SAR Test Report

Report No.: AGC00148130301FH01

FCC ID	:	S73W100
APPLICATION PURPOSE		Original Equipment
PRODUCT DESIGNATION	:	GSM MOBILE PHONE
BRAND NAME	:	VIETTEL
MODEL NAME	:	W100
CLIENT	:	VIETTEL PERU S.A.C
DATE OF ISSUE	:	Mar.28, 2013
STANDARD(S)	:	FCC Oet65 Supplement C June 2001 IEEE Std. 1528-2003, 47CFR § 2.1093
REPORT VERSION	:	V1.0

Attestation of Global Compliance(Shenzhen) Co., Ltd.

CAUTION:
This report shall not be reproduced except in full without the written permission of the test laboratory and shall not be quoted out of context.

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Mar.28, 2013	Valid	Original Report

Test Report Certification

Applicant Name	VIETTEL PERU S.A.C
Applicant Address	Calle 21, 878 corpac, San Isidro, Lima, Peru
Manufacturer Name	GINWAVE MOBILE (HK) LIMITED
Manufacturer Address	ROOM 1701, 17/F., HENA BUILDING, 90 JAFFE ROAD, WANCHAI, HONGKONG
Product Designation	GSM MOBILE PHONE
Brand Name	VIETTEL
Model Name	W100
Different Description	N/A
EUT Voltage	DC3.7V by battery
Applicable Standard	FCC Oet65 Supplement C June 2001 IEEE Std. 1528-2003, 47CFR § 2.1093
Test Date	Mar.28, 2013
Test Results	MAX SAR MEASUREMENT(1g) Head: **0.569** W/Kg Body: **0.659**W/Kg (Maximum Scaling SAR =0.670 W/Kg)
Performed Location	Attestation of Global Compliance(Shenzhen) Co., Ltd.
	2 F, Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang Street, Bao'an District, Shenzhen, China
Report Template	AGCRT-US-2.5G1/SAR (2013-03-01)

Documented By Vivi Zeng

Vivi Zeng Mar.28, 2013

Checked By Angela Li

Angela Li Mar.28, 2013

Authorized By Solger Zhang

Solger Zhang Mar.28, 2013

TABLE OF CONTENTS

1. GENERAL INFORMATION 5

1.1. EUT DESCRIPTION 5
1.2. TEST PROCEDURE 7
1.3. TEST ENVIRONMENT 7

2. SAR MEASUREMENT SYSTEM 8

2.1. COMOSAR SYSTEM DESCRIPTION 8
2.2. COMOSAR E-FIELD PROBE 10
2.3. ROBOT 10
2.4. VIDEO POSITIONING SYSTEM 11
2.5. DEVICE HOLDER 11
2.6. SAM TWIN PHANTOM 12

3. TISSUE SIMULATING LIQUID 13

3.1. THE COMPOSITION OF THE TISSUE SIMULATING LIQUID 13
3.2. TISSUE CALIBRATION RESULT 14
3.3. TISSUE DIELECTRIC PARAMETERS FOR HEAD AND BODY PHANTOMS 15

4. SAR MEASUREMENT PROCEDURE 16

4.1. SAR SYSTEM VALIDATION 16
4.2. SAR MEASUREMENT PROCEDURE 18

5. SAR EXPOSURE LIMITS 19

6. TEST EQUIPMENT LIST 20

7. MEASUREMENT UNCERTAINTY 21

8. CONDUCTED POWER MEASUREMENT 22

9. TEST RESULTS 23

9.1. SAR TEST RESULTS SUMMARY 23

APPENDIX A. SAR SYSTEM VALIDATION DATA 28

APPENDIX B. SAR MEASUREMENT DATA 32

APPENDIX C. TEST SETUP PHOTOGRAPHS &EUT PHOTOGRAPHS 68

APPENDIX D. PROBE CALIBRATION DATA 79

APPENDIX E. DIPOLE CALIBRATION DATA 89

1. General Information

1.1. EUT Description

General Information	
Product Designation	GSM MOBILE PHONE
Test Model	W100
Hardware Version	P7
Software Version	N/A
Device Category	Portable
RF Exposure Environment	Uncontrolled
Antenna Type	Internal
GSM and GPRS	
Support Band	☒GSM 850 ☒PCS 1900 (U.S. Bands) ☒GSM 900 ☒DCS 1800 (Non-U.S. Bands)
GPRS Type	Class B
GPRS Class	Class 8,10 (1Tx+4Rx, 2Tx+3Rx)
TX Frequency Range	GSM 850 : 824.2~848.8MHz; PCS 1900: 1850.2~1909.8MHz;
RX Frequency Range	GSM 850 : 869~894MHz PCS 1900: 1930~1990MHz
Release Version	R99
Type of modulation	GMSK for GSM/GPRS
Antenna Gain	1.0dBi
Max. Output Power (Avg. Burst Power)	GSM850: 31.68dBm(32.60dBm-Peak Power) PCS1900: 28.47dBm(29.50dBm-Peak Power)
Max. Output Power (Radiated)	GSM850: 30.74dBm- ERP PCS1900: 28.34dBm- EIRP

Accessories	
Battery	Brand name: VIETTEL Model No. : W100 Voltage and Capacitance: 3.7 V &900mA
Adapter	Brand name: VIETTEL Model No. : W100 Input: AC 100-240V~500mA Output: DC 5V
Earphone	Brand name: VIETTEL Model No. : W100

Note: The sample used for testing is end product.

1.2. Test Procedure

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	EUT Communicate with CMU 200, and test them respectively at U.S. bands

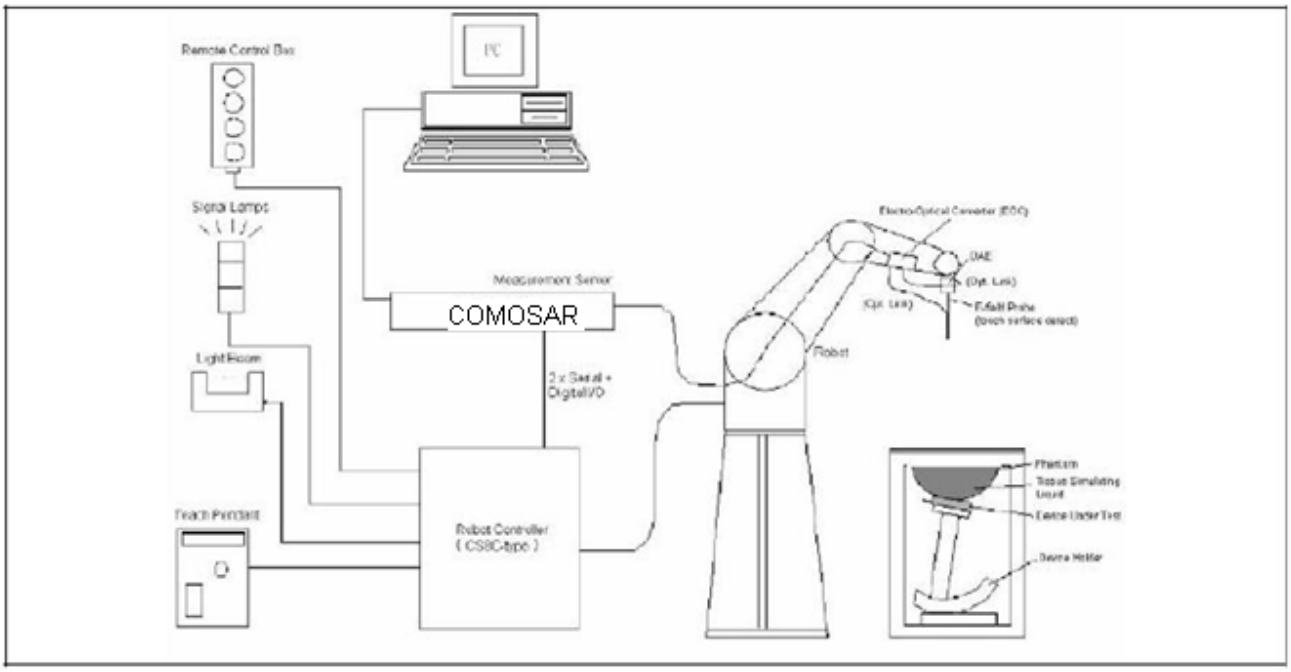
1.3. Test Environment

Ambient conditions in the laboratory:

Items	Required	Actual
Temperature (°C)	18-25	21± 2
Humidity (%RH)	30-70	55±2

2. SAR Measurement System

2.1. COMOSAR System Description



The COMOSAR system for performing compliance tests consists of the following items:

A standard high precision 6-axis robot with controller, teach pendant and software.

An arm extension for accommodating the data acquisition electronics (DAE).

A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection,
collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital Communicate Mobile to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.

The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.

A computer running WinXP and the Opensar software.

Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.

The phantom, the device holder and other accessories according to the targeted measurement.

2.1.1. Applications

Predefined procedures and evaluations for automated compliance testing with all worldwide standards, e.g., IEEE 1528, OET 65, IEC 62209-1, IEC 62209-2, EN 50360, EN 50383 and others.

2.1.2. Area Scans

Area scans are defined prior to the measurement process being executed with a user
defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm² step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.
When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2003, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan).

2.1.3. Zoom Scan (Cube Scan Averaging)

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. A density of 1000 kg/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.
The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 7x7x7 (5mmx5mmx5mm) providing a volume of 30mm in the X & Y axis, and 30mm in the Z axis.

2.1.4. Uncertainty of Inter-/Extrapolation and Averaging

In order to evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Post processor, COMOSAR allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEEE 1528.The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x,y,z) = Ae^{-\frac{z}{2a}} \cos^2\left(\frac{\pi}{2}\frac{\sqrt{x'^2+y'^2}}{5a}\right)$$

$$f_2(x,y,z) = Ae^{-\frac{z}{a}} \frac{a^2}{a^2+x'^2}\left(3-e^{-\frac{2z}{a}}\right)\cos^2\left(\frac{\pi}{2}\frac{y'}{3a}\right)$$

$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4}+x'^2+y'^2}\left(e^{-\frac{2z}{a}}+\frac{a^2}{2(a+2z)^2}\right)$$

2.2. COMOSAR E-Field Probe

The SAR measurement is conducted with the dissymmetric probe manufactured by SPEAG.
The probe is specially designed and calibrated for use in liquid with high permittivity. The dissymmetric probe has special calibration in liquid at different frequency.
SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN62209-1, IEC 62209, etc.) Under ISO17025. The calibration data are in Appendix D.

2.2.1. Isotropic E-Field Probe Specification

Model	EP159	
Manufacture	Satimo	
frequency	0.3 GHz-3 GHz Linearity:±0.2dB(300 MHz-3 GHz)	
Dynamic Range	0.01W/Kg-100W/Kg Linearity:±0.2dB	
Dimensions	Overall length:330mm Length of individual dipoles:4.5mm Maximum external diameter:8mm Probe Tip external diameter:5mm Distance between dipoles/ probe extremity:2.7mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 3 GHz with precision of better 30%.	

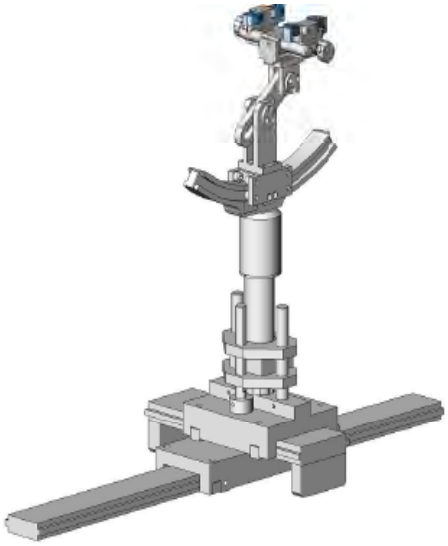
2.3. Robot

The COMOSAR system uses the high precision robots TX90 XL type out of the newer series from Satimo SA (France).For the 6-axis controller COMOSAR system, the KUKA robot controller version from Satimo is used. The XL robot series have many features that are important for our application: High precision (repeatability 0.02 mm) High reliability (industrial design) Jerk-free straight movements Low ELF interference (the closed metallic construction shields against motor control fields) 6-axis controller	

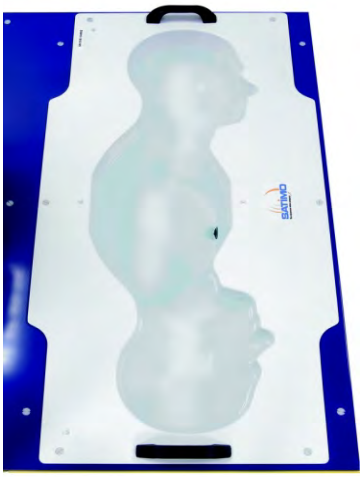
2.4. Video Positioning System

The video positioning system is used in OpenSAR to check the probe. Which is composed of a camera, LED, mirror and mechanical parts. The camera is piloted by the main computer with firewire link. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip. The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.	

2.5. Device Holder

The COMOSAR device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR). Thus the device needs no repositioning when changing the angles. The COMOSAR device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity εr =3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.	

2.6. SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas: Left head Right head Flat phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

3. Tissue Simulating Liquid

3.1. The composition of the tissue simulating liquid

Ingredient	850MHz	850MHz	1900MHz	1900MHz
(% Weight)	Head	Body	Head	Body
Water	40.45	52.4	54.90	40.5
Salt	1.42	1.40	0.18	0.50
Sugar	57.6	45.0	0.00	58.0
HEC	0.40	1.00	0.00	0.50
Preventol	0.10	0.20	0.00	0.50
DGBE	0.00	0.00	44.92	0.00

3.2. Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using COMOSAR Dielectric Probe Kit and R&S Network Analyzer ZVL6 .

Tissue Stimulant Measurement for GSM 850					
Frequency (MHz)	**Parts**	**Description**	**Dielectric Parameters**		**Tissue Temp [°C]**
850MHz	Head	Reference result ±5% window	εr 41.50 39.425-43.575	δ[s/m] 0.90 0.855-0.945	N/A
		Mar.28, 2013	41.33	0.91	21
850MHz	Body	Reference result ±5% window	εr 55.20 52.44-57.96	δ[s/m] 0.97 0.9215-1.0185	N/A
		Mar.28, 2013	53.72	0.99	21

Tissue Stimulant Measurement for PCS 1900					
Frequency (MHz)	**Parts**	**Description**	**Dielectric Parameters**		**Tissue Temp [°C]**
1900MHz	Head	Reference result ±5% window	εr 40.00 38.00-42.00	δ[s/m] 1.40 1.33-1.47	N/A
		Mar.28, 2013	40.12	1.38	21
1900MHz	Body	Reference result ±5% window	εr 53.30 50.635-55.965	δ[s/m] 1.52 1.444-1.596	N/A
		Mar.28, 2013	52.45	1.53	21

3.3. Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

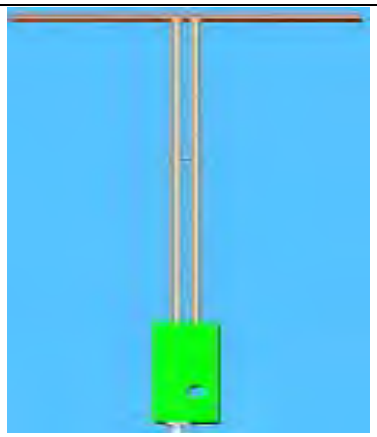
Target Frequency (MHz)	**head**		**body**	
	εr	**σ (S/m)**	**εr**	**σ (S/m)**
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
850	**41.5**	**0.90**	**55.2**	**0.97**
900	41.5	0.97	55.0	1.05
915	41.5	1.01	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	**40.0**	**1.40**	**53.3**	**1.52**
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(εr = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)

4. SAR Measurement Procedure

4.1. SAR System Validation

4.1.1. Validation Dipoles

	The dipoles used is 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)
900 MHz	149.0	83.3	3.6
1900MHz	68	39.5	3.6

4.1.2. Validation Result

System Performance Check at 850 MHz &1900MHz for Head				
Validation Kit: SN 46/11DIP 0G900-185				
Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp.[°C]
850 MHz	Reference result ± 10% window	10.9 9.81 to 11.99	6.99 6.29 to 7.69	N/A
	Mar.28, 2013	11.28	6.92	21.0
Validation Kit: SN 46/11DIP 1G900-187				
Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp.[°C]
1900 MHz	Reference result ± 10% window	39.7 35.73 to 43.67	20.5 18.45 to 22.55	N/A
	Mar.28, 2013	41.51	21.32	21.0
Note: All SAR values are normalized to 1W forward power.				

4.2. SAR Measurement Procedure

The COMOSAR calculates SAR using the following equation,

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

σ: represents the simulated tissue conductivity
ρ: represents the tissue density

The EUT is set to transmit at the required power in line with product specification, at each frequency relating to the LOW, MID, and HIGH channel settings.

Pre-scans are made on the device to establish the location for the transmitting antenna, using a large area scan in either air or tissue simulation fluid.

The EUT is placed against the Universal Phantom where the maximum area scan dimensions are larger than the physical size of the resonating antenna. When the scan size is not large enough to cover the peak SAR distribution, it is modified by either extending the area scan size in both the X and Y directions, or the device is shifted within the predefined area.

The area scan is then run to establish the peak SAR location (interpolated resolution set at $1mm^2$) which is then used to orient the center of the zoom scan. The zoom scan is then executed and the 1g and 10g averages are derived from the zoom scan volume (interpolated resolution set at $1mm^3$).

When multiple peak SAR location were found during the same configuration or test mode, Zoom scan shall performed on each peak SAR location, only the peak point with maximum SAR value will be reported for the configuration or test mode.

5. SAR Exposure Limits

SAR assessments have been made in line with the requirements of IEEE-1528, FCC Supplement C, and comply with ANSI/IEEE C95.1-1992 “Uncontrolled Environments” limits. These limits apply to a location which is deemed as “Uncontrolled Environment” which can be described as a situation where the general public may be exposed to an RF source with no prior knowledge or control over their exposure.

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

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (1g cube tissue for brain or body)	1.60 W/kg

6. Test Equipment List

Equipment description	Manufacturer/Model	Identification No.	Current calibration date	Next calibration date
SAR Probe	Satimo	SN 22/12 EP159	12/11/2012	12/10/2013
Phantom	Satimo	SN_4511_SAM90	Validated. No cal required.	Validated. No cal required.
Liquid	Satimo	-	Validated. No cal required.	Validated. No cal required.
Comm Tester	R&S - CMU200	069Y7-158-13-712	02/28/2013	02/27/2014
Comm Tester	Agilent-8960	GB46310822	10/22/2012	10/21/2013
Multimeter	Keithley 2000	1188656	02/28/2013	02/27/2014
Dipole	Satimo SID900	SN46/11 DIP 0G900-185	12/09/2011	12/08/2013
Dipole	Satimo SID1900	SN46/11 DIP 1G900-187	12/09/2011	12/08/2013
Amplifier	Aethercomm	SN 046	12/08/2012	12/07/2013
Signal Generator	Agilent-E4421B	MY43351603	5/29/2012	5/28/2013
Power Meter	HP E4418A	US38261498	02/28/2013	02/27/2014
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/28/2013	02/27/2014

Note: Per KDB 50824 Dipole SAR Validation Verification, AGC Lab has adopted 3 years calibration intervals. On annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:
1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss is within 20% of calibrated measurement;
4. Impedance is within 5Ω of calibrated measurement.

