

# SAR TEST REPORT

HCT CO., LTD

EUT Type:	Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)		
FCC ID:	Q78-A415		
Model:	A415	Trade Name	ZTE CORPORATION
Date of Issue:	Mar.04, 2011		
Test report No.:	HCTA1103FS02		
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Testing has been carried out in accordance with:	47CFR §2.1093 FCC OET Bulletin 65(Edition 97-01), Supplement C (Edition 01-01) ANSI/ IEEE C95.1 – 2005 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	<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">   <hr style="width: 200px; margin: 0 auto;"/>           Report prepared by            : Young-Soo Jang            Test Engineer of SAR Part         </div> <div style="text-align: center;">   <hr style="width: 200px; margin: 0 auto;"/>           Approved by            : Jae-Sang So            Manager of SAR Part         </div> </div>		

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# Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTA1101FS02	March 04, 2011	First Approval Report
HCTA1101FS02	March 09, 2011	Adding the DAE calibration report

# 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 (r). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body.

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

**Figure 2. SAR Mathematical Equation**

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

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

where:

- $\sigma$  = conductivity of the tissue-simulant material (S/m)
- $\rho$  = mass density of the tissue-simulant material (kg/m<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	Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA) (CDMA 20001X and CDMA 2000 ED-VO Rev.0)
FCC ID	Q78-A415
Model(s)	A415
Trade Name	ZTE CORPORATION
Serial Number(s)	#1
Application Type	Certification
Modulation(s)	CDMA835/AWS1700/PCS1900
Tx Frequency	824.70 – 848.31 MHz (CDMA) 1 711.25 – 1 753.75 MHz (AWS CDMA) 1 851.25 – 1 908.75 MHz (PCS CDMA)
Rx Frequency	869.70 – 893.31 MHz (CDMA) 2 111.25 – 2 153.75 MHz (AWS CDMA) 1 931.25 – 1 988.75 MHz (PCS CDMA)
FCC Classification	Licensed Portable Transmitter Held to Ear (PCE)
Production Unit or Identical Prototype	Prototype
Max. SAR	0.554 W/kg CDMA835 Head SAR / 0.504 W/kg CDMA835 Body SAR 1.37 W/kg AWS1700 Head SAR / 0.590 W/kg AWS1700 Body SAR 1.4 W/kg PCS1900 Head SAR / 0.649 W/kg PCS1900 Body SAR
Date(s) of Tests	Mar.02, 2011 ~ Mar.03, 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.

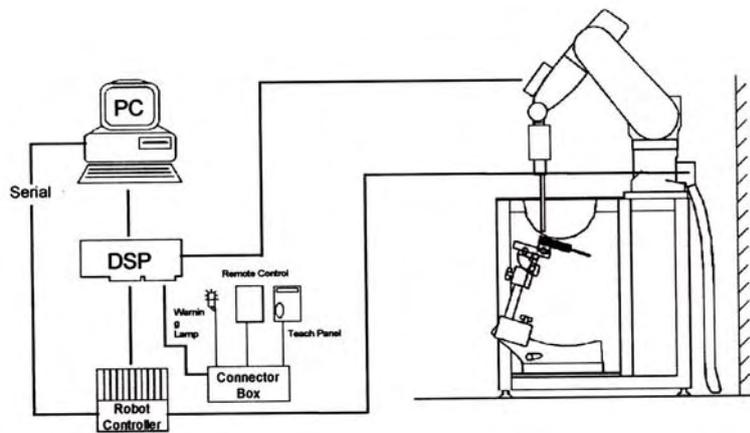


Figure 3.1 HCT SAR Lab. Test Measurement Set-up

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 DASY E-FIELD PROBE SYSTEM**

### **3.2.1 ES3DV6 Probe Specification**

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



Figure 3.2 Photograph of the probe and the Phantom



Figure 3.3 ET3DV6 E-field Probe

The SAR measurements were conducted with the dosimetric probe ET3DV6, designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches a maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 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 ± 10 %. The spherical isotropy was evaluated with the proper procedure and found to be better than ± 0.25 dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

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

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

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

where:

- $\Delta t$  = exposure time (30 seconds),
- C = heat capacity of tissue (brain or muscle),
- $\Delta T$  = temperature increase due to RF exposure.

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

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

where:

- $\sigma$  = simulated tissue conductivity,
- $\rho$  = Tissue density (1.25 g/cm<sup>3</sup> for brain tissue)

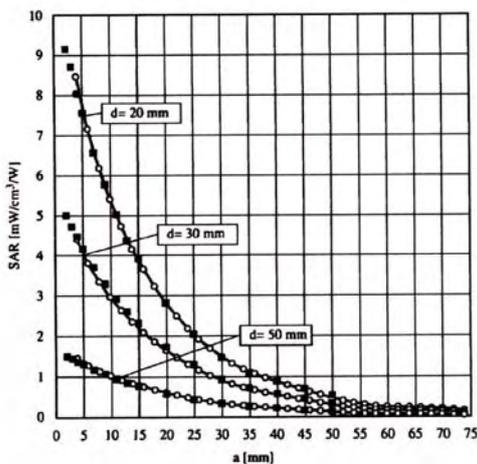


Figure 3.4 E-Field and Temperature measurements at 900 MHz

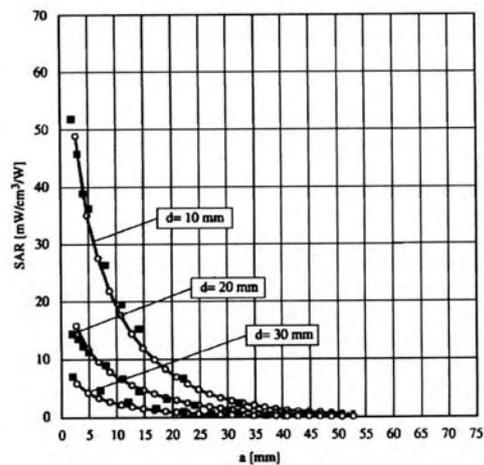


Figure 3.5 E-Field and temperature measurements at 1.8 GHz

### 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: 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

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

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 SAM Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90 % of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

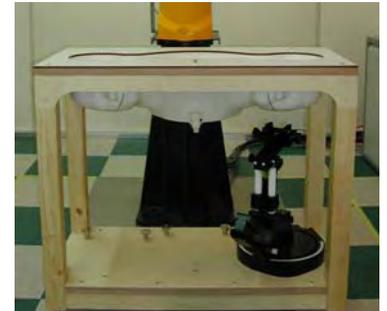


Figure 3.6 SAM Phantom

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

### 3.5 Device Holder for Transmitters

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

Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produce an 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 (% 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	446	Sep. 21, 2010	Annual	Sep. 21, 2011
SPEAG	E-Field Probe ET3DV6	1609	Nov. 24, 2010	Annual	Nov. 24, 2011
SPEAG	Validation Dipole D835V2	441	May 21, 2010	Annual	May 21, 2011
SPEAG	Validation Dipole D1800V2	2d006	Apr. 20, 2010	Biennial	Apr. 20, 2012
SPEAG	Validation Dipole D1900V2	5d032	July 16, 2010	Annual	July 16, 2011
SPEAG	Validation Dipole D2450V2	743	Aug. 25, 2010	Biennial	Aug. 27, 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, 2010	Annual	July 26, 2011
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	MY4000025	Sep. 02, 2010	Annual	Sep. 02, 2011

**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.

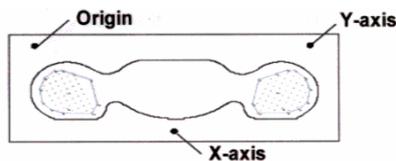


Figure 4.1 SAR Measurement Point in Area Scan

## 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.

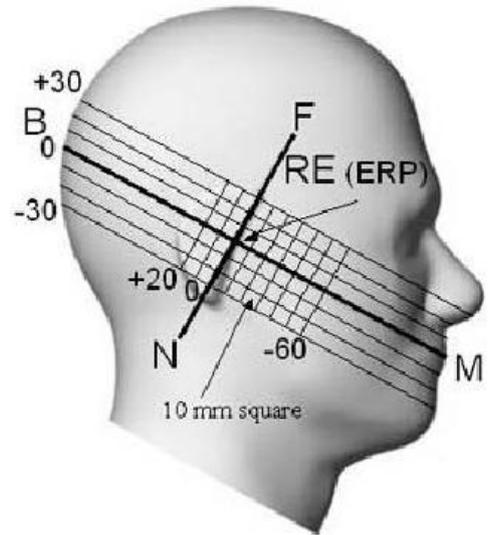


Figure 5.1 Side view of the phantom

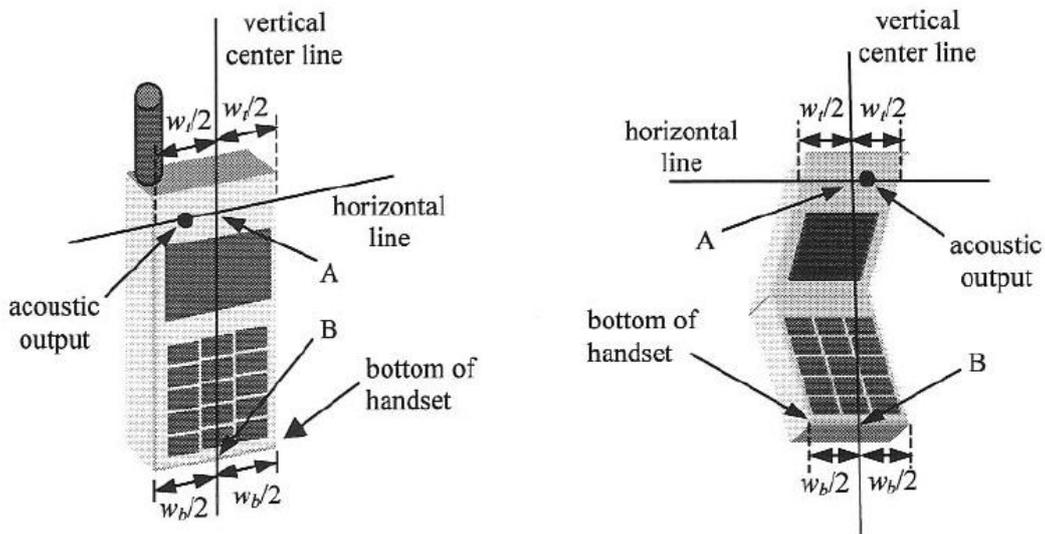


Figure 5.2 Handset vertical and horizontal reference lines

## **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 (± %)	Prob. dist.	Div.	$c_i$	Standard Uncertainty (± %)	$v_{eff}$
<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 Noise	3.00	R	1.73	1	1.73	∞
RF Ambient Reflection	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	1.80	N	1.00	1	1.80	9
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>					10.76	
<b>Coverage Factor for 95 %</b>					$k=2$	
<b>Expanded STD Uncertainty</b>					21.53	

Table 6.1 Breakdown of Errors

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

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

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

**NOTES:**

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

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

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

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

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

## 8. SYSTEM VERIFICATION

### 8.1 Tissue Verification

Freq. [MHz]	Date	Liquid	Liquid Temp.[°C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
835	Mar.02, 2011	Head	21.1	$\epsilon r$	41.5	42.5	+ 2.41	$\pm 5$
				$\sigma$	0.90	0.9	0.00	$\pm 5$
835	Mar.02, 2011	Body	21.1	$\epsilon r$	55.2	56.84	+ 2.97	$\pm 5$
				$\sigma$	0.97	0.97	0.00	$\pm 5$
1 800	Mar.03, 2011	Head	21.1	$\epsilon r$	40.0	38.9	- 2.75	$\pm 5$
				$\sigma$	1.40	1.42	+ 1.43	$\pm 5$
1 800	Mar.03, 2011	Body	21.1	$\epsilon r$	53.3	52.61	- 1.29	$\pm 5$
				$\sigma$	1.52	1.55	+ 1.97	$\pm 5$
1 900	Mar.02, 2011	Head	21.1	$\epsilon r$	40.0	40	0.00	$\pm 5$
				$\sigma$	1.40	1.39	- 0.71	$\pm 5$
1 900	Mar.02, 2011	Body	21.1	$\epsilon r$	53.3	53.58	+ 0.53	$\pm 5$
				$\sigma$	1.52	1.48	- 2.63	$\pm 5$

### 8.2 System Validation

Prior to assessment, the system is verified to the  $\pm 10\%$  of the specifications at 835 MHz / 1 800 MHz / 1 900 MHz by using the system validation kit. (Graphic Plots Attached)

\* Input Power: 100 mW

Freq. [MHz]	Date	Liquid	Liquid Temp. [°C]	SAR Average	Target Value (SPEAG) (mW/g)	* Measured Value (mW/g)	Deviation [%]	Limit [%]
835	Mar.02, 2011	Head	21.1	1 g	9.56	0.977	+ 2.20	$\pm 10$
1800	Mar.03, 2011	Head	21.1	1 g	38.9	3.91	+ 0.51	$\pm 10$
1 900	Mar.02, 2011	Head	21.2	1 g	38.9	3.98	+ 2.31	$\pm 10$

## 9. 3G MEASUREMENT PROCEDURES

### 9.1 Procedures Used To Establish Test Signal

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

### 9.2 SAR Measurement Conditions for CDMA2000 1x

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

#### 9.2.1 Output Power Verification

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

1. If the mobile station supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 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

#### 9.2.2 Head SAR Measurement

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

### 9.2.3 Body SAR Measurement

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCHn) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCHn) with FCH at full rate and SCH0 enabled at 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.

### 9.2.4 Handsets with EV-DO

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev. 0 is less than ¼ dB higher than that measured in RC3 (1x RTT), body SAR for Ev-Do is not required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at 153.6 kbps using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev. A is not required when the maximum average output of each channel is less than that measured in Rev. 0 or less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev. A using a Reverse Data Channel payload size of 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.

**Average Output Power Measurement for FCC ID: Q78-A415**

Band	Channel	SO2	SO2	SO55	SO55	TDSO	1xEVDO	1xEVDO
		RC1/1 (dBm)	RC3/3 (dBm)	RC1/1 (dBm)	RC3/3 (dBm)	SO32 RC3/3 (dBm)	Rev.0 (FTAP)	Rev.0 (RTAP)
CDMA	1013	24.16	24.00	24.08	23.89	23.96	24.14	24.08
	384	24.10	23.81	23.92	23.80	23.86	24.17	24.01
	777	23.98	24.02	24.11	23.95	24.21	24.32	24.18
AWS	25	23.95	24.01	23.84	24.03	23.67	24.05	24.08
	450	24.10	24.26	24.06	24.11	24.07	24.10	24.14
	875	24.13	24.18	23.93	23.89	24.08	24.12	24.14
PCS	25	24.09	24.11	24.05	24.02	24.06	24.11	24.13
	600	24.03	23.74	23.91	23.87	23.86	24.03	23.94
	1175	24.25	24.31	24.21	24.17	24.26	24.30	24.37

# 10. SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas

## 10.1 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.

	<b>2.45</b>	<b>5.15 - 5.35</b>	<b>5.47 - 5.85</b>	<b>GHz</b>
<b>P<sub>Ref</sub></b>	<b>12</b>	<b>6</b>	<b>5</b>	<b>mW</b>
Device output power should be rounded to the nearest mW to compare with values specified in this				

Table. 10.1 Output Power Thresholds for Unlicensed Transmitters

	Individual Transmitter	Simultaneous Transmission
<b>Licensed Transmitters</b>	<u>Routine evaluation required</u>	<b>SAR not required:</b> <u>Unlicensed only</u>
<b>Unlicensed Transmitters</b>	<p><u>When there is no simultaneous transmission –</u></p> <ul style="list-style-type: none"> <li>o output ≤ 60/f: SAR not required</li> <li>o output &gt; 60/f: stand-alone SAR required</li> </ul> <p><u>When there is simultaneous transmission –</u></p> <p><u>Stand-alone SAR not required when</u></p> <ul style="list-style-type: none"> <li>o output ≤ 2·P<sub>Ref</sub> and antenna is ≥ 5.0 cm from other antennas</li> <li>o output ≤ P<sub>Ref</sub> and antenna is ≥ 2.5 cm from other antennas</li> <li>o output ≤ P<sub>Ref</sub> and antenna is &lt; 2.5 cm from other antennas, each with either output power ≤ P<sub>Ref</sub> or 1-g SAR &lt; 1.2 W/kg</li> </ul> <p><u>Otherwise stand-alone SAR is required</u></p> <p><u>When stand-alone SAR is required</u></p> <ul style="list-style-type: none"> <li>o test SAR on highest output channel for each wireless mode and exposure condition</li> <li>o if SAR for highest output channel is &gt; 50% of SAR limit, evaluate all channels according to normal procedures</li> </ul>	<ul style="list-style-type: none"> <li>o when stand-alone 1-g SAR is not required and antenna is ≥ 5 cm from other antennas</li> </ul> <p><u>Licensed &amp; Unlicensed</u></p> <ul style="list-style-type: none"> <li>o when the sum of the 1-g SAR is &lt; 1.6 W/kg for all simultaneous transmitting antennas</li> <li>o when SAR to peak location separation ratio of simultaneous transmitting antenna pair is &lt; 0.3</li> </ul> <p><b>SAR required:</b></p> <p><u>Licensed &amp; Unlicensed</u></p> <p>antenna pairs with SAR to peak location separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in stand-alone configuration for each wireless mode and exposure condition</p> <p><b>Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply</b></p>
<b>Jaw, Mouth and Nose</b>	<p><u>Flat phantom SAR required</u></p> <ul style="list-style-type: none"> <li>o 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>o 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. 10.2 SAR Evaluation Requirements for Cellphones with Multiple Transmitters

FCC ID: Q78-A415

BT Max. RF output power: 3.58 dBm (2.28 mW)

Antenna separation distance: 3.35 cm

## 10.2 Simultaneous Transmission

- Main antenna can transmit simultaneously with BT antenna.

