

Industrial Internet Innovation Center (Shanghai) Co.,Ltd.**RF TEST REPORT**

PRODUCT	Smart POS system
BRAND	SUNMI
MODEL	T6F10
APPLICANT	Shanghai Sunmi Technology Co.,Ltd.
FCC ID	2AH25T6F10LA
ISSUE DATE	February 26, 2024
STANDARD(S)	FCC Part 2, FCC Part 22H, FCC Part 24E

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

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CONTENTS

1. SUMMARY OF TEST REPORT	3
1.1 TEST STANDARD (S)	3
1.2 REFERENCE DOCUMENTS.....	3
1.3 SUMMARY OF TEST RESULTS.....	3
1.4 DATA PROVIDED BY APPLICANT.....	5
2. GENERAL INFORMATION OF THE LABORATORY	6
2.1 TESTING LABORATORY	6
2.2 LABORATORY ENVIRONMENTAL REQUIREMENTS.....	6
2.3 PROJECT INFORMATION	6
3. GENERAL INFORMATION OF THE CUSTOMER.....	7
3.1 APPLICANT	7
3.2 MANUFACTURER	7
4. GENERAL INFORMATION OF THE PRODUCT.....	8
4.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	8
4.2 DESCRIPTION FOR AUXILIARY EQUIPMENT (AE)	8
4.3 ADDITIONAL INFORMATION	9
5. TEST CONFIGURATION INFORMATION	10
5.1 LABORATORY ENVIRONMENTAL CONDITIONS.....	10
5.2 TEST EQUIPMENTS UTILIZED.....	10
5.3 MEASUREMENT UNCERTAINTY	11
6. TEST RESULTS	13
6.1 OUTPUT POWER.....	13
6.2 EMISSION LIMIT.....	15
ANNEX A: REVISED HISTORY	19
ANNEX B: ACCREDITATION CERTIFICATE.....	20

1. Summary of Test Report

1.1 Test Standard (s)

No.	Test Standard	Title	Version
1	FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	--
2	FCC Part 22H	CELLULAR RADIOTELEPHONE SERVICE	--
3	FCC Part 24E	BROADBAND PCS	--

Note: FCC Part 2 have not been accredited by A2LA.

1.2 Reference Documents

No.	Test 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

Note: KDB 971168 D01 have not been accredited by A2LA.

1.3 Summary of Test Results

GSM850

Measurement Items	Sub-clause of FCC	Verdict
Output Power/ERP	2.1046/22.913(a)	Pass ^{Note2} ^{Note3}
Peak-to-Average Ratio	N/A	N/A
99%Occupied Bandwidth	2.1049	Pass ^{Note2}
26dB Emission Bandwidth	2.1049	Pass ^{Note2}
Band Edge at antenna terminals	2.1051/22.917(a)	Pass ^{Note2}
Frequency stability	22.355	Pass ^{Note2}
Conducted Spurious mission	2.1051/22.917(a)	Pass ^{Note2}
Emission Limit	2.1053/22.917(a)	Pass ^{Note2} ^{Note3}

PCS1900

Measurement Items	Sub-clause of FCC	Verdict
Output Power/EIRP	2.1046,24.232(c)	Pass ^{Note2 Note3}
Peak-to-Average Ratio	24.232(d)	Pass ^{Note2}
99%Occupied Bandwidth	2.1049	Pass ^{Note2}
26dB Emission Bandwidth	2.1049	Pass ^{Note2}
Band Edge at antenna terminals	2.1051/24.238(a)	Pass ^{Note2}
Frequency stability	24.235	Pass ^{Note2}
Conducted Spurious mission	2.1051/24.238(a)	Pass ^{Note2}
Emission Limit	2.1053/24.238(a)	Pass ^{Note2 Note3}

Note1:

The T6F10, manufactured by Shanghai Sunmi Technology Co.,Ltd. is a variant product for testing.

This project is a variant project based on the 23T04I30131-RF01-V01,original FCC ID 2AH25T6F10 with below changes:

Software Modifications:

-subtract eu bands

Hardware Modifications:

-Band changes: YES

WCDMA reduced by B6/B19

LTE reduced by B8/B18/B19/B20/B26/B34/B39/B40; B41(200M)->B41(120M);

These changes do not affect the RF performance of other frequency bands.

