

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT  
INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 15 SUBPART C REQUIREMENT**

*OF*

**300M wireless router**

**Model No.: EL001**

**FCC ID: 2ANAM-EL001**

**Trademark: N/A**

**Report No.: ED170721024E**

**Issue Date: July 11, 2017**

*Prepared for*

**Edgeless Limited.  
Sertus Chambers, P.O. Box 603 Apia, Samoa.**

*Prepared by*

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EMTEK(DONGGUAN) CO., LTD.**

**VERIFICATION OF COMPLIANCE**

|                      |                                                                                                                                |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Applicant:           | Edgeless Limited.<br>Sertus Chambers, P.O. Box 603 Apia, Samoa.                                                                |
| Manufacturer:        | Shenzhen Bilian Electronic Co., Ltd.<br>No.10 Nanping East Road Hunnan New District Shenyang,<br>Liaoning Province P.R .China. |
| Product Description: | 300M wireless router                                                                                                           |
| Model Number:        | EL001                                                                                                                          |
| Input Rating:        | DC 12V from adapter                                                                                                            |

**We hereby certify that:**

The above equipment was tested by EMTEK(DONGGUAN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247(2016).

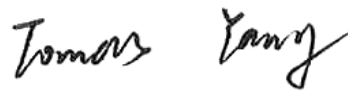
Date of Test :

July 06, 2017 to July 11, 2017



Prepared by :

Abby Li/Editor



Reviewer :

Tomas Yang/Supervisor



Approved &amp; Authorized Signer :

Sam Lv/Manager

## Modified Information

| Version | Summary         | Revision Date | Report No.   |
|---------|-----------------|---------------|--------------|
| Ver.1.0 | Original Report | /             | ED170721024E |
|         |                 |               |              |
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## APPENDIX I (PHOTOS OF EUT)(4 PAGES)

## 1. General Information

### 1.1 Product Description

| Characteristics                        | Description                                                                                                                                                                                                                                                                                  |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IEEE 802.11 WLAN Mode Supported</b> | <input checked="" type="checkbox"/> 802.11b(20MHz channel bandwidth)<br><input checked="" type="checkbox"/> 802.11g(20MHz channel bandwidth)<br><input checked="" type="checkbox"/> 802.11n(20MHz channel bandwidth)<br><input checked="" type="checkbox"/> 802.11n(40MHz channel bandwidth) |
| <b>Data Rate</b>                       | 802.11 b:1,2,5.5,11Mbps;<br>802.11 g:6,9,12,18,24,36,48,54Mbps;<br>802.11n(HT20):MCS0-MCS7;<br>802.11n(HT40):MCS0-MCS7;<br>802.11n(HT40):MCS8-MCS15;                                                                                                                                         |
| <b>MIMO Mode</b>                       | 802.11n(HT20), 802.11n(HT40)                                                                                                                                                                                                                                                                 |
| <b>Modulation</b>                      | DSSS with DBPSK/DQPSK/CCK for 802.11b;<br>OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n;                                                                                                                                                                                                     |
| <b>Operating Frequency Range</b>       | 2412-2462MHz for 802.11b/g;<br>2412-2462MHz for 802.11n(HT20);<br>2422-2452MHz for 802.11n(HT40);                                                                                                                                                                                            |
| <b>Number of Channels</b>              | 11 channels for 802.11b/g;<br>11 channels for 802.11n(HT20);<br>7 channels for 802.11n(HT40);                                                                                                                                                                                                |
| <b>Transmit Power Max</b>              | 17.52dBm for 802.11b;<br>14.17dBm for 802.11g;<br>16.69dBm for 802.11n(HT20);<br>14.29dBm for 802.11n(HT40);                                                                                                                                                                                 |
| <b>Antenna Type</b>                    | 2TX2RX                                                                                                                                                                                                                                                                                       |
| <b>Antenna Port</b>                    | <input checked="" type="checkbox"/> Ant1; <input checked="" type="checkbox"/> Ant2;                                                                                                                                                                                                          |
| <b>Smart system</b>                    | <input checked="" type="checkbox"/> SISO for 802.11b/g<br><input checked="" type="checkbox"/> MIMO for 802.11n                                                                                                                                                                               |
| <b>Antenna Gain</b>                    | 5dBi ( for per antenna port Max)<br>8dBi for MIMO(Ant1+Ant2 Directional Gain)                                                                                                                                                                                                                |

**Note:** for more details, please refer to the User's manual of the EUT.

## 2. System Test Configuration

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

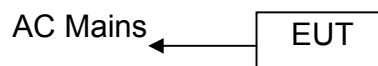
The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.

#### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. Emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013.

### 2.4 Configuration of Tested System

**Fig. 2-1 Configuration of Tested System**



**Table 2-1 Equipment Used in Tested System**

| Item | Equipment            | Trademark | Model No. | FCC ID      | Note |
|------|----------------------|-----------|-----------|-------------|------|
| 1.   | 300M wireless router | N/A       | EL001     | 2ANAM-EL001 | EUT  |

**Note:**

- (1) Unless otherwise denoted as EUT in 『Remark』 column, device(s) used in tested system is a support equipment.

### 3. Description of Test Modes

The EUT has been tested under its typical operating condition.

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Those data rates (802.11b: 1 Mbps; 802.11g: 6 Mbps; 802.11n (HT20 ): MCS0; 802.11n (HT40 ): MCS0) were used for all test.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list for 802.11 b/g/n (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 1       | 2412            | 5       | 2432            | 9       | 2452            |
| 2       | 2417            | 6       | 2437            | 10      | 2457            |
| 3       | 2422            | 7       | 2442            | 11      | 2462            |
| 4       | 2427            | 8       | 2447            |         |                 |

Frequency and Channel list for 802.11 n (HT40):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 3       | 2422            | 5       | 2432            | 8       | 2447            |
| 4       | 2427            | 6       | 2437            | 9       | 2452            |
|         |                 | 7       | 2442            |         |                 |

Test Frequency and Channel for 802.11 b/g/n (HT20):

| Lowest Frequency |                 | Middle Frequency |                 | Highest Frequency |                 |
|------------------|-----------------|------------------|-----------------|-------------------|-----------------|
| Channel          | Frequency (MHz) | Channel          | Frequency (MHz) | Channel           | Frequency (MHz) |
| 1                | 2412            | 6                | 2437            | 11                | 2462            |

Test Frequency and channel for 802.11 n (HT40):

| Lowest Frequency |                 | Middle Frequency |                 | Highest Frequency |                 |
|------------------|-----------------|------------------|-----------------|-------------------|-----------------|
| Channel          | Frequency (MHz) | Channel          | Frequency (MHz) | Channel           | Frequency (MHz) |
| 3                | 2422            | 6                | 2437            | 9                 | 2452            |

#### 4. Summary of Test Results

| FCC Rules           | Description Of Test         | Result |
|---------------------|-----------------------------|--------|
| §15.247(a)(2)       | 6dB bandwidth               | Pass   |
| §15.247(b)(3)       | Max Peak output Power test  | Pass   |
| §15.247(e)          | Power density               | Pass   |
| §15.247(d)          | Band edge test              | Pass   |
| §15.207             | AC Power Conducted Emission | Pass   |
| §15.247(d), §15.209 | Radiated Emission           | Pass   |
| §15.247(d)          | Antenna Port Emission       | Pass   |
| §15.247(b)&§15.203  | Antenna Application         | Pass   |

#### RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2ANAM-EL001 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

The system is compliance with Subpart B is authorized under a DOC procedure

#### 5. Test Methodology

According to its specifications, the EUT must comply with the requirements of the following standards:

FCC 47 CFR Part 2, Subpart J

FCC 47 CFR Part 15, Subpart C

FCC KDB 558074 D01 DTS Meas Guidance v04

FCC KDB 662911 D01 Multiple Transmitter Output v01

FCC KDB 662911 D02 MIMO With Cross Polarized Antenna V01

#### 6. Test Facility

##### Site Description

EMC Lab : Registered on FCC, July 06, 2016  
The Certificate Number is 247565.

Registered on Industry Canada, January 13, 2017  
The Certificate Number is 9444A

Name of Firm : EMTEK(DONGGUAN) CO., LTD.  
Site Location : No.281, Guantai Road, Nancheng District,  
Dongguan, Guangdong, China

## 7. TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| Parameter                      | Uncertainty               |
|--------------------------------|---------------------------|
| Radio Frequency                | $\pm 1 \times 10^{-5}$    |
| Maximum Peak Output Power Test | $\pm 1.0\text{dB}$        |
| Conducted Emissions Test       | $\pm 2.0\text{dB}$        |
| Radiated Emission Test         | $\pm 2.0\text{dB}$        |
| Power Density                  | $\pm 2.0\text{dB}$        |
| Occupied Bandwidth Test        | $\pm 1.0\text{dB}$        |
| Band Edge Test                 | $\pm 3\text{dB}$          |
| All emission, radiated         | $\pm 3\text{dB}$          |
| Antenna Port Emission          | $\pm 3\text{dB}$          |
| Temperature                    | $\pm 0.5^{\circ}\text{C}$ |
| Humidity                       | $\pm 3\%$                 |

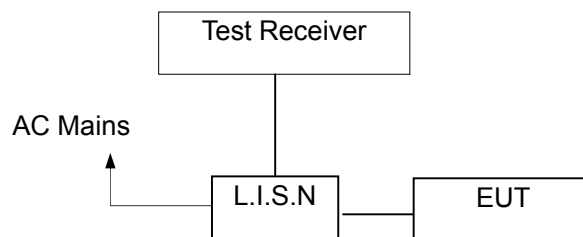
Measurement Uncertainty for a level of Confidence of 95%

## 8. Conducted Emissions Test

### 8.1 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

### 8.2 Test SET-UP (Block Diagram of Configuration)



### 8.3 Measurement Equipment Used

| Conducted Emission Test Site |                 |              |               |            |            |
|------------------------------|-----------------|--------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR             | MODEL NUMBER | SERIAL NUMBER | Last Cal.  | Due date   |
| Test Receiver                | Rohde & Schwarz | ESCS30       | 100018        | 05/16/2017 | 05/15/2018 |
| L.I.S.N                      | Rohde & Schwarz | ENV216       | 100017        | 05/16/2017 | 05/15/2018 |
| RF Switching Unit            | CDS             | RSU-M2       | 38401         | 05/16/2017 | 05/15/2018 |
| Coaxial Cable                | CDS             | 79254        | 46107086      | 05/16/2017 | 05/15/2018 |

### 8.4 Conducted Emission Limit

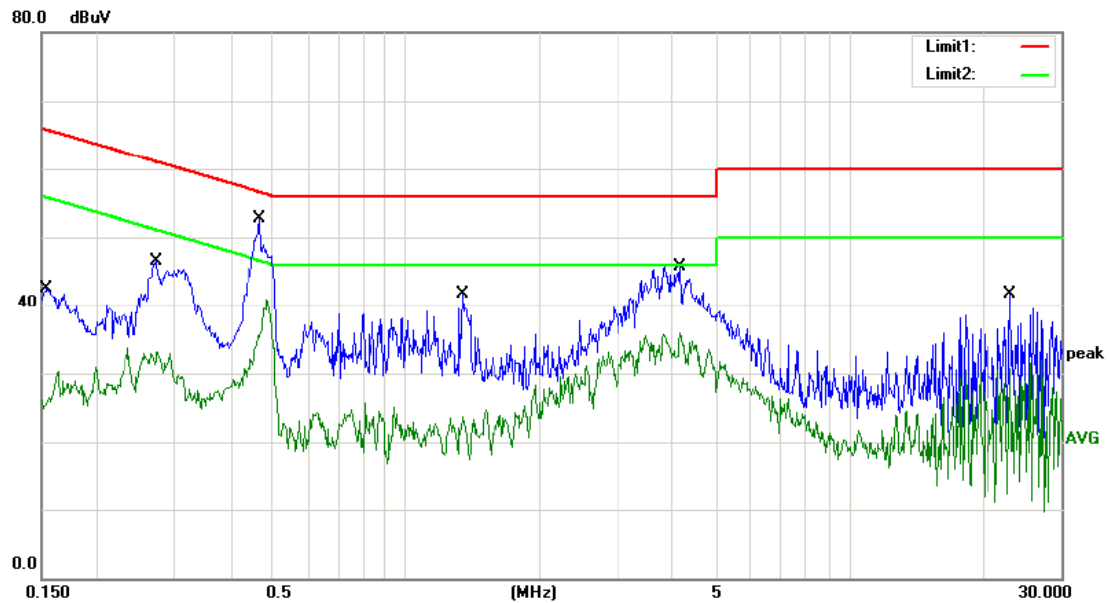
| Conducted Emission Frequency(MHz) | Quasi-peak | Average |
|-----------------------------------|------------|---------|
| 0.15-0.5                          | 66-56      | 56-46   |
| 0.5-5.0                           | 56         | 46      |
| 5.0-30.0                          | 60         | 50      |

**Note:** 1. The lower limit shall apply at the transition frequencies  
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 8.5 Measurement Result

Conducted emission at both 120V & 240V is assessed, and emission at 120V represents the worst case. All the modulation modes were tested the data of the worst mode (TX 802.11b 2462MHz) are recorded in the following pages and the others modulation

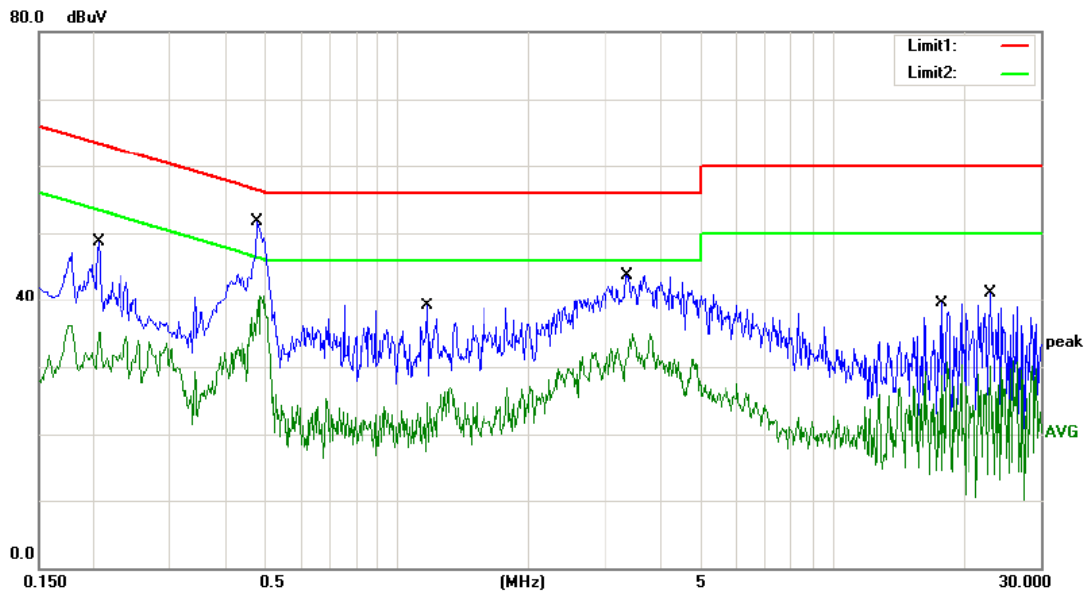
methods do not exceed the limits. Please refer to following pages.



Site site #1 Phase: **L1** Temperature: 24  
 Limit: (CE)FCC PART 15C\_QP Power: AC 120V/60Hz Humidity: 55 %  
 Mode: TX2462  
 Note:

| No. | Mk. | Freq.   | Reading Level | Correct Factor | Measure-ment | Limit | Over   |                  |
|-----|-----|---------|---------------|----------------|--------------|-------|--------|------------------|
|     |     | MHz     | dBuV          | dB             | dBuV         | dBuV  | dB     | Detector Comment |
| 1   |     | 0.1540  | 32.74         | 9.78           | 42.52        | 65.78 | -23.26 | QP               |
| 2   |     | 0.1540  | 20.43         | 9.78           | 30.21        | 55.78 | -25.57 | AVG              |
| 3   |     | 0.2740  | 36.73         | 9.80           | 46.53        | 61.00 | -14.47 | QP               |
| 4   |     | 0.2740  | 23.99         | 9.80           | 33.79        | 51.00 | -17.21 | AVG              |
| 5   | *   | 0.4661  | 42.93         | 9.83           | 52.76        | 56.58 | -3.82  | QP               |
| 6   |     | 0.4661  | 31.00         | 9.83           | 40.83        | 46.58 | -5.75  | AVG              |
| 7   |     | 1.3380  | 31.88         | 9.84           | 41.72        | 56.00 | -14.28 | QP               |
| 8   |     | 1.3380  | 14.89         | 9.84           | 24.73        | 46.00 | -21.27 | AVG              |
| 9   |     | 4.1380  | 35.91         | 9.85           | 45.76        | 56.00 | -10.24 | QP               |
| 10  |     | 4.1380  | 26.14         | 9.85           | 35.99        | 46.00 | -10.01 | AVG              |
| 11  |     | 23.1300 | 31.40         | 10.32          | 41.72        | 60.00 | -18.28 | QP               |
| 12  |     | 23.1300 | 21.62         | 10.32          | 31.94        | 50.00 | -18.06 | AVG              |

\*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: Aspen



Site site #1 Phase: **N** Temperature: 24  
 Limit: (CE)FCC PART 15C\_QP Power: AC 120V/60Hz Humidity: 55 %  
 Mode: TX2462  
 Note:

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1   |     | 0.2060       | 38.98                    | 9.79                    | 48.77                    | 63.37         | -14.60     | QP       |         |
| 2   |     | 0.2060       | 26.40                    | 9.79                    | 36.19                    | 53.37         | -17.18     | AVG      |         |
| 3   | *   | 0.4780       | 41.82                    | 9.84                    | 51.66                    | 56.37         | -4.71      | QP       |         |
| 4   |     | 0.4780       | 30.84                    | 9.84                    | 40.68                    | 46.37         | -5.69      | AVG      |         |
| 5   |     | 1.1660       | 29.19                    | 9.84                    | 39.03                    | 56.00         | -16.97     | QP       |         |
| 6   |     | 1.1660       | 16.98                    | 9.84                    | 26.82                    | 46.00         | -19.18     | AVG      |         |
| 7   |     | 3.3700       | 33.94                    | 9.85                    | 43.79                    | 56.00         | -12.21     | QP       |         |
| 8   |     | 3.3700       | 25.15                    | 9.85                    | 35.00                    | 46.00         | -11.00     | AVG      |         |
| 9   |     | 17.6940      | 29.37                    | 10.18                   | 39.55                    | 60.00         | -20.45     | QP       |         |
| 10  |     | 17.6940      | 16.73                    | 10.18                   | 26.91                    | 50.00         | -23.09     | AVG      |         |
| 11  |     | 23.1300      | 30.80                    | 10.32                   | 41.12                    | 60.00         | -18.88     | QP       |         |
| 12  |     | 23.1300      | 20.58                    | 10.32                   | 30.90                    | 50.00         | -19.10     | AVG      |         |

\*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: Aspen

## 9. Radiated Emission Test

### 9.1 Measurement Procedure

1. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane, And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured was complete.

When spectrum scanned from 30MHz to 1GHz setting resolution bandwidth 120KHz and video bandwidth 300KHz:

| EMI Test Receiver | Setting  |
|-------------------|----------|
| Attenuation       | Auto     |
| RBW               | 120KHz   |
| VBW               | 300KHz   |
| Detector          | QP       |
| Trace             | Max hold |

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

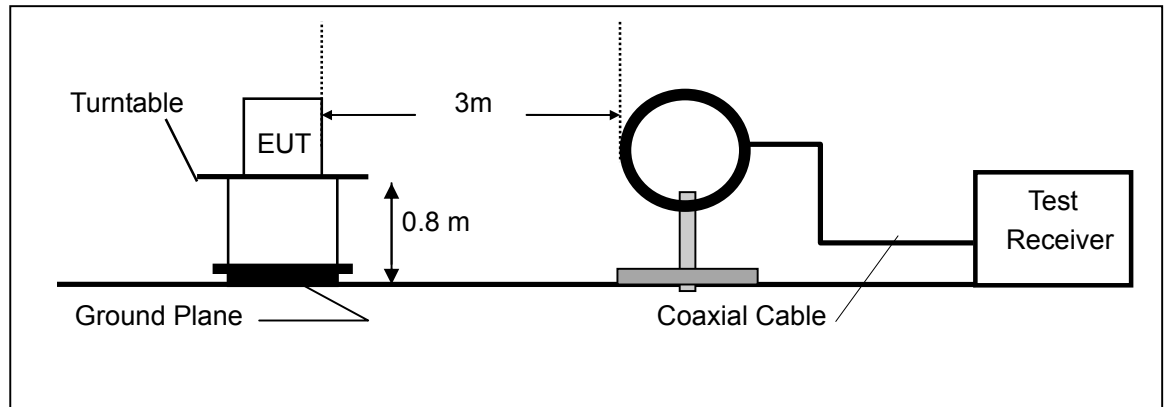
| EMI Test Receiver | Setting  |
|-------------------|----------|
| Attenuation       | Auto     |
| RBW               | 1MHz     |
| VBW               | 3MHz     |
| Detector          | Peak     |
| Trace             | Max hold |

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz:

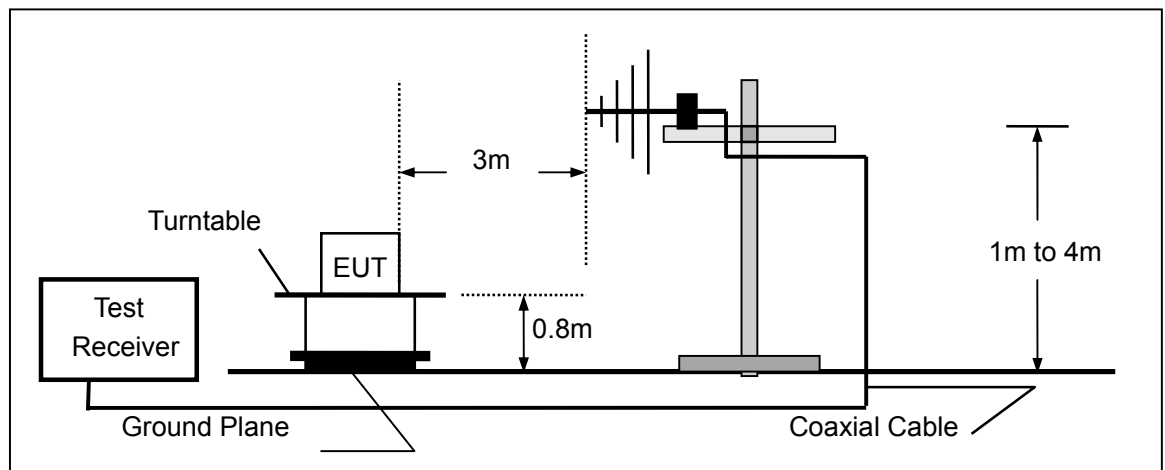
| EMI Test Receiver | Setting  |
|-------------------|----------|
| Attenuation       | Auto     |
| RBW               | 1MHz     |
| VBW               | 10Hz     |
| Detector          | Peak     |
| Trace             | Max hold |

## 9.2 Test SET-UP (Block Diagram of Configuration)

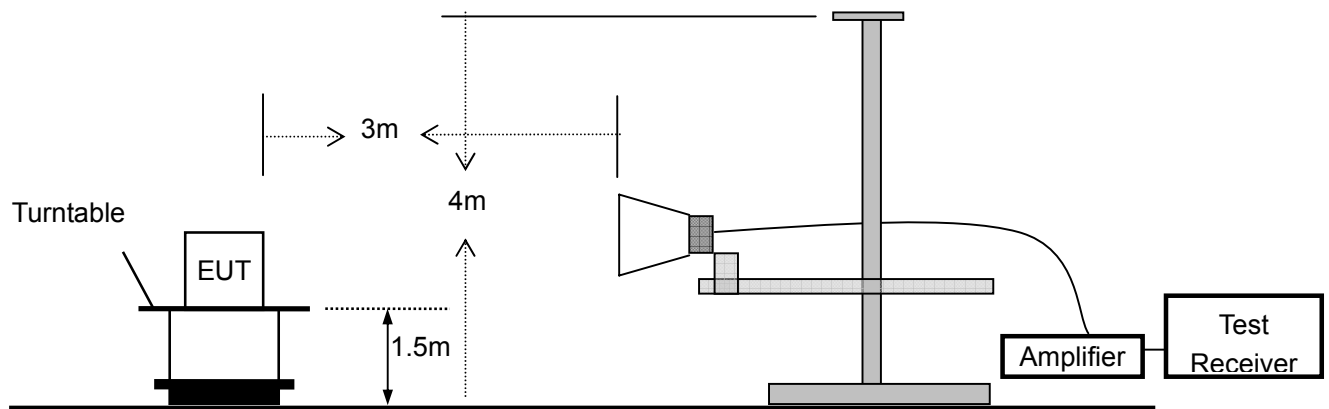
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



### 9.3 Measurement Equipment Used

| Item | Equipment                      | Manufacturer    | Model No.  | Serial No.   | Last Cal.  | Cal. Interval |
|------|--------------------------------|-----------------|------------|--------------|------------|---------------|
| 1.   | Test Receiver                  | Rohde & Schwarz | ESCI       | 1166.5950.03 | 05/16/2017 | 1 Year        |
| 2.   | Bilog Antenna                  | Schwarzbeck     | VULB9163   | 000141       | 05/16/2017 | 1 Year        |
| 3.   | Power Amplifier                | CDS             | RSU-M352   | 818          | 05/16/2017 | 1 Year        |
| 4.   | Power Amplifier                | HP              | 8447F      | OPT H64      | 05/16/2017 | 1 Year        |
| 5.   | Color Monitor                  | SUNSPO          | SP-140A    | N/A          | 05/16/2017 | 1 Year        |
| 6.   | Single Line Filter             | JIANLI          | XL-3       | N/A          | 05/16/2017 | 1 Year        |
| 7.   | Single Phase Power Line Filter | JIANLI          | DL-2X100B  | N/A          | 05/16/2017 | 1 Year        |
| 8.   | 3 Phase Power Line Filter      | JIANLI          | DL-4X100B  | N/A          | 05/16/2017 | 1 Year        |
| 9.   | DC Power Filter                | JIANLI          | DL-2X50B   | N/A          | 05/16/2017 | 1 Year        |
| 10.  | Cable                          | Schwarzbeck     | PLF-100    | 549489       | 05/16/2017 | 1 Year        |
| 11.  | Cable                          | Rosenberger     | CIL02      | A0783566     | 05/16/2017 | 1 Year        |
| 12.  | Cable                          | Rosenberger     | RG 233/U   | 525178       | 05/16/2017 | 1 Year        |
| 13.  | Signal Analyzer                | Rohde & Schwarz | FSV30      | 103040       | 05/16/2017 | 1 Year        |
| 14.  | Horn Antenna                   | Schwarzbeck     | BBHA9120D  | 9120D-1272   | 05/16/2017 | 1 Year        |
| 15.  | Power Amplifier                | LUNAR EM        | LNA1G18-40 | J10100000081 | 05/16/2017 | 1 Year        |
| 16.  | Cable                          | H+S             | CBL-26     | N/A          | 05/16/2017 | 1 Year        |
| 17.  | Cable                          | H+S             | CBL-26     | N/A          | 05/16/2017 | 1 Year        |
| 18.  | Cable                          | H+S             | CBL-26     | N/A          | 05/16/2017 | 1 Year        |

#### 9.4 Radiated Emission Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table 15.209(a):

| 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                                |

Restricted bands of operation

| MHz                        | MHz                   | MHz             | GHz              |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905            | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128              | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775          | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775          | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218              | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7      |
| 6.26775 - 6.26825          | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225          | 123 - 138             | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294              | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366              | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675          | 156.7 - 156.9         | 2690 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475          | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293             | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025        | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725        | 322 - 335.4           | 3600 - 4400     | ( <sup>2</sup> ) |

Remark 1. Emission level in dBuV/m=20 log (uV/m)

- : 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.  
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of § 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

## 9.5 Measurement Result

### Below 30MHz:

All the modulation modes were tested the data of the test mode are recorded in the following pages.

|                    |            |               |               |
|--------------------|------------|---------------|---------------|
| Operation Mode:    | TX Mode    | Test Date :   | July 10, 2017 |
| Frequency Range:   | 9KHz~30MHz | Temperature : | 28°C          |
| Test Result:       | PASS       | Humidity :    | 60 %          |
| Measured Distance: | 3m         | Test By:      | Andy          |

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | Emission Level<br>(dBuV/m) | Limit 3m<br>(dBuV/m) | Over<br>(dB) |
|----------------|-----------------|----------------------------|----------------------|--------------|
| --             | --              | --                         | --                   | --           |

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

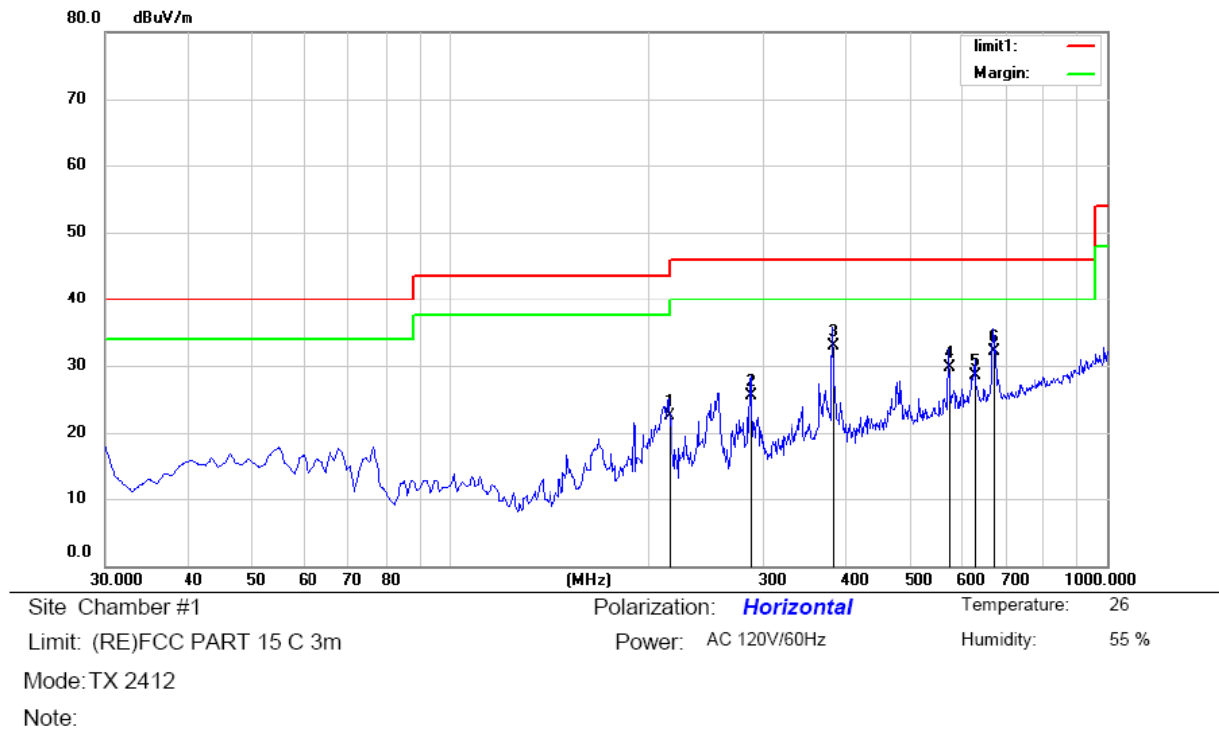
Distance extrapolation factor =  $40 \log(\text{Specific distance} / \text{test distance})$  (dB);

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

### Below 1000MHz:

Radiated emission at both 120V & 240V is assessed, and emission at 120V represents the worst case. All the modulation modes were tested the data of the worst mode (ANT 1: TX 802.11b) are recorded in the following pages and the others modulation methods do not exceed the limits.

