



## TEST REPORT

Date: 2011-08-16

Report No.: 68.870.11.002.02F

**Applicant:** Maxin Technology Limited  
Block C, East Xueziwei Industrial Zone, Yabian, Shajing,  
Shenzhen, China

**Description of Samples:** Model name: 2.4GHz Mouse  
Brand name: maxin  
Model no.: MOU-2018G, MOU-906G, MOU-907G, MOU-908G,  
MOU-909G, MOU-910G, MOU-916G, MOU-917G,  
MOU-919G, MOU-1012G, MOU-1014G, MOU-  
1015G  
FCCID: ZVL-2018G

**Date Samples Received:** 2011-07-21

**Date Tested:** 2011-07-22 to 2011-08-02

**Investigation Requested:** FCC Part 15 Subpart C, Section 15.249

**Conclusions:** The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

**Remarks:** ----

Checked by:

Approved by:

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John Zhi  
Project Engineer  
Wireless & Telecom department

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Nicolas Cheng  
Project Manager  
Wireless & Telecom department


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**1.0    General Details**

**1.1    Test Laboratory**

Neutron Engineering Inc.  
EMC Laboratory registered by FCC with  
FCC Registration Number: 538587

Test By:   
Ares Liu

**1.2    Applicant Details**

**Applicant**

**Maxin Technology Limited**  
Block C, East Xueziwei Industrial Zone, Yabian, Shajing,  
Shenzhen, China

**Manufacturer**

**Shenzhen Maxin Industry Co., Ltd**  
Block C, East Xueziwei Industrial Zone, Yabian, Shajing,  
Shenzhen, China

### **1.3 Equipment Under Test [EUT]**

#### **Description of EUT**

|                                      |                                                                                                                            |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Model Name:                          | 2.4GHz Mouse                                                                                                               |
| Brand Name:                          | maxin                                                                                                                      |
| Model Number:                        | MOU-2018G, MOU-906G, MOU-907G, MOU-908G, MOU-909G, MOU-910G, MOU-916G, MOU-917G, MOU-919G, MOU-1012G, MOU-1014G, MOU-1015G |
| FCCID:                               | ZVL-2018G                                                                                                                  |
| Rating:                              | 3.0 VDC ( 2*AAA Battery )                                                                                                  |
| Antenna Type:                        | Integral Antenna                                                                                                           |
| Operated Frequency:                  | 2405-2476MHz                                                                                                               |
| No. of Channel:                      | 32                                                                                                                         |
| Accessories and Auxiliary Equipment: | None                                                                                                                       |
| EUT Exercising Software:             | None                                                                                                                       |

As per Client Declaration, the circuit design, PCB Layout, shielding and interface of MOU-2018G, MOU-906G, MOU-907G, MOU-908G, MOU-909G, MOU-910G, MOU-916G, MOU-917G, MOU-919G, MOU-1012G, MOU-1014G and MOU-1015G are identical, the purpose of different model number is designed for different buyers only. So we use MOU-2018G as a representative model to perform all testing.

#### **General Operation of EUT**

The Equipment Under Test (EUT) is a wireless mouse operated at 2405-2476 MHz which Data transfer to its associated receiver.

### **1.4 Equipment Modification**

No modification was made to the tested unit by TÜV SÜD China Ltd.

### **1.5 Related Submittal(s) Grants**

This is a single application of certification for this transmitter.

**2.0    Technical Details**

**2.1    Investigations Requested**

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR  
[Codes of Federal Regulations] Part 15: 2009 and ANSI C63.4: 2003 for FCC  
Verification.

**2.2    Test Standards and Results Summary Tables**

| <b>EMISSION<br/>Results Summary</b>               |                                               |                                     |                          |                          |
|---------------------------------------------------|-----------------------------------------------|-------------------------------------|--------------------------|--------------------------|
| Test Condition                                    | FCC Test Requirement                          | Test Result                         |                          |                          |
|                                                   |                                               | Pass                                | Failed                   | N/A                      |
| Field Strength of<br>Fundamental and<br>Harmonics | Part 15.249 (a),(e)                           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spurious Radiated<br>Emission                     | Part 15.249 (d)<br>Part 15.209<br>Part 15.205 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Out of Band<br>Emissions                          | Part 15.249 (d)                               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Bandwidth<br>Measurement                          | Part 15.215 (c)                               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Conducted<br>Emission                             | Part 15.207                                   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Note: N/A - Not Applicable

### **3.0 Test Methodology**

#### **3.1 Radiated Emission**

The sample was placed 0.8m above the ground plane on a standard emission test site \*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

\*On a standard emission test site with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 538587.

#### **3.2 Field Strength Calculation**

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$\begin{aligned} \text{FS} &= \text{R} + \text{System Factor} \\ \text{System Factor} &= \text{AF} + \text{CF} + \text{FA} - \text{PA} \end{aligned}$$

Where FS = Net Field Strength in dBuV/m at 3 meters.

R = Reading of Spectrum Analyzer / Test Receiver in dBuV.

AF = Antenna Factor in dB.

CF = Cable Attenuation Factor in dB.

FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

#### **3.3 Conducted Emissions**

The EUT was placed on a non-metallic table 0.8m above the horizontal metal reference plane and 0.4m from a vertical ground plane which is connected to the horizontal metal ground plane. Meanwhile, the AC main of EUT was connected to the distance of 0.8m line impedance stabilization network (LISN) during measurement.

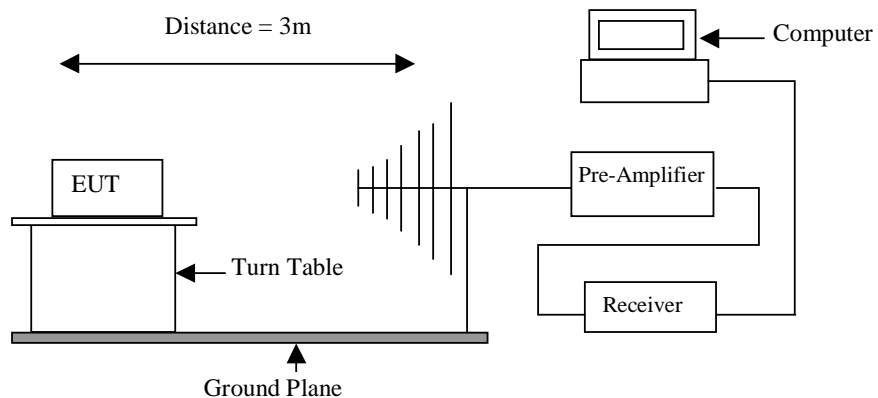
Initial measurements were performed in quasi-peak and average detection modes by the test receiver, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

#### **4.0**    **Test Results**

##### **4.1**    **Field Strength of Fundamental and Harmonics**

|                    |                                                                  |
|--------------------|------------------------------------------------------------------|
| Test Requirement:  | FCC part 15 section 15.249(a)(e)                                 |
| Test Method:       | ANSI C63.4:2003                                                  |
| Test Date:         | 2011-07-22                                                       |
| Mode of Operation: | Transmitting mode.                                               |
| Detector Function: | Quasi-peak (Below 1000 MHz)<br>Average and Peak (Above 1000 MHz) |
| Measurement BW:    | 120 kHz (Below 1000 MHz)<br>1 MHz (Above 1000 MHz)               |

