

# SAR TEST REPORT

HCT CO., LTD

|                                                  |                                                                                                                                                                                                                                                                         |                                                                                                                                                    |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT Type:                                        | PCS CDMA Phone with Bluetooth/WLAN                                                                                                                                                                                                                                      |                                                                                                                                                    |
| FCC ID:                                          | RAD209                                                                                                                                                                                                                                                                  |                                                                                                                                                    |
| Model:                                           | JukeB                                                                                                                                                                                                                                                                   |                                                                                                                                                    |
| Date of Issue:                                   | Sep. 21, 2011                                                                                                                                                                                                                                                           |                                                                                                                                                    |
| Test report No.:                                 | HCTA1109FS05                                                                                                                                                                                                                                                            |                                                                                                                                                    |
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| 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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## Version

| TEST REPORT NO. | DATE          | DESCRIPTION                       |
|-----------------|---------------|-----------------------------------|
| HCTA1109FS05    | Sep. 21, 2011 | First Approval Report             |
| HCTA1109FS05    | Sep. 23, 2011 | Antenna Drawing has been changed. |
|                 |               |                                   |
|                 |               |                                   |
|                 |               |                                   |

# 1. INTRODUCTION

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

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

## SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative 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:                              | PCS CDMA Phone with Bluetooth/ WLAN                                                                                               |                  |    |
| FCC ID:                                | RAD209                                                                                                                            |                  |    |
| Model:                                 | JukeB                                                                                                                             |                  |    |
| Trade Name                             | TCT MOBILE LIMITED.                                                                                                               | Serial Number(s) | #1 |
| Application Type                       | Certification                                                                                                                     |                  |    |
| Mode(s) of Operation                   | PCS1900/ 802.11b/g/n                                                                                                              |                  |    |
| Tx Frequency                           | 1 851.25 MHz -1 908.75 MHz (PCS CDMA)<br>2402 MHz - 2480 MHz (Bluetooth)<br>2 412- 2 462 MHz (WLAN)                               |                  |    |
| Rx Frequency                           | 1 931.25 MHz - 1 988.75 MHz (PCS CDMA)<br>2402 MHz - 2480 MHz (Bluetooth)<br>2 412- 2 462 MHz (WLAN)                              |                  |    |
| FCC Classification                     | Licensed Portable Transmitter Held to Ear (PCE)                                                                                   |                  |    |
| Production Unit or Identical Prototype | Prototype                                                                                                                         |                  |    |
| Max SAR                                | 1.17 W/kg PCS1900 Head SAR / 0.532 W/kg PCS1900 Body SAR<br>0.112 W/kg Wi-Fi 802.11b Head SAR / 0.065 W/kg Wi-Fi 802.11b Body SAR |                  |    |
| Date(s) of Tests                       | Sep. 8, 2011 / Sep. 19, 2011                                                                                                      |                  |    |
| Antenna Type                           | Intenna                                                                                                                           |                  |    |

## **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.

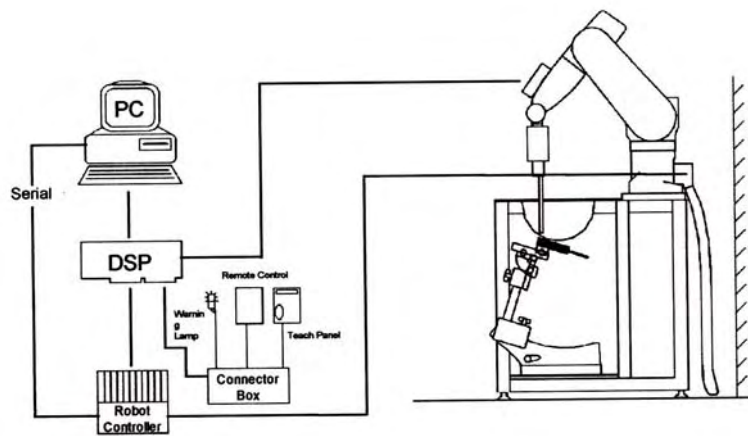


Figure 3.1 HCT SAR Lab. Test Measurement Set-up

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

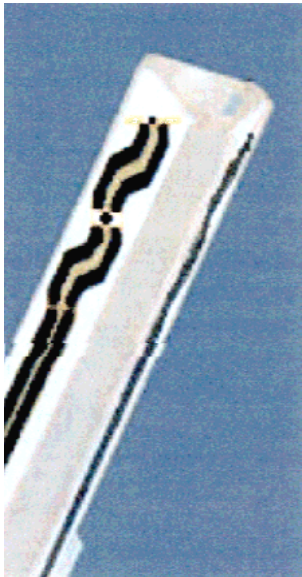


Figure 3.3 ET3DV6 E-field Probe

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)

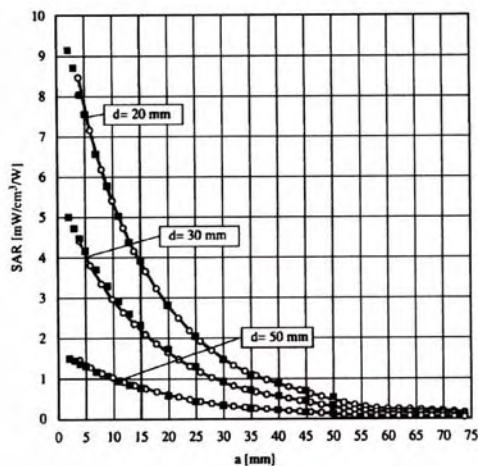


Figure 3.4 E-Field and Temperature measurements at 900 MHz

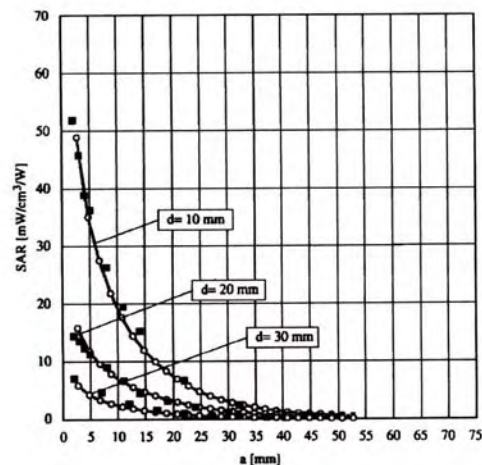


Figure 3.5 E-Field and temperature measurements at 1.8 GHz

### 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.

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

with  $P_{pwe}$  = 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                    |
| 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 produced infinite number of configurations. To produce the Worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.



Figure 3.7 Device Holder

### 3.6 Brain & Muscle Simulating Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydrox-ethyl cellulose (HEC) gelling agent and saline solution (see Table 3.1). Preservation with a bactericide 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             |       | 835   |      | 915   |       | 1 900 |      | 2 450 |      |
| Tissue Type                  | Head            | Body  | Head  | Body | Head  | Body  | Head  | Body | Head  | Body |
| Water                        | 38.56           | 51.16 | 41.45 | 52.4 | 41.05 | 56.0  | 54.9  | 40.4 | 62.7  | 73.2 |
| Salt (NaCl)                  | 3.95            | 1.49  | 1.45  | 1.4  | 1.35  | 0.76  | 0.18  | 0.5  | 0.5   | 0.04 |
| Sugar                        | 56.32           | 46.78 | 56.0  | 45.0 | 56.5  | 41.76 | 0.0   | 58.0 | 0.0   | 0.0  |
| HEC                          | 0.98            | 0.52  | 1.0   | 1.0  | 1.0   | 1.21  | 0.0   | 1.0  | 0.0   | 0.0  |
| Bactericide                  | 0.19            | 0.05  | 0.1   | 0.1  | 0.1   | 0.27  | 0.0   | 0.1  | 0.0   | 0.0  |
| Triton X-100                 | 0.0             | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0  | 36.8  | 0.0  |
| DGBE                         | 0.0             | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 44.92 | 0.0  | 0.0   | 26.7 |

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

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

### 3.7 SAR TEST EQUIPMENT

| Manufacturer | Type / Model                | S/N             | Calib. Date   | Calib.Interval | Calib.Due     |
|--------------|-----------------------------|-----------------|---------------|----------------|---------------|
| SPEAG        | SAM Phantom                 | -               | N/A           | N/A            | N/A           |
| Staubli      | Robot RX90L                 | F01/5K09A1/A/01 | N/A           | N/A            | N/A           |
| Staubli      | Robot ControllerCS7MB       | F99/5A82A1/C/01 | N/A           | N/A            | N/A           |
| HP           | Pavilion t000_puffer        | KRJ51201TV      | N/A           | N/A            | N/A           |
| SPEAG        | Light Alignment Sensor      | 265             | N/A           | N/A            | N/A           |
| Staubli      | Teach Pendant (Joystick)    | D221340.01      | N/A           | N/A            | N/A           |
| SPEAG        | DAE3                        | 479             | Aug. 29, 2011 | Annual         | Aug. 29, 2012 |
| SPEAG        | DAE4                        | 869             | Sep 21, 2010  | Annual         | Sep 21, 2011  |
| SPEAG        | E-Field Probe ET3DV6        | 1609            | Nov. 24, 2010 | Annual         | Nov. 24, 2011 |
| 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. 05, 2010 | Annual         | Nov. 05, 2011 |
| Agilent      | Power Sensor(G) 8481        | MY41090870      | Nov. 05, 2010 | Annual         | Nov. 05, 2011 |
| HP           | Dielectric Probe Kit 85070C | 00721521        | N/A           | N/A            | N/A           |
| HP           | Dual Directional Coupler    | 16072           | Nov. 05, 2010 | Annual         | Nov. 05, 2011 |
| R&S          | Base Station CMU200         | 110740          | July 26, 2011 | Annual         | July 26, 2012 |
| Agilent      | Base Station E5515C         | GB44400269      | Feb. 10, 2011 | Annual         | Feb. 10, 2012 |
| HP           | Signal Generator E4438C     | MY42082646      | Nov. 11, 2010 | Annual         | Nov. 11, 2011 |
| HP           | Network Analyzer 8753ES     | JP39240221      | Mar. 30, 2011 | Annual         | Mar. 30, 2012 |

**NOTE:**

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

## 4. SAR MEASUREMENT PROCEDURE

The evaluation was performed with the following procedure:

1. The SAR value at a fixed location above the ear point was measured and was used as a reference value for assessing the power drop.
2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20 mm x 20 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.
3. Around this point, a volume of 32 mm x 32 mm x 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.

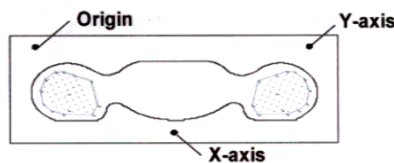


Figure 4.1 SAR Measurement Point in Area Scan

## 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.

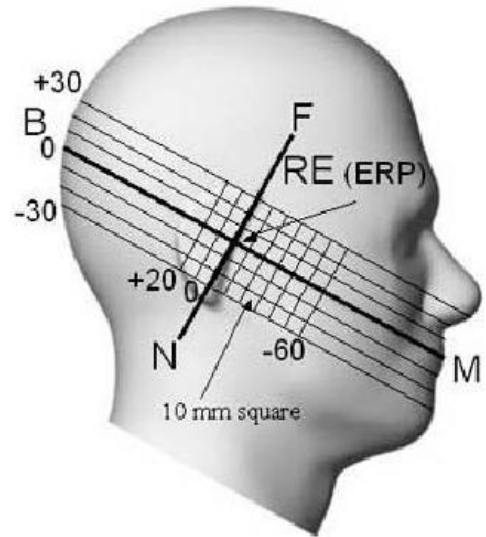


Figure 5.1 Side view of the phantom

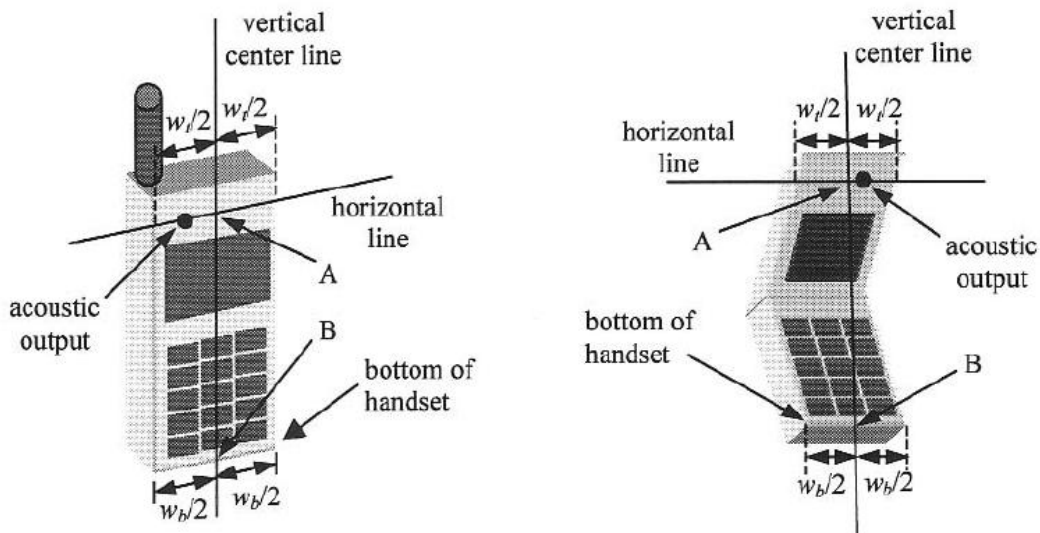


Figure 5.2 Handset vertical and horizontal reference lines

## **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 2.0 cm from the EUT back surface to the liquid interface is configured for the generic test.

"See the Test SET-UP Photo"

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

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

## 6. MEASUREMENT UNCERTAINTY

| Error Description                   | Tol<br>(± %) | Prob.<br>dist. | Div. | $c_i$ | Standard<br>Uncertainty<br>(± %) | $V_{eff}$ |
|-------------------------------------|--------------|----------------|------|-------|----------------------------------|-----------|
| <b>1. Measurement System</b>        |              |                |      |       |                                  |           |
| Probe Calibration                   | 5.50         | N              | 1    | 1     | 5.50                             | ∞         |
| Axial Isotropy                      | 4.70         | R              | 1.73 | 0.7   | 1.90                             | ∞         |
| Hemispherical Isotropy              | 9.60         | R              | 1.73 | 0.7   | 3.88                             | ∞         |
| Boundary Effects                    | 1.00         | R              | 1.73 | 1     | 0.58                             | ∞         |
| Linearity                           | 4.70         | R              | 1.73 | 1     | 2.71                             | ∞         |
| System Detection Limits             | 1.00         | R              | 1.73 | 1     | 0.58                             | ∞         |
| Readout Electronics                 | 0.30         | N              | 1.00 | 1     | 0.30                             | ∞         |
| Response Time                       | 0.8          | R              | 1.73 | 1     | 0.46                             | ∞         |
| Integration Time                    | 2.6          | R              | 1.73 | 1     | 1.50                             | ∞         |
| RF Ambient Conditions               | 3.00         | R              | 1.73 | 1     | 1.73                             | ∞         |
| Probe Positioner                    | 0.40         | R              | 1.73 | 1     | 0.23                             | ∞         |
| Probe Positioning                   | 2.90         | R              | 1.73 | 1     | 1.67                             | ∞         |
| Max SAR Eval                        | 1.00         | R              | 1.73 | 1     | 0.58                             | ∞         |
| <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                             | ∞         |
| <b>3. Phantom and Setup</b>         |              |                |      |       |                                  |           |
| Phantom Uncertainty                 | 4.00         | R              | 1.73 | 1     | 2.31                             | ∞         |
| Liquid Conductivity(target)         | 5.00         | R              | 1.73 | 0.64  | 1.85                             | ∞         |
| Liquid Conductivity(meas.)          | 2.07         | N              | 1    | 0.64  | 1.32                             | 9         |
| Liquid Permittivity(target)         | 5.00         | R              | 1.73 | 0.6   | 1.73                             | ∞         |
| Liquid Permittivity(meas.)          | 5.02         | N              | 1    | 0.6   | 3.01                             | 9         |
| <b>Combine Standard Uncertainty</b> |              |                |      |       | 10.86                            |           |
| <b>Coverage Factor for 95 %</b>     |              |                |      |       | $k = 2$                          |           |
| <b>Expanded STD Uncertainty</b>     |              |                |      |       | 21.73                            |           |

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 [%] |
|-------------|-------------|--------|------------------|--------------|--------------|----------------|---------------|-----------|
| 1 900       | Sep. 8,2011 | Head   | 21.1             | $\epsilon_r$ | 40.0         | 39.2           | -2.00         | $\pm 5$   |
|             |             |        |                  | $\sigma$     | 1.40         | 1.38           | -1.43         | $\pm 5$   |
| 1 900       | Sep. 8,2011 | Body   |                  | $\epsilon_r$ | 53.3         | 55.3           | +3.75         | $\pm 5$   |
|             |             |        |                  | $\sigma$     | 1.52         | 1.48           | -2.63         | $\pm 5$   |
| 2 450       | Sep.19,2011 | Head   | 21.1             | $\epsilon_r$ | 39.7         | 38.4           | -3.27         | $\pm 5$   |
|             |             |        |                  | $\sigma$     | 1.84         | 1.85           | +0.54         | $\pm 5$   |
| 2 450       | Sep.19,2011 | Body   |                  | $\epsilon_r$ | 52.7         | 50.7           | -3.80         | $\pm 5$   |
|             |             |        |                  | $\sigma$     | 1.95         | 2.01           | +3.08         | $\pm 5$   |

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

### 8.2 System Validation

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

\* Input Power: 100 m W

| Freq. [MHz] | Date        | Liquid | Liquid Temp. [°C] | SAR Average | Target Value (SPEAG) (mW/g) | *Measured Value (mW/g) | Deviation [%] | Limit [%] |
|-------------|-------------|--------|-------------------|-------------|-----------------------------|------------------------|---------------|-----------|
| 1 900       | Sep. 8,2011 | Head   | 21.1              | 1 g         | 39.9                        | 3.96                   | - 0.75        | $\pm 10$  |
| 1 900       | Sep. 8,2011 | Body   |                   | 1 g         | 40.9                        | 4.08                   | - 0.24        | $\pm 10$  |
| 2 450       | Sep.19,2011 | Head   | 21.1              | 1 g         | 53.8                        | 5.44                   | + 1.12        | $\pm 10$  |
| 2 450       | Sep.19,2011 | Body   |                   | 1 g         | 51.7                        | 5.19                   | + 0.39        | $\pm 10$  |

### 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 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.

## 9. SAR Testing with IEEE 802.11 a/b/g Transmitters

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.

