FCC SAR TEST REPORT

TESTING
CNAS L3572

Issued to

Qixiang Electron Science & Technology Co., Ltd. Quanzhou

For

TWO WAY RADIO

Model Name	:	518UV,3208UV,298UV,938UV,318UV 518UVII,3208UVII
Trade Name	:	N/A
Brand Name	:	AnyTone
FCC ID	:	T4K3208UV
Standard	:	47CFR 2.1093 IEEE 1528-2013
MAX SAR	:	Head: 2.366W/kg(50% duty cycle) Body: 3.990W/kg(50% duty cycle)
Test date	:	2014-7- 8
Issue date	:	2014-7-24

by

Shenzhen Morlab Communications Technology Co., Ltd.

FL.3, Building A, FeiYang Science Park, No.8 LongChang Road,Block 67, BaoAn District,
ShenZhen, GuangDong Province,P. R. China 518101

Tested by	Zou Jian	***Approved by***	Zeng Dexin	***Reviewed by***	Peng Huarui
	Zou Jian		Zeng Dexin		Peng Huarui
	(Test Engineer)		(Chief Engineer)		(SAR Manager)
Date	2014.7.24	***Date***	2014.7.24	***Date***	2014.7.24

DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	July 24, 2014	First edition

1. TESTING LABORATORY

1.1 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

1.2 Accreditation Certificate

Accredited Testing Laboratory: No. CNAS L3572

1.3 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	Aglient (8960, SN:10752)	2014-2-21	1year
3	Network Analyzer	Agilent(E5071B ,SN:MY42404762)	2013-9-26	1year
4	Voltmeter	Keithley (2000, SN:1000572)	2013-9-24	1year
5	Signal Generator	Rohde&Schwarz (SMP_02)	2013-9-24	1year
6	Power Amplifier	PRANA (Ap32 SV125AZ)	2013-9-24	1year
7	Power Meter	Agilent (E4416A, SN:MY45102093)	2014-2-26	1year
8	Power Sensor	Agilent (N8482A, SN:MY41091706)	2014-2-26	1year
9	Directional coupler	Giga-tronics(SN:1829112)	2013-9-24	1year
10	Probe	Satimo (SN:SN 37/08 EP80)	2013-9-25	1year
11	Dielectric Probe Kit	Agilent (85033E)	2013-9-24	1year
12	Phantom	Satimo (SN:SN_36_08_SAM62)	2013-9-24	1year
13	Liquid	Satimo(Last Calibration: 2014-7-8)	N/A	N/A
14	Dipole 450MHz	Satimo (SN 36/08 DIPB98)	2013-9-25	1year

2. TECHNICAL INFORMATION

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

2.1 Identification of Applicant

Company Name:	Qixiang Electron Science & Technology Co., Ltd.
Address:	Qixiang Building,Tangxi Industrial Zone, Luojiang District, Quanzhou, Fujian, China

2.2 Identification of Manufacturer

Company Name:	Qixiang Electron Science & Technology Co., Ltd.
Address:	Qixiang Building,Tangxi Industrial Zone, Luojiang District, Quanzhou, Fujian, China

2.3 Equipment Under Test (EUT)

Model Name:	518UV,3208UV,298UV,938UV,318UV 518UVII,3208UVII
Trade Name:	N/A
Brand Name:	AnyTone
Hardware Version:	N/A
Software Version:	N/A
Frequency Bands:	TX: 400.000-406.000MHz ;406.100-480.000MHz
Modulation Type:	FM
Rated Power:	UHF: 4W/1W
Channel Spacing:	12.5KHz
Antenna type:	External Antenna
Development Stage:	Identical prototype
Battery Model:	QB-38L
Battery specification:	1200mAh7.4V
Exposure Category::	Occupational/Controlled Exposure

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#	N/A	N/A

2.4 Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	**47 CFR§2.1093**	Radiofrequency Radiation Exposure Evaluation: Portable Devices
2	**IEEE 1528-2013**	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.
3	**KDB 447498 D01v05r02**	General RF Exposure Guidance
4	**KDB 643646 D01v01r01**	SAR Test for PTT Radios
5	**KDB 865664 D01v01r03**	SAR Measurement 100 MHz to 6 GHz
6	**KDB 865664 D02v01r01**	SAR Reporting

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 Occupational/Controlled Exposure should be applied for this device, it is 8.0 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:	400.025MHz/440.025MHz/479.975MHz
Operation mode:	Transmitting
Power Level:	Maximum transmitting power

During SAR test, the EUT was transmitting at maximum transmitting mode.
This EUT supports 400.00MHz-480.000MHz band. For 400.000MHz-480.000MHz, the SAR test was located on 400.025MHz, 440.025MHz and 479.975MHz. 12.5KHz bandwidth mode are performed.

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 Middle 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:

