



# FCC Part 15C&RSS-247 Test Report

## FCC ID:2BBAJ-R2

## IC:30615-R2

Applicant: HERMAN INNOVATIONS TECHNOLOGY CO., LIMITED

Address: UNIT 83, 3/F, YAU LEE CENTRE NO. 45 HOI YUEN ROAD KWUN TONG KOWLOON.  
HONG KONG China

Manufacturer: HERMAN INNOVATIONS TECHNOLOGY CO., LIMITED

Address: UNIT 83, 3/F, YAU LEE CENTRE NO. 45 HOI YUEN ROAD KWUN TONG KOWLOON.  
HONG KONG China

EUT: DASH CAM

Trade Mark: POFOTO

Model Number: R2, S1, S2, S4, R1, R2Pro, R4L, R4, R4Pro, N1, N2, N2Pro, N4L, N4, N4Pro, M1, M2, M3, M4, G4

Date of Receipt: May 08, 2023

Test Date: May 08, 2023 - May 26, 2023

Date of Report: May 29, 2023

Prepared By: Shenzhen DL Testing Technology Co., Ltd.

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FCC PART 15 C 15.247

Applicable Standards: RSS-247 Issue 2: February 2017,  
RSS-Gen Issue 5 April 2019  
ANSI C63.4:2014

Test Result: Pass

Report Number: DL-20230519035E

Prepared (Test Engineer): Pxing Huang

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Approved (Manager): Jade Yang



*This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.*



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## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| FCC Part15 (15.247) , Subpart C<br>RSS-247 Issue 2: February 2017<br>RSS-Gen Issue 5 April 2019 |                                |          |        |
|-------------------------------------------------------------------------------------------------|--------------------------------|----------|--------|
| Standard Section                                                                                | Test Item                      | Judgment | Remark |
| 15.207<br>RSS-Gen 8.8                                                                           | Conducted Emission             | N/A      |        |
| 15.209(a)<br>RSS-Gen §6.13                                                                      | Radiated Spurious Emission     | PASS     |        |
| FCC part 15.247(d)<br>RSS-247 5.5                                                               | Band Edge Emission             | PASS     |        |
| 15.247(b)(1)<br>RSS-247 5.4(d)                                                                  | Peak Output Power              | PASS     |        |
| 15.247(a)(2)<br>RSS-247 5.2(a)                                                                  | 6dB Bandwidth& 99% OCB         | PASS     |        |
| FCC part 15.247 (e)<br>RSS-247 5.2(b)                                                           | Power Spectral Density         | PASS     |        |
| FCC part 15.247(d)<br>RSS-Gen 8.9                                                               | Spurious RF Conducted Emission | PASS     |        |
| FCC part 15.203/15.247 (c)<br>RSS-Gen 6.8                                                       | Antenna Requirement            | PASS     |        |

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

### 1.1 TEST FACILITY

Shenzhen DL Testing Technology Co., Ltd.

Add. : 101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China

FCC Test Firm Registration Number: 854456

Designation Number: CN1307

ISED Registration number: 27485

IC Registered No.:CN0118

### 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| No. | Item                         | Uncertainty               |
|-----|------------------------------|---------------------------|
| 1   | Conducted Emission Test      | $\pm 2.56\text{dB}$       |
| 2   | RF power,conducted           | $\pm 0.42\text{dB}$       |
| 3   | Spurious emissions,conducted | $\pm 2.76\text{dB}$       |
| 4   | All emissions,radiated(<1G)  | $\pm 3.65\text{dB}$       |
| 5   | All emissions,radiated(>1G)  | $\pm 4.89\text{dB}$       |
| 6   | Temperature                  | $\pm 0.5^{\circ}\text{C}$ |
| 7   | Humidity                     | $\pm 2\%$                 |



## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

|                        |                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Product Name:          | DASH CAM                                                                                                                       |
| Model No.:             | R2                                                                                                                             |
| Sample ID:             | DL-20230519035E-1#                                                                                                             |
| HVIN:                  | R2                                                                                                                             |
| Serial No.:            | S1, S2, S4, R1, R2Pro, R4L, R4, R4Pro, N1, N2, N2Pro, N4L, N4, N4Pro, M1, M2, M3, M4, G4                                       |
| Model Difference       | All PCB board, circuit, structure and internal of these model(s) are the same, Only model number is different for these model. |
| Operation Frequency:   | 2412~2462 MHz for 802.11b/g/nHT20<br>2422~2452 MHz for 802.11nHT40                                                             |
| Channel numbers:       | 11 Channels for 802.11b/g/n(HT20)<br>7 channels for 802.11nHT40                                                                |
| Channel separation:    | 5MHz                                                                                                                           |
| Modulation technology: | 802.11b: DSSS (CCK, DQPSK, DBPSK)<br>802.11g/n(20): DSSS (CCK, DQPSK,DBPSK)+OFDM<br>(QPSK, BPSK, 16-QAM, 64-QAM)               |
| Rate of Transmitter    | 802.11b: 11/5.5/2/1Mbps<br>802.11g: 54/48/36/24/18/12/9/6Mbps<br>802.11n: up to 150Mbps                                        |
| Antenna Type:          | Internal Antenna                                                                                                               |
| Antenna gain:          | 3.29dBi                                                                                                                        |
| Power supply:          | DC 12V-24V From Battery                                                                                                        |

Note:

- 1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- 2.The EUT's all information provided by client.

#### 2. Channel List(802.11b/g/nHT20)

| Channel | Frequency (GHz) | Channel | Frequency (GHz) |
|---------|-----------------|---------|-----------------|
| 01      | 2.412           | 08      | 2.447           |
| 02      | 2.417           | 09      | 2.452           |
| 03      | 2.422           | 10      | 2.457           |
| 04      | 2.427           | 11      | 2.462           |
| 05      | 2.432           |         |                 |
| 06      | 2.437           |         |                 |
| 07      | 2.442           |         |                 |

#### Channel List(802.11nHT40)

| Channel | Frequency (GHz) | Channel | Frequency (GHz) |
|---------|-----------------|---------|-----------------|
| 03      | 2.422           | 08      | 2.447           |
| 04      | 2.427           | 09      | 2.452           |
| 05      | 2.432           |         |                 |
| 06      | 2.437           |         |                 |
| 07      | 2.442           |         |                 |



## 2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Pretest Mode | Description                |
|--------------|----------------------------|
| Mode 1       | 802.11b CH1/ CH6/ CH11     |
| Mode 2       | 802.11g CH1/ CH6/ CH11     |
| Mode 3       | 802.11nHT20 CH1/ CH6/ CH11 |
| Mode 4       | 802.11nHT40 CH3/ CH6/ CH09 |

| For Conducted & Radiated Emission |                            |
|-----------------------------------|----------------------------|
| Final Test Mode                   | Description                |
| Mode 1                            | 802.11b CH1/ CH6/ CH11     |
| Mode 2                            | 802.11g CH1/ CH6/ CH11     |
| Mode 3                            | 802.11nHT20 CH1/ CH6/ CH11 |
| Mode 4                            | 802.11nHT40 CH3/ CH6/ CH09 |

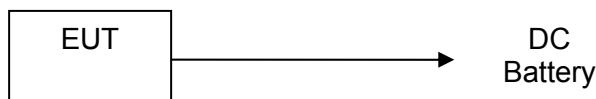
Note: 1. The measurements are performed at the highest, middle, lowest available channels.

2. During the test, the duty cycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

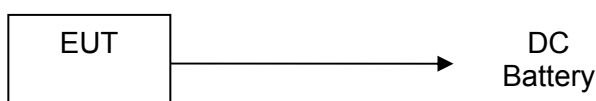


## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

### Radiated Spurious Emission Test



### Conducted Spurious Emission Test



## 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Item | Equipment | Model/Type No. | Series No. | Note |
|------|-----------|----------------|------------|------|
| E-1  | DASH CAM  | R2             | N/A        | EUT  |
| AE   | Notebook  | B40-80         | MP07F6JD   | AE   |

| Item | Shielded Type | Ferrite Core | Length | Note |
|------|---------------|--------------|--------|------|
|      |               |              |        |      |

Note:

- (1) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

## 2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the end product.

| Max output power Setting  |                         |         |              |              |
|---------------------------|-------------------------|---------|--------------|--------------|
| Test software Version     | Test program: SecuerCRT |         |              |              |
| Mode                      | 802.11b                 | 802.11g | 802.11n HT20 | 802.11n HT40 |
| Data Rate                 | 11Mbps                  | 54Mbps  | MSC0         | MSC0         |
| Power Setting of Softwave | 40                      | 40      | 40           | 40           |



## 2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

### Radiation test, Band-edge test and 6db bandwidth test equipment

| Item | Equipment                        | Manufacturer    | Type No.  | Serial No. | Last calibration | Calibrated until |
|------|----------------------------------|-----------------|-----------|------------|------------------|------------------|
| 1    | Spectrum Analyzer (9kHz-26.5GHz) | Agilent         | E4408B    | MY50140780 | Nov. 05, 2022    | Nov. 04, 2023    |
| 2    | Test Receiver (9kHz-7GHz)        | R&S             | ESRP7     | 101393     | Nov. 05, 2022    | Nov. 04, 2023    |
| 3    | Bilog Antenna (30MHz-1GHz)       | R&S             | VULB9162  | 00306      | Nov. 05, 2022    | Nov. 04, 2023    |
| 4    | Horn Antenna (1GHz-18GHz)        | Schwarzbeck     | BBHA9120D | 02139      | Nov. 05, 2022    | Nov. 04, 2023    |
| 5    | Horn Antenna (18GHz-40GHz)       | A.H. Systems    | SAS-574   | 588        | Nov. 05, 2022    | Nov. 04, 2023    |
| 6    | Amplifier (9KHz-6GHz)            | Schwarzbeck     | BBV9743B  | 00153      | Nov. 05, 2022    | Nov. 04, 2023    |
| 7    | Amplifier (1GHz-18GHz)           | EMEC            | EM01G8GA  | 00270      | Nov. 05, 2022    | Nov. 04, 2023    |
| 8    | Amplifier (18GHz-40GHz)          | Quanjuda        | DLE-161   | 97         | Nov. 05, 2022    | Nov. 04, 2023    |
| 9    | Loop Antenna (9KHz-30MHz)        | Schwarzbeck     | FMZB1519B | 00014      | Nov. 05, 2022    | Nov. 04, 2023    |
| 10   | RF cables1 (9kHz-1GHz)           | ChengYu         | 966       | 004        | Nov. 05, 2022    | Nov. 04, 2023    |
| 11   | RF cables2 (1GHz-40GHz)          | ChengYu         | 966       | 003        | Nov. 05, 2022    | Nov. 04, 2023    |
| 12   | Antenna connector                | Florida RF Labs | N/A       | RF 01#     | Nov. 05, 2022    | Nov. 04, 2023    |
| 13   | Power probe                      | KEYSIGHT        | U2021XA   | MY55210018 | Nov. 05, 2022    | Nov. 04, 2023    |
| 14   | Signal Analyzer 9kHz-26.5GHz     | Agilent         | N9020A    | MY55370280 | Nov. 05, 2022    | Nov. 04, 2023    |
| 15   | Test Receiver 20kHz-40GHz        | R&S             | ESU 40    | 100376     | Nov. 05, 2022    | Nov. 04, 2023    |
| 16   | D.C. Power Supply                | LongWei         | PS-305D   | 010964729  | Nov. 05, 2022    | Nov. 04, 2023    |
| 17   | Power Meter                      | Anritsu         | ML2495A   | N/A        | Nov. 05, 2022    | Nov. 04, 2023    |

### Conduction Test equipment

| Item | Equipment         | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|------|-------------------|--------------|----------|------------|------------------|------------------|
| 1    | 843 Shielded Room | ChengYu      | 843 Room | 843        | Sep. 20, 2022    | Sep. 19, 2025    |
| 2    | EMI Receiver      | R&S          | ESR      | 101421     | Nov. 05, 2022    | Nov. 04, 2023    |
| 3    | LISN              | R&S          | ENV216   | 102417     | Nov. 05, 2022    | Nov. 04, 2023    |
| 4    | 843 Cable 1#      | ChengYu      | CE Cable | 001        | Nov. 05, 2022    | Nov. 04, 2023    |

### Other

| Item | Name                         | Manufacturer | Model   | Software version |
|------|------------------------------|--------------|---------|------------------|
| 1    | EMC Conduction Test System   | FALA         | EZ_EMCC | EMC-CON 3A1.1    |
| 2    | EMC radiation test system    | FALA         | EZ_EMCC | FA-03A2          |
| 3    | RF test system               | MAIWEI       | MTS8310 | 2.0.0.0          |
| 4    | RF communication test system | MAIWEI       | MTS8200 | 2.0.0.0          |



### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

| FREQUENCY (MHz) | Limit (dBuV) |           | Standard |
|-----------------|--------------|-----------|----------|
|                 | Quasi-peak   | Average   |          |
| 0.15 -0.5       | 66 - 56 *    | 56 - 46 * | IC       |
| 0.50 -5.0       | 56.00        | 46.00     | IC       |
| 5.0 -30.0       | 60.00        | 50.00     | IC       |

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

| Receiver Parameters | Setting  |
|---------------------|----------|
| Attenuation         | 10 dB    |
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

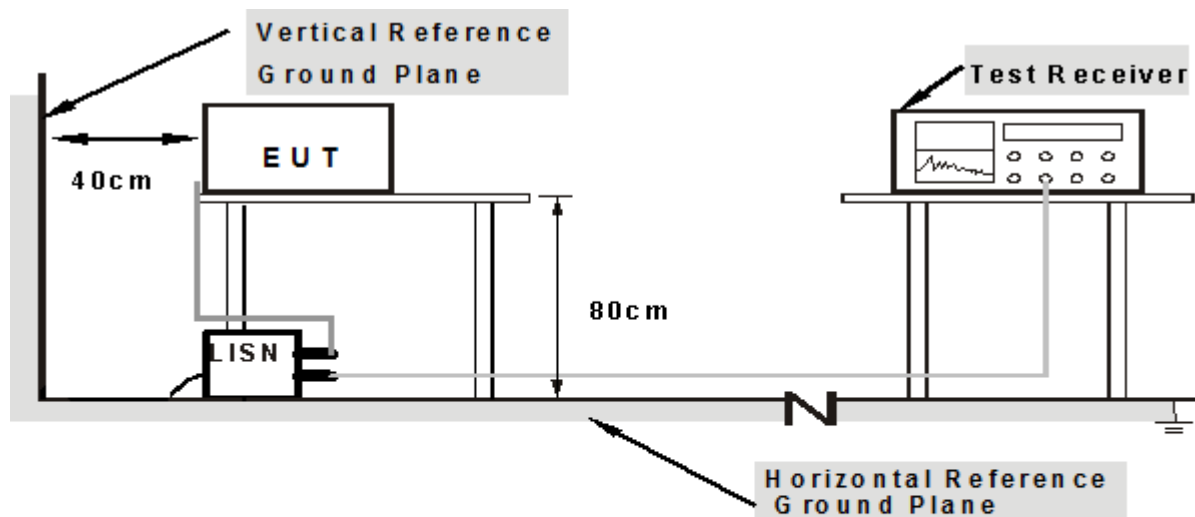
##### 3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

##### 3.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.1.4 TEST SETUP



**Note: 1. Support units were connected to second LISN.**

**2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes**

### 3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

### 3.1.6 TEST RESULTS

Not applicable.



### 3.2 RADIATED EMISSION MEASUREMENT

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

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies<br>(MHz) | Field Strength<br>(micorvolts/meter) | Measurement Distance<br>(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                                |
| 216~230              | 180                                  | 3                                |
| 230~960              | 200                                  | 3                                |
| Above 960            | 500                                  | 3                                |

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

| FREQUENCY (MHz) | Limit (dBuV/m) (at 3M) |         |
|-----------------|------------------------|---------|
|                 | 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)=20log Emission level (uV/m).

| Spectrum Parameter                    | Setting                                          |
|---------------------------------------|--------------------------------------------------|
| Attenuation                           | Auto                                             |
| Start Frequency                       | 1000 MHz                                         |
| Stop Frequency                        | 25GHz                                            |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |

| Receiver Parameter     | Setting                          |
|------------------------|----------------------------------|
| Attenuation            | Auto                             |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP    |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP    |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

### 3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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.
- The antenna height 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.
- 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre( Above 18GHz the distance is 1 meter and table is 1.5 metre).
- Test the EUT in the lowest channel, the middle channel, the Highest channel

Note:

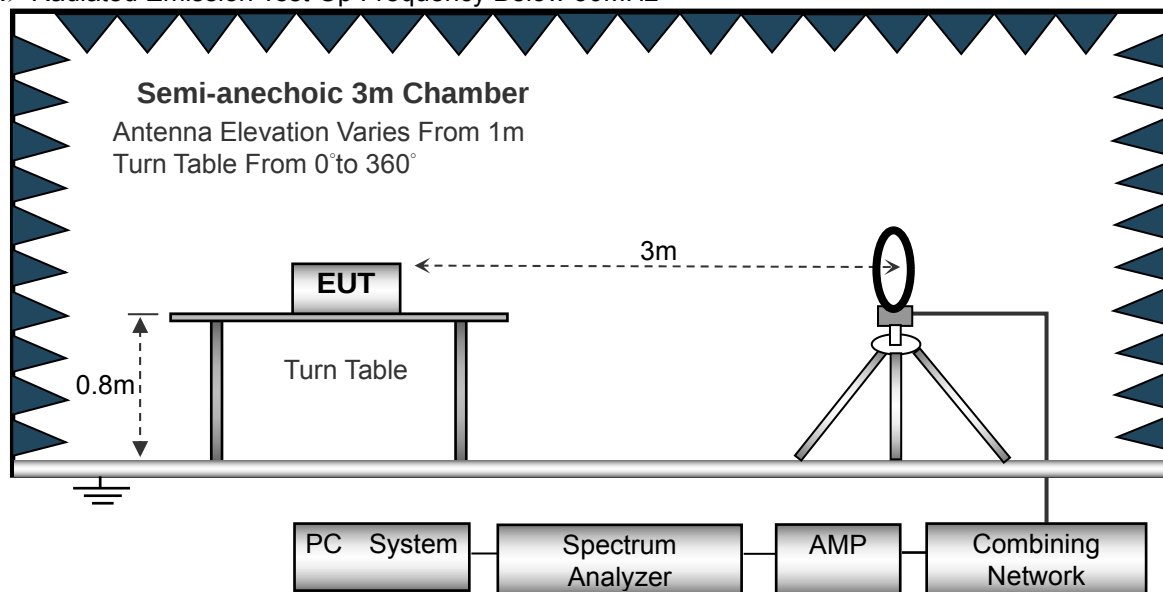
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.2.3 DEVIATION FROM TEST STANDARD