7. Measurement Uncertainty

Satimo Uncertainty Measurement uncertainty for 300 MHz to 6 GHz averaged over 1 gram / 10 gram.									
Error Description	Sec	Tol (±%)	Prob. Dist.	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g) (±%)	Std. Unc. (10g)(± %)	(Vi) Veff
Measurement System									
Probe Calibration	E.2.1	6	N	1	1	1	6	6	∞
Axial Isotropy	E.2.2	3	R	$\sqrt{3}$	$(1-c_p)^{1/2}$	$(1-c_p)^{1/2}$	1.22474	1.22474	∞
Hemispherical Isotropy	E.2.2	5	R	$\sqrt{3}$	$\sqrt{C_p}$	$\sqrt{C_p}$	2.04124	2.04124	∞
Boundary Effects	E.2.3	1	R	$\sqrt{3}$	1	1	0.57735	0.57735	∞
Linearity	E.2.4	5	R	$\sqrt{3}$	1	1	2.88675	2.88675	∞
System Detection Limits	E.2.5	1	R	$\sqrt{3}$	1	1	0.57735	0.57735	∞
Readout Electronics	E.2.6	0.5	N	1	1	1	0.5	0.5	∞
Response Time	E.2.7	0.2	R	$\sqrt{3}$	1	1	0.11547	0.11547	∞
Integration Time	E.2.8	2	R	$\sqrt{3}$	1	1	1.1547	1.1547	∞
RF Ambient Noise	E.6.1	3	R	$\sqrt{3}$	1	1	1.73205	1.73205	∞
Probe Positioner Mechanical Tolerance	E.6.2	2	R	$\sqrt{3}$	1	1	1.1547	1.1547	∞
Probe Positioning with Respect to Phantom Shell	E.6..3	1	R	$\sqrt{3}$	1	1	0.57735	0.57735	∞
Extrapolation,interpolation and Integration Algorithms for Max. SAR Evaluation	E.5.2	1.5	R	$\sqrt{3}$	1	1	0.86603	0.86603	∞
Dipole									
Device Positioning	8,E.4.2	1	N	$\sqrt{3}$	1	1	0.57735	0.57735	N-1
Power Drift	8.6.6.2	2	R	$\sqrt{3}$	1	1	1.1547	1.1547	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4	R	$\sqrt{3}$	1	1	2.3094	2.3094	∞
Liquid Conductivity (target)	E.3.2	5	R	$\sqrt{3}$	0.64	0.43	1.84752	1.2413	∞
Liquid Conductivity (meas.)	E.3.3	2.5	N	1	0.64	0.43	1.6	1.075	∞
Liquid Permittivity (target)	E.3.2	3	R	$\sqrt{3}$	0.6	0.49	1.03923	0.8487	∞
Liquid Permittivity (meas.)	E.3.3	2.5	N	1	0.6	0.49	1.5	1.225	M
Combined Standard Uncertainty			RSS				8.09272	7.9296	
Expanded Uncertainty (95%CONFIDENCE INTERVAL)			k				16.18544	15.8592	

8. Conducted Power Measurement

Mode	Frequency(MHz)	Peak Power(dBm)	Avg. Burst Power(dBm)	Duty cycle Factor(dBm)	Frame Power(dBm)
Maximum Power <1>					
GSM 850	824.2	32.55	31.62	-9	22.62
	836.6	32.46	31.54	-9	22.54
	848.8	**32.60**	**31.68**	-9	22.68
GPRS 850 （1 Slot）	824.2	32.41	31.49	-9	22.49
	836.6	32.30	31.38	-9	22.38
	848.8	32.45	31.59	-9	22.59
GPRS 850 （2 Slot）	824.2	29.49	28.55	-6	22.55
	836.6	29.43	28.48	-6	22.48
	848.8	29.61	28.66	-6	22.66
PCS1900	1850.2	29.38	28.36	-9	19.36
	1880	**29.50**	**28.47**	-9	19.47
	1909.8	29.47	28.44	-9	19.44
GPRS1900 （1 Slot）	1850.2	29.30	28.35	-9	19.35
	1880	29.37	28.36	-9	19.36
	1909.8	29.33	28.31	-9	19.31
GPRS1900 （2 Slot）	1850.2	26.50	25.36	-6	19.36
	1880	26.37	25.27	-6	19.27
	1909.8	26.34	25.44	-6	19.44
Maximum Power <2>					
GSM 850	824.2	32.38	31.57	-9	22.57
PCS1900	1880	29.41	28.30	-9	19.30

Note 1:
The Frame Power (Source-based time-averaged Power) is scaled the maximum burst average power based on time slots. The calculated methods are show as following:
Frame Power = Max burst power (1 Up Slot) – 9 dB
Frame Power = Max burst power (2 Up Slot) – 6 dB

9. Test Results

9.1. SAR Test Results Summary

9.1.1. Test position and configuration

Head SAR was performed with the device configured in the positions according to IEEE1528,
and Body SAR was performed with the device 15mm from the phantom. Body SAR was also performed with the headset attached and without.

9.1.2. Body SAR with Headset

Testing with the headset was performed at the position and channels that resulted in the highest body SAR. This testing was performed with GPRS transmitting with 2 uplink timeslots. This operation mode represents the maximum SAR situation, when downloading data via GPRS and listening to music by headset. SAR without the headset attached was significantly higher than with the headset, and also was verified several times and confirmed, so the final test data shown were the worst case without headset. In the Body SAR test result table, body-worn means display of device down, body-front means display of device up.

9.1.3. Operation Mode

This is a multi-slot class 10 device capable of 2 uplink timeslots. During the head SAR test, the device was transmitting with maximum 1 uplink timeslot; during the body SAR test, it was transmitting with maximum 2 uplink timeslots. Additionally, this device doesn’t support dual transfer mode (DTM).

9.1.4. Test Result

SAR MEASUREMENT								
Ambient Temperature (°C) : 21 ± 2						Relative Humidity (%): 55		
Liquid Temperature (°C) : 21 ± 2						Depth of Liquid (cm):>15		
Product: GSM MOBILE PHONE								
Test Mode: GSM850 with GMSK modulation								
Configuration			Antenna Position	Frequency		Power Drift (<±5%)	SAR (1g) (W/kg)	Limit (W/kg)
SIM	Position	Status		channel	MHz			
<1>	Left Head	Cheek	Fixed	128	824.2	--	--	--
				190	836.6	2.36	0.179	1.6
				251	848.8	--	--	--
		Tilted	Fixed	128	824.2	--	--	--
				190	836.6	1.02	0.100	1.6
				251	848.8	--	--	--
	Right Head	Cheek	Fixed	128	824.2	--	--	--
				190	836.6	-2.69	**0.211**	1.6
				251	848.8	--	--	--
		Tilted	Fixed	128	824.2	--	--	--
				190	836.6	1.41	0.109	1.6
				251	848.8	--	--	--
<2>	Right	Cheek	Fixed	190	836.6	0.85	0.200	1.6
Note: when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. refer to KDB 941225.								

SAR MEASUREMENT								
Ambient Temperature (°C) : 21 ± 2						Relative Humidity (%): 55		
Liquid Temperature (°C) : 21 ± 2						Depth of Liquid (cm):>15		
Product: GSM MOBILE PHONE								
Test Mode: GSM850 with GMSK modulation								
Configuration			Antenna Position	Frequency		Power Drift (<±5%)	SAR (1g) (W/kg)	Limit (W/kg)
SIM	Position	Status		channel	MHz			
<1>	Body back	MS	Fixed	128	824.2	--	--	--
				190	836.6	2.33	**0.226**	1.6
				251	848.8	--	--	--
		GPRS 2 TS	Fixed	128	824.2	--	--	--
				190	836.6	-0.85	0.138	1.6
				251	848.8	--	--	--
	Body Front	MS	Fixed	128	824.2	--	--	--
				190	836.6	1.02	0.136	1.6
				251	848.8	--	--	--
	Body back	MS with Earphone	Fixed	128	824.2	--	--	--
				190	836.6	0.08	0.173	1.6
				251	848.8	--	--	--
Note: when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. refer to KDB 941225.								

SAR MEASUREMENT								
Ambient Temperature (°C) : 21 ± 2						Relative Humidity (%): 55		
Liquid Temperature (°C) : 21 ± 2						Depth of Liquid (cm):>15		
Product: GSM MOBILE PHONE								
Test Mode: PCS1900 with GMSK modulation								
Configuration			Antenna Position	Frequency		Power Drift (<±5%)	SAR (1g) (W/kg)	Limit (W/kg)
SIM	Position	Status		channel	MHz			
<1>	Left Head	Cheek	Fixed	512	1850.2	--	--	--
				661	1880.0	1.65	**0.569**	1.6
				810	1909.8	--	--	--
		Tilted	Fixed	512	1850.2	--	--	--
				661	1880.0	-2.12	0.486	1.6
				810	1909.8	--	--	--
	Right Head	Cheek	Fixed	512	1850.2	--	--	--
				661	1880.0	0.36	0.548	1.6
				810	1909.8	--	--	--
		Tilted	Fixed	512	1850.2	--	--	--
				661	1880.0	0.84	0.413	1.6
				810	1909.8	--	--	--
<2>	Left	Cheek	Fixed	661	1880.0	-2.94	0.545	1.6
Note: when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. refer to KDB 941225.								

SAR MEASUREMENT								
Ambient Temperature (°C) : 21 ± 2						Relative Humidity (%): 55		
Liquid Temperature (°C) : 21 ± 2						Depth of Liquid (cm):>15		
Product: GSM MOBILE PHONE								
Test Mode: PCS1900 with GMSK modulation								
Configuration			Antenna Position	Frequency		Power Drift (<±5%)	SAR (1g) (W/kg)	Limit (W/kg)
SIM	Position	Status		channel	MHz			
<1>	Body Back	MS	Fixed	512	1850.2	--	--	--
				661	1880.0	-2.02	**0.659**	1.6
				810	1909.8	--	--	--
		GPRS 2 TS	Fixed	512	1850.2	--	--	--
				661	1880.0	1.34	0.423	1.6
				810	1909.8	--	--	--
	Body front	MS	Fixed	512	1850.2	--	--	--
				661	1880.0	-1.52	0.357	1.6
				810	1909.8	--	--	--
	Body Back	MS with Earphone	Fixed	512	1850.2	--	--	--
				661	1880.0	0.85	0.597	1.6
				810	1909.8	--	--	--
Note: when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. refer to KDB 941225.								

Appendix A. SAR System Validation Data

Test Laboratory: AGC Lab **Date: Mar.28, 2013**

System Check Head 850 MHz

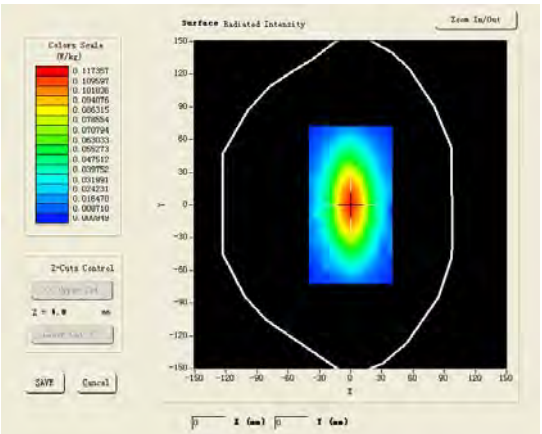
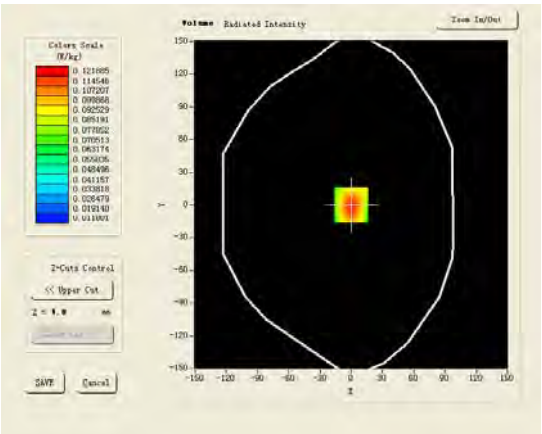
DUT: Dipole 900 MHz Type: SID 900

Communication System CW; Communication System Band: D850 (850.0 MHz); Duty Cycle: 1:1; Conv.F=6.05
Frequency: 850 MHz; Medium parameters used: f = 850 MHz; σ =0.91 mho/m; ε r =41.33; ρ = 1000 kg/m^3 ;
Phantom section: Flat Section; Input Power=10dBm
Ambient temperature (℃): 21, Liquid temperature (℃): 21

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

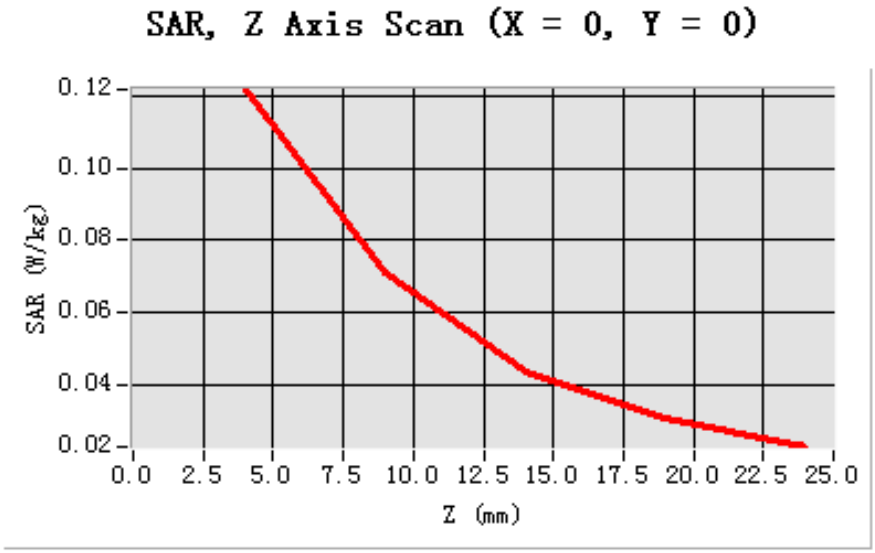
Configuration/System Check GSM 850 Head/Area Scan: Measurement grid: dx=8mm,dy=8mm
Configuration/System Check GSM 850 Head/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm

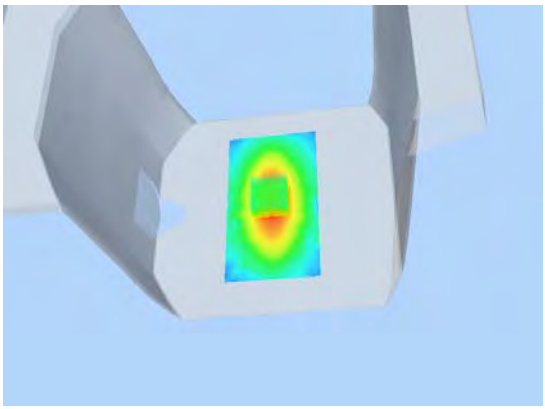
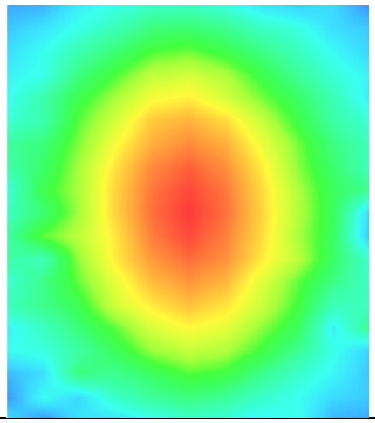
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	0.069213
SAR 1g (W/Kg)	0.112845

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.1215	0.0712	0.0450	0.0311

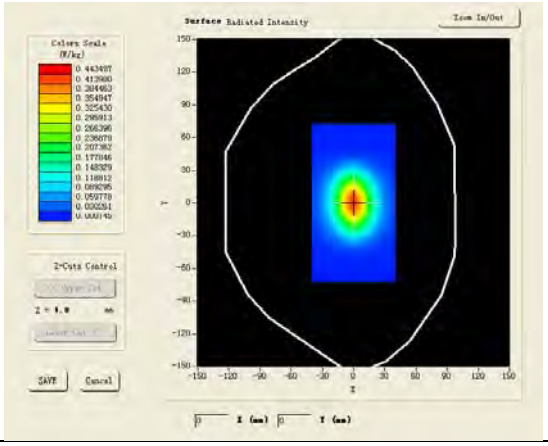
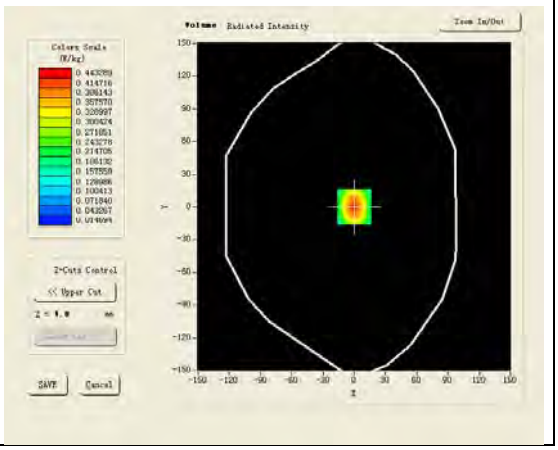


3D screen shot	Hot spot position
	

Test Laboratory: AGC Lab **Date: Mar.28, 2013**
System Check Head 1900MHz
DUT: Dipole 1900 MHz; Type: SID 1900
Communication System: CW; Communication System Band: D1900 (1900.0 MHz); Duty Cycle:1:1; Conv.F=5.73
Frequency: 1900 MHz; Medium parameters used: f = 1900 MHz; σ =1.38 mho/m; ε r =40.12; ρ = 1000 kg/m^3 ;
Phantom section: Flat Section; Input Power=10dBm
Ambient temperature (℃): 21, Liquid temperature (℃): 21

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

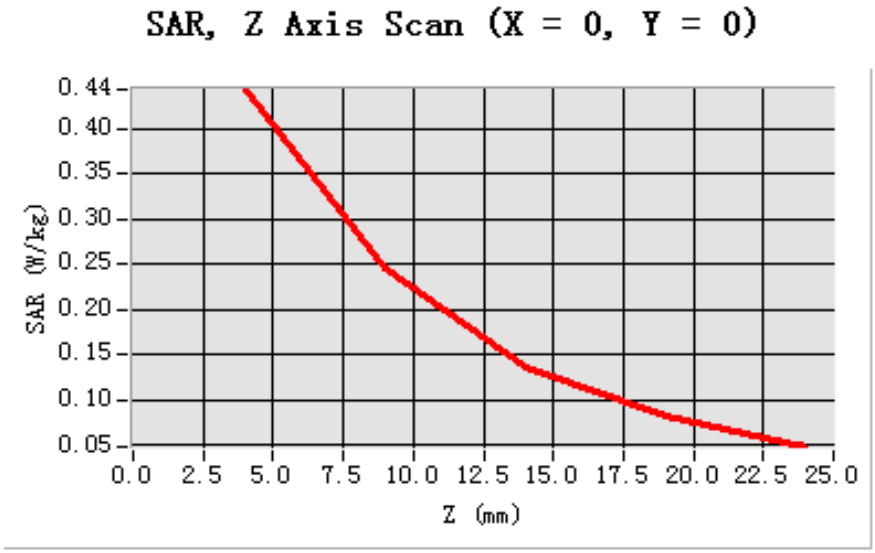
Configuration/System Check PCS1900 Head/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/System Check PCS1900 Head/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm

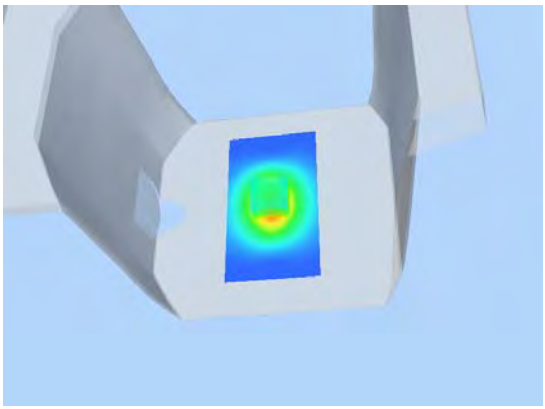
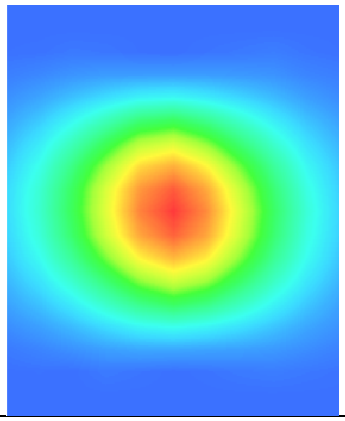
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	0.213237
SAR 1g (W/Kg)	0.415111

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.44238	0.2441	0.1349	0.0810



3D screen shot	Hot spot position
	

Appendix B. SAR measurement Data

Test Laboratory: AGC Lab **Date: Mar.28, 2013**
GSM 850 Mid-Touch-Left <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

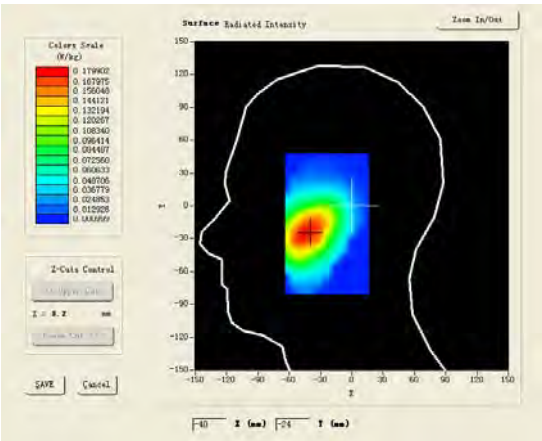
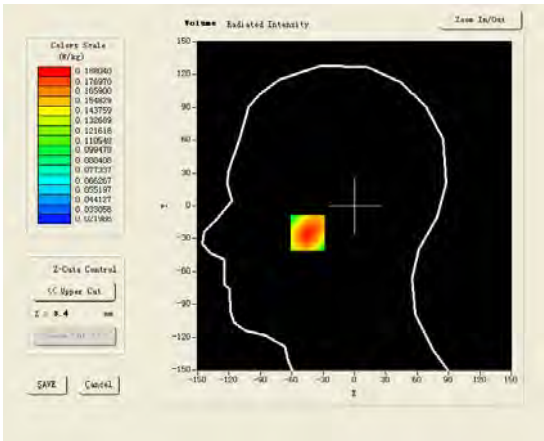
Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=6.05
Frequency: 836.6 MHz; Medium parameters used: f = 850 MHz; σ =0.91 mho/m; ε r =41.33; ρ = 1000 kg/m^3 ;
Phantom section: Left Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/GSM 850 Mid-Touch-Left/Area Scan (6x8x1): Measurement grid: dx=20mm, dy=20mm
Configuration/GSM 850 Mid-Touch-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

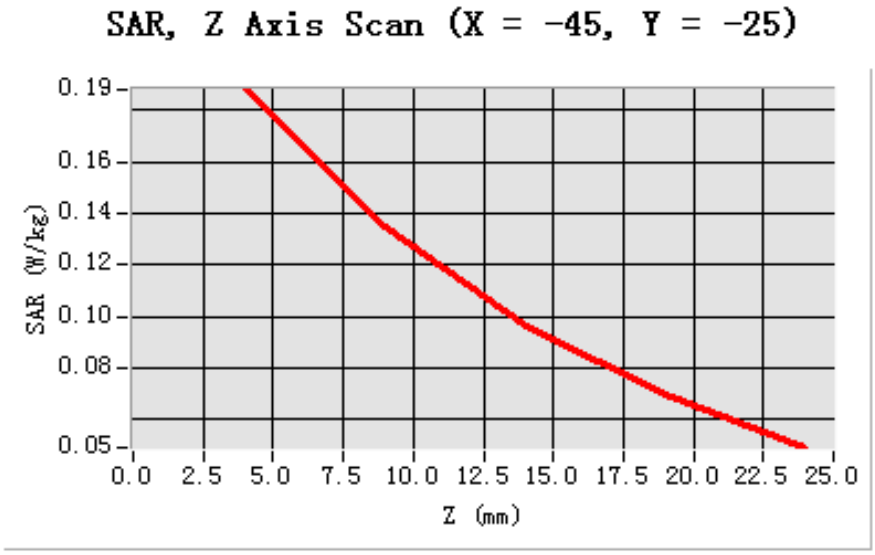
Area Scan	sam_direct_droit2_surf8mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Left head
Device Position	Cheek
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

