# SAR TEST REPORT

**HCT CO., LTD**

| | |
|---|---|
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| FCC ID: | ZNFP705F |
| Model: | LG-P705f |
| Date of Issue: | Mar.19, 2012 |
| Test report No.: | HCTA1203FS07 |
| Test Laboratory: | **HCT CO., LTD.**<br>105-1, Jangam-ri, Majang-myeon, Icheon-si, Gyeonggi-do, Korea 467-811<br>TEL: +82 31 645 6485 FAX: +82 31 645 6401 |
| Applicant : | **LG Electronics, MobileComm U.S.A., Inc.**<br>10101 Old Grove Road, San Diego, CA 92131 |
| Testing has been carried out in accordance with: | RSS-102 Issue 4; Health Canada Safety Code 6<br>47CFR §2.1093<br>FCC OET Bulletin 65(Edition 97-01), Supplement C (Edition 01-01)<br>ANSI/ IEEE C95.1 – 1992<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 |   <br>Report prepared by : Young-Soo Jang Test Engineer of SAR Part<br>Approved by : Jae-Sang So Manager of SAR Part |

# 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.

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

## SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative of the incremental electromagnetic energy (d*W*) absorbed by (dissipated in) an incremental mass (d*m*) contained in a volume element (d*V*) 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.

# 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 | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| FCC ID: | ZNFP705F |
| Model: | LG-P705f |
| Additional Model: | P705f, LGP705f |
| Trade Name | LG Electronics, MobileComm U.S.A., Inc. |
| Application Type | Certification |
| Mode(s) of Operation | GSM850/GSM1900 /WCDMA850 /802.11b/g/n |
| Tx Frequency | 824.20 - 848.80 MHz (GSM850) /1 850.20 – 1 909.80 MHz (GSM1900)<br>826.4~846.6 MHz (WCDMA850)/ 2 412- 2 462 MHz (WLAN) |
| Rx Frequency | 869.20 - 893.80 MHz (GSM850)/ 1 930.20 – 1 989.80 MHz (GSM1900)<br>871.4 - 891.6 MHz (WCDMA850)/ 2 412- 2 462 MHz (WLAN) |
| FCC Classification | Licensed Portable Transmitter Held to Ear (PCE) |
| Production Unit or Identical Prototype | Prototype |

Max SAR

| Band | 1g SAR (W/kg) | | |
|---|---|---|---|
| | Head | Body-worn | Hotspot |
| GSM850 | 0.511 | 0.951 | 0.951 |
| GSM1900 | 0.308 | 0.237 | 0.241 |
| WCDMA850 | 0.473 | 0.796 | 0.796 |
| 802.11b | 0.366 | 0.087 | 0.087 |

| | |
|---|---|
| Date(s) of Tests | Mar. 13, 2012 ~ Mar. 14, 2012 |
| Antenna Type | Integral Antenna |
| GPRS | Multislot Class: 12, Mode Class: B |
| Key Feature(s) | This device support Mobile Hotspot. |

# 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 Figure.3.1).

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

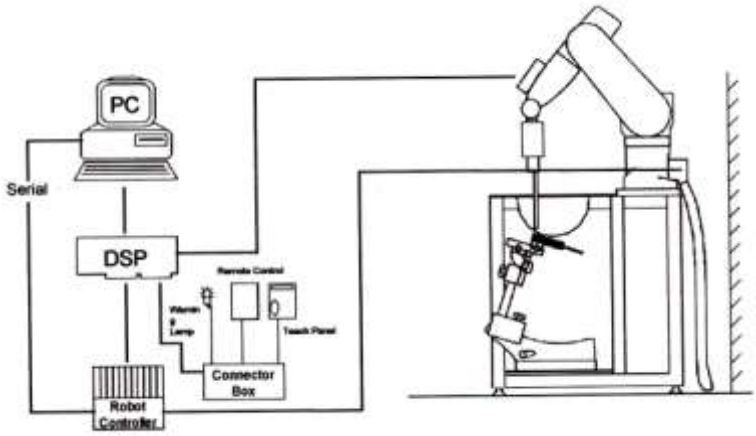



Figure 3.1 HCT SAR Lab. Test Measurement Set-up

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in.

# 3.2 DASY4 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 μW/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

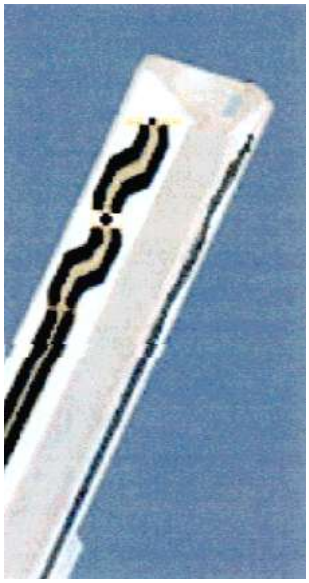


Figure 3.3 ET3DV6 E-field Probe

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

# 3.3 PROBE CALIBRATION PROCESS

## 3.3.1 E-Probe Calibration

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

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

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

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

where:

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

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

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

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

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

where:

$\sigma$ = simulated tissue conductivity,

$\rho$ = Tissue density (1.25 g/cm$^3$ for brain tissue)

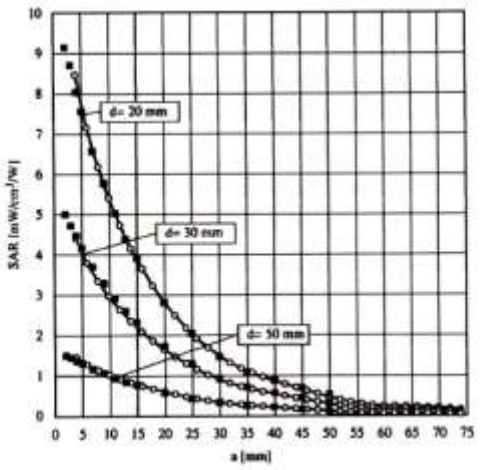



Figure 3.4 E-Field and Temperature measurements at 900 MHz

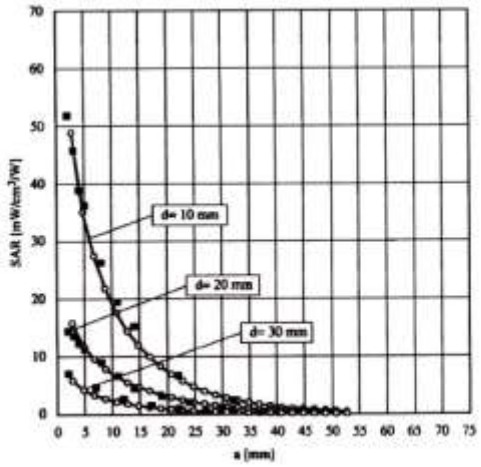



Figure 3.5 E-Field and temperature measurements at 1.8 GHz

## 3.3.2 Data Extrapolation

The DASY4 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given like below;

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

with $V_i$ = compensated signal of channel i (i=x,y,z)
$U_i$ = input signal of channel i (i=x,y,z)
cf = crest factor of exciting field (DASY parameter)
$dcp_i$ = diode compression point (DASY parameter)

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

E-field probes:

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

with $V_i$ = compensated signal of channel i (i = x,y,z)
$Norm_i$ = sensor sensitivity of channel i (i = x,y,z)
$\mu V/(V/m)^2$ for E-field probes
ConvF = sensitivity of enhancement in solution
$E_i$ = electric field strength of channel i in V/m

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

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

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

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

with SAR = local specific absorption rate in W/g
$E_{tot}$ = total field strength in V/m
$\sigma$ = conductivity in [mho/m] or [Siemens/m]
$\rho$ = equivalent tissue density in $g/cm^3$

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 shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Figure 3.6 SAM Phantom

| | |
|---|---|
| Shell Thickness | 2.0 mm ± 0.2 mm (6 ± 0.2 mm at ear point) |
| Filling Volume | about 25 L |
| Dimensions | 1 000 mm x 500 mm (L x W) |

## 3.5 Device Holder for Transmitters

In combination with the SAM Phantom V 4.0, the Mounting Device (POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatable positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

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

Figure 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.

| Ingredients (% by weight) | Frequency (MHz) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 450 | | 750 | | 835 | | 915 | | 1 900 | | 2 450 | |
| Tissue Type | Head | Body | Head | Body | Head | Body | Head | Body | Head | Body | Head | Body |
| Water | 38.56 | 51.16 | 41.2 | 51.7 | 41.45 | 52.4 | 41.05 | 56.0 | 54.9 | 40.4 | 62.7 | 73.2 |
| Salt (NaCl) | 3.95 | 1.49 | 1.4 | 1.0 | 1.45 | 1.4 | 1.35 | 0.76 | 0.18 | 0.5 | 0.5 | 0.04 |
| Sugar | 56.32 | 46.78 | 57 | 47.2 | 56.0 | 45.0 | 56.5 | 41.76 | 0.0 | 58.0 | 0.0 | 0.0 |
| HEC | 0.98 | 0.52 | 0.2 | 0.0 | 1.0 | 1.0 | 1.0 | 1.21 | 0.0 | 1.0 | 0.0 | 0.0 |
| Bactericide | 0.19 | 0.05 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.27 | 0.0 | 0.1 | 0.0 | 0.0 |
| Triton X-100 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 36.8 | 0.0 |
| DGBE | 0.0 | 0.0 | 0.00 | 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

| Manufacturer | Type / Model | S/N | Calib. Date | Calib.Interval | Calib.Due |
|---|---|---|---|---|---|
| SPEAG | SAM Phantom | - | N/A | N/A | N/A |
| Staubli | Robot RX90L | F01/5K09A1/A/01 | N/A | N/A | N/A |
| Staubli | Robot ControllerCS7MB | F99/5A82A1/C/01 | N/A | N/A | N/A |
| HP | Pavilion t000_puffer | KRJ51201TV | N/A | N/A | N/A |
| SPEAG | Light Alignment Sensor | 265 | N/A | N/A | N/A |
| Staubli | Teach Pendant (Joystick) | D221340.01 | N/A | N/A | N/A |
| SPEAG | DAE3 | 466 | Feb. 21, 2012 | Annual | Feb. 21, 2013 |
| SPEAG | E-Field Probe ET3DV6 | 1630 | Nov. 18, 2011 | Annual | Nov. 18, 2012 |
| SPEAG | Validation Dipole D835V2 | 441 | May 16, 2011 | Annual | May 16, 2012 |
| SPEAG | Validation Dipole D1900V2 | 5d032 | July 22, 2011 | Annual | July 22, 2012 |
| SPEAG | Validation Dipole D2450V2 | 743 | Aug. 29, 2011 | Annual | Aug. 29, 2012 |
| Agilent | Power Meter(F) E4419B | MY41291386 | Nov. 04, 2011 | Annual | Nov. 04, 2012 |
| Agilent | Power Sensor(G) 8481 | MY41090870 | Nov. 04, 2011 | Annual | Nov. 04, 2012 |
| HP | Dielectric Probe Kit 85070C | 00721521 | N/A | N/A | N/A |
| HP | Dual Directional Coupler | 16072 | Nov. 04, 2011 | Annual | Nov. 04, 2012 |
| R&S | Base Station CMU200 | 110740 | July 26, 2011 | Annual | July 26, 2012 |
| Agilent | Base Station E5515C | GB44400269 | Feb. 10, 2012 | Annual | Feb. 10, 2013 |
| HP | Signal Generator E4438C | MY42082646 | Nov. 11, 2011 | Annual | Nov. 11, 2012 |
| HP | Network Analyzer 8753ES | JP39240221 | Mar. 30, 2011 | Annual | Mar. 30, 2012 |

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 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15 mm x 15 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

3. Around this point, a volume of 32 mm x 32 mm x 30 mm was assessed by measuring 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

   a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
   b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions. The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

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

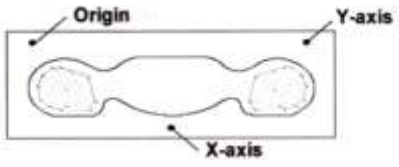



Figure 4.1 SAR Measurement Point in Area Scan

# 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 1528-2003 illustration below.

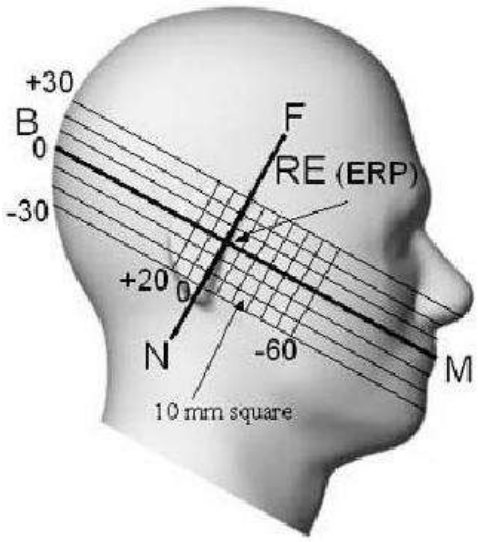



Figure 5.1 Side view of the phantom

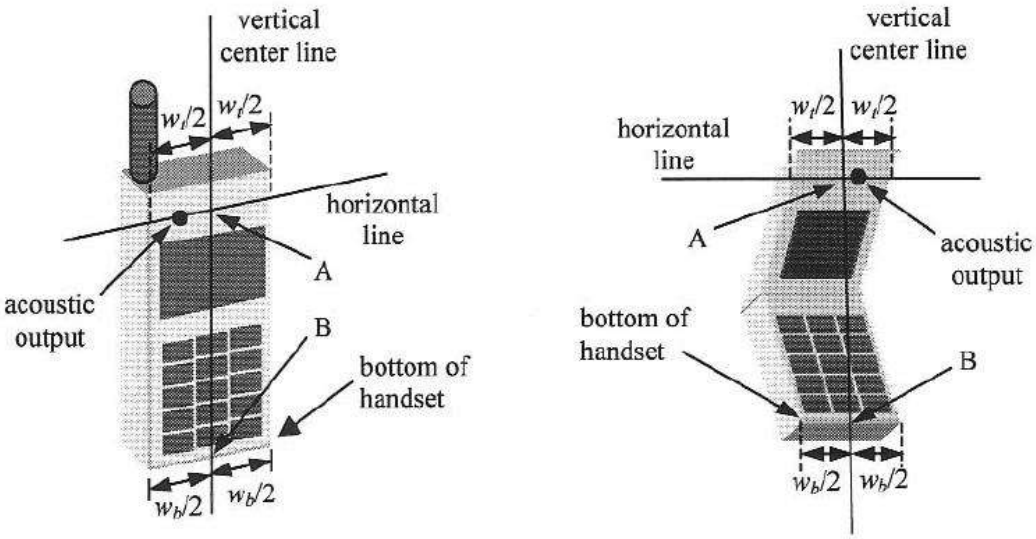



Figure 5.2 Handset vertical and horizontal reference lines

## 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 1.0 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

| Error Description | Tol (± %) | Prob. dist. | Div. | $c_i$ | Standard Uncertainty (± %) | $v_{eff}$ |
|---|---|---|---|---|---|---|
| **1. Measurement System** | | | | | | |
| Probe Calibration | 6.00 | N | 1 | 1 | 6.00 | ∞ |
| Axial Isotropy | 4.70 | R | 1.73 | 0.7 | 1.90 | ∞ |
| Hemispherical Isotropy | 9.60 | R | 1.73 | 0.7 | 3.88 | ∞ |
| Boundary Effects | 1.00 | R | 1.73 | 1 | 0.58 | ∞ |
| Linearity | 4.70 | R | 1.73 | 1 | 2.71 | ∞ |
| System Detection Limits | 1.00 | R | 1.73 | 1 | 0.58 | ∞ |
| Readout Electronics | 0.30 | N | 1.00 | 1 | 0.30 | ∞ |
| Response Time | 0.8 | R | 1.73 | 1 | 0.46 | ∞ |
| Integration Time | 2.6 | R | 1.73 | 1 | 1.50 | ∞ |
| RF Ambient Conditions | 3.00 | R | 1.73 | 1 | 1.73 | ∞ |
| Probe Positioner | 0.40 | R | 1.73 | 1 | 0.23 | ∞ |
| Probe Positioning | 2.90 | R | 1.73 | 1 | 1.67 | ∞ |
| Max SAR Eval | 1.00 | R | 1.73 | 1 | 0.58 | ∞ |
| **2.Test Sample Related** | | | | | | |
| Device Positioning | 2.90 | N | 1.00 | 1 | 2.90 | 145 |
| Device Holder | 3.60 | N | 1.00 | 1 | 3.60 | 5 |
| Power Drift | 5.00 | R | 1.73 | 1 | 2.89 | ∞ |
| **3.Phantom and Setup** | | | | | | |
| Phantom Uncertainty | 4.00 | R | 1.73 | 1 | 2.31 | ∞ |
| Liquid Conductivity(target) | 5.00 | R | 1.73 | 0.64 | 1.85 | ∞ |
| Liquid Conductivity(meas.) | 2.07 | N | 1 | 0.64 | 1.32 | 9 |
| Liquid Permitivity(target) | 5.00 | R | 1.73 | 0.6 | 1.73 | ∞ |
| Liquid Permitivity(meas.) | 5.02 | N | 1 | 0.6 | 3.01 | 9 |
| **Combind Standard Uncertainty** | | | | | 11.13 | |
| **Coverage Factor for 95 %** | | | | | *k*=2 | |
| **Expanded STD Uncertainty** | | | | | 22.25 | |

**Table 6.1 Uncertainty (800 MHz- 2450 MHz)**

# 7. ANSI/ IEEE C95.1 - 1992 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 g 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 g 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 | Mar.13, 2012 | Head | 21.2 | ε r | 41.5 | 42.7 | + 2.89 | ± 5 |
| | | | | σ | 0.90 | 0.896 | - 0.44 | ± 5 |
| 835 | | Body | 21.2 | ε r | 55.2 | 55 | - 0.36 | ± 5 |
| | | | | σ | 0.97 | 1.01 | + 4.12 | ± 5 |
| 1 900 | Mar.14, 2012 | Head | 21.1 | ε r | 40.0 | 39.1 | - 2.25 | ± 5 |
| | | | | σ | 1.40 | 1.39 | - 0.71 | ± 5 |
| 1 900 | | Body | 21.1 | ε r | 53.3 | 54.9 | + 3.00 | ± 5 |
| | | | | σ | 1.52 | 1.47 | - 3.29 | ± 5 |
| 2 450 | Mar.14, 2012 | Head | 21.1 | ε r | 39.2 | 38.5 | - 1.79 | ± 5 |
| | | | | σ | 1.80 | 1.85 | + 2.78 | ± 5 |
| 2 450 | | Body | 21.1 | ε r | 52.7 | 52.1 | - 1.14 | ± 5 |
| | | | | σ | 1.95 | 1.89 | - 3.08 | ± 5 |

The Tissue dielectronic parameters were measured prior to the SAR evaluation using an Agilent 85070C Dielectronic Probe Kit and Agilent Network Analyzer.

## 8.2 System Validation

Prior to assessment, the system is verified to the ± 10 % of the specifications at 835 MHz /1 900 MHz/ 2 450 MHz by using the system validation kit. (Graphic Plots Attached)

| Freq. [MHz] | Date | Probe (SN) | Liquid | Amb. Temp. [°C] | Liquid Temp. [°C] | 1 W Target $SAR_{1g}$ (SPEAG) (mW/g) | Measured $SAR_{1g}$ (mW/g) | 1 W Normalized $SAR_{1g}$ (mW/g) | Deviation [%] | Limit [%] |
|---|---|---|---|---|---|---|---|---|---|---|
| 835 | Mar.13, 2012 | 1630 | Head | 21.4 | 21.2 | 9.34 | 0.969 | 9.69 | + 3.75 | ± 10 |
| 835 | Mar.13, 2012 | | Body | 21.4 | 21.2 | 9.45 | 0.966 | 9.66 | + 2.22 | ± 10 |
| 1 900 | Mar.14, 2012 | | Head | 21.3 | 21.1 | 39.9 | 4.01 | 40.1 | + 0.50 | ± 10 |
| 1 900 | Mar.14, 2012 | | Body | 21.3 | 21.1 | 40.9 | 4.01 | 40.1 | - 1.96 | ± 10 |
| 2 450 | Mar.14, 2012 | | Head | 21.3 | 21.1 | 53.8 | 5.43 | 54.3 | + 0.93 | ± 10 |
| 2 450 | Mar.14, 2012 | | Body | 21.3 | 21.1 | 51.7 | 5.33 | 53.3 | + 3.09 | ± 10 |

## 8.3 System Validation Procedure

SAR measurement was prior to assessment, the system is verified to the ± 10 % of the specifications at each frequency band by using the system validation kit. (Graphic Plots Attached)

- Cabling the system, using the validation kit equipments.
- Generate about 100 mW Input Level from the Signal generator to the Dipole Antenna.
- Dipole Antenna was placed below the Flat phantom.
- The measured one-gram SAR at the surface of the phantom above the dipole feed-point should be within 10 % of the target reference value.
- The results are normalized to 1 W input power.

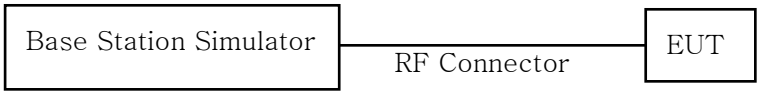
Note;
SAR Verification was performed according to the FCC KDB 450824.

# 9. RF CONDUCTED POWER MEASUREMENT

Power measurements were performed using a base station simulator under digital average power.
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 evaluation 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.

## 9.1 GSM

Conducted output power measurements were performed using a base station simulator under digital average power.




SAR Test for WWAN were performed with a base station simulator Agilent E5515C. Communication between the device and the emulator was established by air link. Set base station emulator to allow DUT to radiate maximum output power during all tests. Please refer to the below worst case SAR operation setup.

- GSM voice: Head SAR
- GPRS Multi-slots : Body SAR with GPRS Multi-slot Class12 CS 1 (GMSK)

**Note;**

CS1 coding scheme was used in GPRS output power measurements and SAR Testing, as a condition where GMSK modulation was ensured. Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels in the GPRS modes.

