



## FCC/IC- TEST REPORT

Report Number : **708881780402-00** Date of Issue: November 16, 2017

Model : W-WRN-000

Product Type : Wireless Repeater Node

FCC ID : N73-WRN

IC : 7449B-WRN

Applicant : Mine Site Technologies Pty Limited.

Address : Level 5, 113 Wicks Road, North Ryde. 2113 NSW, Australia

Production Facility : MINE SITE TECHNOLOGIES CHINA CO.,LTD

Address : 4F, Building 1, No.1413, Moganshan Road, Hangzhou,  
China, 310015

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including  
Appendices : 85

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## 2 Details about the Test Laboratory

### Details about the Test Laboratory

#### Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch  
No.16 Lane, 1951 Du Hui Road,  
Shanghai 201108,  
P.R. China  
FCC Registration No.: 820234  
Telephone: +86 21 6141 0123  
Fax: +86 21 6140 8600

#### Test Site 2

Company name: MRT Technology (Suzhou) Co., Ltd.  
D8 Building, Youxin Industrial Park, No. 2 Tina'ed Wuzhong  
Economic Development Zone, Suzhou, China  
FCC Registration No.: 893164  
IC Registration No.: 11384A-1  
Telephone: +86-512-66308358  
Fax: +86-512-66308368

### 3 Description of the Equipment under Test

#### Description of the Equipment Under Test

Product: Wireless Repeater Node

Model no.: W-WRN-000

FCC ID: N73-WRN

IC: 7449B-WRN

Options and accessories: NA

Input Rated Voltage: DC 7.4V  
Extreme Voltage: DC 5.4V-8.4V

RF Transmission Frequency: 802.11b/g/n-HT20: 2412 ~ 2462 MHz  
802.11n-HT40: 2422 ~ 2452 MHz

No. of Operated Channel: 11 for 802.11b/802.11g/802.11(H20) 7 for 802.11n(H40)

Channel Space: 5MHz

#### Channel list:

| Operation Frequency each of channel For 802.11b/g/n(H20) |           |         |           |         |           |         |           |
|----------------------------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                                                  | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1                                                        | 2412MHz   | 4       | 2427MHz   | 7       | 2442MHz   | 10      | 2457MHz   |
| 2                                                        | 2417MHz   | 5       | 2432MHz   | 8       | 2447MHz   | 11      | 2462MHz   |
| 3                                                        | 2422MHz   | 6       | 2437MHz   | 9       | 2452MHz   |         |           |

| Operation Frequency each of channel For 802.11n(H40) |           |         |           |         |           |         |           |
|------------------------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                                              | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
|                                                      |           | 4       | 2427MHz   | 7       | 2442MHz   |         |           |
|                                                      |           | 5       | 2432MHz   | 8       | 2447MHz   |         |           |
| 3                                                    | 2422MHz   | 6       | 2437MHz   | 9       | 2452MHz   |         |           |

Radio technology: IEEE 802.11b/802.11g/802.11(H20)/802.11n(H40)

Modulation: Direct Sequence Spread Spectrum (DSSS) for 802.11b  
Orthogonal Frequency Division Multiplexing(OFDM) for 802.11g/n

Data speed (IEEE 802.11b): 1Mbps, 2Mbps, 5.5Mbps, 11Mbps

Data speed (IEEE 802.11g): 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps

Data speed (IEEE 802.11n): Up to 150Mbps

Hardware version: HR-A

Software version: 3.2.1

Antenna Type: External

Antenna Gain: 2.0dBi

Description of the EUT: The Equipment Under Test (EUT) is Wireless Repeater Node operated at 2.4GHz.

## 4 Summary of Test Standards

| Test Standards        |                                                                                                                              |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------|
| FCC Part 15 Subpart C | PART 15 - RADIO FREQUENCY DEVICES<br>Subpart C - Intentional Radiators                                                       |
| RSS-247 Issue 2       | Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices |

All the test methods were according to KDB558074 D01 DTS Measurement Guidance v04 and ANSI C63.10 (2013).

## 5 Summary of Test Results

| Technical Requirements                   |                                                           |            |           |                                     |                          |                                     |
|------------------------------------------|-----------------------------------------------------------|------------|-----------|-------------------------------------|--------------------------|-------------------------------------|
| FCC Part 15 Subpart C & RSS-210 Issue 2  |                                                           |            |           |                                     |                          |                                     |
| Test Condition                           |                                                           | Pages      | Test Site | Test Result                         |                          |                                     |
|                                          |                                                           |            |           | Pass                                | Fail                     | N/A                                 |
| §15.207<br>RSS-Gen [8.8]                 | Conducted emission AC power port                          | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247 (b) (1)<br>RSS-247 [5.4(4)]      | Conducted peak output power                               | 12         | Site 2    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(a)(1)                            | 20dB bandwidth                                            | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)                            | Carrier frequency separation                              | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)(iii)                       | Number of hopping frequencies                             | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)(iii)                       | Dwell Time                                                | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(e)<br>RSS-247 [5.2]              | Power spectral density                                    | 18         | Site 2    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(a)(2)<br>RSS-247 [5.2]           | 6dB bandwidth and 99% Occupied Bandwidth                  | 13         | Site 2    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(d)<br>RSS-247 [5.5]              | Spurious RF conducted emissions                           | 23         | Site 2    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(d) &<br>§15.209<br>RSS-247 [5.5] | Spurious radiated emissions and Band edge for transmitter | 22         | Site 2    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.203                                  | Antenna requirement                                       | See note 1 |           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |

Remark 1: N/A – Not Applicable.

Note 1: 15.203 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, 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. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

E.U.T Antenna: The WiFi antenna is an external antenna which fixed and user by professional, the best-case gain of the antenna is 2 dBi.

## 6 General Remarks

### Remarks

This submittal(s) (test report) is intended for FCC ID: N73-WRN, IC: 7449B-WRN complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-247 Issue 2.

### SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: August 23, 2017

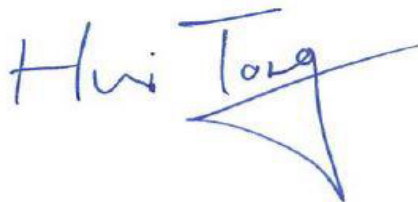
Testing Start Date: August 24, 2017

Testing End Date: August 30, 2017

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Reviewed by:

Prepared by:



Hui TONG  
Review Engineer

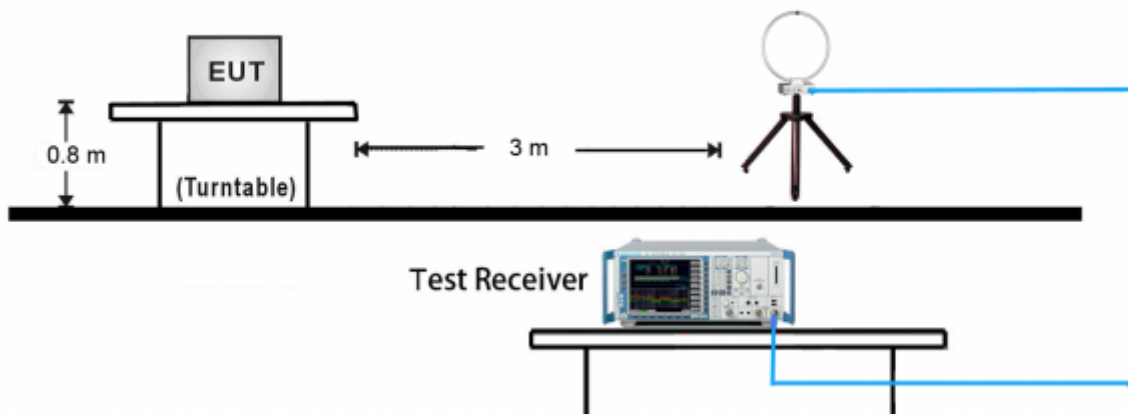


Jiayi XU  
Project Engineer

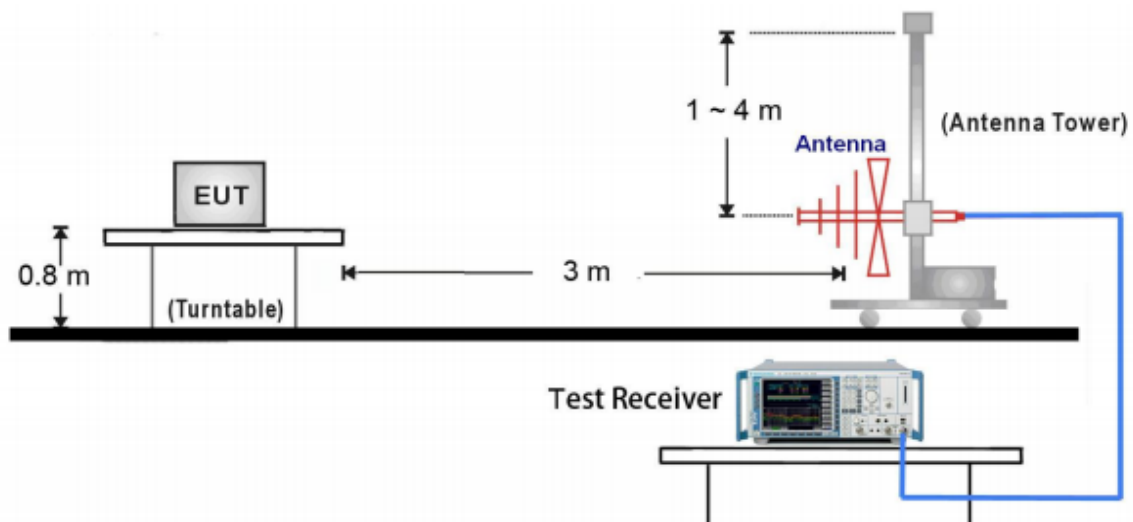
## 7 Test Setups

### 7.1 Radiated test setups

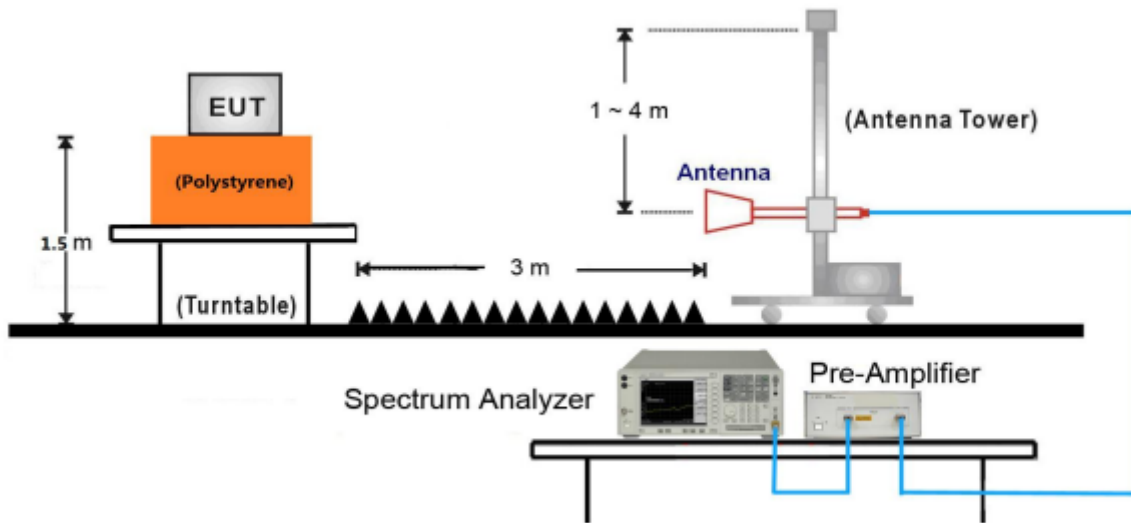
#### 9kHz ~ 30MHz Test Setup:



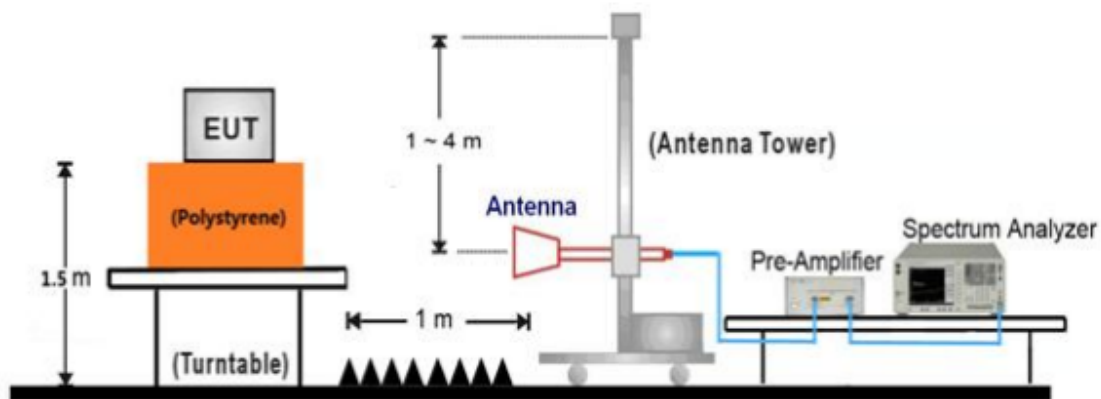
#### 30MHz ~ 1GHz Test Setup:



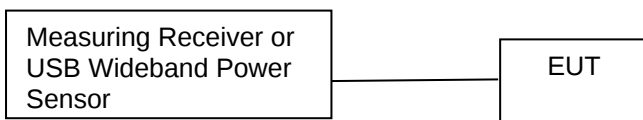
### 1GHz ~ 18GHz Test Setup:



### 18GHz ~ 25GHz Test Setup:



## 7.2 Conducted RF test setups



## 8 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO.(SHIELD) |
|-------------|--------------|-------------------|
| Notebook    | Lenove       | X240              |

Test channel & mode:

The Wireless Repeater Node was configured using a proprietary communication interface provided by the client. The interface allows power level and channel control required to support the evaluation. The power level settings in the table below were used for the evaluation.

|               |                       |
|---------------|-----------------------|
| Test software | putty.exe, artgui.exe |
|---------------|-----------------------|

### 802.11b/802.11g/802.11n-HT20

| Test mode | Channel | Frequency (MHz) |
|-----------|---------|-----------------|
| Tx        | 1       | 2412            |
| Tx        | 6       | 2437            |
| Tx        | 11      | 2462            |

### 802.11n-HT40

| Test mode | Channel | Frequency (MHz) |
|-----------|---------|-----------------|
| Tx        | 3       | 2422            |
| Tx        | 6       | 2437            |
| Tx        | 9       | 2452            |

### Device Capabilities

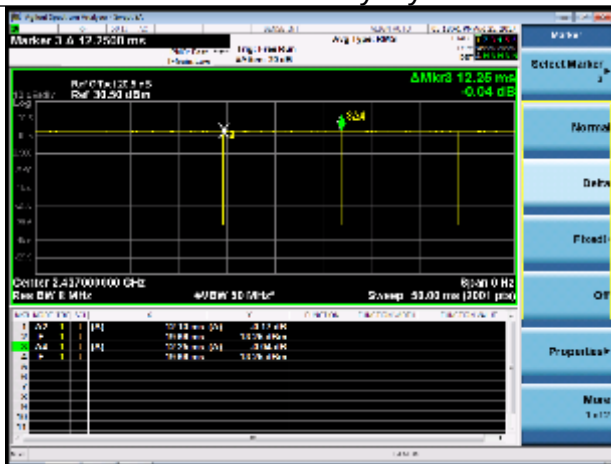
This device contains the following capabilities:

802.11b/g/n-HT20/n-HT40 Wi-Fi Device.

**Note:** 2.4GHz WLAN (DTS) operation is possible in 20MHz, and 40MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section 6.0 b) of KDB 558074 D01v04. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

| Test Mode    | Duty Cycle |
|--------------|------------|
| 802.11b      | 99.02      |
| 802.11g      | 97.07      |
| 802.11n-HT20 | 97.27      |
| 802.11n-HT40 | 95.80      |

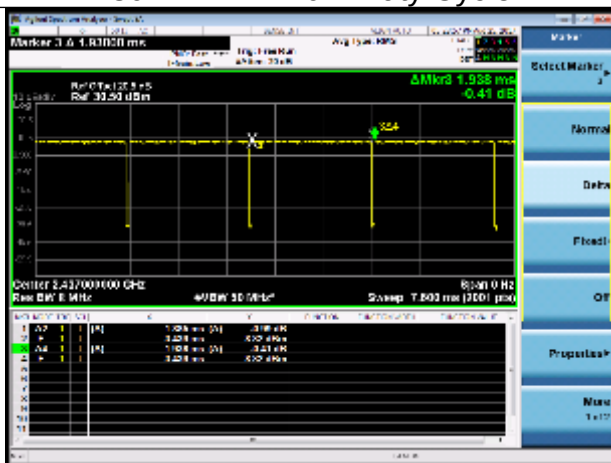
802.11b – Duty Cycle



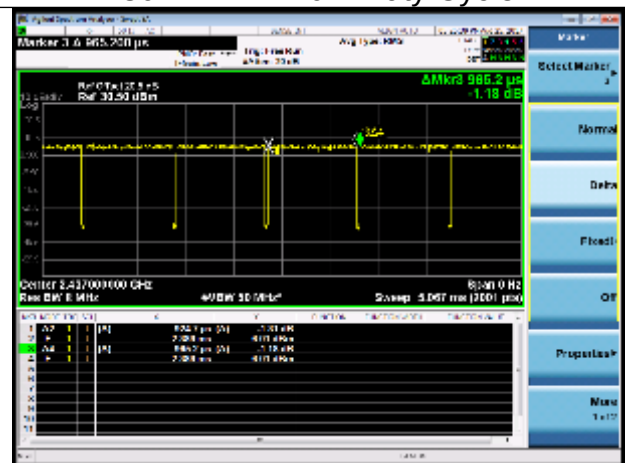
802.11g – Duty Cycle



802.11n-HT20 – Duty Cycle



802.11n-HT40 – Duty Cycle



## 9 Technical Requirement

### 9.1 Conducted peak output power

#### Test Method

KDB 558074 D01 v04 – Section 9.1.3 PKPM1 – Peak Power Method

9.1.3 PKPM1 Peak-reading power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

#### Limits

| Frequency Range<br>MHz | Limit<br>W | Limit<br>dBm |
|------------------------|------------|--------------|
| 2400-2483.5            | ≤1         | ≤30          |

Test result as below table

| FCC Part 15.247 |                    |         |                 |                           |                  |                     |             |
|-----------------|--------------------|---------|-----------------|---------------------------|------------------|---------------------|-------------|
| Mode            | Antenna Gain (dBi) | Channel | Frequency (MHz) | Final Power Setting Value | Peak Power (dBm) | Average Power (dBm) | Limit (dBm) |
| b               | 2                  | CH01    | 2412            | 68                        | 17.42            | 14.84               | 30.00       |
|                 | 2                  | CH06    | 2437            | 68                        | 17.31            | 14.43               | 30.00       |
|                 | 2                  | CH11    | 2462            | 68                        | 17.13            | 13.95               | 30.00       |
| g               | 2                  | CH01    | 2412            | 62                        | 17.82            | 12.66               | 30.00       |
|                 | 2                  | CH06    | 2437            | 66                        | 17.12            | 11.04               | 30.00       |
|                 | 2                  | CH11    | 2462            | 66                        | 17.08            | 10.75               | 30.00       |
| n-HT20          | 2                  | CH01    | 2412            | 61                        | 16.66            | 9.73                | 30.00       |
|                 | 2                  | CH06    | 2437            | 66                        | 17.12            | 11.21               | 30.00       |
|                 | 2                  | CH11    | 2462            | 66                        | 17.04            | 10.79               | 30.00       |
| n-HT40          | 2                  | CH03    | 2422            | 58                        | 15.87            | 8.00                | 30.00       |
|                 | 2                  | CH06    | 2437            | 63                        | 16.50            | 9.51                | 30.00       |
|                 | 2                  | CH09    | 2452            | 63                        | 16.32            | 9.13                | 30.00       |

## 9.2 6dB bandwidth and 99% Occupied Bandwidth

### Test Method

1. Use the following spectrum analyzer settings:  
RBW=100K, VBW $\geq$ 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be  $\geq$  6 dB.
3. Allow the trace to stabilize, record the 6 dB Bandwidth value.

