



# FCC PART 15C TEST REPORT No. I15Z41840-SRD01

for

**TCL Communication Ltd**

**HSUPA/HSDPA/UMTS Quad-band/GSM Quad-band mobile phone**

**MODEL NAME: 4028S**

with

**FCC ID: 2ACCJH027**

**Hardware Version: PIO**

**Software Version: v6DB2**

**Issued Date: 2015-07-28**



**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

**Test Laboratory:**

CTTL, Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT

No.52, HuayuanNorth Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512,Fax:+86(0)10-62304633-2504

Email:[cttl\\_terminals@catr.cn](mailto:cttl_terminals@catr.cn), website:[www.chinattl.com](http://www.chinattl.com)



## **REPORT HISTORY**

| Report Number   | Revision | Description | Issue Date |
|-----------------|----------|-------------|------------|
| I15Z41840-SRD01 | Rev.0    | 1st edition | 2015-07-28 |

## **CONTENTS**

|                                                                        |           |
|------------------------------------------------------------------------|-----------|
| <b>1. TEST LABORATORY .....</b>                                        | <b>5</b>  |
| <b>1.1. TESTINGLOCATION .....</b>                                      | <b>5</b>  |
| <b>1.2. TESTINGENVIRONMENT .....</b>                                   | <b>5</b>  |
| <b>1.3. PROJECT DATA .....</b>                                         | <b>5</b>  |
| <b>1.4. SIGNATURE .....</b>                                            | <b>5</b>  |
| <b>2. CLIENTINFORMATION .....</b>                                      | <b>6</b>  |
| <b>2.1. APPLICANT INFORMATION.....</b>                                 | <b>6</b>  |
| <b>2.2. MANUFACTURER INFORMATION.....</b>                              | <b>6</b>  |
| <b>3. EQUIPMENT UNDERTEST (EUT) AND ANCILLARY EQUIPMENT (AE) .....</b> | <b>7</b>  |
| <b>3.1. ABOUT EUT .....</b>                                            | <b>7</b>  |
| <b>3.2. INTERNAL IDENTIFICATION OF EUT .....</b>                       | <b>7</b>  |
| <b>3.3. INTERNAL IDENTIFICATION OF AE.....</b>                         | <b>7</b>  |
| <b>3.4. GENERAL DESCRIPTION .....</b>                                  | <b>8</b>  |
| <b>3.5. INTERPRETATION OF THE TEST ENVIRONMENT .....</b>               | <b>8</b>  |
| <b>4. REFERENCE DOCUMENTS.....</b>                                     | <b>9</b>  |
| <b>4.1. DOCUMENTS SUPPLIED BY APPLICANT.....</b>                       | <b>9</b>  |
| <b>4.2. REFERENCE DOCUMENTS FOR TESTING.....</b>                       | <b>9</b>  |
| <b>5. TEST RESULTS.....</b>                                            | <b>10</b> |
| <b>5.1. SUMMARY OF TEST RESULTS .....</b>                              | <b>10</b> |
| <b>5.2. STATEMENTS.....</b>                                            | <b>10</b> |
| <b>5.3. TEST CONDITIONS.....</b>                                       | <b>10</b> |
| <b>6. TEST FACILITIES UTILIZED .....</b>                               | <b>11</b> |
| <b>ANNEX A: DETAILED TEST RESULTS .....</b>                            | <b>12</b> |
| <b>A.1. MEASUREMENT METHOD .....</b>                                   | <b>12</b> |
| <b>A.2. MAXIMUM OUTPUT POWER.....</b>                                  | <b>13</b> |
| A.2.1. PEAK OUTPUT POWER-CONDUCTED .....                               | 13        |
| A.2.2. AVERAGE OUTPUT POWER-CONDUCTED .....                            | 14        |
| <b>A.3. PEAK POWER SPECTRAL DENSITY .....</b>                          | <b>16</b> |
| <b>A.4. DTS 6-DB SIGNAL BANDWIDTH .....</b>                            | <b>24</b> |
| <b>A.5. BAND EDGES COMPLIANCE .....</b>                                | <b>31</b> |
| <b>A.6. TRANSMITTER SPURIOUS EMISSION .....</b>                        | <b>36</b> |



|                                                       |            |
|-------------------------------------------------------|------------|
| A.6.1 TRANSMITTER SPURIOUS EMISSION – CONDUCTED ..... | 36         |
| A.6.2 TRANSMITTER SPURIOUS EMISSION - RADIATED .....  | 89         |
| <b>A.7. AC POWER-LINE CONDUCTED EMISSION.....</b>     | <b>116</b> |
| <b>ANNEX B: ACCREDITATION CERTIFICATE .....</b>       | <b>120</b> |

## **1. Test Laboratory**

### **1.1. Testing Location**

Location 1:CTTL(Huayuan North Road)

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

Location 2:CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road,  
Haidian District, Beijing, P. R. China100191

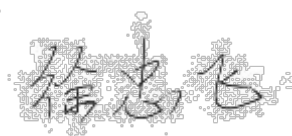
### **1.2. Testing Environment**

Normal Temperature: 15-35°C  
Extreme Temperature: -20/+55°C  
Relative Humidity: 20-75%

### **1.3. Project data**

Testing Start Date: 2015-02-11  
Testing End Date: 2015-07-27

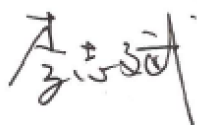
### **1.4. Signature**



---

**Xu Zhongfei**

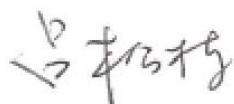
**(Prepared this test report)**



---

**Li Zhibin**

**(Reviewed this test report)**



---

**Lv Songdong**

**(Approved this test report)**

## **2. Client Information**

### **2.1. Applicant Information**

Company Name: TCL Communication Ltd  
Address: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,  
Pudong Area Shanghai, P.R. China. 201203  
City: Shanghai  
Postal Code: 201203  
Country: China  
Telephone: 0086-21-51798260  
Fax: 0086-21-61460602

### **2.2. Manufacturer Information**

Company Name: TCL Communication Ltd  
Address: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,  
Pudong Area Shanghai, P.R. China. 201203  
City: Shanghai  
Postal Code: 201203  
Country: China  
Telephone: 0086-21-51798260  
Fax: 0086-21-61460602

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

#### 3.1. About EUT

|                     |                                                       |
|---------------------|-------------------------------------------------------|
| Description         | HSUPA/HSDPA/UMTS Quad-band/GSM Quad-band mobile phone |
| Model name          | 4028S                                                 |
| FCC ID              | 2ACCJH027                                             |
| IC ID               | /                                                     |
| With WLAN Function  | Yes                                                   |
| Frequency Range     | ISM 2400MHz~2483.5MHz                                 |
| Type of Modulation  | DSSS/CCK/OFDM                                         |
| Number of Channels  | 11                                                    |
| Antenna             | Integral Antenna                                      |
| MAX Conducted Power | 24.28dBm(OFDM)                                        |
| Power Supply        | 3.8V DC by Battery                                    |

#### 3.2. Internal Identification of EUT

| EUT ID* | SN or IMEI | HW Version | SW Version |
|---------|------------|------------|------------|
| UT01a   | /          | PIO        | v6DB2      |
| UT02a   | /          | PIO        | v6DB2      |

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

#### 3.3. Internal Identification of AE

| AE ID* | Description | SN  |
|--------|-------------|-----|
| AE1    | Battery     | --- |
| AE2    | Battery     | --- |
| AE3    | Battery     | --- |
| AE4    | Battery     | --- |
| AE5    | Battery     | --- |

##### AE1

|                 |              |
|-----------------|--------------|
| Commercial name | Battery      |
| Type            | CAB60B0000C1 |
| Manufacturer    | /            |
| Length of cable | /            |

##### AE2

|                 |              |
|-----------------|--------------|
| Commercial name | Battery      |
| Type            | CAB60B0000CB |
| Manufacturer    | /            |
| Length of cable | /            |

**AE3**

|                 |              |
|-----------------|--------------|
| Commercial name | Battery      |
| Type            | CAB1400002C2 |
| Manufacturer    | /            |
| Length of cable | /            |

**AE4**

|                 |              |
|-----------------|--------------|
| Commercial name | Battery      |
| Type            | CAB60B0002C1 |
| Manufacturer    | /            |
| Length of cable | /            |

**AE5**

|                 |              |
|-----------------|--------------|
| Commercial name | Battery      |
| Type            | CAB1650001C1 |
| Manufacturer    | /            |
| 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 HSUPA/HSDPA/UMTS Quad-band/GSM Quad-band mobile phone with integrated antenna and inbuilt battery.

It has Bluetooth (EDR) function.

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

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:                                                                                                            | 2014    |
|                  | 15.205 Restricted bands of operation;                                                                                                      |         |
|                  | 15.209 Radiated emission limits, general requirements;                                                                                     |         |
| ANSI C63.10      | 15.247 Operation within the bands 902-928MHz,<br>2400-2483.5 MHz, and 5725-5850 MHz.                                                       | 2013    |
|                  | Methods of Measurement of Radio-Noise Emissions from<br>Low-Voltage Electrical and Electronic Equipment in the<br>Range of 9 kHz to 40 GHz |         |
| KDB558074 v03r01 | Guidance for Performing Compliance Measurements on<br>Digital Transmission Systems (DTS) Operating Under<br>§15.247                        | 2013    |

## 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 |
| 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.

This model is a variant product which market name is 4027A, 4028A; all the test results have been derived from test report of 4027A,4028A. besides Radiated Transmitter Spurious Emission.

### 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 | 3.8V(By battery) |
| Humidity    | H nom | 44%              |

## 6. Test Facilities Utilized

### Conducted test system

| No. | Equipment              | Model   | Serial Number | Manufacturer    | Calibration date | Calibration Due date |
|-----|------------------------|---------|---------------|-----------------|------------------|----------------------|
| 1   | Vector Signal Analyzer | FSQ40   | 200089        | Rohde & Schwarz | 2015-07-08       | 2016-07-07           |
| 2   | Test Receiver          | ESS     | 847151/015    | Rohde & Schwarz | 2014-11-29       | 2015-11-28           |
| 3   | LISN                   | ESH2-Z5 | 829991/012    | Rohde & Schwarz | 2015-4-15        | 2016-4-14            |
| 4   | Shielding Room         | S81     | /             | ETS-Lindgren    | /                | /                    |

### Radiated emission test system

| No. | Equipment                         | Model    | Serial Number | Manufacturer     | Calibration date | Calibration Due date |
|-----|-----------------------------------|----------|---------------|------------------|------------------|----------------------|
| 1   | Test Receiver                     | ESU26    | 100376        | Rohde & Schwarz  | 2014-11-6        | 2015-11-5            |
| 2   | BiLog Antenna                     | VULB9163 | 9163-514      | Schwarzbeck      | 2012-11-11       | 2015-11-10           |
| 3   | Dual-Ridge Waveguide Horn Antenna | 3117     | 00119024      | ETS-Lindgren     | 2014-4-20        | 2017-4-19            |
| 4   | Dual-Ridge Waveguide Horn Antenna | 3116     | 2661          | EMCO             | 2014-7-1         | 2017-06-30           |
| 5   | Loop antenna                      | HFH2-Z2  | 829324/007    | Rohde & Schwarz  | 2012-12-21       | 2015-12-20           |
| 6   | Semi-anechoic chamber             | /        | CT000332-1074 | Frankonia German | /                | /                    |

## **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

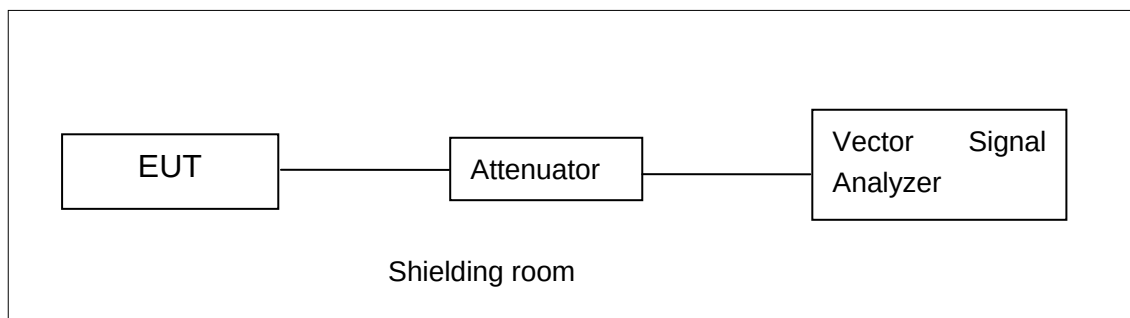


Fig.A.1.1.1: Test Setup Diagram for Conducted Measurements

#### **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;

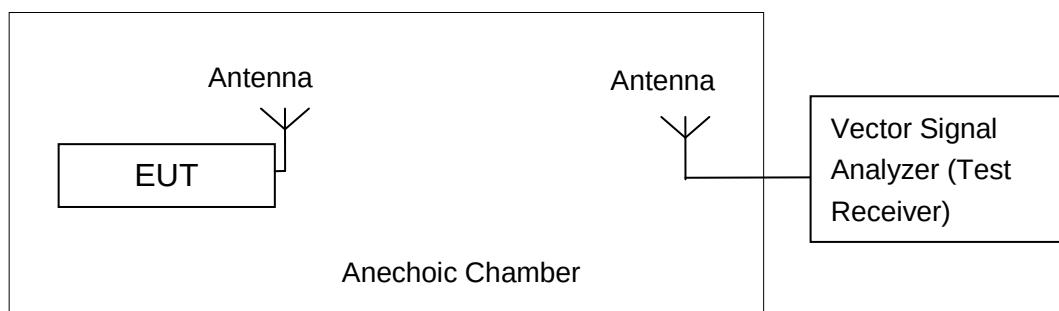


Fig.A.1.2.1: Test Setup Diagram for Radiated Measurements

## A.2. Maximum Output Power

### Method of Measurement: See ANSI C63.10-2009-clause 6.10

- Set span to encompass the entire EBW of the signal.
- Set RBW = 1 MHz
- Set VBW =3 MHz
- Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise, use peak detector mode
- Use a video trigger with the trigger level set to enable triggering only on full power pulses.  
Unlicensed wireless device must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to “free run.” Power-gated sweeping may be used to ensure the analyzer sweeps only while the device is transmitting.
- Trace average across 100 traces in power averaging mode.
- Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer band-power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

### 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                | 20.18             | /             | /               |
|         | 2                | 20.42             | /             | /               |
|         | 5.5              | 21.82             | /             | /               |
|         | 11               | 23.39             | 23.63         | 23.94           |
| 802.11g | 6                | 23.41             | /             | /               |
|         | 9                | 23.43             | /             | /               |
|         | 12               | 23.02             | /             | /               |
|         | 18               | 22.93             | /             | /               |
|         | 24               | 23.49             | 24.11         | 24.28           |
|         | 36               | 23.47             | /             | /               |
|         | 48               | 23.30             | /             | /               |
|         | 54               | 23.37             | /             | /               |

The data rate 11Mbps and 24Mbps 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                 | 21.13             | /                | /                  |
|                    | MCS1                 | 20.96             | /                | /                  |
|                    | MCS2                 | 20.86             | /                | /                  |
|                    | MCS3                 | 21.38             | /                | /                  |
|                    | MCS4                 | 21.36             | /                | /                  |
|                    | MCS5                 | 21.45             | /                | /                  |
|                    | MCS6                 | 21.50             | /                | /                  |
|                    | MCS7                 | 21.52             | 21.61            | 22.04              |

The data rate MCS7 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                 | 19.23             | 19.52            | 19.67             |
|                    | MCS1                 | 19.08             | /                | /                 |
|                    | MCS2                 | 19.07             | /                | /                 |
|                    | MCS3                 | 19.15             | /                | /                 |
|                    | MCS4                 | 19.12             | /                | /                 |
|                    | MCS5                 | 19.19             | /                | /                 |
|                    | MCS6                 | 19.14             | /                | /                 |
|                    | MCS7                 | 19.06             | /                | /                 |

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

**Conclusion: Pass**

#### A.2.2. Average Output Power-conducted

##### 802.11b/g mode

| Mode    | Test Result (dBm) |               |                 |
|---------|-------------------|---------------|-----------------|
|         | 2412MHz (Ch1)     | 2437MHz (Ch6) | 2462 MHz (Ch11) |
| 802.11b | 16.57             | 16.84         | 17.28           |
| 802.11g | 14.49             | 14.76         | 15.10           |

**802.11n-HT20 mode**

| Mode            | Test Result (dBm) |               |                 |
|-----------------|-------------------|---------------|-----------------|
|                 | 2412MHz (Ch1)     | 2437MHz (Ch6) | 2462 MHz (Ch11) |
| 802.11n (20MHz) | 12.20             | 12.54         | 13.05           |

**802.11n-HT40 mode**

| Mode           | Test Result (dBm) |               |                |
|----------------|-------------------|---------------|----------------|
|                | 2422MHz (Ch3)     | 2437MHz (Ch6) | 2452 MHz (Ch9) |
| 802.11n(40MHz) | 9.75              | 10.05         | 10.18          |

**Conclusion: Pass**

### A.3. Peak Power Spectral Density

#### Method of Measurement: See ANSI C63.10

The measurement procedure shall be as follows:

Connect the antenna port to be measured through the 20 dB pad to the spectrum analyzer input. Configure the spectrum analyzer as described below (all losses between the unlicensed wireless device output and the spectrum analyzer, such as attenuator value, cable losses and other offsets shall be recorded). Locate and zoom in on emission peak(s) within the passband.