##### **Test Setup:**



Results: PASS

| Field Strength of Fundamental and Harmonics |       |                     |                  |         |               |                      |        |                |          |
|---------------------------------------------|-------|---------------------|------------------|---------|---------------|----------------------|--------|----------------|----------|
| Channel                                     | Value | Emissions Frequency | E-Field Polarity | Reading | System Factor | Field Strength at 3m | Limit  | Delta to Limit | Remarks  |
|                                             |       | MHz                 |                  | dBμV/m  | dB            | dBμV/m               | dBμV/m | dBμV/m         |          |
| 1                                           | PK    | 2405.00             | V                | 52.91   | 31.56         | 84.47                | 114    | -29.53         | Fund.    |
|                                             | AV    | 2405.00             |                  | 13.11   | 31.56         | 44.67                | 94     | -49.33         | Fund.    |
| 1                                           | PK    | 2405.00             | H                | 55.07   | 31.56         | 86.63                | 114    | -27.37         | Fund.    |
|                                             | AV    | 2405.00             |                  | 15.27   | 31.56         | 46.83                | 94     | -47.17         | Fund.    |
| 16                                          | PK    | 2439.00             | V                | 55.06   | 31.62         | 86.68                | 114    | -27.32         | Fund.    |
|                                             | AV    | 2439.00             |                  | 15.26   | 31.62         | 46.88                | 94     | -47.12         | Fund.    |
| 16                                          | PK    | 2439.00             | H                | 56.85   | 31.62         | 88.47                | 114    | -25.53         | Fund.    |
|                                             | AV    | 2439.00             |                  | 17.05   | 31.62         | 48.67                | 94     | -45.33         | Fund.    |
| 32                                          | PK    | 2476.00             | V                | 54.69   | 31.69         | 86.38                | 114    | -27.62         | Fund.    |
|                                             | AV    | 2476.00             |                  | 14.89   | 31.69         | 46.58                | 94     | -47.42         | Fund.    |
| 32                                          | PK    | 2476.00             | H                | 57.42   | 31.69         | 89.11                | 114    | -24.89         | Fund.    |
|                                             | AV    | 2476.00             |                  | 17.62   | 31.69         | 49.31                | 94     | -44.69         | Fund.    |
| 1                                           | PK    | *4810.00            | V                | 51.35   | 5.79          | 57.14                | 74     | -16.86         | Harmonic |
|                                             | AV    | *4810.00            |                  | 11.55   | 5.79          | 17.34                | 54     | -36.66         | Harmonic |
| 1                                           | PK    | *4810.00            | H                | 49.23   | 5.79          | 55.02                | 74     | -18.98         | Harmonic |
|                                             | AV    | *4810.00            |                  | 9.43    | 5.79          | 15.22                | 54     | -38.78         | Harmonic |
| 16                                          | PK    | *4878.00            | V                | 51.82   | 6.16          | 57.98                | 74     | -16.02         | Harmonic |
|                                             | AV    | *4878.00            |                  | 12.02   | 6.16          | 18.18                | 54     | -35.82         | Harmonic |
| 16                                          | PK    | *4878.00            | H                | 49.02   | 6.16          | 55.18                | 74     | -18.82         | Harmonic |
|                                             | AV    | *4878.00            |                  | 9.22    | 6.16          | 15.38                | 54     | -38.62         | Harmonic |
| 32                                          | PK    | *4952.00            | V                | 51.67   | -5.05         | 46.62                | 74     | -27.38         | Harmonic |
|                                             | AV    | *4952.00            |                  | 11.87   | -5.05         | 6.82                 | 54     | -47.18         | Harmonic |
| 32                                          | PK    | *4952.00            | H                | 49.85   | -1.71         | 48.14                | 74     | -25.86         | Harmonic |
|                                             | AV    | *4952.00            |                  | 10.05   | -1.71         | 8.34                 | 54     | -45.66         | Harmonic |

Note :

- Result data graphs are shown at P.12 - 17 for reference.
- Average factor is applied, where AV=Peak+ Average factor

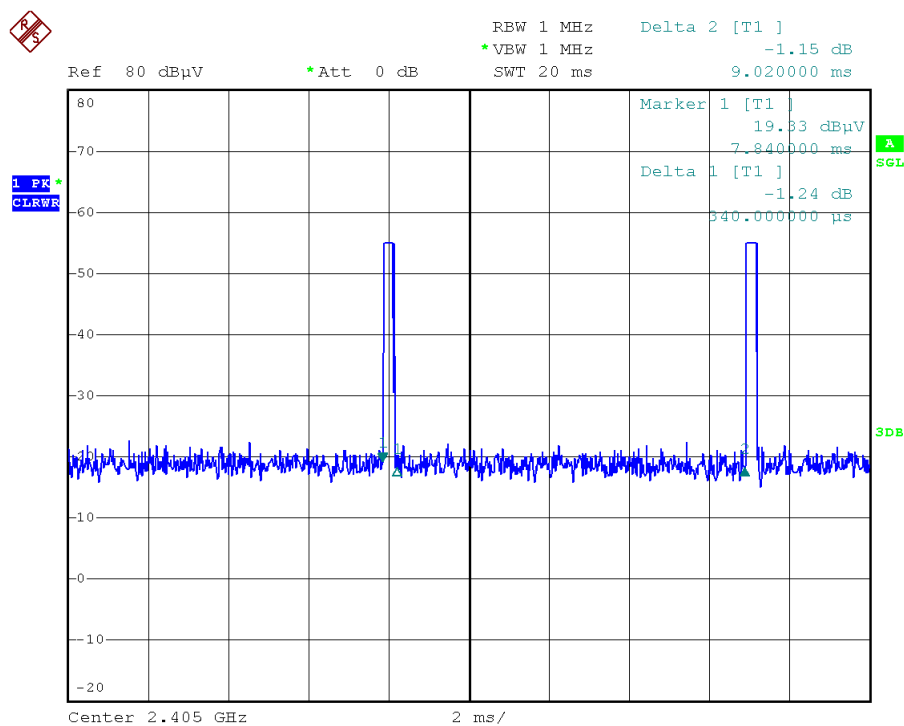
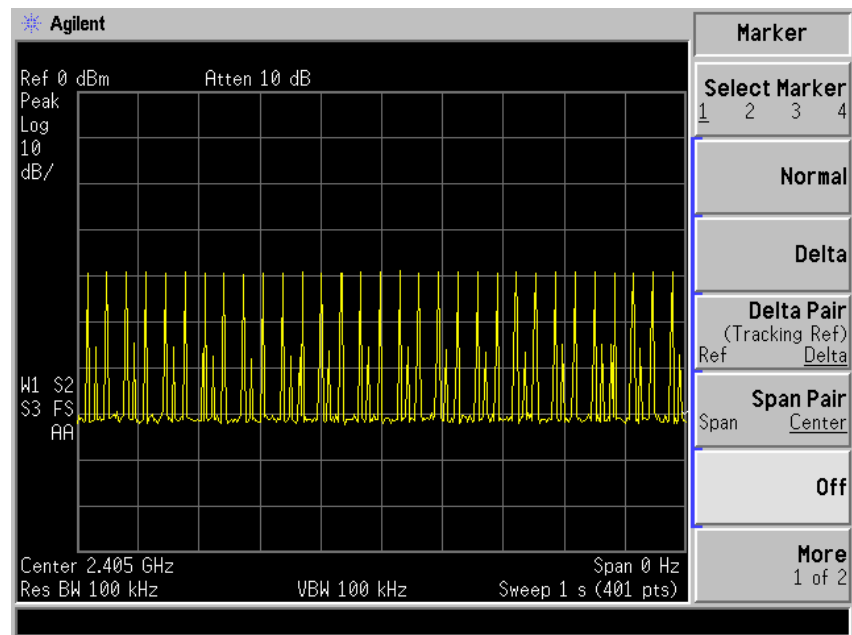
When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long the specification for output field strengths in accordance with the FCC rules specify measurements with an average detector.

The duty cycle is the total signal on time per one transmission.  
 Average factor in dB =  $20 \log (\text{duty cycle})$   
 Effective period of the cycle per 100ms =  $(3 \times 0.340\text{ms}) / 100\text{ms}$   
 $= 1.02\text{ms} / 100\text{ms}$

Duty cycle = 0.0102  
 Therefore, the averaging factor is  $20 \log (0.0102)$   
 $= -39.8\text{dB}$ .



