

# FCC ID: 2AL6KBL-M8733BS2

## Maximum Permissible Exposure (MPE)

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz \* = Plane-wave equivalent power density

## MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average 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

$$Pd = \frac{30 * P * G}{377 * D^2}$$

From the 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.

BT:

**Measurement Result**

Operation Frequency: 2402MHz~2480MHz

Power density limited: 1mW/ cm<sup>2</sup>

Antenna Type: ANT1:FPC Antenna, ANT2: FPC Antenna

Antenna gain: ANT1: 1.7dBi, ANT2: 2.3dBi

R=20cm

$mW=10^{(dBm/10)}$

Max antenna gain Numeric= $10^{(dBi/10)}=10^{(2.3/10)}=1.70$

**BR EDR**

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK	5.41	5±1	6	3.981	2.30	1.70	0.0013	1
2441		5.46	5±1	6	3.981	2.30	1.70	0.0013	1
2480		4.77	5±1	6	3.981	2.30	1.70	0.0013	1
2402	π/4-DQPSK	7.51	7±1	8	6.310	2.30	1.70	0.0021	1
2441		7.17	7±1	8	6.310	2.30	1.70	0.0021	1
2480		6.46	7±1	8	6.310	2.30	1.70	0.0021	1
2402	8-DPSK	7.9	7±1	8	6.310	2.30	1.70	0.0021	1
2441		7.68	7±1	8	6.310	2.30	1.70	0.0021	1
2480		6.91	7±1	8	6.310	2.30	1.70	0.0021	1

**BLE**

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK(1M)	7.66	7±1	8	6.310	2.30	1.70	0.0021	1
2440		7.29	7±1	8	6.310	2.30	1.70	0.0021	1
2480		6.58	7±1	8	6.310	2.30	1.70	0.0021	1

## 2.4G WIFI:

Operation Frequency: WIFI 802.11b/g/n HT20: 2412-2462MHz,

WIFI 802.11n HT40:2422-2452MHz

Power density limited:  $1\text{mW}/\text{cm}^2$

Antenna Type: ANT1: FPC Antenna, ANT2: FPC Antenna

Antenna gain: ANT1: 1.7dBi, ANT2: 2.3dBi

R=20cm

$\text{mW}=10^{(\text{dBm}/10)}$

Max antenna gain Numeric= $10^{(\text{dBi}/10)}=10^{(2.3/10)}=1.70$

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm <sup>2</sup> )	Power density (mW/cm <sup>2</sup> )
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2412	802.11b	18.65	19±1	20	100.000	2.30	1.70	0.0338	1
2437		19.45	19±1	20	100.000	2.30	1.70	0.0338	1
2462		19.22	19±1	20	100.000	2.30	1.70	0.0338	1
2412	802.11g	17.83	18±1	19	79.433	2.30	1.70	0.0268	1
2437		17.89	18±1	19	79.433	2.30	1.70	0.0268	1
2462		18.01	18±1	19	79.433	2.30	1.70	0.0268	1
2412	802.11n H20	17.68	18±1	19	79.433	2.30	1.70	0.0268	1
2437		17.82	18±1	19	79.433	2.30	1.70	0.0268	1
2462		17.67	18±1	19	79.433	2.30	1.70	0.0268	1
2422	802.11n(H T40)	17.42	18±1	19	79.433	2.30	1.70	0.0268	1
2437		17.15	18±1	19	79.433	2.30	1.70	0.0268	1
2452		17.22	18±1	19	79.433	2.30	1.70	0.0268	1

## 5G WIFI:

Operation Frequency: WIFI 802.11a/ac/n(HT20): 5180-5240MHz; 5745-5825MHz;

WIFI 802.11ac/n(HT40): 5190-5230MHz;5755-5795MHz;

WIFI 802.11ac80:5210-5210MHz;5775-5775MHz

Power density limited: 1mW/cm

Antenna Type: ANT1:FPC Antenna, ANT2: FPC Antenna

Antenna gain: ANT 1 Gain:

WIFI 5.2G:-0.3dBi, WIFI 5.3G:1.6dBi, WiFi5.6G: 1.9dBi, WIFI 5.8G: 1.9dBi ;

ANT 2Gain:

WIFI 5.2G:0.9dBi, WIFI 5.3G:1.5dBi, WiFi5.6G 2.8dBi: WIFI 5.8G: 2.3dBi

R=20cm

$mW=10^{(dBi/10)}$

5.2 Max antenna gain Numeric= $10^{(dBi/10)}=10^{(0.9/10)}=1.23$

5.3 Max antenna gain Numeric= $10^{(dBi/10)}=10^{(1.6/10)}=1.45$

5.6 Max antenna gain Numeric= $10^{(dBi/10)}=10^{(2.8/10)}=1.91$

5.8 Max antenna gain Numeric= $10^{(dBi/10)}=10^{(2.3/10)}=1.70$

### 5.2G

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm <sup>2</sup> )	Power density (mW/cm <sup>2</sup> )
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5180	a	18.19	18±1	19	79.433	0.90	1.23	0.0194	1
5200	a	18.92	18±1	19	79.433	0.90	1.23	0.0194	1
5240	a	18.9	18±1	19	79.433	0.90	1.23	0.0194	1
5180	n20	17.95	18±1	19	79.433	0.90	1.23	0.0194	1
5200	n20	18.79	18±1	19	79.433	0.90	1.23	0.0194	1
5240	n20	18.6	18±1	19	79.433	0.90	1.23	0.0194	1
5190	n40	17.01	18±1	19	79.433	0.90	1.23	0.0194	1
5230	n40	17.23	18±1	19	79.433	0.90	1.23	0.0194	1

### 5.3G

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm <sup>2</sup> )	Power density (mW/cm <sup>2</sup> )
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5260	a	17.56	17±1	18	63.096	1.60	1.45	0.0181	1
5280	a	17.62	17±1	18	63.096	1.60	1.45	0.0181	1
5320	a	17.85	17±1	18	63.096	1.60	1.45	0.0181	1
5260	n20	17.43	17±1	18	63.096	1.60	1.45	0.0181	1
5280	n20	17.4	17±1	18	63.096	1.60	1.45	0.0181	1
5320	n20	17.78	17±1	18	63.096	1.60	1.45	0.0181	1
5270	n40	14.79	15±1	16	39.811	1.60	1.45	0.0114	1
5310	n40	14.84	15±1	16	39.811	1.60	1.45	0.0114	1

### 5.6G

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm <sup>2</sup> )	Power density (mW/cm <sup>2</sup> )
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5500	a	17.89	17±1	18	63.096	2.80	1.91	0.0239	1
5600	a	17.95	17±1	18	63.096	2.80	1.91	0.0239	1
5700	a	17.92	17±1	18	63.096	2.80	1.91	0.0239	1
5500	n20	17.38	17±1	18	63.096	2.80	1.91	0.0239	1
5600	n20	17.17	17±1	18	63.096	2.80	1.91	0.0239	1
5700	n20	17.43	17±1	18	63.096	2.80	1.91	0.0239	1
5510	n40	16.62	17±1	18	63.096	2.80	1.91	0.0239	1
5590	n40	16.62	17±1	18	63.096	2.80	1.91	0.0239	1
5670	n40	17.78	17±1	18	63.096	2.80	1.91	0.0239	1

5.8G

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm2 )	Power density (mW/cm2)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5500	a	17.89	17±1	18	63.096	2.30	1.70	0.0213	1
5600	a	17.95	17±1	18	63.096	2.30	1.70	0.0213	1
5700	a	17.92	17±1	18	63.096	2.30	1.70	0.0213	1
5500	n20	17.38	17±1	18	63.096	2.30	1.70	0.0213	1
5600	n20	17.17	17±1	18	63.096	2.30	1.70	0.0213	1
5700	n20	17.43	17±1	18	63.096	2.30	1.70	0.0213	1
5510	n40	16.62	16±1	17	50.119	2.30	1.70	0.0169	1
5590	n40	16.62	16±1	17	50.119	2.30	1.70	0.0169	1

**SIMULTANEOUS TRANSMISSIONS**

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE. To comply with the MPE, the fraction of the MPE in terms of E<sup>2</sup>, H<sup>2</sup> (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity. In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

**Max. SIMULTANEOUS TRANSMISSIONS MODE**

Band						Evaluation result	Power density Limits	Verdict
	Max conducted Power	Antenna	Separation distance (cm)	Evaluation result	Power density Limits			
	(dBm)	Gain (dBi)		(mW/cm2)	(mW/cm2)			
Wi-Fi 2.4G + BT	19.45	2.3	20	0.0774	1	0.152666	1	PASS
	18.92	0.9	20	0.0753	1			

**Signature:**  
**Date:** 2024-11-08



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