### 9.1 General Device Setup

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.

### 9.2 Frequency Channel Configurations

802.11 a/b/g and 4.9 GHz operating modes are tested independently according to the service requirements in each frequency band. 802.11 b/g modes are tested on channels 1, 6 and 11. 802.11a is tested for UNII operations on channels 36 and 48 in the 5.15-5.25 GHz band; channels 52 and 64 in the 5.25-5.35 GHz band; Channels 104, 116, 124 and 136 in the 5.470-5.725 GHz band; and channels 149 and 161 in the 5.8 GHz band. When 5.8 GHz § 15.247 is also available, channels 149, 157 and 165 should be tested instead of the UNII channels. 4.9 GHz is tested on channels 1, 10 and 5 or 6, whichever has the higher output power, for 5 MHz channels; channels 11, 15 and 19 for 10 MHz channels; and channels 21 and 25 for 20 MHz channels.

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

| Mode                  | GHz     | Channel | Turbo Channel  | "Default Test Channels" |      |   |  |
|-----------------------|---------|---------|----------------|-------------------------|------|---|--|
|                       |         |         |                | §15.247                 | UNII |   |  |
| 802.11 b/g            | 2.412   | 1       |                | ✓                       | ▽    |   |  |
|                       | 2.437   | 6       | 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      | 58 (5.29 GHz)  |                         |      | ✓ |  |
|                       | 5.28    | 56      |                |                         |      |   |  |
|                       | 5.30    | 60      |                |                         |      |   |  |
|                       | 5.32    | 64      |                |                         |      | ✓ |  |
|                       | 5.500   | 100     | Unknown        |                         |      |   |  |
|                       | 5.520   | 104     |                |                         |      | ✓ |  |
|                       | 5.540   | 108     |                |                         |      |   |  |
|                       | 5.560   | 112     |                |                         |      |   |  |
|                       | 5.580   | 116     |                |                         |      | ✓ |  |
|                       | 5.600   | 120     |                |                         |      |   |  |
|                       | 5.620   | 124     |                |                         |      | ✓ |  |
|                       | 5.640   | 128     |                |                         |      |   |  |
|                       | 5.660   | 132     |                |                         |      |   |  |
|                       | 5.680   | 136     |                |                         |      | ✓ |  |
|                       | 5.700   | 140     |                |                         |      |   |  |
| UNII<br>or<br>§15.247 | 5.745   | 149     |                | ✓                       |      | ✓ |  |
|                       | 5.765   | 153     | 152 (5.76 GHz) |                         |      |   |  |
|                       | 5.785   | 157     |                | ✓                       |      |   |  |
|                       | 5.805   | 161     | 160 (5.80 GHz) |                         |      |   |  |
|                       | §15.247 | 5.825   | 165            | ✓                       |      |   |  |

802.11 Test Channels per FCC Requirements

## 10. RF CONDUCTED POWER

### 10.1 Procedures Used To Establish Test Signal

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

### 10.2 SAR Measurement Conditions for CDMA2000 1x

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

#### 10.2.1 Output Power Verification

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

1. If the mobile station supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9 600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1 (Table 9.1) parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH0 and demodulation of RC 3, 4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9 600 bps Fundamental Channel and 9 600 bps SCH0 data rate Channel and 9 600 bps SCH0 data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2 (Table 9.2) was applied.
5. FCHs were configured at full rate for maximum SAR with "All Up" power control bits.

| Parameters for Max. Power for RC1 |              |       |
|-----------------------------------|--------------|-------|
| Parameter                         | Units        | Value |
| $I_{or}$                          | dBm/1.23 MHz | -104  |
| $\frac{Pilot E_c}{I_{or}}$        | dB           | -7    |
| $\frac{Traffic E_c}{I_{or}}$      | dB           | -7.4  |

Table. 9.1

| Parameters for Max. Power for RC3 |              |       |
|-----------------------------------|--------------|-------|
| Parameter                         | Units        | Value |
| $I_{or}$                          | dBm/1.23 MHz | -86   |
| $\frac{Pilot E_c}{I_{or}}$        | dB           | -7    |
| $\frac{Traffic E_c}{I_{or}}$      | dB           | -7.4  |

Table. 9.2

#### 10.2.2 Head SAR Measurement

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

### 10.2.3 Body SAR Measurement

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCHn) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCHn) with FCH at full rate and SCH0 enabled at 9 600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts.

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

### 10.2.4 Handsets with EV-DO

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev. 0 is less than ¼ dB higher than that measured in RC3 (1x RTT), body SAR for Ev-Do is not required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at 153.6 kbps using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev. A is not required when the maximum average output of each channel is less than that measured in Rev. 0 or less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev. A using a Reverse Data Channel payload size of 4 096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots should be configured in the downlink for both Rev. 0 and Rev. A.

| Band | Channel | SO2            | SO2            | SO55           | SO55           | TDSO<br>SO32   | 1xEvD<br>Rev.O | 1xEvD<br>Rev.O | 1xEvD<br>Rev.1 | 1xEvD<br>Rev.1 |
|------|---------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|      |         | RC1/1<br>(dBm) | RC3/3<br>(dBm) | RC1/1<br>(dBm) | RC3/3<br>(dBm) | RC3/3<br>(dBm) | (FTAP)         | (RTAP)         | (FETAP)        | (RETAP)        |
| PCS  | 25      | 24.70          | 24.81          | 24.66          | 24.46          | 24.78          | 24.52          | 24.64          | 24.55          | 24.59          |
|      | 600     | 24.66          | 24.90          | 24.86          | 24.72          | 24.70          | 24.49          | 24.63          | 24.63          | 24.56          |
|      | 1175    | 24.70          | 24.88          | 24.70          | 24.88          | 24.65          | 24.53          | 24.49          | 24.41          | 24.43          |

Average Conducted output powers

| Band            | Channel | Mbps (dBm) |       |       |       |
|-----------------|---------|------------|-------|-------|-------|
|                 |         | 1          | 2     | 5.5   | 11    |
| IEEE<br>802.11b | 1       | 15.07      | 14.98 | 14.71 | 14.56 |
|                 | 6       | 14.70      | 14.55 | 14.26 | 14.12 |
|                 | 11      | 14.62      | 14.50 | 14.19 | 14.03 |

Table 2. Average IEEE 802.11b Conducted output power

| Band            | Channel | Mbps (dBm) |       |       |       |       |       |       |       |
|-----------------|---------|------------|-------|-------|-------|-------|-------|-------|-------|
|                 |         | 6          | 9     | 12    | 18    | 24    | 36    | 48    | 54    |
| IEEE<br>802.11g | 1       | 14.14      | 13.99 | 13.73 | 13.51 | 13.24 | 13.07 | 12.80 | 12.41 |
|                 | 6       | 14.16      | 14.05 | 13.81 | 13.64 | 13.31 | 13.12 | 12.95 | 12.60 |
|                 | 11      | 13.98      | 13.75 | 13.49 | 13.22 | 12.97 | 12.81 | 12.54 | 12.26 |

Table 3. Average IEEE 802.11g Conducted output power

| Band                       | Channel | Mbps (dBm) |       |       |       |       |       |       |      |
|----------------------------|---------|------------|-------|-------|-------|-------|-------|-------|------|
|                            |         | 6.5        | 13    | 20    | 26    | 39    | 52    | 58    | 65   |
| IEEE<br>802.11n<br>(HT-20) | 1       | 11.63      | 11.48 | 11.32 | 11.07 | 10.79 | 10.44 | 10.16 | 9.87 |
|                            | 6       | 11.60      | 11.44 | 11.25 | 10.99 | 10.57 | 10.38 | 10.05 | 9.71 |
|                            | 11      | 11.55      | 11.36 | 11.17 | 10.80 | 10.51 | 10.29 | 9.88  | 9.62 |

Table 4. Average IEEE 802.11n Conducted output power

# 11. SAR Evaluation Considerations for Handsets with 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Table. 11.2 SAR Evaluation Requirements for Cellphones with Multiple Transmitters

FCC ID: RAD209

Antenna separation distance between Main and BT: 75.1 mm

BT Max. RF output power: 3.01 mW

## 11.2 Simultaneous Transmission

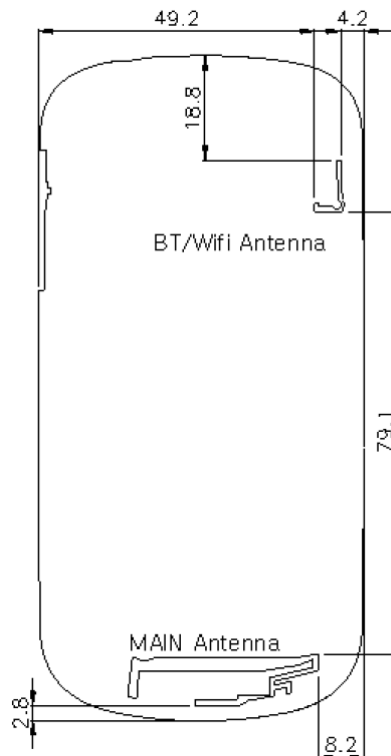
- Main antenna can transmit simultaneously with BT antenna.
- Main antenna can transmit simultaneously with WLAN antenna
- WiFi cannot transmit simultaneously with BT.

| Test Position | Highest 1g SAR (W/kg) |       | $\Sigma$ SAR(W/kg) |
|---------------|-----------------------|-------|--------------------|
|               | 2G                    | WiFi  |                    |
| Head          | 1.17                  | 0.112 | 1.282              |
| Body          | 0.532                 | 0.065 | 0.597              |

## 11.3 Conclusion

Because the conducted output power level of the BT transmitter is less than  $2 \cdot P_{ref}$ , and the BT antenna is more than 5 cm from the Main antenna, neither simultaneous SAR nor stand-alone BT SAR are required for the EUT.

| Antenna Pair | Justification                                                                    | Simultaneous SAR required |
|--------------|----------------------------------------------------------------------------------|---------------------------|
| Wifi / BT    | BT SAR is not required.                                                          | No                        |
| Wifi / WWAN  | The sum of WLAN and 2G SAR is less than 1.6 mW/g                                 | No                        |
| BT / WWAN    | Antenna separation is $\geq 5$ cm, BT transmitter is less than $2 \cdot P_{ref}$ | No                        |



## 12. SAR TEST DATA SUMMARY

### 12.1 Measurement Results (PCS1900 Head SAR)

| Frequency                                                                                                               |            | Modulation | Conducted Power (dBm) |       | Battery  | Phantom Position                                              | Antenna Type | SAR(mW/g) |
|-------------------------------------------------------------------------------------------------------------------------|------------|------------|-----------------------|-------|----------|---------------------------------------------------------------|--------------|-----------|
| MHz                                                                                                                     | Channel    |            | Begin                 | End   |          |                                                               |              |           |
| 1 851.25                                                                                                                | 25 (Low)   | PCS1900    | 24.46                 | 24.33 | Standard | Left Ear                                                      | Intenna      | 0.933     |
| 1 880.00                                                                                                                | 600 (Mid)  | PCS1900    | 24.72                 | 24.81 | Standard | Left Ear                                                      | Intenna      | 0.871     |
| 1 908.75                                                                                                                | 1175(High) | PCS1900    | 24.88                 | 24.85 | Standard | Left Ear                                                      | Intenna      | 1.1       |
| 1 880.00                                                                                                                | 600 (Mid)  | PCS1900    | 24.72                 | 24.71 | Standard | Left Tilt 15°                                                 | Intenna      | 0.415     |
| 1 851.25                                                                                                                | 25 (Low)   | PCS1900    | 24.46                 | 24.44 | Standard | Right Ear                                                     | Intenna      | 1.05      |
| 1 880.00                                                                                                                | 600 (Mid)  | PCS1900    | 24.72                 | 24.66 | Standard | Right Ear                                                     | Intenna      | 1.05      |
| 1 908.75                                                                                                                | 1175(High) | PCS1900    | 24.88                 | 24.86 | Standard | Right Ear                                                     | Intenna      | 1.17      |
| 1 880.00                                                                                                                | 600 (Mid)  | PCS1900    | 24.72                 | 24.73 | Standard | Right Tilt 15                                                 | Intenna      | 0.351     |
| <b>ANSI/ IEEE C95.1 - 1992– Safety Limit</b><br><b>Spatial Peak</b><br><b>Uncontrolled Exposure/ General Population</b> |            |            |                       |       |          | <b>Head</b><br><b>1.6 W/kg (mW/g)</b><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).
- PCS CDMA mode was tested under RC3/SO55.

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

| Frequency                                                                                                               |         | Modulation | Conducted Power (dBm) |       | Battery  | Data Rate | Phantom Position                                                             | Antenna Type | SAR(mW/g) |
|-------------------------------------------------------------------------------------------------------------------------|---------|------------|-----------------------|-------|----------|-----------|------------------------------------------------------------------------------|--------------|-----------|
| MHz                                                                                                                     | Channel |            | Begin                 | End   |          |           |                                                                              |              |           |
| 2 412                                                                                                                   | 1 (Low) | 802.11b    | 15.07                 | 15.14 | Standard | 1 Mbps    | Left Ear                                                                     | Intenna      | 0.084     |
| 2 412                                                                                                                   | 1 (Low) | 802.11b    | 15.07                 | 15.22 | Standard | 1 Mbps    | Left Tilt 15°                                                                | Intenna      | 0.064     |
| 2 412                                                                                                                   | 1 (Low) | 802.11b    | 15.07                 | 14.96 | Standard | 1 Mbps    | Right Ear                                                                    | Intenna      | 0.112     |
| 2 412                                                                                                                   | 1 (Low) | 802.11b    | 15.07                 | 15.15 | Standard | 1 Mbps    | Right Tilt 15                                                                | Intenna      | 0.057     |
| <b>ANSI/ IEEE C95.1 - 1992– Safety Limit</b><br><b>Spatial Peak</b><br><b>Uncontrolled Exposure/ General Population</b> |         |            |                       |       |          |           | <b>Head</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-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.

## 12.3 Measurement Results (PCS1900 Body SAR)

| Frequency                                                                                                               |           | Modulation | Conducted Power (dBm) |       | Configuration | Separation Distance                                           | SAR(mW/g) |
|-------------------------------------------------------------------------------------------------------------------------|-----------|------------|-----------------------|-------|---------------|---------------------------------------------------------------|-----------|
| MHz                                                                                                                     | Channel   |            | Begin                 | End   |               |                                                               |           |
| 1 880.00                                                                                                                | 600 (Mid) | PCS1900    | 24.72                 | 24.74 | Rear          | 2.0 cm without Holster                                        | 0.532     |
| <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>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  $\pm$  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).
- PCS CDMA mode was tested under RC3/SO32.

## 12.4 Measurement Results (802.11b Body SAR)

| Frequency                                                                                                              |         | Modulation | Conducted Power (dBm) |       | Configuration | Separation Distance                                           | Data Rate | SAR(mW/g) |
|------------------------------------------------------------------------------------------------------------------------|---------|------------|-----------------------|-------|---------------|---------------------------------------------------------------|-----------|-----------|
| MHz                                                                                                                    | Channel |            | Begin                 | End   |               |                                                               |           |           |
| 2 412                                                                                                                  | 1 (Low) | 802.11b    | 15.07                 | 15.15 | Rear          | 2.0 cm                                                        | 1 Mbps    | 0.065     |
| <b>ANSI/ IEEE C95.1 2005 – 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>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  $\pm$  0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard with Charger ☐ 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.