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

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

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

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

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

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

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

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

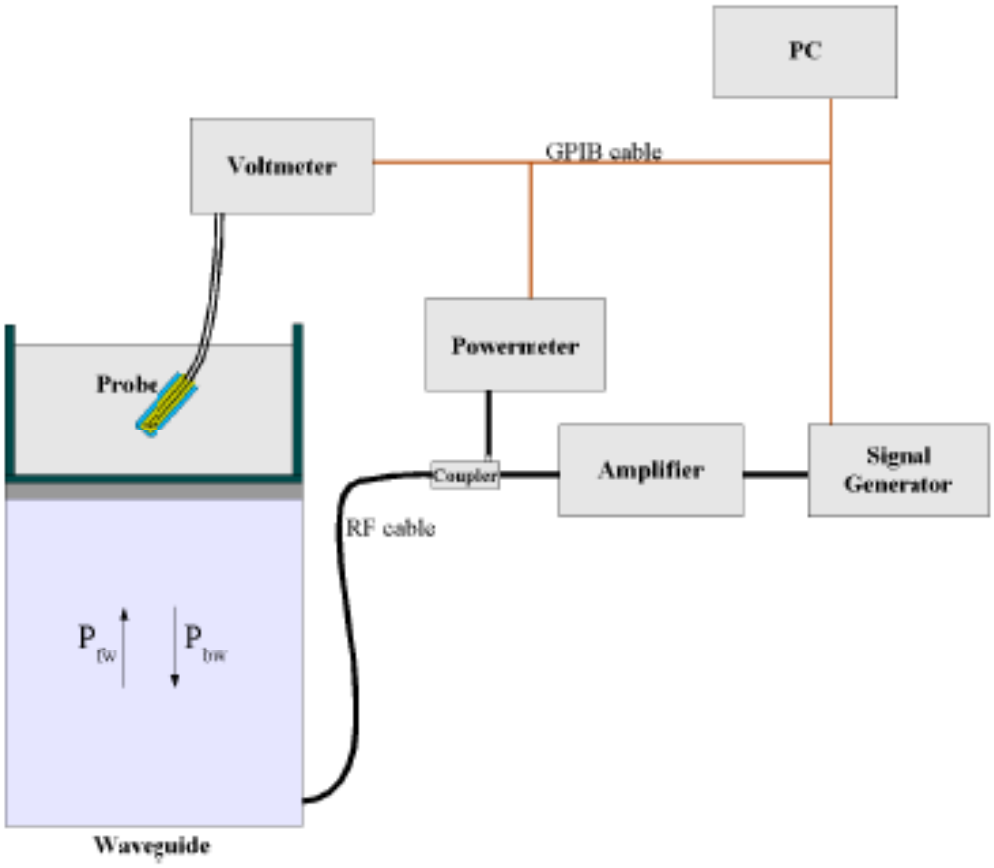
For the measurements the Specific Dosimetric E-Field Probe SN 37/08 EP80 with Following specifications is used

- 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: 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 annex 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:

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

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

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

Where DCP is the diode compression point in mV.

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 a 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.

4.3.3 Temperature Assessment Procedure

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

Where:

δt = exposure time (30 seconds),

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

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

δT = temperature increase due to RF exposure.

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

Where:

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

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 Middle than 1°.

Device holder

System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

5. 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)	450.00	
Tissue Type	Head	Body
Ingredients (% by weight)		
Deionised Water	38.56	51.16
Salt(NaCl)	3.95	1.49
Sugar	56.32	46.78
Tween 20	0.0	0.0
HEC	0.98	0.52
Bactericide	0.19	0.05
Triton X-100	0.0	0.0
DGBE	0.0	0.0
Diethylenglycol monohexylether	0.0	0.0
Measured dielectric parameters		
Dielectric Constant	43.42	58.0
Conductivity (S/m)	0.85	0.83

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

Table 1: Dielectric Performance of Tissue Simulating Liquid

Temperature: 22.0~23.8°C, humidity: 54~60%.						
Date	**Freq.(MHz)**	**Liquid Parameters**	**Meas.**	**Target**	**Delta(%)**	**Limit±(%)**
2014/7/8	Head 450	Relative Permittivity(εr):	43.19	43.42	-0.53	5
		Conductivity(σ):	0.83	0.85	-2.35	5
	Body 450	Relative Permittivity(εr):	58.10	58.0	0.17	5
		Conductivity(σ):	0.84	0.83	1.20	5

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 EUT SAR TEST

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/ e	k
Uncertainty Component	Sec.	Tol (+-%)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	4.76	N	1	1	1	4.76	4.7	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	0.7	0.7	1.01	1.0	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	0.7	0.7	1.62	1.6	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.8	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.0	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.1	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Test sample Related									
Test sample positioning	E.4.2.1	0.03	N	1	1	1	0.03	0.03	N-1
Device Holder Uncertainty	E.4.1.1	5.00	N	1	1	1	5.00	5.00	N-1
Output power Power drift -	6.6.2	4.04	R	$\sqrt{3}$	1	1	2.33	2.3	∞

SAR drift measurement								3	
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

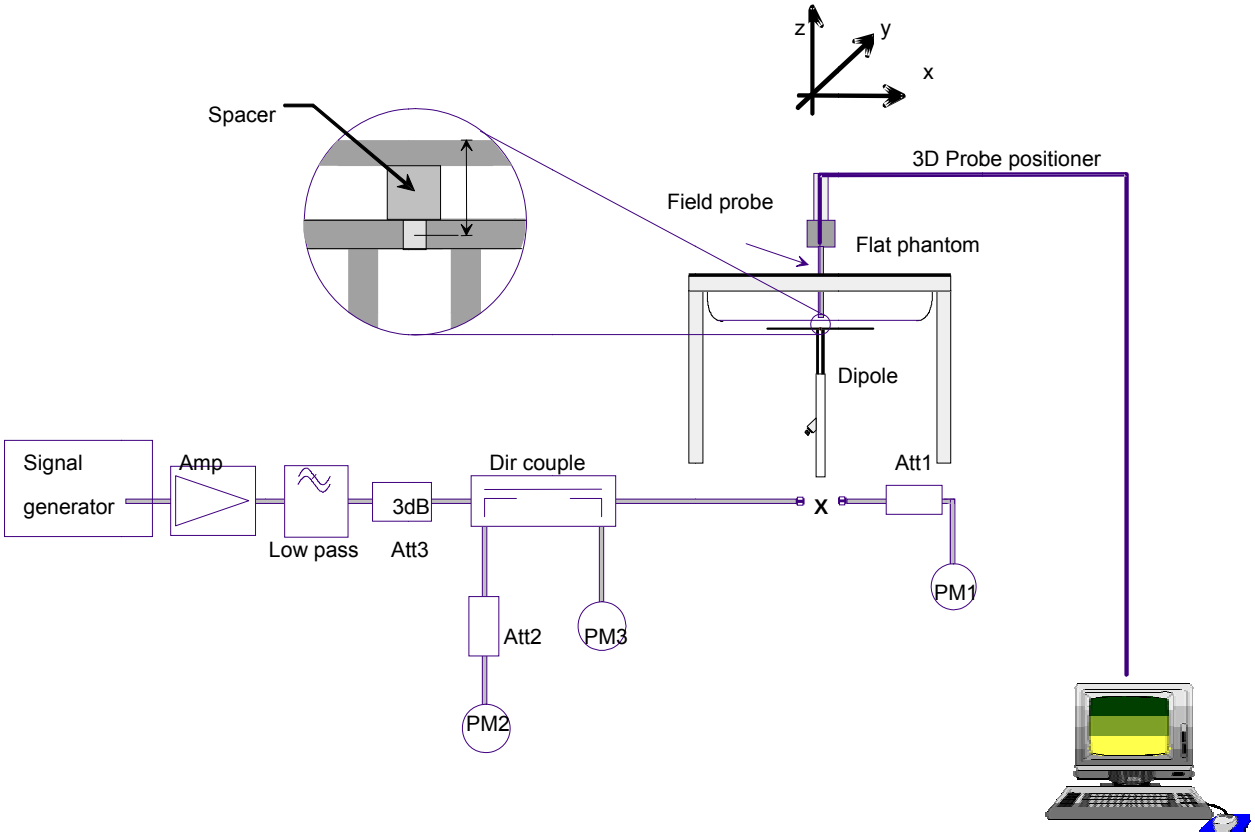
a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	Sec.	Tol (+-%)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	4.76	N	1	1	1	4.76	4.7	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	0.7	0.7	1.01	1.0	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	0.7	0.7	1.62	1.6	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.8	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.0	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.1	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞

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

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. 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.

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	450MHz(H)	450MHz(B)
Target value (1g)	4.62 W/kg	4.74 W/kg
Test value (1g 250 mW input)	1.037 W/kg (July 8)	1.086 W/kg (July 8)
Normalized value (1g)	4.148 W/kg	4.344 W/kg

Note: System checks the specific test data please see page 36~39.

8. OPERATIONAL CONDITIONS DURING TEST

8.1 Information on the testing

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

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

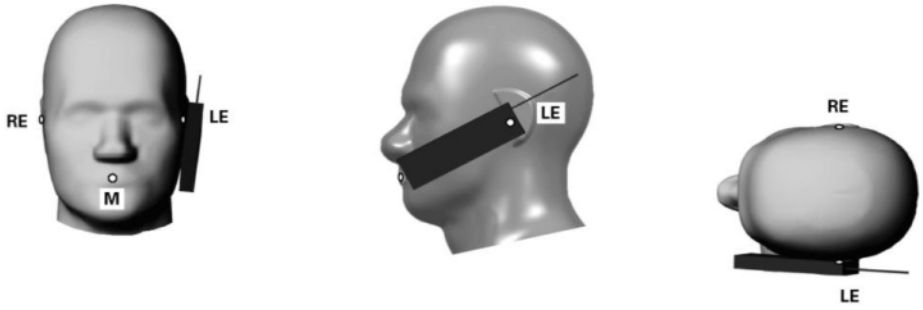


Illustration for Cheek Position

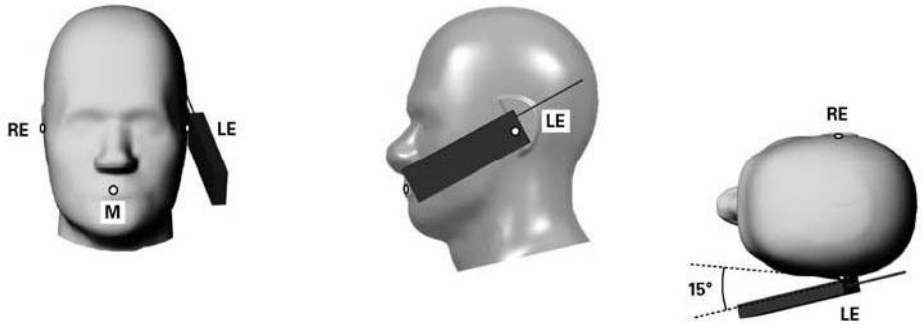


Illustration for Tilted Position

Description of the “cheek” position:

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

Description of the “tilted” position:

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

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

8.2 Body-worn Configurations

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

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

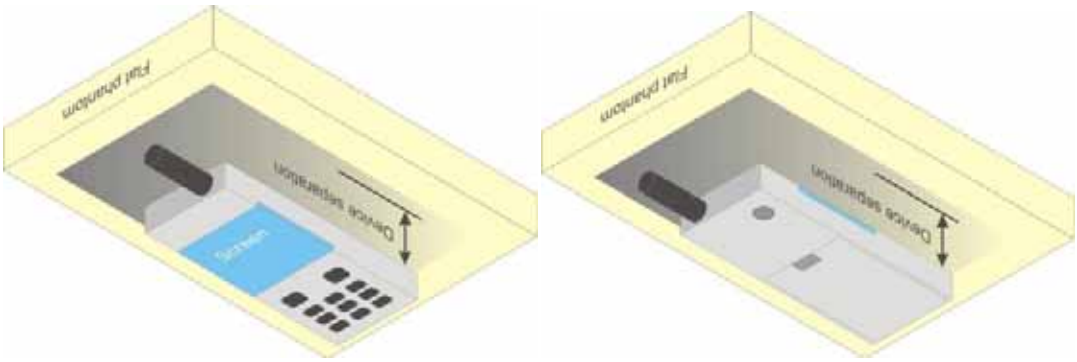


Illustration for Body Worn Position

8.3 Measurement procedure

The Following steps are used for each test position

1. Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface.
2. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
3. Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to16 mm and a constant distance to the inner surface of the phantom. Since the sensors 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.
4. Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or 8 * 5 or 8*4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

8.4 Description of interpolation/extrapolation scheme

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

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

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

9. MEASUREMENT OF CONDUCTED PEAK OUTPUT POWER

1. Conducted output power

Mode	Frequency (MHz)	Channel Spacing	Highest output power(dBm)
			4W
UHF	400.025	12.5KHz	36.80
	440.025		36.75
	479.975		36.88

10. TEST RESULTS LIST

Summary of Measurement Results (Channel Spacing: 12.5 KHz)

Temperature: 21.0~23.8°C, humidity: 54~60%.						
Phantom Configurations	Frequency	Antenna Positions	1g SAR Value(W/Kg), Limit: 8.0W/Kg			
			Measure SAR	Scaling Factor	Scaled SAR	50% duty cycle SAR
Face toward Flat phantom-12.5KHz bandwidth (Held to face)						
Body (2.5 cm Separation)	440.025MHz	External	4.469	1.059	4.733	2.366
Back with belt clip toward Flat phantom- 12.5KHz bandwidth (Body-worn)						
Body (direct)	400.025MHz	External	8.797	1.047	9.210	4.605
	440.025MHz	External	7.536	1.059	7.981	3.990
	479.975MHz	External	7.675	1.028	7.879	3.945