### Limit

Limit [kHz]

$\geq 500$

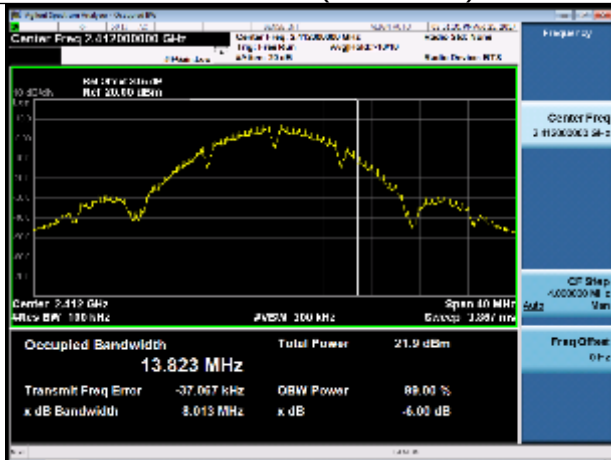
### Test result

| Test Mode    | Data Rate / MCS | Channel No. | Freq. (MHz) | 6db Bandwidth (MHz) | Limit (MHz) | Result |
|--------------|-----------------|-------------|-------------|---------------------|-------------|--------|
| 802.11b      | 1Mbps           | 01          | 2412        | 8.01                | $\geq 0.5$  | Pass   |
| 802.11b      | 1Mbps           | 06          | 2437        | 7.12                | $\geq 0.5$  | Pass   |
| 802.11b      | 1Mbps           | 11          | 2462        | 7.58                | $\geq 0.5$  | Pass   |
| 802.11g      | 6Mbps           | 01          | 2412        | 16.35               | $\geq 0.5$  | Pass   |
| 802.11g      | 6Mbps           | 06          | 2437        | 16.35               | $\geq 0.5$  | Pass   |
| 802.11g      | 6Mbps           | 11          | 2462        | 16.35               | $\geq 0.5$  | Pass   |
| 802.11n-HT20 | 6.5Mbps         | 01          | 2412        | 17.54               | $\geq 0.5$  | Pass   |
| 802.11n-HT20 | 6.5Mbps         | 06          | 2437        | 17.32               | $\geq 0.5$  | Pass   |
| 802.11n-HT20 | 6.5Mbps         | 11          | 2462        | 17.58               | $\geq 0.5$  | Pass   |
| 802.11n-HT40 | 13.5Mbps        | 03          | 2422        | 35.18               | $\geq 0.5$  | Pass   |
| 802.11n-HT40 | 13.5Mbps        | 06          | 2437        | 35.18               | $\geq 0.5$  | Pass   |
| 802.11n-HT40 | 13.5Mbps        | 09          | 2452        | 35.17               | $\geq 0.5$  | Pass   |

| Test Mode    | Data Rate / MCS | Channel No. | Freq. (MHz) | 99% Bandwidth (MHz) | Limit | Result |
|--------------|-----------------|-------------|-------------|---------------------|-------|--------|
| 802.11b      | 1Mbps           | 01          | 2412        | 13.82               | NA    | NA     |
| 802.11b      | 1Mbps           | 06          | 2437        | 13.34               |       |        |
| 802.11b      | 1Mbps           | 11          | 2462        | 13.05               |       |        |
| 802.11g      | 6Mbps           | 01          | 2412        | 16.53               |       |        |
| 802.11g      | 6Mbps           | 06          | 2437        | 16.69               |       |        |
| 802.11g      | 6Mbps           | 11          | 2462        | 16.55               |       |        |
| 802.11n-HT20 | 6.5Mbps         | 01          | 2412        | 17.69               |       |        |
| 802.11n-HT20 | 6.5Mbps         | 06          | 2437        | 17.79               |       |        |
| 802.11n-HT20 | 6.5Mbps         | 11          | 2462        | 17.72               |       |        |
| 802.11n-HT40 | 13.5Mbps        | 03          | 2422        | 35.89               |       |        |
| 802.11n-HT40 | 13.5Mbps        | 06          | 2437        | 35.97               |       |        |
| 802.11n-HT40 | 13.5Mbps        | 09          | 2452        | 35.93               |       |        |

## 802.11b 6dB Bandwidth

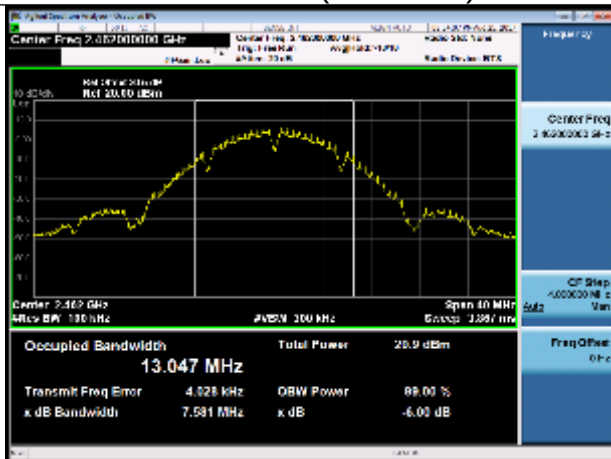
Channel 01 (2412MHz)



Channel 06 (2437MHz)

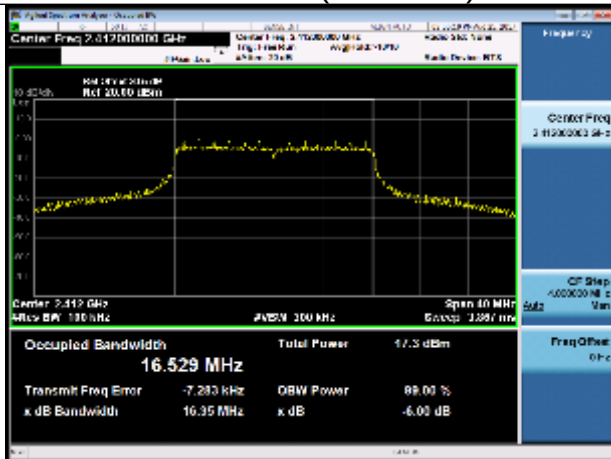


Channel 11 (2462MHz)

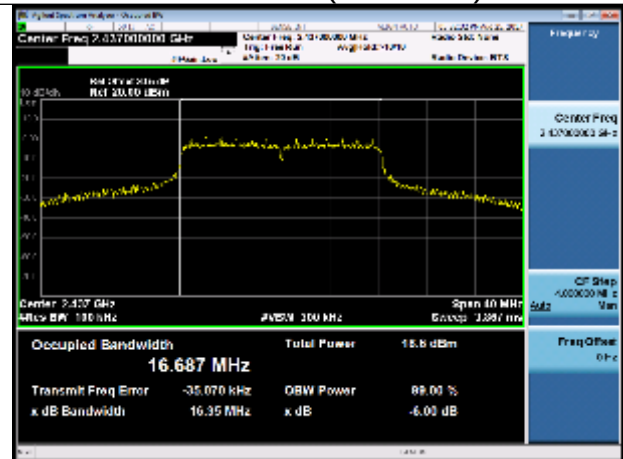


## 802.11g 6dB Bandwidth

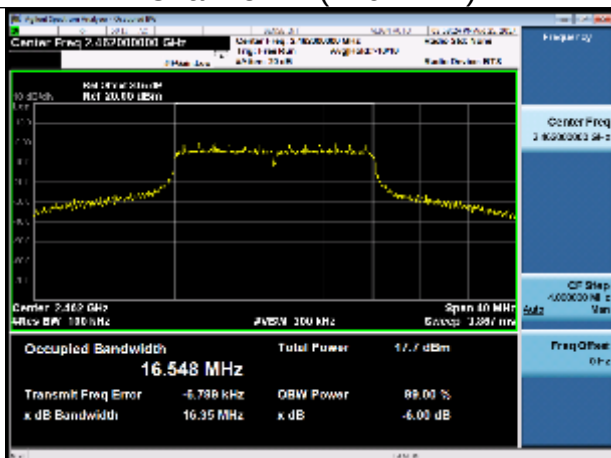
## Channel 01 (2412MHz)



## Channel 06 (2437MHz)

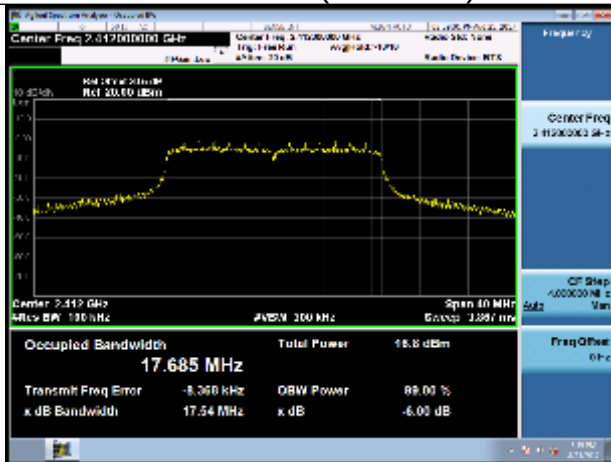


## Channel 11 (2462MHz)

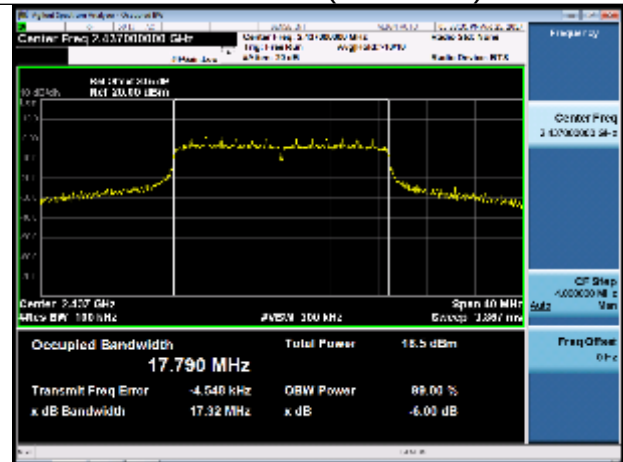


## 802.11n HT20 6dB Bandwidth

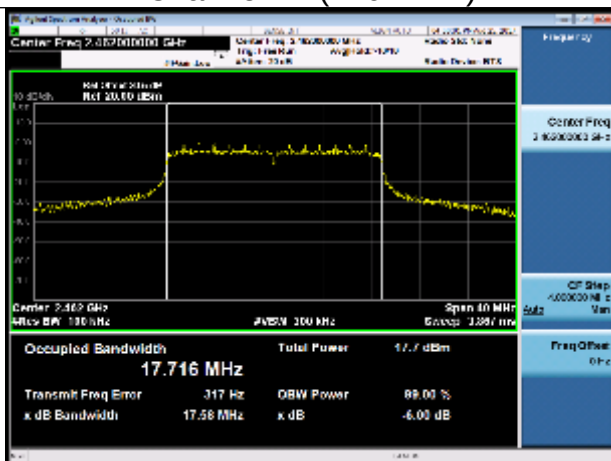
Channel 01 (2412MHz)



Channel 06 (2437MHz)

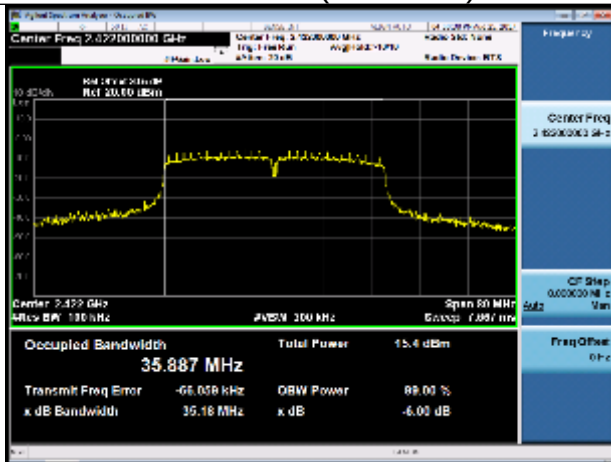


Channel 11 (2462MHz)

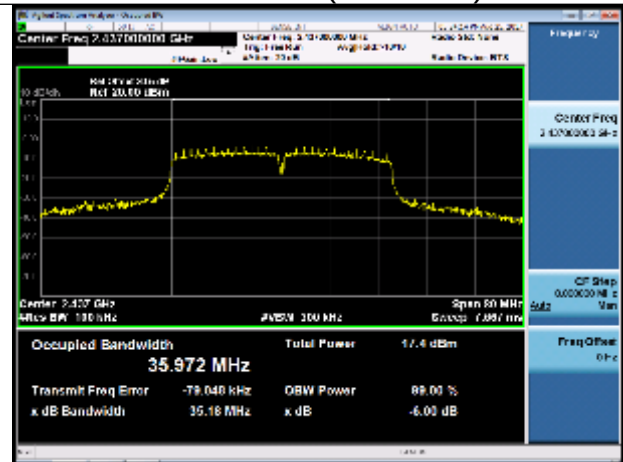


## 802.11n HT40 6dB Bandwidth

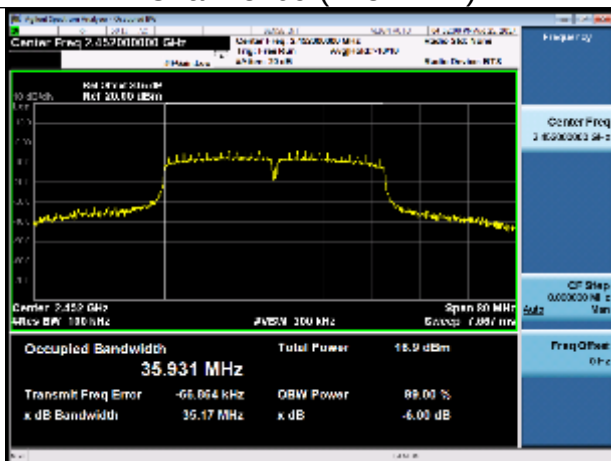
Channel 03 (2422MHz)



Channel 06 (2437MHz)



Channel 09 (2452MHz)



### 9.3 Power spectral density

#### Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW $\geq$ 3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

#### Limit

Limit [dBm]

$\leq 8$

#### Test result

| Test Mode    | Data Rate / MCS | Channel No. | Freq. (MHz) | PKPSD (dBm / 10kHz) | Limit (dBm/3kHz) | Result |
|--------------|-----------------|-------------|-------------|---------------------|------------------|--------|
| 802.11b      | 1Mbps           | 01          | 2412        | -7.21               | $\leq 8$         | Pass   |
| 802.11b      | 1Mbps           | 06          | 2437        | -7.49               | $\leq 8$         | Pass   |
| 802.11b      | 1Mbps           | 11          | 2462        | -7.79               | $\leq 8$         | Pass   |
| 802.11g      | 6Mbps           | 01          | 2412        | -12.46              | $\leq 8$         | Pass   |
| 802.11g      | 6Mbps           | 06          | 2437        | -12.79              | $\leq 8$         | Pass   |
| 802.11g      | 6Mbps           | 11          | 2462        | -13.31              | $\leq 8$         | Pass   |
| 802.11n-HT20 | 6.5Mbps         | 01          | 2412        | -12.97              | $\leq 8$         | Pass   |
| 802.11n-HT20 | 6.5Mbps         | 06          | 2437        | -13.78              | $\leq 8$         | Pass   |
| 802.11n-HT20 | 6.5Mbps         | 11          | 2462        | -14.36              | $\leq 8$         | Pass   |
| 802.11n-HT40 | 13.5Mbps        | 03          | 2422        | -14.74              | $\leq 8$         | Pass   |
| 802.11n-HT40 | 13.5Mbps        | 06          | 2437        | -15.44              | $\leq 8$         | Pass   |
| 802.11n-HT40 | 13.5Mbps        | 09          | 2452        | -15.28              | $\leq 8$         | Pass   |



China

802.11b PKPSD

Channel 01 (2412MHz)



Channel 06 (2437MHz)



Channel 11 (2462MHz)

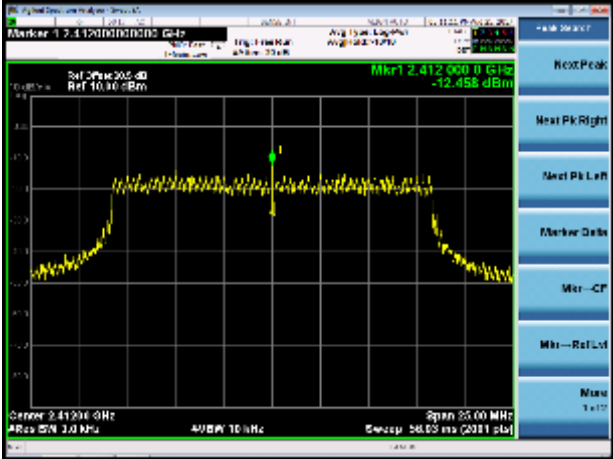




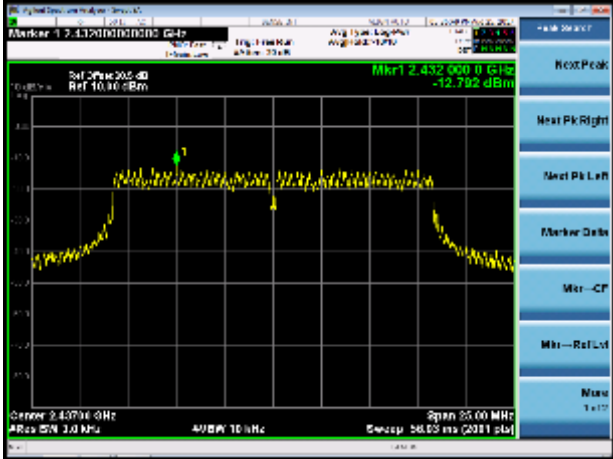
China

802.11g PKPSD

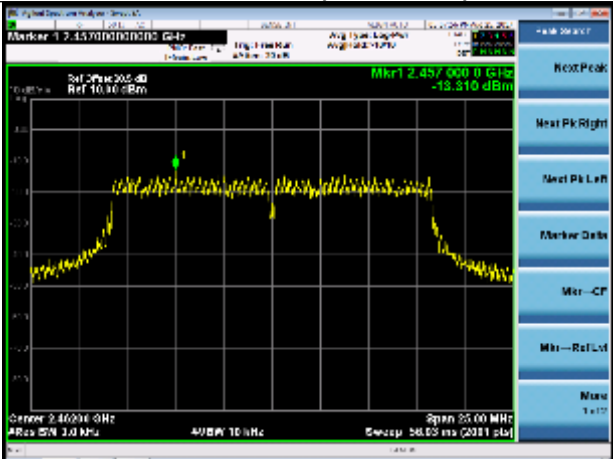
Channel 01 (2412MHz)

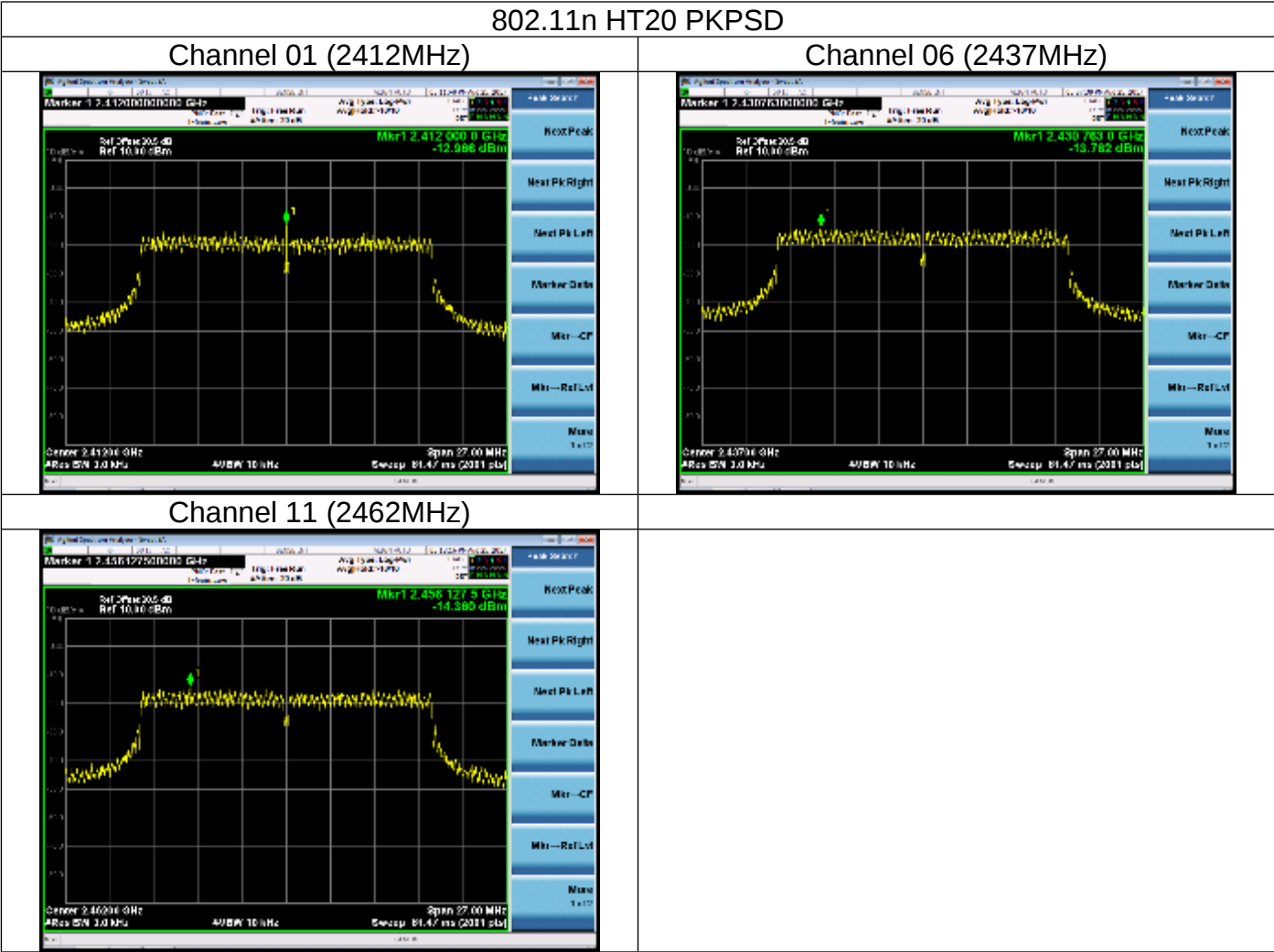


Channel 06 (2437MHz)



Channel 11 (2462MHz)



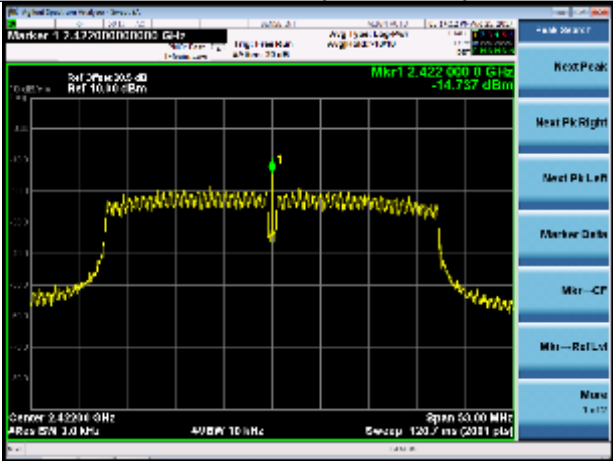




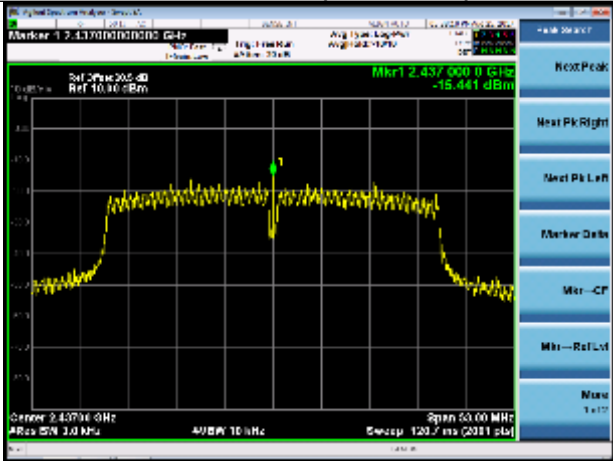
China

802.11n HT40 PKPSD

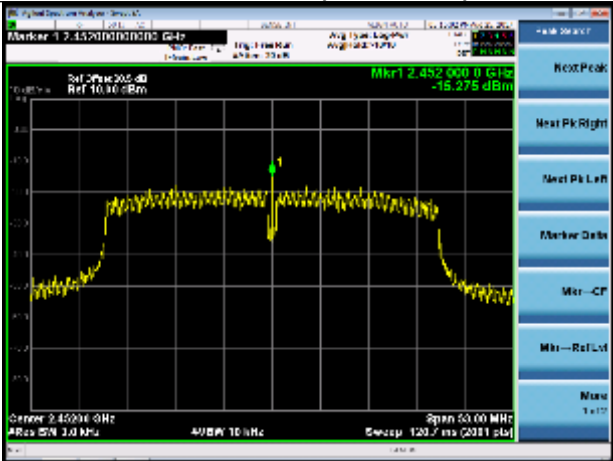
Channel 03 (2422MHz)