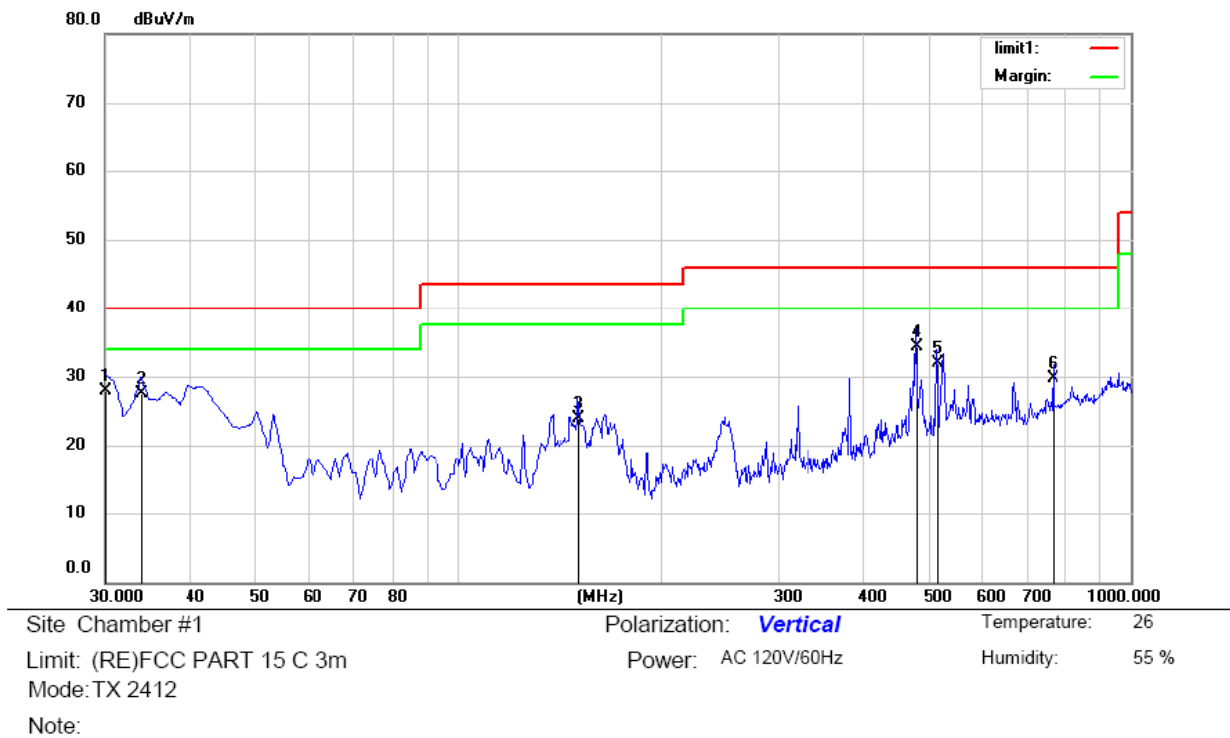
Please refer to the following test plots:



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   | Antenna Height | Table Degree |        |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|--------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector       | cm           | degree |
| 1   |     | 215.2700 | 39.65         | -17.17         | 22.48       | 43.50  | -21.02 | QP             |              |        |
| 2   |     | 287.0500 | 39.80         | -14.23         | 25.57       | 46.00  | -20.43 | QP             |              |        |
| 3   | *   | 383.0800 | 44.23         | -11.29         | 32.94       | 46.00  | -13.06 | QP             |              |        |
| 4   |     | 575.1400 | 36.85         | -7.11          | 29.74       | 46.00  | -16.26 | QP             |              |        |
| 5   |     | 630.4300 | 34.12         | -5.65          | 28.47       | 46.00  | -17.53 | QP             |              |        |
| 6   |     | 671.1700 | 37.20         | -5.06          | 32.14       | 46.00  | -13.86 | QP             |              |        |

\*:Maximum data x:Over limit l:over margin

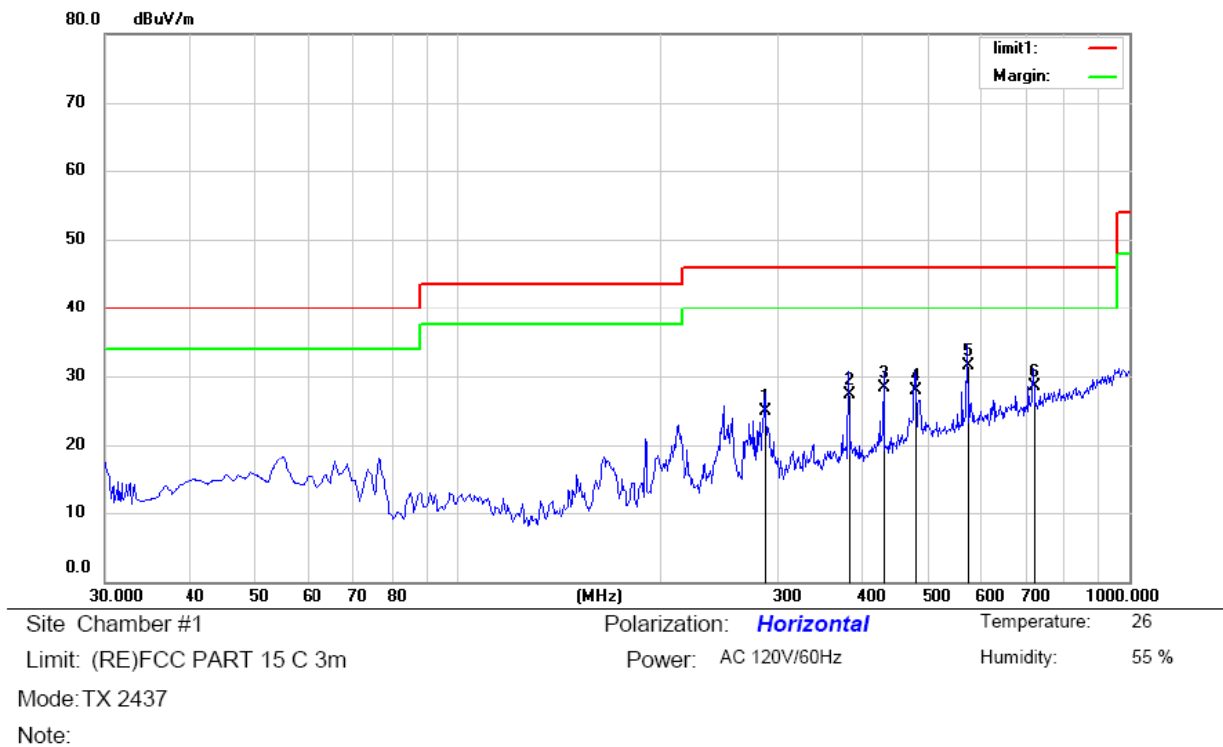
Operator: washington



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Antenna<br>Height<br>cm | Table<br>Degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|-------------------------|-----------------|---------|
| 1   |     | 30.0000      | 43.23                    | -15.36                  | 27.87                      | 40.00           | -12.13     | QP                      |                 |         |
| 2   |     | 33.8800      | 42.15                    | -14.66                  | 27.49                      | 40.00           | -12.51     | QP                      |                 |         |
| 3   |     | 151.2500     | 42.65                    | -18.65                  | 24.00                      | 43.50           | -19.50     | QP                      |                 |         |
| 4   | *   | 480.0800     | 44.23                    | -10.01                  | 34.22                      | 46.00           | -11.78     | QP                      |                 |         |
| 5   |     | 515.9700     | 41.30                    | -9.34                   | 31.96                      | 46.00           | -14.04     | QP                      |                 |         |
| 6   |     | 767.2000     | 34.05                    | -4.41                   | 29.64                      | 46.00           | -16.36     | QP                      |                 |         |

\*:Maximum data    x:Over limit    !:over margin

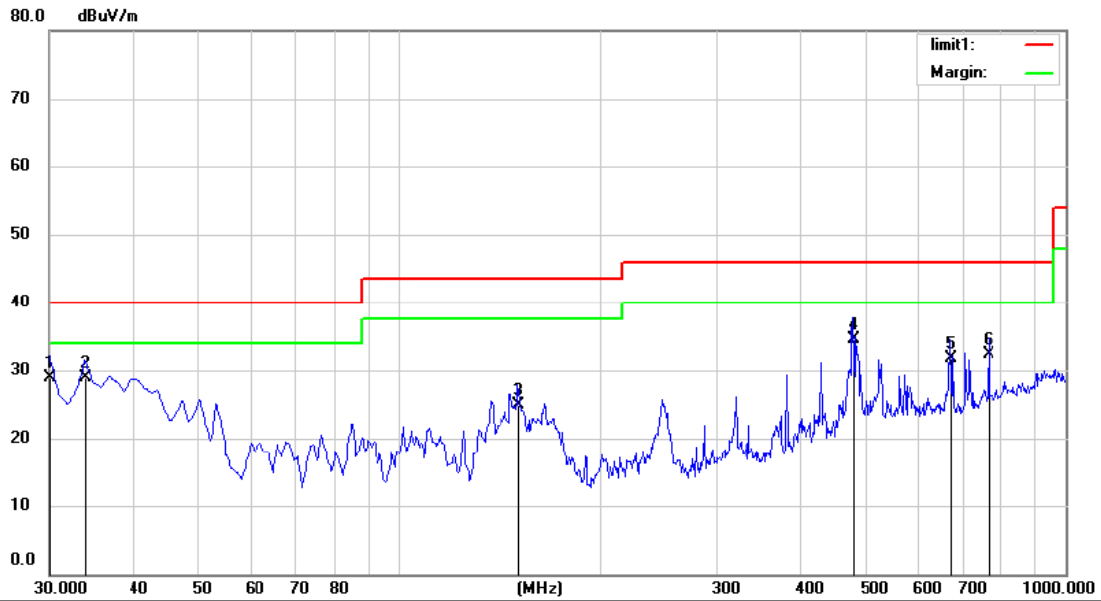
Operator: washington



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Antenna<br>Height<br>cm | Table<br>Degree<br>degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|-------------------------|---------------------------|---------|
| 1   |     | 287.0500     | 39.10                    | -14.23                  | 24.87                      | 46.00           | -21.13     | QP                      |                           |         |
| 2   |     | 383.0800     | 38.56                    | -11.29                  | 27.27                      | 46.00           | -18.73     | QP                      |                           |         |
| 3   |     | 431.5800     | 38.56                    | -10.29                  | 28.27                      | 46.00           | -17.73     | QP                      |                           |         |
| 4   |     | 479.1100     | 37.23                    | -9.42                   | 27.81                      | 46.00           | -18.19     | QP                      |                           |         |
| 5   | *   | 575.1400     | 38.60                    | -7.11                   | 31.49                      | 46.00           | -14.51     | QP                      |                           |         |
| 6   |     | 719.6700     | 32.66                    | -4.25                   | 28.41                      | 46.00           | -17.59     | QP                      |                           |         |

\*:Maximum data    x:Over limit    !:over margin

Operator: washington



Site: Chamber #1

Polarization: **Vertical**

Temperature: 26

Limit: (RE)FCC PART 15 C 3m

Power: AC 120V/60Hz

Humidity: 55 %

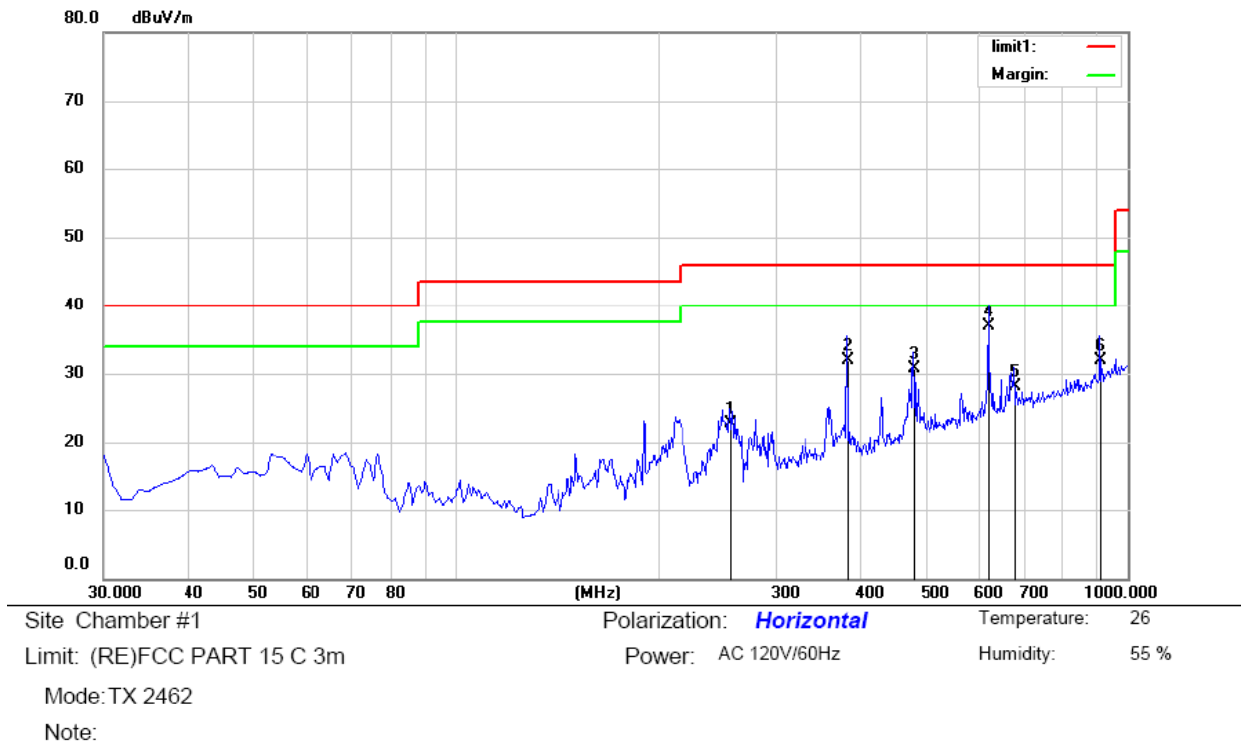
Mode: TX 2437

Note:

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Antenna<br>Height<br>cm | Table<br>Degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|-------------------------|-----------------|---------|
| 1   | *   | 30.0000      | 44.35                    | -15.36                  | 28.99                      | 40.00           | -11.01     | QP                      |                 |         |
| 2   |     | 33.8800      | 43.65                    | -14.66                  | 28.99                      | 40.00           | -11.01     | QP                      |                 |         |
| 3   |     | 151.2500     | 43.60                    | -18.65                  | 24.95                      | 43.50           | -18.55     | QP                      |                 |         |
| 4   |     | 480.0800     | 44.59                    | -10.01                  | 34.58                      | 46.00           | -11.42     | QP                      |                 |         |
| 5   |     | 671.1700     | 38.20                    | -6.56                   | 31.64                      | 46.00           | -14.36     | QP                      |                 |         |
| 6   |     | 767.2000     | 36.80                    | -4.41                   | 32.39                      | 46.00           | -13.61     | QP                      |                 |         |

\*:Maximum data    x:Over limit    !:over margin

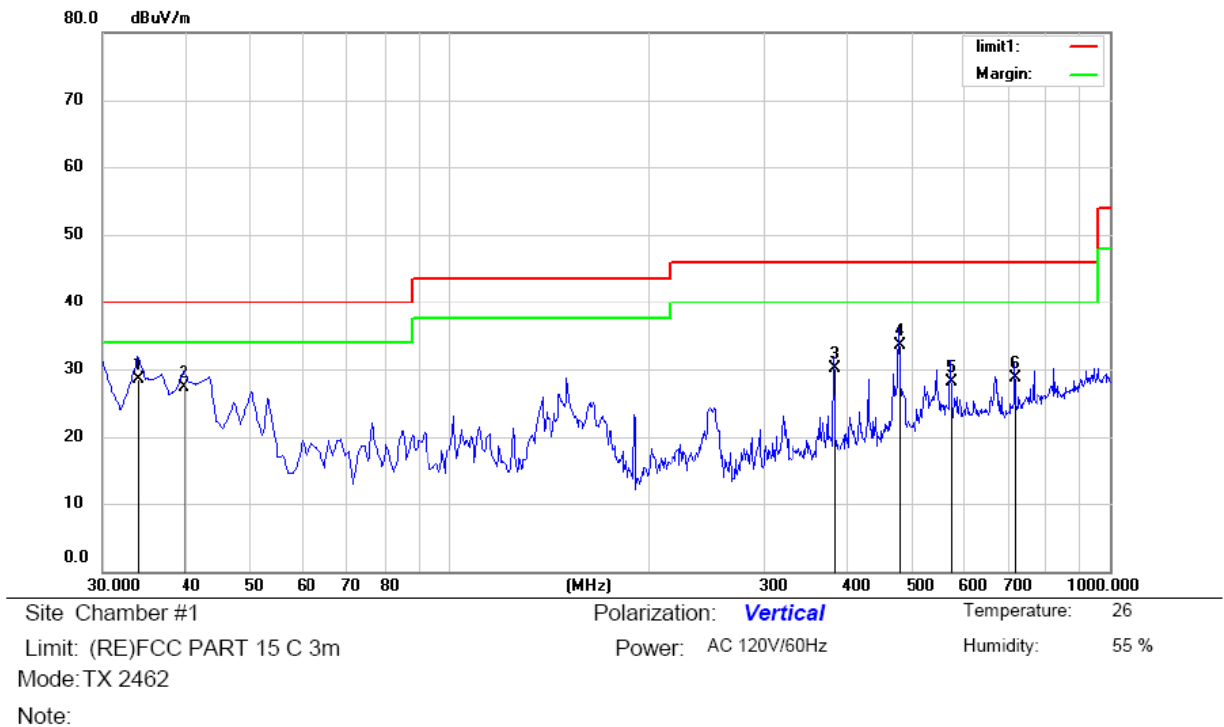
Operator: washington



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit  | Over   | Antenna Height | Table Degree |        |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------------|--------------|--------|
|     |     | MHz      | dBuV          | dB             | dBuV/m       | dBuV/m | dB     | Detector       | cm           | degree |
| 1   |     | 256.0100 | 38.10         | -15.40         | 22.70        | 46.00  | -23.30 | QP             |              |        |
| 2   |     | 383.0800 | 43.25         | -11.29         | 31.96        | 46.00  | -14.04 | QP             |              |        |
| 3   |     | 480.0800 | 40.10         | -9.41          | 30.69        | 46.00  | -15.31 | QP             |              |        |
| 4   | *   | 622.6700 | 42.60         | -5.77          | 36.83        | 46.00  | -9.17  | QP             |              |        |
| 5   |     | 678.9300 | 33.10         | -4.96          | 28.14        | 46.00  | -17.86 | QP             |              |        |
| 6   |     | 910.7600 | 32.26         | -0.31          | 31.95        | 46.00  | -14.05 | QP             |              |        |

\*:Maximum data    x:Over limit    !:over margin

Operator: washington



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 33.8800  | 43.26         | -14.66         | 28.60       | 40.00  | -11.40 | QP             |              |         |
| 2   |     | 39.7000  | 41.20         | -13.82         | 27.38       | 40.00  | -12.62 | QP             |              |         |
| 3   |     | 383.0800 | 42.10         | -12.07         | 30.03       | 46.00  | -15.97 | QP             |              |         |
| 4   |     | 479.1100 | 43.50         | -10.03         | 33.47       | 46.00  | -12.53 | QP             |              |         |
| 5   |     | 575.1400 | 35.90         | -7.76          | 28.14       | 46.00  | -17.86 | QP             |              |         |
| 6   |     | 718.7000 | 34.26         | -5.49          | 28.77       | 46.00  | -17.23 | QP             |              |         |

\*:Maximum data x:Over limit !:over margin

Operator: washington

**Above 1000MHz:**

**All the modulation modes were tested the data of the worst mode (ANT 1: TX 802.11b) are recorded in the following pages.**

Operation Mode: 802.11b Lowest Test Date : July 10, 2017  
Test Voltage: AC 120V/60Hz Test by: Andy

| Freq. | Ant. Pol. | Emission Level(dBuV/m) |       | Limit 3m(dBuV/m) |    | Over(dB) |        |
|-------|-----------|------------------------|-------|------------------|----|----------|--------|
| (MHz) | H/V       | PK                     | AV    | PK               | AV | PK       | AV     |
| 4824  | V         | 64.02                  | 44.05 | 74               | 54 | -9.98    | -9.95  |
| 7236  | V         | 63.25                  | 43.62 | 74               | 54 | -10.75   | -10.38 |
| 9648  | V         | 62.14                  | 42.14 | 74               | 54 | -11.86   | -11.86 |
| 12060 | V         | 61.26                  | 41.58 | 74               | 54 | -12.74   | -12.42 |
| 14472 | V         | 60.59                  | 40.95 | 74               | 54 | -13.41   | -13.05 |
| 16884 | V         | 59.42                  | 39.54 | 74               | 54 | -14.58   | -14.46 |
| 4824  | H         | 63.42                  | 43.51 | 74               | 54 | -10.58   | -10.49 |
| 7236  | H         | 62.51                  | 42.14 | 74               | 54 | -11.49   | -11.86 |
| 9648  | H         | 61.42                  | 41.28 | 74               | 54 | -12.58   | -12.72 |
| 12060 | H         | 60.25                  | 40.28 | 74               | 54 | -13.75   | -13.72 |
| 14472 | H         | 59.42                  | 39.41 | 74               | 54 | -14.58   | -14.59 |
| 16884 | H         | 58.41                  | 38.41 | 74               | 54 | -15.59   | -15.59 |

Operation Mode: 802.11b Middle Test Date : July 10, 2017  
Test Voltage: AC 120V/60Hz Test by: Andy

| Freq. | Ant. Pol. | Emission Level(dBuV/m) |       | Limit 3m(dBuV/m) |    | Over(dB) |        |
|-------|-----------|------------------------|-------|------------------|----|----------|--------|
| (MHz) | H/V       | PK                     | AV    | PK               | AV | PK       | AV     |
| 4874  | V         | 65.25                  | 45.04 | 74               | 54 | -8.75    | -8.96  |
| 7311  | V         | 63.25                  | 43.51 | 74               | 54 | -10.75   | -10.49 |
| 9688  | V         | 62.14                  | 42.95 | 74               | 54 | -11.86   | -11.05 |
| 12185 | V         | 61.52                  | 41.54 | 74               | 54 | -12.48   | -12.46 |
| 14622 | V         | 60.26                  | 40.36 | 74               | 54 | -13.74   | -13.64 |
| 17059 | V         | 59.62                  | 39.42 | 74               | 54 | -14.38   | -14.58 |
| 4874  | H         | 64.51                  | 44.14 | 74               | 54 | -9.49    | -9.86  |
| 7311  | H         | 63.52                  | 43.61 | 74               | 54 | -10.48   | -10.39 |
| 9688  | H         | 62.41                  | 42.84 | 74               | 54 | -11.59   | -11.16 |
| 12185 | H         | 61.41                  | 41.47 | 74               | 54 | -12.59   | -12.53 |
| 14622 | H         | 60.05                  | 40.29 | 74               | 54 | -13.95   | -13.71 |
| 17059 | H         | 59.41                  | 39.41 | 74               | 54 | -14.59   | -14.59 |

Operation Mode: 802.11b Highest

Test Date : July 10, 2017

Test Voltage: AC 120V/60Hz

Test by: Andy

| Freq.<br>(MHz) | Ant. Pol.<br>H/V | Emission Level(dBuV/m) |       | Limit 3m(dBuV/m) |    | Over(dB) |        |
|----------------|------------------|------------------------|-------|------------------|----|----------|--------|
|                |                  | PK                     | AV    | PK               | AV | PK       | AV     |
| 4924           | V                | 63.52                  | 43.51 | 74               | 54 | -10.48   | -10.49 |
| 7386           | V                | 62.41                  | 42.65 | 74               | 54 | -11.59   | -11.35 |
| 9848           | V                | 61.41                  | 41.25 | 74               | 54 | -12.59   | -12.75 |
| 12310          | V                | 60.25                  | 40.14 | 74               | 54 | -13.75   | -13.86 |
| 14772          | V                | 59.42                  | 39.41 | 74               | 54 | -14.58   | -14.59 |
| 17234          | V                | 58.41                  | 38.42 | 74               | 54 | -15.59   | -15.58 |
| 4924           | H                | 64.12                  | 44.14 | 74               | 54 | -9.88    | -9.86  |
| 7386           | H                | 63.25                  | 43.65 | 74               | 54 | -10.75   | -10.35 |
| 9848           | H                | 62.41                  | 42.14 | 74               | 54 | -11.59   | -11.86 |
| 12310          | H                | 61.65                  | 41.95 | 74               | 54 | -12.35   | -12.05 |
| 14772          | H                | 60.29                  | 40.29 | 74               | 54 | -13.71   | -13.71 |
| 17234          | H                | 59.42                  | 39.51 | 74               | 54 | -14.58   | -14.49 |

**All emissions not reported were more than 20dB below the specified limit or in the noise floor.**

- Note:**
- (1) All Readings are Peak Value and AV.
  - (2) Emission Level= Reading Level+Probe Factor +Cable Loss.
  - (3) Data of measurement within this frequency range shown “ – ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

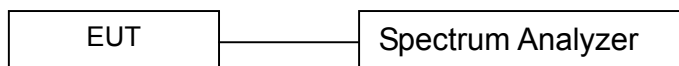
## 10. 6dB Bandwidth Test

### 10.1 Measurement Procedure

The EUT was operating in IEEE 802.11b, 802.11g, 802.11n(HT20), 802.11n(HT40) mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

1. Set resolution bandwidth (RBW) = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3 \times$  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 frequency) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 10.2 Test SET-UP (Block Diagram of Configuration)



### 10.3 Measurement Equipment Used

| EQUIPMENT TYPE    | MFR     | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
|-------------------|---------|--------------|---------------|------------|------------|
| Spectrum Analyzer | Agilent | FSV30        | 1321.3008K    | 05/16/2017 | 05/15/2018 |

### 10.4 Measurement Results

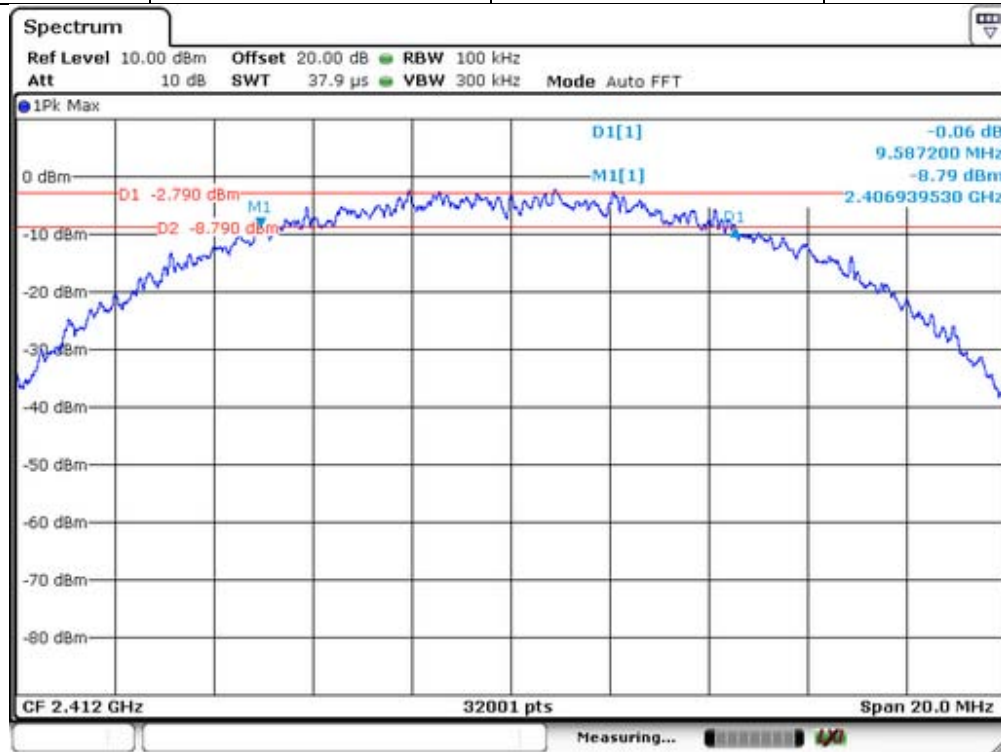
6 Bandwidth Test Data Chart:

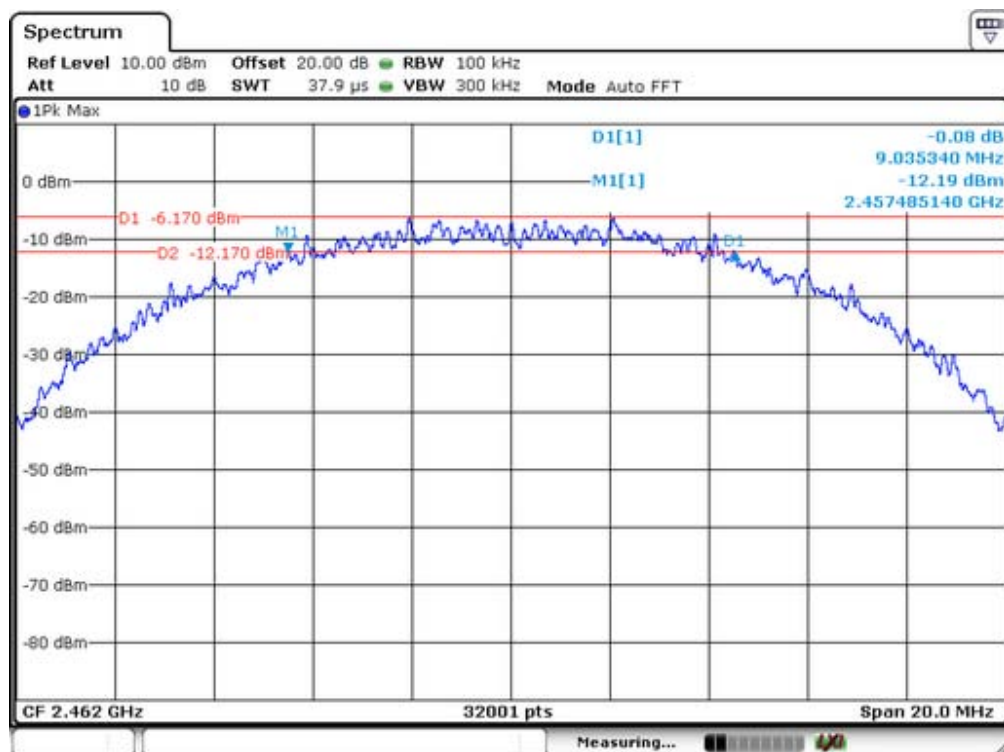
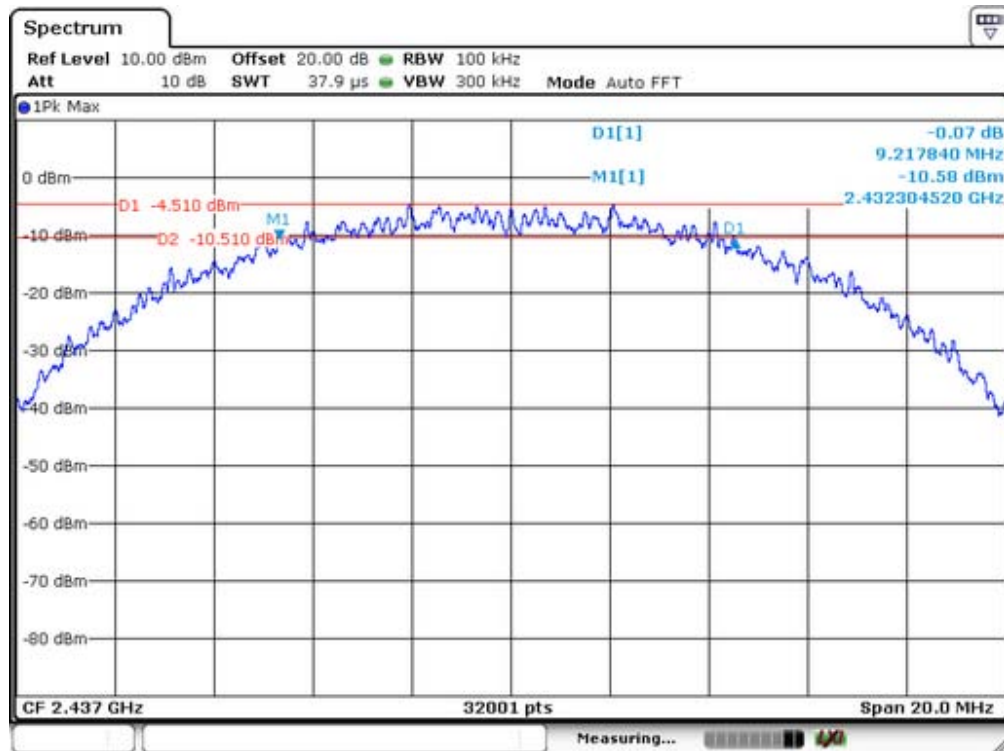
Refer to attached data chart.

