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# RADIO TEST REPORT

Report No:STS1811315W06

Issued for

COOL BEER DOO

CRKVISTE 5 A,11210 Beograd,Serbia

|                       |                                |
|-----------------------|--------------------------------|
| <b>Product Name:</b>  | Cooler Manager                 |
| <b>Brand Name:</b>    | Cooler Manager                 |
| <b>Model Name:</b>    | SmartFlow                      |
| <b>Series Model:</b>  | Serie 1                        |
| <b>FCC ID:</b>        | 2ARZOCM2018V1                  |
| <b>IC ID:</b>         | 24629-CM2018                   |
| <b>Test Standard:</b> | FCC Part 15.247                |
|                       | RSS-247 Issue 2, February 2017 |

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## TEST RESULT CERTIFICATION

**Applicant's name** ..... : COOL BEER DOO

**Address** ..... : CRKVISTE 5 A,11210 Beograd,Serbia

**Manufacture's Name** ..... : COOL BEER DOO

**Address** ..... : CRKVISTE 5 A,11210 Beograd,Serbia

**Product description**

**Product Name** ..... : Cooler Manager

**Brand Name** ..... : Cooler Manager

**Model Name**..... : SmartFlow

**Series Model** ..... : Serie 1

**Test Standards** ..... : FCC Part15.247

RSS-247 Issue 2, February 2017

**Test procedure** ..... ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC/IC requirements. And it is applicable only to the tested sample identified in the report.

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**Date of Test**..... :

**Date (s) of performance of tests**..... : 29 Nov.2018 ~10 Dec.2018

**Date of Issue** ..... : 19 Dec.2018

**Test Result** ..... : **Pass**

**Testing Engineer** :

( Chris chen )

**Technical Manager** :

( Sunday Hu )

**Authorized Signatory** :

(Vita Li)

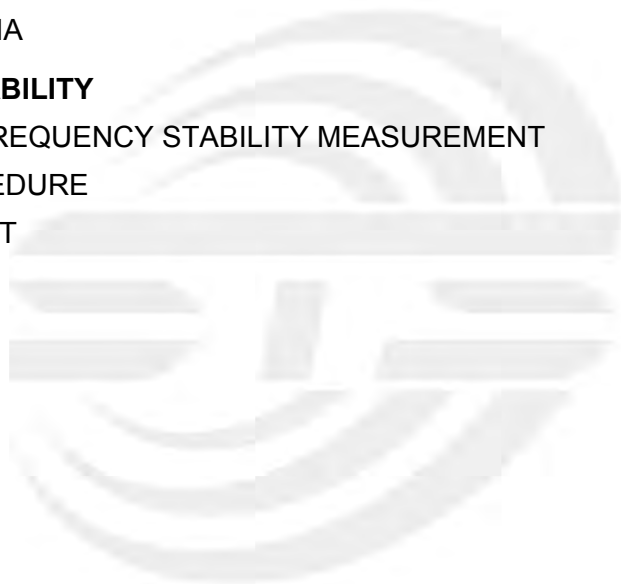




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**Revision History**

| Rev. | Issue Date  | Report NO.    | Effect Page | Contents      |
|------|-------------|---------------|-------------|---------------|
| 00   | 19 Dec.2018 | STS1811315W06 | ALL         | Initial Issue |
|      |             |               |             |               |





## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

KDB 558074 D01 DTS Meas Guidance v05 and KDB 558074 D01 DTS Meas Guidance v03r05

| FCC Part 15.247, Subpart C<br>RSS-247 Issue 2                   |                                         |          |        |
|-----------------------------------------------------------------|-----------------------------------------|----------|--------|
| Standard Section                                                | Test Item                               | Judgment | Remark |
| 15.207<br>RSS-Gen Issue 5 April 2018                            | Conducted Emission                      | PASS     |        |
| 15.247 (a)(2)                                                   | 6dB Bandwidth                           | PASS     |        |
| 1RSS-GEN clause 6.7                                             | 99% Bandwidth                           | PASS     |        |
| 15.247 (b)(3)<br>RSS-247 Issue 2, February 2017 (5.4)           | Output Power                            | PASS     |        |
| 15.247 (c)<br>RSS-247 Issue 2, February 2017 (5.5)              | Radiated Spurious Emission              | PASS     |        |
| 15.247 (d)<br>RSS-247 Issue 2, February 2017 (5.5)              | Conducted Spurious & Band Edge Emission | PASS     |        |
| 15.247 (e)<br>RSS-247 Issue 2, February 2017                    | Power Spectral Density                  | PASS     |        |
| 15.205                                                          | Restricted Band Edge Emission           | PASS     |        |
| Part 15.247(d)/part 15.209(a)<br>RSS-247 Issue 2, February 2017 | Band Edge Emission                      | PASS     |        |
| 15.203<br>RSS-Gen Issue 5 April 2018                            | Antenna Requirement                     | PASS     |        |
| RSS-Gen Issue 5 April 2018                                      | Frequency Stability                     | PASS     |        |

### NOTE:

- (1) "N/A" denotes test is not applicable in this Test Report
- (2) all tests are according to ANSI C63.10-2013 .



## 1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.

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Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

FCC Registration No.: 625569

IC Registration No.: 12108A; A2LA Certificate No.: 4338.01;

## 1.2 MEASUREMENT UNCERTAINTY

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

|   |                                    |                     |
|---|------------------------------------|---------------------|
| 1 | RF output power,conducted          | $\pm 0.71\text{dB}$ |
| 2 | Unwanted Emissions,conducted       | $\pm 0.63\text{dB}$ |
| 3 | All emissions,radiated 30-200MHz   | $\pm 3.43\text{dB}$ |
| 4 | All emissions,radiated 200MHz-1GHz | $\pm 3.57\text{dB}$ |
| 5 | All emissions,radiated>1G          | $\pm 4.13\text{dB}$ |
| 6 | Conducted Emission(9KHz-150KHz)    | $\pm 3.18\text{dB}$ |
| 7 | Conducted Emission(150KHz-30MHz)   | $\pm 2.70\text{dB}$ |



## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF THE EUT

|                                              |                                                                                               |                                                                                                                       |
|----------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Product Name                                 | Cooler Manager                                                                                |                                                                                                                       |
| Trade Name                                   | Cooler Manager                                                                                |                                                                                                                       |
| Model Name                                   | SmartFlow                                                                                     |                                                                                                                       |
| Series Model                                 | Serie 1                                                                                       |                                                                                                                       |
| Model Difference                             | Only different in DC power connector.                                                         |                                                                                                                       |
| Product Description                          | The EUT is Cooler Manager                                                                     |                                                                                                                       |
|                                              | Operation Frequency:                                                                          | 802.11b/g/n20: 2412~2462 MHz                                                                                          |
|                                              | Modulation Type:                                                                              | 802.11b(DSSS):CCK,DQPSK,DBPSK<br>802.11g(OFDM):BPSK,QPSK,16-QAM,64-QAM<br>802.11n(OFDM):BPSK,QPSK,16-QAM,64-QAM       |
|                                              | Bit Rate of Transmitter:                                                                      | 802.11b:11/5.5/2/1 Mbps<br>802.11g:54/48/36/24/18/12/9/6 Mbps<br>802.11n(20MHz):<br>65/58.5/52/39/26/19.5/13/6.5 Mbps |
|                                              | Number Of Channel:                                                                            | 802.11b/g/n20:11CH                                                                                                    |
|                                              | Antenna Designation:                                                                          | Please see Note 3                                                                                                     |
|                                              | Antenna Gain (dBi):                                                                           | 2dBi                                                                                                                  |
|                                              | Duty Cycle:                                                                                   | >98%                                                                                                                  |
| Channel List                                 | Please refer to the Note 2.                                                                   |                                                                                                                       |
| Adapter                                      | Power supply and ADP(rating):<br>Input: AC 100-240V, 1500mA, 50-60Hz<br>Output: DC 9V, 2000mA |                                                                                                                       |
| Hardware version                             | V1.0                                                                                          |                                                                                                                       |
| Software version                             | V1.0                                                                                          |                                                                                                                       |
| Radio Hardware version                       | MPLY.LR9.W1444,MD.LWTG.MP.V79.P4                                                              |                                                                                                                       |
| Radio Software version                       | SC6531_W13.04.05_Release                                                                      |                                                                                                                       |
| Test Software                                | 3.18.19                                                                                       |                                                                                                                       |
| RF Power Setting TEST Software (power class) | 2.4 GHz:802.11 b/g/n 20:12/10/9                                                               |                                                                                                                       |
| Connecting I/O Port(s)                       | Please refer to the User's Manual                                                             |                                                                                                                       |



Note:

- 1 For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2

| Operation Frequency of channel |           |
|--------------------------------|-----------|
| 802.11b/g/n(20MHz)             |           |
| Channel                        | Frequency |
| 01                             | 2412      |
| 02                             | 2417      |
| 03                             | 2422      |
| 04                             | 2427      |
| 05                             | 2432      |
| 06                             | 2437      |
| 07                             | 2442      |
| 08                             | 2447      |
| 09                             | 2452      |
| 10                             | 2457      |
| 11                             | 2462      |

- 3 Note:  
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:  
Carrier Frequency Channel

2.4GHz Test Frequency:

| For 802.11b/g/n (HT20) |            |
|------------------------|------------|
| Channel                | Freq.(MHz) |
| 01                     | 2412       |
| 06                     | 2437       |
| 11                     | 2462       |

4

| Ant | Brand          | Model Name | Antenna Type | Connector | Gain (dBi) | NOTE         |
|-----|----------------|------------|--------------|-----------|------------|--------------|
| 1   | Cooler Manager | SmartFlow  | PCB Antenna  | N/A       | 2          | WLAN Antenna |



## 2.2 DESCRIPTION OF THE TEST MODES

Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Worst Mode | Description               | Data Rate |
|------------|---------------------------|-----------|
| Mode 1     | TX IEEE 802.11b CH1       | 1 Mbps    |
| Mode 2     | TX IEEE 802.11b CH6       | 1 Mbps    |
| Mode 3     | TX IEEE 802.11 b CH11     | 1 Mbps    |
| Mode 4     | TX IEEE 802.11g CH1       | 6 Mbps    |
| Mode 5     | TX IEEE 802.11g CH6       | 6 Mbps    |
| Mode 6     | TX IEEE 802.11g CH11      | 6 Mbps    |
| Mode 7     | TX IEEE 802.11n HT20 CH1  | MCS 0     |
| Mode 8     | TX IEEE 802.11n HT20 CH6  | MCS 0     |
| Mode 9     | TX IEEE 802.11n HT20 CH11 | MCS 0     |

Note:

- (1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported
- (2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V/60Hz is shown in the report
- (3) Controlled using a bespoke application on the laptop PC supplied by the customer. The application was used to enable a continuous transmission mode and to select the test channels, data rates and modulation schemes as required.

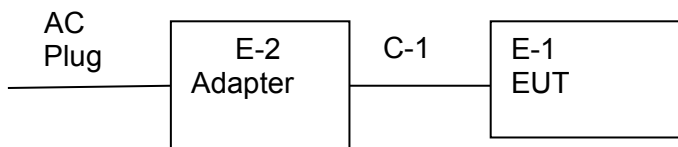
### AC Conducted Emission

| Test Case             |                         |
|-----------------------|-------------------------|
| AC Conducted Emission | Mode10: Keeping WIFI TX |

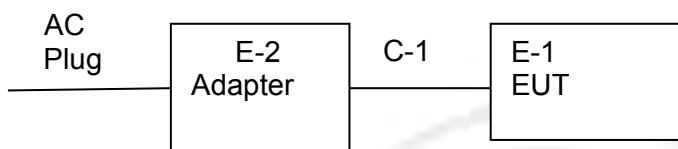


## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

### Radiation Test Set



### conduction Test Set





## 2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

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.

### Necessary accessories

| Item | Equipment | Mfr/Brand | Model/Type No. | Serial No. | Note |
|------|-----------|-----------|----------------|------------|------|
| E-2  | Notebook  | N/A       | YHY            | N/A        | N/A  |
| C-1  | USB Cable | NO        | 100cm          | N/A        | N/A  |
|      |           |           |                |            |      |
|      |           |           |                |            |      |
|      |           |           |                |            |      |

### Support units

| Item | Shielded Type | Ferrite Core | Length | Note |
|------|---------------|--------------|--------|------|
| N/A  | N/A           | N/A          | N/A    | N/A  |
|      |               |              |        |      |
|      |               |              |        |      |

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.



## 2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

## Radiation Test equipment

| Kind of Equipment                | Manufacturer | Type No.            | Serial No.   | Last calibration | Calibrated until |
|----------------------------------|--------------|---------------------|--------------|------------------|------------------|
| Test Receiver                    | R&S          | ESCI                | 101427       | 2018.10.13       | 2019.10.12       |
| Signal Analyzer                  | Agilent      | N9020A              | MY51110105   | 2018.03.08       | 2019.03.07       |
| Active loop Antenna              | ZHINAN       | ZN30900C            | 16035        | 2018.03.11       | 2021.03.10       |
| Bilog Antenna                    | TESEQ        | CBL6111D            | 34678        | 2017.11.02       | 2020.11.1        |
| Horn Antenna                     | SCHWARZBECK  | BBHA<br>9120D(1201) | 9120D-1343   | 2018.10.19       | 2021.10.18       |
| SHF-EHF Horn Antenna (15G-40GHz) | A-INFO       | LB-180400-KF        | J211020657   | 2018.03.11       | 2019.03.10       |
| Pre-mpifier(0.1M-3GHz)           | EM           | EM330               | 060665       | 2018.10.13       | 2019.10.12       |
| PreAmplifier (1G-18GHz)          | SKET         | LNPA-01018G-45      | SK2018080901 | 2018.10.13       | 2019.10.12       |
| Temperature & Humidity           | HH660        | Mieo                | N/A          | 2018.10.11       | 2019.10.10       |
| turn table                       | EM           | SC100_1             | 60531        | N/A              | N/A              |
| Antenna mast                     | EM           | SC100               | N/A          | N/A              | N/A              |

## Conduction Test equipment

| Kind of Equipment      | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|------------------------|--------------|----------|------------|------------------|------------------|
| Test Receiver          | R&S          | ESCI     | 101427     | 2018.10.13       | 2019.10.12       |
| LISN                   | R&S          | ENV216   | 101242     | 2018.10.11       | 2019.10.10       |
| LISN                   | EMCO         | 3810/2NM | 23625      | 2018.10.11       | 2019.10.10       |
| Temperature & Humidity | HH660        | Mieo     | N/A        | 2018.10.11       | 2019.10.10       |

## RF Connected Test

| Kind of Equipment      | Manufacturer | Type No. | Serial No.    | Last calibration | Calibrated until |
|------------------------|--------------|----------|---------------|------------------|------------------|
| USB RF power sensor    | DARE         | RPR3006W | 15I00041SNO03 | 2018.10.13       | 2019.10.12       |
| Signal Analyzer        | Agilent      | N9020A   | MY49100060    | 2018.10.13       | 2019.10.12       |
| Temperature & Humidity | HH660        | Mieo     | N/A           | 2018.10.11       | 2019.10.10       |



### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

operating frequency band. In case the emission fall within the restricted band specified on Part 15.207(a) and RSS-Gen Issue 5 limit in the table below has to be followed.

| FREQUENCY (MHz) | Conducted Emission limit (dBuV) |           |
|-----------------|---------------------------------|-----------|
|                 | Quasi-peak                      | Average   |
| 0.15 -0.5       | 66 - 56 *                       | 56 - 46 * |
| 0.50 -5.0       | 56.00                           | 46.00     |
| 5.0 -30.0       | 60.00                           | 50.00     |

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.

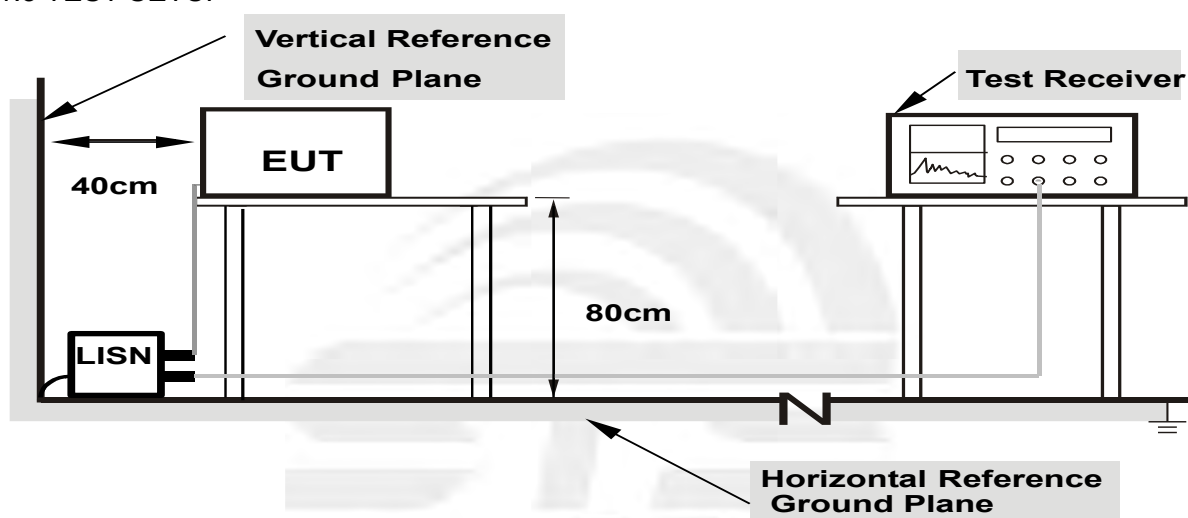
The following table is the setting of the receiver

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

### 3.1.2 TEST PROCEDURE

- The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical 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.
- 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.
- 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.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 3.1.3 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 from other units and other metal planes**

### 3.1.4 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.



## 3.1.5 TEST RESULT

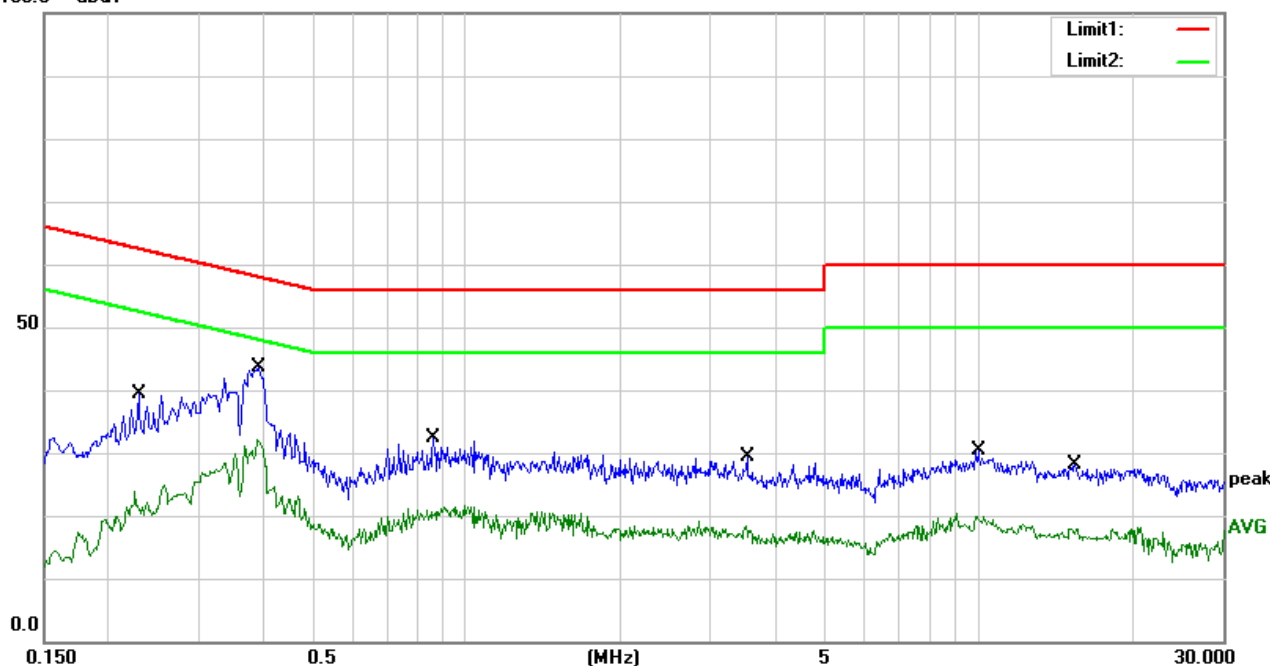
|               |              |                    |     |
|---------------|--------------|--------------------|-----|
| Temperature:  | 23.8 °C      | Relative Humidity: | 54% |
| Test Voltage: | AC 120V/60Hz | Phase:             | L   |
| Test Mode:    | Mode 10      |                    |     |

| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 0.2300             | 18.92             | 20.38                 | 39.30            | 62.45           | -23.15         | QP     |
| 0.2300             | 4.39              | 20.38                 | 24.77            | 52.45           | -27.68         | AVG    |
| 0.3940             | 23.03             | 20.51                 | 43.54            | 57.98           | -14.44         | QP     |
| 0.3940             | 11.56             | 20.51                 | 32.07            | 47.98           | -15.91         | AVG    |
| 0.8620             | 12.08             | 20.20                 | 32.28            | 56.00           | -23.72         | QP     |
| 0.8620             | 1.40              | 20.20                 | 21.60            | 46.00           | -24.40         | AVG    |
| 3.5300             | 9.36              | 19.96                 | 29.32            | 56.00           | -26.68         | QP     |
| 3.5300             | -1.58             | 19.96                 | 18.38            | 46.00           | -27.62         | AVG    |
| 9.9740             | 10.18             | 20.13                 | 30.31            | 60.00           | -29.69         | QP     |
| 9.9740             | 0.14              | 20.13                 | 20.27            | 50.00           | -29.73         | AVG    |
| 15.3940            | 8.22              | 19.97                 | 28.19            | 60.00           | -31.81         | QP     |
| 15.3940            | -1.24             | 19.97                 | 18.73            | 50.00           | -31.27         | AVG    |

Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result = Reading + Factor) - Limit

100.0 dBuV





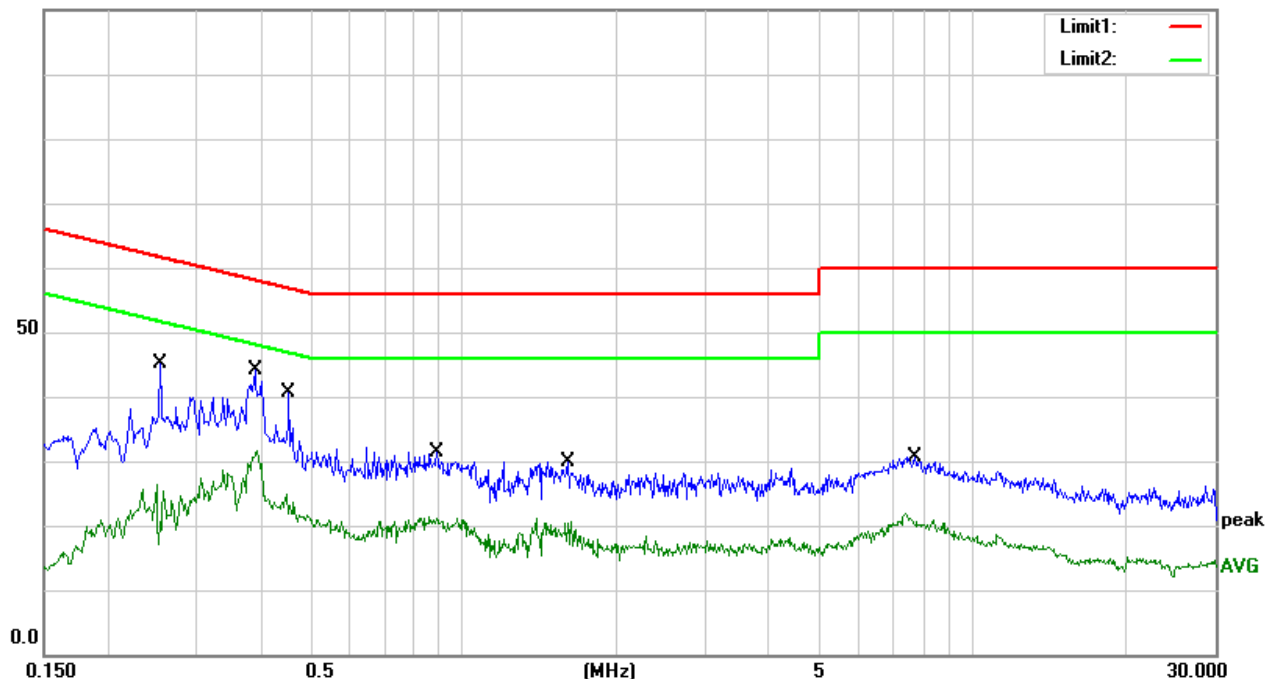
|               |              |                    |     |
|---------------|--------------|--------------------|-----|
| Temperature:  | 23.8 °C      | Relative Humidity: | 54% |
| Test Voltage: | AC 120V/60Hz | Phase:             | N   |
| Test Mode:    | Mode 10      |                    |     |

| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 0.2540             | 24.65             | 20.49                 | 45.14            | 61.63           | -16.49         | QP     |
| 0.2540             | 5.84              | 20.49                 | 26.33            | 51.63           | -25.30         | AVG    |
| 0.3900             | 23.51             | 20.52                 | 44.03            | 58.06           | -14.03         | QP     |
| 0.3900             | 11.10             | 20.52                 | 31.62            | 48.06           | -16.44         | AVG    |
| 0.4540             | 20.18             | 20.49                 | 40.67            | 56.80           | -16.13         | QP     |
| 0.4540             | 4.28              | 20.49                 | 24.77            | 46.80           | -22.03         | AVG    |
| 0.8860             | 11.26             | 20.20                 | 31.46            | 56.00           | -24.54         | QP     |
| 0.8860             | 1.23              | 20.20                 | 21.43            | 46.00           | -24.57         | AVG    |
| 1.6060             | 9.80              | 20.10                 | 29.90            | 56.00           | -26.10         | QP     |
| 1.6060             | 0.52              | 20.10                 | 20.62            | 46.00           | -25.38         | AVG    |
| 7.7260             | 10.74             | 19.96                 | 30.70            | 60.00           | -29.30         | QP     |
| 7.7260             | 1.90              | 19.96                 | 21.86            | 50.00           | -28.14         | AVG    |

Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result = Reading + Factor) – Limit

100.0 dBuV





### 3.2 RADIATED EMISSION MEASUREMENT

#### 3.2.1 RADIATED EMISSION LIMITS

in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) and RSS-247 Issue 2 limit in the table and according to ANSI C63.10-2013 below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

| 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                                |
| 216~960              | 200                                  | 3                                |
| Above 960            | 500                                  | 3                                |

LIMITS OF RADIATED EMISSION MEASUREMENT (1000MHz-25GHz)

| FREQUENCY (MHz) | (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).

For Radiated Emission

| Spectrum Parameter                    | Setting                       |
|---------------------------------------|-------------------------------|
| Attenuation                           | Auto                          |
| Detector                              | Peak/AV                       |
| Start Frequency                       | 1000 MHz(Peak/AV)             |
| Stop Frequency                        | 10th carrier hamonic(Peak/AV) |
| RB / VB (emission in restricted band) | 1 MHz /3MHz                   |

For Band edge

| Spectrum Parameter                    | Setting                                                                |
|---------------------------------------|------------------------------------------------------------------------|
| Detector                              | Peak/AV                                                                |
| Start/Stop Frequency                  | Lower Band Edge: 2300 to 2422 MHz<br>Upper Band Edge: 2452 to 2500 MHz |
| RB / VB (emission in restricted band) | 1 MHz /3MHz                                                            |



| Receiver Parameter     | Setting                              |
|------------------------|--------------------------------------|
| Start ~ Stop Frequency | 9kHz~90kHz / RB 200Hz for PK & AV    |
| Start ~ Stop Frequency | 90kHz~110kHz / RB 200Hz for QP       |
| Start ~ Stop Frequency | 110kHz~490kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 490kHz~30MHz / RB 9kHz for QP        |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP     |

### 3.2.2 TEST PROCEDURE

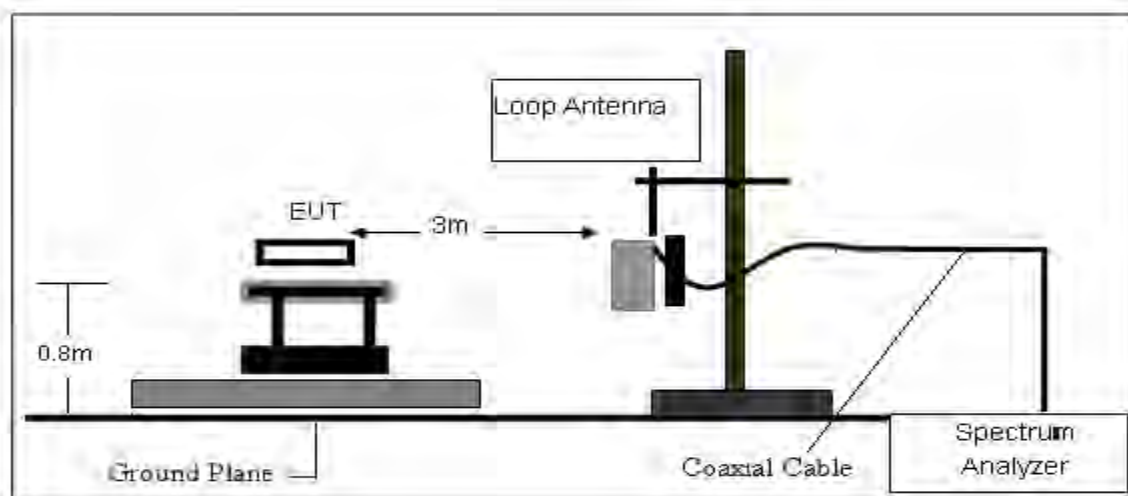
- The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarizations of the antenna are set to make the measurement
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

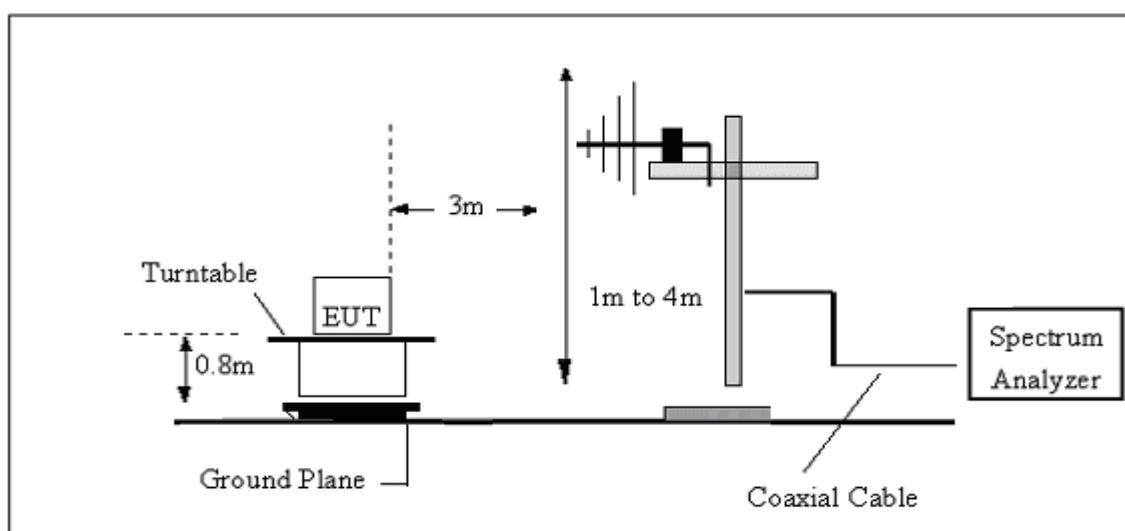
Both horizontal and vertical antenna polarities were tested and performed test to three orthogonal axis. The worst case emissions were reported

### 3.2.3 TEST SETUP

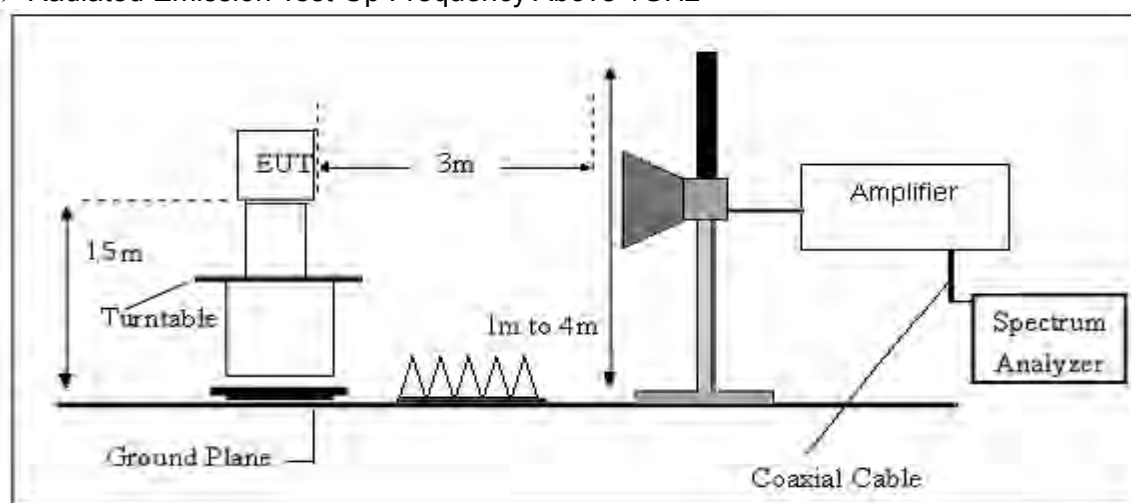
#### (A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



### 3.2.4 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.



### 3.2.5 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

| Frequency | FS       | RA       | AF   | CL   | AG   | Factor |
|-----------|----------|----------|------|------|------|--------|
| (MHz)     | (dBμV/m) | (dBμV/m) | (dB) | (dB) | (dB) | (dB)   |
| 300       | 40       | 58.1     | 12.2 | 1.6  | 31.9 | -18.1  |

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$





## 3.2.6 TEST RESULT

9KHz-30MHz

|                |              |                    |     |
|----------------|--------------|--------------------|-----|
| Temperature:   | 24.4 °C      | Relative Humidity: | 56% |
| Test Voltage : | AC 120V/60HZ | Polarization :     | --  |
| Test Mode :    | TX Mode      |                    |     |

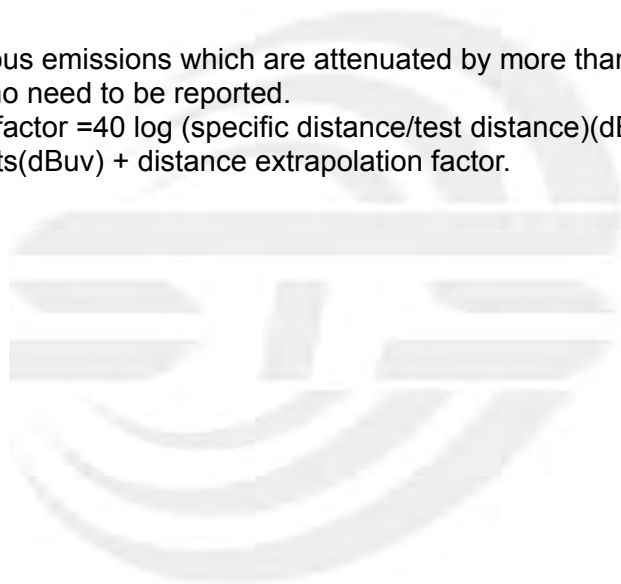
| Freq. | Reading  | Limit    | Margin | State | Test Result |
|-------|----------|----------|--------|-------|-------------|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB)   | P/F   |             |
| --    | --       | --       | --     | --    | PASS        |
| --    | --       | --       | --     | --    | 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 =  $40 \log (\text{specific distance}/\text{test distance})$ (dB);

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





(30MHz - 1000MHz)

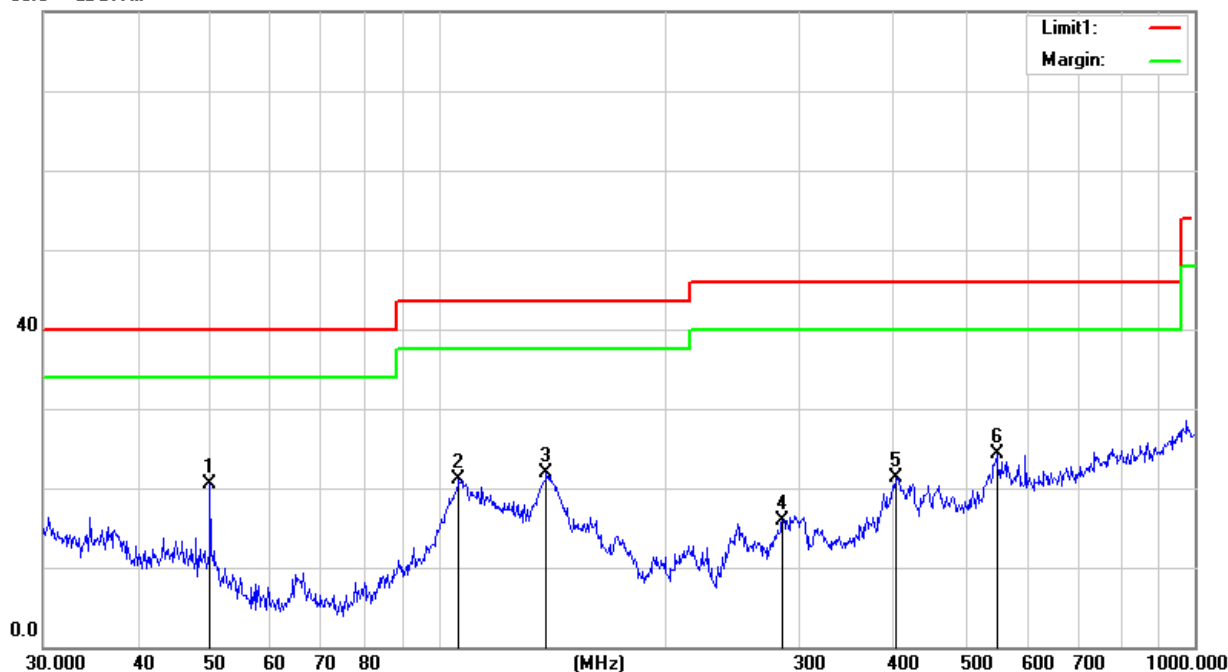
|                |                                              |                    |            |
|----------------|----------------------------------------------|--------------------|------------|
| Temperature:   | 24.4℃                                        | Relative Humidity: | 56%        |
| Test Voltage : | AC 120V/60HZ                                 | Polarization :     | Horizontal |
| Test Mode :    | Mode 1/2/3/4/5/6/7/8/9(Mode 1-1M worst mode) |                    |            |

| Frequency | Reading | Correct      | Result   | Limit    | Margin | Remark |
|-----------|---------|--------------|----------|----------|--------|--------|
| (MHz)     | (dBuV)  | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB)   |        |
| 49.8813   | 41.83   | -21.42       | 20.41    | 40.00    | -19.59 | QP     |
| 106.3850  | 39.79   | -18.64       | 21.15    | 43.50    | -22.35 | QP     |
| 138.8735  | 39.47   | -17.51       | 21.96    | 43.50    | -21.54 | QP     |
| 284.9766  | 31.59   | -15.61       | 15.98    | 46.00    | -30.02 | QP     |
| 403.2500  | 32.48   | -11.17       | 21.31    | 46.00    | -24.69 | QP     |
| 547.0977  | 31.08   | -6.85        | 24.23    | 46.00    | -21.77 | QP     |

Remark:

1. Margin = Result (Result = Reading + Factor )-Limit

80.0 dBuV/m



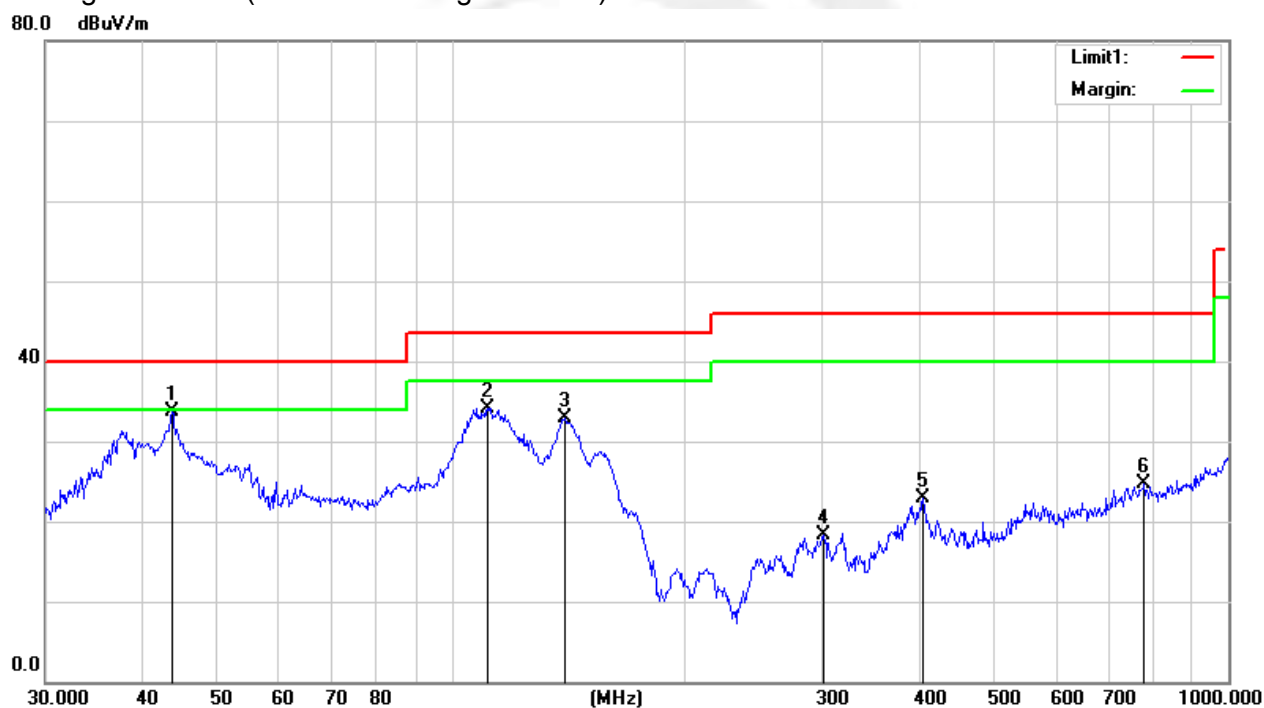


|                |                                              |                    |          |
|----------------|----------------------------------------------|--------------------|----------|
| Temperature:   | 24.4 °C                                      | Relative Humidity: | 56%      |
| Test Voltage : | AC 120V/60HZ                                 | Polarization :     | Vertical |
| Test Mode :    | Mode 1/2/3/4/5/6/7/8/9(Mode 1-1M worst mode) |                    |          |

| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 43.6584            | 51.88             | -18.21                  | 33.67              | 40.00             | -6.33          | QP     |
| 111.3468           | 52.33             | -18.25                  | 34.08              | 43.50             | -9.42          | QP     |
| 139.8508           | 50.46             | -17.51                  | 32.95              | 43.50             | -10.55         | QP     |
| 301.4224           | 32.99             | -14.78                  | 18.21              | 46.00             | -27.79         | QP     |
| 404.6665           | 34.02             | -11.15                  | 22.87              | 46.00             | -23.13         | QP     |
| 779.6068           | 27.75             | -3.11                   | 24.64              | 46.00             | -21.36         | QP     |

Remark:.

