# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENTS

*OF*

150Mbps Wireless N Portable AP

MODEL No.: IPuppy III, IP04223

FCC ID: X7D-IP04223

Trade Mark: TOTOLINK

REPORT NO.: ES141023301E

ISSUE DATE: November 5, 2014

Prepared for

ZIONCOM ELECTRONICS (SHENZHEN) LTD.

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# VERIFICATION OF COMPLIANCE

| | |
|---|---|
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| Product Description: | 150Mbps Wireless N Portable AP |
| Model Number: | IPuppy III , IP04223 |
| File Number: | ES141023301E |
| Date of Test: | October 23, 2014 to November 5, 2014 |

**We hereby certify that:**

The above equipment was tested by SHENZHEN EMTEK CO., LTD.
The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247

The test results of this report relate only to the tested sample identified in this report.

Date of Test : October 23, 2014 to November 5, 2014

Prepared by : Joe Xia /Editor

Reviewer : Jack Li /Supervisor

Approve & Authorized Signer : Lisa Wang/Manager

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# 1. General Information

## 1.1 Product Description

A major technical descriptions of EUT is described as following:

A). Operation Frequency:
2.4G 802.11b/g/n(HT20):2412MHz-2462MHz; 802.11n(HT40): 2422MHz-2452MHz
B). Modulation: OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n,
DSSS with DBPSK/DQPSK/CCK for 802.11b;
C). Number of Channel: 2.4G 802.11b/g/n(HT20): 11channels; 802.11n(HT40): 7channels
D). Max Peak Conducted Power: 2.4G wifi 20.46dBm
E). Antenna Gain: 2.0dBi for 2.4G WIFI
F). Antenna Type: PiFa antenna
G). Power Supply: DC 5V from USB

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

Note:
1. This device is included 802.11b, 802.11g, 802.11n 2.4GHz transceiver function.
2. Test of channel was included the lowest middle and highest frequency in lowest data rate and to perform the test, then record on this report.

## 1.2 Related Submittal(s) / Grant(s)

This submittal(s) (test report) is intended for FCC ID: X7D-IP04223 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.
The composite system is compliance with Subpart B is authorized under a DOC procedure.

## 1.3 Test Methodology

All the test program has follow FCC new test procedure KDB558074 D01 v03r02, Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2009). Radiated testing was performed at an antenna to EUT distance 3 meters.

## 1.4 Special Accessories

Not available for this EUT intended for grant.

## 1.5 Equipment Modifications

Not available for this EUT intended for grant.

## 1.6 Test Facility

Site Description

| | | |
|---|---|---|
| EMC Lab. | : | Accredited by CNAS, 2013.10.29<br>The certificate is valid until 2016.10.28<br>The Laboratory has been assessed and proved to be in compliance with CNAS/CL01: 2006(identical to ISO/IEC17025: 2005)<br>The Certificate Registration Number is L2291<br><br>Accredited by TUV Rheinland Shenzhen 2010.5.25<br>The Laboratory has been assessed according to the requirements ISO/IEC 17025<br><br>Accredited by FCC, April 17, 2013<br>The Certificate Registration Number is 406365.<br><br>Accredited by Industry Canada, March 05, 2010<br>The Certificate Registration Number is 4480A-2. |
| Name of Firm | : | SHENZHEN EMTEK CO., LTD. |
| Site Location | : | Bldg 69, Majialong Industry Zone,<br>Nanshan District, Shenzhen, Guangdong, China |

# 2. System Test Configuration

## 2.1 EUT Configuration

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

## 2.2 EUT Exercise

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

## 2.3 Test Procedure

### 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2009 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.

### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. Emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009.

## 2.4 Configuration of Tested System

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

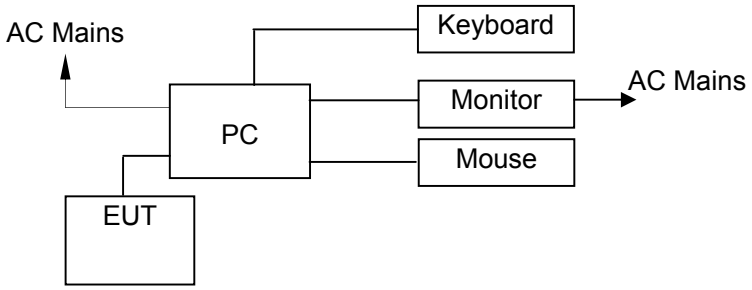



**Table 2-1 Equipment Used in Tested System**

| Item | Equipment | Mfr/Brand | Model/Type No. | FCC ID | Series No. | Note |
|---|---|---|---|---|---|---|
| 1. | 150Mbps Wireless N Portable AP | TOTOLINK | IP04223 | X7D-IP04223 | N/A | EUT |
| 2. | PC | Lenovo | ThinkCentre 8701 | N/A | N/A | |
| 3. | LCD Monitor | Lenovo | 9227-AE6 | N/A | N/A | |
| 4. | Keyboard | Lenovo | KU-0225 | N/A | N/A | |
| 5. | Mouse | Lenovo | MO28UOL | N/A | N/A | |

**Note:**

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

# 3. Description of Test Modes

The Transmitter of EUT is an 150Mbps Wireless N Portable AP and powered by host equipment; these is Digital Transmission system (DTS) and have modulation OFDM, DSSS, DBPSK, DQPSK, CCK, 16QAM, 64QAM. According exploratory test, EUT will have maximum output power in those data rate (802.11b: 1 Mbps; 802.11g: 6 Mbps; 802.11n: MCS0), so those data rate were used for all test.
The equipment enables high-speed access without wires to network assets. This adapter uses the IEEE 802.11 protocol to enable wireless communications between the host and Wireless rooter.

For 802.11b/g/n(HT20):
1. For lowest channel : 2412MHz (Channel 1)
2. For middle channel : 2437MHz (Channel 6)
3. For highest channel : 2462MHz (Channel 11)

For 802.11b/g/n(HT40)
4. For lowest channel : 2422MHz (Channel 3)
5. For middle channel : 2437MHz (Channel 6)
6. For highest channel : 2452MHz (Channel 9)

# 4. Summary of Test Results

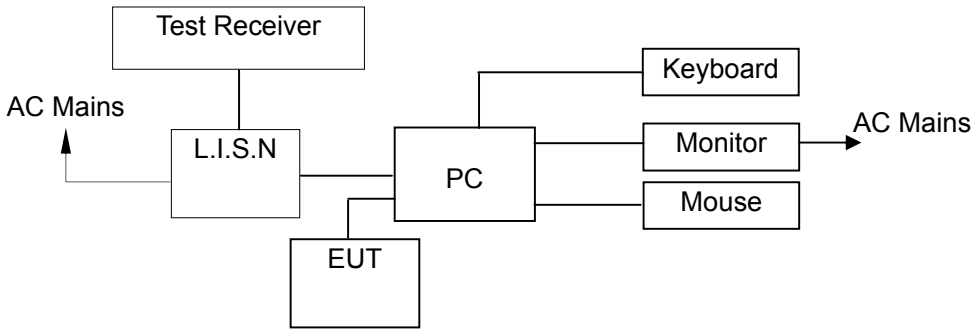
| FCC Rules | Description Of Test | Result |
|---|---|---|
| §15.247(a)(2) | 6dB bandwidth | Pass |
| §15.247(b)(3) | Max Peak output Power test | Pass |
| §15.247(e) | Power density | Pass |
| §15.247(d) | Band edge test | Pass |
| §15.207 | AC Power Conducted Emission | Pass |
| §15.247(d), §15.209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

# 5. Conducted Emissions Test

## 5.1 Measurement Procedure

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

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




## 5.3 Measurement Equipment Used

| Conducted Emission Test Site | | | | | |
|---|---|---|---|---|---|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| Test Receiver | Rohde & Schwarz | ESCS30 | 828985/018 | 05/17/2014 | 05/16/2015 |
| L.I.S.N. | Schwarzbeck | NNLK8129 | 8129203 | 05/17/2014 | 05/16/2015 |
| 50Ω Coaxial Switch | Anritsu | MP59B | M20531 | N/A | N/A |
| Pulse Limiter | Rohde & Schwarz | ESH3-Z2 | 100006 | 05/17/2014 | 05/16/2015 |
| Voltage Probe | Rohde & Schwarz | TK9416 | N/A | 05/17/2014 | 05/16/2015 |
| I.S.N | Rohde & Schwarz | ENY22 | 1109.9508.02 | 05/17/2014 | 05/16/2015 |

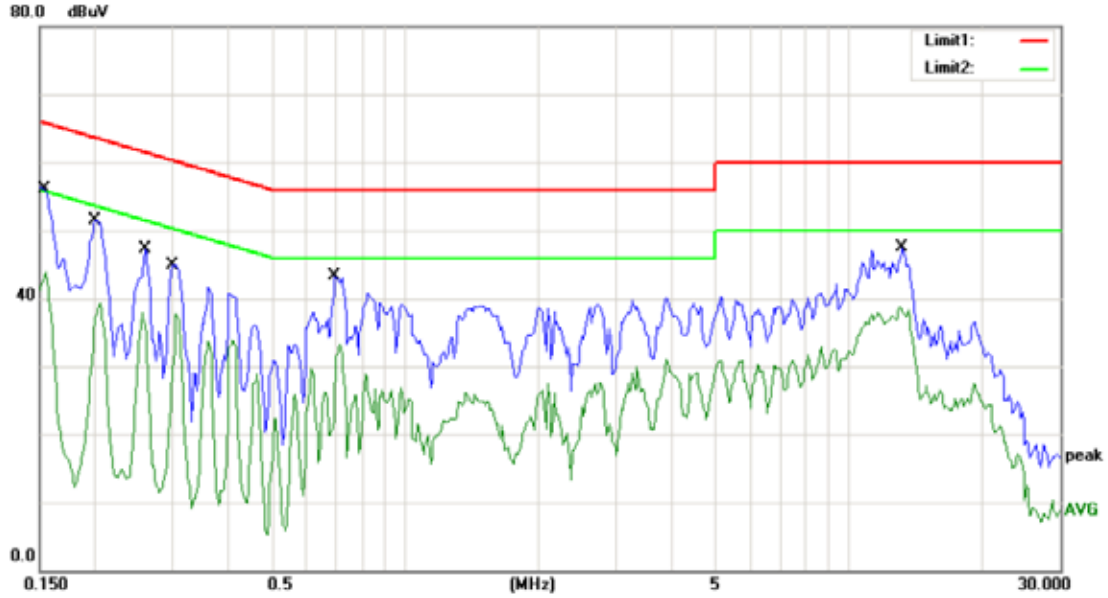
## 5.4 Conducted Emission Limit

**Conducted Emission**

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

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

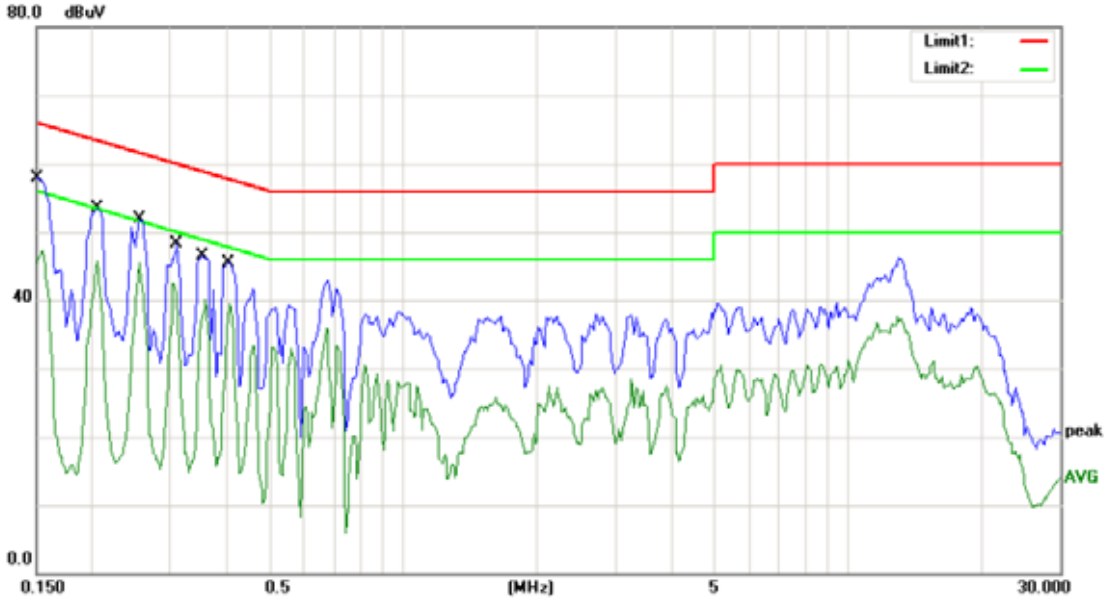
## 5.5 Measurement Result




Site Conduction #1 Phase: *L1* Temperature: 24
Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 53 %
EUT: 150Mbps Wireless N Portable AP
M/N: IP04223
Mode: ON
Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | * | 0.1556 | 55.28 | 0.00 | 55.28 | 65.70 | -10.42 | QP | |
| 2 | | 0.1556 | 43.84 | 0.00 | 43.84 | 55.70 | -11.86 | AVG | |
| 3 | | 0.2000 | 51.59 | 0.00 | 51.59 | 63.61 | -12.02 | QP | |
| 4 | | 0.2000 | 39.23 | 0.00 | 39.23 | 53.61 | -14.38 | AVG | |
| 5 | | 0.2600 | 47.37 | 0.00 | 47.37 | 61.43 | -14.06 | QP | |
| 6 | | 0.2600 | 37.84 | 0.00 | 37.84 | 51.43 | -13.59 | AVG | |
| 7 | | 0.3000 | 44.94 | 0.00 | 44.94 | 60.24 | -15.30 | QP | |
| 8 | | 0.3000 | 37.80 | 0.00 | 37.80 | 50.24 | -12.44 | AVG | |
| 9 | | 0.6950 | 43.26 | 0.00 | 43.26 | 56.00 | -12.74 | QP | |
| 10 | | 0.6950 | 33.33 | 0.00 | 33.33 | 46.00 | -12.67 | AVG | |
| 11 | | 13.2250 | 47.58 | 0.00 | 47.58 | 60.00 | -12.42 | QP | |
| 12 | | 13.2250 | 38.77 | 0.00 | 38.77 | 50.00 | -11.23 | AVG | |

