



**ANSI/IEEE Std. C95.1-1992**  
**In accordance with the requirements of**  
**FCC Report and Order: ET Docket 93-62, and OET Bulletin 65**  
**Supplement C**

## **FCC SAR TEST REPORT**

**For**  
**GSM Mobile Phone**  
**Model No.: TZ8300**  
**Trade Name: TZONTZEN**  
**FCC ID: ZKB-TZ8300**

*for*  
**COSMOCOM, SAC**  
**LUIS ARIAS SCHEREIBER, 215-LIMA-PERU**

*Issued by*  
**Compliance Certification Services (Kunshan) Inc.**  
**No.10, Weiye Rd., Innovation Park, Eco & Tec. Development Part,**  
**Kunshan City, Jiangsu Province, P.R.China.**  
**TEL: 86-512-57355888**  
**FAX: 86-512-57370818**  
**<http://www.ccsrf.com>**



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## TABLE OF CONTENTS

<b>1. CERTIFICATE OF COMPLIANCE (SAR EVALUATION)</b>	<b>3</b>
<b>2. EUT DESCRIPTION</b>	<b>4</b>
<b>3. REQUIREMENTS FOR COMPLIANCE TESTING DEFINED BY THE FCC</b>	<b>5</b>
<b>4. TEST METHODOLOGY</b>	<b>5</b>
<b>5. TEST CONFIGURATION</b>	<b>5</b>
<b>6. DOSIMETRIC ASSESSMENT SETUP</b>	<b>5</b>
6.1 MEASUREMENT SYSTEM DIAGRAM	7
6.2 SYSTEM COMPONENTS	8
<b>7. EVALUATION PROCEDURES</b>	<b>11</b>
<b>8. MEASUREMENT UNCERTAINTY</b>	<b>14</b>
<b>9. EXPOSURE LIMIT</b>	<b>15</b>
<b>10. EUT ARRANGEMENT</b>	<b>16</b>
10.1 ANTHROPOMORPHIC HEAD PHANTOM	16
10.2 DEFINITION OF THE "CHEEK/TOUCH" POSITION	17
10.3 DEFINITION OF THE "TILTED" POSITION	18
<b>11. MEASUREMENT RESULTS</b>	<b>19</b>
11.1 TEST LIQUIDS CONFIRMATION	19
LIQUID MEASUREMENT RESULTS	19
11.2 SYSTEM PERFORMANCE CHECK	20
11.3 EUT TUNE-UP PROCEDURES AND TEST MODE	23
11.4 CONDUCTED OUTPUT POWER	24
11.5 KDB 648474 SAR HANDSETS MULTI XMITER ASSESSMENT	25
11.6 EUT SETUP PHOTOS	27
11.7 SAR MEASUREMENT RESULTS	28
<b>12. EUT PHOTO</b>	<b>34</b>
<b>13. EQUIPMENT LIST &amp; CALIBRATION STATUS</b>	<b>38</b>
<b>14. FACILITIES</b>	<b>39</b>
<b>15. REFERENCES</b>	<b>39</b>
<b>16. ATTACHMENTS</b>	<b>40</b>



## 1. CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

**Product Name:** GSM Mobile Phone  
**Model Name.:** TZ8300  
**Applicant Discrepancy:** Initial  
**Trade Name:** TZONTZEN  
**Devices supporting GPRS:** Class B  
**Description Test Modes(worst case ):** N/A  
**Device Category:** PORTABLE DEVICES  
**Exposure Category:** GENERAL POPULATION/UNCONTROLLED EXPOSURE  
**Date of Test:** May 12, 2011  
**Applicant:** COSMOCOM, SAC  
LUIS ARIAS SCHEREIBER, 215-LIMA-PERU  
**Manufacturer:** COSMOCOM, SAC  
LUIS ARIAS SCHEREIBER, 215-LIMA-PERU  
**Application Type:** Certification

### APPLICABLE STANDARDS AND TEST PROCEDURES

STANDARDS AND TEST PROCEDURES	TEST RESULT
FCC OET 65 Supplement C	No non-compliance noted
Deviation from Applicable Standard	
None	

The device was tested by Compliance Certification Services Inc. in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C(Edition 01-01). The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Hadiif Hoo  
RF Manager  
Compliance Certification Services Inc.

Tested by:

Star  
Test Engineer  
Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

<b>Product Name:</b>	GSM Mobile Phone	
<b>Model Name:</b>	TZ8300	
<b>Series Model:</b>	N/A	
<b>Model Discrepancy:</b>	N/A	
<b>Brand Name:</b>	TZONTZEN	
<b>FCC ID:</b>	ZKB-TZ8300	
<b>GPRS Level:</b>	Class 12	
<b>Power reduction:</b>	N/A	
<b>DTM Description:</b>	N/A	
<b>Frequency Range:</b>	GSM / GPRS: 850: 824.2 ~ 848.8 MHz GSM / GPRS: 1900: 1850.2 ~ 1909.8 MHz 802.11b / g: 2412 ~ 2462 MHz Bluetooth: 2402 ~ 2480 MHz	
<b>Transmit Power(Average):</b>	GSM850 Band: GSM 850: 32.42 dBm GPRS 850: 32.39 dBm GSM1900 Band: GSM 1900: 30.26 dBm GPRS 1900: 30.23 dBm	WI-FI IEEE 802.11b:17.24dBm WI-FI IEEE 802.11g:13.16 dBm Bluetooth:-0.16 dBm
<b>Max. SAR:</b>	850 Band: Body: 0.868 W/kg Head: 0.462 W/kg 1900 Band: Body: 0.532 W/kg Head: 0.503 W/kg	WI-FI IEEE 802.11b: Body: 0.317 W/kg Head: 0.359 W/kg WI-FI IEEE 802.11g: Body: 0.324 W/kg Head: 0.355 W/kg
<b>Modulation Technique:</b>	GSM / GPRS : GMSK WI-FI 802.11b / 802.11g: WI-FI IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) WI-FI IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM) Bluetooth:FHSS	
<b>Accessories:</b>	Power Adapter Trade Name:BAR Mode Name:S4 Rating:100-240V 50/60 Hz 500mA Li-ion Battery Chargeable Voltage:3.7V 1500mAh	
<b>Antenna Specification:</b>	GSM PIFA antenna:1dBi    Wifi PIFA antenna :1 dBi Bluetooth PIFA antenna :1 dBi	
<b>Operating Mode:</b>	Maximum continuous output	



### 3. REQUIREMENTS FOR COMPLIANCE TESTING DEFINED BY THE FCC

The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

### 4. TEST METHODOLOGY

The Specific Absorption Rate (SAR) testing specification, method and procedure for this Mobile Phone is in accordance with the following standards:

- ☐ 47 CFR Part 2 ( 2.1093)
- ☐ IEEE C95.1-1999
- ☐ KDB 941225 D01 SAR test for 3G devices
- ☐ KDB 248227 D01 SAR measurement procedures for 802.11 a/b/g transmitters
- ☐ KDB 648474 D01 SAR evaluation considerations for handsets with multiple transmitters and antennas
- ☐ OET Bulletin 65 Supplement C (Edition 01-01)
- ☐ Preliminary Guidance for Reviewing Applications for Certification of 3G Device. May 2006.

### 5. TEST CONFIGURATION

The device was controlled by using a base station emulator R&S CMU200. Communication between the device and the emulator was established by air link. The distance between the DUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of DUT. The DUT was set from the emulator to radiate maximum output power during all tests.

Measurements were performed on the lowest, middle, and highest channel for each testing position.

