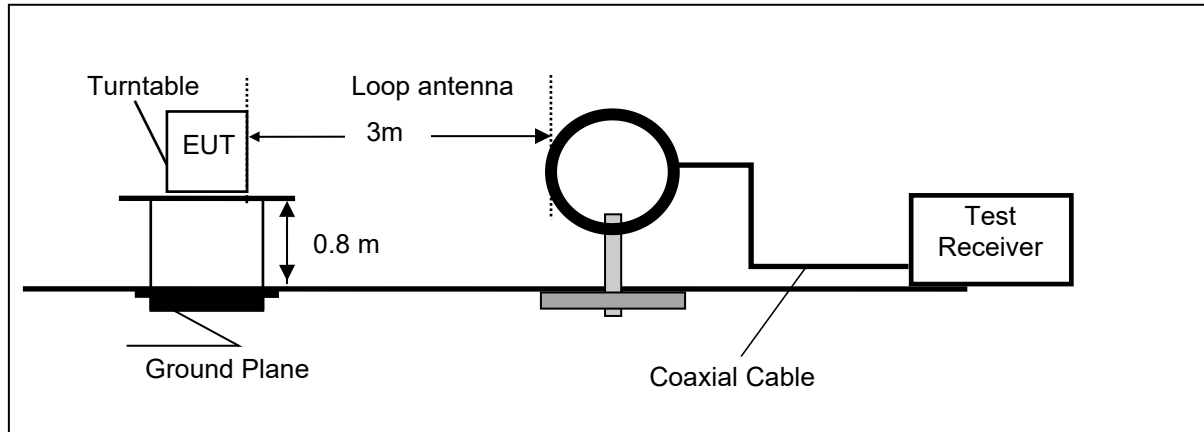
#### TEST RESULTS

The EUT is powered by car battery, so this test item is not applicable for the EUT.

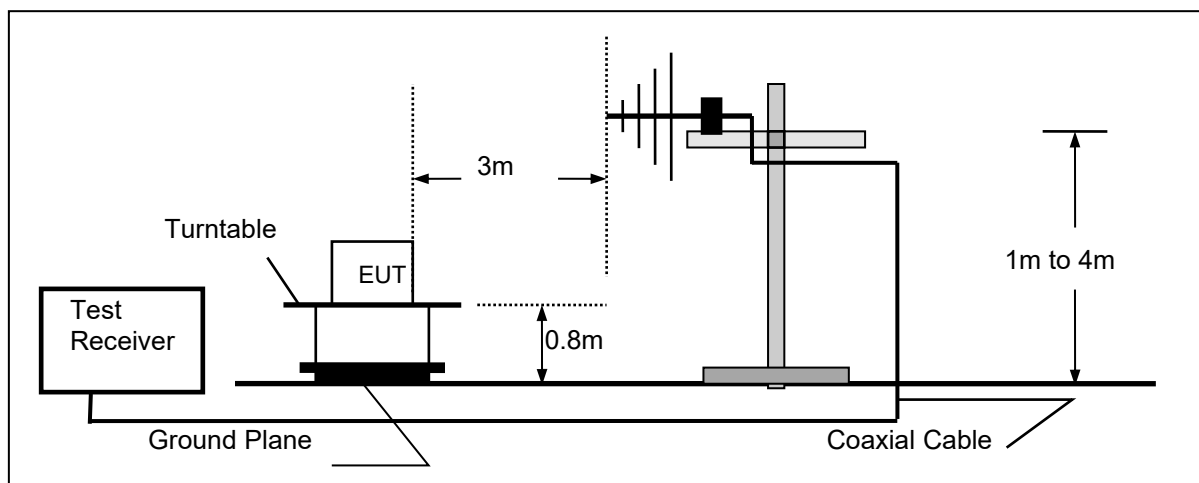
## 4.2 Radiated Emission

### TEST CONFIGURATION

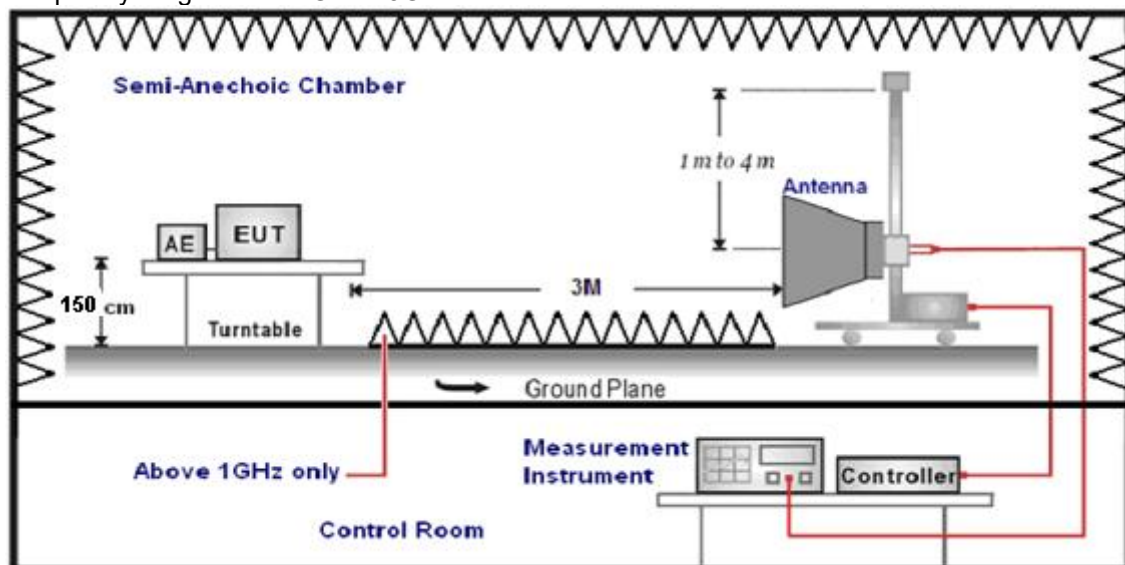
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



**TEST PROCEDURE**

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz, the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type          | Test Distance |
|----------------------|----------------------------|---------------|
| 9KHz-30MHz           | Active Loop Antenna        | 3             |
| 30MHz-1GHz           | Ultra-Broadband Antenna    | 3             |
| 1GHz-18GHz           | Double Ridged Horn Antenna | 3             |
| 18GHz-25GHz          | Horn Antenna               | 1             |

7. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting                                                                            | Detector |
|----------------------|-----------------------------------------------------------------------------------------------------------|----------|
| 9KHz-150KHz          | RBW=200Hz/VBW=3KHz, Sweep time=Auto                                                                       | QP       |
| 150KHz-30MHz         | RBW=9KHz/VBW=100KHz, Sweep time=Auto                                                                      | QP       |
| 30MHz-1GHz           | RBW=120KHz/VBW=1000KHz, Sweep time=Auto                                                                   | QP       |
| 1GHz-40GHz           | Peak Value: RBW=1MHz/VBW=3MHz,<br>Sweep time=Auto<br>Average Value: RBW=1MHz/VBW=10Hz,<br>Sweep time=Auto | Peak     |

**Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

|                           |                                            |
|---------------------------|--------------------------------------------|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude    | AG = Amplifier Gain                        |
| AF = Antenna Factor       |                                            |

$$\text{Transd} = AF + CL - AG$$

**RADIATION LIMIT**

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT 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 desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

| Frequency (MHz) | Distance (Meters) | Radiated (dBµV/m)                            | Radiated (µV/m)       |
|-----------------|-------------------|----------------------------------------------|-----------------------|
| 0.009-0.49      | 3                 | $20\log(2400/F(\text{KHz})) + 40\log(300/3)$ | $2400/F(\text{KHz})$  |
| 0.49-1.705      | 3                 | $20\log(24000/F(\text{KHz})) + 40\log(30/3)$ | $24000/F(\text{KHz})$ |
| 1.705-30        | 3                 | $20\log(30) + 40\log(30/3)$                  | 30                    |
| 30-88           | 3                 | 40.0                                         | 100                   |
| 88-216          | 3                 | 43.5                                         | 150                   |
| 216-960         | 3                 | 46.0                                         | 200                   |
| Above 960       | 3                 | 54.0                                         | 500                   |

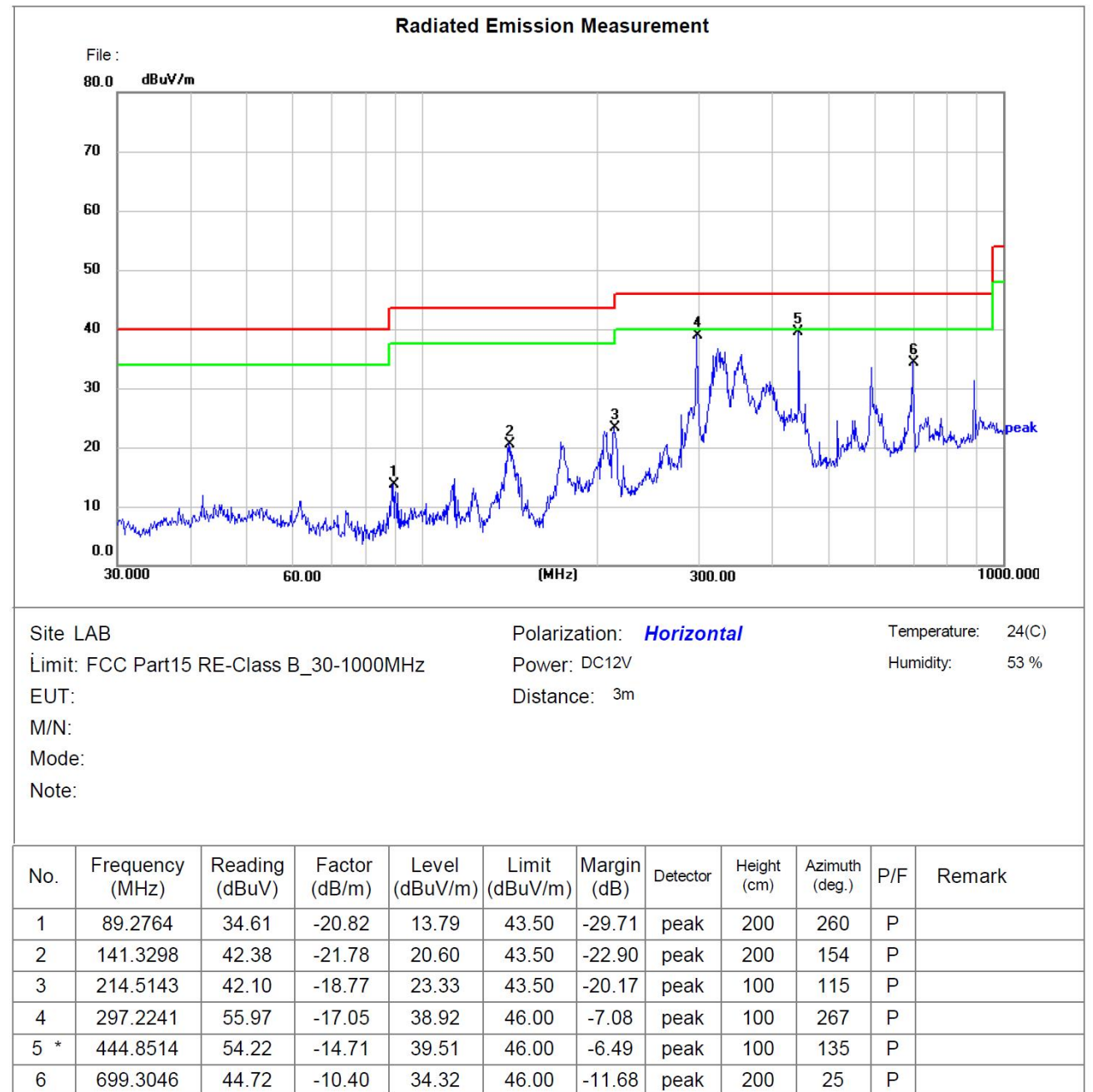
## TEST RESULTS

Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. All three channels (lowest/middle/highest) of each mode were measured below 1GHz and recorded worst case at 802.11b low channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

