



REPORT No. : SZ16020035S02

# FCC SAR TEST REPORT

**APPLICANT** : Rope Innovation Co.,Ltd

**PRODUCT NAME** : GPS PHONE WATCH

**MODEL NAME** : R1X (X could be 1~9)

**TRADE NAME** : MyRope

**BRAND NAME** : MyRope

**FCC ID** : 2AHRQGPSR11-19

**STANDARD(S)** : 47CFR 2.1093  
IEEE 1528-2013

**ISSUE DATE** : 2016-05-10



**SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.**

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Change History		
Issue	Date	Reason for change
1.0	2016-05-10	First edition



REPORT No. : SZ16020035S02

**TEST REPORT DECLARATION**

Applicant	Rope Innovation Co.,Ltd		
Applicant Address	Room 306-309, Floor 3rd, NO.1 Idea Bank of TKG Technology Park, Chuangye Road 2, Bao'an, Shenzhen, China		
Manufacturer	Rope Innovation Co.,Ltd		
Manufacturer Address	5 Floor, TKG NO. 11 Building, Yangtian Road, Bao'an, Shenzhen, China		
Product Name	GPS PHONE WATCH		
Model Name	R1X (X could be 1~9)		
Brand Name	MyRope		
HW Version	MYROPE_S_V2.0		
SW Version	V01_160301_CTA		
Test Standards	47CFR 2.1093; IEEE 1528-2013		
Test Date	2016-05-09		
The Highest Reported SAR(W/kg)	Head	0.534W/kg	Limit:1.6W/kg(1g)
	Wrist	1.839W/kg	Limit:4.0W/kg(10g)

Tested by : Liu Jun  
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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:	Rope Innovation Co.,Ltd
Address:	Room 306-309, Floor 3rd, NO.1 Idea Bank of TGK Technology Park, Chuangye Road 2, Bao'an, Shenzhen, China

### 1.2 Identification of Manufacturer

Company Name:	Rope Innovation Co.,Ltd
Address:	5 Floor, TGK NO. 11 Building, Yangtian Road, Bao'an, Shenzhen, China

### 1.3 Equipment Under Test (EUT)

Model Name:	R1X (X could be 1~9)
Trade Name:	MyRope
Brand Name:	MyRope
Hardware Version:	MYROPE_S_V2.0
Software Version:	V01_160301_CTA
Tx Frequency Bands:	GSM850 : 824.2 ~ 848.8 MHz GSM1900 : 1850.2 ~ 1909.8 MHz
Uplink Modulation	GSM/GPRS:GMSK EDGE:8PSK
Multi-slot Class:	GPRS: Multi-slot Class 12; EDGE: Multi-slot Class 12
Antenna type:	Fixed Internal Antenna
Development Stage:	Identical prototype
DTM Capability	Not Support
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 EUTs

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#	MYROPE_S_V2.0	V01_160301_CTA

### 1.4 Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	<b>47 CFR§2.1093</b>	Radiofrequency Radiation Exposure Evaluation: Portable Devices
2	<b>IEEE 1528-2013</b>	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
3	<b>KDB 447498 D01v06</b>	General RF Exposure Guidance
4	<b>KDB 865664 D01v01r04</b>	SAR Measurement 100 MHz to 6 GHz
5	<b>KDB 865664 D02v01r02</b>	SAR Reporting



## 1.5 Device Category and SAR Limits

### Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

### Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

**Limits for Occupational/Controlled Exposure (W/kg)**

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

**Limits for General Population/Uncontrolled Exposure (W/kg)**

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0





## 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 Middle 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.

(p). The equation description is as below:

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

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by,

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

Where **C** is the specific head capacity,  $\delta T$  is the temperature rise and  $\delta t$  the exposure duration, or related to the electrical field in the tissue by

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

Where  $\sigma$  is the conductivity of the tissue,  $\rho$  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

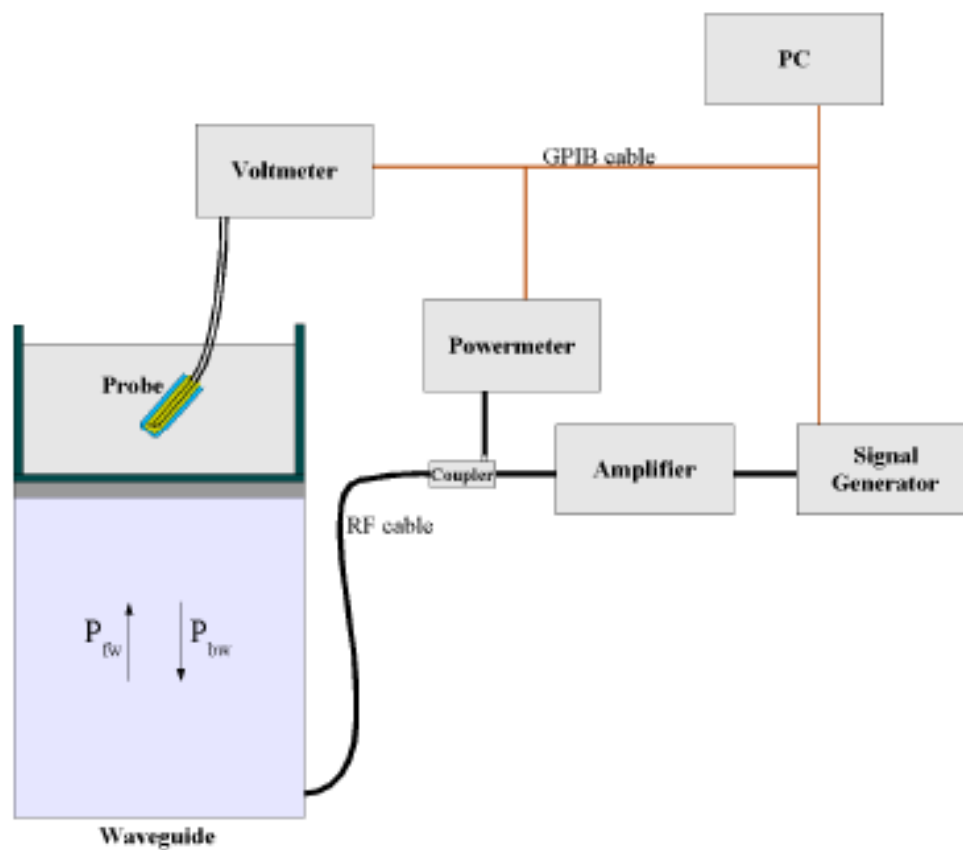
For the measurements the Specific Dosimetric E-Field Probe SN 37/08 EP80 with following specifications is used

- 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: 835 to 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 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

l = 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:

$$CF(N)=SAR(N)/V_{lin}(N) \quad (N=1,2,3)$$

The linearised output voltage  $V_{lin}(N)$  is obtained from the displayed output voltage  $V(N)$  using

$$V_{lin}(N)=V(N)*(1+V(N)/DCP(N)) \quad (N=1,2,3)$$

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<sup>2</sup>) 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<sup>2</sup>.

#### 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:

$\delta t$  = exposure time (30 seconds),

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

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

$\delta T$  = temperature increase due to RF exposure.

SAR is proportional to  $\Delta T/\Delta t$ , 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.

Where:

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

$\sigma$  = simulated tissue conductivity,

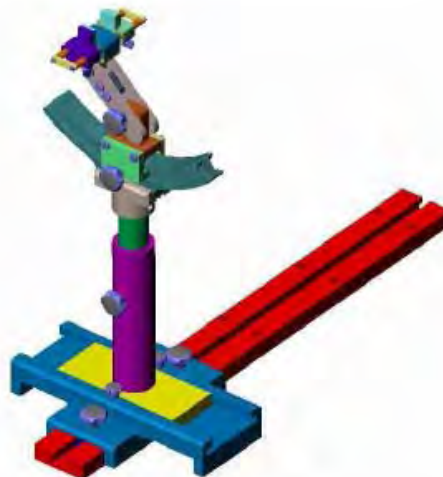
$\rho$  = Tissue density (1.25 g/cm<sup>3</sup> for brain tissue)

### 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 lower 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)	835.00		1900.00	
Tissue Type	Head	Body	Head	Body
Ingredients (% by weight )				
Deionised Water	50.36	50.20	54.90	40.40
Salt(NaCl)	1.25	0.90	0.18	0.50
Sugar	0.00	48.50	0.00	58.00
Tween 20	48.39	0.00	0.00	0.00
HEC	0.00	0.20	0.00	1.00
Bactericide	0.00	0.20	0.00	0.10
Triton X-100	0.00	0.00	0.00	0.00
DGBE	0.00	0.00	44.92.	0.00
Diethyleneglycol monohexylether	0.00	0.00	0.00	0.00
Measured dielectric parameters				
Dielectric Constant	41.50	56.10	39.90	53.30
Conductivity (S/m)	0.90	0.95	1.42	1.52

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

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.



