

**Jiangsu Midea Cleaning Appliances Co., Ltd.**

# RF TEST REPORT

**Report Type:**

FCC Part 15.247 RF report

**Model:**

M3LDS, VCR21, Tornado, CFR08, NER600, M6

**REPORT NUMBER:**

201101813SHA-001

**ISSUE DATE:**

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**DOCUMENT CONTROL NUMBER:**

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**TEST REPORT**

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Report no.: 201101813SHA-001

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**FCC ID:** 2AWUS-MD002

**SUMMARY:**

The equipment complies with the requirements according to the following standard(s) or Specification:

**47CFR Part 15 (2019):** Radio Frequency Devices (Subpart C)

**ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

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## TEST REPORT

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### Revision History

| Report No.       | Version | Description             | Issued Date  |
|------------------|---------|-------------------------|--------------|
| 201101813SHA-001 | Rev. 01 | Initial issue of report | May 11, 2021 |
|                  |         |                         |              |
|                  |         |                         |              |

## Measurement result summary

| TEST ITEM                                           | FCC REFERENCE               | IC REFERENCE                       | RESULT |
|-----------------------------------------------------|-----------------------------|------------------------------------|--------|
| Minimum 6dB Bandwidth                               | 15.247(a)(2)                | RSS-247 Issue 2<br>Clause 5.2      | Pass   |
| Maximum conducted output power<br>and e.i.r.p.      | 15.247(b)(3)                | RSS-247 Issue 2<br>Clause 5.4      | Pass   |
| Power spectrum density                              | 15.247(e)                   | RSS-247 Issue 2<br>Clause 5.2      | Pass   |
| Emission outside the frequency band                 | 15.247(d)                   | RSS-247 Issue 2<br>Clause 5.5      | Pass   |
| Radiated Emissions in restricted<br>frequency bands | 15.247(d),<br>15.205&15.209 | RSS-Gen Issue 5<br>Clause 8.9&8.10 | Pass   |
| Power line conducted emission                       | 15.207(a)                   | RSS-Gen Issue 5<br>Clause 8.8      | Pass   |
| Occupied bandwidth                                  | -                           | RSS-Gen Issue 5<br>Clause 6.6      | Tested |
| Antenna requirement                                 | 15.203                      | -                                  | Pass   |

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

## 1 GENERAL INFORMATION

### 1.1 Description of Equipment Under Test (EUT)

|                       |                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product name:         | Robot vacuum cleaner                                                                                                                                                                                                                                                                                                                                  |
| Type/Model:           | M3LDS, VCR21, Tornado, CFR08, NER600, M6                                                                                                                                                                                                                                                                                                              |
| Description of EUT:   | The EUT is automatically battery-powered cleaner and dry pick up for household indoor use only. M3LDS, VCR21, NER600, M6 and CFR08 are same appliance except for the model name. Tornado is same as M3LDS except for different appearance. M3LDS was tested as representative. The EUT contains WIFI mode and BLE mode. This report is for WIFI mode. |
| Rating:               | DC 14,4V<br>Docking station(I5-DS):<br>Class II<br>Input: 100-240V~, 50/60Hz, 24W;<br>Output:17.2V d.c., 1A                                                                                                                                                                                                                                           |
| EUT type:             | <input type="checkbox"/> Table top <input checked="" type="checkbox"/> Floor standing                                                                                                                                                                                                                                                                 |
| Software Version:     | /                                                                                                                                                                                                                                                                                                                                                     |
| Hardware Version:     | /                                                                                                                                                                                                                                                                                                                                                     |
| Sample received date: | Jun 3, 2020                                                                                                                                                                                                                                                                                                                                           |
| Date of test:         | Jun 3~Nov 19, 2020                                                                                                                                                                                                                                                                                                                                    |

### 1.2 Technical Specification

|                     |                                                                                                                                                   |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency Range:    | 2412MHz ~ 2462 MHz                                                                                                                                |
| Support Standards:  | IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20                                                                                                     |
| Type of Modulation: | IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK)<br>IEEE 802.11g: OFDM (64-QAM, 16-QAM, QPSK, BPSK)<br>IEEE 802.11n-HT20: OFDM (64-QAM, 16-QAM, QPSK, BPSK) |
| Channel Number:     | 11 Channels for 802.11b, 802.11g and 802.11n(HT20)                                                                                                |
| Data Rate:          | IEEE 802.11b: Up to 11 Mbps<br>IEEE 802.11g: Up to 54 Mbps<br>IEEE 802.11n-HT20: Up to MCS7                                                       |
| Channel Separation: | 5 MHz                                                                                                                                             |

### 1.3 Antenna information

| Antenna No. | Model | Antenna type | Antenna Gain | Note |
|-------------|-------|--------------|--------------|------|
| 1           | /     | PIFA         | 2.6dBi       |      |
|             |       |              |              |      |

| Mode          | Tx/Rx Function | Beamforming function | CDD function |
|---------------|----------------|----------------------|--------------|
| 802.11b       | 1Tx/1Rx        | NO                   | NO           |
| 802.11g       | 1Tx/1Rx        | NO                   | NO           |
| 802.11n(HT20) | 1Tx/1Rx        | NO                   | NO           |
|               |                |                      |              |
|               |                |                      |              |

## 1.4 Description of Test Facility

|            |                                                                        |
|------------|------------------------------------------------------------------------|
| Name:      | Intertek Testing Services Shanghai                                     |
| Address:   | Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China |
| Telephone: | 86 21 61278200                                                         |
| Telefax:   | 86 21 54262353                                                         |

|                                                                                   |                                                                               |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| The test facility is recognized, certified, or accredited by these organizations: | CNAS Accreditation Lab<br>Registration No. CNAS L0139                         |
|                                                                                   | FCC Accredited Lab<br>Designation Number: CN1175                              |
|                                                                                   | IC Registration Lab<br>CAB identifier.: CN0051                                |
|                                                                                   | VCCI Registration Lab<br>Registration No.: R-14243, G-10845, C-14723, T-12252 |
|                                                                                   | A2LA Accreditation Lab<br>Certificate Number: 3309.02                         |

## 2 TEST SPECIFICATIONS

### 2.1 Standards or specification

47CFR Part 15 (2019)

ANSI C63.10 (2013)

KDB 558074 D01(v05r02)

### 2.2 Mode of operation during the test

While testing transmitting mode of EUT, the continuously transmission was applied by following software.

| Software name | Manufacturer | Version | Supplied by  |
|---------------|--------------|---------|--------------|
| SecureCRT     | /            | /       | Manufacturer |

The lowest, middle and highest channel were tested as representatives.

| Frequency Band (MHz) | Mode          | Lowest (MHz) | Middle (MHz) | Highest (MHz) |
|----------------------|---------------|--------------|--------------|---------------|
| 2400-2483.5          | 802.11b       | 2412         | 2437         | 2462          |
|                      | 802.11g       | 2412         | 2437         | 2462          |
|                      | 802.11n(HT20) | 2412         | 2437         | 2462          |
|                      | /             | /            | /            | /             |

#### Data rate VS Power:

The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases. After this pre-scan, we choose the following table of the data rate as the worst case.

| Frequency Band (MHz) | Mode          | Worst case data rate |
|----------------------|---------------|----------------------|
| 2400-2483.5          | 802.11b       | 1Mbps                |
|                      | 802.11g       | 6Mbps                |
|                      | 802.11n(HT20) | MCS0                 |
|                      | /             | /                    |

The EUT will use two types antenna, and there have the following test mode:

Radiated test mode:

Mode 1: EUT transmitted signal with internal antenna;

Conducted test mode:

Mode 2: EUT transmitted signal from PCBA RF port connected to SPA directly;

We have verified all test modes, and choose the worst mode 1 for radiated test and mode 2 for conducted test as representatively to list the results in this report.

## 2.3 Test software list

| Test Items         | Software | Manufacturer | Version |
|--------------------|----------|--------------|---------|
| Conducted emission | ESxS-K1  | R&S          | V2.1.0  |
| Radiated emission  | ES-K1    | R&S          | V1.71   |

## 2.4 Test peripherals list

| Item No. | Name            | Band and Model   | Description                                               |
|----------|-----------------|------------------|-----------------------------------------------------------|
| 1        | Laptop computer | HP ProBook 6470b | 100-240V AC, 50/60Hz                                      |
| 2        | Dock station    | I5-DS            | Input: 100-240V~, 50/60Hz, 24W;<br>Output: 17.2V d.c., 1A |
|          |                 |                  |                                                           |

## 2.5 Test environment condition:

| Test items                                       | Temperature | Humidity |
|--------------------------------------------------|-------------|----------|
| Minimum 6dB Bandwidth                            | 22°C        | 55% RH   |
| Maximum conducted output power and e.i.r.p.      |             |          |
| Power spectrum density                           |             |          |
| Emission outside the frequency band              |             |          |
| Occupied bandwidth                               |             |          |
| Radiated Emissions in restricted frequency bands | 22°C        | 55% RH   |
| Power line conducted emission                    | 22°C        | 55% RH   |

## 2.6 Instrument list

| Conducted Emission                  |                       |              |                        |              |            |
|-------------------------------------|-----------------------|--------------|------------------------|--------------|------------|
| Used                                | Equipment             | Manufacturer | Type                   | Internal no. | Due date   |
| <input checked="" type="checkbox"/> | Test Receiver         | R&S          | ESCS 30                | EC 2107      | 2021-07-08 |
| <input checked="" type="checkbox"/> | A.M.N.                | R&S          | ESH2-Z5                | EC 3119      | 2021-11-10 |
| <input checked="" type="checkbox"/> | Shielded room         | Zhongyu      | -                      | EC 2838      | 2021-01-13 |
| Radiated Emission                   |                       |              |                        |              |            |
| Used                                | Equipment             | Manufacturer | Type                   | Internal no. | Due date   |
| <input checked="" type="checkbox"/> | Test Receiver         | R&S          | ESIB 26                | EC 3045      | 2021-09-15 |
| <input checked="" type="checkbox"/> | Bilog Antenna         | TESEQ        | CBL 6112D              | EC 4206      | 2021-09-25 |
| <input checked="" type="checkbox"/> | Pre-amplifier         | R&S          | AFS42-00101800-25-S-42 | EC5262       | 2021-06-11 |
| <input checked="" type="checkbox"/> | Horn antenna          | R&S          | HF 906                 | EC 3049      | 2021-01-17 |
| <input checked="" type="checkbox"/> | Semi-anechoic chamber | Albatross    | -                      | EC 3048      | 2021-07-14 |
| RF test                             |                       |              |                        |              |            |
| Used                                | Equipment             | Manufacturer | Type                   | Internal no. | Due date   |
| <input checked="" type="checkbox"/> | PXA Signal Analyzer   | Keysight     | N9030A                 | EC 5338      | 2021-03-16 |
| <input checked="" type="checkbox"/> | Coaxial cable         | ETS          | /                      | /            | 2021-03-16 |
| Additional instrument               |                       |              |                        |              |            |
| Used                                | Equipment             | Manufacturer | Type                   | Internal no. | Due date   |
| <input checked="" type="checkbox"/> | Therom-Hygrograph     | ZJ1-2A       | S.M.I.F.               | EC 3481      | 2021-01-05 |
| <input checked="" type="checkbox"/> | Therom-Hygrograph     | ZJ1-2A       | S.M.I.F.               | EC 3442      | 2021-01-05 |

