




# SAR TEST REPORT

HCT CO., LTD

EUT Type:	GSM/WCDMA PDA with Bluetooth & WLAN	
FCC ID:	ZP4CW20	
Model:	CW20	
Date of Issue:	Oct. 28, 2011	
Test report No.:	HCTA1110FS03	
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Testing has been carried out in accordance with:	RSS-102 Issue 4; Health Canada Safety Code 6 47CFR §2.1093 FCC OET Bulletin 65(Edition 97-01), Supplement C (Edition 01-01) ANSI/ IEEE C95.1 – 1992 IEEE Std 1528	
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> _____ Report prepared by : Young-Soo Jang Test Engineer of SAR Part</div> <div> _____ Approved by : Jae-Sang So Manager of SAR Part</div>	

# Table of Contents

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1. INTRODUCTION .....	4
2. DESCRIPTION OF DEVICE.....	5
3. DESCRIPTION OF TEST EQUIPMENT .....	6
4. SAR MEASUREMENT PROCEDURE .....	1 3
5. DESCRIPTION OF TEST POSITION.....	1 4
5.1 HEAD POSITION .....	1 4
5.2 Body Holster/Belt Clip Configurations .....	1 5
6. MEASUREMENT UNCERTAINTY .....	1 6
7. ANSI/ IEEE C95.1 - 1992 RF EXPOSURE LIMITS.....	1 7
8. SYSTEM VERIFICATION .....	1 8
8.1 Tissue Verification .....	1 8
8.2 System Validation.....	1 8
8.3 System Validation Procedure .....	1 8
9. RF CONDUCTED POWER .....	1 9
9.1 GSM .....	1 9
9.2 WCDMA.....	2 0
9.3 WiFi .....	2 2
10. SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas.....	2 4
11. SAR TEST DATA SUMMARY .....	2 6
11.1 Measurement Results (GSM850 Head SAR).....	2 6
11.2 Measurement Results (GSM1900 Head SAR).....	2 7
11.3 Measurement Results (WCDMA850 Head SAR) .....	2 8
11.4 Measurement Results (WCDMA1900 Head SAR) .....	2 9
11.5 Measurement Results (GSM850 Body-Worn SAR) .....	3 0
11.6 Measurement Results (GSM1900 Body-Worn SAR) .....	3 1
11.7 Measurement Results (WCDMA850 Body-Worn SAR).....	3 2
11.8 Measurement Results (WCDMA1900 Body-Worn SAR).....	3 3
12. CONCLUSION.....	3 4
13. REFERENCES .....	3 5
Attachment 1. – SAR Test Plots .....	3 6
Attachment 2. – Dipole Validation Plots.....	6 5
Attachment 3. – Probe Calibration Data .....	7 4
Attachment 4. – Dipole Calibration Data .....	8 8
Attachment 5. – DAE Calibration Data .....	1 0 5

## Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTA1110FS03	Oct. 28, 2011	First Approval 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 Extendeds Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-2005 Extended 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 (ρ). 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).**

where:

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

$\sigma$	=	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	GSM/WCDMA PDA with Bluetooth & WLAN		
FCC ID:	ZP4CW20		
Model:	CW20		
Trade Name	CATCHWELL.Inc	Serial Number(s)	#1
Application Type	Certification		
Mode(s)of Operation	GSM850/GSM1900/WCDMA850/WCDMA1900/WLAN		
Tx Frequency	824.20 - 848.80 MHz (GSM850)/ 1 850.20 – 1 909.80 MHz (GSM1900) 826.4~846.6 MHz (WCDMA850)/ 1 852.4 – 1 907.6 MHz (WCDMA1900) 2 412- 2 462 MHz (WLAN)		
Rx Frequency	869.20 - 893.80 MHz (GSM850)/ 1 930.20 – 1 989.80 MHz (GSM1900) 871.4 - 891.6 MHz (WCDMA850)/ 1 932.4 – 1 987.6 MHz (WCDMA1900) 2 412- 2 462 MHz (WLAN)		
FCC Classification	Licensed Portable Transmitter Held to Ear (PCE)		
Production Unit or Identical Prototype	Prototype		
Max SAR	0.253 W/kg GSM850 Head SAR / 0.201 W/kg GSM850 Body SAR 0.252 W/kg GSM1900 Head SAR / 0.1 W/kg GSM1900 Body SAR 0.223 W/kg WCDMA850 Head SAR / 0.186 W/kg WCDMA850 Body SAR 0.632 W/kg WCDMA1900 Head SAR / 0.254 W/kg WCDMA1900 Body SAR		
Date(s) of Tests	Oct. 26, 2011 ~ Oct. 27, 2011		
Antenna Type	Intenna		
GPRS	Multislot Class: 12, Mode Class: B		
	Max number of uplink slot: 4 Max number of downlink slot: 4 Max number of total active slot: 5		

## 3. DESCRIPTION OF TEST EQUIPMENT

### 3.1 SAR MEASUREMENT SETUP

These measurements are performed using the DASY4 automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists of high precision robotics system (Staubli), robot controller, Pentium III computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Figure.3.1).

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

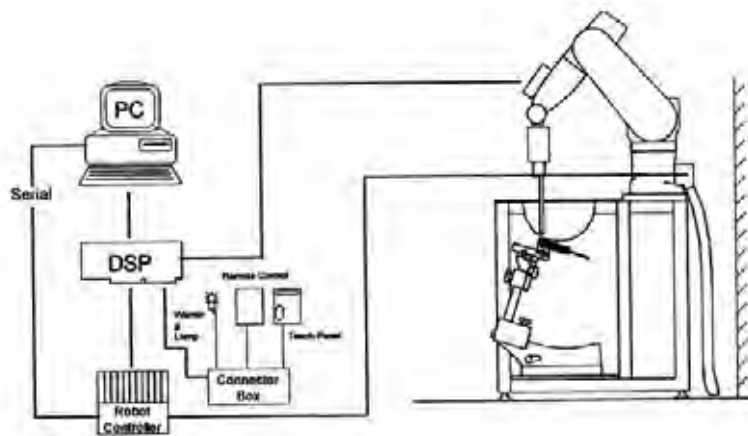


Figure 3.1 HCT SAR Lab. Test Measurement Set-up

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

## 3.2 DASY4 E-FIELD PROBE SYSTEM

### 3.2.1 ET3DV6 Probe Specification

Construction	Symmetrical design with triangular core 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  $\pm 10\%$ . The spherical isotropy was evaluated with the proper procedure and found to be better than  $\pm 0.25$  dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

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

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

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

where:

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

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

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

where:

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

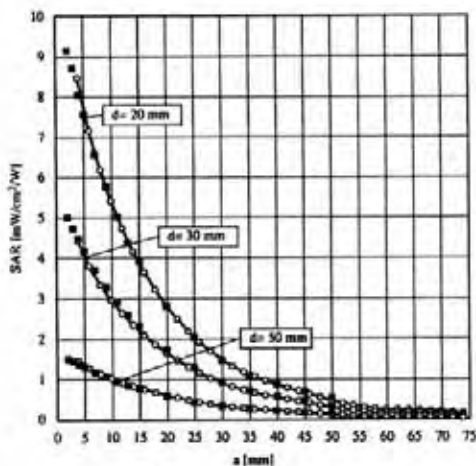


Figure 3.4 E-Field and Temperature measurements at 900 MHz

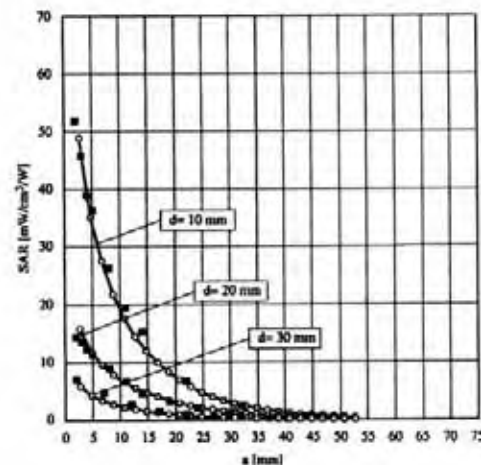


Figure 3.5 E-Field and temperature measurements at 1.8 GHz



### 3.3.2 Data Extrapolation

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

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

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

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

E-field probes:

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

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

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

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

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

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

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

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

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

with  $P_{pwe}$  = equivalent power density of a plane wave in W/cm<sup>2</sup>  
 $E_{tot}$  = total electric field strength in V/m

### **3.4 SAM Phantom**

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



Figure 3.6 SAM Phantom

Shell Thickness	2.0 mm
Filling Volume	about 25 L
Dimensions	1 000 mm x 500 mm (L x W)

### **3.5 Device Holder for Transmitters**

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

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



Figure 3.7 Device Holder

### 3.6 Brain & Muscle Simulating Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydrox-ethyl cellulose (HEC) gelling agent and saline solution (see Table 3.1). Preservation with a bactericide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The mixture characterizations used for the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Hartsgrove.

Ingredients (% 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	466	Mar. 1, 2011	Annual	Mar. 1, 2012
SPEAG	E-Field Probe ET3DV6	1609	Nov. 24, 2010	Annual	Nov. 24, 2011
SPEAG	Validation Dipole D835V2	441	May 16, 2011	Annual	May 16, 2012
SPEAG	Validation Dipole D1900V2	5d032	July 22, 2011	Annual	July 22, 2012
SPEAG	Validation Dipole D2450V2	743	Aug. 29, 2011	Annual	Aug. 29, 2012
Agilent	Power Meter(F) E4419B	MY41291386	Nov. 05, 2010	Annual	Nov. 05, 2011
Agilent	Power Sensor(G) 8481	MY41090870	Nov. 05, 2010	Annual	Nov. 05, 2011
HP	Dielectric Probe Kit 85070C	00721521	N/A	N/A	N/A
HP	Dual Directional Coupler	16072	Nov. 05, 2010	Annual	Nov. 05, 2011
R&S	Base Station CMU200	110740	July 26, 2011	Annual	July 26, 2012
Agilent	Base Station E5515C	GB44400269	Feb. 10, 2011	Annual	Feb. 10, 2012
HP	Signal Generator E4438C	MY42082646	Nov. 11, 2010	Annual	Nov. 11, 2011
HP	Network Analyzer 8753ES	JP39240221	Mar. 30, 2011	Annual	Mar. 30, 2012

**NOTE:**

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

## 4. SAR MEASUREMENT PROCEDURE

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The evaluation was performed with the following procedure:

1. The SAR value at a fixed location above the ear point was measured and was used as a reference value for assessing the power drop.
2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15 mm x 15 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.
3. Around this point, a volume of 32 mm x 32 mm x 30 mm was assessed by measuring 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:
  - a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
  - b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions. The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.
  - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR value, at the same location as procedure #1, was re-measured. If the value changed by more than 5 %, the evaluation is repeated.

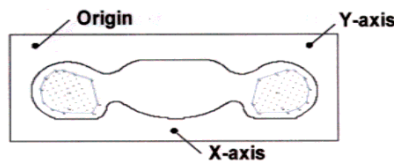


Figure 4.1 SAR Measurement Point in Area Scan

## 5. DESCRIPTION OF TEST POSITION

### 5.1 HEAD POSITION

The device was placed in a normal operating position with the Point A on the device, as illustrated in following drawing, aligned with the location of the RE(ERP) on the phantom. With the ear-piece pressed against the head, the vertical center line of the body of the handset was aligned with an imaginary plane consisting of the RE, LE and M. While maintaining these alignments, the body of the handset was gradually moved towards the cheek until any point on the mouth-piece or keypad contacted the cheek. This is a cheek/touch position. For ear/tilt position, while maintain the device aligned with the BM and FN lines, the device was pivot against ERP back for 15° or until the device antenna touch the phantom. Please refer to IEEE 1528-2003 illustration below.

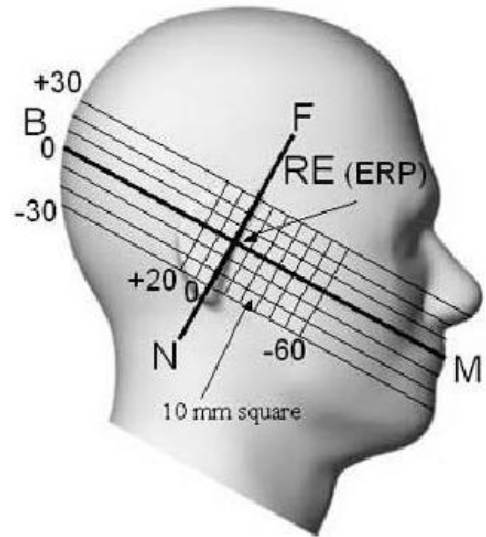


Figure 5.1 Side view of the phantom

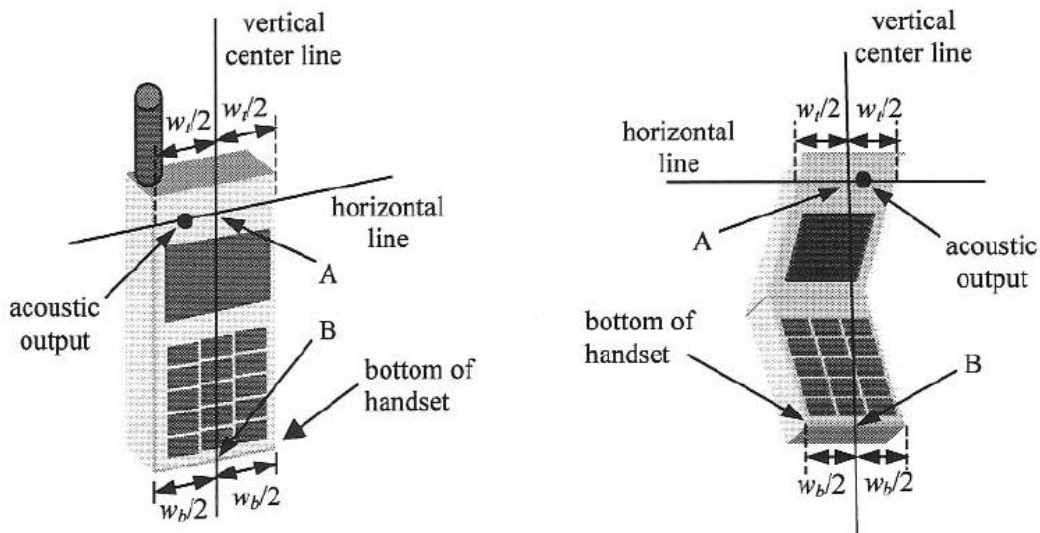


Figure 5.2 Handset vertical and horizontal reference lines

## **5.2 Body Holster/Belt Clip Configurations**

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. A device with a headset output is tested with a headset connected to the device. Body dielectric parameters are used.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with each accessory. If multiple accessory share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some Devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used.

Since this EUT does not supply any body worn accessory to the end user a distance of 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	$\infty$
Axial Isotropy	4.70	R	1.73	0.7	1.90	$\infty$
Hemispherical Isotropy	9.60	R	1.73	0.7	3.88	$\infty$
Boundary Effects	1.00	R	1.73	1	0.58	$\infty$
Linearity	4.70	R	1.73	1	2.71	$\infty$
System Detection Limits	1.00	R	1.73	1	0.58	$\infty$
Readout Electronics	0.30	N	1.00	1	0.30	$\infty$
Response Time	0.8	R	1.73	1	0.46	$\infty$
Integration Time	2.6	R	1.73	1	1.50	$\infty$
RF Ambient Conditions	3.00	R	1.73	1	1.73	$\infty$
Probe Positioner	0.40	R	1.73	1	0.23	$\infty$
Probe Positioning	2.90	R	1.73	1	1.67	$\infty$
Max SAR Eval	1.00	R	1.73	1	0.58	$\infty$
<b>2. Test Sample Related</b>						
Device Positioning	2.90	N	1.00	1	2.90	145
Device Holder	3.60	N	1.00	1	3.60	5
Power Drift	5.00	R	1.73	1	2.89	$\infty$
<b>3. Phantom and Setup</b>						
Phantom Uncertainty	4.00	R	1.73	1	2.31	$\infty$
Liquid Conductivity(target)	5.00	R	1.73	0.64	1.85	$\infty$
Liquid Conductivity(meas.)	2.07	N	1	0.64	1.32	9
Liquid Permittivity(target)	5.00	R	1.73	0.6	1.73	$\infty$
Liquid Permittivity(meas.)	5.02	N	1	0.6	3.01	9
<b>Combine Standard Uncertainty</b>					10.86	
<b>Coverage Factor for 95 %</b>					$k = 2$	
<b>Expanded STD Uncertainty</b>					21.73	

Table 6.1 Uncertainty (800 MHz- 2450 MHz)

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

HUMAN EXPOSURE	UNCONTROLLED ENVIRONMENT 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

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

### 8.1 Tissue Verification

Freq. [MHz]	Date	Liquid	Liquid Temp.[°C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
835	Oct. 26, 2011	Head	21.2	$\epsilon_r$	41.5	42.9	+ 3.37	$\pm 5$
				$\sigma$	0.90	0.9	0.00	$\pm 5$
835	Oct. 26, 2011	Body	21.2	$\epsilon_r$	55.2	55.9	+ 1.27	$\pm 5$
				$\sigma$	0.97	0.95	- 2.06	$\pm 5$
1 900	Oct. 27, 2011	Head	21.3	$\epsilon_r$	40.0	39.7	- 0.75	$\pm 5$
				$\sigma$	1.40	1.36	- 2.86	$\pm 5$
1 900	Oct. 27, 2011	Body	21.3	$\epsilon_r$	53.3	55.1	+ 3.38	$\pm 5$
				$\sigma$	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 / 1 900 MHz by using the system validation kit. (Graphic Plots Attached)

\* Input Power: 100 m W

Probe (SN)	Dipole (SN)	Freq. [MHz]	Date	Liquid	Liquid Temp. [°C]	SAR Average	Target Value (SPEAG) (mW/g)	*Measured Value (mW/g)	Deviation [%]	Limit [%]
1609	441	835	Oct. 26, 2011	Head	21.2	1 g	9.34	0.925	- 0.96	$\pm 10$
		835	Oct. 26, 2011	Body	21.2	1 g	9.45	0.938	- 0.74	$\pm 10$
	5d032	1 900	Oct. 27, 2011	Head	21.3	1 g	39.9	3.95	- 1.00	$\pm 10$
		1 900	Oct. 27, 2011	Body	21.3	1 g	40.9	4.04	- 1.22	$\pm 10$

### 8.3 System Validation Procedure

SAR measurement was Prior to assessment, the system is verified to the  $\pm 10\%$  of the specifications at target frequency by using the system validation kit. (Graphic Plots Attached)

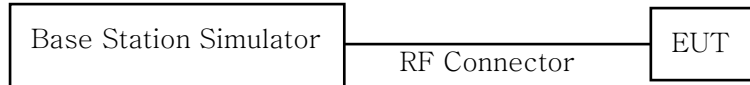
- Cabling the system, using the validation kit equipments.
- Generate about 100 mW Input Level from the Signal generator to the Dipole Antenna.
- Dipole Antenna was placed below the Flat phantom.
- The measured one-gram SAR at the surface of the phantom above the dipole feed-point should be within 10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

Note;

SAR Verification was performed according to the FCC KDB 450824.

