

RF Exposure Evaluation

Limit

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 1.1310 & 2.1091

Table 1-Limits for Maximum Permissible Exposure (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm ²) | Averaging time (minutes) |
|---|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| (A) Limits for Occupational/Controlled Exposures | | | | |
| 0.3–3.0 | 614 | 1.63 | *(100) | 6 |
| 3.0–30 | 1842/f | 4.89/f | *(900/f ²) | 6 |
| 30–300 | 61.4 | 0.163 | 1.0 | 6 |
| 300–1500 | - | - | f/300 | 6 |
| 1500–100,000 | - | - | 5 | 6 |
| (B) Limits for General Population/Uncontrolled Exposure | | | | |
| 0.3–1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34–30 | 824/f | 2.19/f | *(180/f ²) | 30 |
| 30–300 | 27.5 | 0.073 | 0.2 | 30 |
| 300–1500 | - | - | f/1500 | 30 |
| 1500–100,000 | - | - | 1.0 | 30 |

Note: f = frequency in MHz

Evaluation Method

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

Where

P_d = power density in mW/cm², P_{out} = output power to antenna in mW, G = gain of antenna in linear scale;

$P_i = 3.1416$, R = distance between observation point and center of the radiator in cm

Conducted Power Results

WIFI

| Mode | Channel | Frequency (MHz) | Conducted Peak Output Power (dBm) |
|---------------|---------|-----------------|-----------------------------------|
| 802.11b | 1 | 2412 | 15.78 |
| | 6 | 2437 | 16.63 |
| | 11 | 2462 | 16.69 |
| 802.11g | 1 | 2412 | 15.59 |
| | 6 | 2437 | 16.02 |
| | 11 | 2462 | 16.35 |
| 802.11n(HT20) | 1 | 2412 | 15.44 |
| | 6 | 2437 | 16.22 |
| | 11 | 2462 | 16.17 |

Manufacturing tolerance

WIFI

| 802.11b | | | |
|------------------|-----------|-----------|------------|
| Channel | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm) | 16 | 16 | 16 |
| Tolerance ±(dB) | 1 | 1 | 1 |
| 802.11g | | | |
| Channel | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm) | 16 | 16 | 16 |
| Tolerance ±(dB) | 1 | 1 | 1 |
| 802.11n20 | | | |
| Channel | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm) | 16 | 16 | 16 |
| Tolerance ±(dB) | 1 | 1 | 1 |

Evaluation Results

WIFI

| Band/Mode | Antenna Distance (cm) | EIRP | | Gain of antenna in linear scale | Power Density (mW/cm ²) | Limit (mW/cm ²) | Result |
|-----------|-----------------------|------|-------|---------------------------------|-------------------------------------|-----------------------------|--------|
| | | dBm | mW | | | | |
| 802.11b | 20 | 17 | 50.12 | 1.78 | 0.018 | 1.0 | Pass |
| 802.11g | 20 | 17 | 50.12 | 1.78 | 0.018 | 1.0 | Pass |
| 802.11n20 | 20 | 17 | 50.12 | 1.78 | 0.018 | 1.0 | Pass |

Remark:

1. Output power including tune up tolerance;
2. The maximum antenna gain is 2.5dBi
3. The exposure safety distance is 20cm.
4. $EIRP = \text{Conducted Peak Output Power} + \text{Tolerance}$

Conclusion

The measurement results comply with the FCC Limit per 47 CFR 1.1310 & 2.1091 for the uncontrolled RF Exposure and MPE compliance per KDB 447498 v06.