

# TEST REPORT

**Reference No.** ..... : WTS18S05112766W  
**FCC ID**..... : 2AIOC-FLD01W  
**Applicant** ..... : HANK ELECTRONICS CO., LTD.  
**Address** ..... : Floor 2nd-7th,A8,Hongye Industry City, Lezhujiao, Zhoushi Road,Baoan District,Shenzhen,China  
**Manufacturer** ..... : HANK ELECTRONICS CO., LTD.  
**Address** ..... : Floor 2nd-7th,A8,Hongye Industry City, Lezhujiao, Zhoushi Road,Baoan District,Shenzhen,China  
**Product**..... : FLOOD SENSOR  
**Model(s)**..... : HKWL-FLD01W  
**Standards**..... : FCC CFR47 Part 15 C Section 15.247: 2017  
**Date of Receipt sample**..... : 2018-05-25  
**Date of Test**..... : 2018-05-26 to 2018-06-08  
**Date of Issue** ..... : 2018-06-11  
**Test Result** ..... : **Pass**

**Remarks:**

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

**Prepared By:**

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## 1. Laboratories Introduction

**Waltek Services (Shenzhen) Co., Ltd** is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation) of USA, Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), IC(Industry Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.



Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. ElectroMagnetic Compatibility(EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

## 2.1 Test Facility

### A. Accreditations for Conformity Assessment (International)

| Country/Region                                                      | Accreditation Body                               | Scope                         | Note |
|---------------------------------------------------------------------|--------------------------------------------------|-------------------------------|------|
| USA                                                                 | <b>A2LA</b><br><b>(Certificate No.: 4243.01)</b> | FCC ID \ DOC \ VOC            | 1    |
| Canada                                                              |                                                  | IC ID \ VOC                   | 2    |
| Japan                                                               |                                                  | MIC-T \ MIC-R                 | -    |
| Europe                                                              |                                                  | EMCD \ RED                    | -    |
| Taiwan                                                              |                                                  | NCC                           | -    |
| Hong Kong                                                           |                                                  | OFCA                          | -    |
| Australia                                                           |                                                  | RCM                           | -    |
| India                                                               |                                                  | <b>International Services</b> | WPC  |
| Thailand                                                            | NTC                                              |                               | -    |
| Singapore                                                           | IDA                                              |                               | -    |
| Note:                                                               |                                                  |                               |      |
| 1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476. |                                                  |                               |      |
| 2. IC Canada Registration No.: 7760A                                |                                                  |                               |      |

### B.TCBs and Notify Bodies Recognized Testing Laboratory.

| Recognized Testing Laboratory of ...     | Notify body number |
|------------------------------------------|--------------------|
| TUV Rheinland                            | Optional.          |
| Intertek                                 |                    |
| TUV SUD                                  |                    |
| SGS                                      |                    |
| Phoenix Testlab GmbH                     | 0700               |
| Element Materials Technology Warwick Ltd | 0891               |
| Timco Engineering, Inc.                  | 1177               |
| Eurofins Product Service GmbH            | 0681               |

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#### 4 Revision History

| Test report #   | Date of Receipt sample | Date of Test             | Date of Issue | Purpose  | Comment | Approved |
|-----------------|------------------------|--------------------------|---------------|----------|---------|----------|
| WTS18S05112766W | 2018-05-25             | 2018-05-26 to 2018-06-08 | 2018-06-11    | Original | -       | Valid    |

## 5 General Information

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

|                        |                                                                                                                                                       |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product:               | FLOOD SENSOR                                                                                                                                          |
| Model(s):              | HKWL-FLD01W                                                                                                                                           |
| Operation Frequency:   | 802.11b/g/n HT20: 2412MHz ~ 2462MHz,                                                                                                                  |
| RF output power        | Wifi: 14.21dBm                                                                                                                                        |
| The Lowest Oscillator: | 26MHz                                                                                                                                                 |
| Antenna installation:  | Integrated Antenna                                                                                                                                    |
| Antenna Gain:          | 0dBi                                                                                                                                                  |
| Type of modulation:    | IEEE 802.11b (CCK/QPSK/BPSK,11Mbps max.)<br>IEEE 802.11g (BPSK/QPSK/16QAM/64QAM,54Mbps max.)<br>IEEE 802.11n (BPSK/QPSK/16QAM/64QAM,HT20:72Mbps max.) |

### 5.2 Details of E.U.T

|         |                        |
|---------|------------------------|
| Ratings | DC 3V by 2*AAA battery |
|---------|------------------------|

### 5.3 Channel List

WIFI

| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|
| 1           | 2412            | 2           | 2417            | 3           | 2422            | 4           | 2427            |
| 5           | 2432            | 6           | 2437            | 7           | 2442            | 8           | 2447            |
| 9           | 2452            | 10          | 2457            | 11          | 2462            | 12          | -               |

## 5.4 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

| Test Items                     | Mode         | Data Rate | Channel | TX/RX |
|--------------------------------|--------------|-----------|---------|-------|
| Maximum Peak Output Power      | 802.11b      | 11 Mbps   | 1/6/11  | TX    |
|                                | 802.11g      | 54 Mbps   | 1/6/11  | TX    |
|                                | 802.11n HT20 | 108 Mbps  | 1/6/11  | TX    |
| Power Spectral Density         | 802.11b      | 11 Mbps   | 1/6/11  | TX    |
|                                | 802.11g      | 54 Mbps   | 1/6/11  | TX    |
|                                | 802.11n HT20 | 108 Mbps  | 1/6/11  | TX    |
| Frequency Range                | 802.11b      | 11 Mbps   | 1/11    | TX    |
|                                | 802.11g      | 54 Mbps   | 1/11    | TX    |
|                                | 802.11n HT20 | 108 Mbps  | 1/11    | TX    |
| Transmitter Spurious Emissions | 802.11b      | 11 Mbps   | 1/6/11  | TX    |
|                                | 802.11g      | 54 Mbps   | 1/6/11  | TX    |
|                                | 802.11n HT20 | 108 Mbps  | 1/6/11  | TX    |

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

## 6 Equipment Used during Test

### 6.1 Equipments List

| 3m Semi-anechoic Chamber for Radiation Emissions Test site |                                  |                      |             |            |                       |                      |
|------------------------------------------------------------|----------------------------------|----------------------|-------------|------------|-----------------------|----------------------|
| Item                                                       | Equipment                        | Manufacturer         | Model No.   | Serial No. | Last Calibration Date | Calibration Due Date |
| 1                                                          | Spectrum Analyzer                | R&S                  | FSP30       | 100091     | 2018-04-29            | 2019-04-28           |
| 2                                                          | Broad-band Horn Antenna          | SCHWARZBECK          | BBHA 9120 D | 667        | 2018-04-09            | 2019-04-08           |
| 3                                                          | Broadband Preamplifier           | COMPLIANCE DIRECTION | PAP-1G18    | 2004       | 2018-04-13            | 2019-04-12           |
| 4                                                          | Coaxial Cable (above 1GHz)       | Top                  | 1GHz-18GHz  | EW02014-7  | 2018-04-13            | 2019-04-12           |
| 5                                                          | Spectrum Analyzer                | R&S                  | FSP40       | 100501     | 2017-10-20            | 2018-10-19           |
| 6                                                          | Broad-band Horn Antenna          | SCHWARZBECK          | BBHA 9170   | 335        | 2017-09-14            | 2018-09-13           |
| 7                                                          | Microwave Broadband Preamplifier | SCHWARZBECK          | BBV 9721    | 100472     | 2017-10-25            | 2018-10-24           |
| 8                                                          | Cable                            | Top                  | 18GHz-40GHz | -          | 2017-10-25            | 2018-10-24           |
| 3m Semi-anechoic Chamber for Radiation Emissions Test site |                                  |                      |             |            |                       |                      |
| Item                                                       | Equipment                        | Manufacturer         | Model No.   | Serial No  | Last Calibration Date | Calibration Due Date |
| 1                                                          | Test Receiver                    | R&S                  | ESCI        | 101296     | 2018-04-13            | 2019-04-12           |
| 2                                                          | Ative Loop Antenna               | Beijing Dazhi        | ZN30900A    | -          | 2017-10-17            | 2018-10-16           |
| 3                                                          | Trilog Broadband Antenna         | SCHWARZBECK          | VULB9160    | 9160-3325  | 2018-04-08            | 2019-04-07           |
| 4                                                          | Amplifier                        | ANRITSU              | MH648A      | M43381     | 2018-04-13            | 2019-04-12           |
| 5                                                          | Cable                            | HUBER+SUHNER         | CBL2        | 525178     | 2018-04-13            | 2019-04-12           |
| 6                                                          | Coaxial Cable (below 1GHz)       | Top                  | TYPE16(13M) | -          | 2017-09-12            | 2018-09-11           |
| RF Conducted Testing                                       |                                  |                      |             |            |                       |                      |
| Item                                                       | Equipment                        | Manufacturer         | Model No.   | Serial No. | Last Calibration Date | Calibration Due Date |
| 1.                                                         | EMC Analyzer (9k~26.5GHz)        | Agilent              | E7405A      | MY45114943 | 2017-09-14            | 2018-09-13           |
| 2.                                                         | Spectrum Analyzer (9k-6GHz)      | R&S                  | FSL6        | 100959     | 2017-09-12            | 2018-09-11           |
| 3.                                                         | Signal Analyzer (9k~26.5GHz)     | Agilent              | N9010A      | MY50520207 | 2017-09-12            | 2018-09-11           |
| 4.                                                         | Coaxial Cable (10Hz-30GHz)       | /                    | /           | /          | 2017-09-12            | 2018-09-11           |
| 5.                                                         | Antenna Connector*               | /                    | /           | /          | 2017-09-12            | 2018-09-11           |