Refer to the following graph for the detail.



Remark : - ( \* ) Radiated emissions which fall in the restricted bands as defined in Section 15.205(a).

- Calculated measurement uncertainty:  $\pm 5.0$  dB

**Limits of Field Strength for Fundamental and Harmonics Frequency [ Section 15.249 (a) ]:**

| Fundamental Frequency<br>[MHz] | Field Strength of Fundamental |                | Field Strength of Harmonics |                |
|--------------------------------|-------------------------------|----------------|-----------------------------|----------------|
|                                | [mV/m]                        | [dB $\mu$ V/m] | [ $\mu$ V/m]                | [dB $\mu$ V/m] |
| 2400 – 2483.5                  | 50                            | 94(Average)    | 500                         | 54(Average)    |

Compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

**Limit Requirement under Section 15.249 (e) :**

According to section 15.249 (e), for frequencies above 1000MHz, the above field strength limits is based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

**Limit for Radiated Emission [ Section 15.209 ]:**

| Frequency (MHz) | Field Strength<br>[ $\mu$ V/m] | Field Strength<br>[dB $\mu$ V/m] |
|-----------------|--------------------------------|----------------------------------|
| 30-88           | 100                            | 40.0                             |
| 88-216          | 150                            | 43.5                             |
| 216-960         | 200                            | 46.0                             |
| Above 960       | 500                            | 54.0                             |

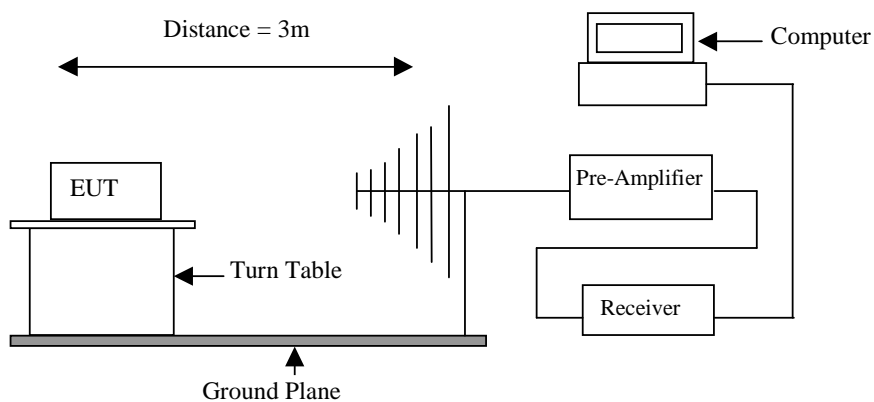
Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

## **4.2 Spurious Radiated Emission**

|                    |                                                                  |
|--------------------|------------------------------------------------------------------|
| Test Requirement:  | FCC part 15 section 15.249(d), 15.209                            |
| Test Method:       | ANSI C63.4:2003                                                  |
| Test Date:         | 2011-07-22                                                       |
| Mode of Operation: | Transmitting mode.                                               |
| Detector Function: | Quasi-peak (Below 1000 MHz)<br>Average and Peak (Above 1000 MHz) |
| Measurement BW:    | 120 kHz (Below 1000 MHz)<br>1 MHz (Above 1000 MHz)               |

### **Test Setup:**



Results: PASS

| Spurious Radiated Emissions |       |                        |                     |         |                  |                            |        |                   |
|-----------------------------|-------|------------------------|---------------------|---------|------------------|----------------------------|--------|-------------------|
| Channel                     | Value | Emissions<br>Frequency | E-Field<br>Polarity | Reading | System<br>Factor | Field<br>Strength<br>at 3m | Limit  | Delta to<br>Limit |
|                             |       | MHz                    |                     | dBμV/m  | dB               | dBμV/m                     | dBμV/m | dBμV/m            |
| 32                          | QP    | 37.76*                 | H                   | 43.40   | -14.36           | 29.04                      | 40.00  | -10.96            |
| 32                          | QP    | 108.57*                | H                   | 36.80   | -23.98           | 10.75                      | 43.50  | -32.75            |
| 32                          | QP    | 255.04*                | H                   | 34.16   | -21.13           | 13.03                      | 46.00  | -32.97            |
| 32                          | QP    | 387.93                 | H                   | 37.07   | -14.87           | 22.20                      | 46.00  | -23.80            |
| 32                          | QP    | 510.15                 | H                   | 30.56   | -12.11           | 18.45                      | 46.00  | -27.55            |
| 32                          | QP    | 797.27                 | H                   | 30.77   | -6.23            | 24.54                      | 46.00  | -21.46            |
| 32                          | QP    | 38.73                  | V                   | 36.91   | -15.05           | 21.86                      | 40.00  | -18.14            |
| 32                          | QP    | 108.57*                | V                   | 40.74   | -23.98           | 16.76                      | 43.50  | -26.74            |
| 32                          | QP    | 164.83*                | V                   | 32.17   | -21.07           | 11.10                      | 43.50  | -32.40            |
| 32                          | QP    | 298.69                 | V                   | 29.58   | -17.16           | 12.42                      | 46.00  | -33.58            |
| 32                          | QP    | 715.79                 | V                   | 31.23   | -7.66            | 23.57                      | 46.00  | -22.43            |
| 32                          | QP    | 940.83                 | V                   | 29.70   | -3.55            | 26.15                      | 46.00  | -19.85            |

Note:

- The worst case channel is presented in this result table.
- No further spurious emissions found between 30MHz and lowest internal used / generated frequency.
- Result data graphs are shown at P.12 - 19 for reference.

Remark :

- ( \* ) Radiated emissions which fall in the restricted bands as defined in Section 15.205(a).
- Calculated measurement uncertainty: ±5.0dB.