*:Maximum data x:Over limit I:over margin Comment: Factor build in receiver. Operator: csl




Site Conduction #1 Phase: N Temperature: 24
Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 53 %
EUT: 150Mbps Wireless N Portable AP
M/N: IP04223
Mode: ON
Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1524 | 57.80 | 0.00 | 57.80 | 65.87 | -8.07 | QP | |
| 2 | | 0.1524 | 47.34 | 0.00 | 47.34 | 55.87 | -8.53 | AVG | |
| 3 | | 0.2050 | 53.50 | 0.00 | 53.50 | 63.41 | -9.91 | QP | |
| 4 | | 0.2050 | 45.65 | 0.00 | 45.65 | 53.41 | -7.76 | AVG | |
| 5 | | 0.2550 | 51.93 | 0.00 | 51.93 | 61.59 | -9.66 | QP | |
| 6 | * | 0.2550 | 45.52 | 0.00 | 45.52 | 51.59 | -6.07 | AVG | |
| 7 | | 0.3100 | 48.32 | 0.00 | 48.32 | 59.97 | -11.65 | QP | |
| 8 | | 0.3100 | 42.59 | 0.00 | 42.59 | 49.97 | -7.38 | AVG | |
| 9 | | 0.3550 | 46.43 | 0.00 | 46.43 | 58.84 | -12.41 | QP | |
| 10 | | 0.3550 | 40.11 | 0.00 | 40.11 | 48.84 | -8.73 | AVG | |
| 11 | | 0.4050 | 45.56 | 0.00 | 45.56 | 57.75 | -12.19 | QP | |
| 12 | | 0.4050 | 39.55 | 0.00 | 39.55 | 47.75 | -8.20 | AVG | |

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

# 6. Radiated Emission Test

## 6.1 Measurement Procedure

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

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

| EMI Test Receiver | Setting |
|---|---|
| Attenuation | Auto |
| RB | 120kHz |
| VB | 300kHz |
| Detector | QP |
| Trace | Max hold |

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

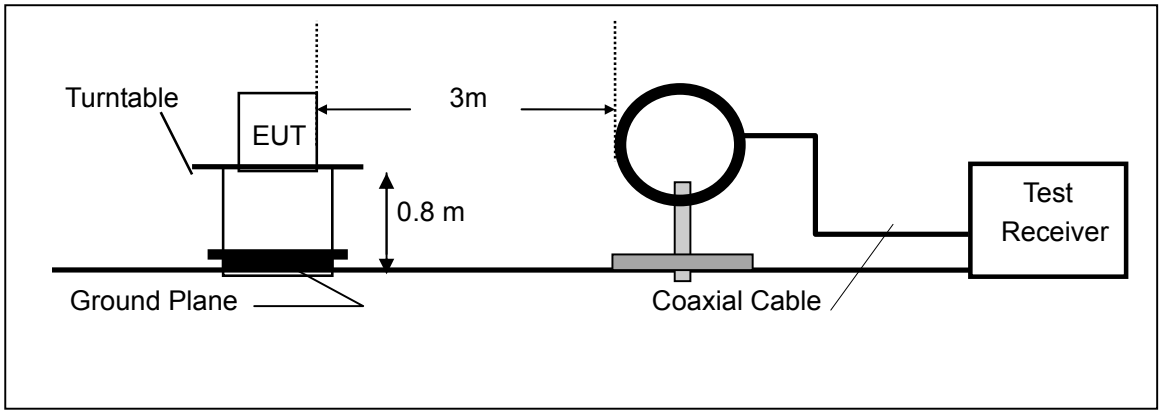
| EMI Test Receiver | Setting |
|---|---|
| Attenuation | Auto |
| RB | 1MHz |
| VB | 3MHz |
| Detector | Peak |
| Trace | Max hold |

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

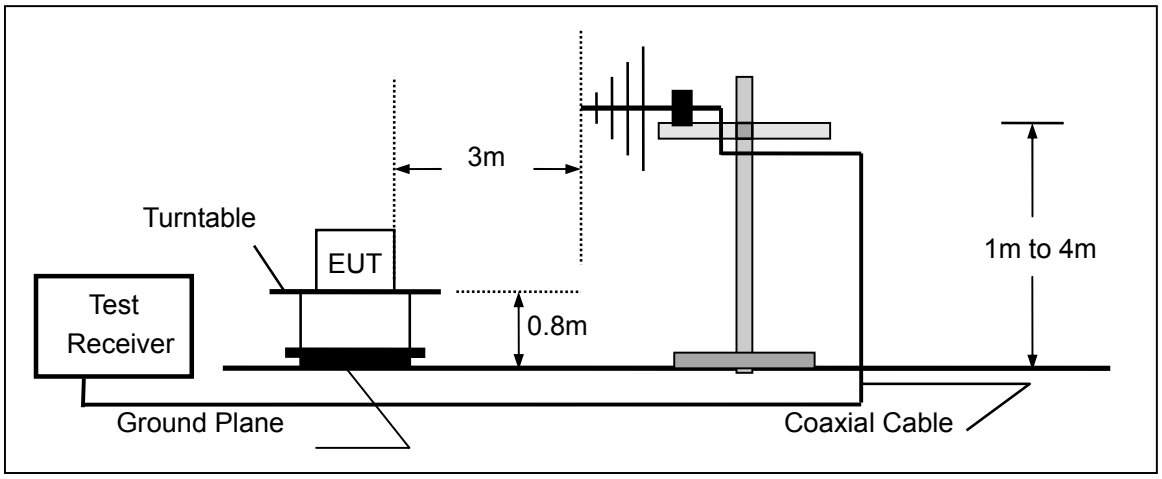
| EMI Test Receiver | Setting |
|---|---|
| Attenuation | Auto |
| RB | 1MHz |
| VB | 10Hz |
| Detector | Peak |
| Trace | Max hold |

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

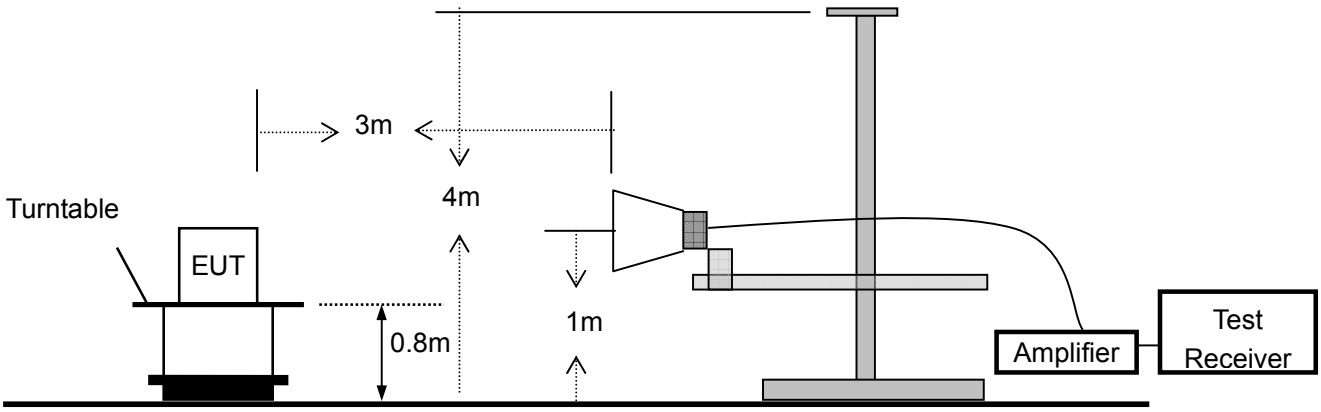
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz




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




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



## 6.3 Measurement Equipment Used

| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
|---|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESU | 1302.6005.26 | 05/17/2014 | 05/16/2015 |
| Pre-Amplifier | HP | 8447D | 2944A07999 | 05/17/2014 | 05/16/2015 |
| Bilog Antenna | Schwarzbeck | VULB9163 | 142 | 05/17/2014 | 05/16/2015 |
| Loop Antenna | ARA | PLA-1030/B | 1029 | 05/17/2014 | 05/16/2015 |
| Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170399 | 05/17/2014 | 05/16/2015 |
| Horn Antenna | Schwarzbeck | BBHA 9120 | D143 | 05/17/2014 | 05/16/2015 |
| Cable | Schwarzbeck | AK9513 | ACRX1 | 05/17/2014 | 05/16/2015 |
| Cable | Rosenberger | N/A | FP2RX2 | 05/17/2014 | 05/16/2015 |
| Cable | Schwarzbeck | AK9513 | CRPX1 | 05/17/2014 | 05/16/2015 |
| Cable | Schwarzbeck | AK9513 | CRRX2 | 05/17/2014 | 05/16/2015 |

## 6.4 Radiated Emission Limit

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

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

15.205 Restricted bands of operation

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

Remark: 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

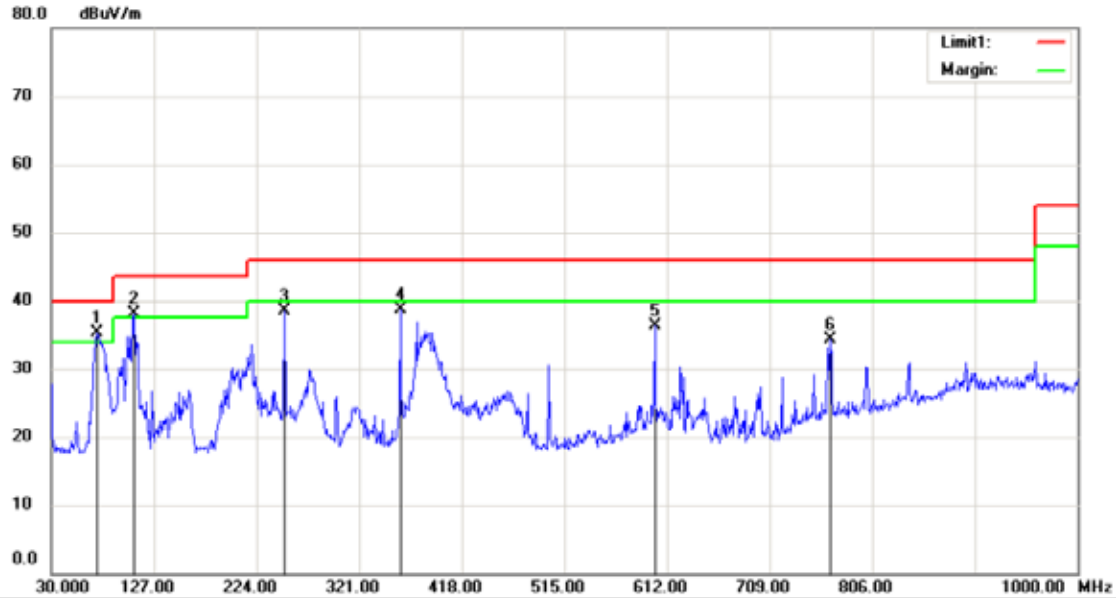
## 6.5 Measurement Result

All modes 2.4G 802.11b/g/n have been tested, and the worst result 802.11b recorded as below:

| | | | |
|---|---|---|---|
| Operation Mode: | TX Mode | Test Date : | October 30, 2014 |
| Frequency Range: | 9KHz~30MHz | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 63 % |
| Measured Distance: | 3m | Test By: | RU |
| Note: | | | |

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

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.
Distance extrapolation factor =40log(Specific distance/ test distance)( dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.




Site 3m Chamber #2 Polarization: *Horizontal* Temperature: 24 C

Limit: ( RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %

EUT: 150Mbps Wireless N portable AP

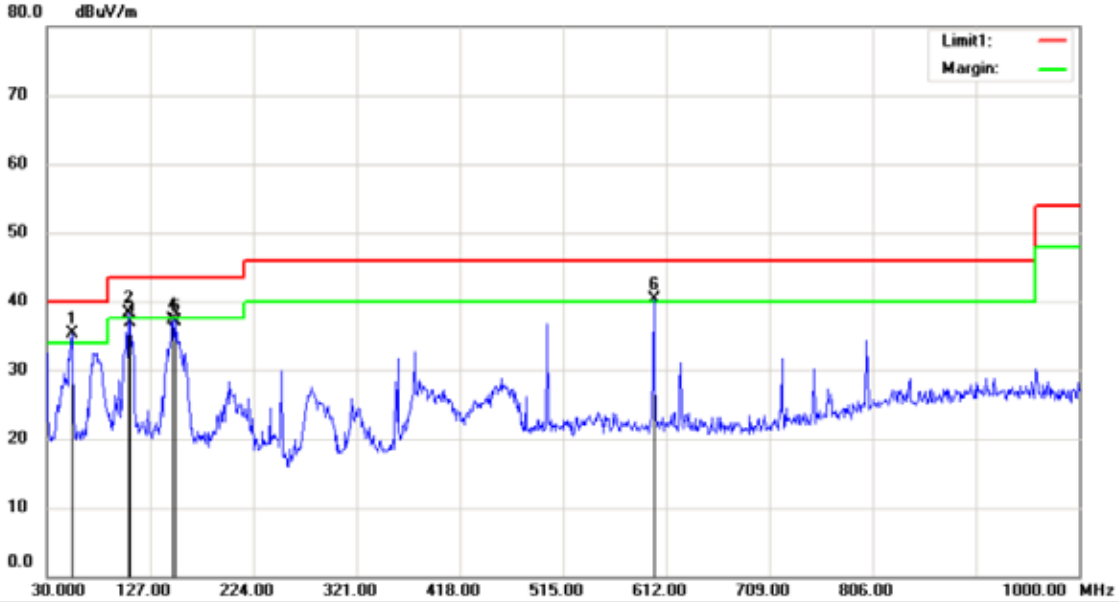
M/N: IP04223

Mode:2412

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | * | 73.6500 | 54.96 | -19.75 | 35.21 | 40.00 | -4.79 | QP | | | |
| 2 | ! | 108.5700 | 52.58 | -14.53 | 38.05 | 43.50 | -5.45 | QP | | | |
| 3 | | 250.1900 | 51.72 | -13.25 | 38.47 | 46.00 | -7.53 | QP | | | |
| 4 | | 359.8000 | 48.90 | -10.20 | 38.70 | 46.00 | -7.30 | QP | | | |
| 5 | | 600.3600 | 42.08 | -5.71 | 36.37 | 46.00 | -9.63 | QP | | | |
| 6 | | 766.2300 | 36.59 | -2.26 | 34.33 | 46.00 | -11.67 | QP | | | |