Test Position	Highest 1g SAR (W/kg)		$\Sigma$ SAR(W/kg)
	2G	BT	
Head	1.4	0	1.4
Body	0.649	0	0.649

## 10.3 Conclusion

Because the conducted output power level of the BT transmitter is less than  $P_{ref}$ , and the BT antenna is more than 2.5 cm from the CDMA antenna, neither simultaneous SAR nor stand-alone BT SAR are required for the EUT.

Antenna Pair	Justification	Simultaneous SAR required
BT / WWAN	Antenna separation is > 2.5 cm, BT transmitter is less than $P_{ref}$	No

# 11. SAR TEST DATA SUMMARY

## 11.1 Measurement Results (CDMA835 Head SAR)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
836.52	384 (Mid)	CDMA835	23.80	23.74	Standard	Left Ear	Intenna	0.544
836.52	384 (Mid)	CDMA835	23.80	23.68	Standard	Left Tilt 15°	Intenna	0.338
836.52	384 (Mid)	CDMA835	23.80	23.71	Standard	Right Ear	Intenna	0.514
836.52	384 (Mid)	CDMA835	23.80	23.69	Standard	Right Tilt 15°	Intenna	0.356
<b>ANSI/ IEEE C95.1 2005 – Safety Limit</b>						<b>Head</b>		
<b>Spatial Peak</b>						<b>1.6 W/kg (mW/g)</b>		
<b>Uncontrolled Exposure/ General Population</b>						<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
- Head SAR was tested under RC3/SO55.
- 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).

## 11.2 Measurement Results (AWS1700 Head SAR)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 732.5	450 (Mid)	AWS1700	24.11	24.18	Standard	Left Ear	Intenna	0.665
1 732.5	450 (Mid)	AWS1700	24.11	24.12	Standard	Left Tilt 15°	Intenna	0.480
1 711.25	25(Low)	AWS1700	24.03	24.14	Standard	Right Ear	Intenna	1.37
1 732.5	450 (Mid)	AWS1700	24.11	24.24	Standard	Right Ear	Intenna	1.04
1 753.75	875(High)	AWS1700	23.89	23.74	Standard	Right Ear	Intenna	1.30
1 732.5	450 (Mid)	AWS1700	24.11	24.11	Standard	Right Tilt 15°	Intenna	0.56
<b>ANSI/ IEEE C95.1 2005 – Safety Limit</b>						<b>Head</b>		
<b>Spatial Peak</b>						<b>1.6 W/kg (mW/g)</b>		
<b>Uncontrolled Exposure/ General Population</b>						<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
- Head SAR was tested under RC3/SO55.
- 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).

## 11.3 Measurement Results (PCS1900 Head SAR)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 880.00	600 (Mid)	PCS1900	23.87	23.84	Standard	Left Ear	Intenna	0.727
1 880.00	600 (Mid)	PCS1900	23.87	23.72	Standard	Left Tilt 15°	Intenna	0.533
1 851.25	25(Low)	PCS1900	24.02	23.91	Standard	Right Ear	Intenna	1.22
1 880.00	600 (Mid)	PCS1900	23.87	23.82	Standard	Right Ear	Intenna	1.4
1 908.75	1175(High)	PCS1900	24.17	24.16	Standard	Right Ear	Intenna	1.25
1 880.00	600 (Mid)	PCS1900	23.87	23.87	Standard	Right Tilt 15°	Intenna	0.775
<b>ANSI/ IEEE C95.1 2005 – Safety Limit</b>						<b>Head</b>		
<b>Spatial Peak</b>						<b>1.6 W/kg (mW/g)</b>		
<b>Uncontrolled Exposure/ General Population</b>						<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
- Head SAR was tested under RC3/SO55.
- 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).

## 11.4 Measurement Results (CDMA835 Body SAR)

Frequency		Modulation	Conducted Power (dBm)		Configuration	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
836.52	384 (Mid)	CDMA835	23.86	23.70	Rear	2.0 cm without Holster	Intenna	0.504
<b>ANSI/ IEEE C95.1 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population</b>						<b>Body 1.6 W/kg (mW/g) Averaged over 1 gram</b>		

**NOTES:**

- 1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- 2 All modes of operation were investigated and the worst-case are reported.
- 3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- 4 Tissue parameters and temperatures are listed on the SAR plot.
- 5 Battery Type                     Standard                     Extended                     Slim  
Batteries are fully charged for all readings.
- 6 Test Signal Call Mode        Manual Test cord        Base Station Simulator
- 7 Both side of the phone were tested and the worst-case side is reported.
- 8 HEADSET was connected.
- 9 Test Configuration            With Holster                     Without Holster
- 10 CDMA Body SAR was tested under RC3/SO32.
- 11 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

## 11.5 Measurement Results (AWS1700 Body SAR)

Frequency		Modulation	Conducted Power (dBm)		Configuration	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 732.5	450 (Mid)	AWS1700	24.07	23.98	Rear	2.0 cm without Holster	Intenna	0.590
<b>ANSI/ IEEE C95.1 2005 – Safety Limit</b>						<b>Body</b>		
<b>Spatial Peak</b>						<b>1.6 W/kg (mW/g)</b>		
<b>Uncontrolled Exposure/ General Population</b>						<small>Averaged over 1 gram</small>		

**NOTES:**

- 1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- 2 All modes of operation were investigated and the worst-case are reported.
- 3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- 4 Tissue parameters and temperatures are listed on the SAR plot.
- 5 Battery Type                     Standard                     Extended                     Slim  
Batteries are fully charged for all readings.
- 6 Test Signal Call Mode         Manual Test cord         Base Station Simulator
- 7 Both side of the phone were tested and the worst-case side is reported.
- 8 HEADSET was connected.
- 9 Test Configuration             With Holster                     Without Holster
- 10 AWS Body SAR was tested under RC3/SO32.
- 11 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

## 11.6 Measurement Results (PCS1900 Body SAR)

Frequency		Modulation	Conducted Power (dBm)		Configuration	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 880.00	600 (Mid)	PCS1900	23.86	23.86	Rear	2.0 cm without Holster	Intenna	0.649
<b>ANSI/ IEEE C95.1 2005 – Safety Limit</b> <b>Spatial Peak</b> <b>Uncontrolled Exposure/ General Population</b>						<b>Body</b> <b>1.6 W/kg (mW/g)</b> <small>Averaged over 1 gram</small>		

### NOTES:

- 1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- 2 All modes of operation were investigated and the worst-case are reported.
- 3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- 4 Tissue parameters and temperatures are listed on the SAR plot.
- 5 Battery Type            Standard            Extended            Slim  
Batteries are fully charged for all readings.
- 6 Test Signal Call Mode    Manual Test cord    Base Station Simulator
- 7 Both side of the phone were tested and the worst-case side is reported.
- 8 HEADSET was connected.
- 9 Test Configuration        With Holster            Without Holster
- 10 PCS Body SAR was tested under RC3/SO32.
- 11 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

## 12. 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 2005.

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

## 13. REFERENCES

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## Attachment 1. – SAR Test Plots

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.901$  mho/m;  $\epsilon_r = 42.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: 835/900 Phantom ; Type: SAM

**Left touch 384/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.619 mW/g

**Left touch 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

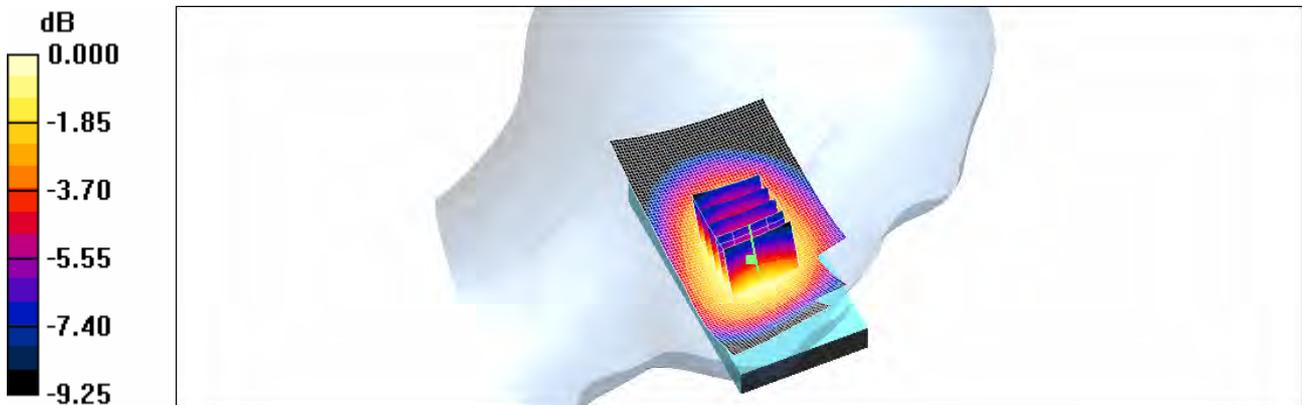
Reference Value = 26.2 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.698 W/kg

**SAR(1 g) = 0.554 mW/g; SAR(10 g) = 0.407 mW/g**

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

Maximum value of SAR (measured) = 0.584 mW/g



0 dB = 0.584mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.901$  mho/m;  $\epsilon_r = 42.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: 835/900 Phantom ; Type: SAM

**Left tilt 384/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.353 mW/g

**Left tilt 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

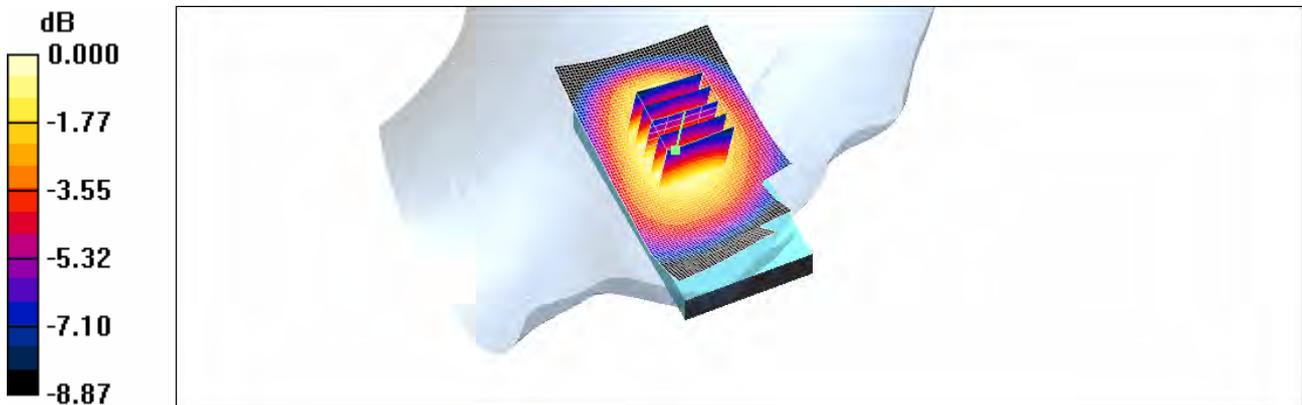
Reference Value = 16.0 V/m; Power Drift = -0.121 dB

Peak SAR (extrapolated) = 0.420 W/kg

**SAR(1 g) = 0.338 mW/g; SAR(10 g) = 0.252 mW/g**

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

Maximum value of SAR (measured) = 0.355 mW/g



0 dB = 0.355mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.901$  mho/m;  $\epsilon_r = 42.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: 835/900 Phantom ; Type: SAM

**Right touch 384/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.553 mW/g

**Right touch 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

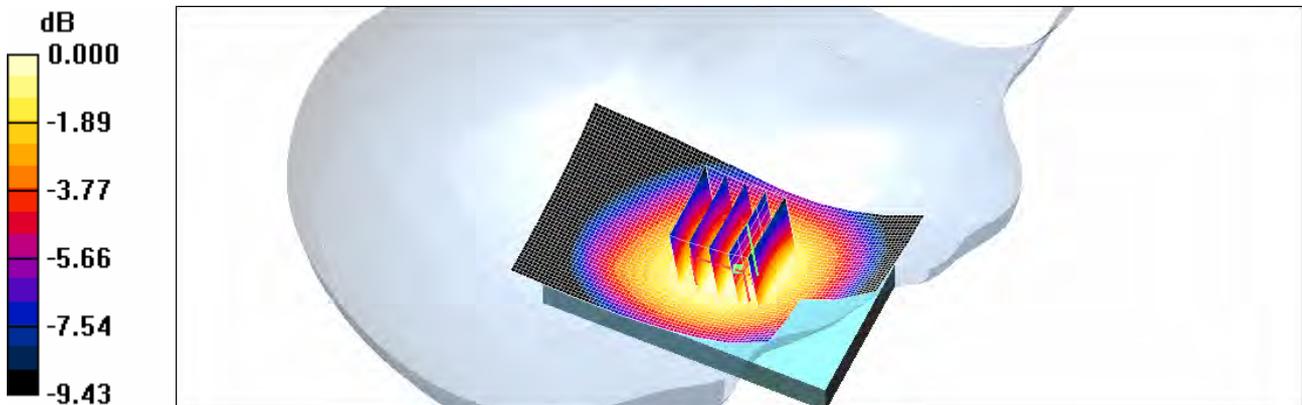
Reference Value = 25.3 V/m; Power Drift = -0.093 dB

Peak SAR (extrapolated) = 0.661 W/kg

**SAR(1 g) = 0.514 mW/g; SAR(10 g) = 0.377 mW/g**

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

Maximum value of SAR (measured) = 0.544 mW/g



0 dB = 0.544mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz;Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.901$  mho/m;  $\epsilon_r = 42.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: 835/900 Phantom ; Type: SAM

**Right tilt 384/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.378 mW/g

**Right tilt 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

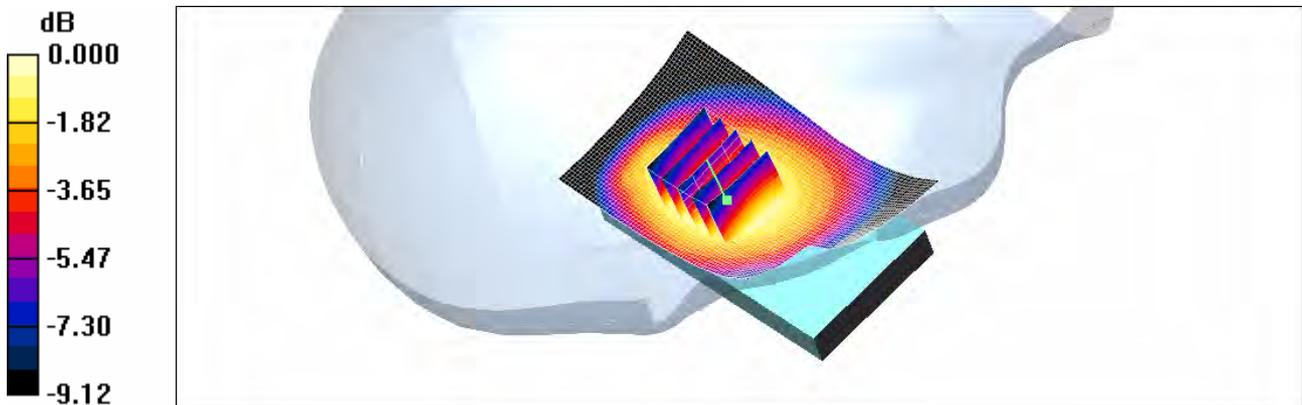
Reference Value = 17.0 V/m; Power Drift = -0.108 dB

