SAR TEST REPORT

For

Shenzhen Huaruian Technology Co.,Ltd

Mobile phone

Model No.: S400

Prepared for	:	Shenzhen Huaruian Technology Co.,Ltd
Address	:	4th Floor of Yuxing, Sanwei Science and Technology, Park,Hangcheng Road,Bao'an District, Shenzhen, China

Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	September 30, 2015
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	October 08, 2015 - October 13, 2015
Date of Report	:	October 14, 2015

SAR TEST REPORT

Report Reference No.................:	**LCS1510080075E**
Date Of Issue...............................:	October 14, 2015
Testing Laboratory Name ....:	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address..:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure ....:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name......................:	**Shenzhen Huaruian Technology Co.,Ltd**
Address..:	4th Floor of Yuxing, Sanwei Science and Technology, Park,Hangcheng Road,Bao'an District, Shenzhen, China
Test Specification:	
SAR Max. Values is....................:	1.498 W/Kg (1g) for Head and 1.112 W/Kg (1g) for Body.
Standard ....:	ANSI/IEEE C95.1:2005/ANSI/IEEE C95.3 :2002 IEEE1528 :2013/47CFR §2.1093
Test Report Form No. ....:	LCSEMC-1.0
TRF Originator............................:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF ....:	Dated 2014-09

Test Item Description................:	**Mobile phone**
Trade Mark..................................:	N/A
Model/Type Reference................:	S400
Ratings ....:	DC 3.7V by li-ion battery(1500mAh) Adapter Parameters: Input: AC100-240V 50/60Hz 0.3A Output: DC 5V/ 1A
Result ....:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Dick Su		Gavin Liang
Dick Su/ File administrators	Glin Lu/ Technique principal	Gavin Liang/ Manager

SAR -- TEST REPORT

Test Report No. : LCS1510080075E	October 14, 2015 Date of issue

Type / Model.........................	:	S400
EUT.......................................	:	Mobile phone
Applicant..............................	**:**	**Shenzhen Huaruian Technology Co.,Ltd**
Address..................................	:	4th Floor of Yuxing, Sanwei Science and Technology, Park,Hangcheng Road,Bao'an District, Shenzhen, China
Telephone..............................	:	/
Fax...	:	/
Manufacturer.......................	**:**	**Shenzhen Huaruian Technology Co.,Ltd**
Address..................................	:	4th Floor of Yuxing, Sanwei Science and Technology, Park,Hangcheng Road,Bao'an District, Shenzhen, China
Telephone..............................	:	/
Fax...	:	/
Factory..................................	**:**	**Shenzhen Huaruian Technology Co.,Ltd**
Address..................................	:	4th Floor of Yuxing, Sanwei Science and Technology, Park,Hangcheng Road,Bao'an District, Shenzhen, China
Telephone..............................	:	/
Fax...	:	/

Test Result	**Positive**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

TABLE OF CONTENTS

1.TEST STANDARDS AND TEST DESCRIPTION

1.1. Test Standards

ANSI/IEEE C95.1: 2005:IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fileds,3 kHz to 300 GHz.
ANSI/IEEE C95.3: 2002:IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to SuchFields,100 kHz—300 GHz.
IEEE1528:2013:Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate.
KDB447498 D01v05r02:General RF Exposure Guidance.
KDB248227 D01 802.11Wifi SAR vo2:SAR measure for 802.11 a/b/g.
KDB865664 D01v01r03:SAR measurement 100MHz to 6GHz.
KDB865664 D02v01r01:SAR Report.
KDB690783 D01v01r03:SAR lisitings on Grants.
KDB616217 D04v01r01: SAR for laptop and tablets v01r01
KDB648474 D04:SAR Handsets Multi Xmiter and Ant v01
KDB941225 D01v02:SAR Test for 3G devices.
KDB941225 D01v02r02:HSPA and 1xAdvanced.
KDB941225 D06:Hot Spot SAR v01
FCC Part 2:2012: frequency alloca-tions and radio treaty mat-ters; general rules and reg-ulations

1.2. Test Description

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power .
And Test device is identical prototype.

2. SUMMARY

2.1. Product Description

Product Name:	Mobile phone
Trade Mark:	N/A
Model/Type reference:	S400
Listed Model(s):	S400
Hardware Version	PX6S45G REV1.4
Software Version:	W83_MB_REV1.3
Power supply:	DC 3.7V by li-ion battery(1500mAh) Adapter Parameters: Input: AC100-240V 50/60Hz 0.3A Output: DC 5V/ 1A
2G	
Operation Band:	GSM850, PCS1900
Supported type:	GSM/GPRS/EGPRS
Power Class:	GSM850:Power Class 5 PCS1900:Power Class 0
Modulation Type:	GMSK for GSM/GPRS; 8PSK for EGPRS
GSM Release Version	R9
GPRS Multislot Class	12
EGPRS Multislot Class	12
WCDMA	
Operation Band:	FDD Band II , FDD Band V
Power Class:	Power Class 3
Modulation Type:	QPSK for WCDMA/HSUPA/HSDPA
WCDMA Release Version:	R7
HSDPA Release Version:	Release 8
HSUPA Release Version:	Release 6
DC-HSUPA Release Version:	Not Supported
WIFI	
Supported type:	802.11b/802.11g/802.11n(HT20)
Modulation:	802.11b: DSSS 802.11g/802.11n:OFDM
Operation frequency:	2412MHz~2462MHz;
Channel number:	11
Channel separation:	5MHz
Bluetooth	
Version:	Supported BT4.0
Modulation:	BLE, GFSK(1Mbps) , π/4-DQPSK(2Mbps), 8DPSK(3Mbps)
Operation frequency:	2402MHz~2480MHz
Channel number:	40/79
Channel separation:	2MHz/1MHz

2.2. Summary SAR Results

Table 1:Max. SAR Measured(1g)

Exposure Configuration	Technolohy Band	Highest Measured SAR 1g(W/Kg)
Head	GSM850	**0.992**
	PCS1900	**0.848**
	WCDMA Band V	**0.903**
	WCDMA Band II	**0.522**
	WLAN2450	**0.511**
Body (Separation Distance 15mm)	GSM850	**0.609**
	PCS1900	**0.652**
	WCDMA Band V	**0.913**
	WCDMA Band II	**0.337**
	WLAN2450	**0.273**
Hotspot (Separation Distance 10mm)	GSM850	**0.673**
	PCS1900	**0.720**
	WCDMA Band V	**1.067**
	WCDMA Band II	**0.557**
	WLAN2450	**0.398**

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6W/Kg as averaged over any 1g tissue accordintg to the ANSI C95.1-1999.
For body worn operation,this devices has been tested and meets FCC RF exposure guidelines when used with any accessory that conrtains no metal and which provides a minimum separation distance of 15mm between this devices and the body of the user.User of other accessories may not ensure compliance with FCC RF exposure guidelines.
The EUT battery must be fully charged and checked periodically during the test to ascertain iniform power output

2.3. EUT operation mode

The EUT has been tested under typical operating condition and The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

2.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

3.TEST ENVIRONMENT

3.1. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

Site Description

EMC Lab. : CNAS Registration Number. is L4595.
FCC Registration Number. is 899208.
Industry Canada Registration Number. is 9642A-1.
VCCI Registration Number. is C-4260 and R-3804.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001.

3.2. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	18-25 ° C
Humidity:	40-65 %
Atmospheric pressure:	950-1050mbar

3.3. SAR Limits

FCC Limit (1g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average(averaged over the whole body)	0.08	0.4
Spatial Peak(averaged over any 1 g of tissue)	1.6	8.0
Spatial Peak(hands/wrists/ feet/anklesaveraged over 10 g)	4.0	20.0

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.
Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

3.4. Equipments Used during the Test

Test Equipment	Manufacturer	Type/Model	Serial Number	Calibration	
				Calibration Date	Calibration Due
PC	Lenovo	G5005	MY42081102	N/A	N/A
Signal Generator	Angilent	E4438C	MY42081396	09/25/2015	09/24/2016
Multimeter	Keithley	MiltiMeter 2000	4059164	10/01/2015	09/30/2016
S-parameter Network Analyzer	Agilent	8753ES	US38432944	09/25/2015	09/24/2016
Wireless Communication Test Set	R & S	CMU200	105988	09/25/2015	09/24/2016
Power Meter	Agilent	E4407B	MY41440754	09/25/2015	09/24/2016
E-Field PROBE	SATIMO	SSE5	SN 17/14 EP220	10/01/2015	09/30/2016
DIPOLE 835	SATIMO	SID 835	SN 07/14 DIP 0G835-303	10/01/2015	09/30/2016
DIPOLE 1900	SATIMO	SID 1900	SN 30/14 DIP 1G900-333	09/01/2015	08/31/2016
DIPOLE 2450	SATIMO	SID 2450	SN 07/14 DIP 2G450-306	10/01/2015	09/30/2016
COMOSAR OPEN Coaxial Probe	SATIMO	OCPG 68	SN 40/14 OCPG68	10/01/2015	09/30/2016
Communication Antenna	SATIMO	ANTA57	SN 39/14 ANTA57	10/01/2015	09/30/2016
Mobile Phone POSITIONING DEVICE	SATIMO	MSH98	SN 40/14 MSH98	N/A	N/A
DUMMY PROBE	SATIMO	DP60	SN 03/14 DP60	N/A	N/A
SAM PHANTOM	SATIMO	SAM117	SN 40/14 SAM117	N/A	N/A
Simulated Tissue 900 MHzBody and Head	SATIMO	SAM-9-H	SN 21/14 HLD438	Each Time	N/A
Simulated Tissue 1900 MHz For Head	SATIMO	SAM-18-H	SN 21/14 HLF439	Each Time	N/A
Simulated Tissue 2450 MHz Body and Head	SATIMO	SAM-24-H	SN 21/14 HLJ445	Each Time	N/A
PHANTOM TABLE	SATIMO	TABP98	SN 40/14 TABP98	N/A	N/A
6 AXIS ROBOT	KUKA	KR6-R900	501217	N/A	N/A
High Power Solid State Amplifier (80MHz~1000MHz)	Instruments for Industry	CMC150	M631-0627	09/25/2015	09/24/2016
Medium Power Solid State Amplifier (0.8~4.2GHz)	Instruments for Industry	S41-25	M629-0539	09/25/2015	09/24/2016
Wave Tube Amplifier 48 GHz at 20Watt	Hughes Aircraft Company	1277H02F000	102	09/25/2015	09/24/2016

4.SAR MEASUREMENTS SYSTEM CONFIGURATION

4.1. SARMeasurement Set-up

The OPENSAR system for performing compliance tests consist of the following items:

A standard high precision 6-axis robot (KUKA) with controller and software.

KUKA Control Panel (KCP)

A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with a Video Positioning System(VPS).

The stress sensor is composed with mechanical and electronic when the electronic part detects a change on the electro-mechanical switch,It sends an “Emergency signal” to the robot controller that to stop robot’s moves

A computer operating Windows XP.

OPENSAR software

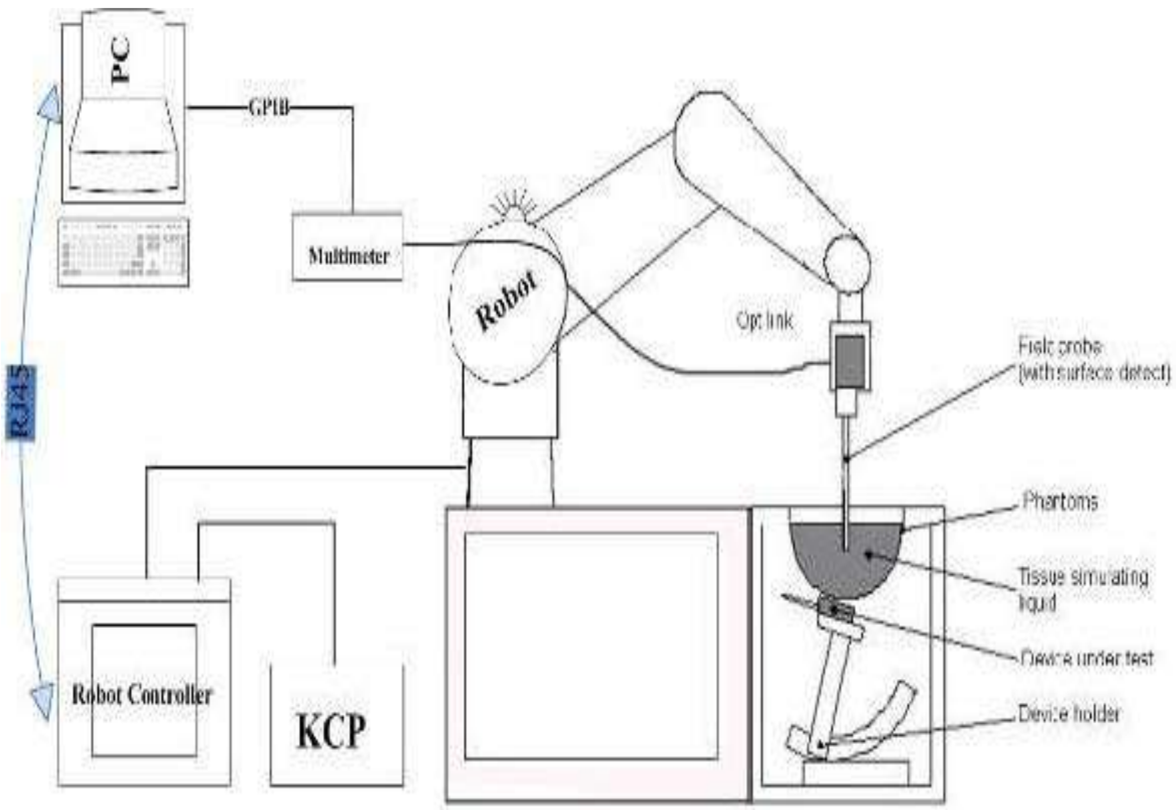
Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

The SAM phantom enabling testing left-hand right-hand and body usage.

The Position device for handheld EUT

Tissue simulating liquid mixed according to the given recipes .

System validation dipoles to validate the proper functioning of the system.



4.2. OPENSAR E-field Probe System

The SAR measurements were conducted with the dosimetric probe EP220 (manufactured by SATIMO), designed in the classical triangular configuration and optimized for dosimetric evaluation.

Probe Specification

ConstructionSymmetrical design with triangular core
Interleaved sensors
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

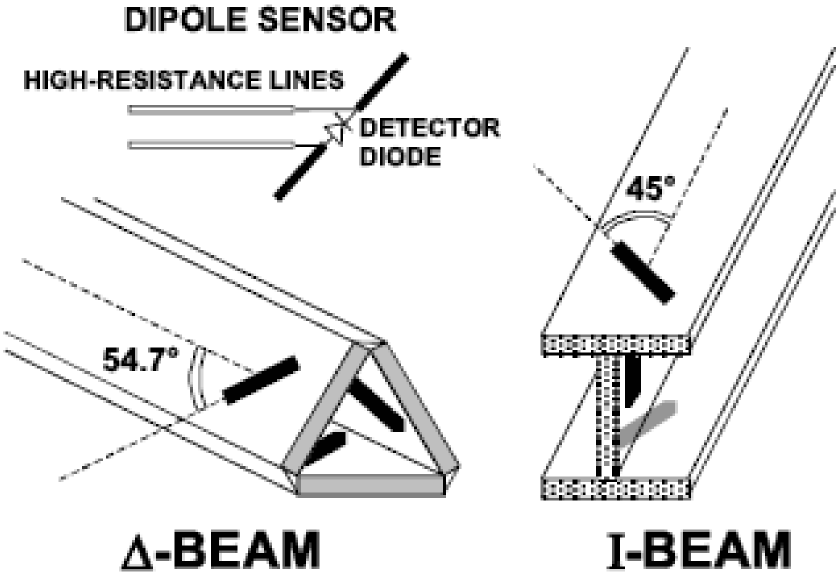
CalibrationISO/IEC 17025 calibration service available.

Frequency	700 MHz to 3 GHz; Linearity:0.25dB(700 MHz to 3GHz)
Directivity	0.25 dB in HSL (rotation around probe axis) 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	0.01W/kg to > 100 W/kg; Linearity: 0.25 dB
Dimensions	Overall length: 330 mm (Tip: 16mm) Tip diameter: 5 mm (Body: 8 mm) Distance from probe tip to sensor centers: 2.5 mm
Application	General dosimetry up to 3 GHz Dosimetry in strong gradient fields Compliance tests of Mobile Phones

Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



4.3. Phantoms

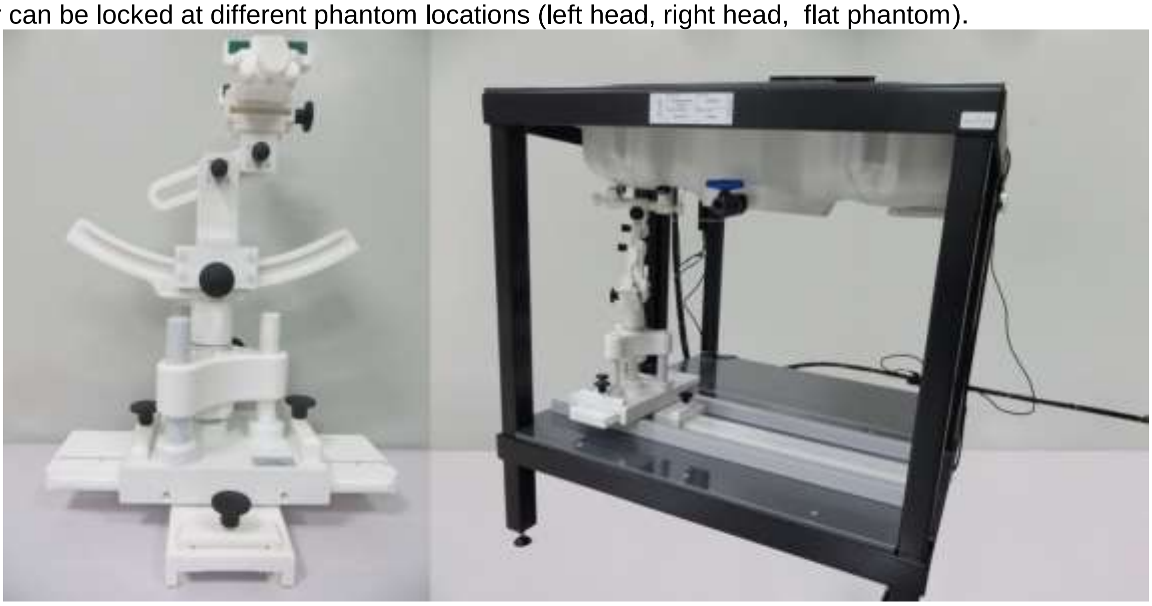
The SAM Phantom SAM117 is constructed of a fiberglass shell ntegrated in a wooden table. The shape of the shell is in compliance with the specification set in IEEE P1528 and CENELEC EN62209-1 , EN62209-2:2010.The phantom enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of allpredefined phantom positions and measurement grids by manually teaching three points in the robo

System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.

SAM Twin Phantom

4.4. Device Holder

In combination with the Generic Twin PhantomSAM117, the Mounting Device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).



Device holder supplied by SATIMO

4.5. Scanning Procedure

The procedure for assessing the peak spatial-average SAR value consists of the following steps

Power Reference Measurement
The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

Area Scan
The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot.Thesophisticated interpolation routines implemented in OPENSAR software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, grid was at to 15 mm by 15 mm and can be edited by a user.

Zoom Scan
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. The default zoom scan measures 5 x 5 x 4 points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more then one maximum, the number of Zoom Scans has to be enlarged accordingly (The default number inserted is 1).

Power Drift measurement
The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have OPENSAR software stop the measurements if this limit is exceeded.

4.6. Data Storage and Evaluation

Data Storage
The OPENSAR software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files . The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

Data Evaluation
The OPENSAR software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	Dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the OPENSAR components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

With Vi = compensated signal of channel i (i = x, y, z)
Ui = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field
dcpi = diode compression point

From the compensated input signals the primary field data for each channel can be evaluated:

$$\mathrm{E-fieldprobes:} \qquad E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$\mathrm{H-fieldprobes:} \qquad H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

With Vi = compensated signal of channel i (i = x, y, z)
Normi = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)2] for E-field Probes
ConvF = sensitivity enhancement in solution
aij = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strength of channel i in V/m
Hi = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

with SAR = local specific absorption rate in mW/g
Etot = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

4.7. Position of the wireless device in relation to the phantom

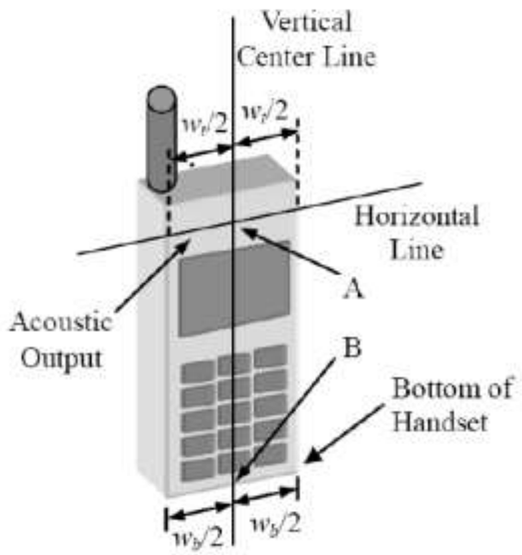
General considerations

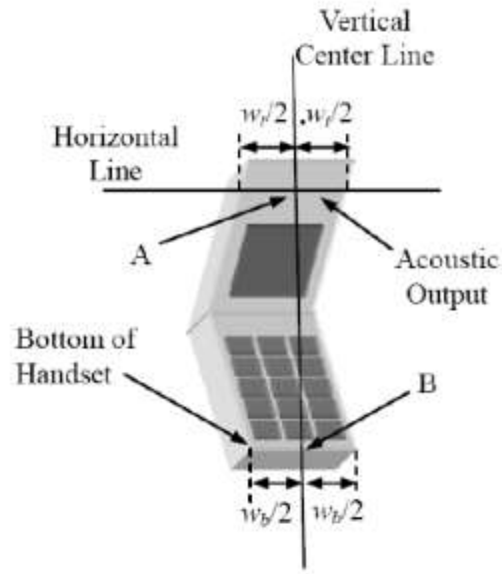
This standard specifies two handset test positions against the head phantom – the “cheek” position and the “tilt” position.

The power flow density is calculated assuming the excitation field as a free space field

$$P_{(\mathrm{pwe})} = \frac{E_{tot}^2}{3770} \text{ or } P_{(pwe)} = H_{tot}^2 .37.7$$

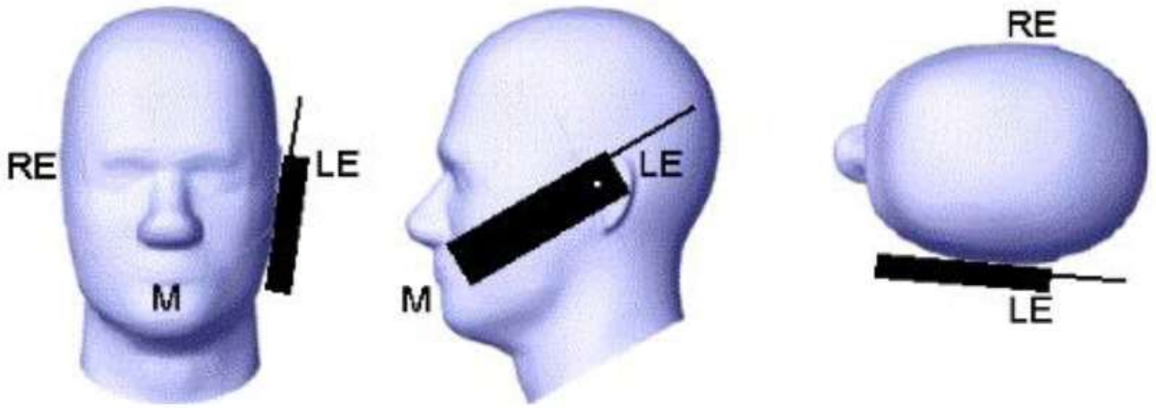
Where P_{pwe}=Equivalent power density of a plane wave in mW/cm2
E_{tot}=total electric field strength in V/m
H_{tot}=total magnetic field strength in A/m



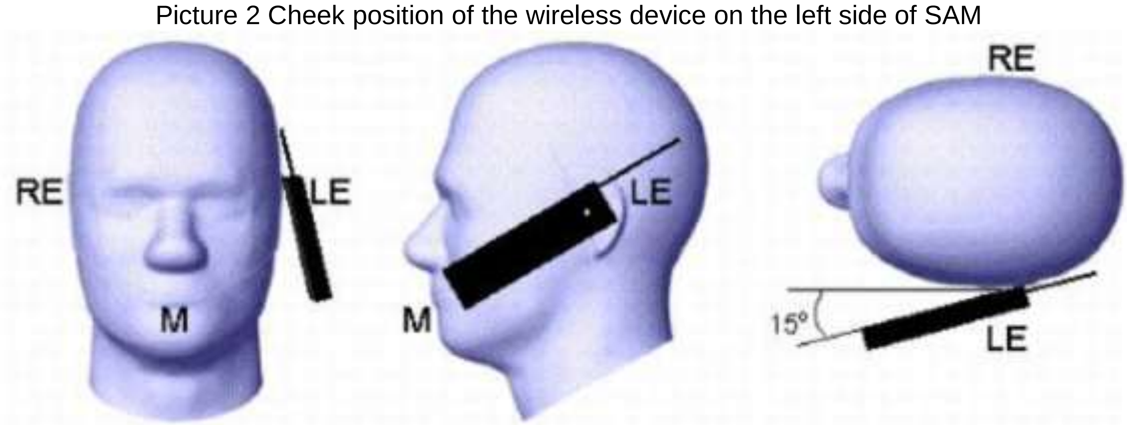


W_t Width of the handset at the level of the acoustic
W_b Width of the bottom of the handset
A Midpoint of the width w_t of the handset at the level of the acoustic output
B Midpoint of the width w_b of the bottom of the handset

Picture 1-a Typical “fixed” case handset Picture 1-b Typical “clam-shell” case handset

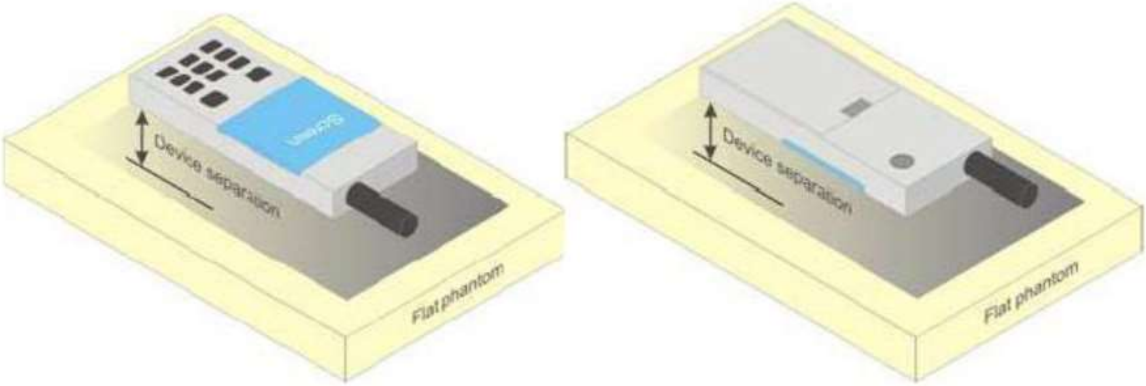


Picture 2 Cheek position of the wireless device on the left side of SAM



Picture 3 Tilt position of the wireless device on the left side of SAM

Body-worn device
A typical example of a body-worn device is a mobile phone, wireless enabled PDA or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer.