#### Limit of Outside of the Specified Bands [ Section 15.249 (d) ]

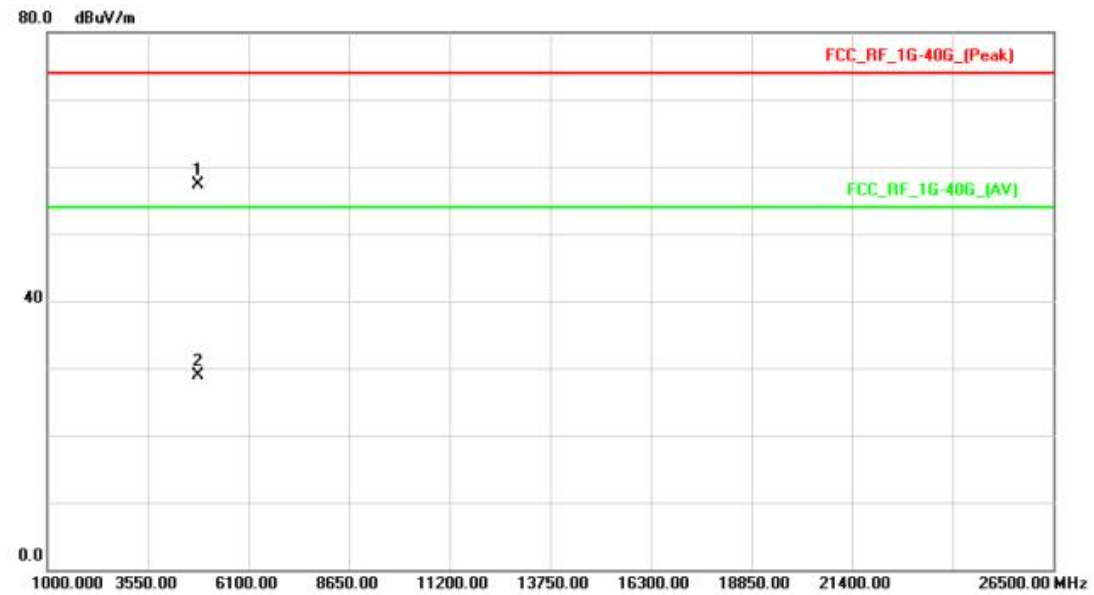
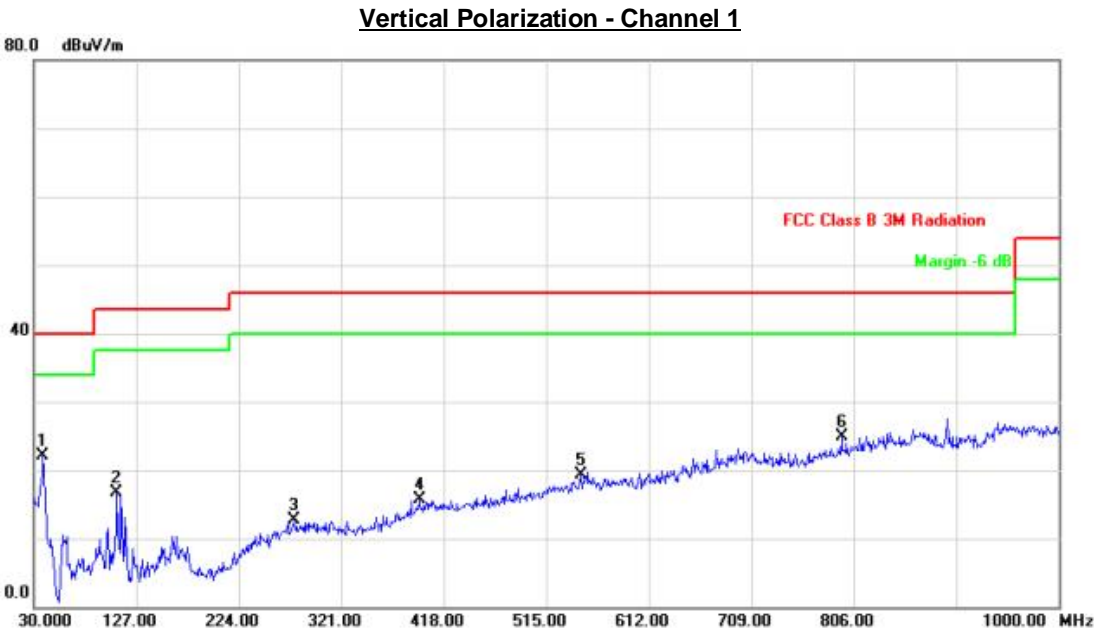
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

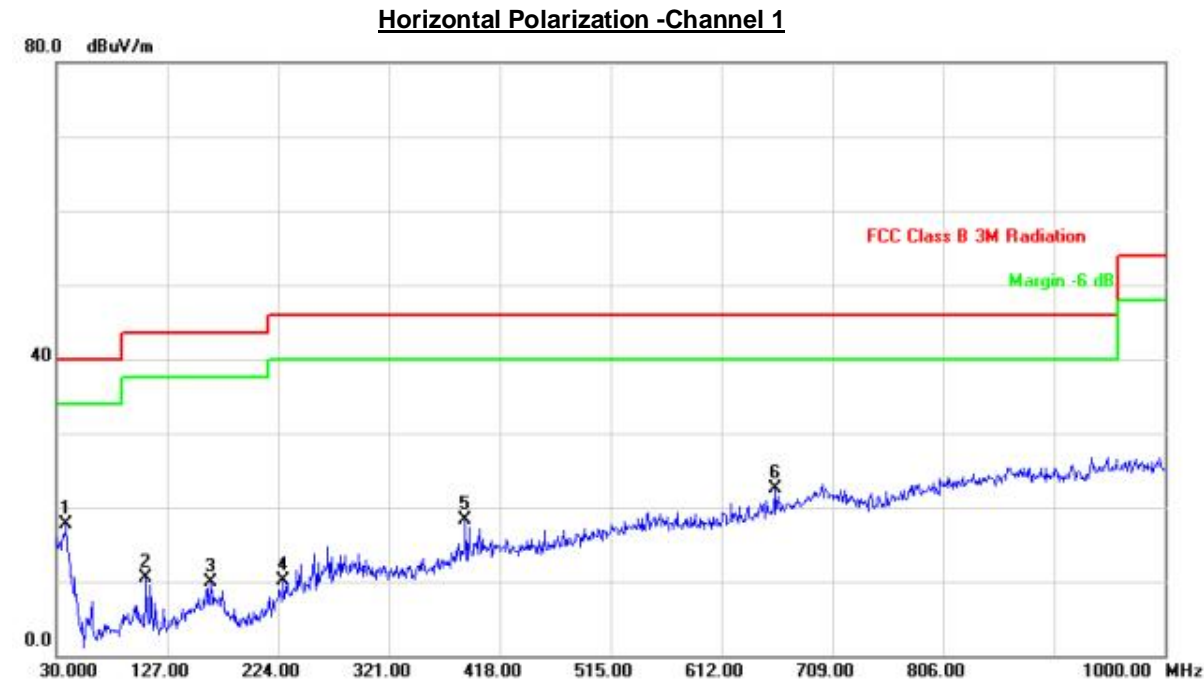
#### Limit for Radiated Emission [ Section 15.209 ]:

| Frequency (MHz) | Field Strength<br>[μV/m] | Field Strength<br>[dBμV/m] |
|-----------------|--------------------------|----------------------------|
| 30-88           | 100                      | 40.0                       |
| 88-216          | 150                      | 43.5                       |
| 216-960         | 200                      | 46.0                       |
| Above 960       | 500                      | 54.0                       |

