RF Exposure Report

FCC ID:2BG8S-WL65

Report No.	:	SSP24060118-4E
Applicant	:	Shenzhen Hantu Electronics Co., Ltd.
Product Name	:	3D hologram fan
Model Name	:	WL-65
Test Standard	:	FCC CFR 47 PART 1.1307(b)
Date of Issue	:	2024-07-15

Shenzhen CCUT Quality Technology Co., Ltd.
1F, Building 35, Changxing Technology Industrial Park, Yutang Street, Guangming District, Shenzhen, Guangdong, China; (Tel.:+86-755-23406590 website: www.ccuttest.com)

Test Report Basic Information

Applicant:	Shenzhen Hantu Electronics Co., Ltd.
Address of Applicant:	Room 203, Building B3-2, No. 41, Gangtou Road, Ganggang Community, Shajing Street, Bao'an District, Shenzhen, China
Manufacturer:	Shenzhen Hantu Electronics Co., Ltd.
Address of Manufacturer:	Room 203, Building B3-2, No. 41, Gangtou Road, Ganggang Community, Shajing Street, Bao'an District, Shenzhen, China
Product Name:	3D hologram fan
Brand Name:	Twotrees
Main Model:	WL-65
Series Models:	WL-42, WL-30-Z, WL-65-S, WL-80, WL-11, WL-30, WL-45, WL-49, WL-52, WL-56, WL-73, WL-85, WL-130, WL-100, WL-23, WL-150, WL-180, WL-196, WL-23-Z, WL-11-Z, WL-73-S
Test Standard:	FCC CFR 47 PART 1.1307(b) KDB 447498 D01 v06
Date of Test:	2024-06-18 to 2024-07-15
Test Result:	PASS

Tested By:	Coke Huang	(Coke Huang)
Reviewed By:	Lieber Ouyang	(Lieber Ouyang)
Authorized Signatory:	Lahm Peng	(Lahm Peng)

Shenzhen CCUT Quality Technology Co., Ltd. APPROVED

Note : This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen CCUT Quality Technology Co., Ltd.. All test data presented in this test report is only applicable to presented test sample.

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Revision History

Revision	Issue Date	Description	Revised By
V1.0	2024-07-15	Initial Release	Lahm Peng

1. General Information

1.1 Product Information

Product Name:	3D hologram fan
Trade Name:	Twotrees
Main Model:	WL-65
Series Models:	WL-42, WL-30-Z, WL-65-S, WL-80, WL-11, WL-30, WL-45, WL-49, WL-52, WL-56, WL-73, WL-85, WL-130, WL-100, WL-23, WL-150, WL-180, WL-196, WL-23-Z, WL-11-Z, WL-73-S
Rated Voltage:	DC24V by adapter
Hardware Version:	V2.2.2
Software Version:	2.0.1.1
Note 1: The test data is gathered from a production sample, provided by the manufacturer. Note 2: The color of appearance and model name of series models listed are different from the main model, but the circuit and the electronic construction are the same, declared by the manufacturer.	

Wireless Specification	
Wireless Standard:	Bluetooth: BR, 2.4GWiFi:11b/g/n, WPT: ASK
Operating Frequency:	Bluetooth:2402MHz~2480MHz, 2.4GWiFi: 2412 MHz ~2462 MHz, WPT: 50KHz-70KHz
RF Output Power:	BR:4.81dBm, 2.4GWiFi:11.69dBm, WPT: 77.97dBuV/m
Antenna Gain:	0dBi
Type of Antenna:	BR: Integral Antenna, 2.4GWiFi: PCB Antenna, WPT: Coil Antenna
Type of Device:	☐ Portable Device ☒ Mobile Device ☐ Modular Device

1.2 Test Facilities

Laboratory Name:	**Shenzhen CCUT Quality Technology Co., Ltd.** 1F, Building 35, Changxing Technology Industrial Park, Yutang Street, Guangming District, Shenzhen, Guangdong, China
CNAS Laboratory No.:	L18863
A2LA Certificate No.:	6893.01
FCC Registration No:	583813
ISED Registration No.:	CN0164
All measurement facilities used to collect the measurement data are located at 1F, Building 35, Changxing Technology Industrial Park, Yutang Street, Guangming District, Shenzhen, Guangdong, China.	

2. RF Exposure for Power Density

2.1 Standard and Limit

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/cm2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f2)	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				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f2)	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
Friis transmission formula: Pd = (Pout*G)/(4*pi*r2)

Where
Pd = power density in mW/cm2, Pout = output power to antenna in mW;
G = gain of antenna in linear scale, Pi = 3.1416;
R = distance between observation point and center of the radiator in cm

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

Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

2.2 Test Data and Results

For 2.4GHz Wi-Fi

Mode	Output power to antenna (dBm)	Tune-up Power(dBm)	Max Tune-up Power(dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm2)	Limit (mW/cm2)	Result
802.11b	12.49	12(±1)	13	19.95	0.0040	1.0	PASS

For Bluetooth

Mode	Output power to antenna (dBm)	Tune-up Power(dBm)	Max Tune-up Power(dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm2)	Limit (mW/cm2)	Result
GFSK	4.81	4(±1)	5	3.16	0.0006	1.0	PASS

Remark: antenna gain = 0dBi

3. RF Exposure for E-field and H-field

3.1 Standard and Limit

According to the dictates of KDB 680106 D01 v04, Section 3.2 Equipment Authorization Procedures for Devices Operating at Frequencies Below 4MHz.

