



MPE ESTIMATION

Test report
On Behalf of
EMBUX Technology Co. Ltd.
For
Industrial dual band Wi-Fi radio module
Model No.: MWF220HDB

FCC ID: 2AVW3-MWF220HDB

Prepared for : **EMBUX Technology Co. Ltd.**

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Date of Test: **Jan. 11, 2020 ~ Mar. 03, 2020**

Date of Report: **Mar. 03, 2020**

Report Number: **HK2002260224-5E**

**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

Note: F= Frequency in MHz

2, Estimation Result**For antenna 1:****2.4G WIFI**

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)
11b	18.93	18±1(19)	79.43	4.5	2.8184	0.04456
11g	18.84	18±1(19)	79.43	4.5	2.8184	0.04456
11n/HT20	18.76	18±1(19)	79.43	4.5	2.8184	0.04456
11n/HT40	18.32	18±1(19)	79.43	4.5	2.8184	0.04456

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

Note:

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-1E, antenna port 1 gain=4.5dBi, antenna port 2 gain=4.5dBi, MIMO gain=7.510dBi

**5.2G WIFI**

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)
11a	19.78	19±1(20)	100.00	7	5.0119	0.09976
11n(HT20)	16.88	16±1(17)	50.12	7	5.0119	0.05000
11n(HT40)	15.78	15±1(16)	39.81	7	5.0119	0.03971
$Pd = \frac{P_{out} * G}{4\pi r^2};$						
Note:						
Note: The estimation distance is 20cm						
Note: PK Output power= conducted power. Conducted power see the test report HK2002260224-2E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi,MIMO gain=10.01dBi						

5.3G WIFI

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)
11a	19.74	19±1(20)	100.00	7	5.0119	0.09976
11n(HT20)	16.76	16±1(17)	50.12	7	5.0119	0.05000
11n(HT40)	15.66	15±1(16)	39.81	7	5.0119	0.03971
$Pd = \frac{P_{out} * G}{4\pi r^2};$						
Note:						
Note: The estimation distance is 20cm						
Note: PK Output power= conducted power. Conducted power see the test report HK2002260224-2E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi,MIMO gain=10.01dBi						

5.6G WIFI

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)
11a	19.72	19±1(20)	100.0000	7	5.0119	0.09976
11n(HT20)	16.69	16±1(17)	50.12	7	5.0119	0.05000



11n(HT40)	15.69	15±1(16)	39.81	7	5.0119	0.03971
$Pd = \frac{P_{out} * G}{4\pi r^2};$						
Note:						
Note: The estimation distance is 20cm						
Note:						
PK Output power= conducted power.						
Conducted power see the test report HK2002260224-2E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi,MIMO gain=10.01dBi						

5.8G WIFI

Mode	Max PK Output power(dBm)	Tune Up Power(dBm)	Max Tune Up power(mW)	Antenna Gain(dBi)	Antenna Gain (linear)	MPE (mW/cm²)
11a	18.64	18±1(19)	79.4328	7	5.0119	0.07924
11n(HT20)	18.95	18±1(19)	79.4328	7	5.0119	0.07924
11n(HT40)	18.74	18±1(19)	79.4328	7	5.0119	0.07924

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

Note:

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-3E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi,MIMO gain=10.01dBi

**For antenna 2:****2.4G WIFI**

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)
11b	18.54	18±1(19)	79.43	4.5	2.8184	0.04456
11g	18.87	18±1(19)	79.43	4.5	2.8184	0.04456
11n/HT20	18.77	18±1(19)	79.43	4.5	2.8184	0.04456
11n/HT40	18.88	18±1(19)	79.43	4.5	2.8184	0.04456

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

Note:

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-1E, antenna port 1 gain=4.5dBi, antenna port 2 gain=4.5dBi, MIMO gain=7.510dBi

5.2G WIFI

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)
11a	19.85	19±1(20)	100.0000	7	5.0119	0.09976
11n(HT20)	16.72	16±1(17)	50.12	7	5.0119	0.05000
11n(HT40)	15.67	15±1(16)	39.81	7	5.0119	0.03971

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

Note:

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-2E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi, MIMO gain=10.01dBi

**5.3G WIFI**

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)
11a	19.74	19±1(20)	100.0000	7	5.0119	0.09976
11n(HT20)	16.67	16±1(17)	50.12	7	5.0119	0.05000
11n(HT40)	15.74	15±1(16)	39.81	7	5.0119	0.03971

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

Note:

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-2E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi, MIMO gain=10.01dBi

5.6G WIFI

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)
11a	19.63	19±1(20)	100.00	7	5.0119	0.09976
11n(HT20)	16.74	16±1(17)	50.12	7	5.0119	0.05000
11n(HT40)	15.78	15±1(16)	39.81	7	5.0119	0.03971

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

Note:

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-2E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi, MIMO gain=10.01dBi

**5.8G WIFI**

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)
11a	18.31	18±1(19)	79.4328	7	5.0119	0.07924
11n(HT20)	18.65	18±1(19)	79.4328	7	5.0119	0.07924
11n(HT40)	18.27	18±1(19)	79.4328	7	5.0119	0.07924

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

Note:

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-3E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi, MIMO gain=10.01dBi

For MIMO:**2.4G WIFI**

Mode	MPE (mW/cm ²)
11n/HT20	0.08912
11n/HT40	0.08912

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-1E, antenna port 1 gain=1dBi, antenna port 2 gain=1dBi, MIMO gain=4.01dBi

5.2G WIFI

Mode	MPE (mW/cm ²)
11n(HT20)	0.10000
11n(HT40)	0.07942

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.



Conducted power see the test report HK2002260224-2E, antenna port 1 gain=4.5dBi, antenna port 2 gain=4.5dBi, MIMO gain=7.510dBi

5.3G WIFI

Mode	MPE (mW/cm ²)
11n(HT20)	0.10000
11n(HT40)	0.07942

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-2E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi, MIMO gain=10.01dBi

5.6G WIFI

Mode	MPE (mW/cm ²)
11n(HT20)	0.10000
11n(HT40)	0.07942

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-2E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi, MIMO gain=10.01dBi

5.8G WIFI

Mode	MPE (mW/cm ²)
11n(HT20)	0.15848
11n(HT40)	0.15848

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

Note:

Note: The estimation distance is 20cm

Note:

PK Output power= conducted power.

Conducted power see the test report HK2002260224-3E, antenna port 1 gain=7dBi, antenna port 2 gain=7dBi, MIMO gain=10.01dBi



simultaneously MPE

2.4G WIFI MPE_(max) = 0.08912(mW/cm²)

5G WIFI MPE_(max) = 0.15848 (mW/cm²)

simultaneously MPE=0.08912+0.15848=0.2476(mW/cm²)

when the minimum test separation distance is >20 cm, a distance of 20 cm is applied to determine SAR test exclusion. The test exclusion threshold is 0.2476mW/cm² which is < 1.0mW/cm², SAR testing is not required.

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