For SAR testing, EUT is in GSM/GPRS link mode. In GSM link mode, its crest factor is 8, In GPRS link mode, its crest factor is 2, because EUT is set in GPRS multi-slot class 12 with 4 uplink slots.

### 6. DOSIMETRIC ASSESSMENT SETUP

These measurements were performed with the automated near-field scanning system OPENSAR from ATENNESSA. The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than  $\pm 0.02$  mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetric probe EP100 1109 (manufactured by SATIMO), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [7] with accuracy of better than  $\pm 10\%$ . The spherical isotropy was evaluated with the procedure described in [8] and found to be better than  $\pm 0.25$  dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEE P1528 and CENELEC EN 62209.

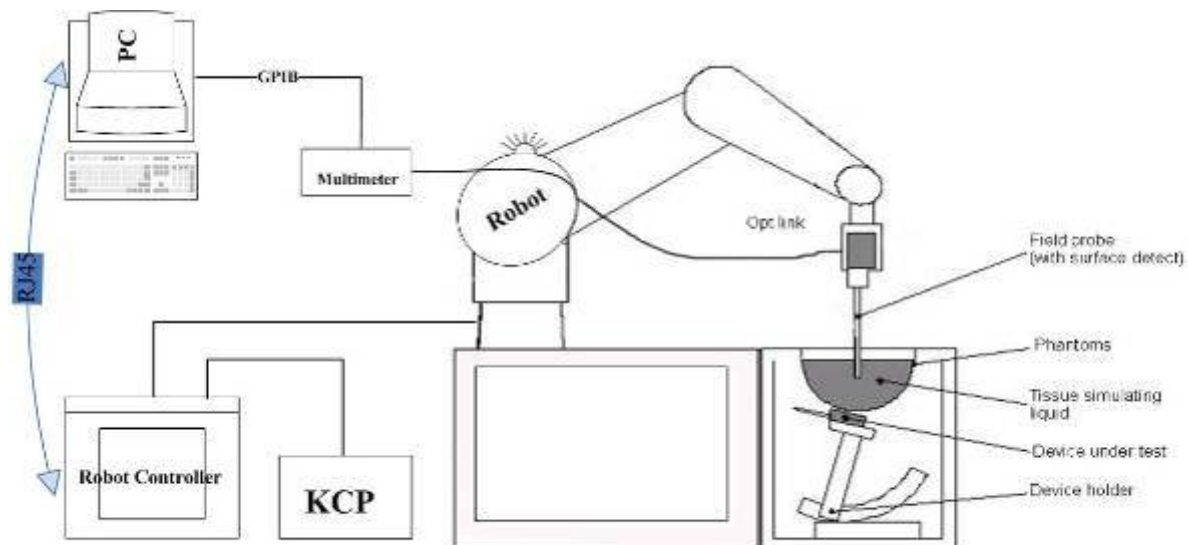


The Tissue simulation liquid used for each test is in according with the FCC OET65 supplement C as listed below.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78



## 6.1 MEASUREMENT SYSTEM DIAGRAM



### The DASY5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.





## 6.2 SYSTEM COMPONENTS



The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV celeron, 128MB chip-disk and 128 MB RAM. The necessary circuits for communication with either the DAE4(or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY5 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.



The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server. Calibration: No calibration required.

### Data Acquisition Electronics (DAE)



The data acquisition electronics (DAE4) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE4 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

### EX3DV4 Isotropic E-Field Probe for Dosimetric Measurements



**Construction:** Symmetrical design with triangular core

Built-in shielding against static charges

PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

**Calibration:** Basic Broad Band Calibration in air: 10-3000 MHz.

Conversion Factors (CF) for HSL 900 and HSL 1800  
CF-Calibration for other liquids and frequencies upon request.

**Frequency:** 10 MHz to > 6 GHz; Linearity:  $\pm 0.2$  dB (30 MHz to 3 GHz)

**Directivity:**  $\pm 0.3$  dB in HSL (rotation around probe axis)  
 $\pm 0.5$  dB in HSL (rotation normal to probe axis)

**Dynamic Range:** 10  $\mu$ W/g to > 100 mW/g; Linearity:  $\pm 0.2$  dB  
(noise: typically < 1  $\mu$ W/g)





**Dimensions:** Overall length: 337 mm (Tip: 9 mm)  
Tip diameter: 2.5 mm (Body: 10 mm)  
Distance from probe tip to dipole centers: 1 mm

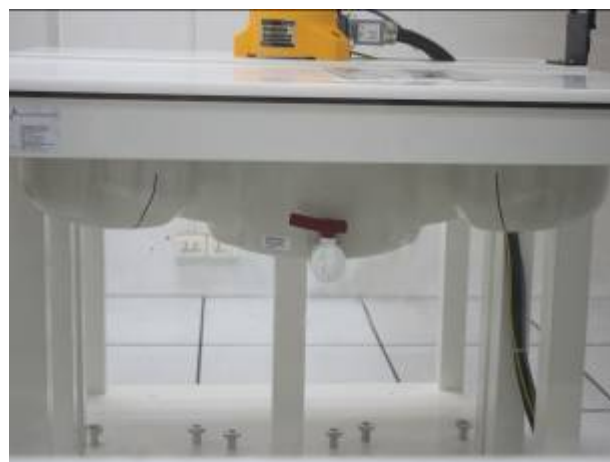
**Application:** High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



Interior of probe

## SAM Twin Phantom(V4.0)

**Construction:** The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209. It 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 evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.



**Shell Thickness:**  $2 \pm 0.2$  mm

**Filling Volume:** Approx. 25 liters

**Dimensions:** Height: 850mm; Length: 1000mm;  
Width: 750mm

## SAM Phantom (ELI4)

### Description Construction:

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4/DASY5.5 and higher and is compatible with all SPEAG dosimetric probes and dipoles



**Shell Thickness:**  $2.0 \pm 0.2$  mm (sagging:  
<1%)



**Filling Volume:** Approx. 25 liters  
**Dimensions:** Major ellipse axis: 600 mm  
**Minor axis:** 400 mm 500mm

## Device Holder for SAM Twin Phantom

**Construction:** In combination with the Twin SAM Phantom, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).



## System Validation Kits for SAM Twin Phantom

**Construction:** Symmetrical dipole with 1/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

**Frequency:** 900,1800,2450,5800 MHz

**Return loss:** > 20 dB at specified validation position

**Power capability:** > 100 W ( $f < 1\text{GHz}$ ); > 40 W ( $f > 1\text{GHz}$ )

**Dimensions:** D835V2: dipole length: 161 mm; overall height: 340 mm  
D1800V2: dipole length: 72.5 mm; overall height: 300 mm  
D1900V2: dipole length: 67.7 mm; overall height: 300 mm  
D2450V2: dipole length: 51.5 mm; overall height: 290 mm  
D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm



## System Validation Kits for ELI4 phantom

**Construction:** Symmetrical dipole with 1/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

**Frequency:** 900, 1800, 2450, 5800 MHz

**Return loss:** > 20 dB at specified validation position

**Power capability:** > 100 W ( $f < 1\text{GHz}$ ); > 40 W ( $f > 1\text{GHz}$ )

**Dimensions:** D835V2: dipole length: 161 mm; overall height: 340 mm  
D1800V2: dipole length: 72.5 mm; overall height: 300 mm  
D1900V2: dipole length: 67.7 mm; overall height: 300 mm  
D2450V2: dipole length: 51.5 mm; overall height: 290 mm  
D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm





## 7. EVALUATION PROCEDURES

### DATA EVALUATION

The OPENSAR4 post processing 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	$Norm_i, a_{i0}, a_{i1}, a_{i2}$
	- Conversion factor	$ConvF_i$
	- Diode compression point	$dcp_i$
Device parameters:	- Frequency	$f$
	- Crest factor	$cf$
Media parameters:	- Conductivity	$\sigma$
	- Density	$\rho$

These parameters must be set correctly in the software. They can be found in the component documents or be imported into the software from the configuration files issued for the OPENSAR components. In the direct measuring mode of the multi-meter 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	$V_i$	= Compensated signal of channel i (i = x, y, z)
	$U_i$	= Input signal of channel i (i = x, y, z)
	$cf$	= Crest factor of exciting field (OPENSAR parameter)
	$dcp_i$	= Diode compression point (OPENSAR parameter)

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

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes:

$$H_i = \sqrt{V_i} \cdot \frac{a_{i10} + a_{i11}f + a_{i12}f^2}{f}$$

with	$V_i$	= Compensated signal of channel i (i = x, y, z)
	$Norm_i$	= Sensor sensitivity of channel i (i = x, y, z) $\mu V/(V/m)^2$ for E0field Probes
	$ConvF$	= Sensitivity enhancement in solution
	$a_{ij}$	= Sensor sensitivity factors for H-field probes
	$f$	= Carrier frequency (GHz)
	$E_i$	= Electric field strength of channel i in V/m
	$H_i$	= 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.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with  $SAR$  = local specific absorption rate in mW/g

$E_{tot}$  = total field strength in V/m

$\sigma$  = conductivity in [mho/m] or [Siemens/m]

$\rho$  = equivalent tissue density in g/cm<sup>3</sup>

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.

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

$$P_{pwe} = \frac{E_{tot}^2}{3770} \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with  $P_{pwe}$  = Equivalent power density of a plane wave in mW/cm<sup>2</sup>

$E_{tot}$  = total electric field strength in V/m

$H_{tot}$  = total magnetic field strength in A/m

## **SAR EVALUATION PROCEDURES**

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. The sophisticated 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 7 x 7 x 9 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 than 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.



## SPATIAL PEAK SAR EVALUATION

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard. It can be conducted for 1 g and 10 g.

The OPENSAR4 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maximum searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

### Extrapolation

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.

Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 5x5x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1 g and 10 g cubes.

### Boundary effect

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosimetric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$S \approx S_o + S_b \exp\left(-\frac{z}{a}\right) \cos\left(\pi \frac{z}{\lambda}\right)$$

Since the decay of the boundary effect dominates for small probes ( $a \ll \lambda$ ), the cos-term can be omitted. Factors  $S_b$  (parameter Alpha in the OPENSAR software) and  $a$  (parameter Delta in the OPENSAR software) are assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- the boundary curvature is small
- the probe axis is angled less than 30° to the boundary normal
- the distance between probe and boundary is larger than 25% of the probe diameter
- the probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a OPENSAR system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during post processing.





## 8. MEASUREMENT UNCERTAINTY

UNCERTAINTY BUDGE ACCORDING TO IEEE P1528						
Error Description	Uncertainty Value $\pm\%$	Probability distribution	Divisor	C <sub>1</sub> 1g	Standard unc.(1g/10g) $\pm\%$	V <sub>1</sub> or V <sub>eff</sub>
<b>Measurement System</b>						
Probe calibration	$\pm 5.9$	normal	1	1	$\pm 5.9$	$\infty$
Axial isotropy of probe	$\pm 4.7$	rectangular	$\sqrt{3}$	$(1-C_p)^{1/2}$	$\pm 1.9$	$\infty$
Sph. Isotropy of probe	$\pm 9.6$	rectangular	$\sqrt{3}$	$(C_p)^{1/2}$	$\pm 3.9$	$\infty$
Probe linearity	$\pm 4.7$	rectangular	$\sqrt{3}$	1	$\pm 2.7$	$\infty$
Detection Limit	$\pm 1.0$	rectangular	$\sqrt{3}$	1	$\pm 0.6$	$\infty$
Boundary effects	$\pm 1.0$	rectangular	$\sqrt{3}$	1	$\pm 0.6$	$\infty$
Readoutelectronics	$\pm 0.3$	normal	1	1	$\pm 0.3$	$\infty$
Response time	$\pm 0.8$	rectangular	$\sqrt{3}$	1	$\pm 0.5$	$\infty$
Integration time	$\pm 2.6$	rectangular	$\sqrt{3}$	1	$\pm 1.5$	$\infty$
Probe positioning	$\pm 0.4$	rectangular	$\sqrt{3}$	1	$\pm 0.2$	$\infty$
Extrap. And integration	$\pm 4.0$	rectangular	$\sqrt{3}$	1	$\pm 2.3$	$\infty$
RF ambient conditiona	$\pm 3.0$	rectangular	$\sqrt{3}$	1	$\pm 1.7$	$\infty$
RF ambient conditiona	$\pm 3.0$	rectangular	$\sqrt{3}$	1	$\pm 1.7$	$\infty$
<b>Test Sample Related</b>						
Device positioning	$\pm 2.9$	normal	1	1	$\pm 2.9$	145
Device holder uncertainty	$\pm 3.6$	normal	1	1	$\pm 3.6$	5
Power drift	$\pm 5.0$	rectangular	$\sqrt{3}$	1	$\pm 2.9$	$\infty$
<b>Phantom and Set up</b>						
Phantom uncertainty	$\pm 4.0$	rectangular	$\sqrt{3}$	1	$\pm 2.3$	$\infty$
Liquid conductivity	$\pm 5.0$	rectangular	$\sqrt{3}$	0.6	$\pm 1.8/1.2$	$\infty$
Liquid conductivity	$\pm 1.5$	rectangular	$\sqrt{3}$	0.6	$\pm 0.6$	$\infty$
Liquid permittivity	$\pm 5.0$	rectangular	$\sqrt{3}$	0.6	$\pm 1.7/1.4$	$\infty$
Liquid permittivity	$\pm 1.0$	rectangular	$\sqrt{3}$	0.6	$\pm 0.4$	$\infty$
<b>Combined Standard Uncertainty</b>					$\pm 10.375/\pm 10.1$ 12	
<b>Coverage Factor for 95%</b>		kp=2				
<b>Expanded Standard Uncertainty</b>					$\pm 20.75/\pm 19.23$	



## 9. EXPOSURE LIMIT

(A). Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	<u>Partial-Body</u>	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

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

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

**Note:** *Whole-Body SAR* is averaged over the entire body, *partial-body SAR* is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. **SAR for hands, wrists, feet and ankles** is averaged over any 1 grams of tissue defined as a tissue volume in the shape of a cube.

**Population/Uncontrolled Environments** are defined as locations where there is the exposure of individuals 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).

**NOTE**  
**GENERAL POPULATION/UNCONTROLLED EXPOSURE**  
**PARTIAL BODY LIMIT**  
**1.6 W/kg**





## 10. EUT ARRANGEMENT

Please refer to IEEE P1528 illustration below.

### 10.1 ANTHROPOMORPHIC HEAD PHANTOM

Figure 7-1a shows the front, back and side views of SAM. The point “M” is the reference point for the center of mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERPs are 15 mm posterior to the entrance to ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 7-1b. The plane passing through the two ear reference points and M is defined as the Reference Plane. The line N-F (Neck-Front) perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 7-1c). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines should be marked on the external phantom shell to facilitate handset positioning. Posterior to the N-F line, the thickness of the phantom shell with the shape of an ear is a flat surface 6 mm thick at the ERPs. Anterior to the N-F line, the ear is truncated as illustrated in Figure 7-1b. The ear truncation is introduced to avoid the handset from touching the ear lobe, which can cause unstable handset positioning at the cheek.

