Report No. SH15120054S01

FCC SAR TEST REPORT

Issued to

esky wireless Inc

For

GPS Tracker

Model Name	:	ES620
Trade Name	:	esky
Brand Name	:	esky
Standard	:	47CFR 2.1093 ANSI C95.1-2005 IEEE 1528-2013
MAX SAR	:	Body:0.729W/kg Head:0.368W/kg
Test date	:	Jan.29,2016 to Feb.2,2016
Issue date	:	Feb.4,2016

Shanghai MORLAB Communication Technology Co., Ltd.

Tested by Wu Hongfei *Approved by* Cia Yeyong *Review by* Pangmin

CTIA Authorized Test Lab LAB CODE 20081223-00 IEEE 1725 OTA OFTA 電訊管理局 ilac-MRA TAF Testing Laboratory 2030 GCF Official Observer of Global Certification Forum Bluetooth BQTF FCC Reg. No.741109

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DIRECTORY

Change History

Issue	Date	Reason for change
1.0	Feb.4,2016	First edition

1. General Information

1.1 Applicant

esky wireless Inc
22-303 #328 street Xinghu, Suzhou, China

1.2 Manufacturer

esky wireless Inc
22-303 #328 street Xinghu, Suzhou, China

1.3 Description of EUT

EUT Type ....:	GPS Tracker
Brand Name..........................:	esky
Trade Name ....:	esky
Model Name ....:	ES620
Hardware Version ....:	ES620-MB-H102
Software Version ....:	ES620_V1.5_B03_160105
Antenna type……………… :	Internal
Antenna gain……………… :	GSM 850: 2dBi GSM 1900: 2dBi
Frequency Range..................	GSM 850MHz: Tx: 824.20-848.80 MHz (at intervals of 200kHz); Rx: 869.20-893.80 MHz (at intervals of 200kHz) GSM 1900MHz Tx: 1850.20-1909.80 MHz (at intervals of 200kHz); Rx: 1930.20-1989.80 MHz (at intervals of 200kHz)
Modulation Type ....:	GPRS/GSM mode with GMSK modulation
Battery ....:	3.7V, 1000mAh

NOTE：

(1) The transmitter (Tx) frequency arrangement of the cellular 850MHz used by the EUT can be represented with the formula F(n)=824.2+0.2(n-128), 128<=n<=251; the lowest, middle, highest channel numbers (ARFCHs) used and tested in this report are separately 128 (824.2MHz), 190(836.6MHz) and 251 (848.8MHz)；the PCS 1900MHz used by the EUT can be represented with the formula F(n)=1850.2+0.2*(n-512), 512<=n<=810; the lowest, middle, highest channel numbers (ARFCHs) used and tested in this report are separately 512 (1850.2MHz), 661(1880.0MHz) and 810 (1909.8MHz).*

(2) Base on the manufacturer, The EUT is a GPS tracker. In normal using It could carry in a car or carry in body. Continue send out GPS location by GPRS data transmit mode. At emergent case, the EUT support SOS call by press SOS call button, when call setup, It could use as a mobile phone.

(3) For a more detailed description, please refer toSpecification or User'sManual supplied by the applicant and/or manufacturer.

1.1 Identification of all used EUTs

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

EUTIdentity	Serial Number	Hardware Version	Software Version	IMEI
1#	n.a	ES620-MB-H102	ES620_V1.5_B03_160105	/

2 Facilities and Accreditations

2.1 Test Facility

Shanghai MORLAB Communications Technology Co., Ltd. MORLAB Laboratory is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6644. A 9*6*6(m) fully anechoic chamber was used for the radiated spurious emissions test.

2.2 Environmental Conditions

Normal Temperature (NT): 20 ~ 25 °C
Relative Humidity: 30 ~70 %
Air Pressure: 98~102kPa

2.3 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	Rohde&Schwarz (CMU200, SN:105894)	2015-9-22	1year
3	Voltmeter	Keithley (2000, SN:1000572)	2015-9-24	1year
4	Signal Generator	Rohde&Schwarz (SMP_02)	2015-9-24	1year
5	Amplifier	PRANA(Ap32 SV125AZ)	2015-9-24	1year
6	Power Meter	Agilent(E4416A)	2015-5-7	1year
7	Power Sensor	Agilent(N8482A)	2015-5-7	1year
8	Directional Coupler	Giga-tronics(SN:1829112)	2015-9-24	1year
9	Network Analyser	Agilent(E5071C,SN:MY46100438)	2015-11-15	1year
10	Dielectric Probe Kit	Agilent(85033E)	2015-9-24	1year
11	Liquid	Satimo(Last calibration:2016-1-31 to 2016-2-2)	N/A	N/A
12	Probe	Satimo (SN:SN37/08EP80)	2014-9-22	2year
13	Phantom	Satimo (SN:SN36/08SAM62)	2014-9-22	3year
14	Dipole 835MHz	Satimo (SN 20/08 DIPC 99)	2014-9-22	3year
15	Dipole 1900MHz	Satimo (SN 30/13 DIPG1G900-261)	2014-9-22	3year

2.4 Measurement Uncertainties

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

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	6.0	N	1	1	1	6.0	6.0	∞
Axial Isotropy	E.2.2	2.5	R	√3	$(1-cp)^{1/2}$	$(1-cp)^{1/2}$	1.0	1.0	∞
Hemispherical Isotropy	E.2.2	4.0	R	√3	√cp	√cp	1.6	1.6	∞
Boundary effect	E.2.3	1.0	R	√3	1	1	0.6	0.6	∞
Linearity	E.2.4	5.0	R	√3	1	1	2.9	2.9	∞
System detection limits	E.2.5	1.0	R	√3	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.5	N	1	1	1	0.5	0.5	∞
Reponse Time	E.2.7	0.2	R	√3	1	1	0.1	0.1	∞
Integration Time	E.2.8	2.0	R	√3	1	1	1.2	1.2	∞
RF ambient Conditions	E.6.1	3.0	R	√3	1	1	1.7	1.7	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	√3	1	1	1.2	1.2	∞
Probe positioning with respect to Phantom Shell	E.6.3	1.0	R	√3	1	1	0.6	0.6	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	1.5	R	√3	1	1	0.9	0.9	∞
Test sample Related									
Test sample positioning	E.4.2.1	1.5	N	1	1	1	1.5	1.5	N-1
Device Holder Uncertainty	E.4.1.1	5.0	N	1	1	1	5.0	5.0	
Output power Variation - SAR drift measurement	6.6.2	4.4	R	√3	1	1	2.6	2.6	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	4.0	R	√3	1	1	2.3	2.3	∞
Liquid conductivity - deviation from target value	E.3.2	35.3	R	√3	0.64	0.43	13.0	8.8	∞
Liquid conductivity - measurement uncertainty	E.3.3	2.5	N	1	0.64	0.43	1.6	1.1	M
Liquid permitivity - deviation from target value	E.3.2	8.5	R	√3	0.6	0.49	2.9	2.4	∞
Liquid permitivity - measurement uncertainty	E.3.3	2.5	N	1	0.6	0.49	1.5	1.2	M
Combined Standard Uncertainty			RSS				12.9	10.4	
Expanded Uncertainty			k				25.2	20.4	

(95% Confidence interval)									

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 (+-%)	V i
Measurement System									
Probe calibration	E.2.1	6.0	N	1	1	1	6.0	6.0	∞
Axial Isotropy	E.2.2	2.5	R	√3	$(1\text{-cp})^{1/2}$	$(1\text{-cp})^{1/2}$	1.0	1.0	∞
Hemispherical Isotropy	E.2.2	4.0	R	√3	√cp	√cp	1.6	1.6	∞
Boundary effect	E.2.3	1.0	R	√3	1	1	0.6	0.6	∞
Linearity	E.2.4	5.0	R	√3	1	1	2.9	2.9	∞
System detection limits	E.2.5	1.0	R	√3	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.5	N	1	1	1	0.5	0.5	∞
Reponse Time	E.2.7	0.2	R	√3	1	1	0.1	0.1	∞
Integration Time	E.2.8	2.0	R	√3	1	1	1.2	1.2	∞
RF ambient Conditions	E.6.1	3.0	R	√3	1	1	1.7	1.7	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	√3	1	1	1.2	1.2	∞
Probe positioning with respect to Phantom Shell	E.6.3	1.0	R	√3	1	1	0.6	0.6	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	1.5	R	√3	1	1	0.9	0.9	∞
Dipole									
Dipole axis to liquid Distance	8,E.4. 2	1.0	N	√3	1	1	0.6	0.6	N -1
Input power and SAR drift measurement	8,6.6. 2	4.4	R	√3	1	1	2.6	2.6	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	4.0	R	√3	1	1	2.3	2.3	∞
Liquid conductivity - deviation from target value	E.3.2	35.3	R	√3	0.64	0.43	13.0	8.8	∞
Liquid conductivity - measurement uncertainty	E.3.3	2.5	N	1	0.64	0.43	1.6	1.1	M
Liquid permitivity - deviation from target value	E.3.2	8.5	R	√3	0.6	0.49	2.9	2.4	∞
Liquid permitivity - measurement uncertainty	E.3.3	2.5	N	1	0.6	0.49	1.5	1.2	M

Combined Standard Uncertainty			RSS				11.9	9.1	
Expanded Uncertainty (95% Confidence interval)			k				23.1	17.7	

3 Test Standardsand Configuration

3.1 Test Standards

Leading reference documents for testing:

No.	Identity	Document Title
1	47 CFR§2.1O93	Radio Frequency Radiation Exposure Evaluation: Portable Devices
2	ANSI C95.1-2005	IEEE Standard for Safety Levels with Respect to human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz
3	IEEE 1528-2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate(SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.
4	KDB 447498 D01 V06	General RF exposure Guidance
5	KDB 941225 D03 v01	SAR Test Reduction GSM GPRS EDGE
6	KDB648474 D04 V01r03	Handset SAR
7	KDB 865664 D01 v01r04	SAR measurement 100MHz to 6GHz
8	KDB 865664 D02 v01r02	RF exposure Reporting

3.2 Device Category and SAR Limits

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 leaveing 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	1.60	4.00

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.

3.3 Test Configuration

Test frequency: GSM850MHz/1900MHz;

Operation mode: Call/GPRS data transformit established

Power Level: GSM 850 MHz Maximum output power(level 5)
GSM 1900MHz Maximum output power(level 0)

During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. Acommunication 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 128, 190 and 251 respectively in the case of GSM 850 MHz, or to 512, 661 and 810 respectively in the case of GSM1900 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 thosespecified by the manufacturer. The EUT battery must be fully charged and checked periodicallyduring the test to ascertain uniform power output. If a wireless link is used, the antenna connectedto 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 outputpower level of the handset by at least 35 dB.

For SAR testing, EUT is in GPRS mode.In GPRS link mode, its crest factor is 2, because EUT is set in GPRS multi-slot class 12 with 4 uplink slots.

4 Specific Absorption Rate (SAR)

4.1 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.

4.2 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. The equation description is as below:

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

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

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

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

, 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

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

, whereσ 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.

5 SAR 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.

COMOSAR bench

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.

5.1 Probe

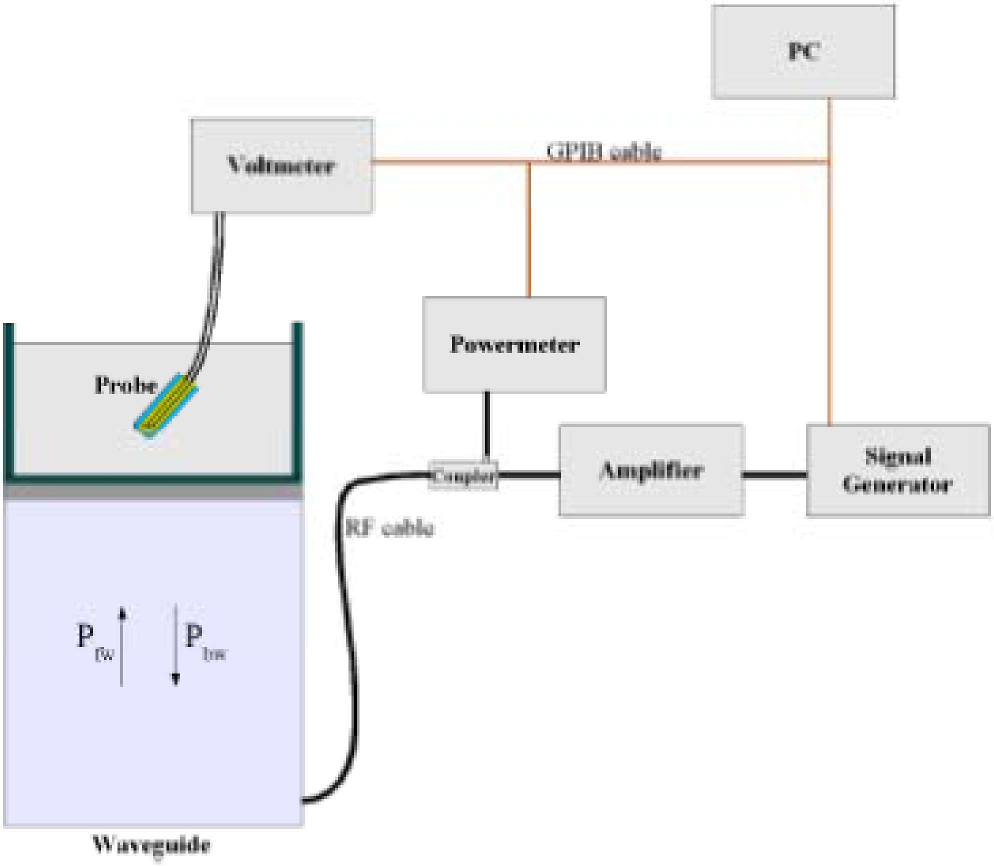
For the measurements the Specific Dosimetric E-Field Probe SN 12/05 EP42 with following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter : 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: ＜0.5 dB
- Calibration range: 835to 2500MHz for head 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 622091annexe 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 :
P_{fw}= Forward Power
P_{bw}= 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.

5.2 Probe Calibration Process

5.2.1 Dosimetric Assessment Procedure

Each E-Probe/Probe Amplifier combination has unique calibration parameters. SATIMO Probe calibrationprocedure is conducted to determine the proper amplifier settings to enter in the probe parameters. Theamplifier settings are determined for a given frequency by subjecting the probe to a known E-field density(1 mW/cm2) using an withCALISAR, Antenna proprietary calibration system.

5.2.2 Free Space AssessmentProcedure

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration canbe performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologiesabove 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center ofthe cavity and at the proper orientation with the field. The probe is rotated 360 degrees until the threechannels show the maximum reading. The power density readings equates to 1 mW/cm2.

5.2.3 Temperature AssessmentProcedure

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

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

Where:

Δt = exposure time (30 seconds),
C = heat capacity of tissue (brain or muscle),
ΔT = temperature increase due to RF exposure.