Note:

Scaling Factor calculation

Mode	Rate Power	Channel Spacing	Tune-up power tolerance (dBm)	SAR test channel Power (dBm)	Scaling Factor
UHF	4W	12.5KHz	Max output power =36.5+-0.5	36.80	1.047
				36.75	1.059
				36.88	1.028

1. According to KDB643646 D01 v01r01, when the 1-g SAR tested using the default batter and default accessories is ≤ 3.5W/Kg (corrected by Multiplying 50% for FM mode),testing for other channels are optional.
2. For a analog PTT, only simplex communication technology was supported, so the SAR value need to be corrected by Multiplying 50%.
3. According to 47 CFR Part 90 Frequencies, 400.025MHz is not for FCC Review.

ANNEX A PHOTOGRAPHS OF THE EUT

1. Hold to face condition

2. Body-worn condition

Liquid Level Photo Body Liquid

Liquid depth :15.5cm

ANNEX B GRAPH TEST RESULTS

BAND	PARAMETERS
12.5KHz Bandwidth	Measurement 1:Hold to Face toward Flat phantom on Middle Channel Measurement 2: Back with belt clip toward Flat phantom on Low Channel Measurement 3: Back with belt clip toward Flat phantom on Middle Channel Measurement 4: Back with belt clip toward Flat phantom on High Channel

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: 2014.7.8

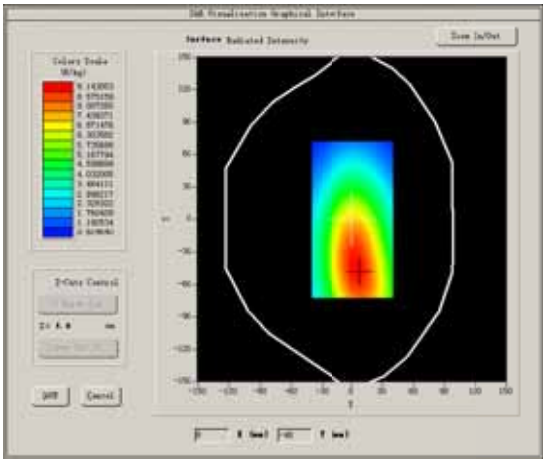
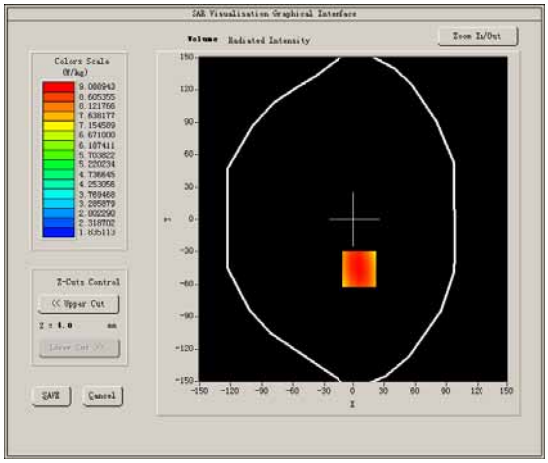
Measurement duration: 9 minutes 34 seconds

A. Experimental conditions.

Phantom File	sam_direct_droit2_surf8mm.txt
Phantom	Validation plane
Device Position	Flat phantom
Band	440.025MHz
Channels	Middle
Signal	FM

B. SAR Measurement Results

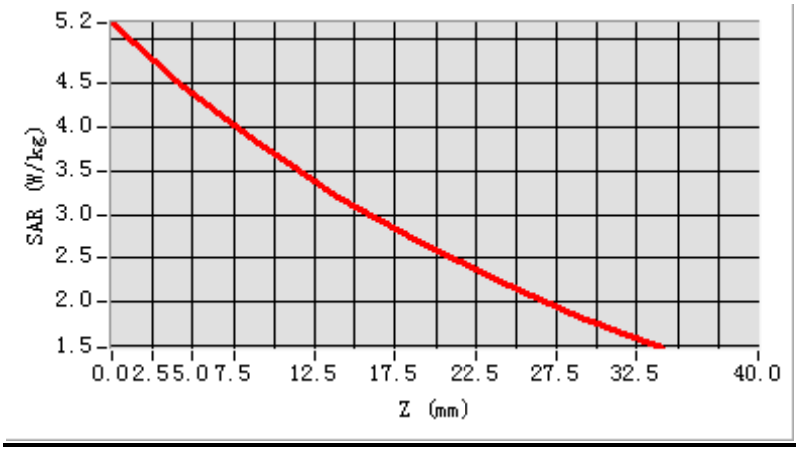
Frequency (MHz)	440.025000
Relative permittivity (real part)	43.193725
Conductivity (S/m)	0.834296
Power drift (%)	-3.950000
Ambient Temperature:	22.3°C
Liquid Temperature:	22.6°C
ConvF:	8.24
Crest factor:	1:1

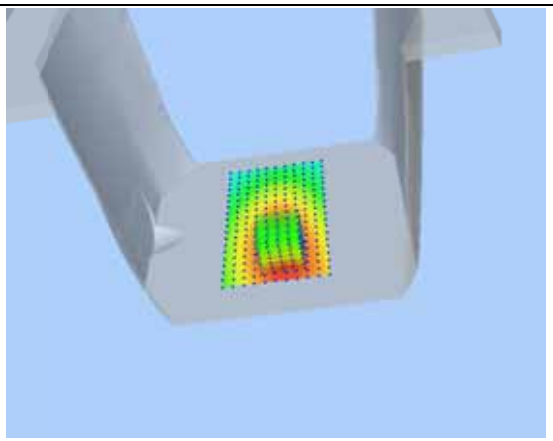
SURFACE SAR	VOLUME SAR
	

Maximum location: X=6.00, Y=-46.00
SAR Peak: 5.32 W/kg

SAR 10g (W/Kg)	3.557854
SAR 1g (W/Kg)	4.469473

Z axis scan



3D screen shot	Hot spot position
	

MEASUREMENT 2

Type: Phone measurement (Complete)

