

# **Test Report**

FCC ID: ZCB-K2

Date of issue: Sep. 13, 2016

Sample Description: IP Camera

Model(s): K2(NCM703GC), NCM622GA(Q2), K3, Q3

Applicant: Shenzhen Smart-eye Digital Electronics Co., Ltd

Address: #6 Northern Zone, Shangxue S&T City, Bantian, Longgang

District, Shenzhen, China

Date of Test: Aug. 13, 2016 to Sep. 06, 2016

Shenzhen Microtest Co., Ltd. http://www.mtitest.com

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| Test Result Certification                                |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  |  |
| Applicant's name:  | Shenzhen Smart-eye Digital Electronics Co., Ltd                                  |  |  |  |
| Address:   | #6 Northern Zone, Shangxue S&T City, Bantian, Longgang District, Shenzhen, China |  |  |  |
| Manufacture's Name:                                      | Shenzhen Smart-eye Digital Electronics Co., Ltd                                  |  |  |  |
| Address: #6 Northern Zone, Shangxue S&T City, Bantian, I |  |  |  |  |
| Product description                                      |  |  |  |  |
| Product name:  | IP Camera  |  |  |  |
| Trademark:   | /  |  |  |  |
| Model name:  | K2(NCM703GC), NCM622GA(Q2), K3, Q3   |  |  |  |
| Standards:   | FCC Part 15.247  |  |  |  |
| Test Procedure:  | ANSI C63.10-2013 ANSI C63.4-2014<br>558074 D01 DTS Meas Guidance v03r05          |  |  |  |

This device described above has been tested by Shenzhen Toby Technology Co., Ltd. and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

| Tested by:   | David      | David Chen    |  |  |  |
|--------------|------------|---------------|--|--|--|
|              | David Chen | Sep. 13, 2016 |  |  |  |
| Reviewed by: |            | chen          |  |  |  |
|              | Leon Chen  | Sep. 13, 2016 |  |  |  |
| Approved by: | J          | ra liu.       |  |  |  |
|              | Ares Liu   | Sep. 13, 2016 |  |  |  |



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## **Summary of Test Result**

| Item | FCC Part No.                 | Description of Test              | Result |
|------|------------------------------|----------------------------------|--------|
| 1    | 15.203                       | Antenna requirement              | Pass   |
| 2    | 15.207                       | AC power line conducted emission | Pass   |
| 3    | 15.247(b)(3)                 | Maximum output power             | Pass   |
| 4    | 15.247(a)(2)                 | 6dB emission bandwidth           | Pass   |
| 5    | 15.247(e)                    | Power spectral density (PSD)     | Pass   |
| 8    | 15.247(d)                    | Band edge spurious emission      | Pass   |
| 9    | 15.247(d), 15.205,<br>15.209 | Radiated emission                | Pass   |



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### 1 General description

### 1.1 Feature of equipment under test (EUT)

| Product name:              | IP Camera   |
|----------------------------|---|
| Model name:                | K2(NCM703GC), NCM622GA(Q2), K3, Q3  |
| Operating frequency range: | 2412MHz~2462MHz for 802.11b/g/n20<br>2422MHz~2452MHz for 802.11n40  |
| WIFI feature:              | ⊠802.11b ⊠802.11g<br>⊠802.11n20 ⊠802.11n40  |
| Modulation type:           | DSSS, OFDM  |
| Adapter information:       | MODEL:STC-A508A-Z<br>INPUT:100-240V 50/60Hz 0.2A<br>OUTPUT:5V 0.8A  |
| Antenna designation:       | Chip antenna (Antenna Gain: 3.3dBi)   |
| Remark:                    | All the models above are identical in interior structure, electrical circuits and components; just colors of cover are different for marking requirement. The model K2(NCM703GC) has been tested. |

### 1.2 Operation channel list

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

### 1.3 Test frequency channel

| Channel | 802.11b/g/n20 | 802.11n40 |
|---------|---------------|-----------|
| Low     | 2412MHz       | 2422MHz   |
| Middle  | 2437MHz       | 2437MHz   |
| High    | 2462MHz       | 2452MHz   |



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#### 1.4 EUT operation mode

During testing, RF test program provided by the manufacture to control the Tx operation followed the test requirement. The EUT is configured to transmit continuously (duty cycle > 98 %) at the maximum power control level.

#### 1.5 Test conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 20°C~30°C - Humidity: 30%~70%

- Atmospheric pressure: 98kPa~101kPa

#### 1.6 Testing site

| Test Site Shenzhen Toby Technology Co., Ltd. |  |
|--|--|
| Test Site Location                           | 1 A/F., Bldg.6, Yusheng Industrial Zone The National Road No.107 Xixiang Section 467, Shenzhen, Guangdong, China |
| FCC Registration No.:                        | 811562   |
| CNAS Registration No.:                       | CNAS L5813   |

#### 1.7 Ancillary equipment list

| Equipment | Model | S/N | Manufacturer | Certificate type |
|-----------|-------|-----|--------------|------------------|
| /         | /     | /   | /            | /                |

#### 1.8 Measurement uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %, U=2xUc(y)

| RF frequency                     | 1 x 10-7  |
|----------------------------------|-----------|
| RF power, conducted              | ± 1 dB    |
| Conducted emission(150kHz~30MHz) | ± 2.5 dB  |
| Radiated emission(30MHz~1GHz)    | ± 4.2 dB  |
| Radiated emission (above 1GHz)   | ± 4.3 dB  |
| Temperature                      | ±1 degree |
| Humidity                         | ±5%       |



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### 2 List of test equipment

For AC power line conducted emission:

| Equipment         | Manufacturer | Model      | Serial No. | Calibration Due |
|-------------------|--------------|------------|------------|-----------------|
| LISN              | R&S          | ENV216     | 101313     | 2016.12.06      |
| LISN              | SCHWARZBECK  | NNLK 8129  | 8129245    | 2016.12.25      |
| Pulse Limiter     | SCHWARZBECK  | VTSD 9561F | 9716       | 2016.12.25      |
| Test Cable        | N/A          | N/A        | C01        | 2016.12.06      |
| EMI Test Receiver | R&S          | ESCI       | 101160     | 2016.12.06      |