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

Where:

σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm3 for brain tissue)

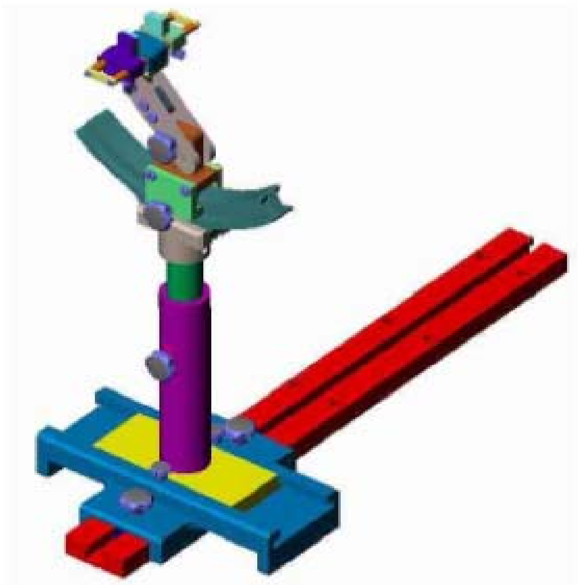
5.3 Phantoms, Device Holder and Simulant Liquid

5.3.1 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.

5.3.2 Device Holder

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



Device holder

System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

5.3.3 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 15cm. For head SAR testing, the liquid height from the ear reference point(ERP) of the phantom to the liquid top surface is larger than 15cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in below table.

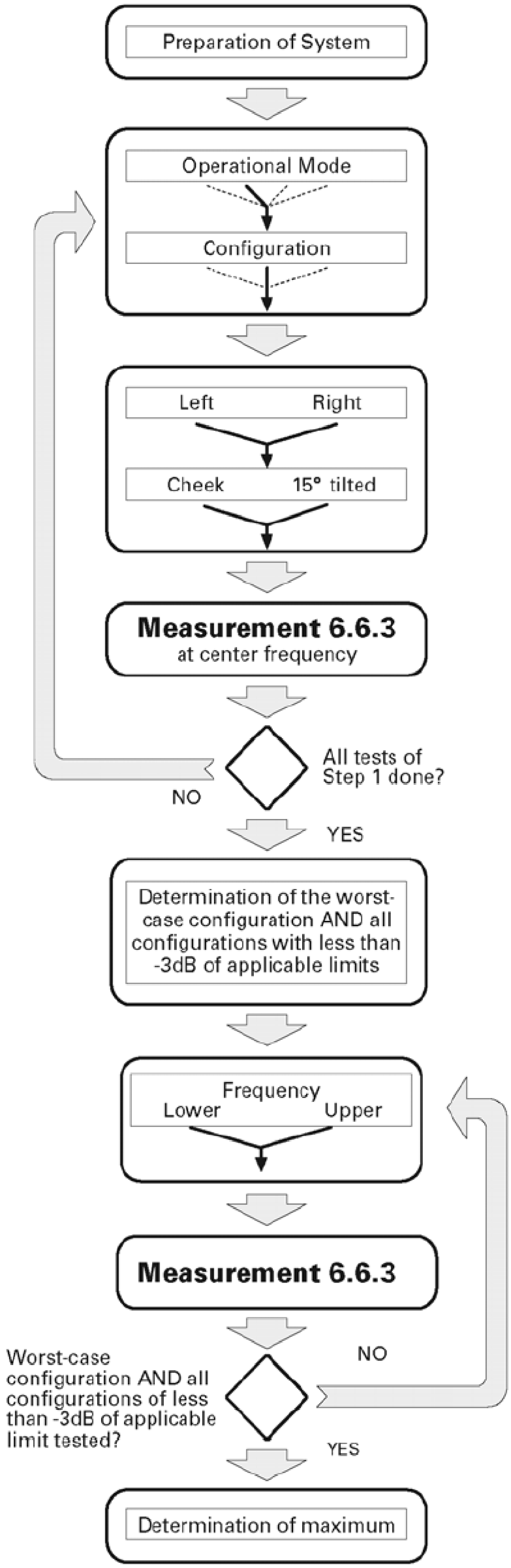
The following table gives the recipes for tissue simulating liquids.

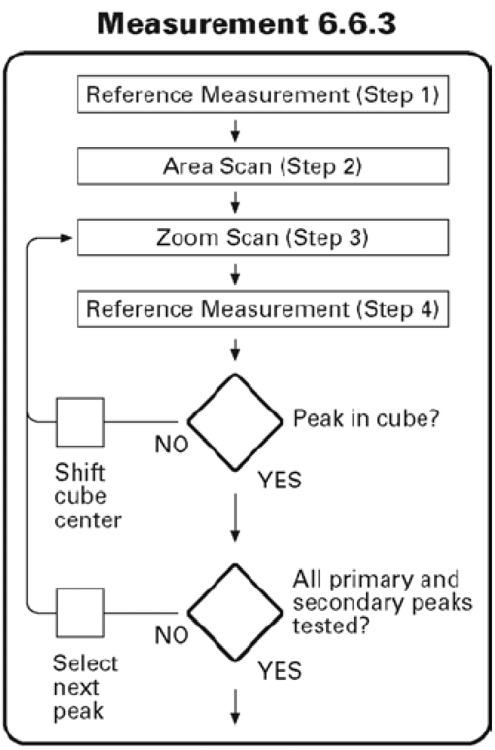
Freqency Band (MHz)	835		1900	
Tissue Type	Head	Body	Head	Body
Ingredients(%by weight)				
Deionised Water	50.36	50.20	54.90	40.40
Salt(NaCl)	1.25	0.90	0.18	0.50
Sugar	0.00	48.50	0.00	58.00
Tween 20	48.39	0.00	0.00	0.00
HEC	0.00	0.20	0.00	1.00
Bactericide	0.00	0.20	0.00	0.10
Triton X-100	0.00	0.00	0.00	0.00
DGBE	0.00	0.00	44.92	0.00
Diethylenglycol Monohexylether	0.00	0.00	0.00	0.00
Target dielectric parameters				
Dielectric Constant	41.50	56.10	39.90	5330.00
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 Dielectic properties of the tissue simulating liquids ware verified prior to the SAR evaluation using an Agilent 85033E Dielectric Probe Kit and an Agilent Network Analyzer E5071C.

5.3.4 SAR measurement procedure





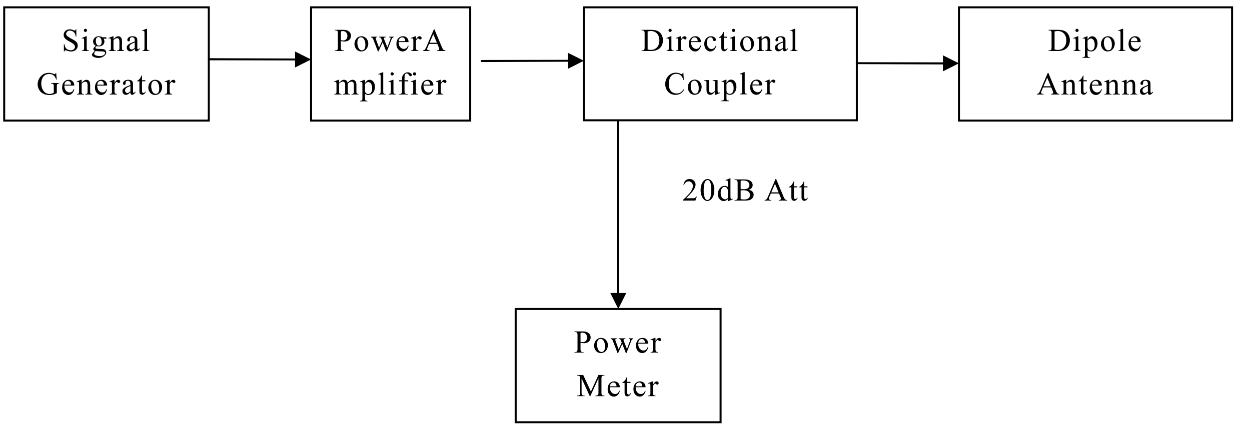
Channel	Left				Right			
	Cheek		Tilt		Cheek		Tilt	
	Retracted	Extended	Retracted	Extended	Retracted	Extended	Retracted	Extended
Mode 1:								
High			S2(-1.4dB)	S2(-0.4dB)			S2(-2.2dB)	S2(-1.4dB)
Middle	S1(-4dB)	S1(-4dB)	S1(-1.5dB)	S1(-0.5dB)	S1(-5dB)	S1(-5dB)	S1(-2.5dB)	S1(-1.5dB)
Low			S2(-1.3dB)	S2(-0.7dB)			S2(-2.7dB)	S2(-0.6dB)
Mode 2:								
High			S2(-2.7dB)	S2(-1.1dB)				
Middle	S1(-5dB)	S1(-5dB)	S1(-2.5dB)	S1(-1dB)	S1(-6dB)	S1(-6dB)	S1(-5dB)	S1(-5dB)
Low			S2(-2.2dB)	S2(-0.8dB)				

After an area scan has been done at a fixed distance of 8mm from the surface of the phantom on the source side, a 3D scan is set up around the location of the maximum spot SAR. First, a point within the scan area is visited by the probe and a SAR reading taken at the start of testing. At the end of testing, the probe is returned to the same point and a second reading is taken. Comparison between these start and end readings enables the power drift during measurement to be assessed.

Above is the scanning procedure flow chart and table from the IEEE P1528 standard. This is the procedure for which all compliant testing should be carried out to ensure that all variations of the device position and transmission behavior are tested.

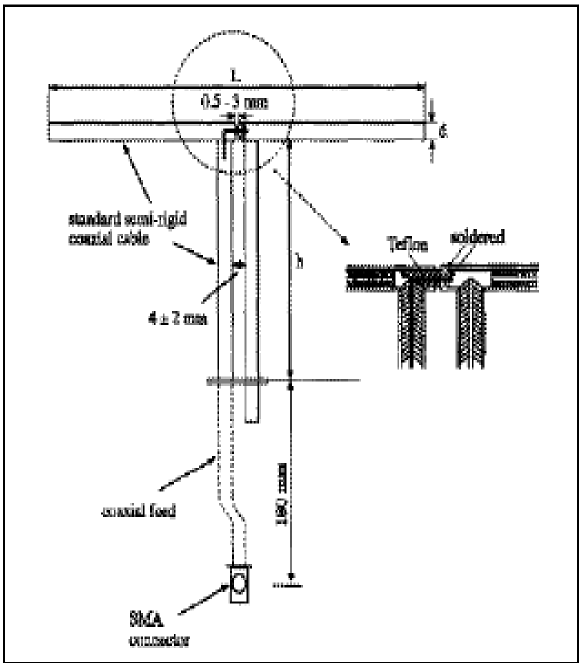
5.3.5 Validation Test Using Flat Phantom

The following procedure, recommended for performing validation tests using flat phantom is based on the procedures described in the IEEE standard P1528. Setup according to the setup diagram below:



5.3.6 Setting up the Box Phantom for Validation Testing

5.3.6.1 Validation Dipoles



The dipoles used are based on the IEEE-1528 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. The table below provides details for the mechanical and electrical specifications for the dipoles.

Frequency	L(mm)	h(mm)	d(mm)
835MHZ	161	89.8	3.6
1900MHZ	68	39.5	3.6

5.3.6.2 Validation Result

Comparing to the original SAR value provided by SATIMO, the validation data should be within itsspecification of 10 %.

Frequency	835MHz(B)	835MHz(H)	1900MHz(B)	1900MHz(H)
Target value 1W(1g)	10.04W/Kg	9.68W/Kg	42.36W/Kg	39.36W/Kg
Test Value 1g (250mW input power)	2.451W/Kg (2016-2-1)	2.389W/Kg (2016-2-2)	9.999W/Kg (2016-2-1)	9.781W/Kg (2016-2-2)
Normalized to 1W value(1g)	9.804W/Kg	9.556W/Kg	39.996W/Kg	39.124W/Kg

5.4 Measurement Procedure

The following steps are used for each test position

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.

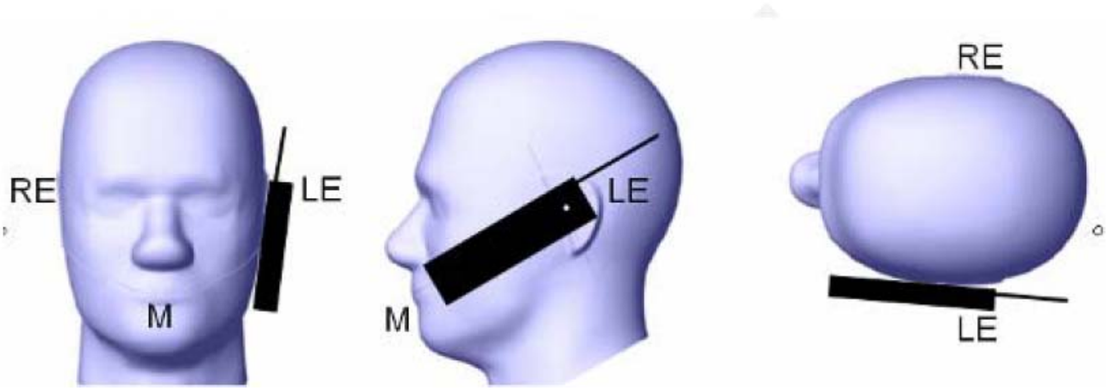


Illustration for Cheek Position

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.

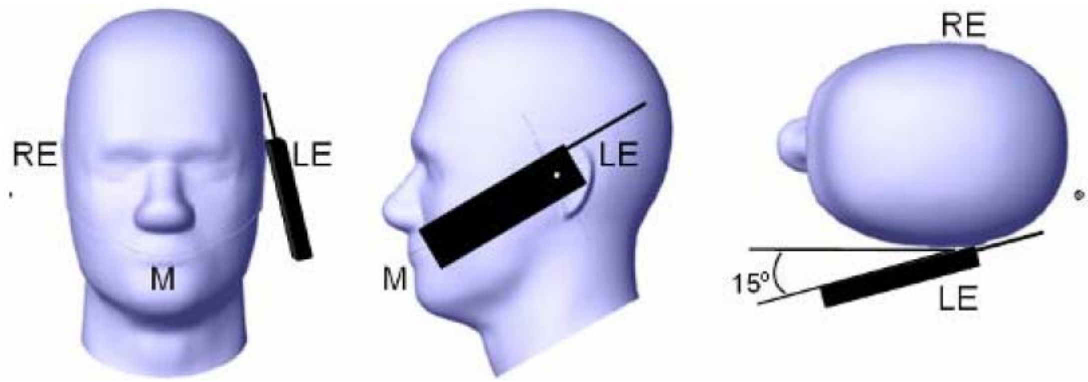


Illustration for Tilted Position

Remark: Please refer to Appendix test setup photos.

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 materal with electrical properties similar to the corresponding tissues.