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

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

Date of measurement: 2014.7.8

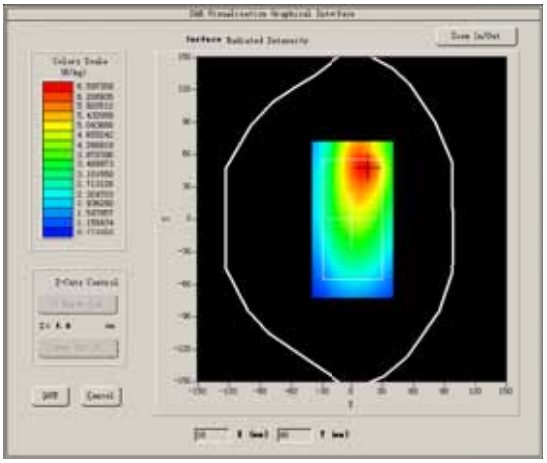
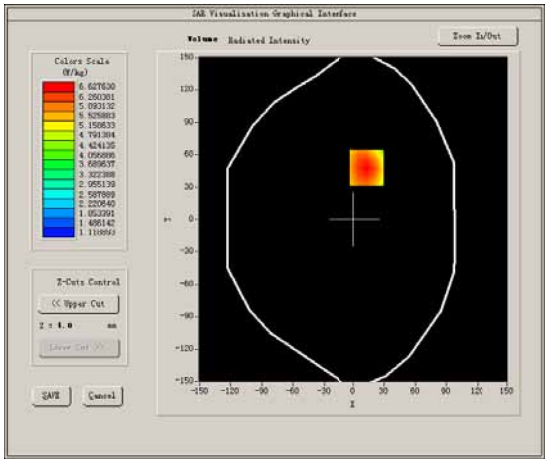
Measurement duration: 9 minutes 28 seconds

A. Experimental conditions.

Phantom File	sam_direct_droit2_surf8mm.txt
Phantom	Validation plane
Device Position	Flat phantom
Band	400.025MHz
Channels	Low
Signal	FM

B. SAR Measurement Results

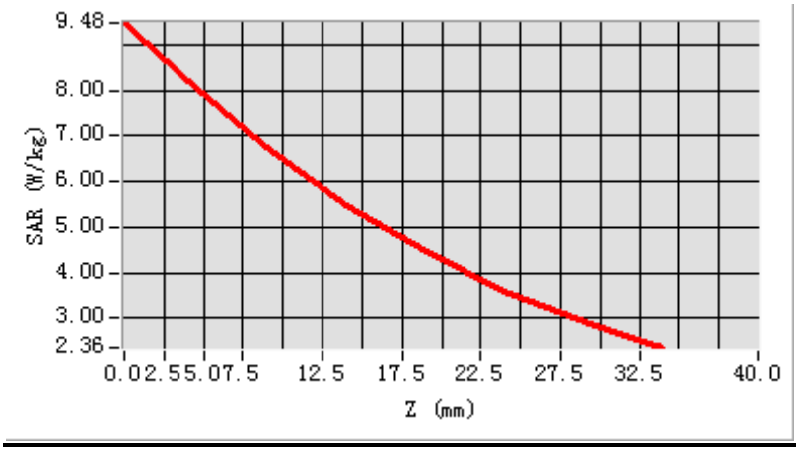
Frequency (MHz)	400.025000
Relative permittivity (real part)	58.097261
Conductivity (S/m)	0.843652
Power drift (%)	-2.760000
Ambient Temperature:	22.3°C
Liquid Temperature:	22.6°C
ConvF:	8.48
Crest factor:	1:1

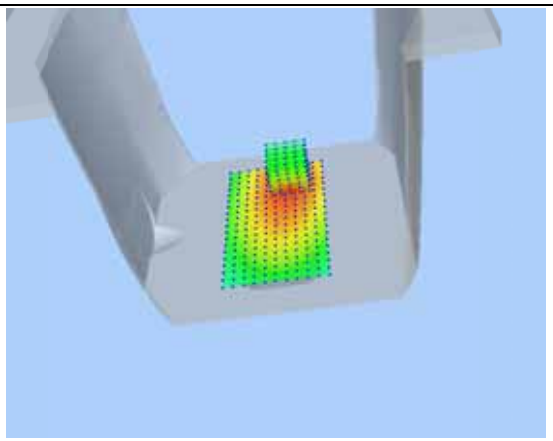
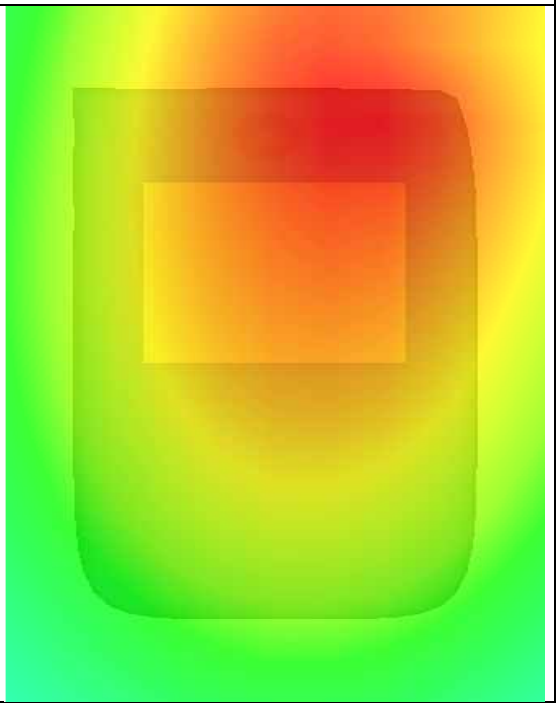
SURFACE SAR	VOLUME SAR
	

Maximum location: X=13.00, Y=48.00
SAR Peak: 13.04 W/kg

SAR 10g (W/Kg)	6.307586
SAR 1g (W/Kg)	8.796658

Z axis scan



3D screen shot	Hot spot position
	

MEASUREMENT 3

Type: Phone measurement (Complete)