- a) Set RBW = 3 kHz
- b) Set VBW  $\geq$  9 kHz
- c) Set Sweep time to Automatic
- d) Use a peak detector. A sample detector mode can be used only if the following conditions can be achieved with automatic sweep time and adjusting the bin width.
  - 1) Bin width (i.e., span/number of points in spectrum display) < 0.5 RBW.
  - 2) The transmission pulse or sequence of pulses remains at maximum transmit power throughout each of the 100 sweeps of averaging and that the interval between pulses is not included in any of the sweeps.

NOTE—If condition 2) cannot be achieved, then PSD Option 1 (method of 6.11.2.3) shall be used and trace averaging cannot be used.

- e) Use a video trigger (or RF gating) with the trigger level set to enable the sweep only during full power pulses. Transmitter shall operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to “free run.”

- f) Trace average 100 traces in power averaging mode. Do not use video averaging mode.

NOTE—Some analyzers will automatically select sample mode when trace averaging is selected. If a peak detector is used, then peak detector must be manually selected when trace averaging is enabled.

#### 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                               | 1.80   | <b>P</b>   |
|         | 6       | Fig.A.3.2                               | -7.25  | <b>P</b>   |
|         | 11      | Fig.A.3.3                               | -6.92  | <b>P</b>   |
| 802.11g | 1       | Fig.A.3.4                               | -10.72 | <b>P</b>   |
|         | 6       | Fig.A.3.5                               | -9.35  | <b>P</b>   |
|         | 11      | Fig.A.3.6                               | -10.66 | <b>P</b>   |



### 802.11n-HT20 mode

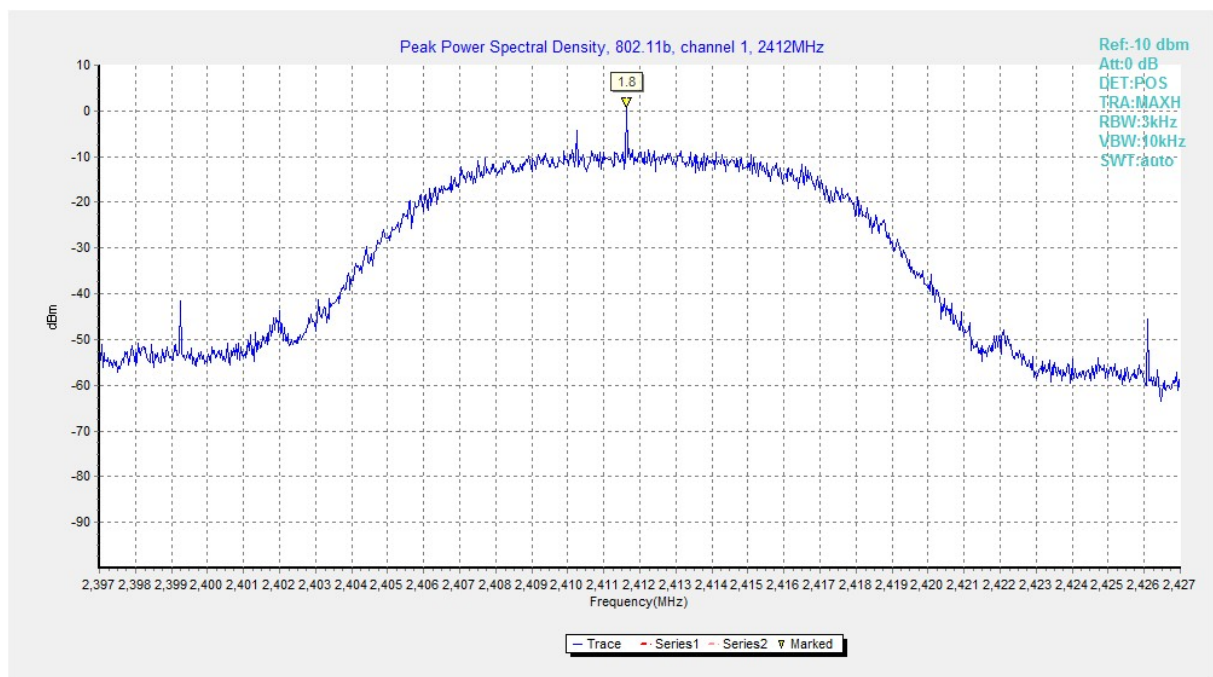
| Mode              | Channel | Power Spectral Density<br>( dBm/3 kHz ) |        | Conclusion |
|-------------------|---------|-----------------------------------------|--------|------------|
| 802.11n<br>(HT20) | 1       | Fig.A.3.7                               | -13.32 | <b>P</b>   |
|                   | 6       | Fig.A.3.8                               | -13.51 | <b>P</b>   |
|                   | 11      | Fig.A.3.9                               | -11.64 | <b>P</b>   |

### 802.11n-HT40 mode

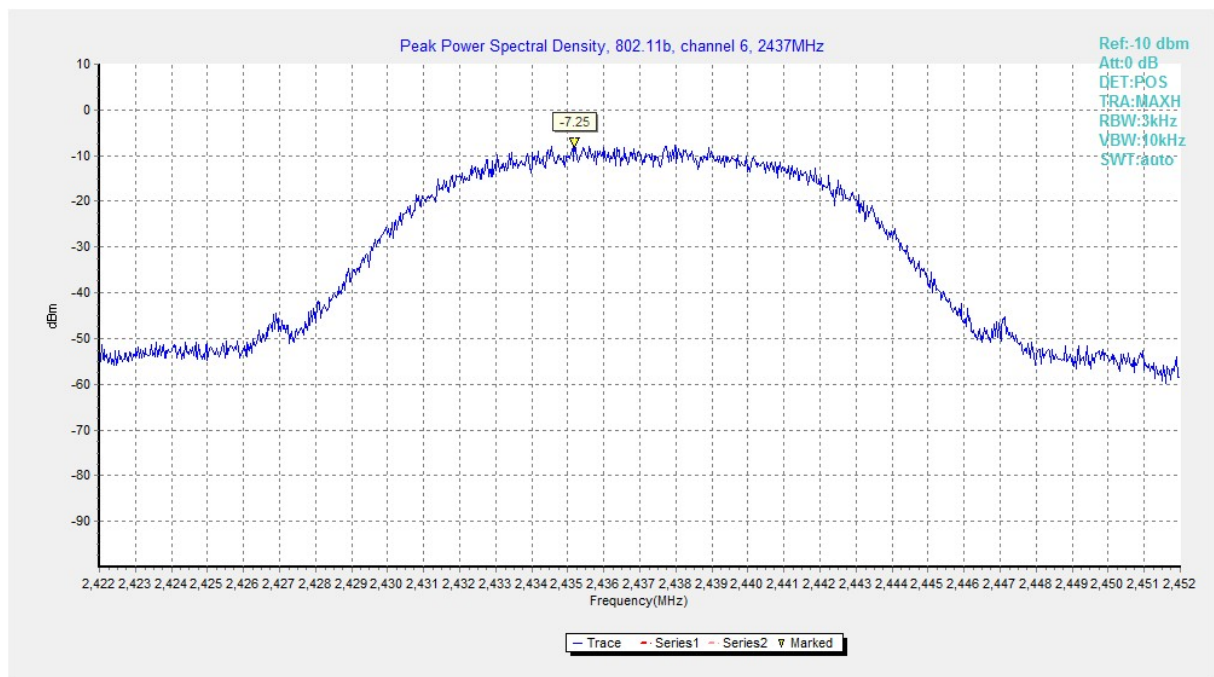
| Mode              | Channel | Power Spectral Density<br>( dBm/3 kHz ) |        | Conclusion |
|-------------------|---------|-----------------------------------------|--------|------------|
| 802.11n<br>(HT40) | 3       | Fig.A.3.10                              | -11.20 | <b>P</b>   |
|                   | 6       | Fig.A.3.11                              | -17.94 | <b>P</b>   |
|                   | 9       | Fig.A.3.12                              | -17.59 | <b>P</b>   |

**Conclusion: Pass**

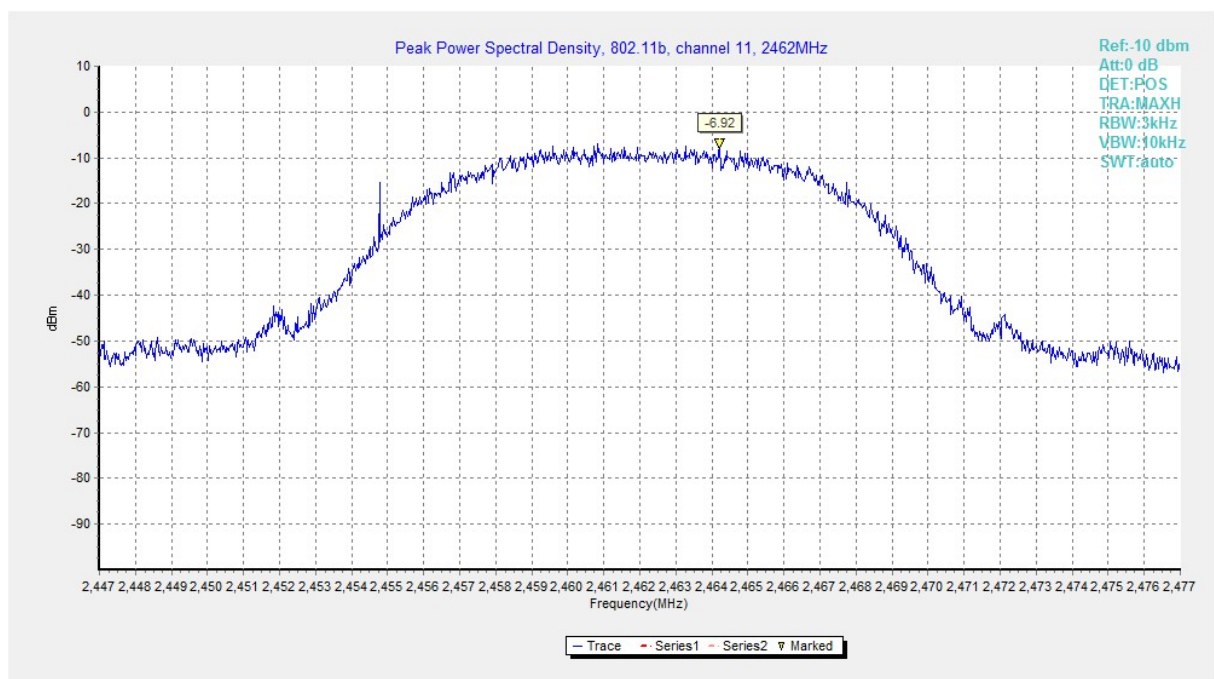
**Test graphs as below:**



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



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



**Fig.A.3.3 Power Spectral Density (802.11b, Ch 11)**

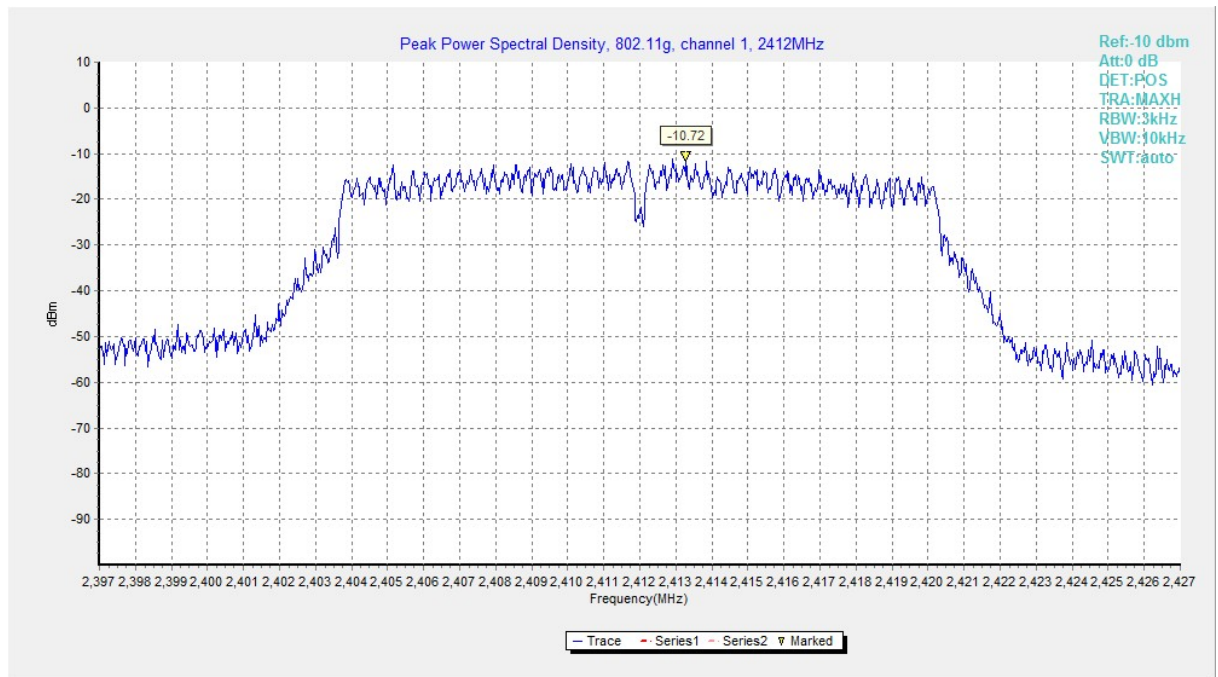


Fig.A.3.4 Power Spectral Density (802.11g, Ch 1)

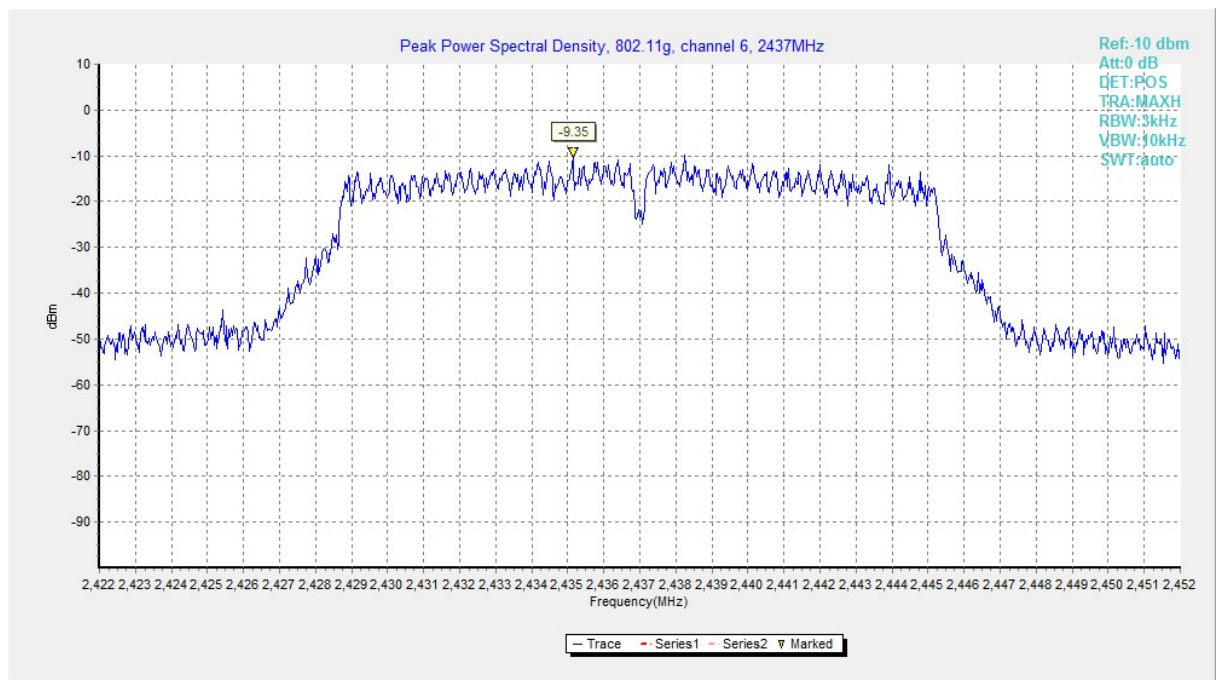


Fig.A.3.5 Power Spectral Density (802.11g, Ch 6)

