RF exposure limit according to FCC CFR 47part 1, §1.1307, §1.1310

The calculation was done for power density at 20 cm distance for GSM and 315 MHz transmitters operating simultaneously, no limit exists for 125-128 kHz transmitter.
Simultaneous transmission by GSM module in 824.2 –848.8 MHz and 1850.2 – 1909.8 MHz is not possible. The maximum output power of GSM module (in 824.2 –848.8 MHz) was taken for calculation.

Limit for power density for general population/uncontrolled exposure is $f/1500$ mW/cm^2 for 300 – 1500 MHz frequency range.

The following must be true:

Power density 1(P_1)/Limit$_1$ + Power density 2/Limit$_2$ < 1.

<u>1) Operating frequency range 824.2 –848.8 MHz.</u>

$$\text{Limit}_1 = 849/1500 = 0.566 \text{ mW/cm}^2$$

The power density **P (mW/cm^2) = P_T / $4\pi\,r^2$**, where
P_T is the maximum equivalent isotropically radiated power. The ERP of 25.62 dBm corresponds to the equivalent isotropically radiated power EIRP of 27.8 dBm.

$$P_T = 27.8 \text{ dBm} = 603 \text{ mW.}$$

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

$$P_1 = 603 \text{ mW} / 4\pi \,(20 \text{ cm})^2 = 0.12 \text{ mW/cm}^2$$

<u>2) Operating frequency range 315 MHz.</u>

$$\text{Limit}_2 = 300/1500 = 0.2 \text{ mW/cm}^2$$

The 315 MHz transmitter EIRP is 0.015 mW.
$$P_2 = 0.015 \text{ mW} / 4\pi \,(20 \text{ cm})^2 = 3 \times 10^{-6}$$

$$P_1/\text{Limit}_1 + P_2/\text{Limit}_2 = 0.12 / 0.566 + 1.5 \times 10^{-5} = 0.21 < 1.$$

Note: P_1/Limit$_1$ for 1850.2 – 1909.8 MHz is equal to 0.11 mW/cm^2 / 1 mW/cm^2= 0.11, less than 0.21.
The peak transmitter output power 27.5 dBm plus maximum antenna gain 0 dBi, the maximum equivalent isotropically radiated power EIRP is
$$P_T = 27.5 \text{ Bm} = 562 \text{ mW.}$$
The power density P at 20 cm
$$P = 562 \text{ mW} / 4\pi \,(20 \text{ cm})^2 = 0.11 \text{ mW/cm}^2 \,.$$