# 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: 2ANPBGWSN-W02W

## EUT Specification

| EUT | Renogy ONE Core |
|---|---|
| **Frequency band (Operating)** | ☒ WLAN: 2.412GHz ~ 2.462GHz<br>☐ WLAN: 5.18GHz ~ 5.24GHz<br>☐ WLAN: 5.745GHz ~ 5.825GHz<br>☒ Others: BLE: 2402-2480MHz<br>Zigbee: 2405~2480MHz |
| **Device category** | ☐ Portable (<20cm separation)<br>☒ Mobile (>20cm separation)<br>☐ Others ___ |
| **Exposure classification** | ☐ Occupational/Controlled exposure<br>☒ General Population/Uncontrolled exposure |
| **Antenna diversity** | ☐ Single antenna<br>☒ Multiple antennas<br>☐ Tx diversity<br>☐ Rx diversity<br>☐ Tx/Rx diversity |
| **Antenna gain (Max)** | BLE (Module RTL8762): -5.08 dBi<br>BLE (Module RTL8723): 0.57 dBi<br>WiFi 2.4G: 0.57 dBi<br>Zigbee: 1.71 dBi |
| **Evaluation applied** | ☒ MPE Evaluation<br>☐ SAR Evaluation |

Limits for Maximum Permissible Exposure(MPE)

| Frequency Range(MHz) | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density($mW/cm^2$) | 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** | **30** |
| **1500-100000** | **--** | **--** | **1** | **30** |

## Friis transmission formula: Pd=(Pout*G)\(4*pi*R2)

Where
Pd= Power density in mW/cm$^2$
Pout=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
Pd the limit of MPE. 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.

## Max Measurement Result

| Operating Mode | Measured Power | Tune up tolerance | Max. Tune up Power | Antenna Gain | Power density at 20cm | Power density Limits (mW/cm$^2$ ) |
|---|---|---|---|---|---|---|
| | (dBm) | (dBm) | (dBm) | (dBi) | (mW/ cm$^2$ ) | |
| BLE (Module RTL8762) | -0.66 | -0.66 ±1 | 0.34 | -5.08 | 0.0001 | 1 |
| BLE (Module RTL8723) | 1.20 | 1.20 ±1 | 2.20 | 0.57 | 0.0004 | 1 |
| WiFi 2.4G | 18.54 | 18.54 ±1 | 19.54 | 0.57 | 0.0204 | 1 |
| Zigbee | 4.10 | 4.10 ±1 | 5.10 | 1.71 | 0.0010 | 1 |

### The BLE (Module RTL8762) and BLE (Module RTL8723) can transmit simultaneously:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

=$S_{BLE\ (Module\ RTL8762)}/S_{limit\text{-}BLE\ (Module\ RTL8762)}$+ $S_{BLE\ (Module\ RTL8723)}/S_{limit\text{-}BLE\ (Module\ RTL8723)}$
=0.0001/1+0.0004/1
=0.0005
< 1.0

### The BLE (Module RTL8762) and WiFi 2.4G can transmit simultaneously:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

=$S_{BLE\ (Module\ RTL8762)}/S_{limit\text{-}BLE\ (Module\ RTL8762)}$+ $S_{WiFi\ 2.4G}/S_{limit\text{-}WiFi\ 2.4G}$
=0.0001/1+0.0204/1
=0.0205
< 1.0

**The BLE (Module RTL8762) and Zigbee can transmit simultaneously:**

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$=SS_{BLE\ (Module\ RTL8762)}/S_{limit\text{-}BLE\ (Module\ RTL8762)}+ S_{Zigbee}/S_{limit\text{-}Zigbee}$

=0.0001/1+0.0010/1

=0.0011

< 1.0

**The BLE (Module RTL8723) and Zigbee can transmit simultaneously:**

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$=S_{BLE\ (Module\ RTL8723)}/S_{limit\text{-}BLE\ (Module\ RTL8723)}+ S_{Zigbee}/S_{limit\text{-}Zigbee}$

=0.0004/1+0.0010/1

=0.0014

< 1.0

**The WiFi 2.4G and Zigbee can transmit simultaneously:**

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$=S_{WiFi\ 2.4G}/S_{limit\text{-}WiFi\ 2.4G}+ S_{Zigbee}/S_{limit\text{-}Zigbee}$

=0.0204/1+0.0010/1

=0.0214

< 1.0

**Result:** No Standalone SAR test is required.