

## FCC 47 CFR PART 15 SUBPART C

### RF Test Report

Applicant : Comtrend Corporation  
Product Type : Multi-DSL Wireless Router  
Trade Name : COMTREND  
Model Number : VR-3033u, VR-3033  
Applicable Standard : FCC 47 CFR PART 15 SUBPART C  
ANSI C63.10:2013  
Receive Date : Jan. 08, 2016  
Test Period : Jan. 08 ~ Feb. 17, 2016  
Issue Date : Mar. 31, 2016

#### Issue by

A Test Lab Techno Corp.  
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Taiwan Accreditation Foundation accreditation number: 1330

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**Revision History**

| Rev. | Issue Date    | Revisions     | Revised By |
|------|---------------|---------------|------------|
| 00   | Mar. 31, 2016 | Initial Issue | Snow Wang  |
|      |               |               |            |
|      |               |               |            |
|      |               |               |            |

## Verification of Compliance

Issued Date: Mar. 31, 2016

Applicant : Comtrend Corporation  
Product Type : Multi-DSL Wireless Router  
Trade Name : COMTREND  
Model Number : VR-3033u, VR-3033  
FCC ID : L9VVR-3033U  
EUT Rated Voltage : DC 12V, 1A  
Test Voltage : 120 Vac / 60 Hz  
Applicable Standard : FCC 47 CFR PART 15 SUBPART C  
ANSI C63.10:2013  
Test Result : Complied  
Performing Lab. : A Test Lab Techno Corp.

No. 140-1, Changan Street, Bade District,  
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Taiwan Accreditation Foundation accreditation number: 1330  
<http://www.atl-lab.com.tw/e-index.htm>

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By

: Fly Lu

(Manager)

Reviewed By

: Eric Ou Yang

(Testing Engineer)

(Eric Ou Yang)

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## 1 General Information

### 1.1 Summary of Test Result

| Standard     | Item                                    | Result | Remark |
|--------------|-----------------------------------------|--------|--------|
| 15.247       |                                         |        |        |
| 15.207       | AC Power Conducted Emission             | PASS   | -----  |
| Standard     | Item                                    | Result | Remark |
| 15.247       |                                         |        |        |
| 15.247(d)    | Transmitter Radiated Emissions          | PASS   | -----  |
| 15.247(b)(3) | Max. Output Power                       | PASS   | -----  |
| 15.247(a)(2) | 6dB RF Bandwidth                        | PASS   | -----  |
| 15.247(e)    | Power Spectral Density                  | PASS   | -----  |
| 15.247(d)    | Out of Band Conducted Spurious Emission | PASS   | -----  |
| 15.203       | Antenna Requirement                     | PASS   | -----  |

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

### 1.2 Measurement Uncertainty

| Test Item          | Frequency Range     | Uncertainty (dB) |
|--------------------|---------------------|------------------|
| Conducted Emission | 9kHz ~ 150KHz       | 2.7              |
|                    | 150kHz ~ 30MHz      | 2.8              |
| Radiated Emission  | 9kHz ~ 30MHz        | 1.457            |
|                    | 30MHz ~ 1000MHz     | 6.300            |
|                    | 1000MHz ~ 18000MHz  | 5.474            |
|                    | 18000MHz ~ 26500MHz | 5.630            |
|                    | 26500MHz ~ 40000MHz | 5.054            |

## 2 EUT Description

|                           |                                                                                                                           |                   |                   |                       |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|-----------------------|
| Applicant                 | Comtrend Corporation<br>3F-1, No. 10, Lane 609, Chung Hsin Road, Section 5, San Chung Dist, New Taipei City 24159, Taiwan |                   |                   |                       |
| Manufacturer              | Comtrend Corporation<br>3F-1, No. 10, Lane 609, Chung Hsin Road, Section 5, San Chung Dist, New Taipei City 24159, Taiwan |                   |                   |                       |
| Product Type              | Multi-DSL Wireless Router                                                                                                 |                   |                   |                       |
| Trade Name                | COMTREND                                                                                                                  |                   |                   |                       |
| Model Number              | VR-3033u, VR-3033                                                                                                         |                   |                   |                       |
| Different Description     | Those number models differ from each other in selling region                                                              |                   |                   |                       |
| FCC ID                    | L9VVR-3033U                                                                                                               |                   |                   |                       |
| Operate Freq. Band        | Frequency Range (MHz)                                                                                                     | Modulation        | Channel Bandwidth | Data Rate 400 GI (ns) |
| IEEE 802.11b              | 2412 ~ 2462                                                                                                               | DSSS              | 20MHz             | Up to 11Mbps          |
| IEEE 802.11g              | 2412 ~ 2462                                                                                                               | OFDM (16/64QAM)   | 20MHz             | Up to 54Mbps          |
| IEEE 802.11n 2.4GHz 20MHz | 2412 ~ 2462                                                                                                               | OFDM (16/64QAM)   | 20MHz             | Up to 144.4Mbps       |
| IEEE 802.11n 2.4GHz 40MHz | 2422 ~ 2452                                                                                                               | OFDM (16/64QAM)   | 40MHz             | Up to 300Mbps         |
| Antenna Delivery          | See section 3.1                                                                                                           |                   |                   |                       |
| Antenna information       | ANT Port                                                                                                                  | Model Name        | Type              | Max. Gain (dBi)       |
|                           | ANT-0                                                                                                                     | EDA-1313-2G4C1-B4 | External Antenna  | 2.59 dBi              |
|                           | ANT-1                                                                                                                     | EDA-1313-2G4C1-B3 |                   | 2.63 dBi              |

| Frequency Band            | Max. RF Output Power (W) |
|---------------------------|--------------------------|
| IEEE 802.11b              | 0.136                    |
| IEEE 802.11g              | 0.415                    |
| IEEE 802.11n 2.4GHz 20MHz | 0.782                    |
| IEEE 802.11n 2.4GHz 40MHz | 0.632                    |

### 3 Test Methodology

#### 3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

| Test Mode                                   |
|---------------------------------------------|
| Mode 1: Normal operation mode               |
| Mode 2: IEEE 802.11b link mode              |
| Mode 3: IEEE 802.11g link mode              |
| Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode |
| Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode |

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

| Test Mode                                   | ANT-0 | ANT-1 | ANT-0+1 |
|---------------------------------------------|-------|-------|---------|
| Mode 2: IEEE 802.11b link mode              | V     | ---   | ---     |
| Mode 3: IEEE 802.11g link mode              | V     | V     | ---     |
| Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode | V     | V     | V       |
| Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode | V     | V     | V       |

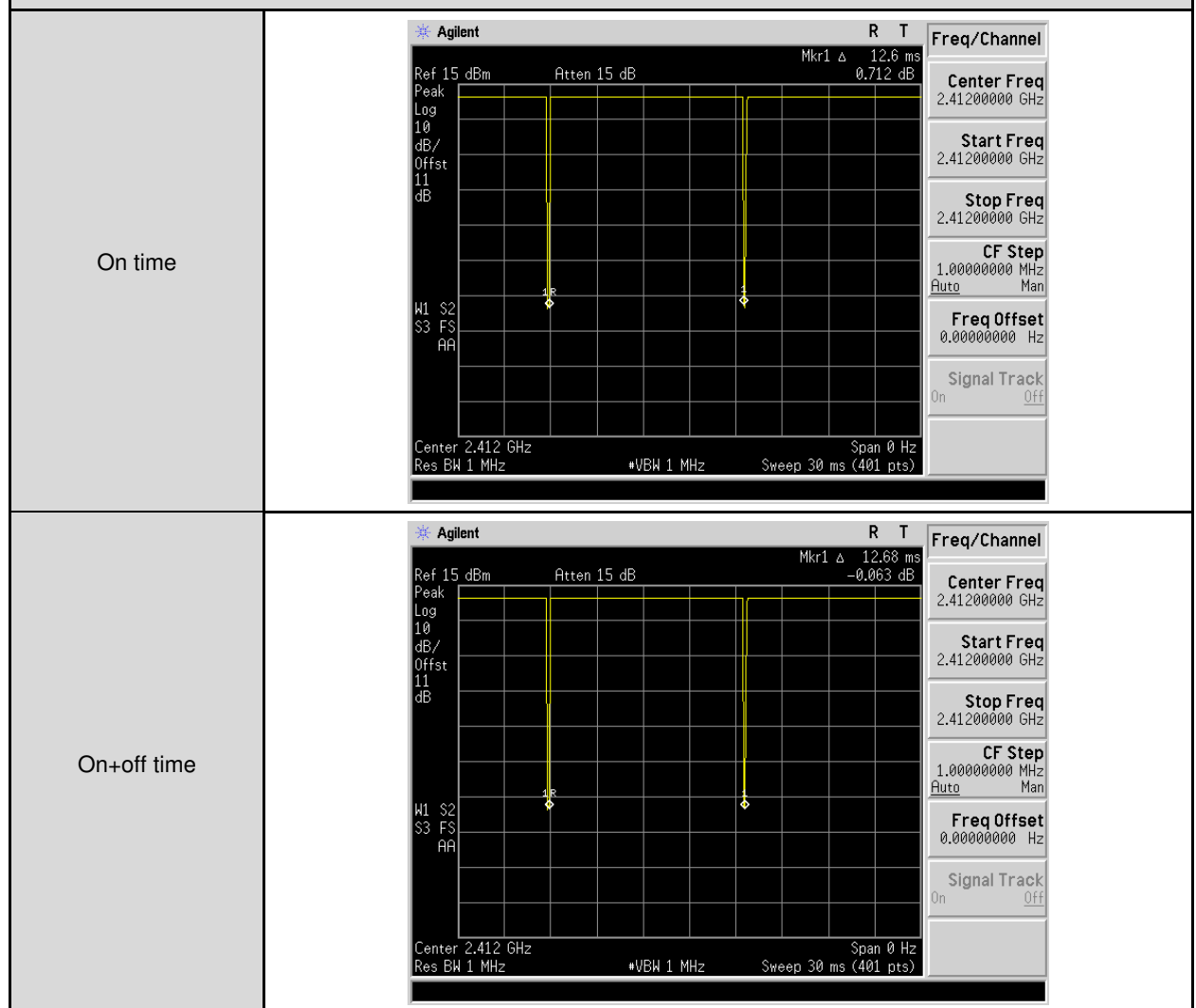
| Test Mode                                   | Antenna Delivery    | Test Channel | Data Rate |
|---------------------------------------------|---------------------|--------------|-----------|
| Mode 2: IEEE 802.11b link mode              | 1TX / 1RX           | 1, 6, 11     | 1         |
| Mode 3: IEEE 802.11g link mode              | 1TX / 1RX_Diversity | 1, 6, 11     | 6         |
| Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode | 2TX / 2RX_MIMO      | 1, 6, 11     | 13        |
| Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode | 2TX / 2RX_MIMO      | 3, 6, 9      | 27        |

#### Duty cycle

| Test Mode                                   | Frequency (MHz) | on time (ms) | on+off time (ms) | Duty cycle | Duty Factor (dB) | 1/T Minimum VBW (kHz) |
|---------------------------------------------|-----------------|--------------|------------------|------------|------------------|-----------------------|
| Mode 2: IEEE 802.11b link mode              | 2412.0          | 12.600       | 12.680           | 0.994      | 0.027            | 0.010                 |
| Mode 3: IEEE 802.11g link mode              | 2412.0          | 2.125        | 2.375            | 0.895      | 0.483            | 0.471                 |
| Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode | 2412.0          | 1.050        | 1.275            | 0.824      | 0.843            | 0.952                 |
| Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode | 2422.0          | 0.525        | 0.775            | 0.677      | 1.691            | 1.905                 |

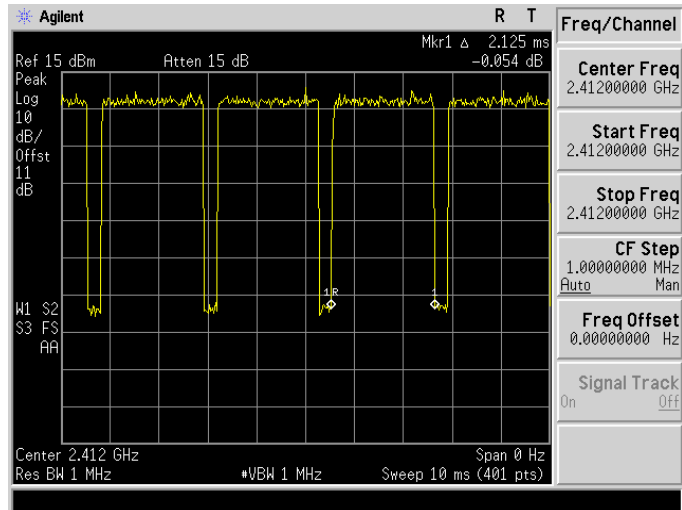
### Duty Cycle Graphs

Mode 2: IEEE 802.11b link mode

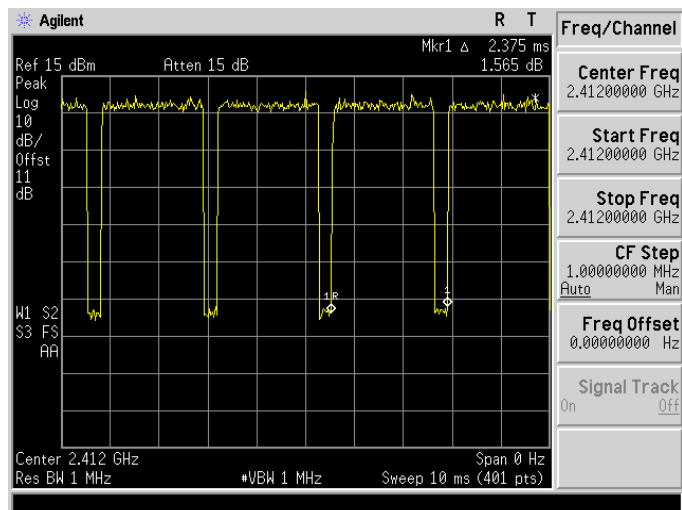


Mode 3: IEEE 802.11g Mode

On time

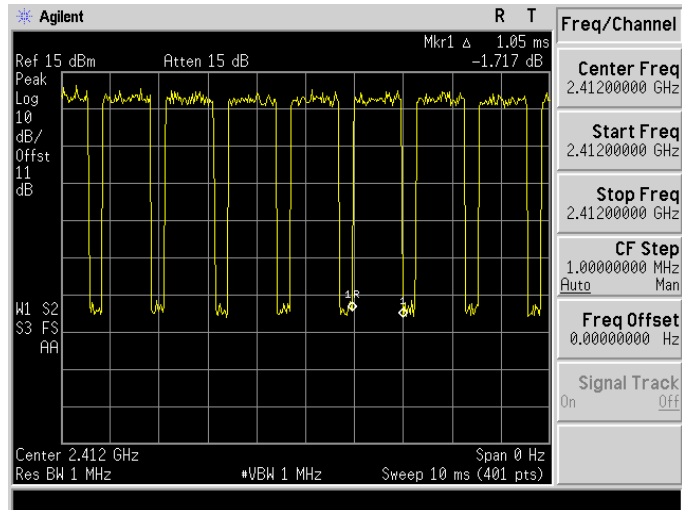


On+off time

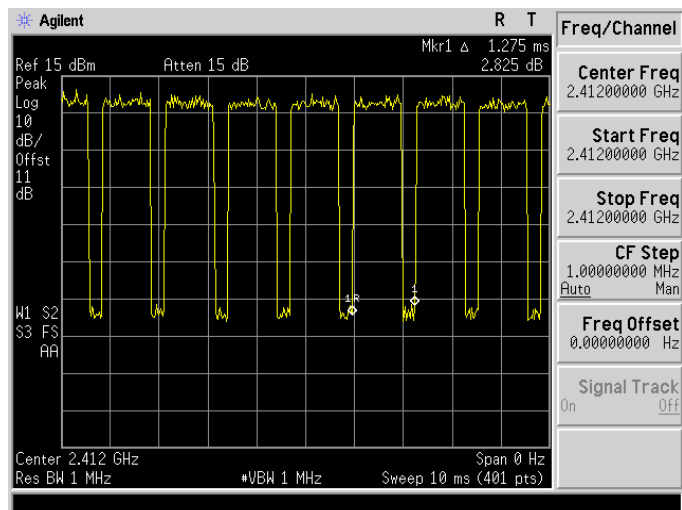


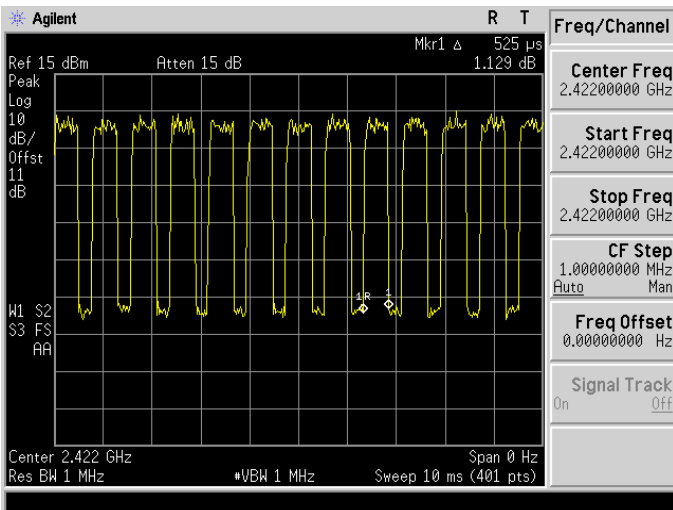
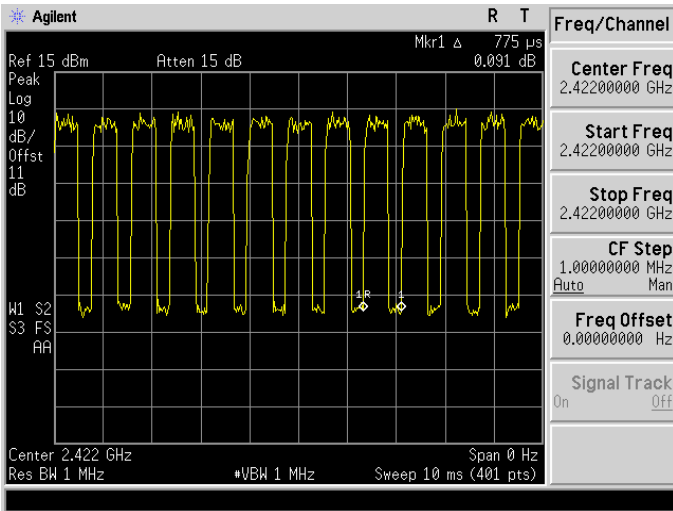
Mode 4: IEEE 802.11n 2.4GHz 20MHz Mode

On time



On+off time



| Mode 5: IEEE 802.11n 2.4GHz 40MHz Mode |                                                                                     |
|----------------------------------------|-------------------------------------------------------------------------------------|
| On time                                |   |
| On+off time                            |  |

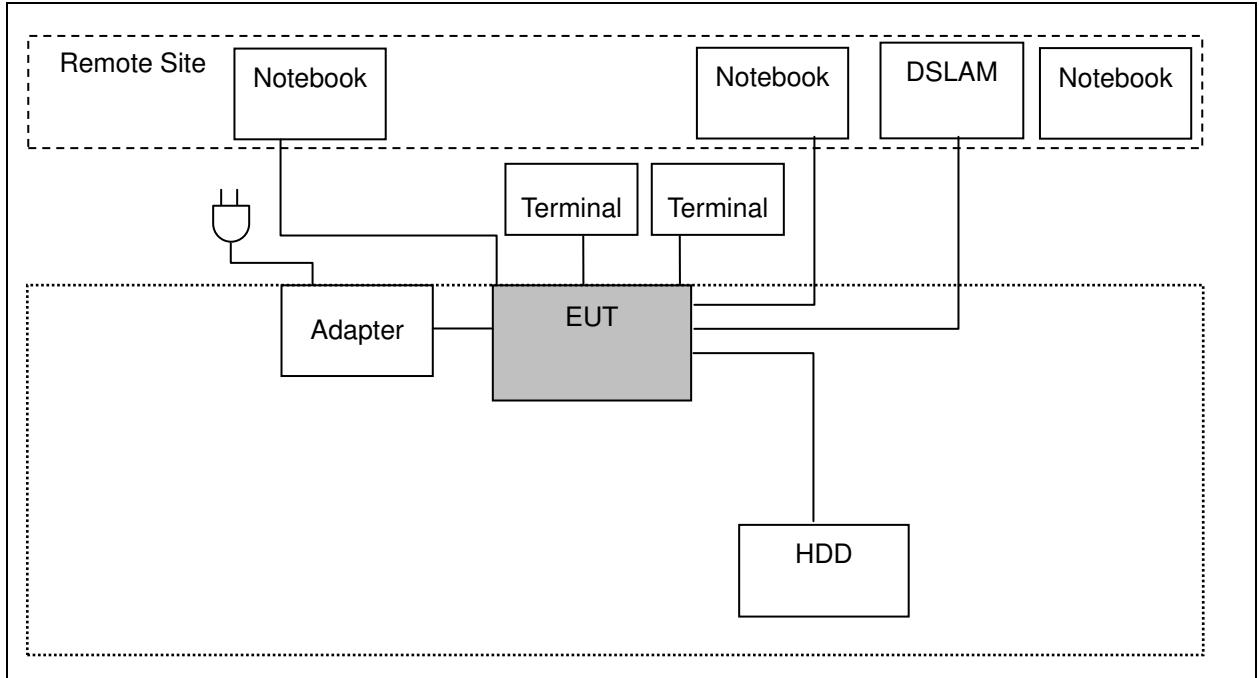
### 3.2. EUT Exercise Software

|    |                                     |
|----|-------------------------------------|
| 1. | Setup the EUT shown on 3.3.         |
| 2. | Turn on the power of all equipment. |
| 3. | Turn on Wi-Fi function.             |
| 4. | EUT run test program.               |

