

Prediction of MPE at a given distance

1. Limits

The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

Frequency range (MHz)	Electric field strength (V/m rms)	Magnetic field strength (A/m rms)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3 –1.34	614	1.63	*(100)	30
1.34 –30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1	30

2. Test Procedure

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

G = numeric gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the centre of radiation of the antenna

3. Result for Transmitters used in mobile exposure conditions for standalone operations

Frequency (MHz)	Maximum Output power (dBm)	Maximum Output power (mW)	Antenna Gain (dBi)	Antenna Gain (numeric)	Distance (cm)	Result (mW/cm ²)	Limits for General Population/ Uncontrolled Exposure (mW/cm ²)
BLE (worse case)							
2442	-3.78	0.419	4.9	3.09	20.00	0.000258	1
WIFI (worse case)							
2462	16.77	47.534	4.9	3.09	20.00	0.029236	1
GSM 850 (worse case)							
848.80	32.33	1710.015	0.5	1.12	20.00	0.381214	0.57
PCS 1900 (worse case)							
1850.20	30.47	1114.295	0.5	1.12	20.00	0.248410	1
WCDMA 850 (worse case)							
826.40	23.11	204.644	0.5	1.12	20.00	0.045621	0.55
WCDMA 1900 (worse case)							
1880.00	23.23	210.378	0.5	1.12	20.00	0.046900	1

4. Results for Transmitters used in mobile exposure conditions for simultaneous transmission operations

According to KDB 447498 D01v05r02 section 7.2, simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency.

MPE Ratios (MPE/MPE Limit)	BLE	WIFI	GSM 850	GSM 1900	WCDMA 850	WCDMA 1900
	0.000258	0.029236	0.668796	0.248410	0.0829473	0.046900

For this device, WCDMA and GSM share the same antenna, Bluetooth Low energy and WiFi share the same antenna, and so, they cannot simultaneous transmission with each other. The simultaneous transmission combinations see below table.

	Combinations	Σ MPE ratios	Limit
Simultaneous Transmission Consideration	GSM 850 + BLE	0.669054	≤ 1.0
	GSM 850 + WiFi	0.698032	
	GSM 1900 + BLE	0.248668	
	GSM 1900 + WiFi	0.277646	
	WCDMA 850 + BLE	0.083205	
	WCDMA 850 + WiFi	0.112183	
	WCDMA 1900 + BLE	0.047158	
	WCDMA 1900 + WiFi	0.076136	

So, Simultaneous transmission MPE is exclusion.