Picture 4 Test positions for body-worn devices

Devices with hinged or swivel antenna(s)
For devices that employ one or more external antennas with variable positions (e.g. antenna extended, retracted, rotated), these shall be positioned in accordance with the user instructions provided by the manufacturer. For a device with only one antenna, if no intended antenna position is specified, tests shall be performed if applicable in both the horizontal and vertical positions relative to the phantom, and with the antenna oriented away from the body of the DUT (Figure 5) and/or with the antenna extended and retracted such as to obtain the highest exposure condition. For antennas that may be rotated through one or two planes, an evaluation should be made and documented in the measurement report to the highest exposure scenario and only that position(s) need(s) to be tested. For devices with multiple detachable antennas see provisions of 6.2.2.

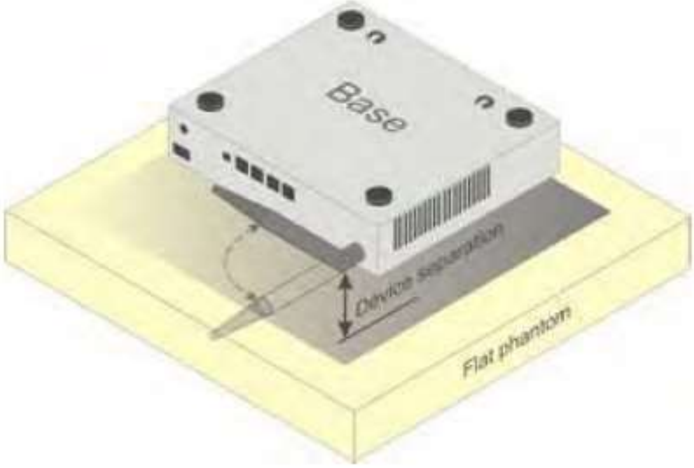
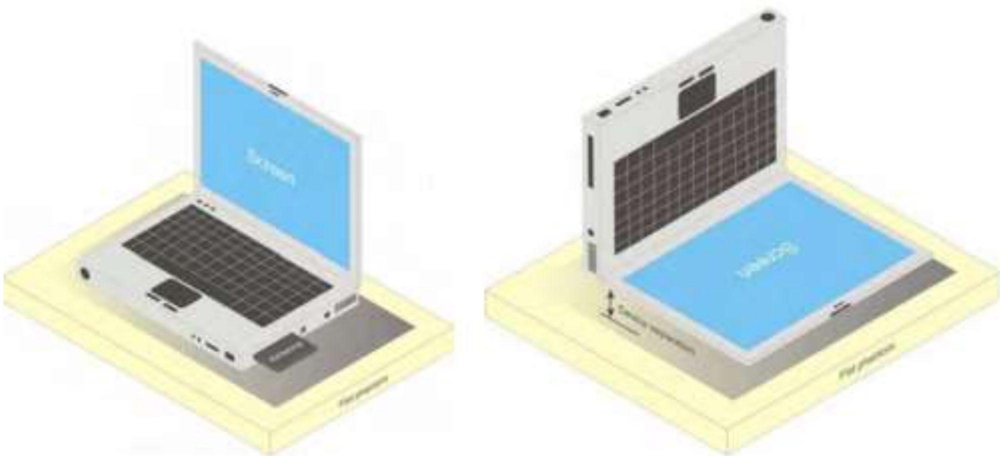


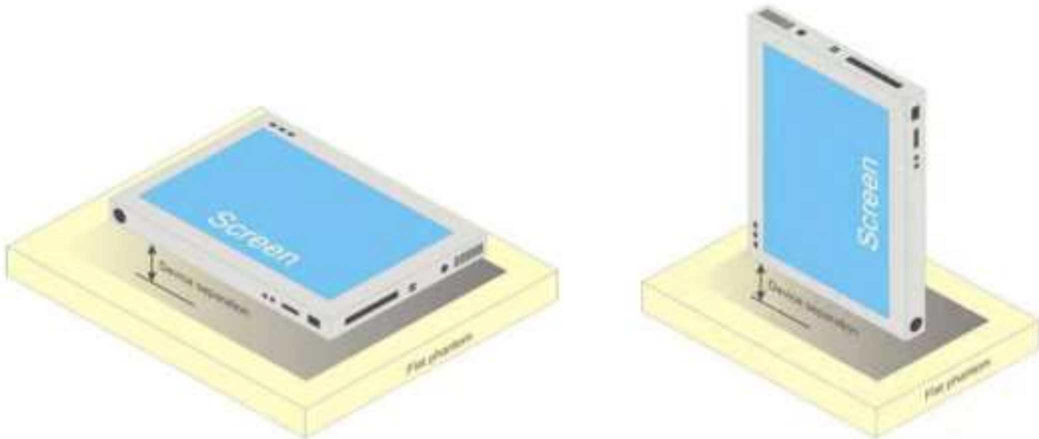
Figure 5– Device with swivel antenna (example of desktop device)

Body-supported device
A typical example of a body supported device is a wireless enabled laptop device that among other orientations may be supported on the thighs of a sitting user. To represent this orientation, the device shall be positioned with its base against the flat phantom. Other orientations may be specified by the manufacturer in the user instructions. If the intended use is not specified, the device shall be tested directly against the flat phantom in all usable orientations.
The screen portion of the device shall be in an open position at a 90° angle as seen in Figure 6a (left side), or at an operating angle specified for intended use by the manufacturer in the operating instructions. Where a body supported device has an integral screen required for normal operation, then the screen-side will not need to be tested if the antenna(s) integrated in it ordinarily remain(s) 200 mm from the body. Where a screen mounted antenna is present, the measurement shall be performed with the screen against the flat phantom as shown in Figure 6a) (right side), if operating the screen against the body is consistent with the intended use.
Other devices that fall into this category include tablet type portable computers and credit card transaction authorisation terminals, point-of-sale and/or inventory terminals. Where these devices may be torso or limb-supported, the same principles for body-supported devices are applied.

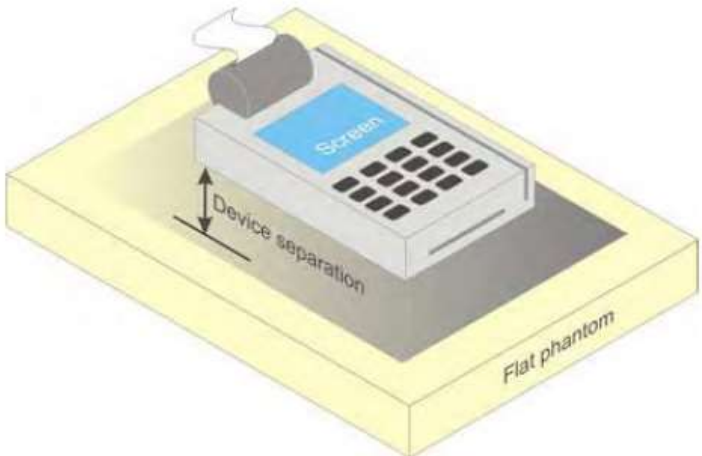
The example in Figure 6b) shows a tablet form factor portable computer for which SAR should be separately assessed with
c). each surface and
d). the separation distances
positioned against the flat phantom that correspond to the intended use as specified by the manufacturer. If the intended use is not specified in the user instructions, the device shall be tested directly against the flat phantom in all usable orientations.
Some body-supported devices may allow testing with an external power supply (e.g. a.c. adapter) supplemental to the battery, but it shall be verified and documented in the measurement report that SAR is still conservative.
For devices that employ an external antenna with variable positions (e.g. swivel antenna), see 6.1.4.5 and Figure 5.



a) Portable computer with external antenna plug-in-radio-card (left side) or with internal antenna located in screen section (right side)



b) Tablet form factor portable computer



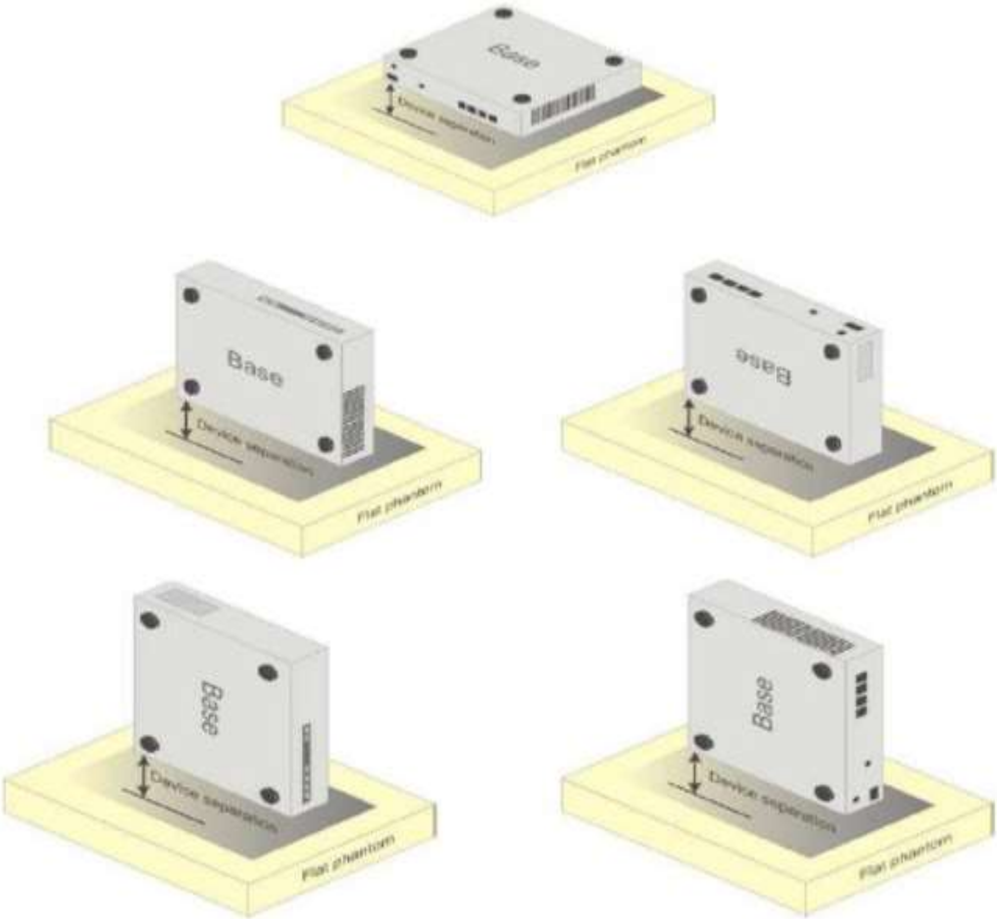
c) Wireless credit card transaction authorisation terminal

Figure 6 – Test positions for body supported devices

Desktop device

A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.

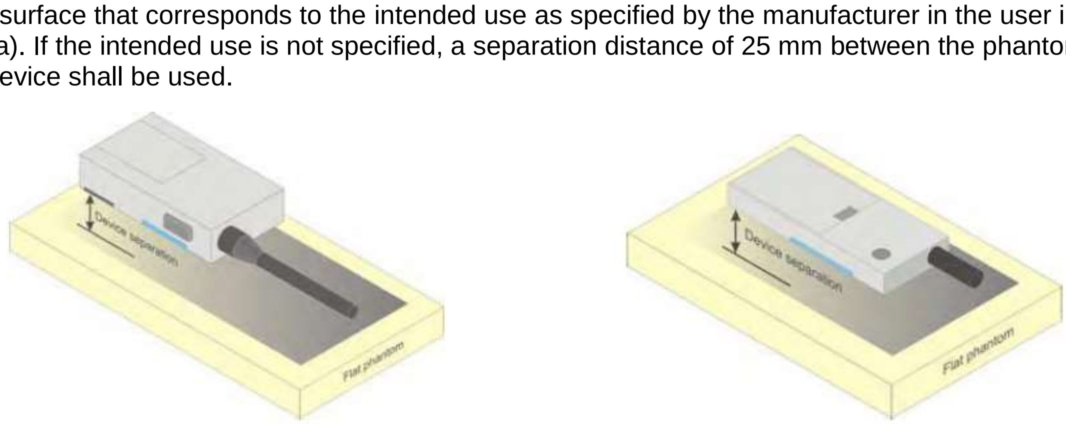
The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions, tests shall be performed for all antenna positions specified. Picture 14 shows positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.



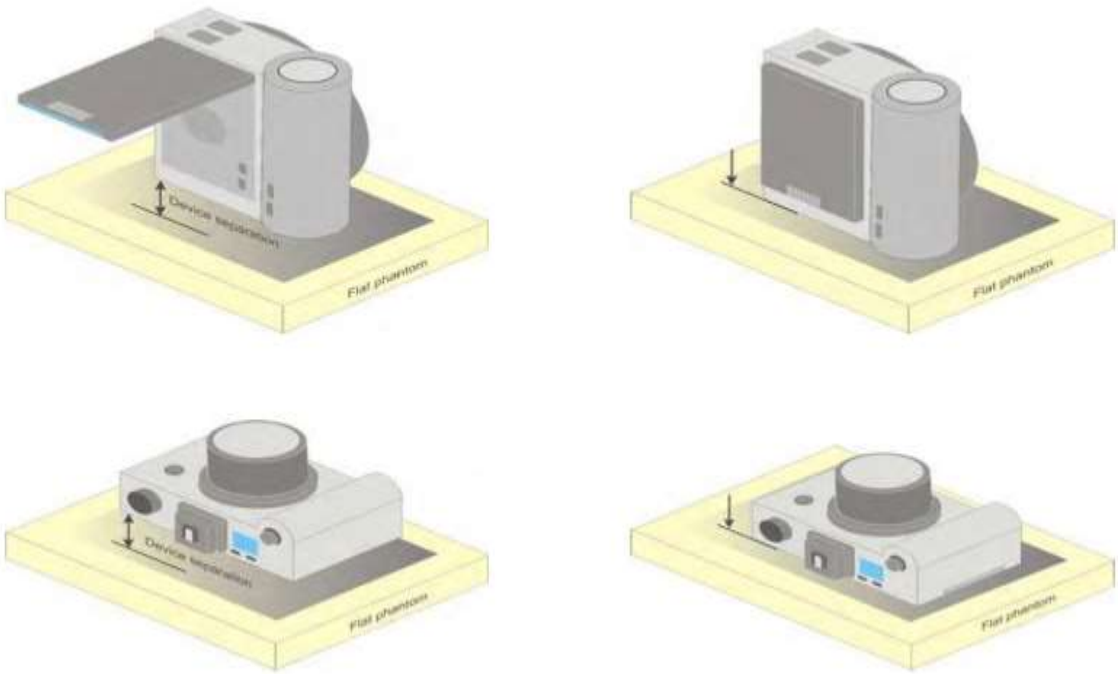
Picture 7 Test positions for desktop devices

Front-of-face device

A typical example of a front-of-face device is a two-way radio that is held at a distance from the face of the user when transmitting. In these cases the device under test shall be positioned at the distance to the phantom surface that corresponds to the intended use as specified by the manufacturer in the user instructions (Figure 8a). If the intended use is not specified, a separation distance of 25 mm between the phantom surface and the device shall be used.



a) Two-way radios



b) Still cameras and video cameras

Figure 8 – Test positions for front-of-face devices

Other devices that fall into this category include wireless-enabled still cameras and video cameras that can send data to a network or other device (Figure 8b). In the case of a devicewhose intended use requires a separation distance from the user (e.g., device with a viewing screen), this shall be positioned at the distance to the phantom surface that corresponds to the intended use as specified by the manufacturer in the user instructions (Figure 8b, left side). If the intended use is not specified, a separation distance of 25 mm between the phantom surface and the device shall be used.
For a device whose intended use requires the user's face to be in contact with the device (e.g., device with an optical viewfinder), this shall be placed directly against the phantom (Figure 8b, right side).

Hand-held usage of the device, not at the head or torso
Additional studies remain needed for devising a representative method for evaluating SAR in the hand of hand-held devices. Future versions of this standard are intended to contain a test method based on scientific data and rationale. Annex J presents the currently available test procedure.

Limb-worn device
A limb-worn device is a unit whose intended use includes being strapped to the arm or leg of the user while transmitting (except in idle mode). It is similar to a body-worn device. Therefore, the test positions of 6.1.4.4 also apply. The strap shall be opened so that it is divided into two parts as shown in Figure 9. The device shall be positioned directly against the phantom surface with the strap straightened as much as possible and the back of the device towards the phantom.
If the strap cannot normally be opened to allow placing in direct contact with the phantom surface, it may be necessary to break the strap of the device but ensuring to not damage the antenna.

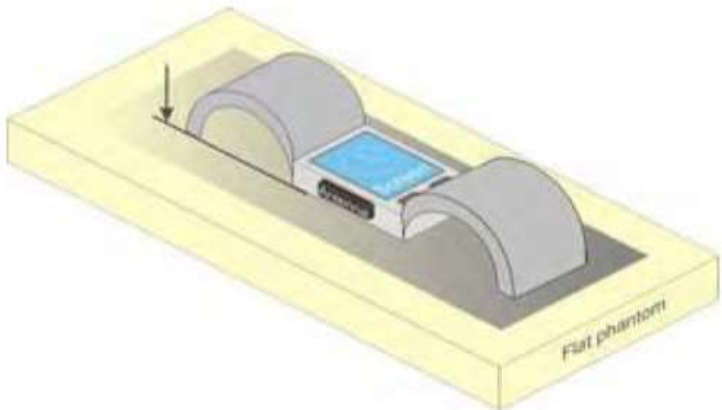


Figure 9 – Test position for limb-worn devices

Clothing-integrated device

A typical example of a clothing-integrated device is a wireless device (mobile phone) integrated into a jacket to provide voice communications through an embedded speaker and microphone. This category also includes headgear with integrated wireless devices.

All wireless or RF transmitting components shall be placed in the orientation and at the separation distance to the phantom surface that correspond to intended use of the device when it is integrated into the clothing (Figure 10).

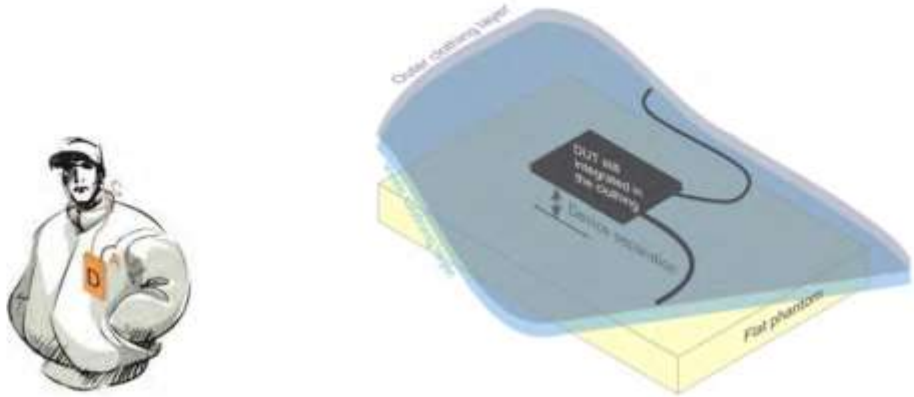


Figure 10– Test position for clothing-integrated wireless devices

4.8. Tissue Dielectric Parameters for Head and Body Phantoms

The liquid used for the frequency range of 100MHz-6G consisted of water, sugar, salt and Cellulose. The liquid has been previously proven to be suited for worst-case. The folowing Tableshows the detail solution. It’s satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and IEC 62209.

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the determine of the dielectric parameter are within the tolerances of the specified target values.The measured cond-uctivity and relative permittivity should be within ±5% of the target values.

The folowing materials are used for producing the tissue-equivalent materials.

Table 2. Composition of the Head Tissue Equivalent Matter

Ingredients (% by weight)	**Frequency (MHz)**				
	835	**900**	**1800**	**2000**	**2450**
Water	41.45	40.92	16.33	54.89	46.70
Sugar	56.0	56.5	/	/	/
Salt	4.45	1.48	0.41	0.18	/
Preventol	0.19	0.1	/	/	/
Cellulose	0.1	0.4	/	/	/
Clycol Monobutyl	/	/	65.3	44.93	53.3
Dielectric ParametersTarget Value	f=835MHz ε =41.5 σ =0.90	f=900MHz ε =41.5 σ =0.97	f=1800MHz ε =40.0 σ =1.40	f=1950 MHz ε =40.0 σ =1.40	f=2450 MHz ε =39.2 σ =1.80

Table 3. Composition of the Body Tissue Equivalent Matter

Ingredients (% by weight)	**Frequency (MHz)**				
	835	**1800**	**1900**	**2450**	**2600**
Water	52.4	69.91	69.91	73.2	64.493
Sugar	45.0	0.0	0.0	0.0	0.0
Salt	1.4	0.13	0.13	0.04	0.024
HEC	1.0	0.0	0.0	0.0	0.0
Bactericide	0.1	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	29.96	29.96	26.7	32.252
Dielectric ParametersTarget Value	f=835MHz ε =55.2 σ =0.97	f=1800MHz ε =53.30 σ =1.52	f=1900MHz ε =53.30 σ =1.52	f=2450 MHz ε =52.7 σ =1.95	f=2450 MHz ε =52.5 σ =2.16

Table 4. Targets for tissue simulating liquid

Frequency (MHz)	**Liquid Type**	**Liquid Type (σ)**	**± 5% Range**	**Permittivity (ε)**	**± 5% Range**
150	Head	0.76	0.72～0.80	52.3	49.69～54.92
300	Head	0.87	0.83～0.91	45.3	43.04～47.57
450	Head	0.87	0.83～0.91	43.5	41.33～45.68
835	Head	0.90	0.86～0.95	41.5	39.43～43.58
900	Head	0.97	0.92～1.02	41.5	39.43～43.58
915	Head	0.98	0.93～1.03	41.5	39.43～43.58
1450	Head	1.20	1.14～1.26	40.5	38.48～42.53
1610	Head	1.29	1.23～1.35	40.3	38.29～42.32
1800-2000	Head	1.40	1.33～1.47	40.0	38.00～42.00
2450	Head	1.80	1.71～1.89	39.2	37.24～41.16
3000	Head	2.40	2.28～2.52	38.5	36.58～40.43
5800	Head	5.27	5.01～5.53	35.3	33.54～37.07
150	Body	0.80	0.76～0.84	61.9	58.81～65.00
300	Body	0.92	0.87～0.97	58.2	55.29～61.11
450	Body	0.94	0.89～0.99	56.7	53.87～59.54
835	Body	0.97	0.92～1.02	55.2	52.44～57.96
900	Body	1.05	1.00～1.10	55.0	52.25～57.75
915	Body	1.06	1.01～1.11	55.0	52.25～57.75
1450	Body	1.30	1.24～1.37	54.0	51.30～56.70
1610	Body	1.40	1.33～1.47	53.8	51.11～56.49
1800-2000	Body	1.52	1.44～1.60	53.3	50.64～55.97
2450	Body	1.95	1.85～2.05	52.7	50.07～55.34
3000	Body	2.73	2.59～2.87	52.0	49.40～54.60
5800	Body	6.00	5.70～6.30	48.2	45.79～50.61

4.9. Dielectric Performance

Dielectric Performance of Head and Body Tissue Simulating Liquid

Measurement is made at temperature 22.0℃and relative humidity 52%.

Liquid temperature during the test: 22.0℃

Measurement Date: 835 MHz October 08, 2015;1900 MHz October 09, 2015;2450 MHz October 12, 2015.

Frequency (MHz)	Body Tissue		Head Tissue	
	Ơ(S/m)	εr	Ơ(S/m)	Er
835	0.98	55.19	0.92	41.26
1900	1.53	53.28	1.43	40.15
2450	1.96	52.75	1.85	39.23

4.10. Basic SAR system validation requirements

The SAR syetem must be validated against its performance specifications before it is deployed.when SAR probe and system component or sorftware are changed,upgraded or recalibrated,these must be validated with the SAR system(s) that operates with such component. Reference dipoles are used with the required tissure-equivalent media for system validation

The detailed syetem validation result are maintained by each test laboratory,which are normally not required for equip-ment approval. Only a tabulated summary of the system validation status, according to the validation date(s)measure-ment frequencies,SAR probe and tissue dielectric parameters is required in the SAR report.

LCS lab has performed the system validation at 10/28/2014,and all the measured results within ±10% of the system calibrated SAR targets.

4.11. System setup

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected.It is recommended that the system performance check be performed prior to any usage of system in order to guarantee reproducieble results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensivity to all parameters that might fail or vary over time. The system check does not intend to replace the cali-bration of component, but indicates situations where the system uncertainty is exceeded due to drift or failure.

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed benea-th the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

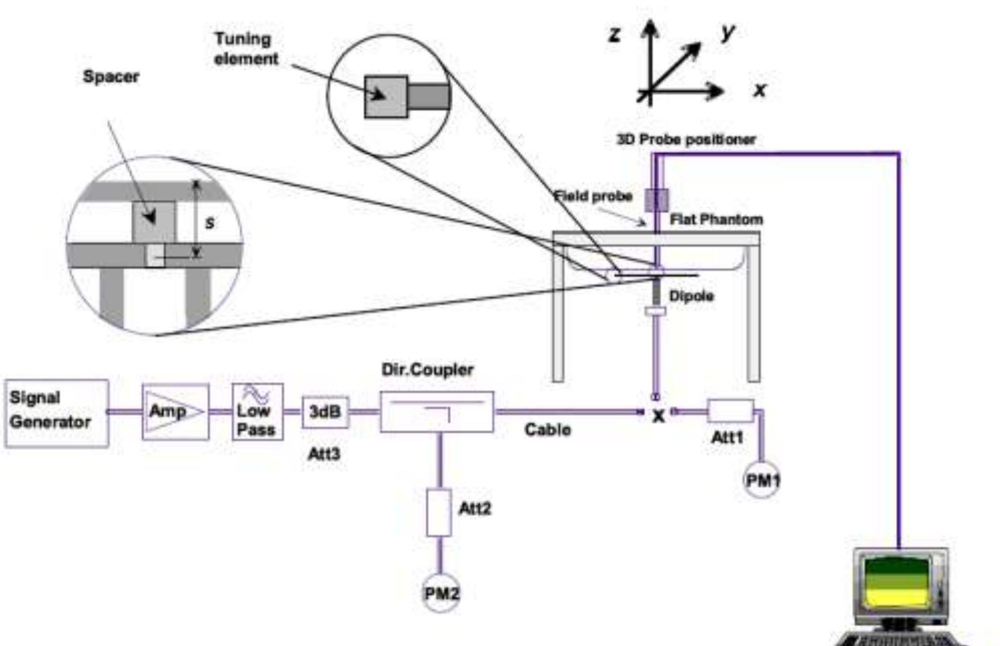


Photo of Dipole Setup

System Validation of Head

Measurement is made at temperature 22.0 ℃ and relative humidity 52%.							
Measurement is made at temperature 22.0℃ and relative humidity 54%.							
Measurement Date: 835 MHz October 08, 2015;1900 MHz October 09, 2015;2450 MHz October 12, 2015.							
Verification Results	Frequency (MHz)	Target value (W/kg)		Measured value(W/kg)		Deviation	
		1 g Average	10 g Average	1 g Average	10 g Average	1 g Average	10 g Average
Body	835	9.90	6.39	9.87	6.43	0.303	0.625
	1900	43.33	21.59	42.16	20.75	2.70	3.890
	2450	54.65	24.58	54.54	24.93	0.202	1.420
Head	835	9.60	6.20	9.53	6.26	0.737	0.968
	1900	39.84	20.20	38.34	20.19	1.26	0.050
	2450	53.89	24.15	52.36	24.34	2.840	0.786

4.12. Measurement procedure

The following procedure shall be performed for each of the test conditions

a) Measure the local SAR at a test point within 4 mm or less in the normal direction from the inner surface of the phantom.

b) Measure the two-dimensional SAR distribution within the phantom (area scan procedure). The boundary of the measurement area shall not be closer than 20 mm from the phantom side walls. The distance between the measurement points should enable the detection of the location of localmaximum with an accuracy of better than half the linear dimension of the tissue cube after interpolation. A maximum grip spacing of 20 mm for frequencies below 3 GHz and (60/f [GHz]) mm for frequencies of 3GHz and greater is recommended. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz andδln(2)/2 mm for frequencies of 3 GHz and greater, whereδis theplane wave skin depth and In(x) is the natural logarithm. The maximum variation of thesensor-phantom surface shall be ±1 mm for frequencies below 3 GHz and ±0.5 mm forfrequencies of 3 GHz and greater. At all measurement points the angle of the probe with respect tothe line normal to the surface should be less than 5°. If this cannot be achieved for ameasurement distance to the phantom inner surface shorter than the probe diameter, additionalmeasurement distance to the phantom inner surface shorter than the probe diameter, additional

c) From the scanned SAR distribution, identify the position of the maximum SAR value, in addition identify the positions of any local maxima with SAR values within 2 dB of the maximum value that are not within the zoom-scan volume; additional peaks shall be measured only when the primary peak is within 2 dB of the SAR limit. This is consistent with the 2 dB threshold already stated;

d) Measure the three-dimensional SAR distribution at the local maxima locations identified in step

e) The horizontal grid step shall be (24 / f[GHz]) mm or less but not more than 8 mm. The minimum zoom size of 30 mm by 30 mm and 30 mm for frequencies below 3 GHz. For higher frequencies, the minimum zoom size of 22 mm by 22 mm and 22 mm. The grip step in the vertical direction shall be (8-f[GHz]) mm or less but not more than 5 mm, if uniform spacing is used. If variable spacing is used in the vertical direction, the maximum spacing between the two closest measured points to the phantom shell shall be (12 / f[GHz]) mm or less but not more than 4 mm, and the spacing between father points shall increase by an incremental factor not exceeding 1.5. When variable spacing is used, extrapolation routines shall be tested with the same spacing as used in measurements. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz andδln(2)/2 mm for frequencies of 3 GHz and greater, where δis the plane wave skin depth and In(x)is the natural logarithm. Separate grids shall be centered on each of the local SAR maxima foundin step c). Uncertainties due to field distortion between the media boundary and the dielectricenclosure of the probe should also be minimized, which is achieved is the distance between thephantom surface and physical tip of the probe is larger than probe tip diameter. Other methodsmay utilize correction procedures for these boundary effects that enable high precisionmeasurements closer than half the probe diameter. For all measurement points, the angle of theprobe with respect to the flat phantom surface shall be less than 5. If this cannot be achievedan additional uncertainty evaluation is needed.

f) Use post processing(e.g. interpolation and extrapolation) procedures to determine the localSAR values at the spatial resolution needed for mass averaging.

