# SAR TEST REPORT

## HCT CO., LTD

| | |
|---|---|
| EUT Type: | Fixed Wireless Phone |
| FCC ID: | PH7PG110 |

| Model: | PG110 | Trade Name | AXESSTEL INC. |
|---|---|---|---|

| | |
|---|---|
| Date of Issue: | Nov.08, 2007 |
| Test report No.: | HCT-SAR07-1102 |
| Test Laboratory: | **HCT CO., LTD.**<br>SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNGKI-DO, 467-701, KOREA<br>TEL: +82 31 639 8518    FAX: +82 31 639 8525 |
| Applicant : | **AXESSTEL INC.**<br>6815 Flanders Drive Ste.210,<br>San Diego, CA 92121<br>Tel: 858- 625-2100 Fax: 858- 625- 2110<br>E-Mail: dskim@axesstel.com |
| Testing has been carried out in accordance with: | 47CFR §2.1093<br>FCC OET Bulletin 65(Edition 97-01), Supplement C (Edition 01-01)<br>ANSI/ IEEE C95.1 – 2005<br>IEEE 1528-2003 |
| Test result: | The tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory. |
| Signature | Report prepared by<br>: Sun-Hee Kim<br>Test Engineer of SAR Part          Approved by<br>: Nam-Wook Kang<br>Manager of SAR Part |

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# 1. INTRODUCTION

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices.

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-2005 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring SAR due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86 NCRP, 1986, Bethesda, MD 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

## SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (r ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body.

$$ S\ A\ R\ =\ \frac{d}{d\ t}\left(\frac{d\ U}{d\ m}\right)\ =\ \frac{d}{d\ t}\left(\frac{d\ U}{\rho\ d\ v}\right) $$

**Figure 2. SAR Mathematical Equation**

*SAR is expressed in units of Watts per Kilogram (W/kg).*

$$ SAR\ =\ \sigma E^2 / \rho $$

where:

| | | |
|---|---|---|
| $\sigma$ | = | conductivity of the tissue-simulant material (S/m) |
| $\rho$ | = | mass density of the tissue-simulant material (kg/m$^3$) |
| $E$ | = | Total RMS electric field strength (V/m) |

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

# 2. DESCRIPTION OF DEVICE

Environmental evaluation measurements of specific absorption rate (SAR) distributions in emulated human head and body tissues exposed to radio frequency (RF) radiation from wireless portable devices for compliance with the rules and regulations of the U.S. Federal Communications Commission (FCC).

| | |
|---|---|
| EUT Type | Fixed Wireless Phone |
| FCC ID | PH7PG110 |
| Model(s) | PG110 |
| Trade Name | AXESSTEL INC. |
| Serial Number(s) | #1 |
| Application Type | Certification |
| Modulation(s) | GSM850/GSM1900 |
| Tx Frequency | 824.20 - 848.80 MHz (GSM850)<br>1 850.20 – 1 909.80 MHz (GSM1900) |
| Rx Frequency | 869.20 - 893.80 MHz (GSM850)<br>1 930.20 – 1 989.80 MHz (GSM1900) |
| FCC Classification | Licensed Non-Broadcast station Transmitter (TNB) |
| Production Unit or Identical Prototype | Prototype |
| Max SAR | 0.073 W/kg GSM850 Body SAR<br>0.169 W/kg GSM1900 Body SAR |
| Date(s) of Tests | Nov. 7, 2007 |
| Antenna Type | Removable |

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# 3. DESCRIPTION OF TEST EQUIPMENT

## 3.1 SAR MEASUREMENT SETUP

These measurements are performed using the DASY4 automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists of high precision robotics system (Staubli), robot controller, Pentium III computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Fig.3.1).

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The PC consists of the HP Pentium IV 3.0GHz computer with Windows XP system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.



Figure 3.1 HCT SAR Lab. Test Measurement Set-up

The 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 PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in.

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# 3.2 DASY E-FIELD PROBE SYSTEM

## 3.2.1 ET3DV6 Probe Specification

Construction  Symmetrical design with triangular core
Built-in optical fiber for surface detection System
Built-in shielding against static charges

Calibration  In air from 10 MHz to 2.5 GHz
In brain and muscle simulating tissue at
Frequencies of 450 MHz, 900 MHz and
1.8 GHz (accuracy : 8 %)

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

Directivity  $\pm$ 0.2 dB in brain tissue (rotation around probe axis)
$\pm$ 0.4 dB in brain tissue (rotation normal probe axis)

Dynamic  5 $\mu$W/g to > 100 mW/g;

Range Linearity:  $\pm$ 0.2 dB

Surface  $\pm$ 0.2 mm repeatability in air and clear liquids
Detection  over diffuse reflecting surfaces.

Dimensions  Overall length: 330 mm
Tip length: 16 mm
Body diameter: 12 mm
Tip diameter: 6.8 mm
Distance from probe tip to dipole centers: 2.7 mm

Application  General dissymmetry up to 3 GHz
Compliance tests of mobile phones

Fast automatic scanning in arbitrary phantoms

Figure 3.2 Photograph of the probe

and the Phantom

Figure 3.3 ET3DV6 E-field Probe

The SAR measurements were conducted with the dosimetric probe ET3DV6, designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches a maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a   software approach and looks for the maximum using a 2nd  order fitting. The approach is stopped at reaching the maximum.

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# 3.3 PROBE CALIBRATION PROCESS

## 3.3.1 E-Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with an accuracy better than ± 10 %. The spherical isotropy was evaluated with the proper procedure and found to be better than ± 0.25 dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a waveguide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

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

where:

$\Delta t$ =  exposure time (30 seconds),

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

$\Delta T$ =  temperature increase due to RF exposure.

SAR is proportional to $\Delta T / \Delta t$, the initial rate of tissue heating, before thermal diffusion takes place. Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

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

where:

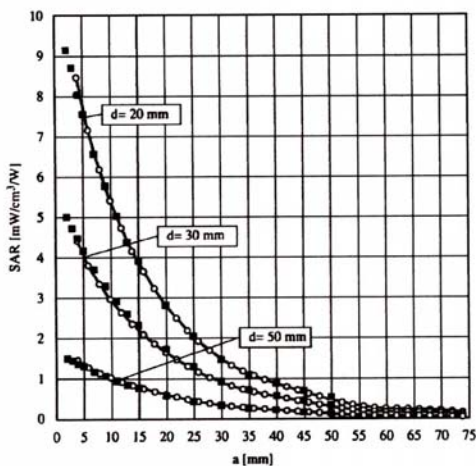$\sigma$  = simulated tissue conductivity,

$\rho$  = Tissue density (1.25 g/cm³ for brain tissue)



Figure 3.4 E-Field and Temperature measurements at 900 MHz
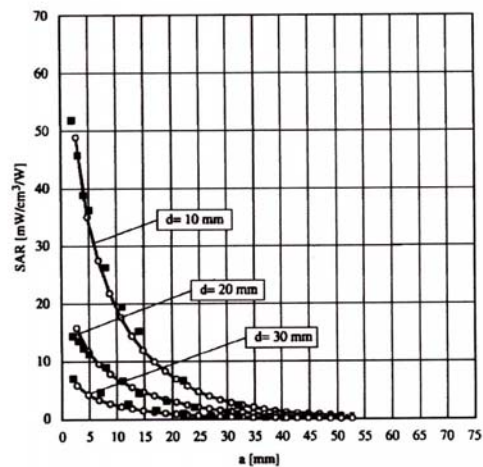


Figure 3.5 E-Field and temperature measurements at 1.8 GHz

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## 3.3.2 Data Extrapolation

The DASY4 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. 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 like below;

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

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 (DASY parameter)
$dcp_i$ = diode compression point (DASY parameter)

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

E-field probes:

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

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 E-field probes
ConvF = sensitivity of enhancement in solution
$E_i$ = electric field strength of channel i in V/m

The RSS value of the field components gives the total field strength (Hermetian 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 W/g
$E_{tot}$ = total field strength in V/m
$\sigma$ = conductivity in [mho/m] or [Siemens/m]
$\rho$ = equivalent tissue density in g/cm³

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

$$P_{pwe} = \frac{E_{tot}^2}{3770}$$

with
$P_{pwe}$ = equivalent power density of a plane wave in W/cm²
$E_{tot}$ = total electric field strength in V/m

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# 3.4 SAM Phantom

The SAM Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90 % of all users. 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 the 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 in the robot.