Figure 7-1a  
Front, back and side view of SAM (model for the phantom shell)



Figure 7-1b  
Close up side view of phantom showing the ear region

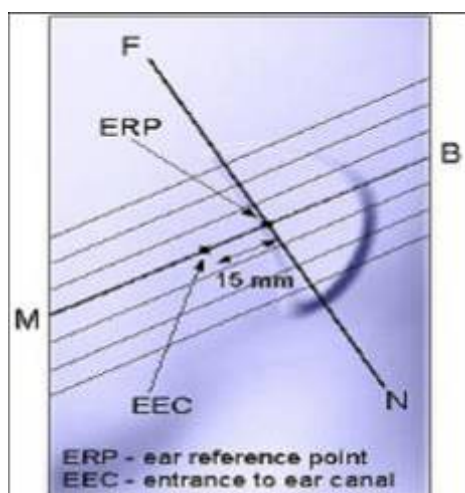


Figure 7-1b  
Close up side view of phantom showing the ear region

Figure 7-1c  
Side view of the phantom showing relevant markings and the 7 cross sectional plane locations

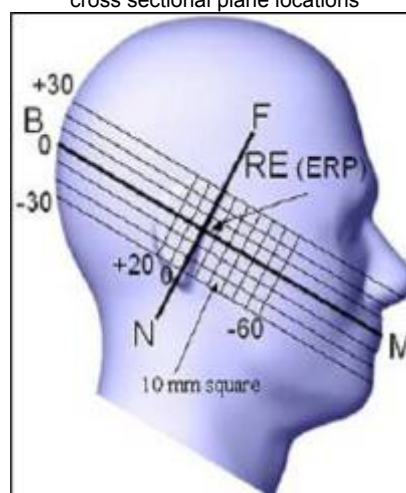


Figure 7-1c  
Side view of the phantom showing relevant markings and the 7 cross sectional plane locations



## 10.2 DEFINITION OF THE “CHEEK/TOUCH” POSITION

The “cheek” or “touch” position is defined as follows:

- Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover. (If the handset can also be used with the cover closed both configurations must be tested.)
- Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width  $w_t$  of the handset at the level of the acoustic output (point A on Figures 7-2a and 7-2b), and the midpoint of the width  $w_b$  of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 7-2a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 7-2b), especially for clamshell handsets, handsets with flip pieces, and other irregularly-shaped handsets.
- Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 7-2c), such that the plane defined by the vertical center line and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
- Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the pinna.
- e) While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).
- f. Rotate the handset around the vertical centerline until the handset (horizontal line) is symmetrical with respect to the line NF.
- g. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the handset contact with the pinna, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the pinna (cheek). See Figure 7-2c. The physical angles of rotation should be noted.

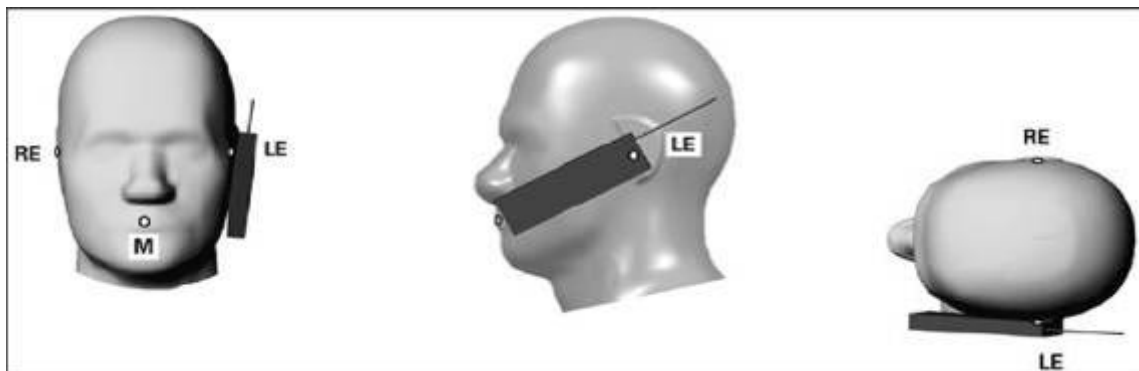


Figure 7.2c

Phone “cheek” or “touch” position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for handset positioning, are indicated.

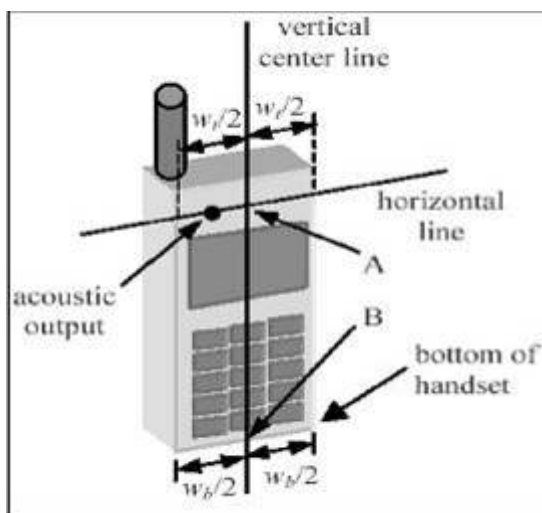


Figure 7.2a

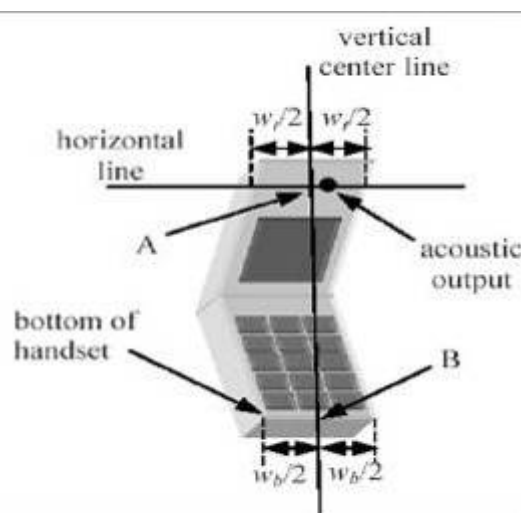


Figure 7.2b

## 10.3 DEFINITION OF THE “TILTED” POSITION

The “tilted” position is defined as follows:

- Repeat steps (a) – (g) of 7.2 to place the device in the “cheek position.”
- While maintaining the orientation of the handset move the handset away from the pinna along the line passing through RE and LE in order to enable a rotation of the handset by 15 degrees.
- Rotate the handset around the horizontal line by 15 degrees.
- While maintaining the orientation of the handset, move the handset towards the phantom on a line passing through RE and LE until any part of the handset touches the ear. The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna (e.g., the antenna with the back of the phantom head), the angle of the handset should be reduced. In this case, the tilted position is obtained if any part of the handset is in contact with the pinna as well as a second part of the handset is contact with the phantom (e.g., the antenna with the back of the head).

