

# SAR TEST REPORT

HCT CO., LTD

|                                                  |                                                                                                                                                                                                                                                                         |                                                                                                                                                    |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT Type:                                        | Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC                                                                                                                                                                                                                 |                                                                                                                                                    |
| FCC ID:                                          | ZNFE610V                                                                                                                                                                                                                                                                |                                                                                                                                                    |
| Model:                                           | LG-E610V                                                                                                                                                                                                                                                                |                                                                                                                                                    |
| Date of Issue:                                   | Jun.5, 2012                                                                                                                                                                                                                                                             |                                                                                                                                                    |
| Test report No.:                                 | HCTA1205FS06                                                                                                                                                                                                                                                            |                                                                                                                                                    |
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| Applicant :                                      | <b>LG Electronics, MobileComm U.S.A., Inc.</b><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><hr/> Report prepared by<br>: Young-Soo Jang<br>Test Engineer of SAR Part                                                                                                        | <br><hr/> Approved by<br>: Jae-Sang So<br>Manager of SAR Part |

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## 1. INTRODUCTION

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

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 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 (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density ( $\rho$ ). 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 <sup>3</sup> ) |
| $E$      | = | 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 Phone with Bluetooth and WLAN/NFC                                                                   |               |           |         |
| FCC ID:                                | ZNFE610V                                                                                                                  |               |           |         |
| Model:                                 | LG-E610V                                                                                                                  |               |           |         |
| Additional Model:                      | LG-E610V, E610v, E610V, LGE610v, LGE610V                                                                                  |               |           |         |
| Trade Name                             | LG Electronics, MobileComm U.S.A., Inc.                                                                                   |               |           |         |
| Application Type                       | Certification                                                                                                             |               |           |         |
| Mode(s) of Operation                   | GSM850/GSM1900 /802.11b/g/n                                                                                               |               |           |         |
| Tx Frequency                           | 824.20 - 848.80 MHz (GSM850) /1 850.20 – 1 909.80 MHz (GSM1900)<br>2 412- 2 462 MHz (WLAN)/ 2 402 – 2 480 MHz (Bluetooth) |               |           |         |
| Rx Frequency                           | 869.20 - 893.80 MHz (GSM850)/ 1 930.20 – 1 989.80 MHz (GSM1900)<br>2 412- 2 462 MHz (WLAN)/ 2 402 – 2 480 MHz (Bluetooth) |               |           |         |
| 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                                                                                                                    | 0.126         | 0.321     | 0.321   |
|                                        | GSM1900                                                                                                                   | 0.344         | 0.28      | 0.292   |
|                                        | 802.11b                                                                                                                   | 0.385         | 0.173     | 0.173   |
| Simultaneous SAR per KDB 690783 D01    |                                                                                                                           | 0.729         | 0.494     | 0.494   |
| Date(s) of Tests                       | Jun. 2, 2012 ~ Jun. 3, 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.

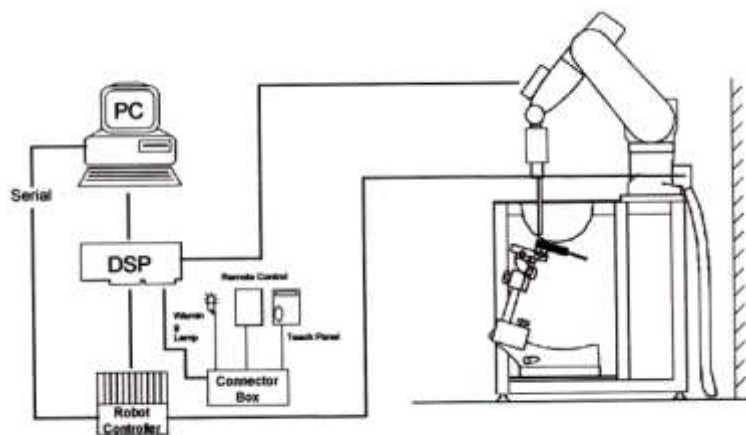


Figure 3.1 HCT SAR Lab. Test Measurement Set-up

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: $\pm 0.2$ dB<br>(30 MHz to 3 GHz)                                                                                  |
| Directivity       | $\pm 0.2$ dB in brain tissue (rotation around probe axis)<br>$\pm 0.4$ dB in brain tissue (rotation normal probe axis)                           |
| Dynamic           | 5 $\mu$ W/g to > 100 mW/g;                                                                                                                       |
| Range Linearity:  | $\pm 0.2$ dB                                                                                                                                     |
| Surface Detection | $\pm 0.2$ 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

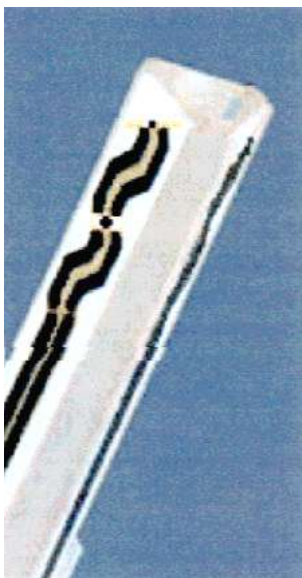


Figure 3.3 ET3DV6 E-field Probe

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 2<sup>nd</sup> 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  $\pm 10\%$ . The spherical isotropy was evaluated with the proper procedure and found to be better than  $\pm 0.25$  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 below 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<sup>3</sup> for brain tissue)

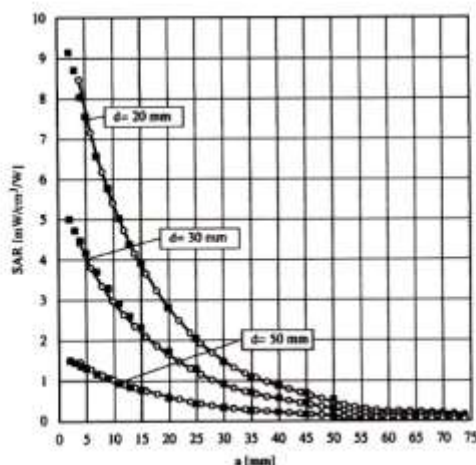


Figure 3.4 E-Field and Temperature measurements at 900 MHz

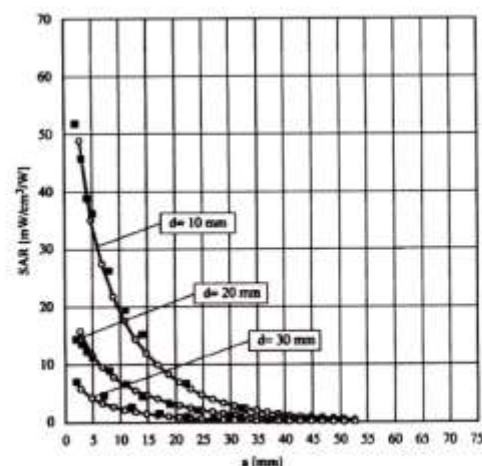


Figure 3.5 E-Field and temperature measurements at 1.8 GHz

### 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<sup>3</sup>

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

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

with  $P_{free}$  = equivalent power density of a plane wave in W/cm<sup>2</sup>  
 $E_{tot}$  = 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 $\pm$ 0.2 mm (6 $\pm$ 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 repeatably 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 produce 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<br>(% 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        | DAE4                        | 869             | Sep. 22, 2011 | Annual         | Sep. 22, 2012 |
| SPEAG        | E-Field Probe ET3DV6        | 1630            | Nov. 18, 2011 | Annual         | Nov. 18, 2012 |
| SPEAG        | Validation Dipole D835V2    | 441             | May 16, 2012  | Annual         | May 16, 2013  |
| 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      | Apr. 3, 2012  | Annual         | Apr. 3, 2013  |

**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.

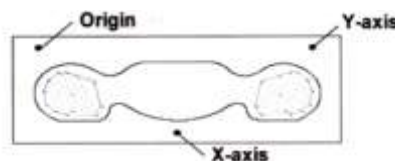


Figure 4.1 SAR Measurement Point in Area Scan

## 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 15° or until the device antenna touch the phantom. Please refer to IEEE 1528-2003 illustration below.

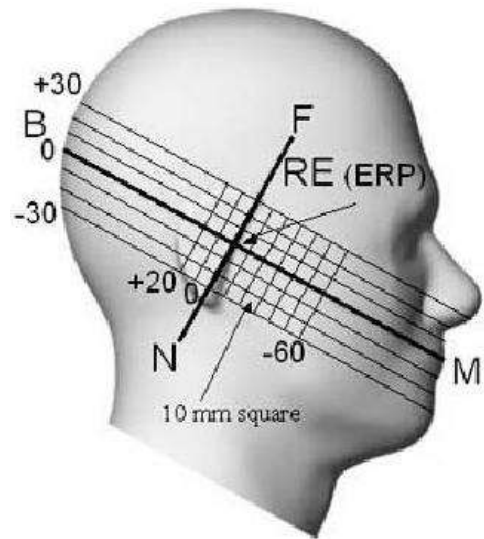


Figure 5.1 Side view of the phantom

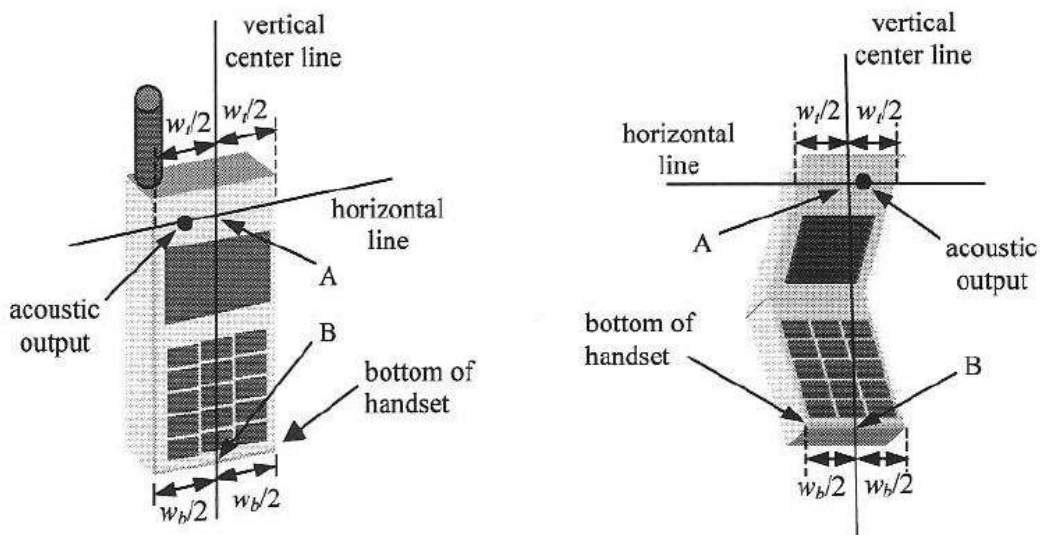


Figure 5.2 Handset vertical and horizontal reference lines

## **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<br>(± %) | Prob.<br>dist. | Div. | $C_i$ | Standard<br>Uncertainty<br>(± %) | $V_{eff}$ |
|-------------------------------------|--------------|----------------|------|-------|----------------------------------|-----------|
| <b>1. Measurement System</b>        |              |                |      |       |                                  |           |
| Probe Calibration                   | 6.00         | N              | 1    | 1     | 6.00                             | $\infty$  |
| Axial Isotropy                      | 4.70         | R              | 1.73 | 0.7   | 1.90                             | $\infty$  |
| Hemispherical Isotropy              | 9.60         | R              | 1.73 | 0.7   | 3.88                             | $\infty$  |
| Boundary Effects                    | 1.00         | R              | 1.73 | 1     | 0.58                             | $\infty$  |
| Linearity                           | 4.70         | R              | 1.73 | 1     | 2.71                             | $\infty$  |
| System Detection Limits             | 1.00         | R              | 1.73 | 1     | 0.58                             | $\infty$  |
| Readout Electronics                 | 0.30         | N              | 1.00 | 1     | 0.30                             | $\infty$  |
| Response Time                       | 0.8          | R              | 1.73 | 1     | 0.46                             | $\infty$  |
| Integration Time                    | 2.6          | R              | 1.73 | 1     | 1.50                             | $\infty$  |
| RF Ambient Conditions               | 3.00         | R              | 1.73 | 1     | 1.73                             | $\infty$  |
| Probe Positioner                    | 0.40         | R              | 1.73 | 1     | 0.23                             | $\infty$  |
| Probe Positioning                   | 2.90         | R              | 1.73 | 1     | 1.67                             | $\infty$  |
| Max SAR Eval                        | 1.00         | R              | 1.73 | 1     | 0.58                             | $\infty$  |
| <b>2. Test Sample Related</b>       |              |                |      |       |                                  |           |
| 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                             | $\infty$  |
| <b>3. Phantom and Setup</b>         |              |                |      |       |                                  |           |
| Phantom Uncertainty                 | 4.00         | R              | 1.73 | 1     | 2.31                             | $\infty$  |
| Liquid Conductivity(target)         | 5.00         | R              | 1.73 | 0.64  | 1.85                             | $\infty$  |
| Liquid Conductivity(meas.)          | 2.07         | N              | 1    | 0.64  | 1.32                             | 9         |
| Liquid Permittivity(target)         | 5.00         | R              | 1.73 | 0.6   | 1.73                             | $\infty$  |
| Liquid Permittivity(meas.)          | 5.02         | N              | 1    | 0.6   | 3.01                             | 9         |
| <b>Combine Standard Uncertainty</b> |              |                |      |       | 11.13                            |           |
| <b>Coverage Factor for 95 %</b>     |              |                |      |       | $k=2$                            |           |
| <b>Expanded STD Uncertainty</b>     |              |                |      |       | 22.25                            |           |

Table 6.1 Uncertainty (800 MHz- 2450 MHz)

## 7. ANSI/ IEEE C95.1 - 1992 RF EXPOSURE LIMITS

| HUMAN EXPOSURE                                         | UNCONTROLLED ENVIRONMENT<br>General Population<br>(W/kg) or (mW/g) | CONTROLLED ENVIRONMENT<br>Occupational<br>(W/kg) or (mW/g) |
|--------------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------|
| SPATIAL PEAK SAR *<br>(Brain)                          | 1.60                                                               | 8.00                                                       |
| SPATIAL AVERAGE SAR **<br>(Whole Body)                 | 0.08                                                               | 0.40                                                       |
| SPATIAL PEAK SAR ***<br>(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         | Jun. 2, 2012 | Head   | 21.1             | $\epsilon_r$ | 41.5         | 40.8           | - 1.69        | $\pm 5$   |
|             |              |        |                  | $\sigma$     | 0.90         | 0.874          | - 2.89        | $\pm 5$   |
| 835         |              | Body   | 21.1             | $\epsilon_r$ | 55.2         | 54.8           | - 0.72        | $\pm 5$   |
|             |              |        |                  | $\sigma$     | 0.97         | 1.01           | + 4.12        | $\pm 5$   |
| 1 900       | Jun. 3, 2012 | Head   | 21.3             | $\epsilon_r$ | 40.0         | 39.8           | - 0.50        | $\pm 5$   |
|             |              |        |                  | $\sigma$     | 1.40         | 1.40           | 0.00          | $\pm 5$   |
| 1 900       |              | Body   | 21.3             | $\epsilon_r$ | 53.3         | 53.7           | + 0.75        | $\pm 5$   |
|             |              |        |                  | $\sigma$     | 1.52         | 1.5            | - 1.32        | $\pm 5$   |
| 2 450       | Jun. 3, 2012 | Head   | 21.3             | $\epsilon_r$ | 39.2         | 40.1           | + 2.30        | $\pm 5$   |
|             |              |        |                  | $\sigma$     | 1.80         | 1.88           | + 4.26        | $\pm 5$   |
| 2 450       |              | Body   | 21.3             | $\epsilon_r$ | 52.7         | 51.7           | - 1.90        | $\pm 5$   |
|             |              |        |                  | $\sigma$     | 1.95         | 1.96           | + 0.51        | $\pm 5$   |

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

### 8.2 System Validation

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

| Freq.<br>[MHz] | Date         | Probe<br>(SN) | Liquid | Amb.<br>Temp.<br>[°C] | Liquid<br>Temp.<br>[°C] | 1 W Target<br>SAR <sub>1g</sub><br>(SPEAG)<br>(mW/g) | Measured<br>SAR <sub>1g</sub><br>(mW/g) | 1 W<br>Normalized<br>SAR <sub>1g</sub><br>(mW/g) | Deviation<br>[%] | Limit<br>[%] |
|----------------|--------------|---------------|--------|-----------------------|-------------------------|------------------------------------------------------|-----------------------------------------|--------------------------------------------------|------------------|--------------|
| 835            | Jun. 2, 2012 | 1630          | Head   | 21.3                  | 21.1                    | 9.43                                                 | 0.936                                   | 9.36                                             | - 0.74           | ± 10         |
| 835            |              |               | Body   |                       |                         | 9.50                                                 | 0.971                                   | 9.71                                             | + 2.21           | ± 10         |
| 1 900          | Jun. 3, 2012 |               | Head   | 21.5                  | 21.3                    | 39.9                                                 | 3.96                                    | 39.6                                             | - 0.75           | ± 10         |
| 1 900          |              |               | Body   |                       |                         | 40.9                                                 | 4.29                                    | 42.9                                             | + 4.89           | ± 10         |
| 2 450          | Jun. 3, 2012 |               | Head   | 21.5                  | 21.3                    | 53.8                                                 | 5.35                                    | 53.5                                             | - 0.56           | ± 10         |
| 2 450          |              |               | Body   |                       |                         | 51.7                                                 | 5.21                                    | 52.1                                             | + 0.77           | ± 10         |

