

## TEST REPORT For FCC

Test Report No. : TK-FR11002  
Date of Issue : 01/27/2011  
FCC ID : P5A-AA-SM1PWL B  
Description of Product : 2.4GHz Mouse  
Model No. : AA-SR1PWL B  
Applicant : Areson Technology Corp.  
Manufacturer : Axonic International Corp.  
Standards : FCC Part 15.249  
Test Date : 01/13/2011 – 01/25/2011  
Test Results : ☒ PASS ☐ FAIL

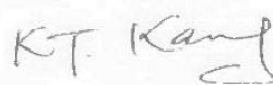
The test results relate only to the items tested.

**Tested by:**



Jeff Do  
Test Engineer  
Date: 01/27/2011

**Reviewed by:**



KT Kang  
Technical Manager  
Date: 01/27/2011

## THRU-KES CO.,LTD.

477-6, Hager-ri, Yoju-up, Yoju-gun Kyunggi-do, 469-803, Korea  
Tel: +82-31-425-6200 / Fax: +82-31-424-0450

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## 1.0 General product description

Equipment model name : AA-SM1PWLB  
Serial number : Prototype  
EUT condition : Pre-production, not damaged  
Antenna type & gain : PCB antenna / Gain -9.2dBi  
Frequency Range : 2403 ~ 2478 MHz  
Number of channels : 20  
Type of Modulation : GFSK  
Power Source : DC 3V

## 1.1 Test frequency

|                 | Low channel | Middle channel | High channel |
|-----------------|-------------|----------------|--------------|
| Frequency (MHz) | 2403        | 2453           | 2478         |

## 1.2 Test mode

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

## 1.3 Model differences

Not applicable

## 1.4 Device modifications

The following modifications were necessary for compliance: Not applicable manufacturer

## 1.5 Peripheral devices

| Device | Manufacturer | Model No. | Serial No. |
|--------|--------------|-----------|------------|
| N/A    |              |           |            |

## 1.6 Calibration details of equipment used for measurement




Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

## 1.7 Test facility

The measurement facility is located at 477-6, Hager-ri, Yoju-up, Yoju-gun Kyunggi-do, 469-803, Korea. Tel: +82-31-883-5092/Fax: +82-31-883-5169.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

## 1.8 Laboratory accreditations and listings

| Country | Agency | Scope of accreditation   | Logo   |
|---------|--------|--|--|
| USA     | FCC    | 3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.                                     | <br>343818   |
| KOREA   | KCC    | EMI<br>(10 meter Open Area Test Site and two conducted sites)<br>Radio<br>(3 & 10 meter Open Area Test Sites and one conducted site) | <br>KR100   |
| Canada  | IC     | 3 & 10 meter Open Area Test Sites and one conducted site   | <br>4769B-1 |

## 2.0 Summary of tests

| Section in FCC Part 15  | Parameter   | Status |
|---|---|--------|
| 15.209(a)<br>15.249(a)<br>15.249(d)<br>15.205   | Fundamental, spurious emission and<br>band edge radiated emission | C      |
| Note 1: C=Complies    NC=Not complies    NT=Not tested    NA=Not applicable                                 |   |        |
| Note 2: The data in this test report are traceable to the national or international standards.              |   |        |
| Note 3: The sample was tested according to the following specification:<br>FCC Part 15.249, ANSI C63.4-2003 |   |        |