5.TEST CONDITIONS AND RESULTS

5.1. Test condition:

1. All test measurements carried out are traceable to national standard. The uncertainty of the measurement at a confidence level of approximately 95%(in the case where distributions are nomal),with a coverage factor of 2, In the range of 30MHz-40GHz is±1.5dB.
2. Evironment conditions:

Temperature	23℃
Relative Humidy	53%
Atmospheric Pressure	1019mbar

3. Test Date: October 08, 2015 - October 13, 2015
   Tested By: Dick

5.2. Test Procedure:

EUT radio output power measurement

1. The transmitter output port was connected to base station emulator.
2. Establish communication link between emulator and EUT and Set EUT to operate at maximum output power all the time.
3. Select lowest, middle, and highest channels for each band and different possible test mode.
4. Measure the conducted peak burst power and conducted average bust power from EUT antenna port.

5.3. Conducted Power Measurement

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMU200) to ensure the maximum power transmission and proper modulation. Max Conducted power measurement results and power drift from the 2G report by Shenzhen LCS Compliance Testing Laboratory Ltd.
Note: CMU200 measures GSM peak and average output power for active timeslots.for SAR the timebased average power is relevant. The difference in between depends on the duty cycle of the TDMA signal:

Source-based Time Averaged Bust Power calculation:

Number of Time slot	1	2	3	4
Duty cycle	1:8	1:4	1:2.66	1:2
Duty cycle factor	-9.03dB	-6.02dB	-4.26dB	-3.01dB
Crest factor	8	4	2.66	2

Remark:Time slot duty cycle factor=10*log(1/Time slot Duty Cycle)
Source based time averaged power=Maximum bust averaged power (1 Uplink)-9.03dB
Source based time averaged power=Maximum bust averaged power (2 Uplink)-6.02dB
Source based time averaged power=Maximum bust averaged power (3 Uplink)-4.26dB
Source based time averaged power=Maximum bust averaged power (4 Uplink)-3.01dB

The signalling modes differ as follows:

Mode	Code Scheme	Modulation	Mode	Code Scheme
GPRS	CS1 to CS4	GMSK	GPRS	CS1 to CS4
EDGE	MCS1 to MCS4	GMSK	EDGE	MCS1 to MCS4
EDGE	MCS5 to MCS9	8PSK	EDGE	MCS5 to MCS9

Conducted power measurement results for GSM850/PCS1900

GSM850	Conducted Power (dBm)		
	Channel 128 (824.2MHz)	Channel 190 (836.6MHz)	Channel 251 (848.8MHz)
	33.32	32.21	32.18
PCS1900	Conducted Power (dBm)		
	Channel 512 (1850.2MHz)	Channel 661 (1880.0MHz)	Channel 810 (1909.8MHz)
	29.68	29.58	29.49

Conducted power measurements of GSM 850/ EDGE 850

GPRS	Measured Power (dBm)			Calculation (dB)	Averaged Power (dBm)		
	824.2MHz	836.6MHz	848.8MHz		824.2MHz	836.6MHz	848.8MHz
1 Txslot	31.78	31.67	31.56	-9.03	22.75	22.64	22.53
2 Txslot	31.69	31.56	31.45	-6.02	25.67	25.54	25.43
3 Txslot	31.86	31.64	31.51	-4.26	27.6	27.38	27.25
4 Txslot	31.55	31.49	31.65	-3.01	28.54	28.48	28.64
EDGE	Measured Power (dBm)			Calculation (dB)	Averaged Power (dBm)		
	824.2MHz	836.6MHz	848.8MHz		824.2MHz	836.6MHz	848.8MHz
1 Txslot	30.45	30.42	30.47	-9.03	21.42	21.39	21.44
2 Txslot	30.43	30.30	30.28	-6.02	24.41	24.28	24.26
3 Txslot	30.50	30.41	30.44	-4.26	26.24	26.15	26.18
4 Txslot	30.48	30.38	30.36	-3.01	27.47	27.37	27.35

Note：

1. *The conducted power of GSM850 is measured with RMS dector.*
2. *Frame-averaged output power was calculated from the measured bust-averaged output power by converting the slot powers into liner units and calculating the energy over 8 timeslots.*
3. *According the KDB941225 D03 ,the bolded GPRS 4TX mode was selected for SAR testing according to the highest frame-averaged output power table.*

Conducted power measurements of PCS 1900/ EDGE 1900

GPRS	Measured Power (dBm)			Calculation (dB)	Averaged Power (dBm)		
	1850.2MHz	1880.0MHz	1909.8MHz		1850.2MHz	1880.0MHz	1909.8MHz
1 Txslot	28.65	28.55	28.47	-9.03	19.62	21.46	19.44
2 Txslot	28.54	28.48	28.39	-6.02	22.52	22.46	22.37
3 Txslot	28.46	28.43	28.56	-4.26	24.20	24.17	24.30
4 Txslot	28.44	28.36	28.51	-3.01	25.43	25.35	25.50
EDGE	**Measured Power (dBm)**			**Calculation (dB)**	**Averaged Power (dBm)**		
	1850.2MHz	**1880.0MHz**	**1909.8MHz**		**1850.2MHz**	**1880.0MHz**	**1909.8MHz**
1 Txslot	27.52	27.46	27.48	-9.03	18.49	21.46	18.45
2 Txslot	27.39	27.33	27.30	-6.02	21.37	21.31	21.28
3 Txslot	27.61	27.55	27.51	-4.26	23.35	23.29	23.25
4 Txslot	27.53	27.35	27.43	-3.01	24.52	24.34	24.42

Note：

1. *The conducted power of GSM1900 is measured with RMC dector.*
2. *Frame-averaged output power was calculated from the measured bust-averaged output power by converting the slot powers into liner units and calculating the energy over 8 timeslots.*
3. *According the KDB941225 D03 ,the bolded GPRS 4TX mode was selected for SAR testing according to the highest frame-averaged output power table.*

Conducted power measurements of UMTS Band V

Item	Band	FDD Band V result (dBm)		
		Test Channel		
		4132CH	4182CH	4233CH
WCDMA	12.2kbps RMC	22.62	22.79	22.97
HSDPA	Subtest 1	21.61	21.82	21.96
	Subtest 2	21.73	21.71	21.68
	Subtest 3	20.96	20.52	20.36
	Subtest 4	20.78	20.16	20.51
HSUPA	Subtest 1	21.14	21.68	21.32
	Subtest 2	19.61	19.98	20.03
	Subtest 3	20.60	20.78	20.91
	Subtest 4	20.95	20.37	20.17
	Subtest 5	19.95	20.22	20.44

Note:

1. *The conducted power of UMTS Band V is measured with RMS detector.*
2. *According to KDB941225 D01v02, when maximum output of each RF channel with HSDPA active is ≤1/4 dB higher than without HSDPA using 12.2kbps RMC and maximum SAR for 12.2kbps RMC is ≤75% of SAR limit, SAR evaluation for HSDPA is not required.*
3. *According to KBD941225 D02v02r02, when the maximum average output power of each RF channel with (uplink) HSPA+/DC-HSDPS active is ≤1/4 dB higher than without HSPA+/DC-HSDPS using 12.2kbps RMC or the maximum reported SAR for 12.2kbps RMC without HSPA+/DC-HSDPS is ≤75% of SAR limit, SAR evalution for HSPA+/DC-HSDPS is not required.*

Conducted power measurements of UMTS Band II

Item	Mode	FDD Band II result (dBm)		
		Test Channel		
		9262CH	9400CH	9538CH
WCDMA	12.2kbps RMC	23.10	22.72	22.91
HSDPA	Subtest 1	22.77	21.48	21.97
	Subtest 2	21.67	21.77	21.91
	Subtest 3	21.18	20.75	21.54
	Subtest 4	21.20	20.40	21.64
HSUPA	Subtest 1	21.11	21.35	21.23
	Subtest 2	19.83	20.55	20.52
	Subtest 3	20.04	20.56	19.98
	Subtest 4	20.11	20.09	20.45
	Subtest 5	20.63	20.33	20.13

Note:
1. *The conducted power of UMTS Band II is measured with RMS detector.*
2. *According to KDB941225 D01v02, when maximum output of each RF channel with HSDPA active is ≤1/4 dB higher than without HSDPA using 12.2kbps RMC and maximum SAR for 12.2kbps RMC is ≤75% of SAR limit, SAR evaluation for HSDPA is not required.*
3. *According to KDB941225 D02v02r02, when the maximum average output power of each RF channel with (uplink) HSPA+/DC-HSDPS active is ≤1/4 dB higher than without HSPA+/DC-HSDPS using 12.2kbps RMC or the maximum reported SAR for 12.2kbps RMC without HSPA+/DC-HSDPS is ≤75% of SAR limit, SAR evalution for HSPA+/DC-HSDPS is not required.*

Conducted power measurements of Wifi 2.4GHz

Mode	channel	Frequency (MHz)	Conducted output AVG power(dBm)	Test Rate Date
802.11b	1	2412	16.87	1Mbps
	6	2437	16.95	1Mbps
	11	2462	16.70	1Mbps
802.11g	1	2412	15.29	6Mbps
	6	2437	15.65	6Mbps
	11	2462	15.47	6Mbps
802.11n 20MHz	1	2412	15.02	6.5Mbps
	6	2.437	14.89	6.5Mbps
	11	2462	15.13	6.5Mbps

Note:

According to the KDB248227, for WiFi 2.4G, highest average RF output power channel for the lowest date rate of 802.11b mode was selected for SAR evaluation. SAR test at higher date rates and higher order modulations(including 802.11g/n) were not required since the maximum average output powerfor each of these configurations is not more than 1/4dB higher than the tested channnel for the lowest date rate of 802.11b mode.

Conducted power measurement of BluetoothV4.0

Mode	channel	Frequency (MHz)	Conducted output power (dBm)
BLE	0	2402	-2.951
	20	2440	-2.358
	39	2480	-2.672
GFSK(1M)	0	2402	4.471
	39	2441	4.537
	78	2480	4.431
π /4-DQPSK	0	2402	4.452
	39	2441	4.366
	78	2480	4.508
8DPSK	0	2402	3.191
	39	2441	3.297
	78	2480	3.153

Note:

According to KDB447498 D01 General RF Exposure Guidence v05r01 standalone SAR test exclusion considerations,SAR test is not required in 100MHz to 6GHz at test separation distances≤50mm , if the output of EUT satisfay the fllowing eqation:

[(max power of channel,including tune-up tolerance,mW)/(min test separation distance,mm)].[$f^{1/2}_{(GHz)}$].≤3.0 For 1-g SAR and ≤7.5 for 10-g extremity SAR.

a. $f_{(GHz)}$is the RF channel transmit frequency in GHz.
b. Power and distance are rounded to the nearest mW and mm before calculation
c. The result is rounded to one decimal place for comparison
d. 3.5 and 7.5 are referred to as the numeric thresholds

6.SAR TEST RESULT

6.1. Test condition:

1. SAR Measuremnt
   The distance between the EUT and the antenna of the emulator is more than 50cm and the out put power radiated from the emulator antenna is at least 30dB less than the output power of EUT.
2. Measurement Uncertainty: See page 36and37 for detail
3. Environmental Conditions

Temperature	23℃
Relative Humidity	53%
Atmospheric Pressure	1019mbar

4. Test Date: October 08, 2015 - October 13, 2015
   Tested By: Dick

6.2. Operation Mode

・According to KDB 447498 D01 v05r02 ,for each exposure position, if the highest 1-g SAR is ≤0.8 W/kg, testing for low and high channel is optional.

・Per KDB 865664 D01 v01r03,for each frequency band, if the measured SAR is ≥0.8W/Kg, testing for repeated SAR measurement is required , that the highest measured SAR is only to be tested. When the SAR results are near the limit, the following procedures are required for each device to verify these types of SAR measurement related variation concerns by repeating the highest measured SAR configuration in each frequency band.

(1) When the original highest measured SAR is ≥0.8W/Kg, repeat that measurement once.

(2) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is ＞1.20 or when the original or repeated measurement is ≥1.45 W/Kg.

(3) Perform a third repeated measurement only if the original, first and second repeated measurement is ≥

1.5 W/Kg and ratio of largest to smallest SAR for the original, first and second measurement is ≥1.20.

・Body-worn exposure conditions are intended to voice call operations, therefore GSM voice call mode is selected to be test.

(1) the procedures explained in footnote 11 of the standard may be applied to reduce SAR test requirements for GPRS modes when the source-based time-averaged output power for each data mode is lower than that in the normal GSM voice mode.

(2) when multiple slots can be used, the device should be tested to account for the maximum source-based time-averaged output power.

(3) when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional.

・Maximum Scaling SAR in order to calculate the Maximum SAR values to test under the standard Peak Power, Calculation method is as follows:

Maximum Scaling SAR =tested SAR (Max.) × [maximum turn-up power (mw)/ maximum measurement output power(mw)]

6.3. SAR summary Test result

SAR Values for GSM850 Band -Head

Frequency		Test Position	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
836.6	**190**	**Left Cheek**	**GSM**	**0.992**	**4.47**	**32.21**	**34.00**	**1.498**	**1.60**
836.6	190	Left Tilt	GSM	0.665	-0.90	32.21	34.00	1.004	1.60
836.6	190	Right Cheek	GSM	0.923	-0.02	32.21	34.00	1.394	1.60
836.6	190	Right Tilt	GSM	0.493	0.74	32.21	34.00	0.744	1.60
824.2	128	Left Cheek	GSM	0.834	3.71	32.21	34.00	1.259	1.60
848.8	251	Left Cheek	GSM	0.739	3.73	32.21	34.00	1.116	1.60
824.2	128	Right Cheek	GSM	0.864	-2.47	32.21	34.00	1.305	1.60
848.8	251	Right Cheek	GSM	0.652	0.38	32.21	34.00	0.985	1.60

SAR Values for GSM850 Band -Body

Frequency		Test Position (15mm)	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
836.6	190	Front	GPRS(4TX)	0.499	-3.58	31.92	32.00	0.508	1.60
836.6	**190**	**Rear**	**GPRS(4TX)**	**0.609**	**-1.29**	**31.92**	**32.00**	**0.620**	**1.60**

Hotspot SAR test results of GSM850

Frequency		Test Position (10mm)	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
836.0	190	Front	GPRS(4TX)	0.510	2.50	31.92	32.00	0.519	1.60
836.0	**190**	**Rear**	**GPRS(4TX)**	**0.673**	**-0.44**	**31.92**	**32.00**	**0.686**	**1.60**
836.0	190	Left	GPRS(4TX)	0.235	2.61	31.92	32.00	0.239	1.60
836.0	190	Right	GPRS(4TX)	0.264	3.53	31.92	32.00	0.269	1.60
836.0	190	Top	GPRS(4TX)	0.226	1.97	31.92	32.00	0.230	1.60

Note:

1.SAR test was performed in the middle channel only the measured leve was<50% of the SAR of limit,test in the low and high channel is optional.

2.The EUT is a Class B mobile phone which can be attached to both GPRS and GSM services,using one service a time

3.The Multi-slot Classes of EUT is Class12 which has maximum 1 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 1DL+4UL is the worse case base on the out put power measurements above.

SAR Values for PCS1900 Band -Head

Frequency		Test Position	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
1880.0	661	Left Cheek	GSM	0.832	-1.49	32.56	33.00	0.921	1.60
1880.0	661	Left Tilt	GSM	0.607	3.35	32.56	33.00	0.672	1.60
1880.0	**661**	**Right Cheek**	**GSM**	**0.848**	**0.08**	**32.56**	**33.00**	**0.938**	**1.60**
1880.0	661	Right Tilt	GSM	0.587	2.44	32.56	33.00	0.650	1.60
1850.2	512	Left Cheek	GSM	0.626	-2.44	32.56	33.00	0.693	1.60
1909.8	810	Left Cheek	GSM	0.803	1.76	32.56	33.00	0.889	1.60
1850.2	512	Right Cheek	GSM	0.628	2.07	32.56	33.00	0.695	1.60
1909.8	810	Right Cheek	GSM	0.820	-2.88	32.56	33.00	0.907	1.60

SAR Values for PCS1900 Band -Body

Frequency		Test Position (15mm)	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
1880.0	661	Front	GPRS(4TX)	0.502	5.23	31.53	32.00	0.559	1.60
1880.0	**661**	**Rear**	**GPRS(4TX)**	**0.652**	**0.63**	**31.53**	**32.00**	**0.727**	**1.60**

Hotspot SAR test results of GSM 1900

Frequency		Test Position (10mm)	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
1880.0	661	Front	GPRS(4TX)	0.565	0.08	31.53	32.00	0.630	1.60
1880.0	**661**	**Rear**	**GPRS(4TX)**	**0.720**	**-0.50**	**31.53**	**32.00**	**0.802**	**1.60**
1880.0	661	Left	GPRS(4TX)	0.232	-0.84	31.53	32.00	0.259	1.60
1880.0	661	Right	GPRS(4TX)	0.234	3.61	31.53	32.00	0.261	1.60
1880.0	661	Top	GPRS(4TX)	0.228	2.46	31.53	32.00	0.254	1.60

Note:

1.SAR test was performed in the middle channel only the measured leve was<50% of the SAR of limit,test in the low and high channel is optional.

2.The EUT is a Class B mobile phone which can be attached to both GPRS and GSM services,using one service a time

3.The Multi-slot Classes of EUT is Class12 which has maximum 1 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 1DL+4UL is the worse case base on the out put power measurements above.

SAR Values for WCDMA Band V -Head

Frequency		Test Position	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
835.0	**4175**	**Left Cheek**	**RMC**	**0.903**	**-1.43**	**22.79**	**23.00**	**0.948**	**1.60**
835.0	4175	Left Tilt	RMC	0.687	-0.12	22.79	23.00	0.721	1.60
835.0	4175	Right Cheek	RMC	0.790	1.15	22.79	23.00	0.829	1.60
835.0	4175	Right Tilt	RMC	0.505	0.34	22.79	23.00	0.530	1.60
826.4	4132	Left Cheek	RMC	0.803	-0.92	22.79	23.00	0.843	1.60
846.6	4233	Left Cheek	RMC	0.817	0.02	22.79	23.00	0.857	1.60

SAR Values for WCDMA Band V -Body

Frequency		Test Position (15mm)	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
835.0	4175	Front	RMC	0.626	-0.56	21.82	22.00	0.652	1.60
835.0	**4175**	**Rear**	**RMC**	**0.913**	**-1.06**	**21.82**	**22.00**	**0.952**	**1.60**
826.4	4132	Rear	RMC	0.815	-0.96	21.82	22.00	0.849	1.60
846.6	4233	Rear	RMC	0.811	0.37	21.82	22.00	0.845	1.60

Hotspot SAR test results of WCDMA Band V

Frequency		Test Position (10mm)	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
835.0	4175	Front	RMC	0.618	-0.35	21.82	22.00	0.644	1.60
835.0	**4175**	**Rear**	**RMC**	**1.067**	**0.40**	**21.82**	**22.00**	**1.112**	**1.60**
835.0	4175	Left	RMC	0.864	3.61	21.82	22.00	0.901	1.60
835.0	4175	Right	RMC	0.976	2.64	21.82	22.00	1.017	1.60
835.0	4175	Top	RMC	0.853	1.69	21.82	22.00	0.889	1.60

Note:

1.SAR test was performed in the middle channel only the measured leve was<50% of the SAR of limit,test in the low and high channel is optional.

2.The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2kbps RMC(reference measurement channel) configuration in test loop mode

SAR Values for WCDMA Band II -Head

Frequency		Test Position	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
1880	9400	Left Cheek	RMC	0.413	-1.56	22.72	24.00	0.555	1.60
1880	9400	Left Tilt	RMC	0.319	1.05	22.72	24.00	0.428	1.60
1880	**9400**	**Right Cheek**	**RMC**	**0.522**	**-2.87**	**22.72**	**24.00**	**0.701**	**1.60**
1880	9400	Right Tilt	RMC	0.378	-3.21	22.72	24.00	0.508	1.60

SAR Values for WCDMA Band II -Body

Frequency		Test Position (15mm)	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
1880	9400	Front	RMC	0.235	-0.98	21.48	23.00	0.333	1.60
1880	**9400**	**Rear**	**RMC**	**0.337**	**1.25**	**21.48**	**23.00**	**0.478**	**1.60**

Hotspot SAR test results of WCDMA Band II

Frequency		Test Position (10mm)	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
1880	9400	Front	RMC	0.459	-1.58	21.48	23.00	0.651	1.60
1880	**9400**	**Rear**	**RMC**	**0.557**	**0.91**	**21.48**	**23.00**	**0.790**	**1.60**
1880	9400	Left	RMC	0.134	2.16	21.48	23.00	0.190	1.60
1880	9400	Right	RMC	0.126	3.22	21.48	23.00	0.179	1.60
1880	9400	Top	RMC	0.128	2.67	21.48	23.00	0.182	1.60

Note:

1.SAR test was performed in the middle channel only the measured leve was<50% of the SAR of limit,test in the low and high channel is optional.

2.The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2kbps RMC(reference measurement channel) configuration in test loop mode

SAR Values for WLAN2450 Band -Head

Frequency		Test Position	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
2437	**6**	**Left Cheek**	**802.11b**	**0.511**	**-4.56**	**16.95**	**18.00**	**0.651**	**1.60**
2437	6	Left Tilt	802.11b	0.171	-0.01	16.95	18.00	0.218	1.60
2437	6	Right Cheek	802.11b	0.265	-2.14	16.95	18.00	0.337	1.60
2437	6	Right Tilt	802.11b	0.131	-1.11	16.95	18.00	0.167	1.60

SAR Values for WLAN2450 Band -Body

Frequency		Test Position (15mm)	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
2437	6	Front	802.11b	0.042	0.41	16.95	18.00	0.053	1.60
2437	**6**	**Rear**	**802.11b**	**0.273**	**-0.49**	**16.95**	**18.00**	**0.348**	**1.60**

Hotspot SAR test results of WLAN 2450

Frequency		Test Position (10mm)	Test Mode	SAR 1g(W/kg)	Power Drift (%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1g(W/kg)	Limit 1g(W/kg)
MHz	Channel								
2437	6	Front	802.11b	0.126	1.94	16.95	18.00	0.160	1.60
2437	**6**	**Rear**	**802.11b**	**0.398**	**-1.04**	**16.95**	**18.00**	**0.507**	**1.60**
2437	6	Left	802.11b	0.123	3.56	16.95	18.00	0.157	1.60
2437	6	Right	802.11b	0.124	1.78	16.95	18.00	0.158	1.60
2437	6	Top	802.11b	0.116	2.16	16.95	18.00	0.148	1.60

Note:

1.When the SAR measured for the middle channel is ≤ 50% of the limit, test in the low and high channel is optional.
2. The result was tested under the lowest data rate 1Mbps for 802.11b.

6.4. Test reduction procedure

Simultaneous multi-band transmission

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB447498D01 General RF Exposure Guidence v05r02.

Figure 1:The diagonal dimension of the DUT

Top side

Length：125mm
Width: 73mm

Right side

Left side

Bottom side

Figure1:The antenna position of the DUT

Simultaneous Transmission SAR Analysis

No	Applicable Simultaneous Transmission Combination
1.	GSM/WCDMA+BT
2.	GSM/WCDMA+WiFi

Note:1) WLAN2.4GHz and Bluetooth share the same antenna, and cannot transmit simultaneously.

2) The Reported SAR summation is calculated based on the same configuration and test position.

3) Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,

a) Scalar SAR summation < 1.6W/kg.

b) SPLSR = (SAR1 + SAR2) 1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of \[(x1-x2) 2 + (y1-y2) 2 + (z1-z2) 2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan

c) If SPLSR≦0.04, simultaneously transmission SAR measurement is not necessary

d) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg

4) For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r02 based on the formula below.

a) (max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] .[√f(GHz)/ x] W/kg for test separation distances≦50 mm; where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.

b) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.

c) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

d) Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions.

5) BT's maximum turn up procedure conducted power is 4.537 dBm(2.84mW) and the estimated SAR is listed below.

