Raspberry Pi Trading Ltd

MPE Calculation - FCC ID :2ABCB-RPIRM0

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 RM0 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:

$$S = EIRP/4 \pi R^2$$

Where   S = Power density

EIRP = Effective Isotropically Radiated Power (EIRP = P x 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 = 6.5dBm

G = 3.5dBi (x 2.24)

EIRP = 10.0dBm (10.0mW)

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_{req1} = 1.0 mW/cm^2

Calculation:

$$S = EIRP/4 \pi R^2$$
$$= 10.0/(12.56 \times 20^2)$$
$$= 10.0/(5024)$$

S_1 = 0.002

(Equivalent to 0.89cm safe operating distance)

Calculation for 2.4GHz WLAN

Values:

Transmitter frequency range = 2412 – 2462MHz

P = 15.4dBm

G = 3.5dBi

EIRP = 18.9dBm = 77.6mW

Power Density Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for 1900MHz for 2.4GHz

S_{req2} = 1.0 mW/cm^2

Calculation:

$$S = EIRP/4 \pi R^2$$
$$= 77.6/(12.56 \times 20^2)$$
$$= 77.6/(5024)$$

$S_2 = 0.0154$

(Equivalent to 2.5cm safe operating distance)

Calculation for 5.0GHz WLAN

Values:

Transmitter frequency range = 5170 - 5825MHz

P = 18.2dBm

G = 2.3dBi

EIRP = 20.5dBm = 112.2mW

Power Density Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for 1900MHz for 5GHz

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

Calculation:

$$S = EIRP/4 \pi R^2$$
$$= 112.2/(12.56 \times 20^2)$$
$$= 112.2/(5024)$$

$S_3 = 0.0223$

(Equivalent to 3.0cm 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 RM0 using antennas having a maximum gain of 3.5dBi (2.4GHz) and 2.3dBi (5GHz).

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