

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

The Smart grid sensor is classified as a fixed device. The Smart grid sensor includes transmitter operating according to FCC part 15 subpart C section 15.247 (FHSS) and Cellular module approval under FCC ID: 2AJYU-8PYA008.

915MHz radio and the Cellular can work together.

Limit for power density for general population/uncontrolled exposure is $f/1500$ mW/cm² for 300 – 1500 MHz frequency range:

$$P = 915/1500 = 0.61 \text{ mW/cm}^2$$

The power density **P (mW/cm²)** = $P_T / 4\pi r^2$, where

PT is the transmitted power, which is equal to the peak transmitter output power 15.09 dBm plus maximum antenna gain 0.5dBi, the maximum equivalent isotropically radiated power EIRP is

$$PT = 15.09\text{dBm} + 0.5\text{dBi} = 15.59\text{dBm} = 36.22\text{mW}$$

15.09 dBm is the EUT maximum output power with the tune up tolerance,
0.5 dBi – antenna gain.

Maximum ERP given in FCC ID: 2AJYU-8PYA008 module grant is:

1412.5mW (or 2316.5mW EIRP) in band 2, 851mW (or 1395.64mW EIRP) in band 4,
1238.8mW (or 2031.63mW EIRP) in band 5, 861mw (or 1412.04mW EIRP) in band 12,
673mW (or 1103.72mW EIRP) in band 13, 930mW (or 1525.2mW EIRP) in band 26
and maximum EIRP is 599.8mW in band 66 and 1140.2mW in band 41.

Limit for power density is:

$f/1500 = 0.56\text{mW/cm}^2$ for band 5 (824-849 MHz), 0.47mW/cm^2 for band 12 (699-716 MHz),
 0.52mW/cm^2 for band 13 (777-787 MHz), 0.56mW/cm^2 for band 26 (814-849 MHz)
and 1mW/cm^2 for 1500 -100000 MHz for general population/uncontrolled exposure for bands 41, 4, 66 and 2.

The maximum equivalent isotropic radiated power EIRP is for band 5:

$$PT = 2031.63\text{mW}$$

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

Assessment of RF hazard from 915MHz radio transmitter and LTE module:

The power density $P \text{ (W/m}^2\text{)} = P_T / 4 \pi r^2$, where

P_T is the maximum equivalent isotropically radiated power (EIRP) of 915MHz radio and LTE module, for worst case when all of them transmitter together, measured value is 2067.85 mW.

According to customer request the minimum separation distance at which complying with the applicable RF exposure limit, the following calculation was made:

$$2067.85 \text{ mW} / 4 \pi (x \text{ cm})^2 \leq 0.56 \text{ mW/cm}^2$$

$$2067.85 \text{ mW} / 12.56(x \text{ cm})^2 \leq 0.56 \text{ mW/cm}^2$$

$$(x \text{ cm})^2 \geq 2067.85 \text{ mW} / 12.56 / 0.56 \text{ mW/cm}^2$$

$$(x \text{ cm})^2 \geq 293.99 \text{ cm}^2$$

$$x \geq 17.14 \text{ cm}$$

$$x \geq 17.2 \text{ cm}^*$$

***A warning about a safe distance provided in the user guide.**

Power Density calculations at minimum admissible separation distance

Band	Frequency (MHz)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 17.2cm (W/m ²)	Limit (W/m ²)	Verdict
902 – 928 MHz	915	15.59	36.22	0.0097	0.61	Pass
824-849 MHz	849	33.08	2031.63	0.5464	0.56	Pass

Assessment of RF hazard from 915MHz radio and LTE wireless module

$$S1/\text{limit} + S2/\text{limit} \leq 1, \text{ i.e}$$

$$0.0097/0.61 + 0.5464/0.56 = 0.0159 + 0.9757 = 0.9916 \leq 1$$

The aggregate ratio of transmit power to the relevant power limits does not exceed 100% and meets the safety requirements.