## 2.1 Technical characteristic test

### 2.1.1 Fundamental, spurious emission and band edge radiated emission

#### Test location

Testing was performed at a test distance of 3 meter Open Area Test Site

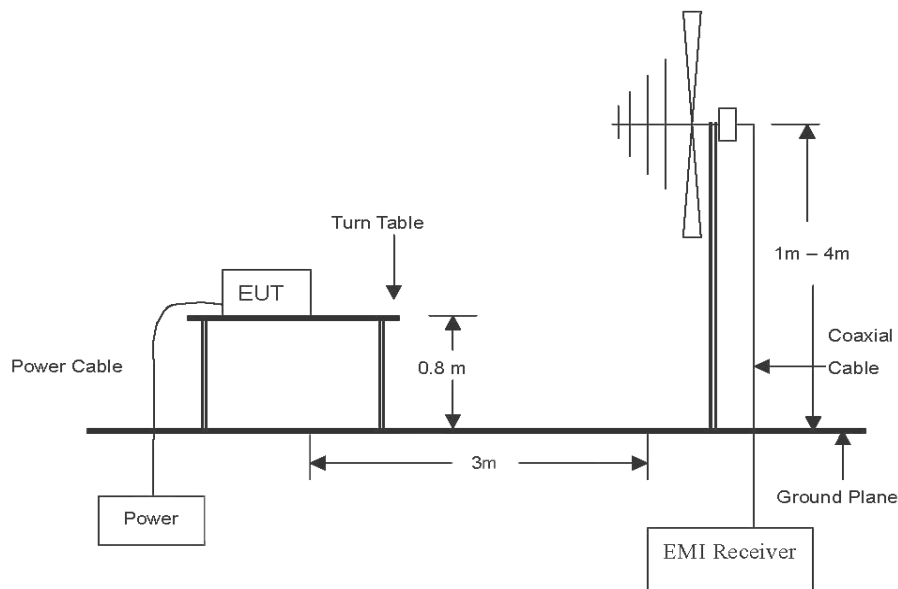
#### Test procedures

The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity. The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

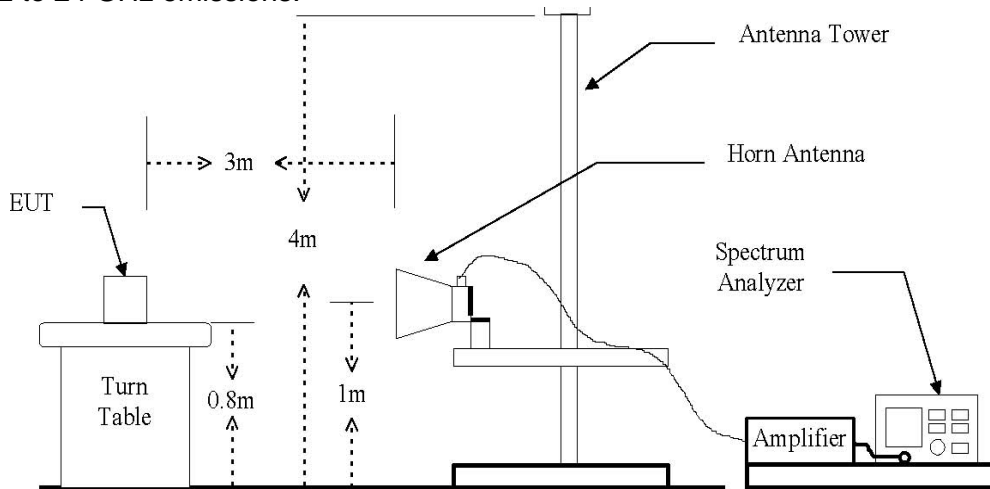
The spectrum analyzer is set to:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 120 kHz for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 GHz.

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 24 GHz emissions.



### Limit

In the section 15.249(a) :

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency | Field strength of fundamental (mV/ m) | Field strength of harmonics (uV/ m) |
|-----------------------|---------------------------------------|-------------------------------------|
| 902 ~ 928 MHz         | 50                                    | 500                                 |
| 2 400 ~ 2 483.5 MHz   | 50                                    | 500                                 |
| 5 725 ~ 5 875 MHz     | 50                                    | 500                                 |
| 24.0 ~ 24.25 GHz      | 250                                   | 2500                                |

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Fundamental frequency (MHz) | Field strength (uV/ m)m | Measurement distance (m) |
|-----------------------------|-------------------------|--------------------------|
| 30 ~ 88                     | 100*                    | 3                        |
| 88 ~ 216                    | 150*                    | 3                        |
| 216 ~ 960                   | 200*                    | 3                        |
| Above 960                   | 500                     | 3                        |