“\*”: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

## 6.2 Measurement Uncertainty

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

## 6.3 Test Equipment Calibration

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

## 7 Test Summary

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

## 8 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

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

### 8.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

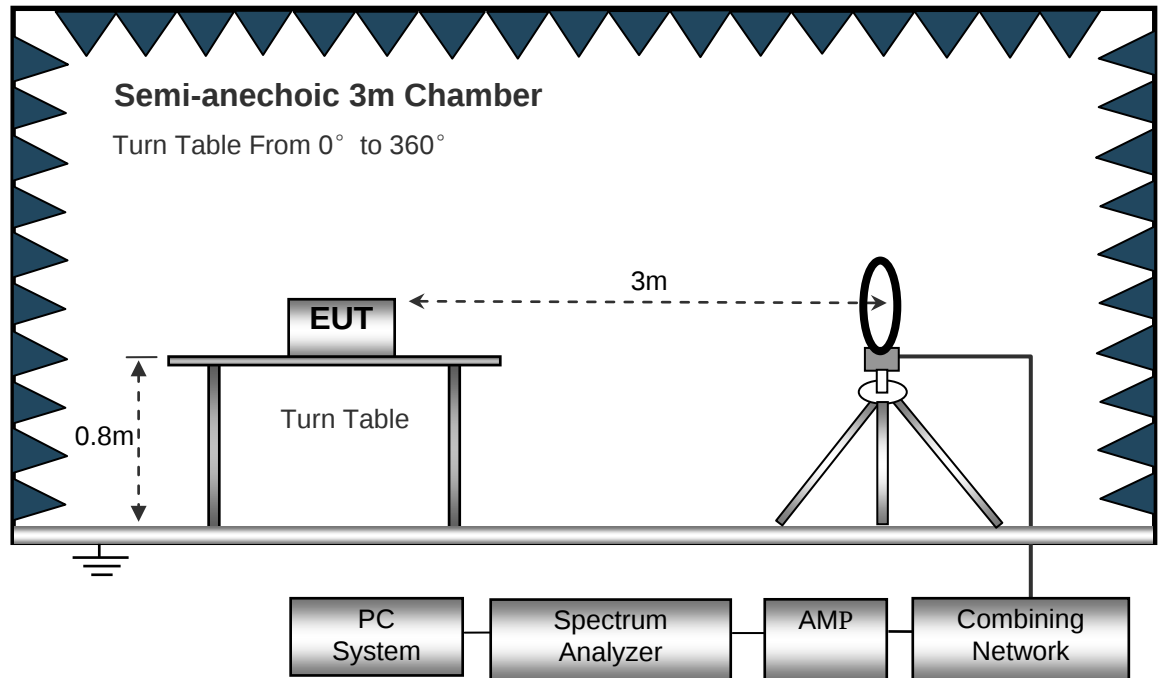
EUT Operation :

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

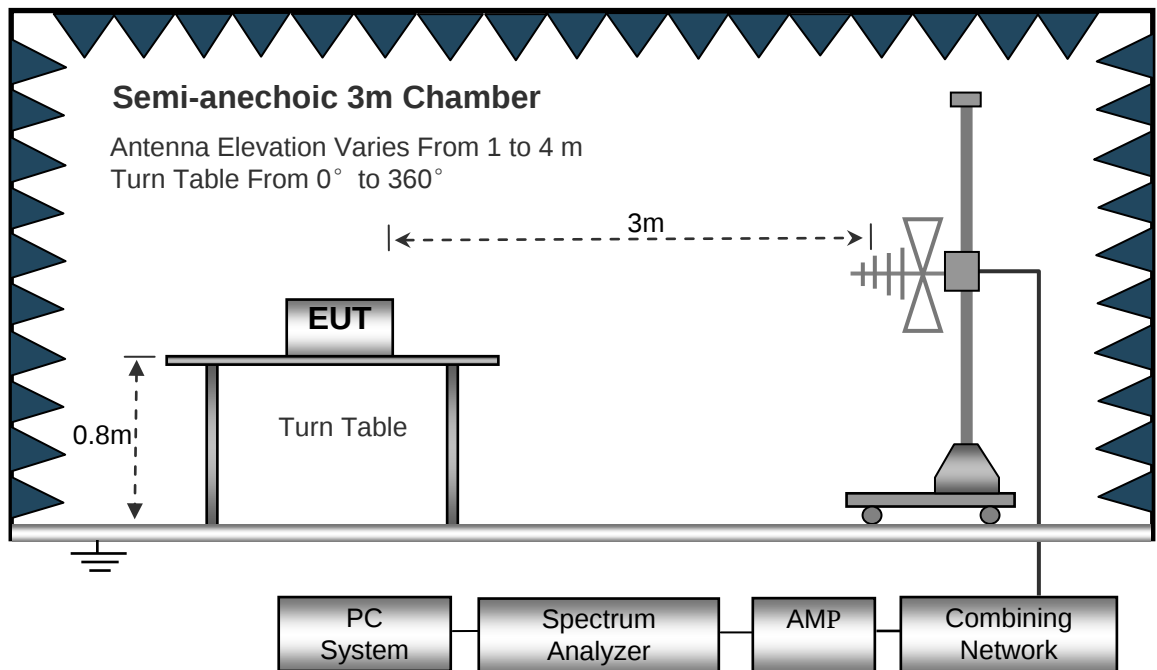
## 8.2 Test Setup

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

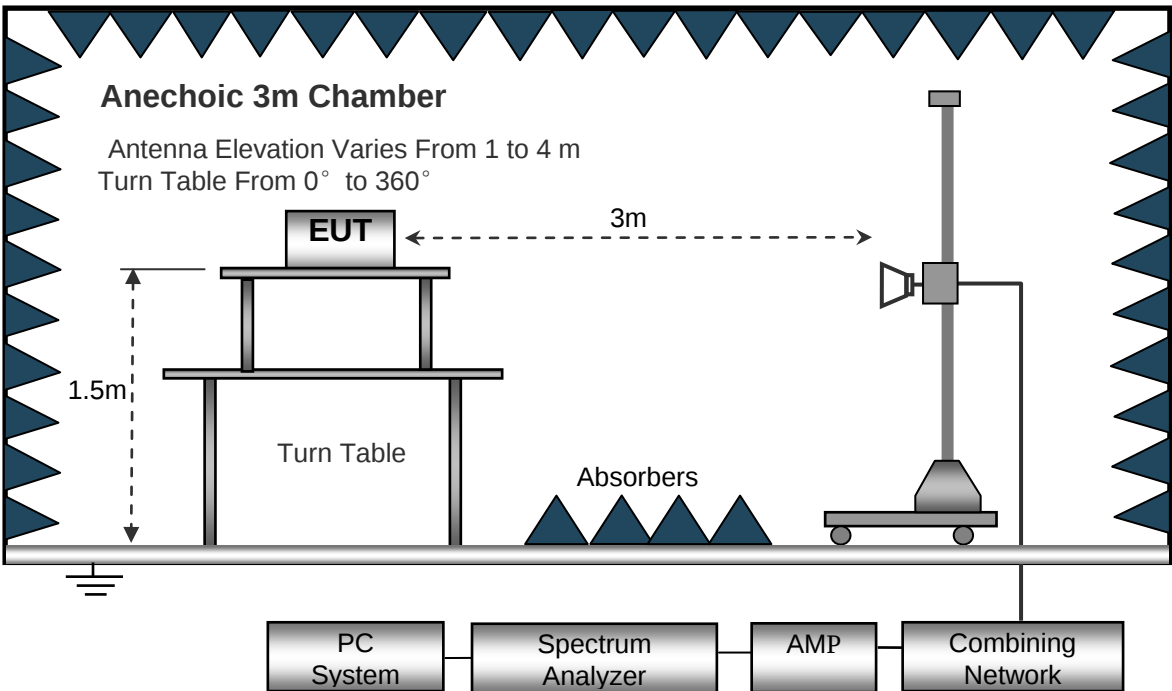
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed ..... Auto  
IF Bandwidth.....10kHz  
Video Bandwidth.....10kHz  
Resolution Bandwidth.....10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto  
Detector .....PK  
Resolution Bandwidth.....100kHz  
Video Bandwidth.....300kHz

Above 1GHz

Sweep Speed ..... Auto  
Detector .....PK  
Resolution Bandwidth.....1MHz  
Video Bandwidth.....3MHz  
Detector .....Ave.  
Resolution Bandwidth.....1MHz  
Video Bandwidth.....10Hz

## 8.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane;  
For above 1GHz, the EUT is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in X axis,so the worst data were shown as follow.
8. A 2.4GHz high -pass filter is used during radiated emissions above 1GHz measurement.

## 8.5 Corrected Amplitude & Margin Calculation

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

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

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

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

## 8.6 Summary of Test Results

### Test Frequency: 9kHz ~ 30MHz

The measurements were more than 20 dB below the limit and not reported.

### Test Frequency : 30MHz ~ 18GHz

| Frequency                | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|--------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                          |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                    | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11b: Low Channel 2412MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 486.17                   | 14.34            | PK          | 236              | 1.8        | H     | 21.09            | 35.43               | 45.00                   | -9.57  |
| 486.17                   | 9.93             | PK          | 126              | 1.9        | V     | 21.09            | 31.02               | 45.00                   | -13.98 |
| 4824.00                  | 50.20            | PK          | 269              | 1.3        | V     | -1.05            | 49.15               | 74.00                   | -24.85 |
| 4824.00                  | 42.52            | Ave         | 269              | 1.3        | V     | -1.05            | 41.47               | 54.00                   | -12.53 |
| 7236.00                  | 45.64            | PK          | 281              | 1.4        | H     | 1.34             | 46.98               | 74.00                   | -27.02 |
| 7236.00                  | 39.49            | Ave         | 281              | 1.4        | H     | 1.34             | 40.83               | 54.00                   | -13.17 |
| 2335.84                  | 46.36            | PK          | 126              | 1.0        | V     | -13.19           | 33.17               | 74.00                   | -40.83 |
| 2335.84                  | 37.96            | Ave         | 126              | 1.0        | V     | -13.19           | 24.77               | 54.00                   | -29.23 |
| 2377.27                  | 42.74            | PK          | 298              | 1.6        | H     | -13.15           | 29.59               | 74.00                   | -44.41 |
| 2377.27                  | 38.86            | Ave         | 298              | 1.6        | H     | -13.15           | 25.71               | 54.00                   | -28.29 |
| 2489.82                  | 42.85            | PK          | 156              | 1.3        | V     | -13.08           | 29.77               | 74.00                   | -44.23 |
| 2489.82                  | 36.58            | Ave         | 156              | 1.3        | V     | -13.08           | 23.50               | 54.00                   | -30.50 |

| Frequency                   | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|-----------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                             |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                       | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11b: Middle Channel 2437MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 486.17                      | 11.64            | PK          | 331              | 1.5        | H     | 21.09            | 32.73               | 45.00                   | -12.27 |
| 486.17                      | 15.44            | PK          | 64               | 1.2        | V     | 21.09            | 36.53               | 45.00                   | -8.47  |
| 4874.00                     | 51.90            | PK          | 342              | 1.7        | V     | -0.63            | 51.27               | 74.00                   | -22.73 |
| 4874.00                     | 43.05            | Ave         | 342              | 1.7        | V     | -0.63            | 42.42               | 54.00                   | -11.58 |
| 7311.00                     | 43.07            | PK          | 174              | 1.1        | H     | 2.21             | 45.28               | 74.00                   | -28.72 |
| 7311.00                     | 43.73            | Ave         | 174              | 1.1        | H     | 2.21             | 45.94               | 54.00                   | -8.06  |
| 2310.47                     | 45.54            | PK          | 36               | 1.0        | V     | -13.19           | 32.35               | 74.00                   | -41.65 |
| 2310.47                     | 37.32            | Ave         | 36               | 1.0        | V     | -13.19           | 24.13               | 54.00                   | -29.87 |
| 2377.60                     | 42.23            | PK          | 22               | 1.7        | H     | -13.14           | 29.09               | 74.00                   | -44.91 |
| 2377.60                     | 38.54            | Ave         | 22               | 1.7        | H     | -13.14           | 25.40               | 54.00                   | -28.60 |
| 2487.49                     | 43.43            | PK          | 329              | 1.2        | V     | -13.08           | 30.35               | 74.00                   | -43.65 |
| 2487.49                     | 36.69            | Ave         | 329              | 1.2        | V     | -13.08           | 23.61               | 54.00                   | -30.39 |