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±(%)
2016-05-09	Head 835	Relative Permittivity( $\epsilon_r$ ):	41.37	41.50	-0.31	5
		Conductivity( $\sigma$ ):	0.91	0.90	1.11	5
	Body 835	Relative Permittivity( $\epsilon_r$ ):	56.12	56.10	0.04	5
		Conductivity( $\sigma$ ):	0.93	0.95	-2.11	5
2016-05-09	Head 1900	Relative Permittivity( $\epsilon_r$ ):	39.87	39.90	-0.08	5
		Conductivity( $\sigma$ ):	1.43	1.42	0.70	5
	Body 1900	Relative Permittivity( $\epsilon_r$ ):	53.31	53.30	0.02	5
		Conductivity( $\sigma$ ):	1.50	1.52	-1.32	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 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
<b>Measurement System</b>									
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	1.1 5	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.0 3	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.8 9	∞
<b>Test sample Related</b>									
Test sample positioning	E.4.2. 1	0.03	N	1	1	1	0.03	0.0 3	N- 1
Device Holder Uncertainty	E.4.1. 1	5.00	N	1	1	1	5.00	5.0 0	N- 1



Output power Power drift - SAR drift measurement	6.6.2	4.04	R	$\sqrt{3}$	1	1	2.33	2.3 3	$\infty$
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.0 3	$\infty$
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.1 3	$\infty$
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.1 5	M
Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.0 4	$\infty$
Liquid permittivity - measurement uncertainty	E.3.3	10.0 0	N	1	0.6	0.49	6.00	4.9 0	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
<b>Measurement System</b>									
Probe calibration	E.2.1	4.76	N	1	1	1	4.76	4.7	$\infty$
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	0.7	0.7	1.01	1.0	$\infty$
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	0.7	0.7	1.62	1.6	$\infty$
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	$\infty$
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.8	$\infty$
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	$\infty$
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.0	$\infty$
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	$\infty$



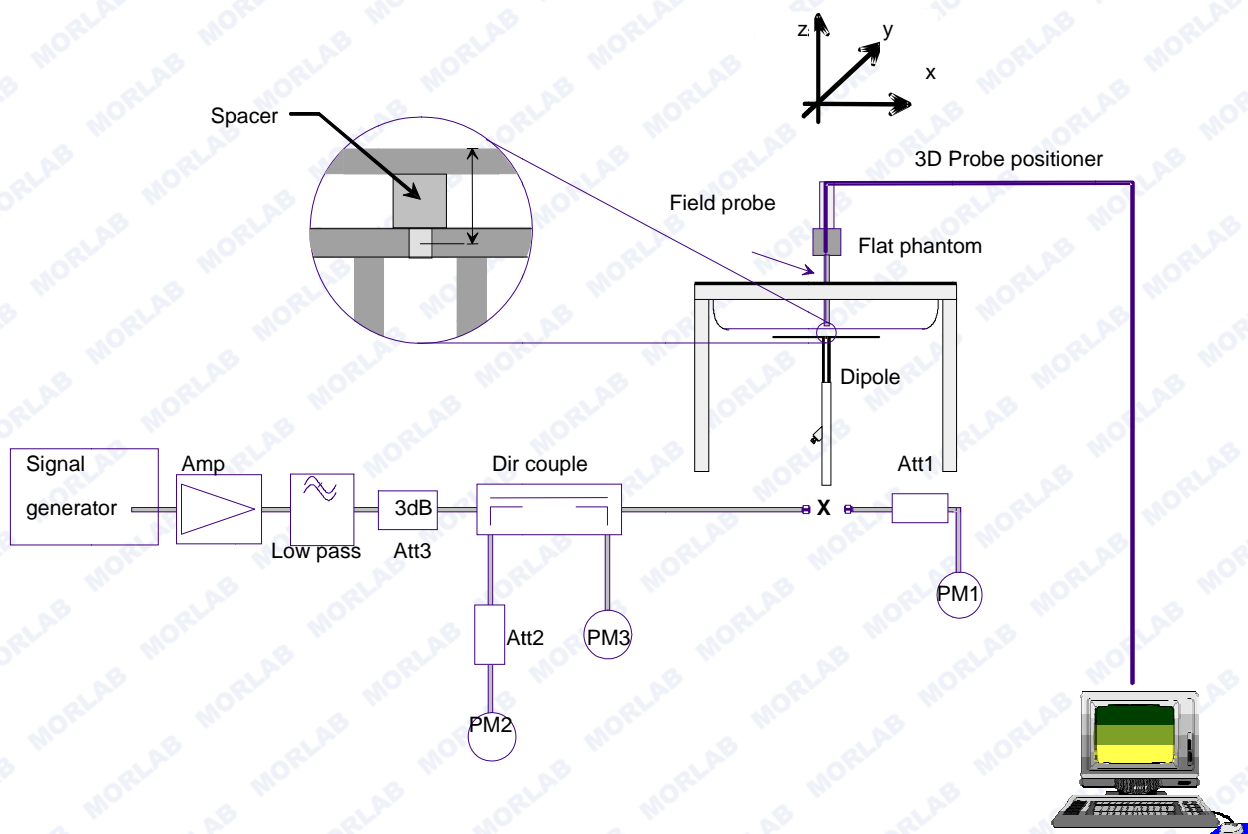


Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.1	$\infty$
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	$\infty$
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.1 5	$\infty$
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.0 3	$\infty$
Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.8 9	$\infty$
<b>Dipole</b>									
Dipole axis to liquid Distance	8,E.4. 2	1.00	N	$\sqrt{3}$	1	1	0.58	0.5 8	$\infty$
Input power and SAR drift measurement	8,6.6. 2	4.04	R	$\sqrt{3}$	1	1	2.33	2.3 3	$\infty$
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.0 3	$\infty$
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.1 3	$\infty$
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	$\sqrt{3}$	0.64	0.43	1.85	1.2 4	M
Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.0 4	$\infty$
Liquid permittivity - measurement uncertainty	E.3.3	10.0 0	N	$\sqrt{3}$	0.6	0.49	3.46	2.8 3	M
Combined Standard Uncertainty			RSS				8.83	8.3 7	
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)	1900MHz(H)	1900MHz(B)
Target value (1g)	9.680 W/Kg	10.040 W/Kg	39.360 W/Kg	42.360 W/Kg
Test value (1g 100 mW input)	0.954 W/kg	0.992 W/kg	4.018 W/kg	4.348 W/kg
Normalized value (1g)	9.54 W/kg	9.92 W/kg	40.18 W/kg	43.48 W/kg

**Note:** System checks the specific test data please see 37-44.



## 7. OPERATIONAL CONDITIONS DURING TEST

### 7.1 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 15.1cm.

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.

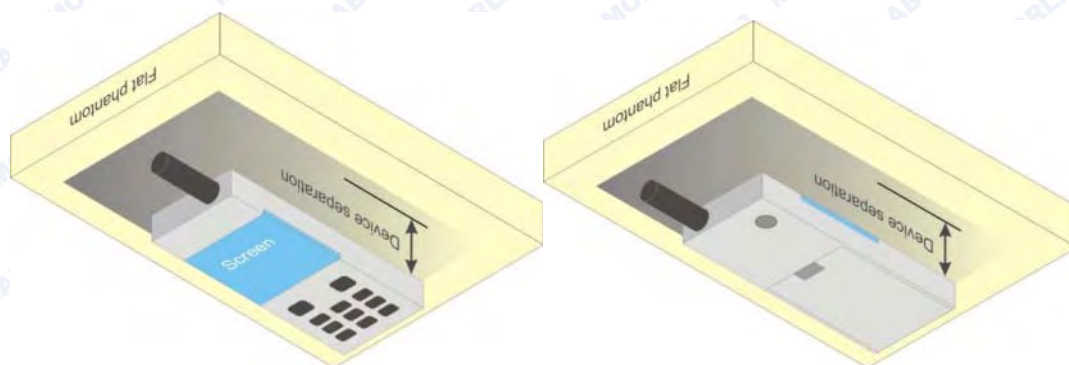


Illustration for Body Worn Position

### 7.2 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 to 16 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.