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

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

Date of measurement: 2014.7.8

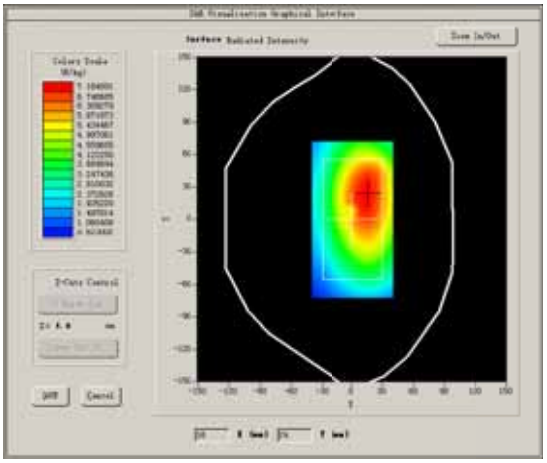
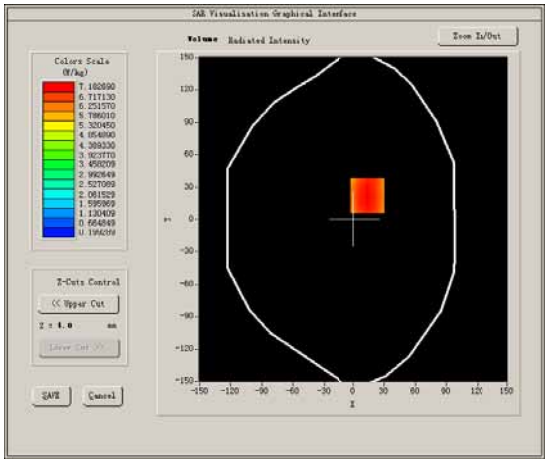
Measurement duration: 9 minutes 39 seconds

A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	Flat phantom
Band	440.025MHz
Channels	Middle
Signal	FM

B. SAR Measurement Results

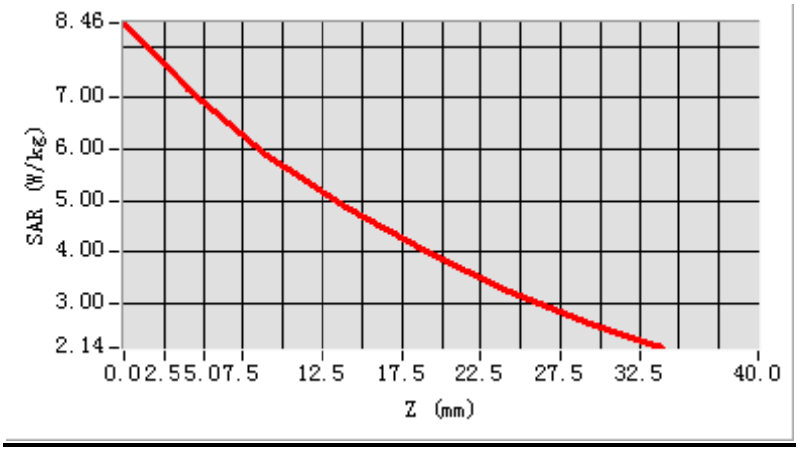
Frequency (MHz)	440.025000
Relative permittivity (real part)	58.097261
Conductivity (S/m)	0.843652
Power drift (%)	-2.280000
Ambient Temperature:	22.3°C
Liquid Temperature:	22.6°C
ConvF:	8.48
Crest factor:	1:1

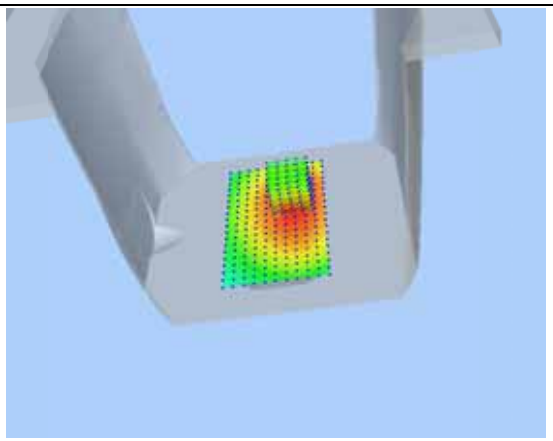
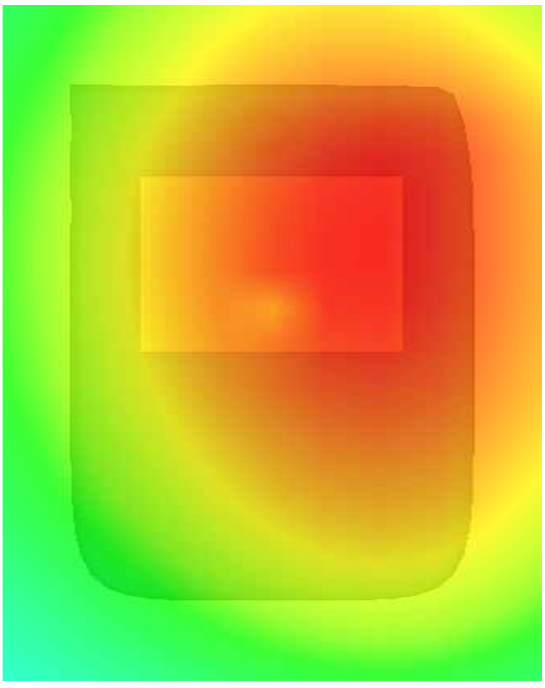
SURFACE SAR	VOLUME SAR
	

Maximum location: X=14.00, Y=22.00
SAR Peak: 10.83 W/kg

SAR 10g (W/Kg)	5.552382
SAR 1g (W/Kg)	7.536230

Z axis scan



3D screen shot	Hot spot position
	

MEASUREMENT 4

Type: Phone measurement (Complete)