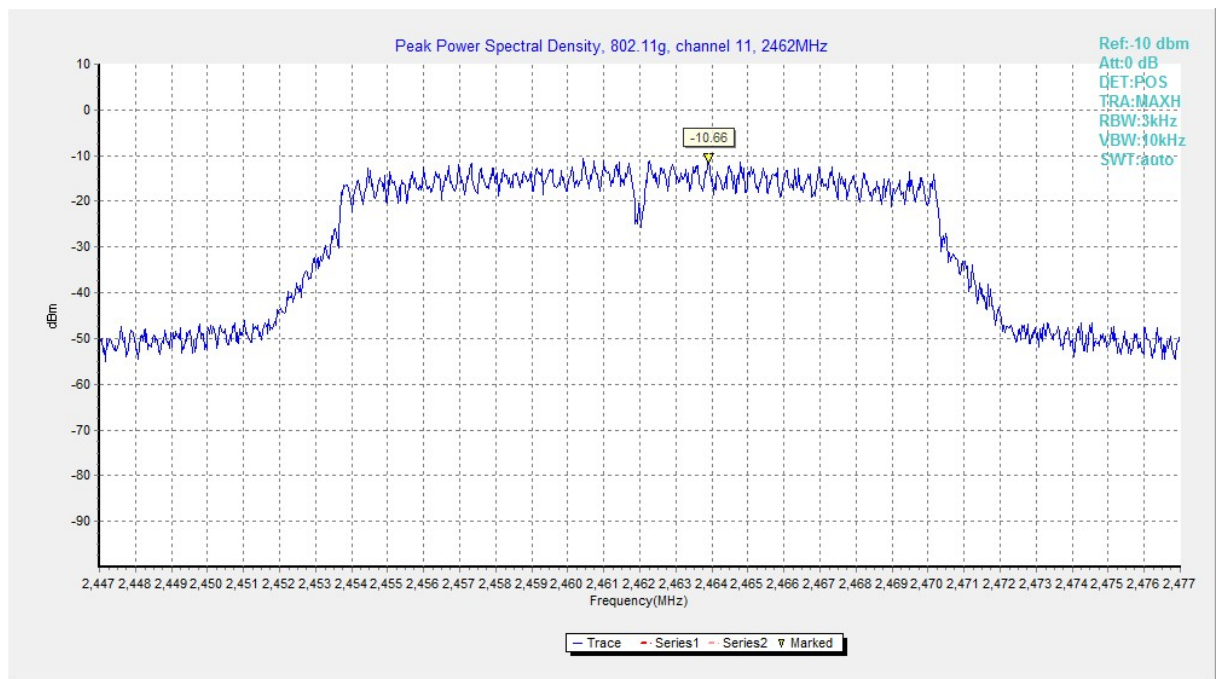


Fig.A.3.6 Power Spectral Density (802.11g, Ch 11)

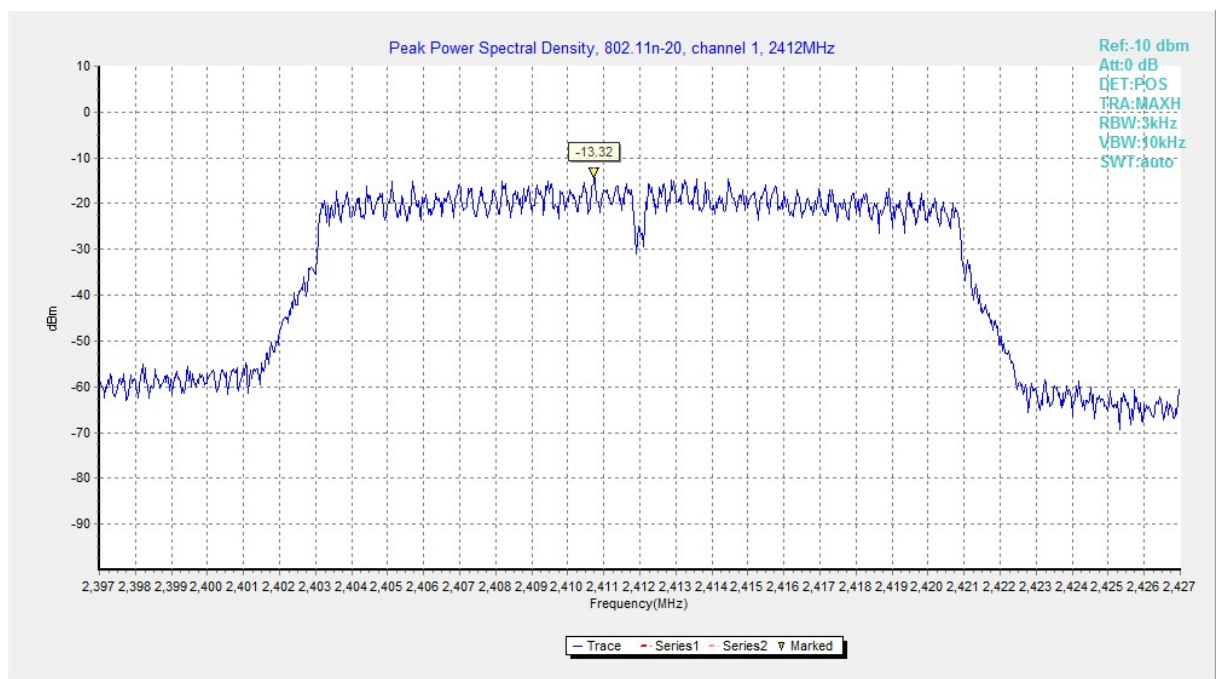
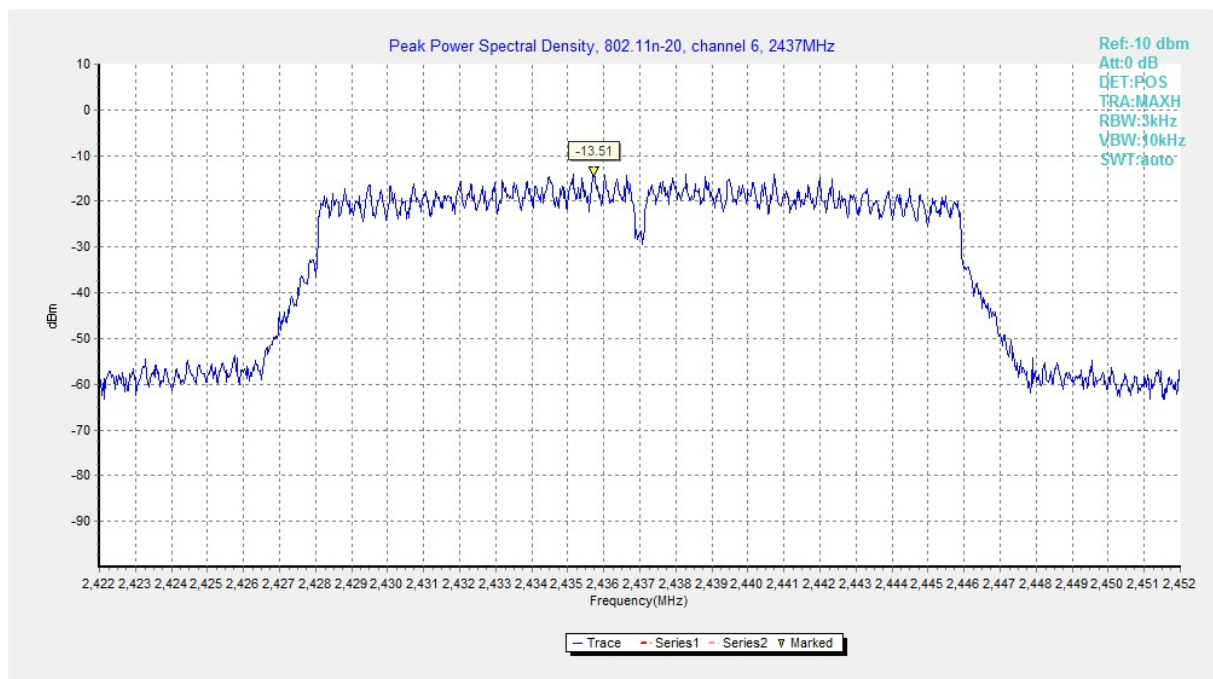
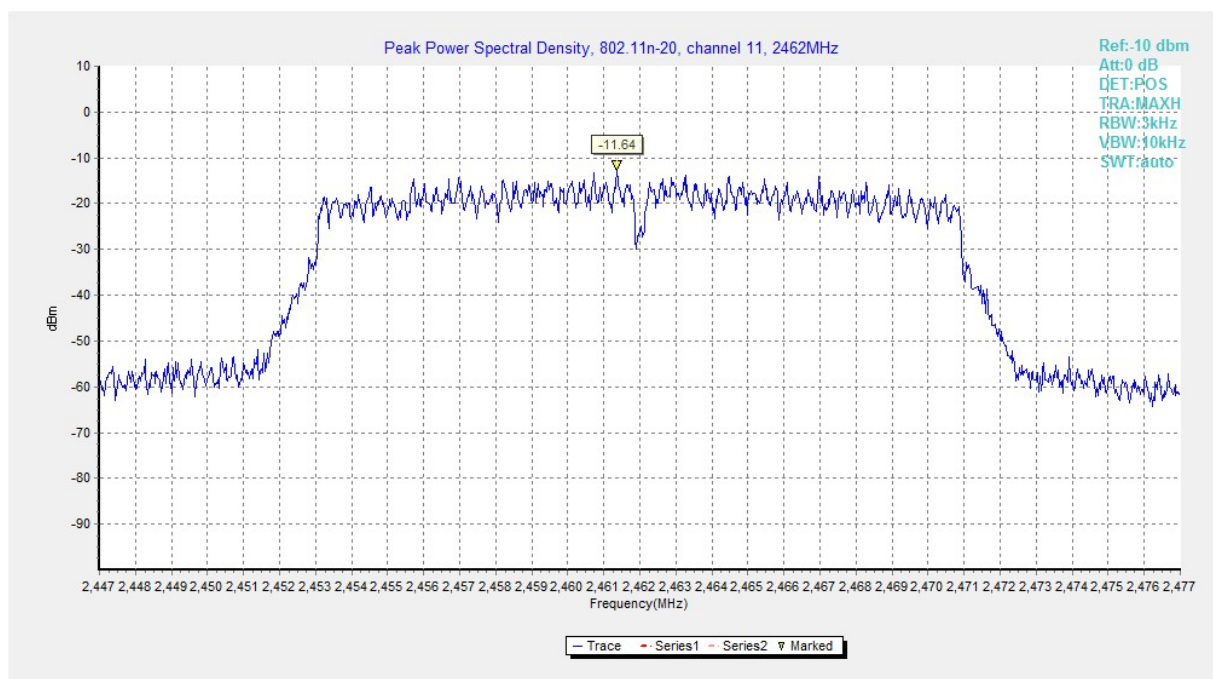


Fig.A.3.7 Power Spectral Density (802.11n-HT20, Ch 1)





**Fig.A.3.8 Power Spectral Density (802.11n-HT20, Ch 6)**



**Fig.A.3.9 Power Spectral Density (802.11n-HT20, Ch 11)**

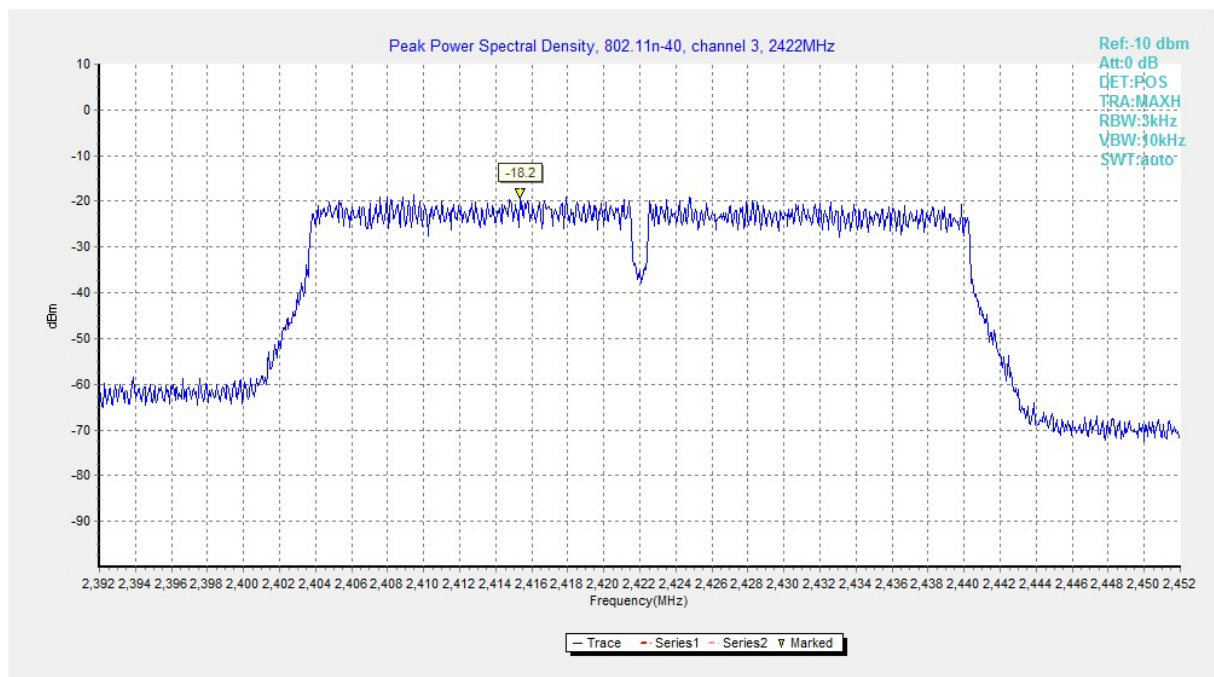


Fig.A.3.10 Power Spectral Density (802.11n-HT40, Ch 3)

