

Calculation: **RF-Exposure for radio module**

Type identification: EWLAN1
FCC ID: U99EWLAN1

Subject of Investigation

According the 47CFR §2.1091 the EWLAN1 module from Hirschmann Automation and Control GmbH (FCC ID: U99EWLAN1) has been defined as a device mounted in such a way, that a separation distance of at least 50 cm is normally maintained between the device and the user. The human exposure to RF emissions from such devices could be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and / or power density. The limits for Occupational / Controlled Exposure are given in Table 1, the limits for General Population / Uncontrolled Exposure are given in Table 2.

Frequency Range [MHz]	Electric Field Strength (E) [V/m]	Magnetic Field Strength (H) [A/m]	Power Density (S) [mW/cm ²]	Averaging Time E ² , H ² or S [min]
0.3 – 3.0	614	1.63	(100)*	6
3.0 – 30	1842/f	4.89/f	(900/f)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500			f/300	
1500 – 100,000			5	

Table 1: Limits for Occupational / Controlled Exposure.

Frequency Range [MHz]	Electric Field Strength (E) [V/m]	Magnetic Field Strength (H) [A/m]	Power Density (S) [mW/cm ²]	Averaging Time E ² , H ² or S [min]
0.3 – 1.34	614	1.63	(100)*	30
1.34 – 30	824/f	2.19/f	(180/f)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500			f/1500	30
1500 – 100,000			1.0	

Table 2: Limits for General Population / Uncontrolled Exposure.

Note: f = frequency in MHz; * Plane – wave equivalent power density

MPE evaluation

In accordance to the **CFR Part 47, §2.1091**

S: Limit for power density according to CFR Part 47, §1.1310:

1 mW/cm²

e.i.r.p. (4.9 GHz): 457.088 mW* (Average, including the maximum of 9 dBi antenna gain and 0.5 dB tune up range)

D (4.9 GHz): Duty cycle: 100 % = 1

R: Distance in what the limit of S has to be reached: 0.5 m

$$4.9 \text{ GHz: } S = \frac{e.i.r.p.*D}{4\pi \cdot R^2} \rightarrow S = \frac{457.088 \text{ mW} \cdot 1}{4\pi \cdot (50 \text{ cm})^2} = 0.0146 \frac{\text{mW}}{\text{cm}^2}$$

The value for the “General population / Uncontrolled Exposure” of the power density is below the limit of CFR Part 47, §1.1310.

Limits and calculated results

The results for EWLAN1 are given in Table 3 and based on the power measurements shown in Phoenix Testlab Reports F191416E1.

Band	CH	f [MHz]	d [cm]	EIRP* [dBm]	EIRP* [mW]	Power Density [mW/cm ²]	Limit of Power Density [mW/cm ²]	Evaluation Result
4.9 GHz	23	4965	50	26.6	457.088	0.0146	1.0	Complies

Table 3: Calculated results for the EWLAN1 compared to the limit for uncontrolled exposure.

*The EIRP value includes 0.5 dB tune-up margin as declared by the applicant.

The EWLAN1 from Hirschmann Automation and Control GmbH (FCC ID: U99EWLAN1) is in compliance with the maximum permissible exposure (MPE) limits for the Power Density given by the FCC 47CFR §1.1310 (4)(e) Table 1.