

1 Cover Page

RF Exposure Evaluation Report

Application No.: SHEM2003001567CR
FCC ID: 2AH25F4E00
Applicant: Shanghai Sunmi Technology Co.,Ltd.
Address of Applicant: Room 605,Block 7,KIC Plaza,No.388 Song Hu Road Yang Pu District,Shanghai,China
Manufacturer: Shanghai Sunmi Technology Co.,Ltd.
Address of Manufacturer: Room 605,Block 7,KIC Plaza,No.388 Song Hu Road Yang Pu District,Shanghai,China
Factory: BYD Precision Manufacture Co.,Ltd
Address of Factory: No.3001,Bao He Road,Baolong Industry Zone,Longgang Sub-district,Longgang District,Shenzhen,Guangdong Province,China

Equipment Under Test (EUT):
EUT Name: Self-Checkout Kiosk
Model No.: F4E00
Trade mark: SUNMI
Standard(s) : FCC Rules 47 CFR §2.1091
 KDB447498 D01 General RF Exposure Guidance v06

Date of Receipt: 2020-03-19
Date of Test: 2020-03-15 to 2020-05-26
Date of Issue: 2020-05-27

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Parlan Zhan

Parlan Zhan
E&E Section Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



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Revision Record			
Version	Description	Date	Remark
00	Original	2020-05-27	/

Authorized for issue by:			
			
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		Micheal Niu /Project Engineer	
			
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		Parlam Zhan /Reviewer	



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3 General Information

3.1 General Description of E.U.T.

Power supply:	AC 100~240V 50/60Hz
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3.2 Technical Specifications

2.4G WiFi

Antenna Gain:	2 dBi
Antenna Type:	PIFA Antenna
Channel Spacing:	5MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz
Data Rate:	802.11b:1/2/5.5./11Mbps 802.11g:6/9/12/18/24/36/48/54Mbps 802.11n:MCS0-MCS7

BT

Antenna Gain:	2dBi
Antenna Type:	PIFA Antenna
Bluetooth Version:	V4.2 Dual mode
Channel Spacing:	1MHz
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Data Rate:	1/2/3Mbps
Number of Channels:	79
Operation Frequency:	2402MHz to 2480MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)

BLE

Antenna Gain:	2dBi
Antenna Type:	PIFA Antenna
Bluetooth Version:	V4.2 Dual mode
Channel Spacing:	2MHz
Data Rate:	1Mbps
Modulation Type:	GFSK
Number of Channels:	40
Operation Frequency:	2402MHz to 2480MHz

5G

Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	Band 1	802.11a/n(HT20)/ac(HT20)	5180-5240	4
		802.11n(HT40)/ac(HT40)	5190-5230	2
		802.11ac(HT80)	5210	1
	Band 4	802.11a/n(HT20)/ac(HT20)	5745-5825	5
		802.11n(HT40)/ac(HT40)	5755-5795	2
		802.11ac(HT80)	5775	1
Modulation Type:	802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)			
Channel Spacing:	802.11a/n(HT20)/ac(HT20): 20MHz 802.11n(HT40)/ac(HT40): 40MHz 802.11ac(HT80): 80MHz			
Data Rate:	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: MCS0-7 802.11ac: MCS0-9			
Antenna Gain:	2 dBi			
Antenna Type:	PIFA Antenna			

13.56MHz

Antenna Type	Loop Antenna
Modulation Type	ASK
Number of Channels	1
Operation Frequency	13.56MHz

125KHz

Antenna Type:	Loop Antenna
Modulation Type:	ASK
Number of Channels:	1
Operation Frequency:	125KHz

3.3 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

All measurement facilities used to collect the measurement data are located at

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

No tests were sub-contracted.

3.4 Test Facility

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

- **CNAS (No. CNAS L4354)**

CNAS has accredited Compliance Certification Services (Kunshan) Inc. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 2541.01)**

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

- **FCC –Designation Number: CN1172**

Compliance Certification Services Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172. Test Firm Registration Number: 995260.

- **Industry Canada (IC) – IC Assigned Code: 2324E**

The 10m and 3m Semi-anechoic chamber of Compliance Certification Services (Kunshan) Inc. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 2324E-1 for 10m chamber, 2324E-2 for 3m chamber.

- **VCCI (Member No.: 1938)**

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-1600, C-1707, T-1499, G-10216 respectively.

