Industrial Internet Innovation Center (Shanghai) Co.,Ltd.

FCC/IC GSM TEST REPORT

PRODUCT	Wireless data POS System
BRAND	SUNMI
MODEL	T5820
APPLICANT	Shanghai Sunmi Technology Co.,Ltd.
FCC ID	2AH25T5820
IC	22621-T5820
ISSUE DATE	February 23, 2023
STANDARD(S)	FCC Part 2, FCC Part 22, FCC Part 24, RSS-Gen Issue 5, RSS-132 Issue 3, RSS-133 Issue 6

Prepared by:Wu Rui **Reviewed by:** ***Yang Fan*** **Approved by:** ***Zhang Min***

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1. Summary of Test Report

1.1 Test Standard (s)

No.	Test Standard（Include the version of standard）	Title	Version
1	FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	2021-10-01
2	FCC Part 22	PUBLIC MOBILE SERVICES	2021-10-01
3	FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	2021-10-01
4	RSS-Gen Issue 5	RSS-Gen —General Requirements for Compliance of Radio Apparatus	2021-02
5	RSS-132 Issue 3	Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz	2013-01
6	RSS-133 Issue 6	2 GHz Personal Communications Services	2018-01

1.2 Reference Documents

No.	Test Standard（Include the version of standard）	Title	Version
1	ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
2	ANSI C63.26	American National Standard of Procedures for Compliance Testing of Licensed Transmitters Used in Licensed Radio	2015
3	KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v03r01

1.3 Summary of Test Results

Measurement Items	Sub-clause of FCC	Sub-clause of IC	Verdict
Output Power	2.1046/22.913(a)/24.232(c)	RSS-132 5.4 RSS-133 6.4	PASS
Peak-to-Average Ratio	24.232(d)	RSS-132 5.4 RSS-133 6.4	PASS (Note 2)
99%Occupied Bandwidth	2.1049(h)(i)/ 22.917(b)	RSS-Gen 6.7	PASS (Note 2)
-26dB Emission Bandwidth	22.917(b)/24.238(b)	RSS-Gen 6.7	PASS (Note 2)

Band Edge at antenna terminals	22.917(a)/24.238(a)	RSS-132 5.5 RSS-133 6.5	PASS (Note 2)
Frequency stability	2.1055/24.235	RSS-132 5.3 RSS-133 6.3	PASS (Note 2)
Conducted Spurious mission	2.1053/22.917(a)/24.238(a)	RSS-132 5.5 RSS-133 6.5	PASS (Note 2)
Emission Limit	2.1051/22.917/24.238/22.913/24.232	RSS-132 5.5 RSS-133 6.5	PASS

Note1:

The T5820, manufactured by Shanghai Sunmi Technology Co.,Ltd. is a variant product for testing.

This project is a variant project based on the I22I30121-RF01-V00,original FCC ID 2AH25T5820C and IC 22621-T5820C. we tested the worst mode of the original report, and the test data of the worst mode was recorded in the report. Verify the power of the variant product ,and the test results meet the limit requirement.The main difference of EUT is as below：

Type of Certification	Configuration type	NFC function	Cradle (Pogo PIN)	AC adapter	Panel dimension
Parent	High configuration	Yes	Yes	input： 5V/2A	5.0 inch
Variant (Based on Parent)	Basic configuration	No	No	input： 5V/1A	4.95 inch

Industrial Internet Innovation Center (Shanghai) Co., Ltd. only performed test cases which identified with Pass/Fail/Inc result in section 1.3.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 1 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 4 of this test report.

Note 2:

The test verdict of this item come form the original report.

1.4 Data Provided by Applicant

No.	Item(s)	Data
N/A	N/A	N/A

2. General Information of The Laboratory

2.1 Testing Laboratory

Lab Name	Industrial Internet Innovation Center (Shanghai) Co.,Ltd.
Address	Building 4，No. 766，Jingang Road，Pudong，Shanghai，China
Telephone	021-68866880
FCC Registration No.	958356
FCC Designation No.	CN1177
IC Designation No.	10766A
CAB identifier	CN0067

2.2 Laboratory Environmental Requirements

Temperature	15℃~35℃
Relative Humidity	25%RH~75%RH
Atmospheric Pressure	101kPa

2.3 Project Information

Project Manager	Gao Hongning
Test Date	October 20, 2022 to Novmber 30, 2022

3. General Information of The Customer

3.1 Applicant

Company	Shanghai Sunmi Technology Co.,Ltd.
Address	Room 505, No.388,Song Hu Road, Yang Pu District, Shanghai, China
Telephone	13510126210

3.2 Manufacturer

Company	Shanghai Sunmi Technology Co.,Ltd.
Address	Room 505, No.388,Song Hu Road, Yang Pu District, Shanghai, China