**※ Remark**

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

In the above emission table, the tighter limit applies at the band edges.

| <b>Fundamental frequency<br/>(MHz)</b> | <b>Field strength<br/>(<math>\mu\text{V}/\text{m}</math> at 3 meter)</b> | <b>Field strength<br/>(dB<math>\mu\text{V}/\text{m}</math> at 3 meter)</b> |
|--|--|--|
| 30 ~ 88                                | 100  | 40   |
| 88 ~ 216                               | 150  | 43.5   |
| 216 ~ 960                              | 200  | 46   |
| Above 960                              | 500  | 54   |



### Test results (Below 1000 MHz)

The frequency spectrum from 30 MHz to 1000 MHz was investigated. Emission levels are not reported much lower than the limits by over 20 dB.

| Radiated emissions |                | Ant. | Correction factors |                 | Total           | Limit           |             |
|--------------------|----------------|------|--------------------|-----------------|-----------------|-----------------|-------------|
| Frequency (MHz)    | Reading (dBUV) | Pol. | Ant. factor (dB/m) | Cable loss (dB) | Actual (dBUV/m) | Limit (dBUV/ m) | Margin (dB) |
| 175.20             | 10.9           | V    | 15.35              | 2.50            | 28.75           | 43.50           | 14.75       |
| 182.50             | 12.6           | H    | 15.90              | 2.60            | 31.10           | 43.50           | 12.40       |
| 204.69             | 11.2           | H    | 16.41              | 2.63            | 30.24           | 43.50           | 13.26       |
| 204.91             | 10.4           | H    | 16.40              | 2.63            | 29.43           | 43.50           | 14.07       |
| 205.48             | 13.0           | H    | 16.37              | 2.63            | 32.00           | 43.50           | 11.50       |
| 205.80             | 13.1           | H    | 16.36              | 2.63            | 32.09           | 43.50           | 10.60       |
| 272.82             | 5.8            | H    | 17.76              | 2.99            | 26.55           | 46.00           | 19.45       |
| 274.14             | 5.2            | V    | 17.87              | 3.00            | 26.07           | 46.00           | 19.93       |
| 275.46             | 5.2            | H    | 17.99              | 3.00            | 26.19           | 46.00           | 19.81       |
| 344.50             | 5.8            | H    | 17.81              | 3.46            | 27.07           | 46.00           | 18.93       |
| 344.50             | 5.2            | V    | 17.81              | 3.46            | 26.47           | 46.00           | 19.53       |
| 408.35             | 5.3            | H    | 17.84              | 3.84            | 26.98           | 46.00           | 19.02       |

### ※ Remark

1. All spurious emission at channels are almost the same below 1 GHz, so that middle channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + CL (Cable loss)
3. Detector mode: Quasi peak
4. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

## Test results (Above 1000 MHz)

### A. Low channel (2403 MHz)

| Radiated emissions |                |               | Ant. | Correction factors |               | Total           | Limit           |             |
|--------------------|----------------|---------------|------|--------------------|---------------|-----------------|-----------------|-------------|
| Frequency (MHz)    | Reading (dBUV) | Detector mode | Pol. | Ant. factor (dB/m) | Amp + CL (dB) | Actual (dBUV/m) | Limit (dBUV/ m) | Margin (dB) |
| 2403               | 84.72          | P             | H    | 28.14              | -34.48        | 78.38           | 114.00          | 35.62       |
| 2403               | 35.04          | A             | H    | 28.14              | -34.48        | 28.70           | 94.00           | 65.30       |
| 2403               | 84.39          | P             | V    | 28.14              | -34.48        | 78.05           | 114.00          | 35.95       |
| 2403               | 35.44          | A             | V    | 28.14              | -34.48        | 29.10           | 94.00           | 64.90       |
| 2390*              | 45.50          | P             | H    | 28.11              | -34.47        | 39.14           | 74.00           | 34.86       |
| 2390*              | 45.68          | P             | V    | 28.11              | -34.47        | 39.32           | 74.00           | 34.68       |
| 4806               | 30.87          | P             | H    | 33.43              | -31.91        | 32.39           | 74.00           | 41.61       |
| 4806               | 30.33          | P             | V    | 33.43              | -31.91        | 31.85           | 74.00           | 42.15       |

