

5.6. RF EXPOSURE REQUIRMENTS [§§ 15.247(i), 1.1310 & 2.1091]

5.6.1. Limits

§ 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	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			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Note 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.6.2. Method of Measurements

Calculation Method of Power Density/RF Safety Distance:

$$S = \frac{PG}{4\pi \cdot r^2} = \frac{EIRP}{4\pi \cdot r^2}$$

Where,
P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm²
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

5.6.3. RF Evaluation

5.6.3.1. Standalone

For Portable Application				
Pursuant to FCC KDB 447498 D01 General RF Exposure Guidance v06, Section 4.3.1. Standalone SAR test exclusion considerations				
a) For 100 MHz to 6 GHz and <i>test separation distances</i> ≤ 50 mm, the 1-g and 10-g <i>SAR test exclusion thresholds</i> are determined by the following:				
[(<i>max. power of channel, including tune-up tolerance, mW</i>) / (<i>min. test separation distance, mm</i>)] · [√ <i>f</i> _(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR, where <i>f</i> _(GHz) is the RF channel transmit frequency in GHz				
Max. power of channel, including tune-up tolerance, mW	Min. test separation distance, mm	<i>f</i> _(GHz)	Calculated 1-g (head or boby) SAR test exclusion threshold	1-g (head or boby) SAR test exclusion threshold limit
28.119	20	2.480	2.2	3.0
Conclusion: The EUT qualify for SAR test exclusion at an evaluated separation distance of 20 mm, the calculated 1-g SAR test exclusion threshold is 2.2 ≤ 3.0.				

5.6.3.2. Co-location for Mobile Device

Pursuant to KDB 447498 D01 General RF Exposure Guidance v06, Section 7.2:

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0 , according to calculated/estimated, numerically modeled, or measured field strengths or power density.

The maximum calculated MPE ratio of the EUT with 0 dBi PCB Trace Antenna

Frequency (MHz)	EUT EIRP (dBm)	EUT EIRP (mW)	Evaluation Distance (cm)	Power Density (mW/cm ²)	FCC MPE Limit (mW/cm ²)	MPE Ratio
2402	14.49	28.119	20	0.00559	1.0	0.00559

The maximum calculated MPE ratio for the EUT with 0 dBi PCB Trace Antenna is 0.00559, this configuration can be co-located with other antennas provided the sum of the MPE ratios for all the other simultaneous transmitting antennas incorporated in a host device is $\leq 1.0 - 0.00559 \leq 0.99441$.