# SAR TEST REPORT

**HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.**

**FCC Class II Permissive Change**

| | | | |
|---|---|---|---|
| EUT Type: | Dual-Band CDMA Phone with Bluetooth | | |
| FCC ID: | PP4L1 | | |
| Model: | L1 | Trade Name | PANTECH&CURITEL |
| Date of Issue: | July 4, 2007 | | |
| Test report No.: | HCT-SAR07-0701 | | |
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES 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 : | PANTECH&CURITEL COMMUNICATIONS, INC.<br>110-1, ONGJEONG-RI, TONGJIN-EUP, GIMPO-SI, GYOUNGGI-DO, 415-865, KOREA<br>Tel: +82-31-999-8801 Fax: +82-31-984-9771<br>E-Mail: leekiyeoul@pantech.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 | Ki Soo Kim<br>Report prepared by: Ki-Soo Kim<br>Manager of Product Compliance Team | | |

# Table of Contents

# 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. [1]

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. (c) 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017.[2] The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave[3] 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 (c) NCRP, 1986, Bethesda, MD 20814.[4] 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 .

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

**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.[4]

# 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 | Dual-Band CDMA Phone with Bluetooth |
| FCC ID | PP4L1 |
| Model(s) | L1 |
| Trade Name | PANTECH&CURITEL |
| Serial Number(s) | PP4L1 #1 |
| Application Type | Permissive Change Class II |
| Change of Contents | Antenna has been changed |
| Modulation(s) | CDMA835/PCS1900 |
| Tx Frequency | 824.70 - 848.31 MHz (CDMA)<br>1851.25 - 1908.75 MHz (PCS CDMA)<br>2402 - 2480 MHz (Bluetooth) |
| Rx Frequency | 869.70 - 893.31 MHz (CDMA)<br>1931.25 - 1988.75 MHz (PCS CDMA)<br>2402 - 2480 MHz (Bluetooth) |
| FCC Classification | Licensed Portable Transmitter Held to Ear (PCE) |
| Production Unit or Identical Prototype | Prototype |
| Max SAR | 1.36 W/kg CDMA835 Head SAR / 0.466 W/kg CDMA835 Body SAR<br>0.888 W/kg PCS1900 Head SAR / 0.490 W/kg PCS1900 Body SAR |
| Date(s) of Tests | July. 2, 2007 ~ July. 3, 2007 |
| Antenna | Intenna |
| This device does not transmit with flip cover closed. | |

# 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 4 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.

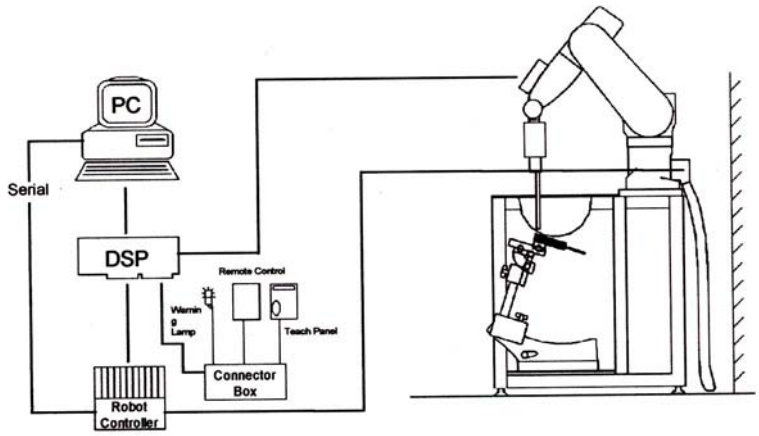



Figure 3.1 HCT SAR Lab. Test Measurement Set-up

The DAE3 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 [5].

# 3.2 DASY E-FIELD PROBE SYSTEM

## 3.2.1 ET3DV6 Probe Specification

| | |
|---|---|
| Construction | Symmetrical design with triangular core<br>Built-in optical fiber for surface detection System<br>Built-in shielding against static charges |
| Calibration | In air from 10 MHz to 2.5 GHz<br>In brain and muscle simulating tissue at<br>Frequencies of 450 MHz, 900 MHz and<br>1.8 GHz (accuracy. :8%) |
| Frequency | 10 MHz to > 6 GHz; Linearity: . 0.2 dB<br>(30 MHz to 3 GHz) |
| Directivity | 0.2 dB in brain tissue (rotation around probe axis)<br>0.4 dB in brain tissue (rotation normal probe axis) |
| Dynamic | 5 uW/g to > 100 mW/g; |
| Range Linearity: | 0.2 dB |
| Surface Detection | 0.2 mm repeatability in air and clear liquids<br>over diffuse reflecting surfaces. |
| Dimensions | Overall length: 330 mm<br>Tip length: 16 mm<br>Body diameter: 12 mm<br>Tip diameter: 6.8 mm<br>Distance from probe tip to dipole centers: 2.7 mm |
| Application | General dissymmetry up to 3 GHz<br>Compliance tests of mobile phones<br>Fast automatic scanning in arbitrary phantoms |

Figure 3.2 Photograph of the probe and the Phantom

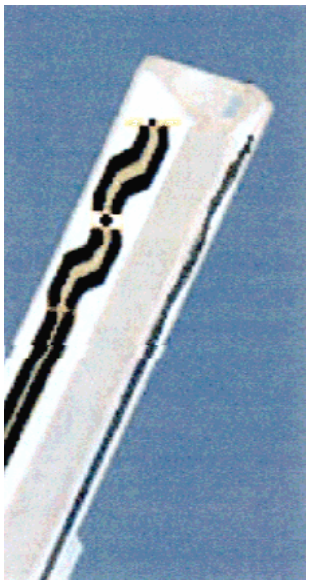


Figure 3.3 ET3DV6 E-field Probe

The SAR measurements were conducted with the dosimetric probe ET3DV6, designed in the classical triangular configuration [5] 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 mortifier 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 2 nd order fitting. The approach is stopped at reaching the maximum.

# 3.3 PROBE CALIBRATION PROCESS

## 3.3.1 E-Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure described in [6] with an accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in [7] and found to be better than +/-0.25dB. 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/cm$^3$ for brain tissue)

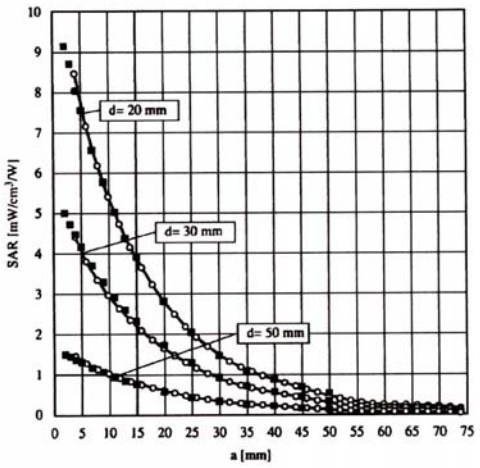



Figure 3.4 E-Field and Temperature measurements at 900MHz[5]

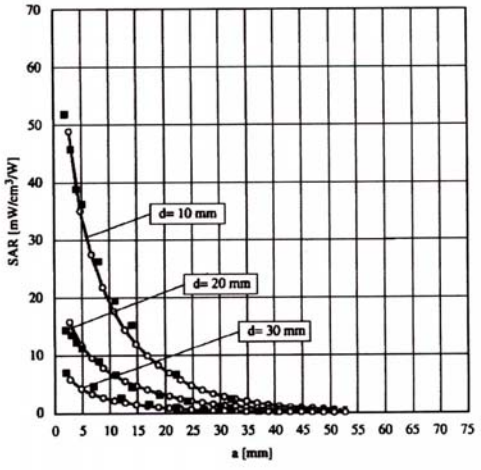



Figure 3.5 E-Field and temperature measurements at 1.8GHz [5]

## 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 as [8]:

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

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 $g/cm^3$

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 $W/cm^2$
$E_{tot}$ = total electric field strength in V/m

## 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 [9][10]. 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.

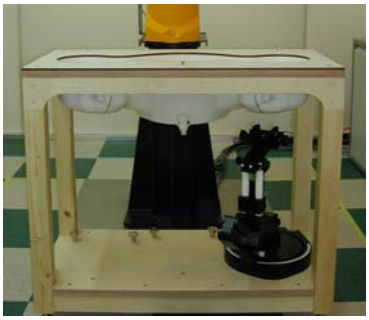


Figure 3.6 SAM Phantom

| | |
|---|---|
| **Shell Thickness** | **2.0 mm** |
| Filling Volume | Volume Approx. 30 liters |
| Dimensions | 810 x 1000 x 500 mm (H x L x W) |

## 3.5 Device Holder for Transmitters

In combination with the SAM Phantom V4.0, 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 [10]. To produce the Worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Fig. 3.7 Device Holder

# 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 [11].

| 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**

# 3.7 SAR TEST EQUIPMENT

| Manufactur | Type / Model | S/N | Calib. Date | Calib.Interv | Calib.Due |
|---|---|---|---|---|---|
| SPEAG | SAM Phantom | - | N/A | N/A | N/A |
| Staubli | Robot RX90L | F01/5K09A1/A/0 | N/A | N/A | N/A |
| Staubli | Robot ControllerCS7MB | F99/5A82A1/C/0 | 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 | DAE3V1 | 446 | Nov.15, 2006 | Annual | Nov.15, 2007 |
| SPEAG | E-Field Probe ET3DV6 | 1798 | Aug.25, 2006 | Annual | Aug.25, 2007 |
| 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 | 441 | Aug.14, 2006 | Annual | Aug.14, 2007 |
| SPEAG | Validation Dipole D900V2 | 121 | Feb.19, 2007 | Annual | Feb.19, 2008 |
| SPEAG | Validation Dipole D1800V2 | 2d007 | Aug.16, 2006 | Annual | Aug.16, 2007 |
| 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.08, 2006 | Annual | Nov.08, 2007 |
| 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.09, 2006 | Annual | Nov.09, 2007 |
| 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.

# 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 3.9mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20mm x 20mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

3. Around this point, a volume of 32mm x 32mm x 34mm 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 2.7mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. The extrapolation was based on a least square algorithm [13]. 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 (1g or 10g) 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) [13][14]. 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.

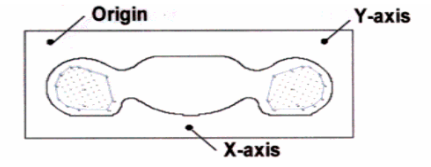



Fig. 4.1 SAR Measurement Point in Area Scan

# 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 SC-2 P1528 illustration below.

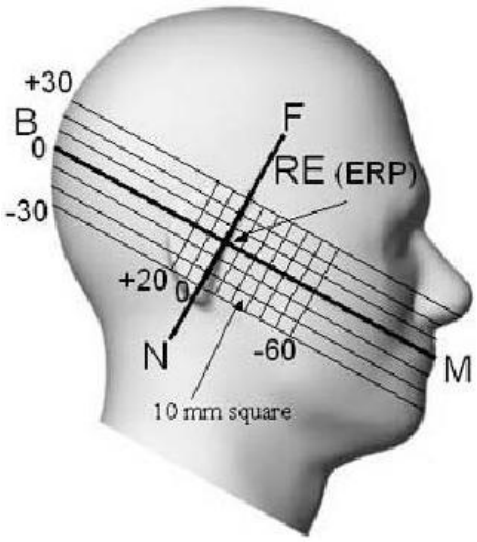



Figure 5.1 Side view of the phantom

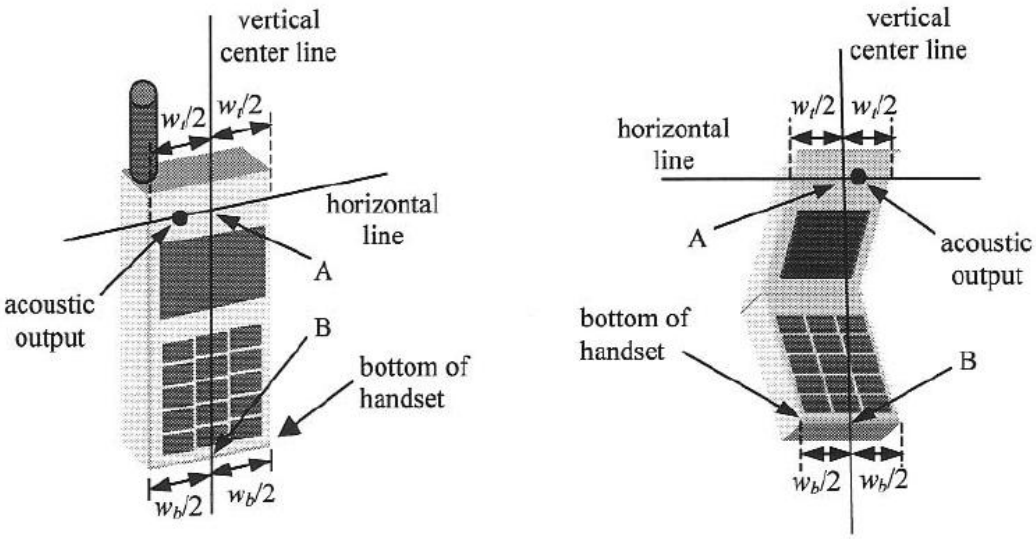



Figure 5.2 Handset vertical and horizontal reference lines

## 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 % [16].

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 ± 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 ± 2dB can be expected.[3]

According to CENELEC [17], typical worst-case uncertainty of field measurements is 5 dB. For well-defined modulation characteristics the uncertainty can be reduced to ± 3 dB.

| Error Description | Uncertainty value [%] | Probability Distribution | Divisor | ci | ci^2 | Standard Uncertainty [%] | Stand Uncert^2 | (Stand Uncert^2) X (ci^2) | Vi & Veff |
|---|---|---|---|---|---|---|---|---|---|
| 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**

# 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).

# 8. SYSTEM VERIFICATION

## 8.1 Tissue Verification

| Freq. [MHz] | Date | Liquid | Liquid Temp[°C] | Parameters | Target Value | Measured Value | Deviation [%] | Limit [%] |
|---|---|---|---|---|---|---|---|---|
| 835 | July 2, 2007 | Head | 22.6 | ε r | 41.5 | 39.9 | - 3.86 | ± 5 |
| | | | | σ | 0.90 | 0.874 | - 2.89 | ± 5 |
| 835 | July 2, 2007 | Body | 22.6 | ε r | 55.2 | 54.8 | - 0.72 | ± 5 |
| | | | | σ | 0.97 | 0.98 | + 1.03 | ± 5 |
| 1900 | July 3, 2007 | Head | 22.5 | ε r | 40.0 | 39.1 | - 2.25 | ± 5 |
| | | | | σ | 1.40 | 1.44 | + 2.86 | ± 5 |
| 1900 | July 3, 2007 | Body | 22.5 | 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/1900 MHz by using the system validation kit. (Graphic Plots Attached)

| Freq. [MHz] | Date | Liquid | Liquid Temp [°C] | SAR Average | Target Value (SPEAG) (mW/g) | Measured Value (mW/g) | Deviation [%] | Limit [%] |
|---|---|---|---|---|---|---|---|---|
| 835 MHz | July 2, 2007 | Head | 22.6 | 1 g | 9.51 | 9.72 | + 2.21 | ± 10 |
| 1900 MHz | July 3, 2007 | Head | 22.5 | 1 g | 37.2 | 38.2 | + 2.69 | ± 10 |

* Input Power: 1 W

# 9. 3G MEASUREMENT PROCEDURES

## 9.1 Procedures Used To Establish Test Signal

The handset was placed into a simulated call using a base station simulator in a shielded chamber. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR. SAR measurements were taken with a fully charged battery. In order to verify that the device was tested and maintained at full power, this was configured with the base station simulator. The SAR measurement software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more then 5% occurred, the tests were repeated.

## 9.2 SAR Measurement Conditions for CDMA2000 1x

These procedures were followed according to FCC "SAR Measurement Procedures for 3G Devices", May 2006.

### 9.2.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by "SAR Measurement Procedures for 3G Devices", May 2006. Maximum output power is verified on the High, Middle and Low channels according to procedures defined in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in “All Up” condition.

1. If the mobile station supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1 (Table 4) parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH0 and demodulation of RC 3, 4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH0 data rate Channel and 9600 bps SCH0 data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2(Table 5) was applied.
5. FCHs were configured at full rate for maximum SAR with “All Up” power control bits.

Parameters for Max. Power for RC1

| Parameter | Units | Value |
|---|---|---|
| $\hat{I}_{or}$ | dBm/1.23 MHz | -104 |
| $\frac{\text{Pilot } E_c}{I_{or}}$ | dB | -7 |
| $\frac{\text{Traffic } E_c}{I_{or}}$ | dB | -7.4 |

Table. 9.1

Parameters for Max. Power for RC3

| Parameter | Units | Value |
|---|---|---|
| $\hat{I}_{or}$ | dBm/1.23 MHz | -86 |
| $\frac{\text{Pilot } E_c}{I_{or}}$ | dB | -7 |
| $\frac{\text{Traffic } E_c}{I_{or}}$ | dB | -7.4 |

Table. 9.2

### 9.2.2 Head SAR Measurement

SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

## 9.2.3 Body SAR Measurement

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCHn) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCHn) with FCH at full rate and SCH0 enabled at 9600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts.

Body SAR in RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

## 9.2.4 Handsets with EV-DO

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev. 0 is less than ¼ dB higher than that measured in RC3 (1x RTT), body SAR for Ev-Do is not required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at 153.6 kbps using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev. A is not required when the maximum average output of each channel is less than that measured in Rev. 0 or less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev. A using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots should be configured in the downlink for both Rev. 0 and Rev. A.

### Average Output Power Measurement for FCC ID: PP4L1

| Band | Channel | SO2 | SO2 | SO55 | SO55 | TDSO | 1xEvDO | 1xEvDO |
|---|---|---|---|---|---|---|---|---|
| | | RC1/1 | RC3/3 | RC1/1 | RC3/3 | RC3/3 | (FTAP) | (RTAP) |
| CDMA | 1013 | 24.98 | 24.99 | 24.96 | 25.01 | 25.02 | - | - |
| | 384 | 24.97 | 24.99 | 25.01 | 24.99 | 25.00 | - | - |
| | 777 | 24.97 | 24.96 | 24.98 | 25.02 | 24.99 | - | - |
| PCS | 25 | 24.99 | 24.99 | 24.97 | 25.00 | 25.03 | - | - |
| | 600 | 24.95 | 24.96 | 24.99 | 24.99 | 25.01 | - | - |
| | 1175 | 24.95 | 25.01 | 25.00 | 25.01 | 25.01 | - | - |

# 10. SAR TEST DATA SUMMARY

## 10.1 Measurement Results (CDMA835 Head SAR Touch)

| Frequency | | Modulation | Conducted Power (dBm) | | Battery | Phantom Position | Ant. Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|---|
| MHz | Channel. | | Begin | End | | | | |
| 824.70 | 1013 (Low) | CDMA835 | 25.01 | 24.92 | Standard | Left Ear | Intenna | 0.530 |
| 836.52 | 384 (Mid) | CDMA835 | 24.99 | 24.82 | Standard | Left Ear | Intenna | 0.558 |
| 848.31 | 777 (High) | CDMA835 | 25.02 | 25.12 | Standard | Left Ear | Intenna | 0.729 |
| 824.70 | 1013 (Low) | CDMA835 | 25.01 | 24.86 | Standard | Right Ear | Intenna | 0.966 |
| 836.52 | 384 (Mid) | CDMA835 | 24.99 | 25.02 | Standard | Right Ear | Intenna | 1.01 |
| 848.31 | 777 (High) | CDMA835 | 25.02 | 25.03 | Standard | Right Ear | Intenna | 1.36 |
| 848.31 | 777 (High) | CDMA835 | 25.02 | 24.97 | Standard | Right Ear | Intenna | *1.32 |
| **ANSI/ IEEE C95.1 2005 – Safety Limit<br>Spatial Peak<br>Uncontrolled Exposure/ General Population** | | | | | | **Head<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 ± 0.2cm.
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
7 Head SAR was tested under RC3/SO55.
8 Highest SAR value measurement in this band repeated with *Bluetooth.

# 10.2 Measurement Results (CDMA835 Head SAR Tilt)

| Frequency | | Modulation | Conducted Power (dBm) | | Battery | Phantom Position | Ant. Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|---|
| MHz | Channel. | | Begin | End | | | | |
| 836.52 | 384 (Mid) | CDMA835 | 24.99 | 25.07 | Standard | Left Tilt 15° | Intenna | 0.172 |
| 836.52 | 384 (Mid) | CDMA835 | 24.99 | 25.03 | Standard | Right Tilt 15° | Intenna | 0.169 |
| **ANSI/ IEEE C95.1 2005 – Safety Limit<br>Spatial Peak<br>Uncontrolled Exposure/ General Population** | | | | | | **Head<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 ± 0.2cm.
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
7 Head SAR was tested under RC3/SO55.
8 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

# 10.3 Measurement Results (PCS1900 Head SAR Touch)

| Frequency | | Modulation | Conducted Power (dBm) | | Battery | Phantom Position | Ant. Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|---|
| MHz | Channel. | | Begin | End | | | | |
| 1851.25 | 25 (Low) | PCS1900 | 25.00 | 24.80 | Standard | Left Ear | Intenna | 0.407 |
| 1880.00 | 600 (Mid) | PCS1900 | 24.99 | 24.81 | Standard | Left Ear | Intenna | 0.558 |
| 1908.75 | 1175 (High) | PCS1900 | 25.01 | 24.96 | Standard | Left Ear | Intenna | 0.768 |
| 1851.25 | 25 (Low) | PCS1900 | 25.00 | 25.01 | Standard | Right Ear | Intenna | 0.459 |
| 1880.00 | 600 (Mid) | PCS1900 | 24.99 | 24.82 | Standard | Right Ear | Intenna | 0.697 |
| 1908.75 | 1175 (High) | PCS1900 | 25.01 | 25.16 | Standard | Right Ear | Intenna | 0.888 |
| 1908.75 | 1175 (High) | PCS1900 | 25.01 | 24.92 | Standard | Right Ear | Intenna | *0.869 |
| **ANSI/ IEEE C95.1 2005 – Safety Limit<br>Spatial Peak<br>Uncontrolled Exposure/ General Population** | | | | | | **Head<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 ± 0.2cm.
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
7 Head SAR was tested under RC3/SO55.
8 Highest SAR value measurement in this band repeated with *Bluetooth.

# 10.4 Measurement Results (PCS1900 Head SAR Tilt)

| Frequency | | Modulation | Conducted Power (dBm) | | Battery | Phantom Position | Ant. Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|---|
| MHz | Channel. | | Begin | End | | | | |
| 1880.00 | 600 (Mid) | PCS1900 | 24.99 | 25.07 | Standard | Left Tilt 15° | Intenna | 0.087 |
| 1880.00 | 600 (Mid) | PCS1900 | 24.99 | 24.94 | Standard | Right Tilt 15° | Intenna | 0.067 |
| **ANSI/ IEEE C95.1 2005 – Safety Limit<br>Spatial Peak<br>Uncontrolled Exposure/ General Population** | | | | | | **Head<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 ± 0.2cm.
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
7 Head SAR was tested under RC3/SO55.
8 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

# 10.5 Measurement Results (CDMA835 Body SAR)

| Frequency | | Modulation | Conducted Power (dBm) | | Battery | Phantom Position | Ant. Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|---|
| MHz | Channel. | | Begin | End | | | | |
| 836.52 | 384 (Mid) | CDMA835 | 25.00 | 25.05 | Standard | 2.0 cm without Holster | Intenna | 0.466 |
| 836.52 | 384 (Mid) | CDMA835 | 25.00 | 24.84 | Standard | 2.0 cm without Holster | Intenna | *0.456 |
| 836.52 | 384 (Mid) | CDMA835 | 25.00 | 24.86 | Standard | 2.0 cm without Holster | Intenna | **0.285 |
| **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 ± 0.2cm.
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
7 Both side of the phone were tested and the worst-case side is reported.
8 HEADSET was connected.
9 Test Configuration ☐ With Holster ☒ Without Holster
10 Body SAR was tested under RC3/SO32.
11 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
Highest SAR value measurement in this band repeated with *Bluetooth/**Front.

# 10.6 Measurement Results (PCS1900 Body SAR)

| Frequency | | Modulation | Conducted Power (dBm) | | Battery | Phantom Position | Ant. Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|---|
| MHz | Channel. | | Begin | End | | | | |
| 1880.00 | 600 (Mid) | PCS1900 | 25.01 | 25.03 | Standard | 2.0 cm without Holster | Intenna | 0.490 |
| 1880.00 | 600 (Mid) | PCS1900 | 25.01 | 25.02 | Standard | 2.0 cm without Holster | Intenna | *0.472 |
| 1880.00 | 600 (Mid) | PCS1900 | 25.01 | 24.99 | Standard | 2.0 cm without Holster | Intenna | **0.208 |
| **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 ± 0.2cm.
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
7 Both side of the phone were tested and the worst-case side is reported.
8 HEADSET was connected.
9 Test Configuration ☐ With Holster ☒ Without Holster
10 Body SAR was tested under RC3/SO32.
11 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
Highest SAR value measurement in this band repeated with *Bluetooth/**Front.