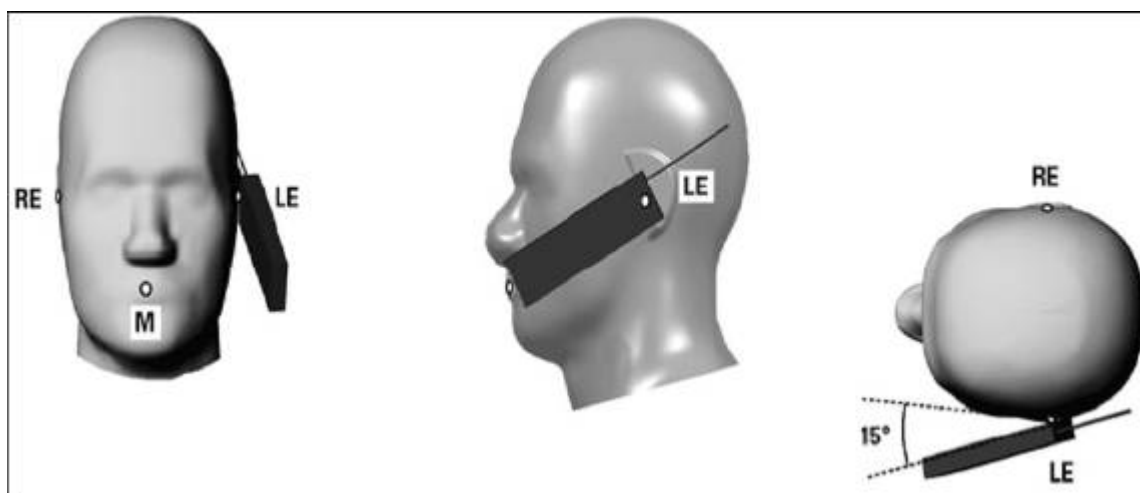


Figure 7-3

Phone “tilted” position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for handset positioning, are indicated.



## 11. MEASUREMENT RESULTS

### 11.1 TEST LIQUIDS CONFIRMATION

#### SIMULATED TISSUE LIQUID PARAMETER CONFIRMATION

The dielectric parameters were checked prior to assessment using the HP85070C dielectric probe kit. The dielectric parameters measured are reported in each correspondent section.

#### IEEE SCC-34/SC-2 P1528 RECOMMENDED TISSUE DIELECTRIC PARAMETERS

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

Target Frequency (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	45.3	5.27	48.2	6.00

( $\epsilon_r$  = relative permittivity,  $\sigma$  = conductivity and  $\rho$  = 1000 kg/m<sup>3</sup>)

### LIQUID MEASUREMENT RESULTS

Ambient condition: Temperature: 21 °C Relative humidity: 58%

Liquid Type	Frequency	Temp. [°C]	Depth [cm]	Parameters	Target	Measured	Deviation[%]	Limited[%]	Measured Date
Head850	835 MHz	20	15	Permittivity	41.50	41.44	-0.14	± 5	May 12,1011
		20	15	Conductivity	0.90	0.94	4.44	± 5	May 12,1011
Body850	835 MHz	20	15	Permittivity	55.20	54.51	-1.25	± 5	May 12,1011
		20	15	Conductivity	0.97	1.00	3.09	± 5	May 12,1011
Head1900	1950 MHz	20	15	Permittivity	40.00	40.1	0.25	± 5	May 12,1011
		20	15	Conductivity	1.40	1.38	-1.43	± 5	May 12,1011
Body1900	1950 MHz	20	15	Permittivity	53.30	53.27	-0.06	± 5	May 12,1011
		20	15	Conductivity	1.52	1.55	1.97	± 5	May 12,1011
Head2450	2450 MHz	20	15	Permittivity	39.20	38.00	-3.06	± 5	May 12,1011
		20	15	Conductivity	1.80	1.73	-3.89	± 5	May 12,1011
Body2450	2450 MHz	20	15	Permittivity	52.70	52.71	0.02	± 5	May 12,1011
		20	15	Conductivity	1.95	1.98	1.54	± 5	May 12,1011



## 11.2 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of  $\pm 10\%$ . The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

### SYSTEM PERFORMANCE CHECK MEASUREMENT CONDITIONS

- The measurements were performed in the flat section of the SAM twin phantom filled with head and body simulating liquid of the following parameters.
- The OPENSAR system withan E-fileld probe EX3DV4 SN: 3755 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15 mm (below 1 GHz) and 10 mm (above 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 10mm was aligned with the dipole.
- Special 7x7x7 fine cube was chosen for cube integration ( $dx= 5\text{ mm}$ ,  $dy= 5\text{ mm}$ ,  $dz= 5\text{ mm}$ ).
- Distance between probe sensors and phantom surface was set to 2.5 mm.
- The dipole input power was  $1W \pm 3\%$ .
- The results are normalized to 1 W input power.

**The depth of Liquid must above 15cm**







## Reference SAR values

The reference SAR values were using measurement results indicated in the dipole calibration document (see table below)

Frequency (MHz)	1g SAR	10g SAR	Local SAR at Surface (Above Feed Point)	Local SAR at Surface (y = 2cm offset from feed point)
835 Head	2.38	1.55	14.1	4.9
835 Body	2.53	1.66		
1950 Head	10.30	5.33	67.6	6.6
1950 Body	10.10	5.31		
2450 Head	13.60	6.33	104.2	7.7
2450 Body	13.30	6.15		

## SYSTEM PERFORMANCE CHECK RESULTS

### Ambient conduction

Temperature: 21 °C Relative humidity: 58%

System Validation Dipole: D835V2-SN:4d114

Date: May 12, 2011

Head Simulatinf Liquid			Parameters	Target	Measured	Deviation[%]	Limited[%]
Frequency	Temp. [°C]	Depth [cm]					
835 MHz	20.30	15.00	1g SAR	2.38	9.54	300.84	±10
			10g SAR	1.55	6.38	311.61	±10

Temperature: 21 °C Relative humidity: 58%

System Validation Dipole: D835V2-SN:4d114

Date: May 12, 2011

Body Simulatinf Liquid			Parameters	Target	Measured	Deviation[%]	Limited[%]
Frequency	Temp. [°C]	Depth [cm]					
835 MHz	20.30	15.00	1g SAR	2.53	9.54	277.08	±10
			10g SAR	1.66	6.38	284.34	±10

Temperature: 21 °C Relative humidity: 58%

System Validation Dipole: D1900V2-SN:5d136

Date: May 12, 2011

Head Simulatinf Liquid			Parameters	Target	Measured	Deviation[%]	Limited[%]
Frequency	Temp. [°C]	Depth [cm]					
1950 MHz	20.30	15.00	1g SAR	10.30	39.37	282.23	±10
			10g SAR	5.33	21.12	296.25	±10



Temperature: 21 °C Relative humidity: 58%

**System Validation Dipole:** D1900V2-SN:5d136 **Date:** May 12, 2011

Body Simulatinf Liquid			Parameters	Target	Measured	Deviation[%]	Limited[%]
Frequency	Temp. [°C]	Depth [cm]					
1950 MHz	20.30	15.00	1g SAR	10.10	39.37	289.80	±10
			10g SAR	5.31	21.12	297.74	±10

Temperature: 21 °C Relative humidity: 58%

**Dipole:** D2450V2-SN:817 **Date:** May 12, 2011

Head Simulatinf Liquid			Parameters	Target	Measured	Deviation[%]	Limited[%]
Frequency	Temp. [°C]	Depth [cm]					
2450 MHz	20.30	15.00	1g SAR	13.60	51.75	280.51	±10
			10g SAR	6.33	23.74	275.04	±10

Temperature: 21 °C Relative humidity: 58%

**Dipole:** D2450V2-SN:817 **Date:** May 12, 2011

Body Simulatinf Liquid			Parameters	Target	Measured	Deviation[%]	Limited[%]
Frequency	Temp. [°C]	Depth [cm]					
2450 MHz	20.30	15.00	1g SAR	13.30	51.75	289.10	±10
			10g SAR	6.15	23.74	286.02	±10





## **11.3 EUT TUNE-UP PROCEDURES AND TEST MODE**

The following procedure had been used to prepare the EUT for the SAR test.

a. To setup the desire channel frequency and the maximum output power. A Radio Communication Tester "CMU200 " was used to program the EUT.