GSM Conducted output powers (Burst-Average)

| Band | Channel | Voice | GPRS(GMSK) Data – CS1 | | | |
|---|---|---|---|---|---|---|
| | | GSM (dBm) | GPRS 1 TX Slot (dBm) | GPRS 2 TX Slot (dBm) | GPRS 3 TX Slot (dBm) | GPRS 4 TX Slot (dBm) |
| GSM 850 | 128 | 33.26 | 33.26 | 29.87 | 28.07 | 26.96 |
| | 190 | 33.42 | 33.42 | 29.85 | 28.04 | 26.94 |
| | 251 | 33.54 | 33.54 | 29.84 | 28.01 | 26.91 |
| GSM 1900 | 512 | 29.22 | 29.23 | 26.39 | 24.48 | 23.38 |
| | 661 | 29.28 | 29.28 | 26.43 | 24.51 | 23.4 |
| | 810 | 29.18 | 29.21 | 26.38 | 24.46 | 23.35 |

GSM Conducted output powers (Frame-Average)

| Band | Channel | Voice | GPRS(GMSK) Data – CS1 | | | |
|---|---|---|---|---|---|---|
| | | GSM (dBm) | GPRS 1 TX Slot (dBm) | GPRS 2 TX Slot (dBm) | GPRS 3 TX Slot (dBm) | GPRS 4 TX Slot (dBm) |
| GSM 850 | 128 | 24.23 | 24.23 | 23.85 | 23.81 | 23.95 |
| | 190 | 24.39 | 24.39 | 23.83 | 23.78 | 23.93 |
| | 251 | 24.51 | 24.51 | 23.82 | 23.75 | 23.9 |
| GSM 1900 | 512 | 20.19 | 20.2 | 20.37 | 20.22 | 20.37 |
| | 661 | 20.25 | 20.25 | 20.41 | 20.25 | 20.39 |
| | 810 | 20.15 | 20.18 | 20.36 | 20.2 | 20.34 |

**Note:**

Time slot average factor is as follows:

1 Tx slot = 9.03 dB, Frame-Average output power = Burst-Average output power – 9.03 dB

2 Tx slot = 6.02 dB, Frame-Average output power = Burst-Average output power – 6.02 dB

3 Tx slot = 4.26 dB, Frame-Average output power = Burst-Average output power – 4.26 dB

4 Tx slot = 3.01 dB, Frame-Average output power = Burst-Average output power – 3.01 dB

# 9.2 WCDMA

Body SAR is not required for handsets with HSDPA capabilities when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Otherwise, SAR is Measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that results in the highest SAR in 12.2 kbps RMC for that RF channel.

## 9.2.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3 GPP TS 34.121, using the appropriate RMC or AMR with TPC(transmit power control) set to all “1s”.

## 9.2.2 Head SAR Measurements

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than ¼ dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer using the exposure configuration that results in the highest SAR for that RF channel in 12.2 RMC.

## 9.2.3 Body SAR Measurement

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all “1s”.

## 9.2.4 Handsets with Release 5 HSDPA

Body SAR is not required for handsets with HSDPA capabilities when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Otherwise, SAR is Measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that results in the highest SAR in 12.2 kbps RMC for that RF channel.

**Sub-Test 1 Setup for Release 5 HSDPA**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{hs}$ (1) | CM (dB) (2) |
|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 |
| 2 | 12/15 (3) | 15/15 (3) | 64 | 12/15 (3) | 24/15 | 1.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 |

Note 1: $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2: CM = 1 for $\beta_c/\beta_d$ =12/15, $\beta_{hs}/\beta_c$=24/15.
Note 3: For subtest 2 the $\beta_c/\beta_d$ ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 11/15 and $\beta_d$ = 15/15.

| 3GPP Release Version | Mode | 3GPP 34.121 Subtest | Cellular Band [dBm] UL 4132 (826.4) DL 4357 | UL 4183 (836.6) DL 4408 | UL 4233 (846.6) DL 4458 | MPR |
|---|---|---|---|---|---|---|
| 99 | WCDMA | 12.2 kbps RMC | 23.23 | 23.32 | 23.31 | - |
| 99 | WCDMA | 12.2 kbps AMR | 23.23 | 23.29 | 23.32 | - |
| 5 | HSDPA | Subtest 1 | 23.03 | 23.13 | 23.09 | 0 |

WCDMA Average Conducted output powers

# 9.3 WiFi

## 9.3.1 SAR Testing for 802.11a/b/g/n modes

## General Device Setup

Normal Network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

## Frequency Channel Configurations

80.11 a/b/g and 4.9 GHz operating modes are tested independently according to the service requirements in each frequency band. 80.211 b/g modes are tested on channels 1, 6 and 11.802.11a is tested for UNII operations on channels 36 and 48 in the 5.15-5.25 GHz band; channels 52 and 64 in the 5.25-5.35 GHz band; Channels 104, 116, 124 and 136 in the 5.470-5.725 GHz band; and channels 149 and 161 in the 5.8 GHz band. When 5.8 GHz § 15.247 is also available, channels 149, 157 and 165 should be tested instead of the UNII channels. 4.9 GHz is tested on channels 1, 10 and 5 or 6, whichever has the higher output power, for 5 MHz channels; channels 11,15 and 19 for 10 MHz channels; and channels 21 and 25 for 20 MHz channels.

These are referred to as the “default test channels”. 802.11g mode was evaluated only if the output power was 0.25 dB higher than the 802.11b mode.

| Mode | | GHz | Channel | Turbo Channel | “Default Test Channels” | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | §15.247 | | UNII | |
| | | | | | 802.11b | 802.11g | | |
| 802.11 b/g | | 2.412 | 1 | | √ | ∇ | | |
| | | 2.437 | 6 | 6 | √ | ∇ | | |
| | | 2.462 | 11 | | √ | ∇ | | |
| 802.11a | UNII | 5.18 | 36 | | | | √ | |
| | | 5.20 | 40 | 42 (5.21 GHz) | | | | * |
| | | 5.22 | 44 | | | | | * |
| | | 5.24 | 48 | 50 (5.25 GHz) | | | √ | |
| | | 5.26 | 52 | | | | √ | |
| | | 5.28 | 56 | 58 (5.29 GHz) | | | | * |
| | | 5.30 | 60 | | | | | * |
| | | 5.32 | 64 | | | | √ | |
| | | 5.500 | 100 | Unknown | | | | * |
| | | 5.520 | 104 | | | | √ | |
| | | 5.540 | 108 | | | | | * |
| | | 5.560 | 112 | | | | | * |
| | | 5.580 | 116 | | | | √ | |
| | | 5.600 | 120 | | | | | * |
| | | 5.620 | 124 | | | | √ | |
| | | 5.640 | 128 | | | | | * |
| | | 5.660 | 132 | | | | | * |
| | | 5.680 | 136 | | | | √ | |
| | | 5.700 | 140 | | | | | * |
| | UNII or §15.247 | 5.745 | 149 | | √ | | √ | |
| | | 5.765 | 153 | 152 (5.76 GHz) | | * | | * |
| | | 5.785 | 157 | | √ | | | * |
| | | 5.805 | 161 | 160 (5.80 GHz) | | * | √ | |
| | §15.247 | 5.825 | 165 | | √ | | | |

802.11 Test Channels per FCC Requirements

| Band | Channel | Conducted Power (dBm) | | | |
|---|---|---|---|---|---|
| | | Data Rate (Mbps) | | | |
| | | 1 | 2 | 5.5 | 11 |
| IEEE 802.11b | 1 | 15.53 | 15.16 | 15.57 | 15.30 |
| | 6 | 14.52 | 14.18 | 14.43 | 14.22 |
| | 11 | 15.38 | 15.20 | 15.44 | 15.27 |

Average IEEE 802.11b Conducted output power

| Band | Channel | Conducted Power (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate (Mbps) | | | | | | | |
| | | 6 | 9 | 12 | 18 | 24 | 36 | 48 | 54 |
| IEEE 802.11g | 1 | 13.43 | 12.90 | 12.87 | 12.69 | 12.47 | 12.32 | 11.75 | 11.62 |
| | 6 | 12.26 | 12.03 | 11.91 | 11.81 | 11.65 | 11.29 | 10.88 | 10.77 |
| | 11 | 12.64 | 12.34 | 12.31 | 12.19 | 11.97 | 11.65 | 11.27 | 11.19 |

Average IEEE 802.11g Conducted output power

| Band | Channel | Conducted Power (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate (Mbps) | | | | | | | |
| | | 6.5 | 13 | 20 | 26 | 39 | 52 | 58 | 65 |
| IEEE 802.11n (HT-20) | 1 | 12.06 | 11.84 | 11.60 | 11.47 | 11.15 | 10.77 | 10.54 | 10.47 |
| | 6 | 11.35 | 11.11 | 11.05 | 10.76 | 10.48 | 9.96 | 10.07 | 9.86 |
| | 11 | 11.41 | 11.17 | 11.12 | 10.90 | 10.57 | 10.25 | 9.92 | 9.90 |

Average IEEE 802.11n Conducted output power

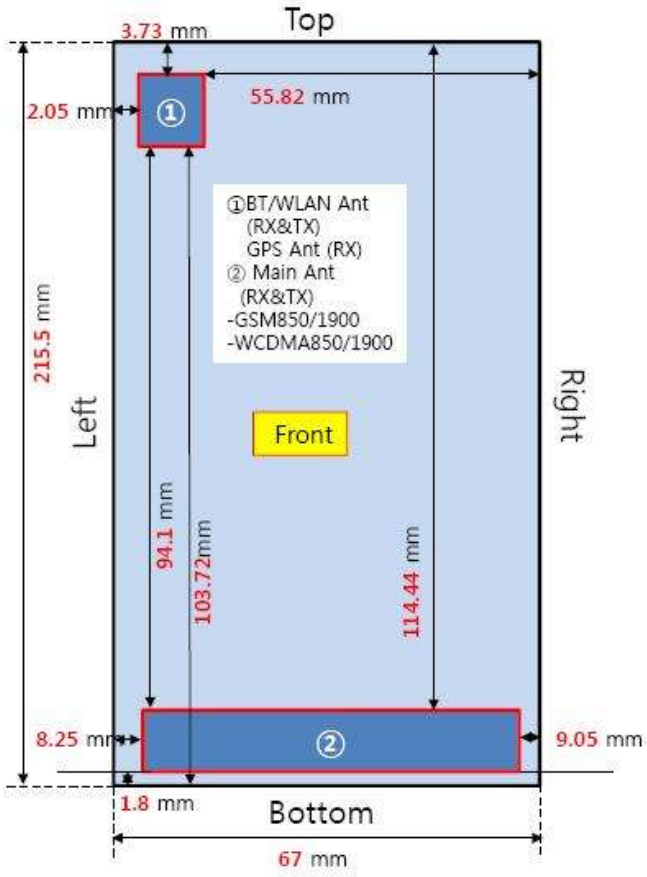
Note;
SAR testing was performed according to the FCC KDB 248227.

# 10. SAR Test configuration & Antenna Information

## 10.1 SAR Test configurations

| Mode | Back | Front | Left | Right | Bottom | Top |
|---|---|---|---|---|---|---|
| 850 GPRS | Yes | Yes | Yes | Yes | Yes | No |
| 1900 GPRS | Yes | Yes | Yes | Yes | Yes | No |
| WCDMA850 | Yes | Yes | Yes | Yes | Yes | No |
| WLAN | Yes | Yes | Yes | No | No | Yes |

## 10.2 Antenna and Device Information




**[Rear side View]**

**Note;**

Per FCC KDB Publication 941225 D06, we performed the SAR testing at 1 cm from the top & bottom surfaces and also from side edges with a transmitting antenna ≤ 2.5 cm from an edge.

# 11. SAR Considerations for Multiple Transmitters and Antennas

## 11.1 SAR Evaluation Considerations

These procedures were followed according to FCC "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas", May 2008. The procedures are applicable to phones with built-in unlicensed transmitters, such as 802.11 a/b/g and Bluetooth devices.

| | 2.45 | 5.15 - 5.35 | 5.47 - 5.85 | GHz |
|---|---|---|---|---|
| $P_{Ref}$ | 12 | 6 | 5 | mW |
| Device output power should be rounded to the nearest mW to compare with values specified in this | | | | |

Table. 11.1 Output Power Thresholds for Unlicensed Transmitters

| | Individual Transmitter | Simultaneous Transmission |
|---|---|---|
| **Licensed Transmitters** | Routine evaluation required | SAR not required:<br>Unlicensed only<br>○ when stand-alone 1-g SAR is not required and antenna is ≥ 5 cm from other antennas<br>Licensed & Unlicensed<br>○ when the sum of the 1-g SAR is < 1.6 W/kg for all simultaneous transmitting antennas<br>○ when SAR to peak location separation ratio of simultaneous transmitting antenna pair is < 0.3<br>SAR required:<br>Licensed & Unlicensed<br>antenna pairs with SAR to peak location separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in stand-alone configuration for each wireless mode and exposure condition<br>Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply |
| **Unlicensed Transmitters** | When there is no simultaneous transmission –<br>○ output ≤ 60/f: SAR not required<br>○ output > 60/f: stand-alone SAR required<br>When there is simultaneous transmission –<br>Stand-alone SAR not required when<br>○ output ≤ 2·$P_{Ref}$ and antenna is ≥ 5.0 cm from other antennas<br>○ output ≤ $P_{Ref}$ and antenna is ≥ 2.5 cm from other antennas<br>○ output ≤ $P_{Ref}$ and antenna is < 2.5 cm from other antennas, each with either output power ≤ $P_{Ref}$ or 1-g SAR < 1.2 W/kg<br>Otherwise stand-alone SAR is required<br>When stand-alone SAR is required<br>○ test SAR on highest output channel for each wireless mode and exposure condition<br>○ if SAR for highest output channel is > 50% of SAR limit, evaluate all channels according to normal procedures | |
| **Jaw, Mouth and Nose** | Flat phantom SAR required<br>○ when measurement is required in tight regions of SAM and it is not feasible or the results can be questionable due to probe tilt, calibration, positioning and orientation issues<br>○ position rectangular and clam-shell phones according to flat phantom procedures and conduct SAR measurements for these specific locations | When simultaneous transmission SAR testing is required, contact the FCC Laboratory for interim guidance. |

SAR Evaluation Requirements for Multiple Transmitters Handsets

FCC ID: ZNFP705F / BT Max. RF output power: 9.64 dBm (9.20 mW)

WLAN Max. RF output power: Wi-Fi 802.11b (15.57 dBm)

## 11.2 SAR Summation Scenario

**Simultaneous Transmission Summation for Held to Ear**

| Simultaneous TX | configuration | 850 GSM SAR(W/kg) | WIFI SAR (W/kg) | ∑SAR (W/kg) | Simultaneous TX | configuration | 1900 GSM SAR(W/kg) | WIFI SAR (W/kg) | ∑SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|
| Head SAR | Left Cheek | 0.399 | 0.15 | 0.549 | Head SAR | Left Cheek | 0.308 | 0.15 | 0.458 |
| | Left Tilt | 0.246 | 0.133 | 0.379 | | Left Tilt | 0.18 | 0.133 | 0.313 |
| | Right Cheek | 0.511 | 0.366 | 0.877 | | Right Cheek | 0.239 | 0.366 | 0.605 |
| | Right Tilt | 0.258 | 0.14 | 0.398 | | Right Tilt | 0.215 | 0.14 | 0.355 |

| Simultaneous TX | configuration | 850 WCDMA SAR(W/kg) | WIFI SAR (W/kg) | ∑SAR (W/kg) |
|---|---|---|---|---|
| Head SAR | Left Cheek | 0.377 | 0.15 | 0.527 |
| | Left Tilt | 0.177 | 0.133 | 0.310 |
| | Right Cheek | 0.473 | 0.366 | 0.839 |
| | Right Tilt | 0.249 | 0.14 | 0.389 |

The above tables represent a held to ear voice call with 2.4 GHz WLAN.

**Simultaneous Transmission Summation for Body-Worn (1cm)**

| Simultaneous TX | configuration | 850 GPRS SAR(W/kg) | WIFI SAR (W/kg) | ∑SAR (W/kg) | Simultaneous TX | configuration | 1900 GPRS SAR(W/kg) | WIFI SAR (W/kg) | ∑SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|
| Body SAR | Back | 0.951 | 0.087 | 1.038 | Body SAR | Back | 0.237 | 0.087 | 0.324 |

| Simultaneous TX | configuration | 850 WCDMA SAR(W/kg) | WIFI SAR (W/kg) | ∑SAR (W/kg) |
|---|---|---|---|---|
| Body SAR | Back | 0.796 | 0.087 | 0.883 |

The above tables represent a body-worn call with 2.4 GHz WLAN.

**Simultaneous Transmission Summation for Hotspot**

| Simultaneous TX | configuration | 850 GPRS SAR(W/kg) | WIFI SAR (W/kg) | ∑SAR (W/kg) | Simultaneous TX | configuration | 1900 GPRS SAR(W/kg) | WIFI SAR (W/kg) | ∑SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|
| Body SAR | Back | 0.951 | 0.087 | 1.038 | Body SAR | Back | 0.237 | 0.087 | 0.324 |
| | Front | 0.577 | 0.043 | 0.620 | | Front | 0.241 | 0.043 | 0.284 |
| | Left | 0.615 | 0.039 | 0.654 | | Left | 0.128 | 0.039 | 0.167 |
| | Right | 0.774 | - | 0.774 | | Right | 0.093 | - | 0.093 |
| | Bottom | 0.074 | - | 0.074 | | Bottom | 0.162 | - | 0.162 |
| | Top | - | 0.027 | - | | Top | - | 0.027 | - |

| Simultaneous TX | configuration | 850 WCDMA SAR(W/kg) | WIFI SAR (W/kg) | ∑SAR (W/kg) |
|---|---|---|---|---|
| Body SAR | Back | 0.796 | 0.087 | 0.883 |
| | Front | 0.545 | 0.043 | 0.588 |
| | Left | 0.523 | 0.039 | 0.562 |
| | Right | 0.656 | - | 0.656 |
| | Bottom | 0.074 | - | 0.074 |
| | Top | - | 0.027 | - |

The above tables represent a portable hotspot condition.

**Note;**

**Body-Worn SAR** : The Rear side hotspot SAR test configurations can be considered for body-worn accessory SAR. Although body-worn accessory conditions are typically for voice configurations, the GPRS slot frame averaged output power was more conservative and was included for the body-worn accessory SAR assessment.

## 11.3 Simultaneous Transmission Conclusion

The above numerical summed SAR was below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit.No volumetric SAR summation is required per FCC KDB Publication 648474.

The above tables represent the worst-case simultaneous transmission scenarios possibility with this device.

The conducted output power level of the BT transmitter is less than $2*P_{ref}$, the BT antenna is more than 5 cm from the other antenna, therefore, a stand-alone BT SAR evaluation is not required.

# 12. SAR TEST DATA SUMMARY

## 12.1 Measurement Results (GSM850 Head SAR)

| Frequency | | Modulation | Conducted Power (dBm) | Power Drift (dB) | Battery | Phantom Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|
| MHz | Channel | | | | | | |
| 836.6 | 190 (Mid) | GSM850 | 33.42 | -0.060 | Standard | Left Ear | 0.399 |
| | | | 33.42 | -0.060 | Standard | Left Tilt 15° | 0.246 |
| | | | 33.42 | -0.041 | Standard | Right Ear | 0.511 |
| | | | 33.42 | -0.054 | Standard | Right Tilt 15° | 0.258 |
| **ANSI/ IEEE C95.1 - 1992– 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 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 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).

# 12.2 Measurement Results (GSM1900 Head SAR)

| Frequency | | Modulation | ConductedPower (dBm) | Power Drift (dB) | Battery | Phantom Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|
| MHz | Channel | | | | | | |
| 1 880.0 | 661 (Mid) | GSM1900 | 29.28 | -0.091 | Standard | Left Ear | 0.308 |
| | | | 29.28 | -0.076 | Standard | Left Tilt 15° | 0.18 |
| | | | 29.28 | 0.059 | Standard | Right Ear | 0.239 |
| | | | 29.28 | -0.031 | Standard | Right Tilt 15° | 0.215 |
| **ANSI/ IEEE C95.1 - 1992– 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 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 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).

# 12.3 Measurement Results (WCDMA850 Head SAR)

| Frequency | | Modulation | Conducted Power (dBm) | Power Drift (dB) | Battery | Phantom Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|
| MHz | Channel | | | | | | |
| 836.6 | 4183 (Mid) | WCDMA850 | 23.32 | -0.092 | Standard | Left Ear | 0.377 |
| 836.6 | 4183 (Mid) | WCDMA850 | 23.32 | -0.001 | Standard | Left Tilt 15° | 0.177 |
| 836.6 | 4183 (Mid) | WCDMA850 | 23.32 | -0.030 | Standard | Right Ear | 0.473 |
| 836.6 | 4183 (Mid) | WCDMA850 | 23.32 | 0.049 | Standard | Right Tilt 15° | 0.249 |
| **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 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 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).
8 WCDMA Mode was tested under RMC 12.2 kbps and HSDPA Inactive.

# 12.4 Measurement Results (802.11b/g/n Head)

| Frequency | | Modulation | Conducted Power (dBm) | Power Drift (dB) | Battery | Phantom Position | Data Rate | SAR(mW/g) |
|---|---|---|---|---|---|---|---|---|
| MHz | Channel | | | | | | | |
| 2 412 | 1 (Low) | 802.11b | 15.53 | -0.075 | Standard | Left Ear | 1 Mbps | 0.15 |
| 2 412 | 1 (Low) | 802.11b | 15.53 | -0.014 | Standard | Left Tilt 15° | 1 Mbps | 0.133 |
| 2 412 | 1 (Low) | 802.11b | 15.53 | -0.074 | Standard | Right Ear | 1 Mbps | 0.366 |
| 2 412 | 1 (Low) | 802.11b | 15.53 | -0.102 | Standard | Right Tilt 15 | 1 Mbps | 0.14 |
| **ANSI/ IEEE C95.1 - 1992– 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 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☒ Manual Test cord ☐ Base Station Simulator
7 IEEE 802.11g(including 802.11n) SAR testing is required when the conducted powers are equal to or greater than 0.25 dB Than the conducted powers in IEEE 802.11b.
8 For 2.4GHz WLAN, Highest average power channel for the lowest data rate was selected for SAR evaluation based on KDB 248227. Other channels are not necessary because 1g-average SAR < 0.8 W/Kg and peak SAR < 1.6W/Kg per KDB 248227.