## 2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Test item                                                   | Measurement uncertainty |
|-------------------------------------------------------------|-------------------------|
| Maximum peak output power                                   | $\pm 0.74\text{dB}$     |
| Radiated Emissions in restricted frequency bands below 1GHz | $\pm 4.90\text{dB}$     |
| Radiated Emissions in restricted frequency bands above 1GHz | $\pm 5.02\text{dB}$     |
| Emission outside the frequency band                         | $\pm 2.89\text{dB}$     |
| Power line conducted emission                               | $\pm 3.19\text{dB}$     |

### 3 Minimum 6dB bandwidth

Test result: Pass

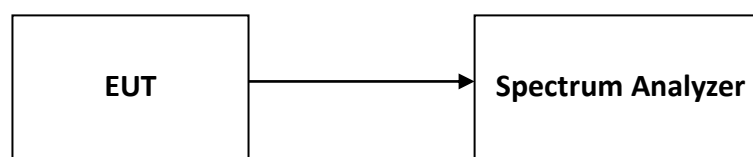
#### 3.1 Limit

For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

#### 3.2 Measurement Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 3.3 Test Configuration



#### 3.4 Test Results of Minimum 6dB bandwidth

Please refer to Appendix A

## 4 Maximum conducted output power and e.i.r.p.

**Test result:** Pass

### 4.1 Limit

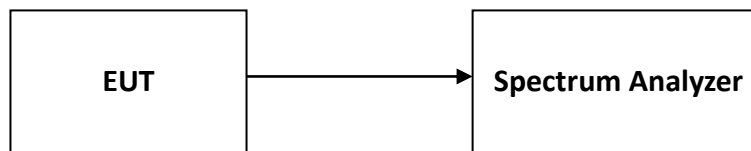
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands:  
1 W. (The e.i.r.p. shall not exceed 4 W)

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

### 4.2 Measurement Procedure

The EUT was tested according to DTS test procedure of “KDB558074 D01v05r02 15.247 Meas Guidance” (clause 8.3.2.2) for compliance requirements.

### 4.3 Test Configuration



### 4.4 Test Results of Maximum conducted output power

Please refer to Appendix A

## 5 Power spectrum density

**Test result:** Pass

### 5.1 Limit

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

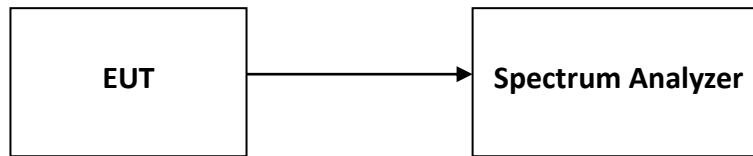
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and  $8 + (6 - \text{antenna gain} - \text{beam forming gain})$ .

### 5.2 Measurement Procedure

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to  $1.5 \times \text{DTS bandwidth}$ .
- c) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq 3 \times \text{RBW}$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 5.3 Test Configuration



### 5.4 Test Results of Power spectrum density

Please refer to Appendix A

## 6 Emission outside the frequency band

**Test result:** Pass

### 6.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

### 6.2 Measurement Procedure

#### Reference level measurement

Establish a reference level by using the following procedure:

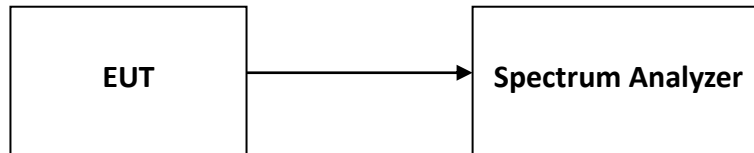
- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to  $\geq 1.5$  times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW  $\geq 3 \times$  RBW.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.

#### Emission level measurement

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW  $\geq 3 \times$  RBW.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

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 specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

### 6.3 Test Configuration



### 6.4 The results of Emission outside the frequency band

Please refer to Appendix A

## 7 Radiated Emissions in restricted frequency bands

Test result: Pass

### 7.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009 ~ 0.490     | 2400/F(kHz)                       | 300                           |
| 0.490 ~ 1.705     | 24000/F(kHz)                      | 30                            |
| 1.705 ~ 30.0      | 30                                | 30                            |
| 30 ~ 88           | 100                               | 3                             |
| 88 ~ 216          | 150                               | 3                             |
| 216 ~ 960         | 200                               | 3                             |
| Above 960         | 500                               | 3                             |

### 7.2 Measurement Procedure

#### For Radiated emission below 30MHz:

- The EUT was placed on the top of a rotating table 0.8 meters (0.1 meters for floor-standing device) above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

#### NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

**TEST REPORT****For Radiated emission above 30MHz:**

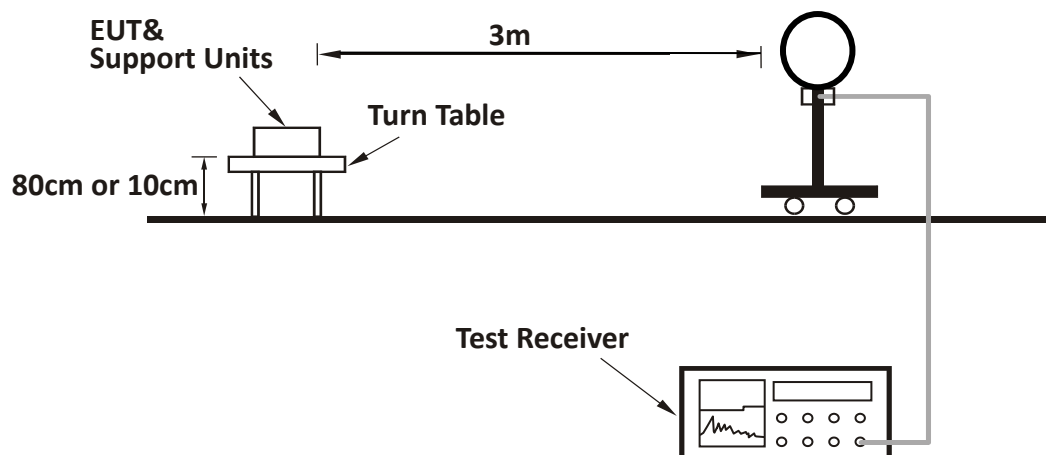
- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) or 0.1 meters (for floor-standing device) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) 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.
- d) 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.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

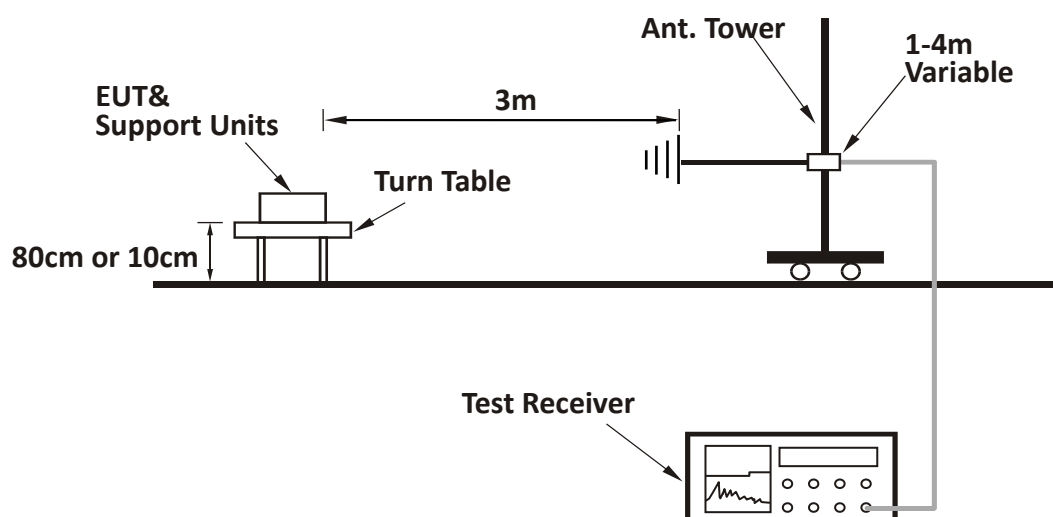
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 3 x RBW (Duty cycle  $\geq$  98%) for Average detection (AV) at frequency above 1GHz.
- 4. All modes of operation were investigated and the worst-case emissions are reported

### 7.3 Test Configuration

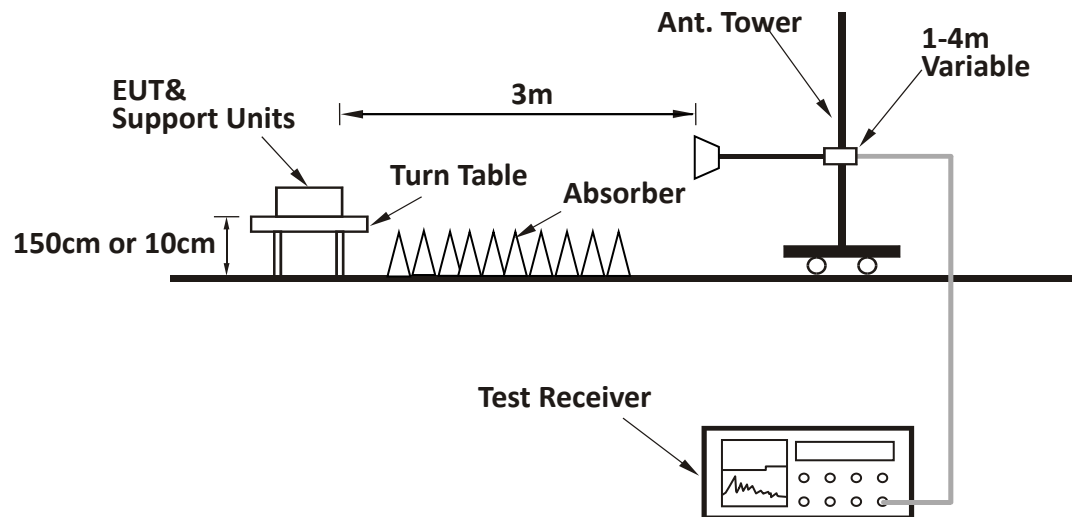
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