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

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

Date of measurement: 2014.7.8

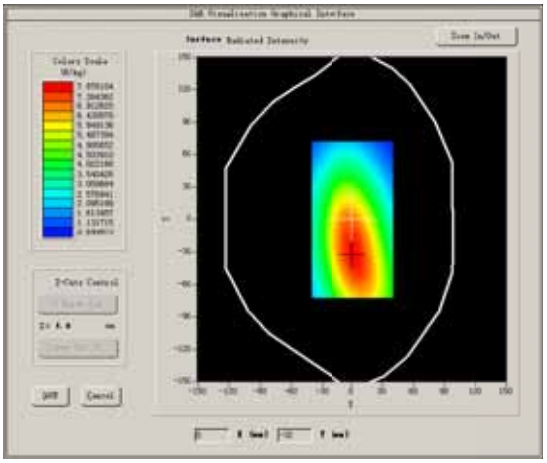
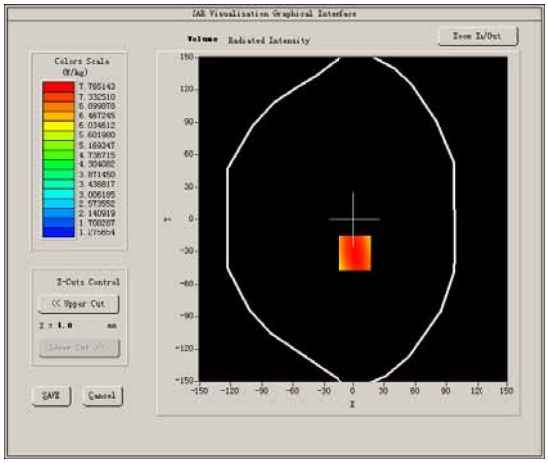
Measurement duration: 9 minutes 29 seconds

A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	Flat phantom
Band	479.975MHz
Channels	High
Signal	FM

B. SAR Measurement Results

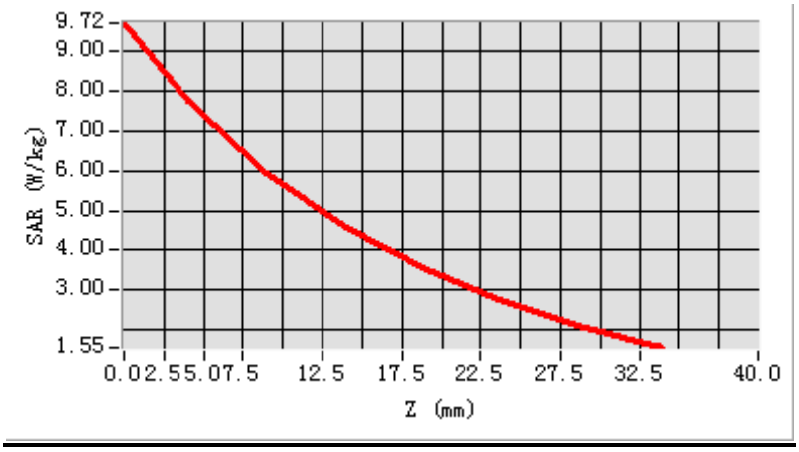
Frequency (MHz)	479.975000
Relative permittivity (real part)	58.097261
Conductivity (S/m)	0.843652
Power drift (%)	-3.620000
Ambient Temperature:	22.3°C
Liquid Temperature:	22.6°C
ConvF:	8.24
Crest factor:	1:1

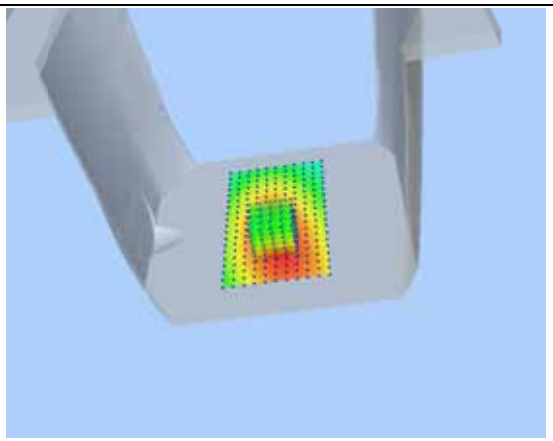
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-31.00
SAR Peak: 9.75 W/kg

SAR 10g (W/Kg)	5.637620
SAR 1g (W/Kg)	7.675237

Z axis scan



3D screen shot	Hot spot position
	

450MHz System Check Data(Head)

Type: Phone measurement (Complete)

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

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

Date of measurement: 2014.7.8

Measurement duration: 13 minutes 27 seconds

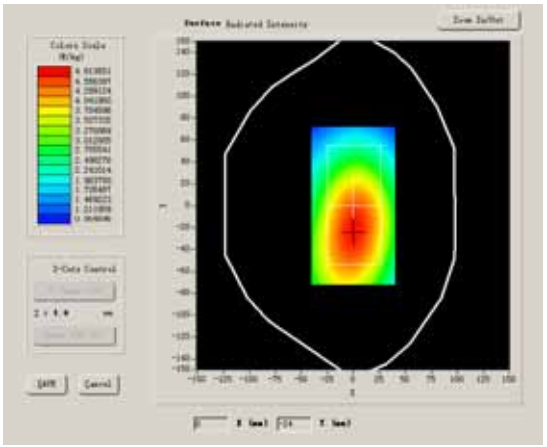
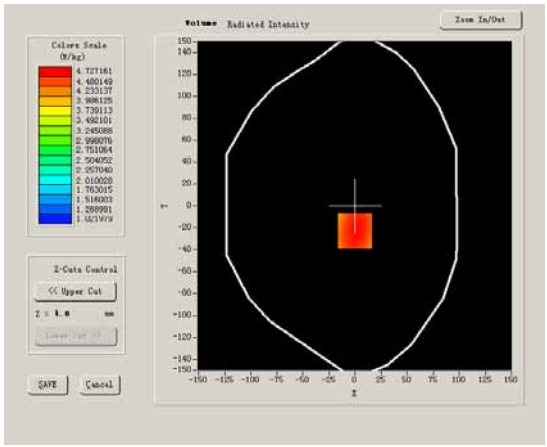
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	
Band	450MHz
Channels	
Signal	CW

B. SAR Measurement Results

Band SAR

Frequency (MHz)	450.000000
Relative permittivity (real part)	43.193725
Conductivity (S/m)	0.834296
Power Drift (%)	0.170000
Ambient Temperature:	22.0°C
Liquid Temperature:	21.8°C
ConvF:	8.24
Crest factor:	1:1