# 12.5 Measurement Results (GSM850 Hotspot SAR)

| Frequency | | Modulation | Conducted Power (dBm) | Power Drift (dB) | Configuration | Separation Distance | SAR(mW/g) |
|---|---|---|---|---|---|---|---|
| MHz | Channel | | | | | | |
| 824.2 | 128 (Low) | GPRS 1Tx | 33.26 | -0.019 | Rear | 1.0 cm | 0.832 |
| 836.6 | 190 (Mid) | GPRS 1Tx | 33.42 | -0.036 | Rear | 1.0 cm | 0.898 |
| 848.8 | 251 (High) | GPRS 1Tx | 33.54 | -0.005 | Rear | 1.0 cm | 0.951 |
| 836.6 | 190 (Mid) | GPRS 1Tx | 33.42 | -0.035 | Front | 1.0 cm | 0.577 |
| 836.6 | 190 (Mid) | GPRS 1Tx | 33.42 | -0.009 | Left | 1.0 cm | 0.615 |
| 836.6 | 190 (Mid) | GPRS 1Tx | 33.42 | 0.001 | Right | 1.0 cm | 0.774 |
| 836.6 | 190 (Mid) | GPRS 1Tx | 33.42 | 0.042 | Bottom | 1.0 cm | 0.074 |
| **ANSI/ IEEE C95.1 - 1992– 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-body 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 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Test Configuration ☐ With Holster ☒ Without Holster
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).
9 For body SAR testing, the EUT was set in GPRS multi-slot class12 with 1uplink slots for GSM850 due to maximum source-based time-averaged output power.
According to the KDB 941225 D03 SAR test reduction GSM/GPRS/EDGE, the maximum output power configuration were chosen for Body SAR testing.

# 12.6 Measurement Results (GSM1900 Hotspot SAR)

| Frequency | | Modulation | Conducted Power (dBm) | Power Drift (dB) | Configuration | Separation Distance | SAR(mW/g) |
|---|---|---|---|---|---|---|---|
| MHz | Channel | | | | | | |
| 1 880.0 | 661 (Mid) | GPRS 1Tx | 29.28 | -0.012 | Rear | 1.0 cm | 0.203 |
| 1 880.0 | 661 (Mid) | GPRS 2Tx | 26.43 | 0.041 | Rear | 1.0 cm | 0.237 |
| 1 880.0 | 661 (Mid) | GPRS 3Tx | 24.51 | -0.118 | Rear | 1.0 cm | 0.227 |
| 1 880.0 | 661 (Mid) | GPRS 4Tx | 23.40 | -0.186 | Rear | 1.0 cm | 0.226 |
| 1 880.0 | 661 (Mid) | GPRS 2Tx | 26.43 | 0.091 | Front | 1.0 cm | 0.241 |
| 1 880.0 | 661 (Mid) | GPRS 2Tx | 26.43 | 0.013 | Left | 1.0 cm | 0.128 |
| 1 880.0 | 661 (Mid) | GPRS 2Tx | 26.43 | -0.052 | Right | 1.0 cm | 0.093 |
| 1 880.0 | 661 (Mid) | GPRS 2Tx | 26.43 | -0.089 | Bottom | 1.0 cm | 0.162 |
| **ANSI/ IEEE C95.1 - 1992– 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-body 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 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Test Configuration ☐ With Holster ☒ Without Holster
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).
9 For body SAR testing, the EUT was set in GPRS multi-slot class12 with 2uplink slots for GSM1900 due to maximum source-based time-averaged output power.
According to the KDB 941225 D03 SAR test reduction GSM/GPRS/EDGE, the maximum output power configuration were chosen for Body SAR testing.

# 12.7 Measurement Results (WCDMA850 Hotspot SAR)

| Frequency | | Modulation | Conducted Power (dBm) | Power Drift (dB) | Configuration | Phantom Position | SAR(mW/g) |
|---|---|---|---|---|---|---|---|
| MHz | Channel | | | | | | |
| 836.6 | 4132(Low) | WCDMA850 | 23.32 | -0.073 | Rear | 1.0 cm | 0.796 |
| 836.6 | 4183 (Mid) | WCDMA850 | 23.32 | 0.027 | Front | 1.0 cm | 0.545 |
| 836.6 | 4183 (Mid) | WCDMA850 | 23.32 | -0.032 | Left | 1.0 cm | 0.523 |
| 836.6 | 4183 (Mid) | WCDMA850 | 23.32 | -0.011 | Right | 1.0 cm | 0.656 |
| 836.6 | 4183 (Mid) | WCDMA850 | 23.32 | 0.075 | Bottom | 1.0 cm | 0.074 |
| **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** | | |

1 The test data reported are the worst-case SAR value with the antenna-body 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 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Test Configuration ☐ With Holster ☒ Without Holster
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).
9 WCDMA Mode was tested under RMC 12.2 kbps and HSDPA Inactive.

# 12.8 Measurement Results (802.11b/g/n Hotspot SAR)

| Frequency | | Modulation | Conducted Power (dBm) | Power Drift (dB) | Configuration | Separation Distance | Data Rate | SAR(mW/g) |
|---|---|---|---|---|---|---|---|---|
| MHz | Channel | | | | | | | |
| 2 412 | 1 (Low) | 802.11b | 15.53 | -0.052 | Rear | 1.0 cm | 1 Mbps | 0.087 |
| 2 412 | 1 (Low) | 802.11b | 15.53 | 0.114 | Front | 1.0 cm | 1 Mbps | 0.043 |
| 2 412 | 1 (Low) | 802.11b | 15.53 | -0.084 | Left | 1.0 cm | 1 Mbps | 0.039 |
| 2 412 | 1 (Low) | 802.11b | 15.53 | 0.007 | Top | 1.0 cm | 1 Mbps | 0.027 |
| **ANSI/ IEEE C95.1 1992 – 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-body 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 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☒ Manual Test code ☐ Base Station Simulator
7 IEEE 802.11g(including 802.11n) SAR testing is required when the conducted powers are equal to or greater than 0.25 dB Than the conducted powers in IEEE 802.11b.
8 For 2.4GHz WLAN, Highest average power channel for the lowest data rate was selected for SAR evaluation based on KDB 248227. Other channels are not necessary because 1g-average SAR < 0.8 W/Kg and peak SAR < 1.6W/Kg per KDB 248227.

# 13. CONCLUSION

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the ANSI/ IEEE C95.1 1992.

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.

# 14. 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, 300 kHz to 100 GHz, 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. Pokovi$^{o}$, 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 300 MHz, 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: 10 kHz-300 GHz, Jan. 1995.

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

[21] SAR Evaluation of Handsets with Multiple Transmitters and Antennas #648474.

[22] SAR Measurement Procedure for 802.11 a/b/g Transmitters #KDB 248227.

# Attachment 1. – SAR Test Plots

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.898 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

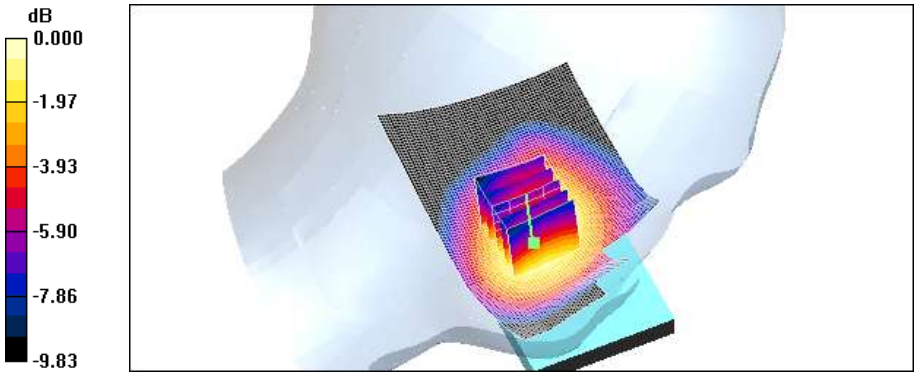
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phamtom ; Type: SAM

**Left touch 190/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.427 mW/g

**Left touch 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.75 V/m; Power Drift = -0.060 dB
Peak SAR (extrapolated) = 0.490 W/kg
**SAR(1 g) = 0.399 mW/g; SAR(10 g) = 0.296 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.419 mW/g




0 dB = 0.419mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.898 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

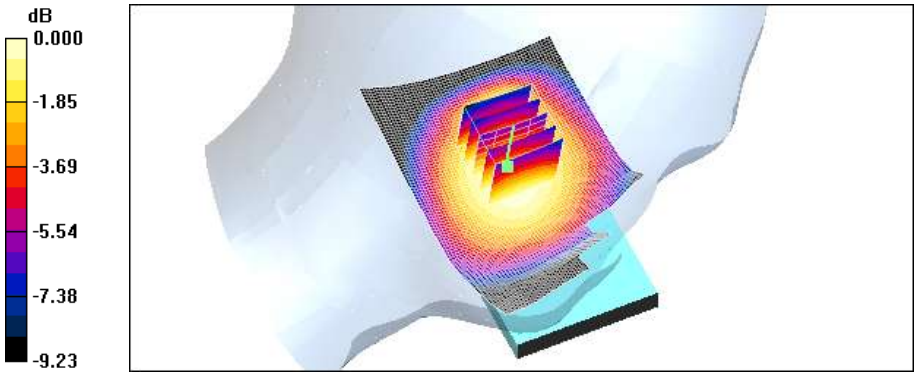
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phamtom ; Type: SAM

**Left tilt 190/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.257 mW/g

**Left tilt 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.8 V/m; Power Drift = -0.060 dB
Peak SAR (extrapolated) = 0.287 W/kg
**SAR(1 g) = 0.246 mW/g; SAR(10 g) = 0.191 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.258 mW/g




0 dB = 0.258mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.898 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

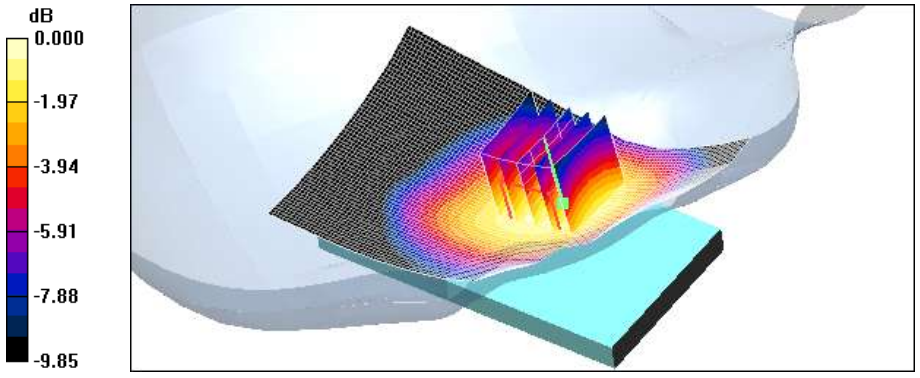
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phamtom ; Type: SAM

**Right touch 190/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.543 mW/g

**Right touch 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.44 V/m; Power Drift = -0.041 dB
Peak SAR (extrapolated) = 0.633 W/kg
**SAR(1 g) = 0.511 mW/g; SAR(10 g) = 0.380 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.540 mW/g




0 dB = 0.540mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.898 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

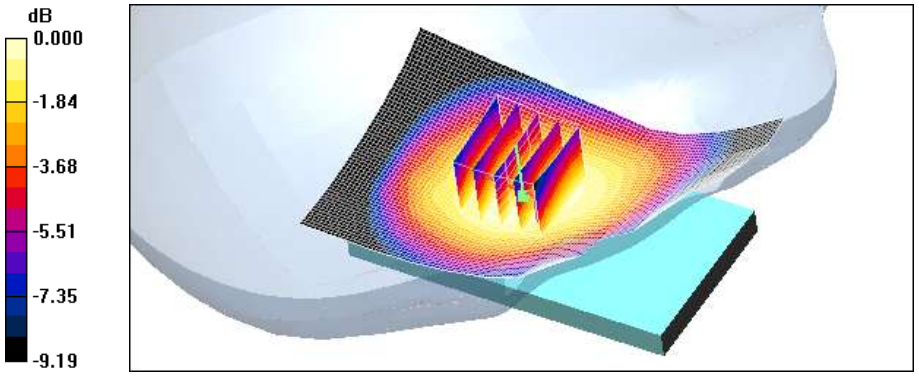
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phamtom ; Type: SAM

**Right tilt 190/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.269 mW/g

**Right tilt 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.7 V/m; Power Drift = -0.054 dB
Peak SAR (extrapolated) = 0.303 W/kg
**SAR(1 g) = 0.258 mW/g; SAR(10 g) = 0.200 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.268 mW/g




0 dB = 0.268mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |

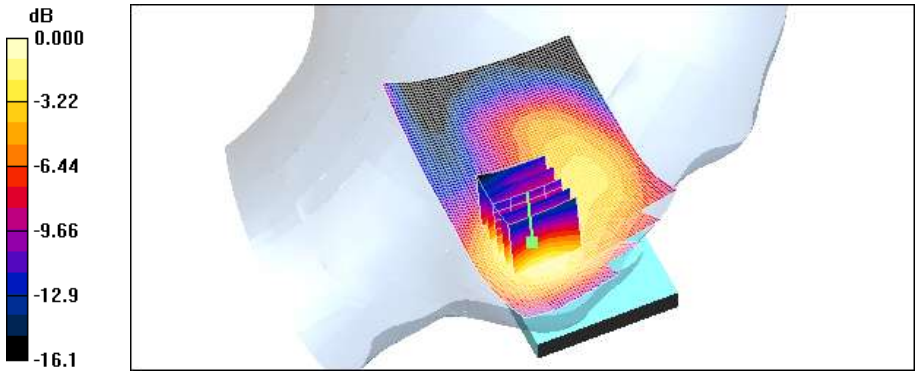
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.37 mho/m; $\varepsilon_r$ = 39.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left touch 661/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.342 mW/g

**Left touch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.4 V/m; Power Drift = -0.091 dB
Peak SAR (extrapolated) = 0.492 W/kg
**SAR(1 g) = 0.308 mW/g; SAR(10 g) = 0.185 mW/g**
Maximum value of SAR (measured) = 0.335 mW/g




0 dB = 0.335mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |

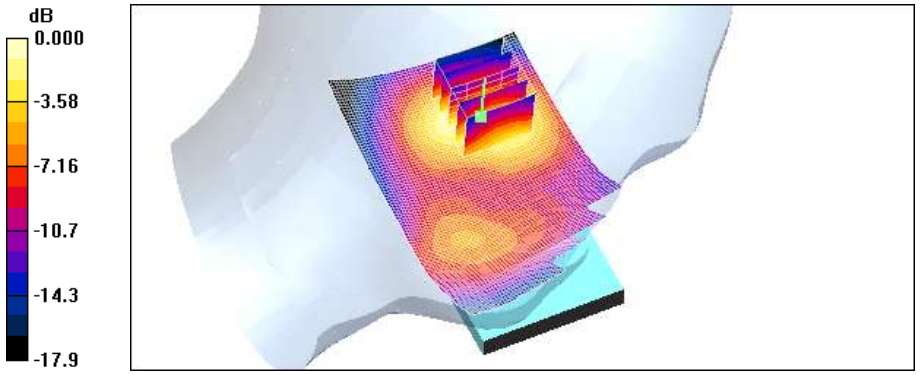
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.37 mho/m; $\varepsilon_r$ = 39.2; $\rho$ = 1000 kg/$m^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left tilt 661/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.207 mW/g

**Left tilt 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.55 V/m; Power Drift = -0.076 dB
Peak SAR (extrapolated) = 0.280 W/kg
**SAR(1 g) = 0.180 mW/g; SAR(10 g) = 0.107 mW/g**
Maximum value of SAR (measured) = 0.190 mW/g




0 dB = 0.190mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |

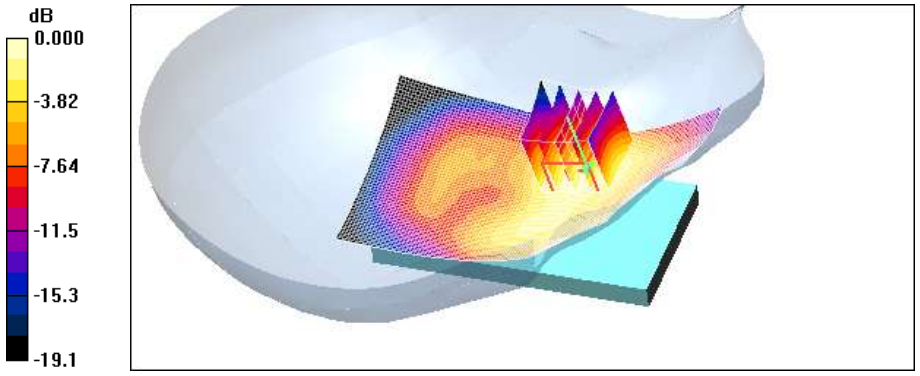
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.37 mho/m; $\varepsilon_r$ = 39.2; $\rho$ = 1000 kg/$m^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 661/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.263 mW/g

**Right touch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.58 V/m; Power Drift = 0.059 dB
Peak SAR (extrapolated) = 0.352 W/kg
**SAR(1 g) = 0.239 mW/g; SAR(10 g) = 0.149 mW/g**
Maximum value of SAR (measured) = 0.254 mW/g




0 dB = 0.254mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |

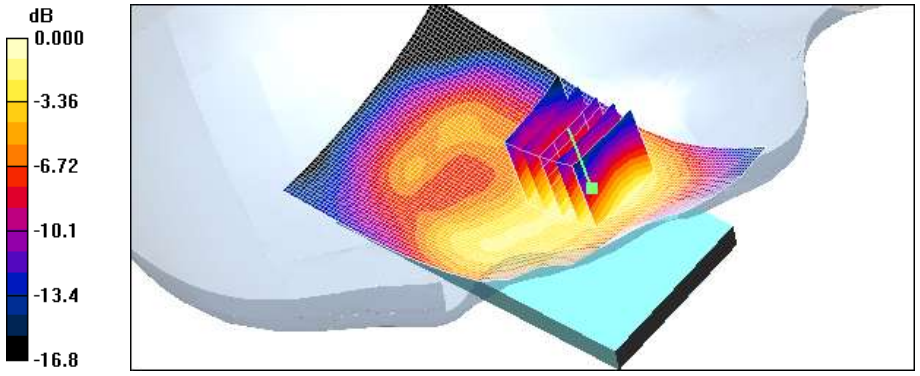
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.37 mho/m; $\varepsilon_r$ = 39.2; $\rho$ = 1000 kg/$m^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right tilt 661/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.224 mW/g

**Right tilt 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.73 V/m; Power Drift = -0.031 dB
Peak SAR (extrapolated) = 0.322 W/kg
**SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.131 mW/g**
Maximum value of SAR (measured) = 0.227 mW/g




0 dB = 0.227mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.898 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

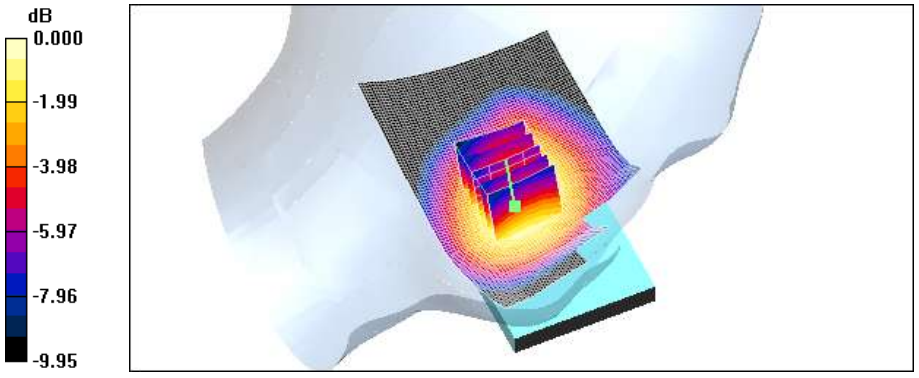
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phamtom ; Type: SAM

**Left touch 4183/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.405 mW/g

**Left touch 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.99 V/m; Power Drift = -0.092 dB
Peak SAR (extrapolated) = 0.454 W/kg
**SAR(1 g) = 0.377 mW/g; SAR(10 g) = 0.283 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.400 mW/g




0 dB = 0.400mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.898 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

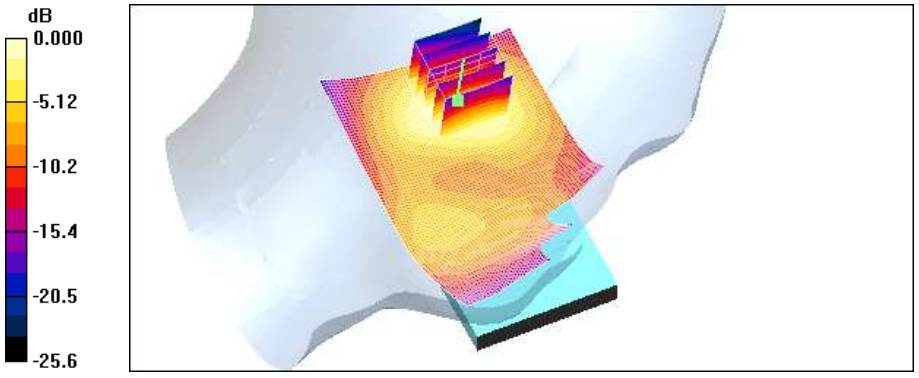
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phamtom ; Type: SAM

**Left tilt 4183/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.210 mW/g

**Left tilt 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.9 V/m; Power Drift = -0.001 dB
Peak SAR (extrapolated) = 0.336 W/kg
**SAR(1 g) = 0.177 mW/g; SAR(10 g) = 0.094 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.191 mW/g




0 dB = 0.191mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.898 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

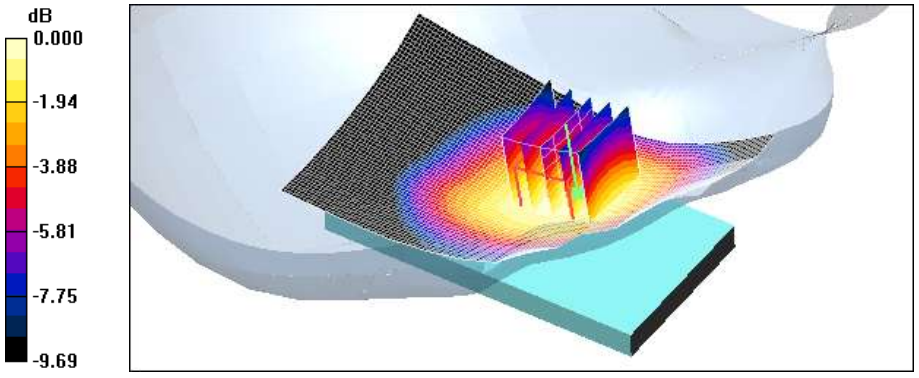
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phamtom ; Type: SAM

**Right touch 4183/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.506 mW/g

**Right touch 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.42 V/m; Power Drift = -0.030 dB
Peak SAR (extrapolated) = 0.583 W/kg
**SAR(1 g) = 0.473 mW/g; SAR(10 g) = 0.355 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: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.898 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

