



# FCC PART 15C TEST REPORT No.I20Z61117-IOT01

for

**Wingtech Group (Hongkong) Limited**

**Multi-band WCDMA/LTE MIFI with WLAN**

**CT2MHS01**

With

**FCC ID: 2APXW-CT2MHS01**

**Hardware Version: 89323\_1\_21**

**Software Version: CT2MHS01\_0.01.41**

**Issued Date: 2020-09-11**

**Note:**

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The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

**Test Laboratory:**

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## **REPORT HISTORY**

| Report Number   | Revision | Description | Issue Date |
|-----------------|----------|-------------|------------|
| I20Z61117-IOT01 | Rev.0    | 1st edition | 2020-09-11 |
|                 |          |             |            |

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## **1. Test Laboratory**

### **1.1.Introduction & Accreditation**

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

### **1.2. Testing Location**

Location 1:CTTL(Huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing,  
P. R. China100191

Location 2:CTTL(BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology  
Development Area, Beijing, P. R. China 100176

### 1.3. Testing Environment

Normal Temperature: 15-35°C

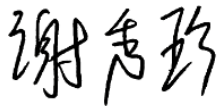
Relative Humidity: 20-75%

### 1.4. Project date

Testing Start Date: 2020-07-29

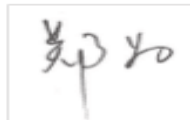
Testing End Date: 2020-09-11

### 1.5. Signature



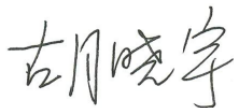
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Xie Xiuzhen  
(Prepared this test report)



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Zheng Wei  
(Reviewed this test report)



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Hu Xiaoyu  
(Approved this test report)

## **2. Client Information**

### **2.1.Applicant Information**

Company Name: Wingtech Group (Hongkong) Limited  
Address: Flat/RM 1903 ,19/F, Podium Plaza, 5 Hanoi Road, Tsim Sha Tsui,  
Kowloon, Hongkong.  
City: Hongkong.  
Postal Code: /  
Country: China  
Telephone: +86-13917939276  
Fax: /

### **2.2.Manufacturer Information**

Company Name: Wingtech Group (Hongkong) Limited  
Address: Flat/RM 1903 ,19/F, Podium Plaza, 5 Hanoi Road, Tsim Sha Tsui,  
Kowloon, Hongkong.  
City: Hongkong  
Postal Code: /  
Country: China  
Telephone: +86-13917939276  
Fax: /

### 3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

#### 3.1. About EUT

|                     |                                     |
|---------------------|-------------------------------------|
| Description         | Multi-band WCDMA/LTE MIFI with WLAN |
| Model name          | CT2MHS01                            |
| FCC ID              | 2APXW-CT2MHS01                      |
| With WLAN Function  | Yes                                 |
| Frequency Band      | ISM 2400MHz~2483.5MHz               |
| Type of Modulation  | DSSS/CCK/OFDM                       |
| Number of Channels  | 11                                  |
| Antenna             | Integral Antenna                    |
| MAX Conducted Power | 24.68dBm                            |
| Power Supply        | 3.85V                               |

#### 3.2. Internal Identification of EUT

| EUT ID* | SN or IMEI      | HW Version | SW Version       |
|---------|-----------------|------------|------------------|
| EUT1    | 353929580015579 | 89323_1_21 | CT2MHS01_0.01.41 |
| EUT2    | 353929580002510 | 89323_1_21 | CT2MHS01_0.01.41 |

\*EUT ID: is used to identify the test sample in the lab internally.