Peak SAR (extrapolated) = 0.438 W/kg

**SAR(1 g) = 0.356 mW/g; SAR(10 g) = 0.262 mW/g**

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

Maximum value of SAR (measured) = 0.372 mW/g



0 dB = 0.372mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.03, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1732.5$  MHz;  $\sigma = 1.36$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.51, 5.51, 5.51); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left touch 450/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.686 mW/g

**Left touch 450/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.5 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.907 W/kg

**SAR(1 g) = 0.665 mW/g; SAR(10 g) = 0.435 mW/g**

Maximum value of SAR (measured) = 0.709 mW/g

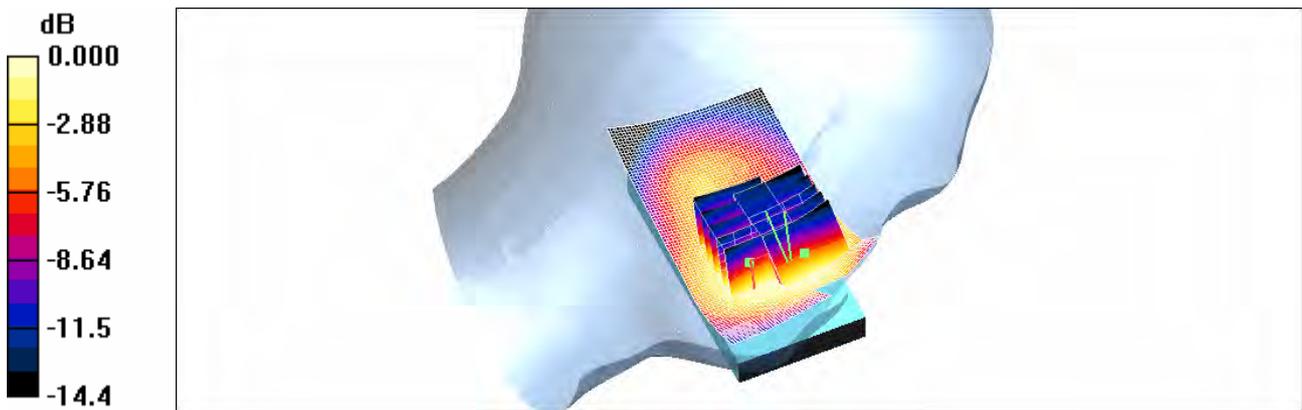
**Left touch 450/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.5 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.941 W/kg

**SAR(1 g) = 0.651 mW/g; SAR(10 g) = 0.427 mW/g**

Maximum value of SAR (measured) = 0.740 mW/g



0 dB = 0.740mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.03, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1732.5$  MHz;  $\sigma = 1.36$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.51, 5.51, 5.51); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left tilt 450/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.517 mW/g

**Left tilt 450/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

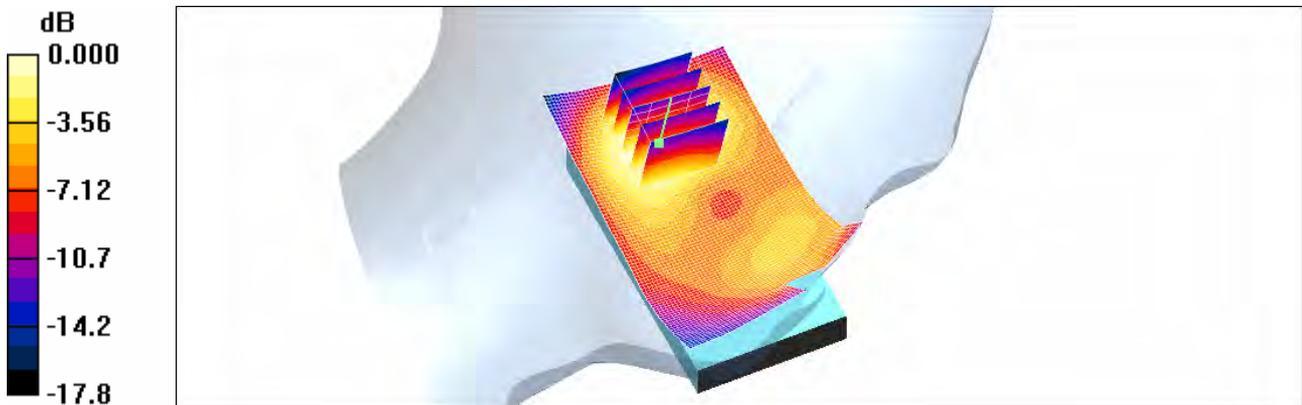
Reference Value = 10.2 V/m; Power Drift = 0.013 dB

Peak SAR (extrapolated) = 0.700 W/kg

**SAR(1 g) = 0.480 mW/g; SAR(10 g) = 0.291 mW/g**

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

Maximum value of SAR (measured) = 0.521 mW/g



0 dB = 0.521mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.03, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: AWS 1700 MHz FCC; Frequency: 1711.25 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1711.25$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.51, 5.51, 5.51); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 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) = 1.56 mW/g

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

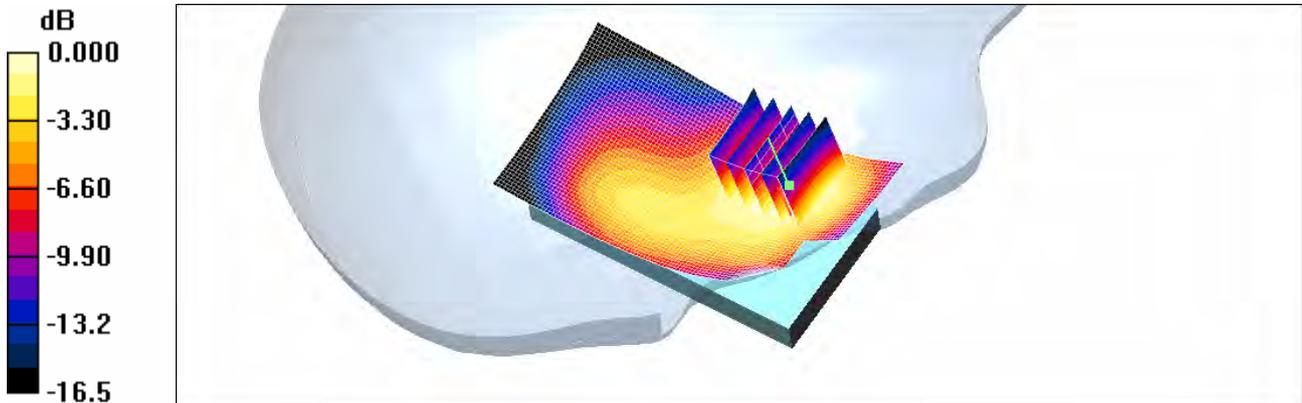
Reference Value = 30.0 V/m; Power Drift = 0.108 dB

Peak SAR (extrapolated) = 2.04 W/kg

**SAR(1 g) = 1.37 mW/g; SAR(10 g) = 0.842 mW/g**

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

Maximum value of SAR (measured) = 1.50 mW/g



0 dB = 1.50mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.03, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1732.5$  MHz;  $\sigma = 1.36$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.51, 5.51, 5.51); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 450/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.20 mW/g

**Right touch 450/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

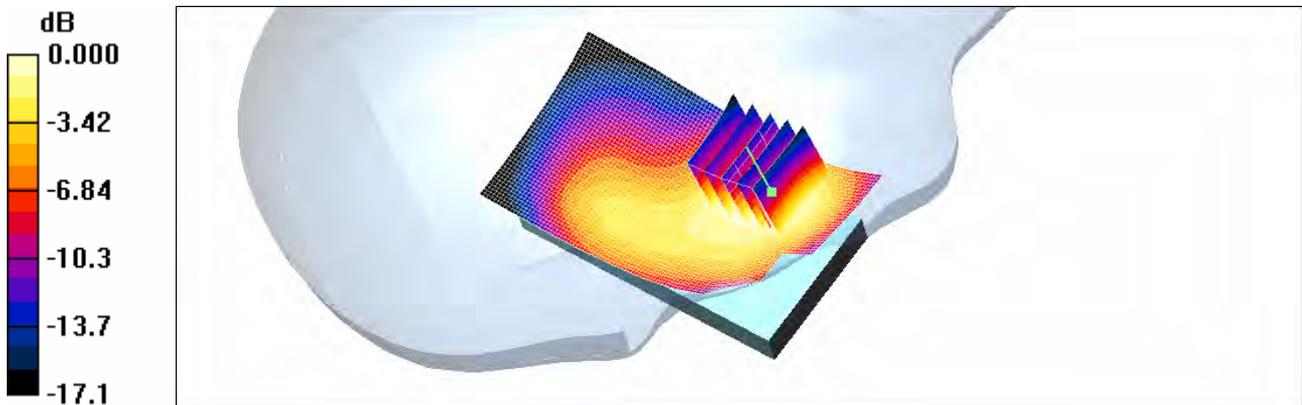
Reference Value = 27.1 V/m; Power Drift = 0.132 dB

Peak SAR (extrapolated) = 1.56 W/kg

**SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.644 mW/g**

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

Maximum value of SAR (measured) = 1.14 mW/g



0 dB = 1.14mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.03, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: AWS 1700 MHz FCC; Frequency: 1753.75 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1753.75$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.51, 5.51, 5.51); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 875/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.39 mW/g

**Right touch 875/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 27.3 V/m; Power Drift = -0.151 dB

Peak SAR (extrapolated) = 1.88 W/kg

**SAR(1 g) = 1.3 mW/g; SAR(10 g) = 0.795 mW/g**

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

Maximum value of SAR (measured) = 1.42 mW/g

**Right touch 875/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

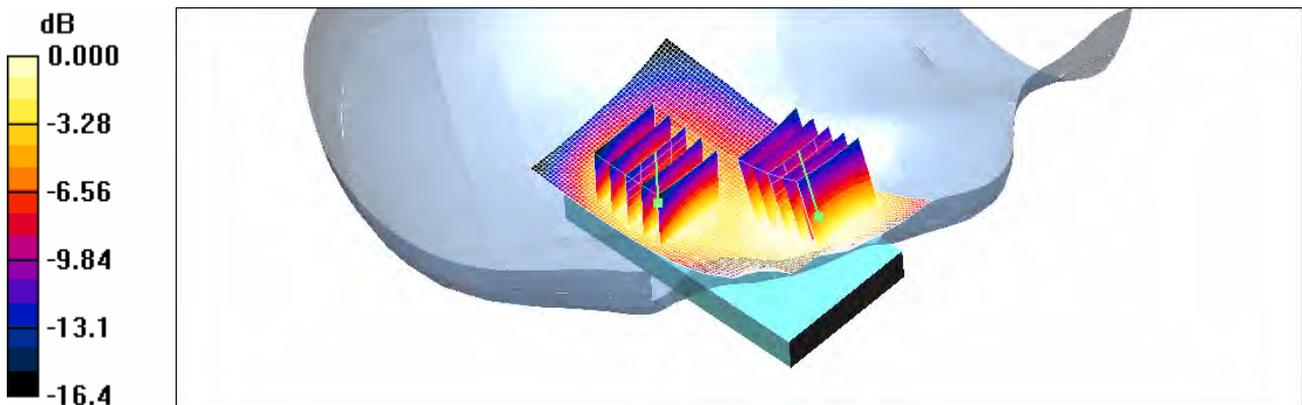
Reference Value = 27.3 V/m; Power Drift = -0.151 dB

Peak SAR (extrapolated) = 1.26 W/kg

**SAR(1 g) = 0.889 mW/g; SAR(10 g) = 0.549 mW/g**

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

Maximum value of SAR (measured) = 0.977 mW/g



0 dB = 0.977mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.03, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1732.5$  MHz;  $\sigma = 1.36$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.51, 5.51, 5.51); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right tilt 450/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.607 mW/g

**Right tilt 450/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

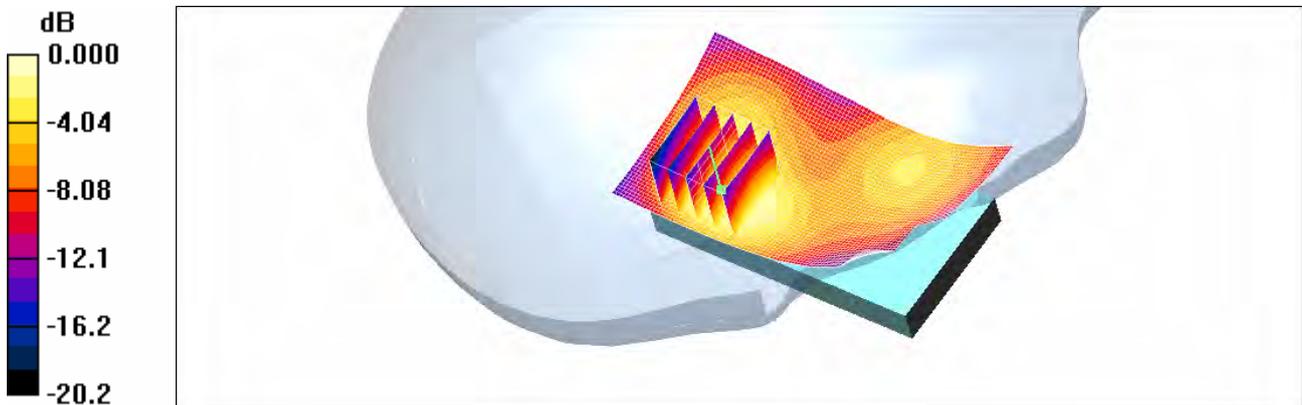
Reference Value = 11.9 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 0.835 W/kg

**SAR(1 g) = 0.560 mW/g; SAR(10 g) = 0.340 mW/g**

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

Maximum value of SAR (measured) = 0.608 mW/g



0 dB = 0.608mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

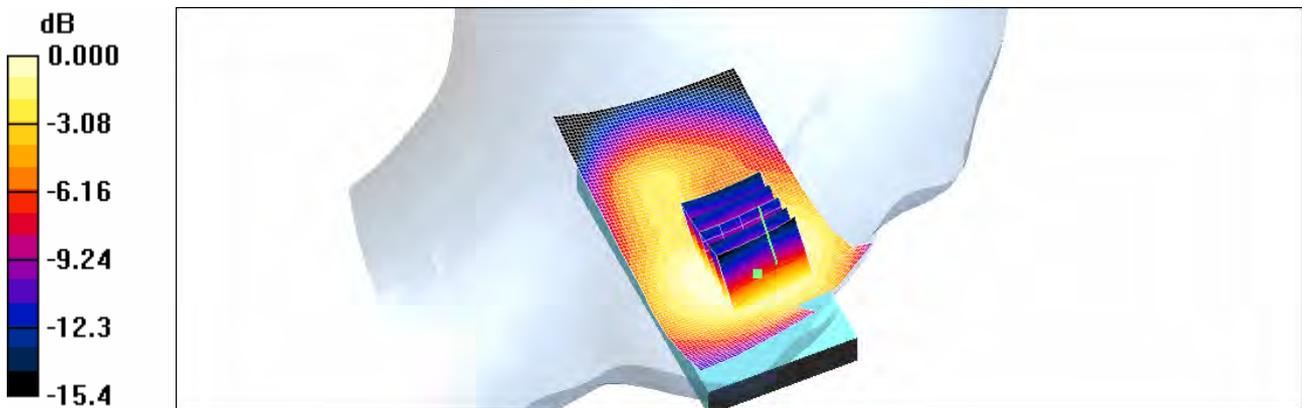
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 40$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left touch 600/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.801 mW/g

**Left touch 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 25.1 V/m; Power Drift = -0.031 dB  
Peak SAR (extrapolated) = 1.04 W/kg  
**SAR(1 g) = 0.727 mW/g; SAR(10 g) = 0.458 mW/g**  
Maximum value of SAR (measured) = 0.779 mW/g



