

## Calculation: RF-Exposure for 2.4 GHz WLAN transmitter

Type identification: EK037  
FCC ID: 2ACUWEK037

### Subject of Investigation

According the 47CFR §2.1091 the EK037 from Miele & Cie. KG (FCC ID: 2ACUWEK037) has been defined as a mobile device, used in such a way that a separation distance of at least 20 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 <sup>2</sup> ] | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> 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 <sup>2</sup> ] | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> 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:

$$1 \text{ mW/cm}^2$$

P: 89.1 mW (averaged over 30 min)

G: 2 dBi = 3

D: Duty cycle: 100 % = 1

R: Distance in what the limit of S has to be reached: 0.2 m

$$S = \frac{P \cdot G \cdot D}{4 \cdot \pi \cdot R^2} \Rightarrow \underline{\underline{S}} = \frac{89.1 \text{ mW} \cdot 3 \cdot 1}{4 \cdot \pi \cdot (20 \text{ cm})^2} = \underline{\underline{0.053 \frac{\text{mW}}{\text{cm}^2}}}$$

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 EK037 are given in Table 3 and based on the power measurements shown in Phoenix Testlab Report F150729E2

| Band    | CH | f [MHz] | d [cm] | EIRP [dBm] | EIRP [mW] | Power Density [mW/cm <sup>2</sup> ] | Limit of Power Density [mW/cm <sup>2</sup> ] | Evaluation Result |
|---------|----|---------|--------|------------|-----------|-------------------------------------|--|-------------------|
| 2.4 GHz | 6  | 2437    | 20     | 21.5       | 141.3     | 0.053                               | 1.0  | Complies          |

Table 3: Calculated results for the EK037 compared to the limit for uncontrolled exposure.

**The EK037 from Miele & Cie. KG (FCC ID: 2ACUWEK037) 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.**