### **GSM 850 / GPRS850:**

Network Support: GSM only / GPRS

Main Service: Circuit Switched / Packet data

Power Setting: 33dBm / 33dBm

### **GSM 1900 / GPRS 1900:**

Network Support: GSM only / GPRS

Main Service: Circuit Switched / Packet data

Power Setting: 30dBm / 30dBm

b. Maximum conducted power was measured by replacing the antenna with an adapter for conductive measurement.

### **Bluetooth & WIFI (IEEE802.11b/g)**

a. The client supplied a special driver to program the EUT, allowing it to continually transmit the specified maximum power and change the channel frequency.

c. The conducted power was measured at the high, middle and low channel frequency before and after the SAR measurement.

d. During SAR test, the highest output channel per band measured first, and then if necessary, the other channels were measured according to the normal procedures.



## 11.4 CONDUCTED OUTPUT POWER

### Conducted output power (Average):

Band Channel Mode	GSM850 ( dBm )			GSM1900 ( dBm )		
	Ch 128	Ch 190	Ch 251	Ch 512	Ch 661	Ch 810
GSM	32.42	31.74	31.65	30.26	29.70	29.57
GPRS 12 (4 uplink)	32.39	31.72	31.62	30.23	29.64	29.55

### 802.11b/g output power (Average)(dBm)

Mode Frequency	802.11b 1M	802.11g 6M
1(2412 MHz)	17.24	13.16
6(2437 MHz)	17.10	13.02
11(2462 MHz)	16.57	12.81

Ps.

(1)802.11b

17.24dBm(=52.97mW)  $\geq 2 \cdot P_{Ref}$

Antenna(Wifi) is  $\geq 5.0$  cm from other antennas(GSM), so **802.11b stand-alone SAR is required.**

Antenna(Wifi) is  $\leq 5.0$  cm from other antennas(BT), so **802.11b stand-alone SAR is required.**

(2) 802.11g

13.16 dBm(=20.70mW)  $\leq 2 \cdot P_{Ref}$

Antenna(Wifi) is  $\geq 5.0$  cm from other antennas(GSM), so **802.11g stand-alone SAR is not required.**

Antenna(Wifi) is  $\leq 5.0$  cm from other antennas(BT), so **802.11g stand-alone SAR is required.**

### Bluetooth output power (Average)(dBm)

Mode Frequency	DATA1 1M	DATA3 3M
2402 MHz	-0.59	-3.18
2441 MHz	-0.16	-2.54
2480 MHz	-0.91	-3.57

Ps.

-0.16 dBm(=0.96mW)  $\leq 2 \cdot P_{Ref}$

(1)Antenna(BT) is  $\geq 5.0$  cm from other antennas(GSM), so **BT stand-alone SAR is not required.**

(2)Antenna(BT) is  $\leq 5.0$  cm from other antennas(Wifi), but output (0.96mW)  $\leq P_{Ref}$  and antenna is  $\geq 2.5$  cm from other antennas(Wifi), so **BT stand-alone SAR is not required.**



## 11.5 KDB 648474 SAR HANDSETS MULTI XMITER ASSESSMENT

	<i>GSM 850 head</i>	<i>GSM 850 body</i>	<i>GPRS 850 body</i>
<i>GSM 850 SAR(worst)</i>	0.462	0.661	0.868
<i>802.11b SAR(worst)</i>	0.359	0.317	0.317
<i>Σ1g-SAR</i>	0.821	0.978	1.185
<i>remark</i>	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)

	<i>GSM 850 head</i>	<i>GSM 850 body</i>	<i>GPRS 850 body</i>
<i>GSM 850 SAR(worst)</i>	0.462	0.661	0.868
<i>802.11g SAR(worst)</i>	0.355	0.324	0.324
<i>Σ1g-SAR</i>	0.817	0.985	1.192
<i>remark</i>	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)

	<i>GSM 1900 head</i>	<i>GSM 1900 body</i>	<i>GPRS 1900 body</i>
<i>GSM 1900 SAR(worst)</i>	0.503	0.425	0.532
<i>802.11b SAR(worst)</i>	0.359	0.317	0.317
<i>Σ1g-SAR</i>	0.862	0.742	0.849
<i>remark</i>	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)

	<i>GSM 1900 head</i>	<i>GSM 1900 body</i>	<i>GPRS 1900 body</i>
<i>GSM 1900 SAR(worst)</i>	0.503	0.425	0.532
<i>802.11g SAR(worst)</i>	0.355	0.324	0.324
<i>Σ1g-SAR</i>	0.858	0.749	0.856
<i>remark</i>	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)

	<i>head</i>	<i>body</i>
<i>Bluetooth SAR(worst)</i>	0.000	0.00
<i>802.11b SAR(worst)</i>	0.359	0.317
<i>Σ1g-SAR</i>	0.359	0.317
<i>remark</i>	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)

### KDB 648474 simultaneous SAR evaluation:

#### Antenna Location:

<i>antenna1</i>	<i>antenna2</i>	<i>antenna3</i>	<i>GSM to WIFI antenna distance(cm)</i>	<i>GSM to Bluetooth antenna distance(cm)</i>	<i>Bluetooth to WIFI antenna distance(cm)</i>	<i>remark</i>
<i>GSM</i>	<i>Bluetooth</i>	<i>WIFI</i>	7.3cm	9.3cm	0.4cm	Please refer to page 26

<i>Device mode, f</i>	<i>P, dBm</i>	<i>P, mW</i>	<i>stand-alone SAR(W/kg)</i>
GSM 850/1900	Please refer to page 24		<b>Yes</b> , Please refer to page 28-32
WIFI, 802.11b	17.24	52.97	<b>Yes</b> , Please refer to page 32
WIFI, 802.11g	13.16	20.70	<b>Yes</b> , Please refer to page 33
Bluetooth, 2441	-0.16	0.96	<b>No</b> , Please refer to page 24



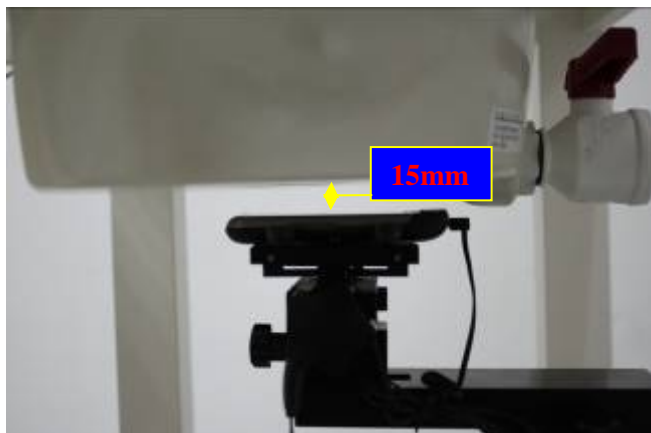
(x,y)	$d_{xy}$ , cm	simultaneous Tx SAR	remarks
GSM to WIFI antenna distance(cm)	7.3 cm	No	$d_{xy} > 5$ cm Please refer to page 26
WIFI to Bluetooth antenna distance(cm)	0.4 cm	No	$d_{xy} < 2.5$ cm are $\leq$ PRef or $< 1.2$ W/kg Please refer to page 32-33
GSM to WIFI antenna distance(cm)	9.3 cm	No	$d_{xy} > 5$ cm Please refer to page 26





