

**SmartAC.com, Inc.**

# TEST REPORT

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# Maximum Permissible Exposure (MPE) Evaluation Report

|                               |                                                                                                                                                                |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant:</b>             | SmartAC.com, Inc.<br>5302 Egbert Street, Houston, TX 77007, United States                                                                                      |
| <b>Product:</b>               | Gateway                                                                                                                                                        |
| <b>Model No.:</b>             | SMSHB1A1                                                                                                                                                       |
| <b>Brand Name:</b>            | smartAC.com                                                                                                                                                    |
| <b>FCC ID:</b>                | 2AVMLSMSHB1                                                                                                                                                    |
| <b>Test Method/ Standard:</b> | FCC 1.1310                                                                                                                                                     |
| <b>Test By:</b>               | Intertek Testing Services Taiwan Ltd.,<br>Hsinchu Laboratory<br>No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,<br>Shiang-Shan District, Hsinchu City, Taiwan |

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### Revision History

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|------------------|---------------|------------------|
| 200700307TWN-001 | Aug. 28, 2020 | Original report  |

## Table of Contents

|                                     |    |
|-------------------------------------|----|
| 1. General Information .....        | 5  |
| 1.1 Identification of the EUT ..... | 5  |
| 1.2 Adapter information .....       | 5  |
| 1.3 Antenna description .....       | 5  |
| 1.4 Peripherals equipment .....     | 6  |
| 2. Test specifications .....        | 7  |
| 2.1 Introduction .....              | 7  |
| 2.2 RF Exposure Limit .....         | 8  |
| 2.3 RF Exposure calculations .....  | 10 |
| 2.4 Operation mode .....            | 10 |
| 2.5 Test equipment .....            | 11 |
| 2.6 Test Set-up .....               | 11 |
| 3. Test results .....               | 12 |

## Summary of Tests

### MPE Evaluation meet FCC OET No. 65: 1997, IEEE C95.1-2005

| Test           | Reference                                    | Results  |
|----------------|----------------------------------------------|----------|
| MPE Evaluation | FCC Guidelines for Human Exposure IEEE C95.1 | Complies |

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.

Other Testing: the specification, standard and not taking into account the measurement uncertainty.

## 1. General Information

### 1.1 Identification of the EUT

|                               |                                                                               |
|-------------------------------|-------------------------------------------------------------------------------|
| <b>Product:</b>               | Gateway                                                                       |
| <b>Model No.:</b>             | SMSHB1A1                                                                      |
| <b>Operating Frequency:</b>   | 1. 2412 MHz ~ 2462 MHz<br>2. 2407MHz ~ 2477MHz                                |
| <b>Channel Number:</b>        | 1. 11 channels for 2412 MHz ~ 2462 MHz<br>2. 8 channels for 2407MHz ~ 2477MHz |
| <b>Access scheme:</b>         | DSSS, OFDM, GFSK                                                              |
| <b>Rated Power:</b>           | DC 5 V from adapter                                                           |
| <b>Power Cord:</b>            | N/A                                                                           |
| <b>Sample receiving date:</b> | Jul. 23, 2020                                                                 |
| <b>Sample condition:</b>      | Workable                                                                      |
| <b>Test Date(s):</b>          | Aug. 05, 2020                                                                 |

### 1.2 Adapter information

The EUT will be supplied with a power supply from below list:

| No.     | Model no.       | Specification                                        |
|---------|-----------------|------------------------------------------------------|
| Adapter | PG062-0501000UC | I/P: 100-240Vac, 50/60Hz, 0.3A,<br>O/P: 5Vdc, 1000mA |

### 1.3 Antenna description

|                |                |
|----------------|----------------|
| Antenna Gain   | : 2.69 dBi     |
| Antenna Type   | : PIFA antenna |
| Connector Type | : Fixed        |

#### 1.4 Peripherals equipment

| Peripherals | Brand | Model No.      | Serial No. | Data cable                   |
|-------------|-------|----------------|------------|------------------------------|
| Notebook PC | DELL  | Latitude E5420 | HXYJBT1    | USB shielded cable 0.3 meter |

## **2. Test specifications**

### **2.1 Introduction**

The EUT operates in the 2.4 GHz band. Due to the EUT (include antenna) at its normal operation distance is at least 20 cm from the human body, the EUT was defined as a Mobile Device.