# 11. 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.

# 12.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.

# Attachment 1. – SAR Test Plots

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

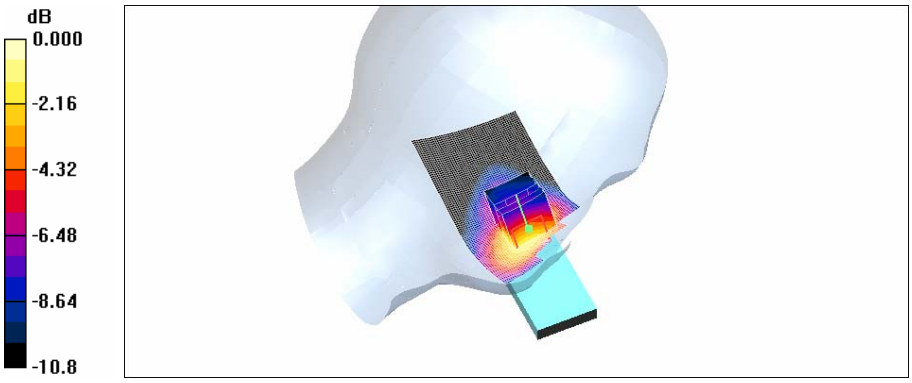
**DUT: L1; Type: Folder; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium parameters used: f = 825 MHz; $\sigma$ = 0.867 mho/m; $\varepsilon_r$ = 40; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Left touch 1013/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.527 mW/g

**Left touch 1013/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.4 V/m; Power Drift = -0.095 dB
Peak SAR (extrapolated) = 1.09 W/kg
**SAR(1 g) = 0.530 mW/g; SAR(10 g) = 0.346 mW/g**
aximum value of SAR (measured) = 0.547 mW/g




0 dB = 0.547mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; $\sigma$ = 0.876 mho/m; $\varepsilon_r$ = 39.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

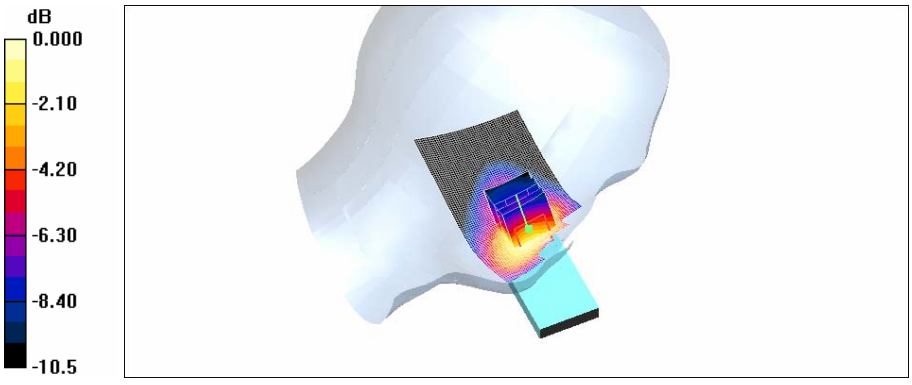
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Left touch 384/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.626 mW/g

**Left touch 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.4 V/m; Power Drift = -0.175 dB
Peak SAR (extrapolated) = 1.01 W/kg
**SAR(1 g) = 0.558 mW/g; SAR(10 g) = 0.372 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
aximum value of SAR (measured) = 0.588 mW/g




0 dB = 0.588mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 848.31 MHz; $\sigma$ = 0.885 mho/m; $\varepsilon_r$ = 39.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

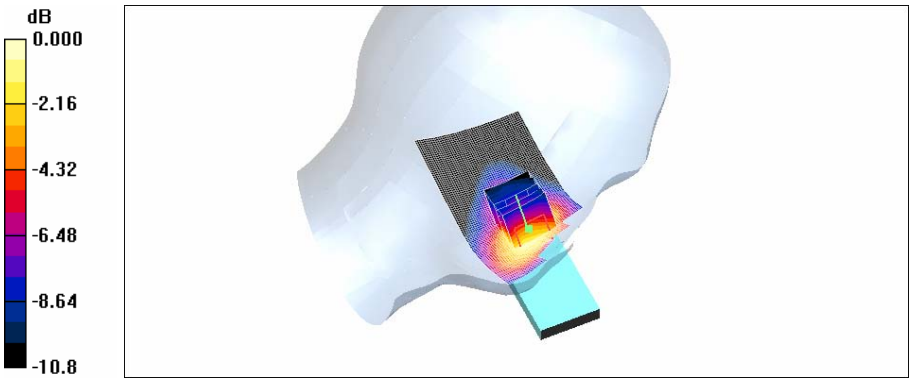
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Left touch 777/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.868 mW/g

**Left touch 777/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.6 V/m; Power Drift = 0.098 dB
Peak SAR (extrapolated) = 1.15 W/kg
**SAR(1 g) = 0.729 mW/g; SAR(10 g) = 0.490 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
aximum value of SAR (measured) = 0.824 mW/g




0 dB = 0.824mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

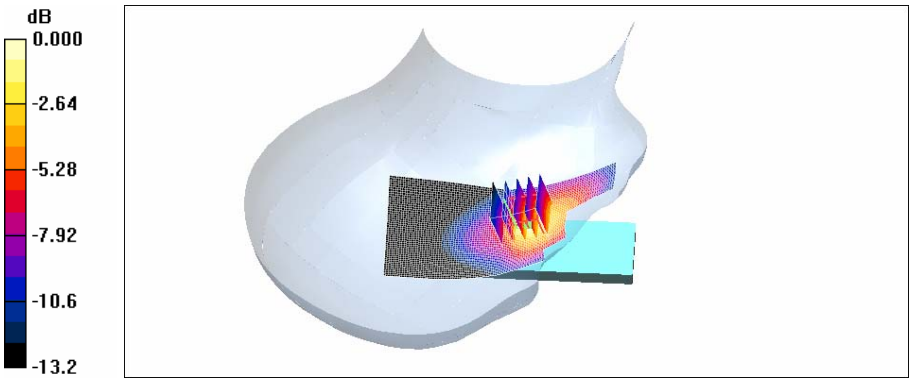
**DUT: L1; Type: Folder; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium parameters used: f = 825 MHz; $\sigma$ = 0.867 mho/m; $\varepsilon_r$ = 40; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 1013/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.991 mW/g

**Right touch 1013/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.6 V/m; Power Drift = -0.151 dB
Peak SAR (extrapolated) = 2.58 W/kg
**SAR(1 g) = 0.966 mW/g; SAR(10 g) = 0.496 mW/g**
Maximum value of SAR (measured) = 1.03 mW/g




0 dB = 1.03mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; $\sigma$ = 0.876 mho/m; $\varepsilon_r$ = 39.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

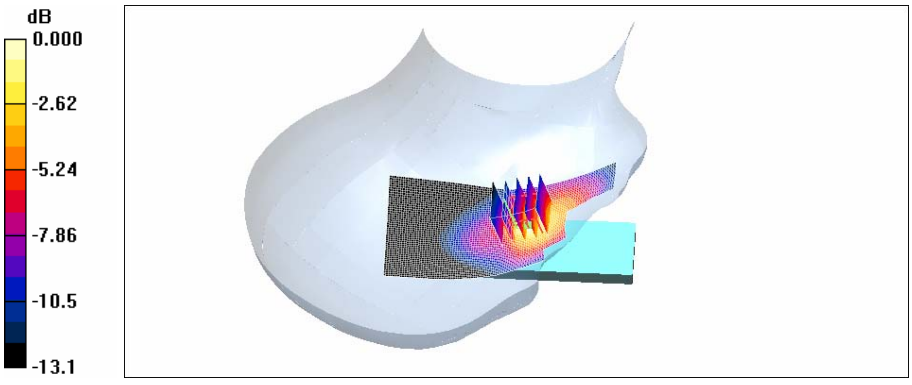
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 384/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.04 mW/g

**Right touch 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.7 V/m; Power Drift = 0.030 dB
Peak SAR (extrapolated) = 3.03 W/kg
**SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.499 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.03 mW/g




0 dB = 1.03mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 848.31 MHz; $\sigma$ = 0.885 mho/m; $\varepsilon_r$ = 39.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

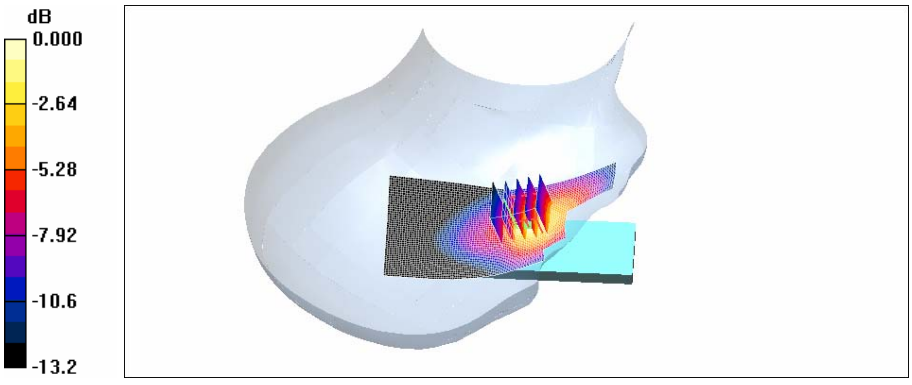
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 777/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.41 mW/g

**Right touch 777/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.7 V/m; Power Drift = 0.006 dB
Peak SAR (extrapolated) = 3.80 W/kg
**SAR(1 g) = 1.36 mW/g; SAR(10 g) = 0.681 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.39 mW/g




0 dB = 1.39mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |
| Option | Bluetooth |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 848.31 MHz; $\sigma$ = 0.885 mho/m; $\varepsilon_r$ = 39.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

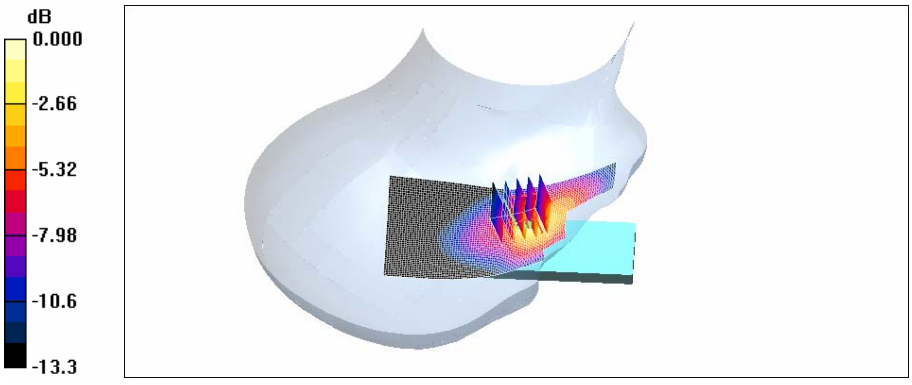
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 777/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.29 mW/g

**Right touch 777/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.6 V/m; Power Drift = -0.053 dB
Peak SAR (extrapolated) = 3.62 W/kg
**SAR(1 g) = 1.32 mW/g; SAR(10 g) = 0.664 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.40 mW/g




0 dB = 1.40mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; $\sigma$ = 0.876 mho/m; $\varepsilon_r$ = 39.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

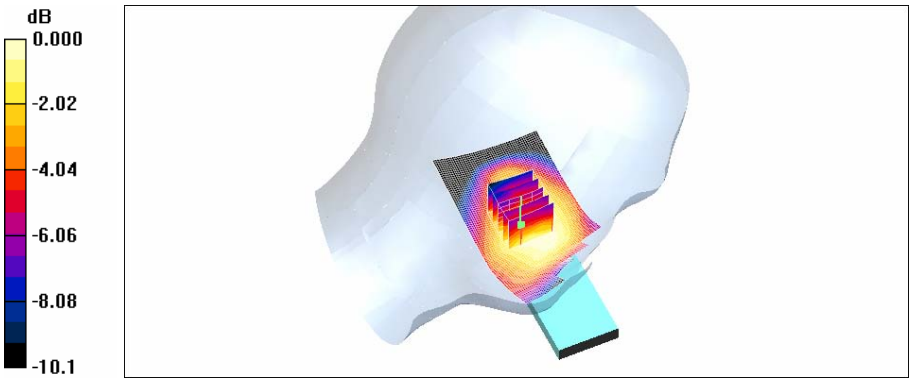
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Left tilt 384/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.183 mW/g

**Left tilt 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.2 V/m; Power Drift = 0.084 dB
Peak SAR (extrapolated) = 0.258 W/kg
**SAR(1 g) = 0.172 mW/g; SAR(10 g) = 0.125 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.183 mW/g




0 dB = 0.183mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; $\sigma$ = 0.876 mho/m; $\varepsilon_r$ = 39.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

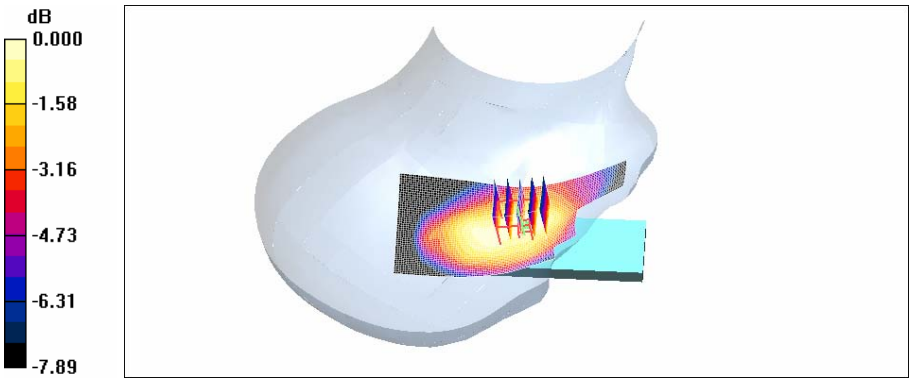
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Right tilt 384/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.188 mW/g

**Right tilt 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.3 V/m; Power Drift = 0.037 dB
Peak SAR (extrapolated) = 0.250 W/kg
**SAR(1 g) = 0.169 mW/g; SAR(10 g) = 0.123 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.181 mW/g




0 dB = 0.181mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: PCS 1900; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1851.25 MHz; $\sigma$ = 1.41 mho/m; $\varepsilon_r$ = 39.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