## 9. RF CONDUCTED POWER

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



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

- GSM voice: Head SAR
- GPRS Multi-slot Class 12: Body SAR with MCS 1 (GMSK)

For body SAR testing, the EUT was set in GPRS multi-slot class12 with 4uplink slots for GSM850/1900 due to maximum source-based time-averaged output power.

### 9.1 GSM

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

Band	Channel	Voice	GPRS(GMSK) Data-CS1				EDGE(8-PSK) Data-MCS5			
		GSM (dBm)	GPRS 1 TXSlot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)	EDGE 4 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)
GSM 850	128	32.81	32.81	30.67	29.07	27.94	27.28	24.25	23.19	22.11
	190	32.89	32.88	30.76	29.15	28.03	27.36	24.33	23.22	22.04
	251	32.83	32.82	30.73	29.09	28.00	27.31	24.29	23.15	22.25
GSM 1900	512	30.32	30.32	28.23	26.62	25.60	26.79	23.73	22.65	21.61
	661	30.33	30.33	28.25	26.63	25.62	26.80	23.74	22.66	21.63
	810	30.37	30.36	28.25	26.63	25.66	26.83	23.78	22.69	21.66

Table 1. GSM Conducted output powers (Burst-Average)

Band	Channel	Voice	GPRS(GMSK) Data-CS1				EDGE(8-PSK) Data-MCS5			
		GSM (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)	EDGE 4 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)
GSM 850	128	23.78	23.78	24.65	24.81	24.93	18.25	18.23	18.93	19.1
	190	23.86	23.85	24.74	24.89	25.02	18.33	18.31	18.96	19.03
	251	23.8	23.79	24.71	24.83	24.99	18.28	18.27	18.89	19.24
GSM 1900	512	21.29	21.29	22.21	22.36	22.59	17.76	17.71	18.39	18.6
	661	21.3	21.3	22.23	22.37	22.61	17.77	17.72	18.4	18.62
	810	21.34	21.33	22.23	22.37	22.65	17.8	17.76	18.43	18.65

Table 2. GSM Conducted output powers (Frame-Average)

**Note:**

Time slot average factor is as follows:

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

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

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

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

## 9.2 WCDMA

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

### 9.2.1 Output Power Verification

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

### 9.2.2 Head SAR Measurements

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

### 9.2.3 Body SAR Measurement

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

## 9.2.4 Handsets with Release 5 HSDPA

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

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

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

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

3GPP Release Version	Mode	3GPP 4.121	Cellular Band [dBm]			PCS Band [dBm]			MPR
		Subtest	4132 (826.4)	4183 (836.6)	4233 (846.6)	9262 (1852.4)	9400 (1880.0)	9538 (1907.6)	
99	WCDMA	12.2 kbps RMC	24.04	23.91	23.90	24.08	24.41	23.62	-
99	WCDMA	12.2 kbps AMR	23.98	23.85	23.84	24.01	24.40	23.61	-
5	HSDPA	Subtest 1	24.02	23.90	23.92	24.06	24.40	23.60	0

Table 3. WCDMA Conducted output powers



## 9.3 WiFi

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

#### General Device Setup

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

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

#### Frequency Channel Configurations

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

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

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

802.11 Test Channels per FCC Requirements



Band	Channel	Conducted Power (dBm)			
		Data Rate (Mbps)			
		1	2	5.5	11
IEEE 802.11b	1	-4.21	-3.90	-4.18	-4.47
	6	-3.14	-3.32	-3.62	-4.14
	11	-3.33	-3.60	-3.72	-4.19

Average IEEE 802.11b Conducted output power

Band	Channel	Conducted Power (dBm)							
		Data Rate (Mbps)							
		6	9	12	18	24	36	48	54
IEEE 802.11g	1	-5.41	-5.44	-5.70	-6.15	-6.50	-7.29	-7.97	-8.33
	6	-4.64	-4.90	-5.07	-5.47	-5.84	-6.67	-7.51	-7.88
	11	-4.60	-4.94	-5.01	-5.44	-5.71	-6.48	-7.20	-7.51

Average IEEE 802.11g Conducted output power

## 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.

	2.45	5.15 - 5.35	5.47 - 5.85	GHz
$P_{Ref}$	12	6	5	mW

Device output power should be rounded to the nearest mW to compare with values specified in this

Table. 12.1 Output Power Thresholds for Unlicensed Transmitters

$T_{Tr}$
$U_{Tr}$
$J_{Tr}$

Table. 12.2 SAR Evaluation Requirements for Cellphones with Multiple Transmitters

FCC ID: ZP4CW20

BT Max. RF output power: 3.18 mW

## 10.2 Simultaneous Transmission

- Main antenna can transmit simultaneously with BT antenna.
- Main antenna can transmit simultaneously with WLAN antenna
- WiFi can transmit simultaneously with BT.

Test Position	Highest 1g SAR (W/kg)		$\Sigma$ SAR(W/kg)
	2G/3G	WiFi	
Head	0.632	0	0.632
Body	0.254	0	0.254

## 10.3 Conclusion

The conducted output power level of the BT transmitter is less than  $P_{ref}$ , the BT antenna is less than 2.5 cm from the Main antenna, and licensed Transmitter SAR is less than 1.2 W/kg, therefore, a stand-alone BT SAR evaluation is not required.. **BT& WLAN SAR testing is not required since the BT& WLAN Power is less than 60/f.**

Antenna Pair	Justification	Simultaneous SAR required
Wifi / BT	WiFi & BT SAR is not required.	No
Wifi / WWAN	The sum of WLAN and 2G/3G SAR is less than 1.6 mW/g	No
BT / WWAN	Antenna separation is < 2.5 cm, BT transmitter is less than $P_{ref}$	No

\* Please see the antenna separation distance photos.

Separation distance between Main and BT: 0 cm

Separation distance between Main and WiFi: 1.66 cm

Separation distance between WiFi and BT: 2.77 cm

## 11. SAR TEST DATA SUMMARY

### 11.1 Measurement Results (GSM850 Head SAR)

Frequency		Modulation	Conducte d Power (dBm)	Power Drift (dB)	Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel							
836.6	190 (Mid)	GSM850	32.89	0.05	Extended	Left Ear	Intenna	0.190
836.6	190 (Mid)	GSM850	32.89	0.076	Extended	Left Tilt 15°	Intenna	0.125
836.6	190 (Mid)	GSM850	32.89	0.058	Extended	Right Ear	Intenna	0.253
836.6	190 (Mid)	GSM850	32.89	-0.184	Extended	Right Tilt 15°	Intenna	0.165
<b>ANSI/ IEEE C95.1 - 1992– Safety Limit</b> <b>Spatial Peak</b> <b>Uncontrolled Exposure/ General Population</b>						<b>Head</b> <b>1.6 W/kg (mW/g)</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 ☒ Extended ☐ Standard ☐ Slim  
Batteries are fully charged for all readings.  
Manufacturer only supply the extended battery.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

## 11.2 Measurement Results (GSM1900 Head SAR)

Frequency		Modulation	Conduct ed Power (dBm)	Power Drift (dB)	Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel							
1 880.0	661 (Mid)	GSM1900	30.33	0.020	Extended	Left Ear	Intenna	0.204
1 880.0	661 (Mid)	GSM1900	30.33	-0.163	Extended	Left Tilt 15°	Intenna	0.181
1 880.0	661 (Mid)	GSM1900	30.33	-0.169	Extended	Right Ear	Intenna	0.252
1 880.0	661 (Mid)	GSM1900	30.33	-0.194	Extended	Right Tilt 15°	Intenna	0.199
<b>ANSI/ IEEE C95.1 - 1992– Safety Limit</b> <b>Spatial Peak</b> <b>Uncontrolled Exposure/ General Population</b>						<b>Head</b> <b>1.6 W/kg (mW/g)</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 ☒ Extended ☐ Standard ☐ Slim  
Batteries are fully charged for all readings.  
Manufacturer only supply the extended battery.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

## 11.3 Measurement Results (WCDMA850 Head SAR)

Frequency		Modulation	Conducte d Power (dBm)	Power Drift (dB)	Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel							
836.6	4183 (Mid)	WCDMA850	23.91	-0.02	Extended	Left Ear	Intenna	0.120
836.6	4183 (Mid)	WCDMA850	23.91	0.003	Extended	Left Tilt 15°	Intenna	0.168
836.6	4183 (Mid)	WCDMA850	23.91	-0.002	Extended	Right Ear	Intenna	0.330
836.6	4183 (Mid)	WCDMA850	23.91	0.031	Extended	Right Tilt 15°	Intenna	0.223
<b>ANSI/ IEEE C95.1 - 1992– Safety Limit</b> <b>Spatial Peak</b> <b>Uncontrolled Exposure/ General Population</b>						<b>Head</b> <b>1.6 W/kg (mW/g)</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 ☒ Extended ☐ Standard ☐ Slim  
Batteries are fully charged for all readings.  
Manufacturer only supply the extended battery.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
- WCDMA Mode was tested under RMC 12.2 kbps and HSDPA Inactive.

## 11.4 Measurement Results (WCDMA1900 Head SAR)

Frequency		Modulation	Conducte d Power (dBm)	Power Drift (dB)	Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel							
1 880.0	9400 (Mid)	WCDMA1900	24.41	0.025	Extended	Left Ear	Intenna	0.515
1 880.0	9400 (Mid)	WCDMA1900	24.41	-0.092	Extended	Left Tilt 15°	Intenna	0.489
1 880.0	9400 (Mid)	WCDMA1900	24.41	-0.14	Extended	Left Ear	Intenna	0.632
1 880.0	9400 (Mid)	WCDMA1900	24.41	-0.032	Extended	Right Tilt 15°	Intenna	0.556
<b>ANSI/ IEEE C95.1 - 1992– Safety Limit</b> <b>Spatial Peak</b> <b>Uncontrolled Exposure/ General Population</b>						<b>Head</b> <b>1.6 W/kg (mW/g)</b> Averaged over 1 gram		

### NOTES:

- The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Extended ☐ Standard ☐ Slim  
Batteries are fully charged for all readings.  
Manufacturer only supply the extended battery.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- WCDMA Mode was tested under RMC 12.2 kbps and HSDPA Inactive.



## 11.5 Measurement Results (GSM850 Body-Worn SAR)

Frequency		Modulation	Conducte d Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	SAR(mW/g)
MHz	Channel						
836.6	190 (Mid)	GPRS 4Tx	28.03	-0.066	Back	2.0 cm	0.201
<b>ANSI/ IEEE C95.1 – 1992– Safety Limit</b> <b>Spatial Peak</b> <b>Uncontrolled Exposure/ General Population</b>						<b>Body</b> <b>1.6 W/kg (mW/g)</b> Averaged over 1 gram	

### NOTES:

- The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Extended ☐ Standard ☐ Slim  
Batteries are fully charged for all readings.  
Manufacturer only supply the extended battery.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Test Configuration ☐ With Holster ☒ Without Holster
- Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
- For body SAR testing, the EUT was set in GPRS multi-slot class12 with 4uplink slots for GSM850 due to maximum source-based time-averaged output power.  
According to the KDB 941225 D03 SAR test reduction GSM/GPRS/EDGE, the maximum output power configuration were chosen for Body SAR testing.

## 11.6 Measurement Results (GSM1900 Body-Worn SAR)

Frequency		Modulation	Conducte d Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	SAR(mW/g)
MHz	Channel						
1 880.0	661 (Mid)	GPRS 4Tx	25.62	0.04	Back	2.0 cm without Holster	0.1
<b>ANSI/ IEEE C95.1 – 1992– Safety Limit</b> <b>Spatial Peak</b> <b>Uncontrolled Exposure/ General Population</b>						<b>Body</b> <b>1.6 W/kg (mW/g)</b> Averaged over 1 gram	

### NOTES:

- The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm  $\pm$  0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Extended ☐ Standard ☐ Slim  
Batteries are fully charged for all readings.  
Manufacturer only supply the extended battery.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Test Configuration ☐ With Holster ☒ Without Holster
- Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
- For body SAR testing, the EUT was set in GPRS multi-slot class12 with 4uplink slots for GSM1900 due to maximum source-based time-averaged output power.  
According to the KDB 941225 D03 SAR test reduction GSM/GPRS/EDGE, the maximum output power configuration were chosen for Body SAR testing.

## 11.7 Measurement Results (WCDMA850 Body-Worn SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	SAR(mW/g)
MHz	Channel						
836.6	4183 (Mid)	WCDMA850	23.91	-0.119	Back	2.0 cm without Holster	0.186
<b>ANSI/ IEEE C95.1 – 1992– Safety Limit</b> <b>Spatial Peak</b> <b>Uncontrolled Exposure/ General Population</b>						<b>Body</b> <b>1.6 W/kg (mW/g)</b> Averaged over 1 gram	

- The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm  $\pm$  0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Extended ☐ Standard ☐ Slim  
Batteries are fully charged for all readings.  
Manufacturer only supply the extended battery.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Test Configuration ☐ With Holster ☒ Without Holster
- Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
- WCDMA Mode was tested under RMC 12.2 kbps and HSDPA Inactive.

## 11.8 Measurement Results (WCDMA1900 Body-Worn SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	SAR(mW/g)
MHz	Channel						
1 880.0	9400 (Mid)	WCDMA1900	24.41	0.056	Back	2.0 cm without Holster	0.254
<b>ANSI/ IEEE C95.1 – 1992– Safety Limit</b> <b>Spatial Peak</b> <b>Uncontrolled Exposure/ General Population</b>						<b>Body</b> <b>1.6 W/kg (mW/g)</b> Averaged over 1 gram	

- The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm  $\pm$  0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Extended ☐ Standard ☐ Slim  
Batteries are fully charged for all readings.  
Manufacturer only supply the extended battery.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Test Configuration ☐ With Holster ☒ Without Holster
- Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
- WCDMA Mode was tested under RMC 12.2 kbps and HSDPA Inactive.

## 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 1992.

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

## 13. REFERENCES

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## Attachment 1. – SAR Test Plots



Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3  
Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.901 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:  
- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24  
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01  
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left touch 190/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Maximum value of SAR (interpolated) = 0.206 mW/g

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

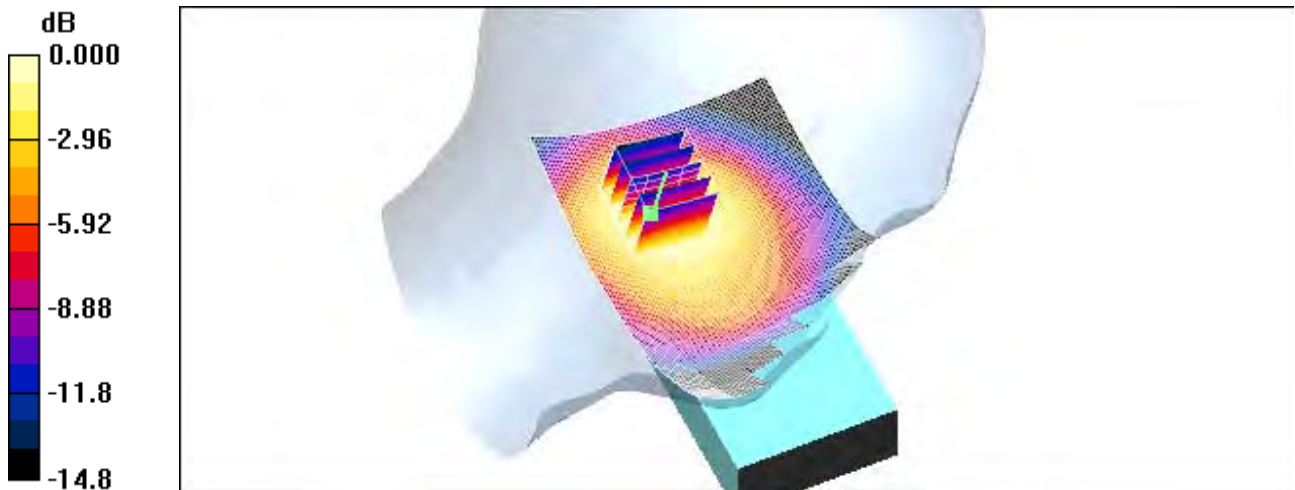
Reference Value = 9.62 V/m; Power Drift = 0.050 dB

Peak SAR (extrapolated) = 0.300 W/kg

**SAR(1 g) = 0.190 mW/g; SAR(10 g) = 0.118 mW/g**

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

Maximum value of SAR (measured) = 0.207 mW/g



0 dB = 0.207mW/g

Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.2 °C  
 Ambient Temperature: 21.4 °C  
 Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.901 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:  
 - Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24  
 - Sensor-Surface: 4mm (Mechanical Surface Detection)  
 - Electronics: DAE3 Sn466; Calibrated: 2011-03-01  
 - Phantom: SAM 1800/1900 MHz; Type: SAM

**Left tilt 190/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.143 mW/g

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

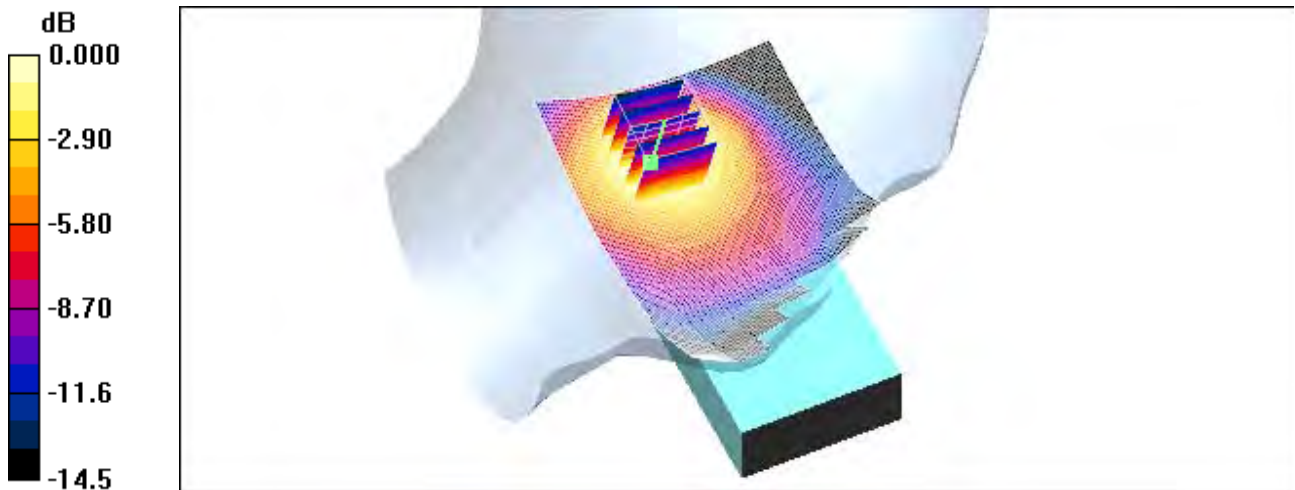
Reference Value = 5.68 V/m; Power Drift = 0.076 dB