### 7.3 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.



## 8. MEASUREMENT OF CONDUCTED PEAK OUTPUT POWER

### 1. GSM Conducted peak output power

Band	Channel	Frequency (MHz)	Output Power
			(dBm)
GSM 850	128	824.2	32.58
	190	836.6	32.72
	251	848.8	32.95
PCS 1900	512	1850.2	30.78
	661	1880.0	30.33
	810	1909.8	30.24

### 2. GPRS Mode

Band	Channel	Frequency (MHz)	Output Power(dBm)			
			Slot 1	Slot 2	Slot 3	Slot 4
GSM 850	128	824.2	31.86	30.81	29.70	28.68
	190	836.6	32.01	30.96	29.85	28.83
	251	848.8	32.23	31.18	30.07	29.05
PCS 1900	512	1850.2	29.69	28.64	27.53	26.51
	661	1880.0	29.25	28.20	27.09	26.07
	810	1909.8	29.28	28.23	27.12	26.10

### GPRS Mode Time-based Average Power

Band	Channel	Frequency (MHz)	Output Power(dBm)			
			Slot 1	Slot 2	Slot 3	Slot 4
GSM 850	128	824.2	22.83	24.79	25.44	25.67
	190	836.6	22.98	24.94	25.59	25.82
	251	848.8	23.20	25.16	25.81	26.04
PCS 1900	512	1850.2	20.66	22.62	23.27	23.50
	661	1880.0	20.22	22.18	22.83	23.06
	810	1909.8	20.25	22.21	22.86	23.09





## 3. EGPRS Mode

Band	Channel	Frequency (MHz)	Output Power(dBm)			
			Slot 1	Slot 2	Slot 3	Slot 4
GSM 850	128	824.2	29.65	28.60	27.49	26.47
	190	836.6	29.88	28.83	27.72	26.70
	251	848.8	30.29	29.24	28.13	27.11
PCS 1900	512	1850.2	27.37	26.32	25.21	24.19
	661	1880.0	26.97	25.92	24.81	23.79
	810	1909.8	27.03	25.98	24.87	23.85

## EGPRS Mode Time-based Average Power

Band	Channel	Frequency (MHz)	Output Power(dBm)			
			Slot 1	Slot 2	Slot 3	Slot 4
GSM 850	128	824.2	20.62	22.58	23.23	23.46
	190	836.6	20.85	22.81	23.46	23.69
	251	848.8	21.26	23.22	23.87	24.10
PCS 1900	512	1850.2	18.34	20.30	20.95	21.18
	661	1880.0	17.94	19.90	20.55	20.78
	810	1909.8	18.00	19.96	20.61	20.84

## Timeslot consignations:

No. Of Slots	Slot 1	Slot 2	Slot 3	Slot 4
Slot Consignation	1Up4Down	2Up3Down	3Up2Down	4Up1Down
Duty Cycle	1:8	1:4	1:2.67	1:2
Correct Factor	-9.03dB	-6.02dB	-4.26dB	-3.01dB



## 9. TEST RESULTS LIST

### Wrist-worn

Temperature: 21.0~23.8°C, humidity: 54~60%.						
Phantom Configurations		Device Test Mode	Device Test channel	SAR(W/Kg), Peak,10g	Scaling Factor	Scaled SAR (W/Kg),10g
0mm Separation	Wrist-worn	GSM850	251	1.054	1.01	1.065
		GPRS850	128	1.426	1.21	1.725
			190	1.572	1.17	1.839
			251	1.448	1.11	1.607
		GSM1900	512	0.535	1.05	0.562
		GPRS1900	512	0.795	1.12	0.890

### Hold to Face

Temperature: 21.0~23.8°C, humidity: 54~60%.						
Phantom Configurations		Device Test Mode	Device Test channel	SAR(W/Kg), Peak,1g	Scaling Factor	Scaled SAR (W/Kg),1g
10mm Separation	Hold to Face	GSM850	251	0.529	1.01	0.534
		GSM1900	512	0.262	1.05	0.275



Note:

1. GPRS test Scenario (Based on the Max. Time-based Average Power)

Band	Channel	Slots	Power level	Duty Cycle
GPRS850	128	4	5	1:2
GPRS1900	661	4	0	1:2

Note:

- 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 v06)
  - $\leq 0.8$  W/kg and transmission band  $\leq 100$  MHz
  - $\leq 0.6$  W/kg and,  $100$  MHz  $<$  transmission bandwidth  $\leq 200$  MHz
  - $\leq 0.4$  W/kg and transmission band  $> 200$  MHz
- SAR is not required for EDGE mode because its output power is less than that of GPRS mode.
- Scaling Factor calculation

Band	Tune-up power tolerance(dBm)	SAR test channel Power (dBm)	Scaling Factor
GSM 850	PCL = 5, PWR = $32.5 \pm 0.5$	32.95	1.01
GPRS 850	PCL = 5, PWR = $29 \pm 0.5$ (4 slots)	28.68	1.21
		28.83	1.17
		29.05	1.11
PCS 1900	PCL = 0, PWR = $30.5 \pm 0.5$	30.78	1.05
GPRS 1900	PCL=0, PWR= $26.5 \pm 0.5$ (4 slots)	26.51	1.12





## 10. REPEATED SAR MEASUREMENT

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

- 1) Repeated measurement is not required when the original highest measured SAR is  $< 0.80$  W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is  $\geq 0.80$  W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is  $> 1.20$  or when the original or repeated measurement is  $\geq 1.45$  W/kg ( $\sim 10\%$  from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .

**ANNEX A GRAPH TEST RESULTS**

<b><u>Configuration</u></b>	<b><u>PARAMETERS</u></b>
<b><u>Wrist-worn</u></b>	<u>Measurement 1:</u> Flat with Body device position on Middle Channel in GSM850 mode <u>Measurement 2:</u> Flat with Body device position on Middle Channel in GPRS850 mode <u>Measurement 3:</u> Flat with Body device position on Middle Channel in GPRS850 mode <u>Measurement 4:</u> Flat with Body device position on Middle Channel in GPRS850 mode <u>Measurement 5:</u> Flat with Body device position on Middle Channel in GSM1900mode <u>Measurement 6:</u> Flat with Body device position on Middle Channel in GPRS1900 mode
<b><u>Hold to Face</u></b>	<u>Measurement 7:</u> Flat with Body device position on Middle Channel in GSM850 mode <u>Measurement 8:</u> Flat with Body device position on Middle Channel in GSM1900 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: 2016.05.09

Measurement duration: 9 minutes 30 seconds

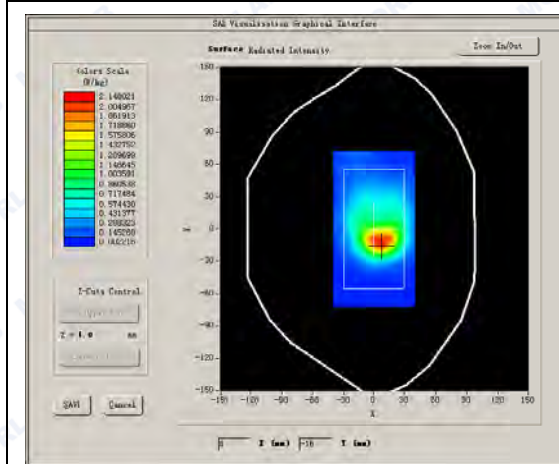
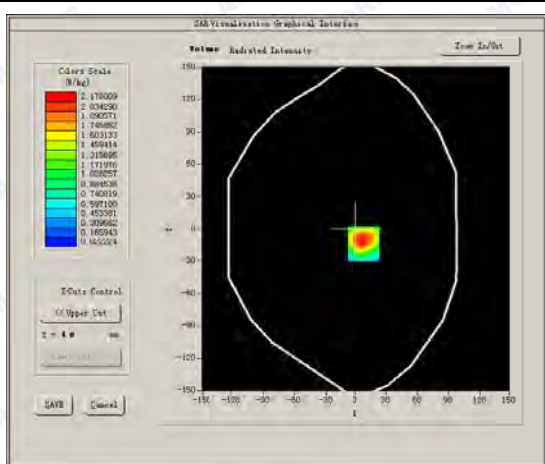
**A. Experimental conditions.**

Phantom File	surf_sam_plan.txt
Phantom	Flat
Device Position	Body
Band	GSM850
Channels	Middle
Signal	GSM

**B. SAR Measurement Results**

High Band SAR (Channel 251):

Frequency (MHz)	848.600000
Relative permittivity (real part)	55.932524
Conductivity (S/m)	0.932354
Power drift (%)	1.850000
Ambient Temperature:	22.8°C
Liquid Temperature:	22.7°C
ConvF:	5.93
Crest factor:	1:8

