TEST REPORT

No. I19Z61038-EMC01

for

Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd

smartphone

Model Name: cp3648A

FCC ID: R38YLCP3648A

with

Hardware Version: P1

Software Version: 9.0.002.P1.190609.cp3648A

Issued Date: 2019-07-02

TESTING
NVLAP LAB CODE 600118-0

Note:

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The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z61038-EMC01	Rev.0	1st edition	2019-07-02

CONTENTS

1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

Location 1: CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China 100191

1.3. Testing Environment

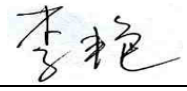
Normal Temperature:	15-35℃
Relative Humidity:	20-75%
Air pressure	980 - 1040 hPa

The climatic requirements above are general exclude the special requirements for dedicated test environments listed in section 5 and some specific test cases in other parts of this report.

1.4. Project data

Testing Start Date:	2019-06-12
Testing End Date:	2019-07-02

1.5. Signature

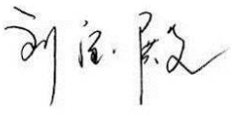


Li Yan

(Prepared this test report)

Zhang Ying

(Reviewed this test report)



Liu Baodian

Deputy Director of the laboratory

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd
Address /Post:	Building B, Boton Science Park, Chaguang Road, Xili Town, Nanshan District, Shenzhen
Contact:	Yentl Chen
Email:	chenyanting@yulong.com
Telephone:	+86 15927320221
Fax:	/

2.2. Manufacturer Information

Company Name:	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd
Address /Post:	Building B, Boton Science Park, Chaguang Road, Xili Town, Nanshan District, Shenzhen
Contact:	Yentl Chen
Email:	chenyanting@yulong.com
Telephone:	+86 15927320221
Fax:	/

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	smartphone
Model Name	cp3648A
FCC ID	R38YLCP3648A
Antenna	Embedded
Extreme vol. Limits	3.7VDC to 4.4VDC (nominal: 3.85VDC)
Extreme temp. Tolerance	-10°C to +55°C

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL, Telecommunication Technology Labs, Telecommunication Technology Labs, CAICT.

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
UT03a	990013500007864	P1	9.0.002.P1.190609.cp3648A

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description
AE1	Battery
AE1	Battery

AE1

Model	Li-ion Polymer
Manufacturer	Tianjin Lishen
Capacitance	2450mAh

AE2

Model	Li-ion Polymer
Manufacturer	Zhuhai Coslight
Capacitance	2450mAh

*AE ID: is used to identify the test sample in the lab internally.

3.4. General Description

The Equipment Under Test (EUT) is a model of smartphone with embedded antenna. Manual and specifications of the EUT were provided to fulfil the test.

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 90	PRIVATE LAND MOBILE RADIO SERVICES	10-1-18 Edition
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS;GENERAL RULES AND REGULATIONS	10-1-18 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v03 r01

5. LABORATORY ENVIRONMENT

Control room / conducted chamber did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. =20 %, Max. = 80 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber FAC-3 (9 meters×6.5 meters×4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 4000 MHz

6. SUMMARY OF TEST RESULTS

6.1. Summary of test results

Abbreviations used in this clause:		
Verdict Column	P	Pass
	F	Fail
	NA	Not applicable
	NM	Not measured
Location Column	A/B/C/D	The test is performed in test location A, B, C or D which are described in section 1.2 of this report

LTE Band 26(814MHz~824MHz)

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	90.635	A.1	P
2	Emission Limit	2.1053/90.691	A.2	P

6.2. Statements

The test cases listed in section 6.1 of this report for the EUT specified in section 3 were performed by CTTL according to the standards or reference documents in section 4.1

The EUT met all applicable requirements of the standards or reference documents in section 4.1.

This report only deals with the LTE functions among the features described in section 3.