### 8.3 System Validation Procedure

SAR measurement was prior to assessment, the system is verified to the  $\pm 10\%$  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 than 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     | 33.16     | 33.15                 | 30.59                | 29.10                | 27.59                |
|          | 190     | 33.15     | 33.14                 | 30.59                | 29.07                | 27.58                |
|          | 251     | 33.14     | 33.14                 | 30.60                | 29.07                | 27.60                |
| GSM 1900 | 512     | 29.54     | 29.53                 | 26.18                | 24.24                | 23.11                |
|          | 661     | 29.60     | 29.60                 | 26.24                | 24.30                | 23.18                |
|          | 810     | 29.68     | 29.67                 | 26.31                | 24.37                | 23.25                |

## 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     | 24.13     | 24.12                 | 24.57                | 24.84                | 24.58                |
|          | 190     | 24.12     | 24.11                 | 24.57                | 24.81                | 24.57                |
|          | 251     | 24.11     | 24.11                 | 24.58                | 24.81                | 24.59                |
| GSM 1900 | 512     | 20.51     | 20.5                  | 20.16                | 19.98                | 20.1                 |
|          | 661     | 20.57     | 20.57                 | 20.22                | 20.04                | 20.17                |
|          | 810     | 20.65     | 20.64                 | 20.29                | 20.11                | 20.24                |

**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 WiFi

### 9.2.1 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" |         | UNII |
|-----------------------|---------|---------|----------------|-------------------------|---------|------|
|                       |         |         |                | §15.247<br>802.11b      | 802.11g |      |
| 802.11 b/g            | 2.412   | 1       |                | √                       | √       |      |
|                       | 2.437   | 6       |                | √                       | √       |      |
|                       | 2.462   | 11      |                | √                       | √       |      |
| 802.11a               | 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     |                |                         |         | *    |
|                       | 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     |                |                         |         | *    |
|                       | 5.745   | 149     |                | √                       |         | √    |
|                       | 5.765   | 153     | 152 (5.76 GHz) |                         | *       | *    |
| UNII<br>or<br>§15.247 | 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       | 17.28                 | 17.03 | 17.40 | 17.20 |
|              | 6       | 17.05                 | 16.91 | 17.21 | 17.12 |
|              | 11      | 17.07                 | 16.87 | 17.32 | 16.94 |

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       | 13.00                 | 12.98 | 13.41 | 13.20 | 13.08 | 12.80 | 12.42 | 12.39 |
|              | 6       | 13.83                 | 13.71 | 13.62 | 13.51 | 13.30 | 12.31 | 12.68 | 12.02 |
|              | 11      | 13.68                 | 13.71 | 13.60 | 13.40 | 13.32 | 12.94 | 12.50 | 12.27 |

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       | 11.73                 | 12.01 | 11.81 | 11.69 | 11.04 | 11.12 | 10.61 | 11.03 |
|                      | 6       | 12.45                 | 12.26 | 12.09 | 11.90 | 11.64 | 11.35 | 11.20 | 11.08 |
|                      | 11      | 12.46                 | 12.22 | 12.10 | 11.81 | 11.63 | 11.22 | 11.15 | 11.07 |

Average IEEE 802.11n Conducted output power

Note;

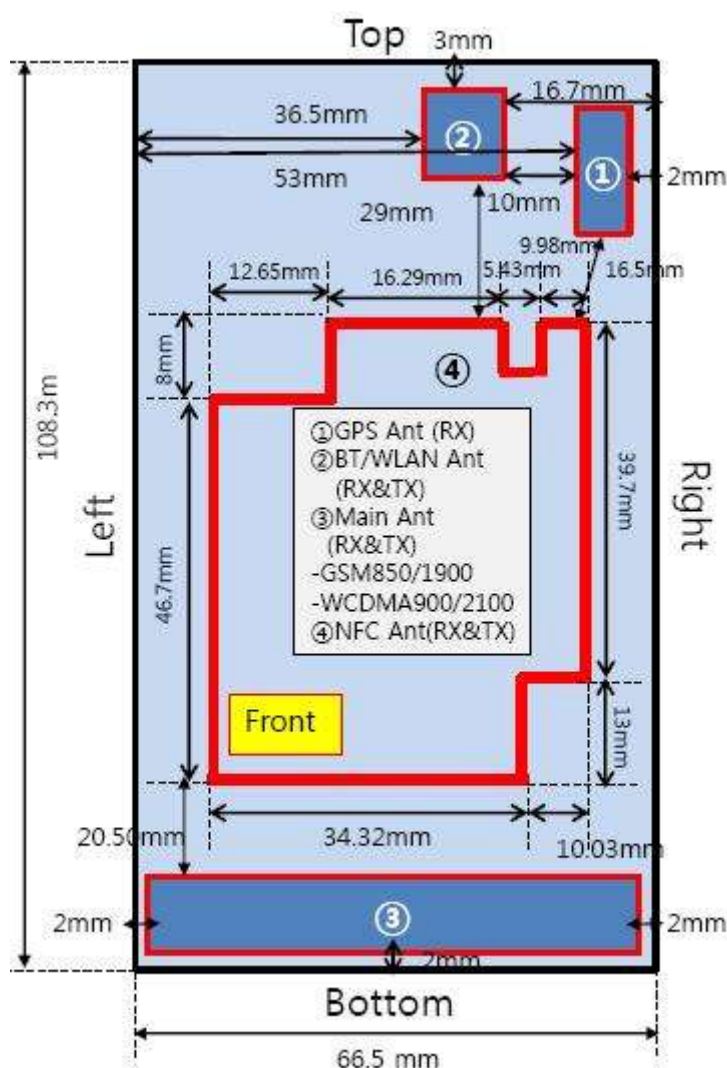
SAR testing was performed according to the FCC KDB 248227.

## 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  |
| WLAN      | Yes  | Yes   | No   | Yes   | No     | Yes |

### 10.2 Antenna and Device Information



[Front 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  $\leq 2.5$  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   | <u>Routine evaluation required</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>SAR not required:</b><br><u>Unlicensed only</u><br><ul style="list-style-type: none"> <li>when stand-alone 1-g SAR is not required and antenna is <math>\geq 5</math> cm from other antennas</li> </ul> <u>Licensed &amp; Unlicensed</u><br><ul style="list-style-type: none"> <li>when the sum of the 1-g SAR is <math>&lt; 1.6</math> W/kg for all simultaneous transmitting antennas</li> <li>when SAR to peak location separation ratio of simultaneous transmitting antenna pair is <math>&lt; 0.3</math></li> </ul> <b>SAR required:</b><br><u>Licensed &amp; Unlicensed</u><br>antenna pairs with SAR to peak location separation ratio $\geq 0.3$ ; 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><b>Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply</b> |
| Unlicensed Transmitters | <u>When there is no simultaneous transmission –</u> <ul style="list-style-type: none"> <li>output <math>\leq 60</math> f: SAR not required</li> <li>output <math>&gt; 60</math> f: stand-alone SAR required</li> </ul> <u>When there is simultaneous transmission –</u><br><u>Stand-alone SAR not required when</u> <ul style="list-style-type: none"> <li>output <math>\leq 2 \cdot P_{Ref}</math> and antenna is <math>\geq 5.0</math> cm from other antennas</li> <li>output <math>\leq P_{Ref}</math> and antenna is <math>\geq 2.5</math> cm from other antennas</li> <li>output <math>\leq P_{Ref}</math> and antenna is <math>&lt; 2.5</math> cm from other antennas, each with either output power <math>\leq P_{Ref}</math> or 1-g SAR <math>&lt; 1.2</math> W/kg</li> </ul> <u>Otherwise stand-alone SAR is required</u><br><u>When stand-alone SAR is required</u> <ul style="list-style-type: none"> <li>test SAR on highest output channel for each wireless mode and exposure condition</li> <li>if SAR for highest output channel is <math>&gt; 50\%</math> of SAR limit, evaluate all channels according to normal procedures</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Jaw, Mouth and Nose     | <u>Flat phantom SAR required</u> <ul style="list-style-type: none"> <li>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</li> <li>position rectangular and clam-shell phones according to flat phantom procedures and conduct SAR measurements for these specific locations</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | When simultaneous transmission SAR testing is required, contact the FCC Laboratory for interim guidance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

SAR Evaluation Requirements for Multiple Transmitters Handsets

FCC ID: ZNFE610V

BT Max. RF output power: 9.62 dBm (9.16 mW)

## 11.2 SAR Summation Scenario

### Simultaneous Transmission Summation for Held to Ear

| Simultaneous TX | configuration | 850 GSM SAR(W/kg) | WIFI SAR (W/kg) | $\Sigma$ SAR (W/kg) | Simultaneous TX | configuration | 1900 GSM SAR(W/kg) | WIFI SAR (W/kg) | $\Sigma$ SAR (W/kg) |
|-----------------|---------------|-------------------|-----------------|---------------------|-----------------|---------------|--------------------|-----------------|---------------------|
| Head SAR        | Left Cheek    | 0.126             | 0.385           | 0.511               | Head SAR        | Left Cheek    | 0.344              | 0.385           | 0.729               |
|                 | Left Tilt     | 0.065             | 0.352           | 0.417               |                 | Left Tilt     | 0.146              | 0.352           | 0.498               |
|                 | Right Cheek   | 0.103             | 0.338           | 0.441               |                 | Right Cheek   | 0.284              | 0.338           | 0.622               |
|                 | Right Tilt    | 0.063             | 0.303           | 0.366               |                 | Right Tilt    | 0.126              | 0.303           | 0.429               |

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) | $\Sigma$ SAR (W/kg) | Simultaneous TX | configuration | 1900 GPRS SAR(W/kg) | WIFI SAR (W/kg) | $\Sigma$ SAR (W/kg) |
|-----------------|---------------|--------------------|-----------------|---------------------|-----------------|---------------|---------------------|-----------------|---------------------|
| Body SAR        | Back          | 0.321              | 0.173           | 0.494               | Body SAR        | Back          | 0.28                | 0.173           | 0.453               |

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) | $\Sigma$ SAR (W/kg) | Simultaneous TX | configuration | 1900 GPRS SAR(W/kg) | WIFI SAR (W/kg) | $\Sigma$ SAR (W/kg) |
|-----------------|---------------|--------------------|-----------------|---------------------|-----------------|---------------|---------------------|-----------------|---------------------|
| Body SAR        | Back          | 0.321              | 0.173           | 0.494               | Body SAR        | Back          | 0.28                | 0.173           | 0.453               |
|                 | Front         | 0.224              | 0.067           | 0.291               |                 | Front         | 0.292               | 0.067           | 0.359               |
|                 | Left          | 0.183              | -               | 0.183               |                 | Left          | 0.145               | -               | 0.145               |
|                 | Right         | 0.032              | 0.032           | 0.064               |                 | Right         | 0.087               | 0.032           | 0.119               |
|                 | Bottom        | 0.06               | -               | 0.060               |                 | Bottom        | 0.28                | -               | 0.280               |
|                 | Top           | -                  | 0.123           | 0.123               |                 | Top           | -                   | 0.123           | 0.123               |

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  $2 \cdot P_{ref}$ , 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     | 33.15                 | -0.166           | Standard | Left Ear                                                       | 0.126     |
| 836.6                                                                                              | 190 (Mid) |            | 33.15                 | -0.120           | Standard | Left Tilt 15°                                                  | 0.065     |
| 836.6                                                                                              | 190 (Mid) |            | 33.15                 | -0.075           | Standard | Right Ear                                                      | 0.103     |
| 836.6                                                                                              | 190 (Mid) |            | 33.15                 | -0.097           | Standard | Right Tilt 15°                                                 | 0.063     |
| ANSI/ IEEE C95.1 - 1992– Safety Limit<br>Spatial Peak<br>Uncontrolled Exposure/ General Population |           |            |                       |                  |          | Head<br>1.6 W/kg (mW/g)<br><small>Averaged over 1 gram</small> |           |

#### NOTES:

- 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].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim  
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- 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    | 29.60                | -0.014           | Standard | Left Ear                                        | 0.344     |
| 1 880.0                                                                                            | 661 (Mid) |            | 29.60                | -0.066           | Standard | Left Tilt 15°                                   | 0.146     |
| 1 880.0                                                                                            | 661 (Mid) |            | 29.60                | -0.015           | Standard | Right Ear                                       | 0.284     |
| 1 880.0                                                                                            | 661 (Mid) |            | 29.60                | 0.178            | Standard | Right Tilt 15°                                  | 0.126     |
| 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:

- 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].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim  
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- 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 (802.11b/g/n Head SAR)

| Frequency                                                                                          |         | Modulation | Conducted Power (dBm) | Power Drift (dB) | Battery  | Phantom Position                                | Data Rate | SAR(mW/g) |
|----------------------------------------------------------------------------------------------------|---------|------------|-----------------------|------------------|----------|-------------------------------------------------|-----------|-----------|
| MHz                                                                                                | Channel |            |                       |                  |          |                                                 |           |           |
| 2 412                                                                                              | 1 (Low) | 802.11b    | 17.28                 | 0.01             | Standard | Left Ear                                        | 1 Mbps    | 0.385     |
| 2 412                                                                                              | 1 (Low) | 802.11b    | 17.28                 | -0.06            | Standard | Left Tilt 15°                                   | 1 Mbps    | 0.352     |
| 2 412                                                                                              | 1 (Low) | 802.11b    | 17.28                 | -0.16            | Standard | Right Ear                                       | 1 Mbps    | 0.338     |
| 2 412                                                                                              | 1 (Low) | 802.11b    | 17.28                 | -0.001           | Standard | Right Tilt 15                                   | 1 Mbps    | 0.303     |
| 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:

- 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].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim  
Batteries are fully charged for all readings.
- Test Signal Call Mode ☒ Manual Test cord ☐ Base Station Simulator
- 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.
- 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.

## 12.4 Measurement Results (GPRS850 Hotspot SAR)

| Frequency                                                                                          |           | Modulation | Conducted Power (dBm) | Power Drift (dB) | Configuration | Separation Distance                             | SAR(mW/g) |
|----------------------------------------------------------------------------------------------------|-----------|------------|-----------------------|------------------|---------------|-------------------------------------------------|-----------|
| MHz                                                                                                | Channel   |            |                       |                  |               |                                                 |           |
| 836.6                                                                                              | 190 (Mid) | GPRS 3Tx   | 29.07                 | -0.044           | Rear          | 1.0 cm                                          | 0.321     |
| 836.6                                                                                              | 190 (Mid) | GPRS 3Tx   | 29.07                 | -0.02            | Front         | 1.0 cm                                          | 0.224     |
| 836.6                                                                                              | 190 (Mid) | GPRS 3Tx   | 29.07                 | -0.04            | Left          | 1.0 cm                                          | 0.183     |
| 836.6                                                                                              | 190 (Mid) | GPRS 3Tx   | 29.07                 | -0.127           | Right         | 1.0 cm                                          | 0.032     |
| 836.6                                                                                              | 190 (Mid) | GPRS 3Tx   | 29.07                 | -0.06            | Bottom        | 1.0 cm                                          | 0.066     |
| 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:

- 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].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm  $\pm$  0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim  
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Test Configuration ☐ With Holster ☒ Without Holster
- 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).
- For body SAR testing, the EUT was set in GPRS multi-slot class11 with 3uplink 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.

## 12.5 Measurement Results (GPRS1900 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   | 29.60                 | 0.094            | Rear          | 1.0 cm                                                                       | 0.280     |
| 1 880.0                                                                                                                 | 661 (Mid) | GPRS 1Tx   | 29.60                 | 0.008            | Front         | 1.0 cm                                                                       | 0.292     |
| 1 880.0                                                                                                                 | 661 (Mid) | GPRS 1Tx   | 29.60                 | -0.044           | Left          | 1.0 cm                                                                       | 0.145     |
| 1 880.0                                                                                                                 | 661 (Mid) | GPRS 1Tx   | 29.60                 | -0.073           | Right         | 1.0 cm                                                                       | 0.087     |
| 1 880.0                                                                                                                 | 661 (Mid) | GPRS 1Tx   | 29.60                 | 0.098            | Bottom        | 1.0 cm                                                                       | 0.280     |
| <b>ANSI/ IEEE C95.1 - 1992– Safety Limit</b><br><b>Spatial Peak</b><br><b>Uncontrolled Exposure/ General Population</b> |           |            |                       |                  |               | <b>Body</b><br><b>1.6 W/kg (mW/g)</b><br><small>Averaged over 1 gram</small> |           |

### NOTES:

- 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].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm  $\pm$  0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim  
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Test Configuration ☐ With Holster ☒ Without Holster
- 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).
- For body SAR testing, the EUT was set in GPRS multi-slot class8 with 1uplink 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.

