

FCC ID: 2AMKM-OLIO

RF EXPOSURE EVALUATION

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 ²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

11.1 Friis transmission formula: $P_d = \frac{P_{out} * G}{4 * \pi * R^2}$

Where

P_d = Power density in mW/cm²

P_{out} = output power to antenna in mW

G = Numeric gain of the antenna relative to isotropic antenna

π = 3.1416

R = distance between observation point and center of the radiator in cm(20cm)

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

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

Note: The product has only one antenna, does not support the simultaneous transmission mode.

11.2 Measurement Result

Operation Frequency: 2402MHz~2480MHz

Power density limited: 1mW/ cm²

Antenna Type: PIFA Antenna

Antenna gain: 1.28dBi,

R=20cm

mW=10^(dBm/10)

BR+EDR:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	DH5	4.902	5±1	6	3.981	1.28	1.34	0.0011	1
2441		6.416	6±1	7	5.012	1.28	1.34	0.0013	1
2480		6.629	6±1	7	5.012	1.28	1.34	0.0013	1
2402	2DH5	4.262	5±1	6	3.981	1.28	1.34	0.0011	1
2441		5.788	6±1	7	5.012	1.28	1.34	0.0013	1
2480		5.888	6±1	7	5.012	1.28	1.34	0.0013	1
2402	3DH5	4.565	5±1	6	3.981	1.28	1.34	0.0011	1
2441		6.031	6±1	7	5.012	1.28	1.34	0.0013	1
2480		6.115	6±1	7	5.012	1.28	1.34	0.0013	1

BLE 1M:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK	3.986	4.5±1	5.5	3.548	1.28	1.34	0.0009	1
2440		5.41	4.5±1	5.5	3.548	1.28	1.34	0.0009	1
2480		5.459	4.5±1	5.5	3.548	1.28	1.34	0.0009	1

BLE 2M:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK	4.07	5±1	6	3.981	1.28	1.34	0.0011	1
2440		5.461	5±1	6	3.981	1.28	1.34	0.0011	1
2480		5.548	5±1	6	3.981	1.28	1.34	0.0011	1

Operation Frequency: 2412MHz~2462MHz

Power density limited: 1mW/ cm²

Antenna Type: PIFA Antenna

Antenna gain: 1.28dBi

R=20cm

mW=10^(dBm/10)

2.4G WIFI:

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2412	802.11b	14.24	14±1	15	31.623	1.28	1.34	0.0084	1
2437		14.65	14±1	15	31.623	1.28	1.34	0.0084	1
2462		13.99	14±1	15	31.623	1.28	1.34	0.0084	1
2412	802.11g	13.43	14±1	15	31.623	1.28	1.34	0.0084	1
2437		13.77	14±1	15	31.623	1.28	1.34	0.0084	1
2462		13.6	14±1	15	31.623	1.28	1.34	0.0084	1
2412	802.11n H20	12.79	13±1	14	25.119	1.28	1.34	0.0067	1
2437		13.15	13±1	14	25.119	1.28	1.34	0.0067	1
2462		12.8	13±1	14	25.119	1.28	1.34	0.0067	1

Operation Frequency: WIFI 802.11a/ac/n(HT20): 5180-5240MHz;5260-5320MHz,5500-5700MHz,5745-5825MHz;WIFI 802.11ac/n(HT40): 5190-5230MHz;5270-5310MHz,5510-5670MHz5755-5795MHz; WIFI 802.11ac80:5210-5210MHz;5290-5290MHz;5530-5610MHz; 5775-5775MHz

Power density limited: 1mW/ cm²

Antenna Type: PIFA Antenna

Antenna gain: 3.11dBi

R=20cm

mW=10^(dBm/10)

5.2G WIFI:

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5180	802.11a	10.108	10±1	11	12.589	3.11	2.05	0.0051	1
5200		10.048	10±1	11	12.589	3.11	2.05	0.0051	1
5240		10.12	10±1	11	12.589	3.11	2.05	0.0051	1
5180	802.11ac20	9.031	9±1	10	10.000	3.11	2.05	0.0041	1
5200		9.535	9±1	10	10.000	3.11	2.05	0.0041	1
5240		9.679	9±1	10	10.000	3.11	2.05	0.0041	1
5190	802.11ac40	8.447	8±1	9	7.943	3.11	2.05	0.0032	1
5230		8.619	8±1	9	7.943	3.11	2.05	0.0032	1
5210	802.11ac8	7.11	7±1	8	6.310	3.11	2.05	0.0026	1
5180	802.11n20	8.446	9±1	10	10.000	3.11	2.05	0.0041	1
5200		9.195	9±1	10	10.000	3.11	2.05	0.0041	1
5240		9.602	9±1	10	10.000	3.11	2.05	0.0041	1
5190	802.11n40	8.254	8±1	9	7.943	3.11	2.05	0.0032	1
5230		8.574	8±1	9	7.943	3.11	2.05	0.0032	1