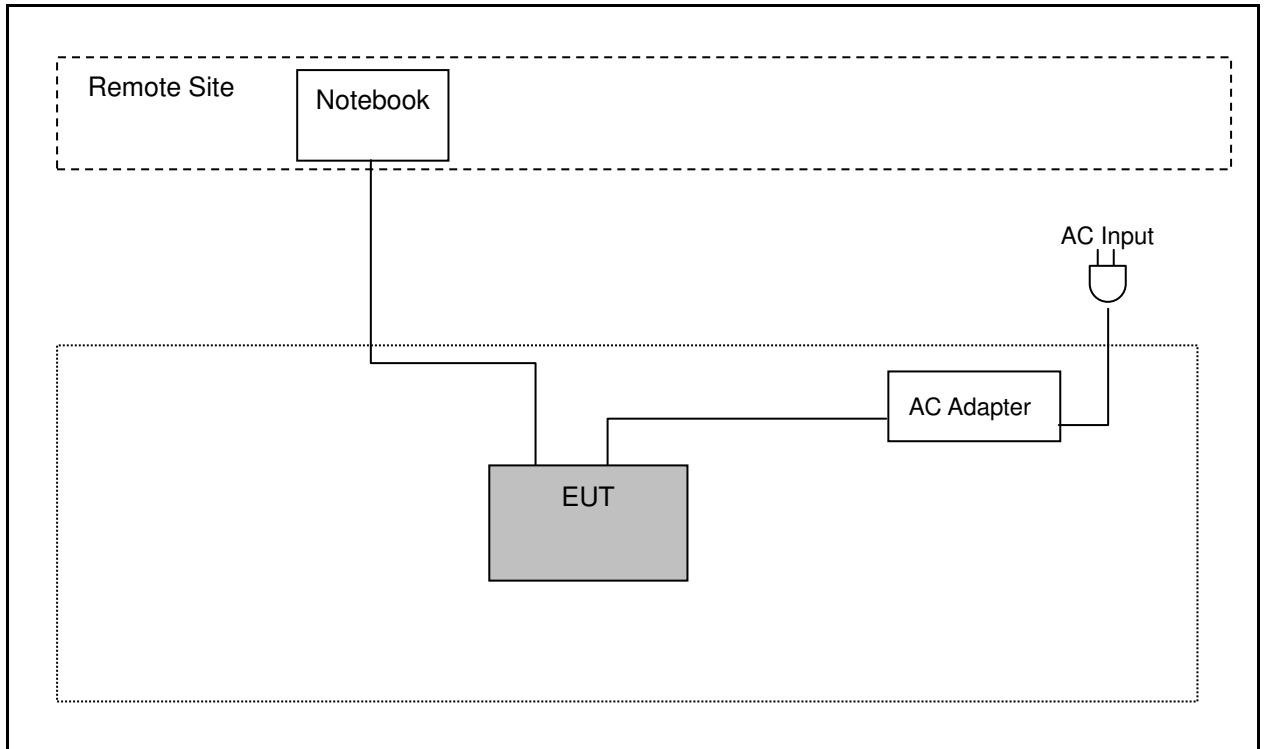
| Measurement Software |                          |
|----------------------|--------------------------|
| 1                    | EZ-EMC Ver. ATL-03A1-1   |
| 2                    | EZ-EMC Ver ATL-ITC-3A1-1 |

### 3.3. Configuration of Test System Details

#### Conducted Emissions



#### Radiated Emissions



**3.4. Test Site Environment**

| Items                      | Required (IEC 60068-1) | Actual |
|----------------------------|------------------------|--------|
| Temperature (°C)           | 15-35                  | 26     |
| Humidity (%RH)             | 25-75                  | 60     |
| Barometric pressure (mbar) | 860-1060               | 950    |

## 4 Conducted Emission Measurement

### 4.1. Limit

| Frequency (MHz) | Quasi-peak | Average  |
|-----------------|------------|----------|
| 0.15 - 0.5      | 66 to 56   | 56 to 46 |
| 0.50 - 5.0      | 56         | 46       |
| 5.0 - 30.0      | 60         | 50       |

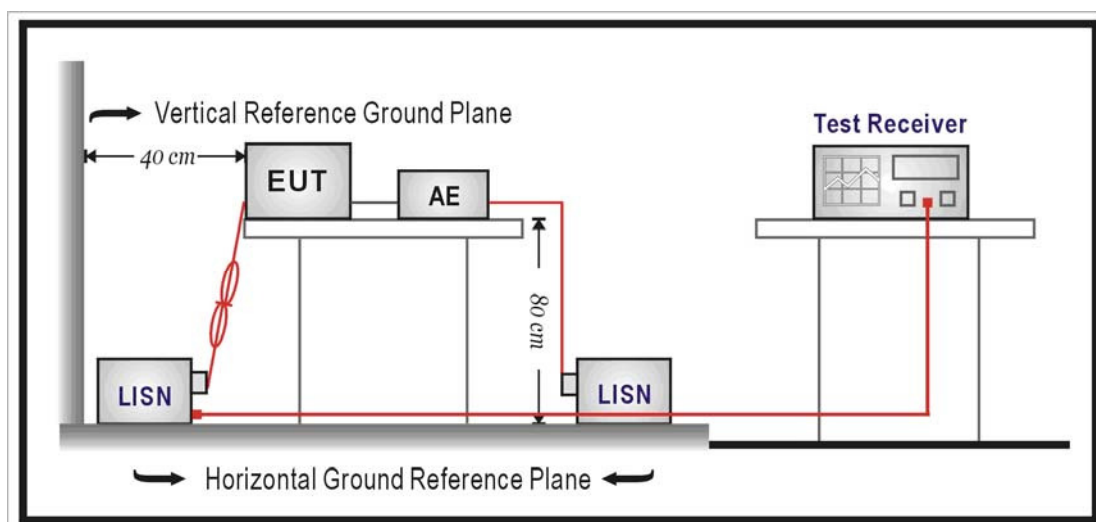
### 4.2. Test Instruments

| Describe      | Manufacturer | Model Number   | Serial Number | Cal. Date  | Remark |
|---------------|--------------|----------------|---------------|------------|--------|
| Test Receiver | R&S          | ESCI           | 100367        | 06/25/2015 | (1)    |
| LISN          | R&S          | ENV216         | 101040        | 03/10/2015 | (1)    |
| LISN          | R&S          | ENV216         | 101041        | 03/06/2015 | (1)    |
| RF Cable      | Woken        | 00100D1380194M | TE-02-02      | 06/26/2015 | (1)    |
| Test Site     | ATL          | TE02           | TE02          | N.C.R.     | -----  |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

### 4.3. Test Setup



#### **4.4. Test Procedure**

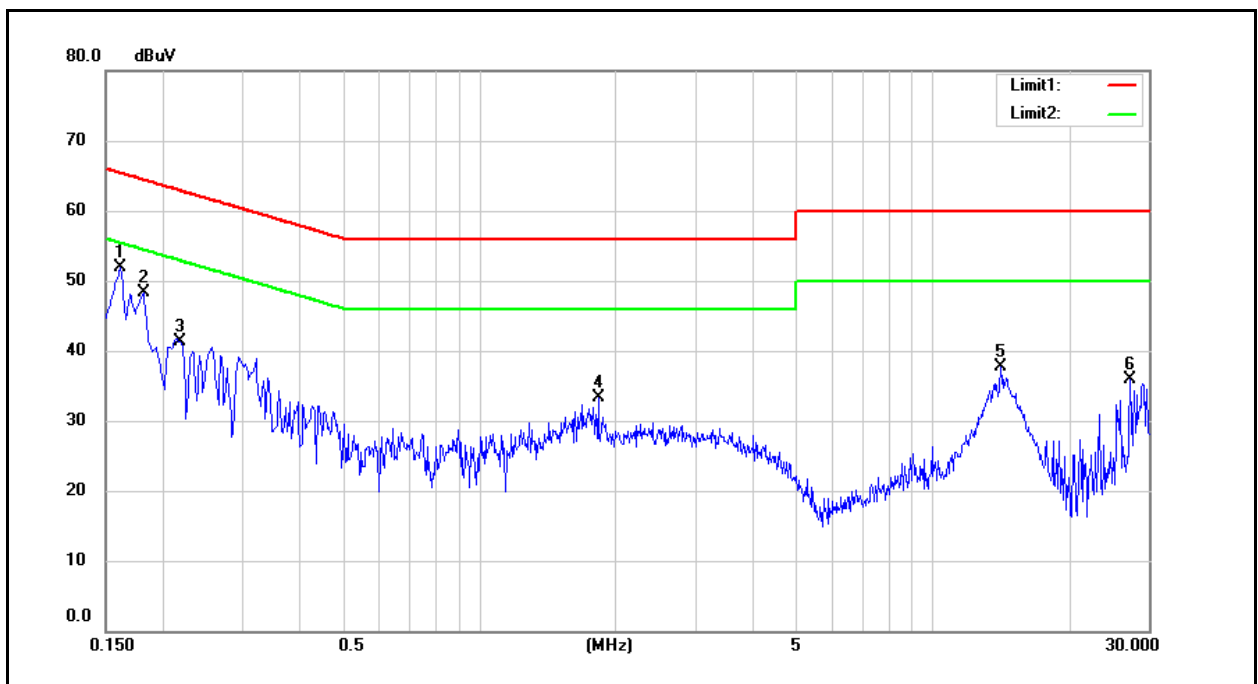
The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.

#### 4.5. Test Result

|               |                    |                      |              |
|---------------|--------------------|----------------------|--------------|
| Standard:     | FCC Part 15C       | Line:                | L1           |
| Test item:    | Conducted Emission | Power:               | AC 120V/60Hz |
| Model Number: | VR-3033u           | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | Mode 1             | Date:                | 01/08/2016   |
|               |                    | Test By:             | Eric Ou Yang |
| Description:  |                    |                      |              |

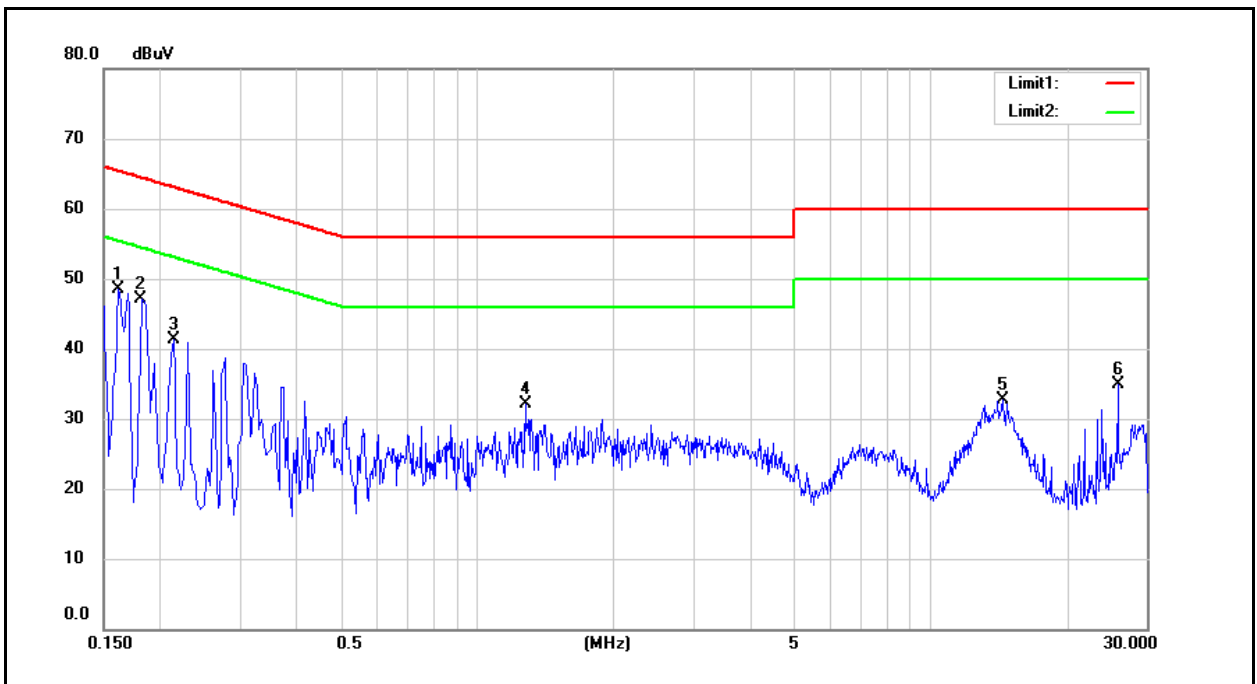


| No. | Frequency (MHz) | QP reading (dBuV) | AVG reading (dBuV) | Correction factor (dB) | QP result (dBuV) | AVG result (dBuV) | QP limit (dBuV) | AVG limit (dBuV) | QP margin (dB) | AVG margin (dB) | Remark |
|-----|-----------------|-------------------|--------------------|------------------------|------------------|-------------------|-----------------|------------------|----------------|-----------------|--------|
| 1   | 0.1620          | 32.19             | 9.83               | 9.69                   | 41.88            | 19.52             | 65.36           | 55.36            | -23.48         | -35.84          | Pass   |
| 2   | 0.1820          | 35.32             | 17.17              | 9.68                   | 45.00            | 26.85             | 64.39           | 54.39            | -19.39         | -27.54          | Pass   |
| 3   | 0.2208          | 30.53             | 15.05              | 9.68                   | 40.21            | 24.73             | 62.79           | 52.79            | -22.58         | -28.06          | Pass   |
| 4   | 1.8340          | 17.42             | 9.58               | 9.76                   | 27.18            | 19.34             | 56.00           | 46.00            | -28.82         | -26.66          | Pass   |
| 5   | 14.2020         | 20.25             | 12.49              | 10.01                  | 30.26            | 22.50             | 60.00           | 50.00            | -29.74         | -27.50          | Pass   |
| 6   | 27.3580         | 17.84             | 3.85               | 10.06                  | 27.90            | 13.91             | 60.00           | 50.00            | -32.10         | -36.09          | Pass   |

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

|               |                    |                      |              |
|---------------|--------------------|----------------------|--------------|
| Standard:     | FCC Part 15C       | Line:                | N            |
| Test item:    | Conducted Emission | Power:               | AC 120V/60Hz |
| Model Number: | VR-3033u           | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | Mode 1             | Date:                | 01/08/2016   |
|               |                    | Test By:             | Eric Ou Yang |
| Description:  |                    |                      |              |



| No. | Frequency (MHz) | QP reading (dBuV) | AVG reading (dBuV) | Correction factor (dB) | QP result (dBuV) | AVG result (dBuV) | QP limit (dBuV) | AVG limit (dBuV) | QP margin (dB) | AVG margin (dB) | Remark |
|-----|-----------------|-------------------|--------------------|------------------------|------------------|-------------------|-----------------|------------------|----------------|-----------------|--------|
| 1   | 0.1620          | 31.46             | 8.96               | 9.66                   | 41.12            | 18.62             | 65.36           | 55.36            | -24.24         | -36.74          | Pass   |
| 2   | 0.1820          | 34.76             | 16.77              | 9.65                   | 44.41            | 26.42             | 64.39           | 54.39            | -19.98         | -27.97          | Pass   |
| 3   | 0.2140          | 30.61             | 15.42              | 9.65                   | 40.26            | 25.07             | 63.05           | 53.05            | -22.79         | -27.98          | Pass   |
| 4   | 1.2780          | 17.72             | 10.46              | 9.70                   | 27.42            | 20.16             | 56.00           | 46.00            | -28.58         | -25.84          | Pass   |
| 5   | 14.4940         | 17.58             | 10.84              | 10.06                  | 27.64            | 20.90             | 60.00           | 50.00            | -32.36         | -29.10          | Pass   |
| 6   | 25.9540         | 18.78             | 2.99               | 10.21                  | 28.99            | 13.20             | 60.00           | 50.00            | -31.01         | -36.80          | Pass   |

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

## 5 Radiated Emission Measurement

### 5.1. Limit

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency<br>(MHz) | Field Strength<br>( $\mu\text{V}/\text{m}$ at 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                                |

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

### 5.2. Test Instruments

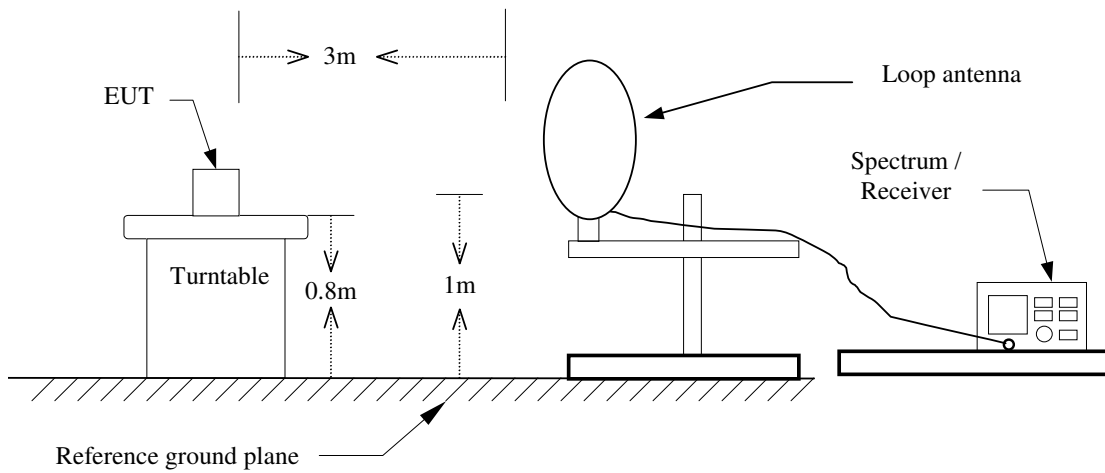
| 3 Meter Chamber                   |                                |                         |               |            |        |
|-----------------------------------|--------------------------------|-------------------------|---------------|------------|--------|
| Equipment                         | Manufacturer                   | Model Number            | Serial Number | Cal. Date  | Remark |
| RF Pre-selector                   | Agilent                        | N9039A                  | MY46520256    | 01/08/2016 | (1)    |
| Spectrum Analyzer                 | Agilent                        | E4446A                  | MY46180578    | 01/08/2016 | (1)    |
| Pre Amplifier                     | Agilent                        | 8449B                   | 3008A02237    | 10/07/2015 | (1)    |
| Pre Amplifier                     | Agilent                        | 8447D                   | 2944A10961    | 02/24/2015 | (1)    |
| Broadband Antenna<br>(30MHz~1GHz) | SCHWARZBECK<br>MESS-ELEKTRONIK | VULB9163                | 9163-270      | 08/11/2015 | (1)    |
| Horn Antenna<br>(1~18GHz)         | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA9120D               | 9120D-550     | 06/12/2015 | (1)    |
| Horn Antenna<br>(18~40GHz)        | ETS                            | 3116                    | 86467         | 09/01/2015 | (1)    |
| Loop Antenna                      | COM-POWER<br>CORPORATION       | AL-130                  | 121014        | 02/01/2016 | (1)    |
| Microwave Cable                   | EMCI                           | EMC102-KM-K<br>M-14000  | 151001        | 10/15/2015 | (1)    |
| Microwave Cable                   | EMCI                           | EMC-104-SM-S<br>M-14000 | 140202        | 10/15/2015 | (1)    |
| Microwave Cable                   | EMCI                           | EMC104-SM-S<br>M-600    | 140301        | 10/15/2015 | (1)    |
| Test Site                         | ATL                            | TE01                    | 888001        | 08/27/2015 | (1)    |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

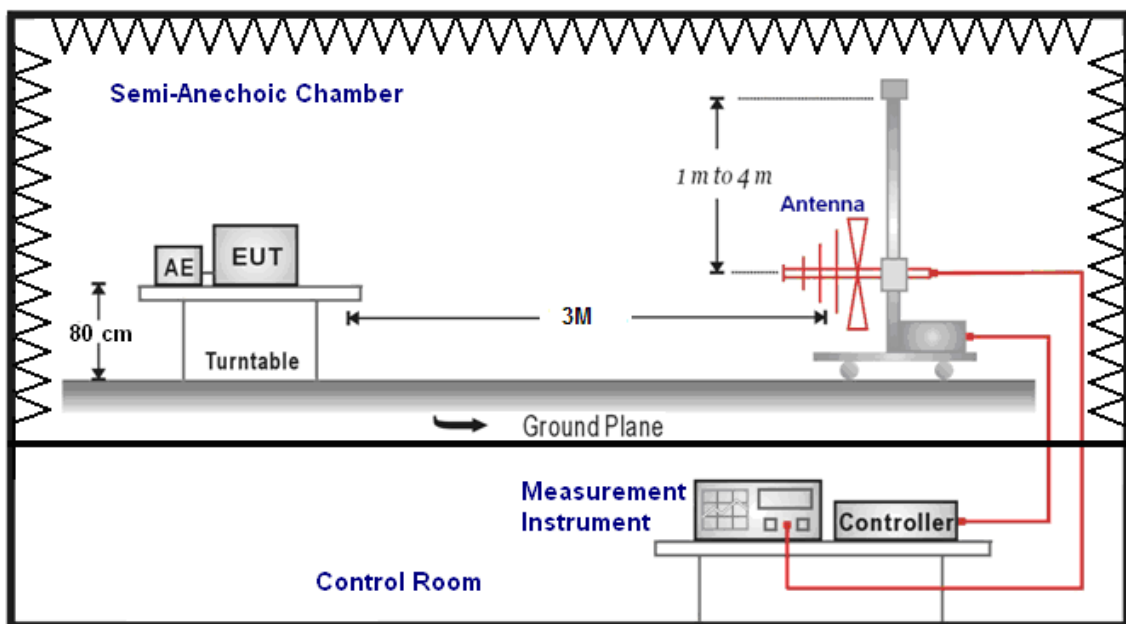
Note: N.C.R. = No Calibration Request.

### 5.3. Setup

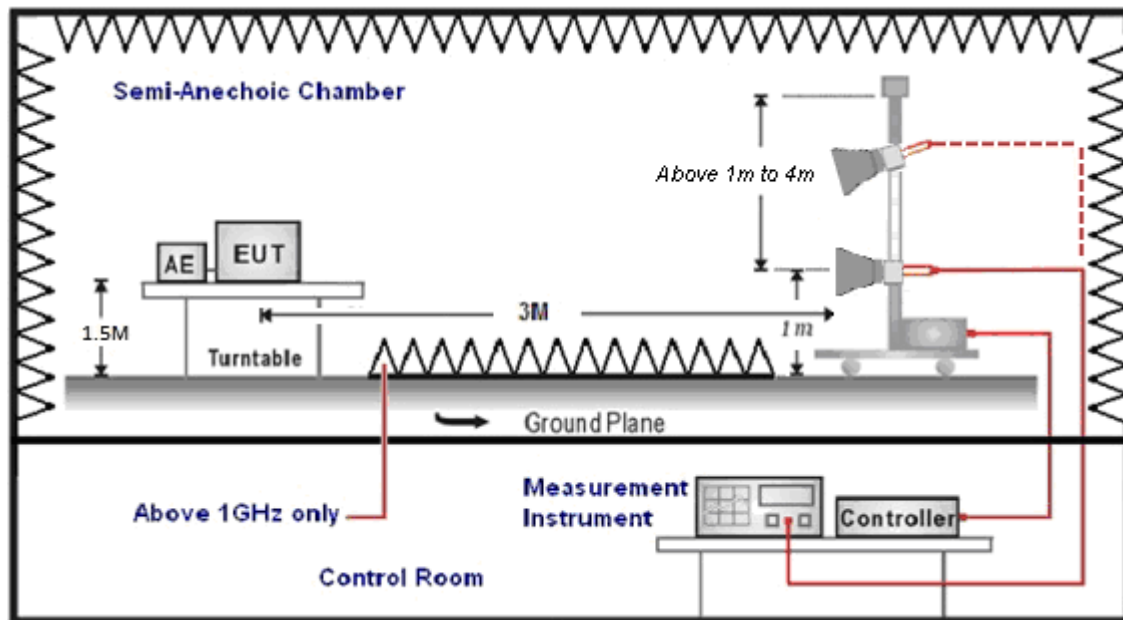
9kHz ~ 30MHz



Below 1GHz



Above 1GHz



## 5.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 or 1.5 meters height(below 1GHz use 0.8m turntable / above 1GHz use 1.5m turntable), top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements when Duty cycle >0.98 / 1/T for average measurements when Duty cycle <0.98. A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (model VULB9163) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 –26.5 GHz at a distance of 3 meter. The antenna at an angle toward the source of the emission. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro volts per meter (dBuV/m).