## 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.

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## Attachment 1. – SAR Test Plots

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: PCS 1900MHz FCC; Frequency: 1851.25 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1851.25$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.4$ ;  $\rho = 1000$  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 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Left touch 25/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.01 mW/g

**Left touch 25/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.6 V/m; Power Drift = -0.132 dB

Peak SAR (extrapolated) = 1.45 W/kg

**SAR(1 g) = 0.933 mW/g; SAR(10 g) = 0.555 mW/g**

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

Maximum value of SAR (measured) = 1.01 mW/g

**Left touch 25/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.6 V/m; Power Drift = -0.132 dB

Peak SAR (extrapolated) = 1.09 W/kg

**SAR(1 g) = 0.764 mW/g; SAR(10 g) = 0.504 mW/g**

Maximum value of SAR (measured) = 0.813 mW/g

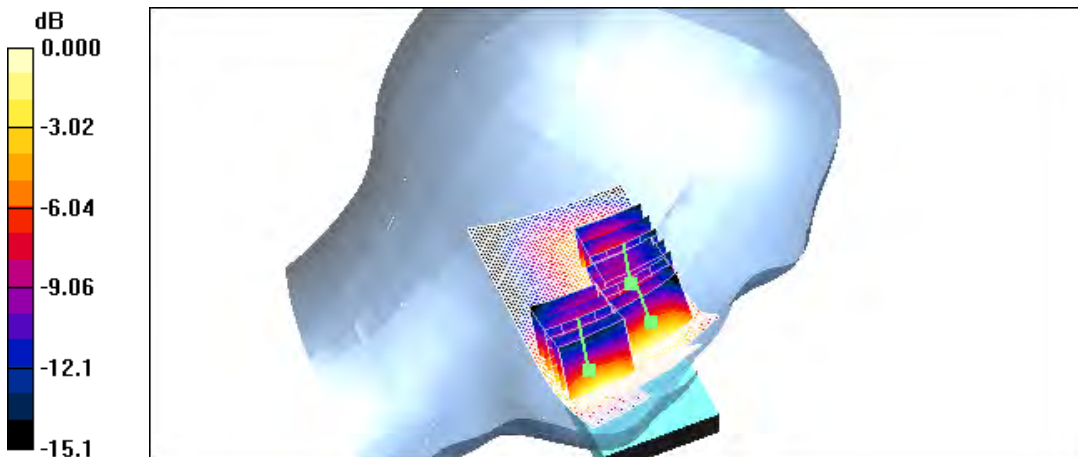
**Left touch 25/Zoom Scan (5x5x7)/Cube 2:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.6 V/m; Power Drift = -0.132 dB

Peak SAR (extrapolated) = 1.11 W/kg

**SAR(1 g) = 0.735 mW/g; SAR(10 g) = 0.461 mW/g**

Maximum value of SAR (measured) = 0.814 mW/g



0 dB = 0.814mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.36 \text{ mho/m}$ ;  $\epsilon_r = 39.2$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

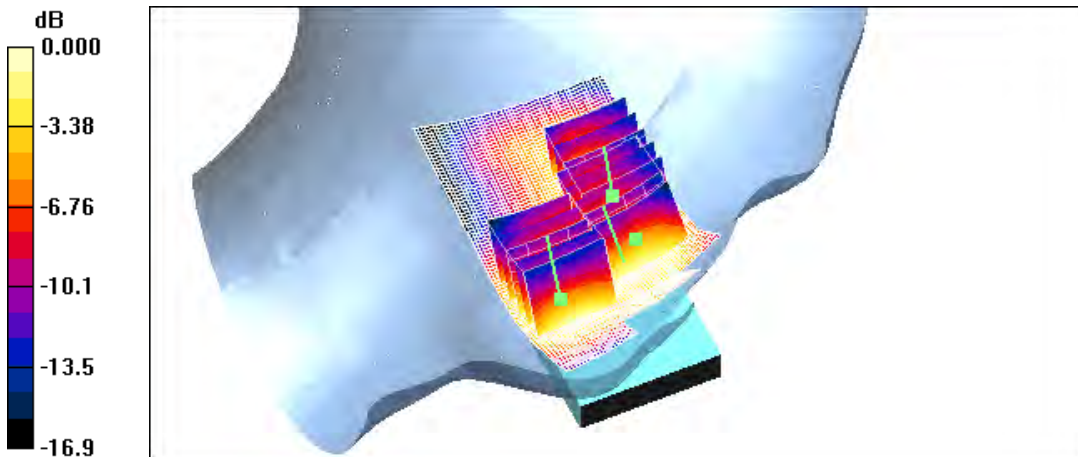
- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Left touch 600/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.978 mW/g

**Left touch 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 22.3 V/m; Power Drift = 0.091 dB  
Peak SAR (extrapolated) = 1.35 W/kg  
**SAR(1 g) = 0.871 mW/g; SAR(10 g) = 0.522 mW/g**  
Maximum value of SAR (measured) = 0.943 mW/g

**Left touch 600/Zoom Scan (5x5x7)/Cube 1:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 22.3 V/m; Power Drift = 0.091 dB  
Peak SAR (extrapolated) = 1.06 W/kg  
**SAR(1 g) = 0.699 mW/g; SAR(10 g) = 0.439 mW/g**  
Maximum value of SAR (measured) = 0.785 mW/g

**Left touch 600/Zoom Scan (5x5x7)/Cube 2:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 22.3 V/m; Power Drift = 0.091 dB  
Peak SAR (extrapolated) = 1.03 W/kg  
**SAR(1 g) = 0.709 mW/g; SAR(10 g) = 0.471 mW/g**  
Maximum value of SAR (measured) = 0.756 mW/g



0 dB = 0.756mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: PCS 1900MHz FCC; Frequency: 1908.75 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1908.75 \text{ MHz}$ ;  $\sigma = 1.39 \text{ mho/m}$ ;  $\epsilon_r = 39.1$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:  
- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24  
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21  
- Phantom: SAM 835/900 MHz; Type: SAM

**Left touch 1175/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

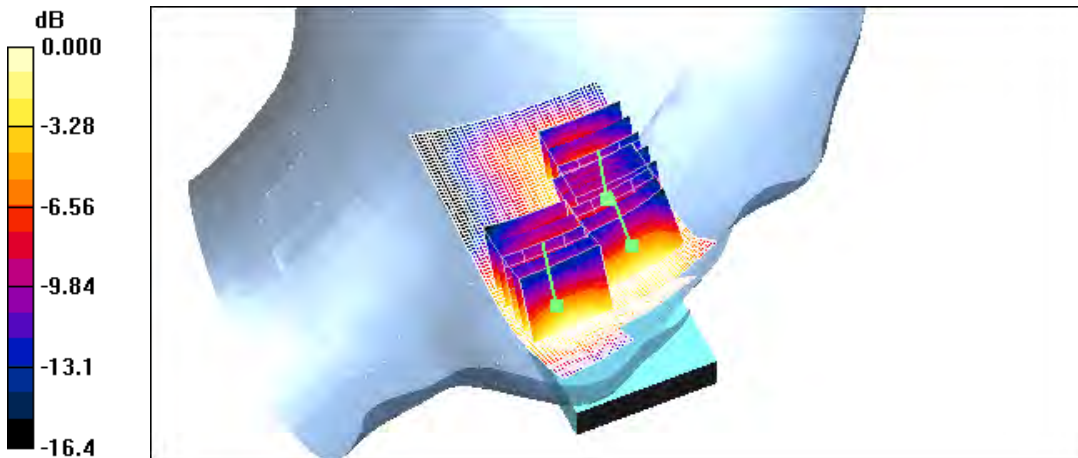
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 1.15 mW/g

**Left touch 1175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 23.4 V/m; Power Drift = -0.032 dB  
Peak SAR (extrapolated) = 1.74 W/kg  
**SAR(1 g) = 1.1 mW/g; SAR(10 g) = 0.647 mW/g**  
Maximum value of SAR (measured) = 1.19 mW/g

**Left touch 1175/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 23.4 V/m; Power Drift = -0.032 dB  
Peak SAR (extrapolated) = 1.26 W/kg  
**SAR(1 g) = 0.818 mW/g; SAR(10 g) = 0.505 mW/g**  
Maximum value of SAR (measured) = 0.926 mW/g

**Left touch 1175/Zoom Scan (5x5x7)/Cube 2:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 23.4 V/m; Power Drift = -0.032 dB  
Peak SAR (extrapolated) = 1.18 W/kg  
**SAR(1 g) = 0.778 mW/g; SAR(10 g) = 0.510 mW/g**  
Maximum value of SAR (measured) = 0.843 mW/g



0 dB = 0.843mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.36 \text{ mho/m}$ ;  $\epsilon_r = 39.2$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

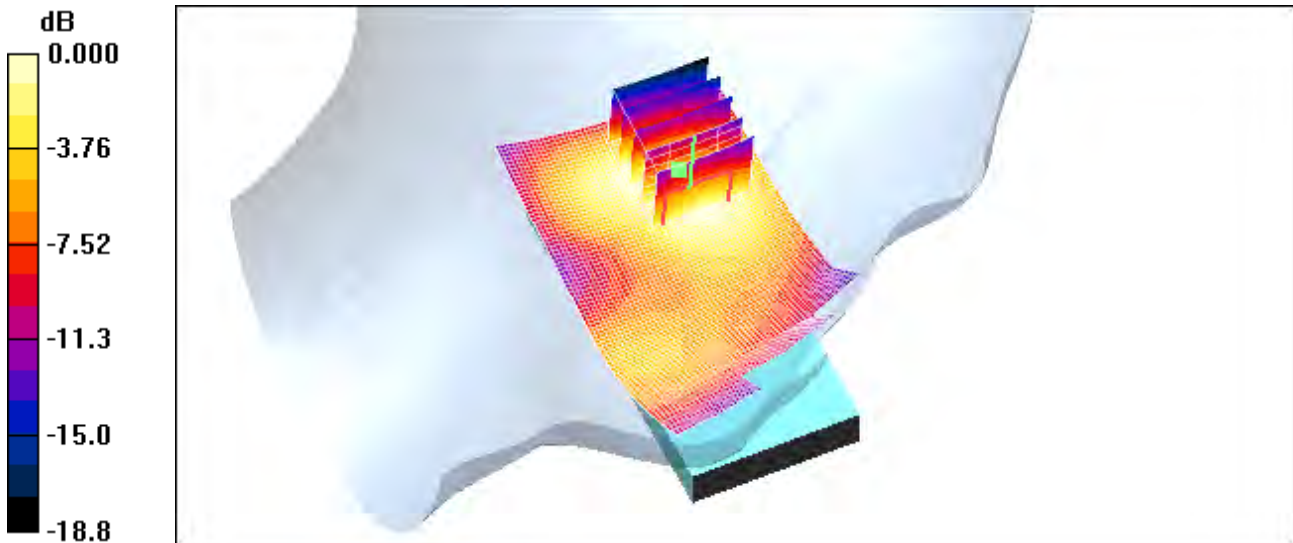
DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Left tilt 600/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.470 mW/g

**Left tilt 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 9.08 V/m; Power Drift = -0.009 dB  
Peak SAR (extrapolated) = 0.611 W/kg  
**SAR(1 g) = 0.415 mW/g; SAR(10 g) = 0.258 mW/g**

Maximum value of SAR (measured) = 0.447 mW/g



0 dB = 0.447mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: PCS 1900MHz FCC; Frequency: 1851.25 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1851.25$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.4$ ;  $\rho = 1000$  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 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 25/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.16 mW/g

**Right touch 25/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

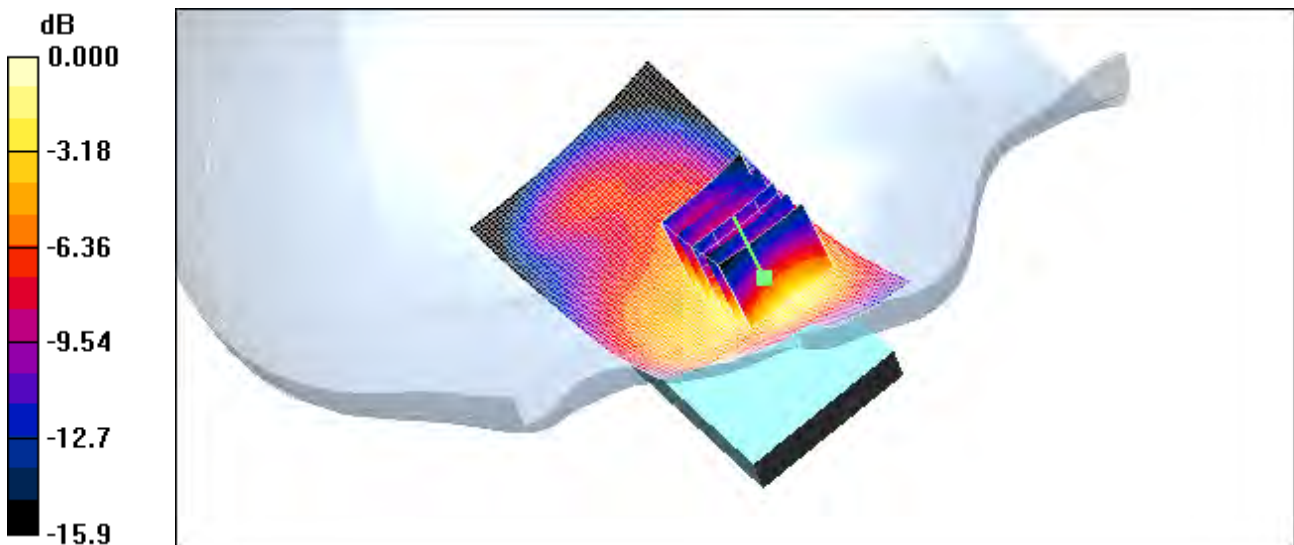
Reference Value = 24.8 V/m; Power Drift = -0.025 dB

Peak SAR (extrapolated) = 1.53 W/kg

**SAR(1 g) = 1.05 mW/g; SAR(10 g) = 0.644 mW/g**

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

Maximum value of SAR (measured) = 1.16 mW/g



0 dB = 1.16mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

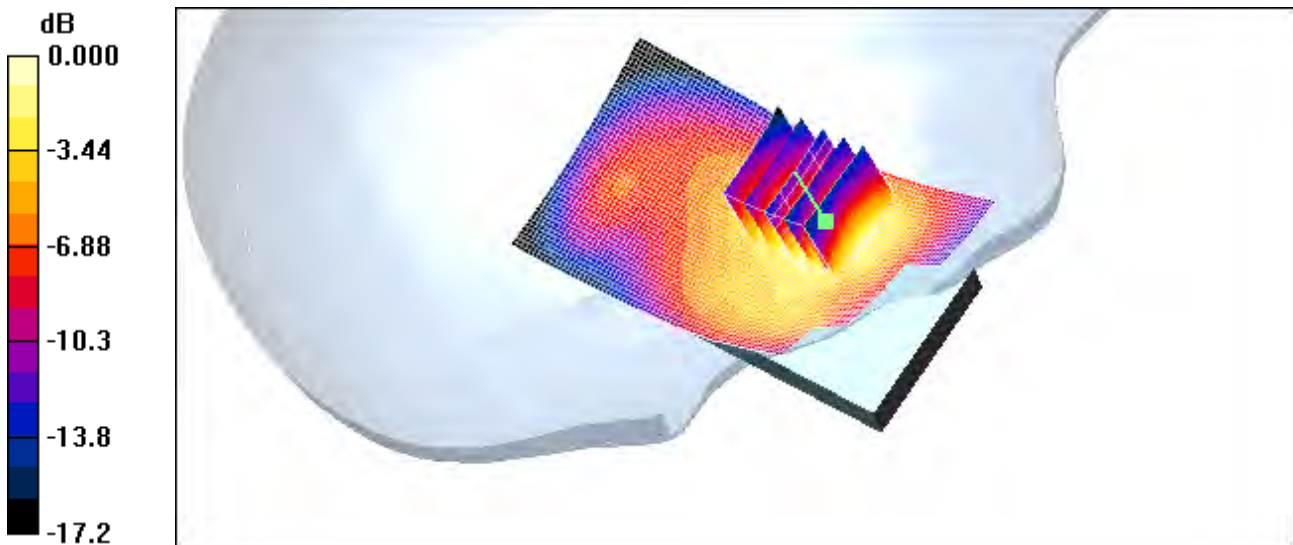
Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.36 \text{ mho/m}$ ;  $\epsilon_r = 39.2$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 600/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 1.13 mW/g

**Right touch 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 24.0 V/m; Power Drift = -0.064 dB  
Peak SAR (extrapolated) = 1.54 W/kg  
**SAR(1 g) = 1.05 mW/g; SAR(10 g) = 0.630 mW/g**  
Maximum value of SAR (measured) = 1.16 mW/g



0 dB = 1.16mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: PCS 1900MHz FCC; Frequency: 1908.75 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1908.75$  MHz;  $\sigma = 1.39$  mho/m;  $\epsilon_r = 39.1$ ;  $\rho = 1000$  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 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24  
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21  
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 1175/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.29 mW/g

**Right touch 1175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

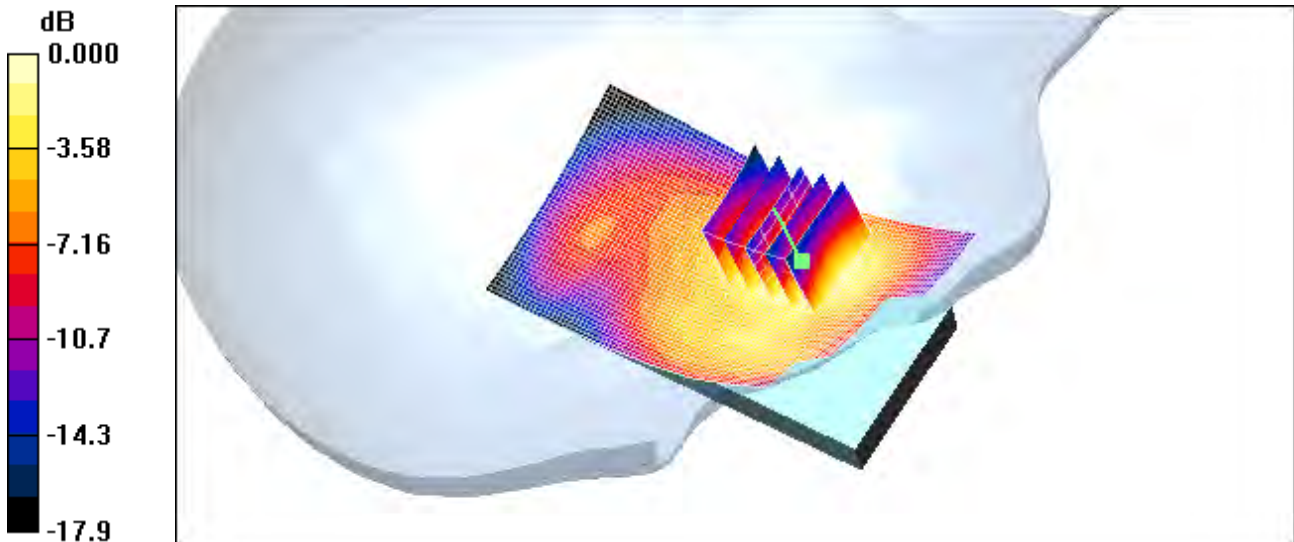
Reference Value = 25.3 V/m; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 1.74 W/kg

**SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.693 mW/g**

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

Maximum value of SAR (measured) = 1.29 mW/g



0 dB = 1.29mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

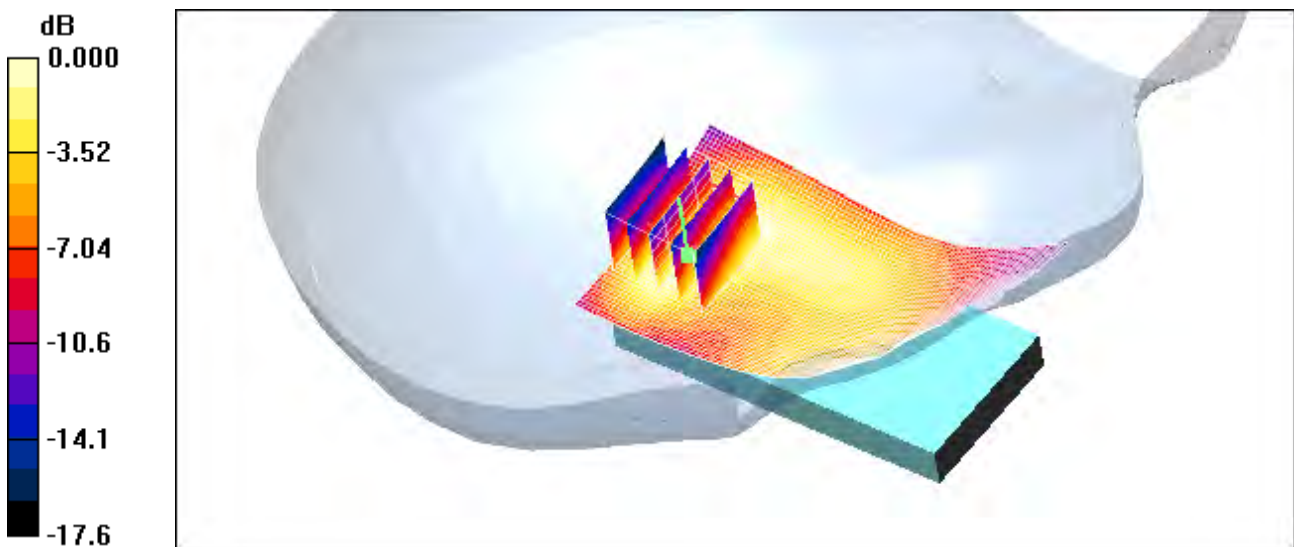
Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.36 \text{ mho/m}$ ;  $\epsilon_r = 39.2$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Right tilt 600/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.427 mW/g

**Right tilt 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 11.6 V/m; Power Drift = 0.010 dB  
Peak SAR (extrapolated) = 0.549 W/kg  
**SAR(1 g) = 0.351 mW/g; SAR(10 g) = 0.209 mW/g**  
Maximum value of SAR (measured) = 0.380 mW/g



0 dB = 0.380mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 19, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.81$  mho/m;  $\epsilon_r = 38.6$ ;  $\rho = 1000$  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 - SN1609; ConvF(4.61, 4.61, 4.61); Calibrated: 2010-11-24  
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29  
- Phantom: 1800/1900 Phantom; Type: SAM

**Left touch 1/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.087 mW/g

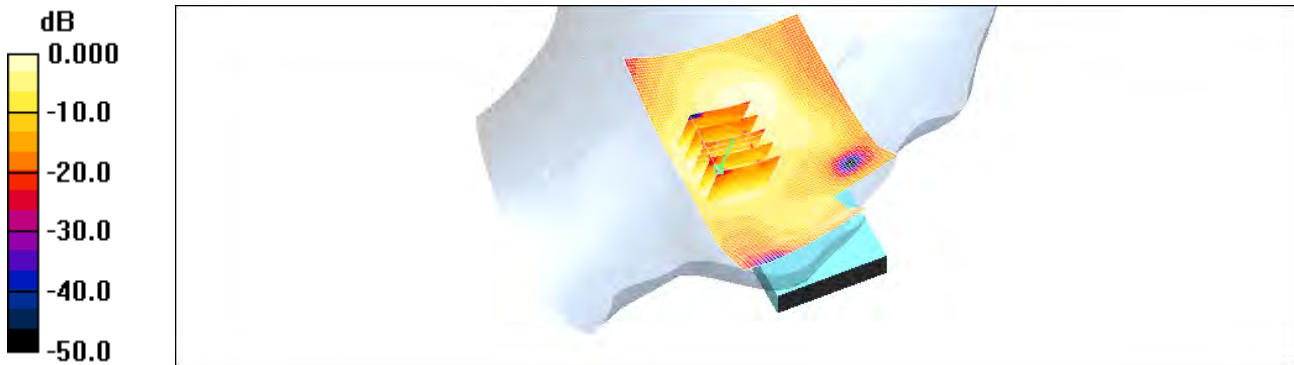
**Left touch 1/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.35 V/m; Power Drift = 0.073 dB

Peak SAR (extrapolated) = 0.186 W/kg

**SAR(1 g) = 0.084 mW/g; SAR(10 g) = 0.040 mW/g**

Maximum value of SAR (measured) = 0.093 mW/g



0 dB = 0.093mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 19, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.81$  mho/m;  $\epsilon_r = 38.6$ ;  $\rho = 1000$  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 - SN1609; ConvF(4.61, 4.61, 4.61); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- Phantom: 1800/1900 Phantom; Type: SAM

**Left tilt 1/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

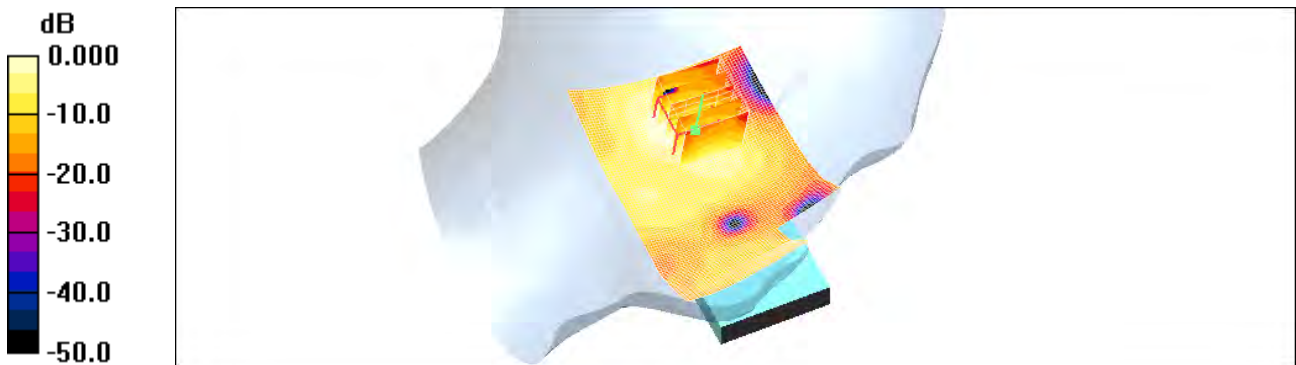
**Left tilt 1/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.00 V/m; Power Drift = 0.151 dB

Peak SAR (extrapolated) = 0.143 W/kg

**SAR(1 g) = 0.064 mW/g; SAR(10 g) = 0.031 mW/g**

Maximum value of SAR (measured) = 0.066 mW/g



0 dB = 0.066mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 19, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.81$  mho/m;  $\epsilon_r = 38.6$ ;  $\rho = 1000$  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 - SN1609; ConvF(4.61, 4.61, 4.61); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- Phantom: 1800/1900 Phantom; Type: SAM

**Right touch 1/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.122 mW/g

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

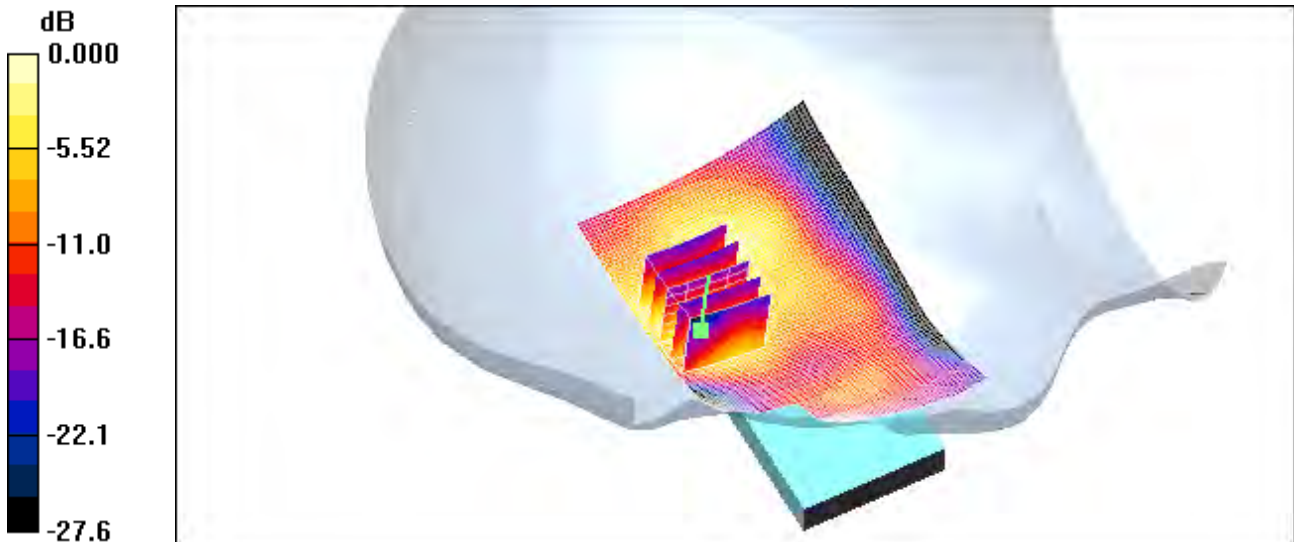
Reference Value = 4.82 V/m; Power Drift = -0.111 dB

Peak SAR (extrapolated) = 0.264 W/kg

**SAR(1 g) = 0.112 mW/g; SAR(10 g) = 0.052 mW/g**

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

Maximum value of SAR (measured) = 0.124 mW/g



0 dB = 0.124mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 19, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.81$  mho/m;  $\epsilon_r = 38.6$ ;  $\rho = 1000$  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 - SN1609; ConvF(4.61, 4.61, 4.61); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- Phantom: 1800/1900 Phantom; Type: SAM

**Right tilt 1/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.057 mW/g

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

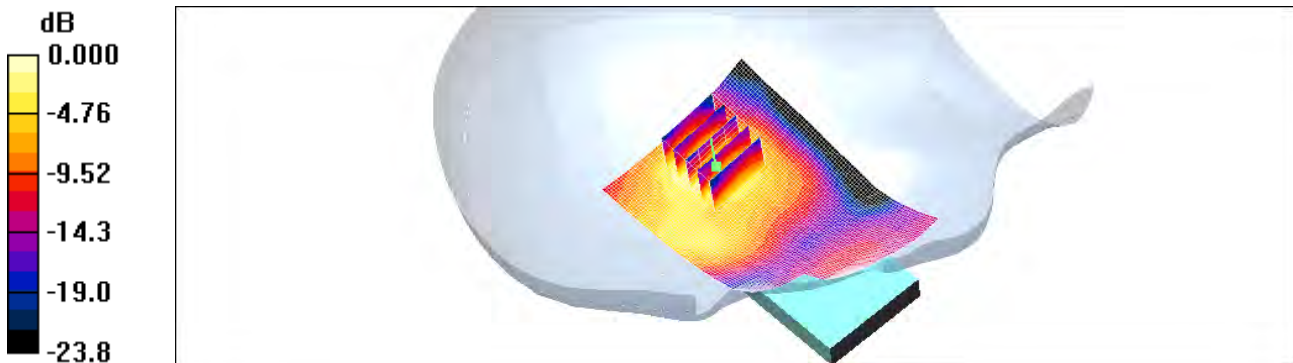
Reference Value = 5.62 V/m; Power Drift = 0.080 dB

Peak SAR (extrapolated) = 0.117 W/kg

**SAR(1 g) = 0.057 mW/g; SAR(10 g) = 0.029 mW/g**

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

Maximum value of SAR (measured) = 0.062 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

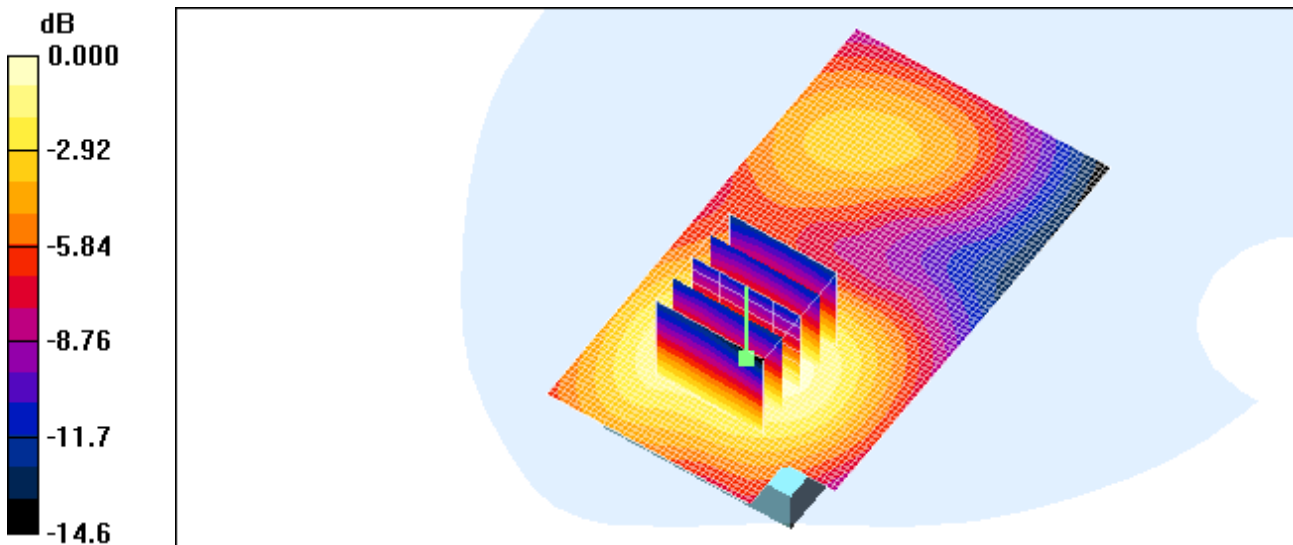
Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.46 \text{ mho/m}$ ;  $\epsilon_r = 55.3$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.6, 4.6, 4.6); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Body rear 600/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.558 mW/g

**Body rear 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 11.8 V/m; Power Drift = 0.021 dB  
Peak SAR (extrapolated) = 0.774 W/kg  
**SAR(1 g) = 0.532 mW/g; SAR(10 g) = 0.341 mW/g**  
Maximum value of SAR (measured) = 0.571 mW/g



0 dB = 0.571mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 19, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.96 \text{ mho/m}$ ;  $\epsilon_r = 50.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.2, 4.2, 4.2); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- Phantom: 1800/1900 Phantom; Type: SAM

**Body rear 1/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

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

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

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

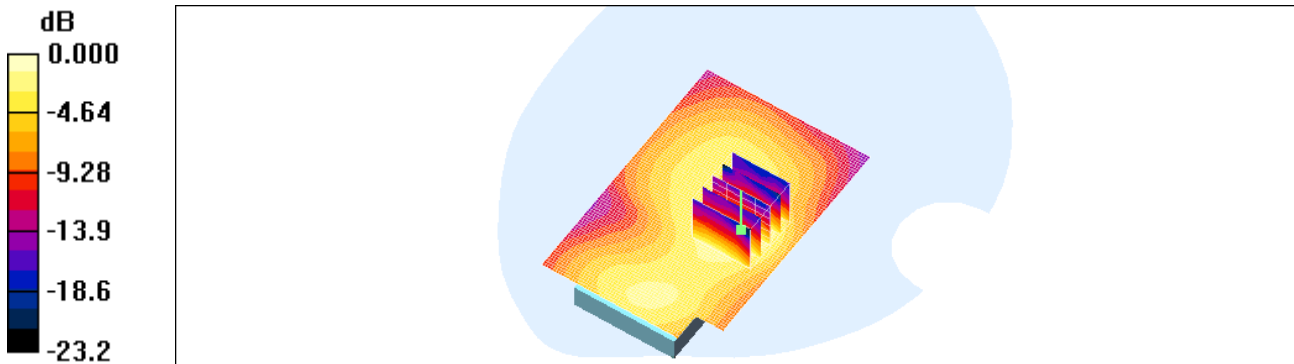
Reference Value = 3.28 V/m; Power Drift = 0.080 dB

Peak SAR (extrapolated) = 0.141 W/kg

**SAR(1 g) = 0.065 mW/g; SAR(10 g) = 0.034 mW/g**

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

Maximum value of SAR (measured) = 0.069 mW/g



0 dB = 0.069mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: PCS 1900MHz FCC; Frequency: 1908.75 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1908.75$  MHz;  $\sigma = 1.39$  mho/m;  $\epsilon_r = 39.1$ ;  $\rho = 1000$  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 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 1175/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.29 mW/g