4. General Information of The Product

4.1 Product Description for Equipment under Test (EUT)

Product	Wireless data POS System
Model	T5820
Date of Receipt	S02aa:October 20,2022
EUT ID*	S02aa
SN/IMEI	S02aa: 860450060011182 860450060011190
Supported Radio Technology and Bands	GSM850/GSM900/DCS1800/PCS1900 WCDMA Band I/II/IV/V/VIII LTE Band 2/4/5/7/12/17/38/41 BT 5.1 BR/EDR ,BLE WLAN 802.11b/g/n WLAN 802.11a/n/ac GPS/Glonass/BDS/OTDOA
HVIN	T5820
Hardware Version	V01
Software Version	XQT530_V004_20220923
FCC ID	2AH25T5820
IC	22621-T5820
NOTE： EUT ID is the internal identification code of the laboratory.	

4.2 Description for Auxiliary Equipment (AE)

AE ID*	Description	Model	SN/Remark
AE1	RF Cable	N/A	N/A
NOTE： AE ID is the internal identification code of the laboratory.			

4.3 Additional Information

Type of modulation	GMSK/8PSK

5. Test Configuration Information

5.1 Laboratory Environmental Conditions

5.1.1 Permanent Facilities

Relative Humidity	Min. = 45%, Max. = 55 %		
Atmospheric Pressure	101kPa		
Temperature	Normal	Minimum	Maximum
	25℃	0℃	45℃
Working Voltage of EUT	Normal	Minimum	Maximum
	7.2V	6.8V	8.4V

5.2 Test Equipments Utilized

Radiated emission test system

No.	Name	Model	S/N	Manufacturer	Cal. Date	Cal. Interval
1	Universal Radio Communication Tester	CMU200	123123	R&S	October 17,2022	1Year
					March 10, 2021	1.5 Years
2	Universal Radio Communication Tester	CMW500	104178	R&S	October 17,2022	1Year
					March 10, 2021	1.5 Years
3	EMI Test Receiver	ESU40	100307	R&S	February 23, 2022	1 Year
4	TRILOG Broadband Antenna	VULB9163	VULB9163-515	Schwarzbeck	March 11, 2022	1 Year
5	Double- ridged Waveguide Antenna	ETS-3117	00135890	ETS	March 9, 2022	2 Years
6	2-Line V-Network	ENV216	101380	R&S	February 21, 2022	1 Year
7	EMI Test Software	EMC32 V9.15.00	N/A	R&S	N/A	N/A

Anechoic chamber

Fully anechoic chamber by ETS.

Conducted Test System

5.3 Measurement Uncertainty

Measurement uncertainty for all the testing in this report are within the limit specified in 3IN documents.

The detailed measurement uncertainty is defined in 3IN documents.

Measurement Items	Range	Confidence Level	Calculated Uncertainty
Maximum Peak Output Power	30MHz-3600MHz	95%	±0.544dB
EBW and VBW	30MHz-3600MHz	95%	±62.04Hz
Transmitter Spurious Emission-Conducted	30MHz-2GHz	95%	±0.90dB
Transmitter Spurious Emission-Conducted	2GHz-3.6GHz	95%	±0.88dB
Transmitter Spurious Emission-Conducted	3.6GHz-8GHz	95%	±0.96dB
Transmitter Spurious Emission-Conducted	8GHz-20GHz	95%	±0.94dB
Transmitter Spurious Emission-Radiated	9KHz-30MHz	95%	±5.66dB
Transmitter Spurious Emission-Radiated	30MHz-1000MHz	95%	±4.98dB
Transmitter Spurious Emission-Radiated	1000MHz -18000MHz	95%	±5.06dB
Transmitter Spurious Emission-Radiated	18000MHz -40000MHz	95%	±5.20dB
Frequency stability	1MHz-16GHz	95%	±62.04Hz

6. Test Results

6.1 Radiated

6.1.1 EMISSION LIMIT

6.1.1.1 GSM Measurement Method

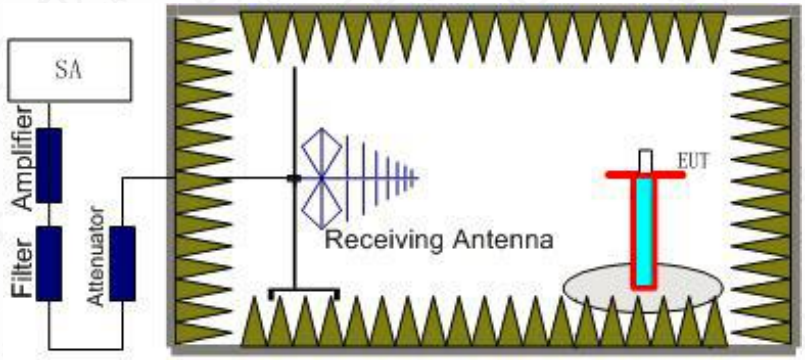
The measurements procedures in TIA-603E-2016 are used.