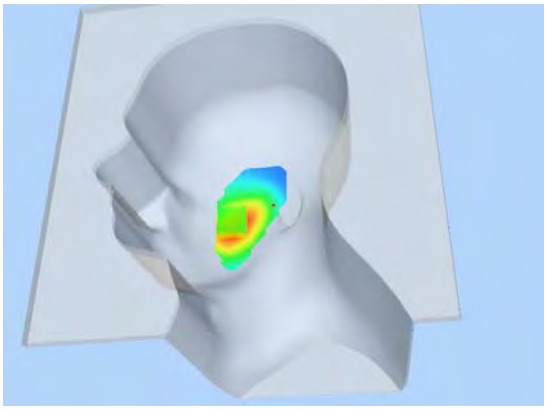
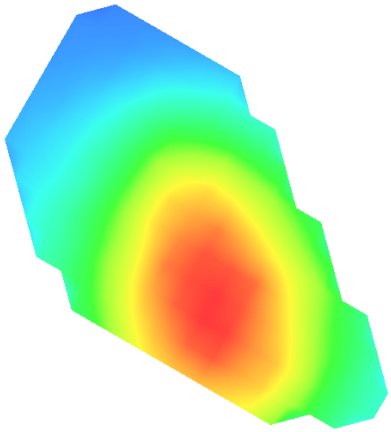
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-45.00, Y=-25.00

SAR 10g (W/Kg)	0.120615
SAR 1g (W/Kg)	0.179186

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.1880	0.1344	0.0964	0.0694



3D screen shot	Hot spot position
	

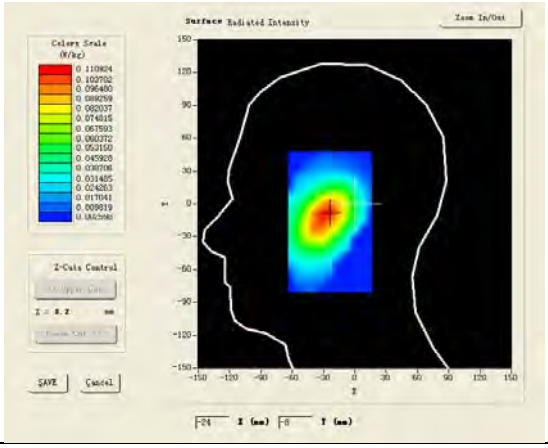
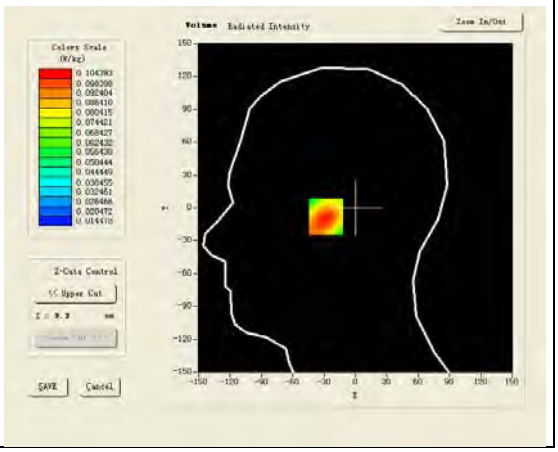
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
GSM 850 Mid-Tilt-Left <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=6.05; Frequency: 836.6 MHz; Medium parameters used: f = 850 MHz; σ =0.91 mho/m; ε r =41.33 ; ρ = 1000 kg/m^3 ;
Phantom section: Left Section
Ambient temperature (℃): 21.0, Liquid temperature(℃): 21.0

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/GSM 850 Mid-Tilt-Left/Area Scan (6x8x1): Measurement grid: dx=20mm, dy=20mm
Configuration/GSM 850 Mid-Tilt-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm,dz=5mm;

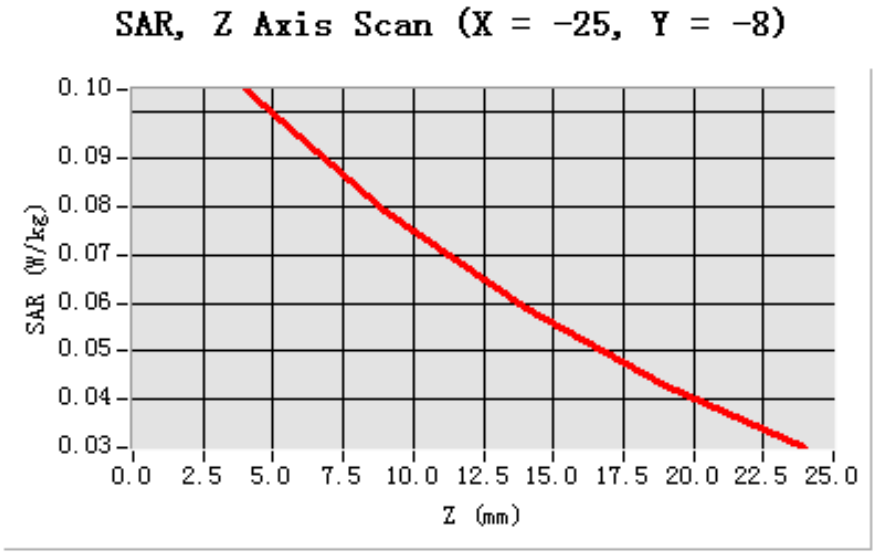
Area Scan	sam_direct_droit2_surf8mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Left head
Device Position	Tilt
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

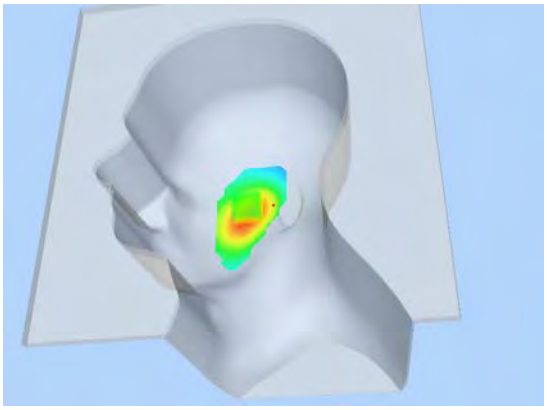
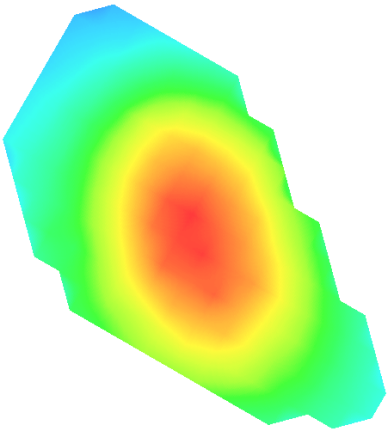
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-25.00, Y=-8.00

SAR 10g (W/Kg)	0.069208
SAR 1g (W/Kg)	0.099984

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.1044	0.0791	0.0590	0.0430



3D screen shot	Hot spot position
	

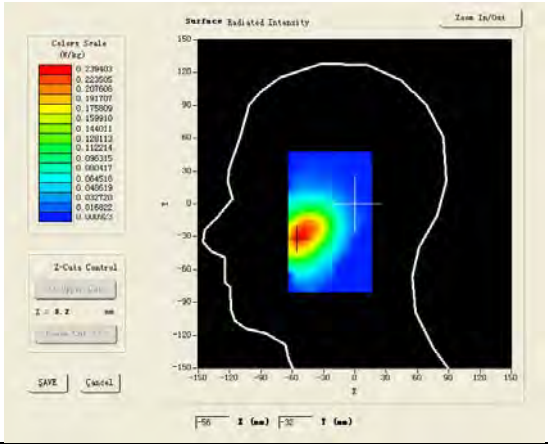
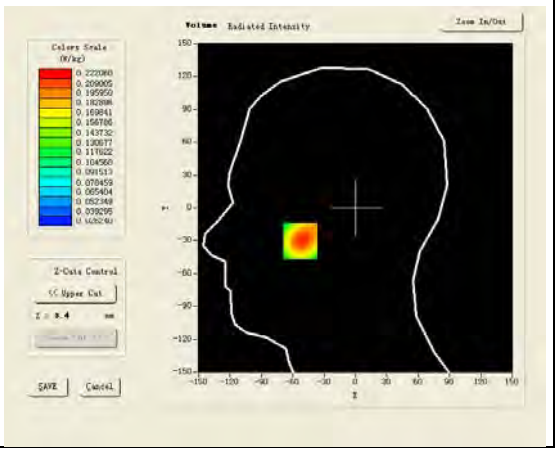
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
GSM 850 Mid- Touch-Right <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=6.05; Frequency: 836.6 MHz; Medium parameters used: f = 850 MHz; σ = 0.91 mho/m; ε r = 41.33; ρ = 1000 kg/m^3 ;
Phantom section: Right Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/GSM 850 Mid-Touch-Right/Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/GSM 850 Mid-Touch-Right/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

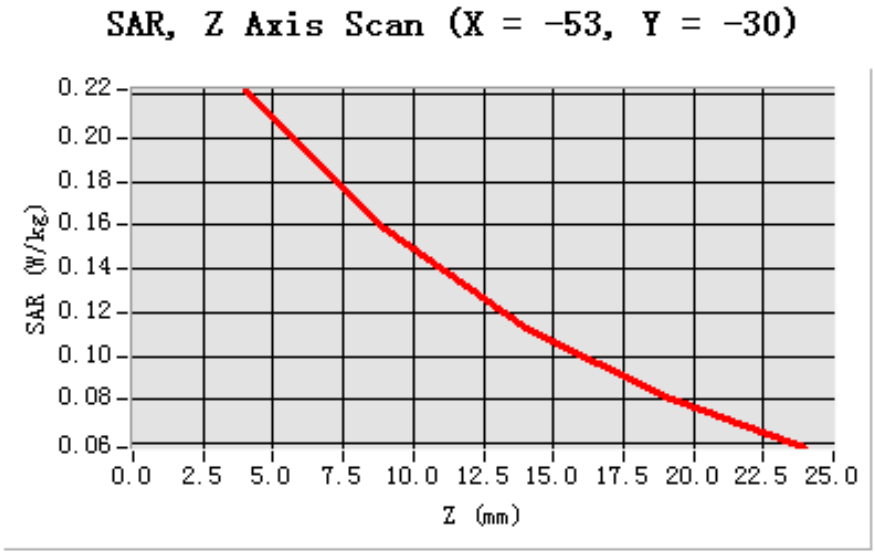
Area Scan	sam_direct_droit2_surf8mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Right head
Device Position	Cheek
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

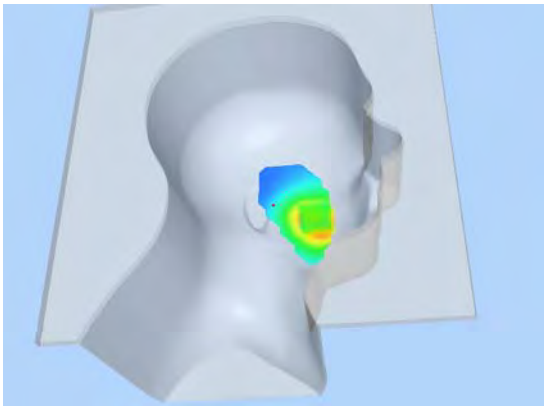
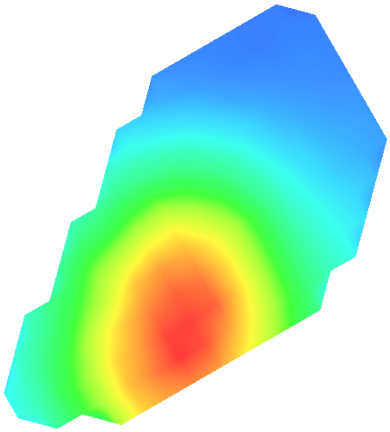
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-53.00, Y=-30.00

SAR 10g (W/Kg)	0.140409
SAR 1g (W/Kg)	0.211338

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.2221	0.1578	0.1129	0.0816



3D screen shot	Hot spot position
	

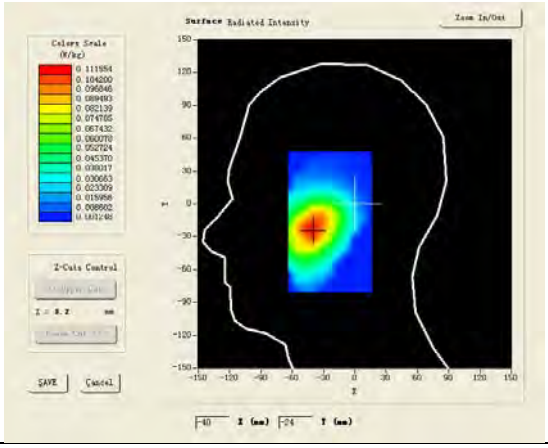
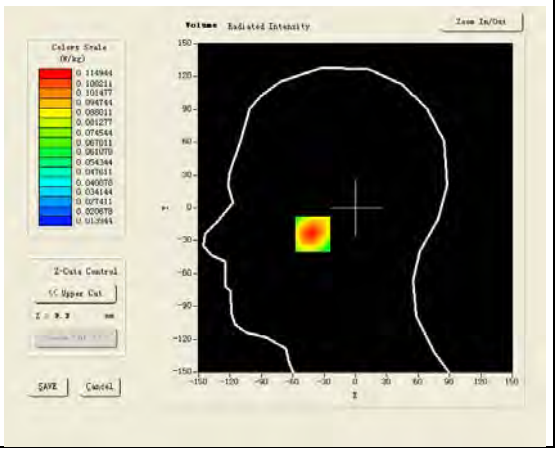
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
GSM 850 Mid-Tilt-Right <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=6.05; Frequency: 836.6 MHz; Medium parameters used: f = 850 MHz; σ =0.91 mho/m; ε r =41.33 ; ρ = 1000 kg/m³ ;
Phantom section: Right Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/GSM 850 Mid-Tilt-Right/Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/GSM 850 Mid-Tilt-Right/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

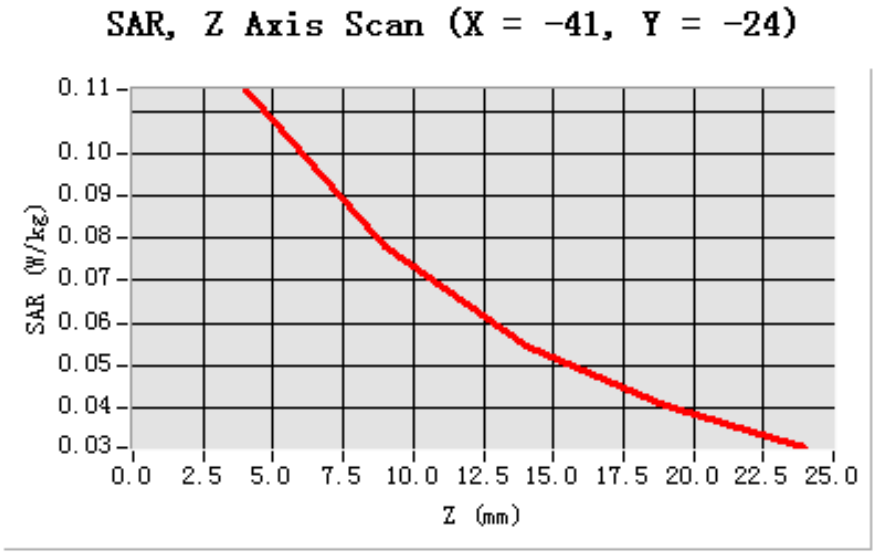
Area Scan	sam_direct_droit2_surf8mm.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Right head
Device Position	Tilt
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

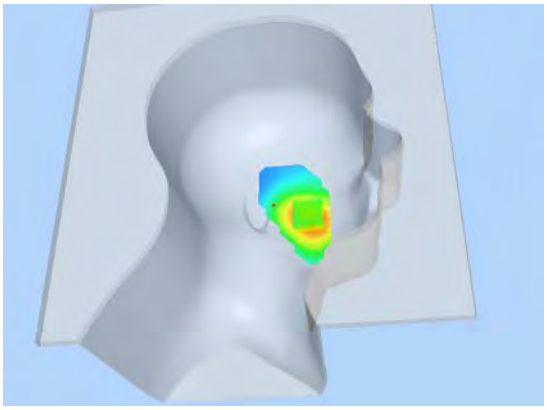
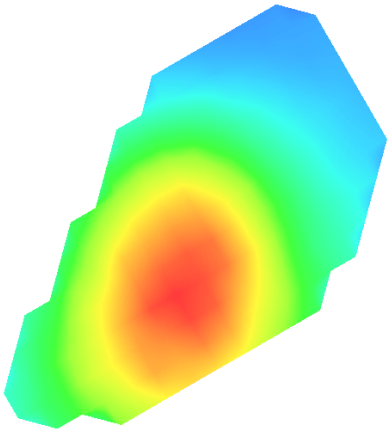
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-41.00, Y=-24.00

SAR 10g (W/Kg)	0.071111
SAR 1g (W/Kg)	0.109109

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.1149	0.0779	0.0547	0.0406



3D screen shot	Hot spot position
	

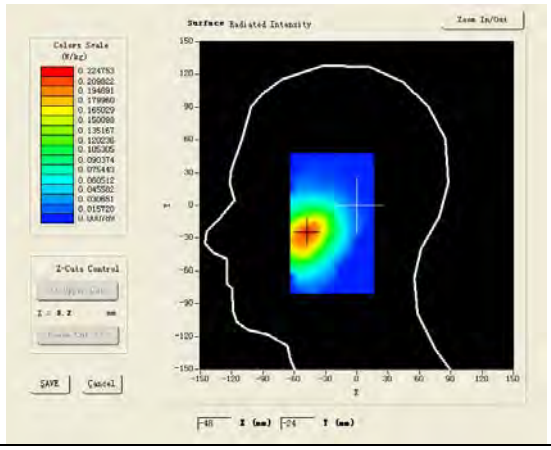
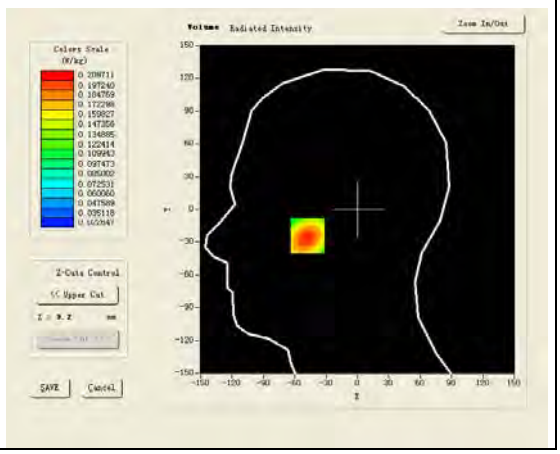
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
GSM 850 Mid-Touch-Right <SIM 2>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=6.05
Frequency: 836.6 MHz; Medium parameters used: f = 850 MHz; σ =0.91 mho/m; ε r =41.33; ρ = 1000 kg/m^3 ;
Phantom section: Right Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/GSM 850 Mid-Touch-Right/Area Scan (6x8x1): Measurement grid: dx=20mm, dy=20mm
Configuration/GSM 850 Mid-Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

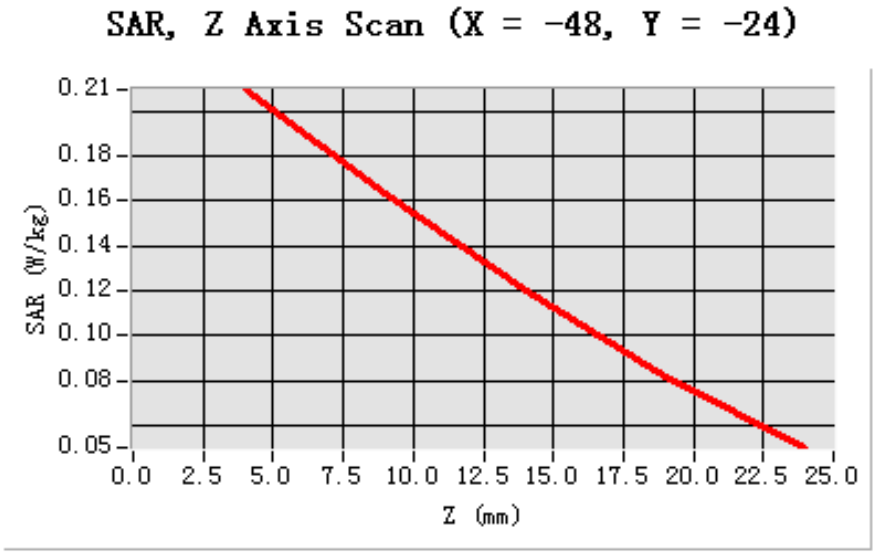
Area Scan	sam_direct_droit2_surf8mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Right head
Device Position	Cheek
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