**Right touch 1175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

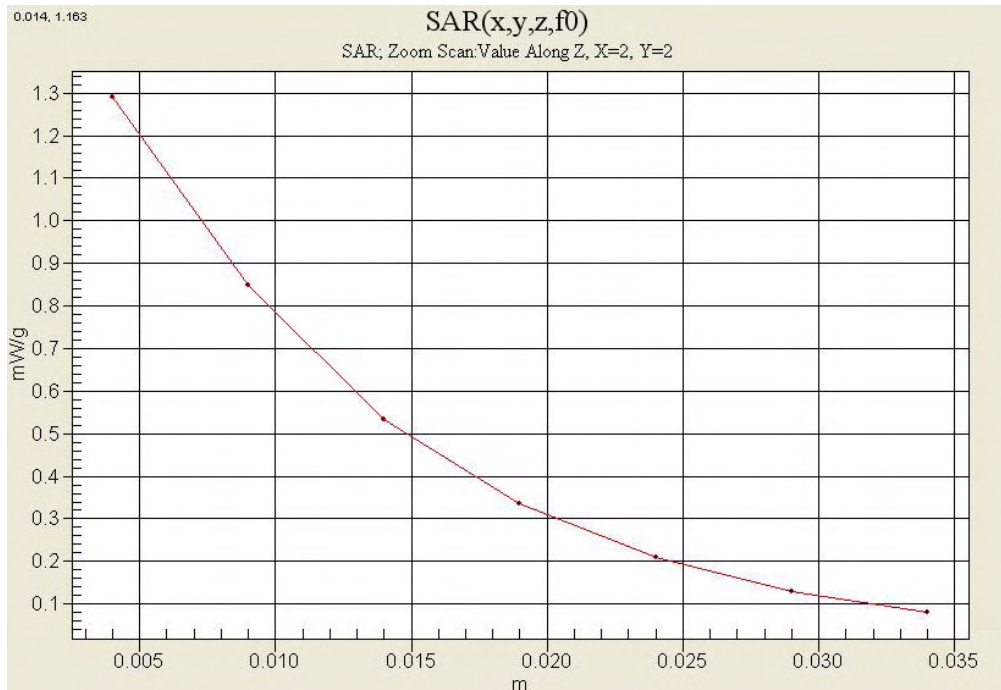
Reference Value = 25.3 V/m; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 1.74 W/kg

**SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.693 mW/g**

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

Maximum value of SAR (measured) = 1.29 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 8, 2011

**DUT: JukeB; Type: bar; Serial: #1**

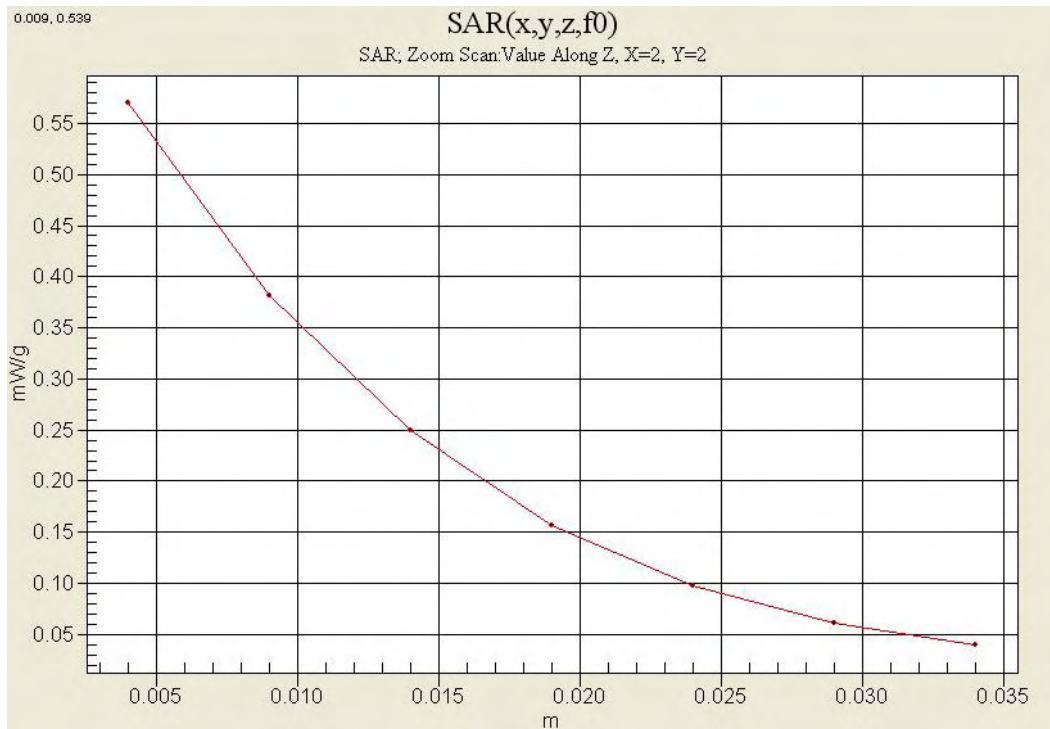
Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 55.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.6, 4.6, 4.6); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

**Body rear 600/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.558 mW/g

**Body rear 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 11.8 V/m; Power Drift = 0.021 dB  
Peak SAR (extrapolated) = 0.774 W/kg  
**SAR(1 g) = 0.532 mW/g; SAR(10 g) = 0.341 mW/g**  
Maximum value of SAR (measured) = 0.571 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 19, 2011

**DUT: JukeB; Type: bar; Serial: #1**

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

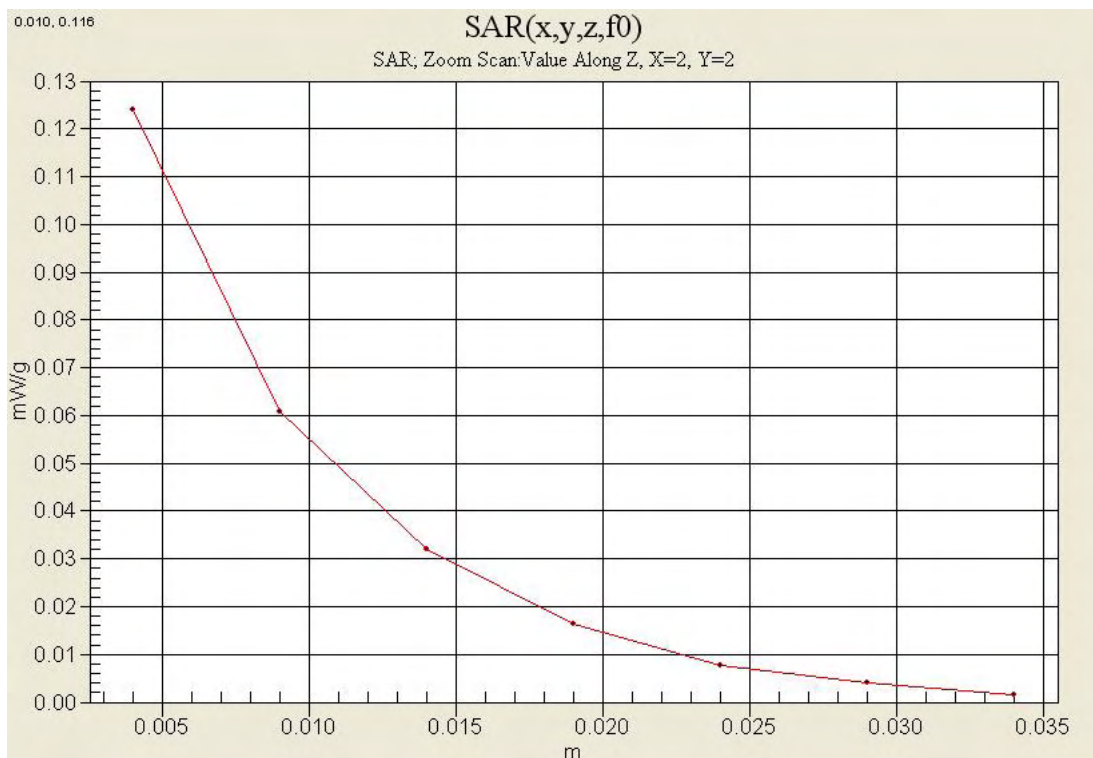
DASY4 Configuration:  
- Probe: ET3DV6 - SN1609; ConvF(4.61, 4.61, 4.61); Calibrated: 2010-11-24  
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29  
- Phantom: 1800/1900 Phantom; Type: SAM

**Right touch 1/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)  
Maximum value of SAR (interpolated) = 0.122 mW/g

**Right touch 1/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 4.82 V/m; Power Drift = -0.111 dB  
Peak SAR (extrapolated) = 0.264 W/kg  
**SAR(1 g) = 0.112 mW/g; SAR(10 g) = 0.052 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)  
Maximum value of SAR (measured) = 0.124 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: PCS CDMA Phone with Bluetooth/WLAN  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Sep. 19, 2011

**DUT: JukeB; Type: bar; Serial: #1**

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.96$  mho/m;  $\epsilon_r = 50.8$ ;  $\rho = 1000$  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 - SN1609; ConvF(4.2, 4.2, 4.2); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- Phantom: 1800/1900 Phantom; Type: SAM

**Body rear 1/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

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

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

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

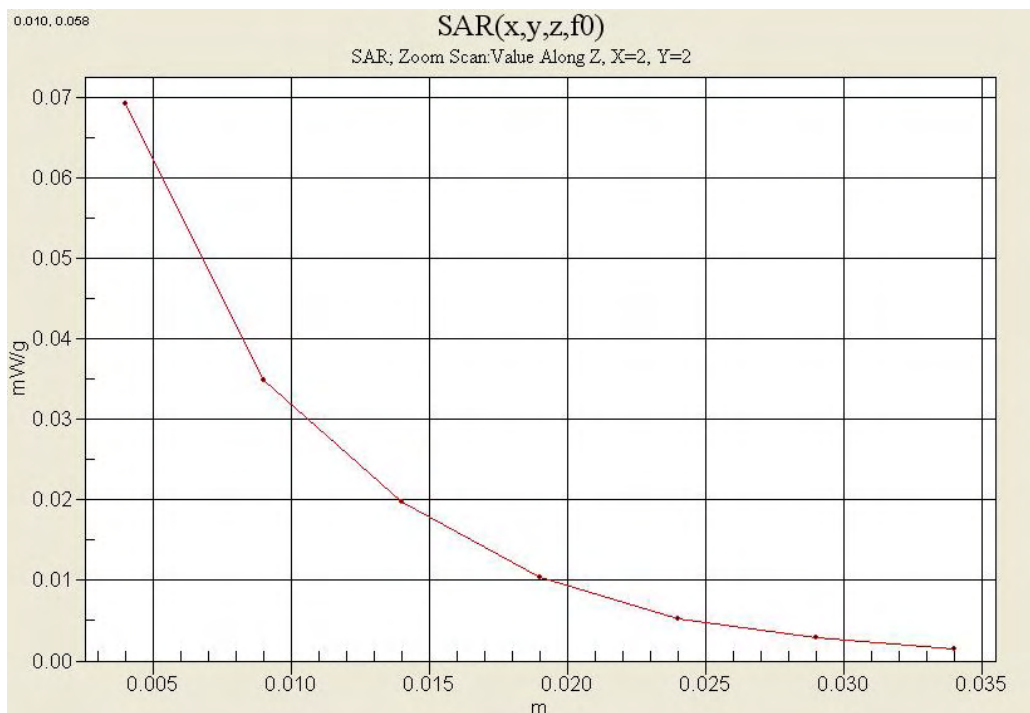
Reference Value = 3.28 V/m; Power Drift = 0.080 dB

Peak SAR (extrapolated) = 0.141 W/kg

**SAR(1 g) = 0.065 mW/g; SAR(10 g) = 0.034 mW/g**

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

Maximum value of SAR (measured) = 0.069 mW/g



## Attachment 2. – Dipole Validation Plots

## ■ Validation Data (1900 MHz Head)

Test Laboratory: HCT CO., LTD  
Input Power 100 mW (20 dBm)  
Liquid Temp: 21.1 °C  
Test Date: Sep. 8, 2011

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

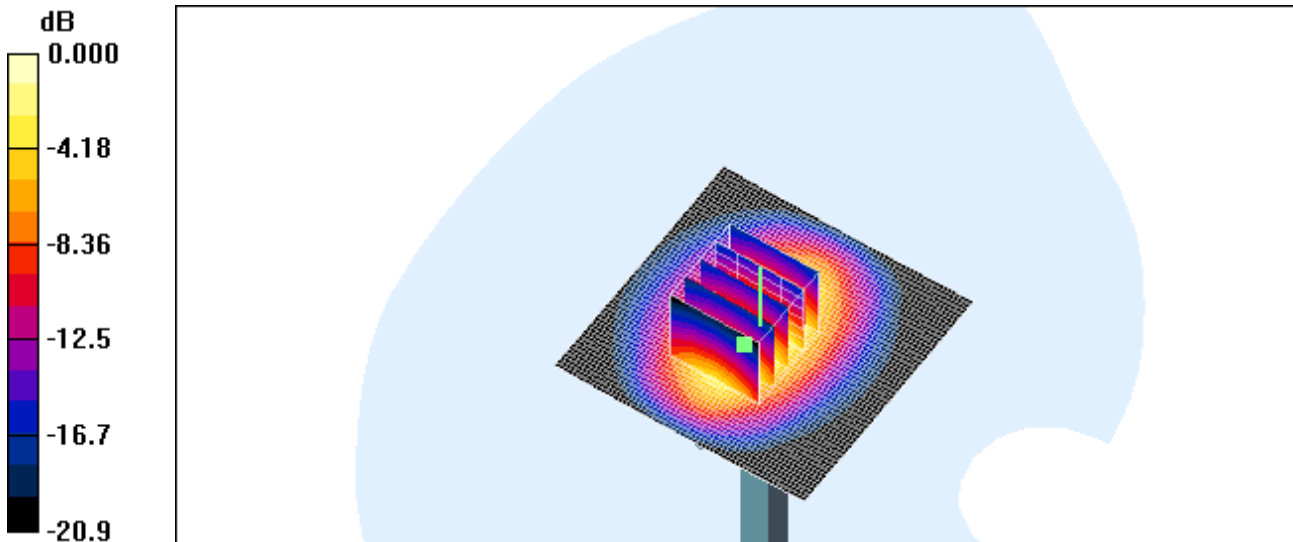
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.38$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Dipole 1900MHz Validation/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 4.61 mW/g

**Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 58.9 V/m; Power Drift = -0.025 dB  
Peak SAR (extrapolated) = 7.18 W/kg  
**SAR(1 g) = 3.96 mW/g; SAR(10 g) = 2.02 mW/g**  
Maximum value of SAR (measured) = 4.46 mW/g



0 dB = 4.46mW/g

## ■ Validation Data (1900 MHz Body)

Test Laboratory: HCT CO., LTD  
Input Power 100 mW (20 dBm)  
Liquid Temp: 21.1 °C  
Test Date: Sep. 8, 2011

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

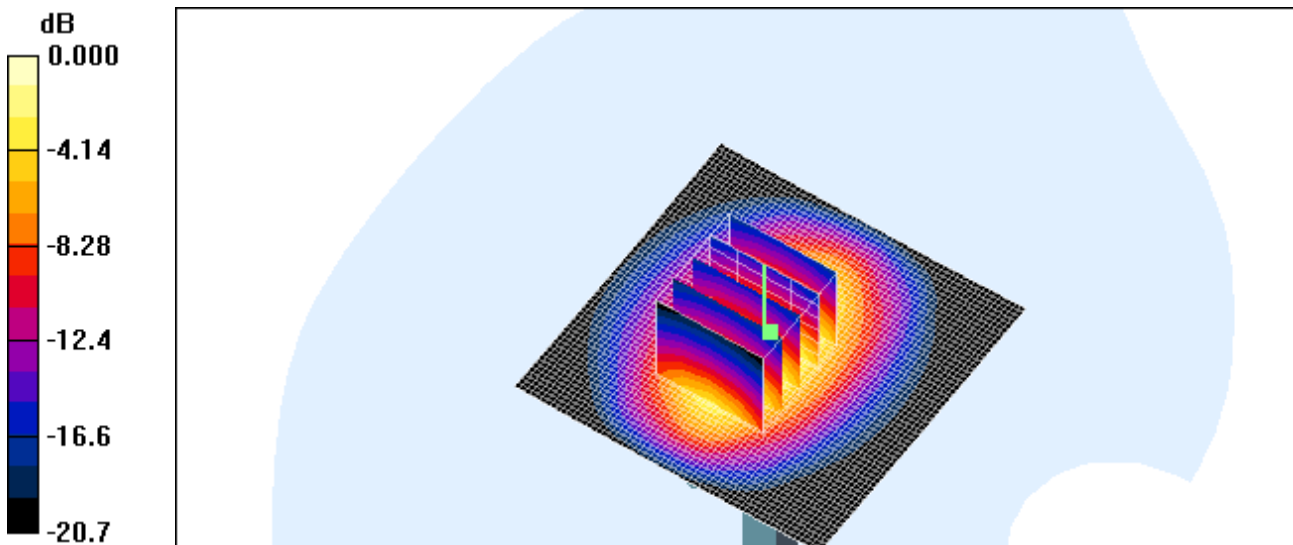
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 55.3$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(4.6, 4.6, 4.6); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- 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) = 4.81 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 = 59.5 V/m; Power Drift = -0.008 dB  
Peak SAR (extrapolated) = 6.72 W/kg  
**SAR(1 g) = 4.08 mW/g; SAR(10 g) = 2.12 mW/g**  
Maximum value of SAR (measured) = 4.64 mW/g



0 dB = 4.64mW/g

## ■ Validation Data (2450 MHz Head)

Test Laboratory: HCT CO., LTD  
Input Power 100 mW (20 dBm)  
Liquid Temp: 21.1 °C  
Test Date: Sep. 19, 2011