4 Test Standards and Limits

4.1 FCC Radiofrequency radiation exposure limits:

According to §1.1310, the limit for general population/uncontrolled exposures

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	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

Note: Limit for 2.4GHz&5GHz is 1.0 mW/cm²

Limit for 125kHz is 614 V/m

Limit for 13.56MHz is 60.77 V/m

5 Measurement and Calculation

5.1 Maximum transmit power

The Power Data is based on the RF Test Report SHEM200300156701, SHEM200300156702, SHEM200300156703, SHEM200300156704, SHEM200300156705, SHEM200300156706

BLE

Test Mode	Test Frequency (MHz)	Output Power (dBm)	Reading Power (mW)
BLE	2402	7.74	5.94
	2440	8.61	7.26
	2480	7.97	6.27

BT

Test Mode	Test Frequency (MHz)	Output Power (dBm)	Reading Power (mW)
GFSK	2402	7.91	6.18
	2441	8.20	6.61
	2480	7.77	5.98
Pi/4DQPSK	2402	3.76	2.38
	2441	4.68	2.94
	2480	4.19	2.62
8DPSK	2402	4.18	2.62
	2441	5.10	3.24
	2480	4.62	2.90

2.4G WIFI

Test Mode	Test Channel	Ant	Power [dBm]	Power [mW]
11B	2412	Ant1	17.13	51.64
11B	2437	Ant1	16.99	50.00
11B	2462	Ant1	17.14	51.76
11G	2412	Ant1	17.05	50.70
11G	2437	Ant1	17.88	61.38
11G	2462	Ant1	18.18	65.77
11N20SISO	2412	Ant1	17.13	51.64
11N20SISO	2437	Ant1	17.48	55.98
11N20SISO	2462	Ant1	17.48	55.98

5G

Test Mode	Frequency (MHz)	Ant	Power [dBm]	Power [mW]
802.11a	5180	Ant1	10.82	12.08
	5200	Ant1	11.10	12.88
	5240	Ant1	10.64	11.59
	5745	Ant1	13.79	23.93
	5785	Ant1	13.89	24.49
	5825	Ant1	13.40	21.88
802.11ac	5180	Ant1	12.33	17.10
	5190	Ant1	12.94	19.68
	5200	Ant1	12.63	18.32
	5210	Ant1	12.70	18.62
	5230	Ant1	12.31	17.02
	5240	Ant1	12.15	16.41
	5745	Ant1	14.35	27.23
	5755	Ant1	14.77	29.99
	5775	Ant1	15.85	38.46
	5785	Ant1	14.39	27.48
	5795	Ant1	15.28	33.73
	5825	Ant1	13.98	25.00
802.11n	5180	Ant1	12.15	16.41
	5190	Ant1	13.71	23.50
	5200	Ant1	12.47	17.66
	5230	Ant1	13.89	24.49
	5240	Ant1	12.00	15.85
	5745	Ant1	14.24	26.55
	5755	Ant1	15.28	33.73
	5785	Ant1	14.49	28.12
	5795	Ant1	15.67	36.90
	5825	Ant1	14.00	25.12

13.56MHz: 55.08 dBuV/m @3m, @20cm=@3m+40log(3/0.02)=142.16 dBuV/m

125KHz: 58.39 dBuV/m @3m, @20cm=@3m+40log(3/0.02)=145.43 dBuV/m

5.2 MPE Calculation

For WiFi:

According to the formula $S=P/4\pi R^2$, we can calculate S which is MPE.

Note:

- 1) P (mW)
- 2) R = distance to the center of radiation of antenna (in meter) = 20cm
- 3) MPE limit = 1mW/cm²

For WIFI

The max. antenna gain is 2 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
65.77	1.585	20	0.02074	1	Pass

For BT

The max. antenna gain is 2 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
6.61	1.585	20	0.00208	1	Pass

For BLE

The max. antenna gain is 2 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
7.26	1.585	20	0.00229	1	Pass

For 5G

The max. antenna gain is 2 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
38.46	1.585	20	0.01213	1	Pass

For 13.56MHz: 142.16dBuV/m=12.82V/m < 60.77 V/m.

For 125kHz: 145.43 dBuV/m=18.69V/m < 614 V/m

The 2.4G band and 5G band and 13.56MHz function can simultaneous transmitting. But the maximum rate of MPE is

$0.021/1.0 + 0.012/1.0 + 12.82/60.77 = 0.244 \leq 1.0$. according to the KDB447498 section 7.2 determine the device is exclusion from SAR test.

--End of the Report--