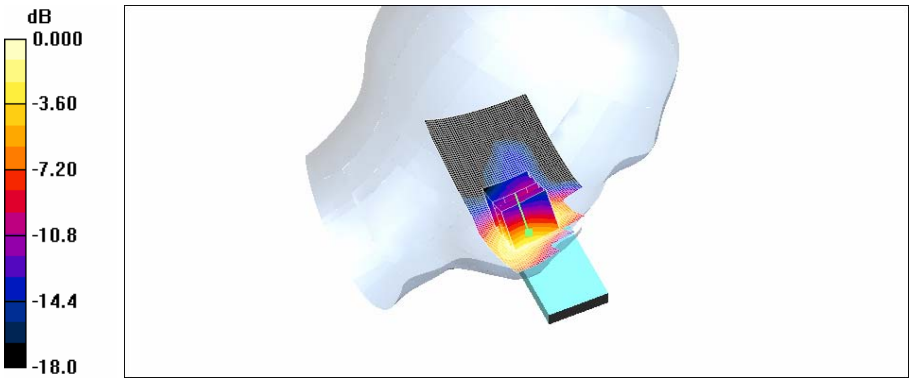
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left touch 25/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.432 mW/g

**Left touch 25/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.34 V/m; Power Drift = -0.198 dB
Peak SAR (extrapolated) = 0.655 W/kg
**SAR(1 g) = 0.407 mW/g; SAR(10 g) = 0.244 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.435 mW/g




0 dB = 0.435mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

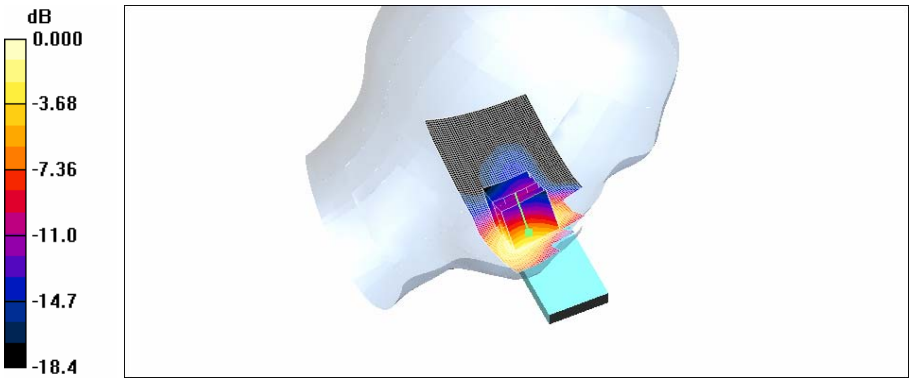
**DUT: L1; Type: Folder; Serial: #1**

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.42 mho/m; $\varepsilon_r$ = 39.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left touch 600/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.616 mW/g

**Left touch 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.10 V/m; Power Drift = -0.182 dB
Peak SAR (extrapolated) = 0.948 W/kg
**SAR(1 g) = 0.558 mW/g; SAR(10 g) = 0.326 mW/g**
Maximum value of SAR (measured) = 0.599 mW/g




0 dB = 0.599mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: PCS 1900; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1908.75 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 38.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

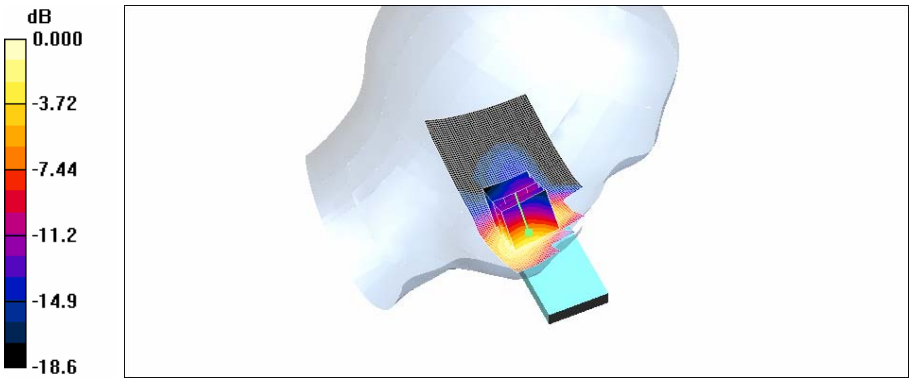
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left touch 1175/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.830 mW/g

**Left touch 1175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.4 V/m; Power Drift = -0.045 dB
Peak SAR (extrapolated) = 1.36 W/kg
**SAR(1 g) = 0.768 mW/g; SAR(10 g) = 0.443 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.808 mW/g




0 dB = 0.808mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

**DUT: L1; Type: Folder; Serial: #1**
**Program Name: L1**

Communication System: PCS 1900; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1851.25 MHz; $\sigma$ = 1.41 mho/m; $\varepsilon_r$ = 39.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

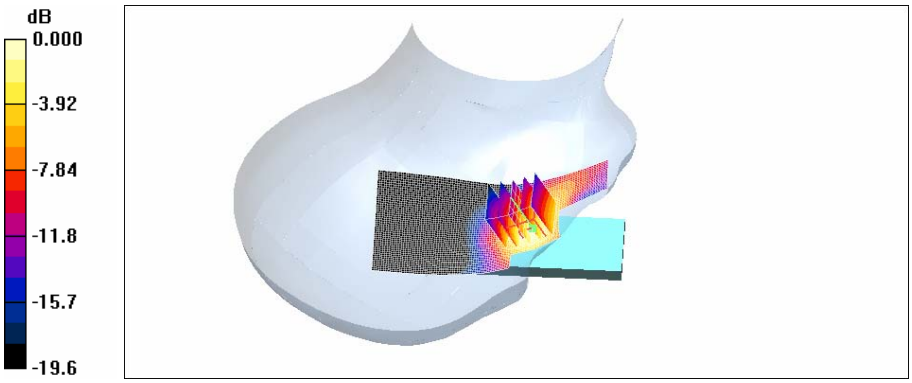
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 25/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.495 mW/g

**Right touch 25/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.09 V/m; Power Drift = 0.012 dB
Peak SAR (extrapolated) = 0.664 W/kg
**SAR(1 g) = 0.459 mW/g; SAR(10 g) = 0.269 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.510 mW/g




0 dB = 0.510mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

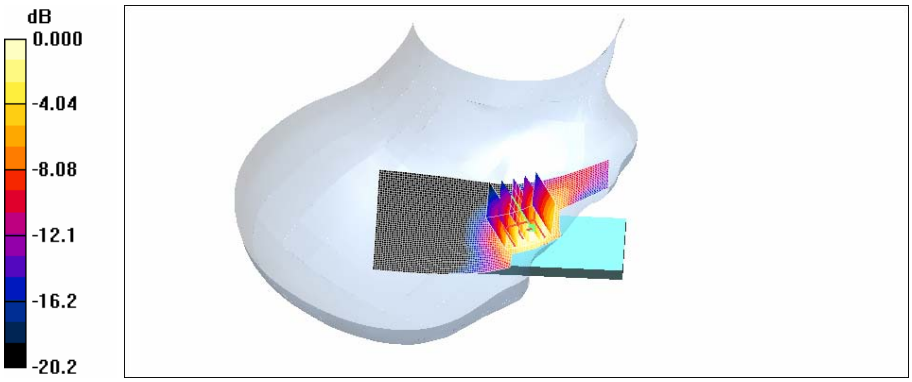
**DUT: L1; Type: Folder; Serial: #1**

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.42 mho/m; $\varepsilon_r$ = 39.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 600/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.787 mW/g

**Right touch 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.1 V/m; Power Drift = -0.171 dB
Peak SAR (extrapolated) = 1.04 W/kg
**SAR(1 g) = 0.697 mW/g; SAR(10 g) = 0.398 mW/g**
Maximum value of SAR (measured) = 0.771 mW/g




0 dB = 0.771mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: PCS 1900; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1908.75 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 38.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

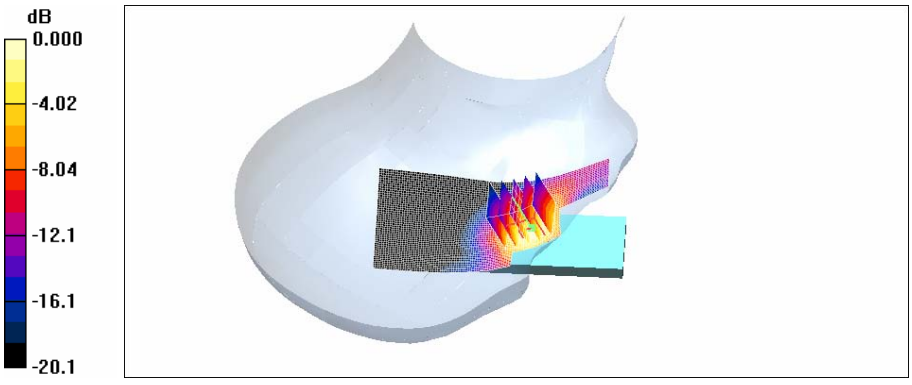
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 1175/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.959 mW/g

**Right touch 1175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.9 V/m; Power Drift = 0.145 dB
Peak SAR (extrapolated) = 1.34 W/kg
**SAR(1 g) = 0.888 mW/g; SAR(10 g) = 0.498 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.997 mW/g




0 dB = 0.997mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |
| Option | Bluetooth |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: PCS 1900; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1908.75 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 38.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

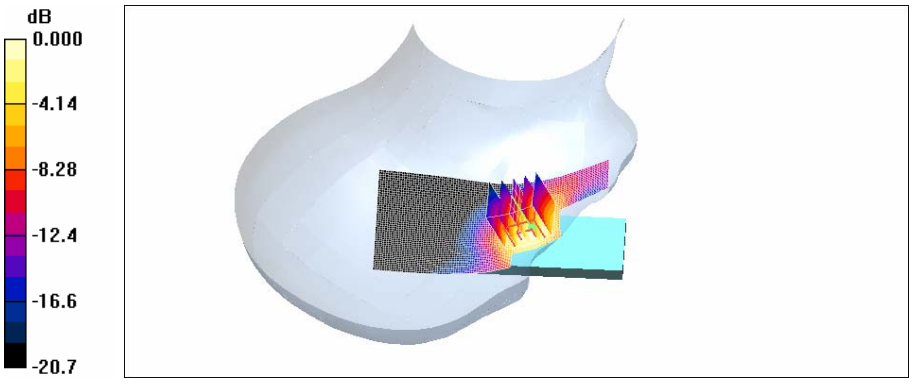
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 1175/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.958 mW/g

**Right touch 1175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.1 V/m; Power Drift = -0.088 dB
Peak SAR (extrapolated) = 1.32 W/kg
**SAR(1 g) = 0.869 mW/g; SAR(10 g) = 0.487 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.955 mW/g




0 dB = 0.955mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

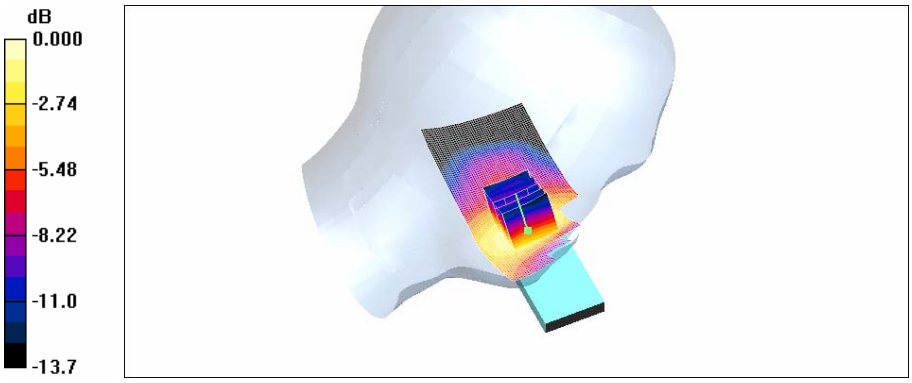
**DUT: L1; Type: Folder; Serial: #1**

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.42 mho/m; $\varepsilon_r$ = 39.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left tilt 600/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.095 mW/g

**Left tilt 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.84 V/m; Power Drift = 0.080 dB
Peak SAR (extrapolated) = 0.123 W/kg
**SAR(1 g) = 0.087 mW/g; SAR(10 g) = 0.055 mW/g**
Maximum value of SAR (measured) = 0.094 mW/g




0 dB = 0.094mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

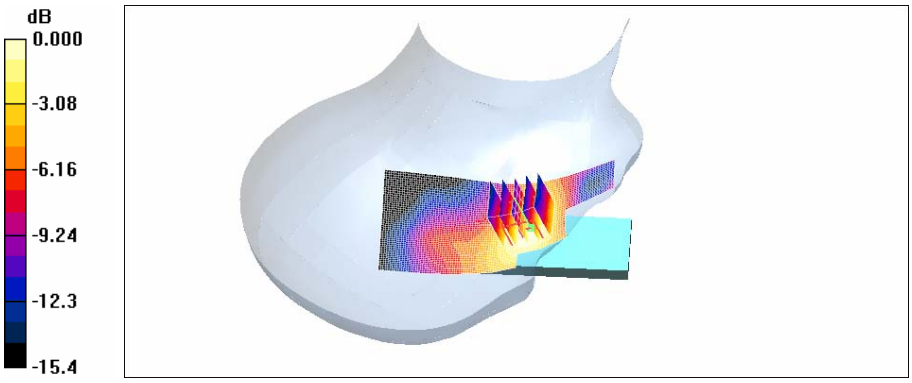
**DUT: L1; Type: Folder; Serial: #1**

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.42 mho/m; $\varepsilon_r$ = 39.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right tilt 600/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.078 mW/g

**Right tilt 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.66 V/m; Power Drift = -0.048 dB
Peak SAR (extrapolated) = 0.097 W/kg
**SAR(1 g) = 0.067 mW/g; SAR(10 g) = 0.042 mW/g**
Maximum value of SAR (measured) = 0.073 mW/g