Figure 3.6 SAM Phantom

| | |
|---|---|
| Shell Thickness | 2.0 mm |
| Filling Volume | About 30 L |
| Dimensions | 810 mm x 1 000 mm x 500 mm (H x L x W) |

# 3.5 Device Holder for Transmitters

In combination with the SAM Phantom V 4.0, the Mounting Device (POM) 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 repeatable positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations. To produce the Worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.



Fig. 3.7 Device Holder

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# 3.6 Brain & Muscle Simulating Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydrox-ethyl cellulose (HEC) gelling agent and saline solution (see Table 3.1). Preservation with a bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The mixture characterizations used for the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Hartsgrove.

| 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 |

| | | | |
|---|---|---|---|
| Salt: | 99 % Pure Sodium Chloride | Sugar: | 98 % Pure Sucrose |
| Water: | De-ionized, 16M resistivity | HEC: | Hydroxyethyl Cellulose |
| DGBE: | 99 % Di(ethylene glycol) butyl ether,[2-(2-butoxyethoxy) ethanol] | | |
| Triton X-100(ultra pure): | Polyethylene glycol mono[4-(1,1,3,3-tetramethylbutyl)phenyl] ether | | |

**Table 3.1 Composition of the Tissue Equivalent Matter**

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## 3.7 SAR TEST EQUIPMENT

| Manufacturer | Type / Model | S/N | Calib. Date | Calib.Interval | Calib.Due |
|---|---|---|---|---|---|
| SPEAG | SAM Phantom | - | N/A | N/A | N/A |
| Staubli | Robot RX90L | F01/5K09A1/A/01 | N/A | N/A | N/A |
| Staubli | Robot ControllerCS7MB | F99/5A82A1/C/01 | N/A | N/A | N/A |
| HP | Pavilion t000_puffer | KRJ51201TV | N/A | N/A | N/A |
| SPEAG | Light Alignment Sensor | 265 | N/A | N/A | N/A |
| Staubli | Teach Pendant (Joystick) | D221340.01 | N/A | N/A | N/A |
| SPEAG | DAE4V1 | 447 | Mar.06, 2007 | Annual | Mar.06, 2008 |
| SPEAG | DAE3V1 | 466 | Jan.25, 2007 | Annual | Jan.25, 2008 |
| SPEAG | E-Field Probe ET3DV6 | 1609 | Aug.30, 2007 | Annual | Aug.30, 2008 |
| SPEAG | E-Field Probe ET3DV6 | 1607 | Feb.21, 2007 | Annual | Feb.21, 2008 |
| SPEAG | Validation Dipole D450V2 | 1007 | Mar.15, 2007 | Annual | Mar.15, 2008 |
| SPEAG | Validation Dipole D835V2 | 481 | May 24, 2007 | Annual | May 24, 2008 |
| SPEAG | Validation Dipole D900V2 | 121 | Feb.19, 2007 | Annual | Feb.19, 2008 |
| SPEAG | Validation Dipole D1800V2 | 2d066 | May 23, 2007 | Annual | May 23, 2008 |
| SPEAG | Validation Dipole D1900V2 | 5d032 | Feb.20, 2007 | Annual | Feb.20, 2008 |
| SPEAG | Validation Dipole D2450V2 | 743 | Jan.17, 2007 | Annual | Jan.17, 2008 |
| Agilent | Power Meter(F) E4419B | MY40330223 | Nov.05, 2007 | Annual | Nov.05, 2008 |
| Agilent | Power Sensor(G) 8481 | MY41090870 | Nov.21, 2006 | Annual | Nov.21, 2007 |
| HP | Dielectric Probe Kit 85070C | 00721521 | N/A | N/A | N/A |
| HP | Dual Directional Coupler 778D | 16072 | Nov.06, 2007 | Annual | Nov.06, 2008 |
| R&S | Base Station CMU200 | 838207/050 | Nov.14, 2006 | Annual | Nov.14, 2007 |
| Tescom | Bluetooth TC-3000 | 3000A490112 | Jan.22, 2007 | Annual | Jan.22, 2008 |
| Agilent | Base Station E5515C | GB44400269 | Feb.11, 2007 | Annual | Feb.11, 2008 |
| HP | Signal Generator E4438C | MY45092381 | Feb.07, 2007 | Annual | Feb.07, 2008 |
| HP | Network Analyzer 8753ES | JP39240221 | Apr.11, 2007 | Annual | Apr.11, 2008 |
| EM POWER | Power Amp BBS3Q7ELU | 1013-D/C-0127 | Apr.17, 2007 | Annual | Apr.17, 2008 |

NOTE:

The E-field probe was calibrated by SPEAG, by the waveguide technique procedure. Dipole Validation measurement is performed by HCT Lab. before each test. The brain simulating material is calibrated by HCT using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain-equivalent material.

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# 4. SAR MEASUREMENT PROCEDURE

The evaluation was performed with the following procedure:

1.  The SAR value at a fixed location above the ear point was measured and was used as a reference value for assessing the power drop.

2.  The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20 mm x 20 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

3.  Around this point, a volume of 32 mm x 32 mm x 34 mm was assessed by measuring 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

    a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

    b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x,y, and z directions. The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

    c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

4.  The SAR value, at the same location as procedure #1, was re-measured. If the value changed by more than 5 %, the evaluation is repeated.
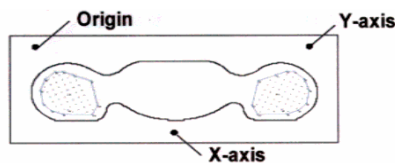


Fig. 4.1 SAR Measurement Point in Area Scan

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# 5. DESCRIPTION OF TEST POSITION

## 5.1 HEAD POSITION

The device was placed in a normal operating position with the Point A on the device, as illustrated in following drawing, aligned with the location of the RE(ERP) on the phantom. With the ear-piece pressed against the head, the vertical center line of the body of the handset was aligned with an imaginary plane consisting of the RE, LE and M. While maintaining these alignments, the body of the handset was gradually moved towards the cheek until any point on the mouth-piece or keypad contacted the cheek. This is a cheek/touch position. For ear/tilt position, while maintain the device aligned with the BM and FN lines, the device was pivot against ERP back for 15º or until the device antenna touch the phantom. Please refer to IEEE 1528-2003 illustration below.
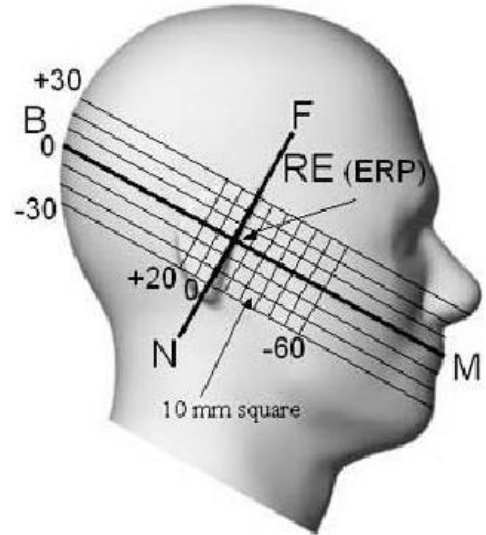