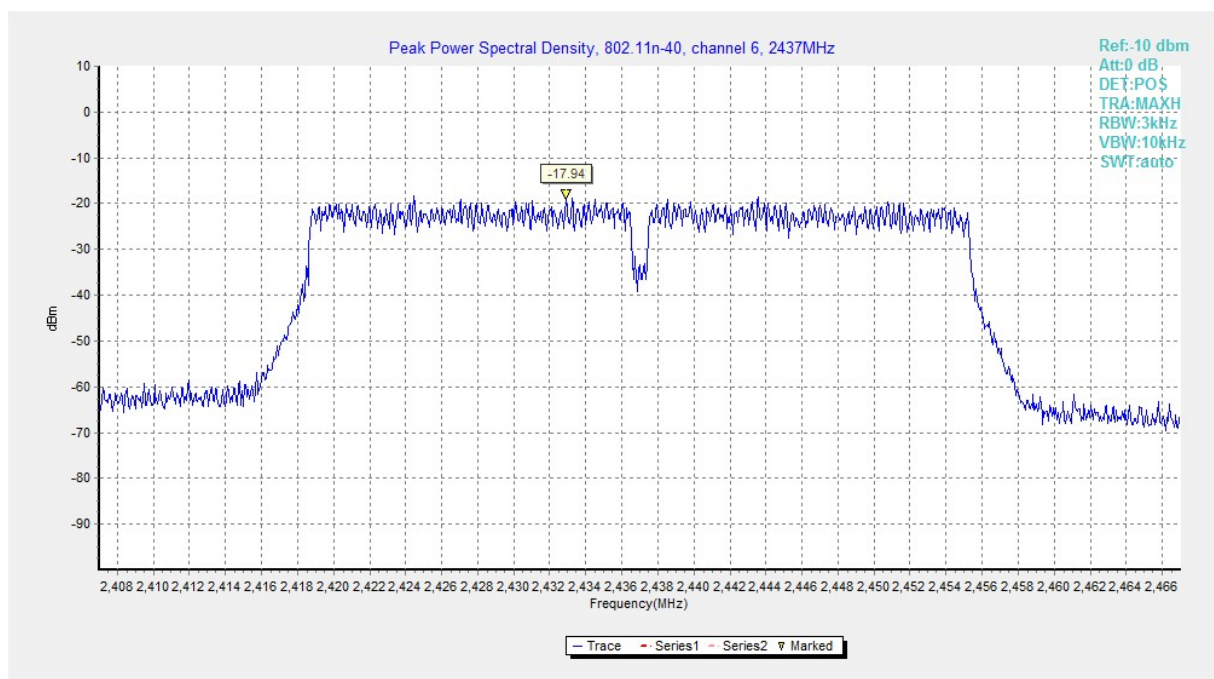


Fig.A.3.11 Power Spectral Density (802.11n-HT40, Ch 6)

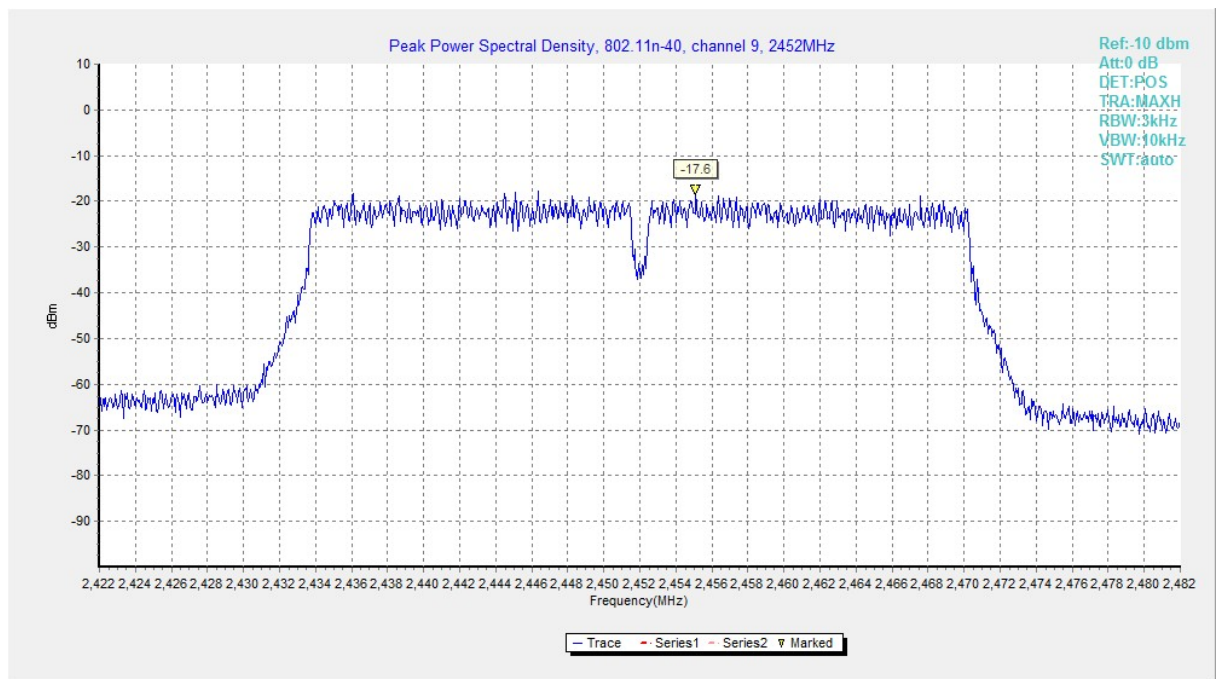


Fig.A.3.12 Power Spectral Density (802.11n-HT40, Ch 9)

#### A.4. DTS 6-dB Signal Bandwidth

**Method of Measurement:** See KDB558074 section 8.1 (Option 1).

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) = 300 kHz.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

**Measurement Limit:**

| Standard                   | Limit (kHz) |
|----------------------------|-------------|
| FCC 47 CFR Part 15.247 (a) | ≥ 500       |

**EUT ID:** EUT2

**Measurement Result:**

##### 802.11b/g mode

| Mode    | Channel | Occupied 6dB Bandwidth ( kHz) |       | conclusion |
|---------|---------|-------------------------------|-------|------------|
| 802.11b | 1       | Fig.A.4.1                     | 9100  | <b>P</b>   |
|         | 6       | Fig.A.4.2                     | 9600  | <b>P</b>   |
|         | 11      | Fig.A.4.3                     | 9200  | <b>P</b>   |
| 802.11g | 1       | Fig.A.4.4                     | 15700 | <b>P</b>   |
|         | 6       | Fig.A.4.5                     | 16350 | <b>P</b>   |
|         | 11      | Fig.A.4.6                     | 16000 | <b>P</b>   |

##### 802.11n-HT20 mode

| Mode              | Channel | Occupied 6dB Bandwidth ( kHz) |       | conclusion |
|-------------------|---------|-------------------------------|-------|------------|
| 802.11n<br>(HT20) | 1       | Fig.A.4.7                     | 16850 | <b>P</b>   |
|                   | 6       | Fig.A.4.8                     | 17000 | <b>P</b>   |
|                   | 11      | Fig.A.4.9                     | 16650 | <b>P</b>   |

##### 802.11n-HT40 mode

| Mode              | Channel | Occupied 6dB Bandwidth ( kHz) |       | conclusion |
|-------------------|---------|-------------------------------|-------|------------|
| 802.11n<br>(HT40) | 3       | Fig.A.4.10                    | 35920 | <b>P</b>   |
|                   | 6       | Fig.A.4.11                    | 36080 | <b>P</b>   |
|                   | 9       | Fig.A.4.12                    | 36000 | <b>P</b>   |

**Conclusion:** Pass



Test graphs as below:

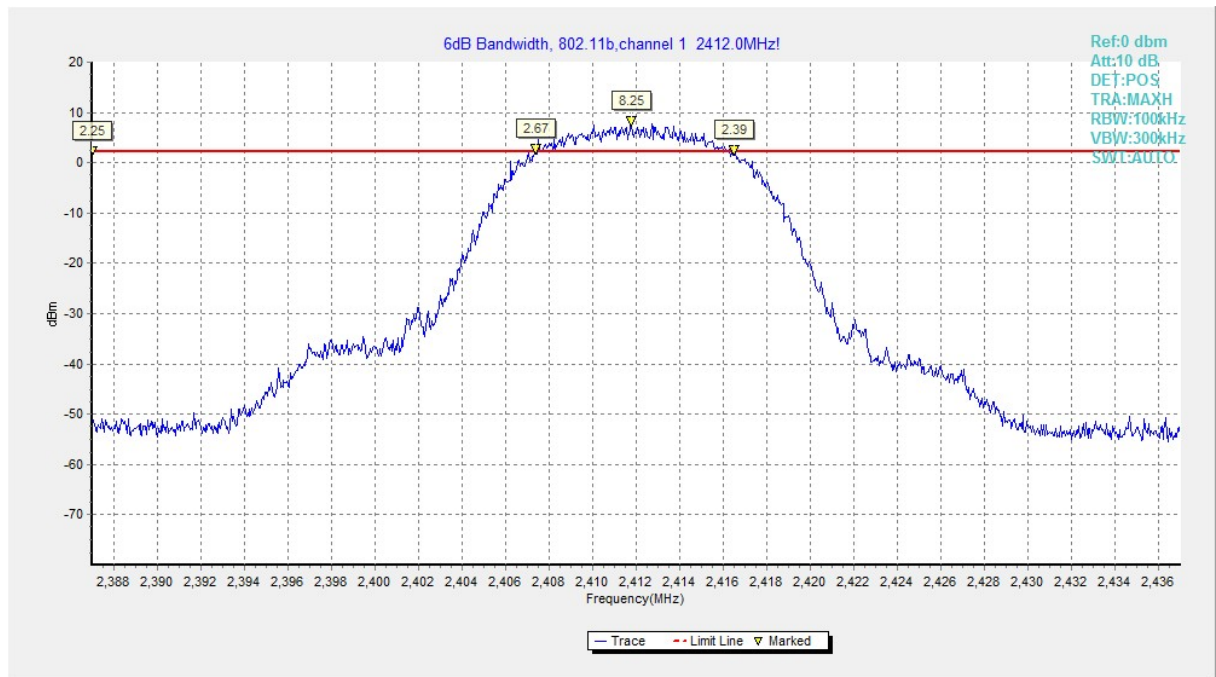


Fig.A.4.1 Occupied 6dB Bandwidth(802.11b,Ch 1)

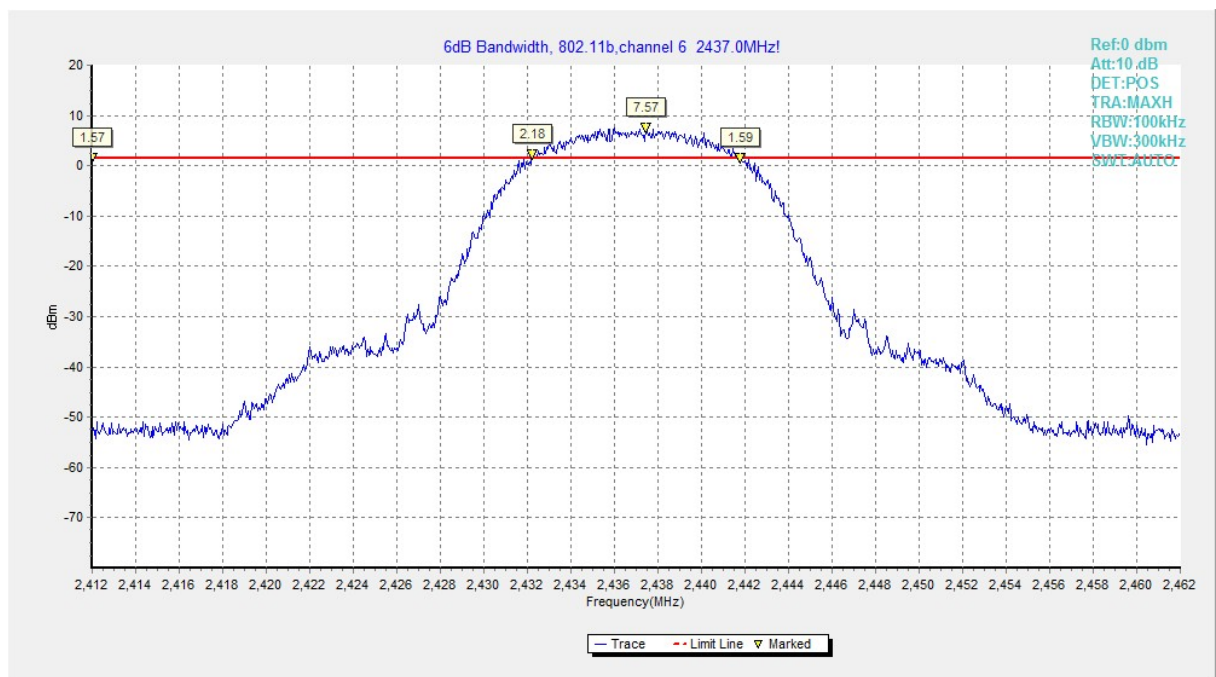
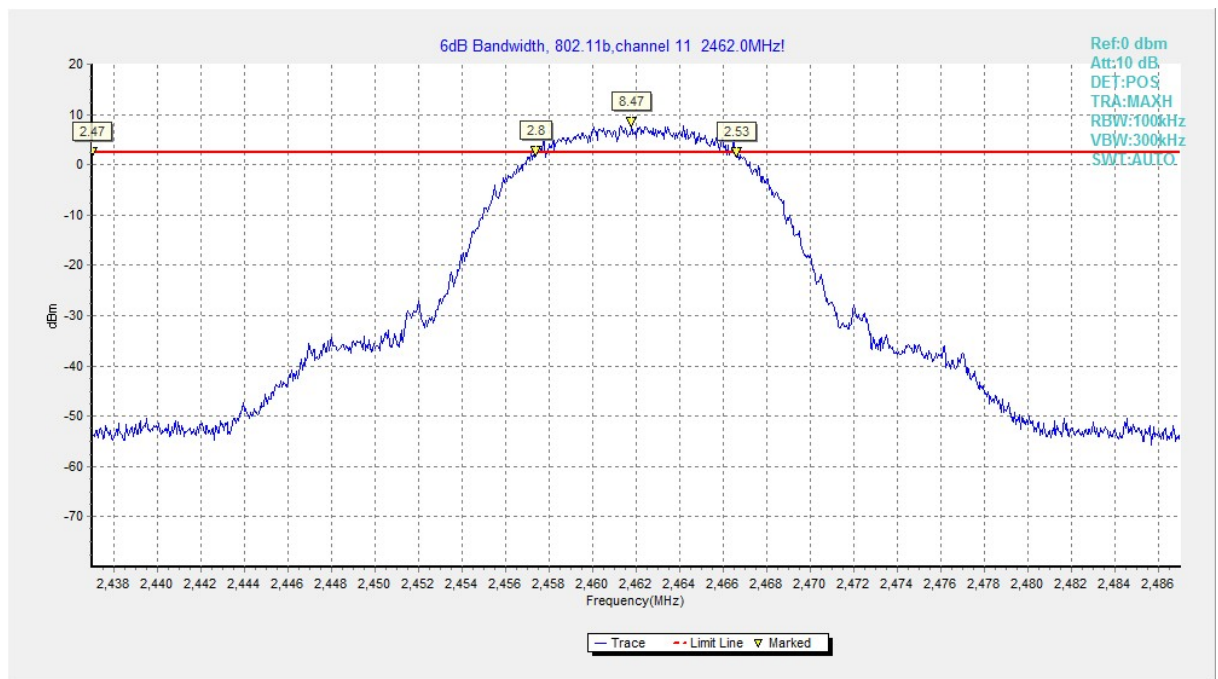
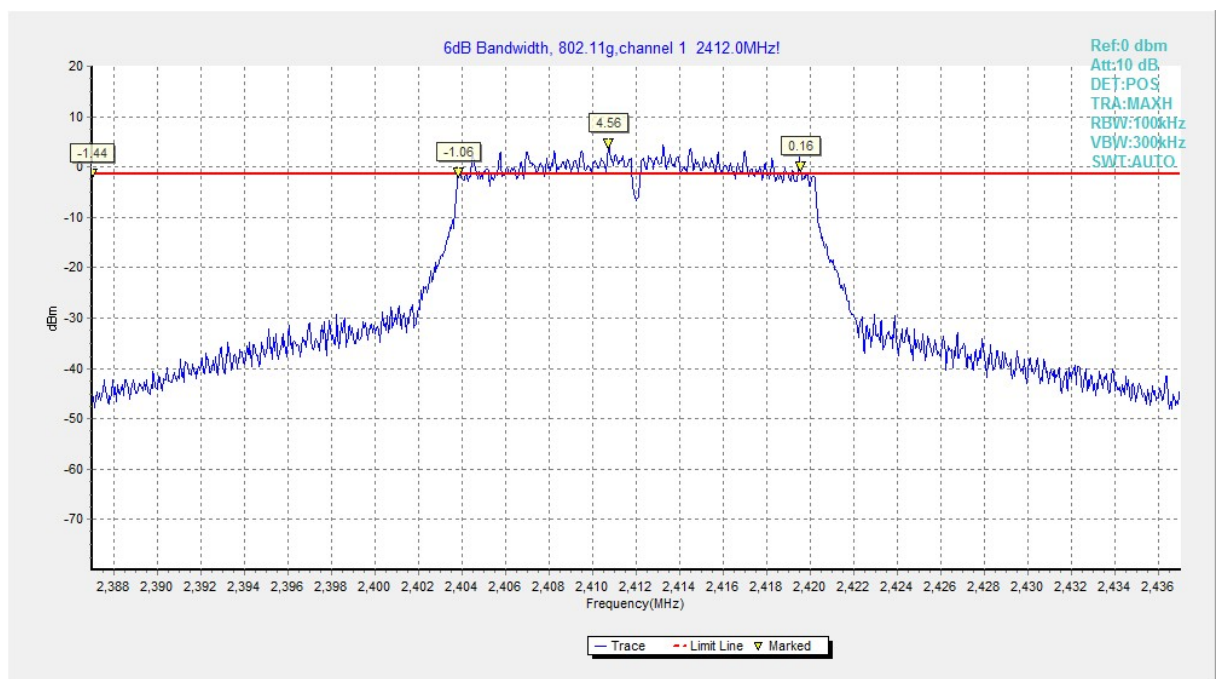


