

FCC Part 15C

Measurement and Test Report

For

Shenzhen Silver Star Intelligent Technology Co., Ltd.
Difu Industrial Areas, Guanguang Road,
Baoan District, Shenzhen, China

FCC ID: 2AGE6-I3

Test Item:	Above 18GHz Radiated Emission
Product Description:	<u>Robotic Vacuum Cleaner</u>
Tested Model:	<u>I3</u>
Report No.:	<u>STR171192363E-3</u>
Sample Receipt Date:	<u>2017-11-15</u>
Tested Date:	<u>2017-11-15 to 2017-11-20</u>
Issued Date:	<u>2017-11-20</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permission by Shenzhen SEM.Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Shenzhen Silver Star Intelligent Technology Co., Ltd.
Address of applicant: Dafu Industrial Areas, Guanguang Road, Baoan
District, Shenzhen, China
Manufacturer: Shenzhen Silver Star Intelligent Technology Co., Ltd.
Address of manufacturer: Dafu Industrial Areas, Guanguang Road, Baoan
District, Shenzhen, China

General Description of EUT	
Product Name:	Robotic Vacuum Cleaner
Trade Name:	N/A
Model No.:	I3
Adding Model(s):	N/A
Rated Voltage:	Input: DC 19V --- 600mA
Power Adapter Model:	NLB060190W1A4S58
Software Version:	N/A
Hardware Version:	N/A
<i>Note: The test data is gathered from a production sample provided by the manufacturer. The appearance of others models listed in the report is different from main-test model I3, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	2404-2480MHz
RF Output Power:	N/A
Type of Modulation:	GFSK
Data Rate:	N/A
Quantity of Channels:	3
Channel Separation:	38MHz
Type of Antenna:	PCB Printed Antenna
Antenna Gain:	0dBi
Lowest Internal Frequency	32.768kHz

1.2 Test Standards

The following report is prepared on behalf of the I3 in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 v04 for digital transmission systems shall be performed also.

1.4 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Transmitting	2404MHz, 2442MHz, 2480MHz
Note: All test modes (different data rate and different modulation) are performed, but only the worst case is recorded in this report.		

Accessories Equipment List and Details			
Description	Manufacturer	Model No.	Serial Number
Accessories Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With Core/Without Core
EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With Core/Without Core

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Transmitter Spurious Emissions	Radiated	±5.1dB

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2017-06-12	2018-06-11
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2017-03-09	2018-03-08
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2017-08-15	2018-08-14
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2017-08-15	2018-08-14

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2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.209(a)	Radiated Emission	Compliant
Remark: Above 18GHz		

N/A: not applicable

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3. Field Strength of Spurious Emissions

3.1 Standard Applicable

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of Harmonics (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

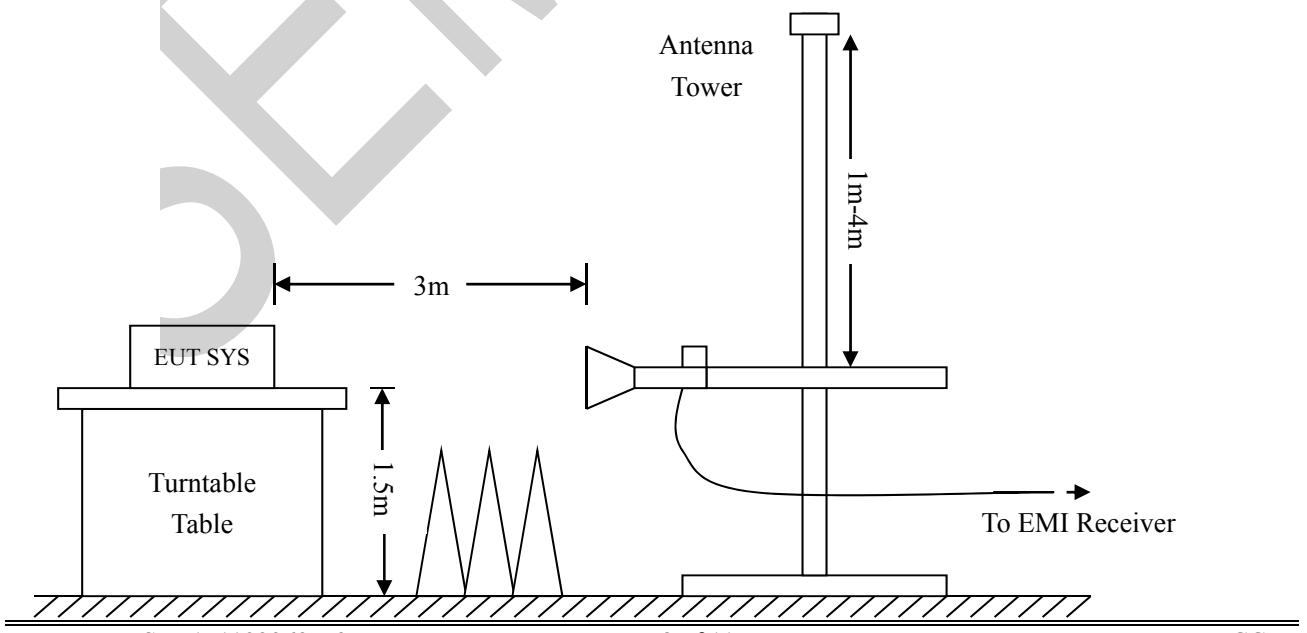
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

3.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.249(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.