#### For Radiated emission:

| Equipment                  | Manufacturer        | Model       | Serial No. | Calibration Due |
|----------------------------|---------------------|-------------|------------|-----------------|
| Log-Bicon Antenna          | MESS-ELEKTRO<br>NIK | VULB 9160   | 3058       | 2016.12.11      |
| Horn Antenna               | Schwarzbeck         | BBHA 9120D  | 631        | 2016.12.05      |
| Horn Antenna               | Schwarzbeck         | BBHA 9170   | 373        | 2016.12.05      |
| Test Cable                 | United Microwave    | 57793       | 1m         | 2016.12.05      |
| Test Cable                 | United Microwave    | A30A30-5006 | 10m        | 2016.12.05      |
| Microwave<br>Pre_amplifier | Agilent             | 8449B       | 3008A01714 | 2016.12.05      |
| Pre-Amplifier              | Anritsu             | MH648A      | M09961     | 2016.12.05      |
| EMI Test Receiver          | R&S                 | ESPI-7      | 101318     | 2016.12.05      |
| Spctrum analyzer           | Agient              | E4470B      | MY41441082 | 2017.06.01      |

#### For RF conducted emission:

| Equipment        | Manufacturer | Model   | Serial No. | Calibration Due |
|------------------|--------------|---------|------------|-----------------|
| Spctrum analyzer | Agient       | E4470B  | MY41441082 | 2017.06.01      |
| Power meter      | Anritsu      | ML2495A | 1005002    | 2017.09.11      |
| Power Senor      | Anritsu      | MA2411B | 0917070    | 2017.09.11      |

Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



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#### 3 Test Result

#### 3.1 Conducted emission

#### 3.1.1 Limit

| Frequency | Limit      |          |  |
|-----------|------------|----------|--|
| (MHz)     | Quasi-peak | Average  |  |
| 0.15-0.5  | 66 to 56   | 56 to 46 |  |
| 0.5-5     | 56         | 46       |  |
| 5-30      | 60         | 50       |  |

Note: Decreases with the logarithm of the frequency from 0.15MHz to 0.5MHz.

#### 3.1.2 Test method

- 1. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/50uH of coupling impedance for the measuring instrument.
- 2. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- 3. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- 4. LISN is at least 80 cm from nearest part of EUT chassis.
- 5. The resolution bandwidth of EMI test receiver is set at 9 kHz.

#### 3.1.3 Test Result



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| Temperature:  | 23°C                                  | Relati  | ve   | 67%  |                                  |
|---------------|---------------------------------------|---|--|--|----------------------------------|
| Pressure:     | 101kPa                                | Polari  | zation:  | L  |                                  |
| Test voltage: | AC 120V/6                             | 0Hz Test n  | est mode: Transmitting   |  |                                  |
| 100.0 dBuV    |                                       |   |  |  |                                  |
| 90            |                                       |   |  |  |                                  |
|               |                                       |   |  |  |                                  |
| 80            |                                       |   |  |  |                                  |
| 70            |                                       |   |  |  |                                  |
| 60            |                                       |   | FCC  | Part15 ClassC AC Cond  | duction(QP)                      |
| 50            |                                       |   | FCCP   | <br>Part15 ClassC AC Condu   | uction(AVG)                      |
| 50 💥          | , A.                                  |   | والدالية .   |  |                                  |
| 40            | Market Market Comment                 | water make plans the rest the                                 | Why who was a same of the same | Marthur market was in  | Markey Markey markey markey back |
| 30            | A A A A A A A A A A A A A A A A A A A | MAS VANDALIA  | med  | A STATE OF THE STA | peak                             |
| 20            | I would need a photomorphic           | Mary and the second second second second second second second | Market for Contract  | hart work the same was a second and a second   | AVG                              |
| 20            |                                       |   |  |  |                                  |
| 10            |                                       |   |  |  |                                  |
| 0.0           | 0.5                                   | (411.)  |  | 5  | 20.000                           |
| 0.150         | 0.5                                   | (MHz)   |  | 5  | 30.000                           |
|               | Reading Correct                       | t Measure-  |  |  |                                  |
| No. Mk. Fre   | •                                     |   | Over   | 0  |                                  |
| 1 0.177       |                                       | dBuV dBuV<br>42.35 64.59                                      | dB Detector  | r Comment  |                                  |
| 2 * 0.177     |                                       |   | -15.42 AVG   | <b>.</b>   |                                  |
| 3 0.248       |                                       |   | -26.17 QP  |  |                                  |
| 4 0.248       |                                       |   | -18.35 AVG   | <b>3</b>   |                                  |
| 5 0.554       | 15 8.26 30.02                         | 38.28 56.00   | -17.72 QP  |  |                                  |
| 6 0.554       | 5 0.41 30.02                          | 30.43 46.00   | -15.57 AVG   | <b>3</b>   |                                  |
| 7 1.946       |                                       |   | -24.25 QP  |  |                                  |
| 8 1.946       |                                       |   | -18.67 AVG   |  |                                  |
| 9 3.649       |                                       |   | -20.24 QP  |  |                                  |
| 10 3.649      |                                       |   | -17.36 AVG   | •  |                                  |
| 12 10.503     |                                       |   | -29.41 QP<br>-25.19 AVG  | <u> </u>   |                                  |
|               | 0.20 00.10                            | 21.01 00.00   | 20.10 /100   | •  |                                  |



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| Temper      | ature:  | 23°C                                  | -                      |  | Relative  |                   | 67%  |        |
|-------------|---------|---------------------------------------|------------------------|--|---|-------------------|--|--------|
| Pressure    | e:      | 1011                                  | кРа                    |  | Polarization  | :                 | N  |        |
| Test vol    | tage:   | AC                                    | 120V/60                | Hz .   | Test mode:  |                   | Transmitting   |        |
| 100.0 dB    | ı۷      |                                       |                        |  |   |                   |  |        |
| 90          |         |                                       |                        |  |   |                   |  |        |
| 30          |         |                                       |                        |  |   |                   |  |        |
| 80          |         |                                       |                        |  |   |                   |  |        |
| 70          |         |                                       |                        |  |   |                   |  |        |
| 60          |         |                                       |                        |  |   | FCCP              | art15 ClassC AC Conduction(QP)   |        |
| -           |         |                                       |                        |  |   | FCCPa             | rt15 ClassC AC Conduction(AVG)   |        |
| 50          |         | ×                                     |                        |  |   | ų.                |  |        |
| 40          | M. A    | , , , , , , , , , , , , , , , , , , , | <b>VA</b>              | .,   | × 1. Julyan   | WANT WALL         | White May have made at the commence of   |        |
| 30          | 10 7000 | 1 Marian                              | "When worth            | Marachaphy   | Although the Alberta and an   | ליישינאה לווו.    | With the Maybe for you are my broad to the specific street and active street and the specific street a | wark   |
| -   ` `     |         | whater?"                              | a more market the same | and the property of the same o | phone and the property of the | and the standards | and the second s | AVG    |
| 20          |         |                                       |                        |  |   |                   |  |        |
| 10          |         |                                       |                        |  |   |                   |  |        |
| 0.0         |         |                                       |                        |  |   |                   |  |        |
| 0.150       |         | 0.5                                   |                        |  | (MHz)   | 5                 |  | 30.000 |
|             |         |                                       |                        |  |   |                   |  |        |
| No. Mk.     | . Freq. | Reading<br>Level                      | Correct<br>Factor      | Measure-<br>ment   | Limit Over  |                   |  |        |
|             | MHz     | dBuV                                  | dB                     | dBuV   | dBuV dB   | Detector          | Comment  |        |
| 1           | 0.5373  | 7.65                                  | 30.02                  | 37.67  | 56.00 -18.33  | QP                |  |        |
| 2 *         | 0.5373  | 1.44                                  | 30.02                  | 31.46  | 46.00 -14.54  | AVG               |  |        |
| 3           | 1.1492  | -1.48                                 | 30.02                  | 28.54  | 56.00 -27.46  | QP                |  |        |
| <del></del> | 1.1492  | -4.64                                 | 30.02                  | 25.38  | 46.00 -20.62<br>56.00 -26.81  | AVG<br>QP         |  |        |
| 6           | 1.5837  | -0.83<br>-4.28                        | 30.02                  | 25.74  | 46.00 -20.26  | AVG               |  |        |
| 7           | 3.3700  | 4.08                                  | 30.02                  | 34.12  | 56.00 -21.88  |                   |  |        |
| 8           | 3.3700  | -1.93                                 | 30.04                  | 28.11  | 46.00 -17.89  |                   |  |        |
| 9           | 6.3605  | -0.83                                 | 30.07                  | 29.24  | 60.00 -30.76  |                   |  |        |
|             | 6.3605  | -6.38                                 | 30.07                  | 23.69  | 50.00 -26.31  | AVG               |  |        |
| 10          |         |                                       |                        |  |   |                   |  |        |
| 10          | 11.9045 | -1.36                                 | 30.10                  | 28.74  | 60.00 -31.26  | QP                |  |        |