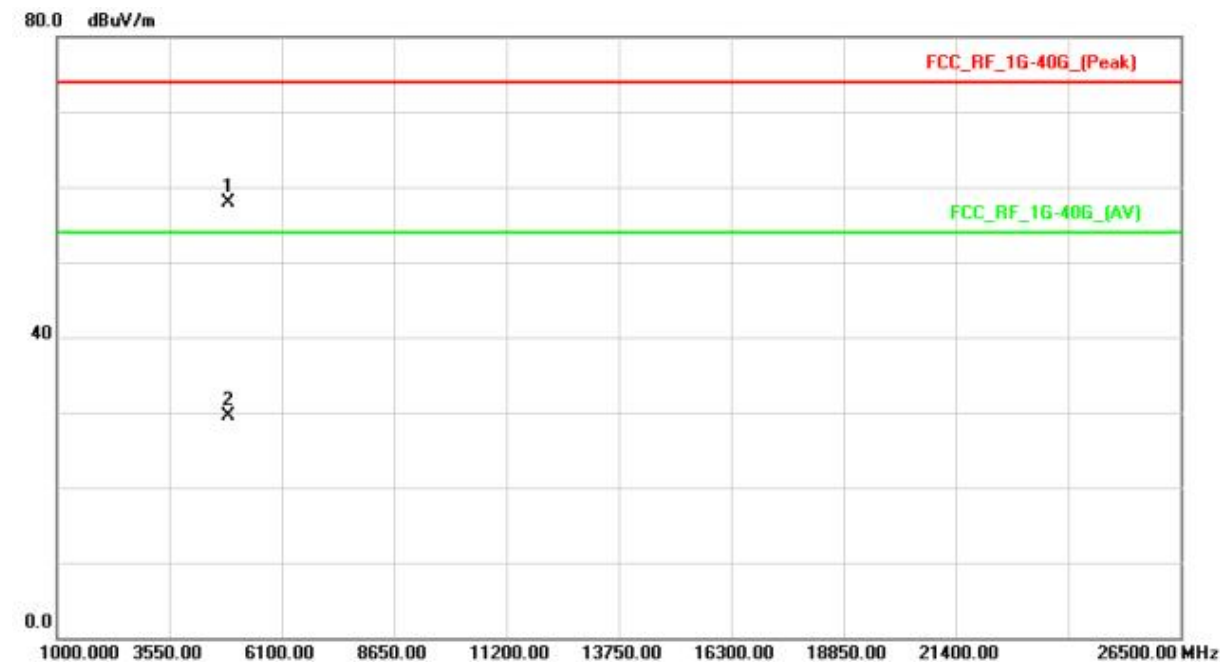
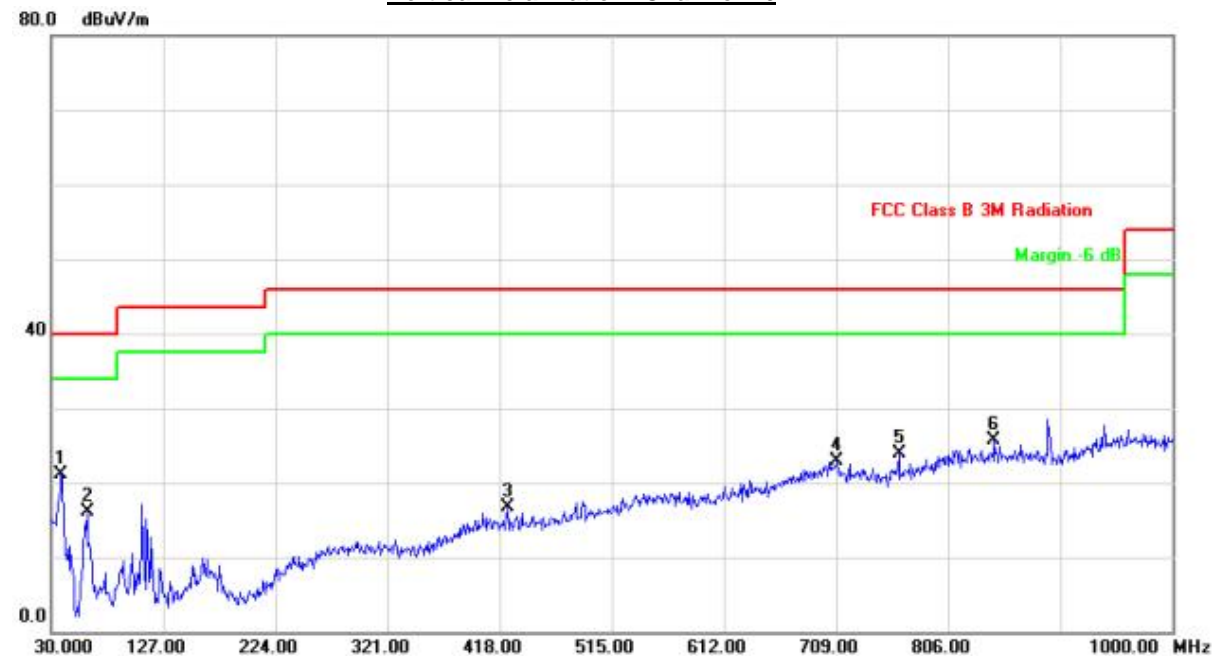
Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

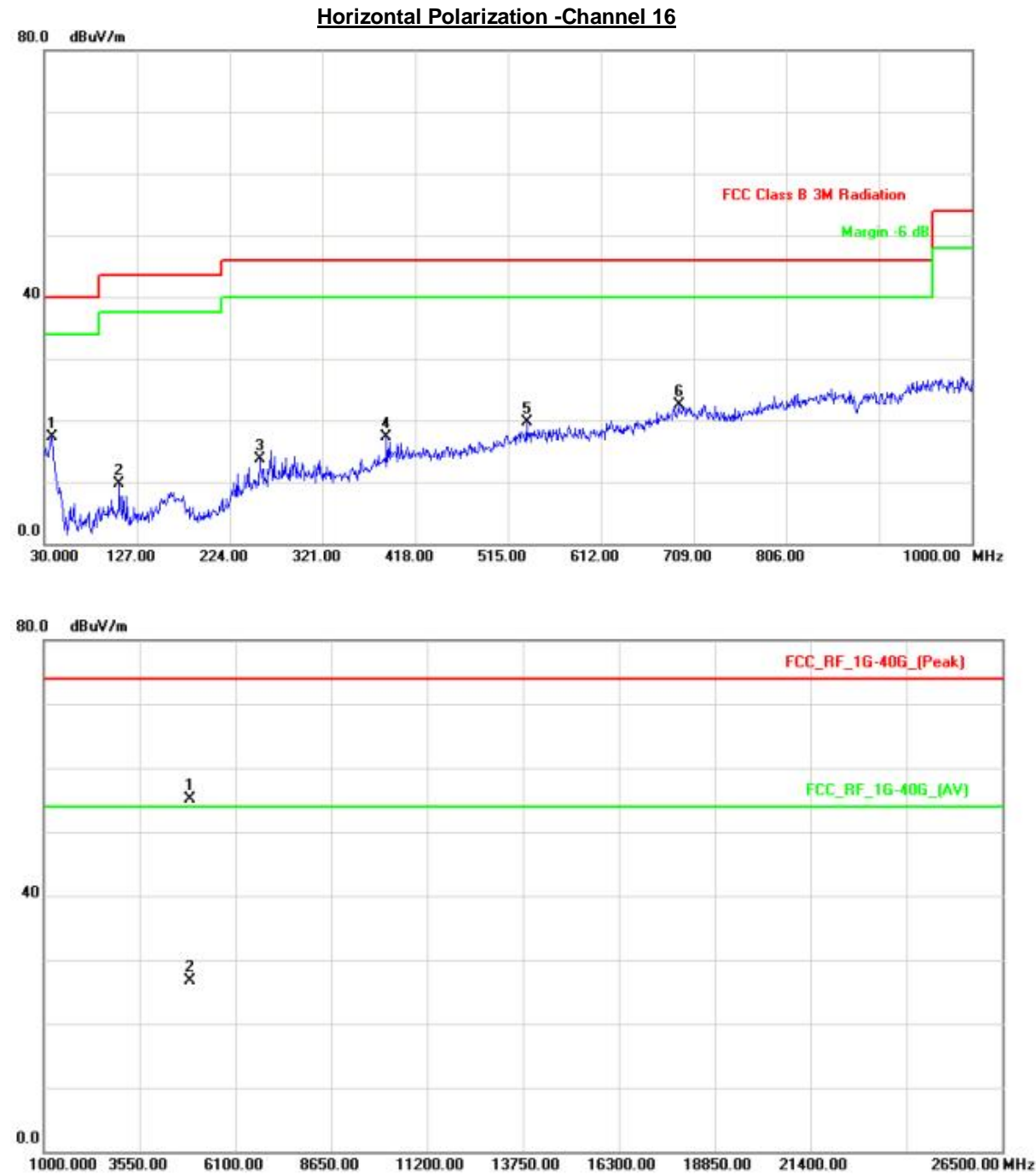
The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.





