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MPE Calculation

Report No: C15423TR5
Project No: C7894
Date: 2ⁿᵈ April 2024

Product details:

Product name	Raspberry Pi RMC2GW4B52
Company name	Raspberry Pi Ltd
Address	194 Cambridge Science Park
	Milton Road
	Cambridge
	CB4 0AB
	United Kingdom
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MPE Calculation for Raspberry Pi Ltd

FCC requirement:

This report contains calculation of maximum Possible Exposure for the Raspberry Pi RMC2GW4B52.

Required distance to the user is assumed to be 20 cm

Mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and generally to be used in such a way that a separation distance of 20cm is normally maintained between radiating structures and the body of the user or nearby persons.

These devices are normally evaluated for exposure potential with relation to the MPE limit.

As the 20cm separation may not be achievable under normal operating conditions, an RF exposure calculation is used to demonstrate the minimum distance required to be less than the power density limit, as required under FCC rules.

FCC rule part:47CFR2.1091(3)

Power density (S) relates to Equivalent Isotropic Radiated power (EIRP) according to the following:

$$S = \frac{EIRP}{4\pi R^2}$$

Where,
R is the distance to the centre of radiation of the antenna (cm)

BLE Power Density

The worst case output power of the BLE module was = 3.5 mW
 (Value obtained from test report C15420TR4)
The antenna gain was declared to be 4.2dBi.

The Power density (S) is calculated as:

Frequency (MHz)	Maximum EIRP (mW)	Power density (S) (mW/cm^2)	Power density limit (S) (mW/cm^2) 47CFR1.1310 Table 1
2480.0	9.3	0.0019	1.0

MPE Calculation for Raspberry Pi Ltd

Bluetooth Classic Power Density

The worst case output power of the Bluetooth module was = 3.4 mW
 (Value obtained from test report C15421TR4)
The antenna gain was declared to be 4.2dBi.

The Power density (S) is calculated as:

Frequency (MHz)	Maximum EIRP (mW)	Power density (S) (mW/cm^2)	Power density limit (S) (mW/cm^2) 47CFR1.1310 Table 1
2480.0	8.8	0.0018	1.0

WiFi Power Density

The worst case output power of the WiFi module was = 50.5 mW
 (Value obtained from test report C15422TR4 using modulation scheme IEEE 802.11g)
The antenna gain was declared to be 4.2dBi.

The Power density (S) is calculated as:

Frequency (MHz)	Maximum EIRP (mW)	Power density (S) (mW/cm^2)	Power density limit (S) (mW/cm^2) 47CFR1.1310 Table 1
2412.0	132.7	0.0264	1.0

Conclusion:
The product was shown to be compliant with the FCC 20cm power density limit.

MPE Calculation for Raspberry Pi Ltd

ISED Requirement

RSS Standard:

RSS-102 Issue 5 Posted on Industry Canada website: February 2021

Required distance to the user is assumed to be 20 cm

Clause:2.5.2 Exemption Limits for Routine Evaluation — RF Exposure Evaluation

At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less then, in Watts,

$$1.31 \times 10^{-2} \; f^{0.6834}$$

adjusted for tune-up tolerance, where f is in MHz

BLE Evaluation

Calculation of e.i.r.p.:
The worst case output power of the BLE module was = 3.5 mW
 (Value obtained from test report C15420TR4)
The antenna gain was declared to be 4.2dBi.

frequency (MHz)	Power (W)	Limit (W)
2480	0.009	2.736

Bluetooth Classic Evaluation

Calculation of e.i.r.p.:
The worst case output power of the Bluetooth module was = 3.4 mW
 (Value obtained from test report C15421TR4)
The antenna gain was declared to be 4.2dBi.

frequency (MHz)	Power (W)	Limit (W)
2480	0.009	2.736

MPE Calculation for Raspberry Pi Ltd

WiFi Evaluation

Calculation of e.i.r.p.:

The worst case output power of the WiFi module was = 50.5 mW

 (Value obtained from test report C15422TR4 using modulation scheme IEEE 802.11g)

The antenna gain was declared to be 4.2dBi.

frequency (MHz)	Power (W)	Limit (W)
2412.0	0.1327	2.684

Conclusion

The apparatus meets the ISED exclusion requirements for RF exposure Evaluation.

Prepared by:

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