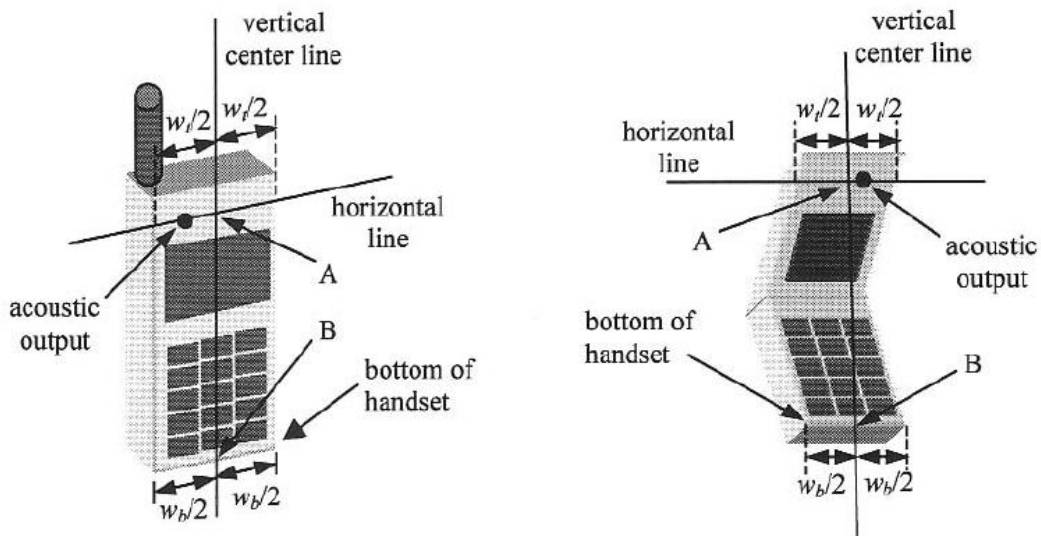Figure 5.1 Side view of the phantom



Figure 5.2 Handset vertical and horizontal reference lines

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## 5.2 Body Holster/Belt Clip Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. A device with a headset output is tested with a headset connected to the device. Body dielectric parameters are used.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with each accessory. If multiple accessory share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some Devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used.

Since this EUT does not supply any body worn accessory to the end user a distance of 2.0 cm from the EUT back surface to the liquid interface is configured for the generic test.

"See the Test SET-UP Photo"

Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessory(ies), Including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worstcase positioning is then documented and used to perform Body SAR testing.

# 6. MEASUREMENT UNCERTAINTY

Measurement uncertainties in SAR measurements are difficult to quantify due to several variables including biological, physiological, and environmental. However, we estimate the measurement uncertainties in SAR to be less than 15 % - 25 %.

According to ANSI/IEEE C95.3, the overall uncertainties are difficult to assess and will vary with the type of meter and usage situation. However, accuracy's of 1 to $\pm$ 3 dB can be expected in practice, with greater uncertainties in near-field situations and at higher frequencies (shorter wavelengths), or areas where large reflecting objects are present. Under optimum measurement conditions, SAR measurement uncertainties of at least $\pm$ 2 dB can be expected.

According to CENELEC, typical worst-case uncertainty of field measurements is 5 dB. For well-defined modulation characteristics the uncertainty can be reduced to $\pm$ 3 dB.

| Error Description | Uncertainty value [%] | Probability Distribution | Divisor | $c_i$ | $c_i^2$ | Standard Uncertainty [%] | Stand Uncert^2 | (Stand Uncert^2) X ($c_i^2$) | $v_i$ & $v_{eff}$ |
|---|---|---|---|---|---|---|---|---|---|
| 1. Measurement System | | | | | | | | | |
| Probe Calibration | 5.5 | Normal | 1.00 | 1 | 1 | 5.50 | 30.25 | 30.25 | ∞ |
| Axial Isotropy | 4.7 | Rectangular | 1.73 | 0.7 | 0.49 | 2.71 | 7.36 | 3.61 | ∞ |
| Hemispherical Isotropy | 9.6 | Rectangular | 1.73 | 0.7 | 0.49 | 5.54 | 30.72 | 15.05 | ∞ |
| Linearity | 4.7 | Rectangular | 1.73 | 1 | 1 | 2.71 | 7.36 | 7.36 | ∞ |
| System Detection limits | 1.0 | Rectangular | 1.73 | 1 | 1 | 0.58 | 0.33 | 0.33 | ∞ |
| Boundary effect | 1.0 | Rectangular | 1.73 | 1 | 1 | 0.58 | 0.33 | 0.33 | ∞ |
| Response time | 0.8 | Rectangular | 1.73 | 1 | 1 | 0.46 | 0.21 | 0.21 | ∞ |
| RF Ambient conditions | 3.0 | Rectangular | 1.73 | 1 | 1 | 1.73 | 3.00 | 3.00 | ∞ |
| Readout Electronics | 0.3 | Normal | 1.00 | 1 | 1 | 0.30 | 0.09 | 0.09 | ∞ |
| Integration time | 2.6 | Rectangular | 1.73 | 1 | 1 | 1.50 | 2.25 | 2.25 | ∞ |
| Probe positioner | 0.4 | Rectangular | 1.73 | 1 | 1 | 0.23 | 0.05 | 0.05 | ∞ |
| Probe positionering | 2.9 | Rectangular | 1.73 | 1 | 1 | 1.67 | 2.80 | 2.80 | ∞ |
| Maximum SAR evaluation | 1.0 | Rectangular | 1.73 | 1 | 1 | 0.58 | 0.33 | 0.33 | ∞ |
| 2. Test Sample Related | | | | | | Sub Total | | 65.69 | |
| Device Positioning | 1.8 | Normal | 1.00 | 1 | 1 | 1.77 | 3.13 | 3.13 | 9 |
| Device Holder | 3.6 | Normal | 1.00 | 1 | 1 | 3.60 | 12.96 | 12.96 | ∞ |
| Power Drift | 5.0 | Rectangular | 1.73 | 1 | 1 | 2.89 | 8.33 | 8.33 | ∞ |
| 3. Phantom and Setup | | | | | | Sub Total | | 24.43 | |
| Phantom Uncertainty | 4.0 | Rectangular | 1.73 | 1 | 1 | 2.31 | 5.33 | 5.33 | ∞ |
| Liquid conductivity (target) | 5.0 | Rectangular | 1.73 | 0.5 | 0.25 | 2.89 | 8.33 | 2.08 | ∞ |
| Liquid conductivity (measurement error) | 2.5 | Normal | 1.00 | 0.5 | 0.25 | 2.50 | 6.25 | 1.56 | ∞ |
| Liquid permittivity (target) | 5.0 | Rectangular | 1.73 | 0.5 | 0.25 | 2.89 | 8.33 | 2.08 | ∞ |
| Liquid permittivity (measurement error) | 2.5 | Normal | 1.00 | 0.5 | 0.25 | 2.50 | 6.25 | 1.56 | ∞ |
| | | | | | | Sub Total | | 12.63 | |
| Combined standard uncertainty [%] | | | | | | **10.14** | | 102.74 | – |
| Expanded uncertainty [$k$ = 2, confidence 95 %] | | | | | | **± 20.3 %** | | | |

**Table 6.1 Breakdown of Errors**

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# 7. ANSI/ IEEE C95.1 - 2005 RF EXPOSURE LIMITS

| HUMAN EXPOSURE | UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g) | CONTROLLED ENVIRONMENT Occupational (W/kg) or (mW/g) |
|---|---|---|
| SPATIAL PEAK SAR * (Brain) | 1.60 | 8.00 |
| SPATIAL AVERAGE SAR ** (Whole Body) | 0.08 | 0.40 |
| SPATIAL PEAK SAR *** (Hands / Feet / Ankle / Wrist) | 4.00 | 20.00 |