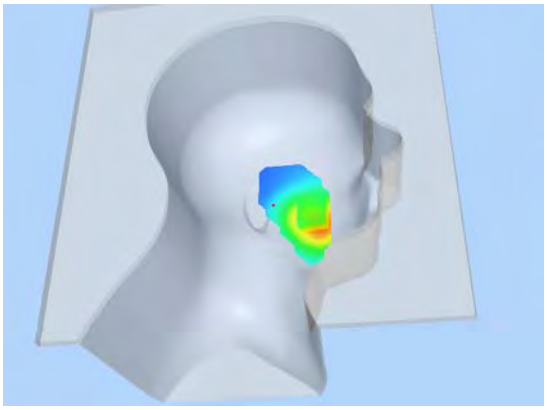
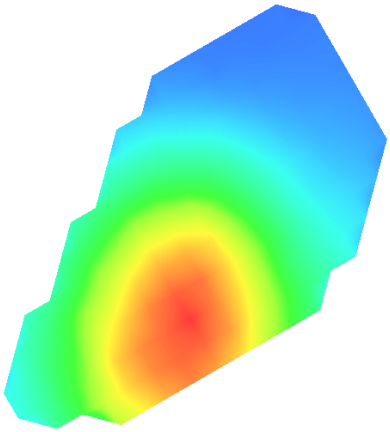
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-48.00, Y=-24.00

SAR 10g (W/Kg)	0.135697
SAR 1g (W/Kg)	0.200128

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.2097	0.1633	0.1201	0.0818



3D screen shot	Hot spot position
	

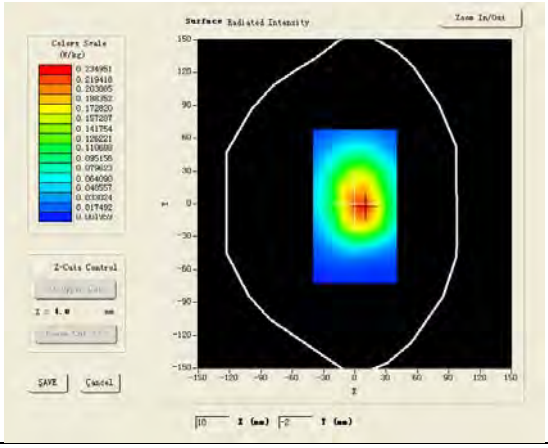
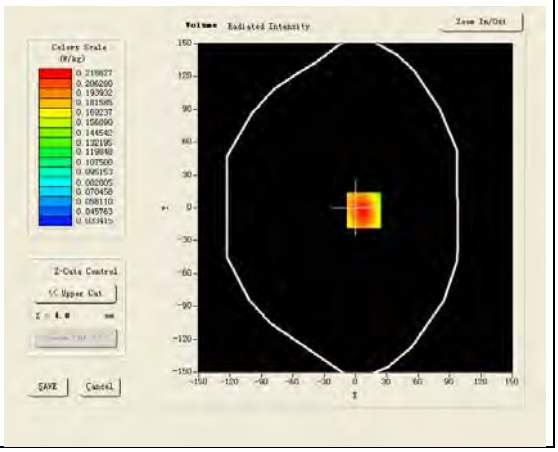
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
GSM 850 Mid- Body- Back <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=6.05; Frequency: 836.6 MHz; Medium parameters used: f = 850 MHz; σ = 0.99 mho/m; ε r = 53.72; ρ = 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/GSM 850 Mid-Body-Back/Area Scan (6x8x1): Measurement grid: dx=20mm, dy=20mm
Configuration/GSM 850 Mid-Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

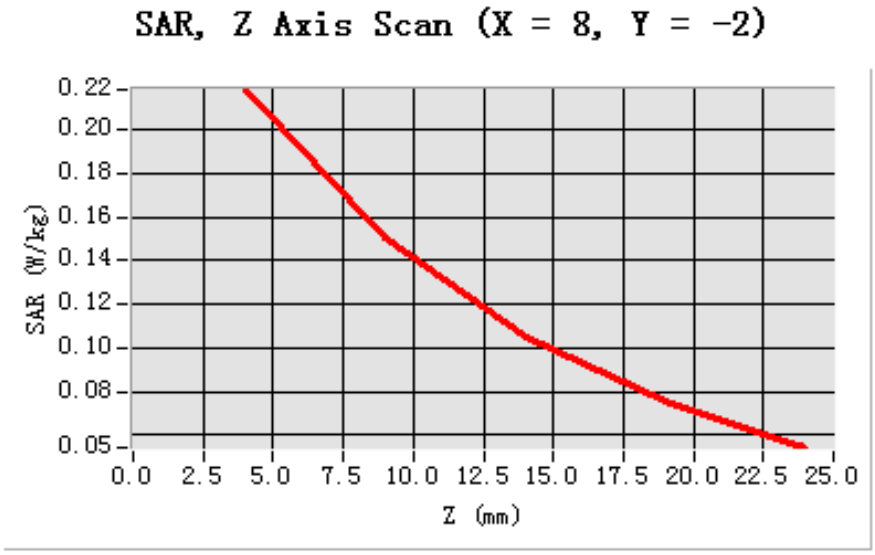
Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Back
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

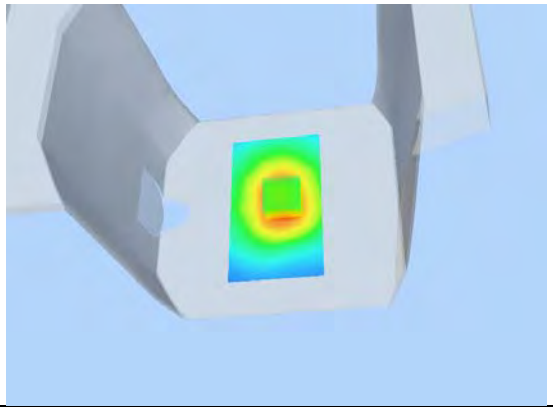
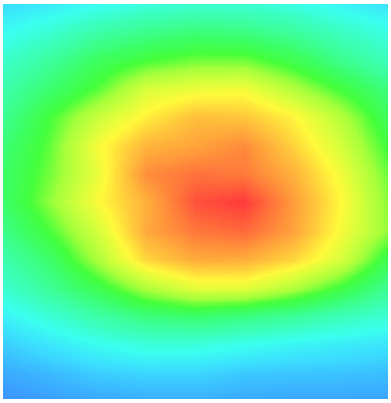
SURFACE SAR	VOLUME SAR
	

Maximum location: X=8.00, Y=-2.00

SAR 10g (W/Kg)	0.150905
SAR 1g (W/Kg)	0.225794

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.2186	0.1504	0.1053	0.0757



3D screen shot	Hot spot position
	

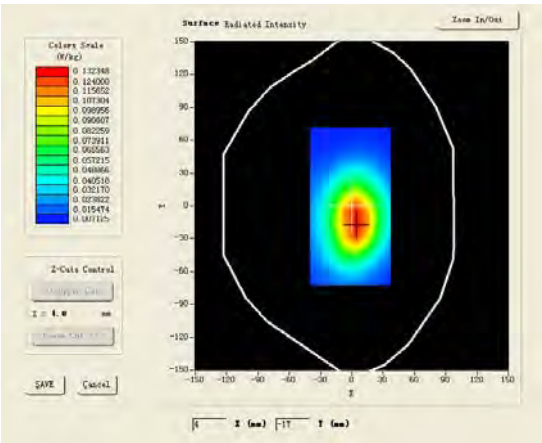
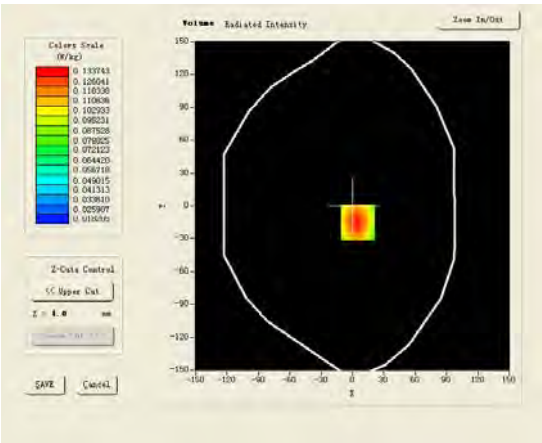
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
GPRS 850 Mid- Body - Back (2up) <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: GPRS -2 Slot; Communication System Band: GSM850; Duty Cycle: 1:4.2; Conv.F=6.05; Frequency: 836.6 MHz; Medium parameters used: f = 850 MHz; σ = 0.99 mho/m; ε r = 53.72; ρ = 1000kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/GPRS 850 Mid-Body-Back/Area Scan (6x8x1): Measurement grid: dx=20mm, dy=20mm
Configuration/GPRS 850 Mid-Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

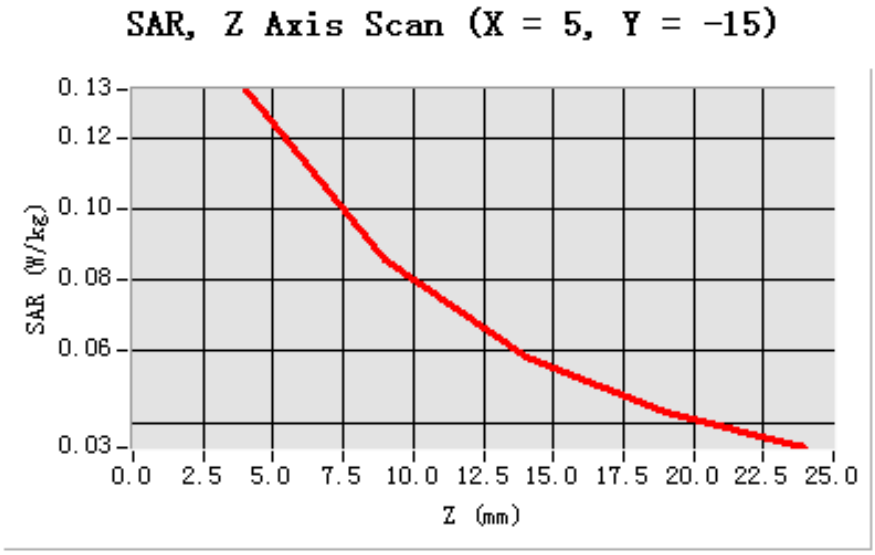
Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Back
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 4.0)

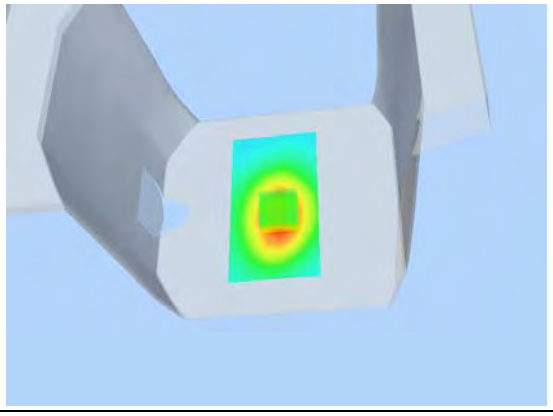
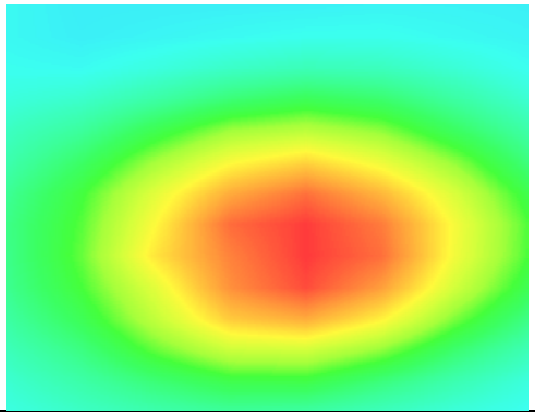
SURFACE SAR	VOLUME SAR
	

Maximum location: X=5.00, Y=-15.00

SAR 10g (W/Kg)	0.086789
SAR 1g (W/Kg)	0.137895

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.1358	0.0879	0.0552	0.0464



3D screen shot	Hot spot position
	

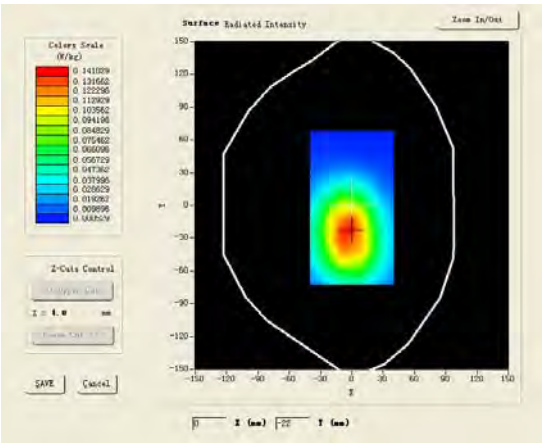
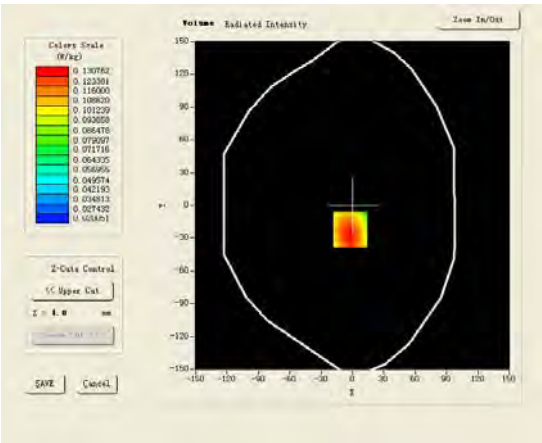
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
GSM 850 Mid- Body- Front (MS) <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=6.05; Frequency: 836.6 MHz; Medium parameters used: f = 850 MHz; σ = 0.99mho/m; ε r = 53.72; ρ = 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/GSM 850 Mid-Body- Front /Area Scan (6x8x1): Measurement grid: dx=20mm, dy=20mm
Configuration/GSM 850 Mid-Body- Front Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

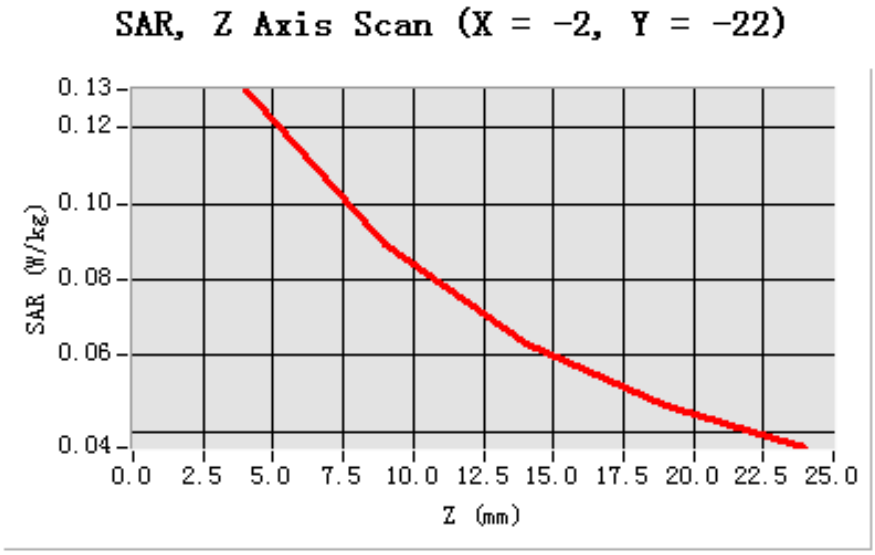
Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Front
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

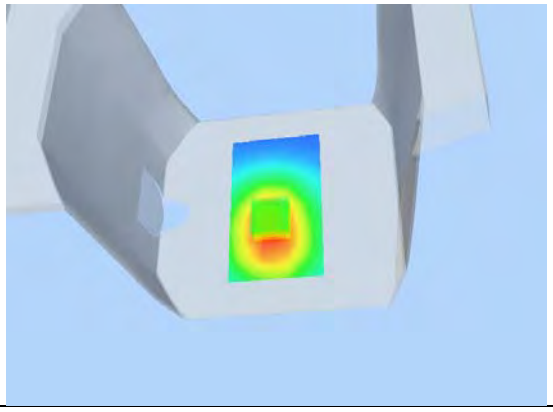
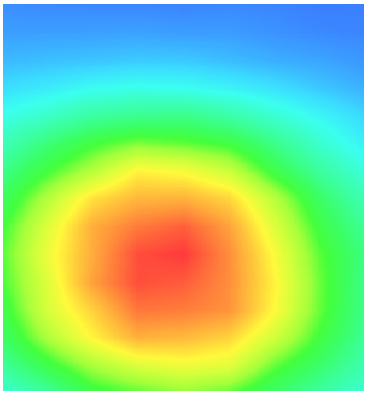
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-2.00, Y=-22.00

SAR 10g (W/Kg)	0.092208
SAR 1g (W/Kg)	0.135862

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.1301	0.0890	0.0631	0.0470



3D screen shot	Hot spot position
	

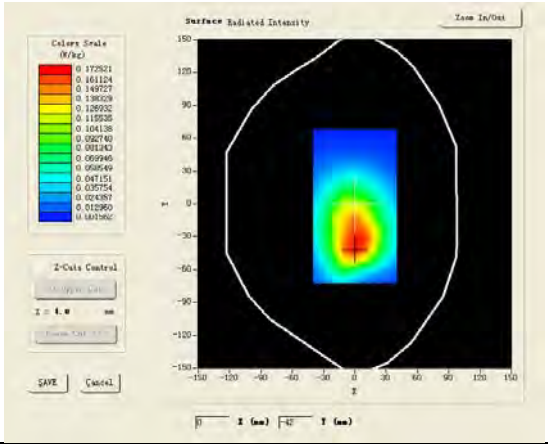
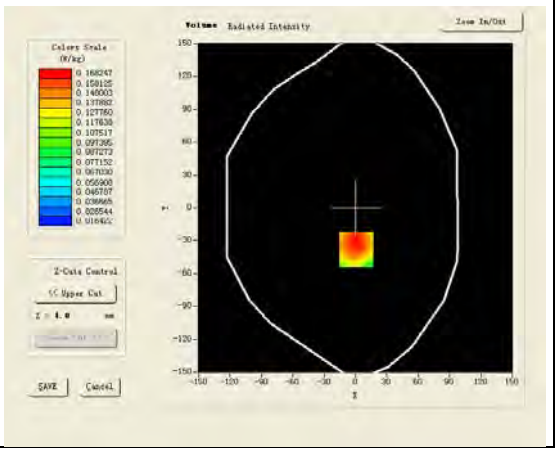
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
GSM 850 Mid- Body- Back (MS) –with earphone <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=6.05; Frequency: 836.6 MHz; Medium parameters used: f = 850 MHz; σ = 0.99mho/m; ε r = 53.72; ρ = 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/GSM 850 Mid-Body-Back/Area Scan (6x8x1): Measurement grid: dx=20mm, dy=20mm
Configuration/GSM 850 Mid-Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

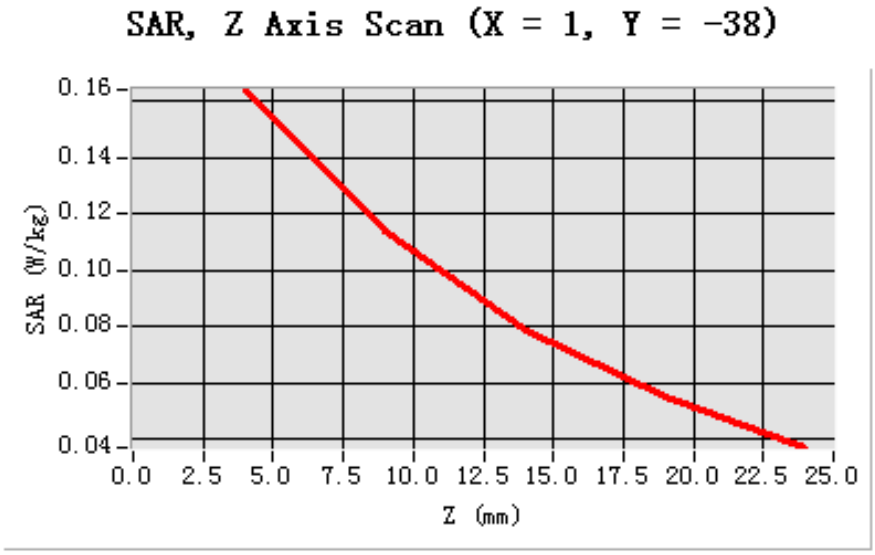
Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Back
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

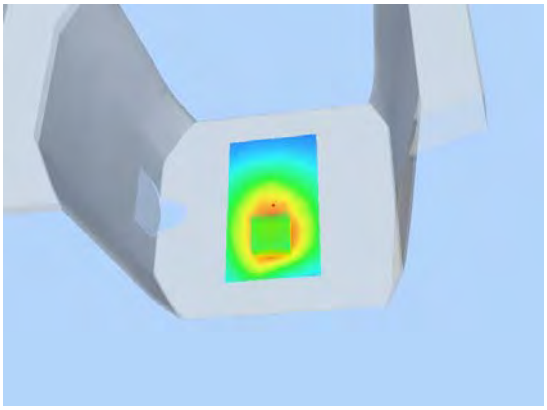
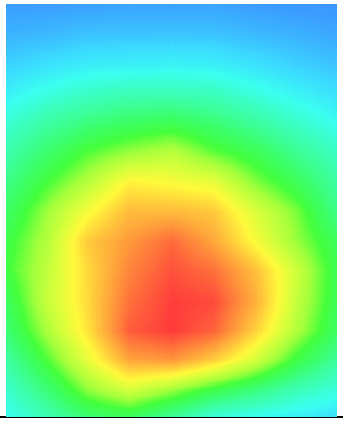
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-38.00

SAR 10g (W/Kg)	0.115968
SAR 1g (W/Kg)	0.173436

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.1642	0.1138	0.0789	0.0548



3D screen shot	Hot spot position
	

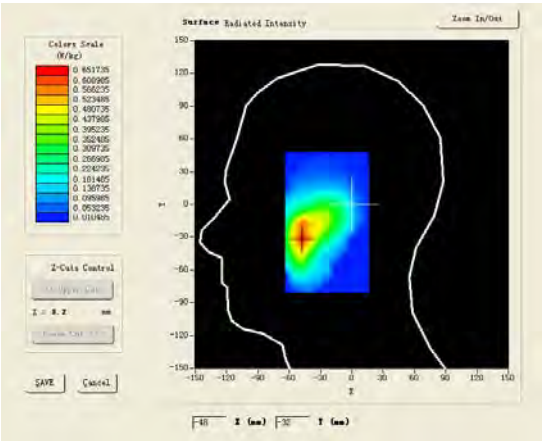
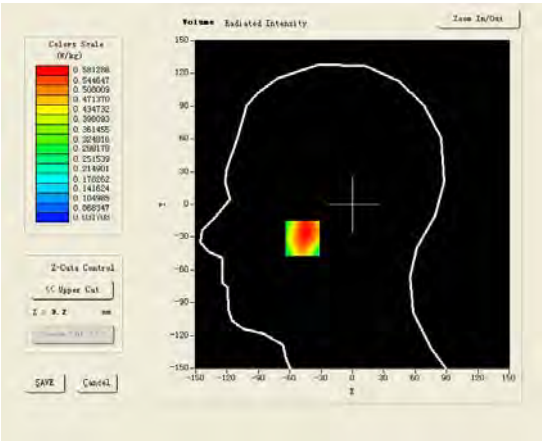
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
PCS 1900 Mid-Touch- Left <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=5.73; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ = 1.38 mho/m; ε r =40.12; ρ = 1000 kg/m^3 ;
Phantom section: Left Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
- Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/PCS1900 Mid-Touch-Left/Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/PCS1900 Mid-Touch-Left/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

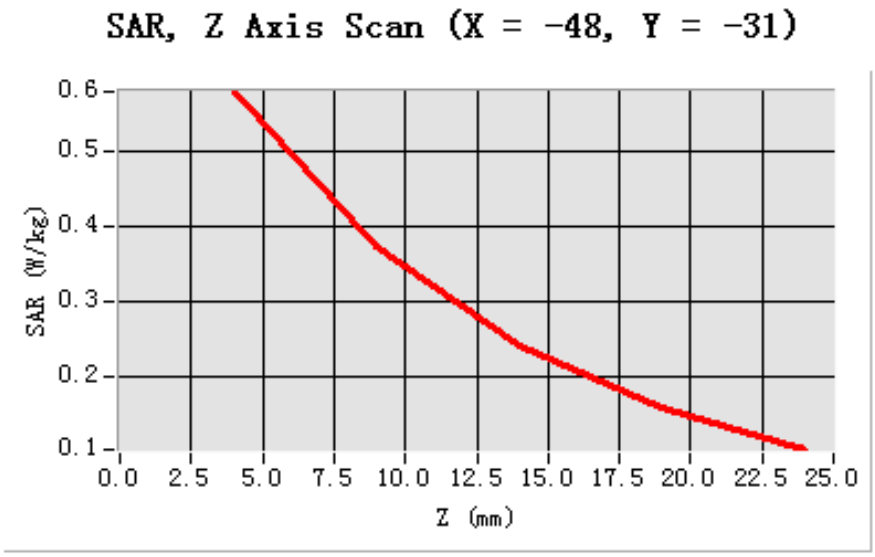
Area Scan	sam_direct_droit2_surf8mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Left head
Device Position	Cheek
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

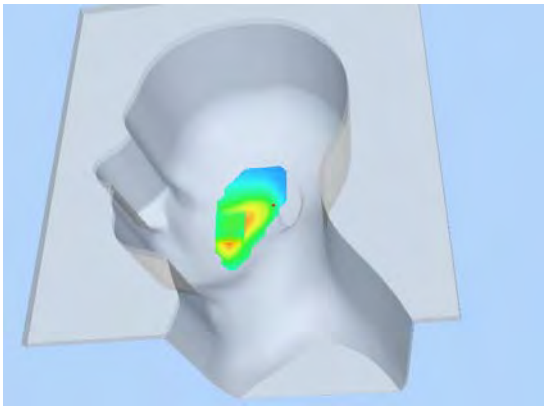
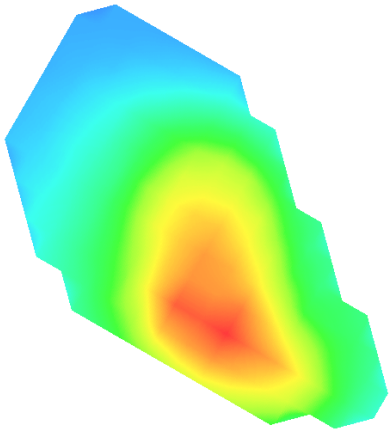
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-48.00, Y=-31.00

SAR 10g (W/Kg)	0.356437
SAR 1g (W/Kg)	0.568642

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.5847	0.3762	0.2448	0.1591



3D screen shot	Hot spot position
	

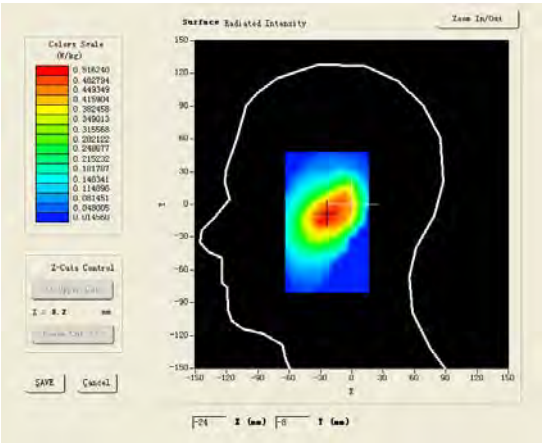
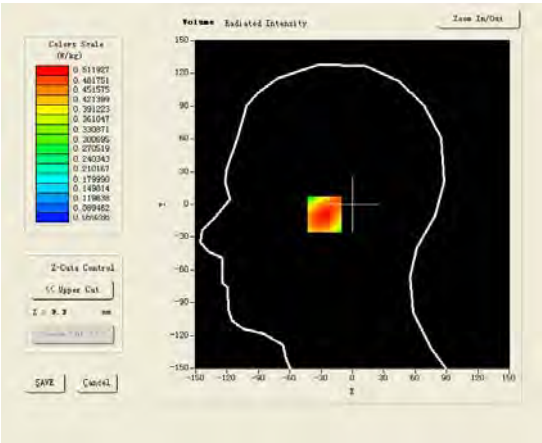
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
PCS 1900 Mid-Tilt-Left <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=5.73; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ = 1.38 mho/m; ε r =40.12; ρ = 1000 kg/m³ ;
Phantom section: Left Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
- Probe:EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/PCS1900 Mid-Tilt-Left/Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/PCS1900 Mid-Tilt-Left/Zoom Scan: Measurement grid: dx=8mm, dy=8mm,dz=5mm;

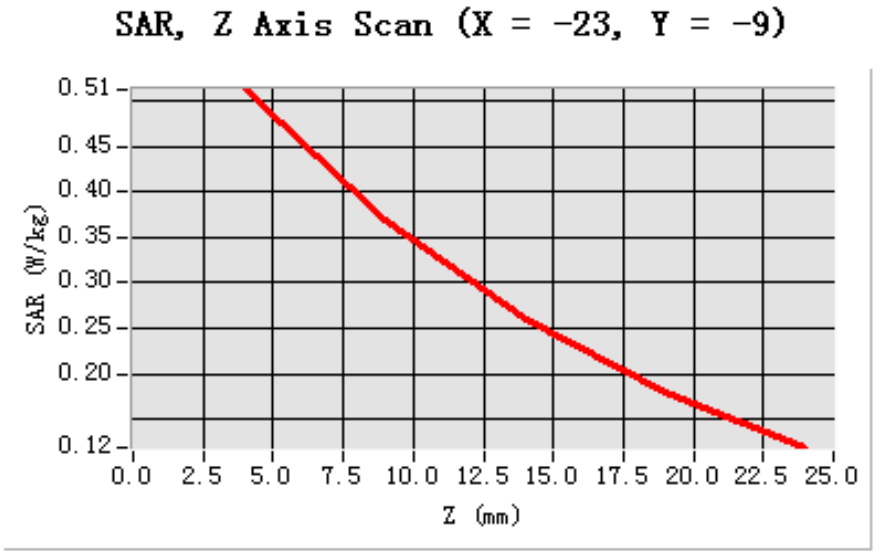
Area Scan	sam_direct_droit2_surf8mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Left head
Device Position	Tilt
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

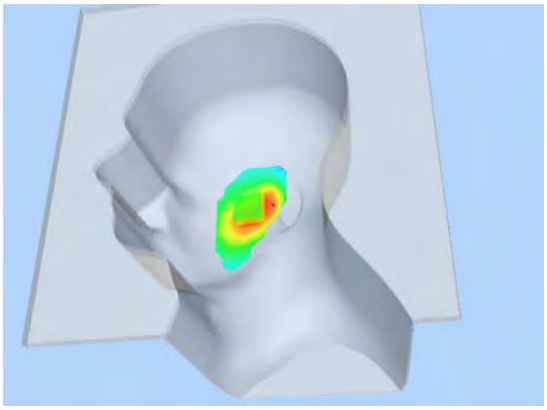
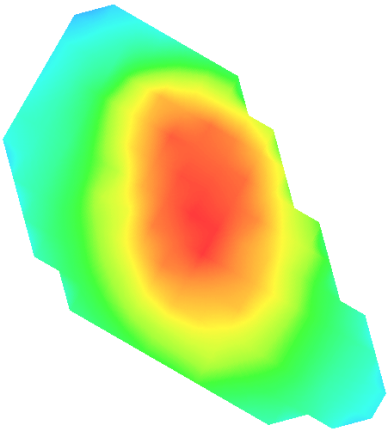
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-23.00, Y=-9.00

SAR 10g (W/Kg)	0.328934
SAR 1g (W/Kg)	0.486415

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.5119	0.3636	0.2681	0.1804



3D screen shot	Hot spot position
	

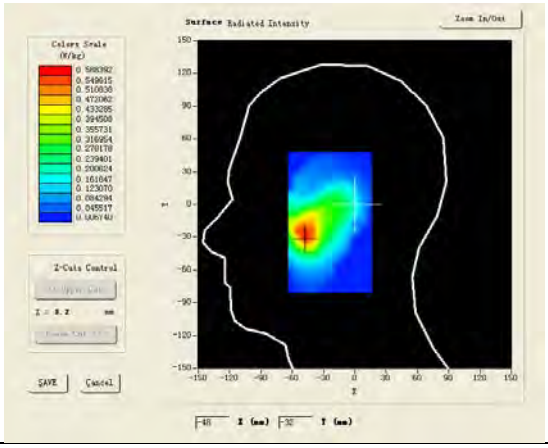
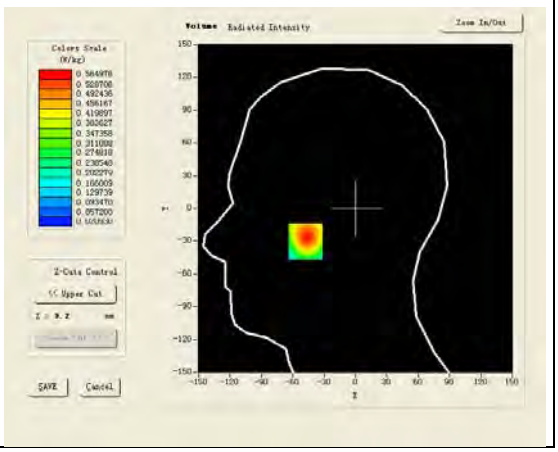
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
PCS 1900 Mid-Touch-Right <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=5.73; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ = 1.38 mho/m; ε r =40.12; ρ = 1000 kg/m^3 ;
Phantom section: Right Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
- Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/PCS1900 Mid-Touch-Right/Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/PCS1900 Mid-Touch-Right/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

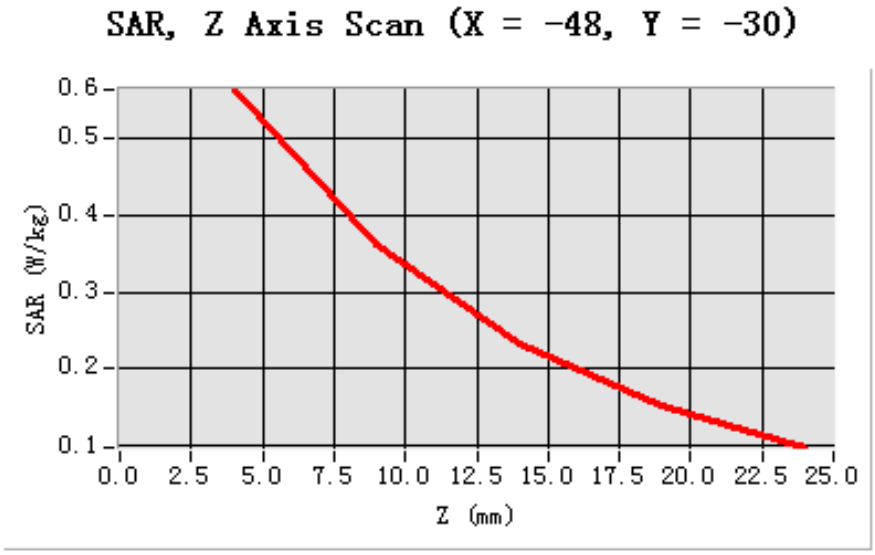
Area Scan	sam_direct_droit2_surf8mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Right head
Device Position	Cheek
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

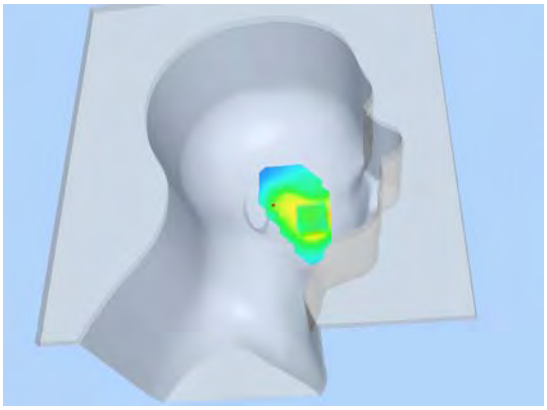
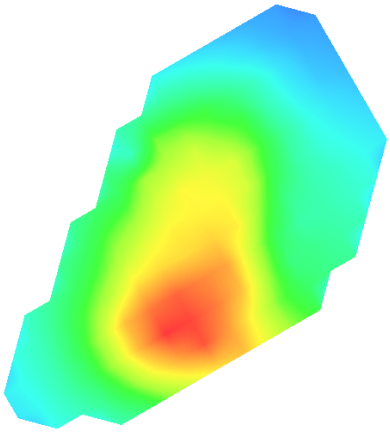
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-48.00, Y=-30.00

SAR 10g (W/Kg)	0.323758
SAR 1g (W/Kg)	0.547594

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.5648	0.3625	0.2366	0.1553



3D screen shot	Hot spot position
	

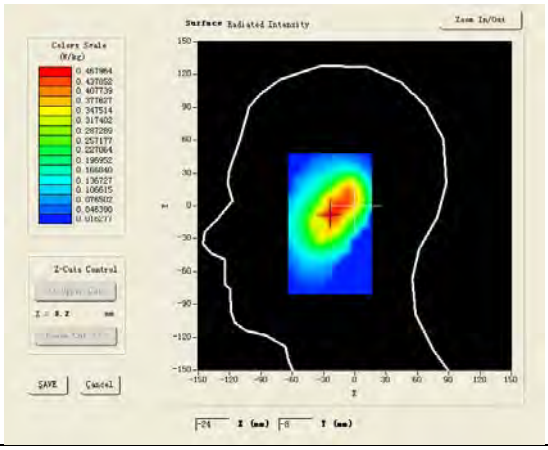
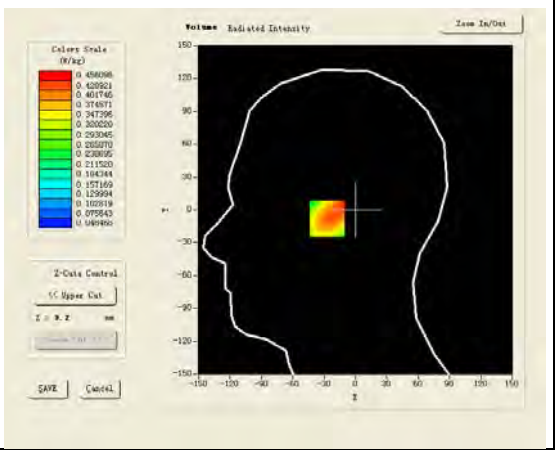
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
PCS 1900 Mid-Tilt-Right <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=5.73;
Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ = 1.38 mho/m; ε r =40.12; ρ = 1000 kg/m³ ;
Phantom section: Right Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
- Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/PCS1900 Mid-Tilt-Right/Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/PCS1900 Mid-Tilt-Right/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

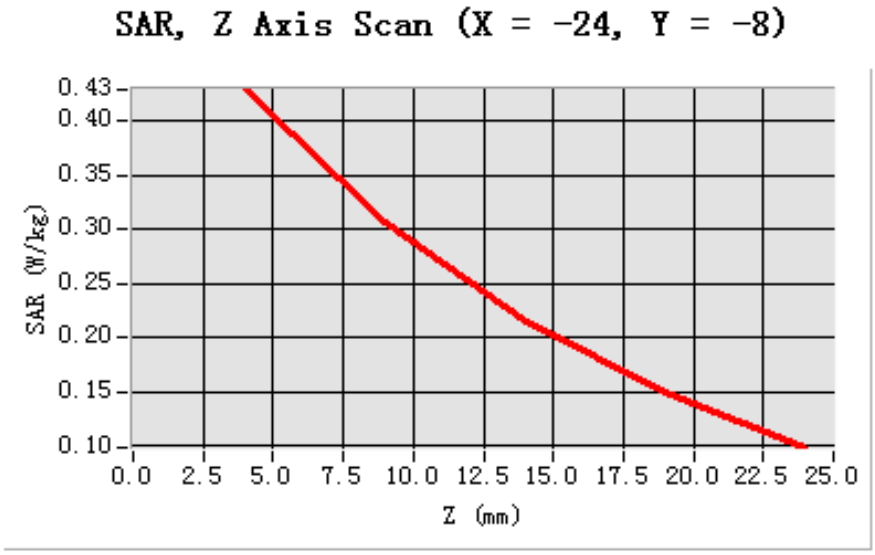
Area Scan	sam_direct_droit2_surf8mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Right head
Device Position	Tilt
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

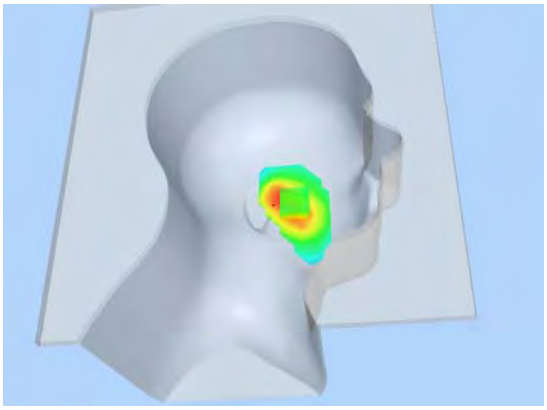
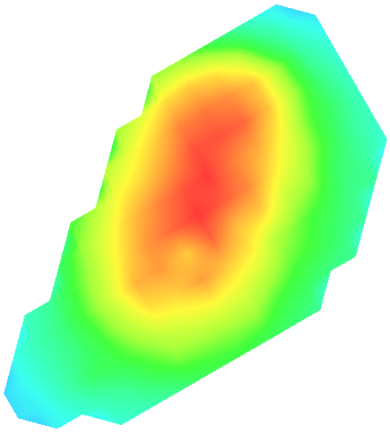
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-24.00, Y=-8.00

SAR 10g (W/Kg)	0.286451
SAR 1g (W/Kg)	0.412753

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.4252	0.3049	0.2156	0.1495



3D screen shot	Hot spot position
	

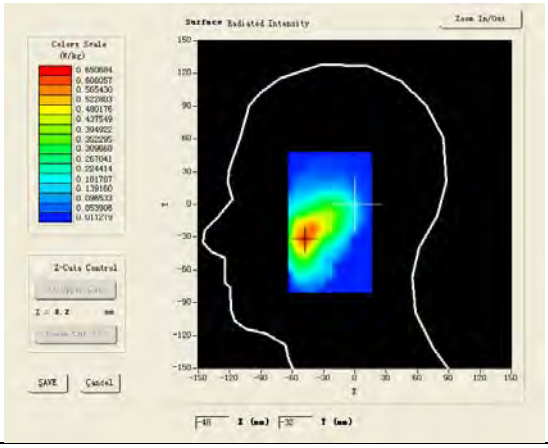
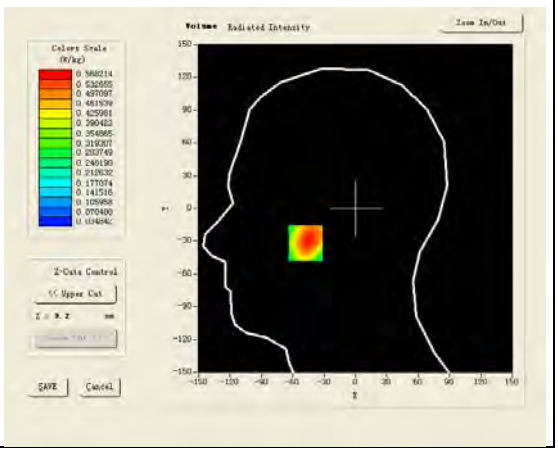
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
PCS 1900 Mid-Touch-Left <SIM 2>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=5.73; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ = 1.38 mho/m; ε r =40.12; ρ = 1000 kg/m^3 ;
Phantom section: Left Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
- Probe:EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/PCS1900 Mid-Touch-Left/Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/PCS1900 Mid-Touch-Left/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