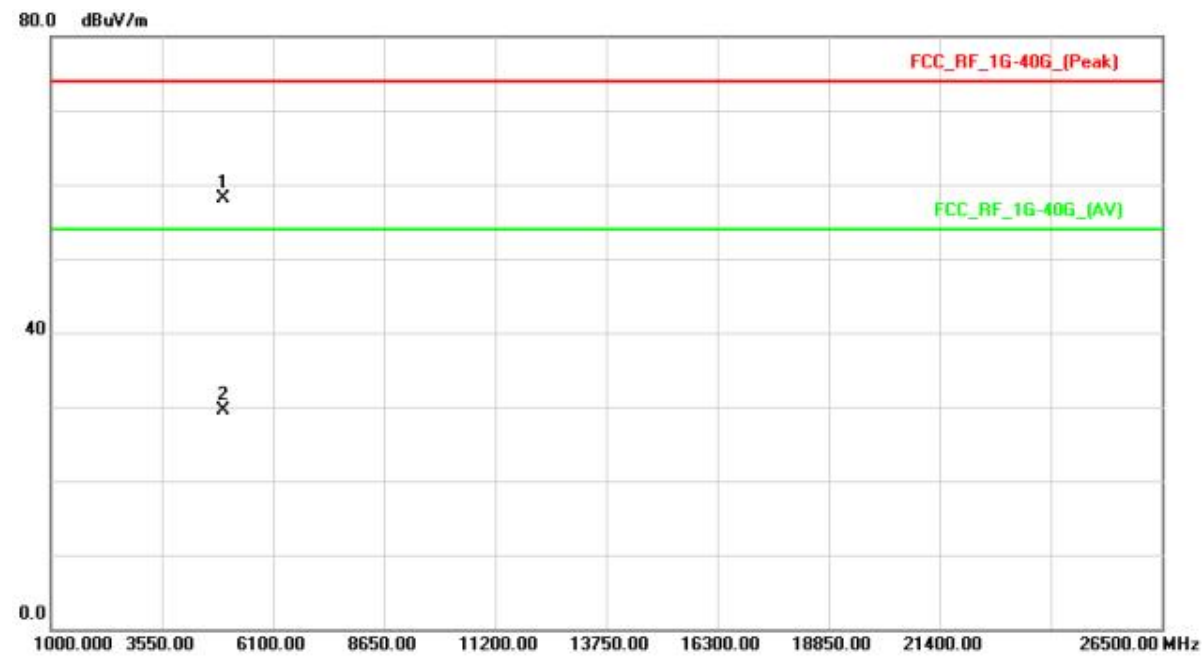
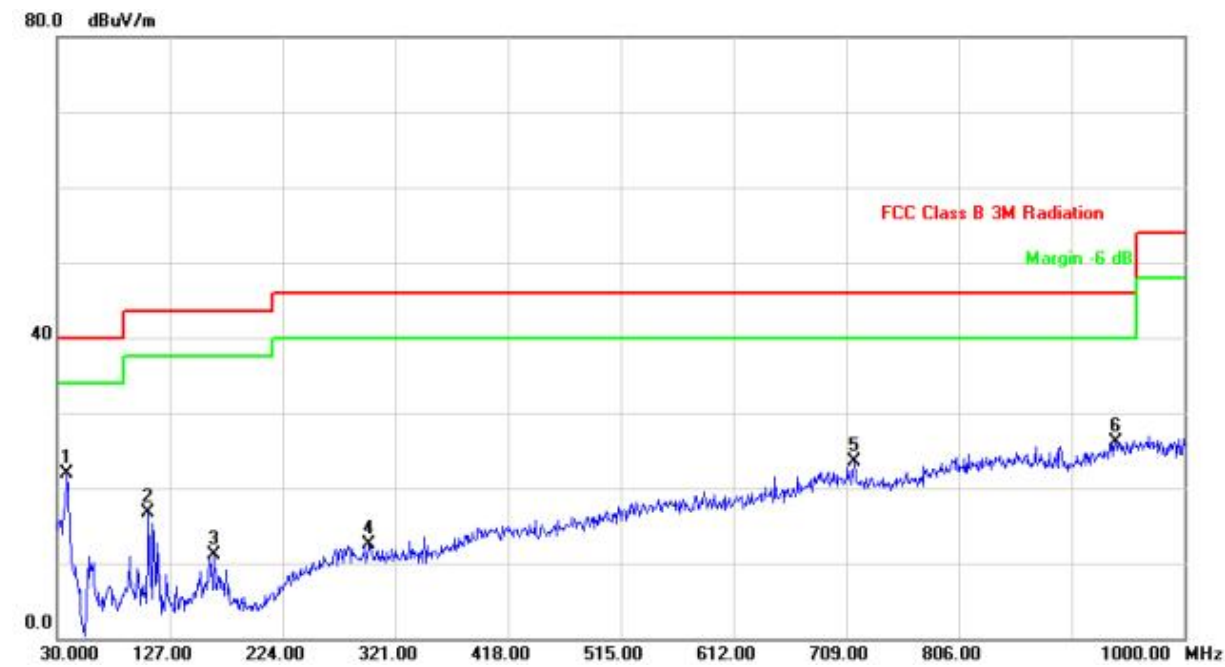
Vertical Polarization -Channel 16



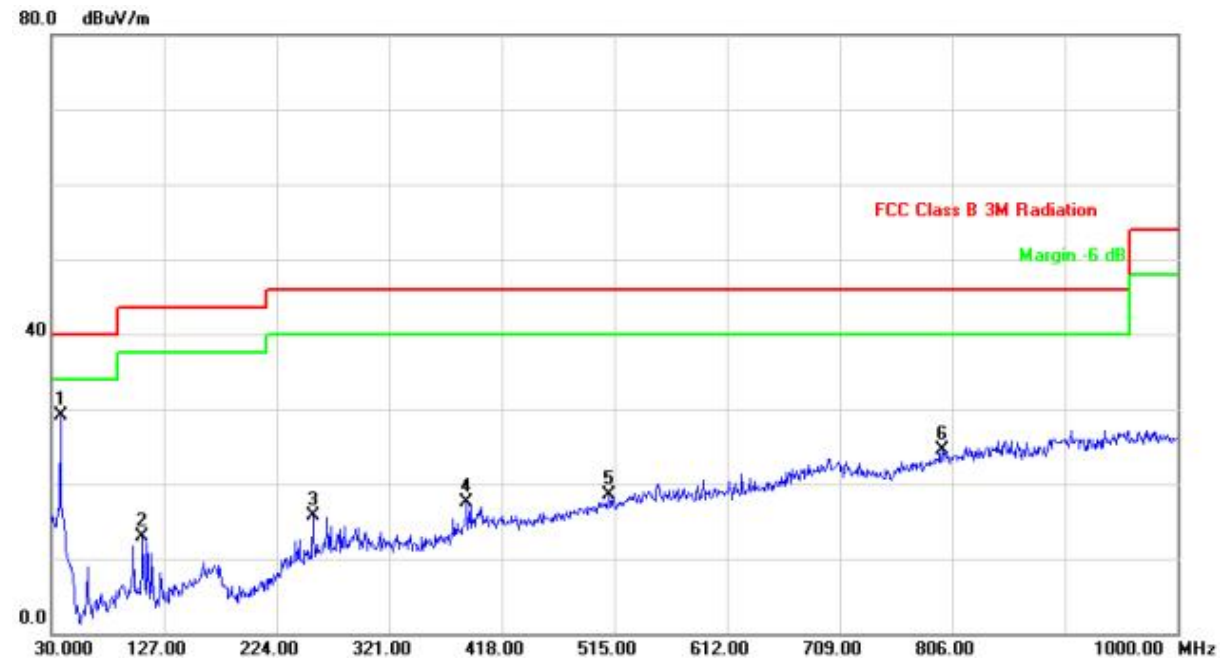




Vertical Polarization -Channel 32



Horizontal Polarization -Channel 32



**4.3 Out of Band Emissions**

|                    |                                |
|--------------------|--------------------------------|
| Test Requirement:  | FCC part 15 section 15.249 (d) |
| Test Method:       | ANSI C63.4:2003                |
| Test Date:         | 2011-07-22                     |
| Mode of Operation: | Transmitting mode.             |
| Detector Function: | Peak                           |

