Report No.: SZ12120050S01

SAR TEST REPORT

Issued to

Brightstar Corporation

For

Fixed Wireless Phone

Model Name	:	GP866
Trade Name	:	AVVIO
Brand Name	:	AVVIO
FCC ID	:	WVB-GP866
Standard	:	FCC Oet65 Supplement C Jun.2001 47CFR 2.1093 ANSI C95.1-1999 IEEE 1528-2003
MAX SAR	:	Body: 0.493 W/kg
Test date	:	2013-3-27
Issue date	:	2013-4-1

Shenzhen MORLAB Communication Technology Co., Ltd.

Tested by Zhu Zhan	*Approved by* Zeng Dexin	*Review by* Samuel Peng
Zhu Zhan	Zeng Dexin	Samuel Peng
(Test Engineer)	*(Department Manager)*	(SAR *Manager*)
Date 2013.4.1	*Date* 2013.4.1	*Date* 2013.4.1

CTIA Authorized Test Lab LAB CODE 20081223-00 IEEE 1725 OTA | OFTA 電訊管理局 | ilac-MRA | TAF Testing Laboratory | GCF Official Observer of Global Certification Forum | Bluetooth BQTF | FCC Reg. No. 695796

DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	Apr. 1, 2013	First edition

Testing Laboratory

1.1. 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 518101
Responsible Test Lab Manager:	Mr. Shu Luan
Telephone:	+86 755 36698525
Facsimile:	+86 755 36698525

1.2. 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 518101
FCC Registration Number:	695796

1.3. Accreditation Certificate

Accredited Testing Laboratory:	No. CNAS L3572

1.4. 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)	2012-9-26	1year
3	Network Analyzer	Agilent(E5071B ,SN:MY42404762)	2012-9-26	1year
4	Voltmeter	Keithley (2000, SN:1000572)	2012-9-24	1year
5	Signal Generator	Rohde&Schwarz (SMP_02)	2012-9-24	1year
6	Power Amplifier	PRANA (Ap32 SV125AZ)	2012-9-24	1year
7	Power Meter	Agilent (E4416A, SN:MY45102093)	2012-5-07	1year
8	Power Sensor	Agilent (N8482A, SN:MY41091706)	2012-5-07	1year
9	Directional coupler	Giga-tronics(SN:1829112)	2012-9-24	1year
10	Probe	Satimo (SN:SN_3708_EP80)	2012-10-04	1year
12	Dielectric Probe Kit	Agilent (85033E)	2012-9-24	1year
13	Phantom	Satimo (SN:SN_36_08_SAM62)	2012-9-24	1year
14	Liquid	Satimo(Last Calibration: 2013-1-11)	N/A	N/A
15	Dipole 835MHz	Satimo (SN 36/08 DIPC 99)	2012-10-05	1year
16	Dipole 1900MHz	Satimo (SN 36/08 DIPF 102)	2012-10-05	1year

2. Technical Information

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

2.1. Identification of Applicant

Company Name:	Brightstar Corporation
Address:	9725 NW 117th Avenue, #300 Miami, FL 33178

2.2. Identification of Manufacturer

Company Name:	LAKIA Teletech Co., Ltd.
Address:	2/F,Unit A, Technology Service Building, Software Garden, 1phase, Xiamen, Fujian, China Zip: 361005

2.3. Equipment Under Test (EUT)

Model Name:	GP866
Trade Name:	AVVIO
Brand Name:	AVVIO
Hardware Version:	P2
Software Version:	LKW_RA1.00
Frequency Bands:	GSM 850MHz / PCS 1900MHz;
Antenna type:	External Monopole Antenna
Development Stage:	Identical prototype
Battery Model:	3A0600-30
Battery specification:	600mAh3.6V

2.3.1. Photographs of the EUT

Please see for photographs of the EUT.

2.3.2. 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#	P2	LKW_RA1.00

2.4. Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	**47 CFR§2.1O93**	Radiofrequency Radiation Exposure Evaluation: Portable Devices
2	**FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01)**	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
3	**ANSI C95.1-1999**	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz
4	**IEEE 1528-2003**	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate(SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.
5	**KDB 447498 D01**	General RF Exposure Guidance v05
6	**KDB 865664 D1**	SAR Measurement 100 MHz to 6 GHz v01
7	**KDB 865664 D2**	SAR Reporting v01

This type of WLL (wireless local loop) phone devices that may not be easily classified as mobile or portable, SAR evaluation has been subject to a KDB inquiry, and the tracking number is 735201.

2.5. 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.

2.6. Test Environment/Conditions

Normal Temperature (NT):	20 ... 25 °C
Relative Humidity:	30 ... 75 %
Air Pressure:	980 ... 1020 hPa
Test frequency:	GSM 850MHz; PCS 1900MHz;
Operation mode:	Call established
Power Level:	GSM 850 MHz Maximum output power(level 5)
	PCS 1900 MHz Maximum output power(level 0)

During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a System Simulator (SS) by air link, and a call is established.
The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 125, 190 and 251 respectively in the case of GSM 850 MHz, or to 512, 661 and 810 respectively in the case of PCS 1900 MHz The EUT is commanded to operate at maximum transmitting power.
The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the manufacturer. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. If a wireless link is used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the handset.
The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the handset by at least 35 dB.

3. Specific Absorption Rate (SAR)

3.1. 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 higher than the limits for general population/uncontrolled.

3.2. 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:

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

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

$$\mathrm{SAR} = C\frac{\delta T}{\delta t}$$

, where C is the specific head capacity, δ T is the temperature rise and δ t the exposure duration, or related to the electrical field in the tissue by

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

, 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.

4. SAR Measurement Setup

4.1. 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.

4.2. Probe

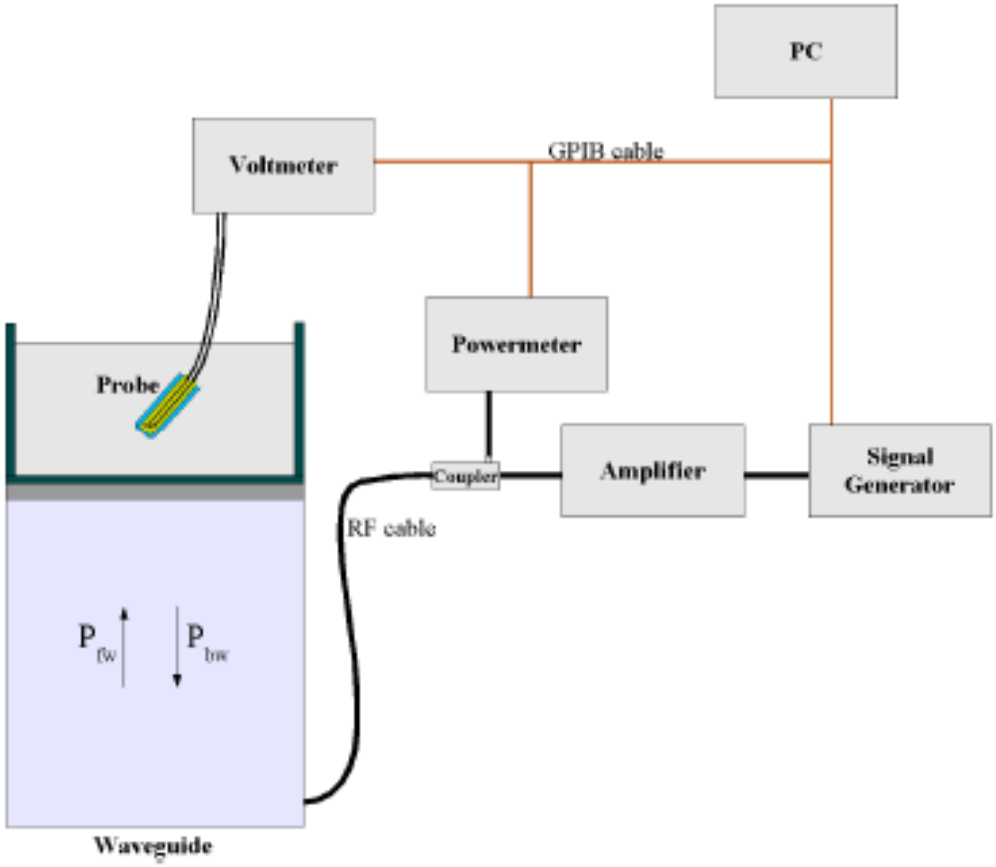
For the measurements the Specific Dosimetric E-Field Probe SN 37/08 EP80 with following specifications is used

- 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 suface normal line:1ess 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 annexe technique using reference guide at the five frequencies.



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

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) (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)) (N=1,2,3)

where DCP is the diode compression point in mV.

4.3. Probe Calibration Process

4.3.1 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/cm2) using an with CALISAR, Antenna proprietary calibration system.

4.3.2 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/cm2.

4.3.2 Temperature Assessment Procedure

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated 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.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:

Δ t = exposure time (30 seconds),

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

Δ T = temperature increase due to RF exposure.

SAR is proportional to Δ T/ Δ t, 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.

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

Where:

σ = simulated tissue conductivity,

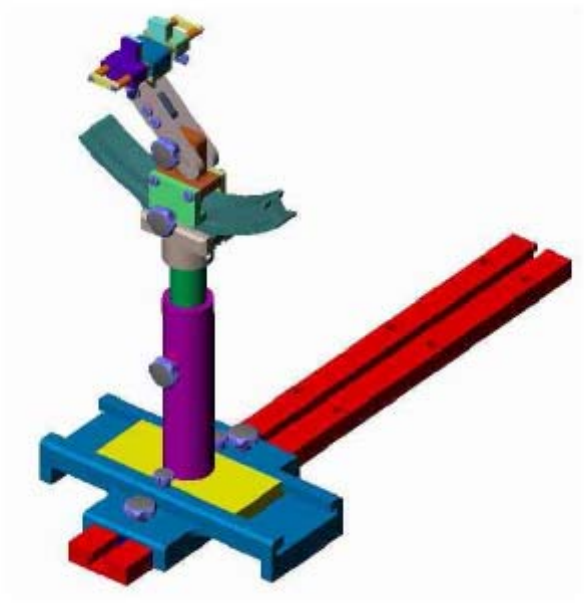
ρ = Tissue density (1.25 g/cm3 for brain tissue)

4.4. 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.