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#### 3.2 Antenna requirement

#### 3.2.1 Requirement defined in FCC 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.

#### 3.2.2 EUT antenna description

The WIFI antenna of EUT is a permanently attached chip antenna, the maximum gain of the antenna is 3.3dBi. So the antenna meets the requirement of this part.



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#### 3.3 Maximum output power

#### 3.3.1 **Limits**

Conducted output power limit is 1W (30dBm).

#### 3.3.2 Test Method

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

#### 3.3.3 Test Result

| Frequency (MHz) | Maximum peak output power (dBm) | Limit (dBm) |  |  |  |  |  |  |
|-----------------|---------------------------------|-------------|--|--|--|--|--|--|
|                 | 802.11b                         |             |  |  |  |  |  |  |
| 2412            | 17.63                           | 30          |  |  |  |  |  |  |
| 2437            | 17.80                           | 30          |  |  |  |  |  |  |
| 2462            | 17.57                           | 30          |  |  |  |  |  |  |
|                 | 802.11g                         |             |  |  |  |  |  |  |
| 2412            | 15.05                           | 30          |  |  |  |  |  |  |
| 2437            | 15.13                           | 30          |  |  |  |  |  |  |
| 2462            | 15.43                           | 30          |  |  |  |  |  |  |
|                 | 802.11n20                       |             |  |  |  |  |  |  |
| 2412            | 15.22                           | 30          |  |  |  |  |  |  |
| 2437            | 15.14                           | 30          |  |  |  |  |  |  |
| 2462            | 15.47                           | 30          |  |  |  |  |  |  |
|                 | 802.11n40                       |             |  |  |  |  |  |  |
| 2422            | 13.18                           | 30          |  |  |  |  |  |  |
| 2437            | 13.26                           | 30          |  |  |  |  |  |  |
| 2452            | 13.25                           | 30          |  |  |  |  |  |  |



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#### 3.4 6dB emission bandwidth

#### **3.4.1** Limits

The minimum 6 dB bandwidth shall be at least 500 kHz.

#### 3.4.2 Test method

Use the following spectrum analyzer settings:

RBW = 100kHz VBW ≥ 3RBW Detector = peak

Trace mode = max hold

Sweep time = auto couple

Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 3.4.3 Test result

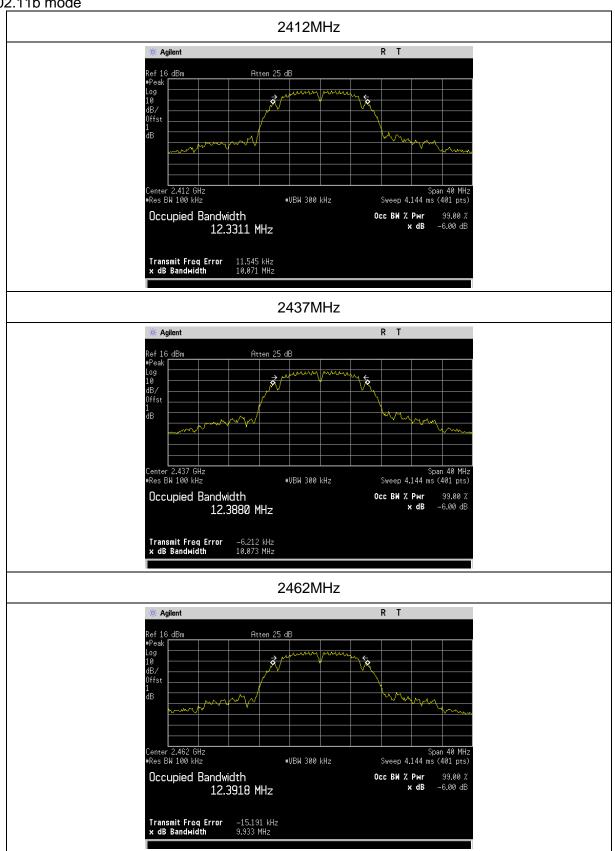
| Frequency (MHz) | 6dB emission bandwidth (MHz) | Limit  |  |
|-----------------|------------------------------|--------|--|
|                 | 802.11b                      |        |  |
| 2412            | 10.071                       |        |  |
| 2437            | 10.073                       | 500kHz |  |
| 2462            | 9.933                        |        |  |
|                 | 802.11g                      |        |  |
| 2412            | 16.477                       |        |  |
| 2437            | 16.475                       | 500kHz |  |
| 2462            | 16.411                       |        |  |
|                 | 802.11n20                    |        |  |
| 2412            | 16.492                       |        |  |
| 2437            | 16.424                       | 500kHz |  |
| 2462            | 16.397                       |        |  |
|                 | 802.11n40                    |        |  |
| 2422            | 35.506                       |        |  |
| 2437            | 35.515                       | 500kHz |  |
| 2452            | 35.539                       |        |  |

Test plots as below:



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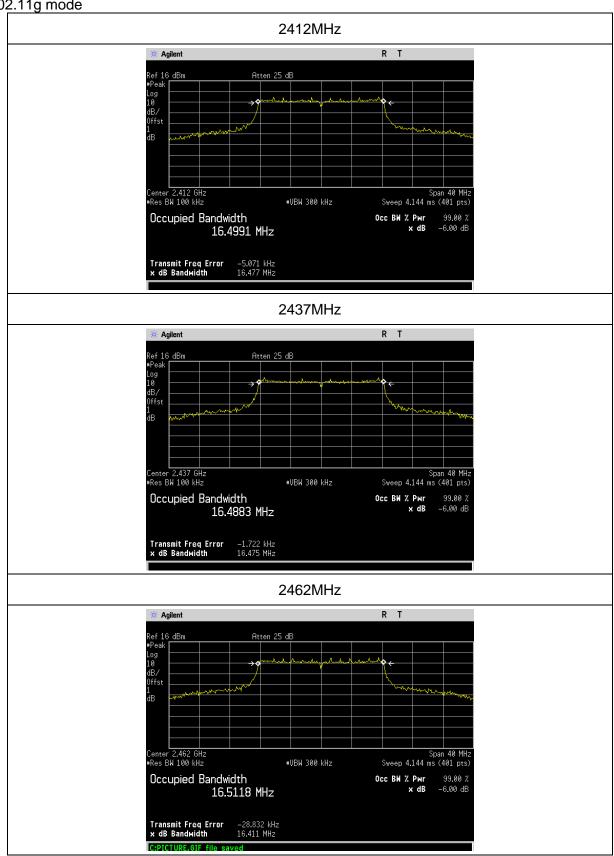
#### 802.11b mode





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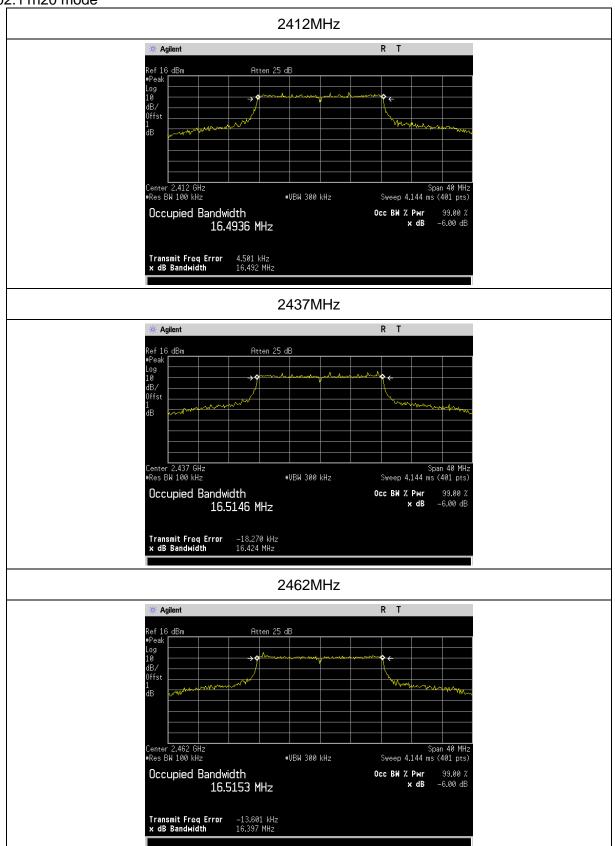
802.11g mode





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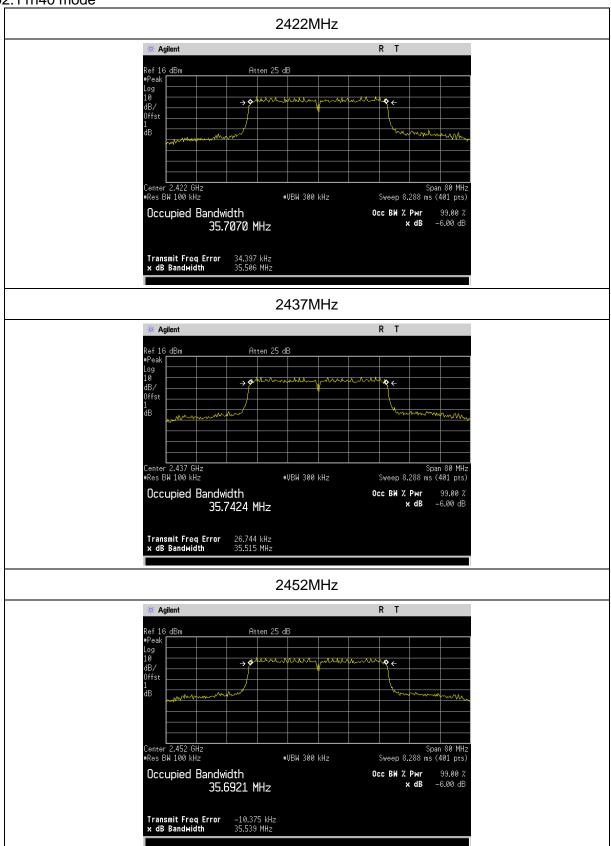
#### 802.11n20 mode





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#### 802.11n40 mode





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#### 3.5 Power spectral density

#### 3.5.1 **Limits**

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

#### 3.5.2 Test method

Span = 1.5 times DTS bandwidth (6dB emission bandwidth, see section 4.4)

RBW = 3kHz to 100kHz

VBW ≥ 3RBW

Detector = Peak

Sweep time = auto

Trace mode = max hold

Allow the trace to stabilize. Use the peak marker function to determine the maximum amplitude level within the RBW.