#### 3.3. Internal Identification of AE

| AE ID* | Description | SN | Remarks |
|--------|-------------|----|---------|
| AE1    | Battery     | /  | /       |
| AE2    | charger     | /  | /       |
| AE3    | USB cable   | /  | /       |
| AE4    | USB cable   | /  | /       |

##### AE1

|                 |                                           |
|-----------------|-------------------------------------------|
| Type            | MF01                                      |
| Manufacturer    | Jiade Energy Technology (Zhuhai) Co.,Ltd. |
| Capacity        | /                                         |
| Nominal Voltage | /                                         |

##### AE2

|                 |                                   |
|-----------------|-----------------------------------|
| Model           | PA-US5V2A-036                     |
| Manufacturer    | Huizhou puan electronics co., ltd |
| Length of cable | /                                 |

##### AE3

|                 |                                    |
|-----------------|------------------------------------|
| Type            | USB TYPE A to C 2.0 Cable (1.0m)   |
| Manufacturer    | Huizhou Washin Electronics Co.,Ltd |
| Length of cable | /                                  |

AE4

|                 |                                  |
|-----------------|----------------------------------|
| Type            | USB TYPE A to C 2.0 Cable (1.0m) |
| Manufacturer    | Shenzhen BRL Technology Co.,Ltd. |
| Length of cable | /                                |

\*AE ID: is used to identify the test sample in the lab internally.

### 3.4. General Description

The Equipment under Test (EUT) is a model of Multi-band WCDMA/LTE MIFI with WLAN with integrated antenna and inbuilt battery.

It consists of normal options: travel charger, USB cable.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

### 3.5. Interpretation of the Test Environment

For the test methods, the test environment uncertainty figures correspond to an expansion factor  $k=2$ .

Measurement Uncertainty

| Parameter   | Uncertainty |
|-------------|-------------|
| temperature | 0.48°C      |
| humidity    | 2 %         |
| DC voltages | 0.003V      |

## 4. Reference Documents

### 4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

### 4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

| Reference      | Title                                                   | Version |
|----------------|---------------------------------------------------------|---------|
| FCC Part15     | FCC CFR 47, Part 15, Subpart C:                         | 2018    |
|                | 15.205 Restricted bands of operation;                   |         |
|                | 15.209 Radiated emission limits, general requirements;  |         |
| ANSI C63.10    | 15.247 Operation within the bands 902-928MHz,           | 2013    |
|                | 2400-2483.5 MHz, and 5725-5850 MHz.                     |         |
|                | American National Standard of Procedures for Compliance |         |
| KDB 558074 D01 | Testing of Unlicensed Wireless Devices                  | 2019    |
|                | Federal Communications Commission Office of             |         |
|                | Engineering and Technology Laboratory Division          |         |
| KDB 558074 D01 | GUIDANCE FOR COMPLIANCE MEASUREMENTS ON                 | 2019    |
|                | DIGITAL TRANSMISSION SYSTEM, FREQUENCY                  |         |
|                | HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID              |         |
| KDB 558074 D01 | SYSTEM DEVICES OPERATING UNDER SECTION                  | 2019    |
|                | 15.247 OF THE FCC RULES                                 |         |
|                |                                                         |         |

## 5. Test Results

### 5.1. Summary of Test Results

| SUMMARY OF MEASUREMENT RESULTS            | Sub-clause of Part15C  | Sub-clause of IC | Verdict |
|-------------------------------------------|------------------------|------------------|---------|
| Maximum Peak Output Power                 | 15.247 (b)             | /                | P       |
| Peak Power Spectral Density               | 15.247 (e)             | /                | P       |
| Occupied 6dB Bandwidth                    | 15.247 (a)             | /                | P       |
| Band Edges Compliance                     | 15.247 (d)             | /                | P       |
| Transmitter Spurious Emission - Conducted | 15.247 (d)             | /                | P       |
| Transmitter Spurious Emission - Radiated  | 15.247, 15.205, 15.209 | /                | P       |
| AC Powerline Conducted Emission           | 15.107, 15.207         | /                | P       |

Please refer to **ANNEX A** for detail.

Terms used in Verdict column

|    |                                                                               |
|----|-------------------------------------------------------------------------------|
| P  | Pass, The EUT complies with the essential requirements in the standard.       |
| NP | Not Perform, The test was not performed by CTTL                               |
| NA | Not Applicable, The test was not applicable                                   |
| F  | Fail, The EUT does not comply with the essential requirements in the standard |

### 5.2. Statements

The test cases as listed in section 5.1 of this report for the EUT specified in section 3 was performed by CTTL and according to the standards or reference documents listed in section 4.2

The EUT met all requirements of the standards or reference documents, and only the WLAN function was tested in this report.

