
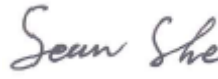


RF Exposure evaluation

Product Name : Robot vacuum cleaner
Brand Name : N/A
Model : X51
Series Model : L1 PRO, X52, X53, X5H, X5 , T8, X54, X51H, RV251, AT701, AT700, AT70H, AT703, AT704
FCC ID : 2BEF9-X51
Applicant : **GuangDong Takdir Smart Robot Co.,Ltd.**
Address : Room 202, Building 9, No.7 Shengqi Road, Changping Town, Dongguan City, Guangdong, China
Manufacturer : **GuangDong Takdir Smart Robot Co.,Ltd.**
Address : Room 202, Building 9, No.7 Shengqi Road, Changping Town, Dongguan City, Guangdong, China
Standard(s) : 47CFR §1.1310, 47CFR §2.1091
KDB447498 D01 General RF Exposure Guidance v06
Date of Receipt : Apr. 16, 2025
Date of Test : Apr. 17, 2025~ May. 13, 2025
Issued Date : May. 13, 2025

Issued By: **Guangdong Asia Hongke Test Technology Limited**
B1/F, Building 11, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street,
Bao'an District, Shenzhen, Guangdong, China
Tel.: +86 0755-230967639 Fax.: +86 0755-230967639

Reviewed by: 
Leon.yi

Approved by: 
Sean She



Note: This device has been tested and found to comply with the standard(s) listed, this 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. This report shall not be reproduced except in full, without the written approval of Guangdong Asia Hongke Test Technology Limited. If there is a need to alter or revise this document, the right belongs to Guangdong Asia Hongke Test Technology Limited, and it should give a prior written notice of the revision document. This test report must not be used by the client to claim product endorsement.



Report Revise Record

Report Version	Issued Date	Notes
M1	May. 13, 2025	Initial Release

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1 GENERAL INFORMATION

1.1 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

1.2 General Description of EUT

Product Name:	Robot vacuum cleaner
Model/Type reference:	X51
Serial Model:	L1 PRO, X52, X53, X5H, X5 , T8, X54, X51H, RV251, AT701, AT700, AT70H, AT703, AT704
Different model:	It's just that the names and appearances are different; Everything else is the same.
Power Rating:	DC 19V By adapter DC 14.4V 2600mAh 37.44 Wh By Rechargeable Li-ion battery
Adapter	Mode: BZ015-190060-AU Input: 100-240V~50/60Hz 0.3A MAX Output: 19.0V/0.6A
Hardware Version:	N/A
Software Version:	N/A
Sample(s) Status:	AiTSZ-250416029 -1(Normal sample) AiTSZ-250416029 -2(Engineer sample)
2.4G WIFI:	
Supported type:	802.11b/802.11g /802.11n(HT20)/802.11n(HT40)
Modulation:	802.11b(DSSS):CCK,DQPSK,DBPSK 802.11g(OFDM):BPSK,QPSK,16-QAM,64-QAM 802.11n(OFDM):BPSK,QPSK,16-QAM,64-QAM
Operation frequency:	802.11b/802.11g/802.11n(H20): 2412MHz~2462MHz 802.11n(H40): 2422MHz~2452MHz
Channel number:	802.11b/802.11g/802.11n(H20): 11 802.11n(H40): 7
Channel separation:	5MHz
Antenna type:	Internal antenna
Antenna gain:	2.89dBi
Bluetooth :	
Supported type:	Bluetooth BLE 1M
Modulation:	GFSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	2MHz
Antenna type:	Internal antenna
Antenna gain:	2.89dBi

5G WIFI:				
Supported type:	20MHz system	40MHz system	80MHz system	160MHz system
	802.11a 802.11n 802.11ac	802.11n 802.11ac	802.11ac	N/A
Operation frequency:	5180-5240MHz	5190-5230MHz	5210MHz	N/A
Modulation:	OFDM	OFDM	OFDM	N/A
Channel number:	9	4	2	N/A
Channel separation:	20MHz	40MHz	80MHz	N/A
Antenna type:	Internal antenna			
Antenna gain:	1.62dBi			
Remark: The above DUT's information was declared by manufacturer. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.				

1.3 Test Facility

Test Laboratory:

Guangdong Asia Hongke Test Technology Limited

B1/F, Building 11, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

The test facility is recognized, certified or accredited by the following organizations:

FCC-Registration No.: 251906 Designation Number: CN1376

Guangdong Asia Hongke Test Technology Limited has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

IC —Registration No.: 31737 CAB identifier: CN0165

The 3m Semi-anechoic chamber of Guangdong Asia Hongke Test Technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 31737

A2LA-Lab Cert. No.: 7133.01

Guangdong Asia Hongke Test Technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

1.4 Measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Guangdong Asia Hongke Test Technology Limited's quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Asia Hongke laboratory is reported:

Test	Measurement Uncertainty	Notes
Power Line Conducted Emission	150KHz~30MHz ± 1.20 dB	(1)
Radiated Emission	9KHz~30Hz ± 3.10 dB	(1)
Radiated Emission	9KHz~1GHz ± 3.75 dB	(1)
Radiated Emission	1GHz~18GHz ± 3.88 dB	(1)
Radiated Emission	18GHz~40GHz ± 3.88 dB	(1)
RF power, conducted	30MHz~6GHz ± 0.16 dB	(1)
RF power density, conducted	± 0.24 dB	(1)
Spurious emissions, conducted	± 0.21 dB	(1)
Temperature	$\pm 1^{\circ}\text{C}$	(1)
Humidity	$\pm 3\%$	(1)
DC and low frequency voltages	$\pm 1.5\%$	(1)
Time	$\pm 2\%$	(1)
Duty cycle	$\pm 2\%$	(1)
Bandwidth	$\pm 1.5 \times 10^{-6}$	(1)

The report uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty Multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

2 Method of measurement

2.1 Applicable Standard

According to §1.1307(b)(1), systems operating under the provisions of this 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.

According to §1.1310 and §2.1091 RF exposure is calculated.

FCC KDB447498 D01 General RF Exposure Guidance v06: Mobile and Portable Device, RF Exposure, Equipment Authorization Procedures

2.2 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)*	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)*	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

2.3 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

2.4 Manufacturing Tolerance

Frequency (MHz)	BLE-1M(Peak)		
	2402	2440	2480
Target (dBm)	2.0	0.2	1.0
Tolerance ± (dB)	1	1	1
Frequency (MHz)	BLE-2M(Peak)		
	2402	2440	2480
Target (dBm)	2.0	0.5	1.0
Tolerance ± (dB)	1	1	1

Frequency (MHz)	2.4G WIFI- IEEE 802.11b		
	2412	2437	2462
Target (dBm)	7.0	8.0	6.0
Tolerance ± (dB)	1	1	1
Frequency (MHz)	2.4G WIFI- IEEE 802.11g		
	2412	2437	2462
Target (dBm)	8.0	8.5	8.0
Tolerance ± (dB)	1	1	1
Frequency (MHz)	2.4G WIFI- IEEE 802.11n 20		
	2412	2437	2462
Target (dBm)	8.0	8.5	8.0
Tolerance ± (dB)	1	1	1
Frequency (MHz)	2.4G WIFI- IEEE 802.11n 40		
	2422	2437	2452
Target (dBm)	8.5	8.5	8.0
Tolerance ± (dB)	1	1	1

Frequency (MHz)	5.2G WIFI- IEEE 802.11 a		
	5180	5200	5240
Target (dBm)	12.0	12.0	12.0
Tolerance \pm (dB)	1	1	1
Frequency (MHz)	5.2G WIFI- IEEE 802.11 n 20		
	5180	5200	5240
Target (dBm)	12.0	12.0	12.0
Tolerance \pm (dB)	1	1	1
Frequency (MHz)	5.2G WIFI- IEEE 802.11 n 40		
	5190	5230	/
Target (dBm)	11.5	11.5	/
Tolerance \pm (dB)	1	1	/
Frequency (MHz)	5.2G WIFI- IEEE 802.11 ac 20		
	5180	5200	5240
Target (dBm)	12.0	12.0	12.0
Tolerance \pm (dB)	1	1	1
Frequency (MHz)	5.2G WIFI- IEEE 802.11 ac 40		
	5190	5230	/
Target (dBm)	12.5	12.0	/
Tolerance \pm (dB)	1	1	/
Frequency (MHz)	5.2G WIFI- IEEE 802.11 ac 80		
	5210	/	/
Target (dBm)	12.5	/	/
Tolerance \pm (dB)	1	/	/

2.5 Standalone MPE Result

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 is refer to section 4, the RF power density can be obtained.

Modulation Type	Output power with tune_up		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
2.4G BLE	3.0	2.00	2.89	1.95	0.0008	1
2.4G WIFI	9.5	8.91	2.89	1.95	0.0035	1
5.2G WIFI	13.5	22.38	1.62	1.45	0.0065	1

Remark:

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

2.6 Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

***** End of Report *****