Test position	Head(0cm)	Body-worn(15cm)
BT Estimated SAR(W/kg)	0.118	0.039

For Bluetooth the Estimated SAR for Head at 5mm for estimate and 15mm to Estimated Body SAR

Estimated SAR_{Head}=((2.84mW)/5mm)*(1.5624/7.5)=0.118W/Kg

Estimated SAR_{Body}=((2.84mW)/15mm)*(1.5624/7.5)=0.039W/Kg

GSM & WLAN Mode

Test Position		GSM850 Reported SAR1g (W/Kg)	GSM1900 Reported SAR1g (W/Kg)	WLAN Reported SAR1g (W/Kg)	Summation Reported SAR(1g) (W/kg)	SAR –to-peak-location Separation Ratio	Simultaneous Measurement Required?
Head	Left Head Touch	**0.992**	0.832	**0.511**	1.503	N/A	No
	Left Head Title	0.665	0.607	0.171	0.836	N/A	No
	Right Head Touch	0.923	**0.848**	0.265	1.188	N/A	No
	Right Head Title	0.493	0.587	0.131	0.718	N/A	No
Body	Body-Front Side	0.499	0.502	0.042	0.544	N/A	No
	Body-Rear Side	**0.609**	**0.652**	**0.273**	0.925	N/A	No
Hotspot	Front	0.510	0.565	0.126	0.691	N/A	No
	Rear	**0.673**	**0.720**	**0.398**	1.118	N/A	No
	Left	0.235	0.232	0.123	0.358	N/A	No
	Right	0.264	0.234	0.124	0.388	N/A	No
	Top	0.226	0.228	0.116	0.344	N/A	No

GSM & BT Mode

Test Position		GSM850 Reported SAR1g (W/Kg)	GSM1900 Reported SAR1g (W/Kg)	Bluetooth Estimated SAR (W/Kg)	Summation Reported SAR(1g) (W/kg)	SAR –to-peak-location Separation Ratio	Simultaneous Measurement Required?
Head	Left Hand Touch	**0.992**	0.832	0.118	1.110	N/A	No
	Left Hand Title	0.665	0.607	0.118	0.783	N/A	No
	Right Hand Touch	0.923	**0.848**	0.118	1.041	N/A	No
	Right Hand Title	0.493	0.587	0.118	0.705	N/A	No
Body	BodyFront Side	0.499	0.502	0.039	0.541	N/A	No
	Body-Rear Side	**0.609**	**0.652**	0.039	0.691	N/A	No
Hotspot	Front	0.510	0.565	0.039	0.604	N/A	No
	Rear	**0.673**	**0.720**	0.039	0.759	N/A	No
	Left	0.235	0.232	0.039	0.274	N/A	No
	Right	0.264	0.234	0.039	0.303	N/A	No
	Top	0.226	0.228	0.039	0.267	N/A	No

WCDMA & WLAN Mode

Test Position		WCDMA 850 Reported SAR1g (W/Kg)	WCDMA1900 Reported SAR1g (W/Kg)	WLAN Reported SAR1g (W/Kg)	Summation Reported SAR(1g) (W/kg)	SAR –to-peak-location Separation Ratio	Simultaneous Measurement Required?
Head	Left Hand Touch	**0.903**	0.413	**0.511**	1.414	N/A	No
	Left Hand Title	0.687	0.319	0.171	0.858	N/A	No
	Right Hand Touch	0.790	**0.522**	0.265	1.055	N/A	No
	Right Hand Title	0.505	0.378	0.131	0.636	N/A	No
Body	Body-Front Side	0.626	0.235	0.042	0.668	N/A	No
	Body-Rear Side	**0.913**	**0.337**	**0.273**	1.186	N/A	No
Hotspot	Front	0.618	0.459	0.126	0.744	N/A	No
	Rear	**1.067**	**0.557**	**0.398**	1.465	N/A	No
	Left	0.864	0.134	0.123	0.987	N/A	No
	Right	0.976	0.126	0.124	1.100	N/A	No
	Top	0.853	0.128	0.116	0.969	N/A	No

WCDMA & BT Mode

Test Position		WCDMA 850 Reported SAR1g (W/Kg)	WCDMA 1900 Reported SAR1g (W/Kg)	Bluetooth Estimated SAR (W/Kg)	Summation Reported SAR(1g) (W/kg)	SAR –to-peak-location Separation Ratio	Simultaneous Measurement Required?
Head	Left Hand Touch	**0.903**	0.413	0.118	1.021	N/A	No
	Left Hand Title	0.687	0.319	0.118	0.805	N/A	No
	Right Hand Touch	0.790	**0.522**	0.118	1.312	N/A	No
	Right Hand Title	0.505	0.378	0.118	0.623	N/A	No
Body	BodyFront Side	0.626	0.235	0.039	0.665	N/A	No
	Body-Rear Side	**0.913**	**0.337**	0.039	0.952	N/A	No
Hotspot	Front	0.618	0.459	0.039	0.657	N/A	No
	Rear	**1.067**	**0.557**	0.039	1.106	N/A	No
	Left	0.864	0.134	0.039	0.123	N/A	No
	Right	0.976	0.126	0.039	1.015	N/A	No
	Top	0.853	0.128	0.039	0.892	N/A	No

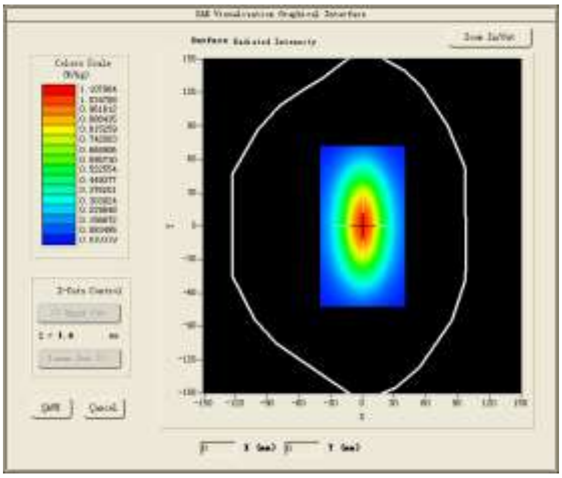
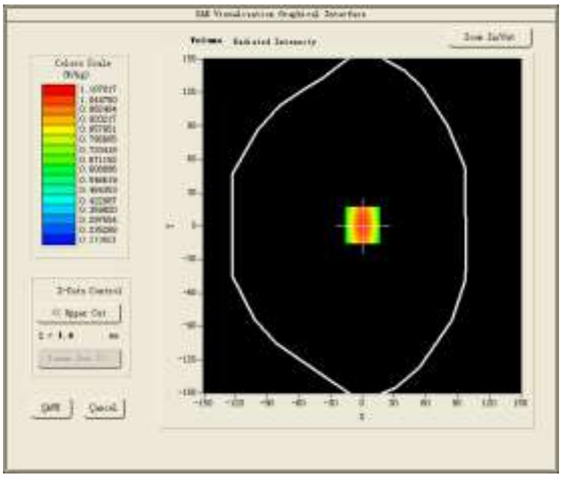
Note: The above numeral summed SAR results is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore simultaneous transmission SAR with volume scans is not required according to KDB447498 D01v05r02.

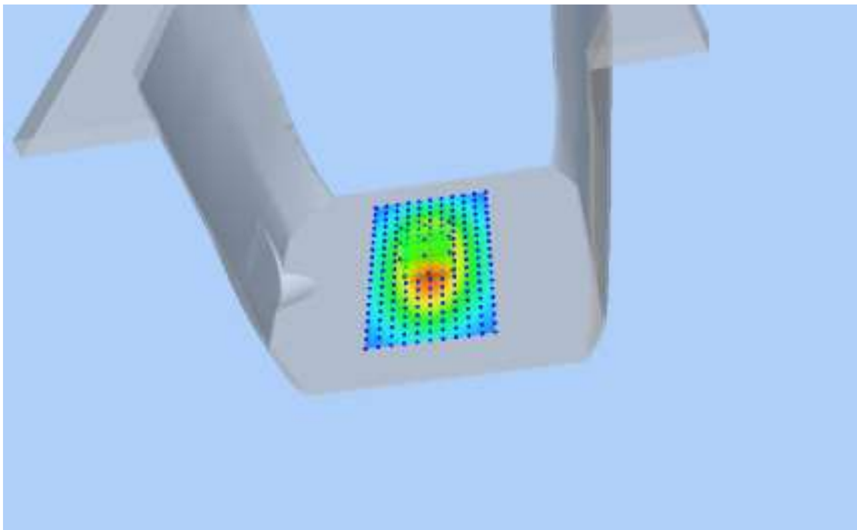
6.5. Measurement Uncertainty (700MHz-3GHz)

Uncertainty Component	Sec.	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	7.2.1	5.8	N		1	1	5.80	5.80	∞
Axial Isotropy	7.2.1.1	3.5	R	√3	(1-Cp)^1/2	(1-Cp)^1/2	1.43	1.43	∞
Hemispherical Isotropy	7.2.1.1	5.9	R	√3	(Cp)^1/2	(Cp)^1/2	2.41	2.41	∞
Boundary effect	7.2.1.4	1.0	R	√3	1	1	0.58	0.58	∞
Linearity	7.2.1.2	4.7	R	√3	1	1	2.71	2.71	∞
System detection limits	7.2.1.2	1.0	R	√3	1	1	0.58	0.58	∞
Modulation response	7.2.1.3	3.00	N		1	1	3.00	3.00	∞
Readout Electronics	7.2.1.5	0.50	N		1	1	0.50	0.50	∞
Reponse Time	7.2.1.6	0.0	R	√3	1	1	0.00	0.00	∞
Integration Time	7.2.1.7	1.4	R	√3	1	1	0.81	0.81	∞
RF ambient Conditions - Noise	7.2.3.7	3.0	R	√3	1	1	1.73	1.73	∞
RF ambient Conditions - Reflections	7.2.3.7	3.0	R	√3	1	1	1.73	1.73	∞
Probe positioner Mechanical Tolerance	7.2.2.1	1.4	R	√3	1	1	0.81	0.81	∞
Probe positioning with respect to Phantom Shell	7.2.2.3	1.40	R	√3	1	1	0.81	0.81	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	7.2.4	2.3	R	√3	1	1	1.33	1.33	∞
Test sample Related									
Test sample positioning	7.2.2.4.4	2.60	N		1	1	2.60	2.60	
Device Holder Uncertainty	7.2.2.4.2 7.2.2.4.3	3.00	N		1	1	3.00	3.00	
Output power Variation - SAR drift measurement	7.2.3.6	5.00	R	√3	1	1	2.89	2.89	∞
SAR scaling	7.2.5	2.00	R	√3	1	1	1.15	1.15	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	7.2.2.2	4.00	R	√3	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviation (in permittivity and conductivity)	7.2.6	2.00	N		1	0.84	2.00	1.68	∞
Liquid conductivity (temperature uncertainty)	7.2.3.5	2.50	N		0.78	0.71	1.95	1.78	
Liquid conductivity - measurement uncertainty	7.2.3.3	4.00	N		0.23	0.26	0.92	1.04	
Liquid permittivity (temperature uncertainty)	7.2.3.5	2.50	N		0.78	0.71	1.95	1.78	∞
Liquid permittivity - measurement uncertainty	7.2.3.4	5.00	N		0.23	0.26	1.15	1.30	∞
Combined Standard Uncertainty			RSS				10.63	10.54	
Expanded Uncertainty (95% Confidence interval)			k				21.26	21.08	

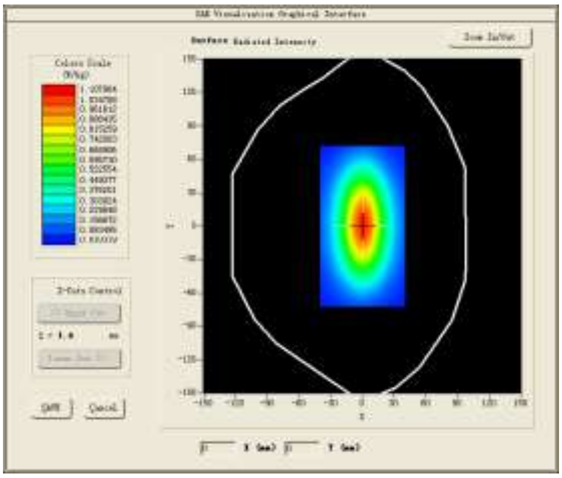
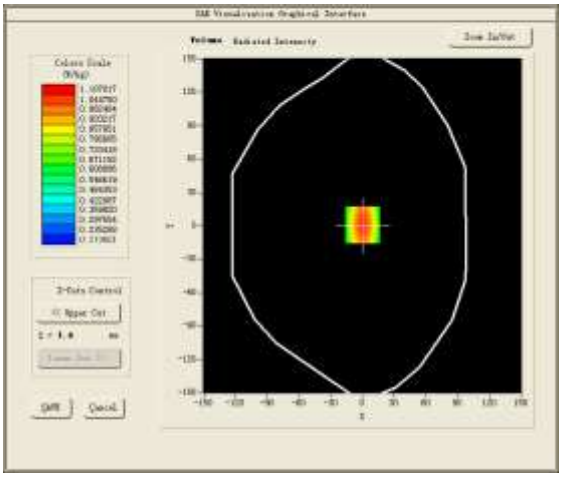
6.6. System Check Results

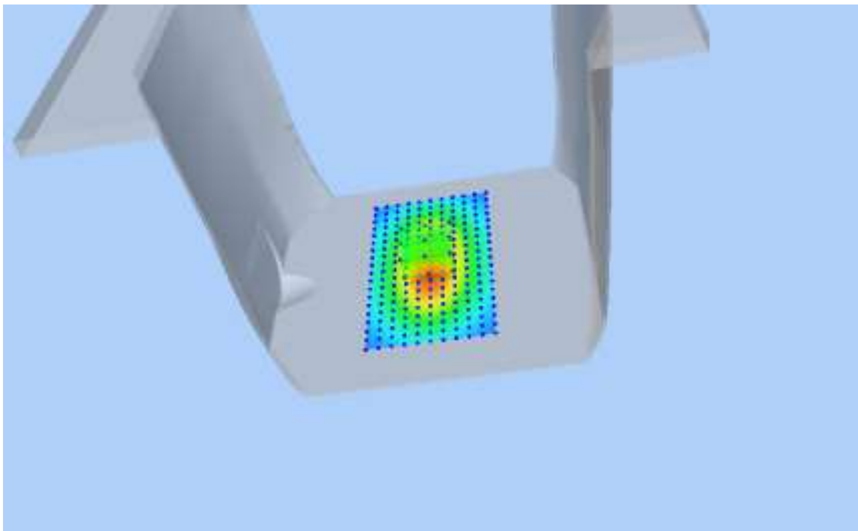
Test mode:835MHz(Head)
Product Description:Validation
Model:Dipole SID835
E-Field Probe:SSE5(SN17/14 EP220)
Test Date: October 08, 2015

Medium(liquid type)	HSL_900
Frequency (MHz)	835.0000
Relative permittivity (real part)	41.26
Conductivity (S/m)	0.92
Input power	100mW
Crest Factor	1.0
Conversion Factor	4.86
Variation (%)	-0.010000
SAR 10g (W/Kg)	0.626382
SAR 1g (W/Kg)	0.953343
SURFACE SAR	**VOLUME SAR**
	

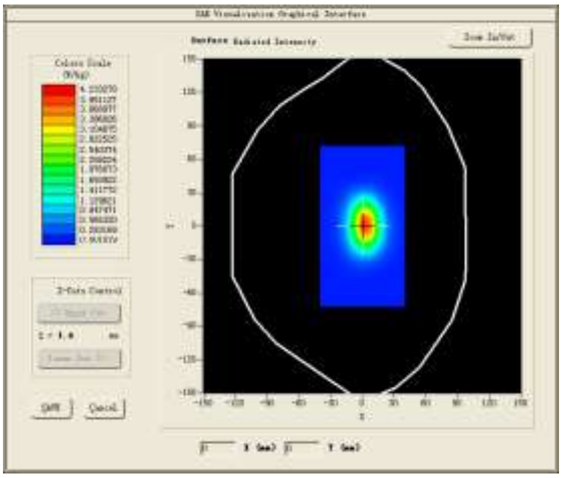
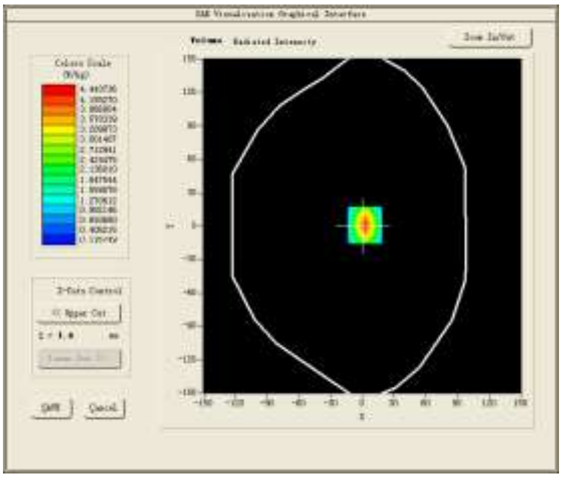
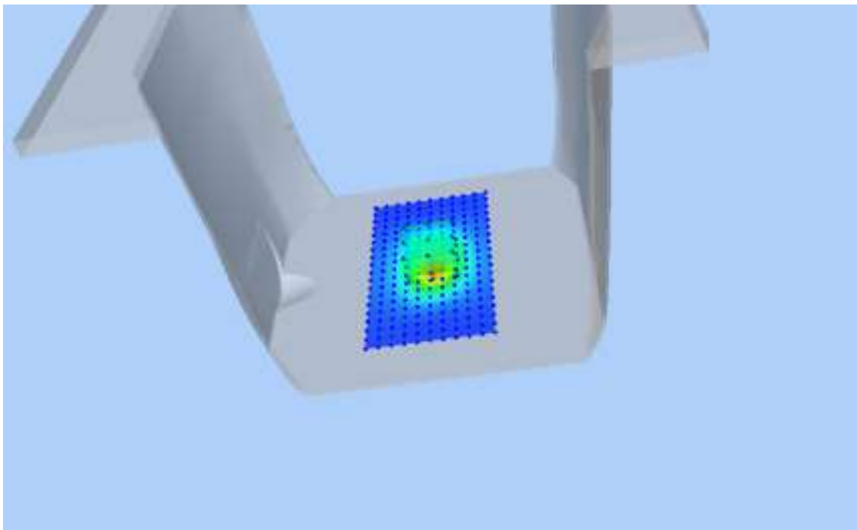


Test mode:835MHz(Body)
Product Description:Validation
Model:Dipole SID835
E-Field Probe:SSE5(SN17/14 EP220)
Test Date: October 08, 2015

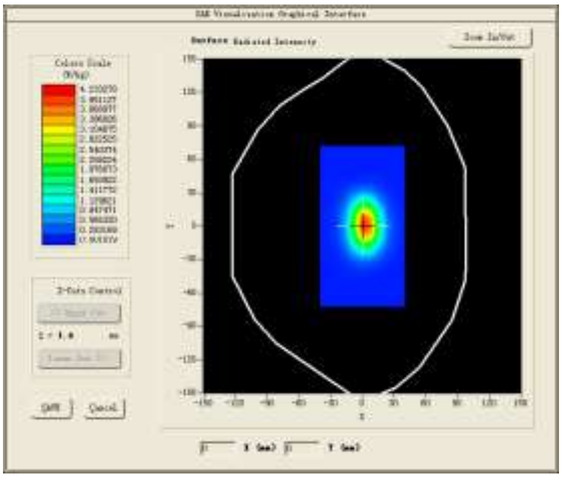
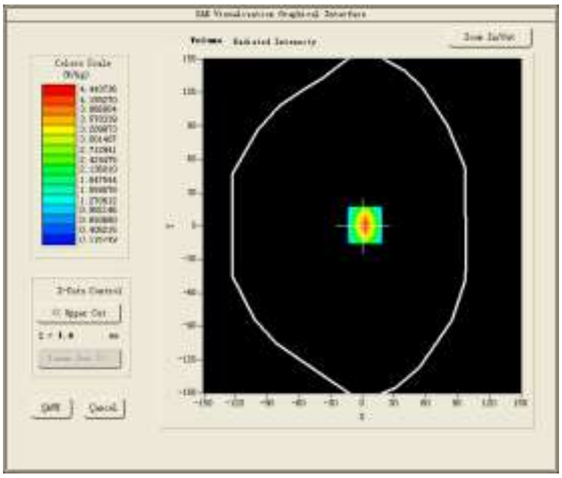
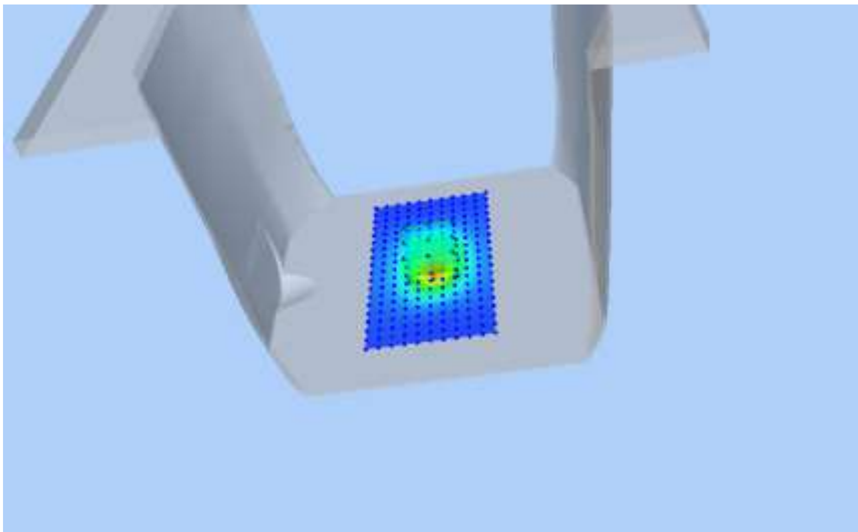
Medium(liquid type)	MSL_900
Frequency (MHz)	835.0000
Relative permittivity (real part)	55.19
Conductivity (S/m)	0.98
Input power	100mW
Crest Factor	1.0
Conversion Factor	5.04
Variation (%)	-0.010000
SAR 10g (W/Kg)	0.643381
SAR 1g (W/Kg)	0.987156
SURFACE SAR	**VOLUME SAR**
	



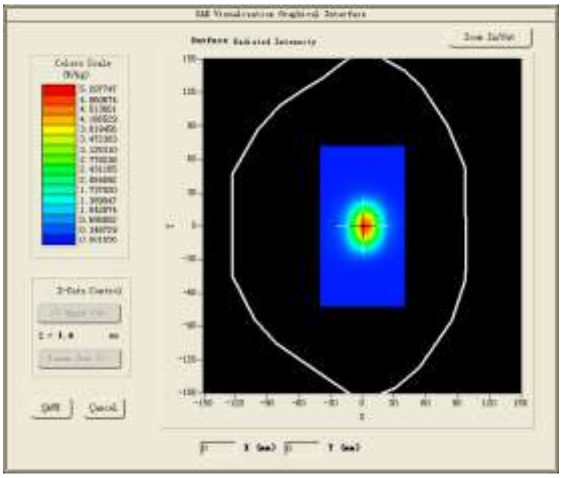
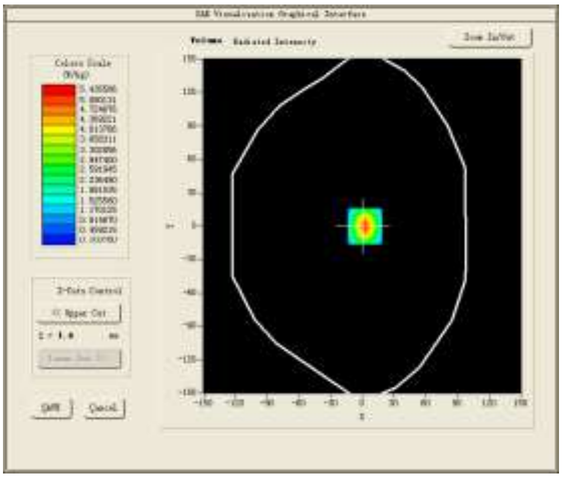
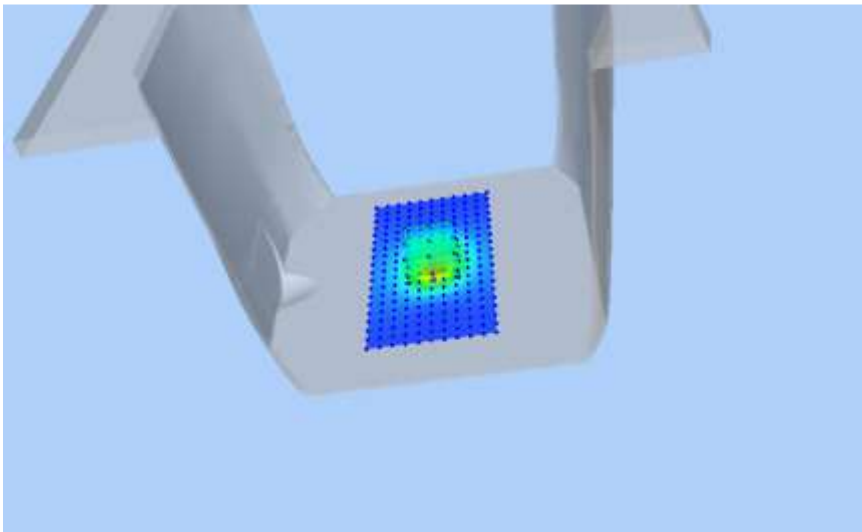
Test mode:1900MHz(Head)
Product Description:Validation
Model :Dipole SID1900
E-Field Probe:SSE5(SN17/14 EP220)
Test Date: October 09, 2015

Medium(liquid type)	HSL_1800
Frequency (MHz)	1900.0000
Relative permittivity (real part)	40.15
Conductivity (S/m)	1.43
Input power	100mW
Crest Factor	1.0
Conversion Factor	4.71
Variation (%)	-0.240000
SAR 10g (W/Kg)	2.192452
SAR 1g (W/Kg)	3.834373
SURFACE SAR	**VOLUME SAR**
	
	

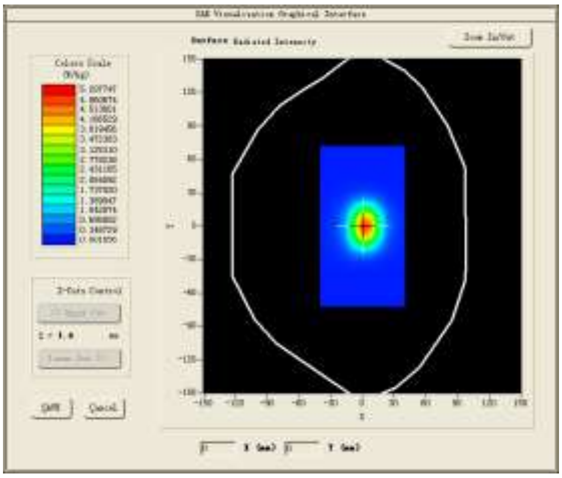
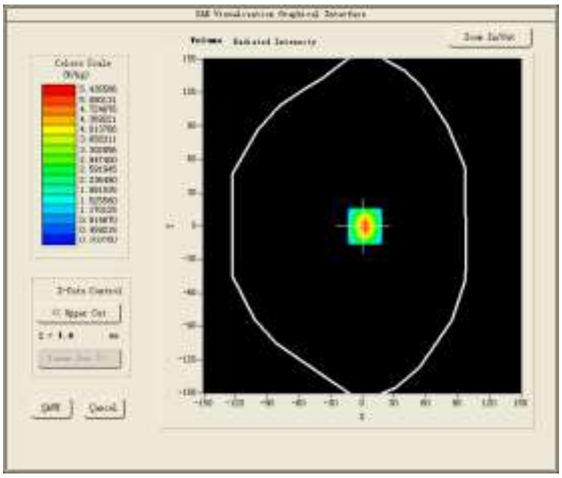
Test mode:1900MHz(Body)
Product Description:Validation
Model :Dipole SID1900
E-Field Probe:SSE5(SN17/14 EP220)
Test Date: October 09, 2015

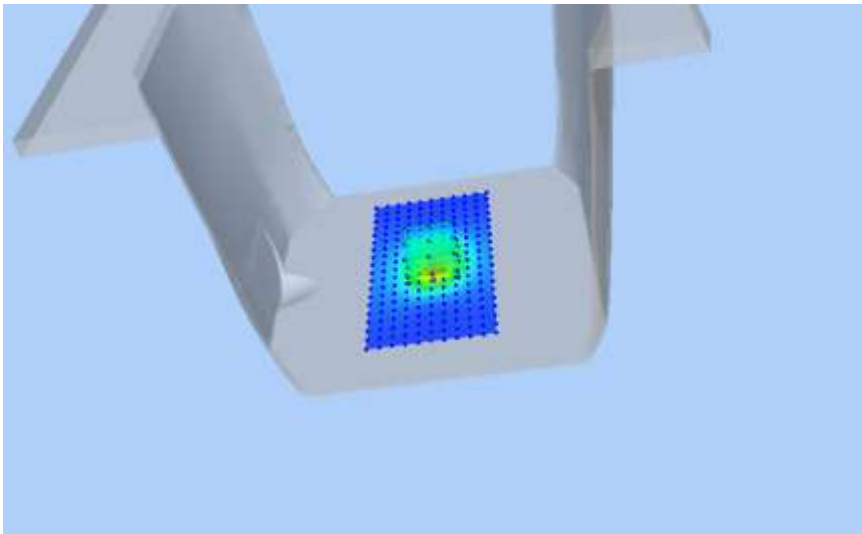
Medium(liquid type)	MSL_1800
Frequency (MHz)	1900.0000
Relative permittivity (real part)	53.28
Conductivity (S/m)	1.53
Input power	100mW
Crest Factor	1.0
Conversion Factor	4.85
Variation (%)	-0.240000
SAR 10g (W/Kg)	2.075454
SAR 1g (W/Kg)	4.2164373
SURFACE SAR	**VOLUME SAR**
	
	

Test mode:2450MHz(Head)
Product Description:Validation
Model:Dipole SID2450
E-Field Probe:SSE5(SN17/14 EP220)
Test Date: October 12, 2015

