REPORT No. : SZ15020015S01

FCC SAR TEST REPORT

APPLICANT	:	ZTE Corporation
PRODUCT NAME	:	CDMA2000 Mobile Phone Handset
MODEL NAME	:	ZTE R144C
TRADE NAME	:	ZTE
BRAND NAME	:	ZTE
FCC ID	:	SRQ-R144C
STANDARD(S)	:	47CFR 2.1093 IEEE 1528-2013
ISSUE DATE	:	2015-03-04

SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

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DIRECTORY

TEST REPORT DECLARATION 4

1.TECHNICAL INFORMATION 5

1.1 IDENTIFICATION OF APPLICANT 5
1.2 IDENTIFICATION OF MANUFACTURER 5
1.3 EQUIPMENT UNDER TEST (EUT) 5
1.3.1 PHOTOGRAPHS OF THE EUT 5
1.3.2 IDENTIFICATION OF ALL USED EUT 6
1.4 APPLIED REFERENCE DOCUMENTS 6
1.5 DEVICE CATEGORY AND SAR LIMITS 6

2. SPECIFIC ABSORPTION RATE (SAR) 7

2.1 INTRODUCTION 7
2.2 SAR DEFINITION 7

3. SAR MEASUREMENT SETUP 8

3.1 THE MEASUREMENT SYSTEM 8
3.2 PROBE 8
3.3 PROBE CALIBRATION PROCESS 10
3.3.1 DOSIMETRIC ASSESSMENT PROCEDURE 10
3.3.2 FREE SPACE ASSESSMENT PROCEDURE 10
3.3.3 TEMPERATURE ASSESSMENT PROCEDURE 10
3.4 PHANTOM 11
3.5 DEVICE HOLDER 11

4. TISSUE SIMULATING LIQUIDS 12

5. UNCERTAINTY ASSESSMENT 14

5.1 UNCERTAINTY EVALUATION FOR EUT SAR TEST 14
5.2 UNCERTAINTY FOR SYSTEM PERFORMANCE CHECK 15

6. SAR MEASUREMENT EVALUATION 17

6.1 SYSTEM SETUP 17
6.2 VALIDATION RESULTS 18

7. OPERATIONAL CONDITIONS DURING TEST 19

7.1 INFORMATION ON THE TESTING 19
7.2 BODY-WORN CONFIGURATIONS 20
7.3 MEASUREMENT PROCEDURE 20
7.4 DESCRIPTION OF INTERPOLATION/EXTRAPOLATION SCHEME 21

8. MEASUREMENT OF CONDUCTED OUTPUT POWER 22

9. TEST RESULTS LIST 23

ANNEX A GRAPH TEST RESULTS 26

ANNEX B GENERAL INFORMATION 43

Change History		
Issue	Date	Reason for change
1.0	2015-03-04	First edition

TEST REPORT DECLARATION

Applicant	ZTE Corporation		
Applicant Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China		
Manufacturer	ZTE Corporation		
Manufacturer Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China		
Product Name	CDMA2000 Mobile Phone Handset		
Model Name	ZTE R144C		
Brand Name	ZTE		
HW Version	R144C_V1AMB_B		
SW Version	R144C_S_MH8J3001		
Test Standards	47CFR 2.1093; IEEE 1528-2013		
Test Date	2015-2-5		
The Highest Reported 1g-SAR(W/kg)	Head	0.503W/kg	Limit(W/kg): 1.6W/kg
	Body-Worn	0.721W/kg	
	Simultaneous	0.837W/kg	

Tested by : Liu Jun

Liu Jun

Reviewed by : Peng Hua

Peng Huarui

Approved by : Zeng Dexin

Zeng Dexin

1.TECHNICAL INFORMATION

Note: the Following data is based on the information by the applicant.

1.1 Identification of Applicant

Company Name:	ZTE Corporation
Address:	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China

1.2 Identification of Manufacturer

Company Name:	ZTE Corporation
Address:	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China

1.3 Equipment Under Test (EUT)

Model Name:	ZTE R144C
Trade Name:	ZTE
Brand Name:	ZTE
Hardware Version:	R144C_V1AMB_B
Software Version:	R144C_S_MH8J3001
Tx Frequency Bands:	CDMA BC 0: 824-849MHz;
Uplink Modulations:	CDMA: CDMA;
DTM:	Not support
Antenna type:	Fixed Internal Antenna
Development Stage:	Identical prototype
Hotspot function:	Not Support

1.3.1 Photographs of the EUT

Please refer to the External Photos for the Photos of the EUT

1.3.2 Identification of all used EUT

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the Following two numerical characters indicate the software version of the test sample.

EUT Identity	Hardware Version	Software Version
1#	R144C_V1AMB_B	R144C_S_MH8J3001

1.4 Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	**47 CFR§2.1093**	Radiofrequency Radiation Exposure Evaluation: Portable Devices
2	**IEEE 1528-2013**	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.
3	**KDB 447498 D01v05r02**	General RF Exposure Guidance
4	**KDB 941225 D01v03**	SAR test for 3G devices
5	**KDB 865664 D01v01r02**	SAR Measurement 100 MHz to 6 GHz
6	**KDB 865664 D02v01r01**	SAR Reporting

1.5 Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

2. SPECIFIC ABSORPTION RATE (SAR)

2.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are High than the limits for general population/uncontrolled.

2.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density. (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be either related to the temperature elevation in tissue by,

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\boldsymbol{\delta}\mathbf{T}}{\boldsymbol{\delta}\mathbf{t}}\right)$$

Where C is the specific head capacity, δT is the temperature rise and δt the exposure duration, or related to the electrical field in the tissue by

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^2}{\boldsymbol{\rho}}$$

Where σ is the conductivity of the tissue, ρ is the mass density of the tissue and $|E|$ is the rms electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

3. SAR MEASUREMENT SETUP

3.1 The Measurement System

Comosar is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The Comosar system consists of the Following items:

- Main computer to control all the system
- 6 axis robot
- Data acquisition system
- Miniature E-field probe
- Phone holder
- Head simulating tissue

The Following figure shows the system.

The EUT under test operating at the maximum power level is placed in the phone holder, under the phantom, which is filled with head simulating liquid. The E-Field probe measures the electric field inside the phantom. The OpenSAR software computes the results to give a SAR value in a 1g or 10g mass.

3.2 Probe

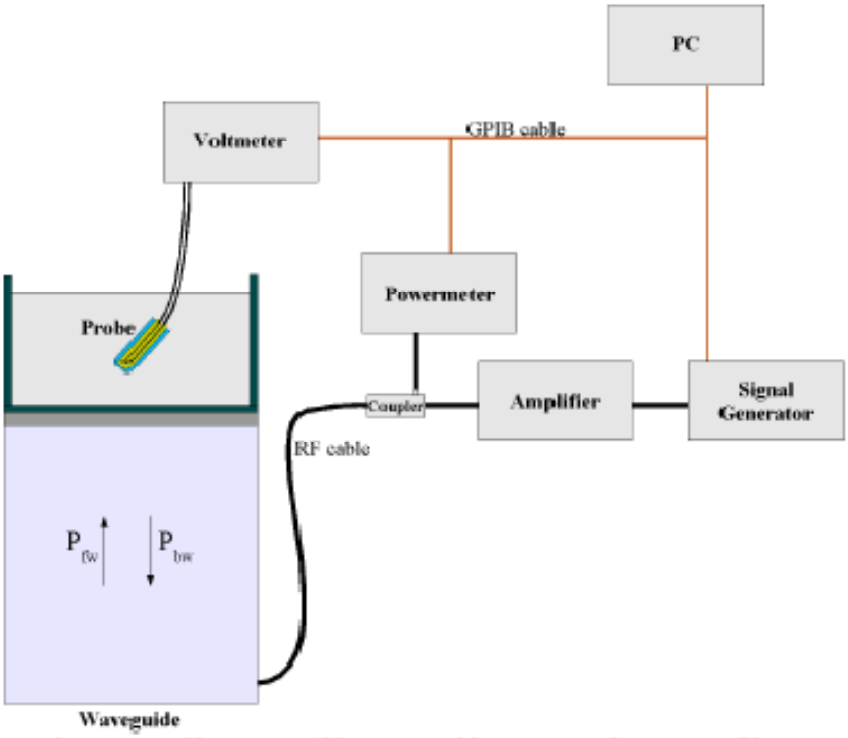
For the measurements the Specific Dosimetric E-Field Probe SN 37/08 EP80 with Following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter: 6.5 mm

- Distance between probe tip and sensor center: 2.5mm
- Distance between sensor center and the inner phantom surface: 4 mm (repeatability better than +/- 1mm)
- Probe linearity: <0.25 dB
- Axial Isotropy: <0.25 dB
- Spherical Isotropy: <0.25 dB
- Calibration range: 835to 2500MHz for head & body simulating liquid.

Angle between probe axis (evaluation axis) and surface normal line: less than 30°

Probe calibration is realized, in compliance with CENELEC EN 62209 and IEEE 1528 std, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the EN 622091 annex technique using reference guide at the five frequencies.



$$SAR = \frac{4\left(P_{fw} - P_{bw}\right)}{ab\delta}\cos^2\left(\pi\frac{y}{a}\right)e^{-(2z/\delta)}$$

Where :

Pfw = Forward Power

Pbw = Backward Power

a and b = Waveguide dimensions

ı = Skin depth

Keithley configuration:

Rate = Medium; Filter =ON; RDGS=10; FILTER TYPE =MOVING AVERAGE; RANGE AUTO
After each calibration, a SAR measurement is performed on a validation dipole and compared with a NPL calibrated probe, to verify it.

