

RF Exposure Compliance Requirement

Model no.: TB80USMJX8Y0Z1

1. Standard requirement

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 limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

(a) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S)(mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
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
300-1500	--	--	f/300	6
1500-100000	--	--	5	6

(b) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S)(mW/cm ²)	Averaging Times E ² , H ² or S (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
1500-100000	--	--	1.0	30

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

2. MPE Calculation Method

$$E(V/m) = (30 \cdot P \cdot G)^{0.5} / d \quad \text{Power Density: } Pd(W/m^2) = E^2 / 377$$

E=Electric Field (V/m)

P=Peak 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

$$Pd = (30 \cdot P \cdot G) / (377 \cdot d^2)$$

From the peak 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.

3. Calculated Result and Limit

RFID:

E=54.8dB μ V/m@3m(max. value provided by client), antenna gain = 0dBi

Frequency (MHz)	Antenna Gain (Numeric)	Output Power (dBm)	Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
13.56	1	-40.4	0.0001	0.00000002	0.98	Complies

MPE ratio:

$$0.00000002(mW/cm^2) / 0.98(mW/cm^2) = 0.0000000204$$

The power for WIFI&BLE module refers to certificate of FCC ID:2AC7Z-ESP32WROVERE

Frequency (MHz)	Antenna Gain (Numeric)	Output Power (dBm)	Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
2412-2462	2.19	27.0	501.19	0.2183	1	Complies
2402-2480	2.19	7.0	5.01	0.0022	1	Complies

Max MPE ratio:

$$0.2183(mW/cm^2) / 1(mW/cm^2) = 0.2183$$

LTE:

The power for LTE module refers to certificate of FCC ID: ZMONL668AM00

Operating Band	Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
WCDMA B2	1850-1910	3.24	24.50	281.84	0.1814	1	Complies
WCDMA B4	1710-1755	2.34	24.50	281.84	0.1314	1	Complies
WCDMA B5	824-849	2.24	24.50	281.84	0.1255	0.549	Complies
LTE B2	1850-1910	3.24	24.00	251.19	0.1617	1	Complies
LTE B4	1710-1755	2.34	24.00	251.19	0.1171	1	Complies

LTE B5	824-849	2.24	24.00	251.19	0.1119	0.549	Complies
LTE B12	699-716	2.34	24.00	251.19	0.1171	0.466	Complies
LTE B13	777-787	3.47	24.00	251.19	0.1733	0.518	Complies
LTE B17	704-716	2.34	24.00	251.19	0.1171	0.469	Complies
LTE B66	1710-1780	2.45	24.00	251.19	0.1227	1	Complies
LTE B71	663-698	1.62	24.00	251.19	0.0810	0.442	Complies

Max MPE ratio:

$$0.1733 \text{ (mW/cm}^2\text{)}/0.518\text{(mW/cm}^2\text{)} = 0.334555985$$

The LTE module and the WIFI&BLE module cannot be transmitted simultaneously. The maximum MPE ratio of LTE was selected as the evaluation.

RFID, LTEI can transmit simultaneously, so the maximum rate of MPE is

$$0.0000000204 + 0.334555985 = 0.3345560054 < 1$$

According to MPE test Exclusion condition in KDB 447498 (D01) General RF Exposure Guidance D01 v06, the MPE report is not required.

Test Location:

Intertek Testing Services Shenzhen Ltd. Guangzhou Branch

All tests were performed at:

Room102/104, No 203, KeZhu Road, Science City, GETDD Guangzhou, China