Peak SAR (extrapolated) = 0.197 W/kg

**SAR(1 g) = 0.125 mW/g; SAR(10 g) = 0.076 mW/g**

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

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



0 dB = 0.136mW/g

Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.2 °C  
 Ambient Temperature: 21.4 °C  
 Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.901 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:  
 - Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24  
 - Sensor-Surface: 4mm (Mechanical Surface Detection)  
 - Electronics: DAE3 Sn466; Calibrated: 2011-03-01  
 - Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 190/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.280 mW/g

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

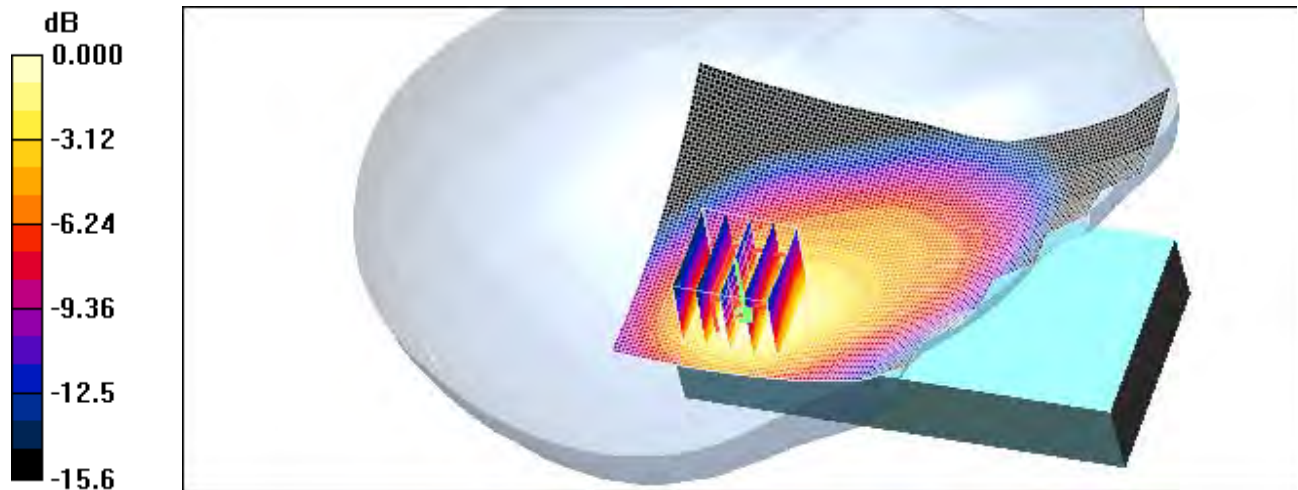
Reference Value = 9.86 V/m; Power Drift = 0.058 dB

Peak SAR (extrapolated) = 0.440 W/kg

**SAR(1 g) = 0.253 mW/g; SAR(10 g) = 0.149 mW/g**

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

Maximum value of SAR (measured) = 0.275 mW/g



0 dB = 0.275mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3  
Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.901 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:  
- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24  
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01  
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right tilt 190/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Maximum value of SAR (interpolated) = 0.179 mW/g

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

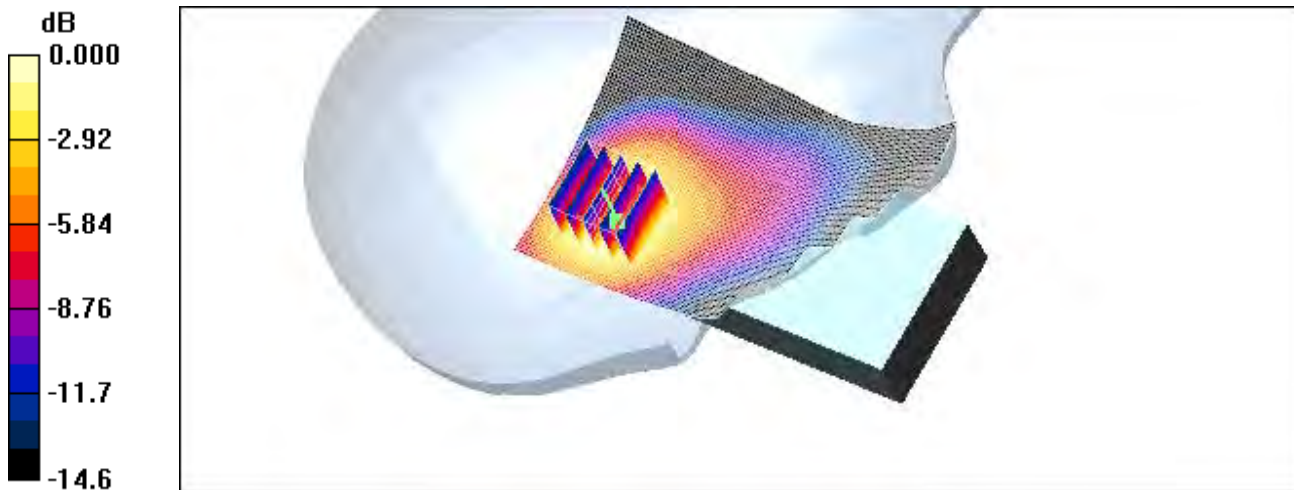
Reference Value = 5.88 V/m; Power Drift = -0.184 dB

Peak SAR (extrapolated) = 0.271 W/kg

**SAR(1 g) = 0.165 mW/g; SAR(10 g) = 0.099 mW/g**

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

Maximum value of SAR (measured) = 0.177 mW/g



0 dB = 0.177mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

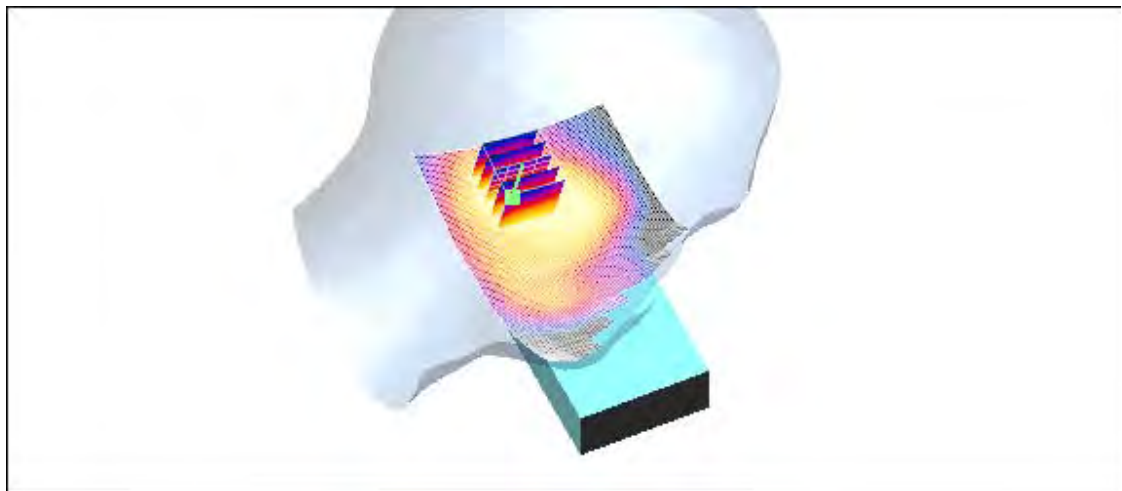
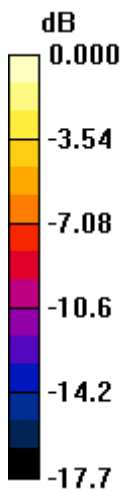
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.34 \text{ mho/m}$ ;  $\epsilon_r = 39.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Left touch 661/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.221 mW/g

**Left touch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 5.22 V/m; Power Drift = 0.02 dB  
Peak SAR (extrapolated) = 0.318 W/kg  
**SAR(1 g) = 0.204 mW/g; SAR(10 g) = 0.121 mW/g**  
Maximum value of SAR (measured) = 0.224 mW/g



0 dB = 0.224mW/g

Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.3 °C  
 Ambient Temperature: 21.5 °C  
 Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

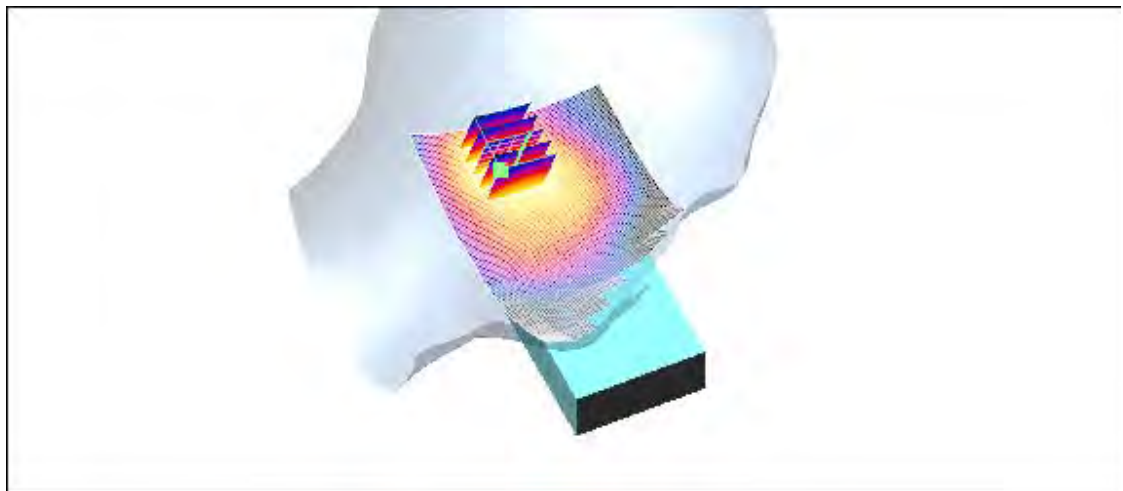
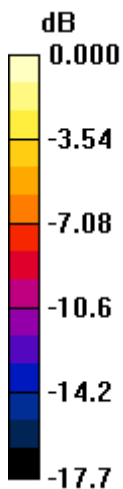
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
 Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.34 \text{ mho/m}$ ;  $\epsilon_r = 39.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Left tilt 661/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.204 mW/g

**Left tilt 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
 Reference Value = 4.20 V/m; Power Drift = -0.163 dB  
 Peak SAR (extrapolated) = 0.280 W/kg  
**SAR(1 g) = 0.181 mW/g; SAR(10 g) = 0.107 mW/g**  
 Maximum value of SAR (measured) = 0.202 mW/g



0 dB = 0.202mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

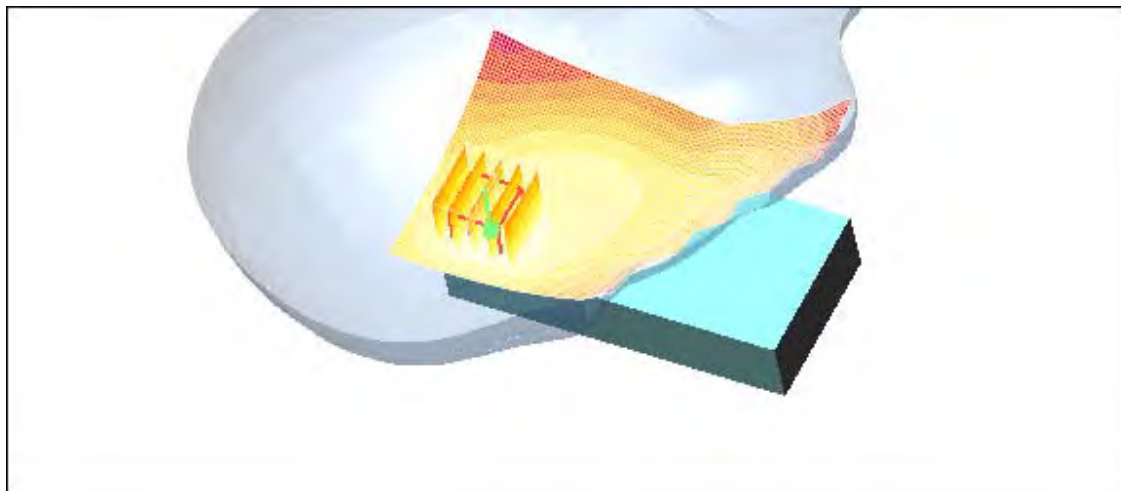
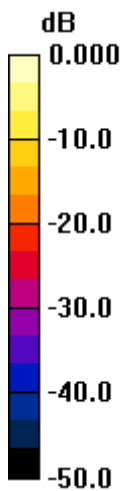
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 6.13 V/m; Power Drift = -0.169 dB  
Peak SAR (extrapolated) = 0.457 W/kg  
**SAR(1 g) = 0.252 mW/g; SAR(10 g) = 0.140 mW/g**  
Maximum value of SAR (measured) = 0.276 mW/g

**Right touch 661/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.267 mW/g



0 dB = 0.267mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.3 °C  
 Ambient Temperature: 21.5 °C  
 Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

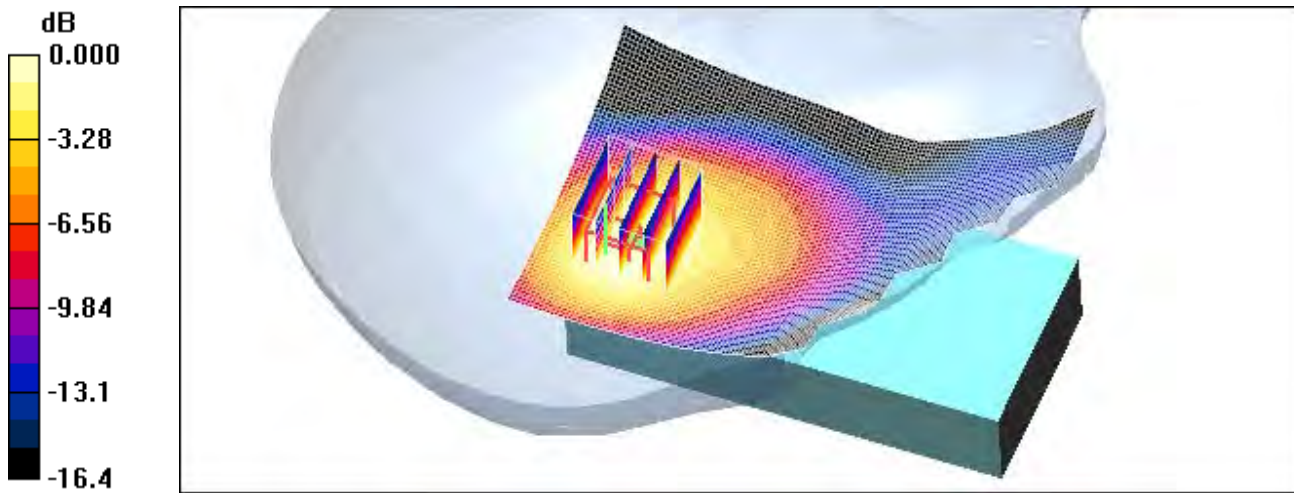
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
 Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.34 \text{ mho/m}$ ;  $\epsilon_r = 39.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Right tilt 661/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.221 mW/g

**Right tilt 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
 Reference Value = 5.10 V/m; Power Drift = -0.194 dB  
 Peak SAR (extrapolated) = 0.348 W/kg  
**SAR(1 g) = 0.199 mW/g; SAR(10 g) = 0.118 mW/g**  
 Maximum value of SAR (measured) = 0.211 mW/g



0 dB = 0.211mW/g

Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.2 °C  
 Ambient Temperature: 21.4 °C  
 Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.901 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:  
 - Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24  
 - Sensor-Surface: 4mm (Mechanical Surface Detection)  
 - Electronics: DAE3 Sn466; Calibrated: 2011-03-01  
 - Phantom: SAM 1800/1900 MHz; Type: SAM

**Left touch 4183/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Maximum value of SAR (interpolated) = 0.221 mW/g

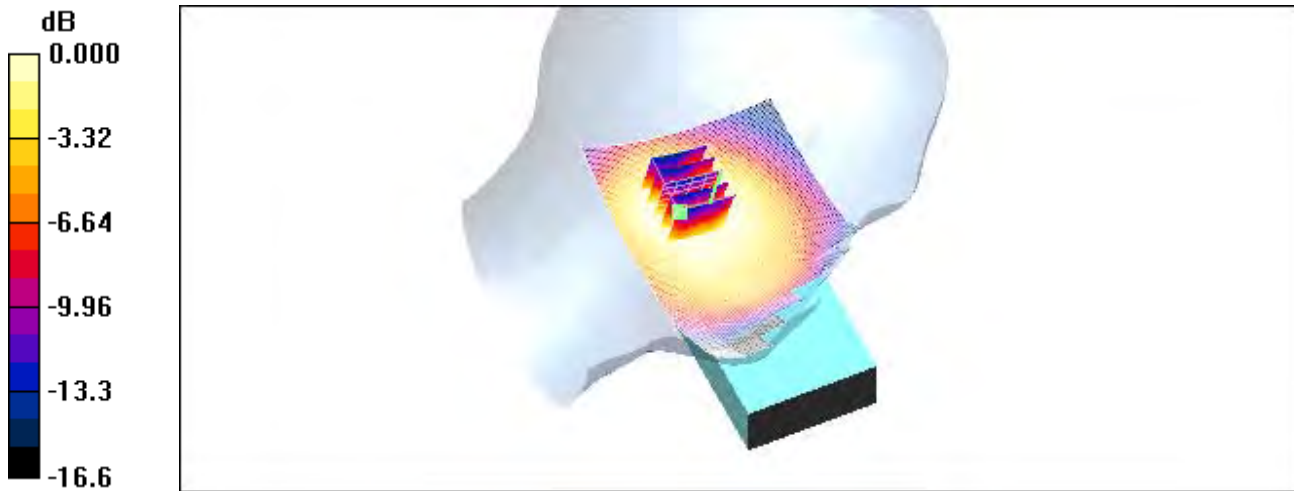
**Left touch 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 10.4 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.244 W/kg