The reason to do the MPE Evaluation is to avoid the RF hazard to human body. The maximum output power and gain of the antenna were used to calculate the limited Power density (S) at 20 cm distance away from the product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 and Safety Code 6 are followed.

According to 1.1307 (b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

## 2.2 RF Exposure Limit

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b) and KDB 447498 D01 General RF Exposure Guidance v06.

### SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

| MHz  | 5   | 10  | 15  | 20  | 25  | mm                                      |
|------|-----|-----|-----|-----|-----|-----------------------------------------|
| 150  | 39  | 77  | 116 | 155 | 194 | SAR Test<br>Exclusion<br>Threshold (mW) |
| 300  | 27  | 55  | 82  | 110 | 137 |                                         |
| 450  | 22  | 45  | 67  | 89  | 112 |                                         |
| 835  | 16  | 33  | 49  | 66  | 82  |                                         |
| 900  | 16  | 32  | 47  | 63  | 79  |                                         |
| 1500 | 12  | 24  | 37  | 49  | 61  |                                         |
| 1900 | 11  | 22  | 33  | 44  | 54  |                                         |
| 2450 | 10  | 19  | 29  | 38  | 48  |                                         |
| 3600 | 8   | 16  | 24  | 32  | 40  |                                         |
| 5200 | 7   | 13  | 20  | 26  | 33  |                                         |
| 5400 | 6   | 13  | 19  | 26  | 32  |                                         |
| 5800 | 6   | 12  | 19  | 25  | 31  |                                         |
|      |     |     |     |     |     |                                         |
| MHz  | 30  | 35  | 40  | 45  | 50  | mm                                      |
| 150  | 232 | 271 | 310 | 349 | 387 | SAR Test<br>Exclusion<br>Threshold (mW) |
| 300  | 164 | 192 | 219 | 246 | 274 |                                         |
| 450  | 134 | 157 | 179 | 201 | 224 |                                         |
| 835  | 98  | 115 | 131 | 148 | 164 |                                         |
| 900  | 95  | 111 | 126 | 142 | 158 |                                         |
| 1500 | 73  | 86  | 98  | 110 | 122 |                                         |
| 1900 | 65  | 76  | 87  | 98  | 109 |                                         |
| 2450 | 57  | 67  | 77  | 86  | 96  |                                         |
| 3600 | 47  | 55  | 63  | 71  | 79  |                                         |
| 5200 | 39  | 46  | 53  | 59  | 66  |                                         |
| 5400 | 39  | 45  | 52  | 58  | 65  |                                         |
| 5800 | 37  | 44  | 50  | 56  | 62  |                                         |

**Note:** 10-g Extremity SAR Test Exclusion Power Thresholds are 2.5 times higher than the 1-g SAR Test Exclusion Thresholds indicated above. These thresholds do not apply, by extrapolation or other means, to occupational exposure limits.

## TEST REPORT

### SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and > 50 mm

Approximate SAR test exclusion power thresholds at selected frequencies and test separation distances are illustrated in the following table.