**For Radiated emission above 1GHz:**



## 7.4 Test Results of Radiated Emissions

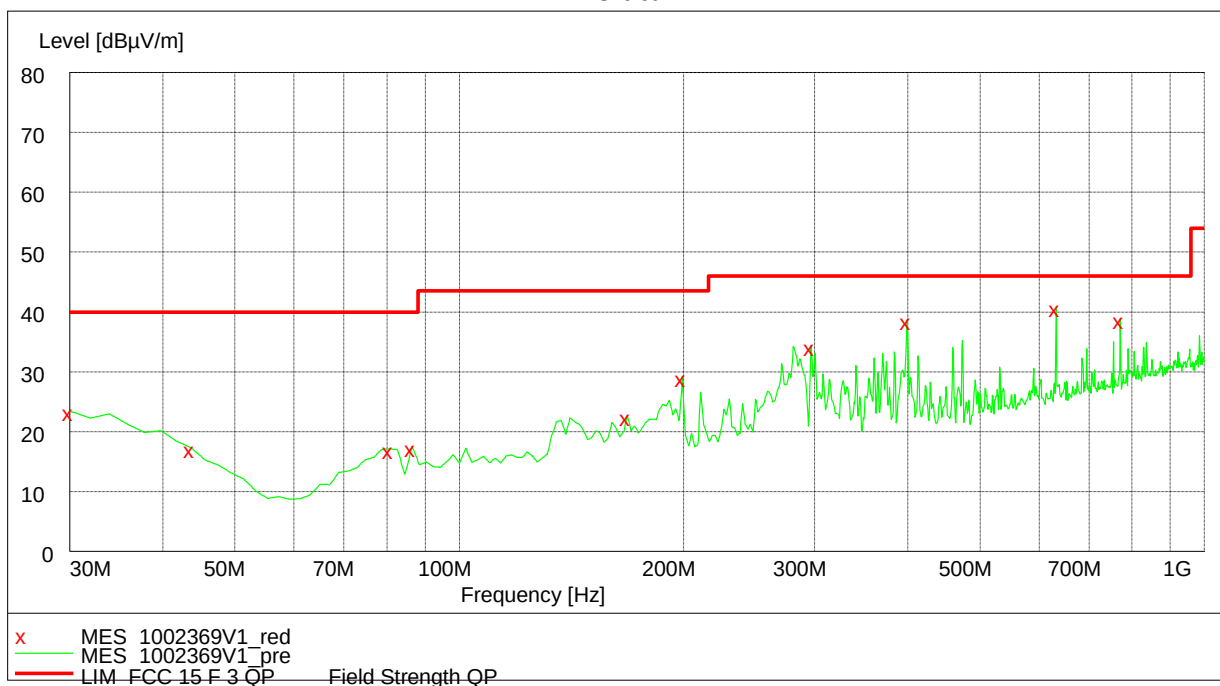
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



## TEST REPORT

### Test data below 1GHz

| Antenna | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---------|-----------------|----------------------------|-----------------------|----------------|-------------|----------|
| H       | 30.00           | 24.30                      | 21.30                 | 40.00          | 15.70       | PK       |
| H       | 193.29          | 24.90                      | 11.20                 | 43.50          | 18.60       | PK       |
| H       | 331.30          | 31.60                      | 15.60                 | 46.00          | 14.40       | PK       |
| H       | 475.15          | 36.50                      | 18.50                 | 46.00          | 9.50        | PK       |
| H       | 700.64          | 36.30                      | 22.30                 | 46.00          | 9.70        | PK       |
| H       | 883.37          | 38.50                      | 24.80                 | 46.00          | 7.50        | PK       |
| V       | 30.00           | 23.40                      | 21.30                 | 40.00          | 16.60       | PK       |
| V       | 199.12          | 29.20                      | 11.20                 | 43.50          | 14.30       | PK       |
| V       | 296.31          | 34.30                      | 14.40                 | 46.00          | 11.70       | PK       |
| V       | 399.34          | 38.70                      | 17.10                 | 46.00          | 7.30        | PK       |
| V       | 632.61          | 40.80                      | 21.40                 | 46.00          | 5.20        | PK       |
| V       | 770.62          | 38.90                      | 23.10                 | 46.00          | 7.10        | PK       |

Note: The worst test result (30MHz to 1GHz) of 802.11b channel L (2412MHz) was chosen to list in the report as representative.

# TEST REPORT

## Test result above 1GHz:

The emission was conducted from 1GHz to 25GHz

### 802.11b

| CH | Antenna | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|----|---------|-----------------|----------------------------|-----------------------|----------------|-------------|----------|
| L  | H/V     | 2390.00         | 51.43                      | 31.20                 | 74.00          | 22.57       | PK       |
|    | H/V     | 2390.00         | 42.73                      | 31.20                 | 54.00          | 11.27       | AV       |
|    | H/V     | 4824.00         | 41.17                      | 2.70                  | 74.00          | 32.83       | PK       |
|    | H/V     | 4824.00         | 36.35                      | 2.70                  | 54.00          | 17.65       | AV       |
| M  | H/V     | 4874.00         | 41.28                      | 2.67                  | 74.00          | 32.72       | PK       |
|    | H/V     | 4874.00         | 36.61                      | 2.67                  | 54.00          | 17.39       | AV       |
| H  | H/V     | 2483.50         | 52.44                      | 31.19                 | 74.00          | 21.56       | PK       |
|    | H/V     | 2483.50         | 42.86                      | 31.19                 | 54.00          | 11.14       | AV       |
|    | H/V     | 4924.00         | 41.32                      | 2.77                  | 74.00          | 32.68       | PK       |
|    | H/V     | 4924.00         | 36.93                      | 2.77                  | 54.00          | 17.07       | AV       |

### 802.11g

| CH | Antenna | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|----|---------|-----------------|----------------------------|-----------------------|----------------|-------------|----------|
| L  | H/V     | 2390.00         | 50.78                      | 31.20                 | 74.00          | 23.22       | PK       |
|    | H/V     | 2390.00         | 41.42                      | 31.20                 | 54.00          | 12.58       | AV       |
|    | H/V     | 4824.00         | 42.53                      | 2.70                  | 74.00          | 31.47       | PK       |
|    | H/V     | 4824.00         | 37.65                      | 2.70                  | 54.00          | 16.35       | AV       |
| M  | H/V     | 4874.00         | 42.56                      | 2.67                  | 74.00          | 31.44       | PK       |
|    | H/V     | 4874.00         | 37.63                      | 2.67                  | 54.00          | 16.37       | AV       |
| H  | H/V     | 2483.50         | 51.27                      | 31.19                 | 74.00          | 22.73       | PK       |
|    | H/V     | 2483.50         | 42.02                      | 31.19                 | 54.00          | 11.98       | AV       |
|    | H/V     | 4924.00         | 42.71                      | 2.77                  | 74.00          | 31.29       | PK       |
|    | H/V     | 4924.00         | 37.88                      | 2.77                  | 54.00          | 16.12       | AV       |

# TEST REPORT

802.11n(HT20)

| CH | Antenna | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|----|---------|-----------------|----------------------------|-----------------------|----------------|-------------|----------|
| L  | H/V     | 2390.00         | 50.66                      | 31.20                 | 74.00          | 23.34       | PK       |
|    | H/V     | 2390.00         | 40.36                      | 31.20                 | 54.00          | 13.64       | AV       |
|    | H/V     | 4824.00         | 40.57                      | 2.70                  | 74.00          | 33.43       | PK       |
|    | H/V     | 4824.00         | 35.24                      | 2.70                  | 54.00          | 18.76       | AV       |
| M  | H/V     | 4874.00         | 40.43                      | 2.67                  | 74.00          | 33.57       | PK       |
|    | H/V     | 4874.00         | 35.15                      | 2.67                  | 54.00          | 18.85       | AV       |
| H  | H/V     | 2483.50         | 51.73                      | 31.19                 | 74.00          | 22.27       | PK       |
|    | H/V     | 2483.50         | 42.17                      | 31.19                 | 54.00          | 11.83       | AV       |
|    | H/V     | 4924.00         | 41.11                      | 2.77                  | 74.00          | 32.89       | PK       |
|    | H/V     | 4924.00         | 36.28                      | 2.77                  | 54.00          | 17.72       | AV       |

- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.  
2. Corrected Reading = Original Receiver Reading + Correct Factor  
3. Margin = Limit - Corrected Reading  
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,  
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,  
Limit = 40.00dBuV/m.  
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;  
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;  
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

## 8 Power line conducted emission

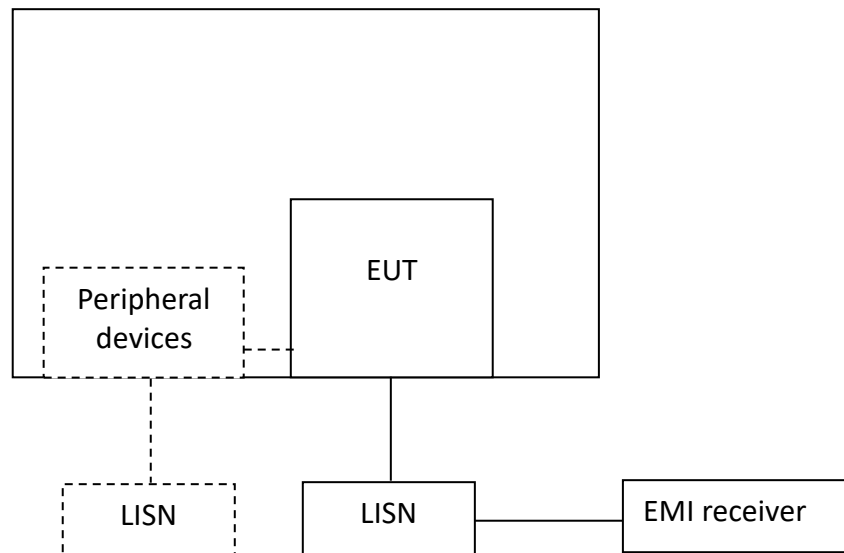
Test result: Pass

### 8.1 Limit

| Frequency of Emission (MHz) | Conducted Limit (dBuV) |            |
|-----------------------------|------------------------|------------|
|                             | QP                     | AV         |
| 0.15-0.5                    | 66 to 56*              | 56 to 46 * |
| 0.5-5                       | 56                     | 46         |
| 5-30                        | 60                     | 50         |

\* Decreases with the logarithm of the frequency.

### 8.2 Test Configuration



**TEST REPORT****8.3 Measurement Procedure**

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50  $\Omega$  LISN port (to which the EUT is connected), where permitted, terminated into a 50  $\Omega$  measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50  $\Omega$  measuring port is terminated by a measuring instrument having 50  $\Omega$  input impedance. All other ports are terminated in 50  $\Omega$  loads.