**SAR(1 g) = 0.120 mW/g; SAR(10 g) = 0.074 mW/g**

Maximum value of SAR (measured) = 0.175 mW/g



0 dB = 0.175mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.901 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:  
- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24  
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01  
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Left tilt 4183/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Maximum value of SAR (interpolated) = 0.189 mW/g

**Left tilt 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

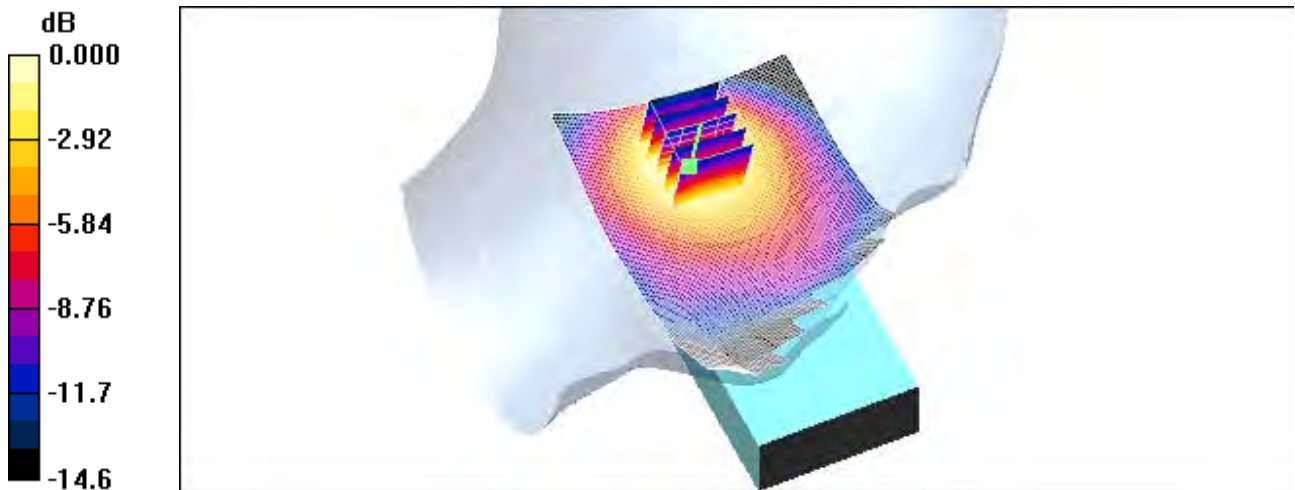
Reference Value = 5.90 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 0.267 W/kg

**SAR(1 g) = 0.168 mW/g; SAR(10 g) = 0.102 mW/g**

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

Maximum value of SAR (measured) = 0.182 mW/g



0 dB = 0.182mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.901 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:  
- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24  
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01  
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 4183/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

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

**Right touch 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

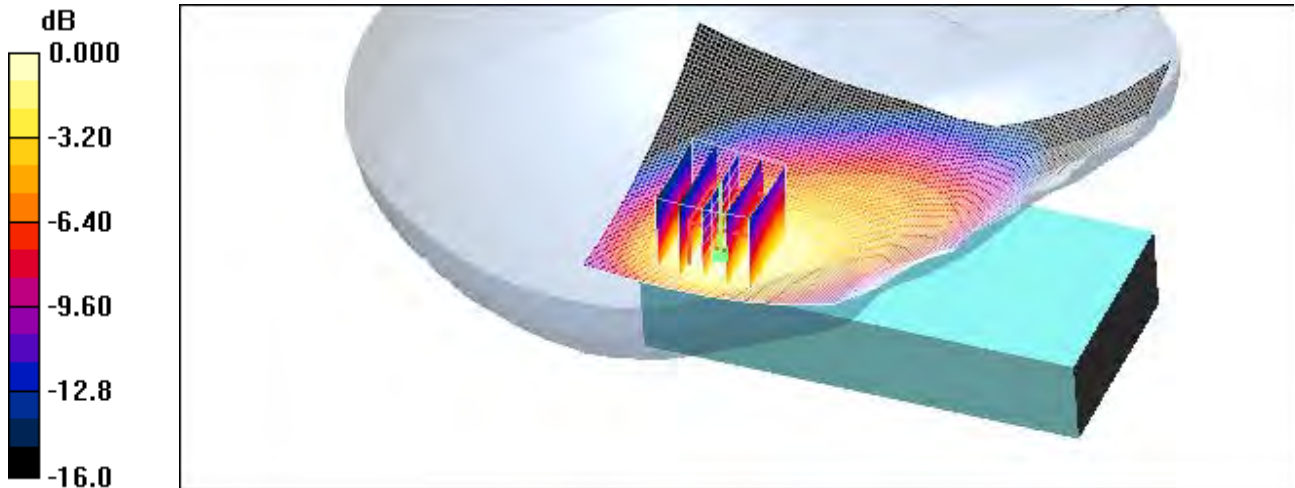
Reference Value = 11.2 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 0.575 W/kg

**SAR(1 g) = 0.330 mW/g; SAR(10 g) = 0.193 mW/g**

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

Maximum value of SAR (measured) = 0.359 mW/g



0 dB = 0.359mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.901 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:  
- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24  
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01  
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right tilt 4183/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Maximum value of SAR (interpolated) = 0.235 mW/g

**Right tilt 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

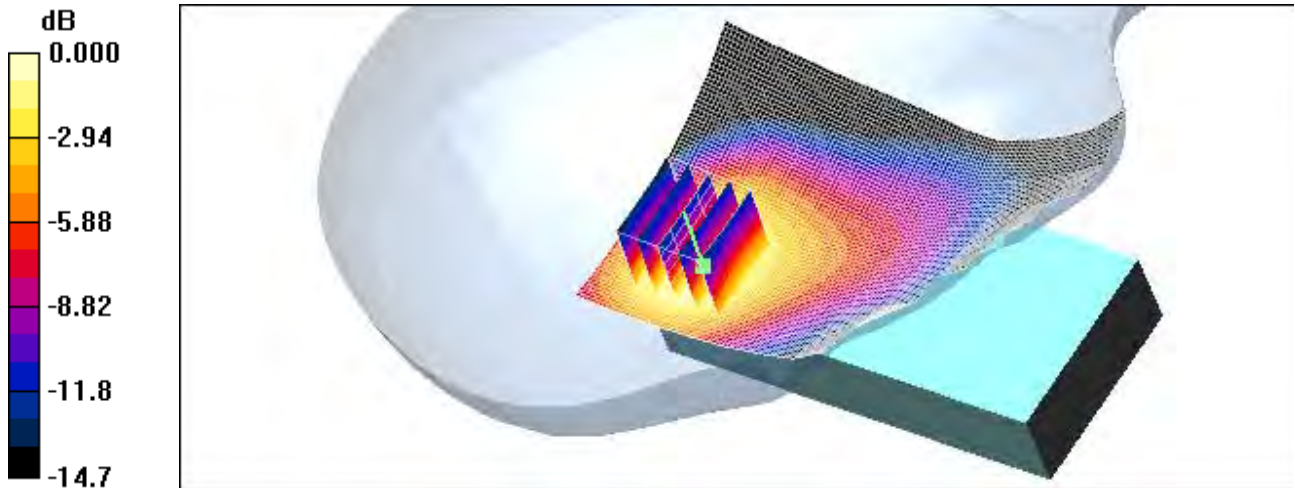
Reference Value = 7.16 V/m; Power Drift = 0.031 dB

Peak SAR (extrapolated) = 0.373 W/kg

**SAR(1 g) = 0.223 mW/g; SAR(10 g) = 0.133 mW/g**

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

Maximum value of SAR (measured) = 0.240 mW/g



0 dB = 0.240mW/g

Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.3 °C  
 Ambient Temperature: 21.5 °C  
 Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

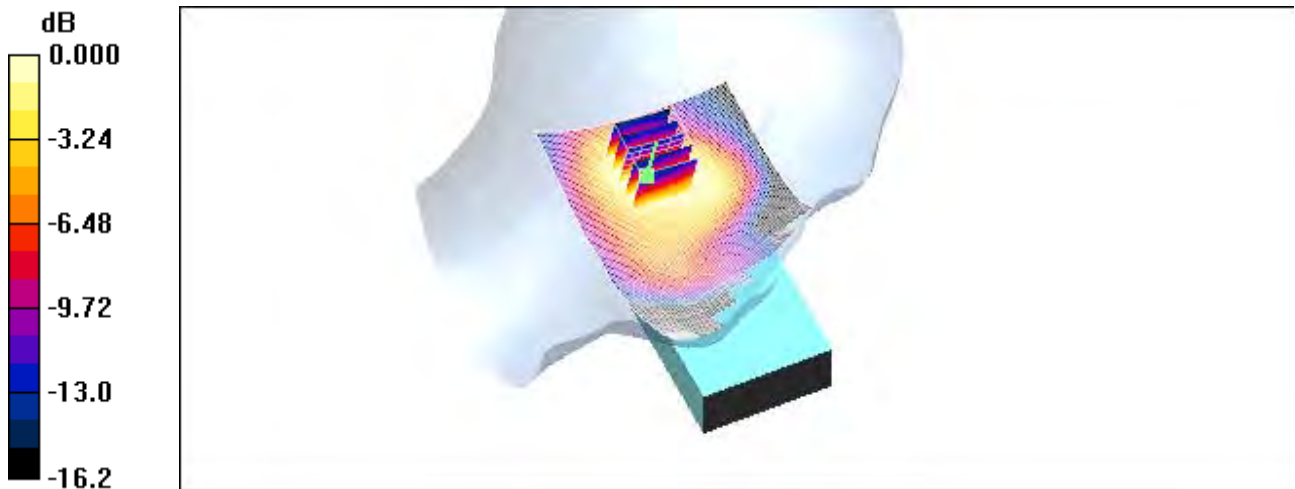
Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.34 \text{ mho/m}$ ;  $\epsilon_r = 39.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Left touch 9400/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.582 mW/g

**Left touch 9400/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
 Reference Value = 8.63 V/m; Power Drift = 0.025 dB  
 Peak SAR (extrapolated) = 0.796 W/kg  
**SAR(1 g) = 0.515 mW/g; SAR(10 g) = 0.308 mW/g**  
 Maximum value of SAR (measured) = 0.563 mW/g



0 dB = 0.563mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.3 °C  
 Ambient Temperature: 21.5 °C  
 Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

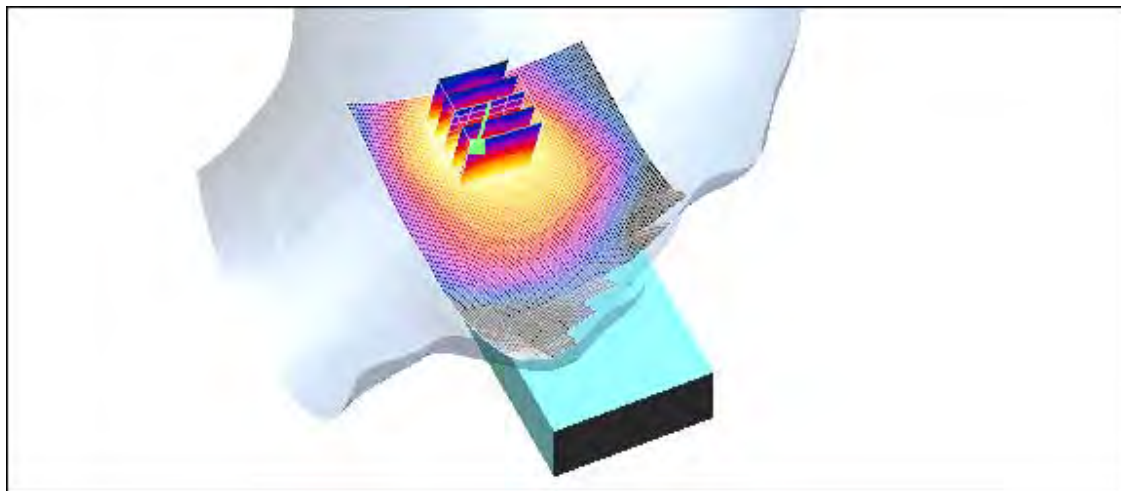
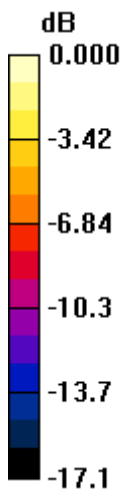
Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.34 \text{ mho/m}$ ;  $\epsilon_r = 39.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Left tilt 9400/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.562 mW/g

**Left tilt 9400/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
 Reference Value = 7.02 V/m; Power Drift = -0.092 dB  
 Peak SAR (extrapolated) = 0.760 W/kg  
**SAR(1 g) = 0.489 mW/g; SAR(10 g) = 0.284 mW/g**  
 Maximum value of SAR (measured) = 0.523 mW/g



0 dB = 0.523mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

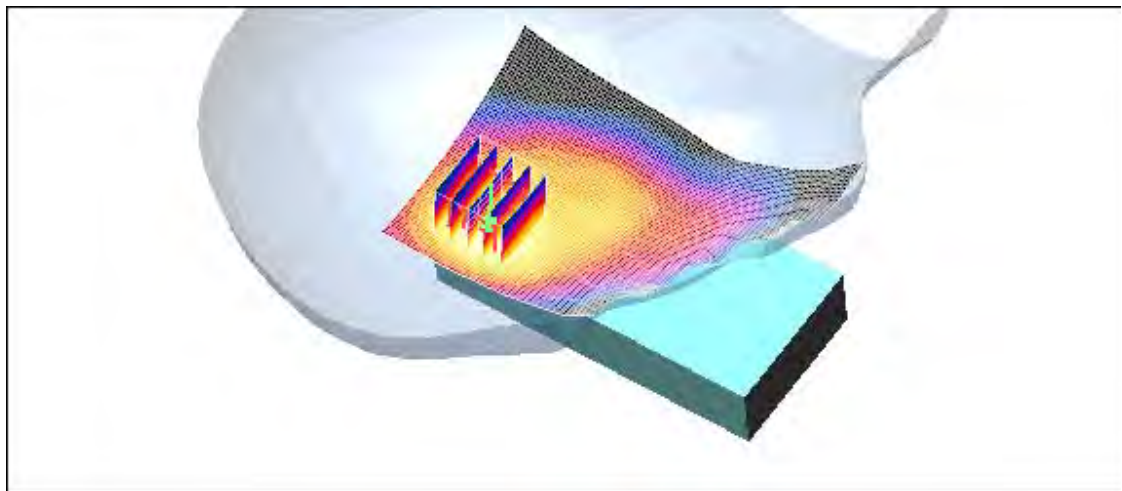
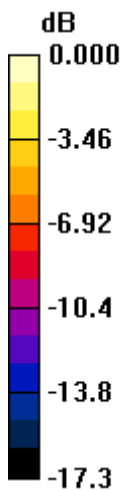
Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 9400/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.671 mW/g

**Right touch 9400/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 9.50 V/m; Power Drift = 0.014 dB  
Peak SAR (extrapolated) = 1.14 W/kg  
**SAR(1 g) = 0.632 mW/g; SAR(10 g) = 0.360 mW/g**  
Maximum value of SAR (measured) = 0.670 mW/g



0 dB = 0.670mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

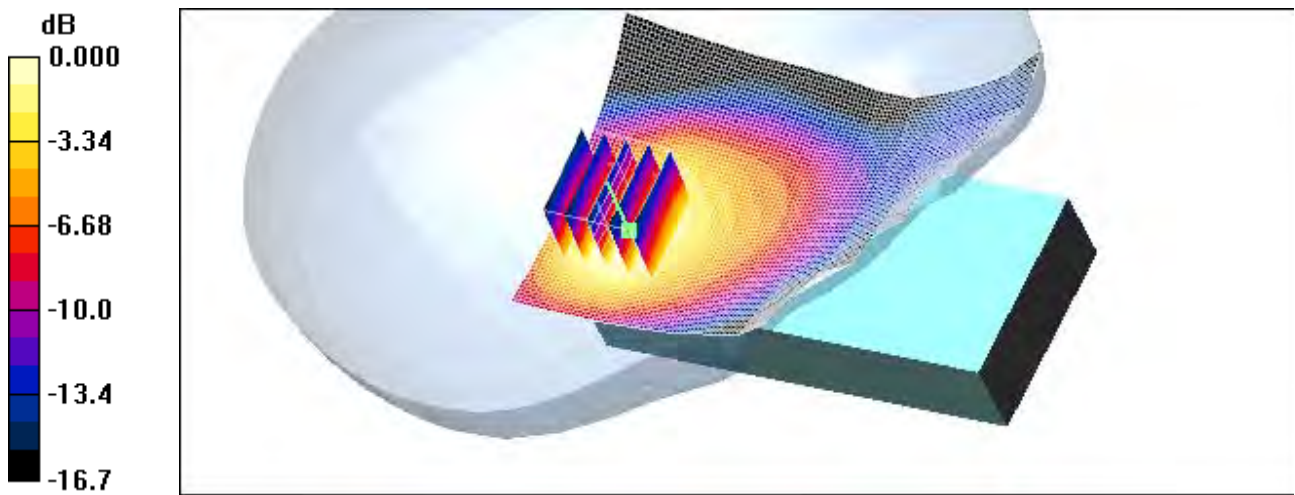
Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Right tilt 9400/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.608 mW/g

**Right tilt 9400/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 7.49 V/m; Power Drift = -0.032 dB  
Peak SAR (extrapolated) = 0.916 W/kg  
**SAR(1 g) = 0.556 mW/g; SAR(10 g) = 0.327 mW/g**  
Maximum value of SAR (measured) = 0.601 mW/g



0 dB = 0.601mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.075  
Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.952 \text{ mho/m}$ ;  $\epsilon_r = 55.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.12, 6.12, 6.12); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 1800/1900 MHz; Type: SAM