The calibration factors, CF(N), for the 3 sensors corresponding to dipole 1, dipole 2 and dipole 3 are:

$$CF(N)=SAR(N)/Vlin(N) \qquad (N=1,2,3)$$

The linearised output voltage Vlin(N) is obtained from the displayed output voltage V(N) using

$$Vlin(N)=V(N)*(1+V(N)/DCP(N)) \qquad (N=1,2,3)$$

Where DCP is the diode compression point in mV.

3.3 Probe Calibration Process

3.3.1 Dosimetric Assessment Procedure

Each E-Probe/Probe Amplifier combination has unique calibration parameters. SATIMO Probe calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an with CALISAR, Antenna proprietary calibration system.

3.3.2 Free Space Assessment Procedure

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm^2.

3.3.3 Temperature Assessment Procedure

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulating head tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

Where:

δt = exposure time (30 seconds),

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\delta \mathbf{T}}{\delta \mathbf{t}}\right)$$

C = heat capacity of tissue (brain or muscle),

δT = temperature increase due to RF exposure.

SAR is proportional to ΔT/Δt, the initial rate of tissue heating, before thermal diffusion takes place. The electric field in the simulated tissue can be used to estimate SAR by equating the thermally derived SAR to that with the E- field component.

$$\mathbf{SAR} = \frac{\sigma|\mathbf{E}|^2}{\rho}$$

Where:

σ = simulated tissue conductivity,

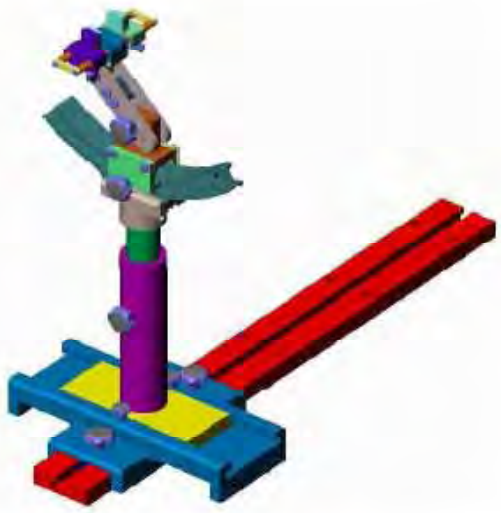
ρ = Tissue density (1.25 g/cm³ for brain tissue)

3.4 Phantom

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.

3.5 Device Holder

The positioning system allows obtaining cheek and tilting position with a very good accuracy. In compliance with CENELEC, the tilt angle uncertainty is High than 1°.



Device holder

System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

4. TISSUE SIMULATING LIQUIDS

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in below table.

The following table gives the recipes for tissue simulating liquids

Frequency Band (MHz)	835	
Tissue Type	Head	Body
Ingredients (% by weight)		
Deionised Water	50.36	50.20
Salt(NaCl)	1.25	0.90
Sugar	0.00	48.50
Tween 20	48.39	0.00
HEC	0.00	0.20
Bactericide	0.00	0.20
Triton X-100	0.00	0.00
DGBE	0.00	0.00
Diethylenglycol monohexylether	0.00	0.00
Measured dielectric parameters		
Dielectric Constant	41.50	56.10
Conductivity (S/m)	0.90	0.95

Note: Please refer to the validation results for dielectric parameters of each frequency band.

The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using an Agilent 85033E Dielectric Probe Kit and an Agilent Network Analyzer.

Table 1: Dielectric Performance of Tissue Simulating Liquid

Temperature: 22.0~23.8°C, humidity: 54~60%.						
Date	**Freq.(MHz)**	**Liquid Parameters**	**Meas.**	**Target**	**Delta(%)**	**Limit±(%)**
2015/2/5	Head 835	Relative Permittivity(εr):	41.42	41.50	-0.19	5
		Conductivity(σ):	0.92	0.90	2.22	5
	Body 835	Relative Permittivity(εr):	56.25	56.10	0.27	5
		Conductivity(σ):	0.91	0.95	-4.21	5

5. UNCERTAINTY ASSESSMENT

The Following table includes the uncertainty table of the IEEE 1528. The values are determined by Antennessa.

5.1 UNCERTAINTY EVALUATION FOR EUT SAR TEST

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	Sec.	Tol (+-%)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	4.76	N	1	1	1	4.76	4.7	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	0.7	0.7	1.01	1.0	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	0.7	0.7	1.62	1.6	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.8	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.0	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.1	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Test sample Related									
Test sample positioning	E.4.2.1	0.03	N	1	1	1	0.03	0.03	N-1
Device Holder Uncertainty	E.4.1.	5.00	N	1	1	1	5.00	5.0	N-

	1							0	1
Output power Power drift - SAR drift measurement	6.6.2	4.04	R	$\sqrt{3}$	1	1	2.33	2.33	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.13	∞
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.15	M
Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.04	∞
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	1	0.6	0.49	6.00	4.90	M
Combined Standard Uncertainty			RSS				11.55	10.67	
Expanded Uncertainty (95% Confidence interval)			K=2				23.11	21.33	

5.2 UNCERTAINTY FOR SYSTEM PERFORMANCE CHECK

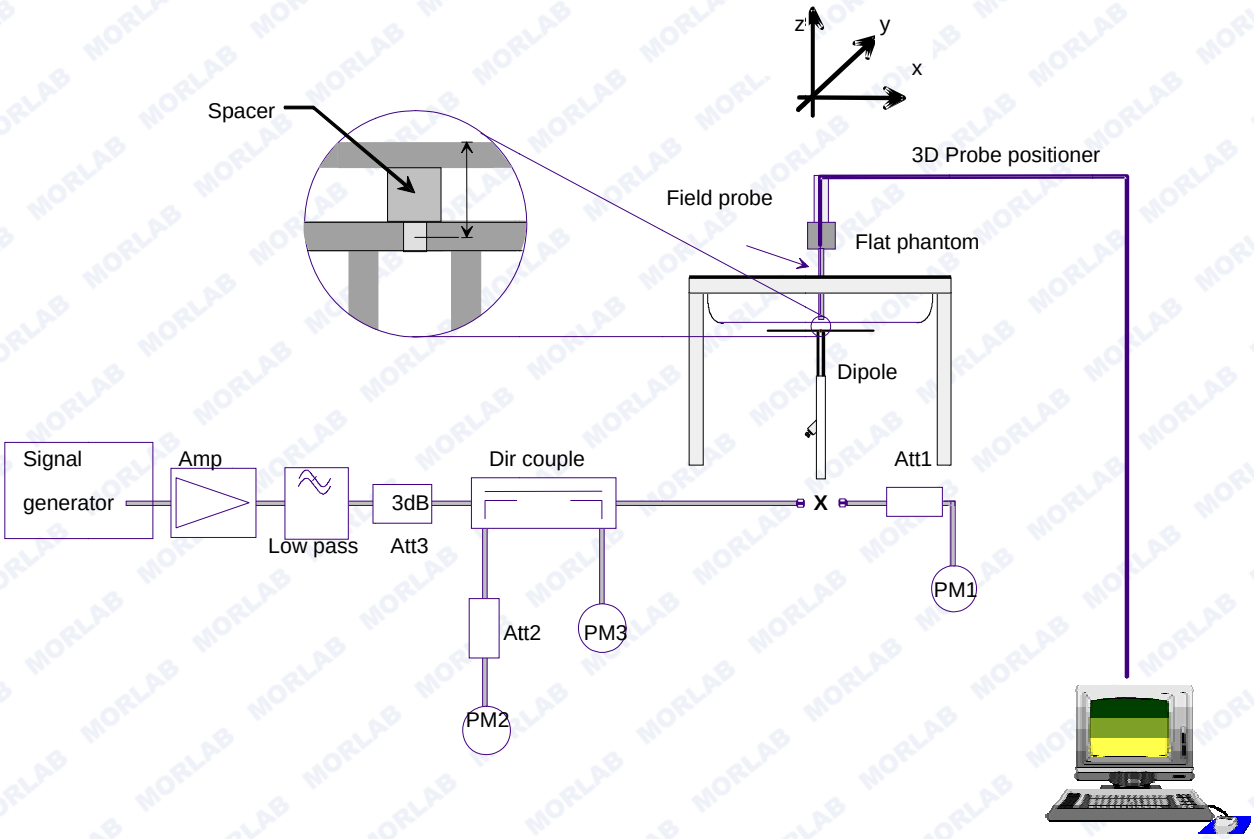
a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	Sec.	Tol (+-%)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	4.76	N	1	1	1	4.76	4.7	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	0.7	0.7	1.01	1.0	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	0.7	0.7	1.62	1.6	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.8	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.0	∞

Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.1	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	$\sqrt{3}$	1	1	0.58	0.58	∞
Input power and SAR drift measurement	8,6.6.2	4.04	R	$\sqrt{3}$	1	1	2.33	2.33	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.13	∞
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	$\sqrt{3}$	0.64	0.43	1.85	1.24	M
Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.04	∞
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	$\sqrt{3}$	0.6	0.49	3.46	2.83	M
Combined Standard Uncertainty			RSS				8.83	8.37	
Expanded Uncertainty (95% Confidence interval)			K=2				17.66	16.73	

6. SAR MEASUREMENT EVALUATION

6.1 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave which comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below



The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The power meter PM1 measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz,100 mW is used for 3.5 GHz to

6 GHz) at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

6.2 Validation Results

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

Frequency	835MHz(H)	835MHz(B)
Target value (1g)	9.68 W/kg	10.04 W/kg
Test value (1g 250 mW input)	2.451 W/kg (2.5)	2.472 W/kg (2.5)
Normalized value (1g)	9.804 W/kg	9.888 W/kg

Note: System checks the specific test data please see 41-42.