The actual field intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

$$(1) \text{ Amplitude (dBuV/m) = FI (dBuV) + AF (dBuV) + CL (dBuV) - Gain (dB)}$$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

$$(2) \text{ Actual Amplitude (dBuV/m) = Amplitude (dBuV) - Dis(dB)}$$

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30dBm

(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark 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.

## 5.5. Test Result

### Below 1GHz

| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | AC 120V/60Hz |                     |
| Model Number:      |                   | VR-3033u                 |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 1                   |                    | Date:                |                | 02/15/2016   |                     |
|                    |                   |                          |                    | Test By:             |                | Eric Ou Yang |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 143.4900           | 40.47             | -11.27                   | 29.20              | 43.50                | -14.30         | QP           | H                   |
| 299.6600           | 41.23             | -9.23                    | 32.00              | 46.00                | -14.00         | QP           | H                   |
| 494.6300           | 40.68             | -5.42                    | 35.26              | 46.00                | -10.74         | QP           | H                   |
| 600.3600           | 38.38             | -3.15                    | 35.23              | 46.00                | -10.77         | QP           | H                   |
| 800.1800           | 33.94             | 0.54                     | 34.48              | 46.00                | -11.52         | QP           | H                   |
| 948.5900           | 27.64             | 3.37                     | 31.01              | 46.00                | -14.99         | QP           | H                   |
|                    |                   |                          |                    |                      |                |              |                     |
| 159.0100           | 47.46             | -11.11                   | 36.35              | 43.50                | -7.15          | QP           | V                   |
| 236.6100           | 43.55             | -11.48                   | 32.07              | 46.00                | -13.93         | QP           | V                   |
| 497.5400           | 46.65             | -5.36                    | 41.29              | 46.00                | -4.71          | QP           | V                   |
| 522.7600           | 47.95             | -4.80                    | 43.15              | 46.00                | -2.85          | QP           | V                   |
| 600.3600           | 46.27             | -3.15                    | 43.12              | 46.00                | -2.88          | QP           | V                   |
| 800.1800           | 31.19             | 0.54                     | 31.73              | 46.00                | -14.27         | QP           | V                   |

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

**Above 1GHz**

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 2            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2412MHz           |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3149.000           | 54.24             | -12.40                   | 41.84              | 74.00                | -32.16         | peak   | H                   |
| 4822.000           | 56.99             | -7.91                    | 49.08              | 74.00                | -24.92         | peak   | H                   |
| 6698.000           | 50.76             | -2.94                    | 47.82              | 74.00                | -26.18         | peak   | H                   |
| 3051.000           | 54.81             | -12.82                   | 41.99              | 74.00                | -32.01         | peak   | V                   |
| 4824.000           | 60.87             | -7.90                    | 52.97              | 74.00                | -21.03         | peak   | V                   |
| 4824.000           | 57.88             | -7.90                    | 49.98              | 54.00                | -4.02          | AVG    | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 2            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2437MHz           |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3177.000           | 53.77             | -12.29                   | 41.48              | 74.00                | -32.52         | peak   | H                   |
| 4874.000           | 55.86             | -7.75                    | 48.11              | 74.00                | -25.89         | peak   | H                   |
| 6698.000           | 50.60             | -2.94                    | 47.66              | 74.00                | -26.34         | peak   | H                   |
| 3114.000           | 54.31             | -12.56                   | 41.75              | 74.00                | -32.25         | peak   | V                   |
| 4874.000           | 58.94             | -7.75                    | 51.19              | 74.00                | -22.81         | peak   | V                   |
| 6656.000           | 50.80             | -3.07                    | 47.73              | 74.00                | -26.27         | peak   | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 2            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2462MHz           |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3100.000           | 54.00             | -12.61                   | 41.39              | 74.00                | -32.61         | peak   | H                   |
| 4668.000           | 53.54             | -8.39                    | 45.15              | 74.00                | -28.85         | peak   | H                   |
| 6600.000           | 51.48             | -3.24                    | 48.24              | 74.00                | -25.76         | peak   | H                   |
| 3282.000           | 55.00             | -11.84                   | 43.16              | 74.00                | -30.84         | peak   | V                   |
| 4924.000           | 57.06             | -7.59                    | 49.47              | 74.00                | -24.53         | peak   | V                   |
| 6726.000           | 51.68             | -2.85                    | 48.83              | 74.00                | -25.17         | peak   | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 3            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2412MHz           |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3184.000           | 53.39             | -12.26                   | 41.13              | 74.00                | -32.87         | peak   | H                   |
| 4824.000           | 53.85             | -7.90                    | 45.95              | 74.00                | -28.05         | peak   | H                   |
| 6642.000           | 50.27             | -3.11                    | 47.16              | 74.00                | -26.84         | peak   | H                   |
| 3023.000           | 54.65             | -12.95                   | 41.70              | 74.00                | -32.30         | peak   | V                   |
| 4824.000           | 59.03             | -7.90                    | 51.13              | 74.00                | -22.87         | peak   | V                   |
| 6957.000           | 50.39             | -2.14                    | 48.25              | 74.00                | -25.75         | peak   | V                   |

| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | AC 120V/60Hz |                     |
| Model Number:      |                   | VR-3033u                 |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 3                   |                    | Date:                |                | 02/15/2016   |                     |
| Frequency:         |                   | 2437MHz                  |                    | Test By:             |                | Eric Ou Yang |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 3198.000           | 54.29             | -12.19                   | 42.10              | 74.00                | -31.90         | peak         | H                   |
| 4668.000           | 52.47             | -8.39                    | 44.08              | 74.00                | -29.92         | peak         | H                   |
| 6698.000           | 50.83             | -2.94                    | 47.89              | 74.00                | -26.11         | peak         | H                   |
| 3107.000           | 54.15             | -12.58                   | 41.57              | 74.00                | -32.43         | peak         | V                   |
| 4874.000           | 56.09             | -7.75                    | 48.34              | 74.00                | -25.66         | peak         | V                   |
| 6537.000           | 51.13             | -3.43                    | 47.70              | 74.00                | -26.30         | peak         | V                   |

| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | AC 120V/60Hz |                     |
| Model Number:      |                   | VR-3033u                 |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 3                   |                    | Date:                |                | 02/15/2016   |                     |
| Frequency:         |                   | 2462MHz                  |                    | Test By:             |                | Eric Ou Yang |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 3023.000           | 54.40             | -12.95                   | 41.45              | 74.00                | -32.55         | peak         | H                   |
| 4402.000           | 52.78             | -9.09                    | 43.69              | 74.00                | -30.31         | peak         | H                   |
| 6628.000           | 50.90             | -3.15                    | 47.75              | 74.00                | -26.25         | peak         | H                   |
|                    |                   |                          |                    |                      |                |              |                     |
| 3065.000           | 54.43             | -12.76                   | 41.67              | 74.00                | -32.33         | peak         | V                   |
| 4924.000           | 55.20             | -7.59                    | 47.61              | 74.00                | -26.39         | peak         | V                   |
| 6649.000           | 51.26             | -3.09                    | 48.17              | 74.00                | -25.83         | peak         | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 4            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2412MHz           |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3128.000           | 54.07             | -12.50                   | 41.57              | 74.00                | -32.43         | peak   | H                   |
| 4824.000           | 53.74             | -7.90                    | 45.84              | 74.00                | -28.16         | peak   | H                   |
| 6677.000           | 51.30             | -3.01                    | 48.29              | 74.00                | -25.71         | peak   | H                   |
| 3037.000           | 54.56             | -12.89                   | 41.67              | 74.00                | -32.33         | peak   | V                   |
| 4824.000           | 55.85             | -7.90                    | 47.95              | 74.00                | -26.05         | peak   | V                   |
| 6691.000           | 50.60             | -2.96                    | 47.64              | 74.00                | -26.36         | peak   | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 4            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2437MHz           |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 2939.000           | 54.30             | -13.19                   | 41.11              | 74.00                | -32.89         | peak   | H                   |
| 4486.000           | 53.10             | -8.94                    | 44.16              | 74.00                | -29.84         | peak   | H                   |
| 6705.000           | 51.12             | -2.91                    | 48.21              | 74.00                | -25.79         | peak   | H                   |
| 2960.000           | 55.63             | -13.14                   | 42.49              | 74.00                | -31.51         | peak   | V                   |
| 4874.000           | 56.12             | -7.75                    | 48.37              | 74.00                | -25.63         | peak   | V                   |
| 6474.000           | 51.75             | -3.66                    | 48.09              | 74.00                | -25.91         | peak   | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 4            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2462MHz           |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3100.000           | 54.94             | -12.61                   | 42.33              | 74.00                | -31.67         | peak   | H                   |
| 4472.000           | 53.33             | -8.96                    | 44.37              | 74.00                | -29.63         | peak   | H                   |
| 6789.000           | 51.65             | -2.66                    | 48.99              | 74.00                | -25.01         | peak   | H                   |
| 3282.000           | 54.02             | -11.84                   | 42.18              | 74.00                | -31.82         | peak   | V                   |
| 4924.000           | 54.23             | -7.59                    | 46.64              | 74.00                | -27.36         | peak   | V                   |
| 6691.000           | 50.85             | -2.96                    | 47.89              | 74.00                | -26.11         | peak   | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 5            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2422MHz           |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3121.000           | 54.18             | -12.53                   | 41.65              | 74.00                | -32.35         | peak   | H                   |
| 4844.000           | 53.03             | -7.83                    | 45.20              | 74.00                | -28.80         | peak   | H                   |
| 6628.000           | 50.99             | -3.15                    | 47.84              | 74.00                | -26.16         | peak   | H                   |
| 3044.000           | 55.14             | -12.86                   | 42.28              | 74.00                | -31.72         | peak   | V                   |
| 4844.000           | 54.39             | -7.83                    | 46.56              | 74.00                | -27.44         | peak   | V                   |
| 6698.000           | 51.44             | -2.94                    | 48.50              | 74.00                | -25.50         | peak   | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 5            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2437MHz           |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 2953.000           | 54.59             | -13.17                   | 41.42              | 74.00                | -32.58         | peak   | H                   |
| 4675.000           | 53.24             | -8.37                    | 44.87              | 74.00                | -29.13         | peak   | H                   |
| 6698.000           | 51.32             | -2.94                    | 48.38              | 74.00                | -25.62         | peak   | H                   |
| 3212.000           | 54.88             | -12.15                   | 42.73              | 74.00                | -31.27         | peak   | V                   |
| 4874.000           | 53.28             | -7.75                    | 45.53              | 74.00                | -28.47         | peak   | V                   |
| 6614.000           | 50.72             | -3.19                    | 47.53              | 74.00                | -26.47         | peak   | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 5            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2452MHz           |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3023.000           | 53.93             | -12.95                   | 40.98              | 74.00                | -33.02         | peak   | H                   |
| 4682.000           | 52.20             | -8.34                    | 43.86              | 74.00                | -30.14         | peak   | H                   |
| 6740.000           | 50.28             | -2.82                    | 47.46              | 74.00                | -26.54         | peak   | H                   |
| 3268.000           | 55.54             | -11.91                   | 43.63              | 74.00                | -30.37         | peak   | V                   |
| 4787.000           | 52.92             | -8.01                    | 44.91              | 74.00                | -29.09         | peak   | V                   |
| 6754.000           | 50.91             | -2.77                    | 48.14              | 74.00                | -25.86         | peak   | V                   |

**Band Edge**

|                    |                   |                          |                    |                      |                |              |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | AC 120V/60Hz |                     |
| Model Number:      |                   | VR-3033u                 |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 2                   |                    | Date:                |                | 02/15/2016   |                     |
| Frequency:         |                   | 2412 MHz                 |                    | Test By:             |                | Eric Ou Yang |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 2376.660           | 53.46             | -0.38                    | 53.08              | 74.00                | -20.92         | peak         | H                   |
| 2376.660           | 45.83             | -0.38                    | 45.45              | 54.00                | -8.55          | AVG          | H                   |
| 2390.000           | 51.46             | -0.33                    | 51.13              | 74.00                | -22.87         | peak         | H                   |
| 2387.770           | 58.27             | -0.33                    | 57.94              | 74.00                | -16.06         | peak         | V                   |
| 2387.770           | 46.90             | -0.33                    | 46.57              | 54.00                | -7.43          | AVG          | V                   |
| 2390.000           | 56.50             | -0.33                    | 56.17              | 74.00                | -17.83         | peak         | V                   |
| 2390.000           | 47.45             | -0.33                    | 47.12              | 54.00                | -6.88          | AVG          | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 2            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2462 MHz          |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 2483.500           | 53.30             | 0.03                     | 53.33              | 74.00                | -20.67         | peak   | H                   |
| 2483.500           | 45.64             | 0.03                     | 45.67              | 54.00                | -8.33          | AVG    | H                   |
| 2490.440           | 55.45             | 0.06                     | 55.51              | 74.00                | -18.49         | peak   | H                   |
| 2490.440           | 44.29             | 0.06                     | 44.35              | 54.00                | -9.65          | AVG    | H                   |
|                    |                   |                          |                    |                      |                |        |                     |
| 2483.500           | 58.64             | 0.03                     | 58.67              | 74.00                | -15.33         | peak   | V                   |
| 2483.500           | 48.10             | 0.03                     | 48.13              | 54.00                | -5.87          | AVG    | V                   |
| 2489.440           | 60.12             | 0.05                     | 60.17              | 74.00                | -13.83         | peak   | V                   |
| 2489.440           | 47.77             | 0.05                     | 47.82              | 54.00                | -6.18          | AVG    | V                   |

| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | AC 120V/60Hz |                     |
| Model Number:      |                   | VR-3033u                 |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 3                   |                    | Date:                |                | 02/15/2016   |                     |
| Frequency:         |                   | 2412 MHz                 |                    | Test By:             |                | Eric Ou Yang |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 2389.750           | 58.22             | -0.33                    | 57.89              | 74.00                | -16.11         | peak         | H                   |
| 2389.750           | 44.43             | -0.33                    | 44.10              | 54.00                | -9.90          | AVG          | H                   |
| 2390.000           | 59.21             | -0.33                    | 58.88              | 74.00                | -15.12         | peak         | H                   |
| 2390.000           | 44.59             | -0.33                    | 44.26              | 54.00                | -9.74          | AVG          | H                   |
|                    |                   |                          |                    |                      |                |              |                     |
| 2388.100           | 58.30             | -0.33                    | 57.97              | 74.00                | -16.03         | peak         | V                   |
| 2388.100           | 44.71             | -0.33                    | 44.38              | 54.00                | -9.62          | AVG          | V                   |
| 2390.000           | 58.23             | -0.33                    | 57.90              | 74.00                | -16.10         | peak         | V                   |
| 2390.000           | 45.23             | -0.33                    | 44.90              | 54.00                | -9.10          | AVG          | V                   |

|                    |                   |                          |                    |                      |                |              |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | AC 120V/60Hz |                     |
| Model Number:      |                   | VR-3033u                 |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 3                   |                    | Date:                |                | 02/15/2016   |                     |
| Frequency:         |                   | 2462 MHz                 |                    | Test By:             |                | Eric Ou Yang |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 2483.500           | 53.35             | 0.03                     | 53.38              | 74.00                | -20.62         | peak         | H                   |
| 2483.500           | 44.42             | 0.03                     | 44.45              | 54.00                | -9.55          | AVG          | H                   |
| 2484.240           | 53.86             | 0.03                     | 53.89              | 74.00                | -20.11         | peak         | H                   |
| 2484.240           | 44.23             | 0.03                     | 44.26              | 54.00                | -9.74          | AVG          | H                   |
|                    |                   |                          |                    |                      |                |              |                     |
| 2483.500           | 56.32             | 0.03                     | 56.35              | 74.00                | -17.65         | peak         | V                   |
| 2483.500           | 45.16             | 0.03                     | 45.19              | 54.00                | -8.81          | AVG          | V                   |
| 2483.840           | 58.26             | 0.03                     | 58.29              | 74.00                | -15.71         | peak         | V                   |
| 2483.840           | 45.05             | 0.03                     | 45.08              | 54.00                | -8.92          | AVG          | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | AC 120V/60Hz   |        |                     |
| Model Number:      | VR-3033u          |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 4            |                          |                    | Date:                | 02/15/2016     |        |                     |
| Frequency:         | 2412 MHz          |                          |                    | Test By:             | Eric Ou Yang   |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 2389.750           | 58.06             | -0.33                    | 57.73              | 74.00                | -16.27         | peak   | H                   |
| 2389.750           | 45.25             | -0.33                    | 44.92              | 54.00                | -9.08          | AVG    | H                   |
| 2390.000           | 55.47             | -0.33                    | 55.14              | 74.00                | -18.86         | peak   | H                   |
| 2390.000           | 45.39             | -0.33                    | 45.06              | 54.00                | -8.94          | AVG    | H                   |
|                    |                   |                          |                    |                      |                |        |                     |
| 2389.530           | 63.15             | -0.33                    | 62.82              | 74.00                | -11.18         | peak   | V                   |
| 2389.530           | 47.83             | -0.33                    | 47.50              | 54.00                | -6.50          | AVG    | V                   |
| 2390.000           | 61.77             | -0.33                    | 61.44              | 74.00                | -12.56         | peak   | V                   |
| 2390.000           | 47.91             | -0.33                    | 47.58              | 54.00                | -6.42          | AVG    | V                   |

| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | AC 120V/60Hz |                     |
| Model Number:      |                   | VR-3033u                 |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 4                   |                    | Date:                |                | 02/15/2016   |                     |
| Frequency:         |                   | 2462 MHz                 |                    | Test By:             |                | Eric Ou Yang |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 2483.500           | 52.35             | 0.03                     | 52.38              | 74.00                | -21.62         | peak         | H                   |
| 2483.500           | 45.07             | 0.03                     | 45.10              | 54.00                | -8.90          | AVG          | H                   |
| 2484.840           | 55.41             | 0.03                     | 55.44              | 74.00                | -18.56         | peak         | H                   |
| 2484.840           | 44.82             | 0.03                     | 44.85              | 54.00                | -9.15          | AVG          | H                   |
|                    |                   |                          |                    |                      |                |              |                     |
| 2483.500           | 57.55             | 0.03                     | 57.58              | 74.00                | -16.42         | peak         | V                   |
| 2483.500           | 47.09             | 0.03                     | 47.12              | 54.00                | -6.88          | AVG          | V                   |
| 2489.840           | 59.96             | 0.05                     | 60.01              | 74.00                | -13.99         | peak         | V                   |
| 2489.840           | 46.92             | 0.05                     | 46.97              | 54.00                | -7.03          | AVG          | V                   |

|                    |                   |                          |                    |                      |                |              |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | AC 120V/60Hz |                     |
| Model Number:      |                   | VR-3033u                 |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 5                   |                    | Date:                |                | 02/15/2016   |                     |
| Frequency:         |                   | 2422 MHz                 |                    | Test By:             |                | Eric Ou Yang |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 2386.680           | 61.12             | -0.34                    | 60.78              | 74.00                | -13.22         | peak         | H                   |
| 2386.680           | 45.97             | -0.34                    | 45.63              | 54.00                | -8.37          | AVG          | H                   |
| 2390.000           | 56.85             | -0.33                    | 56.52              | 74.00                | -17.48         | peak         | H                   |
| 2390.000           | 45.79             | -0.33                    | 45.46              | 54.00                | -8.54          | AVG          | H                   |
|                    |                   |                          |                    |                      |                |              |                     |
| 2386.560           | 65.17             | -0.34                    | 64.83              | 74.00                | -9.17          | peak         | V                   |
| 2386.560           | 47.76             | -0.34                    | 47.42              | 54.00                | -6.58          | AVG          | V                   |
| 2390.000           | 60.75             | -0.33                    | 60.42              | 74.00                | -13.58         | peak         | V                   |
| 2390.000           | 47.59             | -0.33                    | 47.26              | 54.00                | -6.74          | AVG          | V                   |

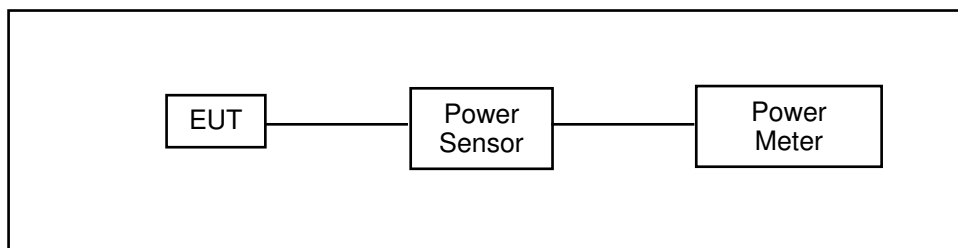
| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | AC 120V/60Hz |                     |
| Model Number:      |                   | VR-3033u                 |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 5                   |                    | Date:                |                | 02/15/2016   |                     |
| Frequency:         |                   | 2452 MHz                 |                    | Test By:             |                | Eric Ou Yang |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 2483.500           | 53.72             | 0.03                     | 53.75              | 74.00                | -20.25         | peak         | H                   |
| 2483.500           | 45.62             | 0.03                     | 45.65              | 54.00                | -8.35          | AVG          | H                   |
| 2484.600           | 55.48             | 0.03                     | 55.51              | 74.00                | -18.49         | peak         | H                   |
| 2484.600           | 45.38             | 0.03                     | 45.41              | 54.00                | -8.59          | AVG          | H                   |
|                    |                   |                          |                    |                      |                |              |                     |
| 2483.500           | 61.07             | 0.03                     | 61.10              | 74.00                | -12.90         | peak         | V                   |
| 2483.500           | 48.60             | 0.03                     | 48.63              | 54.00                | -5.37          | AVG          | V                   |
| 2485.900           | 62.54             | 0.03                     | 62.57              | 74.00                | -11.43         | peak         | V                   |
| 2485.900           | 47.51             | 0.03                     | 47.54              | 54.00                | -6.46          | AVG          | V                   |

## 6 Maximum Conducted Output Power Measurement

### 6.1. Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for maximum output power is 30dBm.

### 6.2. Test Setup



### 6.3. Test Instruments

| Equipment                      | Manufacturer | Model Number      | Serial Number | Cal. Date  | Cal. Period |
|--------------------------------|--------------|-------------------|---------------|------------|-------------|
| Single Channel PK Power Sensor | Agilent      | N1911A            | MY45101619    | 12/11/2015 | (1)         |
| Wideband Power Meter           | Agilent      | N1921A            | MY45241957    | 12/11/2015 | (1)         |
| Microwave Cable                | EMCI         | EMC104-SM-SM-1500 | 140303        | 02/24/2015 | (1)         |
| Test Site                      | ATL          | TE05              | TE05          | N.C.R.     | -----       |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

### 6.4. Test Procedure

The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor. The maximum output power shall not exceed 1 watt.

Use a direct connection between the antenna port of transmitter and the power sensor, for prevent the power sensor input attenuation 40-50 dB. Set the RBW Bandwidth of the emission or use a channel power meter mode.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm). For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6)/3 dBm.