**SURFACE SAR****VOLUME SAR**





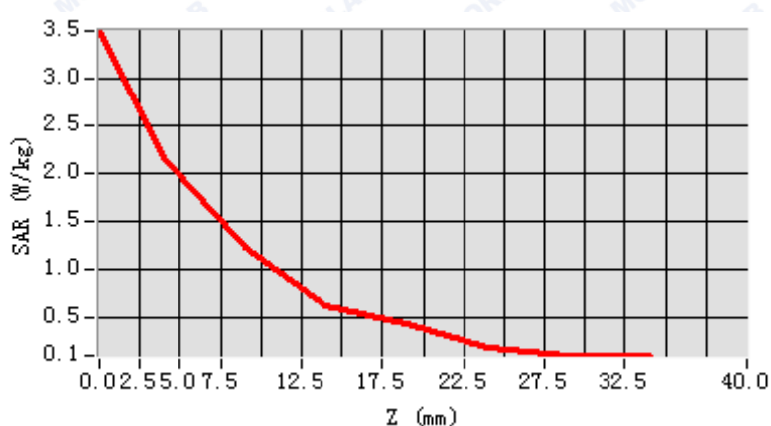
REPORT No. : SZ16020035S02

Maximum location: X=7.00, Y=-14.00

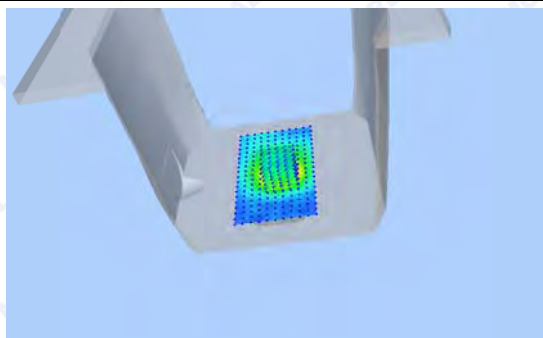
SAR Peak: 3.75 W/kg

SAR 10g (W/Kg)	1.085973
SAR 1g (W/Kg)	2.171421

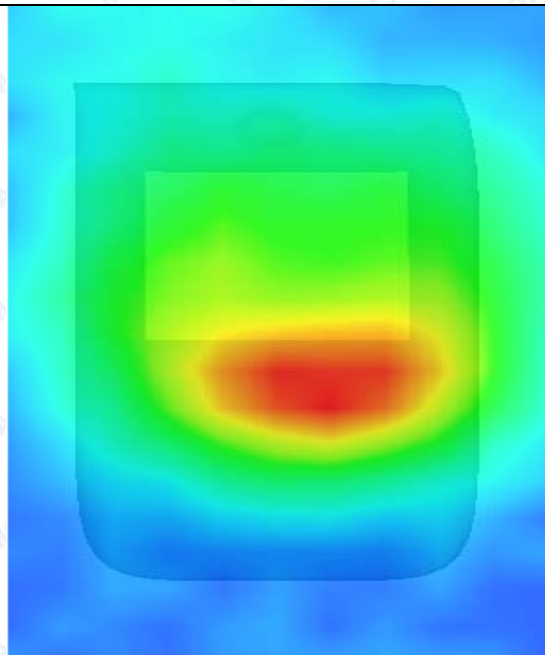
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	3.4949	2.1780	1.2283	0.6304	0.4367	0.1831	0.0992



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: 2016.05.09

Measurement duration: 9 minutes 30 seconds

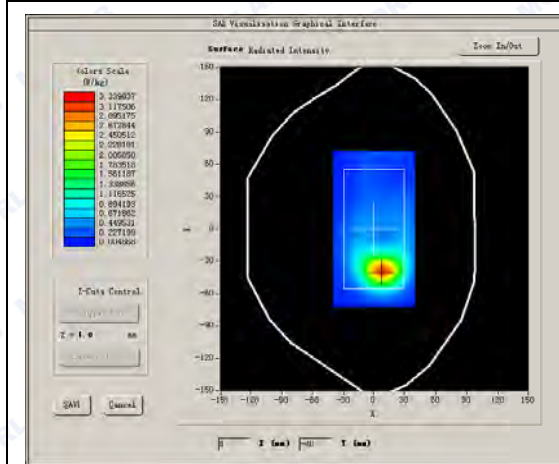
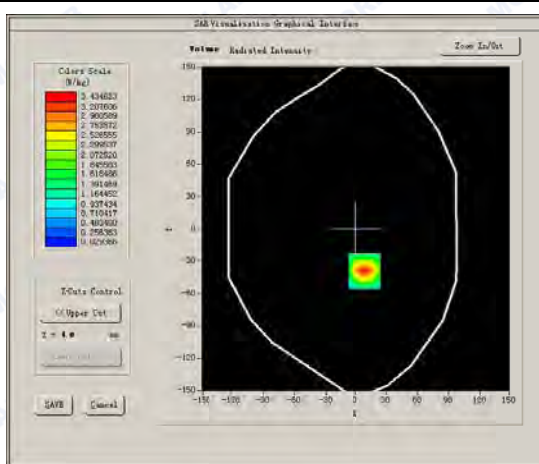
**A. Experimental conditions.**

Phantom File	surf_sam_plan.txt
Phantom	Flat
Device Position	Body
Band	GSM850
Channels	Middle
Signal	GPRS

**B. SAR Measurement Results**

Low Band SAR (Channel 128):

Frequency (MHz)	824.200000
Relative permittivity (real part)	55.932524
Conductivity (S/m)	0.932354
Power drift (%)	1.850000
Ambient Temperature:	22.8°C
Liquid Temperature:	22.7°C
ConvF:	5.93
Crest factor:	1:2

**SURFACE SAR****VOLUME SAR**



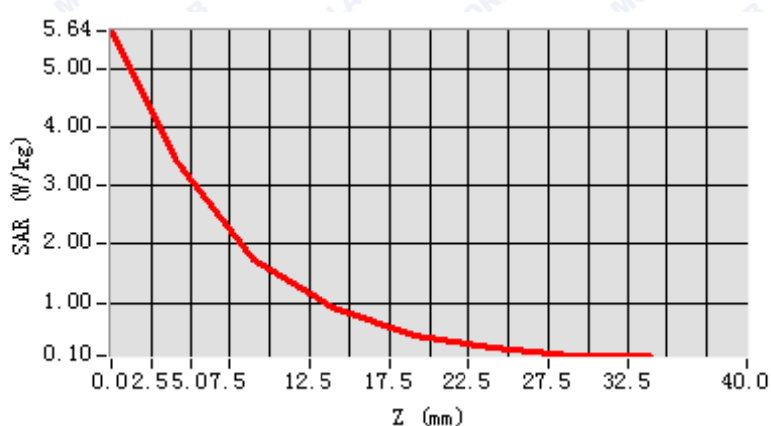
REPORT No. : SZ16020035S02

Maximum location: X=8.00, Y=-39.00

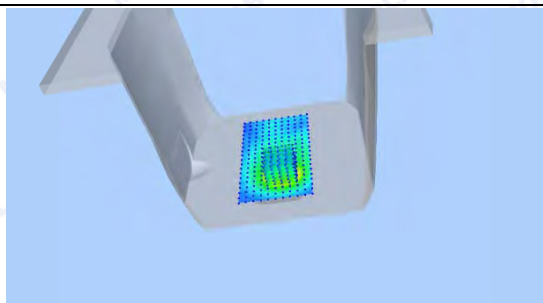
SAR Peak: 4.10 W/kg

SAR 10g (W/Kg)	1.426337
SAR 1g (W/Kg)	2.689822

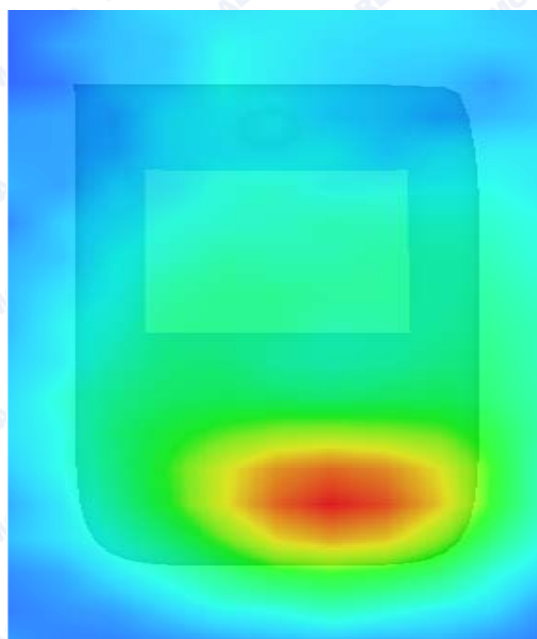
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	5.6373	3.4346	1.7456	0.9118	0.4303	0.2229	0.1171