7. OPERATIONAL CONDITIONS DURING TEST

7.1 Information on the testing

The mobile phone antenna and battery are those specified by the manufacturer. The battery is fully charged before each measurement. The output power and frequency are controlled using a base station simulator. The mobile phone is set to transmit at its highest output peak power level.

The mobile phone is test in the “cheek” and “tilted” positions on the left and right sides of the phantom. The mobile phone is placed with the vertical centre line of the body of the mobile phone and the horizontal line crossing the centre of the earpiece in a plane parallel to the sagittal plane of the phantom.

Illustration for Cheek Position

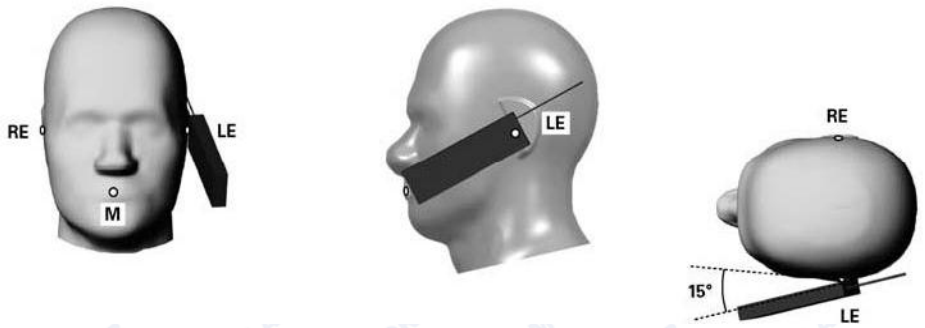


Illustration for Tilted Position

Description of the “cheek” position:

The mobile phone is well placed in the reference plane and the earpiece is in contact with the ear. Then the mobile phone is moved until any point on the front side get in contact with the cheek of the phantom or until contact with the ear is lost.

Description of the “tilted” position:

The mobile phone is well placed in the “cheek” position as described above. Then the mobile phone is moved outward away from the month by an angle of 15 degrees or until contact with the ear lost.

Remark: Please refer to Appendix B for the test setup photos.

7.2 Body-worn Configurations

The body-worn configurations shall be tested with the supplied accessories (belt-clips, holsters, etc.) attached to the device in normal use configuration.

For body-worn and other configurations a flat phantom shall be used which is comprised of material with electrical properties similar to the corresponding tissues.

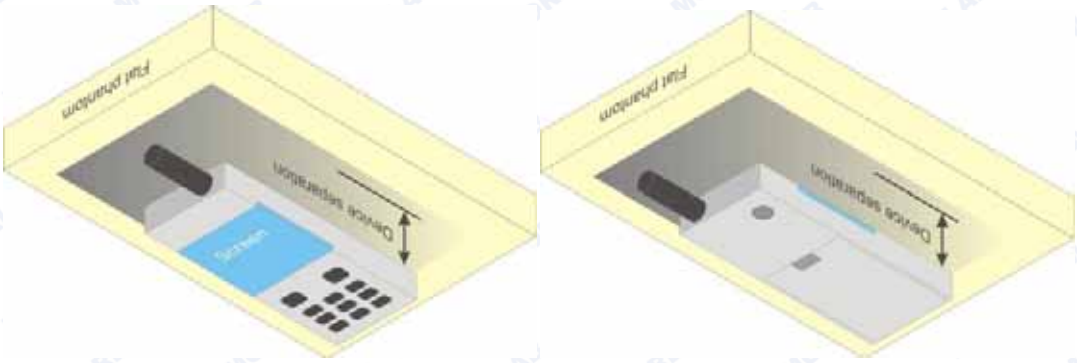


Illustration for Body Worn Position

7.3 Measurement procedure

The Following steps are used for each test position

1. Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface.
2. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
3. Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
4. Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or

8 * 5 or 8*4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

7.4 Description of interpolation/extrapolation scheme

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimize measurements errors, but the highest local SAR will occur at the surface of the phantom.

An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

8. MEASUREMENT OF CONDUCTED OUTPUT POWER

1. CDMA 1xRTT power

Band	Channel	Frequency (MHz)	Output Power(dBm)
			RC3
BC 0	1013	824.7	27.69
	384	836.52	27.82
	777	848.31	28.06

2. Bluetooth peak output power

Band	Channel	Frequency (MHz)	Output Power(dBm)		
			GFSK	π/4-DQPSK	8-DPSK
BT	0	2402	6.63	6.00	4.96
	39	2441	7.45	7.00	6.00
	78	2480	7.34	6.64	5.83

9. TEST RESULTS LIST

Summary of Measurement Results (CDMA BC 0 Band)

Temperature: 21.0~23.8°C, humidity: 54~60%.					
Phantom Configurations	Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g
Right Side Of Head	Cheek/Touch	777	0.454	1.109	0.503
	Ear/Tilt		0.301		0.334
Left Side Of Head	Cheek/Touch		0.432		0.479
	Ear/Tilt		0.252		0.279
Body (10mm Separation)	Back upward		0.650		0.721
	Front upward		0.317		0.352

Note:

1. When the 1-g SAR for the mid-band channel or the channel with the highest output power satisfy the following conditions, testing of the other channels in the band is not required. (Per KDB 447498 D01 General RF Exposure Guidance v05r02)
   ≤ 0.8 W/kg and transmission band ≤ 100 MHz
   ≤ 0.6 W/kg and, 100 MHz < transmission bandwidth ≤ 200 MHz
   ≤ 0.4 W/kg and transmission band > 200 MHz

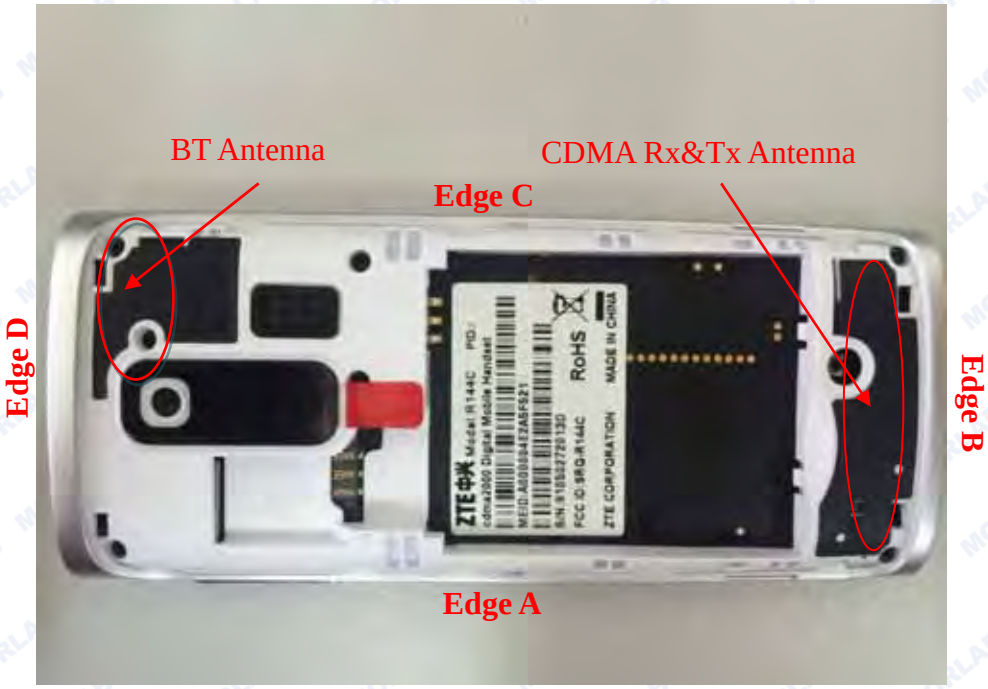
2. BT SAR test is conducted according to section 11 stand-alone SAR evaluation of this report.

3. Scaling Factor calculation

Band	Tune-up power tolerance (dBm)	SAR test channel Power (dBm)	Scaling Factor
CDMA BC 0	Max output power = 28+-0.5	28.05	1.109

11. MULTIPLE TRANSMITTERS EVALUATION

The are three transmitters build in EUT, as following:



Stand-alone SAR

Test distance: 5mm			
Band	**Highest power(mW) per tune up**	**1-g SAR test threshold**	**Test requires?**
BT	5.62	[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√f(GHz)] ≤ 3.0 for 1-g SAR	No

Test distance: 10mm			
Band	**Highest power(mW) per tune up**	**1-g SAR test threshold**	**Test requires?**
BT	5.62	[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√f(GHz)] ≤ 3.0 for 1-g SAR	No

According to the chart above, BT SAR is not required.