Channel 06 (2437MHz)



Channel 09 (2452MHz)



## 9.4 Conducted Band Edge and Out-of-Band Emissions

### Test Method

1. Establish a reference level by using the following procedure:
  - a. Set RBW=100 kHz. VBW $\geq$ 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
  - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
  - a. Set the center frequency and span to encompass frequency range to be measured.
  - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

### Limit

| Frequency Range<br>MHz | Limit (dBc) |
|------------------------|-------------|
| 30-25000               | -20         |

### Test result

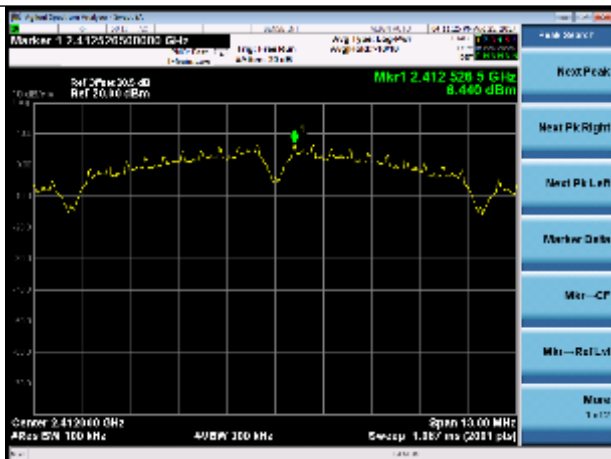
| Test Mode    | Data Rate<br>/ MCS | Channel<br>No. | Freq.<br>(MHz) | Limit | Result |
|--------------|--------------------|----------------|----------------|-------|--------|
| 802.11b      | 1Mbps              | 01             | 2412           | 20dBc | Pass   |
| 802.11b      | 1Mbps              | 06             | 2437           | 20dBc | Pass   |
| 802.11b      | 1Mbps              | 11             | 2462           | 20dBc | Pass   |
| 802.11g      | 6Mbps              | 01             | 2412           | 20dBc | Pass   |
| 802.11g      | 6Mbps              | 06             | 2437           | 20dBc | Pass   |
| 802.11g      | 6Mbps              | 11             | 2462           | 20dBc | Pass   |
| 802.11n-HT20 | 6.5Mbps            | 01             | 2412           | 20dBc | Pass   |
| 802.11n-HT20 | 6.5Mbps            | 06             | 2437           | 20dBc | Pass   |
| 802.11n-HT20 | 6.5Mbps            | 11             | 2462           | 20dBc | Pass   |
| 802.11n-HT40 | 13.5Mbps           | 03             | 2422           | 20dBc | Pass   |
| 802.11n-HT40 | 13.5Mbps           | 06             | 2437           | 20dBc | Pass   |
| 802.11n-HT40 | 13.5Mbps           | 09             | 2452           | 20dBc | Pass   |