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: 2016.05.09

Measurement duration: 9 minutes 33 seconds

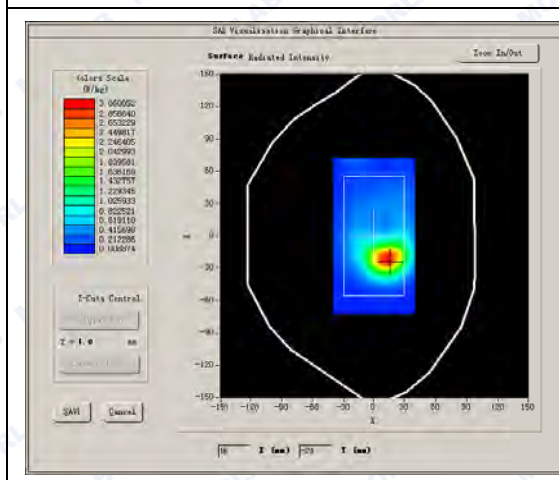
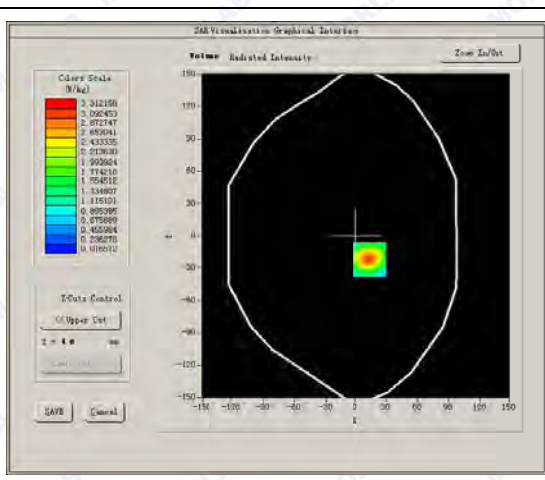
**A. Experimental conditions.**

Phantom File	surf_sam_plan.txt
Phantom	Flat
Device Position	Body
Band	GSM850
Channels	Middle
Signal	GPRS

**B. SAR Measurement Results**

Middle Band SAR (Channel 190):

Frequency (MHz)	836.600000
Relative permittivity (real part)	55.932524
Conductivity (S/m)	0.932354
Power drift (%)	-2.520000
Ambient Temperature:	22.8°C
Liquid Temperature:	22.7°C
ConvF:	5.93
Crest factor:	1:2

**SURFACE SAR****VOLUME SAR**



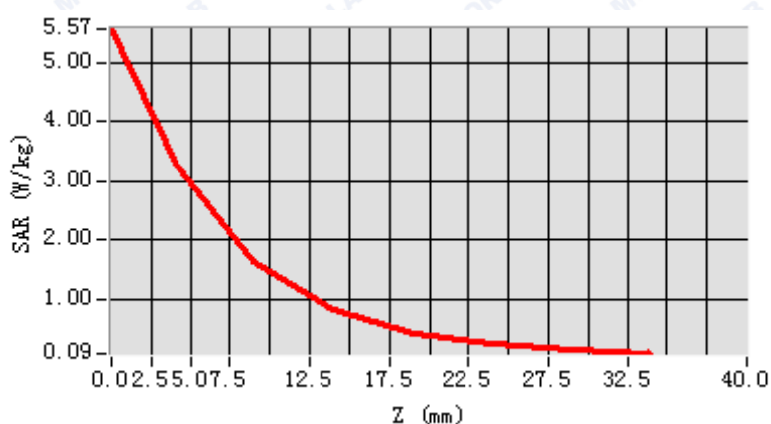
REPORT No. : SZ16020035S02

Maximum location: X=14.00, Y=-22.00

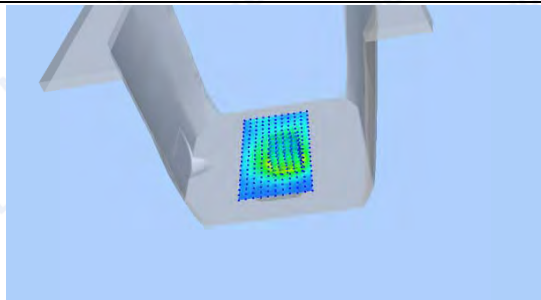
SAR Peak: 5.53 W/kg

SAR 10g (W/Kg)	1.572407
SAR 1g (W/Kg)	3.065527

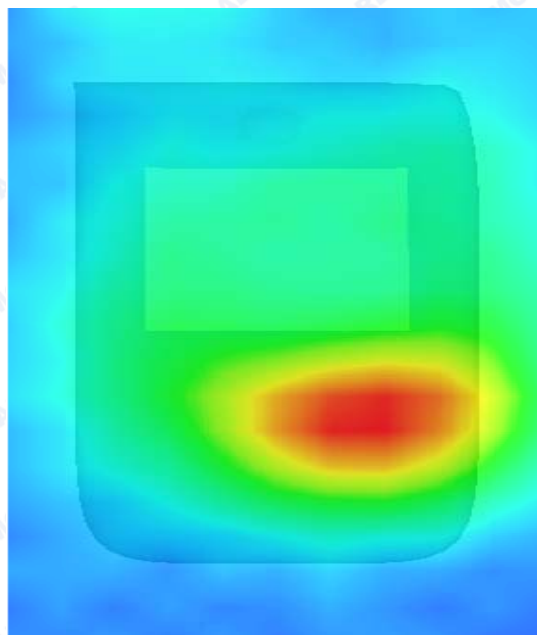
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	5.5687	3.3122	1.6367	0.8220	0.4208	0.2620	0.1509



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: 2016.05.09

Measurement duration: 9 minutes 33 seconds

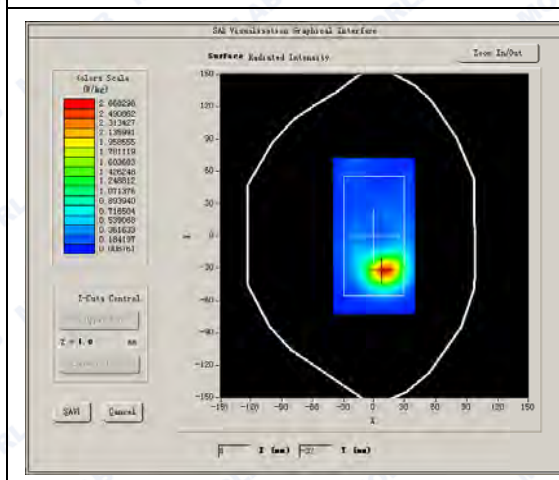
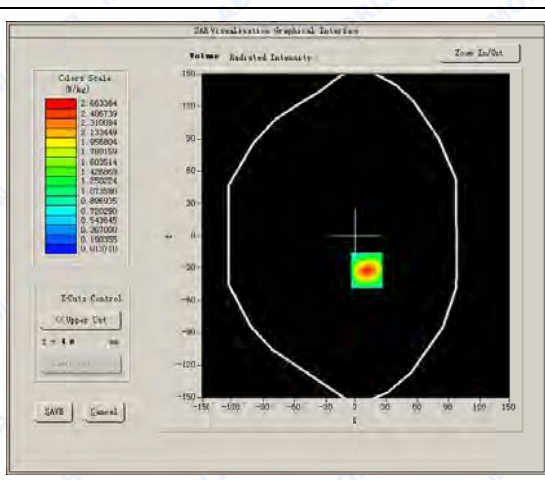
**A. Experimental conditions.**

Phantom File	surf_sam_plan.txt
Phantom	Flat
Device Position	Body
Band	GSM850
Channels	High
Signal	GPRS

**B. SAR Measurement Results**

High Band SAR (Channel 251):

Frequency (MHz)	848.800000
Relative permittivity (real part)	55.932524
Conductivity (S/m)	0.932354
Power drift (%)	1.020000
Ambient Temperature:	22.8°C
Liquid Temperature:	22.7°C
ConvF:	5.93
Crest factor:	1:2

