

RF Exposure information

The Control Panel, model M25LTE-9 are classified as a mobile device. The Control Panel includes transmitter operating according to FCC part 15 subpart C section 15.247 (FHSS) and WiFi / BT module approval under FCC ID: 2AC7Z-ESPWROOM32UE and LTE module approval under FCC ID: XMR202205EC200UUAU.

Wi-Fi and the SRD work together.

BT/BLE are not in use with this application

LTE and the SRD work together.

LTE and Wi-Fi cannot work together.

Calculation for variant when Wi-Fi and the SRD work together:

The FCC limit for power density for general population/uncontrolled exposure is $f/1500 \text{ mW/cm}^2$ for 300 – 1500 MHz frequency range:

$$P = 918.5/1500 = 0.612 \text{ mW/cm}^2$$

Limit for power density for general population/uncontrolled exposure is 1 mW/cm^2 for 1500 -100000 MHz frequency range.

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

The power density **$P \text{ (mW/cm}^2\text{)} = P_T / 4\pi r^2$**

P_T is the transmitted power, which is equal to the peak transmitter output power 18.81 dBm plus maximum antenna gain 0 dBi, the maximum equivalent isotropically radiated power EIRP is

$$P_T = 18.81 \text{ dBm} + 0 \text{ dBi} = 18.81 \text{ dBm} = 76.03 \text{ mW}.$$

The power density at 20 cm (minimum safe distance, required for mobile devices), calculated as follows:

$$\text{Compliance with FCC limit: } 76.03 \text{ mW} / 4\pi (20 \text{ cm})^2 = 0.015 \text{ mW/cm}^2 \ll 0.612 \text{ mW/cm}^2$$

Maximum Wi-Fi conducted power given in FCC ID: 2AC7Z-ESP32WROOM32UE module grant is 261mW (24.17dBm).

The maximum equivalent isotropic radiated power EIRP is:

$$P_T = 24.17\text{dBm} + 4\text{dBi} = 28.17 \text{ dBm} = 656.14\text{mW}$$

The power density at 20 cm (minimum safe distance, required for mobile devices), calculated as follows:

$$656.14\text{mW} / 4\pi (20 \text{ cm})^2 = 0.13\text{mW/cm}^2 \ll 1\text{mW/cm}^2$$

Assessment of RF hazard from SRD and WiFi wireless module

$$S1/limit + S2/limit \leq 1, \text{ i.e.} \\ 0.015/0.612 + 0.13/1 = 0.024 + 0.13 = 0.155 \leq 1$$

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

Calculation for variant when LTE and the SRD work together:

The FCC limit for power density for general population/uncontrolled exposure is f/1500 mW/cm² for 300 – 1500 MHz frequency range:

$$P = 918.5/1500 = 0.612 \text{ mW/cm}^2$$

Limit for power density for general population/uncontrolled exposure is 1 mW/cm² for 1500 -100000 MHz frequency range.

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

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

P_T is the transmitted power, which is equal to the peak transmitter output power 18.81 dBm plus maximum antenna gain 0 dBi, the maximum equivalent isotropically radiated power EIRP is

$$P_T = 18.81 \text{ dBm} + 0 \text{ dBi} = 18.81 \text{ dBm} = 76.03 \text{ mW}.$$

The power density at 20 cm (minimum safe distance, required for mobile devices), calculated as follows:

$$\text{Compliance with FCC limit: } 76.03 \text{ mW} / 4\pi (20 \text{ cm})^2 = 0.015 \text{ mW/cm}^2 \ll 0.612 \text{ mW/cm}^2$$

Maximum LTE conducted power, isotropic radiated power EIRP and power density at 20 cm given in FCC ID: XMR202205EC200UAU indicated in the below table:

Test Mode*	Frequency Band (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Power Density at 20 cm(mW/cm ²)	Limit (mW/cm ²)
LTE B2	1850-1910	25.0	1.59	26.59	0.0907	1.0
LTE B4	1710-1755	25.0	2.00	27.00	0.0997	1.0
LTE B5	824-849	25.0	2.53	27.53	0.068	0.55
LTE B7	2500-2570	25.0	3.00	28.00	0.125	1.0
LTE B38	2570-2620	25.0	2.30	27.30	0.106	1.0
LTE B41	2469-2690	25.0	3.00	28.00	0.125	1.0
LTE B66	1710-1780	25.0	2.00	27.00	0.099	1.0

*The used band declared by the customer. Only one frequency band is always in use.



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Assessment of RF hazard from SRD and LTE wireless module

$$S1/\text{limit} + S2/\text{limit} \leq 1, \text{ i.e.} \\ 0.015/0.612 + 0.125/1 = 0.024 + 0.125 = 0.149 \leq 1$$

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