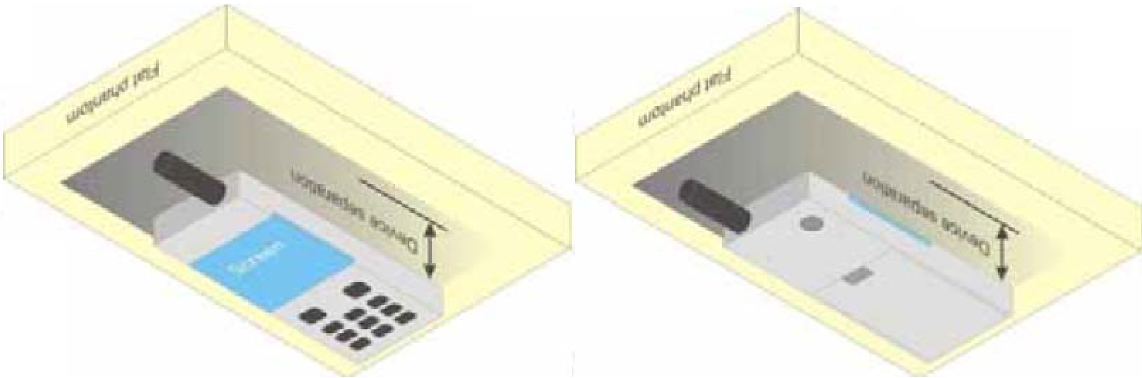


Illustration for Body Worn Position

Measurement procedure
Establish a call with the maximum output power with a base station simulator. The connection between the mobile phone and the base station simulator is established via air interface.
Measurement of the local E-field distribution is done with a grid of 8 to 16mm*8 to 16mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolating scheme.
Around this point, a cube of 30*30*30mm or 32*32*32mm is assessed by measuring 5 or 8*5 or 8*4 or 5mm. With these data, the peak spatial-average SAR value can be calculated.

5.5 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 minimise 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 base 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 (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8mm. to obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1gram requires a very fine resolution in the three-dimensional scanned data array.

6 TEST RESULTS

6.1 Explain

The EUT has been tested under the operating conditions.

6.2 Dielectric Performance

For the measurement, the device was tested at the lowest, middle and highest frequencies in the transmit band.

Table: Dielectric Performance of Head Tissue Simulating Liquid Check

Temperature: 21.0~23.5° C, Relative Humidity: 60~65%.						
Date	Freq. (MHz)	Liquid Parameters	Meas.	Target	Delta(%)	Limit+/-(%)
2016/2/1	Head 835	Permittivity (εr)	41.26	42.56	-3.05	5
		Conductivity(σ)	0.92	0.88	4.55	5
2016/2/1	Body 835	Permittivity (εr)	55.57	55.26	0.56	5
		Conductivity(σ)	0.98	0.96	2.08	5
2016/2/2	Head 1900	Permittivity (εr)	39.78	39.80	-0.05	5
		Conductivity(σ)	1.40	1.42	-1.41	5
2016/2/2	Body 1900	Permittivity (εr)	53.30	52.53	1.47	5
		Conductivity(σ)	1.53	1.50	2.00	5

6.3 Conducted Power

The conducted power for GSM 850/1900 is as following:

Max Output Power (dBm)			
GSM 850MHz	**128**	**190**	**251**
	31.77	32.05	31.73
GSM 1900MHz	**512**	**661**	**810**
	28.38	28.63	28.27

The conducted power for GPRS 850/1900 is as following:

GPRS 850	Max Output Power (dBm)				Average Power (dBm)		
	128	**190**	**251**		**128**	**190**	**251**
1Txslot	31.65	31.98	31.66	-9.03 dB	22.62	22.95	22.63
2 Txslots	31.57	31.65	31.58	-6.02 dB	25.55	25.63	25.56
3Txslots	31.53	31.59	31.47	-4.26 dB	27.27	27.33	27.21
4Txslots	31.33	31.53	31.39	-3.01 dB	28.32	28.52	28.38
GPRS 1900	**Max Output Power (dBm)**				**Average Power (dBm)**		
	512	**661**	**910**		**512**	**661**	**910**
1Txslot	28.23	28.52	28.04	-9.03 dB	19.2	19.49	19.01
2 Txslots	28.16	28.44	27.83	-6.02 dB	22.14	22.42	21.81
3Txslots	28.03	28.32	27.80	-4.26 dB	23.77	24.06	23.54
4Txslots	27.95	28.06	27.69	-3.01 dB	24.94	25.05	24.68

Note 1: Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

According to the conducted power as above, the body-worn position measurements are performed with 4Txslots for GPRS,

6.4 Summary of Measurement Results

Table 1: SAR Values (GSM 850MHz).

Temperature: 21.0~23.5°C, Relative Humidity: 60~65%.						
Limit of SAR (W/kg)	1 g Average					
	1.6					
Test Configuration	Max Meas. Power (dBm)	Max Rated Power (dBm)	Measurement SAR		Scaled SAR	
			1 g Average (W/kg)	Power Drift (%)	Scaling Factor	Scaled SAR 1g(W/kg)
Frontside Towards Body Middle Channel (GPRS)	31.53	32.50	0.414	-1.21	1.250	0.518
Backside Towards Body Middle Channel (GPRS)	31.53	32.50	0.583	1.49		0.729
Right Side of Head Cheek/Touch Middle Channel(GSM)	32.05	32.50	0.226	-0.54	1.109	0.251
Right Side of Head Ear/Tilt Middle Channel(GSM)	32.05	32.50	0.257	0.77		0.285
Left Side of Head/Touch Middle Channel(GSM)	32.05	32.50	0.318	1.04		0.353
Left Side of Head Ear/Tilt Middle Channel(GSM)	32.05	32.50	0.329	-0.39		0.365

Table 2: SAR Values (GSM 1900MHz).

Temperature: 21.0~23.5°C, Relative Humidity: 60~65%.						
Limit of SAR (W/kg)	1 g Average					
	1.6					
Test Configuration	Max Meas. Power (dBm)	Max Rated Power (dBm)	Measurement SAR		Scaled SAR	
			1 g Average (W/kg)	Power Drift (%)	Scaling Factor	Scaled SAR 1g(W/kg)
Frontside Towards Body Middle Channel (GPRS)	28.06	29.00	0.307	1.21	1.242	0.381
Backside Towards Body Middle Channel (GPRS)	28.06	29.00	0.186	1.49		0.231
Right Side of Head Cheek/Touch Middle Channel(GSM)	28.63	29.00	0.288	-0.45	1.089	0.314
Right Side of Head Ear/Tilt Middle Channel(GSM)	28.63	29.00	0.247	-1.18		0.269
Left Side of Head/Touch Middle Channel(GSM)	28.63	29.00	0.338	0.75		0.368
Left Side of Head Ear/Tilt Middle Channel(GSM)	28.63	29.00	0.241	1.43		0.262

Notes:

1. When the 1g 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)

2. Per FCC Publication 447498, if the reported(scaled) SAR measured at the middle channel or highest output power channel for each test configuration is </=0.8W/Kg then testing at the other channels is not required for such test configurations. When the Maximum output power variation across the required test channels is 1/2 dB, instead of the middle channel, the highest output power channel was used.

6.5 Conclusion

Peak Spatial-Average Specific Absorption Rate (SAR) of this portable wireless device has been measured in all configurations requested by the relevant standards cited in Clause 3.3 of this report. SAR values are below exposure limits specified in the relevant standards cited in Clause 3.1 of this test report

Annex A Accreditation Certificate

China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(Registration No. CNAS L6644)

Shanghai Morlab Communications Technology Co., Ltd.

3/F., Building 1, No.1399, Jiangyue Road, Minhang District, Shanghai, China

is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence of testing.

The scope of accreditation is detailed in the attached appendices bearing the same registration number as above. The appendices form an integral part of this certificate.

Date of Issue：2014-01-14

Date of Expiry：2017-01-13

Date of Initial Accreditation：2014-01-14

Date of Update：2014-01-14

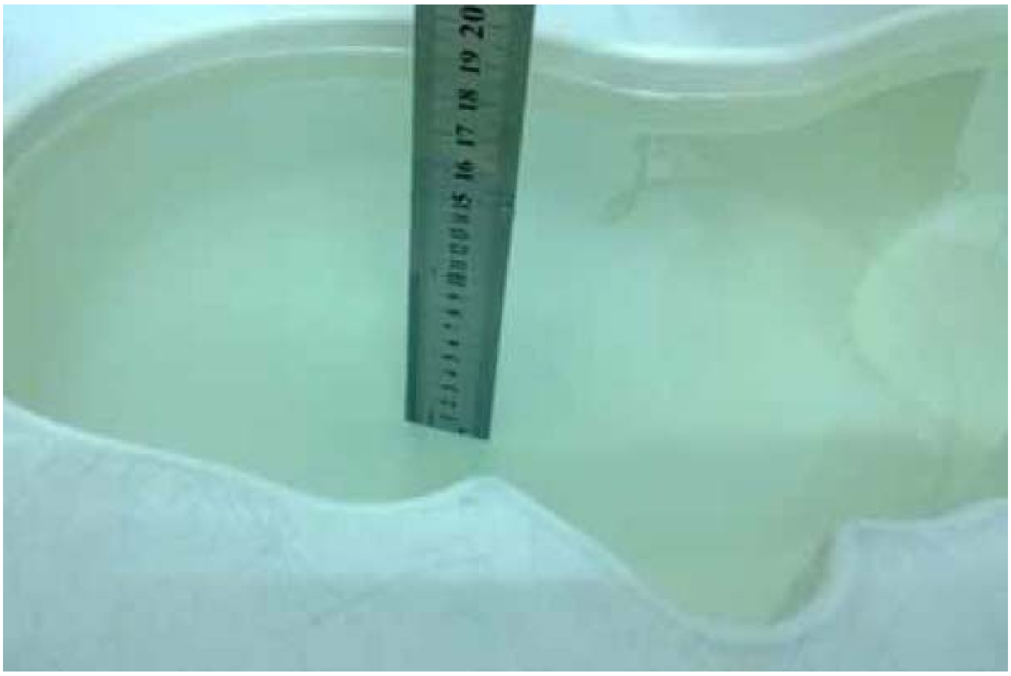
Signed on behalf of China National Accreditation Service for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is the signatory to International Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (ILAC MRA) and Asia Pacific Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (APLAC MRA).