## Spurious RF conducted emissions

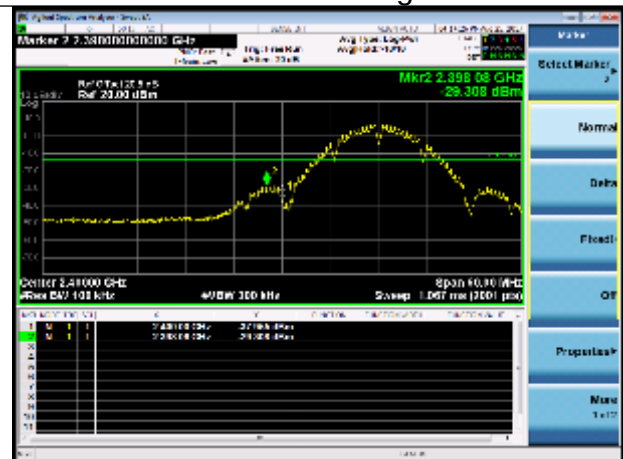
### 802.11b Out-of-Band Emissions

#### Channel 01 (2412MHz)

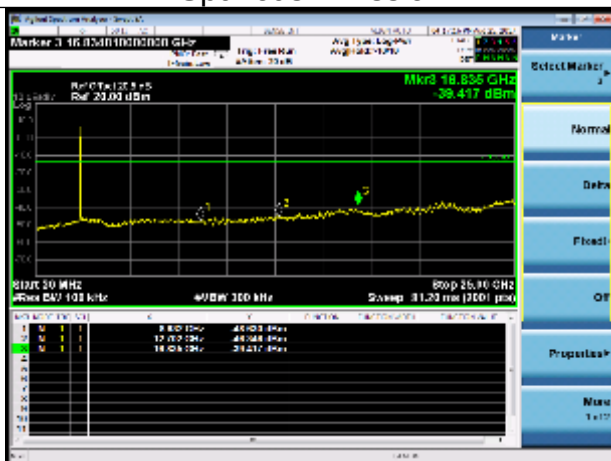
##### 100kHz PSD reference Level



##### Low Band Edge

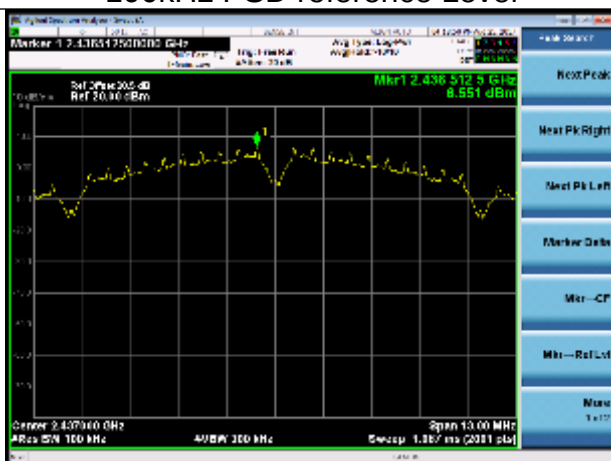


##### Spurious Emission

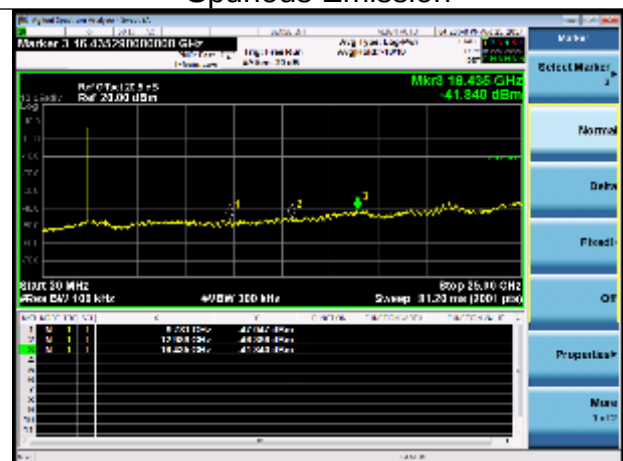


#### Channel 06 (2437MHz)

##### 100kHz PSD reference Level

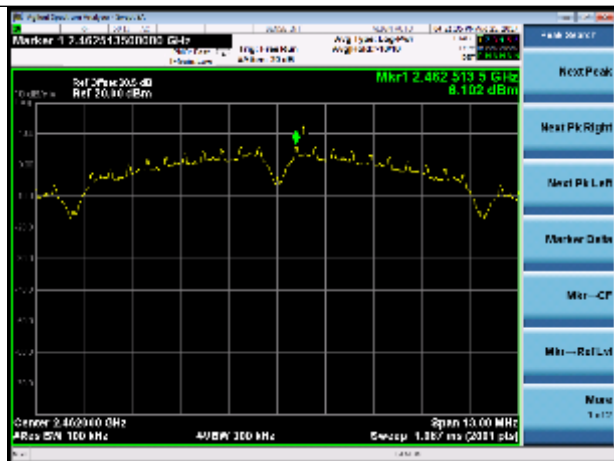


##### Spurious Emission



## Channel 11 (2462MHz)

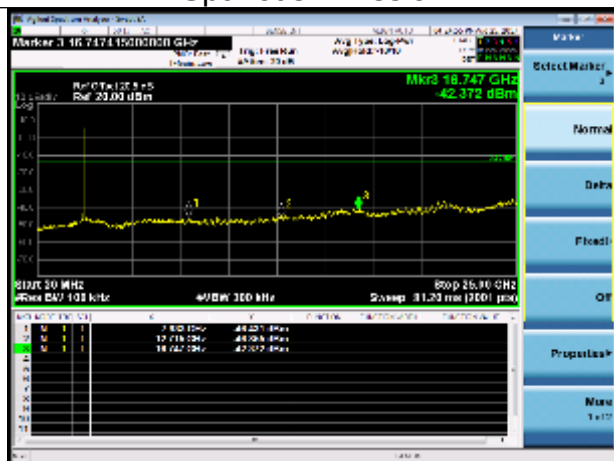
## 100kHz PSD reference Level



## High Band Edge

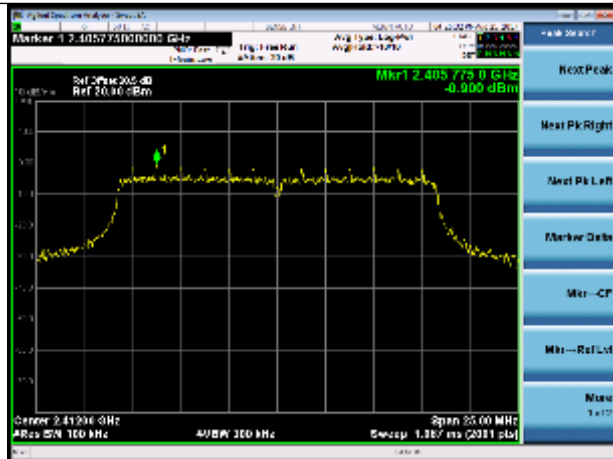


## Spurious Emission



## 802.11g Out-of-Band Emissions Channel 01 (2412MHz)

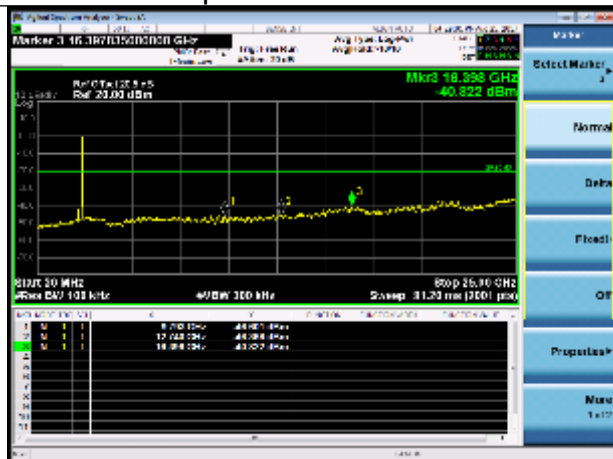
### 100kHz PSD reference Level



### Low Band Edge

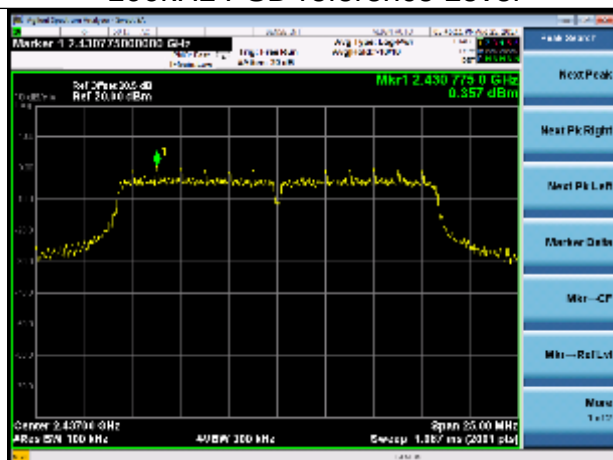


### Spurious Emission

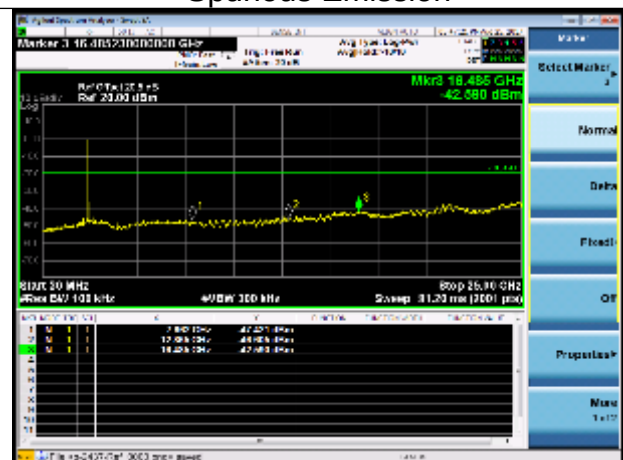


## Channel 06 (2437MHz)

### 100kHz PSD reference Level

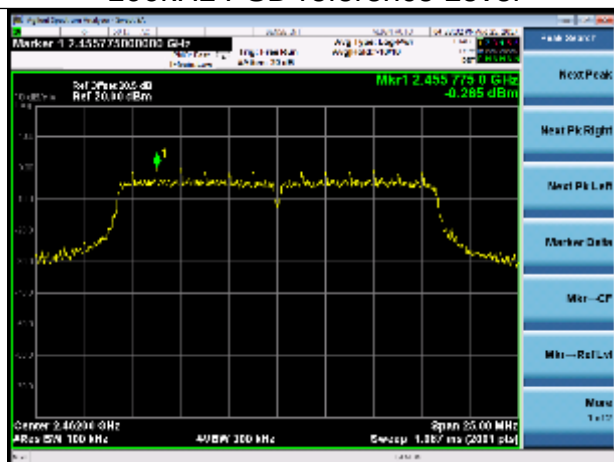


### Spurious Emission

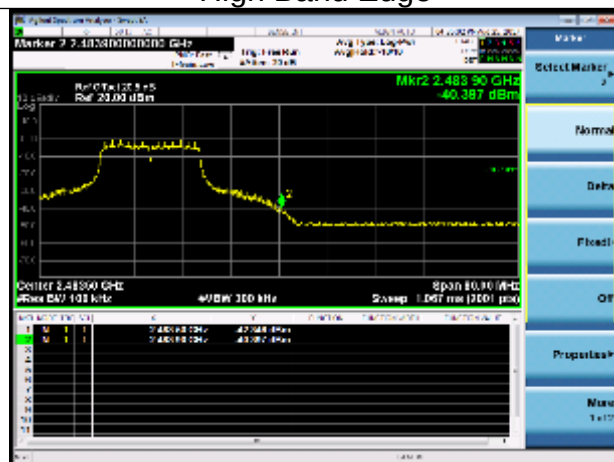


## Channel 11 (2462MHz)

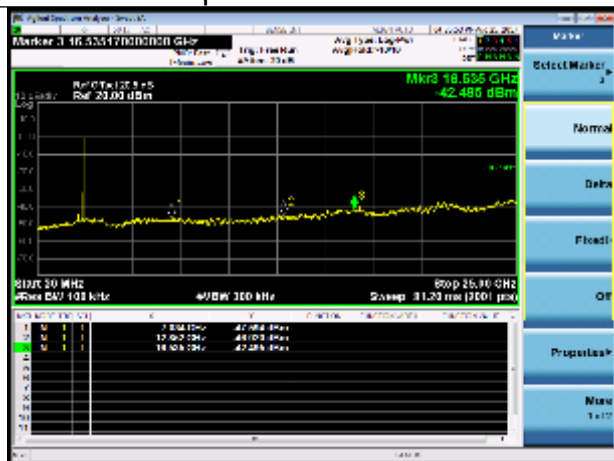
## 100kHz PSD reference Level



## High Band Edge



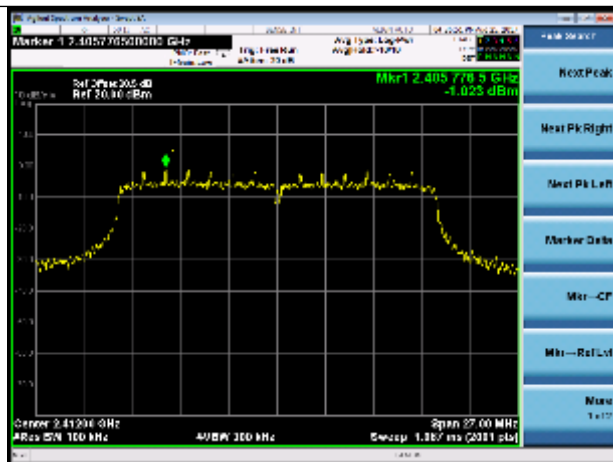
## Spurious Emission



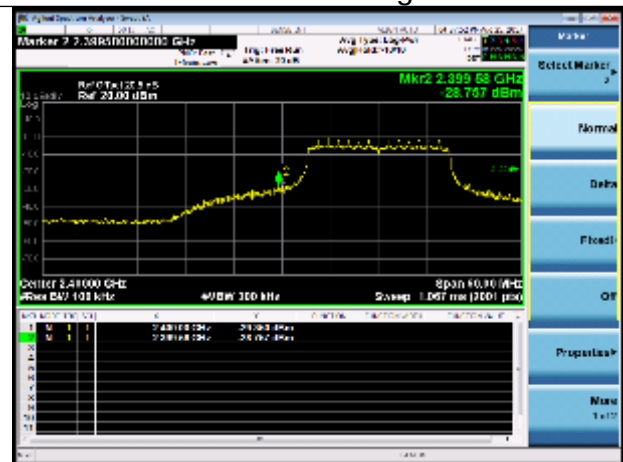
## 802.11n-HT20 Out-of-Band Emissions

## Channel 01 (2412MHz)

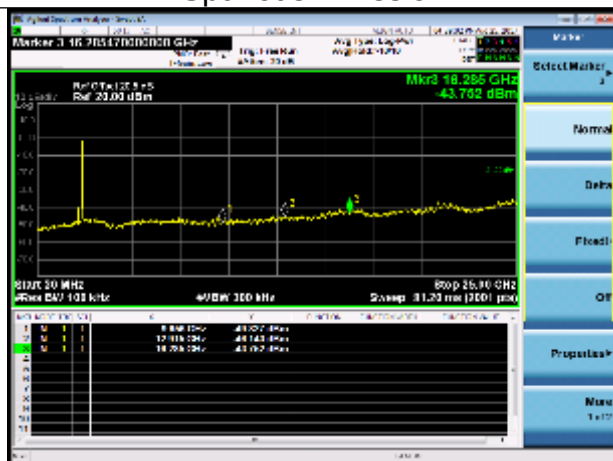
## 100kHz PSD reference Level



## Low Band Edge

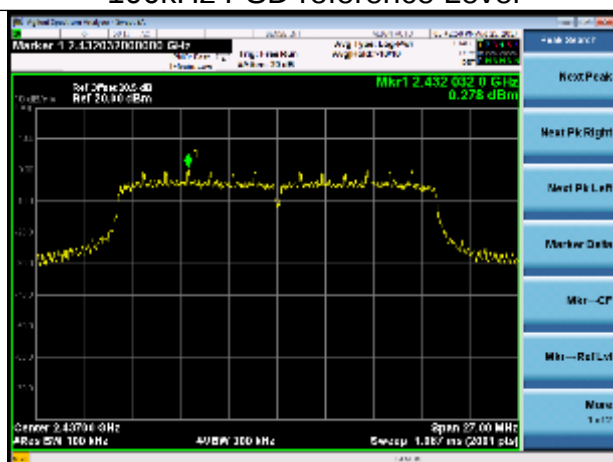


## Spurious Emission

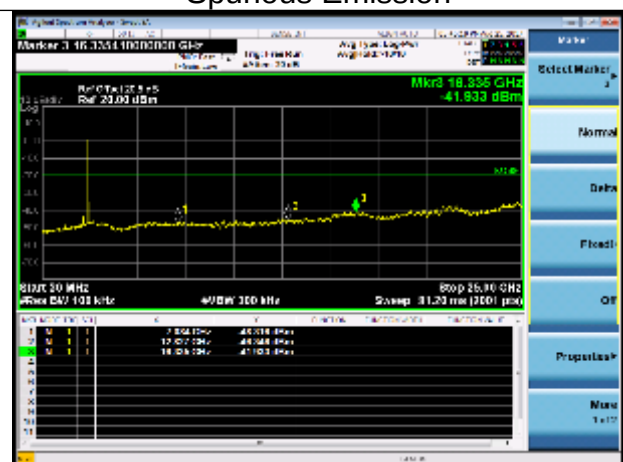


## Channel 06 (2437MHz)

## 100kHz PSD reference Level

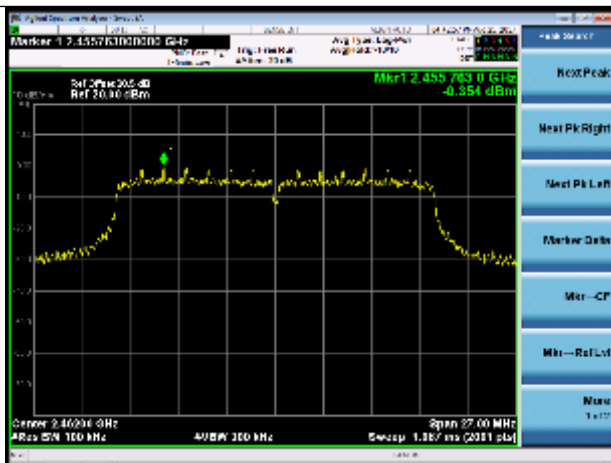


## Spurious Emission



## Channel 11 (2462MHz)

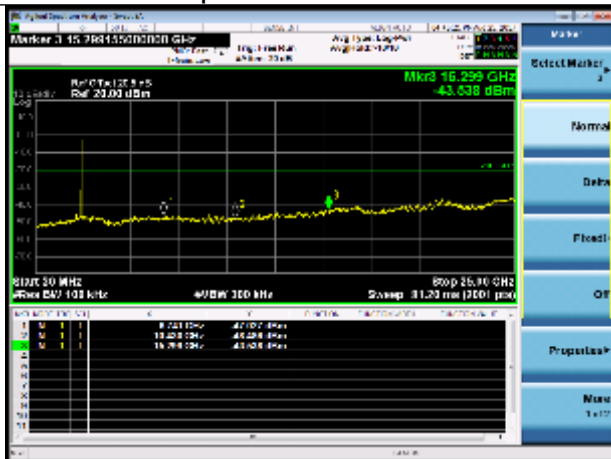
## 100kHz PSD reference Level



## High Band Edge



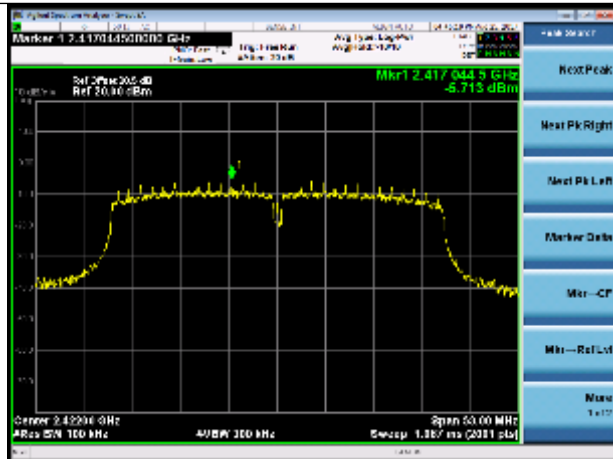
## Spurious Emission



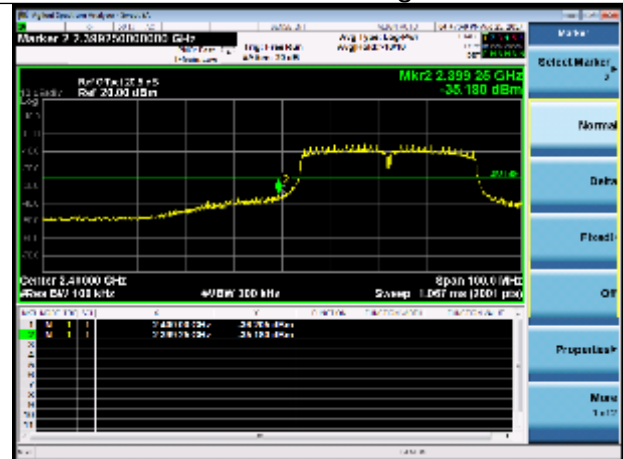
## 802.11n-HT40 Out-of-Band Emissions

## Channel 03 (2422MHz)

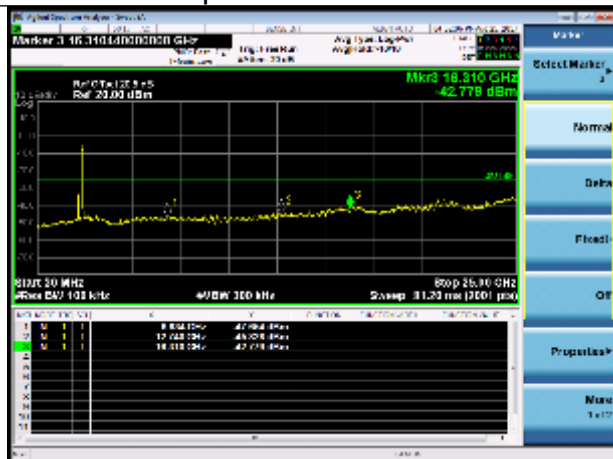
## 100kHz PSD reference Level



## Low Band Edge

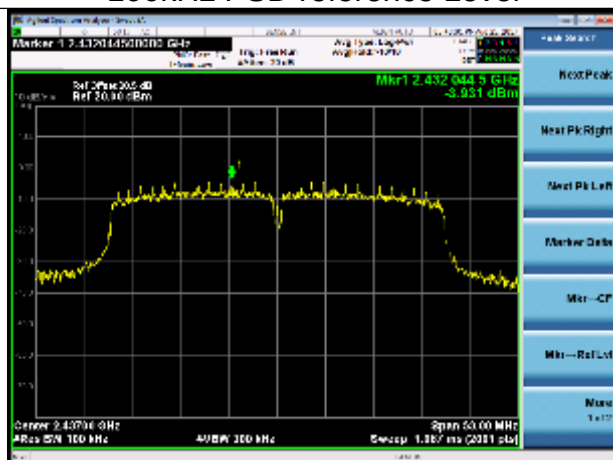


## Spurious Emission

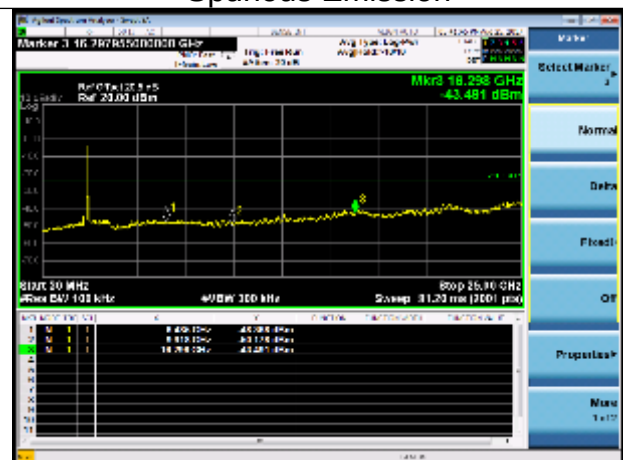


## Channel 06 (2437MHz)

## 100kHz PSD reference Level

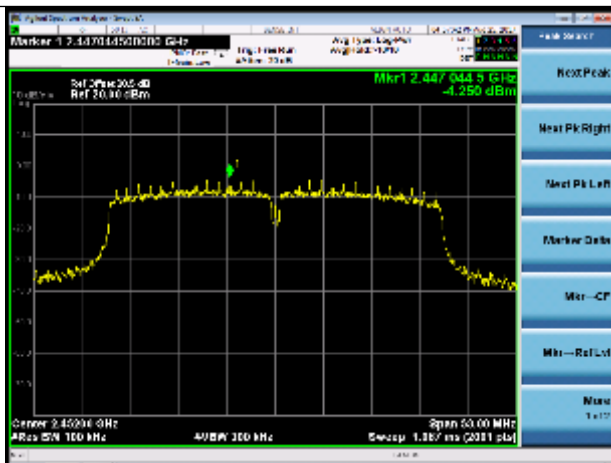


## Spurious Emission



## Channel 09 (2452MHz)

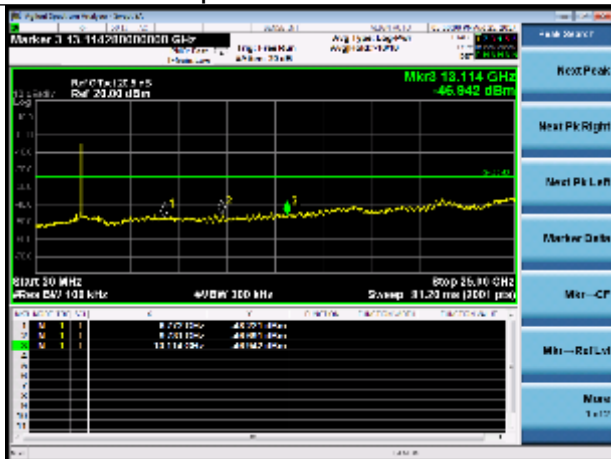
## 100kHz PSD reference Level



## High Band Edge



## Spurious Emission



## 9.5 Spurious radiated emissions for transmitter

### Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3-meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious  
RBW = 1MHz, VBW  $\geq$  RBW for peak measurement and VBW = 10Hz for average measurement,  
Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious  
RBW = 100 KHz, VBW  $\geq$  RBW for peak measurement, Sweep = auto, Detector function = peak,  
Trace = max hold.

### Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ( $20\log(1/\text{duty cycle})$ ).
- 4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

### Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

#### LIMITS OF RADIATED EMISSION MEASUREMENT (Frequency Range 9kHz-1000MHz)

| Frequency<br>MHz | Field Strength<br>uV/m | Measured Distance<br>Meters |
|------------------|------------------------|-----------------------------|
| 0.009~0.490      | 2400/F (kHz)           | 300                         |
| 0.490~1.705      | 24000/F (kHz)          | 30                          |
| 1.705~30         | 30                     | 30                          |
| 30~88            | 100                    | 3                           |
| 88~216           | 150                    | 3                           |
| 216~960          | 200                    | 3                           |
| 960~1000         | 500                    | 3                           |

#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| Frequency<br>MHz | Field Strength<br>(dBuV/m) (at 3M)<br>PEAK | AVERAGE |
|------------------|--------------------------------------------|---------|
| Above 1000       | 74                                         | 54      |

#### Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20logEmission level (uV/m).

### Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

#### Transmitting spurious emission test result as below:

**Remark 1:** There are the ambient noise within frequency range 9kHz ~ 30MHz and 18GHz ~ 25GHz, the permissible value is not show in the report.

Remark 2: Average measurement was not performed if peak level lower than average limit.

Remark 3: Other frequency was 20dB below limit line with 1-18GHz, there is not show in the report.

## Test Result

| Test mode: 802.11b   |                      |             |                        |                |             |          |              |
|----------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 01 (2412MHz) |                      |             |                        |                |             |          |              |
| Frequency (MHz)      | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4825.0               | 48.0                 | 2.7         | 50.6                   | 74.0           | -23.4       | Peak     | Horizontal   |
| 5417.0               | 33.6                 | 3.3         | 36.9                   | 74.0           | -37.1       | Peak     | Horizontal   |
| 6635.0               | 32.0                 | 7.6         | 39.7                   | 74.0           | -34.3       | Peak     | Horizontal   |
| 7835.0               | 32.2                 | 10.3        | 42.5                   | 74.0           | -31.5       | Peak     | Horizontal   |
| 4825.0               | 49.1                 | 2.7         | 51.8                   | 74.0           | -22.2       | Peak     | Vertical     |
| 5432.0               | 34.4                 | 3.3         | 37.7                   | 74.0           | -36.3       | Peak     | Vertical     |
| 6634.0               | 33.3                 | 7.6         | 40.9                   | 74.0           | -33.1       | Peak     | Vertical     |
| 7926.0               | 31.6                 | 10.6        | 42.3                   | 74.0           | -31.7       | Peak     | Vertical     |

| Test mode: 802.11b   |                      |             |                        |                |             |          |              |
|----------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 06 (2437MHz) |                      |             |                        |                |             |          |              |
| Frequency (MHz)      | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4876.0               | 49.3                 | 2.6         | 51.9                   | 74.0           | -22.1       | Peak     | Horizontal   |
| 5403.0               | 34.0                 | 3.0         | 37.0                   | 74.0           | -37.0       | Peak     | Horizontal   |
| 6633.0               | 32.4                 | 7.6         | 40.1                   | 74.0           | -33.9       | Peak     | Horizontal   |
| 7924.0               | 31.5                 | 10.6        | 42.1                   | 74.0           | -31.9       | Peak     | Horizontal   |
| 4876.0               | 50.9                 | 2.6         | 53.5                   | 74.0           | -20.5       | Peak     | Vertical     |
| 5407.0               | 34.1                 | 3.1         | 37.2                   | 74.0           | -36.8       | Peak     | Vertical     |
| 6657.0               | 32.7                 | 7.6         | 40.3                   | 74.0           | -33.8       | Peak     | Vertical     |
| 7925.0               | 31.3                 | 10.6        | 42.0                   | 74.0           | -32.0       | Peak     | Vertical     |

| Test mode: 802.11b   |                      |             |                        |                |             |          |              |
|----------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 11 (2462MHz) |                      |             |                        |                |             |          |              |
| Frequency (MHz)      | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4927.0               | 50.2                 | 2.6         | 52.9                   | 74.0           | -21.1       | Peak     | Horizontal   |
| 5394.0               | 33.8                 | 3.0         | 36.9                   | 74.0           | -37.1       | Peak     | Horizontal   |
| 6678.0               | 33.4                 | 7.7         | 41.1                   | 74.0           | -32.9       | Peak     | Horizontal   |
| 7928.0               | 31.4                 | 10.7        | 42.0                   | 74.0           | -32.0       | Peak     | Horizontal   |
| 4927.0               | 49.1                 | 2.6         | 51.7                   | 74.0           | -22.3       | Peak     | Vertical     |
| 5407.0               | 33.6                 | 3.1         | 36.6                   | 74.0           | -37.4       | Peak     | Vertical     |
| 6687.0               | 32.3                 | 7.6         | 39.9                   | 74.0           | -34.1       | Peak     | Vertical     |
| 7926.0               | 31.5                 | 10.6        | 42.1                   | 74.0           | -31.9       | Peak     | Vertical     |

Remark:

- (1) Emission level= Original Receiver Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
- (3) Margin = limit – Corrected Reading

| Test mode: 802.11g   |                      |             |                        |                |             |          |              |
|----------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 01 (2412MHz) |                      |             |                        |                |             |          |              |
| Frequency (MHz)      | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4816.5               | 44.8                 | 2.6         | 47.4                   | 74.0           | -26.6       | Peak     | Horizontal   |
| 5399.0               | 33.1                 | 3.0         | 36.1                   | 74.0           | -37.9       | Peak     | Horizontal   |
| 6627.0               | 31.7                 | 7.6         | 39.3                   | 74.0           | -34.7       | Peak     | Horizontal   |
| 7825.0               | 31.3                 | 10.4        | 41.7                   | 74.0           | -32.3       | Peak     | Horizontal   |
| 4833.5               | 49.1                 | 2.8         | 51.9                   | 74.0           | -22.1       | Peak     | Vertical     |
| 5417.0               | 33.3                 | 3.3         | 36.6                   | 74.0           | -37.4       | Peak     | Vertical     |
| 6678.0               | 31.6                 | 7.7         | 39.3                   | 74.0           | -34.7       | Peak     | Vertical     |
| 7922.0               | 31.5                 | 10.6        | 42.1                   | 74.0           | -31.9       | Peak     | Vertical     |

| Test mode: 802.11g    |                      |             |                        |                |             |          |              |
|-----------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 06 (2437 MHz) |                      |             |                        |                |             |          |              |
| Frequency (MHz)       | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4874.3                | 45.7                 | 2.6         | 48.3                   | 54.0           | -5.7        | Average  | Horizontal   |
| 4876.0                | 58.8                 | 2.6         | 61.4                   | 74.0           | -12.6       | Peak     | Horizontal   |
| 5417.0                | 33.9                 | 3.3         | 37.1                   | 74.0           | -36.9       | Peak     | Horizontal   |
| 6516.0                | 33.3                 | 7.4         | 40.6                   | 74.0           | -33.4       | Peak     | Horizontal   |
| 8001.0                | 30.9                 | 10.8        | 41.8                   | 74.0           | -32.3       | Peak     | Horizontal   |
| 4874.1                | 45.3                 | 2.6         | 47.9                   | 54.0           | -6.1        | Average  | Vertical     |
| 4876.0                | 59.6                 | 2.6         | 62.3                   | 74.0           | -11.7       | Peak     | Vertical     |
| 5389.0                | 33.4                 | 3.1         | 36.5                   | 74.0           | -37.5       | Peak     | Vertical     |
| 6627.0                | 32.6                 | 7.6         | 40.1                   | 74.0           | -33.9       | Peak     | Vertical     |
| 7923.0                | 31.6                 | 10.6        | 42.2                   | 74.0           | -31.8       | Peak     | Vertical     |

| Test mode: 802.11g   |                      |             |                        |                |             |          |              |
|----------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 11 (2462MHz) |                      |             |                        |                |             |          |              |
| Frequency (MHz)      | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4910.0               | 49.3                 | 2.5         | 51.8                   | 74.0           | -22.2       | Peak     | Horizontal   |
| 5422.0               | 33.2                 | 3.3         | 36.5                   | 74.0           | -37.5       | Peak     | Horizontal   |
| 6678.0               | 32.3                 | 7.7         | 40.0                   | 74.0           | -34.0       | Peak     | Horizontal   |
| 8000.0               | 31.3                 | 10.8        | 42.2                   | 74.0           | -31.8       | Peak     | Horizontal   |
| 4918.5               | 50.5                 | 2.6         | 53.0                   | 74.0           | -21.0       | Peak     | Vertical     |
| 5389.0               | 33.6                 | 3.1         | 36.7                   | 74.0           | -37.3       | Peak     | Vertical     |
| 6656.0               | 33.4                 | 7.6         | 40.9                   | 74.0           | -33.1       | Peak     | Vertical     |
| 7923.0               | 30.9                 | 10.6        | 41.5                   | 74.0           | -32.5       | Peak     | Vertical     |

Remark:

- (1) Emission level= Original Receiver Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
- (3) Margin = limit – Corrected Reading

| Test mode: 802.11n-HT20 |                      |             |                        |                |             |          |              |
|-------------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 01 (2412MHz)    |                      |             |                        |                |             |          |              |
| Frequency (MHz)         | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4825.0                  | 45.9                 | 2.7         | 48.6                   | 74.0           | -25.4       | Peak     | Horizontal   |
| 5427.0                  | 34.4                 | 3.3         | 37.7                   | 74.0           | -36.3       | Peak     | Horizontal   |
| 6627.0                  | 32.8                 | 7.6         | 40.4                   | 74.0           | -33.6       | Peak     | Horizontal   |
| 8909.0                  | 29.8                 | 11.9        | 41.7                   | 74.0           | -32.3       | Peak     | Horizontal   |
| 4825.0                  | 44.7                 | 2.7         | 47.4                   | 74.0           | -26.6       | Peak     | Vertical     |
| 5411.0                  | 32.8                 | 3.1         | 36.0                   | 74.0           | -38.0       | Peak     | Vertical     |
| 6565.0                  | 32.1                 | 7.5         | 39.6                   | 74.0           | -34.4       | Peak     | Vertical     |
| 8867.0                  | 30.7                 | 11.6        | 42.2                   | 74.0           | -31.8       | Peak     | Vertical     |

| Test mode: 802.11n-HT20 |                      |             |                        |                |             |          |              |
|-------------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 06 (2437 MHz)   |                      |             |                        |                |             |          |              |
| Frequency (MHz)         | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4874.7                  | 44.9                 | 2.6         | 47.5                   | 54.0           | -6.5        | Average  | Horizontal   |
| 4876.0                  | 56.6                 | 2.6         | 59.2                   | 74.0           | -14.8       | Peak     | Horizontal   |
| 5422.0                  | 33.8                 | 3.3         | 37.1                   | 74.0           | -36.9       | Peak     | Horizontal   |
| 7937.0                  | 30.9                 | 10.7        | 41.6                   | 74.0           | -32.4       | Peak     | Horizontal   |
| 8773.0                  | 30.5                 | 11.8        | 42.3                   | 74.0           | -31.7       | Peak     | Horizontal   |
| 4873.3                  | 44.9                 | 2.6         | 47.5                   | 54.0           | -6.5        | Average  | Vertical     |
| 4876.0                  | 60.8                 | 2.6         | 63.4                   | 74.0           | -10.6       | Peak     | Vertical     |
| 5404.0                  | 33.3                 | 3.0         | 36.3                   | 74.0           | -37.7       | Peak     | Vertical     |
| 6676.0                  | 32.4                 | 7.7         | 40.1                   | 74.0           | -33.9       | Peak     | Vertical     |
| 7967.0                  | 31.5                 | 10.8        | 42.3                   | 74.0           | -31.7       | Peak     | Vertical     |

| Test mode: 802.11n-HT20 |                      |             |                        |                |             |          |              |
|-------------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 11 (2462MHz)    |                      |             |                        |                |             |          |              |
| Frequency (MHz)         | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4918.5                  | 50.7                 | 2.6         | 53.2                   | 74.0           | -20.8       | Peak     | Horizontal   |
| 5417.0                  | 33.5                 | 3.3         | 36.7                   | 74.0           | -37.3       | Peak     | Horizontal   |
| 7926.0                  | 31.5                 | 10.6        | 42.1                   | 74.0           | -31.9       | Peak     | Horizontal   |
| 8637.0                  | 31.8                 | 11.2        | 43.0                   | 74.0           | -31.0       | Peak     | Horizontal   |
| 4918.5                  | 50.8                 | 2.6         | 53.4                   | 74.0           | -20.6       | Peak     | Vertical     |
| 5387.0                  | 33.5                 | 3.1         | 36.7                   | 74.0           | -37.3       | Peak     | Vertical     |
| 7932.0                  | 31.8                 | 10.7        | 42.5                   | 74.0           | -31.5       | Peak     | Vertical     |
| 8637.0                  | 31.3                 | 11.2        | 42.4                   | 74.0           | -31.6       | Peak     | Vertical     |

Remark:

- (1) Emission level= Original Receiver Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
- (3) Margin = limit – Corrected Reading

| Test mode: 802.11n-HT40 |                      |             |                        |                |             |          |              |
|-------------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 03 (2422MHz)    |                      |             |                        |                |             |          |              |
| Frequency (MHz)         | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 5403.0                  | 33.5                 | 3.0         | 36.5                   | 74.0           | -37.5       | Peak     | Horizontal   |
| 6617.0                  | 32.7                 | 7.6         | 40.2                   | 74.0           | -33.8       | Peak     | Horizontal   |
| 7521.0                  | 31.3                 | 10.9        | 42.2                   | 74.0           | -31.8       | Peak     | Horizontal   |
| 8835.0                  | 30.7                 | 11.6        | 42.4                   | 74.0           | -31.6       | Peak     | Horizontal   |
| 5402.0                  | 33.7                 | 3.0         | 36.7                   | 74.0           | -37.3       | Peak     | Vertical     |
| 7341.0                  | 31.6                 | 10.7        | 42.3                   | 74.0           | -31.7       | Peak     | Vertical     |
| 7924.0                  | 31.0                 | 10.6        | 41.7                   | 74.0           | -32.3       | Peak     | Vertical     |
| 8411.0                  | 32.5                 | 10.1        | 42.6                   | 74.0           | -31.4       | Peak     | Vertical     |

| Test mode: 802.11n-HT40 |                      |             |                        |                |             |          |              |
|-------------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 06 (2437 MHz)   |                      |             |                        |                |             |          |              |
| Frequency (MHz)         | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4873.0                  | 41.9                 | 2.6         | 44.5                   | 54.0           | -9.5        | Average  | Horizontal   |
| 4876.0                  | 53.9                 | 2.6         | 56.5                   | 74.0           | -17.5       | Peak     | Horizontal   |
| 7345.0                  | 31.5                 | 10.7        | 42.2                   | 74.0           | -31.8       | Peak     | Horizontal   |
| 8637.0                  | 31.4                 | 11.2        | 42.5                   | 74.0           | -31.5       | Peak     | Horizontal   |
| 8864.0                  | 30.4                 | 11.6        | 42.0                   | 74.0           | -32.0       | Peak     | Horizontal   |
| 4874.6                  | 41.6                 | 2.6         | 44.2                   | 54.0           | -9.8        | Average  | Vertical     |
| 4876.0                  | 55.6                 | 2.6         | 58.2                   | 74.0           | -15.8       | Peak     | Vertical     |
| 7341.0                  | 32.0                 | 10.7        | 42.7                   | 74.0           | -31.3       | Peak     | Vertical     |
| 8637.0                  | 31.8                 | 11.2        | 42.9                   | 74.0           | -31.1       | Peak     | Vertical     |
| 8864.0                  | 30.4                 | 11.6        | 42.0                   | 74.0           | -32.0       | Peak     | Vertical     |