## 12.6 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    | 17.28                 | -0.078           | Rear          | 1.0 cm                                          | 1 Mbps    | 0.173     |
| 2 412                                                                                             | 1 (Low) | 802.11b    | 17.28                 | 0.061            | Front         | 1.0 cm                                          | 1 Mbps    | 0.067     |
| 2 412                                                                                             | 1 (Low) | 802.11b    | 17.28                 | -0.05            | Right         | 1.0 cm                                          | 1 Mbps    | 0.032     |
| 2 412                                                                                             | 1 (Low) | 802.11b    | 17.28                 | -0.019           | Top           | 1.0 cm                                          | 1 Mbps    | 0.123     |
| 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:

- 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].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm  $\pm$  0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim  
Batteries are fully charged for all readings.
- Test Signal Call Mode ☒ Manual Test code ☐ Base Station Simulator
- 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.
- 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

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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

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## Attachment 1. – SAR Test Plots

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Jun.2, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3  
Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.875 \text{ mho/m}$ ;  $\epsilon_r = 40.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 835/900 MHz; 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) = 0.137 mW/g

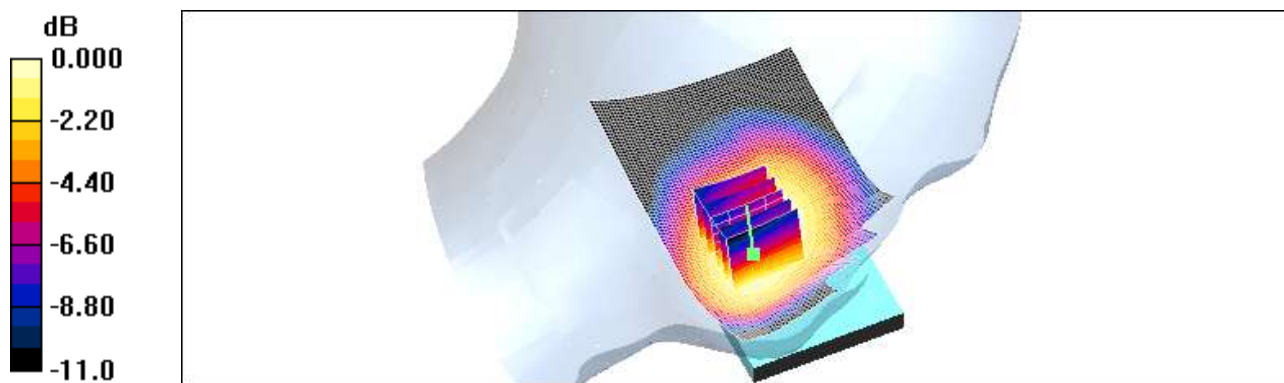
**Left touch 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.14 V/m; Power Drift = -0.166 dB

Peak SAR (extrapolated) = 0.171 W/kg

**SAR(1 g) = 0.126 mW/g; SAR(10 g) = 0.092 mW/g**

Maximum value of SAR (measured) = 0.134 mW/g



0 dB = 0.134mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Jun.2, 2012

**DUT: LG-E610V; 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;  $\sigma = 0.875$  mho/m;  $\epsilon_r = 40.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 835/900 MHz; 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) = 0.069 mW/g

**Left tilt 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

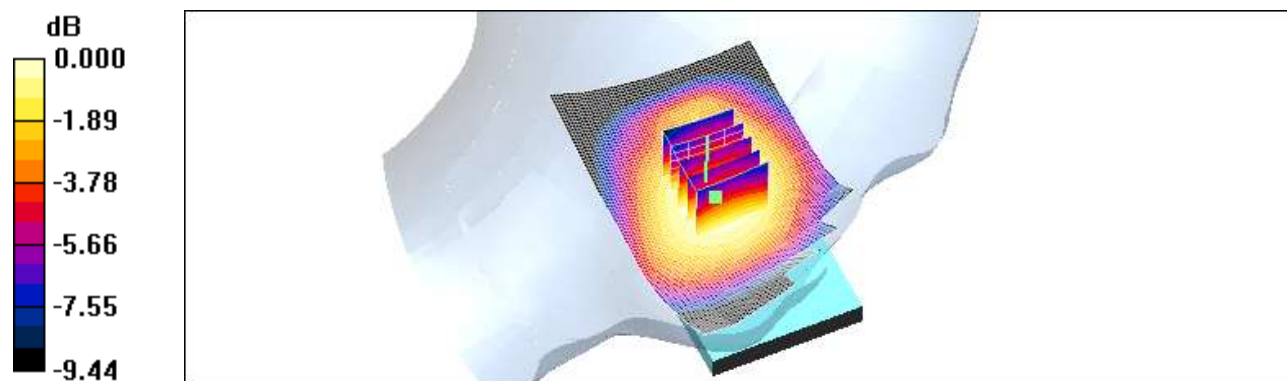
Reference Value = 6.03 V/m; Power Drift = -0.120 dB

Peak SAR (extrapolated) = 0.076 W/kg

**SAR(1 g) = 0.065 mW/g; SAR(10 g) = 0.050 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.067 mW/g



0 dB = 0.067mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Jun.2, 2012

**DUT: LG-E610V; 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;  $\sigma = 0.875$  mho/m;  $\epsilon_r = 40.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 835/900 MHz; 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) = 0.109 mW/g

**Right touch 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

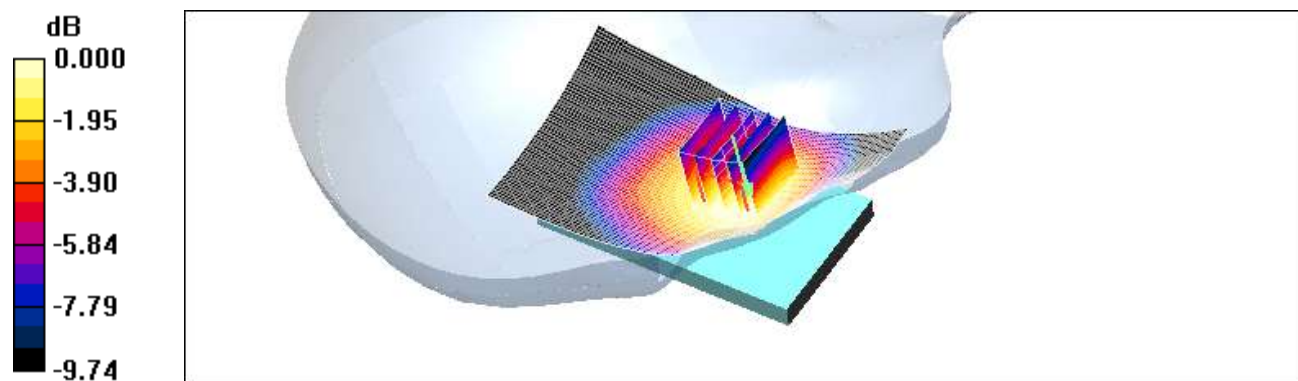
Reference Value = 3.63 V/m; Power Drift = -0.075 dB

Peak SAR (extrapolated) = 0.125 W/kg

**SAR(1 g) = 0.103 mW/g; SAR(10 g) = 0.077 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.108 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Jun.2, 2012

**DUT: LG-E610V; 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;  $\sigma = 0.875$  mho/m;  $\epsilon_r = 40.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 835/900 MHz; 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) = 0.066 mW/g

**Right tilt 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

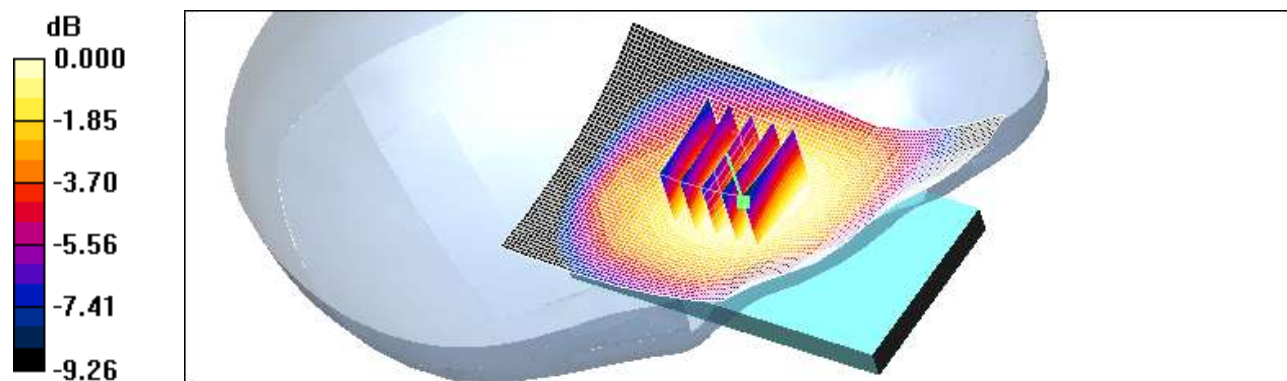
Reference Value = 5.92 V/m; Power Drift = -0.097 dB

Peak SAR (extrapolated) = 0.073 W/kg

**SAR(1 g) = 0.063 mW/g; SAR(10 g) = 0.048 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.065 mW/g



0 dB = 0.065mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

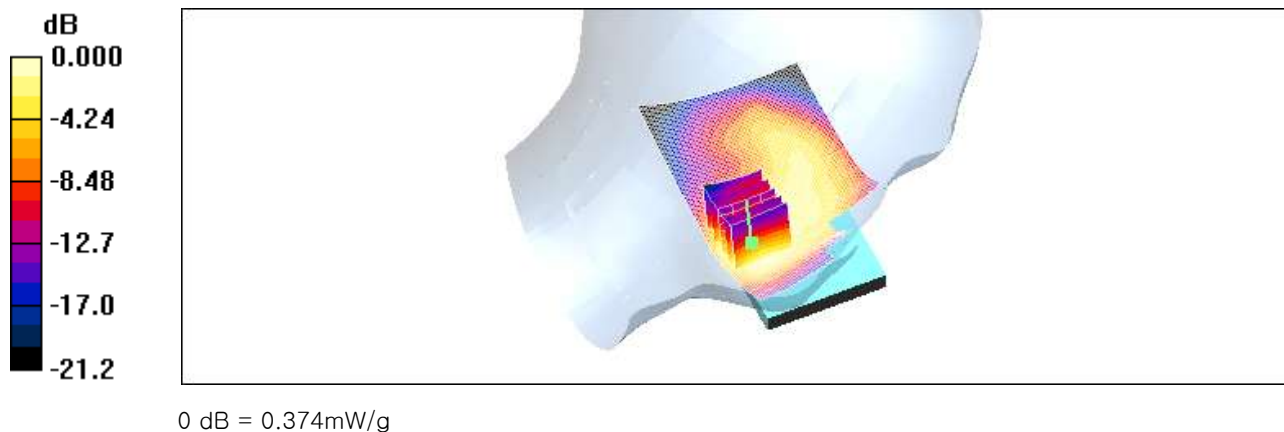
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.38 \text{ mho/m}$ ;  $\epsilon_r = 39.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

**Left touch 661/Area Scan (61x101x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.373 mW/g

**Left touch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 7.40 V/m; Power Drift = -0.014 dB  
Peak SAR (extrapolated) = 0.572 W/kg  
**SAR(1 g) = 0.344 mW/g; SAR(10 g) = 0.203 mW/g**  
Maximum value of SAR (measured) = 0.374 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

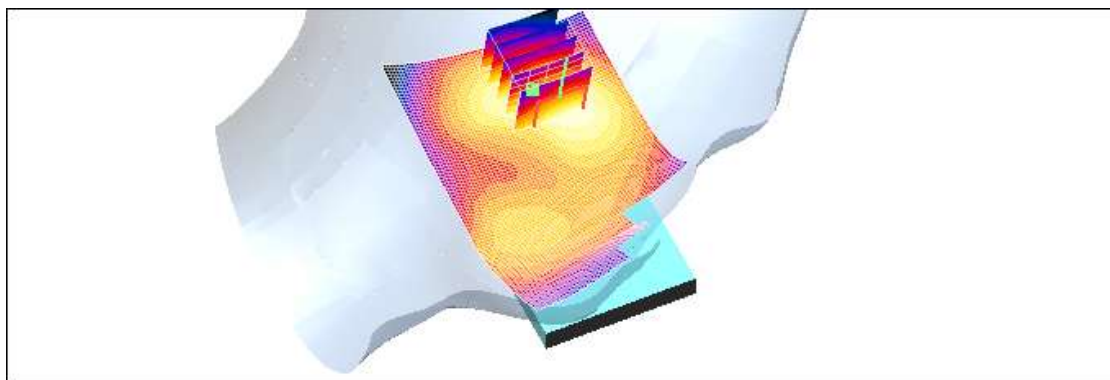
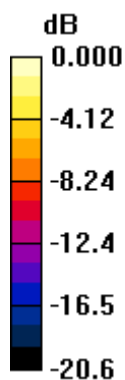
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.38$  mho/m;  $\epsilon_r = 39.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

**Left tilt 661/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.162 mW/g

**Left tilt 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 9.33 V/m; Power Drift = -0.066 dB  
Peak SAR (extrapolated) = 0.251 W/kg  
**SAR(1 g) = 0.146 mW/g; SAR(10 g) = 0.086 mW/g**  
Maximum value of SAR (measured) = 0.160 mW/g



0 dB = 0.160mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

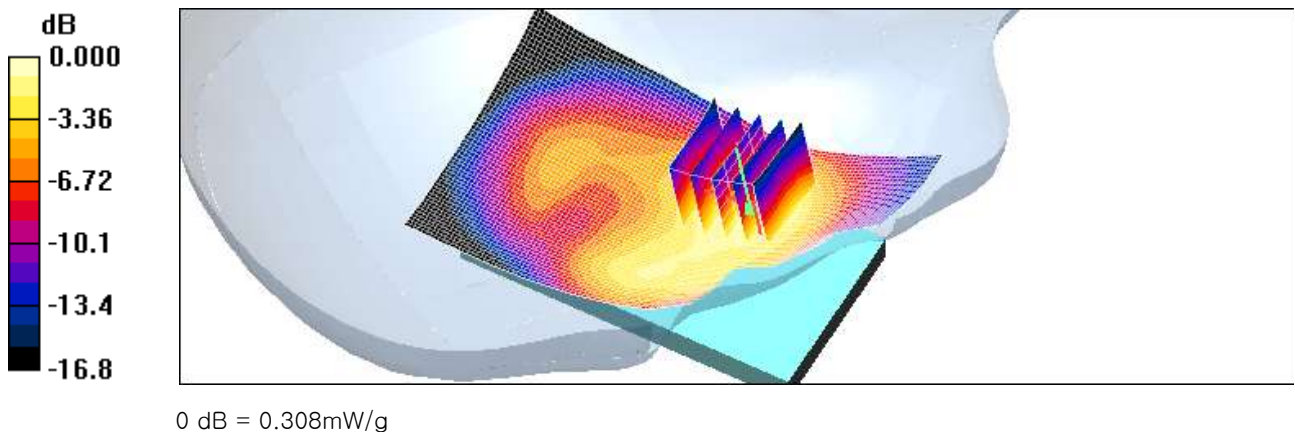
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.38$  mho/m;  $\epsilon_r = 39.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

**Right touch 661/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.308 mW/g

**Right touch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 7.22 V/m; Power Drift = -0.015 dB  
Peak SAR (extrapolated) = 0.422 W/kg  
**SAR(1 g) = 0.284 mW/g; SAR(10 g) = 0.171 mW/g**  
Maximum value of SAR (measured) = 0.308 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

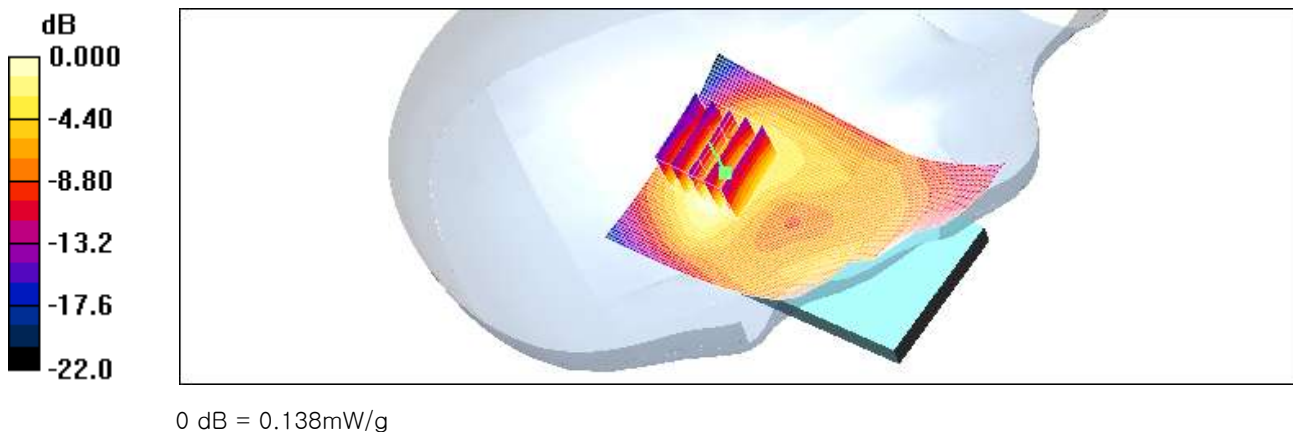
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.38$  mho/m;  $\epsilon_r = 39.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

**Right tilt 661/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.135 mW/g

**Right tilt 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 9.42 V/m; Power Drift = 0.178 dB  
Peak SAR (extrapolated) = 0.208 W/kg  
**SAR(1 g) = 0.126 mW/g; SAR(10 g) = 0.071 mW/g**  
Maximum value of SAR (measured) = 0.138 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.82$  mho/m;  $\epsilon_r = 40.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 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) = 0.448 mW/g

**Left touch 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

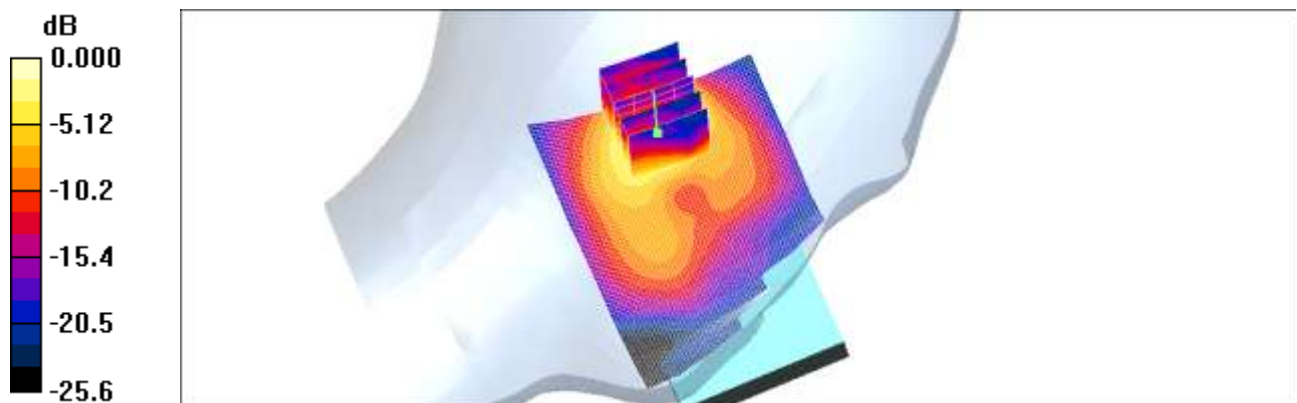
Reference Value = 14.9 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 0.929 W/kg