4.5. 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 lower than 1°.



Device holder

System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

5. Tissue Simulating Liquids

Simulant liquids that are used for testing at frequencies of 850 and 1900MHz, which are made mainly of sugar, salt and water solutions may be left in the phantoms. Approximately 20litres are needed for an upright head compared to about 25 litres for a horizontal bath phantom. The liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is (head SAR) or from the flat phantom to the liquid top surface (body SAR) is 15cm.

Following are the recipes for one liter of head and body tissue simulating liquid for frequency band 835 MHz and1900 MHz.

Ingredients (% by weight)	Frequency Band 835MHz	Frequency Band 1900MHz
Tissue Type	Body	Body
Water	52.4	40.4
Salt(NaCl)	1.4	0.5
Sugar	45.0	58.0
HEC	1.0	1.0
Bactericide	0.1	0.1
Triton	0.0	0.0
DGBE	0.0	0.0
Acticide SPX	0.0	0.0
Dielectric Constant	56.1	54.0
Conductivity (S/m)	0.95	1.45

Recipes for Tissue Simulating Liquid

Table 1: Dielectric Performance of Body Tissue Simulating Liquid

Temperature: 22.0~23.8°C, humidity: 54~60%.			
Frequency	**Description**	**Permittivity ε**	**Conductivity σ (S/m)**
835 MHz	**Reference result per OET65 ±5% window**	55.2 52.44 to 57.96	0.97 0.9215 to 1.0185
	Reference result per probe calibration ±5% window	56.1 53.295 to 58.905	0.95 0.905 to 0.998
	Validation value (Mar. 27)	55.256774	0.962473
1900MHz	**Reference result per OET65 ±5% window**	53.3 50.635 to 55.965	1.52 1.444 to 1.596
	Reference result per probe calibration ±5% window	54 51.3 to 56.7	1.45 1.378 to 1.523
	Validation value (Mar. 27)	53.509672	1.498623

Note:1.The dielectric parameters of the liquids were verified prior to the SAR evaluation using an Agilent 85033E Dielectric Probe Kit and an Agilent Network Analyzer.

2.For body-worn measurements, the device was tested against flat phantom representing the user body. Under measurement phone was put on in the phone holder.

3.Per KDB 450824 D01, tissue used during test are within 5% tolerances of probe calibration report, and also within 5% of the target dielectric parameters for OET65.
"when the actual tissue dielectric parameters are recorded for the probe calibration, the differences for ε and σ between probe calibration and routine measurements should each be ≤ 5% while satisfying the required ±5% tolerances in target dielectric parameters. "(KDB 450824 D01)

6. Uncertainty Assessment

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

6.1. UNCERTAINTY EVALUATION FOR HANDSET 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	4.76	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	0.7	0.7	1.01	1.01	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	0.7	0.7	1.62	1.62	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.02	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
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.4.1.1	5.00	N	1	1	1	5.00	5.00	N-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	

6.2. 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	4.76	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	0.7	0.7	1.01	1.01	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	0.7	0.7	1.62	1.62	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.02	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
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	

7. SAR Measurement Evaluation

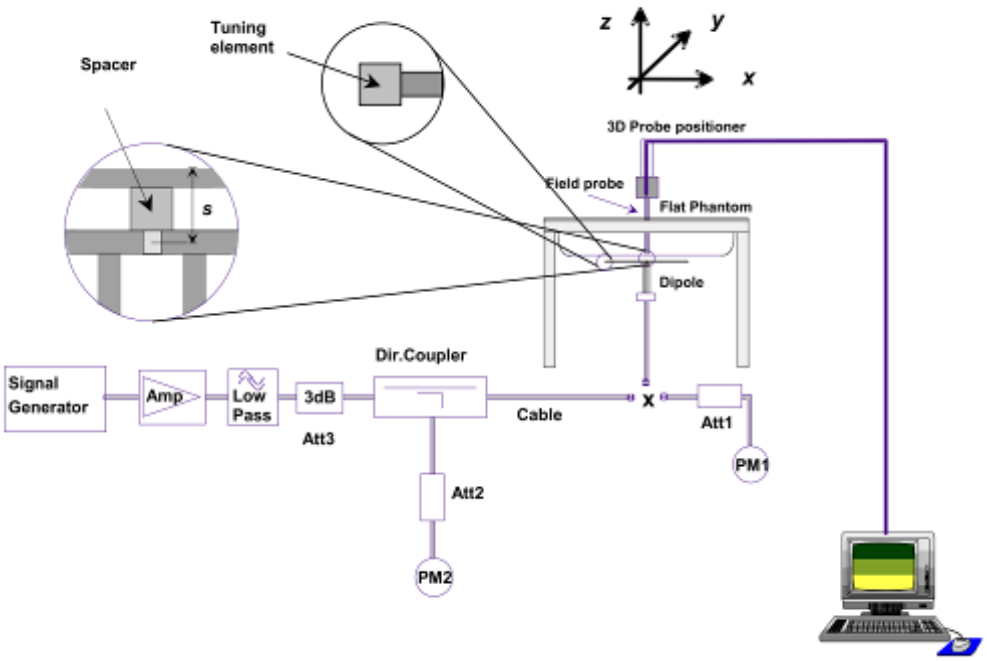
7.1. System Setup

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 at frequency 835 MHz, 1900 MHz and 2450MHz. 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.

Equipments:

name	Type and specification
Signal generator	E4433B
Directional coupler	450MHz-3GHz
Amplifier	3W 502(10-2500MHz)
Reference dipole	835MHz:SN 36/08 DIPC 99 1900MHz:SN 36/08 DIPF 102

System Verification Setup Block Diagram



7.2. 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(B)	1900MHz(B)
Target value (1g)	9.880 W/Kg	38.530 W/Kg
Test value (1g 250 mW input)	2.380 W/Kg	9.953 W/Kg
Normalized value (1g)	9.520W/Kg	39.812 W/Kg

Note: System checks the specific test data please see page 45~48.

8. Operational Conditions During Test

The EUT 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 EUT is set to transmit at its highest output peak power level.

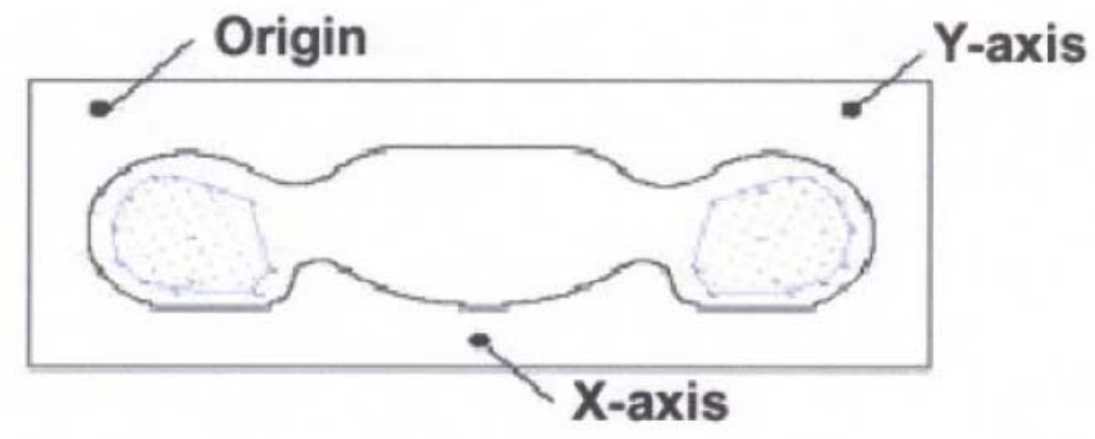
Remark: Please refer to Appendix B for the test setup photos.

8.1. 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.

The depth of the body tissue was 15.3cm. The distance between the back of the device and the bottom of the flat phantom is 1.5cm(taking into account of the IEEE 1528 and the place of the antenna)

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.



SAR Measurement Points in Area Scan

8.2. Measurement procedure

The following steps are used for each test position

- 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
- Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
- 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 can not 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.

- 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.

8.3. 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.

9. 3G MEASUREMENT PROCEDURES

The following procedures are applicable to HSPA (HSUPA/HSDPA) data devices operating under 3GPP Release 6. Body exposure conditions generally apply to these devices, including handset and data modems operating in various electronic devices. HSUPA operates in conjunction with WCDMA and HSDPA. SAR is initially measured in WCDMA test configurations without HSPA. The default test configuration is to establish a radio link between the DUT and a communication test set to configure a 12.2 kbps RMC (reference measurement channel) in Test Loop Mode 1. SAR for HSPA is selectively measured with HS-DPCCH, E-DPCCH and E-DPDCH, all enabled, along with a 12.2 kbps RMC using the highest SAR configuration in WCDMA with 12.2 kbps RMC only. An FRC is configured according to E-DCH Subtest 5 requirements. SAR for other HSPA sub-test configurations is also confirmed selectively according to output power is verified according to procedures in applicable version of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. The UE Categories for HS-DPCCH and HSPA should be clearly identified in the SAR report. The following procedures are applicable only if Max Power Reduction (MPR) is implemented according to Cubic Metric (CM) requirements.

9.1. Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC(transmit power control) set to all “1s”. Results for all applicable physical channel configurations (DPCCH, DPDCH and spreading codes) should be tabulated in the test report. All configurations that are not supported by the EUT or cannot be measured due to technical or equipment limitations should be clearly identified.

9.2. SAR Measurements

When voice transmission and head exposure conditions are applicable to a WCMDA/HSPA data device, head exposure is measured according to the ‘Head SAR Measurements’ of the handset.SAR for body exposure configurations is measured according to the ‘Body SAR Measurements’ procedures of WCDMA handsets. In addition, body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least 1/4 dB Higher than that measured without HSPA using 12.2 kbps RMC or maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP is applicable for head exposure, SAR is not required when the maximum output of each RF channel with HSPA is less than 1/4 dB higher than that measured using 12.2 kbps RMC; otherwise, the same HSPA configuration used for body measurements should be used to test for head exposure.