### For 30MHz-1GHz

Horizontal



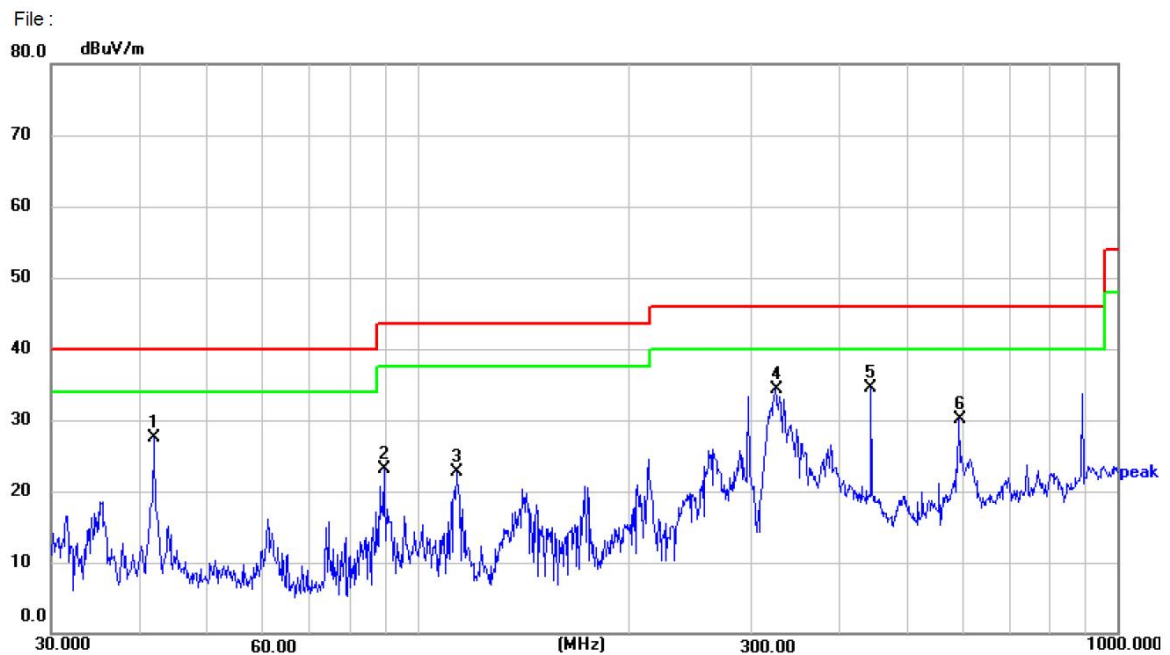
Note:1).Level (dBuV/m)= Reading (dBuV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Level (dBuV/m) - Limit (dBuV/m)

## Vertical

## Radiated Emission Measurement



Site LAB

Polarization: **Vertical**

Temperature: 24(C)

Limit: FCC Part15 RE-Class B\_30-1000MHz

Power: DC12V

Humidity: 53 %

EUT:

Distance: 3m

M/N:

Mode:

Note:

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|-------------|----------------|-----|--------|
| 1   | 42.0066         | 45.57          | -18.09        | 27.48          | 40.00          | -12.52      | peak     | 100         | 211            | P   |        |
| 2   | 89.5899         | 43.79          | -20.74        | 23.05          | 43.50          | -20.45      | peak     | 100         | 258            | P   |        |
| 3   | 113.7143        | 42.28          | -19.57        | 22.71          | 43.50          | -20.79      | peak     | 100         | 119            | P   |        |
| 4   | 324.4561        | 51.01          | -16.68        | 34.33          | 46.00          | -11.67      | peak     | 100         | 142            | P   |        |
| 5 * | 444.8514        | 49.20          | -14.71        | 34.49          | 46.00          | -11.51      | peak     | 100         | 280            | P   |        |
| 6   | 593.0497        | 41.13          | -11.07        | 30.06          | 46.00          | -15.94      | peak     | 100         | 73             | P   |        |

Note:1).Level (dBuV/m)= Reading (dBuV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Level (dBuV/m) - Limit (dBuV/m)

**For 1GHz to 25GHz**

*Note: 802.11b/802.11g/802.11n (H20)/802.11n (H40) Mode all have been tested, only worse case 802.11b mode is reported.*

**(above 1GHz)**

| Frequency(MHz): |                         |    | 2412           |             | Polarity:        |                       | HORIZONTAL        |                    |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4824.00         | 56.49                   | PK | 74             | 17.51       | 77.72            | 28.37                 | 5.1               | 54.7               | -21.23                   |
| 4824.00         | 45.16                   | AV | 54             | 8.84        | 66.39            | 28.37                 | 5.1               | 54.7               | -21.23                   |
| 7236.00         | 53.31                   | PK | 74             | 20.69       | 67.80            | 34.10                 | 6.42              | 55.01              | -14.49                   |
| 7236.00         | 42.87                   | AV | 54             | 11.13       | 57.36            | 34.10                 | 6.42              | 55.01              | -14.49                   |

| Frequency(MHz): |                         |    | 2412           |             | Polarity:        |                       | VERTICAL          |                    |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4824.00         | 56.72                   | PK | 74             | 17.28       | 77.95            | 28.37                 | 5.10              | 54.7               | -21.23                   |
| 4824.00         | 45.87                   | AV | 54             | 8.13        | 67.10            | 28.37                 | 5.10              | 54.7               | -21.23                   |
| 7236.00         | 53.48                   | PK | 74             | 20.52       | 67.97            | 34.10                 | 6.42              | 55.01              | -14.49                   |
| 7236.00         | 42.77                   | AV | 54             | 11.23       | 57.26            | 34.10                 | 6.42              | 55.01              | -14.49                   |

| Frequency(MHz): |                         |    | 2437           |             | Polarity:        |                       | HORIZONTAL        |                    |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4874.00         | 56.29                   | PK | 74             | 17.71       | 76.56            | 28.76                 | 5.35              | 54.38              | -20.27                   |
| 4874.00         | 45.52                   | AV | 54             | 8.48        | 65.79            | 28.76                 | 5.35              | 54.38              | -20.27                   |
| 7311.00         | 53.16                   | PK | 74             | 20.84       | 66.79            | 34.40                 | 6.83              | 54.86              | -13.63                   |
| 7311.00         | 42.84                   | AV | 54             | 11.16       | 56.47            | 34.40                 | 6.83              | 54.86              | -13.63                   |

| Frequency(MHz): |                         |    | 2437           |             | Polarity:        |                       | VERTICAL          |                    |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4874.00         | 57.14                   | PK | 74             | 16.86       | 77.41            | 28.76                 | 5.35              | 54.38              | -20.27                   |
| 4874.00         | 46.25                   | AV | 54             | 7.75        | 66.52            | 28.76                 | 5.35              | 54.38              | -20.27                   |
| 7311.00         | 54.61                   | PK | 74             | 19.39       | 68.24            | 34.40                 | 6.83              | 54.86              | -13.63                   |
| 7311.00         | 44.35                   | AV | 54             | 9.65        | 57.98            | 34.40                 | 6.83              | 54.86              | -13.63                   |

| Frequency(MHz): |                         |    | 2462           |             | Polarity:        |                       | HORIZONTAL        |                    |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4924.00         | 56.58                   | PK | 74             | 17.42       | 76.03            | 29.54                 | 5.66              | 54.65              | -19.45                   |
| 4924.00         | 45.74                   | AV | 54             | 8.26        | 65.19            | 29.54                 | 5.66              | 54.65              | -19.45                   |
| 7386.00         | 53.21                   | PK | 74             | 20.79       | 66.35            | 34.51                 | 7.25              | 54.9               | -13.14                   |
| 7386.00         | 42.75                   | PK | 54             | 11.25       | 55.89            | 34.51                 | 7.25              | 54.9               | -13.14                   |

| Frequency(MHz): |                         |    | 2462           |             | Polarity:        |                       | VERTICAL          |                    |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4924.00         | 56.68                   | PK | 74             | 17.32       | 76.13            | 29.54                 | 5.66              | 54.65              | -19.45                   |
| 4924.00         | 46.24                   | AV | 54             | 7.76        | 65.69            | 29.54                 | 5.66              | 54.65              | -19.45                   |
| 7386.00         | 53.37                   | PK | 74             | 20.63       | 66.51            | 34.51                 | 7.25              | 54.9               | -13.14                   |
| 7386.00         | 43.16                   | PK | 54             | 10.84       | 56.30            | 34.51                 | 7.25              | 54.9               | -13.14                   |

- 1) Emission level (dBuV/m) = Meter Reading+ antenna Factor+ cable loss- preamp factor.
- 2) Margin value = Limits-Emission level.
- 3) -- Mean the PK detector measured value is below average limit.
- 4) The other emission levels were very low against the limit.
- 5) RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

#### Results of Band Edges Test (Radiated)

Note: 802.11b/802.11g/802.11n (H20)/802.11n (H40) Mode all have been tested, only worse case 802.11b mode is reported.

| Frequency(MHz): |                         |    | 2412           |             | Polarity:        |                       | HORIZONTAL        |                    |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2390.00         | 53.26                   | PK | 74             | 20.74       | 77.98            | 25.72                 | 4.32              | 54.76              | -24.72                   |
| 2390.00         | 42.58                   | AV | 54             | 11.42       | 67.30            | 25.72                 | 4.32              | 54.76              | -24.72                   |
| Frequency(MHz): |                         |    | 2412           |             | Polarity:        |                       | VERTICAL          |                    |                          |
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2390.00         | 52.95                   | PK | 74             | 21.05       | 77.67            | 25.72                 | 4.32              | 54.76              | -24.72                   |
| 2390.00         | 42.47                   | AV | 54             | 11.53       | 67.19            | 25.72                 | 4.32              | 54.76              | -24.72                   |
| Frequency(MHz): |                         |    | 2462           |             | Polarity:        |                       | HORIZONTAL        |                    |                          |
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2483.50         | 53.08                   | PK | 74             | 20.92       | 77.65            | 25.78                 | 4.48              | 54.83              | -24.57                   |
| 2483.50         | 42.45                   | AV | 54             | 11.55       | 67.02            | 25.78                 | 4.48              | 54.83              | -24.57                   |
| Frequency(MHz): |                         |    | 2462           |             | Polarity:        |                       | VERTICAL          |                    |                          |
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2483.50         | 53.71                   | PK | 74             | 20.29       | 78.28            | 25.78                 | 4.48              | 54.83              | -24.57                   |
| 2483.50         | 42.63                   | AV | 54             | 11.37       | 67.20            | 25.78                 | 4.48              | 54.83              | -24.57                   |

Note:

- 1) Emission level (dBuV/m) = Meter Reading+ antenna Factor+ cable loss- preamp factor.
- 2) Margin value = Limits-Emission level.
- 3) -- Mean the PK detector measured value is below average limit.
- 4) The other emission levels were very low against the limit.
- 5) RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

### 4.3 Maximum Conducted Output Power

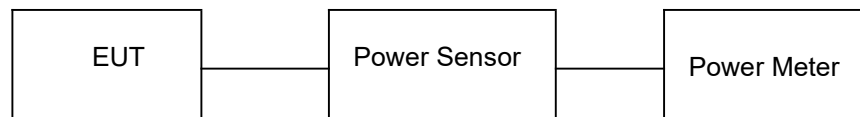
#### Limit

The Maximum Peak Output Power Measurement is 30dBm.

#### Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

#### Test Configuration



#### Test Results

| Type          | Channel | Output power PK (dBm) | Limit (dBm) | Result |
|---------------|---------|-----------------------|-------------|--------|
| 802.11b       | 01      | 15.47                 | 30.00       | Pass   |
|               | 06      | 15.76                 |             |        |
|               | 11      | 15.52                 |             |        |
| 802.11g       | 01      | 11.23                 | 30.00       | Pass   |
|               | 06      | 11.07                 |             |        |
|               | 11      | 11.13                 |             |        |
| 802.11n(HT20) | 01      | 11.22                 | 30.00       | Pass   |
|               | 06      | 11.43                 |             |        |
|               | 11      | 11.36                 |             |        |
| 802.11n(HT40) | 03      | 11.37                 | 30.00       | Pass   |
|               | 06      | 10.79                 |             |        |
|               | 09      | 10.71                 |             |        |

Note:

- 1) Measured output power at difference data rate for each mode and recorded worst case for each mode.
- 2) Test results including cable loss.
- 3) Worst case data at 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20; 13.5Mbps at IEEE 802.11n HT40.

#### 4.4 Power Spectral Density

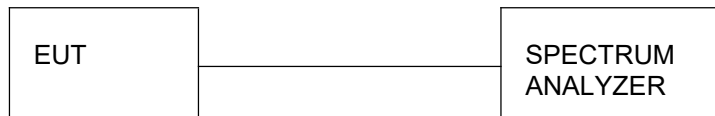
##### Limit

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

##### Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW  $\geq 3$  kHz.
3. Set the VBW  $\geq 3 \times$  RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8dBm.

##### Test Configuration



##### Test Results

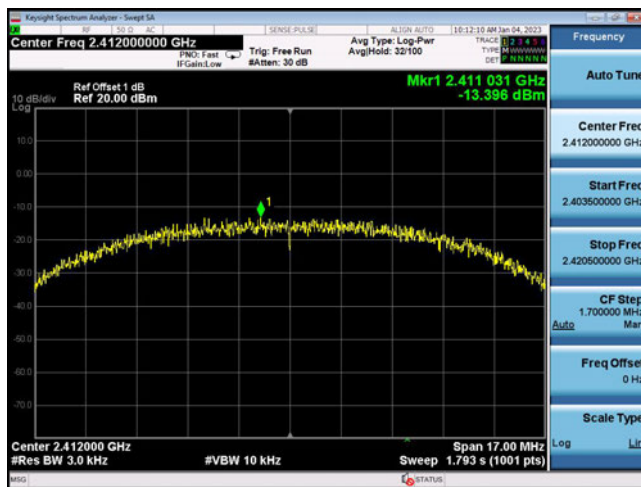
| Type          | Channel | Power Spectral Density (dBm/3KHz) | Limit (dBm/3KHz) | Result |
|---------------|---------|-----------------------------------|------------------|--------|
| 802.11b       | 01      | -13.396                           | 8.00             | Pass   |
|               | 06      | -12.799                           |                  |        |
|               | 11      | -13.073                           |                  |        |
| 802.11g       | 01      | -20.952                           | 8.00             | Pass   |
|               | 06      | -21.657                           |                  |        |
|               | 11      | -21.082                           |                  |        |
| 802.11n(HT20) | 01      | -21.317                           | 8.00             | Pass   |
|               | 06      | -21.302                           |                  |        |
|               | 11      | -21.480                           |                  |        |
| 802.11n(HT40) | 03      | -25.655                           | 8.00             | Pass   |
|               | 06      | -25.557                           |                  |        |
|               | 09      | -24.547                           |                  |        |

Note:

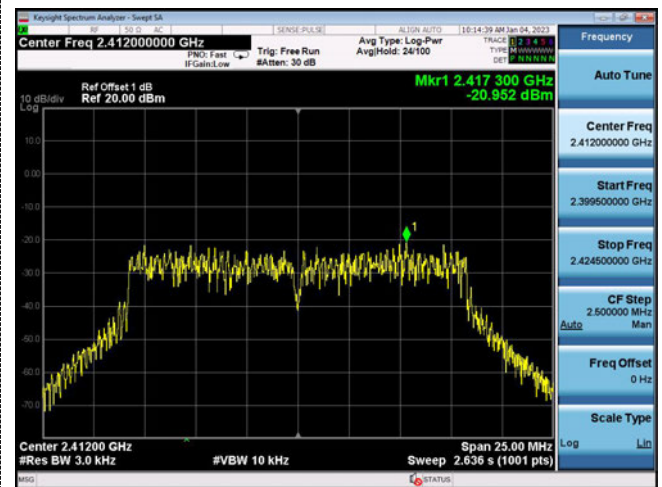
- 1) Measured peak power spectrum density at difference data rate for each mode and recorded worst case for each mode.
- 2) Test results including cable loss;
- 3) Worst case data at 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20; 13.5Mbps at IEEE 802.11n HT40.

Please refer to following plots;

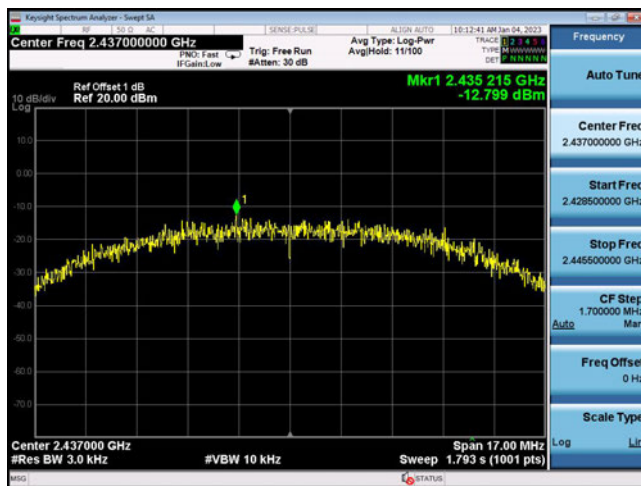
802.11b



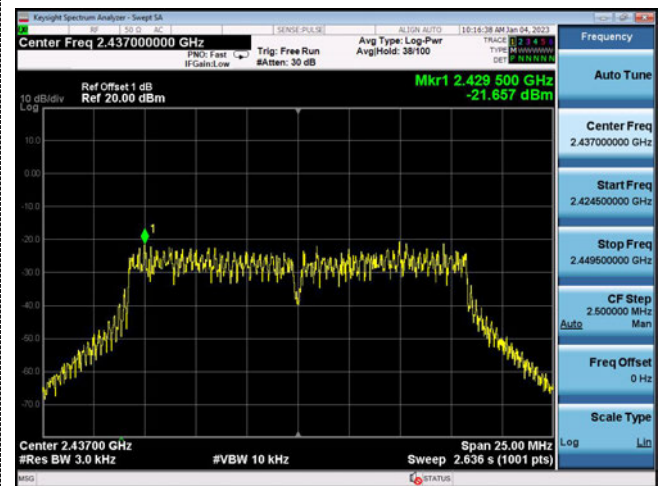
802.11g



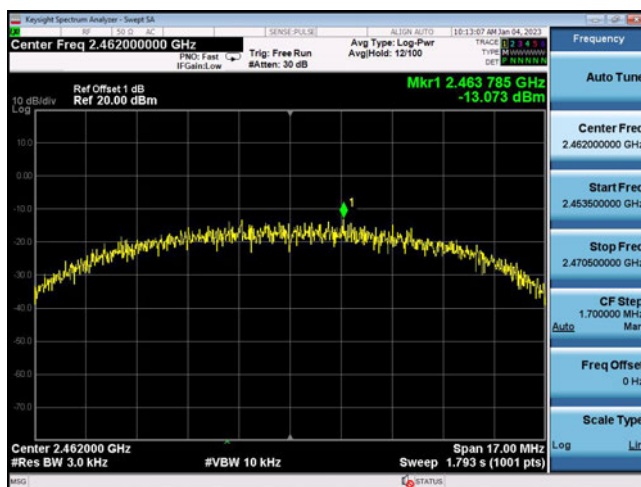
CH01



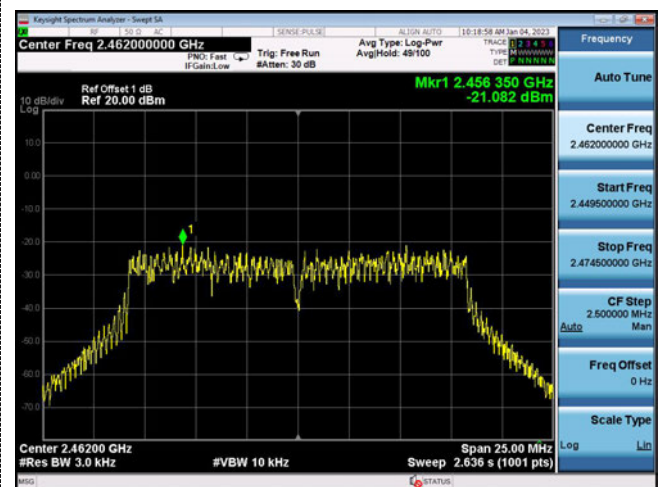
CH01



CH06



CH06



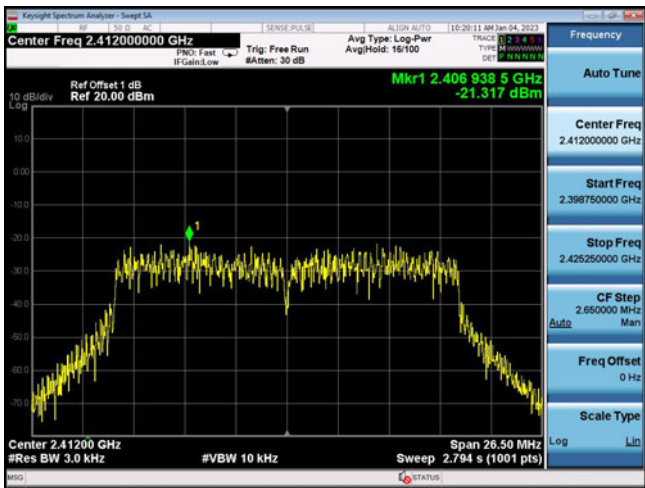
CH11



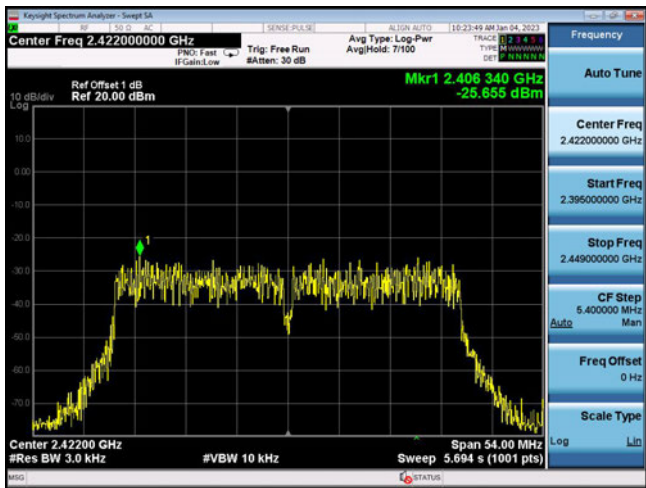
CH11



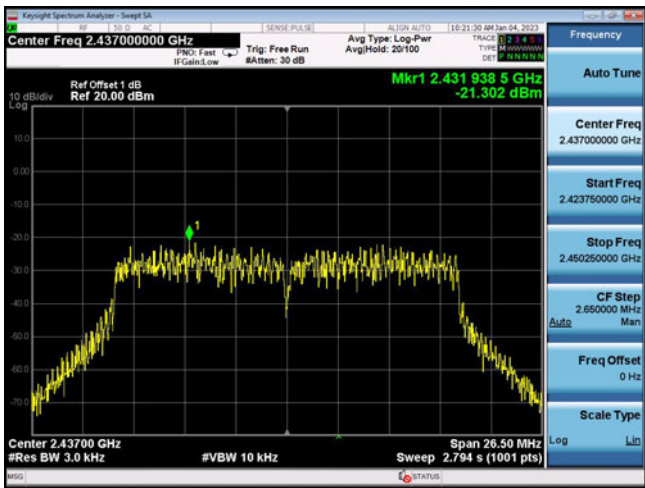
802.11n(HT20)