The antenna port of the EUT was connected to the input of a power sensor. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

## 6.5. Test Result

| Model Number | VR-3033u                       |           |                      |       |                     |              |       |
|--------------|--------------------------------|-----------|----------------------|-------|---------------------|--------------|-------|
| Test Item    | Maximum Conducted Output Power |           |                      |       |                     |              |       |
| Date of Test | 01/08/2016                     |           |                      |       |                     |              |       |
| ANT-0        |                                |           |                      |       |                     |              |       |
| Test Mode    | Frequency<br>(MHz)             | Data Rate | Average Output Power |       | Peak Output Power   |              |       |
|              |                                |           | Measurement Results  |       | Measurement Results |              | Limit |
|              |                                |           | dBm                  | W     | dBm                 | W            | dBm   |
| Mode 2       | 2412                           | 1M        | 17.26                | 0.053 | 21.25               | 0.133        | < 30  |
|              | 2437                           |           | 17.30                | 0.054 | <b>21.33</b>        | <b>0.136</b> | < 30  |
|              | 2462                           |           | 17.16                | 0.052 | 21.12               | 0.129        | < 30  |
|              | 2437                           | 2M        | 17.25                | 0.053 | 21.23               | 0.133        | < 30  |
|              | 2437                           | 5.5M      | 17.21                | 0.053 | 21.18               | 0.131        | < 30  |
|              | 2437                           | 11M       | 17.14                | 0.052 | 21.08               | 0.128        | < 30  |
| Mode 3       | 2412                           | 6M        | 16.15                | 0.041 | <b>26.18</b>        | <b>0.415</b> | < 30  |
|              | 2437                           |           | 15.98                | 0.040 | 26.00               | 0.398        | < 30  |
|              | 2462                           |           | 15.86                | 0.039 | 25.90               | 0.389        | < 30  |
|              | 2437                           | 9M        | 15.95                | 0.039 | 25.98               | 0.396        | < 30  |
|              | 2437                           | 12M       | 15.93                | 0.039 | 25.97               | 0.395        | < 30  |
|              | 2437                           | 18M       | 15.88                | 0.039 | 25.94               | 0.393        | < 30  |
|              | 2437                           | 24M       | 15.80                | 0.038 | 25.86               | 0.385        | < 30  |
|              | 2437                           | 36M       | 15.75                | 0.038 | 25.83               | 0.383        | < 30  |
|              | 2437                           | 48M       | 15.72                | 0.037 | 25.81               | 0.381        | < 30  |
|              | 2437                           | 54M       | 15.66                | 0.037 | 25.78               | 0.378        | < 30  |

| Model Number | VR-3033u                       |           |                      |       |                     |       |       |
|--------------|--------------------------------|-----------|----------------------|-------|---------------------|-------|-------|
| Test Item    | Maximum Conducted Output Power |           |                      |       |                     |       |       |
| Date of Test | 01/08/2016                     |           |                      |       |                     |       |       |
| ANT-0        |                                |           |                      |       |                     |       |       |
| Test Mode    | Frequency<br>(MHz)             | Data Rate | Average Output Power |       | Peak Output Power   |       |       |
|              |                                |           | Measurement Results  |       | Measurement Results |       | Limit |
|              |                                |           | dBm                  | W     | dBm                 | W     | dBm   |
| Mode 4       | 2412                           | 13M       | 16.39                | 0.044 | 26.47               | 0.444 | < 30  |
|              | 2437                           |           | 16.25                | 0.042 | 26.30               | 0.427 | < 30  |
|              | 2462                           |           | 15.93                | 0.039 | 25.96               | 0.394 | < 30  |
|              | 2437                           | 26M       | 16.21                | 0.042 | 26.25               | 0.422 | < 30  |
|              | 2437                           | 39M       | 16.14                | 0.041 | 26.16               | 0.413 | < 30  |
|              | 2437                           | 52M       | 16.10                | 0.041 | 26.14               | 0.411 | < 30  |
|              | 2437                           | 78M       | 16.07                | 0.040 | 26.10               | 0.407 | < 30  |
|              | 2437                           | 104M      | 16.02                | 0.040 | 26.08               | 0.406 | < 30  |
|              | 2437                           | 117M      | 15.99                | 0.040 | 26.02               | 0.400 | < 30  |
|              | 2437                           | 130M      | 15.95                | 0.039 | 25.98               | 0.396 | < 30  |
| Mode 5       | 2422                           | 27M       | 15.14                | 0.033 | 25.28               | 0.337 | < 30  |
|              | 2437                           |           | 14.91                | 0.031 | 25.10               | 0.324 | < 30  |
|              | 2452                           |           | 15.05                | 0.032 | 25.17               | 0.329 | < 30  |
|              | 2437                           | 54M       | 14.89                | 0.031 | 25.06               | 0.321 | < 30  |
|              | 2437                           | 81M       | 14.82                | 0.030 | 25.01               | 0.317 | < 30  |
|              | 2437                           | 108M      | 14.76                | 0.030 | 24.95               | 0.313 | < 30  |
|              | 2437                           | 162M      | 14.74                | 0.030 | 24.90               | 0.309 | < 30  |
|              | 2437                           | 216M      | 14.68                | 0.029 | 24.84               | 0.305 | < 30  |
|              | 2437                           | 243M      | 14.62                | 0.029 | 24.75               | 0.299 | < 30  |
|              | 2437                           | 135M      | 14.57                | 0.029 | 24.65               | 0.292 | < 30  |

| Model Number | VR-3033u                       |           |                      |       |                     |       |       |
|--------------|--------------------------------|-----------|----------------------|-------|---------------------|-------|-------|
| Test Item    | Maximum Conducted Output Power |           |                      |       |                     |       |       |
| Date of Test | 01/08/2016                     |           |                      |       |                     |       |       |
| ANT-1        |                                |           |                      |       |                     |       |       |
| Test Mode    | Frequency<br>(MHz)             | Data Rate | Average Output Power |       | Peak Output Power   |       |       |
|              |                                |           | Measurement Results  |       | Measurement Results |       | Limit |
|              |                                |           | dBm                  | W     | dBm                 | W     | dBm   |
| Mode 3       | 2412                           | 6M        | 15.27                | 0.034 | 25.45               | 0.351 | < 30  |
|              | 2437                           |           | 15.07                | 0.032 | 25.20               | 0.331 | < 30  |
|              | 2462                           |           | 14.84                | 0.030 | 25.04               | 0.319 | < 30  |
|              | 2437                           | 9M        | 15.03                | 0.032 | 25.16               | 0.328 | < 30  |
|              | 2437                           | 12M       | 15.00                | 0.032 | 25.15               | 0.327 | < 30  |
|              | 2437                           | 18M       | 14.95                | 0.031 | 25.13               | 0.326 | < 30  |
|              | 2437                           | 24M       | 14.93                | 0.031 | 25.11               | 0.324 | < 30  |
|              | 2437                           | 36M       | 14.87                | 0.031 | 25.04               | 0.319 | < 30  |
|              | 2437                           | 48M       | 14.85                | 0.031 | 25.02               | 0.318 | < 30  |
|              | 2437                           | 54M       | 14.81                | 0.030 | 24.99               | 0.316 | < 30  |
| Mode 4       | 2412                           | 13M       | 15.15                | 0.033 | 25.30               | 0.339 | < 30  |
|              | 2437                           |           | 14.81                | 0.030 | 25.00               | 0.316 | < 30  |
|              | 2462                           |           | 14.63                | 0.029 | 24.78               | 0.301 | < 30  |
|              | 2437                           | 26M       | 14.79                | 0.030 | 24.97               | 0.314 | < 30  |
|              | 2437                           | 39M       | 14.76                | 0.030 | 24.94               | 0.312 | < 30  |
|              | 2437                           | 52M       | 14.71                | 0.030 | 24.88               | 0.308 | < 30  |
|              | 2437                           | 78M       | 14.67                | 0.029 | 24.82               | 0.303 | < 30  |
|              | 2437                           | 104M      | 14.63                | 0.029 | 24.77               | 0.300 | < 30  |
|              | 2437                           | 117M      | 14.60                | 0.029 | 24.72               | 0.296 | < 30  |
|              | 2437                           | 130M      | 14.55                | 0.029 | 24.61               | 0.289 | < 30  |
| Mode 5       | 2422                           | 27M       | 14.59                | 0.029 | 24.69               | 0.294 | < 30  |
|              | 2437                           |           | 14.25                | 0.027 | 24.33               | 0.271 | < 30  |
|              | 2452                           |           | 14.28                | 0.027 | 24.38               | 0.274 | < 30  |
|              | 2437                           | 54M       | 14.20                | 0.026 | 24.26               | 0.267 | < 30  |
|              | 2437                           | 81M       | 14.17                | 0.026 | 24.21               | 0.264 | < 30  |
|              | 2437                           | 108M      | 14.15                | 0.026 | 24.20               | 0.263 | < 30  |
|              | 2437                           | 162M      | 14.11                | 0.026 | 24.15               | 0.260 | < 30  |
|              | 2437                           | 216M      | 14.08                | 0.026 | 24.12               | 0.258 | < 30  |
|              | 2437                           | 243M      | 14.02                | 0.025 | 24.08               | 0.256 | < 30  |
|              | 2437                           | 135M      | 13.96                | 0.025 | 24.01               | 0.252 | < 30  |

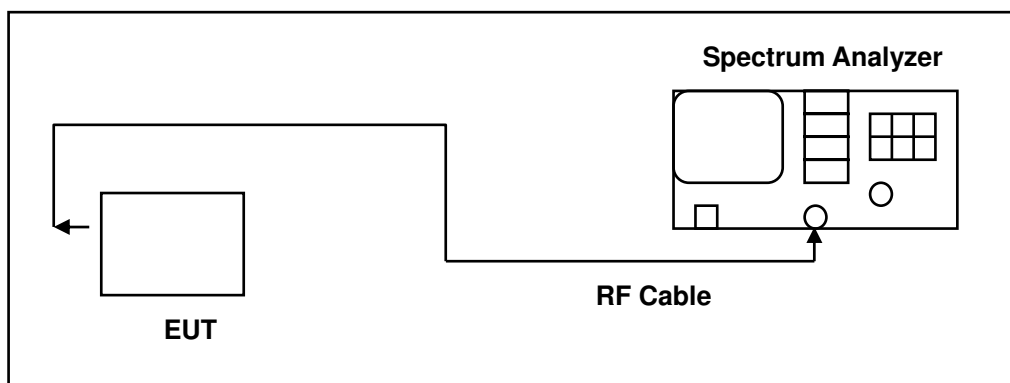
| Model Number | VR-3033u                       |           |                      |       |                     |              |       |
|--------------|--------------------------------|-----------|----------------------|-------|---------------------|--------------|-------|
| Test Item    | Maximum Conducted Output Power |           |                      |       |                     |              |       |
| Date of Test | 01/08/2016                     |           |                      |       |                     |              |       |
| ANT-0+1      |                                |           |                      |       |                     |              |       |
| Test Mode    | Frequency<br>(MHz)             | Data Rate | Average Output Power |       | Peak Output Power   |              |       |
|              |                                |           | Measurement Results  |       | Measurement Results |              | Limit |
|              |                                |           | dBm                  | W     | dBm                 | W            | dBm   |
| Mode 4       | 2412                           | 13M       | 18.82                | 0.076 | <b>28.93</b>        | <b>0.782</b> | < 30  |
|              | 2437                           |           | 18.60                | 0.072 | 28.71               | 0.743        | < 30  |
|              | 2462                           |           | 18.34                | 0.068 | 28.42               | 0.695        | < 30  |
|              | 2437                           | 26M       | 18.57                | 0.072 | 28.67               | 0.736        | < 30  |
|              | 2437                           | 39M       | 18.51                | 0.071 | 28.60               | 0.725        | < 30  |
|              | 2437                           | 52M       | 18.47                | 0.070 | 28.57               | 0.719        | < 30  |
|              | 2437                           | 78M       | 18.44                | 0.070 | 28.52               | 0.711        | < 30  |
|              | 2437                           | 104M      | 18.39                | 0.069 | 28.48               | 0.705        | < 30  |
|              | 2437                           | 117M      | 18.36                | 0.069 | 28.43               | 0.696        | < 30  |
|              | 2437                           | 130M      | 18.32                | 0.068 | 28.36               | 0.685        | < 30  |
| Mode 5       | 2422                           | 27M       | 17.88                | 0.061 | <b>28.01</b>        | <b>0.632</b> | < 30  |
|              | 2437                           |           | 17.60                | 0.058 | 27.74               | 0.595        | < 30  |
|              | 2452                           |           | 17.69                | 0.059 | 27.80               | 0.603        | < 30  |
|              | 2437                           | 54M       | 17.57                | 0.057 | 27.69               | 0.587        | < 30  |
|              | 2437                           | 81M       | 17.52                | 0.056 | 27.64               | 0.581        | < 30  |
|              | 2437                           | 108M      | 17.48                | 0.056 | 27.60               | 0.576        | < 30  |
|              | 2437                           | 162M      | 17.45                | 0.056 | 27.55               | 0.569        | < 30  |
|              | 2437                           | 216M      | 17.40                | 0.055 | 27.51               | 0.563        | < 30  |
|              | 2437                           | 243M      | 17.34                | 0.054 | 27.44               | 0.554        | < 30  |
|              | 2437                           | 135M      | 17.29                | 0.054 | 27.35               | 0.544        | < 30  |

## 7 6dB RF Bandwidth Measurement

### 7.1. Limit

6dB RF Bandwidth: Systems using digital modulation techniques may operate in the 2400–2483.5 MHz bands. The minimum 6 dB band-width shall be at least 500 kHz.

### 7.2. Test Setup



### 7.3. Test Instruments

| Equipment         | Manufacturer | Model Number      | Serial Number | Cal. Date  | Remark |
|-------------------|--------------|-------------------|---------------|------------|--------|
| Spectrum Analyzer | Agilent      | E4445A            | MY45300744    | 12/15/2015 | (1)    |
| Microwave Cable   | EMCI         | EMC104-SM-SM-1500 | 140303        | 02/24/2015 | (1)    |
| Test Site         | ATL          | TE05              | TE05          | N.C.R.     | -----  |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

### 7.4. Test Procedure

The EUT tested to DTS test procedure of KDB558074D01 for compliance to FCC 47CFR 15.247 requirements.

6dB RF Bandwidth: The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RBW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A peak output reading was taken, a DISPLAY line was drawn 6 dB lower than peak level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

The test was performed at 3 channels (Channel low, middle, high)

99 % Occupied Bandwidth: The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

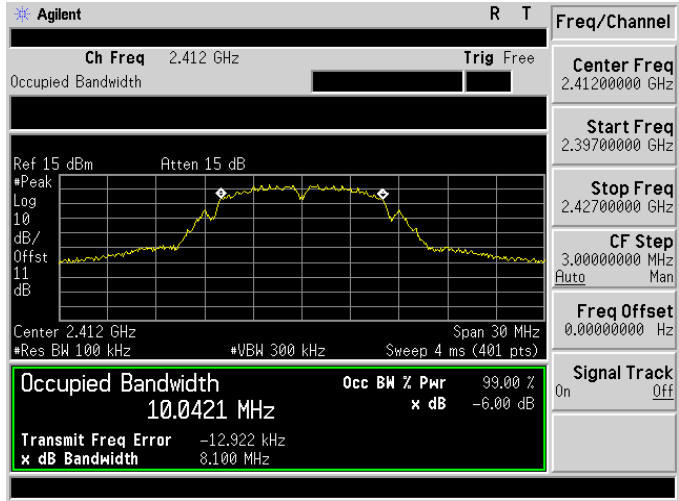
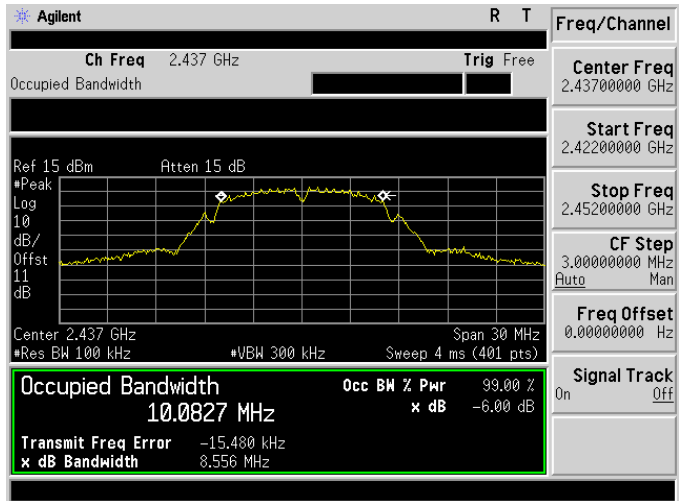
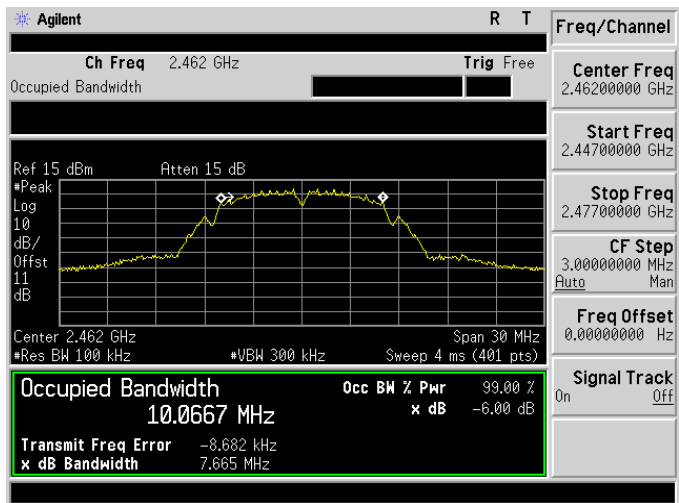
The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

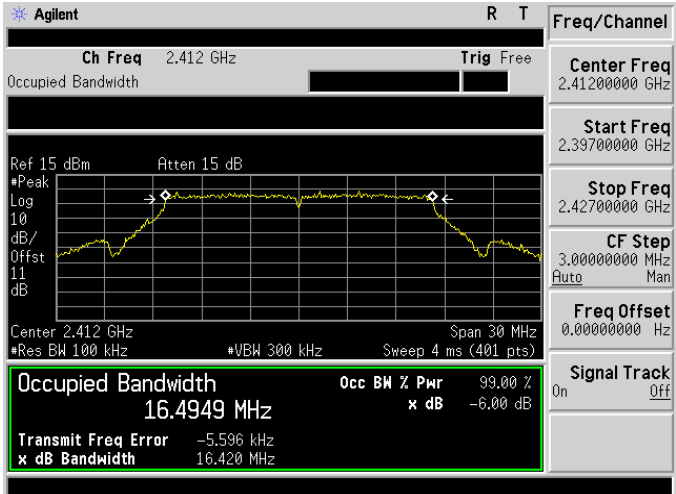
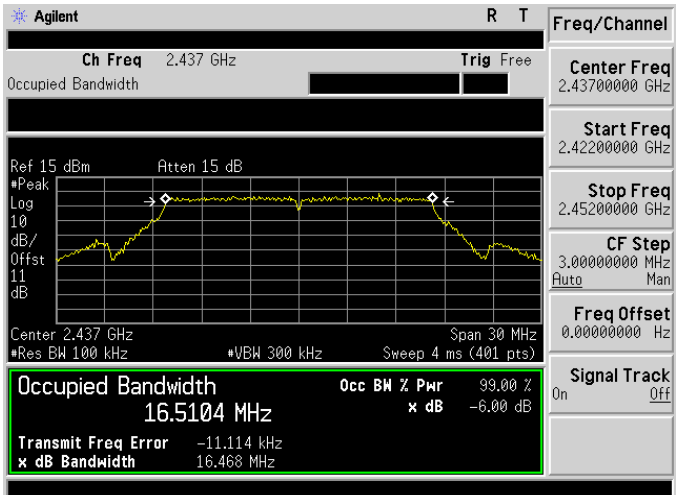
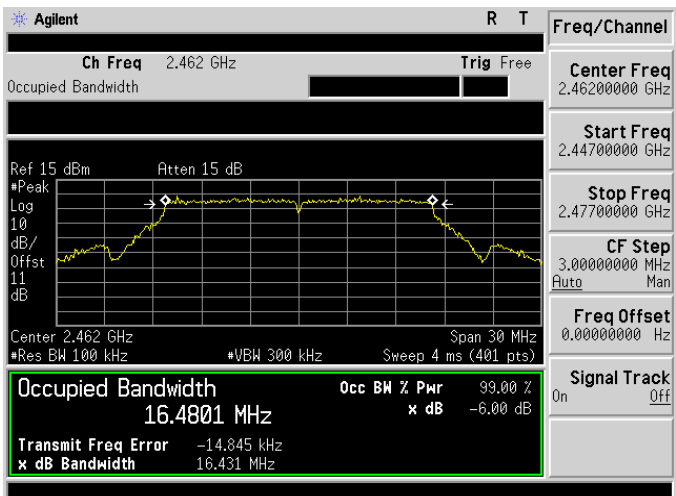
The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

## 7.5. Test Result

|              |                  |                     |       |
|--------------|------------------|---------------------|-------|
| Model Number | VR-3033u         |                     |       |
| Test Item    | 6dB RF Bandwidth |                     |       |
| Date of Test | 02/17/2016       |                     |       |
| ANT-0        |                  |                     |       |
| Test Mode    | Frequency (MHz)  | Measurement Results | Limit |
|              |                  | kHz                 | kHz   |
| Mode 2       | 2412             | 8100                | > 500 |
|              | 2437             | 8556                | > 500 |
|              | 2462             | 7665                | > 500 |
| Mode 3       | 2412             | 16420               | > 500 |
|              | 2437             | 16468               | > 500 |
|              | 2462             | 16431               | > 500 |
| Mode 4       | 2412             | 17424               | > 500 |
|              | 2437             | 17590               | > 500 |
|              | 2462             | 17746               | > 500 |
| Mode 5       | 2422             | 35418               | > 500 |
|              | 2437             | 34015               | > 500 |
|              | 2452             | 35172               | > 500 |
| ANT-1        |                  |                     |       |
| Test Mode    | Frequency (MHz)  | Measurement Results | Limit |
|              |                  | kHz                 | kHz   |
| Mode 4       | 2412             | 17654               | > 500 |
|              | 2437             | 17653               | > 500 |
|              | 2462             | 17621               | > 500 |
| Mode 5       | 2422             | 35869               | > 500 |
|              | 2437             | 35163               | > 500 |
|              | 2452             | 35236               | > 500 |

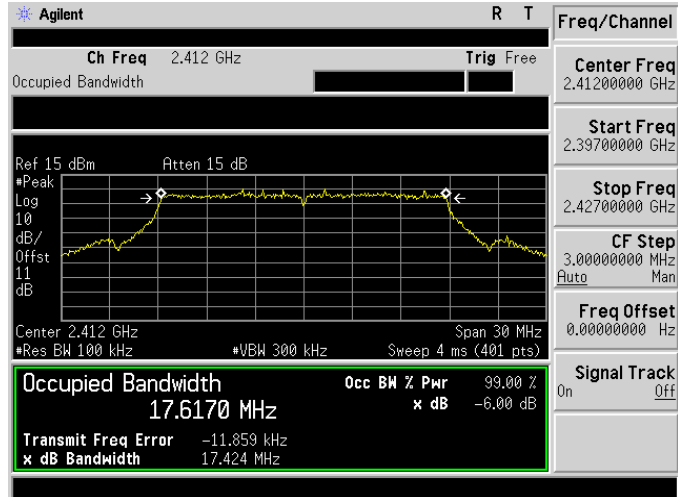
## 7.6. Test Graphs

| Mode 2: IEEE 802.11b link mode_ANT-0 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2412 MHz                             |  <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p>Occupied Bandwidth 10.0421 MHz</p> <p>Occ BW % Pwr 99.00 %</p> <p>x dB -6.00 dB</p> <p>Transmit Freq Error -12.922 kHz</p> <p>x dB Bandwidth 8.100 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.39700000 GHz</p> <p>Stop Freq 2.42700000 GHz</p> <p>CF Step 3.00000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p>  |
| 2437 MHz                             |  <p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p>Occupied Bandwidth 10.0827 MHz</p> <p>Occ BW % Pwr 99.00 %</p> <p>x dB -6.00 dB</p> <p>Transmit Freq Error -15.480 kHz</p> <p>x dB Bandwidth 8.556 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42200000 GHz</p> <p>Stop Freq 2.45200000 GHz</p> <p>CF Step 3.00000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> |
| 2462 MHz                             |  <p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/Offst 11 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p>Occupied Bandwidth 10.0667 MHz</p> <p>Occ BW % Pwr 99.00 %</p> <p>x dB -6.00 dB</p> <p>Transmit Freq Error -8.602 kHz</p> <p>x dB Bandwidth 7.665 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.46200000 GHz</p> <p>Start Freq 2.44700000 GHz</p> <p>Stop Freq 2.47700000 GHz</p> <p>CF Step 3.00000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> |