| MHz  | 50  | 60  | 70  | 80  | 90  | 100 | 110 | 120 | 130 | 140  | 150  | 160  | 170  | 180  | 190  | mm |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|----|
| 100  | 474 | 481 | 487 | 494 | 501 | 507 | 514 | 521 | 527 | 534  | 541  | 547  | 554  | 561  | 567  | mW |
| 150  | 387 | 397 | 407 | 417 | 427 | 437 | 447 | 457 | 467 | 477  | 487  | 497  | 507  | 517  | 527  |    |
| 300  | 274 | 294 | 314 | 334 | 354 | 374 | 394 | 414 | 434 | 454  | 474  | 494  | 514  | 534  | 554  |    |
| 450  | 224 | 254 | 284 | 314 | 344 | 374 | 404 | 434 | 464 | 494  | 524  | 554  | 584  | 614  | 644  |    |
| 835  | 164 | 220 | 275 | 331 | 387 | 442 | 498 | 554 | 609 | 665  | 721  | 776  | 832  | 888  | 943  |    |
| 900  | 158 | 218 | 278 | 338 | 398 | 458 | 518 | 578 | 638 | 698  | 758  | 818  | 878  | 938  | 998  |    |
| 1500 | 122 | 222 | 322 | 422 | 522 | 622 | 722 | 822 | 922 | 1022 | 1122 | 1222 | 1322 | 1422 | 1522 |    |
| 1900 | 109 | 209 | 309 | 409 | 509 | 609 | 709 | 809 | 909 | 1009 | 1109 | 1209 | 1309 | 1409 | 1509 |    |
| 2450 | 96  | 196 | 296 | 396 | 496 | 596 | 696 | 796 | 896 | 996  | 1096 | 1196 | 1296 | 1396 | 1496 |    |
| 3600 | 79  | 179 | 279 | 379 | 479 | 579 | 679 | 779 | 879 | 979  | 1079 | 1179 | 1279 | 1379 | 1479 |    |
| 5200 | 66  | 166 | 266 | 366 | 466 | 566 | 666 | 766 | 866 | 966  | 1066 | 1166 | 1266 | 1366 | 1466 |    |
| 5400 | 65  | 165 | 265 | 365 | 465 | 565 | 665 | 765 | 865 | 965  | 1065 | 1165 | 1265 | 1365 | 1465 |    |
| 5800 | 62  | 162 | 262 | 362 | 462 | 562 | 662 | 762 | 862 | 962  | 1062 | 1162 | 1262 | 1362 | 1462 |    |

### SAR Test Exclusion Thresholds for < 100 MHz and < 200 mm

Approximate SAR test exclusion power thresholds at selected frequencies and test separation distances are illustrated in the following table.

| MHz  | < 50 | 50   | 60   | 70   | 80   | 90   | 100  | 110  | 120  | 130  | 140  | 150  | 160  | 170  | 180  | 190  | mm |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----|
| 100  | 237  | 474  | 481  | 487  | 494  | 501  | 507  | 514  | 521  | 527  | 534  | 541  | 547  | 554  | 561  | 567  | mW |
| 50   | 308  | 617  | 625  | 634  | 643  | 651  | 660  | 669  | 677  | 686  | 695  | 703  | 712  | 721  | 729  | 738  |    |
| 10   | 474  | 948  | 961  | 975  | 988  | 1001 | 1015 | 1028 | 1041 | 1055 | 1068 | 1081 | 1095 | 1108 | 1121 | 1135 |    |
| 1    | 711  | 1422 | 1442 | 1462 | 1482 | 1502 | 1522 | 1542 | 1562 | 1582 | 1602 | 1622 | 1642 | 1662 | 1682 | 1702 |    |
| 0.1  | 948  | 1896 | 1923 | 1949 | 1976 | 2003 | 2029 | 2056 | 2083 | 2109 | 2136 | 2163 | 2189 | 2216 | 2243 | 2269 |    |
| 0.05 | 1019 | 2039 | 2067 | 2096 | 2125 | 2153 | 2182 | 2211 | 2239 | 2268 | 2297 | 2325 | 2354 | 2383 | 2411 | 2440 |    |
| 0.01 | 1185 | 2370 | 2403 | 2437 | 2470 | 2503 | 2537 | 2570 | 2603 | 2637 | 2670 | 2703 | 2737 | 2770 | 2803 | 2837 |    |

### 2.3 RF Exposure calculations

From §FCC 1.1310 table 1, the maximum permissible RF exposure for an uncontrolled environment is 1 mW/(cm<sup>2</sup>) (or 10 W/m<sup>2</sup>)\*

Power density (S) is calculated by the following formula:

$$S = (P * G) / 4\pi R^2$$

where, S = Power density (mW/cm<sup>2</sup>)

P = Output power to antenna (mW)

R = Distance between radiating structure and observation point (cm)

G = Gain of antenna in numeric

$\pi = 3.1416$

Example:

Assume a mobile device operates at 2412MHz and its maximum output power is 50mW, and the maximum gain of antenna is 1 (numeric) /0dBi.

then the power density (S) =  $(50 * 1) / 4 * \pi * 20^2 = 0.00995$  (mW/cm<sup>2</sup>) (or = 0.0995 W/m<sup>2</sup>)

### 2.4 Operation mode

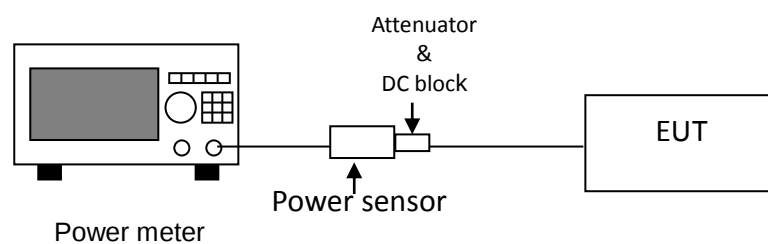
The EUT was supplied with DC 5 V from adapter (Test voltage: 120Vac, 60Hz).