1. Margin = Result (Result =Reading + Factor )-Limit





(1000MHz-25GHz) Restricted band and Spurious emission Requirements

## 802.11b Low Channel

| Meter                  |         | Antenna   |       | Orrected | Emission |          |          |        |          |            |
|------------------------|---------|-----------|-------|----------|----------|----------|----------|--------|----------|------------|
| Frequency              | Reading | Amplifier | Loss  | Factor   | Factor   | Level    | Limits   | Margin | Detector |            |
| (MHz)                  | (dBμV)  | (dB)      | (dB)  | (dB/m)   | (dB)     | (dBμV/m) | (dBμV/m) | (dB)   | Type     | Comment    |
| Low Channel (2412 MHz) |         |           |       |          |          |          |          |        |          |            |
| 3264.73                | 62.03   | 44.70     | 6.70  | 28.20    | -9.80    | 52.23    | 74.00    | -21.77 | PK       | Vertical   |
| 3264.73                | 51.62   | 44.70     | 6.70  | 28.20    | -9.80    | 41.82    | 54.00    | -12.18 | AV       | Vertical   |
| 3264.86                | 60.84   | 44.70     | 6.70  | 28.20    | -9.80    | 51.04    | 74.00    | -22.96 | PK       | Horizontal |
| 3264.86                | 51.16   | 44.70     | 6.70  | 28.20    | -9.80    | 41.36    | 54.00    | -12.64 | AV       | Horizontal |
| 4824.33                | 59.22   | 44.20     | 9.04  | 31.60    | -3.56    | 55.66    | 74.00    | -18.34 | PK       | Vertical   |
| 4824.33                | 50.34   | 44.20     | 9.04  | 31.60    | -3.56    | 46.78    | 54.00    | -7.22  | AV       | Vertical   |
| 4824.38                | 58.64   | 44.20     | 9.04  | 31.60    | -3.56    | 55.08    | 74.00    | -18.92 | PK       | Horizontal |
| 4824.38                | 49.80   | 44.20     | 9.04  | 31.60    | -3.56    | 46.24    | 54.00    | -7.76  | AV       | Horizontal |
| 5359.79                | 48.92   | 44.20     | 9.86  | 32.00    | -2.34    | 46.58    | 74.00    | -27.42 | PK       | Vertical   |
| 5359.79                | 39.34   | 44.20     | 9.86  | 32.00    | -2.34    | 37.00    | 54.00    | -17.00 | AV       | Vertical   |
| 5359.71                | 47.99   | 44.20     | 9.86  | 32.00    | -2.34    | 45.65    | 74.00    | -28.35 | PK       | Horizontal |
| 5359.71                | 38.60   | 44.20     | 9.86  | 32.00    | -2.34    | 36.26    | 54.00    | -17.74 | AV       | Horizontal |
| 7235.81                | 53.82   | 43.50     | 11.40 | 35.50    | 3.40     | 57.22    | 74.00    | -16.78 | PK       | Vertical   |
| 7235.81                | 44.80   | 43.50     | 11.40 | 35.50    | 3.40     | 48.20    | 54.00    | -5.80  | AV       | Vertical   |
| 7235.84                | 53.86   | 43.50     | 11.40 | 35.50    | 3.40     | 57.26    | 74.00    | -16.74 | PK       | Horizontal |
| 7235.74                | 44.56   | 43.50     | 11.40 | 35.50    | 3.40     | 47.96    | 54.00    | -6.04  | AV       | Horizontal |



## 802.11b Mid Channel

| Meter                  |         | Antenna   |       | Orrected | Emission |          |          |        |          |            |
|------------------------|---------|-----------|-------|----------|----------|----------|----------|--------|----------|------------|
| Frequency              | Reading | Amplifier | Loss  | Factor   | Factor   | Level    | Limits   | Margin | Detector |            |
| (MHz)                  | (dBμV)  | (dB)      | (dB)  | (dB/m)   | (dB)     | (dBμV/m) | (dBμV/m) | (dB)   | Type     | Comment    |
| Low Channel (2437 MHz) |         |           |       |          |          |          |          |        |          |            |
| 3264.69                | 62.28   | 44.70     | 6.70  | 28.20    | -9.80    | 52.48    | 74.00    | -21.52 | PK       | Vertical   |
| 3264.69                | 51.54   | 44.70     | 6.70  | 28.20    | -9.80    | 41.74    | 54.00    | -12.26 | AV       | Vertical   |
| 3264.66                | 62.25   | 44.70     | 6.70  | 28.20    | -9.80    | 52.45    | 74.00    | -21.55 | PK       | Horizontal |
| 3264.66                | 50.25   | 44.70     | 6.70  | 28.20    | -9.80    | 40.45    | 54.00    | -13.55 | AV       | Horizontal |
| 4874.53                | 58.28   | 44.20     | 9.04  | 31.60    | -3.56    | 54.72    | 74.00    | -19.28 | PK       | Vertical   |
| 4874.53                | 49.71   | 44.20     | 9.04  | 31.60    | -3.56    | 46.15    | 54.00    | -7.85  | AV       | Vertical   |
| 4874.32                | 58.13   | 44.20     | 9.04  | 31.60    | -3.56    | 54.57    | 74.00    | -19.43 | PK       | Horizontal |
| 4874.32                | 50.59   | 44.20     | 9.04  | 31.60    | -3.56    | 47.03    | 54.00    | -6.97  | AV       | Horizontal |
| 5359.86                | 48.90   | 44.20     | 9.86  | 32.00    | -2.34    | 46.56    | 74.00    | -27.44 | PK       | Vertical   |
| 5359.86                | 39.53   | 44.20     | 9.86  | 32.00    | -2.34    | 37.19    | 54.00    | -16.81 | AV       | Vertical   |
| 5359.78                | 48.26   | 44.20     | 9.86  | 32.00    | -2.34    | 45.92    | 74.00    | -28.08 | PK       | Horizontal |
| 5359.78                | 38.65   | 44.20     | 9.86  | 32.00    | -2.34    | 36.31    | 54.00    | -17.69 | AV       | Horizontal |
| 7310.69                | 54.15   | 43.50     | 11.40 | 35.50    | 3.40     | 57.55    | 74.00    | -16.45 | PK       | Vertical   |
| 7310.69                | 44.24   | 43.50     | 11.40 | 35.50    | 3.40     | 47.64    | 54.00    | -6.36  | AV       | Vertical   |
| 7310.79                | 53.50   | 43.50     | 11.40 | 35.50    | 3.40     | 56.90    | 74.00    | -17.10 | PK       | Horizontal |
| 7310.79                | 43.84   | 43.50     | 11.40 | 35.50    | 3.40     | 47.24    | 54.00    | -6.76  | AV       | Horizontal |



## 802.11b High Channel

| Meter                  |         | Antenna   |       | Orrected | Emission |          |          |        |          |            |
|------------------------|---------|-----------|-------|----------|----------|----------|----------|--------|----------|------------|
| Frequency              | Reading | Amplifier | Loss  | Factor   | Factor   | Level    | Limits   | Margin | Detector |            |
| (MHz)                  | (dBμV)  | (dB)      | (dB)  | (dB/m)   | (dB)     | (dBμV/m) | (dBμV/m) | (dB)   | Type     | Comment    |
| Low Channel (2462 MHz) |         |           |       |          |          |          |          |        |          |            |
| 3264.72                | 61.68   | 44.70     | 6.70  | 28.20    | -9.80    | 51.88    | 74.00    | -22.12 | PK       | Vertical   |
| 3264.72                | 50.49   | 44.70     | 6.70  | 28.20    | -9.80    | 40.69    | 54.00    | -13.31 | AV       | Vertical   |
| 3264.72                | 61.99   | 44.70     | 6.70  | 28.20    | -9.80    | 52.19    | 74.00    | -21.81 | PK       | Horizontal |
| 3264.72                | 50.58   | 44.70     | 6.70  | 28.20    | -9.80    | 40.78    | 54.00    | -13.22 | AV       | Horizontal |
| 4924.54                | 58.88   | 44.20     | 9.04  | 31.60    | -3.56    | 55.32    | 74.00    | -18.68 | PK       | Vertical   |
| 4924.54                | 49.21   | 44.20     | 9.04  | 31.60    | -3.56    | 45.65    | 54.00    | -8.35  | AV       | Vertical   |
| 4924.32                | 58.78   | 44.20     | 9.04  | 31.60    | -3.56    | 55.22    | 74.00    | -18.78 | PK       | Horizontal |
| 4924.32                | 49.44   | 44.20     | 9.04  | 31.60    | -3.56    | 45.88    | 54.00    | -8.12  | AV       | Horizontal |
| 5359.67                | 49.02   | 44.20     | 9.86  | 32.00    | -2.34    | 46.68    | 74.00    | -27.32 | PK       | Vertical   |
| 5359.67                | 39.09   | 44.20     | 9.86  | 32.00    | -2.34    | 36.75    | 54.00    | -17.25 | AV       | Vertical   |
| 5359.64                | 48.25   | 44.20     | 9.86  | 32.00    | -2.34    | 45.91    | 74.00    | -28.09 | PK       | Horizontal |
| 5359.64                | 39.49   | 44.20     | 9.86  | 32.00    | -2.34    | 37.15    | 54.00    | -16.85 | AV       | Horizontal |
| 7385.85                | 53.94   | 43.50     | 11.40 | 35.50    | 3.40     | 57.34    | 74.00    | -16.66 | PK       | Vertical   |
| 7385.85                | 44.10   | 43.50     | 11.40 | 35.50    | 3.40     | 47.50    | 54.00    | -6.50  | AV       | Vertical   |
| 7385.73                | 53.76   | 43.50     | 11.40 | 35.50    | 3.40     | 57.16    | 74.00    | -16.84 | PK       | Horizontal |
| 7385.73                | 44.24   | 43.50     | 11.40 | 35.50    | 3.40     | 47.64    | 54.00    | -6.36  | AV       | Horizontal |

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

2. Scan with 802.11b, 802.11g, 802.11n (HT-20), the worst case is 802.11b.

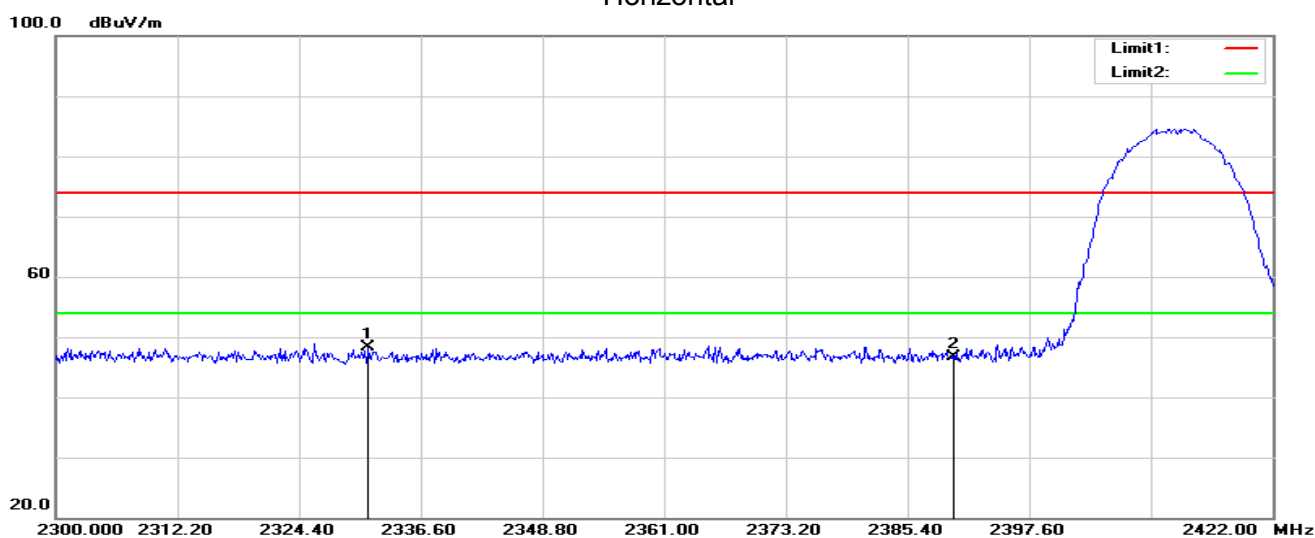
Emission Level = Reading + Factor

Margin = Limit - Emission Leve

3. The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.

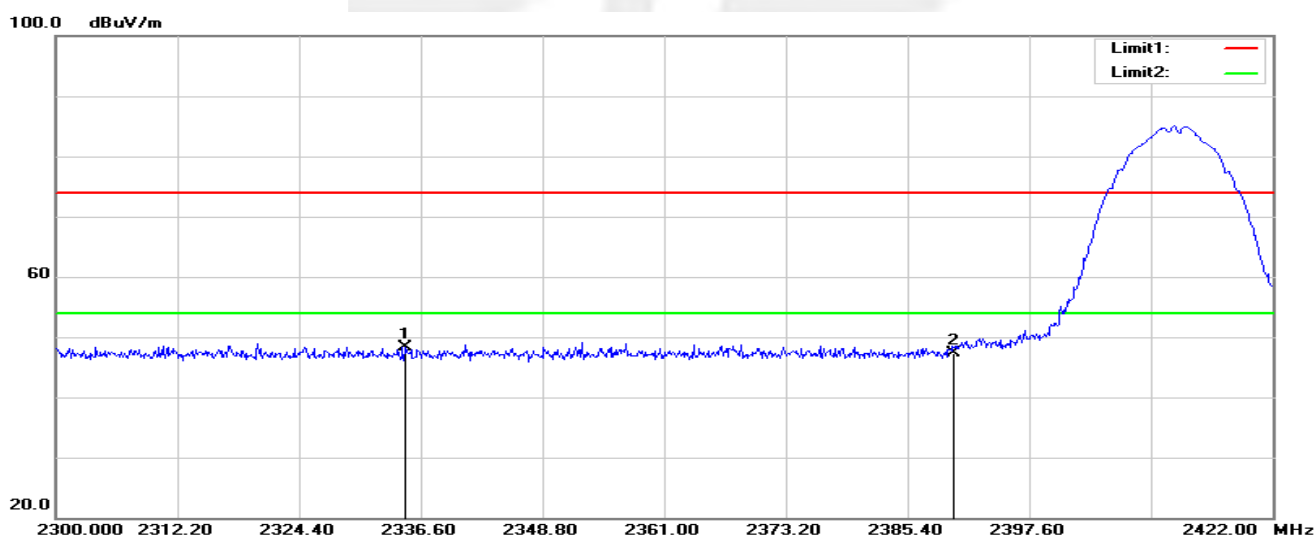


## 3.2.6 TEST RESULTS (Band edge Requirements)

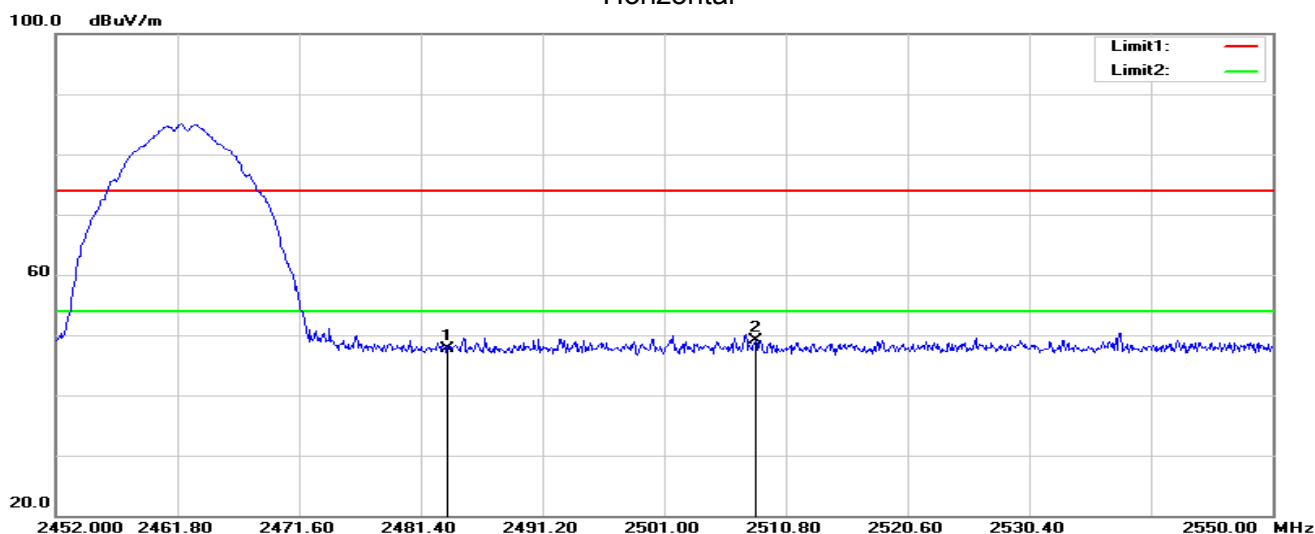
**802.11b-Low**  
Horizontal

| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1   | 2331.354           | 56.08             | -7.79                   | 48.29              | 74.00             | -25.71         | peak   |
| 2   | 2390.000           | 54.31             | -7.54                   | 46.77              | 74.00             | -27.23         | peak   |

## Vertical

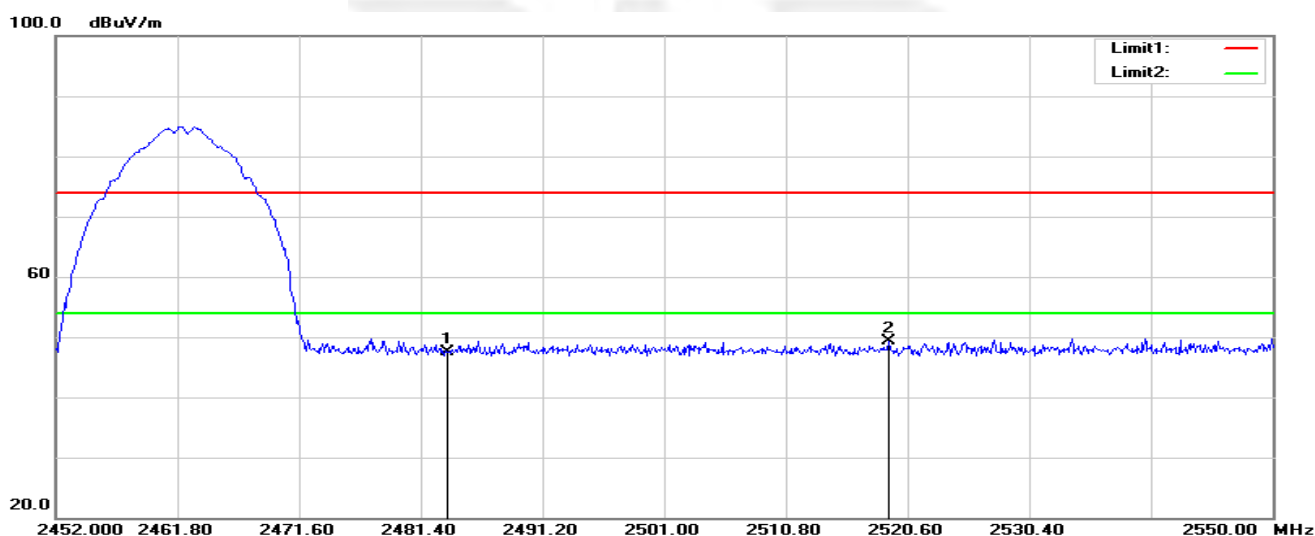


| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1   | 2335.014           | 56.44             | -8.04                   | 48.40              | 74.00             | -25.60         | peak   |
| 2   | 2390.000           | 55.19             | -7.81                   | 47.38              | 74.00             | -26.62         | peak   |

**802.11b-High**  
Horizontal

| No. | Frequency | Reading | Correct      | Result   | Limit    | Margin | Remark |
|-----|-----------|---------|--------------|----------|----------|--------|--------|
|     | (MHz)     | (dBuV)  | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB)   |        |
| 1   | 2483.500  | 54.93   | -7.13        | 47.80    | 74.00    | -26.20 | peak   |
| 2   | 2508.350  | 56.10   | -7.04        | 49.06    | 74.00    | -24.94 | peak   |

## Vertical



| No. | Frequency | Reading | Correct      | Result   | Limit    | Margin | Remark |
|-----|-----------|---------|--------------|----------|----------|--------|--------|
|     | (MHz)     | (dBuV)  | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB)   |        |
| 1   | 2483.500  | 54.91   | -7.43        | 47.48    | 74.00    | -26.52 | peak   |
| 2   | 2519.032  | 56.71   | -7.32        | 49.39    | 74.00    | -24.61 | peak   |

Note: 802.11b, 802.11g, 802.11n(HT20), mode all have been test, the worst mode is 802.11b, only show the worst mode.