Spectrum Detector: PK  
 Test By: Andy  
 Humidity : 60%

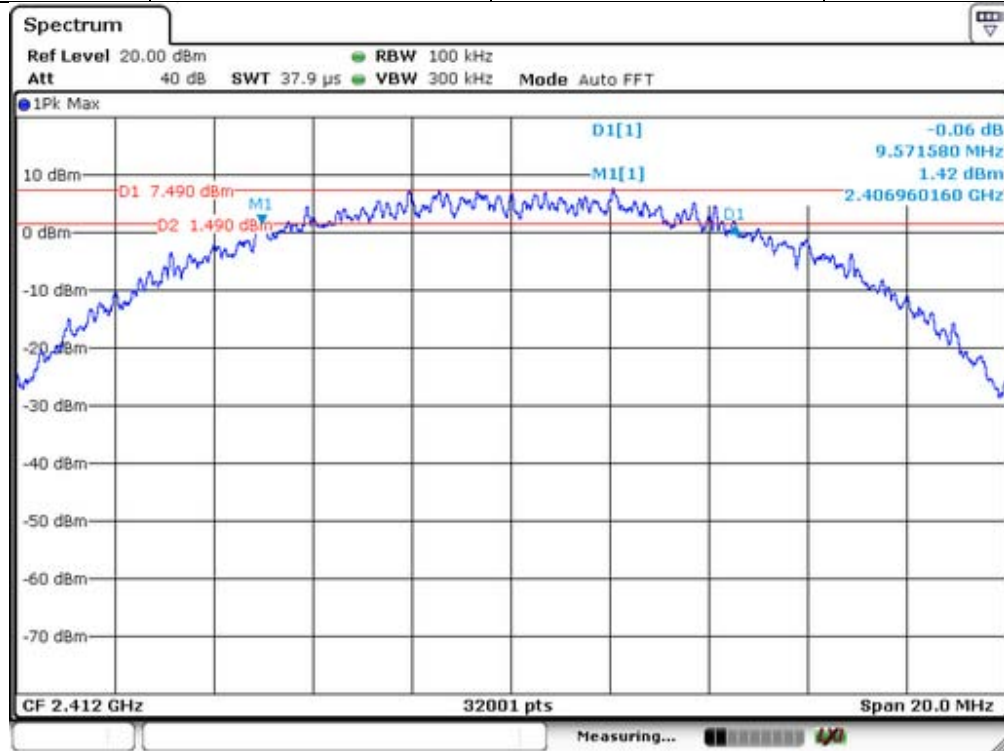
Test Date : July 10, 2017  
 Temperature : 28°C

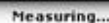
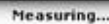
| IEEE 802.11b SISO Ant1  |                         |                      |        |
|-------------------------|-------------------------|----------------------|--------|
| Channel frequency (MHz) | Measurement level (KHz) | Required Limit (KHz) | Result |
| 2412                    | 9587                    | >500                 | Pass   |
| 2437                    | 9218                    | >500                 |        |
| 2462                    | 9035                    | >500                 |        |



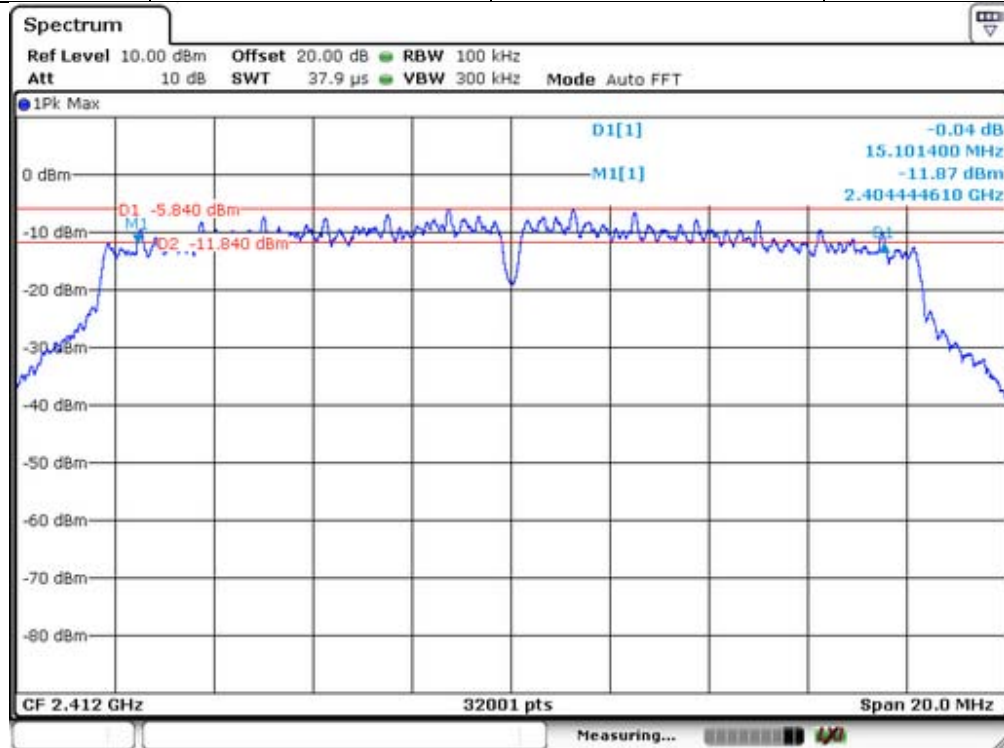


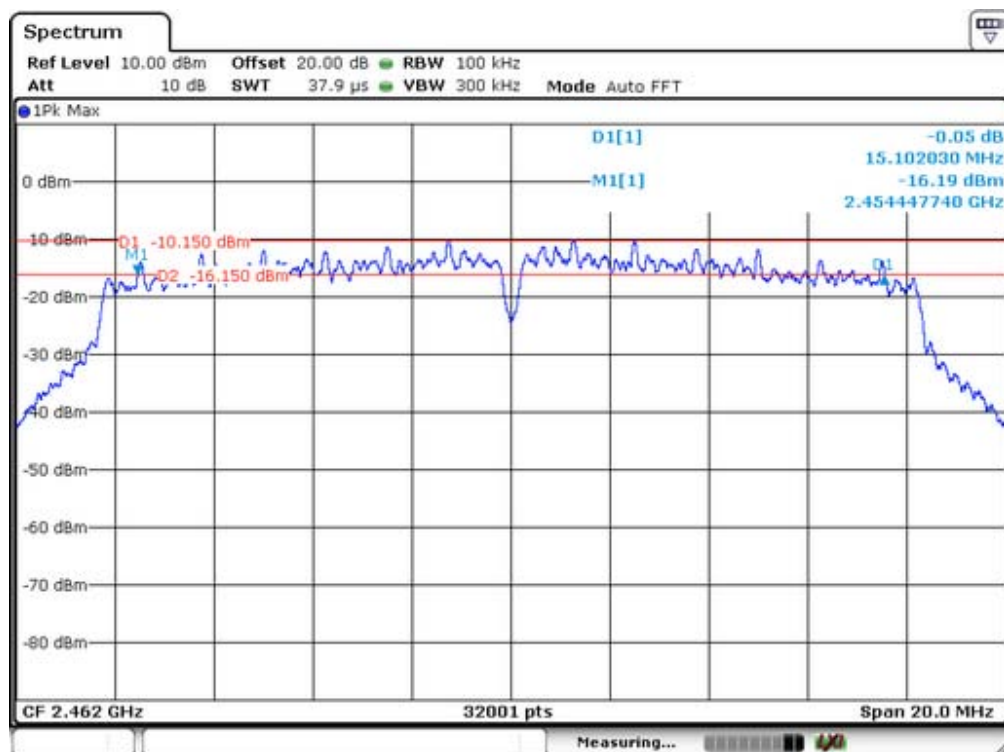
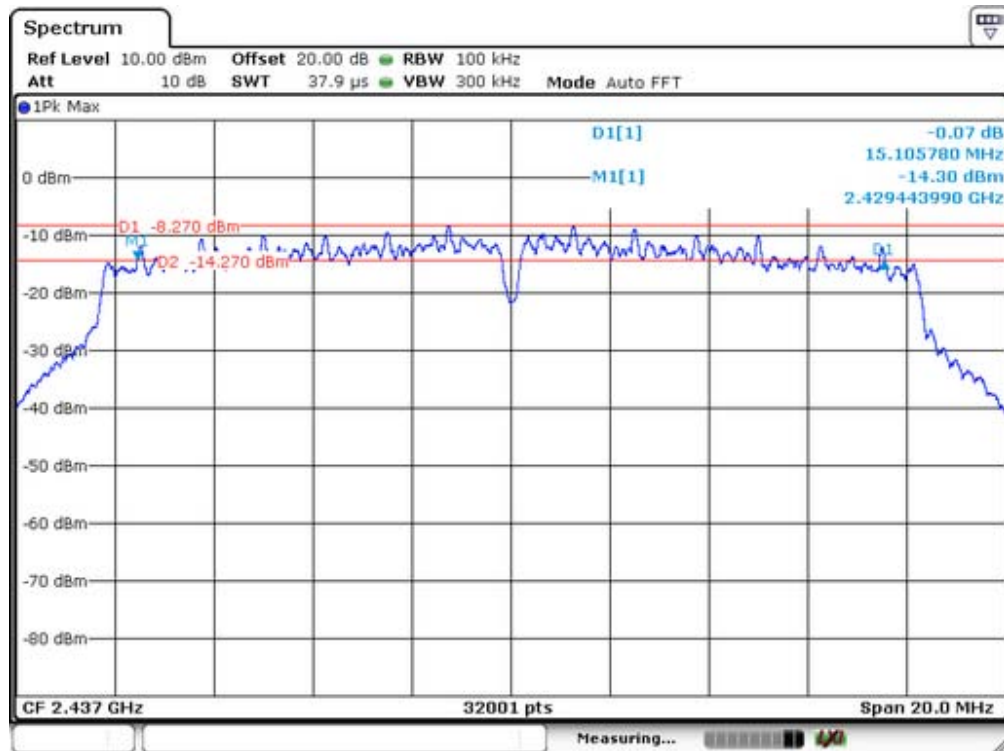
| IEEE 802.11b SISO Ant2  |                         |                      |        |
|-------------------------|-------------------------|----------------------|--------|
| Channel frequency (MHz) | Measurement level (KHz) | Required Limit (KHz) | Result |
| 2412                    | 9572                    | >500                 | Pass   |
| 2437                    | 8964                    | >500                 |        |
| 2462                    | 9049                    | >500                 |        |



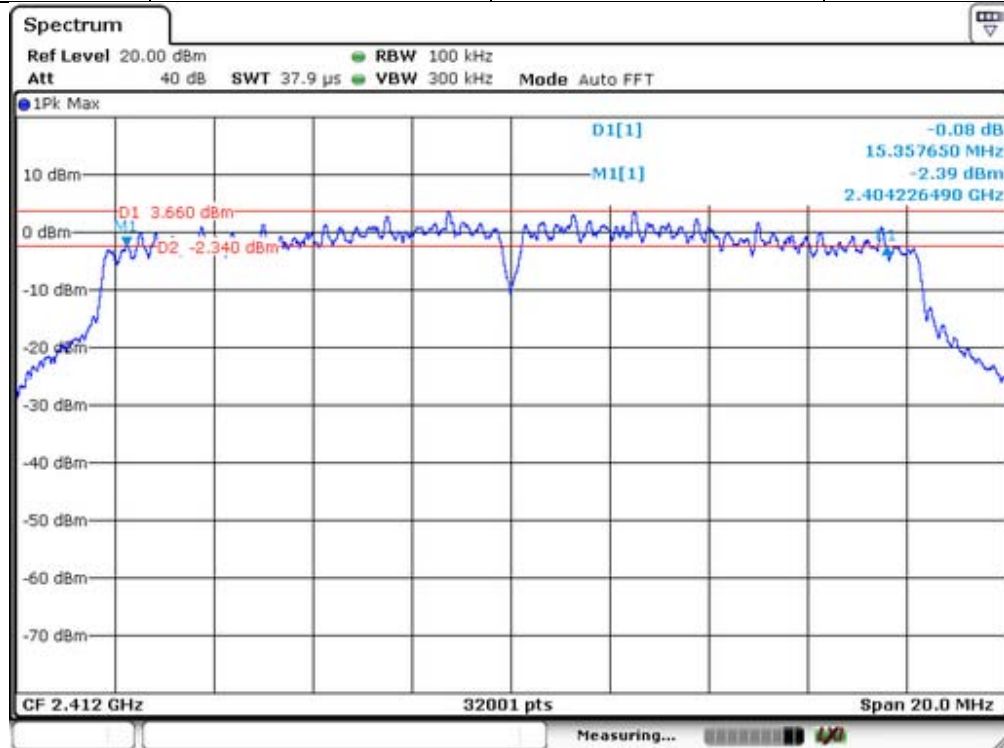


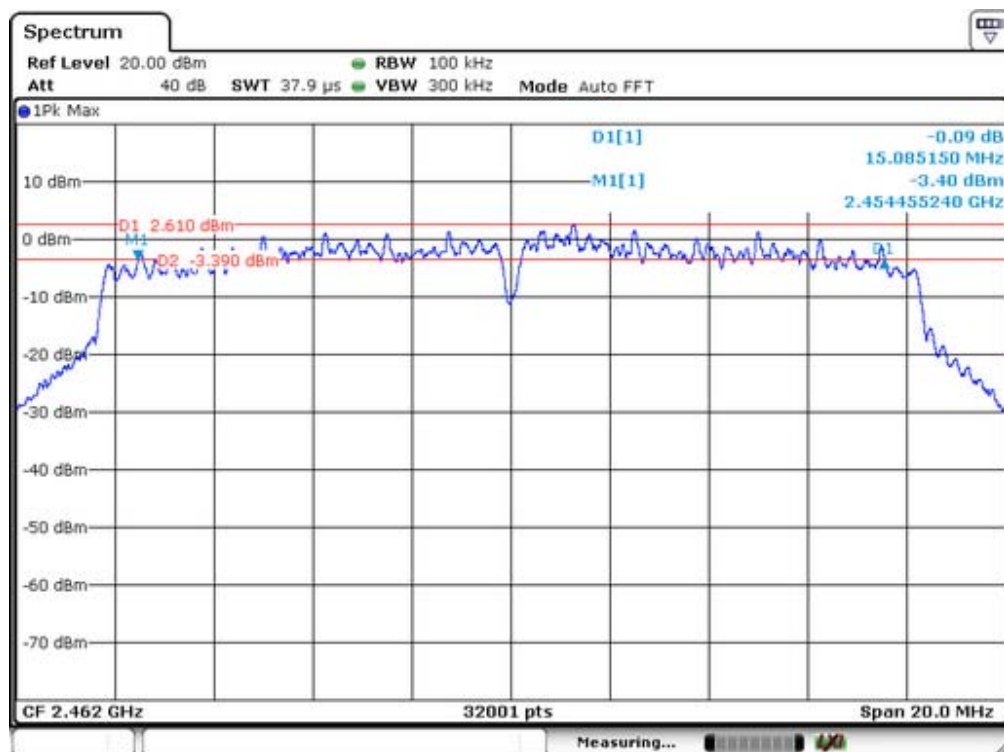
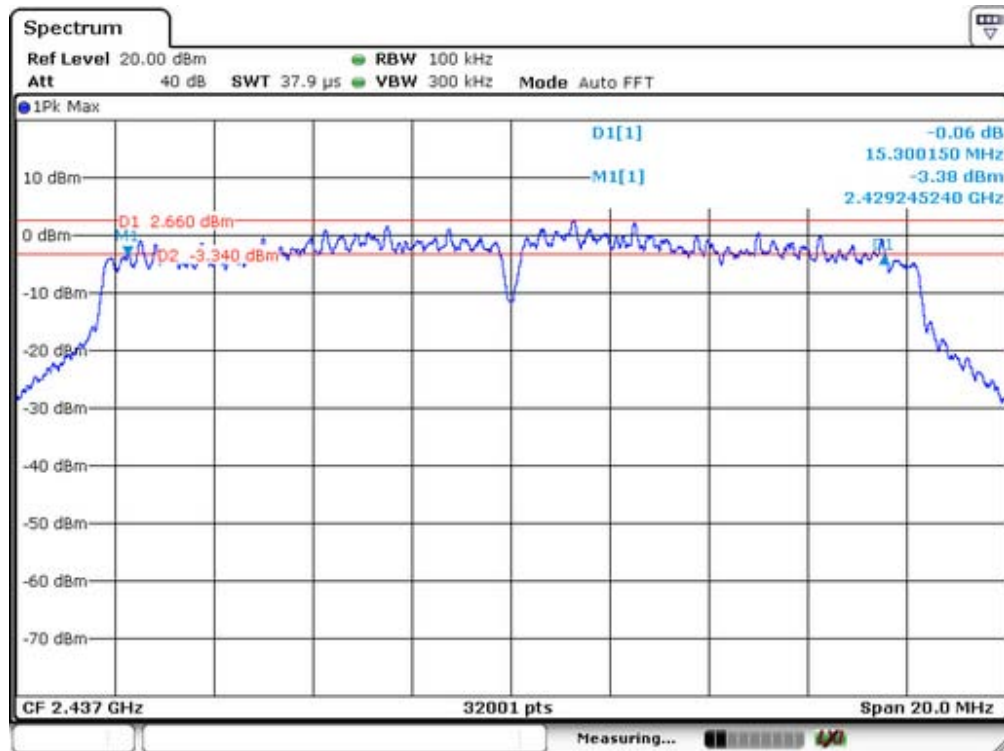
| IEEE 802.11g SISO Ant1  |                         |                      |        |
|-------------------------|-------------------------|----------------------|--------|
| Channel frequency (MHz) | Measurement level (KHz) | Required Limit (KHz) | Result |
| 2412                    | 15101                   | >500                 | Pass   |
| 2437                    | 15106                   | >500                 |        |
| 2462                    | 15102                   | >500                 |        |





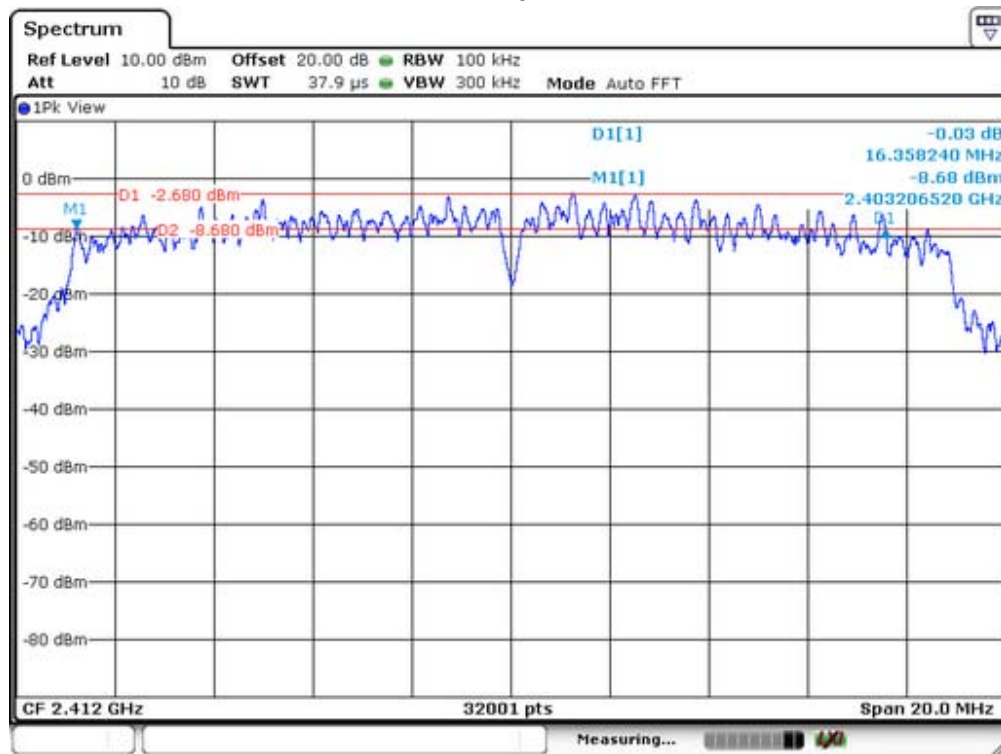
| IEEE 802.11g SISO Ant2  |                         |                      |        |
|-------------------------|-------------------------|----------------------|--------|
| Channel frequency (MHz) | Measurement level (KHz) | Required Limit (KHz) | Result |
| 2412                    | 15358                   | >500                 | Pass   |
| 2437                    | 15300                   | >500                 |        |
| 2462                    | 15085                   | >500                 |        |

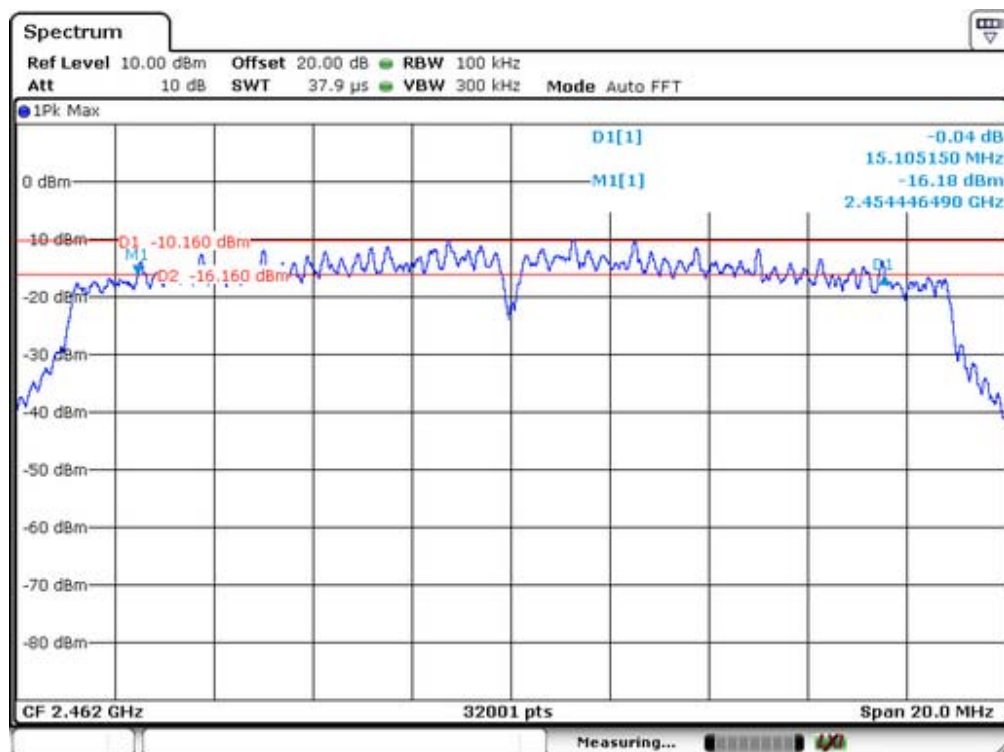
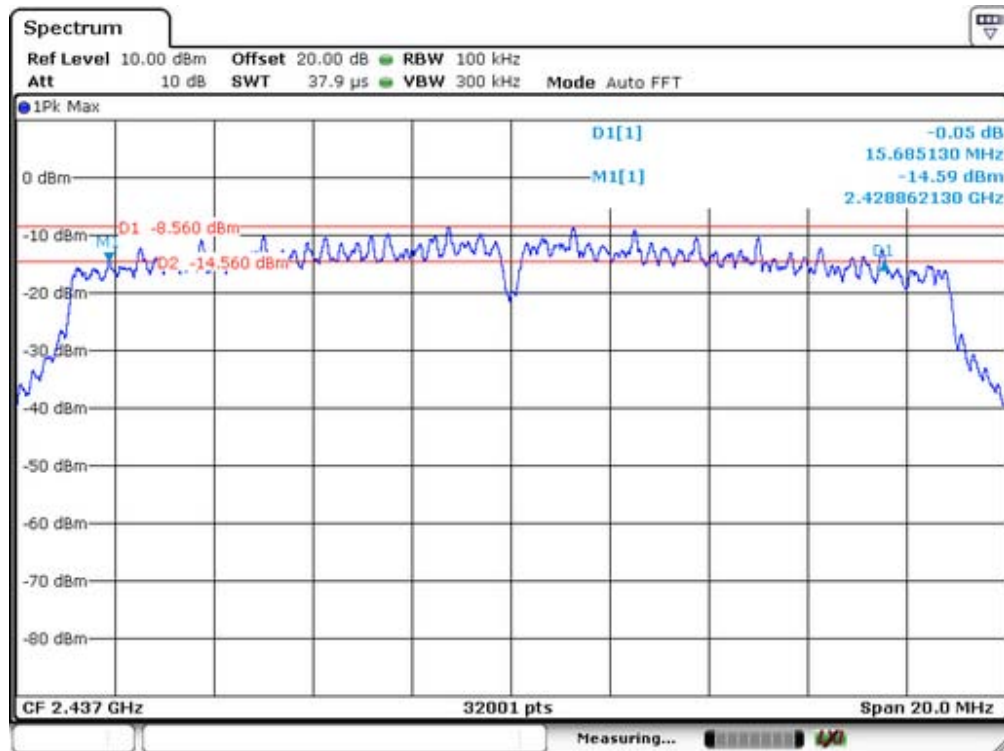




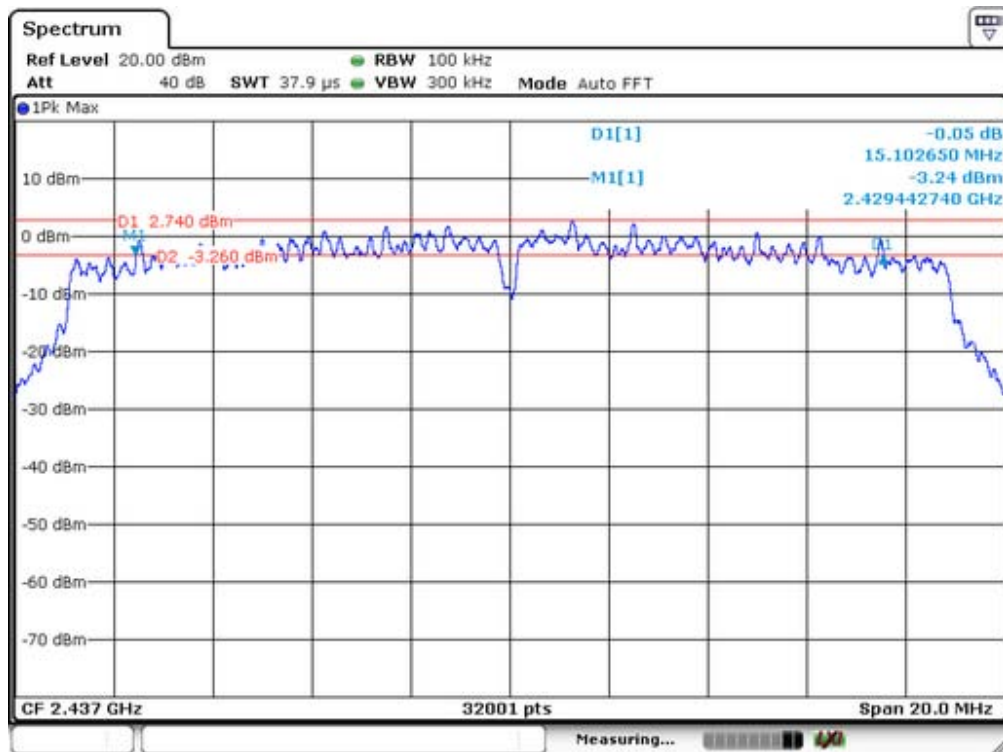
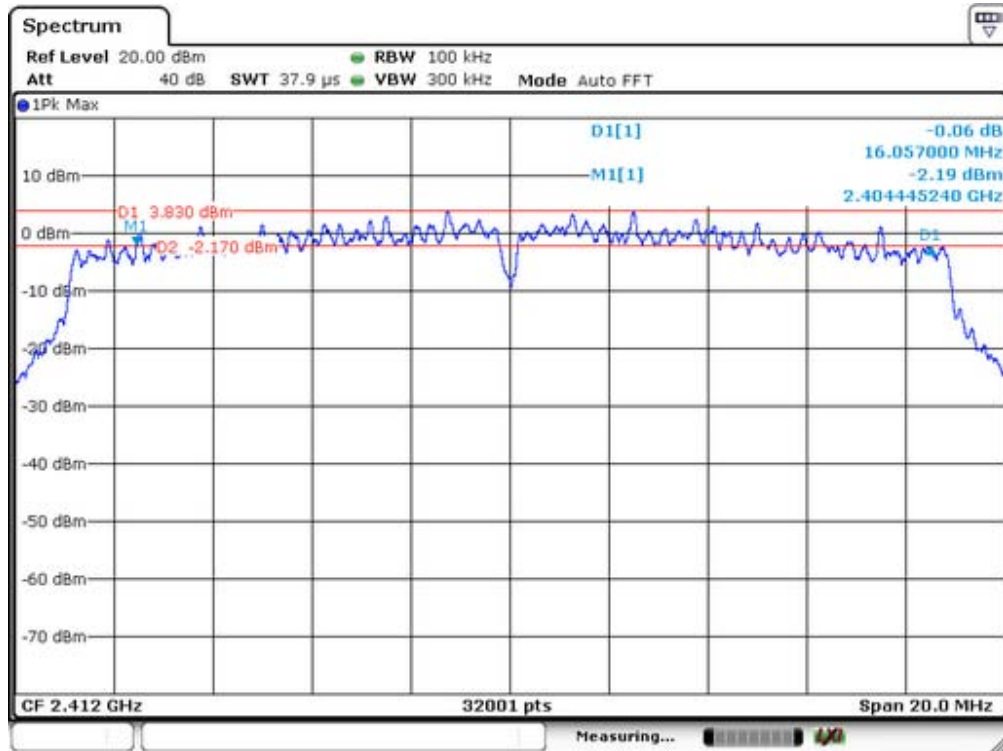
| IEEE 802.11n(HT20) MIMO |                         |       |                      |        |
|-------------------------|-------------------------|-------|----------------------|--------|
| Channel frequency (MHz) | Measurement level (KHz) |       | Required Limit (KHz) | Result |
|                         | Ant1                    | Ant2  |                      |        |
| 2412                    | 16358                   | 16057 | >500                 | Pass   |
| 2437                    | 15685                   | 15103 | >500                 |        |
| 2462                    | 15105                   | 15718 | >500                 |        |

