



MPE Calculation

Applicant:	Hangzhou Huacheng Software Technology Co., Ltd.
Address:	15th Floor, Building 3, No. 582, Liye Road, Changhe Street, Binjiang District, Hangzhou, China
Product:	IMOU Smart Lock
FCC ID:	2BQWU-CUBO2-A1
Model No.:	C11-F-K(L)
Reference RF report #	709502605434-00B, 709502605434-00C, 709502605434-00D

According to subpart 15.247(i) and subpart §1.1307(b)(1), 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: FPC antenna for 2.4G Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	25.27
Maximum peak output power at antenna input terminal (mW):	336.51
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	1.4
Maximum Antenna Gain (numeric):	1.3804
The worst case is power density at predication frequency at 20 cm (mW/cm ²):	0.09241
MPE limit for general population exposure at prediction frequency (mW/cm ²):	1.00

The max power density 0.09241 (mW/cm²) < 1 (mW/cm²)

Calculated Data: FPC antenna for 5G Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	13.73
Maximum peak output power at antenna input terminal (mW):	23.60
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	2.4
Maximum Antenna Gain (numeric):	1.7378
The worst case is power density at predication frequency at 20 cm (mW/cm ²):	0.00816
MPE limit for general population exposure at prediction frequency (mW/cm ²):	1.00

The max power density 0.00816 (mW/cm²) < 1 (mW/cm²)

Calculated Data: FPC antenna for BLE

Maximum peak output power at antenna input terminal (dBm):	-1.73
Maximum peak output power at antenna input terminal (mW):	0.67
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	1.4
Maximum Antenna Gain (numeric):	1.3804
The worst case is power density at predication frequency at 20 cm (mW/cm ²):	0.00018
MPE limit for general population exposure at prediction frequency (mW/cm ²):	1.00

The max power density 0.00018 (mW/cm²) < 1 (mW/cm²)



Simultaneous Transmission MPE:

Frequency Band	MPE (mw/cm2)	Limit (mw/cm2)	Evaluated Distance (cm)	Worst-Case MPE Ratios	Worst-Case Transmitter type MPE Ratios	Limit	Result
Worst Case							
2.4G Wi-Fi	0.09241	1	20	9.24%	10.08%	100%	Pass
5G Wi-Fi	0.00816	1	20	0.82%			
BLE	0.00018	1	20	0.02%			

Result: Compliant

- TÜV SÜD Products Testing (Shanghai) Co., Ltd.

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