## 4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

### 4.1 LIMIT

According to FCC section 15.247(d) and RSS-247 Issue 2, in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### 4.2 TEST PROCEDURE

| Spectrum Parameter                    | Setting                         |
|---------------------------------------|---------------------------------|
| Detector                              | Peak                            |
| Start/Stop Frequency                  | 30 MHz to 10th carrier harmonic |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz                 |
| Trace-Mode:                           | Max hold                        |

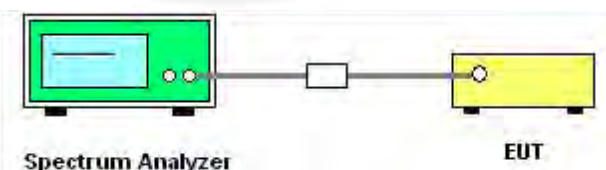
For Band edge

| Spectrum Parameter                    | Setting                                                                |
|---------------------------------------|------------------------------------------------------------------------|
| Detector                              | Peak                                                                   |
| Start/Stop Frequency                  | Lower Band Edge: 2300 to 2422 MHz<br>Upper Band Edge: 2452 to 2500 MHz |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz                                                        |
| Trace-Mode:                           | Max hold                                                               |

### 4.3 DEVIATION FROM STANDARD

No deviation.

### 4.4 TEST SETUP



The EUT which is powered by the Battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

### 4.5 EUT OPERATION CONDITIONS

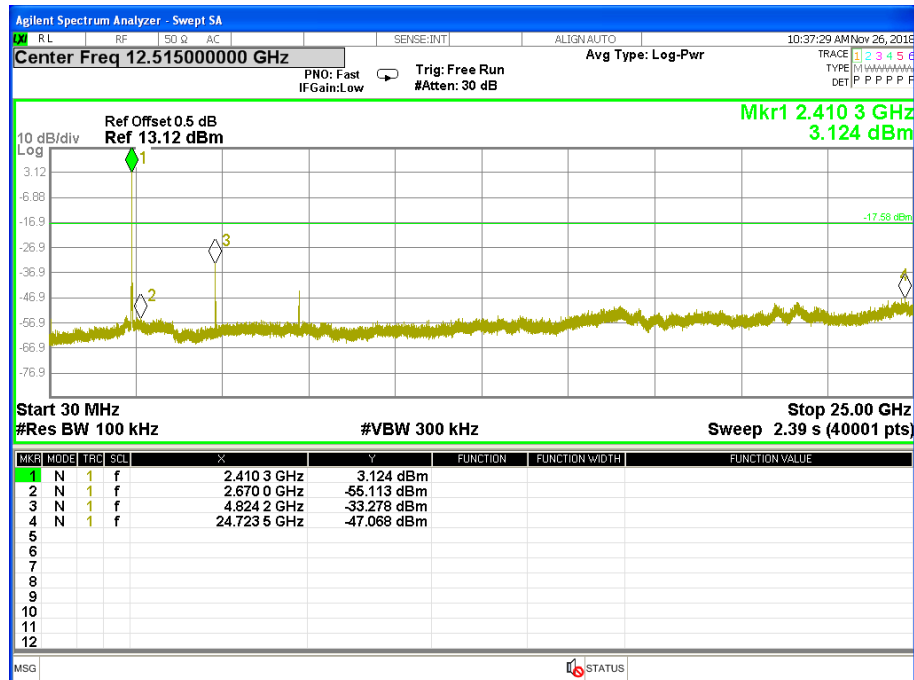
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



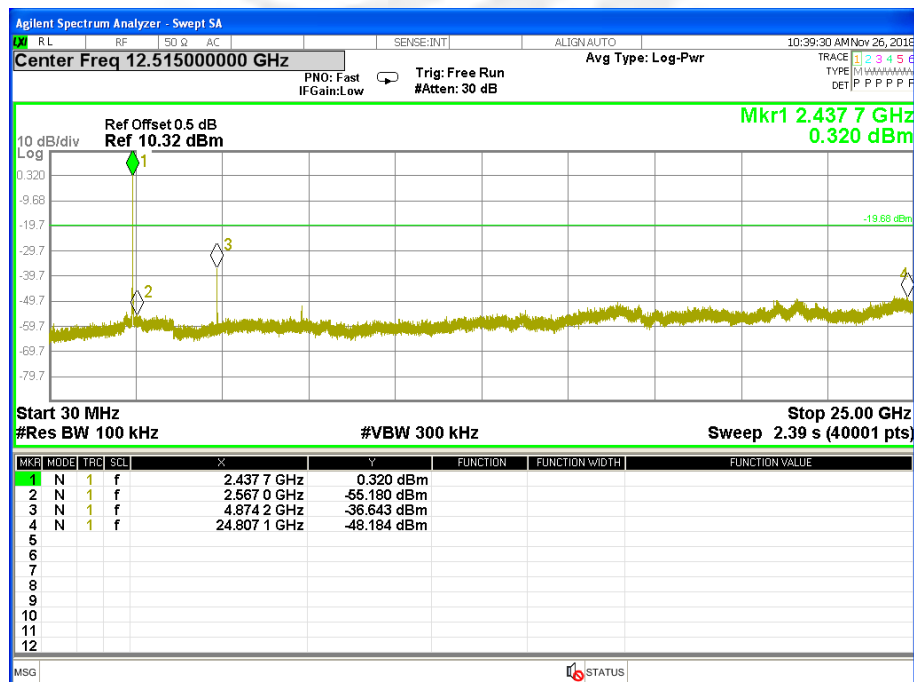
## 4.6 TEST RESULTS

|                |              |                     |                             |
|----------------|--------------|---------------------|-----------------------------|
| Temperature :  | 25 °C        | Relative Humidity : | 60%                         |
| Test Voltage : | AC 120V/60HZ | Test Mode :         | TX b Mode /CH01, CH06, CH11 |

## CH 01

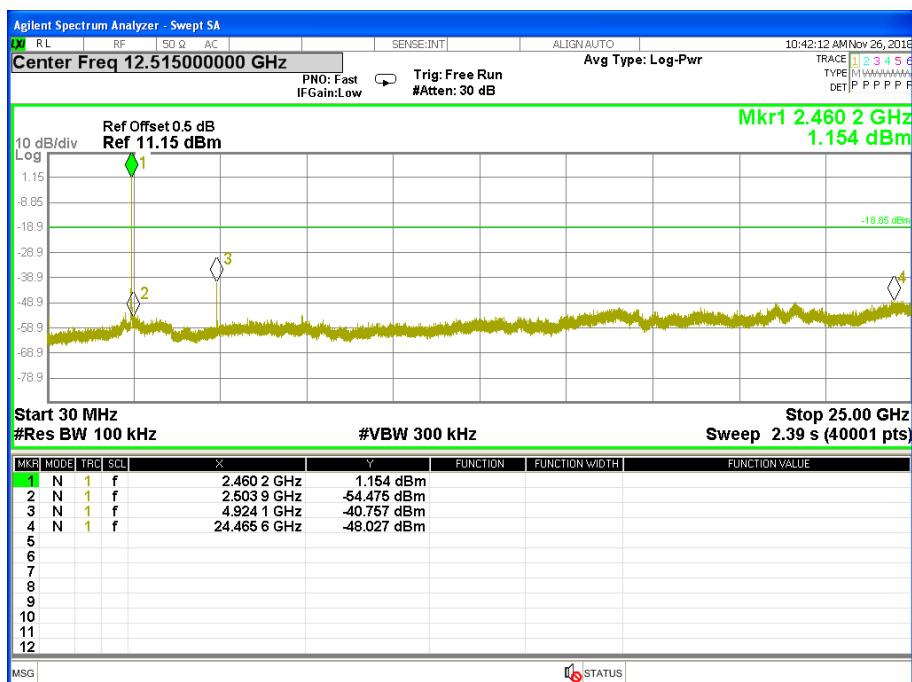


## CH 06





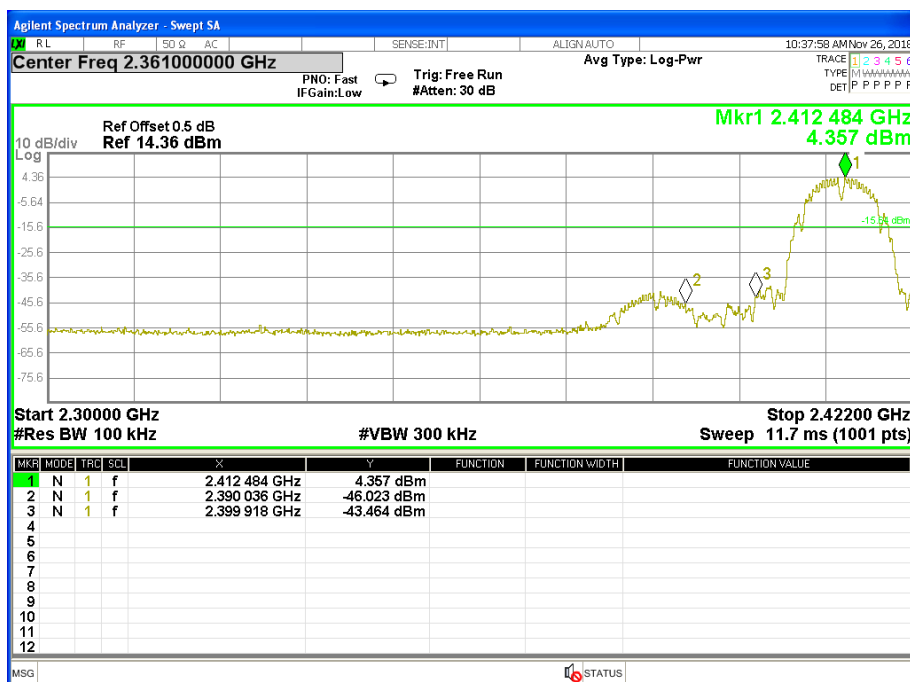
## CH 11



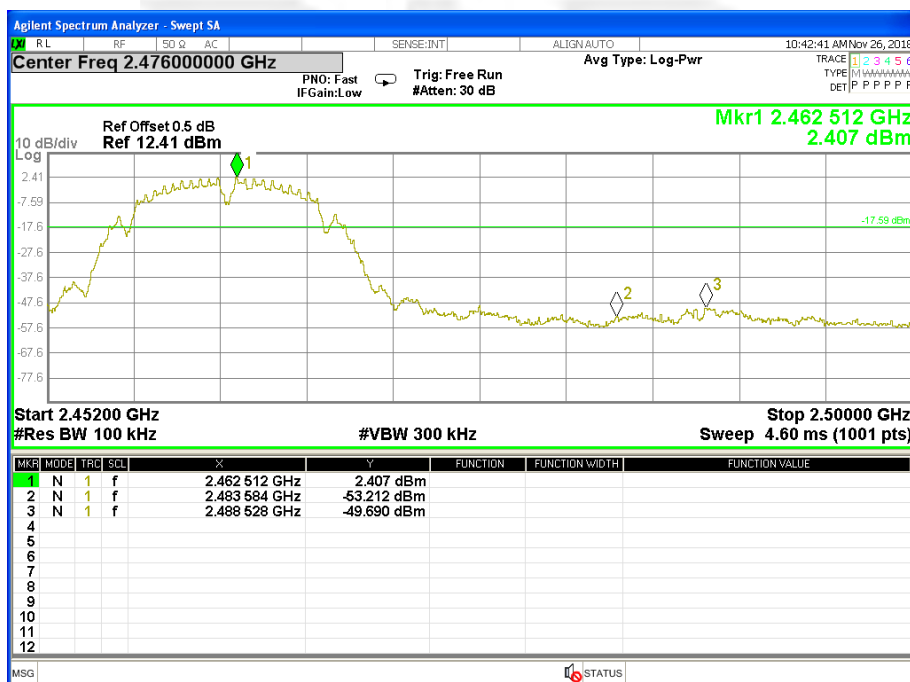


Band edge

CH 01



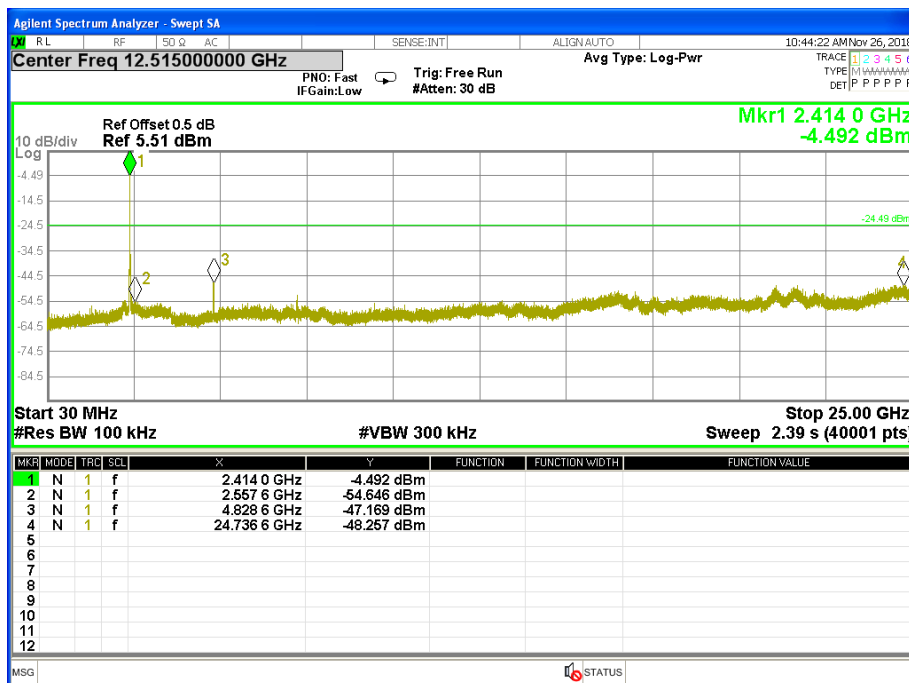
CH 11



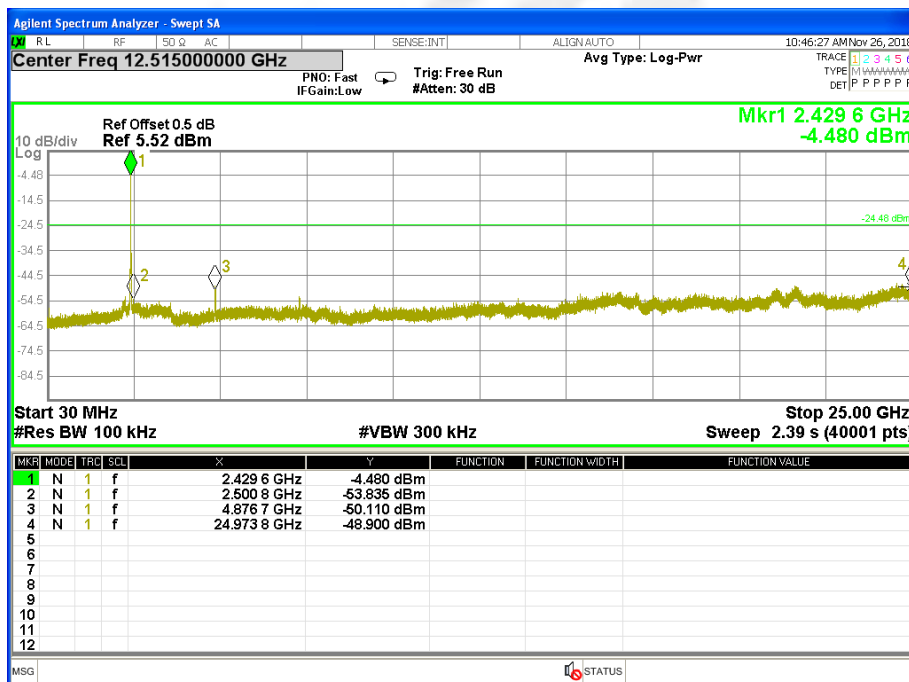


|                |              |                     |                             |
|----------------|--------------|---------------------|-----------------------------|
| Temperature :  | 25 °C        | Relative Humidity : | 60%                         |
| Test Voltage : | AC 120V/60HZ | Test Mode :         | TX g Mode /CH01, CH06, CH11 |