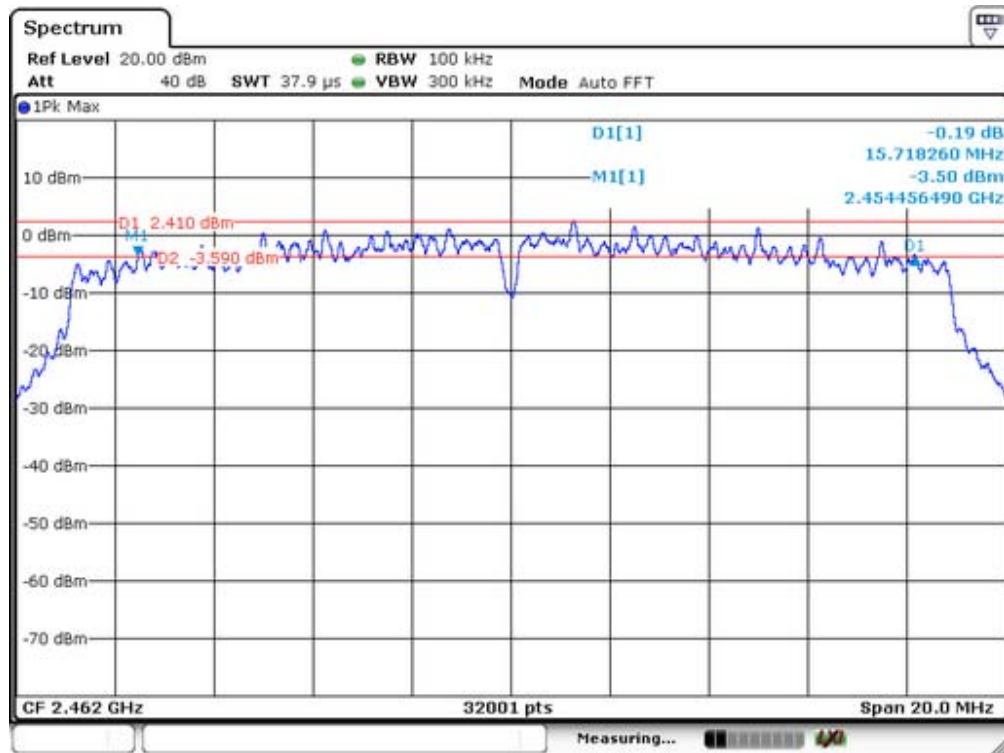
Ant1





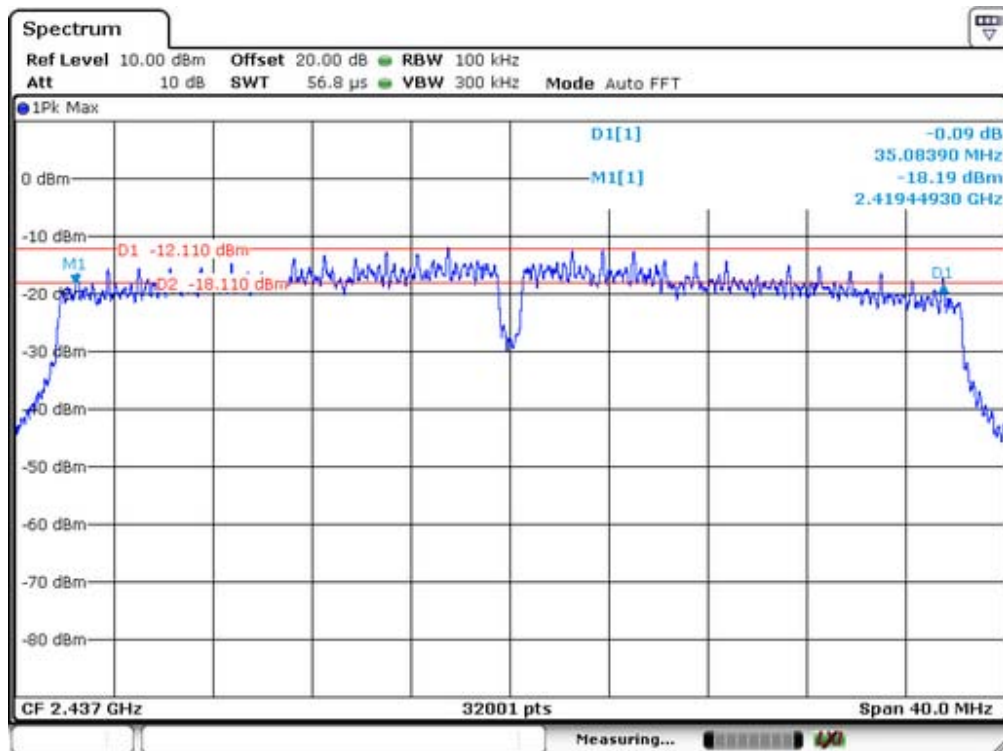
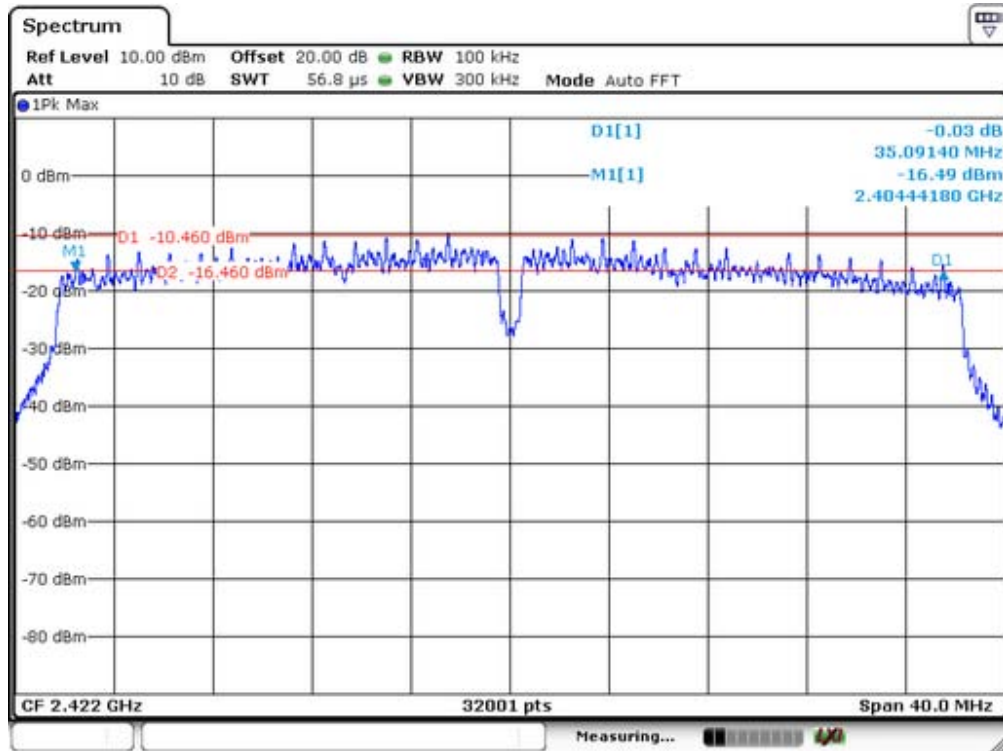
## Ant2

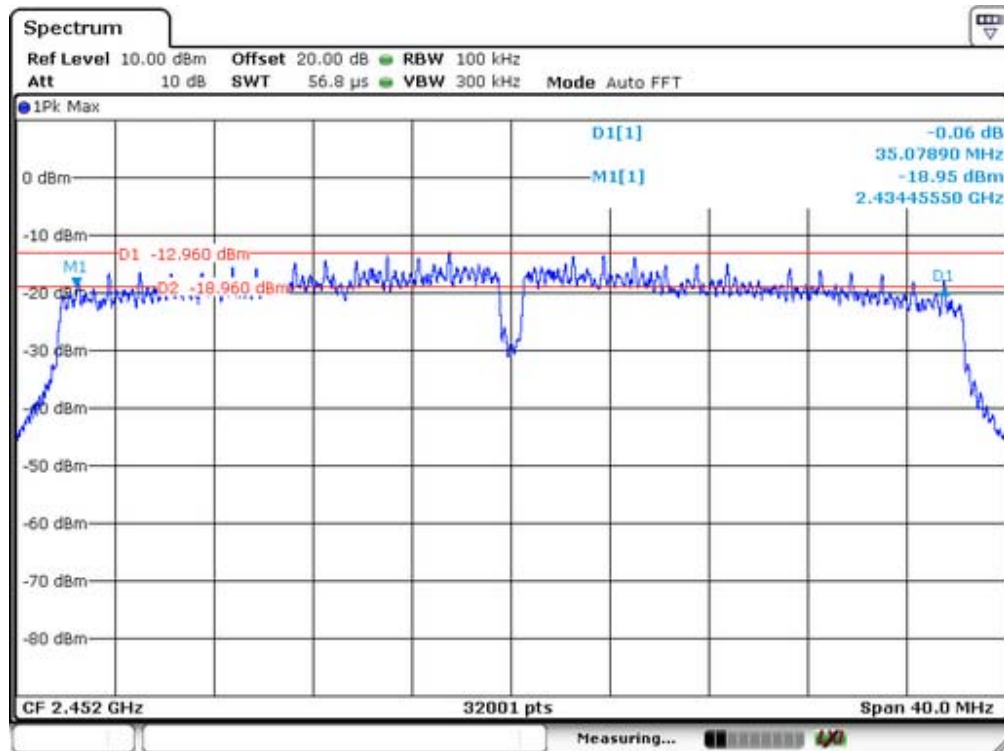




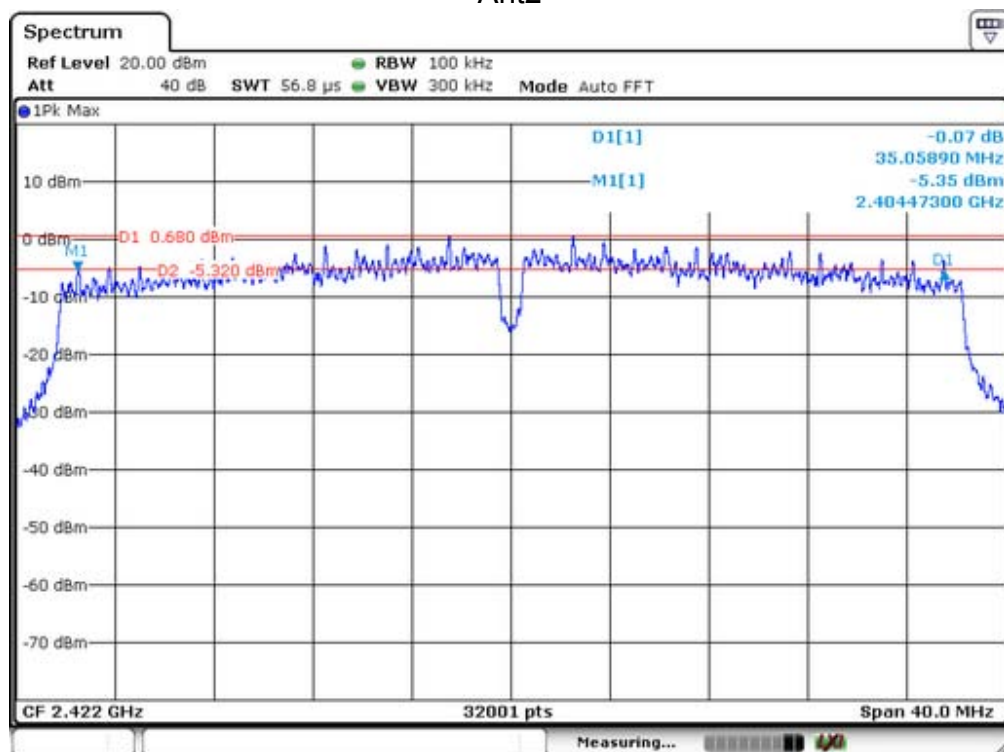
| IEEE 802.11n (HT40) MIMO |                         |       |                      |        |
|--------------------------|-------------------------|-------|----------------------|--------|
| Channel frequency (MHz)  | Measurement level (KHz) |       | Required Limit (KHz) | Result |
|                          | Ant1                    | Ant2  |                      |        |
| 2422                     | 35091                   | 35059 | >500                 | Pass   |
| 2437                     | 35084                   | 35056 | >500                 |        |
| 2452                     | 35079                   | 35074 | >500                 |        |

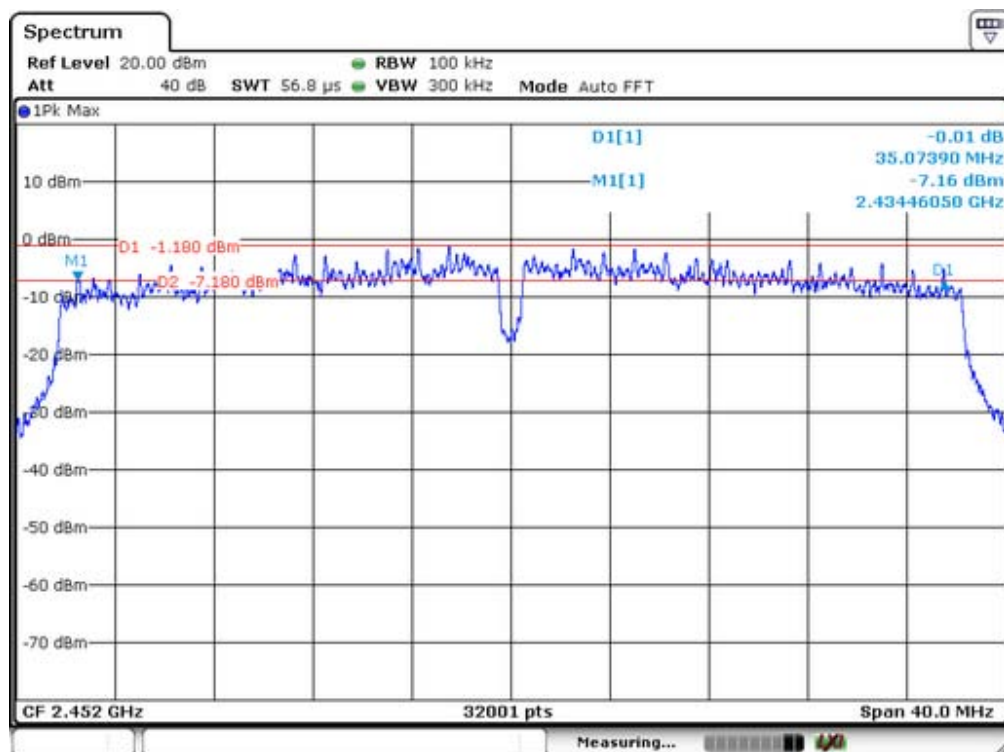
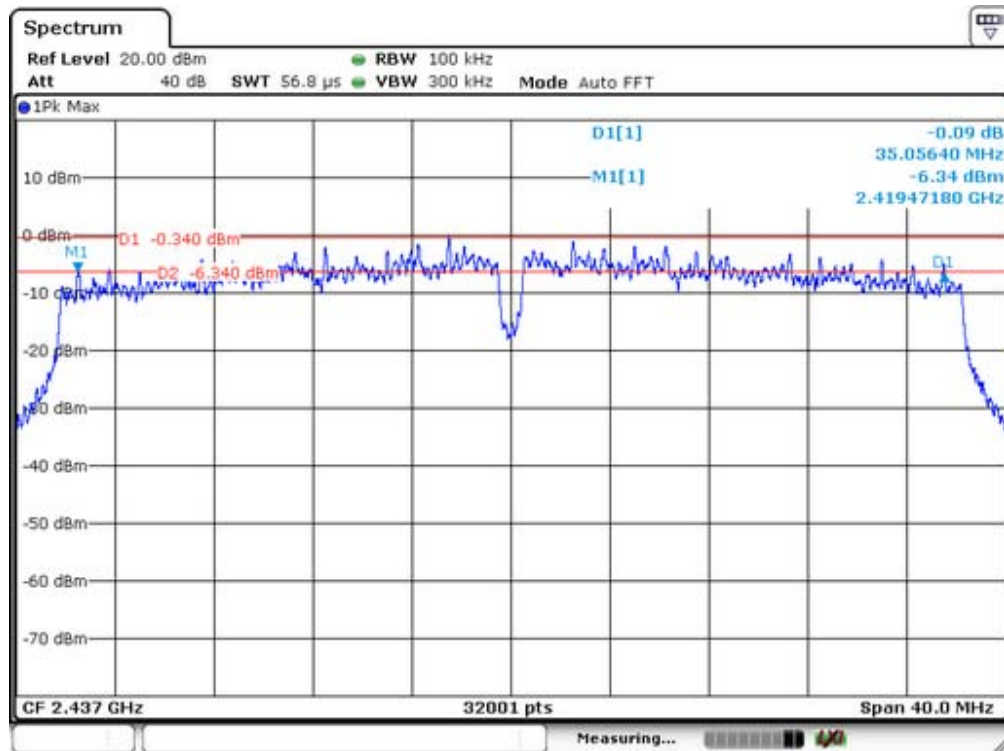
## Ant1





Ant2





## 11. Maximum Peak Output Power Test

### 11.1 Measurement Procedure

(1) According to FCC Part 15.247(b)(3)

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

The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum output power setting and enable the EUT transmit continuously.

Measure the conducted output power with cable loss and record the results in the test report.

Measure and record the results in the report.

(2) According to FCC Part 15.247(b)(4):

Conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note: If antenna Gain exceeds 6 dBi, then Output power Limit =  $30 - (\text{Gain} - 6)$

### 11.2 Test SET-UP (Block Diagram of Configuration)



### 11.3 Measurement Equipment Used

| EQUIPMENT TYPE | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
|----------------|--------------|---------------|------------|------------|
| Power meter    | ML2495A      | 0824006       | 05/16/2017 | 05/15/2018 |
| Power sensor   | MA2411B      | 0738172       | 05/16/2017 | 05/15/2018 |

### 11.4 Peak Power output limit

The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 2400 - 2483.5 MHz bands shall not exceed: 1 Watt (30dBm).

## 11.5 Measurement Results

Spectrum Detector: PK                      Test Date : July 10, 2017  
Test By: Andy                      Temperature : 28°C  
Test Result: PASS                      Humidity : 60%

| Operation Mode | Channel Number | Channel Frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Measurement Level (dBm) |       |       | Limit (dBm) | Verdict |
|----------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------|-------|-------------|---------|
|                |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Ant1                    | Ant2  | Sum   |             |         |
| 802.11b        | 1              | 2412                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 17.31                   | 17.52 | --    | 30          | PASS    |
|                | 6              | 2437                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 15.61                   | 16.52 | --    | 30          | PASS    |
|                | 11             | 2462                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 13.85                   | 16.41 | --    | 30          | PASS    |
| 802.11g        | 1              | 2412                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 14.17                   | 13.64 | --    | 30          | PASS    |
|                | 6              | 2437                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 11.83                   | 12.51 | --    | 30          | PASS    |
|                | 11             | 2462                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 11.13                   | 12.41 | --    | 30          | PASS    |
| 802.11n (HT20) | 1              | 2412                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 13.42                   | 13.92 | 16.69 | 28          | PASS    |
|                | 6              | 2437                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 11.64                   | 12.73 | 15.23 | 28          | PASS    |
|                | 11             | 2462                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 12.09                   | 12.34 | 15.23 | 28          | PASS    |
| 802.11n (HT40) | 3              | 2422                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 11.34                   | 11.21 | 14.29 | 28          | PASS    |
|                | 6              | 2437                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 10.95                   | 10.06 | 13.54 | 28          | PASS    |
|                | 9              | 2452                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 9.01                    | 9.25  | 12.14 | 28          | PASS    |
|                |                | <p>Note:</p> <ol style="list-style-type: none"> <li>1. For MIMO System of 802.11n(HT20) and 802.11n(HT40), total power is calculated by combining the output power of each antenna according to KDB662911.</li> <li>2. Antenna 1 Gain: 5dBi, Antenna 2 Gain: 5dBi. For antennas with gains of 6dBi or less, maximum allowed Transmitter output watt(+30dBm)</li> <li>3. In MIMO, Ant1+Ant2 Directional Gain=<math>G_{ANT}+10\log(N)</math>dBi=5+10log(2)=8dBi.</li> </ol> |                         |       |       |             |         |

## 12. Band Edge Test

### 12.1 Measurement Procedure

#### For Conducted Test

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas Guidance v04 .
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. Measure and record the results in the test report.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

#### For Radiated emission Test

6. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas Guidance v04 .
1. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
2. The EUT was placed on a turntable with 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.
5. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
6. Repeat above procedures until all frequency measured were complete.

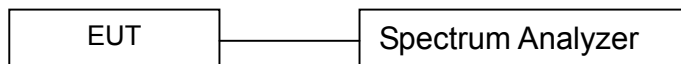
When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz.

| EMI Test Receiver | Setting  |
|-------------------|----------|
| Attenuation       | Auto     |
| RBW               | 1MHz     |
| VBW               | 3MHz     |
| Detector          | Peak     |
| Trace             | Max hold |

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz.

|                   |          |
|-------------------|----------|
| EMI Test Receiver | Setting  |
| Attenuation       | Auto     |
| RBW               | 1MHz     |
| VBW               | 10Hz     |
| Detector          | Peak     |
| Trace             | Max hold |

## 12.2 Test SET-UP (Block Diagram of Configuration)



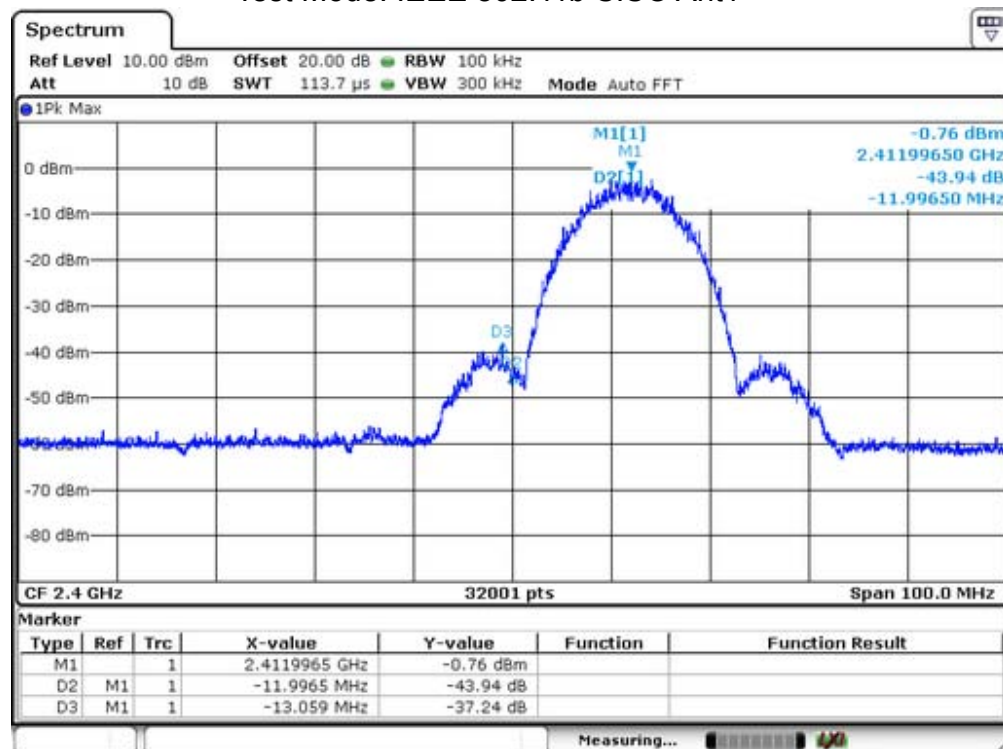
## 12.3 Measurement Equipment Used

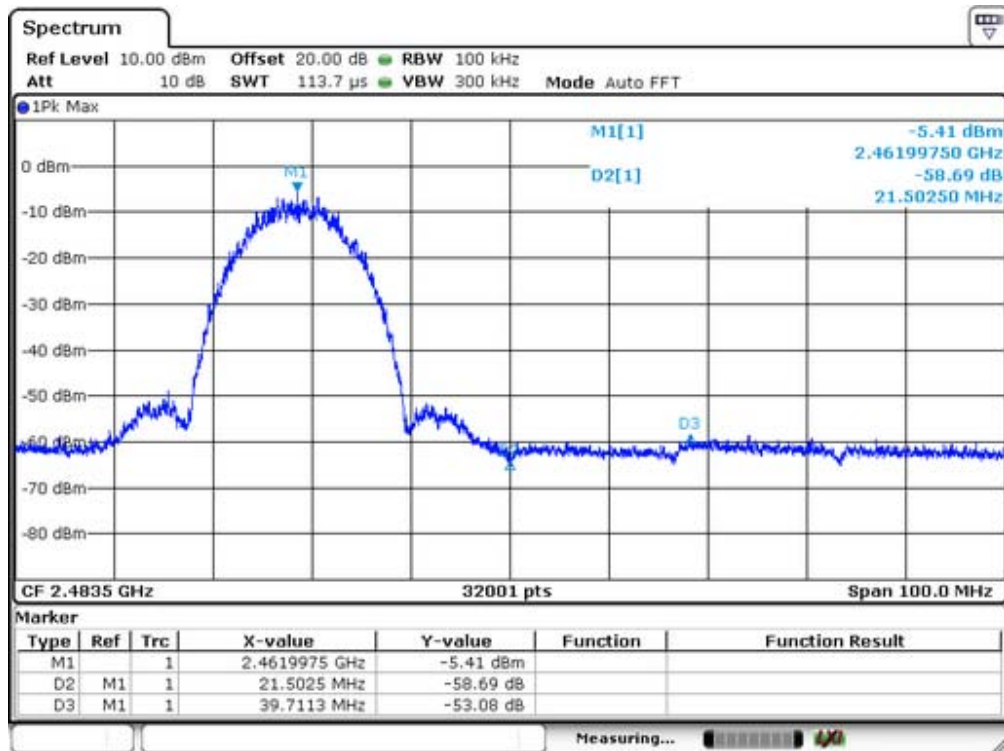
| EQUIPMENT TYPE    | MFR     | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
|-------------------|---------|--------------|---------------|------------|------------|
| Spectrum Analyzer | Agilent | FSV30        | 1321.3008K    | 05/16/2017 | 05/15/2018 |