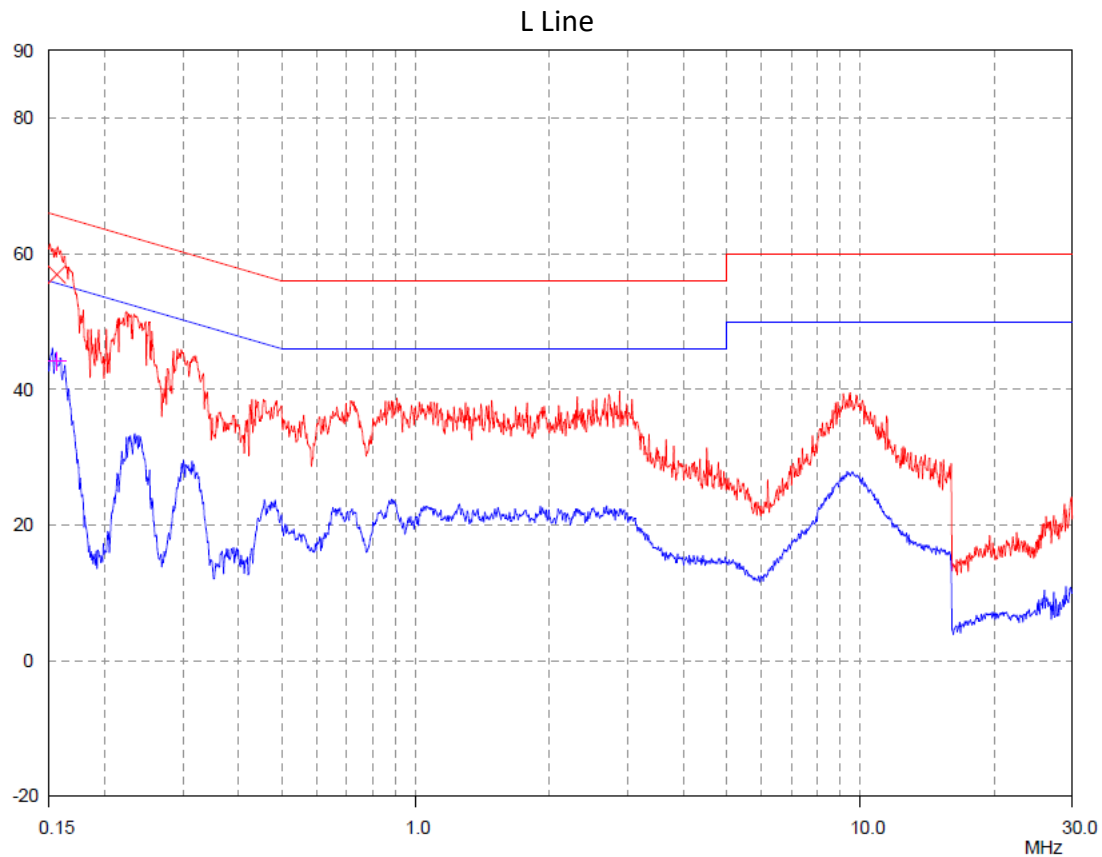
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

## 8.4 Test Results of Power line conducted emission

### Charging mode

#### Test Curve:



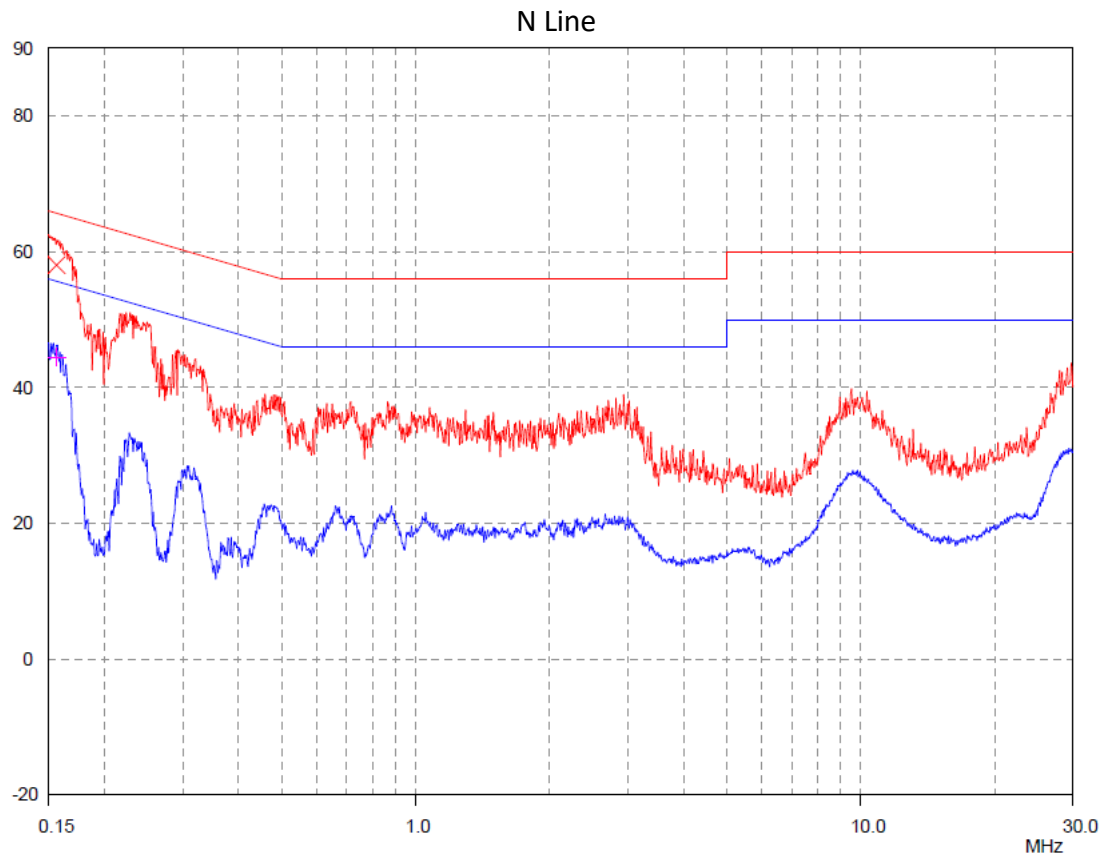
#### Test Data:

| Frequency<br>(MHz) | Quasi-peak      |                 |                | Average         |                 |                |
|--------------------|-----------------|-----------------|----------------|-----------------|-----------------|----------------|
|                    | level<br>dB(μV) | Limit<br>dB(μV) | Margin<br>(dB) | level<br>dB(μV) | limit<br>dB(μV) | Margin<br>(dB) |
| 0.16               | 56.94           | 65.67           | 8.73           | *               | 55.67           | *              |
| 0.31               | *               | 59.98           | *              | *               | 49.98           | *              |
| 0.46               | *               | 56.67           | *              | *               | 46.67           | *              |
| 0.62               | *               | 56.00           | *              | *               | 46.00           | *              |
| 6.50               | *               | 60.00           | *              | *               | 50.00           | *              |
| 19.40              | *               | 60.00           | *              | *               | 50.00           | *              |

Note: \*means margin is more than 10dB.

## TEST REPORT

### Test Curve:



### Test Data:

| Frequency<br>(MHz) | Quasi-peak      |                 |                | Average         |                 |                |
|--------------------|-----------------|-----------------|----------------|-----------------|-----------------|----------------|
|                    | level<br>dB(μV) | Limit<br>dB(μV) | Margin<br>(dB) | level<br>dB(μV) | limit<br>dB(μV) | Margin<br>(dB) |
| 0.16               | 58.04           | 65.67           | 7.63           | *               | 55.67           | *              |
| 0.31               | *               | 59.98           | *              | *               | 49.98           | *              |
| 0.46               | *               | 56.67           | *              | *               | 46.67           | *              |
| 0.62               | *               | 56.00           | *              | *               | 46.00           | *              |
| 6.50               | *               | 60.00           | *              | *               | 50.00           | *              |
| 19.40              | *               | 60.00           | *              | *               | 50.00           | *              |

Note: \*means margin is more than 10dB.