*:Maximum data x:Over limit !:over margin Operator: Wang




Site 3m Chamber #2 Polarization: *Vertical* Temperature: 24 C

Limit: ( RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %

EUT: 150Mbps Wireless N portable AP

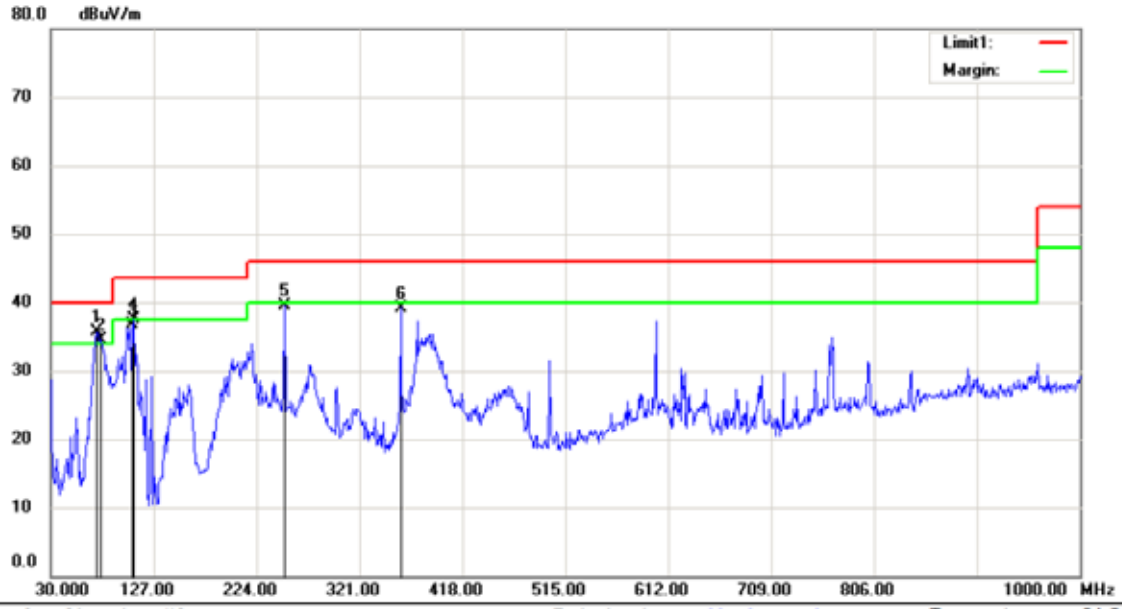
M/N: IP04223

Mode:2412

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | * | 53.2800 | 53.16 | -17.95 | 35.21 | 40.00 | -4.79 | QP | | | |
| 2 | ! | 106.6300 | 52.82 | -14.48 | 38.34 | 43.50 | -5.16 | QP | | | |
| 3 | | 108.5700 | 51.35 | -14.53 | 36.82 | 43.50 | -6.68 | QP | | | |
| 4 | | 148.3400 | 55.74 | -18.37 | 37.37 | 43.50 | -6.13 | QP | | | |
| 5 | | 151.2500 | 55.66 | -18.46 | 37.20 | 43.50 | -6.30 | QP | | | |
| 6 | ! | 600.3600 | 46.04 | -5.71 | 40.33 | 46.00 | -5.67 | QP | | | |

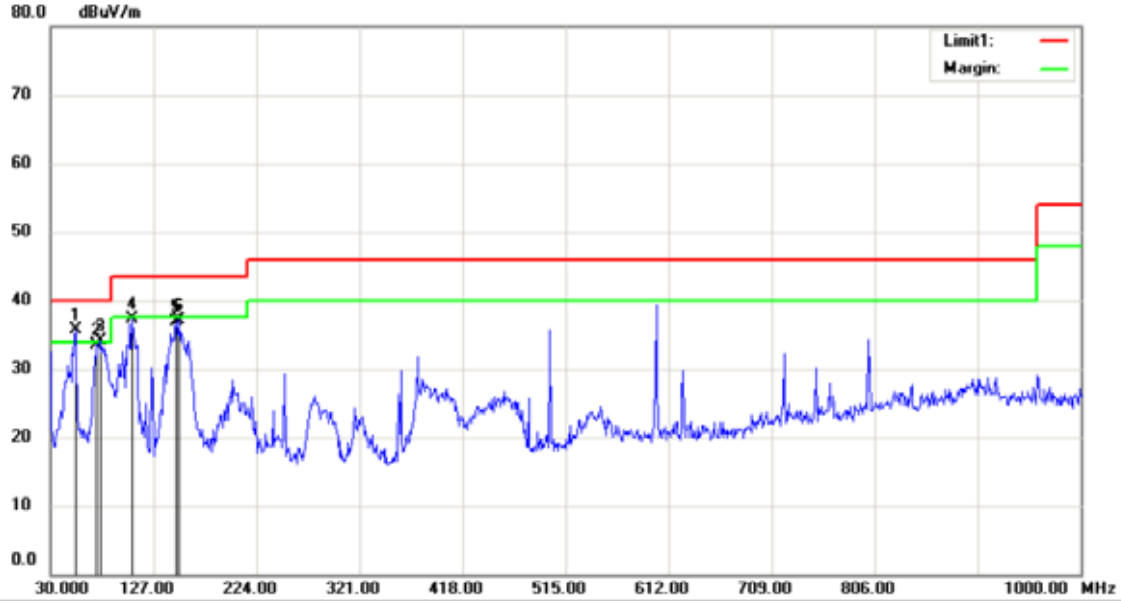
*:Maximum data x:Over limit !:over margin Operator: Wang




Site 3m Chamber #2 Polarization: *Horizontal* Temperature: 24 C
Limit: ( RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: 150Mbps Wireless N portable AP
M/N: IP04223
Mode:2437
Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | * | 73.6500 | 55.46 | -19.75 | 35.71 | 40.00 | -4.29 | QP | | | |
| 2 | ! | 77.5300 | 54.39 | -19.97 | 34.42 | 40.00 | -5.58 | QP | | | |
| 3 | | 106.6300 | 51.27 | -14.48 | 36.79 | 43.50 | -6.71 | QP | | | |
| 4 | ! | 108.5700 | 52.08 | -14.53 | 37.55 | 43.50 | -5.95 | QP | | | |
| 5 | | 250.1900 | 52.72 | -13.25 | 39.47 | 46.00 | -6.53 | QP | | | |
| 6 | | 359.8000 | 49.40 | -10.20 | 39.20 | 46.00 | -6.80 | QP | | | |

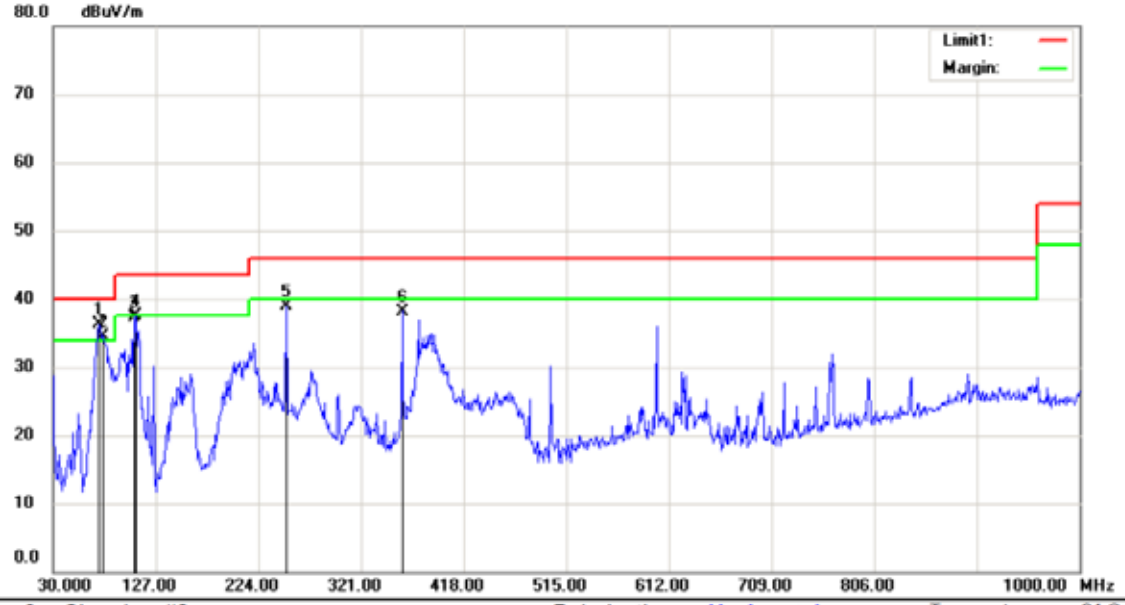
*:Maximum data x:Over limit !:over margin Operator: Wang




Site 3m Chamber #2 Polarization: *Vertical* Temperature: 24 C
Limit: ( RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: 150Mbps Wireless N portable AP
M/N: IP04223
Mode:2437
Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | * | 53.2800 | 53.66 | -17.95 | 35.71 | 40.00 | -4.29 | QP | | | |
| 2 | | 73.6500 | 53.16 | -19.75 | 33.41 | 40.00 | -6.59 | QP | | | |
| 3 | ! | 76.5600 | 54.01 | -19.99 | 34.02 | 40.00 | -5.98 | QP | | | |
| 4 | | 106.6300 | 51.82 | -14.48 | 37.34 | 43.50 | -6.16 | QP | | | |
| 5 | | 148.3400 | 55.24 | -18.37 | 36.87 | 43.50 | -6.63 | QP | | | |
| 6 | | 151.2500 | 55.66 | -18.46 | 37.20 | 43.50 | -6.30 | QP | | | |

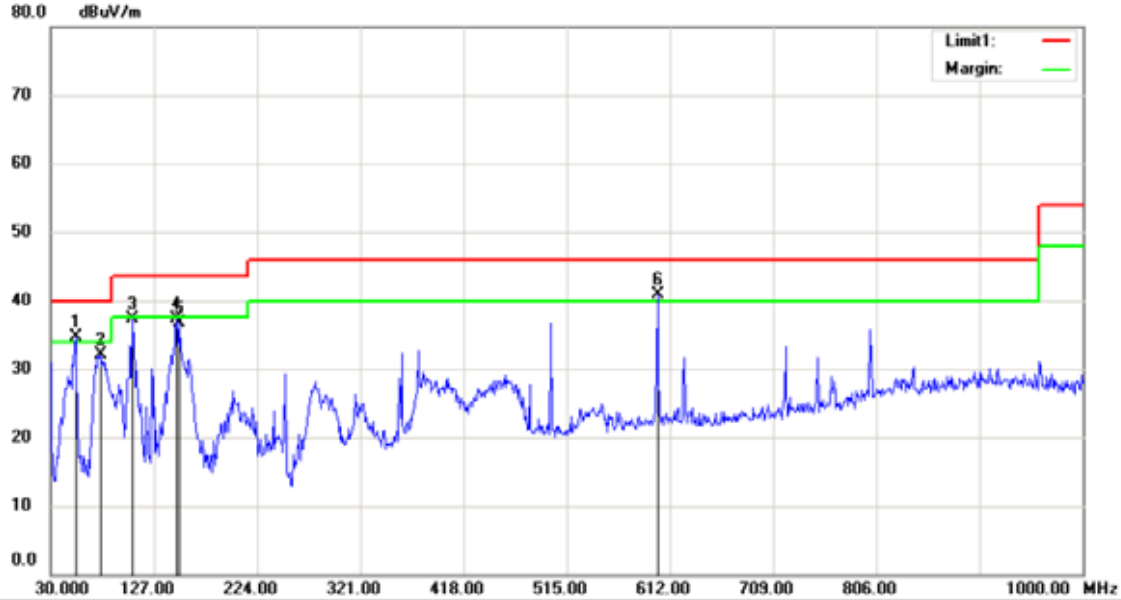
*:Maximum data x:Over limit !:over margin Operator: Wang




Site 3m Chamber #2 Polarization: *Horizontal* Temperature: 24 C
Limit: ( RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: 150Mbps Wireless N portable AP
M/N: IP04223
Mode:2462
Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | * | 73.6500 | 55.96 | -19.75 | 36.21 | 40.00 | -3.79 | QP | | | |
| 2 | ! | 77.5300 | 54.39 | -19.97 | 34.42 | 40.00 | -5.58 | QP | | | |
| 3 | | 106.6300 | 51.77 | -14.48 | 37.29 | 43.50 | -6.21 | QP | | | |
| 4 | ! | 108.5700 | 52.08 | -14.53 | 37.55 | 43.50 | -5.95 | QP | | | |
| 5 | | 250.1900 | 52.22 | -13.25 | 38.97 | 46.00 | -7.03 | QP | | | |
| 6 | | 359.8000 | 48.40 | -10.20 | 38.20 | 46.00 | -7.80 | QP | | | |