**Table 7.1 Safety Limits for Partial Body Exposure**

**NOTES:**

* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

** The Spatial Average value of the SAR averaged over the whole-body.

*** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

**Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

**Controlled Environments** are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

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# 8. SYSTEM VERIFICATION

## 8.1 Tissue Verification

| Freq. [MHz] | Date | Liquid | Liquid Temp[°C] | Parameters | Target Value | Measured Value | Deviation [%] | Limit [%] |
|---|---|---|---|---|---|---|---|---|
| 835 | Nov.07, 2007 | Head | 21.1 | ε r | 41.5 | 40.8 | - 1.69 | ± 5 |
|  |  |  |  | σ | 0.90 | 0.892 | - 0.89 | ± 5 |
| 835 | Nov.07, 2007 | Body | 21.1 | ε r | 55.2 | 54.8 | - 0.72 | ± 5 |
|  |  |  |  | σ | 0.97 | 0.98 | + 1.03 | ± 5 |
| 1 900 | Nov.07, 2007 | Head | 21.1 | ε r | 40.0 | 39.4 | - 1.50 | ± 5 |
|  |  |  |  | σ | 1.40 | 1.41 | + 0.71 | ± 5 |
| 1 900 | Nov.07, 2007 | Body | 21.1 | ε r | 53.3 | 52.0 | - 2.44 | ± 5 |
|  |  |  |  | σ | 1.52 | 1.56 | + 2.63 | ± 5 |

## 8.2 System Validation

Prior to assessment, the system is verified to the ± 10 % of the specifications at 835 MHz/1 900 MHz by using the system validation kit. (Graphic Plots Attached)

(Input Power: 1 W)

| Freq. [MHz] | Date | Liquid | Liquid Temp [°C] | SAR Average | Target Value (SPEAG) (mW/g) | Measured Value (mW/g) | Deviation [%] | Limit [%] |
|---|---|---|---|---|---|---|---|---|
| 835 MHz | Nov.07, 2007 | Head | 21.1 | 1 g | 9.21 | 9.31 | + 1.08 | ± 10 % |
| 1 900 MHz | Nov.07, 2007 | Head | 21.1 | 1 g | 37.2 | 38.30 | + 2.96 | ± 10 % |

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# 9. SAR TEST DATA SUMMARY

## 9.1 Measurement Results (GSM850 body SAR)

| Frequency | | Modulation | Conducted Power (dBm) | | Battery | Separation Distance | Ant. Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|---|
| MHz | Channel. | | Begin | End | | | | |
| 824.2 | 128 (Low) | GSM850 | 32.82 | 32.72 | Standard | | 90 degree upright | 0.073 |
| 836.6 | 190 (Mid) | GSM850 | 32.52 | 32.42 | Standard | | 90 degree upright | 0.068 |
| 848.8 | 251 (High) | GSM850 | 32.41 | 32.39 | Standard | | 90 degree upright | 0.070 |
| 824.2 | 128 (Low) | GSM850 | 32.82 | 32.72 | Standard+ with Charger | 2.0 cm | 90 degree upright | 0.073 |
| 836.6 | 190 (Mid) | GSM850 | 32.52 | 32.51 | Standard+ with Charger | | 90 degree upright | 0.070 |
| 848.8 | 251 (High) | GSM850 | 32.41 | 32.37 | Standard+ with Charger | | 90 degree upright | 0.072 |
| **ANSI/ IEEE C95.1 2005 – Safety Limit** **Spatial Peak** **Uncontrolled Exposure/ General Population** | | | | | | **body** **1.6 W/kg (mW/g)** Averaged over 1 gram | | |

**NOTES:**

1  The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2  All modes of operation were investigated and the worst-case are reported.
3  Measured Depth of Simulating Tissue is 15.0 ± 0.2cm.
4  Tissue parameters and temperatures are listed on the SAR plot.
5  Battery Type        ☒ Standard            ☐ Extended            ☐ Slim
    Batteries are fully charged for all readings.
6  Test Signal Call Mode        ☐ Manual Test cord        ☒ Base Station Simulator

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## 9.2 Measurement Results (GSM1900 body SAR)

| Frequency | | Modulation | Conducted Power (dBm) | | Battery | Separation Distance | Ant. Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|---|
| MHz | Channel. | | Begin | End | | | | |
| 1 850.2 | 512 (Low) | GSM1900 | 29.93 | 29.78 | Standard | | 90 degree upright | 0.167 |
| 1 880.0 | 661 (Mid) | GSM1900 | 30.03 | 30.02 | Standard | | 90 degree upright | 0.116 |
| 1 909.8 | 810 (High) | GSM1900 | 29.78 | 29.74 | Standard | 2.0 cm | 90 degree upright | 0.081 |
| 1 850.2 | 512 (Low) | GSM1900 | 29.93 | 29.92 | Standard+ with Charger | | 90 degree upright | 0.169 |
| 1 880.0 | 661 (Mid) | GSM1900 | 30.03 | 30.01 | Standard+ with Charger | | 90 degree upright | 0.116 |
| 1 909.8 | 810 (High) | GSM1900 | 29.78 | 29.70 | Standard+ with Charger | | 90 degree upright | 0.086 |
| **ANSI/ IEEE C95.1 2005 – Safety Limit** <br> **Spatial Peak** <br> **Uncontrolled Exposure/ General Population** | | | | | | **body** <br> **1.6 W/kg (mW/g)** <br> Averaged over 1 gram | | |

**NOTES:**

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2. All modes of operation were investigated and the worst-case are reported.
3. Measured Depth of Simulating Tissue is 15.0 ± 0.2 cm.
4. Tissue parameters and temperatures are listed on the SAR plot.
5. Battery Type      ☒ Standard      ☐ Extended      ☐ Slim
   Batteries are fully charged for all readings.
6. Test Signal Call Mode    ☐ Manual Test cord    ☒ Base Station Simulator

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# 10. CONCLUSION

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the ANSI/ IEEE C95.1 2005.

These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests.

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# 11.REFERENCES

[1] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields, July 2001.

[2] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2003, IEE Recommended Practice or Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices.

[3] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio frequency Radiation, Aug. 1996.

[4] ANSI/IEEE C95.1 - 1991, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300kHz to 100GHz, New York: IEEE, Aug. 1992

[5] ANSI/IEEE C95.3 - 1991, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, 1992.

[6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 120-124.

[9]K. Pokoviº, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Head Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectro magnetics, Canada: 1987, pp. 29-36.

[14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[15] W. Gander, Computer mathematick, Birkhaeuser, Basel, 1992.

[16] 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.

[17] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C, Dec. 1997.

[18] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[19] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.

[20] Prof. Dr. Niels Kuster, ETH, EidgenØssische Technische Hoschschule Zòrich, Dosimetric Evaluation of the Cellular Phone.

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# Attachment 1. – SAR Test Plots

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| | |
|---|---|
| **Test Laboratory:** | HCT CO., LTD |
| **EUT Type:** | Fixed Wireless Phone |
| **Liquid Temperature:** | 21.1 ℃ |
| **Ambient Temperature:** | 21.3 ℃ |
| **Test Date:** | Nov.07, 2007 |

## DUT: PG110; Serial: #1

Communication System: GSM 850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 825 MHz; σ = 0.967 mho/m; $\varepsilon_r$ = 55; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(6.49, 6.49, 6.49); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Body GSM850 128/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.077 mW/g