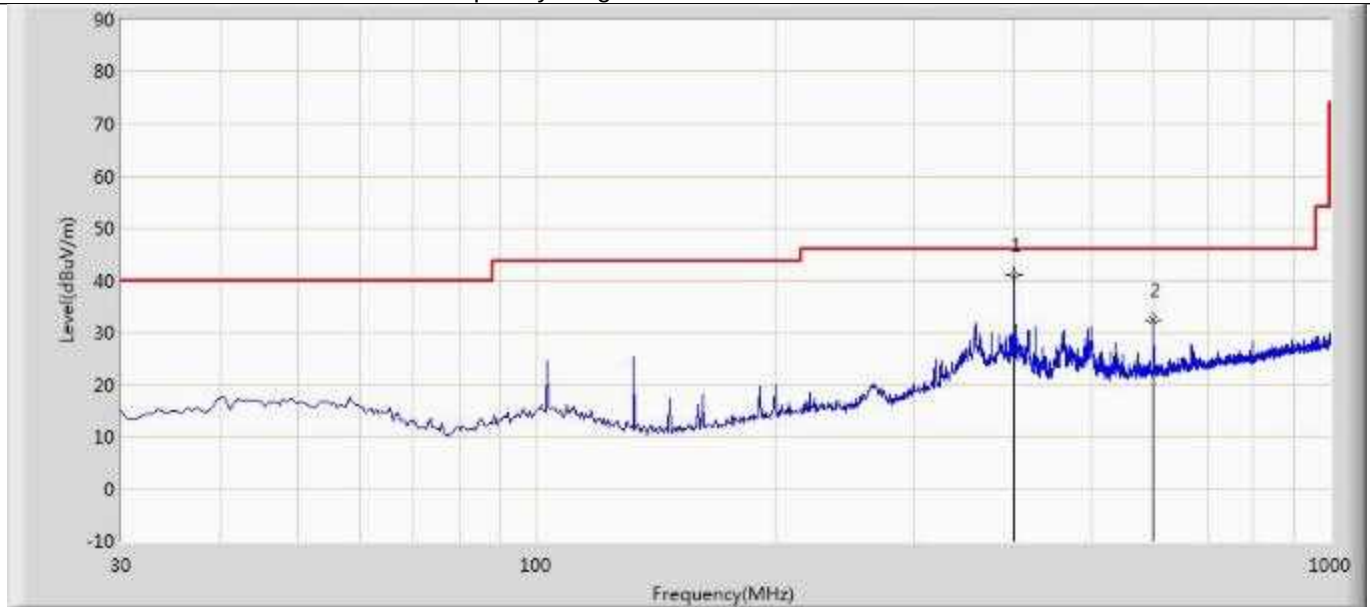
| Test mode: 802.11n-HT40 |                      |             |                        |                |             |          |              |
|-------------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Channel 09 (2452MHz)    |                      |             |                        |                |             |          |              |
| Frequency (MHz)         | Reading Level (dBuV) | Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/M) | Margin (dB) | Detector | Polarization |
| 4893.0                  | 44.2                 | 2.7         | 46.9                   | 74.0           | -27.1       | Peak     | Horizontal   |
| 4898.1                  | 31.9                 | 2.7         | 34.5                   | 54.0           | -19.5       | Average  | Horizontal   |
| 7440.0                  | 31.6                 | 10.7        | 42.3                   | 74.0           | -31.7       | Peak     | Horizontal   |
| 7835.0                  | 31.6                 | 10.3        | 41.9                   | 74.0           | -32.1       | Peak     | Horizontal   |
| 8773.0                  | 30.9                 | 11.8        | 42.7                   | 74.0           | -31.3       | Peak     | Horizontal   |
| 4893.0                  | 44.8                 | 2.7         | 47.5                   | 74.0           | -26.5       | Peak     | Vertical     |
| 7721.0                  | 32.1                 | 10.3        | 42.4                   | 74.0           | -31.6       | Peak     | Vertical     |
| 7923.0                  | 31.5                 | 10.6        | 42.1                   | 74.0           | -31.9       | Peak     | Vertical     |
| 8835.0                  | 30.1                 | 11.6        | 41.8                   | 74.0           | -32.2       | Peak     | Vertical     |

Remark:

- (1) Emission level= Original Receiver Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
- (3) Margin = limit – Corrected Reading

## The worst case of Radiated Emission below 1GHz:

|                                                                  |                          |
|------------------------------------------------------------------|--------------------------|
| Site: AC2                                                        | Time: 2017/08/25 - 17:01 |
| Limit: FCC_Part15.109_RE(3m)_ClassB                              | Engineer: Dandy Li       |
| Probe: VULB9162_0.03-8GHz                                        | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                                      | Power: By Battery        |
| Note: Transmit by 802.11b at channel 2437MHz.                    |                          |
| Note: There is the worst case within frequency range 30MHz~1GHz. |                          |



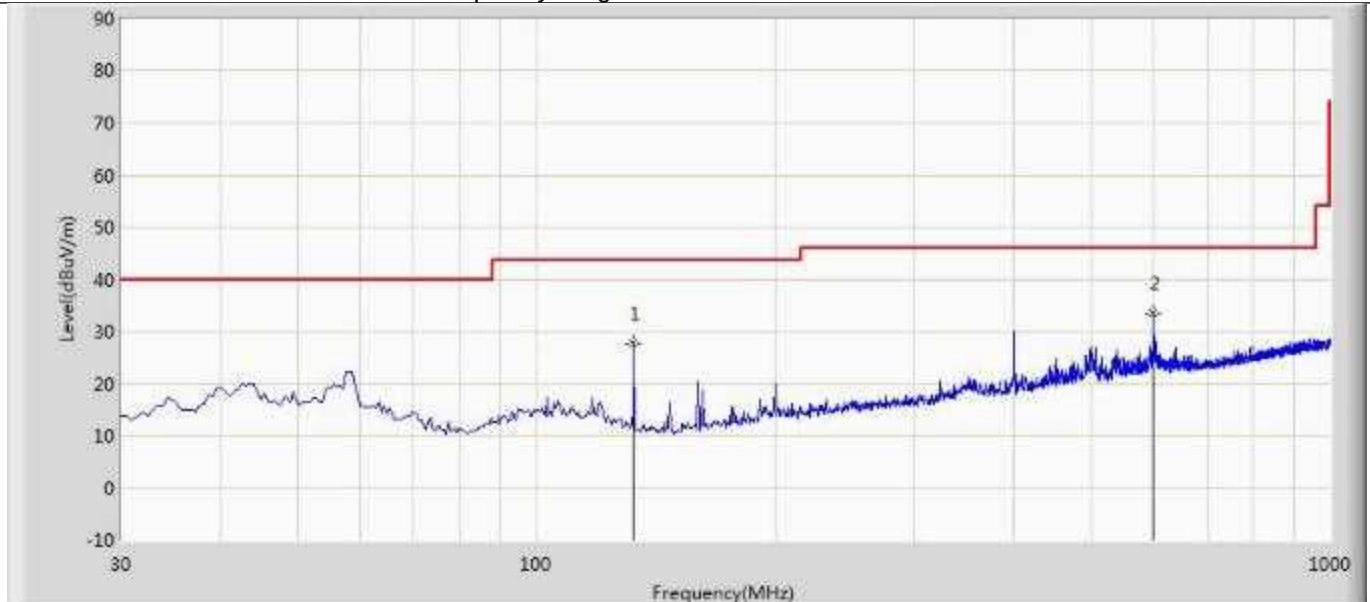
| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 400.055         | 40.987                 | 24.232               | -5.013          | 46.000         | 16.755 | PK   |
| 2  |      |      | 599.875         | 32.206                 | 12.112               | -13.794         | 46.000         | 20.094 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

|                                                                  |                          |
|------------------------------------------------------------------|--------------------------|
| Site: AC2                                                        | Time: 2017/08/25 - 17:04 |
| Limit: FCC_Part15.109_RE(3m)_ClassB                              | Engineer: Dandy Li       |
| Probe: VULB9162 0.03-8GHz                                        | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                                      | Power: By Battery        |
| Note: Transmit by 802.11b at channel 2437MHz.                    |                          |
| Note: There is the worst case within frequency range 30MHz~1GHz. |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 132.820         | 27.787                 | 17.935               | -15.713         | 43.500         | 9.852  | PK   |
| 2  |      | *    | 599.875         | 33.404                 | 13.310               | -12.596         | 46.000         | 20.094 | PK   |

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

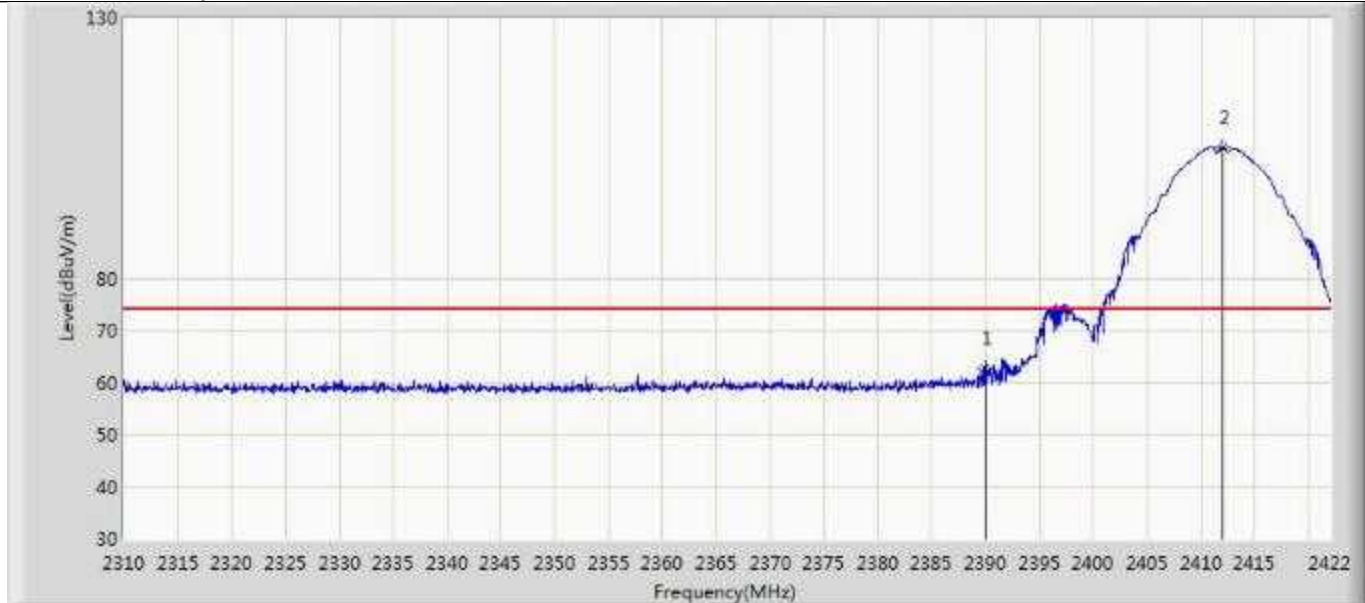
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

## Radiated Restricted Band Edge Measurement

### Test Result:

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 20:28 |
| Limit: FCC_Part15.209_RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D_1-18GHz                              | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11b at channel 2412MHz Power=68 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 62.895                 | 30.617               | -11.105         | 74.000         | 32.278 | PK   |
| 2  |      | *    | 2412.032        | 105.187                | 72.947               | N/A             | N/A            | 32.240 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 20:29 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11b at channel 2412MHz Power=68 |                          |

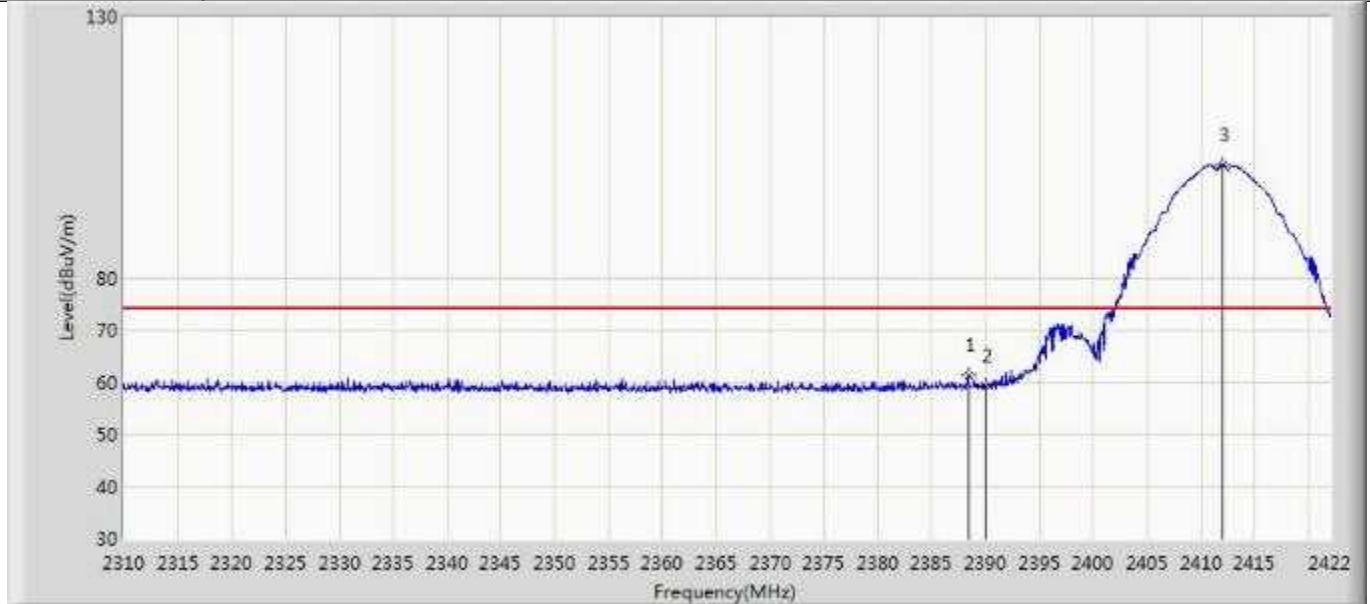


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2387.448        | 47.718                 | 15.454               | -6.282          | 54.000         | 32.263 | AV   |
| 2  |      |      | 2390.000        | 46.919                 | 14.641               | -7.081          | 54.000         | 32.278 | AV   |
| 3  |      | *    | 2411.248        | 101.918                | 69.675               | N/A             | N/A            | 32.243 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 20:30 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11b at channel 2412MHz Power=68 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2388.400        | 61.409                 | 29.140               | -12.591         | 74.000         | 32.269 | PK   |
| 2  |      |      | 2390.000        | 59.303                 | 27.025               | -14.697         | 74.000         | 32.278 | PK   |
| 3  |      | *    | 2412.032        | 101.699                | 69.459               | N/A             | N/A            | 32.240 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 20:31 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11b at channel 2412MHz Power=68 |                          |

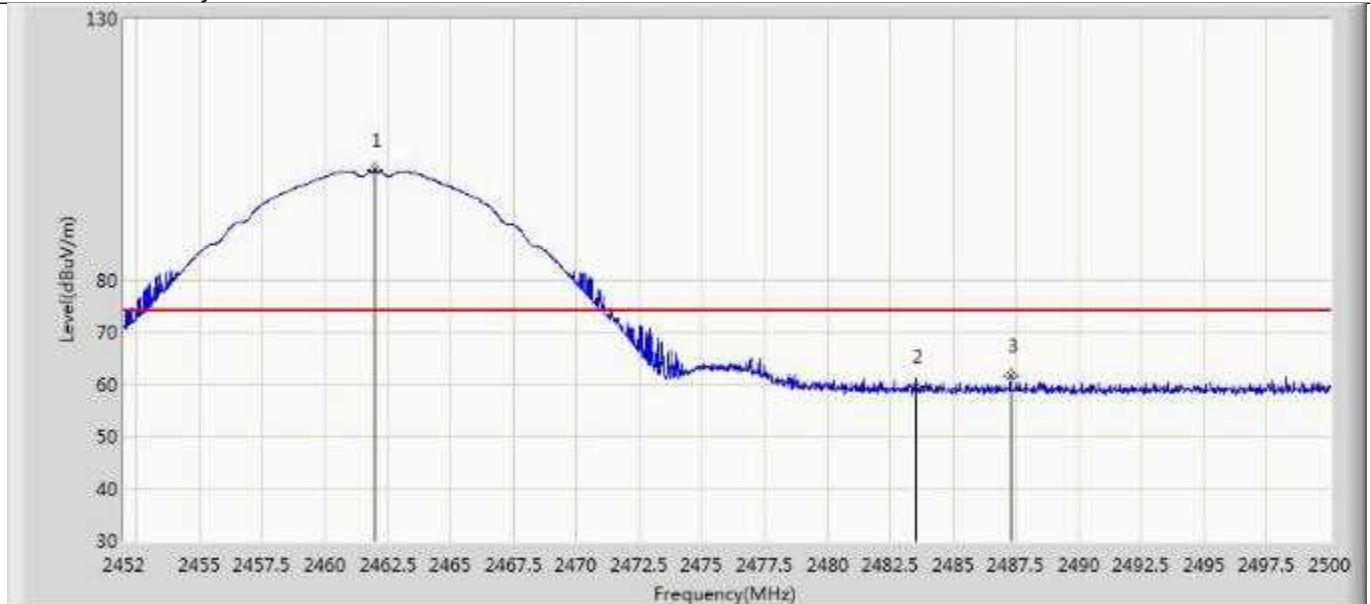


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 46.385                 | 14.107               | -7.615          | 54.000         | 32.278 | AV   |
| 2  |      | *    | 2411.304        | 98.356                 | 66.113               | N/A             | N/A            | 32.243 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/25 - 20:37 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11b at channel 2462MHz Power=68 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2461.984        | 100.926                | 68.688               | N/A             | N/A            | 32.238 | PK   |
| 2  |      |      | 2483.500        | 59.627                 | 27.346               | -14.373         | 74.000         | 32.282 | PK   |
| 3  |      |      | 2487.280        | 61.562                 | 29.268               | -12.438         | 74.000         | 32.294 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/25 - 20:42 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11b at channel 2462MHz Power=68 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2461.384        | 97.242                 | 65.006               | N/A             | N/A            | 32.236 | AV   |
| 2  |      |      | 2483.500        | 46.409                 | 14.128               | -7.591          | 54.000         | 32.282 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/25 - 20:43 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11b at channel 2462MHz Power=68 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2460.856        | 104.197                | 71.964               | N/A             | N/A            | 32.233 | PK   |
| 2  |      |      | 2483.500        | 58.950                 | 26.669               | -15.050         | 74.000         | 32.282 | PK   |
| 3  |      |      | 2484.880        | 60.963                 | 28.677               | -13.037         | 74.000         | 32.286 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/25 - 20:44 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11b at channel 2462MHz Power=68 |                          |

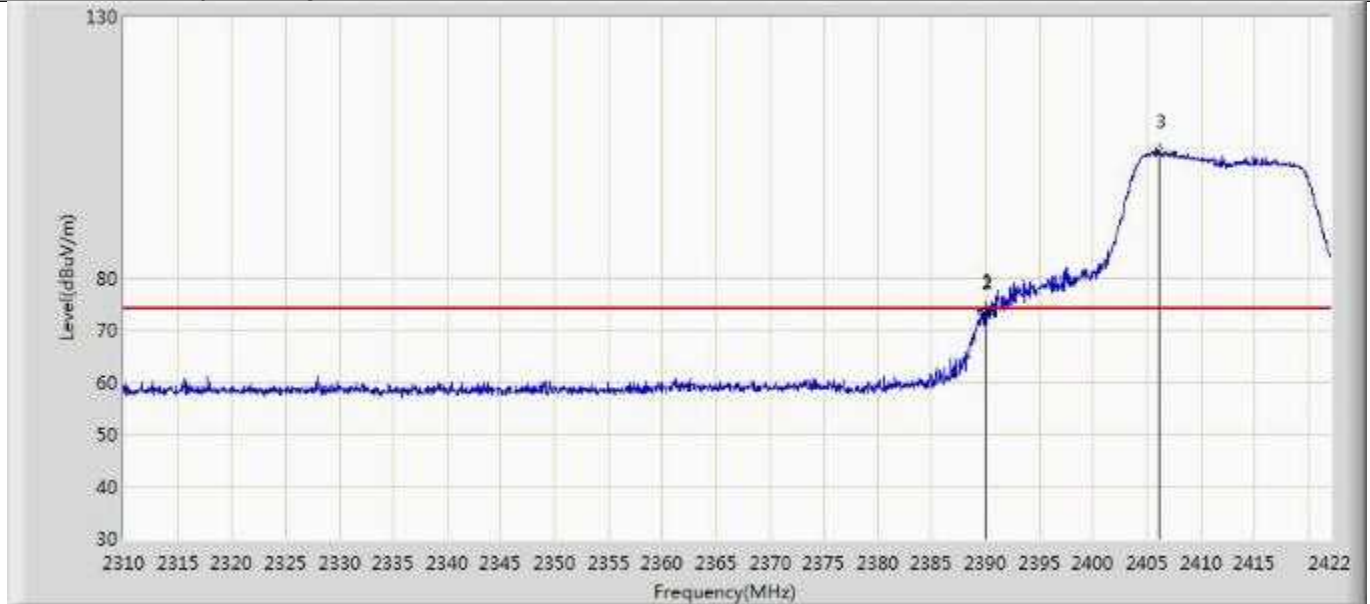


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2461.384        | 100.688                | 68.452               | N/A             | N/A            | 32.236 | AV   |
| 2  |      |      | 2483.500        | 46.625                 | 14.344               | -7.375          | 54.000         | 32.282 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 21:12 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11g at channel 2412MHz Power=62 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2389.968        | 73.850                 | 41.572               | -0.150          | 74.000         | 32.278 | PK   |
| 2  |      |      | 2390.000        | 73.265                 | 40.987               | -0.735          | 74.000         | 32.278 | PK   |
| 3  |      | *    | 2406.152        | 104.089                | 71.829               | N/A             | N/A            | 32.260 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 21:14 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11g at channel 2412MHz Power=62 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 52.500                 | 20.222               | -1.500          | 54.000         | 32.278 | AV   |
| 2  |      | *    | 2404.864        | 92.357                 | 60.093               | N/A             | N/A            | 32.265 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 21:15 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11g at channel 2412MHz Power=62 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 67.373                 | 35.095               | -6.627          | 74.000         | 32.278 | PK   |
| 2  |      | *    | 2407.328        | 99.555                 | 67.299               | N/A             | N/A            | 32.256 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 21:16 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11g at channel 2412MHz Power=62 |                          |