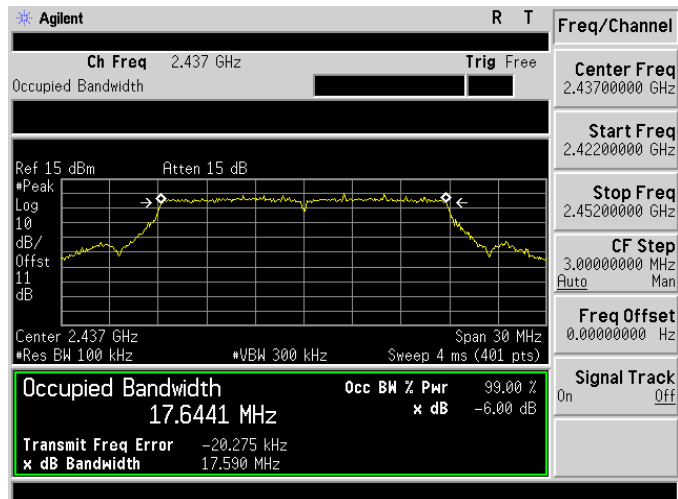
| Mode 3: IEEE 802.11g link mode_ANT-0 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2412 MHz                             |  <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/ Offst 11 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p>Occupied Bandwidth 16.4949 MHz</p> <p>Occ BW % Pwr 99.00 %</p> <p>x dB -6.00 dB</p> <p>Transmit Freq Error -5.596 kHz</p> <p>x dB Bandwidth 16.420 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.39700000 GHz</p> <p>Stop Freq 2.42700000 GHz</p> <p>CF Step 3.00000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p>    |
| 2437 MHz                             |  <p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/ Offst 11 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p>Occupied Bandwidth 16.5104 MHz</p> <p>Occ BW % Pwr 99.00 %</p> <p>x dB -6.00 dB</p> <p>Transmit Freq Error -11.114 kHz</p> <p>x dB Bandwidth 16.468 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42200000 GHz</p> <p>Stop Freq 2.45200000 GHz</p> <p>CF Step 3.00000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p>  |
| 2462 MHz                             |  <p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 15 dBm Atten 15 dB</p> <p>#Peak Log 10 dB/ Offst 11 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)</p> <p>Occupied Bandwidth 16.4801 MHz</p> <p>Occ BW % Pwr 99.00 %</p> <p>x dB -6.00 dB</p> <p>Transmit Freq Error -14.845 kHz</p> <p>x dB Bandwidth 16.431 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.46200000 GHz</p> <p>Start Freq 2.44700000 GHz</p> <p>Stop Freq 2.47700000 GHz</p> <p>CF Step 3.00000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> |

Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode\_ANT-0

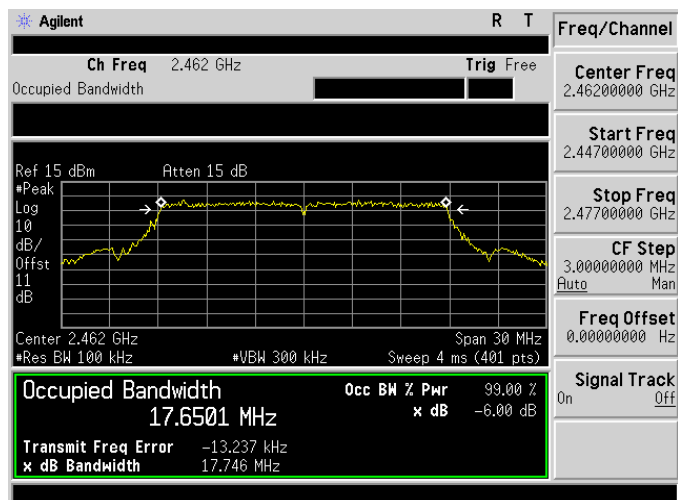
2412 MHz



2437 MHz

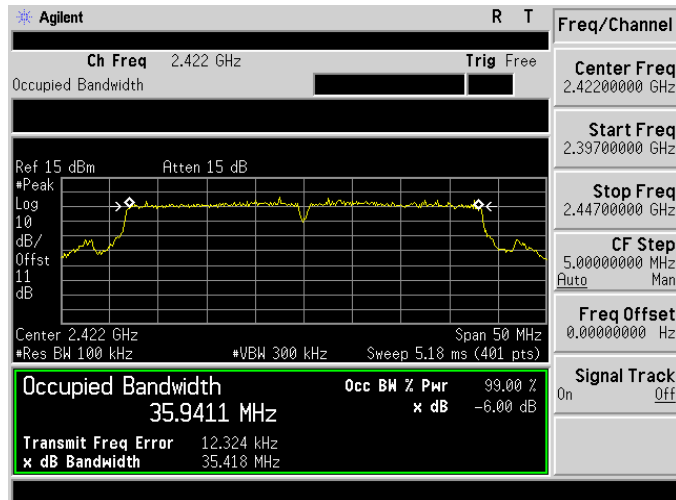


2462 MHz

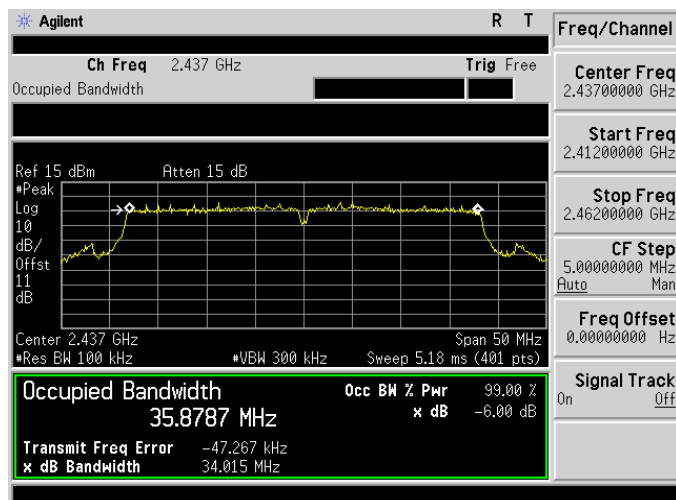


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode\_ANT-0

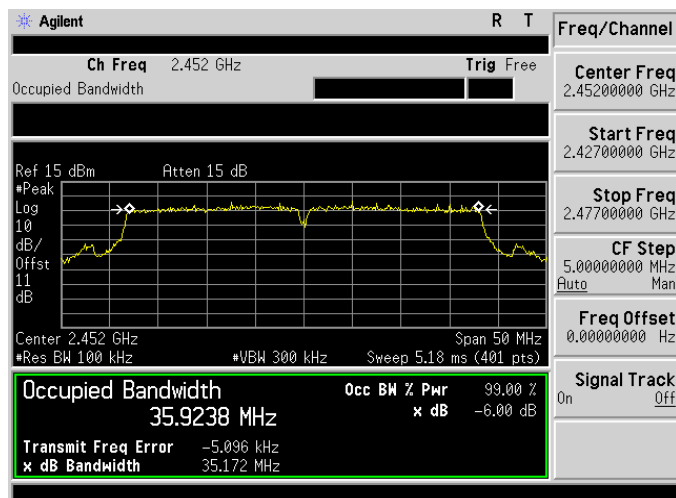
2422 MHz



2437 MHz

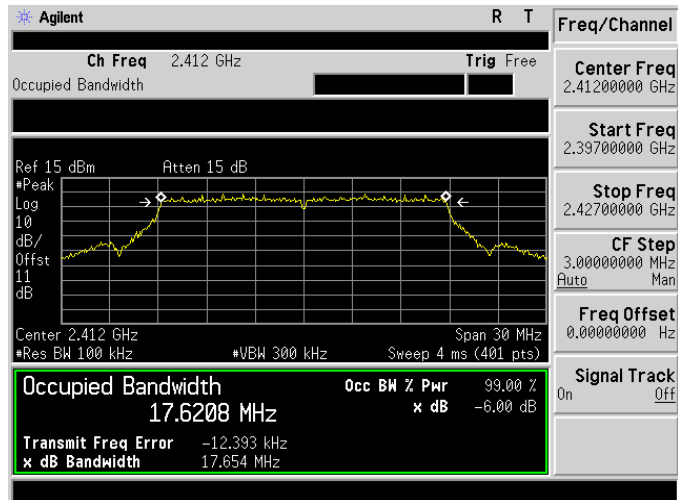


2452 MHz

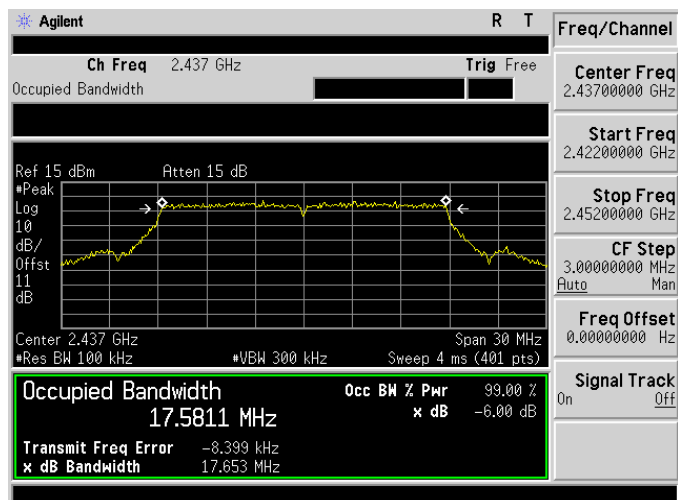


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode\_ANT-1

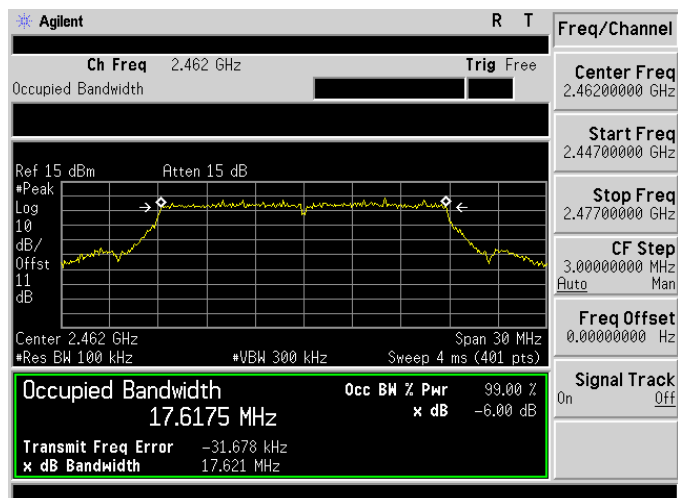
2412 MHz



2437 MHz

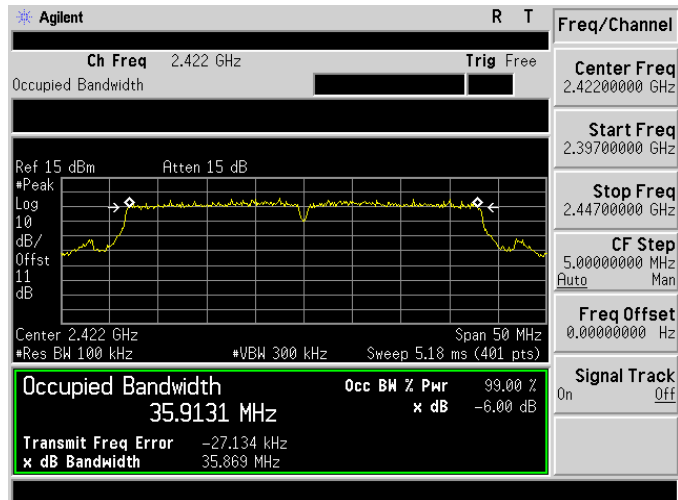


2462 MHz

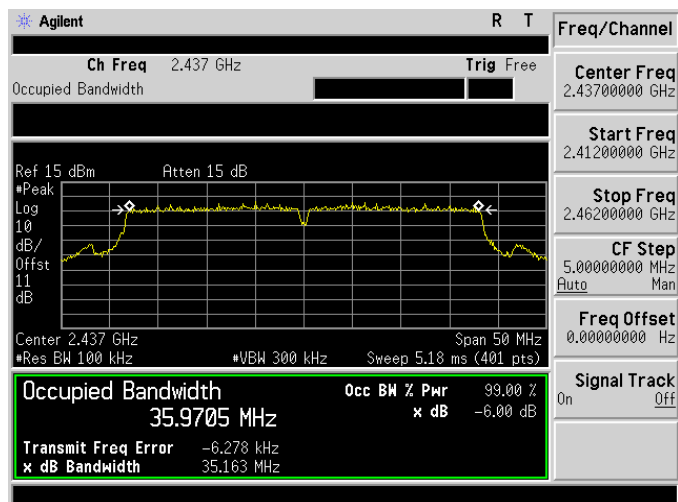


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode\_ANT-1

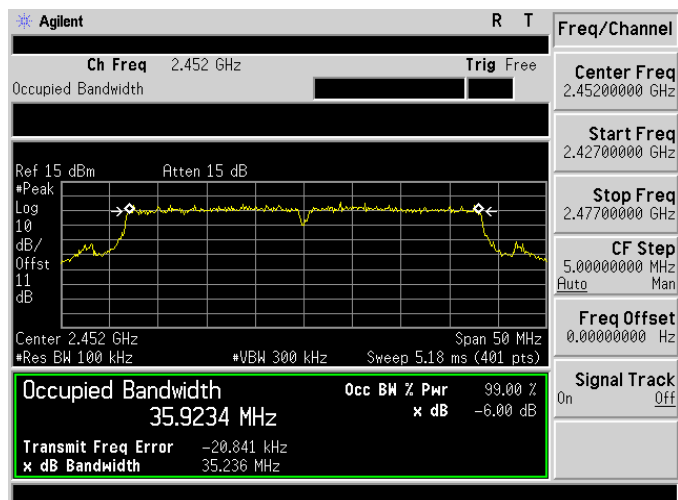
2422 MHz



2437 MHz



2452 MHz

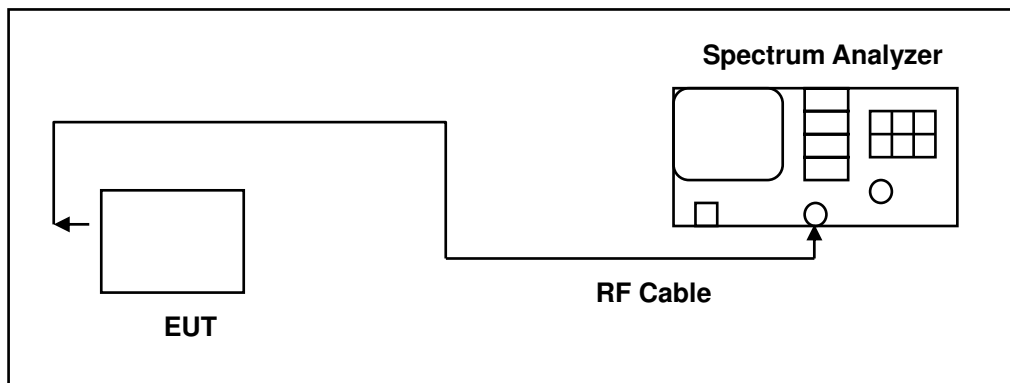


## 8 Maximum Power Density Measurement

### 8.1. Limit

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

### 8.2. Test Setup



### 8.3. Test Instruments

| Equipment         | Manufacturer | Model Number      | Serial Number | Cal. Date  | Remark |
|-------------------|--------------|-------------------|---------------|------------|--------|
| Spectrum Analyzer | Agilent      | E4445A            | MY45300744    | 12/15/2015 | (1)    |
| Microwave Cable   | EMCI         | EMC104-SM-SM-1500 | 140303        | 02/24/2015 | (1)    |
| Test Site         | ATL          | TE05              | TE05          | N.C.R.     | -----  |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

### 8.4. Test Procedure

The EUT tested to DTS test procedure of KDB558074D01 for compliance to FCC 47CFR 15.247 requirements.

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

## 8.5. Test Result

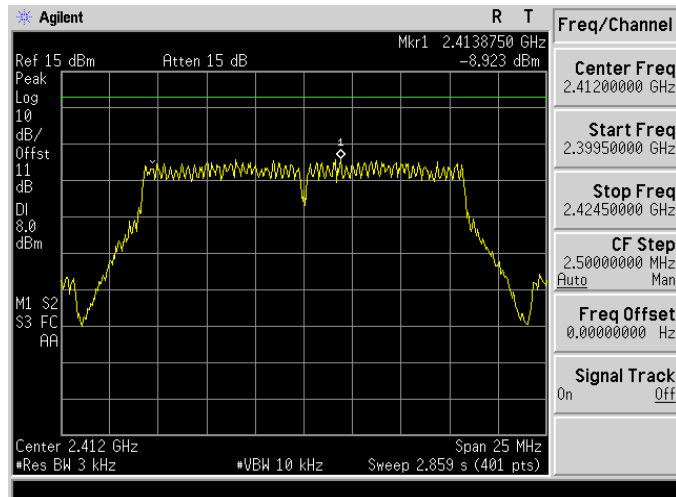
|              |                       |                                |                  |
|--------------|-----------------------|--------------------------------|------------------|
| Model Number | VR-3033u              |                                |                  |
| Test Item    | Maximum Power Density |                                |                  |
| Date of Test | 02/17/2016            |                                |                  |
| ANT-0        |                       |                                |                  |
| Test Mode    | Frequency (MHz)       | Measurement Results (dBm/3KHz) | Limit (dBm/3KHz) |
| Mode 2       | 2412                  | -4.597                         | < 8              |
|              | 2437                  | -3.016                         | < 8              |
|              | 2462                  | -4.722                         | < 8              |
| Mode 3       | 2412                  | -8.923                         | < 8              |
|              | 2437                  | -8.824                         | < 8              |
|              | 2462                  | -8.994                         | < 8              |
| Mode 4       | 2412                  | -8.500                         | < 8              |
|              | 2437                  | -8.415                         | < 8              |
|              | 2462                  | -4.683                         | < 8              |
| Mode 5       | 2422                  | -12.230                        | < 8              |
|              | 2437                  | -11.240                        | < 8              |
|              | 2452                  | -13.280                        | < 8              |
| ANT-1        |                       |                                |                  |
| Test Mode    | Frequency (MHz)       | Measurement Results (dBm/3KHz) | Limit (dBm/3KHz) |
| Mode 4       | 2412                  | -10.490                        | < 8              |
|              | 2437                  | -10.690                        | < 8              |
|              | 2462                  | -8.825                         | < 8              |
| Mode 5       | 2422                  | -12.470                        | < 8              |
|              | 2437                  | -13.790                        | < 8              |
|              | 2452                  | -13.400                        | < 8              |

## 8.6. Test Graphs

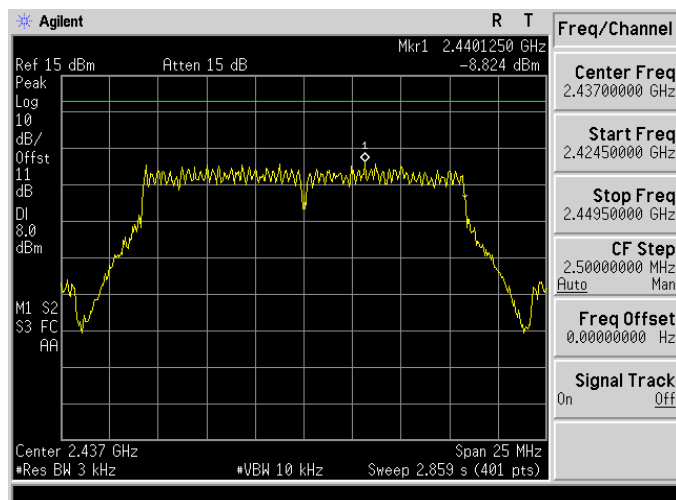
|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode 2: IEEE 802.11b link mode_ANT-0 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 2412 MHz                             | <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.4113175 GHz -4.597 dBm</p> <p>Peak Log 10 dB/Offst 11 dB DI 8.0 dBm</p> <p>M1 S2 S3 FC AR</p> <p>Center 2.412 GHz Span 13 MHz</p> <p>Res BW 3 kHz VBW 10 kHz Sweep 1.487 s (401 pts)</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.40500000 GHz</p> <p>Stop Freq 2.41850000 GHz</p> <p>CF Step 1.30000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> |
| 2437 MHz                             | <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.4377150 GHz -3.016 dBm</p> <p>Peak Log 10 dB/Offst 11 dB DI 8.0 dBm</p> <p>M1 S2 S3 FC AR</p> <p>Center 2.437 GHz Span 13 MHz</p> <p>Res BW 3 kHz VBW 10 kHz Sweep 1.487 s (401 pts)</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.43050000 GHz</p> <p>Stop Freq 2.44350000 GHz</p> <p>CF Step 1.30000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> |
| 2462 MHz                             | <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.4642100 GHz -4.722 dBm</p> <p>Peak Log 10 dB/Offst 11 dB DI 8.0 dBm</p> <p>M1 S2 S3 FC AR</p> <p>Center 2.462 GHz Span 13 MHz</p> <p>Res BW 3 kHz VBW 10 kHz Sweep 1.487 s (401 pts)</p> <p>Freq/Channel</p> <p>Center Freq 2.46200000 GHz</p> <p>Start Freq 2.45550000 GHz</p> <p>Stop Freq 2.46850000 GHz</p> <p>CF Step 1.30000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> |