**SURFACE SAR****VOLUME SAR**





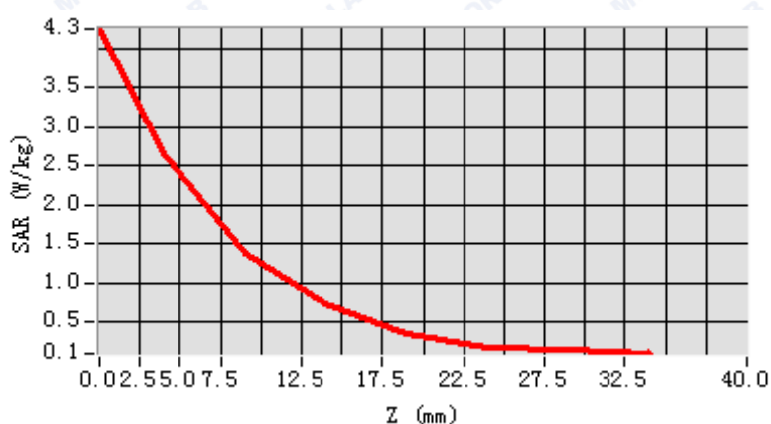
REPORT No. : SZ16020035S02

Maximum location: X=10.00, Y=-32.00

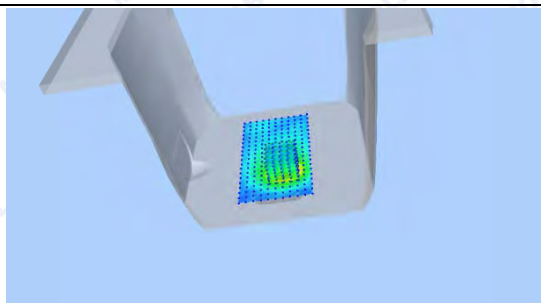
SAR Peak: 4.31 W/kg

SAR 10g (W/Kg)	1.447869
SAR 1g (W/Kg)	2.874889

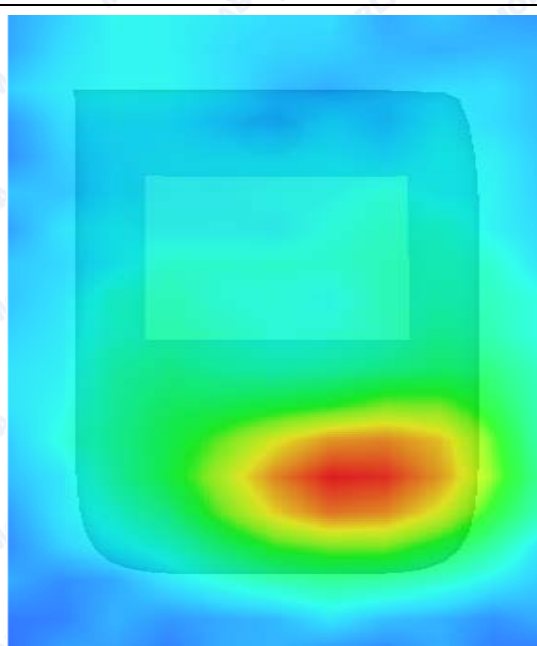
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	4.2591	2.6634	1.3727	0.7343	0.3364	0.1672	0.1270



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: 2016.05.09

Measurement duration: 9 minutes 30 seconds

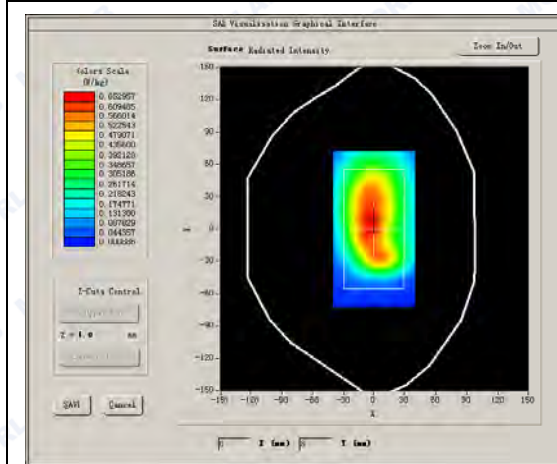
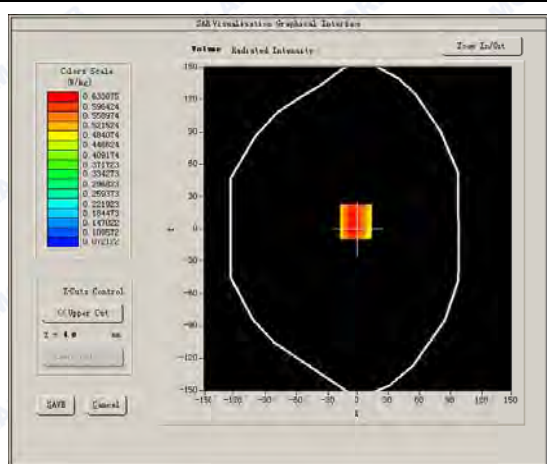
**A. Experimental conditions.**

Phantom File	surf_sam_plan.txt
Phantom	Flat
Device Position	Body
Band	GSM1900
Channels	Low
Signal	GSM

**B. SAR Measurement Results**

Low Band SAR (Channel 512):

Frequency (MHz)	1850.200000
Relative permittivity (real part)	53.302487
Conductivity (S/m)	1.497354
Power drift (%)	0.860000
Ambient Temperature:	22.2°C
Liquid Temperature:	22.6°C
ConvF:	5.53
Crest factor:	1:8

**SURFACE SAR****VOLUME SAR**



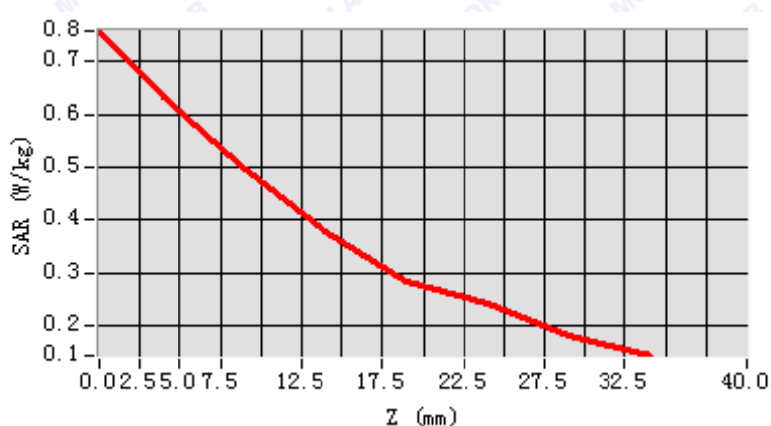
REPORT No. : SZ16020035S02

Maximum location: X=-2.00, Y=7.00

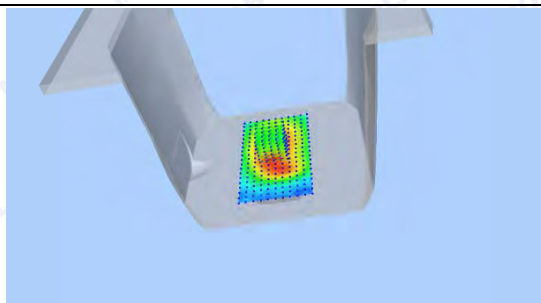
SAR Peak: 0.82 W/kg

SAR 10g (W/Kg)	0.535195
SAR 1g (W/Kg)	0.621386

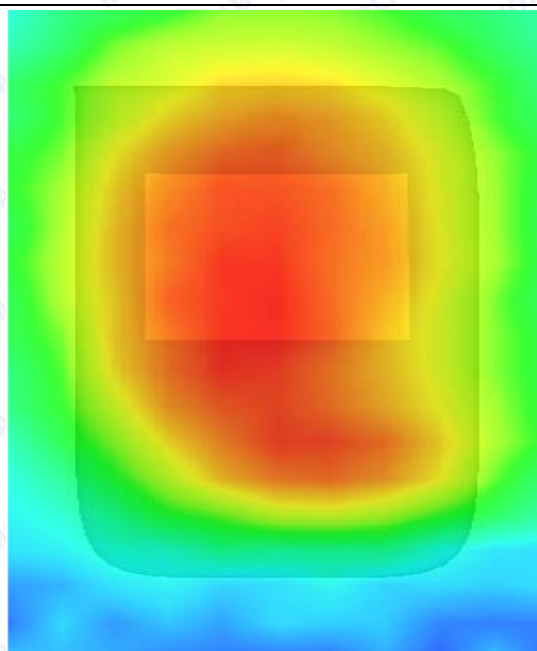
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.7576	0.6339	0.4956	0.3779	0.2844	0.2433	0.1824