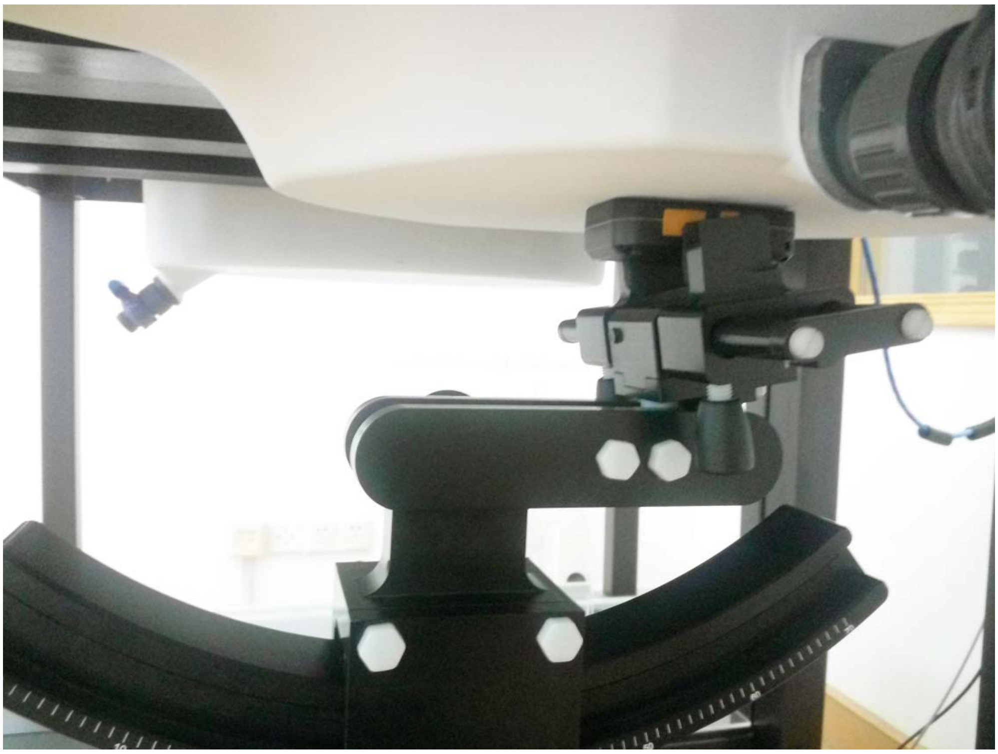
No.CNAS AL 2 0008988

Test Setup

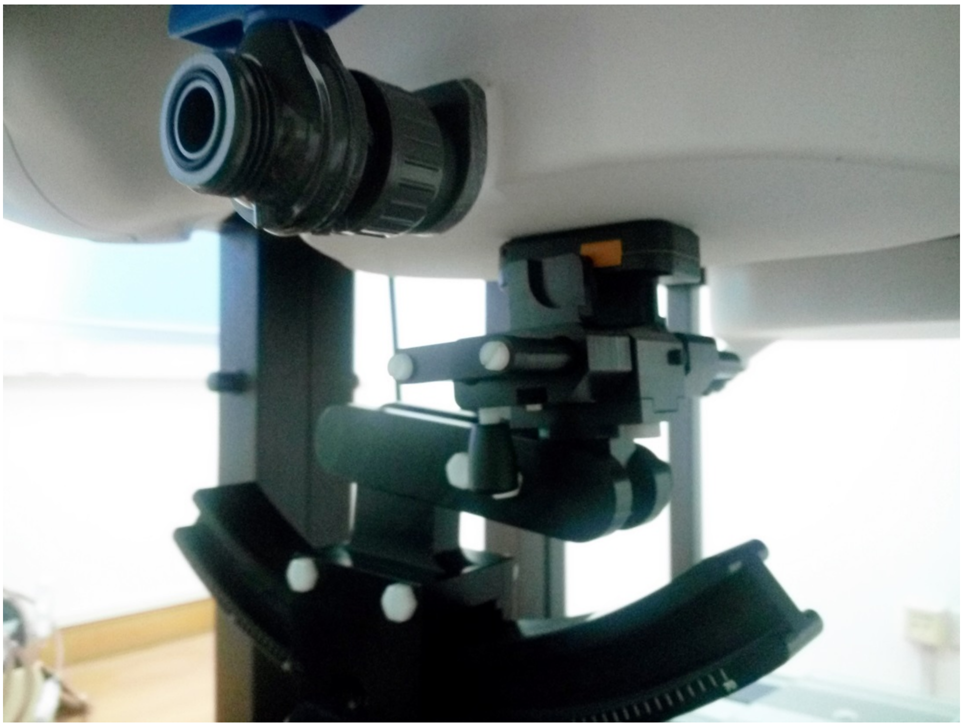
Depth of Liquid,Body, 15.6cm



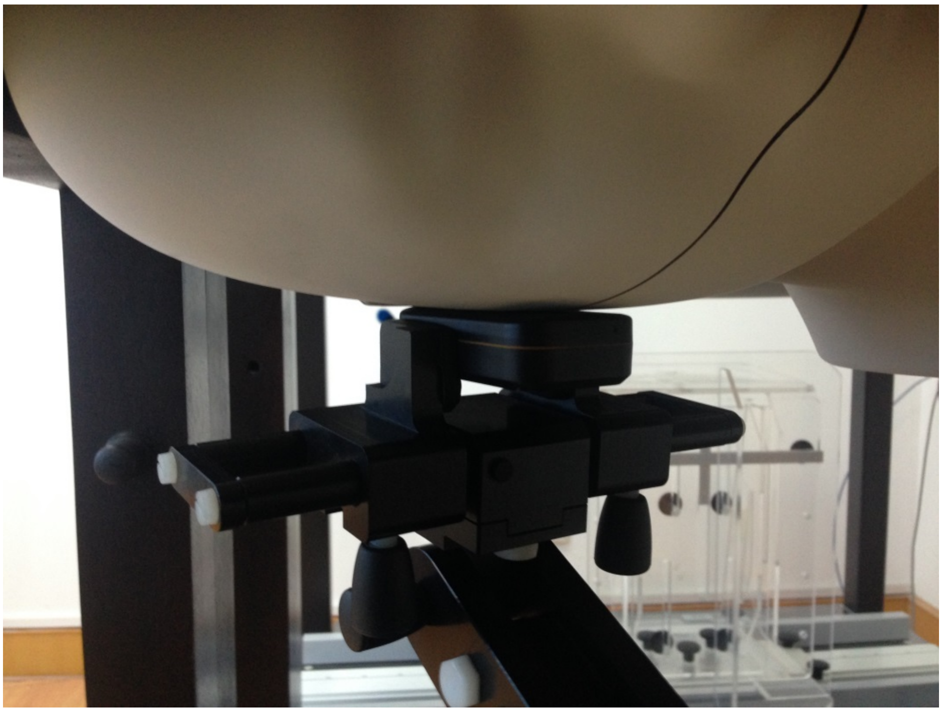
Depth of Liquid, Head, 15.2cm



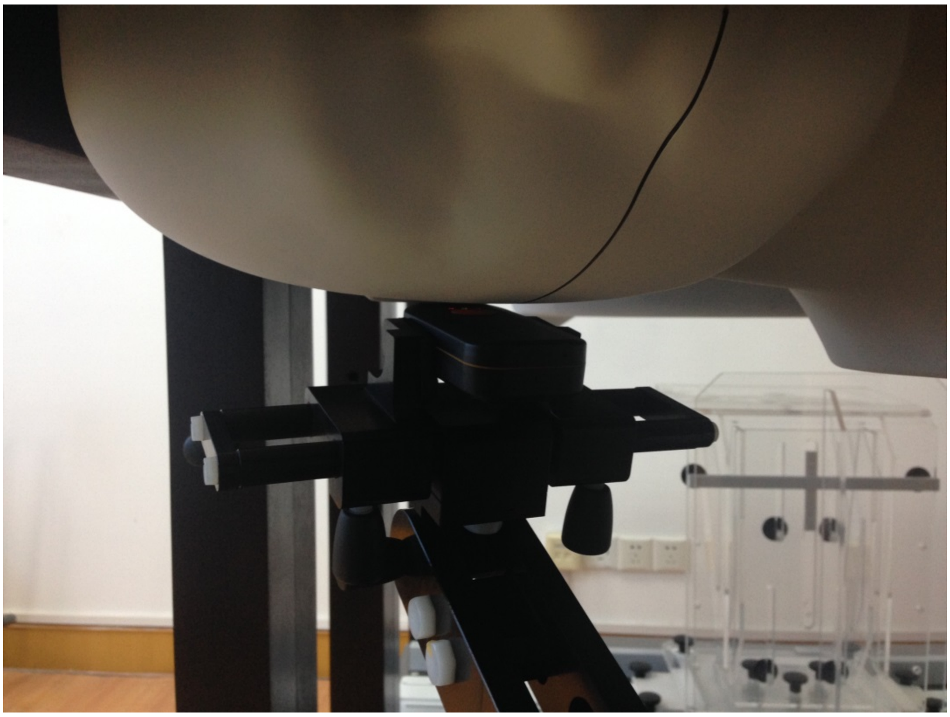
EUT Front side Towards Phantom



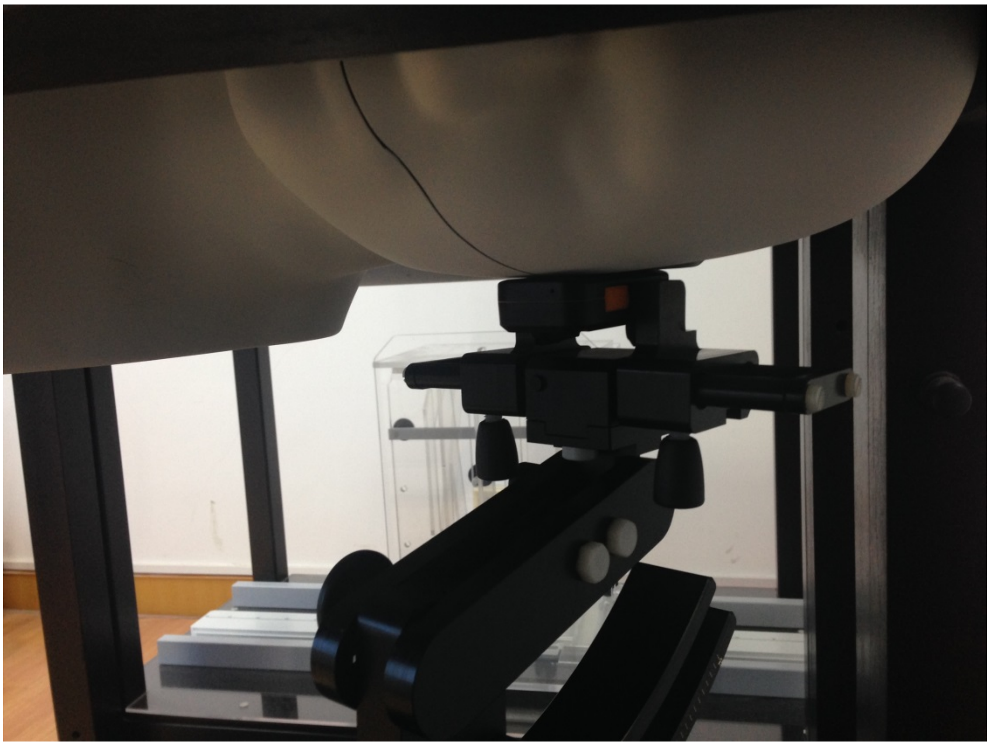
EUT Backside Towards Phantom



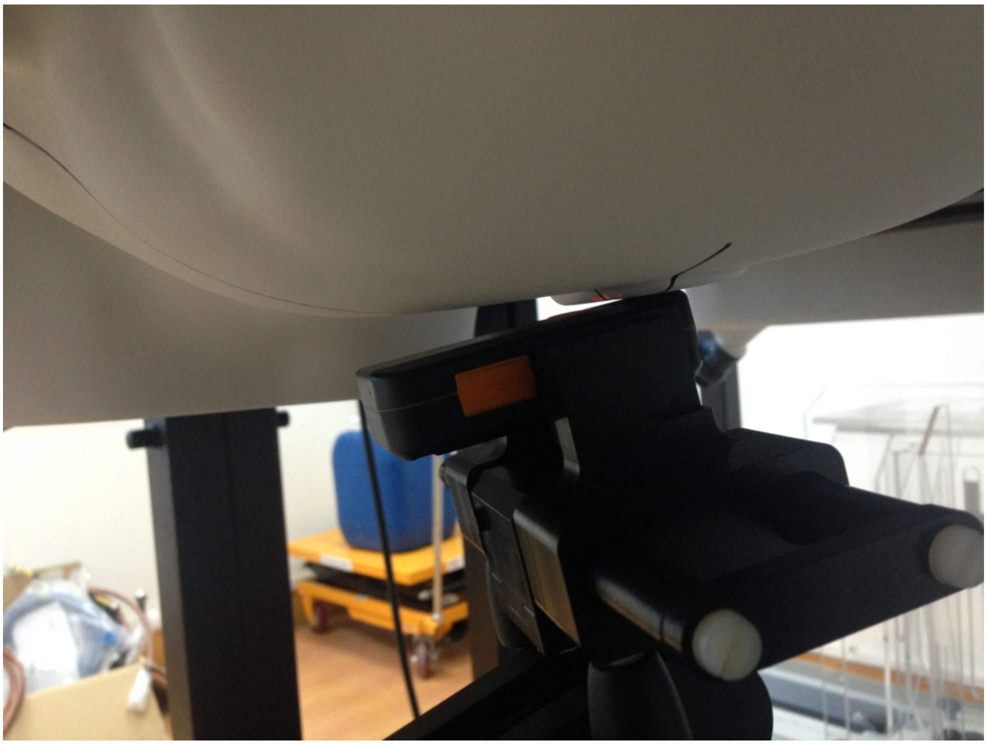
EUT RightHead Touch Cheek Position



EUT Right Head Touch Tilt position

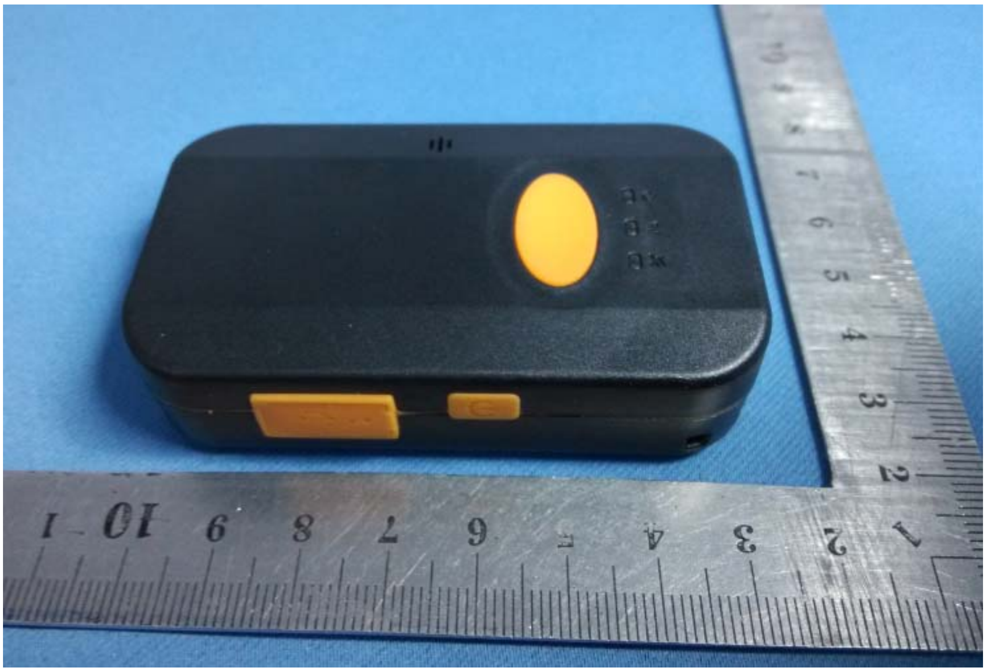


EUT LeftHead Touch Cheek Position



EUT Left Head Touch Tilt position

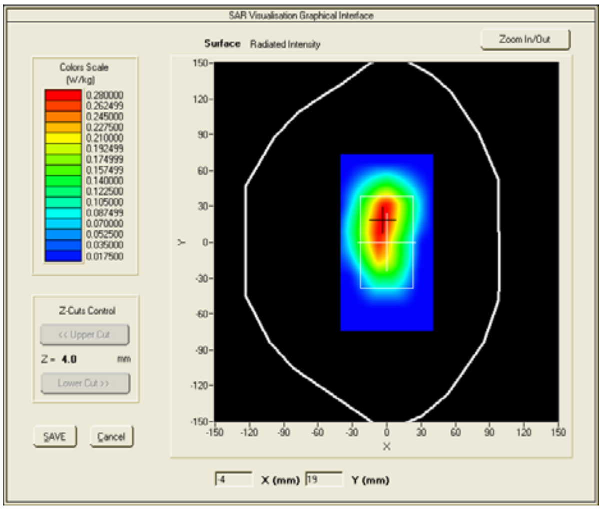
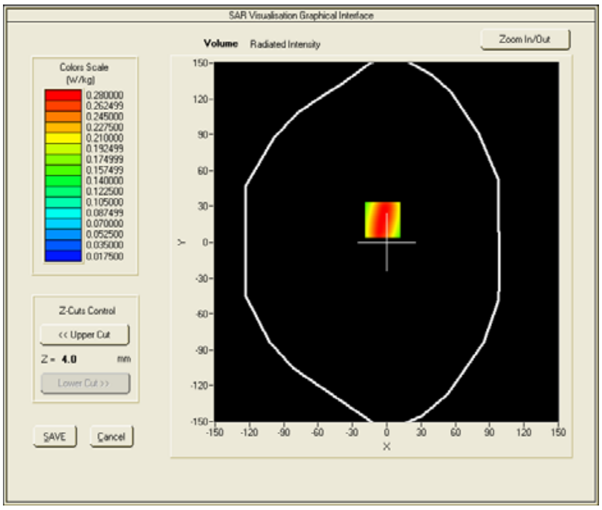
Annex B Sample Photographs



Annex C Graph Test Results

GSM 850 Front side Towards Body(GPRS 190)

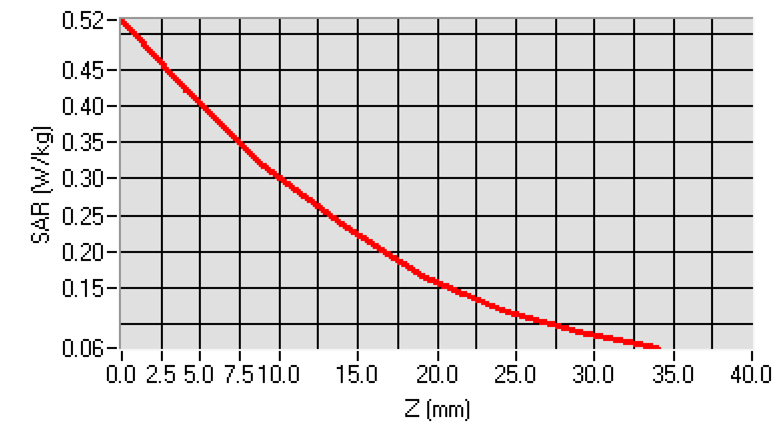
Frequency (MHz)	**836.60**
Relative permitivity (real part)	**55.570385**
Conductivity (S/m)	**0.983557**
Variation (%)	**-1.21**
Crest factor	**2**
Conversion Factor	**6.99**
Temperatures	**21.20° C**
Date	**2016-2-1**