0 dB = 0.779mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

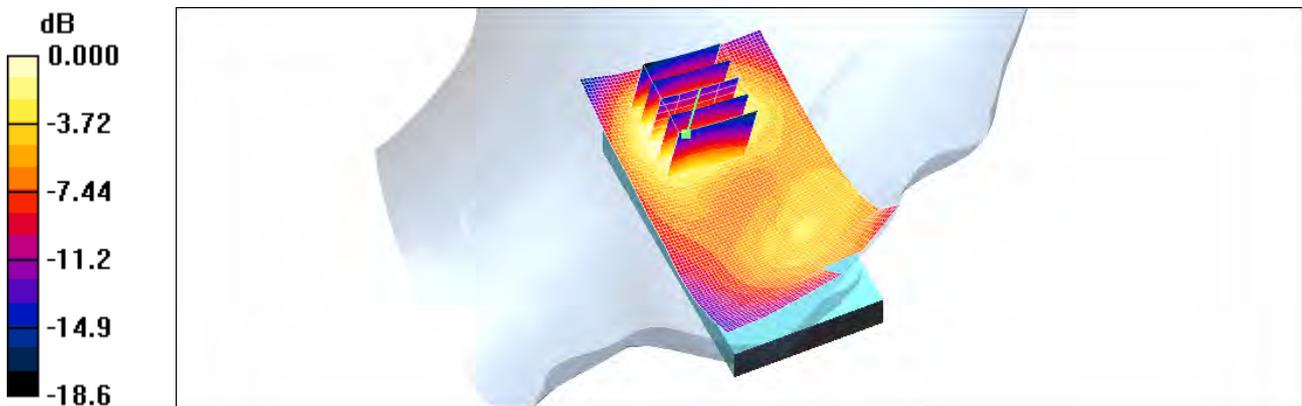
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 40$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left tilt 600/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.600 mW/g

**Left tilt 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 12.5 V/m; Power Drift = -0.152 dB  
Peak SAR (extrapolated) = 0.817 W/kg  
**SAR(1 g) = 0.533 mW/g; SAR(10 g) = 0.311 mW/g**  
Maximum value of SAR (measured) = 0.582 mW/g



0 dB = 0.582mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: PCS 1900; Frequency: 1851.25 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1851.25$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 39.5$ ;  $\rho = 1000$  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: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 600/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.39 mW/g

**Right touch 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

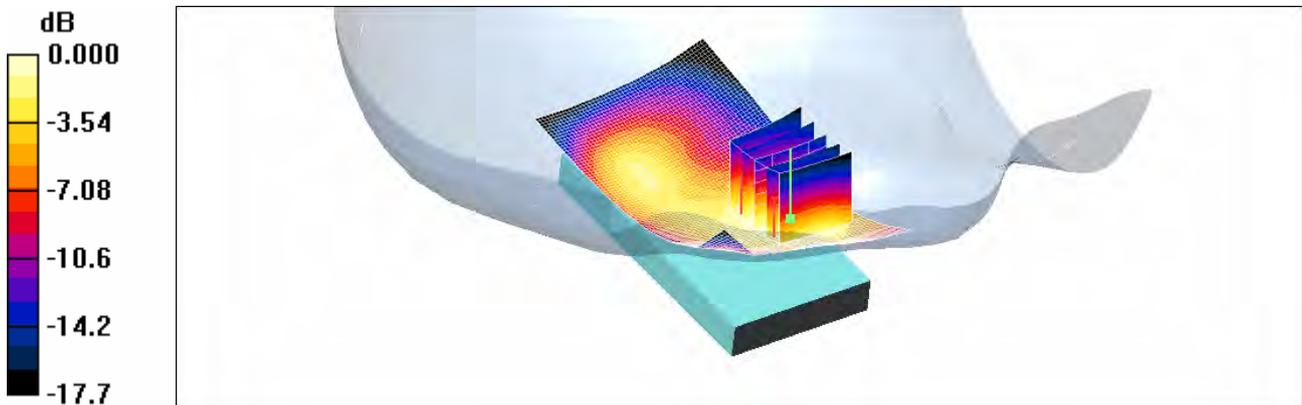
Reference Value = 29.6 V/m; Power Drift = -0.051 dB

Peak SAR (extrapolated) = 1.82 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.732 mW/g**

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

Maximum value of SAR (measured) = 1.31 mW/g



0 dB = 1.31mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

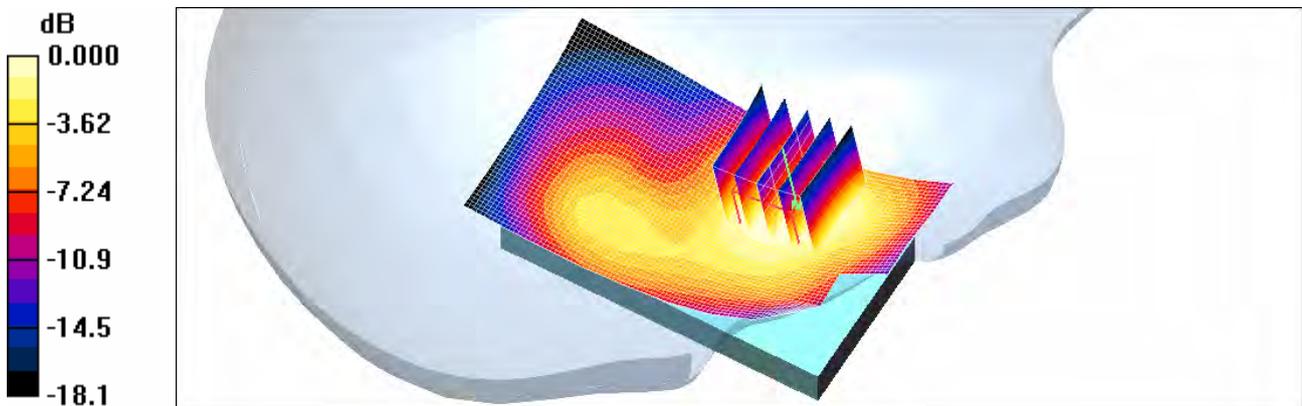
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 40$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 600/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.60 mW/g

**Right touch 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 31.9 V/m; Power Drift = -0.052 dB  
Peak SAR (extrapolated) = 2.11 W/kg  
**SAR(1 g) = 1.4 mW/g; SAR(10 g) = 0.841 mW/g**  
Maximum value of SAR (measured) = 1.50 mW/g



0 dB = 1.50mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: PCS 1900; Frequency: 1908.75 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1908.75$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 40$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; 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: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 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) = 1.46 mW/g

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

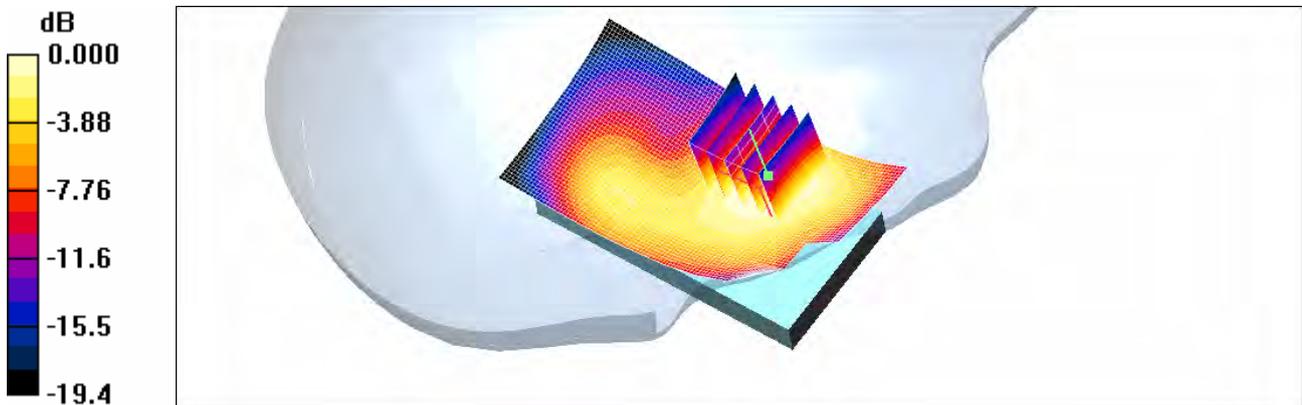
Reference Value = 30.2 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 1.88 W/kg

**SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.763 mW/g**

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

Maximum value of SAR (measured) = 1.35 mW/g



0 dB = 1.35mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

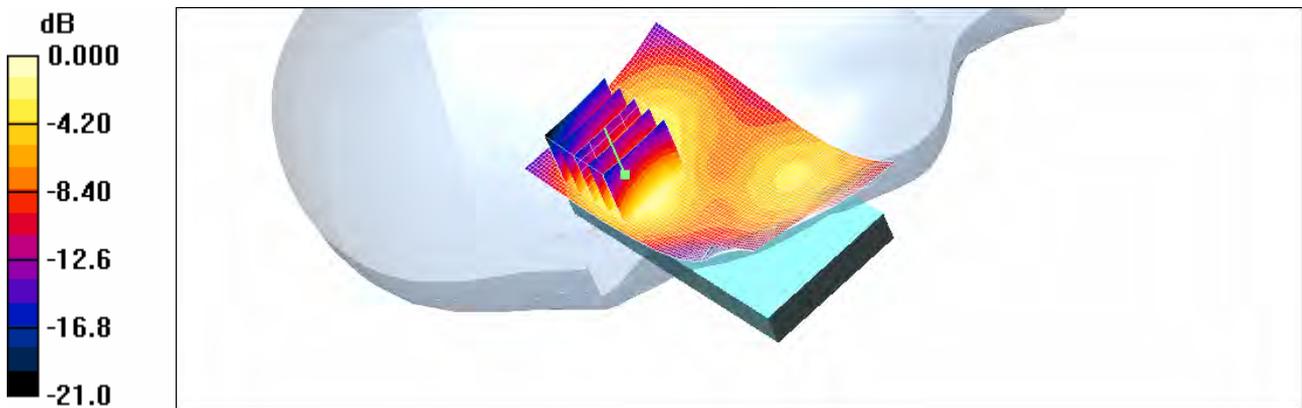
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 40$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right tilt 600/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.938 mW/g

**Right tilt 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 13.4 V/m; Power Drift = -0.03 dB  
Peak SAR (extrapolated) = 1.23 W/kg  
**SAR(1 g) = 0.775 mW/g; SAR(10 g) = 0.441 mW/g**  
Maximum value of SAR (measured) = 0.850 mW/g



0 dB = 0.850mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.981$  mho/m;  $\epsilon_r = 56.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.12, 6.12, 6.12); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: 835/900 Phantom ; Type: SAM

**Body 384/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.544 mW/g

**Body 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

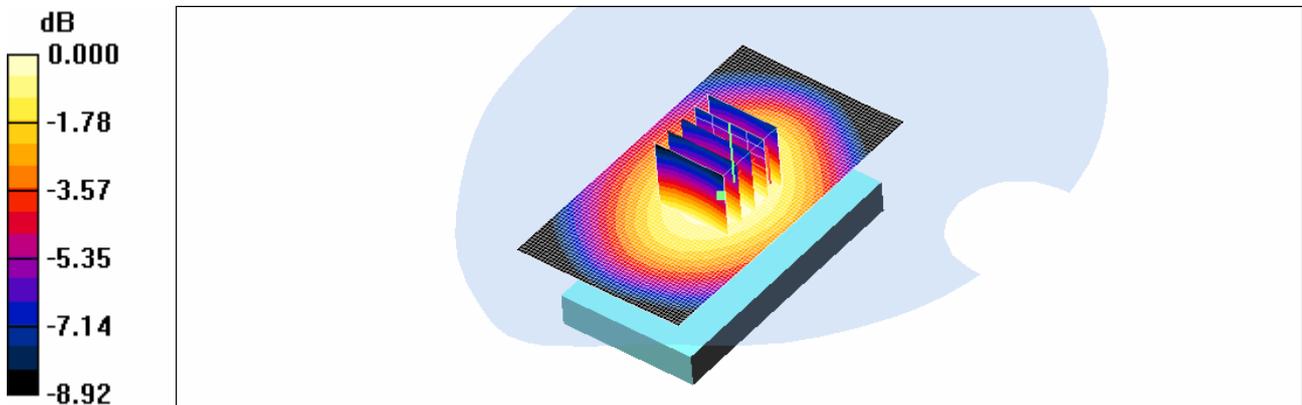
Reference Value = 13.2 V/m; Power Drift = -0.165 dB

Peak SAR (extrapolated) = 0.631 W/kg

**SAR(1 g) = 0.504 mW/g; SAR(10 g) = 0.374 mW/g**

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

Maximum value of SAR (measured) = 0.535 mW/g



0 dB = 0.535mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.03, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1732.5$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 52.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.83, 4.83, 4.83); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**AWS1700 Body/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.670 mW/g

**AWS1700 Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

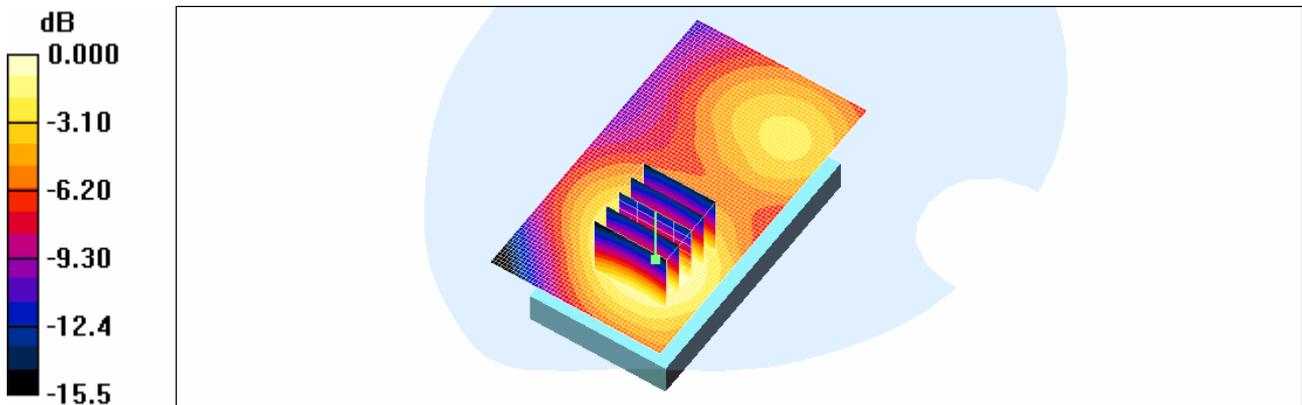
Reference Value = 14.7 V/m; Power Drift = -0.094 dB

Peak SAR (extrapolated) = 0.796 W/kg

**SAR(1 g) = 0.590 mW/g; SAR(10 g) = 0.364 mW/g**

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

Maximum value of SAR (measured) = 0.651 mW/g



0 dB = 0.651mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

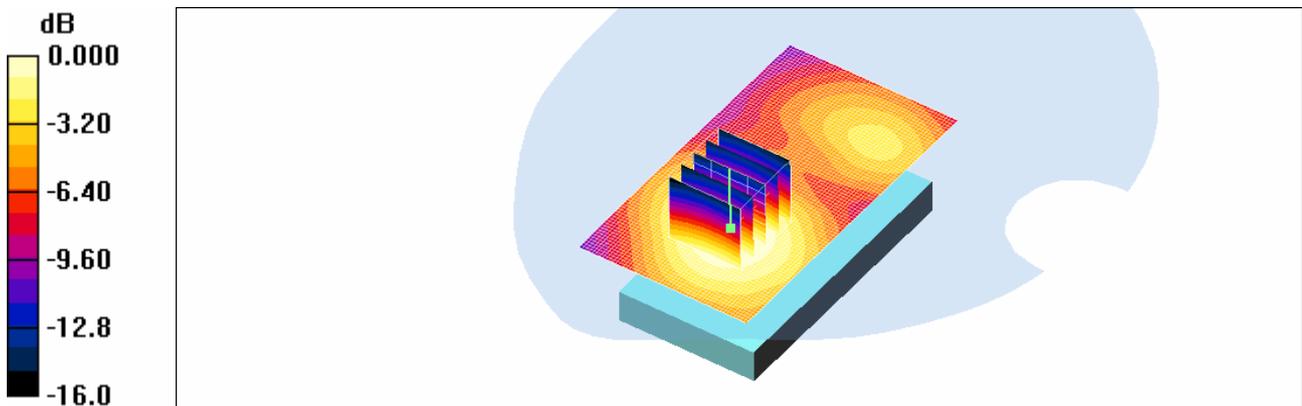
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 53.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.6, 4.6, 4.6); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body 600/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.772 mW/g

