



RF Exposure Analysis – SAR Test Exemption – Prism 2 Transmitter

FCC ID: 2AKCM-57136

The Prism 2 is a wrist worn device that contains transmitters in the 2.4GHz band (LE Bluetooth) and 900MHz ISM band (LoRaWAN).

The transmitters do not operate simultaneously.

The following FCC Rule Parts are applicable:

Part 2.1093 – Radiofrequency radiation exposure evaluation: portable devices

Part 1.1307(b)(3)(i)(C) - SAR test exemption (ii)

Part 1.1307(b)(3)(i)(B) - SAR test exemption (iii)

For model the Prism 2

Operating Frequency: 2402 – 2480MHz

Tx Power: +3.0dBm max. conducted

Antenna gain -1.5dBi

Operating Frequency: 902 – 928MHz

Tx Power: +3.0dBm max. conducted

Antenna gain -17dBi

Minimum separation distance (R) = 5mm (0.005m)

Evaluation

From Part 2.1093(c)(1). RF exemption applies if the maximum transmitted power is less than the maximum of the following three criteria:

- i) Less than 1 mw Blanket exemption. $P_{TH} = 0.001 \text{ W}$ – (Prism V2 not compliant)
- ii) determination of exemption under the MPE-based §1.1307(b)(3)(i)(C), if i) not met

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- iii) determination of exemption under the SAR-based §1.1307(b)(3)(i)(B) if both i) and ii) are not met;

Determination of threshold power (P_{TH}) under the MPE-based §1.1307(b)(3)(i)(C)

This is only applicable at a separation distance greater than $\lambda/2\pi$

For Prism 2.1:

2.4 GHz operation - $\lambda/2\pi = 0.02\text{m}$

0.9GHz operation - $\lambda/2\pi = 0.053\text{m}$

The Prism 2.1 separation distance equals 0.005m therefore this clause is not applicable.

Determination of threshold power (P_{TH}) under §1.1307(b)(3)(i)(B) as the transmitter power threshold for SAR test exemption:

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

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 Prism 2 @ 2.4GHz Operation:

From §1.1307(b)(3)(B) :

$$ERP_{20 \text{ cm}} = 3060 \text{ mW}$$

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$$\begin{aligned}x &= -\log_{10} (60/(3060 \sqrt{2.4})) \\ &= -\log_{10} (0.0127) = 1.9\end{aligned}$$

$$\begin{aligned}\text{Threshold Power } P_{th(1)} &= ERP_{20 \text{ cm}} (d/20 \text{ cm})^x \\ &= 3060 (0.5/20)^{1.9}\end{aligned}$$

$$= 2.76\text{mW (4.4dBm)}$$

(P_{th} = tx power ERP or conducted time averaged, whichever is greater)

The Prism 2 max. transmitter power @ 2402MHz = +3dBm conducted (< 4.4dBm P_{th(1)}), so the Prism 2 is therefore exempt from evaluation.

For Prism 2 @ 0.9GHz Operation:

From §1.1307(b)(3)(B) :

$$ERP_{20 \text{ cm}} = 2040f = 2040 \times 0.902 = 1840$$

$$\begin{aligned}x &= -\log_{10} (60/(1840 \sqrt{0.902})) = 0.034 \\ &= -\log_{10} (0.034) = 1.47\end{aligned}$$

$$\begin{aligned}\text{Threshold Power } P_{th(2)} &= ERP_{20 \text{ cm}} (d/20 \text{ cm})^x \\ &= 1840 (0.5/20)^{1.47}\end{aligned}$$

$$= 8.12\text{mW (9.1dBm)}$$

(P_{th} = tx power ERP or conducted time averaged, whichever is greater)

The Prism 2 max. transmitter power @ 902MHz = +3dBm conducted (< 9.1dBm P_{th(2)}) so the Prism 2 is therefore exempt from evaluation.

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