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-4.00, Y=19.00

SAR 10g (W/Kg)	**0.267388**
SAR 1g (W/Kg)	**0.413842**

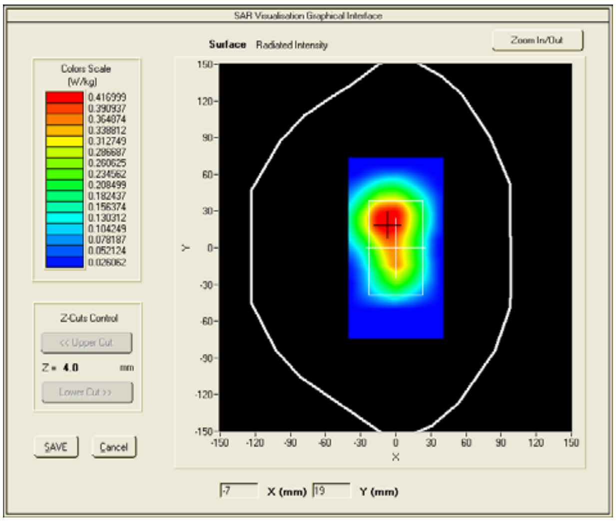
<u>Z Axis Scan</u>

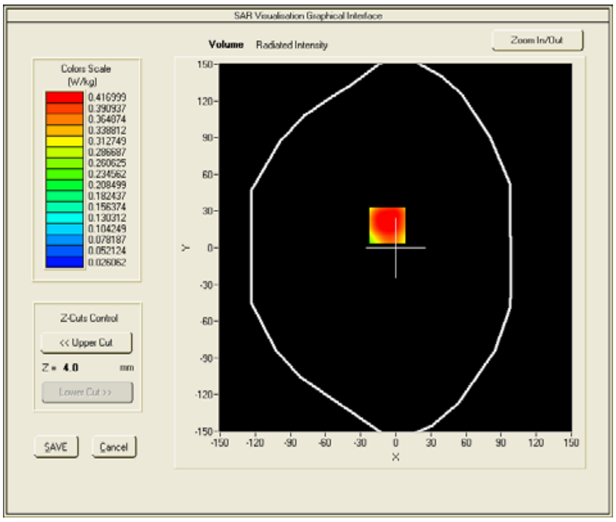

0.52
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.06
SAR [W/kg]
0.0 2.5 5.0 7.5 10.0 15.0 20.0 25.0 30.0 35.0 40.0
Z [mm]

GSM 850Front side Towards Body(GPRS 190)

Frequency (MHz)	**836.60**
Relative permitivity (real part)	**55.570385**
Conductivity (S/m)	**0.983557**
Variation (%)	**1.49**
Crest factor	**2**
Conversion Factor	**6.99**
Temperatures	**21.20° C**
Date	**2016-2-1**

SURFACE SAR	VOLUME SAR

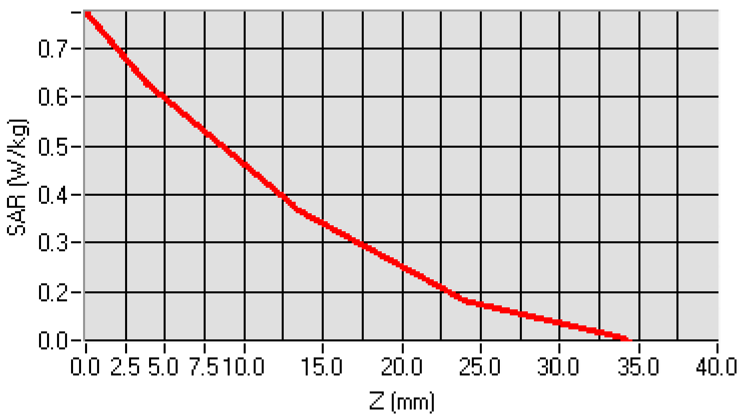




Maximum location: X=-7.00, Y=19.00

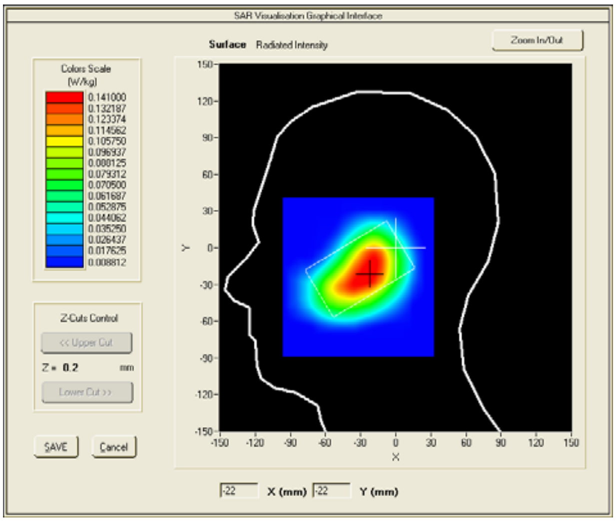
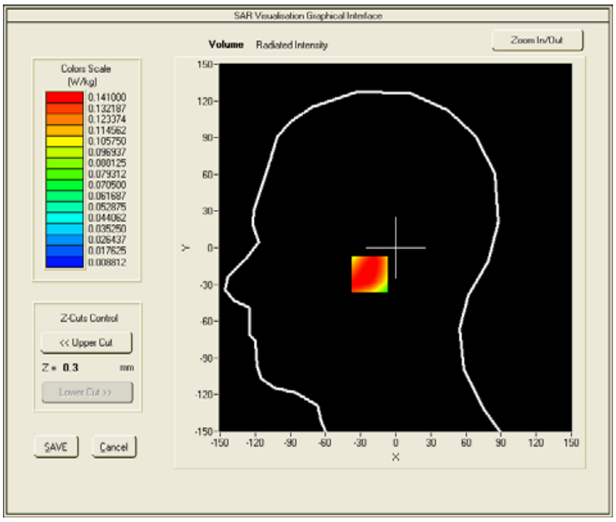
SAR 10g (W/Kg)	**0.416063**
SAR 1g (W/Kg)	**0.583107**

Z Axis Scan


SAR (W/kg)
0.7
0.6
0.5
0.4
0.3
0.2
0.0
0.0 2.5 5.0 7.5 10.0 15.0 20.0 25.0 30.0 35.0 40.0
Z (mm)

GSM850 Right Side of Head Cheek/Touch (GSM 190)

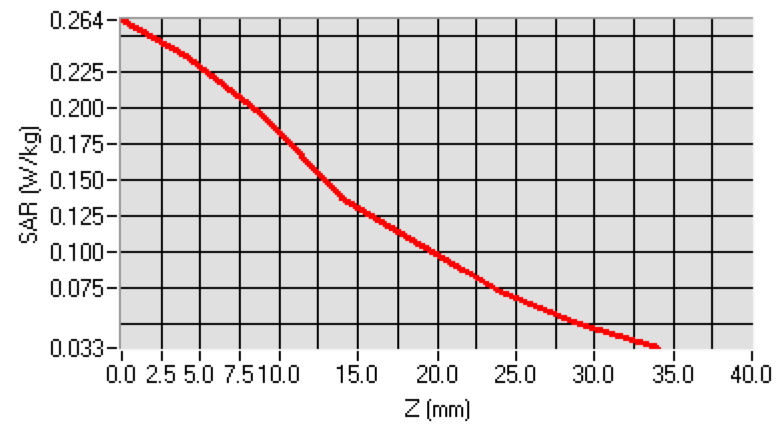
Frequency (MHz)	**836.60**
Relative permitivity (real part)	**41.261722**
Conductivity (S/m)	**0.922576**
Variation (%)	**-0.54**
Crest factor	**8.3**
Conversion Factor	**6.73**
Temperatures	**22.80° C**
Date	**2016-2-2**

SURFACE SAR	VOLUME SAR
	

Maximum location:X=-22.00, Y=-22.00

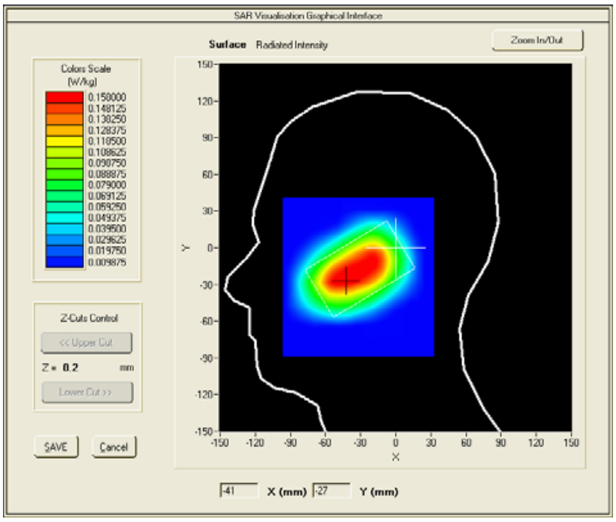
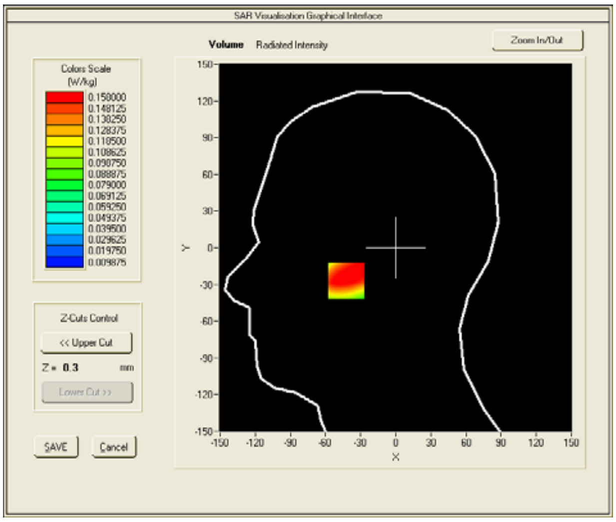
SAR 10g (W/Kg)	**0.141306**
SAR 1g (W/Kg)	**0.226472**

<u>Z Axis Scan</u>


0.264
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.033
SAR (W/kg)
0.0
2.5
5.0
7.5
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Z (mm)

GSM850 Right Side of Head Ear/Tilt (GSM190)

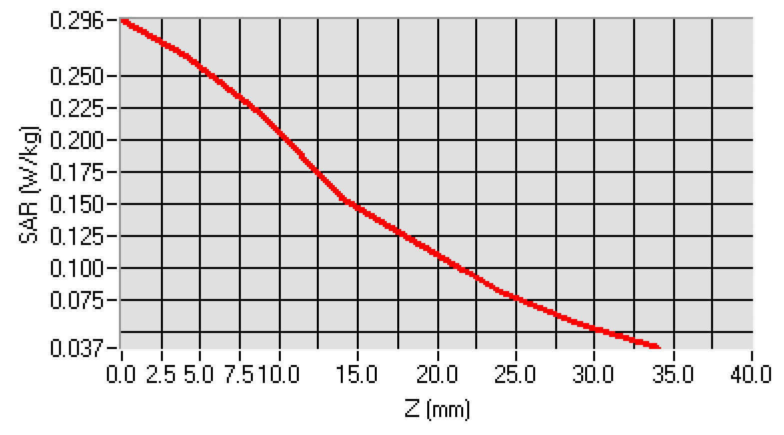
Frequency (MHz)	836.60
Relative permitivity (real part)	41.261722
Conductivity (S/m)	0.922576
Variation (%)	0.77
Crest factor	8.3
Conversion Factor	6.73
Temperatures	22.80° C
Date	2016-2-2

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-41.00, Y=-27.00

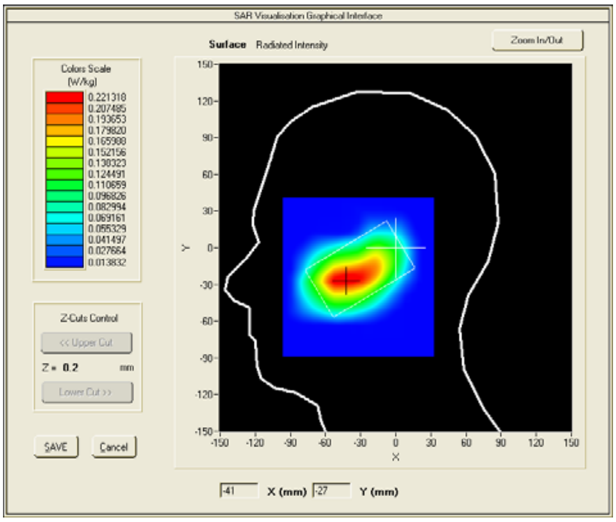
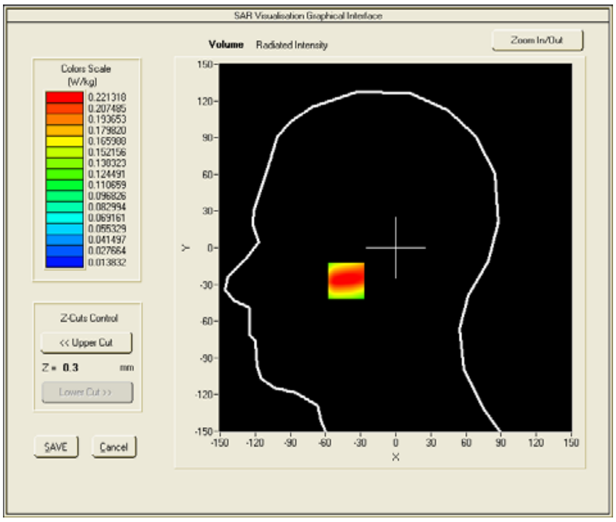
SAR 10g (W/Kg)	0.158453
SAR 1g (W/Kg)	0.257276

<u>Z Axis Scan</u>


0.296
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.037
SAR (W/kg)
0.0 2.5 5.0 7.5 10.0 15.0 20.0 25.0 30.0 35.0 40.0
Z (mm)

GSM850 Left Side of Head/Touch (GSM190)

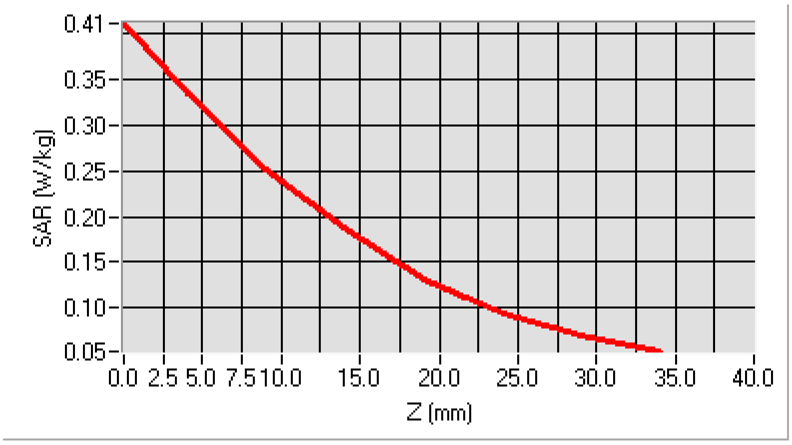
Frequency (MHz)	**836.60**
Relative permitivity (real part)	**41.261722**
Conductivity (S/m)	**0.922576**
Variation (%)	**1.04**
Crest factor	**8.3**
Conversion Factor	**6.73**
Temperatures	**22.80° C**
Date	**2016-2-2**