-Components on PCB changes: Yes

-LCD changes: Please refer to the following difference chart

-Camera changes: Please refer to the following difference chart

Type of Service	Configuration type	Scanner	Front Camera	Rear Camera	Flash Lamp	LCD (Just different manufacturers)
Original	High Configuration	Yes	Yes	5M AF+flash	Yes	SHENZHEN DJN PHOTOELECTRIC TECHNOLOGY CO., LTD (DJN)
Original	Basic Configuration	NO	Yes	5M AF+flash	Yes	CPT Technology (Group) Co.,Ltd (Hua Ying)
Variant (Based on Original)	Low Configuration	NO	NO	2M FF	NO	CPT Technology (Group) Co.,Ltd (Hua Ying)

-Other changes: PCBA Change.

According to the Product Change Description We tested the worst mode of conducted power and radiated spurious emission in the original report, and the test data of the worst mode was recorded in this report.

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 5.3 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 6 of this test report.

Note 2:

The test data is reported by reference to 23T04I30131-RF01-V01.

Note 3:

The test data in this report is validation data for the worst mode.

1.4 Data Provided by Applicant

No.	Item(s)	Data
1	GSM 850	-1.63 dBi
2	PCS 1900	0.46 dBi

Note: The data of antenna gain is provided by Antenna specification may affect the validity of the test results in this report, and the impact and consequences of this shall be undertaken by the customer.

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.	708870
FCC Designation No.	CN1364

2.2 Laboratory Environmental Requirements

Temperature	15°C~35°C
Relative Humidity	25%RH~75%RH
Atmospheric Pressure	86kPa~106kPa

2.3 Project Information

Project Manager	Gao Hongning
Test Date	January 05, 2024 to January 17, 2024

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	18826519551

3.2 Manufacturer

Company	Shanghai Sunmi Technology Co.,Ltd.
Address	Room 505, No.388,Song Hu Road, Yang Pu District, Shanghai, China
Telephone	18826519551

4. General Information of The Product

4.1 Product Description for Equipment under Test (EUT)

Product	Smart POS system
Model	T6F10
Date of Receipt	S01aa/S02aa/S04aa: December 22, 2023
EUT ID*	S01aa/S02aa/S04aa
SN/IMEI	S01aa: P303D3BM10026 S02aa: P303D3BM10050 S04aa: P303D3BM10008
Supported Radio Technology and Bands	GSM850/GSM900/DCS1800/PCS1900 WCDMA Band I/II/IV/V/VIII LTE Band 1/2/3/4/5/7/28/38/41 BT 5.0 BLE/BR/EDR WLAN 802.11b/g/n WLAN 802.11a/n/ac GPS/GLONASS/BDS/Galileo NFC
Hardware Version	V1.0(LA)
Software Version	V3.0.1
FCC ID	2AH25T6F10LA
Power Rating	DC 7.7V form battery, DC 5V form adapter
NOTE1: EUT ID is the internal identification code of the laboratory. NOTE2: Samples in the test report are provided by the customer. The test results are only applicable to the samples received by the laboratory.	

4.2 Description for Auxiliary Equipment (AE)

AE ID*	Description	Model	SN/Remark
AE1	RF Cable	N/A	N/A
CD01	Adapter	TPA-141A050200UU01	N/A
CH02	Adapter	UC13US	N/A
CI02	Adapter	TPA-23A050200UU01	N/A
UA09	USB Cable	N/A	N/A
BA12	Battery	HPPA	ICON ENERGY SYSTEM (SHENZHEN) CO., LTD.
BB07	Battery	HPPA	Guangdong Highpower New Energy TechnologyCo., Ltd.

NOTE1: AE ID is the internal identification code of the laboratory.

NOTE2: By verifying that BA12+CI02 is the worst battery and adapter combination, this battery and adapter are used in all tests.