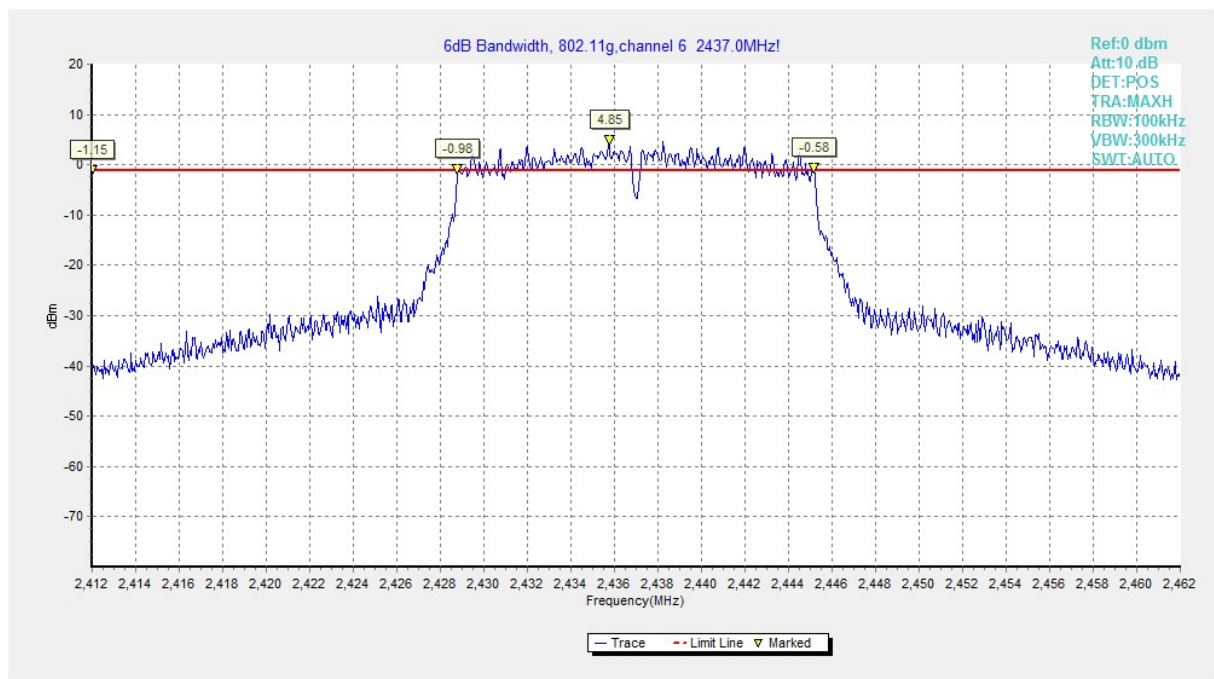
Fig.A.4.2 Occupied 6dB Bandwidth (802.11b, Ch 6)



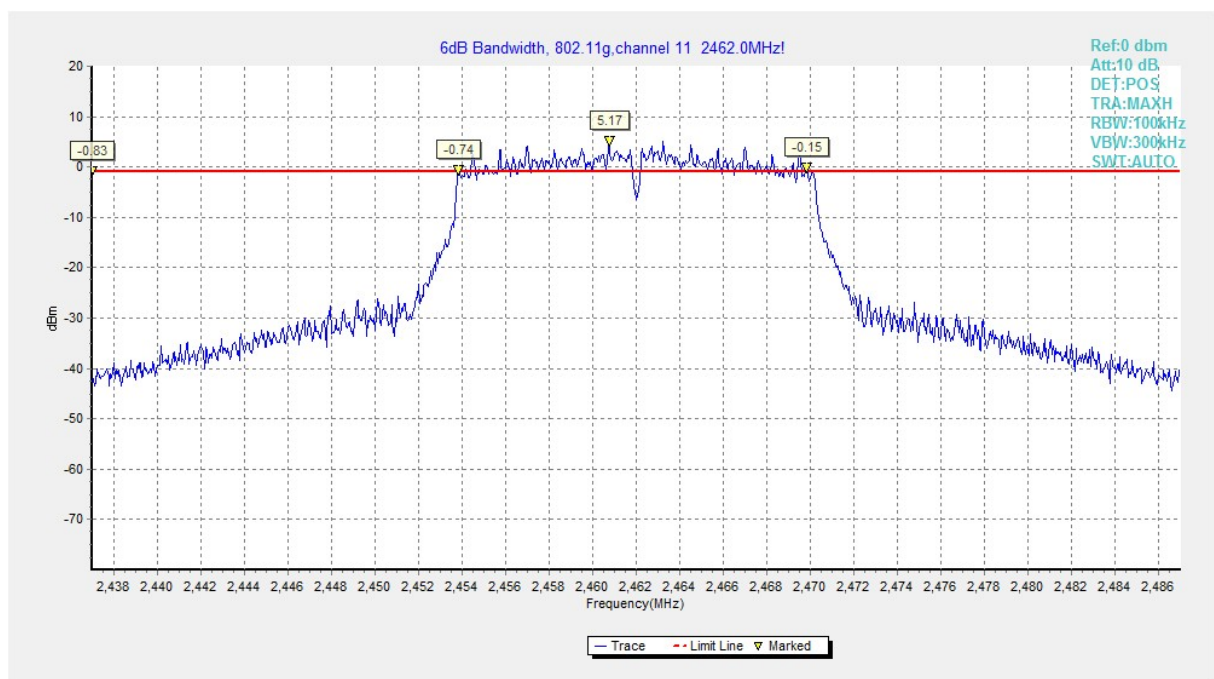
**Fig.A.4.3 Occupied 6dB Bandwidth (802.11b, Ch 11)**



**Fig.A.4.4 Occupied 6dB Bandwidth (802.11g, Ch 1)**



**Fig.A.4.5 Occupied 6dB Bandwidth (802.11g, Ch 6)**



**Fig.A.4.6 Occupied 6dB Bandwidth (802.11g, Ch 11)**

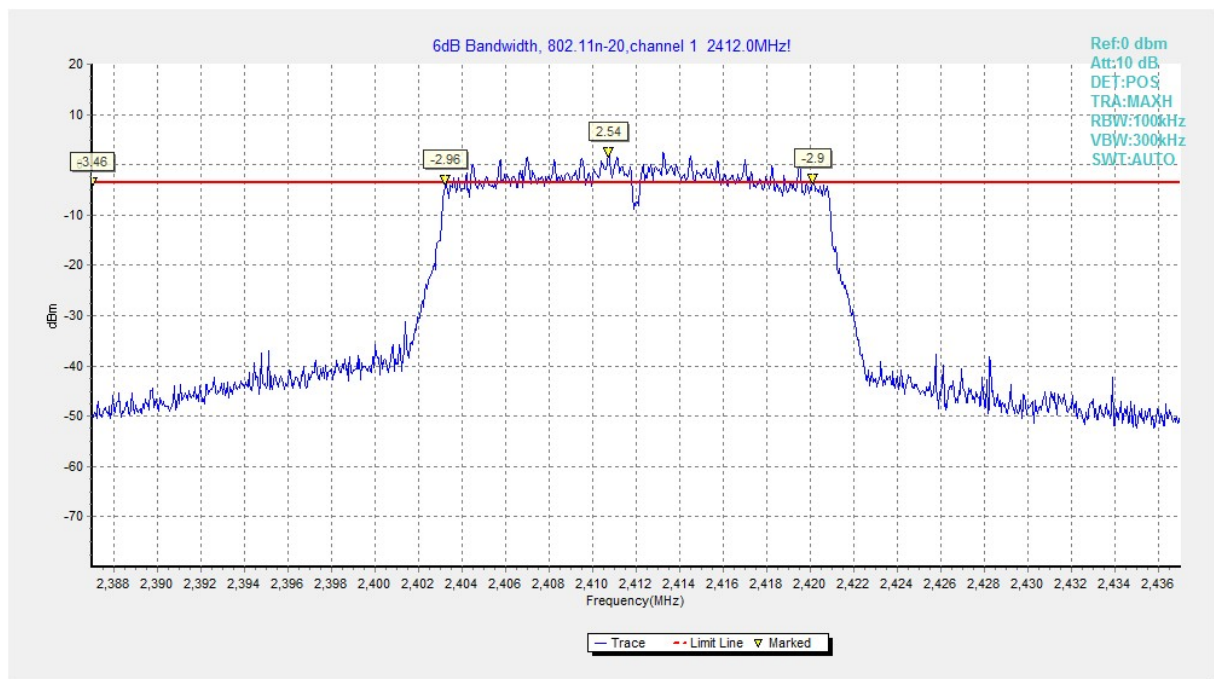


Fig.A.4.7 Occupied 6dB Bandwidth (802.11n-20MHz, Ch 1)

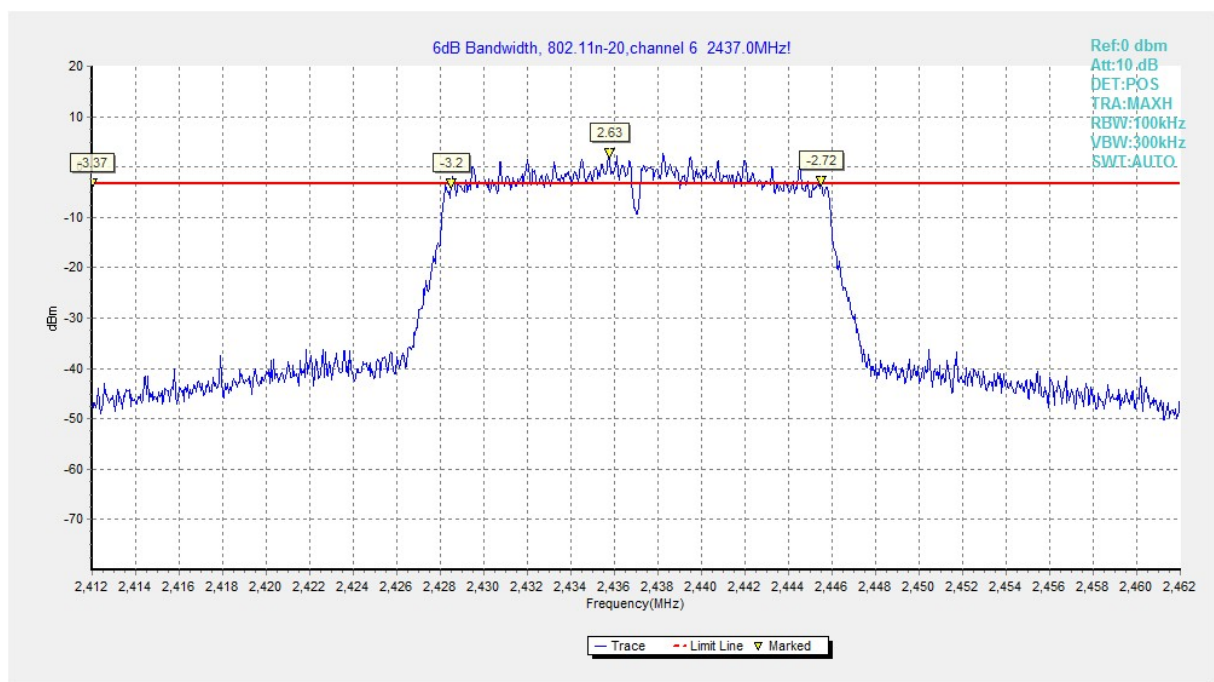


Fig.A.4.8 Occupied 6dB Bandwidth (802.11n-HT20, Ch 6)



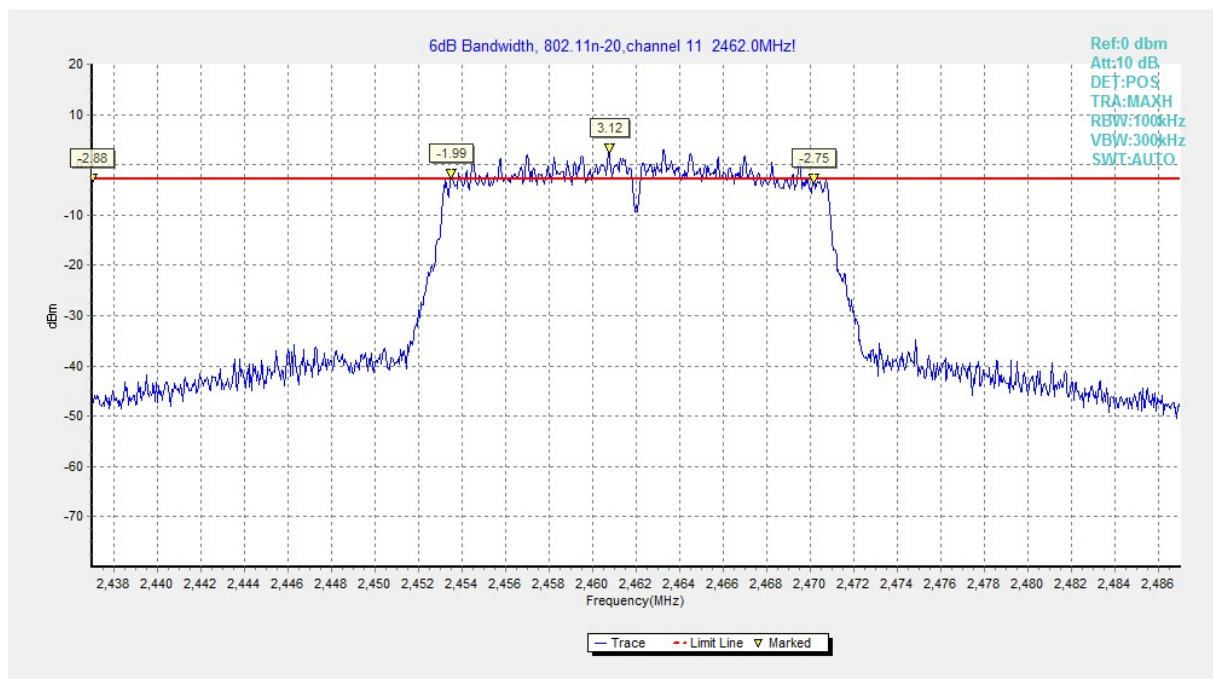


Fig.A.4.9 Occupied 6dB Bandwidth (802.11n-HT20, Ch 11)