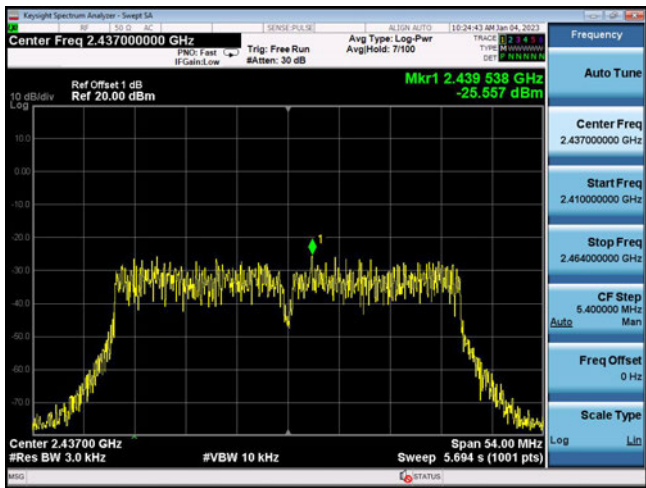
802.11n(HT40)



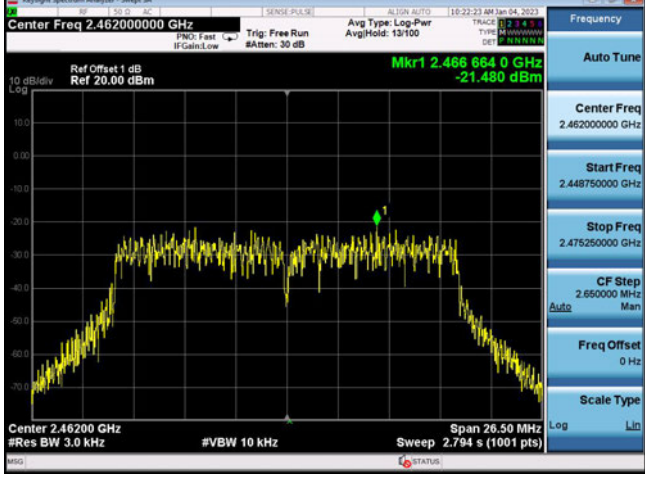
CH01



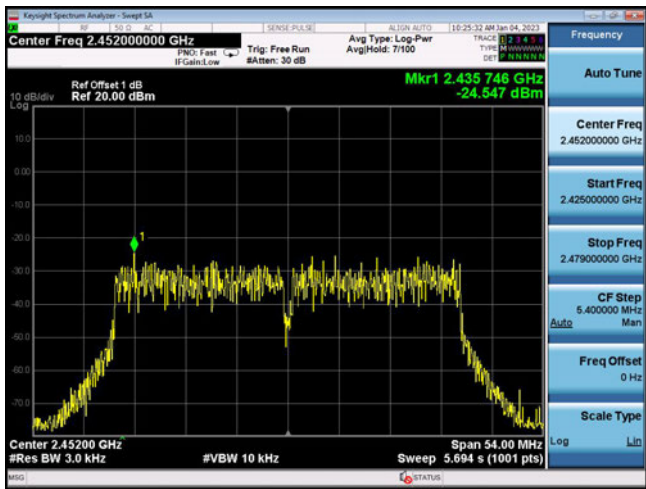
CH03



CH06



CH06



CH11



CH09



## 4.5 6dB Bandwidth

### Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

### Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

### Test Configuration



### Test Results

| Type          | Channel | 6dB Bandwidth (MHz) | Limit (KHz) | Result |
|---------------|---------|---------------------|-------------|--------|
| 802.11b       | 01      | 10.15               | ≥500        | Pass   |
|               | 06      | 11.10               |             |        |
|               | 11      | 10.30               |             |        |
| 802.11g       | 01      | 16.42               | ≥500        | Pass   |
|               | 06      | 16.41               |             |        |
|               | 11      | 16.39               |             |        |
| 802.11n(HT20) | 01      | 17.64               | ≥500        | Pass   |
|               | 06      | 17.60               |             |        |
|               | 11      | 17.65               |             |        |
| 802.11n(HT40) | 03      | 35.62               | ≥500        | Pass   |
|               | 06      | 35.75               |             |        |
|               | 09      | 35.81               |             |        |

Note:

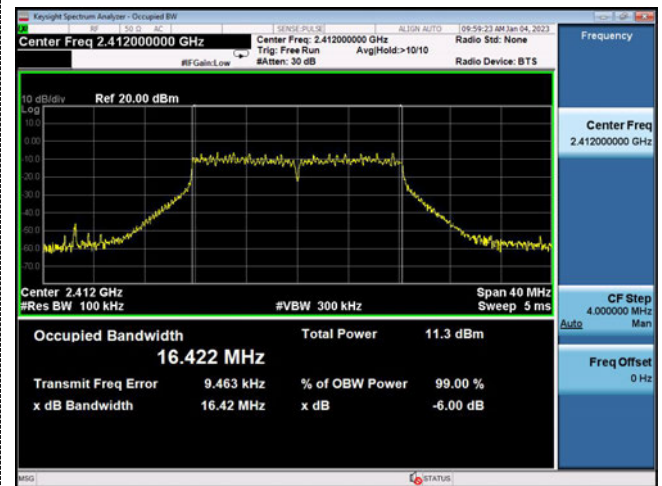
- 1) Measured peak power spectrum density at difference data rate for each mode and recorded worst case for each mode.
- 2) Test results including cable loss;
- 3) Worst case data at 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20; 13.5Mbps at IEEE 802.11n HT40.

Please refer to following plots;

802.11b



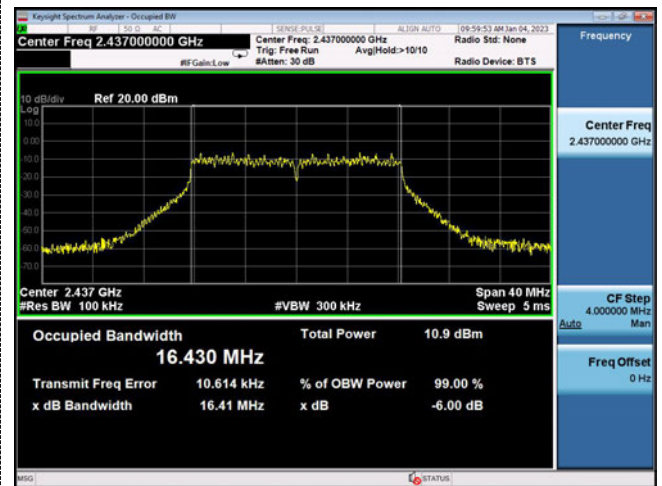
802.11g



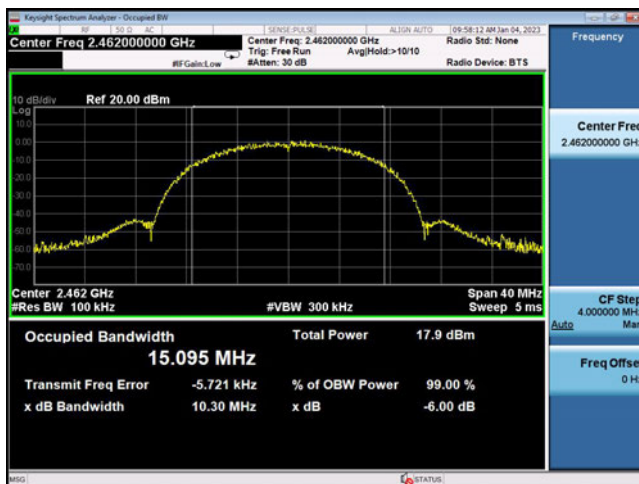
CH01



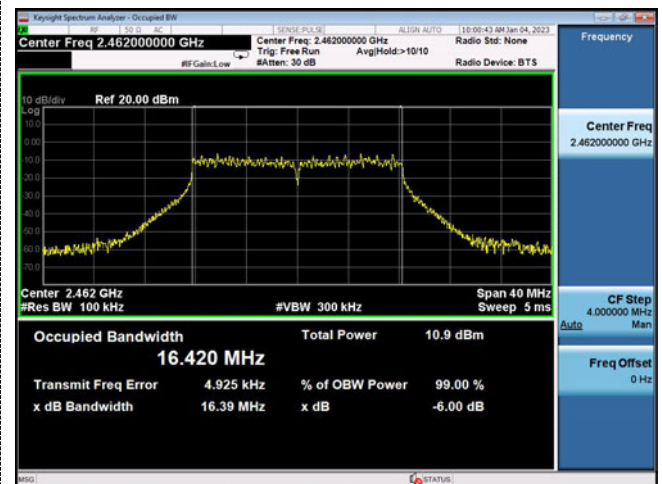
CH01



CH06



CH06



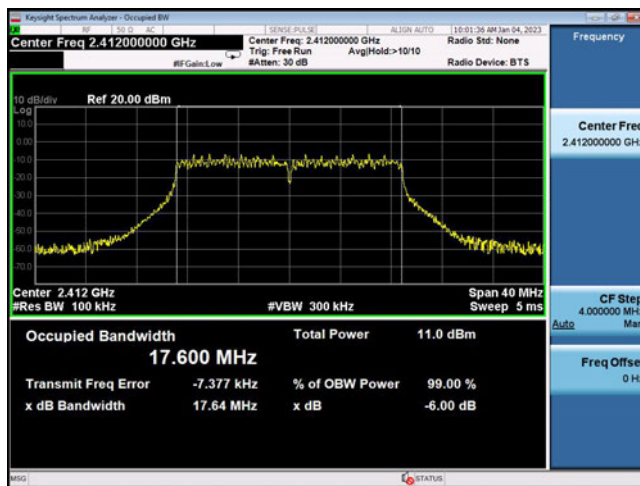
CH11



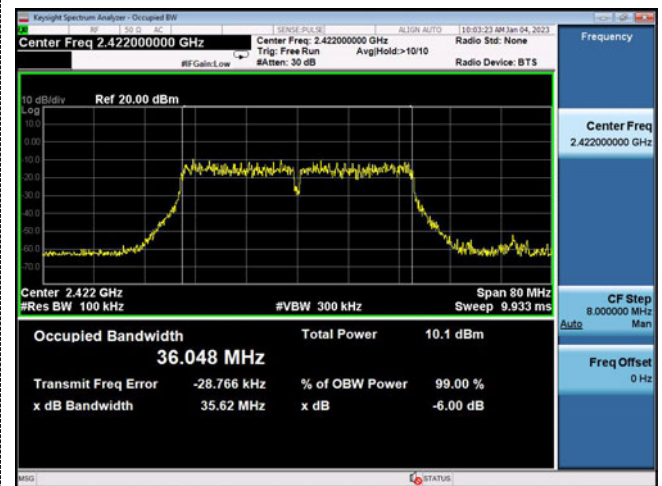
CH11



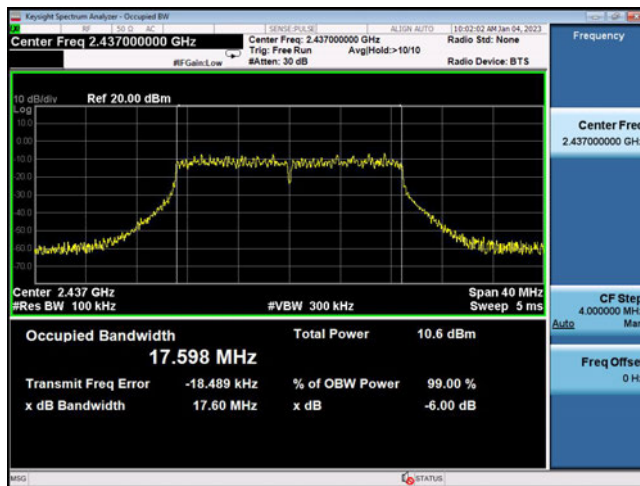
802.11n(HT20)