### 5.3. Test Conditions

|       |                    |
|-------|--------------------|
| T nom | Normal Temperature |
| T min | Low Temperature    |
| T max | High Temperature   |
| V nom | Normal Voltage     |

For this report, if the test cases listed above are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

|             |       |                   |
|-------------|-------|-------------------|
| Temperature | T nom | 26°C              |
| Voltage     | V nom | 3.85V(By battery) |
| Humidity    | H nom | 20-75%            |

## 6. Test Facilities Utilized

### Conducted test system

| No. | Equipment              | Model  | Serial Number | Manufacturer    | Calibration Period | Calibration Due date |
|-----|------------------------|--------|---------------|-----------------|--------------------|----------------------|
| 1   | Vector Signal Analyzer | FSQ40  | 200089        | Rohde & Schwarz | 1 year             | 2021-05-06           |
| 2   | LISN                   | ENV216 | 101459        | R&S             | 1 year             | 2021-03-17           |
| 3   | Test Receiver          | ESCI   | 100766        | R&S             | 1 year             | 2021-03-10           |
| 4   | Shielding Room         | S81    | /             | ETS-Lindgren    | /                  | /                    |

### Radiated emission test system

| No. | Equipment                         | Model    | Serial Number | Manufacturer    | Calibration Period | Calibration Due date |
|-----|-----------------------------------|----------|---------------|-----------------|--------------------|----------------------|
| 1   | Test Receiver                     | ESU26    | 100376        | Rohde & Schwarz | 1 year             | 2020-10-30           |
| 2   | BiLog Antenna                     | VULB9163 | 9163-514      | Schwarzbeck     | 1 year             | 2021-02-24           |
| 3   | Dual-Ridge Waveguide Horn Antenna | 3117     | 00139065      | ETS-Lindgren    | 1 year             | 2020-11-10           |
| 4   | Dual-Ridge Waveguide Horn Antenna | 3116     | 2661          | ETS-Lindgren    | 1 year             | 2020-10-08           |

## 7. Measurement Uncertainty

### 7.1. Maximum Output Power

Measurement Uncertainty: 0.387dB,k=1.96

### 7.2. Peak Power Spectral Density

Measurement Uncertainty: 0.705dB,k=1.96

### 7.3. DTS 6-dB Signal Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

### 7.4. Band Edges Compliance

Measurement Uncertainty : 0.62dB,k=1.96

### 7.5. Transmitter Spurious Emission

#### Conducted (k=1.96)

| Frequency Range                            | Uncertainty(dB) |
|--------------------------------------------|-----------------|
| $30\text{MHz} \leq f \leq 2\text{GHz}$     | 1.22            |
| $2\text{GHz} \leq f \leq 3.6\text{GHz}$    | 1.22            |
| $3.6\text{GHz} \leq f \leq 8\text{GHz}$    | 1.22            |
| $8\text{GHz} \leq f \leq 12.75\text{GHz}$  | 1.51            |
| $12.75\text{GHz} \leq f \leq 26\text{GHz}$ | 1.51            |
| $26\text{GHz} \leq f \leq 40\text{GHz}$    | 1.59            |

#### Radiated (k=2)

| Frequency Range                         | Uncertainty(dB) |
|-----------------------------------------|-----------------|
| 9kHz-30MHz                              | /               |
| $30\text{MHz} \leq f \leq 1\text{GHz}$  | 5.40            |
| $1\text{GHz} \leq f \leq 18\text{GHz}$  | 4.32            |
| $18\text{GHz} \leq f \leq 40\text{GHz}$ | 5.26            |