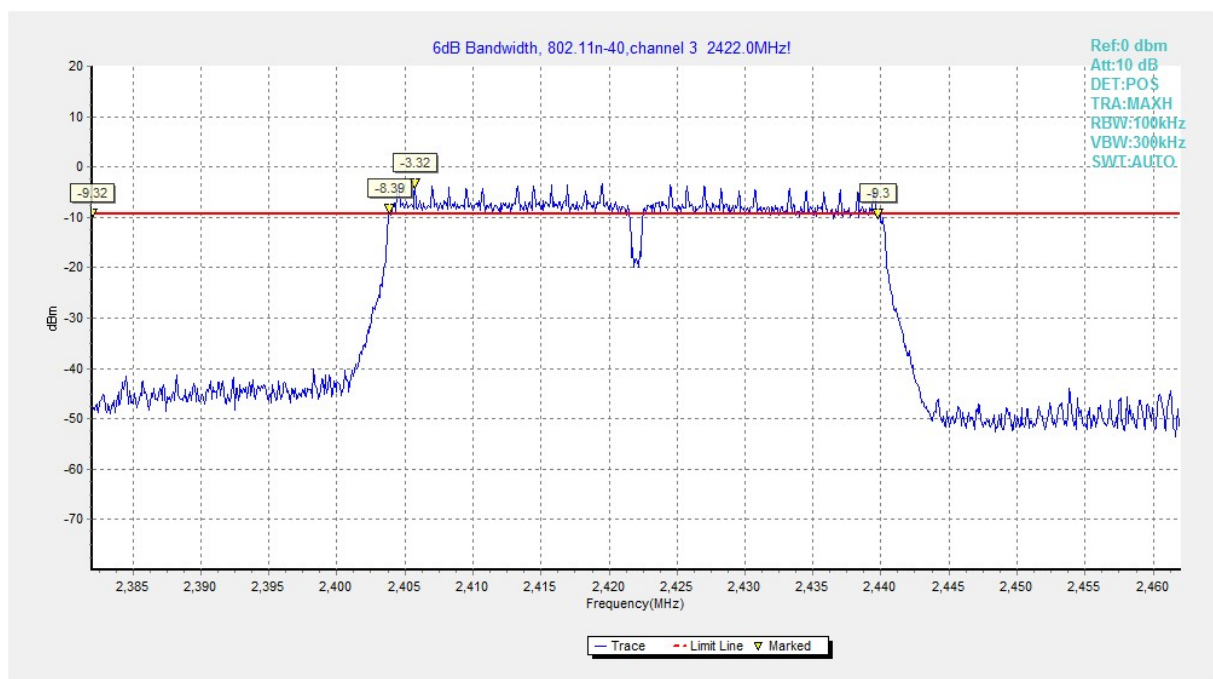


Fig.A.4.10 Occupied 6dB Bandwidth (802.11n-40MHz, Ch 3)

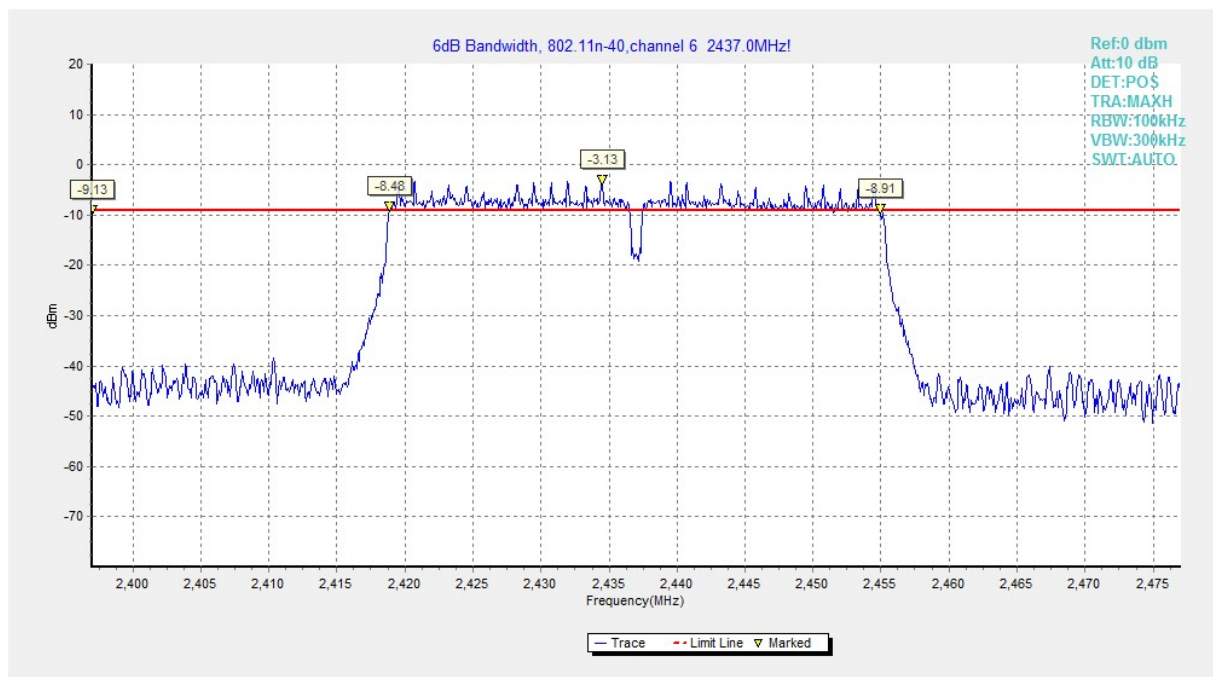


Fig.A.4.11 Occupied 6dB Bandwidth (802.11n-HT40, Ch 6)

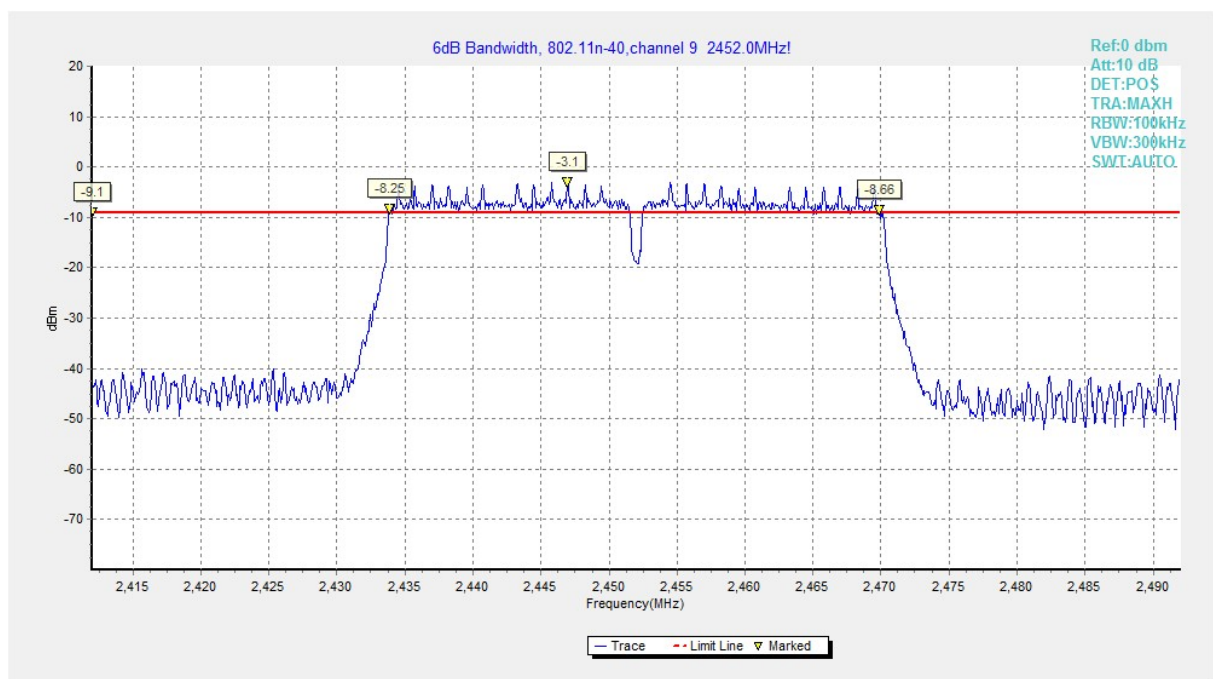


Fig.A.4.12 Occupied 6dB Bandwidth (802.11n-HT40, Ch 9)

## **A.5. Band Edges Compliance**

### **Method of Measurement: See ANSI C63.10**

Connect the spectrum analyzer to the EUT using an appropriate RF cable connected to the EUT output. Configure the spectrum analyzer settings as described below (be sure to enter all losses between the unlicensed wireless device output and the spectrum analyzer).

- Span: Set Span for minimum 50 MHz
- Reference Level: 110 dB  $\mu$  V (corrected for gains and losses of test antenna factor, preamp gain and cable loss)
- Attenuation: 10 dB
- Sweep Time: Coupled
- Resolution Bandwidth: Up to and including 1 GHz =  $\geq$  100 kHz
- Resolution Bandwidth: Above 1 GHz = 1 MHz
- Video Bandwidth: Below 1 GHz = 300 kHz
- Video Bandwidth: Up to and including 1 GHz =  $\geq$  3 MHz for peak and 10 Hz for average
- Detector: Peak

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel.

### **Measurement Limit:**

| Standard                   | Limit (dBc) |
|----------------------------|-------------|
| FCC 47 CFR Part 15.247 (d) | > 20        |

**EUT ID: EUT2**

### **Measurement Result:**

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

| Mode    | Channel | Test Results | Conclusion |
|---------|---------|--------------|------------|
| 802.11b | 1       | Fig.A.5.1    | <b>P</b>   |
|         | 11      | Fig.A.5.2    | <b>P</b>   |
| 802.11g | 1       | Fig.A.5.3    | <b>P</b>   |
|         | 11      | Fig.A.5.4    | <b>P</b>   |

#### **802.11n-HT20 mode**

| Mode              | Channel | Test Results | Conclusion |
|-------------------|---------|--------------|------------|
| 802.11n<br>(HT20) | 1       | Fig.A.5.5    | <b>P</b>   |
|                   | 11      | Fig.A.5.6    | <b>P</b>   |

#### **802.11n-HT40 mode**

| Mode              | Channel | Test Results | Conclusion |
|-------------------|---------|--------------|------------|
| 802.11n<br>(HT40) | 3       | Fig.A.5.7    | <b>P</b>   |
|                   | 9       | Fig.A.5.8    | <b>P</b>   |

**Conclusion: Pass**

**Test graphs as below:**

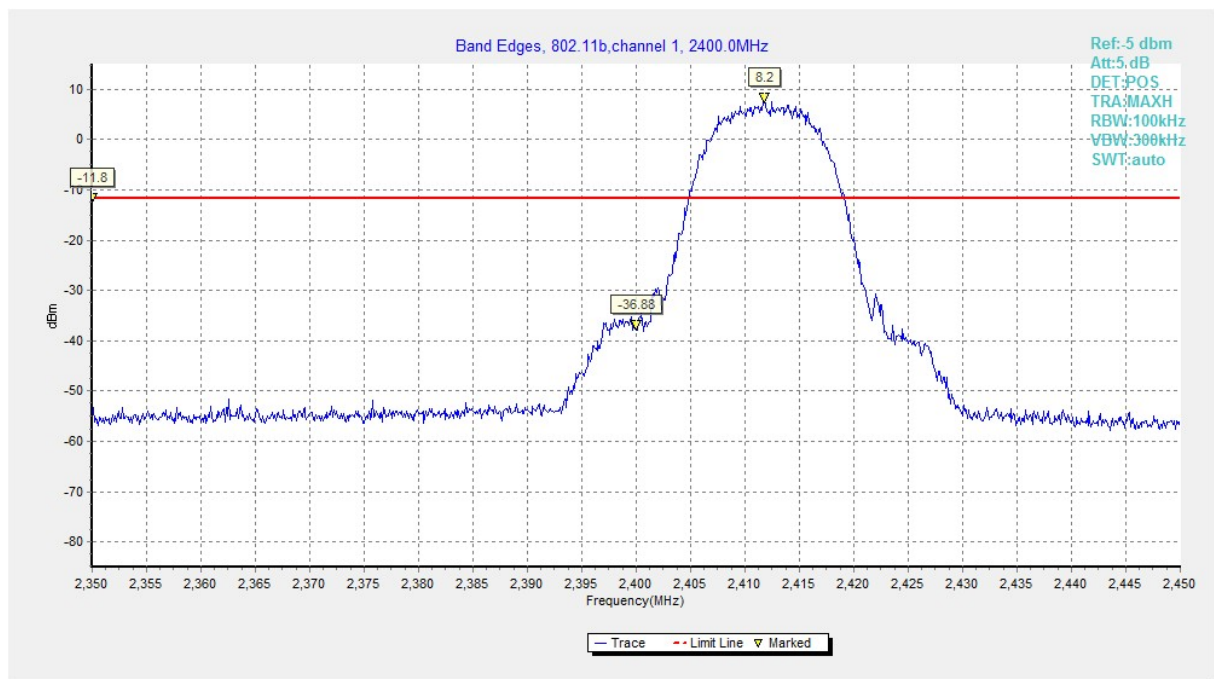


Fig.A.5.1 Band Edges (802.11b, Ch 1)

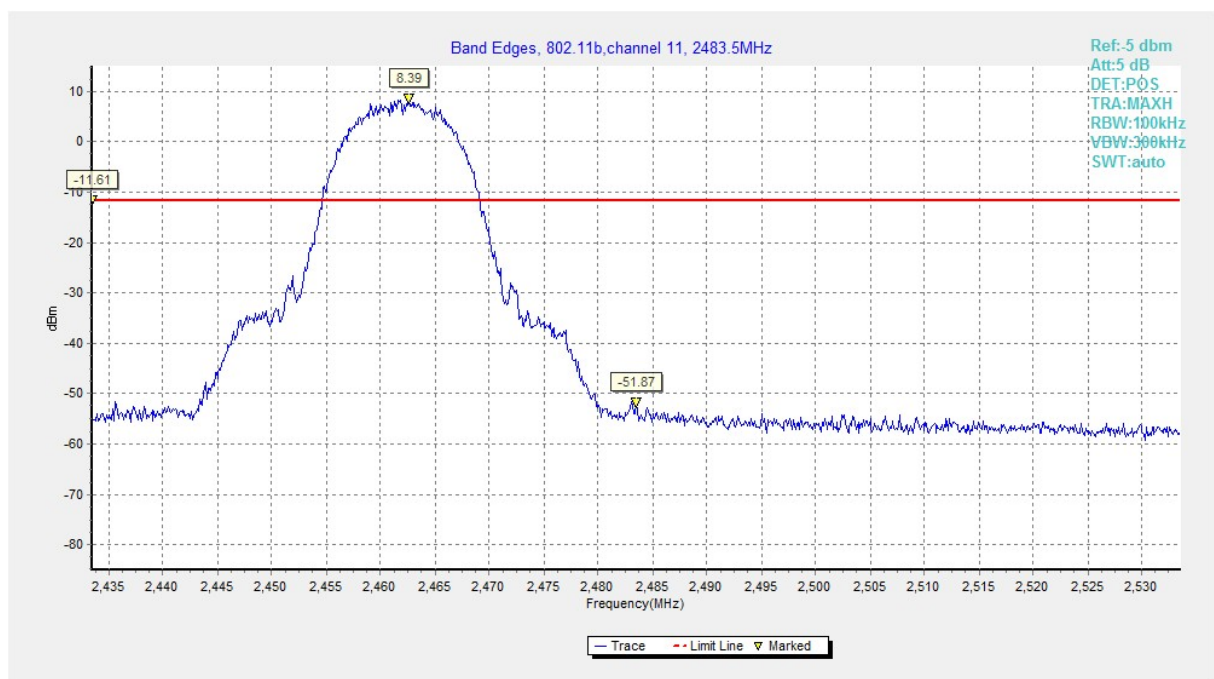


Fig.A.5.2 Band Edges (802.11b, Ch 11)



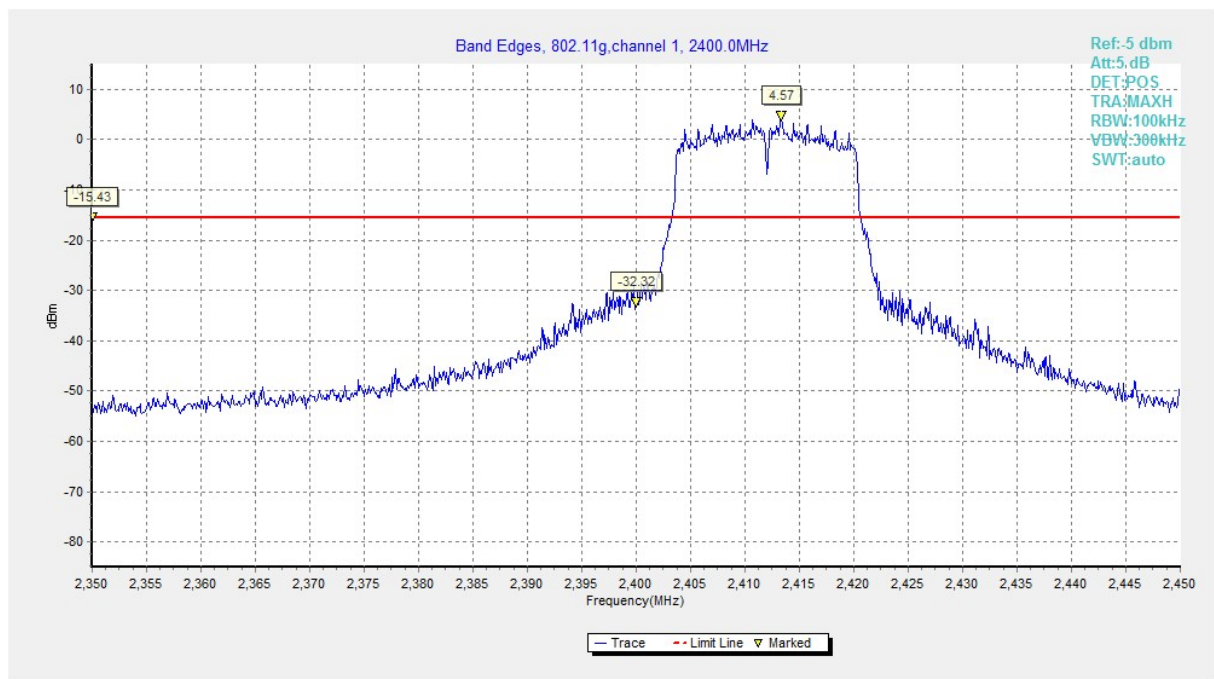


Fig.A.5.3 Band Edges (802.11g, Ch 1)