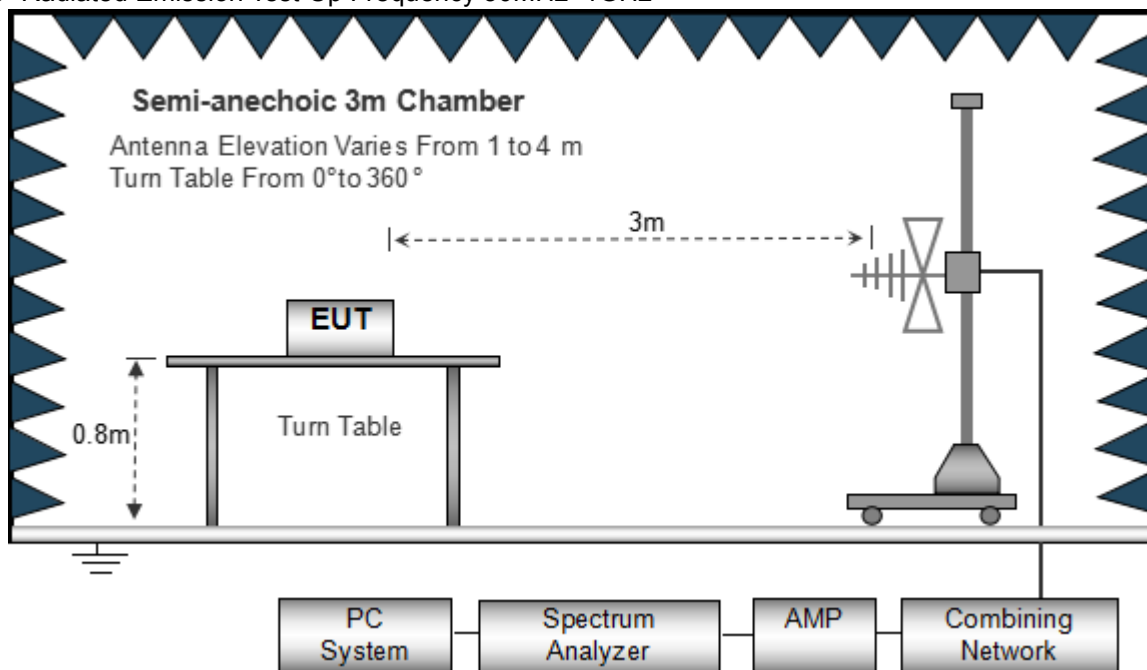
No deviation

### 3.2.4 TEST SETUP

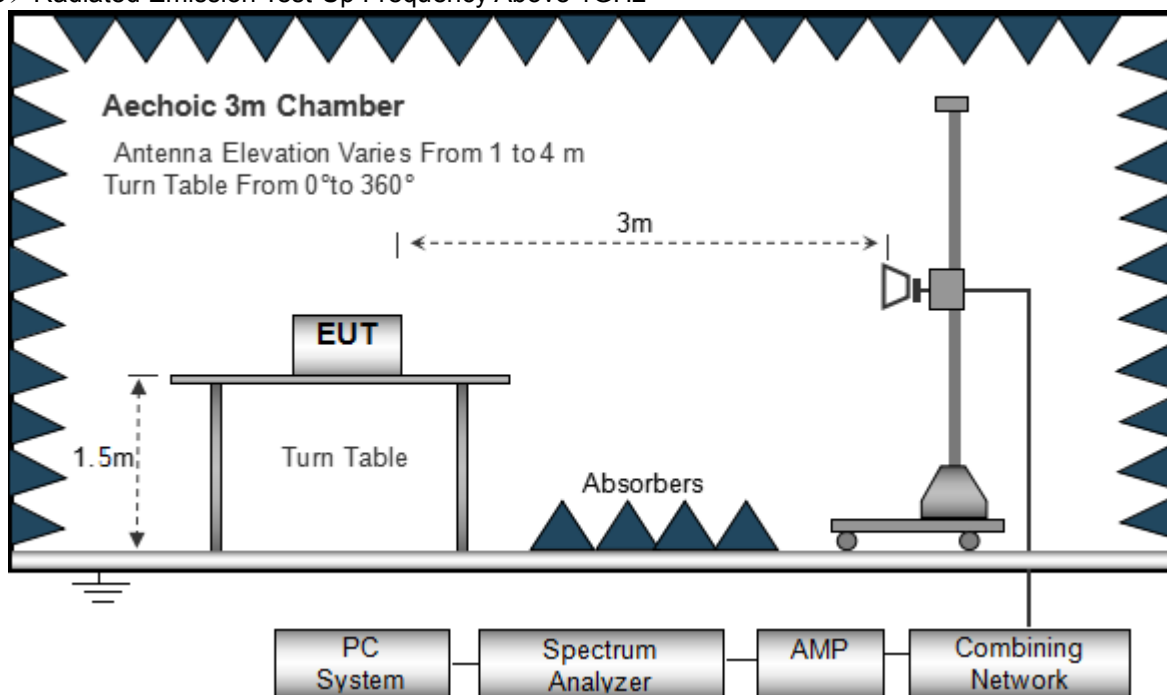
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



### 3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

**3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)**

|              |          |                    |                     |
|--------------|----------|--------------------|---------------------|
| Temperature: | 20℃      | Relative Humidity: | 48%                 |
| Pressure:    | 1010 hPa | Test Voltage :     | DC 24V from battery |
| Test Mode :  | Mode 5   | Polarization :     | --                  |

| Freq. | Reading  | Limit    | Margin | State |
|-------|----------|----------|--------|-------|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB)   | P/F   |
| --    | --       | --       | --     | PASS  |
| --    | --       | --       | --     | PASS  |

**NOTE:**

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log (\text{specific distance/test distance})$ (dB);

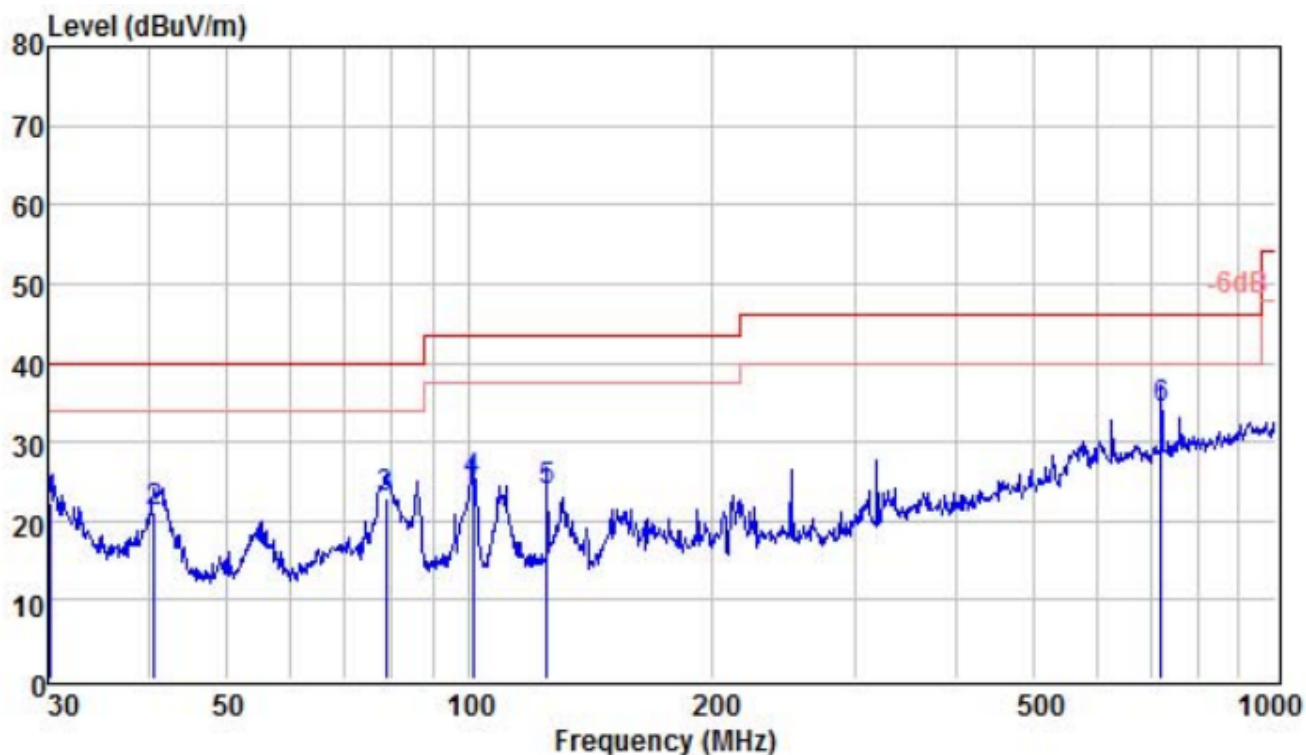
Limit line = specific limits(dBuv) + distance extrapolation factor.

**Remark:**

1. All modes of 802.11b/g/n20/n40 were test at Low, Middle, and High channel, only the worst result of 802.11b Low Channel was reported for below 1GHz test.
2. Remark: We tested at 802.11b/802.11g/802.11n HT20/802.11n HT40 mode at the antenna single and recored the worst data 802.11b mode in report.

**3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)**

|                |                           |                    |            |
|----------------|---------------------------|--------------------|------------|
| Temperature:   | 26℃                       | Relative Humidity: | 54%        |
| Pressure:      | 1010 hPa                  | Polarization :     | Horizontal |
| Test Voltage : | DC 24V from battery       |                    |            |
| Test Mode :    | Transmitting 802.11b mode |                    |            |



|   | Freq   | ReadAntenna | Cable |       | Limit  | Over   |           |
|---|--------|-------------|-------|-------|--------|--------|-----------|
|   | Level  | Factor      | Loss  | Level | Line   | Limit  | Remark    |
|   | MHz    | dBuV        | dB/m  | dB    | dBuV/m | dBuV/m | dB        |
| 1 | 30.21  | 3.02        | 18.80 | 0.45  | 22.27  | 40.00  | -17.73 QP |
| 2 | 40.70  | 7.92        | 12.90 | 0.26  | 21.08  | 40.00  | -18.92 QP |
| 3 | 78.69  | 14.28       | 8.00  | 0.57  | 22.85  | 40.00  | -17.15 QP |
| 4 | 100.93 | 14.74       | 9.45  | 0.76  | 24.95  | 43.50  | -18.55 QP |
| 5 | 125.01 | 14.64       | 8.30  | 0.80  | 23.74  | 43.50  | -19.76 QP |
| 6 | 721.73 | 10.02       | 22.42 | 1.75  | 34.19  | 46.00  | -11.81 QP |

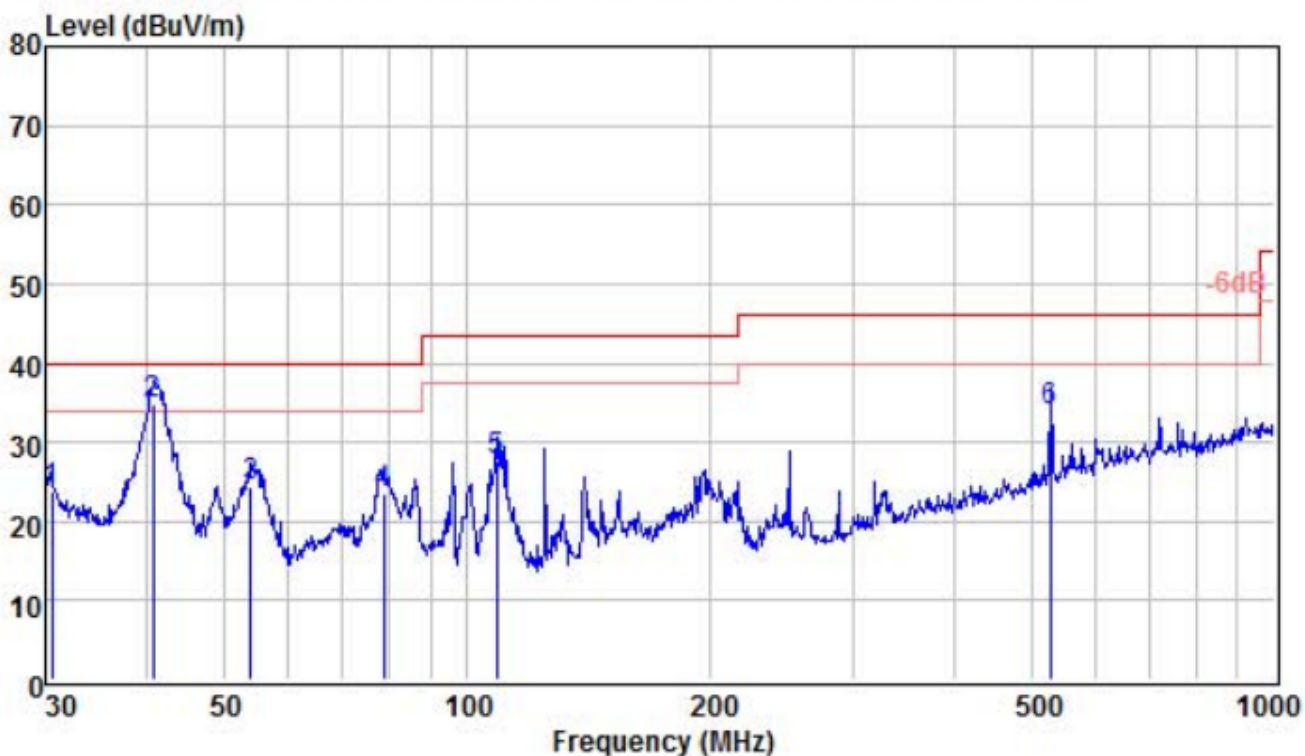
Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;



|                |                           |                    |          |
|----------------|---------------------------|--------------------|----------|
| Temperature:   | 26℃                       | Relative Humidity: | 54%      |
| Pressure:      | 1010 hPa                  | Polarization :     | Vertical |
| Test Voltage : | DC 24V from battery       |                    |          |
| Test Mode :    | Transmitting 802.11b mode |                    |          |



|     | Freq   | Read Level | Antenna Factor | Cable Loss | Level  | Limit  | Over Limit | Remark |
|-----|--------|------------|----------------|------------|--------|--------|------------|--------|
|     | MHz    | dBuV       | dB/m           | dB         | dBuV/m | dBuV/m | dB         |        |
| 1   | 30.53  | 4.82       | 18.49          | 0.44       | 23.75  | 40.00  | -16.25     | QP     |
| 2 ! | 40.84  | 21.85      | 12.55          | 0.26       | 34.66  | 40.00  | -5.34      | QP     |
| 3   | 53.88  | 15.77      | 8.22           | 0.28       | 24.27  | 40.00  | -15.73     | QP     |
| 4   | 78.69  | 14.95      | 7.93           | 0.57       | 23.45  | 40.00  | -16.55     | QP     |
| 5   | 108.65 | 17.47      | 9.34           | 0.77       | 27.58  | 43.50  | -15.92     | QP     |
| 6   | 528.25 | 13.04      | 19.24          | 1.55       | 33.83  | 46.00  | -12.17     | QP     |

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

**3.2.8 TEST RESULTS (1GHZ~25GHZ)**

802.11b(Record the wors test data in report.)

| Polar<br>(H/V)           | Frequency | Meter<br>Reading | Pre-<br>amplifier | Cable<br>Loss | Antenna<br>Factor | Emission<br>Level | Limits   | Margin | Detector<br>Type |
|--------------------------|-----------|------------------|-------------------|---------------|-------------------|-------------------|----------|--------|------------------|
|                          | (MHz)     | (dBuV)           | (dB)              | (dB)          | (dB/m)            | (dBuV/m)          | (dBuV/m) | (dB)   |                  |
| operation frequency:2412 |           |                  |                   |               |                   |                   |          |        |                  |
| V                        | 4824.00   | 66.37            | 50.65             | 6.88          | 31.29             | 53.89             | 74.00    | -20.11 | PK               |
| V                        | 4824.00   | 57.96            | 50.65             | 6.88          | 31.29             | 45.48             | 54.00    | -8.52  | AV               |
| V                        | 7236.00   | 64.37            | 49.98             | 7.16          | 36.63             | 58.18             | 74.00    | -15.82 | PK               |
| V                        | 7236.00   | 53.22            | 49.98             | 7.16          | 36.63             | 47.03             | 54.00    | -6.97  | AV               |
| V                        | 16087.00  | 51.24            | 51.53             | 11.34         | 41.52             | 52.57             | 74.00    | -21.43 | PK               |
| H                        | 4824.00   | 66.94            | 50.65             | 6.88          | 31.29             | 54.46             | 74.00    | -19.54 | PK               |
| H                        | 4824.00   | 57.41            | 50.65             | 6.88          | 31.29             | 44.93             | 54.00    | -9.07  | AV               |
| H                        | 7236.00   | 63.59            | 49.98             | 7.16          | 36.63             | 57.4              | 74.00    | -16.6  | PK               |
| H                        | 7236.00   | 53.89            | 49.98             | 7.16          | 36.63             | 47.7              | 54.00    | -6.3   | AV               |
| H                        | 16087.00  | 51.03            | 51.53             | 11.34         | 41.52             | 52.36             | 74.00    | -21.64 | PK               |
| operation frequency:2437 |           |                  |                   |               |                   |                   |          |        |                  |
| V                        | 4874.00   | 65.37            | 50.67             | 6.89          | 31.38             | 52.97             | 74.00    | -21.03 | PK               |
| V                        | 4874.00   | 55.41            | 50.67             | 6.89          | 31.38             | 43.01             | 54.00    | -10.99 | AV               |
| V                        | 7311.00   | 63.91            | 50.02             | 7.24          | 36.63             | 57.76             | 74.00    | -16.24 | PK               |
| V                        | 7311.00   | 52.89            | 50.02             | 7.24          | 36.63             | 46.74             | 54.00    | -7.26  | AV               |
| V                        | 16087.00  | 50.27            | 51.53             | 11.34         | 41.52             | 51.6              | 74.00    | -22.4  | PK               |
| H                        | 4874.00   | 65.88            | 50.67             | 6.89          | 31.38             | 53.48             | 74.00    | -20.52 | PK               |
| H                        | 4874.00   | 56.23            | 50.67             | 6.89          | 31.38             | 43.83             | 54.00    | -10.17 | AV               |
| H                        | 7311.00   | 63.41            | 50.02             | 7.24          | 36.63             | 57.26             | 74.00    | -16.74 | PK               |
| H                        | 7311.00   | 53.27            | 50.02             | 7.24          | 36.63             | 47.12             | 54.00    | -6.88  | AV               |
| H                        | 16087.00  | 50.36            | 51.53             | 11.34         | 41.52             | 51.69             | 74.00    | -22.31 | PK               |
| operation frequency:2462 |           |                  |                   |               |                   |                   |          |        |                  |
| V                        | 4924.00   | 65.37            | 50.79             | 6.83          | 31.36             | 52.77             | 74.00    | -21.23 | PK               |
| V                        | 4924.00   | 56.32            | 50.79             | 6.83          | 31.36             | 43.72             | 54.00    | -10.28 | AV               |
| V                        | 7386.00   | 63.49            | 50.11             | 7.25          | 36.58             | 57.21             | 74.00    | -16.79 | PK               |
| V                        | 7386.00   | 52.35            | 50.11             | 7.25          | 36.58             | 46.07             | 54.00    | -7.93  | AV               |
| V                        | 16087.00  | 50.27            | 51.53             | 11.34         | 41.52             | 51.6              | 74.00    | -22.4  | PK               |
| H                        | 4924.00   | 64.53            | 50.79             | 6.83          | 31.36             | 51.93             | 74.00    | -22.07 | PK               |
| H                        | 4924.00   | 55.37            | 50.79             | 6.83          | 31.36             | 42.77             | 54.00    | -11.23 | AV               |
| H                        | 7386.00   | 63.29            | 50.11             | 7.25          | 36.58             | 57.01             | 74.00    | -16.99 | PK               |
| H                        | 7386.00   | 53.27            | 50.11             | 7.25          | 36.58             | 46.99             | 54.00    | -7.01  | AV               |
| H                        | 16087.00  | 49.16            | 51.53             | 11.34         | 41.52             | 50.49             | 74.00    | -23.51 | PK               |

