

1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 General Information

Client Information

Applicant: Shenzhen RF-Link Technology Co.,Ltd
Address of applicant: Bldg56A,6/F,Baotian Rd3, Xixiang Town,Baoan District, ShenZhen, China

Manufacturer: Shenzhen RF-Link Technology Co.,Ltd
Address of manufacturer: Bldg56A,6/F,Baotian Rd3, Xixiang Town,Baoan District, ShenZhen, China

General Description of EUT:

Product Name: WIFI+BT module
Trade Name: RF-LINK
Model No.: RL-EM02G-8821CE
Adding Model(s): /
FCC ID: 2AGQ3-8821
Rated Voltage: DC 3.3V

Technical Characteristics of EUT:

BT-EDR

Bluetooth Version: V4.2 (BR/EDR mode)
Frequency Range: 2402-2480MHz
RF Output Power: -3.46dBm (Conducted)
Data Rate: 1Mbps, 2Mbps, 3Mbps
Modulation: GFSK, Pi/4 QDPSK, 8DPSK
Quantity of Channels: 79
Channel Separation: 1MHz

BT-BLE

Bluetooth Version: V4.2 (BLE mode)
Frequency Range: 2402-2480MHz
RF Output Power: 4.53dBm (Conducted)
Data Rate: 1Mbps
Modulation: GFSK
Quantity of Channels: 40
Channel Separation: 2MHz
Type of Antenna: Integral
Antenna Gain: 2dBi

2.4G WIFI

Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/g/n-HT20 2422-2452MHz for 802.11n-HT40
RF Output Power:	21.71dBm (Conducted)
Type of Modulation:	DBPSK,BPSK,DQPSK,QPSK,16QAM,64QAM
Quantity of Channels:	11 for 802.11b/g/n-HT20 7 for 802.11n-HT40
Channel Separation:	5MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	2dBi

5G WIFI

Support Standards:	802.11a, 802.11n(HT20), 802.11n(HT40), 802.11ac(HT20), 802.11ac(HT40), 802.11ac(VHT80)
Frequency Range:	5150-5250MHz, 5250-5350MHz, 5470-5725MHz, 5725-5850MHz
RF Output Power:	10.52dBm (Conducted)
Type of Modulation:	BPSK, QPSK,16QAM,64QAM, 256QAM
Quantity of Channels:	15
Type of Antenna:	Integral Antenna
Antenna Gain:	2dBi

Note 2: The test data is gathered from a production sample provided by the manufacturer.

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

Maximum output power: 21.71(dBm) at 802.11b

Maximum peak output power at antenna input terminal: 148.59(mW)

Prediction distance: >20(cm)

Prediction frequency: 2412 (MHz)

Antenna gain: 2 (dBi)

Directional gain (numeric gain): 1.58

The worst case is power density at prediction frequency at 20cm: 0.05(mw/cm²)

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

Result: Pass