The RF exposure limits, as set forth in § 1.1310, do not cover the frequency range below 100 kHz for Specific Absorption Rate (SAR) and below 300 kHz for Maximum Permitted Exposure (MPE). In addition, present limitations of RF exposure evaluation systems prevent an accurate evaluation of SAR below 4MHz. For these reasons, a specific MPE-based RF Exposure compliance procedure for devices operating in the aforementioned low-frequency ranges has been set in place. This procedure is applicable to Equipment Authorization of all RF devices, thus including, but not limited to, Part 18 and WPT devices.

Accordingly, for § 2.1091-Mobile devices, the MPE limits between 100 kHz to 300 kHz are to be considered the same as those at 300 kHz in Table 1 of § 1.1310, that is, 614 V/m and 1.63 A/m, for the electric field and magnetic field, respectively. For § 2.1093-Portable devices below 4 MHz and down to 100 kHz, the MPE limits in § 1.1310 (with the 300 kHz limit applicable all the way down to 100 kHz) can be used for the purpose of equipment authorization in lieu of SAR evaluations.

Furthermore, consistent with FCC's equipment authorization RF exposure guidance, any device (both portable and mobile) operating at frequencies below 100 kHz is considered compliant for the purpose of equipment authorization when the external (unperturbed) temporal peak field strengths do not exceed the following reference levels:

83 V/m for the electric field strength (E)
and
90 A/m for the magnetic field strength (H).

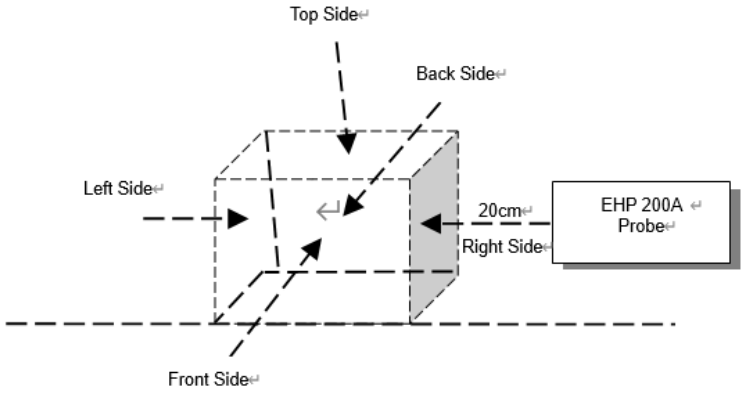
These data may be provided through measurements and/or numerical simulations, and for all the positions in space relevant for any possible body exposure.

3.2 Test Equipment

Software name	Manufacturer	Model	Version
EHP200-TS	Narda	EHP-200A	Rel 1.95

Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

3.3 Test Procedure



Test Setup

Test Procedure

1) The RF exposure test was performed in anechoic chamber.

2) E and H-field measurements should be made with the center of the probe at a distance of 20m surrounding the device and 20 cm above the top surface of the primary/client pair.

These measurements should be repeated for three different client battery levels, 1%, 50%, and 99%.

3) The highest emission level was recorded and compared with limit as soon as measurement of each points were completed.

4) The EUT was measured according to the dictates of KDB 680106 D01 v04.

EUT Information for Wireless Power Transfer (WPT)

This device operate in the frequency range from 50KHz to70KHz,

This device is a mobile device,

This device has only one wireless Power Transfer coil.