4.3 Additional Information

Modulation:

Type of modulation	GMSK/8PSK
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Band Frequency Range:

Band	Frequency Rang(MHz)
GSM850	824.2-848.8
PCS1900	1850.2-1909.8

Band List:

Band	Low Channel	Low Freq. (MHz)	Mid Channel	Mid Freq. (MHz)	High Channel	High Freq. (MHz)
GSM850	128	824.2	189	836.4	251	848.8
PCS1900	512	1850.2	661	1880	810	1909.8

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℃	-10℃	50℃
Working Voltage of EUT	Normal	Minimum	Maximum
	7.7V	6.0V	8.8 V

5.2 Test Equipments Utilized

Conduction test system

No.	Name	Model	S/N	SW Version	HW Version	Manufacturer	Cal. Date	Cal. Interval
1	Software	Eagle V3.3	N/A	V3.3	N/A	3IN	N/A	N/A
2	Frequency spectrum analyzer	FSQ	101091	V4.75	V11.00	R&S	2023-07-26	1 Year
3	Wideband Radio Communication Tester	CMW 500	148874	V3.5.136	N/A	R&S	2023-07-27	1 Year
4	Temperature Chamber	B-TF-107C	201804107	N/A	N/A	BoYi	2023-06-28	1 Year
5	Programmable power supply	Keithley 2303	4039070	N/A	N/A	Keithley	2023-06-23	1 Year
6	RF Test Automation Box	RF 2021B	2001	V3.3	N/A	RANATEC	N/A	N/A

Radiated emission test system

No.	Name	Model	S/N	SW Version	HW Version	Manufacturer	Cal. Date	Cal. Interval
1	Universal Radio Communication Tester	CMU200	123126	V5.2.1	B12	R&S	2023-10-16	1 Year
2	Universal Radio Communication Tester	CMW500	104178	V3.7.20	1206.0600.00	R&S	2023-10-16	1 Year

3	EMI Test Receiver	ESU40	100307	V5.1-24-3	01	R&S	2023-12-19	1 Year
4	TRILOG Broadband Antenna	VULB9163	01345	N/A	N/A	Schwarzbeck	2023-03-23	1 Year
5	Double-ridged Waveguide Antenna	ETS-3117	00135890	N/A	N/A	ETS	2022-03-09	2 Years
6	EMI Test Software	EMC32 V10.35.02	N/A	N/A	N/A	R&S	N/A	N/A
7	Preamplifier	SCU08F1	8320024	N/A	N/A	R&S	2023-10-16	1 year
8	Preamplifier	SCU18	10155	N/A	N/A	R&S	2023-10-16	1 year
9	Antenna	SWB-VUBA 9117	9117-266	N/A	N/A	Schwarzbeck	2023-9-8	1 year
10	Antenna	BBHA9120D	02112	N/A	N/A	Schwarzbeck	2023-7-28	1 year
11	Signal Generator	SMF100A	102314	3.20.390.24	05.10	R&S	2023-10-16	1 year

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 Uncertainty of Radiation test

Frequency Range	Uncertainty(dB)
$30\text{MHz} \leq f \leq 1\text{GHz}$	± 5.10
$1\text{GHz} \leq f \leq 18\text{GHz}$	± 5.66
$18\text{GHz} \leq f \leq 40\text{GHz}$	± 5.22

Measurement Uncertainty of Conduction test

No	Item	Extended uncertainty (k=2)	
1	Frequency Tolerance	23Hz	
2	RF Output Power	0.7dB	
3	conducted spurious	9kHz~3.6GHz	1.5dB
		3.6GHz~8.4GHz	2.8dB
		8.4GHz~12.75GHz	3.4dB
4	EVM	2.1%	
5	Occupied Bandwidth	Bandwidth 1.4MHz	0.03MHz
		Bandwidth 3MHz	0.03MHz
		Bandwidth 5MHz	0.03MHz
		Bandwidth 10MHz	0.05MHz
		Bandwidth 15MHz	0.06MHz

		Bandwidth 20MHz	0.08MHz
6	Emission intermodulation	Adjacent channel	1.4dB
		Alternate channel	1.4dB
7	Range of frequency	0.08MHz	

6. Test Results

6.1 Output Power

6.1.1 Summary

22.913(a) Mobile stations are limited to 7 watts.

24.232(c) Mobile and portable stations are limited to 2 watts.

6.1.2 Method of Measurements

Method of measurements please refer to KDB971168 D01 v03 clause 5.

The EUT was set up for the max output power with pseudo random data modulation.

The power was measured with Rhode & Schwarz base station CMW500.

These measurements were done at 3 frequencies.(bottom, middle and top of operational frequency range).