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

## 9 Occupied Bandwidth

**Test result:**      **Tested**

### 9.1 Limit

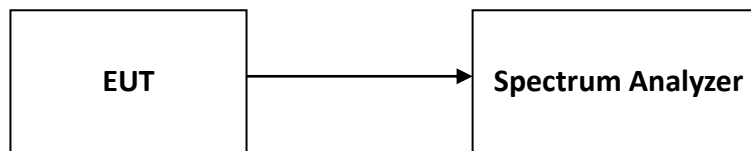
None

### 9.2 Measurement Procedure

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

### 9.3 Test Configuration



### 9.4 The results of Occupied Bandwidth

Please refer to Appendix A

## 10 Antenna requirement

**Requirement:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

**Result:**

EUT uses a permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

# TEST REPORT

## Appendix A: Test results

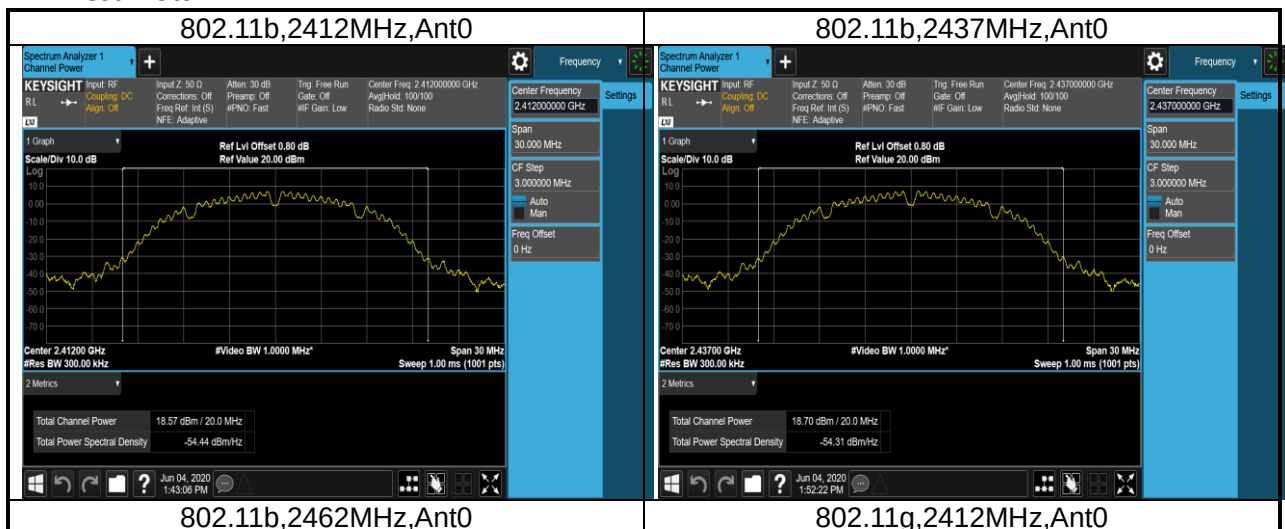
### 1. RF Output Power

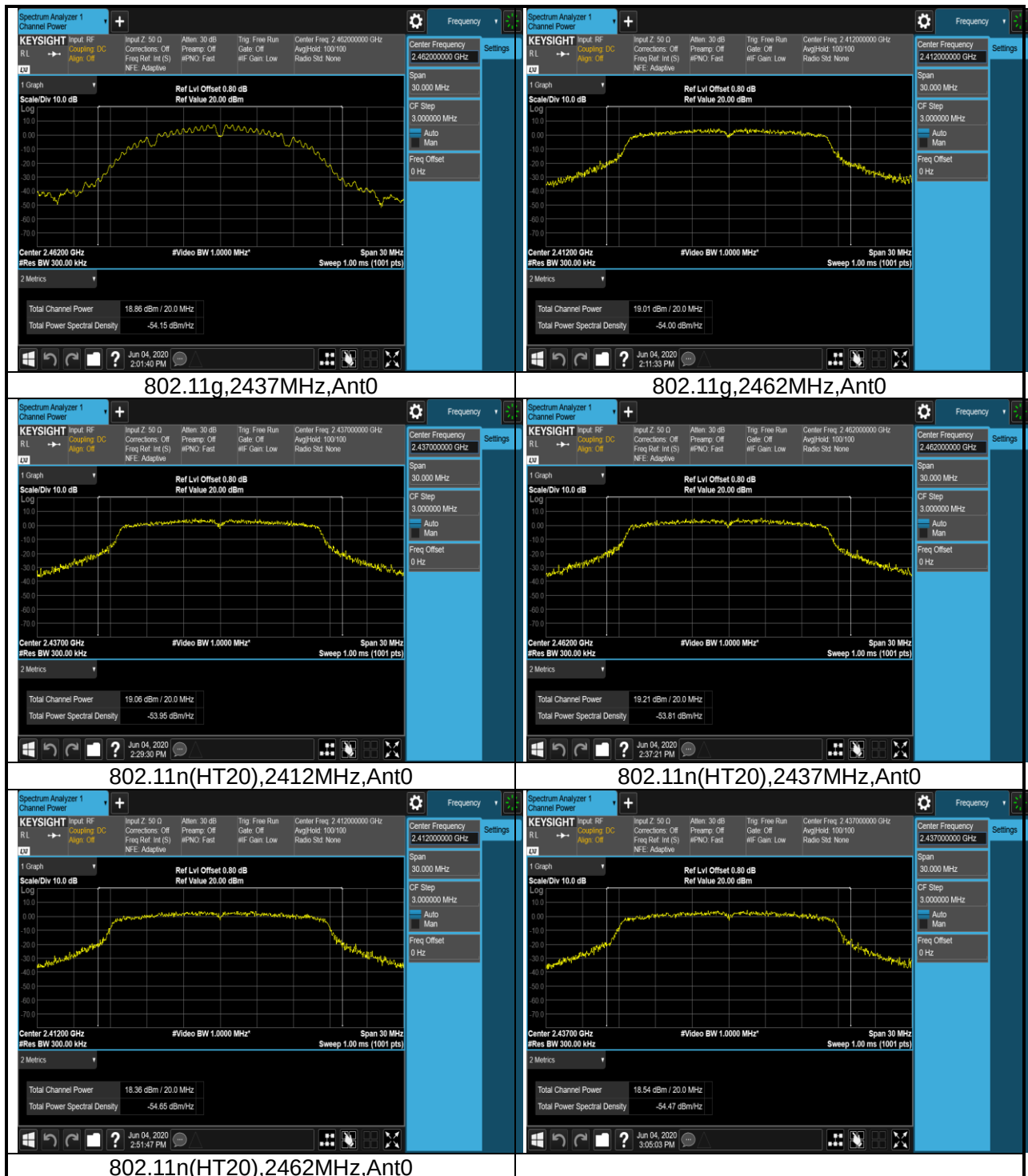
#### 1.1 Test Result and Data

| WLAN Peak Output Power |                      |      |                 |             |            |        |
|------------------------|----------------------|------|-----------------|-------------|------------|--------|
| Mode                   | Test Frequency (MHz) | Ant  | Max Power (dBm) | Limit (dBm) | EIRP (dBm) | Result |
| 802.11b                | 2412                 | Ant0 | 18.57           | 30          | 21.17      | Pass   |
| 802.11b                | 2437                 | Ant0 | 18.70           | 30          | 21.30      | Pass   |
| 802.11b                | 2462                 | Ant0 | 18.86           | 30          | 21.46      | Pass   |
| 802.11g                | 2412                 | Ant0 | 19.31           | 30          | 21.91      | Pass   |
| 802.11g                | 2437                 | Ant0 | 19.45           | 30          | 22.05      | Pass   |
| 802.11g                | 2462                 | Ant0 | 19.51           | 30          | 22.11      | Pass   |
| 802.11n (HT20)         | 2412                 | Ant0 | 18.68           | 30          | 21.28      | Pass   |
| 802.11n (HT20)         | 2437                 | Ant0 | 18.86           | 30          | 21.46      | Pass   |
| 802.11n (HT20)         | 2462                 | Ant0 | 19.03           | 30          | 21.63      | Pass   |

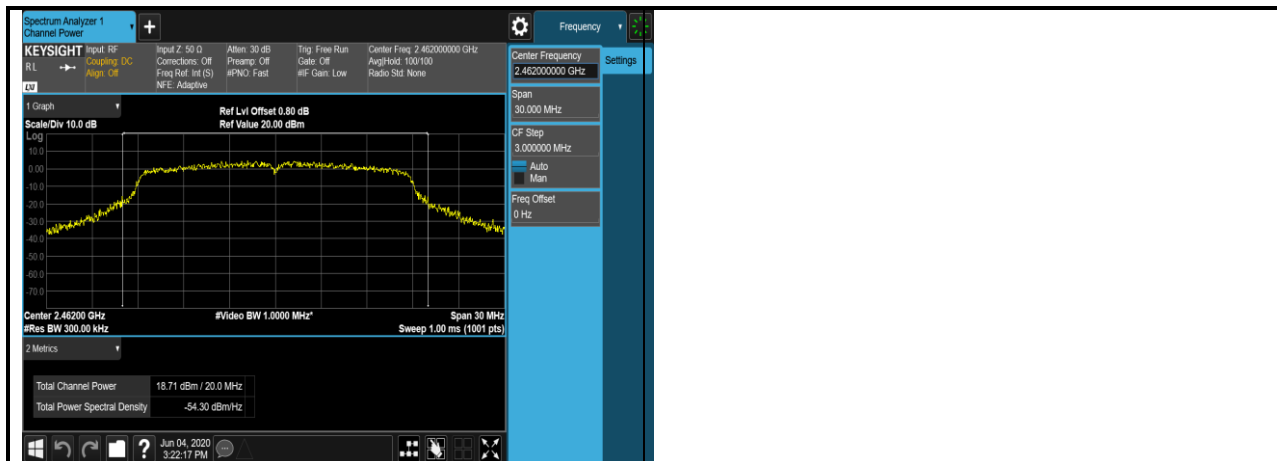
Conclusion: The maximum EIRP = 19.51dBm+2.6dBi = 22.11dBm = 0.163W which is lower than the limit of 4W listed in RSS-247.