The BT stand-alone SAR is not required, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
(*Max. power of channel, including tune-up tolerance, mW*)/(*Min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm;
where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
(Max power=11.22 mW ; *min. test separation distance*=5mm for Head; *f*=2.4GHz)
BT estimated Head SAR = 0.232W/Kg (1g);
(Max power=11.22 mW ; *min. test separation distance*=10mm for Body; *f*=2.4GHz)
BT estimated Body SAR = 0.116W/Kg (1g)

Simultaneous SAR

Applicable Multiple Scenario Evaluation

Test Position	CDMA SAR Max (W/Kg)	Bluetooth SAR(W/Kg)	∑1-g SAR Max(W/Kg)
			BT&Main Ant
Head SAR	0.503	0.232	0.735
Body SAR	0.721	0.116	0.837

Simultaneous Transmission SAR evaluation is not required for BT and GSM, because the sum of 1g SAR Max is **0.837**W/kg < 1.6W/Kg for BT and CDMA.
(According to KDB 447498D01v05, the sum of the Highest *reported* SAR of each antenna does not exceed the limit, simultaneous transmission SAR evaluation is not required.)

ANNEX A GRAPH TEST RESULTS

BAND	PARAMETERS
CDMA BC 0	Measurement 1: Right Head with Cheek device position on High Channel in CDMA mode Measurement 2: Right Head with Tilt device position on High Channel in CDMA mode Measurement 3: Left Head with Cheek device position on High Channel in CDMA mode Measurement 4: Left Head with Tilt device position on High Channel in CDMA mode Measurement 5: Flat Plane with Body device position on High Channel in CDMA mode Measurement 6: Flat Plane with Body device position on High Channel in CDMA mode

MEASUREMENT 1

Type: Phone measurement (Complete)

Area scan resolution: dx=8mm,dy=8mm

Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm

Date of measurement: 2015.2.5

Measurement duration: 8 minutes 30 seconds

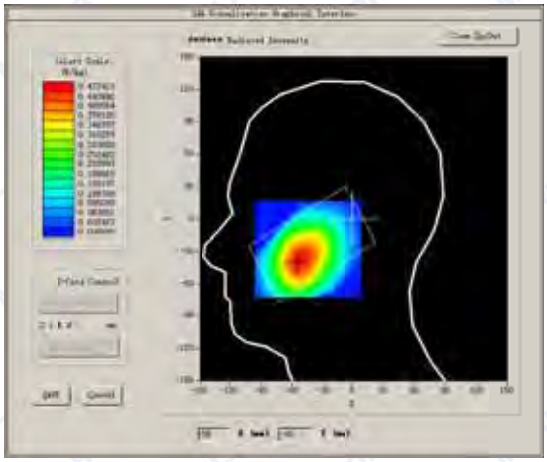
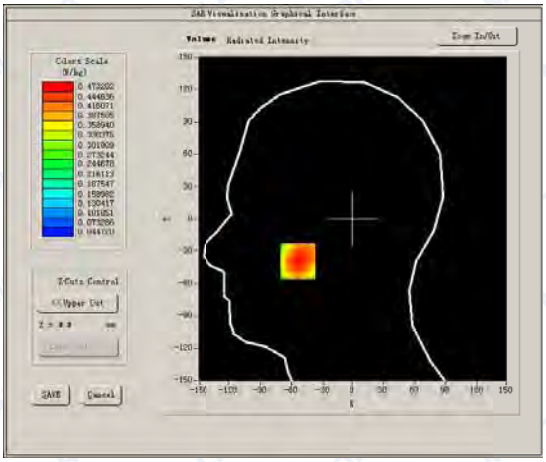
A. Experimental conditions.

Phantom File	sam_direct_droit2_surf8mm.txt
Phantom	Right head
Device Position	Cheek
Band	CDMA BC 0
Channels	High
Signal	CDMA

B. SAR Measurement Results

High Band SAR (Channel 777):

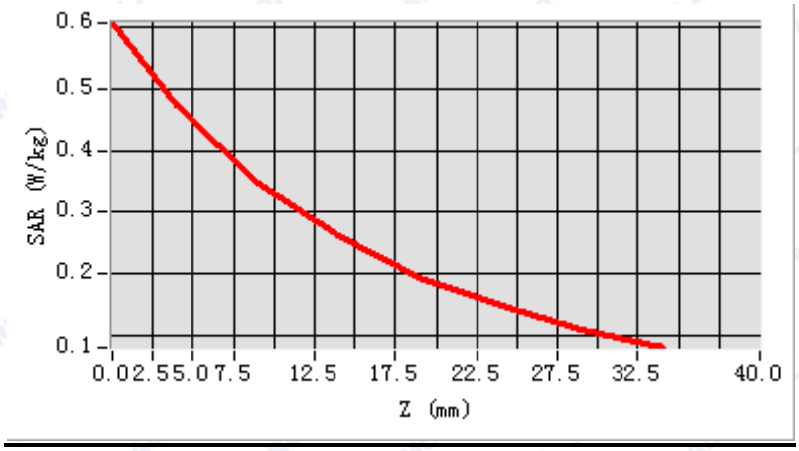
Frequency (MHz)	848.310000
Relative permittivity (real part)	41.423815
Conductivity (S/m)	0.921853
Power drift (%)	1.490000
Ambient Temperature:	22.9°C
Liquid Temperature:	22.1°C
ConvF:	6.73
Crest factor:	1:1

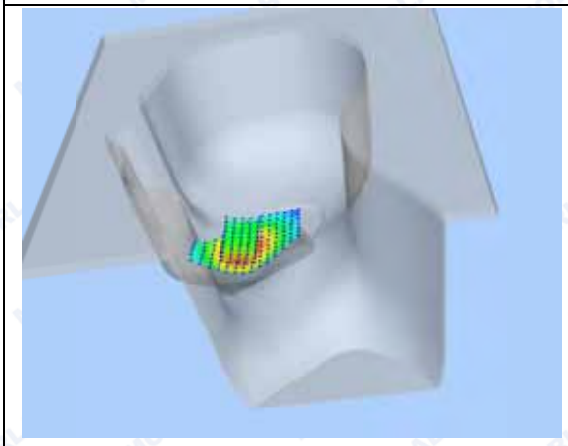
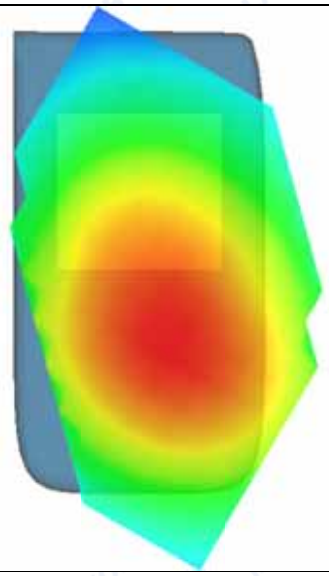
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-54.00, Y=-39.00
SAR Peak: 0.61 W/kg

SAR 10g (W/Kg)	0.317652
SAR 1g (W/Kg)	0.453862

Z axis scan



3D screen shot	Hot spot position
	

MEASUREMENT 2

Type: Phone measurement (Complete)

Area scan resolution: dx=8mm,dy=8mm

Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm

Date of measurement: 2015.2.5

Measurement duration: 8 minutes 9 seconds

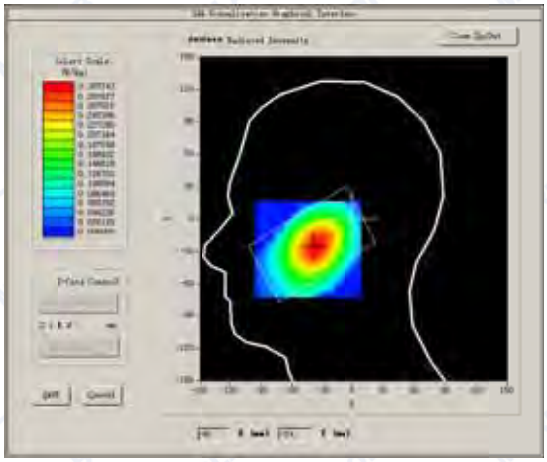
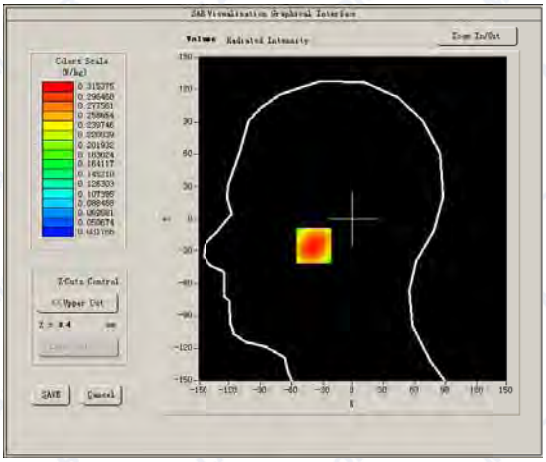
A. Experimental conditions.