**Remark:**

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,  
Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



### 3.3 RADIATED BAND EMISSION MEASUREMENT

#### 3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205, RSS-Gen Issue 5 Section RSS-247 §6.2.1

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| FREQUENCY (MHz) | Limit (dBuV/m) (at 3M) |         |
|-----------------|------------------------|---------|
|                 | PEAK                   | AVERAGE |
| Above 1000      | 74                     | 54      |

Notes:

- (1) The limit for radiated test was performed according to RSS-Gen Issue 5.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

| Spectrum Parameter                    | Setting                                          |
|---------------------------------------|--------------------------------------------------|
| Attenuation                           | Auto                                             |
| Start Frequency                       | 2300MHz                                          |
| Stop Frequency                        | 2520                                             |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |

#### 3.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

- a. 1. The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter camber. 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 antenna height 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel,the Highest channel

Note:

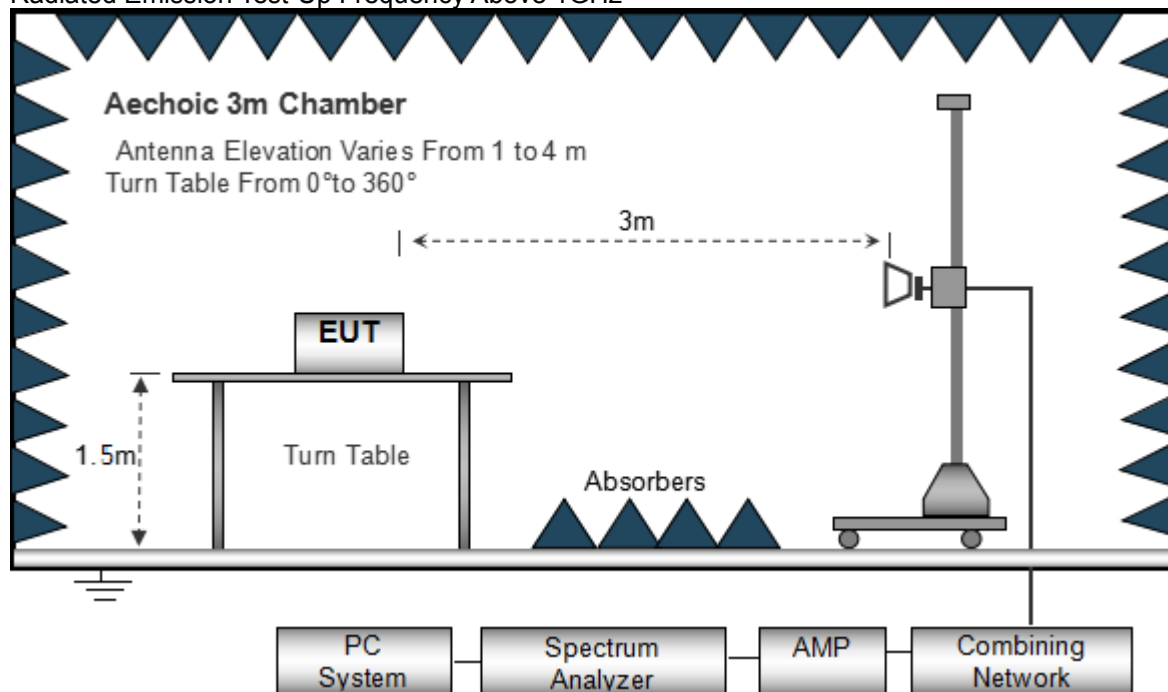
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

#### 3.3.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



### 3.3.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

We tested at 802.11b/802.11g/802.11n HT20/802.11n HT40 mode at the antenna single and recored the worst data mode in report.



### 3.3.6 TEST RESULT

802.11b (Record the worst test data in report.)

| Polar<br>(H/V)           | Frequency | Meter<br>Reading | Pre-<br>amplifier | Cable<br>Loss | Antenna<br>Factor | Emission<br>Level | Limits   | Margin | Detector<br>Type |
|--------------------------|-----------|------------------|-------------------|---------------|-------------------|-------------------|----------|--------|------------------|
|                          | (MHz)     | (dBuV)           | (dB)              | (dB)          | (dB/m)            | (dBuV/m)          | (dBuV/m) | (dB)   |                  |
| operation frequency:2412 |           |                  |                   |               |                   |                   |          |        |                  |
| V                        | 2390.00   | 76.35            | 52.12             | 2.73          | 27.38             | 54.34             | 74.00    | -19.66 | PK               |
| V                        | 2390.00   | 65.24            | 52.12             | 2.73          | 27.38             | 43.23             | 54.00    | -10.77 | AV               |
| V                        | 2400.00   | 75.21            | 52.16             | 2.78          | 27.41             | 53.24             | 74.00    | -20.76 | PK               |
| V                        | 2400.00   | 64.16            | 52.16             | 2.78          | 27.41             | 42.19             | 54.00    | -11.81 | AV               |
| H                        | 2390.00   | 75.82            | 52.12             | 2.73          | 27.38             | 53.81             | 74.00    | -20.19 | PK               |
| H                        | 2390.00   | 63.12            | 52.12             | 2.73          | 27.38             | 41.11             | 54.00    | -12.89 | AV               |
| H                        | 2400.00   | 76.51            | 52.16             | 2.78          | 27.41             | 54.54             | 74.00    | -19.46 | PK               |
| H                        | 2400.00   | 64.39            | 52.16             | 2.78          | 27.41             | 42.42             | 54.00    | -11.58 | AV               |

| Polar<br>(H/V)           | Frequency | Meter<br>Reading | Pre-<br>amplifier | Cable<br>Loss | Antenna<br>Factor | Emission<br>Level | Limits   | Margin | Detector<br>Type |
|--------------------------|-----------|------------------|-------------------|---------------|-------------------|-------------------|----------|--------|------------------|
|                          | (MHz)     | (dBuV)           | (dB)              | (dB)          | (dB/m)            | (dBuV/m)          | (dBuV/m) | (dB)   |                  |
| operation frequency:2462 |           |                  |                   |               |                   |                   |          |        |                  |
| V                        | 2483.50   | 75.39            | 52.23             | 2.86          | 27.44             | 53.46             | 74.00    | -20.54 | PK               |
| V                        | 2483.50   | 65.41            | 52.23             | 2.86          | 27.44             | 43.48             | 54.00    | -10.52 | AV               |
| V                        | 2500.00   | 75.41            | 52.26             | 2.88          | 27.49             | 53.52             | 74.00    | -20.48 | PK               |
| V                        | 2500.00   | 64.92            | 52.26             | 2.88          | 27.49             | 43.03             | 54.00    | -10.97 | AV               |
| H                        | 2483.50   | 75.32            | 52.23             | 2.86          | 27.44             | 53.39             | 74.00    | -20.61 | PK               |
| H                        | 2483.50   | 66.39            | 52.23             | 2.86          | 27.44             | 44.46             | 54.00    | -9.54  | AV               |
| H                        | 2500.00   | 75.61            | 52.26             | 2.88          | 27.49             | 53.72             | 74.00    | -20.28 | PK               |
| H                        | 2500.00   | 66.37            | 52.26             | 2.88          | 27.49             | 44.48             | 54.00    | -9.52  | AV               |

**Remark:**

1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



#### 4. PEAK OUTPUT POWER

##### 4.1 APPLIED PROCEDURES / LIMIT

| FCC PART15 (15.247), SUBPART C, RSS-247 ISSUE 2: FEBRUARY 2017 |                   |                 |                       |        |
|----------------------------------------------------------------|-------------------|-----------------|-----------------------|--------|
| Section                                                        | Test Item         | Limit           | Frequency Range (MHz) | Result |
| 15.247(b)(i)<br>RSS-247 §6.2.1                                 | Peak Output Power | 1 watt or 30dBm | 2400-2483.5           | PASS   |

##### 4.2 TEST PROCEDURE

- The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW > the 20 dB bandwidth of the emission being measured  
Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel  
VBW  $\geq$  RBW  
Sweep = auto  
Detector function = peak  
Trace = max hold

##### 4.3 DEVIATION FROM STANDARD

No deviation.

##### 4.4 TEST SETUP



##### 4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



#### 4.6 TEST RESULTS

|              |          |                    |                     |
|--------------|----------|--------------------|---------------------|
| Temperature: | 25 °C    | Relative Humidity: | 60%                 |
| Pressure:    | 1012 hPa | Test Voltage :     | DC 24V from battery |

| Mode         | Test Channel | Peak Output Power (dBm) | LIMIT (dBm) | Result |
|--------------|--------------|-------------------------|-------------|--------|
| 802.11b      | Low          | 13.33                   | 30.00       | PASS   |
|              | Moddle       | 12.99                   | 30.00       | PASS   |
|              | High         | 13.12                   | 30.00       | PASS   |
| 802.11g      | Low          | 11.76                   | 30.00       | PASS   |
|              | Moddle       | 11.09                   | 30.00       | PASS   |
|              | High         | 10.66                   | 30.00       | PASS   |
| 802.11n HT20 | Low          | 10.86                   | 30.00       | PASS   |
|              | Moddle       | 10.55                   | 30.00       | PASS   |
|              | High         | 10.30                   | 30.00       | PASS   |
| 802.11n HT40 | Low          | 10.65                   | 30.00       | PASS   |
|              | Moddle       | 10.60                   | 30.00       | PASS   |
|              | High         | 10.38                   | 30.00       | PASS   |

| Mode         | Test Channel | Peak Output Power (dBm) | Antenna Gain | EIRP output power (dBm) | LIMIT (dBm) | Result |
|--------------|--------------|-------------------------|--------------|-------------------------|-------------|--------|
| 802.11b      | Low          | 13.33                   | 3.29         | 16.62                   | 36.00       | PASS   |
|              | Moddle       | 12.99                   | 3.29         | 16.28                   | 36.00       | PASS   |
|              | High         | 13.12                   | 3.29         | 16.41                   | 36.00       | PASS   |
| 802.11g      | Low          | 11.76                   | 3.29         | 15.05                   | 36.00       | PASS   |
|              | Moddle       | 11.09                   | 3.29         | 14.38                   | 36.00       | PASS   |
|              | High         | 10.66                   | 3.29         | 13.95                   | 36.00       | PASS   |
| 802.11n HT20 | Low          | 10.86                   | 3.29         | 14.15                   | 36.00       | PASS   |
|              | Moddle       | 10.55                   | 3.29         | 13.84                   | 36.00       | PASS   |
|              | High         | 10.30                   | 3.29         | 13.59                   | 36.00       | PASS   |
| 802.11n HT40 | Low          | 10.65                   | 3.29         | 13.94                   | 36.00       | PASS   |
|              | Moddle       | 10.60                   | 3.29         | 13.89                   | 36.00       | PASS   |
|              | High         | 10.38                   | 3.29         | 13.67                   | 36.00       | PASS   |



## 5. POWER SPECTRAL DENSITY TEST

### 5.1 APPLIED PROCEDURES / LIMIT

| FCC PART15 C SECTION 15.247 (E), RSS-247 ISSUE 2: FEBRUARY 2017 |                        |                        |                       |        |
|-----------------------------------------------------------------|------------------------|------------------------|-----------------------|--------|
| Section                                                         | Test Item              | Limit                  | Frequency Range (MHz) | Result |
| 15.247 (e)<br>RSS-247 §6.2.1                                    | Power Spectral Density | 8 dBm<br>(in any 3KHz) | 2400-2483.5           | PASS   |

| Spectrum Parameters | Setting                           |
|---------------------|-----------------------------------|
| Attenuation         | Auto                              |
| Span Frequency      | = the frequency band of operation |
| RB                  | $RBW \geq 3\text{kHz}$            |
| VB                  | $VBW \geq 3RBW$                   |
| Detector            | Peak                              |
| Trace               | Max Hold                          |
| Sweep Time          | Auto                              |

### 5.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

### 5.3 DEVIATION FROM STANDARD

No deviation.

### 5.4 TEST SETUP



### 5.5 EUT OPERATION CONDITIONS

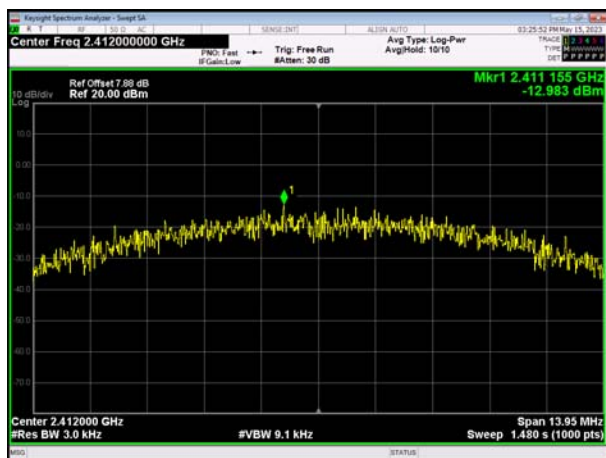
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

**5.6 TEST RESULTS**

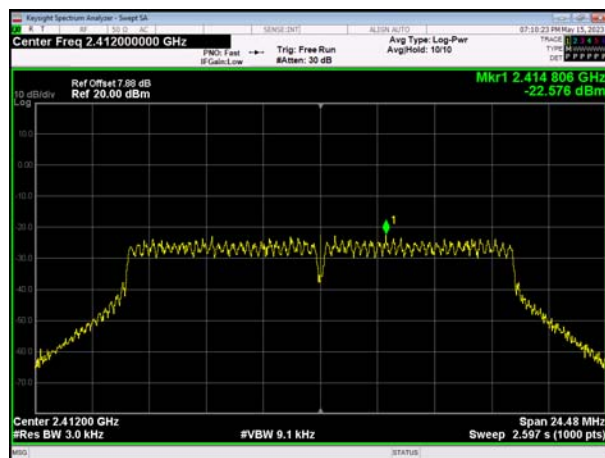
| Mode      | Test Channel | Reading Level<br>(dBm/3kHz) | Limit<br>(dBm/3kHz) | Result |
|-----------|--------------|-----------------------------|---------------------|--------|
| 802.11b   | Low          | -12.983                     | 8                   | PASS   |
|           | Moddle       | -12.964                     | 8                   | PASS   |
|           | High         | -13.182                     | 8                   | PASS   |
| 802.11g   | Low          | -22.576                     | 8                   | PASS   |
|           | Moddle       | -22.941                     | 8                   | PASS   |
|           | High         | -23.265                     | 8                   | PASS   |
| 802.11n20 | Low          | -22.671                     | 8                   | PASS   |
|           | Moddle       | -22.831                     | 8                   | PASS   |
|           | High         | -23.032                     | 8                   | PASS   |
| 802.11n40 | Low          | -22.825                     | 8                   | PASS   |
|           | Moddle       | -23.334                     | 8                   | PASS   |
|           | High         | -23.211                     | 8                   | PASS   |