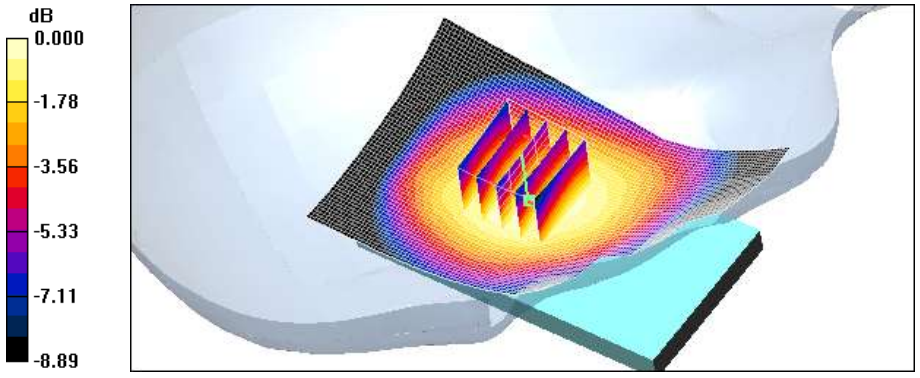
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phamtom ; Type: SAM

**Right tilt 4183/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.263 mW/g

**Right tilt 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.9 V/m; Power Drift = 0.049 dB
Peak SAR (extrapolated) = 0.293 W/kg
**SAR(1 g) = 0.249 mW/g; SAR(10 g) = 0.192 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.261 mW/g




0 dB = 0.261mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; $\sigma$ = 1.81 mho/m; $\varepsilon_r$ = 38.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

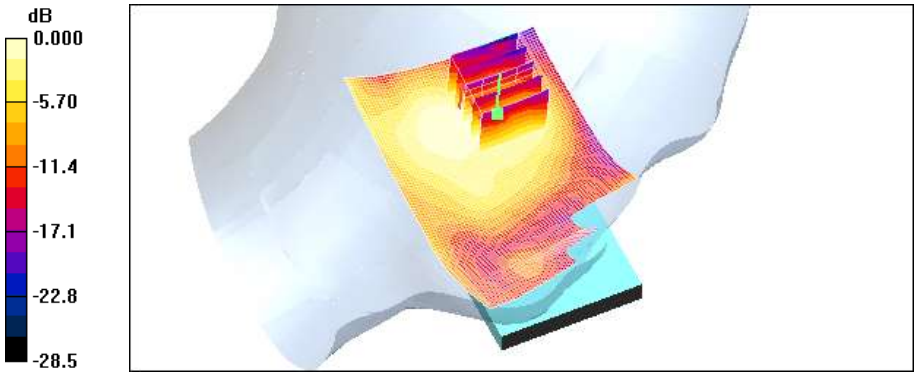
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Left touch 1ch 1Mbps/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

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

**Left touch 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.4 V/m; Power Drift = -0.075 dB
Peak SAR (extrapolated) = 0.288 W/kg
**SAR(1 g) = 0.150 mW/g; SAR(10 g) = 0.081 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.162 mW/g




0 dB = 0.162mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; $\sigma$ = 1.81 mho/m; $\varepsilon_r$ = 38.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

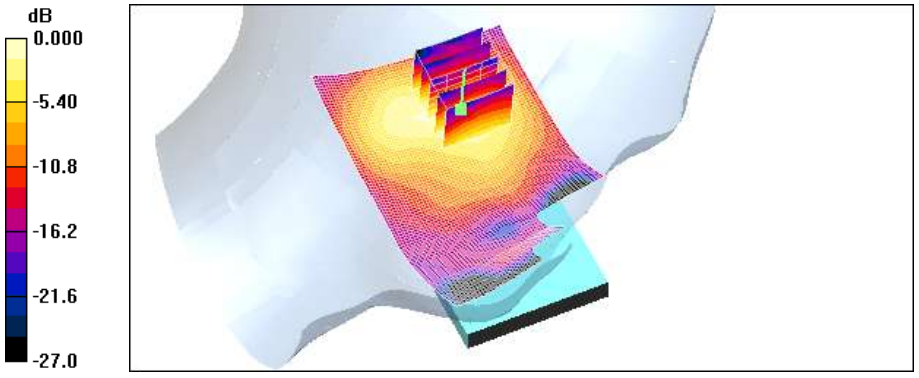
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Left tilt 1ch 1Mbps/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.149 mW/g

**Left tilt 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.87 V/m; Power Drift = -0.014 dB
Peak SAR (extrapolated) = 0.290 W/kg
**SAR(1 g) = 0.133 mW/g; SAR(10 g) = 0.067 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.146 mW/g




0 dB = 0.146mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; $\sigma$ = 1.81 mho/m; $\varepsilon_r$ = 38.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

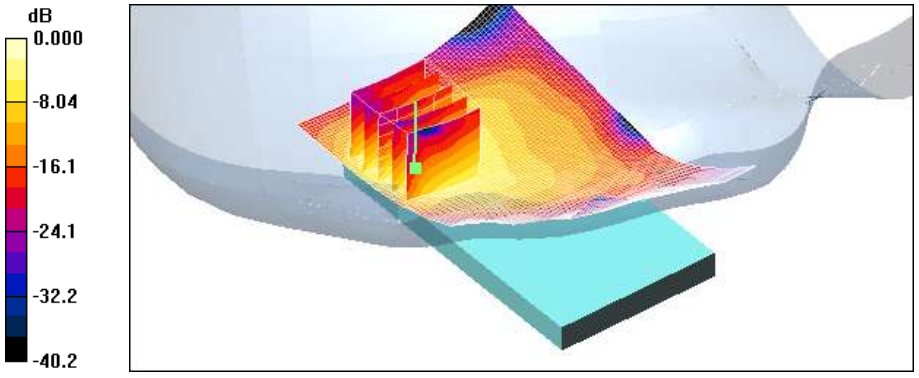
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Right touch 1ch 1Mbps/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.446 mW/g

**Right touch 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.91 V/m; Power Drift = -0.074 dB
Peak SAR (extrapolated) = 0.912 W/kg
**SAR(1 g) = 0.366 mW/g; SAR(10 g) = 0.166 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.412 mW/g




0 dB = 0.412mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; $\sigma$ = 1.81 mho/m; $\varepsilon_r$ = 38.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

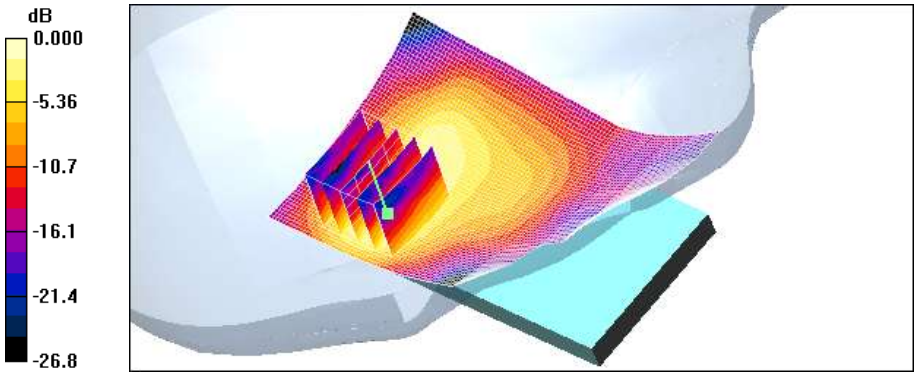
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Right tilt 1ch 1Mbps/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.158 mW/g

**Right tilt 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.39 V/m; Power Drift = -0.102 dB
Peak SAR (extrapolated) = 0.322 W/kg
**SAR(1 g) = 0.140 mW/g; SAR(10 g) = 0.071 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.144 mW/g




0 dB = 0.144mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 825 MHz; $\sigma$ = 0.994 mho/m; $\varepsilon_r$ = 55.1; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

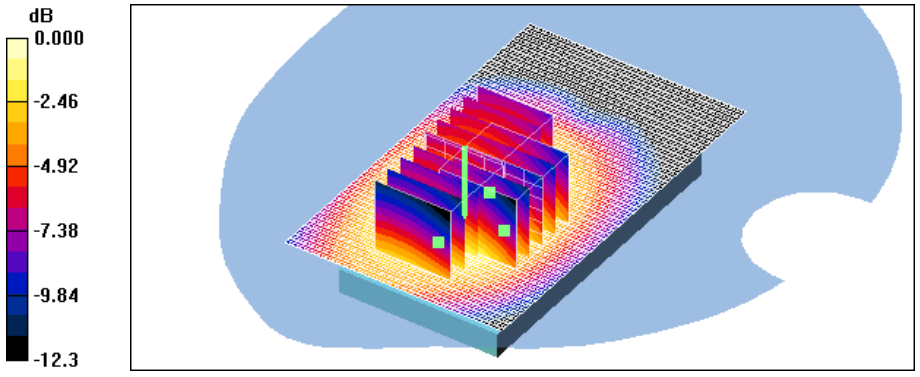
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Rear 128 1TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.871 mW/g

**Body Rear 128 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.8 V/m; Power Drift = -0.019 dB
Peak SAR (extrapolated) = 1.02 W/kg
**SAR(1 g) = 0.832 mW/g; SAR(10 g) = 0.627 mW/g**
Maximum value of SAR (measured) = 0.871 mW/g

**Body Rear 128 1TX/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.8 V/m; Power Drift = -0.019 dB
Peak SAR (extrapolated) = 1.07 W/kg
**SAR(1 g) = 0.806 mW/g; SAR(10 g) = 0.557 mW/g**
Maximum value of SAR (measured) = 0.858 mW/g

**Body Rear 128 1TX/Zoom Scan (5x5x7)/Cube 2:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.8 V/m; Power Drift = -0.019 dB
Peak SAR (extrapolated) = 1.10 W/kg
**SAR(1 g) = 0.830 mW/g; SAR(10 g) = 0.549 mW/g**
Maximum value of SAR (measured) = 0.873 mW/g




0 dB = 0.873mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

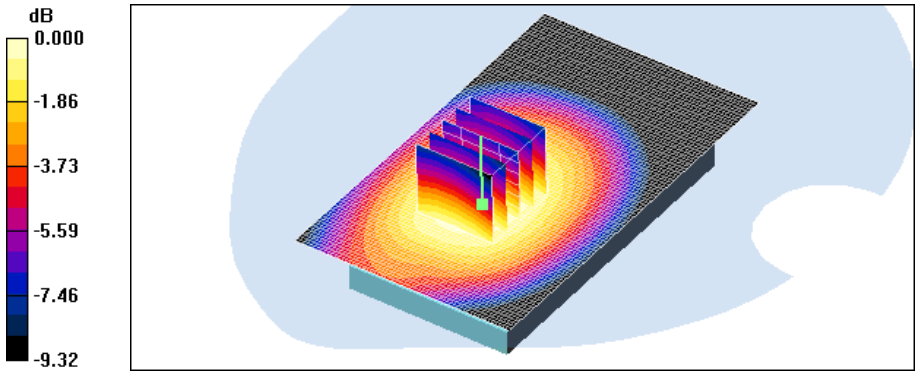
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Rear 190 1TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.950 mW/g

**Body Rear 190 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.9 V/m; Power Drift = -0.036 dB
Peak SAR (extrapolated) = 1.09 W/kg
**SAR(1 g) = 0.898 mW/g; SAR(10 g) = 0.664 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
aximum value of SAR (measured) = 0.946 mW/g




0 dB = 0.946mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 848.8 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 848.8 MHz; $\sigma$ = 1.03 mho/m; $\varepsilon_r$ = 54.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

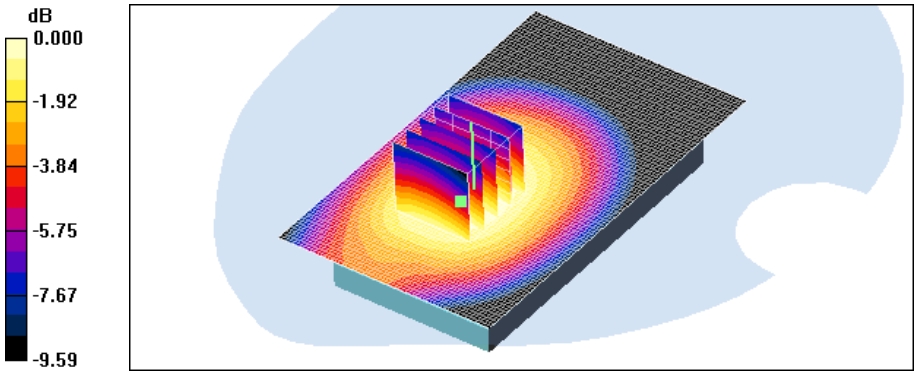
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Rear 251 1TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.00 mW/g

**Body Rear 251 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.1 V/m; Power Drift = -0.005 dB
Peak SAR (extrapolated) = 1.16 W/kg
**SAR(1 g) = 0.951 mW/g; SAR(10 g) = 0.720 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: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

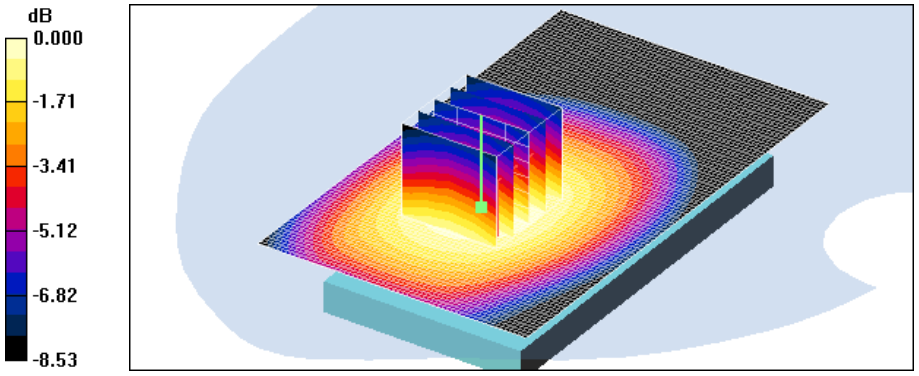
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Front 190 1TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.602 mW/g

**Body Front 190 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.1 V/m; Power Drift = -0.035 dB
Peak SAR (extrapolated) = 0.692 W/kg
**SAR(1 g) = 0.577 mW/g; SAR(10 g) = 0.442 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.608 mW/g




0 dB = 0.608mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

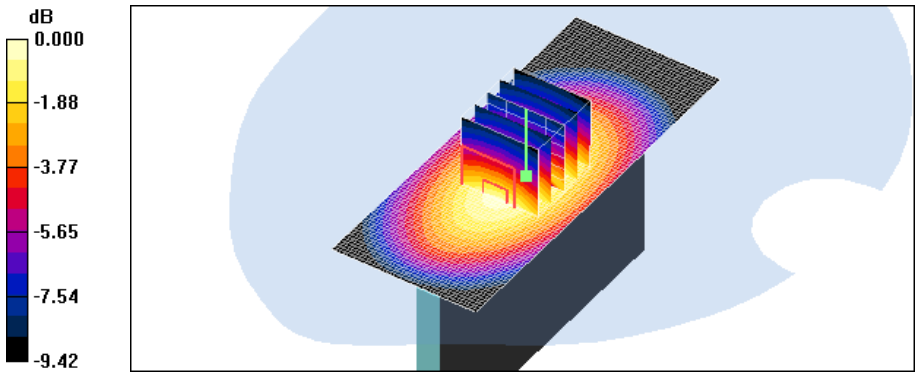
**Body Left 190 1TX/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.678 mW/g

**Body Left 190 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.3 V/m; Power Drift = -0.009 dB
Peak SAR (extrapolated) = 0.840 W/kg
**SAR(1 g) = 0.615 mW/g; SAR(10 g) = 0.411 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.672 mW/g




0 dB = 0.672mW/g

| | |
|---|---|
| est Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

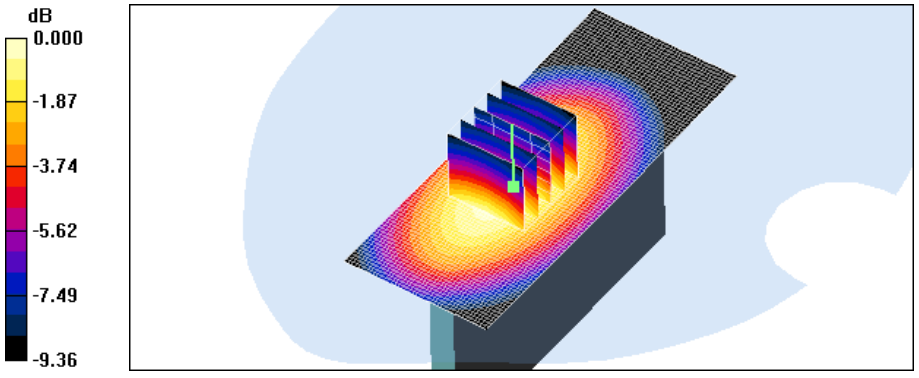
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Right 190 1TX/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.828 mW/g

**Body Right 190 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.6 V/m; Power Drift = 0.001 dB
Peak SAR (extrapolated) = 1.03 W/kg
**SAR(1 g) = 0.774 mW/g; SAR(10 g) = 0.539 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.833 mW/g




0 dB = 0.833mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

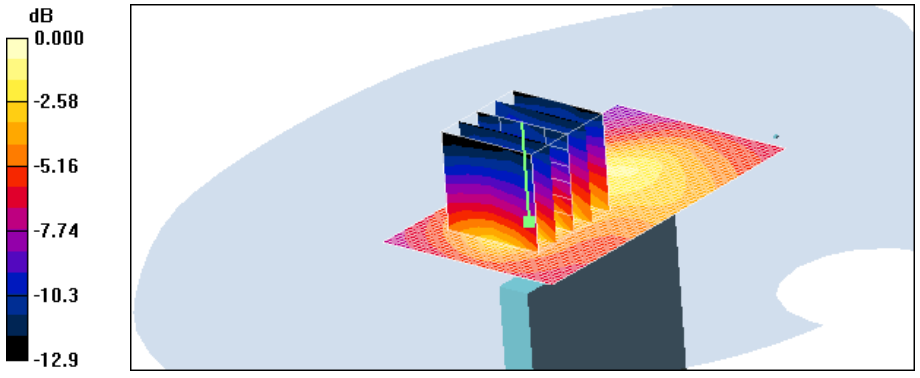
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Bottom 190 1TX/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.081 mW/g

**Body Bottom 190 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.87 V/m; Power Drift = 0.042 dB
Peak SAR (extrapolated) = 0.152 W/kg
**SAR(1 g) = 0.074 mW/g; SAR(10 g) = 0.042 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.084 mW/g




0 dB = 0.084mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

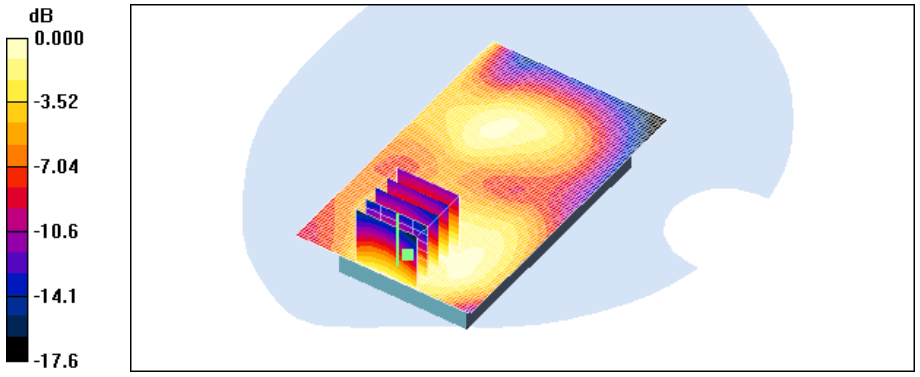
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Body Rear 661 1TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.219 mW/g

**Body Rear 661 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.1 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 0.350 W/kg
**SAR(1 g) = 0.203 mW/g; SAR(10 g) = 0.122 mW/g**
Maximum value of SAR (measured) = 0.214 mW/g




0 dB = 0.214mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

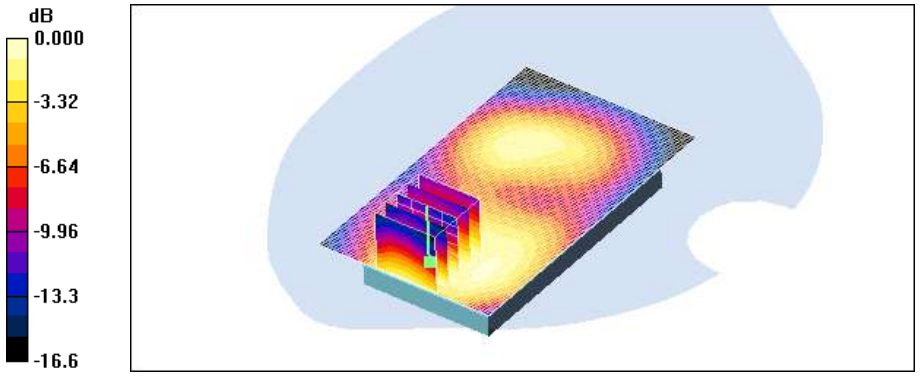
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Body Rear 661 2TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.242 mW/g

**Body Rear 661 2TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.1 V/m; Power Drift = 0.041 dB
Peak SAR (extrapolated) = 0.401 W/kg
**SAR(1 g) = 0.237 mW/g; SAR(10 g) = 0.146 mW/g**
Maximum value of SAR (measured) = 0.246 mW/g




0 dB = 0.246mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

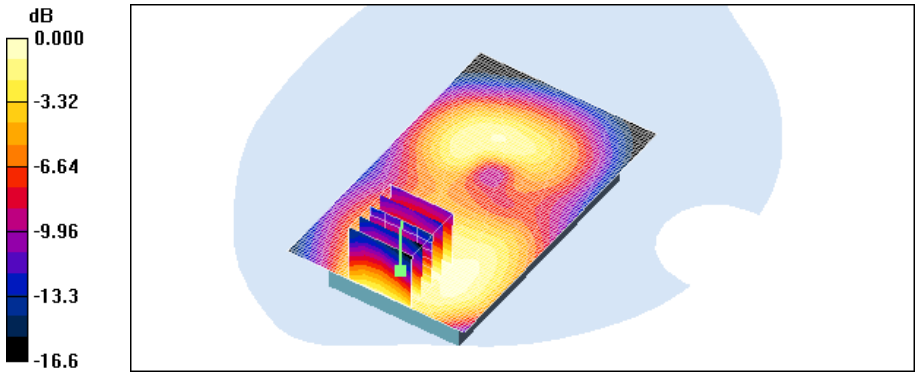
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:2.77
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Body Rear 661 3TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.248 mW/g

**Body Rear 661 3TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.0 V/m; Power Drift = -0.118 dB
Peak SAR (extrapolated) = 0.389 W/kg
**SAR(1 g) = 0.227 mW/g; SAR(10 g) = 0.139 mW/g**
Maximum value of SAR (measured) = 0.238 mW/g