*:Maximum data x:Over limit !:over margin Operator: Wang




Site 3m Chamber #2 Polarization: *Vertical* Temperature: 24 C
Limit: ( RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: 150Mbps Wireless N portable AP
M/N: IP04223
Mode:2462
Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | I | 53.2800 | 52.66 | -17.95 | 34.71 | 40.00 | -5.29 | QP | | | |
| 2 | | 76.5600 | 52.01 | -19.99 | 32.02 | 40.00 | -7.98 | QP | | | |
| 3 | | 106.6300 | 51.82 | -14.48 | 37.34 | 43.50 | -6.16 | QP | | | |
| 4 | | 148.3400 | 55.74 | -18.37 | 37.37 | 43.50 | -6.13 | QP | | | |
| 5 | | 151.2500 | 55.16 | -18.46 | 36.70 | 43.50 | -6.80 | QP | | | |
| 6 | * | 600.3600 | 46.54 | -5.71 | 40.83 | 46.00 | -5.17 | QP | | | |

*:Maximum data x:Over limit I:over margin Operator: Wang

| | | | |
|---|---|---|---|
| Operation Mode: | 802.11b TX Channel 1 | Test Date : | October 30, 2014 |
| Frequency Range: | Above 1GHz | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 63 % |
| Measured Distance: | 3m | Test By: | RU |

| Freq. | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|---|---|---|---|---|---|---|---|
| (MHz) | H/V | PK | AV | PK | AV | PK | AV |
| 4811.93 | V | 48.92 | 33.91 | 74.00 | 54.00 | -25.08 | -20.09 |
| 7235.66 | V | 54.68 | 35.71 | 74.00 | 54.00 | -19.32 | -18.29 |
| 9602.02 | V | 53.00 | 33.97 | 74.00 | 54.00 | -21.00 | -20.03 |
| 4814.41 | H | 49.66 | 31.33 | 74.00 | 54.00 | -24.34 | -22.67 |
| 7237.94 | H | 52.06 | 33.57 | 74.00 | 54.00 | -21.94 | -20.43 |
| 9609.55 | H | 53.35 | 34.44 | 74.00 | 54.00 | -20.65 | -19.56 |

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

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

| | | | |
|---|---|---|---|
| Operation Mode: | 802.11b TX Channel 6 | Test Date : | October 30, 2014 |
| Frequency Range: | Above 1GHz | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 63 % |
| Measured Distance: | 3m | Test By: | RU |

| Freq. | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|---|---|---|---|---|---|---|---|
| (MHz) | H/V | PK | AV | PK | AV | PK | AV |
| 4861.32 | V | 49.78 | 32.19 | 74.00 | 54.00 | -24.22 | -21.81 |
| 7310.81 | V | 53.58 | 35.54 | 74.00 | 54.00 | -20.42 | -18.46 |
| 9699.06 | V | 51.47 | 33.10 | 74.00 | 54.00 | -22.53 | -20.90 |
| 4860.06 | H | 50.26 | 32.33 | 74.00 | 54.00 | -23.74 | -21.67 |
| 7317.59 | H | 52.39 | 33.72 | 74.00 | 54.00 | -21.61 | -20.28 |
| 9707.24 | H | 51.02 | 33.47 | 74.00 | 54.00 | -22.98 | -20.53 |

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

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

| | | | |
|---|---|---|---|
| Operation Mode: | 802.11b TX Channel 11 | Test Date : | October 30, 2014 |
| Frequency Range: | Above 1GHz | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 63 % |
| Measured Distance: | 3m | Test By: | RU |

| Freq. | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|---|---|---|---|---|---|---|---|
| (MHz) | H/V | PK | AV | PK | AV | PK | AV |
| 4912.83 | V | 48.83 | 31.03 | 74.00 | 54.00 | -25.17 | -22.97 |
| 7379.55 | V | 52.27 | 34.18 | 74.00 | 54.00 | -21.73 | -19.82 |
| 9802.13 | V | 53.09 | 34.75 | 74.00 | 54.00 | -20.91 | -19.25 |
| 4913.30 | H | 51.60 | 33.22 | 74.00 | 54.00 | -22.40 | -20.78 |
| 7386.31 | H | 53.08 | 36.14 | 74.00 | 54.00 | -20.92 | -17.86 |
| 9812.38 | H | 50.63 | 34.25 | 74.00 | 54.00 | -23.37 | -19.75 |

**No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.**

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

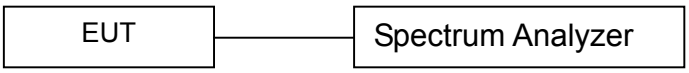
# 7. 6dB Bandwidth Test

## 7.1 Measurement Procedure

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

1. The testing follows FCC KDB Publication No. 558074 DTS 001 Meas. Guidance v03r02
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously
4. Make the measurement with the spectrum analyzer 's resolution bandwidth (RBW) = 100 kHz.Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement The 6dB bandwidth must be greater than 500 kHz
5. Measure and record the results in the test report.

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




## 7.3 Measurement Equipment Used

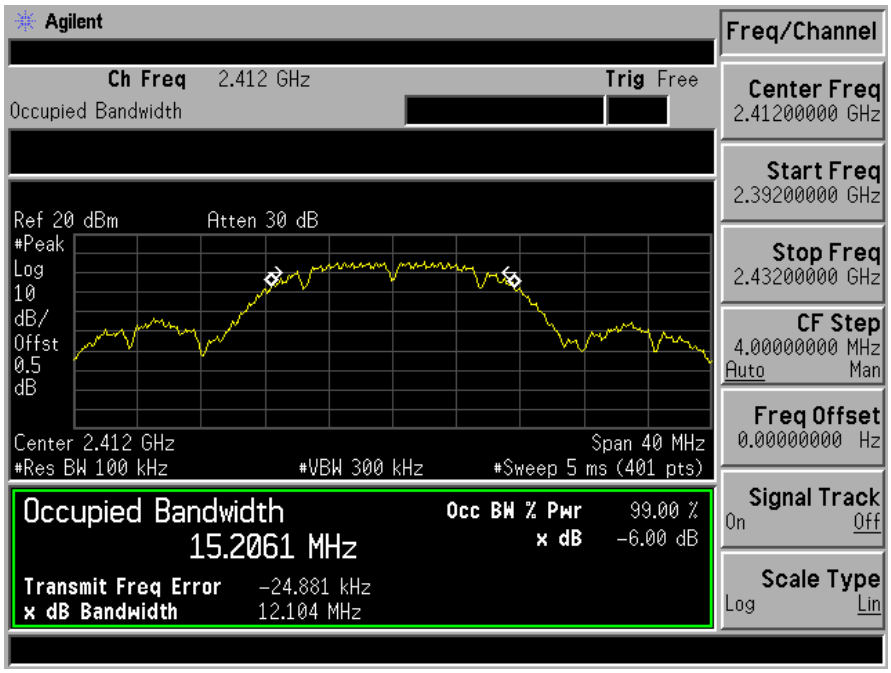
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4407B | 88156318 | 05/17/2014 | 05/16/2015 |

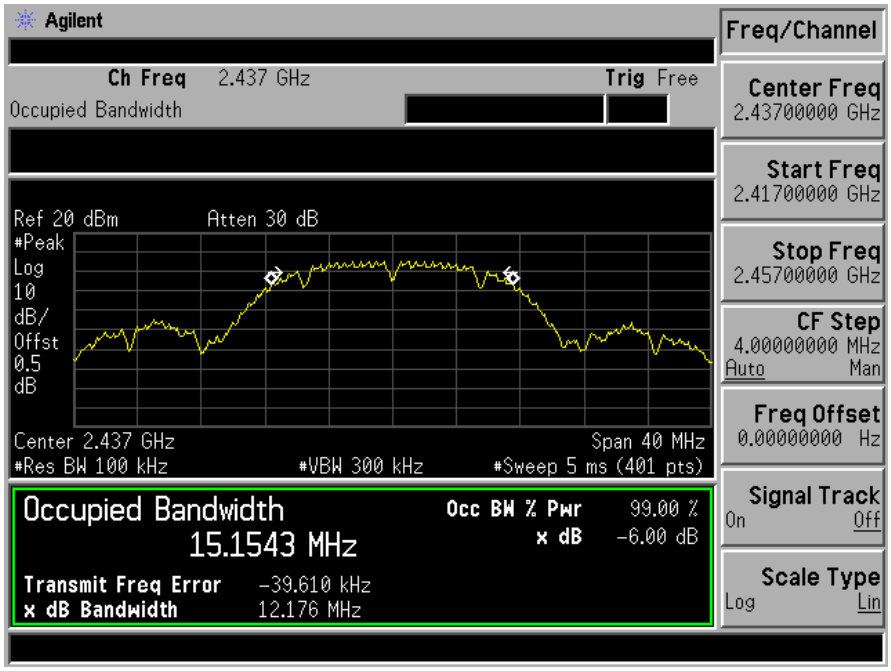
## 7.4 Measurement Results

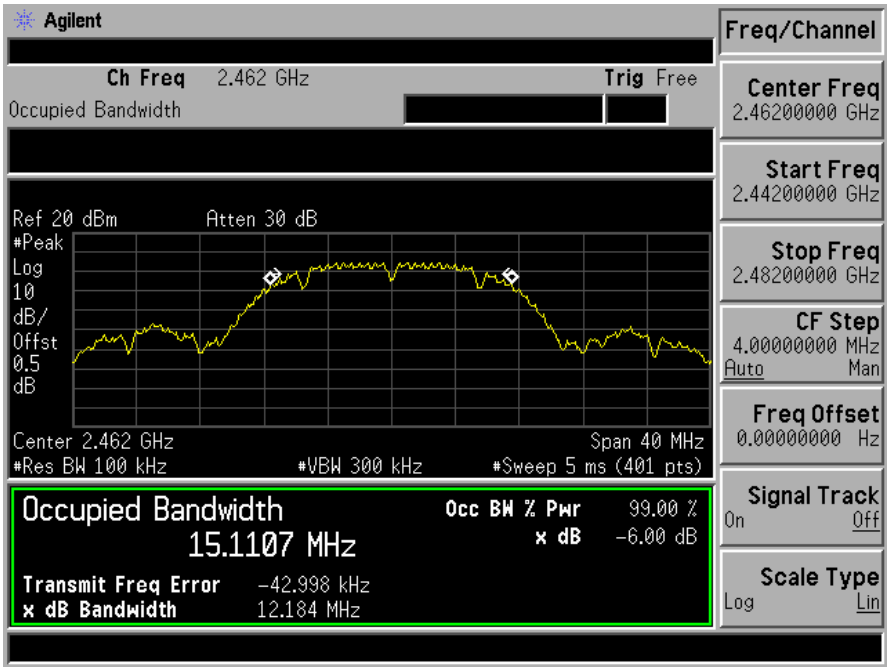
6db Bandwidth Test Data Chart:
Refer to attached data chart.

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date: | September 25, 2014 |
| Test By: | KK | Temperature: | 24℃ |
| Test Result: | PASS | Humidity: | 53 % |
| Operation Mode: | 802.11b | Antenna: | A |

| Channel number | Channel frequency (MHz) | Measurement level (MHz) | 6db Bandwidth Limit(MHz) |
|---|---|---|---|
| 1 | 2412 | 12.104 | >0.5 |
| 6 | 2437 | 12.176 | >0.5 |
| 11 | 2462 | 12.184 | >0.5 |

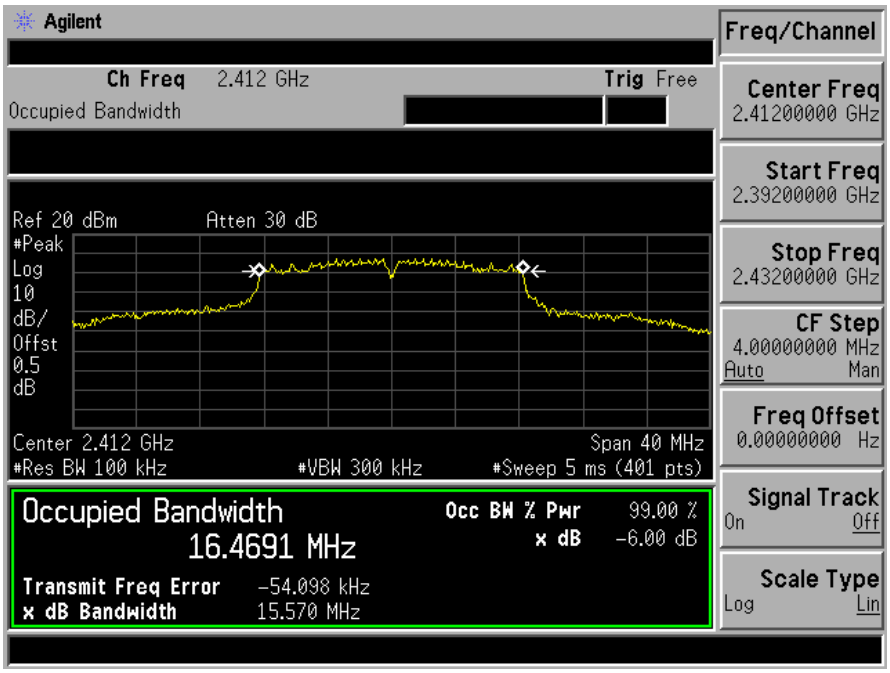


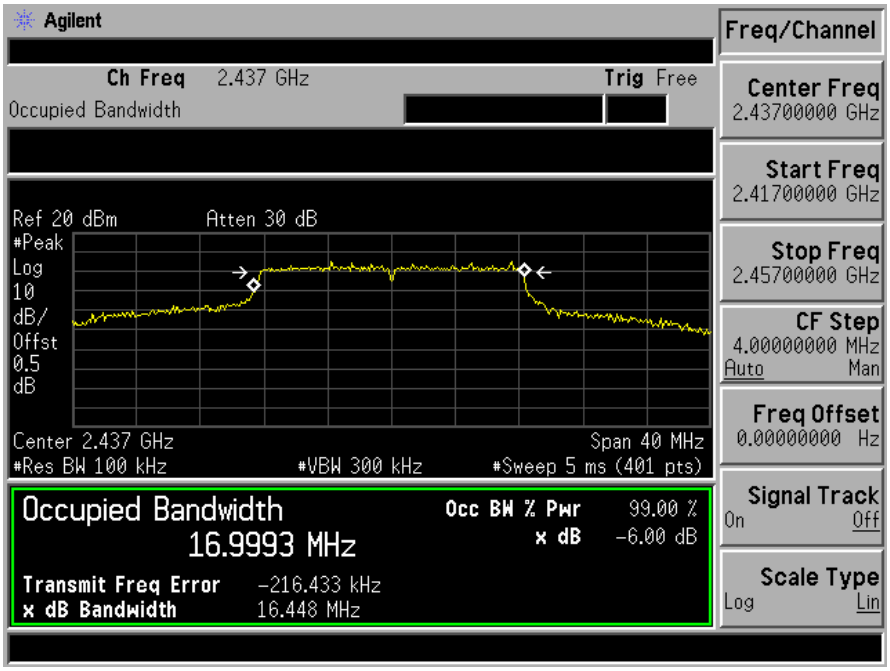

Agilent
Ch Freq 2.437 GHz
Trig Free
Occupied Bandwidth
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
0.5
dB
Center 2.437 GHz
Span 40 MHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 5 ms (401 pts)
Occupied Bandwidth
15.1543 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -39.610 kHz
x dB Bandwidth 12.176 MHz
Freq/Channel
Center Freq
2.43700000 GHz
Start Freq
2.41700000 GHz
Stop Freq
2.45700000 GHz
CF Step
4.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

