

MPE Calculation

Applicant:	SHINING 3D Tech. Co., Ltd.
Address:	No.1398, Xiangbin Road, Wenyan, Xiaoshan, Hangzhou, Zhejiang, China
Product:	Cradle
FCC ID:	2AMG4-CRAEW
Model No.:	Cra EW
Reference RF report #	709502403251-00C and 68.960.24.0002.01

According to subpart 15.247(i) and subpart §1.1307(b)(1) and KDB 447498, 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/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;

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: Capacitor Antenna

For 5GHz Wi-Fi (Report number: 709502403251-00C) Antenna 1

Maximum peak output power at antenna input terminal (dBm):	11.62
Maximum peak output power at antenna input terminal (mW):	14.52
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	4.26
Maximum Antenna Gain (numeric):	2.6669
The worst case is power density at predication frequency at 20 cm (mW/cm ²):	0.00770
MPE limit for general population exposure at prediction frequency (mW/cm ²):	1.00

For 5GHz Wi-Fi (Report number: 709502403251-00C) Antenna 2

Maximum peak output power at antenna input terminal (dBm):	11.86
Maximum peak output power at antenna input terminal (mW):	54.08
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	3.09
Maximum Antenna Gain (numeric):	2.0370
The worst case is power density at predication frequency at 20 cm (mW/cm ²):	0.00622
MPE limit for general population exposure at prediction frequency (mW/cm ²):	1.00

The max power density 0.01392 (mW/cm²) < 1 (mW/cm²)

Result: Compliant

For WPT (Report number: 68.960.24.0002.01)

Calculation method for 111-205kHz

Per the test report included herein, for 142kHz

According to C63.10 Annex G

$$EIRP = p_t \times g_t = (E \times d)^2 / 30$$

where

p_t is the transmitter output power in wattsg_t is the numeric gain of the transmitting antenna (dimensionless)

E is the electric field strength in V/m

d is the measurement distance in meters (m)

transmitter output power for 142kHz Function



Field strength (E):	1.7214 (V/m)
Measurement Distance(dMeas):	20 (Cm)
Equivalent Isotropically Radiated Power(EIRP):	3.9510mW

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);

PG = 3.9510mW (in appropriate units, e.g., mW);

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

The max power density $3.9510/4 \pi R^2 = 1.9651 \cdot 10^{-4}$ (mW/cm²)

Simultaneous transmission of MPE test exclusion for worst case configuration

5GHz Wi-Fi: the ratio is 0.01392/1

WPT: the ratio is $1.9651 \cdot 10^{-4} / 1 = 0.00869$

The sum of the MPE ratios for all simultaneous transmitting antennas:

$0.01392 + 1.9651 \cdot 10^{-4} = 0.014$

As the sum of MPE ratios for all simultaneous transmitting antennas is ≤ 1.0 , simultaneous transmission MPE test exclusion will be applied.

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