| Frequency                 | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|---------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                           |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                     | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11b: High Channel 2462MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 486.17                    | 11.73            | PK          | 109              | 1.7        | H     | 21.09            | 32.82               | 45.00                   | -12.18 |
| 486.17                    | 13.82            | PK          | 15               | 1.8        | V     | 21.09            | 34.91               | 45.00                   | -10.09 |
| 4924.00                   | 48.51            | PK          | 327              | 1.1        | V     | -0.25            | 48.26               | 74.00                   | -25.74 |
| 4924.00                   | 44.76            | Ave         | 327              | 1.1        | V     | -0.25            | 44.51               | 54.00                   | -9.49  |
| 7386.00                   | 43.55            | PK          | 232              | 1.2        | H     | 2.85             | 46.40               | 74.00                   | -27.60 |
| 7386.00                   | 44.31            | Ave         | 232              | 1.2        | H     | 2.85             | 47.16               | 54.00                   | -6.84  |
| 2344.17                   | 46.42            | PK          | 219              | 1.6        | V     | -13.19           | 33.23               | 74.00                   | -40.77 |
| 2344.17                   | 38.38            | Ave         | 219              | 1.6        | V     | -13.19           | 25.19               | 54.00                   | -28.81 |
| 2388.34                   | 42.86            | PK          | 55               | 1.7        | H     | -13.14           | 29.72               | 74.00                   | -44.28 |
| 2388.34                   | 38.66            | Ave         | 55               | 1.7        | H     | -13.14           | 25.52               | 54.00                   | -28.48 |
| 2499.29                   | 44.68            | PK          | 248              | 1.7        | V     | -13.08           | 31.60               | 74.00                   | -42.40 |
| 2499.29                   | 37.07            | Ave         | 248              | 1.7        | V     | -13.08           | 23.99               | 54.00                   | -30.01 |

| Frequency                | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|--------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                          |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                    | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11g: Low Channel 2412MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 486.17                   | 12.04            | PK          | 46               | 1.5        | H     | 21.09            | 33.13               | 45.00                   | -11.87 |
| 486.17                   | 14.34            | PK          | 155              | 1.9        | V     | 21.09            | 35.43               | 45.00                   | -9.57  |
| 4824.00                  | 12.55            | PK          | 264              | 2.0        | V     | -1.06            | 11.49               | 74.00                   | -62.51 |
| 4824.00                  | 53.44            | Ave         | 264              | 2.0        | V     | -1.06            | 52.38               | 54.00                   | -1.62  |
| 7236.00                  | 47.87            | PK          | 233              | 1.6        | H     | 1.35             | 49.22               | 74.00                   | -24.78 |
| 7236.00                  | 48.15            | Ave         | 233              | 1.6        | H     | 1.35             | 49.50               | 54.00                   | -4.50  |
| 2320.80                  | 46.95            | PK          | 86               | 1.2        | V     | -13.19           | 33.76               | 74.00                   | -40.24 |
| 2320.80                  | 38.57            | Ave         | 86               | 1.2        | V     | -13.19           | 25.38               | 54.00                   | -28.62 |
| 2381.29                  | 43.59            | PK          | 189              | 1.4        | H     | -13.14           | 30.45               | 74.00                   | -43.55 |
| 2381.29                  | 37.24            | Ave         | 189              | 1.4        | H     | -13.14           | 24.10               | 54.00                   | -29.90 |
| 2489.08                  | 44.27            | PK          | 161              | 1.3        | V     | -13.08           | 31.19               | 74.00                   | -42.81 |
| 2489.08                  | 36.10            | Ave         | 161              | 1.3        | V     | -13.08           | 23.02               | 54.00                   | -30.98 |

| Frequency                   | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|-----------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                             |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                       | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11g: Middle Channel 2437MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 486.17                      | 12.45            | PK          | 197              | 1.5        | H     | 21.09            | 33.54               | 45.00                   | -11.46 |
| 486.17                      | 14.18            | PK          | 29               | 1.3        | V     | 21.09            | 35.27               | 45.00                   | -9.73  |
| 4874.00                     | 51.06            | PK          | 166              | 1.4        | V     | -0.62            | 50.44               | 74.00                   | -23.56 |
| 4874.00                     | 47.89            | Ave         | 166              | 1.4        | V     | -0.62            | 47.27               | 54.00                   | -6.73  |
| 7311.00                     | 49.66            | PK          | 350              | 1.8        | H     | 2.20             | 51.86               | 74.00                   | -22.14 |
| 7311.00                     | 48.93            | Ave         | 350              | 1.8        | H     | 2.20             | 51.13               | 54.00                   | -2.87  |
| 2330.47                     | 46.67            | PK          | 339              | 1.9        | V     | -13.19           | 33.48               | 74.00                   | -40.52 |
| 2330.47                     | 38.44            | Ave         | 339              | 1.9        | V     | -13.19           | 25.25               | 54.00                   | -28.75 |
| 2359.93                     | 44.33            | PK          | 317              | 1.8        | H     | -13.15           | 31.18               | 74.00                   | -42.82 |
| 2359.93                     | 37.56            | Ave         | 317              | 1.8        | H     | -13.15           | 24.41               | 54.00                   | -29.59 |
| 2495.09                     | 43.97            | PK          | 262              | 1.5        | V     | -13.08           | 30.89               | 74.00                   | -43.11 |
| 2495.09                     | 38.19            | Ave         | 262              | 1.5        | V     | -13.08           | 25.11               | 54.00                   | -28.89 |

| Frequency                 | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|---------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                           |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                     | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11g: High Channel 2462MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 486.17                    | 16.52            | PK          | 142              | 1.9        | H     | 21.09            | 37.61               | 45.00                   | -7.39  |
| 486.17                    | 15.42            | PK          | 224              | 1.2        | V     | 21.09            | 36.51               | 45.00                   | -8.49  |
| 4924.00                   | 50.42            | PK          | 264              | 1.2        | V     | -0.25            | 50.17               | 74.00                   | -23.83 |
| 4924.00                   | 45.39            | Ave         | 264              | 1.2        | V     | -0.25            | 45.14               | 54.00                   | -8.86  |
| 7386.00                   | 43.62            | PK          | 84               | 1.3        | H     | 2.86             | 46.48               | 74.00                   | -27.52 |
| 7386.00                   | 40.62            | Ave         | 84               | 1.3        | H     | 2.86             | 43.48               | 54.00                   | -10.52 |
| 2344.32                   | 46.04            | PK          | 315              | 1.2        | V     | -13.19           | 32.85               | 74.00                   | -41.15 |
| 2344.32                   | 38.11            | Ave         | 315              | 1.2        | V     | -13.19           | 24.92               | 54.00                   | -29.08 |
| 2384.58                   | 44.89            | PK          | 36               | 1.1        | H     | -13.14           | 31.75               | 74.00                   | -42.25 |
| 2384.58                   | 37.00            | Ave         | 36               | 1.1        | H     | -13.14           | 23.86               | 54.00                   | -30.14 |
| 2492.97                   | 42.94            | PK          | 337              | 1.6        | V     | -13.08           | 29.86               | 74.00                   | -44.14 |
| 2492.97                   | 37.77            | Ave         | 337              | 1.6        | V     | -13.08           | 24.69               | 54.00                   | -29.31 |

| Frequency                | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|--------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                          |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                    | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| n20: Low Channel 2412MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 486.17                   | 15.58            | PK          | 39               | 1.9        | H     | 21.09            | 36.67               | 45.00                   | -8.33  |
| 486.17                   | 13.32            | PK          | 48               | 1.1        | V     | 21.09            | 34.41               | 45.00                   | -10.59 |
| 4824.00                  | 52.48            | PK          | 109              | 1.9        | V     | -1.06            | 51.42               | 74.00                   | -22.58 |
| 4824.00                  | 51.07            | Ave         | 109              | 1.9        | V     | -1.06            | 50.01               | 54.00                   | -3.99  |
| 7236.00                  | 49.01            | PK          | 218              | 1.4        | H     | 1.34             | 50.35               | 74.00                   | -23.65 |
| 7236.00                  | 44.15            | Ave         | 218              | 1.4        | H     | 1.34             | 45.49               | 54.00                   | -8.51  |
| 2336.92                  | 46.34            | PK          | 89               | 1.6        | V     | -13.19           | 33.15               | 74.00                   | -40.85 |
| 2336.92                  | 38.79            | Ave         | 89               | 1.6        | V     | -13.19           | 25.60               | 54.00                   | -28.40 |
| 2371.79                  | 43.52            | PK          | 231              | 1.5        | H     | -13.14           | 30.38               | 74.00                   | -43.62 |
| 2371.79                  | 37.35            | Ave         | 231              | 1.5        | H     | -13.14           | 24.21               | 54.00                   | -29.79 |
| 2498.13                  | 43.85            | PK          | 295              | 1.9        | V     | -13.08           | 30.77               | 74.00                   | -43.23 |
| 2498.13                  | 36.46            | Ave         | 295              | 1.9        | V     | -13.08           | 23.38               | 54.00                   | -30.62 |

| Frequency                   | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|-----------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                             |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                       | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| n20: Middle Channel 2437MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 486.17                      | 15.30            | PK          | 105              | 1.8        | H     | 21.09            | 36.39               | 45.00                   | -8.61  |
| 486.17                      | 15.26            | PK          | 249              | 1.1        | V     | 21.09            | 36.35               | 45.00                   | -8.65  |
| 4874.00                     | 47.33            | PK          | 228              | 1.4        | V     | -0.61            | 46.72               | 74.00                   | -27.28 |
| 4874.00                     | 46.80            | Ave         | 228              | 1.4        | V     | -0.61            | 46.19               | 54.00                   | -7.81  |
| 7311.00                     | 45.75            | PK          | 248              | 1.9        | H     | 2.21             | 47.96               | 74.00                   | -26.04 |
| 7311.00                     | 44.84            | Ave         | 248              | 1.9        | H     | 2.21             | 47.05               | 54.00                   | -6.95  |
| 2346.88                     | 45.35            | PK          | 261              | 1.8        | V     | -13.19           | 32.16               | 74.00                   | -41.84 |
| 2346.88                     | 38.27            | Ave         | 261              | 1.8        | V     | -13.19           | 25.08               | 54.00                   | -28.92 |
| 2377.91                     | 42.36            | PK          | 326              | 1.2        | H     | -13.14           | 29.22               | 74.00                   | -44.78 |
| 2377.91                     | 36.80            | Ave         | 326              | 1.2        | H     | -13.14           | 23.66               | 54.00                   | -30.34 |
| 2487.13                     | 42.89            | PK          | 41               | 1.2        | V     | -13.08           | 29.81               | 74.00                   | -44.19 |
| 2487.13                     | 38.16            | Ave         | 41               | 1.2        | V     | -13.08           | 25.08               | 54.00                   | -28.92 |