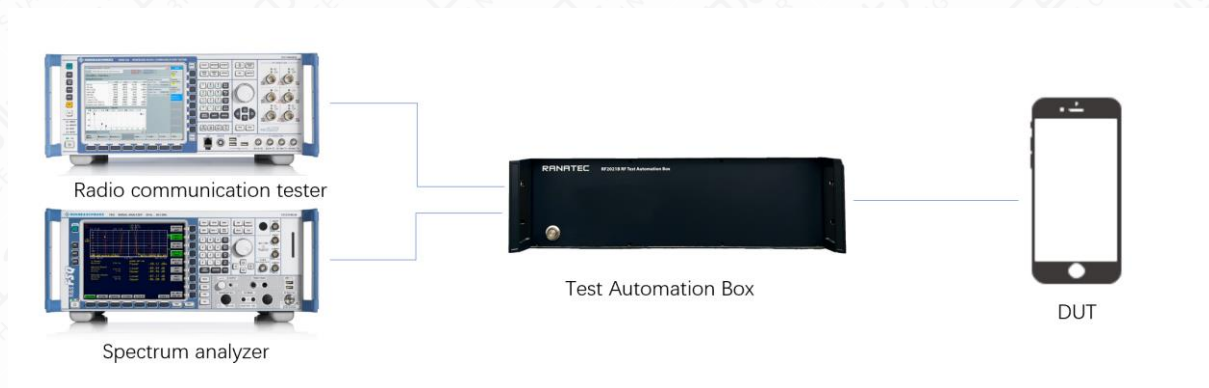
1. The transmitter output port was connected to base station.
2. Set the EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record maximum average power for other modulation signal.
5. During the process of testing, the EUT was controlled Rhode & Schwarz Digital Radio.
6. Communication tester to ensure max power transmission and proper modulation.
7. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

$EIRP = \text{Conducted power} + \text{Gain}$, $ERP = EIRP - 2.15\text{dBi}$.

6.1.3 Test procedures

The transmitter output power was connected to calibrated attenuator, the other end of which was connected to signal analyzer. Transmitter output power was read off the power in dBm. The power outputs at the transmitter antenna port was determined by adding the value of attenuator to the base station reading.

6.1.4 Test Setup



6.1.6 Output Power Measurement result

BAND	Mode	original data(dBm)	verified power(dBm)	d _{dB} ^{Note3}
GSM850	GMSK	33.05	33.02	0.03
GSM1800	GMSK	29.77	29.53	0.24

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

Note2: The difference between Original and verified power is less than 3dB and meets the requirements of KDB484596 D01 data reference. The power listed in the original certificate still applies to this case.

Note3: $d_{dB} = |\text{Verified}_{dB} - \text{original}_{dB}|$

6.2 Emission Limit

Reference

6.2.1 Summary

FCC §22.917/24.238(a) 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 $43 + 10 \log_{10} p$ (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 $43 + 10 \log_{10} p$ (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required." Limit -13 dBm

6.2.2 Method of Measurement

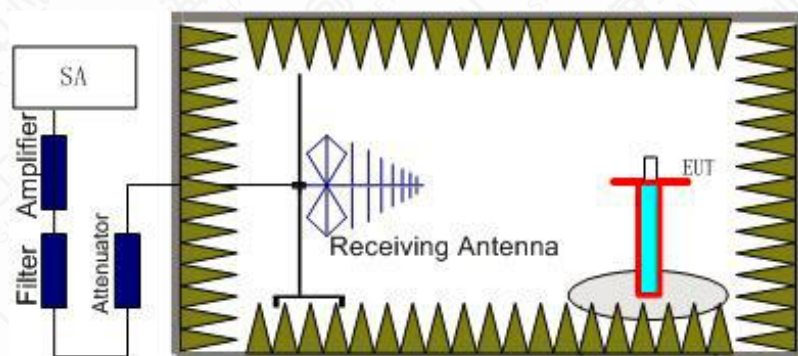
The measurements procedures in TIA-603E-2016 are used.

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.

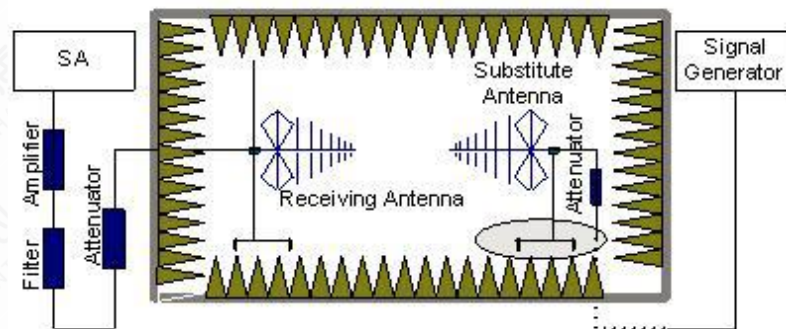
The procedure of radiated spurious emissions is as follows

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 (Pcl) 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 (Pcl) is the summation of the cable loss .

The test results are obtained as described below:

Power(EIRP)=PMea- Pcl+ 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

6.2.3 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) . 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 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.

test Frequency range: 30M-20G

Band	Low Freq. (MHz)	Mid Freq. (MHz)	High Freq. (MHz)	Result
PCS1900	1850.2	1880	1909.8	PASS

Only the worst mode data is provided

RSE-GPRS1900-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result(dBm)	Limit (dBm)	Margin(dBm)	Polarization
3700.2	-48.77	6.6	7.9	-47.47	-13	34.47	V
5551.2	-49.32	8.2	9.8	-47.72	-13	34.72	H
9250.8	-47.79	10.7	12.7	-45.79	-13	32.79	V
11590.8	-46.1	12.2	12.3	-46	-13	33.00	V
13371.6	-44	13.7	12.3	-45.4	-13	32.40	H
16684.8	-36.78	15.1	12.3	-39.58	-13	26.58	H

RSE-GPRS1900-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result(dBm)	Limit (dBm)	Margin(dBm)	Polarization
3760.2	-51.5	6.6	7.9	-50.2	-13	37.20	H
5640.0	-52.75	8.3	10.2	-50.85	-13	37.85	V
8022.0	-53.83	9.9	12.2	-51.53	-13	38.53	H
11497.2	-45.47	12.3	12.3	-45.47	-13	32.47	V
14199.6	-44.43	13.7	12.3	-45.83	-13	32.83	V
16850.4	-36.09	16.3	12.3	-40.09	-13	27.09	H

RSE-GPRS1900-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result(dBm)	Limit (dBm)	Margin(dBm)	Polarization
3759.6	-49.16	6.6	7.9	-47.86	-13	34.86	H
5640.6	-45.15	8.3	10.2	-43.25	-13	30.25	V
7519.2	-52.81	9.7	11.6	-50.91	-13	37.91	H
9399.6	-50.21	10.7	12.7	-48.21	-13	35.21	V
13815.6	-44.89	13.8	12.3	-46.39	-13	33.39	V
16816.8	-36.94	15.8	12.3	-40.44	-13	27.44	H

RSE-EGPRS1900-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result(dBm)	Limit (dBm)	Margin(dBm)	Polarization
3700.2	-49.34	6.6	7.9	-48.04	-13	35.04	H

5551.2	-51.97	8.2	9.8	-50.37	-13	37.37	V
7400.4	-51.72	9.7	11.6	-49.82	-13	36.82	V
9250.8	-48.86	10.7	12.7	-46.86	-13	33.86	H
13603.2	-44.2	13.8	12.3	-45.7	-13	32.70	V
16801.2	-36.21	15.8	12.3	-39.71	-13	26.71	H

RSE-EGPRS1900-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result(dBm)	Limit (dBm)	Margin(dBm)	Polarization
3760.2	-50.82	6.6	7.9	-49.52	-13	36.52	H
5640.0	-52.16	8.3	10.2	-50.26	-13	37.26	H
8193.6	-52.49	10.1	12.4	-50.19	-13	37.19	V
11646.0	-45.78	12.2	12.3	-45.68	-13	32.68	H
13425.6	-44.22	13.7	12.3	-45.62	-13	32.62	H
16954.8	-35.41	16.0	12.3	-39.11	-13	26.11	H

RSE-EGPRS1900-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result(dBm)	Limit (dBm)	Margin(dBm)	Polarization
3819.0	-51.95	6.7	7.9	-50.75	-13	37.75	V
5729.4	-46.09	8.5	10.2	-44.39	-13	31.39	V
7639.2	-53.48	9.7	11.8	-51.38	-13	38.38	V
9642.0	-51.4	10.8	12.7	-49.5	-13	36.50	V
11667.6	-45.37	12.4	12.3	-45.47	-13	32.47	V
15748.8	-38.72	14.5	12.3	-40.92	-13	27.92	H

Annex A: Revised History

Version	Revised Content
V00	Initial

Annex B: Accreditation Certificate



END OF REPORT