0 dB = 0.238mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

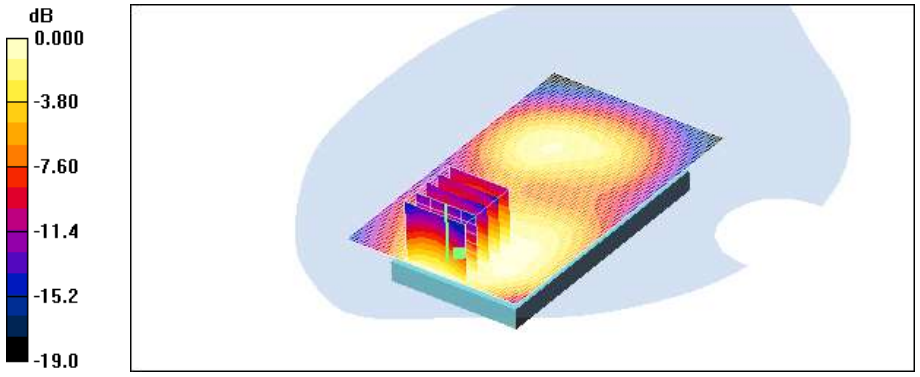
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:2.075
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Body Rear 661 4TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.252 mW/g

**Body Rear 661 4TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.1 V/m; Power Drift = -0.186 dB
Peak SAR (extrapolated) = 0.375 W/kg
**SAR(1 g) = 0.226 mW/g; SAR(10 g) = 0.138 mW/g**
Maximum value of SAR (measured) = 0.244 mW/g




0 dB = 0.244mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

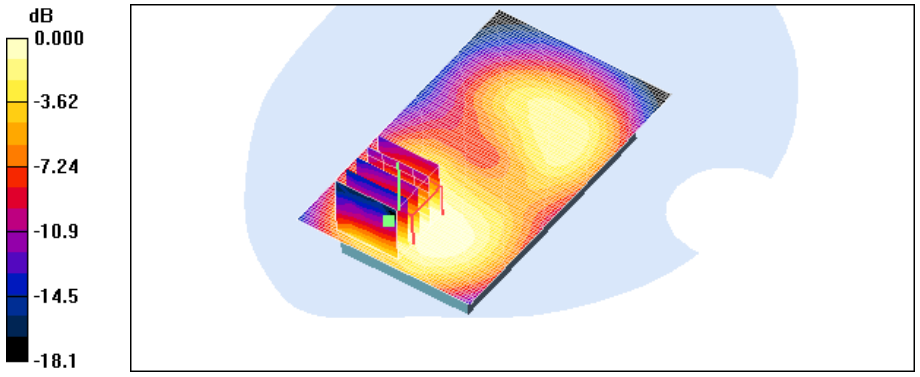
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Body Front 661 2TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.267 mW/g

**Body Front 661 2TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.0 V/m; Power Drift = 0.091 dB
Peak SAR (extrapolated) = 0.371 W/kg
**SAR(1 g) = 0.241 mW/g; SAR(10 g) = 0.154 mW/g**
aximum value of SAR (measured) = 0.259 mW/g




0 dB = 0.259mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

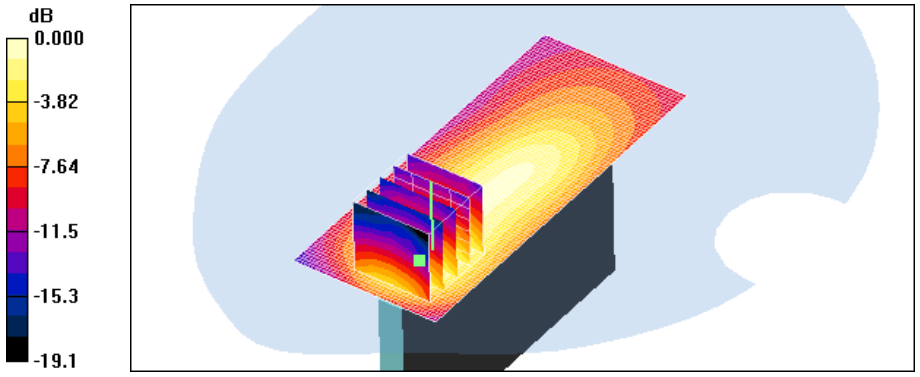
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Body Left 661 2TX/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.149 mW/g

**Body Left 661 2TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.05 V/m; Power Drift = 0.013 dB
Peak SAR (extrapolated) = 0.210 W/kg
**SAR(1 g) = 0.128 mW/g; SAR(10 g) = 0.076 mW/g**
aximum value of SAR (measured) = 0.138 mW/g




0 dB = 0.138mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

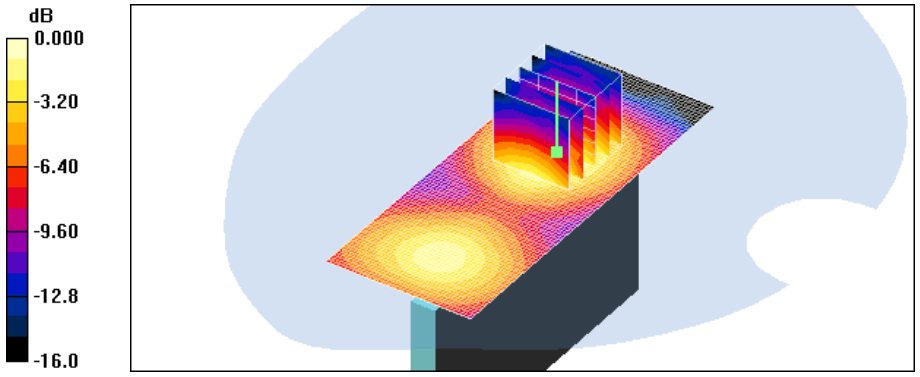
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Body Right 661 2TX/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.104 mW/g

**Body Right 661 2TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.19 V/m; Power Drift = -0.052 dB
Peak SAR (extrapolated) = 0.150 W/kg
**SAR(1 g) = 0.093 mW/g; SAR(10 g) = 0.055 mW/g**
Maximum value of SAR (measured) = 0.101 mW/g




0 dB = 0.101mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

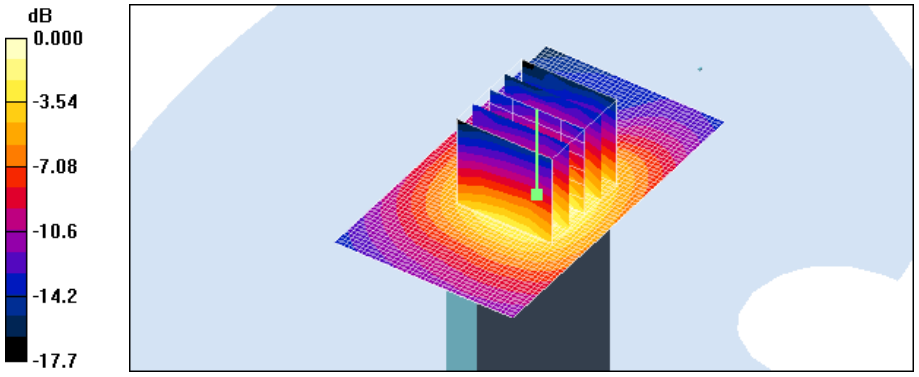
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Body Bottom 661 2TX/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.188 mW/g

**Body Bottom 661 2TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.6 V/m; Power Drift = -0.089 dB
Peak SAR (extrapolated) = 0.271 W/kg
**SAR(1 g) = 0.162 mW/g; SAR(10 g) = 0.092 mW/g**
Maximum value of SAR (measured) = 0.178 mW/g




0 dB = 0.178mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

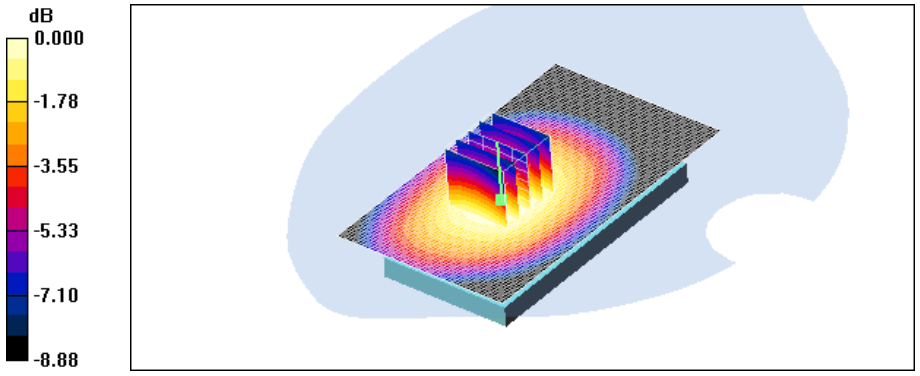
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Rear 4183/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.844 mW/g

**Body Rear 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.9 V/m; Power Drift = -0.073 dB
Peak SAR (extrapolated) = 0.962 W/kg
**SAR(1 g) = 0.796 mW/g; SAR(10 g) = 0.603 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.837 mW/g




0 dB = 0.837mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

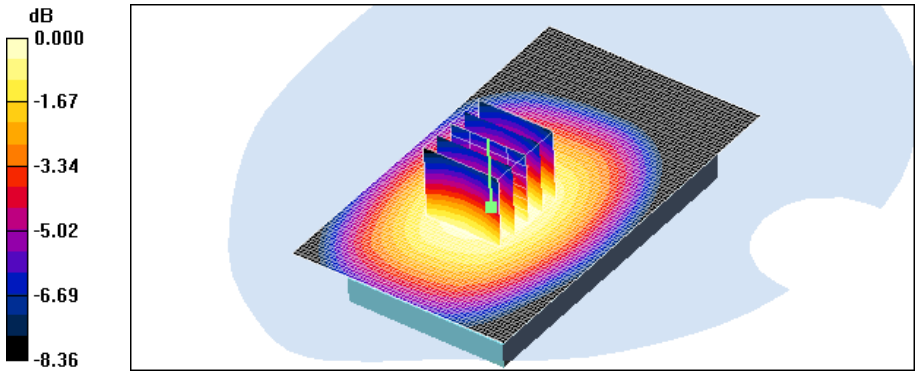
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Front 4183/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.576 mW/g

**Body Front 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.9 V/m; Power Drift = 0.027 dB
Peak SAR (extrapolated) = 0.642 W/kg
**SAR(1 g) = 0.545 mW/g; SAR(10 g) = 0.419 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.571 mW/g




0 dB = 0.571mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

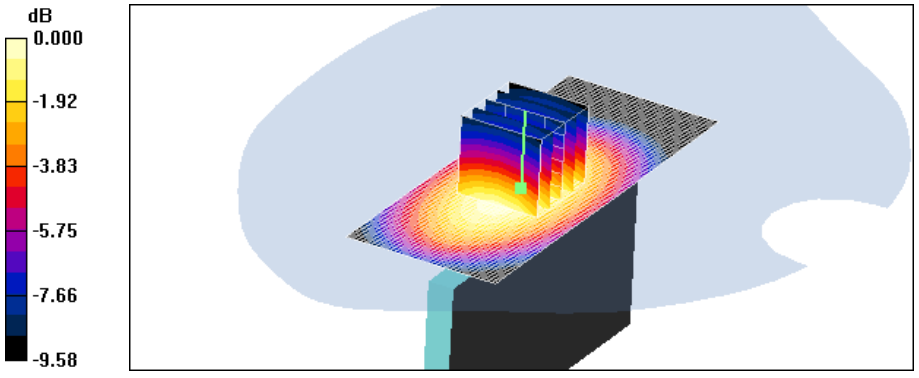
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Left 4183/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.559 mW/g

**Body Left 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.7 V/m; Power Drift = -0.032 dB
Peak SAR (extrapolated) = 0.699 W/kg
**SAR(1 g) = 0.523 mW/g; SAR(10 g) = 0.363 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.559 mW/g




0 dB = 0.559mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

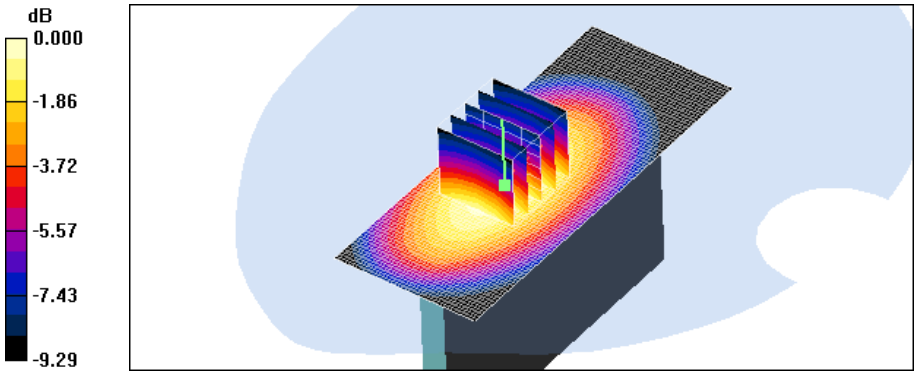
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Right 4183/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.701 mW/g

**Body Right 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.0 V/m; Power Drift = -0.011 dB
Peak SAR (extrapolated) = 0.869 W/kg
**SAR(1 g) = 0.656 mW/g; SAR(10 g) = 0.458 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.703 mW/g




0 dB = 0.703mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

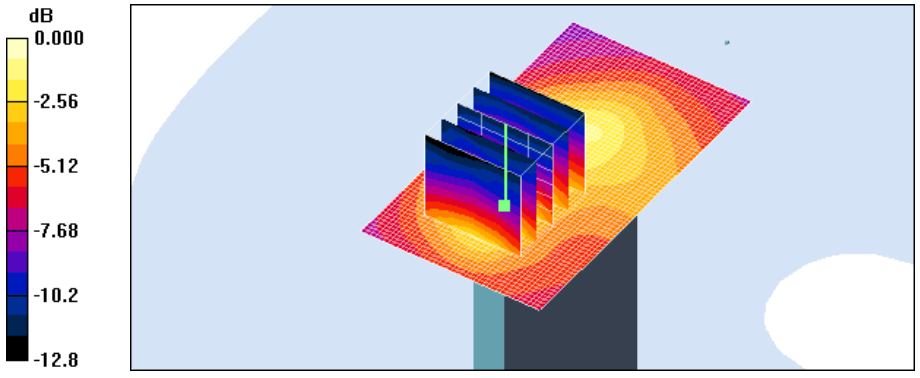
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Bottom 4183/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.082 mW/g

**Body Bottom 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.20 V/m; Power Drift = 0.075 dB
Peak SAR (extrapolated) = 0.153 W/kg
**SAR(1 g) = 0.074 mW/g; SAR(10 g) = 0.041 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.083 mW/g




0 dB = 0.083mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.87 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

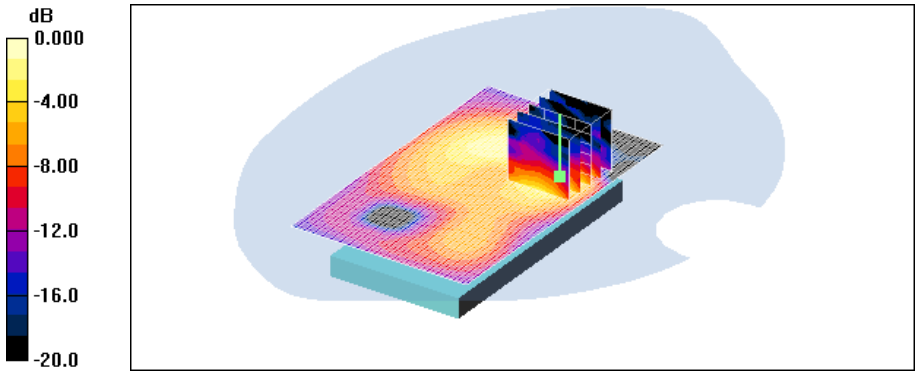
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Body Rear 1ch 1Mbps/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.104 mW/g

**Body Rear 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.80 V/m; Power Drift = -0.052 dB
Peak SAR (extrapolated) = 0.348 W/kg
**SAR(1 g) = 0.087 mW/g; SAR(10 g) = 0.042 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.093 mW/g




0 dB = 0.093mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.87 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

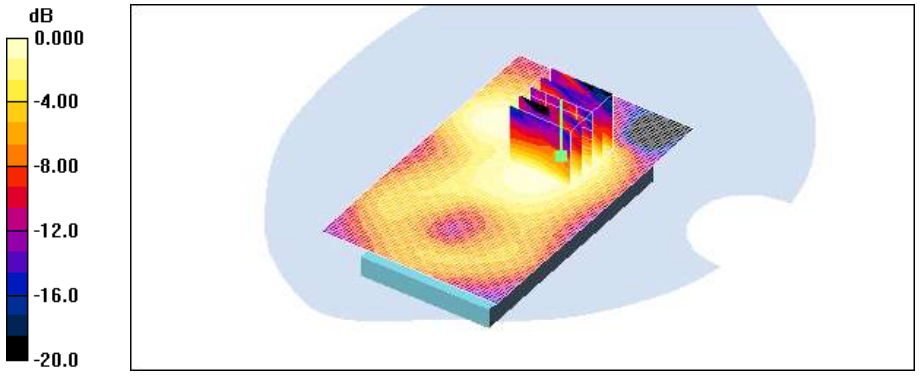
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Body Front 1ch 1Mbps/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.049 mW/g

**Body Front 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.89 V/m; Power Drift = 0.114 dB
Peak SAR (extrapolated) = 0.090 W/kg
**SAR(1 g) = 0.043 mW/g; SAR(10 g) = 0.025 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.045 mW/g




0 dB = 0.045mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; $\sigma$ = 1.84 mho/m; $\varepsilon_r$ = 52.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

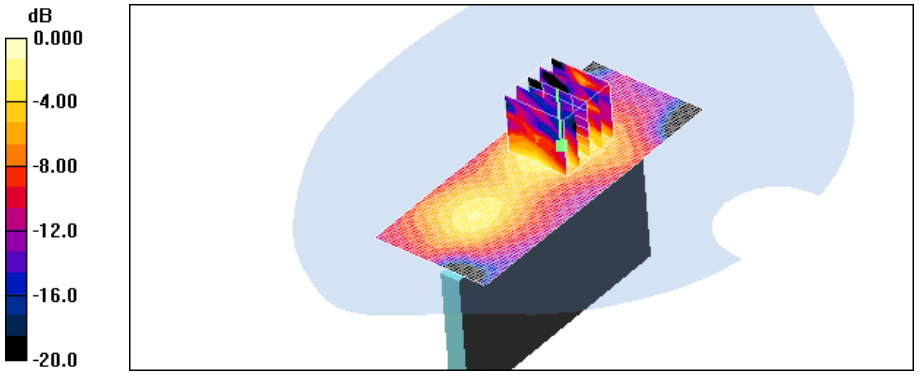
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Body Left 1ch 1Mbps/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.037 mW/g

**Body Left 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.78 V/m; Power Drift = -0.084 dB
Peak SAR (extrapolated) = 0.155 W/kg
**SAR(1 g) = 0.039 mW/g; SAR(10 g) = 0.015 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.037 mW/g




0 dB = 0.037mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; $\sigma$ = 1.84 mho/m; $\varepsilon_r$ = 52.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

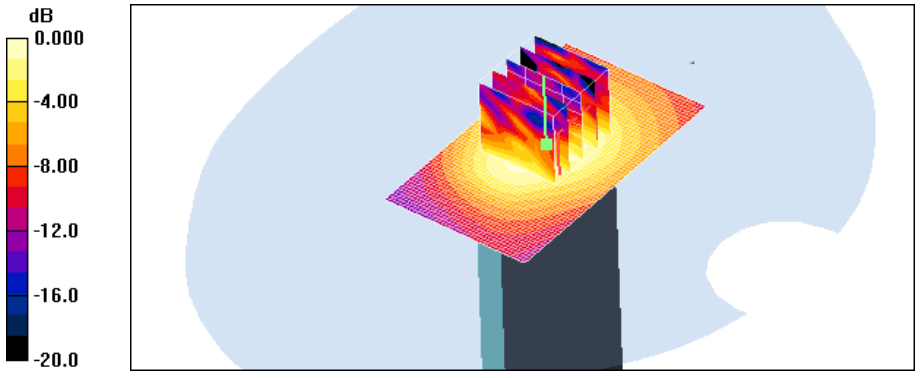
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Body Top 1ch 1Mbps/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.031 mW/g

**Body Top 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.03 V/m; Power Drift = 0.007 dB
Peak SAR (extrapolated) = 0.047 W/kg
**SAR(1 g) = 0.027 mW/g; SAR(10 g) = 0.014 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.030 mW/g




0 dB = 0.030mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.898 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

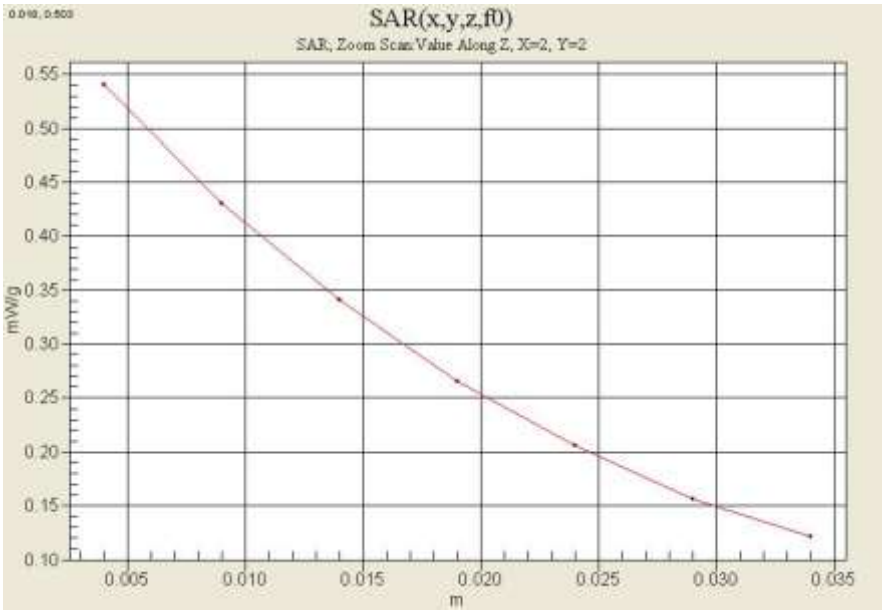
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phamtom ; Type: SAM

**Right touch 190/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.543 mW/g

**Right touch 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.44 V/m; Power Drift = -0.041 dB
Peak SAR (extrapolated) = 0.633 W/kg
**SAR(1 g) = 0.511 mW/g; SAR(10 g) = 0.380 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.540 mW/g



| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 848.8 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 848.8 MHz; $\sigma$ = 1.03 mho/m; $\varepsilon_r$ = 54.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