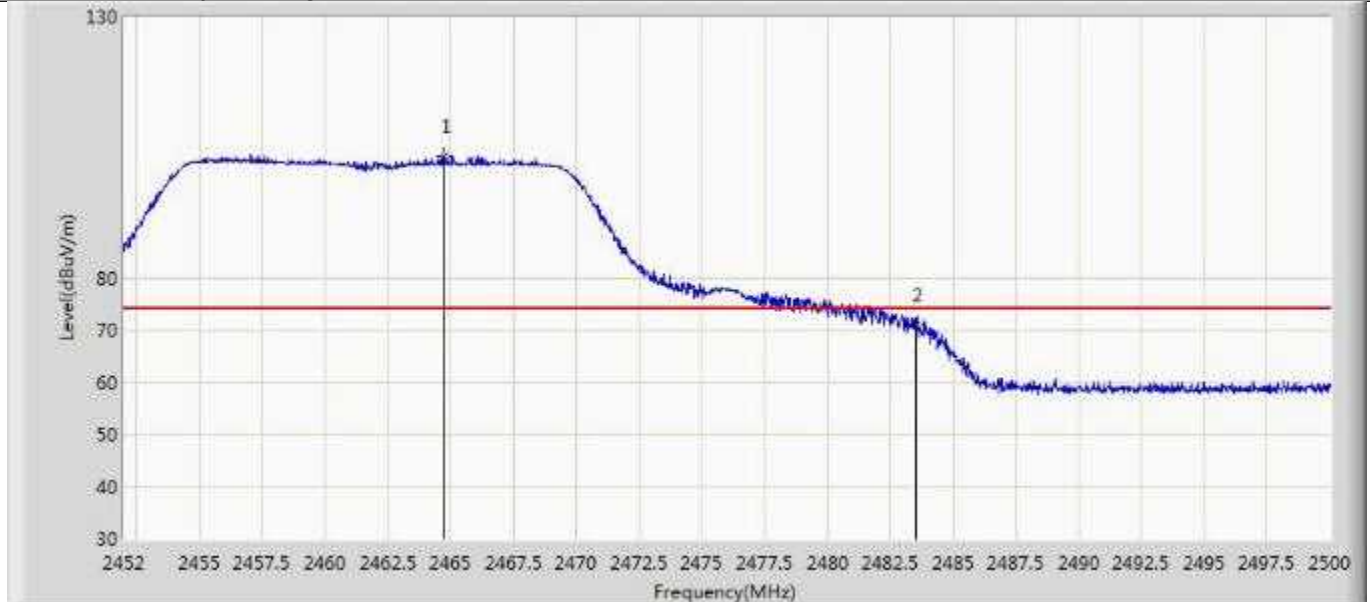


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 49.326                 | 17.048               | -4.674          | 54.000         | 32.278 | AV   |
| 2  |      | *    | 2417.408        | 87.101                 | 54.884               | N/A             | N/A            | 32.217 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 21:27 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11g at channel 2462MHz Power=66 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2464.744        | 103.427                | 71.186               | N/A             | N/A            | 32.242 | PK   |
| 2  |      |      | 2483.500        | 70.885                 | 38.604               | -3.115          | 74.000         | 32.282 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 21:30 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11g at channel 2462MHz Power=66 |                          |

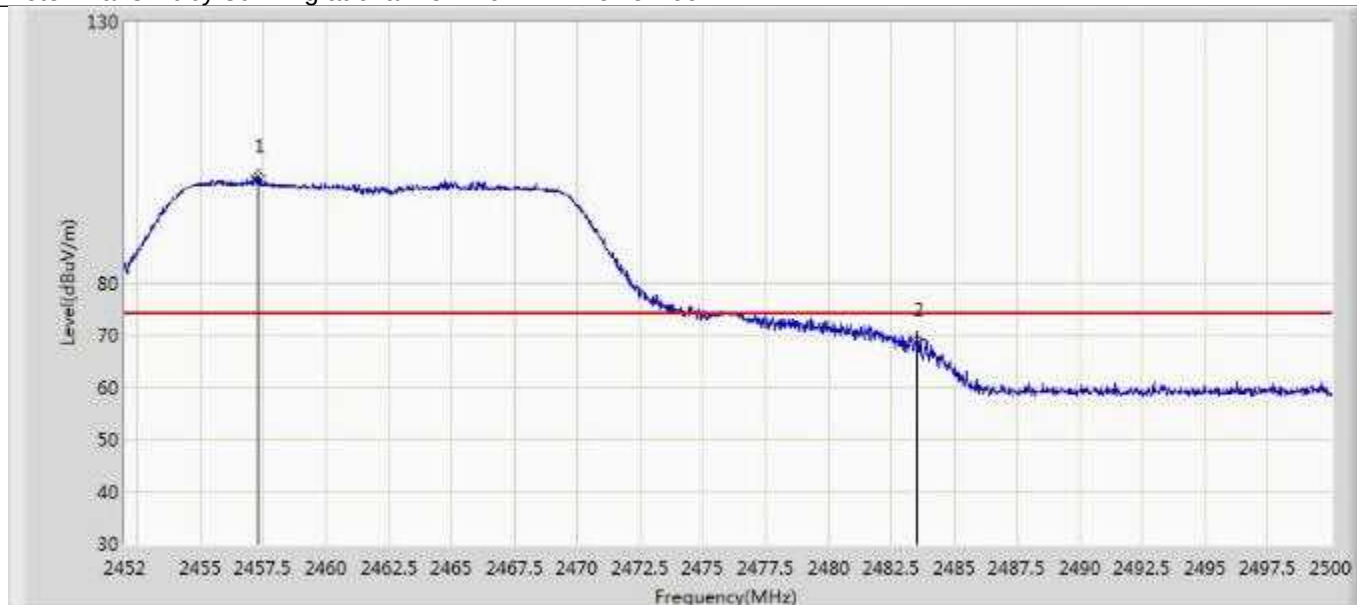


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2455.912        | 91.346                 | 59.134               | N/A             | N/A            | 32.212 | AV   |
| 2  |      |      | 2483.500        | 50.995                 | 18.714               | -3.005          | 54.000         | 32.282 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 21:31 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11g at channel 2462MHz Power=66 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2457.280        | 100.319                | 68.101               | N/A             | N/A            | 32.218 | PK   |
| 2  |      |      | 2483.500        | 69.065                 | 36.784               | -4.935          | 74.000         | 32.282 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| Site: AC2                                             | Time: 2017/08/24 - 21:32 |
| Limit: FCC Part15.209 RE(3m)                          | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                              | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                           | Power: By Battery        |
| Note: Transmit by 802.11g at channel 2462MHz Power=66 |                          |

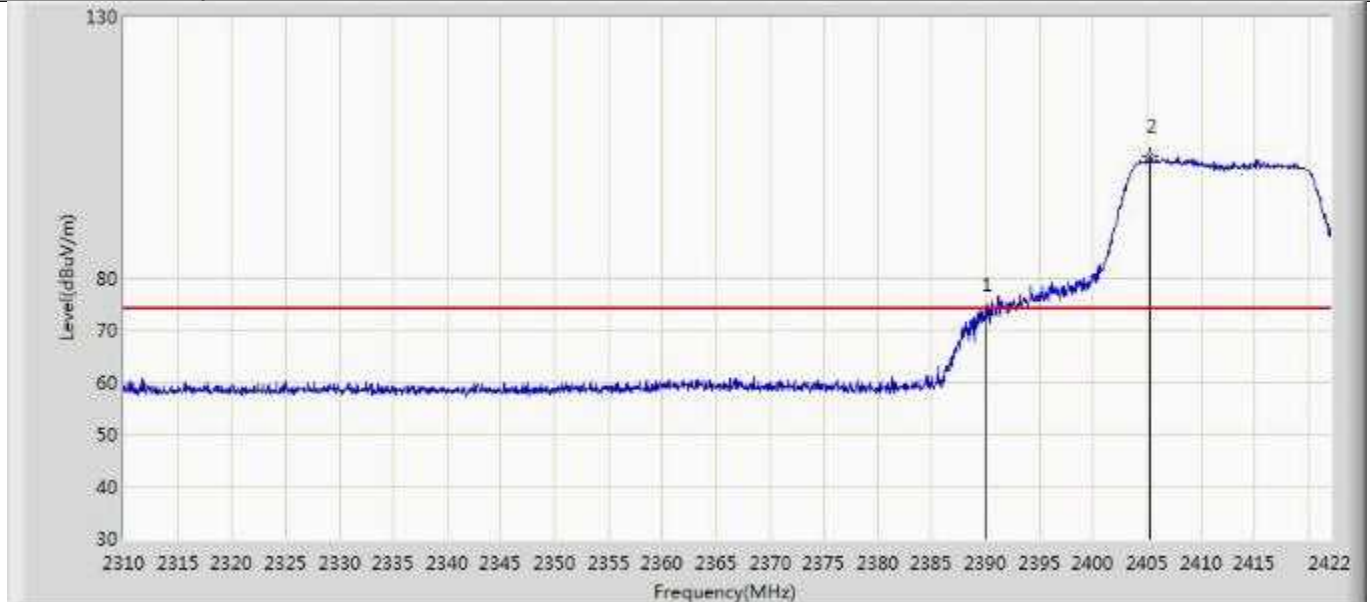


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2456.032        | 87.922                 | 55.709               | N/A             | N/A            | 32.213 | AV   |
| 2  |      |      | 2483.500        | 49.180                 | 16.899               | -4.820          | 54.000         | 32.282 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 21:42 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT20 at channel 2412MHz Power=61 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 72.948                 | 40.670               | -1.052          | 74.000         | 32.278 | PK   |
| 2  |      | *    | 2405.312        | 103.381                | 71.118               | N/A             | N/A            | 32.262 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 21:45 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT20 at channel 2412MHz Power=61 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 53.727                 | 21.449               | -0.273          | 54.000         | 32.278 | AV   |
| 2  |      | *    | 2405.760        | 91.149                 | 58.888               | N/A             | N/A            | 32.261 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 21:45 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT20 at channel 2412MHz Power=61 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 69.717                 | 37.439               | -4.283          | 74.000         | 32.278 | PK   |
| 2  |      | *    | 2408.784        | 98.820                 | 66.569               | N/A             | N/A            | 32.251 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 21:48 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT20 at channel 2412MHz Power=61 |                          |

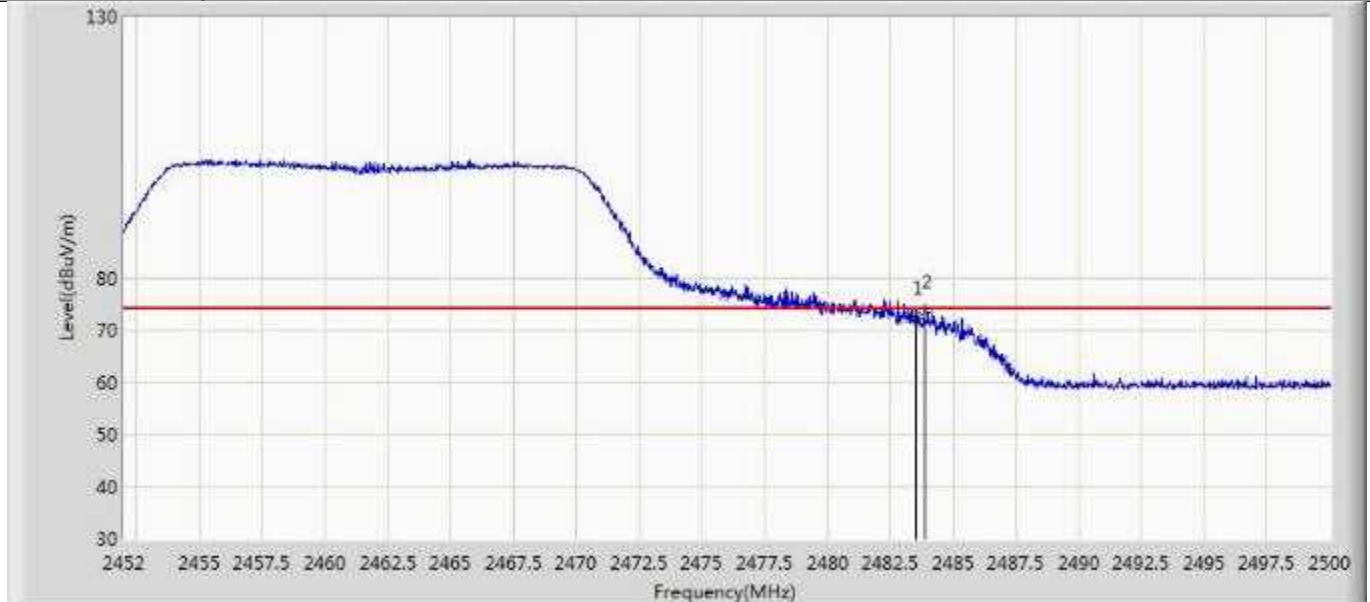


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 50.042                 | 17.764               | -3.958          | 54.000         | 32.278 | AV   |
| 2  |      | *    | 2407.160        | 86.763                 | 54.506               | N/A             | N/A            | 32.257 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 21:49 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT20 at channel 2462MHz Power=66 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2483.500        | 72.192                 | 39.911               | -1.808          | 74.000         | 32.282 | PK   |
| 2  |      | *    | 2483.872        | 73.578                 | 41.295               | -0.422          | 74.000         | 32.282 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 21:53 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT20 at channel 2462MHz Power=66 |                          |

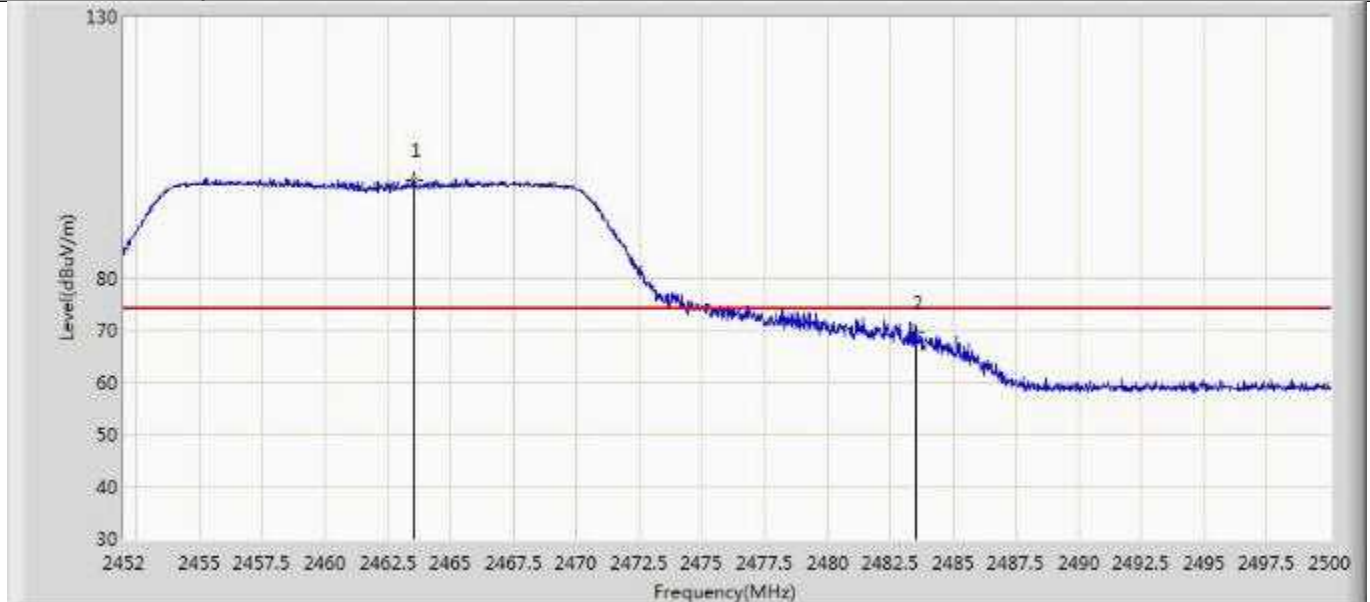


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2455.696        | 90.252                 | 58.041               | N/A             | N/A            | 32.211 | AV   |
| 2  |      |      | 2483.500        | 52.415                 | 20.134               | -1.585          | 54.000         | 32.282 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 21:53 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT20 at channel 2462MHz Power=66 |                          |

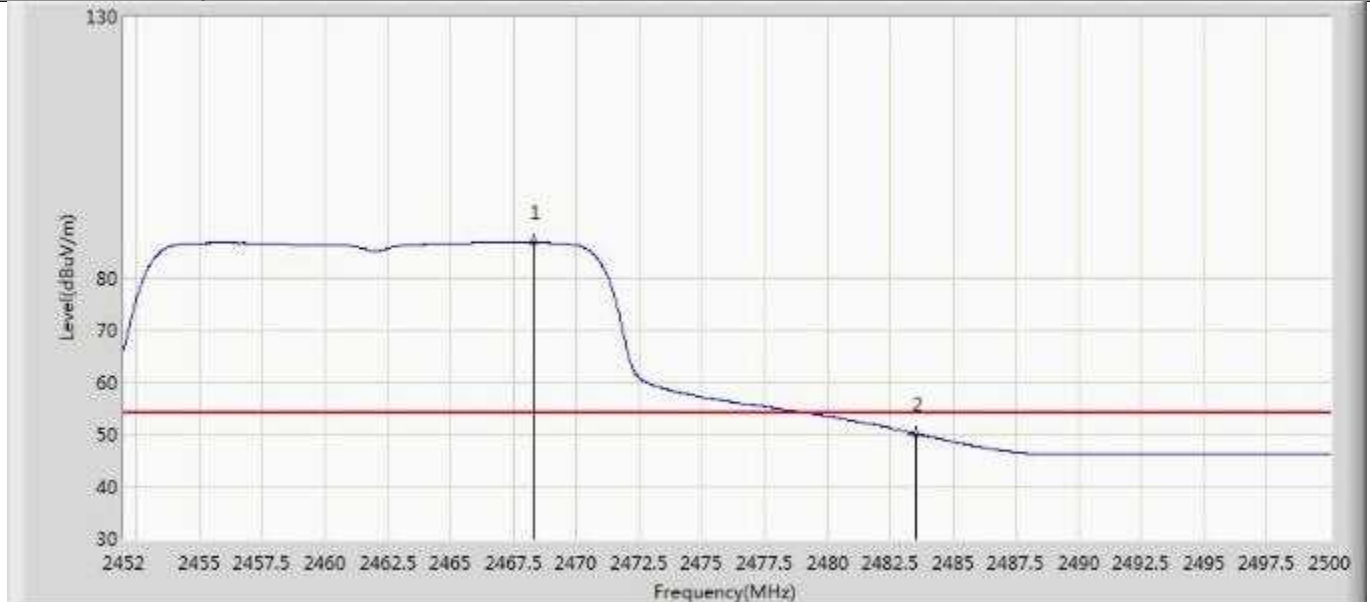


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2463.568        | 98.667                 | 66.428               | N/A             | N/A            | 32.240 | PK   |
| 2  |      |      | 2483.500        | 69.382                 | 37.101               | -4.618          | 74.000         | 32.282 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 21:55 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT20 at channel 2462MHz Power=66 |                          |

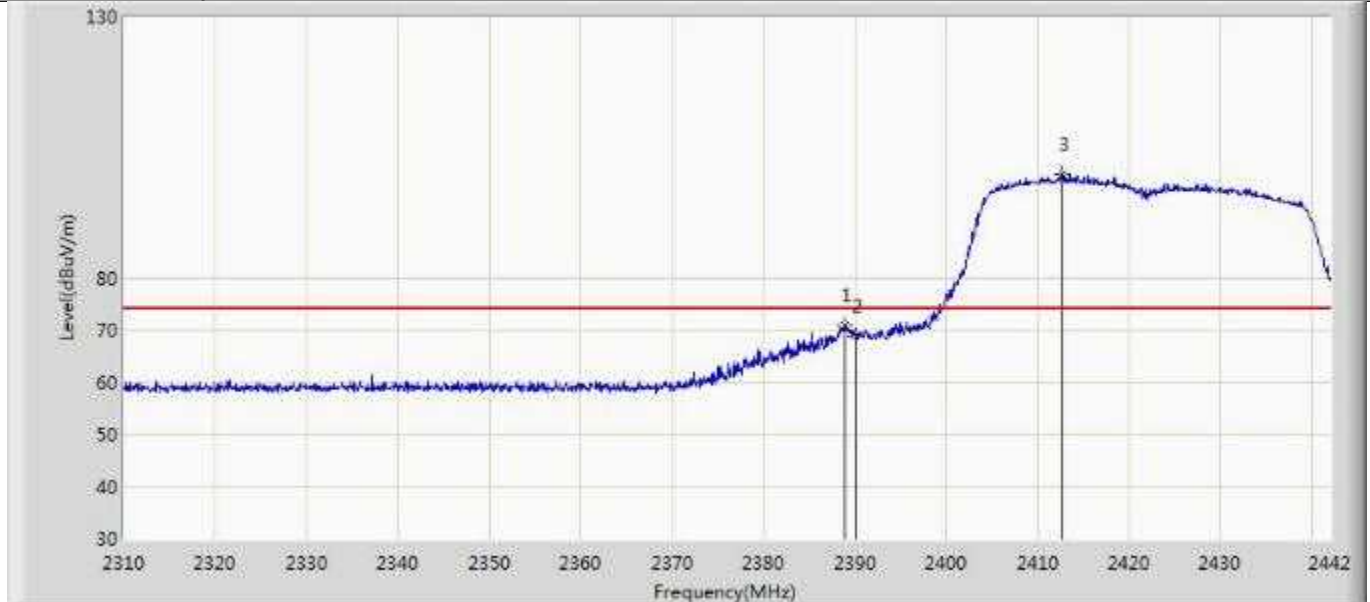


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2468.320        | 86.755                 | 54.508               | N/A             | N/A            | 32.247 | AV   |
| 2  |      |      | 2483.500        | 50.077                 | 17.796               | -3.923          | 54.000         | 32.282 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 22:15 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT40 at channel 2422MHz Power=58 |                          |