**Body 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 15.3 V/m; Power Drift = -0.005 dB  
Peak SAR (extrapolated) = 0.914 W/kg  
**SAR(1 g) = 0.649 mW/g; SAR(10 g) = 0.398 mW/g**  
Maximum value of SAR (measured) = 0.716 mW/g



0 dB = 0.716mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.901$  mho/m;  $\epsilon_r = 42.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: 835/900 Phantom ; Type: SAM

**Left touch 384/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.619 mW/g

**Left touch 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 26.2 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.698 W/kg

**SAR(1 g) = 0.554 mW/g; SAR(10 g) = 0.407 mW/g**

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

Maximum value of SAR (measured) = 0.584 mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
 Liquid Temperature: 21.1 °C  
 Ambient Temperature: 21.3 °C  
 Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 836.52 \text{ MHz}$ ;  $\sigma = 0.981 \text{ mho/m}$ ;  $\epsilon_r = 56.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.12, 6.12, 6.12); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: 835/900 Phantom ; Type: SAM

**Body 384/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.544 mW/g

**Body 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

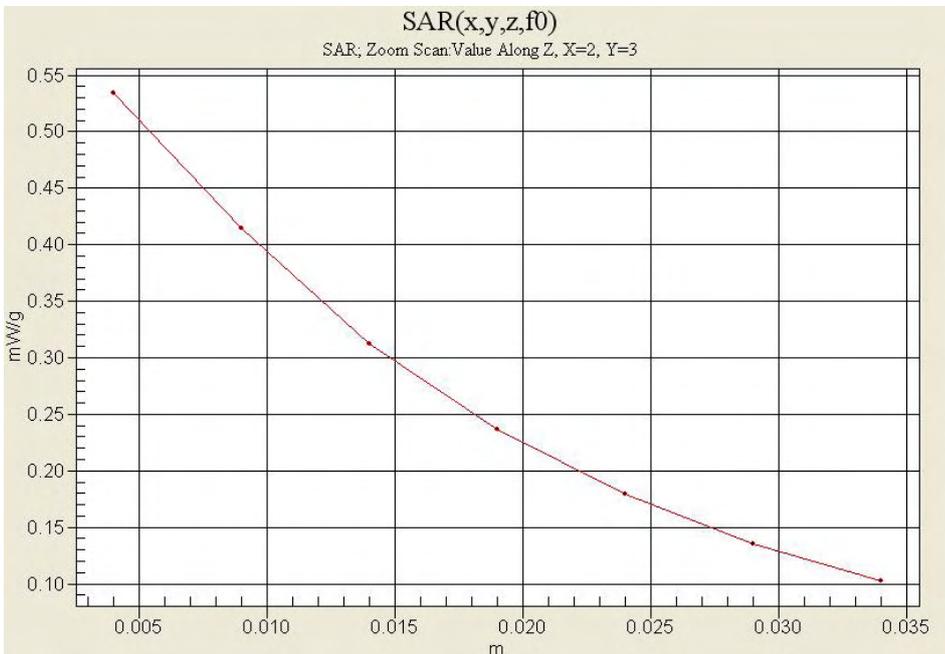
Reference Value = 13.2 V/m; Power Drift = -0.165 dB

Peak SAR (extrapolated) = 0.631 W/kg

**SAR(1 g) = 0.504 mW/g; SAR(10 g) = 0.374 mW/g**

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

Maximum value of SAR (measured) = 0.535 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.03, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: AWS 1700 MHz FCC; Frequency: 1711.25 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1711.25$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.51, 5.51, 5.51); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 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) = 1.56 mW/g

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

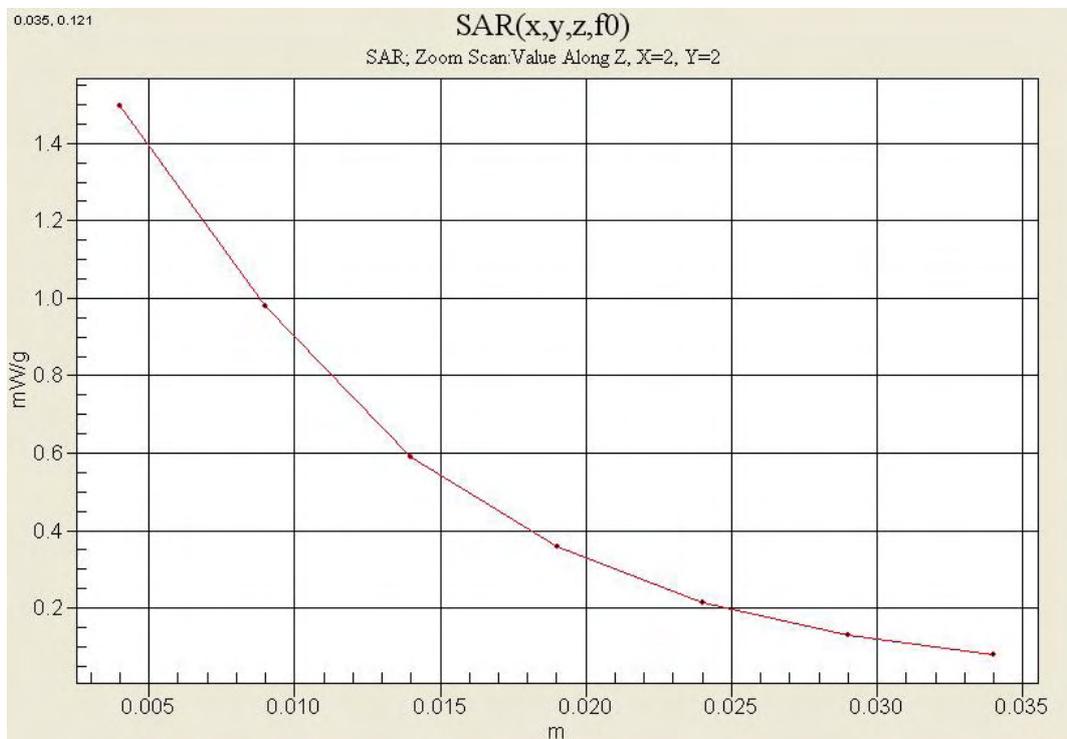
Reference Value = 30.0 V/m; Power Drift = 0.108 dB

Peak SAR (extrapolated) = 2.04 W/kg

**SAR(1 g) = 1.37 mW/g; SAR(10 g) = 0.842 mW/g**

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

Maximum value of SAR (measured) = 1.50 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.03, 2011

**DUT: A415; Type: Bar; Serial: #1**

Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1732.5$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 52.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.83, 4.83, 4.83); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**AWS1700 Body/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.670 mW/g

**AWS1700 Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

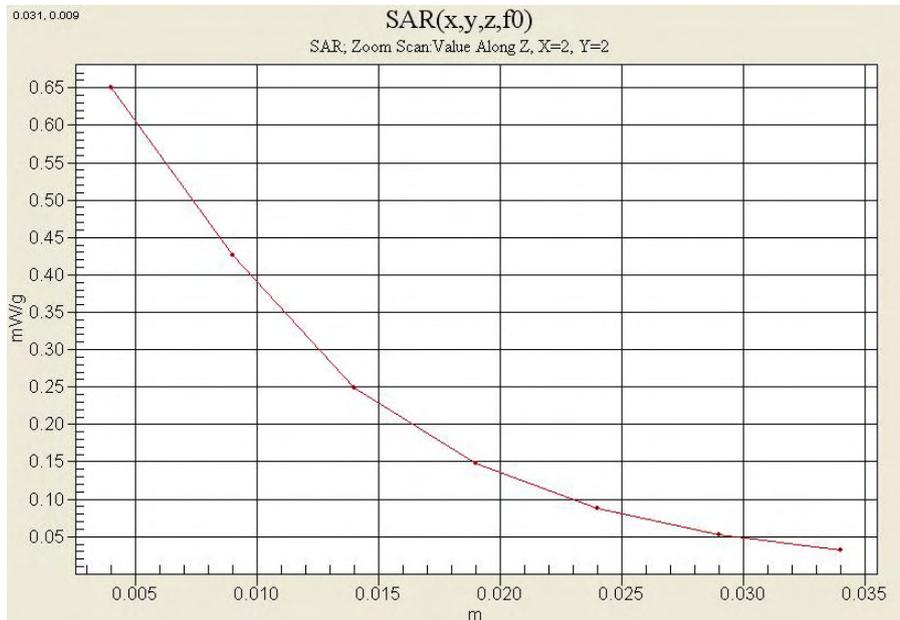
Reference Value = 14.7 V/m; Power Drift = -0.094 dB

Peak SAR (extrapolated) = 0.796 W/kg

**SAR(1 g) = 0.590 mW/g; SAR(10 g) = 0.364 mW/g**

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

Maximum value of SAR (measured) = 0.651 mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
 Liquid Temperature: 21.1 °C  
 Ambient Temperature: 21.3 °C  
 Test Date: Mar.02, 2011

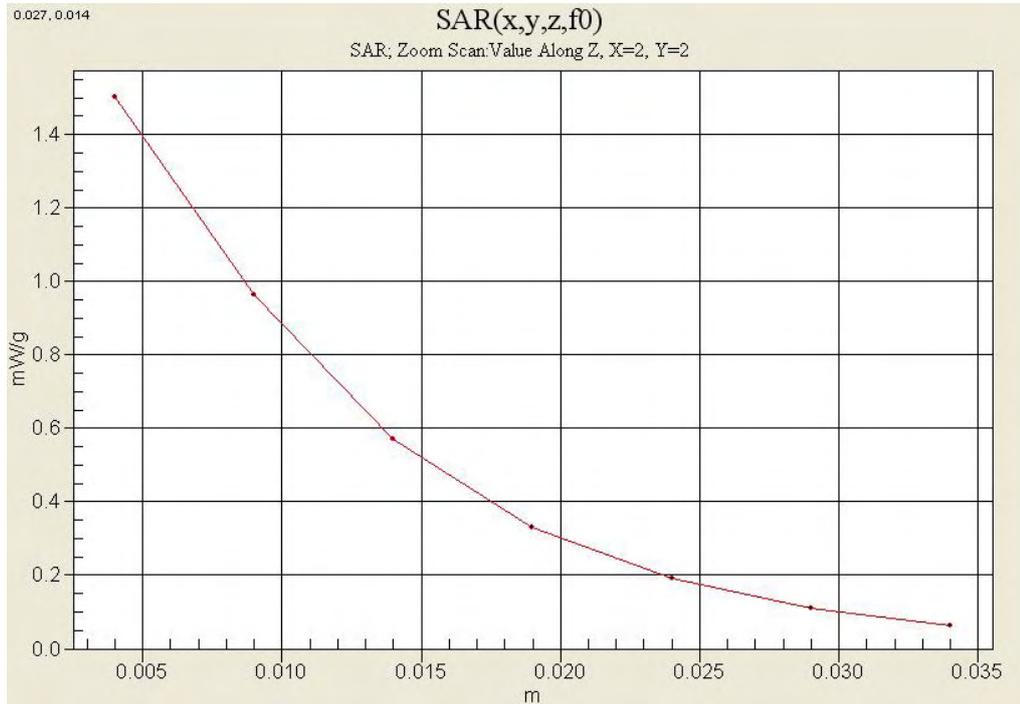
**DUT: A415; Type: Bar; Serial: #1**

Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.37 \text{ mho/m}$ ;  $\epsilon_r = 40$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 80; 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: DAE3 Sn446; Calibrated: 2010-09-21  
 - Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 600/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 1.60 mW/g

**Right touch 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 31.9 V/m; Power Drift = -0.052 dB  
 Peak SAR (extrapolated) = 2.11 W/kg  
**SAR(1 g) = 1.4 mW/g; SAR(10 g) = 0.841 mW/g**  
 Maximum value of SAR (measured) = 1.50 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: Tri-Band CDMA Phone with Bluetooth(CDMA/PCS/AWS CDMA)  
Liquid Temperature: 21.1 °C  
Ambient Temperature: 21.3 °C  
Test Date: Mar.02, 2011

**DUT: A415; Type: Bar; Serial: #1**

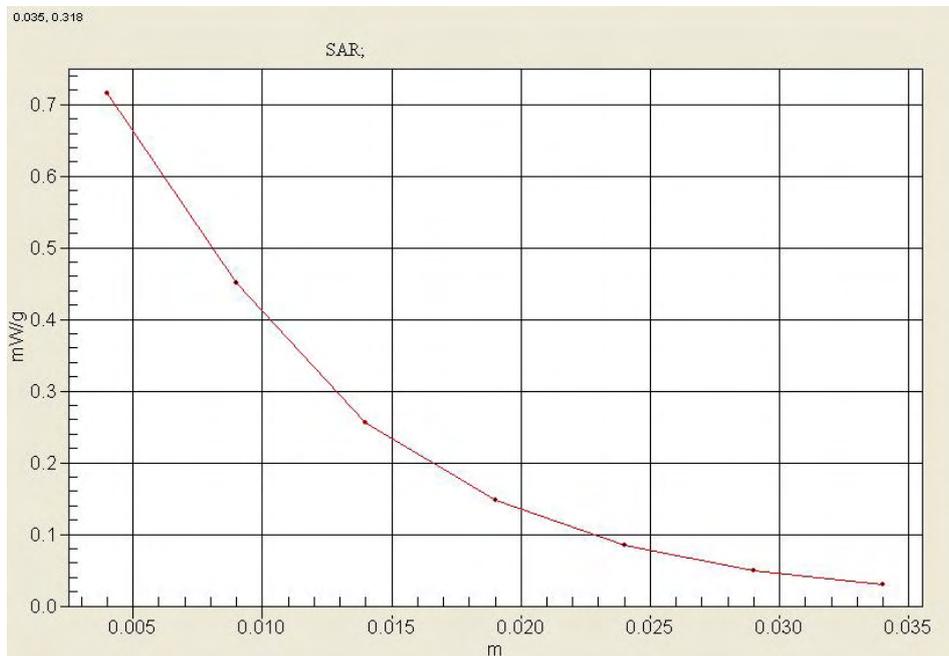
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 53.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

## DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.6, 4.6, 4.6); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Body 600/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.772 mW/g

**Body 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 15.3 V/m; Power Drift = -0.005 dB  
Peak SAR (extrapolated) = 0.914 W/kg  
**SAR(1 g) = 0.649 mW/g; SAR(10 g) = 0.398 mW/g**  
Maximum value of SAR (measured) = 0.716 mW/g



## Attachment 2. – Dipole Validation Plots

## ■ Validation Data (835 MHz Head)

Test Laboratory: HCT CO., LTD  
Input Power 100 mW (20dBm)  
Liquid Temp: 21.1 °C  
Test Date: Mar.02, 2011

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

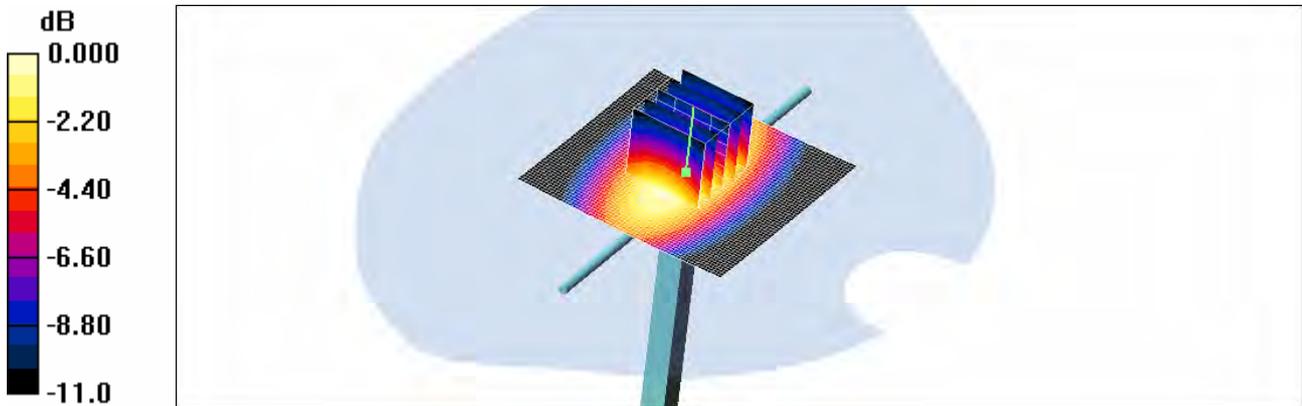
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.9$  mho/m;  $\epsilon_r = 42.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

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

**Validation 835MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 35.7 V/m; Power Drift = -0.021 dB  
Peak SAR (extrapolated) = 1.46 W/kg  
**SAR(1 g) = 0.977 mW/g; SAR(10 g) = 0.626 mW/g**  
Maximum value of SAR (measured) = 1.07 mW/g