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-41.00, Y=-27.00

SAR 10g (W/Kg)	**0.221773**
SAR 1g (W/Kg)	**0.318083**

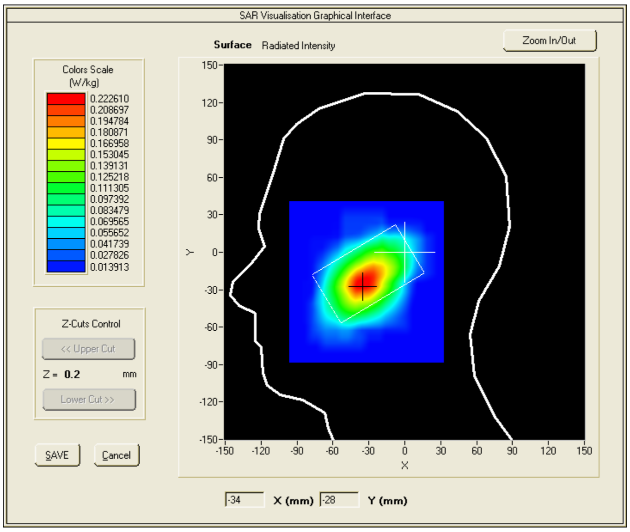
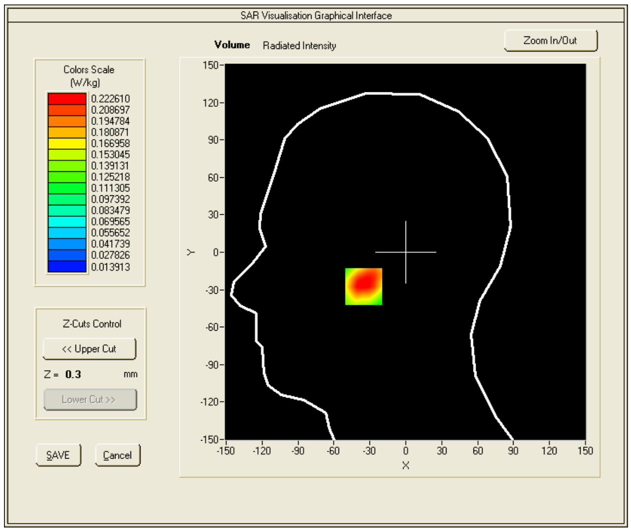
Z Axis Scan



0.41
0.35
0.30
0.25
0.20
0.15
0.10
0.05
SAR [W/kg]
0.0 2.5 5.0 7.5 10.0 15.0 20.0 25.0 30.0 35.0 40.0
Z [mm]

GSM850 Left Side of Head Ear/Tilt (GSM190)

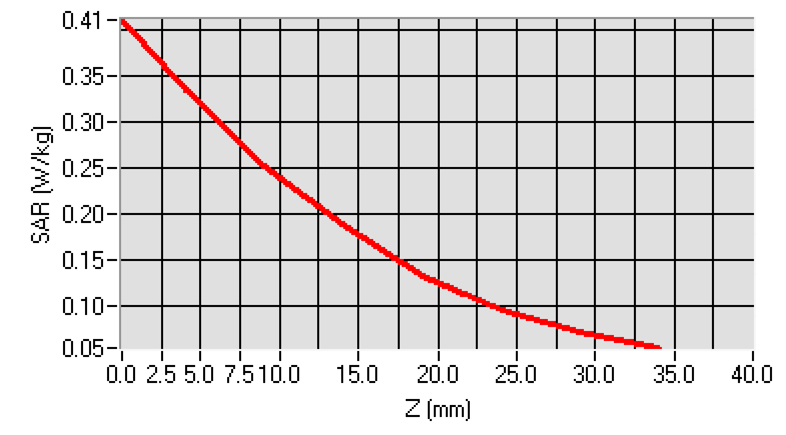
Frequency (MHz)	**836.60**
Relative permitivity (real part)	**41.261722**
Conductivity (S/m)	**0.922576**
Variation (%)	**-0.39**
Crest factor	**8.3**
Conversion Factor	**6.73**
Temperatures	**22.80° C**
Date	**2016-2-2**

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-39.00, Y=-31.00

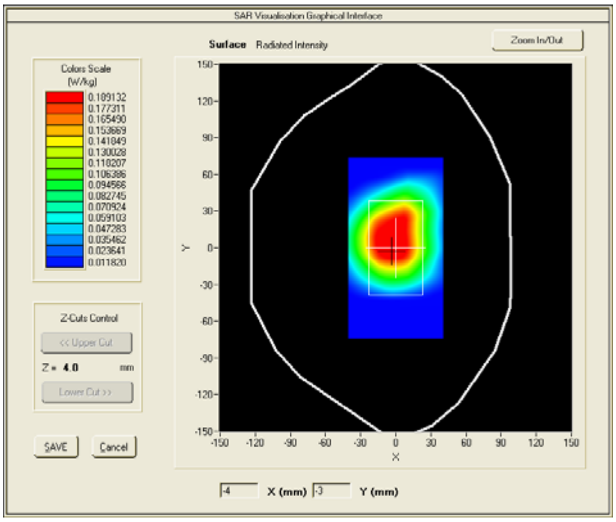
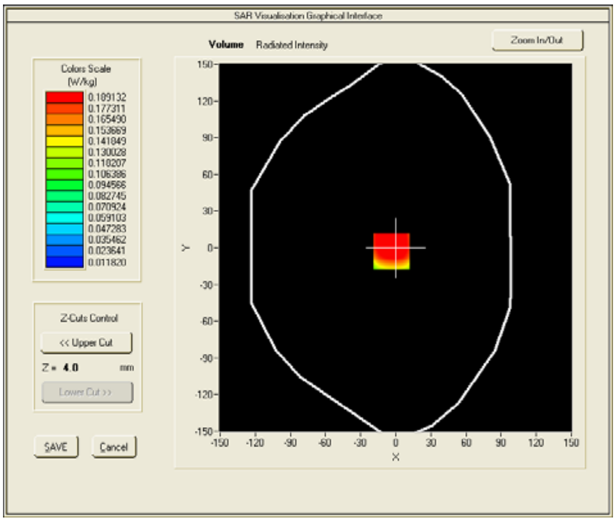
SAR 10g (W/Kg)	**0.222611**
SAR 1g (W/Kg)	**0.329345**

Z Axis Scan


0.41
0.35
0.30
0.25
0.20
0.15
0.10
0.05
SAR [W/kg]
0.0 2.5 5.0 7.5 10.0 15.0 20.0 25.0 30.0 35.0 40.0
Z [mm]

GSM1900 Front side Towards Body (GPRS 661)

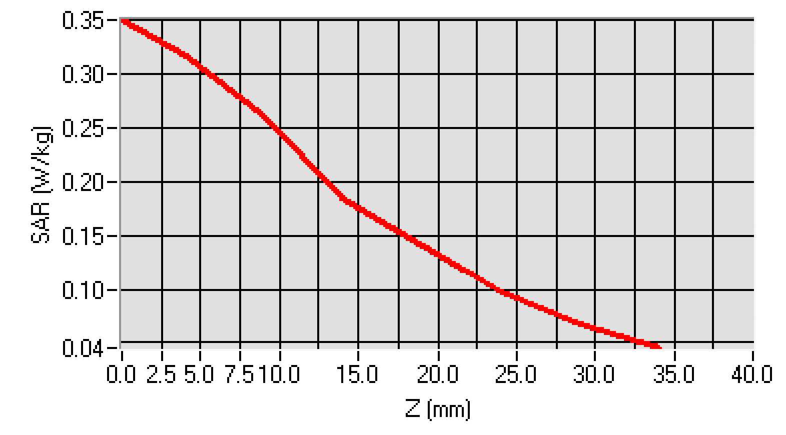
Frequency (MHz)	**1880.00**
Relative permitivity (real part)	**53.304667**
Conductivity (S/m)	**1.533095**
Variation (%)	**1.21**
Crest factor	**2**
Conversion Factor	**6.17**
Temperatures	**21.20° C**
Date	**2016-2-1**

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-4.00, Y=-3.00

SAR 10g (W/Kg)	**0.189224**
SAR 1g (W/Kg)	**0.307104**

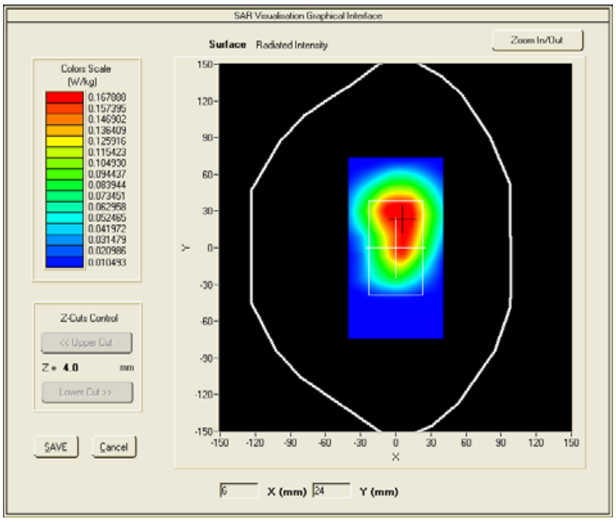
Z Axis Scan

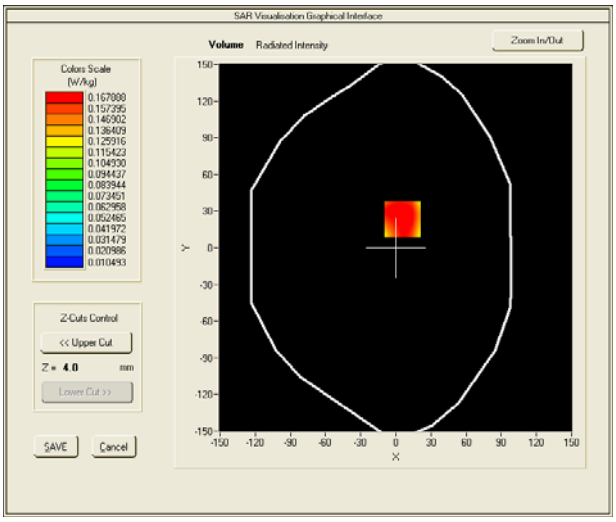

0.35
0.30
0.25
0.20
0.15
0.10
0.04
SAR [W/kg]
0.0
2.5
5.0
7.5
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Z [mm]

GSM1900 Back side Towards Body (GPRS 661)

Frequency (MHz)	**1880.00**
Relative permitivity (real part)	**53.304667**
Conductivity (S/m)	**1.533095**
Variation (%)	**1.49**
Crest factor	**2**
Conversion Factor	**6.17**
Temperatures	**21.20° C**
Date	**2016-2-1**

SURFACE SAR	VOLUME SAR

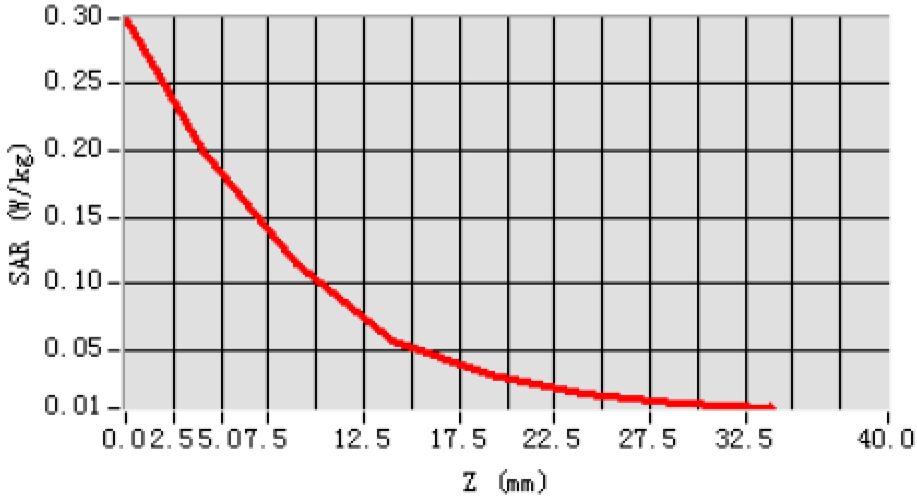




Maximum location: X=6.00, Y=24.00

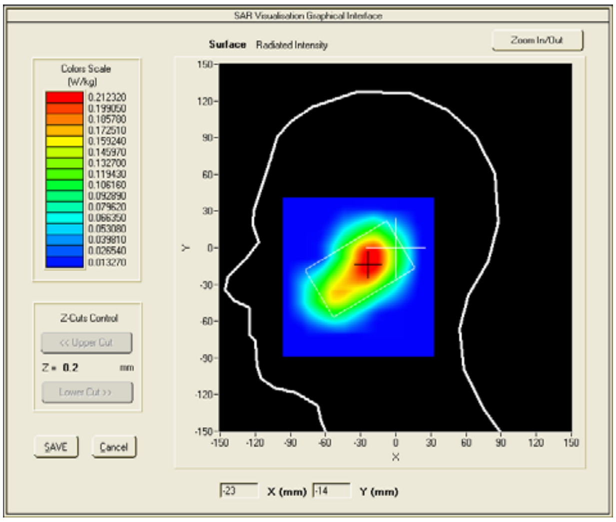
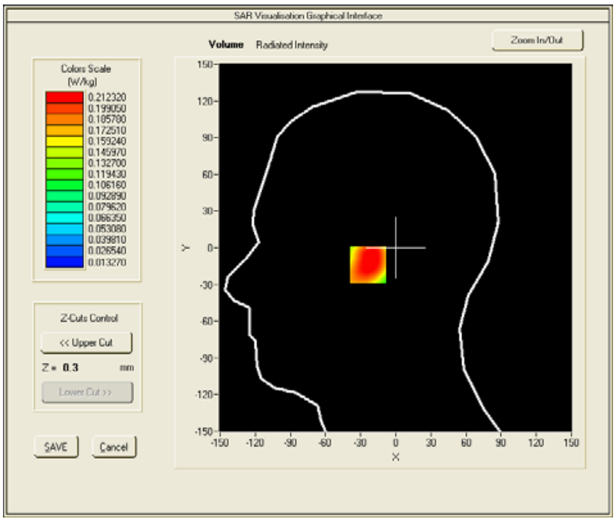
SAR 10g (W/Kg)	**0.158556**
SAR 1g (W/Kg)	**0.185783**

Z Axis Scan


SAR (W/kg)
0.30
0.25
0.20
0.15
0.10
0.05
0.01
0.0 2.5 5.0 7.5
12.5
17.5
22.5
27.5
32.5
40.0
Z (mm)

GSM1900 Right Side of Head Cheek/Touch (GSM661)

