

17 october 2023 | 14:33 BST

## **MPE Calculation - FCC ID: 2ABCB-RPI5**

The FCC requires that the calculated MPE be equal to or less than a given limit dependent on frequency at a distance of 20 cm from a device to the body of a user.

The transmitter operation for the Raspberry Pi 5 covers the 2.4GHz and 5GHz operating bands.

Simultaneous transmission is not supported between any of the transmitters.

The following FCC Rule Parts are applicable:

Part 1.1310 – Radiofrequency radiation exposure limits

Part 2.1091(c) – Radiofrequency radiation exposure evaluation: mobile devices

### **CALCULATION**

The following far field power density equation is applicable:

$$S = \text{EIRP} / (4 * \pi * R^2)$$

#### **Where**

S = Power density

EIRP = Effective Isotropic Radiated Power (EIRP = P \* G)

P = Conducted Transmitter Power

G = Antenna Gain (relative to an isotropic radiator)

R = distance to the centre of radiation of the antenna (safe operating distance)

### **Calculation for 2.4GHz BT (BDR/EDR worst case):**

#### **Values:**

Transmitter frequency range = 2402 – 2480MHz

P = 7.0dBm (including max. tune up tolerance)

G = 3.5dBi

EIRP = 10.5dBm = 11.22mW

R = 20cm

#### **Power Density Requirement**

From table 1 (ii) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for 2.4GHz

$$S_{\text{req1}} = 1.0 \text{ mW/cm}^2$$

Calculation:

$$\begin{aligned} S &= \text{EIRP}/(4 * \pi * R^2) \\ &= 11.22/(4 * \pi * 20^2) \\ \mathbf{S_1} &= \mathbf{0.0022} \end{aligned}$$

(Equivalent to 0.94cm safe operating distance)

**Calculation for 2.4GHz BT LE**Values:

Transmitter frequency range = 2402 – 2480MHz

P = 4.77dBm (including max. tune up tolerance)

G = 3.5dBi

EIRP = 8.27dBm = 6.71mW

R = 20cm

Power Density Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for 2.4GHz

$$\mathbf{S_{req2}} = \mathbf{1.0 \text{ mW/cm}^2}$$

Calculation:

$$\begin{aligned} S &= \text{EIRP}/(4 * \pi * R^2) \\ &= 6.71/(4 * \pi * 20^2) \\ \mathbf{S_2} &= \mathbf{0.0013} \end{aligned}$$

(Equivalent to 0.73 cm safe operating distance)

### Calculation for 2.4GHz WLAN

#### Values:

Transmitter frequency range = 2412 – 2462MHz

P = 13.41dBm (including max. tune up tolerance)

G = 3.5dBi

EIRP = 16.91dBm = 49.1mW

R = 20cm

### Power Density Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for 2.4GHz

$$S_{\text{req3}} = 1.0 \text{ mW/cm}^2$$

#### Calculation:

$$S = \text{EIRP}/(4 * \pi * R^2)$$

$$= 49.1/(4 * \pi * 20^2)$$

$$S_3 = 0.0098$$

(Equivalent to 1.98cm safe operating distance)

### Calculation for 5.0GHz WLAN

#### Values:

Transmitter frequency range = 5170 – 5825MHz

P = 14.84dBm (including max. tune up tolerance)

G = 2.5dBi

EIRP = 17.34dBm = 54.2mW

R = 20cm

### Power Density Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for 5GHz

$$S_{\text{req4}} = 1.0 \text{ mW/cm}^2$$

Calculation:

$$S = \text{EIRP}/(4 * \pi * R^2)$$

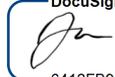
$$= 54.2/(4 * \pi * 20^2)$$

$$S_4 = 0.011$$

(Equivalent to 2.08cm safe operating distance)

Conclusion

The required 20cm RF exposure limits for General Population/ Uncontrolled Exposure FCC Rule Part 1.1310 limits will not be exceeded for the Raspberry Pi 5 using antennas having a maximum gain of 3.5dBi (2.4GHz) and 2.5dBi (5GHz).

DocuSigned by:  
  
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James Adams

Chief operating officer

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