10. Measurement Of Conducted Peak Output Power.

1. GSM Conducted peak output power

Band	Channel	Frequency (MHz)	Output Power (dBm)
GSM 850	128	824.2	31.58
	190	836.6	31.22
	251	848.8	30.96
PCS 1900	512	1850.2	29.44
	661	1880.0	30.81
	810	1909.8	30.96

11. Test Results List

Summary of Measurement Results (GSM 850MHz Band)

Temperature: 21.0~23.8°C, humidity: 54~60%.							
Phantom Configurations	Description				SAR(W/Kg), 1g Peak	Scaling factor	Scaled SAR
	Mode	Channel	Antenna orientation	Power			
Body (25mm Separation)	GSM	128	Position A	AC adaptor	0.382	1.102	0.421
				battery	0.441		0.486
			Position B	AC adaptor	0.412		0.454
				battery	0.447		0.493

Summary of Measurement Results (GSM 1900MHz Band)

Temperature: 21.0~23.8°C, humidity: 54~60%.							
Phantom Configurations	Description				SAR(W/Kg), 1g Peak	Scaling factor	Scaled SAR
	Mode	Channel	Antenna orientation	Power			
Body (25mm Separation)	GSM	810	Position A	AC adaptor	0.196	1.001	0.196
				battery	0.259		0.259
			Position B	AC adaptor	0.273		0.273
				battery	0.298		0.298

Note:

1.SAR test are conducted on the highest channels of each band, refer to KDB 447498, when the SAR procedures require multiple channels to be tested and the 1-g SAR for the highest output channel is less than 0.8 W/kg and peak SAR is less than 1.6W/kg, where the transmission band corresponding to all channels is ≤ 100 MHz, testing for the other channels is not required.

2. Scaled SAR calculation

Band	Tune-up power tolerance (dBm)	SAR test channel Power (dBm)	Scaling Factor
GSM 850	PCL = 5, PWR = 31.5± 0.5	31.58	1.102
PCS 1900	PCL = 0, PWR = 30.5 ± 0.5	30.96	1.001

Scaling Factor = Tune-up Maximum Power (Watt) / SAR test channel Power (Watt)

Scaled SAR = Measure SAR * Scaling Factor

3. Per KDB inquiry 735201:Test the device in one test position with the antenna oriented in two

ways. Test the back of the device at a distance of 2.5 cm from the flat phantom. The side of the device containing the antenna is considered the back; it is not the bottom of the device.
With the device in this position, perform a SAR test with the antenna perpendicular to the device (pointing straight up **Position A**) and also a SAR test with the antenna parallel with the device (flush with the back side **Position B**).

Annex A EUT Setup Photos

1. Positon A

2. Position B

Liquid Level Photo

Liquid depth :15.5cm

Annex B Graph Test Results

BAND	PARAMETERS
GSM850	Measurement 1: Validation Plane with Body device position on Low Channel in GSM mode Measurement 2: Validation Plane with Body device position on Low Channel in GSM mode Measurement 3: Validation Plane with Body device position on Low Channel in GSM mode Measurement 4: Validation Plane with Body device position on Low Channel in GSM mode
GSM1900	Measurement 5: Validation Plane with Body device position on High Channel in GSM mode Measurement 6: Validation Plane with Body device position on High Channel in GSM mode Measurement 7: Validation Plane with Body device position on High Channel in GSM mode Measurement 8: Validation Plane with Body device position on High Channel in GSM 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: 2013.3.27
Measurement duration: 9 minutes 4 seconds

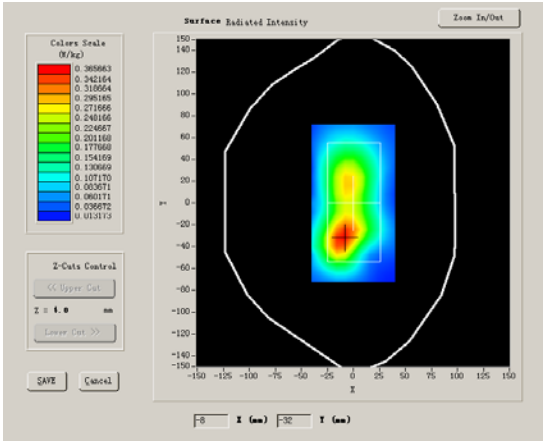
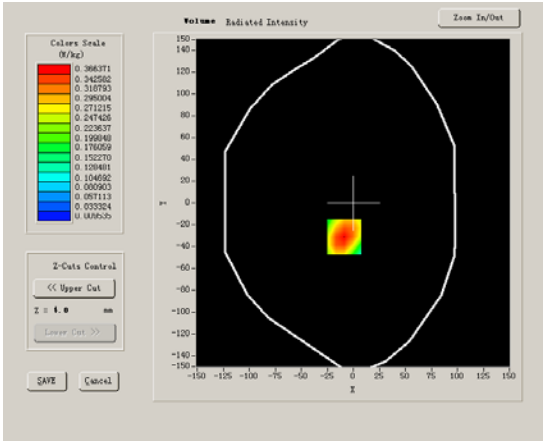
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	Body
Band	GSM850
Channels	Low
Signal	GSM

B. SAR Measurement Results

Lower Band SAR (Channel 128):

Frequency (MHz)	824.200000
Relative permittivity (real part)	55.256774
Conductivity (S/m)	0.962473
Power drift (%)	-2.120000
Ambient Temperature:	22.6°C
Liquid Temperature:	22.4°C
ConvF:	28.559,25.681,27.588
Crest factor:	1:8

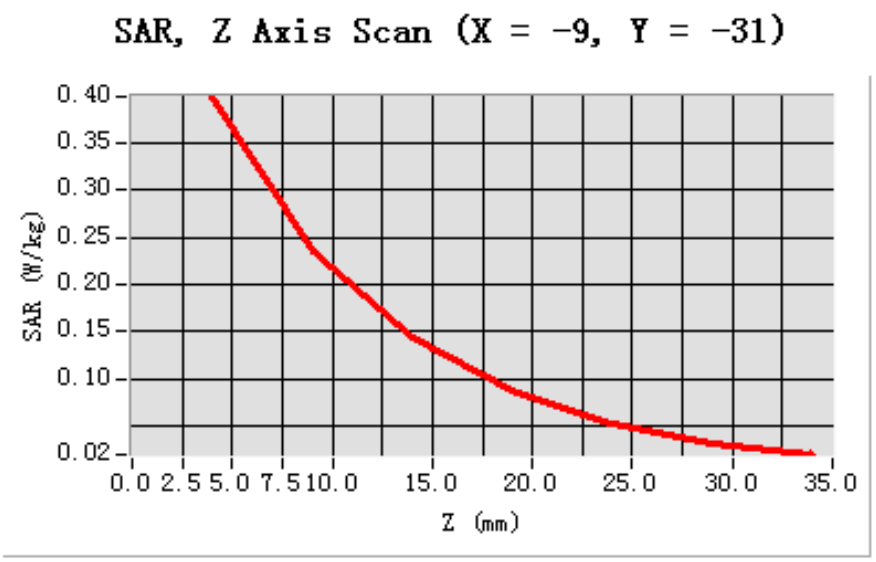
SURFACE SAR	VOLUME SAR
	

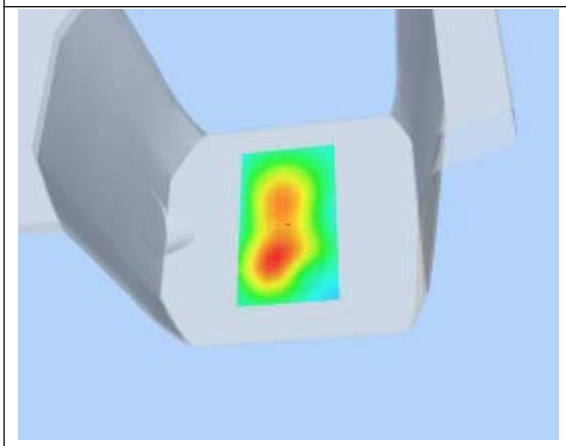
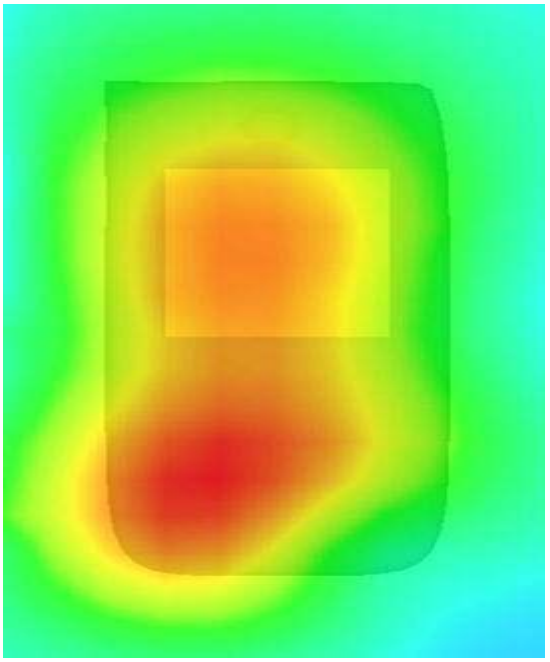
Maximum location: X=-9.00, Y=-31.00

SAR 10g (W/Kg)	0.223408
SAR 1g (W/Kg)	0.381549

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	0.3989	0.2353	0.1425	0.0867	0.0522	0.0308



3D sceen 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: 2013.3.27
Measurement duration: 9 minutes 6 seconds

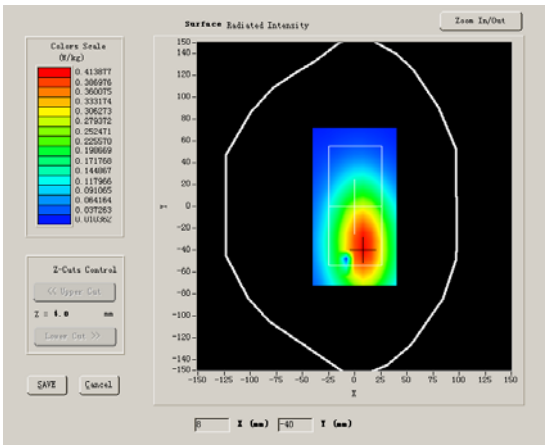
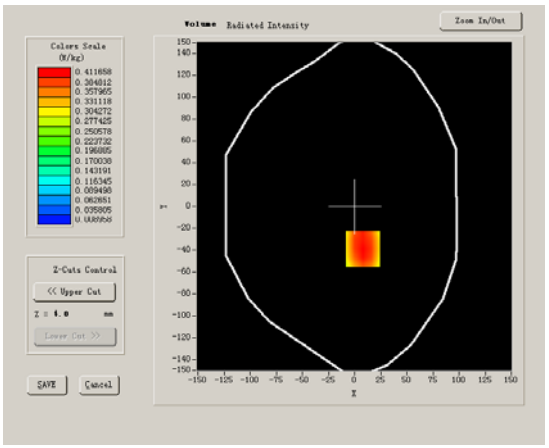
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	Body
Band	GSM850
Channels	Low
Signal	GSM

B. SAR Measurement Results

Lower Band SAR (Channel 128):

Frequency (MHz)	824.200000
Relative permittivity (real part)	55.256774
Conductivity (S/m)	0.962473
Power drift (%)	-2.010000
Ambient Temperature:	22.6°C
Liquid Temperature:	22.4°C
ConvF:	28.559,25.681,27.588
Crest factor:	1:8

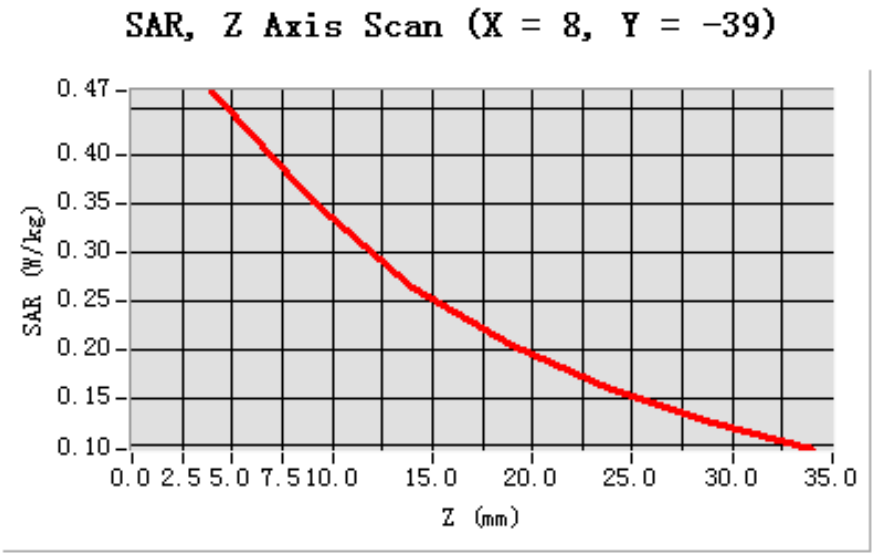
SURFACE SAR	VOLUME SAR
	

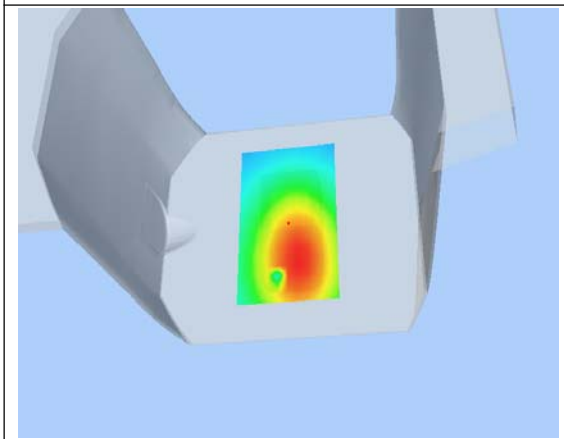
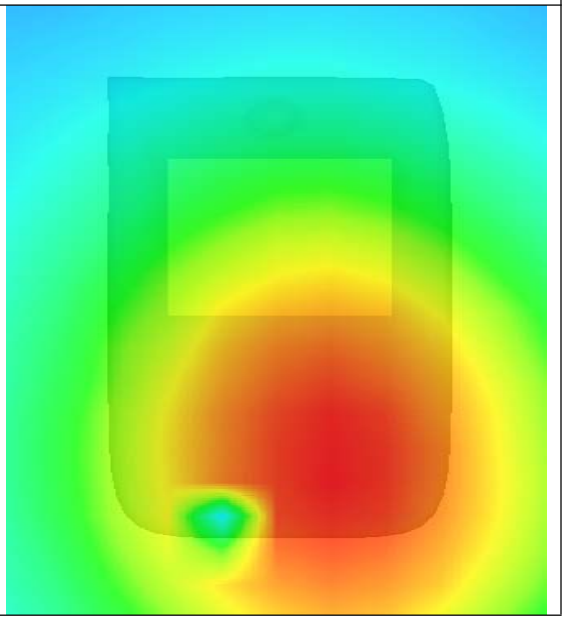
Maximum location: X=8.00, Y=-39.00

SAR 10g (W/Kg)	0.323958
SAR 1g (W/Kg)	0.441227

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	0.4674	0.3538	0.2644	0.2030	0.1579	0.1230



3D sceen 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: 2013.3.27
Measurement duration: 9 minutes 4 seconds

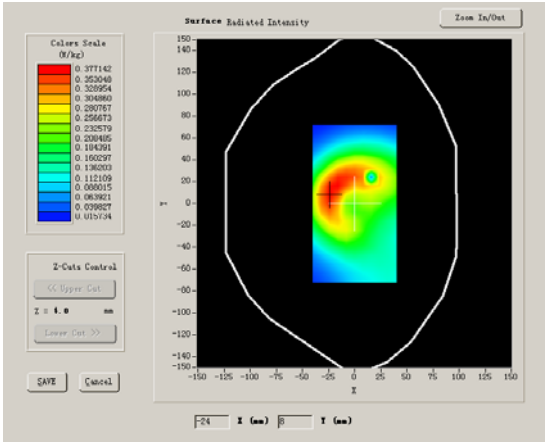
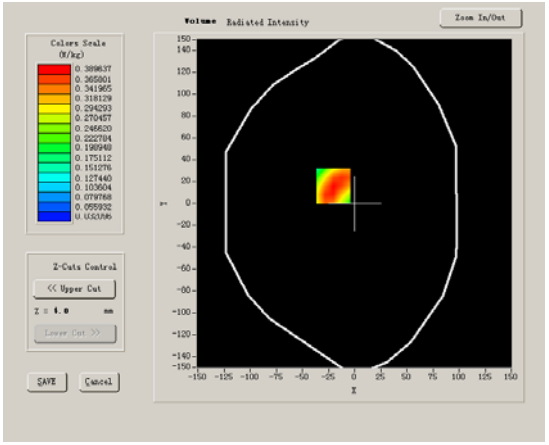
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	Body
Band	GSM850
Channels	Low
Signal	GSM

B. SAR Measurement Results

Lower Band SAR (Channel 128):

Frequency (MHz)	824.200000
Relative permittivity (real part)	55.256774
Conductivity (S/m)	0.962473
Power drift (%)	-1.800000
Ambient Temperature:	22.6°C
Liquid Temperature:	22.4°C
ConvF:	28.559,25.681,27.588
Crest factor:	1:8

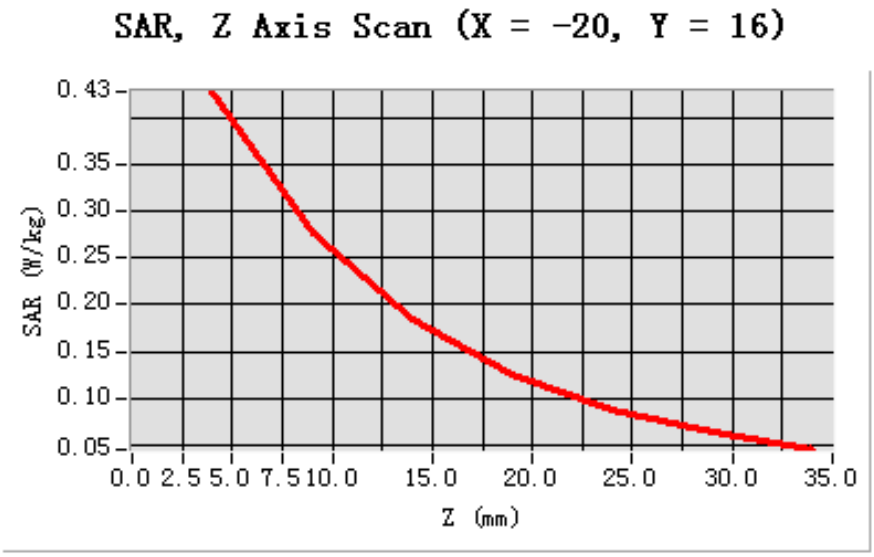
SURFACE SAR	VOLUME SAR
	

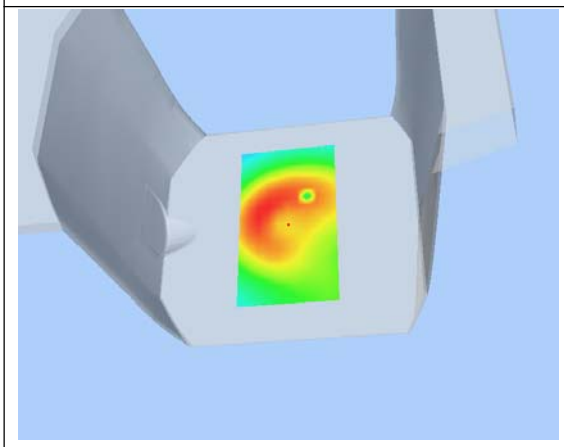
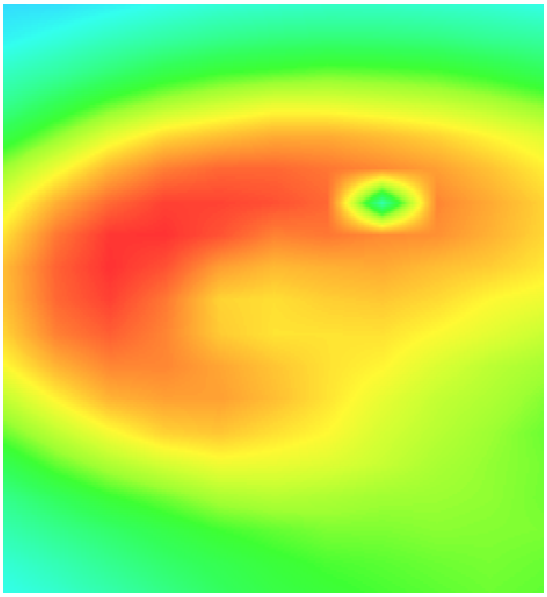
Maximum location: X=-20.00, Y=16.00