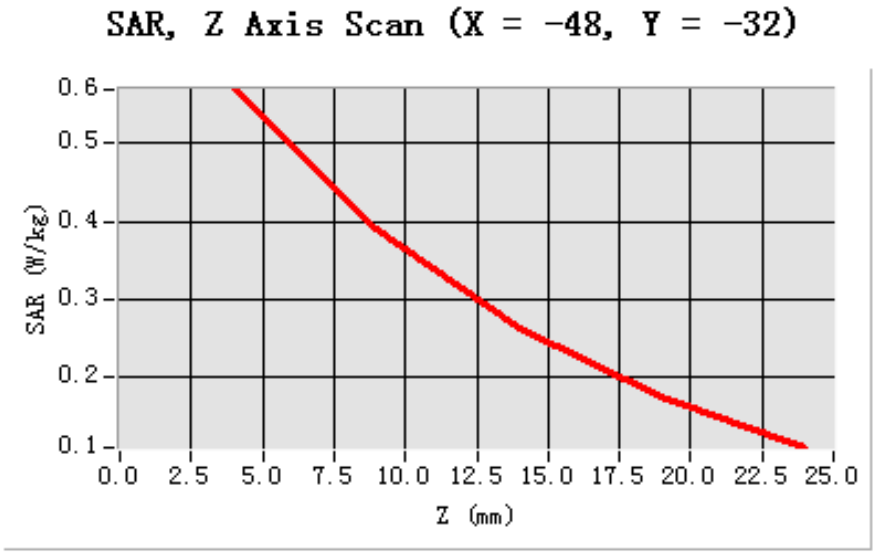
Area Scan	sam_direct_droit2_surf8mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Left head
Device Position	Cheek
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

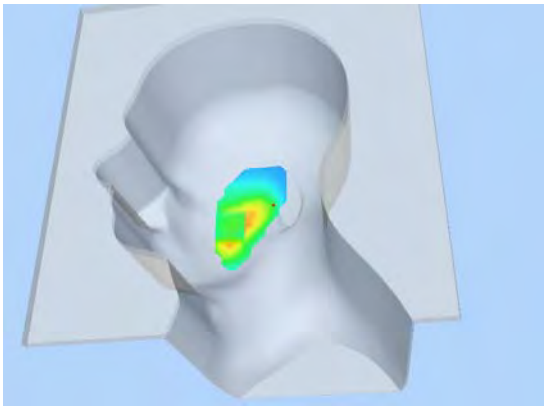
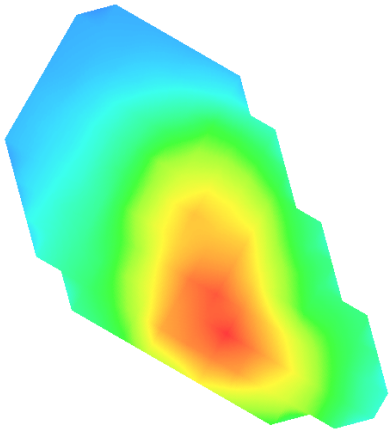
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-48.00, Y=-32.00

SAR 10g (W/Kg)	0.348693
SAR 1g (W/Kg)	0.544690

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.5659	0.3835	0.2641	0.1759



3D screen shot	Hot spot position
	

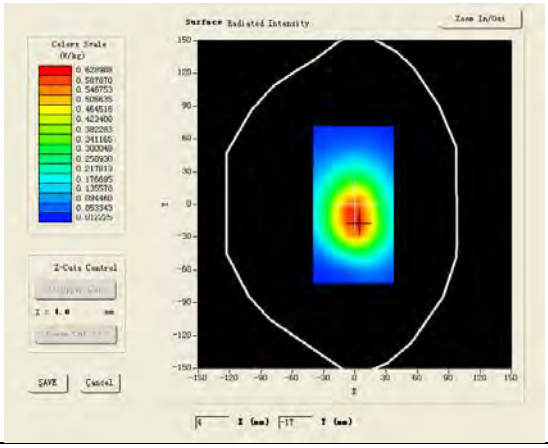
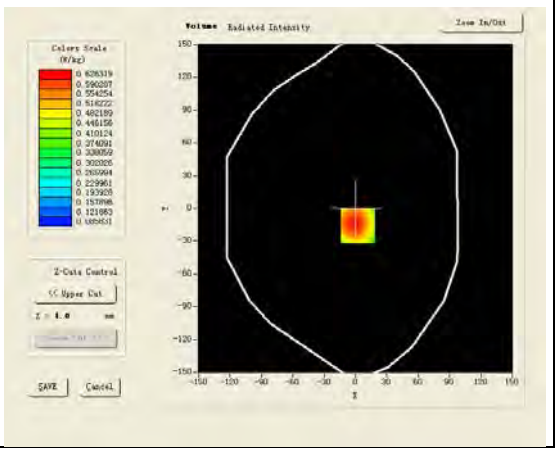
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
PCS 1900 Mid-Body-Back <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=5.73;
Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ = 1.53 mho/m; ε r =52.45; ρ = 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
- Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/PCS1900 Mid-Body-Back/Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/PCS1900 Mid-Body-Back/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

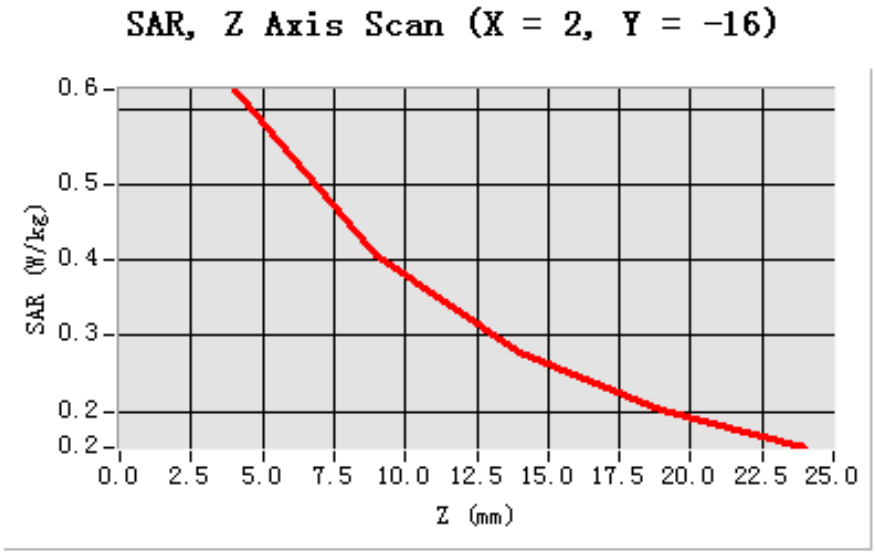
Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Back
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

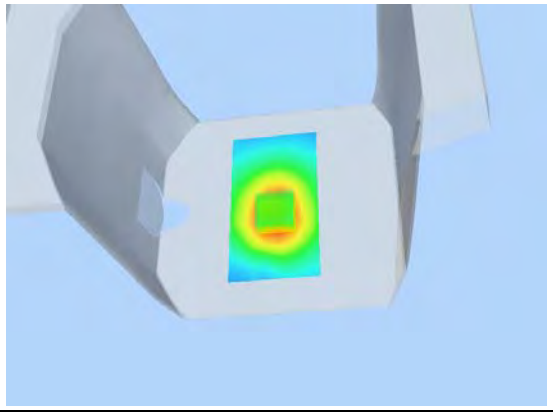
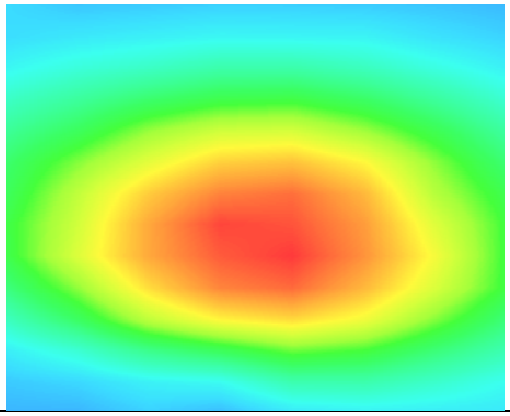
SURFACE SAR	VOLUME SAR
	

Maximum location: X=2.00, Y=-16.00

SAR 10g (W/Kg)	0.429036
SAR 1g (W/Kg)	0.658620

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.6257	0.4056	0.2768	0.2069



3D screen shot	Hot spot position
	

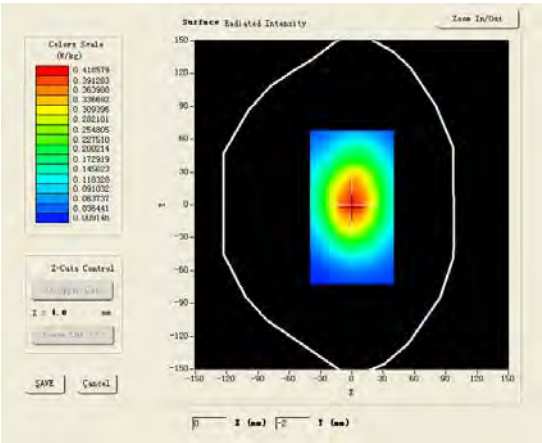
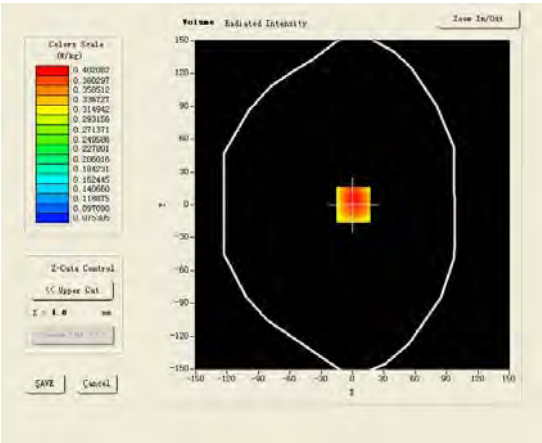
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
GPRS 1900 Mid-Body-Back (2up) <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: GPRS-2 Slot; Communication System Band: PCS1900; Duty Cycle: 1:4.2 ; Conv.F=5.73;
Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ =1.53 mho/m; ε r =52.45; ρ = 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
- Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/GPRS1900 Mid-Body-Back/Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/GPRS1900 Mid-Body-Back/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5m;

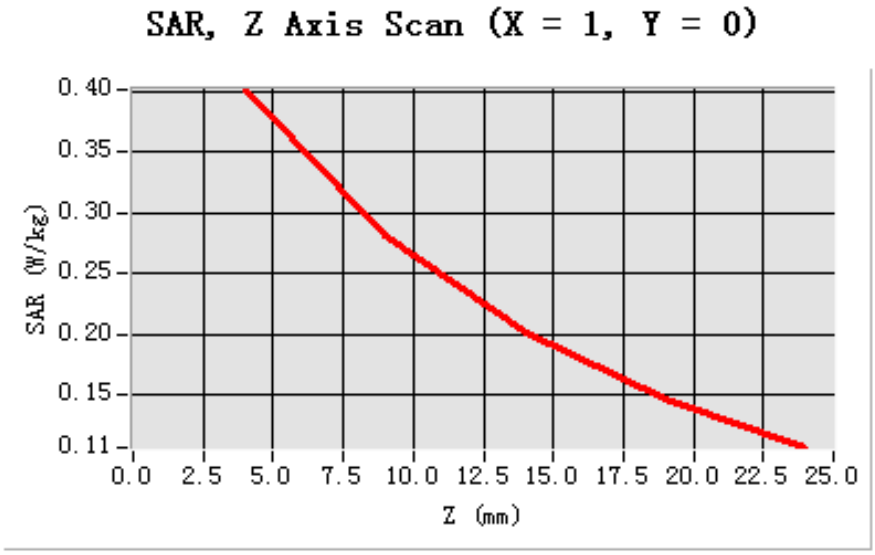
Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Back
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 4.0)

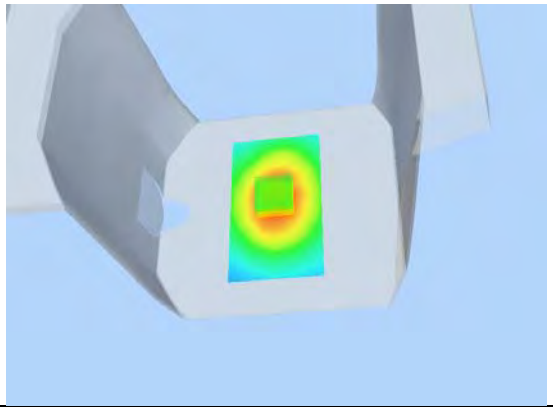
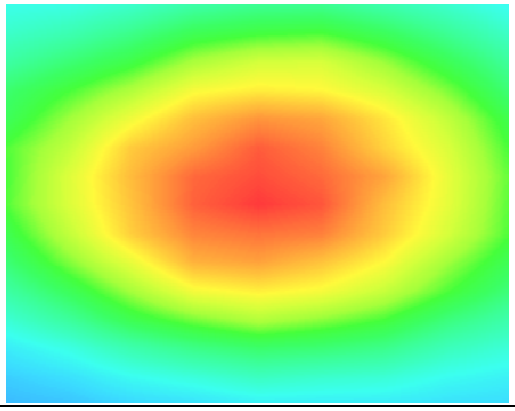
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=0.00

SAR 10g (W/Kg)	0.288562
SAR 1g (W/Kg)	0.423375

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.4068	0.2894	0.2066	0.1455



3D screen shot	Hot spot position
	

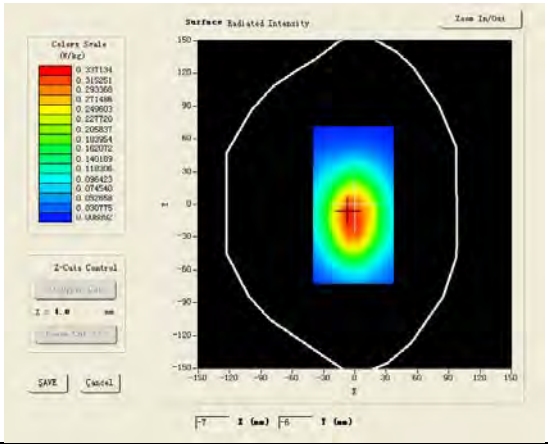
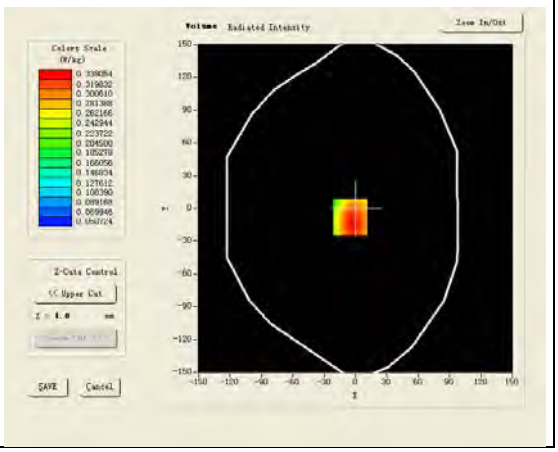
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
PCS 1900 Mid-Body -Front (MS) <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=5.73; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ = 1.53 mho/m; ε r =52.45; ρ = 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
- Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/PCS1900 Mid-Body- Front /Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/PCS1900 Mid-Body- Front /Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

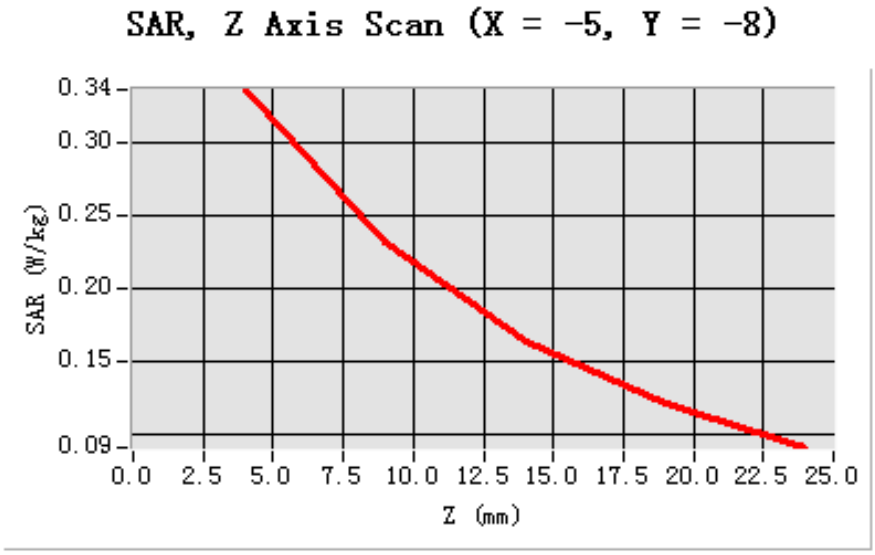
Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Front
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

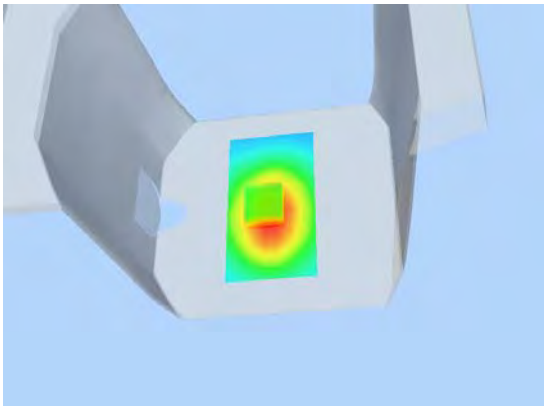
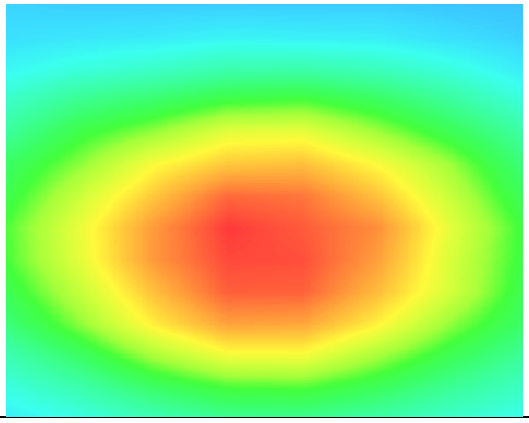
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-5.00, Y=-8.00

SAR 10g (W/Kg)	0.245852
SAR 1g (W/Kg)	0.356846

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.3324	0.2374	0.1645	0.1275



3D screen shot	Hot spot position
	

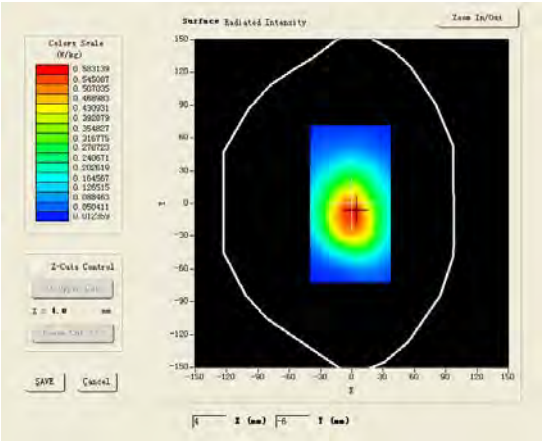
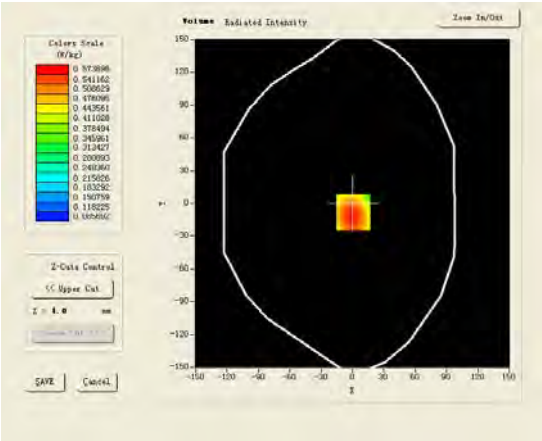
Test Laboratory: AGC Lab **Date: Mar.28, 2013**
PCS 1900 Mid-Body- Back (MS) –with earphone <SIM 1>
DUT: GSM MOBILE PHONE; Type: W100

Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=5.73; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ = 1.53 mho/m; ε r =52.45; ρ = 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

Satimo Configuration:
- Probe: EP159; Calibrated: 12/11/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM1; Type: SAM
- Measurement SW: OpenSAR V4_02_01

Configuration/PCS1900 Mid-Body-Back/Area Scan: Measurement grid: dx=20mm, dy=20mm
Configuration/PCS1900 Mid-Body-Back/Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

