# RF EXPOSURE EVALUATION

## EUT Specification

| | |
|---|---|
| **EUT** | 10.1” IN-CAR SEATBACK MONITOR |
| **Frequency band (Operating)** | ☒WLAN: 2.412GHz ~ 2.462GHz for 802.11b/g/n(HT20)<br>☐WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz<br>☐WLAN: 5.745GHz ~ 5825GHz<br>☒Others(FM: 88.1~107.9MHz) |
| **Device category** | ☐Portable (<20cm separation)<br>☒Mobile (>20cm separation)<br>☐Others ___ |
| **Antenna diversity** | ☐Single antenna<br>☒Multiple antennas<br>☐Tx diversity<br>☐Rx diversity<br>☐Tx/Rx diversity |
| **Max. output power** | For WIFI: 15.02 dBm (31.77mW)<br>For FM: 49.58dBuV/m (-45.68dBm/ 2.70e-5 mW) |
| **Antenna gain** | For WIFI: 0dBi;<br>For FM: 1.0dBi |
| **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** | **6** |
| **1500-100000** | **--** | **--** | **1** | **30** |

## Friis transmission formula: Pd=(Pout*G)\(4*pi*$R^2$)

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, 1mW/cm2. 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 Mode

| Channel | Gain | 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 | 0 | 2412 | 15.02 | ±0.5 | 35.65 | 0.0071 | 1 |
| Middle | 0 | 2437 | 14.69 | ±0.5 | 33.04 | 0.0066 | 1 |
| High | 0 | 2462 | 14.66 | ±0.5 | 32.81 | 0.0065 | 1 |
| 802.11g | | | | | | | |
| Low | 0 | 2412 | 14.47 | ±0.5 | 31.41 | 0.0062 | 1 |
| Middle | 0 | 2437 | 14.34 | ±0.5 | 30.48 | 0.0061 | 1 |
| High | 0 | 2462 | 14.70 | ±0.5 | 33.88 | 0.0067 | 1 |
| 802.11n HT20 | | | | | | | |
| Low | 0 | 2412 | 14.59 | ±0.5 | 32.28 | 0.0064 | 1 |
| Middle | 0 | 2437 | 14.52 | ±0.5 | 31.77 | 0.0063 | 1 |
| High | 0 | 2462 | 14.90 | ±0.5 | 34.67 | 0.0069 | 1 |

## For FM mode

| Channel Frequency (MHz) | Max Output power (dBuV/m) | Max Output power (dBm) | Tolerance | Max Tune-UP power (mW) | Power density at 20cm (mW/ $cm^2$ ) | Power density Limits (mW/$cm^2$ ) |
|---|---|---|---|---|---|---|
| 88.1 | 37.68 | -57.58 | ±0.5 | 1.96e-6 | 4.91e-10 | 1.0 |
| 97.9 | 49.58 | -45.68 | ±0.5 | 3.03e-5 | 7.60e-9 | 1.0 |
| 107.9 | 45.72 | -49.54 | ±0.5 | 1.25e-5 | 3.12e-9 | 1.0 |

$$E = EIRP - 20\log D + 104.8$$

where:

E = electric field strength in dBμV/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

EIRP=E-104.9+20logD=49.58-104.8+20log3= **-45.68** dBm

The EUT can not support the FM and WIFI at the same time.

The SAR measurement is not necessary.