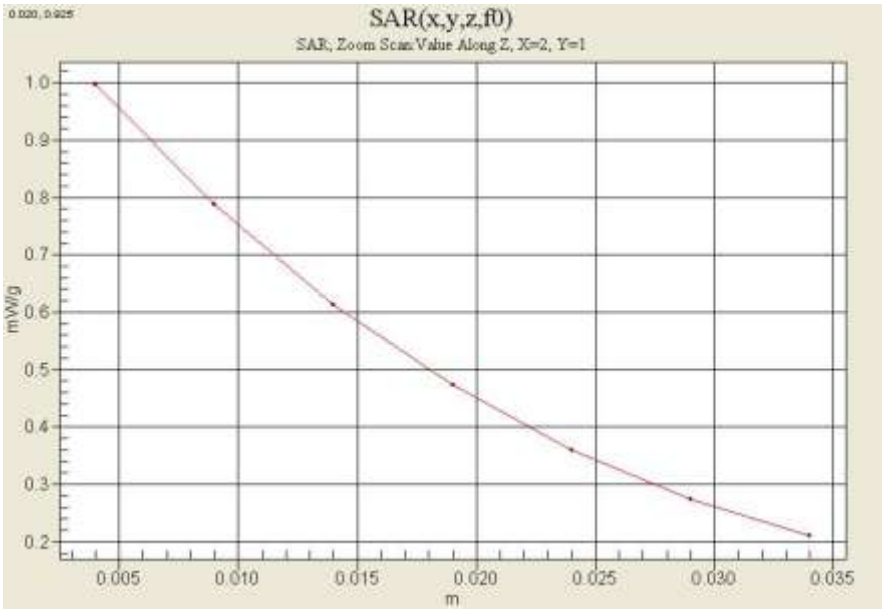
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Rear 251 1TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.00 mW/g

**Body Rear 251 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.1 V/m; Power Drift = -0.005 dB
Peak SAR (extrapolated) = 1.16 W/kg
**SAR(1 g) = 0.951 mW/g; SAR(10 g) = 0.720 mW/g**

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



| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.37 mho/m; $\varepsilon_r$ = 39.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left touch 661/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.342 mW/g

**Left touch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.4 V/m; Power Drift = -0.091 dB
Peak SAR (extrapolated) = 0.492 W/kg
**SAR(1 g) = 0.308 mW/g; SAR(10 g) = 0.185 mW/g**
Maximum value of SAR (measured) = 0.335 mW/g

| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

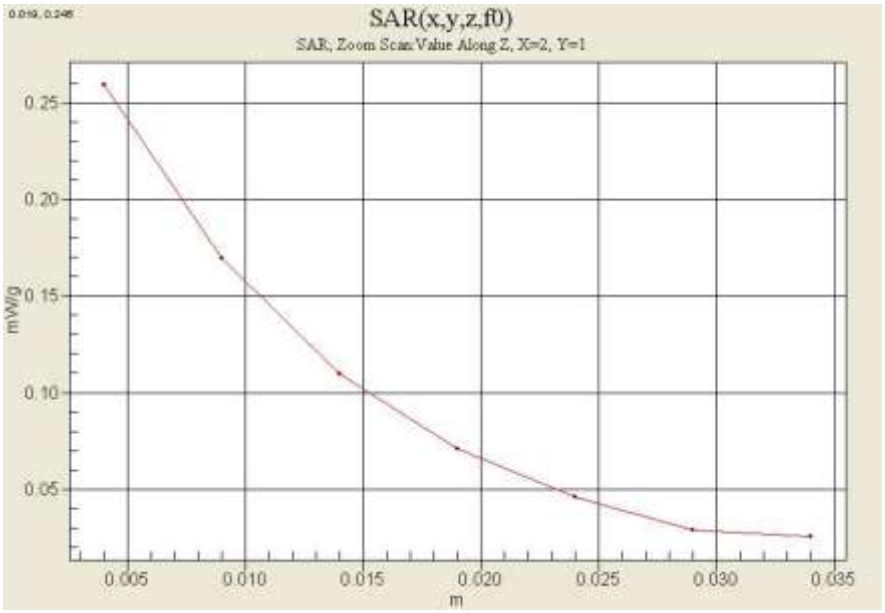
**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.44 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Body Front 661 2TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.267 mW/g

**Body Front 661 2TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.0 V/m; Power Drift = 0.091 dB
Peak SAR (extrapolated) = 0.371 W/kg
**SAR(1 g) = 0.241 mW/g; SAR(10 g) = 0.154 mW/g**
aximum value of SAR (measured) = 0.259 mW/g



| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.898 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

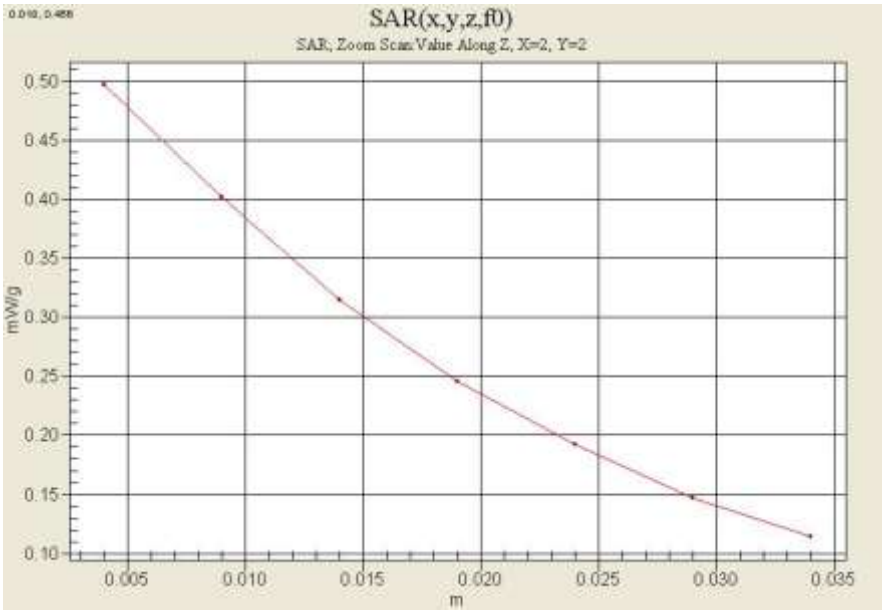
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phamtom ; Type: SAM

**Right touch 4183/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.506 mW/g

**Right touch 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.42 V/m; Power Drift = -0.030 dB
Peak SAR (extrapolated) = 0.583 W/kg
**SAR(1 g) = 0.473 mW/g; SAR(10 g) = 0.355 mW/g**

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



| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.2 ℃ |
| Ambient Temperature: | 21.4 ℃ |
| Test Date: | Mar.13, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

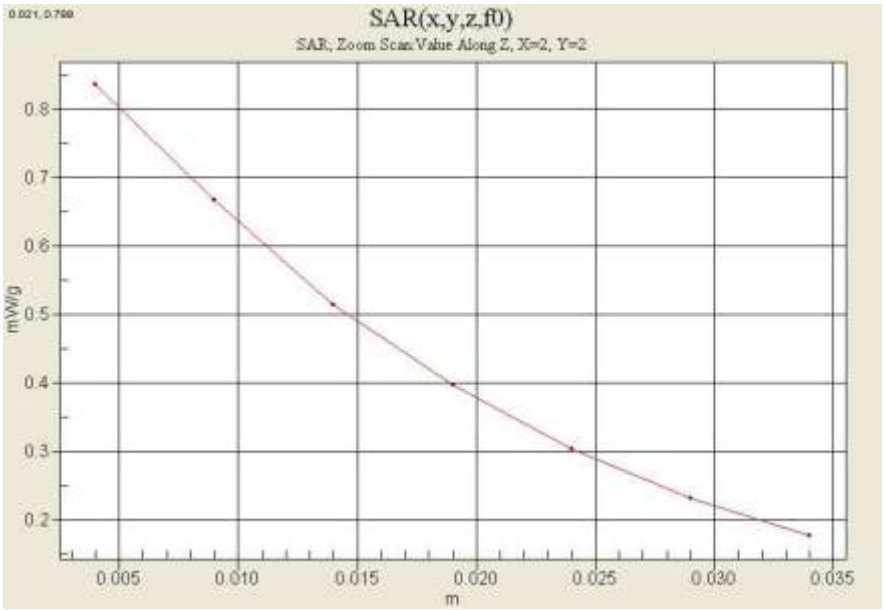
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

**Body Rear 4183/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.844 mW/g

**Body Rear 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.9 V/m; Power Drift = -0.073 dB
Peak SAR (extrapolated) = 0.962 W/kg
**SAR(1 g) = 0.796 mW/g; SAR(10 g) = 0.603 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.837 mW/g



| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; $\sigma$ = 1.81 mho/m; $\varepsilon_r$ = 38.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

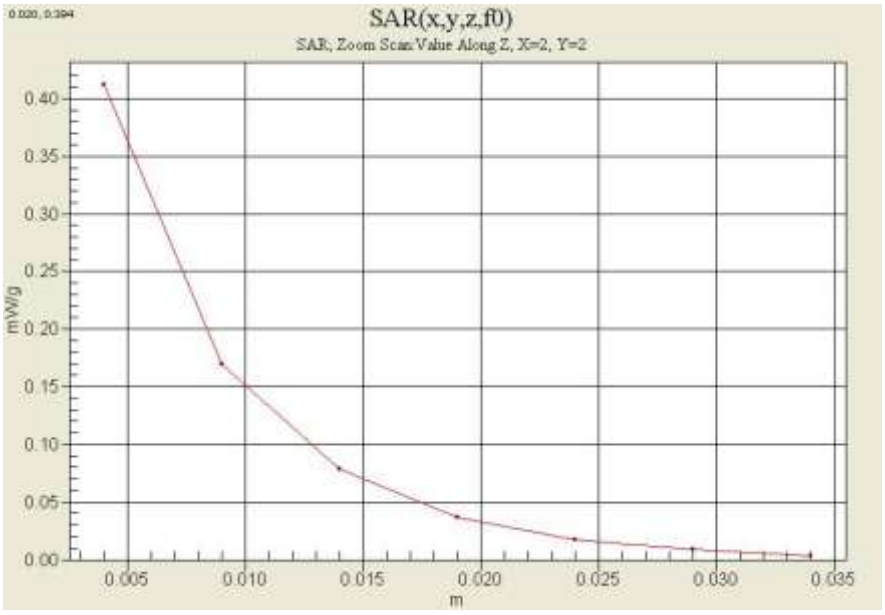
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Right touch 1ch 1Mbps/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.446 mW/g

**Right touch 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.91 V/m; Power Drift = -0.074 dB
Peak SAR (extrapolated) = 0.912 W/kg
**SAR(1 g) = 0.366 mW/g; SAR(10 g) = 0.166 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.412 mW/g



| | |
|---|---|
| Test Laboratory: | HCT CO., LTD |
| EUT Type: | Cellular/PCS GSM/GPRS/EDGE Rx only/WCDMA/HSDPA Phone with Bluetooth and WLAN |
| Liquid Temperature: | 21.1 ℃ |
| Ambient Temperature: | 21.3 ℃ |
| Test Date: | Mar.14, 2012 |
| Separation Distance | 1 cm |

**DUT: LG-P705f; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.87 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

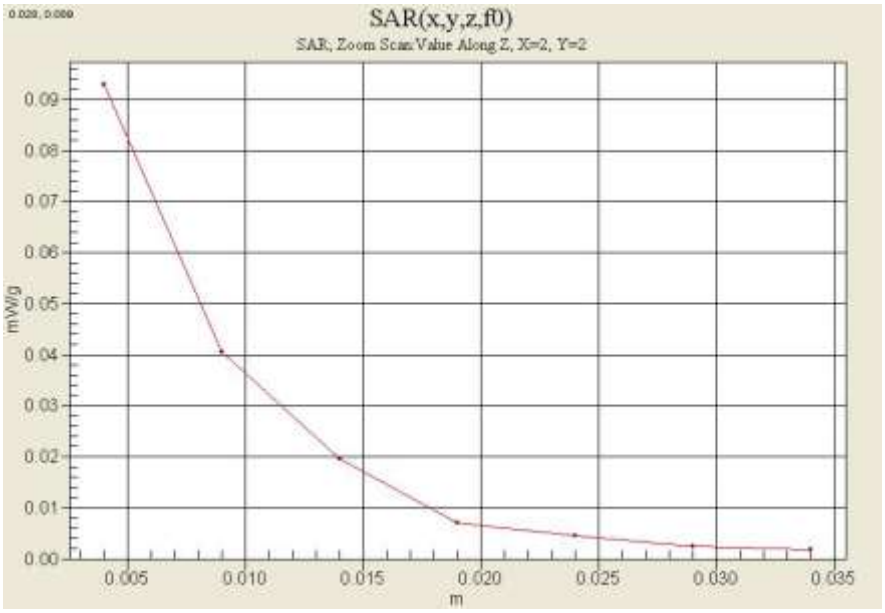
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Body Rear 1ch 1Mbps/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.104 mW/g

**Body Rear 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.80 V/m; Power Drift = -0.052 dB
Peak SAR (extrapolated) = 0.348 W/kg
**SAR(1 g) = 0.087 mW/g; SAR(10 g) = 0.042 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.093 mW/g



# Attachment 2. – Dipole Validation Plots

# ■ Validation Data (835 MHz Head)

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.2 ℃

Test Date: Mar.13, 2012

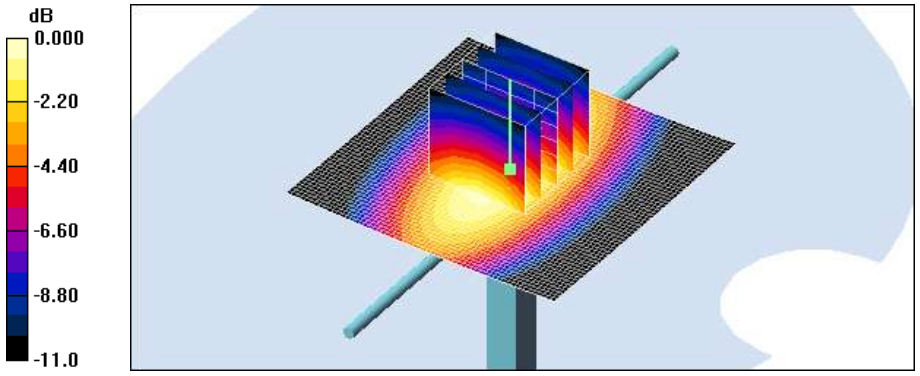
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:441**

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; $\sigma$ = 0.896 mho/m; $\varepsilon_r$ = 42.7; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Validation 835MHz/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.06 mW/g

**Validation 835MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.7 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 1.42 W/kg
**SAR(1 g) = 0.969 mW/g; SAR(10 g) = 0.623 mW/g**
Maximum value of SAR (measured) = 1.06 mW/g




0 dB = 1.06mW/g

## ■ Validation Data (835 MHz Body)

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.2 ℃

Test Date: Mar.13, 2012

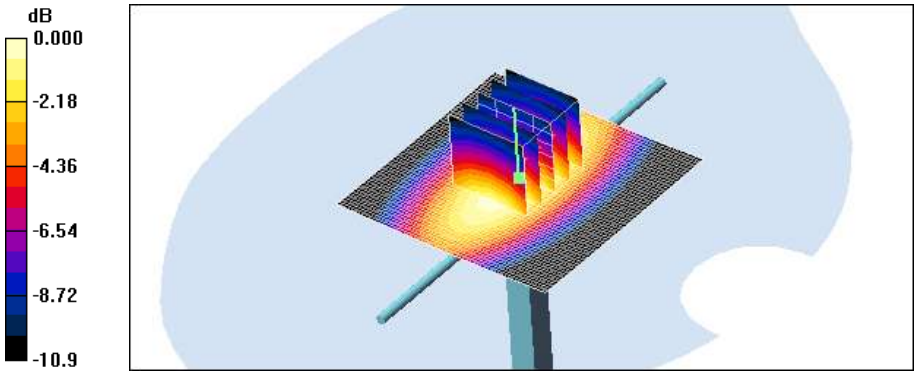
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:441

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; $\sigma$ = 1.01 mho/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.27, 6.27, 6.27); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 835MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.05 mW/g

Validation 835MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.7 V/m; Power Drift = -0.067 dB
Peak SAR (extrapolated) = 1.40 W/kg
SAR(1 g) = 0.966 mW/g; SAR(10 g) = 0.625 mW/g
Maximum value of SAR (measured) = 1.05 mW/g




0 dB = 1.05mW/g

# ■ Validation Data (1 900 MHz Head)

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.1 ℃

Test Date: Mar.14, 2012

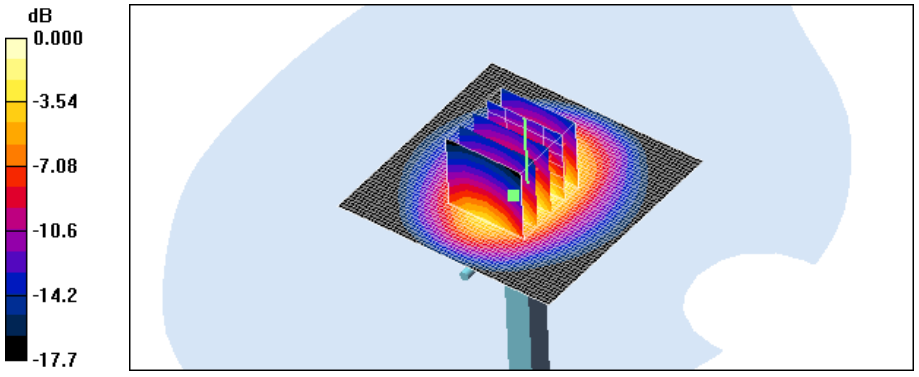
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 – SN:5d032**

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.39 mho/m; $\varepsilon_r$ = 39.1; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Dipole 1900MHz Validation/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.50 mW/g

**Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 59.2 V/m; Power Drift = -0.027 dB
Peak SAR (extrapolated) = 6.83 W/kg
**SAR(1 g) = 4.01 mW/g; SAR(10 g) = 2.23 mW/g**
aximum value of SAR (measured) = 4.42 mW/g




0 dB = 4.42mW/g

# ■ Validation Data (1 900 MHz Body)

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.1 ℃

Test Date: Mar.14, 2012

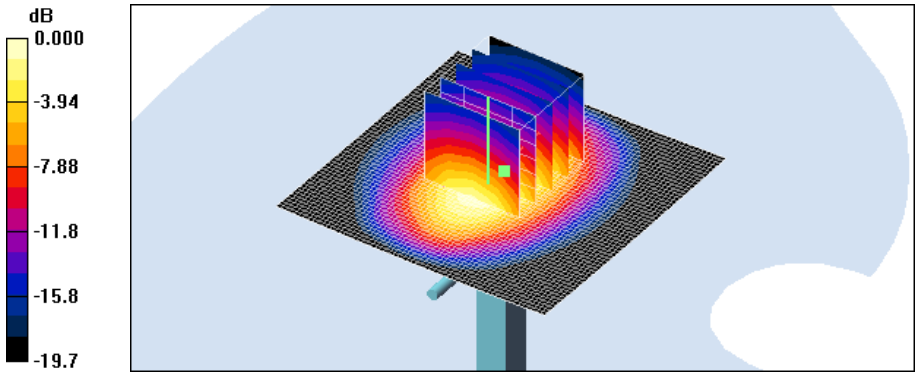
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 – SN:5d032**

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.47 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Dipole 1900MHz Validation/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.66 mW/g

**Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 57.6 V/m; Power Drift = -0.014 dB
Peak SAR (extrapolated) = 6.92 W/kg
**SAR(1 g) = 4.01 mW/g; SAR(10 g) = 2.08 mW/g**
Maximum value of SAR (measured) = 4.52 mW/g




0 dB = 4.52mW/g

## ■ Validation Data (2 450 MHz Head)

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.1 ℃

Test Date: Mar.14, 2012

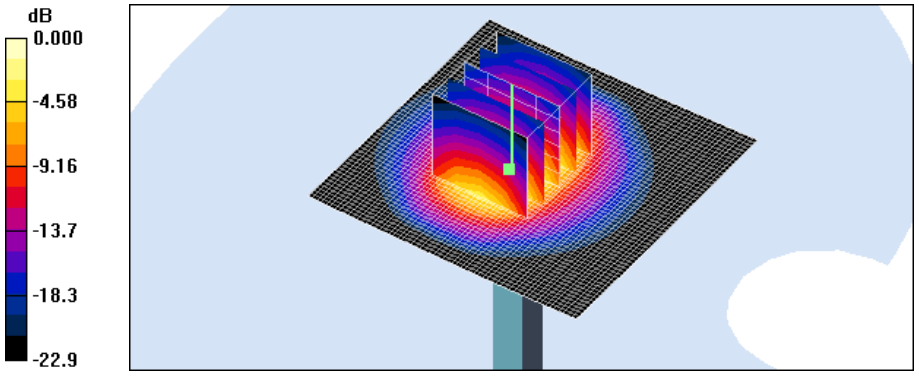
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:743**

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.85 mho/m; $\varepsilon_r$ = 38.5; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Validation 2450MHz/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.54 mW/g

**Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 59.9 V/m; Power Drift = -0.035 dB
Peak SAR (extrapolated) = 12.7 W/kg
**SAR(1 g) = 5.43 mW/g; SAR(10 g) = 2.47 mW/g**
Maximum value of SAR (measured) = 5.98 mW/g




0 dB = 5.98mW/g

# ■ Validation Data (2 450 MHz Body)

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.1 ℃

Test Date: Mar.14, 2012

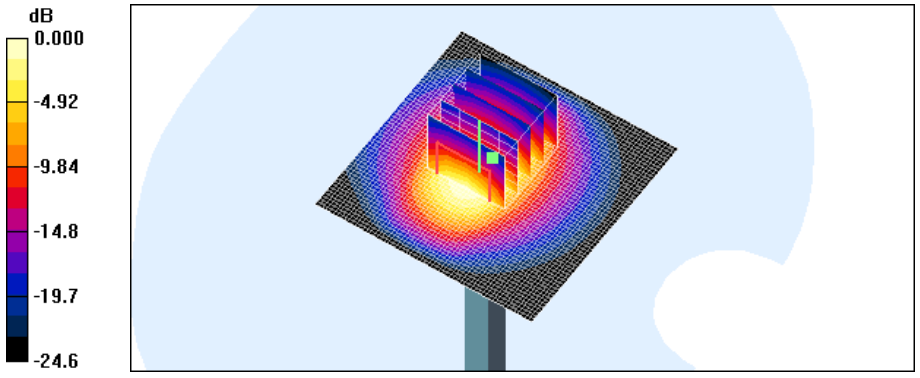
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 – SN:743**