#### 3.5.3 Test result

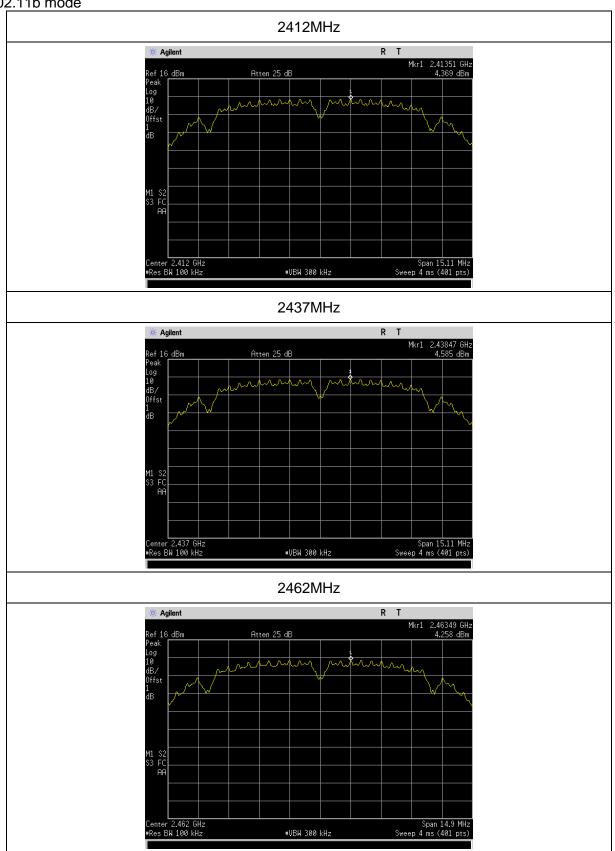
| Frequency (MHz) | PSD (dBm/100kHz) | Limit (dBm/3kHz) |  |  |  |  |
|-----------------|------------------|------------------|--|--|--|--|
|                 | 802.11b          |                  |  |  |  |  |
| 2412            |                  |                  |  |  |  |  |
| 2437            | 4.585            | 8                |  |  |  |  |
| 2462            | 4.258            |                  |  |  |  |  |
|                 | 802.11g          |                  |  |  |  |  |
| 2412            | 0.745            |                  |  |  |  |  |
| 2437            | 1.182            | 8                |  |  |  |  |
| 2462            | 1.231            |                  |  |  |  |  |
|                 | 802.11n20        |                  |  |  |  |  |
| 2412            | 0.754            |                  |  |  |  |  |
| 2437            | 1.191            | 8                |  |  |  |  |
| 2462            | 1.32             |                  |  |  |  |  |
|                 | 802.11n40        |                  |  |  |  |  |
| 2422            | -3.412           |                  |  |  |  |  |
| 2437            | -3.386           | 8                |  |  |  |  |
| 2452            | -3.295           |                  |  |  |  |  |

Test plots as below:



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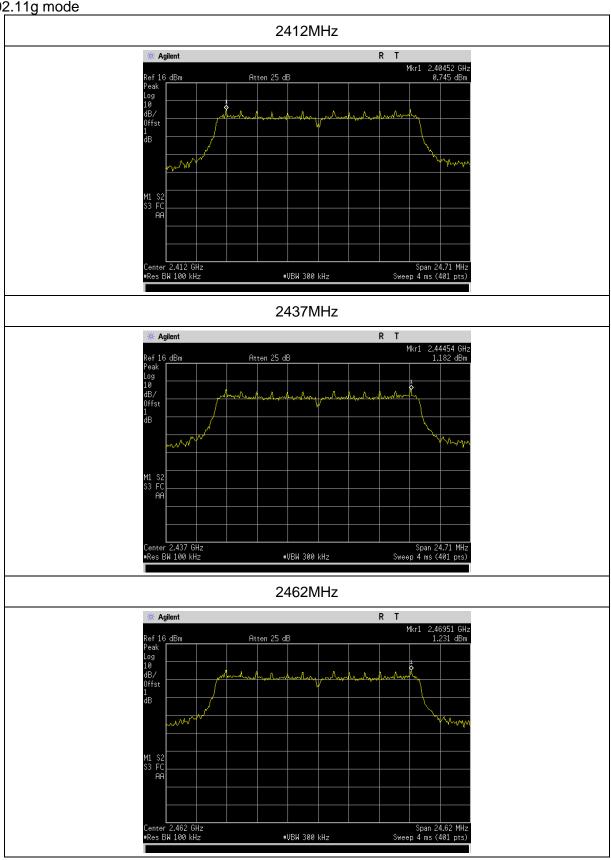
#### 802.11b mode





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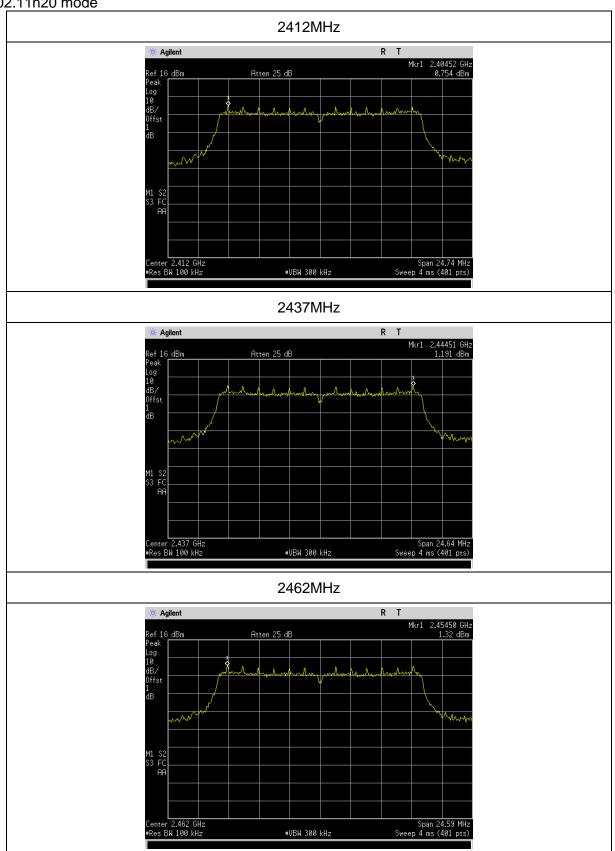
802.11g mode





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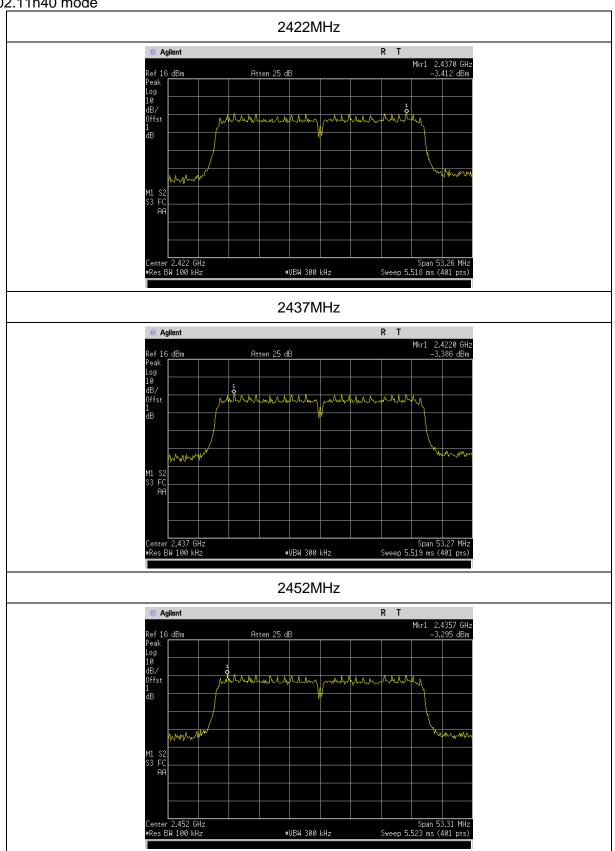
#### 802.11n20 mode





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#### 802.11n40 mode





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#### 3.6 Band edge

#### 3.6.1 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30dB instead of 20dB.

#### 3.6.2 Test method

Use the following spectrum analyzer settings:

Set RBW = 100 kHz. VBW ≥ 3RBW. Detector = peak, Sweep time = auto couple, Trace mode = max hold.

