FCC §1.1310 & §2.1091 – MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart § 2.1091and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f²)	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;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:
Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Base on ERP/EIRP Calculated Data:

Mode	**Max Turn-up Power (dBm)**	**ERP/EIRP Limit (dBm)**	**Max Antenna Gain (dBi)**
WCDMA (Band V)	23.5	38.45	14.95
WCDMA (Band II)	23.5	33	9.5
WCDMA (Band IV)	23.5	30	6.5
LTE (Band II)	24	33	9.0
LTE (Band Ⅳ)	24	30	6.0
LTE (Band Ⅻ)	24	34.77	10.77

To meet MPE requirement, the allowed maximal gain for each band is below:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(Numeric)	(dBm)	(mW)			
WCDMA (Band V)	826.4-846.6	10.92	12.36	23.5	223.87	20	0.551	0.551
WCDMA (Band II)	1852.4-1907.6	13.51	22.44	23.5	223.87	20	1.0	1.0
WCDMA (Band Ⅳ)	1712.4-1752.6	13.51	22.44	23.5	223.87	20	1.0	1.0
LTE (Band II)	1850.7-1909.3	13.01	20.00	24	251.19	20	1.0	1.0
LTE (Band Ⅳ)	1710.7-1754.3	13.01	20.00	24	251.19	20	1.0	1.0
LTE (Band Ⅻ)	699.7-715.3	9.69	9.31	24	251.19	20	0.465	0.466

Note：

1. The device meets FCC MPE at 20 cm distance.
2. Target Power =the max power including Tune-up tolerance, the tune up power declared by manufacture as:

   WCDMA Bands: 22.5±1 dBm;
   LTE Bands: 22.5±1.5 dBm

Output power is conducted. This device is to be used in mobile or fixed applications only. Antenna gain including cable loss must not exceed:

9.69 dBi of frequency band 699-716 MHz
10.92 dBi of frequency band 824-849 MHz
6.0 dBi of frequency band 1710-1755 MHz
9.0 dBi of frequency band 1850-1910 MHz