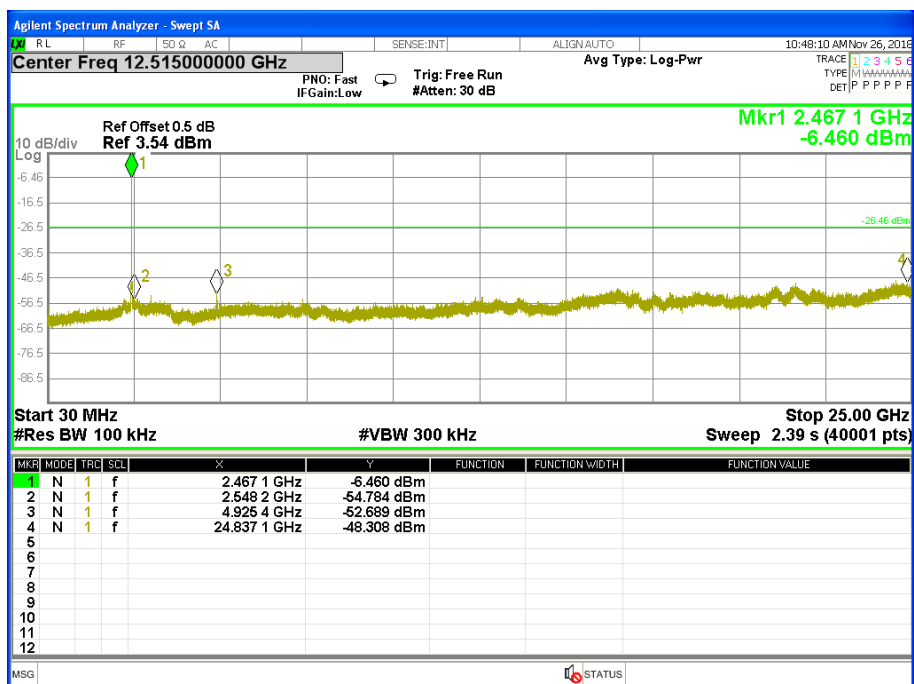
## CH 01



## CH06



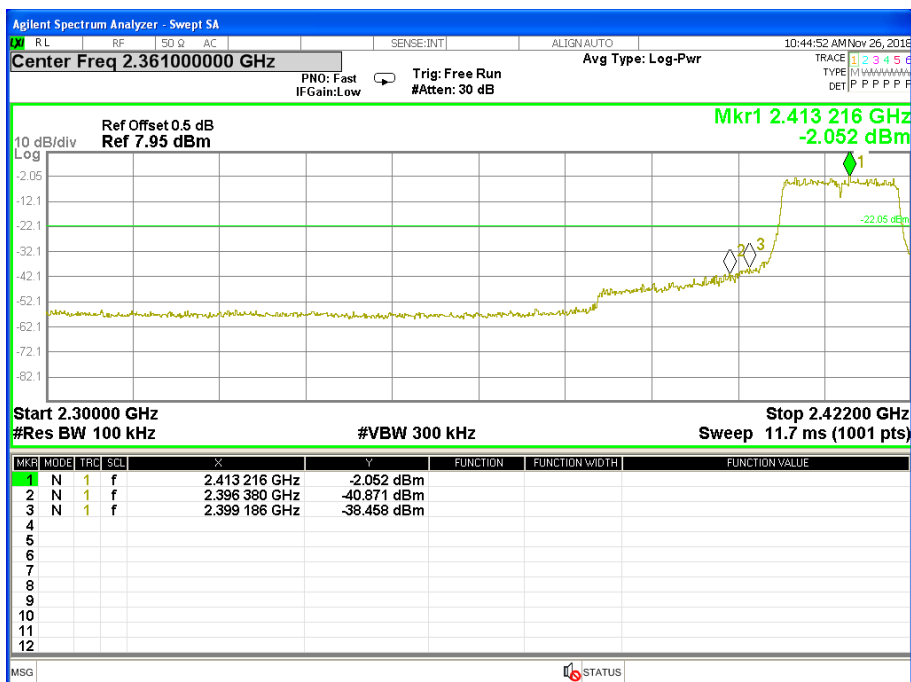
## CH 11



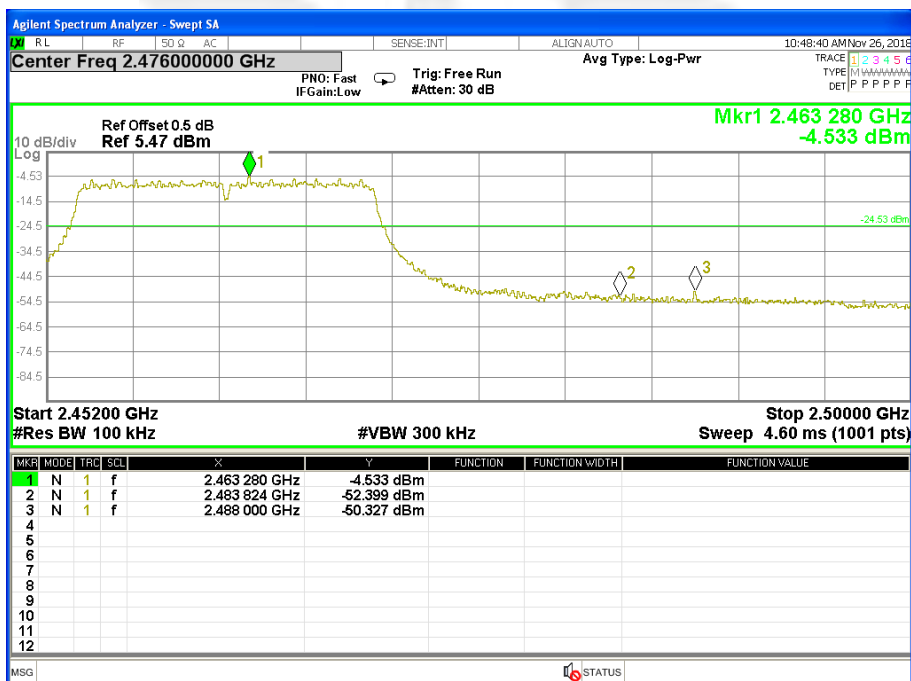


Band edge

CH 01



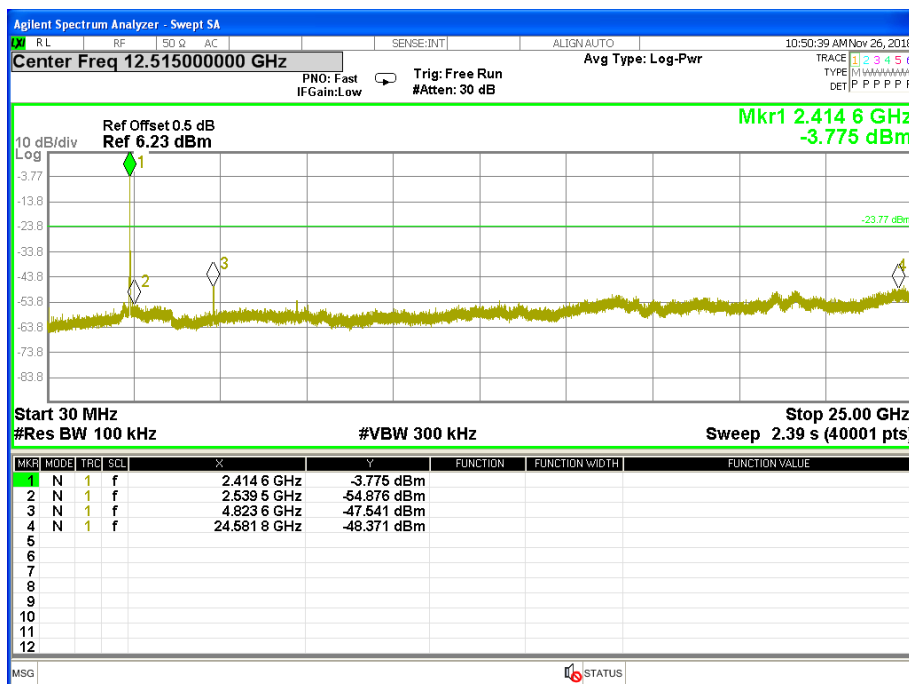
CH11



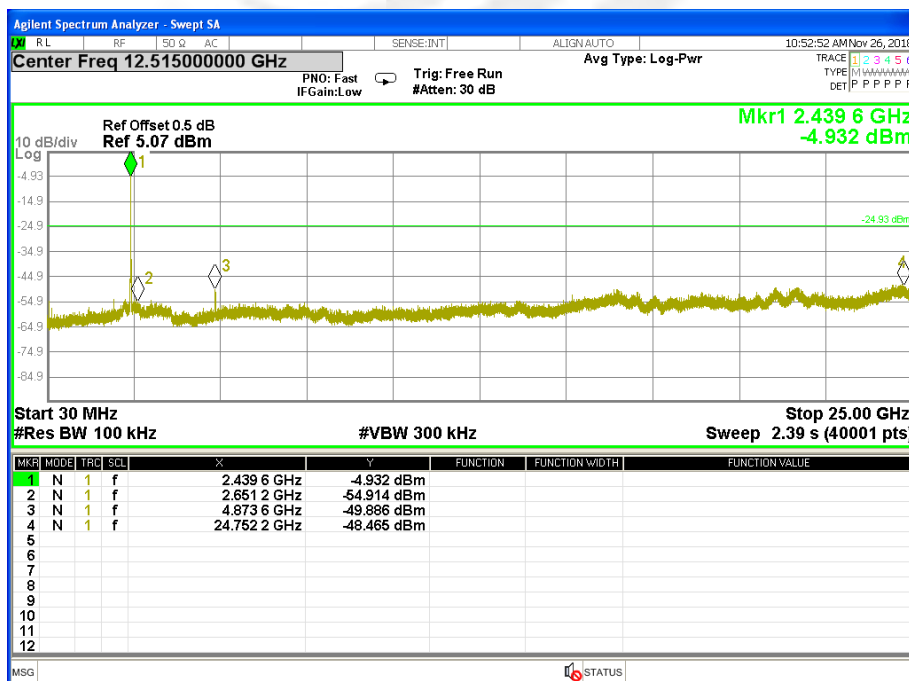


|                |              |                     |                                  |
|----------------|--------------|---------------------|----------------------------------|
| Temperature :  | 25 °C        | Relative Humidity : | 60%                              |
| Test Voltage : | AC 120V/60HZ | Test Mode :         | TX n Mode(20M) /CH01, CH06, CH11 |

## CH 01

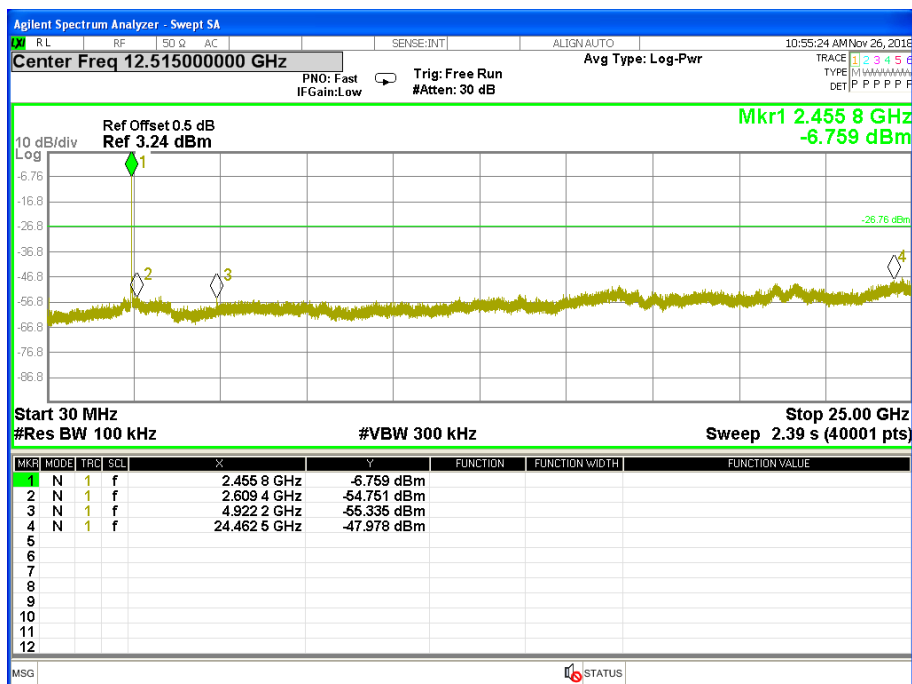


## CH 06





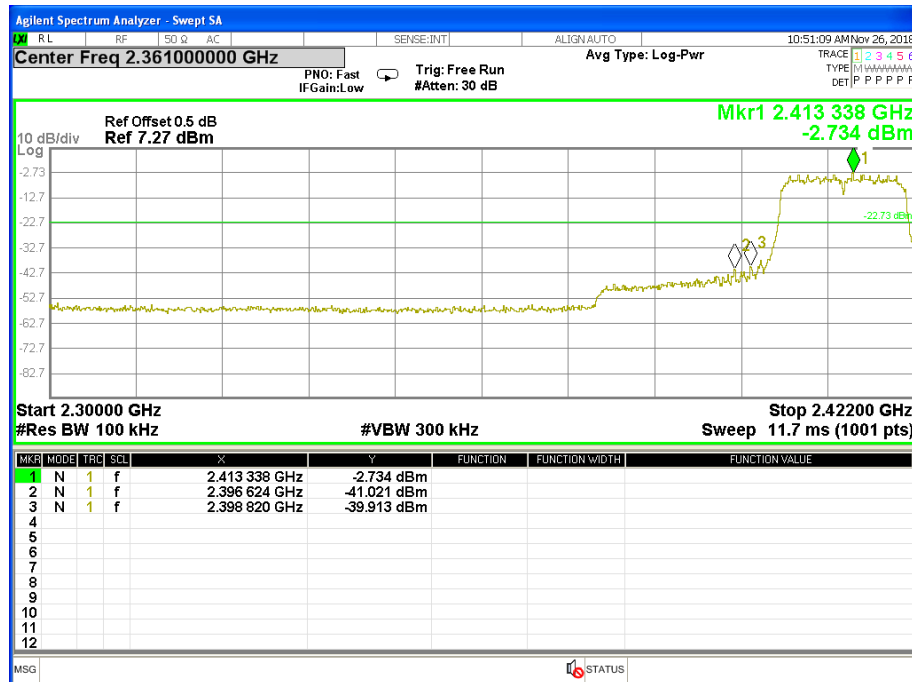
## CH 11



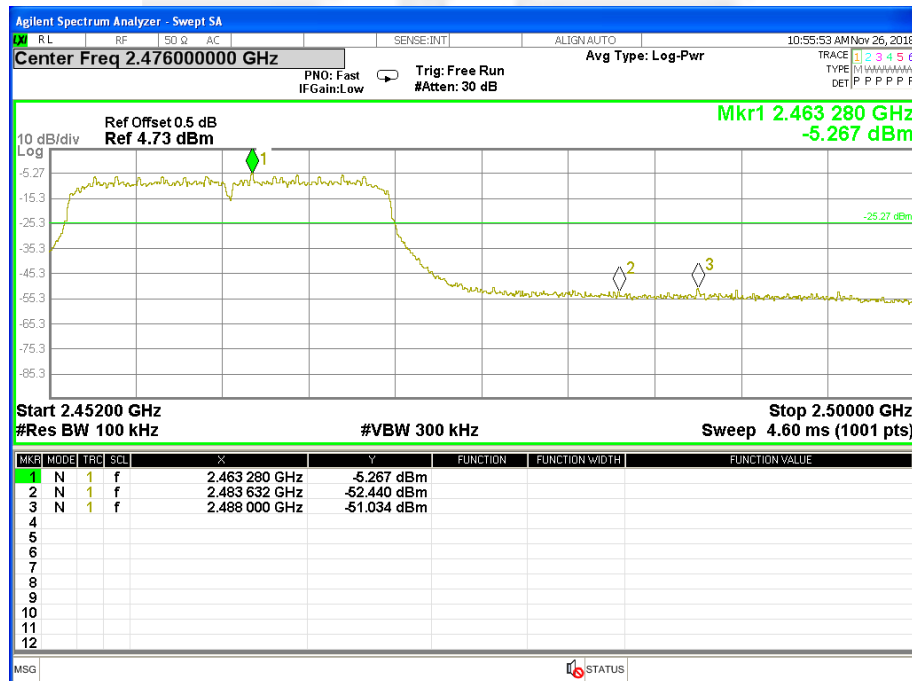


Band edge

CH 01



CH 11





## POWER SPECTRAL DENSITY TEST

### 5.1 LIMIT

| FCC Part 15.247, Subpart C<br>RSS-247 Issue 2 |                        |                                    |                       |        |
|-----------------------------------------------|------------------------|------------------------------------|-----------------------|--------|
| Section                                       | Test Item              | Limit                              | Frequency Range (MHz) | Result |
| 15.247(e)<br>RSS-247 Issue 2                  | Power Spectral Density | $\leq 8$ dBm<br>(RBW $\geq 3$ KHz) | 2400-2483.5           | PASS   |

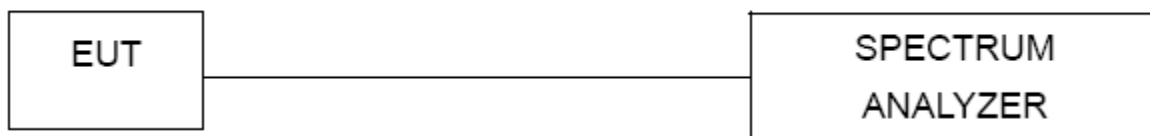
### 5.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the  $100 \text{ kHz} \geq \text{RBW} \geq 3 \text{ kHz}$ .
4. Set the  $\text{VBW} \geq 3 \times \text{RBW}$ .
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 5.3 DEVIATION FROM STANDARD

No deviation.

### 5.4 TEST SETUP



### 5.5 EUT OPERATION CONDITIONS

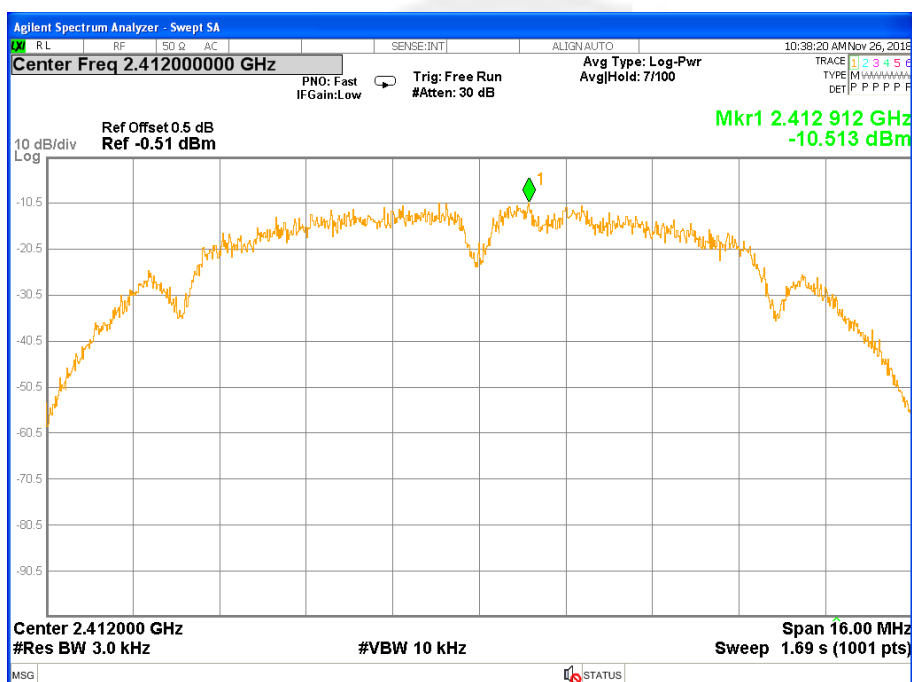
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

## 5.6 TEST RESULTS

|               |              |                    |                             |
|---------------|--------------|--------------------|-----------------------------|
| Temperature:  | 25 °C        | Relative Humidity: | 60%                         |
| Test Voltage: | AC 120V/60HZ | Test Mode:         | TX b Mode /CH01, CH06, CH11 |

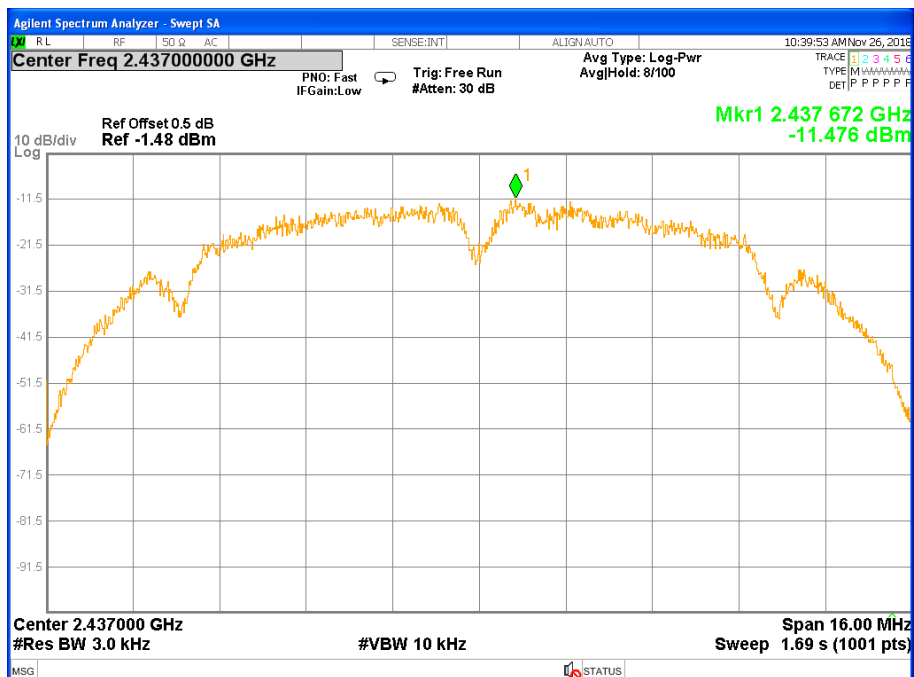
| Frequency | Power Density<br>(dBm/3kHz) | Limit<br>(dBm/3KHz) | Result |
|-----------|-----------------------------|---------------------|--------|
| 2412 MHz  | -10.513                     | ≤8                  | PASS   |
| 2437 MHz  | -11.476                     | ≤8                  | PASS   |
| 2462 MHz  | -12.395                     | ≤8                  | PASS   |

## TX CH01

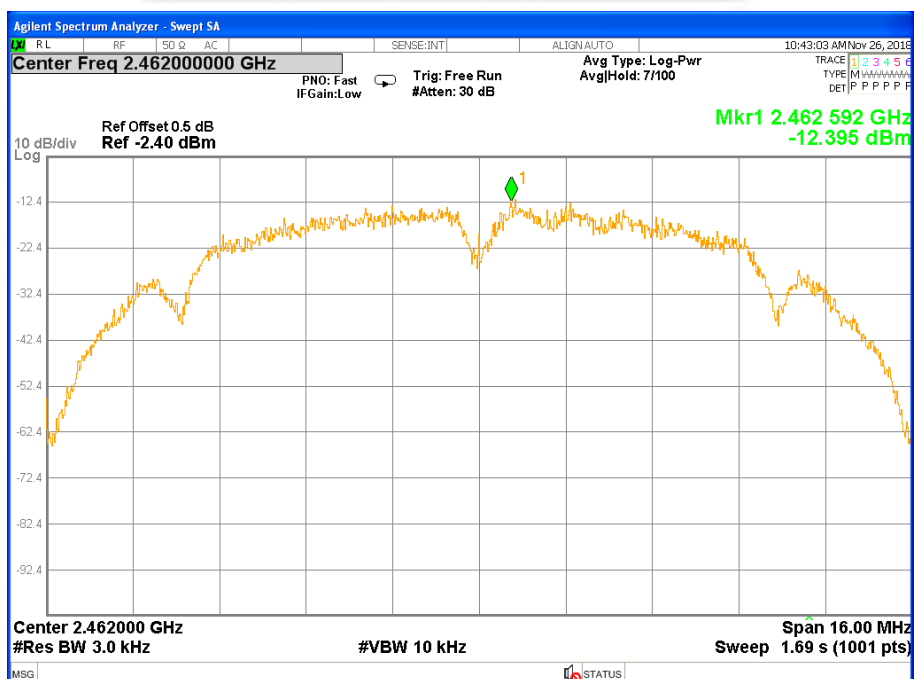




## TX CH06



## TX CH11

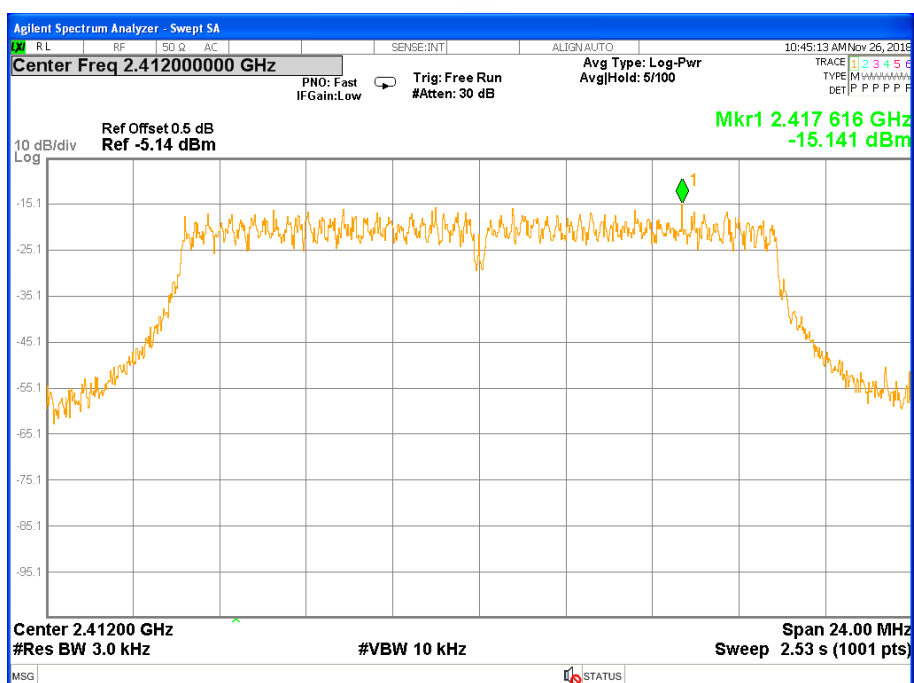




|               |              |                    |                             |
|---------------|--------------|--------------------|-----------------------------|
| Temperature:  | 25 °C        | Relative Humidity: | 60%                         |
| Test Voltage: | AC 120V/60HZ | Test Mode:         | TX g Mode /CH01, CH06, CH11 |