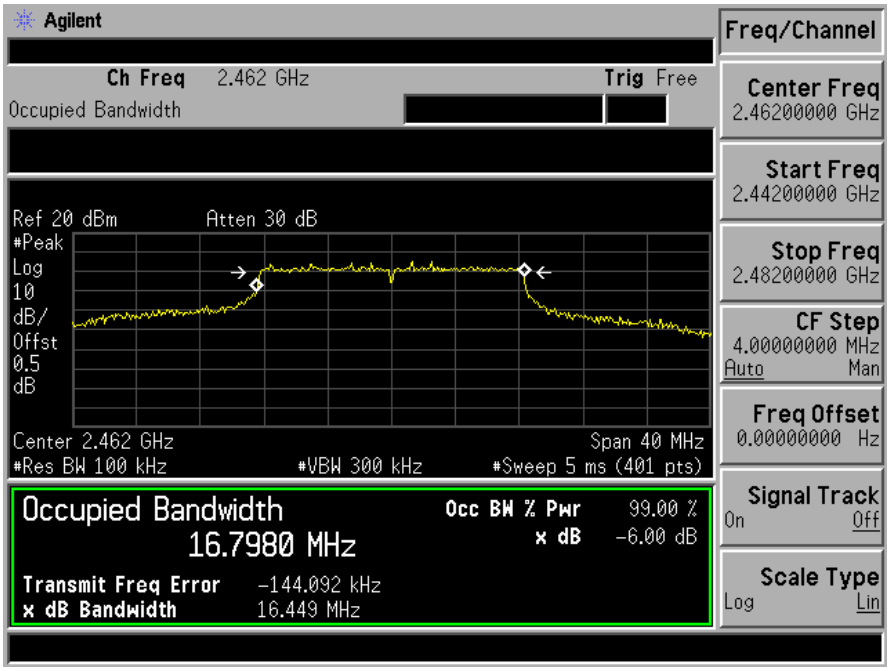

Agilent
Ch Freq 2.462 GHz
Trig Free
Occupied Bandwidth
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
0.5
dB
Center 2.462 GHz
Span 40 MHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 5 ms (401 pts)
Occupied Bandwidth
15.1107 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -42.998 kHz
x dB Bandwidth 12.184 MHz
Freq/Channel
Center Freq
2.46200000 GHz
Start Freq
2.44200000 GHz
Stop Freq
2.48200000 GHz
CF Step
4.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date: | September 25, 2014 |
| Test By: | KK | Temperature: | 24℃ |
| Test Result: | PASS | Humidity: | 53 % |
| Operation Mode: | 802.11g | Antenna: | A |

| Channel number | Channel frequency (MHz) | Measurement level (MHz) | 6db Bandwidth Limit(MHz) |
|---|---|---|---|
| 1 | 2412 | 15.570 | >0.5 |
| 6 | 2437 | 16.448 | >0.5 |
| 11 | 2462 | 16.449 | >0.5 |

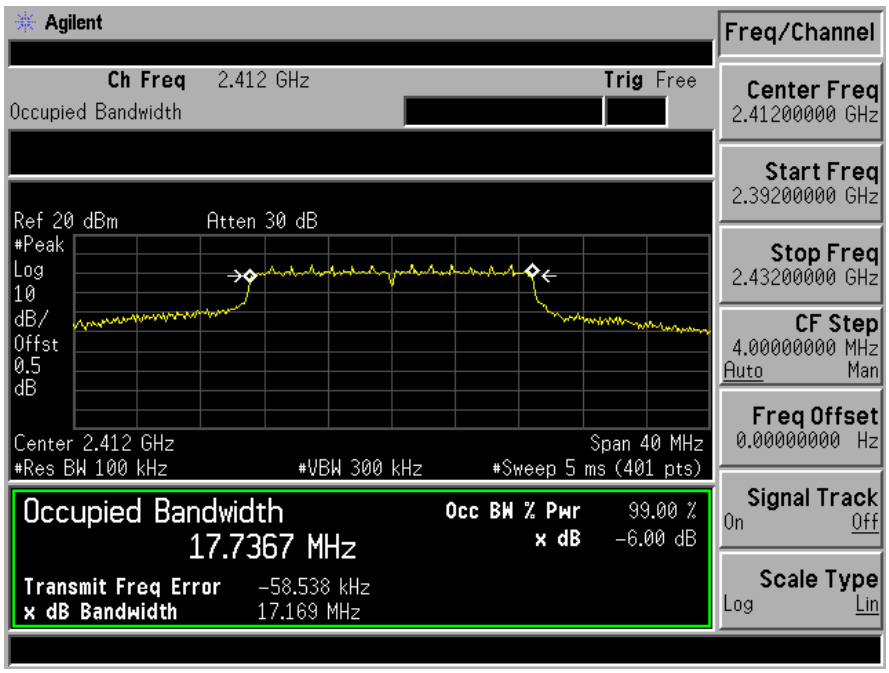


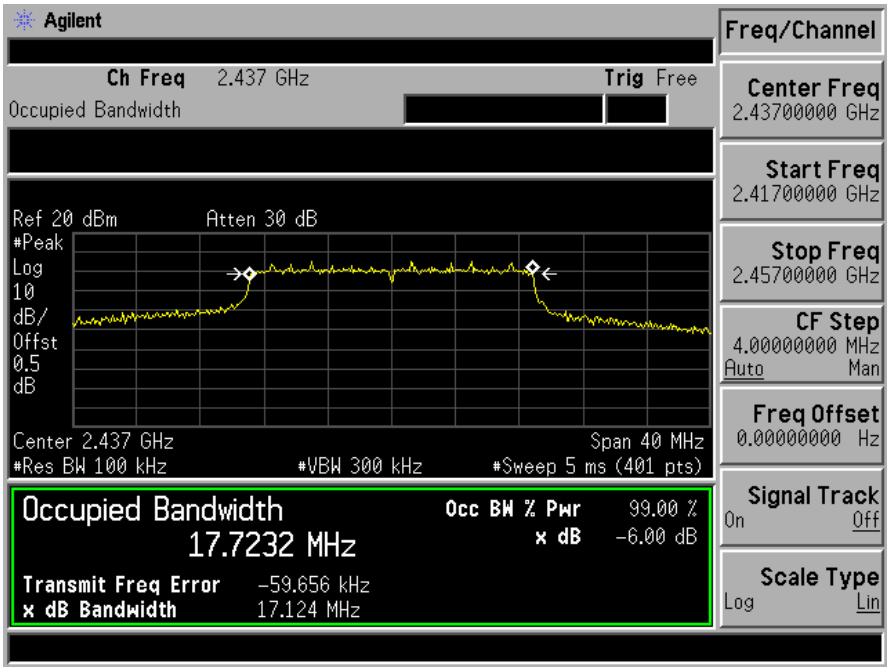

Agilent
Ch Freq 2.437 GHz
Trig Free
Occupied Bandwidth
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
0.5
dB
Center 2.437 GHz
Span 40 MHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 5 ms (401 pts)
Occupied Bandwidth
16.9993 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -216.433 kHz
x dB Bandwidth 16.448 MHz
Freq/Channel
Center Freq
2.43700000 GHz
Start Freq
2.41700000 GHz
Stop Freq
2.45700000 GHz
CF Step
4.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

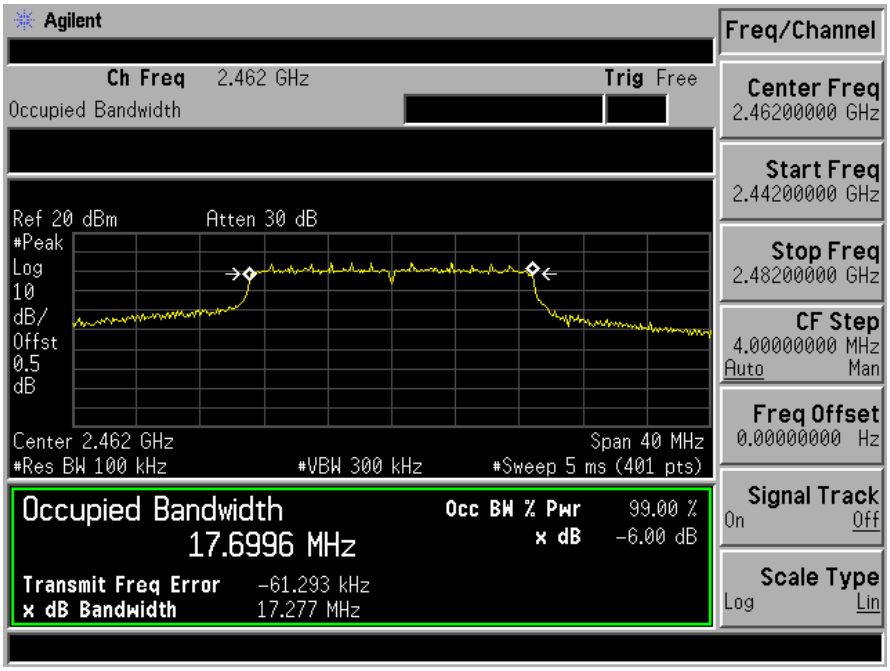

Agilent
Ch Freq 2.462 GHz
Trig Free
Occupied Bandwidth
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
0.5
dB
Center 2.462 GHz
Span 40 MHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 5 ms (401 pts)
Occupied Bandwidth
16.7980 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -144.092 kHz
x dB Bandwidth 16.449 MHz
Freq/Channel
Center Freq
2.46200000 GHz
Start Freq
2.44200000 GHz
Stop Freq
2.48200000 GHz
CF Step
4.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date: | September 25, 2014 |
| Test By: | KK | Temperature: | 24℃ |
| Test Result: | PASS | Humidity: | 53 % |
| Operation Mode: | 802.11n (HT20) | Antenna: | A |

| Channel number | Channel frequency (MHz) | Measurement level (MHz) | 6db Bandwidth Limit(MHz) |
|---|---|---|---|
| 1 | 2412 | 17.169 | >0.5 |
| 6 | 2437 | 17.124 | >0.5 |
| 11 | 2462 | 17.277 | >0.5 |

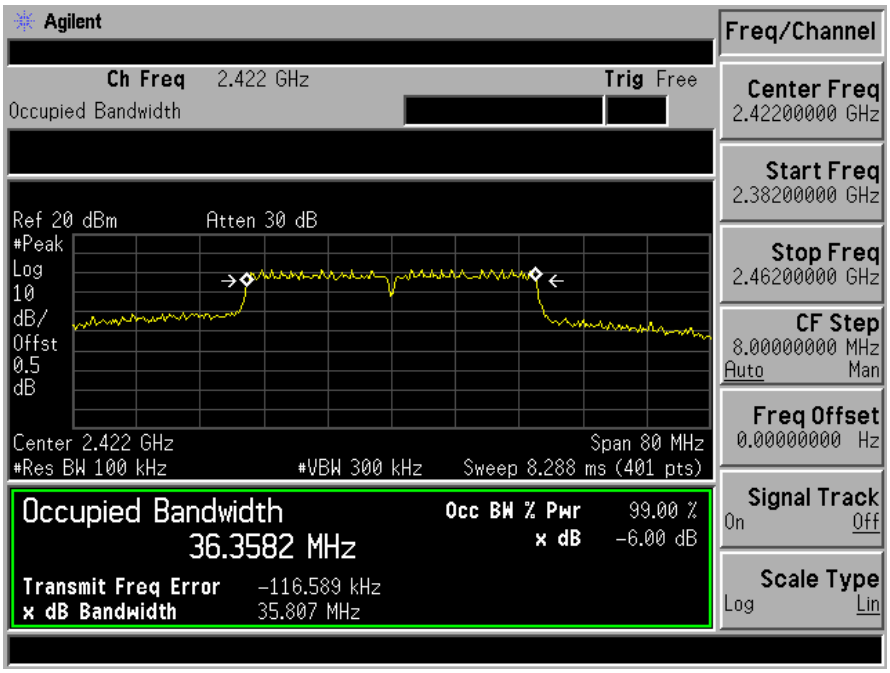


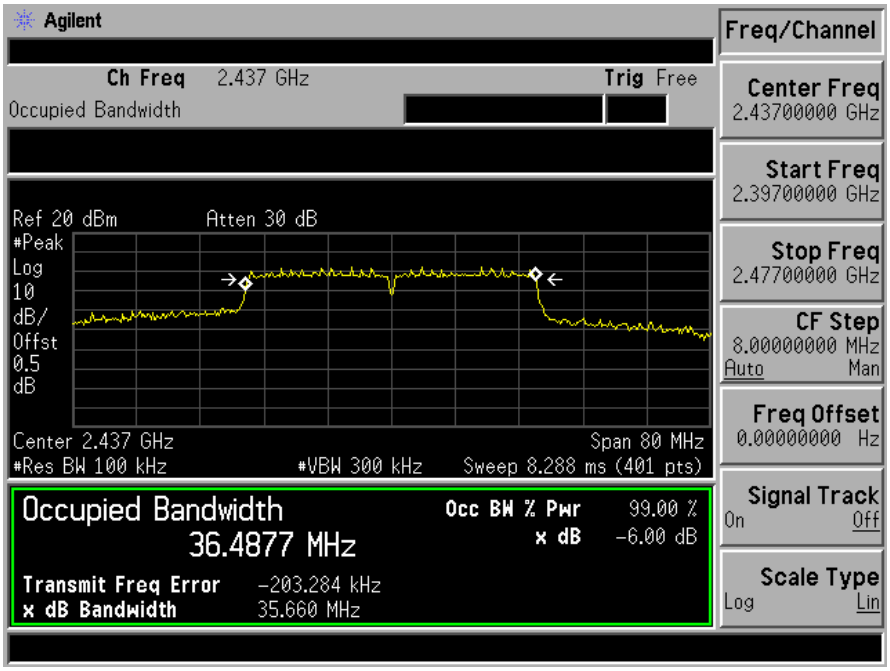

Agilent
Ch Freq 2.437 GHz
Trig Free
Occupied Bandwidth
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
0.5
dB
Center 2.437 GHz
Span 40 MHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 5 ms (401 pts)
Occupied Bandwidth
17.7232 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -59.656 kHz
x dB Bandwidth 17.124 MHz
Freq/Channel
Center Freq
2.43700000 GHz
Start Freq
2.41700000 GHz
Stop Freq
2.45700000 GHz
CF Step
4.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