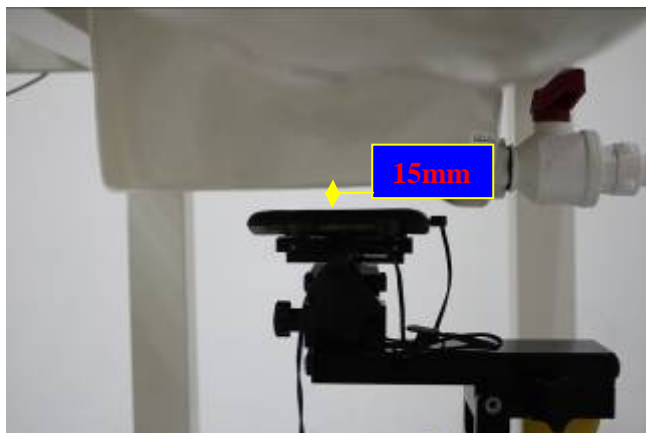
## 11.6 EUT SETUP PHOTOS

The frontside of the EUT in body position



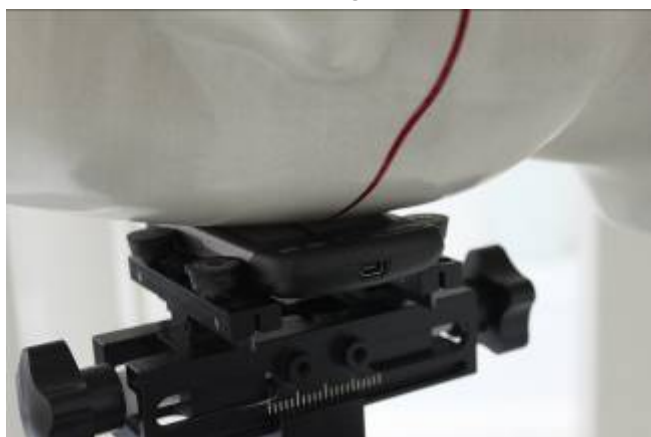
EUT Setup Configuration 1

The backside of the EUT in body position



EUT Setup Configuration 2

Cheek device with right head phantom



EUT Setup Configuration 3

Tilt device with right head phantom



EUT Setup Configuration 4

Cheek device with left head phantom



EUT Setup Configuration 5

Tilt device with left head phantom



EUT Setup Configuration 6



## 11.7 SAR MEASUREMENT RESULTS

Date of Measurement: May 12,2011

### SAR Measurement GSM 850

Crest Factor: 8 (Duty cycle: 12.5%) Depth of Liquid: 15.0 cm

#### EUT Configuration 1

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	128	824.2	20.0	0.540	1.6
		180	836.6	20.0	0.661	
		251	848.8	20.0	0.641	

#### EUT Configuration 2

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	128	824.2	20.0	0.438	1.6
		180	836.6	20.0	0.351	
		251	848.8	20.0	0.341	

#### EUT Configuration 3&5

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
cheek	Right head	Fixed	128	824.2	20.0	1.6
			180	836.6	20.0	
			251	848.8	20.0	
	Left head	Fixed	128	824.2	20.0	
			180	836.6	20.0	
			251	848.8	20.0	

#### EUT Configuration 4&6

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Tilt	Right head	Fixed	128	824.2	20.0	1.6
			180	836.6	20.0	
			251	848.8	20.0	
	Left head	Fixed	128	824.2	20.0	
			180	836.6	20.0	
			251	848.8	20.0	

Remarks: For SAR testing, EUT is in GSM link mode. In GSM850 link mode, its crest factor is 8. (Duty cycle: 1:8)



Date of Measurement: May 12,2011

**SAR Measurement GPRS 850 Class 12**Crest Factor: 2 (Duty cycle: 50%) Depth of Liquid: 15.0 cm**EUT Configuration 1**

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	128	824.2	20.0	0.351	1.6
		180	836.6	20.0	0.309	
		251	848.8	20.0	0.317	

**EUT Configuration 2**

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	128	824.2	20.0	0.421	1.6
		180	836.6	20.0	0.527	
		251	848.8	20.0	0.868	

Remarks: For SAR testing, EUT is in GPRS link mode. In GPRS850 link mode, its crest factor is 2. (Duty cycle: 1:2)





Date of Measurement : May 12,2011

## SAR Measurement GSM 1900

Crest Factor: 8 (Duty cycle: 12.5%) Depth of Liquid: 15.0 cm

### EUT Configuration 1

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	512	1850.2	20.0	0.309	1.6
		661	1880.0	20.0	0.361	
		810	1910.0	20.0	0.407	

### EUT Configuration 2

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	512	1850.2	20.0	0.343	1.6
		661	1880.0	20.0	0.309	
		810	1910.0	20.0	0.425	

### EUT Configuration 3&5

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
cheek	Right head	Fixed	512	1850.2	20.0	1.6
			661	1880.0	20.0	
			810	1910.0	20.0	
	Left head	Fixed	512	1850.2	20.0	
			661	1880.0	20.0	
			810	1910.0	20.0	

### EUT Configuration 4&6

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Tilt	Right head	Fixed	512	1850.2	20.0	1.6
			661	1880.0	20.0	
			810	1910.0	20.0	
	Left head	Fixed	512	1850.2	20.0	
			661	1880.0	20.0	
			810	1910.0	20.0	

Remarks: For SAR testing, EUT is in GSM link mode. In GSM1900 link mode, its crest factor is 8. (Duty cycle: 1:8)



Date of Measurement: May 12,2011

**SAR Measurement GPRS 850 Class 12**Crest Factor: 2 (Duty cycle: 50%) Depth of Liquid: 15.0 cm**EUT Configuration 1**

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	512	1850.2	20.0	0.471	1.6
		661	1880.0	20.0	0.369	
		810	1910.0	20.0	0.420	

**EUT Configuration 2**

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	512	1850.2	20.0	0.532	1.6
		661	1880.0	20.0	0.504	
		810	1910.0	20.0	0.521	

Remarks: For SAR testing, EUT is in GPRS link mode. In GPRS 1900 link mode, its crest factor is 2.  
(Duty cycle: 1:2)



Date of Measurement: May 12,2011

## SAR Measurement IEEE802.11b (WI-FI)

Crest Factor: 1 (Duty cycle: 100%) Depth of Liquid:15.0 cm

### EUT Configuration 1

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	1	2412	20.0	0.317	1.6
		6	2437	20.0	0.301	
		11	2462	20.0	0.301	

### EUT Configuration 2

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	1	2412	20.0	0.302	1.6
		6	2437	20.0	0.309	
		11	2462	20.0	0.317	

### EUT Configuration 3&5

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
cheek	Right head	Fixed	1	2412	20.0	1.6
			6	2437	20.0	
			11	2462	20.0	
	Left head	Fixed	1	2412	20.0	
			6	2437	20.0	
			11	2462	20.0	

### EUT Configuration 4&6

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Tilt	Right head	Fixed	1	2412	20.0	1.6
			6	2437	20.0	
			11	2462	20.0	
	Left head	Fixed	1	2412	20.0	
			6	2437	20.0	
			11	2462	20.0	

Remarks: For SAR testing, EUT is in WIFI link mode. In WIFI link mode, its crest factor is 1. (Duty cycle: 1:1)



Date of Measurement: May 12,2011

## SAR Measurement IEEE802.11g (WI-FI)

Crest Factor: 1 (Duty cycle: 100%) Depth of Liquid:15.0 cm

### EUT Configuration 1

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	1	2412	20.0	0.302	1.6
		6	2437	20.0	0.307	
		11	2462	20.0	0.310	