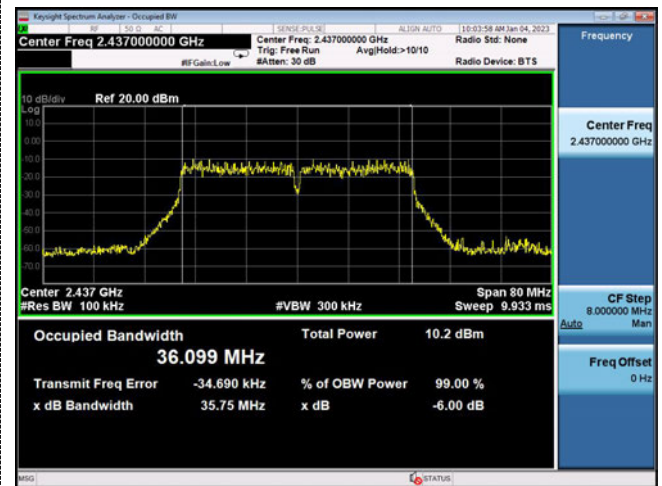
802.11n(HT40)



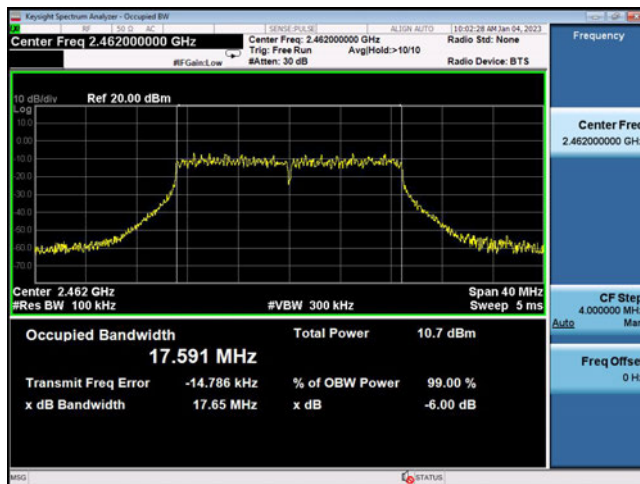
CH01



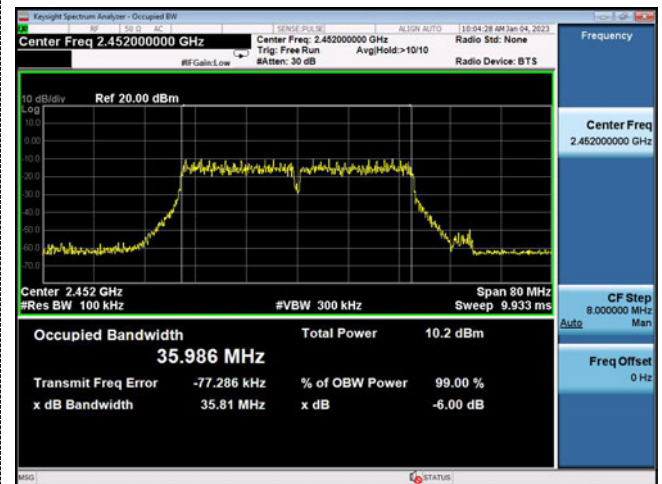
CH03



CH06



CH06



CH11



CH09



## 4.6 Out-of-band Emissions

### Limit

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.

### Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, band edge and out-of-band emissions.

### Test Configuration

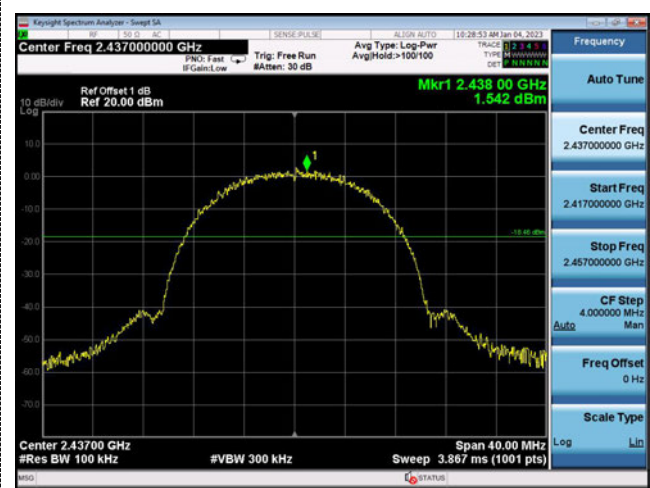


### Test Results

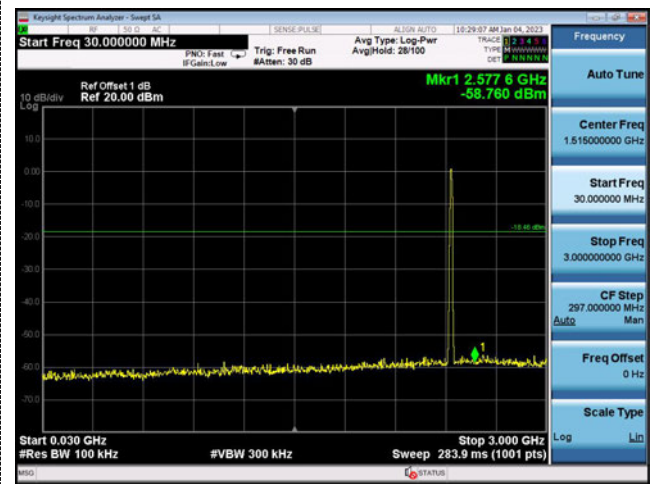
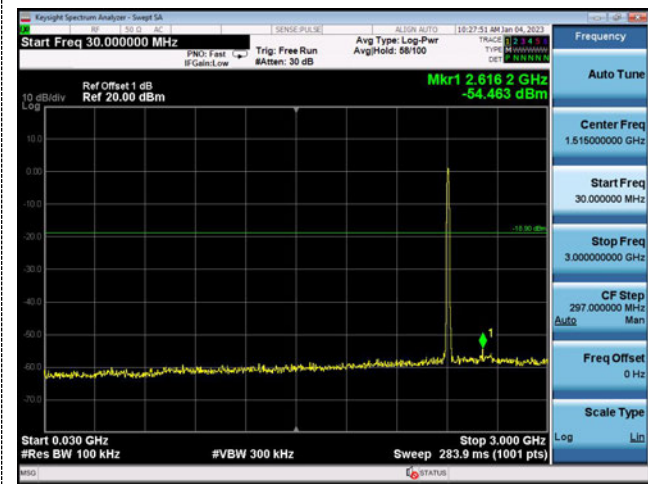
Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data. And record the worst data in the report.

Test plot as follows:

802.11b



CH01



30MHz-3GHz

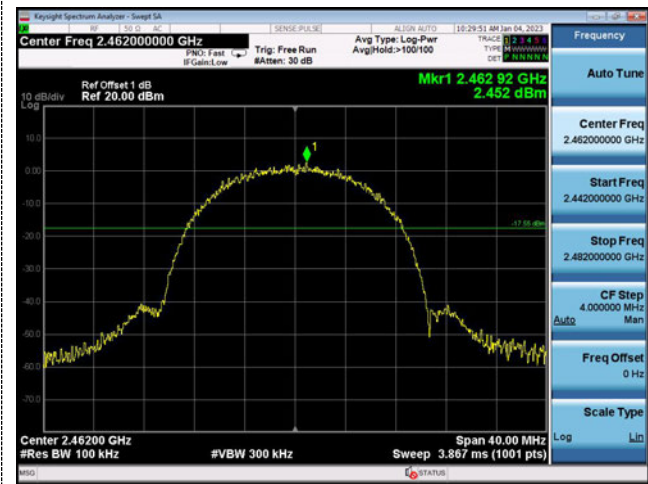
30MHz-3GHz



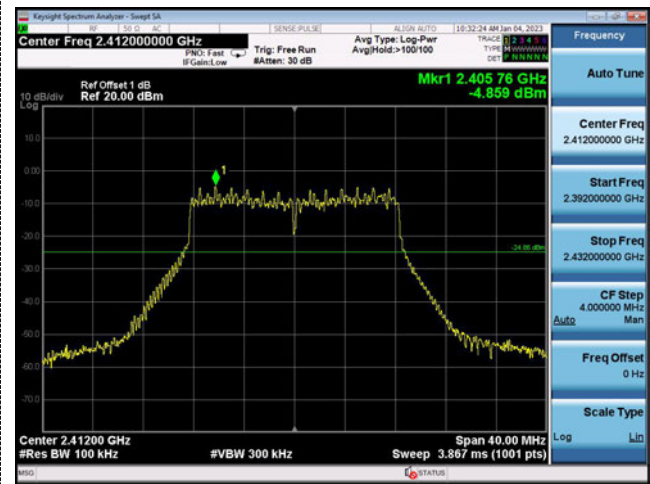
3GHz -25GHz

3GHz -25GHz

802.11b



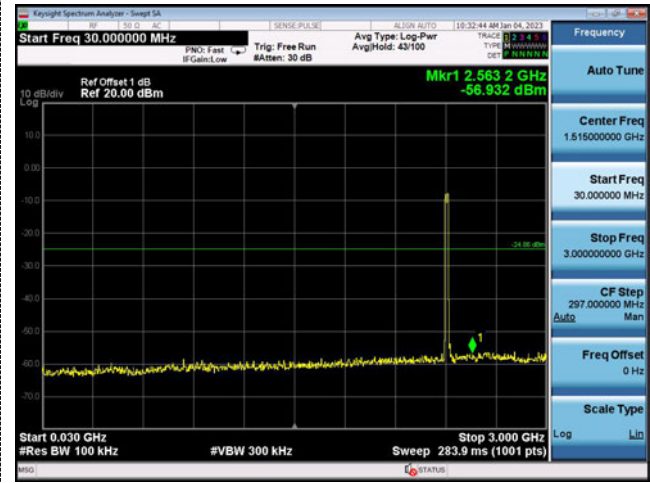
802.11g



CH11



CH01



30MHz-3GHz



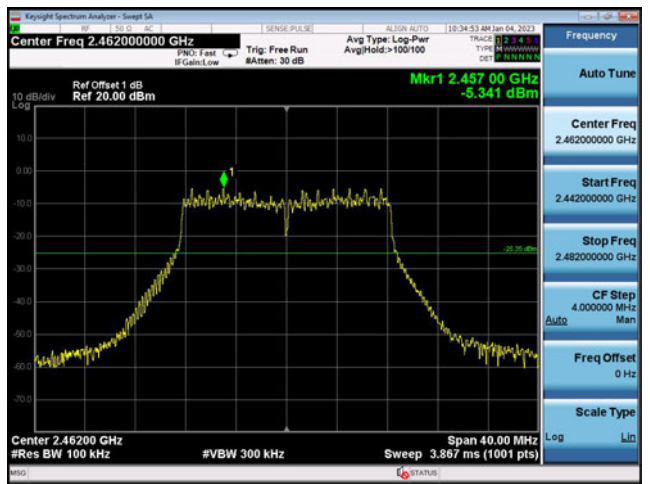
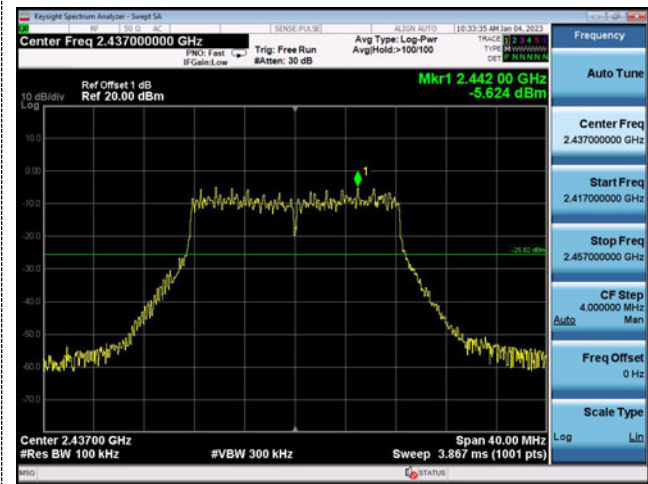
30MHz-3GHz



3GHz -25GHz

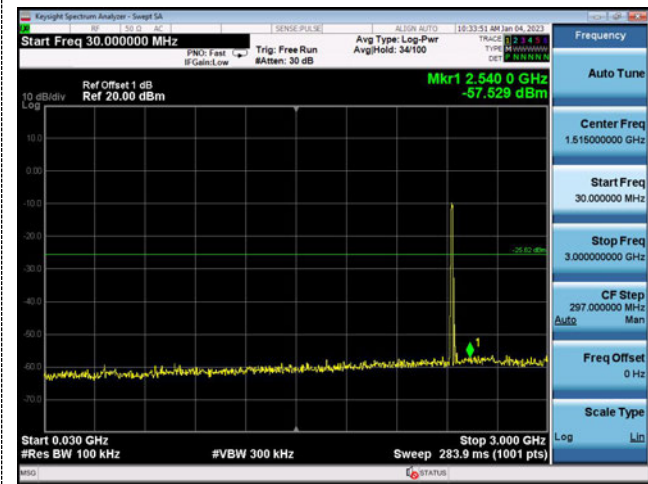
3GHz -25GHz

802.11g



CH06

CH11



30MHz-3GHz

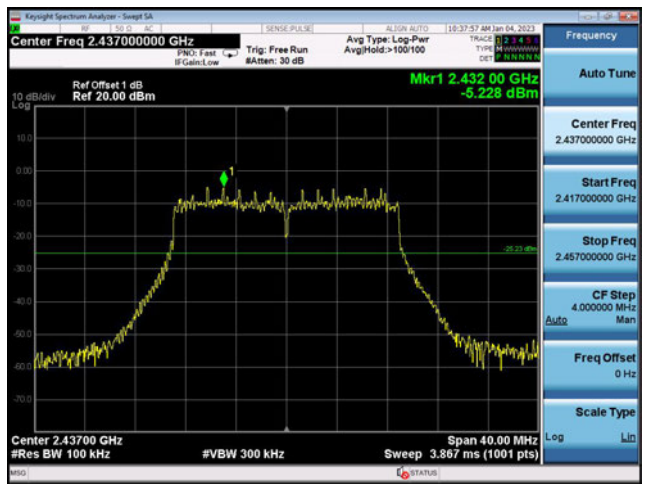
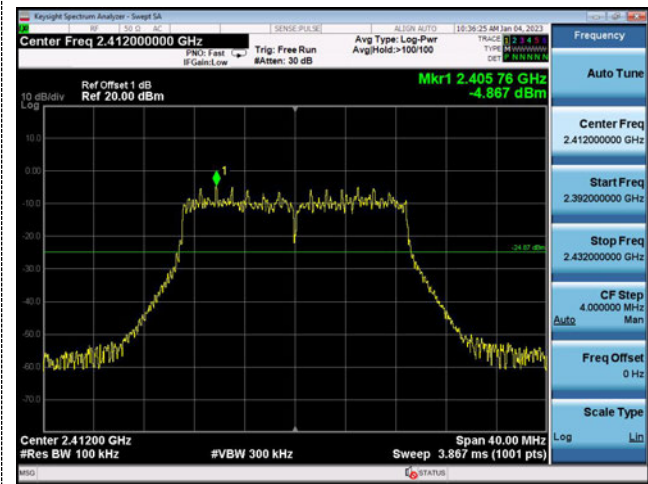
30MHz-3GHz



3GHz -25GHz

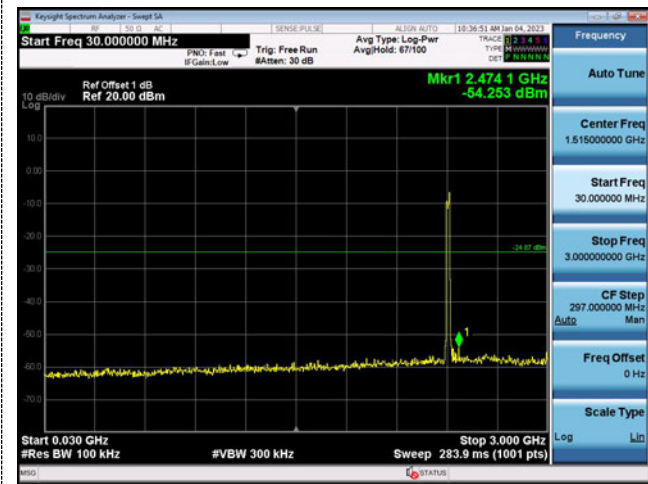
3GHz -25GHz

802.11n(HT20)



CH01

CH06



30MHz-3GHz

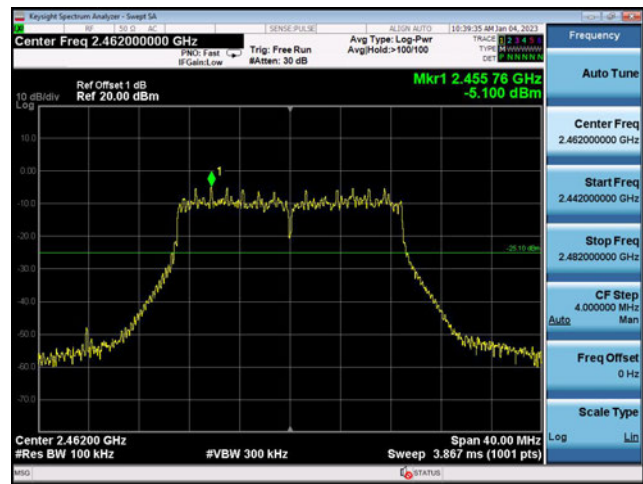
30MHz-3GHz



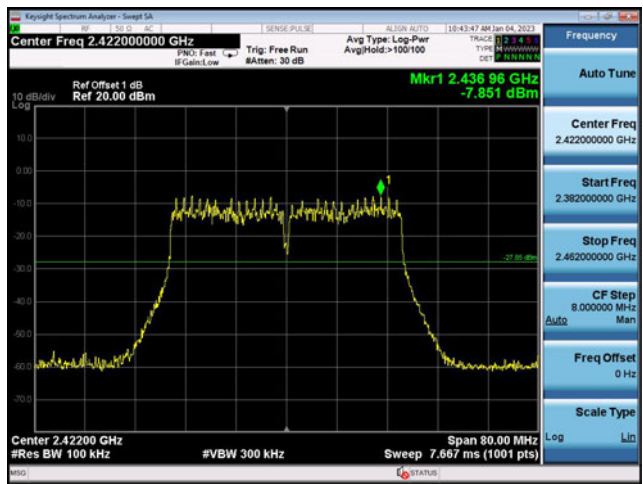
3GHz -25GHz

3GHz -25GHz

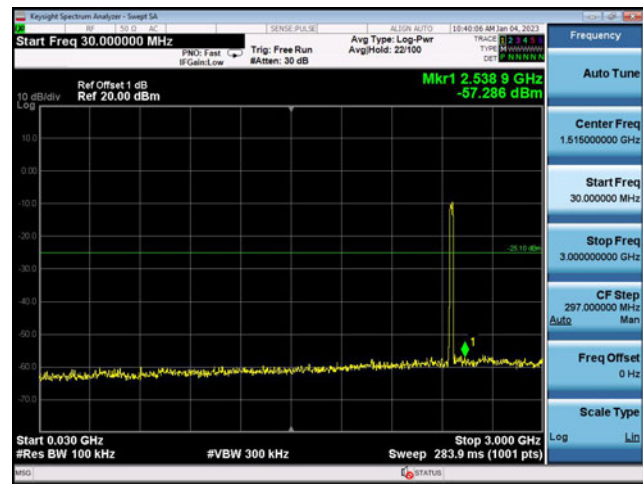
802.11n(HT20)



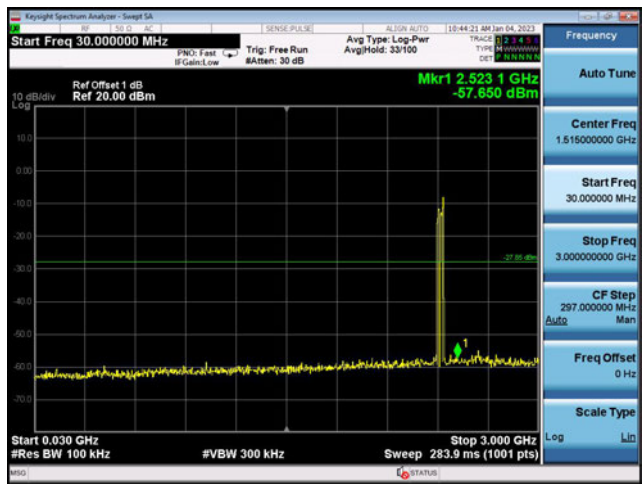
802.11n(HT40)



CH11



CH03



30MHz-3GHz



30MHz-3GHz



3GHz -25GHz

3GHz -25GHz

Keysight Spectrum Analyzer - Gsm5 SA

Center Freq 2.437000000 GHz

Ref Offset 1 dB  
Ref 20.00 dBm

10 dB/div  
Log

Center 2.43700 GHz  
#Res BW 100 kHz

Span 80.00 MHz  
Sweep 7.667 ms (1001 pts)