SAR 10g (W/Kg)	0.260966
SAR 1g (W/Kg)	0.411747

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	0.4277	0.2765	0.1844	0.1256	0.0868	0.0631



3D sceen 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: 2013.3.27
Measurement duration: 9 minutes 6 seconds

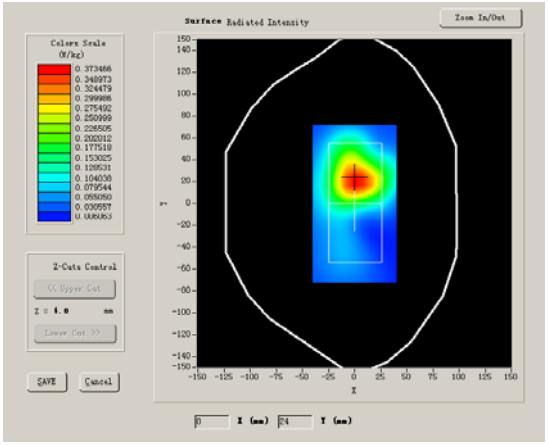
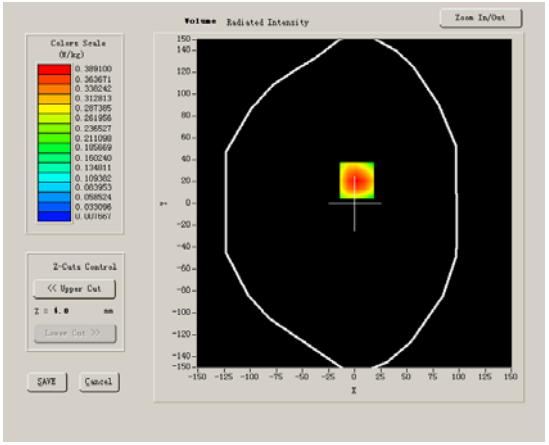
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	Body
Band	GSM850
Channels	Low
Signal	GSM

B. SAR Measurement Results

Lower Band SAR (Channel 128):

Frequency (MHz)	824.200000
Relative permittivity (real part)	55.256774
Conductivity (S/m)	0.962473
Power drift (%)	-2.010000
Ambient Temperature:	22.6°C
Liquid Temperature:	22.4°C
ConvF:	28.559,25.681,27.588
Crest factor:	1:8

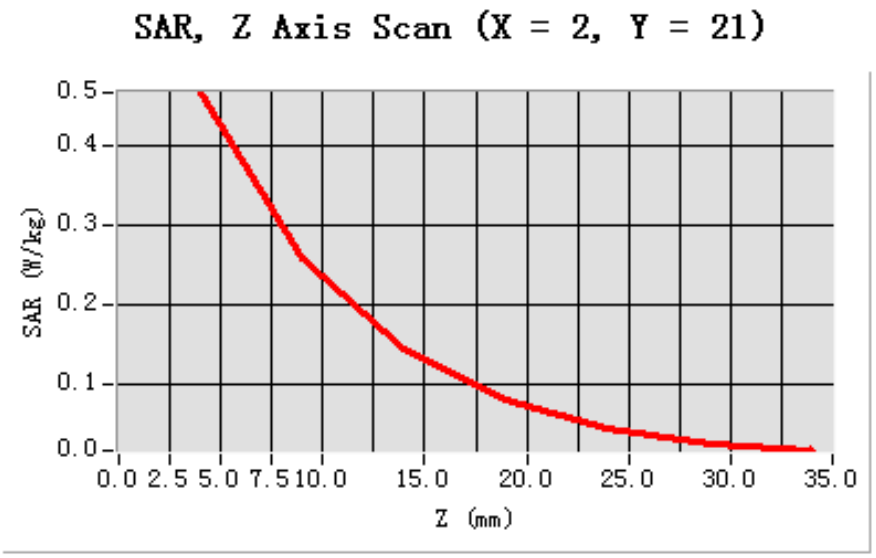
SURFACE SAR	VOLUME SAR
	

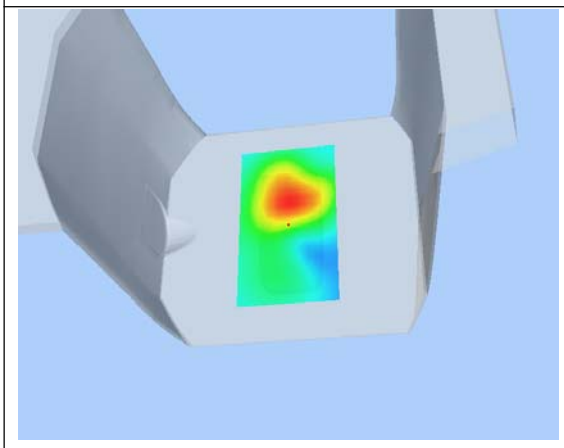
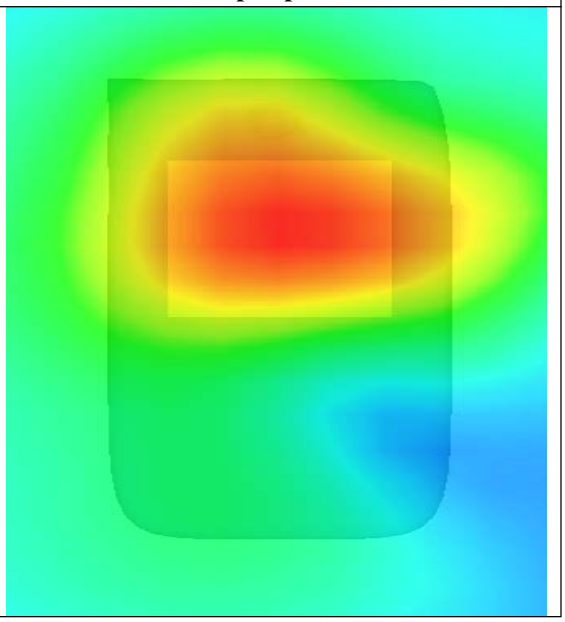
Maximum location: X=2.00, Y=21.00

SAR 10g (W/Kg)	0.251893
SAR 1g (W/Kg)	0.447691

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	0.4670	0.2593	0.1438	0.0789	0.0450	0.0251



3D sceen 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: 2013.3.27
Measurement duration: 8 minutes 59 seconds

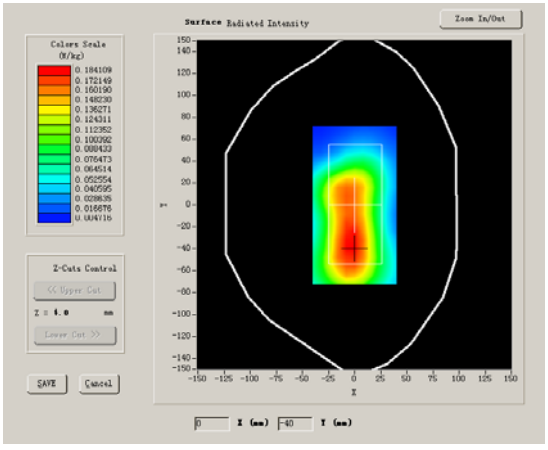
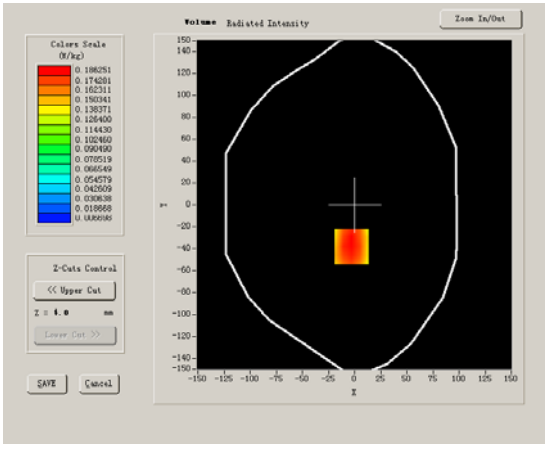
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	Body
Band	GSM1900
Channels	High
Signal	GSM

B. SAR Measurement Results

Higher Band SAR (Channel 810):

Frequency (MHz)	1909.800000
Relative permittivity (real part)	53.509672
Conductivity (S/m)	1.498623
Power drift (%)	-0.240000
Ambient Temperature:	22.6°C
Liquid Temperature:	22.4°C
ConvF:	40.625,34.773,38.535
Crest factor:	1:8

