

## RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

FCC ID: 2ARZX-W11

### EUT Specification

| EUT                               | Robot Vacuum Cleaner   |
|-----------------------------------|--|
| <b>Frequency band (Operating)</b> | <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz<br><input type="checkbox"/> WLAN: 5.18GHz ~ 5.24GHz<br><input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz<br><input checked="" type="checkbox"/> Others: 2.402GHz~2.480GHz BLE |
| <b>Device category</b>            | <input type="checkbox"/> Portable (<20cm separation)<br><input checked="" type="checkbox"/> Mobile (>20cm separation)<br><input type="checkbox"/> Others ____  |
| <b>Exposure classification</b>    | <input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> )<br><input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )  |
| <b>Antenna diversity</b>          | <input checked="" type="checkbox"/> Single antenna<br><input type="checkbox"/> Multiple antennas<br><input type="checkbox"/> Tx diversity<br><input type="checkbox"/> Rx diversity<br><input type="checkbox"/> Tx/Rx diversity               |
| <b>Evaluation applied</b>         | <input checked="" type="checkbox"/> MPE Evaluation<br><input type="checkbox"/> SAR Evaluation  |

Limits for Maximum Permissible Exposure(MPE)

| Frequency Range(MHz)                                  | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density(mW/cm <sup>2</sup> ) | Average Time |
|---|------------------------------|------------------------------|------------------------------------|--------------|
| (A) Limits for Occupational/Control Exposures         |                              |                              |                                    |              |
| 300-1500  | --                           | --                           | F/300                              | 6            |
| 1500-100000   | --                           | --                           | 5                                  | 6            |
| (B) Limits for General Population/Uncontrol Exposures |                              |                              |                                    |              |
| 300-1500  | --                           | --                           | F/1500                             | 6            |
| 1500-100000   | --                           | --                           | 1                                  | 30           |

## Friis transmission formula: $P_d = \frac{P_{out} \cdot G}{4 \cdot \pi \cdot R^2}$

Where

$P_d$  = Power density in  $mW/cm^2$

$P_{out}$  = output power to antenna in Mw

$G$  = gain of antenna in linear scale

$\pi = 3.1416$

$R$  = distance between observation point and center of the radiator in cm

$P_d$  the limit of MPE,  $1mW/cm^2$ . If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

## Measurement Result

### BLE worst case:

| Operating Mode | Channel Frequency | Measured Power | Target Power | Tune up tolerance | Max. Tune up Power | Antenna Gain | Power density at 20cm | Power density Limits<br>( $mW/cm^2$ ) |
|----------------|-------------------|----------------|--------------|-------------------|--------------------|--------------|-----------------------|---------------------------------------|
|                | (MHz)             | (dBm)          | (dBm)        | (dBm)             | (dBm)              | (dBi)        | ( $mW/cm^2$ )         |                                       |
| BLE            | 2402              | 4.40           | 5            | $\pm 1$           | 6                  | 5.16         | 0.0026                | 1                                     |

### 2.4GHz WiFi worst case:

| Operating Mode | Channel Frequency | Measured Power | Target Power | Tune up tolerance | Max. Tune up Power | Antenna Gain | Power density at 20cm | Power density Limits<br>( $mW/cm^2$ ) |
|----------------|-------------------|----------------|--------------|-------------------|--------------------|--------------|-----------------------|---------------------------------------|
|                | (MHz)             | (dBm)          | (dBm)        | (dBm)             | (dBm)              | (dBi)        | ( $mW/cm^2$ )         |                                       |
| 802.11n (HT40) | 2452              | 15.54          | 16           | $\pm 1$           | 17                 | 5.16         | 0.0327                | 1                                     |

Note:

1. BLE and 2.4G WiFi cannot support simultaneous transmission.

**Test Result: Pass**