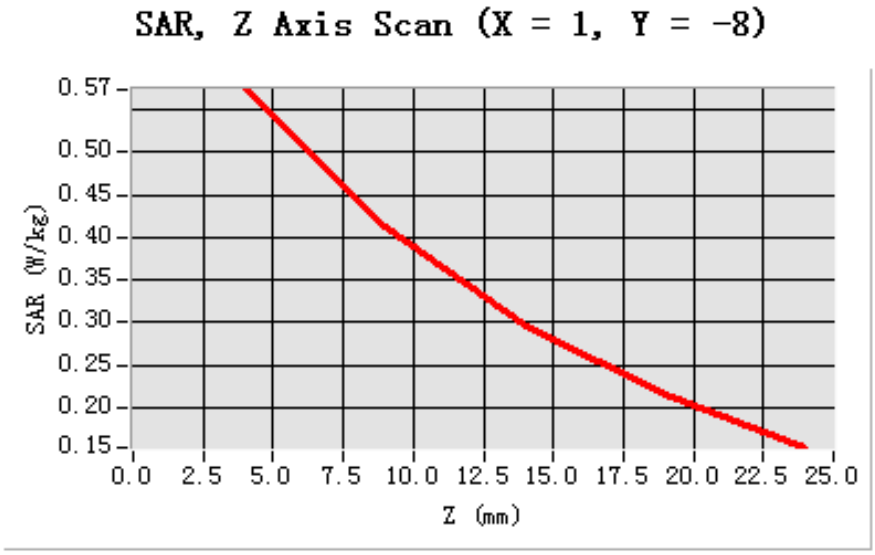
Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Back
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

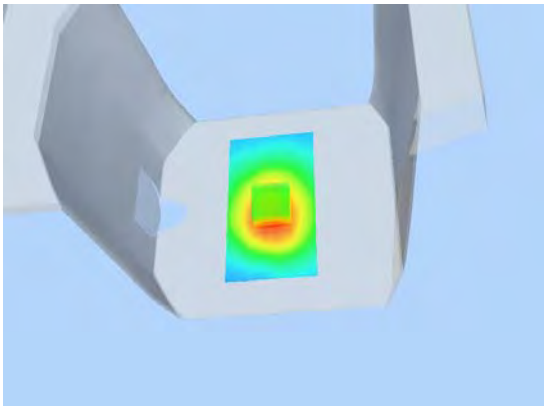
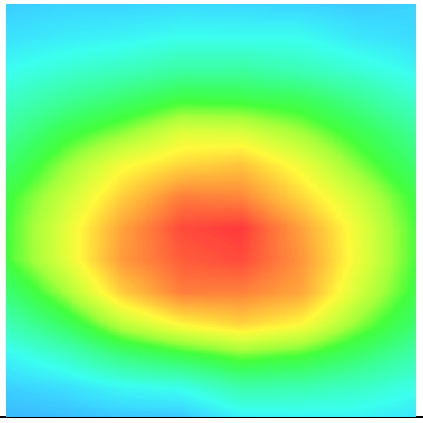
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-8.00

SAR 10g (W/Kg)	0.408376
SAR 1g (W/Kg)	0.596964

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.5758	0.4117	0.2967	0.2196

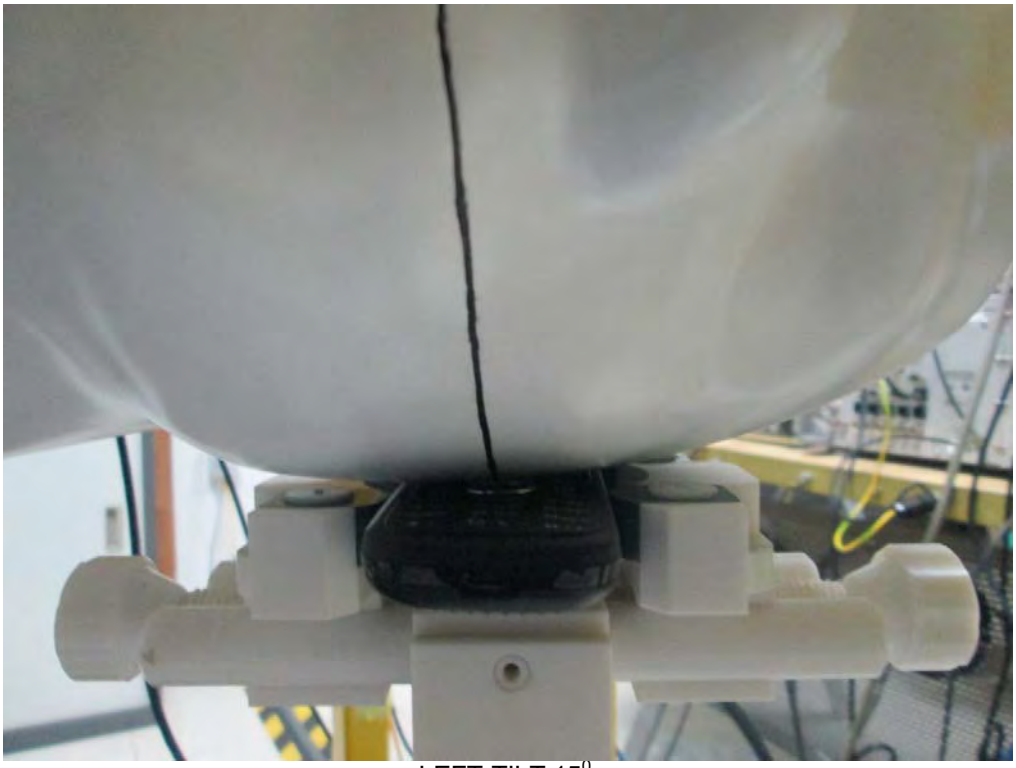


3D screen shot	Hot spot position
	

Appendix C. TEST SETUP PHOTOGRAPHS &EUT PHOTOGRAPHS

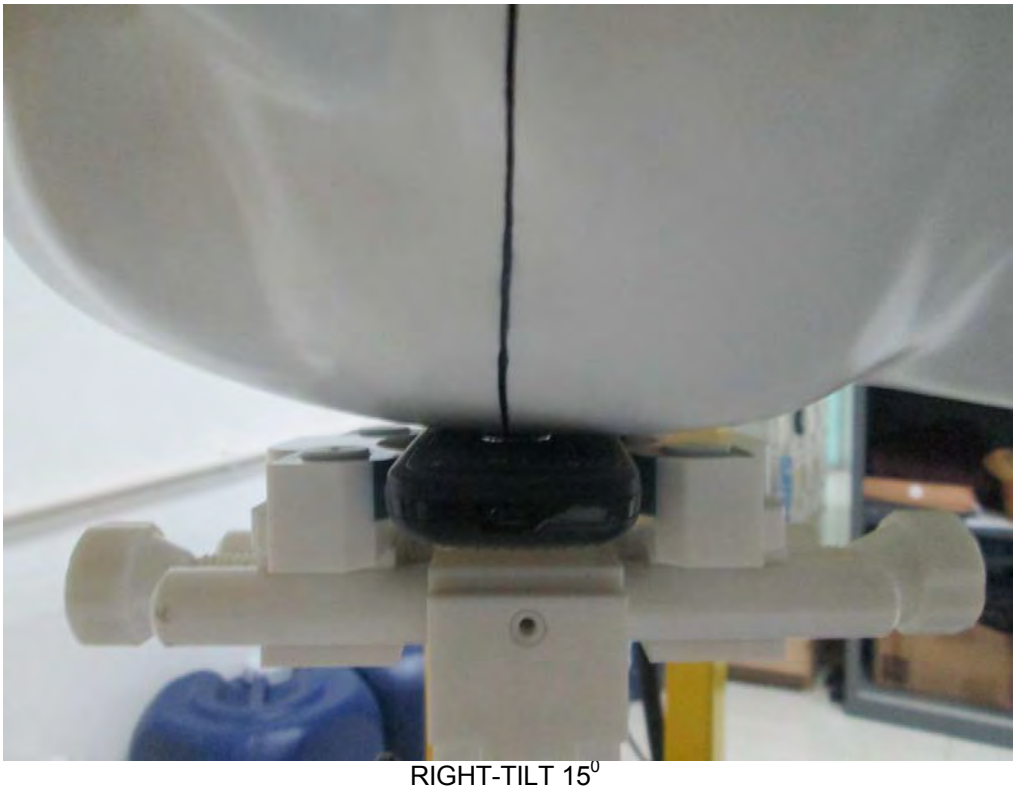
Test Setup Photographs

LEFT-CHECK TOUCH



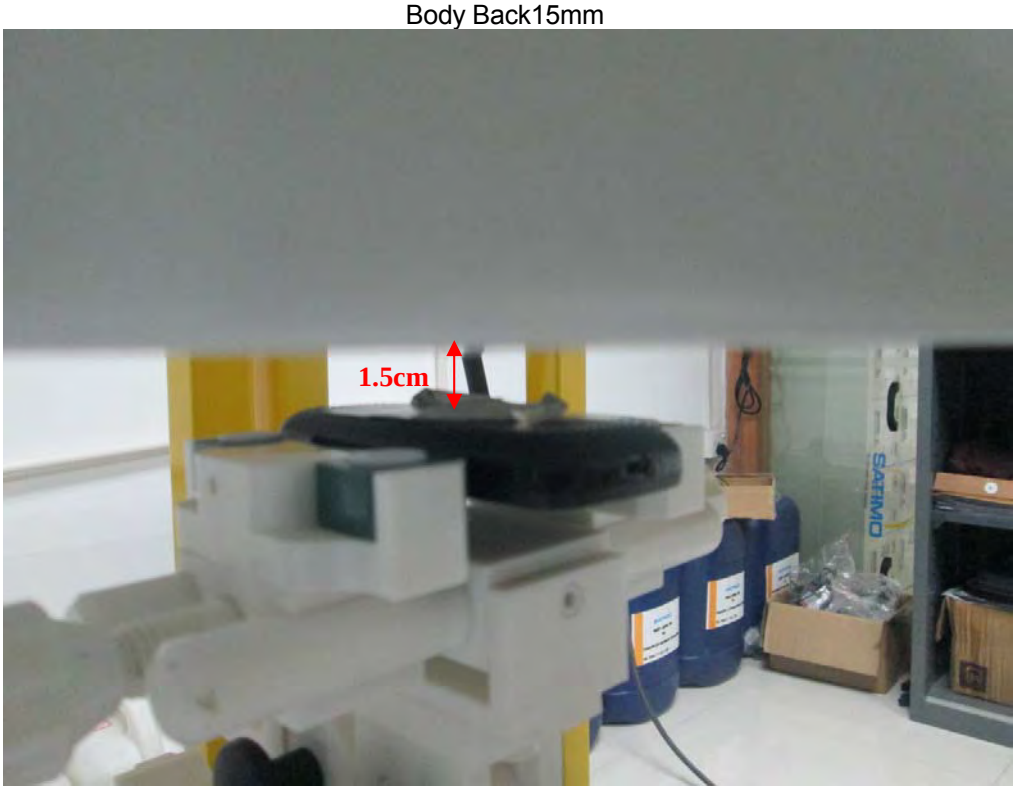
LEFT-TILT 15^0

RIGHT-CHECK TOUCH

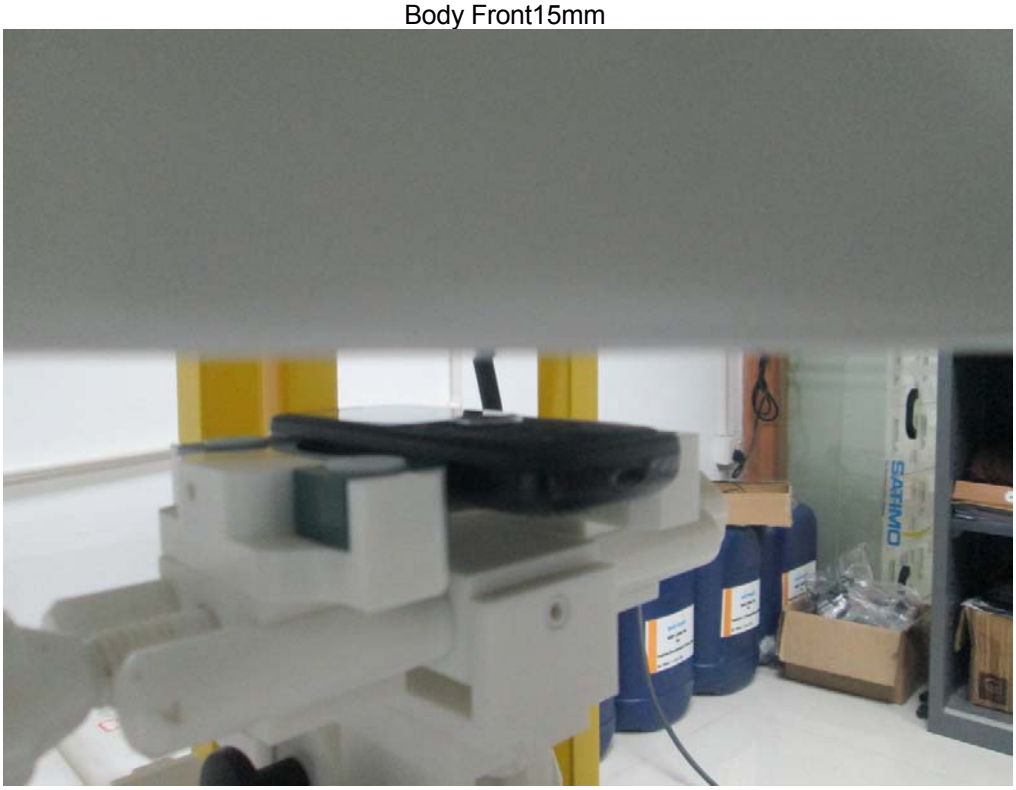


RIGHT-TILT 15^0

Body Back15mm



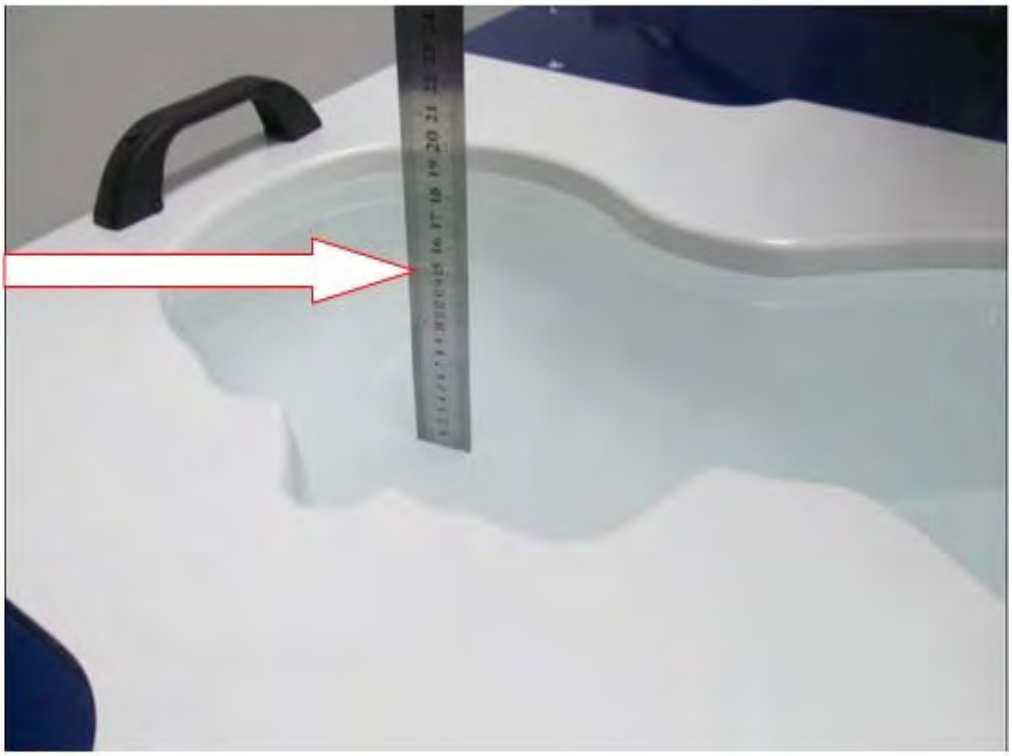
Body Front15mm



Body back with Headset

DEPTH OF THE LIQUID IN THE PHANTOM—ZOOM IN

Note：The position used in the measurement were according to IEEE 1528-2003



TOTAL VIEW OF EUT

TOP VIEW OF EUT

BOTTOM VIEW OF EUT

FRONT VIEW OF EUT

BACK VIEW OF EUT

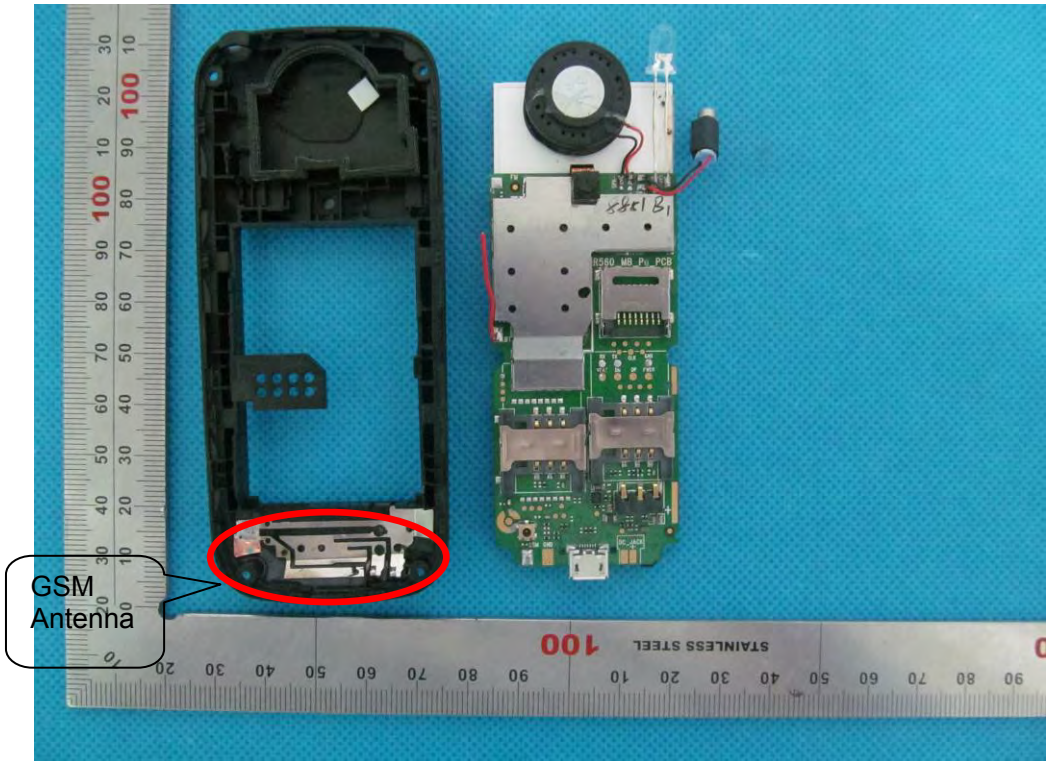
LEFT VIEW OF EUT

RIGHT VIEW OF EUT

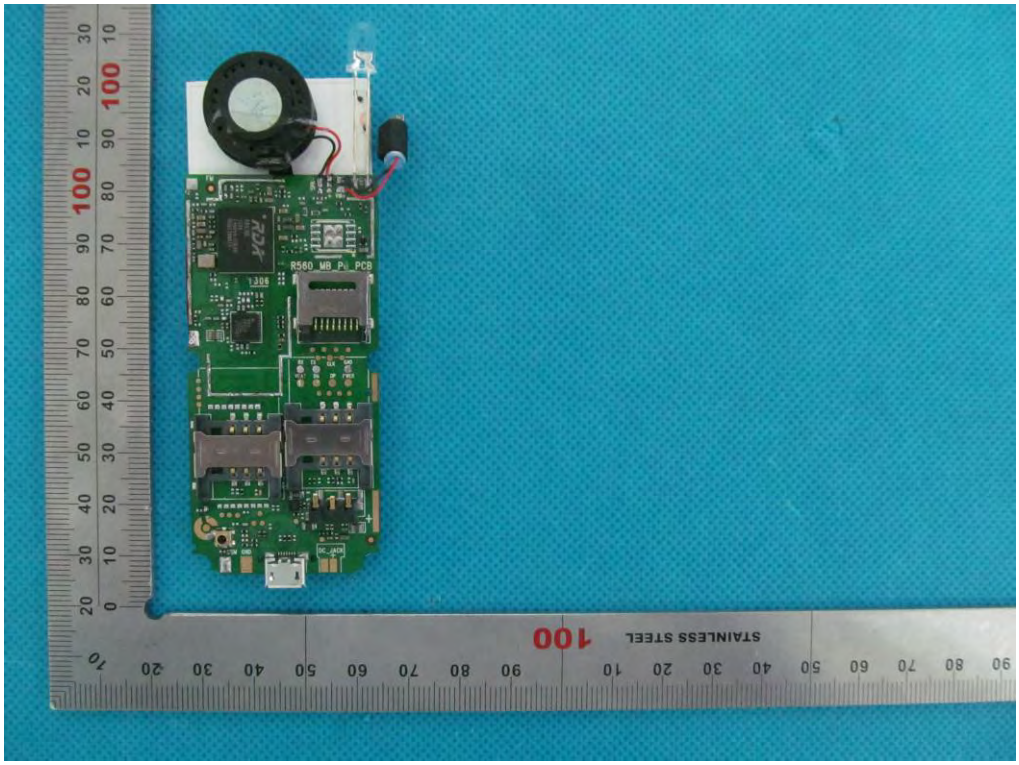
OPEN VIEW OF EUT-1

OPEN VIEW OF EUT-2

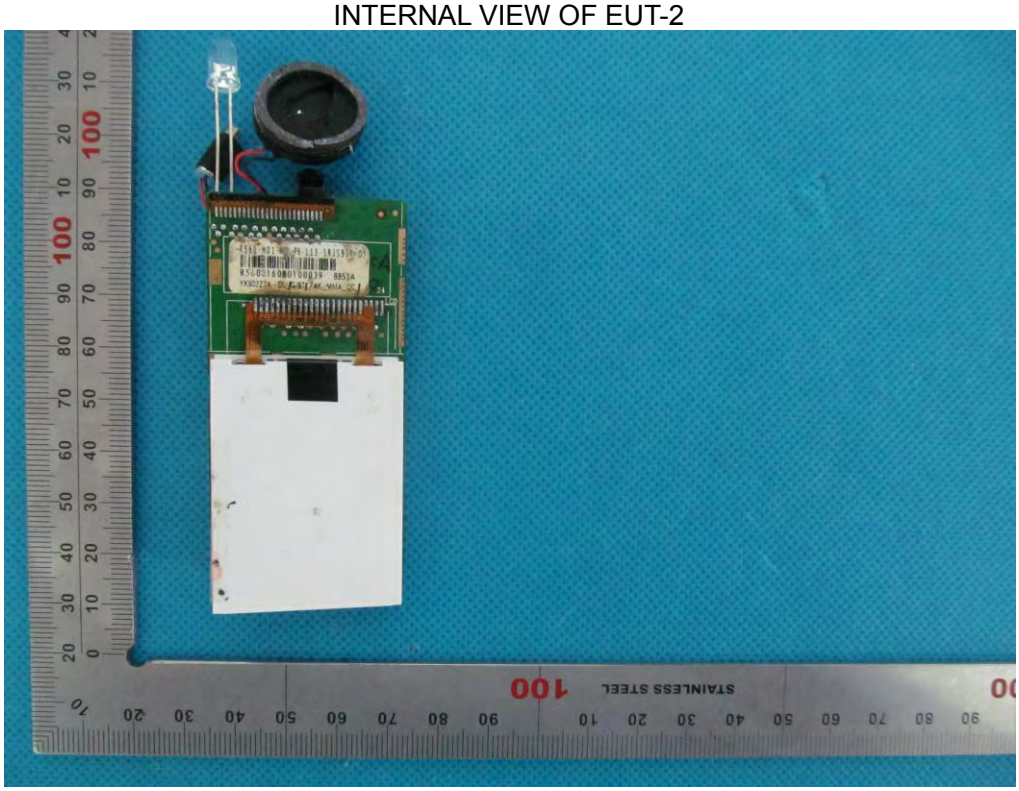
OPEN VIEW OF EUT-3



INTERNAL VIEW OF EUT-1



INTERNAL VIEW OF EUT-2



Appendix D. Probe Calibration Data

SATIMO
The microwave vision company

COMOSAR E-Field Probe Calibration Report

Ref : ACR.346.1.12.SATU.A

ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.