### 7.6. AC Power-line Conducted Emission

Measurement Uncertainty : 3.10dB,k=2

## **ANNEX A: Detailed Test Results**

### **A.1. Measurement Method**

#### **A.1.1. Conducted Measurements**

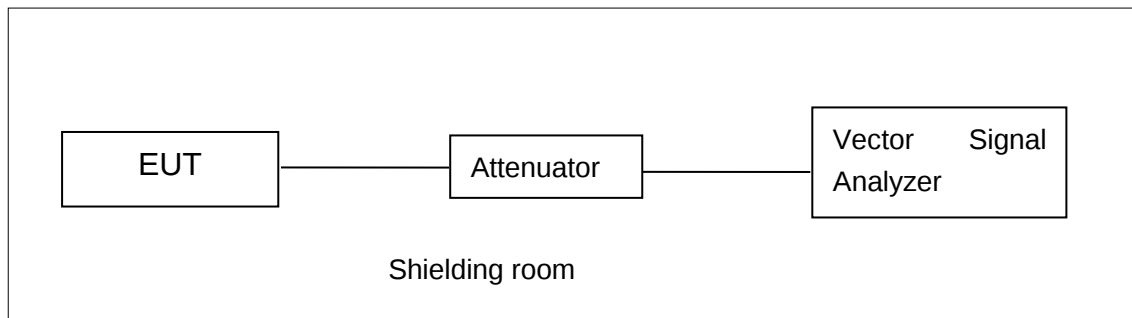
Connect the EUT to the test system as Fig.A.1.1.1 shows.

Set the EUT to the required work mode.

Set the EUT to the required channel.

Set the Vector Signal Analyzer and start measurement.

Record the values. Vector Signal Analyzer



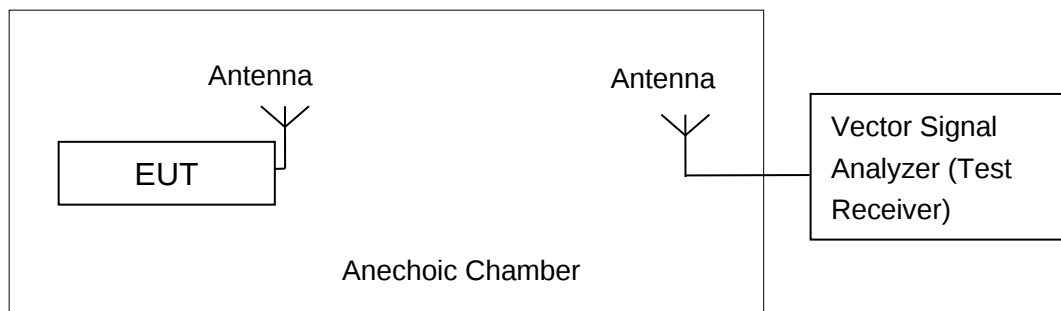
**Fig.A.1.1.1: Test Setup Diagram for Conducted Measurements**

#### **A.1.2. Radiated Emission Measurements**

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 10Hz;



**Fig.A.1.2.1: Test Setup Diagram for Radiated Measurements**

## **A.2. Maximum Output Power**

**Method of Measurement:** See ANSI C63.10-2013-clause 11.9.1.2

- a) Set the RBW = 1 MHz.
- b) Set the VBW = 3 MHz.
- c) Set the span  $\geq [1.5 \times \text{DTS bandwidth}]$ .
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector).

**Measurement Limit:**

| Standard               | Limit (dBm) |
|------------------------|-------------|
| FCC CRF Part 15.247(b) | < 30        |

**EUT ID:** EUT2

### **A.2.1. Peak Output Power-conducted**

**Measurement Results:**

#### **802.11b/g mode**

| Mode    | Data Rate (Mbps) | Test Result (dBm) |               |                 |
|---------|------------------|-------------------|---------------|-----------------|
|         |                  | 2412MHz (Ch1)     | 2437MHz (Ch6) | 2462 MHz (Ch11) |
| 802.11b | 1                | 21.21             | 21.08         | 21.20           |
| 802.11g | 6                | 24.60             | 24.48         | 24.52           |

The data rate 1Mbps and 6Mbps are selected as worse condition, and the following cases are performed with this condition.