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.89 mho/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

**Validation 2450MHz/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.82 mW/g

**Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 58.7 V/m; Power Drift = -0.005 dB
Peak SAR (extrapolated) = 12.8 W/kg
**SAR(1 g) = 5.33 mW/g; SAR(10 g) = 2.46 mW/g**
aximum value of SAR (measured) = 5.72 mW/g




0 dB = 5.72mW/g

## ■ Dielectric Parameter (835 MHz Head)

| | |
|---|---|
| Title | LG-P705f |
| SubTitle | 835MHz |
| Test Date | Mar.13, 2012 |

| Frequency | e' | e'' |
|---|---|---|
| 800000000.0000 | 43.1329 | 19.4299 |
| 805000000.0000 | 43.0579 | 19.4176 |
| 810000000.0000 | 42.9901 | 19.3495 |
| 815000000.0000 | 42.9279 | 19.3936 |
| 820000000.0000 | 42.8563 | 19.3813 |
| 825000000.0000 | 42.8049 | 19.3050 |
| 830000000.0000 | 42.7214 | 19.3181 |
| 835000000.0000 | 42.6824 | 19.2976 |
| 840000000.0000 | 42.6122 | 19.2758 |
| 845000000.0000 | 42.5666 | 19.2630 |
| 850000000.0000 | 42.4826 | 19.2407 |
| 855000000.0000 | 42.4041 | 19.2329 |
| 860000000.0000 | 42.3456 | 19.2195 |
| 865000000.0000 | 42.2787 | 19.2089 |
| 870000000.0000 | 42.2445 | 19.2195 |
| 875000000.0000 | 42.1962 | 19.2139 |
| 880000000.0000 | 42.1405 | 19.1804 |
| 885000000.0000 | 42.0975 | 19.1535 |
| 890000000.0000 | 42.0461 | 19.1295 |
| 895000000.0000 | 42.0600 | 19.1209 |
| 900000000.0000 | 41.9491 | 19.1254 |

## ■ Dielectric Parameter (835 MHz Body)

| | |
|---|---|
| Title | LG-P705f |
| SubTitle | 835MHz |
| Test Date | Mar.13, 2012 |

| Frequency | e' | e'' |
|---|---|---|
| 800000000.0000 | 55.1025 | 21.6532 |
| 805000000.0000 | 55.1380 | 21.6210 |
| 810000000.0000 | 55.0952 | 21.6226 |
| 815000000.0000 | 55.0785 | 21.6768 |
| 820000000.0000 | 55.0941 | 21.6622 |
| 825000000.0000 | 55.0775 | 21.6648 |
| 830000000.0000 | 55.0523 | 21.7318 |
| 835000000.0000 | 55.0429 | 21.7479 |
| 840000000.0000 | 54.9815 | 21.7553 |
| 845000000.0000 | 54.8846 | 21.7818 |
| 850000000.0000 | 54.8204 | 21.7741 |
| 855000000.0000 | 54.7186 | 21.7646 |
| 860000000.0000 | 54.5937 | 21.7045 |
| 865000000.0000 | 54.5106 | 21.6512 |
| 870000000.0000 | 54.4346 | 21.5853 |
| 875000000.0000 | 54.3317 | 21.5305 |
| 880000000.0000 | 54.2694 | 21.4396 |
| 885000000.0000 | 54.2556 | 21.3626 |
| 890000000.0000 | 54.2127 | 21.3187 |
| 895000000.0000 | 54.1455 | 21.2110 |
| 900000000.0000 | 54.0970 | 21.1757 |

## ■ Dielectric Parameter (1 900 MHz Head)

| | |
|---|---|
| Title | LG-P705f |
| SubTitle | 1 900MHz |
| Test Date | Mar.14, 2012 |

| Frequency | e' | e'' |
|---|---|---|
| 1800000000.0000 | 39.4692 | 12.8622 |
| 1810000000.0000 | 39.4027 | 12.8888 |
| 1820000000.0000 | 39.3792 | 12.9196 |
| 1830000000.0000 | 39.3521 | 12.9524 |
| 1840000000.0000 | 39.3141 | 12.9799 |
| 1850000000.0000 | 39.2706 | 13.0109 |
| 1860000000.0000 | 39.2361 | 13.0305 |
| 1870000000.0000 | 39.1987 | 13.0578 |
| 1880000000.0000 | 39.1678 | 13.0841 |
| 1890000000.0000 | 39.1232 | 13.1102 |
| 1900000000.0000 | 39.0850 | 13.1353 |
| 1910000000.0000 | 39.0259 | 13.1532 |
| 1920000000.0000 | 38.9959 | 13.2057 |
| 1930000000.0000 | 38.9550 | 13.2300 |
| 1940000000.0000 | 38.9194 | 13.2743 |
| 1950000000.0000 | 38.8779 | 13.2758 |
| 1960000000.0000 | 38.8327 | 13.3150 |
| 1970000000.0000 | 38.7993 | 13.3436 |
| 1980000000.0000 | 38.7621 | 13.3690 |
| 1990000000.0000 | 38.7041 | 13.4140 |
| 2000000000.0000 | 38.6953 | 13.4527 |

## ■ Dielectric Parameter (1 900 MHz Body)

| | |
|---|---|
| Title | LG-P705f |
| SubTitle | 1 900MHz |
| Test Date | Mar.14, 2012 |

| Frequency | e' | e'' |
|---|---|---|
| 1850000000.0000 | 54.9748 | 13.7378 |
| 1855000000.0000 | 54.9500 | 13.7574 |
| 1860000000.0000 | 54.9517 | 13.7444 |
| 1865000000.0000 | 54.9356 | 13.7686 |
| 1870000000.0000 | 54.9282 | 13.7706 |
| 1875000000.0000 | 54.9192 | 13.7928 |
| 1880000000.0000 | 54.9028 | 13.8099 |
| 1885000000.0000 | 54.8994 | 13.8238 |
| 1890000000.0000 | 54.8868 | 13.8530 |
| 1895000000.0000 | 54.8757 | 13.8585 |
| 1900000000.0000 | 54.8844 | 13.8757 |
| 1905000000.0000 | 54.8899 | 13.8984 |
| 1910000000.0000 | 54.8998 | 13.9099 |
| 1915000000.0000 | 54.8909 | 13.9176 |
| 1920000000.0000 | 54.8871 | 13.9304 |
| 1925000000.0000 | 54.8821 | 13.9235 |
| 1930000000.0000 | 54.8884 | 13.9335 |
| 1935000000.0000 | 54.8654 | 13.9309 |
| 1940000000.0000 | 54.8645 | 13.9357 |
| 1945000000.0000 | 54.8484 | 13.9311 |
| 1950000000.0000 | 54.8317 | 13.9101 |

## ■ Dielectric Parameter (2 450 MHz Head)

| | |
|---|---|
| Title | LG-P705f |
| SubTitle | 2 450MHz |
| Test Date | Mar.14, 2012 |

| Frequency | e' | e'' |
|---|---|---|
| 2400000000.0000 | 38.6412 | 13.4045 |
| 2405000000.0000 | 38.6304 | 13.4310 |
| 2410000000.0000 | 38.6307 | 13.4540 |
| 2415000000.0000 | 38.6123 | 13.4673 |
| 2420000000.0000 | 38.6089 | 13.4851 |
| 2425000000.0000 | 38.5862 | 13.4994 |
| 2430000000.0000 | 38.5803 | 13.5136 |
| 2435000000.0000 | 38.5787 | 13.5327 |
| 2440000000.0000 | 38.5778 | 13.5457 |
| 2445000000.0000 | 38.5547 | 13.5550 |
| 2450000000.0000 | 38.5385 | 13.5724 |
| 2455000000.0000 | 38.5247 | 13.5824 |
| 2460000000.0000 | 38.5127 | 13.6075 |
| 2465000000.0000 | 38.5052 | 13.6179 |
| 2470000000.0000 | 38.4886 | 13.6304 |
| 2475000000.0000 | 38.4668 | 13.6363 |
| 2480000000.0000 | 38.4386 | 13.6476 |
| 2485000000.0000 | 38.4216 | 13.6718 |
| 2490000000.0000 | 38.4116 | 13.6845 |
| 2495000000.0000 | 38.3985 | 13.6998 |
| 2500000000.0000 | 38.3829 | 13.7119 |

## ■ Dielectric Parameter (2 450 MHz Body)

| | |
|---|---|
| Title | LG-P705f |
| SubTitle | 2 450MHz |
| Test Date | Mar.14, 2012 |

| Frequency | e' | e'' |
|---|---|---|
| 2400000000.0000 | 52.2560 | 13.6823 |
| 2405000000.0000 | 52.2277 | 13.7052 |
| 2410000000.0000 | 52.2170 | 13.7061 |
| 2415000000.0000 | 52.1856 | 13.7259 |
| 2420000000.0000 | 52.1674 | 13.7440 |
| 2425000000.0000 | 52.1461 | 13.7740 |
| 2430000000.0000 | 52.1335 | 13.7929 |
| 2435000000.0000 | 52.1194 | 13.8102 |
| 2440000000.0000 | 52.1173 | 13.8424 |
| 2445000000.0000 | 52.0967 | 13.8571 |
| 2450000000.0000 | 52.0780 | 13.8845 |
| 2455000000.0000 | 52.0636 | 13.8916 |
| 2460000000.0000 | 52.0519 | 13.9180 |
| 2465000000.0000 | 52.0573 | 13.9222 |
| 2470000000.0000 | 52.0323 | 13.9436 |
| 2475000000.0000 | 52.0307 | 13.9419 |
| 2480000000.0000 | 52.0008 | 13.9474 |
| 2485000000.0000 | 51.9978 | 13.9556 |
| 2490000000.0000 | 51.9849 | 13.9388 |
| 2495000000.0000 | 51.9740 | 13.9578 |
| 2500000000.0000 | 51.9495 | 13.9491 |

# 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
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
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 HCT (Dymstec) Certificate No: ET3-1630_Nov11

# CALIBRATION CERTIFICATE

Object ET3DV6 - SN:1630

Calibration procedure(s) QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: November 18, 2011

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 (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 31-Mar-11 (No. 217-01372) | Apr-12 |
| Power sensor E4412A | MY41498087 | 31-Mar-11 (No. 217-01372) | Apr-12 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 29-Mar-11 (No. 217-01369) | Apr-12 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 29-Mar-11 (No. 217-01367) | Apr-12 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 29-Mar-11 (No. 217-01370) | Apr-12 |
| Reference Probe ES3DV2 | SN: 3013 | 29-Dec-10 (No. ES3-3013_Dec10) | Dec-11 |
| DAE4 | SN: 654 | 3-May-11 (No. DAE4-654_May11) | May-12 |
| | | | |
| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (in house check Apr-11) | In house check: Apr-13 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (in house check Oct-11) | In house check: Oct-12 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Jeton Kastrati | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: November 18, 2011

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

Certificate No: ET3-1630_Nov11 Page 1 of 11

**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 Accreditation Service (SAS)
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 |
| ConvF | sensitivity in TSL / NORMx,y,z |
| DCP | diode compression point |
| CF | crest factor (1/duty_cycle) of the RF signal |
| A, B, C | modulation dependent linearization parameters |
| 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) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

## 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 affect 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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR*: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *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:1630

Manufactured: October 12, 2001
Calibrated: November 18, 2011

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

ET3DV6– SN:1630 November 18, 2011

# DASY/EASY - Parameters of Probe: ET3DV6 - SN:1630

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|---|---|---|---|
| Norm (μV/(V/m)$^2$)$^A$ | 1.71 | 1.62 | 1.60 | ± 10.1 % |
| DCP (mV)$^B$ | 100.3 | 99.5 | 101.7 | |

## Modulation Calibration Parameters

| UID | Communication System Name | PAR | | A dB | B dB | C dB | VR mV | Unc$^E$ (k=2) |
|---|---|---|---|---|---|---|---|---|
| 10000 | CW | 0.00 | X | 0.00 | 0.00 | 1.00 | 98.2 | ±2.7 % |
| | | | Y | 0.00 | 0.00 | 1.00 | 101.9 | |
| | | | Z | 0.00 | 0.00 | 1.00 | 98.0 | |

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 Pages 5 and 6).
B Numerical linearization parameter: uncertainty not required.
E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Certificate No: ET3-1630_Nov11 Page 4 of 11

# DASY/EASY - Parameters of Probe: ET3DV6 - SN:1630

## Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha | Depth (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 300 | 45.3 | 0.87 | 8.13 | 8.13 | 8.13 | 0.31 | 1.60 | ± 13.4 % |
| 450 | 43.5 | 0.87 | 7.40 | 7.40 | 7.40 | 0.22 | 2.27 | ± 13.4 % |
| 750 | 41.9 | 0.89 | 6.61 | 6.61 | 6.61 | 0.82 | 1.68 | ± 12.0 % |
| 835 | 41.5 | 0.90 | 6.27 | 6.27 | 6.27 | 0.72 | 1.84 | ± 12.0 % |
| 900 | 41.5 | 0.97 | 6.16 | 6.16 | 6.16 | 0.68 | 1.92 | ± 12.0 % |
| 1450 | 40.5 | 1.20 | 5.57 | 5.57 | 5.57 | 0.54 | 2.48 | ± 12.0 % |
| 1750 | 40.1 | 1.37 | 5.43 | 5.43 | 5.43 | 0.60 | 2.26 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 5.17 | 5.17 | 5.17 | 0.63 | 2.15 | ± 12.0 % |
| 1950 | 40.0 | 1.40 | 5.05 | 5.05 | 5.05 | 0.63 | 2.13 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 4.57 | 4.57 | 4.57 | 0.81 | 1.74 | ± 12.0 % |

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

# DASY/EASY - Parameters of Probe: ET3DV6 - SN:1630

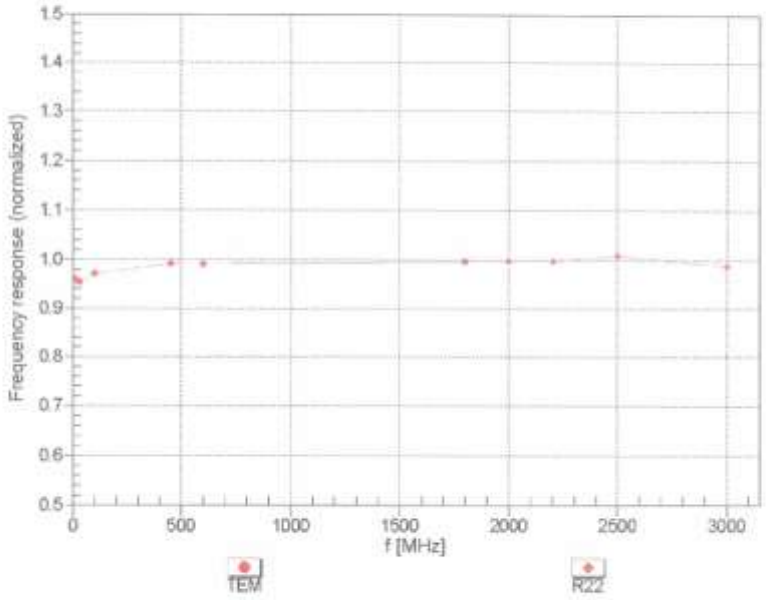
## Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha | Depth (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 300 | 58.2 | 0.92 | 7.96 | 7.96 | 7.96 | 0.29 | 2.29 | ± 13.4 % |
| 450 | 56.7 | 0.94 | 7.74 | 7.74 | 7.74 | 0.16 | 2.25 | ± 13.4 % |
| 750 | 55.5 | 0.96 | 6.36 | 6.36 | 6.36 | 0.75 | 1.84 | ± 12.0 % |
| 835 | 55.2 | 0.97 | 6.27 | 6.27 | 6.27 | 0.72 | 1.88 | ± 12.0 % |
| 1450 | 54.0 | 1.30 | 5.46 | 5.46 | 5.46 | 0.70 | 1.97 | ± 12.0 % |
| 1750 | 53.4 | 1.49 | 4.95 | 4.95 | 4.95 | 0.59 | 2.72 | ± 12.0 % |
| 1900 | 53.3 | 1.52 | 4.75 | 4.75 | 4.75 | 0.60 | 2.56 | ± 12.0 % |
| 2450 | 52.7 | 1.95 | 4.30 | 4.30 | 4.30 | 1.00 | 1.29 | ± 12.0 % |

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

ET3DV6– SN:1630 November 18, 2011

## Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



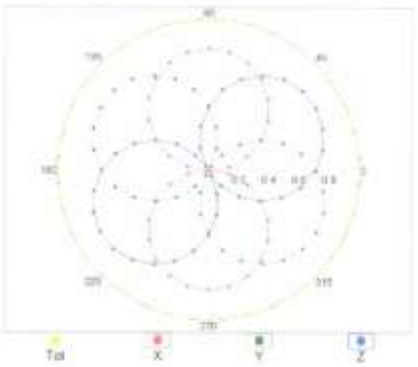

Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

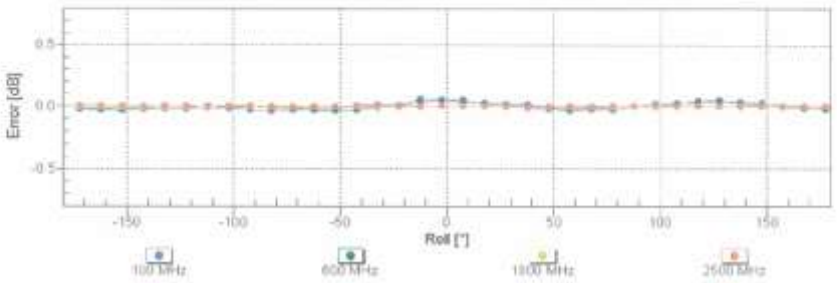
ET3DV6- SN:1630 November 18, 2011

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

f=600 MHz,TEM

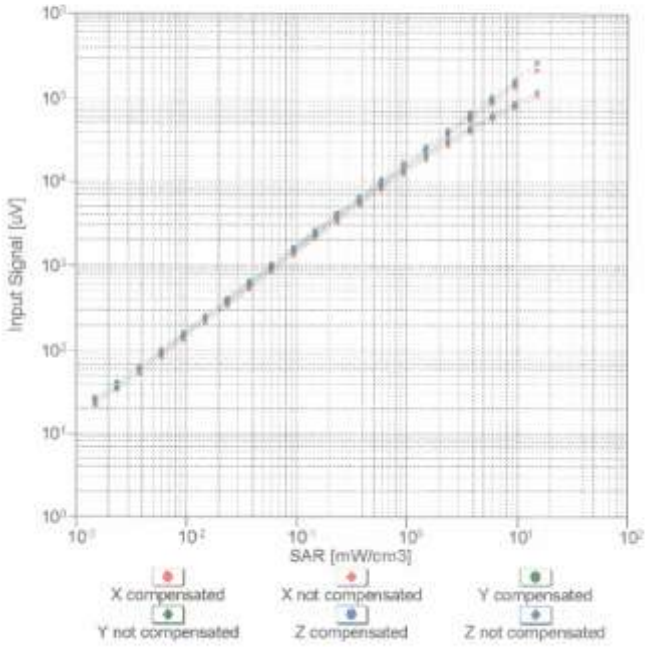

f=1800 MHz,R22

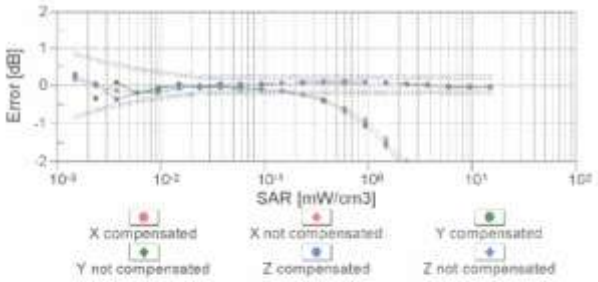



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

## Dynamic Range f($SAR_{head}$)
(TEM cell , f = 900 MHz)



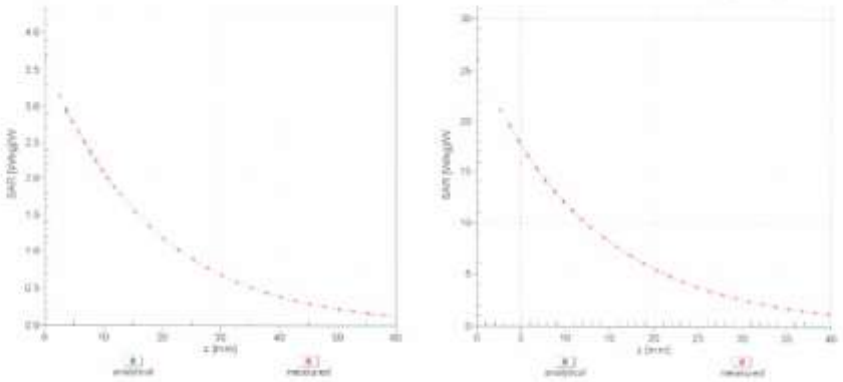




**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

ET3DV6- SN:1630 November 18, 2011

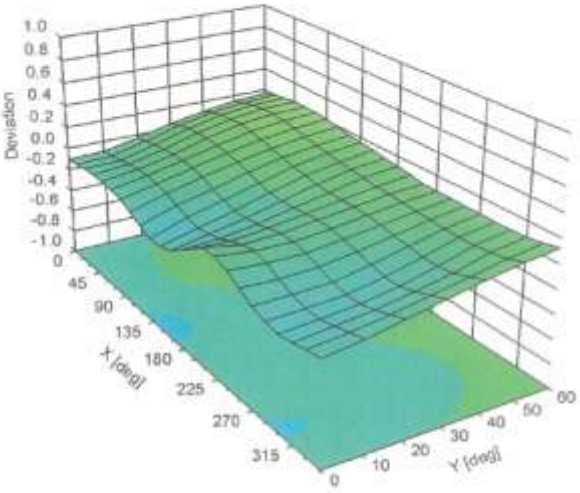
## Conversion Factor Assessment

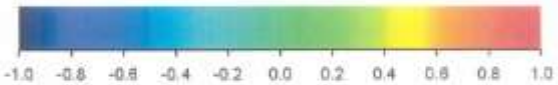
f = 900 MHz,WGLS R9 (H_convF) f = 1750 MHz,WGLS R22 (H_convF)



## Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz




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

# DASY/EASY - Parameters of Probe: ET3DV6 - SN:1630

**Other Probe Parameters**

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | Not applicable |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 10 mm |
| Tip Diameter | 6.8 mm |
| Probe Tip to Sensor X Calibration Point | 2.7 mm |
| Probe Tip to Sensor Y Calibration Point | 2.7 mm |
| Probe Tip to Sensor Z Calibration Point | 2.7 mm |
| Recommended Measurement Distance from Surface | 4 mm |

Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

s p e a g

# Additional Conversion Factors

**for Dosimetric E-Field Probe**

| | |
|---|---|
| Type: | **ET3DV6** |
| Serial Number: | **1630** |
| Place of Assessment: | **Zurich** |
| Date of Assessment: | **November 21, 2011** |
| Probe Calibration Date: | **November 18, 2011** |

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 450, 900 MHz or at 1750 MHz.

Assessed by:

Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

s p e a g

## Dosimetric E-Field Probe ET3DV6 - SN:1630

Conversion factor (± standard deviation)

| | | | |
|---|---|---|---|
| 150 ± 50 MHz | *ConvF* | 8.03 ± 10% | $\varepsilon_r$ = 52.3 ± 5%<br>$\sigma$ = 0.76 ± 5% mho/m<br>(head tissue) |
| 150 ± 50 MHz | *ConvF* | 8.29 ± 10% | $\varepsilon_r$ = 61.9 ± 5%<br>$\sigma$ = 0.80 ± 5% mho/m<br>(body tissue) |

**Important Note:**

**For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.**

**Please see also DASY Manual.**

# 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 Accreditation Service (SAS)
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 HCT (Dymstec)

Certificate No: D835V2-441_May11

# CALIBRATION CERTIFICATE

Object D835V2 - SN: 441

Calibration procedure(s) QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: May 16, 2011

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 (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 06-Oct-10 (No. 217-01266) | Oct-11 |
| Power sensor HP 8481A | US37292783 | 06-Oct-10 (No. 217-01266) | Oct-11 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 29-Mar-11 (No. 217-01367) | Apr-12 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 29-Mar-11 (No. 217-01371) | Apr-12 |
| Reference Probe ES3DV3 | SN: 3205 | 29-Apr-11 (No. ES3-3205_Apr11) | Apr-12 |
| DAE4 | SN: 601 | 10-Jun-10 (No. DAE4-601_Jun10) | Jun-11 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (in house check Oct-09) | In house check: Oct-11 |
| RF generator R&S SMT-06 | 100005 | 4-Aug-99 (in house check Oct-09) | In house check: Oct-11 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-10) | In house check: Oct-11 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Dimce Iliev | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: May 16, 2011

**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 Accreditation Service (SAS)
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) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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) DASY4/5 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** | DASY5 | V52.6.2 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **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 | 40.4 ± 6 % | 0.88 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.31 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **9.34 mW /g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.51 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.09 mW /g ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 55.2 | 0.97 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 53.9 ± 6 % | 1.00 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.43 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **9.45 mW / g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.60 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **6.27 mW / g ± 16.5 % (k=2)** |

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 50.2 Ω - 9.8 jΩ |
| Return Loss | - 20.2 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 46.3 Ω - 10.3 jΩ |
| Return Loss | - 18.9 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.374 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 |

## DASY5 Validation Report for Head TSL

Date: 16.05.2011

Test Laboratory: SPEAG, Zurich, Switzerland

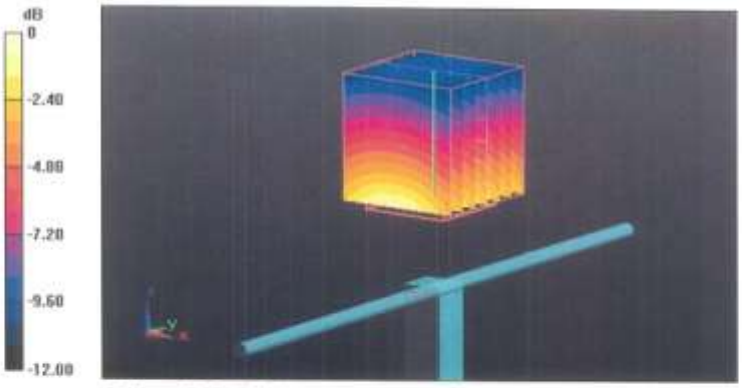
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 441**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL900
Medium parameters used: f = 835 MHz; $\sigma$ = 0.88 mho/m; $\varepsilon_r$ = 40.4; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

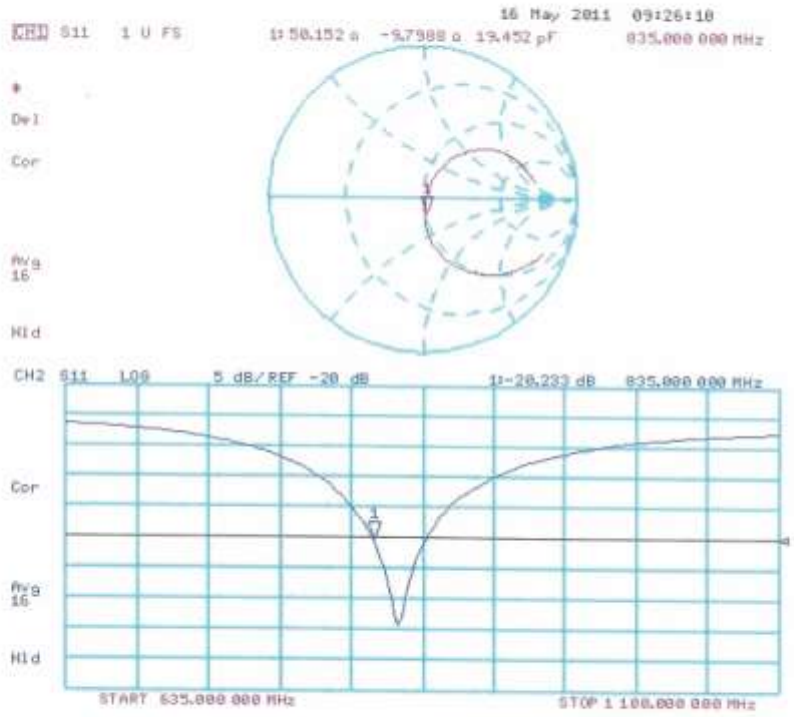
- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.041 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.442 W/kg
**SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.51 mW/g**
Maximum value of SAR (measured) = 2.703 mW/g




0 dB = 2.700mW/g

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 16.05.2011

Test Laboratory: SPEAG, Zurich, Switzerland

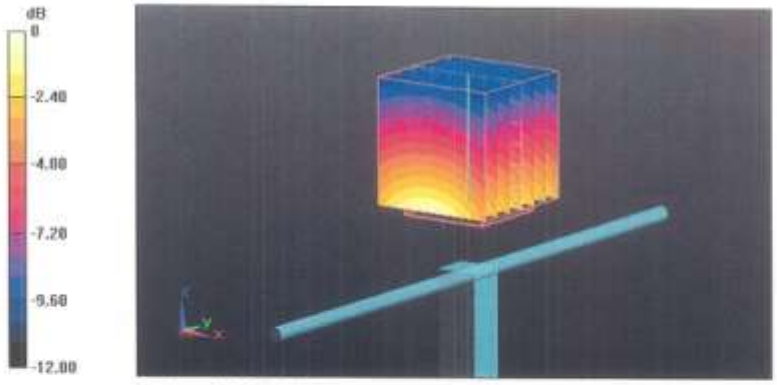
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:441**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL900
Medium parameters used: f = 835 MHz; $\sigma$ = 1 mho/m; $\varepsilon_r$ = 53.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

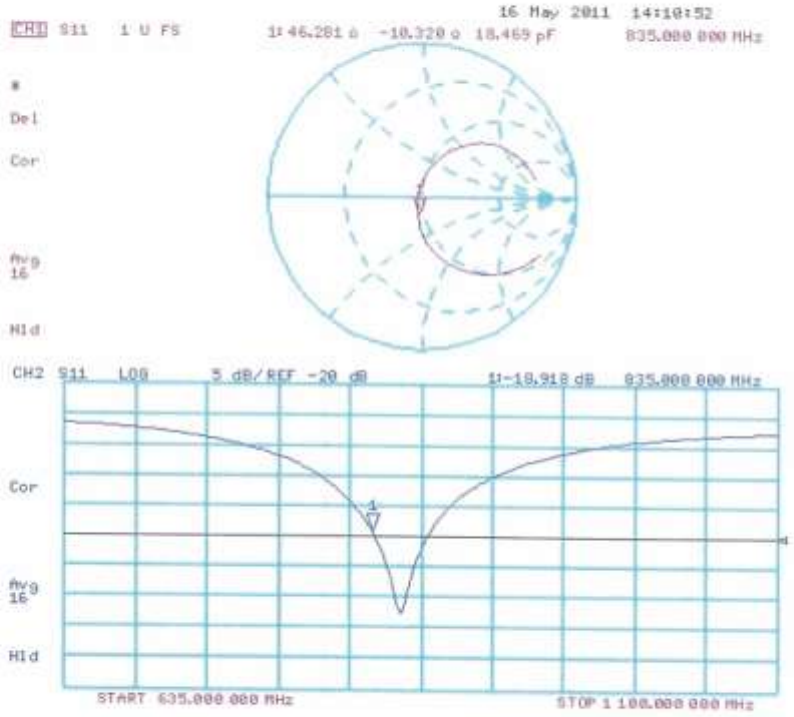
- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.302 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.553 W/kg
**SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.6 mW/g**
Maximum value of SAR (measured) = 2.833 mW/g




0 dB = 2.830mW/g

## Impedance Measurement Plot for Body 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
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
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 HCT (Dymstec)

Certificate No: D1900V2-5d032_Jul11

# CALIBRATION CERTIFICATE

Object D1900V2 - SN: 5d032

Calibration procedure(s) QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: July 22, 2011

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 (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 06-Oct-10 (No. 217-01266) | Oct-11 |
| Power sensor HP 8481A | US37292783 | 06-Oct-10 (No. 217-01266) | Oct-11 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 29-Mar-11 (No. 217-01367) | Apr-12 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 29-Mar-11 (No. 217-01371) | Apr-12 |
| Reference Probe ES3DV3 | SN: 3205 | 29-Apr-11 (No. ES3-3205_Apr11) | Apr-12 |
| DAE4 | SN: 601 | 04-Jul-11 (No. DAE4-601_Jul11) | Jul-12 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (in house check Oct-09) | In house check: Oct-11 |
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-09) | In house check: Oct-11 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-10) | In house check: Oct-11 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Dimce Iliev | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: August 2, 2011

**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 Accreditation Service (SAS)
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) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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) DASY4/5 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** | DASY5 | V52.6.2 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **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 | 39.1 ± 6 % | 1.42 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 10.1 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **39.9 mW /g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.29 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **21.0 mW /g ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 53.3 | 1.52 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 52.3 ± 6 % | 1.53 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 10.3 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **40.9 mW / g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.39 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **21.5 mW / g ± 16.5 % (k=2)** |

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 52.6 Ω + 6.5 jΩ |
| Return Loss | - 23.3 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 46.6 Ω + 6.0 jΩ |
| Return Loss | - 22.9 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.190 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 |

**DASY5 Validation Report for Head TSL**

Date: 20.07.2011

Test Laboratory: SPEAG, Zurich, Switzerland

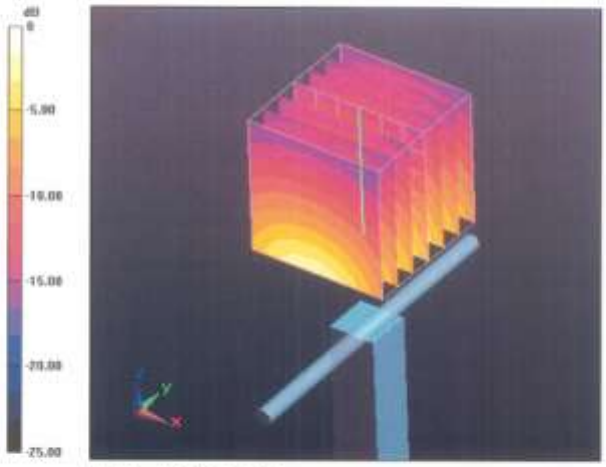
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d032**

Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.42 mho/m; $\varepsilon_r$ = 39.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

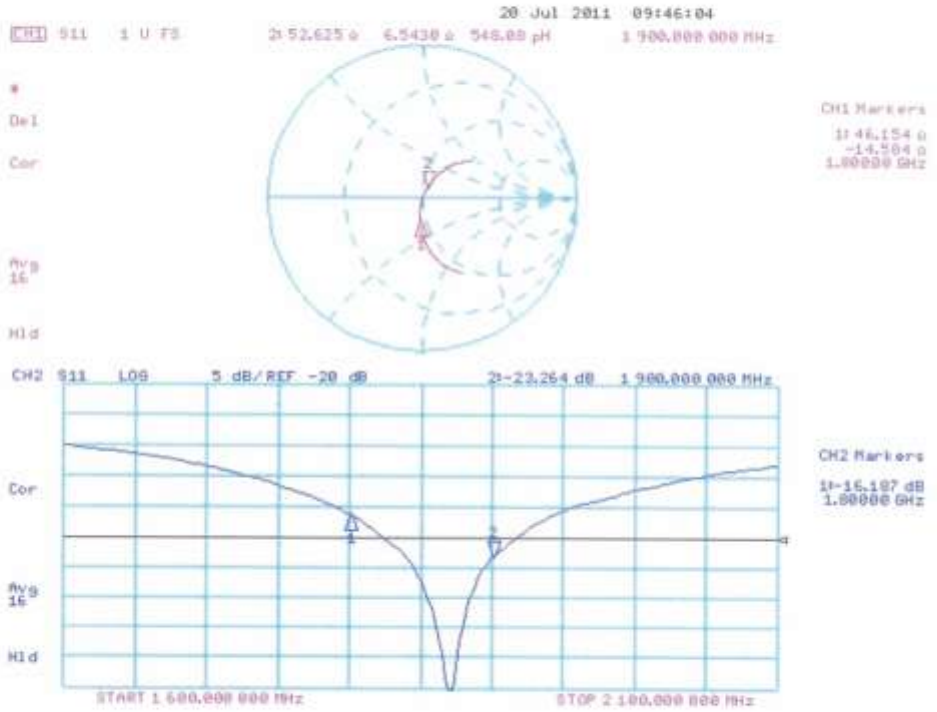
- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.253 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 18.469 W/kg
**SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.29 mW/g**
Maximum value of SAR (measured) = 12.721 mW/g




0 dB = 12.720mW/g

**Impedance Measurement Plot for Head TSL**



**DASY5 Validation Report for Body TSL**

Date: 22.07.2011

Test Laboratory: SPEAG, Zurich, Switzerland

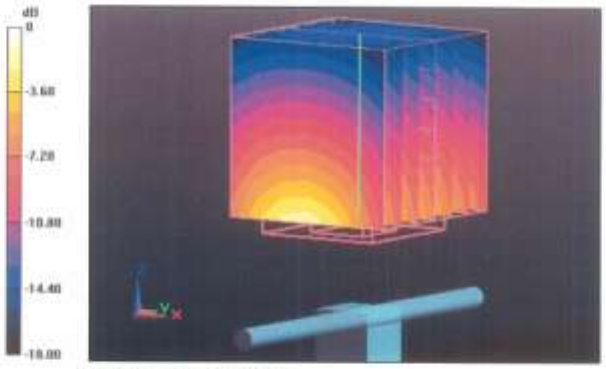
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d032**

Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.53 mho/m; $\varepsilon_r$ = 52.3; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

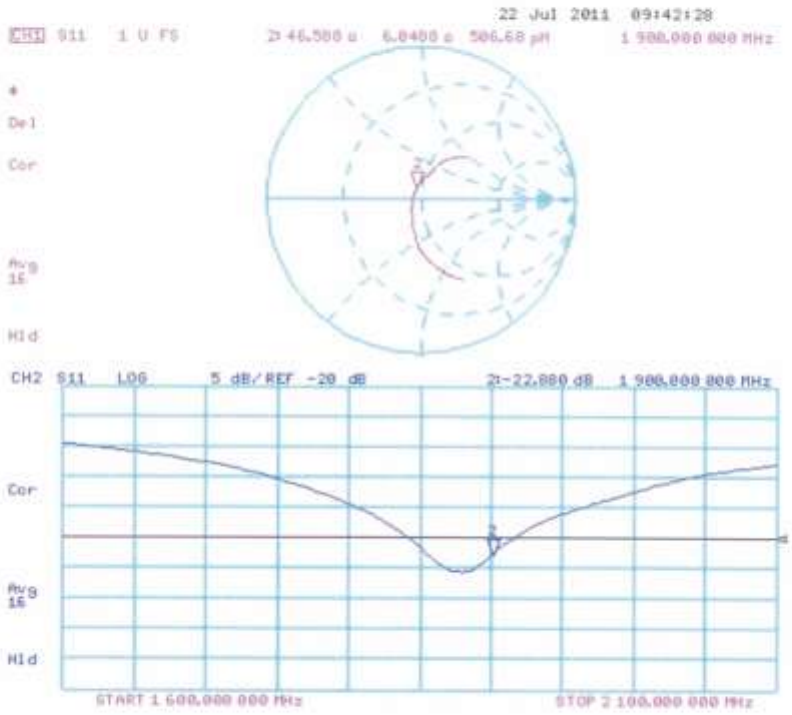
- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.827 V/m; Power Drift = 0.0078 dB
Peak SAR (extrapolated) = 18.111 W/kg
**SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.39 mW/g**
Maximum value of SAR (measured) = 12.898 mW/g




0 dB = 12.900mW/g

**Impedance Measurement Plot for Body 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
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
**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 **HCT (Dymstec)** Certificate No: **D2450V2-743_Aug11**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D2450V2 - SN: 743 |
| Calibration procedure(s) | QA CAL-05.v8<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | August 29, 2011 |

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 (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 06-Oct-10 (No. 217-01266) | Oct-11 |
| Power sensor HP 8481A | US37292783 | 06-Oct-10 (No. 217-01266) | Oct-11 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 29-Mar-11 (No. 217-01367) | Apr-12 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 29-Mar-11 (No. 217-01371) | Apr-12 |
| Reference Probe ES3DV3 | SN: 3205 | 29-Apr-11 (No. ES3-3205_Apr11) | Apr-12 |
| DAE4 | SN: 601 | 04-Jul-11 (No. DAE4-601_Jul11) | Jul-12 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (in house check Oct-09) | In house check: Oct-11 |
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-09) | In house check: Oct-11 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-10) | In house check: Oct-11 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Dimce Iliev | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: August 29, 2011

**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 Accreditation Service (SAS)
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) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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) DASY4/5 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** | DASY5 | V52.6.2 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 2450 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 39.2 | 1.80 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 38.4 ± 6 % | 1.85 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.7 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **53.8 mW /g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.40 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **25.4 mW /g ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 52.7 | 1.95 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 51.8 ± 6 % | 2.02 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.2 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **51.7 mW / g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.11 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **24.2 mW / g ± 16.5 % (k=2)** |

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 55.0 Ω + 4.8 jΩ |
| Return Loss | - 23.6 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 50.3 Ω + 5.8 jΩ |
| Return Loss | - 24.8 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.160 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 | December 01, 2003 |

**DASY5 Validation Report for Head TSL**

Date: 29.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

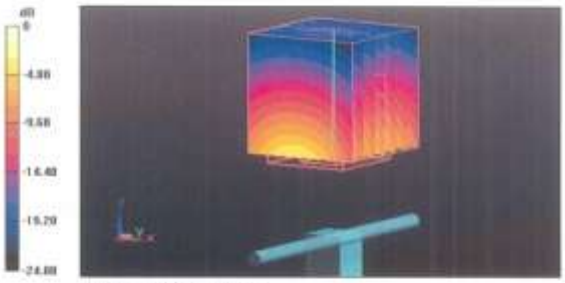
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 743**

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.85 mho/m; $\varepsilon_r$ = 38.4; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

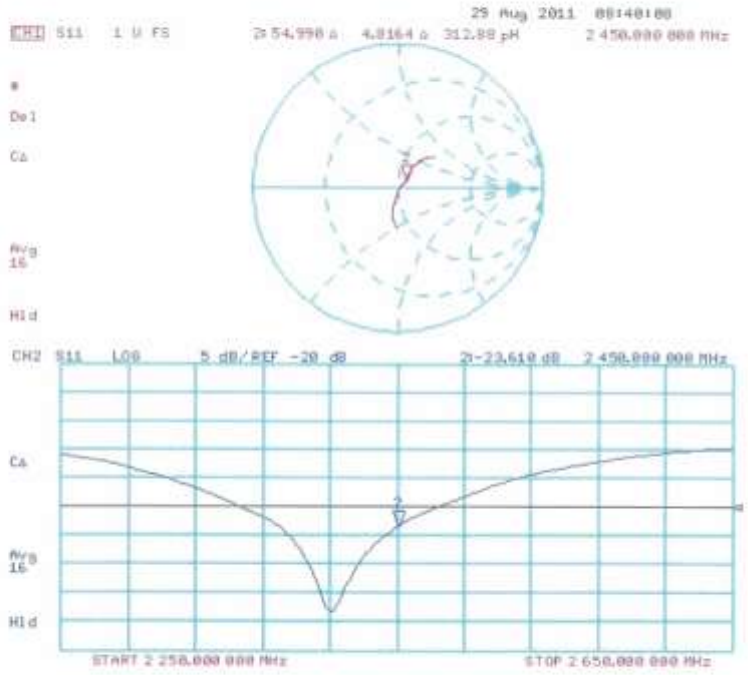
- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.2 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 28.291 W/kg
**SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.4 mW/g**
Maximum value of SAR (measured) = 17.657 mW/g



0 dB = 17.660mW/g

**Impedance Measurement Plot for Head TSL**



**DASY5 Validation Report for Body TSL**

Date: 29.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

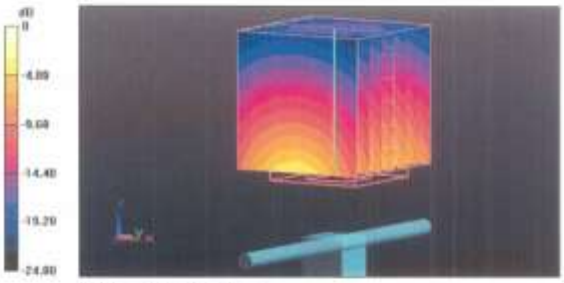
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 743**

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 2.02 mho/m; $\varepsilon_r$ = 51.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.903 V/m; Power Drift = -0.0051 dB
Peak SAR (extrapolated) = 27.107 W/kg
**SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.11 mW/g**
Maximum value of SAR (measured) = 17.329 mW/g




0 dB = 17.330mW/g

**Impedance Measurement Plot for Body TSL**