Medium(liquid type)	HSL_2450
Frequency (MHz)	2450.0000
Relative permittivity (real part)	39.23
Conductivity (S/m)	1.85
Input power	100mW
Crest Factor	1.0
Conversion Factor	3.94
Variation (%)	-0.340000
SAR 10g (W/Kg)	2.434041
SAR 1g (W/Kg)	5.363435
SURFACE SAR	**VOLUME SAR**
	
	

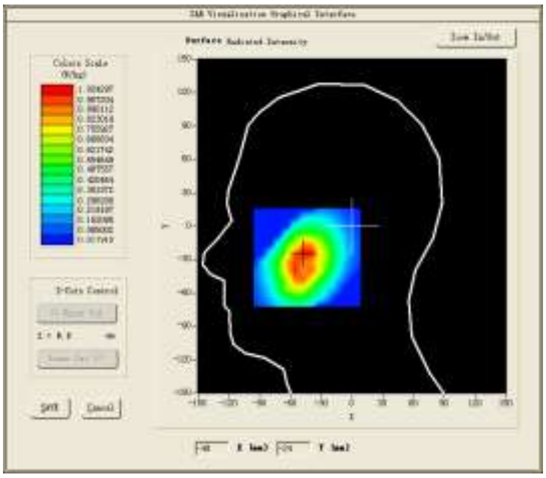
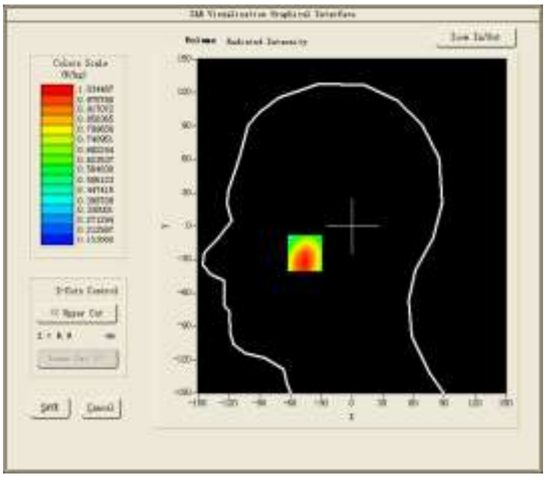
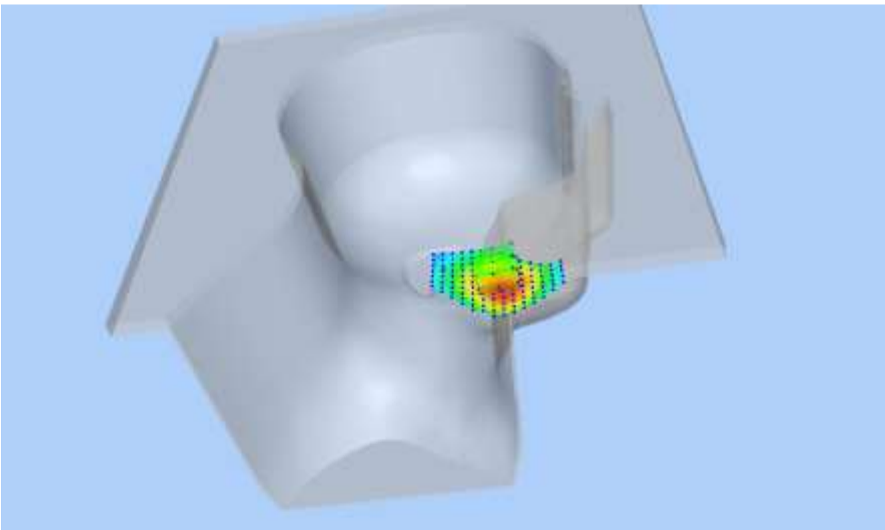
Test mode:2450MHz(Body)
Product Description:Validation
Model:Dipole SID2450
E-Field Probe:SSE5(SN17/14 EP220)
Test Date: October 12, 2015

Medium(liquid type)	MSL_2450
Frequency (MHz)	2450.0000
Relative permittivity (real part)	52.75
Conductivity (S/m)	1.96
Input power	100mW
Crest Factor	1.0
Conversion Factor	4.05
Variation (%)	-0.340000
SAR 10g (W/Kg)	2.493042
SAR 1g (W/Kg)	5.45436
SURFACE SAR	**VOLUME SAR**
	

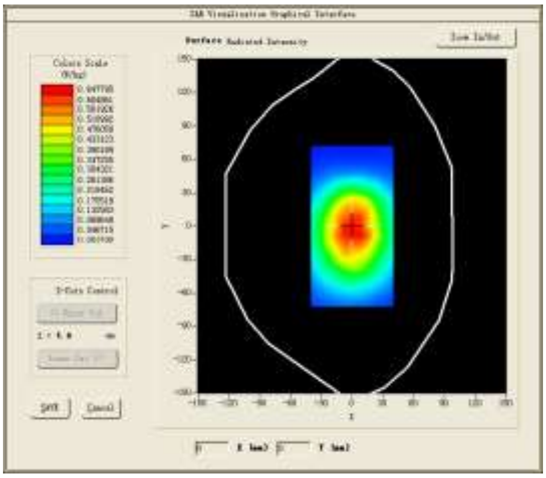
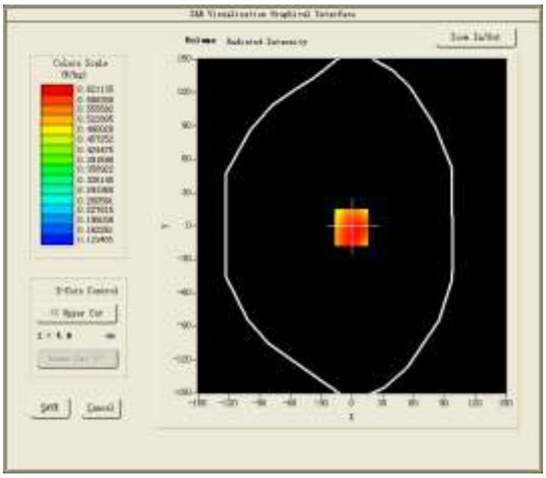


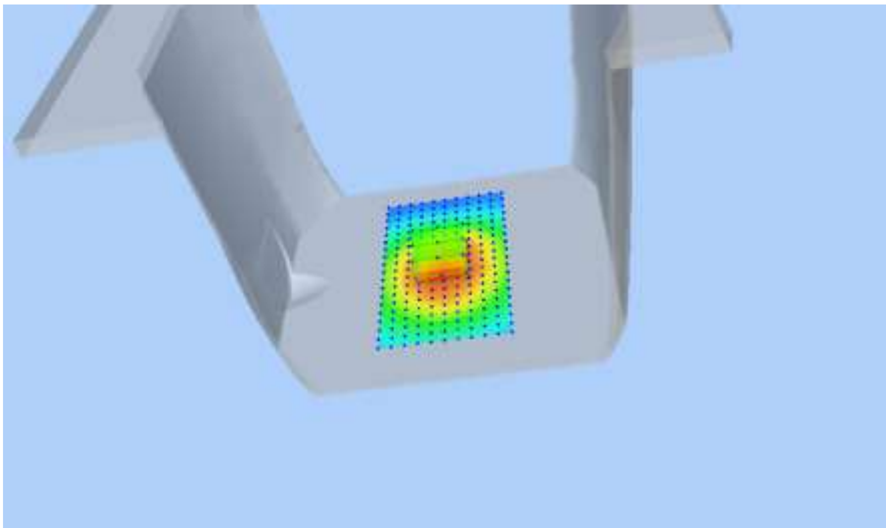
6.7. SAR Test Graph Results

Test Mode:GSM 850MHz,Mid channel(Head Left Cheek)
Product Description: Mobile phone
Model: S400
Test Date: October 08, 2015

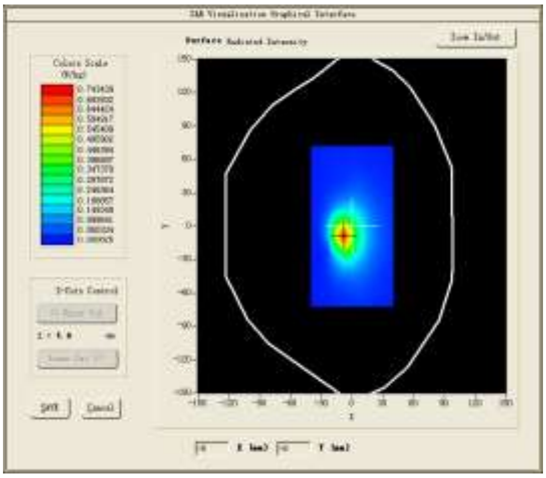
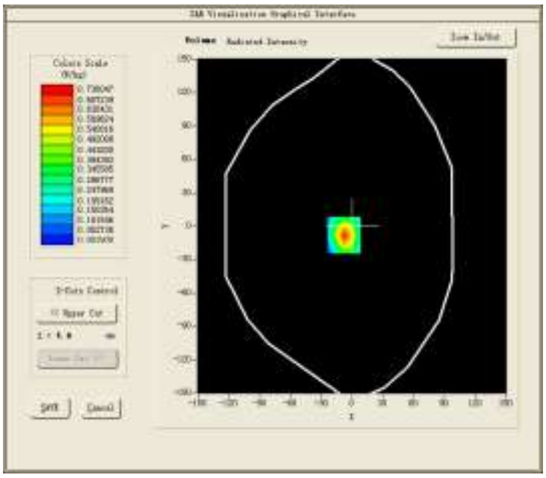
Medium(liquid type)	MSL_900
Frequency (MHz)	836.400000
Relative permittivity (real part)	42.81
Conductivity (S/m)	0.89
E-Field Probe	SN 17/14 EP220
Crest Factor	2.0
Conversion Factor	4.86
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	4.470000
SAR 10g (W/Kg)	0.701448
SAR 1g (W/Kg)	0.991860
SURFACE SAR	**VOLUME SAR**
	
	

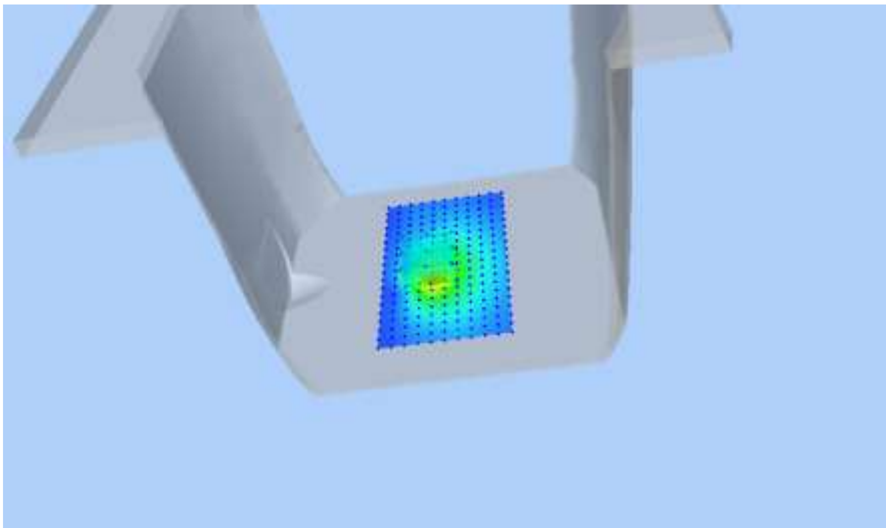
Test Mode:GPRS850MHz,Mid channel(Body Back Side)
Product Description: Mobile phone
Model: S400
Test Date: October 08, 2015

Medium(liquid type)	MSL_900
Frequency (MHz)	836.400000
Relative permittivity (real part)	53.46
Conductivity (S/m)	0.96
E-Field Probe	SN 17/14 EP220
Crest Factor	2.0
Conversion Factor	5.04
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-1.290000
SAR 10g (W/Kg)	0.457197
SAR 1g (W/Kg)	0.609266
SURFACE SAR	**VOLUME SAR**
	

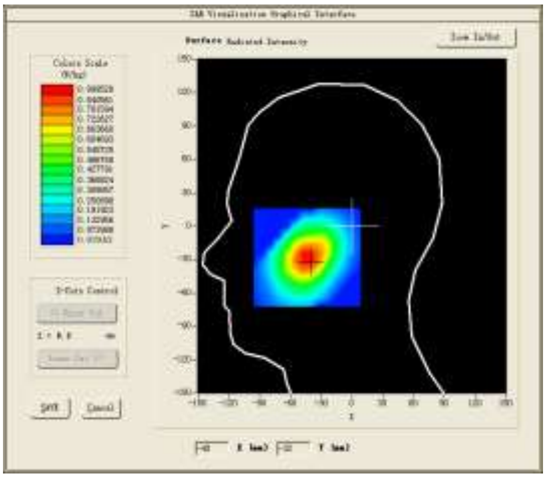
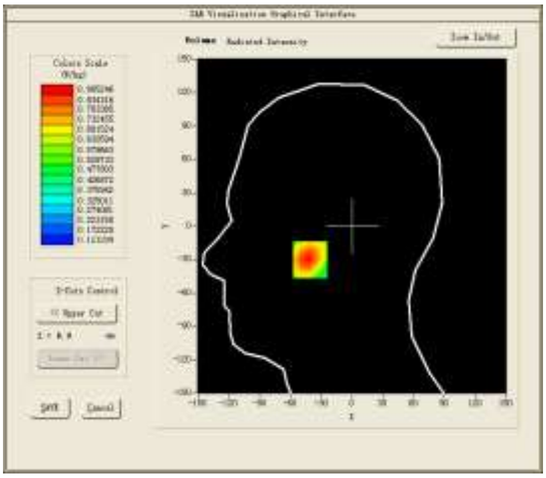


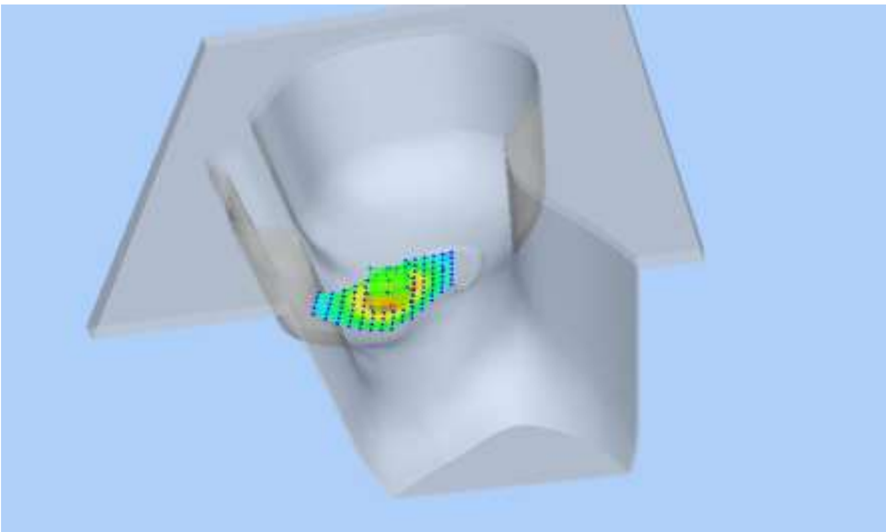
Test Mode: Hotspot GSM850MHz,Mid channel(Body Back Side)
Product Description: Mobile phone
Model: S400
Test Date: October 08, 2015

Medium(liquid type)	MSL_900
Frequency (MHz)	836.400000
Relative permittivity (real part)	53.46
Conductivity (S/m)	0.96
E-Field Probe	SN 17/14 EP220
Crest Factor	2.0
Conversion Factor	5.04
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.440000
SAR 10g (W/Kg)	0.302589
SAR 1g (W/Kg)	0.672597
SURFACE SAR	**VOLUME SAR**
	

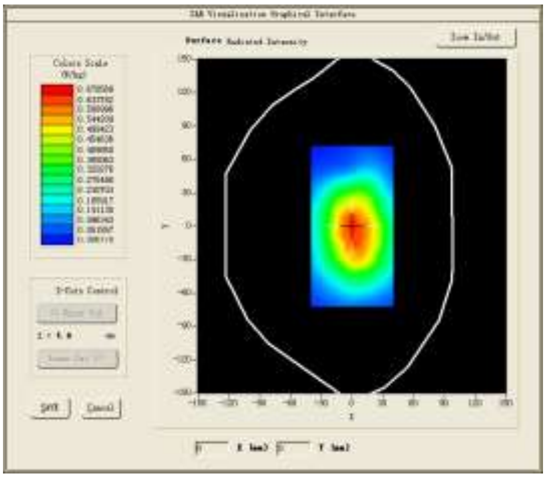
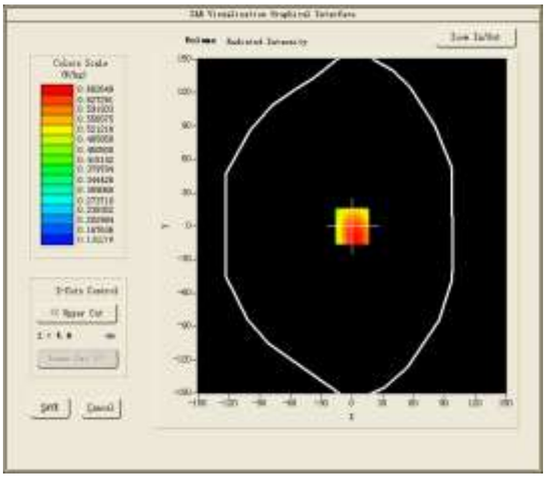


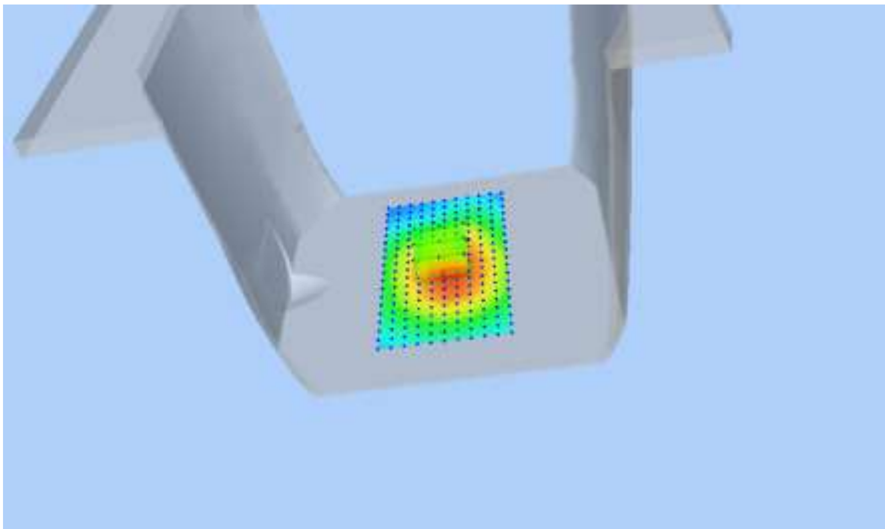
Test Mode:GSM 1900MHz,Mid channel(Head Right Cheek)
Product Description: Mobile phone
Model: S400
Test Date: October 09, 2015

Medium(liquid type)	MSL_1800
Frequency (MHz)	1880.000000
Relative permittivity (real part)	41.31
Conductivity (S/m)	1.38
E-Field Probe	SN 17/14 EP221
Crest Factor	2.0
Conversion Factor	4.16
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.080000
SAR 10g (W/Kg)	0.575397
SAR 1g (W/Kg)	0.848373
SURFACE SAR	**VOLUME SAR**
	

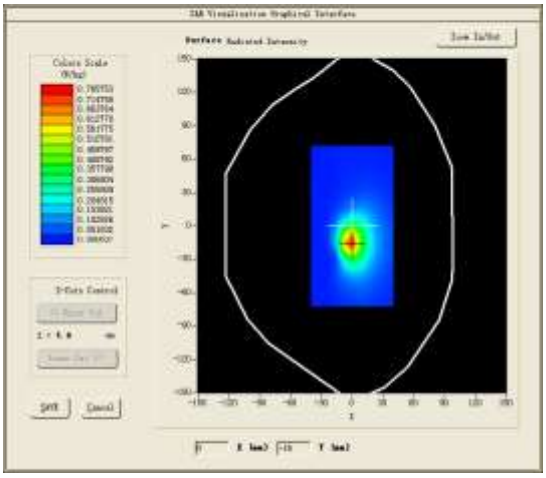
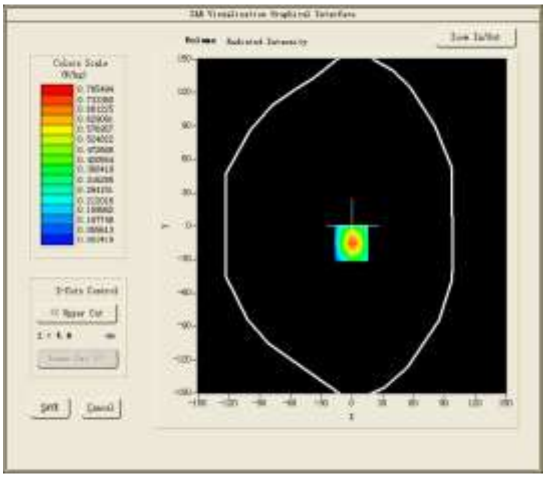


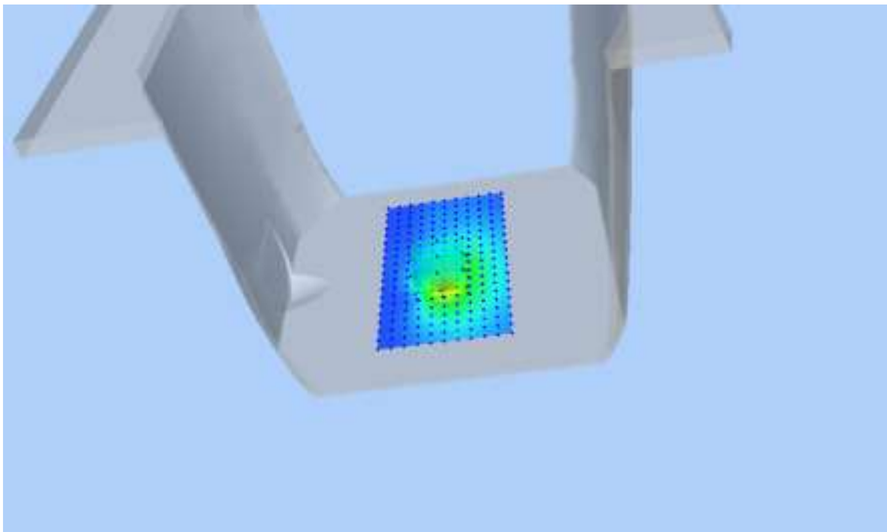
Test Mode:GPRS1900MHz,Mid channel(Body Back Side)
Product Description: Mobile phone
Model: S400
Test Date: October 09, 2015

Medium(liquid type)	MSL_1800
Frequency (MHz)	1880.000000
Relative permittivity (real part)	53.27
Conductivity (S/m)	1.51
E-Field Probe	SN 17/14 EP221
Crest Factor	2.0
Conversion Factor	4.29
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.630000
SAR 10g (W/Kg)	0.460194
SAR 1g (W/Kg)	0.652500
SURFACE SAR	**VOLUME SAR**
	

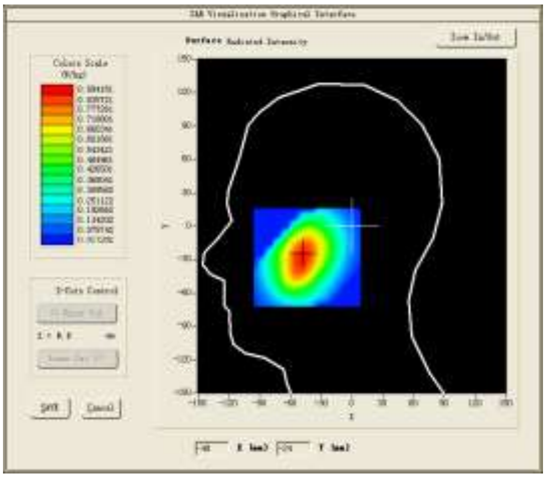
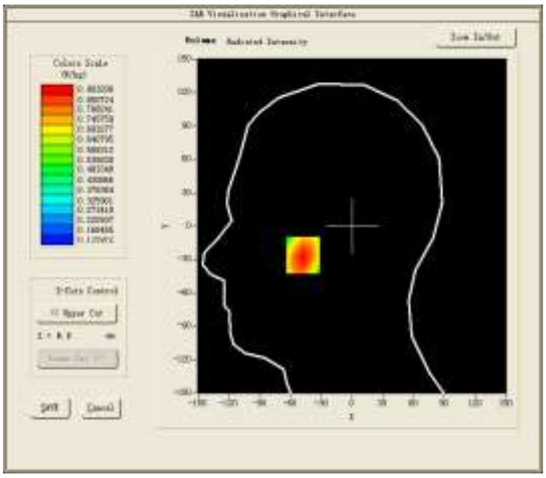


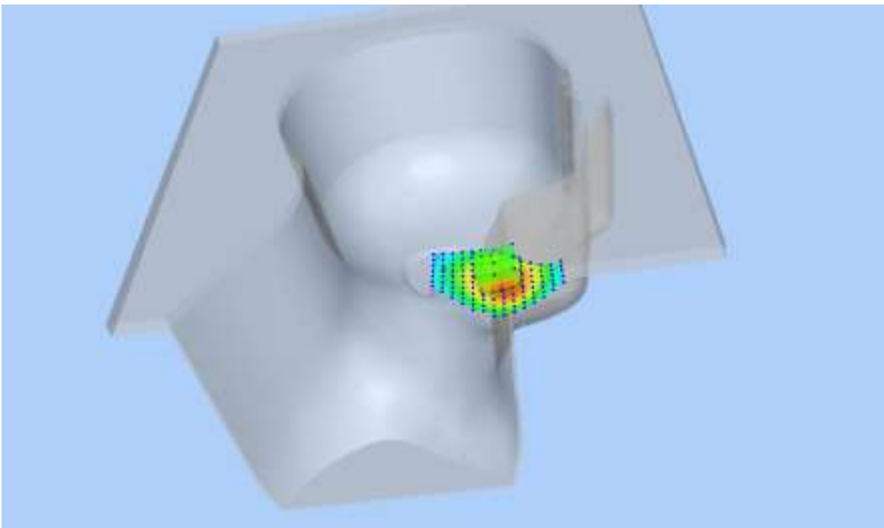
Test Mode: Hotspot GPRS1900MHz,Mid channel(Body Back Side)
Product Description: Mobile phone
Model: S400
Test Date: October 09, 2015

Medium(liquid type)	MSL_1800
Frequency (MHz)	1880.000000
Relative permittivity (real part)	53.27
Conductivity (S/m)	1.51
E-Field Probe	SN 17/14 EP221
Crest Factor	2.0
Conversion Factor	4.29
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.500000
SAR 10g (W/Kg)	0.316414
SAR 1g (W/Kg)	0.720442
SURFACE SAR	**VOLUME SAR**
	

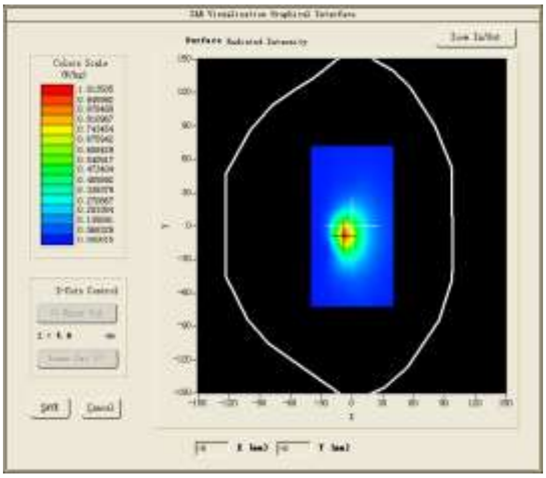
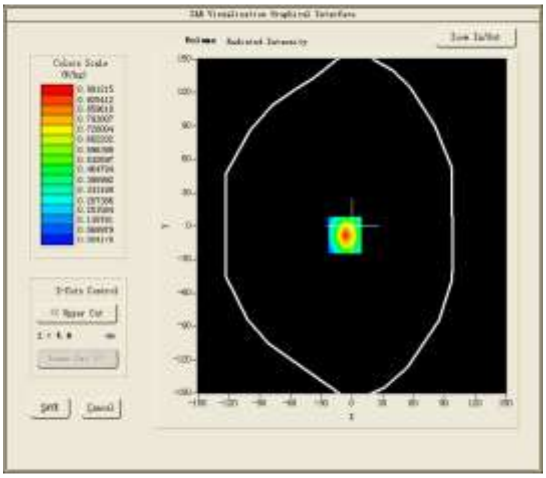