**802.11n-HT20 mode**

| Mode               | Data Rate<br>(Index) | Test Result (dBm) |                  |                    |
|--------------------|----------------------|-------------------|------------------|--------------------|
|                    |                      | 2412MHz<br>(Ch1)  | 2437MHz<br>(Ch6) | 2462 MHz<br>(Ch11) |
| 802.11n<br>(20MHz) | MCS0                 | 24.68             | 24.67            | 24.61              |

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

**802.11n-HT40 mode**

| Mode               | Data Rate<br>(Index) | Test Result (dBm) |                  |                   |
|--------------------|----------------------|-------------------|------------------|-------------------|
|                    |                      | 2422MHz<br>(Ch3)  | 2437MHz<br>(Ch6) | 2452 MHz<br>(Ch9) |
| 802.11n<br>(40MHz) | MCS0                 | 24.32             | 24.05            | 23.98             |

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

**Conclusion: Pass**

### A.3. Peak Power Spectral Density

**Method of Measurement:** See ANSI C63.10-2013-clause 11.10.2

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to  $RBW = 3 \text{ kHz}$ .
- Set the VBW = 10 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

**Measurement Limit:**

| Standard               | Limit         |
|------------------------|---------------|
| FCC CRF Part 15.247(e) | < 8 dBm/3 kHz |

**Measurement Results:**

#### 802.11b/g mode

| Mode    | Channel | Power Spectral Density<br>( dBm/3 kHz ) |        | Conclusion |
|---------|---------|-----------------------------------------|--------|------------|
| 802.11b | 1       | Fig.A.3.1                               | -7.39  | P          |
|         | 6       | Fig.A.3.2                               | -7.22  | P          |
|         | 11      | Fig.A.3.3                               | -4.41  | P          |
| 802.11g | 1       | Fig.A.3.4                               | -11.51 | P          |
|         | 6       | Fig.A.3.5                               | -11.49 | P          |
|         | 11      | Fig.A.3.6                               | -11.86 | P          |

#### 802.11n-HT20 mode

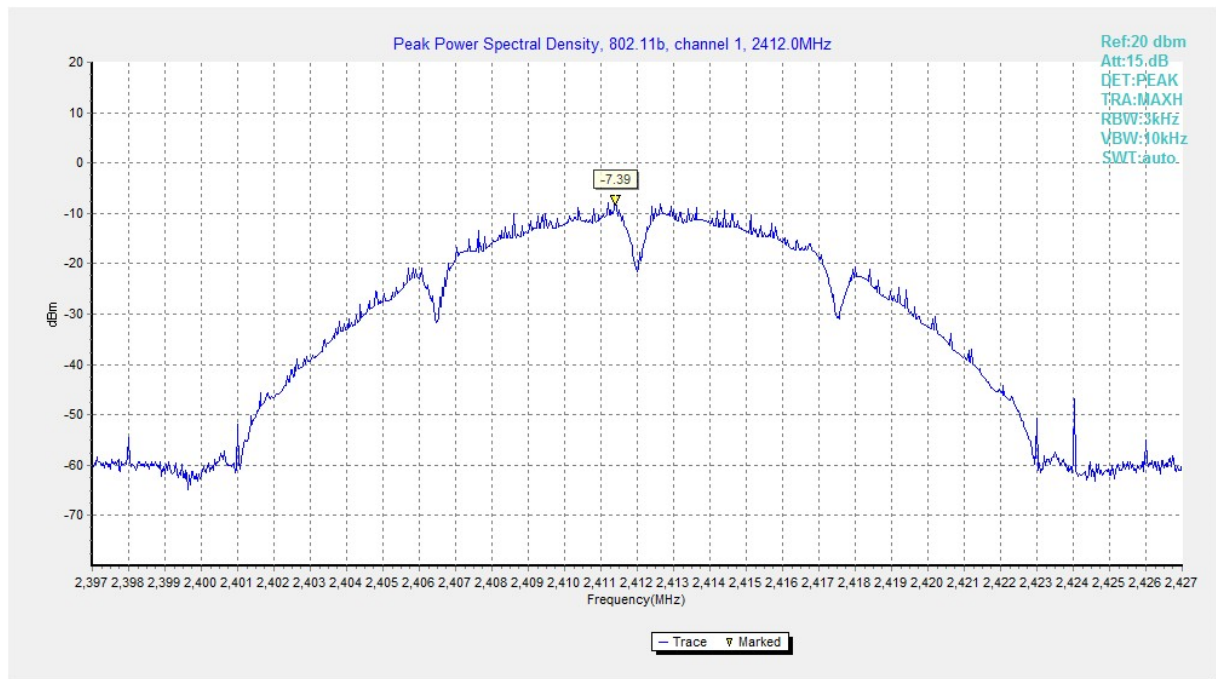
| Mode              | Channel | Power Spectral Density<br>( dBm/3 kHz ) |        | Conclusion |
|-------------------|---------|-----------------------------------------|--------|------------|
| 802.11n<br>(HT20) | 1       | Fig.A.3.7                               | -11.12 | P          |
|                   | 6       | Fig.A.3.8                               | -10.41 | P          |
|                   | 11      | Fig.A.3.9                               | -10.90 | P          |