### B. Middle channel (2453 MHz)

| Radiated emissions |                |               | Ant. | Correction factors |               | Total           | Limit           |             |
|--------------------|----------------|---------------|------|--------------------|---------------|-----------------|-----------------|-------------|
| Frequency (MHz)    | Reading (dBUV) | Detector mode | Pol. | Ant. factor (dB/m) | Amp + CL (dB) | Actual (dBUV/m) | Limit (dBUV/ m) | Margin (dB) |
| 2453               | 84.35          | P             | H    | 28.23              | -34.54        | 78.04           | 114.00          | 35.96       |
| 2453               | 36.35          | A             | H    | 28.23              | -34.54        | 30.04           | 94.00           | 63.96       |
| 2453               | 84.79          | P             | V    | 28.23              | -34.54        | 78.48           | 114.00          | 35.52       |
| 2453               | 36.24          | A             | V    | 28.23              | -34.54        | 29.93           | 94.00           | 64.07       |
| 4906               | 30.65          | P             | H    | 33.67              | -31.75        | 32.57           | 74.00           | 41.43       |
| 4906               | 31.96          | P             | V    | 33.67              | -31.75        | 33.88           | 74.00           | 40.12       |

**C. High channel (2478 MHz)**

| Radiated emissions |                |               | Ant. | Correction factors |              | Total           | Limit           |             |
|--------------------|----------------|---------------|------|--------------------|--------------|-----------------|-----------------|-------------|
| Frequency (MHz)    | Reading (dBuV) | Detector mode | Pol. | Ant. factor (dB/m) | Amp + CL(dB) | Actual (dBuV/m) | Limit (dBuV/ m) | Margin (dB) |
| 2478               | 84.73          | P             | H    | 28.27              | -34.57       | 78.43           | 114.00          | 35.57       |
| 2478               | 35.93          | A             | H    | 28.27              | -34.57       | 29.63           | 94.00           | 64.37       |
| 2478               | 85.08          | P             | V    | 28.27              | -34.57       | 78.78           | 114.00          | 35.22       |
| 2478               | 35.15          | A             | V    | 28.27              | -34.57       | 28.85           | 94.00           | 65.15       |
| 2483.5*            | 49.71          | P             | H    | 28.28              | -34.58       | 43.41           | 74.00           | 30.59       |
| 2483.5*            | 47.35          | P             | V    | 28.28              | -34.58       | 41.05           | 74.00           | 32.95       |
| 4956               | 31.11          | P             | H    | 33.79              | -31.67       | 33.23           | 74.00           | 40.77       |
| 4956               | 29.59          | P             | V    | 33.79              | -31.67       | 31.71           | 74.00           | 42.29       |

**※ Remark**

1. "\*" means the restricted band.
2. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using peak/average detector mode.
4. Average test would be performed if the peak result were greater than the average limit.
5. Actual = Reading + Ant. factor +( Amp + CL (Cable loss))
6. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

**Appendix A – Test equipment used For test**

| <b>Equipment</b>         | <b>Manufacturer</b>   | <b>Model</b>  | <b>Calibration due.</b> |
|--------------------------|-----------------------|---------------|-------------------------|
| Spectrum Analyzer        | R&S                   | FSV30         | 2012-01-07              |
| Trilog-Broadband Antenna | SCHWARZBECK           | VULB 9168     | 2011-03-27              |
| Horn Antenna             | A.H. System           | SAS-571       | 2011-03-16              |
| High Pass Filter         | Wainwright Instrument | WHJS3000-10TT | 2012-01-07              |
| Preamplifier             | HP                    | 8447F         | 2011-05-06              |
| Preamplifier             | HP                    | 8449B         | 2011-07-27              |
| EMI Test Receiver        | R&S                   | ESVS10        | 2011-03-05              |

## Test setup photos and configuration

### Radiated electric field emissions

