



RF Exposure Evaluation

For

Shenzhen KingChuang Smart Navi Technology Co., Ltd.

Robot Vacuum Cleaner

Test Model: SL40

Additional Model No.: Please Refer to Page 6

Prepared for : Shenzhen KingChuang Smart Navi Technology Co., Ltd.
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Date of receipt of test sample : February 11, 2025
Number of tested samples : 2
Sample No. : A250109111-1, A250109111-2
Serial number : Prototype
Date of Test : February 11, 2025 ~ March 12, 2025
Date of Report : March 13, 2025



**RF Exposure Evaluation****Report Reference No. : LCSA02085010EG****Date of Issue..... : March 13, 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..... : Shenzhen KingChuang Smart Navi Technology Co., Ltd.****Address..... : 3rd Floor, Building 10, Furong Industrial Zone, No.179 Furong Avenue, Xinqiao Street, Baoan District, Shenzhen****Test Specification****Standard : ANSI C95.1-2019**
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****Shenzhen LCS Compliance Testing Laboratory Ltd. All rights reserved.**

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EUT Description..... : Robot Vacuum Cleaner**Trade Mark..... : N/A****Test Model : SL40****Ratings..... : Please Refer to Page 6****Result : Positive****Compiled by:**

Diamond Lu/ Administrator

Supervised by:

Jack Liu/ Technique principal

Approved by:

Gavin Liang/ Manager



**FCC -- TEST REPORT**

Test Report No. :	LCSA02085010EG	<u>March 13, 2025</u> Date of issue
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EUT.....	: Robot Vacuum Cleaner
Test Model.....	: SL40
Applicant.....	: Shenzhen KingChuang Smart Navi Technology Co., Ltd.
Address.....	: 3rd Floor, Building 10, Furong Industrial Zone, No.179 Furong Avenue, Xinqiao Street, Baoan District, Shenzhen
Telephone.....	: /
Fax.....	: /
Manufacturer.....	: Shenzhen KingChuang Smart Navi Technology Co., Ltd.
Address.....	: 3rd Floor, Building 10, Furong Industrial Zone, No.179 Furong Avenue, Xinqiao Street, Baoan District, Shenzhen
Telephone.....	: /
Fax.....	: /
Factory.....	: /
Address.....	: /
Telephone.....	: /
Fax.....	: /

Test Result:	Positive
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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	March 13, 2025	Initial Issue	---





Description

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1. Product Information

EUT	: Robot Vacuum Cleaner
Test Model	: SL40
Additional Model No.	: Vacuum cleaner robot with adapter shipping model: SL40, SL40A, SL40B, SL40C, SL40D. Vacuum cleaner robot with Dust collection station model: SDL40, SDL40A, SDL40B, SDL40C, SDL40D, L8000 Plus, L8500 Plus.
Model Declaration	: The PCB board, structure and internal of these models of robot vacuum cleaner are the same, These models differ in their charging docks for the robot vacuum cleaner. With the consideration of the identities and differences list above, SL40 is fully tested, at AC conducted emission test item, we choose SDL40 for differences test.
Ratings	: DUST COLLECTOR: Input: 200-240V~ 50/60Hz Output: 19V~1A Reted Power: 650W ROBOT VACUUM CLEANER: Input: 19V~0.6A Rated Voltage: 14.4V Power: 42W Battery: 2600mAh For Adapter Model: CZH013190060USWP Input: 100-240V~ 50/60Hz 0.4A Max Output: 19.0V~600mA For Adapter Model: DBS012A-1900600U Input: 100-240V~ 50-60Hz 0.35A Output: 19.0V~0.6A
Hardware Version	: V2.02
Software Version	: V2.6.81
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	: FPC Antenna, 3.15dBi(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	: FPC Antenna, 3.15dBi (Max.)
WIFI (5.2G Band):	
Frequency Range	: 5180MHz~5240MHz
Channel Number	: 4 Channels for 20MHz bandwidth(5180MHz~5240MHz) 2 channels for 40MHz bandwidth(5190MHz~5230MHz)
Modulation Type	: IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: FPC Antenna, 2.21 dBi(Max.)
WIFI (5.3G Band):	
Frequency Range	: 5260MHz~5320MHz
Channel Number	: 4 Channels for 20MHz bandwidth(5260MHz~5320MHz) 2 channels for 40MHz bandwidth(5270MHz~5310MHz)
Modulation Type	: IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: FPC Antenna, 2.67dBi (Max.)
WIFI (5.5G Band):	
Frequency Range	: 5500MHz~5700MHz
Channel Number	: 11 Channels for 20MHz bandwidth(5500MHz~5700MHz) 5 Channels for 40MHz bandwidth(5510MHz~5670MHz)
Modulation Type	: IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: FPC Antenna, 2.73dBi (Max.)
WIFI (5.8G Band)	
Frequency Range	: 5745MHz~5825MHz
Channel Number	: 5 channels for 20MHz bandwidth(5745MHz~5825MHz) 2 channels for 40MHz bandwidth(5755MHz~5795MHz)
Modulation Type	: IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: FPC Antenna, 2.82dBi (Max.)
Exposure category	: General population/uncontrolled environment
EUT Type	: Production Unit
Device Type	: Mobile Device