#### 802.11n-HT40 mode

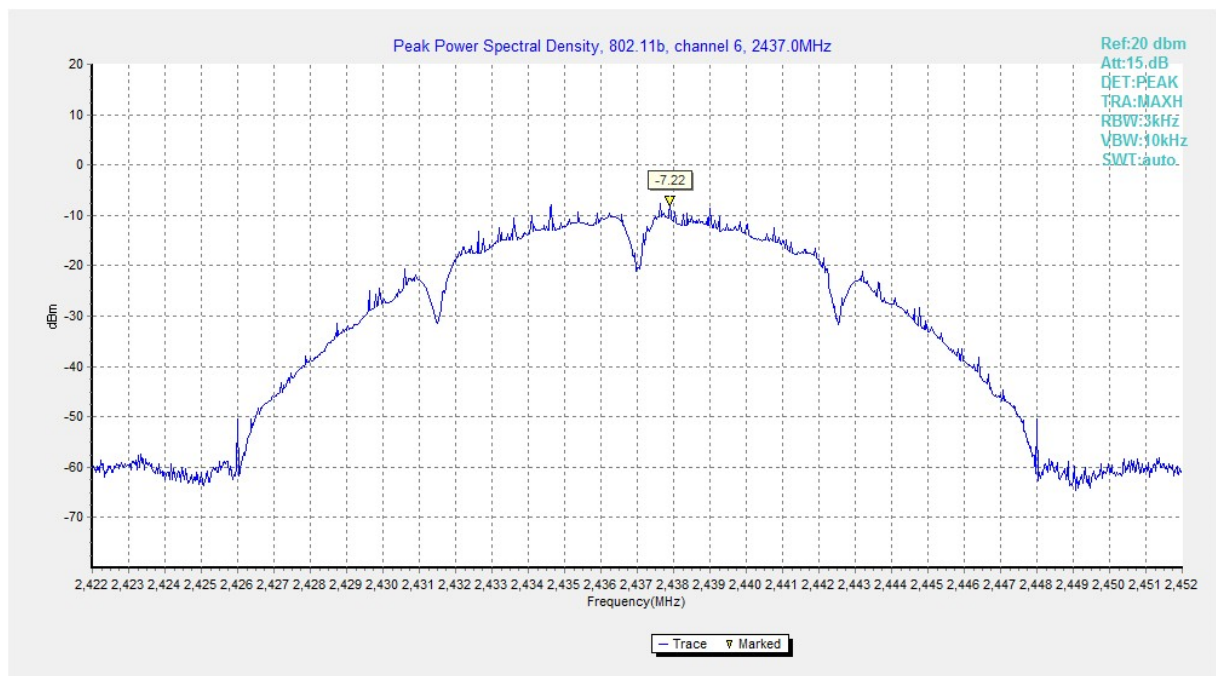
| Mode              | Channel | Power Spectral Density<br>( dBm/3 kHz ) |        | Conclusion |
|-------------------|---------|-----------------------------------------|--------|------------|
| 802.11n<br>(HT40) | 3       | Fig.A.3.10                              | -13.02 | P          |
|                   | 6       | Fig.A.3.11                              | -14.44 | P          |
|                   | 9       | Fig.A.3.12                              | -14.46 | P          |

**Conclusion: Pass**

Test graphs as below:



**Fig.A.3.1 Power Spectral Density(802.11b,Ch1)**



**Fig.A.3.2 Power Spectral Density (802.11b, Ch 6)**