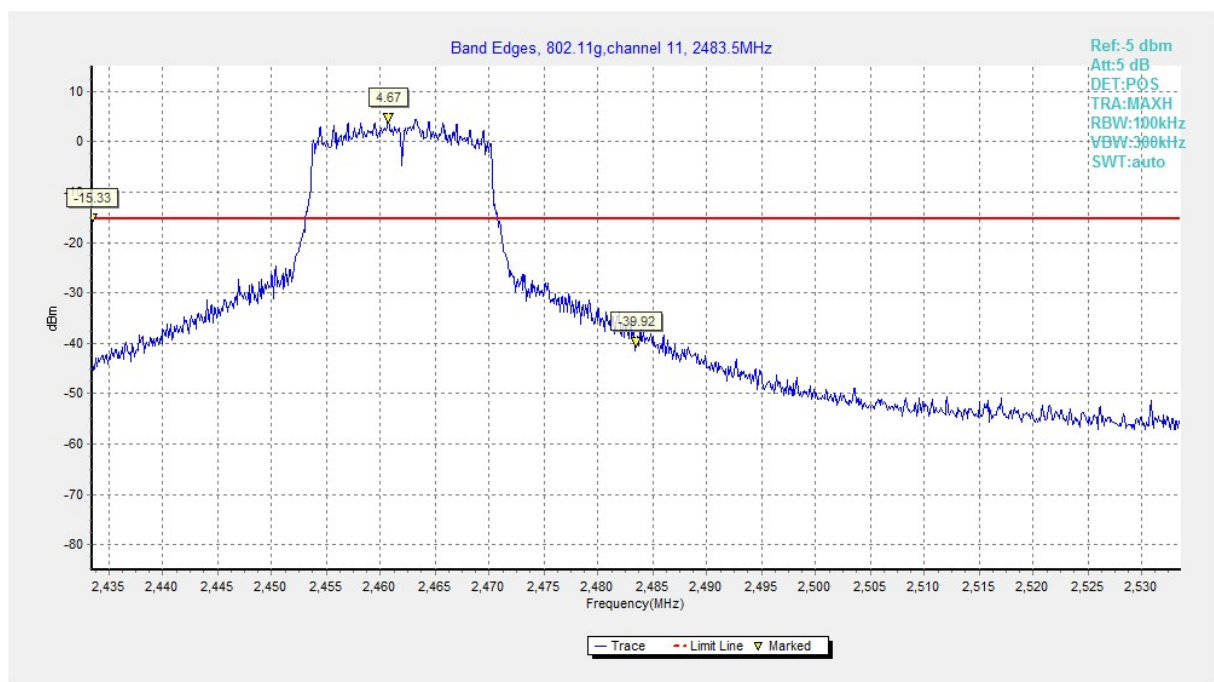


Fig.A.5.4 Band Edges (802.11g, Ch 11)

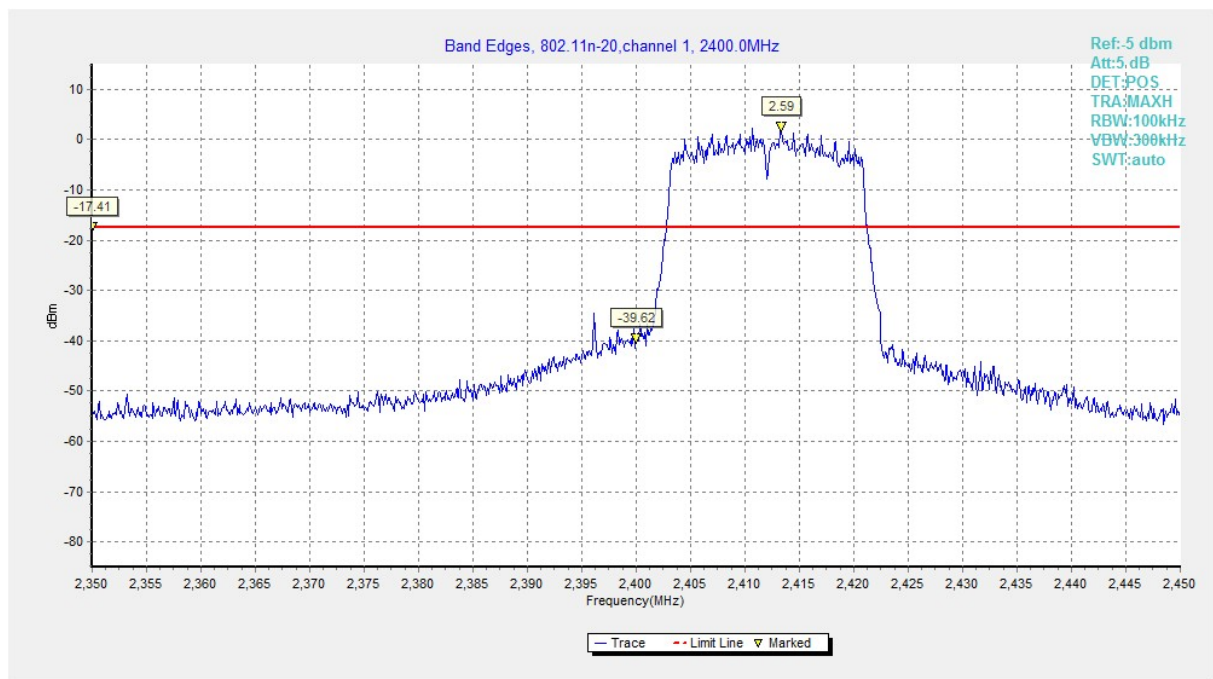


Fig.A.5.5 Band Edges (802.11n-HT20, Ch 1)

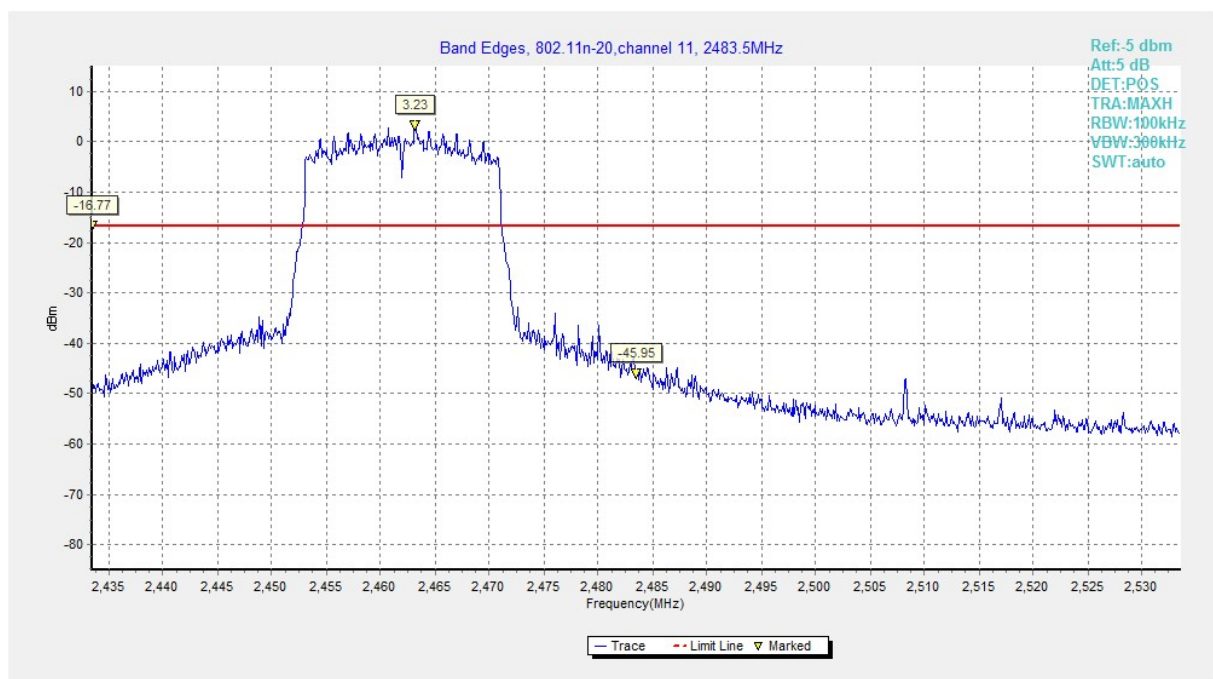


Fig.A.5.6 Band Edges (802.11n-HT20, Ch 11)

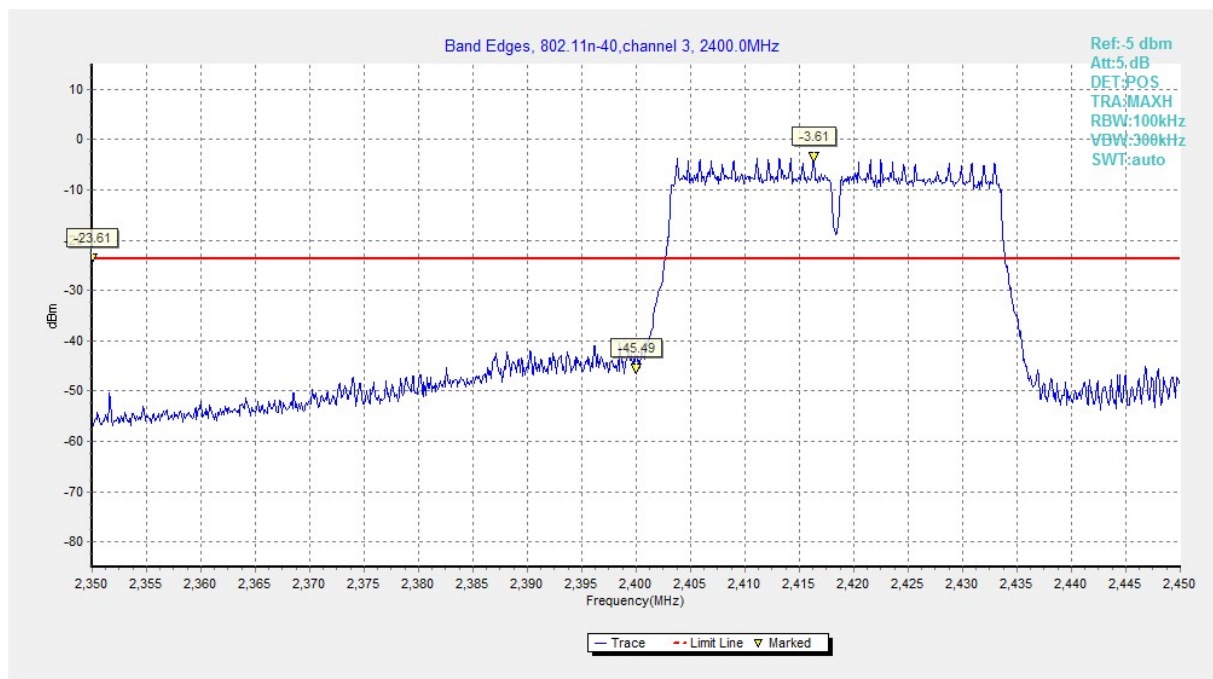


Fig.A.5.7 Band Edges (802.11n-HT40, Ch 3)

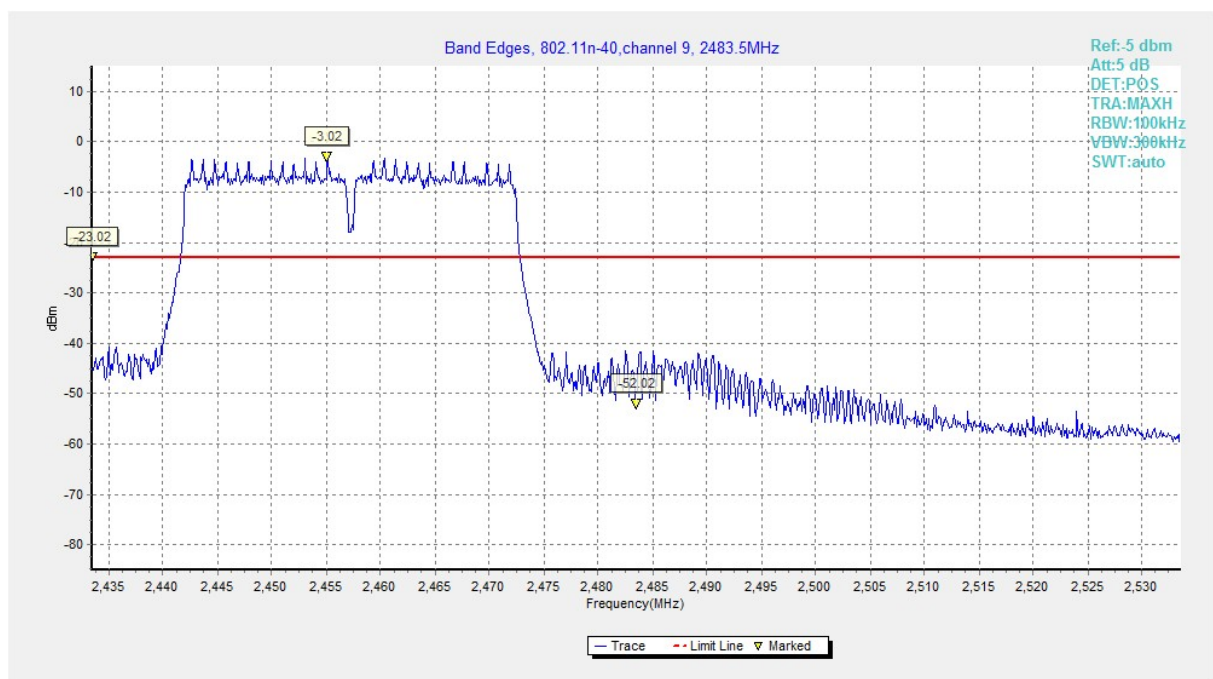


Fig.A.5.8 Band Edges (802.11n-HT40, Ch 9)

## **A.6. Transmitter Spurious Emission**

### **A.6.1 Transmitter Spurious Emission – Conducted**

#### **Method of Measurement: See ANSI C63.10**

Establish a reference level by using the following procedure:

- a) Set instrument center frequency to DTS channel center frequency
- b) Set the span to  $\geq 1.5$  times the DTS bandwidth
- c) Set the RBW= 100 kHz
- d) Set the VBW= 300 kHz
- e) Detector = Peak
- f) Sweep time = auto couple
- g) Trace mode = max hold
- h) Allow trace to fully stabilize
- i) Use the peak marker function to determine the maximum PSD level

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Establish an emission level by using the following procedure:

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW = 300 kHz.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

#### **Measurement Limit:**

| Standard                   | Limit                                             |
|----------------------------|---------------------------------------------------|
| FCC 47 CFR Part 15.247 (d) | 20dB below peak output power in 100 kHz bandwidth |