1&2F, NO.2 BUILDING, HUAFENG NO.1 INDUSTRIAL PARK, GUSHU COMMUNITY XIXIANG STREET BAOAN DISTRICT, SHENZHEN, P.R. CHINA

SATIMO COMOSAR DOSIMETRIC E-FIELD PROBE

SERIAL NO.: SN 22/12 EP159

Calibrated at SATIMO US

2105 Barrett Park Dr. - Kennesaw, GA 30144

ACCREDITED
Calibration CERT #2246.03

12/11/12

Summary:

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed in SATIMO USA using the CALISAR / CALIBAIR test bench, for use with a SATIMO COMOSAR system only. All calibration results are traceable to national metrology institutions.

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	12/11/2012	
Checked by :	Jérôme LUC	Product Manager	12/11/2012	
Approved by :	Kim RUTKOWSKI	Quality Manager	12/11/2012	Kim Rutkowski

	Customer Name
Distribution :	ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.

Issue	Date	Modifications
A	12/11/2012	Initial release

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

TABLE OF CONTENTS

1 Device Under Test 4
2 Product Description 4
2.1 General Information 4
3 Measurement Method 4
3.1 Linearity 4
3.2 Sensitivity 5
3.3 Lower Detection Limit 5
3.4 Isotropy 5
3.5 Boundary Effect 5
4 Measurement Uncertainty 5
5 Calibration Measurement Results 6
5.1 Sensitivity in air 6
5.2 Linearity 7
5.3 Sensitivity in liquid 7
5.4 Isotropy 8
6 List of Equipment 10

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	Satimo
Model	SSE5
Serial Number	SN 22/12 EP159
Product Condition (new / used)	new
Frequency Range of Probe	0.3 GHz-3GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.228 MΩ Dipole 2: R2=0.227 MΩ Dipole 3: R3=0.234 MΩ

A yearly calibration interval is recommended.

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

Satimo's COMOSAR E field Probes are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards.

Figure 1 – *Satimo COMOSAR Dosimetric E field Dipole*

Probe Length	330 mm
Length of Individual Dipoles	4.5 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	5 mm
Distance between dipoles / probe extremity	2.7 mm

3 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their affect. All calibrations / measurements performed meet the fore mentioned standards.

3.1 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01W/kg to 100W/kg.

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

3.2 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards.

3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

3.4 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 - 360 degrees in 15 degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°–180°) in 15° increments. At each step the probe is rotated about its axis (0°–360°).

3.5 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	ci	Standard Uncertainty (%)
Incident or forward power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Reflected power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Liquid conductivity	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Liquid permittivity	4.00%	Rectangular	$\sqrt{3}$	1	2.309%
Field homogeneity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Field probe positioning	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Field probe linearity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

Combined standard uncertainty					5.831%
Expanded uncertainty 95 % confidence level k = 2					11.662%

5 CALIBRATION MEASUREMENT RESULTS

Calibration Parameters	
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

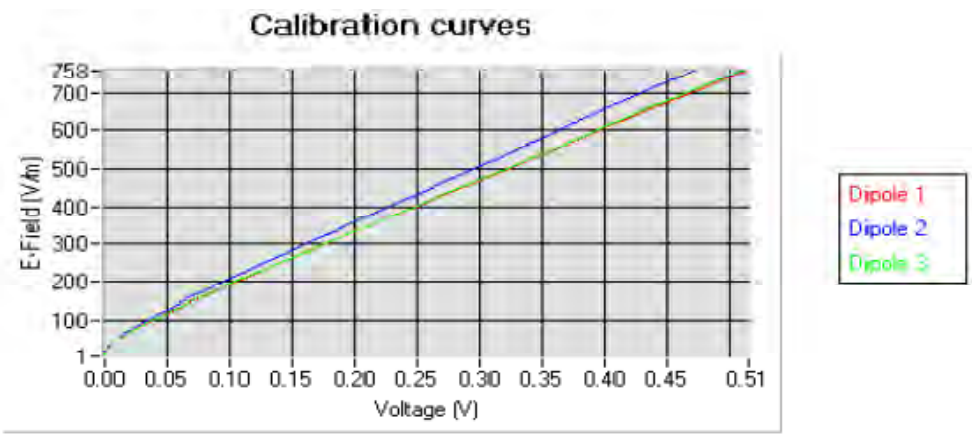
5.1 SENSITIVITY IN AIR

Normx dipole 1 (µV/(V/m)^2)	Normy dipole 2 (µV/(V/m)^2)	Normz dipole 3 (µV/(V/m)^2)
5.41	4.68	5.48

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
102	99	95

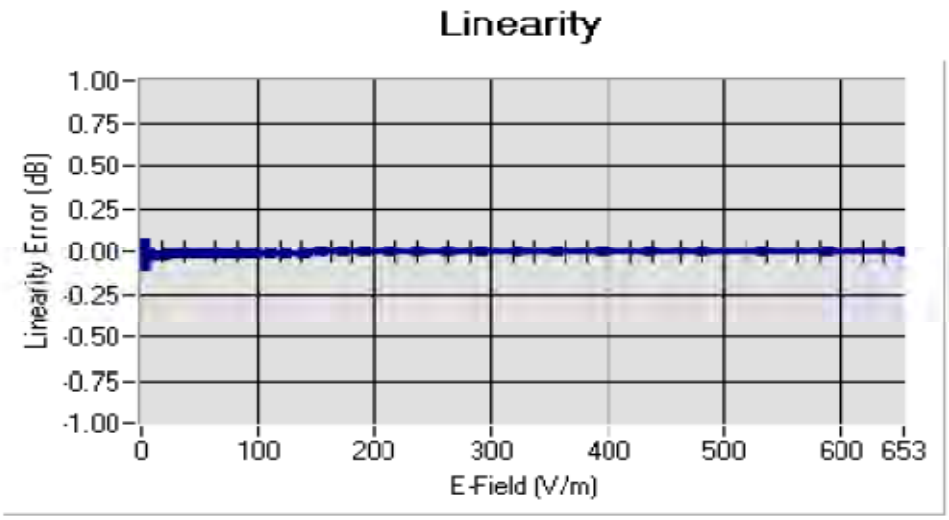
Calibration curves ei=f(V) (i=1,2,3) allow to obtain H-field value using the formula:

$$E = \sqrt{E_1^{\,2} + E_2^{\,2} + E_3^{\,2}}$$



This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

5.2 LINEARITY



Linearity: +/-1.97% (+/-0.09dB)

5.3 SENSITIVITY IN LIQUID

Liquid	Frequency (MHz +/- 100MHz)	Permittivity	Epsilon (S/m)	ConvF
HL300	300	44.87	0.86	7.03
HL450	450	42.90	0.87	6.89
HL850	835	41.92	0.91	6.05
HL900	900	42.40	0.98	5.79
HL1800	1750	39.75	1.38	5.22
HL1900	1880	38.99	1.39	5.73
HL2000	1950	40.85	1.42	5.30
HL2450	2450	40.32	1.79	5.49

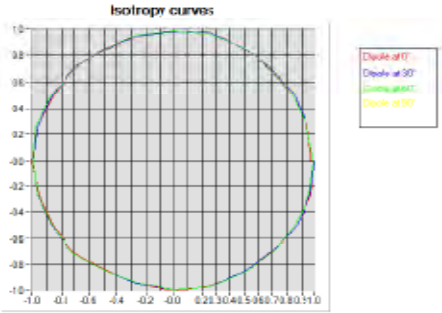
LOWER DETECTION LIMIT: 7mW/kg

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

5.4 ISOTROPY

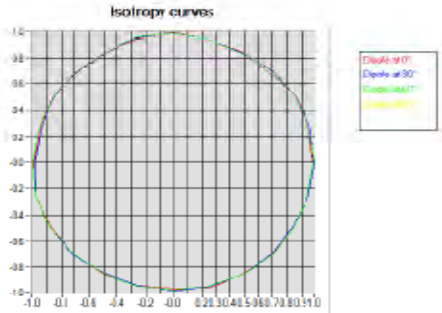
HL900 MHz

- Axial isotropy: 0.05 dB
- Hemispherical isotropy: 0.08 dB



HL1800 MHz

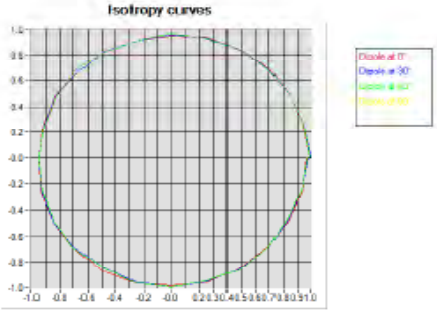
- Axial isotropy: 0.06 dB
- Hemispherical isotropy: 0.12 dB



This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

HL2450 MHz

- Axial isotropy: 0.07 dB
- Hemispherical isotropy: 0.14 dB



This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

6 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
Flat Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2010	02/2013
Reference Probe	Satimo	EP 94 SN 37/08	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Multimeter	Keithley 2000	1188656	11/2010	11/2013
Signal Generator	Agilent E4438C	MY49070581	12/2010	12/2013
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	11/2010	11/2013
Power Sensor	HP ECP-E26A	US37181460	11/2010	11/2013
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	Mega Industries	069Y7-158-13-712	Validated. No cal required.	Validated. No cal required.
Waveguide Transition	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Waveguide Termination	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Control Company	11-661-9	3/2012	3/2014

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

Appendix E. Dipole Calibration Data

SAR Reference Dipole Calibration Report

Ref : ACR.343.5.11.SATU.A

ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.
1&2F, NO.2 BUILDING, HUAFENG NO.1 INDUSTRIAL PARK, GUSHU COMMUNITY XIXIANG STREET
BAOAN DISTRICT, SHENZHEN, P.R. CHINA
SATIMO COMOSAR REFERENCE DIPOLE
FREQUENCY: 900 MHZ
SERIAL NO.: SN 46/11 DIP 0G900-185

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

ACCREDITED
Calibration CERT #2246.02

12/09/11

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme LUC	Product Manager	12/9/2011	
Checked by :	Jérôme LUC	Product Manager	12/9/2011	
Approved by :	Kim RUTKOWSKI	Quality Manager	12/9/2011	

	Customer Name
Distribution :	ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.

Issue	*Date*	*Modifications*
A	12/9/2011	Initial release

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

TABLE OF CONTENTS

1 Introduction 4
2 Device Under Test 4
3 Product Description 4
3.1 General Information 4
4 Measurement Method 5
4.1 Return Loss Requirements 5
4.2 Mechanical Requirements 5
5 Measurement Uncertainty 5
5.1 Return Loss 5
5.2 Dimension Measurement 5
5.3 Validation Measurement 5
6 Calibration Measurement Results 6
6.1 Return Loss 6
6.2 Mechanical Dimensions 6
7 Validation measurement 7
7.1 Measurement Condition 7
7.2 Head Liquid Measurement 7
7.3 Measurement Result 8
8 List of Equipment 8

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 835 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID900
Serial Number	SN 46/11 DIP 0G900-185
Product Condition (new / used)	new

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.

Figure 1 – *Satimo COMOSAR Validation Dipole*

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constucted as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

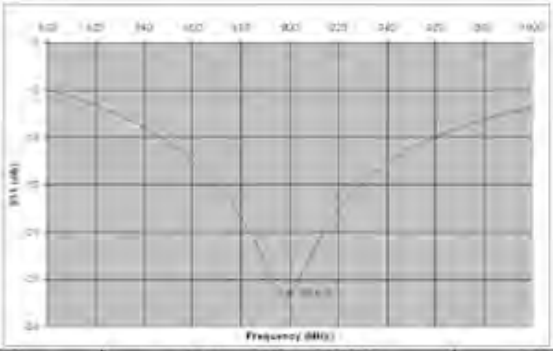
The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	16.19 %
10 g	15.86 %

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS



Frequency (MHz)	Return Loss (dB)	Requirement (dB)
900	-26.52	-20

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %		250.0 ±1 %		6.35 ±1 %	
450	290.0 ±1 %		166.7 ±1 %		6.35 ±1 %	
750	176.0 ±1 %		100.0 ±1 %		6.35 ±1 %	
835	161.0 ±1 %		89.8 ±1 %		3.6 ±1 %	
900	149.0 ±1 %	PASS	83.3 ±1 %	PASS	3.6 ±1 %	PASS
1450	89.1 ±1 %		51.7 ±1 %		3.6 ±1 %	
1500	80.5 ±1 %		50.0 ±1 %		3.6 ±1 %	
1640	79.0 ±1 %		45.7 ±1 %		3.6 ±1 %	
1750	75.2 ±1 %		42.9 ±1 %		3.6 ±1 %	
1800	72.0 ±1 %		41.7 ±1 %		3.6 ±1 %	
1900	68.0 ±1 %		39.5 ±1 %		3.6 ±1 %	
1950	66.3 ±1 %		38.5 ±1 %		3.6 ±1 %	
2000	64.5 ±1 %		37.5 ±1 %		3.6 ±1 %	
2100	61.0 ±1 %		35.7 ±1 %		3.6 ±1 %	
2300	55.5 ±1 %		32.6 ±1 %		3.6 ±1 %	
2450	51.5 ±1 %		30.4 ±1 %		3.6 ±1 %	
2600	48.5 ±1 %		28.8 ±1 %		3.6 ±1 %	
3000	41.5 ±1 %		25.0 ±1 %		3.6 ±1 %	
3500	37.0±1 %		26.4 ±1 %		3.6 ±1 %	
3700	34.7±1 %		26.4 ±1 %		3.6 ±1 %	

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 MEASUREMENT CONDITION

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 41.5 sigma : 0.97
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoom Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	900 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

7.2 HEAD LIQUID MEASUREMENT

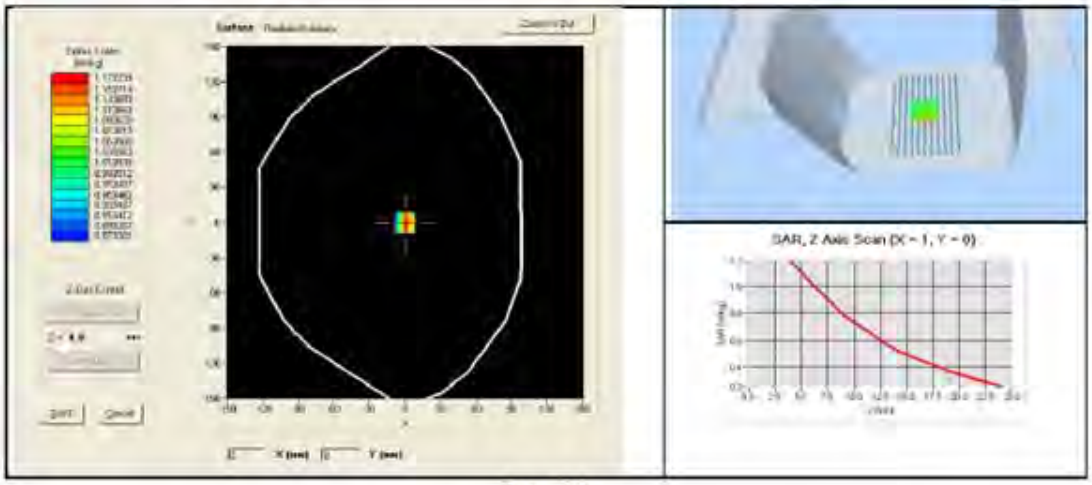
Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %	PASS	0.97 ±5 %	PASS
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	
1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

7.3 MEASUREMENT RESULT

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9	11.20 (1.12)	6.99	7.04 (0.70)
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
Flat Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2010	02/2013
Calipers	Carrera	CALIPER-01	12/2010	12/2013
Reference Probe	Satimo	EPG122 SN 18/11	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Multimeter	Keithley 2000	1188656	11/2010	11/2013
Signal Generator	Agilent E4438C	MY49070581	12/2010	12/2013
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	11/2010	11/2013
Power Sensor	HP ECP-E26A	US37181460	11/2010	11/2013
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	3/2010	3/2012

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

SAR Reference Dipole Calibration Report

Ref : ACR.343.7.11.SATU.A

ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.

1&2F, NO.2 BUILDING, HUAFENG NO.1 INDUSTRIAL PARK, GUSHU COMMUNITY XIXIANG STREET

BAOAN DISTRICT, SHENZHEN, P.R. CHINA

SATIMO COMOSAR REFERENCE DIPOLE

FREQUENCY: 1900 MHZ

SERIAL NO.: SN 46/11 DIP 1G900-187

Calibrated at SATIMO US

2105 Barrett Park Dr. - Kennesaw, GA 30144

ACCREDITED

Calibration CERT #2246.02

12/09/11

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme LUC	Product Manager	12/9/2011	
Checked by :	Jérôme LUC	Product Manager	12/9/2011	
Approved by :	Kim RUTKOWSKI	Quality Manager	12/9/2011	

	Customer Name
Distribution :	ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.

Issue	*Date*	*Modifications*
A	12/9/2011	Initial release

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

TABLE OF CONTENTS

1 Introduction 4
2 Device Under Test 4
3 Product Description 4
3.1 General Information 4
4 Measurement Method 5
4.1 Return Loss Requirements 5
4.2 Mechanical Requirements 5
5 Measurement Uncertainty 5
5.1 Return Loss 5
5.2 Dimension Measurement 5
5.3 Validation Measurement 5
6 Calibration Measurement Results 6
6.1 Return Loss 6
6.2 Mechanical Dimensions 6
7 Validation measurement 6
7.1 Measurement Condition 6
7.2 Head Liquid Measurement 6
7.3 Measurement Result 6
8 List of Equipment 6

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 1900 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID1900
Serial Number	SN 46/11 DIP 1G900-187
Product Condition (new / used)	new

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.

Figure 1 – *Satimo COMOSAR Validation Dipole*

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constucted as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

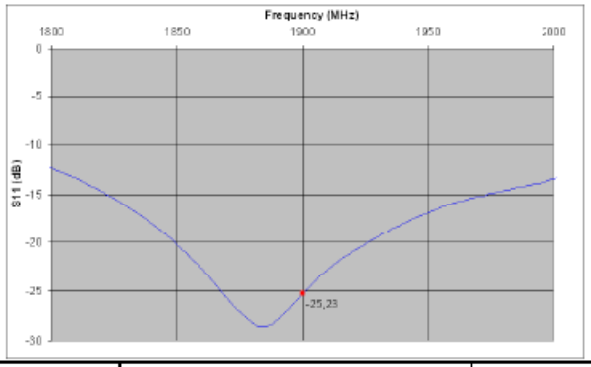
The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	16.19 %
10 g	15.86 %

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS



Frequency (MHz)	Return Loss (dB)	Requirement (dB)
1900	-25.23	-20

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	
450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.	PASS	39.5 ±1 %.	PASS	3.6 ±1 %.	PASS
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 MEASUREMENT CONDITION

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 39.4 sigma : 1.42
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoom Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	1900 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

7.2 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	
1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %	PASS	1.40 ±5 %	PASS
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

7.3 MEASUREMENT RESULT

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7	40.44 (4.04)	20.5	20.60 (2.06)
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
Flat Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2010	02/2013
Calipers	Carrera	CALIPER-01	12/2010	12/2013
Reference Probe	Satimo	EPG122 SN 18/11	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Multimeter	Keithley 2000	1188656	11/2010	11/2013
Signal Generator	Agilent E4438C	MY49070581	12/2010	12/2013
Amplifier	Aethercomm	SN 04E	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	11/2010	11/2013
Power Sensor	HP ECP-E26A	US37181460	11/2010	11/2013
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	3/2010	3/2012

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.