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

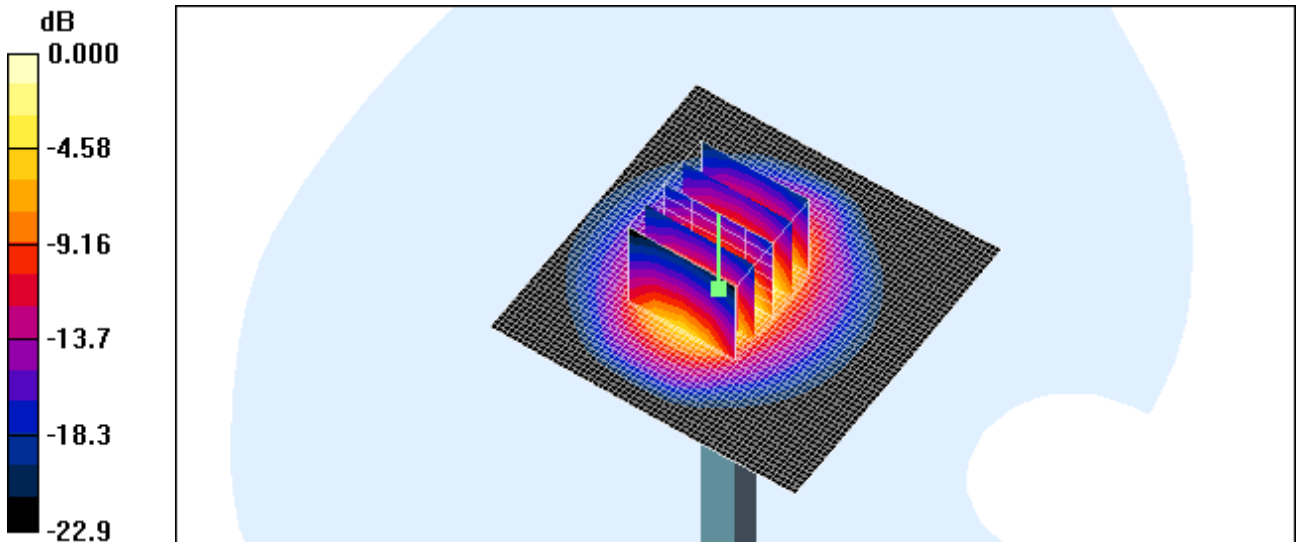
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.85$  mho/m;  $\epsilon_r = 38.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(4.61, 4.61, 4.61); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Validation 2450MHz/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 6.65 mW/g

**Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 60.3 V/m; Power Drift = -0.105 dB  
Peak SAR (extrapolated) = 12.4 W/kg  
**SAR(1 g) = 5.44 mW/g; SAR(10 g) = 2.5 mW/g**  
Maximum value of SAR (measured) = 5.94 mW/g



0 dB = 5.94mW/g

## ■ Validation Data (2450 MHz Body)

Test Laboratory: HCT CO., LTD  
Input Power 100 mW (20 dBm)  
Liquid Temp: 21.1 °C  
Test Date: Sep. 19, 2011

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

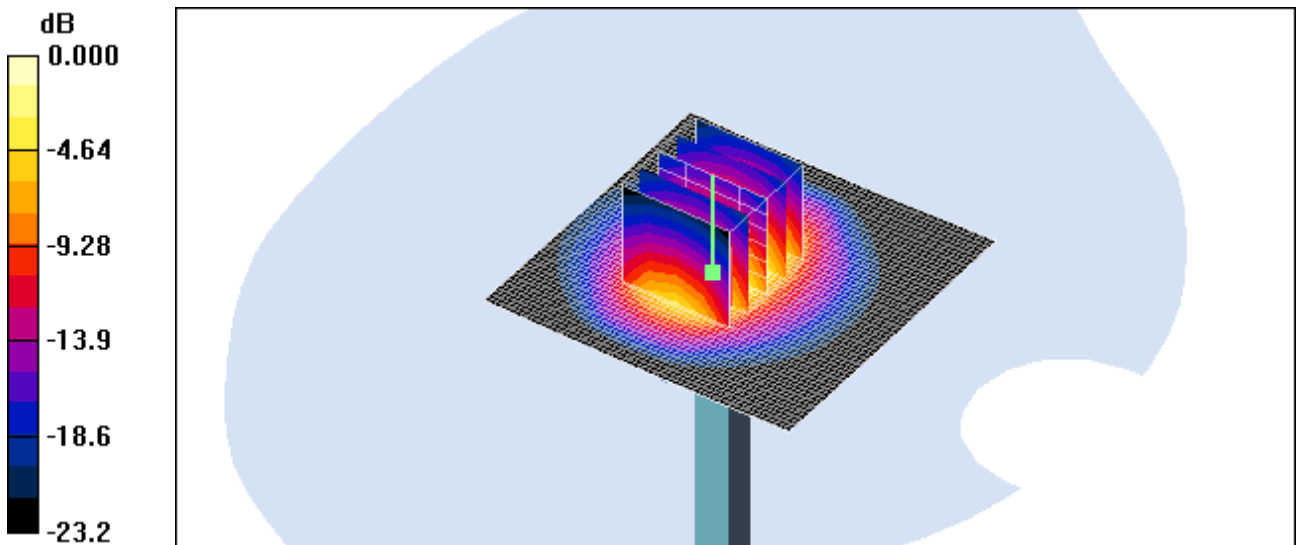
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 2.01 \text{ mho/m}$ ;  $\epsilon_r = 50.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(4.2, 4.2, 4.2); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Validation 2450MHz/Area Scan (61x61x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 6.37 mW/g

**Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 57.1 V/m; Power Drift = -0.029 dB  
Peak SAR (extrapolated) = 11.5 W/kg  
**SAR(1 g) = 5.19 mW/g; SAR(10 g) = 2.39 mW/g**  
Maximum value of SAR (measured) = 5.70 mW/g



0 dB = 5.70mW/g

## ■ Dielectric Parameter (1900 MHz Head)

Title JukeB  
 SubTitle 1900(Head)  
 Test Date Sep. 8,2011

| Frequency       | e'      | e''     |
|-----------------|---------|---------|
| 1800000000.0000 | 39.5448 | 12.8075 |
| 1810000000.0000 | 39.4996 | 12.8301 |
| 1820000000.0000 | 39.4606 | 12.8610 |
| 1830000000.0000 | 39.4293 | 12.9022 |
| 1840000000.0000 | 39.3879 | 12.9346 |
| 1850000000.0000 | 39.3596 | 12.9619 |
| 1860000000.0000 | 39.3120 | 12.9803 |
| 1870000000.0000 | 39.2863 | 13.0031 |
| 1880000000.0000 | 39.2481 | 13.0279 |
| 1890000000.0000 | 39.2097 | 13.0646 |
| 1900000000.0000 | 39.1693 | 13.0820 |
| 1910000000.0000 | 39.1136 | 13.1152 |
| 1920000000.0000 | 39.0875 | 13.1560 |
| 1930000000.0000 | 39.0422 | 13.1741 |
| 1940000000.0000 | 39.0090 | 13.2225 |
| 1950000000.0000 | 38.9716 | 13.2357 |
| 1960000000.0000 | 38.9247 | 13.2727 |
| 1970000000.0000 | 38.8869 | 13.2952 |
| 1980000000.0000 | 38.8440 | 13.3124 |
| 1990000000.0000 | 38.7997 | 13.3656 |
| 2000000000.0000 | 38.7799 | 13.3881 |

**■ Dielectric Parameter (1900 MHz Body)**

Title JukeB  
SubTitle 1900(Body)  
Test Date Sep. 8,2011

| Frequency       | e'      | e''     |
|-----------------|---------|---------|
| 1850000000.0000 | 55.4102 | 13.8961 |
| 1855000000.0000 | 55.3946 | 13.9262 |
| 1860000000.0000 | 55.3756 | 13.9100 |
| 1865000000.0000 | 55.3526 | 13.9182 |
| 1870000000.0000 | 55.3314 | 13.9324 |
| 1875000000.0000 | 55.3248 | 13.9498 |
| 1880000000.0000 | 55.3098 | 13.9724 |
| 1885000000.0000 | 55.3128 | 13.9840 |
| 1890000000.0000 | 55.2947 | 14.0037 |
| 1895000000.0000 | 55.2909 | 14.0181 |
| 1900000000.0000 | 55.2813 | 14.0339 |
| 1905000000.0000 | 55.2880 | 14.0671 |
| 1910000000.0000 | 55.2885 | 14.0667 |
| 1915000000.0000 | 55.2820 | 14.0695 |
| 1920000000.0000 | 55.2668 | 14.0694 |
| 1925000000.0000 | 55.2587 | 14.0756 |
| 1930000000.0000 | 55.2580 | 14.0965 |
| 1935000000.0000 | 55.2558 | 14.0843 |
| 1940000000.0000 | 55.2386 | 14.0892 |
| 1945000000.0000 | 55.2151 | 14.0690 |
| 1950000000.0000 | 55.1868 | 14.0667 |

## ■ Dielectric Parameter (2450 MHz Head)

Title JukeB  
 SubTitle 2450(Head)  
 Test Date Sep. 19, 2011

| Frequency       | e'      | e''     |
|-----------------|---------|---------|
| 2400000000.0000 | 38.6212 | 13.4818 |
| 2405000000.0000 | 38.6113 | 13.4992 |
| 2410000000.0000 | 38.5891 | 13.5046 |
| 2415000000.0000 | 38.5621 | 13.5141 |
| 2420000000.0000 | 38.5407 | 13.5301 |
| 2425000000.0000 | 38.5211 | 13.5446 |
| 2430000000.0000 | 38.4936 | 13.5492 |
| 2435000000.0000 | 38.4834 | 13.5645 |
| 2440000000.0000 | 38.4638 | 13.5682 |
| 2445000000.0000 | 38.4436 | 13.5809 |
| 2450000000.0000 | 38.4097 | 13.5967 |
| 2455000000.0000 | 38.4042 | 13.6166 |
| 2460000000.0000 | 38.3847 | 13.6260 |
| 2465000000.0000 | 38.3725 | 13.6240 |
| 2470000000.0000 | 38.3344 | 13.6437 |
| 2475000000.0000 | 38.3197 | 13.6384 |
| 2480000000.0000 | 38.2880 | 13.6584 |
| 2485000000.0000 | 38.2813 | 13.6686 |
| 2490000000.0000 | 38.2628 | 13.6778 |
| 2495000000.0000 | 38.2499 | 13.6932 |
| 2500000000.0000 | 38.2241 | 13.6867 |

## ■ Dielectric Parameter (2450 MHz Body)

Title JukeB  
 SubTitle 2450(Body)  
 Test Date Sep. 19, 2011

| Frequency       | e'      | e''     |
|-----------------|---------|---------|
| 2400000000.0000 | 50.8831 | 14.6188 |
| 2405000000.0000 | 50.8604 | 14.6270 |
| 2410000000.0000 | 50.8392 | 14.6300 |
| 2415000000.0000 | 50.8230 | 14.6491 |
| 2420000000.0000 | 50.8151 | 14.6656 |
| 2425000000.0000 | 50.7942 | 14.6650 |
| 2430000000.0000 | 50.7742 | 14.6891 |
| 2435000000.0000 | 50.7699 | 14.7017 |
| 2440000000.0000 | 50.7717 | 14.7400 |
| 2445000000.0000 | 50.7506 | 14.7292 |
| 2450000000.0000 | 50.7367 | 14.7539 |
| 2455000000.0000 | 50.7180 | 14.7625 |
| 2460000000.0000 | 50.7068 | 14.7769 |
| 2465000000.0000 | 50.7153 | 14.7891 |
| 2470000000.0000 | 50.7045 | 14.8032 |
| 2475000000.0000 | 50.6839 | 14.7854 |
| 2480000000.0000 | 50.6569 | 14.7978 |
| 2485000000.0000 | 50.6568 | 14.8137 |
| 2490000000.0000 | 50.6389 | 14.8151 |
| 2495000000.0000 | 50.6248 | 14.8193 |
| 2500000000.0000 | 50.6101 | 14.8169 |

## Attachment 3. – Probe Calibration Data

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



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

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **ET3-1609\_Nov10**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1609**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v6, QA CAL-23.v3 and QA CAL-25.v2**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **November 24, 2010**

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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID #            | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Power sensor E4412A        | MY41495277      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Power sensor E4412A        | MY41498087      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 30-Mar-10 (No. 217-01159)         | Mar-11                 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 30-Mar-10 (No. 217-01161)         | Mar-11                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 30-Mar-10 (No. 217-01160)         | Mar-11                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-09 (No. ES3-3013_Dec09)    | Dec-10                 |
| DAE4                       | SN: 660         | 20-Apr-10 (No. DAE4-660_Apr10)    | Apr-11                 |
| Secondary Standards        | ID #            | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Oct-09)  | In house check: Oct-11 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-10) | In house check: Oct-11 |

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

Issued: November 25, 2010

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

Certificate No: ET3-1609\_Nov10

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**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)

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

**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 $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ 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  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  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 effect the  $E^2$ -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.
- 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:1609

November 24, 2010

# Probe ET3DV6

## SN:1609

|                  |                   |
|------------------|-------------------|
| Manufactured:    | July 21, 2001     |
| Last calibrated: | March 17, 2009    |
| Modified:        | November 17, 2010 |
| Recalibrated:    | November 24, 2010 |

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1609

November 24, 2010

## DASY/EASY - Parameters of Probe: ET3DV6 SN:1609

### Basic Calibration Parameters

|                                       | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu V/(V/m)^2$ ) <sup>A</sup> | 1.98     | 1.88     | 1.83     | ± 10.1%   |
| DCP (mV) <sup>B</sup>                 | 99.1     | 97.1     | 98.2     |           |

### Modulation Calibration Parameters

| UID   | Communication System Name | PAR  |   | A<br>dB | B<br>dBuV | C    | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-------|---------------------------|------|---|---------|-----------|------|----------|---------------------------|
| 10000 | CW                        | 0.00 | X | 0.00    | 0.00      | 1.00 | 152.5    | ± 2.6 %                   |
|       |                           |      | Y | 0.00    | 0.00      | 1.00 | 144.6    |                           |
|       |                           |      | Z | 0.00    | 0.00      | 1.00 | 150.5    |                           |

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>E</sup> Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

ET3DV6 SN:1609

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## DASY/EASY - Parameters of Probe: ET3DV6 SN:1609

### Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>C</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 300     | ± 50 / ± 100                | 45.3 ± 5%    | 0.87 ± 5%    | 7.94    | 7.94    | 7.94    | 0.30  | 1.54 ± 13.3%    |
| 450     | ± 50 / ± 100                | 43.5 ± 5%    | 0.87 ± 5%    | 7.13    | 7.13    | 7.13    | 0.21  | 2.35 ± 13.3%    |
| 835     | ± 50 / ± 100                | 41.5 ± 5%    | 0.90 ± 5%    | 6.27    | 6.27    | 6.27    | 0.52  | 2.06 ± 11.0%    |
| 900     | ± 50 / ± 100                | 41.5 ± 5%    | 0.97 ± 5%    | 6.15    | 6.15    | 6.15    | 0.42  | 2.33 ± 11.0%    |
| 1750    | ± 50 / ± 100                | 40.1 ± 5%    | 1.37 ± 5%    | 5.51    | 5.51    | 5.51    | 0.53  | 2.63 ± 11.0%    |
| 1900    | ± 50 / ± 100                | 40.0 ± 5%    | 1.40 ± 5%    | 5.26    | 5.26    | 5.26    | 0.68  | 2.21 ± 11.0%    |
| 1950    | ± 50 / ± 100                | 40.0 ± 5%    | 1.40 ± 5%    | 5.05    | 5.05    | 5.05    | 0.70  | 2.24 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 39.2 ± 5%    | 1.80 ± 5%    | 4.61    | 4.61    | 4.61    | 0.99  | 1.70 ± 11.0%    |

<sup>C</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1609

November 24, 2010

## DASY/EASY - Parameters of Probe: ET3DV6 SN:1609

### Calibration Parameter Determined in Body Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>C</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 300     | ± 50 / ± 100                | 58.2 ± 5%    | 0.92 ± 5%    | 7.65    | 7.65    | 7.65    | 0.28  | 2.26 ± 13.3%    |
| 450     | ± 50 / ± 100                | 56.7 ± 5%    | 0.94 ± 5%    | 7.50    | 7.50    | 7.50    | 0.15  | 2.30 ± 13.3%    |
| 835     | ± 50 / ± 100                | 55.2 ± 5%    | 0.97 ± 5%    | 6.12    | 6.12    | 6.12    | 0.54  | 2.10 ± 11.0%    |
| 900     | ± 50 / ± 100                | 55.0 ± 5%    | 1.05 ± 5%    | 6.05    | 6.05    | 6.05    | 0.42  | 2.49 ± 11.0%    |
| 1750    | ± 50 / ± 100                | 53.4 ± 5%    | 1.49 ± 5%    | 4.83    | 4.83    | 4.83    | 0.60  | 3.10 ± 11.0%    |
| 1900    | ± 50 / ± 100                | 53.3 ± 5%    | 1.52 ± 5%    | 4.60    | 4.60    | 4.60    | 0.84  | 2.40 ± 11.0%    |
| 1950    | ± 50 / ± 100                | 53.3 ± 5%    | 1.52 ± 5%    | 4.74    | 4.74    | 4.74    | 0.85  | 2.50 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 52.7 ± 5%    | 1.95 ± 5%    | 4.20    | 4.20    | 4.20    | 0.99  | 1.82 ± 11.0%    |