**body 190/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Maximum value of SAR (interpolated) = 0.230 mW/g

**body 190/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

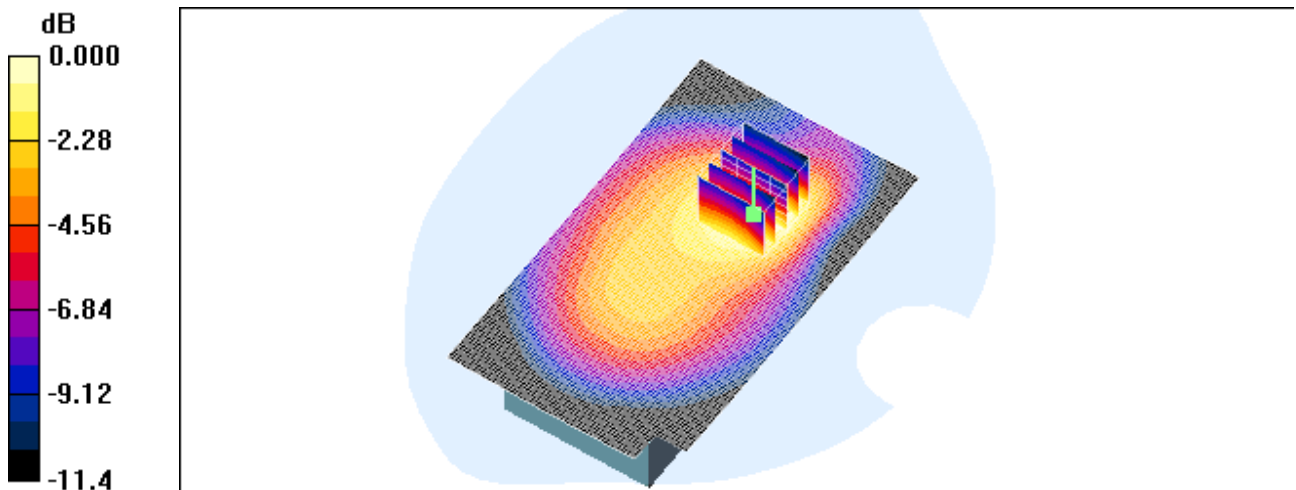
Reference Value = 9.43 V/m; Power Drift = -0.066 dB

Peak SAR (extrapolated) = 0.283 W/kg

**SAR(1 g) = 0.201 mW/g; SAR(10 g) = 0.133 mW/g**

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

Maximum value of SAR (measured) = 0.213 mW/g



0 dB = 0.213mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

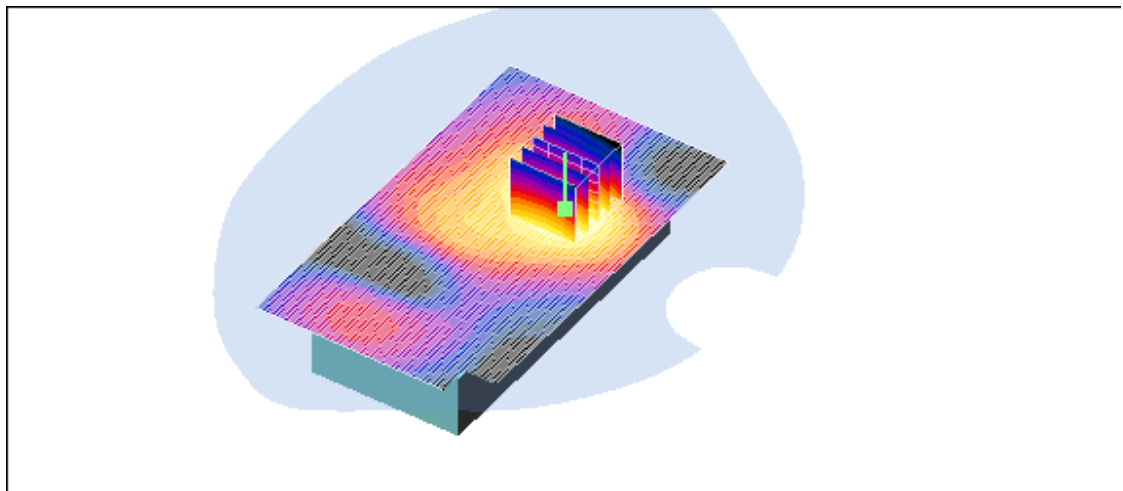
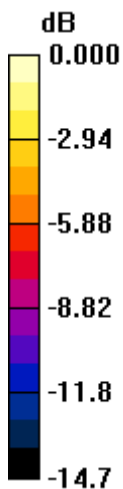
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.46 \text{ mho/m}$ ;  $\epsilon_r = 55.2$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.6, 4.6, 4.6); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**body 661/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.111 mW/g

**body 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 3.42 V/m; Power Drift = 0.04 dB  
Peak SAR (extrapolated) = 0.149 W/kg  
**SAR(1 g) = 0.100 mW/g; SAR(10 g) = 0.063 mW/g**  
Maximum value of SAR (measured) = 0.109 mW/g



0 dB = 0.109mW/g

Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.3 °C  
 Ambient Temperature: 21.5 °C  
 Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.952 \text{ mho/m}$ ;  $\epsilon_r = 55.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.12, 6.12, 6.12); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 1800/1900 MHz; Type: SAM

**body 4183/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.203 mW/g

**body 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

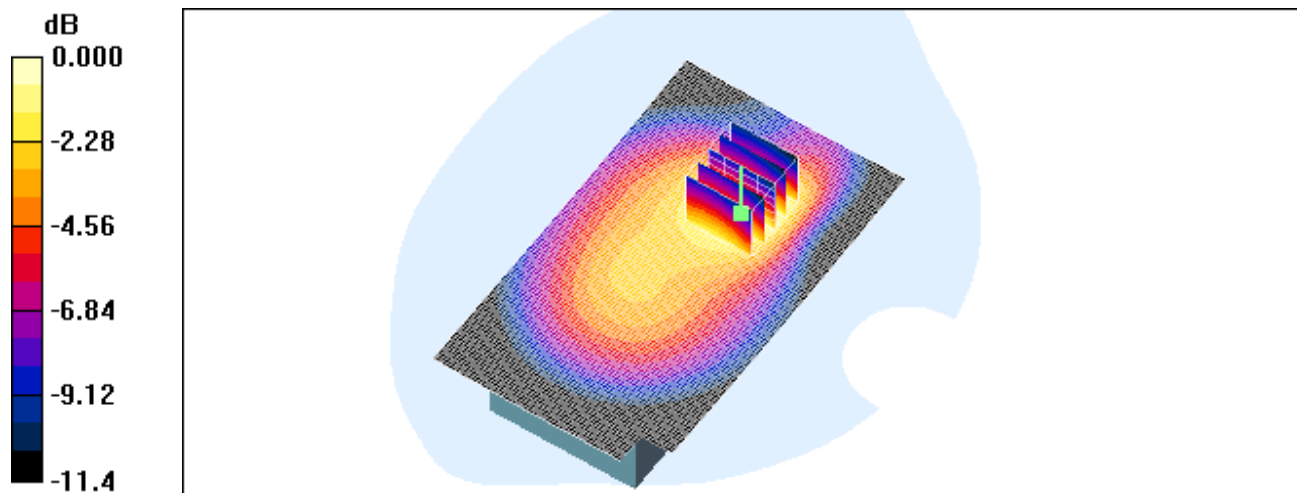
Reference Value = 12.2 V/m; Power Drift = -0.119 dB

Peak SAR (extrapolated) = 0.262 W/kg

**SAR(1 g) = 0.186 mW/g; SAR(10 g) = 0.123 mW/g**

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

Maximum value of SAR (measured) = 0.198 mW/g



0 dB = 0.198mW/g

Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.2 °C  
 Ambient Temperature: 21.4 °C  
 Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

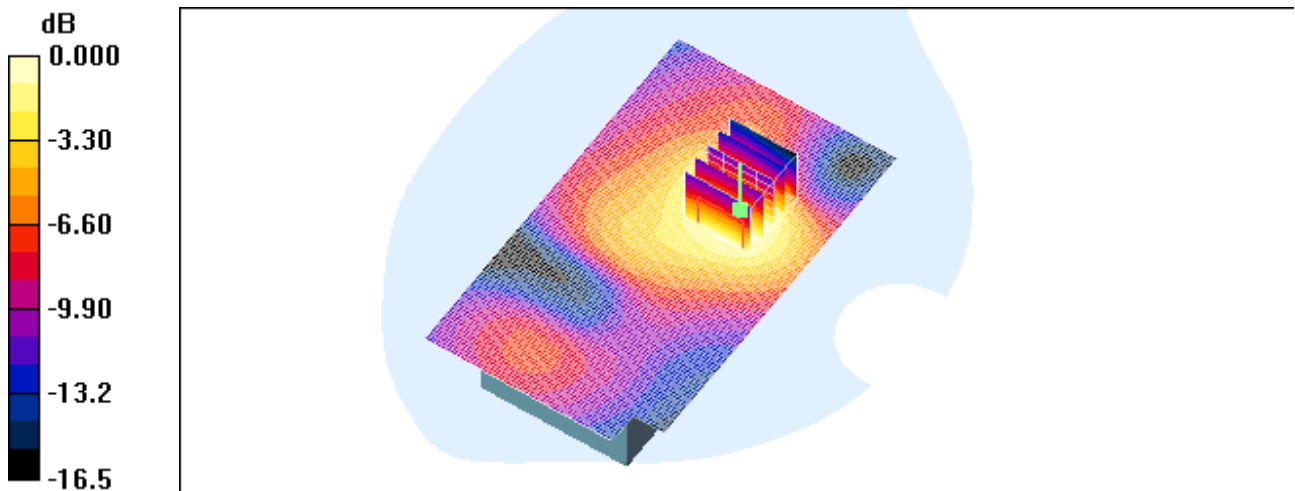
Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.46 \text{ mho/m}$ ;  $\epsilon_r = 55.2$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.6, 4.6, 4.6); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**body 9400/Area Scan (71x121x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.298 mW/g

**body 9400/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
 Reference Value = 4.03 V/m; Power Drift = 0.056 dB  
 Peak SAR (extrapolated) = 0.380 W/kg  
**SAR(1 g) = 0.254 mW/g; SAR(10 g) = 0.159 mW/g**  
 Maximum value of SAR (measured) = 0.273 mW/g



0 dB = 0.273mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.2 °C  
 Ambient Temperature: 21.4 °C  
 Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.901 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right touch 190/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.280 mW/g

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

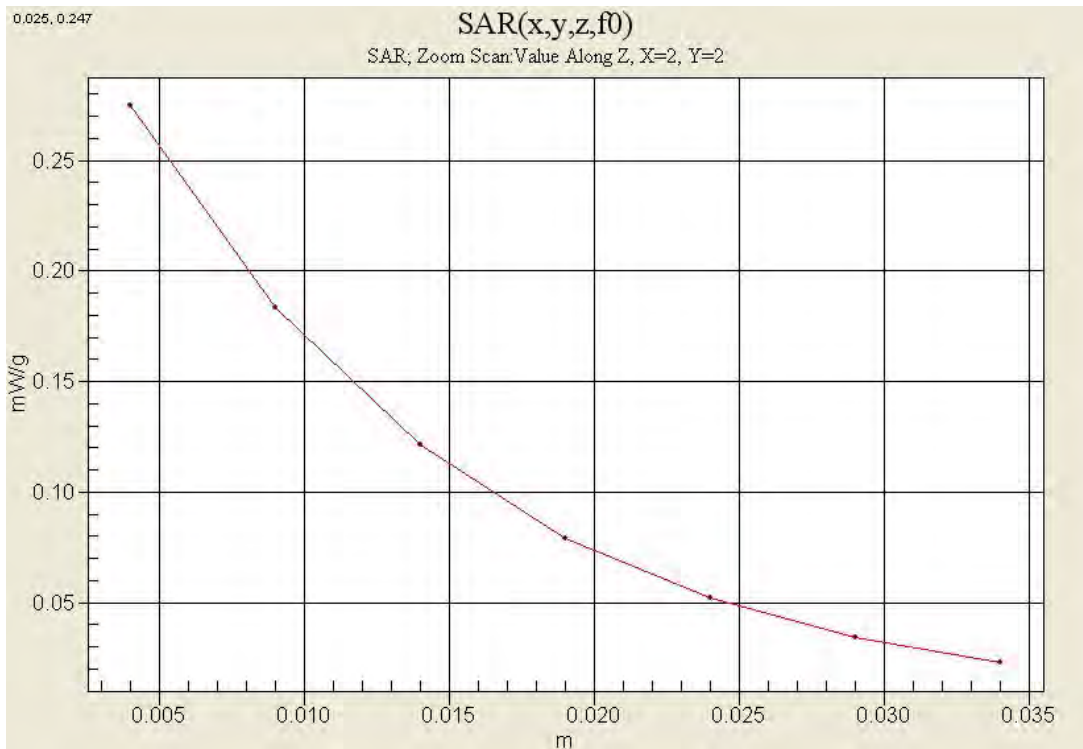
Reference Value = 9.86 V/m; Power Drift = 0.058 dB

Peak SAR (extrapolated) = 0.440 W/kg

**SAR(1 g) = 0.253 mW/g; SAR(10 g) = 0.149 mW/g**

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

Maximum value of SAR (measured) = 0.275 mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.2 °C  
 Ambient Temperature: 21.4 °C  
 Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.075  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.952 \text{ mho/m}$ ;  $\epsilon_r = 55.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.12, 6.12, 6.12); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 1800/1900 MHz; Type: SAM

**body 190/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.230 mW/g

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

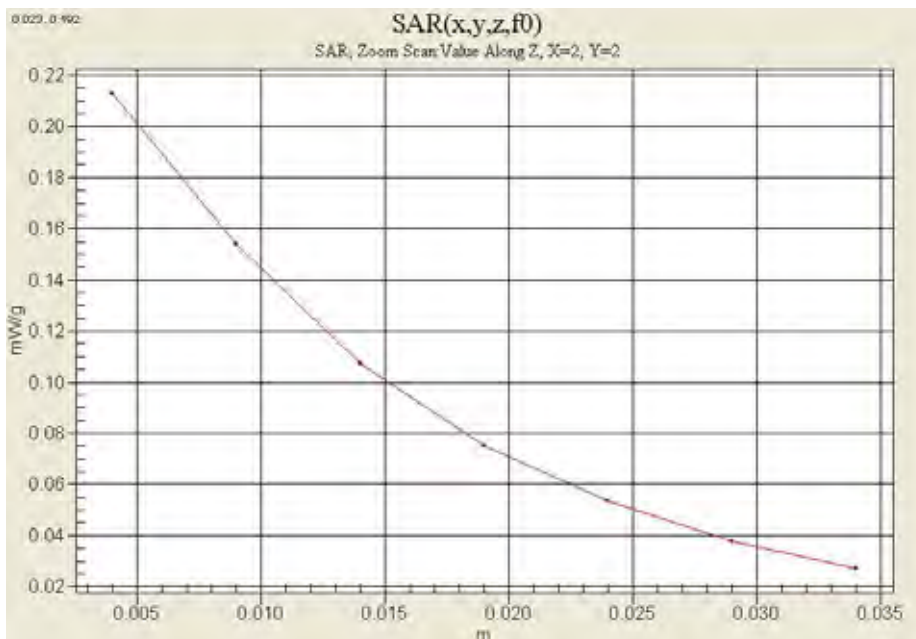
Reference Value = 9.43 V/m; Power Drift = -0.066 dB

Peak SAR (extrapolated) = 0.283 W/kg

**SAR(1 g) = 0.201 mW/g; SAR(10 g) = 0.133 mW/g**

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

Maximum value of SAR (measured) = 0.213 mW/g





Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.13 V/m; Power Drift = -0.169 dB

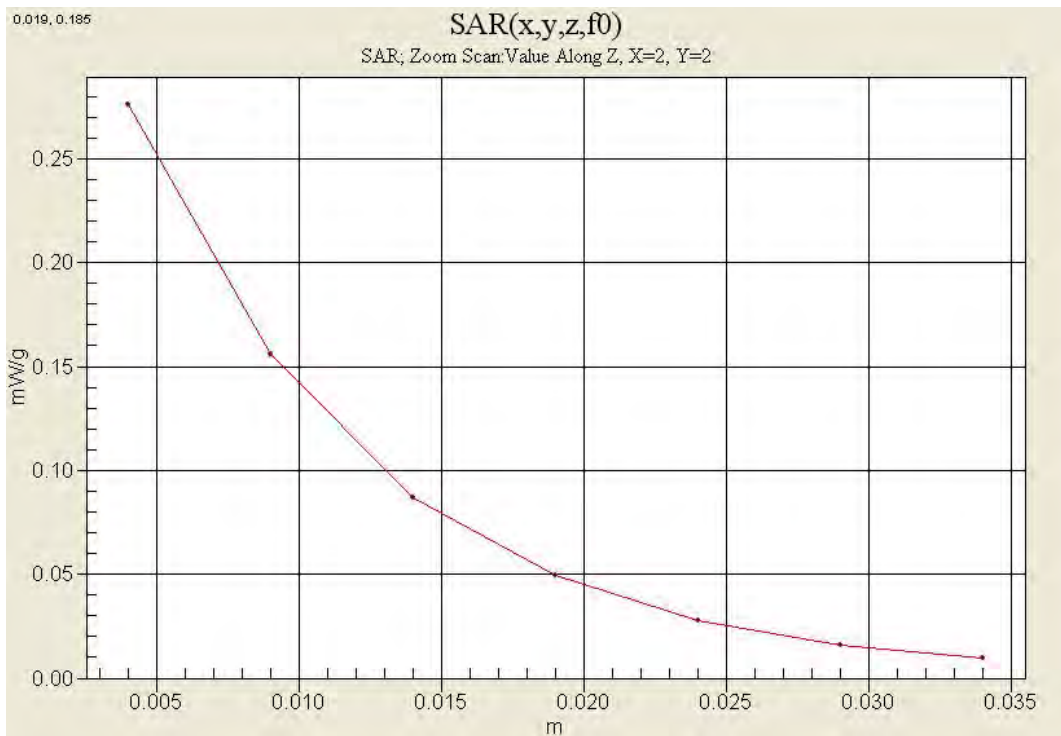
Peak SAR (extrapolated) = 0.457 W/kg

**SAR(1 g) = 0.252 mW/g; SAR(10 g) = 0.140 mW/g**

Maximum value of SAR (measured) = 0.276 mW/g

**Right touch 661/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.267 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

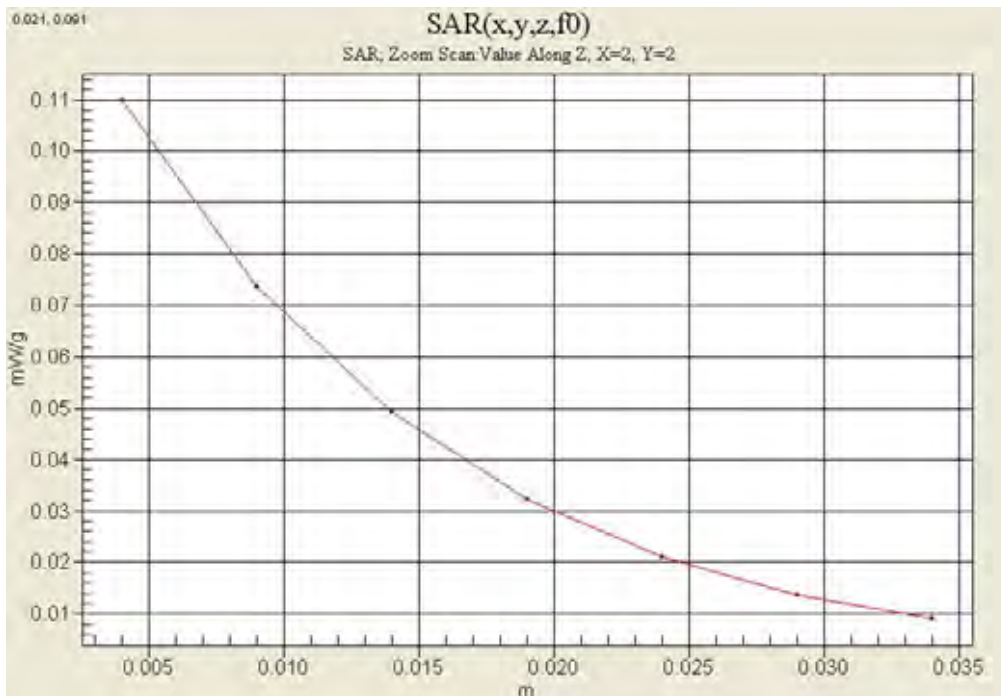
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.6, 4.6, 4.6); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**body 661/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.111 mW/g