Mode 3: IEEE 802.11g link mode\_ANT-0

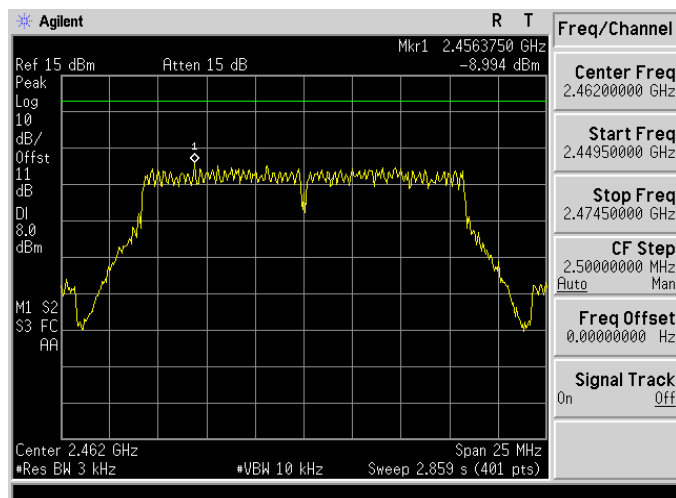
2412 MHz



2437 MHz

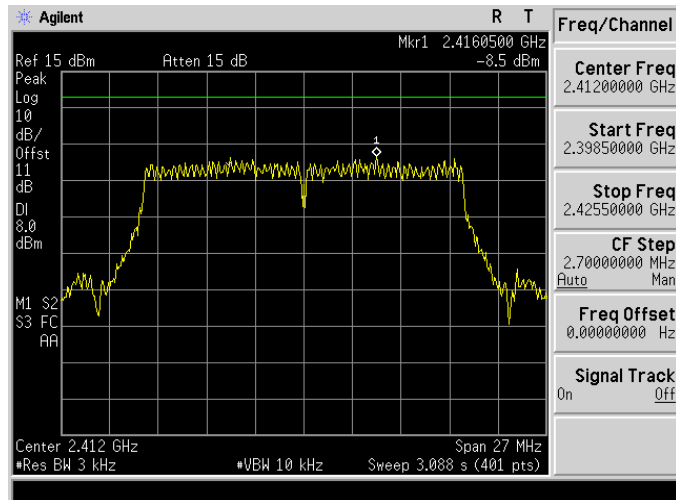


2462 MHz

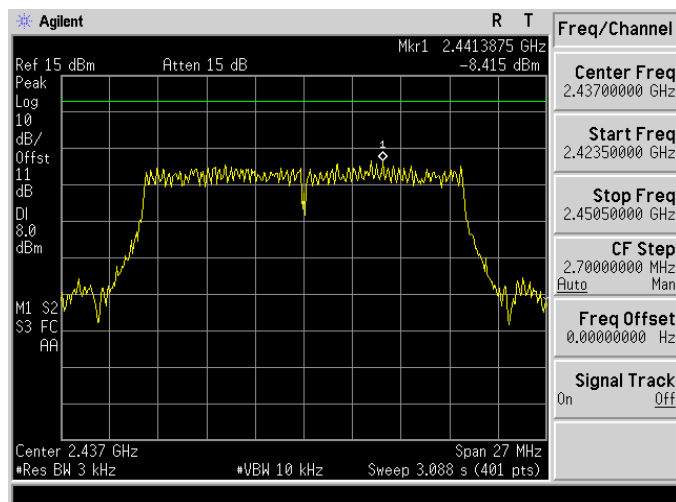


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode\_ANT-0

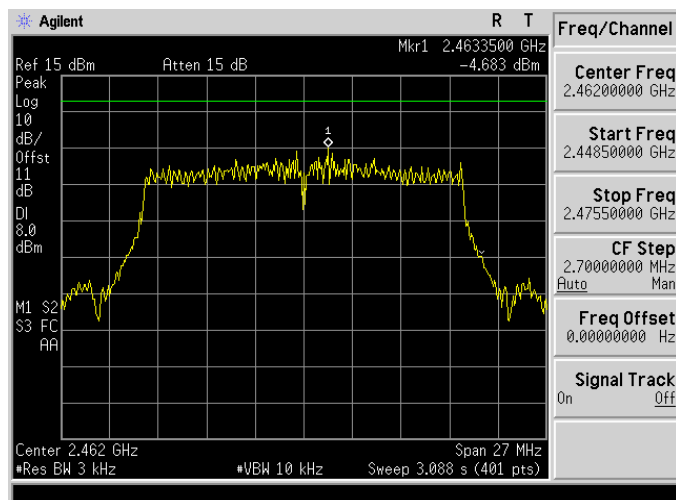
2412 MHz



2437 MHz

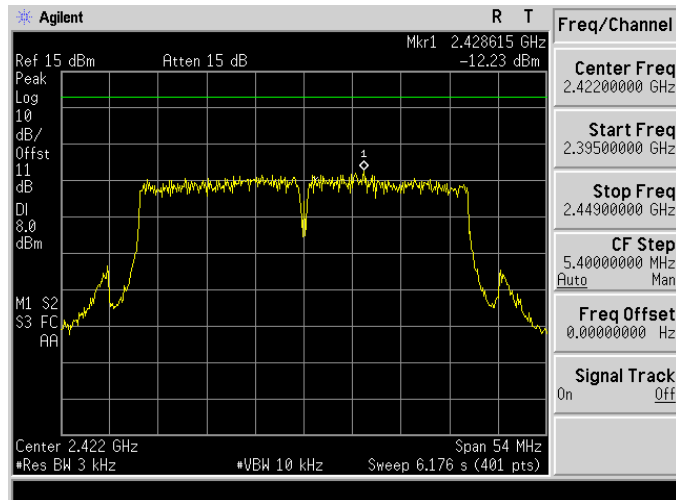


2462 MHz

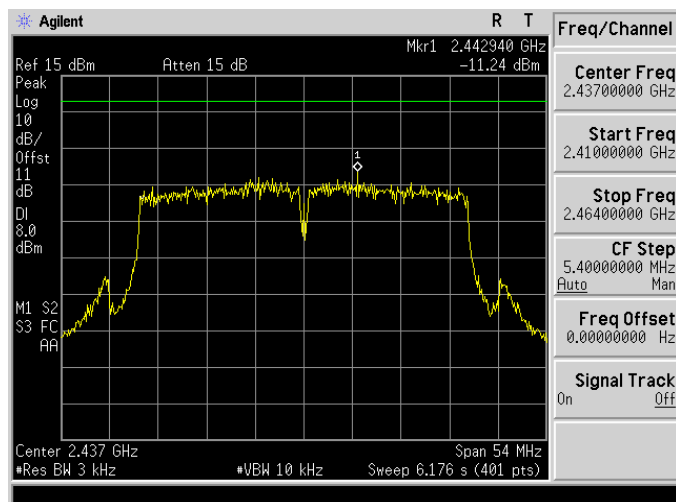


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode\_ANT-0

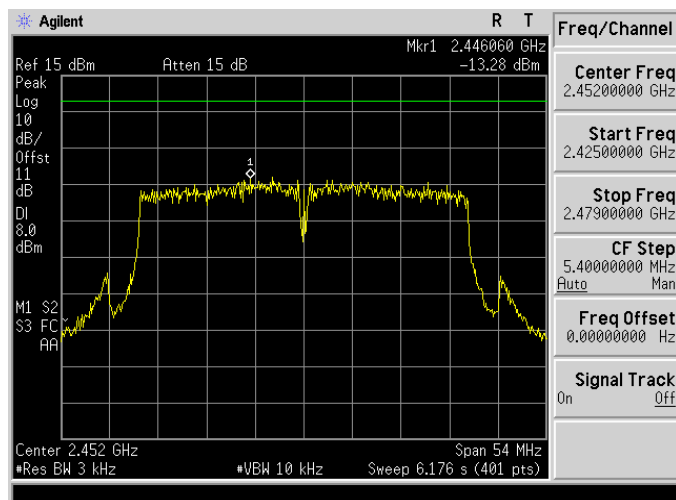
2422 MHz



2437 MHz

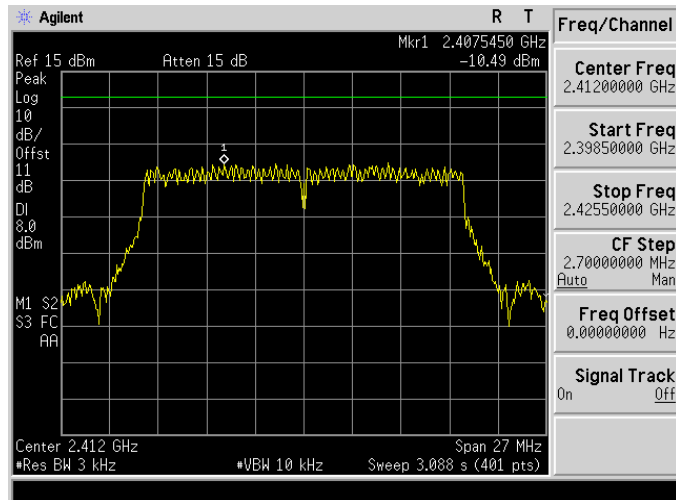


2452 MHz

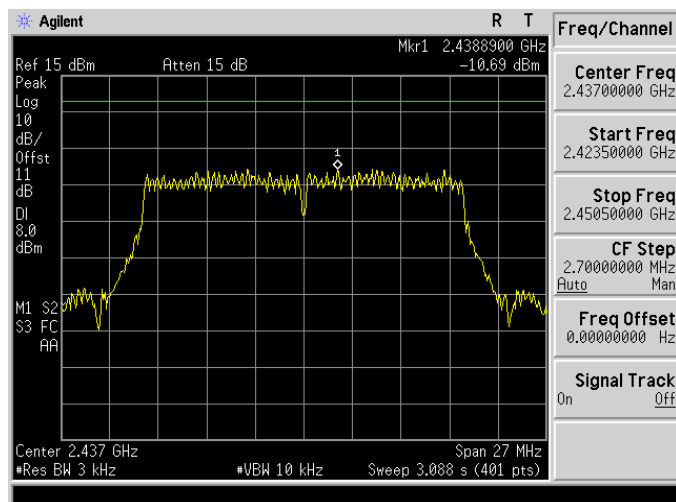


Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode\_ANT-1

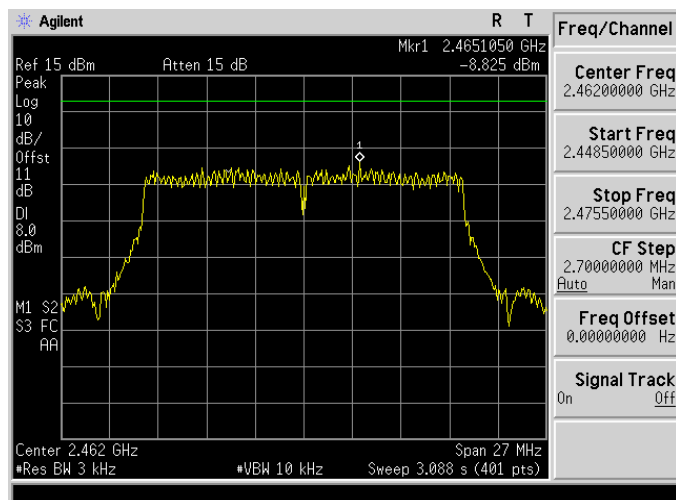
2412 MHz



2437 MHz

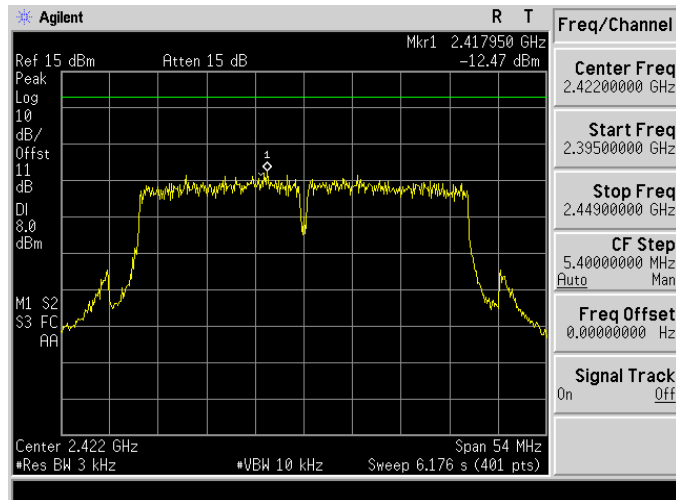


2462 MHz

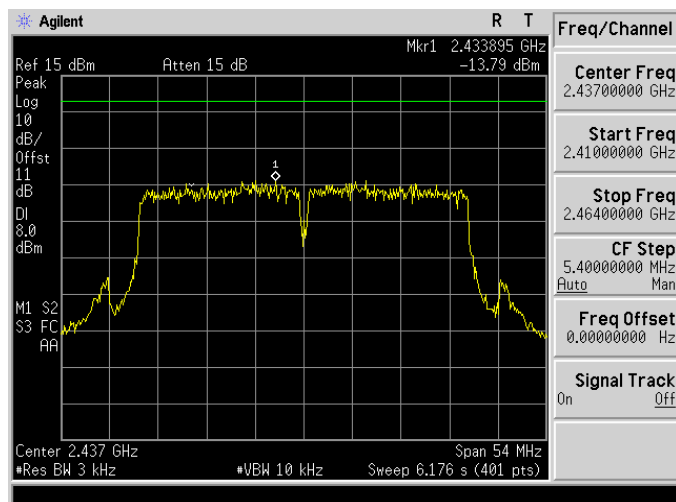


Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode\_ANT-1

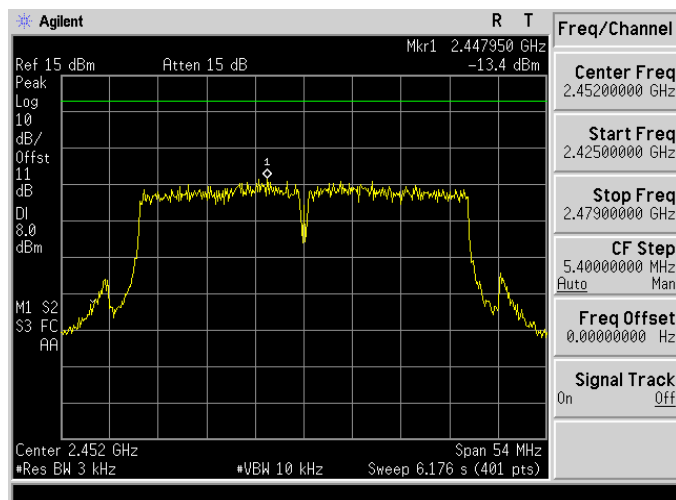
2422 MHz



2437 MHz



2452 MHz

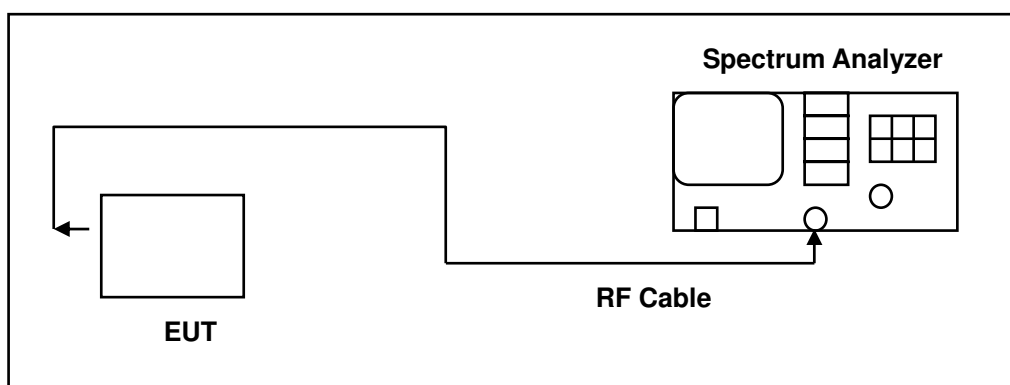


## 9 Out of Band Conducted Emissions Measurement

### 9.1. Limit

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

### 9.2. Test Setup



### 9.3. Test Instruments

| Equipment         | Manufacturer | Model Number      | Serial Number | Cal. Date  | Remark |
|-------------------|--------------|-------------------|---------------|------------|--------|
| Spectrum Analyzer | Agilent      | E4445A            | MY45300744    | 12/15/2015 | (1)    |
| Spectrum Analyzer | Agilent      | E4408B            | MY45107753    | 07/27/2015 | (1)    |
| Microwave Cable   | EMCI         | EMC104-SM-SM-1500 | 140303        | 02/24/2015 | (1)    |
| Test Site         | ATL          | TE05              | TE05          | N.C.R.     | -----  |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

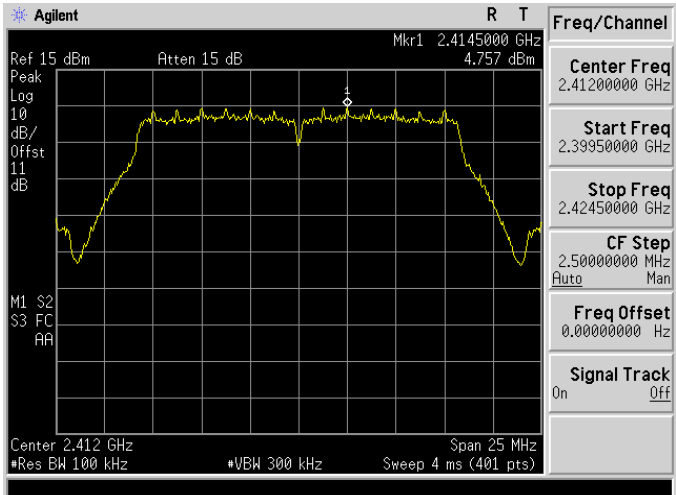
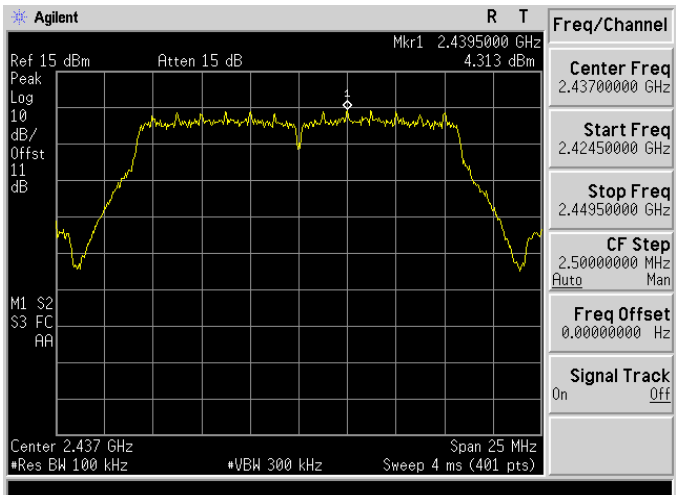
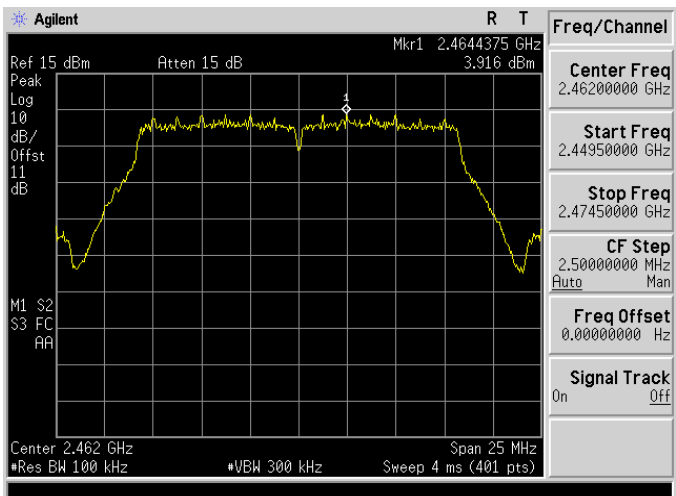
Note: N.C.R. = No Calibration Request.

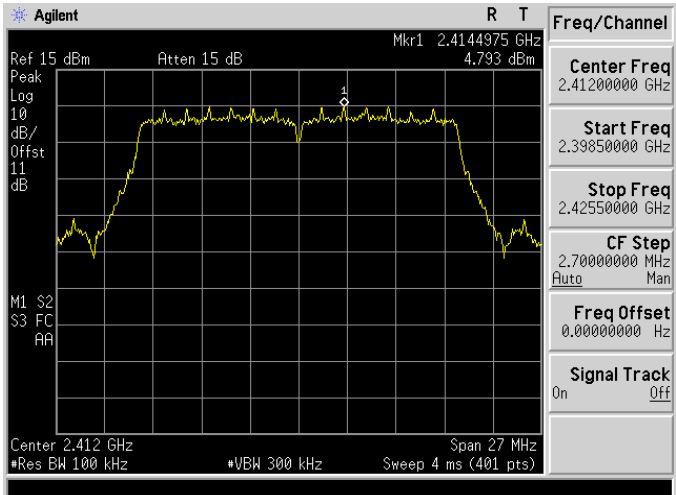
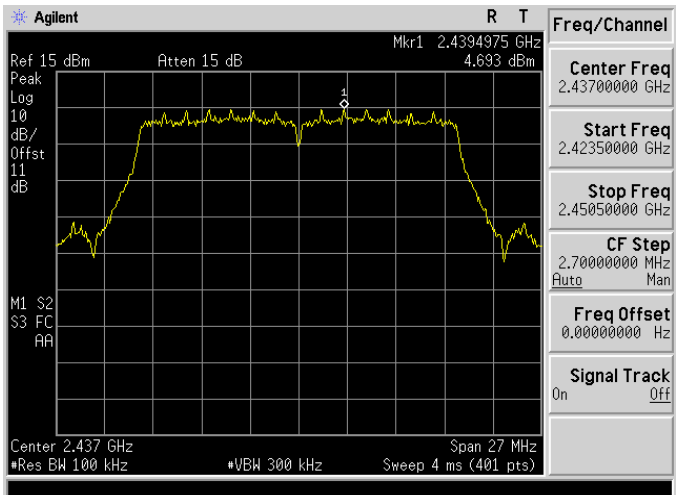
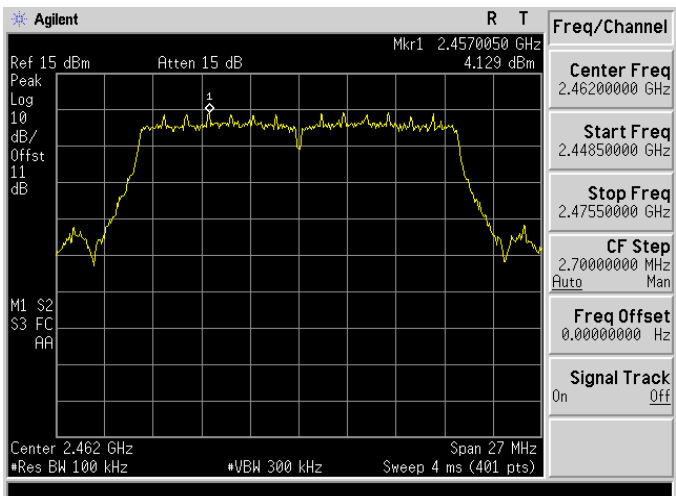
### 9.4. Test Procedure

In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function. All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band. The test was performed at 3 channels.