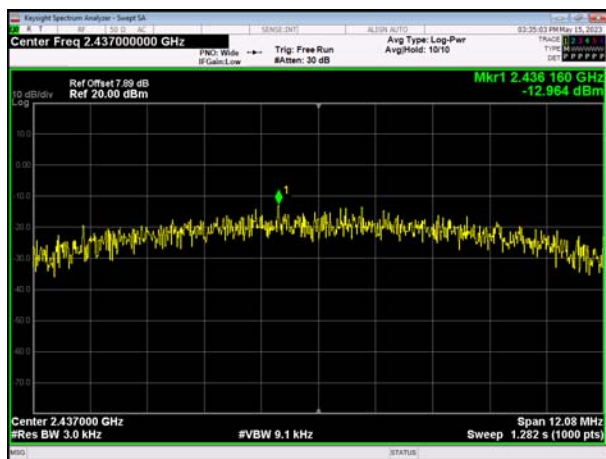
802.11b



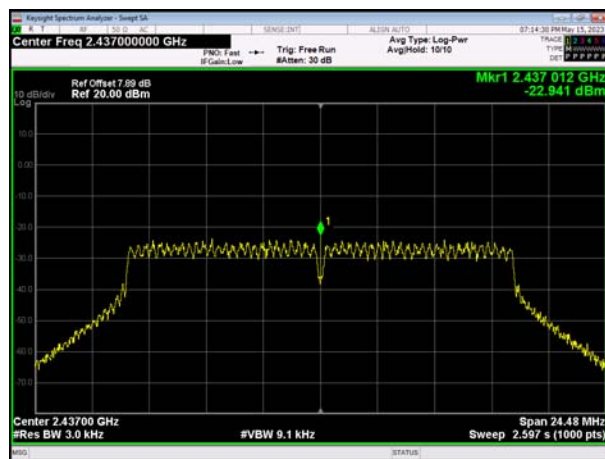
802.11g



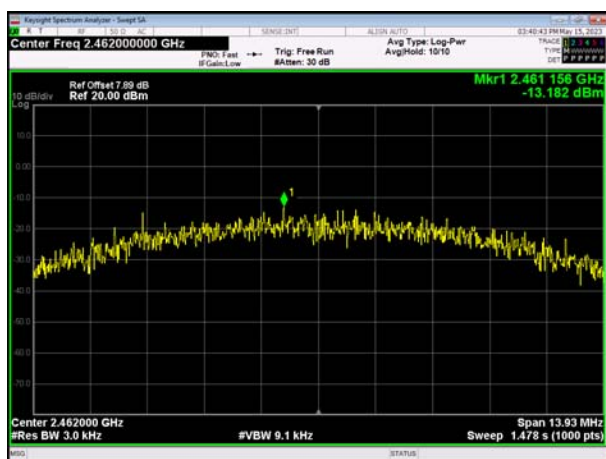
2412MHz



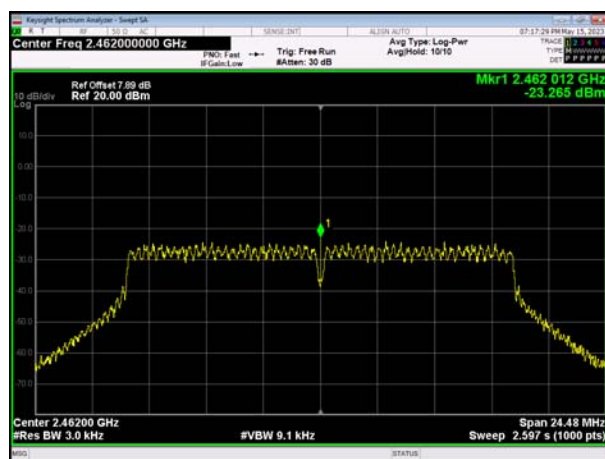
2412MHz



2437MHz



2437MHz

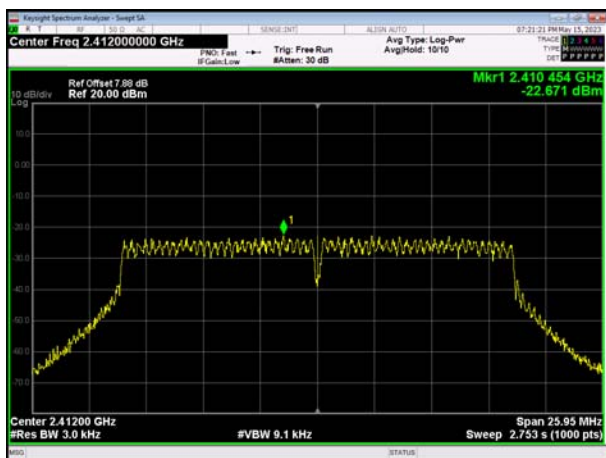


2462MHz

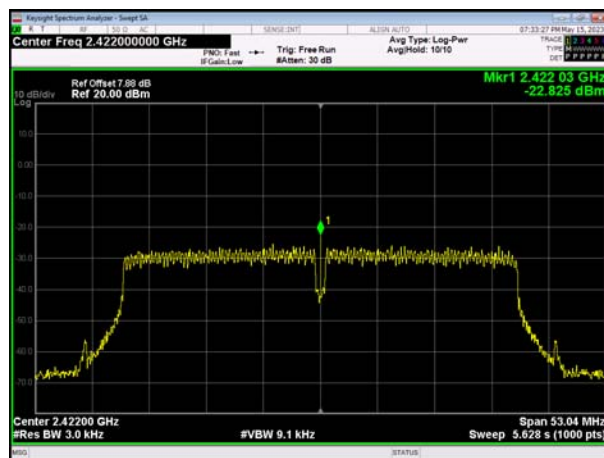
2462MHz



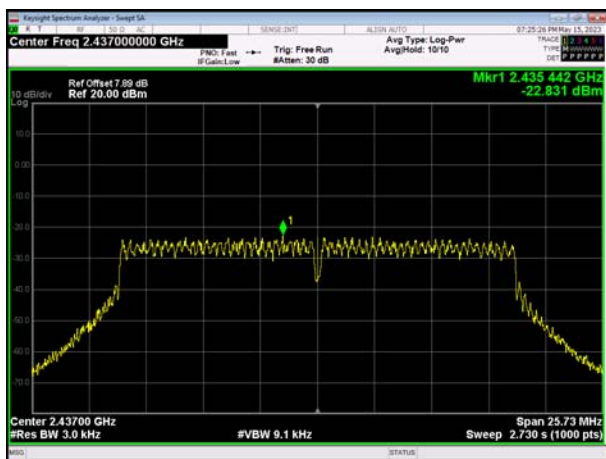
802.11n HT20



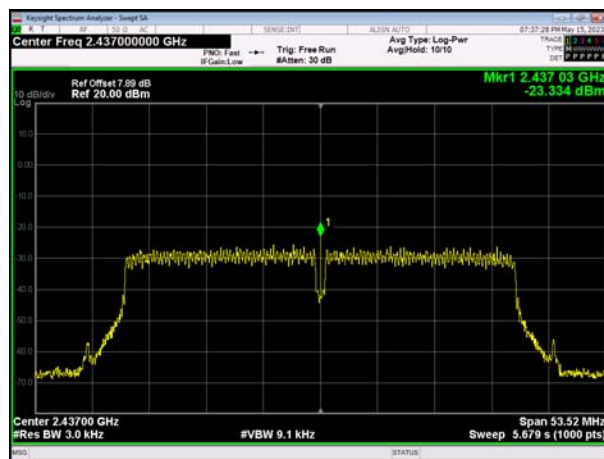
802.11n HT40



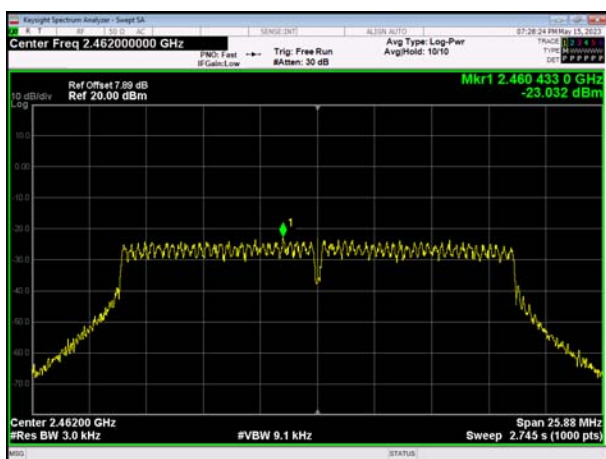
2412MHz



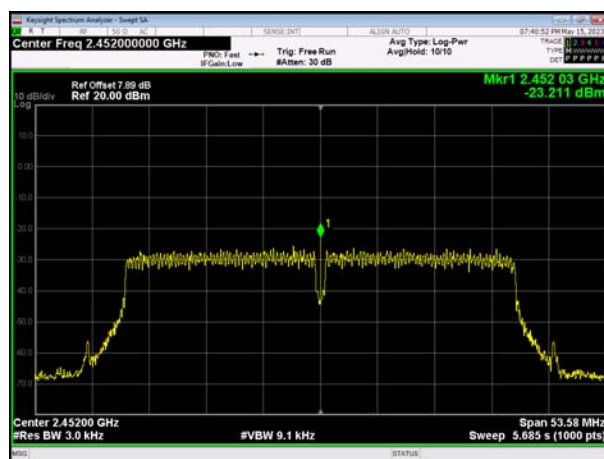
2422MHz



2437MHz



2437MHz



2462MHz

2452MHz



## 6. 6DB BANDWIDTH TEST

### 6.1 APPLIED PROCEDURES / LIMIT

| FCC PART15 (15.247) , SUBPART C, RSS-247 ISSUE 2: FEBRUARY 2017 |           |                                         |                      |        |
|-----------------------------------------------------------------|-----------|-----------------------------------------|----------------------|--------|
| Section                                                         | Test Item | Limit                                   | Frequency Range(MHz) | Result |
| 15.247(a)(2)<br>RSS-247 §5.2(1)<br>&RSS-Gen§6.6                 | Bandwidth | $\geq 500\text{KHz}$<br>(6dB bandwidth) | 2400-2483.5          | PASS   |

### 6.2 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. 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 20 dB relative to the maximum level measured in the fundamental emission.

### 6.3 DEVIATION FROM STANDARD

No deviation.

### 6.4 TEST SETUP



### 6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



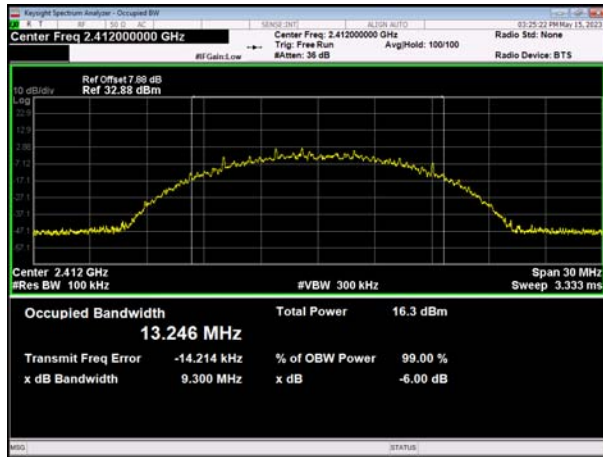
## 6.6 TEST RESULTS

|              | Test Channel | 6dB Bandwidth (MHz) | 99% Occupied bandwidth(MHz) | Limit (MHz) | Result |
|--------------|--------------|---------------------|-----------------------------|-------------|--------|
| 802.11b      | Low          | 9.300               | 13.254                      | 0.5         | Pass   |
|              | Middle       | 8.052               | 13.256                      | 0.5         | Pass   |
|              | High         | 9.287               | 13.211                      | 0.5         | Pass   |
| 802.11g      | Low          | 16.32               | 16.708                      | 0.5         | Pass   |
|              | Middle       | 16.32               | 16.653                      | 0.5         | Pass   |
|              | High         | 16.32               | 16.607                      | 0.5         | Pass   |
| 802.11n HT20 | Low          | 17.30               | 17.789                      | 0.5         | Pass   |
|              | Middle       | 17.15               | 17.725                      | 0.5         | Pass   |
|              | High         | 17.25               | 17.696                      | 0.5         | Pass   |
| 802.11n HT40 | Low          | 35.36               | 36.082                      | 0.5         | Pass   |
|              | Middle       | 35.68               | 36.145                      | 0.5         | Pass   |
|              | High         | 35.72               | 36.113                      | 0.5         | Pass   |