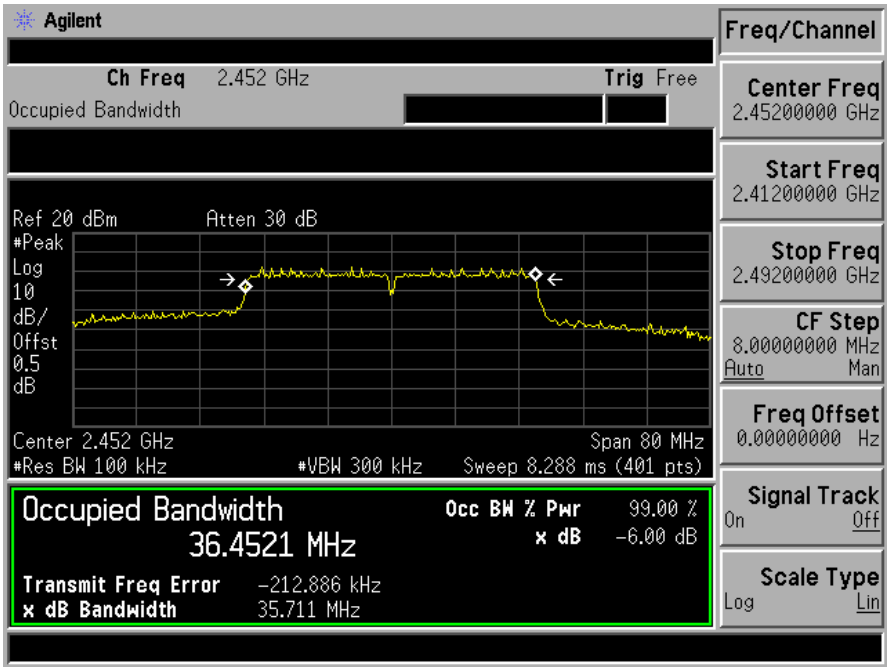

Agilent
Ch Freq 2.462 GHz
Trig Free
Occupied Bandwidth
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
0.5
dB
Center 2.462 GHz
Span 40 MHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 5 ms (401 pts)
Occupied Bandwidth
17.6996 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -61.293 kHz
x dB Bandwidth 17.277 MHz
Freq/Channel
Center Freq
2.46200000 GHz
Start Freq
2.44200000 GHz
Stop Freq
2.48200000 GHz
CF Step
4.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date: | September 25, 2014 |
| Test By: | KK | Temperature: | 24℃ |
| Test Result: | PASS | Humidity: | 53 % |
| Operation Mode: | 802.11n (HT40) | Antenna: | A |

| Channel number | Channel frequency (MHz) | Measurement level (MHz) | 6db Bandwidth Limit(MHz) |
|---|---|---|---|
| 3 | 2422 | 35.807 | >0.5 |
| 6 | 2437 | 35.660 | >0.5 |
| 9 | 2452 | 35.711 | >0.5 |




Agilent
Ch Freq 2.437 GHz
Trig Free
Occupied Bandwidth
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
0.5
dB
Center 2.437 GHz
Span 80 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 8.288 ms (401 pts)
Occupied Bandwidth
36.4877 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -203.284 kHz
x dB Bandwidth 35.660 MHz
Freq/Channel
Center Freq
2.43700000 GHz
Start Freq
2.39700000 GHz
Stop Freq
2.47700000 GHz
CF Step
8.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin


Agilent
Ch Freq 2.452 GHz
Trig Free
Occupied Bandwidth
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
0.5
dB
Center 2.452 GHz
Span 80 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 8.288 ms (401 pts)
Occupied Bandwidth
36.4521 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -212.886 kHz
x dB Bandwidth 35.711 MHz
Freq/Channel
Center Freq
2.45200000 GHz
Start Freq
2.41200000 GHz
Stop Freq
2.49200000 GHz
CF Step
8.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

# 8. Maximum Peak Output Power Test

## 8.1 Measurement Procedure

a. The testing follows FCC public Notice DA 00-705 Measurement Guidelines.
b. The RF output of EUT was connected to the power meter by RF cable and attnuator. The path loss was compensated to the results for each measurement.
c. Set to the maximum output power setting and enable the EUT transmit continuously.
d. Measure the conducted output power with cable loss and record the results in the test report.
e. Measure and record the results in the report.

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

## 8.3 Measurement Equipment Used

| EQUIPMENT TYPE | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
|---|---|---|---|---|
| Power meter | ML2495A | 0824006 | 05/17/2014 | 05/16/2015 |
| Power sensor | MA2411B | 0738172 | 05/17/2014 | 05/16/2015 |

## 8.4 Peak Power output limit

The maximum peak power shall be less 1Watt.

## 8.5 Measurement Results

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date: | September 25, 2014 |
| Test By: | KK | Temperature: | 24℃ |
| Test Result: | PASS | Humidity: | 53 % |
| Operation Mode: | 802.11b | Antenna: | A |

| Channel number | Channel Frequency(MHz) | Peak Power output(dBm) | Peak Power Limit(W) | Pass/Fail |
|---|---|---|---|---|
| 1 | 2412 | 12.53 | 1W(30dBm) | PASS |
| 6 | 2437 | 12.05 | 1W(30dBm) | PASS |
| 11 | 2462 | 12.42 | 1W(30dBm) | PASS |

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date: | September 25, 2014 |
| Test By: | KK | Temperature: | 24℃ |
| Test Result: | PASS | Humidity: | 53 % |
| Operation Mode: | 802.11g | Antenna: | A |

| Channel number | Channel Frequency (MHz) | Peak Power output(dBm) | Peak Power Limit(W) | Pass/Fail |
|---|---|---|---|---|
| 1 | 2412.00 | 9.04 | 1W(30dBm) | PASS |
| 6 | 2437.00 | 9.26 | 1W(30dBm) | PASS |
| 11 | 2462.00 | 9.43 | 1W(30dBm) | PASS |

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date: | September 25, 2014 |
| Test By: | KK | Temperature: | 24℃ |
| Test Result: | PASS | Humidity: | 53 % |
| Operation Mode: | 802.11n H20 | Antenna: | A |

| Channel number | Channel Frequency (MHz) | Peak Power output(dBm) | Peak Power Limit(W) | Pass/Fail |
|---|---|---|---|---|
| 1 | 2412.00 | 8.91 | 1W(30dBm) | PASS |
| 6 | 2437.00 | 9.16 | 1W(30dBm) | PASS |
| 11 | 2462.00 | 9.37 | 1W(30dBm) | PASS |

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date: | September 25, 2014 |
| Test By: | KK | Temperature: | 24℃ |
| Test Result: | PASS | Humidity: | 53 % |
| Operation Mode: | 802.11n H40 | Antenna: | A |

| Channel number | Channel Frequency (MHz) | Peak Power output(dBm) | Peak Power Limit(W) | Pass/Fail |
|---|---|---|---|---|
| 3 | 2422.00 | 8.79 | 1W(30dBm) | PASS |
| 6 | 2437.00 | 9.16 | 1W(30dBm) | PASS |
| 9 | 2452.00 | 9.43 | 1W(30dBm) | PASS |

# 9. Band Edge Test

## 9.1 Measurement Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
6. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f≥1 GHz for peak measurement.
   For average measurement:
   VBW = 10 Hz, when duty cycle is no less than 98 percent.
   VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

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

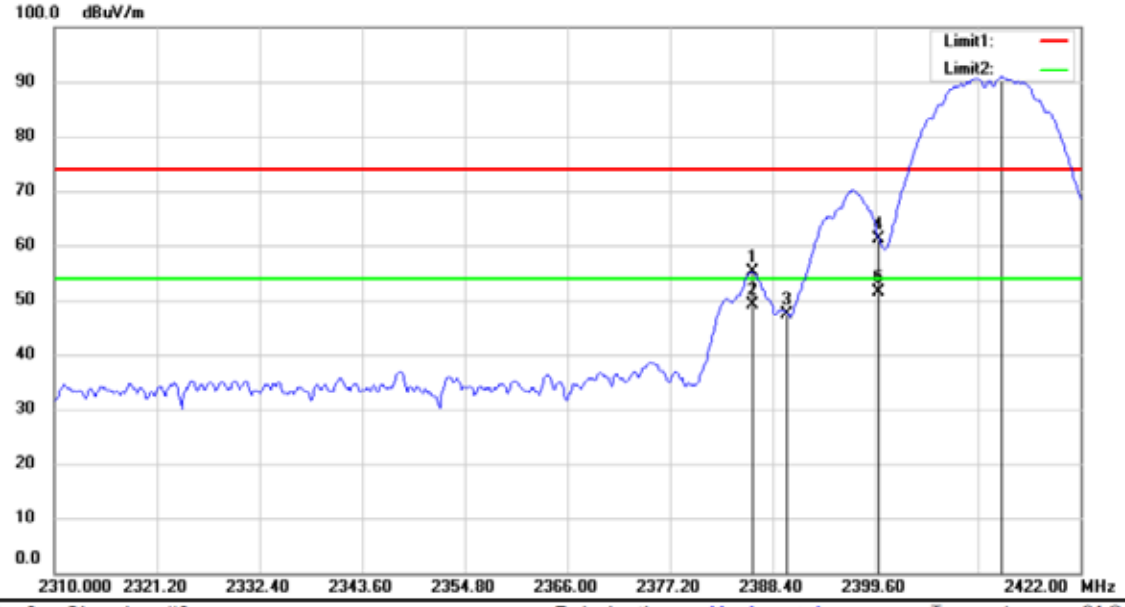
As 6.2 Test set up (B) and (C)

## 9.3 Measurement Equipment Used

Same as 6.3 Radiated Emission Measurement.

## 9.4 Measurement Results

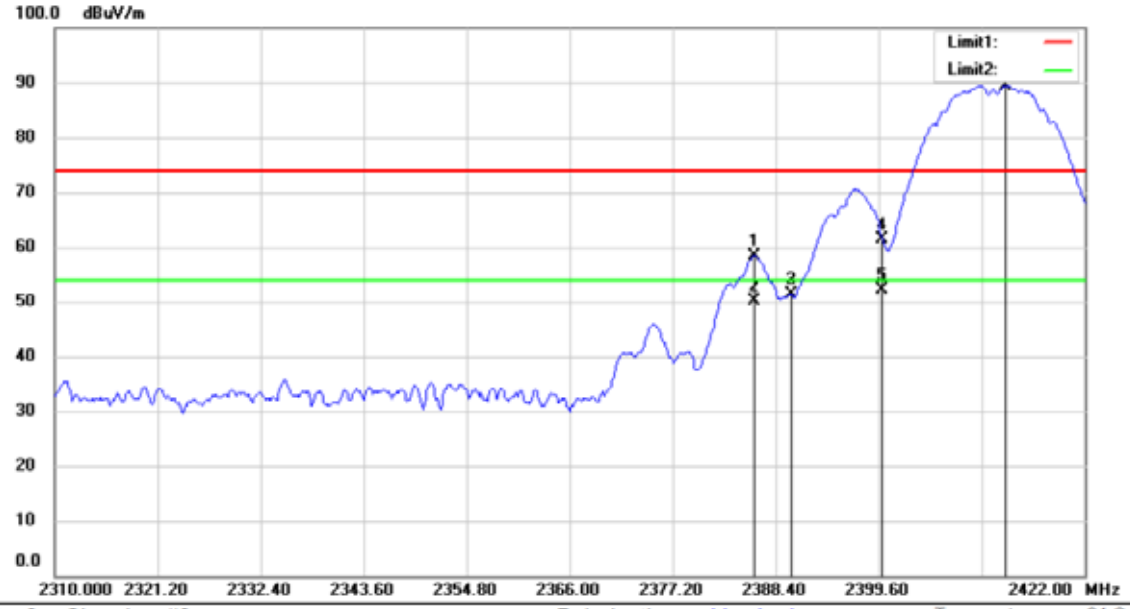
All modes 2.4G 802.11b/g/n have been tested, and the worst result 802.11b recorded as below