0 dB = 0.073mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

**DUT: L1; Type: Body; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; $\sigma$ = 0.98 mho/m; $\varepsilon_r$ = 54.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

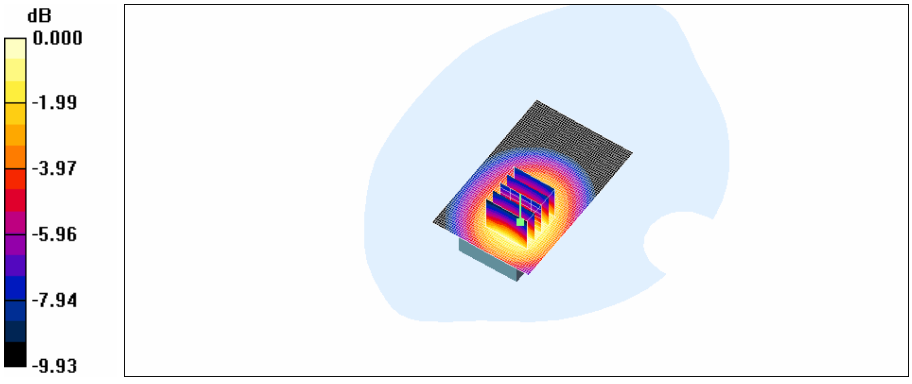
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.58, 6.58, 6.58); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**CDMA Body 384/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.494 mW/g

**CDMA Body 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.9 V/m; Power Drift = 0.053 dB
Peak SAR (extrapolated) = 0.596 W/kg
**SAR(1 g) = 0.466 mW/g; SAR(10 g) = 0.333 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.497 mW/g




0 dB = 0.497mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |
| Option | Bluetooth |

**DUT: L1; Type: Body; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; $\sigma$ = 0.98 mho/m; $\varepsilon_r$ = 54.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

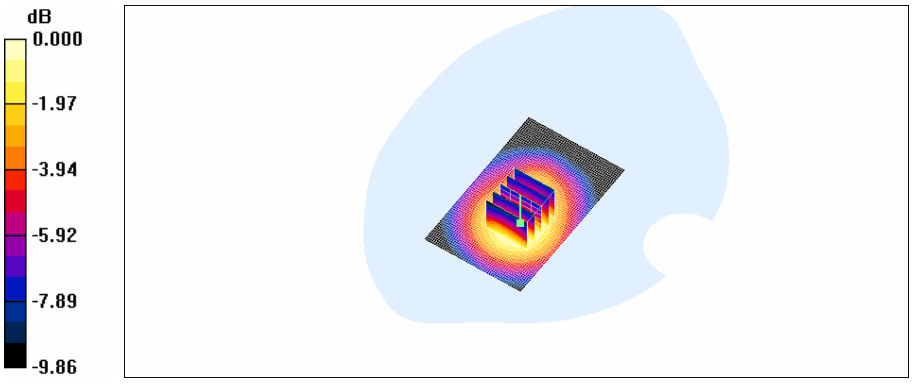
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.58, 6.58, 6.58); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**CDMA Body 384/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.531 mW/g

**CDMA Body 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.7 V/m; Power Drift = -0.156 dB
Peak SAR (extrapolated) = 0.589 W/kg
**SAR(1 g) = 0.456 mW/g; SAR(10 g) = 0.326 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.487 mW/g




0 dB = 0.487mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |
| Option | Front |

**DUT: L1; Type: Body; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; $\sigma$ = 0.98 mho/m; $\varepsilon_r$ = 54.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

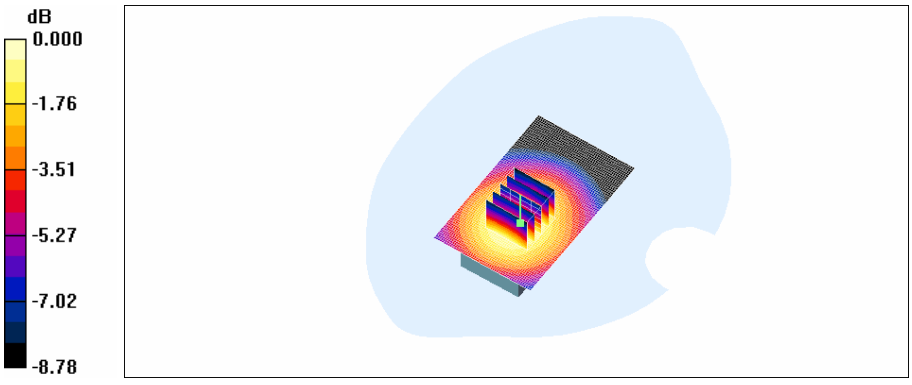
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.58, 6.58, 6.58); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**CDMA Body 384/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.299 mW/g

**CDMA Body 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.7 V/m; Power Drift = -0.140 dB
Peak SAR (extrapolated) = 0.379 W/kg
**SAR(1 g) = 0.285 mW/g; SAR(10 g) = 0.206 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.307 mW/g




0 dB = 0.307mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

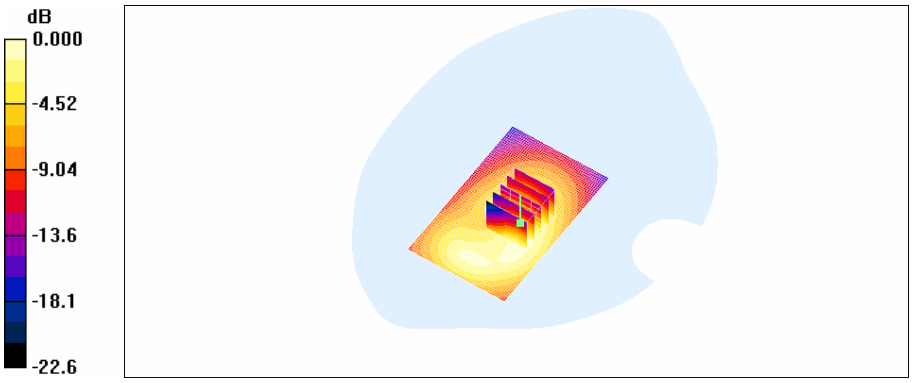
**DUT: L1; Type: Body; Serial: #1**

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.54 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(4.61, 4.61, 4.61); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**PCS Body 600/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.496 mW/g

**PCS Body 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.85 V/m; Power Drift = 0.019 dB
Peak SAR (extrapolated) = 0.745 W/kg
**SAR(1 g) = 0.490 mW/g; SAR(10 g) = 0.289 mW/g**
Maximum value of SAR (measured) = 0.535 mW/g




0 dB = 0.535mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |
| Option | Bluetooth |

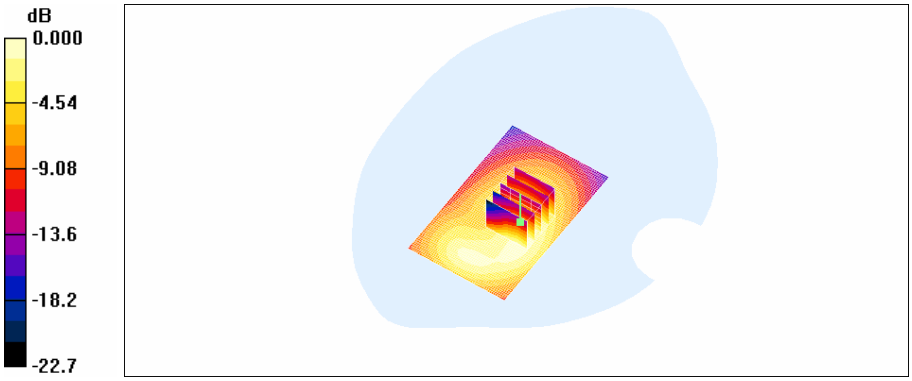
**DUT: L1; Type: Body; Serial: #1**

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.54 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(4.61, 4.61, 4.61); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**PCS Body 600/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.474 mW/g

**PCS Body 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.77 V/m; Power Drift = 0.012 dB
Peak SAR (extrapolated) = 0.706 W/kg
**SAR(1 g) = 0.472 mW/g; SAR(10 g) = 0.281 mW/g**
Maximum value of SAR (measured) = 0.513 mW/g




0 dB = 0.513mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |
| Option | Front |

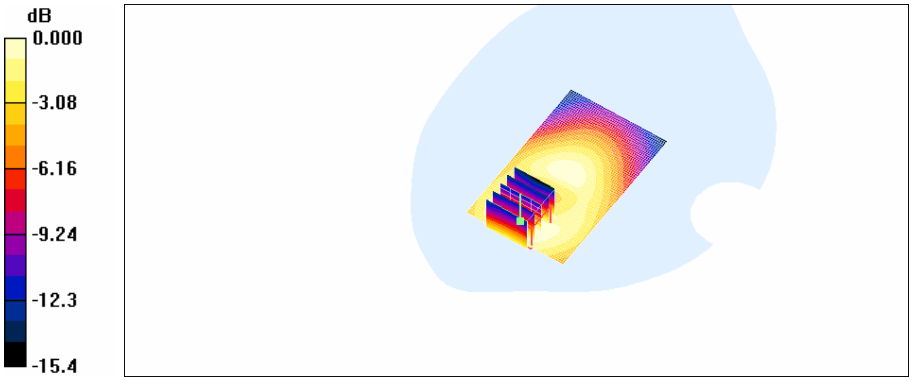
**DUT: L1; Type: Body; Serial: #1**

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.54 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(4.61, 4.61, 4.61); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**PCS Body 600/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.248 mW/g

**PCS Body 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.15 V/m; Power Drift = -0.017 dB
Peak SAR (extrapolated) = 0.307 W/kg
**SAR(1 g) = 0.208 mW/g; SAR(10 g) = 0.130 mW/g**
aximum value of SAR (measured) = 0.227 mW/g




0 dB = 0.227mW/g

| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 848.31 MHz; $\sigma$ = 0.885 mho/m; $\varepsilon_r$ = 39.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

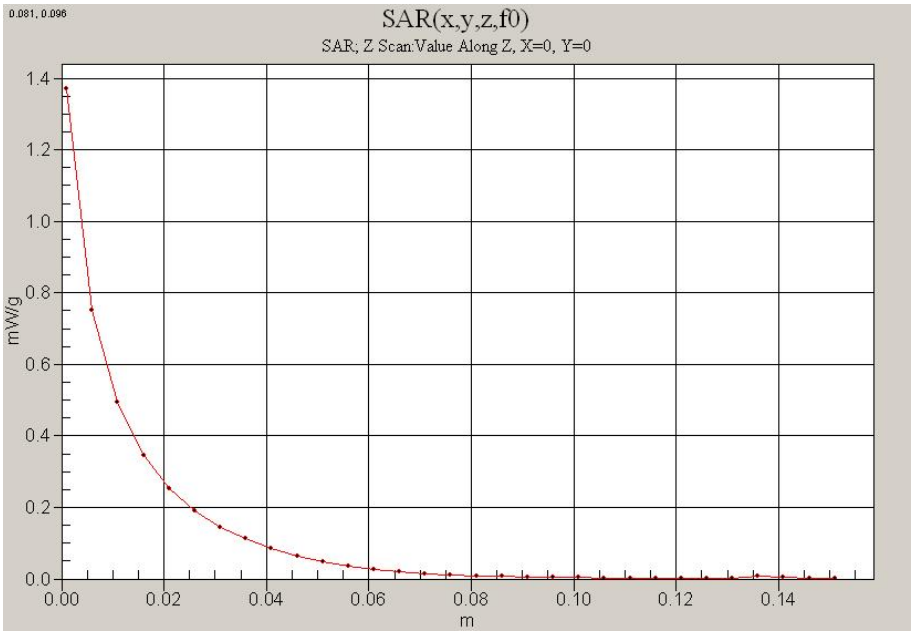
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 777/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.41 mW/g

**Right touch 777/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.7 V/m; Power Drift = 0.006 dB
Peak SAR (extrapolated) = 3.80 W/kg
**SAR(1 g) = 1.36 mW/g; SAR(10 g) = 0.681 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.39 mW/g



| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.6 ℃ |
| Ambient Temperature: | 22.8 ℃ |
| Test Date: | July 2, 2007 |

**DUT: L1; Type: Body; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; $\sigma$ = 0.98 mho/m; $\varepsilon_r$ = 54.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 159

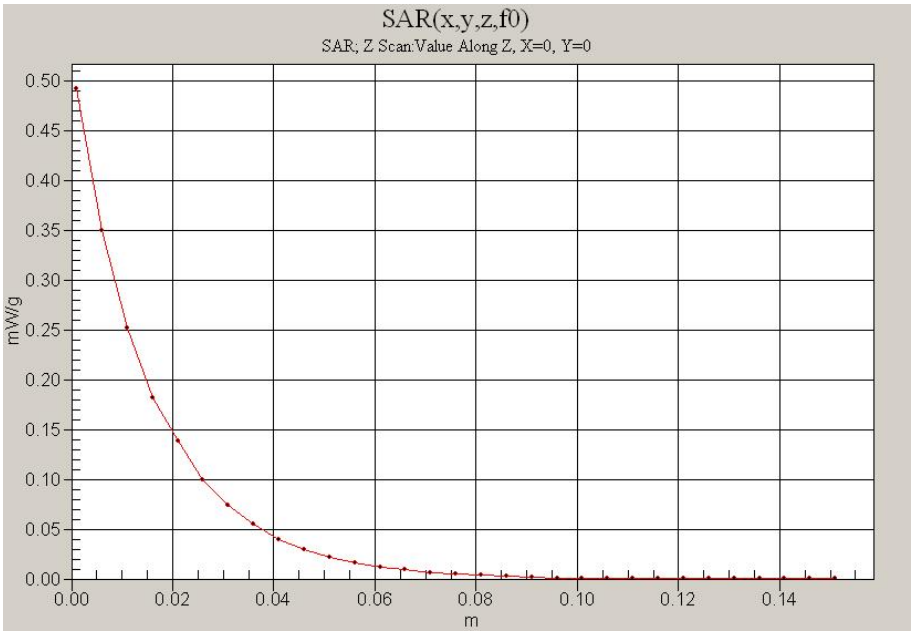
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.58, 6.58, 6.58); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**CDMA Body 384/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.494 mW/g

**CDMA Body 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.9 V/m; Power Drift = 0.053 dB
Peak SAR (extrapolated) = 0.596 W/kg
**SAR(1 g) = 0.466 mW/g; SAR(10 g) = 0.333 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.497 mW/g



| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

**DUT: L1; Type: Folder; Serial: #1**

Communication System: PCS 1900; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1908.75 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 38.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

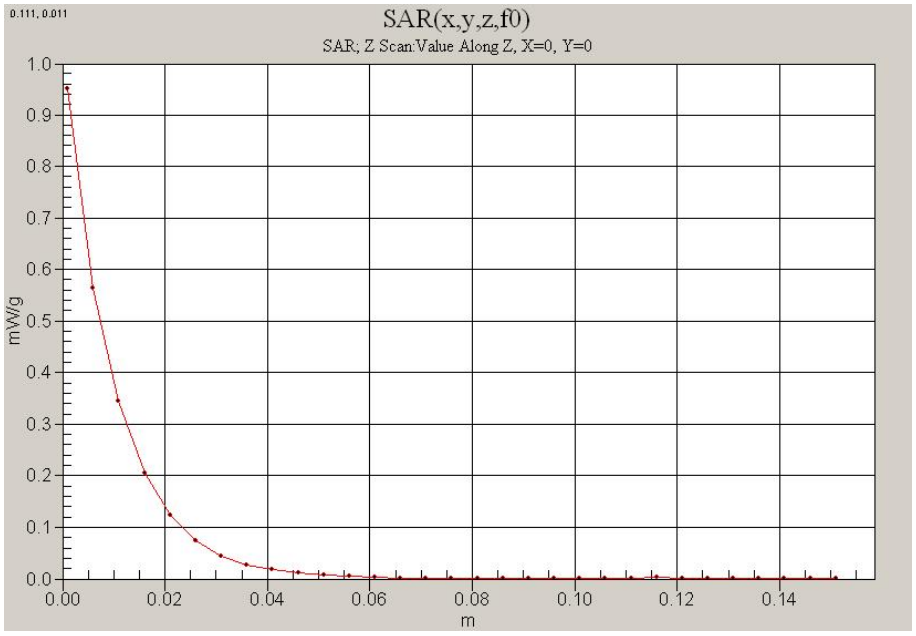
DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 1175/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.959 mW/g

**Right touch 1175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.9 V/m; Power Drift = 0.145 dB
Peak SAR (extrapolated) = 1.34 W/kg
**SAR(1 g) = 0.888 mW/g; SAR(10 g) = 0.498 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.997 mW/g



| | |
|---|---|
| Test Laboratory: | HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD |
| EUT Type: | Dual-Band CDMA Phone with Bluetooth (CDMA/PCS CDMA) |
| Liquid Temperature: | 22.5 ℃ |
| Ambient Temperature: | 22.7 ℃ |
| Test Date: | July 3, 2007 |

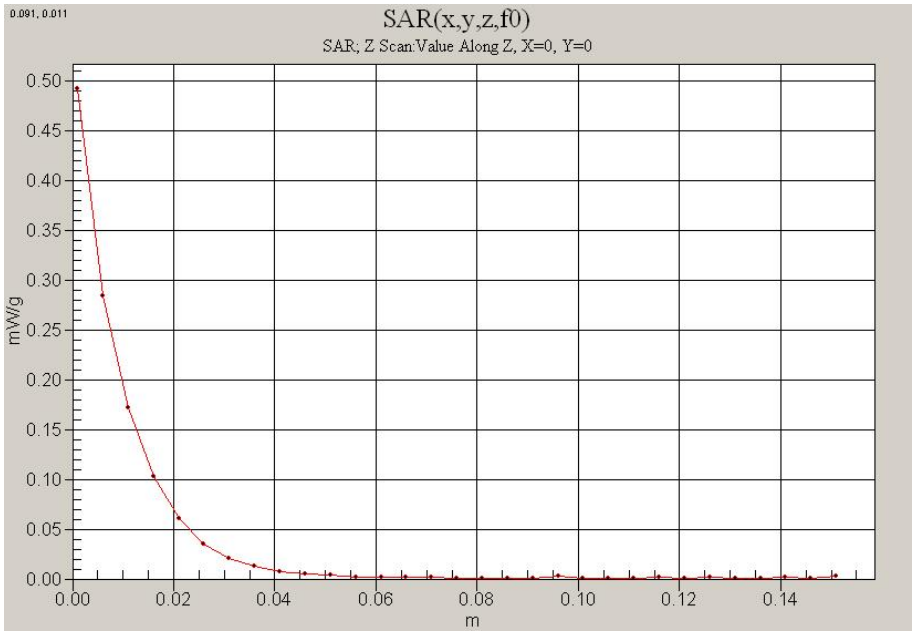
**DUT: L1; Type: Body; Serial: #1**

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.54 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(4.61, 4.61, 4.61); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**PCS Body 600/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.496 mW/g

**PCS Body 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.85 V/m; Power Drift = 0.019 dB
Peak SAR (extrapolated) = 0.745 W/kg
**SAR(1 g) = 0.490 mW/g; SAR(10 g) = 0.289 mW/g**
Maximum value of SAR (measured) = 0.535 mW/g



# Attachment 2. – Dipole Validation Plots

# ■ Validation Data (835 MHz Head)

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD

Input Power 1W (30dBm)

Liquid Temp: 22.6 ℃

Test Date: July 2, 2007

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:441**
**Program Name: Validation**

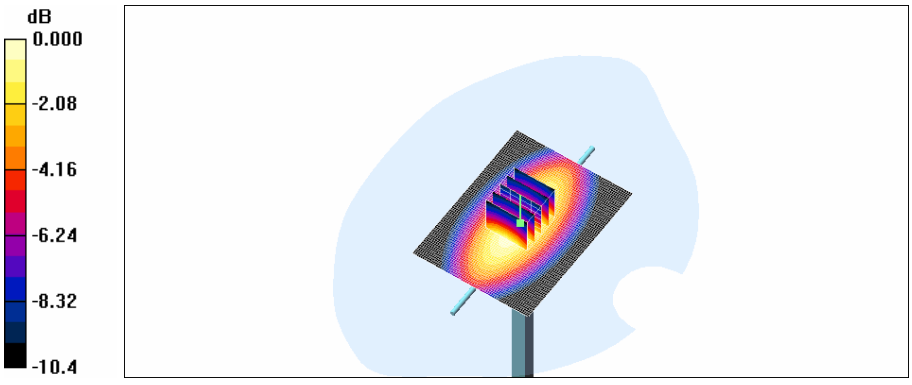
Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; $\sigma$ = 0.874 mho/m; $\varepsilon_r$ = 39.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 835/900 MHz; Type: SAM

**Validation 835 MHz/Area Scan (61x81x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 10.7 mW/g

**Validation 835 MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 114.4 V/m; Power Drift = -0.005 dB
Peak SAR (extrapolated) = 14.3 W/kg
**SAR(1 g) = 9.72 mW/g; SAR(10 g) = 6.37 mW/g**
Maximum value of SAR (measured) = 10.5 mW/g




0 dB = 10.5mW/g

# ■ Validation Data (1900 MHz Head)

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD

Input Power 1W (30dBm)

Liquid Temp: 22.5 ℃

Test Date: July 3, 2007

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 – SN:5d032**
**Program Name: Validation**

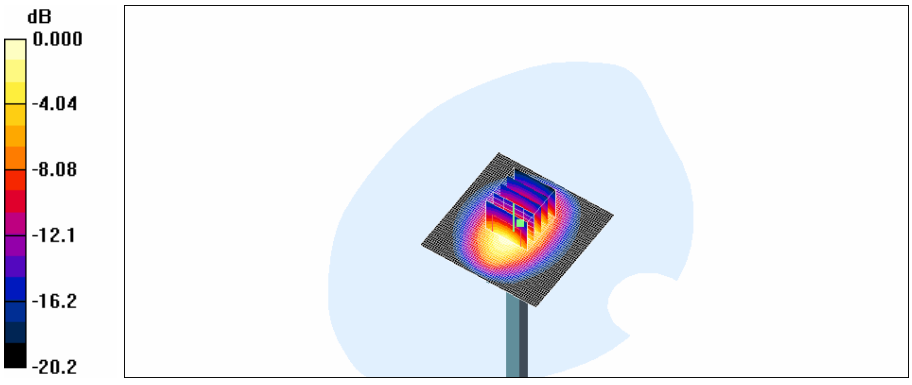
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 39.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 159

DASY4 Configuration:
- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2007-01-25
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Dipole 1900MHz Validation/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 45.0 mW/g

**Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 183.5 V/m; Power Drift = -0.011 dB
Peak SAR (extrapolated) = 68.0 W/kg
**SAR(1 g) = 38.2 mW/g; SAR(10 g) = 19.7 mW/g**
Maximum value of SAR (measured) = 42.8 mW/g




0 dB = 42.8mW/g

## ■ Dielectric Parameter (835 MHz Head)

| | |
|---|---|
| Title | L1 |
| SubTitle | CDMA835(Head) |
| Test Date | July 2, 2007 |

| Frequency | e' | e'' |
|---|---|---|
| 800000000 | 39.8530 | 18.9496 |
| 805000000 | 39.8736 | 18.9556 |
| 810000000 | 39.9258 | 18.9583 |
| 815000000 | 39.9511 | 18.9197 |
| 820000000 | 39.9704 | 18.8985 |
| 825000000 | 39.9862 | 18.8836 |
| 830000000 | 39.9797 | 18.8430 |
| 835000000 | 39.9481 | 18.8250 |
| 840000000 | 39.9080 | 18.8304 |
| 845000000 | 39.8323 | 18.7781 |
| 850000000 | 39.7342 | 18.7533 |
| 855000000 | 39.6183 | 18.7340 |
| 860000000 | 39.4504 | 18.6684 |
| 865000000 | 39.3274 | 18.6120 |
| 870000000 | 39.1510 | 18.6317 |
| 875000000 | 38.9792 | 18.6055 |
| 880000000 | 38.7878 | 18.5556 |
| 885000000 | 38.6595 | 18.5293 |
| 890000000 | 38.5245 | 18.5450 |
| 895000000 | 38.3785 | 18.5149 |
| 900000000 | 38.3072 | 18.5187 |

## ■ Dielectric Parameter (835 MHz Body)

| | |
|---|---|
| Title | L1 |
| SubTitle | CDMA835(Body) |
| Test Date | July 2, 2007 |

| Frequency | e' | e'' |
|---|---|---|
| 800000000 | 55.2859 | 21.1759 |
| 805000000 | 55.2180 | 21.1484 |
| 810000000 | 55.1286 | 21.1517 |
| 815000000 | 55.0501 | 21.0725 |
| 820000000 | 55.0008 | 21.0396 |
| 825000000 | 54.9603 | 21.0429 |
| 830000000 | 54.9135 | 21.0263 |
| 835000000 | 54.8349 | 21.0549 |
| 840000000 | 54.7981 | 21.0733 |
| 845000000 | 54.7486 | 21.0689 |
| 850000000 | 54.7378 | 21.0773 |
| 855000000 | 54.6491 | 21.0499 |
| 860000000 | 54.6270 | 21.0516 |
| 865000000 | 54.5869 | 21.0602 |
| 870000000 | 54.5315 | 21.0263 |
| 875000000 | 54.5288 | 21.0152 |
| 880000000 | 54.4646 | 21.0225 |
| 885000000 | 54.4535 | 20.9721 |
| 890000000 | 54.4665 | 20.9282 |
| 895000000 | 54.3434 | 20.9119 |
| 900000000 | 54.3432 | 20.8579 |

## ■ Dielectric Parameter (1900 MHz Head)

| | |
|---|---|
| Title | L1 |
| SubTitle | PCS1900(Head) |
| Test Date | July 3, 2007 |

| Frequency | e' | e'' |
|---|---|---|
| 1850000000 | 39.7581 | 13.6569 |
| 1855000000 | 39.8091 | 13.6371 |
| 1860000000 | 39.8547 | 13.6327 |
| 1865000000 | 39.8471 | 13.6584 |
| 1870000000 | 39.8554 | 13.6801 |
| 1875000000 | 39.7328 | 13.5803 |
| 1880000000 | 39.6376 | 13.5658 |
| 1885000000 | 39.5461 | 13.5941 |
| 1890000000 | 39.3758 | 13.5772 |
| 1895000000 | 39.2504 | 13.5830 |
| 1900000000 | 39.0925 | 13.6067 |
| 1905000000 | 38.9528 | 13.6015 |
| 1910000000 | 38.8156 | 13.6041 |
| 1915000000 | 38.7443 | 13.6775 |
| 1920000000 | 38.6447 | 13.6864 |
| 1925000000 | 38.5485 | 13.7698 |
| 1930000000 | 38.5342 | 13.7959 |
| 1935000000 | 38.5409 | 13.8734 |
| 1940000000 | 38.6143 | 13.9348 |
| 1945000000 | 38.7042 | 14.0030 |
| 1950000000 | 38.8117 | 14.0154 |

## ■ Dielectric Parameter (1900 MHz Body)

| | |
|---|---|
| Title | L1 |
| SubTitle | PCS1900(Body) |
| Test Date | July 3, 2007 |

| Frequency | e' | e'' |
|---|---|---|
| 1850000000 | 52.1537 | 14.6459 |
| 1855000000 | 52.1916 | 14.6712 |
| 1860000000 | 52.1559 | 14.7066 |
| 1865000000 | 52.1535 | 14.7092 |
| 1870000000 | 52.1081 | 14.7281 |
| 1875000000 | 52.1141 | 14.7271 |
| 1880000000 | 52.1039 | 14.7440 |
| 1885000000 | 52.0989 | 14.7743 |
| 1890000000 | 52.0705 | 14.7859 |
| 1895000000 | 52.0520 | 14.7635 |
| 1900000000 | 52.0346 | 14.7943 |
| 1905000000 | 52.0549 | 14.7985 |
| 1910000000 | 52.0124 | 14.8124 |
| 1915000000 | 51.9959 | 14.8425 |
| 1920000000 | 51.9970 | 14.8280 |
| 1925000000 | 51.9797 | 14.8878 |
| 1930000000 | 51.9695 | 14.8836 |
| 1935000000 | 51.9507 | 14.9090 |
| 1940000000 | 51.9325 | 14.9266 |
| 1945000000 | 51.9642 | 14.9237 |
| 1950000000 | 51.8981 | 14.9390 |

# Attachment 3. – Probe Calibration Data

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
**Zeughausstrasse 43, 8004 Zurich, Switzerland**

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 108**

**Client** H-CT (Dymstec) **Certificate No: ET3-1607_Feb07**

## CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | ET3DV6 - SN:1607 |
| Calibration procedure(s) | QA CAL-01.v5 and QA CAL-12.v4<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | February 21, 2007 |
| Condition of the calibrated item | In Tolerance |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 5-Apr-06 (METAS, No. 251-00557) | Apr-07 |
| Power sensor E4412A | MY41495277 | 5-Apr-06 (METAS, No. 251-00557) | Apr-07 |
| Power sensor E4412A | MY41498087 | 5-Apr-06 (METAS, No. 251-00557) | Apr-07 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 10-Aug-06 (METAS, No. 217-00592) | Aug-07 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 4-Apr-06 (METAS, No. 251-00558) | Apr-07 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 10-Aug-06 (METAS, No. 217-00593) | Aug-07 |
| Reference Probe ES3DV2 | SN: 3013 | 4-Jan-07 (SPEAG, No. ES3-3013_Jan07) | Jan-08 |
| DAE4 | SN: 654 | 21-Jun-06 (SPEAG, No. DAE4-654_Jun06) | Jun-07 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (SPEAG, in house check Nov-05) | In house check: Nov-07 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (SPEAG, in house check Oct-06) | In house check: Oct-07 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Katja Pokovic | Technical Manager | |
| Approved by: | Niels Kuster | Quality Manager | |

Issued: February 22, 2007

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: ET3-1607_Feb07 Page 1 of 9

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| NORMx,y,z | sensitivity in free space |
| ConF | sensitivity in TSL / NORMx,y,z |
| DCP | diode compression point |
| Polarization φ | φ rotation around probe axis |
| Polarization ϑ | ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

**Methods Applied and Interpretation of Parameters:**

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the $E^2$-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

# Probe ET3DV6

## SN:1607

| | |
|---|---|
| Manufactured: | July 27, 2001 |
| Last calibrated: | August 30, 2005 |
| Modified: | February 19, 2007 |
| Recalibrated: | February 21, 2007 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1607 February 21, 2007

# DASY - Parameters of Probe: ET3DV6 SN:1607

## Sensitivity in Free Space[A] Diode Compression[B]

| | | | | |
|---|---|---|---|---|
| NormX | **1.69** ± 10.1% | $\mu V/(V/m)^2$ | DCP X | **91** mV |
| NormY | **1.72** ± 10.1% | $\mu V/(V/m)^2$ | DCP Y | **93** mV |
| NormZ | **1.81** ± 10.1% | $\mu V/(V/m)^2$ | DCP Z | **88** mV |

## Sensitivity in Tissue Simulating Liquid (Conversion Factors)

**Please see Page 8.**

## Boundary Effect

**TSL** **900 MHz** **Typical SAR gradient: 5 % per mm**

| Sensor Center to Phantom Surface Distance | | **3.7 mm** | **4.7 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 8.8 | 4.4 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.0 | 0.1 |

**TSL** **1810 MHz** **Typical SAR gradient: 10 % per mm**

| Sensor Center to Phantom Surface Distance | | **3.7 mm** | **4.7 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 14.5 | 9.8 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.2 | 0.2 |

## Sensor Offset

| | |
|---|---|
| Probe Tip to Sensor Center | **2.7** mm |

**The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.**

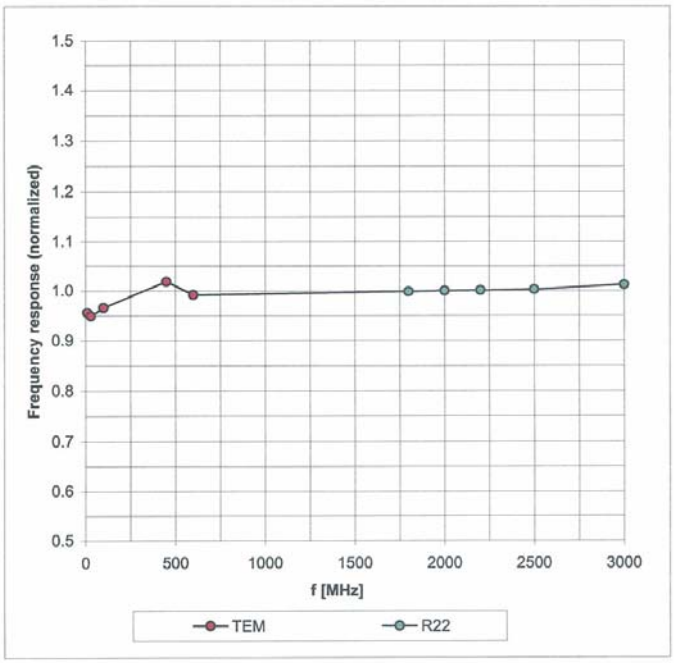
[A] The uncertainties of NormX,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1607 February 21, 2007

## Frequency Response of E-Field

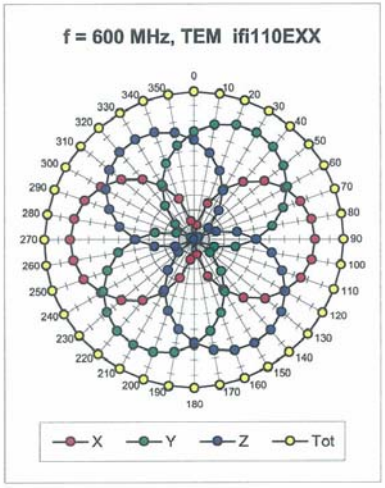
(TEM-Cell:ifi110 EXX, Waveguide: R22)

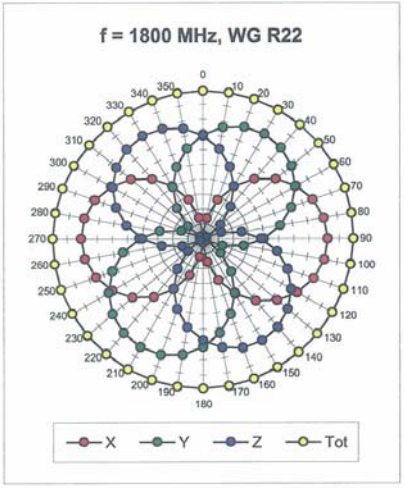


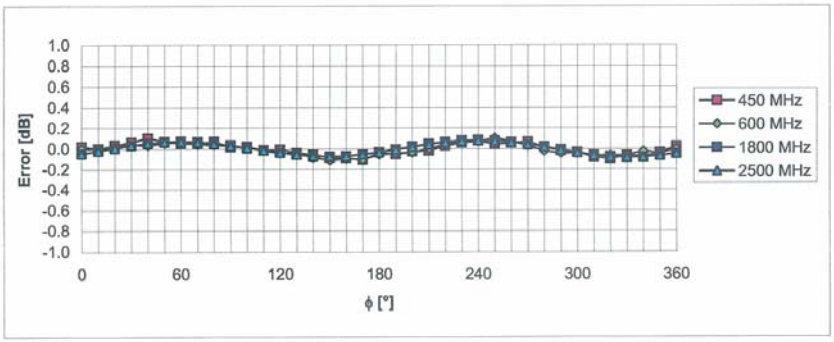

Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

ET3DV6 SN:1607 February 21, 2007

## Receiving Pattern ($\phi$), $\vartheta$ = 0°



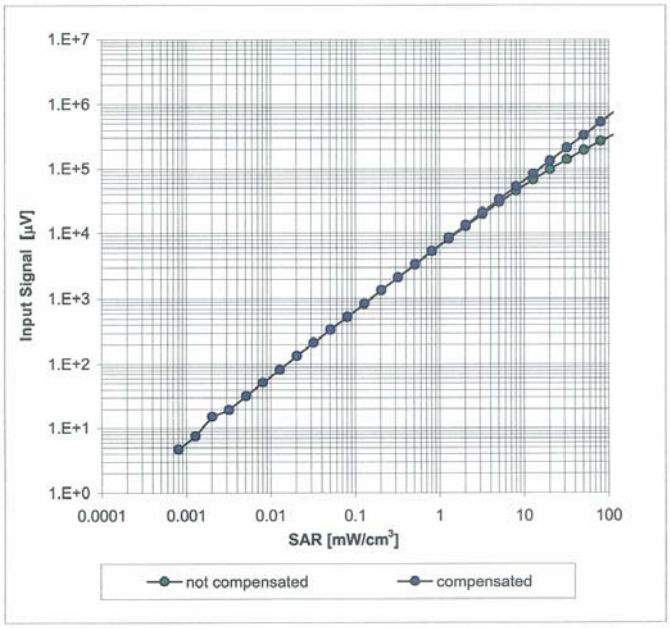



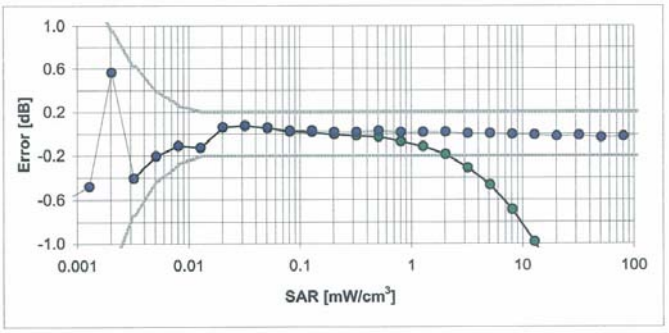

Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

ET3DV6 SN:1607 February 21, 2007

## Dynamic Range f($SAR_{head}$)

(Waveguide R22, f = 1800 MHz)

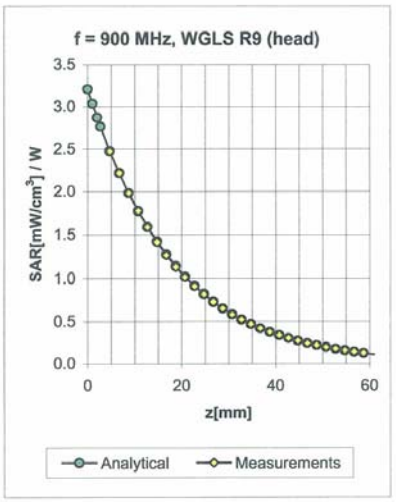


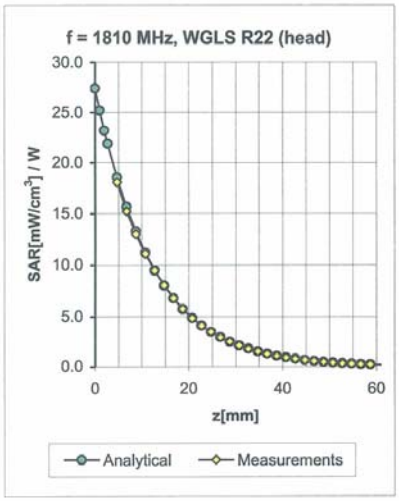




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ET3DV6 SN:1607 February 21, 2007