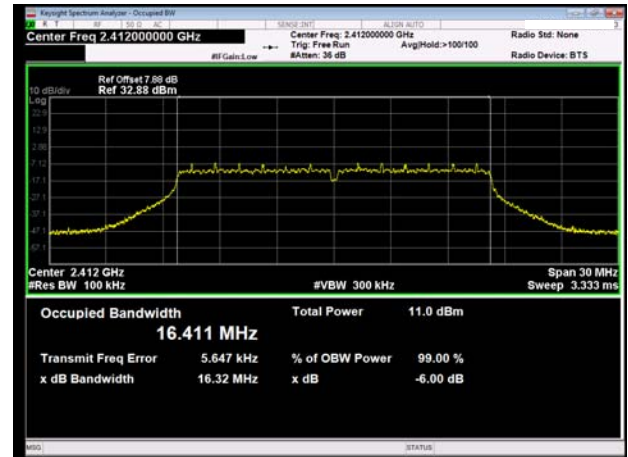


## 6dB Bandwidth

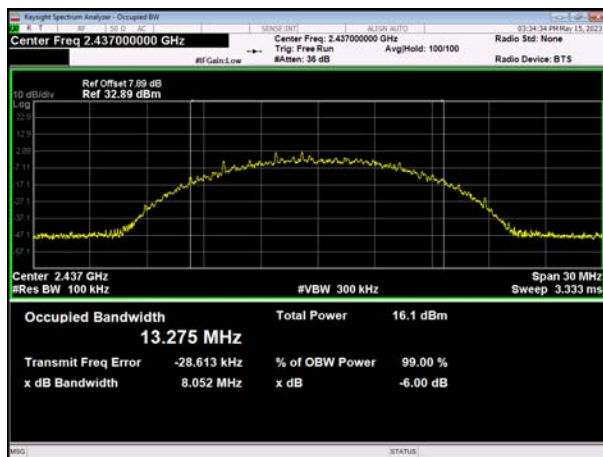
802.11b



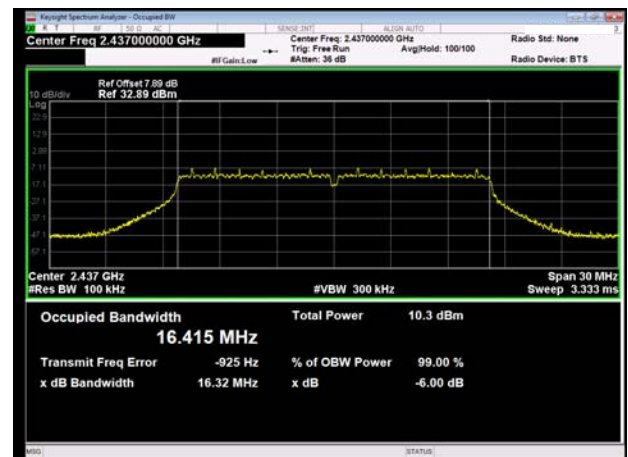
802.11g



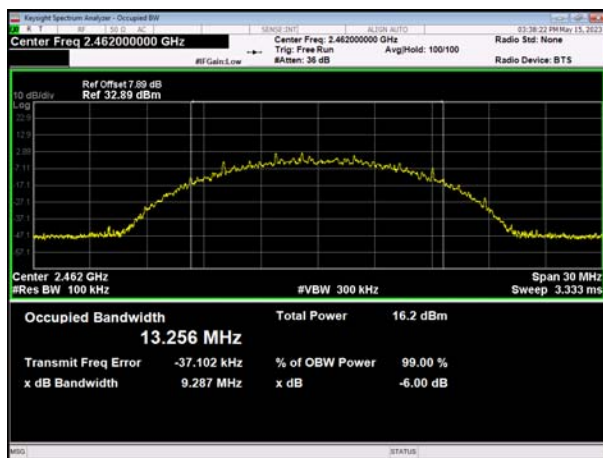
2412MHz



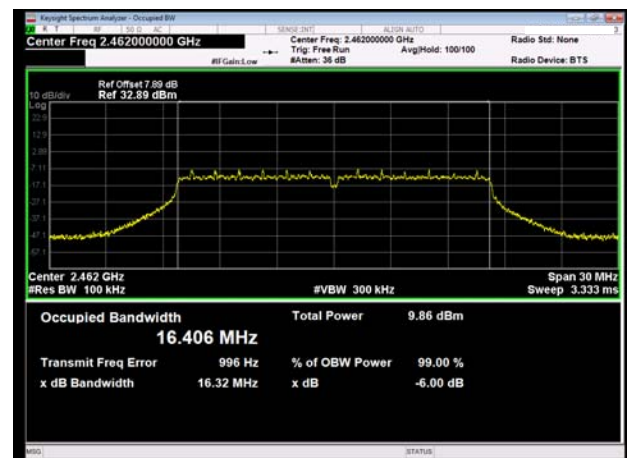
2412MHz



2437MHz



2437MHz



2462MHz

2462MHz

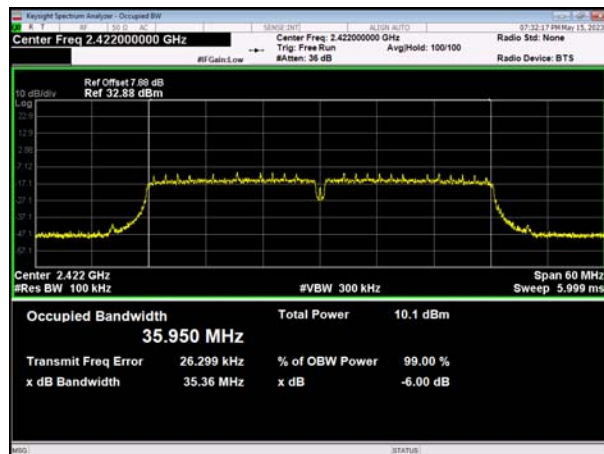


## 6dB Bandwidth

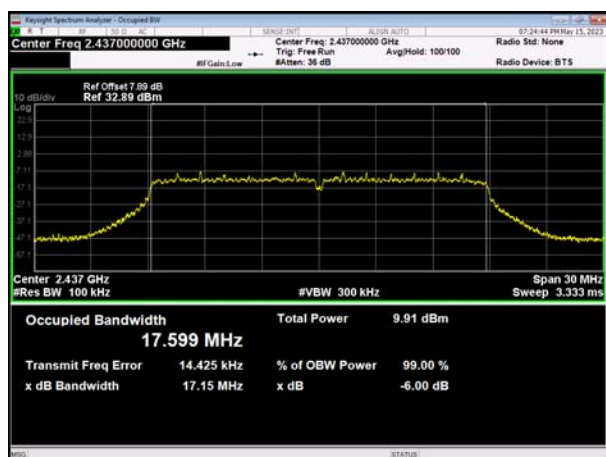
## 802.11n HT20



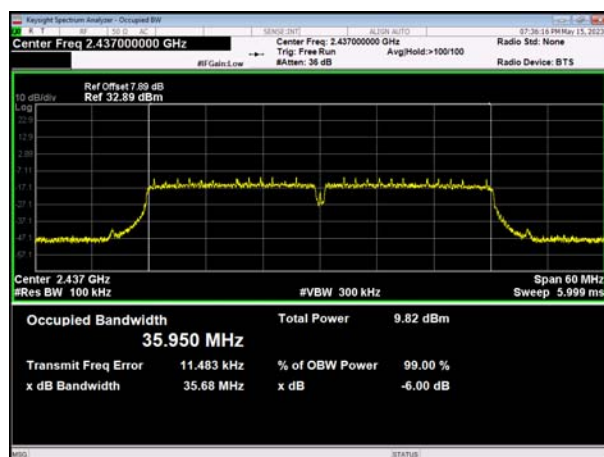
## 802.11n HT40



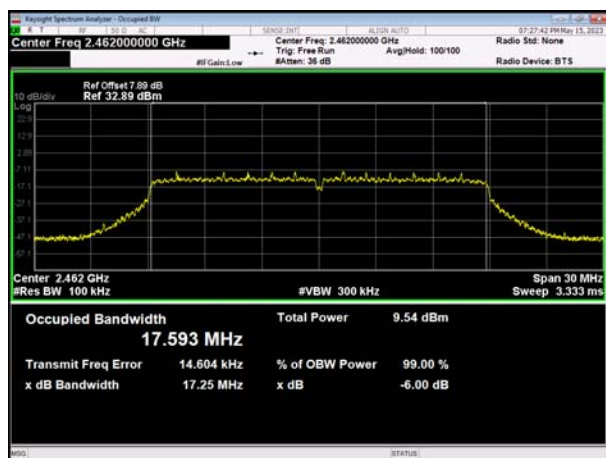
## 2412MHz



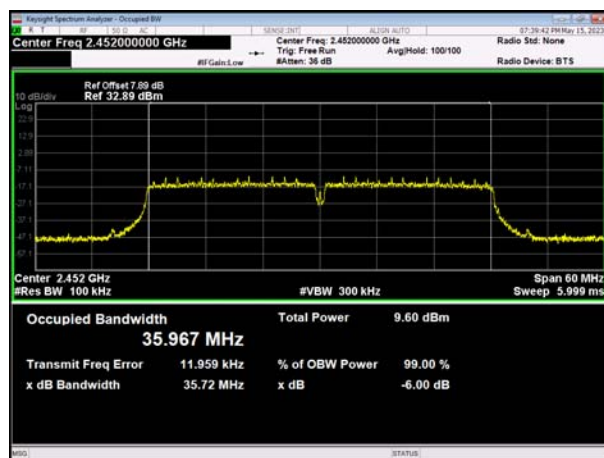
## 2422MHz



## 2437MHz



## 2437MHz



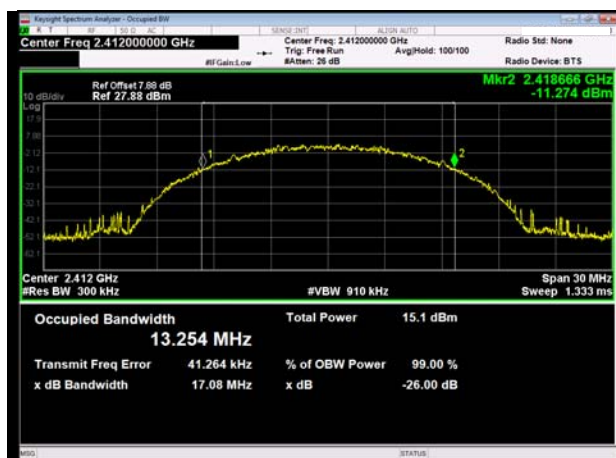
## 2462MHz

## 2452MHz

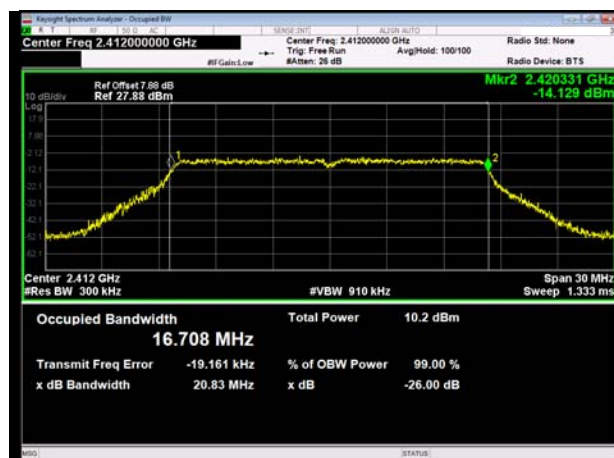


## 99% Bandwidth

802.11b



802.11g



2412MHz



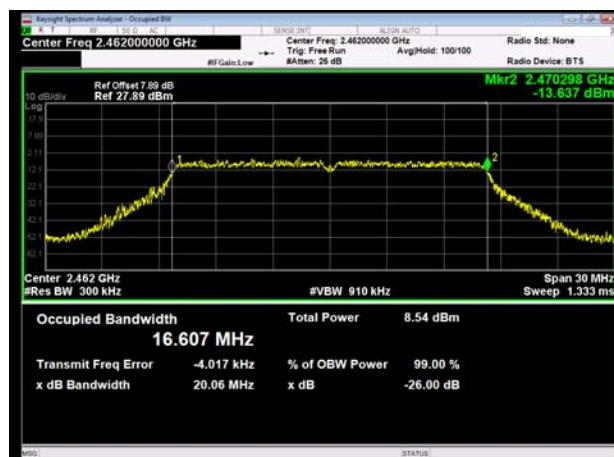
2412MHz



2437MHz



2437MHz



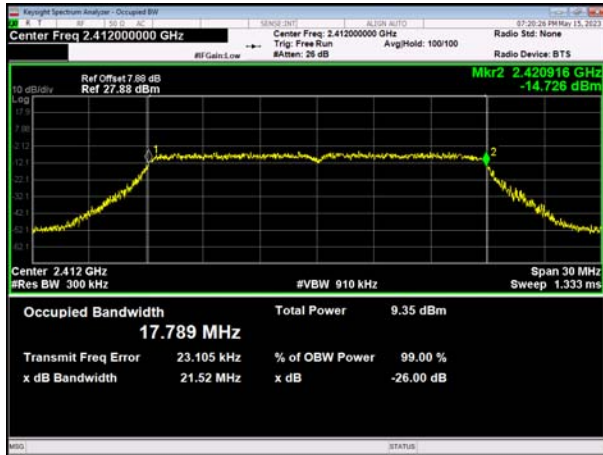
2462MHz

2462MHz

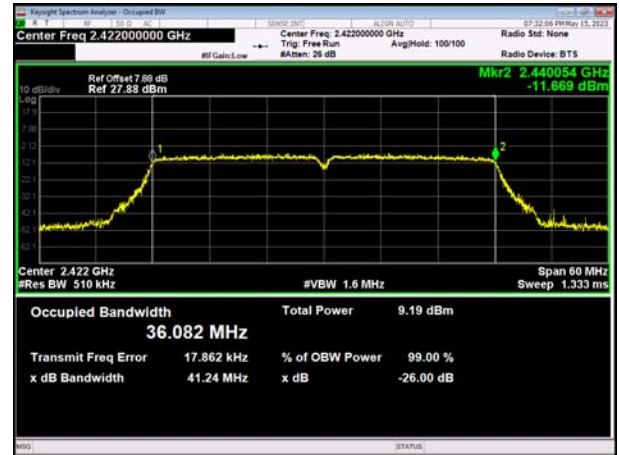


## 99% Bandwidth

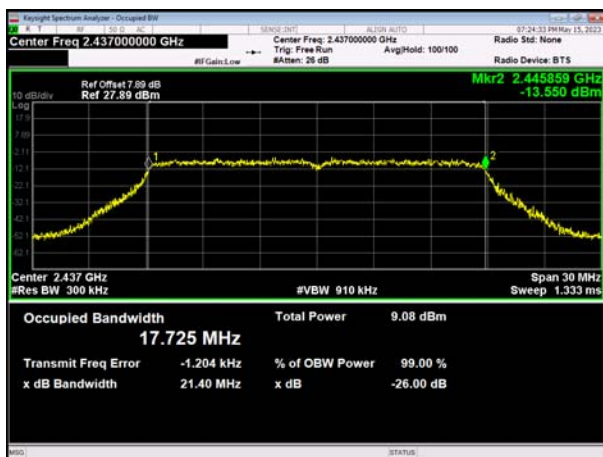
## 802.11n HT20



## 802.11n HT40



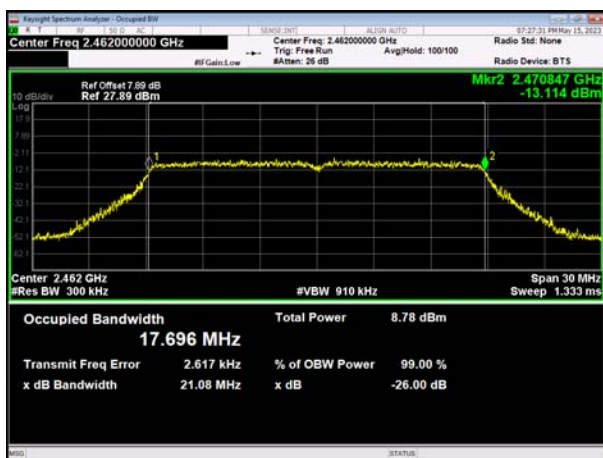
## 2412MHz



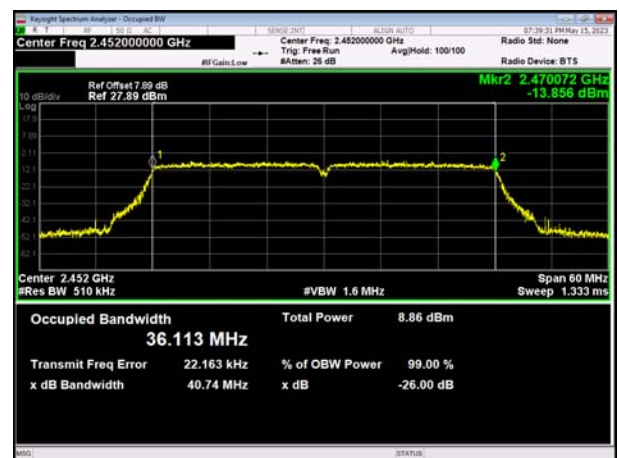
## 2422MHz



## 2437MHz



## 2437MHz



## 2462MHz



## 2452MHz





## 7. OUT OF BAND EMISSIONS TEST

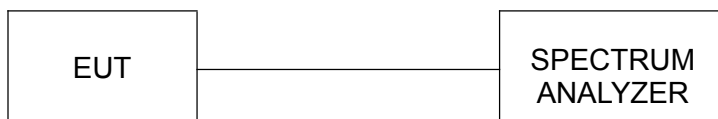
### 7.1 TEST LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB.

#### 7.1.1 TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as TX operation and connect directly to the spectrum analyzer.
3. Based on RSS-247 Issue 2 Section 15.247: RBW=100KHz, VBW=300KHz.
4. Set detected by the spectrum analyzer with peak detector.

#### 7.1.2 TEST SETUP



#### 7.1.3 TEST RESULT

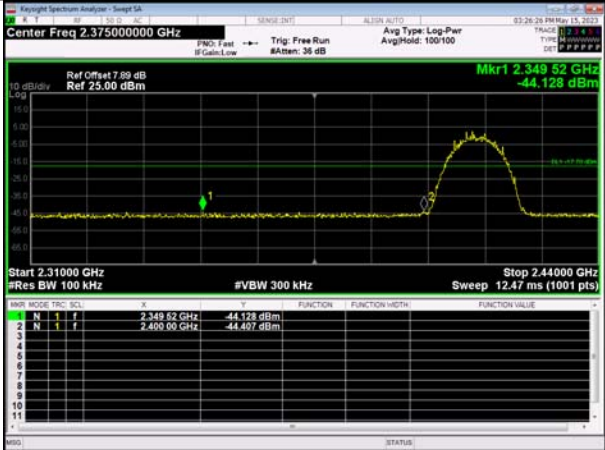
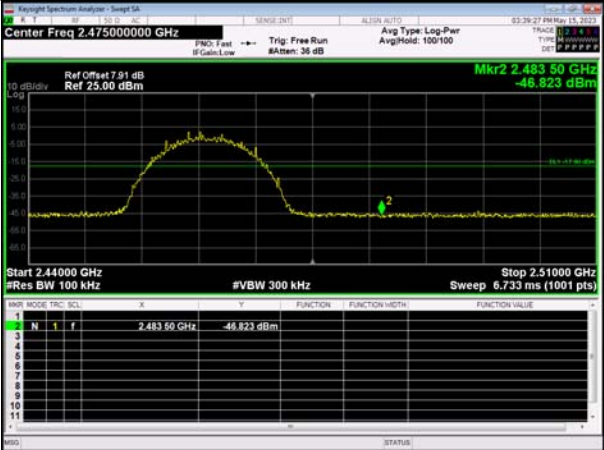
PASS



## 802.11b

| Frequency (MHz) | Delta Peak to Band emission (dBc) | Limit (dBc) | Verdict |
|-----------------|-----------------------------------|-------------|---------|
| 2400.00         | 44.407                            | 20          | PASS    |
| 2483.50         | 46.823                            | 20          | PASS    |

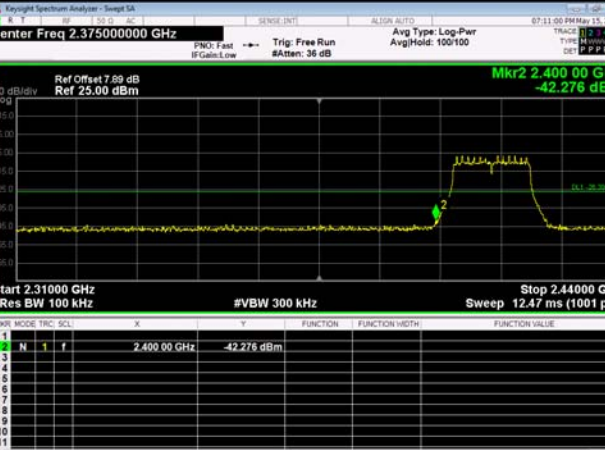
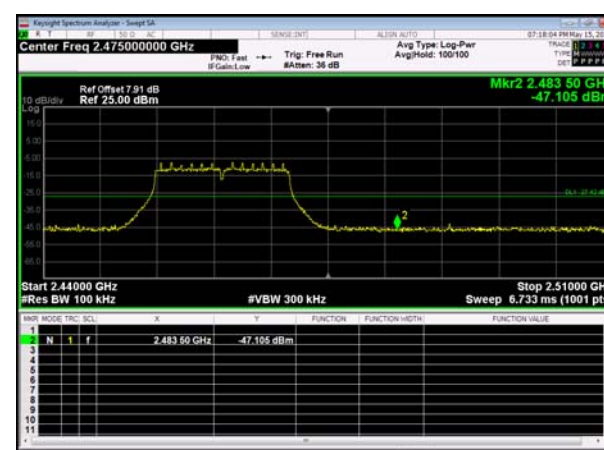
  

|                                                                                   |                                                                                    |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|  |  |
| 2412                                                                              | 2462                                                                               |

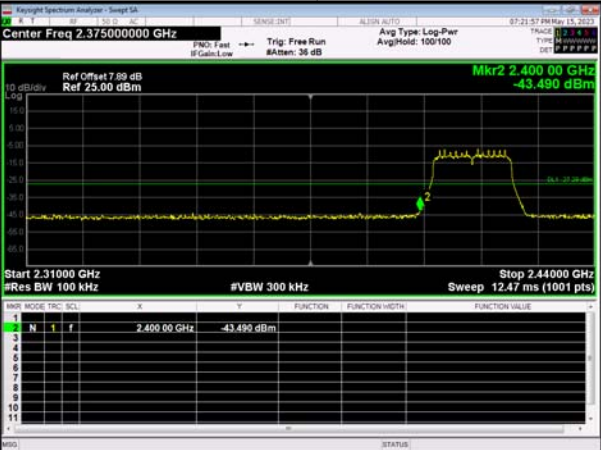
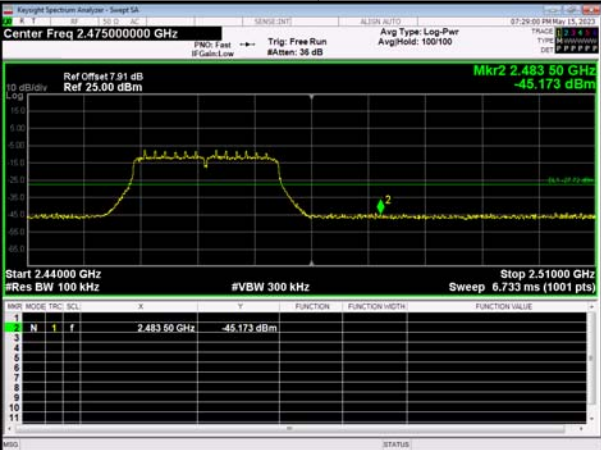
## 802.11g

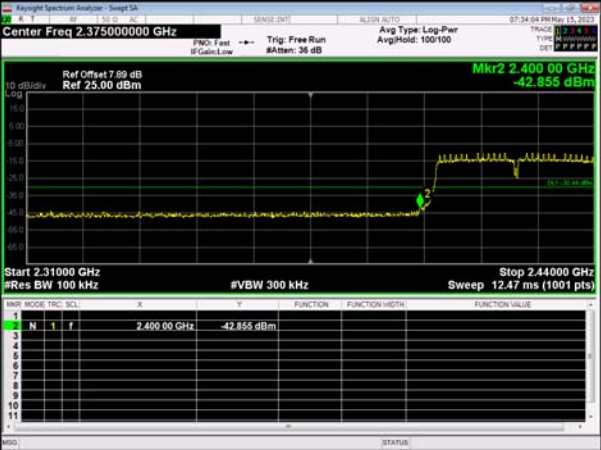
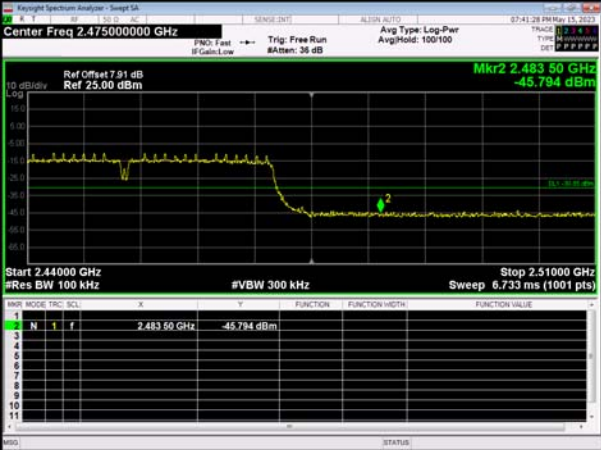
| Frequency (MHz) | Delta Peak to Band emission (dBc) | Limit (dBc) | Verdict |
|-----------------|-----------------------------------|-------------|---------|
| 2400.00         | 42.276                            | 20          | PASS    |
| 2483.05         | 47.105                            | 20          | PASS    |

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| 2412                                                                                | 2462                                                                                 |



| 802.11n HT20                                                                      |                                   |                                                                                    |         |
|-----------------------------------------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------|---------|
| Frequency (MHz)                                                                   | Delta Peak to Band emission (dBc) | Limit (dBc)                                                                        | Verdict |
| 2400.00                                                                           | 43.490                            | 20                                                                                 | PASS    |
| 2483.50                                                                           | 45.173                            | 20                                                                                 | PASS    |
|  |                                   |  |         |
| 2412                                                                              |                                   | 2462                                                                               |         |

| 802.11n HT40                                                                        |                                   |                                                                                      |         |
|-------------------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------|---------|
| Frequency (MHz)                                                                     | Delta Peak to Band emission (dBc) | Limit (dBc)                                                                          | Verdict |
| 2400.00                                                                             | 42.855                            | 20                                                                                   | PASS    |
| 2483.50                                                                             | 45.794                            | 20                                                                                   | PASS    |
|  |                                   |  |         |
| 2422                                                                                |                                   | 2452                                                                                 |         |



## 8. SPURIOUS RF CONDUCTED EMISSION

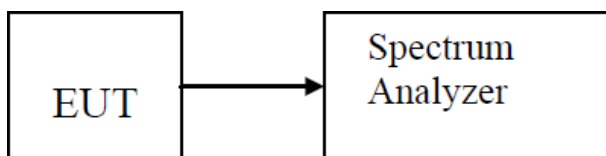
### 8.1 TEST LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.
3. For below 30MHz, For 9KHz-150kHz, 150K-10MHz, We use the RBW 1KHz, 10KHz, So the limit need to be calculated by  $10\lg(BW1/BW2)$ . for example For 9KHz-150kHz, RBW 1KHz, The Limit = the highest emission level -  $20 - 10\lg(100/1) =$  the highest emission level - 40.

#### 8.1.1 TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013, For 9KHz-150kHz, Set RBW=1kHz and VBW= 3KHz; For 150KHz-10MHz, Set RBW=10kHz and VBW= 30KHz; For 10MHz-25GHz, Set RBW=100kHz and VBW= 300KHz in order to measure the peak field strength, and measure frequency range from 9KHz to 25GHz.