**Results: PASS**

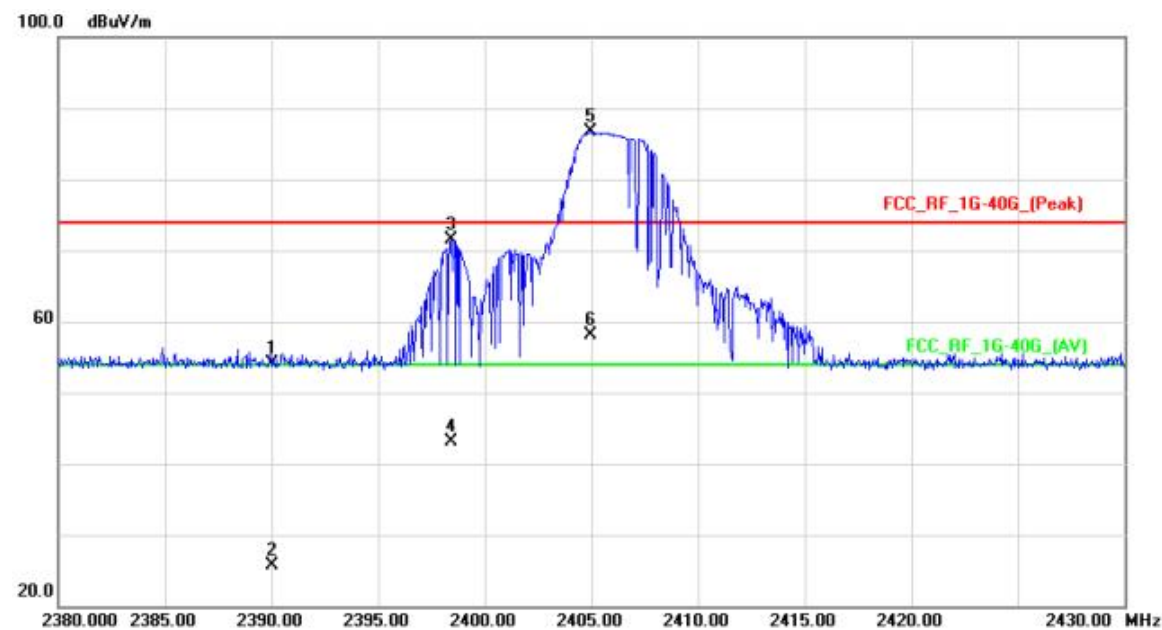
Refer to the data graph, the lower and higher edge of the specified frequency bands fulfill the general radiated emission limits in section 15.209. Therefore, the EUT meets the requirement of section 15.249 (d).

**Limit for Out of Band Emissions [ Section 15.249 (d) ]**

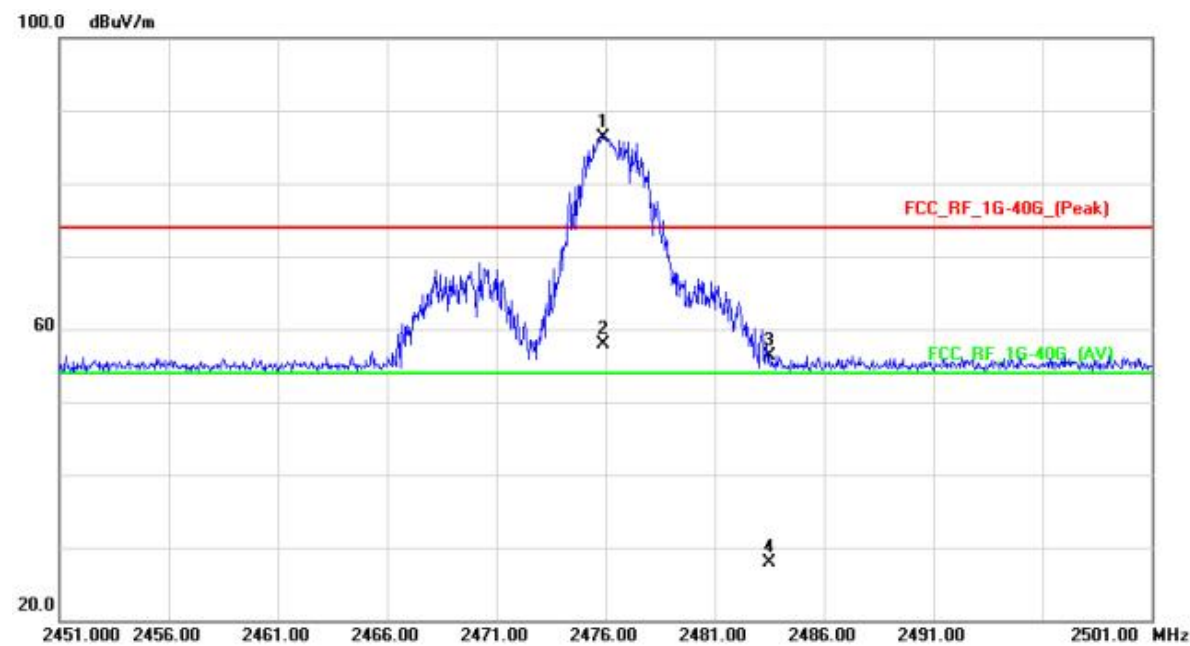
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

**Test Result:** Result data graph is shown at the next pages for reference.

Lowest Channel



Highest Channel



**4.4 Bandwidth Measurement**

|                    |                                |
|--------------------|--------------------------------|
| Test Requirement:  | FCC part 15 section 15.215 (c) |
| Test Method:       | ANSI C63.4:2003                |
| Test Date:         | 2009-11-18                     |
| Mode of Operation: | Transmitting mode.             |
| Detector Function: | Peak                           |

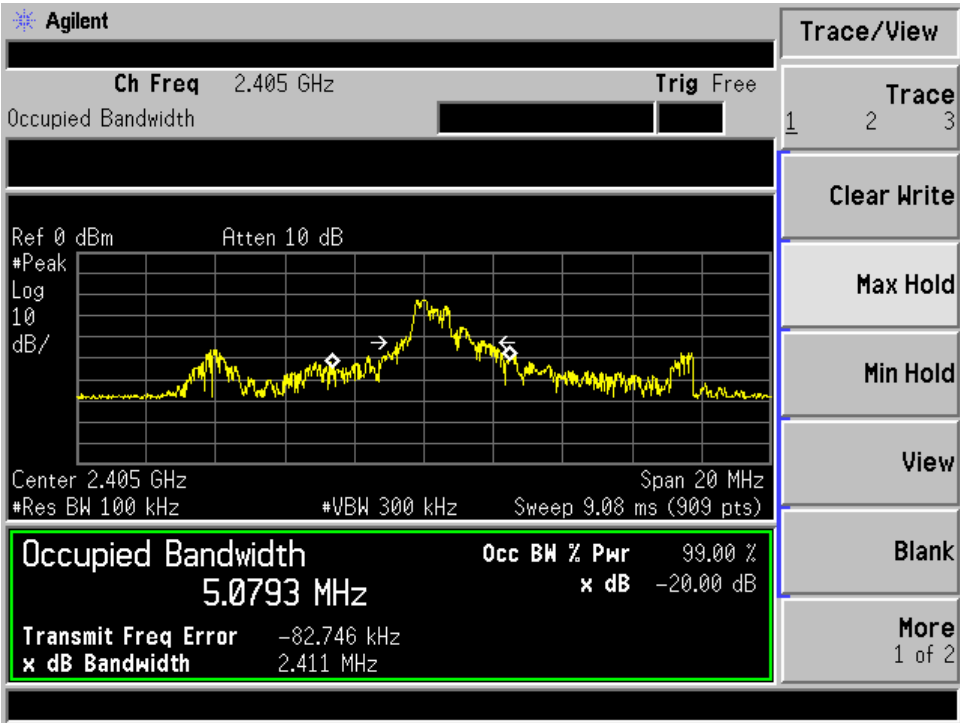
**Results: PASS**

Refer to the data graph, the 20dB points of Channel 1, Channel 2 and Channel 3 are 2.411MHz, 3.089MHz and 2.808MHz. All channels within the operation bandwidth when equipment is operated. Therefore, the EUT meets the requirement of section 15.215(c).