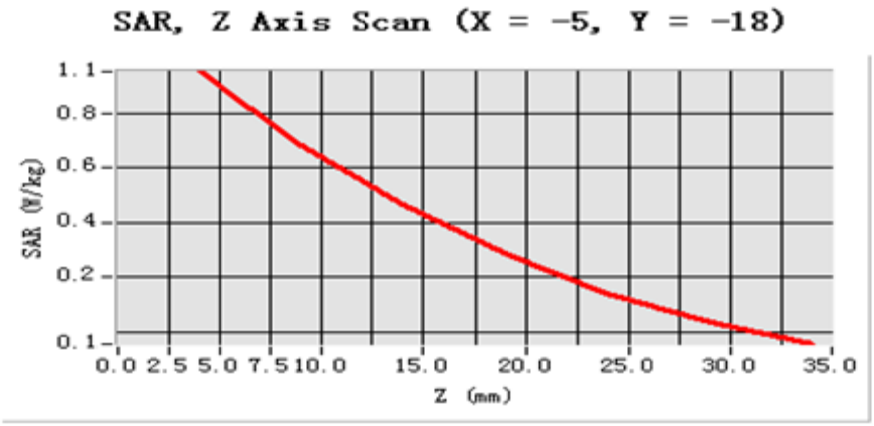
SURFACE SAR	VOLUME SAR
	

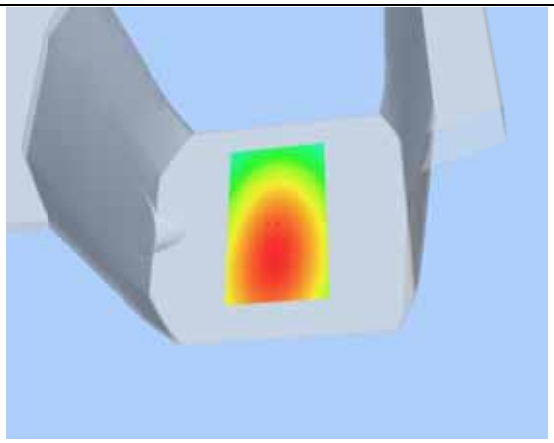
Maximum location: X=-5.00, Y=-18.00

SAR 10g (W/Kg)	0.637619
SAR 1g (W/Kg)	1.037291

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	1.0545	0.7926	0.49865	0.2764	0.1972	0.1328



3D sceen shot	Hot spot position
	

450MHz System 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: 2014.7.8

Measurement duration: 13 minutes 27 seconds

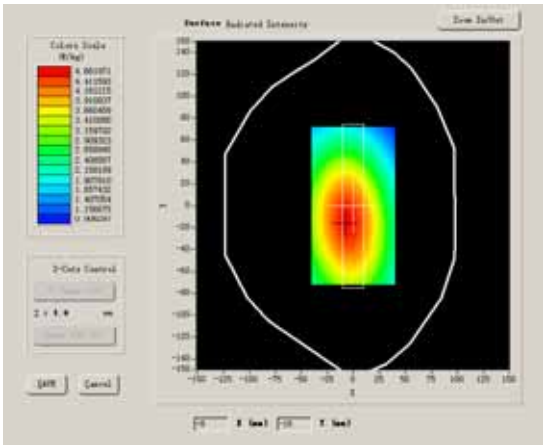
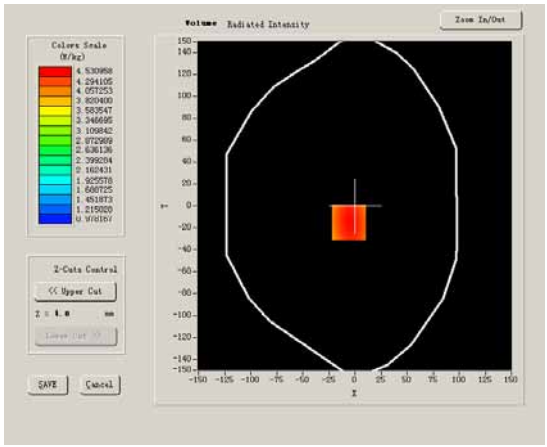
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	
Band	450MHz
Channels	
Signal	CW

B. SAR Measurement Results

Band SAR

Frequency (MHz)	450.000000
Relative permittivity (real part)	58.097261
Conductivity (S/m)	0.843652
Power Drift (%)	0.170000
Ambient Temperature:	22.0°C
Liquid Temperature:	21.8°C
ConvF:	8.48
Crest factor:	1:1

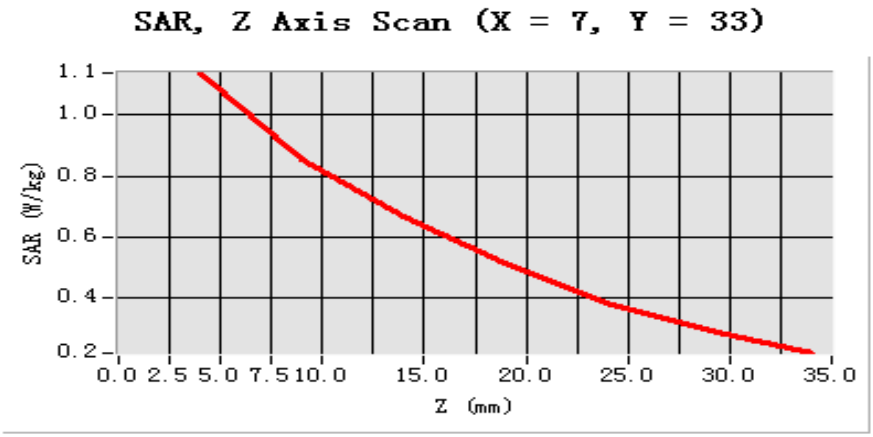
SURFACE SAR	VOLUME SAR
	

Maximum location: X=7.00, Y=33.00

SAR 10g (W/Kg)	0.706428
SAR 1g (W/Kg)	1.086247

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	1.1038	0.9671	0.7264	0.5926	0.3061	0.2140



3D sceen shot	Hot spot position