RF EXPOSURE REPORT FOR FCC

RZBG(W) 20220421002-5

Applicant : TianJin HuaLai Technology Co.,Ltd.

Address : No.10 JinPing Road, Ya An Street, Nankai District Tianjin, China.

Product Name : Ailofy Bulb Color

Type/Model : AIBC-A

FCC ID : 2ANJH-AIBC-A

TEST RESULT : PASS

SUMMARY

The equipment complies with the requirements according to the following standard(s):

FCC KDB 447498 D04： Interim General RF Exposure Guidance v01

Date of issue: Aug. 10, 22

Prepared by	Reviewed by:	Issued by:
Hao Wei (Project engineer)	Haohui Qiu (Reviewer)	Bing Cai (General Manager)
Hao Wei	Haohui Qiu	Bing Cai

Content

1. GENERAL INFORMATION OF EUT

1.1 Applicant information

Applicant	TianJin HuaLai Technology Co.,Ltd.
Address	No.10 JinPing Road, Ya An Street, Nankai District Tianjin, China.
Contact person	Mengli Li
Phone number	15102259016

1.2 Manufacture information

Manufacture	TianJin HuaLai Technology Co.,Ltd.
Address	No.10 JinPing Road, Ya An Street, Nankai District Tianjin, China.

1.3 General description for equipment under test(EUT)

EUT name	Ailofy Bulb Color
Trade name	Ailofy
Under test mode name	AIBC-A
Series model name	N/A
Description of different model name	N/A
Hardware version	0.0.0.0
Software version	4.13.0.0
Network and Wireless connectivity	IEEE 802.11b/g/n（HT20/HT40），BLE 1M&2M

1.4 Technical information of equipment under test (EUT)

Operate Freq. range	Frequency range (MHz)	Modulation	Channel bandwidth （MHz）	Date rate （Mbps）
IEEE 802.11b	2412-2462	DSSS/CCK	20	Up to 11
IEEE 802.11g	2412-2462	OFDM	20	Up to 54
IEEE 802.11n(20MHz)	2412-2462	OFDM	20	Up to 72.2
IEEE 802.11n(40MHz)	2422-2452	OFDM	40	Up to 150
BLE	2402-2480	GFSK	2	1 to 2
Test channel	Low(2412 for 20MHz bandwidth,2422 for 40MHz bandwidth) Middle(2437 for 20MHz bandwidth,2437 for 40MHz bandwidth) High(2462 for 20MHz bandwidth,2452 for 40MHz bandwidth) BLE (Low2402 Middle2440 High2480)			
Maximum RF Output Power(dBm)	IEEE 802.11b:23.54 IEEE 802.11g:24.23 IEEE 802.11n(20MHz):23.28 IEEE 802.11n(40MHz):22.41 BLE:2.5			
FCC ID	2ANJH-AIBC-A			
Equipment type	☒ Mobile ☐ Portable ☐ Fix Location			
About the Product	This wifi is used for data transmission			
Antenna Type	Monopole Rod Antenna			
Antenna Gain	1.33 dBi			
Note:The antenna gain was declared by the manufacture.				

2. DESCRIPTION OF TEST FACLITY

☒	Company Name	Hangzhou TDT Technologies Co., Ltd.
	Address	Room 101, Building 3, No. 12, Binwen Road, Xixing Street, Binjiang district, Hangzhou, Zhejiang, China
	Telephone	+86571-88317620
	Telefax	+86571-88316350
	Test Location	Hangzhou TDT Technologies Co., Ltd.
	Address	Room 101, Building 3, No. 12, Binwen Road, Xixing Street, Binjiang district, Hangzhou, Zhejiang, China
	Telephone	+86571-88317620
	Telefax	+86571-88316350
	A2LA Certification number	4037.01
	CNAS Certification number	CNAS L7728
	VCCI Site registration number	C-14683, G-10832, R-14200, T-12223
	FCC Site registration number	645845

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3. SUMMARY OF TEST RESULT

3.1 Test standard

No.	Identify	Document title
1	47 CFR Part 15 Sub-part 2.1091	Radio frequency radiation exposure evaluation： mobile devices
2	FCC KDB 447498 D04	Interim General RF Exposure Guidance v01

4. DEVICE CATEGORY AND LEVELS LIMITS

According to FCC §§1.1307 and KDB 447498 D04, the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW).

The definition of the category as following:

1) Option A. 1-mW Test Exemption

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

2) Option B. SAR-Based Exemption

A more comprehensive exemption, considering a variable power threshold that depends on both the separation distance and power, is provided in § 1.1307(b)(3)(i)(B). This exemption is applicable to the frequency range between 300 MHz and 6 GHz, with test separation distances between 0.5 cm and 40 cm, and for all RF sources in fixed, mobile, and portable device exposure conditions.

Accordingly, a RF source is considered an RF exempt device if its available maximum time-averaged (matched conducted) power or its effective radiated power (ERP), whichever is greater, are below a specified threshold.

This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

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$$P_{\text{th}}\ (\text{mW}) = \begin{cases} ERP_{20\ \text{cm}}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ \text{cm}} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \quad \text{(B.2)}$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ \text{cm}}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20\text{cm}}$ is per Formula (B.1).

The example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

$$P_{\text{th}}\,(\text{mW}) = ERP_{20\,\text{cm}}\,(\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases} \qquad \text{(B. 1)}$$

3) Option C MPE-Based Exemption

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to λ/2π, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power. For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source Frequency			**Minimum Distance**			**Threshold ERP**
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	–	1.34	159 m	–	35.6 m	1,920 R^2
1.34	–	30	35.6 m	–	1.6 m	3,450 R^2/f^2
30	–	300	1.6 m	–	159 mm	3.83 R^2
300	–	1,500	159 mm	–	31.8 mm	0.0128 $R^2 f$
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R^2
Subscripts L and H are low and high; λ is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

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)].

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

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

5. MPE ASSESSMENT

Output power test data

2.4G WIFI		
Mode	802.11 b	802.11 g
	Out put power	Out put power
output power (dBm)	23.54	24.23
Mode	802.11 n HT20	802.11 n HT40
	Out put power	Out put power
output power (dBm)	23.28	22.41
Mode	BLE	
	Out put power	
output power (dBm)	2.5	
Note: This report listed the worst case peak output power value, please refer to RF test report for more details.		

Assessment result

Evolution mode	Freq (MHz)	Maximum output power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Maximum ERP (dBm)	Distance (mm)	Maximum ERP (mw)	Threshold ERP Limit (mw)
2.4G WIFI	2412	24.5	1.33	25.68	23.53	200	225.42	768
BLE	2480	3	1.33	4.33	2.18	200	1.65	768

Conclusion:

RF exposure evaluation results: **Compliance**

Note:

1. Output power including tune up tolerance.
2.More power list please refer to RF test report.

Annex A Revision History

Version	Issue Date	Revisions Content
Rev.01	Jun.29.2022	Initial Issue
Rev.02	Aug.09.2022	Revised the test report to address TCB`s comments.
Rev.03	Aug.10.2022	Revised the test report to address TCB`s comments.

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