

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

§ 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 <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	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.

**5.6.1. 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/cm<sup>2</sup>  
G: numeric gain of antenna relative to isotropic radiator  
r: distance to centre of radiation in cm

**5.6.2. RF Evaluation**

**5.6.2.1. Standalone**

Frequency (MHz)	EIRP (dBm)	EIRP (mW)	Evaluation Distance, r (cm)	Power Density, S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Margin (mW/cm <sup>2</sup> )
2401.6	36	3981.072	25	0.507	1.0	-0.493

**5.6.2.2. Co-location**

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.*

Co-location will only applies to EUT with 2.5 dBi dipole antenna, worst case EIRP of 32.5 dBm will be used in co-location at the minimum of 33 cm evaluation separation distance required by the operating configurations and exposure conditions of the host device.

**The maximum calculated MPE ratio of the EUT with 2.5 dBi dipole antenna**

Frequency (MHz)	EUT EIRP (dBm)	EUT EIRP (mW)	Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	FCC MPE Limit (mW/cm <sup>2</sup> )	MPE Ratio
2401.6	32.5	1778.279	33	0.13	1.0	0.130

The maximum calculated MPE ratio for the EUT with 2.5 dBi dipole antenna is 0.130, 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  $\leq 1.0 - 0.130 \leq 0.870$ . The following table addresses the co-location of the EUT with 2.5 dBi antenna with the specified radio modules.

**EUT with 2.5 dBi dipole antenna co-location with radio module identified in this table**

*Radio Module	Frequency (MHz)	EIRP (mW)	Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	FCC MPE Limit (mW/cm <sup>2</sup> )	MPE Ratio	MPE Ratio of EUT with 2.5 dBi antenna	Sum of MPE Ratio	Verdict
Data Card Module (FCC ID: R17LN930, IC: 5131A-LN930)	824.2	2511.890	33	0.184	0.549	0.335	0.130	0.465	Compliant
UMTS/LTE Data Module (FCC ID: XPYTOBYL201, IC: 8595A-TOBYL201)	710.0	2398.833	33	0.175	0.473	0.370	0.130	0.500	Compliant
LE910NA V2 LTE/3G Module (FCC ID: R17LE910NAV2, IC: 5131A-LE910NAV2)	699.0	1156.112	33	0.084	0.466	0.180	0.130	0.310	Compliant

\* The test data of the radio modules represented in this table is the worst-case configuration (maximum MPE ratio) derived from the original radio modules MPE reports. Refer to these reports for details.