## 12.4 Measurement Results

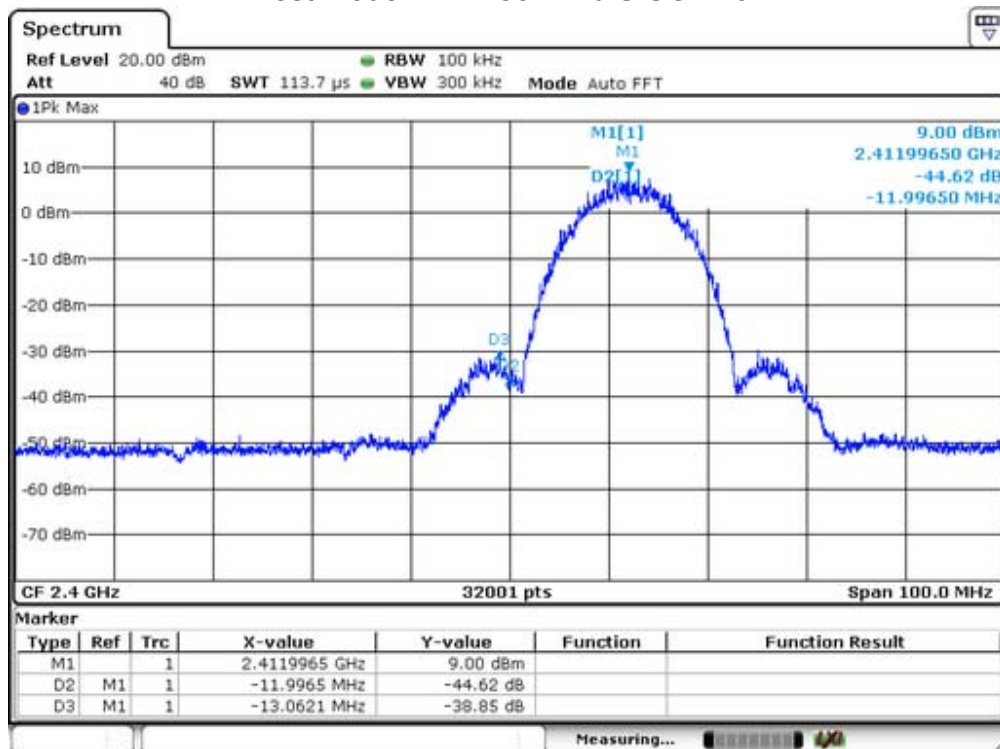
### 1. Conducted Test

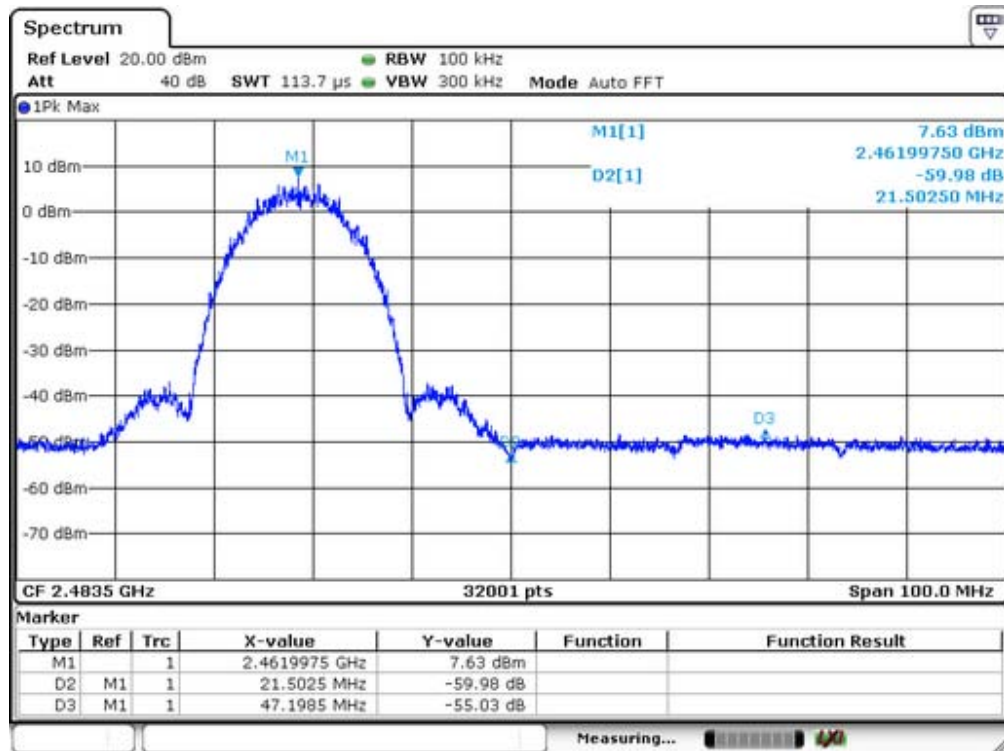
Test Mode: IEEE 802.11b SISO Ant1



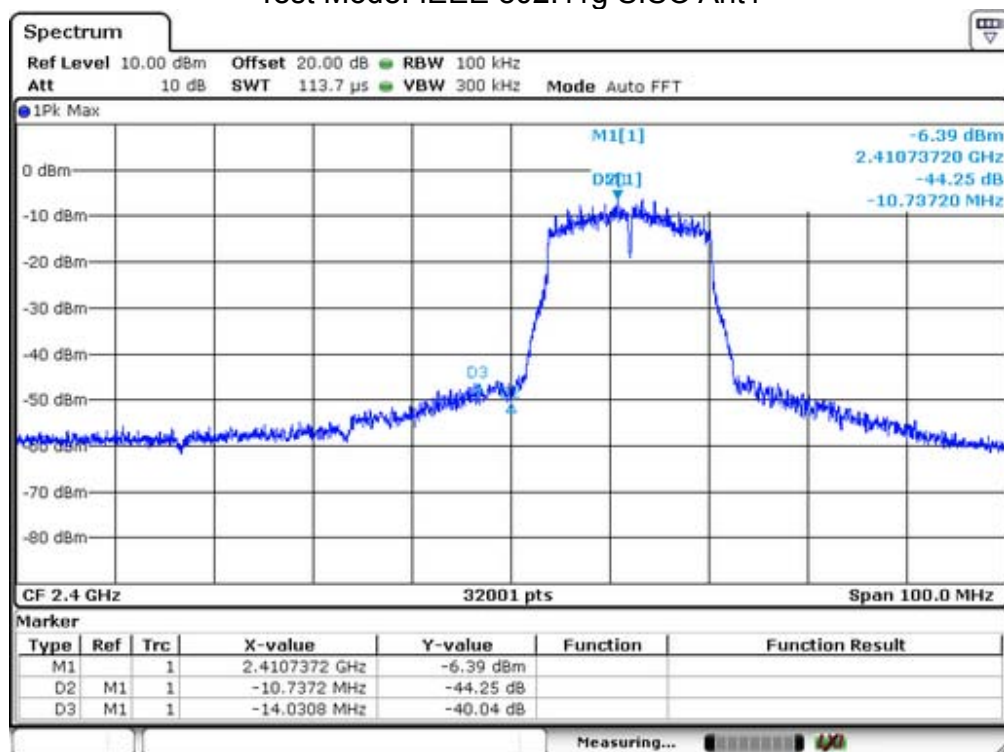


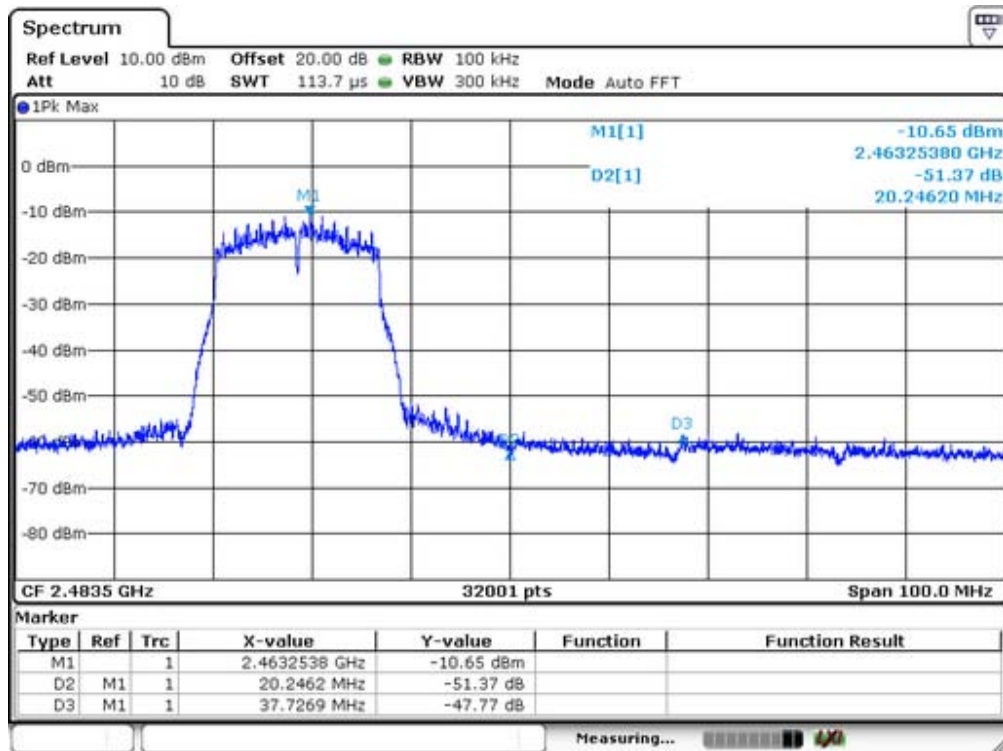
Test Mode: IEEE 802.11b SISO Ant2



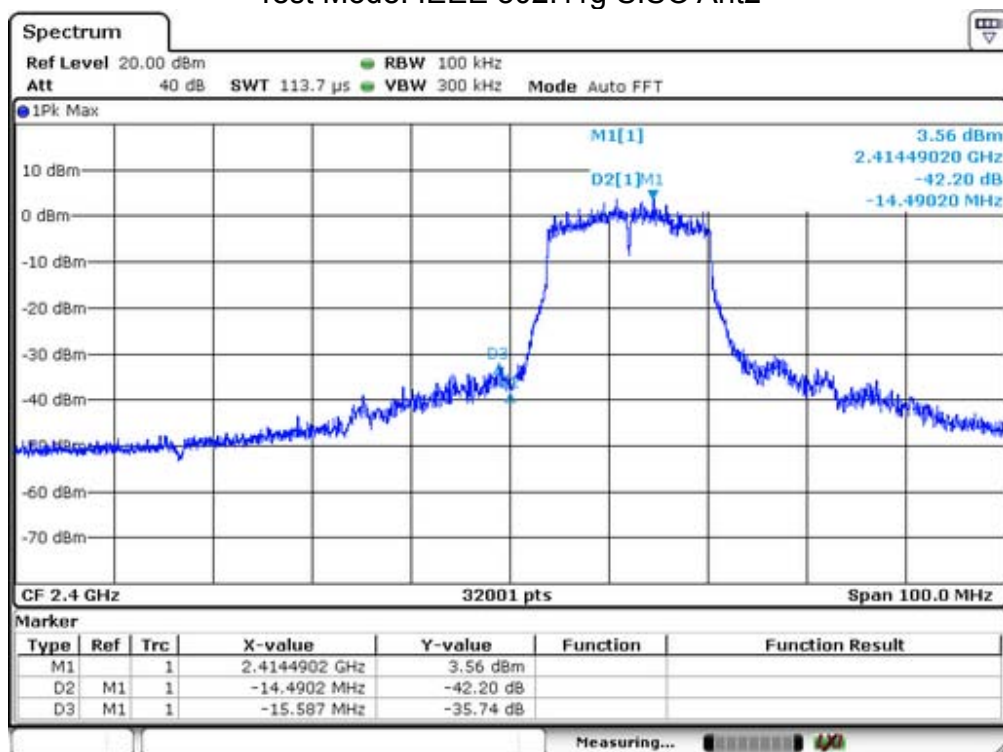


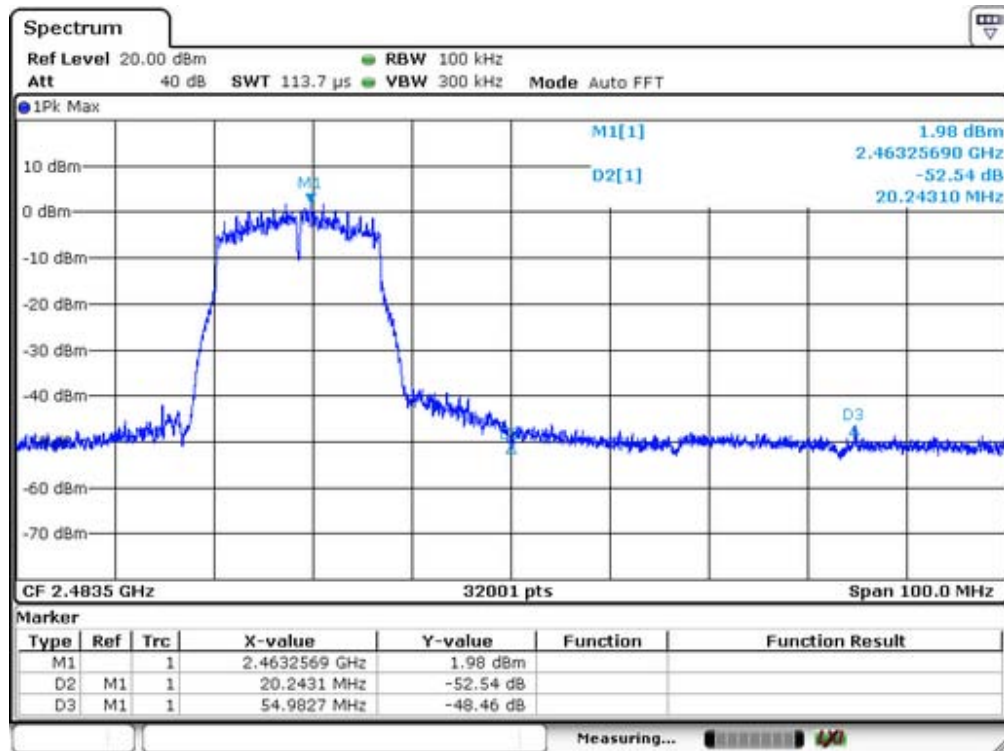
Test Mode: IEEE 802.11g SISO Ant1



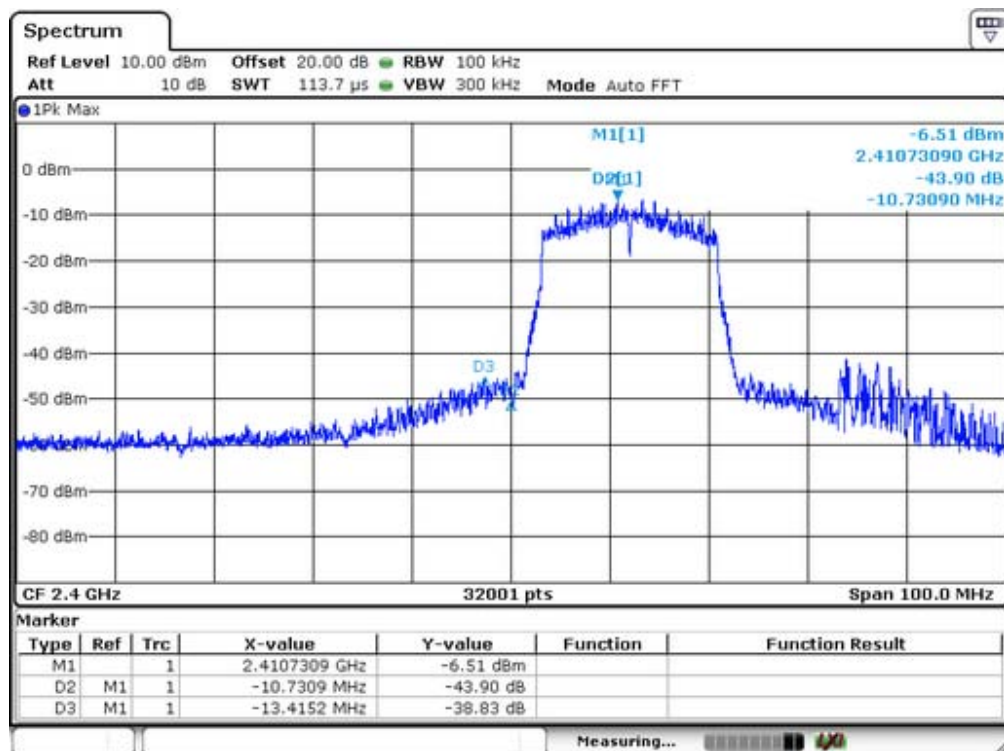


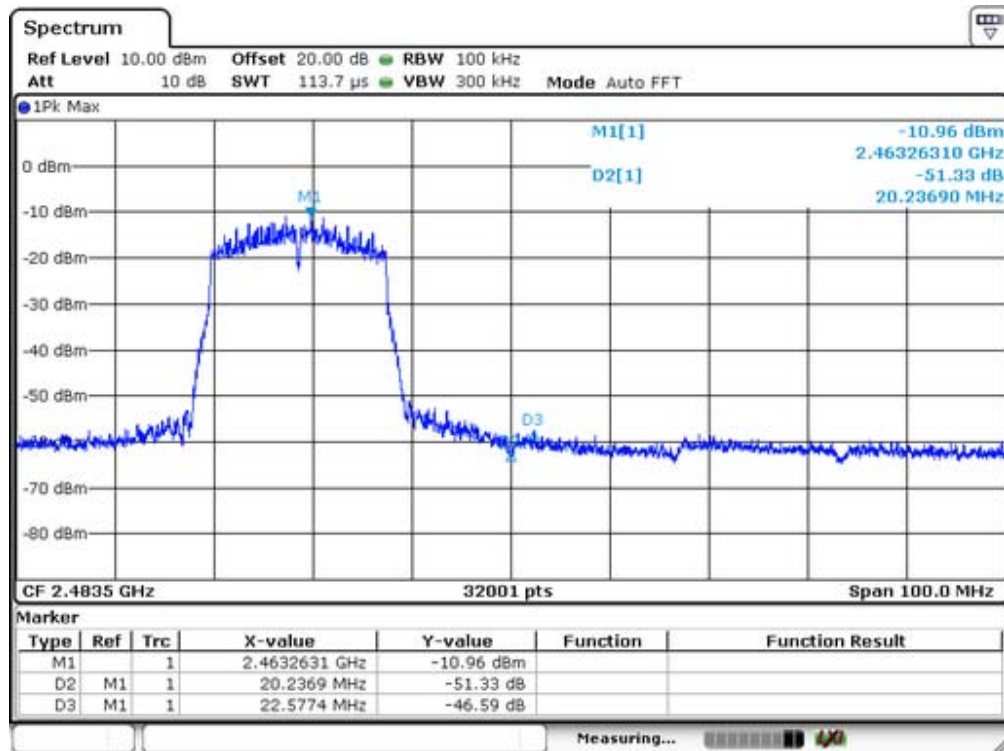
Test Mode: IEEE 802.11g SISO Ant2



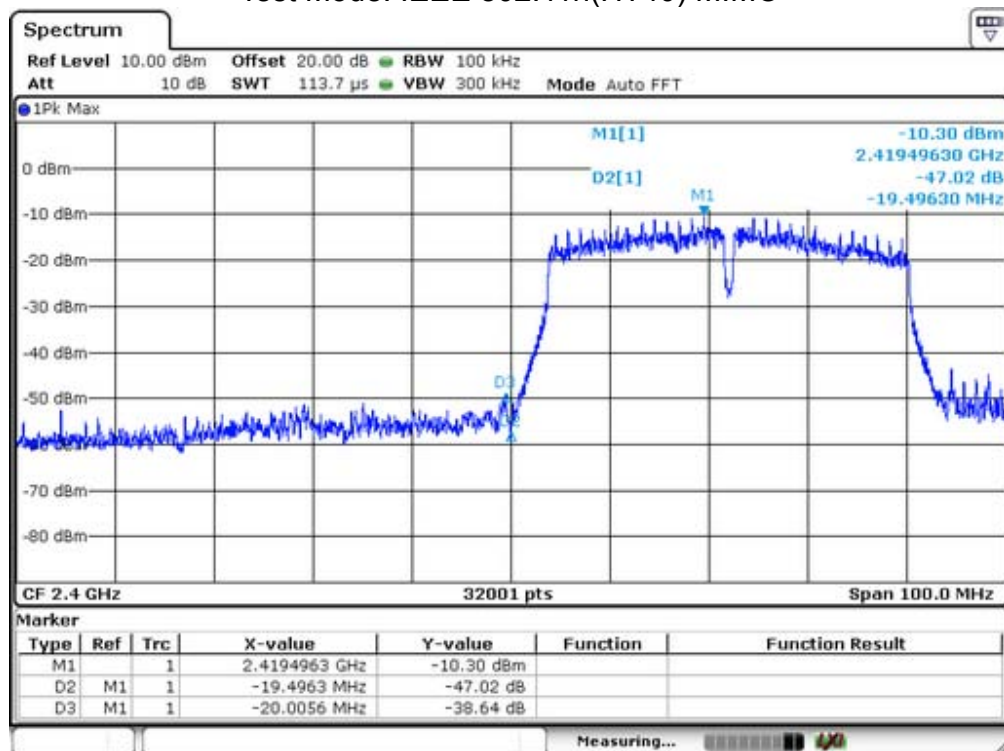


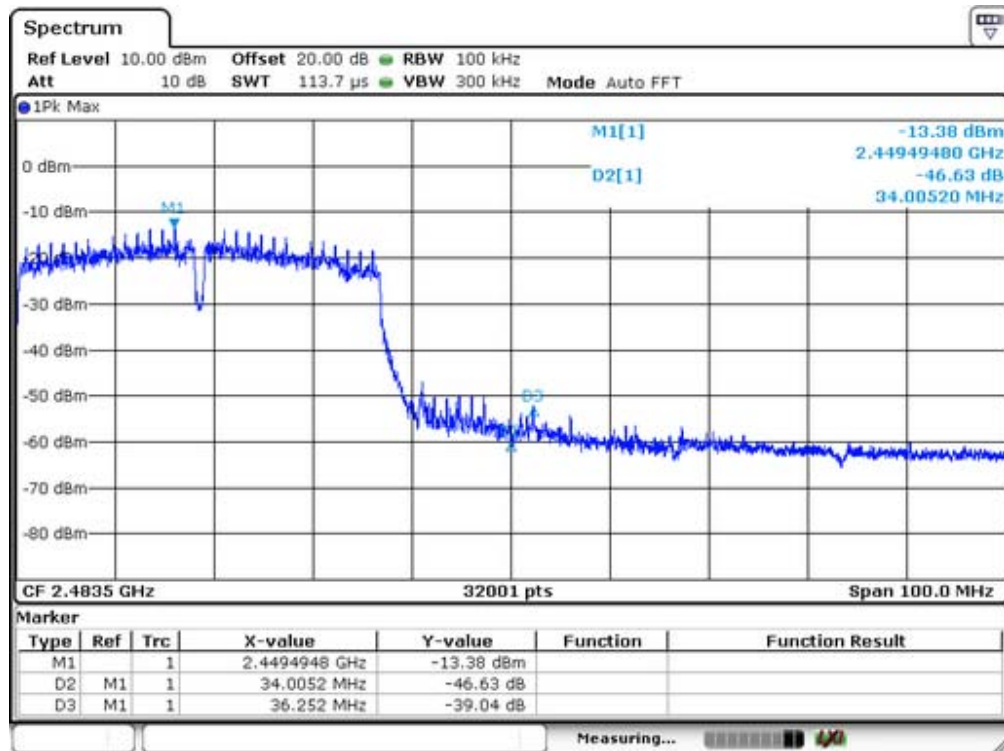
Test Mode: IEEE 802.11n(HT20) MIMO





## Test Mode: IEEE 802.11n(HT40) MIMO





## 2. Radiated emission Test

Spectrum Detector: PK/AV      Test Date : July 10, 2017  
Test By: Andy      Temperature : 28 °C  
Humidity : 65 %

| IEEE 802.11b SISO Ant1 |                      |                   |       |                          |    |             |        |
|------------------------|----------------------|-------------------|-------|--------------------------|----|-------------|--------|
| Frequency (MHz)        | Antenna polarization | Emission (dBuV/m) |       | Band edge Limit (dBuV/m) |    | Margin (dB) |        |
|                        | (H/V)                | PK                | AV    | PK                       | AV | PK          | AV     |
| <2400                  | H                    | 62.12             | 42.12 | 74                       | 54 | -11.88      | -11.88 |
| <2400                  | V                    | 60.31             | 40.01 | 74                       | 54 | -13.69      | -13.99 |
| >2483.5                | H                    | 63.48             | 43.95 | 74                       | 54 | -10.52      | -10.05 |
| >2483.5                | V                    | 59.42             | 39.41 | 74                       | 54 | -14.58      | -14.59 |

| IEEE 802.11b SISO Ant2 |                      |                   |       |                          |    |             |        |
|------------------------|----------------------|-------------------|-------|--------------------------|----|-------------|--------|
| Frequency (MHz)        | Antenna polarization | Emission (dBuV/m) |       | Band edge Limit (dBuV/m) |    | Margin (dB) |        |
|                        | (H/V)                | PK                | AV    | PK                       | AV | PK          | AV     |
| <2400                  | H                    | 64.74             | 44.16 | 74                       | 54 | -9.26       | -9.84  |
| <2400                  | V                    | 59.42             | 39.12 | 74                       | 54 | -14.58      | -14.88 |
| >2483.5                | H                    | 63.42             | 43.75 | 74                       | 54 | -10.58      | -10.25 |
| >2483.5                | V                    | 59.68             | 39.42 | 74                       | 54 | -14.32      | -14.58 |

| IEEE 802.11g SISO Ant1 |                      |                   |       |                          |    |             |        |
|------------------------|----------------------|-------------------|-------|--------------------------|----|-------------|--------|
| Frequency (MHz)        | Antenna polarization | Emission (dBuV/m) |       | Band edge Limit (dBuV/m) |    | Margin (dB) |        |
|                        | (H/V)                | PK                | AV    | PK                       | AV | PK          | AV     |
| <2400                  | H                    | 63.15             | 43.16 | 74                       | 54 | -10.85      | -10.84 |
| <2400                  | V                    | 59.42             | 39.12 | 74                       | 54 | -14.58      | -14.88 |
| >2483.5                | H                    | 64.12             | 44.18 | 74                       | 54 | -9.88       | -9.82  |
| >2483.5                | V                    | 60.28             | 40.39 | 74                       | 54 | -13.72      | -13.61 |

| IEEE 802.11g SISO Ant2 |                      |                   |       |                          |    |             |        |
|------------------------|----------------------|-------------------|-------|--------------------------|----|-------------|--------|
| Frequency (MHz)        | Antenna polarization | Emission (dBuV/m) |       | Band edge Limit (dBuV/m) |    | Margin (dB) |        |
|                        | (H/V)                | PK                | AV    | PK                       | AV | PK          | AV     |
| <2400                  | H                    | 64.29             | 44.71 | 74                       | 54 | -9.71       | -9.29  |
| <2400                  | V                    | 60.28             | 40.94 | 74                       | 54 | -13.72      | -13.06 |
| >2483.5                | H                    | 63.12             | 43.74 | 74                       | 54 | -10.88      | -10.26 |
| >2483.5                | V                    | 59.46             | 39.46 | 74                       | 54 | -14.54      | -14.54 |

| IEEE 802.11n(HT20) MIMO |                         |                      |       |                             |    |                |        |
|-------------------------|-------------------------|----------------------|-------|-----------------------------|----|----------------|--------|
| Frequency<br>(MHz)      | Antenna<br>polarization | Emission<br>(dBuV/m) |       | Band edge Limit<br>(dBuV/m) |    | Margin<br>(dB) |        |
|                         | (H/V)                   | PK                   | AV    | PK                          | AV | PK             | AV     |
| <2400                   | H                       | 63.11                | 43.12 | 74                          | 54 | -10.89         | -10.88 |
| <2400                   | V                       | 60.28                | 40.28 | 74                          | 54 | -13.72         | -13.72 |
| >2483.5                 | H                       | 64.82                | 44.18 | 74                          | 54 | -9.18          | -9.82  |
| >2483.5                 | V                       | 59.46                | 39.75 | 74                          | 54 | -14.54         | -14.25 |

| IEEE 802.11n(HT40) MIMO |                         |                      |       |                             |    |                |        |
|-------------------------|-------------------------|----------------------|-------|-----------------------------|----|----------------|--------|
| Frequency<br>(MHz)      | Antenna<br>polarization | Emission<br>(dBuV/m) |       | Band edge Limit<br>(dBuV/m) |    | Margin<br>(dB) |        |
|                         | (H/V)                   | PK                   | AV    | PK                          | AV | PK             | AV     |
| <2400                   | H                       | 63.25                | 43.92 | 74                          | 54 | -10.75         | -10.08 |
| <2400                   | V                       | 60.11                | 40.25 | 74                          | 54 | -13.89         | -13.75 |
| >2483.5                 | H                       | 63.84                | 43.65 | 74                          | 54 | -10.16         | -10.35 |
| >2483.5                 | V                       | 59.46                | 39.47 | 74                          | 54 | -14.54         | -14.53 |

## 13. Maximum Power Spectral Density

### 13.1 Test Equipment

| EQUIPMENT TYPE    | MFR     | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
|-------------------|---------|--------------|---------------|------------|------------|
| Spectrum Analyzer | Agilent | FSV30        | 1321.3008K    | 05/16/2017 | 05/15/2018 |

### 13.2 Measuring Instruments and Setting

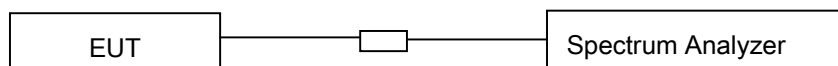
The following table is the setting of spectrum analyzer.

| Spectrum analyzer | Setting                                      |
|-------------------|----------------------------------------------|
| Attenuation       | Auto                                         |
| Span Frequency    | Set the span to 1.5 times the DTS bandwidth. |
| RBW               | 3KHz                                         |
| VBW               | 10KHz                                        |
| Detector          | Peak                                         |
| Trace             | Max hold                                     |
| Sweep Time        | Automatic                                    |

### 13.3 Test Procedures

- The transmitter output (antenna port) was connected to the spectrum analyzer.
- Set analyzer center frequency to DTS channel center frequency.
- Set the analyzer span to a minimum of 1.5 times the DTS bandwidth.
- Set the RBW=3KHz. Set the VBW=10KHz
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

### 13.4 Block Diagram of Test Setup



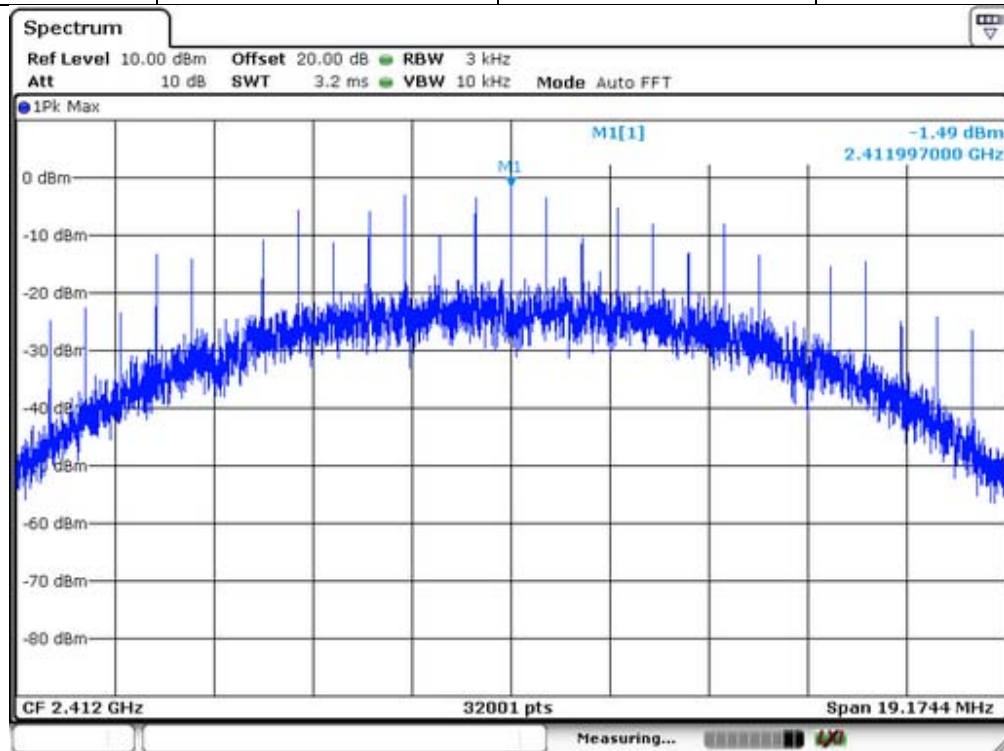
### 13.5 Limit

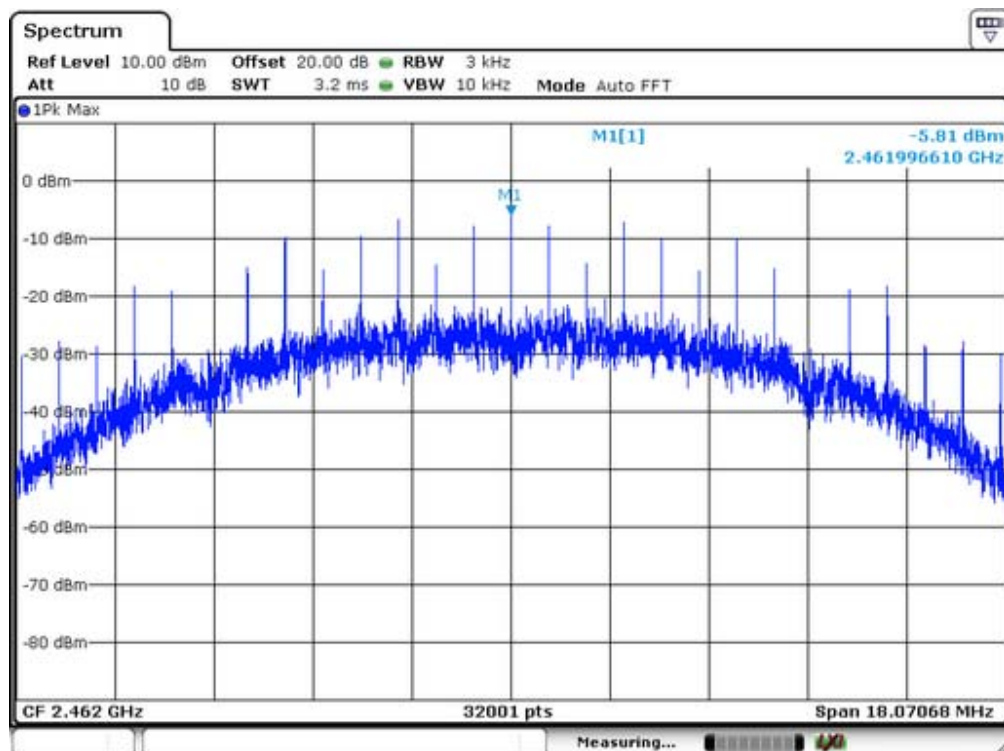
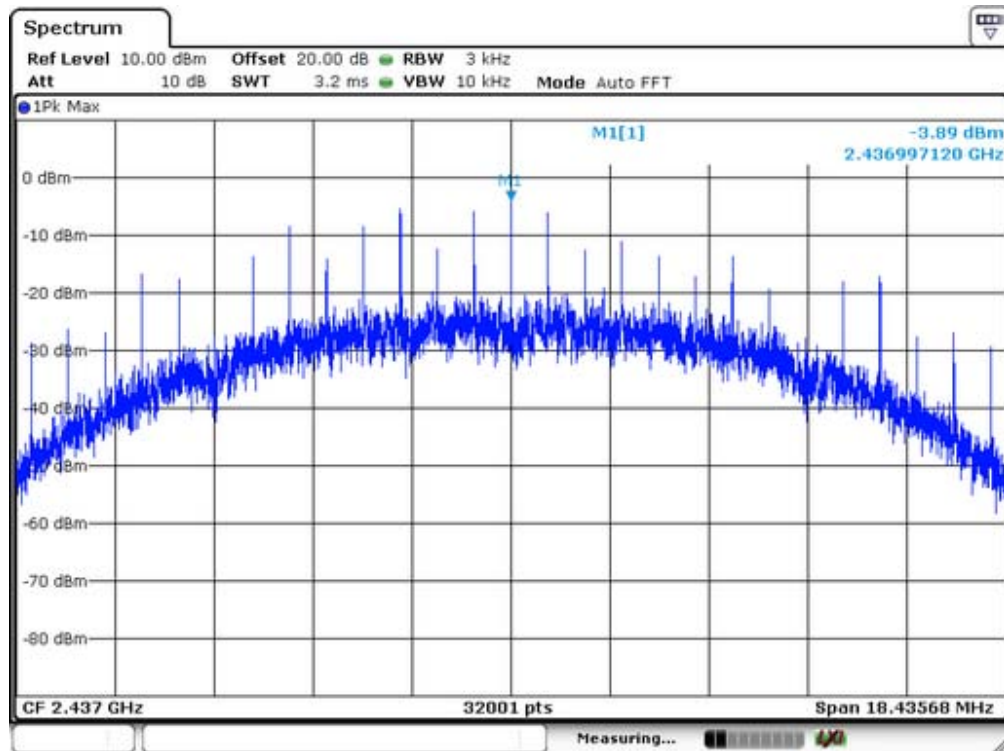
The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3 kHz bandwidth.

