

## RF EXPOSURE EVALUATION

### EUT Specification

|                                   |                                                                                                                                                                                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EUT</b>                        | WiFi Video Doorbell                                                                                                                                                                                                                                 |
| <b>Frequency band (Operating)</b> | <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz<br><input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz<br><input type="checkbox"/> WLAN: 5.745GHz ~ 5825GHz<br><input checked="" type="checkbox"/> Others(433.92MHz) |
| <b>Device category</b>            | <input type="checkbox"/> Portable (<20cm separation)<br><input checked="" type="checkbox"/> Mobile (>20cm separation)<br><input type="checkbox"/> Others ____                                                                                       |
| <b>Antenna diversity</b>          | <input type="checkbox"/> Single antenna<br><input checked="" type="checkbox"/> Multiple antennas<br><input type="checkbox"/> Tx diversity<br><input type="checkbox"/> Rx diversity<br><input type="checkbox"/> Tx/Rx diversity                      |
| <b>Max. output power</b>          | 18.80dBm(75.86mW) for WIFI<br><b>75.95dBuV/m</b><br>-19.31dBm(0.0117mW) for 433.92MHz                                                                                                                                                               |
| <b>Antenna gain</b>               | For WIFI: 2.5dBi;<br>For 433.92MHz: -15dBi                                                                                                                                                                                                          |
| <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 |
|--------------------------------------------------------------|------------------------------|------------------------------|------------------------------------|--------------|
| <b>(A) Limits for Occupational/Control Exposures</b>         |                              |                              |                                    |              |
| 300-1500                                                     | --                           | --                           | F/300                              | 6            |
| 1500-100000                                                  | --                           | --                           | 5                                  | 6            |
| <b>(B) Limits for General Population/Uncontrol Exposures</b> |                              |                              |                                    |              |
| 300-1500                                                     | --                           | --                           | F/1500                             | 6            |
| 1500-100000                                                  | --                           | --                           | 1                                  | 30           |

## Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

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

For WIFI

| Channel      | Channel Frequency (MHz) | Max Output power (dBm) | Tolerance | Max Tune-UP power (mW) | Power density at 20cm ( $mW/cm^2$ ) | Power density Limits ( $mW/cm^2$ ) |
|--------------|-------------------------|------------------------|-----------|------------------------|-------------------------------------|------------------------------------|
| 802.11b      |                         |                        |           |                        |                                     |                                    |
| Low          | 2412                    | 12.20                  | $\pm 0.5$ | 18.62                  | 0.0066                              | 1                                  |
| Middle       | 2437                    | 14.47                  | $\pm 0.5$ | 31.41                  | 0.0111                              | 1                                  |
| High         | 2462                    | 14.61                  | $\pm 0.5$ | 32.43                  | 0.0115                              | 1                                  |
| 802.11g      |                         |                        |           |                        |                                     |                                    |
| Low          | 2412                    | 15.59                  | $\pm 0.5$ | 102.09                 | 0.0361                              | 1                                  |
| Middle       | 2437                    | 18.07                  | $\pm 0.5$ | 71.94                  | 0.0255                              | 1                                  |
| High         | 2462                    | 18.23                  | $\pm 0.5$ | 74.64                  | 0.0264                              | 1                                  |
| 802.11n HT20 |                         |                        |           |                        |                                     |                                    |
| Low          | 2412                    | 15.65                  | $\pm 0.5$ | 41.21                  | 0.0146                              | 1                                  |
| Middle       | 2437                    | 17.94                  | $\pm 0.5$ | 69.82                  | 0.0247                              | 1                                  |
| High         | 2462                    | 18.04                  | $\pm 0.5$ | 71.45                  | 0.0253                              | 1                                  |
| 802.11n HT40 |                         |                        |           |                        |                                     |                                    |
| Low          | 2422                    | 18.80                  | $\pm 0.5$ | 85.11                  | 0.0301                              | 1                                  |
| Middle       | 2437                    | 17.38                  | $\pm 0.5$ | 61.38                  | 0.0217                              | 1                                  |
| High         | 2452                    | 14.15                  | $\pm 0.5$ | 29.17                  | 0.0103                              | 1                                  |

For 433.92MHz

| Channel Frequency (MHz) | Max Output power (dBm) | Tolerance | Max Tune-UP power (mW) | Power density at 20cm (mW/cm <sup>2</sup> ) | Power density Limits (mW/cm <sup>2</sup> ) |
|-------------------------|------------------------|-----------|------------------------|---------------------------------------------|--------------------------------------------|
| 433.92                  | -19.31                 | ±0.5      | 0.01315                | 8.27e-8                                     | 1                                          |

$$E = \text{EIRP} - 20\log D + 104.8$$

where:

E = electric field strength in dB $\mu$ V/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

$$\text{EIRP} = E - 104.8 + 20\log D = 75.95 - 104.8 + 20\log 3 = -19.31 \text{ dBm}$$