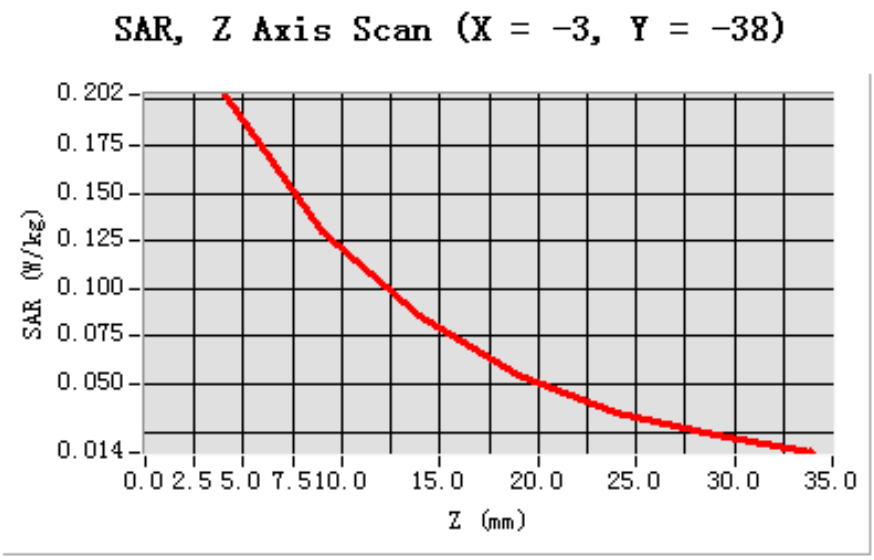
SURFACE SAR	VOLUME SAR
	

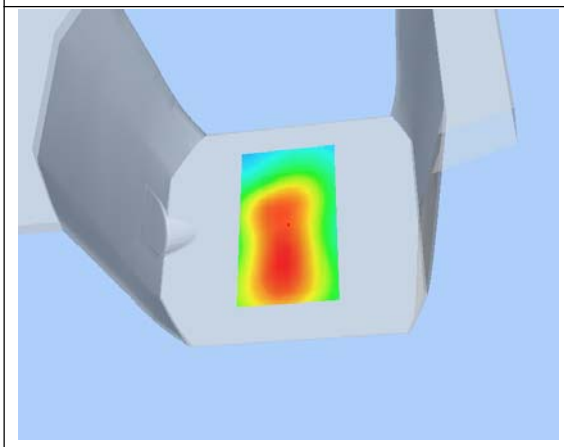
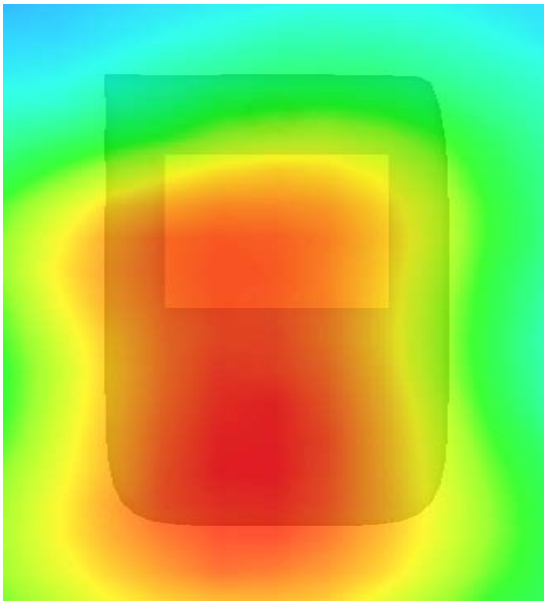
Maximum location: X=-3.00, Y=-38.00

SAR 10g (W/Kg)	0.124105
SAR 1g (W/Kg)	0.195618

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	0.2019	0.1305	0.0860	0.0551	0.0354	0.0231



3D sceen 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: 2013.3.27
Measurement duration: 8 minutes 59 seconds

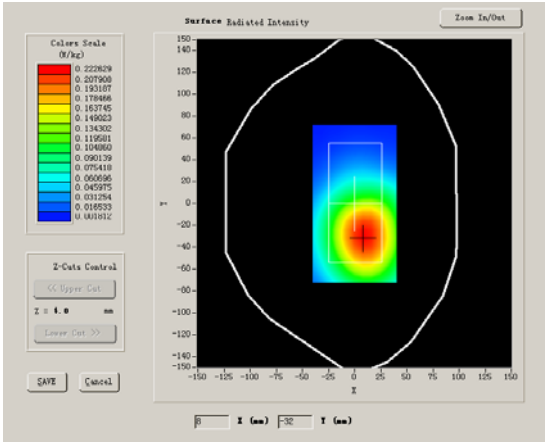
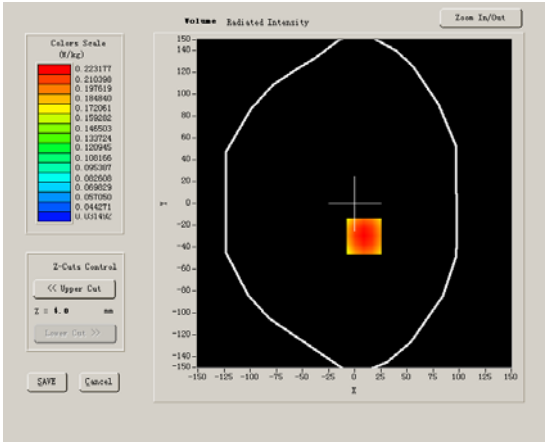
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	Body
Band	GSM1900
Channels	High
Signal	GSM

B. SAR Measurement Results

Higher Band SAR (Channel 810):

Frequency (MHz)	1909.800000
Relative permittivity (real part)	53.509672
Conductivity (S/m)	1.498623
Power drift (%)	-2.450000
Ambient Temperature:	22.6°C
Liquid Temperature:	22.4°C
ConvF:	40.625,34.773,38.535
Crest factor:	1:8

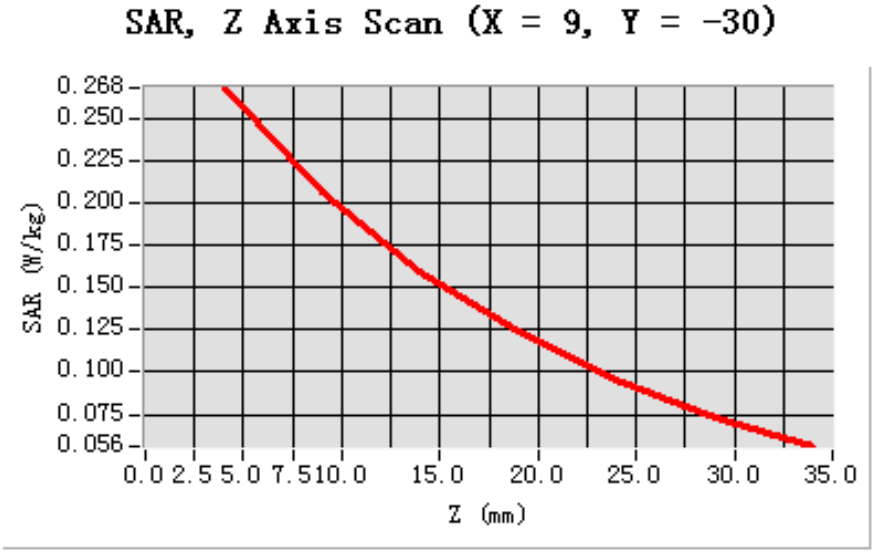
SURFACE SAR	VOLUME SAR
	

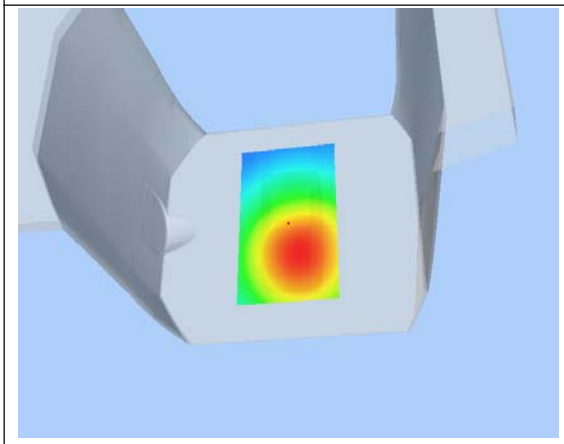
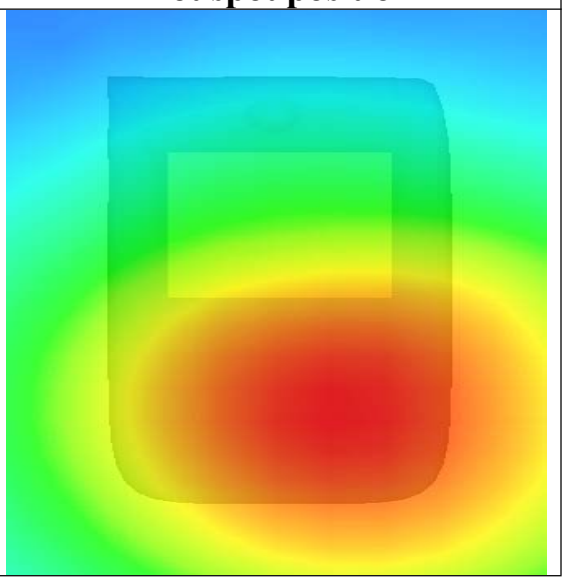
Maximum location: X=9.00, Y=-30.00

SAR 10g (W/Kg)	0.162736
SAR 1g (W/Kg)	0.259277

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	0.2678	0.2069	0.1596	0.1236	0.0949	0.0736



3D sceen shot	Hot spot position
	

MEASUREMENT 7

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2013.3.27
Measurement duration: 8 minutes 59 seconds

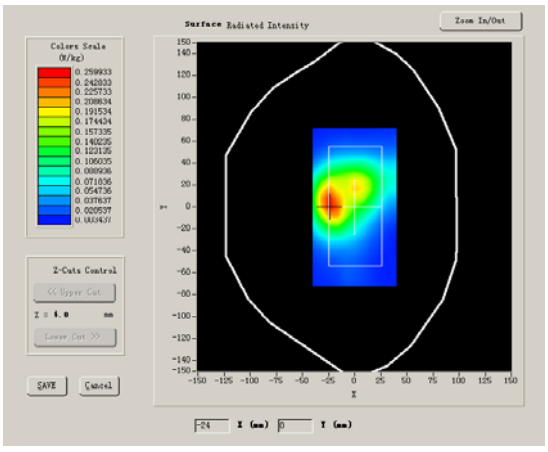
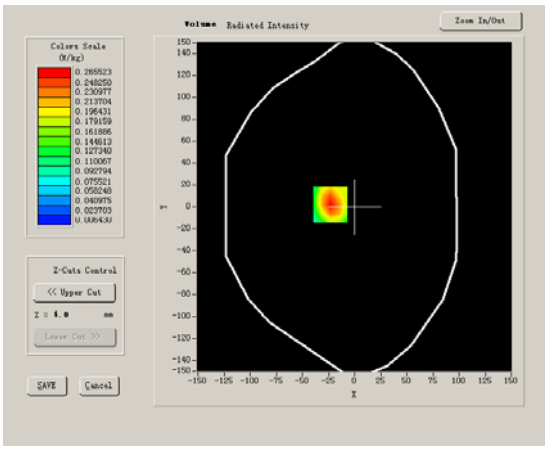
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	Body
Band	GSM1900
Channels	High
Signal	GSM