Phantom File	sam_direct_droit2_surf8mm.txt
Phantom	Right head
Device Position	Tilt
Band	CDMA BC 0
Channels	High
Signal	CDMA

B. SAR Measurement Results

High Band SAR (Channel 777):

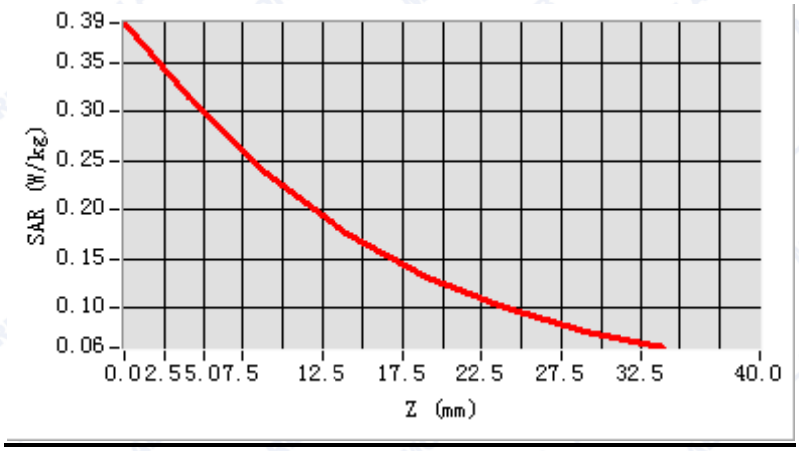
Frequency (MHz)	848.310000
Relative permittivity (real part)	41.423815
Conductivity (S/m)	0.921853
Power drift (%)	0.120000
Ambient Temperature:	22.9°C
Liquid Temperature:	22.1°C
ConvF:	6.73
Crest factor:	1:1

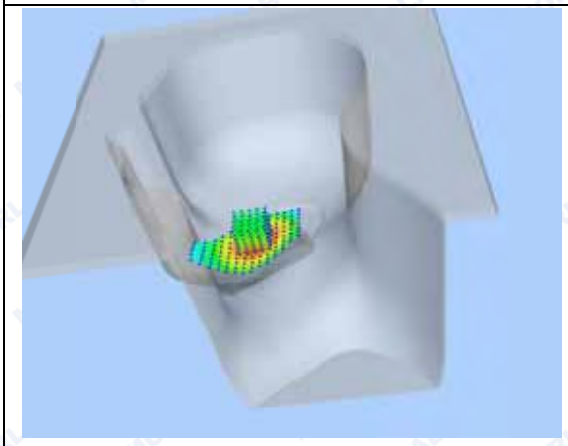
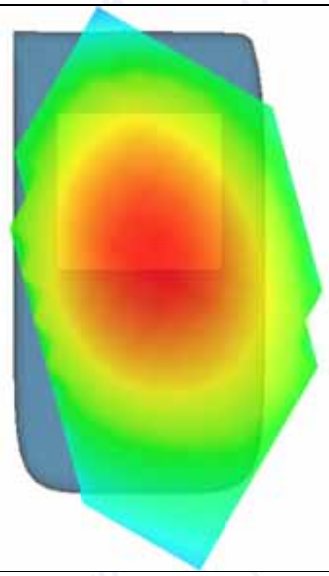
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-37.00, Y=-25.00
SAR Peak: 0.39 W/kg

SAR 10g (W/Kg)	0.213030
SAR 1g (W/Kg)	0.301448

Z axis scan



3D screen shot	Hot spot position
	

MEASUREMENT 3

Type: Phone measurement (Complete)

Area scan resolution: dx=8mm,dy=8mm

Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm

Date of measurement: 2015.2.5

Measurement duration: 8 minutes 22 seconds

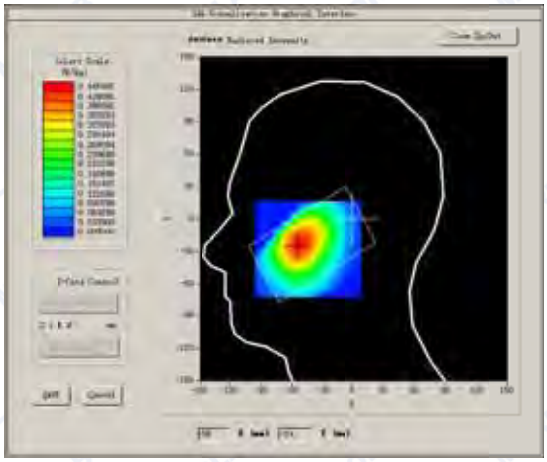
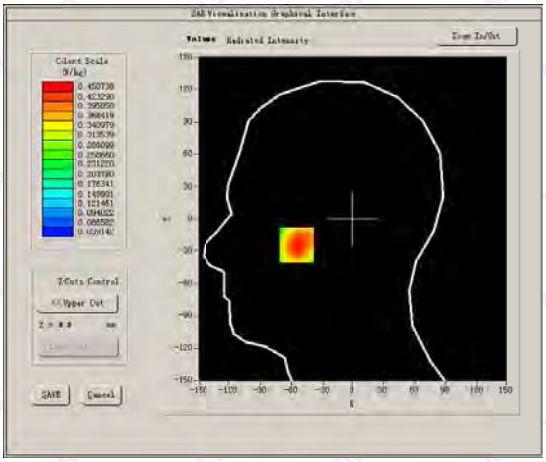
A. Experimental conditions.

Phantom File	sam_direct_droit2_surf8mm.txt
Phantom	Left head
Device Position	Cheek
Band	CDMA BC 0
Channels	High
Signal	CDMA

B. SAR Measurement Results

High Band SAR (Channel 777):

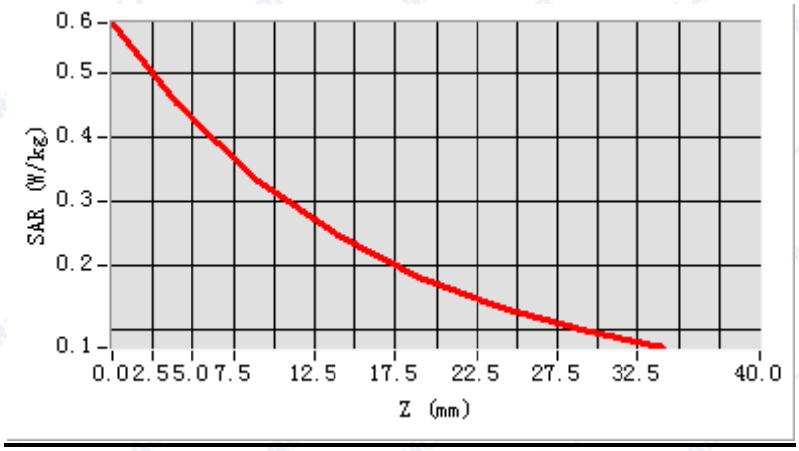
Frequency (MHz)	848.310000
Relative permittivity (real part)	41.423815
Conductivity (S/m)	0.921853
Power drift (%)	0.920000
Ambient Temperature:	22.9°C
Liquid Temperature:	22.1°C
ConvF:	6.73
Crest factor:	1:1

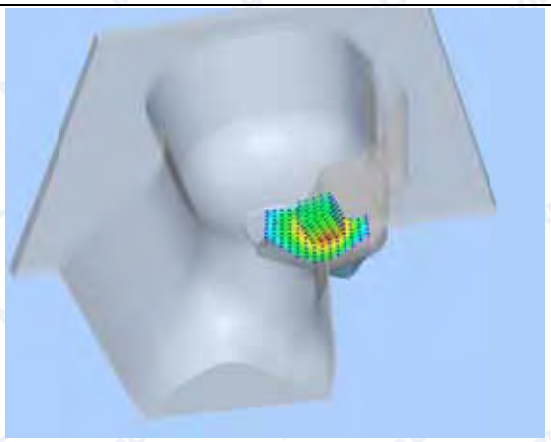
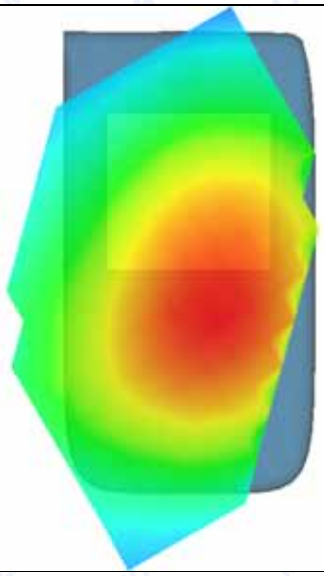
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-55.00, Y=-24.00
SAR Peak: 0.59 W/kg

SAR 10g (W/Kg)	0.298404
SAR 1g (W/Kg)	0.432072

Z axis scan



3D screen shot	Hot spot position
	

MEASUREMENT 4

Type: Phone measurement (Complete)

Area scan resolution: dx=8mm,dy=8mm

Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm

Date of measurement: 2015.2.5

Measurement duration: 8 minutes 21 seconds

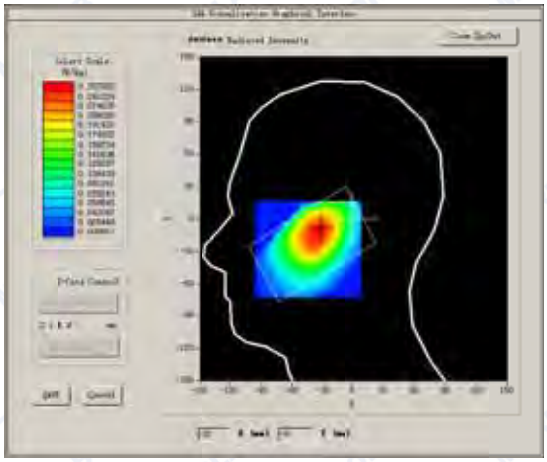
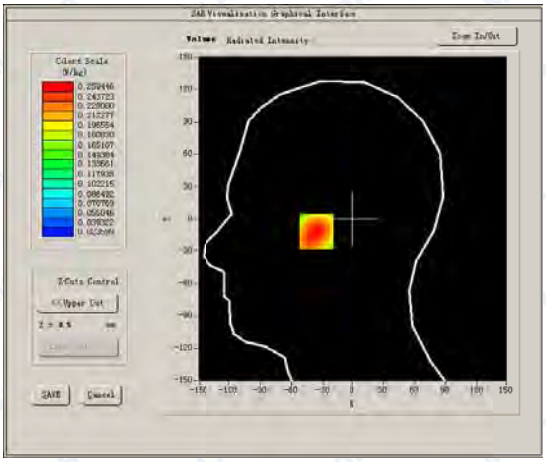
A. Experimental conditions.

