



RF Exposure Analysis – SAR Test Exemption – BT32D

FCC ID: 2A924-BT32D

The BT32D equipment operates using 2.4GHz BT basic and LE

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)

KDB 447498 D04 – RF Exposure Procedures

For the PHC20

(Values from original module certification MPE FCC ID: 2AC7Z-ESPWROOM32D)

BT Operating Frequency: 2402 – 2480MHz

Tx Power: -0.05dBm BT LE
4.58dBm BT basic

Antenna gain 3.7dBi

EIRP = 4.58 + 3.7dBm = 8.28dBm max.

ERP = 8.28-2.15dBm = 6.13dBm (4.1mW)

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

Limb extremity usage

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. $P_{TH} = 0.001 \text{ W}$ – (The BT32D is not compliant)
- ii) determination of exemption under the MPE-based §1.1307(b)(3)(i)(C), if i) not met
- 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 the BT32D:

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

The BT32D separation distance is 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 the BT32D @ 2.4GHz Operation:

From §1.1307(b)(3)(B) :

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

$$\begin{aligned} x &= -\log_{10} (60 / (3060 * \sqrt{2.4})) \\ &= -\log_{10} (0.0127) = 1.898 \end{aligned}$$

$$\begin{aligned} \text{Threshold Power } P_{th} &= ERP_{20 \text{ cm}} (d/20 \text{ cm})^x \\ &= 3060 (0.5/20)^{1.898} \\ &= 2.79\text{mW (4.45dBm)} \end{aligned}$$

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

For product extremity use a factor of 2.5 can be applied to P_{th} (ref: KDB447498 D04)

ie: For the PHC20, $P_{th} = 2.79 \times 4 = 11.16\text{mW}$

The BT32D max. transmitter power @ 2.4GHz = 4.1mW ERP so the BT32D is therefore exempt from SAR testing.