### 13.6 Test Result

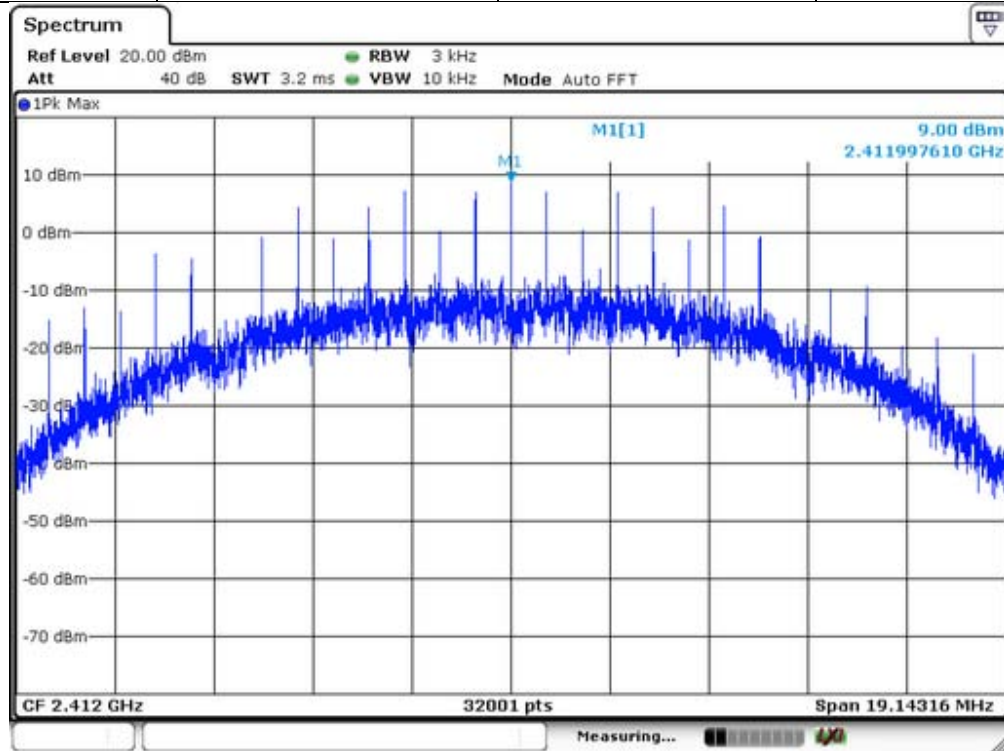
Spectrum Detector: PK                      Test Date : July 10, 2017  
Test By: Andy                      Temperature : 28°C  
Humidity : 60%

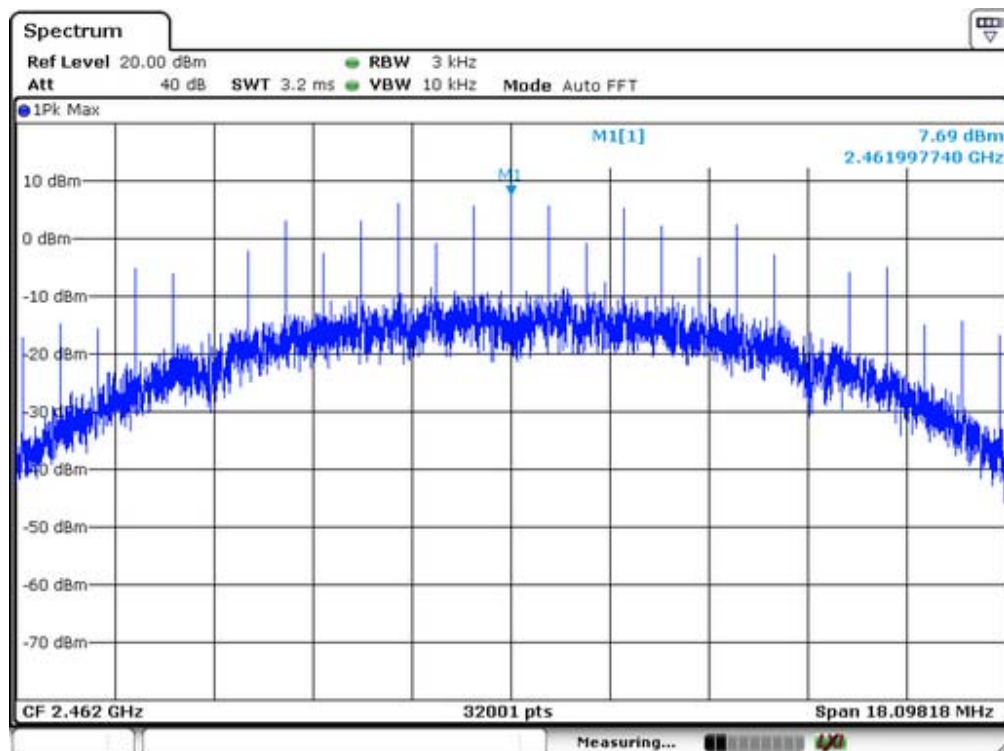
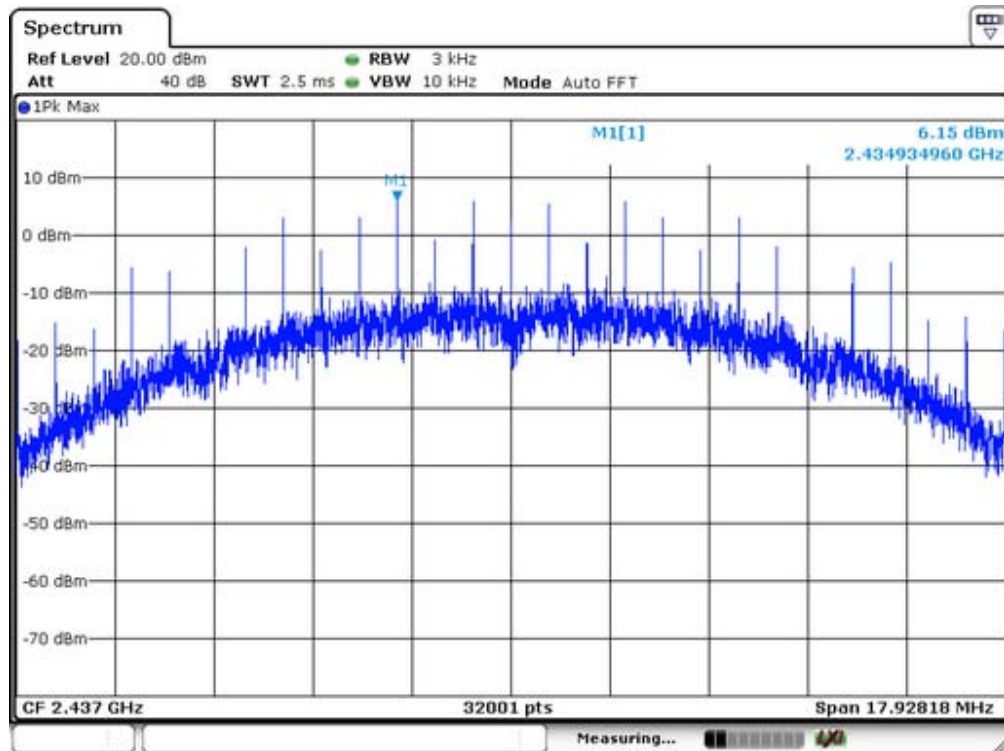
| IEEE 802.11b SISO Ant1  |                          |                                |        |
|-------------------------|--------------------------|--------------------------------|--------|
| Channel frequency (MHz) | Power Density (dBm/3kHz) | Power Density Limit (dBm/3kHz) | Result |
| 2412                    | -1.49                    | 8                              | Pass   |
| 2437                    | -3.89                    |                                |        |
| 2462                    | -5.81                    |                                |        |



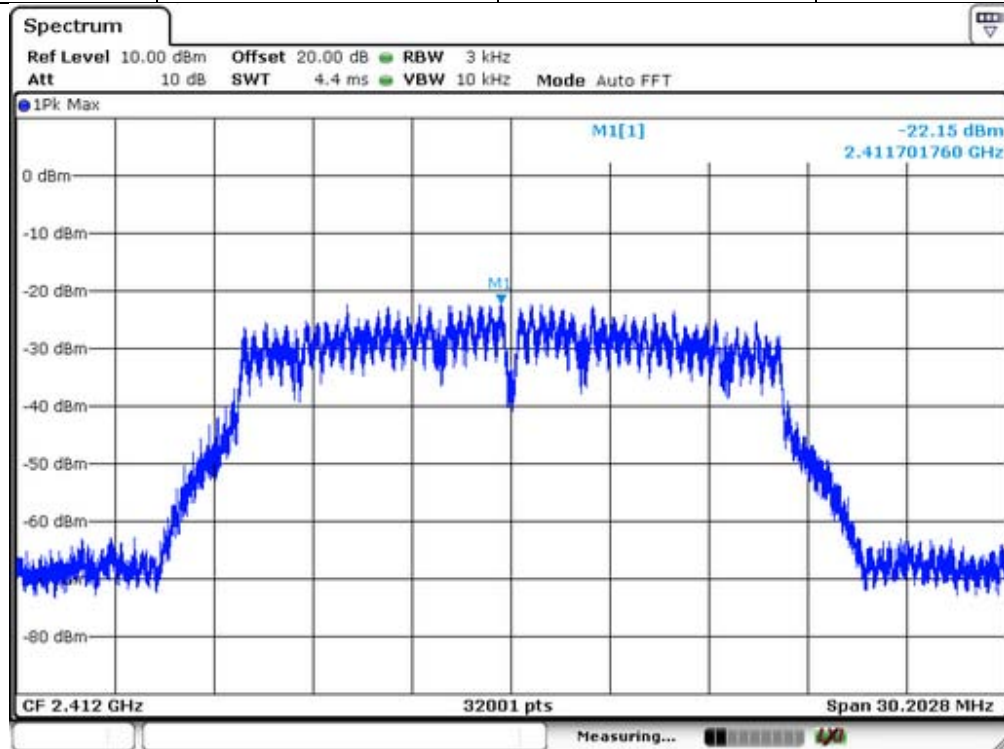


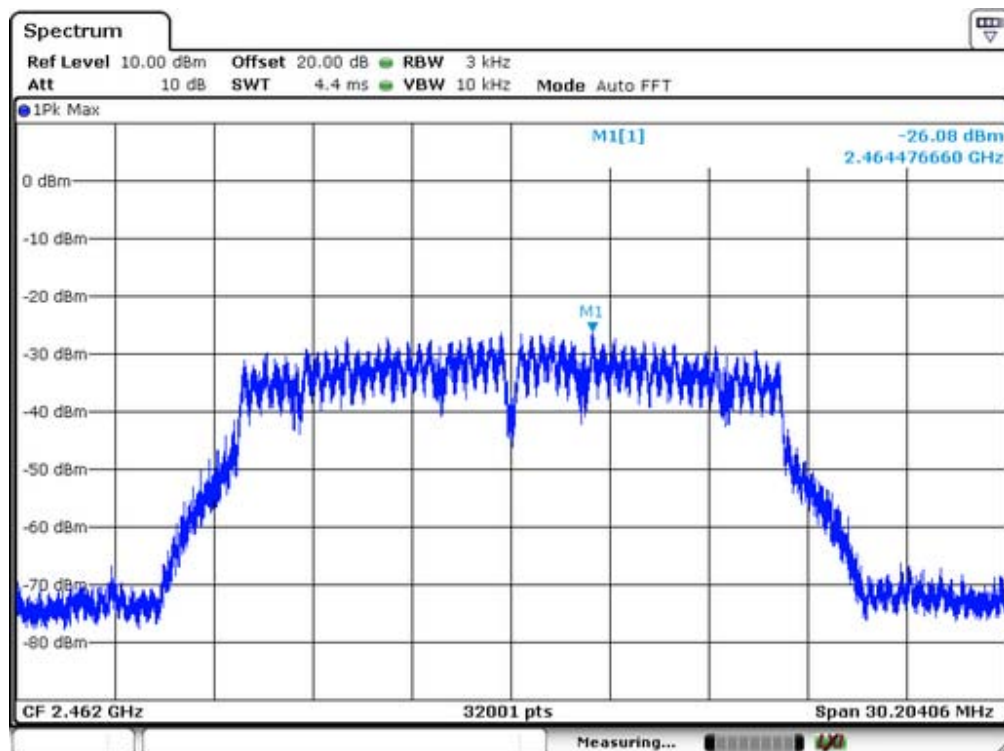
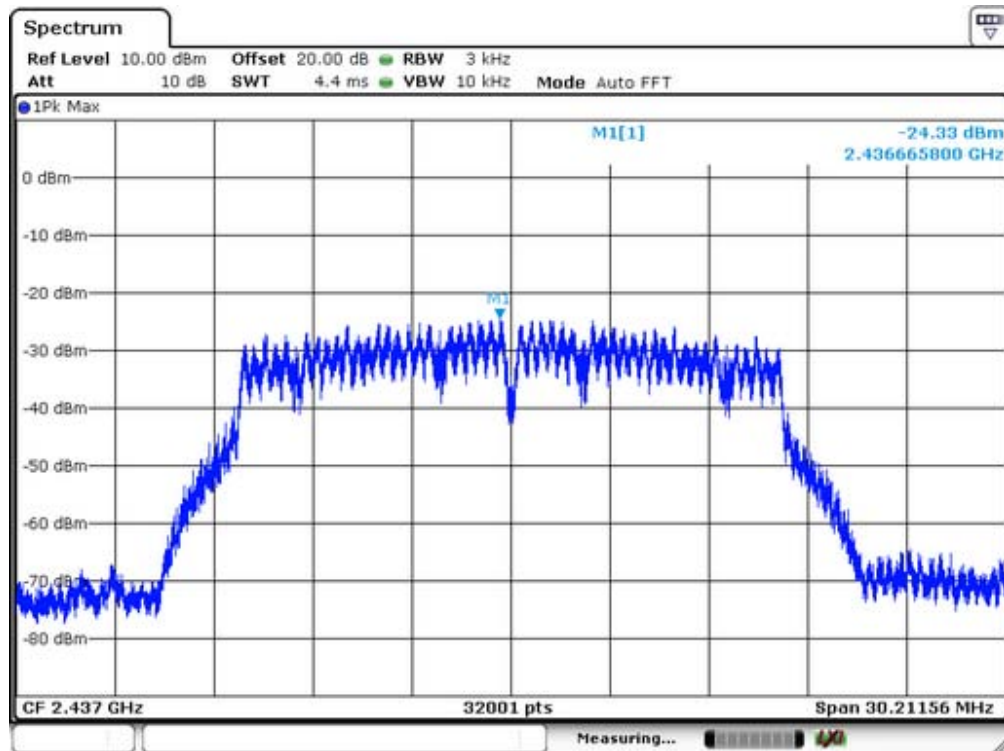
| IEEE 802.11b SISO Ant2  |                          |                                |        |
|-------------------------|--------------------------|--------------------------------|--------|
| Channel frequency (MHz) | Power Density (dBm/3kHz) | Power Density Limit (dBm/3kHz) | Result |
| 2412                    | 9.00                     | 8                              | Pass   |
| 2437                    | 6.15                     |                                |        |
| 2462                    | 7.69                     |                                |        |



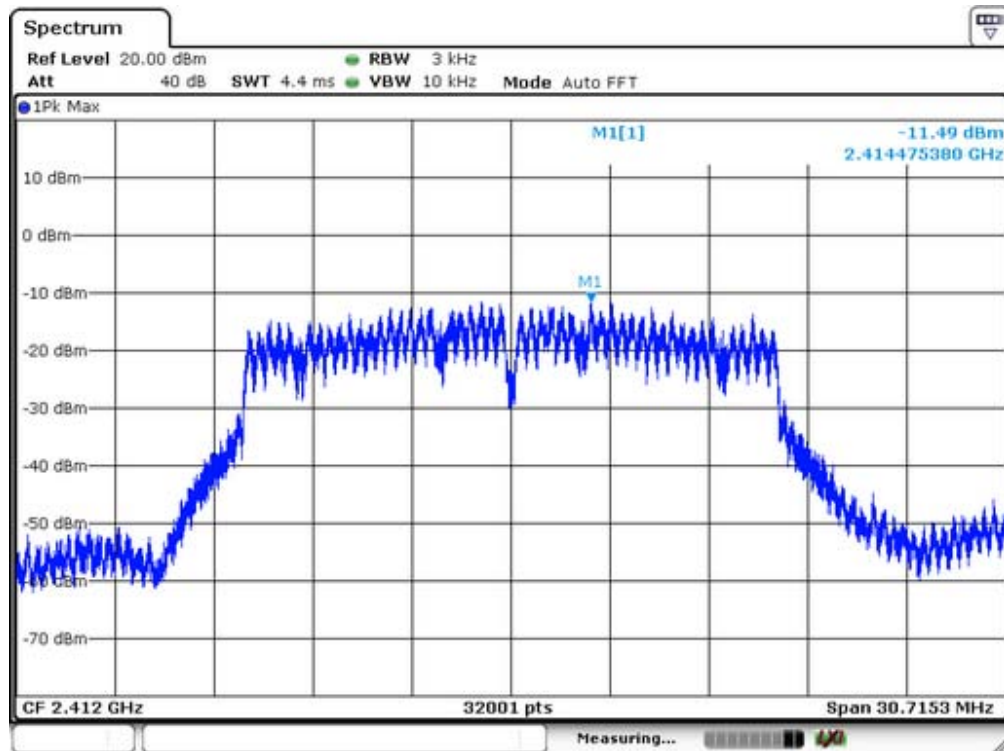


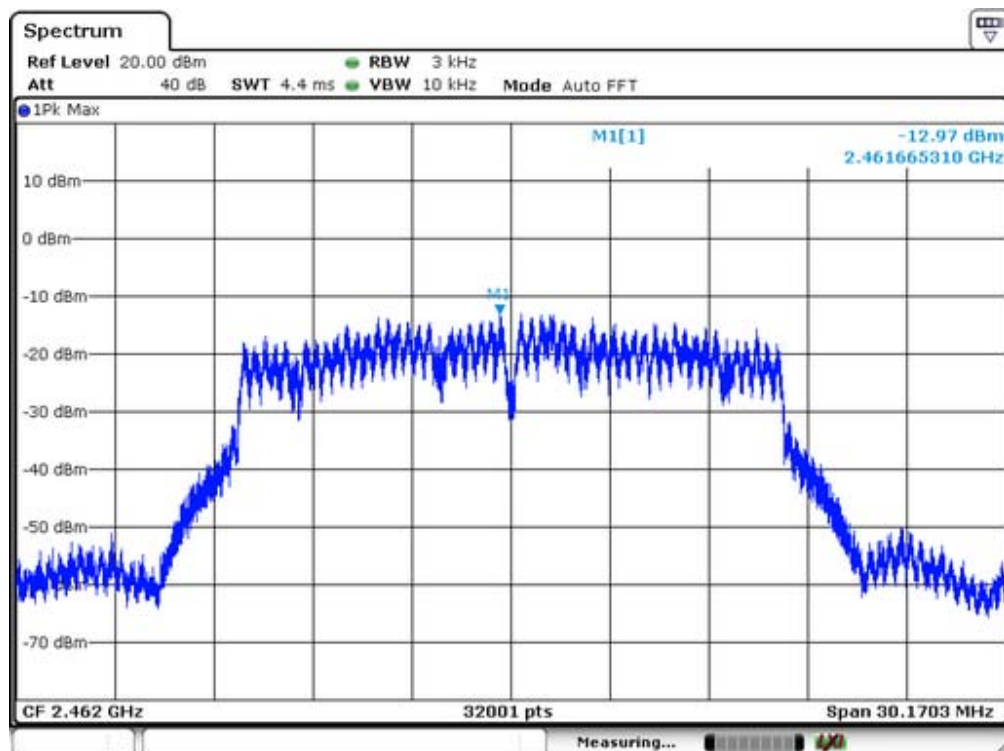
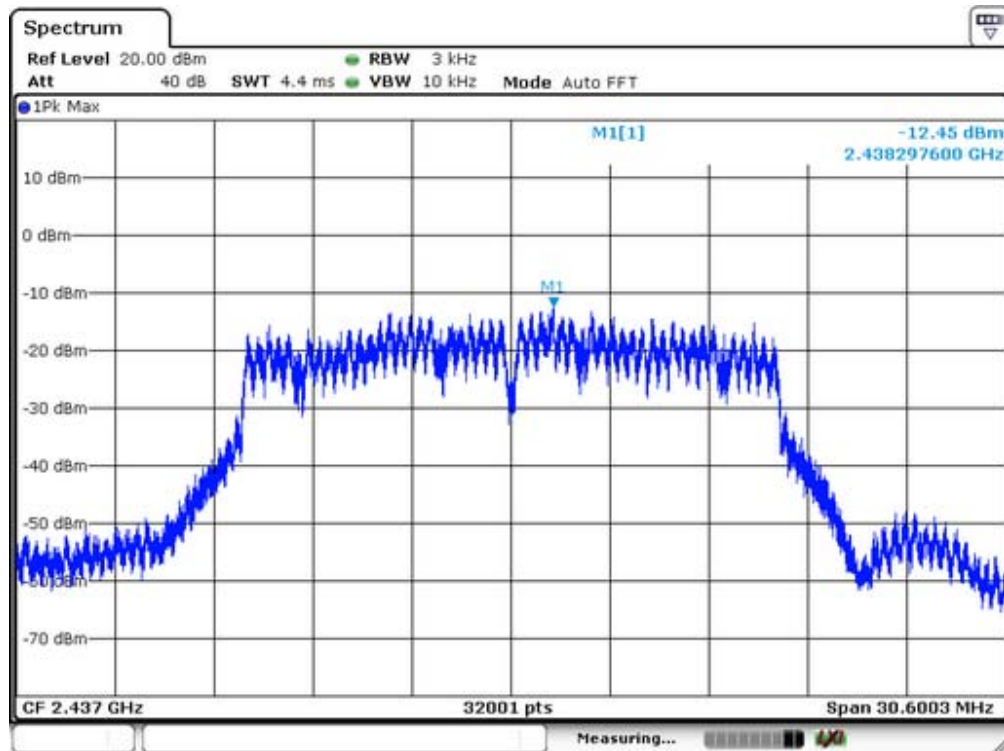
| IEEE 802.11g(SISO) Ant 1 |                          |                                |        |
|--------------------------|--------------------------|--------------------------------|--------|
| Channel frequency (MHz)  | Power Density (dBm/3kHz) | Power Density Limit (dBm/3kHz) | Result |
| 2412                     | -22.15                   | 8                              | Pass   |
| 2437                     | -24.33                   |                                |        |
| 2462                     | -26.08                   |                                |        |





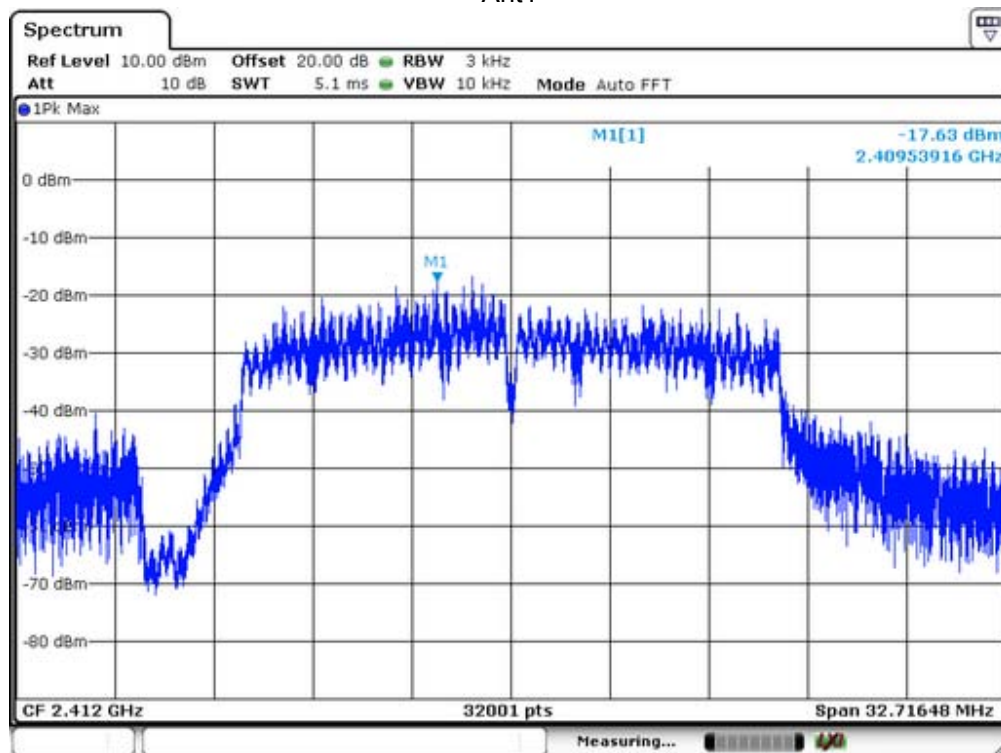
| IEEE 802.11g(SISO) Ant 2 |                          |                                |        |
|--------------------------|--------------------------|--------------------------------|--------|
| Channel frequency (MHz)  | Power Density (dBm/3kHz) | Power Density Limit (dBm/3kHz) | Result |
| 2412                     | -11.49                   | 8                              | Pass   |
| 2437                     | -12.45                   |                                |        |
| 2462                     | -12.97                   |                                |        |

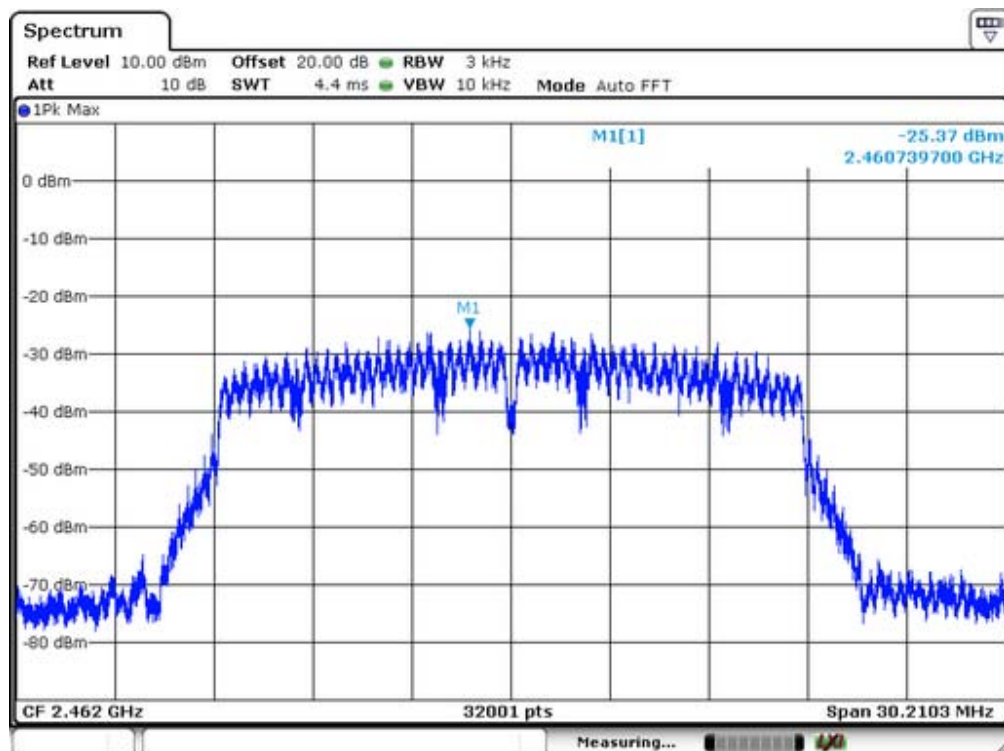
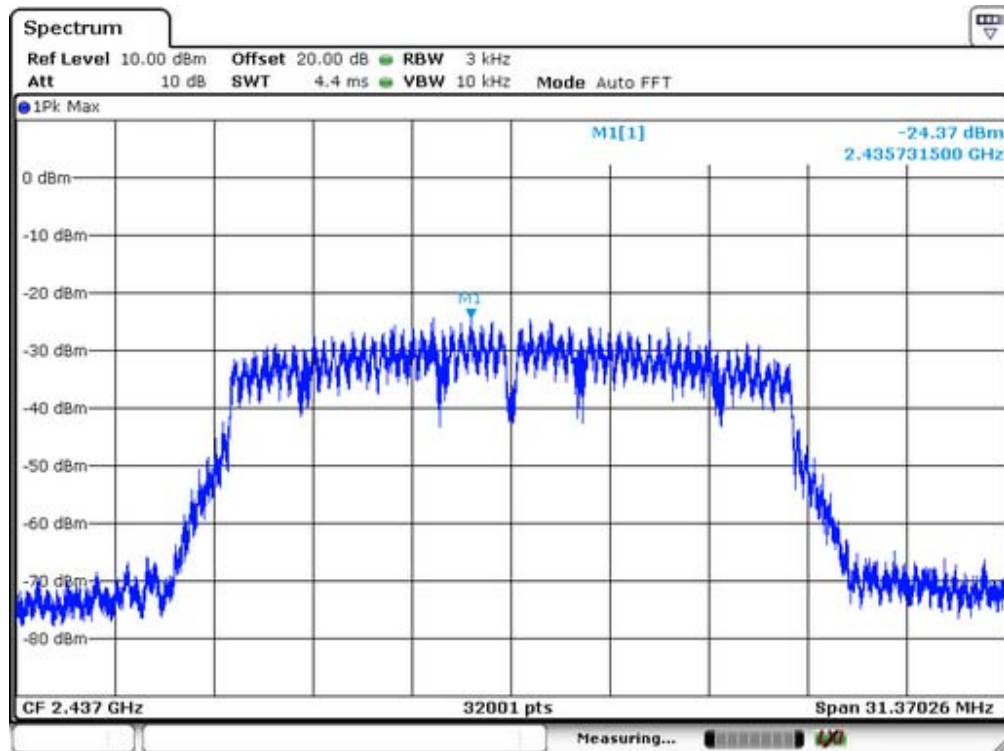




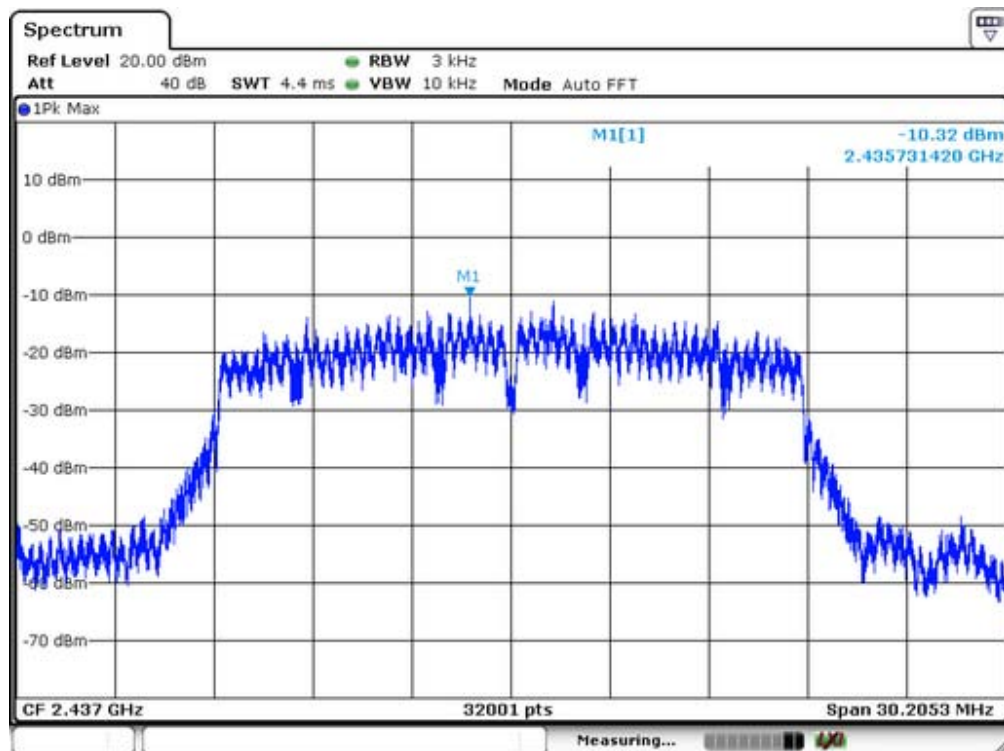
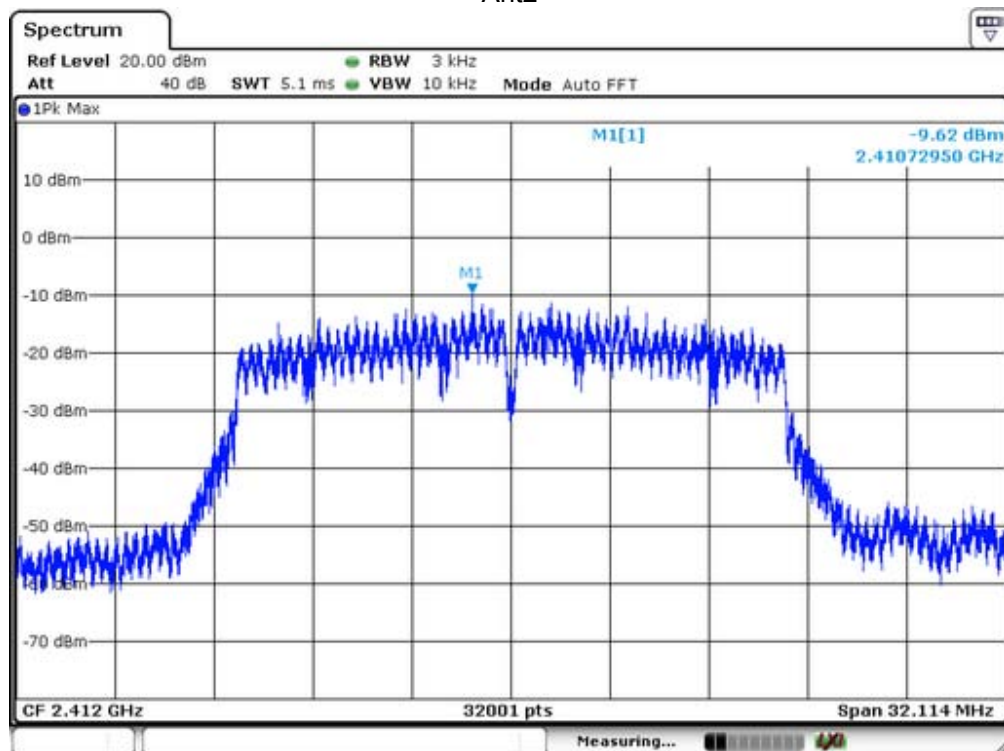
| IEEE 802.11n(HT20) MIMO(Antenna Gain=8dBi) |                          |                                                                                                                                                                  |        |                                |        |
|--------------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------|--------|
| Channel frequency (MHz)                    | Power Density (dBm/3kHz) |                                                                                                                                                                  |        | Power Density Limit (dBm/3kHz) | Result |
|                                            | Ant1                     | Ant2                                                                                                                                                             | Total  |                                |        |
| 2412                                       | -17.63                   | -9.62                                                                                                                                                            | -8.98  | 6                              | Pass   |
| 2437                                       | -24.37                   | -10.32                                                                                                                                                           | -10.15 |                                |        |
| 2462                                       | -25.37                   | -12.42                                                                                                                                                           | -12.21 |                                |        |
|                                            |                          | Remark: In MIMO, Ant1+Ant2 Directional Gain= $G_{ant}+10\text{Log}(N)\text{dBi}=5+10\text{Log}(2)=8\text{dBi}$ .<br>Directional Gain was according to KDB662911. |        |                                |        |