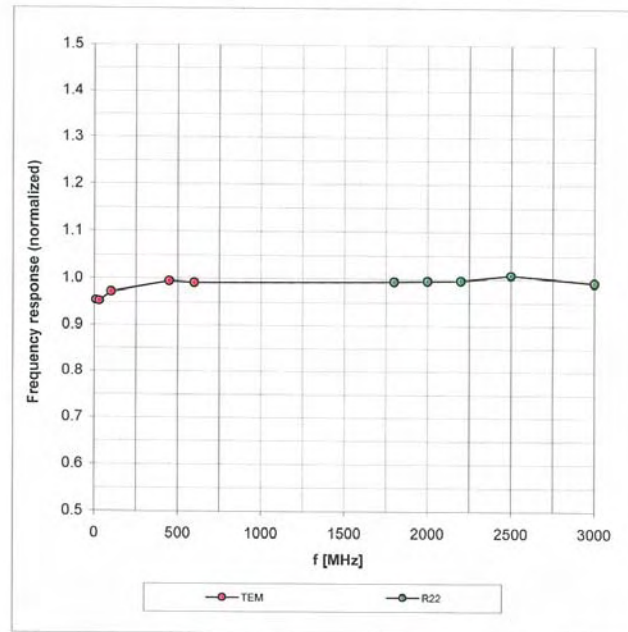
<sup>C</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1609

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## Frequency Response of E-Field

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

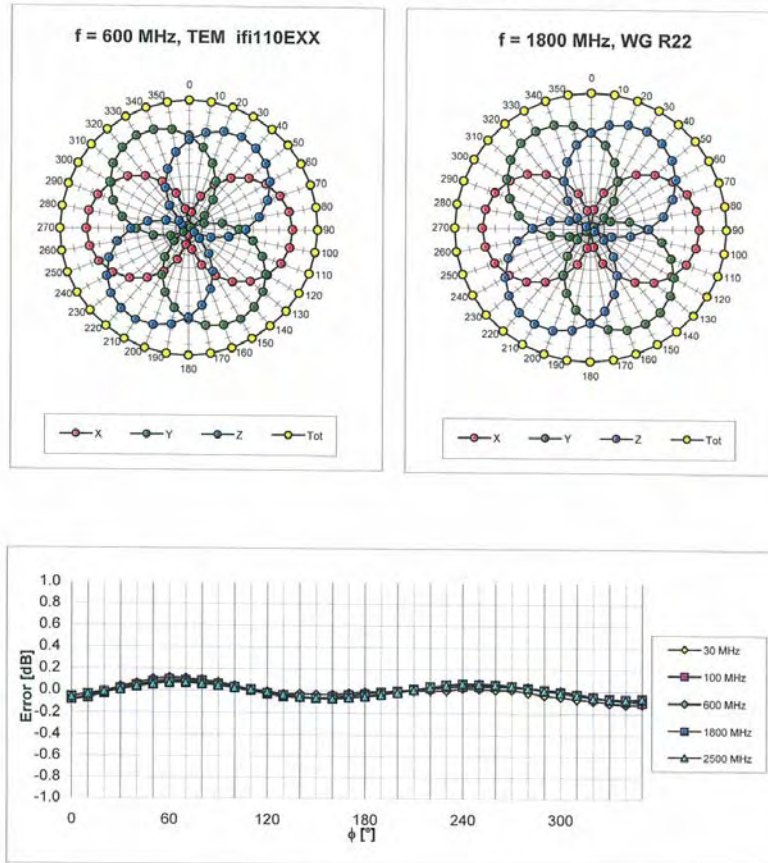


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

ET3DV6 SN:1609

November 24, 2010

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



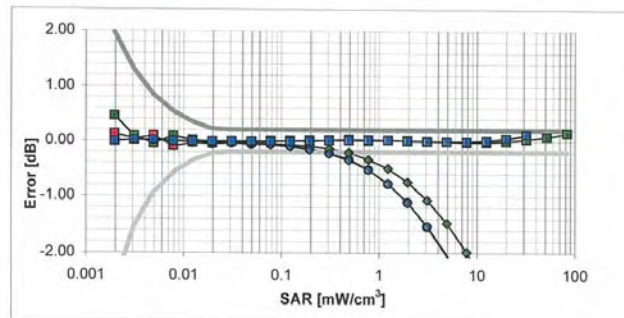
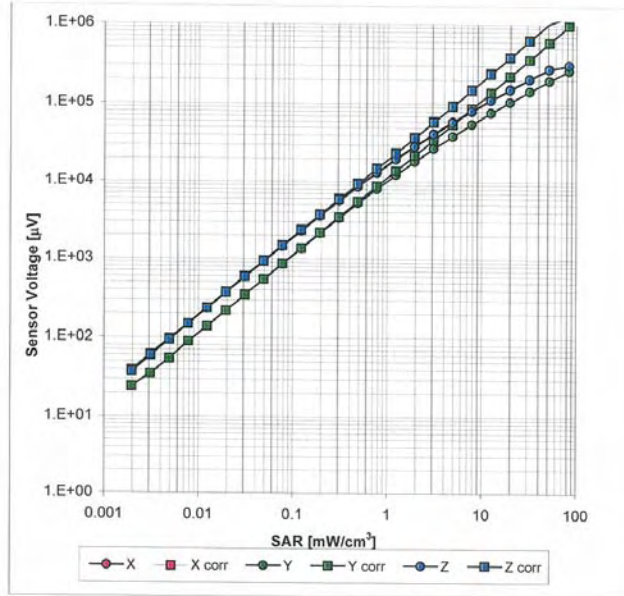
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

ET3DV6 SN:1609

November 24, 2010

### Dynamic Range $f(\text{SAR}_{\text{head}})$

(TEM cell,  $f = 900 \text{ MHz}$ )

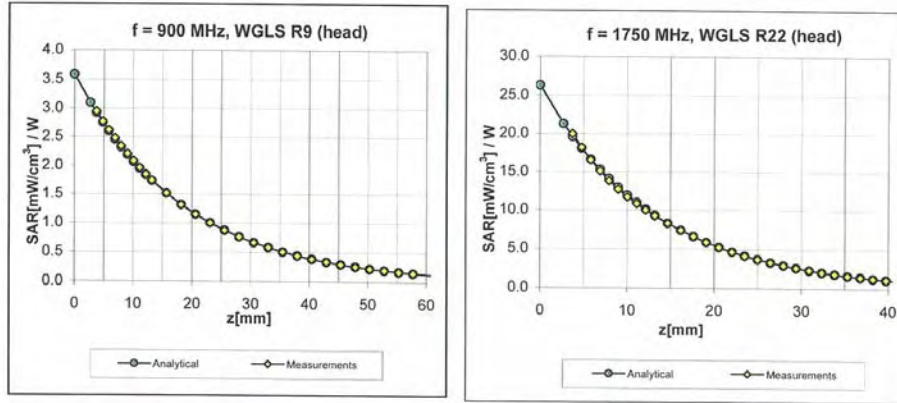


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

ET3DV6 SN:1609

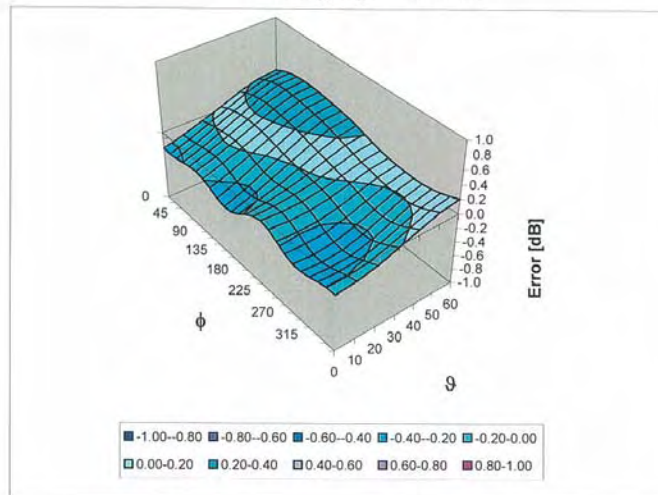
November 24, 2010

## Conversion Factor Assessment



## Deviation from Isotropy in HSL

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



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  (k=2)

ET3DV6 SN:1609

November 24, 2010

**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 | 3.7 mm         |

Schmid &amp; Partner Engineering AG

**s p e a g**Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone +41 44 245 9700, Fax +41 44 245 9779  
info@speag.com, <http://www.speag.com>

### Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1609

Place of Assessment:

Zurich

Date of Assessment:

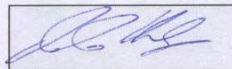
November 26, 2010

Probe Calibration Date:

November 24, 2010

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

Assessed by:



ET3DV6-SN:1609

Page 1 of 2

November 26, 2010

Schmid & Partner Engineering AG

**s p e a g**

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

**Dosimetric E-Field Probe ET3DV6 SN:1609**

Conversion factor ( $\pm$  standard deviation)

**150  $\pm$  50 MHz**      *СолвF*      **8.4  $\pm$  10%**

$\epsilon_r = 52.3$   
 $\sigma = 0.76$  mho/m  
(head tissue)

**150  $\pm$  50 MHz**      *СолвF*      **8.1  $\pm$  10%**

$\epsilon_r = 61.9$   
 $\sigma = 0.80$  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 DASY4 Manual.**

## Attachment 4. – Dipole Calibration Data

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



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**C** Service suisse d'étalonnage  
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **D1900V2-5d032\_Jul11**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d032**

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

Calibration date: **July 22, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A        | GB37480704         | 06-Oct-10 (No. 217-01266)         | Oct-11                 |
| Power sensor HP 8481A       | US37292783         | 06-Oct-10 (No. 217-01266)         | Oct-11                 |
| Reference 20 dB Attenuator  | SN: S5086 (20b)    | 29-Mar-11 (No. 217-01367)         | Apr-12                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 29-Mar-11 (No. 217-01371)         | Apr-12                 |
| Reference Probe ES3DV3      | SN: 3205           | 29-Apr-11 (No. ES3-3205_Apr11)    | Apr-12                 |
| DAE4                        | SN: 601            | 04-Jul-11 (No. DAE4-601_Jul11)    | Jul-12                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power sensor HP 8481A       | MY41092317         | 18-Oct-02 (in house check Oct-09) | In house check: Oct-11 |
| RF generator R&S SMT-06     | 100005             | 04-Aug-99 (in house check Oct-09) | In house check: Oct-11 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-10) | In house check: Oct-11 |

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

Issued: August 2, 2011

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

Accreditation No.: SCS 108

**Glossary:**

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

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

- 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:**

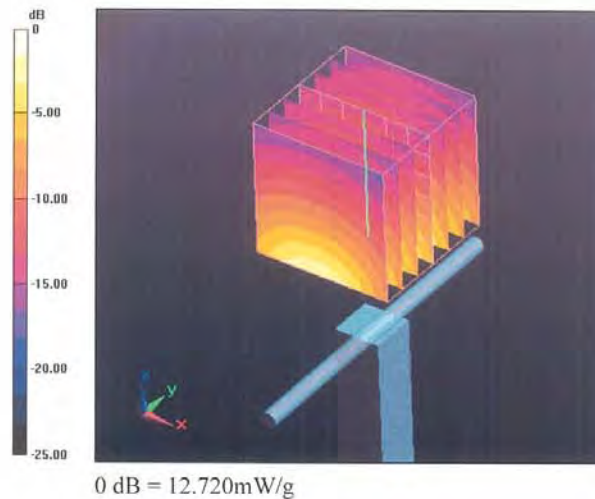
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

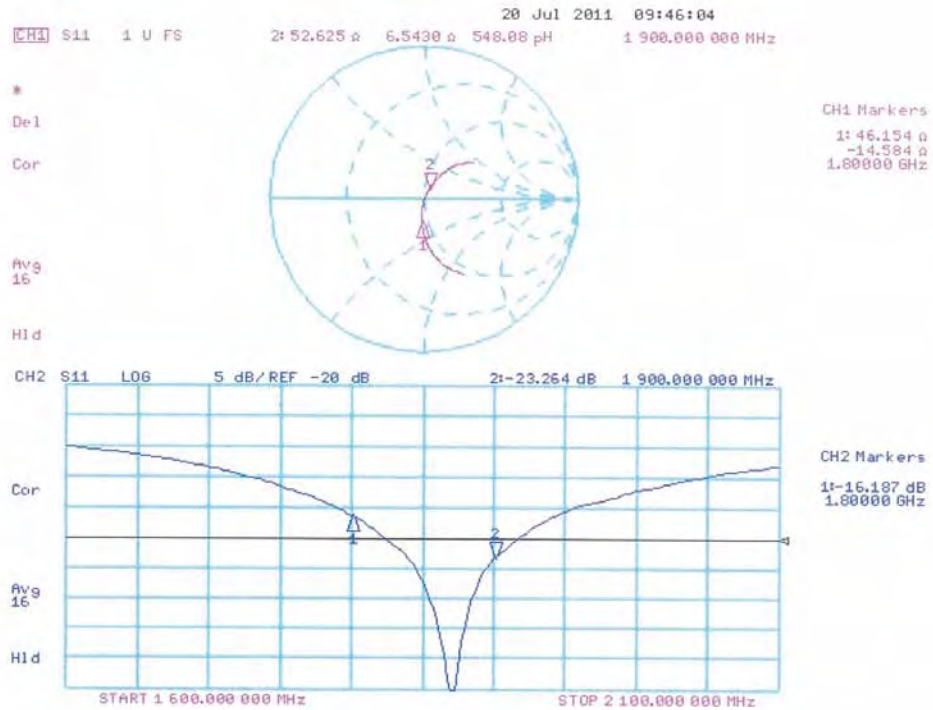
Peak SAR (extrapolated) = 18.469 W/kg

**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:**

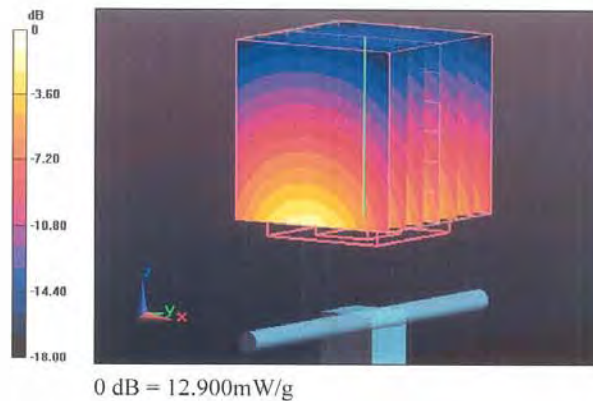
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

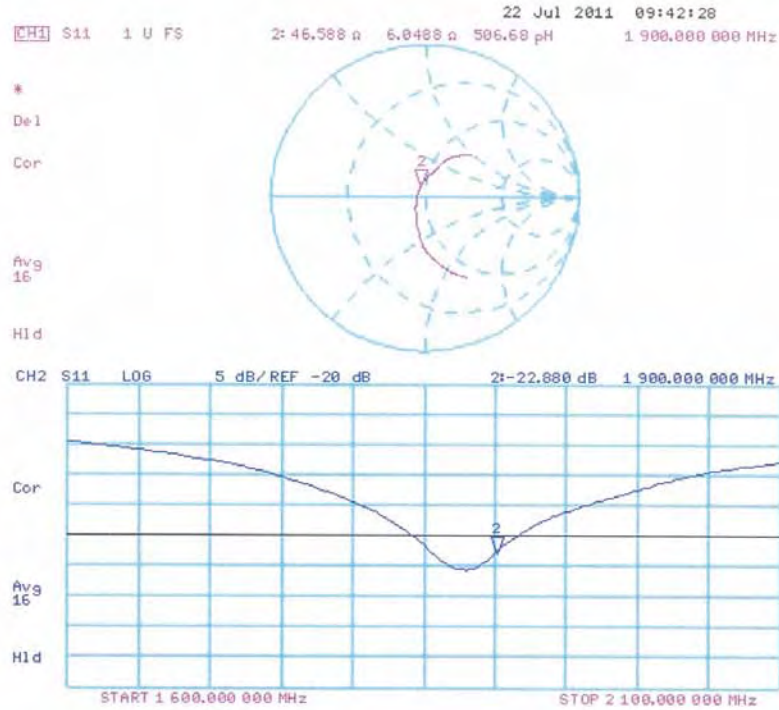
Peak SAR (extrapolated) = 18.111 W/kg

**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**



**Calibration Laboratory of**  
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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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A        | GB37480704         | 06-Oct-10 (No. 217-01266)         | Oct-11                 |
| Power sensor HP 8481A       | US37292783         | 06-Oct-10 (No. 217-01266)         | Oct-11                 |
| Reference 20 dB Attenuator  | SN: S5086 (20b)    | 29-Mar-11 (No. 217-01367)         | Apr-12                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 29-Mar-11 (No. 217-01371)         | Apr-12                 |
| Reference Probe ES3DV3      | SN: 3205           | 29-Apr-11 (No. ES3-3205_Apr11)    | Apr-12                 |
| DAE4                        | SN: 601            | 04-Jul-11 (No. DAE4-601_Jul11)    | Jul-12                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power sensor HP 8481A       | MY41092317         | 18-Oct-02 (in house check Oct-09) | In house check: Oct-11 |
| RF generator R&S SMT-06     | 100005             | 04-Aug-99 (in house check Oct-09) | In house check: Oct-11 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-10) | In house check: Oct-11 |

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

Issued: August 29, 2011

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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:**

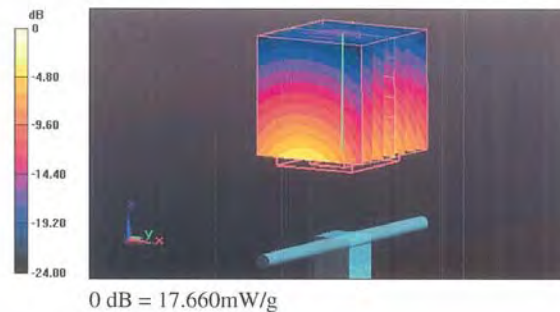
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