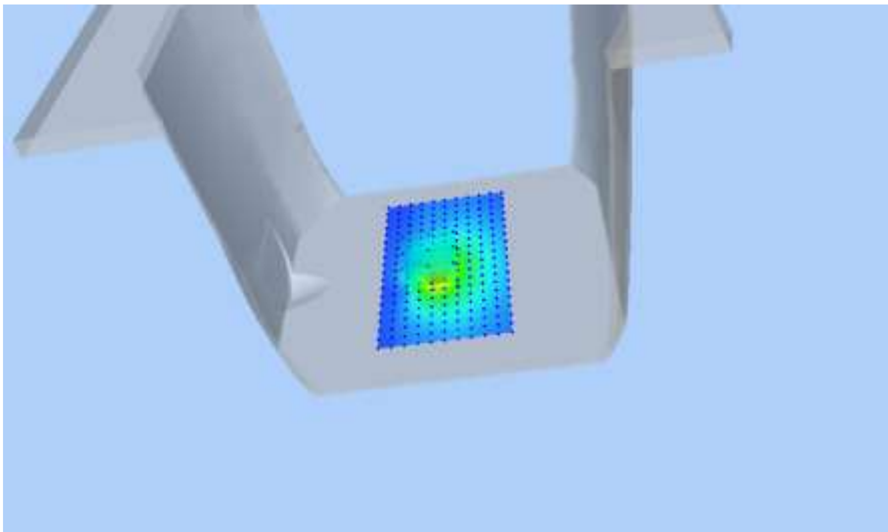
Test Mode:WCDMA 850MHz,Mid channel(Head Left Cheek)
Product Description: Mobile phone
Model: S400
Test Date: October 08, 2015

Medium(liquid type)	MSL_900
Frequency (MHz)	836.400000
Relative permittivity (real part)	42.81
Conductivity (S/m)	0.89
E-Field Probe	SN 17/14 EP220
Crest Factor	2.0
Conversion Factor	4.86
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-1.430000
SAR 10g (W/Kg)	0.616310
SAR 1g (W/Kg)	0.902868
SURFACE SAR	**VOLUME SAR**
	

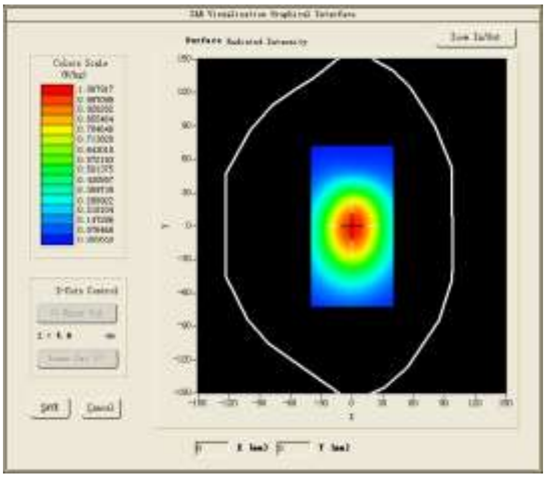
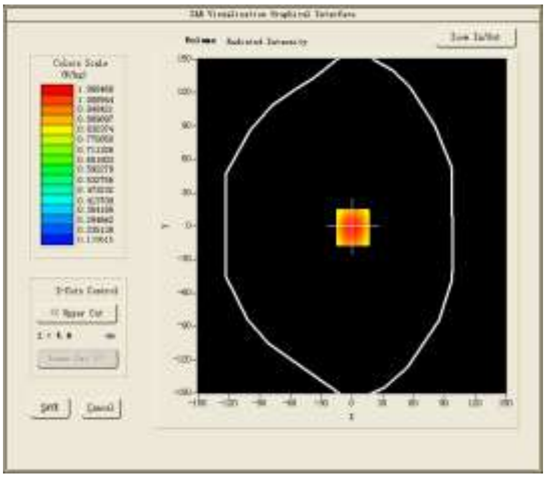
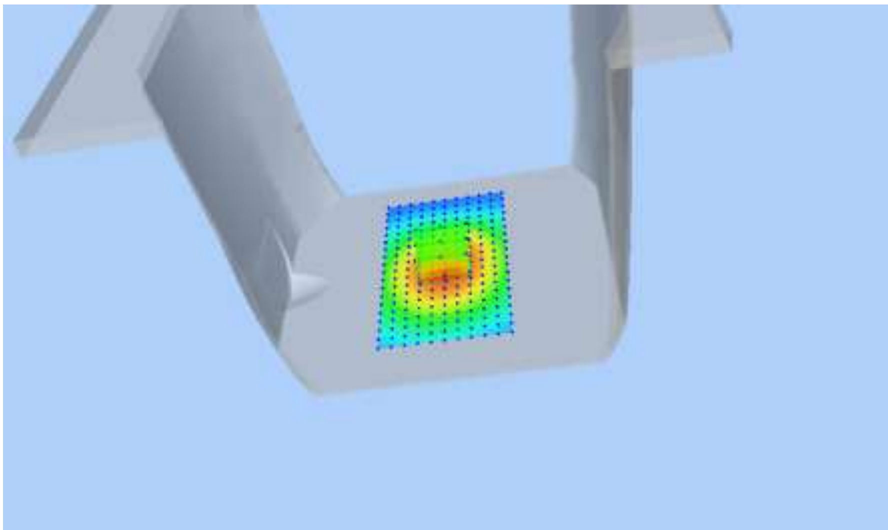


Test Mode:WCDMA850MHz,Mid channel(Body Back Side)
Product Description: Mobile phone
Model: S400
Test Date: October 08, 2015

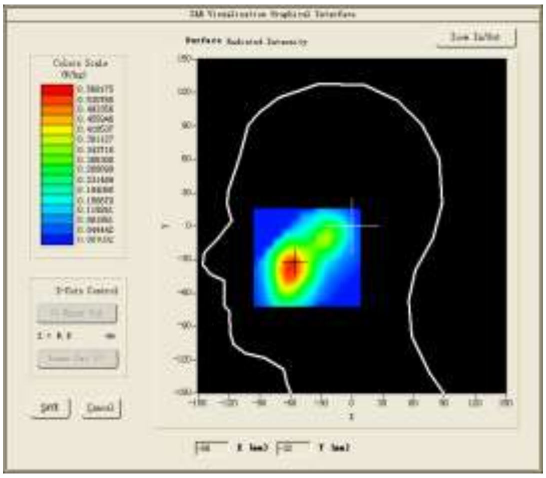
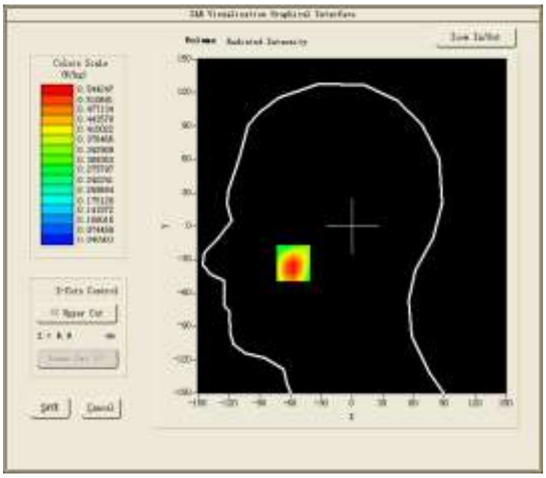
Medium(liquid type)	MSL_900
Frequency (MHz)	836.400000
Relative permittivity (real part)	53.46
Conductivity (S/m)	0.96
E-Field Probe	SN 17/14 EP220
Crest Factor	2.0
Conversion Factor	5.04
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-1.060000
SAR 10g (W/Kg)	0.401598
SAR 1g (W/Kg)	0.912596
SURFACE SAR	**VOLUME SAR**
	

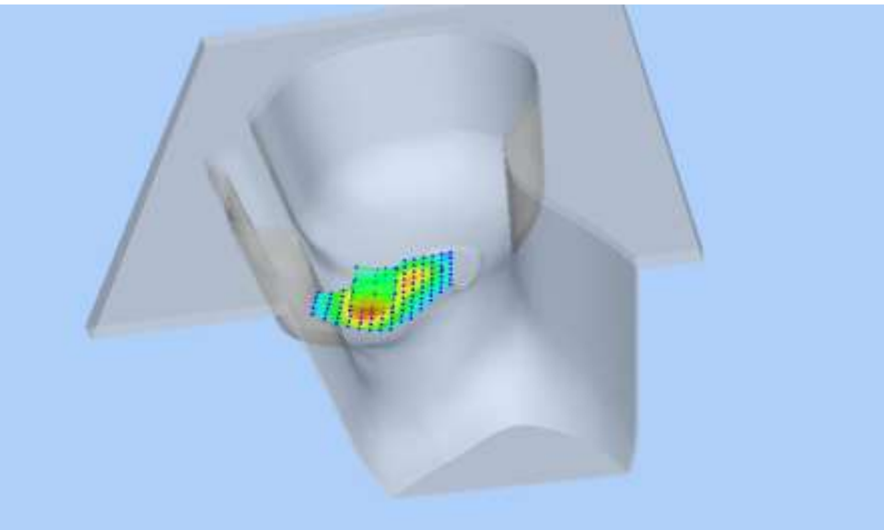


Test Mode: Hotspot WCDMA850MHz,Mid channel(Body Back Side)
Product Description: Mobile phone
Model: S400
Test Date: October 08, 2015

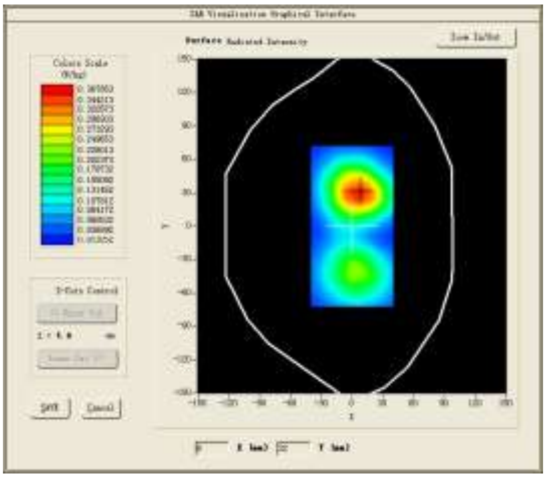
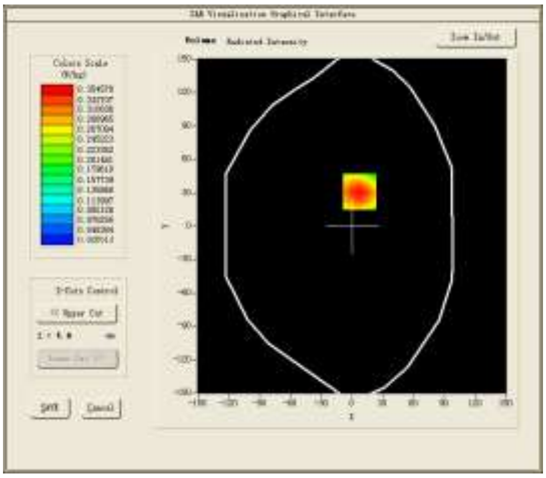
Medium(liquid type)	MSL_900
Frequency (MHz)	836.400000
Relative permittivity (real part)	53.46
Conductivity (S/m)	0.96
E-Field Probe	SN 17/14 EP220
Crest Factor	2.0
Conversion Factor	5.04
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.400000
SAR 10g (W/Kg)	0.730846
SAR 1g (W/Kg)	1.067265
SURFACE SAR	**VOLUME SAR**
	
	

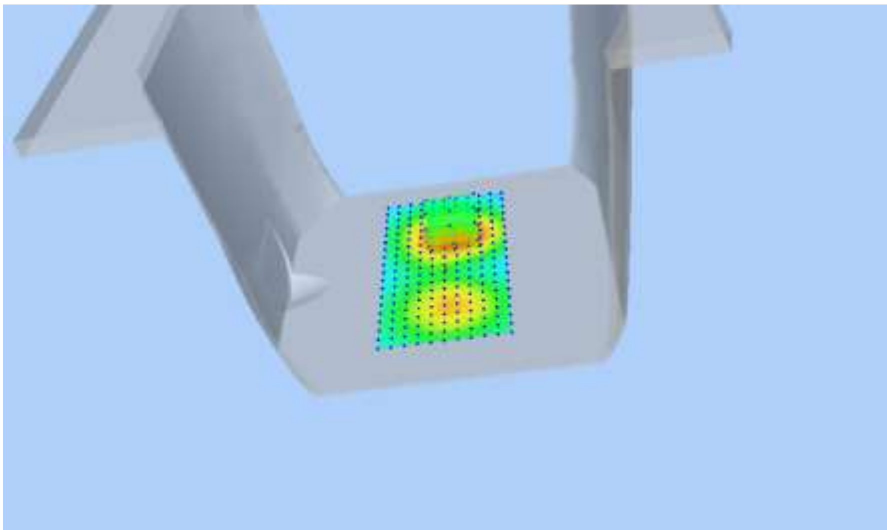
Test Mode:WCDMA1900MHz,Mid channel(Head Right Cheek)
Product Description: Mobile phone
Model: S400
Test Date: October 09, 2015

Medium(liquid type)	MSL_1800
Frequency (MHz)	1880.000000
Relative permittivity (real part)	41.31
Conductivity (S/m)	1.38
E-Field Probe	SN 17/14 EP221
Crest Factor	2.0
Conversion Factor	4.16
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-2.870000
SAR 10g (W/Kg)	0.315274
SAR 1g (W/Kg)	0.521612
SURFACE SAR	**VOLUME SAR**
	

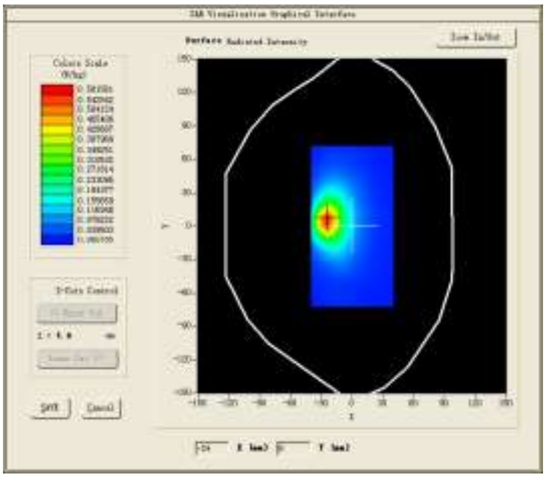
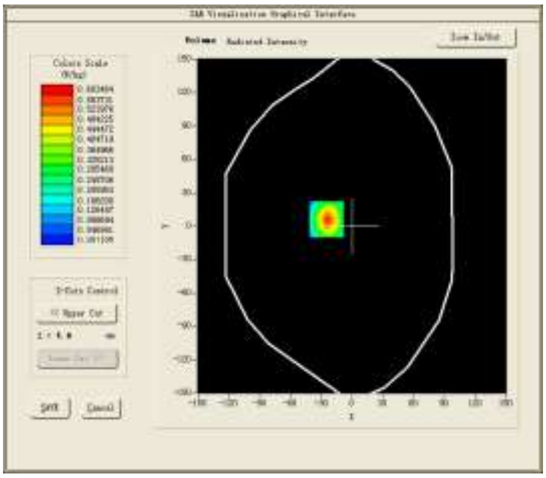


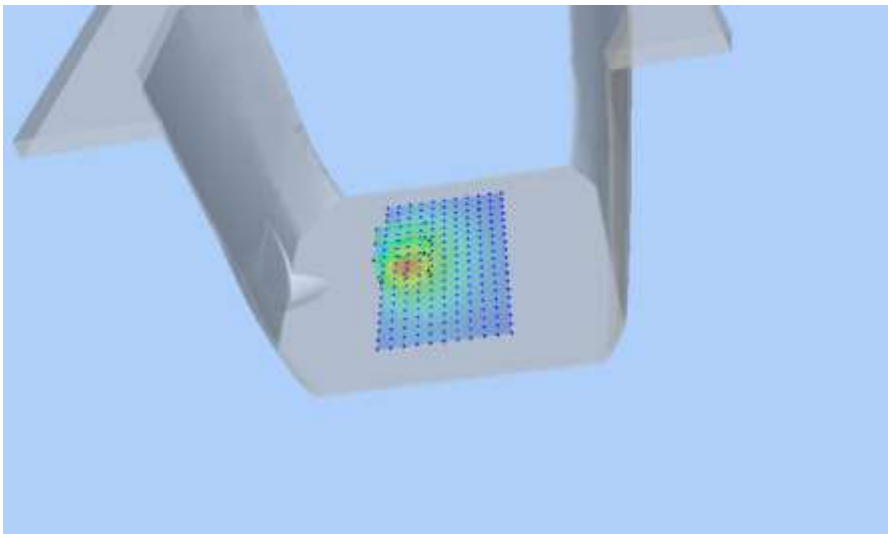
Test Mode:WCDMA1900MHz,Mid channel(Body Back Side)
Product Description: Mobile phone
Model: S400
Test Date: October 09, 2015

Medium(liquid type)	MSL_1800
Frequency (MHz)	1880.000000
Relative permittivity (real part)	53.27
Conductivity (S/m)	1.51
E-Field Probe	SN 17/14 EP221
Crest Factor	2.0
Conversion Factor	4.29
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	1.250000
SAR 10g (W/Kg)	0.209829
SAR 1g (W/Kg)	0.337312
SURFACE SAR	**VOLUME SAR**
	

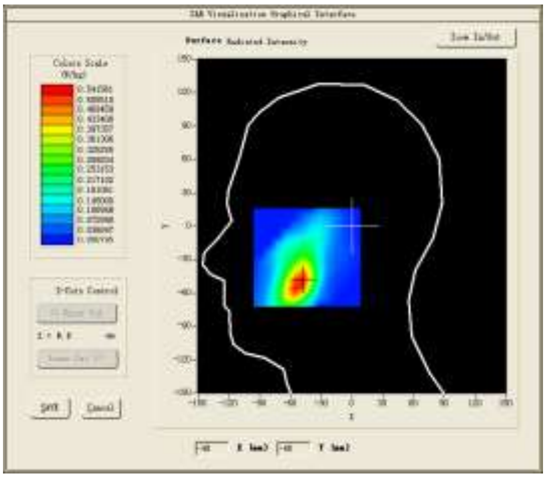
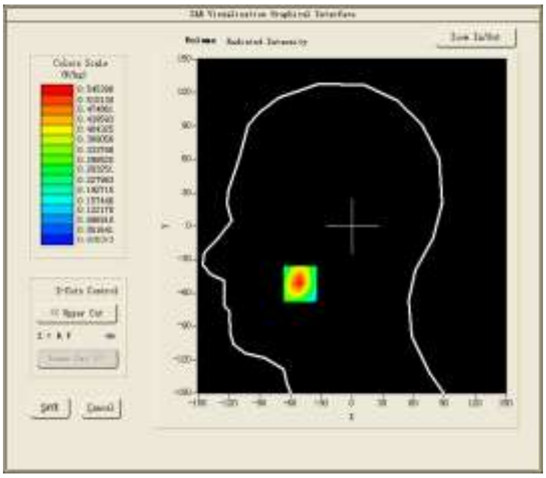


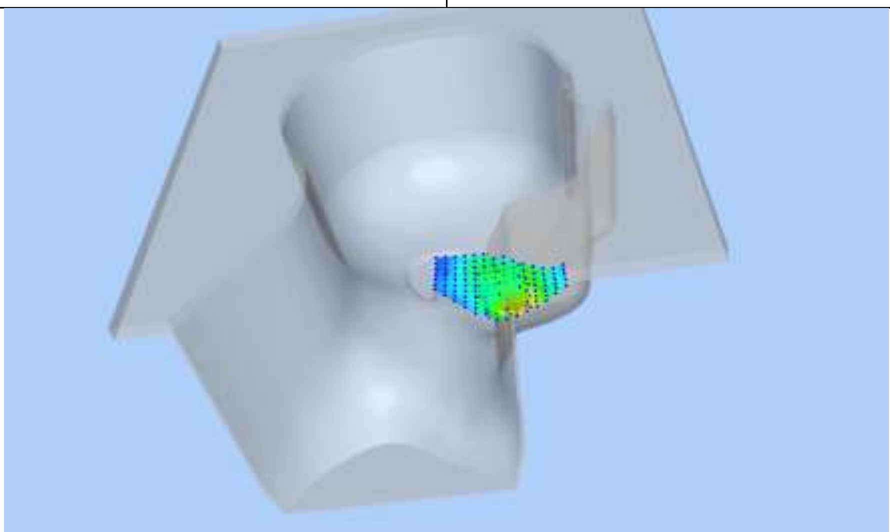
Test Mode: Hotspot WCDMA1900MHz,Mid channel(Body Back Side)
Product Description: Mobile phone
Model: S400
Test Date: October 09, 2015

Medium(liquid type)	MSL_1800
Frequency (MHz)	1880.000000
Relative permittivity (real part)	53.27
Conductivity (S/m)	1.51
E-Field Probe	SN 17/14 EP221
Crest Factor	2.0
Conversion Factor	4.29
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.910000
SAR 10g (W/Kg)	0.263265
SAR 1g (W/Kg)	0.556631
SURFACE SAR	**VOLUME SAR**
	

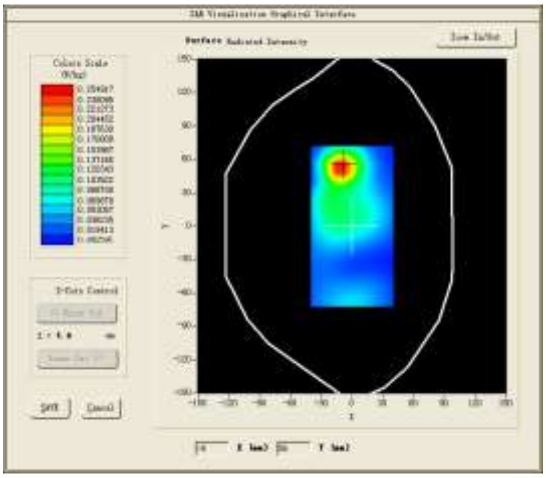
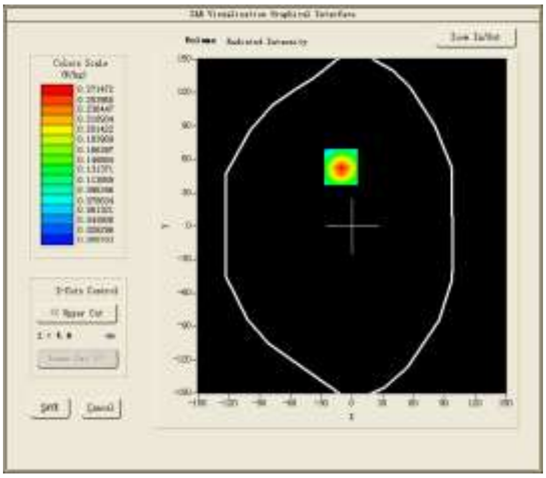


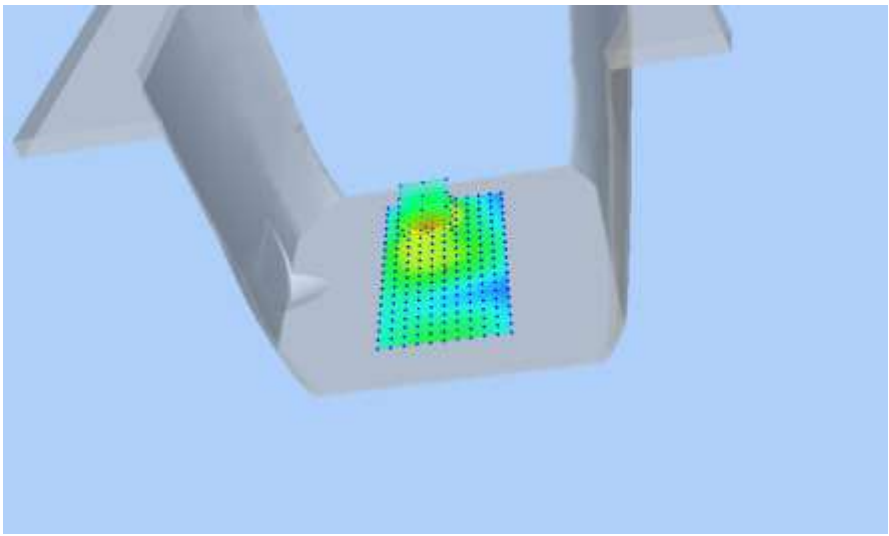
Test Mode:802.11b,Mid channel(Head Left Cheek)
Product Description: Mobile phone
Model: S400
Test Date: October 12, 2015

Medium(liquid type)	MSL_2450
Frequency (MHz)	2437.000000
Relative permittivity (real part)	39.05
Conductivity (S/m)	1.77
E-Field Probe	SN 17/14 EP220
Crest Factor	1.0
Conversion Factor	3.94
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-4.560000
SAR 10g (W/Kg)	0.279321
SAR 1g (W/Kg)	0.511030
SURFACE SAR	**VOLUME SAR**
	

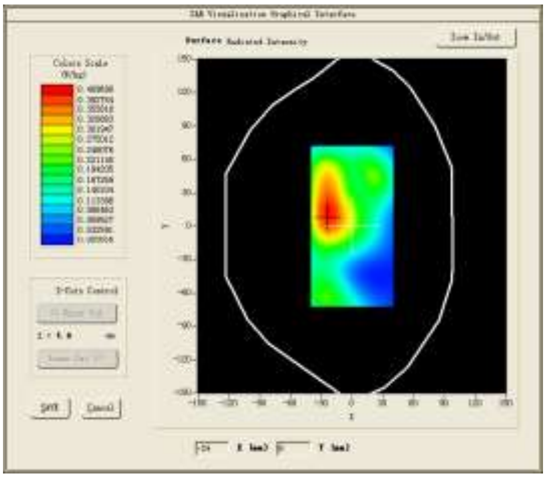
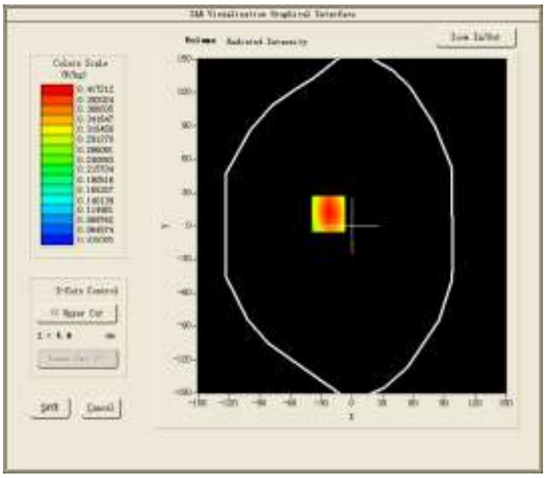
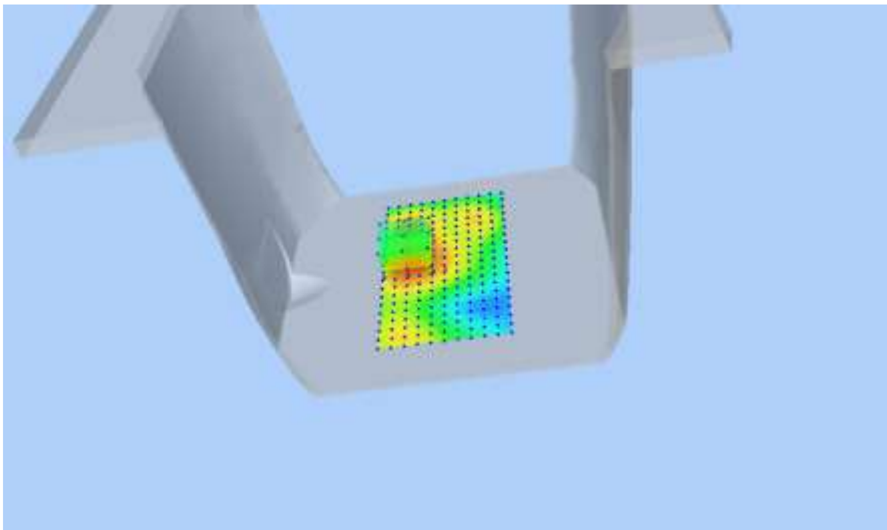


Test Mode:802.11b,Mid channel(Body SAR Back Side)
Product Description: Mobile phone
Model: S400
Test Date: October 12, 2015

Medium(liquid type)	MSL_2450
Frequency (MHz)	2437.000000
Relative permittivity (real part)	52.97
Conductivity (S/m)	1.93
E-Field Probe	SN 17/14 EP220
Crest Factor	1.0
Conversion Factor	4.05
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.490000
SAR 10g (W/Kg)	0.144960
SAR 1g (W/Kg)	0.272998
SURFACE SAR	**VOLUME SAR**
	



Test Mode: Hotspot 802.11b,Mid channel(Body SAR Back Side)
Product Description: Mobile phone
Model: S400
Test Date: October 12, 2015

Medium(liquid type)	MSL_2450
Frequency (MHz)	2437.000000
Relative permittivity (real part)	52.97
Conductivity (S/m)	1.93
E-Field Probe	SN 17/14 EP220
Crest Factor	1.0
Conversion Factor	4.05
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-1.040000
SAR 10g (W/Kg)	0.246295
SAR 1g (W/Kg)	0.397821
SURFACE SAR	**VOLUME SAR**
	
	

7.CALIBRATION CERTIFICATES

SARTIMO Calibration Certificate-Extended Dipole Calibrations

According to KDB 450824 D02, Dipoles must be recalibrated at least once every three years; however, immediate re-calibration is required for following conditions. The test laboratory must ensure that the required supporting information and documentation have been included in the SAR report to qualify for extended 3-year calibration interval.