The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set as outlined in Part 24.238 and Part 24.917.

The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of PCS1900 and GSM850.

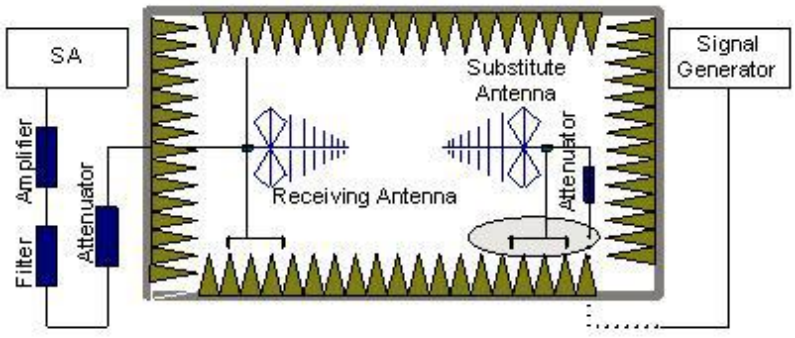
6.1.1.2 The procedure of radiated spurious emissions is as follows

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10thharmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).

3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is

connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss (Ppl) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (Ga) should be recorded after test.

A amplifier should be connected in for the test.

The Path loss (Ppl) is the summation of the cable loss .

The measurement results are obtained as described below:

Power(EIRP)=PMea- Ppl+ Ga

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi

6.1.1.3 Measurement Limit

Rule 2.1051/22.917/24.238/22.913/24.232 specifies that " In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p (watts).

(ii) After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required." Limit -13 dBm

Rule 2.1051/22.917/24.238/22.913/24.232 specifies that " In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p(watts).

After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p(watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required." Limit -13 dBm

6.1.1.4 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz) and GSM850 band (824.2MHz, 836.6MHz, 848.8MHz) . It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the PCS1900 ,GSM850 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

6.1.1.5 Measurement Results Table

Frequency	Channel	Frequency Range	Result

GSM850	**Low**	30MHz~10GHz	N/A
	Middle	30MHz~10GHz	N/A
	High	30MHz~10GHz	N/A
GSM1900	**Low**	30MHz~20GHz	Pass
	Middle	30MHz~20GHz	Pass
	High	30MHz~20GHz	Pass

Note:

Power(ERP)= Pmea-Pcl+Ga

This method Applicable to the following table.

RSE-GPRS1900-S02aa-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
3700.8	-47.13	6.6	7.9	-45.83	-13	H
5550.6	-39.72	8.2	9.8	-38.12	-13	H
7400.4	-48.17	9.7	11.6	-46.27	-13	H
9250.8	-42.35	10.7	12.7	-40.35	-13	H
12951.6	-41.8	13.2	12.3	-42.7	-13	H
17056.8	-39.46	16.0	12.3	-43.16	-13	H

RSE-GPRS1900-S02aa-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
3700.2	-44.31	6.6	7.9	-43.01	-13	H
5551.2	-38.76	8.2	9.8	-37.16	-13	V
7400.4	-49.35	9.7	11.6	-47.45	-13	V
9250.8	-41.44	10.7	12.7	-39.44	-13	H
12952.8	-43.77	13.2	12.3	-44.67	-13	H
16021.2	-40.86	15.0	12.3	-43.56	-13	H

RSE-GPRS1900-S02aa-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
3700.8	-47.56	6.6	7.9	-46.26	-13	H

5550.6	-38.62	8.2	9.8	-37.02	-13	H
7400.4	-49.63	9.7	11.6	-47.73	-13	V
9250.8	-42.93	10.7	12.7	-40.93	-13	V
12951.6	-41.13	13.2	12.3	-42.03	-13	V
16812.0	-39.56	15.8	12.3	-43.06	-13	V

6.2 OutPut Power

Note1: The power of the worst part is verified to meet the requirements.

BAND	Mode	original data(dBm)	verified power(dBm)
GSM850	GMSK	32.71	32.56
GSM1800	GMSK	30.59	30.55

Note2:

The verified power is still in the tune-up power range and meets the requirements of KDB484596 D01 data reference. The power listed in the original certificate still applies to this case.

Annex A: Revised History

Version	Revised Content
V00	Initial
V01	The original FCC ID was added
V02	Added power description
V03	Added validation power data

Annex B: Accreditation Certificate

Accredited Laboratory

A2LA has accredited

INDUSTRIAL INTERNET INNOVATION CENTER (SHANGHAI) CO., LTD.

Shanghai, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 12th day of April 2021.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3682.01
Valid to February 28, 2023

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.