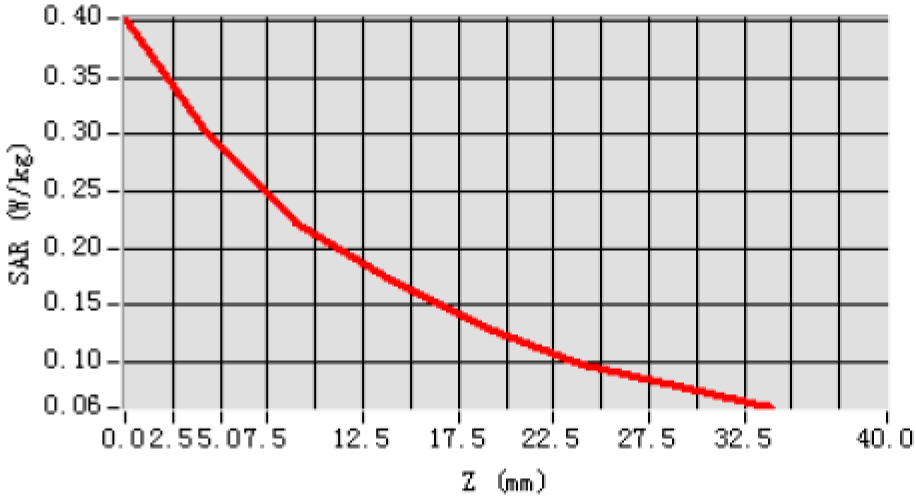
Frequency (MHz)	**1880.00**
Relative permitivity (real part)	**39.784543**
Conductivity (S/m)	**1.402145**
Variation (%)	**-0.45**
Crest factor	**8.3**
Conversion Factor	**6.00**
Temperatures	**22.80° C**
Date	**2016-2-2**

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-23.00, Y=-14.00

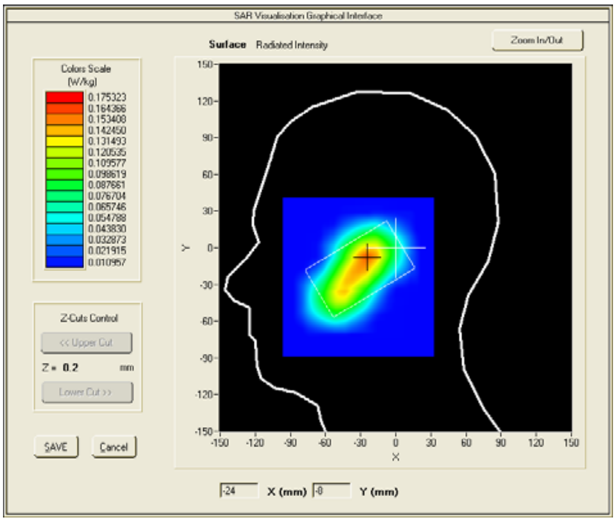
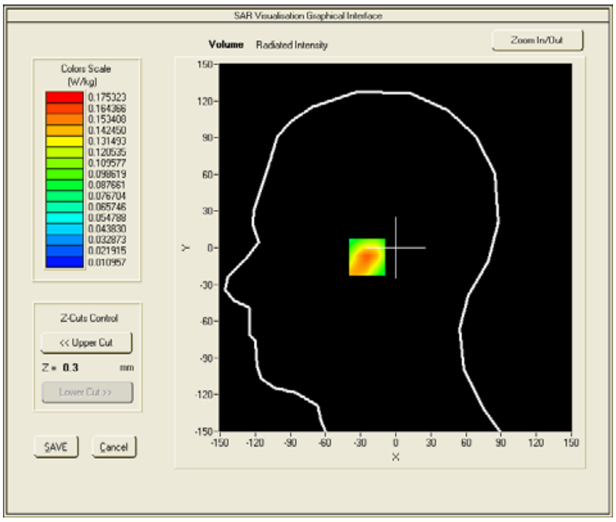
SAR 10g (W/Kg)	**0.212436**
SAR 1g (W/Kg)	**0.287629**

<u>Z Axis Scan</u>


0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.06
SAR (W/kg)
0.0
2.5
5.0
7.5
12.5
17.5
22.5
27.5
32.5
40.0
Z (mm)

GSM1900 Right Side of Head Ear/Tilt(GSM 661)

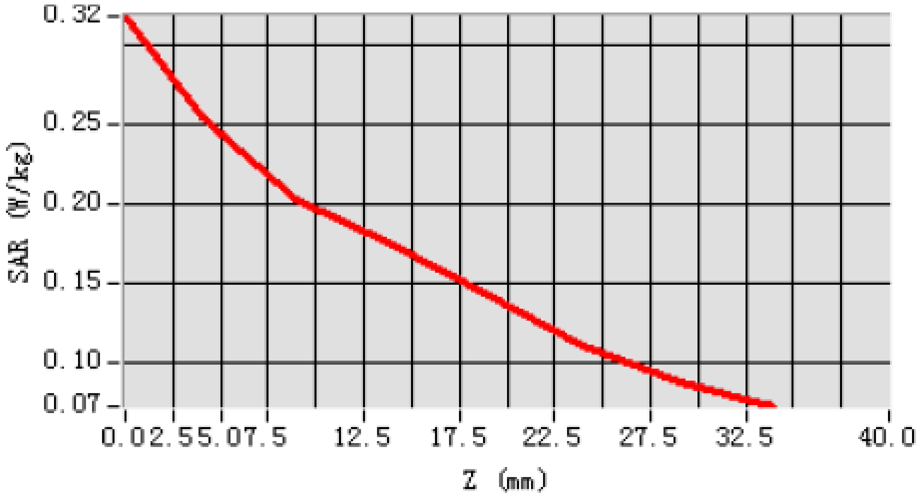
Frequency (MHz)	1880.00
Relative permitivity (real part)	39.784543
Conductivity (S/m)	1.402145
Variation (%)	-1.18
Crest factor	8.3
Conversion Factor	6.00
Temperatures	22.80° C
Date	2016-2-2

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-24.00, Y=8.00

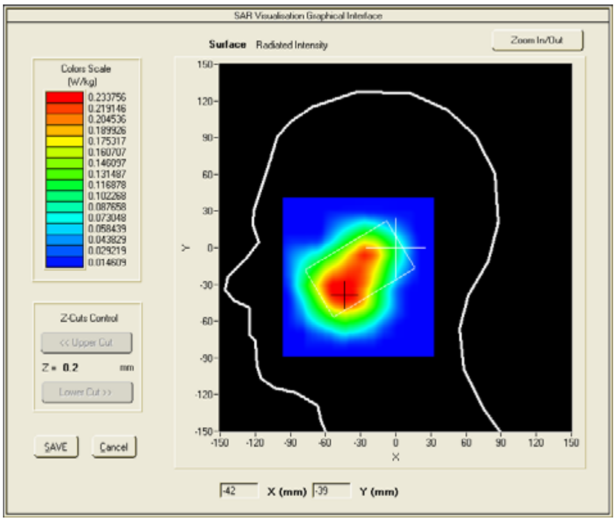
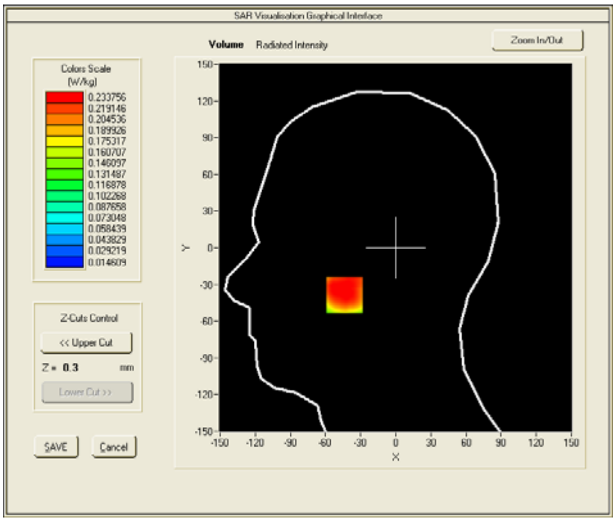
SAR 10g (W/Kg)	0.175489
SAR 1g (W/Kg)	0.247461

Z Axis Scan


0.32
0.25
0.20
0.15
0.10
0.07
SAR (W/kg)
0.0 2.5 5.0 7.5 12.5 17.5 22.5 27.5 32.5 40.0
Z (mm)

GSM1900 Left Side of Head/Touch (GSM661)

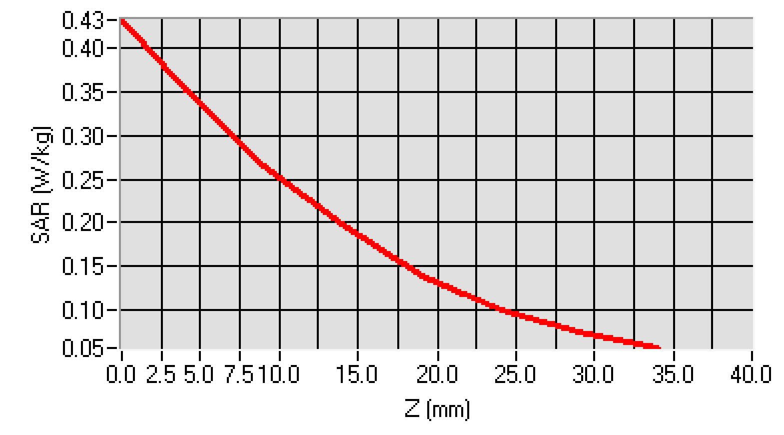
Frequency (MHz)	1880.00
Relative permitivity (real part)	39.784543
Conductivity (S/m)	1.402145
Variation (%)	0.75
Crest factor	8.3
Conversion Factor	6.00
Temperatures	22.80° C
Date	2016-2-2

SURFACE SAR	VOLUME SAR
	

Maximum location:X=-42.00, Y=-39.00

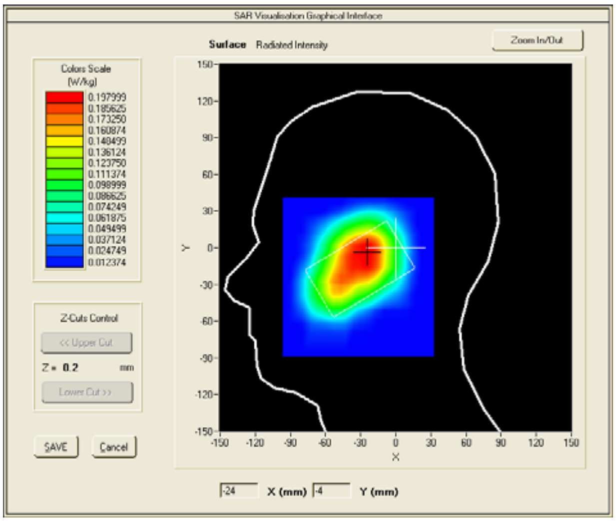
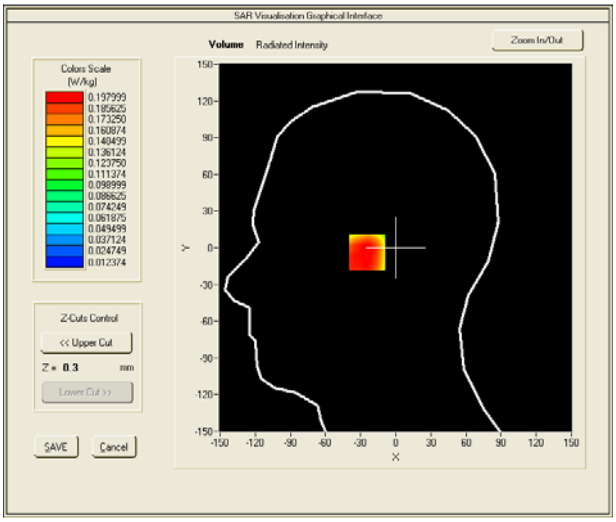
SAR 10g (W/Kg)	0.234226
SAR 1g (W/Kg)	0.337517

<u>Z Axis Scan</u>


0.43
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
SAR [W/kg]
0.0 2.5 5.0 7.5 10.0 15.0 20.0 25.0 30.0 35.0 40.0
Z [mm]

GSM1900 Left Side of Head Ear/Tilt (GSM 661)

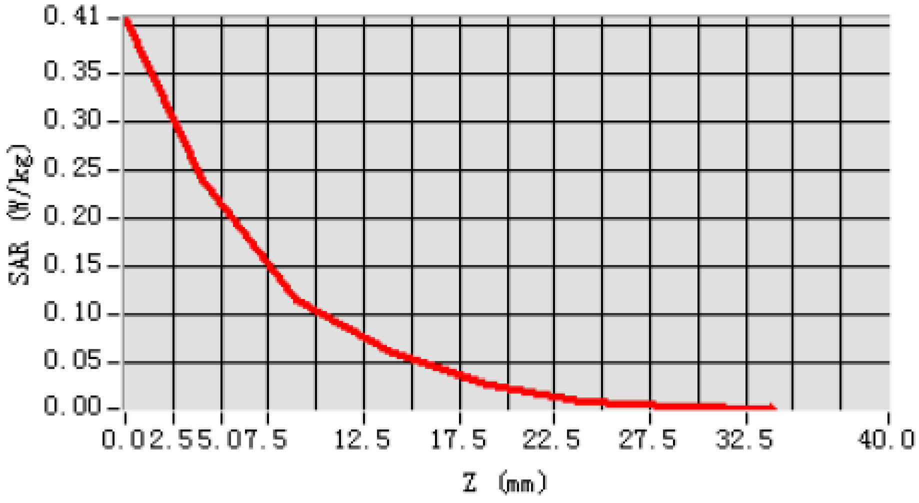
Frequency (MHz)	1880.00
Relative permitivity (real part)	39.784543
Conductivity (S/m)	1.402145
Variation (%)	1.43
Crest factor	8.3
Conversion Factor	6.00
Temperatures	22.80° C
Date	2016-2-2

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-24.00, Y=-4.00

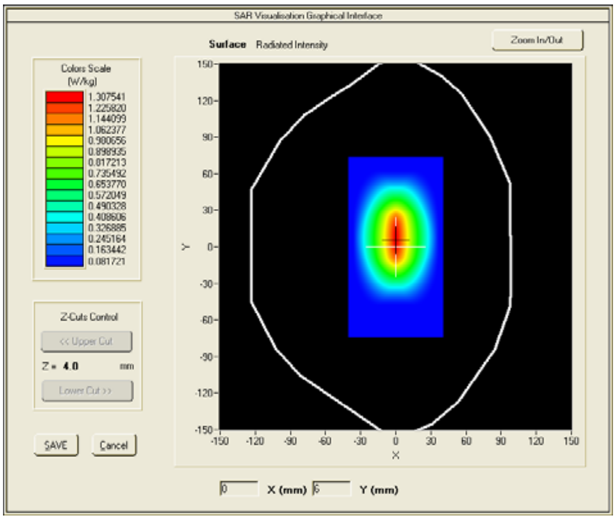
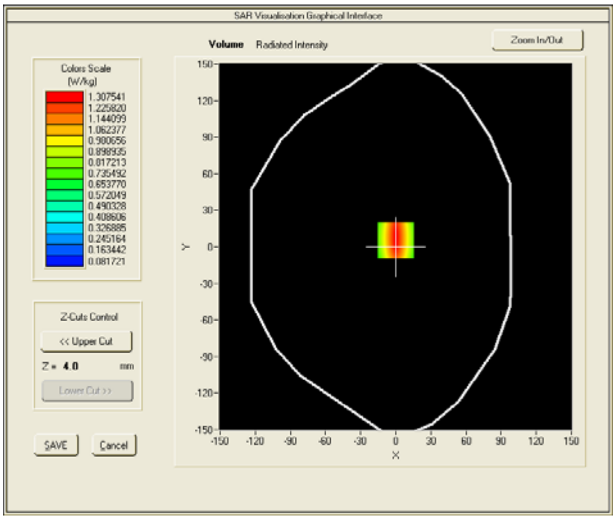
SAR 10g (W/Kg)	0.198520
SAR 1g (W/Kg)	0.241459