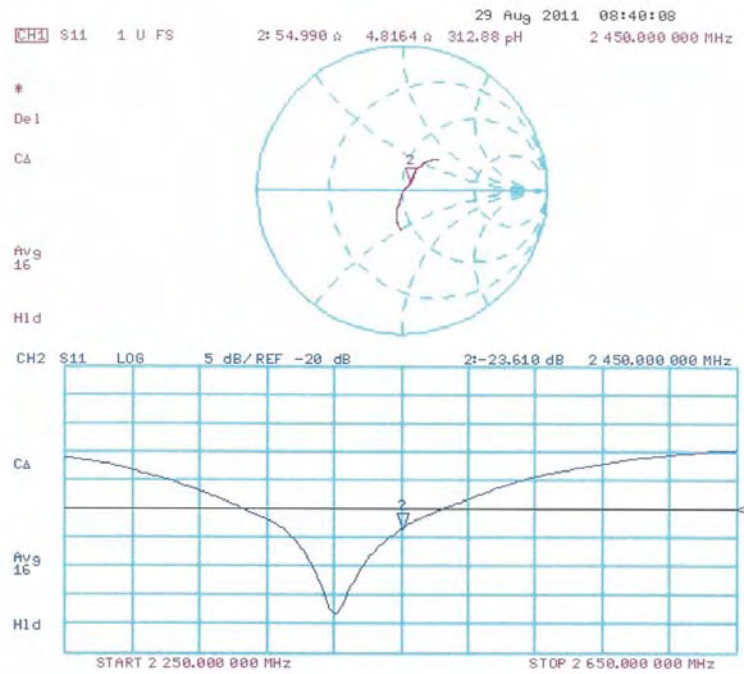
Peak SAR (extrapolated) = 28.291 W/kg

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

Maximum value of SAR (measured) = 17.657 mW/g



**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:**

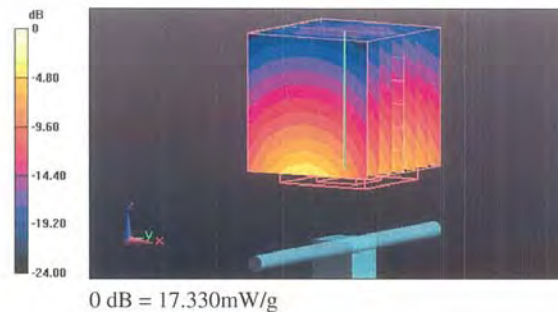
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.903 V/m; Power Drift = -0.0051 dB

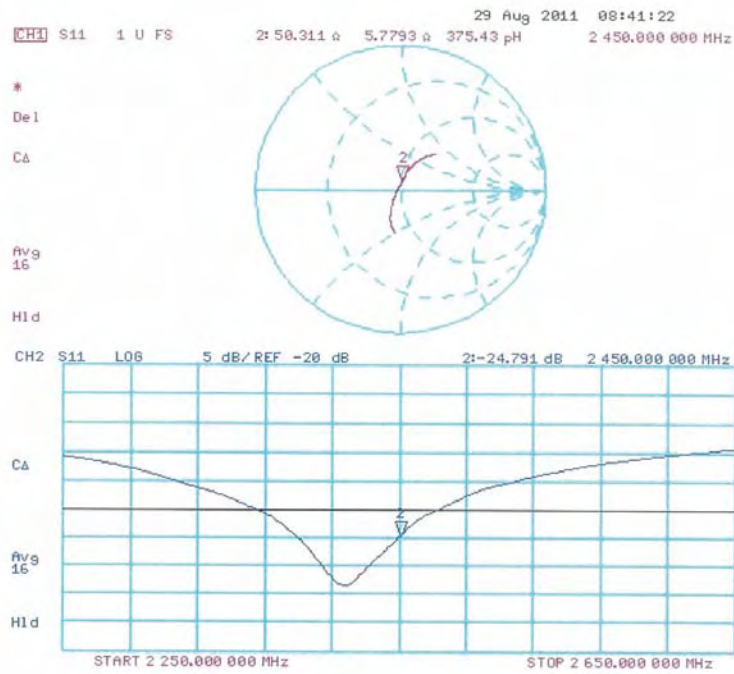
Peak SAR (extrapolated) = 27.107 W/kg

**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**



## **Attachment 5. – DAE Calibration Data**

Schmid &amp; Partner Engineering AG

**s p e a g**Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone +41 44 245 9700, Fax +41 44 245 9779  
info@speag.com, <http://www.speag.com>

## IMPORTANT NOTICE

### USAGE OF THE DAE 4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

**Battery Exchange:** The battery cover of the DAE4 unit is closed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

**Shipping of the DAE:** Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

**E-Stop Failures:** Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

**Repair:** Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

**DASY Configuration Files:** Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

**Important Note:**

**Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.**

**Important Note:**

**Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.**

**Important Note:**

**To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.**

Schmid &amp; Partner Engineering

TN\_BR040315AD DAE4.doc

11.12.2009

**Calibration Laboratory of**  
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Zeughausstrasse 43, 8004 Zurich, Switzerland



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Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **DAE4-869\_Sep10**

## CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BJ - SN: 869**

Calibration procedure(s) **QA CAL-06.v22**  
**Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **September 21, 2010**

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  |
|-------------------------------|--------------------|----------------------------|------------------------|
| Keithley Multimeter Type 2001 | SN: 0810278        | 1-Oct-09 (No: 9055)        | Oct-10                 |
| Secondary Standards           | ID #               | Check Date (in house)      | Scheduled Check        |
| Calibrator Box V1.1           | SE UMS 006 AB 1004 | 07-Jun-10 (in house check) | In house check: Jun-11 |

|                |                   |              |           |
|----------------|-------------------|--------------|-----------|
|                | Name              | Function     | Signature |
| Calibrated by: | Dominique Steffen | Technician   |           |
| Approved by:   | Fin Bornholt      | R&D Director |           |

Issued: September 21, 2010

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Accreditation No.: **SCS 108**

### Glossary

**DAE** data acquisition electronics  
**Connector angle** information used in DASY system to align probe sensor X to the robot coordinate system.

### Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
  - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
  - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
  - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
  - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
  - **Power consumption:** Typical value for information. Supply currents in various operating modes.

#### DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V, full range = -100...+300 mV

Low Range: 1LSB = 61nV, full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X                        | Y                        | Z                        |
|---------------------|--------------------------|--------------------------|--------------------------|
| High Range          | 405.027 $\pm$ 0.1% (k=2) | 405.247 $\pm$ 0.1% (k=2) | 406.181 $\pm$ 0.1% (k=2) |
| Low Range           | 3.98117 $\pm$ 0.7% (k=2) | 4.00201 $\pm$ 0.7% (k=2) | 4.01643 $\pm$ 0.7% (k=2) |

#### Connector Angle

|                                           |                                     |
|-------------------------------------------|-------------------------------------|
| Connector Angle to be used in DASY system | 153.0 $^{\circ}$ $\pm$ 1 $^{\circ}$ |
|-------------------------------------------|-------------------------------------|

**Appendix**
**1. DC Voltage Linearity**

| High Range        | Reading ( $\mu$ V) | Difference ( $\mu$ V) | Error (%) |
|-------------------|--------------------|-----------------------|-----------|
| Channel X + Input | 200006.5           | -3.68                 | -0.00     |
| Channel X + Input | 20000.75           | 1.05                  | 0.01      |
| Channel X - Input | -19996.97          | 2.23                  | -0.01     |
| Channel Y + Input | 200008.8           | -0.33                 | -0.00     |
| Channel Y + Input | 19999.91           | 0.51                  | 0.00      |
| Channel Y - Input | -19998.82          | 0.38                  | -0.00     |
| Channel Z + Input | 200005.3           | -3.05                 | -0.00     |
| Channel Z + Input | 19998.94           | -0.56                 | -0.00     |
| Channel Z - Input | -20002.60          | -2.40                 | 0.01      |

| Low Range         | Reading ( $\mu$ V) | Difference ( $\mu$ V) | Error (%) |
|-------------------|--------------------|-----------------------|-----------|
| Channel X + Input | 1999.4             | -0.47                 | -0.02     |
| Channel X + Input | 199.95             | -0.25                 | -0.13     |
| Channel X - Input | -200.76            | -0.96                 | 0.48      |
| Channel Y + Input | 2001.0             | 1.11                  | 0.06      |
| Channel Y + Input | 198.84             | -1.36                 | -0.68     |
| Channel Y - Input | -201.15            | -1.05                 | 0.52      |
| Channel Z + Input | 1999.8             | -0.11                 | -0.01     |
| Channel Z + Input | 199.31             | -0.69                 | -0.34     |
| Channel Z - Input | -200.60            | -0.60                 | 0.30      |

**2. Common mode sensitivity**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | Common mode Input Voltage (mV) | High Range Average Reading ( $\mu$ V) | Low Range Average Reading ( $\mu$ V) |
|-----------|--------------------------------|---------------------------------------|--------------------------------------|
| Channel X | 200                            | 18.06                                 | 16.34                                |
|           | - 200                          | -15.24                                | -16.90                               |
| Channel Y | 200                            | 7.51                                  | 7.12                                 |
|           | - 200                          | -9.32                                 | -9.53                                |
| Channel Z | 200                            | -1.22                                 | -1.02                                |
|           | - 200                          | -1.09                                 | -0.97                                |

**3. Channel separation**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | Input Voltage (mV) | Channel X ( $\mu$ V) | Channel Y ( $\mu$ V) | Channel Z ( $\mu$ V) |
|-----------|--------------------|----------------------|----------------------|----------------------|
| Channel X | 200                | -                    | 2.11                 | 0.27                 |
| Channel Y | 200                | 4.09                 | -                    | 4.93                 |
| Channel Z | 200                | 1.03                 | -1.93                | -                    |

**4. AD-Converter Values with inputs shorted**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | High Range (LSB) | Low Range (LSB) |
|-----------|------------------|-----------------|
| Channel X | 15923            | 15139           |
| Channel Y | 15988            | 15655           |
| Channel Z | 16096            | 15591           |

**5. Input Offset Measurement**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M $\Omega$ 

|           | Average ( $\mu$ V) | min. Offset ( $\mu$ V) | max. Offset ( $\mu$ V) | Std. Deviation ( $\mu$ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | 0.27               | -1.01                  | 1.57                   | 0.50                      |
| Channel Y | -0.83              | -3.43                  | 1.10                   | 0.73                      |
| Channel Z | -0.67              | -2.58                  | 1.13                   | 0.51                      |

**6. Input Offset Current**

Nominal Input circuitry offset current on all channels: &lt;25fA

**7. Input Resistance** (Typical values for information)

|           | Zeroing (kOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 200            | 200              |
| Channel Y | 200            | 200              |
| Channel Z | 200            | 200              |

**8. Low Battery Alarm Voltage** (Typical values for information)

| Typical values | Alarm Level (VDC) |
|----------------|-------------------|
| Supply (+ Vcc) | +7.9              |
| Supply (- Vcc) | -7.6              |

**9. Power Consumption** (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.01             | +6            | +14               |
| Supply (- Vcc) | -0.01             | -8            | -9                |

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Accreditation No.: SCS 108

Client: **Dynatec**Certificate No: **DAE3-479\_Aug11****CALIBRATION CERTIFICATE**Object: **DAE3 - SD 000 D03 BJ - SN: 479**Calibration procedure(s): **QA CAL-06 v23  
Calibration procedure for the data acquisition electronics (DAE)**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  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&amp;TE critical for calibration)

| Primary Standards             | ID #               | Cal Date (Certificate No.) | Scheduled Calibration  |
|-------------------------------|--------------------|----------------------------|------------------------|
| Keithley Multimeter Type 2001 | SN: 0810278        | 28-Sep-10 (No:10376)       | Sep-11                 |
| Secondary Standards           | ID #               | Check Date (in house)      | Scheduled Check        |
| Calibrator Box V1.1           | SE UMS 006 AB 1004 | 08-Jun-11 (in house check) | In house check: Jun-12 |

|                |                             |                               |               |
|----------------|-----------------------------|-------------------------------|---------------|
| Calibrated by: | Name<br><b>Eric Bräunli</b> | Function<br><b>Technician</b> | Signature<br> |
|----------------|-----------------------------|-------------------------------|---------------|

|              |                              |                                     |               |
|--------------|------------------------------|-------------------------------------|---------------|
| Approved by: | Name<br><b>Fin Bornholdt</b> | Function<br><b>R&amp;D Director</b> | Signature<br> |
|--------------|------------------------------|-------------------------------------|---------------|

Issued: August 29, 2011

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Certificate No: DAE3-479\_Aug11

Page 1 of 5

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Accreditation No.: **SCS 108**

## Glossary

**DAE** data acquisition electronics  
**Connector angle** information used in DASY system to align probe sensor X to the robot coordinate system.

## Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
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- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
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  - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
  - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
  - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
  - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
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  - **Power consumption:** Typical value for information. Supply currents in various operating modes.

### DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV, full range = -100...+300 mV

Low Range: 1LSB = 61nV, full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X                    | Y                    | Z                    |
|---------------------|----------------------|----------------------|----------------------|
| High Range          | 403.335 ± 0.1% (k=2) | 404.663 ± 0.1% (k=2) | 404.429 ± 0.1% (k=2) |
| Low Range           | 3.96166 ± 0.7% (k=2) | 3.96051 ± 0.7% (k=2) | 3.96781 ± 0.7% (k=2) |

### Connector Angle

|                                           |              |
|-------------------------------------------|--------------|
| Connector Angle to be used in DASY system | 71.5 ° ± 1 ° |
|-------------------------------------------|--------------|

## Appendix

### 1. DC Voltage Linearity

| High Range |         | Reading ( $\mu$ V) | Difference ( $\mu$ V) | Error (%) |
|------------|---------|--------------------|-----------------------|-----------|
| Channel X  | + Input | 200001.1           | -1.15                 | -0.00     |
| Channel X  | + Input | 20000.71           | 0.51                  | 0.00      |
| Channel X  | - Input | -19997.07          | 2.83                  | -0.01     |
| Channel Y  | + Input | 199999.0           | -2.17                 | -0.00     |
| Channel Y  | + Input | 19994.57           | -5.43                 | -0.03     |
| Channel Y  | - Input | -20001.85          | -2.15                 | 0.01      |
| Channel Z  | + Input | 200000.9           | 0.60                  | 0.00      |
| Channel Z  | + Input | 19997.56           | -3.14                 | -0.02     |
| Channel Z  | - Input | -19999.90          | 0.80                  | -0.00     |

| Low Range |         | Reading ( $\mu$ V) | Difference ( $\mu$ V) | Error (%) |
|-----------|---------|--------------------|-----------------------|-----------|
| Channel X | + Input | 1999.8             | -0.23                 | -0.01     |
| Channel X | + Input | 199.86             | 0.16                  | 0.08      |
| Channel X | - Input | -200.29            | -0.39                 | 0.19      |
| Channel Y | + Input | 1999.7             | -0.29                 | -0.01     |
| Channel Y | + Input | 199.31             | -0.69                 | -0.35     |
| Channel Y | - Input | -201.78            | -1.78                 | 0.89      |
| Channel Z | + Input | 1999.9             | -0.21                 | -0.01     |
| Channel Z | + Input | 199.27             | -0.63                 | -0.32     |
| Channel Z | - Input | -200.76            | -0.76                 | 0.38      |

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | Common mode Input Voltage (mV) | High Range Average Reading ( $\mu$ V) | Low Range Average Reading ( $\mu$ V) |
|-----------|--------------------------------|---------------------------------------|--------------------------------------|
| Channel X | 200                            | 18.40                                 | 16.77                                |
|           | - 200                          | -15.99                                | -17.76                               |
| Channel Y | 200                            | 7.13                                  | 6.81                                 |
|           | - 200                          | -8.07                                 | -8.70                                |
| Channel Z | 200                            | -7.24                                 | -7.73                                |
|           | - 200                          | 6.67                                  | 6.51                                 |

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | Input Voltage (mV) | Channel X ( $\mu$ V) | Channel Y ( $\mu$ V) | Channel Z ( $\mu$ V) |
|-----------|--------------------|----------------------|----------------------|----------------------|
| Channel X | 200                | -                    | 1.88                 | -1.20                |
| Channel Y | 200                | 2.40                 | -                    | 4.80                 |
| Channel Z | 200                | 1.65                 | -1.03                | -                    |

**4. AD-Converter Values with inputs shorted**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | High Range (LSB) | Low Range (LSB) |
|-----------|------------------|-----------------|
| Channel X | 15757            | 16312           |
| Channel Y | 16204            | 17522           |
| Channel Z | 15654            | 16295           |

**5. Input Offset Measurement**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec  
Input 10M $\Omega$ 

|           | Average ( $\mu$ V) | min. Offset ( $\mu$ V) | max. Offset ( $\mu$ V) | Std. Deviation ( $\mu$ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | 0.03               | -1.50                  | 3.01                   | 0.68                      |
| Channel Y | -0.72              | -2.15                  | 0.78                   | 0.66                      |
| Channel Z | -0.59              | -1.29                  | 0.70                   | 0.38                      |

**6. Input Offset Current**

Nominal Input circuitry offset current on all channels: &lt;25fA

**7. Input Resistance** (Typical values for information)

|           | Zeroing (k $\Omega$ m) | Measuring (M $\Omega$ m) |
|-----------|------------------------|--------------------------|
| Channel X | 200                    | 200                      |
| Channel Y | 200                    | 200                      |
| Channel Z | 200                    | 200                      |

**8. Low Battery Alarm Voltage** (Typical values for information)

| Typical values | Alarm Level (VDC) |
|----------------|-------------------|
| Supply (+ Vcc) | +7.9              |
| Supply (- Vcc) | -7.6              |

**9. Power Consumption** (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.01             | +6            | +14               |
| Supply (- Vcc) | -0.01             | -8            | -9                |