FCC ID: 2AQ64EMGL

Maximum Permissible Exposure (MPE)

According to FCC 1.1310: 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)

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 Exposure				
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
300-1,500			f/300	6
1,500-100,000			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
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

MPE Calculation Method

E (V/m) = $\frac{\sqrt{30*P*G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

Pd = $\frac{30*P*G}{377*D^2}$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

Measurement Result

Lora-CSS:

Operation Frequency: 902MHz~928MHz;

Power density limited: 1mW/ cm^2

Antenna Type: External Antenna;

WIFI antenna gain: 4dBi;

R=20cm

mW=10^(dBm/10)

antenna gain Numeric=10^(dBi/10)= 10^(1/10)=2.51

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Max tune-up power (mW)	Antenna Gain Numeric	Evaluation result at 20cm Power density(mW/cm2)	Power density Limits (mW/cm2)
923.3	CSS	25.37	25±1	26	398.1072	2.51	0.19879	0.61553
925.7		24.79	25±1	26	398.1072	2.51	0.19879	0.61713
927.5		24.23	25±1	26	398.1072	2.51	0.19879	0.61833

GSM/ WCDMA/LTE:
Antenna Type: External Antenna;
antenna gain: 4dBi;

For GSM:

Operating Mode	TX Freq Range (MHz)		Max EIRP(ERP) power	Frame-Avg power	Frame-Avg power	Antenna Gain	Antenna Gain	Evaluation result	Power density Limits
	Low	High	(dBm)	(dBm)	(mW)	(dBi)	Numeric	(mW/cm2)	(mW/cm2)
GSM 850	824.2	848.8	35.05	26.02	399.9447498	4	2.51	0.19971	0.54947
GSM 1900	1850.2	1909.8	31.89	22.86	193.1968317	4	2.51	0.09647	1.00000

Note: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots. The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 TS) - 9.03 dB

For WCDMA/LTE

Operating Mode	TX Freq Range (MHz)		Maximum measured EIRP(ERP) Power	Maximum measured EIRP(ERP) Power	Antenna Gain	Antenna Gain	Evaluation result	Power density Limits
	Low	High	(dBm)	(mW)	(dBi)	Numeric	(mW/cm2)	(mW/cm2)
WCDMA Band II LTE Band 2	1850	1910	27.05	506.9907083	4	2.51	0.25317	1.00000
WCDMA Band V LTE Band 5	824	849	27.23	528.4452518	4	2.51	0.26388	0.54933
LTE Band 7	2500	2570	26.04	401.7908108	4	2.51	0.20063	1.00000
LTE Band 2	1850	1910	26.95	495.4501908	4	2.51	0.24740	0.47000
LTE Band 4	1710	1755	26.29	425.5984131	4	2.51	0.21252	1.00000
LTE Band 5	824	829	25.89	388.150366	4	2.51	0.19382	0.54933

Synchronous transmission:

According KDB 447498 D01, 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 evaluation here considers a LTE/WCDMA transmitter &a WIFI transmitter. The MPE ratio is defined by the ratio of power density to MPE limit. The sum of the MPE ratios is calculated as follows:

$\Sigma MPE\ Ratio$ = Max (GSM/LTE/WCDMA MPE ratio) + Max (Lora-CSS MPE ratio)

Conclusion:

For the max result : 0.19879+0.24740=0.44619≤0.47000 for Max Power Density, compliance the RF Exposure.

Jason chen

Signature: **Date:** 2018-09-27

NAME AND TITLE (Please print or type): Jason Chen/Manager

COMPANY (Please print or type): Shenzhen NTEK Testing Technology Co., Ltd./ 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street Bao'an District, Shenzhen P.R. China.