Phantom File	sam_direct_droit2_surf8mm.txt
Phantom	Left head
Device Position	Tilt
Band	CDMA BC 0
Channels	High
Signal	CDMA

B. SAR Measurement Results

High Band SAR (Channel 777):

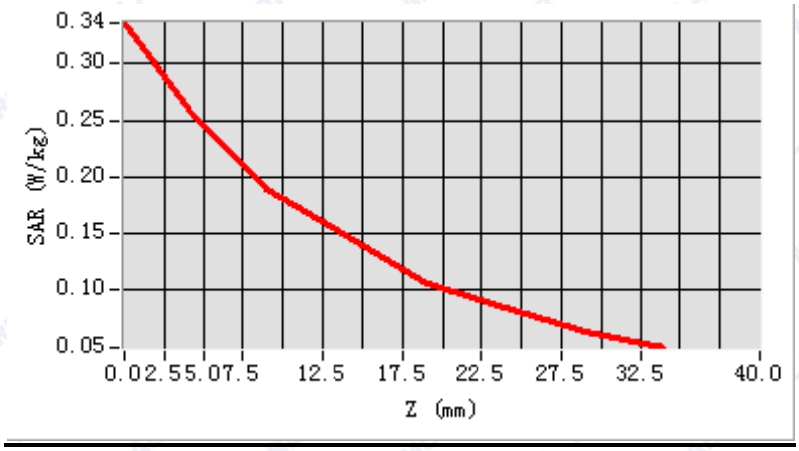
Frequency (MHz)	848.310000
Relative permittivity (real part)	41.423815
Conductivity (S/m)	0.921853
Power drift (%)	1.360000
Ambient Temperature:	22.9°C
Liquid Temperature:	22.1°C
ConvF:	6.73
Crest factor:	1:1

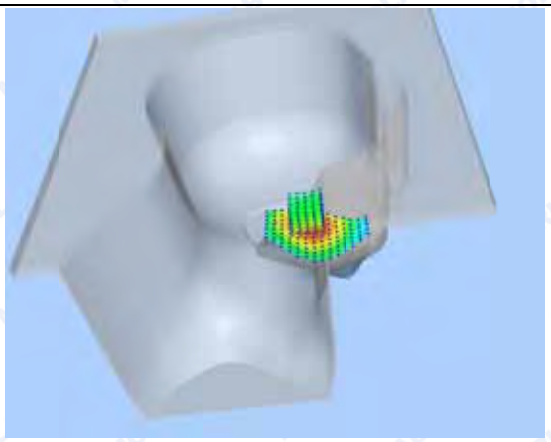
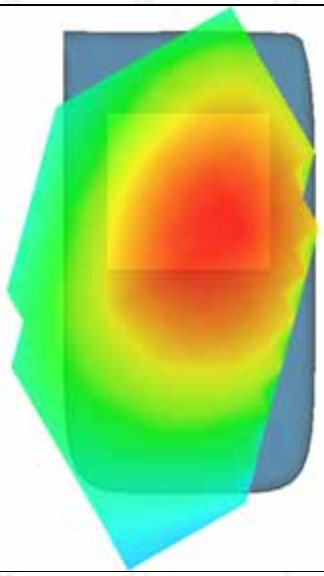
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-35.00, Y=-11.00
SAR Peak: 0.34 W/kg

SAR 10g (W/Kg)	0.176151
SAR 1g (W/Kg)	0.251526

Z axis scan



3D screen shot	Hot spot position
	

MEASUREMENT 5

Type: Phone measurement (Complete)

Area scan resolution: dx=8mm,dy=8mm

Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm

Date of measurement: 2015.2.5

Measurement duration: 9 minutes 39 seconds

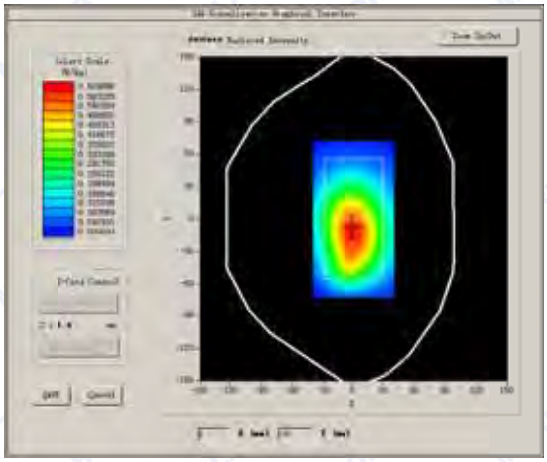
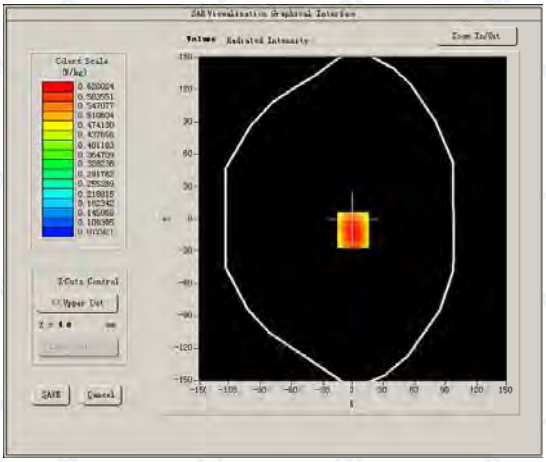
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Flat Plane
Device Position	Body
Band	CDMA BC 0
Channels	High
Signal	CDMA

B. SAR Measurement Results

High Band SAR (Channel 777):

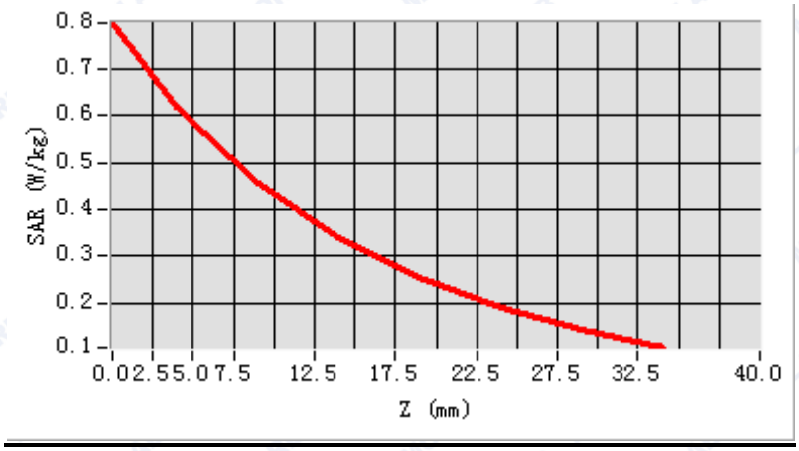
Frequency (MHz)	848.310000
Relative permittivity (real part)	56.246812
Conductivity (S/m)	0.906274
Power drift (%)	2.900000
Ambient Temperature:	22.9°C
Liquid Temperature:	22.1°C
ConvF:	6.99
Crest factor:	1:1

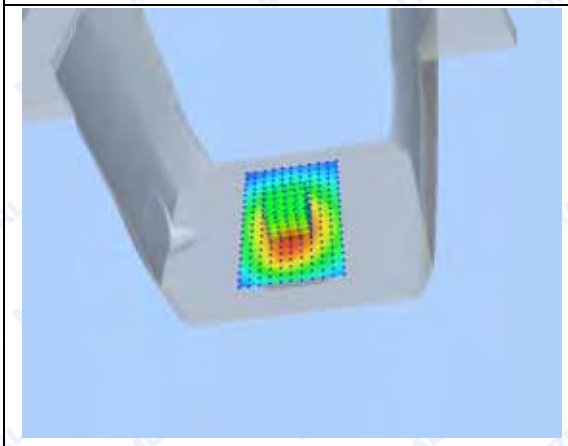
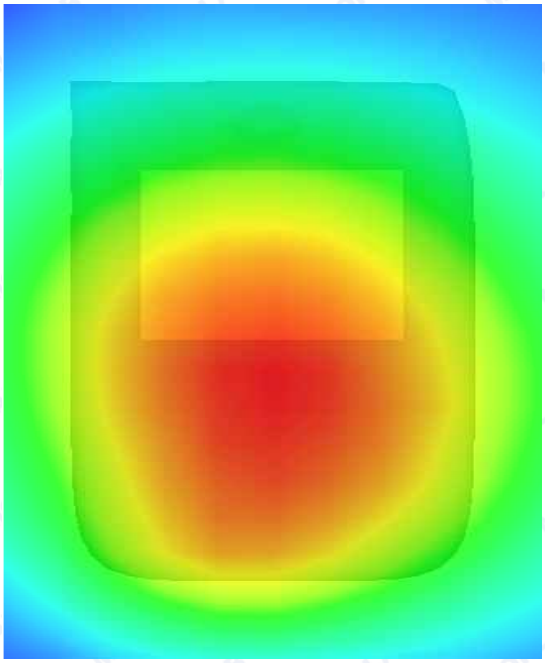
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=-10.00
SAR Peak: 0.88 W/kg

SAR 10g (W/Kg)	0.456466
SAR 1g (W/Kg)	0.650496

Z axis scan



3D screen shot	Hot spot position
	

MEASUREMENT 6

Type: Phone measurement (Complete)