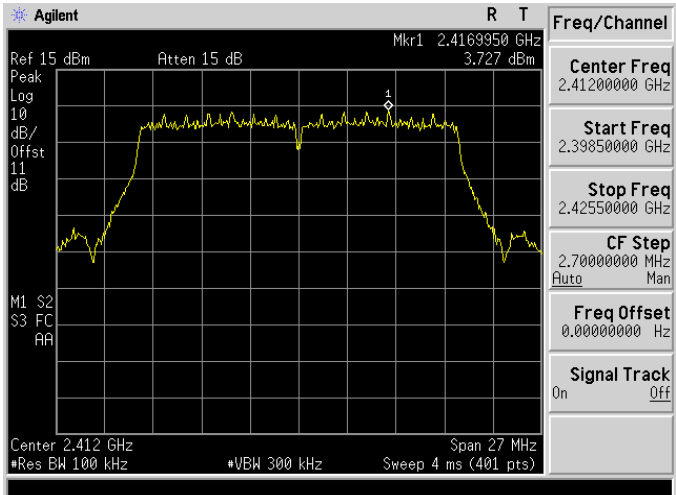
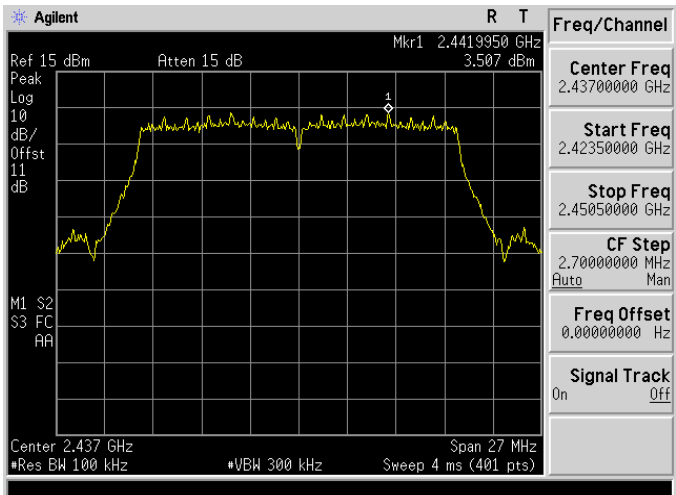
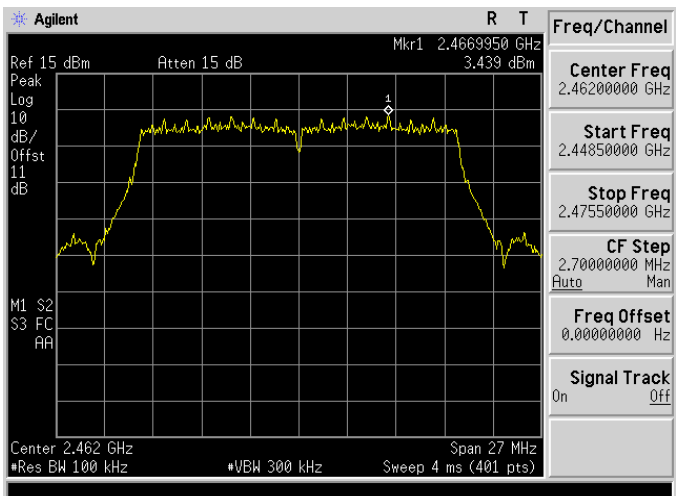
## 9.5. Test Graphs

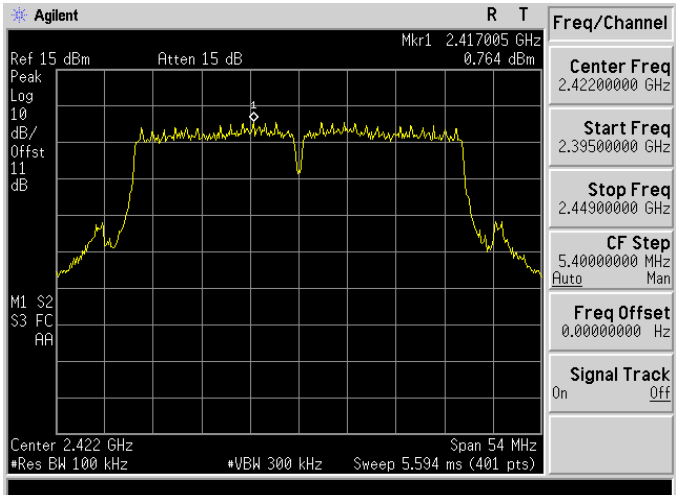
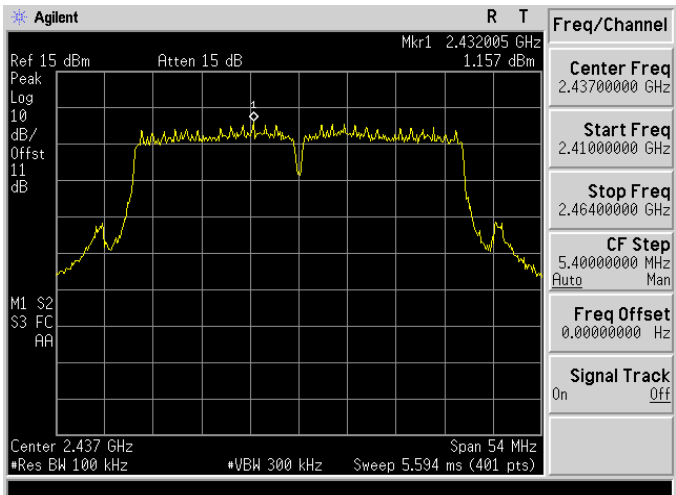
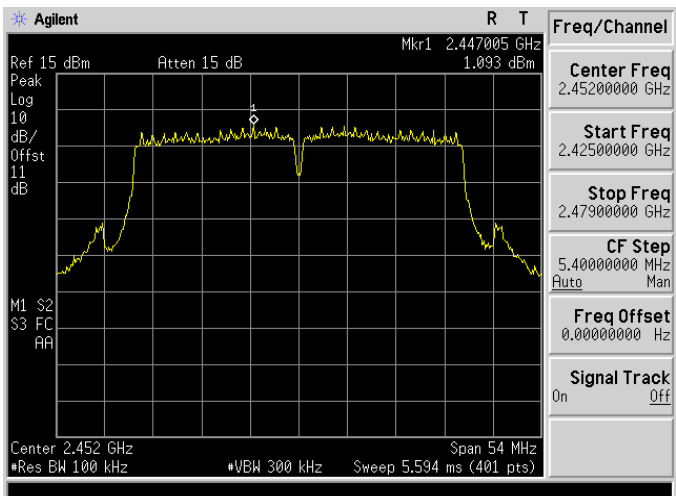
|                                      |  |
|--------------------------------------|--|
| Reference level                      |  |
| Mode 2: IEEE 802.11b link mode_ANT-0 |  |
| 2412 MHz                             |  |
| 2437 MHz                             |  |
| 2462 MHz                             |  |

|                                      |                                                                                      |
|--------------------------------------|--------------------------------------------------------------------------------------|
| Reference level                      |                                                                                      |
| Mode 3: IEEE 802.11g link mode_ANT-0 |                                                                                      |
| 2412 MHz                             |    |
| 2437 MHz                             |   |
| 2462 MHz                             |  |

|                                                   |                                                                                      |
|---------------------------------------------------|--------------------------------------------------------------------------------------|
| Reference level                                   |                                                                                      |
| Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-0 |                                                                                      |
| 2412 MHz                                          |    |
| 2437 MHz                                          |   |
| 2462 MHz                                          |  |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference level                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-0 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 2422 MHz                                          | <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.425780 GHz 1.364 dBm</p> <p>Peak Log 10 dB/Offst 11 dB</p> <p>M1 S2 S3 FC AA</p> <p>Center 2.422 GHz Span 54 MHz</p> <p>Res BW 100 kHz VBW 300 kHz Sweep 5.594 ms (401 pts)</p> <p>Freq/Channel</p> <p>Center Freq 2.42200000 GHz</p> <p>Start Freq 2.39500000 GHz</p> <p>Stop Freq 2.44900000 GHz</p> <p>CF Step 5.40000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> |
| 2437 MHz                                          | <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.441995 GHz 1.307 dBm</p> <p>Peak Log 10 dB/Offst 11 dB</p> <p>M1 S2 S3 FC AA</p> <p>Center 2.437 GHz Span 54 MHz</p> <p>Res BW 100 kHz VBW 300 kHz Sweep 5.594 ms (401 pts)</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.41000000 GHz</p> <p>Stop Freq 2.46400000 GHz</p> <p>CF Step 5.40000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> |
| 2452 MHz                                          | <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.456995 GHz 1.219 dBm</p> <p>Peak Log 10 dB/Offst 11 dB</p> <p>M1 S2 S3 FC AA</p> <p>Center 2.452 GHz Span 54 MHz</p> <p>Res BW 100 kHz VBW 300 kHz Sweep 5.594 ms (401 pts)</p> <p>Freq/Channel</p> <p>Center Freq 2.45200000 GHz</p> <p>Start Freq 2.42500000 GHz</p> <p>Stop Freq 2.47900000 GHz</p> <p>CF Step 5.40000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> |

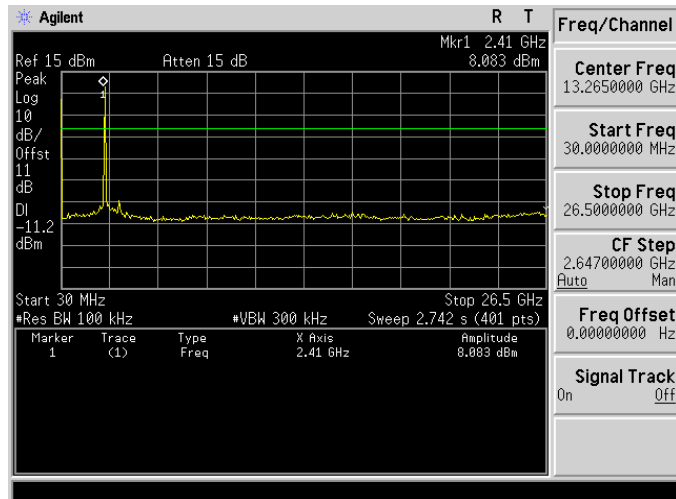
|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference level                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode_ANT-1 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 2412 MHz                                          |  <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.4169950 GHz 3.727 dBm</p> <p>Center 2.412 GHz Span 27 MHz<br/>Res BW 100 kHz VBW 300 kHz Sweep 4 ms (401 pts)</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.39850000 GHz</p> <p>Stop Freq 2.42550000 GHz</p> <p>CF Step 2.70000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p>   |
| 2437 MHz                                          |  <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.4419950 GHz 3.507 dBm</p> <p>Center 2.437 GHz Span 27 MHz<br/>Res BW 100 kHz VBW 300 kHz Sweep 4 ms (401 pts)</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42350000 GHz</p> <p>Stop Freq 2.45050000 GHz</p> <p>CF Step 2.70000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p>  |
| 2462 MHz                                          |  <p>Agilent R T</p> <p>Ref 15 dBm Atten 15 dB Mkr1 2.4669950 GHz 3.439 dBm</p> <p>Center 2.462 GHz Span 27 MHz<br/>Res BW 100 kHz VBW 300 kHz Sweep 4 ms (401 pts)</p> <p>Freq/Channel</p> <p>Center Freq 2.46200000 GHz</p> <p>Start Freq 2.44850000 GHz</p> <p>Stop Freq 2.47550000 GHz</p> <p>CF Step 2.70000000 MHz Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference level                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode_ANT-1 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2422 MHz                                          |  <p>Agilent R T Freq/Channel<br/>         Ref 15 dBm Atten 15 dB Mkr1 2.417005 GHz<br/>         Peak Log 10 dB/Offst 11 dB<br/>         Center 2.422 GHz Span 54 MHz<br/>         Res BW 100 kHz VBW 300 kHz Sweep 5.594 ms (401 pts)</p> <p>Center Freq 2.42200000 GHz<br/>         Start Freq 2.39500000 GHz<br/>         Stop Freq 2.44900000 GHz<br/>         CF Step 5.40000000 MHz Auto Man<br/>         Freq Offset 0.00000000 Hz<br/>         Signal Track On Off</p>   |
| 2437 MHz                                          |  <p>Agilent R T Freq/Channel<br/>         Ref 15 dBm Atten 15 dB Mkr1 2.432005 GHz<br/>         Peak Log 10 dB/Offst 11 dB<br/>         Center 2.437 GHz Span 54 MHz<br/>         Res BW 100 kHz VBW 300 kHz Sweep 5.594 ms (401 pts)</p> <p>Center Freq 2.43700000 GHz<br/>         Start Freq 2.41000000 GHz<br/>         Stop Freq 2.46400000 GHz<br/>         CF Step 5.40000000 MHz Auto Man<br/>         Freq Offset 0.00000000 Hz<br/>         Signal Track On Off</p>  |
| 2452 MHz                                          |  <p>Agilent R T Freq/Channel<br/>         Ref 15 dBm Atten 15 dB Mkr1 2.447005 GHz<br/>         Peak Log 10 dB/Offst 11 dB<br/>         Center 2.452 GHz Span 54 MHz<br/>         Res BW 100 kHz VBW 300 kHz Sweep 5.594 ms (401 pts)</p> <p>Center Freq 2.45200000 GHz<br/>         Start Freq 2.42500000 GHz<br/>         Stop Freq 2.47900000 GHz<br/>         CF Step 5.40000000 MHz Auto Man<br/>         Freq Offset 0.00000000 Hz<br/>         Signal Track On Off</p> |