## ■ Validation Data (1800 MHz Head)

Test Laboratory: HCT CO., LTD  
Input Power: 100 mW (20dBm)  
Liquid Temp: 21.1 °C  
Test Date: Mar.03, 2011

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 – SN:2d006

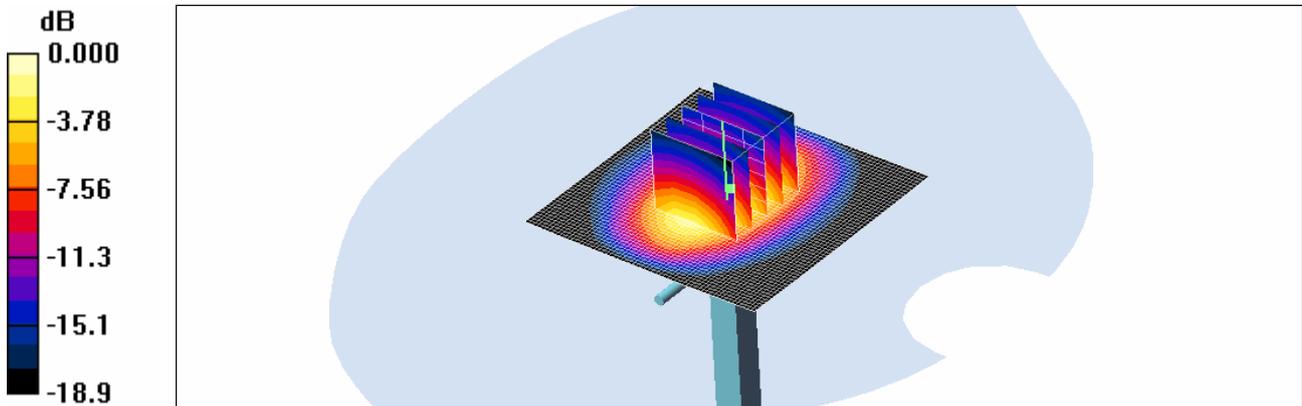
Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1800$  MHz;  $\sigma = 1.42$  mho/m;  $\epsilon_r = 38.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(5.51, 5.51, 5.51); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Dipole 1800MHz Validation/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 4.59 mW/g

Dipole 1800MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 57.6 V/m; Power Drift = -0.038 dB  
Peak SAR (extrapolated) = 6.80 W/kg  
**SAR(1 g) = 3.91 mW/g; SAR(10 g) = 2.05 mW/g**  
Maximum value of SAR (measured) = 4.18 mW/g



0 dB = 4.18mW/g

## ■ Validation Data (1900 MHz Head)

Test Laboratory: HCT CO., LTD  
Input Power 100 mW (20 dBm)  
Liquid Temp: 21.1 °C  
Test Date: Mar.02, 2011

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

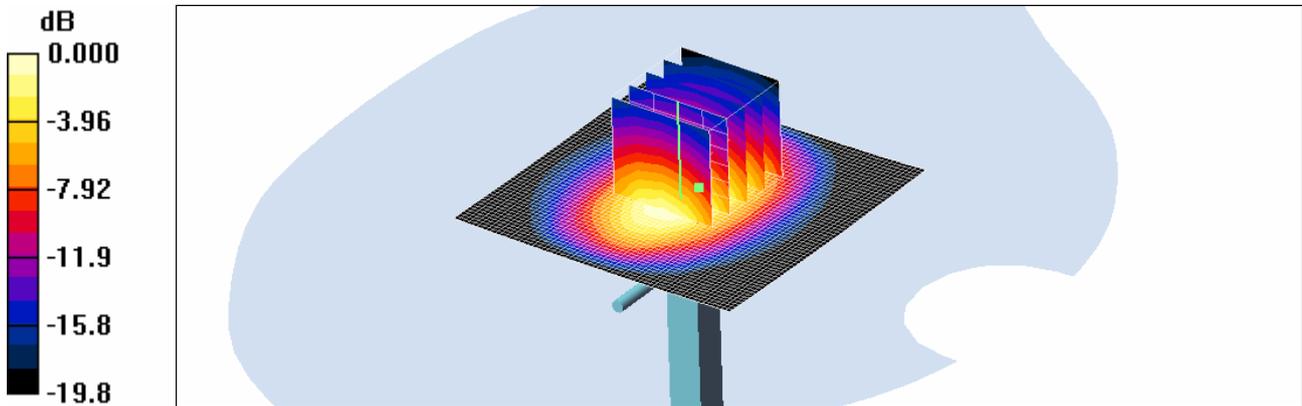
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.39$  mho/m;  $\epsilon_r = 40$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; 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) = 4.73 mW/g

Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 60.3 V/m; Power Drift = 0.001 dB  
Peak SAR (extrapolated) = 6.98 W/kg  
**SAR(1 g) = 3.98 mW/g; SAR(10 g) = 2.07 mW/g**  
Maximum value of SAR (measured) = 4.44 mW/g



0 dB = 4.44mW/g

## ■ Dielectric Parameter (835 MHz Head)

Title                   A415  
 SubTitle               CDMA835(Head)  
 Test Date              Mar.02, 2011

Frequency	e'	e''
800000000.0000	42.8918	19.4859
805000000.0000	42.8139	19.4584
810000000.0000	42.7543	19.4534
815000000.0000	42.7264	19.4235
820000000.0000	42.6735	19.4544
825000000.0000	42.6105	19.4454
830000000.0000	42.6052	19.3937
835000000.0000	42.5153	19.3772
840000000.0000	42.4780	19.3565
845000000.0000	42.4420	19.3199
850000000.0000	42.3644	19.3167
855000000.0000	42.3324	19.3418
860000000.0000	42.2772	19.3374
865000000.0000	42.1560	19.3322
870000000.0000	42.1190	19.3127
875000000.0000	42.0450	19.2690
880000000.0000	41.9937	19.2646
885000000.0000	41.9257	19.2855
890000000.0000	41.9162	19.2638
895000000.0000	41.7987	19.2299
900000000.0000	41.7405	19.2235

**■ Dielectric Parameter (835 MHz Body)**

Title A415  
SubTitle CDMA835(Body)  
Test Date Mar.02, 2011

Frequency	e'	e''
800000000.0000	57.0458	21.2931
805000000.0000	57.0388	21.2412
810000000.0000	57.0046	21.2227
815000000.0000	56.9248	21.2107
820000000.0000	56.9537	21.1766
825000000.0000	56.8727	21.1571
830000000.0000	56.8656	21.1201
835000000.0000	56.8420	21.0924
840000000.0000	56.7891	21.0587
845000000.0000	56.7100	21.0402
850000000.0000	56.6855	20.9646
855000000.0000	56.5834	20.9874
860000000.0000	56.5316	20.8838
865000000.0000	56.4767	20.8899
870000000.0000	56.3304	20.8424
875000000.0000	56.3036	20.7847
880000000.0000	56.2661	20.8130
885000000.0000	56.1691	20.7444
890000000.0000	56.1423	20.7932
895000000.0000	56.0898	20.7218
900000000.0000	56.0482	20.7404

-

**■ Dielectric Parameter (1800 MHz Head)**

Title A415  
SubTitle AWS1800(Head)  
Test Date Mar.03, 2011

Frequency	e'	e''
1700000000.0000	39.3875	14.0128
1710000000.0000	39.3322	14.0323
1720000000.0000	39.3465	14.0624
1730000000.0000	39.2667	14.0619
1740000000.0000	39.2588	14.0547
1750000000.0000	39.2554	14.0110
1760000000.0000	39.1735	14.0222
1770000000.0000	39.1181	14.0767
1780000000.0000	39.0401	14.1107
1790000000.0000	38.9400	14.1305
1800000000.0000	38.9026	14.1507
1810000000.0000	38.8852	14.2077
1820000000.0000	38.8520	14.2769
1830000000.0000	38.8530	14.3346
1840000000.0000	38.8028	14.3351
1850000000.0000	38.7983	14.3445
1860000000.0000	38.7640	14.3479
1870000000.0000	38.7812	14.3260
1880000000.0000	38.6832	14.3836
1890000000.0000	38.6398	14.4497
1900000000.0000	38.5320	14.4572

**■ Dielectric Parameter (1800 MHz Body)**

Title A415  
SubTitle AWS1800(Body)  
Test Date Mar.03, 2011

Frequency	e'	e''
1700000000.0000	52.8384	15.5793
1710000000.0000	52.7145	15.6575
1720000000.0000	52.5927	15.7532
1730000000.0000	52.4124	15.7859
1740000000.0000	52.2887	15.7895
1750000000.0000	52.2284	15.7691
1760000000.0000	52.2326	15.7045
1770000000.0000	52.3095	15.6427
1780000000.0000	52.3885	15.6182
1790000000.0000	52.5124	15.6065
1800000000.0000	52.6165	15.5914
1810000000.0000	52.6050	15.6327
1820000000.0000	52.5286	15.7329
1830000000.0000	52.3897	15.8212
1840000000.0000	52.2300	15.9246
1850000000.0000	52.0426	15.9837
1860000000.0000	51.8918	15.9766
1870000000.0000	51.8480	15.9441
1880000000.0000	51.8414	15.8908
1890000000.0000	51.9257	15.8449
1900000000.0000	52.0654	15.8032

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

Title A415  
SubTitle PCS1900(Head)  
Test Date Mar.02, 2011

Frequency	e'	e''
1800000000.0000	40.7110	12.8657
1810000000.0000	40.6090	12.8850
1820000000.0000	40.5141	12.8791
1830000000.0000	40.3974	12.9181
1840000000.0000	40.2632	12.9838
1850000000.0000	40.1703	13.0118
1860000000.0000	40.1011	13.0132
1870000000.0000	40.0535	13.0464
1880000000.0000	40.0373	13.0984
1890000000.0000	40.0268	13.1525
1900000000.0000	40.0431	13.1769
1910000000.0000	40.0178	13.2134
1920000000.0000	39.9665	13.2222
1930000000.0000	39.8709	13.2428
1940000000.0000	39.7662	13.2699
1950000000.0000	39.6594	13.2872
1960000000.0000	39.5412	13.2982
1970000000.0000	39.4466	13.3294
1980000000.0000	39.4248	13.4149
1990000000.0000	39.3858	13.4680
2000000000.0000	39.4081	13.5149

## ■ Dielectric Parameter (1900 MHz Body)

Title A415  
 SubTitle PCS1900(Body)  
 Test Date Mar.02, 2011

Frequency	e'	e''
1850000000.0000	53.8407	13.9223
1855000000.0000	53.8520	13.9118
1860000000.0000	53.8170	13.9386
1865000000.0000	53.8159	13.9763
1870000000.0000	53.7801	13.9635
1875000000.0000	53.7458	13.9864
1880000000.0000	53.7332	14.0014
1885000000.0000	53.6857	14.0204
1890000000.0000	53.6452	14.0542
1895000000.0000	53.6323	14.0461
1900000000.0000	53.5862	14.0646
1905000000.0000	53.5660	14.1020
1910000000.0000	53.5369	14.1118
1915000000.0000	53.4811	14.1389
1920000000.0000	53.4867	14.1833
1925000000.0000	53.5070	14.1885
1930000000.0000	53.4366	14.2024
1935000000.0000	53.4558	14.2351
1940000000.0000	53.4565	14.2426
1945000000.0000	53.4572	14.2760
1950000000.0000	53.4759	14.2724

## Attachment 3. – Probe Calibration Data

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



**S** Schweizerischer Kalibrierdienst  
**S** Service suisse d'étalonnage  
**C** 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 ± 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 B648C	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

Calibrated by: **Jeton Kastrati** (Name)      **Laboratory Technician** (Function)      *[Signature]* (Signature)

Approved by: **Katja Pokovic** (Name)      **Technical Manager** (Function)      *[Signature]* (Signature)

Issued: November 25, 2010

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

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



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

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

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

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

**Methods Applied and Interpretation of Parameters:**

- *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<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* frequency\_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCP<sub>x,y,z</sub>*: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *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 ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <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 dB	B dBuV	C	VR mV	Unc <sup>E</sup> (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 TSI. (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 rectangular distribution and is expressed for the square of the field value.

ET3DV6 SN:1609

November 24, 2010

**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%

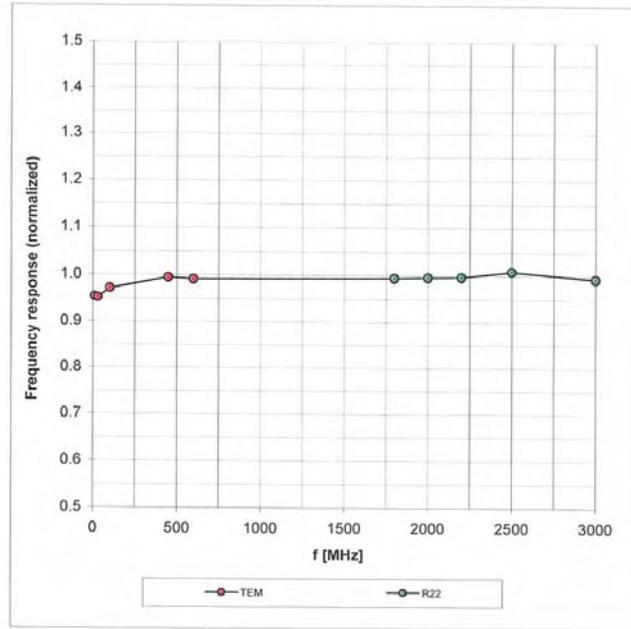
<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1609

November 24, 2010

### Frequency Response of E-Field

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

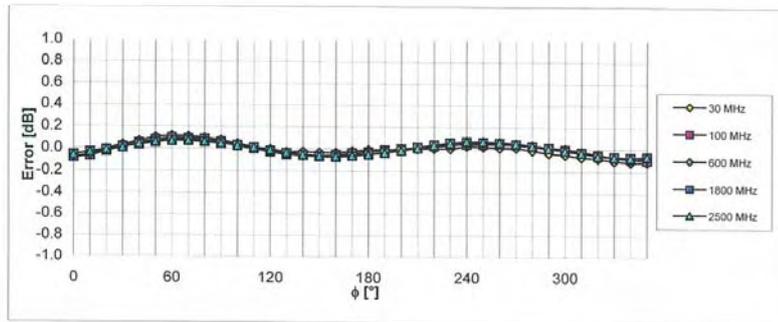
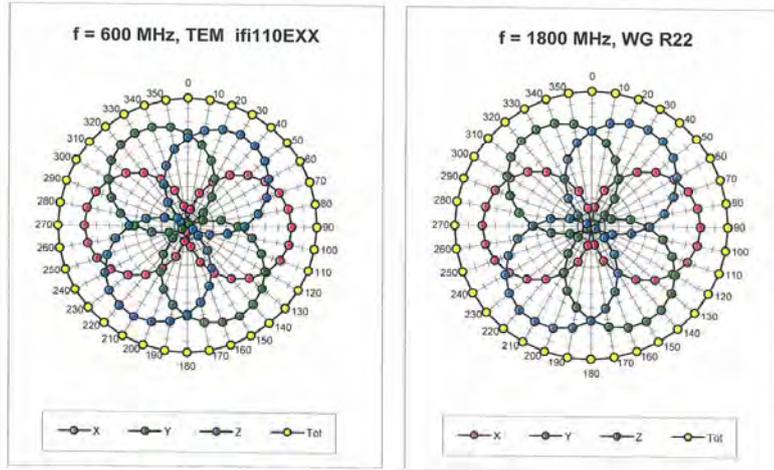