B. SAR Measurement Results

Higher Band SAR (Channel 810):

Frequency (MHz)	1909.800000
Relative permittivity (real part)	53.509672
Conductivity (S/m)	1.498623
Power drift (%)	-0.760000
Ambient Temperature:	22.6°C
Liquid Temperature:	22.4°C
ConvF:	40.625,34.773,38.535
Crest factor:	1:8

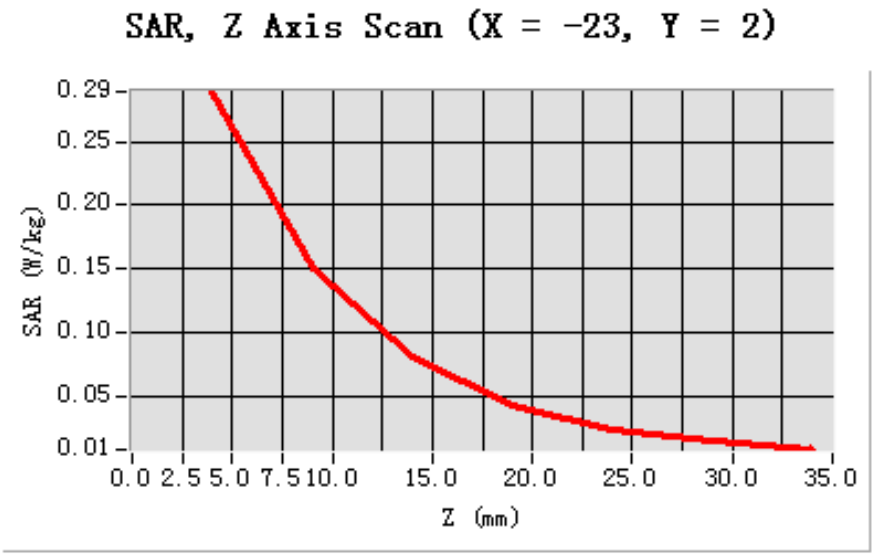
SURFACE SAR	VOLUME SAR
	

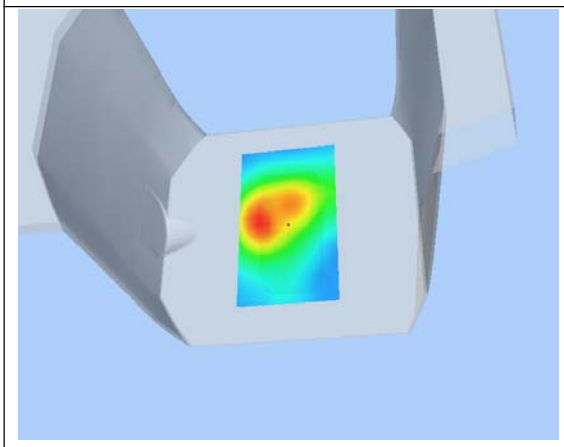
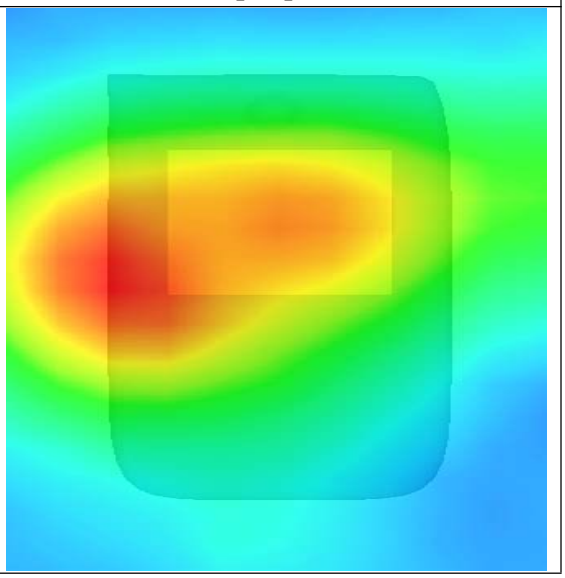
Maximum location: X=-23.00, Y=2.00

SAR 10g (W/Kg)	0.147012
SAR 1g (W/Kg)	0.273047

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	0.2891	0.1501	0.0805	0.0439	0.0244	0.0152



3D sceen shot	Hot spot position
	

MEASUREMENT 8

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2013.3.27
Measurement duration: 8 minutes 59 seconds

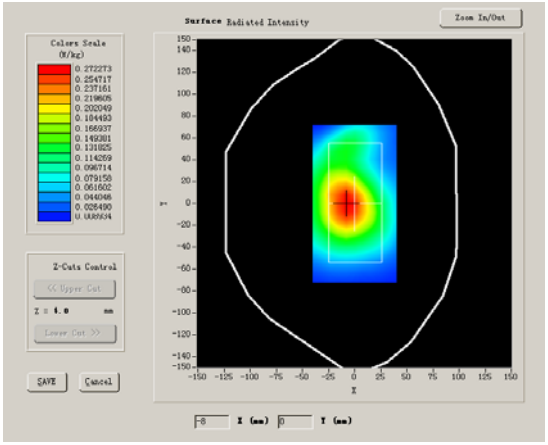
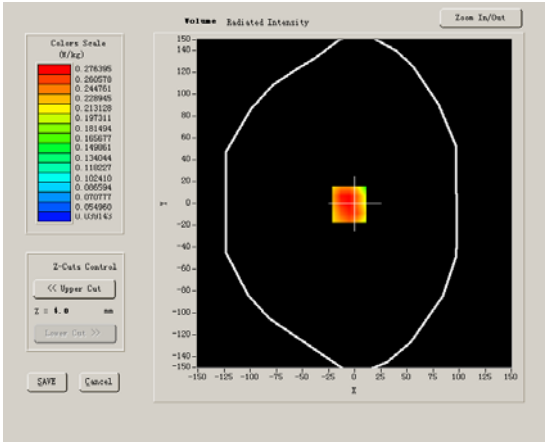
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	Body
Band	GSM1900
Channels	High
Signal	GSM

B. SAR Measurement Results

Higher Band SAR (Channel 810):

Frequency (MHz)	1909.800000
Relative permittivity (real part)	53.509672
Conductivity (S/m)	1.498623
Power drift (%)	-2.170000
Ambient Temperature:	22.6°C
Liquid Temperature:	22.4°C
ConvF:	40.625,34.773,38.535
Crest factor:	1:8

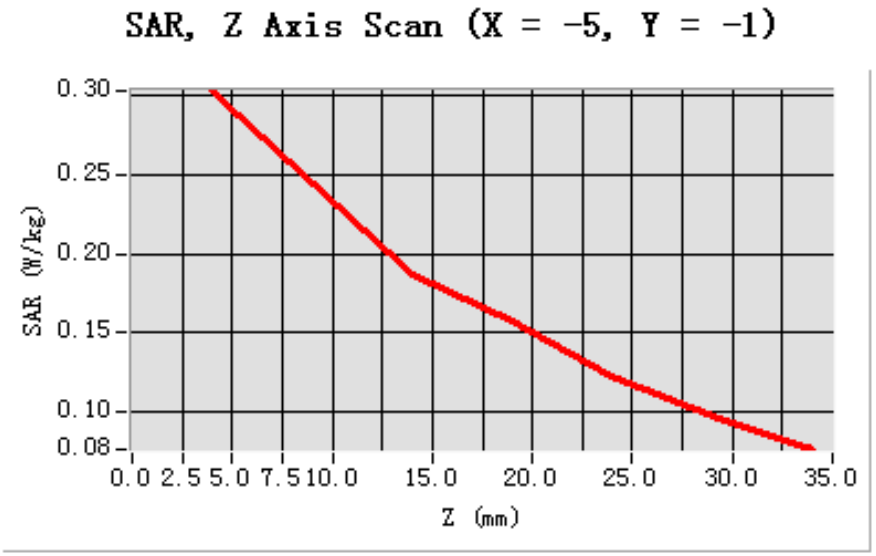
SURFACE SAR	VOLUME SAR
	

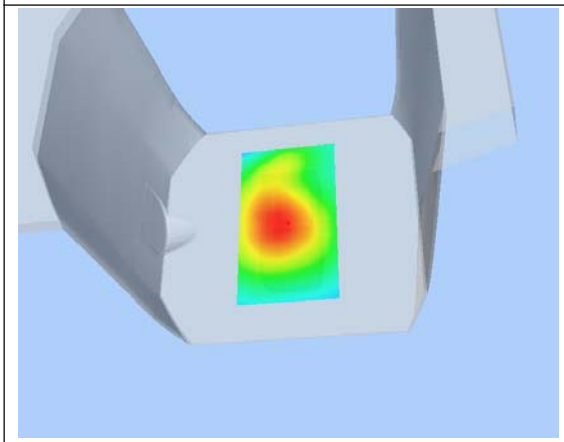
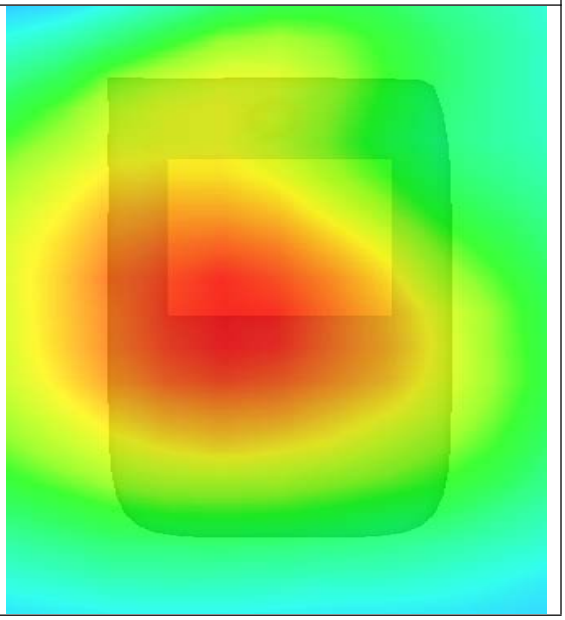
Maximum location: X=-5.00, Y=-1.00