7. Test Equipments Utilized

8. NO.	Description	TYPE	series number	MANUFACTURE	CAL DUE DATE	Calibration interval
1	EMI Antenna	VULB9163	9163-235	Schwarzbeck	2019-11-20	1 year
2	EMI Antenna	3117	00058889	ETS-Lindgren	2020-01-02	1 year
3	EMI Antenna	3117	00119024	ETS-Lindgren	2020-02-25	1 year
6	EMI Antenna	9117	177	Schwarzbeck	2019-08-22	1 year
7	Signal Generator	SMF100A	101295	R&S	2019-11-27	1 year
10	Radio Communication Analyzer	MT8821C	6201763159	Anritsu	2019-07-18	1 year
11	Test Receiver	E4440A	MY48250642	Agilent	2020-03-18	1 year
12	Universal Radio Communication Tester	CMW500	143008	R&S	2019-11-26	1 year
13	Power Amplifier	5S1G4	0341863	AR	/	

ANNEX A: MEASUREMENT RESULTS

A.1 OUTPUT POWER

A.1.1 Summary

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation.
In all cases, output power is within the specified limits.

A.1.3 Radiated

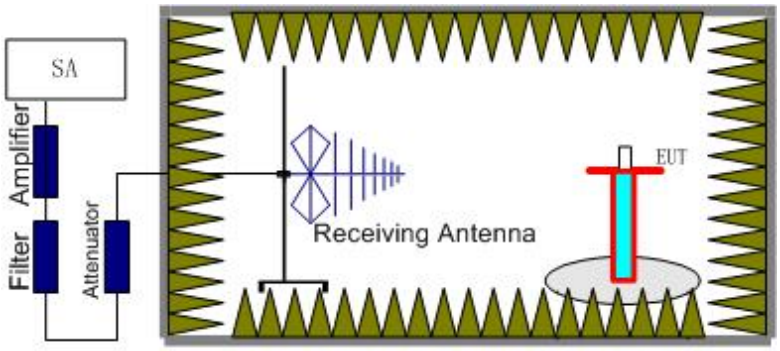
A.1.3.1 Description

This is the test for the maximum radiated power from the EUT.
Rule Part 90.635(b) specifies "The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw)."

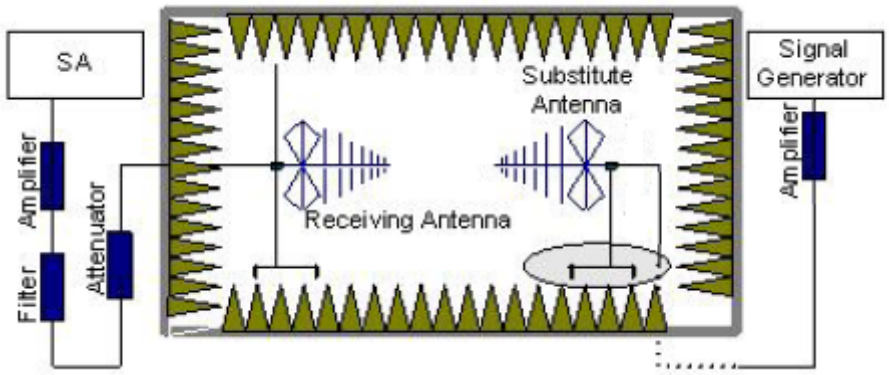
A.1.3.2 Method of Measurement

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

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 transmit frequencies in three channels (High, Middle, Low) were measured with rms 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, a 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 (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. An amplifier should be connected to the Signal Source output port. And the cable should be connected between the amplifier and the substitution antenna.
   The cable loss (P_{cl}), the substitution antenna Gain (G_a) and the amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power (EIRP) = P_{Mea} - P_{Ag} - P_{cl} - G_a
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15.

A.1.3.3 Measurement result

LTE Band 26(814MHz~824MHz)- ERP 90.635(b)

Limits: ≤50dBm (100W)

LTE Band 26_1.4MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
814.70	-23.74	2.13	45.86	0.89	2.15	18.73	50.00	31.27	H
819.00	-23.34	2.19	45.84	1.05	2.15	19.21	50.00	30.79	H
814.70	-23.74	2.13	45.86	0.89	2.15	18.73	50.00	31.27	H

LTE Band 26_3MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
815.50	-23.85	2.14	45.87	0.93	2.15	18.66	50.00	31.34	H
819.00	-23.49	2.19	45.84	1.05	2.15	19.06	50.00	30.94	H
822.50	-22.22	2.23	45.81	0.33	2.15	19.54	50.00	30.46	H