Site 3m Chamber #3 Polarization: *Horizontal* Temperature: 24 C
Limit: ( RE)FCC PART 15 CLASS B Power: Humidity: 53 %
EUT:150Mbps Wireless N portable AP
M/N: 4223
Mode:11B 2462
Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | PK/AV | cm | degree | Comment |
| 1 | | 2386.160 | 78.31 | -23.13 | 55.18 | 74.00 | -18.82 | peak | | | |
| 2 | | 2386.160 | 72.15 | -23.13 | 49.02 | 54.00 | -4.98 | AVG | | | |
| 3 | | 2390.000 | 70.59 | -23.11 | 47.48 | 74.00 | -26.52 | peak | | | |
| 4 | | 2400.000 | 84.24 | -23.06 | 61.18 | 74.00 | -12.82 | peak | | | |
| 5 | | 2400.000 | 74.45 | -23.06 | 51.39 | 54.00 | -2.61 | AVG | | | |
| 6 | * | 2413.376 | 113.77 | -22.98 | 90.79 | 74.00 | 16.79 | peak | | | |

*:Maximum data x:Over limit !:over margin Operator: KK




Site 3m Chamber #3 Polarization: *Vertical* Temperature: 24 C
Limit: ( RE)FCC PART 15 CLASS B Power: Humidity: 53 %
EUT:150Mbps Wireless N portable AP
M/N: 4223
Mode:11B 2412
Note:

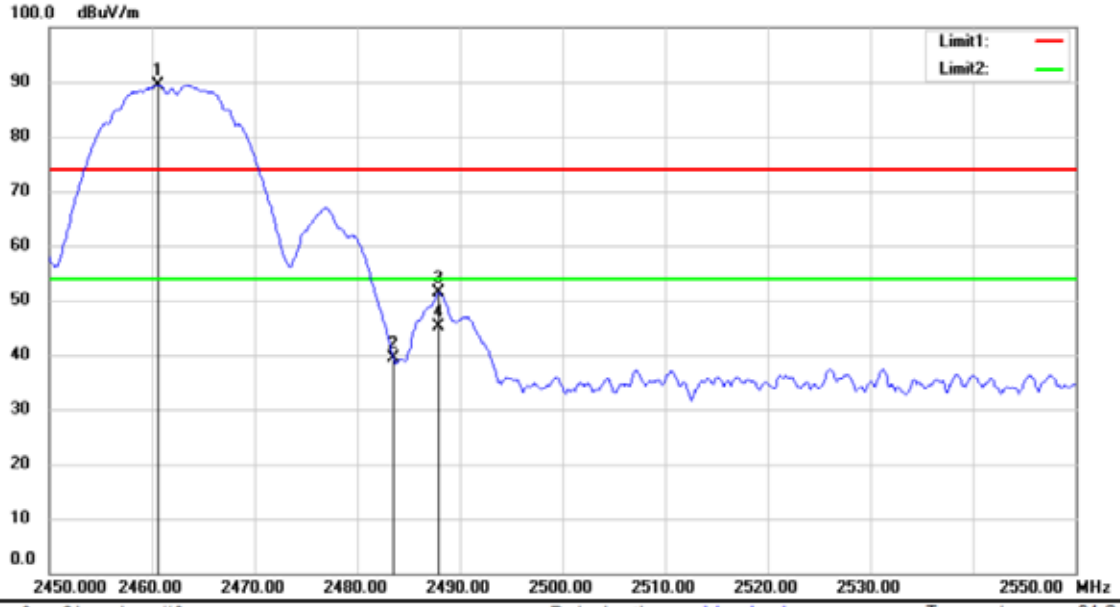
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | PK/AV r | cm | degree | Comment |
| 1 | | 2386.048 | 81.45 | -23.13 | 58.32 | 74.00 | -15.68 | peak | | | |
| 2 | | 2386.048 | 73.26 | -23.13 | 50.13 | 54.00 | -3.87 | AVG | | | |
| 3 | | 2390.000 | 74.53 | -23.11 | 51.42 | 74.00 | -22.58 | peak | | | |
| 4 | | 2400.000 | 84.45 | -23.06 | 61.39 | 74.00 | -12.61 | peak | | | |
| 5 | | 2400.000 | 75.12 | -23.06 | 52.06 | 54.00 | -1.94 | AVG | | | |
| 6 | * | 2413.376 | 112.41 | -22.98 | 89.43 | 74.00 | 15.43 | peak | | | |

*:Maximum data x:Over limit l:over margin Operator: KK

Site 3m Chamber #3 Polarization: *Horizontal* Temperature: 24 C
Limit: ( RE)FCC PART 15 CLASS B Power: Humidity: 53 %
EUT:150Mbps Wireless N portable AP
M/N: 4223
Mode:11B 2462
Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | PK/AV | cm | degree | Comment |
| 1 | * | 2463.300 | 115.40 | -22.72 | 92.68 | 74.00 | 18.68 | peak | | | |
| 2 | | 2483.500 | 76.67 | -22.62 | 54.05 | 74.00 | -19.95 | peak | | | |
| 3 | | 2483.500 | 69.98 | -22.62 | 47.36 | 54.00 | -6.64 | AVG | | | |
| 4 | | 2488.100 | 80.26 | -22.59 | 57.67 | 74.00 | -16.33 | peak | | | |
| 5 | | 2488.100 | 73.62 | -22.59 | 51.03 | 54.00 | -2.97 | AVG | | | |

*:Maximum data x:Over limit !:over margin Operator: KK




Site 3m Chamber #3 Polarization: *Vertical* Temperature: 24 C

Limit: ( RE)FCC PART 15 CLASS B Power: Humidity: 53 %

EUT:150Mbps Wireless N portable AP

M/N: 4223

Mode:11B 2462

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | PK/AV | cm | degree | Comment |
| 1 | * | 2460.600 | 112.03 | -22.73 | 89.30 | 74.00 | 15.30 | peak | | | |
| 2 | | 2483.500 | 62.00 | -22.62 | 39.38 | 74.00 | -34.62 | peak | | | |
| 3 | | 2487.900 | 73.86 | -22.59 | 51.27 | 74.00 | -22.73 | peak | | | |
| 4 | | 2487.900 | 67.62 | -22.59 | 45.03 | 54.00 | -8.97 | AVG | | | |

*:Maximum data x:Over limit l:over margin Operator: KK

# 10. Power Density

## 10.1 Test Equipment

| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
|---|---|---|---|---|---|
| Signal Analyzer | Agilent | N9010A | My53470879 | 05/17/2014 | 05/16/2015 |

## 10.2 Measuring Instruments and Setting

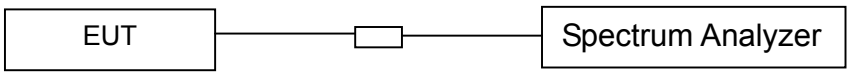
The following table is the setting of spectrum analyzer.

| Spectrum analyzer | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | Set the span to 1.5 times the DTS bandwidth. |
| RB | 3kHz ≤RBW ≤100KHz |
| VB | 3 x RBW |
| Detector | Peak |
| Trace | Max hold |
| Sweep Time | Automatic |

## 10.3 Test Procedures

a. The transmitter output (antenna port) was connected to the spectrum analyzer.
b. Set analyzer center frequency to DTS channel center frequency.
c. Set the analyzer span to a minimum of 1.5 times the DTS bandwidth.
d. Set the RBW ≥ 3 kHz. Set the VBW ≥ 3 x RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

## 10.4 Block Diagram of Test Setup




## 10.5 Limit

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

## 10.6 Test Result

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date : | September 25, 2014 |
| Test By: | KK | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 53 % |
| Operation Mode: | 802.11b | Antenna: | A |

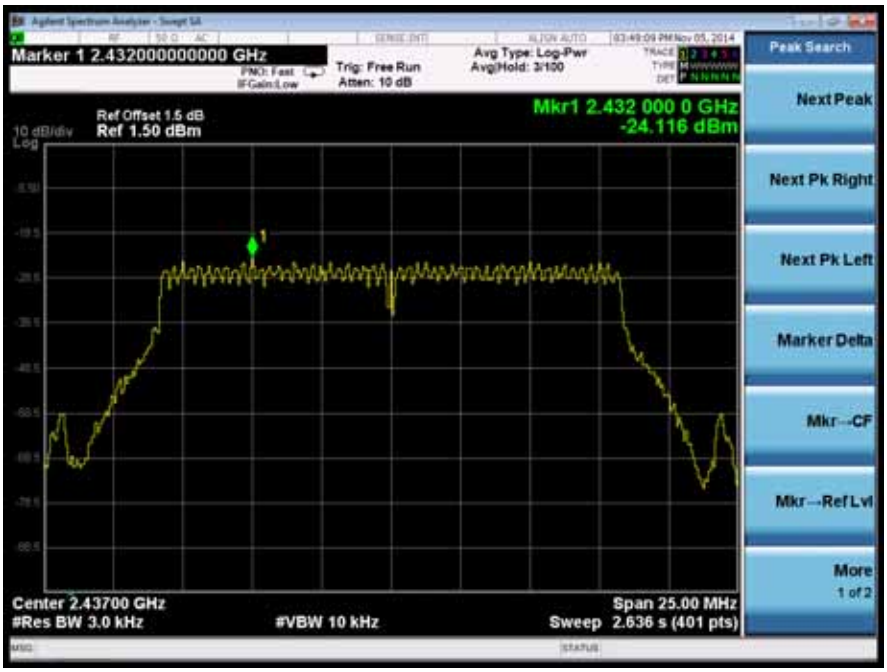
| Channel | Measurement Level (dBm) | Required Limit (dBm) | Result |
|---|---|---|---|
| 1 | -17.314 | <8dBm | PASS |
| 6 | -18.616 | <8dBm | PASS |
| 11 | -19.567 | <8dBm | PASS |

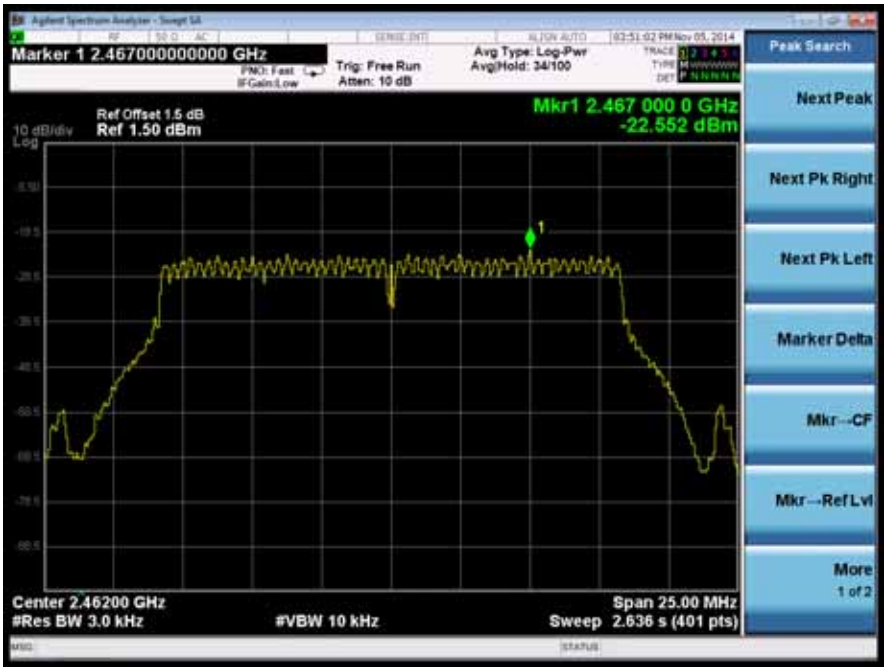
Marker 1 2.436150000000 GHz
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
Ref Offset 1.5 dB
10 dB/div Ref 1.50 dBm
Log
Mkr1 2.436 15 GHz
-18.616 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
Center 2.43700 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 20.00 MHz
Sweep 2.109 s (401 pts)

Marker 1 2.464550000000 GHz
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 1/100
Ref Offset 1.5 dB
10 dB/div Ref 1.50 dBm
Log
Mkr1 2.464 55 GHz
-19.567 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
Center 2.46200 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 20.00 MHz
Sweep 2.109 s (401 pts)

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date : | September 25, 2014 |
| Test By: | KK | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 53 % |
| Operation Mode: | 802.11g | Antenna | A |

| Channel | Measurement Level (dBm) | Required Limit (dBm) | Result |
|---|---|---|---|
| l | -23.492 | <8dBm | PASS |
| 6 | -24.116 | <8dBm | PASS |
| 11 | -22.552 | <8dBm | PASS |


Marker 1 2.432000000000 GHz
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
Ref Offset 1.5 dB
10 dB/div
Ref 1.50 dBm
Mkr1 2.432 000 0 GHz
-24.116 dBm
Center 2.43700 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 25.00 MHz
Sweep 2.636 s (401 pts)


Marker 1 2.467000000000 GHz
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 34/100
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
Ref Offset 1.5 dB
10 dB/div
Ref 1.50 dBm
Mkr1 2.467 000 0 GHz
-22.552 dBm
Center 2.46200 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 25.00 MHz
Sweep 2.636 s (401 pts)

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date : | September 25, 2014 |
| Test By: | KK | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 53 % |
| Operation Mode: | 802.11n HT20 | Antenna | A |

| Channel | Measurement Level (dBm) | Required Limit (dBm) | Result |
|---|---|---|---|
| l | -22.880 | <8dBm | PASS |
| 6 | -24.462 | <8dBm | PASS |
| 11 | -24.931 | <8dBm | PASS |

Marker 1 2.435740000000 GHz
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
Ref Offset 1.5 dB
10 dB/div Ref 1.50 dBm
Log
Mkr1 2.435 74 GHz
-24.462 dBm
Center 2.43700 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 28.00 MHz
Sweep 2.952 s (401 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Marker 1 2.468580000000 GHz
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
Ref Offset 1.5 dB
10 dB/div Ref 1.50 dBm
Log
Mkr1 2.468 58 GHz
-24.931 dBm
Center 2.46200 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 28.00 MHz
Sweep 2.952 s (401 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

| | | | |
|---|---|---|---|
| Spectrum Detector: | PK | Test Date : | September 25, 2014 |
| Test By: | KK | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 53 % |
| Operation Mode: | 802.11n HT40 | Antenna: | A |

| Channel | Measurement Level (dBm) | Required Limit (dBm) | Result |
|---|---|---|---|
| 3 | -26.265 | <8dBm | PASS |
| 6 | -26.520 | <8dBm | PASS |
| 9 | -26.069 | <8dBm | PASS |