**EUT ID: EUT2**

**Measurement Results:**

**802.11b mode**

| MODE    | Channel | Frequency Range   | Test Results | Conclusion |
|---------|---------|-------------------|--------------|------------|
| 802.11b | 1       | 2.412 GHz         | Fig.A.6.1.1  | <b>P</b>   |
|         |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.2  | <b>P</b>   |
|         |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.3  | <b>P</b>   |
|         |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.4  | <b>P</b>   |
|         |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.5  | <b>P</b>   |
|         |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.6  | <b>P</b>   |
|         |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.7  | <b>P</b>   |
|         |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.8  | <b>P</b>   |
|         | 6       | 2.437 GHz         | Fig.A.6.1.9  | <b>P</b>   |
|         |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.10 | <b>P</b>   |
|         |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.11 | <b>P</b>   |
|         |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.12 | <b>P</b>   |
|         |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.13 | <b>P</b>   |
|         |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.14 | <b>P</b>   |
|         |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.15 | <b>P</b>   |
|         |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.16 | <b>P</b>   |
|         | 11      | 2.462 GHz         | Fig.A.6.1.17 | <b>P</b>   |
|         |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.18 | <b>P</b>   |
|         |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.19 | <b>P</b>   |
|         |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.20 | <b>P</b>   |
|         |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.21 | <b>P</b>   |
|         |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.22 | <b>P</b>   |
|         |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.23 | <b>P</b>   |
|         |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.24 | <b>P</b>   |

**802.11g mode**

| MODE    | Channel | Frequency Range   | Test Results | Conclusion |
|---------|---------|-------------------|--------------|------------|
| 802.11g | 1       | 2.412 GHz         | Fig.A.6.1.25 | P          |
|         |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.26 | P          |
|         |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.27 | P          |
|         |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.28 | P          |
|         |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.29 | P          |
|         |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.30 | P          |
|         |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.31 | P          |
|         |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.32 | P          |
|         | 6       | 2.437 GHz         | Fig.A.6.1.33 | P          |
|         |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.34 | P          |
|         |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.35 | P          |
|         |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.36 | P          |
|         |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.37 | P          |
|         |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.38 | P          |
|         |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.39 | P          |
|         |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.40 | P          |
|         | 11      | 2.462 GHz         | Fig.A.6.1.41 | P          |
|         |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.42 | P          |
|         |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.43 | P          |
|         |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.44 | P          |
|         |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.45 | P          |
|         |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.46 | P          |
|         |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.47 | P          |
|         |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.48 | P          |

**802.11n-HT20 mode**

| MODE              | Channel | Frequency Range   | Test Results | Conclusion |
|-------------------|---------|-------------------|--------------|------------|
| 802.11n<br>(HT20) | 1       | 2.412 GHz         | Fig.A.6.1.49 | <b>P</b>   |
|                   |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.50 | <b>P</b>   |
|                   |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.51 | <b>P</b>   |
|                   |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.52 | <b>P</b>   |
|                   |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.53 | <b>P</b>   |
|                   |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.54 | <b>P</b>   |
|                   |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.55 | <b>P</b>   |
|                   |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.56 | <b>P</b>   |
|                   | 6       | 2.437 GHz         | Fig.A.6.1.57 | <b>P</b>   |
|                   |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.58 | <b>P</b>   |
|                   |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.59 | <b>P</b>   |
|                   |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.60 | <b>P</b>   |
|                   |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.61 | <b>P</b>   |
|                   |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.62 | <b>P</b>   |
|                   |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.63 | <b>P</b>   |
|                   |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.64 | <b>P</b>   |
|                   | 11      | 2.462 GHz         | Fig.A.6.1.65 | <b>P</b>   |
|                   |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.66 | <b>P</b>   |
|                   |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.67 | <b>P</b>   |
|                   |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.68 | <b>P</b>   |
|                   |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.69 | <b>P</b>   |
|                   |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.70 | <b>P</b>   |
|                   |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.71 | <b>P</b>   |
|                   |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.72 | <b>P</b>   |

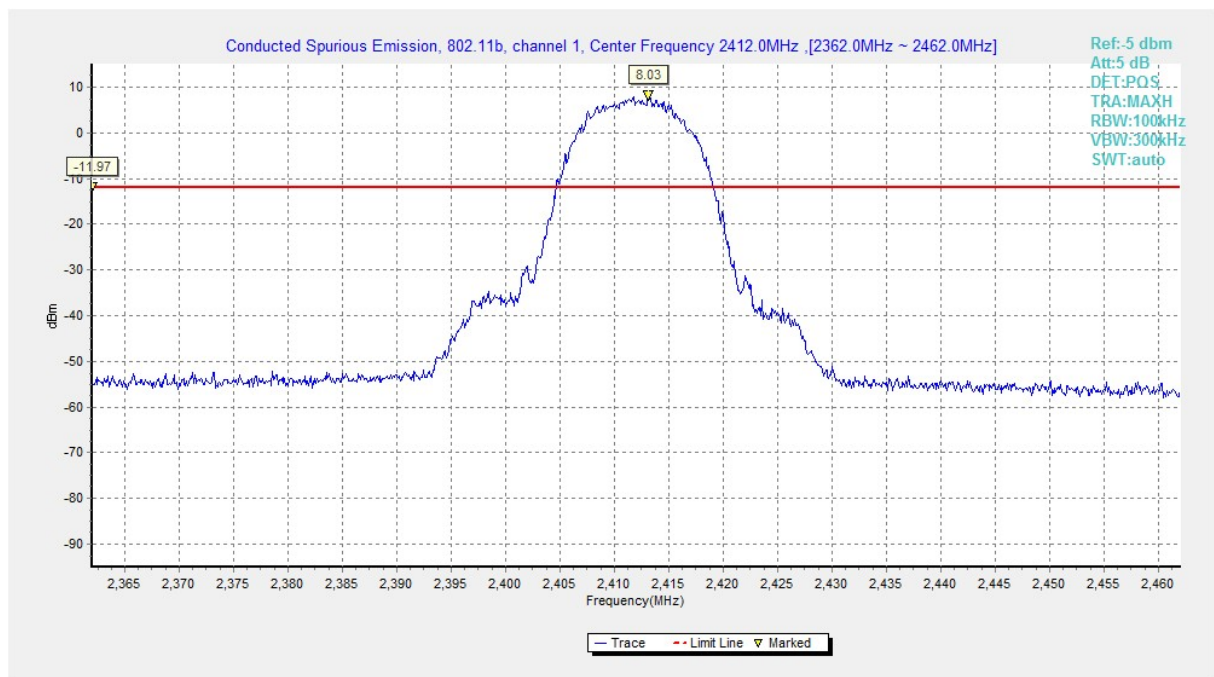


**802.11n-HT40 mode**

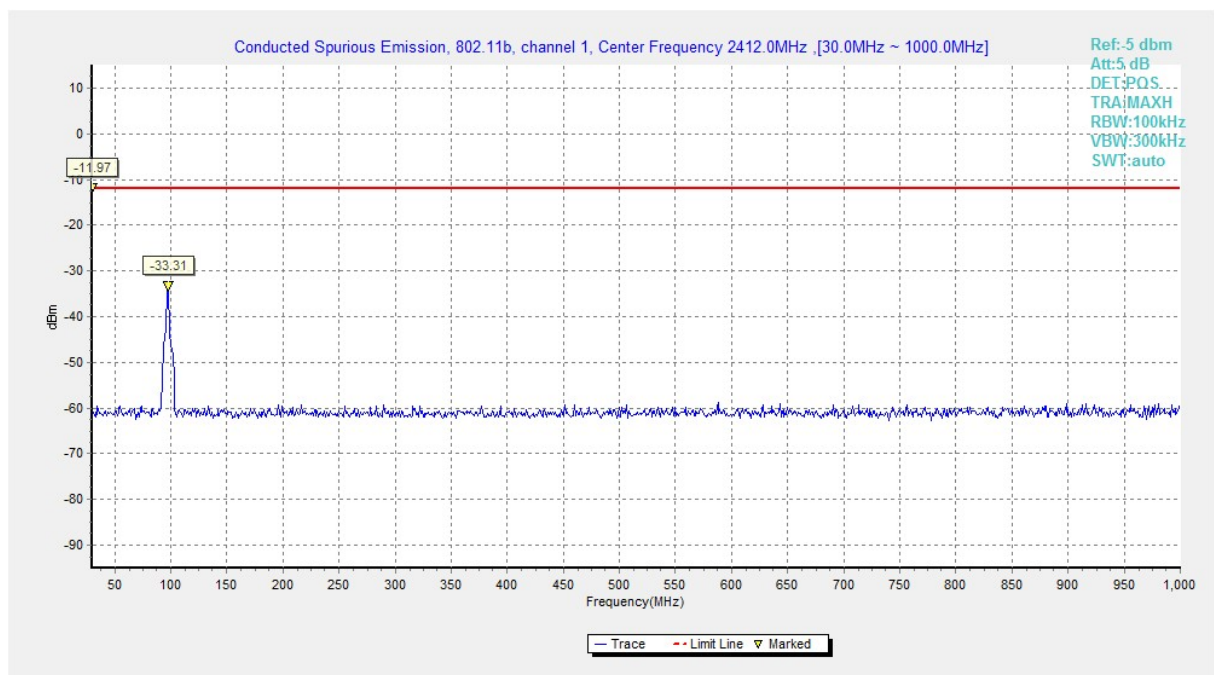
| MODE              | Channel | Frequency Range   | Test Results | Conclusion |
|-------------------|---------|-------------------|--------------|------------|
| 802.11n<br>(HT40) | 3       | 2.422 GHz         | Fig.A.6.1.73 | P          |
|                   |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.74 | P          |
|                   |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.75 | P          |
|                   |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.76 | P          |
|                   |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.77 | P          |
|                   |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.78 | P          |
|                   |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.79 | P          |
|                   |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.80 | P          |
|                   | 6       | 2.437 GHz         | Fig.A.6.1.81 | P          |
|                   |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.82 | P          |
|                   |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.83 | P          |
|                   |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.84 | P          |
|                   |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.85 | P          |
|                   |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.86 | P          |
|                   |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.87 | P          |
|                   |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.88 | P          |
|                   | 9       | 2.452 GHz         | Fig.A.6.1.89 | P          |
|                   |         | 30 MHz ~ 1 GHz    | Fig.A.6.1.90 | P          |
|                   |         | 1 GHz ~ 2.5 GHz   | Fig.A.6.1.91 | P          |
|                   |         | 2.5 GHz ~ 7.5 GHz | Fig.A.6.1.92 | P          |
|                   |         | 7.5 GHz ~ 10 GHz  | Fig.A.6.1.93 | P          |
|                   |         | 10 GHz ~ 15 GHz   | Fig.A.6.1.94 | P          |
|                   |         | 15 GHz ~ 20 GHz   | Fig.A.6.1.95 | P          |
|                   |         | 20 GHz ~ 26 GHz   | Fig.A.6.1.96 | P          |

**Conclusion: Pass**

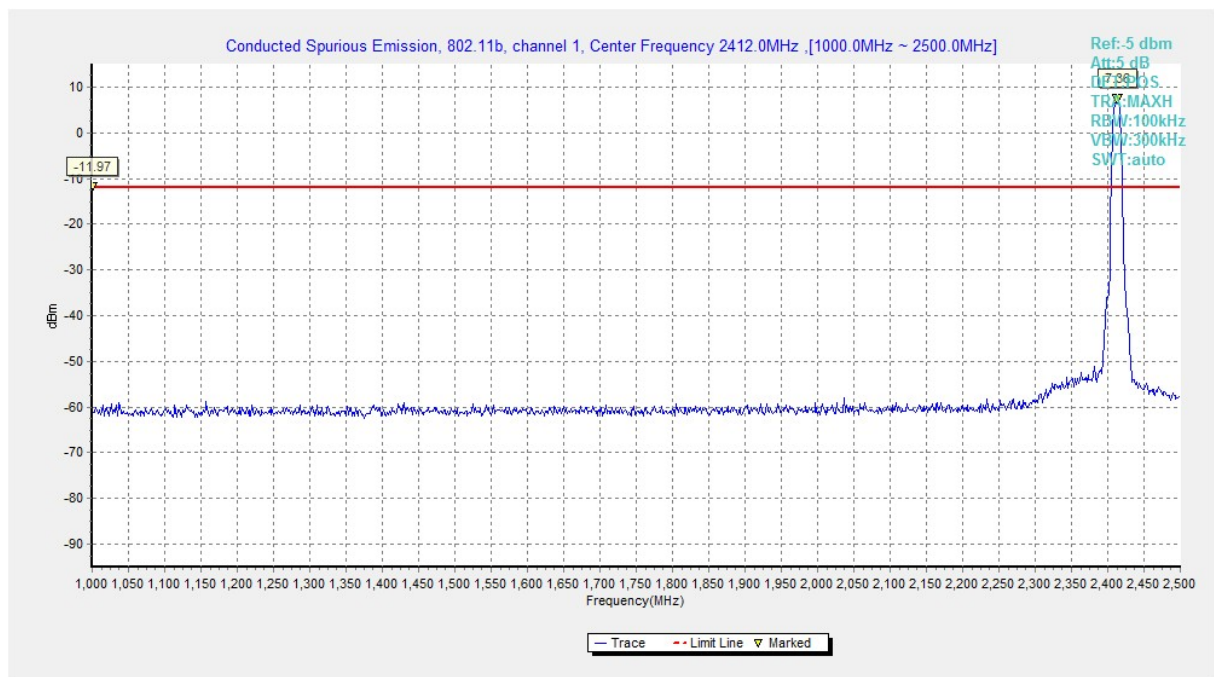
**Test graphs as below:**



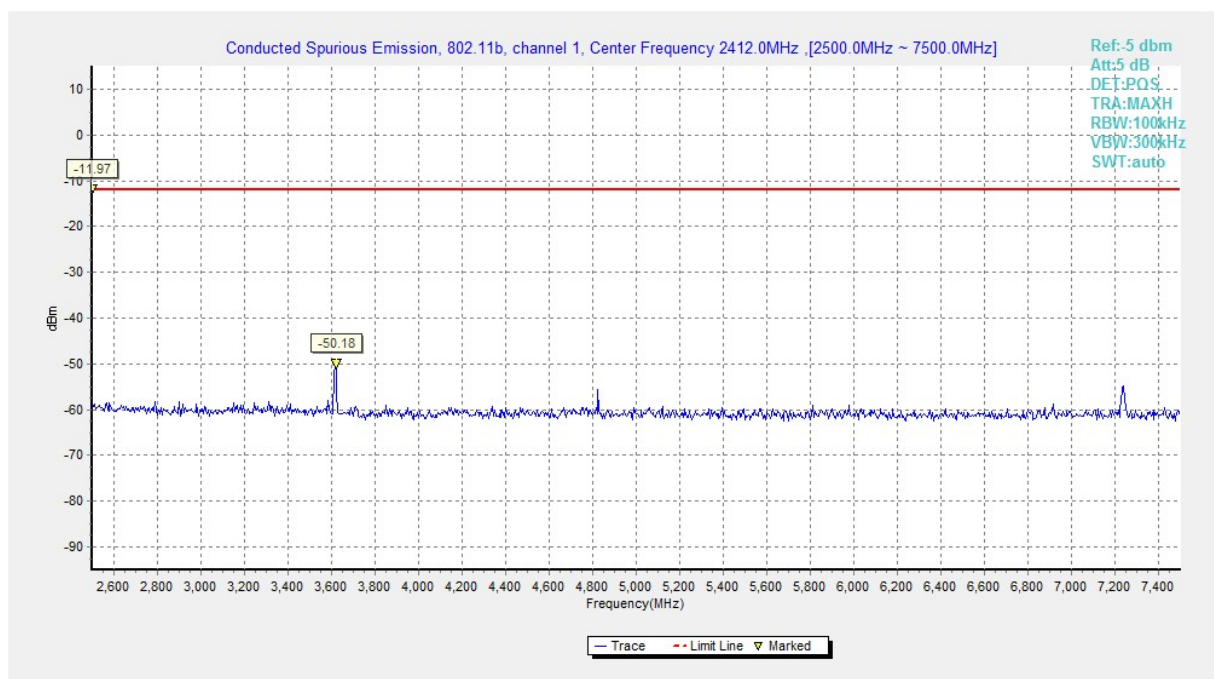
**Fig.A.6.1.1 Transmitter Spurious Emission - Conducted (802.11b, Ch1, Center Frequency)**



**Fig.A.6.1.2 Transmitter Spurious Emission - Conducted (802.11b, Ch1, 30 MHz-1 GHz)**



**Fig.A.6.1.3 Transmitter Spurious Emission - Conducted (802.11b, Ch1, 1 GHz-2.5 GHz)**



**Fig.A.6.1.4 Transmitter Spurious Emission - Conducted (802.11b, Ch1, 2.5 GHz-7.5 GHz)**