



## FCC 47 CFR MPE REPORT

Shengzhen PICEA Intelligent Technology Co., Ltd

Robot Vacuum

Model Number: HOME-S10U

FCC ID: 2BGN6-SCZN0719

|                          |                                                                     |
|--------------------------|---------------------------------------------------------------------|
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|                 |                              |
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## Maximum Permissible Exposure

### 1. Applicable Standards

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

#### 1.1. Limits for Maximum Permissible Exposure (MPE)

##### (a) Limits for Occupational/Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|------------------------------------------------------------------------|
| 0.3-3.0               | 614                               | 1.63                              | (100)*                                  | 6                                                                      |
| 3.0-30                | 1842/f                            | 4.89/f                            | (900/f)*                                | 6                                                                      |
| 30-300                | 61.4                              | 0.163                             | 1.0                                     | 6                                                                      |
| 300-1500              |                                   |                                   | F/300                                   | 6                                                                      |
| 1500-10000            |                                   |                                   | 5                                       | 6                                                                      |

##### (b) Limits for General Population / Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|------------------------------------------------------------------------|
| 0.3-1.34              | 614                               | 1.63                              | (100)*                                  | 30                                                                     |
| 1.34-30               | 824/f                             | 2.19/f                            | (180/f)*                                | 30                                                                     |
| 30-300                | 27.5                              | 0.073                             | 0.2                                     | 30                                                                     |
| 300-1500              |                                   |                                   | F/1500                                  | 30                                                                     |
| 1500-10000            |                                   |                                   | 1.0                                     | 30                                                                     |

Note: f=frequency in MHz; \*Plane-wave equivalent power density

## 1.2. MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric Field (V/m)

P = Peak RF output Power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

## 2. Conducted Power Result

| Mode              | Frequency (MHz) | Peak output power (dBm) | Peak output power (mW) |
|-------------------|-----------------|-------------------------|------------------------|
| GFSK              | 2402            | 6.56                    | 4.529                  |
|                   | 2441            | 5.68                    | 3.698                  |
|                   | 2480            | 5.08                    | 3.221                  |
| $\pi/4$ -DQPSK    | 2402            | 6.44                    | 4.406                  |
|                   | 2441            | 5.56                    | 3.597                  |
|                   | 2480            | 4.97                    | 3.141                  |
| 8-DPSK            | 2402            | 6.83                    | 4.819                  |
|                   | 2441            | 5.90                    | 3.890                  |
|                   | 2480            | 5.26                    | 3.357                  |
| BLE 1M            | 2402            | 4.35                    | 2.723                  |
|                   | 2440            | 3.46                    | 2.218                  |
|                   | 2480            | 5.01                    | 3.170                  |
| IEEE 802.11b      | 2412            | 16.34                   | 43.053                 |
|                   | 2437            | 15.68                   | 36.983                 |
|                   | 2462            | 15.85                   | 38.459                 |
| IEEE 802.11g      | 2412            | 15.98                   | 39.628                 |
|                   | 2437            | 15.74                   | 37.497                 |
|                   | 2462            | 15.67                   | 36.898                 |
| IEEE 802.11n HT20 | 2412            | 16.00                   | 39.811                 |
|                   | 2437            | 15.67                   | 36.898                 |
|                   | 2462            | 15.68                   | 36.983                 |
| IEEE 802.11n HT40 | 2422            | 16.11                   | 40.832                 |
|                   | 2437            | 15.92                   | 39.084                 |
|                   | 2452            | 16.00                   | 39.811                 |
| IEEE 802.11a      | 5180            | 13.71                   | 23.496                 |
|                   | 5200            | 14.60                   | 28.840                 |
|                   | 5240            | 15.06                   | 32.063                 |
|                   | 5260            | 14.60                   | 28.840                 |
|                   | 5300            | 14.37                   | 27.353                 |
|                   | 5320            | 14.79                   | 30.130                 |
|                   | 5500            | 14.42                   | 27.669                 |
|                   | 5580            | 13.91                   | 24.604                 |
|                   | 5700            | 14.96                   | 31.333                 |
|                   | 5745            | 13.66                   | 23.227                 |
|                   | 5785            | 14.02                   | 25.235                 |