#### 8.1.2 TEST SETUP



#### 8.1.3 TEST RESULT

PASS

Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data and record the worst test data for 802.11b mode in report.

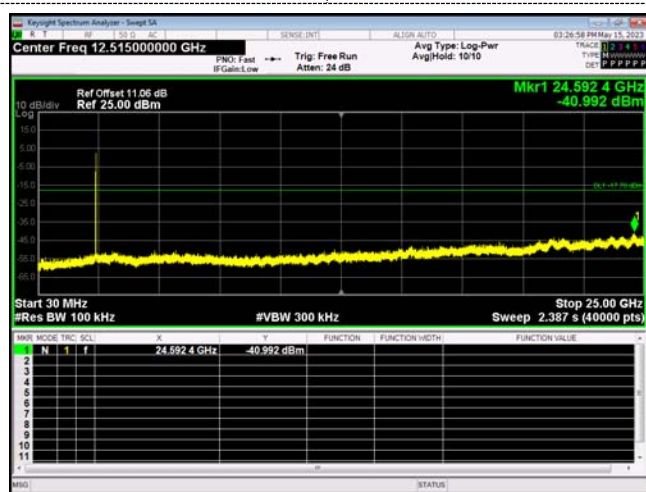
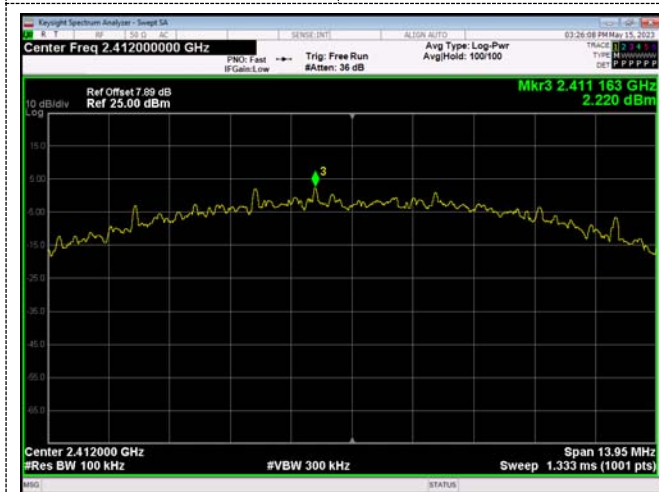


Test Mode:

802.11b

Test channel :

01

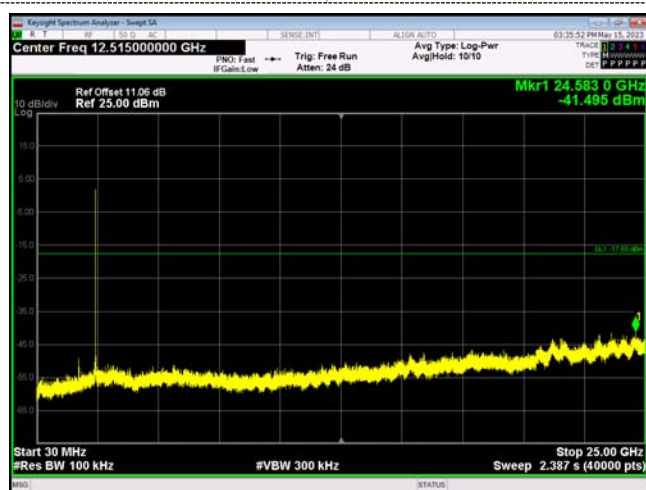
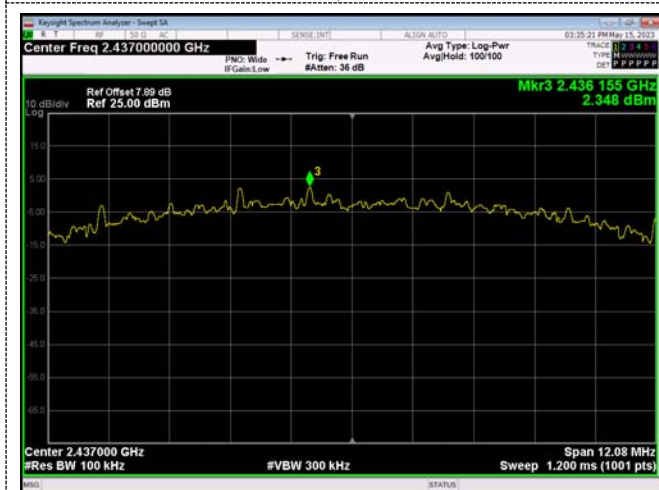


Test Mode:

802.11b

Test channel :

06

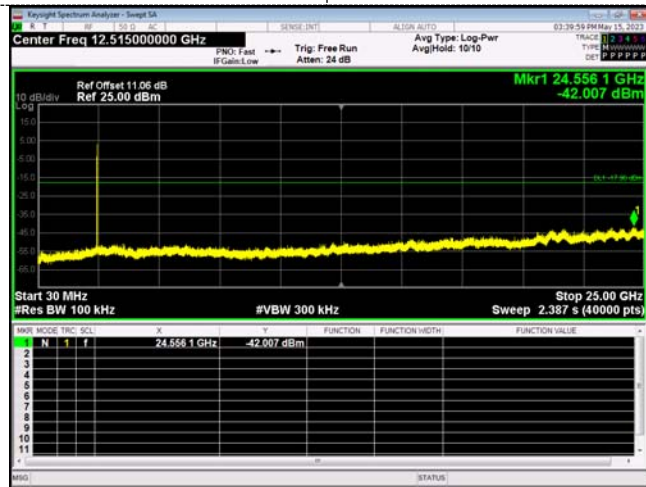
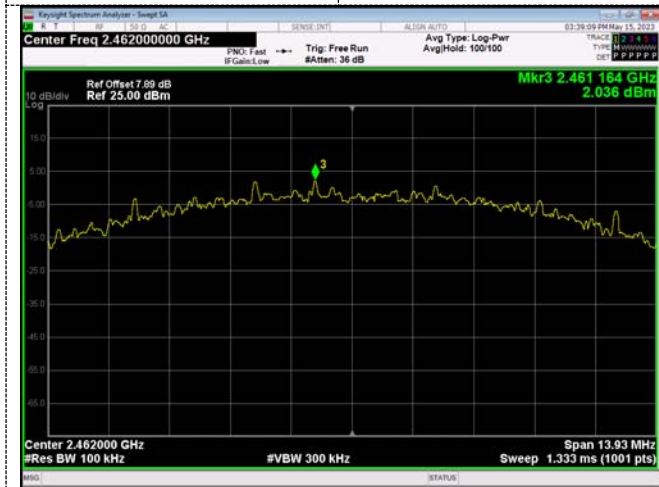


Test Mode:

802.11b

Test channel :

11



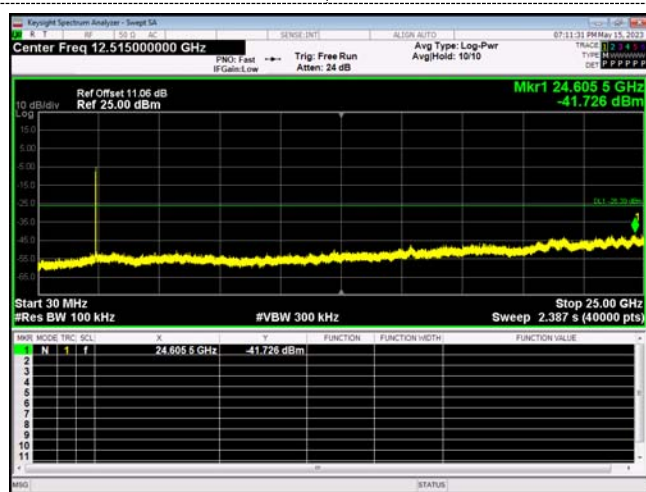


Test Mode:

802.11g

Test channel :

01

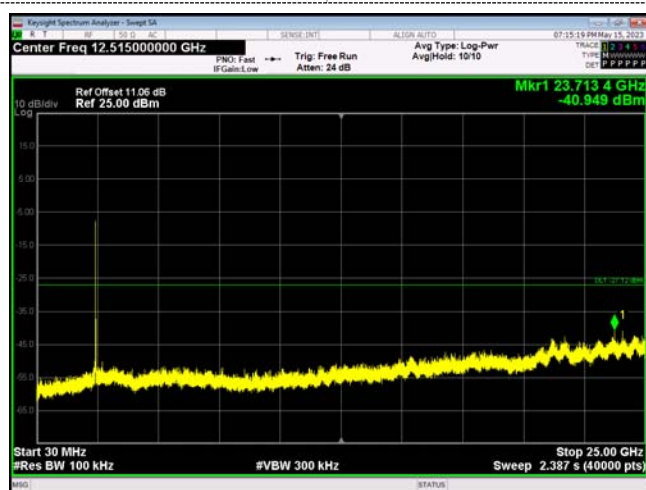


Test Mode:

802.11g

Test channel :

06

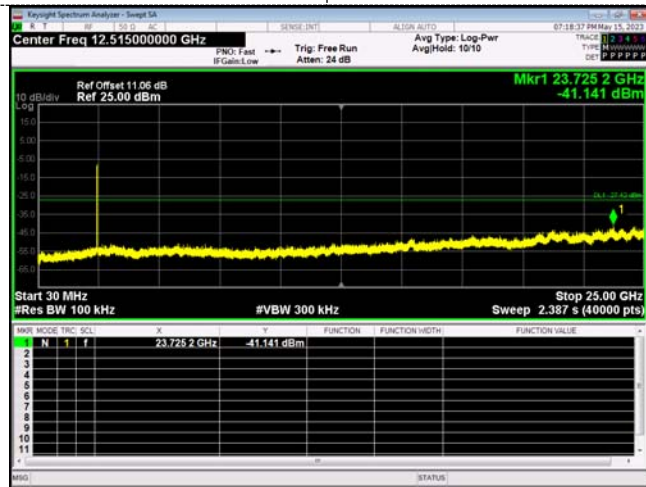
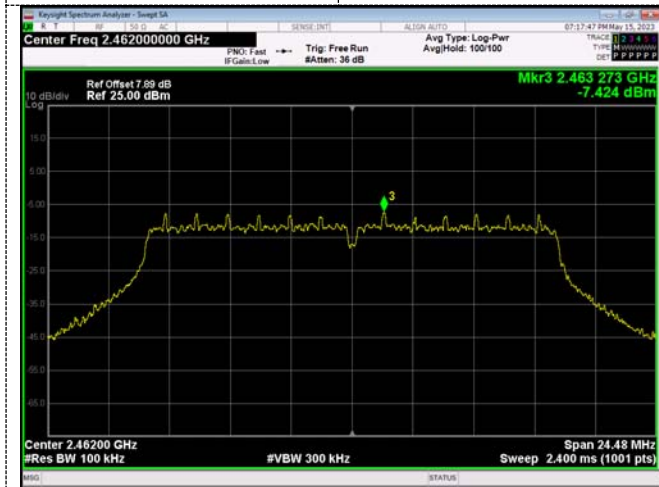


Test Mode:

802.11g

Test channel :

11



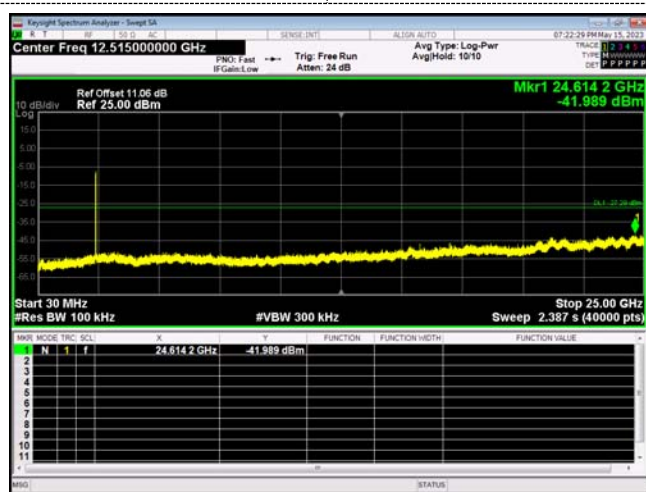


Test Mode:

802.11n HT20

Test channel :

01

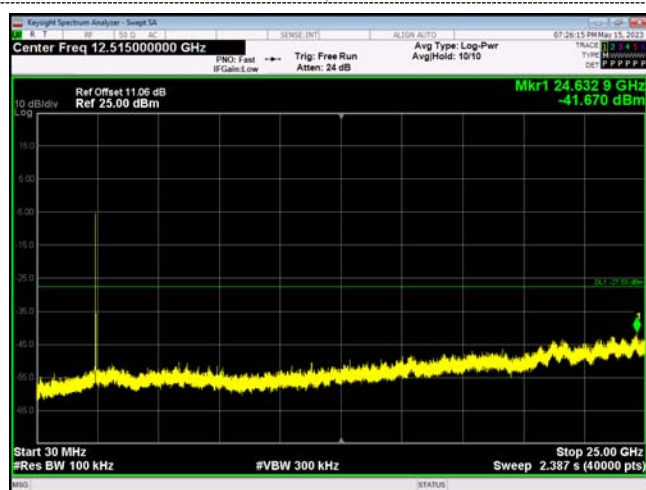


Test Mode:

802.11n HT20

Test channel :

06

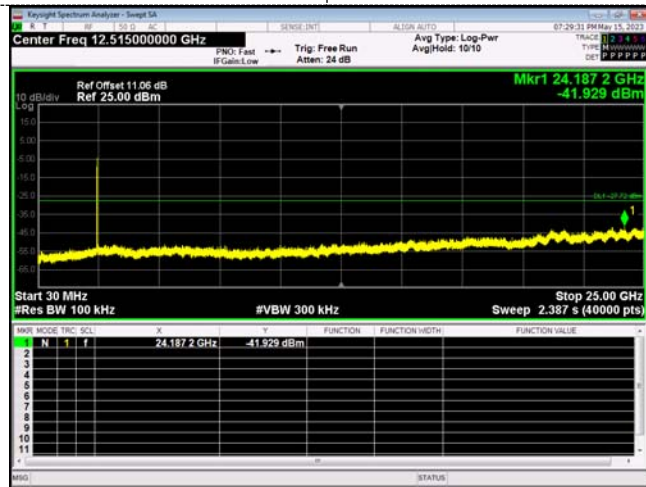
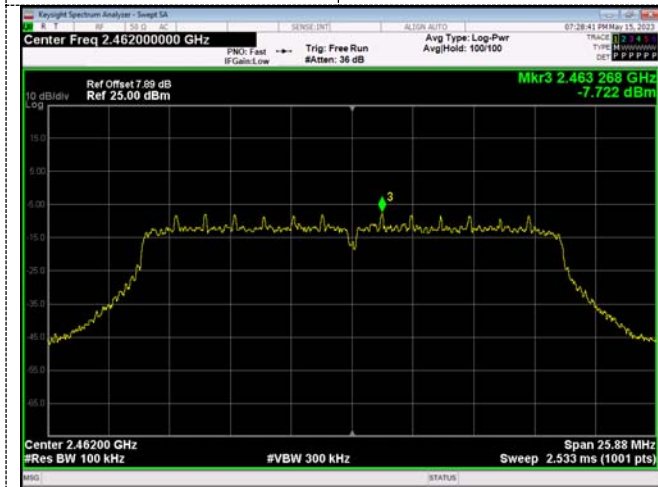


Test Mode:

802.11n HT20

Test channel :

11



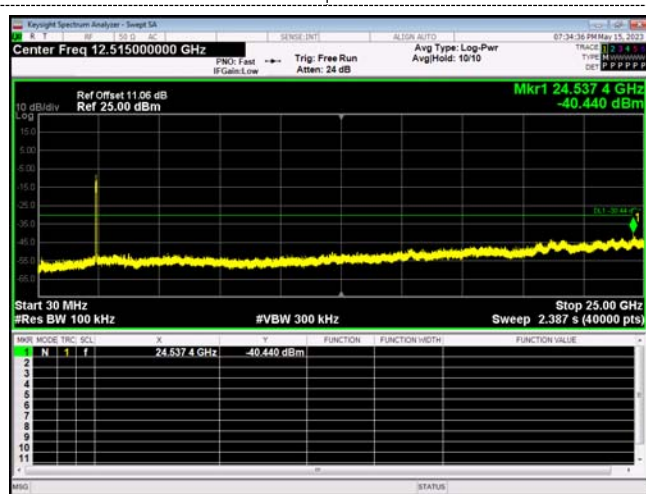
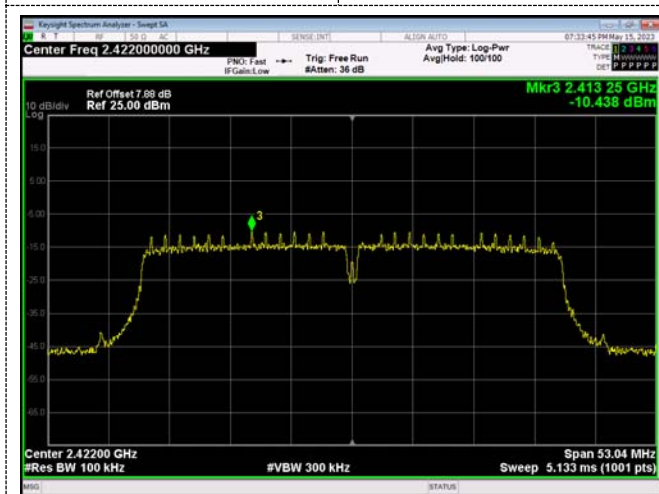


Test Mode:

802.11n HT40

Test channel :

03

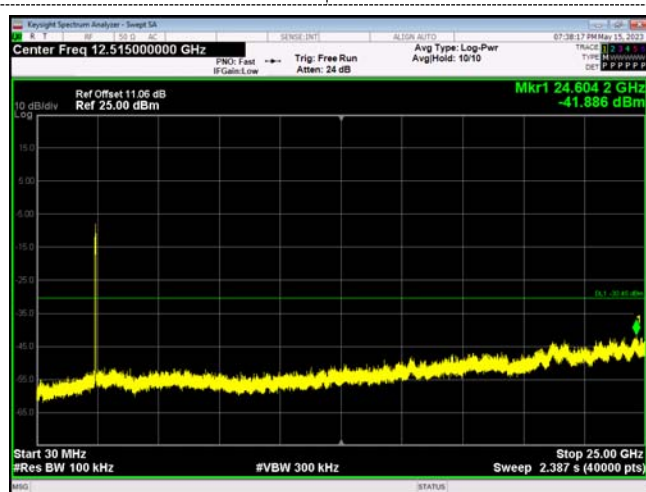
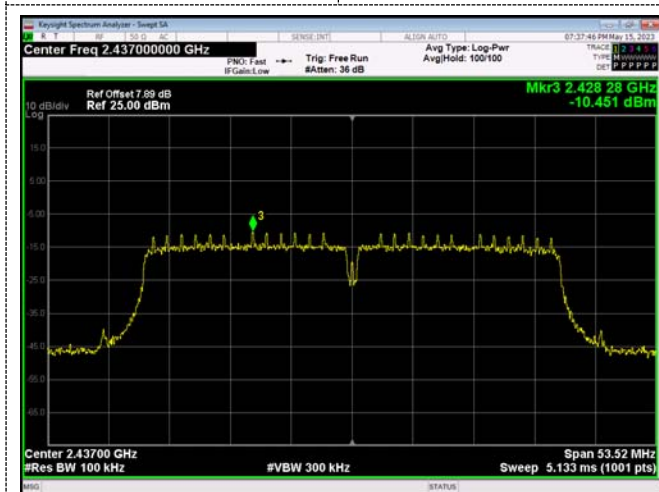