LTE Band 26_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
816.50	-23.84	2.16	45.88	0.98	2.15	18.71	50.00	31.29	H
819.00	-23.52	2.19	45.84	1.05	2.15	19.03	50.00	30.97	H
821.50	-22.82	2.22	45.82	0.71	2.15	19.34	50.00	30.66	H

LTE Band 26_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
819.00	-23.48	2.19	45.84	1.05	2.15	19.07	50.00	30.93	H

LTE Band 26_1.4MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
814.70	-24.69	2.13	45.86	0.89	2.15	17.78	50.00	32.22	H
819.00	-24.28	2.19	45.84	1.05	2.15	18.27	50.00	31.73	H
823.30	-23.02	2.24	45.79	0.55	2.15	18.93	50.00	31.07	H

LTE Band 26_3MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
815.50	-24.73	2.14	45.87	0.93	2.15	17.78	50.00	32.22	H
819.00	-24.27	2.19	45.84	1.05	2.15	18.28	50.00	31.72	H
822.50	-23.15	2.23	45.81	0.33	2.15	18.61	50.00	31.39	H

LTE Band 26_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
816.50	-24.57	2.16	45.88	0.98	2.15	17.98	50.00	32.02	H
819.00	-24.29	2.19	45.84	1.05	2.15	18.26	50.00	31.74	H
821.50	-23.72	2.22	45.82	0.71	2.15	18.44	50.00	31.56	H

LTE Band 26_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
819.00	-24.27	2.19	45.84	1.05	2.15	18.28	50.00	31.72	H

LTE Band 26_1.4MHz_64QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
814.70	-25.56	2.13	45.86	0.89	2.15	16.91	50.00	33.09	H
819.00	-25.24	2.19	45.84	1.05	2.15	17.31	50.00	32.69	H
823.30	-23.79	2.24	45.79	0.55	2.15	18.16	50.00	31.84	H

LTE Band 26_3MHz_64QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
815.50	-25.63	2.14	45.87	0.93	2.15	16.88	50.00	33.12	H
819.00	-25.28	2.19	45.84	1.05	2.15	17.27	50.00	32.73	H
822.50	-23.90	2.23	45.81	0.33	2.15	17.86	50.00	32.14	H

LTE Band 26_5MHz_64QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
816.50	-25.48	2.16	45.88	0.98	2.15	17.07	50.00	32.93	H
819.00	-25.23	2.19	45.84	1.05	2.15	17.32	50.00	32.68	H
821.50	-24.61	2.22	45.82	0.71	2.15	17.55	50.00	32.45	H

LTE Band 26_10MHz_64QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	Ga Antenna Gain(dBi)	Correction	ERP(dBm)	Limit(dBm)	Margin(dB)	Polarization
819.00	-25.09	2.19	45.84	1.05	2.15	17.46	50.00	32.54	H

Note: Expanded measurement uncertainty is U = 2.84 dB, k = 2.

A.2 EMISSION LIMIT

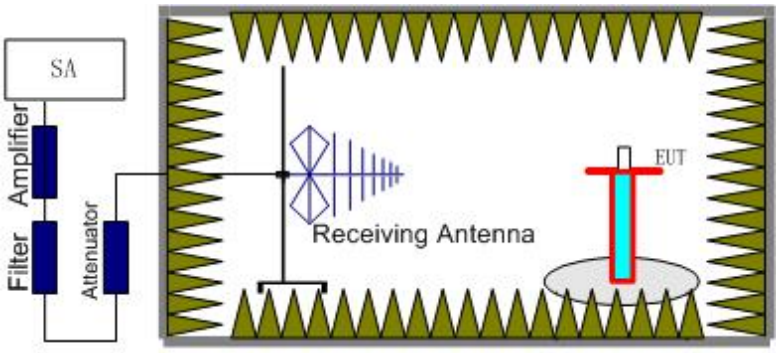
A.2.1 Measurement Method

The measurements procedures in TIA-603E-2016 are used. This measurement is carried out in fully-anechoic chamber FAC-3.