Connected to Notebook via USB cable, executing "RTL11n\_8188EUS" and select different frequency and modulation.

## 2.5 Test equipment

| Equipment    | Brand   | Model No.    | Serial No. | Calibration Date | Next Calibration Date |
|--------------|---------|--------------|------------|------------------|-----------------------|
| Power Meter  | Anritsu | ML2495A      | 0844001    | 2019/10/23       | 2020/10/21            |
| Power Sensor | Anritsu | MA2411B      | 0738452    | 2019/10/23       | 2020/10/21            |
| RF Cable     | SUHNER  | SUCOFLEX 102 | CB0006     | 2020/04/30       | 2021/04/29            |

## 2.6 Test Set-up



### 3. Test results

| Mode           | Channel | Frequency (MHz) | Antenna Gain0 (numeric) | Output power to antenna 0 (dBm) | Output power to antenna 0 (mW) | Tune-up Power Tolerance (dB) | Max Tune-up Power (dBm) | Max Tune-up Power (mW) | Power density (mW/cm <sup>2</sup> ) | Limit of power density (mW/cm <sup>2</sup> ) |
|----------------|---------|-----------------|-------------------------|---------------------------------|--------------------------------|------------------------------|-------------------------|------------------------|-------------------------------------|----------------------------------------------|
| 802.11b        | 1       | 2412            | 1.86                    | 19.10                           | 81.28                          | 2.00                         | 21.10                   | 128.82                 | 0.0300                              | 1.0                                          |
|                | 6       | 2437            | 1.86                    | 19.20                           | 83.18                          | 2.00                         | 21.20                   | 131.83                 | 0.0307                              | 1.0                                          |
|                | 11      | 2462            | 1.86                    | 17.90                           | 61.66                          | 2.00                         | 19.90                   | 97.72                  | 0.0228                              | 1.0                                          |
| 802.11g        | 1       | 2412            | 1.86                    | 20.50                           | 112.20                         | 2.00                         | 22.50                   | 177.83                 | 0.0415                              | 1.0                                          |
|                | 6       | 2437            | 1.86                    | 20.60                           | 114.82                         | 2.00                         | 22.60                   | 181.97                 | 0.0424                              | 1.0                                          |
|                | 11      | 2462            | 1.86                    | 19.30                           | 85.11                          | 2.00                         | 21.30                   | 134.90                 | 0.0315                              | 1.0                                          |
| 802.11n (HT20) | 1       | 2412            | 1.86                    | 20.47                           | 111.43                         | 2.00                         | 22.47                   | 176.60                 | 0.0412                              | 1.0                                          |
|                | 6       | 2437            | 1.86                    | 20.36                           | 108.64                         | 2.00                         | 22.36                   | 172.19                 | 0.0402                              | 1.0                                          |
|                | 11      | 2462            | 1.86                    | 19.10                           | 81.28                          | 2.00                         | 21.10                   | 128.82                 | 0.0300                              | 1.0                                          |
| 802.11n (HT40) | 3       | 2422            | 1.86                    | 20.05                           | 101.16                         | 2.00                         | 22.05                   | 160.32                 | 0.0374                              | 1.0                                          |
|                | 6       | 2437            | 1.86                    | 20.42                           | 110.15                         | 2.00                         | 22.42                   | 174.58                 | 0.0407                              | 1.0                                          |
|                | 9       | 2452            | 1.86                    | 19.50                           | 89.13                          | 2.00                         | 21.50                   | 141.25                 | 0.0329                              | 1.0                                          |

The Notice in Installation Manual has been stated as below:

While installing and operating this transmitter, the radio frequency exposure limit of 1 mW/ (cm<sup>2</sup>) may be exceeded at distances close to the transmitter. Therefore, the user must maintain a minimum distance of 20 cm from the device at all time.