#### 1.2 Test Plots





# TEST REPORT



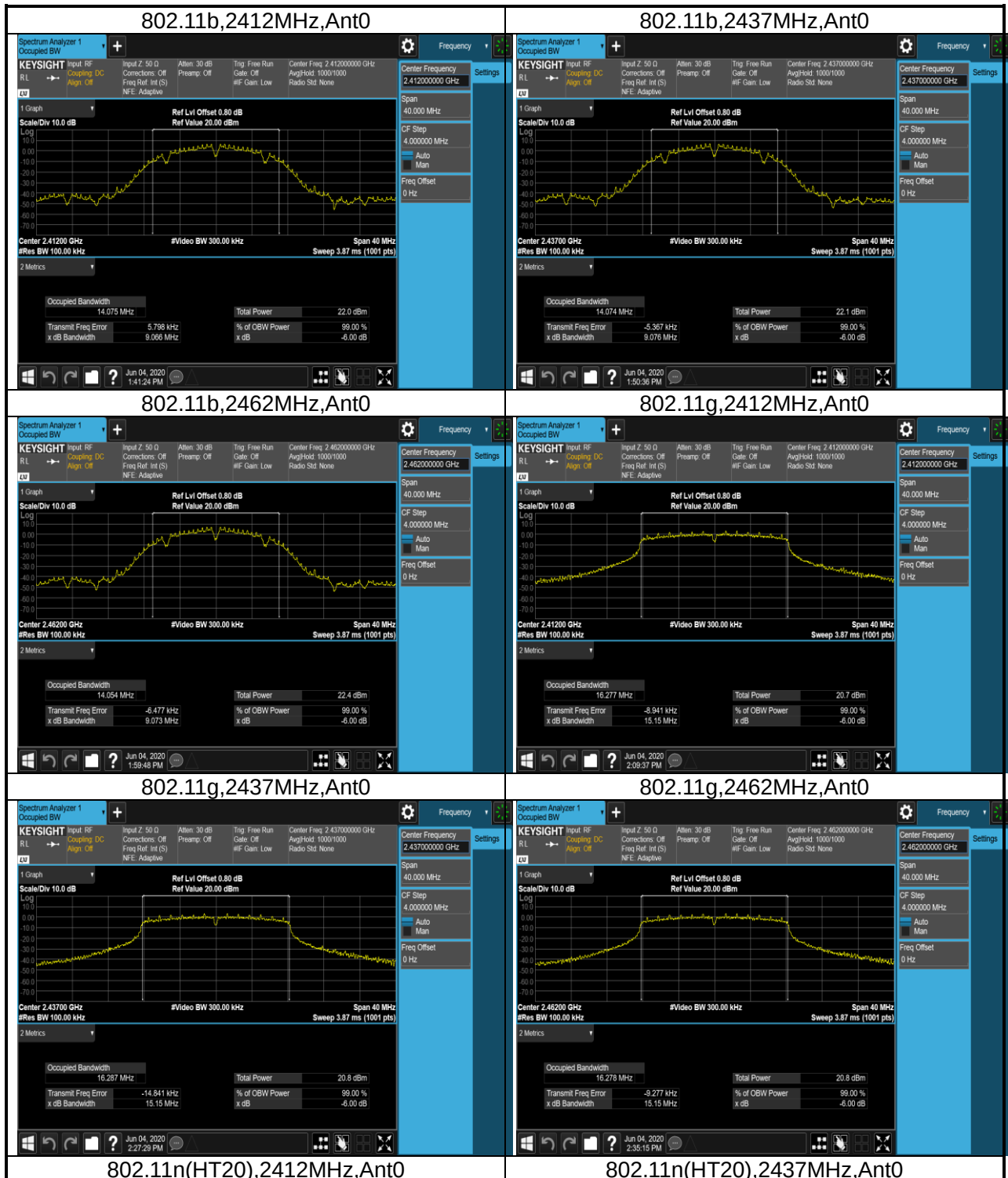
## 2. Minimum 6dB bandwidth

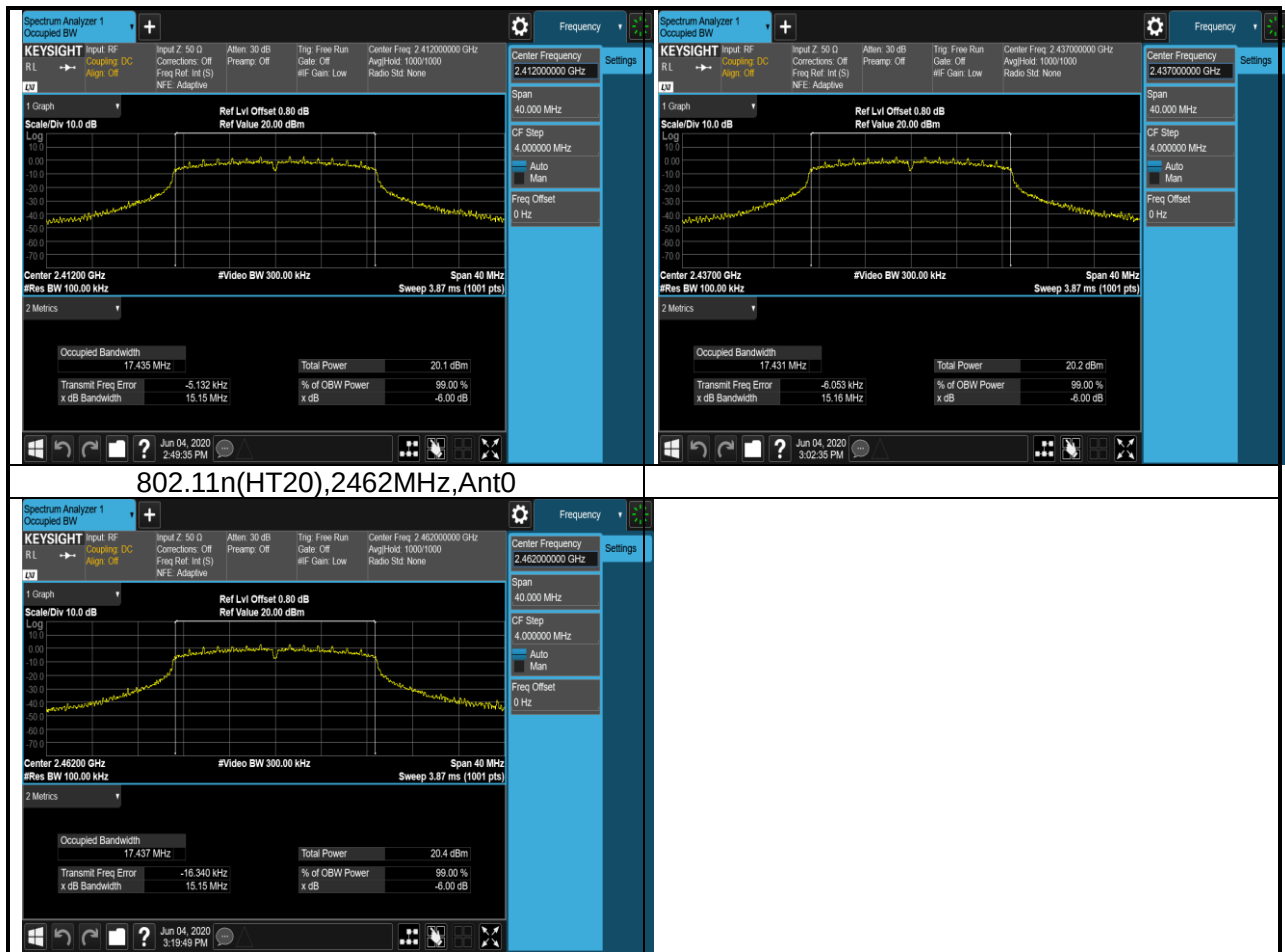
### 2.1 Test Result and Data

| WLAN Occupied 6dB Bandwidth |                      |      |                          |        |
|-----------------------------|----------------------|------|--------------------------|--------|
| Mode                        | Test Frequency (MHz) | Ant  | Occupied Bandwidth (MHz) | Result |
| 802.11b                     | 2412                 | Ant0 | 9.07                     | Pass   |
| 802.11b                     | 2437                 | Ant0 | 9.08                     | Pass   |
| 802.11b                     | 2462                 | Ant0 | 9.07                     | Pass   |
| 802.11g                     | 2412                 | Ant0 | 15.15                    | Pass   |
| 802.11g                     | 2437                 | Ant0 | 15.15                    | Pass   |
| 802.11g                     | 2462                 | Ant0 | 15.15                    | Pass   |
| 802.11n (HT20)              | 2412                 | Ant0 | 15.15                    | Pass   |
| 802.11n (HT20)              | 2437                 | Ant0 | 15.16                    | Pass   |
| 802.11n (HT20)              | 2462                 | Ant0 | 15.15                    | Pass   |