**Body GSM850 128/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
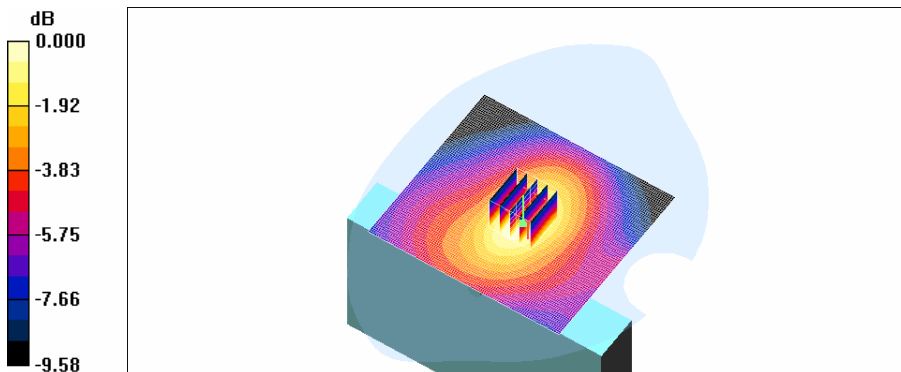Reference Value = 9.06 V/m; Power Drift = -0.100 dB
Peak SAR (extrapolated) = 0.108 W/kg
**SAR(1 g) = 0.073 mW/g; SAR(10 g) = 0.049 mW/g**
Maximum value of SAR (measured) = 0.078 mW/g



0 dB = 0.078mW/g

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**Test Laboratory:**          HCT CO., LTD

**EUT Type:**                Fixed Wireless Phone

**Liquid Temperature:**      21.1 ℃

**Ambient Temperature:**     21.3 ℃

**Test Date:**               Nov.07, 2007

**DUT: PG110; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.981 mho/m; $\varepsilon_r$ = 54.8; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(6.49, 6.49, 6.49); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Body GSM850 190/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.072 mW/g

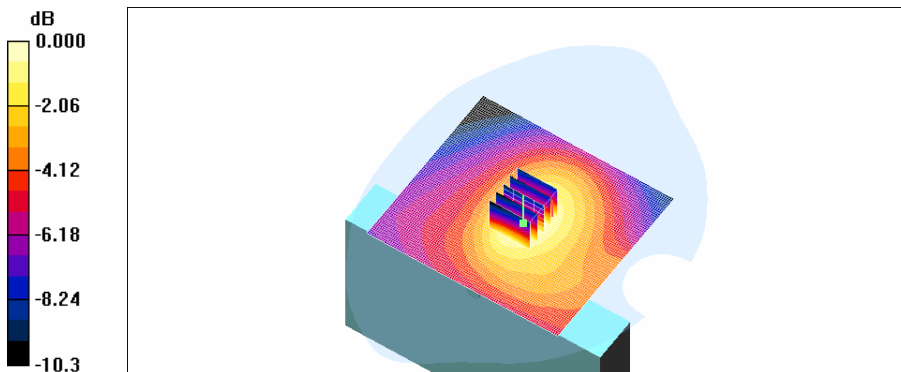**Body GSM850 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.47 V/m; Power Drift = 0.095 dB
Peak SAR (extrapolated) = 0.103 W/kg
**SAR(1 g) = 0.068 mW/g; SAR(10 g) = 0.045 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.072 mW/g



0 dB = 0.072mW/g

| | |
|---|---|
| **Test Laboratory:** | HCT CO., LTD |
| **EUT Type:** | Fixed Wireless Phone |
| **Liquid Temperature:** | 21.1 ℃ |
| **Ambient Temperature:** | 21.3 ℃ |
| **Test Date:** | Nov.07, 2007 |

### DUT: PG110; Serial: #1

Communication System: GSM 850; Frequency: 848.8 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 848.8 MHz; σ = 0.996 mho/m; $\varepsilon_r$ = 54.7; ρ = 1000 kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(6.49, 6.49, 6.49); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Body GSM850 251/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.073 mW/g

**Body GSM850 251/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.73 V/m; Power Drift = 0.021 dB
Peak SAR (extrapolated) = 0.109 W/kg
**SAR(1 g) = 0.070 mW/g; SAR(10 g) = 0.047 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.075 mW/g



0 dB = 0.075mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Fixed Wireless Phone |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Nov.07, 2007 |

### DUT: PG110; Serial:#1
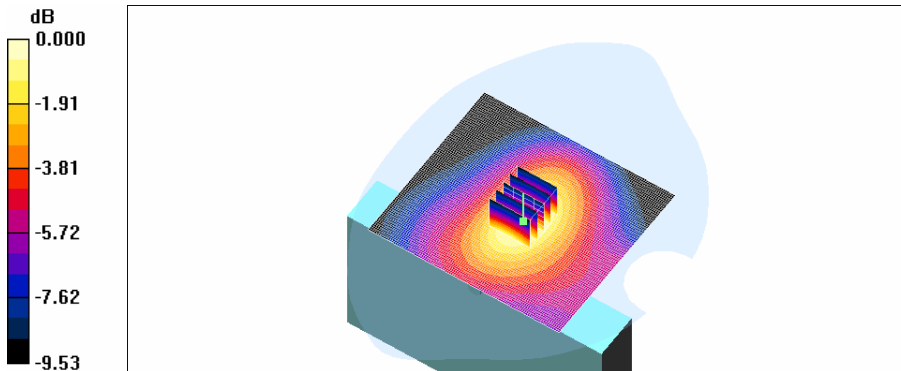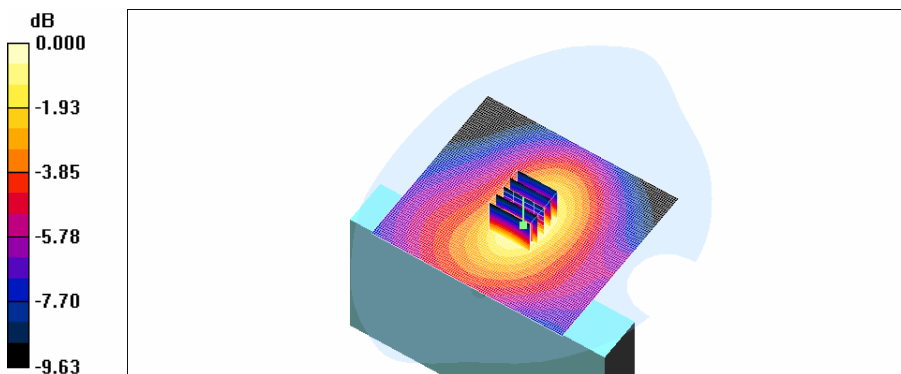
Communication System: GSM 850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 825 MHz; σ = 0.967 mho/m; $\varepsilon_r$ = 55; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(6.49, 6.49, 6.49); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Body GSM850 128/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.078 mW/g

**Body GSM850 128/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.94 V/m; Power Drift = -0.010 dB
Peak SAR (extrapolated) = 0.110 W/kg
**SAR(1 g) = 0.073 mW/g; SAR(10 g) = 0.049 mW/g**
Maximum value of SAR (measured) = 0.077 mW/g



0 dB = 0.077mW/g

| | |
|---|---|
| **Test Laboratory:** | HCT CO., LTD |
| **EUT Type:** | Fixed Wireless Phone |
| **Liquid Temperature:** | 21.1 ℃ |
| **Ambient Temperature:** | 21.3 ℃ |
| **Test Date:** | Nov.07, 2007 |

### DUT: PG110; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.981 mho/m; $\varepsilon_r$ = 54.8; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(6.49, 6.49, 6.49); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Body GSM850 190/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.075 mW/g

**Body GSM850 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.62 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 0.109 W/kg
**SAR(1 g) = 0.070 mW/g; SAR(10 g) = 0.046 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.075 mW/g



0 dB = 0.075mW/g

| | |
|---|---|
| **Test Laboratory:** | HCT CO., LTD |
| **EUT Type:** | Fixed Wireless Phone |
| **Liquid Temperature:** | 21.1 ℃ |
| **Ambient Temperature:** | 21.3 ℃ |
| **Test Date:** | Nov.07, 2007 |

### DUT: PG110; Serial:#1

Communication System: GSM 850; Frequency: 848.8 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 848.8 MHz; σ = 0.996 mho/m; $\varepsilon_r$ = 54.7; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(6.49, 6.49, 6.49); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Body GSM850 251/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.076 mW/g