SAR 10g (W/Kg)	0.221916
SAR 1g (W/Kg)	0.297941

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	0.3034	0.2449	0.1865	0.1572	0.1227	0.0971



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: 2013.3.27
Measurement duration: 13 minutes 27 seconds

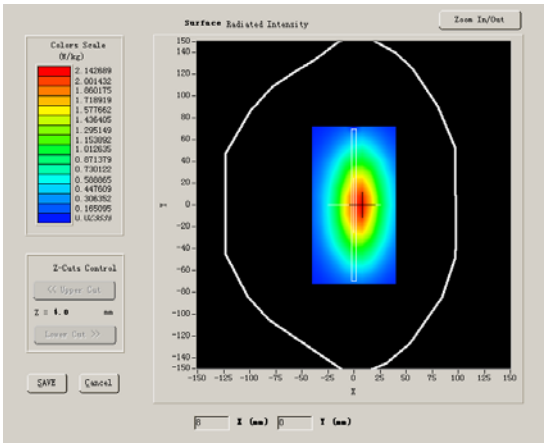
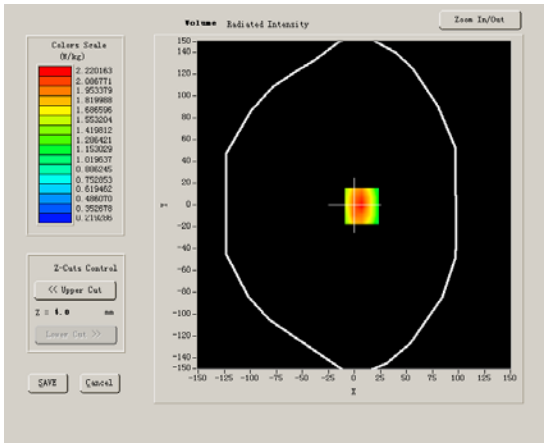
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	
Band	835MHz
Channels	
Signal	CW

B. SAR Measurement Results

Band SAR

Frequency (MHz)	835.000000
Relative permittivity (real part)	55.256774
Conductivity (S/m)	0.962473
Power drift (%)	-0.520000
Ambient Temperature:	22.6°C
Liquid Temperature:	22.4°C
ConvF:	28.559,25.681,27.588
Crest factor:	1:1

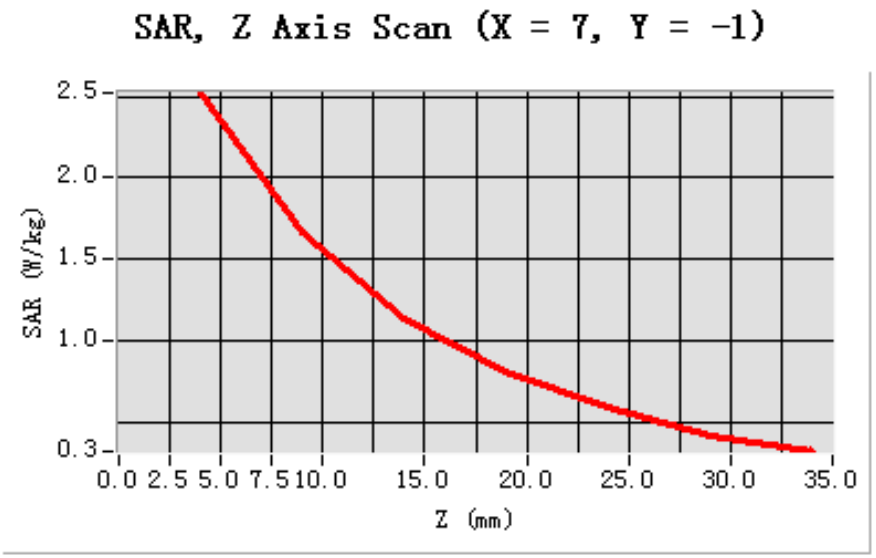
SURFACE SAR	VOLUME SAR
	

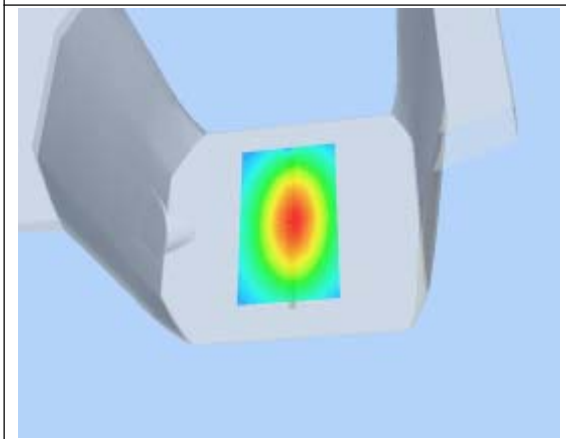
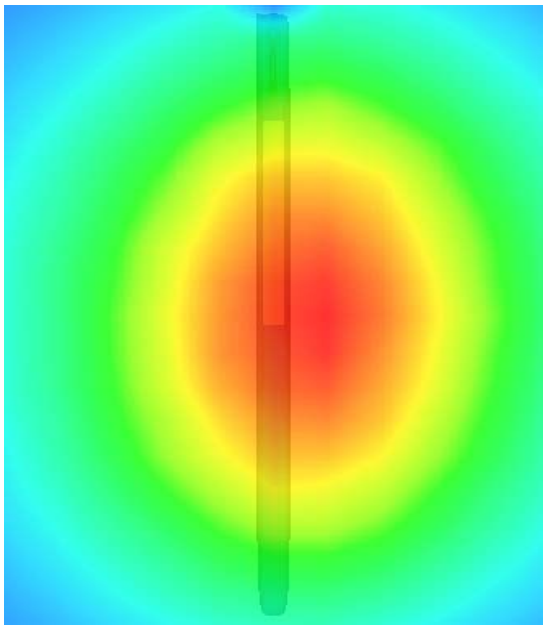
Maximum location: X=7.00, Y=-1.00

SAR 10g (W/Kg)	1.497122
SAR 1g (W/Kg)	2.379818

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	2.5320	1.6629	1.1437	0.8103	0.5901	0.4302



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: 2013.3.27
Measurement duration: 13 minutes 26 seconds

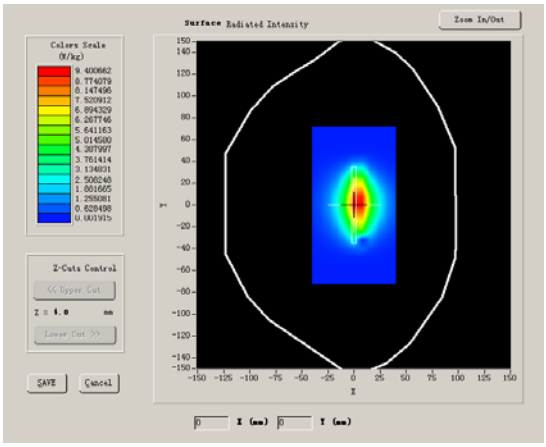
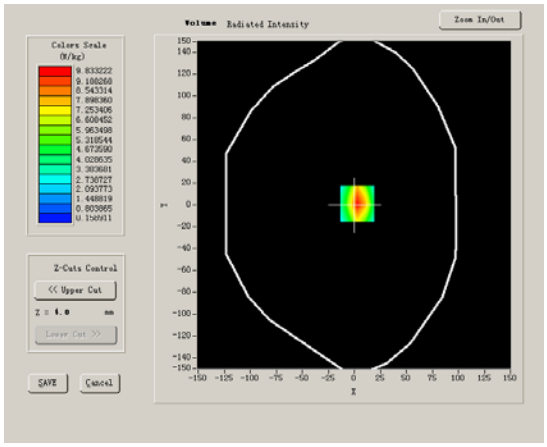
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	
Band	1900MHz
Channels	
Signal	CW

B. SAR Measurement Results

Band SAR

Frequency (MHz)	1900.000000
Relative permittivity (real part)	53.509672
Conductivity (S/m)	1.498623
Power drift (%)	-1.250000
Ambient Temperature:	22.6°C
Liquid Temperature:	22.4°C
ConvF:	40.625,34.773,38.535
Crest factor:	1:1

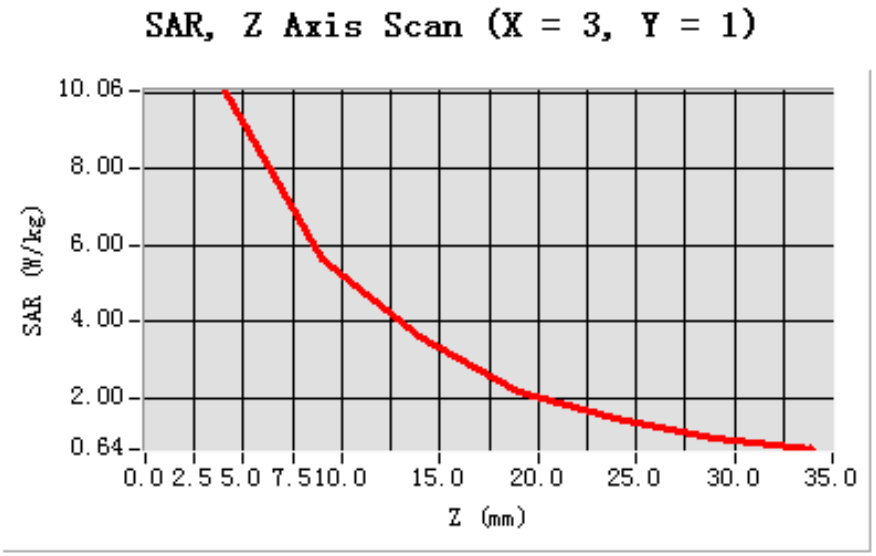
SURFACE SAR	VOLUME SAR
	

Maximum location: X=3.00, Y=1.00

SAR 10g (W/Kg)	6.628519
SAR 1g (W/Kg)	9.953173

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	10.0621	5.7145	3.6136	2.1851	1.4903	0.9152



3D sceen shot	Hot spot position