# TEST REPORT

## 2.2 Test Plots



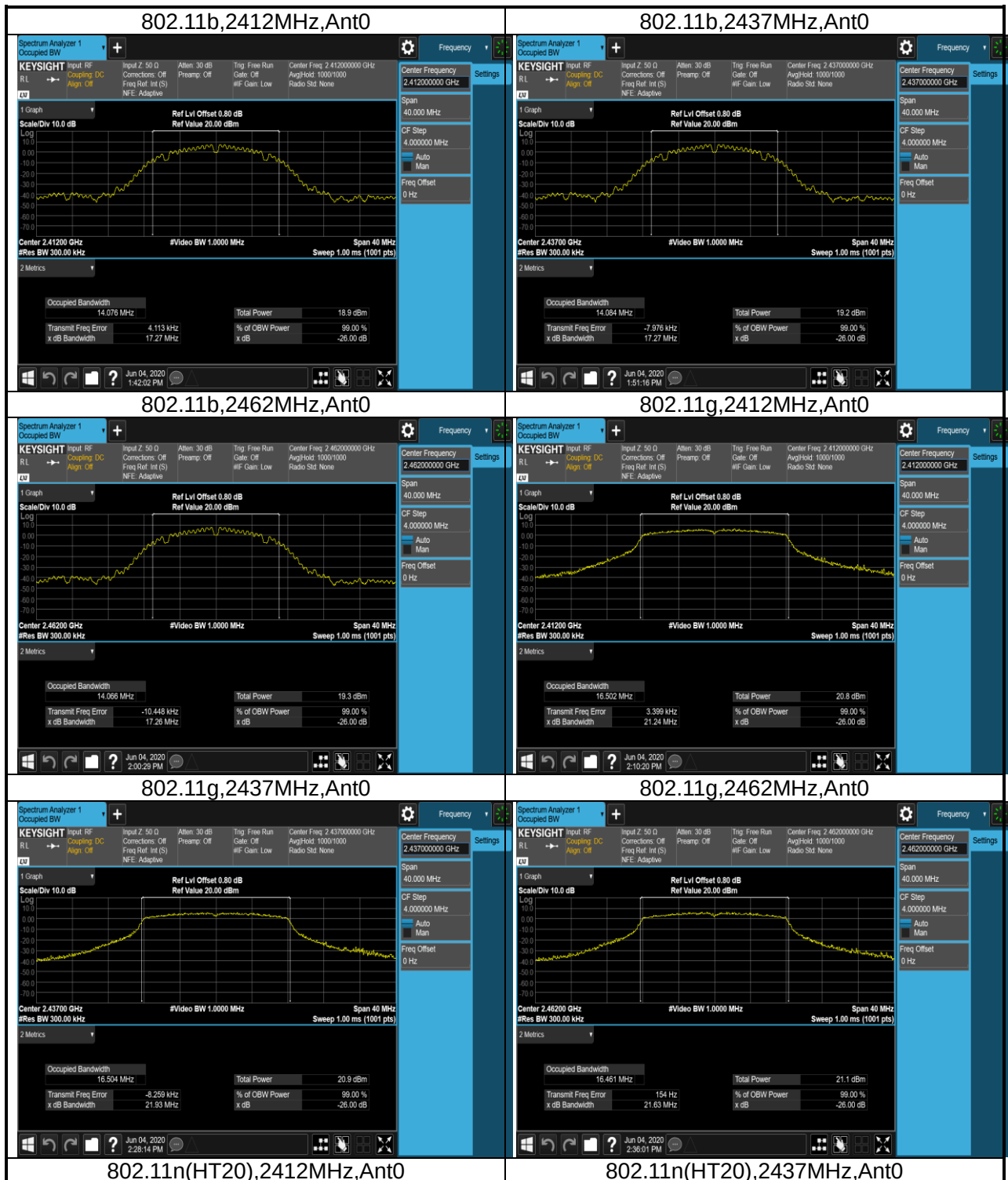


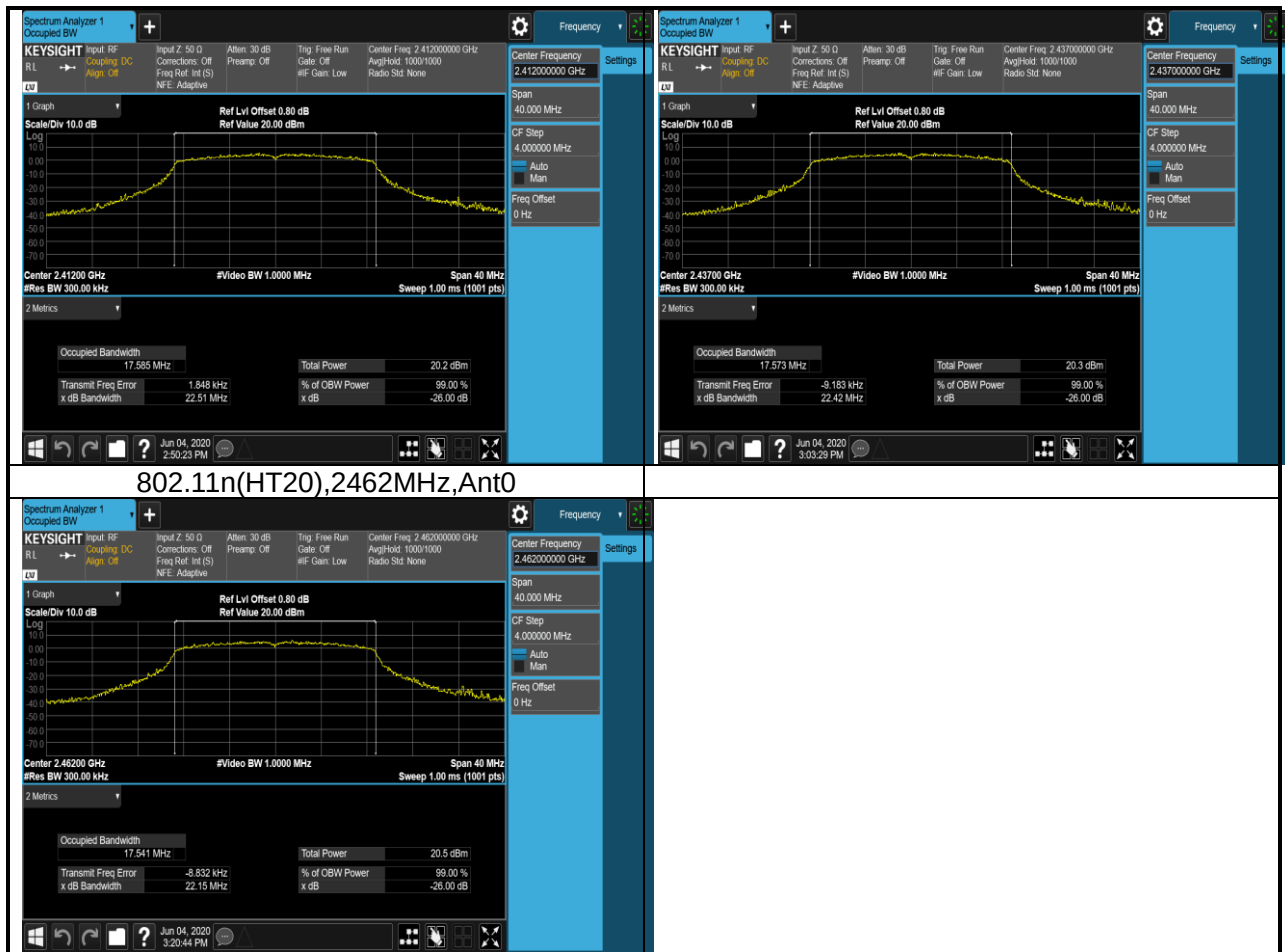
### 3. Occupied Bandwidth

#### 3.1 Test Result and Data

| WLAN 99% Occupied Bandwidth |                      |      |                              |        |
|-----------------------------|----------------------|------|------------------------------|--------|
| Mode                        | Test Frequency (MHz) | Ant  | 99% Occupied Bandwidth (MHz) | Result |
| 802.11b                     | 2412                 | Ant0 | 14.076                       | Pass   |
| 802.11b                     | 2437                 | Ant0 | 14.084                       | Pass   |
| 802.11b                     | 2462                 | Ant0 | 14.066                       | Pass   |
| 802.11g                     | 2412                 | Ant0 | 16.502                       | Pass   |
| 802.11g                     | 2437                 | Ant0 | 16.504                       | Pass   |
| 802.11g                     | 2462                 | Ant0 | 16.461                       | Pass   |
| 802.11n (HT20)              | 2412                 | Ant0 | 17.585                       | Pass   |
| 802.11n (HT20)              | 2437                 | Ant0 | 17.573                       | Pass   |
| 802.11n (HT20)              | 2462                 | Ant0 | 17.541                       | Pass   |

### 3.2 Test Plots



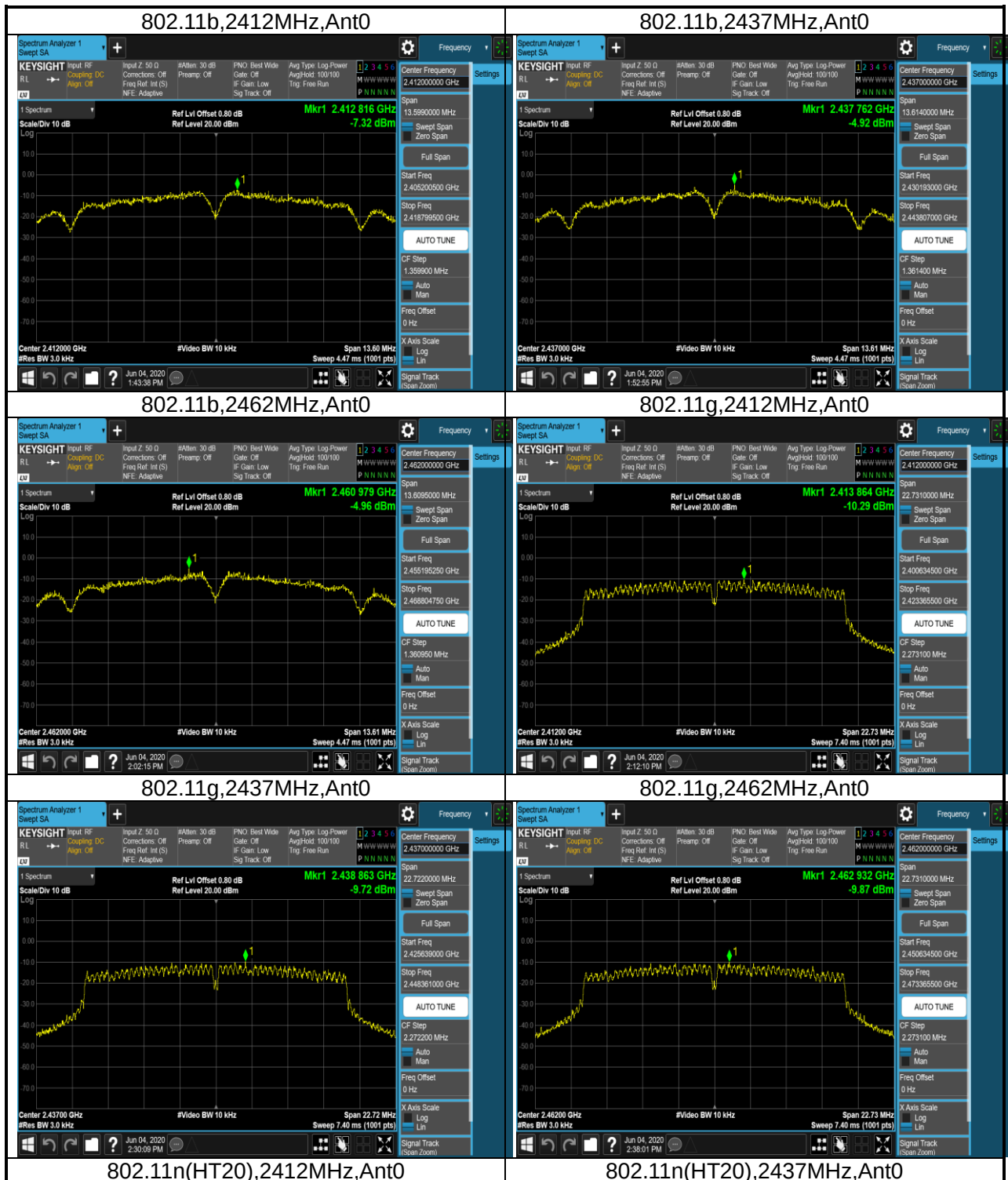


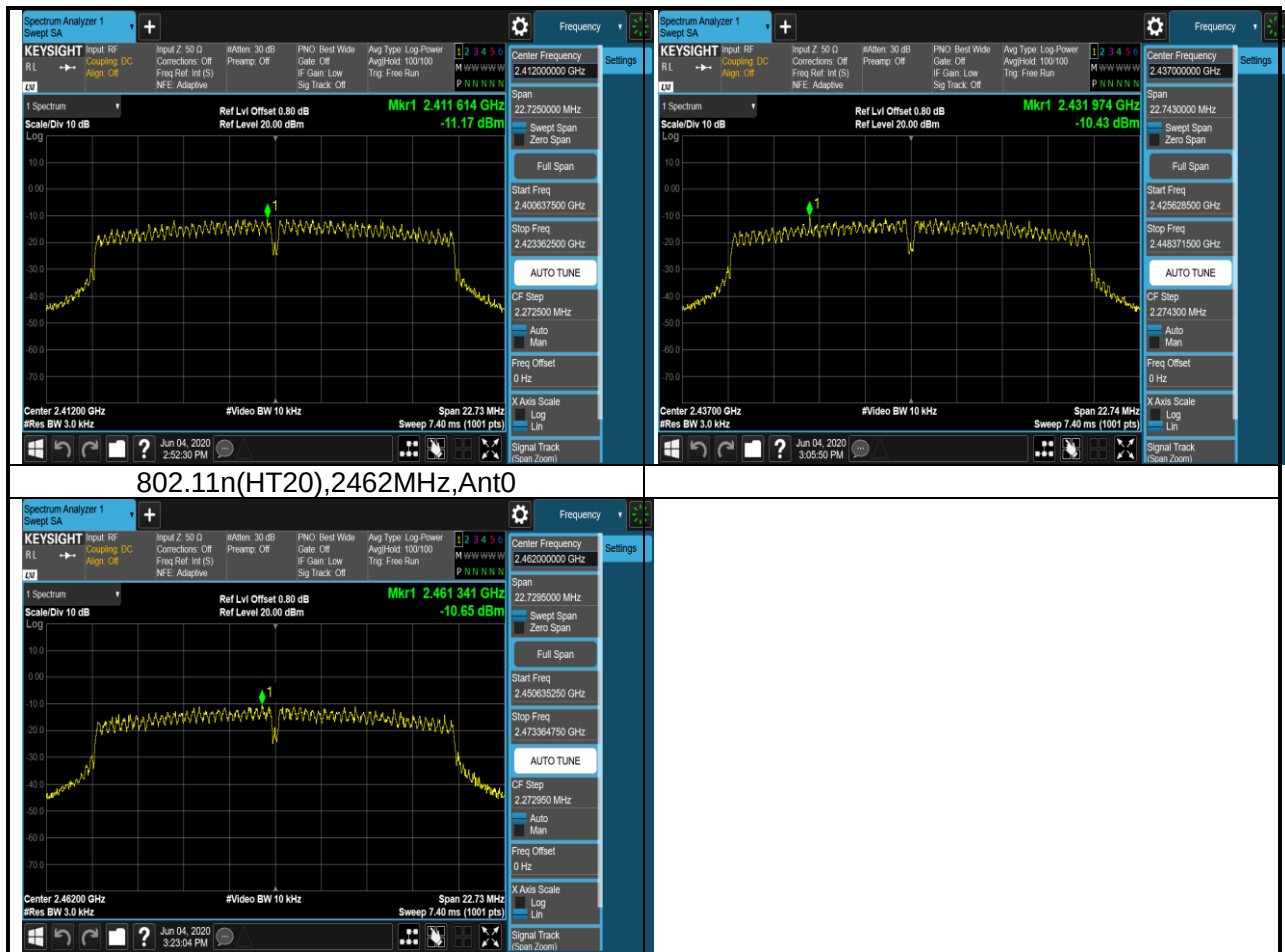
#### 4. Power Spectral Density

##### 4.1 Test Result and Data

| WLAN Peak Power Spectral Density |                      |      |           |           |             |        |
|----------------------------------|----------------------|------|-----------|-----------|-------------|--------|
| Mode                             | Test Frequency (MHz) | Ant  | PSD (dBm) | RBW (kHz) | Limit (dBm) | Result |
| 802.11b                          | 2412                 | Ant0 | -7.319    | 3         | 8           | Pass   |
| 802.11b                          | 2437                 | Ant0 | -4.923    | 3         | 8           | Pass   |
| 802.11b                          | 2462                 | Ant0 | -4.960    | 3         | 8           | Pass   |
| 802.11g                          | 2412                 | Ant0 | -9.995    | 3         | 8           | Pass   |
| 802.11g                          | 2437                 | Ant0 | -9.328    | 3         | 8           | Pass   |
| 802.11g                          | 2462                 | Ant0 | -9.568    | 3         | 8           | Pass   |
| 802.11n (HT20)                   | 2412                 | Ant0 | -10.849   | 3         | 8           | Pass   |
| 802.11n (HT20)                   | 2437                 | Ant0 | -10.107   | 3         | 8           | Pass   |
| 802.11n (HT20)                   | 2462                 | Ant0 | -10.331   | 3         | 8           | Pass   |