**SAR(1 g) = 0.385 mW/g; SAR(10 g) = 0.167 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.436 mW/g



0 dB = 0.436mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.82$  mho/m;  $\epsilon_r = 40.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 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) = 0.400 mW/g

**Left tilt 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

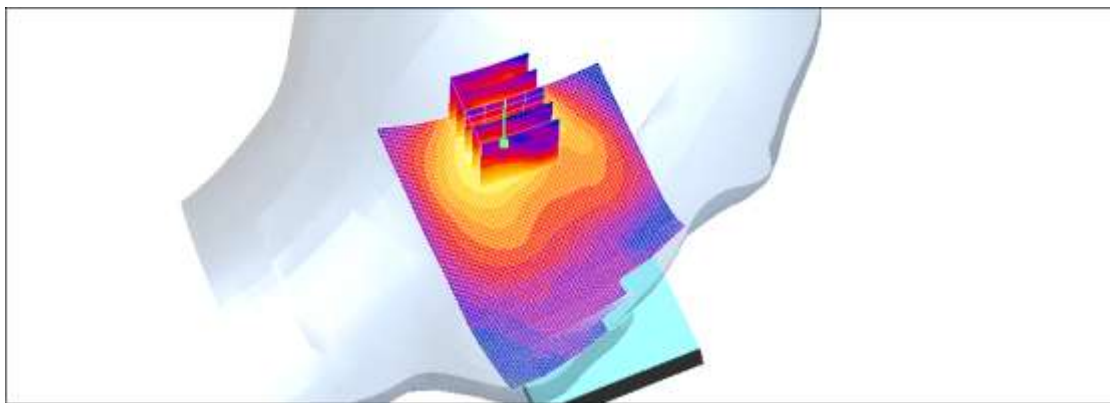
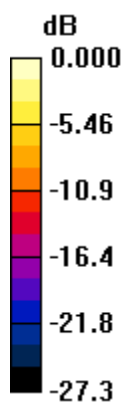
Reference Value = 14.5 V/m; Power Drift = -0.060 dB

Peak SAR (extrapolated) = 0.847 W/kg

**SAR(1 g) = 0.352 mW/g; SAR(10 g) = 0.155 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.371 mW/g



0 dB = 0.371mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.82$  mho/m;  $\epsilon_r = 40.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 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) = 0.369 mW/g

**Right touch 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

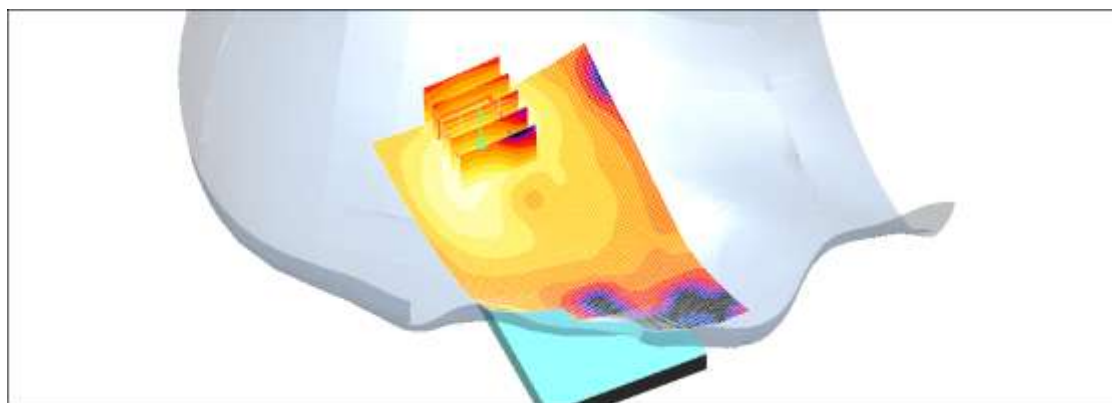
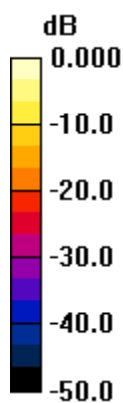
Reference Value = 14.6 V/m; Power Drift = -0.160 dB

Peak SAR (extrapolated) = 0.768 W/kg

**SAR(1 g) = 0.338 mW/g; SAR(10 g) = 0.157 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.370 mW/g



0 dB = 0.370mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.82$  mho/m;  $\epsilon_r = 40.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 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) = 0.345 mW/g

**Right tilt 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

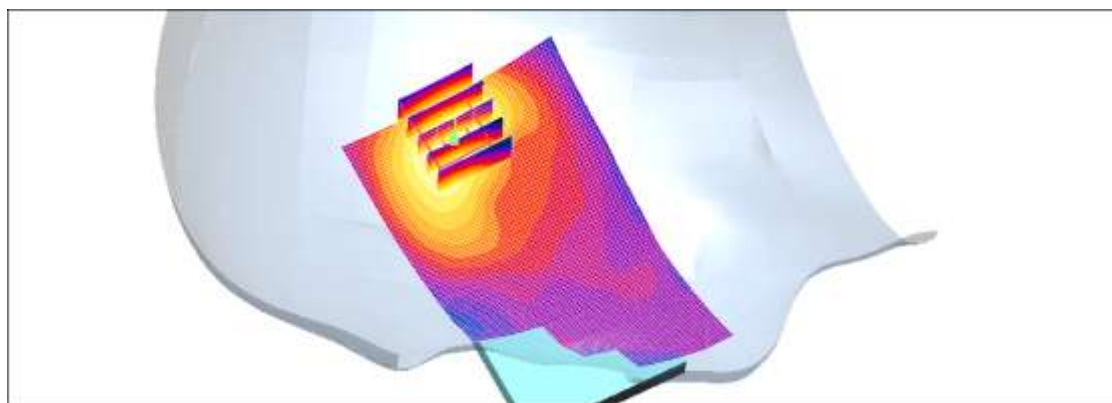
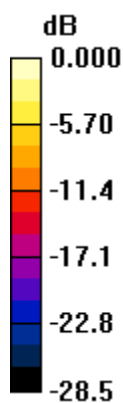
Reference Value = 12.7 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 0.672 W/kg

**SAR(1 g) = 0.303 mW/g; SAR(10 g) = 0.140 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

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 Phone with Bluetooth and WLAN/NFC  
 Liquid Temperature: 21.1 °C  
 Ambient Temperature: 21.3 °C  
 Test Date: Jun.2, 2012  
 Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.77  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 1.01 \text{ mho/m}$ ;  $\epsilon_r = 54.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body rear 190 3TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.338 mW/g

**Body rear 190 3TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

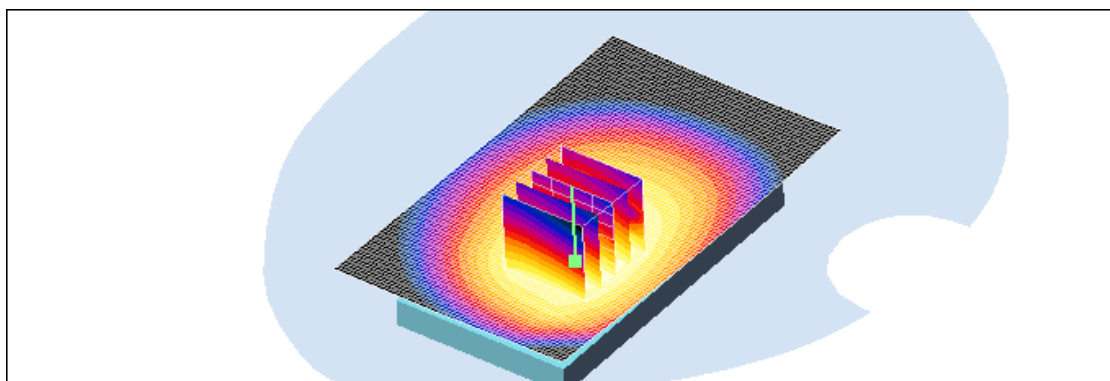
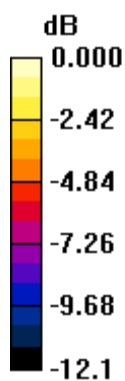
Reference Value = 11.5 V/m; Power Drift = -0.044 dB

Peak SAR (extrapolated) = 0.421 W/kg

**SAR(1 g) = 0.321 mW/g; SAR(10 g) = 0.234 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.340 mW/g



0 dB = 0.340mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Jun.2, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.77  
Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 1.01 \text{ mho/m}$ ;  $\epsilon_r = 54.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body front 190 3TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.238 mW/g

**Body front 190 3TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

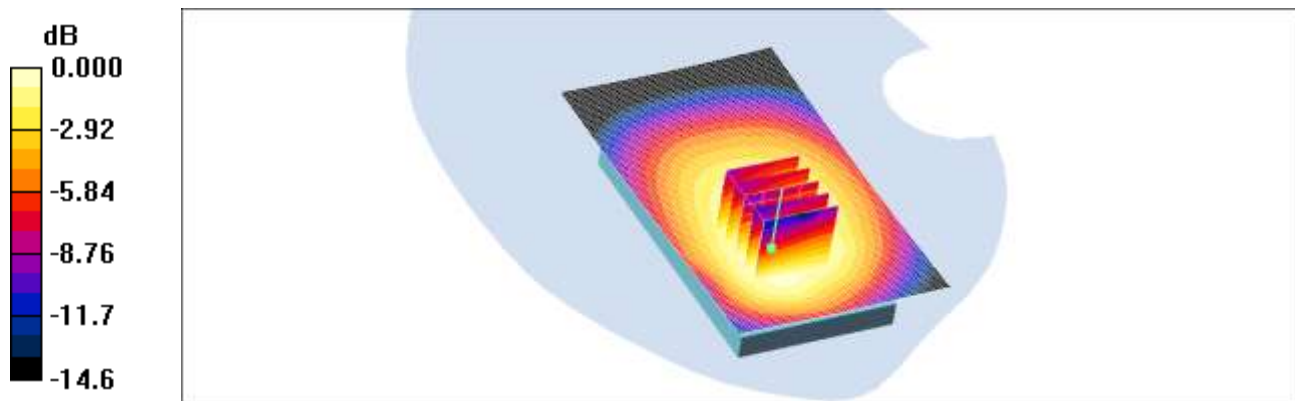
Reference Value = 9.09 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 0.304 W/kg

**SAR(1 g) = 0.224 mW/g; SAR(10 g) = 0.164 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.236 mW/g



0 dB = 0.236mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Jun.2, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.77  
Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 1.01 \text{ mho/m}$ ;  $\epsilon_r = 54.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body left 190 3TX/Area Scan (51x101x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.202 mW/g

**Body left 190 3TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

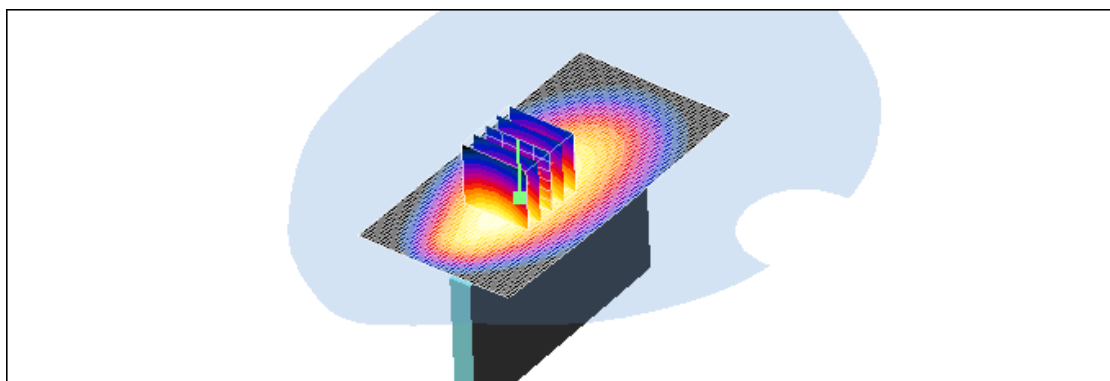
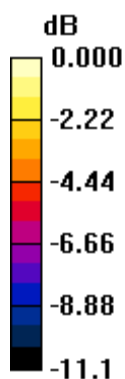
Reference Value = 10.3 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 0.351 W/kg

**SAR(1 g) = 0.183 mW/g; SAR(10 g) = 0.121 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.196 mW/g



0 dB = 0.196mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Jun.2, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.77  
Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 54.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body right 190 3TX/Area Scan (51x101x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.035 mW/g

**Body right 190 3TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

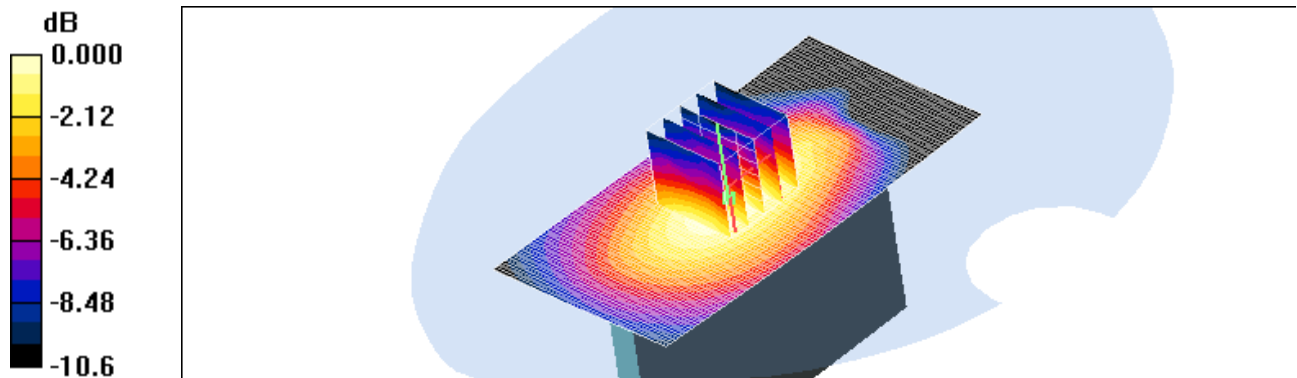
Reference Value = 4.57 V/m; Power Drift = -0.127 dB

Peak SAR (extrapolated) = 0.043 W/kg

**SAR(1 g) = 0.032 mW/g; SAR(10 g) = 0.022 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.034 mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
 Liquid Temperature: 21.1 °C  
 Ambient Temperature: 21.3 °C  
 Test Date: Jun.2, 2012  
 Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.77  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 1.01 \text{ mho/m}$ ;  $\epsilon_r = 54.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body bottom 190 3TX/Area Scan (51x71x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.076 mW/g

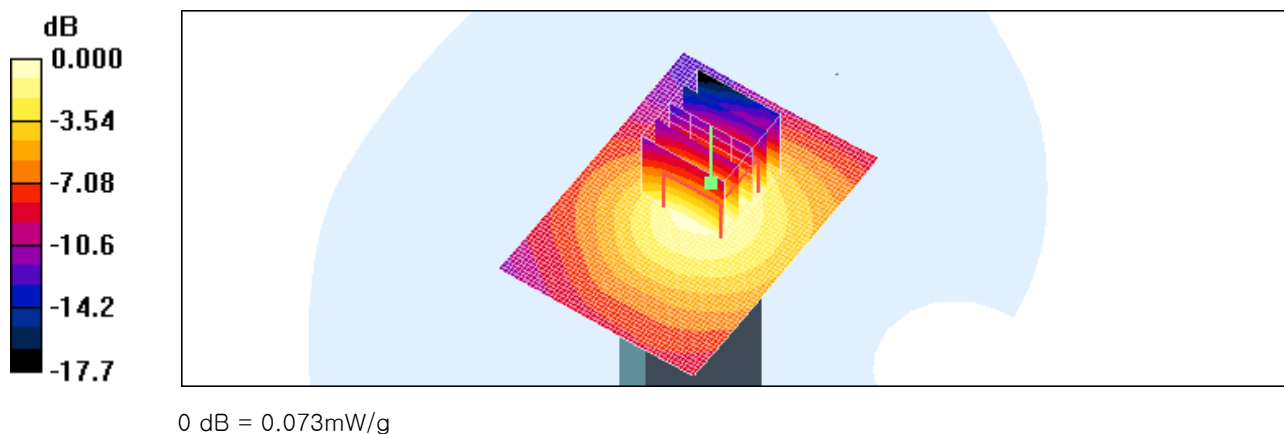
**Body bottom 190 3TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.32 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.130 W/kg

**SAR(1 g) = 0.066 mW/g; SAR(10 g) = 0.040 mW/g**

Maximum value of SAR (measured) = 0.073 mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
 Liquid Temperature: 21.3 °C  
 Ambient Temperature: 21.5 °C  
 Test Date: Jun.3, 2012  
 Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

