

FCC §1.1307& §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart § 2.1051 and 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/cm²)	Averaging Time (minutes)
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;

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/cm²);

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);

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
LTE (Band II)	24	33	9
LTE (Band IV)	24	30	6
(Band XII)	24	34.77	10.77

Mode	Frequency (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)	824.0	10.91	31.26	23.5	223.87	20	0.549	0.549
WCDMA (Band II)	1850.0	13.5	22.38	23.5	223.87	20	1	1.0
LTE (Band II)	1850.0	13	19.95	24	251.19	20	1	1.0
LTE (Band IV)	1755.0	13	19.95	24	251.19	20	1	1.0
(Band XII)	699	9.6	9.12	24	251.19	20	0.466	0.466

Mode	Max Allow Antenna Gain (dBi)
WCDMA (Band V) uplink Frequency 824-849(MHz)	10.91
WCDMA (Band II) uplink Frequency 1850-1910(MHz)	9
LTE(Band II) uplink Frequency 1850-1910(MHz)	9
LTE(Band IV) uplink Frequency 1710-1755(MHz)	6
LTE(Band XII) uplink Frequency 699-716(MHz)	9.6

Note :

(1) Target Power =the max power including Tune-up tolerance, the tune up power declared by manufacture as:

WCDMA Band V = 22.5±1dBm; WCDMA Band II =22.5±1dBm; FDD Band II=23±1dBm ;
FDD Band IV= 23±1dBm ; FDD Band XII= 23±1dBm

Result: The device meet FCC MPE at 20 cm distance

Single Modular Approval. Output power is conducted. This device is to be used in mobile or fixed applications only. Antenna gain including cable loss must not exceed 9.6 dBi of frequency band 699-716MHz, 6 dBi of frequency band 1710-1755MHz, 9 dBi of frequency band 1850-1910MHz, 10.91 dBi of frequency band 824-849MHz, for the purpose of satisfying the requirements of 2.1043 and 2.1091. They operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or they operate at frequencies above 1.5 GHz and their ERP is 3 watts or more. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operated in conjunction with any antenna or transmitter not described under this FCC ID. The final product operating with this transmitter must include operating instructions and antenna installation instructions, for end-users and installers to satisfy RF exposure compliance requirements. Compliance of this device in all final product configurations is the responsibility of the Grantee. Installation of this device into specific final products may require the submission of a Class II permissive change application containing data pertinent to RF Exposure, spurious emissions, ERP/EIRP, and host/module authentication, or new application if appropriate. Installation of this device into specific final products may require the submission of a Class II permissive change application containing data pertinent to RF Exposure, spurious emissions, ERP/EIRP, and host/module authentication, or new application if appropriate.