Mkr1 2.451 96 GHz  
-8.126 dBm

20.0 dBm

-126.0 dBm

Frequency

Auto Tune

Center Freq  
2.437000000 GHz

Start Freq  
2.397000000 GHz

Stop Freq  
2.477000000 GHz

CF Step  
8.000000 MHz

Auto

Freq Offset  
0 Hz

Scale Type

Log

Keysight Spectrum Analyzer - Setup SA

Center Freq 2.452000000 GHz

Ref Offset 1 dB  
Ref 20.00 dBm

10 dB/div  
Log

Center 2.45200 GHz  
#Res BW 100 kHz  
#VBW 300 kHz

Span 80.00 MHz  
Sweep 7.667 ms (1001 pts)

Frequency

Auto Tune

Center Freq  
2.452000000 GHz

Start Freq  
2.412000000 GHz

Stop Freq  
2.492000000 GHz

CF Step  
8.000000 MHz

Autg

Frequency Offset  
0 Hz

Scale Type

Log

MSO

STATUS

Keysight Spectrum Analyzer - J5061 SA

RF 150.0 AC SENSE: PULSE ALIGN: AUTO 10:46:29 AM Jan 04, 2023

Start Freq 30.000000 MHz

TRAC1 1 2 3 4 5  
TYPE Measurement  
DEF: BINS: 100

Avg Type: Log-Pwr  
Avg/Hold: 50/100

PRND: Fast  
IF Gain: Low

Trig: Free Run  
SAttenu: 30 dB

Ref Offset 1 dB  
Ref 20.00 dBm

Mkr1 2.570 8 GHz  
-56.046 dBm

10 dBm/Hz  
Log

Start 0.030 GHz  
#Res BW 100 kHz

#VBW 300 kHz

Sweep 283.9 ms (1001 pts)

Stop 3.000 GHz

MSO STATUS

Frequency

Auto Tun

Center Freq  
1.515000000 GHz

Start Freq  
30.000000 MHz

Stop Freq  
3.000000000 GHz

CF Step  
297.000000 MHz

Audio

Freq Offset  
0 Hz

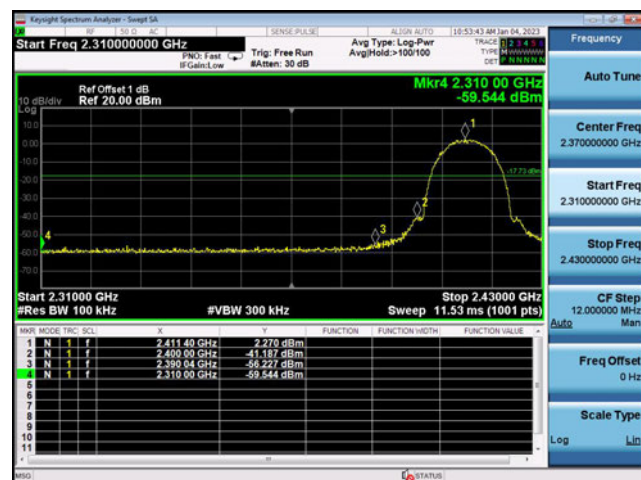
Scale Type

Log

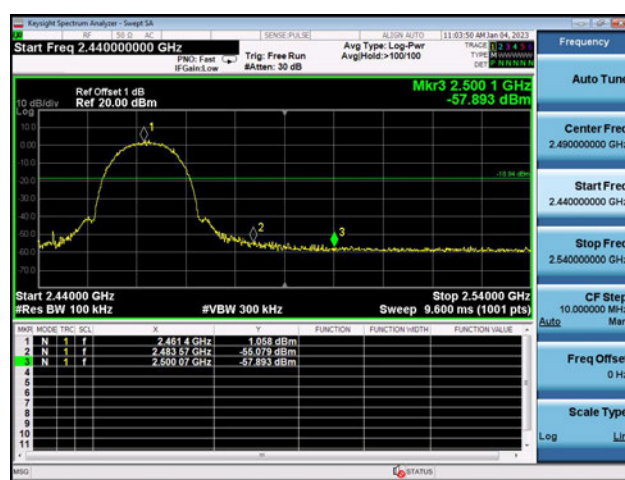
The screenshot displays the Keysight Spectrum Analyzer interface. The main plot shows a signal at 2.5914 GHz with a power level of -57.040 dBm. The plot is set to a frequency range from 0.030 GHz to 3.000 GHz, with a resolution bandwidth (RBW) of 100 kHz and a video bandwidth (VBW) of 300 kHz. The plot is in Log mode, and the reference level is set to 20.00 dBm. The plot shows a noisy baseline with a sharp peak at 2.5914 GHz. The peak is labeled with its frequency and power level. The plot also shows the reference level and the noise floor. The plot is titled 'Start Freq 30.000000 MHz' and 'Stop Freq 3.000000 GHz'. The plot is also labeled with 'Ref Offset 1 dB' and 'Ref 20.00 dBm'. The plot is titled 'Mkr1 2.5914 GHz' and '-57.040 dBm'. The plot is also labeled with 'Start 0.030 GHz' and 'Stop 3.000 GHz'. The plot is also labeled with '#Res BW 100 kHz' and '#VBW 300 kHz'. The plot is also labeled with 'Sweep 283.9 ms (1001 pts)'. The plot is also labeled with 'Log' and 'Lin'.

[illegible][illegible]

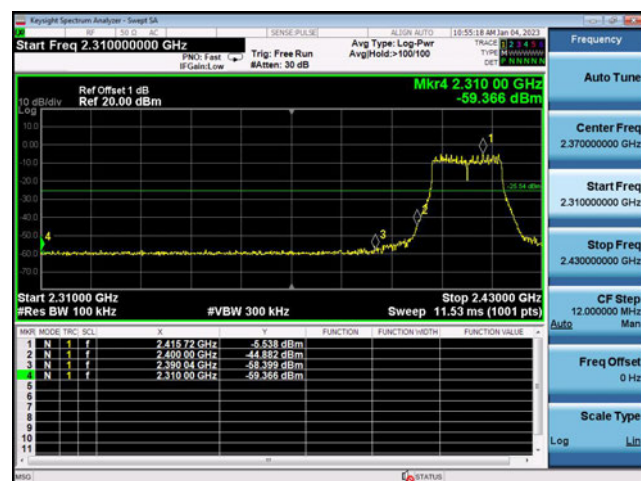
3GHz -25GHz

**Band-edge Measurements for RF Conducted Emissions:****802.11b**

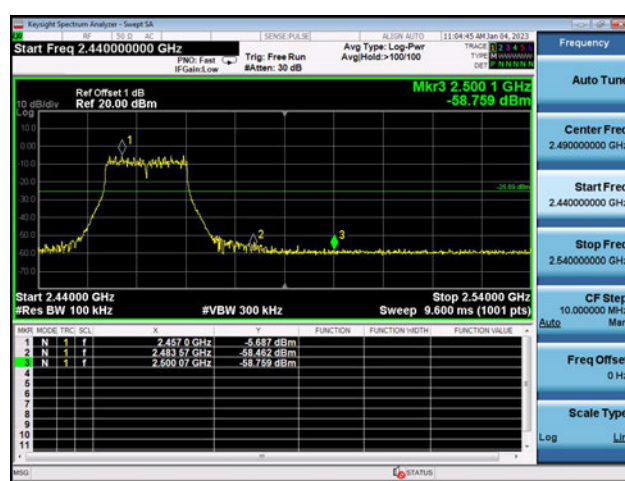
Left bandedge



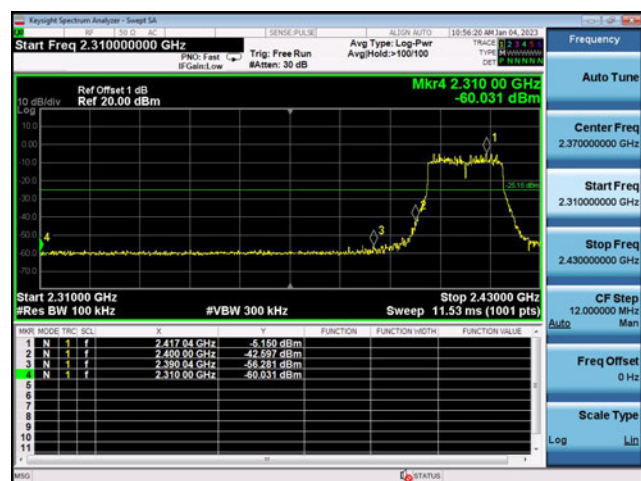
Right bandedge

**802.11g**

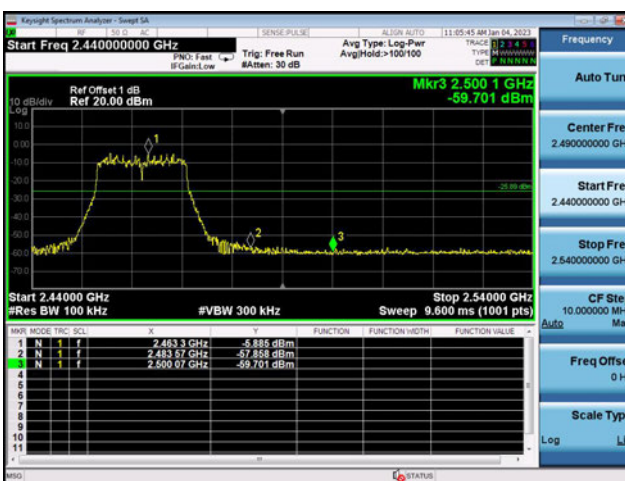
Left bandedge



Right bandedge

**802.11n(HT20)**

Left bandedge

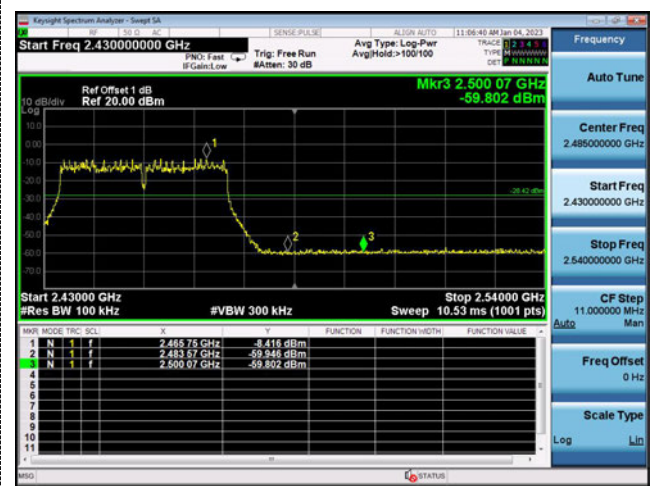


Right bandedge

802.11n(HT40)