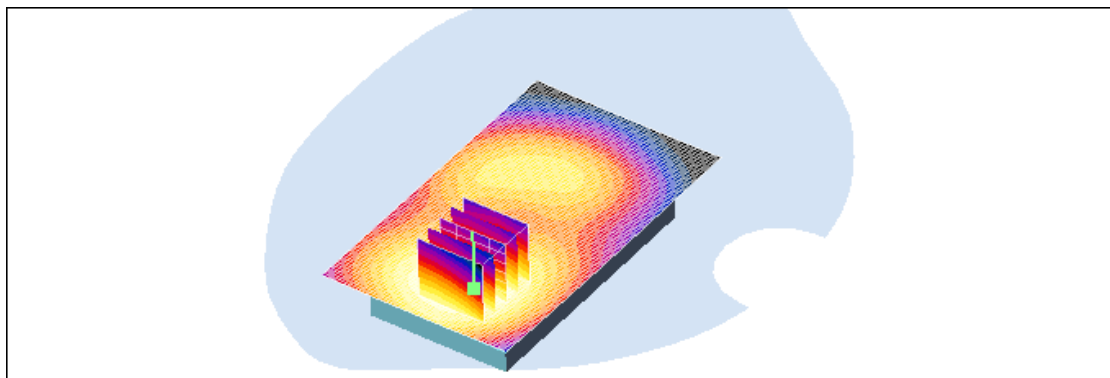
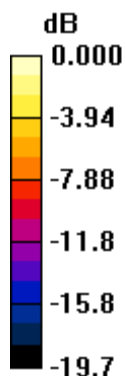
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
 Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

**Body rear 661 1TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.311 mW/g

**Body rear 661 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 10.3 V/m; Power Drift = 0.094 dB  
 Peak SAR (extrapolated) = 0.453 W/kg  
**SAR(1 g) = 0.280 mW/g; SAR(10 g) = 0.173 mW/g**  
 Maximum value of SAR (measured) = 0.299 mW/g



0 dB = 0.299mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012  
Separation Distance 1.0 cm  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

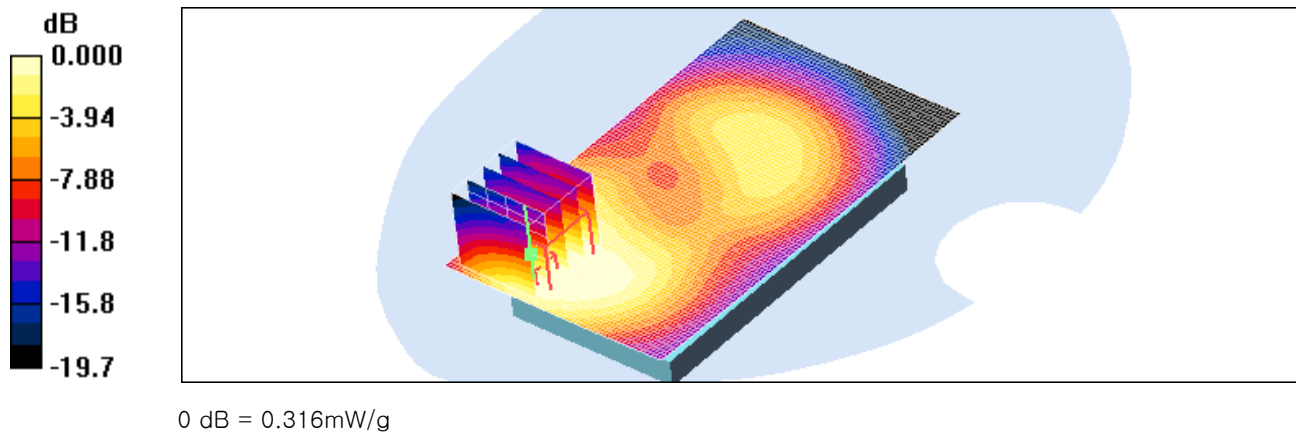
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

**Body front 661 1TX/Area Scan (61x101x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.340 mW/g

**Body front 661 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 11.0 V/m; Power Drift = 0.008 dB  
Peak SAR (extrapolated) = 0.522 W/kg  
**SAR(1 g) = 0.292 mW/g; SAR(10 g) = 0.178 mW/g**  
Maximum value of SAR (measured) = 0.316 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

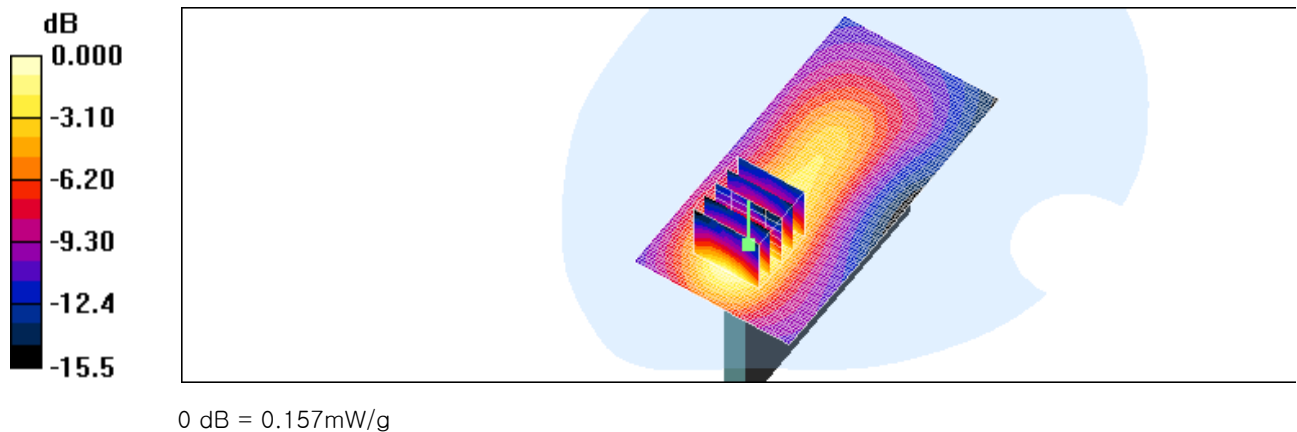
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

**Body left 661 1TX/Area Scan (51x101x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.163 mW/g

**Body left 661 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 5.98 V/m; Power Drift = -0.044 dB  
Peak SAR (extrapolated) = 0.245 W/kg  
**SAR(1 g) = 0.145 mW/g; SAR(10 g) = 0.083 mW/g**  
Maximum value of SAR (measured) = 0.157 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

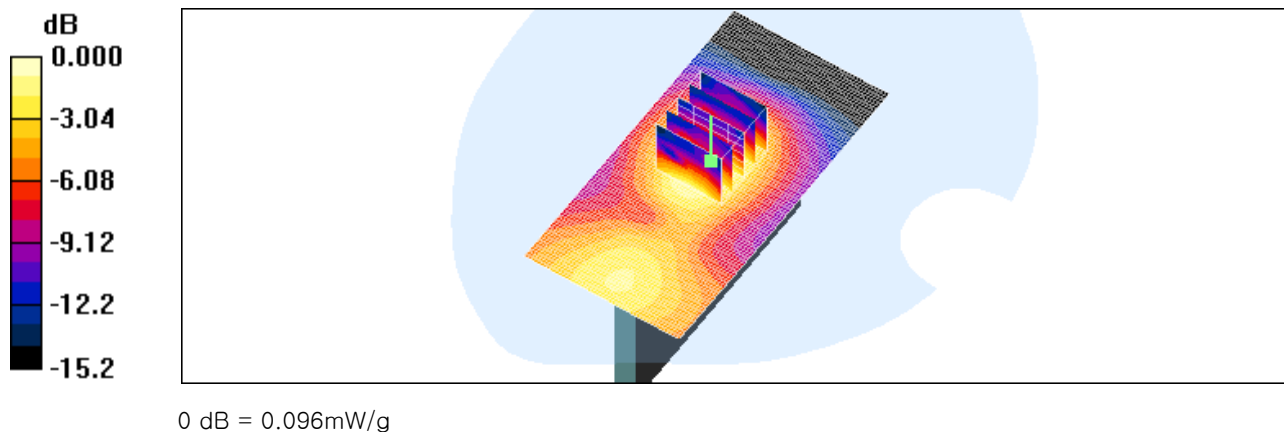
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

**Body right 661 1TX/Area Scan (51x101x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.098 mW/g

**Body right 661 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 5.30 V/m; Power Drift = -0.073 dB  
Peak SAR (extrapolated) = 0.140 W/kg  
**SAR(1 g) = 0.087 mW/g; SAR(10 g) = 0.052 mW/g**  
Maximum value of SAR (measured) = 0.096 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

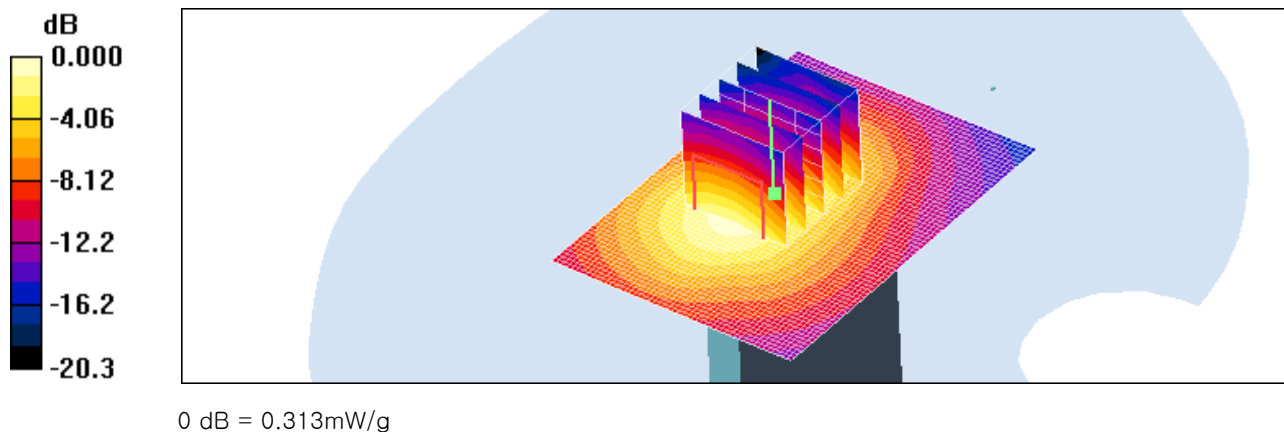
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

**Body bottom 661 1TX/Area Scan (51x71x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.313 mW/g

**Body bottom 661 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 13.0 V/m; Power Drift = 0.098 dB  
Peak SAR (extrapolated) = 0.499 W/kg  
**SAR(1 g) = 0.280 mW/g; SAR(10 g) = 0.157 mW/g**  
Maximum value of SAR (measured) = 0.313 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.9$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; 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) = 0.211 mW/g

**Body rear 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

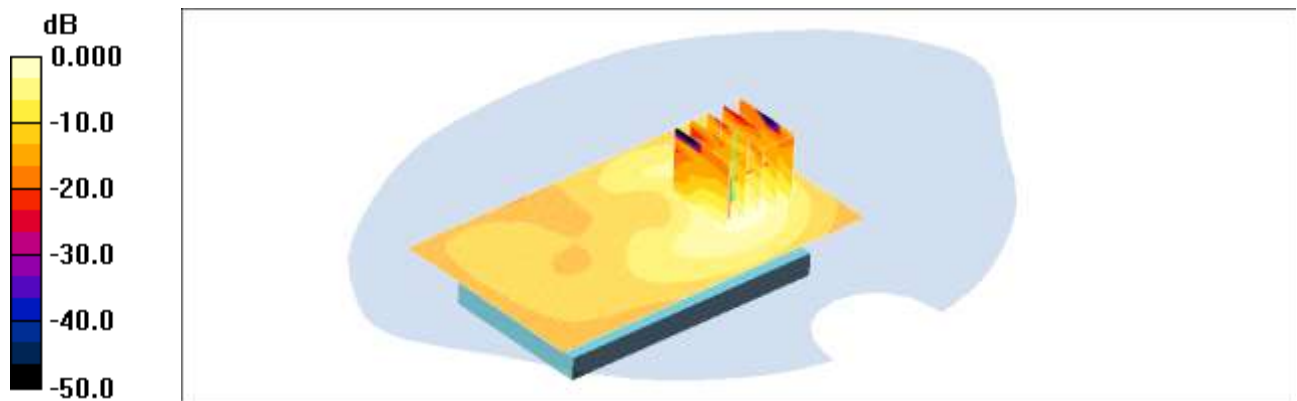
Reference Value = 7.42 V/m; Power Drift = -0.078 dB

Peak SAR (extrapolated) = 0.330 W/kg

**SAR(1 g) = 0.173 mW/g; SAR(10 g) = 0.085 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.197 mW/g



0 dB = 0.197mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.9$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; 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) = 0.073 mW/g

**Body front 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

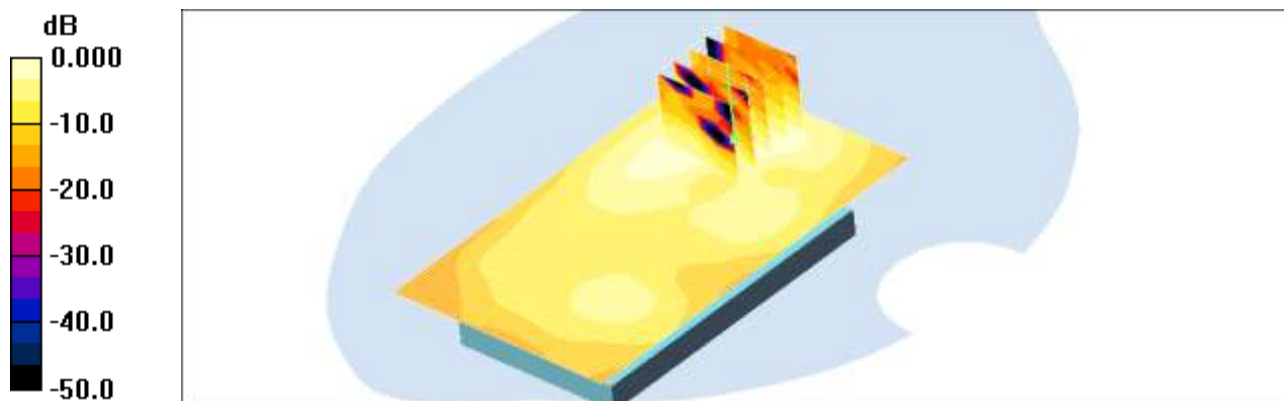
Reference Value = 3.17 V/m; Power Drift = 0.061 dB

Peak SAR (extrapolated) = 0.212 W/kg

**SAR(1 g) = 0.067 mW/g; SAR(10 g) = 0.033 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.079 mW/g



0 dB = 0.079mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.9$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

**Body right 1ch 1Mbps/Area Scan (51x101x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.033 mW/g

**Body right 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.52 V/m; Power Drift = -0.050 dB

Peak SAR (extrapolated) = 0.072 W/kg

**SAR(1 g) = 0.032 mW/g; SAR(10 g) = 0.014 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.035 mW/g



0 dB = 0.035mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.9 \text{ mho/m}$ ;  $\epsilon_r = 51.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

**Body top 1ch 1Mbps/Area Scan (51x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.145 mW/g

**Body top 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

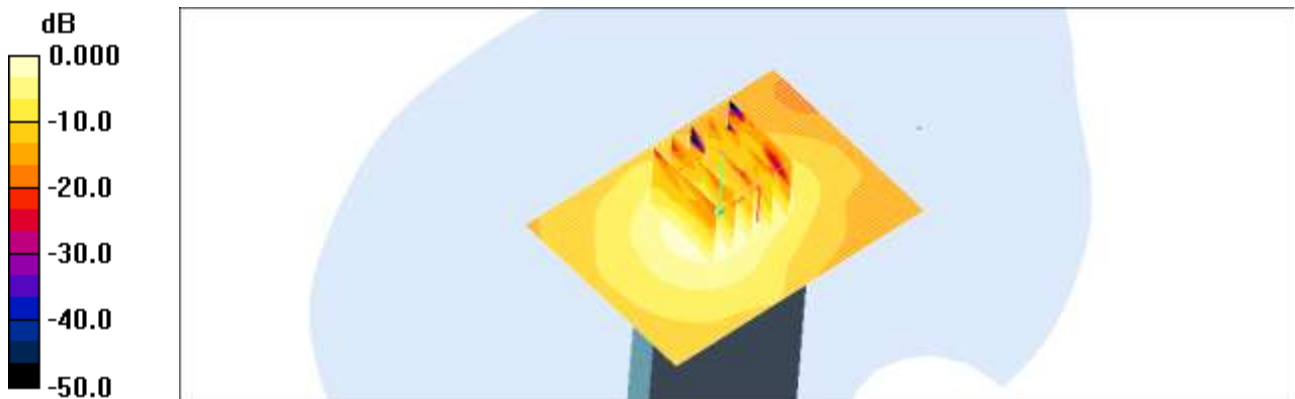
Reference Value = 8.64 V/m; Power Drift = -0.019 dB

Peak SAR (extrapolated) = 0.269 W/kg

**SAR(1 g) = 0.123 mW/g; SAR(10 g) = 0.062 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.136 mW/g



0 dB = 0.136mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Jun.2, 2012

**DUT: LG-E610V; 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;  $\sigma = 0.875$  mho/m;  $\epsilon_r = 40.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 835/900 MHz; 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) = 0.137 mW/g

**Left touch 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.14 V/m; Power Drift = -0.166 dB

Peak SAR (extrapolated) = 0.171 W/kg

**SAR(1 g) = 0.126 mW/g; SAR(10 g) = 0.092 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.134 mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
 Liquid Temperature: 21.1 °C  
 Ambient Temperature: 21.3 °C  
 Test Date: Jun.2, 2012  
 Separation Distance: 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.77  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 1.01 \text{ mho/m}$ ;  $\epsilon_r = 54.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body rear 190 3TX/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.338 mW/g

**Body rear 190 3TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.5 V/m; Power Drift = -0.044 dB

Peak SAR (extrapolated) = 0.421 W/kg

**SAR(1 g) = 0.321 mW/g; SAR(10 g) = 0.234 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.340 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.38$  mho/m;  $\epsilon_r = 39.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

**Left touch 661/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.373 mW/g

**Left touch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 7.40 V/m; Power Drift = -0.014 dB  
Peak SAR (extrapolated) = 0.572 W/kg  
**SAR(1 g) = 0.344 mW/g; SAR(10 g) = 0.203 mW/g**  
Maximum value of SAR (measured) = 0.374 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