| Frequency                 | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|---------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                           |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                     | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| n20: High Channel 2462MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 486.17                    | 12.98            | PK          | 261              | 1.3        | H     | 21.09            | 34.07               | 45.00                   | -10.93 |
| 486.17                    | 11.73            | PK          | 77               | 2.0        | V     | 21.09            | 32.82               | 45.00                   | -12.18 |
| 4924.00                   | 51.66            | PK          | 189              | 1.8        | V     | -0.24            | 51.42               | 74.00                   | -22.58 |
| 4924.00                   | 50.54            | Ave         | 189              | 1.8        | V     | -0.24            | 50.30               | 54.00                   | -3.70  |
| 7386.00                   | 49.73            | PK          | 81               | 2.0        | H     | 2.83             | 52.56               | 74.00                   | -21.44 |
| 7386.00                   | 44.74            | Ave         | 81               | 2.0        | H     | 2.83             | 47.57               | 54.00                   | -6.43  |
| 2321.51                   | 46.06            | PK          | 172              | 1.3        | V     | -13.19           | 32.87               | 74.00                   | -41.13 |
| 2321.51                   | 37.62            | Ave         | 172              | 1.3        | V     | -13.19           | 24.43               | 54.00                   | -29.57 |
| 2368.02                   | 42.20            | PK          | 274              | 1.8        | H     | -13.14           | 29.06               | 74.00                   | -44.94 |
| 2368.02                   | 38.05            | Ave         | 274              | 1.8        | H     | -13.14           | 24.91               | 54.00                   | -29.09 |
| 2493.21                   | 44.81            | PK          | 241              | 1.2        | V     | -13.08           | 31.73               | 74.00                   | -42.27 |
| 2493.21                   | 38.48            | Ave         | 241              | 1.2        | V     | -13.08           | 25.40               | 54.00                   | -28.60 |

**Test Frequency: 18GHz~25GHz**

The measurements were more than 20 dB below the limit and not recorded.

## 9 Band Edge Measurement

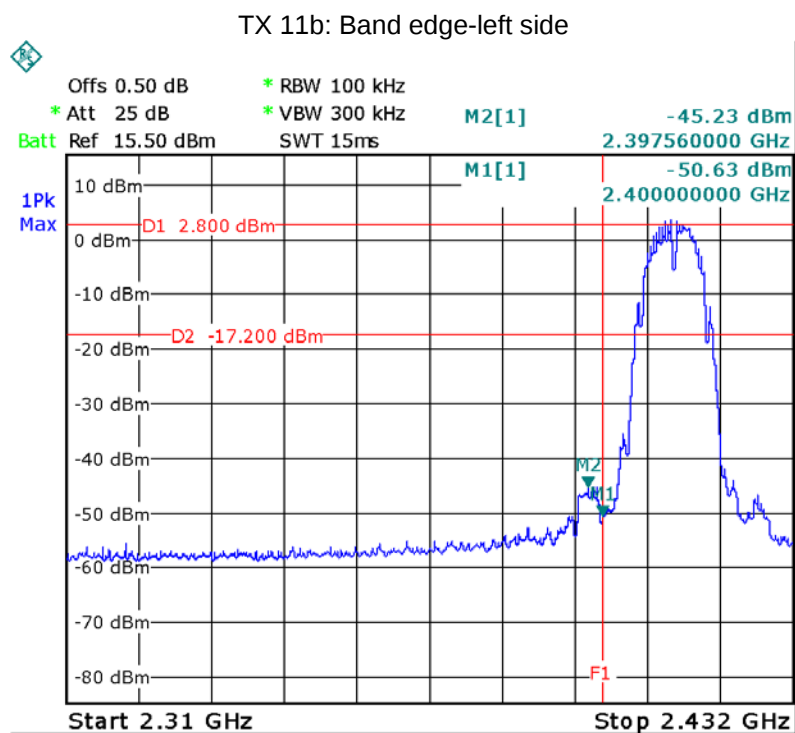
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC CFR47 Part 15 Section 15.247                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Test Method:      | 558074 D01 DTS Meas Guidance V04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Test Limit:       | Regulation 15.247 (d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)). |
| Test Mode:        | Transmitting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

### 9.1 Test Produce

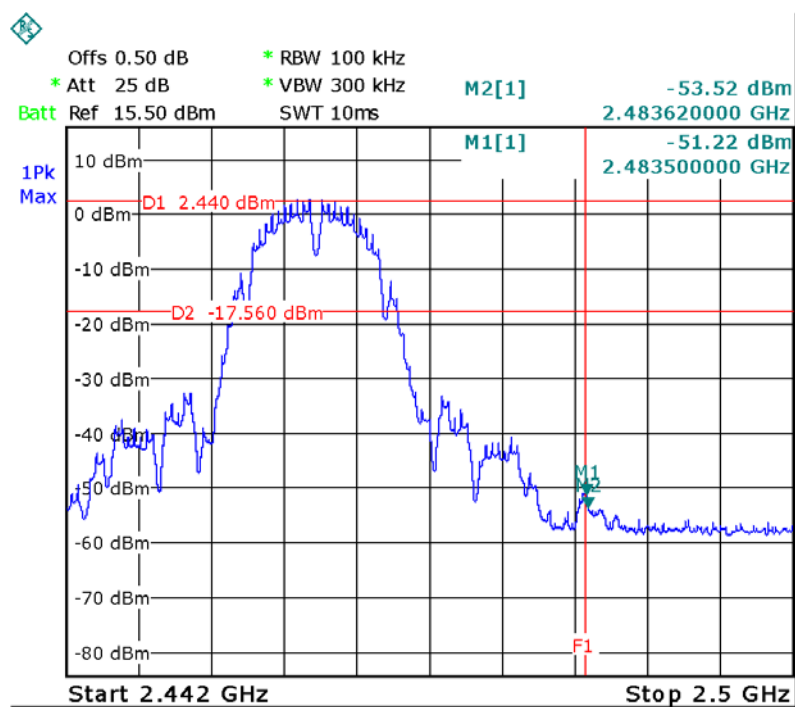
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

## 9.2 Test Result

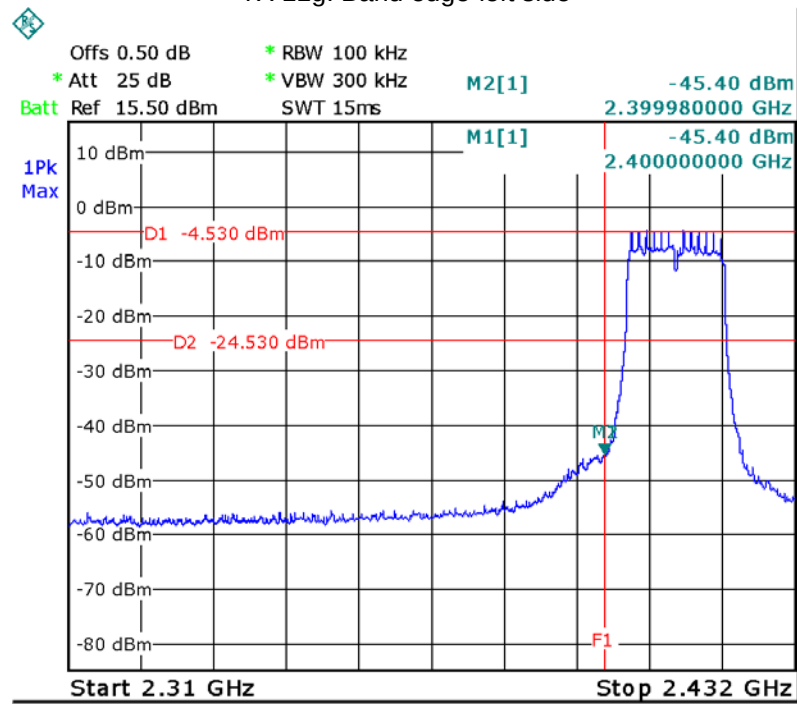
Test result plots shown as follows:



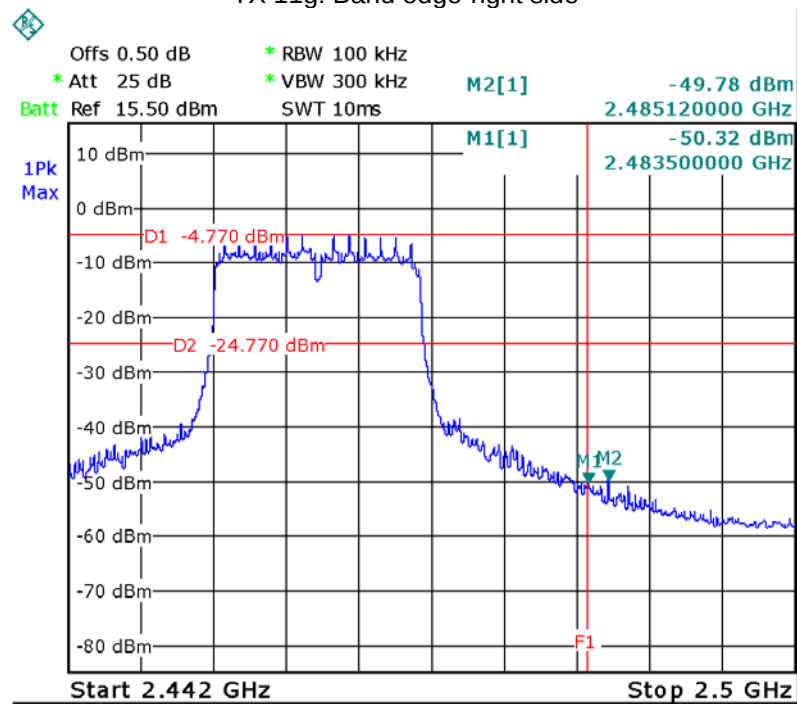
TX 11b: Band edge-right side



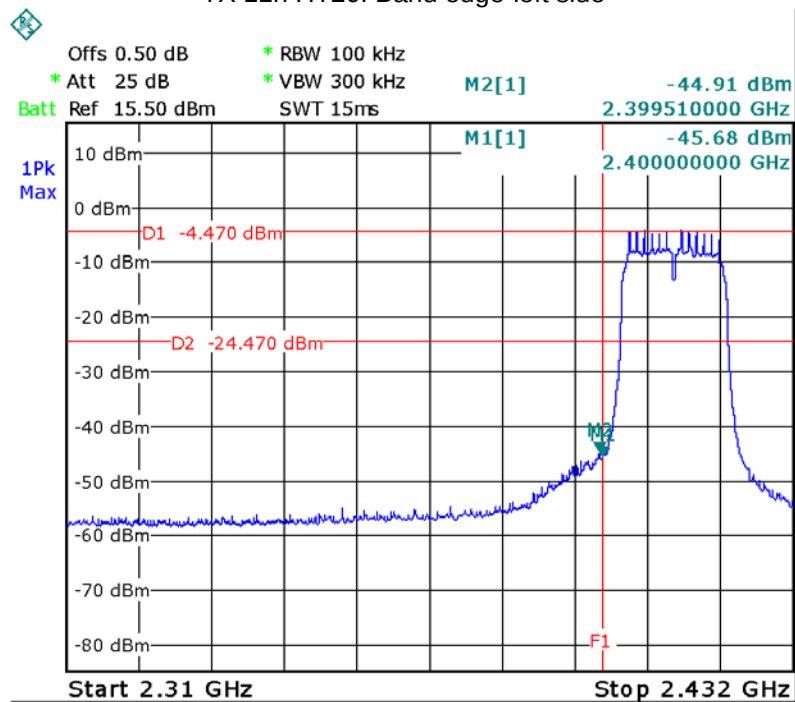
TX 11g: Band edge-left side



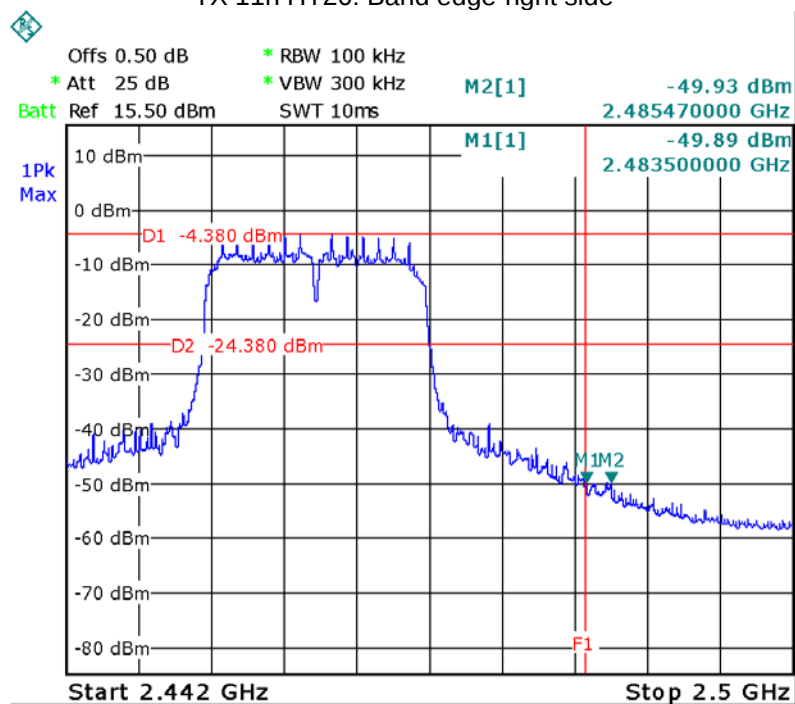
TX 11g: Band edge-right side



TX 11n HT20: Band edge-left side



TX 11n HT20: Band edge-right side



## 10 Bandwidth Measurement

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

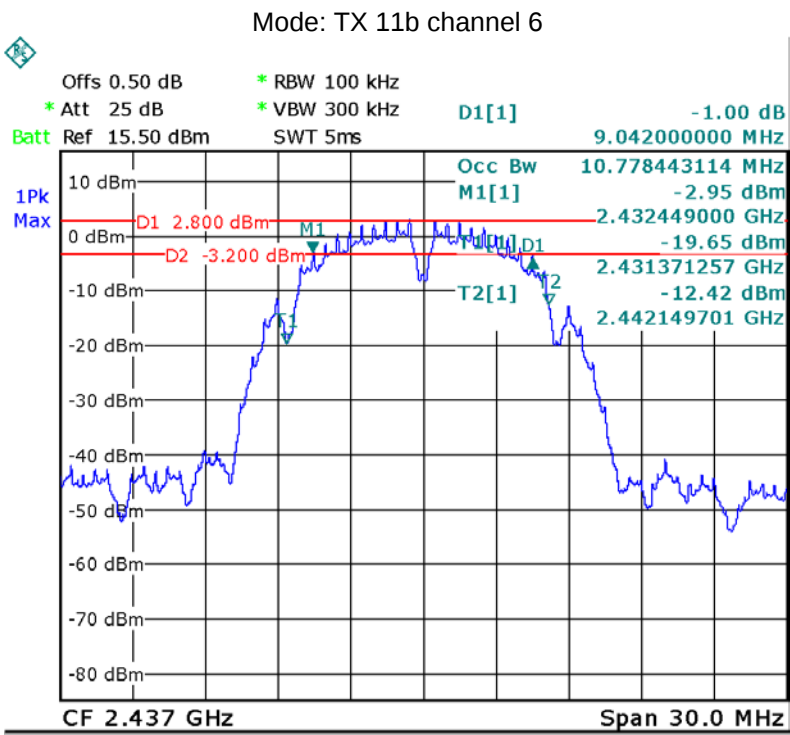
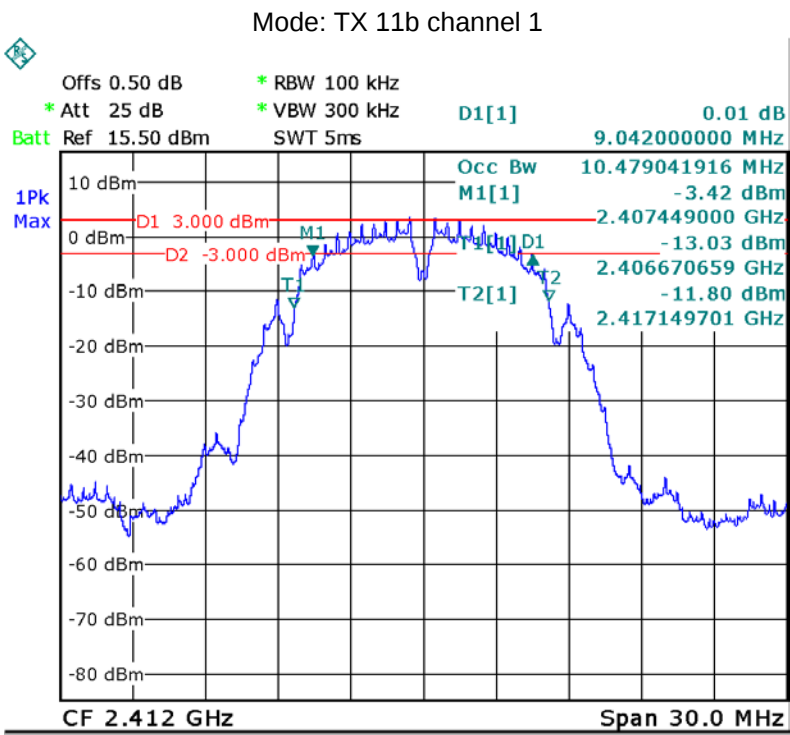
558074 D01 DTS Meas Guidance V04

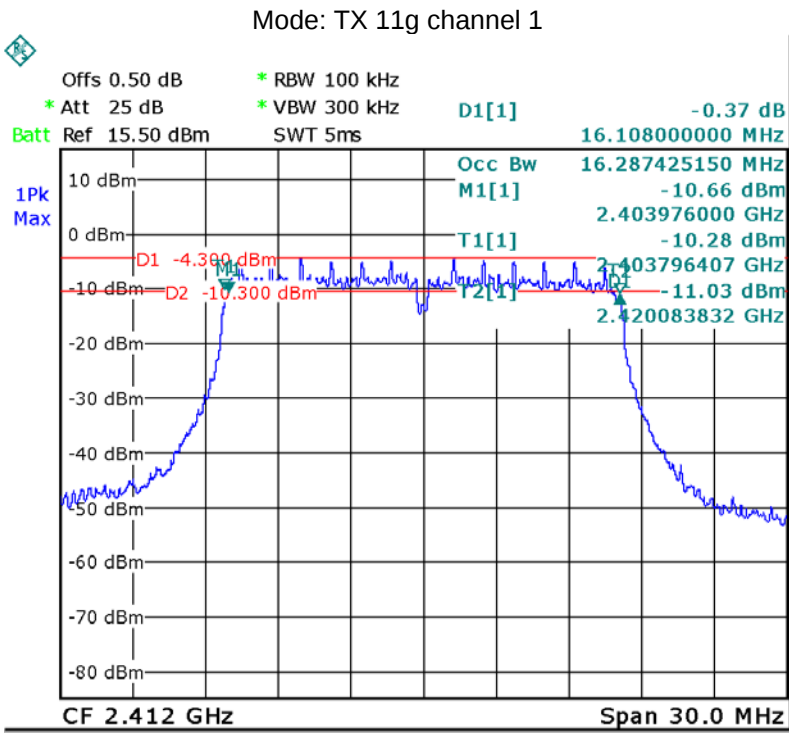
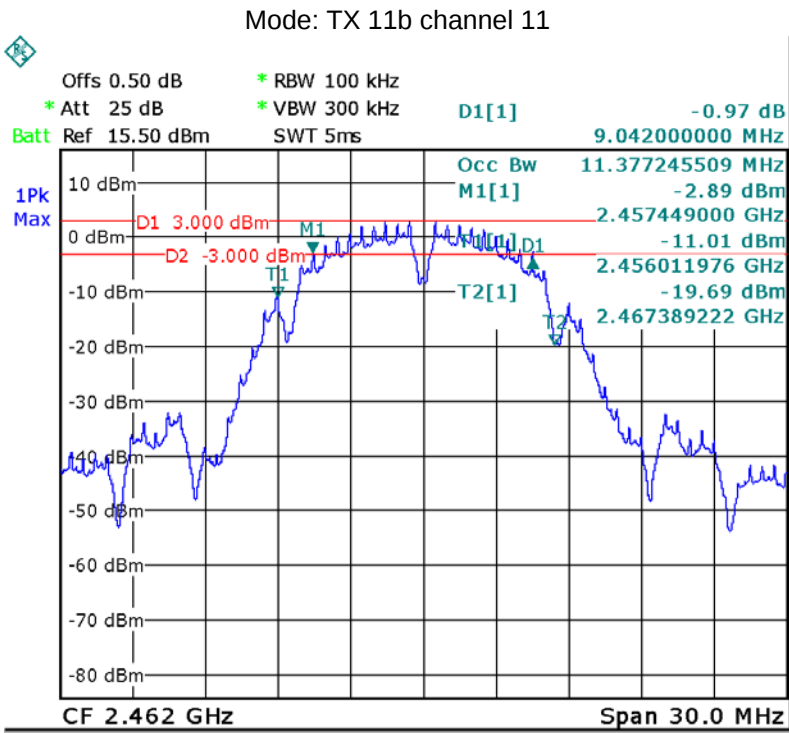
### 10.1 Test Procedure:

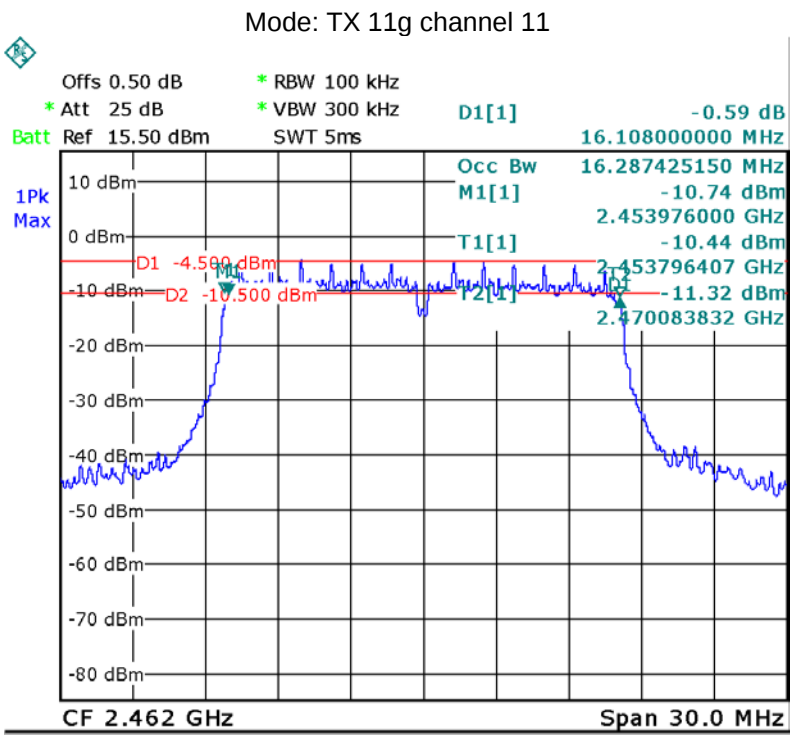
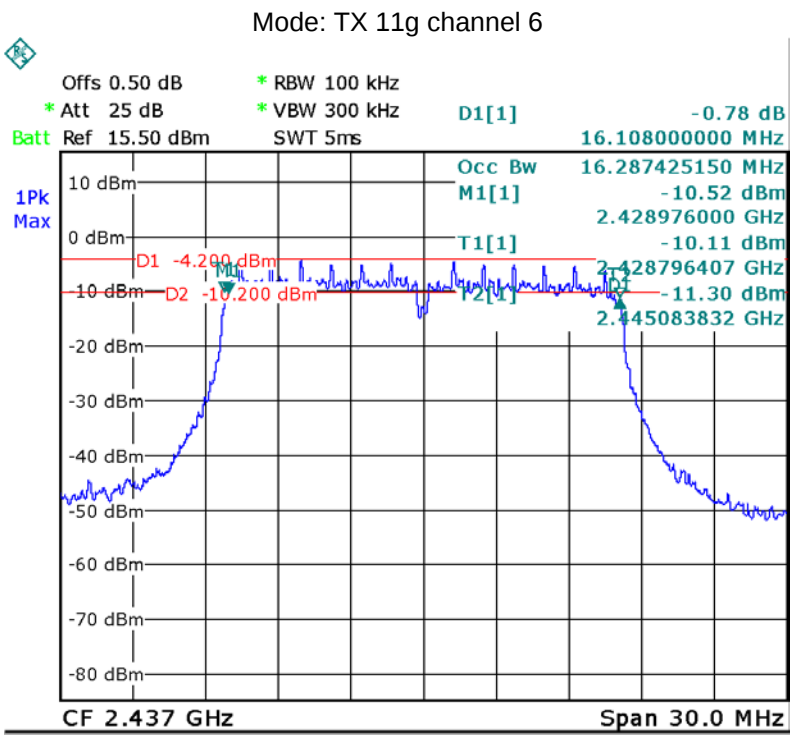
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

### 10.2 Test Result:

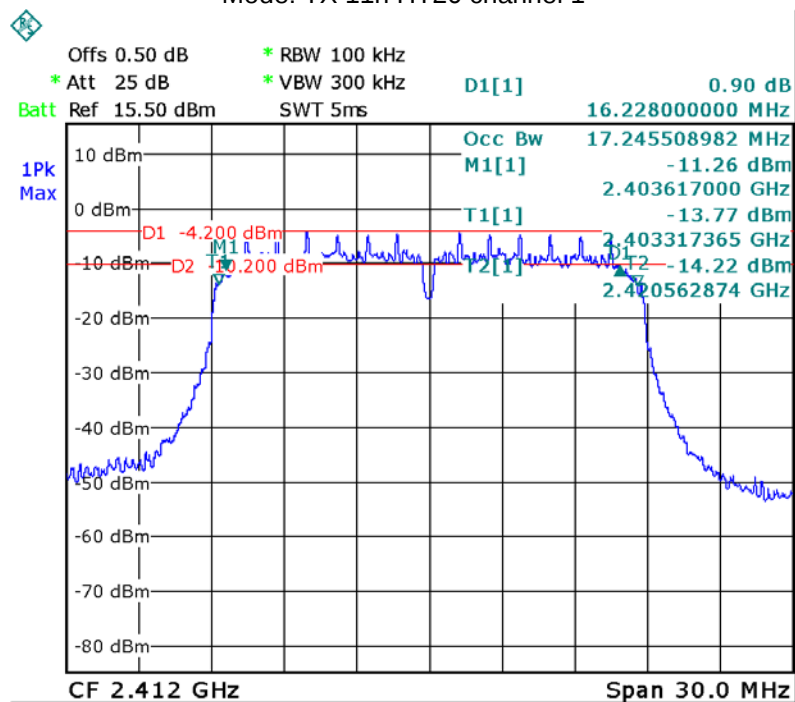
| Operation mode | 6dB Bandwidth (MHz) |           |            | 99% Bandwidth (MHz) |           |            |
|----------------|---------------------|-----------|------------|---------------------|-----------|------------|
| TX 11b         | Channel 1           | Channel 6 | Channel 11 | Channel 1           | Channel 6 | Channel 11 |
|                | 9.042               | 9.042     | 9.042      | 10.479              | 10.778    | 11.377     |
| TX 11g         | Channel 1           | Channel 6 | Channel 11 | Channel 1           | Channel 6 | Channel 11 |
|                | 16.108              | 16.108    | 16.108     | 16.287              | 16.287    | 16.287     |
| TX 11n HT20    | Channel 1           | Channel 6 | Channel 11 | Channel 1           | Channel 6 | Channel 11 |
|                | 16.228              | 16.228    | 16.228     | 17.246              | 17.246    | 17.246     |



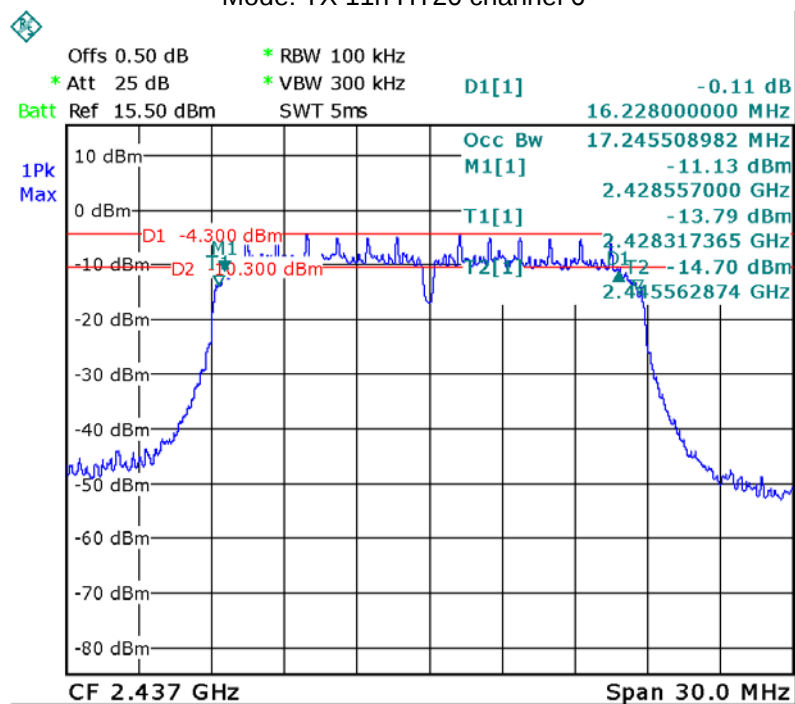


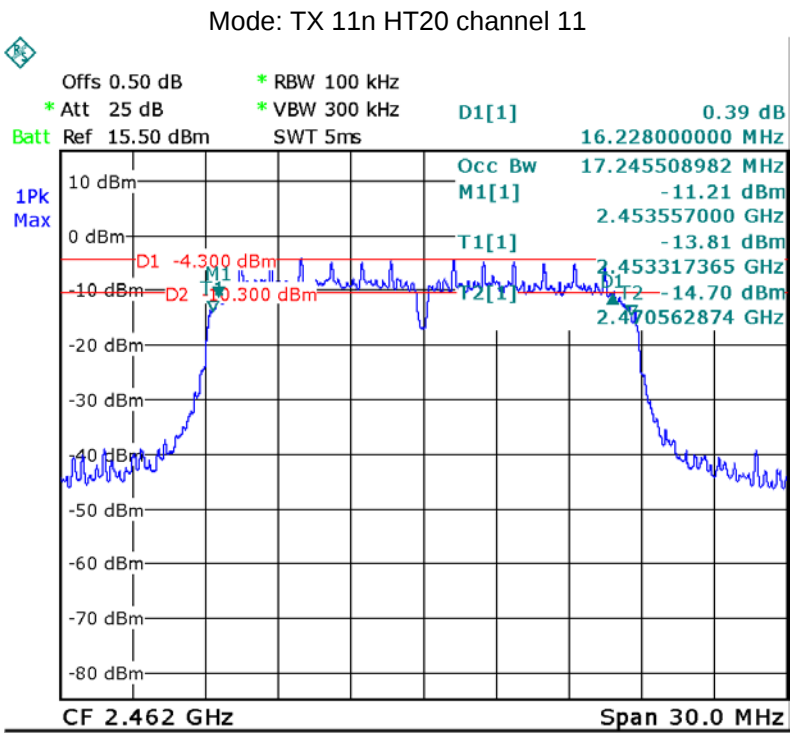


Mode: TX 11n HT20 channel 1



Mode: TX 11n HT20 channel 6





## 11 Maximum Peak Output Power

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

558074 D01 DTS Meas Guidance V04

### 11.1 Test Procedure:

558074 D01 DTS Meas Guidance V04

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

### 11.2 Test Result:

| Test mode :TX 11b               |         |         |
|---------------------------------|---------|---------|
| Maximum Peak Output Power (dBm) |         |         |
| 2412MHz                         | 2437MHz | 2462MHz |
| 14.21                           | 14.02   | 13.05   |
| Limit: 1W/30dBm                 |         |         |

| Test mode :TX 11g               |         |         |
|---------------------------------|---------|---------|
| Maximum Peak Output Power (dBm) |         |         |
| 2412MHz                         | 2437MHz | 2462MHz |
| 13.27                           | 14.13   | 14.06   |
| Limit: 1W/30dBm                 |         |         |

| Test mode :TX 11n HT20          |         |         |
|---------------------------------|---------|---------|
| Maximum Peak Output Power (dBm) |         |         |
| 2412MHz                         | 2437MHz | 2462MHz |
| 13.57                           | 13.50   | 12.86   |
| Limit: 1W/30dBm                 |         |         |