**body 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 3.42 V/m; Power Drift = -0.343 dB  
Peak SAR (extrapolated) = 0.149 W/kg  
**SAR(1 g) = 0.100 mW/g; SAR(10 g) = 0.063 mW/g**  
Maximum value of SAR (measured) = 0.109 mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.2 °C  
 Ambient Temperature: 21.4 °C  
 Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.901 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Right tilt 4183/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.235 mW/g

**Right tilt 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

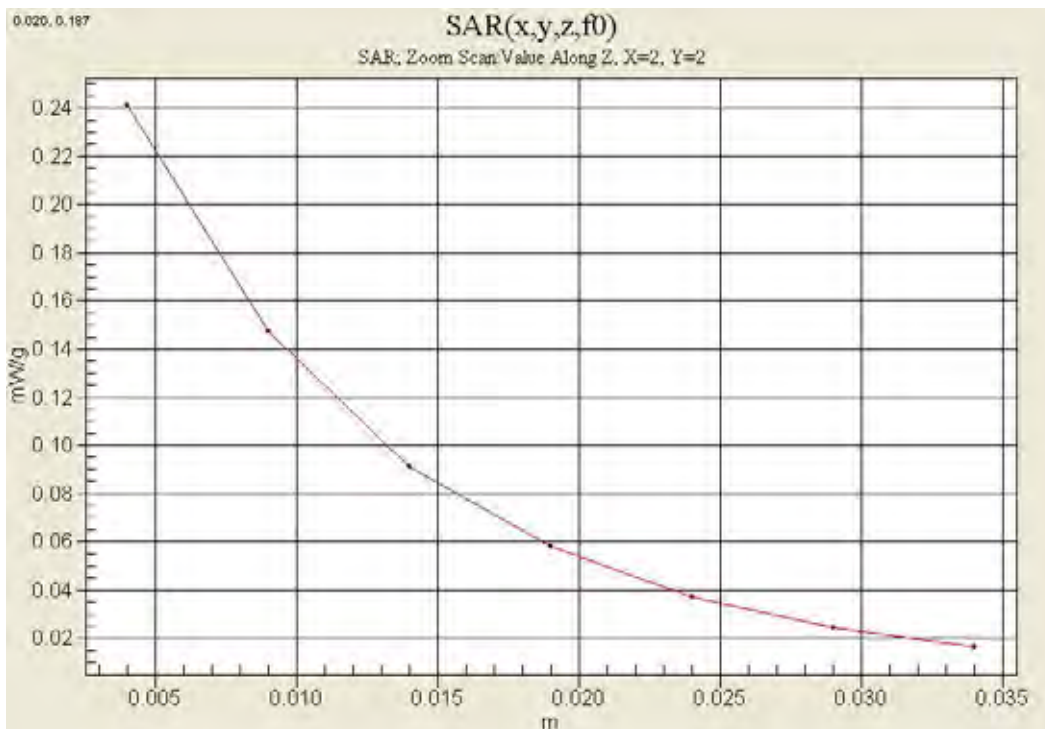
Reference Value = 7.16 V/m; Power Drift = 0.031 dB

Peak SAR (extrapolated) = 0.373 W/kg

**SAR(1 g) = 0.223 mW/g; SAR(10 g) = 0.133 mW/g**

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

Maximum value of SAR (measured) = 0.240 mW/g



Test Laboratory: HCT CO., LTD  
 EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
 Liquid Temperature: 21.3 °C  
 Ambient Temperature: 21.5 °C  
 Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.952 \text{ mho/m}$ ;  $\epsilon_r = 55.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.12, 6.12, 6.12); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 1800/1900 MHz; Type: SAM

**body 4183/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.203 mW/g

**body 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

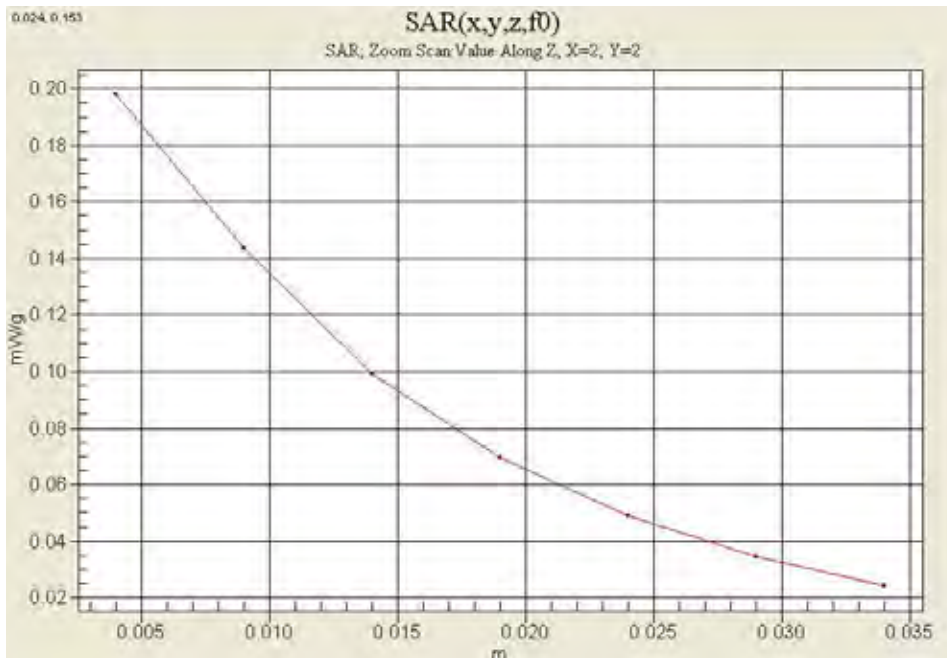
Reference Value = 12.2 V/m; Power Drift = -0.119 dB

Peak SAR (extrapolated) = 0.262 W/kg

**SAR(1 g) = 0.186 mW/g; SAR(10 g) = 0.123 mW/g**

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

Maximum value of SAR (measured) = 0.198 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.3 °C  
Ambient Temperature: 21.5 °C  
Test Date: Oct. 27, 2011

**DUT: CW20; Type: Bar; Serial: #1**

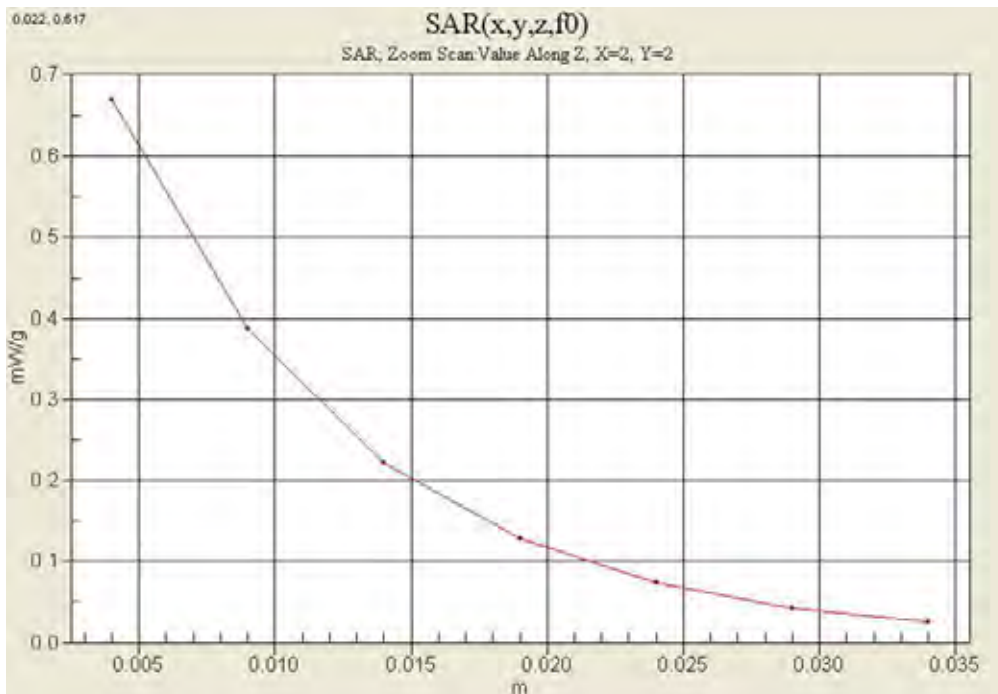
Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.34$  mho/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Right touch 9400/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.671 mW/g

**Right touch 9400/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 9.50 V/m; Power Drift = 0.314 dB  
Peak SAR (extrapolated) = 1.14 W/kg  
**SAR(1 g) = 0.632 mW/g; SAR(10 g) = 0.360 mW/g**  
Maximum value of SAR (measured) = 0.670 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: GSM/WCDMA PDA with Bluetooth & WLAN  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Oct. 26, 2011

**DUT: CW20; Type: Bar; Serial: #1**

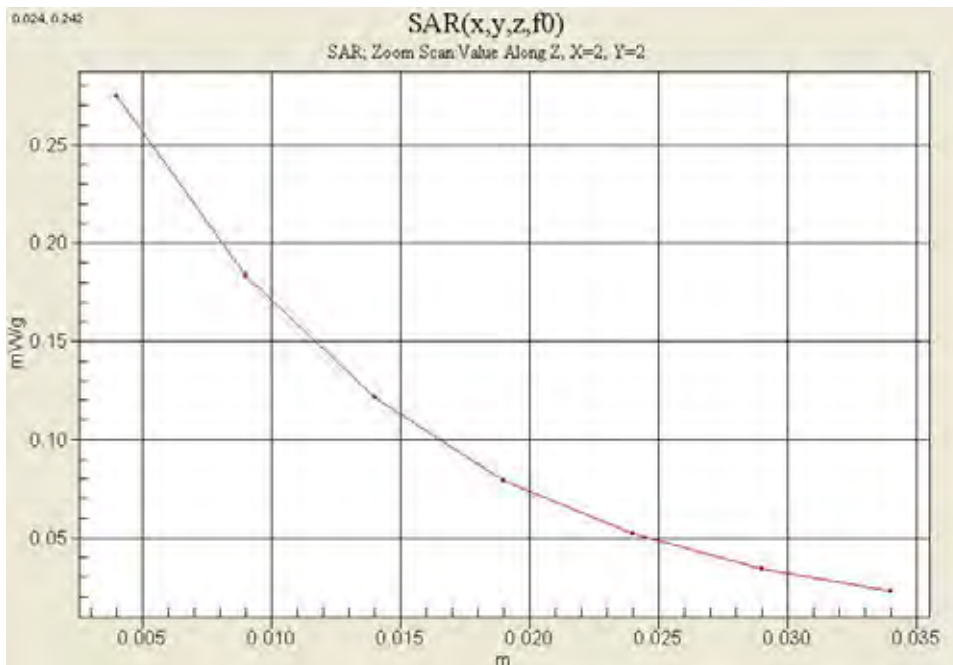
Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 55.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.6, 4.6, 4.6); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**body 9400/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.298 mW/g

**body 9400/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 4.03 V/m; Power Drift = 0.056 dB  
Peak SAR (extrapolated) = 0.380 W/kg  
**SAR(1 g) = 0.254 mW/g; SAR(10 g) = 0.159 mW/g**  
Maximum value of SAR (measured) = 0.273 mW/g



## Attachment 2. – Dipole Validation Plots



## ■ Validation Data (835 MHz Head)

Test Laboratory: HCT CO., LTD  
 Input Power 100 mW (20 dBm)  
 Liquid Temp: 21.2 °C  
 Test Date: Oct. 26, 2011

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

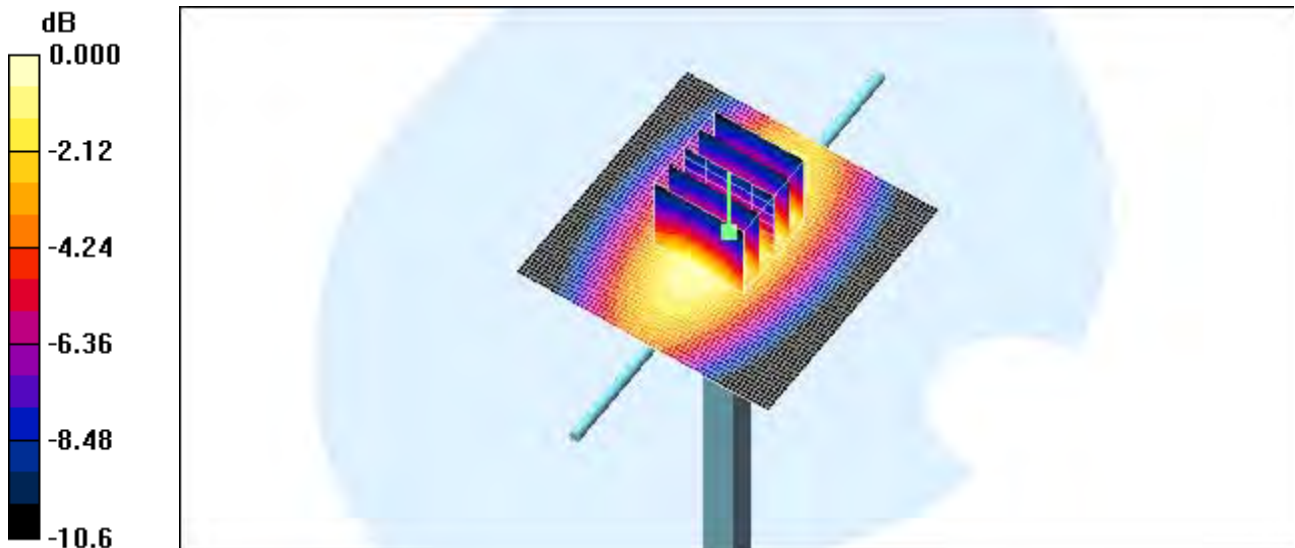
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.9 \text{ mho/m}$ ;  $\epsilon_r = 42.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(6.27, 6.27, 6.27); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

**Validation 835MHz/Area Scan (61x61x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.969 mW/g

**Validation 835MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
 Reference Value = 34.1 V/m; Power Drift = 0.078 dB  
 Peak SAR (extrapolated) = 1.35 W/kg  
**SAR(1 g) = 0.925 mW/g; SAR(10 g) = 0.605 mW/g**  
 Maximum value of SAR (measured) = 1.01 mW/g



0 dB = 1.01mW/g



## ■ Validation Data (835 MHz Body)

Test Laboratory: HCT CO., LTD  
Input Power 100 mW (20 dBm)  
Liquid Temp: 21.2 °C  
Test Date: Oct. 26, 2011

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

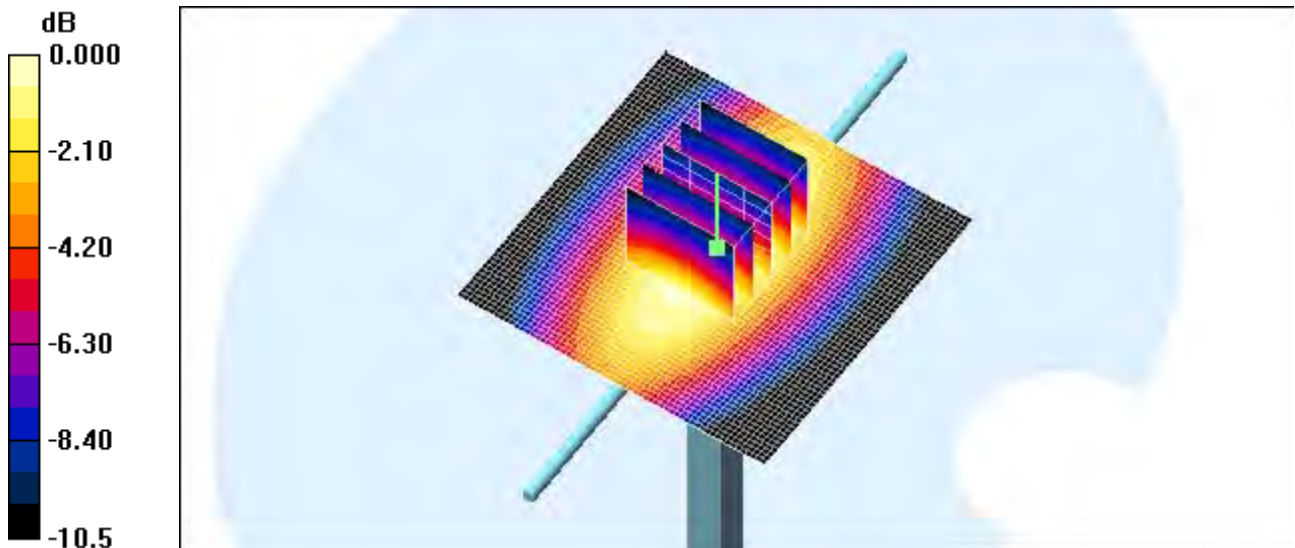
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.95 \text{ mho/m}$ ;  $\epsilon_r = 55.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(6.12, 6.12, 6.12); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 835/900 MHz; Type: SAM

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

**Validation 835MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 34.3 V/m; Power Drift = -0.091 dB  
Peak SAR (extrapolated) = 1.34 W/kg  
**SAR(1 g) = 0.938 mW/g; SAR(10 g) = 0.619 mW/g**  
Maximum value of SAR (measured) = 1.02 mW/g



0 dB = 1.02mW/g

## ■ Validation Data (1900 MHz Head)

Test Laboratory: HCT CO., LTD  
 Input Power: 100 mW (20 dBm)  
 Liquid Temp: 21.3 °C  
 Test Date: Oct. 27, 2011