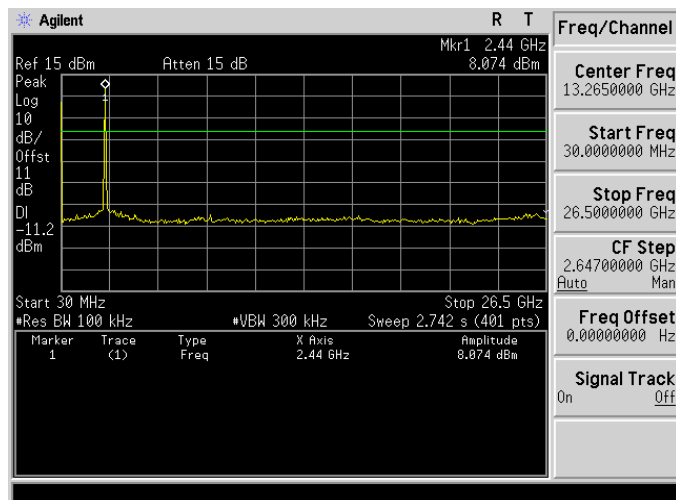
Out of Band Conducted Spurious Emission

Mode 2: IEEE 802.11b link mode\_ANT-0

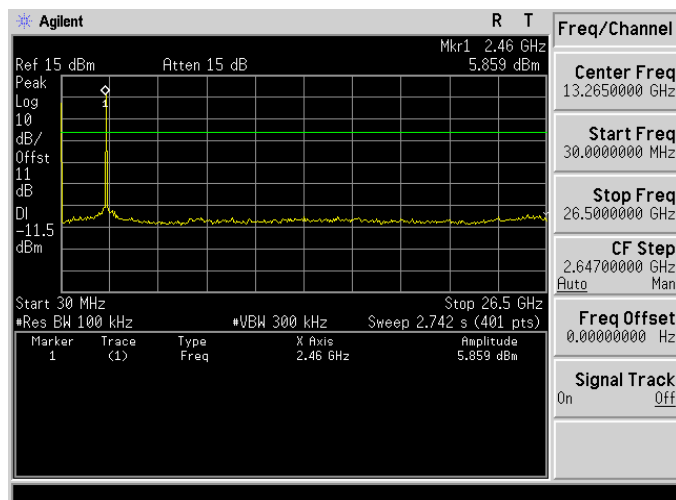
2412 MHz



2437 MHz



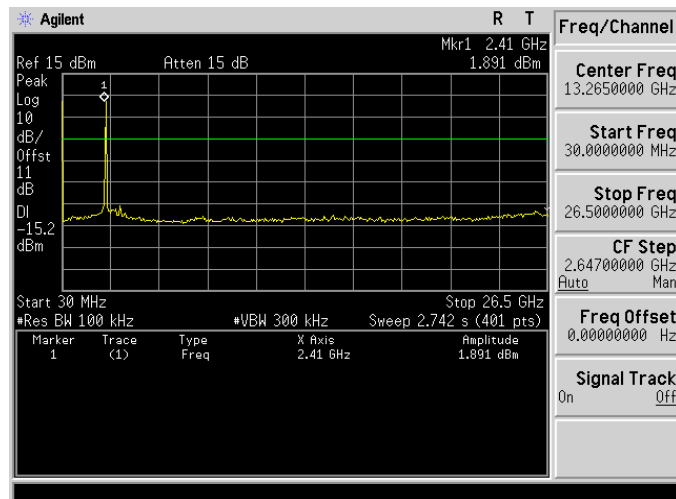
2462 MHz



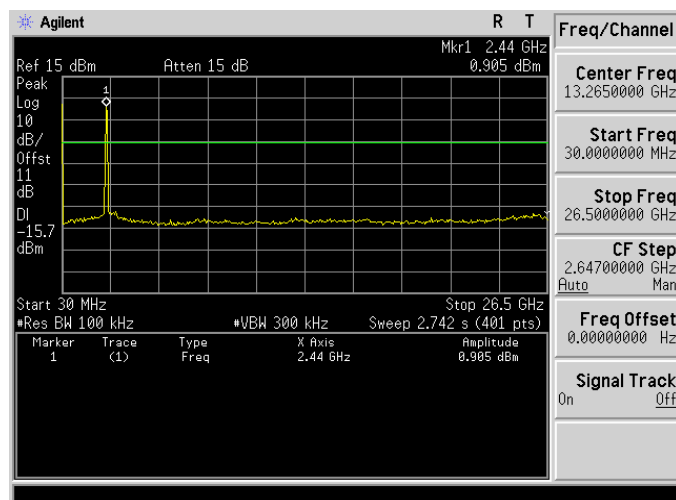
Out of Band Conducted Spurious Emission

Mode 3: IEEE 802.11g link mode\_ANT-0

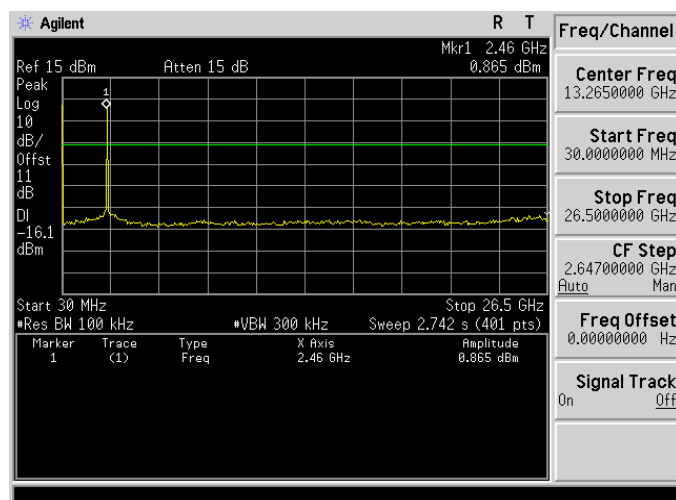
2412 MHz



2437 MHz



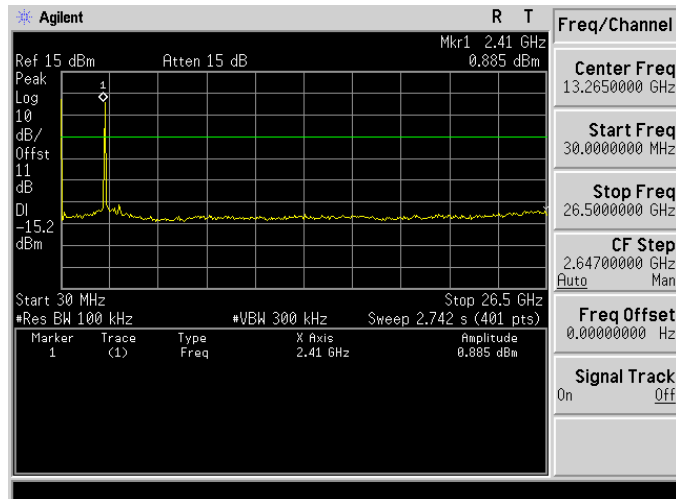
2462 MHz



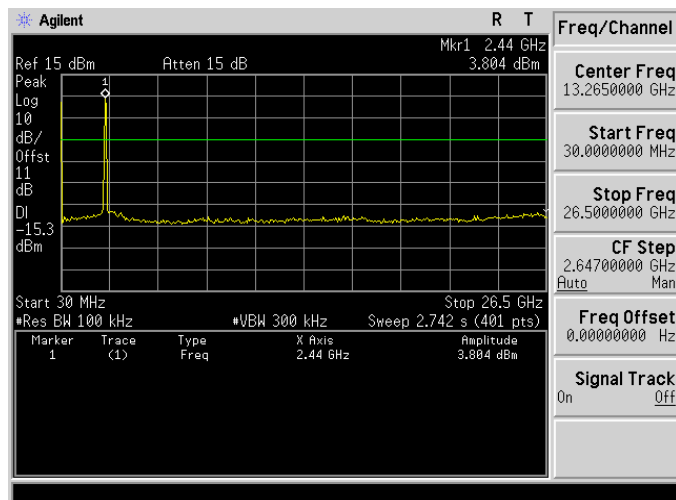
Out of Band Conducted Spurious Emission

Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode\_ANT-0

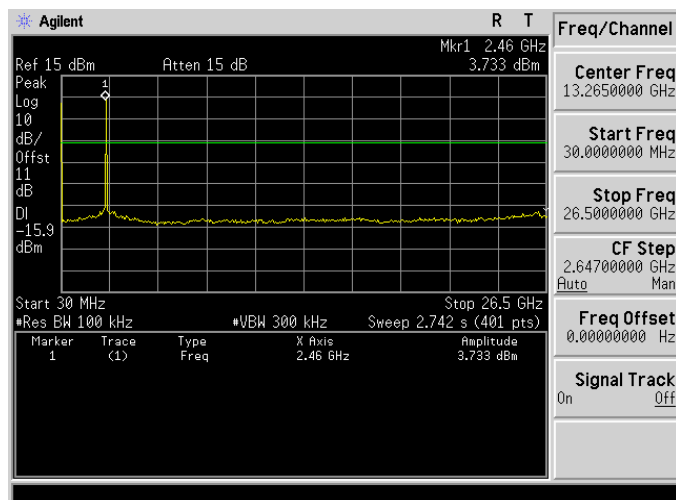
2412 MHz



2437 MHz



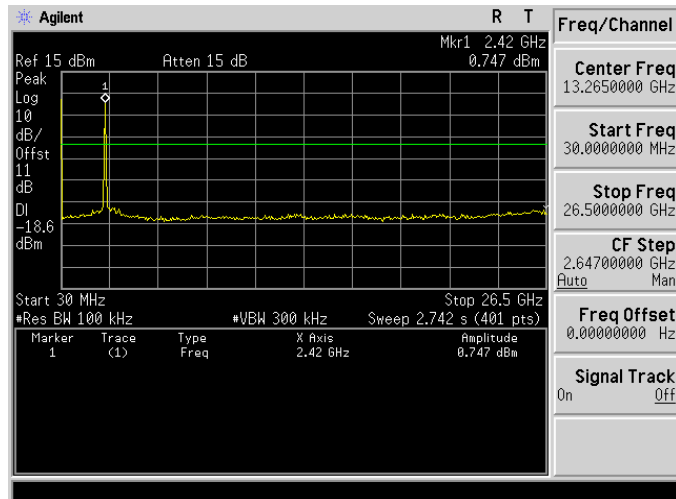
2462 MHz



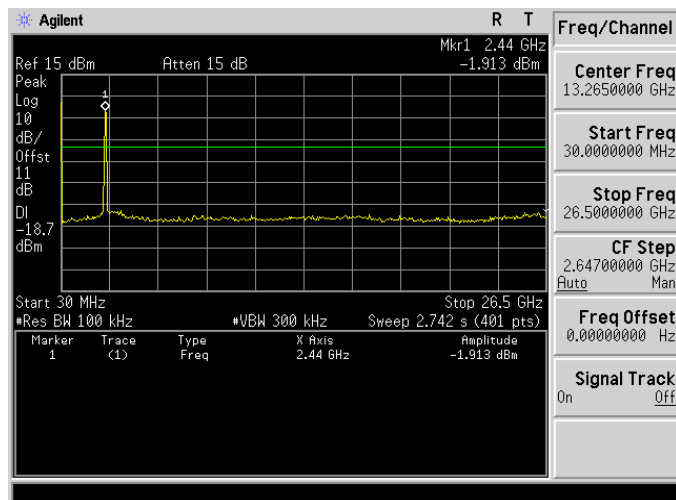
Out of Band Conducted Spurious Emission

Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode\_ANT-0

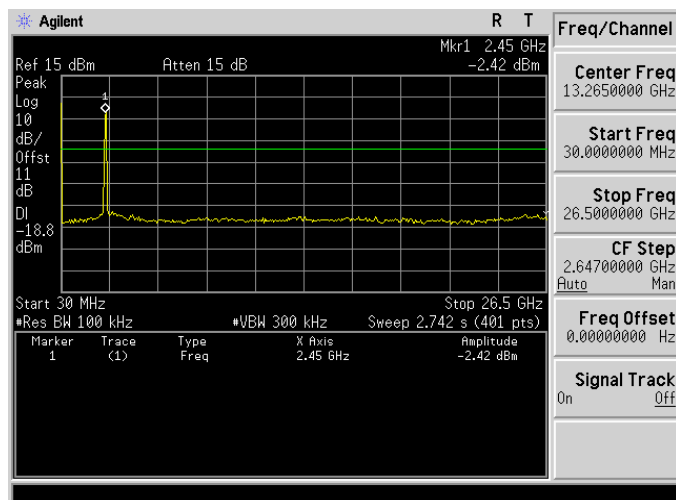
2422 MHz



2437 MHz



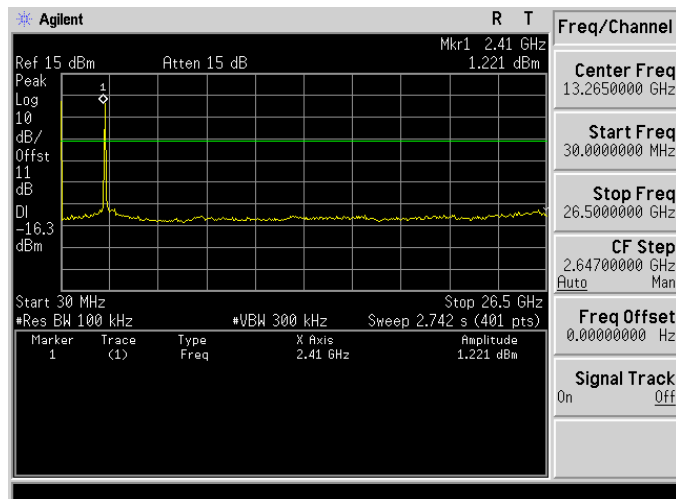
2452 MHz



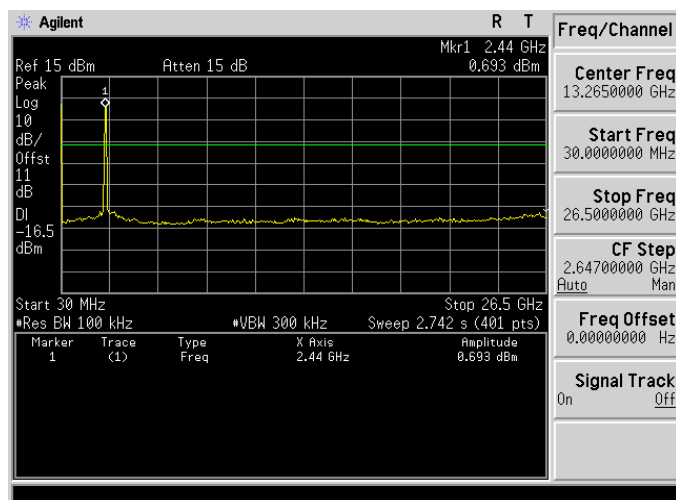
Out of Band Conducted Spurious Emission

Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode\_ANT-1

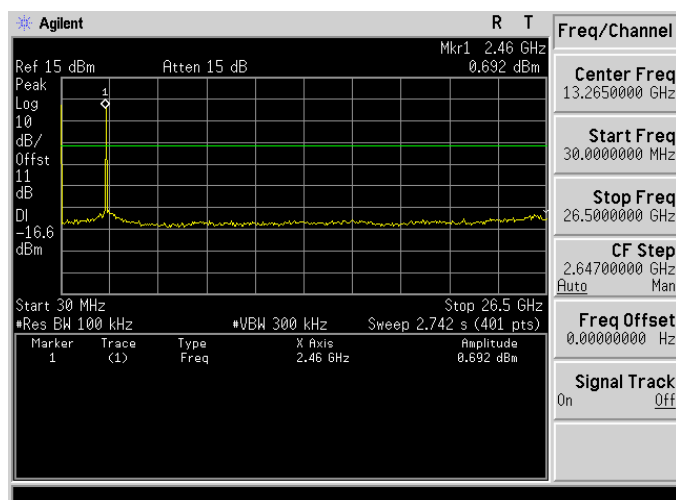
2412 MHz



2437 MHz



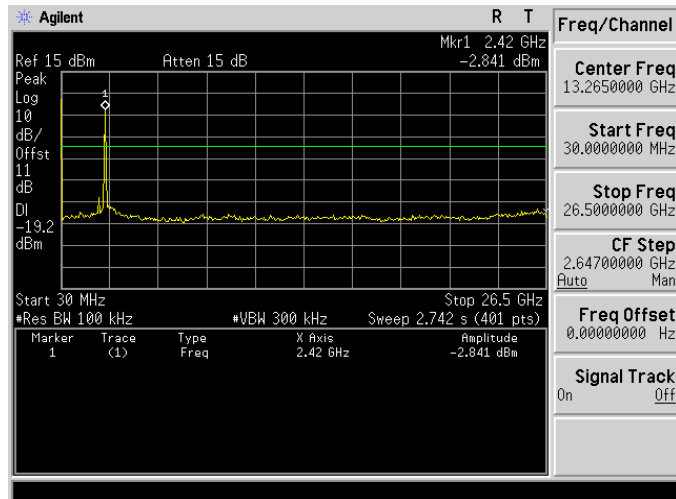
2462 MHz



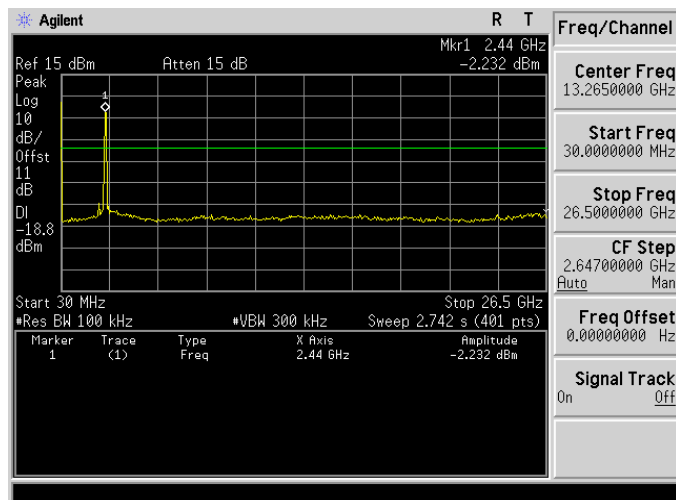
Out of Band Conducted Spurious Emission

Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode\_ANT-1

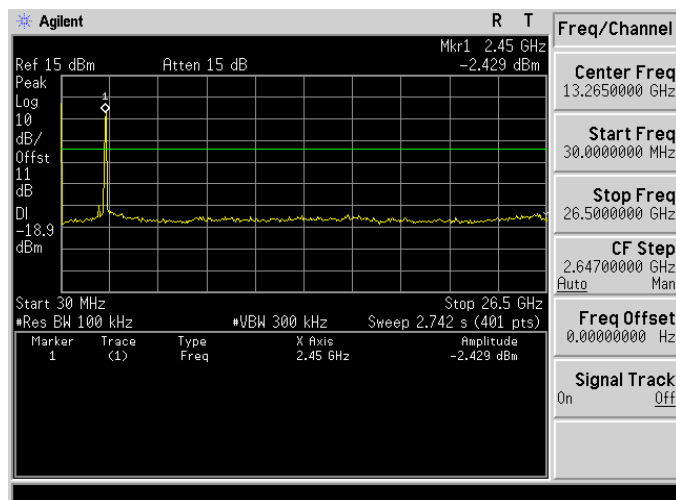
2422 MHz



2437 MHz



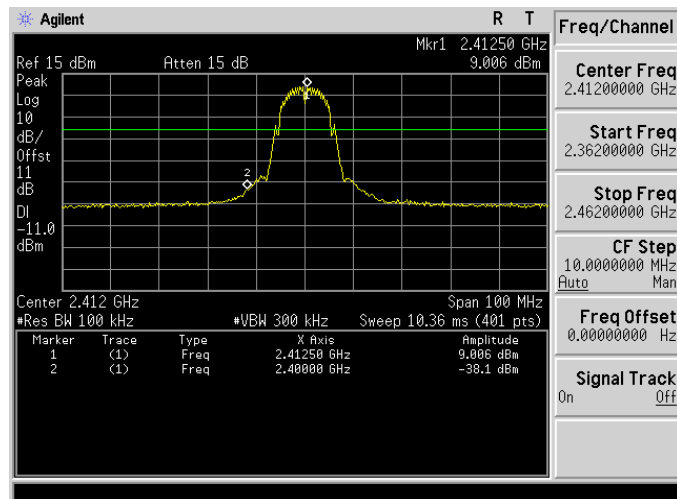
2452 MHz



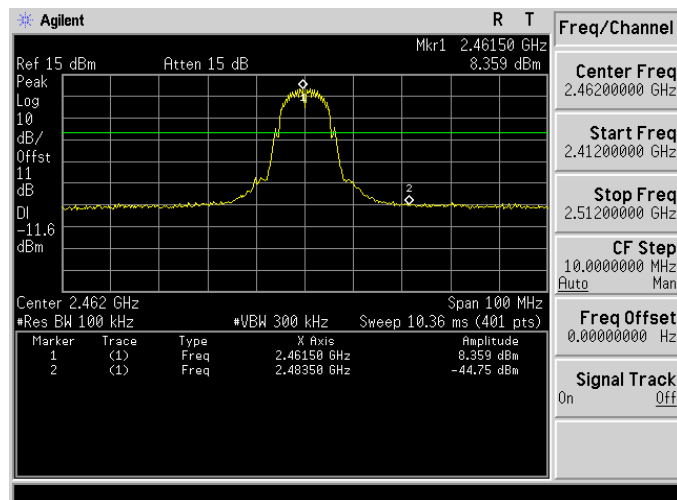
Conducted Band Edge

Mode 2: IEEE 802.11b link mode\_ANT-0

2412 MHz



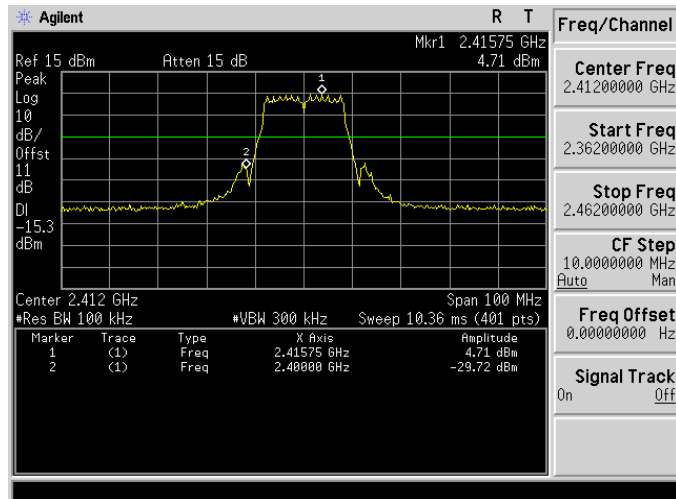
2462 MHz



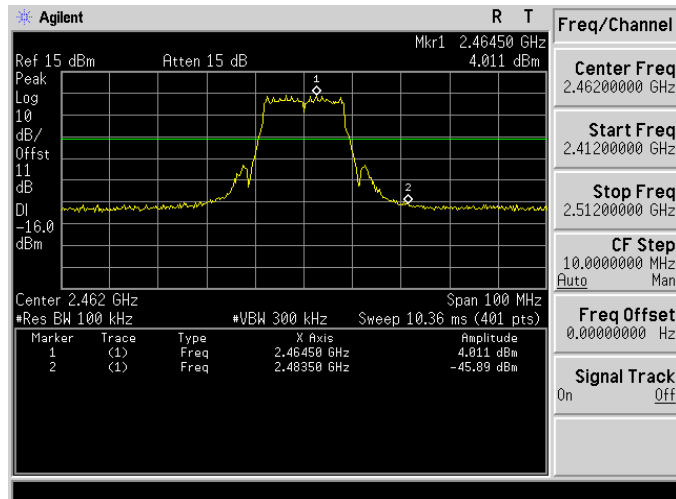
Conducted Band Edge

Mode 3: IEEE 802.11g link mode\_ANT-0

2412 MHz



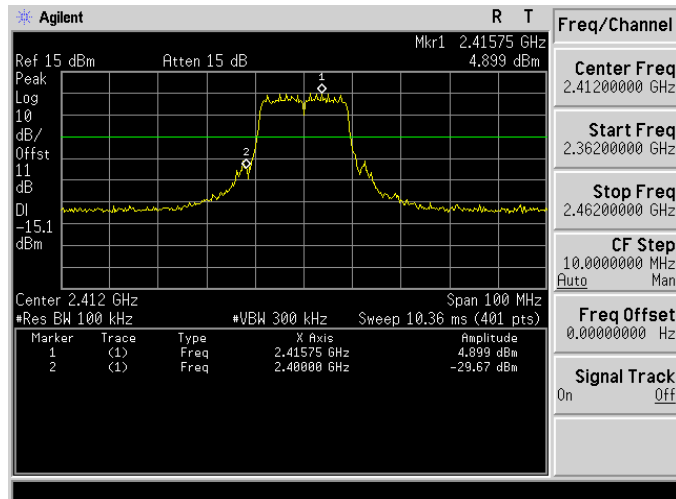
2462 MHz



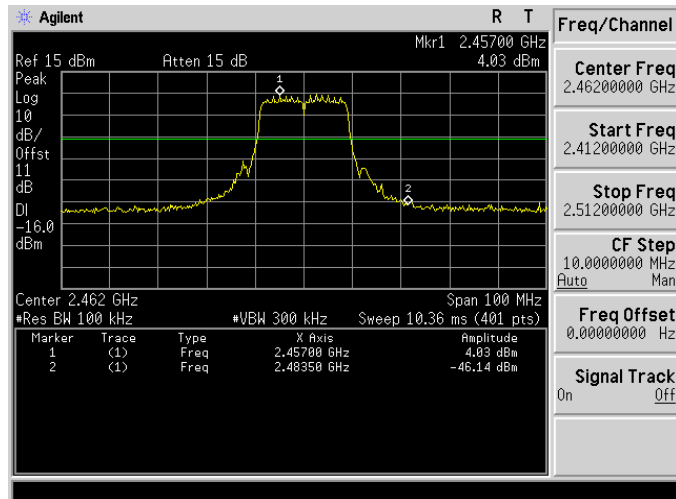
Conducted Band Edge

Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode\_ANT-0

2412 MHz



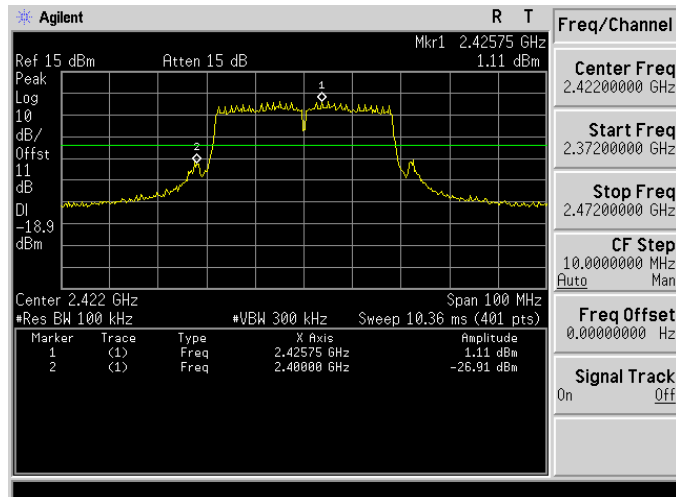
2462 MHz



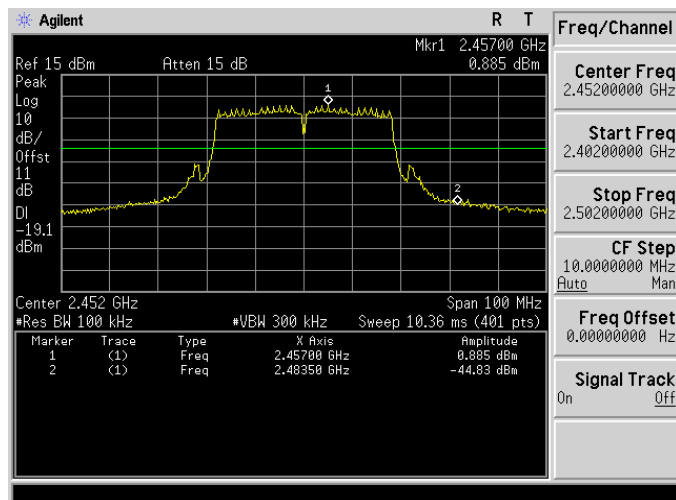
**Conducted Band Edge**

Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode\_ANT-0

2422 MHz



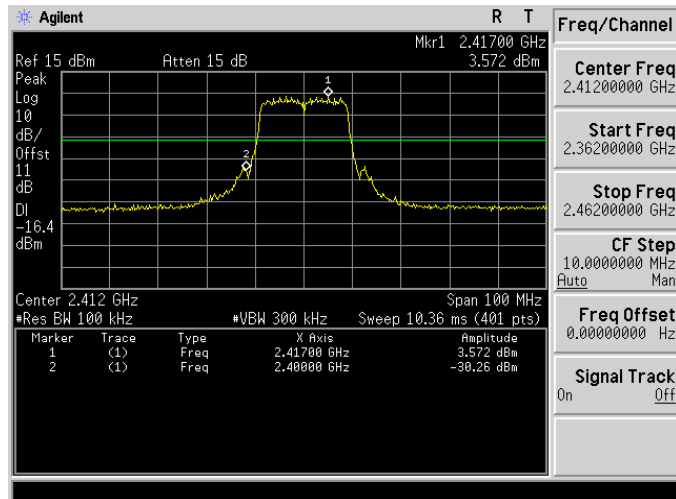
2452 MHz



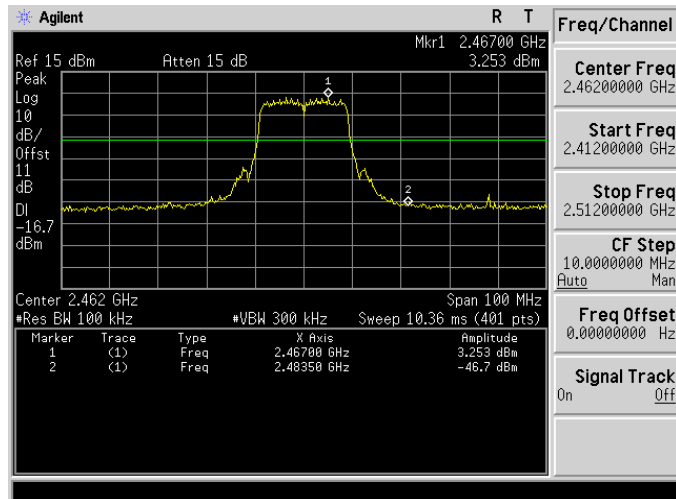
Conducted Band Edge

Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode\_ANT-1

2412 MHz



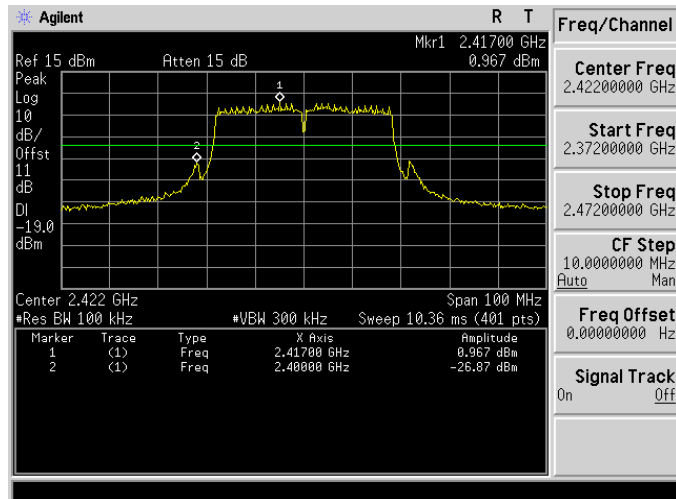
2462 MHz



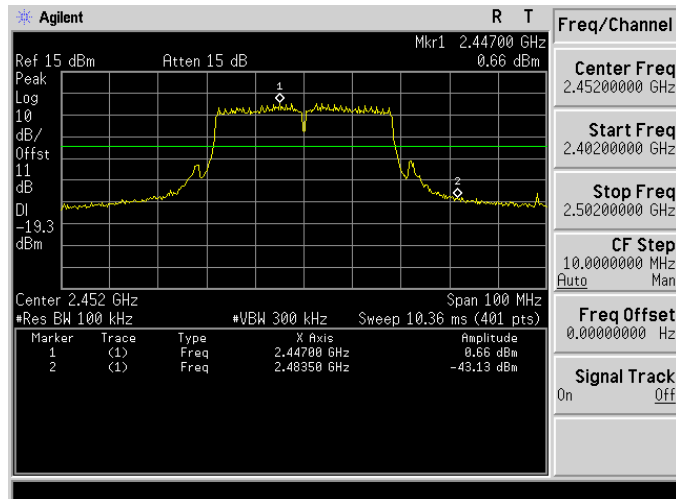
Conducted Band Edge

Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode\_ANT-1

2422 MHz



2452 MHz



## 10 Antenna Measurement

### 10.1.Limit

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

### 10.2.Antenna Description

See section 2 – antenna information.

### 10.3.Directiona Gain Calculated

$$\text{Directional Gain} = 10 \cdot \log \left[ \left( 10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20} \right)^2 / N_{\text{ANT}} \right]$$

| Operate Freq. Band        | Directional Gain (dBi) |
|---------------------------|------------------------|
| IEEE 802.11n 2.4GHz 20MHz | 5.62                   |
| IEEE 802.11n 2.4GHz 40MHz | 5.62                   |