1) When the most recent return-loss, measured at least annually, deviates by more than 20% from theprevious measurement (i.e. 0.2 of the dB value) or not meeting the required -20 dB return-loss specification
2) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, deviates by more than 5 ∩from the previous measurement

Summary Result:

SID835			
Frquency	Return Loss(dB)	Requirement(dB)	Impedence
835	-24.46	-20	55.4Ω+2.4jΩ

SID1900			
Frquency	Return Loss(dB)	Requirement(dB)	Impedence
1900	-23.68	-20	51.2Ω+6.4jΩ

SID 2450			
Frquency	Return Loss(dB)	Requirement(dB)	Impedence
2450	-25.61	-20	44.9Ω-0.9jΩ

7.1. Probe Calibration Ceriticate

COMOSAR E-Field Probe Calibration Report

Ref : ACR.287.1.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD, BAO'AN BLVD
BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
SATIMO COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: SN 17/14 EP220

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

Calibration CERT #2246-02

10/01/2014

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	10/14/2014	JS
Checked by :	Jérôme LUC	Product Manager	10/14/2014	JS
Approved by :	Kim RUTKOWSKI	Quality Manager	10/14/2014	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/14/2014	Initial release

TABLE OF CONTENTS

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	Satimo
Model	SSE5
Serial Number	SN 17/14 EP220
Product Condition (new / used)	New
Frequency Range of Probe	0.7 GHz-3GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.179 MΩ Dipole 2: R2=0.175 MΩ Dipole 3: R3=0.180 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.

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%

Combined standard uncertainty					5.831%
Expanded uncertainty 95 % confidence level k = 2					12.0%

5 CALIBRATION MEASUREMENT RESULTS

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

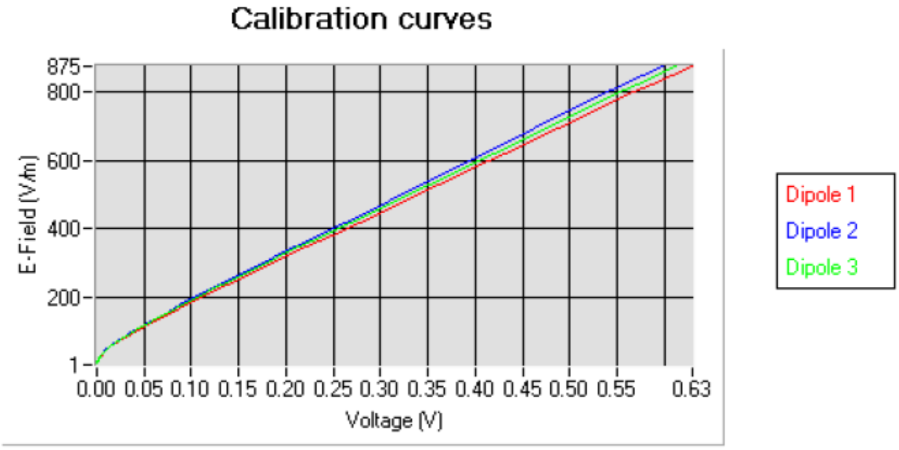
5.1 SENSITIVITY IN AIR

Normx dipole 1 ($\mu V/(V/m)^2$)	Normy dipole 2 ($\mu V/(V/m)^2$)	Normz dipole 3 ($\mu V/(V/m)^2$)
6.02	5.52	5.72

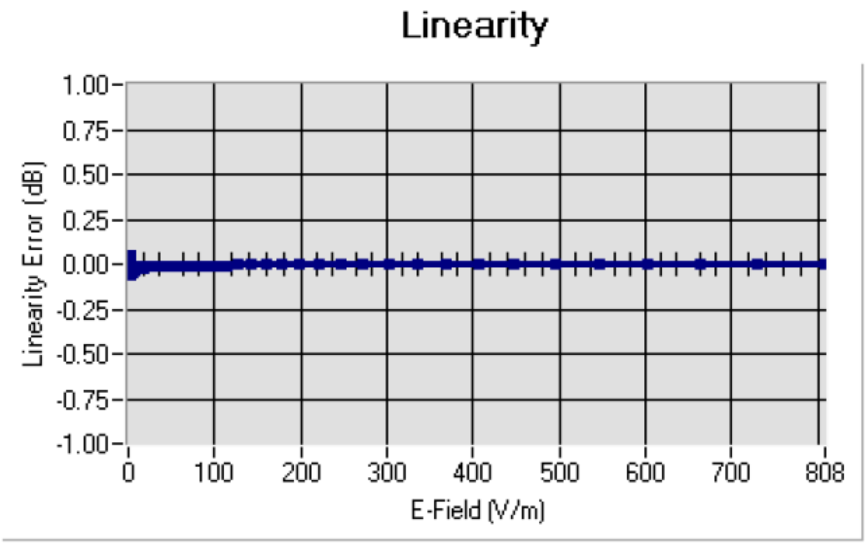
DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
99	98	99

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

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



5.2 LINEARITY



Linearity: +/-1.47% (+/-0.06dB)

5.3 SENSITIVITY IN LIQUID

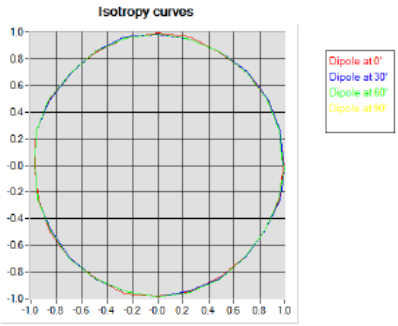
Liquid	Frequency (MHz +/- 100MHz)	Permittivity	Epsilon (S/m)	ConvF
HL750	750	42.06	0.89	4.58
BL750	750	56.57	0.99	4.71
HL850	835	42.81	0.89	4.86
BL850	835	53.46	0.96	5.04
HL900	900	42.47	0.96	4.74
BL900	900	56.69	1.08	4.92
HL1800	1800	41.31	1.38	4.16
BL1800	1800	53.27	1.51	4.29
HL2000	2000	39.72	1.43	4.19
BL2000	2000	53.91	1.53	4.28
HL2450	2450	39.05	1.77	3.94
BL2450	2450	52.97	1.93	4.05

LOWER DETECTION LIMIT: 7mW/kg

5.4 ISOTROPY

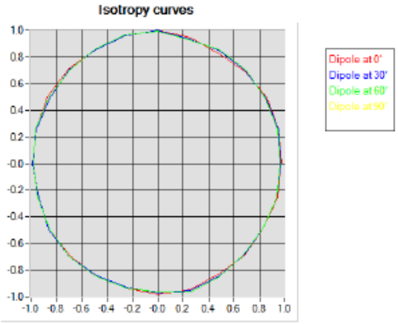
HL900 MHz

- Axial isotropy: 0.04 dB
- Hemispherical isotropy: 0.07 dB



HL1800 MHz

- Axial isotropy: 0.06 dB
- Hemispherical isotropy: 0.08 dB



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	02/2013	02/2016
Reference Probe	Satimo	EP 94 SN 37/08	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
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	8/2012	8/2015

COMOSAR E-Field Probe Calibration Report

Ref : ACR.262.1.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD, BAO'AN BLVD
BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
SATIMO COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: SN 17/14 EP221

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

09/01/2014

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	9/19/2014	JS
Checked by :	Jérôme LUC	Product Manager	9/19/2014	JS
Approved by :	Kim RUTKOWSKI	Quality Manager	9/19/2014	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	9/19/2014	Initial release

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1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	Satimo
Model	SSE5
Serial Number	SN 17/14 EP221
Product Condition (new / used)	New
Frequency Range of Probe	0.4 GHz- 6 GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.179 MΩ Dipole 2: R2=0.167 MΩ Dipole 3: R3=0.178 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.

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%

Combined standard uncertainty					5.831%
Expanded uncertainty 95 % confidence level k = 2					12.0%

5 CALIBRATION MEASUREMENT RESULTS

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

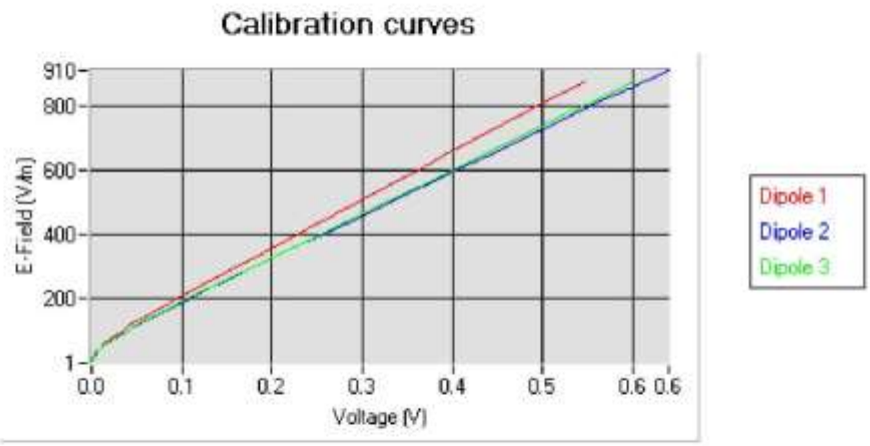
5.1 SENSITIVITY IN AIR

Normx dipole 1 ($\mu V/(V/m)^2$)	Normy dipole 2 ($\mu V/(V/m)^2$)	Normz dipole 3 ($\mu V/(V/m)^2$)
4.81	6.15	6.02

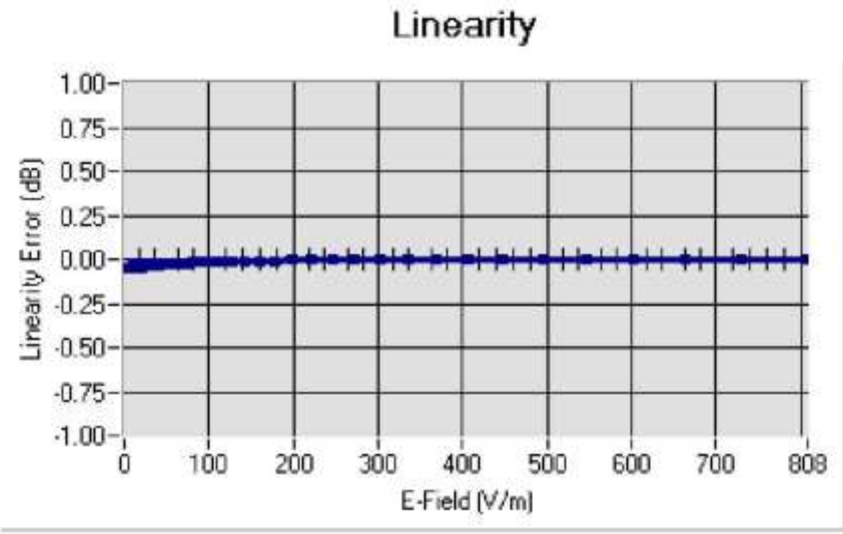
DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
95	100	90

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

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



5.2 LINEARITY



Linearity: +/-1.16% (+/-0.05dB)

5.3 SENSITIVITY IN LIQUID

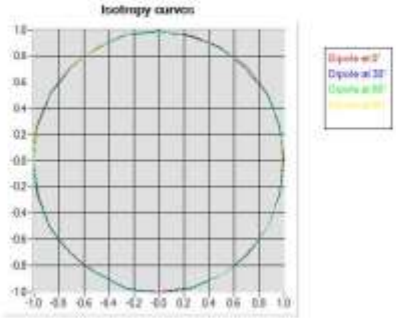
Liquid	Frequency (MHz +/- 100MHz)	Permittivity	Epsilon (S/m)	ConvF
HL450	450	43.90	0.87	4.84
BL450	450	58.63	0.98	4.98
HL750	750	42.06	0.89	4.53
BL750	750	56.57	0.99	4.70
HL850	835	42.81	0.89	4.83
BL850	835	53.46	0.96	5.02
HL900	900	42.47	0.96	4.74
BL900	900	56.69	1.08	4.89
HL1800	1800	41.31	1.38	4.25
BL1800	1800	53.27	1.51	4.34
HL1900	1900	41.09	1.42	4.71
BL1900	1900	54.20	1.54	4.85
HL2000	2000	39.72	1.43	4.27
BL2000	2000	53.91	1.53	4.44
HL2450	2450	39.05	1.77	4.11
BL2450	2450	52.97	1.93	4.25
HL2600	2600	38.35	1.92	4.20
BL2600	2600	51.81	2.19	4.32

LOWER DETECTION LIMIT: 7mW/kg

5.4 ISOTROPY

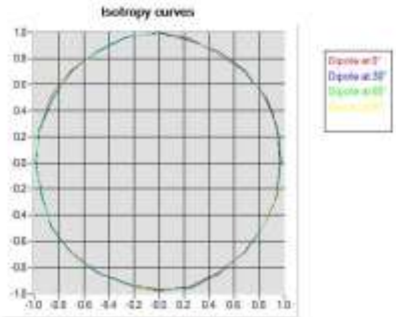
HL900 MHz

- Axial isotropy: 0.04 dB
- Hemispherical isotropy: 0.07 dB



HL1800 MHz

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



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	02/2013	02/2016
Reference Probe	Satimo	EP 94 SN 37/08	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
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	8/2012	8/2015

7.2. SID835Dipole Calibration Ceriticate

The microwave vision company

SAR Reference Dipole Calibration Report

Ref : ACR.287.4.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD, BAO'AN BLVD
BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
SATIMO COMOSAR REFERENCE DIPOLE
FREQUENCY: 835 MHZ
SERIAL NO.: SN 07/14 DIP 0G835-303

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

ACCREDITED
Calibration CERT #2246-02

10/01/2014

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.

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.4.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	10/14/2014	JS
Checked by :	Jérôme LUC	Product Manager	10/14/2014	JS
Approved by :	Kim RUTKOWSKI	Quality Manager	10/14/2014	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/14/2014	Initial release

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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	SID835
Serial Number	SN 07/14 DIP 0G835-303
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*

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

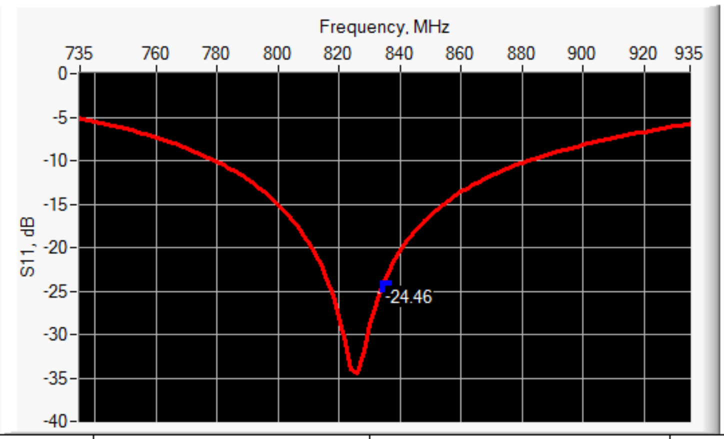
5.3 VALIDATION MEASUREMENT

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	20.3 %
10 g	20.1 %

6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
835	-24.46	-20	55.4 Ω + 2.4 jΩ

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 %.	PASS	89.8 ±1 %.	PASS	3.6 ±1 %.	PASS
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 %.		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 %.	

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 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 %	PASS	0.90 ±5 %	PASS
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 %		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 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

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.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 42.3 sigma : 0.92
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm

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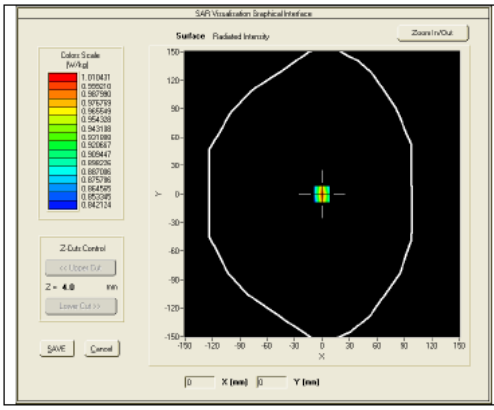
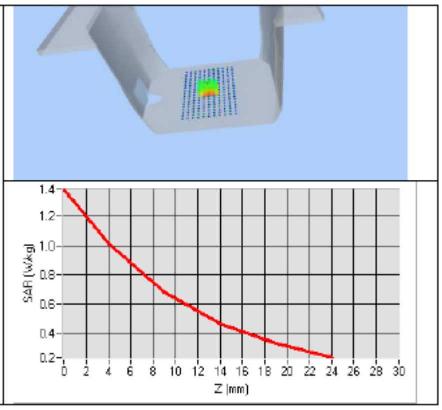
SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.4.14.SATU.A

Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	835 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

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	9.60 (0.96)	6.22	6.20 (0.62)
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		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	





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7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 ±5 %		0.80 ±5 %	
300	58.2 ±5 %		0.92 ±5 %	
450	56.7 ±5 %		0.94 ±5 %	
750	55.5 ±5 %		0.96 ±5 %	
835	55.2 ±5 %	PASS	0.97 ±5 %	PASS
900	55.0 ±5 %		1.05 ±5 %	
915	55.0 ±5 %		1.06 ±5 %	
1450	54.0 ±5 %		1.30 ±5 %	
1610	53.8 ±5 %		1.40 ±5 %	
1800	53.3 ±5 %		1.52 ±5 %	
1900	53.3 ±5 %		1.52 ±5 %	
2000	53.3 ±5 %		1.52 ±5 %	
2100	53.2 ±5 %		1.62 ±5 %	
2450	52.7 ±5 %		1.95 ±5 %	
2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

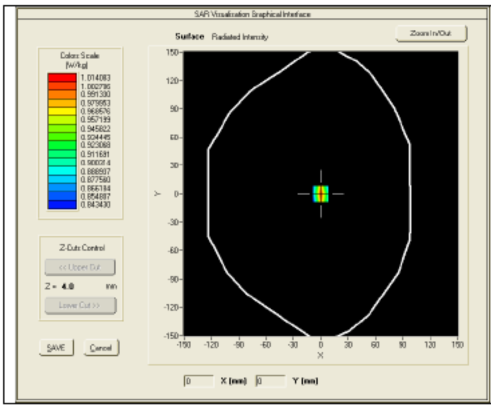
Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: eps' : 54.1 sigma : 0.97
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	835 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

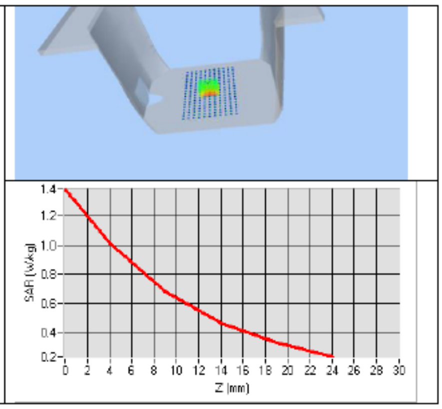
SATIMO

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.4.14.SATU.A

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
835	9.90 (0.99)	6.39 (0.64)





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8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM 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	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2013	12/2016
Reference Probe	Satimo	EPG122 SN 18/11	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
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	8/2012	8/2015

7.3. SID1900 Dipole Calibration Ceriticate

SAR Reference Dipole Calibration Report

Ref : ACR.262.8.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD, BAO'AN BLVD
BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
SATIMO COMOSAR REFERENCE DIPOLE
FREQUENCY: 1900 MHZ
SERIAL NO.: SN 30/14 DIP1G900-333

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

09/01/2014

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.

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.262.8.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	9/19/2014	
Checked by :	Jérôme LUC	Product Manager	9/19/2014	
Approved by :	Kim RUTKOWSKI	Quality Manager	9/19/2014	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	9/19/2014	Initial release

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.262.8.14.SATU.A

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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 30/14 DIP1G900-333
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*

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

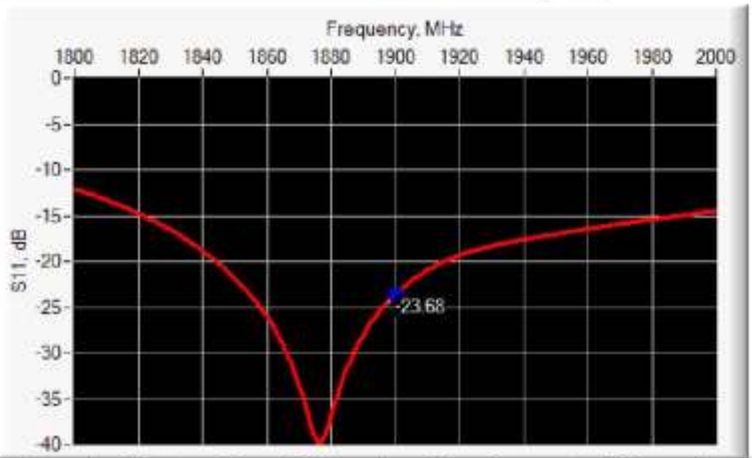
5.3 VALIDATION MEASUREMENT

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	20.3 %
10 g	20.1 %

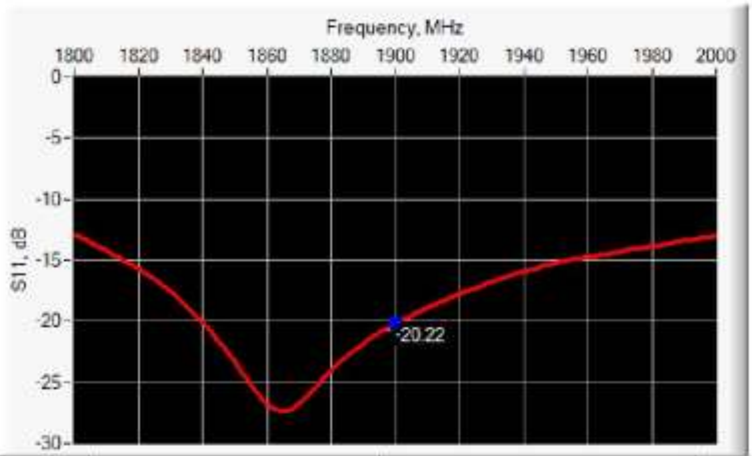
6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
1900	-23.68	-20	51.2 Ω + 6.4 jΩ

6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
1900	-20.22	-20	48.8 Ω + 9.6 jΩ

6.3 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 %.	

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 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε,')		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 %	

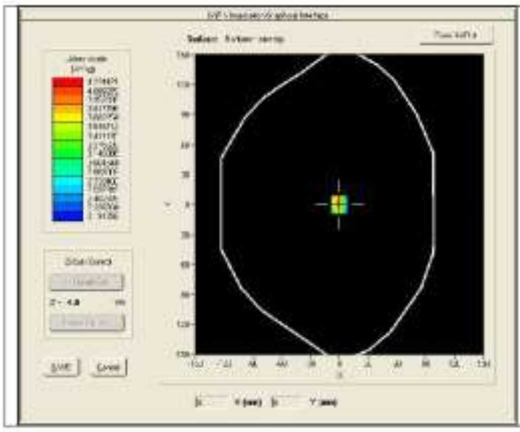
7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

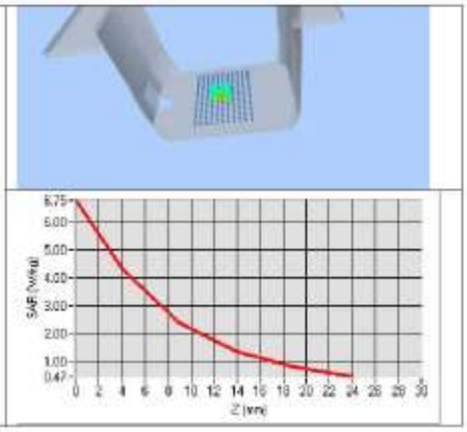
The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is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

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 41.1 sigma : 1.42
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon 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 %

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	39.84 (3.98)	20.5	20.20 (2.02)
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	





7.3 BODY LIQUID MEASUREMENT

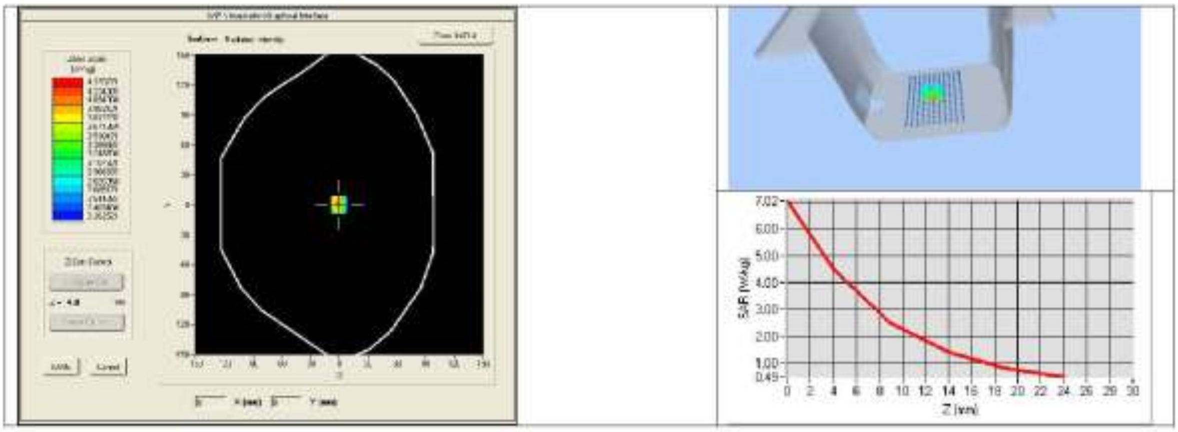
Frequency MHz	Relative permittivity (ε r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 ±5 %		0.80 ±5 %	
300	58.2 ±5 %		0.92 ±5 %	
450	56.7 ±5 %		0.94 ±5 %	
750	55.5 ±5 %		0.96 ±5 %	
835	55.2 ±5 %		0.97 ±5 %	
900	55.0 ±5 %		1.05 ±5 %	
915	55.0 ±5 %		1.06 ±5 %	
1450	54.0 ±5 %		1.30 ±5 %	
1610	53.8 ±5 %		1.40 ±5 %	
1800	53.3 ±5 %		1.52 ±5 %	
1900	53.3 ±5 %	PASS	1.52 ±5 %	PASS
2000	53.3 ±5 %		1.52 ±5 %	
2100	53.2 ±5 %		1.62 ±5 %	
2450	52.7 ±5 %		1.95 ±5 %	
2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	

5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: eps' : 54.2 sigma : 1.54
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon 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 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
1900	43.33 (4.33)	21.59 (2.16)



8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM 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	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2013	12/2016
Reference Probe	Satimo	EPG122 SN 18/11	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
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	8/2012	8/2015

7.4 SID2450 Dipole Calibration Ceriticate

SAR Reference Dipole Calibration Report

Ref : ACR.287.8.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD, BAO'AN BLVD
BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
SATIMO COMOSAR REFERENCE DIPOLE
FREQUENCY: 2450 MHZ
SERIAL NO.: SN 07/14 DIP 2G450-306

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

10/01/2014

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.