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

ET3DV6 SN:1609

November 24, 2010

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

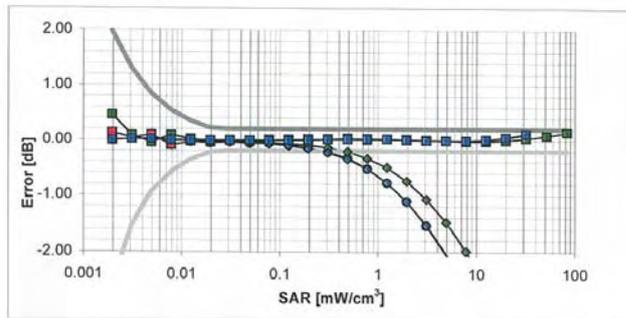
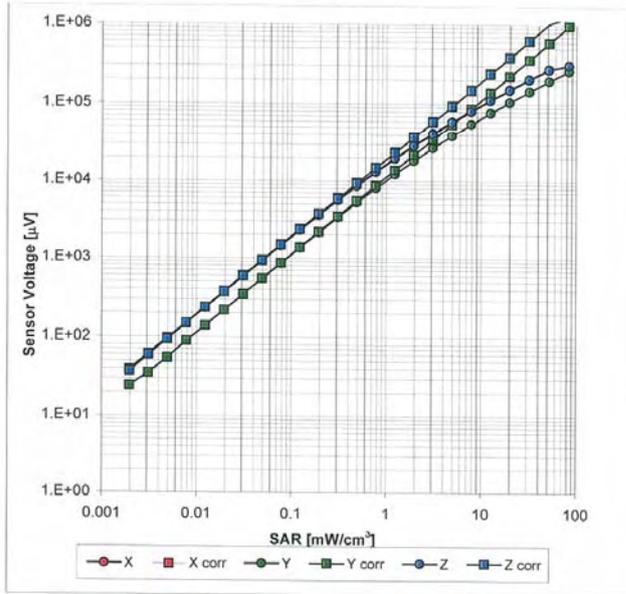


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

ET3DV6 SN:1609

November 24, 2010

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

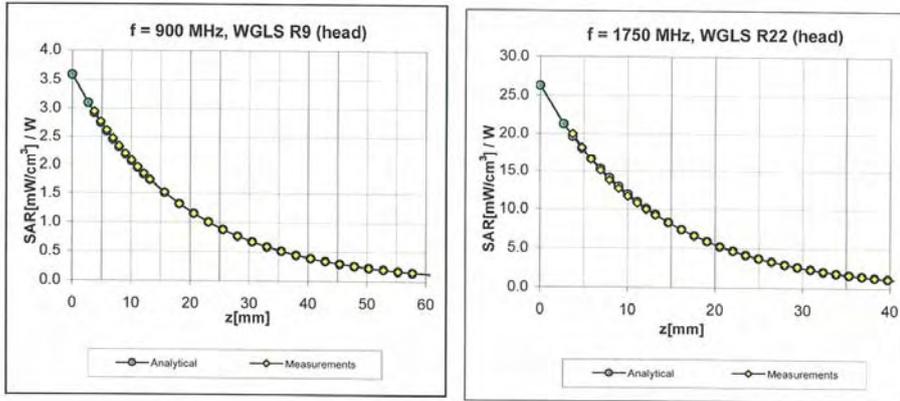


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ET3DV6 SN:1609

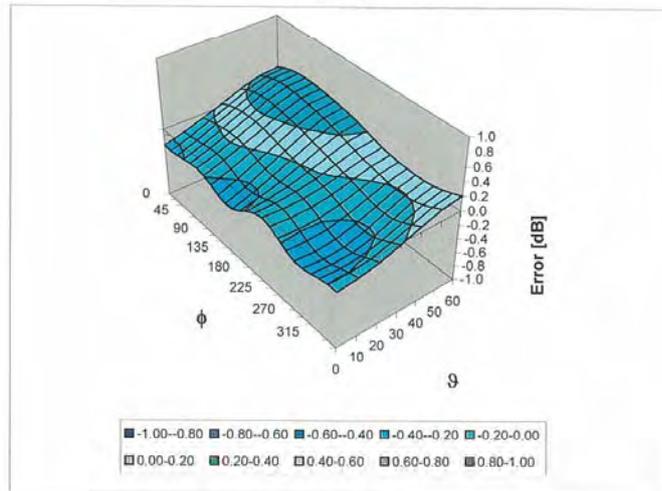
November 24, 2010

### Conversion Factor Assessment



### Deviation from Isotropy in HSL

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



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

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 & 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:

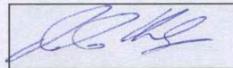
November 26, 2010

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

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info@speag.com, http://www.speag.com

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

Conversion factor ( $\pm$  standard deviation)

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

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

150  $\pm$  50 MHz      *СолvF*      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  
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Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



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**C** Service suisse d'étalonnage  
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**S** Swiss Calibration Service

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **D835V2-441\_May10**

**CALIBRATION CERTIFICATE**

Object **D835V2 - SN: 441**

Calibration procedure(s) **QA CAL-05.v7  
Calibration procedure for dipole validation kits**

Calibration date: **May 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
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	02-Mar-10 (No. DAE4-601_Mar10)	Mar-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

Calibrated by:	Name <b>Jeton Kastrati</b>	Function <b>Laboratory Technician</b>	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Function <b>Technical Manager</b>	Signature 

Issued: May 21, 2010

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

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**S** Swiss Calibration Service

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

Accreditation No.: **SCS 108**

**Glossary:**

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

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

- 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	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.7 $\pm$ 6 %	0.91 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.5 $\pm$ 0.2) °C	----	----

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.43 mW / g
SAR normalized	normalized to 1W	9.72 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>9.66 mW /g <math>\pm</math> 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 mW / g
SAR normalized	normalized to 1W	6.32 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>6.29 mW /g <math>\pm</math> 16.5 % (k=2)</b>

**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.2 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	---	---

**SAR result with Body TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.51 mW / g
SAR normalized	normalized to 1W	10.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>9.92 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.64 mW / g
SAR normalized	normalized to 1W	6.56 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>6.51 mW / g ± 16.5 % (k=2)</b>

**Appendix**

**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	55.2 $\Omega$ - 8.2 j $\Omega$
Return Loss	- 20.8 dB

**Antenna Parameters with Body TSL**

Impedance, transformed to feed point	45.3 $\Omega$ - 9.4 j $\Omega$
Return Loss	- 19.2 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.375 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

**Additional EUT Data**

Manufactured by	SPEAG
Manufactured on	March 09, 2001

**DASY5 Validation Report for Head TSL**

Date/Time: 21.05.2010 09:55:07

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: HSL900

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.03, 6.03, 6.03); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

**Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement**

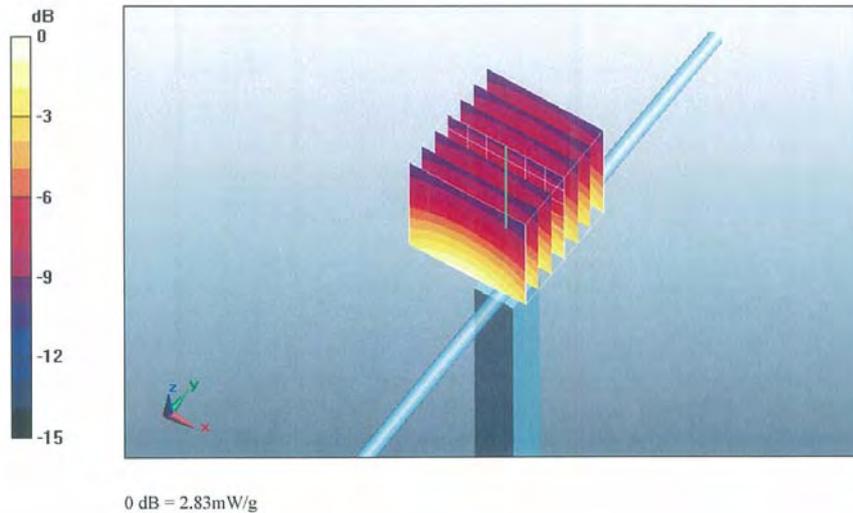
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.3 V/m; Power Drift = -0.023 dB

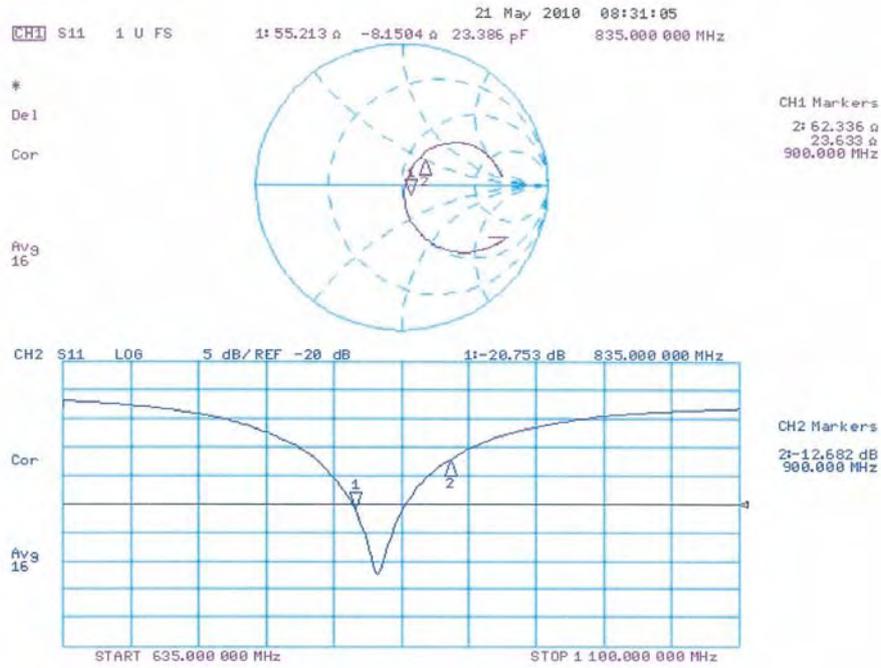
Peak SAR (extrapolated) = 3.63 W/kg

**SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.58 mW/g**

Maximum value of SAR (measured) = 2.83 mW/g



**Impedance Measurement Plot for Head TSL**



**DASY5 Validation Report for Body**

Date/Time: 20.05.2010 09:50:16

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: MSL900

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.98$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.86, 5.86, 5.86); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

**Pin250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement**

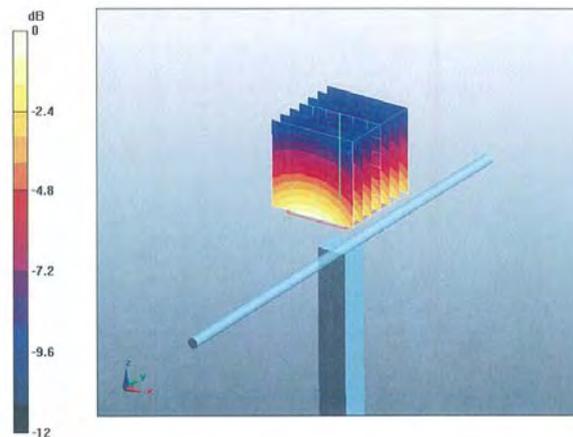
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.4 V/m; Power Drift = 0.000719 dB

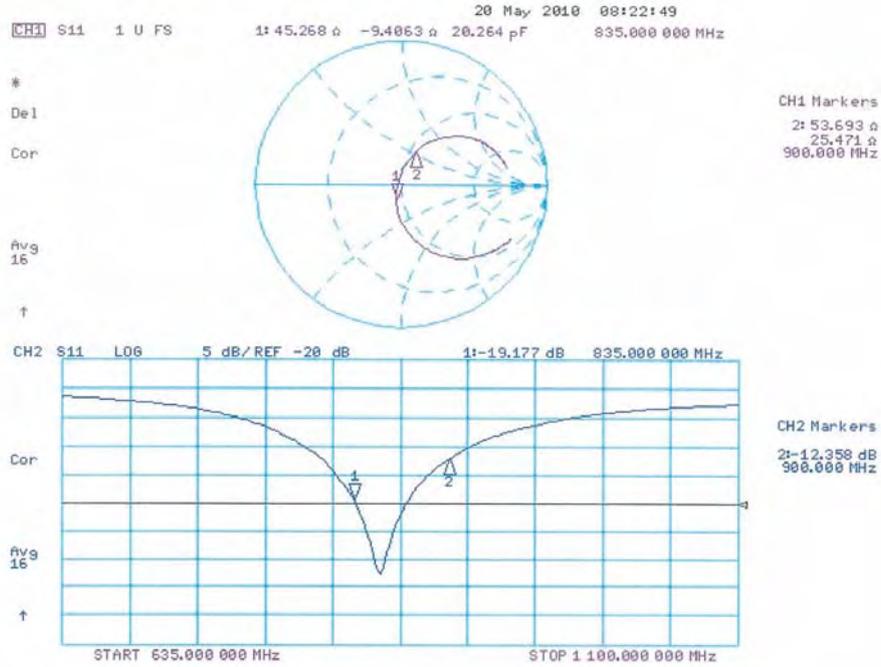
Peak SAR (extrapolated) = 3.69 W/kg

**SAR(1 g) = 2.51 mW/g; SAR(10 g) = 1.64 mW/g**

Maximum value of SAR (measured) = 2.93 mW/g



Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 108**

Client **HTC (Dymstec)**

Certificate No: **D1800V2\_2d006\_Apr10**

**CALIBRATION CERTIFICATE**

Object **D1800V2 - SN: 2d006**

Calibration procedure(s) **QA CAL-05.v7  
Calibration procedure for dipole validation kits**

Calibration date: **April 20, 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
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	02-Mar-10 (No. DAE4-601_Mar10)	Mar-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

Calibrated by: **Jeton Kastrati** (Name), **Laboratory Technician** (Function), *[Signature]* (Signature)

Approved by: **Katja Pokovic** (Name), **Technical Manager** (Function), *[Signature]* (Signature)

Issued: April 20, 2010

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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	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz ± 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.5 ± 6 %	1.35 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °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	9.33 mW / g
SAR normalized	normalized to 1W	37.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>38.2 mW /g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.92 mW / g
SAR normalized	normalized to 1W	19.7 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>19.9 mW /g ± 16.5 % (k=2)</b>

**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.8 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °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	9.63 mW / g
SAR normalized	normalized to 1W	38.5 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>39.6 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.16 mW / g
SAR normalized	normalized to 1W	20.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>20.9 mW / g ± 16.5 % (k=2)</b>



**DASY5 Validation Report for Head TSL**

Date/Time: 20.04.2010 10:13:38

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d006**

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: HSL U11 BB

Medium parameters used:  $f = 1800$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 40.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.25, 5.25, 5.25); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

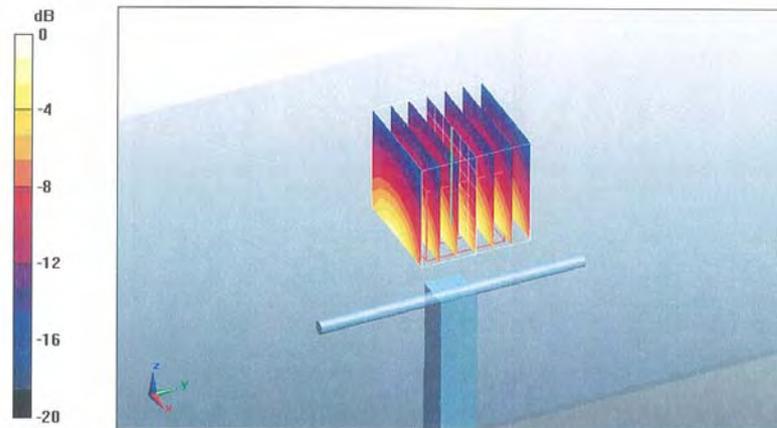
**Pin=250 mW/d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement**  
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96 V/m; Power Drift = 0.038 dB

Peak SAR (extrapolated) = 16.9 W/kg

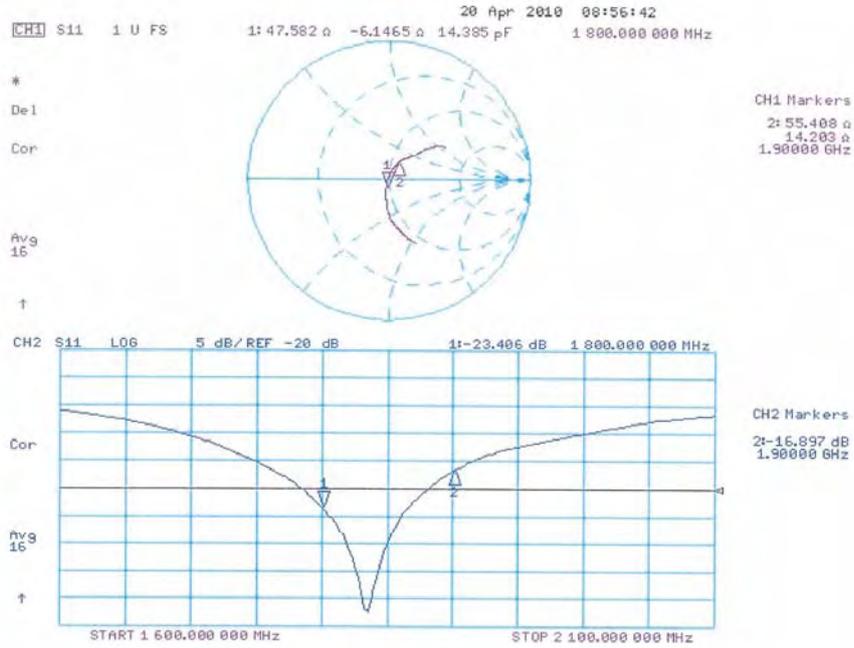
**SAR(1 g) = 9.33 mW/g; SAR(10 g) = 4.92 mW/g**

