

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 ² f
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}=4800.0mW, P_{th3}= 2716.16mW

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: $P_{t1} = 10^{(7.56/10)} \text{ mW} = 5.702 \text{ mW} < 4800.0 \text{ mW}$
WIFI: $P_{t2} = 10^{(23.56/10)} \text{ mW} = 226.986 \text{ mW} < 4800.0 \text{ mW}$
GSM: $P_{t3} = 10^{(34-2.15/10)} \text{ mW} = 1496.236 \text{ mW} < 2716.16 \text{ mW}$

$$\Sigma = P_{t1}/P_{th1} + P_{t2}/P_{th2} + P_{t3}/P_{th3} = 0.60 < 1$$

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