**Body front 661 1TX/Area Scan (61x101x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.340 mW/g

**Body front 661 1TX/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 11.0 V/m; Power Drift = 0.008 dB  
Peak SAR (extrapolated) = 0.522 W/kg  
**SAR(1 g) = 0.292 mW/g; SAR(10 g) = 0.178 mW/g**  
Maximum value of SAR (measured) = 0.316 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.82$  mho/m;  $\epsilon_r = 40.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 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) = 0.448 mW/g

**Left touch 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.9 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 0.929 W/kg

**SAR(1 g) = 0.385 mW/g; SAR(10 g) = 0.167 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.436 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Cellular/PCS GSM/GPRS Phone with Bluetooth and WLAN/NFC  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Jun.3, 2012  
Separation Distance 1.0 cm

**DUT: LG-E610V; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.9 \text{ mho/m}$ ;  $\epsilon_r = 51.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; 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) = 0.211 mW/g

**Body rear 1ch 1Mbps/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.42 V/m; Power Drift = -0.078 dB

Peak SAR (extrapolated) = 0.330 W/kg

**SAR(1 g) = 0.173 mW/g; SAR(10 g) = 0.085 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.197 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: 21.1 °C  
Test Date: Jun.2, 2012

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

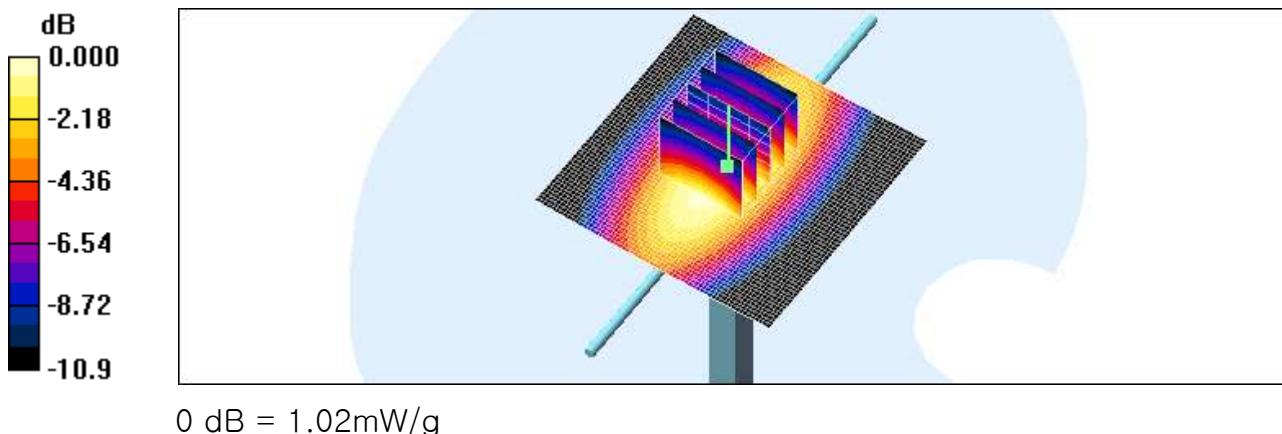
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.874 \text{ mho/m}$ ;  $\epsilon_r = 40.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Validation 835MHz/Area Scan (61x61x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 1.02 mW/g

**Validation 835MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 35.4 V/m; Power Drift = -0.028 dB  
Peak SAR (extrapolated) = 1.37 W/kg  
**SAR(1 g) = 0.936 mW/g; SAR(10 g) = 0.606 mW/g**  
Maximum value of SAR (measured) = 1.02 mW/g



## ■ Validation Data (835 MHz Body)

Test Laboratory: HCT CO., LTD  
Input Power: 100 mW (20 dBm)  
Liquid Temp: 21.1 °C  
Test Date: Jun.2, 2012

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

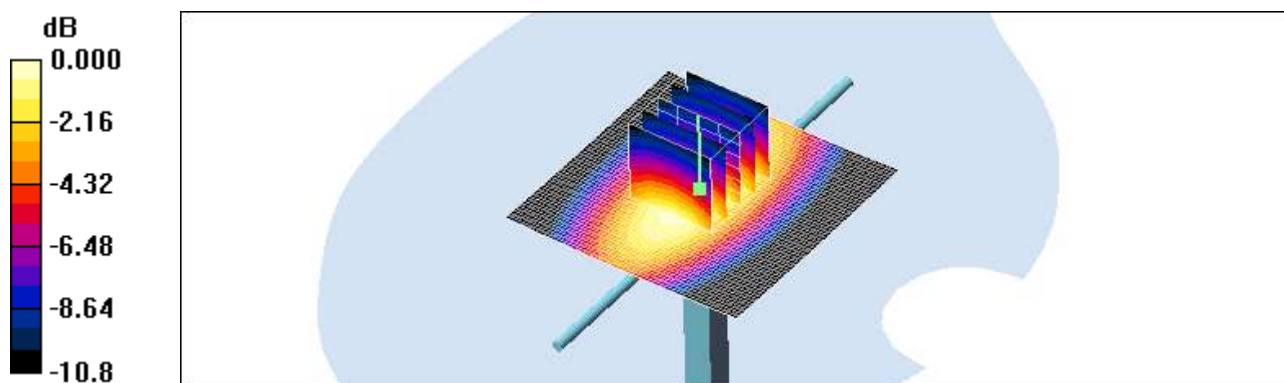
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 1.01 \text{ mho/m}$ ;  $\epsilon_r = 54.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

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

**Validation 835MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 33.8 V/m; Power Drift = -0.067 dB  
Peak SAR (extrapolated) = 1.41 W/kg  
**SAR(1 g) = 0.971 mW/g; SAR(10 g) = 0.630 mW/g**  
Maximum value of SAR (measured) = 1.06 mW/g



0 dB = 1.06mW/g

## ■ Validation Data (1 900 MHz Head)

Test Laboratory: HCT CO., LTD  
Input Power: 100 mW (20 dBm)  
Liquid Temp: 21.3 °C  
Test Date: Jun.3, 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;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

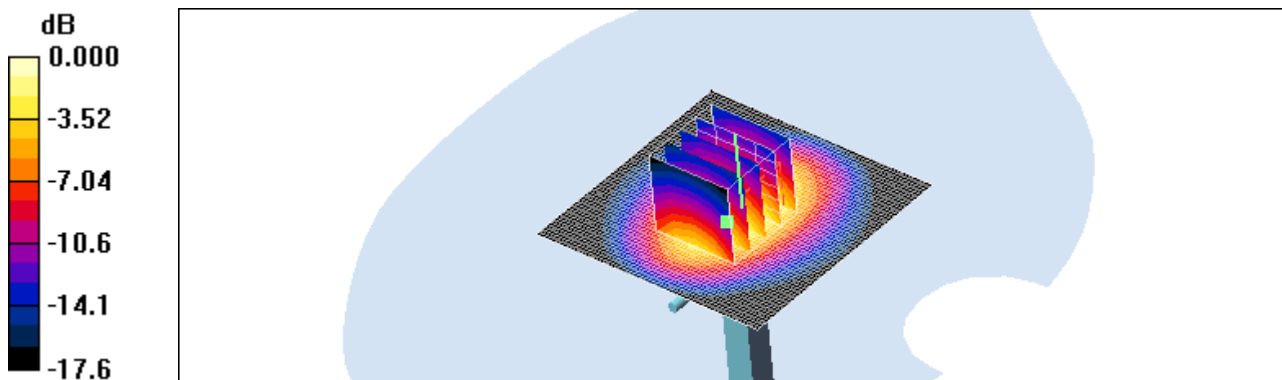
DASY4 Configuration:

- Probe: ET3DV6 – SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 835/900 MHz; Type: SAM

**Dipole 1900MHz Validation/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 4.40 mW/g

**Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 58.3 V/m; Power Drift = -0.017 dB  
Peak SAR (extrapolated) = 6.74 W/kg  
**SAR(1 g) = 3.96 mW/g; SAR(10 g) = 2.21 mW/g**

Maximum value of SAR (measured) = 4.36 mW/g



0 dB = 4.36mW/g

## ■ Validation Data (1 900 MHz Body)

Test Laboratory: HCT CO., LTD  
Input Power 100 mW (20 dBm)  
Liquid Temp: 21.3 °C  
Test Date: Jun.3, 2012

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

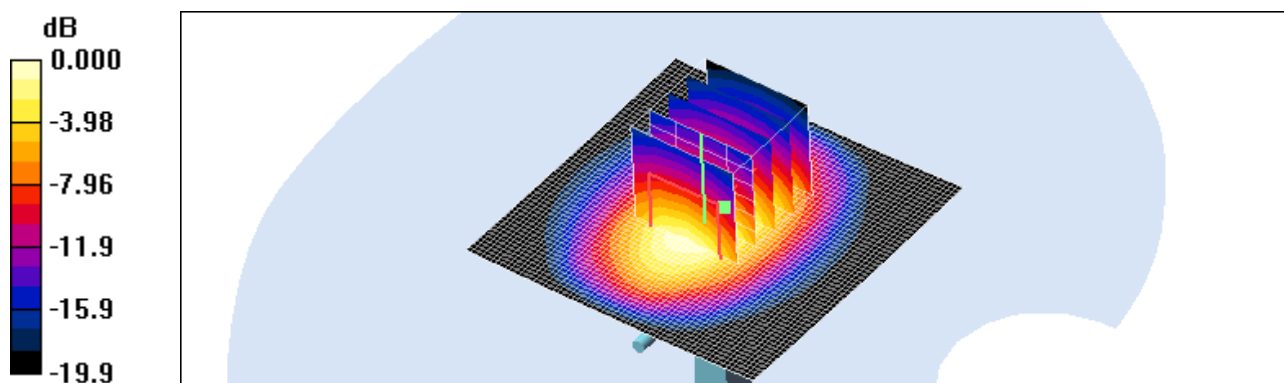
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.5 \text{ mho/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 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: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Dipole 1900MHz Validation/Area Scan (61x61x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 5.03 mW/g

**Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 61.7 V/m; Power Drift = -0.192 dB  
Peak SAR (extrapolated) = 7.31 W/kg  
**SAR(1 g) = 4.29 mW/g; SAR(10 g) = 2.24 mW/g**  
Maximum value of SAR (measured) = 4.84 mW/g



0 dB = 4.84mW/g

## ■ Validation Data (2 450 MHz Head)

Test Laboratory: HCT CO., LTD  
Input Power: 100 mW (20 dBm)  
Liquid Temp: 21.3 °C  
Test Date: Jun.3, 2012

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

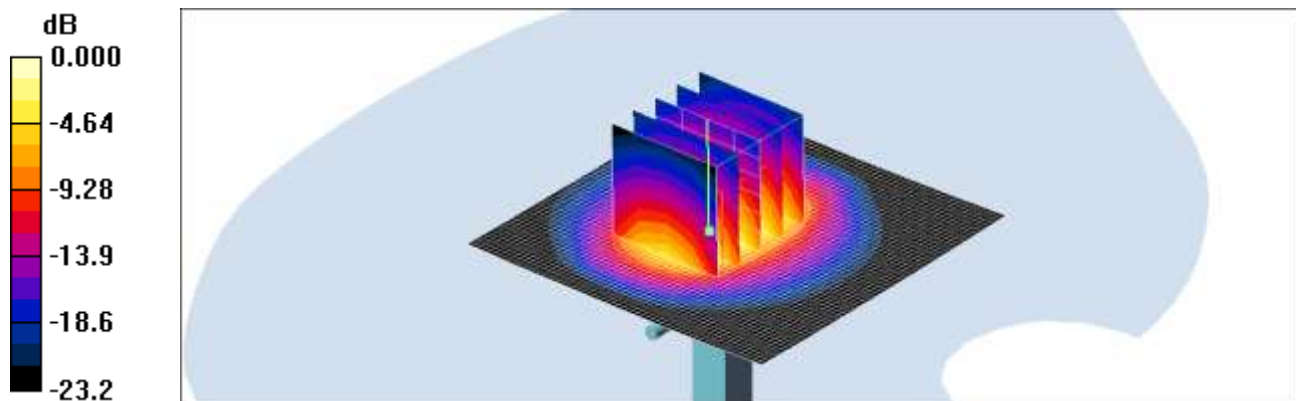
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.88$  mho/m;  $\epsilon_r = 40.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Validation 2450MHz/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 6.46 mW/g

**Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 58.6 V/m; Power Drift = -0.037 dB  
Peak SAR (extrapolated) = 12.6 W/kg  
**SAR(1 g) = 5.35 mW/g; SAR(10 g) = 2.44 mW/g**  
Maximum value of SAR (measured) = 5.83 mW/g



0 dB = 5.83mW/g

## ■ Validation Data (2 450 MHz Body)

Test Laboratory: HCT CO., LTD  
Input Power 100 mW (20 dBm)  
Liquid Temp: 21.3 °C  
Test Date: Jun.3, 2012

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

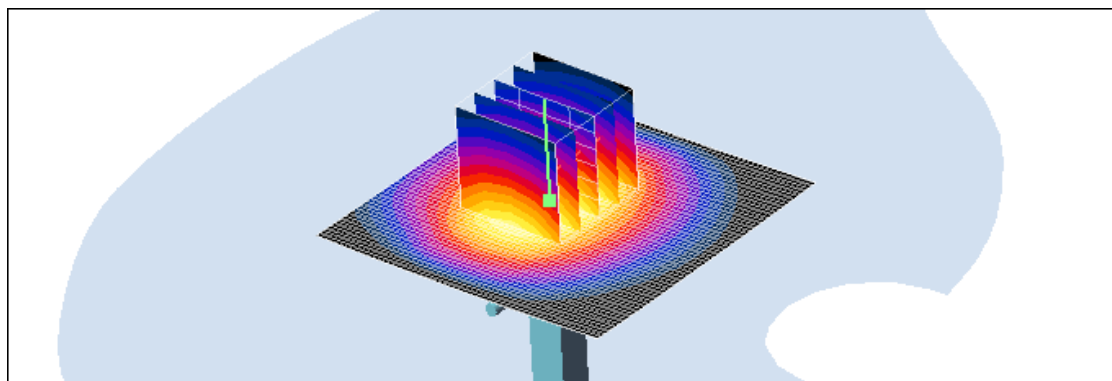
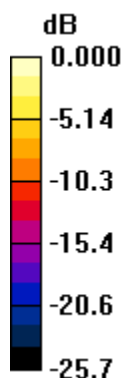
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.96$  mho/m;  $\epsilon_r = 51.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Validation 2450MHz/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 6.24 mW/g

**Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 54.7 V/m; Power Drift = 0.004 dB  
Peak SAR (extrapolated) = 12.6 W/kg  
**SAR(1 g) = 5.21 mW/g; SAR(10 g) = 2.32 mW/g**  
Maximum value of SAR (measured) = 5.73 mW/g



0 dB = 5.73mW/g

## ■ Dielectric Parameter (835 MHz Head)

Title LG-E610V

SubTitle 835MHz

Test Date Jun.2, 2012

| Frequency      | e'      | e''     |
|----------------|---------|---------|
| 800000000.0000 | 41.1802 | 18.8516 |
| 805000000.0000 | 41.0695 | 18.8352 |
| 810000000.0000 | 41.0231 | 18.8128 |
| 815000000.0000 | 40.9377 | 18.8013 |
| 820000000.0000 | 40.9039 | 18.7603 |
| 825000000.0000 | 40.8560 | 18.8397 |
| 830000000.0000 | 40.7833 | 18.8043 |
| 835000000.0000 | 40.8006 | 18.8076 |
| 840000000.0000 | 40.7301 | 18.7931 |
| 845000000.0000 | 40.7226 | 18.7408 |
| 850000000.0000 | 40.6767 | 18.7718 |
| 855000000.0000 | 40.5993 | 18.7601 |
| 860000000.0000 | 40.5878 | 18.7608 |
| 865000000.0000 | 40.5689 | 18.7330 |
| 870000000.0000 | 40.4822 | 18.7146 |
| 875000000.0000 | 40.4592 | 18.7389 |
| 880000000.0000 | 40.3871 | 18.7118 |
| 885000000.0000 | 40.2956 | 18.7008 |
| 890000000.0000 | 40.2310 | 18.7272 |
| 895000000.0000 | 40.1482 | 18.6697 |
| 900000000.0000 | 40.0716 | 18.6309 |

## ■ Dielectric Parameter (835 MHz Body)

Title LG-E610V

SubTitle 835MHz

Test Date Jun.2, 2012

| Frequency      | e'      | e''     |
|----------------|---------|---------|
| 800000000.0000 | 54.8263 | 21.6486 |
| 805000000.0000 | 54.8236 | 21.6654 |
| 810000000.0000 | 54.8022 | 21.6432 |
| 815000000.0000 | 54.7796 | 21.6779 |
| 820000000.0000 | 54.8067 | 21.6603 |
| 825000000.0000 | 54.7552 | 21.6713 |
| 830000000.0000 | 54.7707 | 21.7243 |
| 835000000.0000 | 54.7590 | 21.7312 |
| 840000000.0000 | 54.6911 | 21.7476 |
| 845000000.0000 | 54.5980 | 21.7516 |
| 850000000.0000 | 54.5382 | 21.7817 |
| 855000000.0000 | 54.4508 | 21.7348 |
| 860000000.0000 | 54.3290 | 21.6800 |
| 865000000.0000 | 54.2552 | 21.6621 |
| 870000000.0000 | 54.1711 | 21.6000 |
| 875000000.0000 | 54.0824 | 21.5513 |
| 880000000.0000 | 54.0014 | 21.4364 |
| 885000000.0000 | 54.0105 | 21.4153 |
| 890000000.0000 | 53.9490 | 21.3476 |
| 895000000.0000 | 53.9352 | 21.2251 |
| 900000000.0000 | 53.9003 | 21.1956 |