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

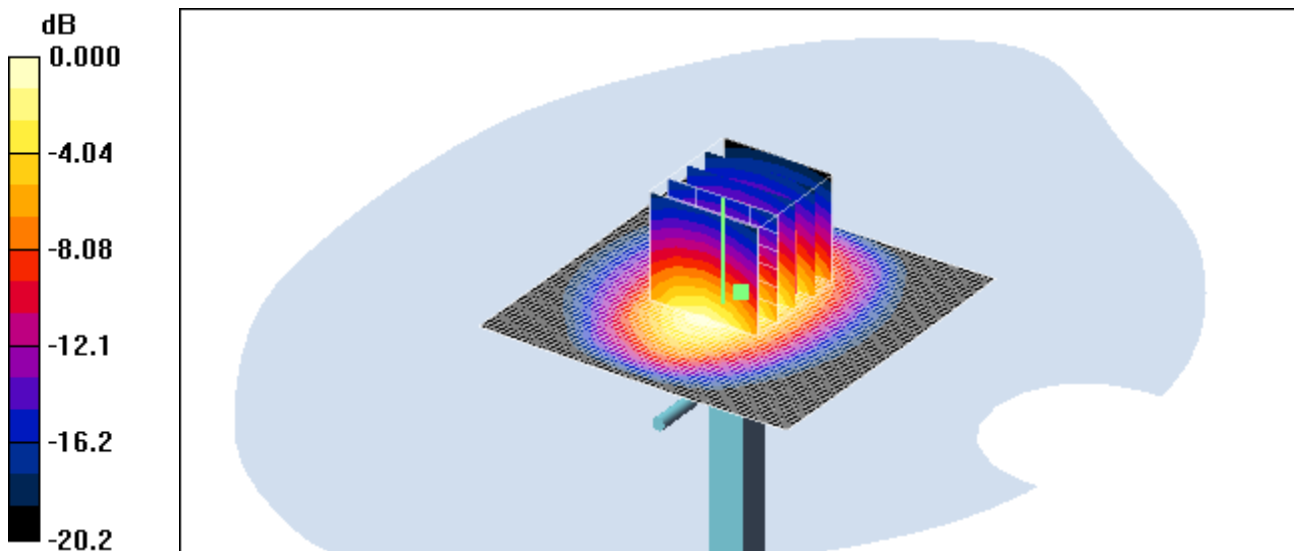
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.36 \text{ mho/m}$ ;  $\epsilon_r = 39.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Dipole 1900MHz Validation/Area Scan (61x61x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 4.73 mW/g

**Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
 Reference Value = 59.5 V/m; Power Drift = -0.008 dB  
 Peak SAR (extrapolated) = 7.09 W/kg  
**SAR(1 g) = 3.95 mW/g; SAR(10 g) = 2.02 mW/g**  
 Maximum value of SAR (measured) = 4.37 mW/g



0 dB = 4.37mW/g

## ■ Validation Data (1900 MHz Body)

Test Laboratory: HCT CO., LTD  
 Input Power 100 mW (20 dBm)  
 Liquid Temp: 21.3 °C  
 Test Date: Oct. 27, 2011

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

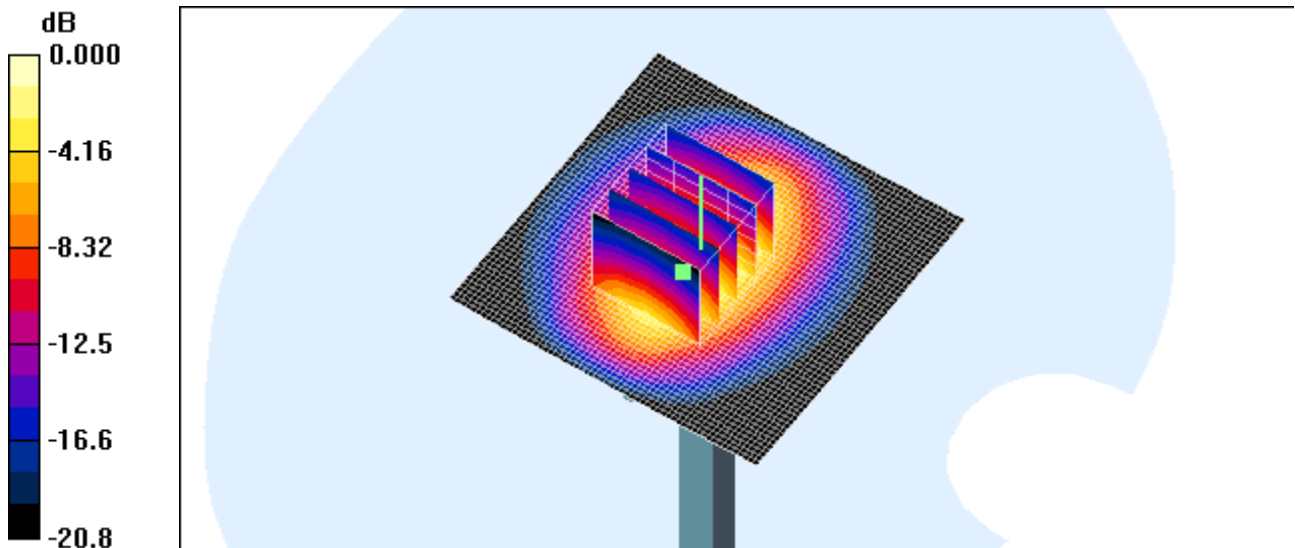
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.48$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(4.6, 4.6, 4.6); Calibrated: 2010-11-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2011-03-01
- Phantom: SAM 1800/1900 MHz; Type: SAM

**Dipole 1900MHz Validation/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 4.77 mW/g

**Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 59.3 V/m; Power Drift = -0.008 dB  
 Peak SAR (extrapolated) = 6.64 W/kg  
**SAR(1 g) = 4.04 mW/g; SAR(10 g) = 2.1 mW/g**  
 Maximum value of SAR (measured) = 4.59 mW/g



0 dB = 4.59mW/g

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

Title CW20  
SubTitle GSM850(Head)  
Test Date Oct. 26, 2011

Frequency	e'	e''
800000000.0000	43.4103	19.4836
805000000.0000	43.3754	19.5025
810000000.0000	43.3287	19.4379
815000000.0000	43.2095	19.4377
820000000.0000	43.1697	19.4099
825000000.0000	43.1005	19.3696
830000000.0000	43.0617	19.3583
835000000.0000	42.9389	19.3820
840000000.0000	42.9228	19.3328
845000000.0000	42.8535	19.3153
850000000.0000	42.7574	19.3269
855000000.0000	42.6975	19.3332
860000000.0000	42.6354	19.2938
865000000.0000	42.5807	19.2939
870000000.0000	42.5059	19.2745
875000000.0000	42.4835	19.2907
880000000.0000	42.4143	19.2500
885000000.0000	42.3331	19.2336
890000000.0000	42.3018	19.2125
895000000.0000	42.2852	19.1722
900000000.0000	42.2065	19.1711

## ■ Dielectric Parameter (835 MHz Body)

Title CW20  
 SubTitle GSM850(Body)  
 Test Date Oct. 26, 2011

Frequency	e'	e''
800000000.0000	56.3117	20.6744
805000000.0000	56.2633	20.6322
810000000.0000	56.2177	20.5845
815000000.0000	56.1178	20.5437
820000000.0000	56.0633	20.5337
825000000.0000	56.0375	20.4906
830000000.0000	55.9732	20.4822
835000000.0000	55.9356	20.4462
840000000.0000	55.8637	20.4429
845000000.0000	55.8360	20.4201
850000000.0000	55.7893	20.4169
855000000.0000	55.7435	20.4047
860000000.0000	55.7072	20.4227
865000000.0000	55.6614	20.3977
870000000.0000	55.6309	20.4128
875000000.0000	55.5987	20.4376
880000000.0000	55.5521	20.4270
885000000.0000	55.5358	20.4515
890000000.0000	55.5397	20.4034
895000000.0000	55.5037	20.3526
900000000.0000	55.4637	20.3522

## ■ Dielectric Parameter (1900 MHz Head)

Title CW20  
 SubTitle GSM1900(Head)  
 Test Date Oct. 27, 2011

Frequency	e'	e''
1800000000.0000	40.2381	12.6049
1810000000.0000	40.1606	12.6238
1820000000.0000	40.1031	12.6578
1830000000.0000	40.0390	12.7080
1840000000.0000	39.9684	12.7596
1850000000.0000	39.9006	12.8036
1860000000.0000	39.8518	12.8327
1870000000.0000	39.8249	12.8332
1880000000.0000	39.8039	12.8599
1890000000.0000	39.7750	12.8588
1900000000.0000	39.7236	12.8488
1910000000.0000	39.6695	12.8378
1920000000.0000	39.6320	12.8371
1930000000.0000	39.5725	12.8599
1940000000.0000	39.4883	12.8698
1950000000.0000	39.4220	12.9095
1960000000.0000	39.3764	12.9386
1970000000.0000	39.3526	12.9680
1980000000.0000	39.3283	12.9948
1990000000.0000	39.3060	13.0058
2000000000.0000	39.3010	13.0109

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

Title CW20  
SubTitle GSM1900(Body)  
Test Date Oct. 27, 2011

Frequency	e'	e''
1850000000.0000	55.2373	13.8406
1855000000.0000	55.2291	13.8593
1860000000.0000	55.2141	13.8461
1865000000.0000	55.1926	13.8609
1870000000.0000	55.1652	13.8769
1875000000.0000	55.1522	13.8961
1880000000.0000	55.1563	13.9146
1885000000.0000	55.1427	13.9271
1890000000.0000	55.1340	13.9582
1895000000.0000	55.1288	13.9534
1900000000.0000	55.1156	13.9753
1905000000.0000	55.1211	14.0108
1910000000.0000	55.1244	14.0151
1915000000.0000	55.1175	14.0234
1920000000.0000	55.1188	14.0228
1925000000.0000	55.1052	14.0208
1930000000.0000	55.1037	14.0256
1935000000.0000	55.0955	14.0420
1940000000.0000	55.0829	14.0393
1945000000.0000	55.0612	14.0257
1950000000.0000	55.0460	14.0103



## 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 (MATE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41283574	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: S5060 (20b)	30-Mar-10 (No. 217-01181)	Mar-11
Reference 30 dB Attenuator	SN: S5120 (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: 000	20-Apr-10 (No. DAE4-000_Apr10)	Apr-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8640C	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:	Name <b>Jefun Kasirali</b>	Function <b>Laboratory Technician</b>	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Function <b>Technical Manager</b>	Signature 

Issued: November 25, 2010

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Certificate No: ET3-1609\_Nov10

Page 1 of 11

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Zeughausstrasse 43, 8004 Zurich, Switzerland



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

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

Accreditation No.: **SCS 108**

**Glossary:**

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

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

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

**Methods Applied and Interpretation of Parameters:**

- NORM<sub>x,y,z</sub>:** Assessed for E-field polarization  $\theta = 0$  ( $f < 900$  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 ( $\mu V/(V/m)^2$ ) <sup>A</sup>	1.98	1.88	1.83	± 10.1%
DCP (mV) <sup>B</sup>	99.1	97.1	98.2	

### Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc <sup>F</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 TSL (see Pages 5 and 6).

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

<sup>F</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>1)</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>1)</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>①</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>①</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.

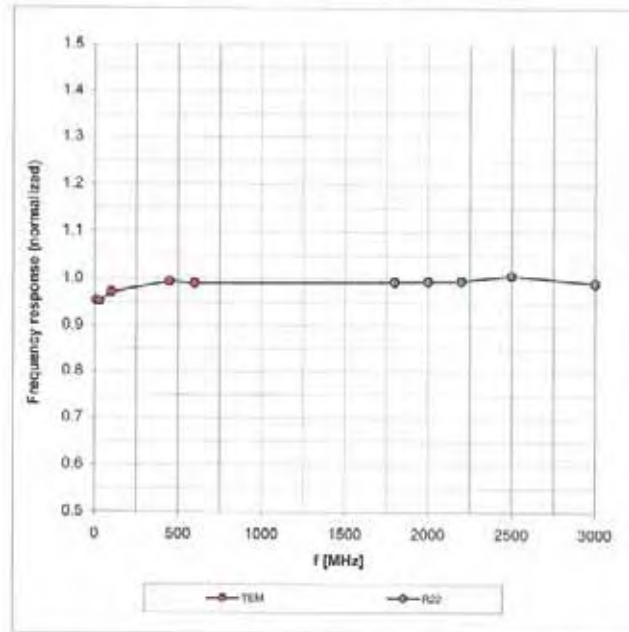


ET3DV6 SN:1609

November 24, 2010

### Frequency Response of E-Field

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

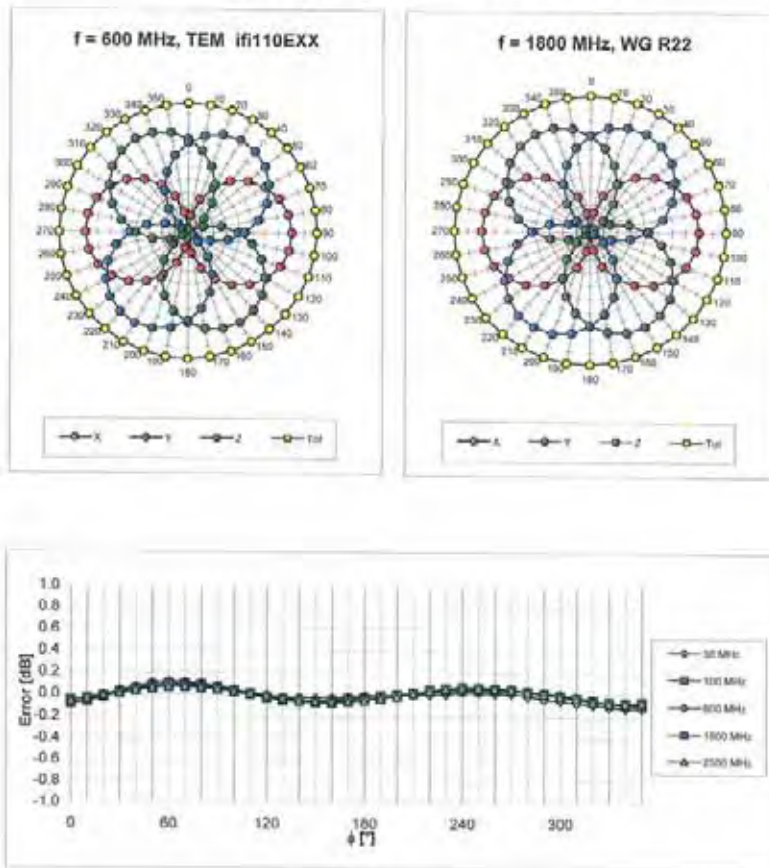


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

ET3DV6 SN:1609

November 24, 2010

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

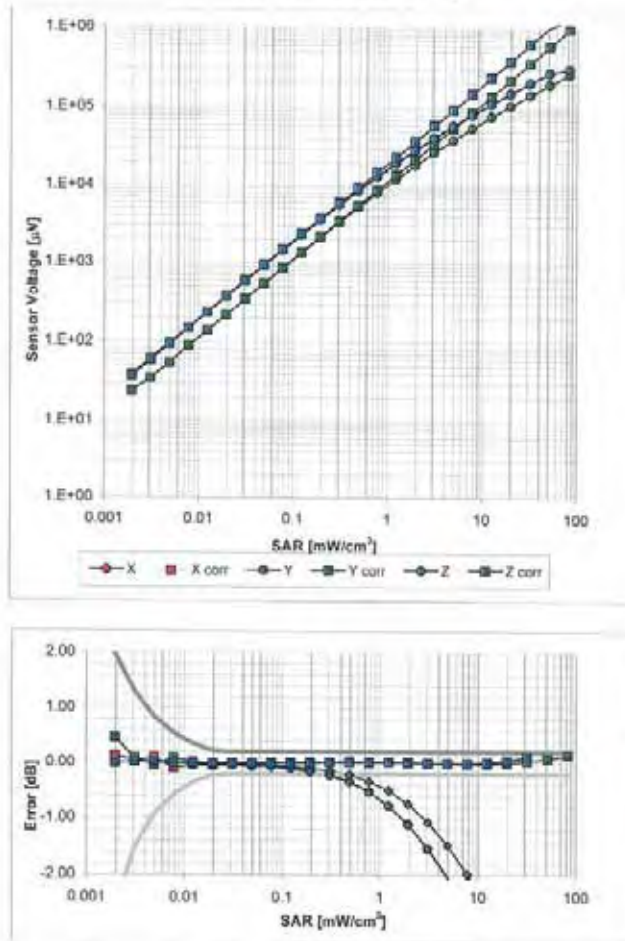


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

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

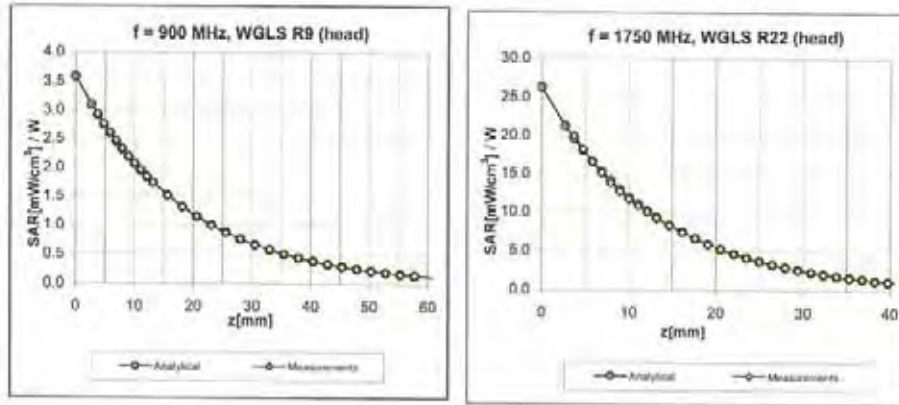


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  (k=2)

ET3DV6 SN:1609

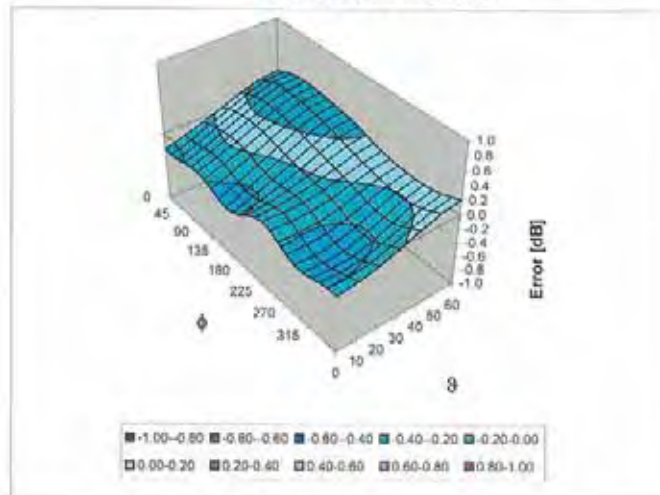
November 24, 2010

### Conversion Factor Assessment



### Deviation from Isotropy in HSL

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



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

ET3DV6 SN:1609

November 24, 2010

**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	3.7 mm

Schmid &amp; Partner Engineering AG

**s p e a g**Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone: +41 44 245 9700, Fax: +41 44 245 9779  
info@speag.com, <http://www.speag.com>**Additional Conversion Factors**  
for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1609

Place of Assessment:

Zurich

Date of Assessment:

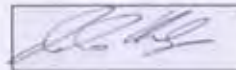
November 26, 2010

Probe Calibration Date:

November 24, 2010

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

Assessed by:



ET3DV6-SN:1609

Page 1 of 2

November 26, 2010



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

Conversion factor ( $\pm$  standard deviation)

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

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

150  $\pm$  50 MHz      *ConvF*      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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Accreditation No.: SCS 108

Client **HCT (Dymstec)**

Certificate No: **D835V2-441 May11**

## CALIBRATION CERTIFICATE

Object **D835V2 - SN: 441**

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

Calibration date: **May 16, 2011**

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

All calibrations have been conducted in the closed laboratory facility; environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01288)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: S5086 (20dB)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 05327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 801	10-Jun-10 (No. DAE4-801_Jun10)	Jun-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimitri Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 16, 2011

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Certificate No: D835V2-441\_May11

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

Accreditation No.: **SCS 108**

**Glossary:**

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

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

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

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

### Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	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	40.4 $\pm$ 6 %	0.88 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.31 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.34 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.51 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.09 mW / g $\pm$ 16.5 % (k=2)

### Body TSL parameters

The following parameters and calculations were applied.