Marker 1 2.422600000000 GHz
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 6/100
Ref Offset 1.5 dB
10 dB/div Ref 1.50 dBm
Log
Mkr1 2.422 60 GHz
-26.520 dBm
Center 2.43700 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 60.00 MHz
Sweep 6.326 s (401 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Marker 1 2.452000000000 GHz
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 4/100
Ref Offset 1.5 dB
10 dB/div Ref 1.50 dBm
Log
Mkr1 2.452 00 GHz
-26.069 dBm
Center 2.45200 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 60.00 MHz
Sweep 6.326 s (401 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

# 11. Antenna Port Emission

## 11.1 Test Equipment

| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4407B | 88156318 | 05/17/2014 | 05/16/2015 |

## 11.2 Measuring Instruments and Setting

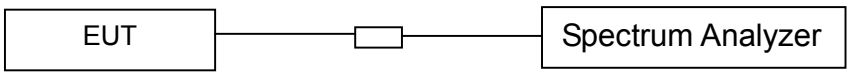
The following table is the setting of spectrum analyzer.

| Spectrum analyzer | Setting |
|---|---|
| Attenuation | Auto |
| RB | 100kHz |
| VB | 300KHz |
| Detector | Peak |
| Trace | Max hold |

## 11.3 Test Procedures

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

## 11.4 Block Diagram of Test setup

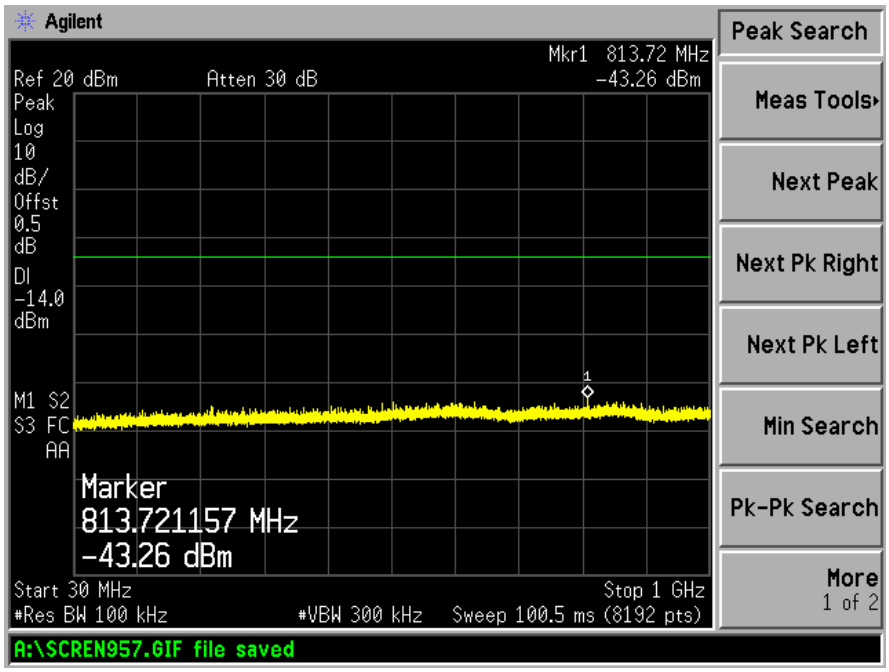


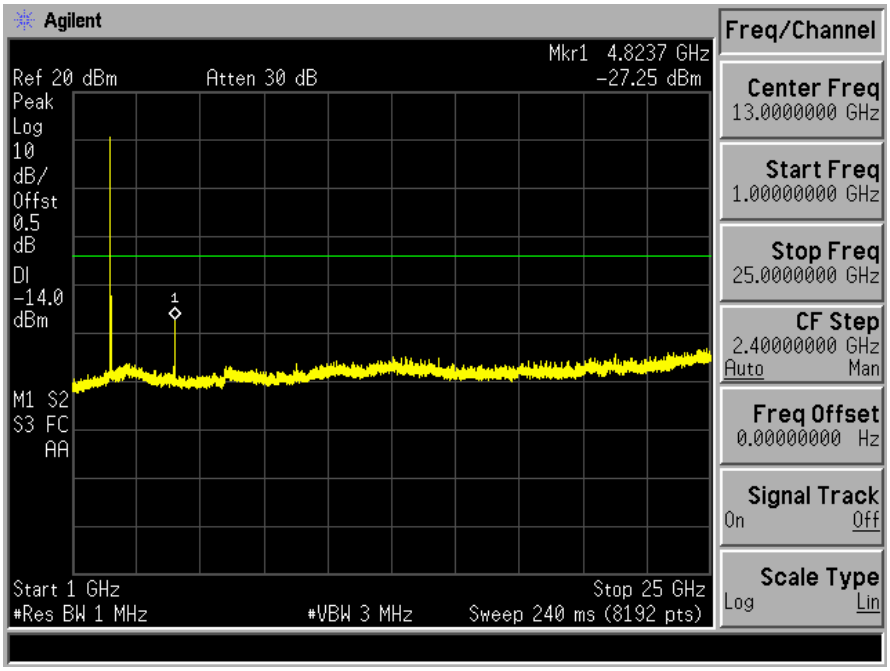

## 11.5 Test Result

**PASS.**

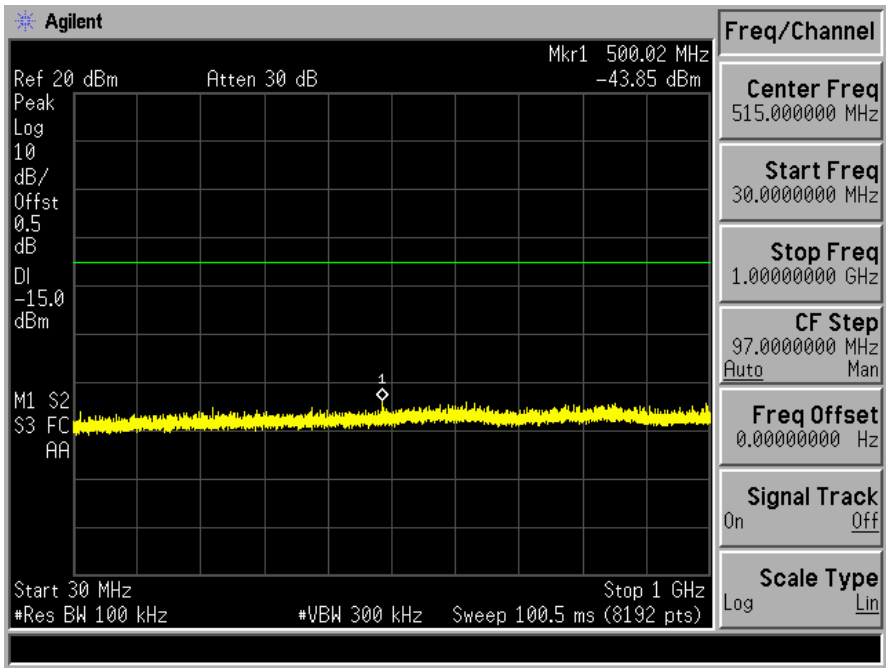
All modes 2.4G 802.11b/g/n have been tested, and the worst result 802.11b recorded as below

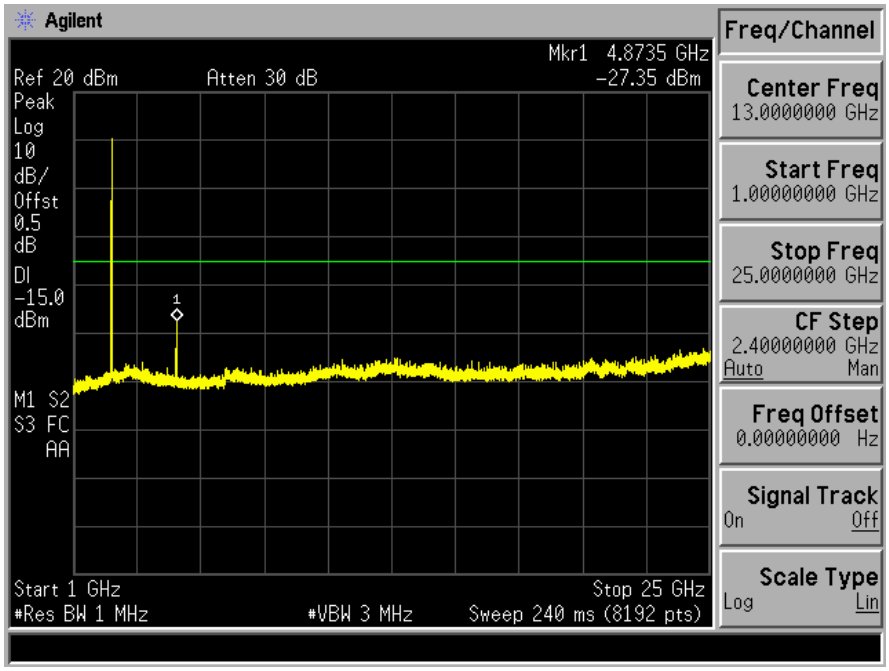
802.11b Low Channel 1



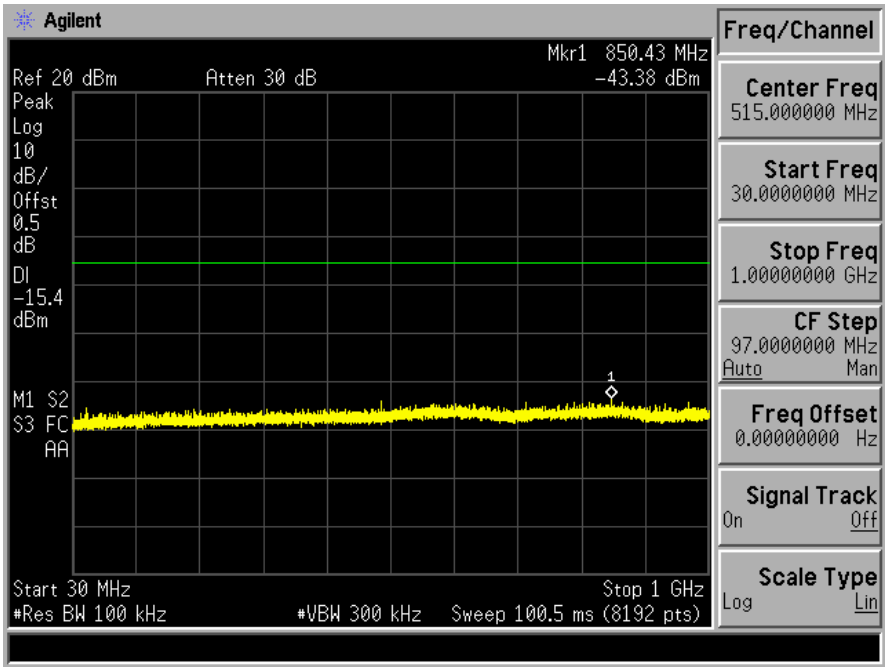



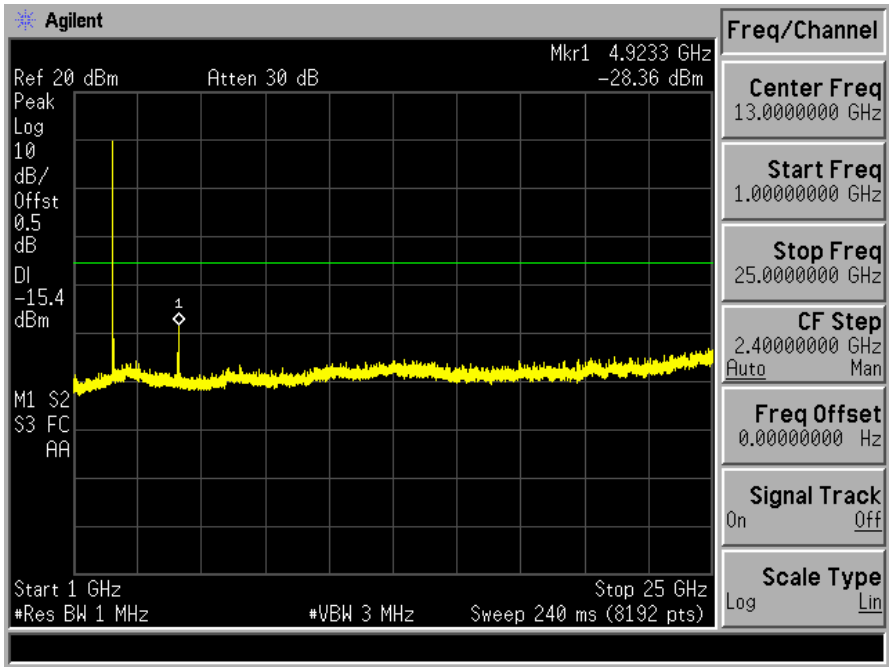
802.11b Mid Channel 6



802.11b High Channel 11



# 12. Antenna Application

## 12.1 Antenna Requirement

| Standard | Requirement |
|---|---|
| FCC CRF Part 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded. |

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

The EUT has1 antenna: PiFa antenna for 2.4G WIFI, the gain is 2 dBi;
Note:Antenna use a permanently attached antenna which is not replaceable.
which in accordance to section 15.203, please refer to the internal photos.

## 12.2 Result

PASS.

# 13. Uncertainty

Measurement Uncertainty for a level of Confidence of 95%

| Parameter | Uncertainty |
|---|---|
| Radio Frequency | ±1x10^-5 |
| Maximum Peak Output Power Test | ±1.0dB |
| Conducted Emissions Test | ±2.0dB |
| Radiated Emission Test | ±2.0dB |
| Power Density | ±2.0dB |
| Occupied Bandwidth Test | ±1.0dB |
| Band Edge Test | ±3dB |
| All emission, radiated | ±3dB |
| Antenna Port Emission | ±3dB |
| Temperature | ±0.5℃ |
| Humidity | ±3% |