Area scan resolution: dx=8mm,dy=8mm

Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm

Date of measurement: 2015.2.5

Measurement duration: 9 minutes 37 seconds

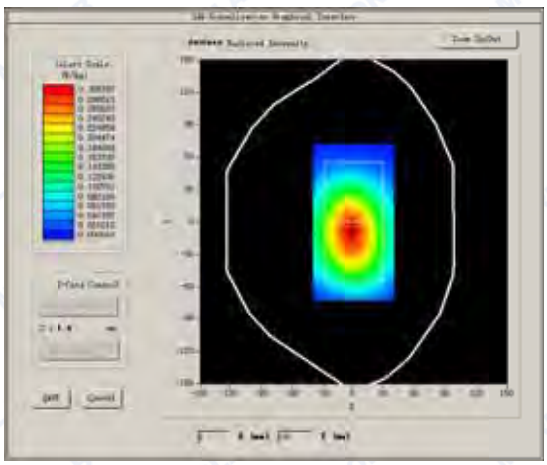
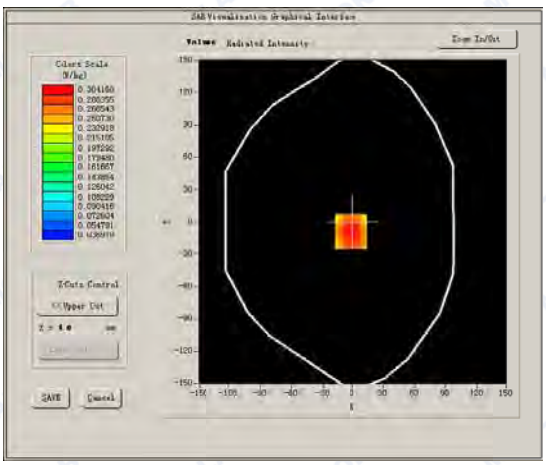
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Flat Plane
Device Position	Body
Band	CDMA BC 0
Channels	High
Signal	CDMA

B. SAR Measurement Results

High Band SAR (Channel 777):

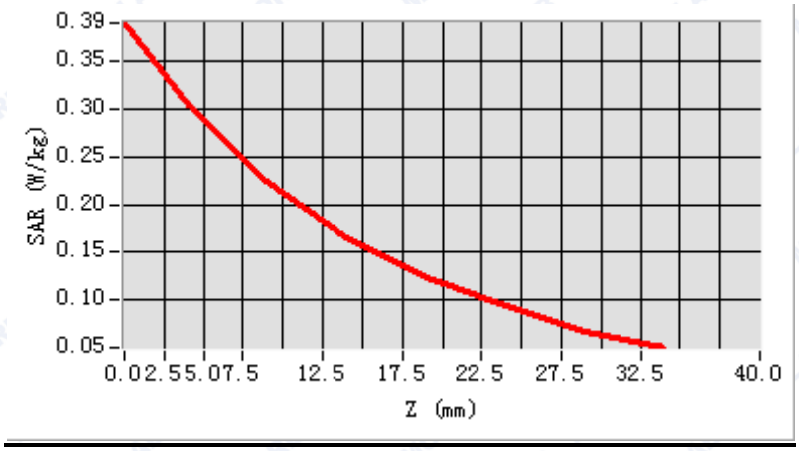
Frequency (MHz)	848.310000
Relative permittivity (real part)	56.246812
Conductivity (S/m)	0.906274
Power drift (%)	-1.220000
Ambient Temperature:	22.9°C
Liquid Temperature:	22.1°C
ConvF:	6.99
Crest factor:	1:1

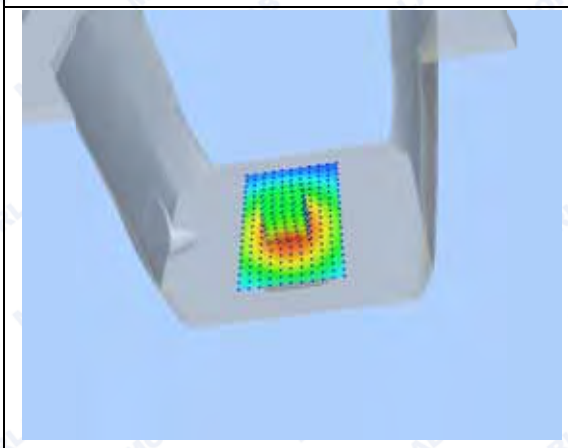
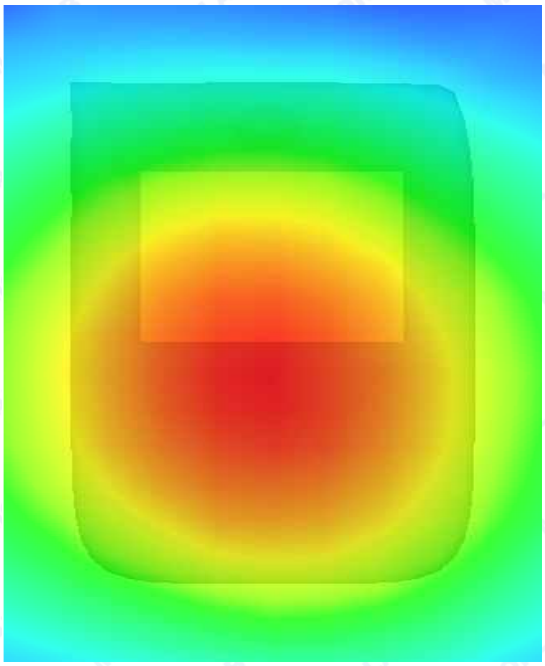
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-2.00, Y=-9.00
SAR Peak: 0.42 W/kg

SAR 10g (W/Kg)	0.224662
SAR 1g (W/Kg)	0.317210

Z axis scan



3D screen shot	Hot spot position
	

System Performance Check Data(Head)

Type: Phone measurement (Complete)

Area scan resolution: dx=8mm,dy=8mm

Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm

Date of measurement: 2015.2.5

Measurement duration: 13 minutes 27 seconds

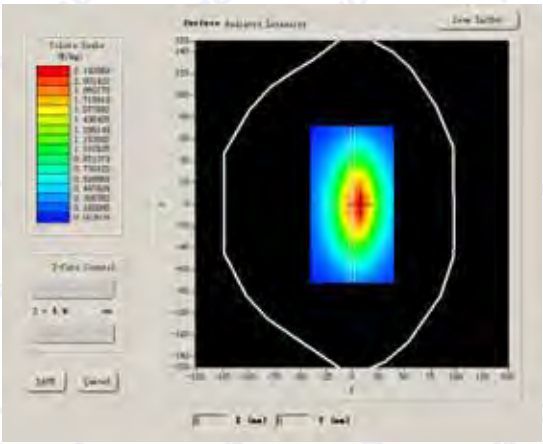
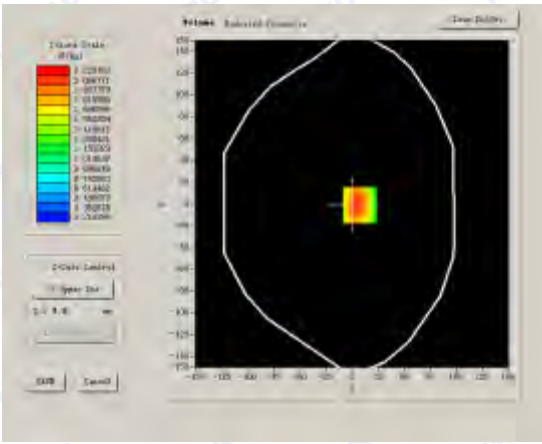
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Flat Plane
Device Position	
Band	835MHz
Channels	
Signal	CW

B. SAR Measurement Results

Band SAR

Frequency (MHz)	835.000000
Relative permittivity (real part)	41.423815
Conductivity (S/m)	0.921853
Power drift (%)	0.420000
Ambient Temperature:	22.9°C
Liquid Temperature:	22.1°C
ConvF:	6.73
Crest factor:	1:1