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

### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.43 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.45 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.27 mW / g $\pm$ 16.5 % (k=2)

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.2 $\Omega$ - 9.8 j $\Omega$
Return Loss	- 20.2 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.3 $\Omega$ - 10.3 j $\Omega$
Return Loss	- 18.9 dB

### General Antenna Parameters and Design

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

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

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

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 09, 2001



## DASY5 Validation Report for Head TSL

Date: 16.05.2011

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium: HSL900

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.88$  mho/m;  $\epsilon_r = 40.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

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

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

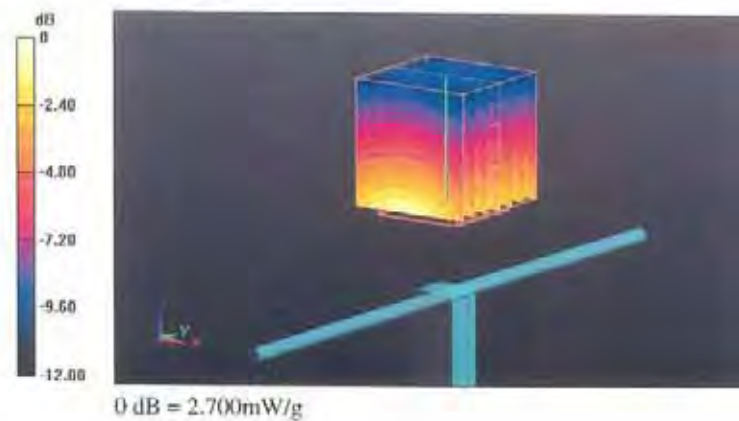
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.041 V/m; Power Drift = 0.03 dB

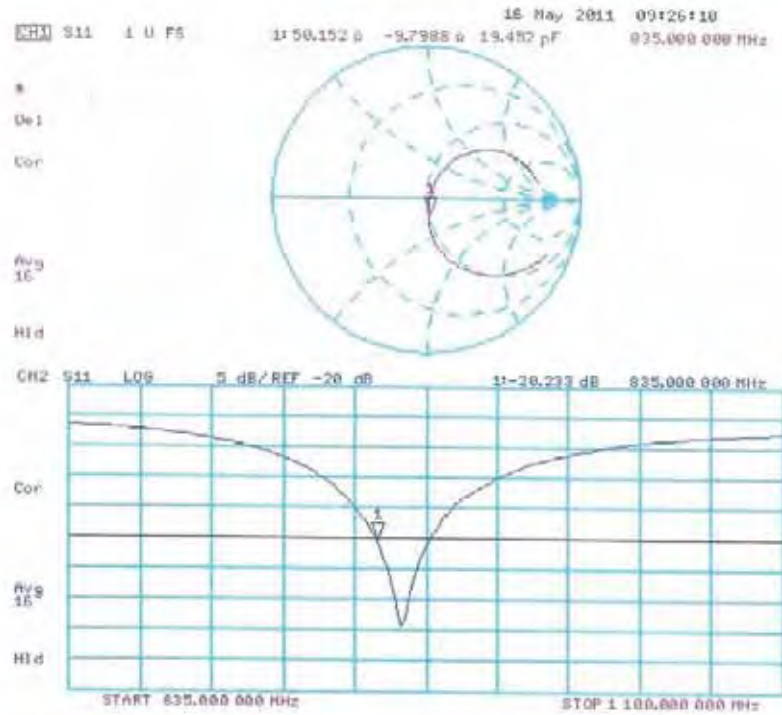
Peak SAR (extrapolated) = 3.442 W/kg

**SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.51 mW/g**

Maximum value of SAR (measured) = 2.703 mW/g



**Impedance Measurement Plot for Head TSL**





## DASY5 Validation Report for Body TSL

Date: 16.05.2011

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium: MSL900

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 1 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

### DASY5 Configuration:

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

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

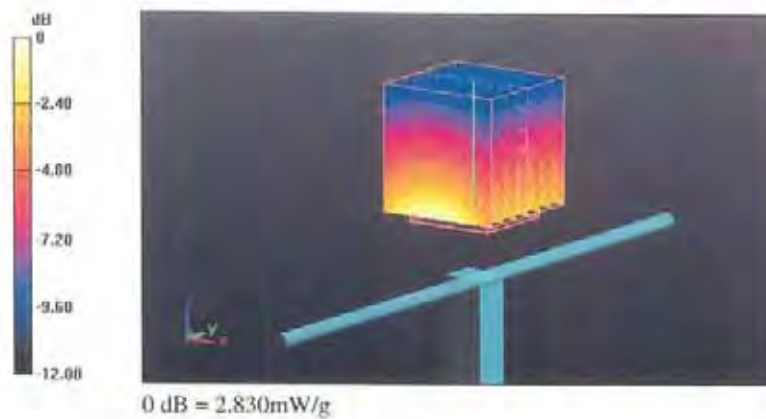
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.302 V/m; Power Drift = 0.02 dB

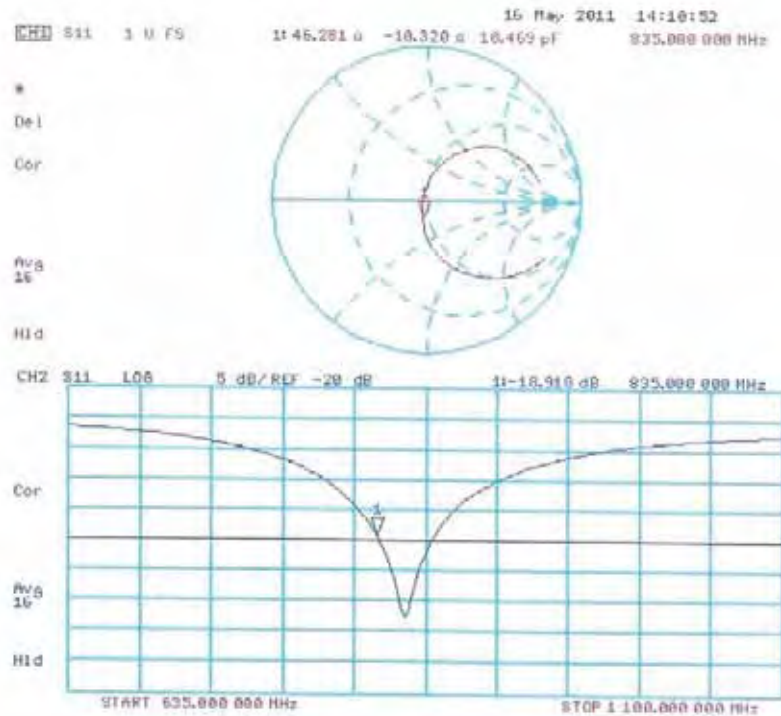
Peak SAR (extrapolated) = 3.553 W/kg

**SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.6 mW/g**

Maximum value of SAR (measured) = 2.833 mW/g



**Impedance Measurement Plot for Body TSL**



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



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Accreditation No.: SCS 108

Client **HCT (Dymstec)**

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

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d032**

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

Calibration date: **July 22, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 55066 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 09327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. E63-3205_Apr11)	Apr-12
DAE4	SN: 801	04-Jul-11 (No. DAE4-001_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41002317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: August 2, 2011

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**Glossary:**

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

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

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

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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



**Measurement Conditions**

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.1 $\pm$ 6 %	1.42 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

**SAR result with Head TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	39.9 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.29 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	21.0 mW / g $\pm$ 16.5 % (k=2)

**Body TSL parameters**

The following parameters and calculations were applied.

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

**SAR result with Body TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	40.9 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.39 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.5 mW / g $\pm$ 16.5 % (k=2)

**Appendix****Antenna Parameters with Head TSL**

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

**Antenna Parameters with Body TSL**

Impedance, transformed to feed point	$46.6 \Omega + 6.0 j\Omega$
Return Loss	- 22.9 dB

**General Antenna Parameters and Design**

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

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

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

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

**Additional EUT Data**

Manufactured by	SPEAG
Manufactured on	March 17, 2003

**DASY5 Validation Report for Head TSL**

Date: 20.07.2011

Test Laboratory: SPE/AG, Zurich, Switzerland

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

Communication System: CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.42$  mho/m;  $\epsilon_r = 39.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

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

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

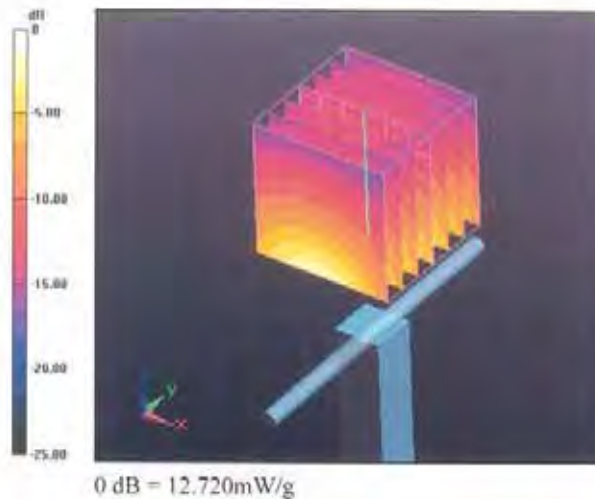
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 18,469 W/kg

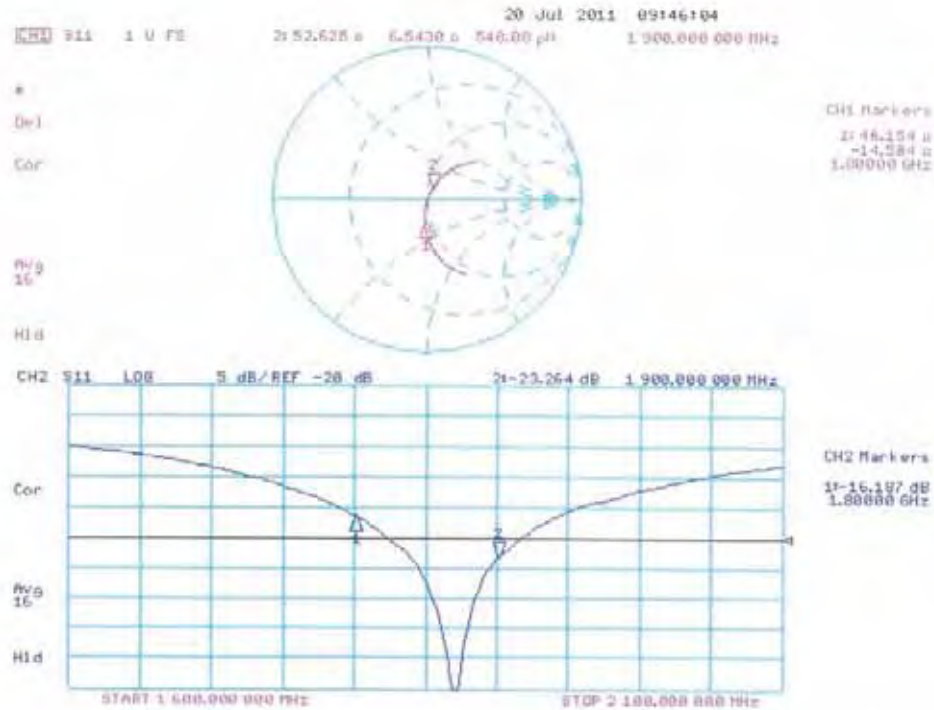
**SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.29 mW/g**

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





**Impedance Measurement Plot for Head TSL**



**DASY5 Validation Report for Body TSL**

Date: 22.07.2011

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.53$  mho/m;  $\epsilon_r = 52.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

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

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

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

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

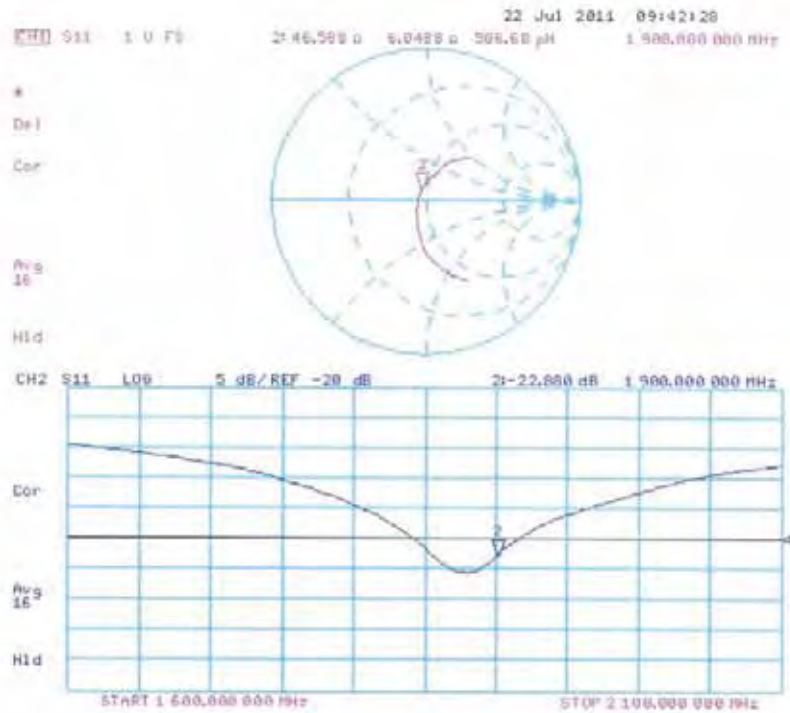
Peak SAR (extrapolated) = 18.111 W/kg

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

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



**Impedance Measurement Plot for Body TSL**



## **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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Client: **HCT (Dymotec)**

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

Accreditation No.: **SCS 108**

Certificate No.: **DAE3-466\_Mar11**

**CALIBRATION CERTIFICATE**

Object: **DAE3 - SD 000 D03 AA - SN: 488**

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

Calibration date: **March 1, 2011**

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

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

Calibration Equipment used (M&E critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Kettley Multimeter Type 2001	SN: 0610278	28-Sep-10 (No:10376)	Sep-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE LMS 006 AB 1004	07-Jun-10 (in house check)	In house check: Jun-11

Calibrated by:


Approved by:


Name: **Dominique Briel**

Name: **F. Briel**

Function: **Technician**

Function: **R&D Director**

Signature: 

Signature: 

Issued: March 1, 2011

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Certificate No: DAE3-466\_Mar11

Page 1 of 5

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#### 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	402.760 $\pm$ 0.1% (k=2)	403.494 $\pm$ 0.1% (k=2)	403.585 $\pm$ 0.1% (k=2)
Low Range	3.92233 $\pm$ 0.7% (k=2)	3.95072 $\pm$ 0.7% (k=2)	3.95259 $\pm$ 0.7% (k=2)

### Connector Angle

Connector Angle to be used in DASY system	316.0 $^{\circ}$ $\pm$ 1 $^{\circ}$
---	-------------------------------------

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

High Range	Reading ( $\mu$ V)	Difference ( $\mu$ V)	Error (%)
Channel X + Input	199992.3	-3.36	-0.00
Channel X + Input	19999.15	-1.25	-0.01
Channel X - Input	-19997.62	2.48	-0.01
Channel Y + Input	199995.8	1.04	0.00
Channel Y + Input	20000.42	0.22	0.00
Channel Y - Input	-20001.20	-1.40	0.01
Channel Z + Input	199996.5	2.59	0.00
Channel Z + Input	20001.14	0.84	0.00
Channel Z - Input	-20001.56	-0.96	0.00

Low Range	Reading ( $\mu$ V)	Difference ( $\mu$ V)	Error (%)
Channel X + Input	1999.7	-0.16	-0.01
Channel X + Input	199.92	-0.18	-0.09
Channel X - Input	-200.40	-0.30	0.15
Channel Y + Input	2000.4	0.22	0.01
Channel Y + Input	199.75	-0.25	-0.13
Channel Y - Input	-200.91	-0.81	0.40
Channel Z + Input	2000.2	0.30	0.01
Channel Z + Input	199.07	-0.73	-0.36
Channel Z - Input	-201.40	-1.10	0.55

**2. Common mode sensitivity**

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

	Common mode Input Voltage (mV)	High Range Average Reading ( $\mu$ V)	Low Range Average Reading ( $\mu$ V)
Channel X	200	14.29	12.20
	-200	-10.20	-12.62
Channel Y	200	-7.80	-8.45
	-200	8.01	7.92
Channel Z	200	10.18	10.10
	-200	-11.82	-11.95

**3. Channel separation**

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

	Input Voltage (mV)	Channel X ( $\mu$ V)	Channel Y ( $\mu$ V)	Channel Z ( $\mu$ V)
Channel X	200	-	3.28	-0.55
Channel Y	200	0.60	-	3.58
Channel Z	200	0.92	-0.26	-

**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	16348	16567
Channel Y	16148	17019
Channel Z	16078	16421

**5. Input Offset Measurement**

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

	Average ( $\mu$ V)	min. Offset ( $\mu$ V)	max. Offset ( $\mu$ V)	Std. Deviation ( $\mu$ V)
Channel X	-1.10	-2.84	-0.28	0.36
Channel Y	1.52	0.67	2.44	0.37
Channel Z	1.20	0.52	2.91	0.33

**6. Input Offset Current**

Nominal Input circuitry offset current on all channels: <25fA

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

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

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

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

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

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