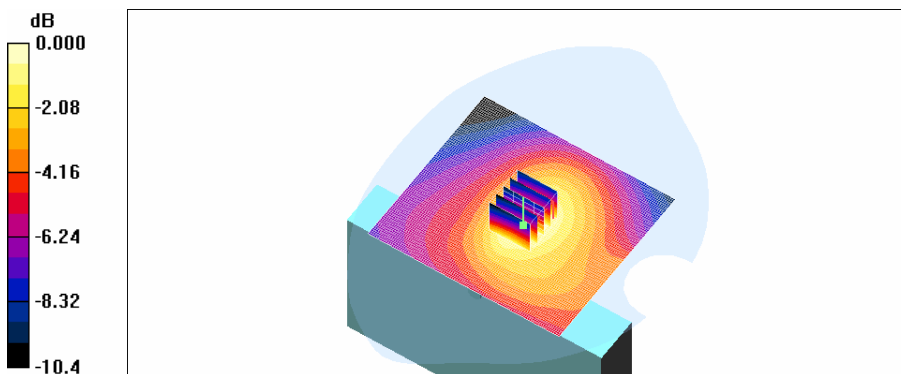**Body GSM850 251/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.80 V/m; Power Drift = -0.033 dB
Peak SAR (extrapolated) = 0.117 W/kg
**SAR(1 g) = 0.072 mW/g; SAR(10 g) = 0.048 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.077 mW/g



0 dB = 0.077mW/g

| | |
|---|---|
| **Test Laboratory:** | HCT CO., LTD |
| **EUT Type:** | Fixed Wireless Phone |
| **Liquid Temperature:** | 21.1 ℃ |
| **Ambient Temperature:** | 21.3 ℃ |
| **Test Date:** | Nov.07, 2007 |

### DUT: PG110; Serial:#1

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.51 mho/m; $\varepsilon_r$ = 52.2; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(4.74, 4.74, 4.74); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body GSM1900 512/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.185 mW/g

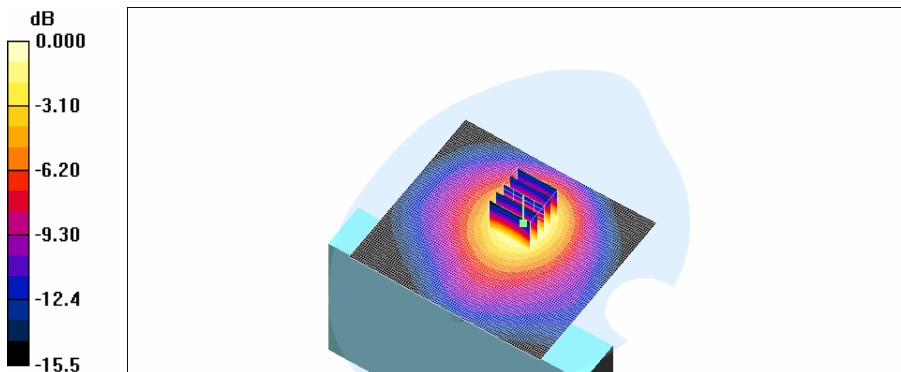**Body GSM1900 512/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.7 V/m; Power Drift = -0.145 dB
Peak SAR (extrapolated) = 0.253 W/kg
**SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.101 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.182 mW/g



0 dB = 0.182mW/g

| | |
|---|---|
| **Test Laboratory:** | HCT CO., LTD |
| **EUT Type:** | Fixed Wireless Phone |
| **Liquid Temperature:** | 21.1 ℃ |
| **Ambient Temperature:** | 21.3 ℃ |
| **Test Date:** | Nov.07, 2007 |

### DUT: PG110; Serial:#1
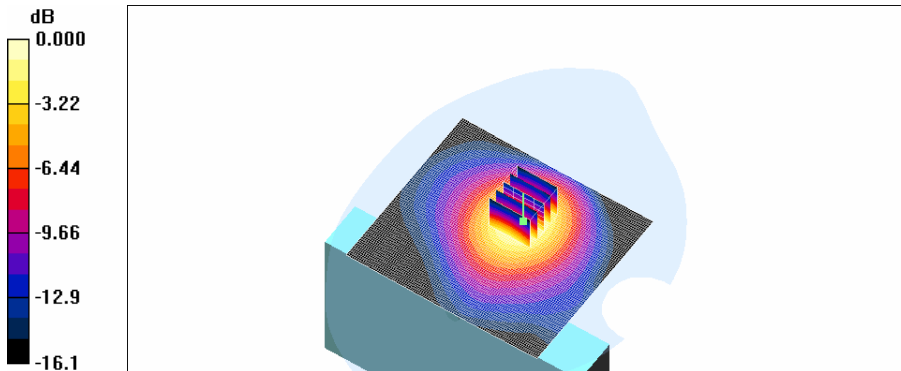
Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.54 mho/m; $\varepsilon_r$ = 52.1; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(4.74, 4.74, 4.74); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body GSM1900 661/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.129 mW/g

**Body GSM1900 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.87 V/m; Power Drift = -0.010 dB
Peak SAR (extrapolated) = 0.181 W/kg
**SAR(1 g) = 0.116 mW/g; SAR(10 g) = 0.069 mW/g**
Maximum value of SAR (measured) = 0.127 mW/g



0 dB = 0.127mW/g

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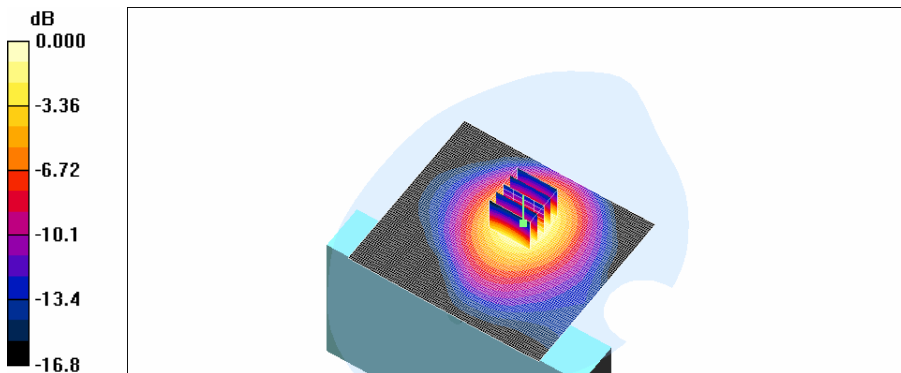| | |
|---|---|
| **Test Laboratory:** | HCT CO., LTD |
| **EUT Type:** | Fixed Wireless Phone |
| **Liquid Temperature:** | 21.1 ℃ |
| **Ambient Temperature:** | 21.3 ℃ |
| **Test Date:** | Nov.07, 2007 |

### DUT: PG110; Serial:#1

Communication System: GSM 1900; Frequency: 1909.8 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1910 MHz; σ = 1.57 mho/m; $\varepsilon_r$ = 52; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(4.74, 4.74, 4.74); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body GSM1900 810/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.089 mW/g

**Body GSM1900 810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.09 V/m; Power Drift = -0.043 dB
Peak SAR (extrapolated) = 0.127 W/kg
**SAR(1 g) = 0.081 mW/g; SAR(10 g) = 0.048 mW/g**
Maximum value of SAR (measured) = 0.088 mW/g



0 dB = 0.088mW/g

Test Laboratory:         HCT CO., LTD

EUT Type:               Fixed Wireless Phone

Liquid Temperature:     21.1 ℃

Ambient Temperature:    21.3 ℃

Test Date:              Nov.07, 2007

### DUT: PG110; Serial:#1

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.51 mho/m; $\varepsilon_r$ = 52.2; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(4.74, 4.74, 4.74); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM


**Body GSM1900 512/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.184 mW/g

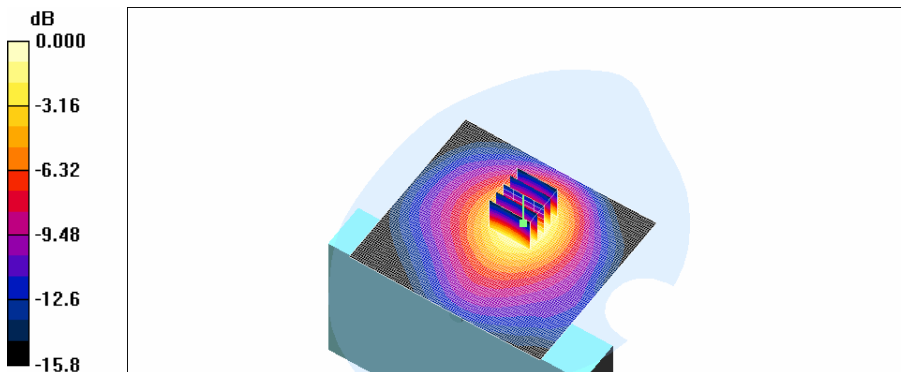**Body GSM1900 512/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.9 V/m; Power Drift = 0.005 dB
Peak SAR (extrapolated) = 0.259 W/kg
**SAR(1 g) = 0.169 mW/g; SAR(10 g) = 0.101 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.184 mW/g



0 dB = 0.184mW/g

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Test Laboratory:              HCT CO., LTD

EUT Type:                     Fixed Wireless Phone

Liquid Temperature:           21.1 ℃

Ambient Temperature:          21.3 ℃

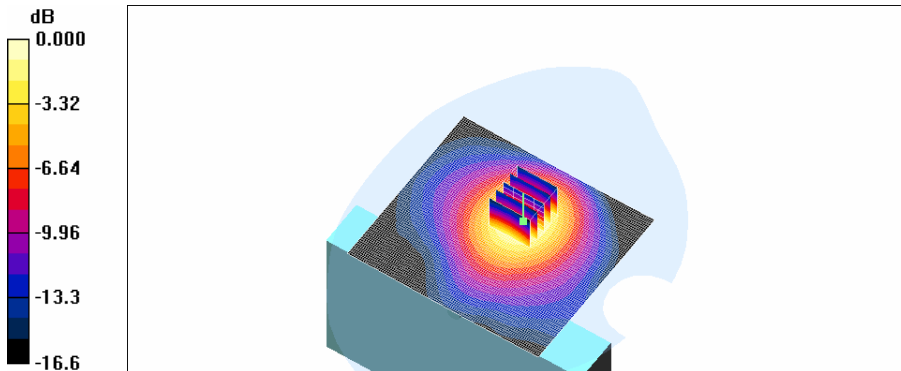Test Date:                    Nov.07, 2007

### DUT: PG110; Serial:#1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.54 mho/m; $\varepsilon_r$ = 52.1; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8
Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(4.74, 4.74, 4.74); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body GSM1900 661/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.126 mW/g

**Body GSM1900 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.88 V/m; Power Drift = -0.025 dB
Peak SAR (extrapolated) = 0.177 W/kg
**SAR(1 g) = 0.116 mW/g; SAR(10 g) = 0.069 mW/g**
Maximum value of SAR (measured) = 0.125 mW/g



0 dB = 0.125mW/g

Test Laboratory:              HCT CO., LTD

EUT Type:                     Fixed Wireless Phone

Liquid Temperature:           21.1 ℃

Ambient Temperature:          21.3 ℃

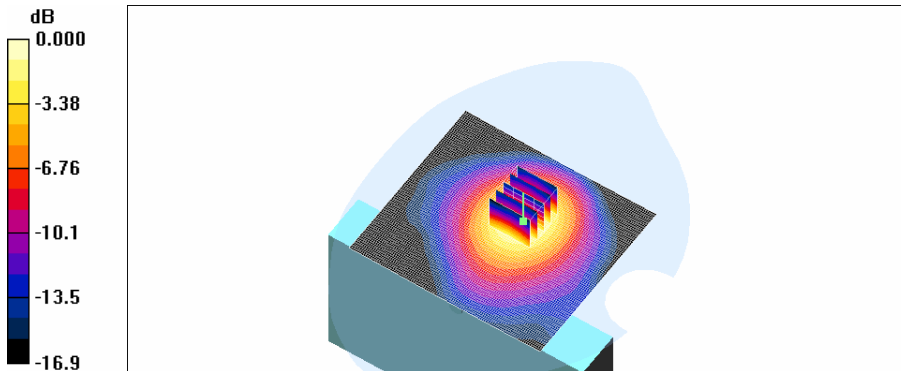Test Date:                    Nov.07, 2007

### DUT: PG110; Serial:#1

Communication System: GSM 1900; Frequency: 1909.8 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1910 MHz; σ = 1.57 mho/m; $\varepsilon_r$ = 52; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(4.74, 4.74, 4.74); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body GSM1900 810/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.095 mW/g

**Body GSM1900 810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.03 V/m; Power Drift = -0.072 dB
Peak SAR (extrapolated) = 0.134 W/kg
**SAR(1 g) = 0.086 mW/g; SAR(10 g) = 0.051 mW/g**
Maximum value of SAR (measured) = 0.093 mW/g



0 dB = 0.093mW/g

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Test Laboratory:              HCT CO., LTD
EUT Type:                     Fixed Wireless Phone
Liquid Temperature:           21.1 ℃
Ambient Temperature:          21.3 ℃
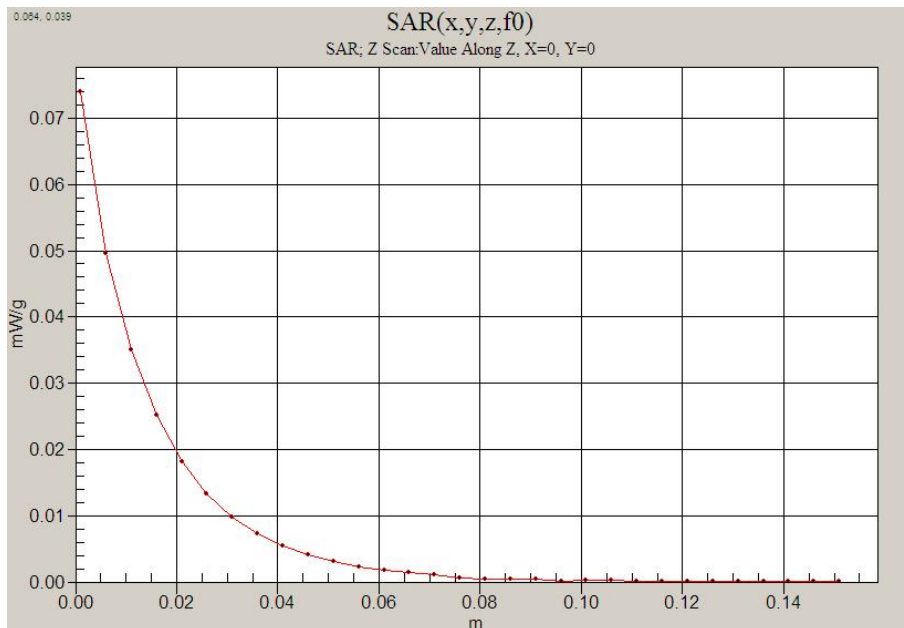Test Date:                    Nov.07, 2007

### DUT: PG110; Serial: #1

Communication System: GSM 850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 825 MHz; σ = 0.967 mho/m; $\varepsilon_r$ = 55; ρ = 1000 kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(6.49, 6.49, 6.49); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Body GSM850 128/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.077 mW/g

**Body GSM850 128/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.06 V/m; Power Drift = -0.100 dB
Peak SAR (extrapolated) = 0.108 W/kg
**SAR(1 g) = 0.073 mW/g; SAR(10 g) = 0.049 mW/g**
Maximum value of SAR (measured) = 0.078 mW/g