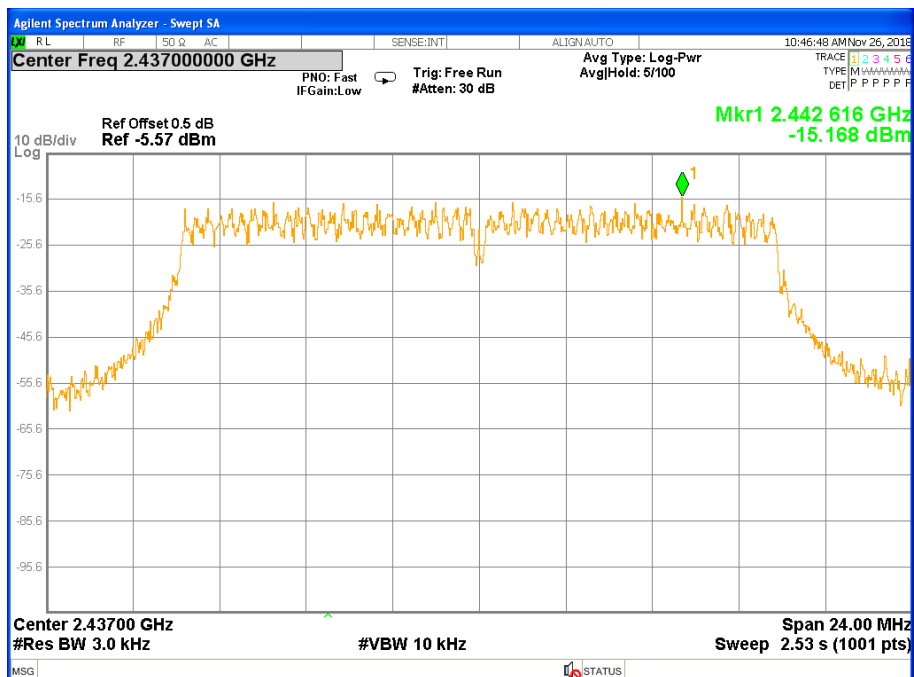
| Frequency | Power Density (dBm/3kHz) | Limit (dBm/3KHz) | Result |
|-----------|--------------------------|------------------|--------|
| 2412 MHz  | -15.141                  | ≤8               | PASS   |
| 2437 MHz  | -15.168                  | ≤8               | PASS   |
| 2462 MHz  | -17.884                  | ≤8               | PASS   |

## TX CH01

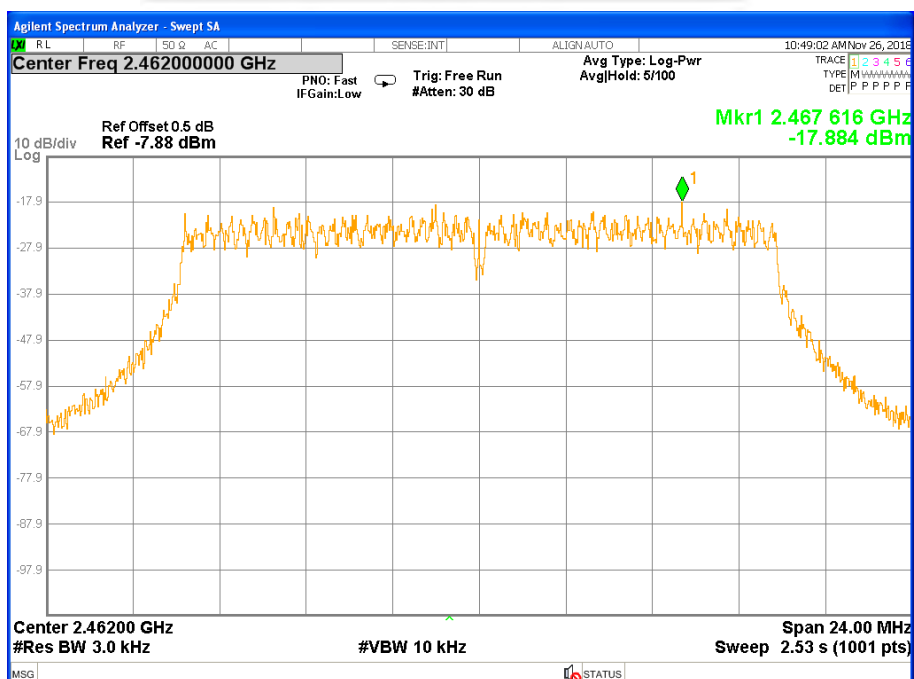




## TX CH06



## TX CH11

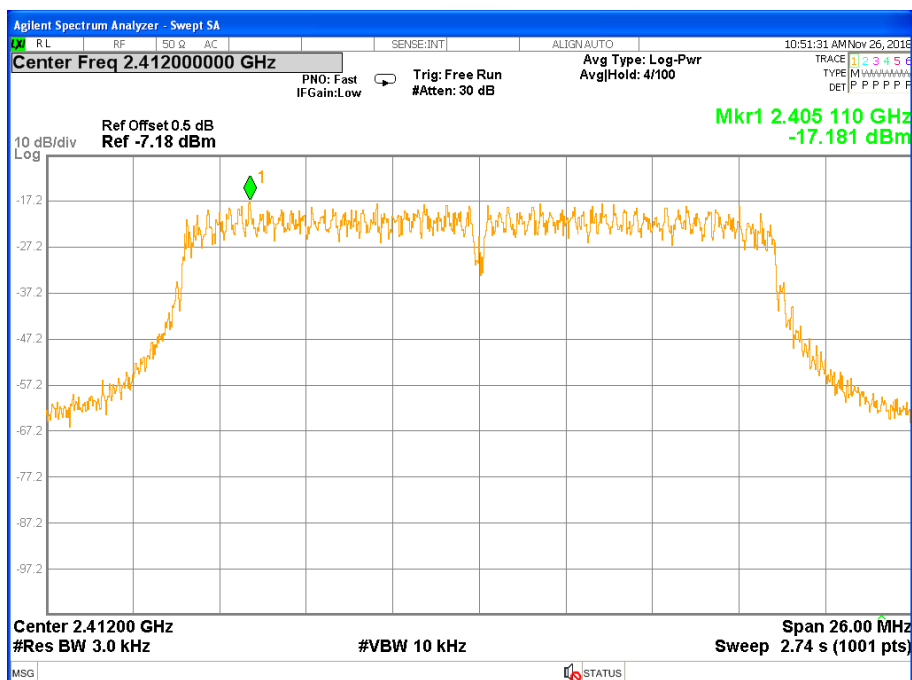




|               |              |                    |                                  |
|---------------|--------------|--------------------|----------------------------------|
| Temperature:  | 25 °C        | Relative Humidity: | 60%                              |
| Test Voltage: | AC 120V/60HZ | Test Mode:         | TX n Mode(20M) /CH01, CH06, CH11 |

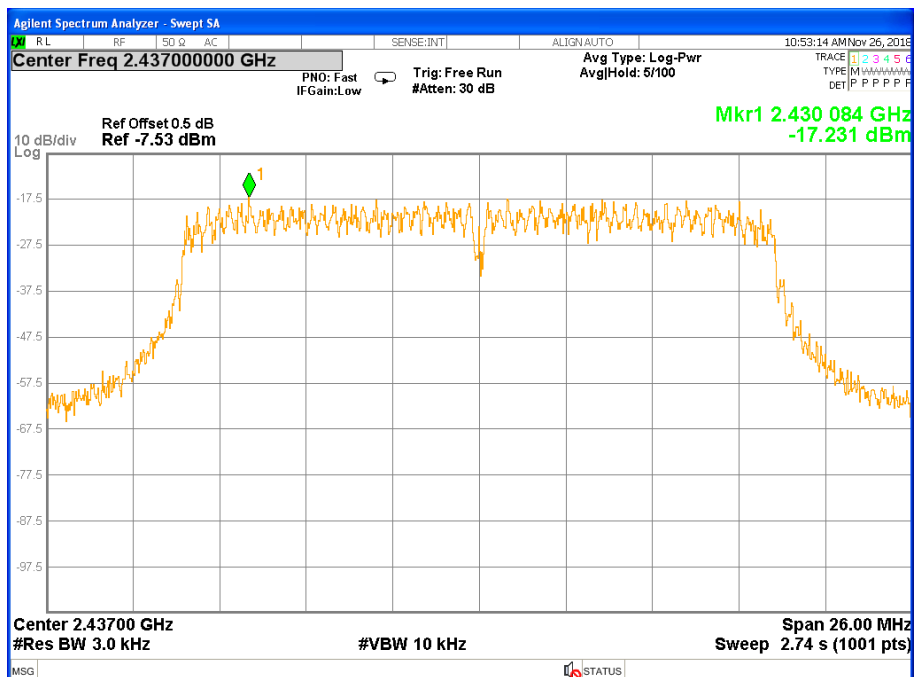
| Frequency | Power Density (dBm/3kHz) | Limit (dBm/3KHz) | Result |
|-----------|--------------------------|------------------|--------|
| 2412 MHz  | -17.181                  | ≤8               | PASS   |
| 2437 MHz  | -17.231                  | ≤8               | PASS   |
| 2462 MHz  | -20.412                  | ≤8               | PASS   |

## TX CH01

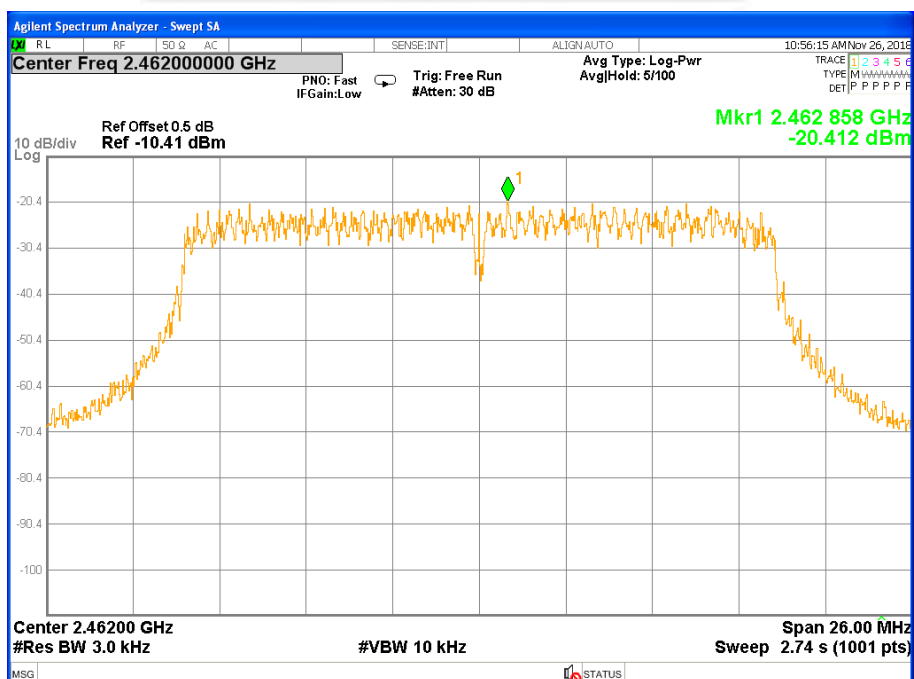




## TX CH06



## TX CH11





## 6. BANDWIDTH TEST

### 6.1 LIMIT

| FCC Part 15.247, Subpart C<br>RSS-Gen Clause 6.7 |               |                                         |                       |        |
|--------------------------------------------------|---------------|-----------------------------------------|-----------------------|--------|
| Section                                          | Test Item     | Limit                                   | Frequency Range (MHz) | Result |
| 15.247(a)(2)                                     | Bandwidth     | $\geq 500\text{KHz}$<br>(6dB bandwidth) | 2400-2483.5           | PASS   |
| RSS-Gen Clause 6.7                               | 99% Bandwidth | For reporting purposes only.            | 2400-2483.5           | PASS   |

### 6.2 TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

|                  |                                                                                                           |
|------------------|-----------------------------------------------------------------------------------------------------------|
| Center Frequency | The centre frequency of the channel under test                                                            |
| Detector         | Peak                                                                                                      |
| RBW              | For 6 dB Bandwidth : 100KHz<br>For 99% Bandwidth : 1% to 5% of the occupied bandwidth                     |
| VBW              | For 6dB Bandwidth : $\geq 3 \times \text{RBW}$<br>For 99% Bandwidth : approximately $3 \times \text{RBW}$ |
| Trace            | Max hold                                                                                                  |
| Sweep            | Auto                                                                                                      |

Allow the trace to stabilize and 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 and 99% 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

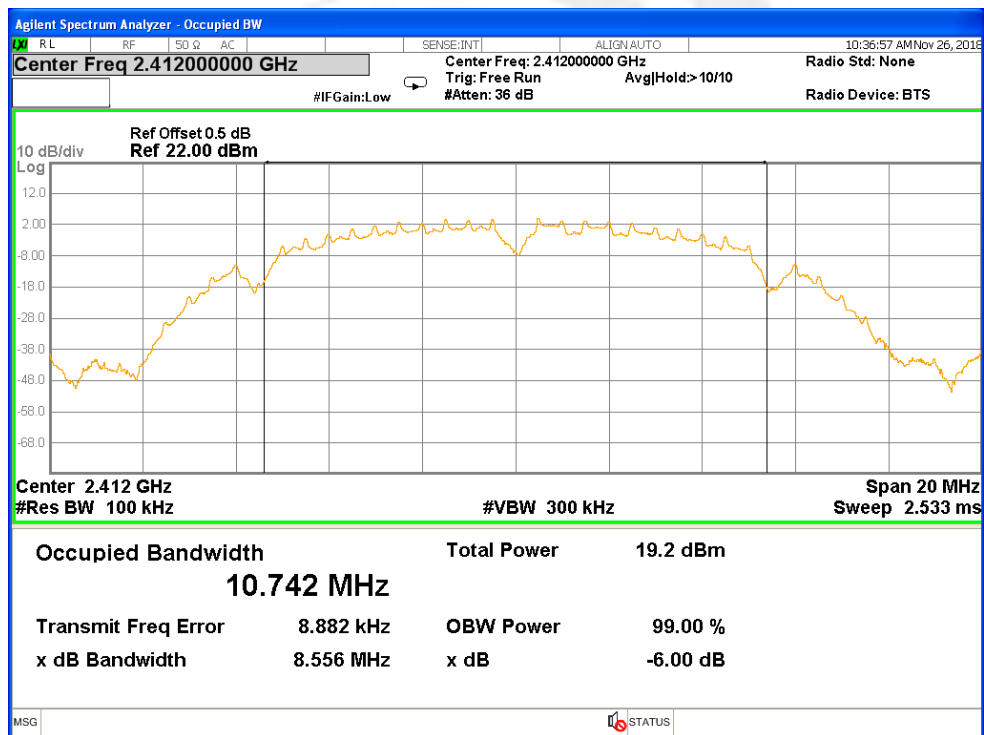
|               |              |                    |                             |
|---------------|--------------|--------------------|-----------------------------|
| Temperature:  | 25 °C        | Relative Humidity: | 60%                         |
| Test Voltage: | AC 120V/60HZ | Test Mode:         | TX b Mode /CH01, CH06, CH11 |

Remark: PEAK DETECTOR IS USED

| Frequency | 6dB Bandwidth (MHz) | 99% Bandwidth (MHz) | Channel Separation (KHz) | Result |
|-----------|---------------------|---------------------|--------------------------|--------|
| 2412 MHz  | 8.556               | 12.467              | >=500KHz                 | PASS   |
| 2437 MHz  | 8.093               | 12.900              | >=500KHz                 | PASS   |
| 2462 MHz  | 8.541               | 12.953              | >=500KHz                 | PASS   |