## ■ Dielectric Parameter (1 900 MHz Head)

Title LG-E610V

SubTitle 1 900MHz

Test Date Jun.3, 2012

| Frequency       | e'      | e''     |
|-----------------|---------|---------|
| 1800000000.0000 | 40.2180 | 12.9879 |
| 1810000000.0000 | 40.1912 | 13.0236 |
| 1820000000.0000 | 40.1534 | 13.0699 |
| 1830000000.0000 | 40.1192 | 13.0879 |
| 1840000000.0000 | 40.0830 | 13.1141 |
| 1850000000.0000 | 40.0465 | 13.1382 |
| 1860000000.0000 | 39.9997 | 13.1557 |
| 1870000000.0000 | 39.9706 | 13.2078 |
| 1880000000.0000 | 39.9231 | 13.2272 |
| 1890000000.0000 | 39.8908 | 13.2693 |
| 1900000000.0000 | 39.8472 | 13.2807 |
| 1910000000.0000 | 39.8001 | 13.3187 |
| 1920000000.0000 | 39.7628 | 13.3364 |
| 1930000000.0000 | 39.7225 | 13.3436 |
| 1940000000.0000 | 39.6902 | 13.3577 |
| 1950000000.0000 | 39.6447 | 13.4024 |
| 1960000000.0000 | 39.6032 | 13.4155 |
| 1970000000.0000 | 39.5684 | 13.4452 |
| 1980000000.0000 | 39.5166 | 13.4927 |
| 1990000000.0000 | 39.4880 | 13.5032 |
| 2000000000.0000 | 39.4282 | 13.5095 |

## ■ Dielectric Parameter (1 900 MHz Body)

Title LG-E610V

SubTitle 1 900MHz

Test Date Jun.3, 2012

| Frequency       | e'      | e''     |
|-----------------|---------|---------|
| 1850000000.0000 | 53.9584 | 14.0509 |
| 1855000000.0000 | 53.9807 | 14.0362 |
| 1860000000.0000 | 53.9966 | 14.0771 |
| 1865000000.0000 | 53.9333 | 14.0927 |
| 1870000000.0000 | 53.9388 | 14.0791 |
| 1875000000.0000 | 53.8431 | 14.0998 |
| 1880000000.0000 | 53.8682 | 14.1444 |
| 1885000000.0000 | 53.7888 | 14.1370 |
| 1890000000.0000 | 53.7394 | 14.1592 |
| 1895000000.0000 | 53.7069 | 14.1812 |
| 1900000000.0000 | 53.6619 | 14.1895 |
| 1905000000.0000 | 53.6115 | 14.2152 |
| 1910000000.0000 | 53.5703 | 14.2438 |
| 1915000000.0000 | 53.5214 | 14.2725 |
| 1920000000.0000 | 53.5188 | 14.3302 |
| 1925000000.0000 | 53.5155 | 14.3388 |
| 1930000000.0000 | 53.4700 | 14.3682 |
| 1935000000.0000 | 53.4809 | 14.4061 |
| 1940000000.0000 | 53.4916 | 14.3981 |
| 1945000000.0000 | 53.4767 | 14.4481 |
| 1950000000.0000 | 53.5311 | 14.4557 |

## ■ Dielectric Parameter (2 450 MHz Head)

Title LG-E610V

SubTitle 2 450MHz

Test Date Jun.3, 2012

| Frequency       | e'      | e''     |
|-----------------|---------|---------|
| 2400000000.0000 | 40.3284 | 13.5601 |
| 2405000000.0000 | 40.3500 | 13.5441 |
| 2410000000.0000 | 40.2646 | 13.5866 |
| 2415000000.0000 | 40.2280 | 13.6154 |
| 2420000000.0000 | 40.2440 | 13.6417 |
| 2425000000.0000 | 40.2284 | 13.6382 |
| 2430000000.0000 | 40.1923 | 13.6699 |
| 2435000000.0000 | 40.1633 | 13.6897 |
| 2440000000.0000 | 40.1432 | 13.7391 |
| 2445000000.0000 | 40.1154 | 13.7695 |
| 2450000000.0000 | 40.1239 | 13.7854 |
| 2455000000.0000 | 40.0731 | 13.8019 |
| 2460000000.0000 | 40.0723 | 13.8002 |
| 2465000000.0000 | 40.0427 | 13.8240 |
| 2470000000.0000 | 40.0339 | 13.8581 |
| 2475000000.0000 | 39.9991 | 13.8496 |
| 2480000000.0000 | 39.9946 | 13.8943 |
| 2485000000.0000 | 39.9470 | 13.9031 |
| 2490000000.0000 | 39.9404 | 13.9383 |
| 2495000000.0000 | 39.9170 | 13.9287 |
| 2500000000.0000 | 39.9086 | 13.9486 |

**■ Dielectric Parameter (2 450 MHz Body)**

Title LG-E610V

SubTitle 2 450MHz

Test Date Jun.3, 2012

| Frequency       | e'      | e''     |
|-----------------|---------|---------|
| 2400000000.0000 | 51.9918 | 14.1204 |
| 2405000000.0000 | 51.9835 | 14.1228 |
| 2410000000.0000 | 51.9350 | 14.1495 |
| 2415000000.0000 | 51.8808 | 14.1684 |
| 2420000000.0000 | 51.8365 | 14.2127 |
| 2425000000.0000 | 51.8055 | 14.2256 |
| 2430000000.0000 | 51.8008 | 14.2769 |
| 2435000000.0000 | 51.7508 | 14.3068 |
| 2440000000.0000 | 51.7472 | 14.3345 |
| 2445000000.0000 | 51.7327 | 14.3651 |
| 2450000000.0000 | 51.7122 | 14.3847 |
| 2455000000.0000 | 51.6969 | 14.4465 |
| 2460000000.0000 | 51.7004 | 14.4548 |
| 2465000000.0000 | 51.6671 | 14.4987 |
| 2470000000.0000 | 51.6494 | 14.5192 |
| 2475000000.0000 | 51.6397 | 14.5221 |
| 2480000000.0000 | 51.6575 | 14.5577 |
| 2485000000.0000 | 51.6373 | 14.5783 |
| 2490000000.0000 | 51.6196 | 14.6033 |
| 2495000000.0000 | 51.6122 | 14.6302 |
| 2500000000.0000 | 51.6013 | 14.6277 |

## Attachment 3. – Probe Calibration Data

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



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

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: SCS 108

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

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         | 0B41293874      | 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: S5088 (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 |

|                           |                            |                                        |            |
|---------------------------|----------------------------|----------------------------------------|------------|
| Calibrated by:            | Name: <b>Jeton Kasriel</b> | Function: <b>Laboratory Technician</b> | Signature: |
| Approved by:              | Name: <b>Katja Pokovic</b> | Function: <b>Technical Manager</b>     | Signature: |
| Issued: November 18, 2011 |                            |                                        |            |

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

**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)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

**Glossary:**

|                        |                                                                                                                                                |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                    | tissue simulating liquid                                                                                                                       |
| NORM <sub>x,y,z</sub>  | sensitivity in free space                                                                                                                      |
| ConvF                  | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                     |
| DCP                    | diode compression point                                                                                                                        |
| CF                     | crest factor (1/duty_cycle) of the RF signal                                                                                                   |
| A, B, C                | modulation dependent linearization parameters                                                                                                  |
| Polarization $\varphi$ | $\varphi$ rotation around probe axis                                                                                                           |
| Polarization $\theta$  | $\theta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\theta = 0$ is normal to probe axis |

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

- 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
- 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:**

- NORM<sub>x,y,z</sub>: Assessed for E-field polarization  $\theta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1600$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM( $f$ )<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* 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.
- DCP<sub>x,y,z</sub>: 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
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>: 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  $f \leq 800$  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 NORM<sub>x,y,z</sub> \* 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  $\pm 50$  MHz to  $\pm 100$  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.

ET3DV6 – SN:1630

November 18, 2011

# Probe ET3DV6

## SN:1630

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

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

---

Certificate No: ET3-1630\_Nov11

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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 ( $\mu V/(V/m)^2$ ) <sup>A</sup> | 1.71     | 1.62     | 1.60     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                 | 100.3    | 99.5     | 101.7    |           |

### Modulation Calibration Parameters

| UID   | Communication System Name | PAR  |   | A<br>dB | B<br>dB | C<br>dB | VR<br>mV | Unc <sup>C</sup><br>(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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>C</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

ET3DV6- SN:1630

November 18, 2011

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

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>c</sup> | Relative Permittivity <sup>a</sup> | Conductivity (S/m) <sup>a</sup> | 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 %    |

<sup>c</sup> 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.

<sup>a</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon'$  and  $\epsilon''$ ) 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 ( $\epsilon'$  and  $\epsilon''$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

ET3DV6- SN:1630

November 18, 2011

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

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>c</sup> | Relative Permittivity <sup>e</sup> | Conductivity (S/m) <sup>f</sup> | 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 %    |

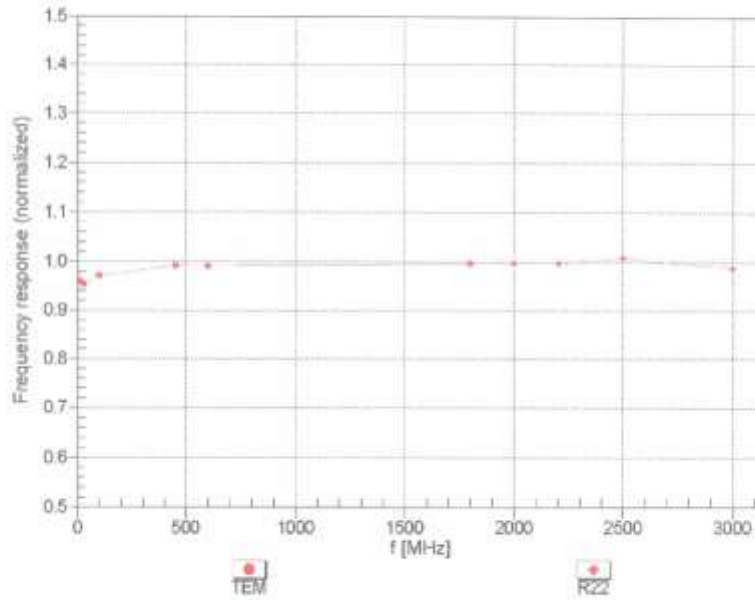
<sup>c</sup> Frequency validity of  $\pm 100$  MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to  $\pm 50$  MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>e</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to  $\pm 10\%$  if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to  $\pm 5\%$ . The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

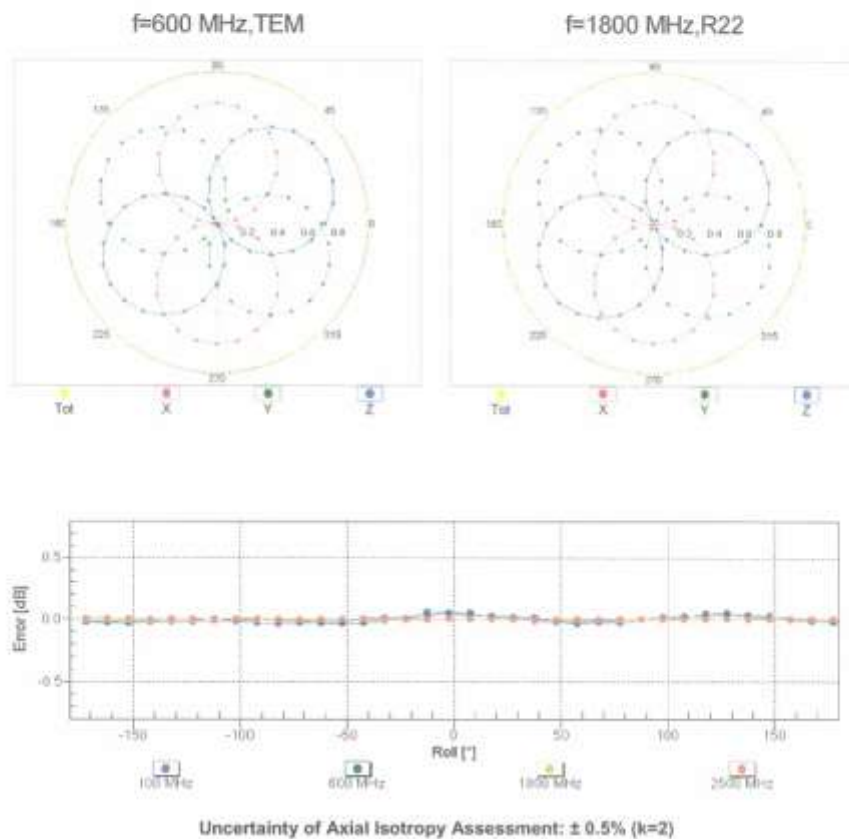


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

ET3DV6- SN:1630

November 18, 2011

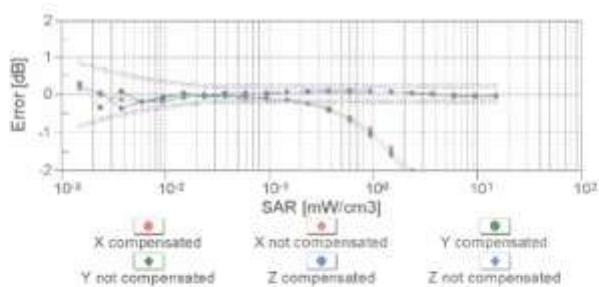
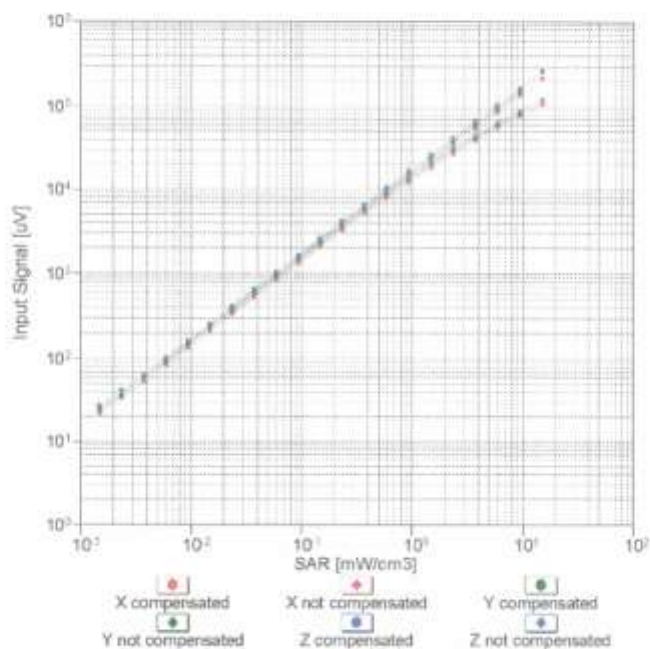
### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



ET3DV8- SN:1630

November 18, 2011

### Dynamic Range f(SAR<sub>head</sub>) (TEM cell , f = 900 MHz)

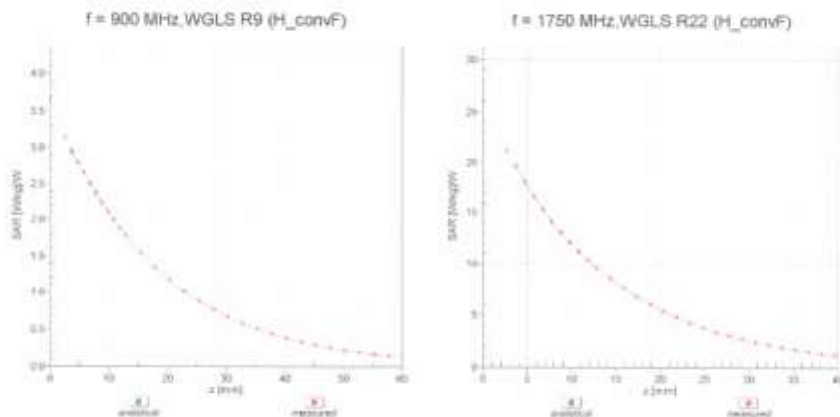


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ET3DV8-SN:1630

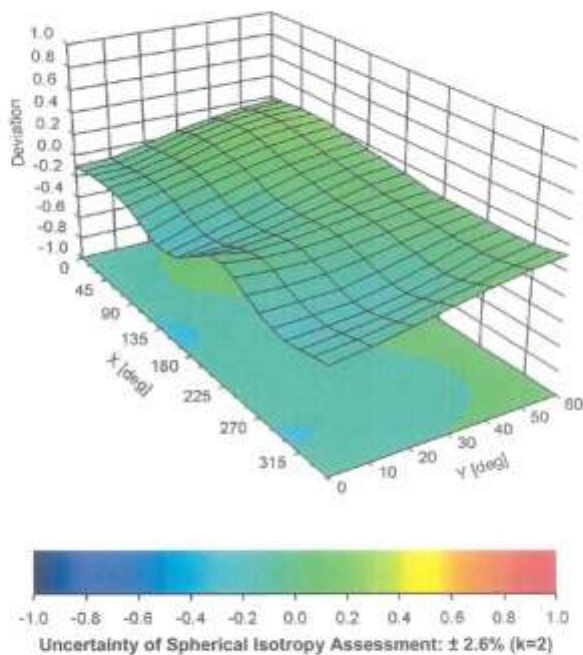
November 18, 2011

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi$ ,  $\theta$ ),  $f = 900$  MHz



ET3DV6 - SN:1630

November 18, 2011

## 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           |

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### 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 recalibration 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:



ET3DV6-SN:1630

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November 21, 2011

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

Conversion factor ( $\pm$  standard deviation)

150  $\pm$  50 MHz      *ConvF*      8.03  $\pm$  10%

$\epsilon_r = 52.3 \pm 5\%$   
 $\sigma = 0.76 \pm 5\% \text{ mho/m}$   
(head tissue)

150  $\pm$  50 MHz      *ConvF*      8.29  $\pm$  10%

$\epsilon_r = 61.9 \pm 5\%$   
 $\sigma = 0.80 \pm 5\% \text{ mho/m}$   
(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

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Accreditation No.: SCS 108

Client: **HCT (Dymstec)**

Certificate No.: **D835V2-441\_May12**

## 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, 2012**

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       | D837480704         | 05-Oct-11 (No. 217-01451)      | Oct-12                |
| Power sensor HP 8461A      | US37282785         | 05-Oct-11 (No. 217-01451)      | Oct-12                |
| Reference 20 dB Attenuator | SN: 9058 (200)     | 27-Mar-12 (No. 217-01530)      | Apr-13                |
| Type-N mismatch combinator | SN: 9047.2 / 06327 | 27-Mar-12 (No. 217-01530)      | Apr-13                |
| Reference Probe E53073     | SN: 3205           | 30-Dec-11 (No. E53-3205_Dec11) | Dec-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 8461A     | MF41062317       | 18-Oct-02 (in house check Oct-11) | In house check: Oct-13 |
| RF generator R&S SM1-05   | 100005           | 04-Aug-99 (in house check Oct-11) | In house check: Oct-13 |
| Network Analyzer HP 8753E | US37390585-54206 | 18-Oct-01 (in house check Oct-11) | In house check: Oct-12 |

|                |               |                       |           |
|----------------|---------------|-----------------------|-----------|
|                | Name          | Function              | Signature |
| Calibrated by: | Imre E-Nagy   | Laboratory Technician |           |
| Approved by:   | Károly Pócsik | Technical Manager     |           |

Issued: May 16, 2012

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Certificate No: D835V2-441\_May12

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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:**

- 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
- 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
- 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:**

- 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.