Left bandedge



Right bandedge

## 4.7 Antenna Requirement

### Standard Applicable

**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. 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.

**FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):**

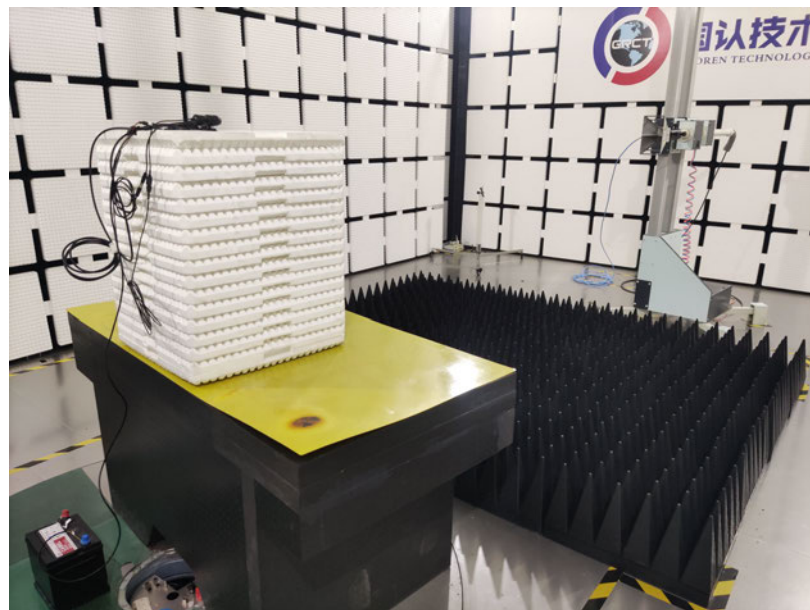
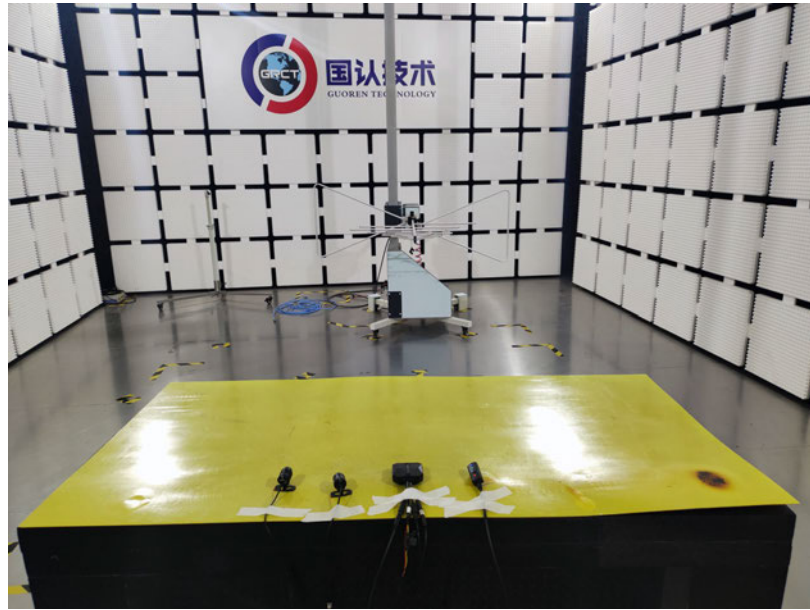
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

### Test Result:

The maximum gain of antenna was 3.54 dBi for 2.4GHz WIFI.

Remark: The antenna gain is provided by the customer, if the data provided by the customer is not accurate, Shenzhen GUOREN Certification Technology Service Co., Ltd. does not assume any responsibility.

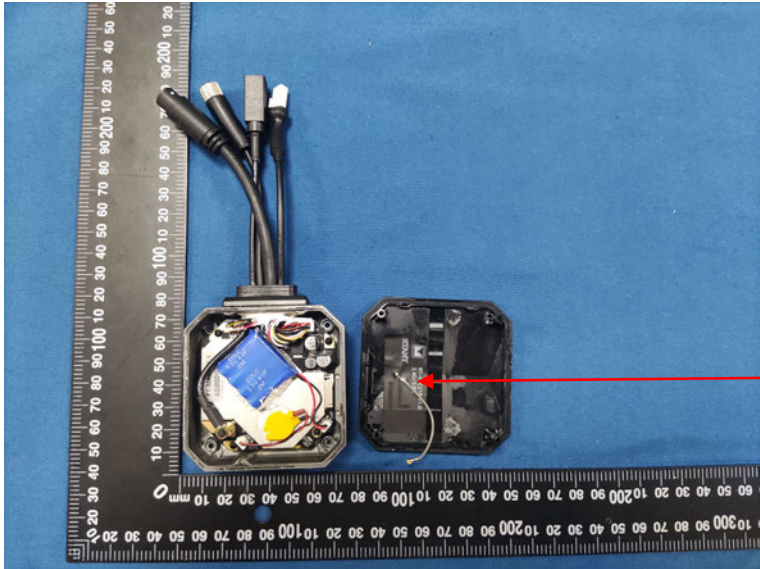
## 5 Test Setup Photos of the EUT



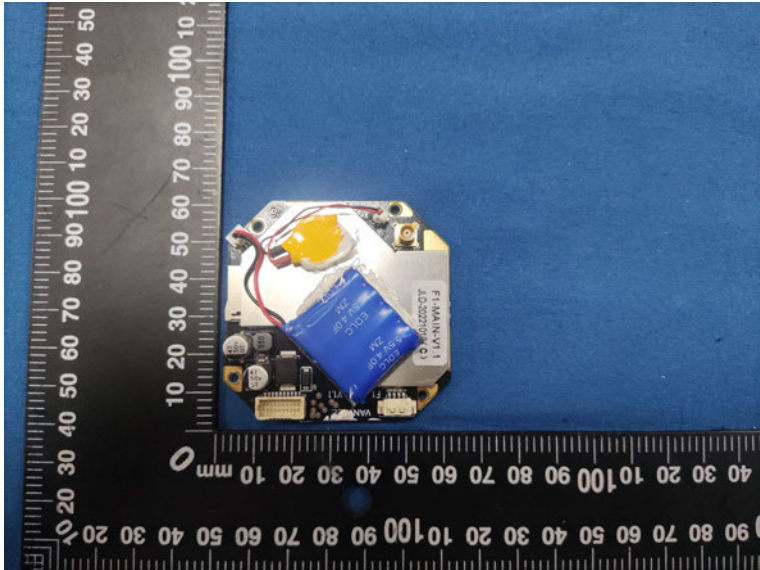
## 6 Photos of the EUT

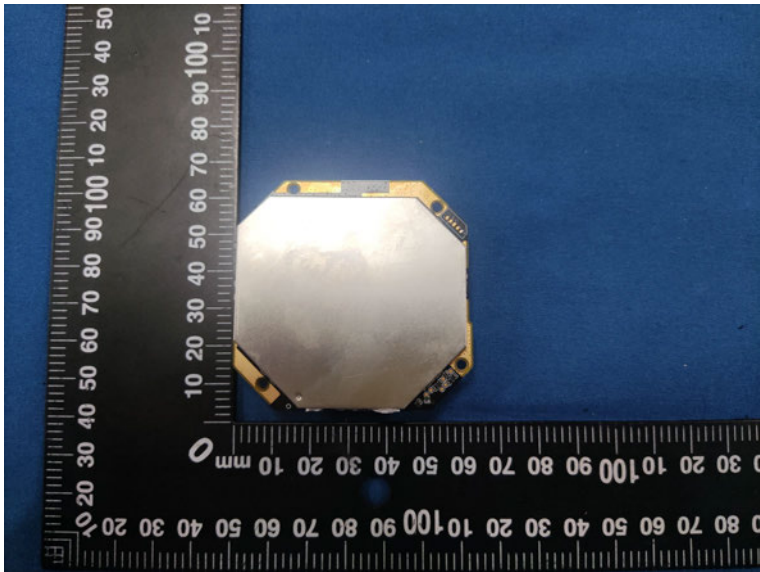
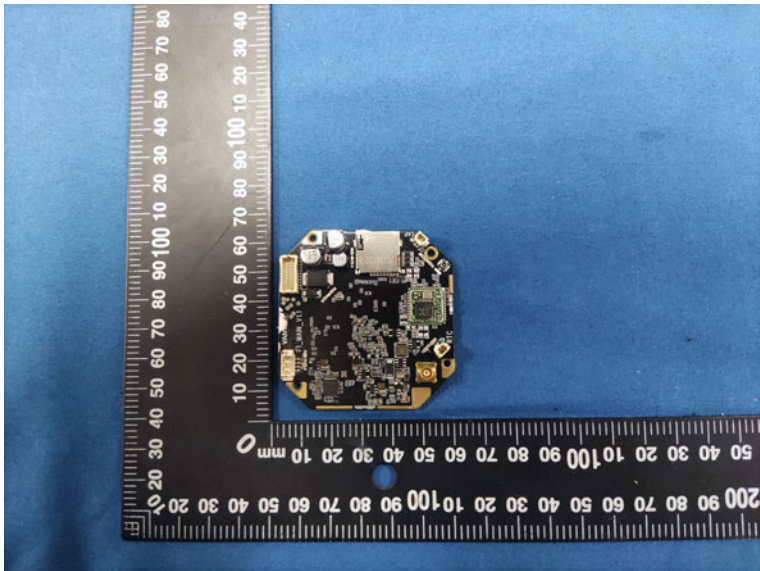
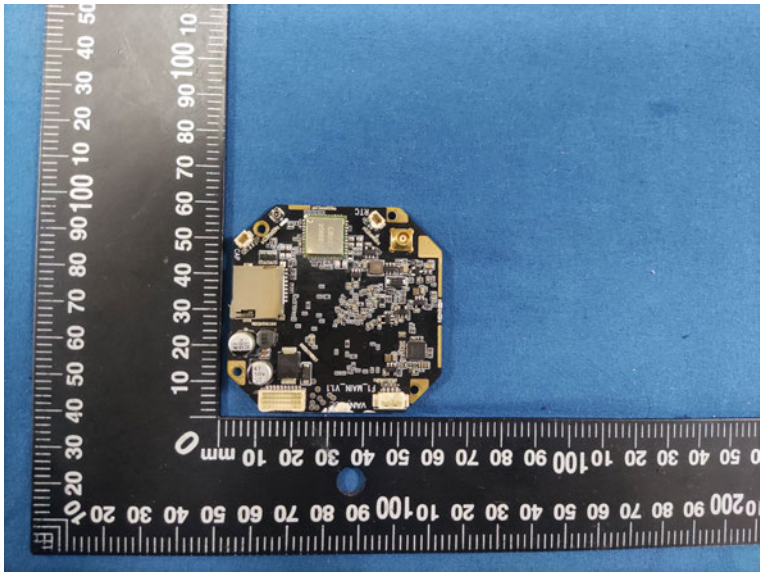


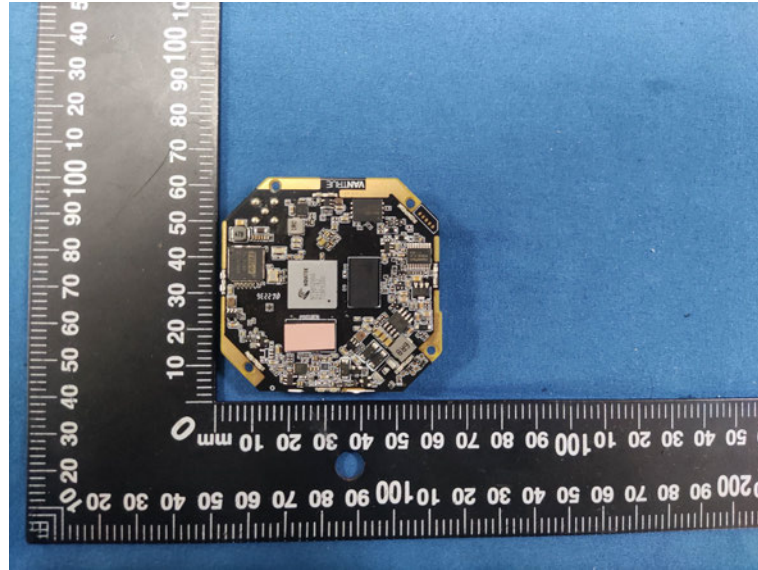




WIFI  
Antenna







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