

MPE ESTIMATION
FCC ID: 2BBFCGM03

1, Limit for General Population/ Uncontrolled Exposures

Frequency	Power density (mW/ cm ²)	Averaging time(minutes)
300MHz---1.5GHz	F/1500	30
1.5GHz---100GHz	1.0	30

2, Estimation Result

BW236:

Mode	Max PK Output power(dBm)	Tune Up Power(dBm)	Max Tune Up power(mW)	Antenna Gain(dBi)	Antenna Gain (linear)	MPE (mW/cm ²)
BLE	5.04	5±1(6)	3.98	3.36	2.17	0.00172
2.4GWIFI	13.86	13±1(14)	25.12	3.36	2.17	0.01085
5.2GWIFI	9.53	9±1(10)	10	2.25	1.68	0.00334
5.8GWIFI	5.55	5±1(6)	3.98	2.17	1.65	0.00131

$$Pd = \frac{Pout * G}{4\pi r^2}$$

| Note:

Note: The estimation distance is 20cm

The device could not transmit simultaneously in BT and 2.4G and 5G

Note: PK Output power= conducted power.

Conducted power see the test report DL-240604009-2ER/5ER/6ER/7ER.

ESP32:

Mode	Max PK Output power(dBm)	Tune Up Power(dBm)	Max Tune Up power(mW)	Antenna Gain(dBi)	Antenna Gain (linear)	MPE (mW/cm ²)
EDR	8.58	8±1(9)	7.94	3.36	2.17	0.00343
BLE	8.74	8±1(9)	7.94	3.36	2.17	0.00343
2.4GWIFI	15.45	15±1(16)	39.81	3.36	2.17	0.01720
$Pd = \frac{P_{out} * G}{4\pi r^2}$;						
Note:						
Note: The estimation distance is 20cm						
The device could not transmit simultaneously in BT and 2.4G						
Note: PK Output power= conducted power.						
Conducted power see the test report DL-240604009-1ER/3ER/4ER.						

ESP32MPE max (2.4WiFi) and BW236MPE max (2.4WiFi) Simultaneous evaluation:

$$0.01720 + 0.01085 = 0.02805 < 1$$

When the minimum test separation distance is >20 cm, a distance of 20 cm is applied to determine RF Exposure test exclusion. The test exclusion threshold is 0.02805 mW/cm² which is < 1.0mW/cm², RF Exposure testing is not required.

433.917MHz:

$$\text{EIRP(dBm)} = 76.52 \text{ (dBuV/m)} - 95.3 = -18.78 \text{ (dBm)}$$

Mode	Max PK Output power(dBm)	Tune Up Power(dBm)	Max Tune Up power(mW)	Antenna Gain(dBi)	Antenna Gain (linear)	MPE (mW/cm ²)
433	-18.78	-19±1(-18)	0.02	3	2	0.00001

$$P_d = \frac{P_{out} * G}{4\pi r^2}$$
 ;

Note:

Note: The estimation distance is 20cm

Note: PK Output power= conducted power.

Conducted power see the test report DL-240604009-9ER.

ESP32MPE max (2.4WiFi) and BW236MPE max (2.4WiFi) and SRD Simultaneous evaluation:

$$0.01720 + 0.01085 + 0.00001 / 0.289 = 0.02808 < 1$$

When the minimum test separation distance is >20 cm, a distance of 20 cm is applied to determine RF Exposure test exclusion. The test exclusion threshold is 0.02808 mW/cm² which is < 1.0mW/cm², RF Exposure testing is not required.

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