### EUT Configuration 2

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	1	2412	20.0	0.303	1.6
		6	2437	20.0	0.304	
		11	2462	20.0	0.324	

### EUT Configuration 3&5

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
cheek	Right head	Fixed	1	2412	20.0	1.6
			6	2437	20.0	
			11	2462	20.0	
	Left head	Fixed	1	2412	20.0	
			6	2437	20.0	
			11	2462	20.0	

### EUT Configuration 4&6

EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Tilt	Right head	Fixed	1	2412	20.0	1.6
			6	2437	20.0	
			11	2462	20.0	
	Left head	Fixed	1	2412	20.0	
			6	2437	20.0	
			11	2462	20.0	

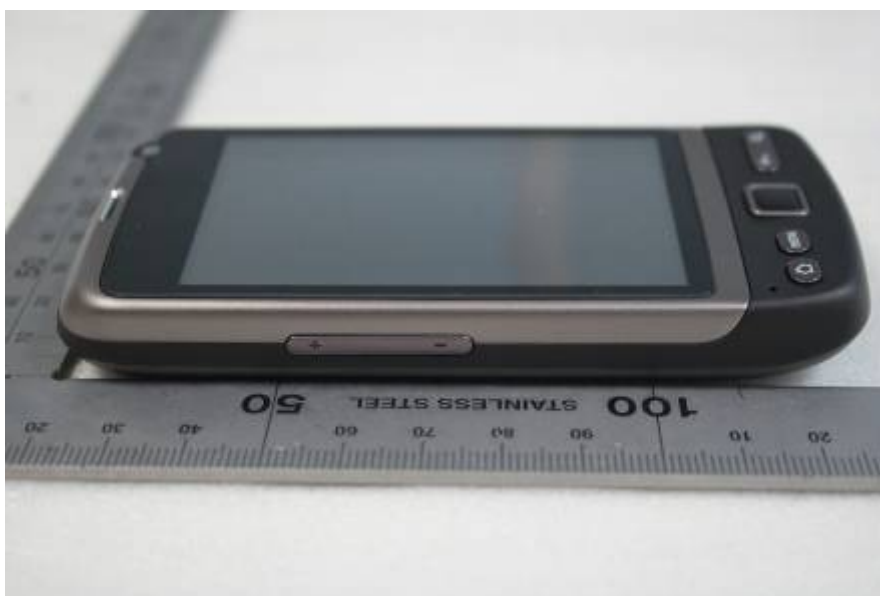
Remarks: For SAR testing, EUT is in WIFI link mode. In WIFI link mode, its crest factor is 1. (Duty cycle: 1:1)



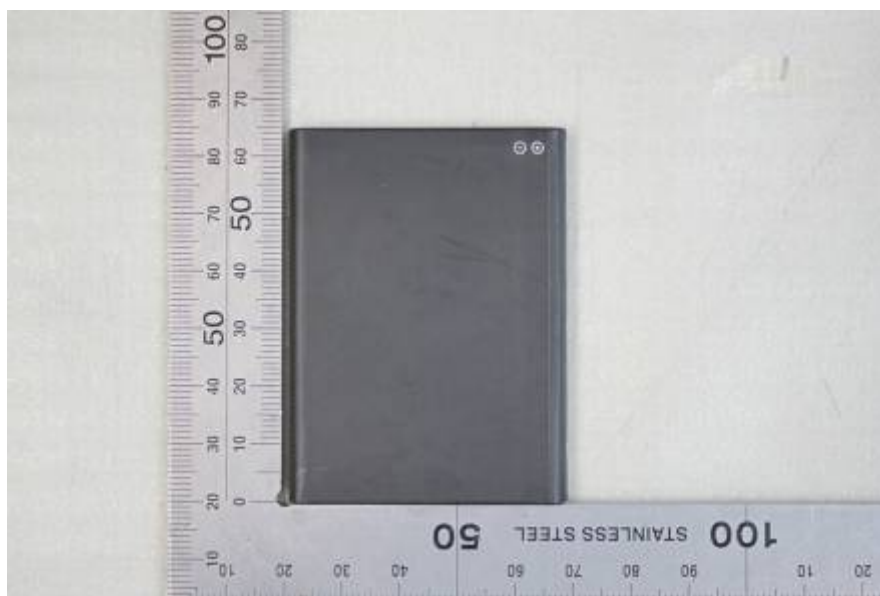
## 12. EUT PHOTO











**13. EQUIPMENT LIST & CALIBRATION STATUS**

Name of Equipment	Manufacturer	Type/Model	Serial Number	Calibration Due
P C	HP	Core(rm)3.16G	CZCO48171H	N/A
Signal Generator	Agilent	E8257C	MY43321570	05/26/2011
S-Parameter Network Analyzer	Agilent	E5071B	MY42301382	03/16/2012
Wireless Communication Test Set	R&S	CMU200	SN:B23-03291	05/26/2011
Power Meter	Agilent	E4416A	QB41292714	03/16/2012
Peak & Average sensor	Agilent	E9327A	CF0001	03/16/2012
E-field PROBE	SPEAG	EX3DV4	3755	01/20/2012
DIPOLE 835MHZ ANTENNA	SPEAG	D835V2	4d114	01/10/2012
DIPOLE 1800MHZ ANTENNA	SPEAG	D1800V2	2d170	01/26/2012
DIPOLE 1900MHZ ANTENNA	SPEAG	D1900V2	5d136	01/05/2012
DIPOLE 2450MHZ ANTENNA	SPEAG	D2450V2	817	01/26/2012
DIPOLE 2000MHZ ANTENNA	SPEAG	D2000V2	1041	01/12/2012
DIPOLE 5000MHZ ANTENNA	SPEAG	D5GHzV2	1095	12/15/2011
DUMMY PROBE	SPEAG	DP_2	SPDP2001AA	N/A
SAM PHANTOM	SPEAG	SAM29	SN 41_05	N/A
PHANTON WOOD TABLE	SPEAG	1609	QD000P40CD	N/A
ROBOT	SPEAG	TX60	F10/5E6AA1/A101	N/A
ROBOT KRC	SPEAG	CS8C	F10/5E6AA1/C101	N/A
LIQUID CALIBRATION KIT	ANTENNESSA	41/05 OCP9	00425167	N/A
DAE	SD000D04BJ	DEA4	1245	01/11/2012



## 14. FACILITIES

All measurement facilities used to collect the measurement data are located at

☒ No.10, Weiye Rd., Innovation Park, Eco & Tec. Development Part, Kunshan City, Jiangsu Province, China.

## 15. REFERENCES

- [1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.
- [2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commision, O\_cce of Engineering & Technology, Washington, DC, 1997.
- [3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-\_eld scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.
- [4] Niels Kuster, Ralph K.astle, and Thomas Schmid, \Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.
- [5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.
- [6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
- [7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-\_eld probes in tissue simulating liquids at mobile communications frequencies", in ICECOM \_ 97, Dubrovnik, October 15{17, 1997, pp. 120{124.
- [8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-\_eld probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172{175.
- [9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. uhn, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865{1873, Oct. 1996.
- [10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.
- [11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
- [12] W. H. Press, S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992..Dosimetric Evaluation of Sample device, month 1998 9
- [13] NIS81 NAMAS, \The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.
- [14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10



## **16. ATTACHMENTS**

<b>Exhibit</b>	<b>Content</b>
1	System Performance Check Plots
2	SAR Test Plots
3	Probe calibration report EX3DV4 SN3755
4	Dipole calibration report D835V2 SN:4d114
5	Dipole calibration report D1800V2 SN: 2d170

**END OF REPORT**