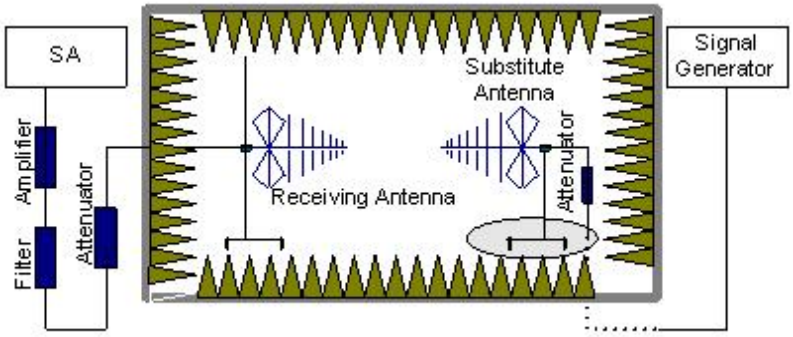
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Bands 13 25 26 41.

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 10th harmonic 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 (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss (P_{pl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test.
   An amplifier should be connected in for the test.
   The Path loss (P_{pl}) is the summation of the cable loss and the gain of the amplifier.
   The measurement results are obtained as described below:
   Power (EIRP)=P_{Mea}+ P_{pl} + G_a
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dB.

A.2.2 Measurement Limit

CFR Part 90.691 all specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands 13 25 26 41. 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 LTE Bands 13 25 26 41 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.The evaluated frequency range is from 30MHz to 26GHz.

LTE Band 26(814MHz~824MHz), 1.4MHz, QPSK, Channel 26697

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
2444.00	-50.29	4.57	5.93	2.15	-51.08	-13.00	38.08	V
6524.01	-53.57	7.50	11.03	2.15	-52.19	-13.00	39.19	H
7317.01	-52.09	8.10	11.98	2.15	-50.36	-13.00	37.36	H
8128.01	-52.62	8.37	12.70	2.15	-50.44	-13.00	37.44	V
8942.00	-51.13	8.99	13.09	2.15	-49.18	-13.00	36.18	V
9774.00	-51.92	8.98	13.13	2.15	-49.92	-13.00	36.92	H

LTE Band 26(814MHz~824MHz), 1.4MHz, QPSK, Channel 26740

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
1638.01	-60.70	3.56	5.25	2.15	-61.16	-13.00	48.16	V
2457.00	-51.14	4.58	5.97	2.15	-51.90	-13.00	38.90	V
3278.02	-54.43	5.28	7.67	2.15	-54.19	-13.00	41.19	V
4076.02	-55.49	6.04	8.98	2.15	-54.70	-13.00	41.70	H
4928.01	-54.15	6.73	9.83	2.15	-53.20	-13.00	40.20	H
5748.01	-54.14	7.27	10.55	2.15	-53.01	-13.00	40.01	V

LTE Band 26(814MHz~824MHz), 1.4MHz, QPSK, Channel 26783

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit （dBm）	Margin(dB)	Polarization
2470.00	-47.64	4.59	6.01	2.15	-48.37	-13.00	35.37	V
4128.02	-51.67	6.04	9.03	2.15	-50.83	-13.00	37.83	H
7564.01	-52.44	8.12	12.25	2.15	-50.46	-13.00	37.46	V
8157.01	-51.66	8.43	12.73	2.15	-49.51	-13.00	36.51	H
8978.00	-50.60	9.12	13.10	2.15	-48.77	-13.00	35.77	H
9888.00	-50.33	9.08	13.01	2.15	-48.55	-13.00	35.55	V

Sample calculation: 1638.01MHz

Peak ERP (dBm) = P_{Mea}(-47.64 dBm) - P_{cl} (4.59dB) - G_a (-6.01 dBi) – 2.15dBm

=-48.37 dBm

Note: Expanded measurement uncertainty for this test item is U = 5.16 dB, k = 2.

ANNEX B: Persons involved in this testing

Test Item	Tester
Out Power	Zhang Baoguang
Transmitter Spurious Emission	Zhang Baoguang

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