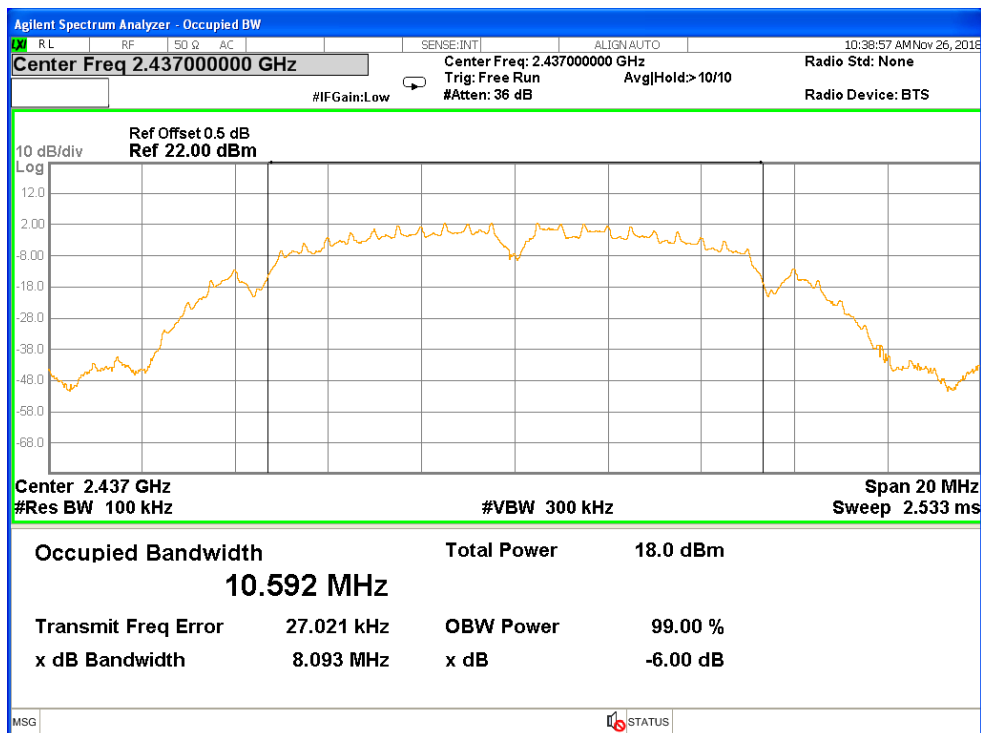
## 6dB Bandwidth

## TX CH 01

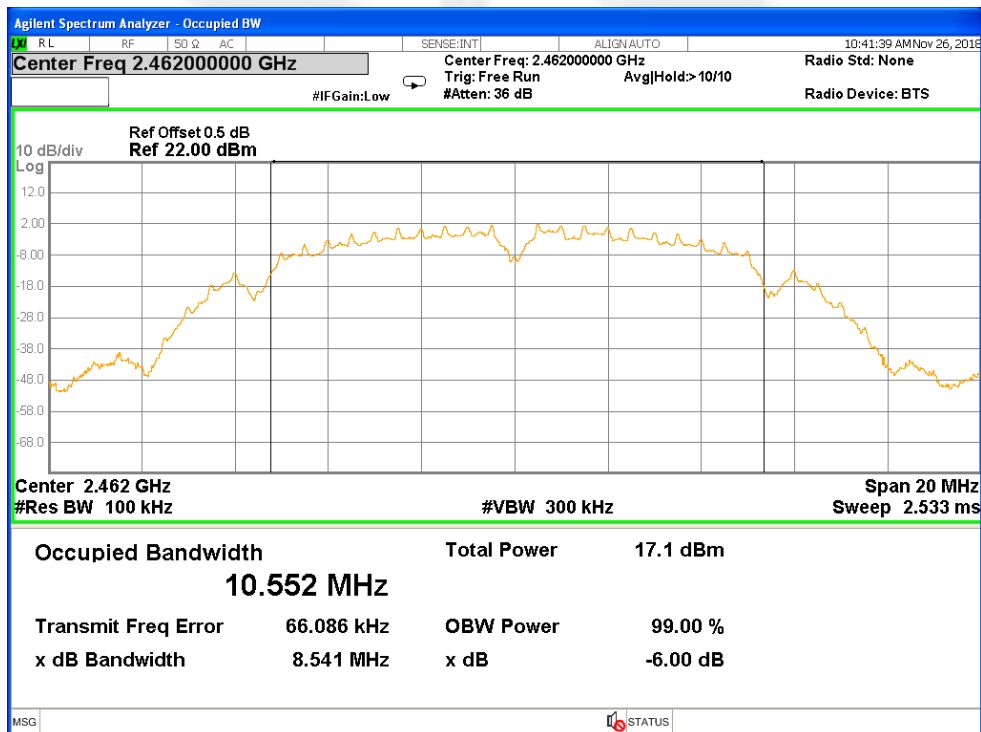




## TX CH 06



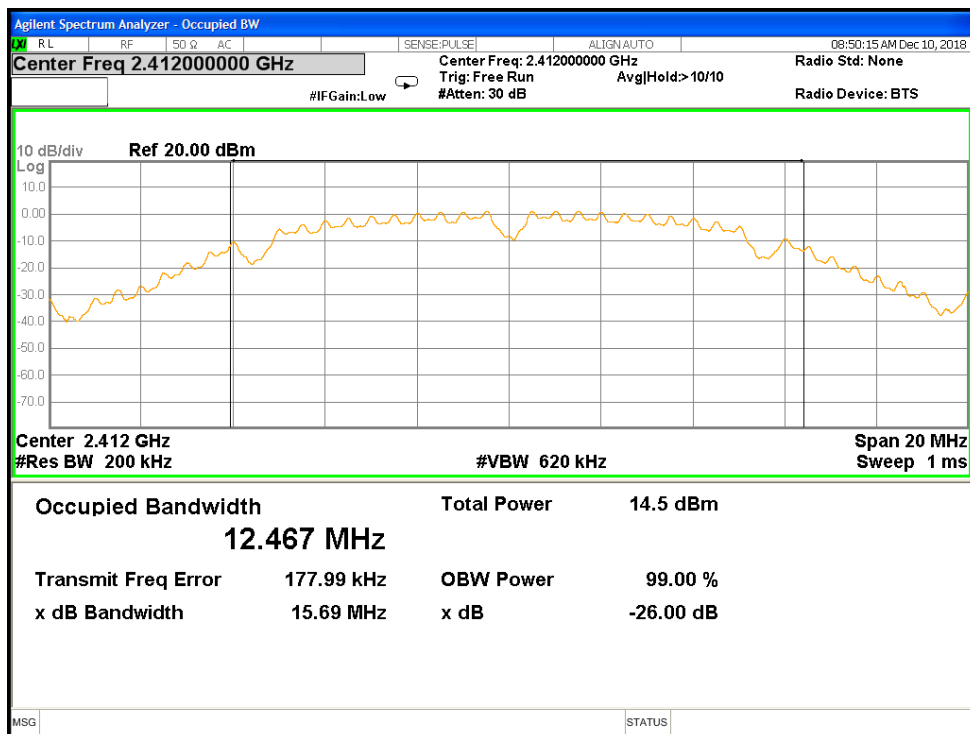
## TX CH 11



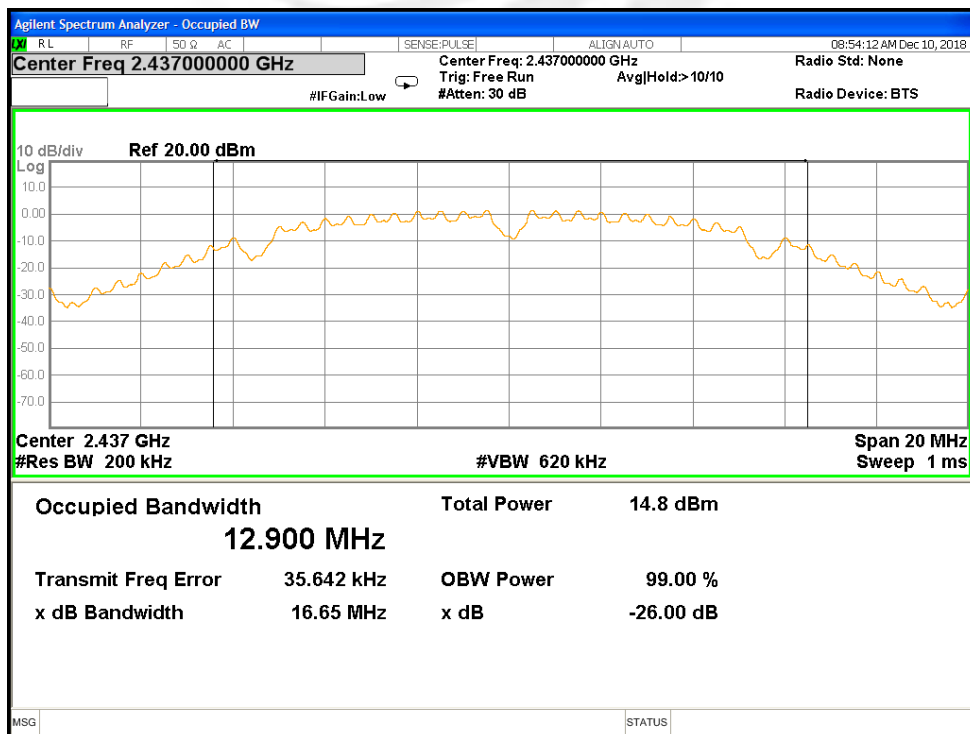


## 99% Bandwidth

## TX CH 01

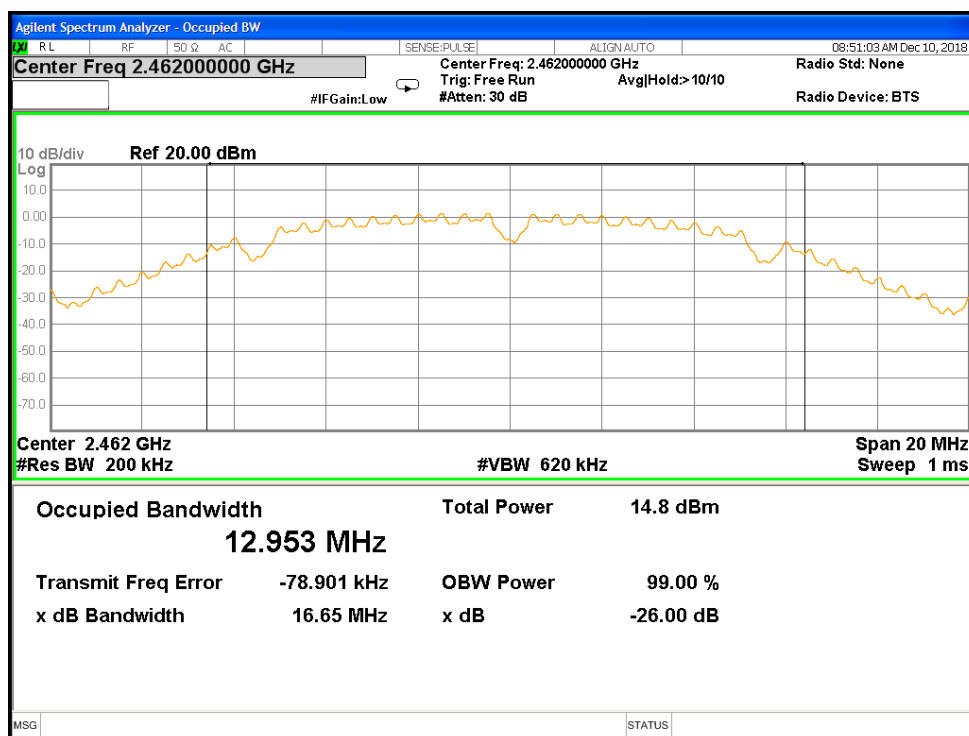


## TX CH 06





## TX CH 11



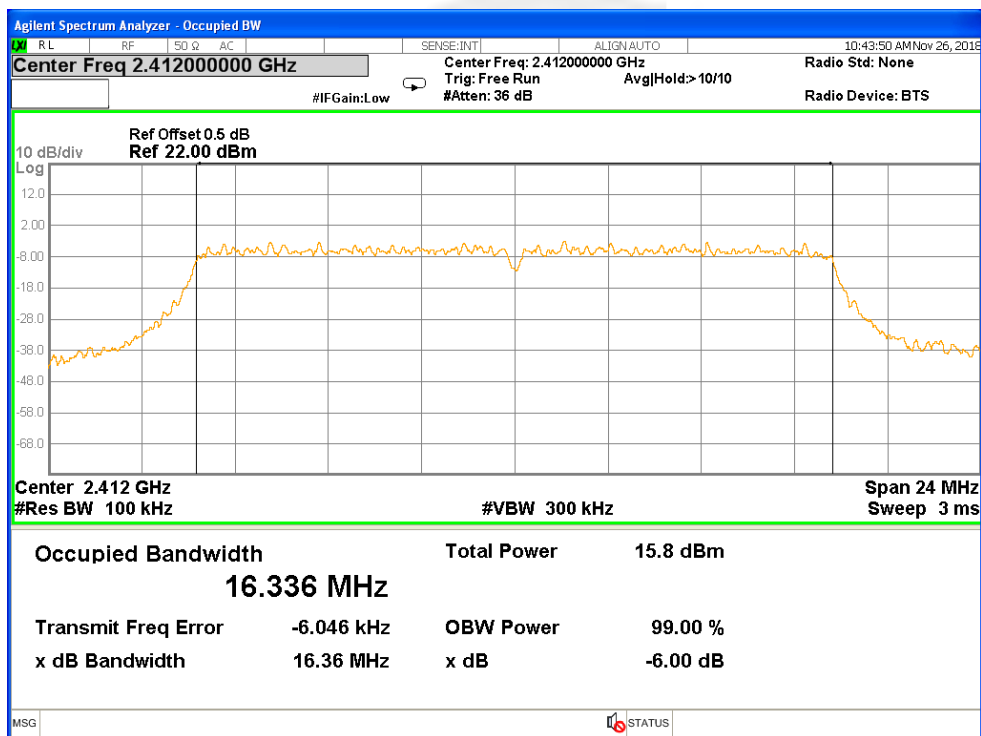


|               |              |                    |                             |
|---------------|--------------|--------------------|-----------------------------|
| Temperature:  | 25 °C        | Relative Humidity: | 60%                         |
| Test Voltage: | AC 120V/60HZ | Test Mode:         | TX g Mode /CH01, CH06, CH11 |

| Frequency | 6dB Bandwidth (MHz) | 99% Bandwidth (MHz) | Channel Separation (KHz) | Result |
|-----------|---------------------|---------------------|--------------------------|--------|
| 2412 MHz  | 16.36               | 16.628              | >=500KHz                 | PASS   |
| 2437 MHz  | 16.36               | 16.671              | >=500KHz                 | PASS   |
| 2462 MHz  | 16.33               | 16.537              | >=500KHz                 | PASS   |

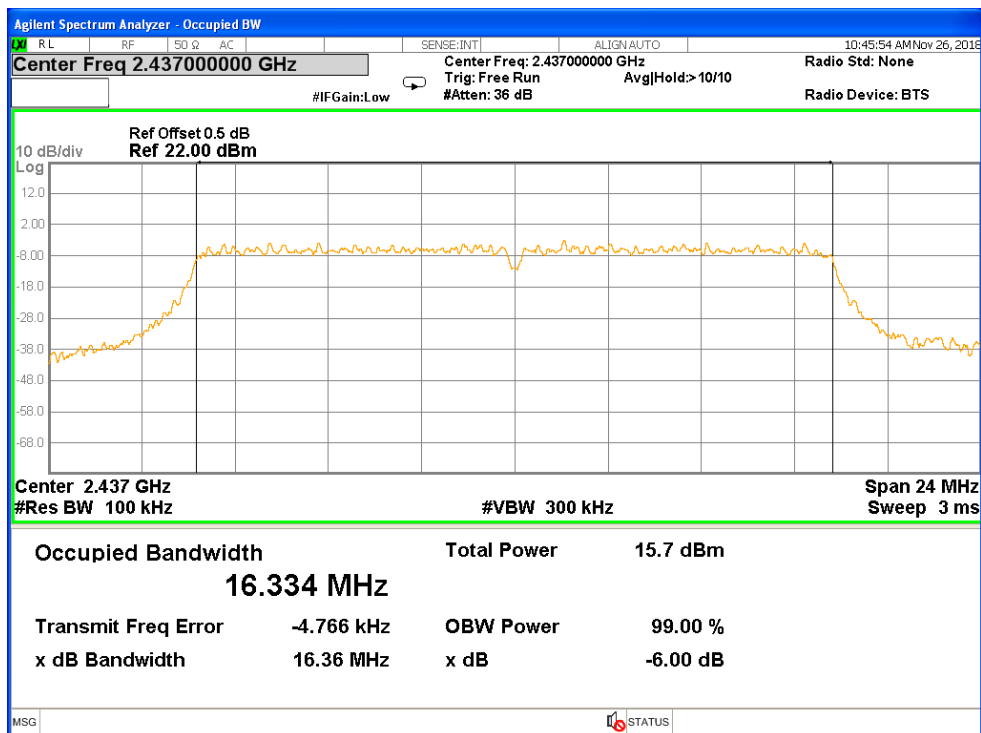
### 6dB Bandwidth

#### TX CH 01

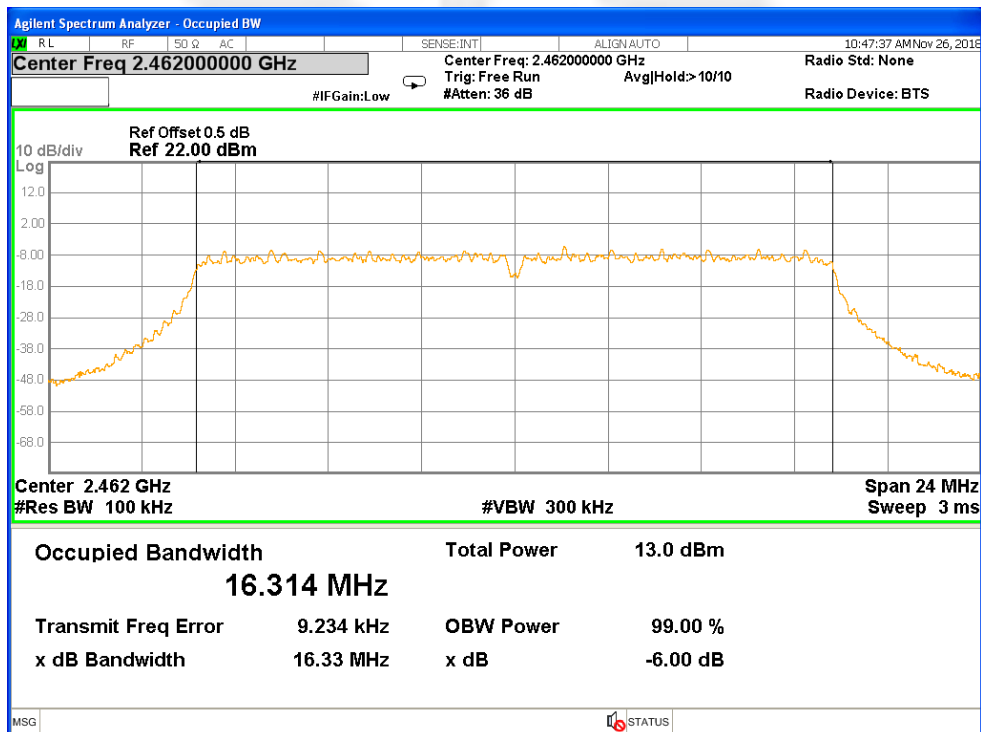




## TX CH 06



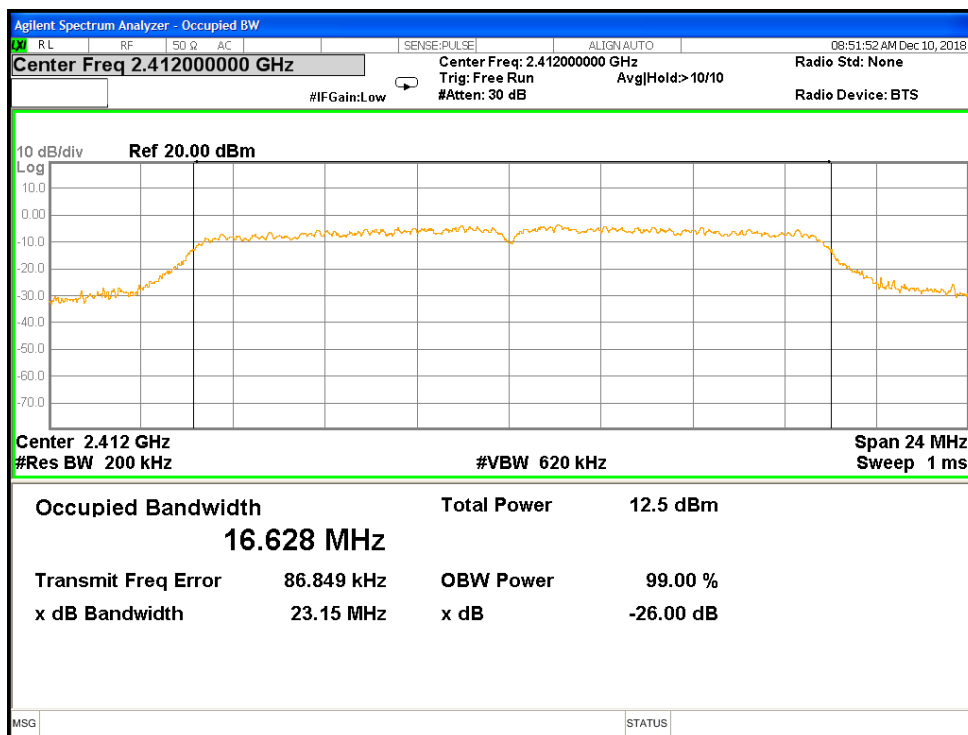
## TX CH 11



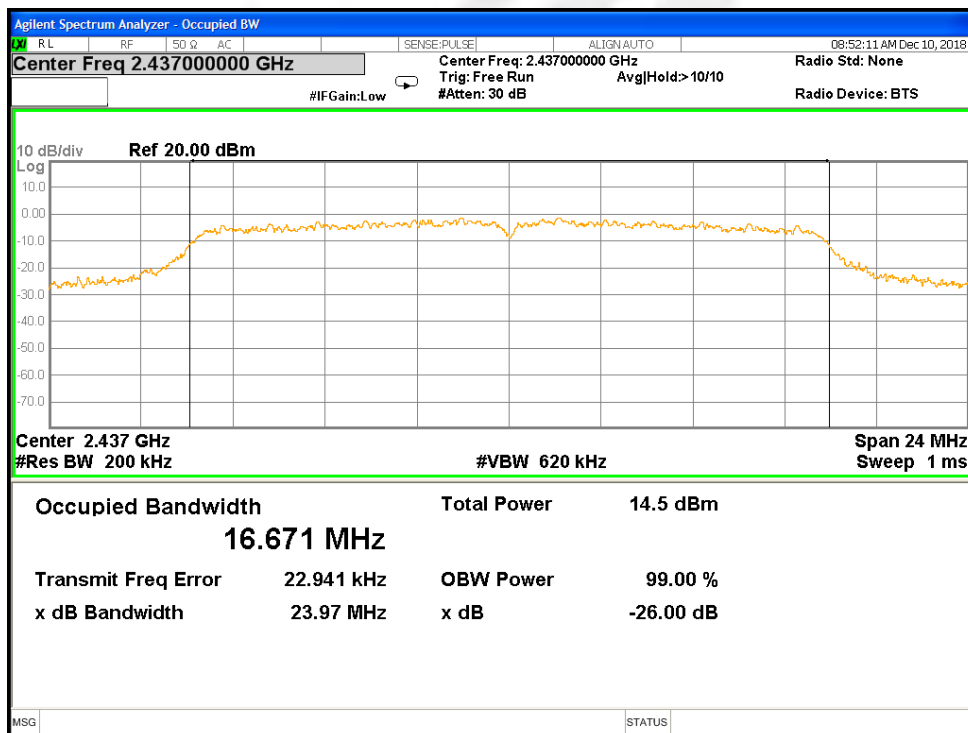


## 99% Bandwidth

## TX CH 01

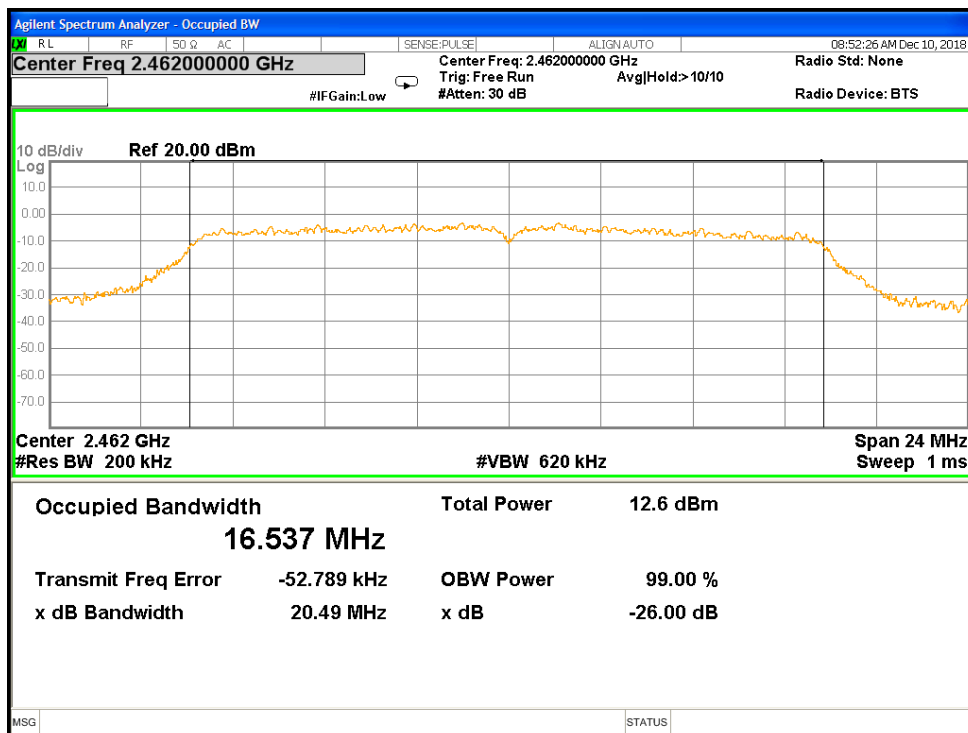


## TX CH 06





## TX CH 11



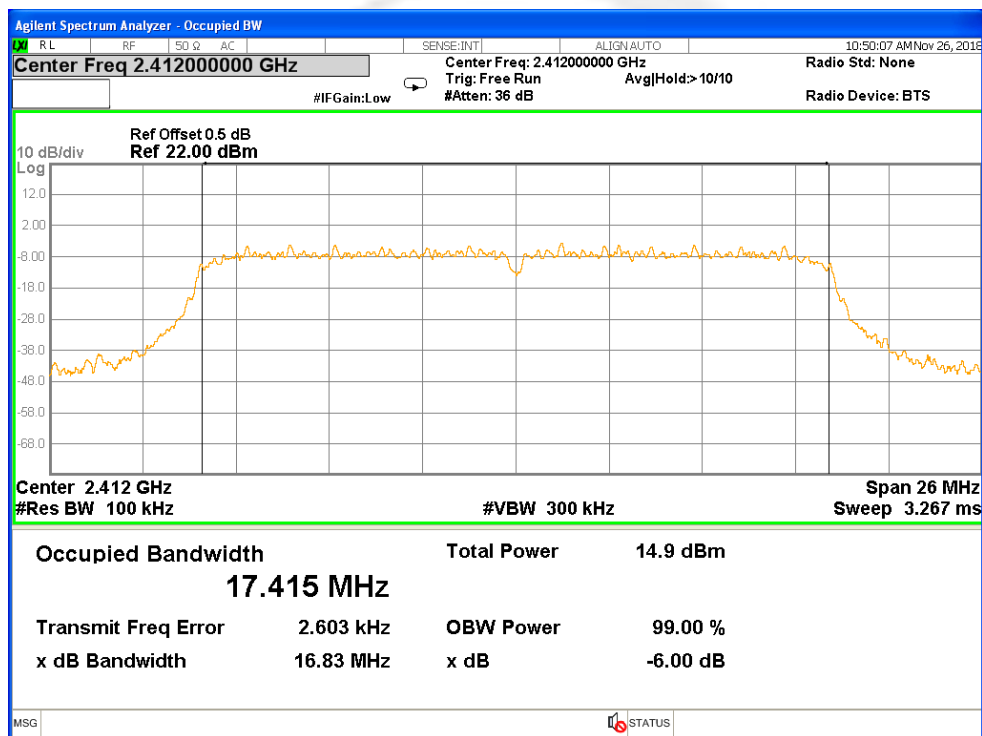


|               |              |                    |                                  |
|---------------|--------------|--------------------|----------------------------------|
| Temperature:  | 25 °C        | Relative Humidity: | 60%                              |
| Test Voltage: | AC 120V/60HZ | Test Mode:         | TX n Mode(20M) /CH01, CH06, CH11 |

| Frequency | 6dB Bandwidth (MHz) | 99% Bandwidth (MHz) | Channel Separation (KHz) | Result |
|-----------|---------------------|---------------------|--------------------------|--------|
| 2412 MHz  | 16.83               | 17.618              | >=500KHz                 | PASS   |
| 2437 MHz  | 16.96               | 17.657              | >=500KHz                 | PASS   |
| 2462 MHz  | 16.43               | 17.569              | >=500KHz                 | PASS   |

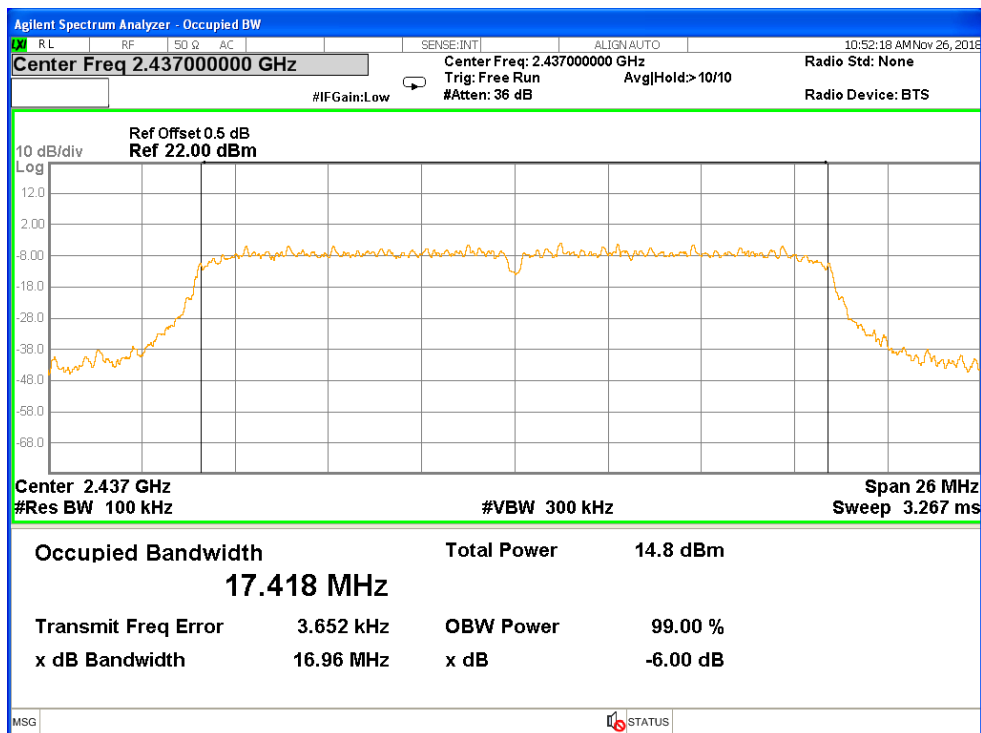
## 6dB Bandwidth

## TX CH 01

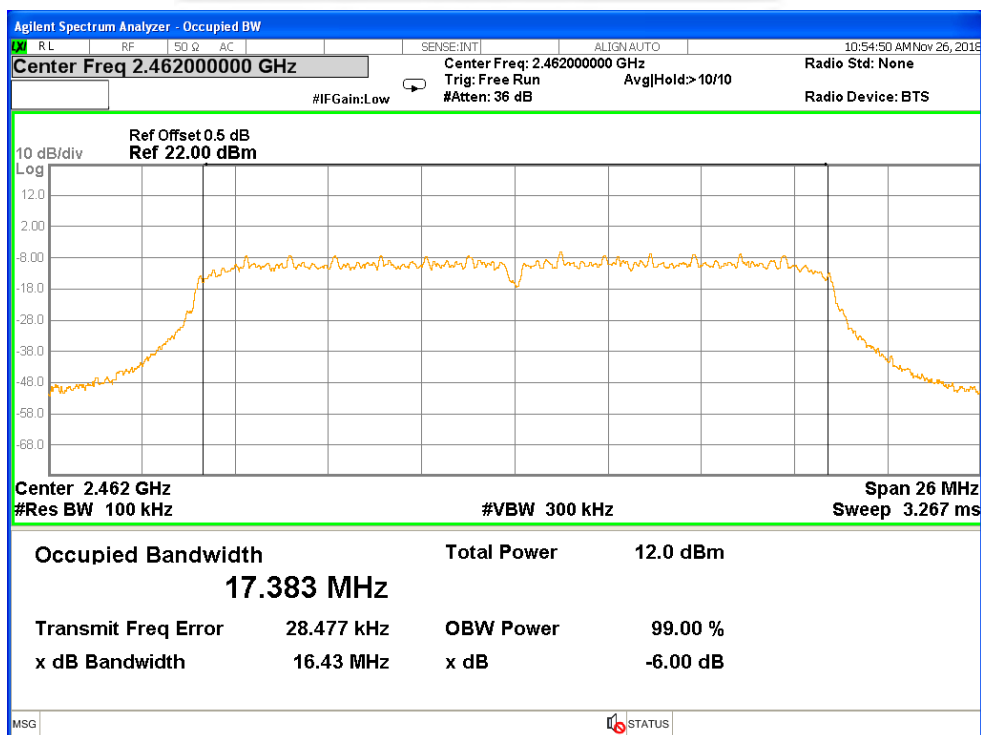




## TX CH 06



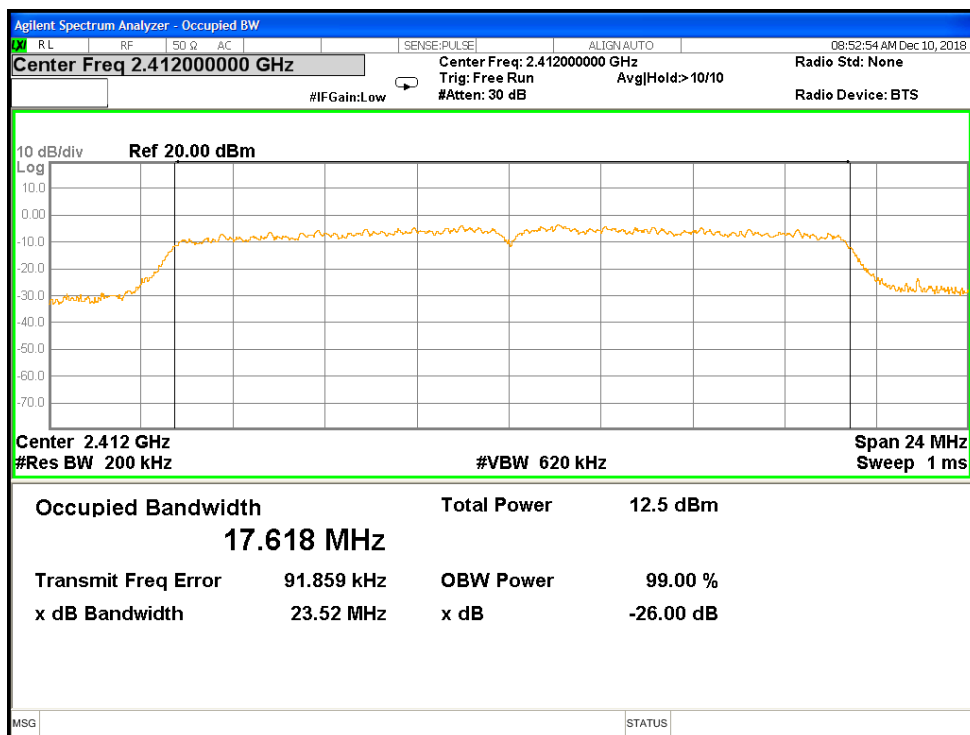
## TX CH 11



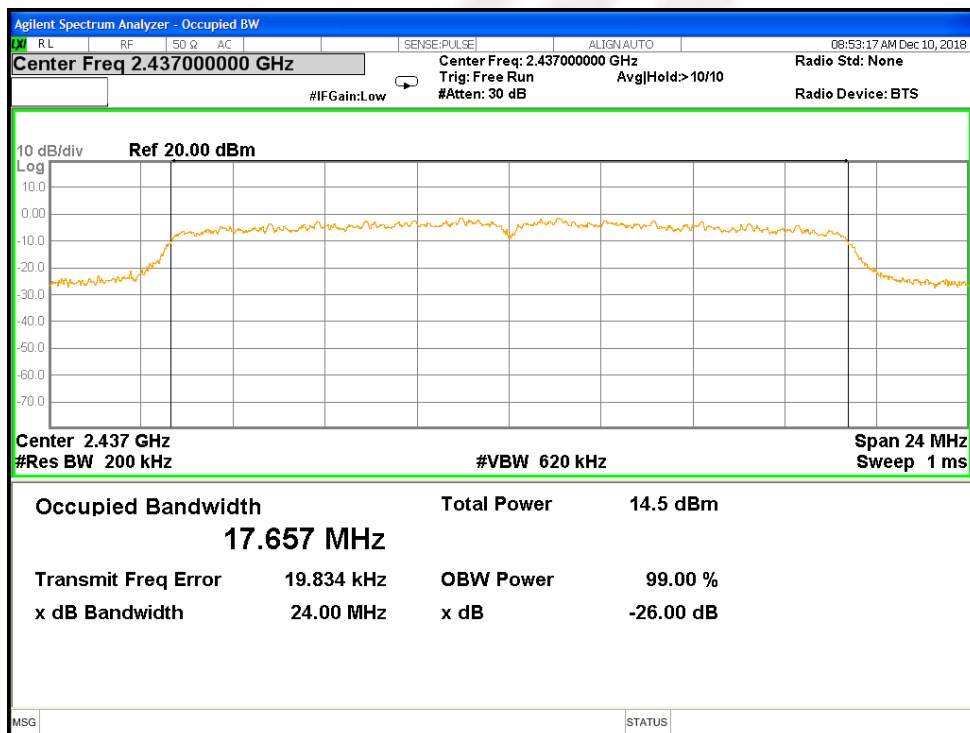


## 99% Bandwidth

## TX CH 01

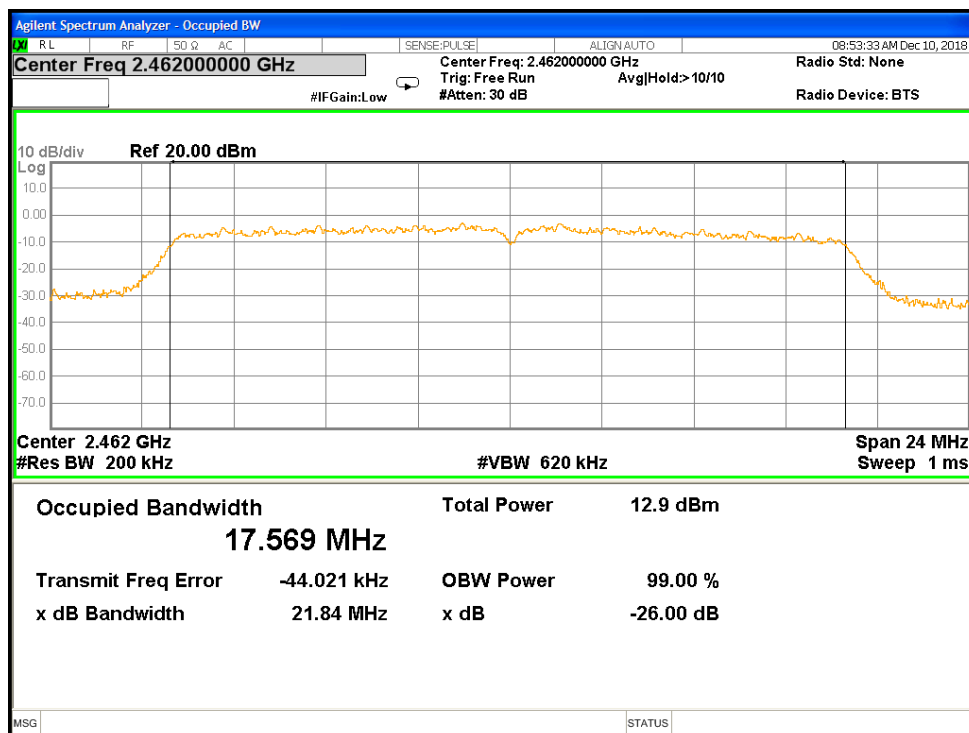


## TX CH 06





## TX CH 11





## 7. PEAK OUTPUT POWER TEST

### 7.1 LIMIT

| FCC Part 15.247, Subpart C<br>RSS-247 Issue 2 |              |                 |                          |        |
|-----------------------------------------------|--------------|-----------------|--------------------------|--------|
| Section                                       | Test Item    | Limit           | Frequency Range<br>(MHz) | Result |
| 15.247(b)(3)<br>RSS-247 Issue 2               | Output Power | 1 watt or 30dBm | 2400-2483.5              | PASS   |

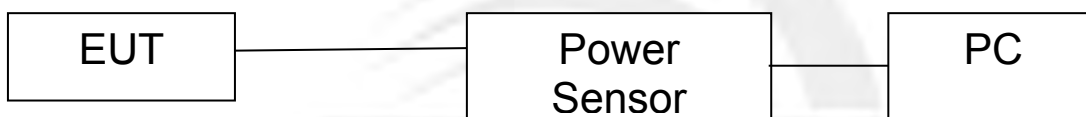
### 7.2 TEST PROCEDURE

- a. The EUT was directly connected to the Power Sensor&PC

### 7.3 DEVIATION FROM STANDARD

No deviation.

### 7.4 TEST SETUP



### 7.5 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.



## 7.6 TEST RESULTS

|                |              |                     |     |
|----------------|--------------|---------------------|-----|
| Temperature :  | 25 °C        | Relative Humidity : | 60% |
| Test Voltage : | AC 120V/60HZ |                     |     |

| TX 802.11b Mode |           |                        |          |       |
|-----------------|-----------|------------------------|----------|-------|
| Test Channel    | Frequency | Conducted Output Power |          | LIMIT |
|                 | (MHz)     | Peak(dBm)              | AVG(dBm) | dBm   |
| CH01            | 2412      | 15.45                  | 14.28    | 30    |
| CH06            | 2437      | 14.58                  | 13.44    | 30    |
| CH11            | 2462      | 13.87                  | 12.47    | 30    |

| TX 802.11g Mode |           |                        |          |       |
|-----------------|-----------|------------------------|----------|-------|
| Test Channel    | Frequency | Conducted Output Power |          | LIMIT |
|                 | (MHz)     | Peak(dBm)              | AVG(dBm) | dBm   |
| CH01            | 2412      | 12.87                  | 11.67    | 30    |
| CH06            | 2437      | 12.64                  | 11.28    | 30    |
| CH11            | 2462      | 12.08                  | 11.01    | 30    |

| TX 802.11n20 Mode |           |                        |          |       |
|-------------------|-----------|------------------------|----------|-------|
| Test Channel      | Frequency | Conducted Output Power |          | LIMIT |
|                   | (MHz)     | Peak(dBm)              | AVG(dBm) | dBm   |
| CH01              | 2412      | 11.28                  | 9.18     | 30    |
| CH06              | 2437      | 11.16                  | 9.07     | 30    |
| CH11              | 2462      | 10.89                  | 8.67     | 30    |



## 8. ANTENNA REQUIREMENT

### 8.1 STANDARD REQUIREMENT

15.203 and RSS-Gen Issue 5 requirement: For intentional device, according to 15.203 and RSS-Gen Issue 5: 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.

### 8.2 EUT ANTENNA

The EUT antenna is PCB Antenna. It comply with the standard requirement.





## 9. FREQUENCY STABILITY

### 9.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.02\%$  of the operating frequency over a temperature variation of  $-30$  degrees to  $50$  degrees C at normal supply voltage, and for a variation in primary supply voltage from  $85\%$  to  $115\%$  of the rated supply voltage at a temperature of  $20$  degrees.

### 9.2 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at  $+20$  degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from  $85\%$  to  $115\%$  and the frequency record.

### 9.3 TEST RESULT

Channel 06 (2437MHz)

Voltage vs. Frequency Stability

| Voltage vs. Frequency<br>Stability Voltage(V) | Measurement<br>Frequency(MHz) |
|-----------------------------------------------|-------------------------------|
| 90                                            | 2437.0041                     |
| 100                                           | 2437.0039                     |
| 110                                           | 2437.0033                     |
| Max.Deviation(MHz)                            | 0.0041                        |
| Max.Deviation(ppm)                            | 1.68                          |

Rated working voltage: AC 100V/50Hz

Temperature vs. Frequency Stability

| Temperature( $^{\circ}$ C) | Measurement<br>Frequency(MHz) |
|----------------------------|-------------------------------|
| -30                        | 2437.0042                     |
| -20                        | 2437.0039                     |
| -10                        | 2437.0040                     |
| 0                          | 2437.0036                     |
| 10                         | 2437.0034                     |
| 20                         | 2437.0041                     |
| 30                         | 2437.0036                     |
| 40                         | 2437.0038                     |
| 50                         | 2437.0036                     |
| Max.Deviation(MHz)         | 0.0042                        |
| Max.Deviation(ppm)         | 1.72                          |



## APPENDIX - PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

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