## 12 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 DTS Meas Guidance V04

### 12.1 Test Procedure:

558074 D01 DTS Meas Guidance V04

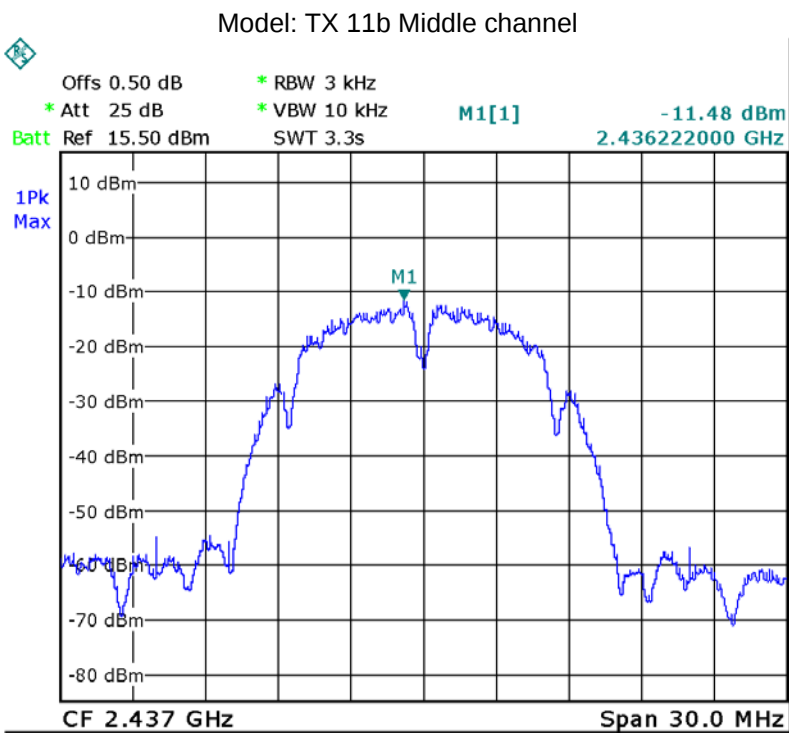
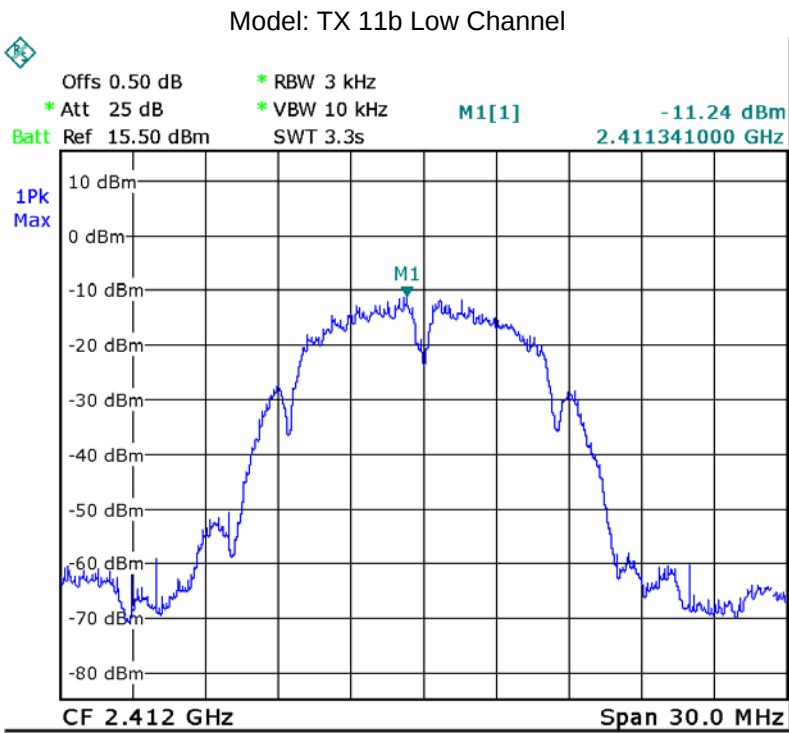
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span =30M. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

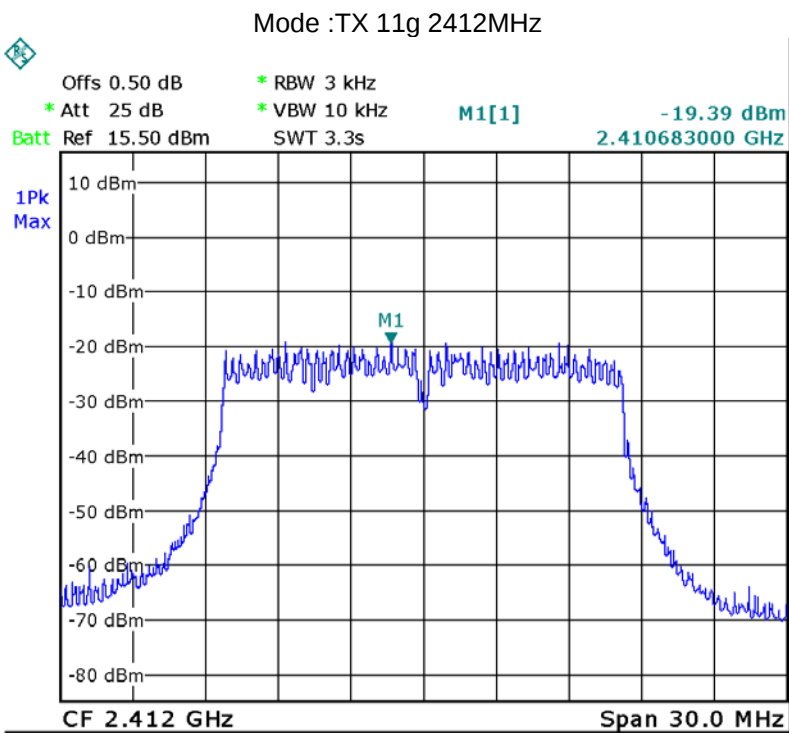
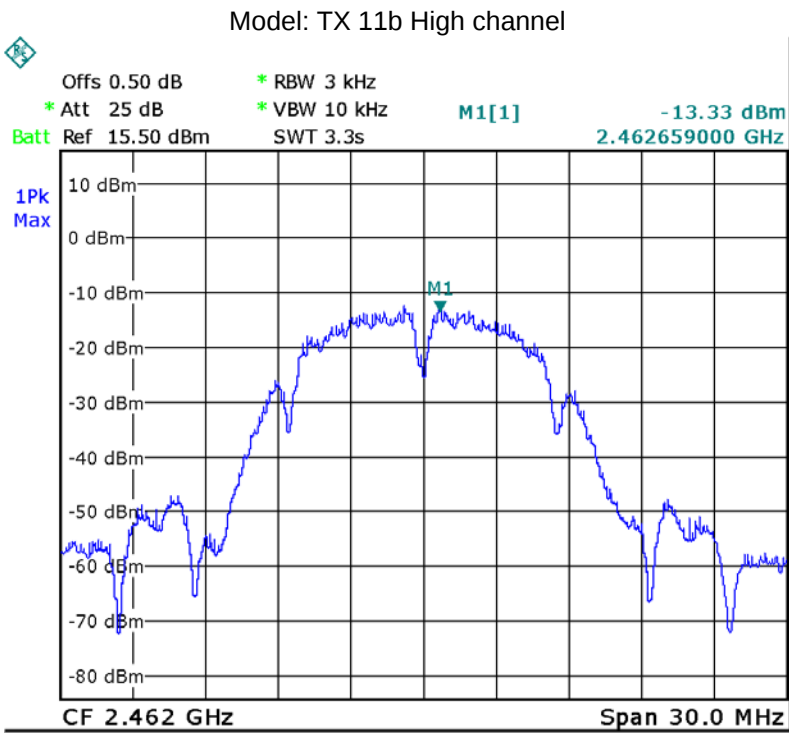
### 12.2 Test Result:

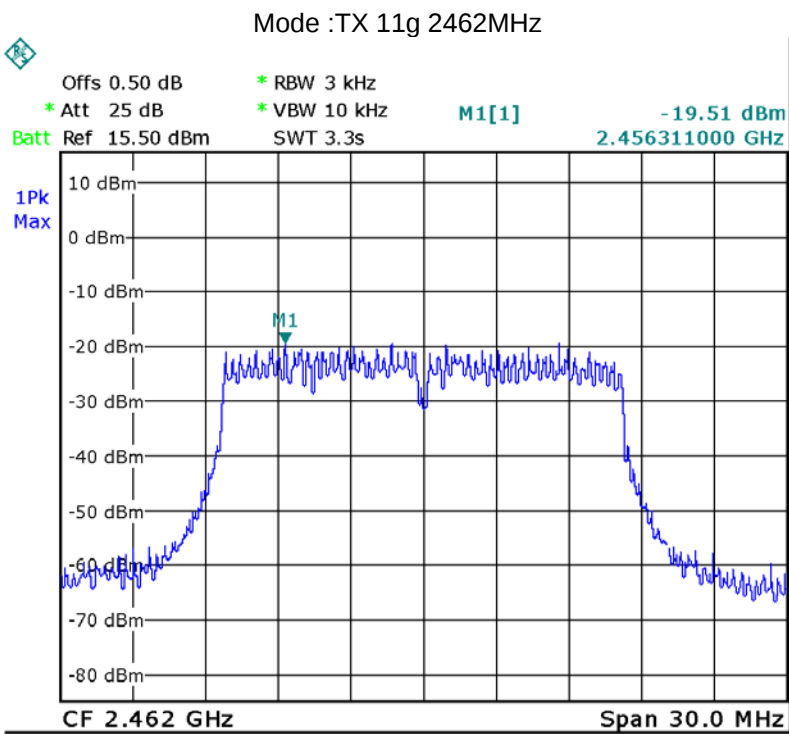
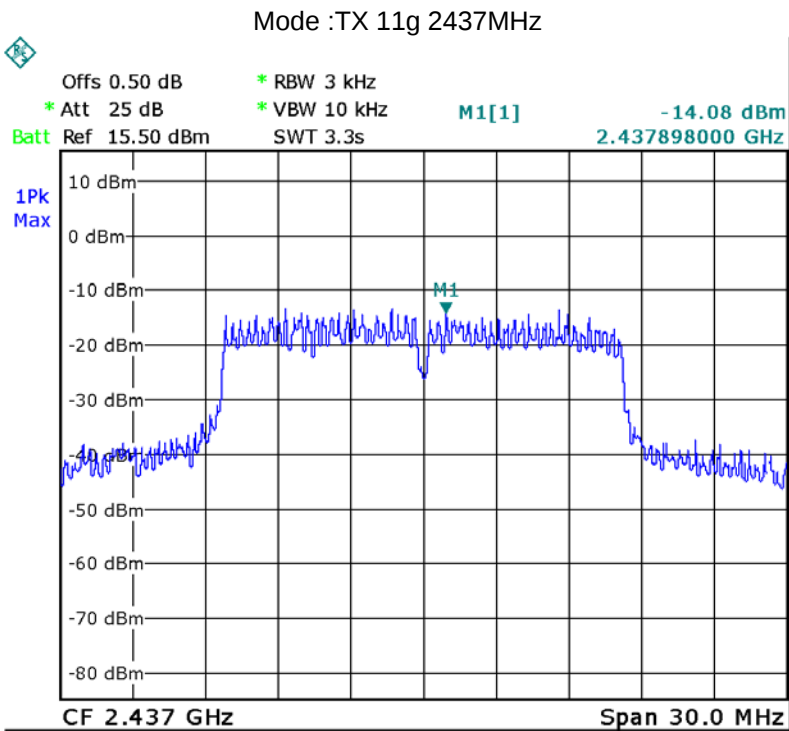
| Test mode :TX 11b             |         |         |
|-------------------------------|---------|---------|
| Power Spectral (dBm per 3kHz) |         |         |
| 2412MHz                       | 2437MHz | 2462MHz |
| -11.24                        | -11.48  | -13.33  |
| Limit: 8dBm per 3kHz          |         |         |