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: 2016.05.09

Measurement duration: 9 minutes 29 seconds

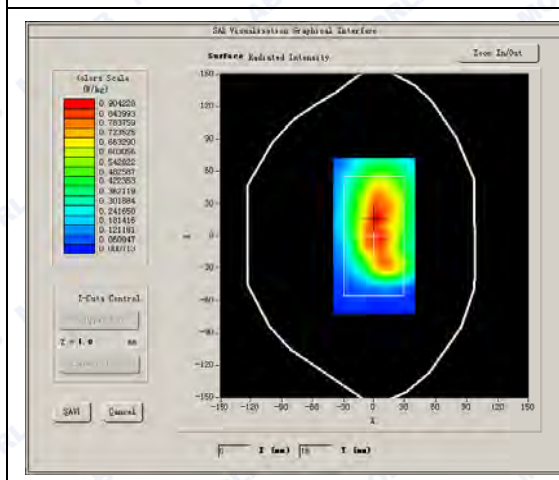
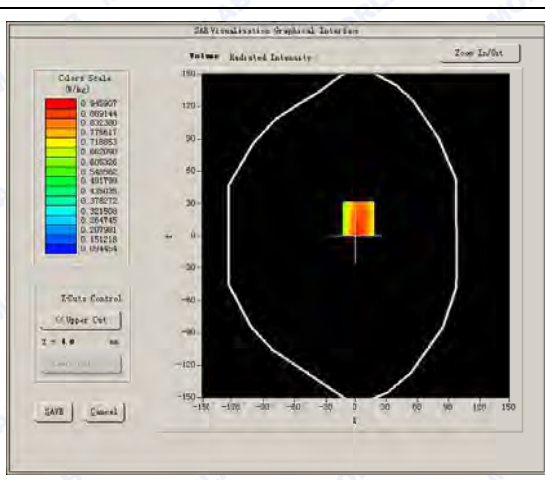
**A. Experimental conditions.**

Phantom File	surf_sam_plan.txt
Phantom	Flat
Device Position	Body
Band	GSM1900
Channels	Low
Signal	GPRS

**B. SAR Measurement Results**

Low Band SAR (Channel 512):

Frequency (MHz)	1850.200000
Relative permittivity (real part)	53.302487
Conductivity (S/m)	1.497354
Power drift (%)	-0.470000
Ambient Temperature:	22.2°C
Liquid Temperature:	22.6°C
ConvF:	5.53
Crest factor:	1:8

**SURFACE SAR****VOLUME SAR**



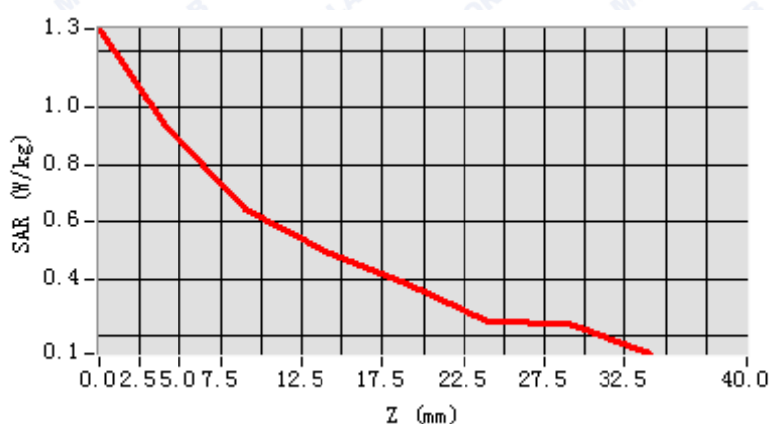
REPORT No. : SZ16020035S02

Maximum location: X=2.00, Y=16.00

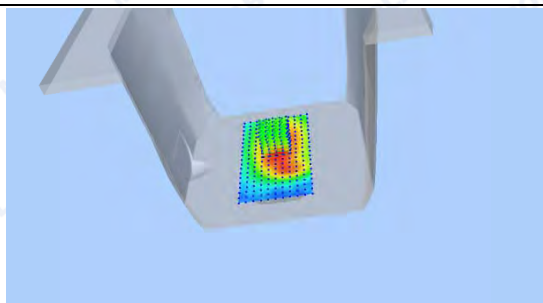
SAR Peak: 1.42 W/kg

SAR 10g (W/Kg)	0.794661
SAR 1g (W/Kg)	0.893214

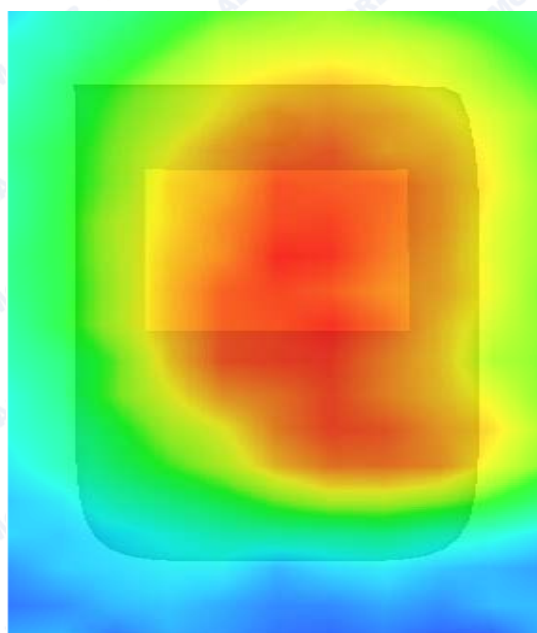
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.2744	0.9459	0.6431	0.4962	0.3842	0.2527	0.2459



3D screen 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: 2016.05.09

Measurement duration: 9 minutes 30 seconds

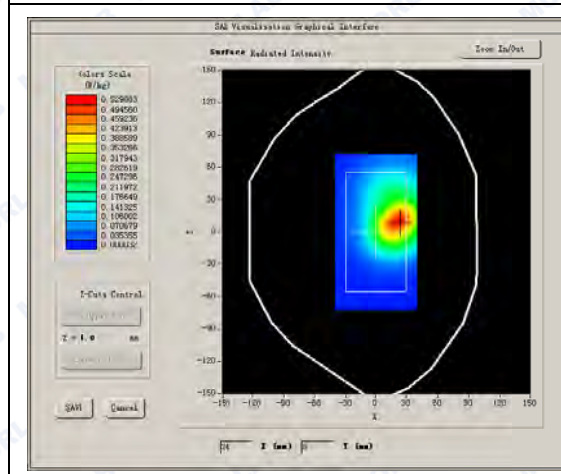
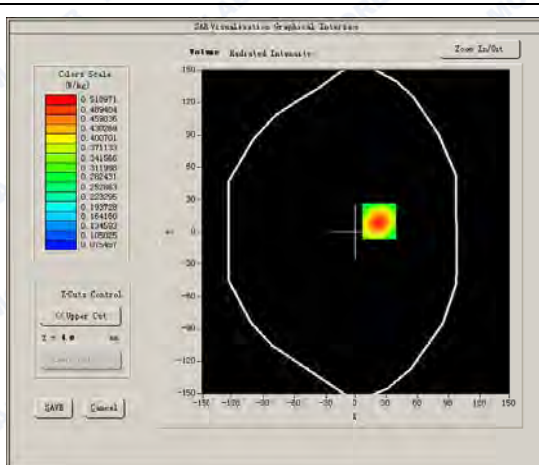
**A. Experimental conditions.**

Phantom File	surf_sam_plan.txt
Phantom	Flat
Device Position	Body
Band	GSM850
Channels	Middle
Signal	GSM

**B. SAR Measurement Results**

High Band SAR (Channel 251):

Frequency (MHz)	848.600000
Relative permittivity (real part)	41.365418
Conductivity (S/m)	0.907541
Power drift (%)	0.850000
Ambient Temperature:	22.8°C
Liquid Temperature:	22.7°C
ConvF:	5.74
Crest factor:	1:8

