

Federal Communications Commission
 Equipment Authorization Division
 Application Processing Branch
 7435 Oakland Mills Road
 Columbia, MD 21048

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SAR-based exemption from Environmental Evaluation according to CFR 47 §1.1307 (b)(3)(i)(B)

FCC ID: YU2-BT4

CFR 47 §1.1307 (b)(3)(i)(B): *A single RF source is exempt if the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from **0.5 centimeters** to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:*

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

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);

Threshold calculation:

$d = 0.5 \text{ cm}$ (device touches skin)

$f = 2.44 \text{ GHz}$ (Bluetooth® LE, mid channel)

$$ERP_{20 \text{ cm}} \text{ (mW)} = 3060 ; \quad x = -\log_{10} \left(\frac{60}{3060 \cdot \sqrt{2.44}} \right) \approx 1.901265$$

$$P_{th} \text{ (mW)} \approx 3060 \cdot (0.5 \text{ cm} / 20 \text{ cm})^{1.901265} \approx \mathbf{2.75284} \quad \rightarrow \underline{P_{th} \approx 2.75 \text{ mW}}$$

$$P_{th} \text{ (dBm)} \approx 10 \cdot \log_{10} \left(\frac{2.75284 \text{ mW}}{1 \text{ mW}} \right) \approx \mathbf{4.3971} \quad \rightarrow \underline{P_{th} \approx 4.4 \text{ dBm}}$$

VL_QM_Allgemeine_Vorlage_V2.0

Evaluation of RF output power

The RF chip has a maximum output power of 6 dBm. The Pre Suite firmware is used and ensures that no output power higher than **0 dBm** can be set.

The tolerance of the RF chip output power at 0 dBm is **± 1.5 dB**.

The **declared maximum output power** of the device is **1.5 dBm** (conducted, radiated EIRP).

The conducted power and radiated power EIRP measured by the testing laboratory can be found in table 1.

$$\text{ERP [dBm]} = \text{EIRP[dBm]} - 2.15 \text{ dB}$$

Table 1: Measured values qualify for exemption

Frequency [MHz]	Conducted power [dBm]	Radiated power [dBm] EIRP	Radiated power [dBm] ERP = EIRP – 2.15 dB	Threshold Pth [dBm]	Qualifies for exemption
2402 (Low Channel)	-7.6	-2.0	-0.15	4.4	yes
2440 (Mid Channel)	-6.8	-0.9	-3.05		
2480 (High Channel)	-7.2	0.2	-1.95		

Source: Test report **1-1358-20-04-03_TR1-R01** by cetecom advanced GmbH, page 19, results

➔ The output power is far below the calculated threshold, thus the RF source qualifies for exemption.

Conclusion:

The device is exempted from routine evaluation according to CFR 47 §1.1307 (b)(3)(i)(B).