#### 3.6.3 Test Result

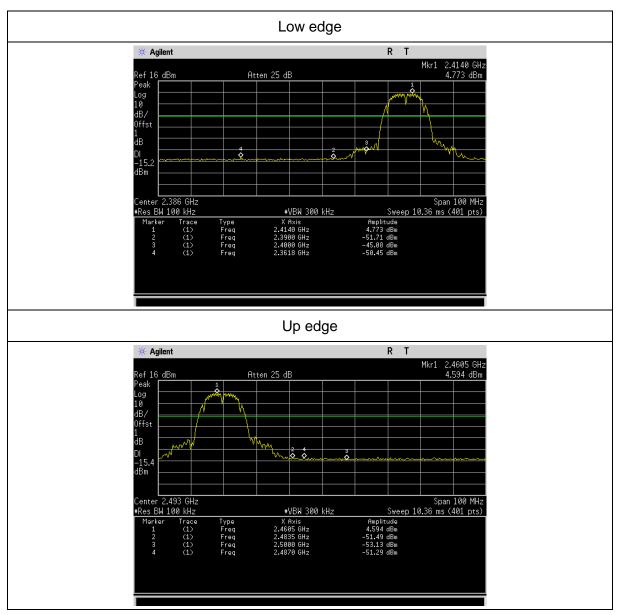
Test plots as below:



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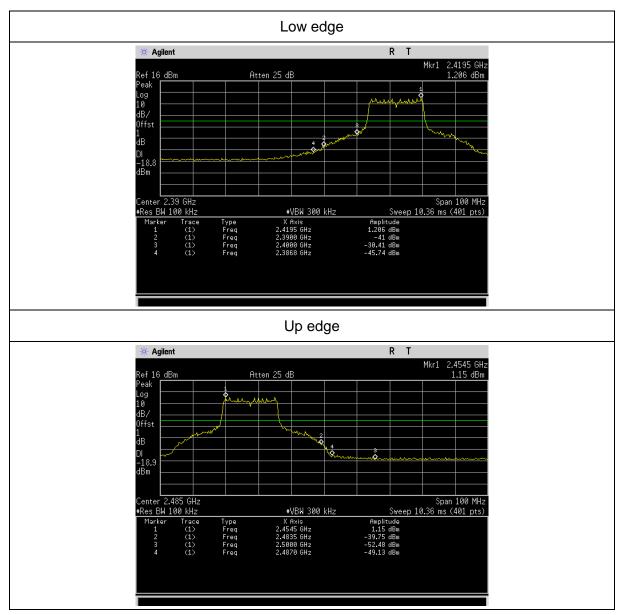
#### 802.11b mode, Band edge





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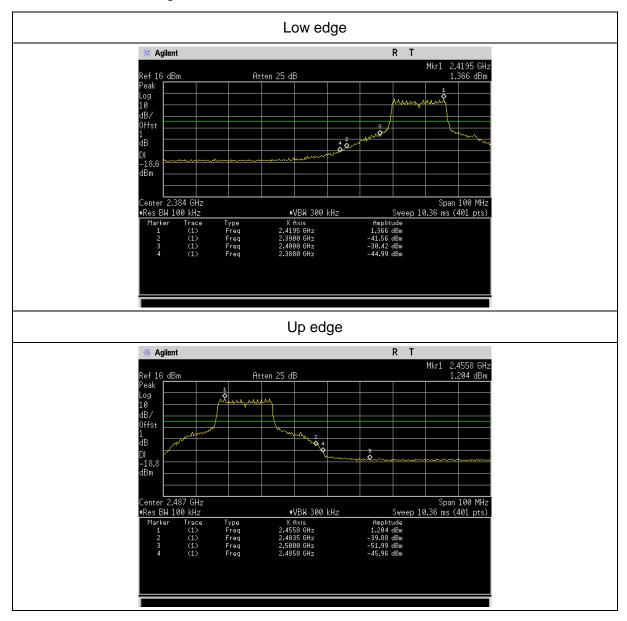
#### 802.11g mode, Band edge





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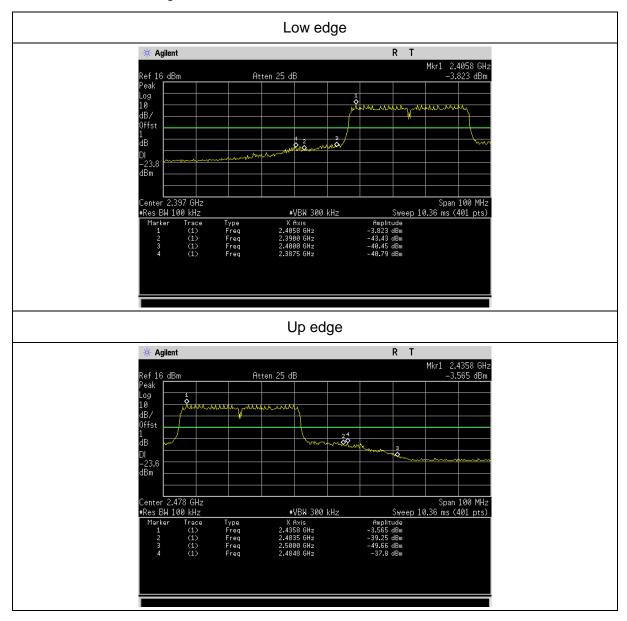
#### 802.11n20 mode, Band edge





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#### 802.11n40 mode, Band edge





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#### 3.7 Radiated emission

#### 3.7.1 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20dB. Attenuation below the general limits defined in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits defined in §15.209(a).

#### Radiated emission limits defined in FCC 15.209:

| Frequency<br>(MHz) | Field strength<br>µV/m | Field strength dBµV/m | Detector | Measurement distance |
|--------------------|------------------------|-----------------------|----------|----------------------|
| 30-88              | 100                    | 40                    | QP       |                      |
| 88-216             | 150                    | 43.5                  | QP       |                      |
| 216-960            | 200                    | 46                    | QP       | 3m                   |
| 960-1000           | 500                    | 46                    | QP       | SIII                 |
| Above 1000         | 500                    | 54                    | AV       |                      |
| Above 1000         | 5000                   | 74                    | PK       |                      |

#### Restricted bands defined in FCC 15.205:

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110       | 16.42-16.423        | 399.9-410     | 4.5-5.15    |
| 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     | Above 38.6  |
| 13.36-13.41       |                     |               |             |



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#### 3.7.2 Test method

- 1. The EUT is placed on a turntable, which is 0.8m above ground plane for test frequency range blew 1GHz, and 1.5m above ground plane for test frequency range above 1GHz.
- 2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 3. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for  $f \ge 1$ GHz, 100 kHz for f < 1 GHz, VBW  $\ge R$ BW, Sweep = auto, Detector function = peak, Trace = max hold

- 4. Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209.