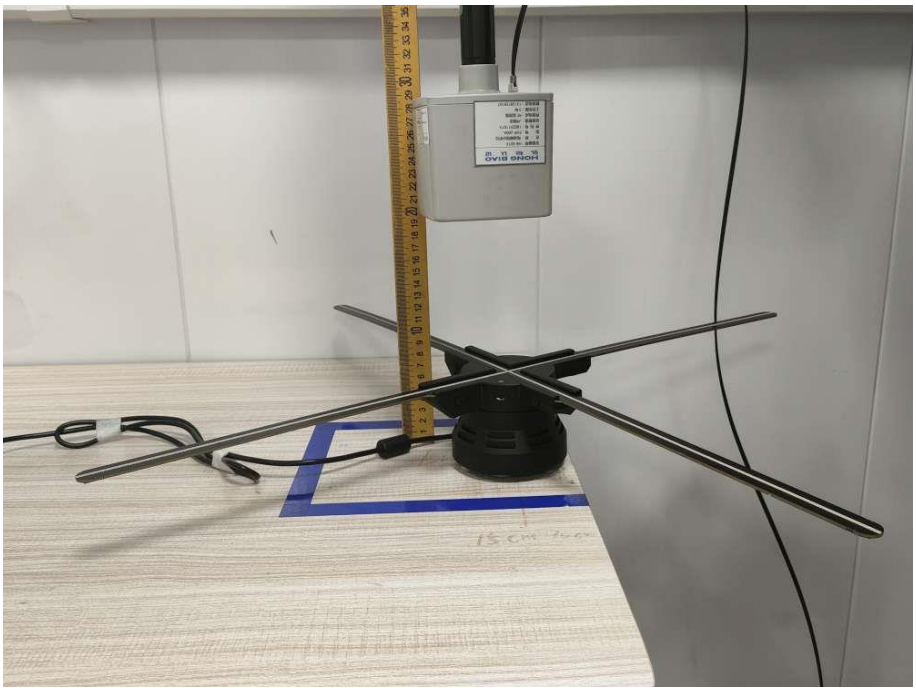
3.4 Test Data and Results

Maximum permissible Exposure of WPT				
Battery levels	Test sides	Test distance(cm)	E –field(V/m)	H–field(A/m)
<1%	Top	20	2.475	0.325
<1%	Left	20	4.253	0.223
<1%	Right	20	6.346	0.477
<1%	Front	20	3.672	0.185
<1%	Back	20	1.731	0.134
Limit			83	90
50% Margin Limit			41.5	45

Maximum permissible Exposure of WPT				
Battery levels	Test sides	Test distance(cm)	E –field(V/m)	H–field(A/m)
<50%	Top	20	2.162	0.199
<50%	Left	20	4.375	0.2353
<50%	Right	20	6.155	0.272
<50%	Front	20	3.857	0.177
<50%	Back	20	1.382	0.178
Limit			83	90
50% Margin Limit			41.5	45

Maximum permissible Exposure of WPT				
Battery levels	Test sides	Test distance(cm)	E –field(V/m)	H–field(A/m)
<99%	Top	20	2.741	0.345
<99%	Left	20	4.722	0.186
<99%	Right	20	6.667	0.388
<99%	Front	20	3.544	0.284
<99%	Back	20	2.362	0.204
Limit			83	90
50% Margin Limit			41.5	45

3.4 Test Setup Photo



4. RF Exposure for Simultaneous Transmission

According to the KDB 447498 D04 Interim General RF Exposure Guidance v01, section 2.2.2 Simultaneous Transmission with both SAR-based and MPE-Based Test Exemptions.

Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR ($Evaluated_k$ term) shall be used to determine exemption for simultaneous transmission according to Formula (C.1) [repeated from § 1.1307(b)(3)(ii)(B)].

$$\sum_{i=1}^{a} \frac{P_i}{P_{\text{th},i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{\text{th},j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1 \qquad \text{(C. 1)}$$

a	number of fixed, mobile, or portable RF sources claiming exemption using the § 1.1307(b)(3)(i)(B) formula for P_{th}, including existing exempt transmitters and those being added.
b	number of fixed, mobile, or portable RF sources claiming exemption using the applicable § 1.1307(b)(3)(i)(C) Table 1 formula for Threshold ERP, including existing exempt transmitters and those being added.
c	number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance.
P_i	the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).
$P_{\text{th},i}$	the exemption threshold power (Pth) according to the § 1.1307(b)(3)(i)(B) formula for fixed, mobile, or portable RF source i.
ERP_j	the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source j.
$ERP_{\text{th},j}$	exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least $\lambda/2\pi$, according to the applicable § 1.1307(b)(3)(i)(C) Table 1 formula at the location in question.
$Evaluated_k$	the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation.
$Exposure\ Limit_k$	either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable sources, as applicable

The sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE shall be less than 1, to determine simultaneous transmission exposure compliance.

The RF exposure for simultaneous transmissions as below:

Calculations the ratios of each transmissions for MPE-based

Mode	Maximum Value	Limit	Ratio
Bluetooth	0.0006mW/cm2	1mW/cm2	0.0006
2.4GHz Wi-Fi	0.0040mW/cm2	1mW/cm2	0.0040
WPT	6.667 V/m	83 V/m	0.0804

Ratio = Power Density or E-field or H-field / Limit.

Calculations the sum of the ratios

Mode	Ratio	Sum of Ratio	Limit	Result
Bluetooth	0.0006	0.085	1	Passed
2.4GHz Wi-Fi	0.0040			
WPT	0.0804			

9 component matrices work simultaneously to calculate the combination

Mode	Ratio	Sum of Ratio	Limit	Result
Bluetooth	0.085	0.765	1	Passed
2.4GHz Wi-Fi				
WPT				

This device is compliant with FCC rules requirements.