5.3G WIFI:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5260	802.11a	9.695	9±1	10	10.000	3.11	2.05	0.0041	1
5280		9.893	9±1	10	10.000	3.11	2.05	0.0041	1
5320		9.88	9±1	10	10.000	3.11	2.05	0.0041	1
5260	802.11ac20	8.583	8±1	9	7.943	3.11	2.05	0.0032	1
5280		8.276	8±1	9	7.943	3.11	2.05	0.0032	1
5320		8.446	8±1	9	7.943	3.11	2.05	0.0032	1
5270	802.11ac40	8.407	8±1	9	7.943	3.11	2.05	0.0032	1
5310		8.646	8±1	9	7.943	3.11	2.05	0.0032	1
5290	802.11ac8	8.063	8±1	9	7.943	3.11	2.05	0.0032	1
5260	802.11n20	8.69	8±1	9	7.943	3.11	2.05	0.0032	1
5280		8.398	8±1	9	7.943	3.11	2.05	0.0032	1
5320		8.434	8±1	9	7.943	3.11	2.05	0.0032	1
5270	802.11n40	8.428	8±1	9	7.943	3.11	2.05	0.0032	1
5310		8.697	8±1	9	7.943	3.11	2.05	0.0032	1

5.6G WIFI:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5500	802.11a	10.715	10±1	11	12.589	3.11	2.05	0.0051	1
5600		9.902	9±1	10	10.000	3.11	2.05	0.0041	1
5700		9.046	9±1	10	10.000	3.11	2.05	0.0041	1
5500	802.11ac20	10.214	10±1	11	12.589	3.11	2.05	0.0051	1
5600		9.377	9±1	10	10.000	3.11	2.05	0.0041	1
5700		8.431	9±1	10	10.000	3.11	2.05	0.0041	1
5510	802.11ac40	9.091	9±1	10	10.000	3.11	2.05	0.0041	1
5590		8.333	8±1	9	7.943	3.11	2.05	0.0032	1
5670		7.747	8±1	9	7.943	3.11	2.05	0.0032	1
5530	802.11ac80	7.881	7±1	8	6.310	3.11	2.05	0.0026	1
5610		7.816	7±1	8	6.310	3.11	2.05	0.0026	1
5500	802.11n20	9.432	9±1	10	10.000	3.11	2.05	0.0041	1
5600		8.446	8±1	9	7.943	3.11	2.05	0.0032	1
5700		7.486	8±1	9	7.943	3.11	2.05	0.0032	1

5.8G WIFI:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5745	802.11a	10.135	10±1	11	12.589	3.11	2.05	0.0051	1
5785		10.036	10±1	11	12.589	3.11	2.05	0.0051	1
5825		10.57	10±1	11	12.589	3.11	2.05	0.0051	1
5745	802.11ac20	8.514	9±1	10	10.000	3.11	2.05	0.0041	1
5785		8.38	9±1	10	10.000	3.11	2.05	0.0041	1
5825		9.135	9±1	10	10.000	3.11	2.05	0.0041	1
5755	802.11ac40	7.344	7±1	8	6.310	3.11	2.05	0.0026	1
5795		7.373	7±1	8	6.310	3.11	2.05	0.0026	1
5775	802.11ac8	7.552	7±1	8	6.310	3.11	2.05	0.0026	1
5745	802.11n20	8.672	8±1	9	7.943	3.11	2.05	0.0032	1
5785		8.343	8±1	9	7.943	3.11	2.05	0.0032	1
5825		8.825	8±1	9	7.943	3.11	2.05	0.0032	1
5755	802.11n40	7.574	7±1	8	6.310	3.11	2.05	0.0026	1
5795		7.515	7±1	8	6.310	3.11	2.05	0.0026	1

Conclusion:

For the max result : $0.0084 \leq 1\text{mW}/\text{cm}^2$ for Power density, compliance with RF exposure.



Signature:

Date: 2021-11-02

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