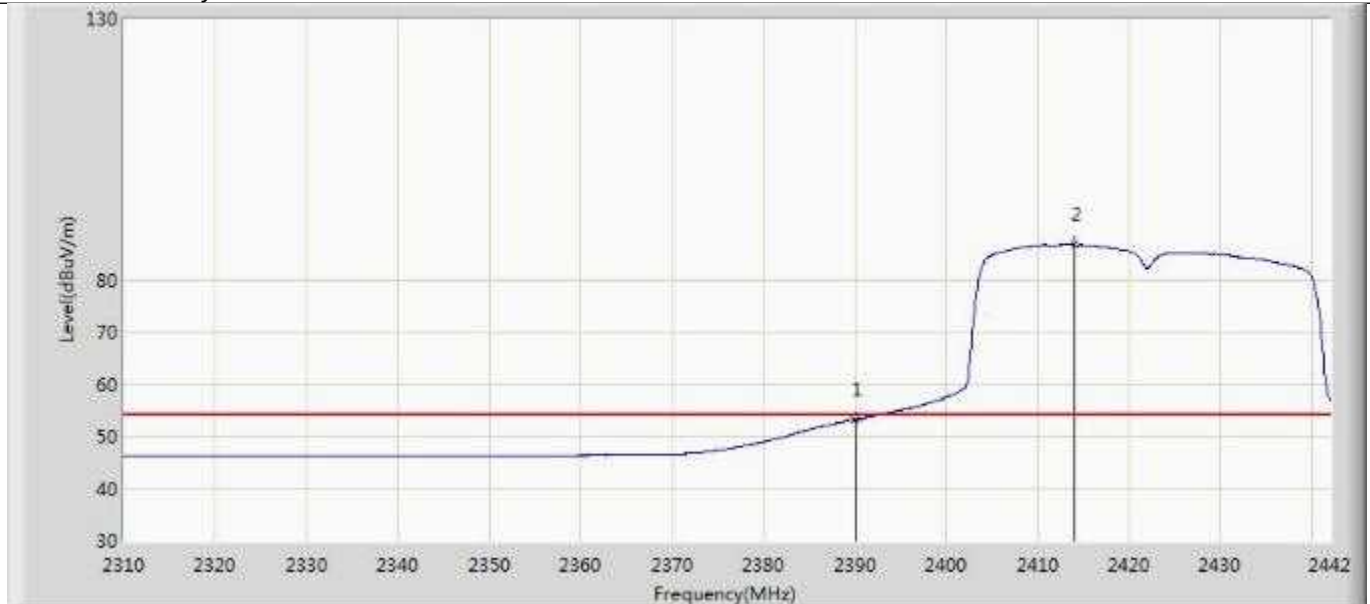


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2388.936        | 70.866                 | 38.594               | -3.134          | 74.000         | 32.273 | PK   |
| 2  |      |      | 2390.000        | 68.888                 | 36.610               | -5.112          | 74.000         | 32.278 | PK   |
| 3  |      | *    | 2412.762        | 99.891                 | 67.654               | N/A             | N/A            | 32.236 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 22:12 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT40 at channel 2422MHz Power=58 |                          |

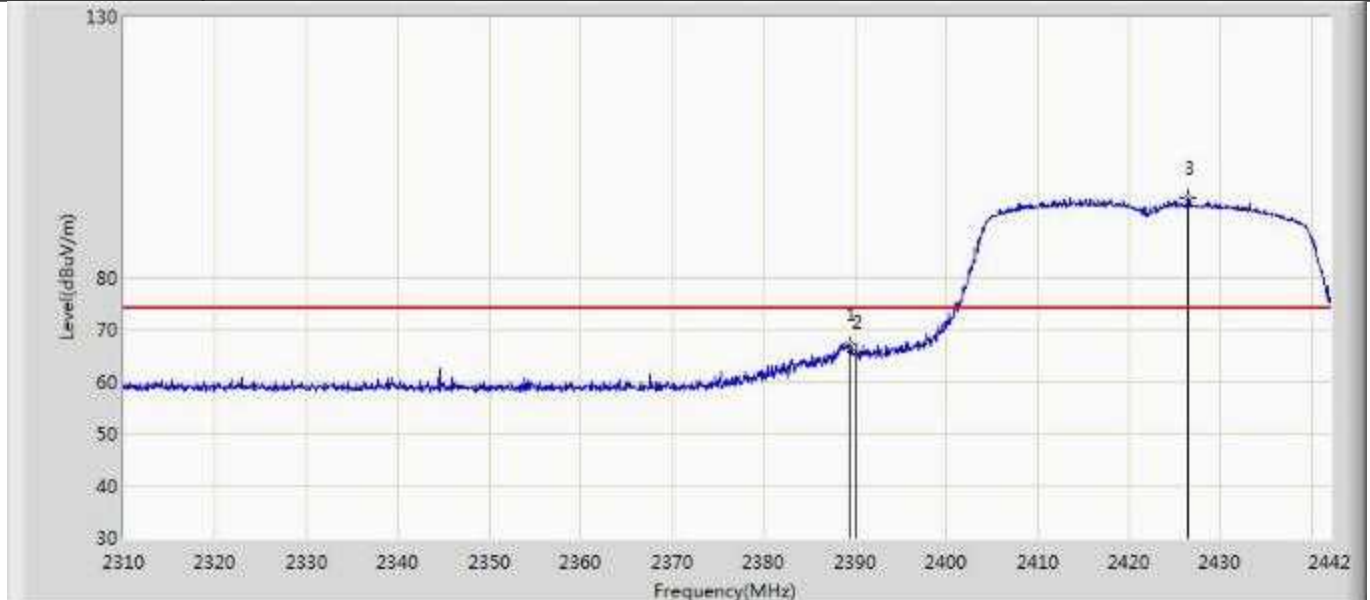


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 53.241                 | 20.963               | -0.759          | 54.000         | 32.278 | AV   |
| 2  |      | *    | 2414.016        | 86.687                 | 54.456               | N/A             | N/A            | 32.231 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 22:16 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT40 at channel 2422MHz Power=58 |                          |

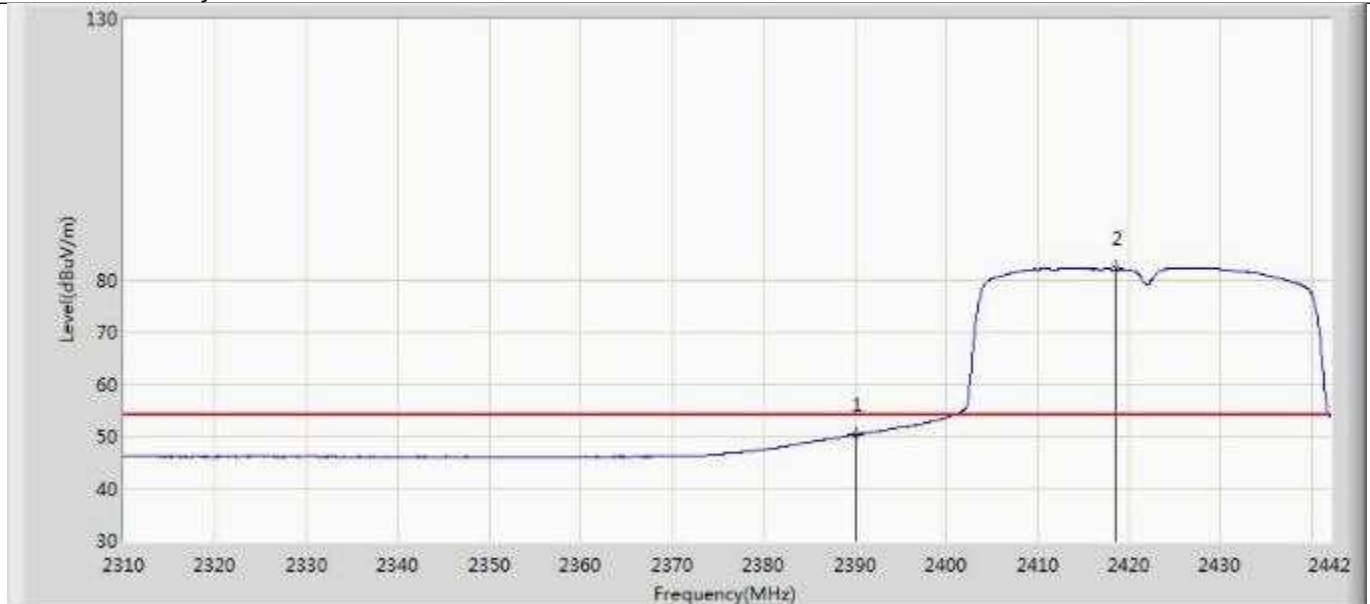


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2389.332        | 67.067                 | 34.793               | -6.933          | 74.000         | 32.275 | PK   |
| 2  |      |      | 2390.000        | 65.774                 | 33.496               | -8.226          | 74.000         | 32.278 | PK   |
| 3  |      | *    | 2426.490        | 95.118                 | 62.939               | N/A             | N/A            | 32.180 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 22:18 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT40 at channel 2422MHz Power=58 |                          |

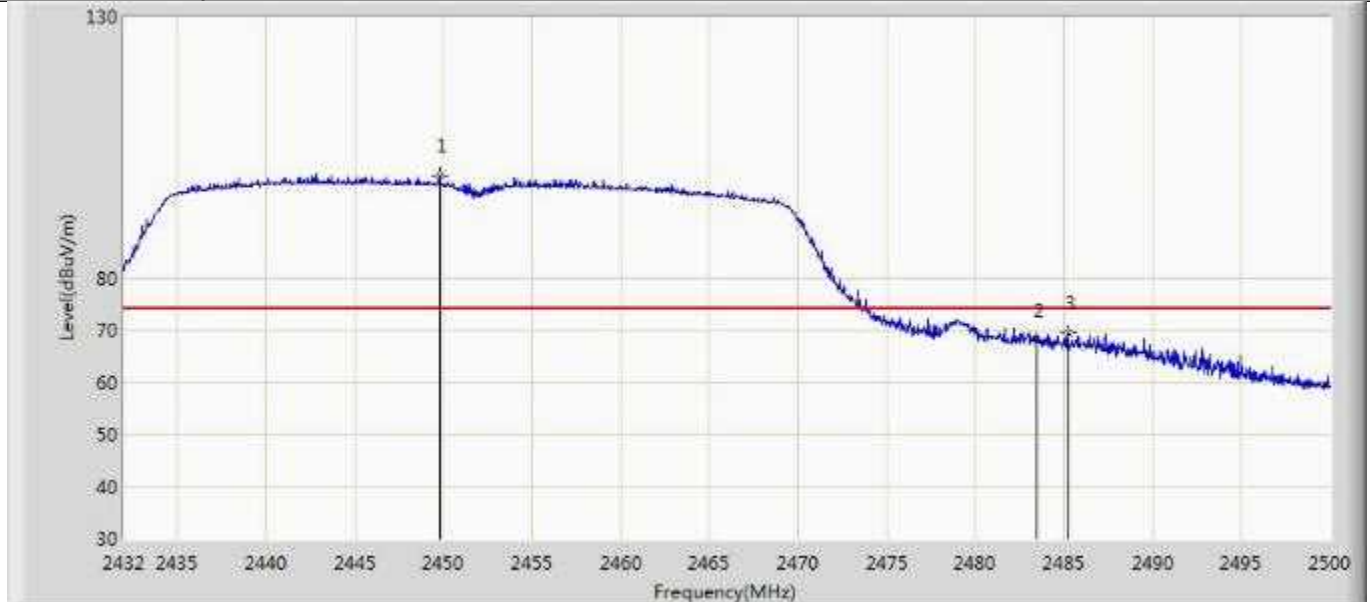


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      |      | 2390.000        | 50.317                 | 18.039               | -3.683          | 54.000         | 32.278 | AV   |
| 2  |      | *    | 2418.438        | 82.040                 | 49.827               | 28.040          | 54.000         | 32.213 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 22:27 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT40 at channel 2452MHz Power=63 |                          |

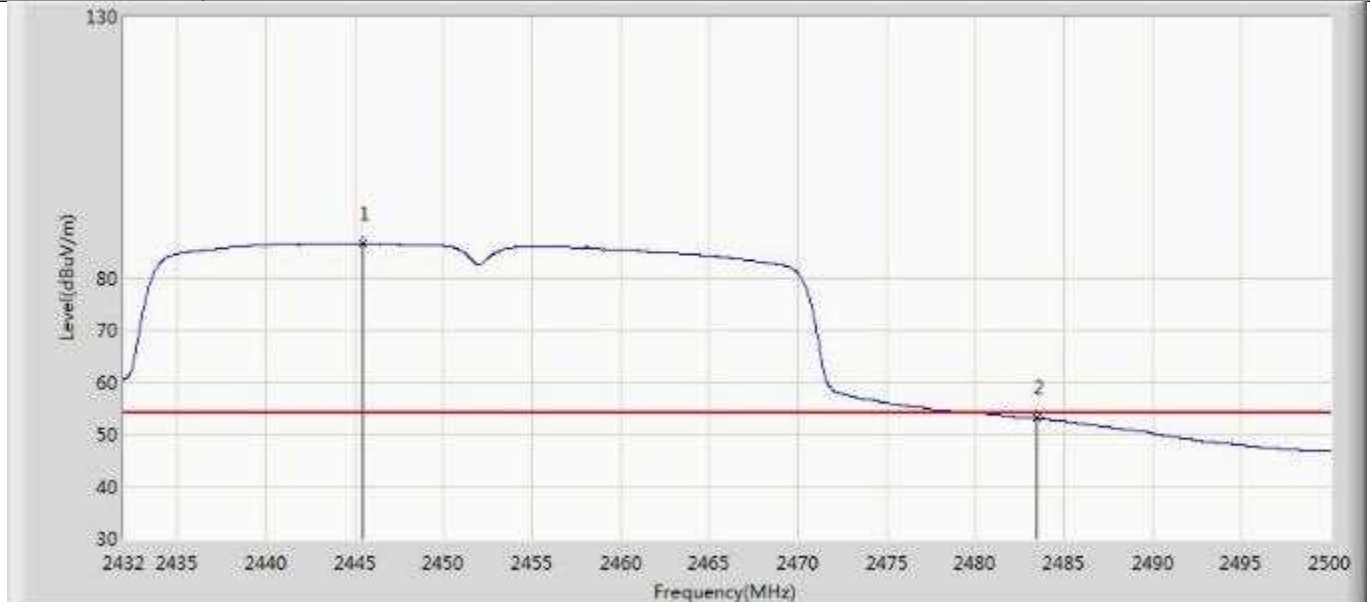


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2449.782        | 99.574                 | 67.388               | N/A             | N/A            | 32.185 | PK   |
| 2  |      |      | 2483.500        | 68.024                 | 35.743               | -5.976          | 74.000         | 32.282 | PK   |
| 3  |      |      | 2485.244        | 69.436                 | 37.149               | -4.564          | 74.000         | 32.287 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 22:25 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Vertical       |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT40 at channel 2452MHz Power=63 |                          |

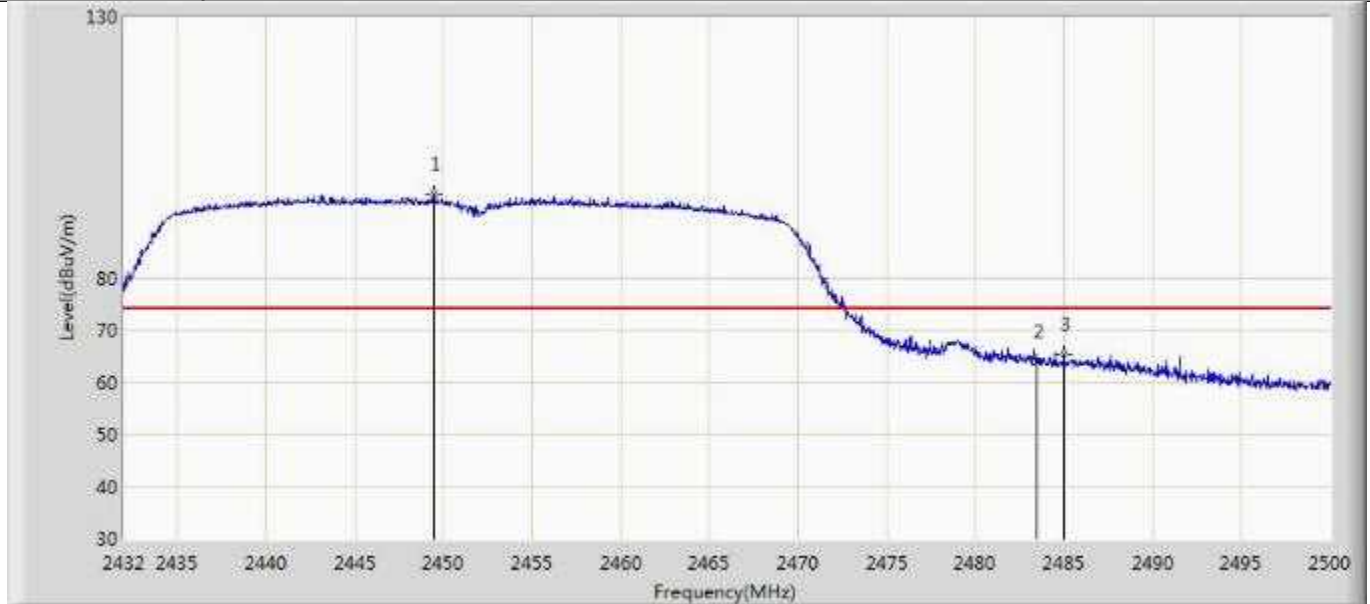


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2445.498        | 86.551                 | 54.382               | N/A             | N/A            | 32.169 | AV   |
| 2  |      |      | 2483.500        | 53.071                 | 20.790               | -0.929          | 54.000         | 32.282 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 22:28 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT40 at channel 2452MHz Power=63 |                          |

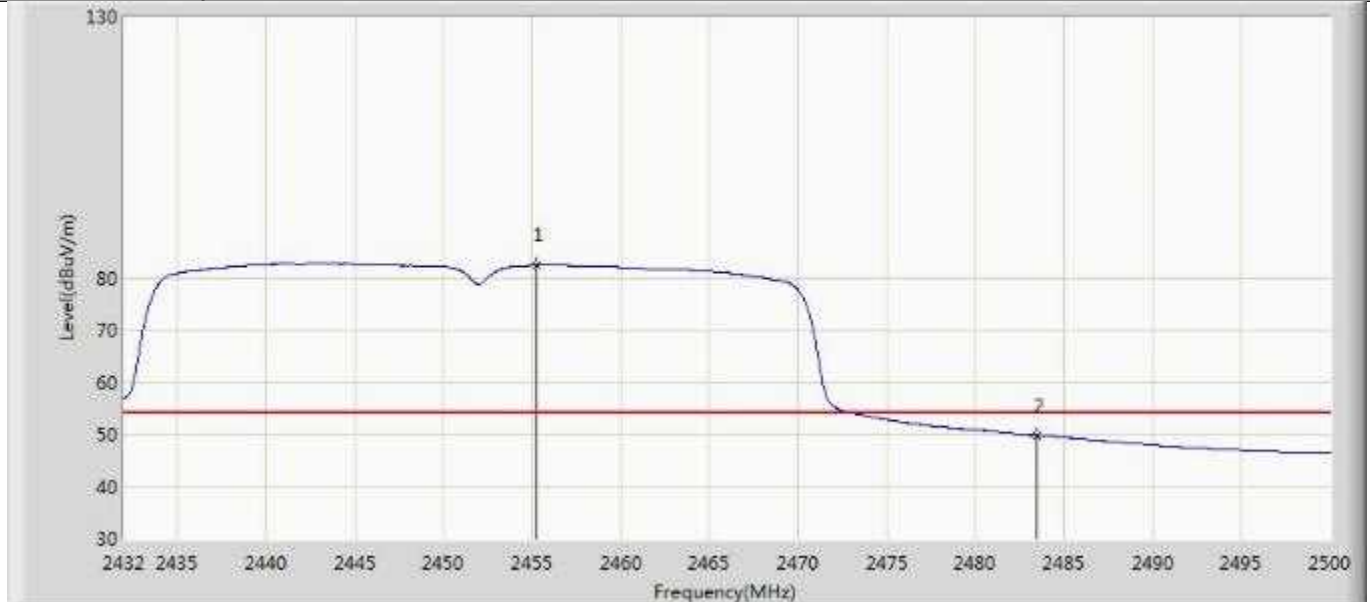


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2449.442        | 96.140                 | 63.956               | N/A             | N/A            | 32.184 | PK   |
| 2  |      |      | 2483.500        | 64.009                 | 31.728               | -9.991          | 74.000         | 32.282 | PK   |
| 3  |      |      | 2485.006        | 65.398                 | 33.112               | -8.602          | 74.000         | 32.286 | PK   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Site: AC2                                                  | Time: 2017/08/24 - 22:30 |
| Limit: FCC Part15.209 RE(3m)                               | Engineer: Dandy Li       |
| Probe: BBHA9120D 1-18GHz                                   | Polarity: Horizontal     |
| EUT: WIRELESS REPEATER NODE                                | Power: By Battery        |
| Note: Transmit by 802.11n-HT40 at channel 2452MHz Power=63 |                          |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor | Type |
|----|------|------|-----------------|------------------------|----------------------|-----------------|----------------|--------|------|
| 1  |      | *    | 2455.222        | 82.365                 | 50.156               | N/A             | N/A            | 32.209 | AV   |
| 2  |      |      | 2483.500        | 49.850                 | 17.569               | -4.150          | 54.000         | 32.282 | AV   |

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

## 10 Test Equipment List

### List of Test Instruments Test Site1

|    | DESCRIPTION                         | MANUFACTURER    | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|----|-------------------------------------|-----------------|-----------|------------|---------------|
| C  | Signal Analyzer                     | Rohde & Schwarz | FSV40     | 101091     | 2018-8-7      |
| RE | EMI Test Receiver                   | Rohde & Schwarz | ESR3      | 101906     | 2018-8-7      |
|    | Trilog Super Broadband Test Antenna | Schwarzbeck     | VULB 9163 | 848        | 2018-9-17     |
|    | Horn Antenna                        | Rohde & Schwarz | HF907     | 102393     | 2018-9-17     |
|    | Pre-amplifier                       | Rohde & Schwarz | SCU-18D   | 19006451   | 2018-8-7      |
|    | 3m Semi-anechoic chamber            | TDK             | 9X6X6     | ----       | 2018-5-20     |
| CE | EMI Test Receiver                   | Rohde & Schwarz | ESR 3     | 101907     | 2018-8-7      |
|    | LISN                                | Rohde & Schwarz | ENV4200   | 100224     | 2018-8-7      |
|    | LISN                                | Rohde & Schwarz | ENV216    | 101924     | 2018-8-7      |

