RF Exposure Evaluation

For

Hangzhou Bublue Sciences and Technologies Ltd.

Robotic Pool Cleaner

Test Model: C20H

Prepared for	:	Hangzhou Bublue Sciences and Technologies Ltd.
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Date of receipt of test sample	:	April 29, 2025
Number of tested samples	:	2
Sample No.	:	A250429070-1, A250429070-2
Serial number	:	Prototype
Date of Test	:	April 29, 2025 ~ May 26, 2025
Date of Report	:	May 27, 2025

RF Exposure Evaluation

Report Reference No. ..... :	**LCSA04155033EC**
Date of Issue ..... :	May 27, 2025
Testing Laboratory Name ..... :	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address ..... :	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Testing Location Procedure ..... :	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name ..... :	**Hangzhou Bublue Sciences and Technologies Ltd.**
Address ..... :	ROOM 202, BUILDING 2, BLOCK A, NO. 365 WUZHOU ROAD, LINPING DISTRICT, HANGZHOU, 311100, ZHEJIANG, CHINA
Test Specification	
Standard ..... :	FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06 FCC CFR 47 part1 1.1310 FCC CFR 47 part2 2.1091
Test Report Form No. ..... :	TRF-4-E-214 A/0
TRF Originator ..... :	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF ..... :	Dated 2011-03

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EUT Description. ..... :	**Robotic Pool Cleaner**
Trade Mark ..... :	N/A
Test Model ..... :	C20H
Ratings ..... :	Power Box's Input Voltage: 100Vac-240Vac; 50/60Hz Power Box's Rated Output Current: Max. 5A Power Box's Rated Output Charging Current: Max. 2.5A Power Box's Rated Output Voltage: 28V
Result ..... :	**PASS**

Compiled by:	**Supervised by:**	**Approved by:**
Nadia Zhou	Jack Liu	Gavin Liang
Nadia Zhou/ Administrator	Jack Liu/ Technique principal	Gavin Liang/ Manager

RF Exposure Evaluation

Test Report No. : **LCSA04155033EC**	May 27, 2025 Date of issue

Test Model.....	: C20H
EUT.....	: Robotic Pool Cleaner
Applicant.....	**: Hangzhou Bublue Sciences and Technologies Ltd.**
Address.....	: ROOM 202, BUILDING 2, BLOCK A, NO. 365 WUZHOU ROAD, LINPING DISTRICT, HANGZHOU, 311100, ZHEJIANG, CHINA
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Telephone.....	: /
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Factory.....	**: Hangzhou Bublue Sciences and Technologies Ltd.**
Address.....	: ROOM 202, BUILDING 2, BLOCK A, NO. 365 WUZHOU ROAD, LINPING DISTRICT, HANGZHOU, 311100, ZHEJIANG, CHINA
Telephone.....	: /
Fax.....	: /

Test Result	**PASS**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Report Version	Issue Date	Revision Content	Revised By
000	May 27, 2025	Initial Issue	--

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1. Product Information

EUT	:	Robotic Pool Cleaner
Test Model	:	C20H
Ratings	:	Power Box's Input Voltage: 100Vac-240Vac; 50/60Hz Power Box's Rated Output Current: Max. 5A Power Box's Rated Output Charging Current: Max. 2.5A Power Box's Rated Output Voltage: 28V
Hardware Version	:	/
Software Version	:	/
Bluetooth		
Frequency Range	:	2402MHz~2480MHz
Channel Number	:	40 channels for Bluetooth V5.0 (DTS)
Channel Spacing	:	2MHz for Bluetooth V5.0 (DTS)
Modulation Type	:	GFSK for Bluetooth V5.0 (DTS)
Bluetooth Version	:	V5.0
Antenna Description	:	PCB Antenna, 3.37dBi (Max.)
WIFI(2.4G Band)		
Frequency Range	:	2412MHz~2462MHz
Channel Spacing	:	5MHz
Channel Number	:	11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz)
Modulation Type	:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	:	PCB Antenna, 3.37dBi (Max.)
Exposure category	:	General population/uncontrolled environment
EUT Type	:	Production Unit
Device Type	:	Mobile Devices

Note: For a more detailed antenna description, please refer to the antenna specifications or the anten na report provided by the customer.

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 C95.1–2019: IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz 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/cm²)	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/f²)*	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/cm²)	Averaging Time (minute)
Limits for Occupational/Uncontrolled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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
*=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;

Internal/External Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Notes
Internal	PCB Antenna	2400-2500MHz	3.37dBi	BT/WIFI Antenna

6. Conducted Power

[BLE 1M]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	00	2402	-0.99
	19	2440	1.51
	39	2480	0.47

[BLE 2M]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	00	2402	-1.10
	19	2440	1.38
	39	2480	0.33

[2.4G WLAN]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
IEEE 802.11b	1	2412	14.03
	6	2437	13.61
	11	2462	13.16
IEEE 802.11g	1	2412	14.47
	6	2437	13.96
	11	2462	13.67
IEEE 802.11n HT20	1	2412	13.91
	6	2437	13.41
	11	2462	13.10
IEEE 802.11n HT40	3	2422	12.59
	6	2437	11.54
	9	2452	12.36

7. Manufacturing Tolerance

[BLE 1M]

GFSK(Peak)			
Channel	Channel 00	Channel 19	Channel 39
Target (dBm)	0	1.0	0
Tolerance ± (dB)	1.0	1.0	1.0

[BLE 2M]

GFSK(Peak)			
Channel	Channel 00	Channel 19	Channel 39
Target (dBm)	-1.0	1.0	0
Tolerance ± (dB)	1.0	1.0	1.0

[2.4G WLAN]

IEEE 802.11b(Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	14.0	13.0	13.0
Tolerance ± (dB)	1.0	1.0	1.0
IEEE 802.11g(Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	14.0	13.0	13.0
Tolerance ± (dB)	1.0	1.0	1.0
IEEE 802.11n20(Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	13.0	13.0	13.0
Tolerance ± (dB)	1.0	1.0	1.0
IEEE 802.11n40(Peak)			
Channel	Channel 03	Channel 06	Channel 09
Target (dBm)	12.0	11.0	12.0
Tolerance ± (dB)	1.0	1.0	1.0

8. Measurement 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 =20cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

[BLE]

Modulation Type		Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm2)	MPE Limits (mW/cm2)
		dBm	mW				
BLE 1M	GFSK	2.0	1.5849	3.37	2.1727	0.0007	1.0000
BLE 2M	GFSK	2.0	1.5849	3.37	2.1727	0.0007	1.0000

[2.4GWLAN]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm2)	MPE Limits (mW/cm2)
	dBm	mW				
IEEE 802.11b	15.0	31.6228	3.37	2.1727	0.0137	1.0000
IEEE 802.11g	15.0	31.6228	3.37	2.1727	0.0137	1.0000
IEEE 802.11n HT20	14.0	25.1189	3.37	2.1727	0.0109	1.0000
IEEE 802.11n HT40	13.0	19.9526	3.37	2.1727	0.0086	1.0000

Remark:
1. Output power including tune-up tolerance;
2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer.

8.2 Simultaneous Transmission MPE Evaluation

The EUT equiped with one antenna. So 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.

10. Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

Test Firm Registration Number: 254912.

11. Measurement Uncertainty

BLE/2.4GWIFI:

Test Item		Frequency Range	Uncertainty	Note
Output power	:	1GHz-40GHz	±0.57dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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