#### 3.7.3 Test Result

#### Remark:

If the PK measured values lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.



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| 802.11b: 241 | 2MHz                 |                |        |          |        |                   |
|--------------|----------------------|----------------|--------|----------|--------|-------------------|
| Frequency    | Ant.<br>Polarization | Emission level | Limits | Detector | Result | Comment           |
| (MHz)        | H/V                  | dBµV/m         | dBµV/m |          |        |                   |
| 264.74       | V                    | 34.2           | 46     | QP       |        | Restricted bands  |
| 264.74       | Н                    | 37.5           | 46     | QP       |        | Restricted bands  |
| 2390         | V                    | 53.44          | 74     | PK       |        | Restricted bands  |
| 2390         | Н                    | 50.27          | 74     | PK       |        | Restricted bands  |
| 4824         | V                    | 55.71          | 74     | PK       | Pass   | Restricted bands  |
| 4824         | V                    | 51.64          | 54     | AV       |        | Restricted bands  |
| 4824         | Н                    | 51.2           | 74     | PK       |        | Restricted bands  |
| 7236         | V                    | 51.99          | 74     | PK       |        | Spurious emission |
| 7236         | Н                    | 51.92          | 74     | PK       |        | Spurious emission |
| 802.11b: 243 | 37MHz                |                |        |          |        |                   |
| Frequency    | Ant.<br>Polarization | Emission level | Limits | Detector | Result | Comment           |
| (MHz)        | H/V                  | dBµV/m         | dBµV/m |          |        |                   |
| 264.74       | V                    | 35.4           | 46     | QP       |        | Restricted bands  |
| 264.74       | Н                    | 38.6           | 46     | QP       |        | Restricted bands  |
| 4874         | V                    | 56.77          | 74     | PK       |        | Restricted bands  |
| 4874         | V                    | 52.59          | 54     | AV       | Pass   | Restricted bands  |
| 4874         | Н                    | 52.52          | 74     | PK       |        | Restricted bands  |
| 7311         | V                    | 51.35          | 74     | PK       |        | Restricted bands  |
| 7311         | Н                    | 51.8           | 74     | PK       |        | Restricted bands  |
| 802.11b: 246 | 2MHz                 |                |        |          |        |                   |
| Frequency    | Ant.<br>Polarization | Emission level | Limits | Detector |        | Comment           |
| (MHz)        | H/V                  | dBµV/m         | dBµV/m |          |        |                   |
| 264.74       | V                    | 33.4           | 46     | QP       |        | Restricted bands  |
| 264.74       | Н                    | 35.8           | 46     | QP       |        | Restricted bands  |
| 2483.5       | V                    | 47.02          | 74     | PK       | Dana   | Restricted bands  |
| 2483.5       | Н                    | 46.36          | 74     | PK       | Pass   | Restricted bands  |
| 4924         | V                    | 55.89          | 74     | PK       |        | Restricted bands  |
| 4924         | V                    | 52.63          | 54     | AVG      |        | Restricted bands  |
| 4924         | Н                    | 51.86          | 74     | PK       |        | Restricted bands  |
| 7386         | V                    | 50.79          | 74     | PK       |        | Restricted bands  |
| 7386         | Н                    | 50.54          | 74     | PK       |        | Restricted bands  |



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| 802.11g: 241 | 2MHz                 |                |        |          |        |                   |  |
|--------------|----------------------|----------------|--------|----------|--------|-------------------|--|
| Frequency    | Ant.<br>Polarization | Emission level | Limits | Detector | Result | Comment           |  |
| (MHz)        | H/V                  | dBµV/m         | dBµV/m | 1        |        |                   |  |
| 264.74       | V                    | 35.3           | 46     | QP       |        | Restricted bands  |  |
| 264.74       | Н                    | 36.2           | 46     | QP       |        | Restricted bands  |  |
| 2390         | V                    | 59.84          | 74     | PK       |        | Restricted bands  |  |
| 2390         | V                    | 45.54          | 54     | AV       |        | Restricted bands  |  |
| 2390         | Н                    | 55.61          | 74     | PK       | D      | Restricted bands  |  |
| 2390         | Н                    | 42.27          | 54     | AV       | Pass   | Restricted bands  |  |
| 4824         | V                    | 52.43          | 74     | PK       |        | Restricted bands  |  |
| 4824         | Н                    | 50.09          | 74     | PK       |        | Restricted bands  |  |
| 7236         | V                    | 51.79          | 74     | PK       |        | Spurious emission |  |
| 7236         | Н                    | 52.48          | 74     | PK       |        | Spurious emission |  |
| 802.11g: 243 | 7MHz                 |                |        |          |        |                   |  |
| Frequency    | Ant.<br>Polarization | Emission level | Limits | Detector | Result | Comment           |  |
| (MHz)        | H/V                  | dBµV/m         | dBµV/m |          |        |                   |  |
| 264.74       | V                    | 33.4           | 46     | QP       |        | Restricted bands  |  |
| 264.74       | Н                    | 34.1           | 46     | QP       |        | Restricted bands  |  |
| 4874         | V                    | 51.59          | 74     | PK       | Door   | Restricted bands  |  |
| 4874         | Н                    | 50.64          | 74     | PK       | Pass   | Restricted bands  |  |
| 7311         | V                    | 50.73          | 74     | PK       |        | Restricted bands  |  |
| 7311         | Н                    | 51.49          | 74     | PK       |        | Restricted bands  |  |
| 802.11g: 246 | 2MHz                 |                |        |          |        |                   |  |
| Frequency    | Ant.<br>Polarization | Emission level | Limits | Detector |        | Comment           |  |
| (MHz)        | H/V                  | dBµV/m         | dBµV/m |          |        |                   |  |
| 264.74       | V                    | 35.5           | 46     | QP       |        | Restricted bands  |  |
| 264.74       | Н                    | 36.4           | 46     | QP       |        | Restricted bands  |  |
| 2483.5       | V                    | 58.73          | 74     | PK       |        | Restricted bands  |  |
| 2483.5       | V                    | 42.45          | 54     | AV       | Pass   | Restricted bands  |  |
| 2483.5       | Н                    | 55.24          | 74     | PK       |        | Restricted bands  |  |
| 2483.5       | Н                    | 40.12          | 54     | AV       |        | Restricted bands  |  |
| 4924         | V                    | 52.84          | 74     | PK       |        | Restricted bands  |  |
| 4924         | Н                    | 50.29          | 74     | PK       |        | Restricted bands  |  |
| 7386         | V                    | 50.46          | 74     | PK       |        | Restricted bands  |  |
| 7386         | Н                    | 51.72          | 74     | PK       |        | Restricted bands  |  |



