

FCC §15.247 (I) & §1.1307 (B) (3) & §2.1091- RF EXPOSURE

Applicable Standard

According to FCC §2.1091 and §1.1307(b) (3), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D04 Interim General RF Exposure Guidance

SAR-Based Exemption:

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum timeaveraged power or maximum time-averaged ERP, whichever is greater.

Per § 1.1307(b)(3)(i)(B), for single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{\text{Evaluated}_k}{\text{Exposure Limit}_k} \leq 1$$

Result

| Mode | Frequency (MHz) | Antenna Gain | | Tune up conducted power | | ERP | | Evaluation Distance (m) | Pth (mW) |
|----------|-----------------|--------------|-------|-------------------------|--------|-------|--------|-------------------------|----------|
| | | (dBi) | (dBd) | (dBm) | (mW) | (dBm) | (mW) | | |
| Wi-Fi | 2412-2462 | 2.20 | 0.05 | 17.5 | 56.23 | 17.55 | 56.89 | 0.2 | 3060 |
| WCDMA B2 | 1850-1910 | 1.59 | -0.56 | 25 | 316.23 | 24.44 | 277.97 | 0.2 | 3060 |
| WCDMA B4 | 1710-1755 | 2.00 | -0.15 | 25 | 316.23 | 24.85 | 305.49 | 0.2 | 3060 |
| WCDMA B5 | 824-849 | 2.53 | 0.38 | 25 | 316.23 | 25.38 | 345.14 | 0.2 | 1681 |
| LTE B2 | 1850-1910 | 1.59 | -0.56 | 25 | 316.23 | 24.44 | 277.97 | 0.2 | 3060 |
| LTE B4 | 1710-1755 | 2.00 | -0.15 | 25 | 316.23 | 24.85 | 305.49 | 0.2 | 3060 |
| LTE B5 | 824-849 | 2.53 | 0.38 | 25 | 316.23 | 25.38 | 345.14 | 0.2 | 1681 |
| LTE B12 | 699-716 | 3.95 | 1.80 | 25 | 316.23 | 26.80 | 478.63 | 0.2 | 1426 |
| LTE B13 | 777-787 | 4.45 | 2.30 | 25 | 316.23 | 27.30 | 537.03 | 0.2 | 1585 |
| LTE B14 | 788-798 | 4.45 | 2.30 | 25 | 316.23 | 27.30 | 537.03 | 0.2 | 1608 |
| LTE B66 | 1710-1780 | 2.00 | -0.15 | 25 | 316.23 | 24.85 | 305.49 | 0.2 | 3060 |
| LTE B71 | 663-698 | 1.66 | -0.49 | 25 | 316.23 | 24.51 | 282.49 | 0.2 | 1353 |

Note: the device contains a certified WWAN module, FCC ID: XMR201808EC25AF

Simultaneous transmitting consideration (worst case):

$$\text{The ratio} = P_{\text{Wi-Fi}}/P_{\text{th}} + P_{\text{WWAN}}/P_{\text{th}} = 56.89/3060 + 537.03/1585 = 0.36 < 1.0$$

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance