

RF Exposure Evaluation

According to 447498 D04 Interim General RF Exposure Guidance v01

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

Frequency(MHz)	Field Strength (dBuv/m)	erp(mW)	limit (mW)
13.56	62.49	0.001	1
0.1342	84.58	0.21	1

according to ANSI C63.10

where:

13.56MHz

$F < 30\text{MHz: EIRP[dBm]} = E[\text{dBuV/m}] - 95.2 + 6$

$\text{ERP} = \text{EIRP} - 2.15\text{dB}$

$E = \text{Field Strength (dBuv/m)}$

So $\text{ERP} = 62.49 - 95.2 + 6 - 2.15 = -28.86\text{dBm}$

134.2KHz

$F < 30\text{MHz: EIRP[dBm]} = E[\text{dBuV/m}] - 95.2 + 6$

$\text{ERP} = \text{EIRP} - 2.15\text{dB}$

$E = \text{Field Strength (dBuv/m)}$

So $\text{ERP} = 84.58 - 95.2 + 6 - 2.15 = -6.77\text{dBm}$

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$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B.2})$$

where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1). The example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

BLE mode

Frequency (MHz)	Output power (dBm)	Ant gain(dBi)	EIRP (dBm)	EIRP (mw)	ERP (dBm)	ERP (mw)	Distance (cm)	P _{th} (mW)
2480	-2.35	4.54	2.19	1.66	0.04	1.01	0.5	2.7

For the maximum simultaneous transmission MPE:

$$\sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k}$$

$$13.56 \text{ MHz} + 134.2 \text{ KHz} + \text{BLE} = (0.001/1) + (0.21/1) + (1.66/2.7) = 0.001 + 0.21 + 0.62 = 0.831 < 1$$

The max power density is less than MPE exempt limit, so it is compliance.