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| 802.11n20: 2 | 412MHz               |                |        |          |        |                   |  |
|--------------|----------------------|----------------|--------|----------|--------|-------------------|--|
| Frequency    | Ant.<br>Polarization | Emission level | Limits | Detector | Result | Comment           |  |
| (MHz)        | H/V                  | dBµV/m         | dBµV/m | 1        |        |                   |  |
| 264.74       | V                    | 34.3           | 46     | QP       |        | Restricted bands  |  |
| 264.74       | Н                    | 35.9           | 46     | QP       |        | Restricted bands  |  |
| 2390         | V                    | 62.83          | 74     | PK       |        | Restricted bands  |  |
| 2390         | V                    | 46.59          | 54     | AV       |        | Restricted bands  |  |
| 2390         | Н                    | 60.34          | 74     | PK       | Door   | Restricted bands  |  |
| 2390         | Н                    | 44.54          | 54     | AV       | Pass   | Restricted bands  |  |
| 4824         | V                    | 49.56          | 74     | PK       |        | Restricted bands  |  |
| 4824         | Н                    | 51.38          | 74     | PK       |        | Restricted bands  |  |
| 7236         | V                    | 50.46          | 74     | PK       |        | Spurious emission |  |
| 7236         | Н                    | 50.62          | 74     | PK       |        | Spurious emission |  |
| 802.11n20: 2 | 437MHz               |                |        |          |        | -                 |  |
| Frequency    | Ant.<br>Polarization | Emission level | Limits | Detector | Result | Comment           |  |
| (MHz)        | H/V                  | dBµV/m         | dBµV/m |          |        |                   |  |
| 264.74       | V                    | 34.2           | 46     | QP       |        | Restricted bands  |  |
| 264.74       | Н                    | 35.3           | 46     | QP       |        | Restricted bands  |  |
| 4874         | V                    | 51.68          | 74     | PK       | Door   | Restricted bands  |  |
| 4874         | Н                    | 51.55          | 74     | PK       | Pass   | Restricted bands  |  |
| 7311         | V                    | 50.63          | 74     | PK       |        | Restricted bands  |  |
| 7311         | Н                    | 52.24          | 74     | PK       |        | Restricted bands  |  |
| 802.11n20: 2 | 462MHz               |                |        |          |        |                   |  |
| Frequency    | Ant.<br>Polarization | Emission level | Limits | Detector |        | Comment           |  |
| (MHz)        | H/V                  | dBµV/m         | dBµV/m |          |        |                   |  |
| 264.74       | V                    | 33.5           | 46     | QP       |        | Restricted bands  |  |
| 264.74       | Н                    | 34.7           | 46     | QP       |        | Restricted bands  |  |
| 2483.5       | V                    | 60.33          | 74     | PK       |        | Restricted bands  |  |
| 2483.5       | V                    | 41.51          | 54     | AV       | Pass   | Restricted bands  |  |
| 2483.5       | Н                    | 56.75          | 74     | PK       |        | Restricted bands  |  |
| 2483.5       | Н                    | 38.23          | 54     | AV       |        | Restricted bands  |  |
| 4924         | V                    | 50.67          | 74     | PK       |        | Restricted bands  |  |
| 4924         | Н                    | 51.81          | 74     | PK       |        | Restricted bands  |  |
| 7386         | V                    | 51.49          | 74     | PK       |        | Restricted bands  |  |
| 7386         | Н                    | 51.57          | 74     | PK       |        | Restricted bands  |  |



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| 802.11n40: 2       | 422MHz               |                |        |          |        |                  |
|--------------------|----------------------|----------------|--------|----------|--------|------------------|
| Frequency          | Ant.<br>Polarization | Emission level | Limits | Detector | Result | Comment          |
| (MHz)              | H/V                  | dBµV/m         | dBµV/m |          |        |                  |
| 264.74             | V                    | 34.9           | 46     | QP       | Pass   | Restricted bands |
| 264.74             | Н                    | 33.5           | 46     | QP       |        | Restricted bands |
| 2390               | V                    | 52.57          | 74     | PK       |        | Restricted bands |
| 2390               | Н                    | 50.46          | 74     | PK       |        | Restricted bands |
| 4844               | V                    | 50.46          | 74     | PK       |        | Restricted bands |
| 4844               | Н                    | 51.27          | 74     | PK       |        | Restricted bands |
| 7266               | V                    | 51.87          | 74     | PK       |        | Restricted bands |
| 7266               | Н                    | 52.75          | 74     | PK       |        | Restricted bands |
| 802.11n40: 2437MHz |                      |                |        |          |        |                  |
| Frequency          | Ant.<br>Polarization | Emission level | Limits | Detector | Result | Comment          |
| (MHz)              | H/V                  | dBµV/m         | dBµV/m |          |        |                  |
| 264.74             | V                    | 32.8           | 46     | QP       | Pass   | Restricted bands |
| 264.74             | Н                    | 34.6           | 46     | QP       |        | Restricted bands |
| 4874               | V                    | 51.12          | 74     | PK       |        | Restricted bands |
| 4874               | Н                    | 52.61          | 74     | PK       |        | Restricted bands |
| 7311               | V                    | 48.69          | 74     | PK       |        | Restricted bands |
| 7311               | Н                    | 50.75          | 74     | PK       |        | Restricted bands |
| 802.11n40: 2452MHz |                      |                |        |          |        |                  |
| Frequency          | Ant.<br>Polarization | Emission level | Limits | Detector |        | Comment          |
| (MHz)              | H/V                  | dBµV/m         | dBµV/m |          |        |                  |
| 264.74             | V                    | 33.6           | 46     | QP       | Pass   | Restricted bands |
| 264.74             | Н                    | 35.2           | 46     | QP       |        | Restricted bands |
| 2483.5             | V                    | 50.16          | 74     | PK       |        | Restricted bands |
| 2483.5             | Н                    | 46.43          | 74     | PK       |        | Restricted bands |
| 4904               | V                    | 49.38          | 74     | PK       |        | Restricted bands |
| 4904               | Н                    | 51.56          | 74     | PK       |        | Restricted bands |
| 7356               | V                    | 50.47          | 74     | PK       |        | Restricted bands |
| 7356               | Н                    | 52.36          | 74     | PK       |        | Restricted bands |

#### ----END OF REPORT----