FCC Maximum Permissible Exposure (MPE) Estimation Report

Report Number	:	60.790.24.017.01S01	Date of Issue:	April 9, 2024
Model/HVIN	:	SBC-D10		
Product Type	:	MasterMind H3		
Applicant	:	Dayton Industrial Co., Ltd		
Address	:	2-12 Kwai Fat Road, 11-A Kwai Chung, New Territories, Hong Kong.		
Production Facility	:	KENDY ELECRTONICS (DONGGUAN) CO., LTD.		
Address	:	XIN SI HUANG TANG VILLAGE HENG LI TOWN, DONGGUAN CITY, GUANGDONG, CHINA.		
Test Result	:	n Positive o Negative		
Total pages including Appendices	:	9		

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12 & 13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District Shenzhen 518052 P.R. China
Telephone:	86 755 8828 6998
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FCC Registration No.:	514049
FCC Deignation No.:	CN5009
IC Registration No.:	10320A
ISED CAB Identifier:	CN0077

3 Description of the Equipment Under Test

Product:	MasterMind H3
Model no.:	SBC-D10
Hardware Version Identification No. (HVIN)	SBC-D10
Product Marketing Name (PMN)	MasterMind H3
Brand name:	N/A
FCC ID:	O4GH3A
IC:	7666A-H3
Rating:	12.0 VDC (Powered by Bike Battery) Or 5.0 VDC (Powered by USB Port)
RF Transmission Frequency:	2402MHz-2480MHz (BLE) 2457 MHz (ANT+)
No. of Operated Channel:	40 (BLE) 1 (ANT+)
Modulation:	GFSK
Antenna Type:	PCB Antenna
Antenna	Gain: 0 dBi
Description of the EUT:	The Equipment Under Test (EUT) is a MasterMind H3 which support Bluetooth (BLE) function and Ant+ function.

NOTE:

1. The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

2. This report contains a PCB antenna, and the evaluating only performed at the antenna support higher gain.

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4 Test Standards

Test Standards	
ANSI Std C95.1-2019	**Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz. (IEEE Std C95.1-1991)**
KDB 447498 D01	**General RF Exposure Guidance v06**

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5 General Information

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- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

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6 RF Exposure Requirements

An estimation of MPE in this application for product is used to ensure if it complies with the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

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

R= distance to the centre of radiation of the antenna

EIRP = P*G

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.

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7 FCC MPE Limits

We analysis if it complies with the limits for General population/uncontrolled exposure. The FCC MPE limits for field strength and power density are given in 47CFR 1.1310(Table below). These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.

(A) Limits for Occupational/controlled Exposure				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm^2)	Averaging Time (minute)|E|^2,|H|^2 or S
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
(B) Limits for General Population/uncontrolled Exposure				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm^2)	Averaging Time (minute)|E|^2,|H|^2 or S
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	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	

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8 RF Exposure Evaluation (FCC)

8.1.1 Calculation of Power Density for Single Chain Transmitters

Mode	EIRP (dBm)	EIRP (mW)	R (m)	S (W/m^2)	Limit (W/m^2)	% of limit
BLE	6.34	4.31	0.2	0.00857	1.0	< 1%
ANT+	-10.62	0.087	0.2	0.000171	1.0	< 1%

8.1.2 Calculation of Simultaneous Transmission

For the multiple transmitter product:

In order to ensure compliance with the EMF for a controlled environment, the sum of the ratios of the power density to the corresponding EMF should not exceed unity. That is

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

The simultaneous transmission possibilities are as below:

No.	Simultaneous Tx Combination	S (W/m^2)	Limit (W/m^2)
1	N/A	N/A	N/A
2	N/A	N/A	N/A

The product doesn't support Simultaneous Transmission.

8.1.3 Conclusion

According to the table above, we can conclude that the product meets the requirements.

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