0 dB = 0.078mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Fixed Wireless Phone |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Nov.07, 2007 |

## DUT: PG110; Serial:#1

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 1850.2 MHz; $\sigma$ = 1.51 mho/m; $\varepsilon_r$ = 52.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(4.74, 4.74, 4.74); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body GSM1900 512/Area Scan (101x91x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.184 mW/g

**Body GSM1900 512/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
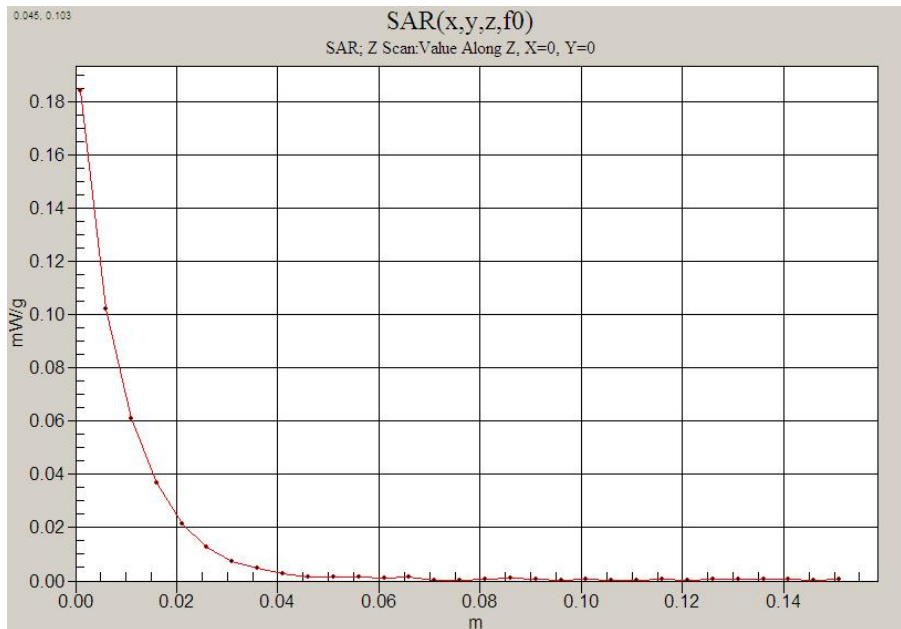Reference Value = 10.9 V/m; Power Drift = 0.005 dB
Peak SAR (extrapolated) = 0.259 W/kg
**SAR(1 g) = 0.169 mW/g; SAR(10 g) = 0.101 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.184 mW/g



0 dB = 0.184mW/g

# Attachment 2. – Dipole Validation Plots

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## ■ Validation Data (835 MHz Head)

Test Laboratory: HCT CO., LTD

Input Power 1W (30dBm)

Liquid Temp: 21.1 ℃

Test Date: Nov.07, 2007

**DUT: Dipole 835 MHz; Serial: D835V2 - SN:481**

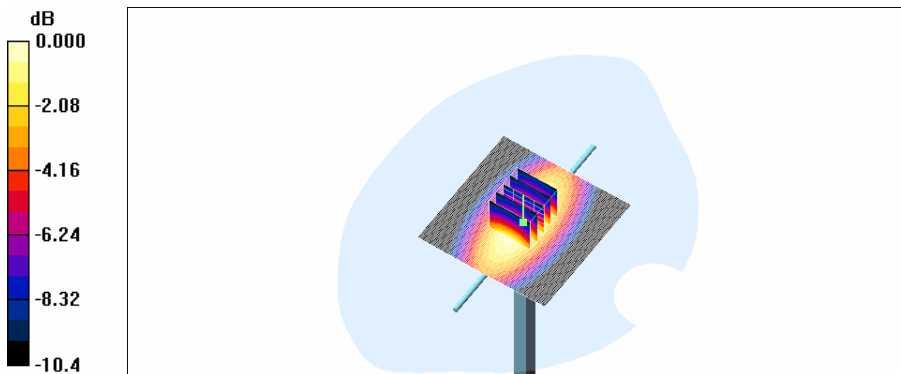Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.892 mho/m; $ε_r$ = 40.8; ρ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(6.81, 6.81, 6.81); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Validatoin 835 MHz/Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 10.1 mW/g

**Validatoin 835 MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 110.2 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 13.5 W/kg
**SAR(1 g) = 9.31 mW/g; SAR(10 g) = 6.12 mW/g**
Maximum value of SAR (measured) = 10.1 mW/g



0 dB = 10.1mW/g

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## ■ Validation Data (1900 MHz Head)

**Test Laboratory:**          HCT CO., LTD

**Input Power**               1W (30dBm)

**Liquid Temp:**              21.1 ℃

**Test Date:**                Nov.07, 2007

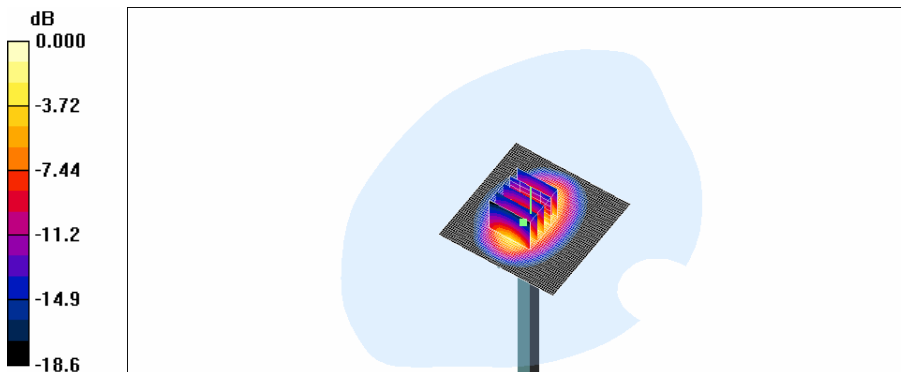**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d032**

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.41 mho/m; $\varepsilon_r$ = 39.4; ρ = 1000 kg/m$^3$ Phantom section: Flat
Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:
- Probe: ET3DV6 - SN1609; ConvF(5.36, 5.36, 5.36); Calibrated: 2007-08-30
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Validation 1900MHz/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 46.2 mW/g

**Validation 1900MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 185.3 V/m; Power Drift = -0.016 dB
Peak SAR (extrapolated) = 65.5 W/kg
**SAR(1 g) = 38.3 mW/g; SAR(10 g) = 20.3 mW/g**
Maximum value of SAR (measured) = 42.6 mW/g



0 dB = 42.6mW/g

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## ■ Dielectric Parameter (835 MHz Head)

Title             PG110
SubTitle          GSM850(Head)
Test Date         Nov.07, 2007

| Frequency | e' | e'' |
|-----------|--------|---------|
| 800000000 | 40.7837 | 19.2384 |
| 805000000 | 40.8031 | 19.2944 |
| 810000000 | 40.8089 | 19.2566 |
| 815000000 | 40.8545 | 19.2670 |
| 820000000 | 40.8471 | 19.2380 |
| 825000000 | 40.8623 | 19.2718 |
| 830000000 | 40.8458 | 19.2452 |
| 835000000 | 40.8195 | 19.2005 |
| 840000000 | 40.7498 | 19.2048 |
| 845000000 | 40.7374 | 19.1309 |
| 850000000 | 40.6018 | 19.1334 |
| 855000000 | 40.5347 | 19.1172 |
| 860000000 | 40.3589 | 19.1114 |
| 865000000 | 40.2797 | 19.0791 |
| 870000000 | 40.1607 | 19.0283 |
| 875000000 | 40.0051 | 19.0038 |
| 880000000 | 39.8945 | 18.9373 |
| 885000000 | 39.7516 | 18.9110 |
| 890000000 | 39.6439 | 18.8804 |
| 895000000 | 39.5564 | 18.8645 |
| 900000000 | 39.4668 | 18.8890 |

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