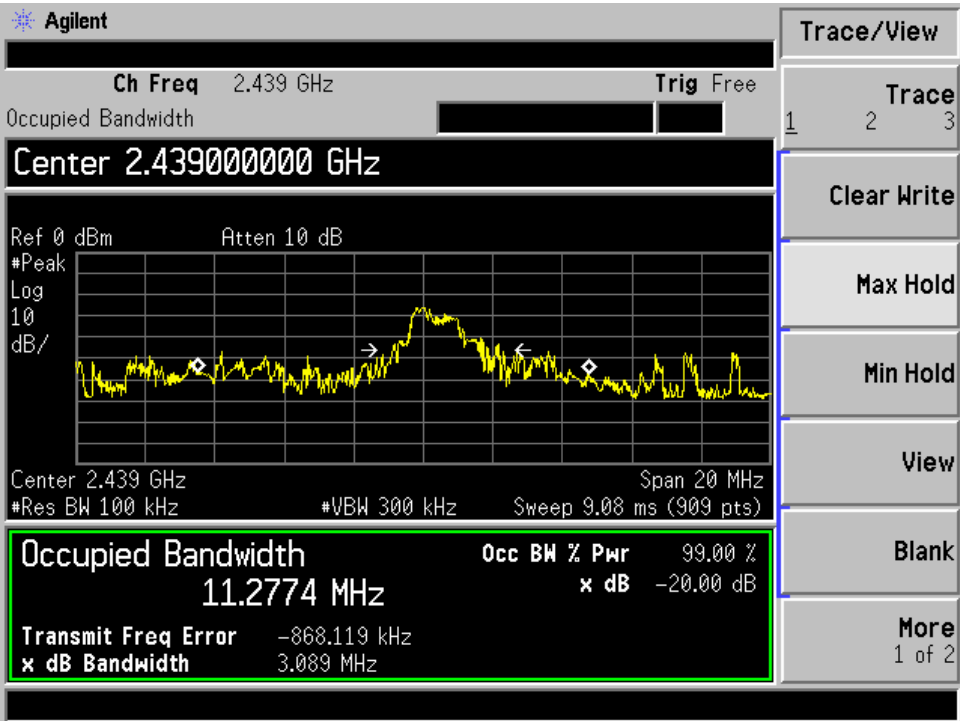
**Limit for Bandwidth [ Section 15.215 (c) ]**

The 20dB bandwidth of the emission shall be within the frequency band designated in the rule section under which the equipment is operated.

**Test Result:** Result data graph is shown at the next pages for reference.



Channel 1 – 20 dB point, Bandwidth 2.411MHz



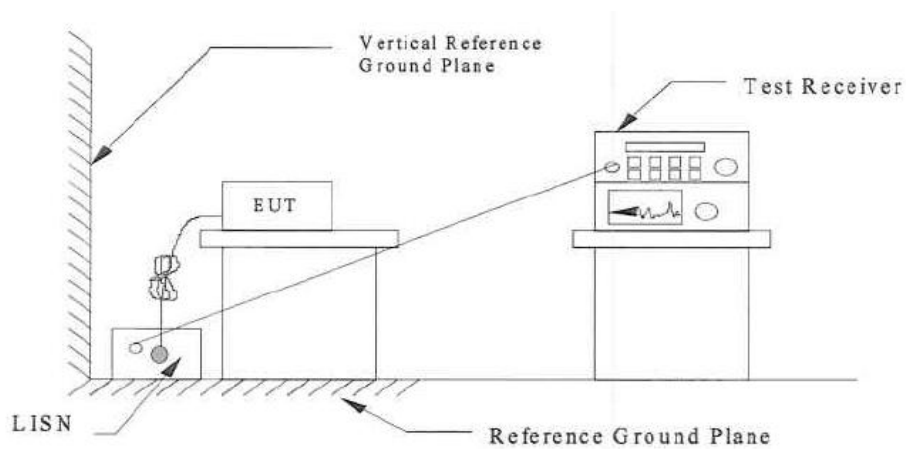
Channel 16 – 20 dB point, Bandwidth 3.089MHz



#### 4.5 Conducted Emissions (0.15MHz to 30MHz)

|                    |                                    |
|--------------------|------------------------------------|
| Test Requirement:  | FCC part 15 Section 15.207 Class B |
| Test Method:       | ANSI C63.4:2003                    |
| Test Date:         | ---                                |
| Mode of Operation: | Transmitting with Charging mode.   |
| Detector Function: | Quasi-peak, average                |
| Measurement BW:    | 9 kHz                              |

##### Test Setup:





**Results: N/A**

Remark: - EUT is the battery operate product, no AC port test.

- Calculated measurement uncertainty:  $\pm 2.8\text{dB}$

**Limits for Conducted Emission [ Section 15.207]:**

| Frequency Range<br>[MHz] | Quasi-Peak Limit<br>[dB $\mu$ V] | Average Limit<br>[dB $\mu$ V] |
|--------------------------|----------------------------------|-------------------------------|
| 0.15-0.5                 | 66 to 56*                        | 56 to 46*                     |
| 0.5-5.0                  | 56                               | 46                            |
| 5.0-30.0                 | 60                               | 50                            |

\* Decreases with the logarithm of the frequency.

## 5.0 List of Measurement Equipment

### Radiated Emission and Out of Band Emissions

| Description                | Manufacturer | Model no.           | Serial no.          | Last cal    | CAL due     |
|----------------------------|--------------|---------------------|---------------------|-------------|-------------|
| Horn Antenna               | EMCO         | 3115                | 9605-4803           | Jul.13.2011 | Jul.14.2012 |
| Antenna                    | EMCO         | 3142C               | 00066464            | Jul.13.2011 | Jul.14.2012 |
| Amplifier                  | Agilent      | 8449B               | 3008A02584          | May.25.2011 | May.26.2012 |
| Test Receiver              | R&S          | ESCI                | 100382              | May.25.2011 | May.26.2012 |
| Test Cable                 | N/A          | C-01_CB03           | N/A                 | May.25.2011 | May.26.2012 |
| Controller                 | CT           | SC100               | N/A                 | May.25.2011 | May.26.2012 |
| Test Cable                 | Huber+Suhner | SUCOFLEX_1<br>5m_4m | N/A                 | May.25.2011 | May.26.2012 |
| Coaxial Cable 50ohm        | Rosenberger  | RTK081-05S-<br>10m  | LA2-001-<br>10M/002 | May.25.2011 | May.26.2012 |
| RF Communications Test Set | HP           | 8920B               | US36492628          | May.25.2011 | May.26.2012 |

### Conducted Emission

| Description       | Manufacturer | Model no. | Serial no. | Last cal    | CAL due     |
|-------------------|--------------|-----------|------------|-------------|-------------|
| LISN              | EMCO         | 3816/2    | 00052765   | May.25.2011 | May.26.2012 |
| LISN              | R&S          | ENV216    | 100087     | May.25.2011 | May.26.2012 |
| Test Cable        | N/A          | C_17      | N/A        | May.25.2011 | Mar.26.2012 |
| EMI TEST RECEIVER | R&S          | ESCS30    | 826547/022 | May.25.2011 | May.26.2012 |
| 50Ω Terminator    | SHX          | TF2-3G-A  | 08122902   | May.25.2011 | May.26.2012 |

Remarks:

CM Corrective Maintenance

N/A Not Applicable or Not Available