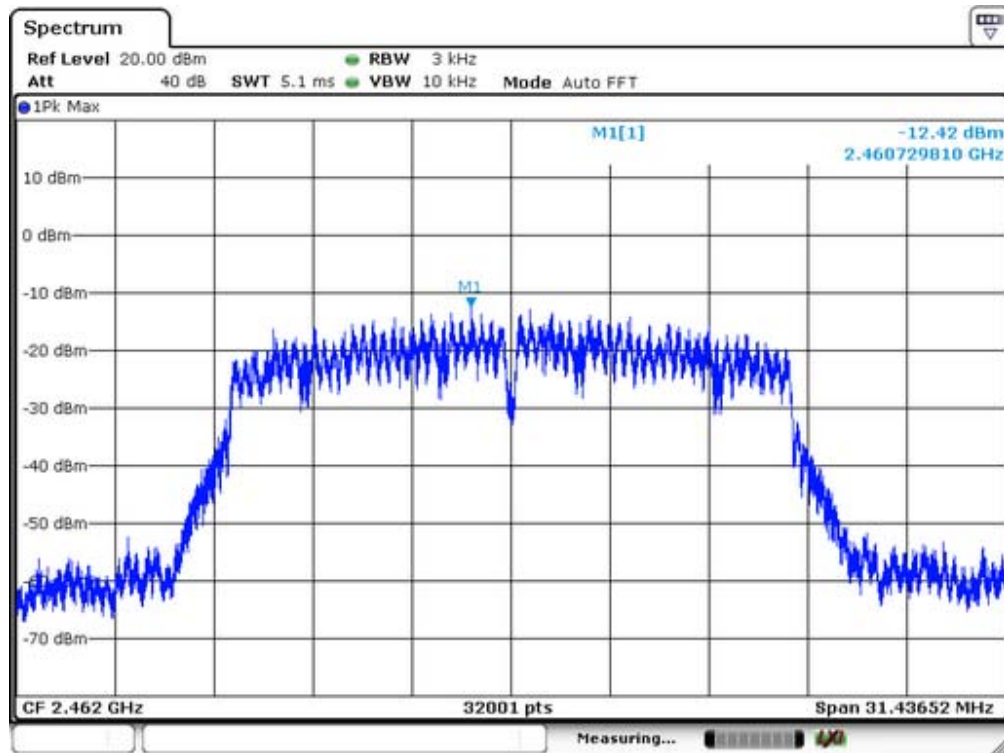
Ant1





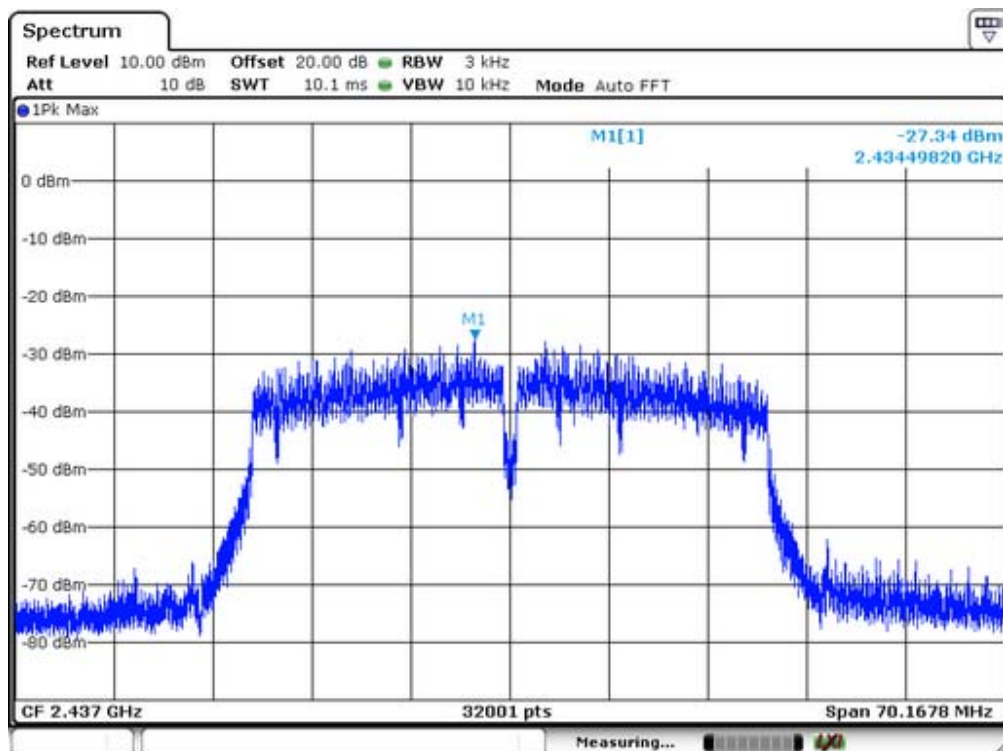
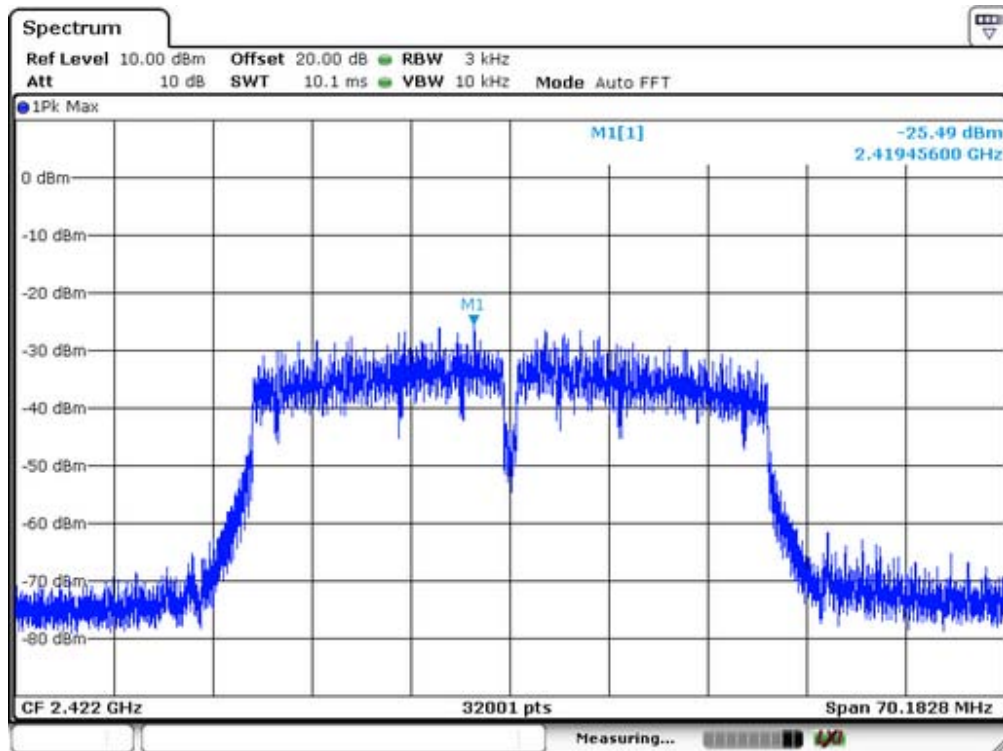
Ant2

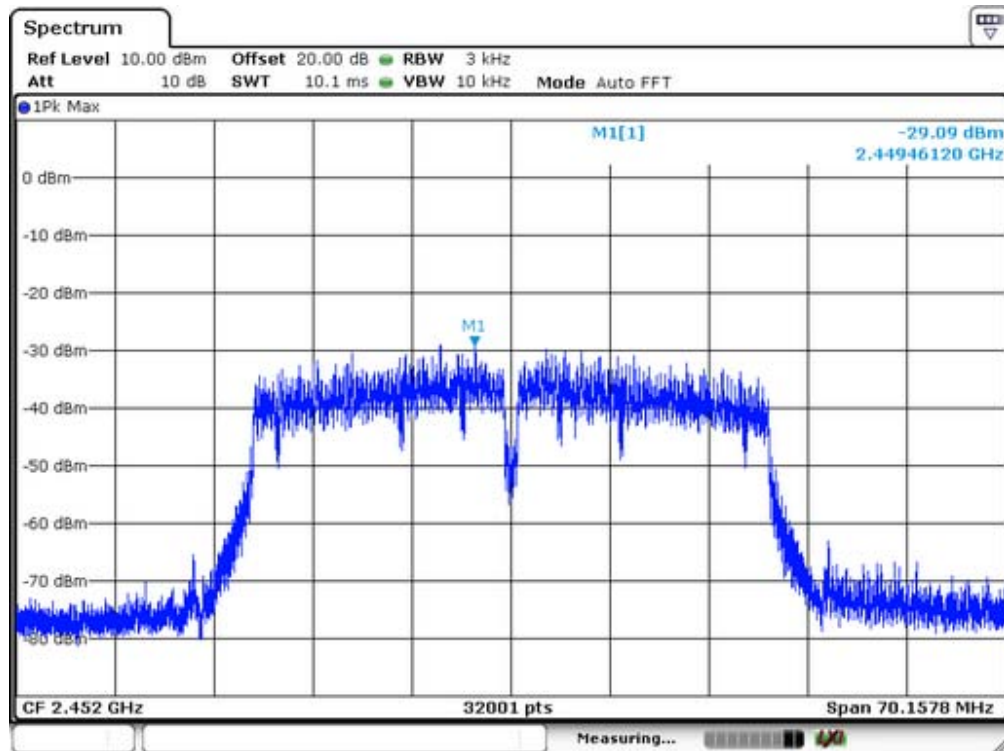




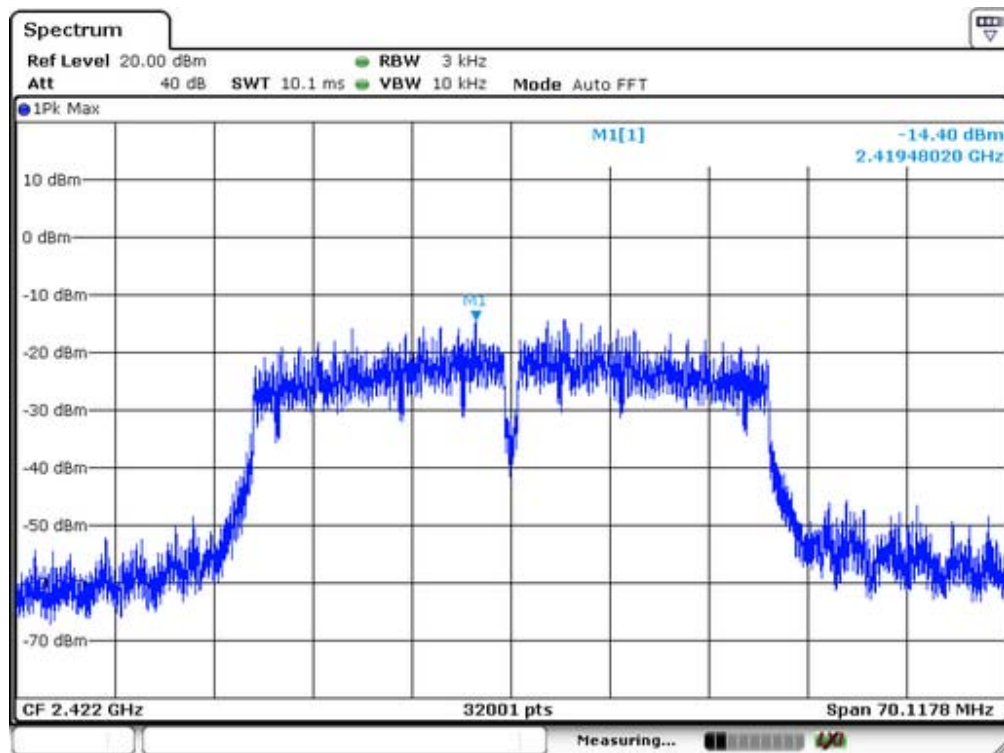
| IEEE 802.11n(HT40) MIMO(Antenna Gain=8dBi) |                          |                                                                                                                                                               |        |                                |        |
|--------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------|--------|
| Channel frequency (MHz)                    | Power Density (dBm/3kHz) |                                                                                                                                                               |        | Power Density Limit (dBm/3kHz) | Result |
|                                            | Ant 1                    | Ant 2                                                                                                                                                         | Total  |                                |        |
| 2422                                       | -25.49                   | -14.40                                                                                                                                                        | -14.07 | 6                              | Pass   |
| 2437                                       | -27.34                   | -15.24                                                                                                                                                        | -14.98 |                                |        |
| 2452                                       | -29.09                   | -14.13                                                                                                                                                        | -13.99 |                                |        |
|                                            |                          | Remark: In MIMO, Ant1+Ant2 Directional Gain= $G_{ant}+10\text{Log}(N)\text{dBi}=5+10\text{Log}(2)=8\text{dBi}$ . Directional Gain was according to KDB662911. |        |                                |        |

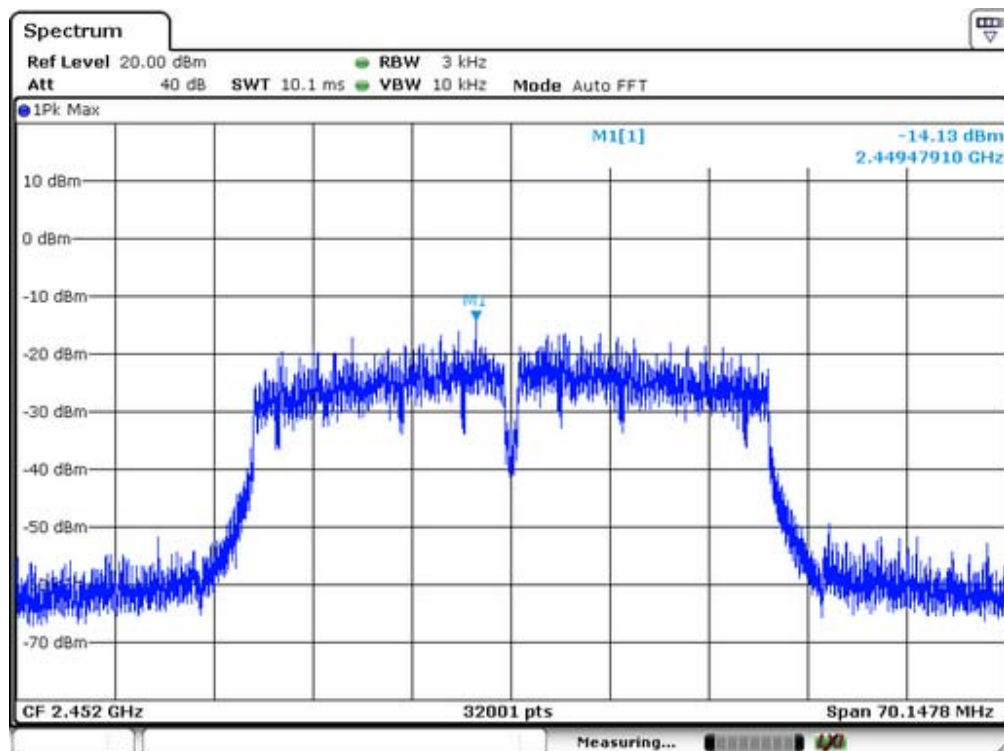
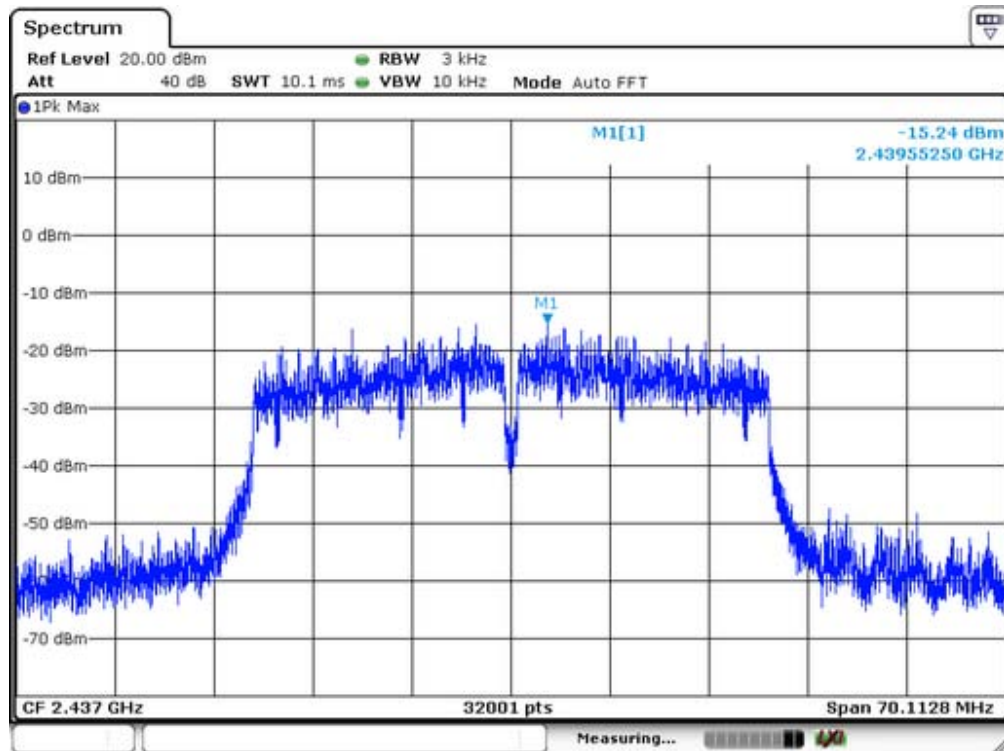
Ant1





Ant2





## 14. Antenna Port Emission

### 14.1 Test Equipment

| EQUIPMENT TYPE    | MFR     | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
|-------------------|---------|--------------|---------------|------------|------------|
| Spectrum Analyzer | Agilent | FSV30        | 1321.3008K    | 05/16/2017 | 05/15/2018 |

### 14.2 Measuring Instruments and Setting

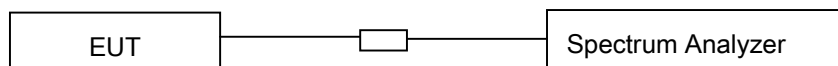
The following table is the setting of spectrum analyzer.

| Spectrum analyzer | Setting  |
|-------------------|----------|
| Attenuation       | Auto     |
| RBW               | 100kHz   |
| VBW               | 300kHz   |
| Detector          | Peak     |
| Trace             | Max hold |

### 14.3 Test Procedures

The conducted spurious emissions were measured conducted using a spectrum analyzer at low, Middle, and high channels, the limit was determined by attenuation 20dB of the RF peak power output.

### 14.4 Block Diagram of Test setup

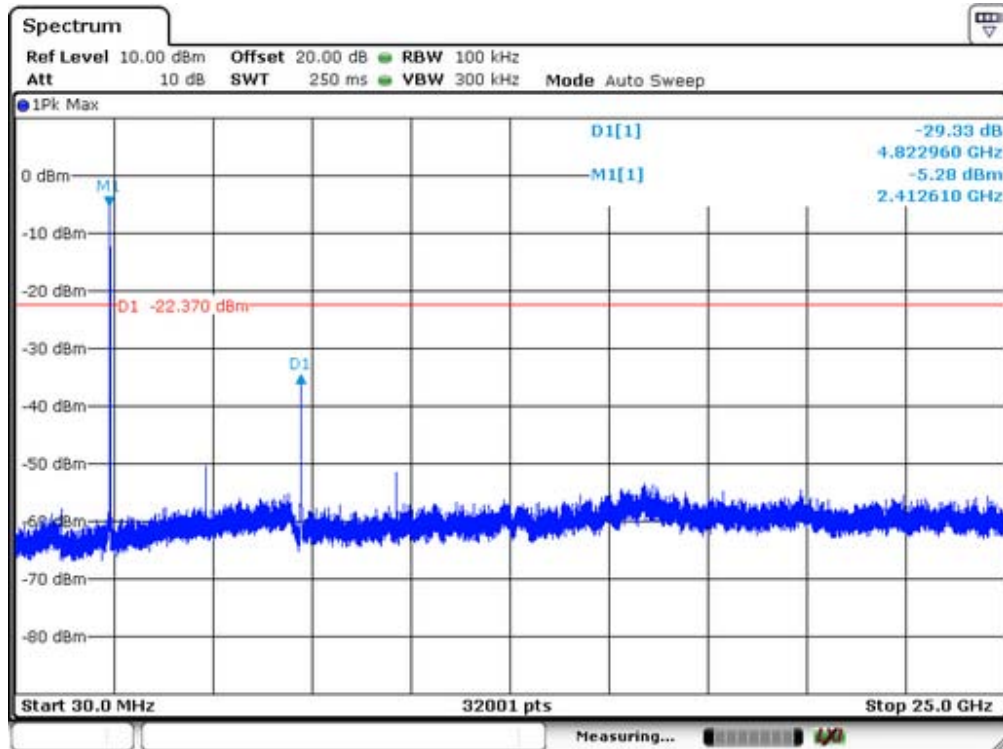


### 14.5 Test Result

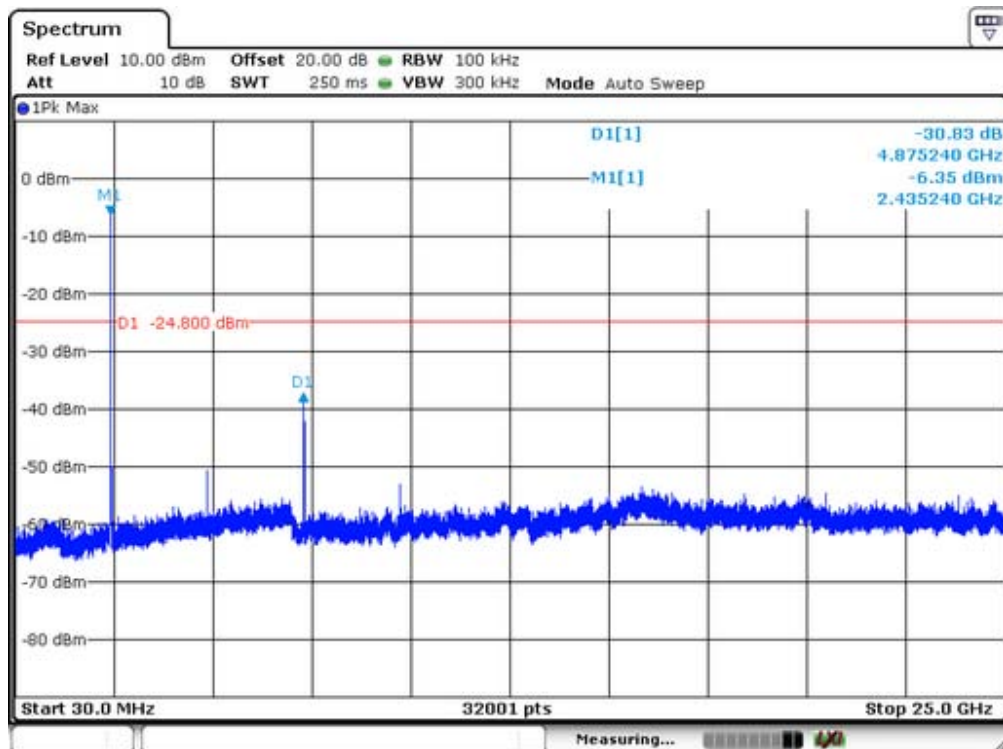
**PASS.**

Please refer to the following pages.

