

1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 General Information

Client Information

Applicant: Shenzhen Mindray Bio-Medical Electronics Co., Ltd
Address of applicant: Mindray Building, Keji 12th Road South, High-tech Industrial Park, Nanshan, Shenzhen 518057, PEOPLE'S REPUBLIC OF CHINA

Manufacturer: Shenzhen Mindray Bio-Medical Electronics Co., Ltd.
Address of manufacturer: 1203 Nanhuan Avenue, Guangming District, Shenzhen, PEOPLE'S REPUBLIC OF CHINA

General Description of EUT:

Product Name: wireless module
Trade Name: /
Model No.: Wlink
Adding Model(s): /
Rated Voltage: DC3.3V
Software Version: V1.0
Hardware Version: V1.0
FCC ID: ZLZ-WLINK
Equipment Type: Fixed or Mobile

Technical Characteristics of EUT:

Wi-Fi(2.4G)

Support Standards: 802.11b, 802.11g, 802.11n-HT20
Frequency Range: 2412-2462MHz for 802.11b/g/n-HT20
RF Output Power: 16.91dBm (Conducted)
Type of Modulation: DBPSK,BPSK,DQPSK,QPSK,16QAM,64QAM
Data Rate: 1-11Mbps, 6-54Mbps, up to72.2Mbps
Quantity of Channels: 11 for 802.11b/g/n-HT20
Channel Separation: 5MHz

ANT 1: FPC dipole
ANT 2: FPC dipole
ANT 3: FPC dipole
Type of Antenna: ANT 4: Copper pipe dipole
ANT 5: Copper pipe dipole
ANT 6: FPC PIFA
ANT 7: FPC PIFA

Antenna Gain: ANT 1: 2.79dBi,
ANT 2: 2.79dBi

ANT 3: 2.6dBi ,
 ANT 4 :1.32dBi
 ANT 5 :1.87dBi,
 ANT 6 :1dBi
 ANT 7 :1.56dBi

Wi-Fi(5G)

Support Standards: 802.11a, 802.11n(HT20), 802.11n-HT40
 Frequency Range: 5180-5240MHz, 5260-5320MHz, 5500-5700MHz,
 5745-5825MHz
 RF Output Power: 12.70dBm (Conducted)
 Type of Modulation: BPSK, QPSK,16QAM,64QAM
 Data Rate: 6-54Mbps, up to 150Mbps

Type of Antenna: ANT 1: FPC dipole
 ANT 2: FPC dipole
 ANT 3: FPC dipole
 ANT 4: Copper pipe dipole
 ANT 5: Copper pipe dipole
 ANT 6: FPC PIFA
 ANT 7: FPC PIFA

Antenna Gain: ANT 1: 3.38dBi
 ANT 2: 3.38dBi
 ANT 3: 3.1dBi
 ANT 4: 2.75dBi
 ANT 5: 0.94dBi
 ANT 6: 1dBi
 ANT 7: 4.17dBi

1.2 Standard Applicable

According to § 1.1307(b)(1) and KDB 447498 D01 General RF Exposure Guidance v06, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

(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)*	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)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100000	/	/	1	30

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

1.3 MPE Calculation Method

$$S = (30 * P * G) / (377 * R^2)$$

S = 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 (in appropriate units, e.g., cm)

1.4 MPE Calculation Result

For Wi-Fi (2.4G)

Maximum Tune-Up output power: 17(dBm)

Maximum peak output power at antenna input terminal: 50.12 (mW)

Prediction distance: >20(cm)

Prediction frequency: 2412 (MHz)

Antenna gain (max): 2.79 (dBi)

Directional gain (numeric gain): 1.90

The worst case is power density at prediction frequency at 20cm: 0.0190 (mw/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm²)

For Wi-Fi (5G)

Maximum Tune-Up output power: 13(dBm)

Maximum peak output power at antenna input terminal: 19.95 (mW)

Prediction distance: >20(cm)

Prediction frequency: 5670(MHz)

Antenna gain (max): 4.17 (dBi)

Directional gain (numeric gain): 2.61

The worst case is power density at prediction frequency at 20cm: 0.0104 (mw/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm²)

Result: Pass