

Maximum Permissible Exposure Report

Product Information

FCC ID:	2AF6CTC-HDMIWM
Product name	TC-HDMIWM
Model number	TC-HDMIWM
Power supply	DC 5V For Adapter
Modulation Type	IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11a: OFDM (64QAM, 16QAM,QPSK,BPSK) IEEE 802.11ac: OFDM (64QAM, 16QAM,QPSK,BPSK)
Antenna Type	Internal Antenna
Antenna Gain	5.00 dBi (maximum)
Hardware version	V1.0
Software version	V1.0
WLAN FCC Operation frequency	IEEE 802.11n HT20: 5150-5250MHz/5725-5825MHz IEEE 802.11n HT40: 5150-5250MHz/5725-5825MHz IEEE 802.11a: 5150-5250MHz/5725.00-5825.00MHz IEEE 802.11ac HT20: 5150-5250MHz/5725.00-5825.00MHz IEEE 802.11ac HT40: 5150-5250MHz/5725.00-5825.00MHz
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Fixed Device

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

E936 can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Antenna 0	Internal Antenna	2000 MHz – 2500 MHz	5.00 dBi

6. Conducted Power

Test Mode	Channel	Frequency (MHz)	Measured Peak Output Power (dBm)
IEEE 802.11a	36	5180	10.98
	44	5200	11.66
	48	5240	12.59
IEEE 802.11n HT20	36	5180	11.52
	44	5200	11.82
	48	5240	12.52
IEEE 802.11n HT40	38	5190	11.87
	46	5230	12.28
IEEE 802.11ac HT20	36	5180	12.71
	44	5200	12.18
	48	5240	12.59
IEEE 802.11ac HT40	38	5190	12.15
	46	5230	12.47
IEEE 802.11ac HT80	42	5210	9.58

Test Mode	Channel	Frequency (MHz)	Measured Peak Output Power (dBm)
IEEE 802.11a	149	5745	11.91
	157	5785	11.79
	165	5825	11.61
IEEE 802.11n HT20	149	5745	11.46
	157	5785	11.15
	165	5825	11.28
IEEE 802.11n HT40	151	5755	12.20
	159	5795	11.97
IEEE 802.11ac HT20	149	5745	11.37
	157	5785	12.10
	165	5825	11.94
IEEE 802.11ac HT40	151	5755	12.45
	159	5795	11.81
IEEE 802.11ac HT80	155	5775	4.92

7. Manufacturing Tolerance

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IEEE 802.11a			
Channel	Channel 36	Channel 44	Channel 48
Target (dBm)	11.0	11.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Peak)			
Channel	Channel 36	Channel 44	Channel 48
Target (dBm)	11.0	11.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Peak)			
Channel	Channel 38	Channel 46	
Target (dBm)	12.0	12.0	
Tolerance $\pm$ (dB)	1.0	1.0	
IEEE 802.11ac HT20 (Peak)			
Channel	Channel 36	Channel 44	Channel 48
Target (dBm)	12.0	12.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac HT40 (Peak)			
Channel	Channel 38	Channel 46	
Target (dBm)	12.0	12.0	
Tolerance $\pm$ (dB)	1.0	1.0	
IEEE 802.11ac HT80 (Peak)			
Channel	Channel 42		
Target (dBm)	9.0		
Tolerance $\pm$ (dB)	1.0		

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IEEE 802.11a			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Peak)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Peak)			
Channel	Channel 151	Channel 159	
Target (dBm)	12.0	12.0	
Tolerance $\pm$ (dB)	1.0	1.0	
IEEE 802.11ac HT20 (Peak)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	12.0	12.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac HT40 (Peak)			
Channel	Channel 151	Channel 159	
Target (dBm)	12.0	12.0	
Tolerance $\pm$ (dB)	1.0	1.0	
IEEE 802.11ac HT80 (Peak)			
Channel	Channel 155		
Target (dBm)	5.0		
Tolerance $\pm$ (dB)	1.0		

8. Measurement Results

8.1 Standalone MPE

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.

5.2G WLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
IEEE 802.11a	13	19.9526	5.000	3.1623	100%	0.0126	1.0000
IEEE 802.11n HT20	13	19.9526	5.000	3.1623	100%	0.0126	1.0000
IEEE 802.11n HT40	13	19.9526	5.000	3.1623	100%	0.0126	1.0000
IEEE 802.11ac HT20	13	19.9526	5.000	3.1623	100%	0.0126	1.0000
IEEE 802.11ac HT40	13	19.9526	5.000	3.1623	100%	0.0126	1.0000
IEEE 802.11ac HT80	10	10.0000	5.000	3.1623	100%	0.0063	1.0000

5.8G WLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
IEEE 802.11a	12	15.8489	5.000	3.1623	100%	0.0100	1.0000
IEEE 802.11n HT20	12	15.8489	5.000	3.1623	100%	0.0100	1.0000
IEEE 802.11n HT40	13	19.9526	5.000	3.1623	100%	0.0126	1.0000
IEEE 802.11ac HT20	13	19.9526	5.000	3.1623	100%	0.0126	1.0000
IEEE 802.11ac HT40	13	19.9526	5.000	3.1623	100%	0.0126	1.0000
IEEE 802.11ac HT80	6	3.9811	5.000	3.1623	100%	0.0025	1.0000

Remark:

1. Output power including tune-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;

8.2 Simultaneous Transmission MPE

The sample only support one WLAN modular and one antenna, no need consider simultaneous transmission;

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-----