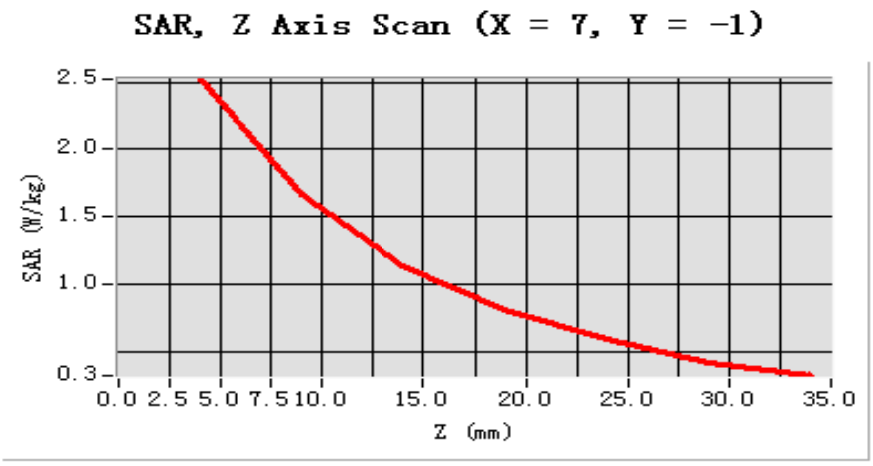
SURFACE SAR	VOLUME SAR
	

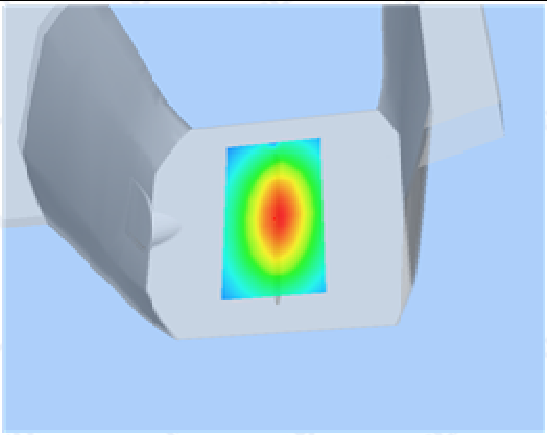
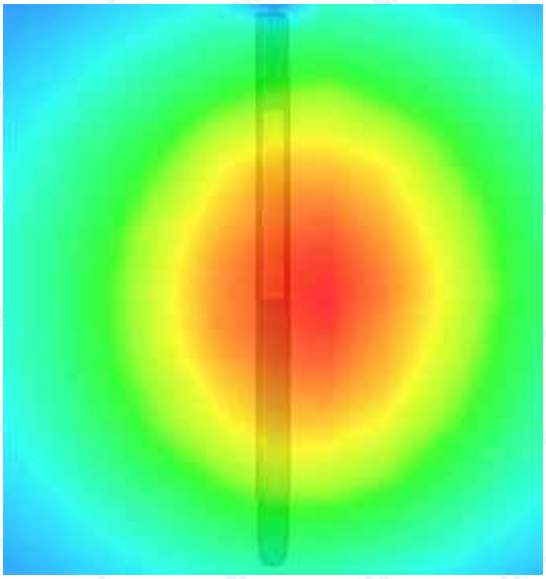
Maximum location: X=7.00, Y=-1.00

SAR 10g (W/Kg)	1.562715
SAR 1g (W/Kg)	2.451372

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	2.5209	1.6629	1.1437	0.8075	0.5889	0.4143



3D sceen shot	Hot spot position
	

System Performance Check Data(Body)

Type: Phone measurement (Complete)

Area scan resolution: dx=8mm,dy=8mm

Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm

Date of measurement: 2015.2.5

Measurement duration: 13 minutes 27 seconds

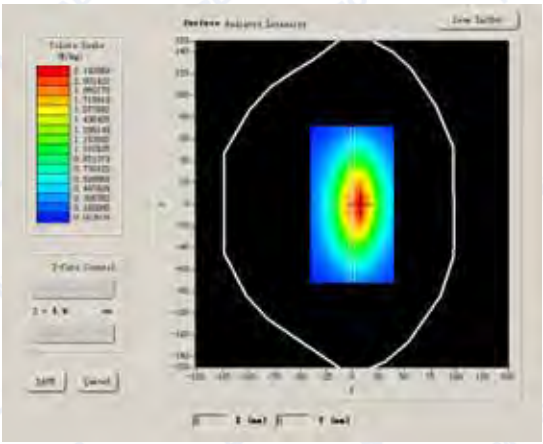
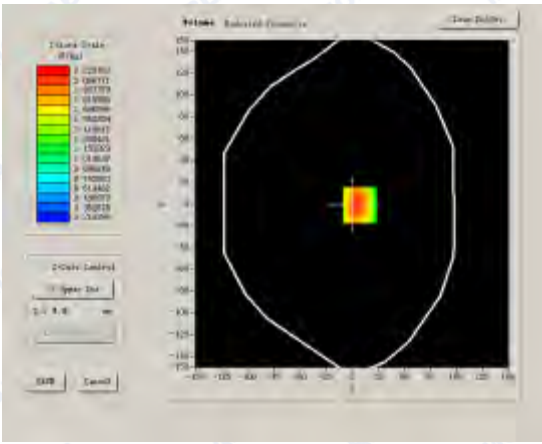
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Flat Plane
Device Position	
Band	835MHz
Channels	
Signal	CW

B. SAR Measurement Results

Band SAR

Frequency (MHz)	835.000000
Relative permittivity (real part)	56.246812
Conductivity (S/m)	0.906274
Power drift (%)	0.520000
Ambient Temperature:	22.9°C
Liquid Temperature:	22.1°C
ConvF:	6.99
Crest factor:	1:1

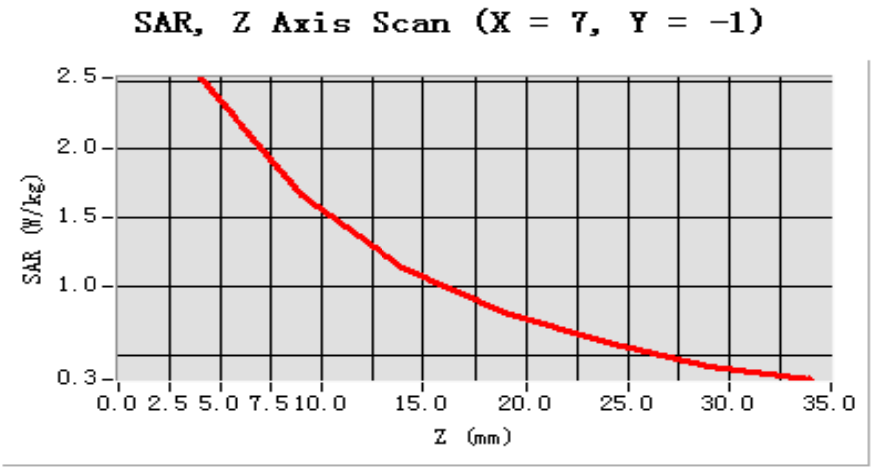
SURFACE SAR	VOLUME SAR
	

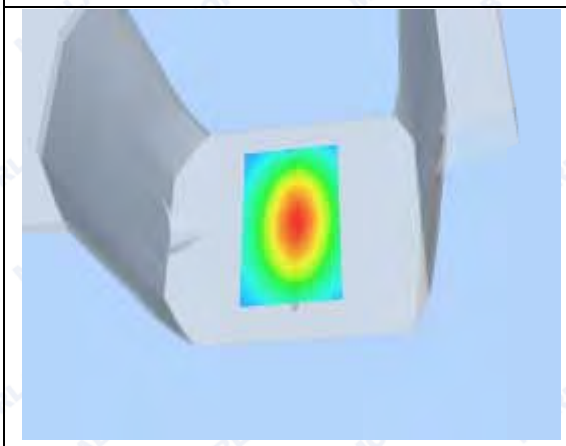
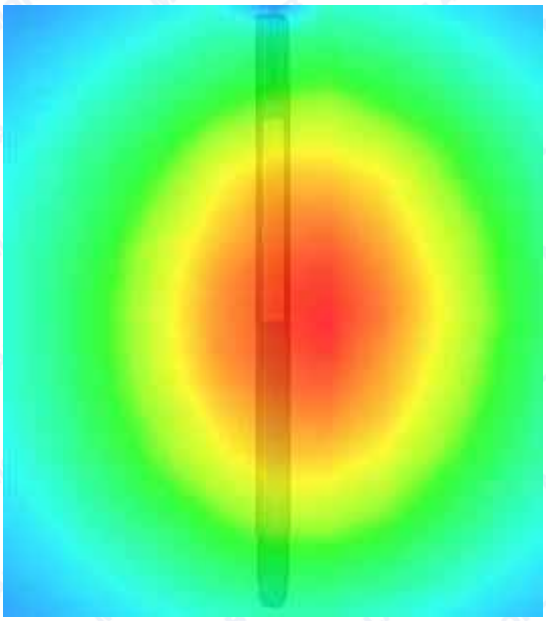
Maximum location: X=7.00, Y=-1.00

SAR 10g (W/Kg)	1.508219
SAR 1g (W/Kg)	2.472058

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	2.5209	1.6629	1.1437	0.8075	0.5889	0.4143



3D sceen shot	Hot spot position
	

ANNEX B GENERAL INFORMATION

1. Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

4. List of Test Equipments

No.	Instrument	Type	Cal. Date	Cal. Due
1	PC	Dell (Pentium IV 2.4GHz, SN:X10-23533)	(n.a)	(n.a)
2	Network Emulator	Aglient (8960, SN:10752)	2014-2-21	1year
3	Network Analyzer	Agilent(E5071B ,SN:MY42404762)	2014-9-24	1year
4	Voltmeter	Keithley (2000, SN:1000572)	2014-9-24	1year
5	Signal Generator	Rohde&Schwarz (SMP_02)	2014-9-24	1year
6	Power Amplifier	PRANA (Ap32 SV125AZ)	2014-9-24	1year
7	Power Meter	Agilent (E4416A, SN:MY45102093)	2014-5-07	1year
8	Power Sensor	Agilent (N8482A, SN:MY41091706)	2014-5-07	1year
9	Directional coupler	Giga-tronics(SN:1829112)	2014-9-24	1year
10	Probe	Satimo (SN:SN 37/08 EP80)	2014-9-22	1year
11	Dielectric Probe Kit	Agilent (85033E)	2014-9-24	1year
12	Phantom	Satimo (SN:SN_36_08_SAM62)	2014-9-24	1year
13	Liquid	Satimo(Last Calibration: 2015-2-5)	N/A	N/A
14	Dipole 835MHz	Satimo (SN 20/08 DIPC 99)	2014-9-22	1year

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