### Test Site2

#### Radiated Disturbance – AC2

| Instrument                       | Manufacturer | Type No.    | Asset No.   | Cali. Interval | Cali. Due Date |
|----------------------------------|--------------|-------------|-------------|----------------|----------------|
| MXE EMI Receiver                 | Agilent      | N9038A      | MRTSUE06125 | 1 year         | 2018/08/03     |
| Loop Antenna                     | Schwarzbeck  | FMZB1519    | MRTSUE06025 | 1 year         | 2017/12/21     |
| Bilog Period Antenna             | Schwarzbeck  | VULB9162    | MRTSUE06022 | 1 year         | 2017/10/22     |
| Broad-Band Horn Antenna          | Schwarzbeck  | BBHA9120D   | MRTSUE06171 | 1 year         | 2017/11/19     |
| Broadband Coaxial Preamplifier   | Schwarzbeck  | BBV 9718    | MRTSUE06106 | 1 year         | 2017/12/10     |
| Broadband Horn Antenna           | Schwarzbeck  | BBHA9170    | MRTSUE06024 | 1 year         | 2018/04/25     |
| Digital Thermometer & Hygrometer | Minggao      | ETH529      | MRTSUE06170 | 1 year         | 2017/11/30     |
| Anechoic Chamber                 | RIKEN        | Chamber-AC2 | MRTSUE06213 | 1 year         | 2018/05/10     |

#### Conducted Test Equipment - TR3

| Instrument                 | Manufacturer | Type No. | Asset No.   | Cali. Interval | Cali. Due Date |
|----------------------------|--------------|----------|-------------|----------------|----------------|
| Spectrum Analyzer          | Agilent      | N9020A   | MRTSUE06106 | 1 year         | 2018/04/25     |
| USB Wideband Power Sensor  | Booton       | 55006    | MRTSUE06109 | 1 year         | 2018/04/25     |
| Temperature/Humidity Meter | Yuhuaze      | HTC-2    | MRTSUE06184 | 1 year         | 2017/12/22     |

#### C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density\*
- Spurious RF conducted emissions
- Conducted Band edge

## 11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

### Test Site1

| Items                                    | Extended Uncertainty                                                                                                                                                                                          |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conducted Disturbance at Mains Terminals | 150kHz to 30MHz, LISN, $\pm 2.73\text{dB}$                                                                                                                                                                    |
| Radiated Disturbance                     | 30MHz to 1GHz, $\pm 5.03\text{dB}$ (Horizontal)<br>$\pm 5.11\text{dB}$ (Vertical)<br>1GHz to 18GHz, $\pm 5.15\text{dB}$ (Horizontal)<br>$\pm 5.12\text{dB}$ (Vertical)<br>18GHz to 25GHz, $\pm 4.76\text{dB}$ |

### Test Site2

#### AC Conducted Emission Measurement - SR2

Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ ):

150kHz~30MHz: 3.46dB

#### Radiated Emission Measurement – AC1

Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ ):

9kHz ~ 1GHz: 4.18dB

1GHz ~ 25GHz: 4.76dB

## 12 Photographs of Test Set-ups

9kHz ~ 30MHz



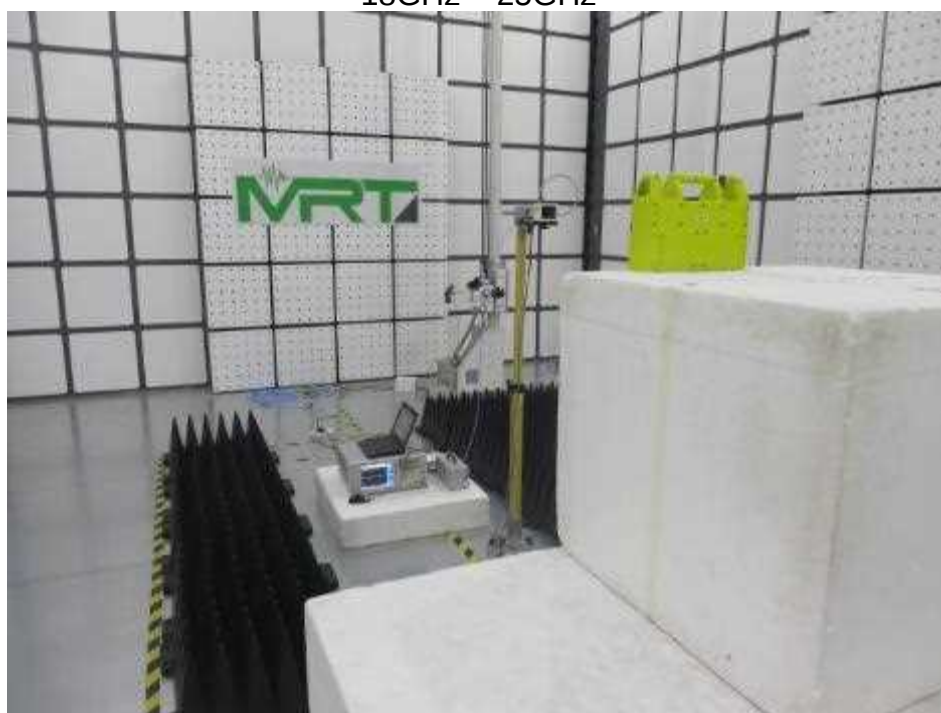
30MHz ~ 1GHz



1GHz ~ 18GHz



18GHz ~ 25GHz



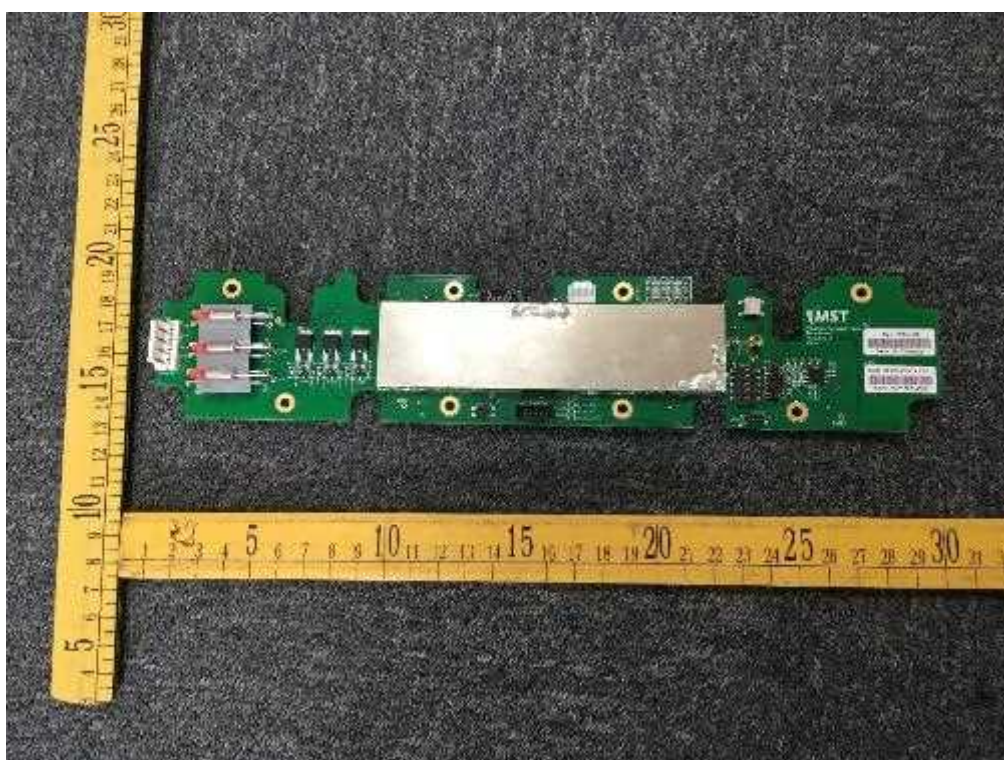
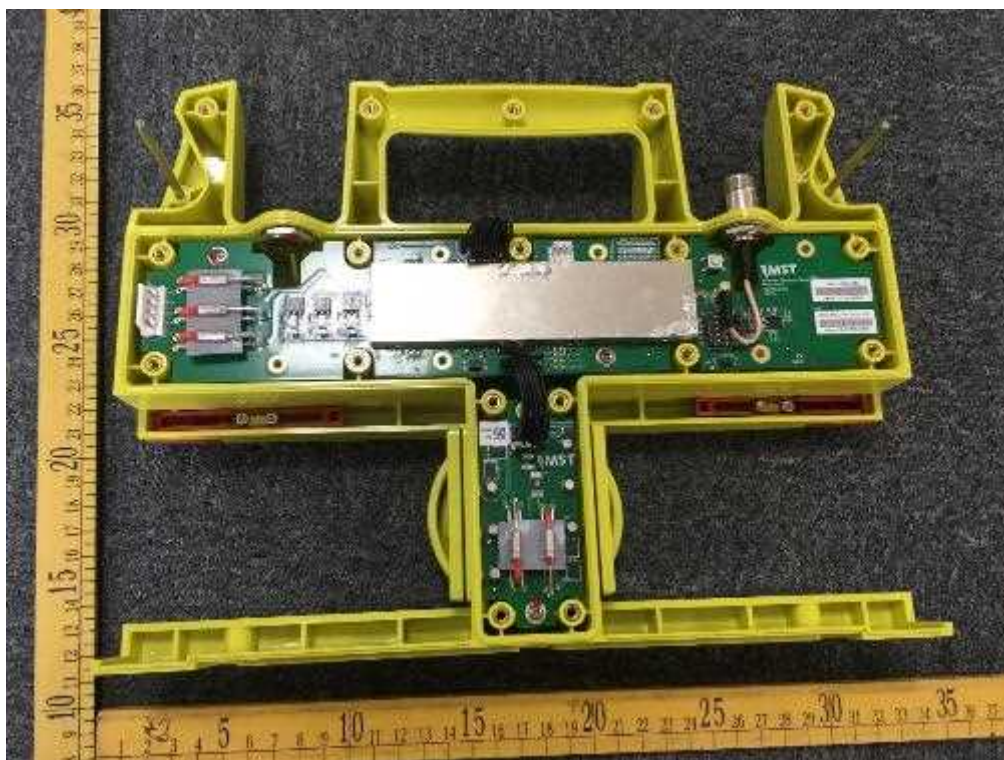
## 13 Photographs of EUT

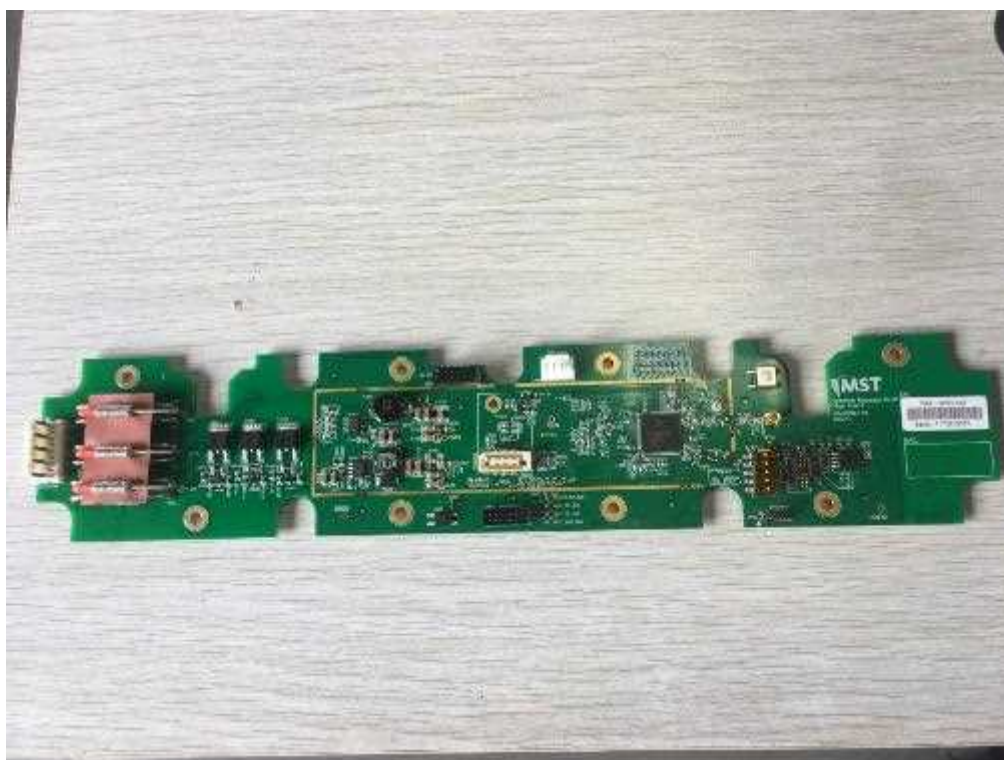
Wireless Repeater Node (Model: W-WRN-000)

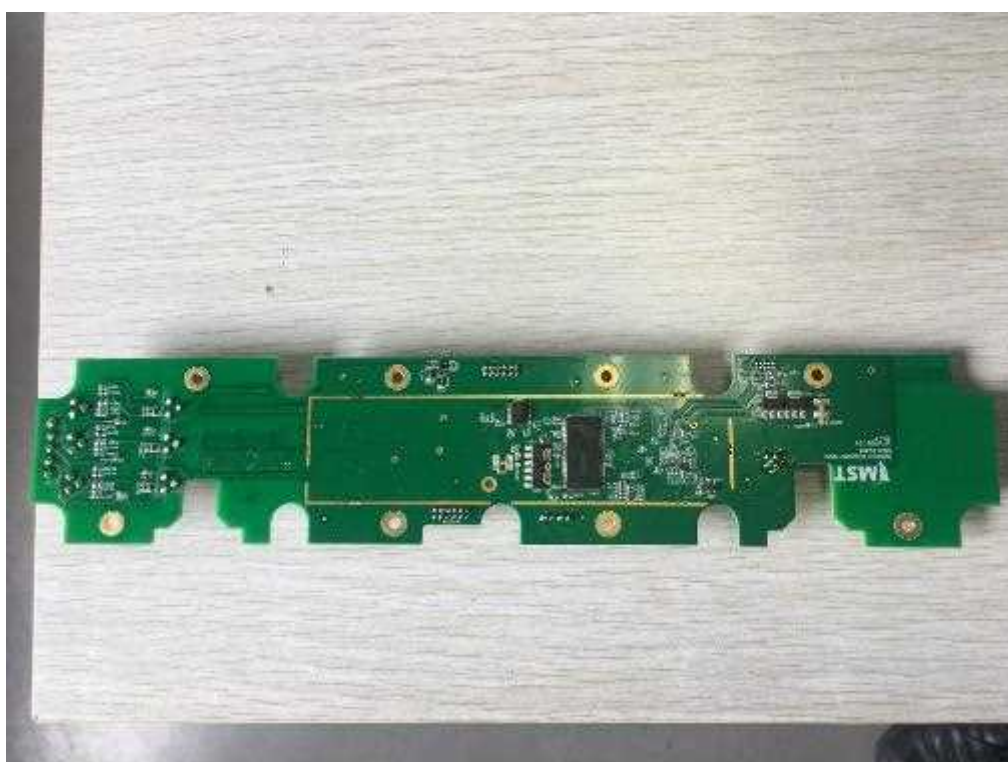


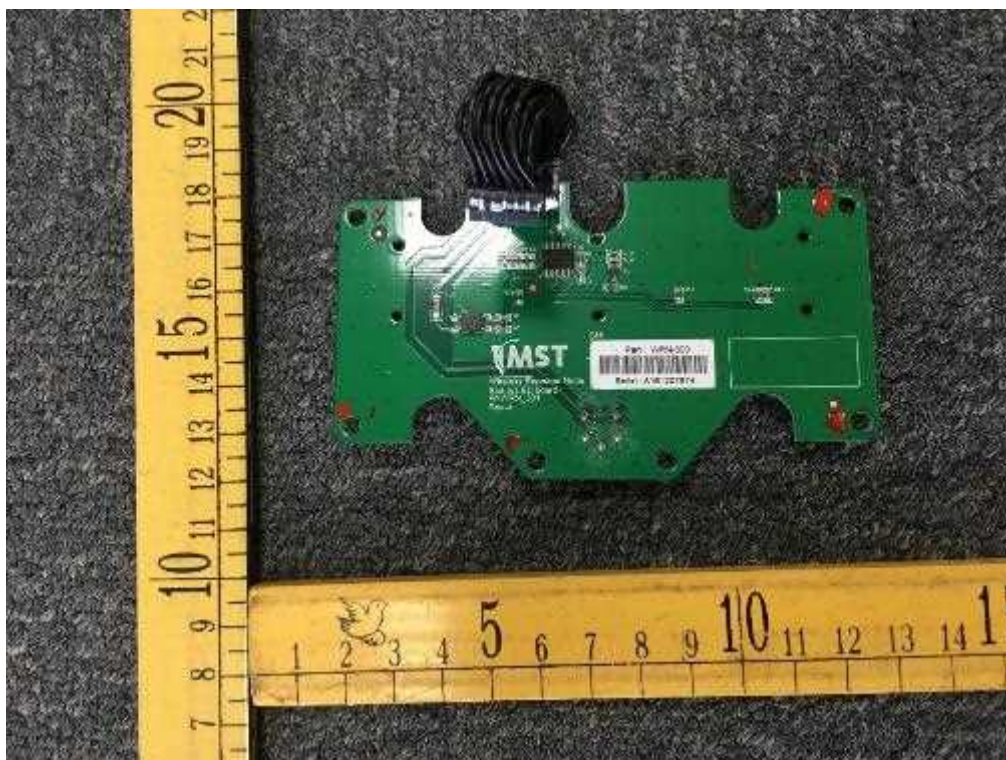


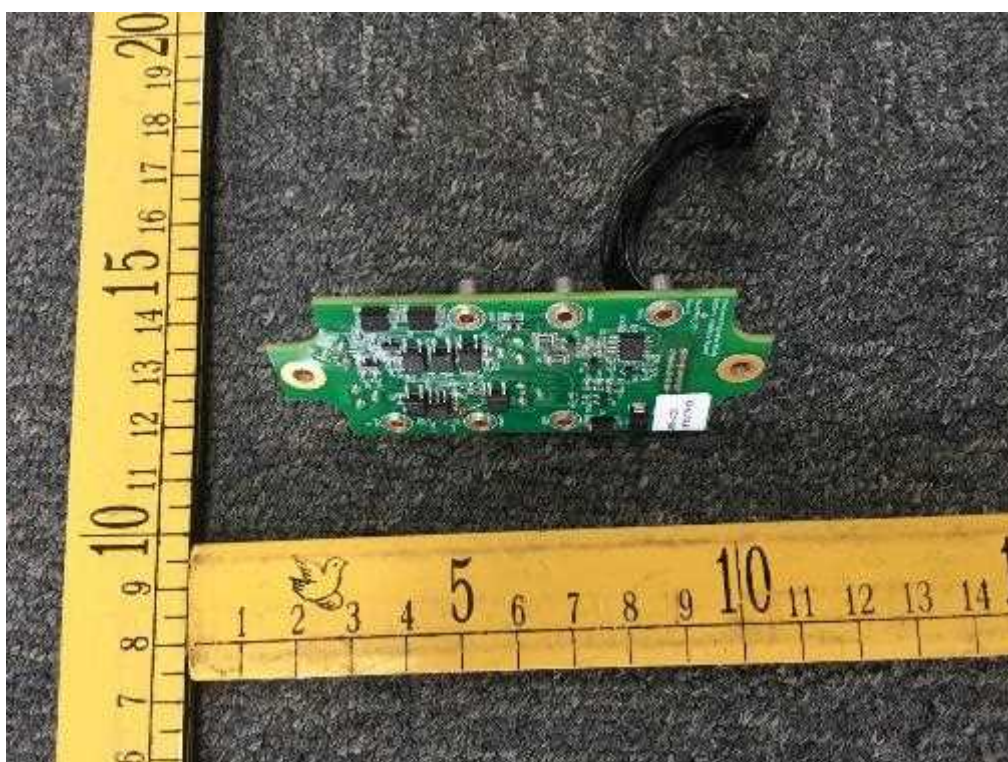
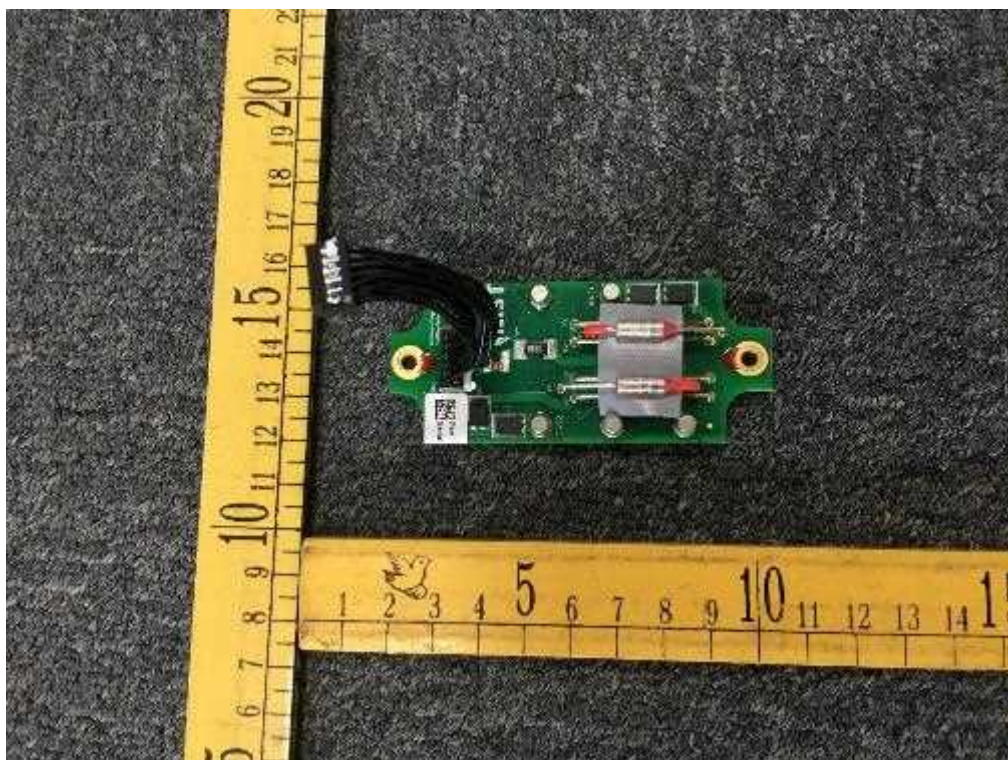














THE END