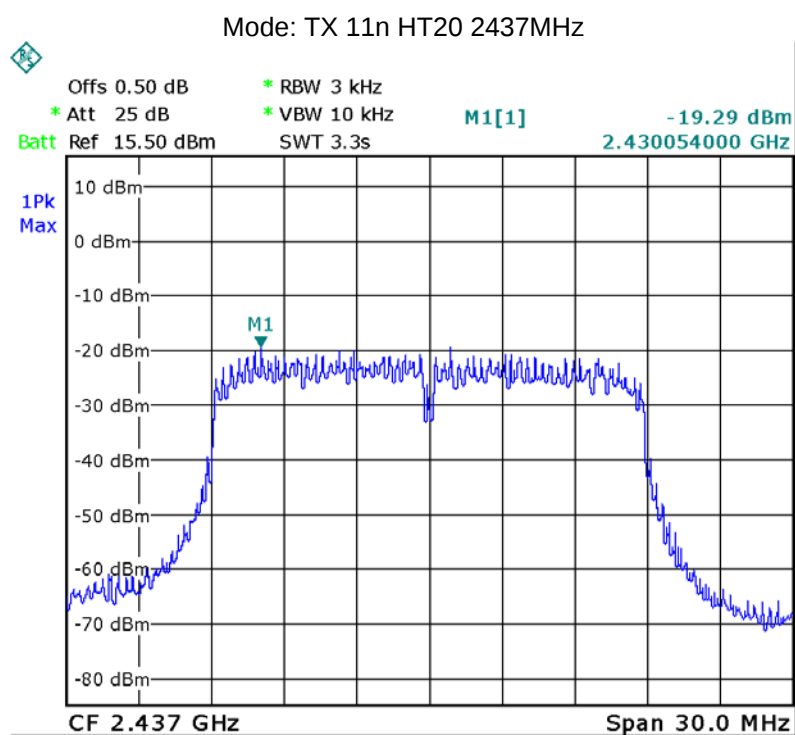
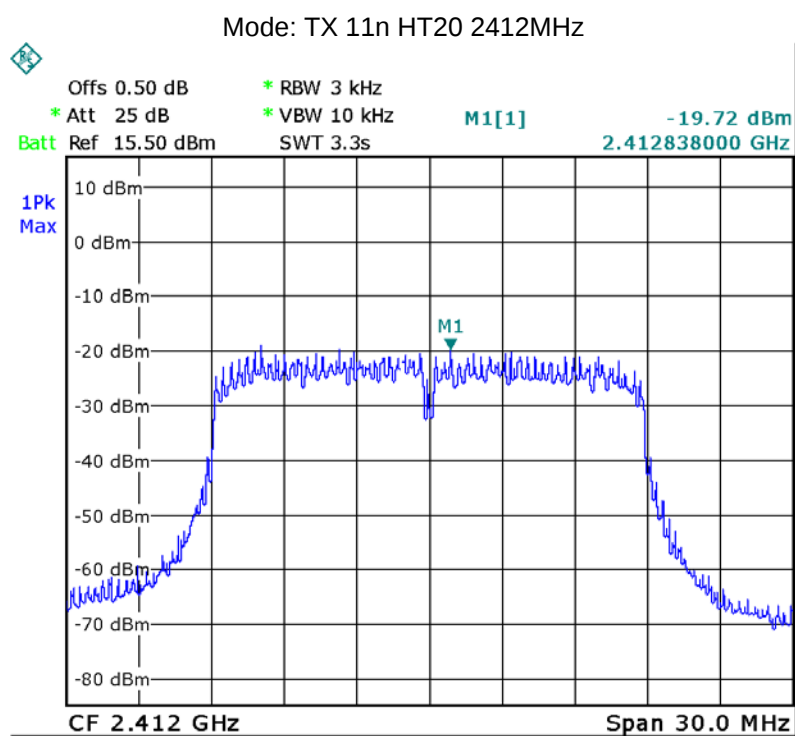
| Test mode :TX 11g             |         |         |
|-------------------------------|---------|---------|
| Power Spectral (dBm per 3kHz) |         |         |
| 2412MHz                       | 2437MHz | 2462MHz |
| -19.39                        | -14.08  | -19.51  |
| Limit: 8dBm per 3kHz          |         |         |

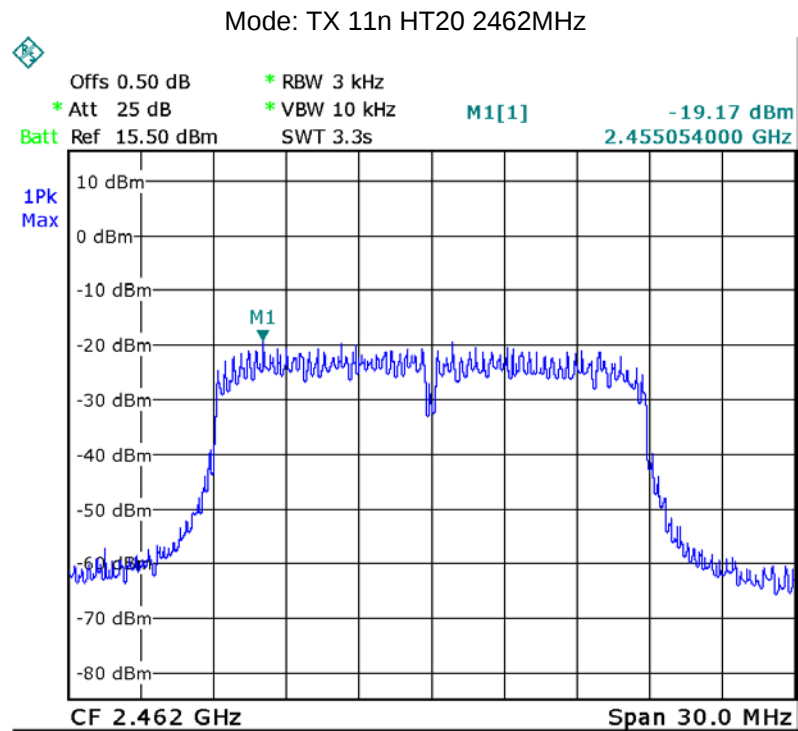
| Test mode :TX 11n HT20        |         |         |
|-------------------------------|---------|---------|
| Power Spectral (dBm per 3kHz) |         |         |
| 2412MHz                       | 2437MHz | 2462MHz |
| -19.72                        | -19.29  | -19.17  |
| Limit: 8dBm per 3kHz          |         |         |











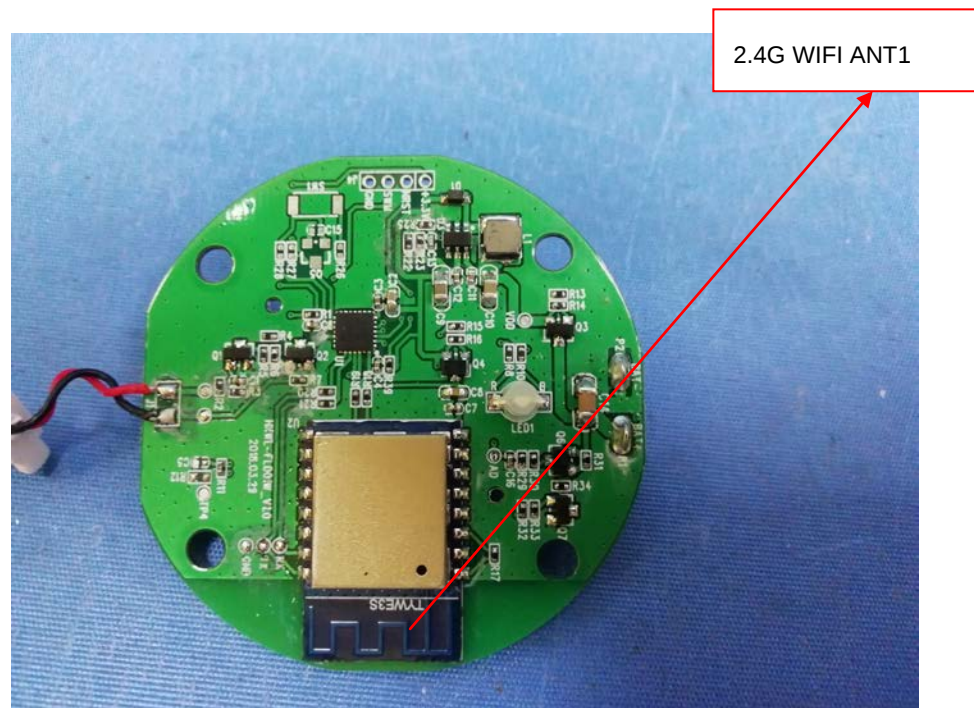
### 13 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Result:

The EUT have one Integrated Antenna, meets the requirements of FCC 15.203.



## **14 SAR Evaluation**

Please refer to SAR report.

## **15 Photographs – Test Setup Photos**

Please refer to the file HKWL-FLD01W \_Ext Photos, HKWL-FLD01W \_Int Photos and HKWL-FLD01W \_Tsup Photos..

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