Z Axis Scan


SAR (W/kg)
0.41
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0 2.5 5.0 7.5 12.5 17.5 22.5 27.5 32.5 40.0
Z (mm)

System Performance Check Data(Body)835MHz

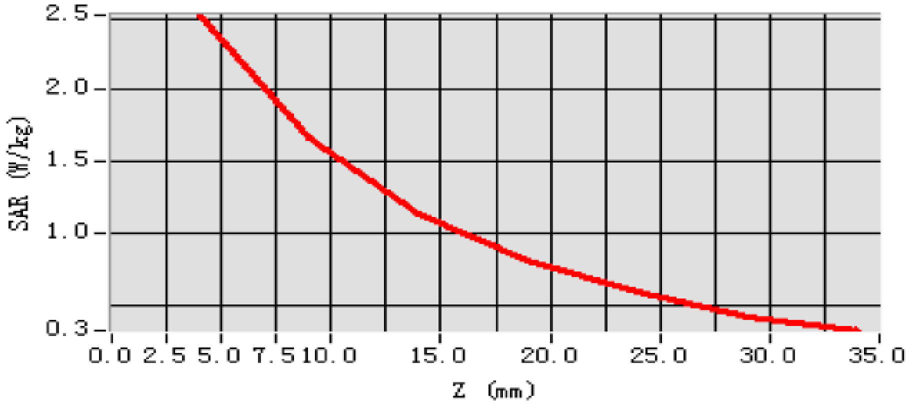
Frequency (MHz)	**835.00**
Relative permitivity (real part)	**55.570385**
Conductivity (S/m)	**0.983557**
Variation (%)	**-0.87**
Crest factor	**1**
Conversion Factor	**6.99**
Temperatures	**21.20° C**
Date	**2016-2-1**

SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=0.00

SAR 10g (W/Kg)	**1.307542**
SAR 1g (W/Kg)	**2.451337**

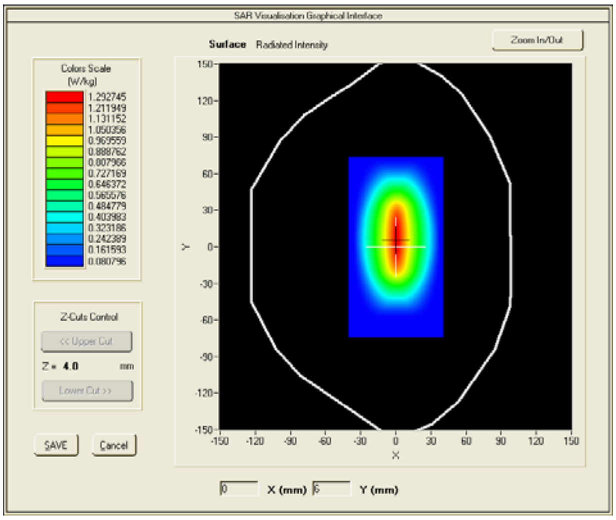
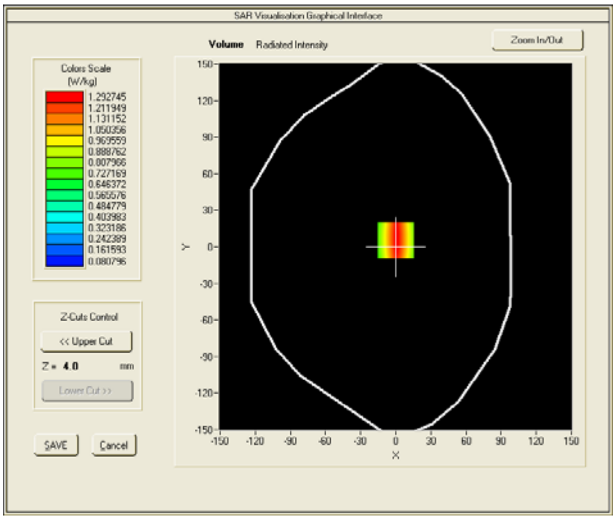
<u>Z Axis Scan</u>



2.5
2.0
1.5
1.0
0.3
SAR (W/kg)
0.0
2.5
5.0
7.5
10.0
15.0
20.0
25.0
30.0
35.0
Z (mm)

System Performance Check Data (Head)835MHz

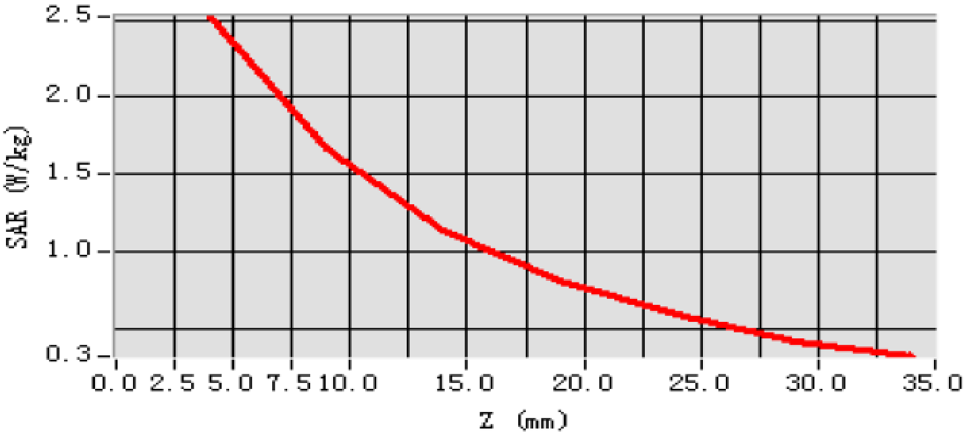
Frequency (MHz)	**835.00**
Relative permitivity (real part)	**41.261722**
Conductivity (S/m)	**0.922576**
Variation (%)	**1.20**
Crest factor	**1**
Conversion Factor	**6.73**
Temperatures	**22.80° C**
Date	**2016-2-2**

SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=6.00

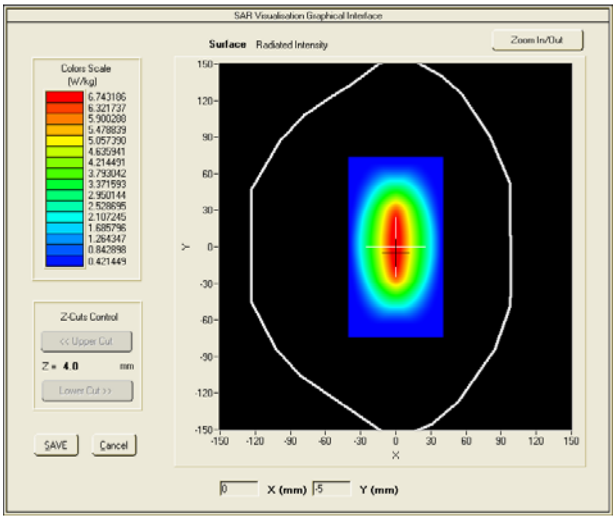
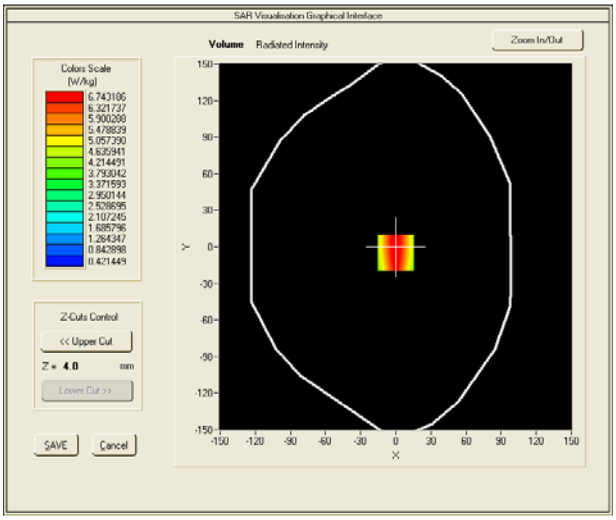
SAR 10g (W/Kg)	**1.292746**
SAR 1g (W/Kg)	**2.388761**

<u>Z Axis Scan</u>


2.5
2.0
1.5
1.0
0.3
SAR (W/kg)
0.0
2.5
5.0
7.5
10.0
15.0
20.0
25.0
30.0
35.0
Z (mm)

System Performance Check Data (Body)1900MHz

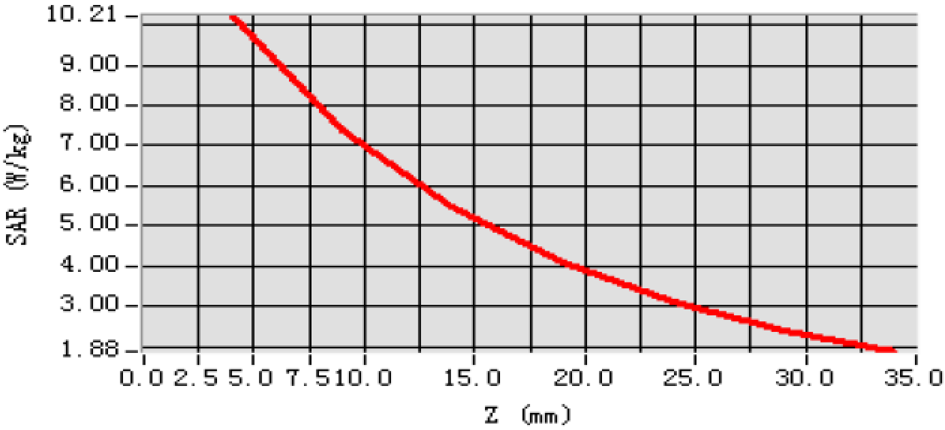
Frequency (MHz)	1900.00
Relative permitivity (real part)	53.304667
Conductivity (S/m)	1.533095
Variation (%)	-1.18
Crest factor	1
Conversion Factor	6.17
Temperatures	21.20° C
Date	2016-2-1

SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=-5.00

SAR 10g (W/Kg)	6.743187
SAR 1g (W/Kg)	9.998564

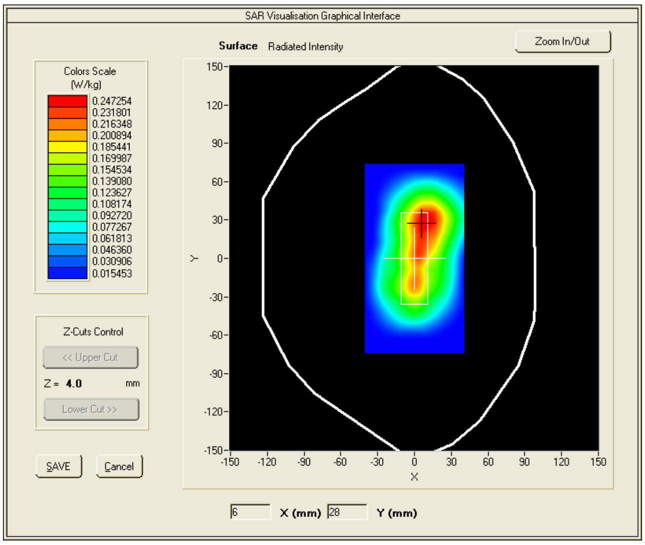
Z Axis Scan

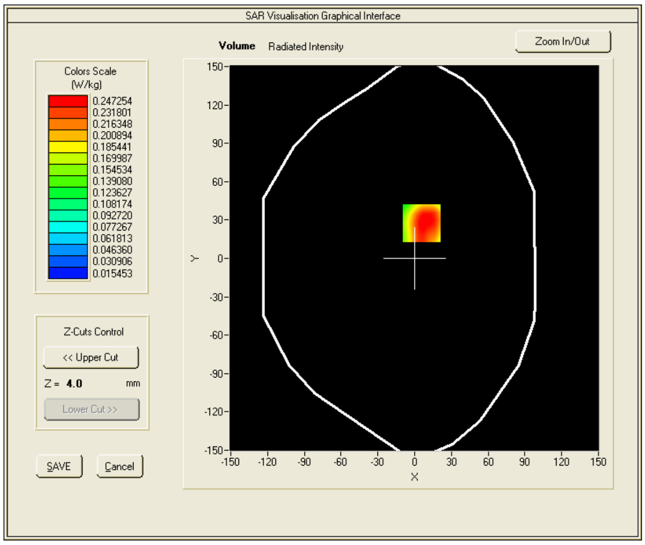

10.21
9.00
8.00
7.00
6.00
5.00
4.00
3.00
1.88
SAR (W/kg)
0.0 2.5 5.0 7.5 10.0 15.0 20.0 25.0 30.0 35.0
Z (mm)

System Performance Check Data (Head)1900MHz

Frequency (MHz)	**1900.00**
Relative permitivity (real part)	**39.784543**
Conductivity (S/m)	**1.402145**
Variation (%)	**0.68**
Crest factor	**1**
Conversion Factor	**6.00**
Temperatures	**22.80° C**
Date	**2016-2-2**

SURFACE SAR	VOLUME SAR

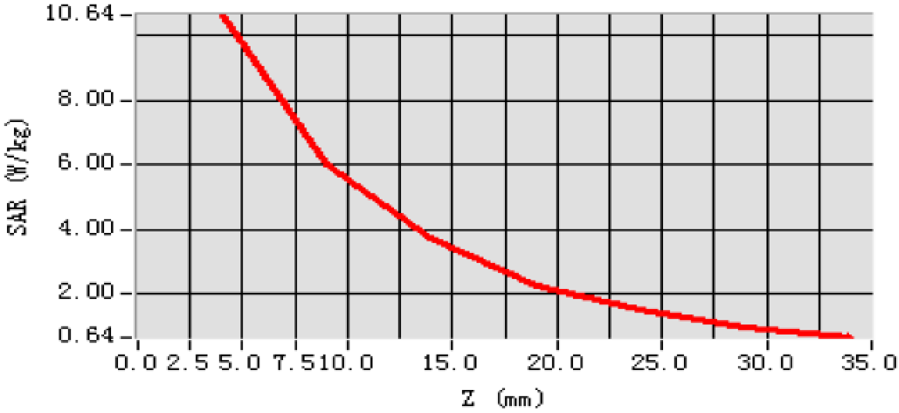




Maximum location:X=6.00, Y=28.00

SAR 10g (W/Kg)	**6.365483**
SAR 1g (W/Kg)	**9.781233**

Z Axis Scan



** END OF REPORT **