

RF EXPOSURE INFORMATION

FCC ID: 2AEUPBHASB001

1 DETERMINATION OF EXEMPTION

1.1 Single RF Source

As per §1.1307(b)(3)(i),

- (A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);
- (B) Or 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);

Note: when 10-g extremity SAR applies, SAR test exemption may be considered by applying a factor of 2.5 to the SAR-based exemption thresholds.

- (C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available

maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

1.2 Multiple RF Sources

In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

1 PG INFORMATION:

Modulation Type	Operation Freq. (MHz)	Max. Output Power Include Tune Up Tolerance (dBm)	Antenna Gain (dBi)	Worst Case
BLE	2402~2480	-7	-1.3	v
LoRa 500KHz DTS	902.5~926.5	16	-3.18	v
LoRa 125KHz FHSS	902.2~927.8	15		
FSK 150Kbps FHSS	902.4~927.6	15		
FSK 50Kbps FHSS	902.2~927.8	15		
FSK 250Kbps FHSS	902.5~927.5	15		
FSK 100 Kbps DTS	902.9~926.9	15		

2 EVALUATION

2.1 Single RF Source Evaluation Results

Chain 0	Frequency (MHz)	Distance (cm)	Max. tune-up power (dBm)	Max. tune-up power (mW)	Peak gain (dBi)	ERP (dBm)	ERP (mW)	x	ERP _{20cm} (mW)	P _{th} (mW)	P or ERP /P _{th}
900M	902.2	20	16	39.811	-3.18	10.67	11.668	1.464	1840.49	1840.49	0.022
BLE	2402	20	-7	0.200	-1.3	-10.45	0.090	1.898	3060.00	3060.00	0.000

Note: For conservativeness, the lowest uplink frequency of each band is used to determine the minimum separation distance of that band. All the single RF source results (P or ERP) are less than their corresponding threshold (P_{th} or ERP_{th}), so they are exempt from RF

exposure testing.

2.2 Multiple RF Sources Evaluation Results

Simultaneous transmission modes	Σ P or ERP /Pth	Criteria
900M + BLE	0.022	1

Note:

$\Sigma(\text{ERP}/\text{ERP}_{\text{th}})$: This is a summation of [(ERP of RF source / exemption threshold ERP for RF source)].

Considering the colocated transmitters, the aggregated ($\text{ERP}/\text{ERP}_{\text{th}}$) is smaller than 1, the colocated transmitters are compliant.