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/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 ²)*	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/Uncontrolled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f ²)*	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	FPC Antenna	2400MHz ~ 2500MHz	3.15dBi	BT/WIFI Antenna
		5150-5250MHz	2.21dBi	WIFI Antenna
		5250-5350MHz	2.67dBi	
		5470-5725MHz	2.73dBi	
		5745-5850MHz	2.82dBi	

6. Conducted Power

[BLE 1M]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
BLE	0	2402	-0.66
	19	2440	0.83
	39	2480	-0.24

[2.4G WIFI]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
11B	1	2412	15.07
	6	2437	15.58
	11	2462	16.03
11G	1	2412	12.96
	6	2437	13.75
	11	2462	14.29
11N20 SISO	1	2412	12.88
	6	2437	12.30
	11	2462	12.92
11N40 SISO	3	2422	10.89
	6	2437	10.76
	9	2452	11.11





[5.2G WIFI]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
11A	36	5180	11.30
	40	5200	10.61
	48	5240	9.13
11N20 SISO	36	5180	11.28
	40	5200	11.14
	48	5240	10.95
11N40 SISO	38	5190	9.88
	46	5230	9.85

[5.3G WIFI]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
11A	52	5260	11.58
	60	5280	11.96
	64	5320	11.08
11N20 SISO	52	5260	10.88
	60	5280	11.74
	64	5320	11.53
11N40 SISO	54	5270	9.53
	62	5310	11.85

[5.5G WIFI]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
11A	100	5500	12.30
	116	5580	11.76
	140	5700	11.43
11N20 SISO	100	5500	12.38
	116	5580	9.77
	140	5700	9.80
11N40 SISO	102	5510	10.17
	110	5550	9.25
	134	5670	9.69





[5.8G WIFI]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
11A	149	5745	12.50
	157	5785	12.05
	165	5825	8.15
11N20 SISO	149	5745	11.55
	157	5785	9.81
	165	5825	9.78
11N40 SISO	151	5755	11.42
	159	5795	9.73

7. Manufacturing Tolerance

[BLE 1M]

BT LE (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	0	0	-1.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

[2.4G WIFI]

11B (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	15.0	15.0	16.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11G (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	12.0	13.0	14.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20 (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	12.0	12.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N40 (Peak)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	10.0	10.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0





[5.2G WIFI]

11A (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	11.0	10.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	11.0	11.0	10.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N40 (Average)			
Channel	Channel 38	Channel 46	
Target (dBm)	9.0	9.0	
Tolerance $\pm$ (dB)	1.0	1.0	

[5.3G WIFI]

11A (Average)			
Channel	Channel 52	Channel 60	Channel 64
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N HT20 (Average)			
Channel	Channel 52	Channel 60	Channel 64
Target (dBm)	10.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N HT40 (Average)			
Channel	Channel 54	Channel 62	
Target (dBm)	9.0	11.0	
Tolerance $\pm$ (dB)	1.0	1.0	

[5.5G WIFI]

11A (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	12.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N HT20 (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	12.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N HT40 (Average)			
Channel	Channel 102	Channel 110	Channel 134
Target (dBm)	10.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0





[5.8G WIFI]

11A (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	12.0	12.0	8.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	11.0	9.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N40 (Average)			
Channel	Channel 151	Channel 159	
Target (dBm)	11.0	9.0	
Tolerance $\pm$ (dB)	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, $r=20\text{cm}$, 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/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
BLE 1M	1.0	1.2589	3.15	2.0654	0.0005	1.0000

[2.4G WIFI]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11b	17.0	50.1187	3.15	2.0654	0.0206	1.0000
IEEE 802.11g	15.0	31.6228	3.15	2.0654	0.0130	1.0000
IEEE 802.11n HT20	13.0	19.9526	3.15	2.0654	0.0082	1.0000
IEEE 802.11n HT40	12.0	15.8489	3.15	2.0654	0.0065	1.0000





[5.2G WIFI]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11a	12.0	15.8489	2.21	1.6634	0.0052	1.0000
IEEE 802.11n HT20	12.0	15.8489	2.21	1.6634	0.0052	1.0000
IEEE 802.11n HT40	11.0	12.5893	2.21	1.6634	0.0042	1.0000

[5.3G WIFI]

Band/Mode	RF output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11a	12.0	15.8489	2.67	1.8493	0.0058	1.0000
IEEE 802.11n HT20	12.0	15.8489	2.67	1.8493	0.0058	1.0000
IEEE 802.11n HT40	12.0	15.8489	2.67	1.8493	0.0058	1.0000

[5.5G WIFI]

Band/Mode	RF output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11a	13.0	19.9526	2.73	1.8750	0.0074	1.0000
IEEE 802.11n HT20	13.0	19.9526	2.73	1.8750	0.0074	1.0000
IEEE 802.11n HT40	11.0	12.5893	2.73	1.8750	0.0047	1.0000

[5.8G WIFI]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11a	13.0	19.9526	2.82	1.9143	0.0076	1.0000
IEEE 802.11n HT20	12.0	15.8489	2.82	1.9143	0.0060	1.0000
IEEE 802.11n HT40	12.0	15.8489	2.82	1.9143	0.0060	1.0000

Remark:

1. Output power including tune-up tolerance;
2. Output power was adjusted 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 equipped with one antenna. So, no need considers 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.

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

