



Maximum Permissible Exposure Report

1. Product Information

FCC ID:	2A52YMK7E
Product name	WiFi Pineapple
Test Model	MK7E
Power supply	Input: AC 100-240V, 50/60Hz
Operation frequency	2412MHz-2462MHz 5180MHz-5240MHz 5745MHz-5825MHz
Antenna Type	2.4G WIFI: External Antenna 5G WIFI: External Antenna
Antenna Gain	5.0dBi(Max)
Hardware version	V1.0
Software version	V1.0
Channel Number	11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz) 4 channels for 20MHz bandwidth (5180-5240MHz) 2 channels for 40MHz bandwidth (5190~5230MHz) 1 channels for 80MHz bandwidth (5210MHz) 5 channels for 20MHz bandwidth(5745-5825MHz) 2 channels for 40MHz bandwidth(5755~5795MHz) 1 channels for 80MHz bandwidth(5775MHz)
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile Devices

2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.



3. Limit

3.1 Refer Evaluation Method

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: Mobile Devices

3.2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f ²)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f ²)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

4. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

5. Antenna Information

EUT can only use antennas certificated as follows provided by manufacturer;

Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Notes
Antenna 0: External Antenna Antenna 1: External Antenna Antenna 2: External Antenna Antenna 3: External Antenna	2412MHz-2462MHz	5 dBi	2.4G WiFi Antenna
Antenna 4: External Antenna Antenna 5: External Antenna Antenna 6: External Antenna Antenna 7: External Antenna	5180MHz-5240MHz 5745MHz-5825MHz	5 dBi	5G WiFi Antenna



6. Conducted Power

[2.4GWIFI Max Conducted Power]

Mode	Channel	Frequency (MHz)	ANT 0 Conducted Power(dBm)	ANT 1 Conducted Power(dBm)	ANT 2 Conducted Power(dBm)	ANT 3 Conducted Power(dBm)
11B	1	2412	9.68	9.35	9.26	9.28
	6	2437	9.41	9.57	9.51	9.46
	11	2462	9.77	9.72	9.64	9.59
11G	1	2412	9.31	9.53	9.47	9.42
	6	2437	9.63	9.84	9.73	9.79
	11	2462	9.27	9.42	9.33	9.34
11N20	1	2412	7.62	7.84	7.77	7.91
	6	2437	7.97	7.64	7.61	7.89
	11	2462	7.49	7.67	7.62	7.65
11N40	3	2422	7.13	7.30	7.25	7.27
	6	2437	7.86	7.97	7.43	7.47
	9	2452	7.54	7.61	7.15	7.13

[2.4GWIFI Max Conducted Power] ANT 0+ANT 1+ANT 2+ANT 3

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
11N20MIMO	1	2412	13.81
	6	2437	13.80
	11	2462	13.63
11N40MIMO	3	2422	13.26
	6	2437	13.71
	9	2452	13.38



[5.2GWIFI Max Conducted Power]

Mode	Channel	Frequency (MHz)	ANT 4 Conducted Power(dBm)	ANT 5 Conducted Power(dBm)	ANT 6 Conducted Power(dBm)	ANT 7 Conducted Power(dBm)
11A	36	5180	7.81	7.90	7.89	7.93
	40	5200	7.36	7.33	7.34	7.27
	48	5240	7.19	7.17	7.11	7.13
11N20	36	5180	7.63	7.98	7.89	7.93
	40	5200	7.41	7.38	7.36	7.33
	48	5240	7.90	7.89	7.88	7.87
11N40	38	5190	7.55	7.42	7.39	7.34
	46	5230	7.66	7.53	7.62	7.48
11AC20	36	5180	7.76	7.59	7.47	7.44
	40	5200	7.28	7.10	7.06	7.05
	48	5240	7.81	7.77	7.76	7.72
11AC40	38	5190	7.81	7.81	7.85	7.89
	46	5230	7.47	7.44	7.40	7.39
11AC80	42	5210	7.59	7.56	7.62	7.69

[5.2GWIFI Max Conducted Power] ANT 4+ANT 5+ANT 6+ANT 7

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
11N20 MIMO	36	5180	13.88
	40	5200	13.39
	48	5240	13.91
11N40 MIMO	38	5190	13.45
	46	5230	13.59
11AC20 MIMO	36	5180	13.59
	40	5200	13.14
	48	5240	13.79
11AC40 MIMO	38	5190	13.86
	46	5230	13.45
11AC80 MIMO	42	5210	13.64



[5.8WIFI Max Conducted Power]

Mode	Channel	Frequency (MHz)	ANT 4 Conducted Power(dBm)	ANT 5 Conducted Power(dBm)	ANT 6 Conducted Power(dBm)	ANT 7 Conducted Power(dBm)
11A	149	5745	7.65	7.50	7.51	7.53
	157	5785	7.79	7.72	7.63	7.62
	165	5825	7.67	7.51	7.47	7.48
11N20	149	5745	7.19	7.35	7.24	7.23
	157	5785	7.58	7.61	7.58	7.53
	165	5825	7.53	7.40	7.22	7.23
11N40	151	5755	7.67	7.63	7.64	7.64
	159	5795	7.55	7.55	7.57	7.56
11AC20	149	5745	7.42	7.40	7.40	7.40
	157	5785	7.62	7.64	7.65	7.67
	165	5825	7.37	7.39	7.35	7.40
11AC40	151	5755	7.88	7.88	7.89	7.88
	159	5795	7.72	7.65	7.65	7.66
11AC80	155	5775	7.44	7.30	7.45	7.45

[5.8WIFI Max Conducted Power] ANT 4+ANT 5+ANT 6+ANT 7

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
11N20 MIMO	149	5745	13.27
	157	5785	13.60
	165	5825	13.37
11N40 MIMO	151	5755	13.67
	159	5795	13.58
11AC20 MIMO	149	5745	13.43
	157	5785	13.67
	165	5825	13.40
11AC40 MIMO	151	5755	13.90
	159	5795	13.69
11AC80 MIMO	155	5775	13.43



7. Measurement Results

2.4GWIFI

11B SISO			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	9.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11G SISO			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	9.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20 MIMO			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13.0	13.0	13.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N40 MIMO			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	13.0	13.0	13.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0



5.2GWIFI

11A SISO			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	7.0	7.5	7.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20 MIMO			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.0	13.0	13.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N40 MIMO			
Channel	Channel 38	Channel 46	
Target (dBm)	13.0	13.0	
Tolerance $\pm$ (dB)	1.0	1.0	
11AC20 MIMO			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.0	13.0	13.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11AC40 MIMO			
Channel	Channel 38	Channel 46	
Target (dBm)	13.0	13.0	
Tolerance $\pm$ (dB)	1.0	1.0	
11AC80 MIMO			
Channel	Channel 42		
Target (dBm)	13.0		
Tolerance $\pm$ (dB)	1.0		



5.8GWIFI			
11A SISO			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	7.0	7.0	7.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20 MIMO			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	13.0	13.0	13.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N40 MIMO			
Channel	Channel 151	Channel 159	
Target (dBm)	13.0	13.0	
Tolerance $\pm$ (dB)	1.0	1.0	
11AC20 MIMO			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	13.0	13.0	13.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11AC40 MIMO			
Channel	Channel 151	Channel 159	
Target (dBm)	13.0	13.0	
Tolerance $\pm$ (dB)	1.0	1.0	
11AC80 MIMO			
Channel	Channel 155		
Target (dBm)	3.0		
Tolerance $\pm$ (dB)	1.0		



8. Evaluation Results

8.1 Standalone MPE Evaluation

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=20\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

2.4GWIFI

Band/Mode	RF output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
11b SISO	10.0	10.00	5.0	3.16	0.0063	1.0
11g SISO	10.0	10.00	5.0	3.16	0.0063	1.0
11n20 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0
11n40 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0

5.2GWIFI

Band/Mode	RF output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
11A SISO	8.0	6.31	5.0	3.16	0.0040	1.0
11N20 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0
11N40 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0
11AC20 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0
11AC40 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0
11AC80 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0

5.8GWIFI

Band/Mode	RF output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
11A SISO	8.0	6.31	5.0	3.16	0.0040	1.0
11N20 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0
11N40 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0
11AC20 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0
11AC40 MIMO	14.0	25.12	5.0	3.16	0.0158	1.0
11AC80 MIMO	14.0	25.12	5.0	3.16	0.0040	1.0



8.2 Simultaneous Transmission MPE

The sample supports 4 pcs 2.4G WIFI antennas and 4 pcs 5G WIFI antennas. So the 2.4G WIFI and 5G WIFI can transmit simultaneously and need consider simultaneous transmission;

Simultaneous transmission MPE

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

Σ of MPE ratios ≤ 1.0

Mode	Max MPE1 (mW/cm ²)	Max MPE2 (mW/cm ²)	Σ MPE ratios	Limit	Results
2.4GWIFI+5.2G WIFI	0.0158	0.0158	0.0316	1.0	Pass
2.4GWIFI+5.8G WIFI	0.0158	0.0158	0.0316	1.0	Pass

Remark:

1. Output power including turn-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;
3. MPE values = $PG/4\pi R^2$, MPE ratio = MPE values/ MPE limit

9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

-----THE END OF REPORT-----