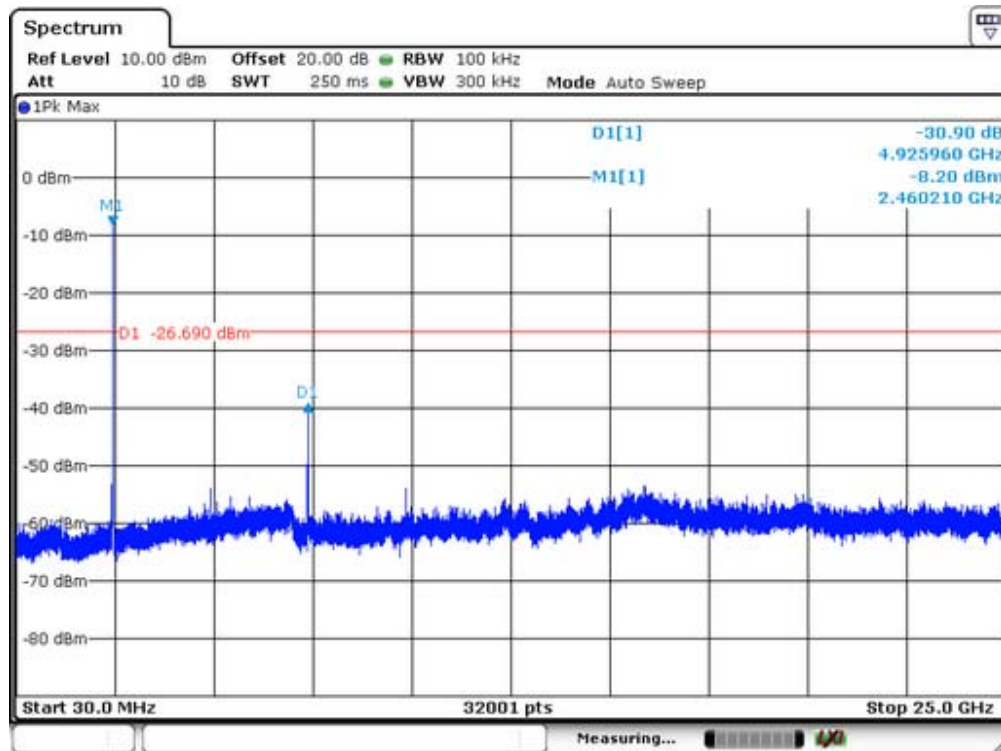
Test Mode: IEEE 802.11b SISO Ant1



Lowest Channel

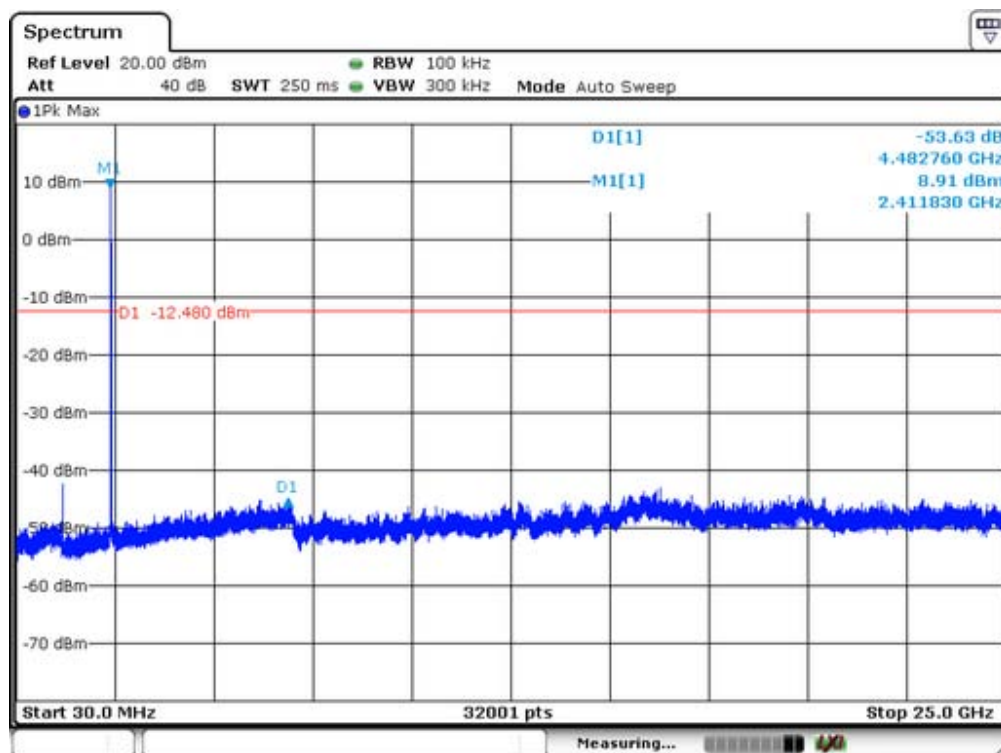


Middel Channel

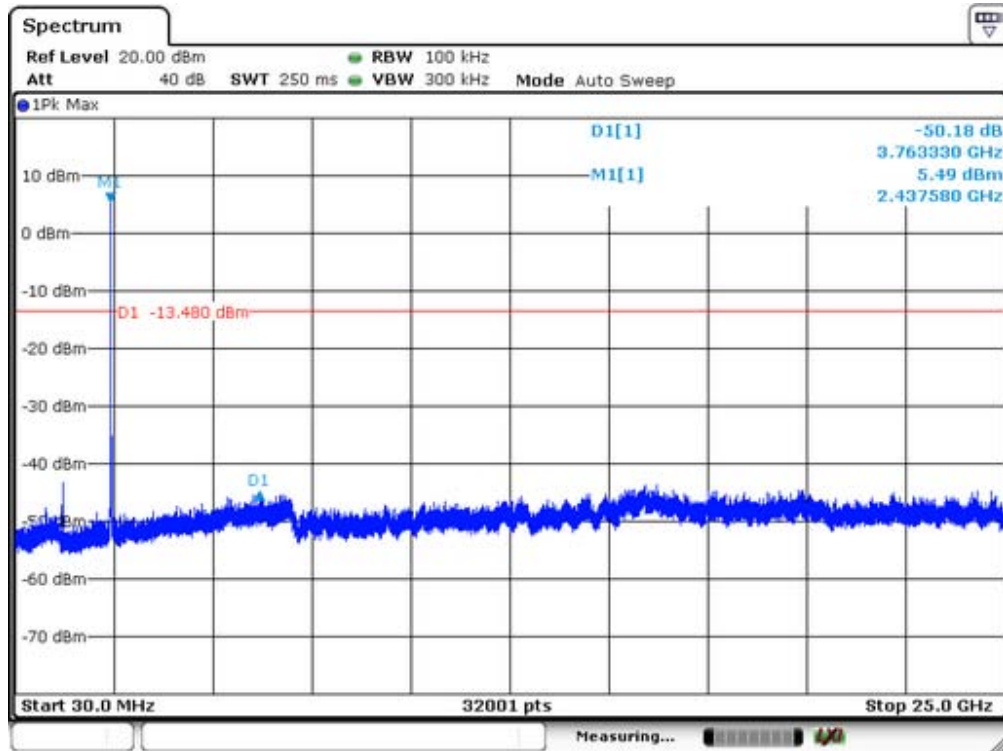


Highest Channel

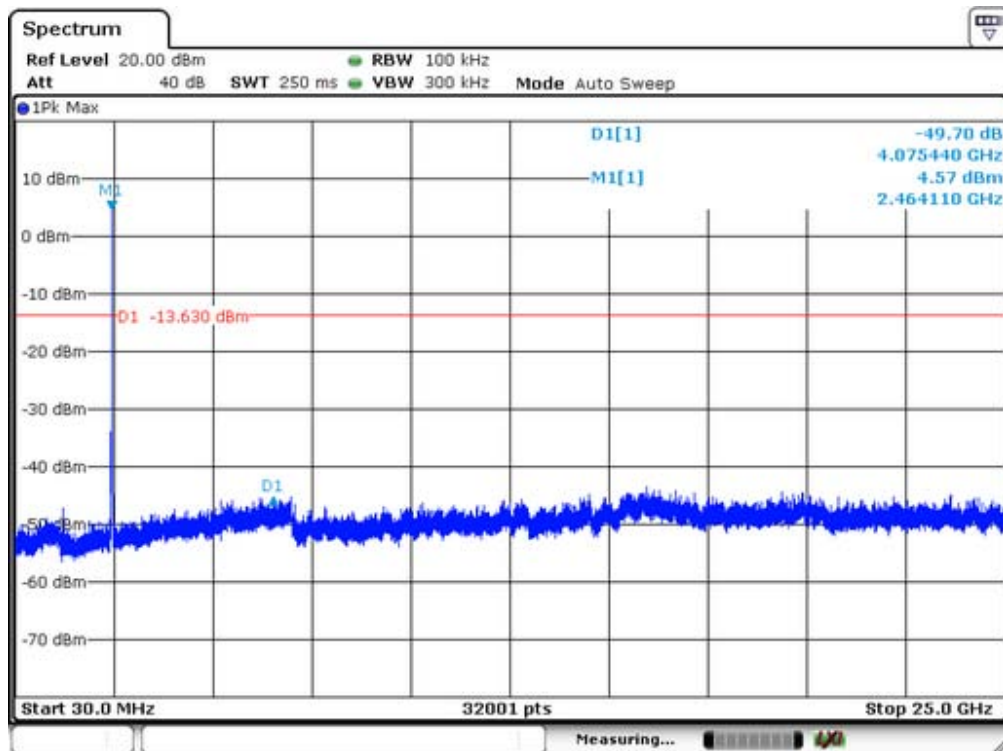
Test Mode: IEEE 802.11b SISO Ant2



Lowest Channel

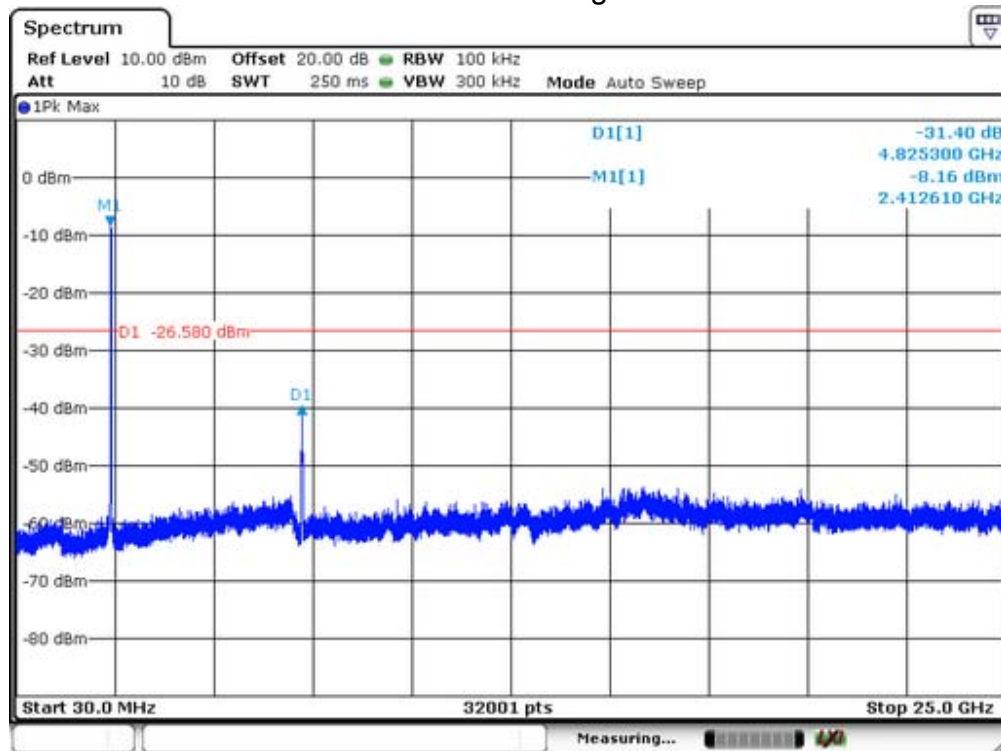


Middel Channel

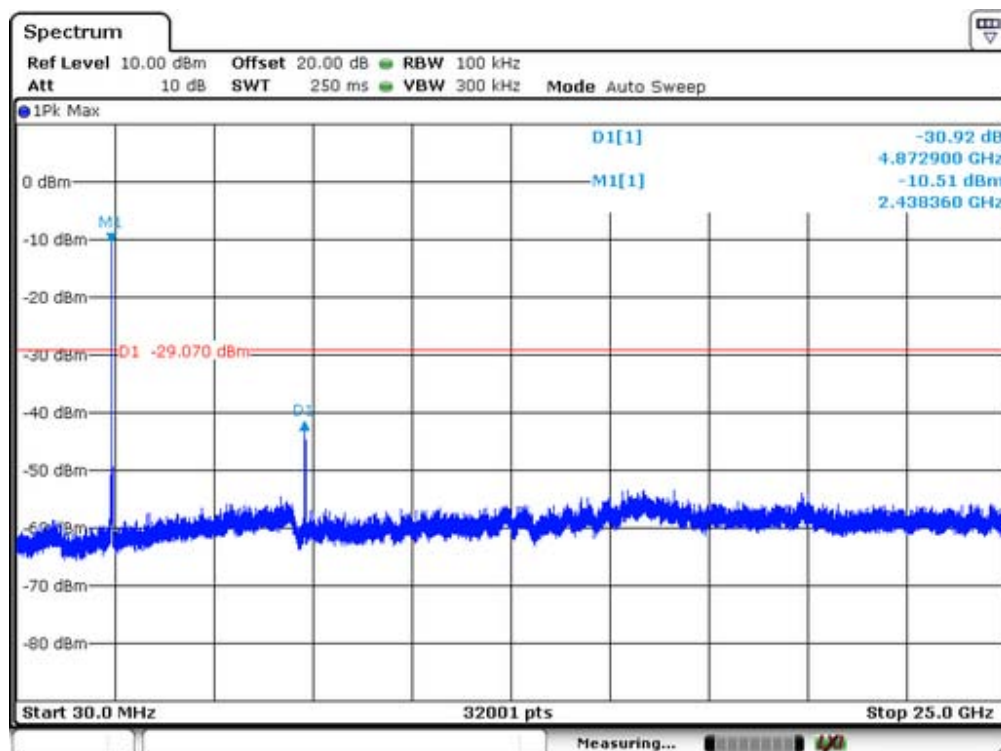


Highest Channel

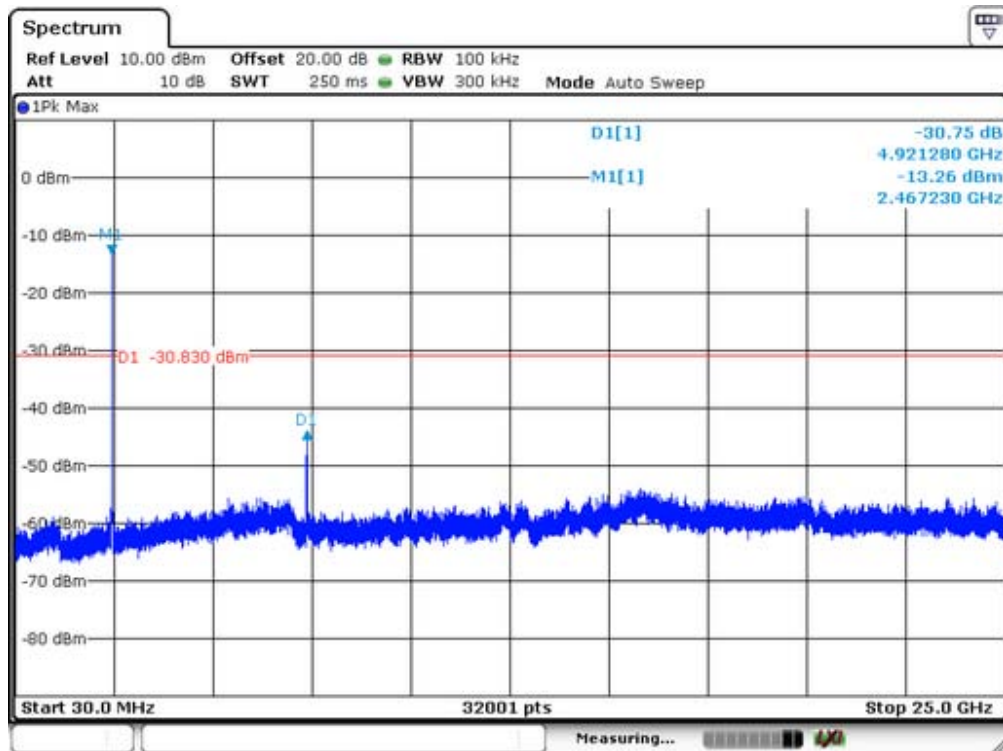
## Test Mode: IEEE 802.11g SISO Ant1



Lowest Channel

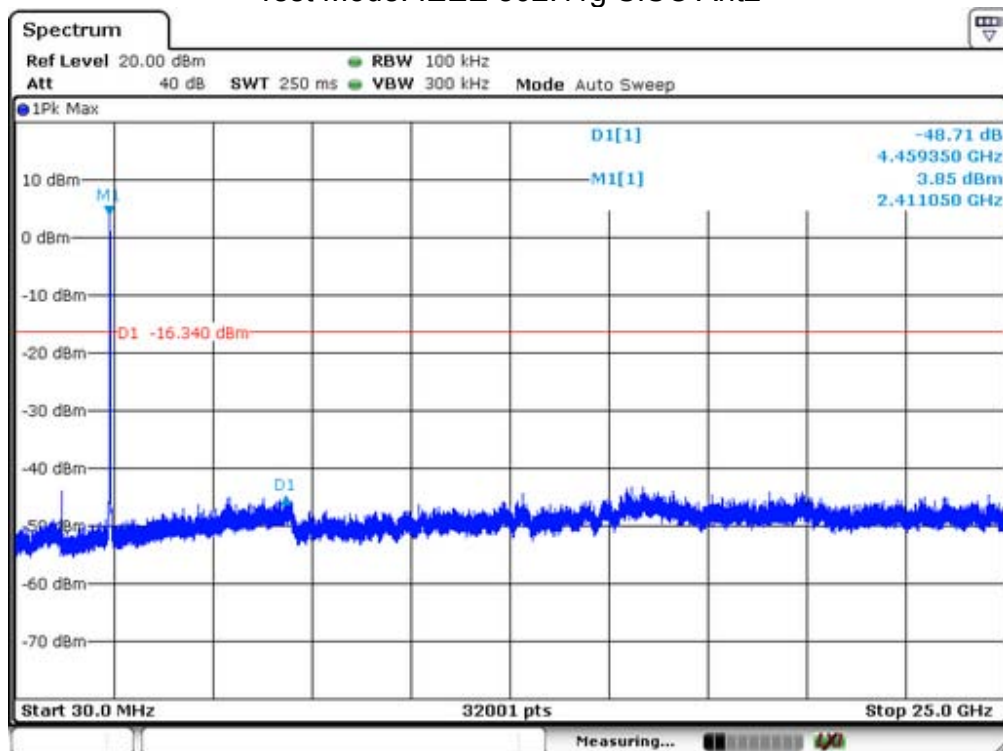


### Middle Channel

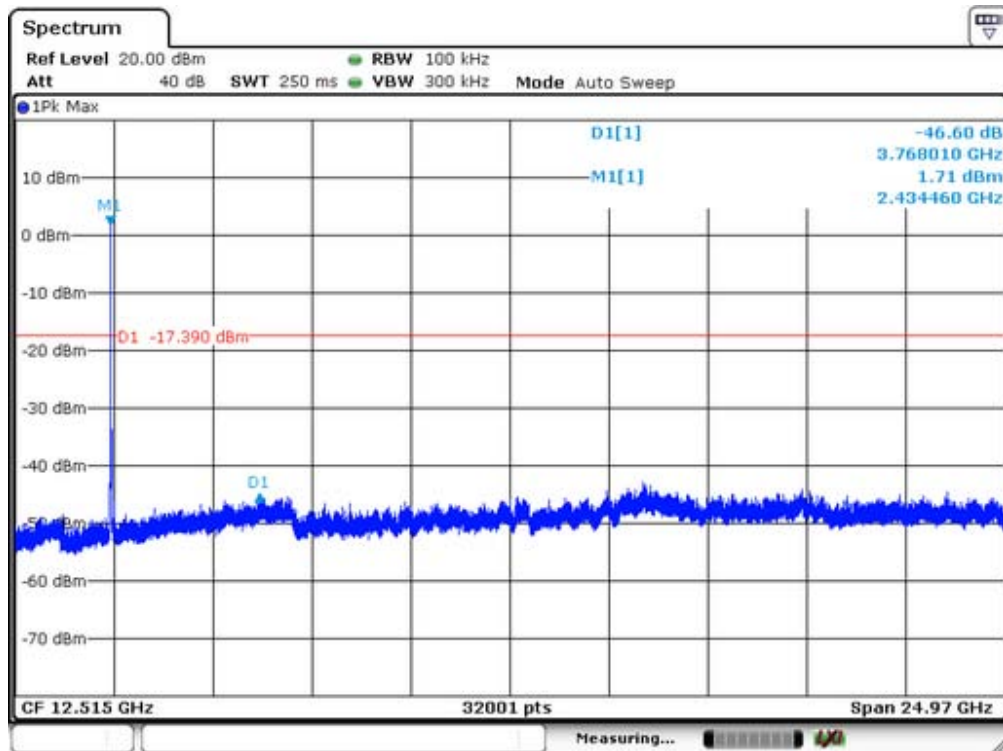


### Highest Channel

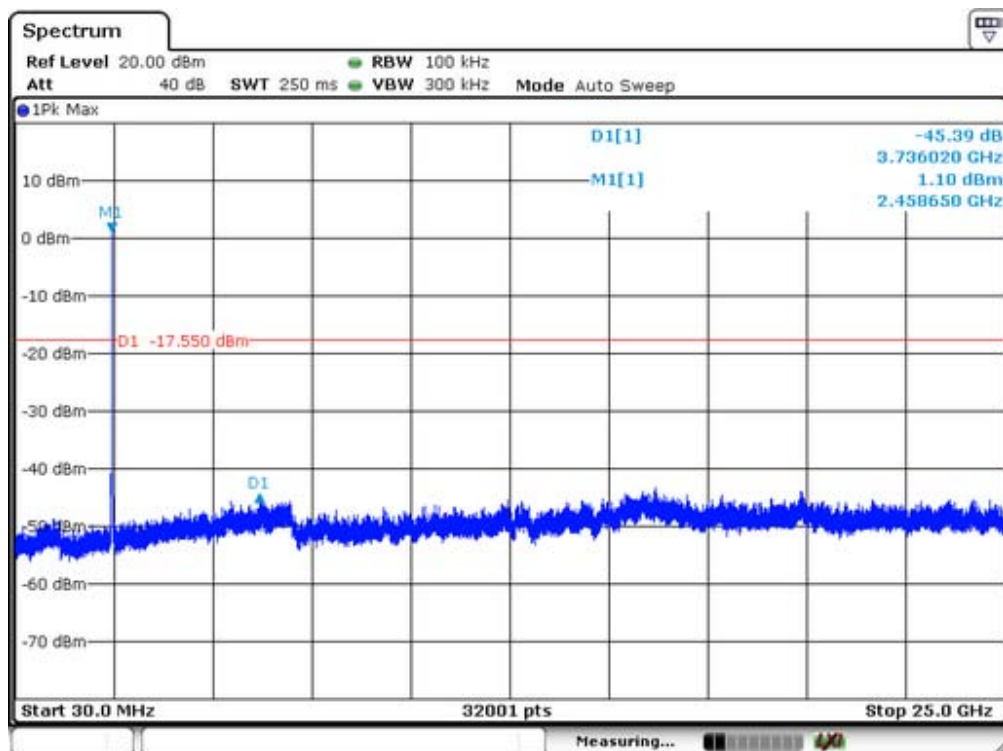
Test Mode: IEEE 802.11g SISO Ant2



### Lowest Channel

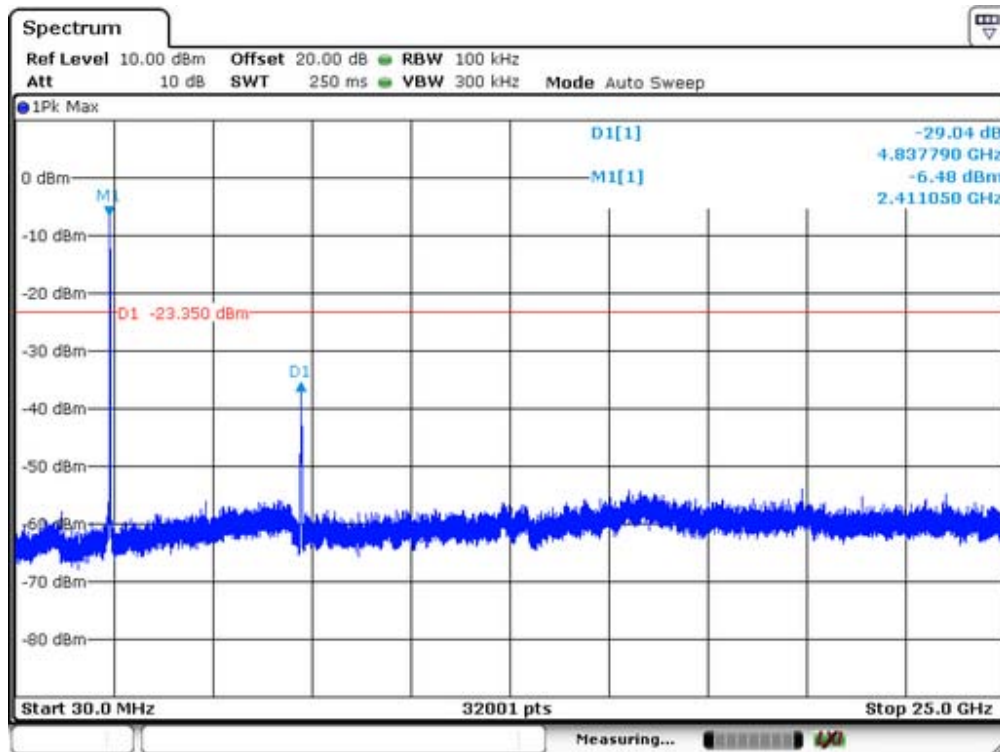


Middle Channel

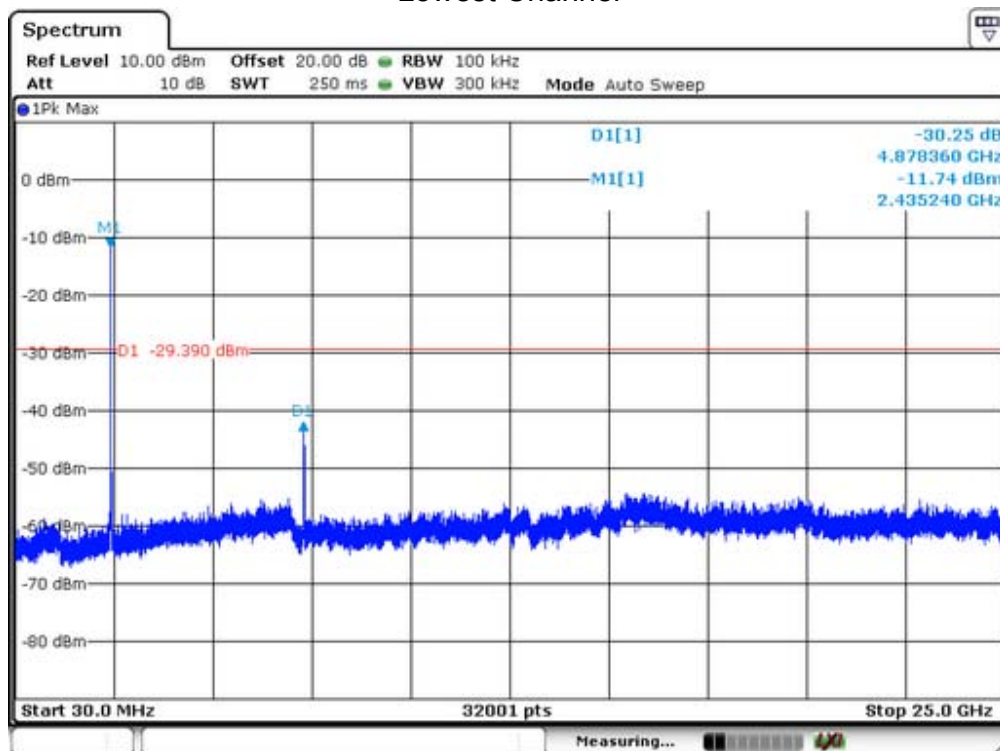


Highest Channel

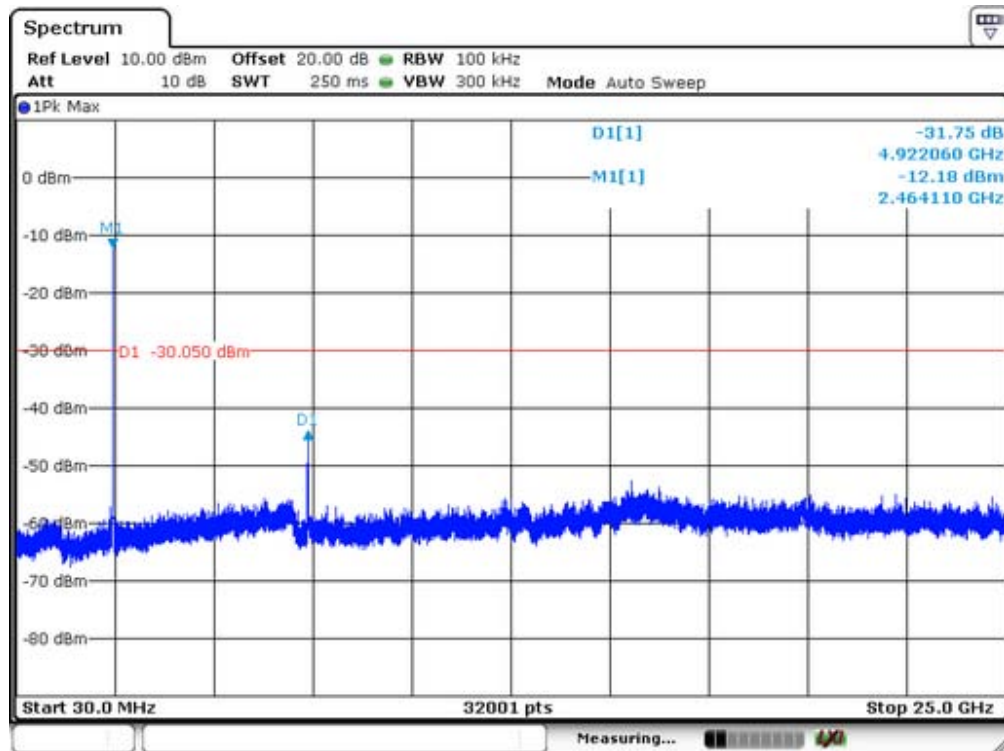
Test Mode: IEEE 802.11n(HT20) MIMO



Lowest Channel

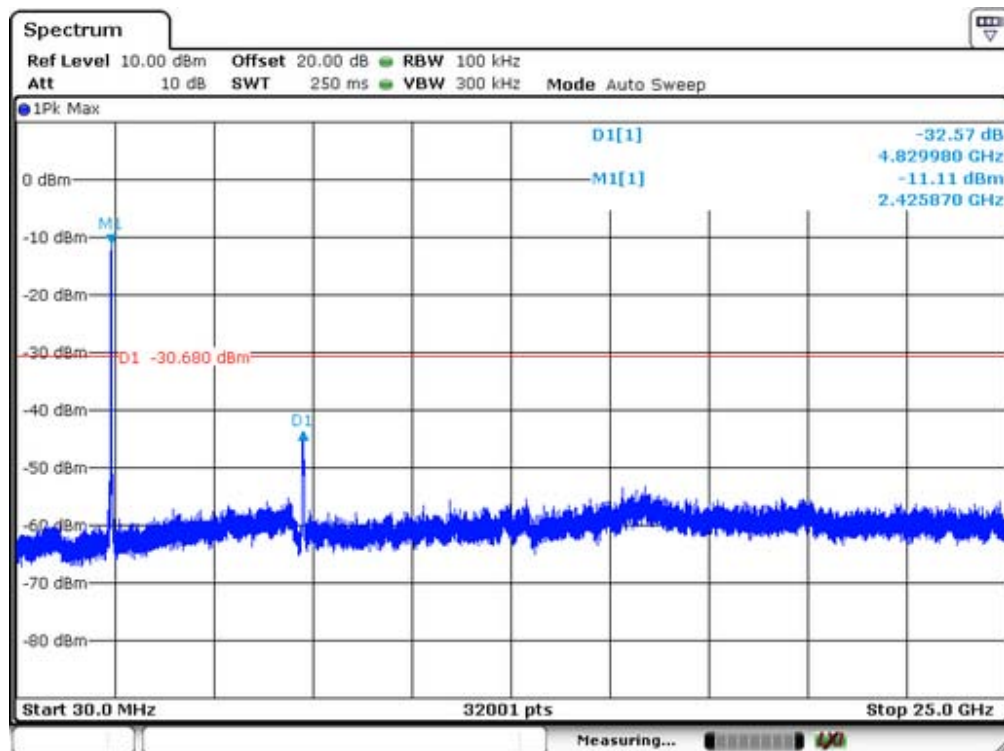


Middle Channel

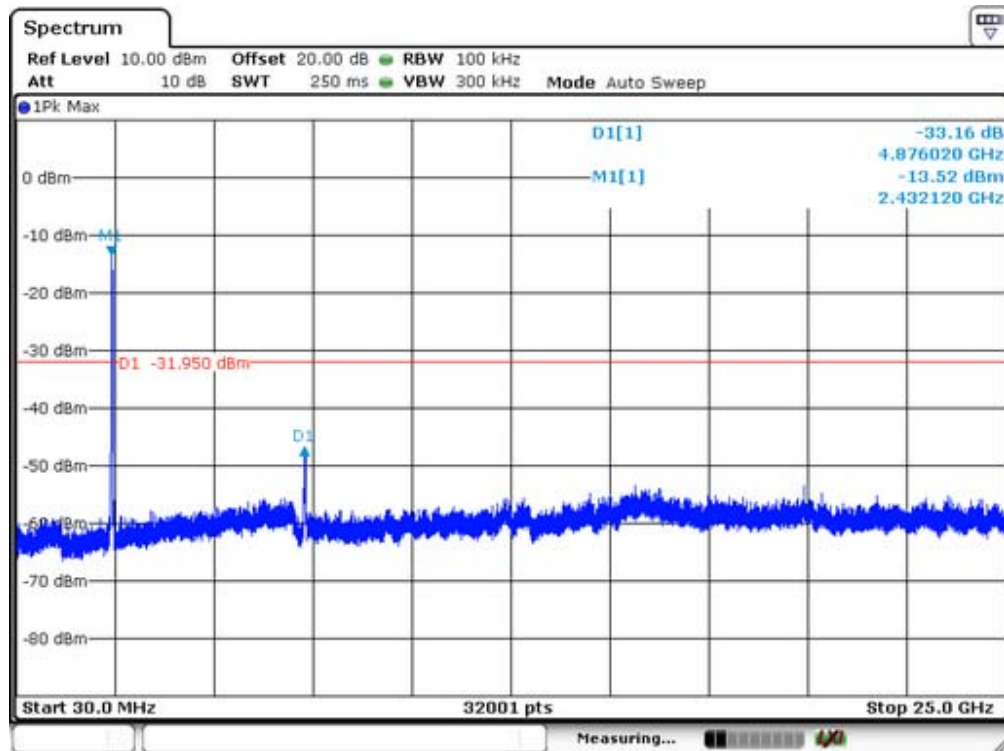


Highest Channel

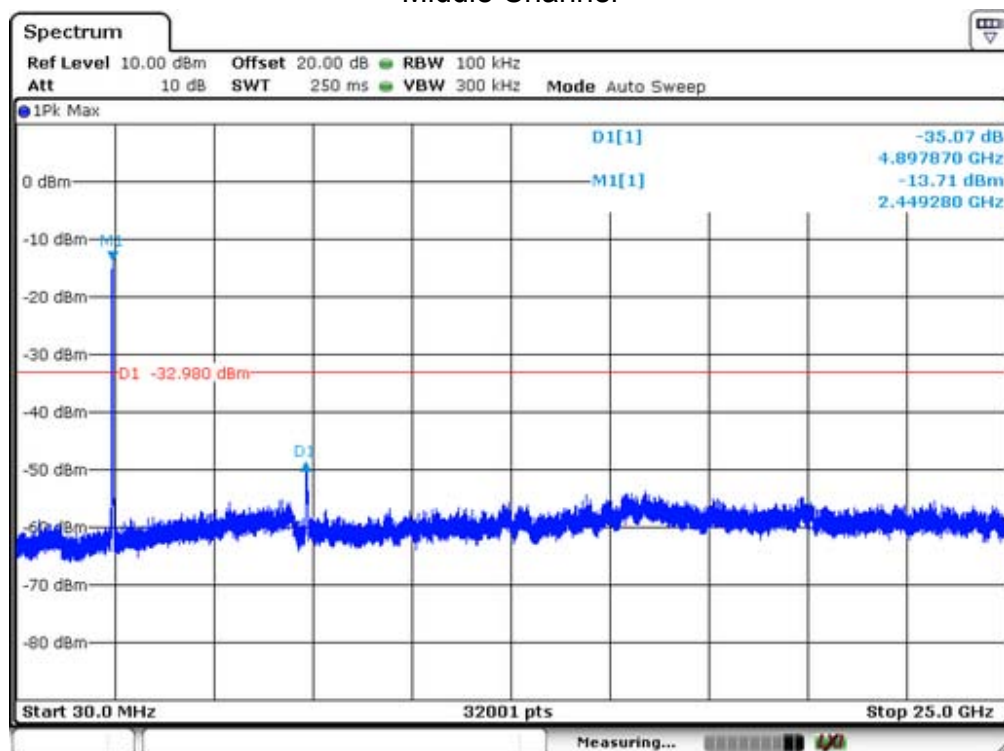
Test Mode: IEEE802.11n(HT40) MIMO



## Lowest Channel



## Middle Channel



## Highest Channel

## **15. Antenna Application**

### **15.1 Antenna Requirement**

For intentional device, according to FCC 47 CFR Section 15.203, 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### **15.2 Result**

The EUT'S antenna, permanent attached antenna, is internal antenna. The antenna's gain is 5dBi and meets the requirement.

# APPENDIX I (PHOTOS OF EUT)