## Conversion Factor Assessment



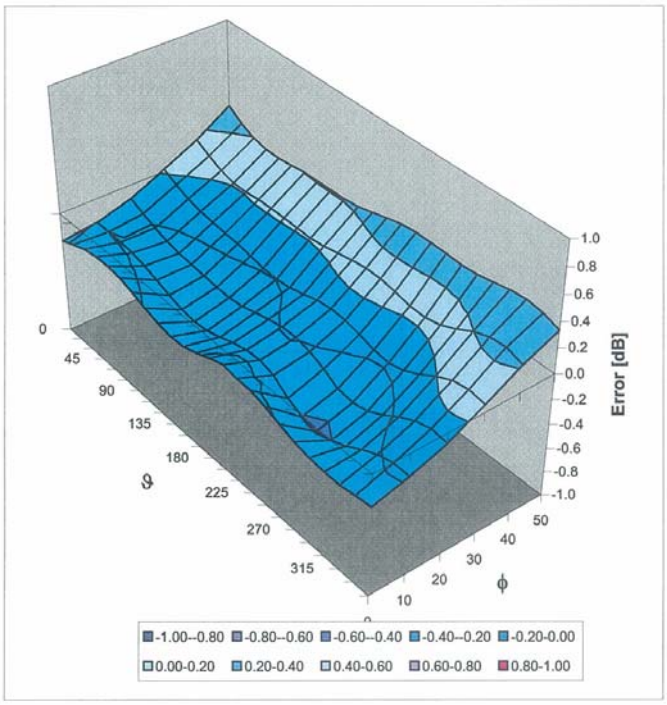

| f [MHz] | Validity [MHz][c] | TSL | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty |
|---|---|---|---|---|---|---|---|
| 450 | ± 50 / ± 100 | Head | 43.5 ± 5% | 0.87 ± 5% | 0.37 | 1.87 | 7.02 ± 13.3% (k=2) |
| 900 | ± 50 / ± 100 | Head | 41.5 ± 5% | 0.97 ± 5% | 0.31 | 2.61 | 6.38 ± 11.0% (k=2) |
| 1810 | ± 50 / ± 100 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.50 | 2.79 | 5.27 ± 11.0% (k=2) |
| 1950 | ± 50 / ± 100 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.53 | 2.69 | 4.99 ± 11.0% (k=2) |
| 2450 | ± 50 / ± 100 | Head | 39.2 ± 5% | 1.80 ± 5% | 0.66 | 1.99 | 4.69 ± 11.8% (k=2) |
| 450 | ± 50 / ± 100 | Body | 56.7 ± 5% | 0.94 ± 5% | 0.32 | 1.97 | 7.62 ± 13.3% (k=2) |
| 835 | ± 50 / ± 100 | Body | 55.2 ± 5% | 0.97 ± 5% | 0.29 | 2.89 | 6.58 ± 11.0% (k=2) |
| 1900 | ± 50 / ± 100 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.70 | 2.39 | 4.61 ± 11.0% (k=2) |
| 2450 | ± 50 / ± 100 | Body | 52.7 ± 5% | 1.95 ± 5% | 0.57 | 2.44 | 4.13 ± 11.8% (k=2) |

[c] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1607 February 21, 2007

## Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz




**Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)**

# Attachment 4. – Dipole Calibration Data

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
**Zeughausstrasse 43, 8004 Zurich, Switzerland**

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 108**

**Client** H-CT (Dymstec)

**Certificate No: D835V2-441_Aug06**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D835V2 - SN: 441 |
| Calibration procedure(s) | QA CAL-05.v6<br>Calibration procedure for dipole validation kits |
| Calibration date: | August 14, 2006 |
| Condition of the calibrated item | In Tolerance |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 04-Oct-05 (METAS, No. 251-00516) | Oct-06 |
| Power sensor HP 8481A | US37292783 | 04-Oct-05 (METAS, No. 251-00516) | Oct-06 |
| Reference 20 dB Attenuator | SN: 5086 (20g) | 10-Aug-06 (METAS, No 217-00591) | Aug-07 |
| Reference 10 dB Attenuator | SN: 5047.2 (10r) | 10-Aug-06 (METAS, No 217-00591) | Aug-07 |
| Reference Probe ET3DV6 | SN 1507 | 28-Oct-05 (SPEAG, No. ET3-1507_Oct05) | Oct-06 |
| DAE4 | SN 601 | 15-Dec-05 (SPEAG, No. DAE4-601_Dec05) | Dec-06 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (SPEAG, in house check Oct-05) | In house check: Oct-07 |
| RF generator Agilent E4421B | MY41000675 | 11-May-05 (SPEAG, in house check Nov-05) | In house check: Nov-07 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (SPEAG, in house check Nov-05) | In house check: Nov-06 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Claudio Leubler | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: August 17, 2006

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
**Zeughausstrasse 43, 8004 Zurich, Switzerland**

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 108**

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

d) DASY4 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| | | |
|---|---|---|
| **DASY Version** | DASY4 | V4.7 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom V4.9 | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 835 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 41.5 | 0.90 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 42.4 ± 6 % | 0.90 mho/m ± 6 % |
| **Head TSL temperature during test** | (21.9 ± 0.2) °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.35 mW / g |
| SAR normalized | normalized to 1W | 9.40 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **9.51 mW / g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.53 mW / g |
| SAR normalized | normalized to 1W | 6.12 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **6.18 mW / g ± 16.5 % (k=2)** |

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 50.1 Ω - 6.7 jΩ |
| Return Loss | - 23.5 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.376 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | March 09, 2001 |

## DASY4 Validation Report for Head TSL

Date/Time: 14.08.2006 13:00:04

Test Laboratory: SPEAG, Zurich, Switzerland

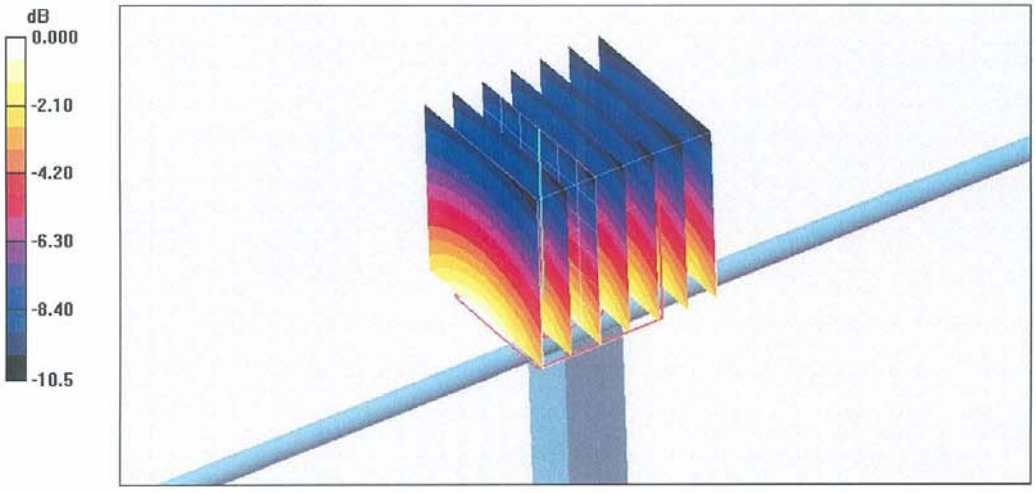
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 441**

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL900;
Medium parameters used: f = 835 MHz; $\sigma$ = 0.9 mho/m; $\varepsilon_r$ = 42.4; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

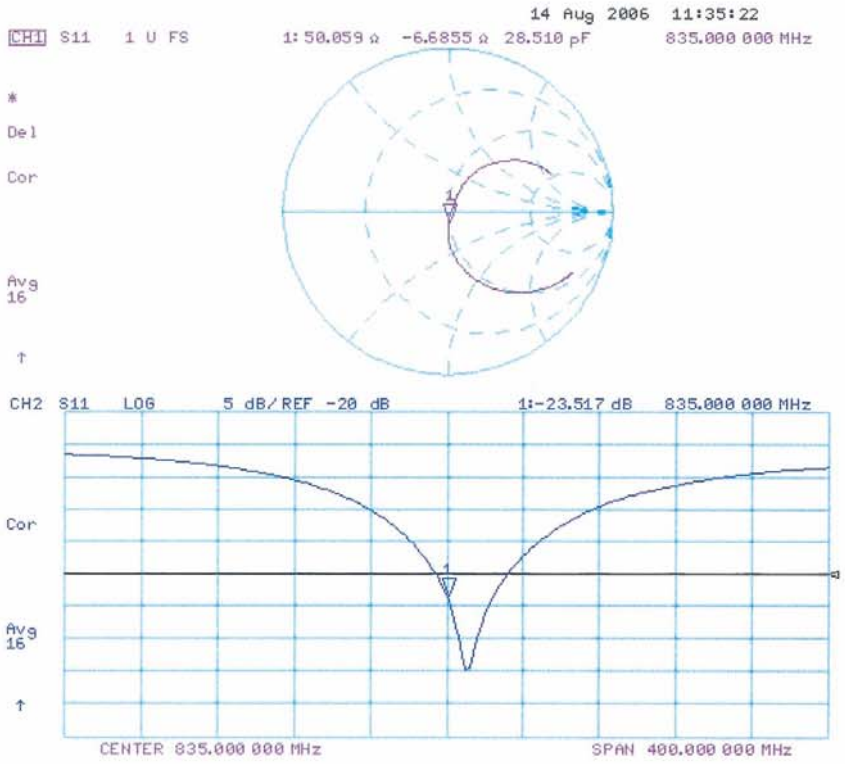
- Probe: ET3DV6 - SN1507 (HF); ConvF(6.09, 6.09, 6.09); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

**Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.4 V/m; Power Drift = -0.067 dB
Peak SAR (extrapolated) = 3.50 W/kg
**SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.53 mW/g**
Maximum value of SAR (measured) = 2.53 mW/g




0 dB = 2.53mW/g

## Impedance Measurement Plot for Head TSL



**Calibration Laboratory of**
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 108**

**Client** H-CT (Dymstec)

**Certificate No: D1900V2-5d032_Feb07**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1900V2 - SN: 5d032 |
| Calibration procedure(s) | QA CAL-05.v6<br>Calibration procedure for dipole validation kits |
| Calibration date: | February 20, 2007 |
| Condition of the calibrated item | In Tolerance |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 03-Oct-06 (METAS, No. 217-00608) | Oct-07 |
| Power sensor HP 8481A | US37292783 | 03-Oct-06 (METAS, No. 217-00608) | Oct-07 |
| Reference 20 dB Attenuator | SN: 5086 (20g) | 10-Aug-06 (METAS, No 217-00591) | Aug-07 |
| Reference 10 dB Attenuator | SN: 5047.2 (10r) | 10-Aug-06 (METAS, No 217-00591) | Aug-07 |
| Reference Probe ET3DV6 | SN: 1507 | 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) | Oct-07 |
| DAE4 | SN 601 | 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) | Jan-08 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (SPEAG, in house check Oct-05) | In house check: Oct-07 |
| RF generator Agilent E4421B | MY41000675 | 11-May-05 (SPEAG, in house check Nov-05) | In house check: Nov-07 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (SPEAG, in house check Oct-06) | In house check: Oct-07 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Mike Meili | Laboratory Technician | M. Meili |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: February 21, 2007

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
**Zeughausstrasse 43, 8004 Zurich, Switzerland**

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

Accreditation No.: **SCS 108**

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

d) DASY4 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| | | |
|---|---|---|
| **DASY Version** | DASY4 | V4.7 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom V5.0 | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1900 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.0 | 1.40 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 38.8 ± 6 % | 1.43 mho/m ± 6 % |
| **Head TSL temperature during test** | (21.0 ± 0.2) °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm$^3$ (1 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.55 mW / g |
| SAR normalized | normalized to 1W | 38.2 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **37.2 mW / g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm$^3$ (10 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.03 mW / g |
| SAR normalized | normalized to 1W | 20.1mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **19.8 mW / g ± 16.5 % (k=2)** |

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 53.5 Ω + 3.3 jΩ |
| Return Loss | - 26.6 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.192 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | March 17, 2003 |

**DASY4 Validation Report for Head TSL**

Date/Time: 20.02.2007 14:35:32

Test Laboratory: SPEAG, Zurich, Switzerland

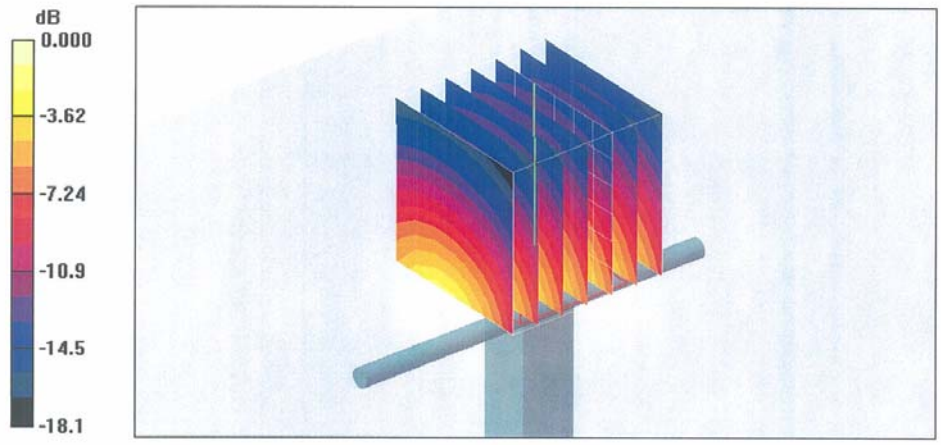
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d032**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL U10 BB;
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.43 mho/m; $\varepsilon_r$ = 38.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.3 V/m; Power Drift = 0.006 dB
Peak SAR (extrapolated) = 16.4 W/kg
**SAR(1 g) = 9.55 mW/g; SAR(10 g) = 5.03 mW/g**
Maximum value of SAR (measured) = 10.5 mW/g




0 dB = 10.5mW/g

**Impedance Measurement Plot for Head TSL**