Test Mode:

802.11n HT40

Test channel :

06

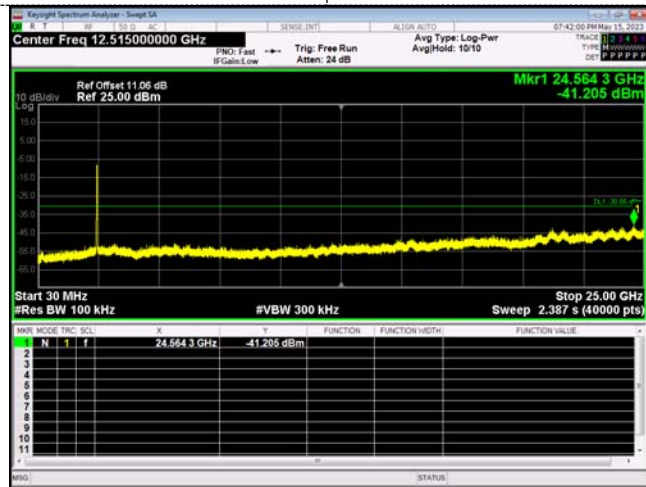
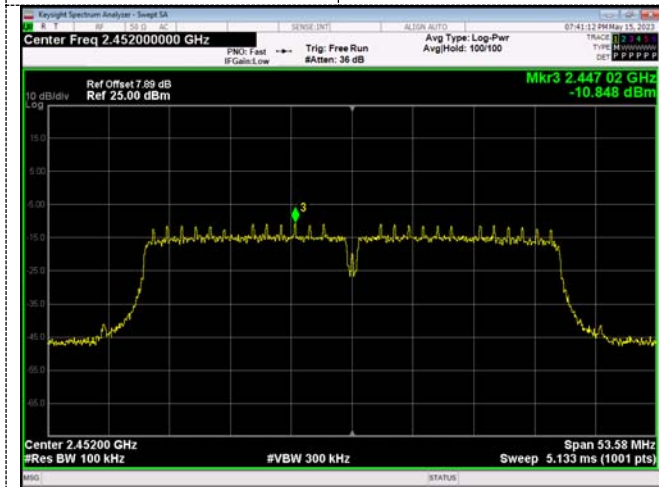


Test Mode:

802.11n HT40

Test channel :

09





## 9. DUTY CYCLE

### 9.1 APPLICABLE STANDARD

According to KDB 558074 D01 15.247 Meas Guidance v05r02 Section 6.

### 9.1 TEST PROCEDURE

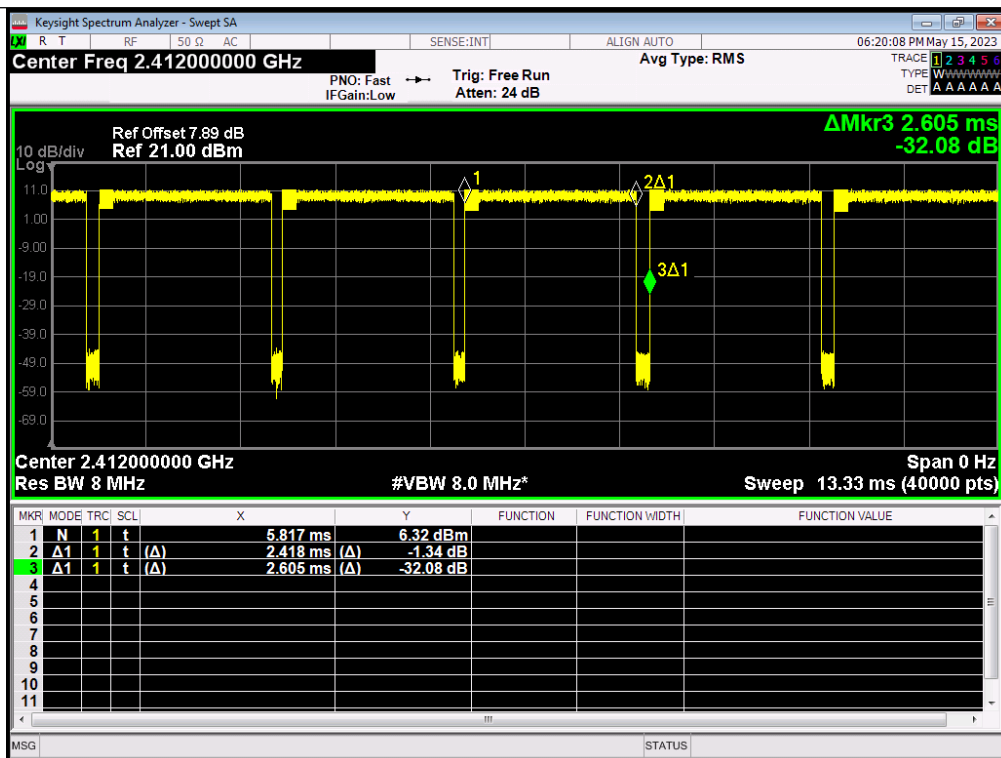
- a) A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.
- b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:
- 1) Set the center frequency of the instrument to the center frequency of the transmission.
  - 2) Set RBW  $\geq$  OBW if possible; otherwise, set RBW to the largest available value.
  - 3) Set VBW  $\geq$  RBW. Set detector = peak or average.
  - 4) The zero-span measurement method shall not be used unless both RBW and VBW are  $> 50/T$  and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if  $T \leq 16.7 \mu s$ .)

Measure  $T_{total}$  and  $T_{on}$

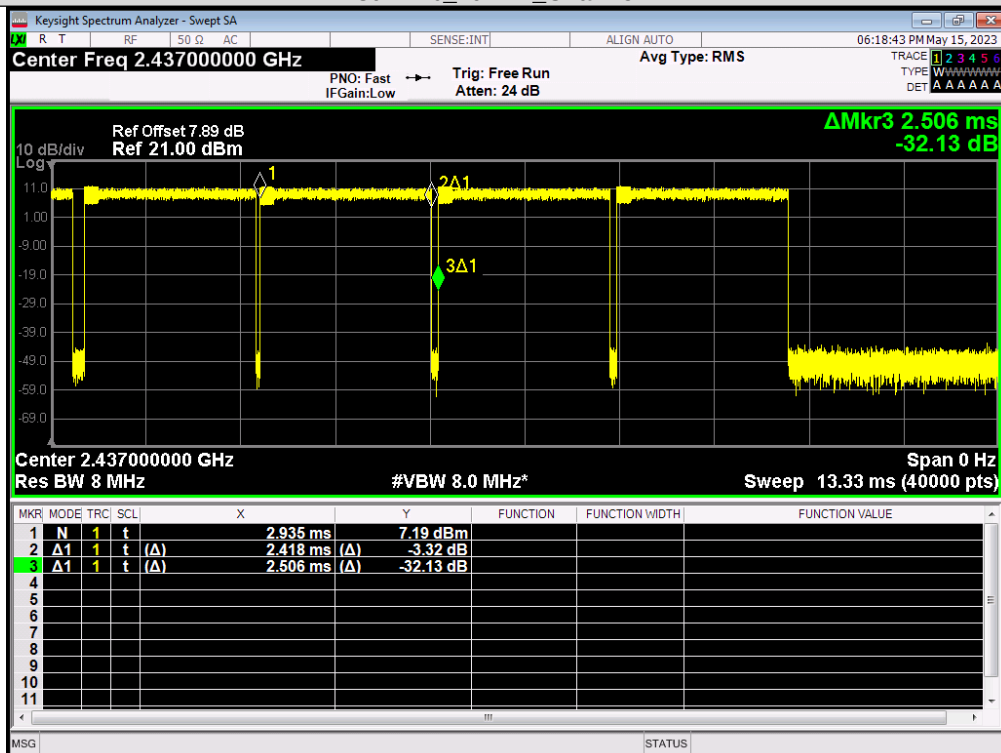
Calculate Duty Cycle =  $T_{on} / T_{total}$

### 9.2 TEST RESULT

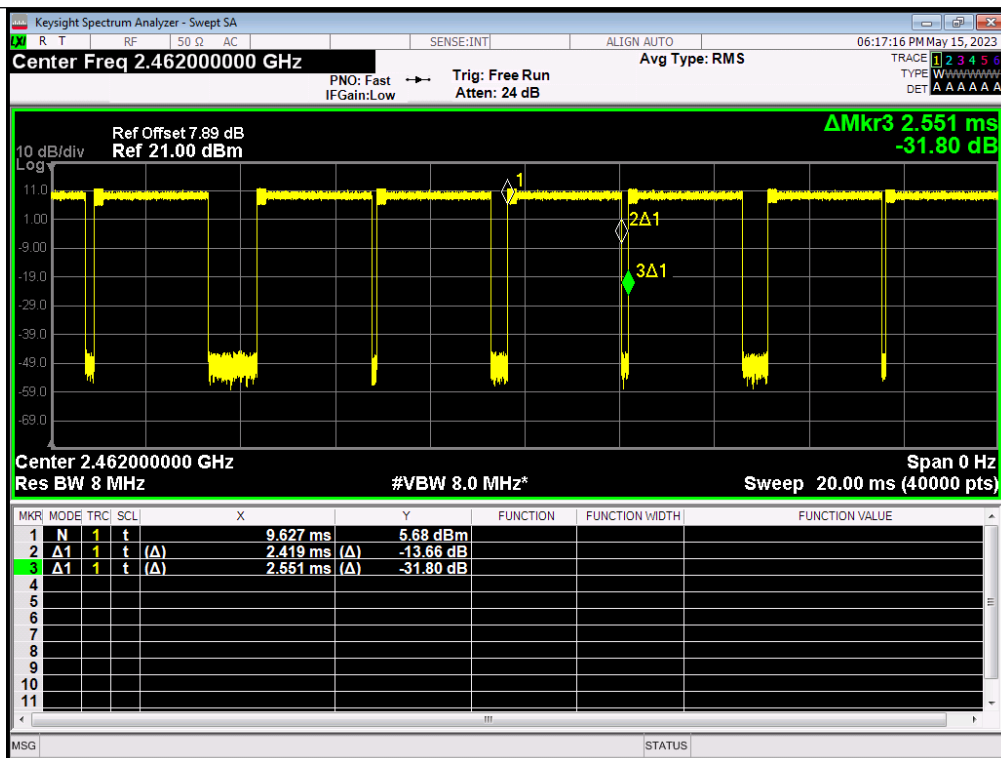
| Mode       | Data rates | Channel | On Time (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle (linear) | Duty Cycle Factor (dB) |
|------------|------------|---------|--------------|-------------|----------------|---------------------|------------------------|
| 802.11b    | 11         | 1       | 2.418        | 2.605       | 92.85          | 0.9285              | 0.3222                 |
|            |            | 6       | 2.418        | 2.506       | 96.51          | 0.9651              | 0.1543                 |
|            |            | 11      | 2.419        | 2.551       | 94.82          | 0.9482              | 0.231                  |
| 802.11g    | 54         | 1       | 2.066        | 2.215       | 93.24          | 0.9324              | 0.304                  |
|            |            | 6       | 2.065        | 2.197       | 94.00          | 0.9400              | 0.2687                 |
|            |            | 11      | 2.066        | 2.125       | 97.19          | 0.9719              | 0.1238                 |
| 802.11n_20 | MCS 0      | 1       | 1.921        | 1.990       | 96.52          | 0.9652              | 0.1538                 |
| 6          |            | 1.922   | 2.080        | 92.37       | 0.9237         | 0.3447              |                        |
| 11         |            | 1.921   | 2.026        | 94.81       | 0.9481         | 0.2315              |                        |
| 802.11n_40 |            | 3       | 0.945        | 1.041       | 90.78          | 0.9078              | 0.4201                 |
| 6          |            | 0.945   | 3.836        | 24.64       | 0.2464         | 6.0836              |                        |
| 9          |            | 0.945   | 1.041        | 90.79       | 0.9079         | 0.4196              |                        |