Maximum value of SAR (measured) = 11.6 mW/g



0 dB = 11.6mW/g

**Impedance Measurement Plot for Head TSL**



**DASY5 Validation Report for Body**

Date/Time: 20.04.2010 12:31:55

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d006**

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB

Medium parameters used:  $f = 1800$  MHz;  $\sigma = 1.47$  mho/m;  $\epsilon_r = 54.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

**DASY5 Configuration:**

- Probe: ES3DV3 - SN3205; ConvF(4.8, 4.8, 4.8); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

**Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement**

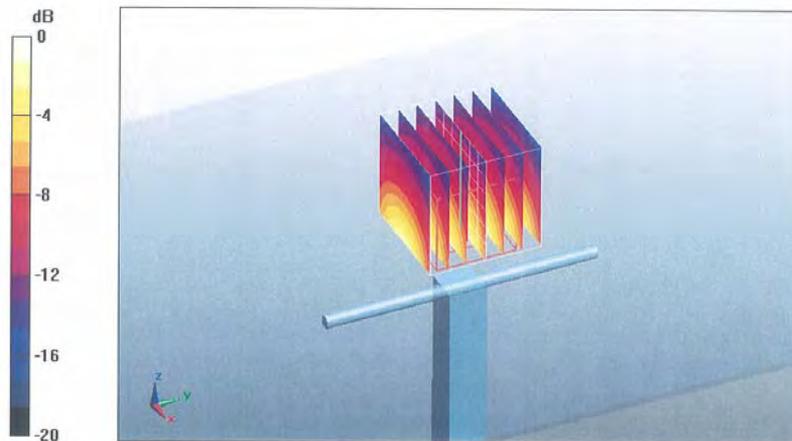
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.5 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 16.6 W/kg

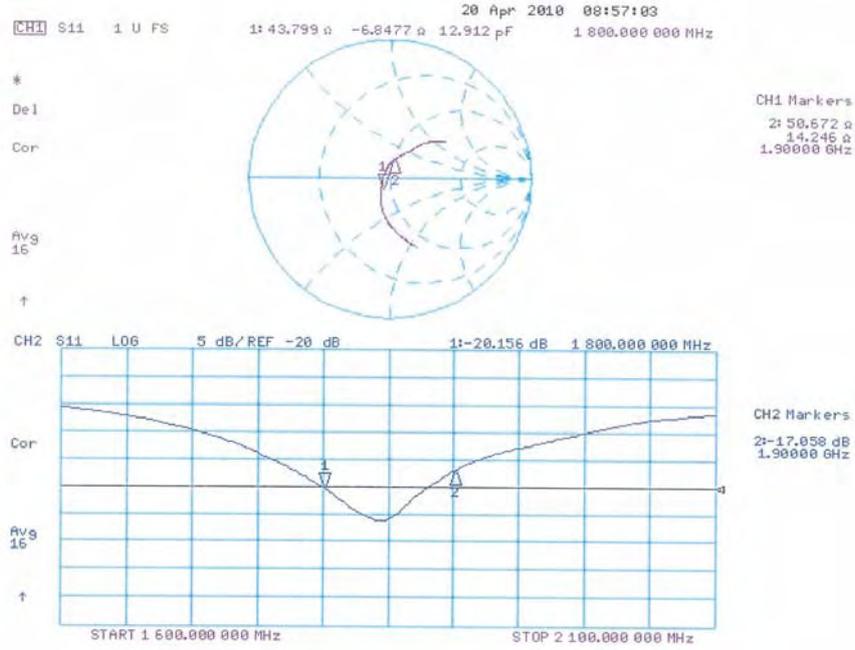
**SAR(1 g) = 9.63 mW/g; SAR(10 g) = 5.16 mW/g**

Maximum value of SAR (measured) = 12.1 mW/g



0 dB = 12.1mW/g

Impedance Measurement Plot for Body TSL



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **D1900V2-5d032\_Jul10**

**CALIBRATION CERTIFICATE**

Object	D1900V2 - SN: 5d032																																														
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits																																														
Calibration date:	July 16, 2010																																														
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity &lt; 70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter EPM-442A</td> <td>GB37480704</td> <td>06-Oct-09 (No. 217-01086)</td> <td>Oct-10</td> </tr> <tr> <td>Power sensor HP 8481A</td> <td>US37292783</td> <td>06-Oct-09 (No. 217-01086)</td> <td>Oct-10</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: 5086 (20g)</td> <td>30-Mar-10 (No. 217-01158)</td> <td>Mar-11</td> </tr> <tr> <td>Type-N mismatch combination</td> <td>SN: 5047.2 / 06327</td> <td>30-Mar-10 (No. 217-01162)</td> <td>Mar-11</td> </tr> <tr> <td>Reference Probe ES3DV3</td> <td>SN: 3205</td> <td>30-Apr-10 (No. ES3-3205_Apr10)</td> <td>Apr-11</td> </tr> <tr> <td>DAE4</td> <td>SN: 601</td> <td>10-Jun-10 (No. DAE4-601_Jun10)</td> <td>Jun-11</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Check Date (in house)</th> <th>Scheduled Check</th> </tr> </thead> <tbody> <tr> <td>Power sensor HP 8481A</td> <td>MY41092317</td> <td>18-Oct-02 (in house check Oct-09)</td> <td>In house check: Oct-11</td> </tr> <tr> <td>RF generator R&amp;S SMT-06</td> <td>100005</td> <td>4-Aug-99 (in house check Oct-09)</td> <td>In house check: Oct-11</td> </tr> <tr> <td>Network Analyzer HP 8753E</td> <td>US37390585 S4206</td> <td>18-Oct-01 (in house check Oct-09)</td> <td>In house check: Oct-10</td> </tr> </tbody> </table>				Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration	Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10	Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10	Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11	Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11	Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11	DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11	Secondary Standards	ID #	Check Date (in house)	Scheduled Check	Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11	RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11	Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10
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Calibrated by:	Name Dimce Iliev	Function Laboratory Technician	Signature 																																												
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature 																																												
			Issued: July 19, 2010																																												
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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:**

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

- d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

**Measurement Conditions**

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

DASY Version	DASY5	V52.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.3 ± 6 %	1.43 mho/m ± 6 %
Head TSL temperature during test	(22.6 ± 0.2) °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 normalized	normalized to 1W	40.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>39.9 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.26 mW / g
SAR normalized	normalized to 1W	21.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>20.9 mW / g ± 16.5 % (k=2)</b>

**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.3 ± 6 %	1.55 mho/m ± 6 %
Body TSL temperature during test	(22.5 ± 0.2) °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	10.5 mW / g
SAR normalized	normalized to 1W	42.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>41.5 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.63 mW / g
SAR normalized	normalized to 1W	22.5 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>22.4 mW / g ± 16.5 % (k=2)</b>

**Appendix**

**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	51.6 $\Omega$ + 6.2 j $\Omega$
Return Loss	- 24.0 dB

**Antenna Parameters with Body TSL**

Impedance, transformed to feed point	50.3 $\Omega$ + 7.0 j $\Omega$
Return Loss	- 23.1 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.177 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/Time: 16.07.2010 12:15:48

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: HSL U12 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.43$  mho/m;  $\epsilon_r = 40.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

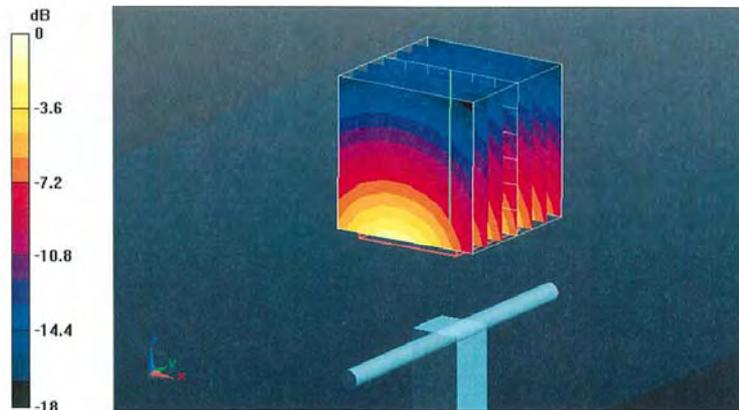
**Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.4 V/m; Power Drift = 0.039 dB

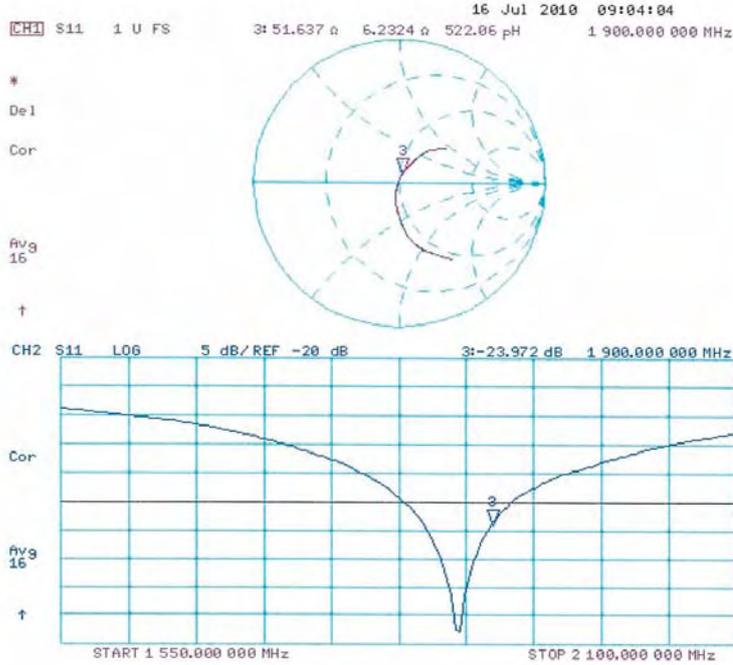
Peak SAR (extrapolated) = 18.3 W/kg

**SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.26 mW/g**

Maximum value of SAR (measured) = 12.3 mW/g



Impedance Measurement Plot for Head TSL



**DASY5 Validation Report for Body**

Date/Time: 13.07.2010 12:14:01

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: MSL U11 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 53.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

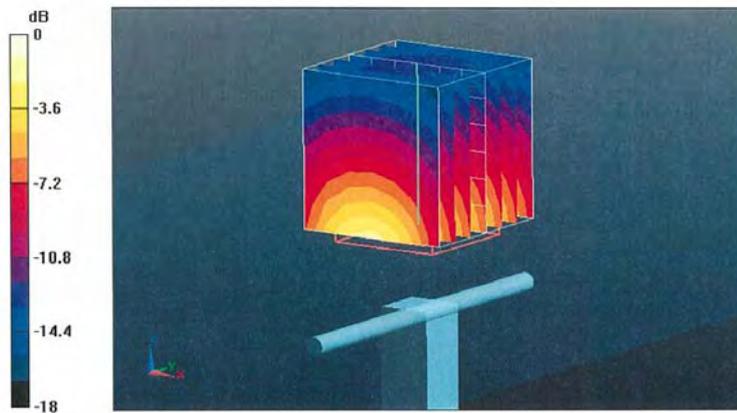
**Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.1 V/m; Power Drift = 0.00127 dB

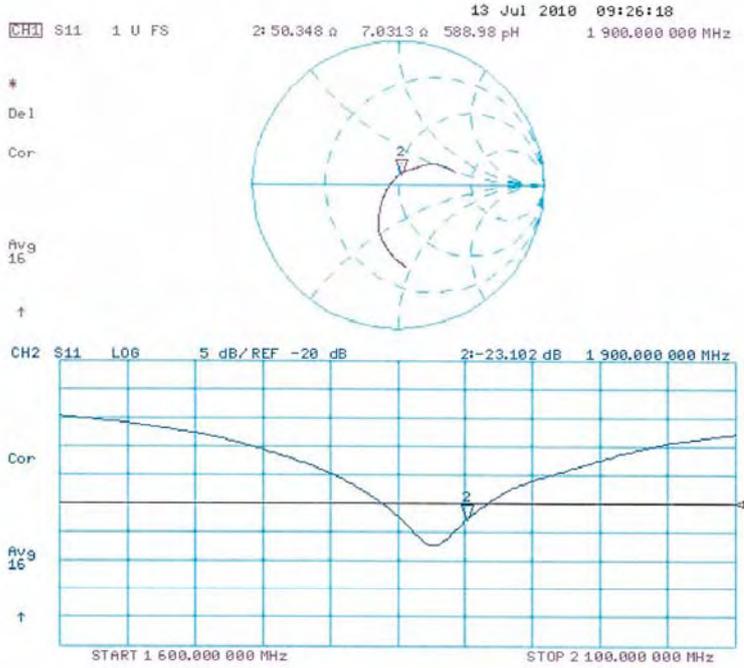
Peak SAR (extrapolated) = 17.6 W/kg

**SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.63 mW/g**

Maximum value of SAR (measured) = 13.2 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 3

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 DAE3 unit is connected to a fragile 3-pin battery connector. Customer is responsible to apply utmost caution not to bend or damage the connector when changing batteries.

**Shipping of the DAE:** Before shipping the DAE to SPEAG for calibration the customer shall 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 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, 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\_BR03091211BD DAE3.doc

11.12.2009

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Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **DAE3-446\_Sep10**

**CALIBRATION CERTIFICATE**

Object **DAE3 - SD 000 D03 AA - SN: 446**

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

Calibrated by:	Name <b>Dominique Steffen</b>	Function <b>Technician</b>	Signature 
Approved by:	Name <b>Fin Bomholt</b>	Function <b>R&amp;D Director</b>	Signature 

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	404.260 $\pm$ 0.1% (k=2)	403.694 $\pm$ 0.1% (k=2)	404.145 $\pm$ 0.1% (k=2)
Low Range	3.96254 $\pm$ 0.7% (k=2)	3.93981 $\pm$ 0.7% (k=2)	3.95623 $\pm$ 0.7% (k=2)

**Connector Angle**

Connector Angle to be used in DASY system	164.5 $^{\circ}$ $\pm$ 1 $^{\circ}$
---	-------------------------------------

## Appendix

### 1. DC Voltage Linearity

High Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	199997.4	-3.08	-0.00
Channel X + Input	20003.35	3.65	0.02
Channel X - Input	-20000.68	-1.38	0.01
Channel Y + Input	200006.5	-2.92	-0.00
Channel Y + Input	20002.52	2.82	0.01
Channel Y - Input	-20000.34	-1.14	0.01
Channel Z + Input	200006.4	-2.23	-0.00
Channel Z + Input	19998.79	-0.71	-0.00
Channel Z - Input	-20006.08	-5.58	0.03

Low Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	2000.3	0.26	0.01
Channel X + Input	199.86	-0.14	-0.07
Channel X - Input	-200.27	-0.27	0.14
Channel Y + Input	2000.0	0.03	0.00
Channel Y + Input	199.38	-0.82	-0.41
Channel Y - Input	-200.70	-0.80	0.40
Channel Z + Input	1999.6	-0.50	-0.03
Channel Z + Input	198.68	-1.32	-0.66
Channel Z - Input	-201.43	-1.43	0.72

### 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 ( $\mu\text{V}$ )	Low Range Average Reading ( $\mu\text{V}$ )
Channel X	200	1.24	0.13
	-200	1.03	-0.40
Channel Y	200	0.55	1.20
	-200	-2.59	-2.48
Channel Z	200	12.30	12.33
	-200	-13.81	-14.40

### 3. Channel separation

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

	Input Voltage (mV)	Channel X ( $\mu\text{V}$ )	Channel Y ( $\mu\text{V}$ )	Channel Z ( $\mu\text{V}$ )
Channel X	200	-	0.55	-1.18
Channel Y	200	0.64	-	2.54
Channel Z	200	1.47	-2.59	-

**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	16294	16100
Channel Y	16174	14940
Channel Z	16420	15871

**5. Input Offset Measurement**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec  
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.91	-1.64	-0.36	0.22
Channel Y	0.02	-1.35	0.68	0.27
Channel Z	-2.23	-2.85	-0.76	0.29

**6. Input Offset Current**

Nominal Input circuitry offset current on all channels: <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