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.8.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	10/14/2014	
Checked by :	Jérôme LUC	Product Manager	10/14/2014	
Approved by :	Kim RUTKOWSKI	Quality Manager	10/14/2014	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/14/2014	Initial release

TABLE OF CONTENTS

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 2450 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID2450
Serial Number	SN 07/14 DIP 2G450-306
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*

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

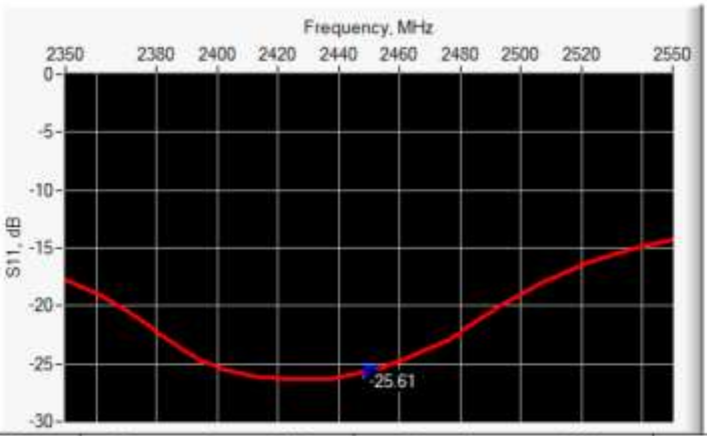
5.3 VALIDATION MEASUREMENT

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	20.3 %
10 g	20.1 %

6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2450	-25.61	-20	44.9 Ω - 0.9 jΩ

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 %.		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 %.	PASS	30.4 ±1 %.	PASS	3.6 ±1 %.	PASS
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 %.	

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 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 %		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 %	PASS	1.80 ±5 %	PASS
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

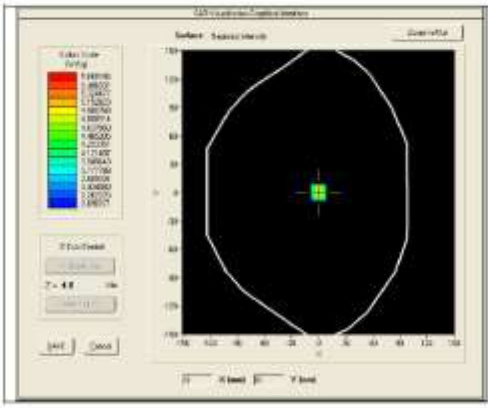
7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

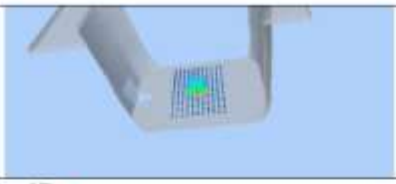
The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is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

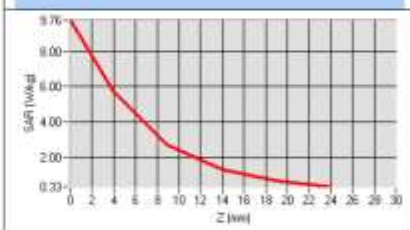
Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 39.0 sigma : 1.77
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm

Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

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		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	53.89 (5.39)	24	24.15 (2.42)
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	







7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 ±5 %		0.80 ±5 %	
300	58.2 ±5 %		0.92 ±5 %	
450	56.7 ±5 %		0.94 ±5 %	
750	55.5 ±5 %		0.96 ±5 %	
835	55.2 ±5 %		0.97 ±5 %	
900	55.0 ±5 %		1.05 ±5 %	
915	55.0 ±5 %		1.06 ±5 %	
1450	54.0 ±5 %		1.30 ±5 %	
1610	53.8 ±5 %		1.40 ±5 %	
1800	53.3 ±5 %		1.52 ±5 %	
1900	53.3 ±5 %		1.52 ±5 %	
2000	53.3 ±5 %		1.52 ±5 %	
2100	53.2 ±5 %		1.62 ±5 %	
2450	52.7 ±5 %	PASS	1.95 ±5 %	PASS
2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

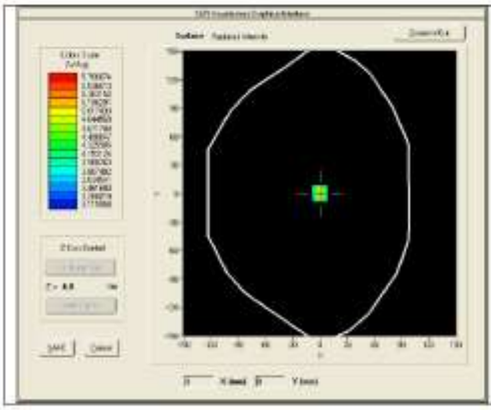
7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

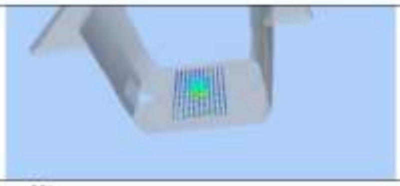
Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: eps' : 53.0 sigma : 1.93
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

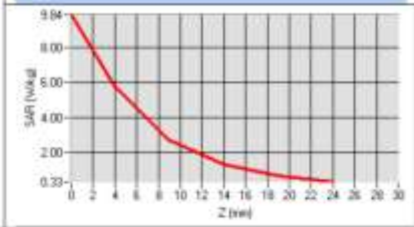
SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.8.14.SATU.A

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2450	54.65 (5.46)	24.58 (2.46)







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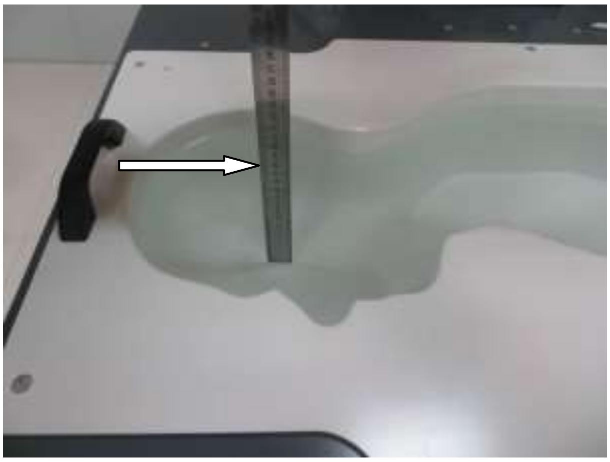
8 LIST OF EQUIPMENT

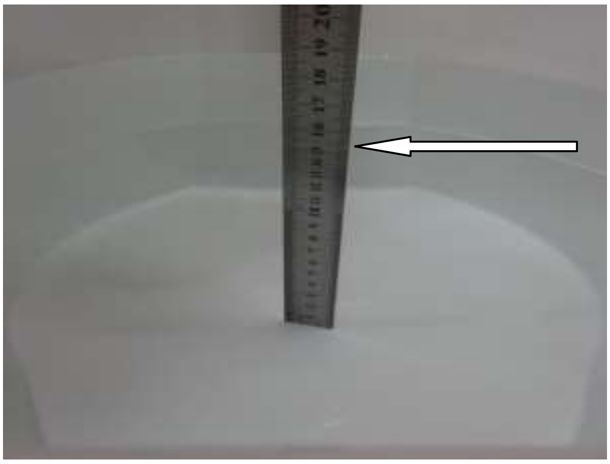
Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2013	12/2016
Reference Probe	Satimo	EPG122 SN 18/11	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
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	8/2012	8/2015

8. SAR System PHOTOGRAPHS

DEPTH OF THE LIQUID IN THE PHANTOM—ZOOM IN

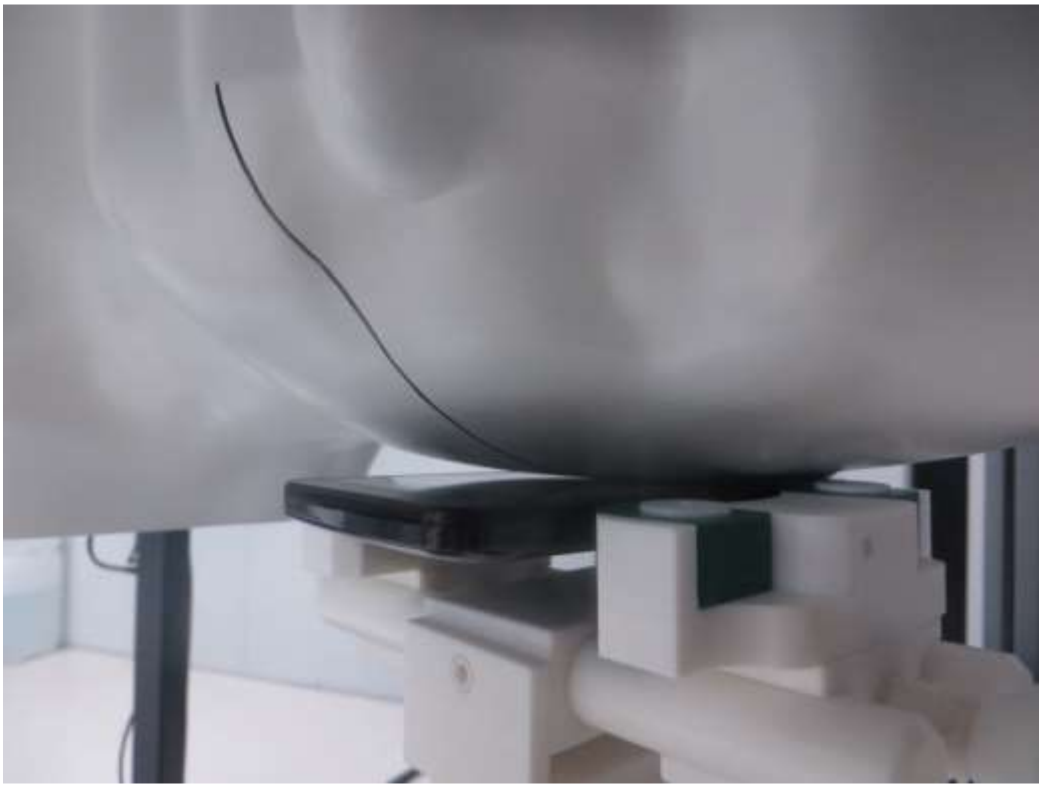
Note:The position used in the measurement were according to IEEE1528-2013



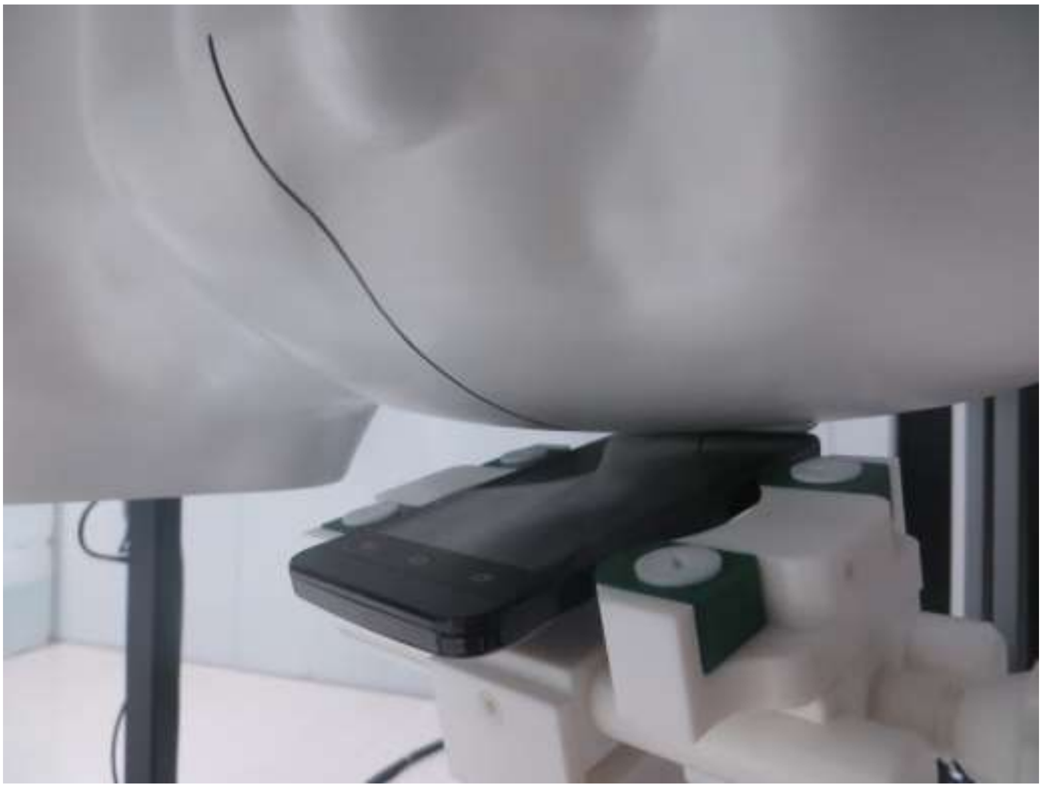


9. SETUP PHOTOGRAPHS

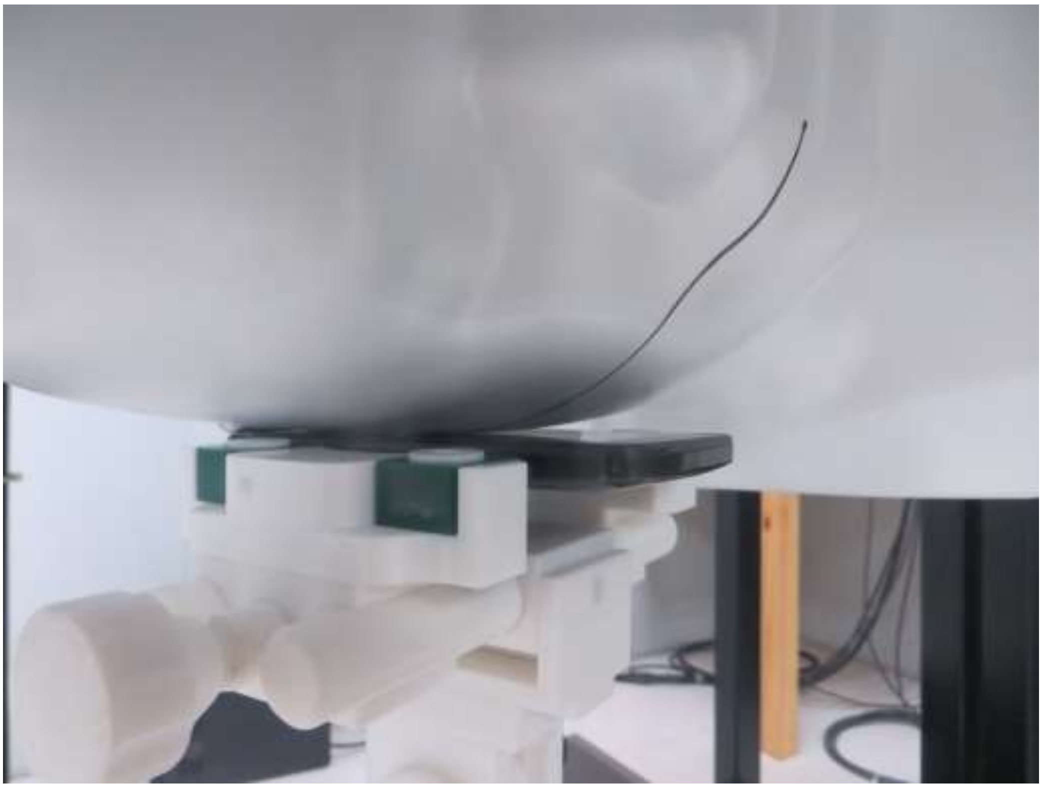
Head Setup Photo(Left cheek)



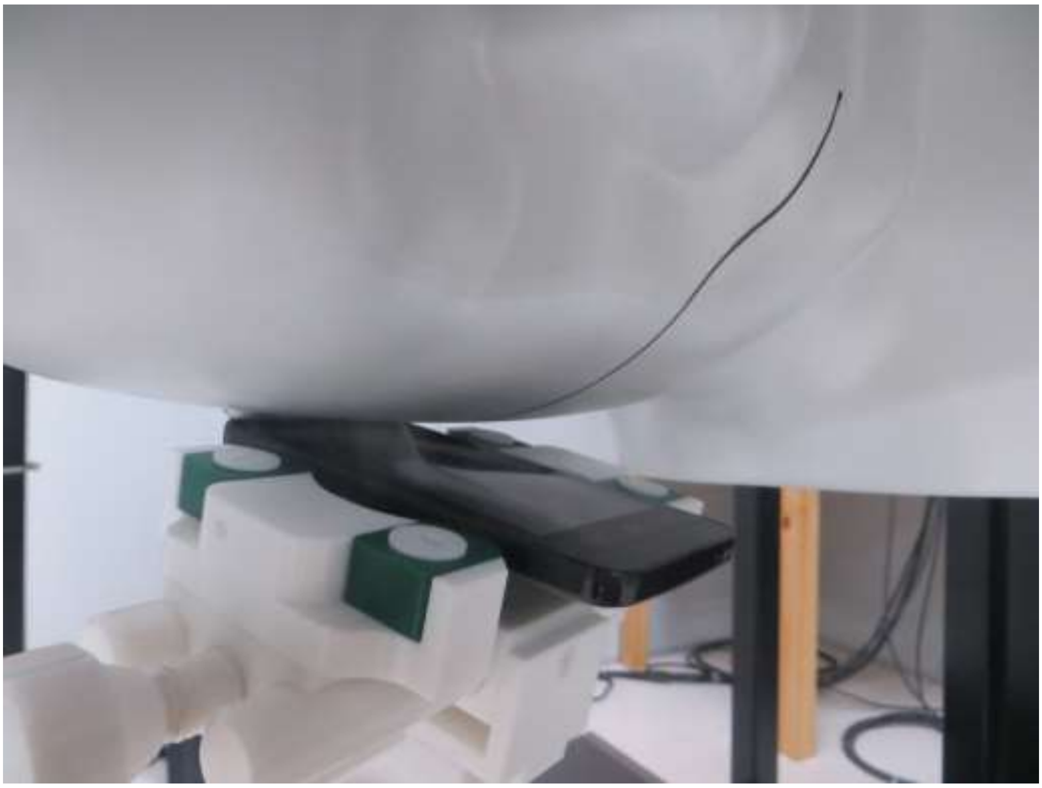
Head Setup Photo(Left Tilt)



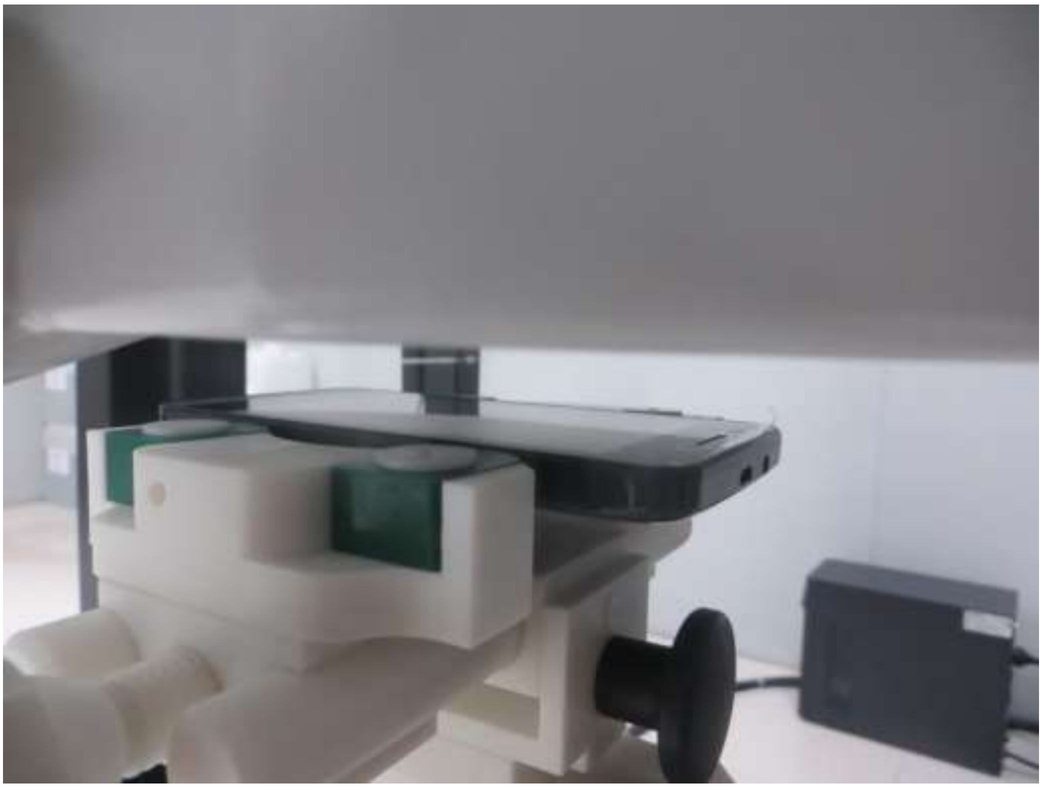
Head Setup Photo(Right Cheek)



Head Setup Photo(Right Tilt)



15mm body-worn Front Side Setup Photo

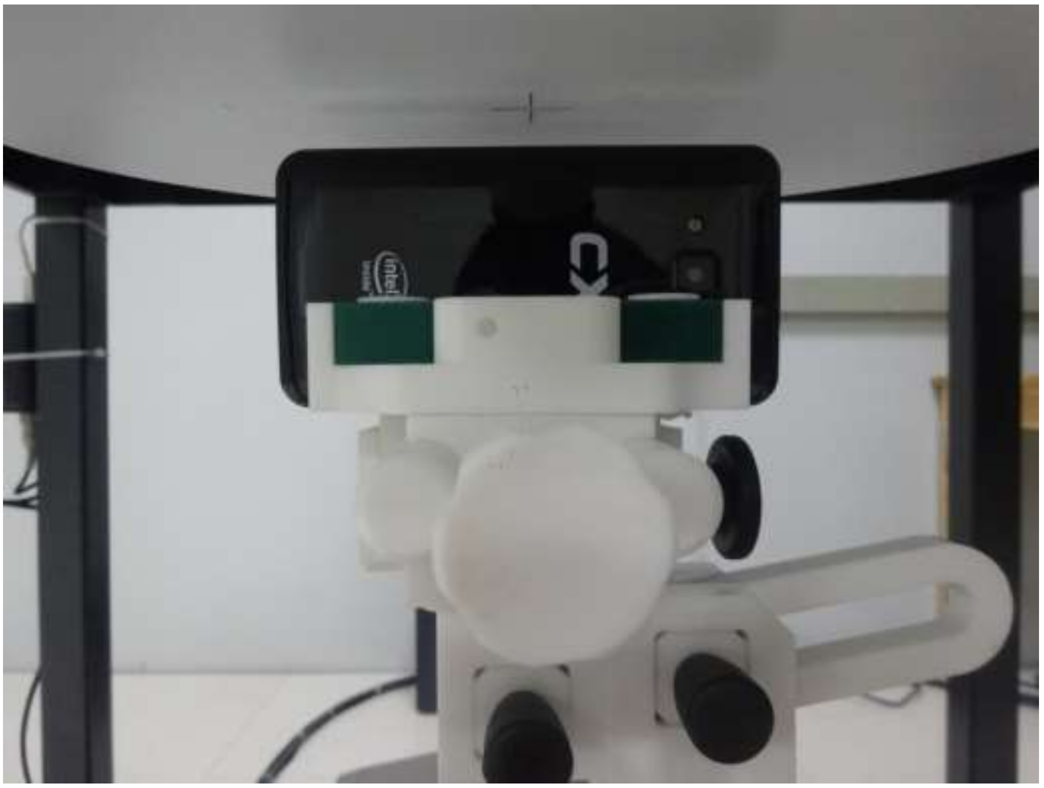


15mm body-worn Back Side Setup Photo

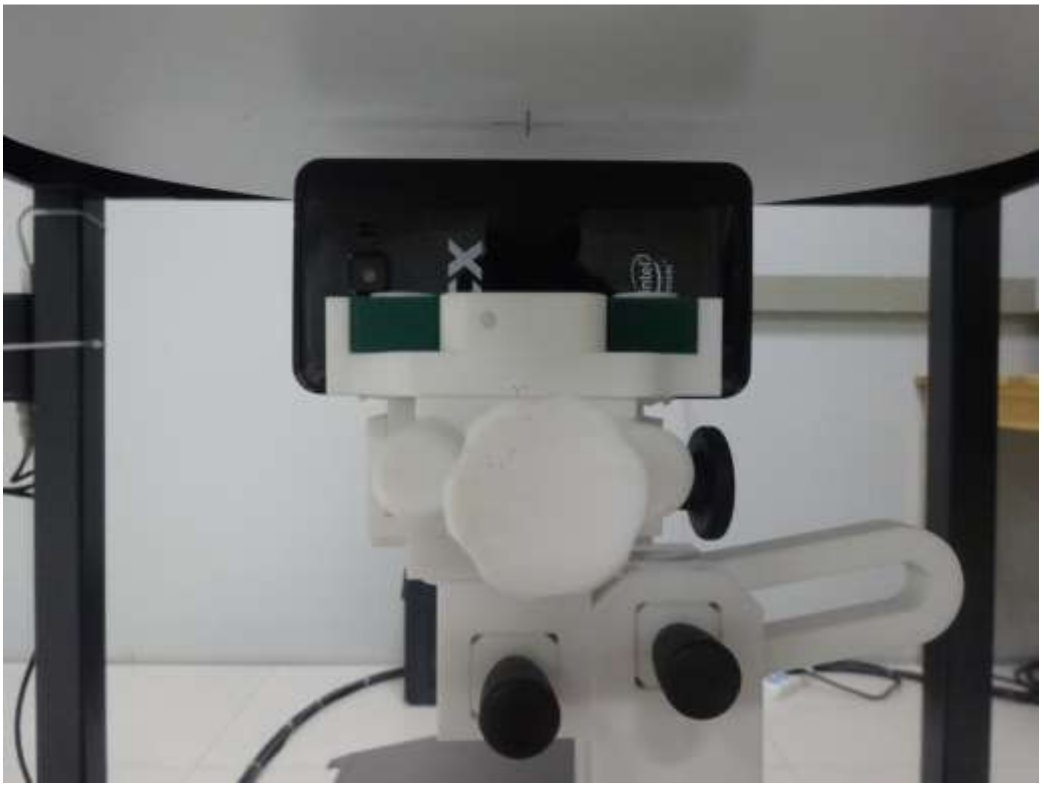
10mm body-worn Back Side Setup Photo(hotspot)

10mm body-worn Front Side Setup Photo(hotspot)

10mm body-worn Right Side Setup Photo(hotspot)



10mm body-worn Left Side Setup Photo(hotspot)



10mm body-worn Top Side Setup Photo(hotspot)

10.EUT PHOTOGRAPHS

....................The End of Test Report.....................