## 4.2 Test Plots





## TEST REPORT

### 5. Emission outside the frequency band

#### 5.1 Test Result and Data

| WLAN Transmitter Spurious Emission |                      |      |          |                  |                |        |
|------------------------------------|----------------------|------|----------|------------------|----------------|--------|
| Mode                               | Test Frequency (MHz) | Ant  | Plot No. | Frequency Range  | Emission (dBm) | Result |
| 802.11b                            | 2412                 | Ant0 | 1        | Reference Level  | 6.76           | Pass   |
| 802.11b                            | 2412                 | Ant0 | 2        | Band Edge        | -38.84         | Pass   |
| 802.11b                            | 2412                 | Ant0 | 3        | 30MHz~2310MHz    | -57.82         | Pass   |
| 802.11b                            | 2412                 | Ant0 | 4        | 2500MHz~5000MHz  | -55.50         | Pass   |
| 802.11b                            | 2412                 | Ant0 | 5        | 5000MHz~25000MHz | -42.58         | Pass   |
| 802.11b                            | 2437                 | Ant0 | 1        | Reference Level  | 6.92           | Pass   |
| 802.11b                            | 2437                 | Ant0 | 2        | Band Edge        | -54.92         | Pass   |
| 802.11b                            | 2437                 | Ant0 | 3        | 30MHz~2310MHz    | -58.08         | Pass   |
| 802.11b                            | 2437                 | Ant0 | 4        | 2500MHz~5000MHz  | -54.77         | Pass   |
| 802.11b                            | 2437                 | Ant0 | 5        | 5000MHz~25000MHz | -41.37         | Pass   |
| 802.11b                            | 2462                 | Ant0 | 1        | Reference Level  | 7.04           | Pass   |
| 802.11b                            | 2462                 | Ant0 | 2        | Band Edge        | -49.55         | Pass   |
| 802.11b                            | 2462                 | Ant0 | 3        | 30MHz~2310MHz    | -58.12         | Pass   |
| 802.11b                            | 2462                 | Ant0 | 4        | 2500MHz~5000MHz  | -55.07         | Pass   |
| 802.11b                            | 2462                 | Ant0 | 5        | 5000MHz~25000MHz | -42.42         | Pass   |
| 802.11g                            | 2412                 | Ant0 | 1        | Reference Level  | 3.19           | Pass   |
| 802.11g                            | 2412                 | Ant0 | 2        | Band Edge        | -30.23         | Pass   |
| 802.11g                            | 2412                 | Ant0 | 3        | 30MHz~2310MHz    | -57.92         | Pass   |
| 802.11g                            | 2412                 | Ant0 | 4        | 2500MHz~5000MHz  | -55.41         | Pass   |
| 802.11g                            | 2412                 | Ant0 | 5        | 5000MHz~25000MHz | -42.35         | Pass   |
| 802.11g                            | 2437                 | Ant0 | 1        | Reference Level  | 3.39           | Pass   |
| 802.11g                            | 2437                 | Ant0 | 2        | Band Edge        | -53.71         | Pass   |
| 802.11g                            | 2437                 | Ant0 | 3        | 30MHz~2310MHz    | -58.55         | Pass   |
| 802.11g                            | 2437                 | Ant0 | 4        | 2500MHz~5000MHz  | -54.96         | Pass   |
| 802.11g                            | 2437                 | Ant0 | 5        | 5000MHz~25000MHz | -42.09         | Pass   |
| 802.11g                            | 2462                 | Ant0 | 1        | Reference Level  | 3.37           | Pass   |
| 802.11g                            | 2462                 | Ant0 | 2        | Band Edge        | -44.60         | Pass   |

# TEST REPORT

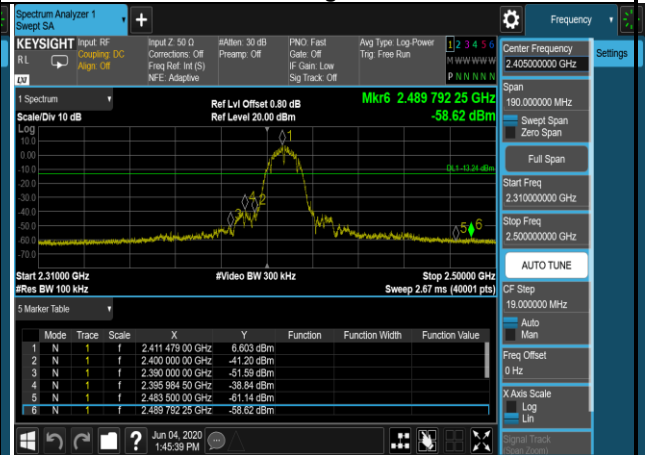
|                   |      |      |   |                  |        |      |
|-------------------|------|------|---|------------------|--------|------|
| 802.11g           | 2462 | Ant0 | 3 | 30MHz~2310MHz    | -58.22 | Pass |
| 802.11g           | 2462 | Ant0 | 4 | 2500MHz~5000MHz  | -55.05 | Pass |
| 802.11g           | 2462 | Ant0 | 5 | 5000MHz~25000MHz | -42.40 | Pass |
| 802.11n<br>(HT20) | 2412 | Ant0 | 1 | Reference Level  | 2.63   | Pass |
| 802.11n<br>(HT20) | 2412 | Ant0 | 2 | Band Edge        | -31.62 | Pass |
| 802.11n<br>(HT20) | 2412 | Ant0 | 3 | 30MHz~2310MHz    | -58.02 | Pass |
| 802.11n<br>(HT20) | 2412 | Ant0 | 4 | 2500MHz~5000MHz  | -54.70 | Pass |
| 802.11n<br>(HT20) | 2412 | Ant0 | 5 | 5000MHz~25000MHz | -41.70 | Pass |
| 802.11n<br>(HT20) | 2437 | Ant0 | 1 | Reference Level  | 2.74   | Pass |
| 802.11n<br>(HT20) | 2437 | Ant0 | 2 | Band Edge        | -54.63 | Pass |
| 802.11n<br>(HT20) | 2437 | Ant0 | 3 | 30MHz~2310MHz    | -58.14 | Pass |
| 802.11n<br>(HT20) | 2437 | Ant0 | 4 | 2500MHz~5000MHz  | -55.09 | Pass |
| 802.11n<br>(HT20) | 2437 | Ant0 | 5 | 5000MHz~25000MHz | -41.97 | Pass |
| 802.11n<br>(HT20) | 2462 | Ant0 | 1 | Reference Level  | 2.90   | Pass |
| 802.11n<br>(HT20) | 2462 | Ant0 | 2 | Band Edge        | -44.44 | Pass |
| 802.11n<br>(HT20) | 2462 | Ant0 | 3 | 30MHz~2310MHz    | -58.41 | Pass |
| 802.11n<br>(HT20) | 2462 | Ant0 | 4 | 2500MHz~5000MHz  | -55.32 | Pass |
| 802.11n<br>(HT20) | 2462 | Ant0 | 5 | 5000MHz~25000MHz | -41.69 | Pass |

## 5.2 Test plots

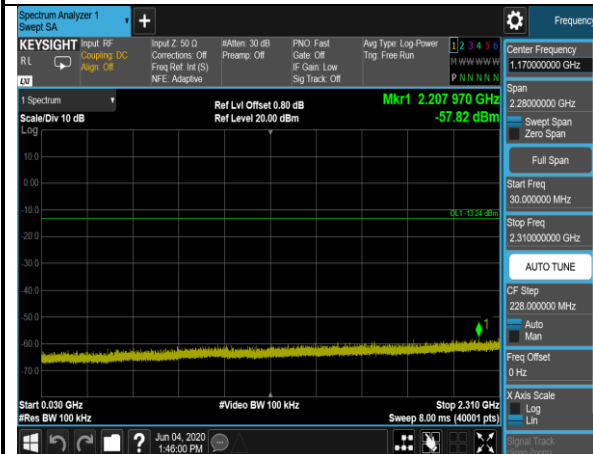
802.11b,2412MHz,Ant0,Plot 1,Reference Level



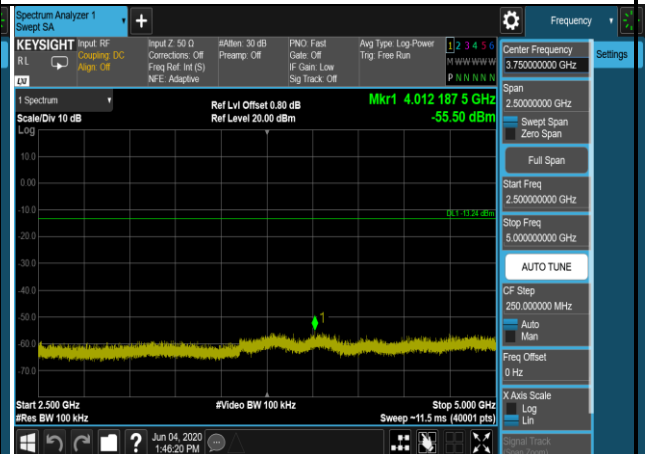
802.11b,2412MHz,Ant0,Plot 2,Band Edge



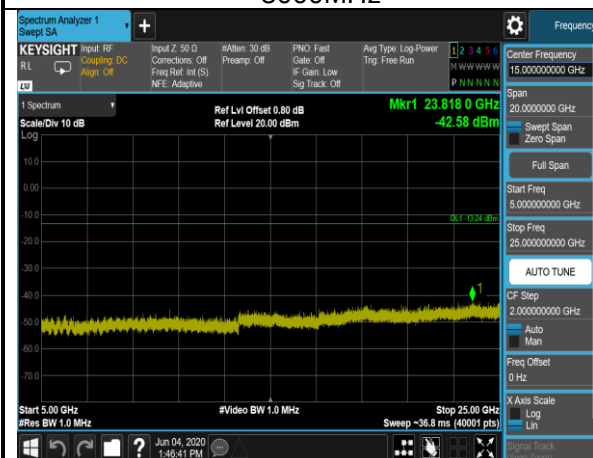
802.11b,2412MHz,Ant0,Plot 3,30MHz~2310MHz



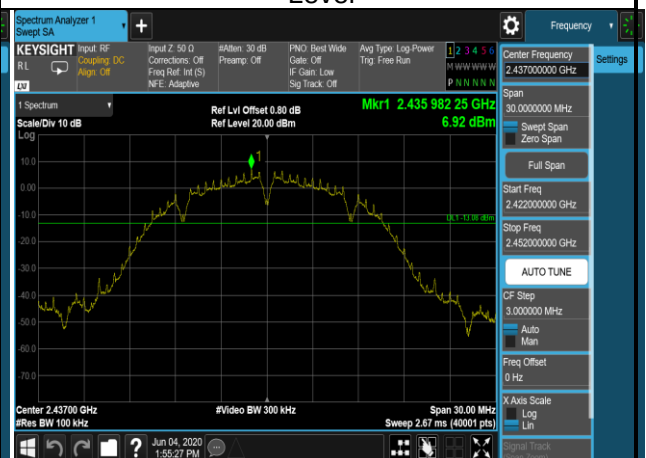
802.11b,2412MHz,Ant0,Plot 4,2500MHz~5000MHz



802.11b,2412MHz,Ant0,Plot 5,5000MHz~25000MHz



802.11b,2437MHz,Ant0,Plot 1,Reference Level



802.11b,2437MHz,Ant0,Plot 2,Band Edge

802.11b,2437MHz,Ant0,Plot 3,30MHz~2310MHz