

Prediction of MPE at a given distance

According to 447498 D04 Interim General RF Exposure Guidance v01

The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power. For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form as below. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

RF Source Frequency			Minimum Distance		Threshold ERP	
f_L MHz	f_H MHz		$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	—	1.34	159 m	—	35.6 m	$1,920 R^2$
1.34	—	30	35.6 m	—	1.6 m	$3,450 R^2/f^2$
30	—	300	1.6 m	—	159 mm	$3.83 R^2$
300	—	1,500	159 mm	—	31.8 mm	$0.0128 R^2f$
1,500	—	100,000	31.8 mm	—	0.5 mm	$19.2R^2$

Subscripts L and H are low and high; λ is wavelength.
From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

“f” is in MHz

Simultaneous Transmission with MPE-based Exemptions

For these cases, a device with multiple RF sources transmitting simultaneously will be considered an RF exempt device if the condition of following Formula is satisfied.

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

As this equipment:

Distance=50cm

BT:f1 = 2480, WIFI:f2 = 2462, GSM:f3= 848.80

So $P_{th1} = P_{th2} = 4800.0\text{mW}$, $P_{th3} = 2716.16\text{mW}$

Where:

$EIRP = P_m + G_i$

$P_t = 10^{(EIRP/10)}$

P_m = measured transmitter output power in dBm,

P_t = transmitter output power in milliwatts,

G_i = numeric gain of the transmitting antenna (unit-dBi)

Ant gain Gi1=1.56 dBi, Gi2=1.56 dBi, Gi3=1 dBi
Pm1=6 dBm, Pm2=22 dBm, Pm3=33 dBm

So BLE: Pt1= $10^{(7.56/10)}$ mW =5.702 mW<4800.0mW

WIFI: Pt2= $10^{(23.56/10)}$ mW =226.986 mW<4800.0mW

GSM: Pt3= $10^{(34-2.15/10)}$ mW =1496.236 mW<2716.16mW

$$\Sigma = \text{Pt1}/P_{th1} + \text{Pt2}/P_{th2} + \text{Pt3}/P_{th3} = 0.60 < 1$$

The MPE-based test exemption condition is meets the requirements.