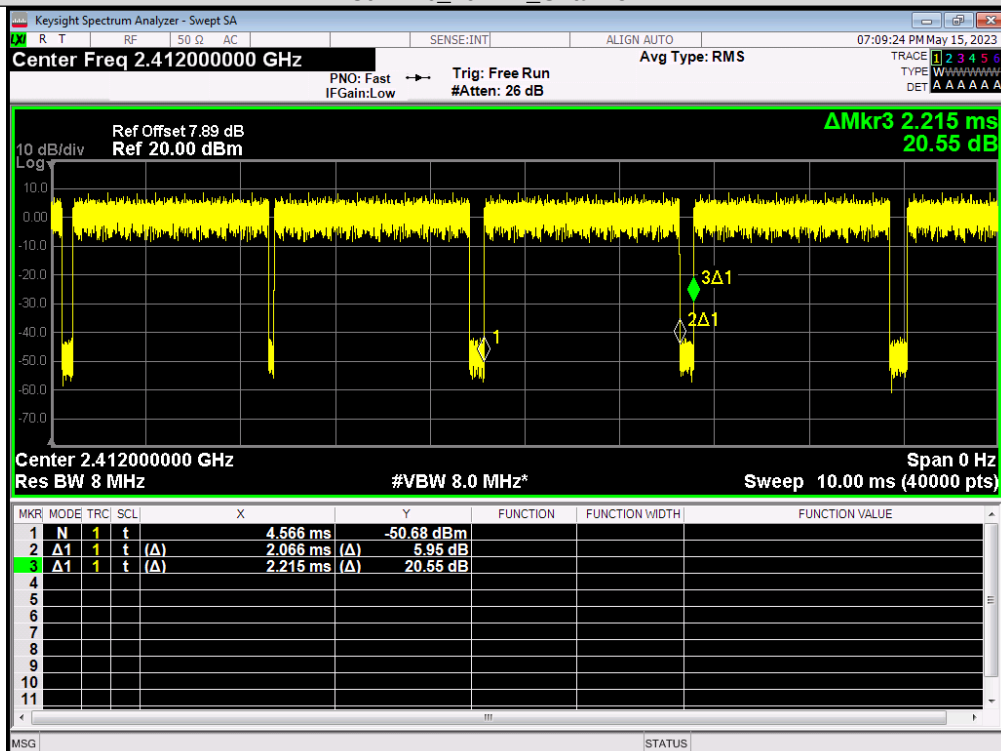
802.11b\_20MHz\_Channel 1



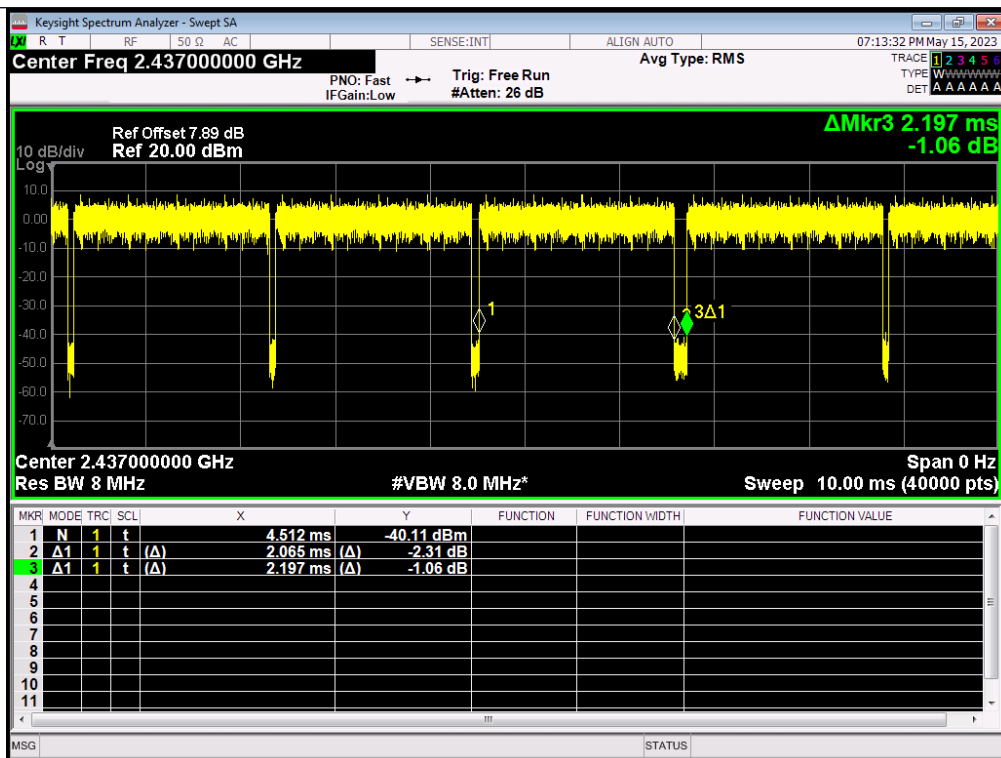
802.11b\_20MHz\_Channel 6



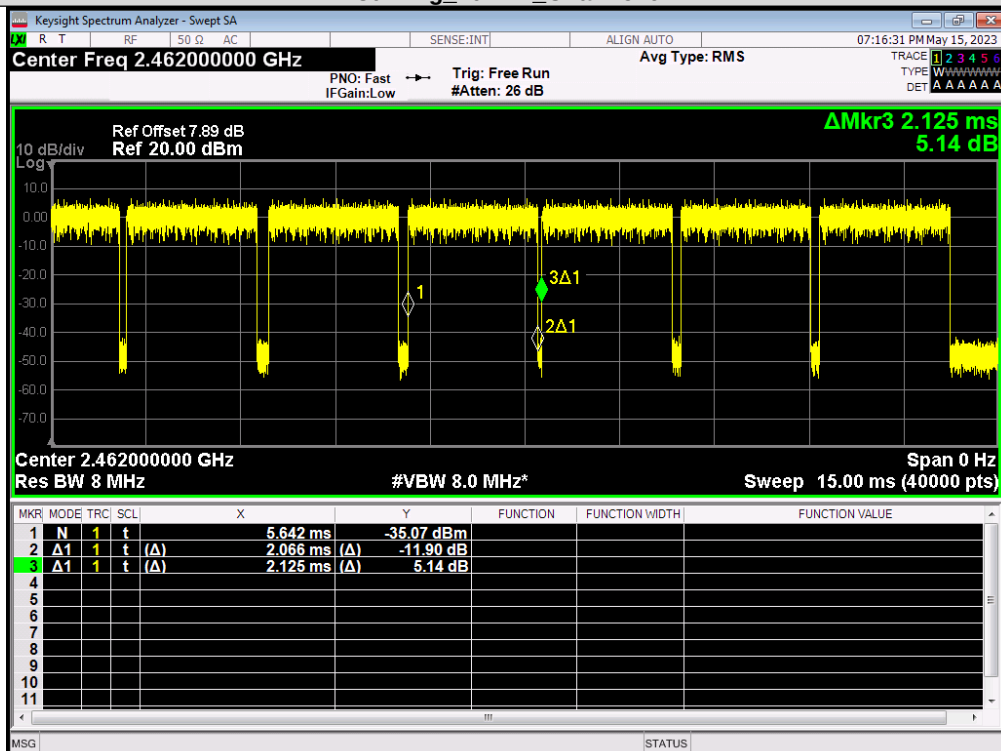
802.11b\_20MHz\_Channel 11



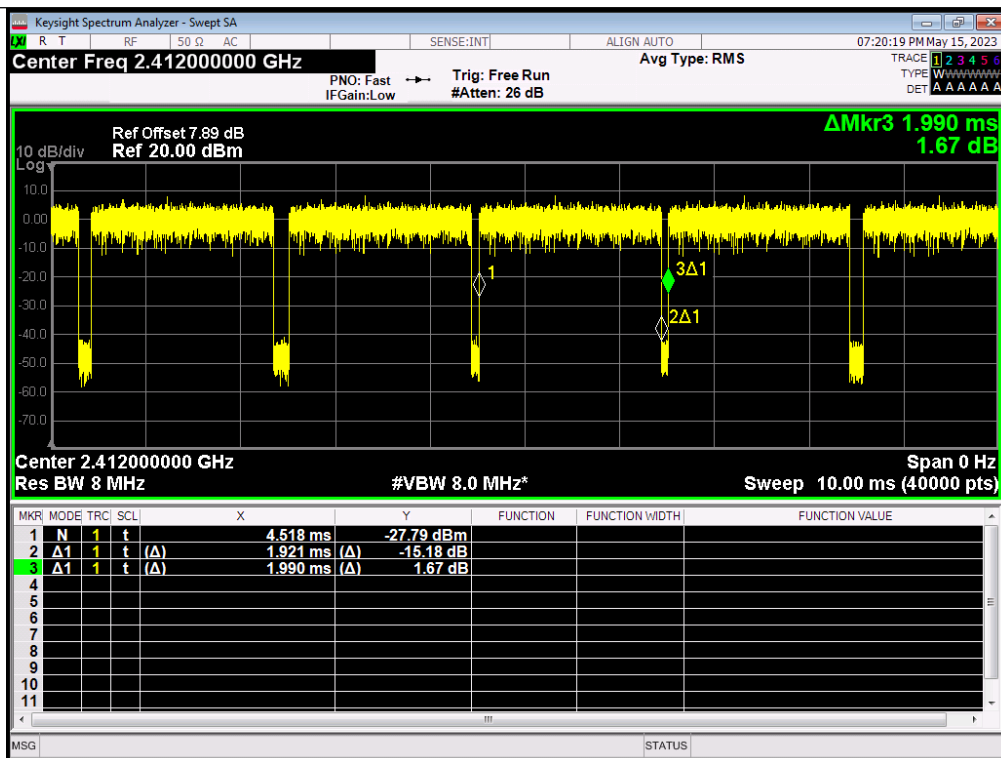
802.11g\_20MHz\_Channel 1



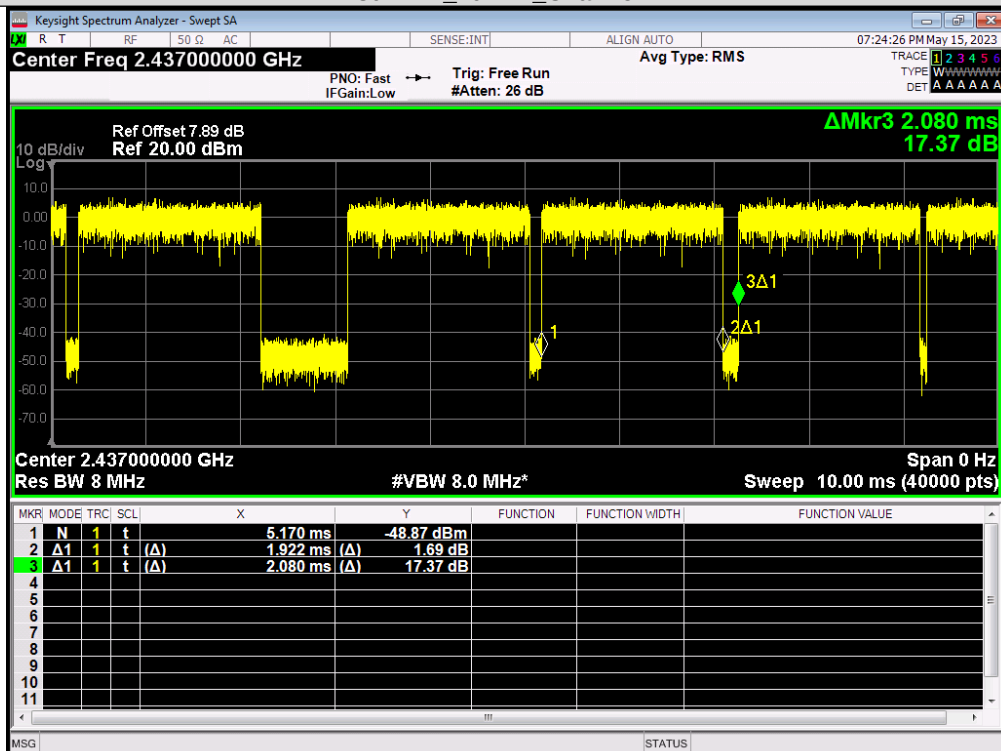
802.11g\_20MHz\_Channel 6



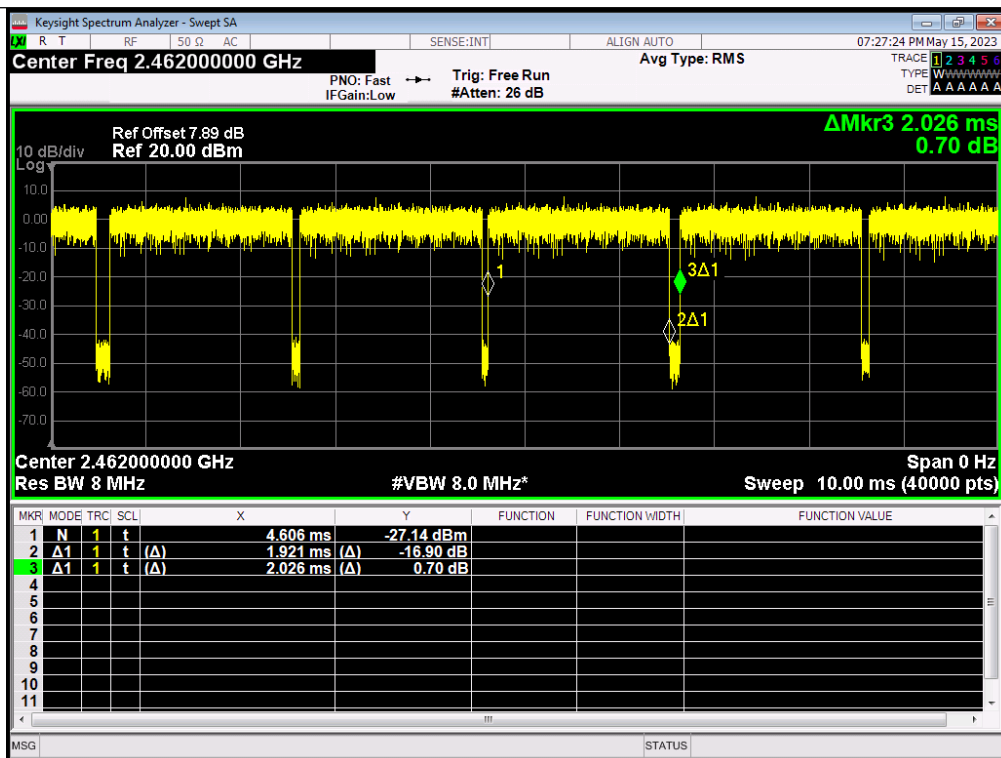
802.11g\_20MHz\_Channel 11



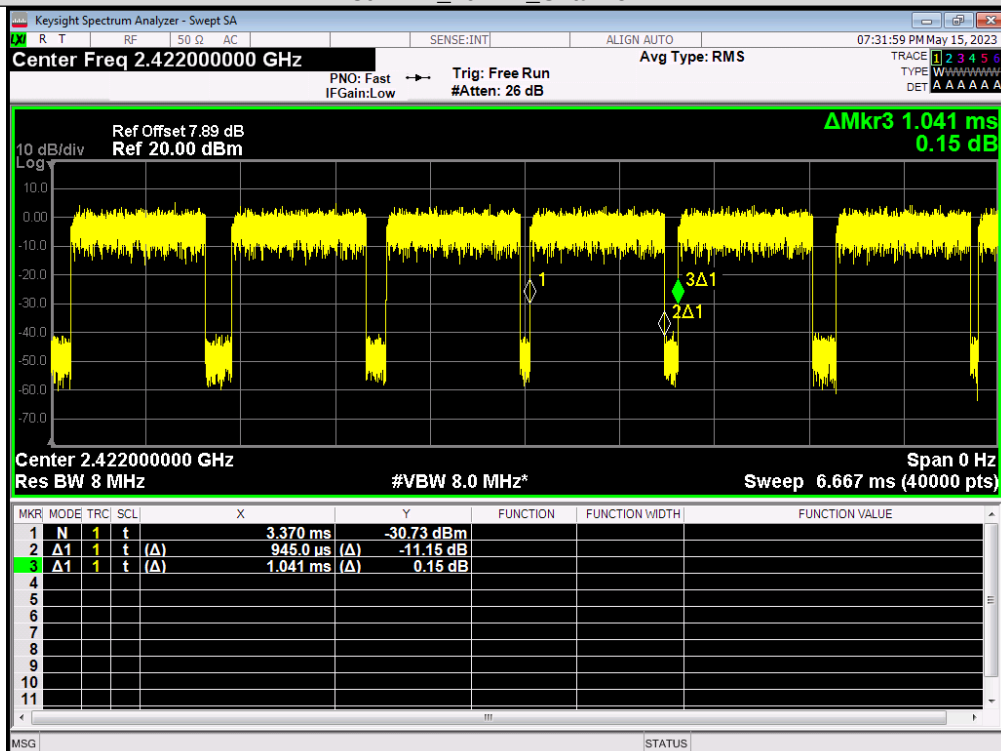
802.11n\_20MHz\_Channel 1



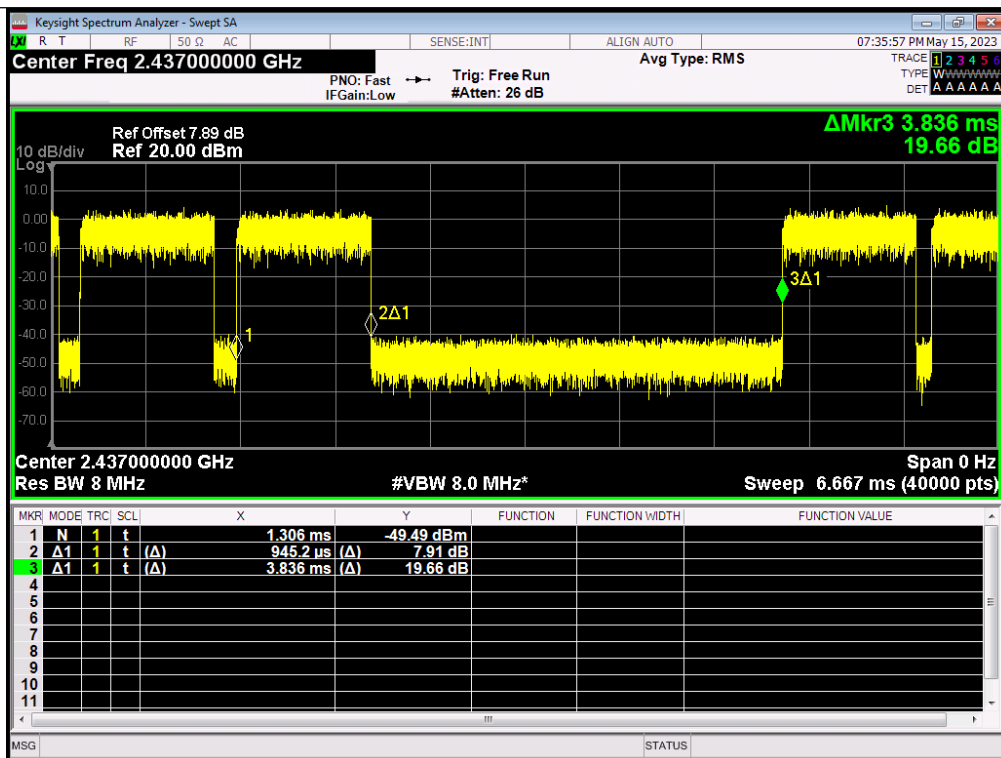
802.11n\_20MHz\_Channel 6



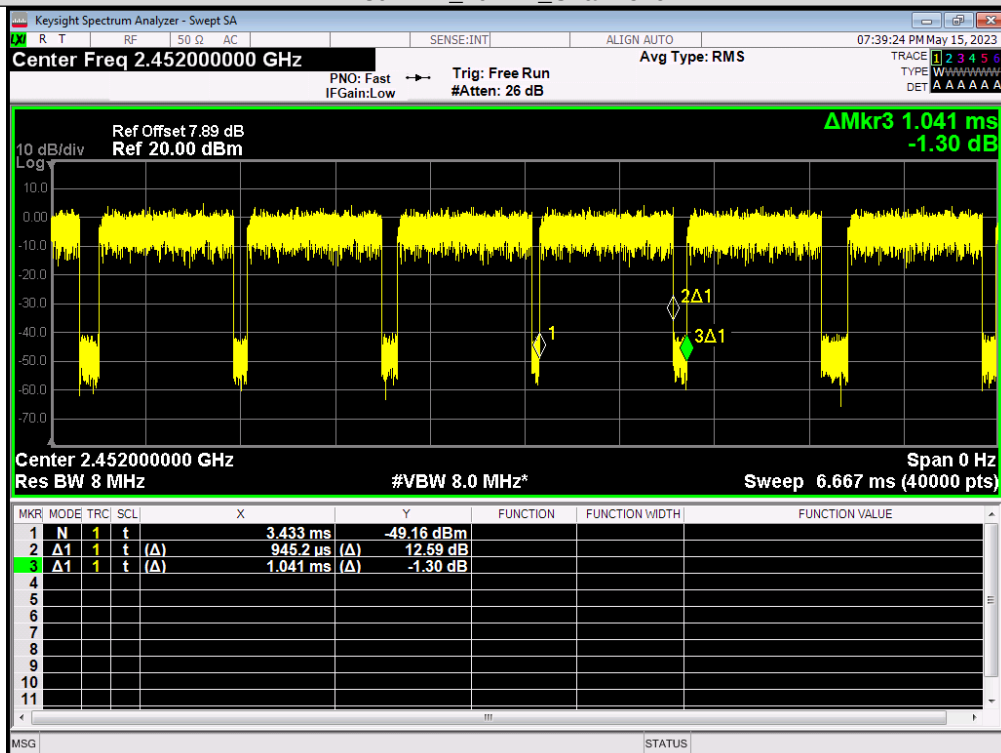
802.11n\_20MHz\_Channel 11



802.11n\_40MHz\_Channel 3



802.11n\_40MHz\_Channel 6



802.11n\_40MHz\_Channel 9



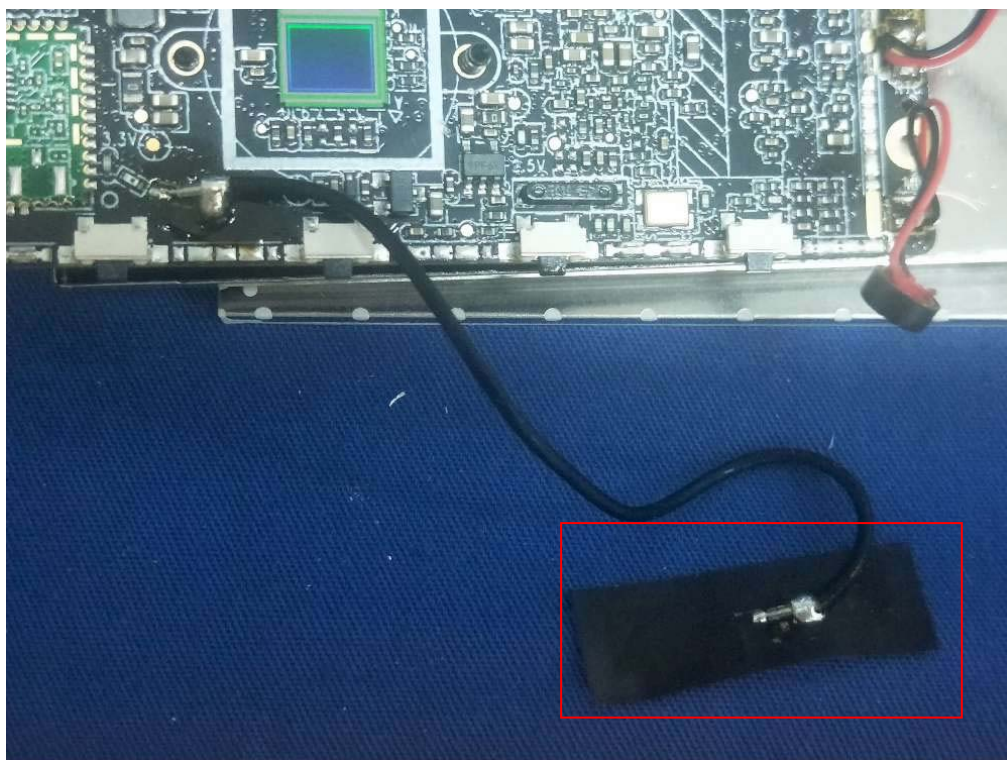
## 10. ANTENNA REQUIREMENT

### 10.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203&RSS-Gen§8.3: 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.

#### 10.1.1 EUT ANTENNA

The EUT antenna is internal antenna,. It comply with the standard requirement.





#### 11. TEST SEUUP PHOTO

Reference to the appendix I for details.

#### 12. EUT PHOTO

Reference to the appendix II for details.

\*\*\*\*\* END OF REPORT \*\*\*\*\*