**SURFACE SAR****VOLUME SAR**





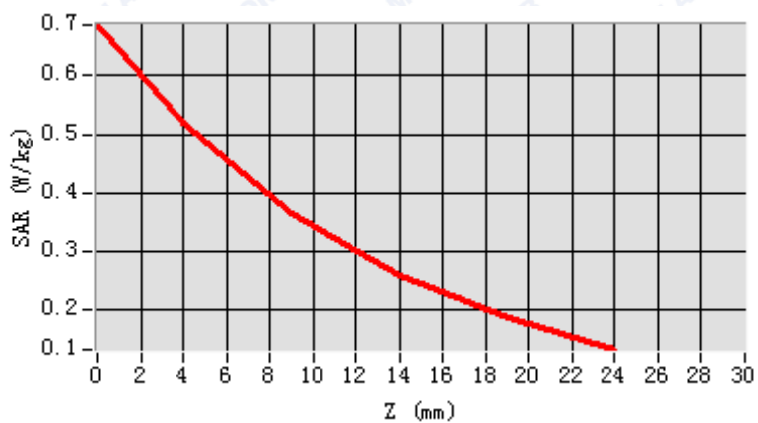
REPORT No. : SZ16020035S02

Maximum location: X=23.00, Y=10.00

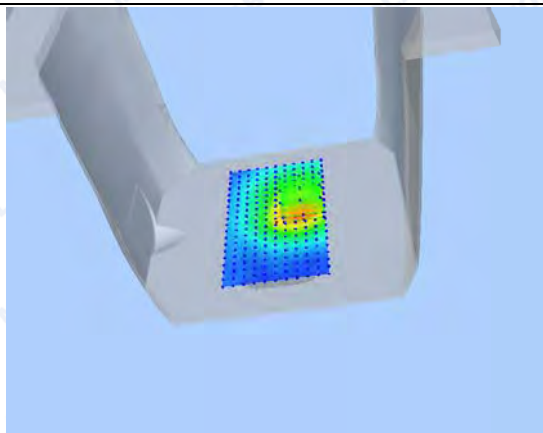
SAR Peak: 0.74 W/kg

SAR 10g (W/Kg)	0.343523
SAR 1g (W/Kg)	0.528539

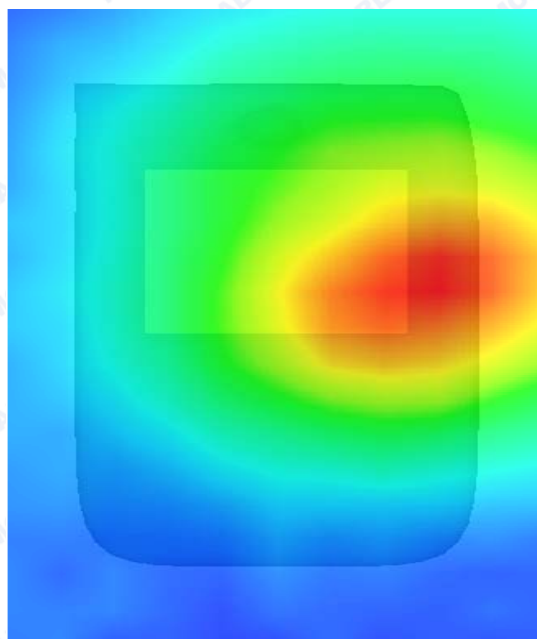
**Z axis scan**



**3D screen 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: 2016.05.09

Measurement duration: 9 minutes 29 seconds

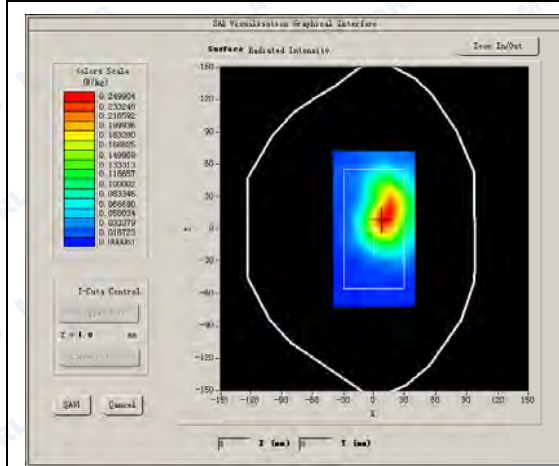
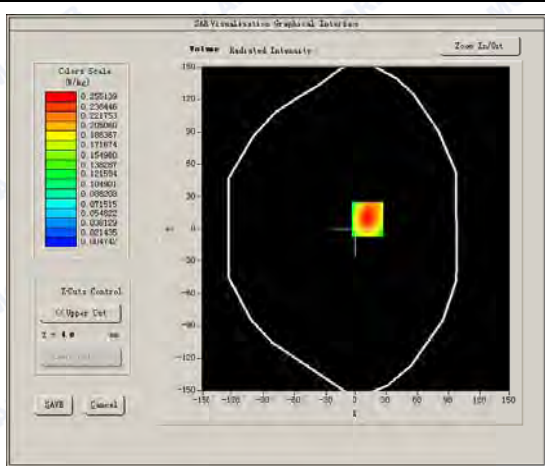
**A. Experimental conditions.**

Phantom File	surf_sam_plan.txt
Phantom	Flat
Device Position	Body
Band	GSM1900
Channels	Low
Signal	GSM

**B. SAR Measurement Results**

Low Band SAR (Channel 512):

Frequency (MHz)	1850.200000
Relative permittivity (real part)	39.852047
Conductivity (S/m)	1.428541
Power drift (%)	1.200000
Ambient Temperature:	22.2°C
Liquid Temperature:	22.6°C
ConvF:	5.32
Crest factor:	1:8

**SURFACE SAR****VOLUME SAR**



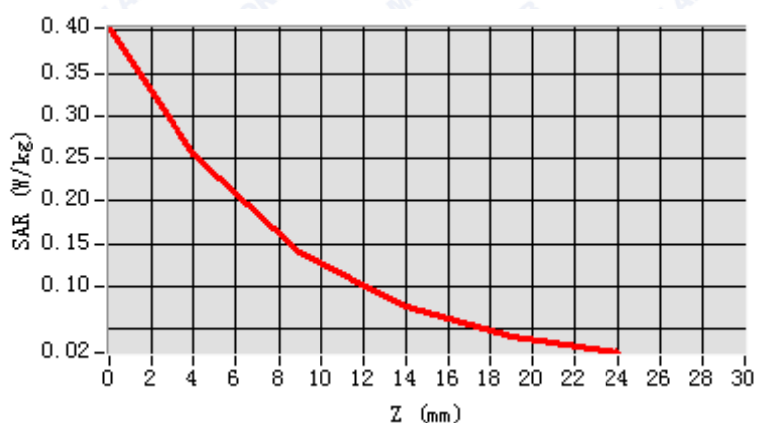
REPORT No. : SZ16020035S02

Maximum location: X=11.00, Y=9.00

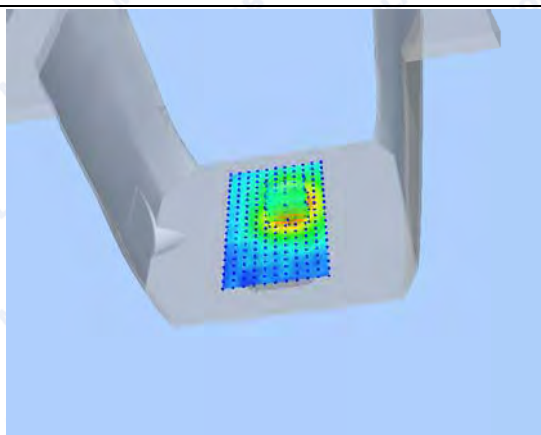
SAR Peak: 0.44 W/kg

SAR 10g (W/Kg)	0.143582
SAR 1g (W/Kg)	0.262334

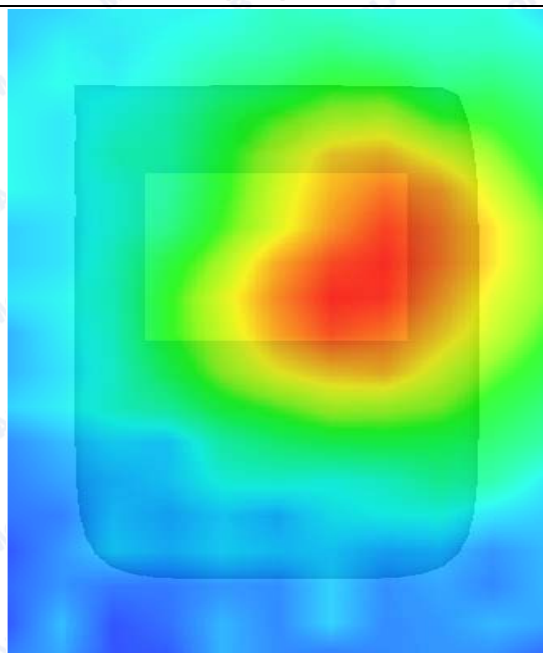
**Z axis scan**



**3D screen 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



REPORT No. : SZ16020035S02

**3. 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	Agilent(8960, SN:10752)	2015-6-17	1year
3	Voltmeter	Keithley (2000, SN:1000572)	2015-8-24	1year
4	Synthetizer	Rohde&Schwarz (SML_03, SN:101868)	2015-8-24	1year
5	Amplifier	Nucl udes (ALB216, SN:10800)	2015-8-24	1year
6	Power Meter	Rohde&Schwarz (NRVD, SN:101066)	2015-8-24	1year
7	Probe	Satimo (SN:SN 37/08 EP80)	2015-8-17	1year
8	Phantom	Satimo (SN:SN_36_08_SAM62)	N/A	N/A
9	Liquid	Satimo (Last Calibration:2016-05-09)	N/A	N/A
10	Dipole 835MHz	Satimo (SN 20/08 DIPC 99)	2015-6-20	1year
11	Dipole 1900MHz	Satimo (SN 30/13 DIP1G900-261)	2015-6-20	1year

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