|                     |      |       |        |
|---------------------|------|-------|--------|
|                     | 5825 | 13.89 | 24.491 |
| IEEE 802.11n HT20   | 5180 | 13.15 | 20.654 |
|                     | 5200 | 13.45 | 22.131 |
|                     | 5240 | 14.09 | 25.645 |
|                     | 5260 | 14.09 | 25.645 |
|                     | 5300 | 15.69 | 37.068 |
|                     | 5320 | 15.29 | 33.806 |
|                     | 5500 | 13.14 | 20.606 |
|                     | 5580 | 12.52 | 17.865 |
|                     | 5700 | 14.16 | 26.062 |
|                     | 5745 | 13.66 | 23.227 |
|                     | 5785 | 14.30 | 26.915 |
|                     | 5825 | 14.04 | 25.351 |
| IEEE 802.11ac VHT20 | 5180 | 15.22 | 33.266 |
|                     | 5200 | 15.51 | 35.563 |
|                     | 5240 | 14.19 | 26.242 |
|                     | 5260 | 14.10 | 25.704 |
|                     | 5300 | 13.72 | 23.550 |
|                     | 5320 | 15.25 | 33.497 |
|                     | 5500 | 13.33 | 21.528 |
|                     | 5580 | 12.47 | 17.660 |
|                     | 5700 | 14.27 | 26.730 |
|                     | 5745 | 14.81 | 30.269 |
|                     | 5785 | 15.37 | 34.435 |
|                     | 5825 | 15.72 | 37.325 |
| IEEE 802.11n HT40   | 5190 | 13.96 | 24.889 |
|                     | 5230 | 14.23 | 26.485 |
|                     | 5270 | 14.08 | 25.586 |
|                     | 5310 | 14.05 | 25.410 |
|                     | 5510 | 12.60 | 18.197 |
|                     | 5550 | 12.83 | 19.187 |
|                     | 5670 | 13.46 | 22.182 |
|                     | 5755 | 14.67 | 29.309 |
|                     | 5795 | 14.66 | 29.242 |
| IEEE 802.11ac VHT40 | 5190 | 15.69 | 37.068 |
|                     | 5230 | 14.77 | 29.992 |
|                     | 5270 | 14.24 | 26.546 |
|                     | 5310 | 14.47 | 27.990 |
|                     | 5510 | 13.18 | 20.797 |



|                     |      |       |        |
|---------------------|------|-------|--------|
|                     | 5550 | 12.60 | 18.197 |
|                     | 5670 | 13.41 | 21.928 |
|                     | 5755 | 15.66 | 36.813 |
|                     | 5795 | 15.82 | 38.194 |
| IEEE 802.11ac VHT80 | 5210 | 13.47 | 22.233 |
|                     | 5290 | 15.57 | 36.058 |
|                     | 5530 | 12.95 | 19.724 |

### 3. Calculated Result and Limit

| Mode               | Peak output power (dBm) | Target power (dBm) | MAX Target power (dBm) | Antenna gain |          | Power Density (S) (mW /cm <sup>2</sup> ) | Limited of Power Density (S) (mW /cm <sup>2</sup> ) | Test Result |
|--------------------|-------------------------|--------------------|------------------------|--------------|----------|------------------------------------------|-----------------------------------------------------|-------------|
|                    |                         |                    |                        | (dBi)        | (Linear) |                                          |                                                     |             |
| 2.4G Band          |                         |                    |                        |              |          |                                          |                                                     |             |
| GFSK               | 6.56                    | 6±1                | 7                      | 3.14         | 2.061    | 0.00205                                  | 1                                                   | Complies    |
| π/4-DQPSK          | 6.44                    | 6±1                | 7                      | 3.14         | 2.061    | 0.00205                                  | 1                                                   | Complies    |
| 8-DPSK             | 6.83                    | 6±1                | 7                      | 3.14         | 2.061    | 0.00205                                  | 1                                                   | Complies    |
| BLE 1M             | 5.01                    | 5±1                | 6                      | 3.14         | 2.061    | 0.00163                                  | 1                                                   | Complies    |
| IEEE 802.11b       | 16.34                   | 16±1               | 17                     | 3.14         | 2.061    | 0.02055                                  | 1                                                   | Complies    |
| IEEE 802.11g       | 15.98                   | 15±1               | 16                     | 3.14         | 2.061    | 0.01632                                  | 1                                                   | Complies    |
| IEEE 802.11n HT20  | 16.00                   | 16±1               | 17                     | 3.14         | 2.061    | 0.02055                                  | 1                                                   | Complies    |
| IEEE 802.11n HT40  | 16.11                   | 16±1               | 17                     | 3.14         | 2.061    | 0.02055                                  | 1                                                   | Complies    |
| 5G Band            |                         |                    |                        |              |          |                                          |                                                     |             |
| IEEE 802.11a       | 15.06                   | 15±1               | 16                     | 4.61         | 2.891    | 0.02289                                  | 1                                                   | Complies    |
| IEEE 802.11n HT20  | 15.69                   | 15±1               | 16                     | 4.61         | 2.891    | 0.02289                                  | 1                                                   | Complies    |
| IEEE802.11ac VHT20 | 15.72                   | 15±1               | 16                     | 4.61         | 2.891    | 0.02289                                  | 1                                                   | Complies    |
| IEEE 802.11n HT40  | 14.67                   | 14±1               | 15                     | 4.61         | 2.891    | 0.01819                                  | 1                                                   | Complies    |
| IEEE802.11ac VHT40 | 15.82                   | 15±1               | 16                     | 4.61         | 2.891    | 0.02289                                  | 1                                                   | Complies    |
| IEEE802.11ac VHT80 | 15.57                   | 15±1               | 16                     | 4.61         | 2.891    | 0.02289                                  | 1                                                   | Complies    |

Note: WIFI 2.4G and 5GHz bands are share an antenna, can't both the 2.4G and 5 GHz bands operate simultaneously.

**End of Test Report**