Frequency :Above 1GHz

RBW=1MHz, VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto, Trace = max hold

Detector function = peak

3.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of $-6\text{dB}\mu\text{V}$ means the emission is $6\text{dB}\mu\text{V}$ below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

3.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

3.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst cases:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Spurious Emissions 18GHz-25GHz

Test Mode: 2404MHz(Transmitting), 2442MHz(Transmitting), 2480MHz(Transmitting)
 Only the worst case horizontal polar result were record as below table.

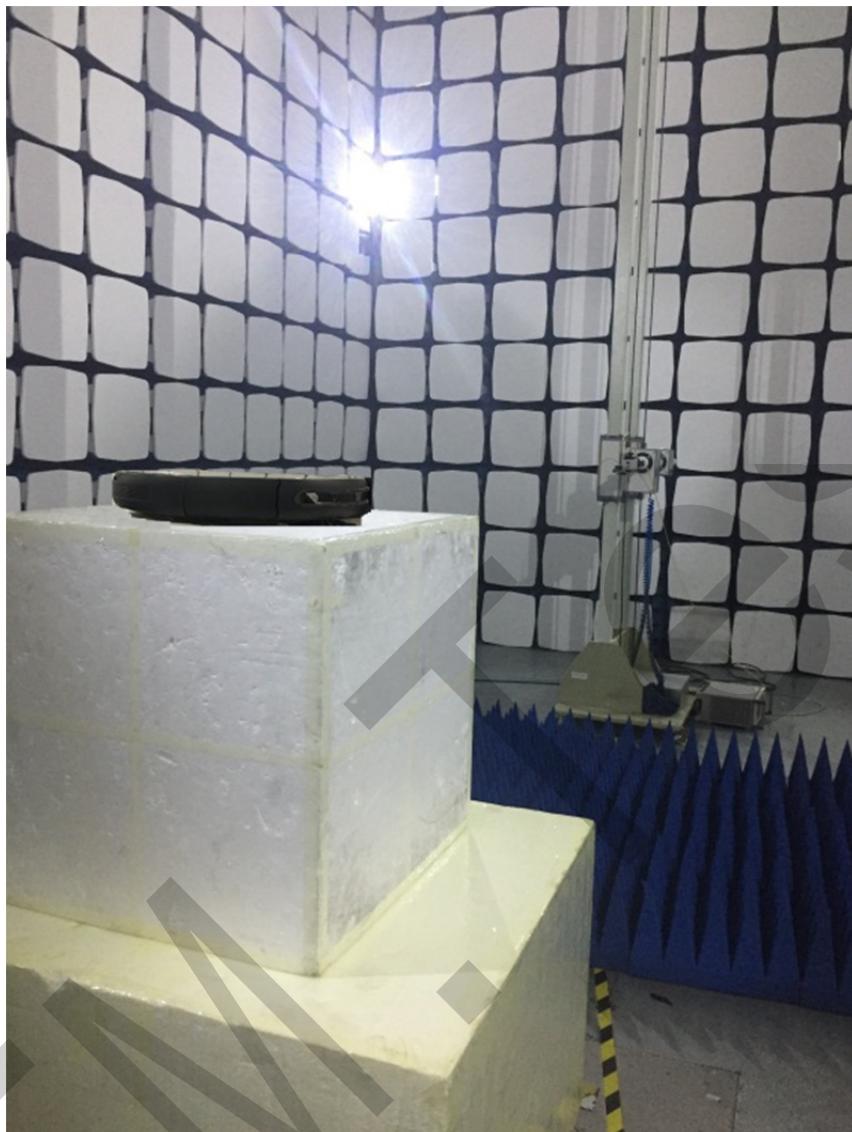
Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2404MHz					
20010	45.69	74	-28.31	H	PK
20010	42.15	54	-11.85	H	AV
23020	46.38	74	-27.62	H	PK
23020	46.20	54	-7.80	H	AV

Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Middle Channel-2442MHz					
20010	44.32	74	-29.68	H	PK
20010	42.06	54	-11.94	H	AV
23020	45.08	74	-28.92	H	PK
23020	44.25	54	-9.75	H	AV

Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
High Channel-2480MHz					
20010	48.62	74	-25.38	H	PK
20010	45.82	54	-8.18	H	AV
23020	46.14	74	-27.86	H	PK
23020	46.47	54	-7.53	H	AV

Note: Testing is carried out with frequency rang 18GHz to 25GHz, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Test setup for 18GHz~25GHz:



***** END OF REPORT *****