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%.

#### Measurement Conditions

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

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.8.1     |
| 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 $\pm$ 1 MHz    |             |

#### Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 41.5           | 0.80 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 40.6 $\pm$ 6 % | 0.89 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

#### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                                |
|-------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                          | 250 mW input power | 2.35 mW / g                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 9.43 mW / g $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                            | 250 mW input power | 1.54 mW / g                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 6.18 mW / g $\pm$ 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 $\pm$ 0.2) °C | 54.3 $\pm$ 6 % | 1.00 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

#### SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                                |
|-------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                          | 250 mW input power | 2.44 mW / g                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 9.50 mW / g $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (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 $\pm$ 16.5 % (k=2) |

## Appendix

### Antenna Parameters with Head TSL

|                                      |                                 |
|--------------------------------------|---------------------------------|
| Impedance, transformed to feed point | 51.1 $\Omega$ - 5.8 $\mu\Omega$ |
| Return Loss                          | - 24.6 dB                       |

### Antenna Parameters with Body TSL

|                                      |                                 |
|--------------------------------------|---------------------------------|
| Impedance, transformed to feed point | 47.0 $\Omega$ - 8.1 $\mu\Omega$ |
| Return Loss                          | - 21.0 dB                       |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.372 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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 | SPEAC          |
| Manufactured on | March 09, 2001 |

**DASY5 Validation Report for Head TSL**

Date: 16.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.89$  mho/m;  $\epsilon_r = 40.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QJ000P49AA; Serial: R001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm 2/Zoom Scan (7x7x7)/Cube 0:**

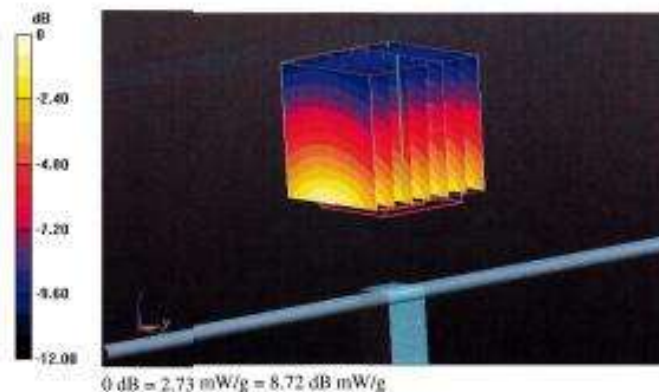
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.129 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 3.474 mW/g

SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.54 mW/g

Maximum value of SAR (measured) = 2.73 mW/g





**DASY5 Validation Report for Body TSL**

Date: 16.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 1 \text{ mho/m}$ ;  $\epsilon_r = 54.3$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**

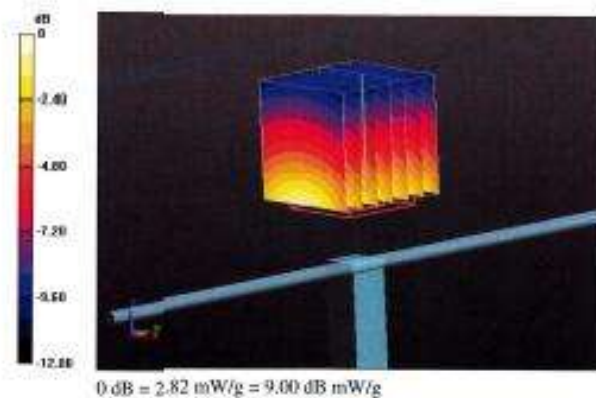
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.054 V/m; Power Drift = 0.03 dB

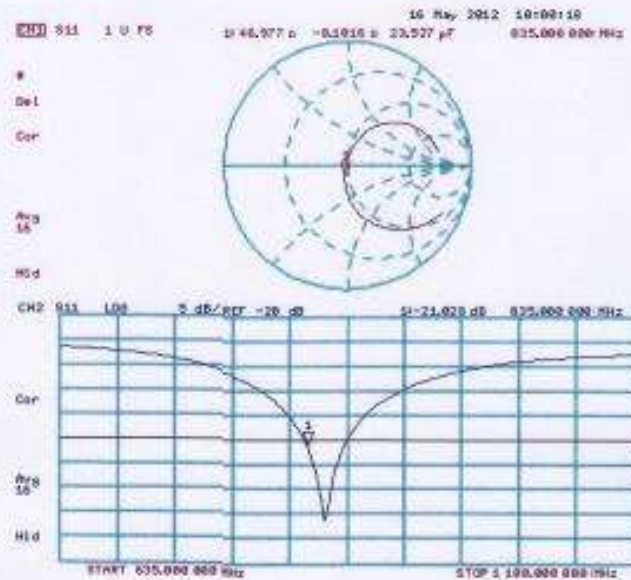
Peak SAR (extrapolated) = 3.533 mW/g

**SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g**

Maximum value of SAR (measured) = 2.82 mW/g



Impedance Measurement Plot for Body TSL



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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 &lt; 70%.

Calibration Equipment used (M&amp;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 |

|                |                       |                                   |               |
|----------------|-----------------------|-----------------------------------|---------------|
| Calibrated by: | Name<br>Dimitre Iliev | Function<br>Laboratory Technician | Signature<br> |
| Approved by:   | Katja Pokovic         | Technical Manager                 |               |

Issued: August 2, 2011

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

Certificate No: D1900V2-5d032\_Jul11

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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:**

- 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
- 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
- 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:**

- 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 $\pm$ 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 $\pm$ 0.2) °C | 39.1 $\pm$ 6 % | 1.42 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (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 $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (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 $\pm$ 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 $\pm$ 0.2) °C | 52.3 $\pm$ 6 % | 1.53 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

### SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (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 $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (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 $\pm$ 16.5 % (k=2) |

## Appendix

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 52.6 $\Omega$ + 6.5 j $\Omega$ |
| Return Loss                          | - 23.3 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.6 $\Omega$ + 6.0 j $\Omega$ |
| 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;  $\epsilon_r = 39.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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:

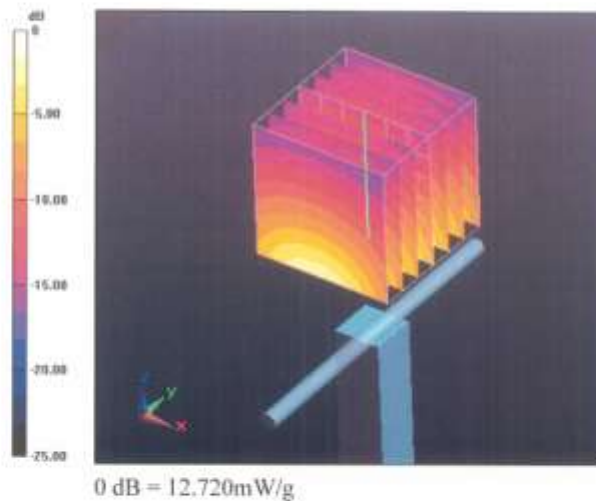
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.253 V/m; Power Drift = 0.03 dB

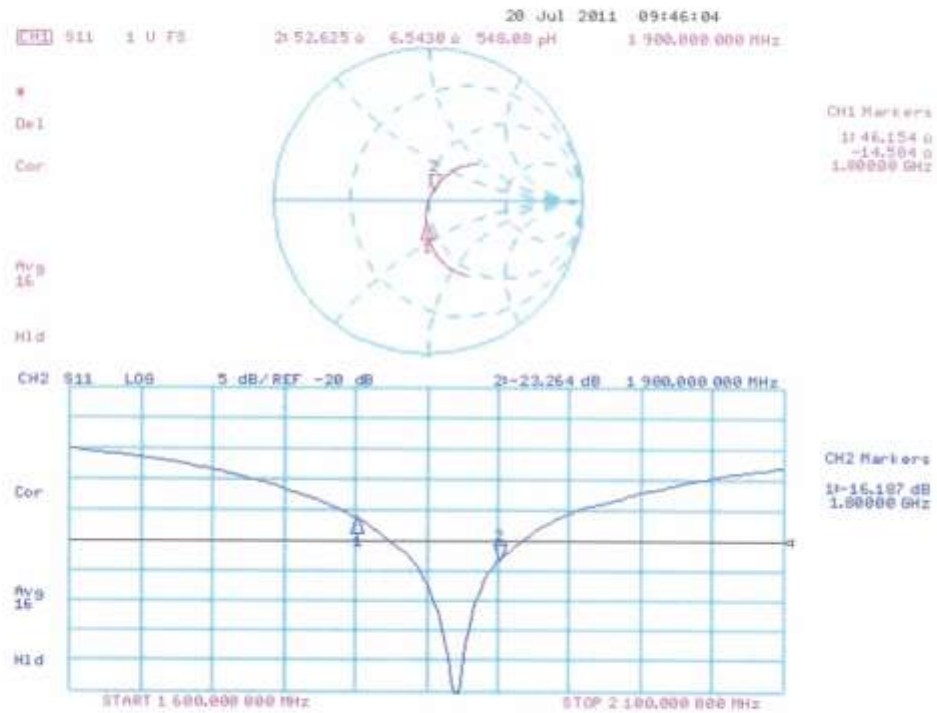
Peak SAR (extrapolated) = 18.469 W/kg

**SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.29 mW/g**

Maximum value of SAR (measured) = 12.721 mW/g



### 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;  $\epsilon_r = 52.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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:**

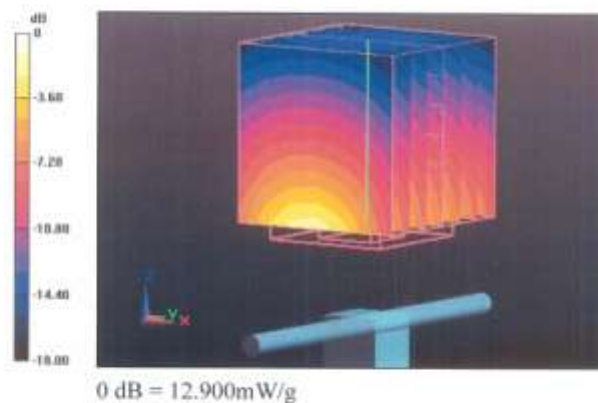
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.827 V/m; Power Drift = 0.0078 dB

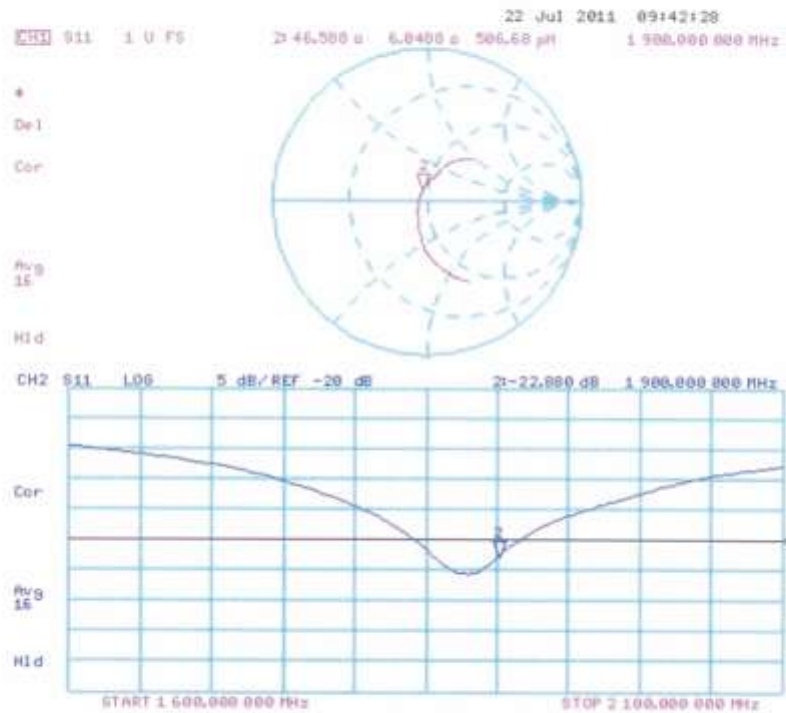
Peak SAR (extrapolated) = 18.111 W/kg

**SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.39 mW/g**

Maximum value of SAR (measured) = 12.898 mW/g



### Impedance Measurement Plot for Body TSL



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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**  
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: 55086 (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       | MY41082317         | 18-Oct-02 (in house check Oct-09) | in house check: Oct-11 |
| RF generator R&S SMT-08     | 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 Rev     | Laboratory Technician |           |
| Approved by:   | Katja Pokovic | Technical Manager     |           |

Issued: August 29, 2011

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Certificate No: D2450V2-743\_Aug11

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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:**

- 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
- 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
- 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:**

- 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 $\pm$ 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 $\pm$ 0.2) °C | 38.4 $\pm$ 6 % | 1.85 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (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 $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (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 $\pm$ 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 $\pm$ 0.2) °C | 51.8 $\pm$ 6 % | 2.02 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

### SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (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 $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (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 $\pm$ 16.5 % (k=2) |

## Appendix

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 55.0 $\Omega$ + 4.8 j $\Omega$ |
| Return Loss                          | - 23.6 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.3 $\Omega$ + 5.8 j $\Omega$ |
| 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;  $\epsilon_r = 38.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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:

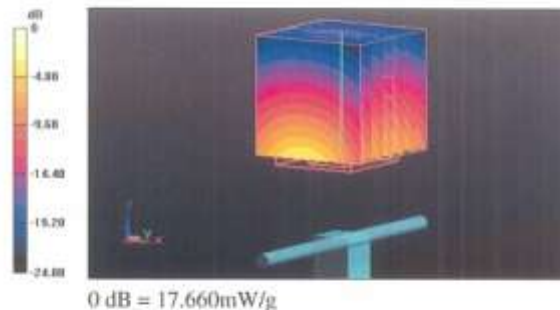
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.2 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 28.291 W/kg

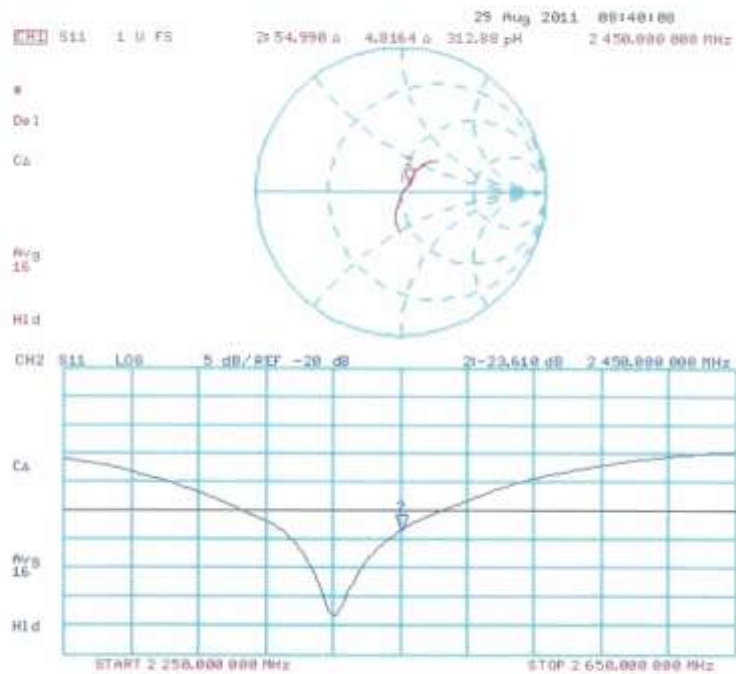
**SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.4 mW/g**

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;  $\epsilon_r = 51.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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:

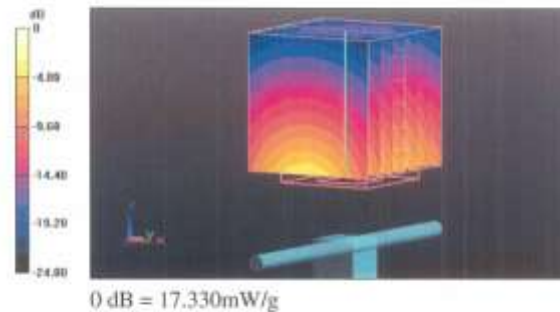
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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



Impedance Measurement Plot for Body TSL

