



Environmental evaluation and exposure limit according to FCC CFR 47part 1, §1.1307, §1.1310

The CU series gateway operating at 434.05 MHz that is a far field region and includes Cellular module approval under FCC ID: RI7LE910CXWWX.

The CU series gateway is classified as a mobile device.

434.05 MHz radio and the Cellular can work together.

Power calculation for Far-Field region at 434.05 MHz

<i>F, MHz</i>	<i>d, m</i>	<i>λ, m</i>	<i>E, dBμV/m</i>	<i>E, V/m</i>	Near-field formula		Far-field Formula*	
					<i>P, W</i>	<i>P, mW</i>	<i>P, W</i>	<i>P, mW</i>
434.05	3	0.669116	82.86	0.0139	0.000058	0.057959	0.000058	0.057959

* Far-Field Region:

Power estimate via the far-field was described by the following equation:

$$P = 4\pi r^2 \frac{E^2}{Z_0}, \text{ where } Z = 120\pi$$

Where:

Z_0 = free impedance in Far-Field region = 377Ω

Maximum source-based time average power (dBm) given in FCC ID: R17LE910CXWWX module grant is: 27.5 dBm that is equivalent to 562.341 mW in band 2 with antenna gain of 1.531 dBi

The maximum equivalent isotropic radiated power EIRP for band 2:

$$PT = 800.018\text{mW}$$

Additional calculation was performed to find the separation distance for complying with the applicable RF exposure limit when both of transmitter work together.

Assessment of RF hazard from 434.05 MHz radio transmitter and LTE module:

The power density P (W/m^2) = $PT / 4 \pi r^2$, where

PT is the maximum equivalent isotropically radiated power (EIRP) of 434.05 MHz radio and LTE module, for worst case when all of them transmitter together, measured value is 800.76 mW.

Limit for power density is:
f/1500= 0.56mW/cm² for band 2 (824-849 MHz) for general population/uncontrolled exposure.

Limit for power density is:
f/1500= 0.29mW/cm² for 434.05 MHz for general population/uncontrolled exposure.

The worst case power density limit is 0.29mW/cm²

The minimum separation distance at which complying with the applicable RF exposure limit, the following calculation was made:

$$\begin{aligned} 800.76 \text{ mW} / 4 \pi (x \text{ cm})^2 &\leq 0.29 \text{ mW/cm}^2 \\ 800.76 \text{ mW} / 12.56(x \text{ cm})^2 &\leq 0.29 \text{ mW/cm}^2 \\ (x \text{ cm})^2 &\geq 800.76 \text{ mW} / 12.56 / 0.29 \text{ mW/cm}^2 \\ (x \text{ cm})^2 &\geq 219.84 \text{ cm}^2 \\ x &\geq 14.83 \text{ cm} \end{aligned}$$

Based on the above the product can be considered complying with the RF exposure limitations.

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