





# SAR TEST REPORT

HCT CO., LTD

EUT Type:	CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem		
FCC ID:	PH7MV140N		
Model:	MV140N	Trade Name	AXESSTEL
Date of Issue:	Nov.03, 2008		
Test report No.:	HCT-IA0810-1701		
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Testing has been carried out in accordance with:	47CFR §2.1093 FCC OET Bulletin 65(Edition 97-01), Supplement C (Edition 01-01) ANSI/ IEEE C95.1 – 2005 IEEE 1528-2003		
Test result:	The tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.		
Signature	<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">   <hr style="width: 100%;"/>           Report prepared by            : Sun-Hee Kim            Test Engineer of SAR Part         </div> <div style="text-align: center;">   <hr style="width: 100%;"/>           Approved by            : Nam-Wook Kang            Manager of SAR Part         </div> </div>		

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# Table of Contents

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<u>1. INTRODUCTION</u> .....	3
<u>2. DESCRIPTION OF DEVICE</u> .....	4
<u>3. DESCRIPTION OF TEST EQUIPMENT</u> .....	5
<u>3.1 SAR MEASUREMENT SETUP</u> .....	5
<u>3.2 DASY E-FIELD PROBE SYSTEM</u> .....	6
<u>3.3 PROBE CALIBRATION PROCESS</u> .....	7
<u>3.4 SAM Phantom</u> .....	9
<u>3.5 Device Holder for Transmitters</u> .....	9
<u>3.6 Brain &amp; Muscle Simulating Mixture Characterization</u> .....	10
<u>3.7 SAR TEST EQUIPMENT</u> .....	11
<u>4. SAR MEASUREMENT PROCEDURE</u> .....	12
<u>5. DESCRIPTION OF TEST POSITION</u> .....	13
<u>5.1 HEAD POSITION</u> .....	13
<u>5.2 Body Holster/Belt Clip Configurations</u> .....	14
<u>5.3 Test Configurations</u> .....	15
<u>6. MEASUREMENT UNCERTAINTY</u> .....	16
<u>7. ANSI/ IEEE C95.1 - 2005 RF EXPOSURE LIMITS</u> .....	17
<u>8. SYSTEM VERIFICATION</u> .....	18
<u>8.1 Tissue Verification</u> .....	18
<u>8.2 System Validation</u> .....	18
<u>9. 3G MEASUREMENT PROCEDURES</u> .....	19
<u>9.1 Procedures Used To Establish Test Signal</u> .....	19
<u>9.2 SAR Measurement Conditions for CDMA2000 1x</u> .....	19
<u>10. SAR TEST DATA SUMMARY</u> .....	21
<u>10.1 Measurement Results (CDMA835 Body SAR)</u> .....	21
<u>10.2 Measurement Results (PCS1900 Body SAR)</u> .....	22
<u>11. CONCLUSION</u> .....	23
<u>12. REFERENCES</u> .....	24
Attachment 1. – SAR Test Plots .....	25
Attachment 2. – Dipole Validation Plots .....	42
Attachment 3. – Probe Calibration Data .....	49
Attachment 4. – Dipole Calibration Data .....	59

# 1. INTRODUCTION

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

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

## SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative of the incremental electromagnetic energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (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).**

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

where:

- $\sigma$  = conductivity of the tissue-simulant material (S/m)
- $\rho$  = mass density of the tissue-simulant material (kg/m<sup>3</sup>)
- $E$  = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

## 2. DESCRIPTION OF DEVICE

Environmental evaluation measurements of specific absorption rate (SAR) distributions in emulated human head and body tissues exposed to radio frequency (RF) radiation from wireless portable devices for compliance with the rules and regulations of the U.S. Federal Communications Commission (FCC).

EUT Type	CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem
FCC ID	PH7MV140N
Model(s)	MV140N
Trade Name	AXESSTEL
Serial Number(s)	#1
Application Type	Certification
Modulation(s)	CDMA835/PCS1900
Tx Frequency	824.70 - 848.31 MHz (CDMA) 1 851.25 – 1 908.75 MHz (PCS CDMA)
Rx Frequency	869.70 - 893.31 MHz (CDMA) 1 931.25 – 1 988.75 MHz (PCS CDMA)
FCC Classification	PCS Licensed Transmitter (PCB)
Production Unit or Identical Prototype	Prototype
Max SAR	0.597 W/kg CDMA835 Body SAR 0.518 W/kg PCS1900 Body SAR
Date(s) of Tests	Nov. 1, 2008
Antenna Type	Intenna

## 3. DESCRIPTION OF TEST EQUIPMENT

### 3.1 SAR MEASUREMENT SETUP

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

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

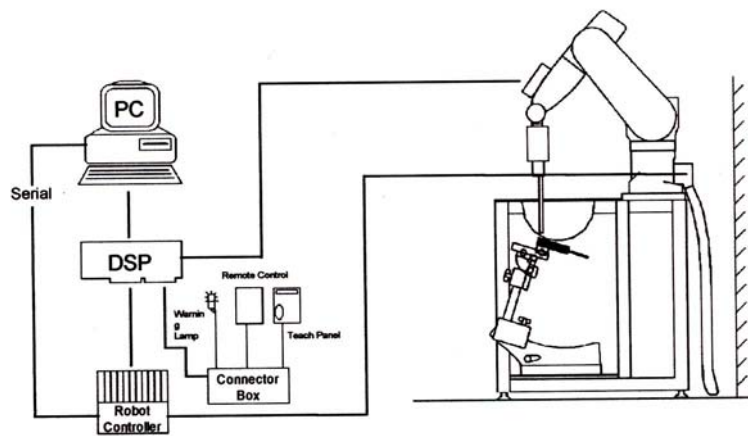


Figure 3.1 HCT SAR Lab. Test Measurement Set-up

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

## **3.2 DASY E-FIELD PROBE SYSTEM**

### **3.2.1 ES3DV3 Probe Specification**

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 900 and HSL 1810 Additional CF for other liquids and frequencies upon request
Frequency	10 MHz to 4 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 4 GHz)
Directivity	$\pm 0.2$ dB in HSL (rotation around probe axis) $\pm 0.3$ dB in tissue material (rotation normal to probe axis)
Dynamic	5 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.2$ dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones

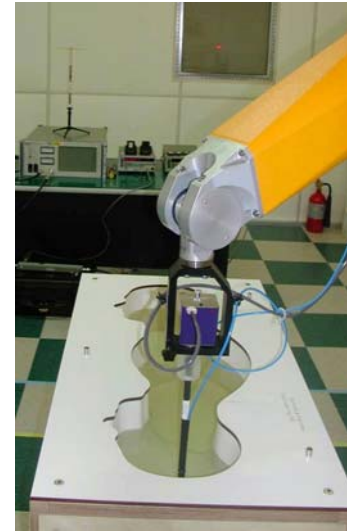


Figure 4.1 Photograph of the probe and the Phantom



Figure 4.2 ES3DV3 E-field Probe

The SAR measurements were conducted with the dosimetric probe ES3DV3, 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)

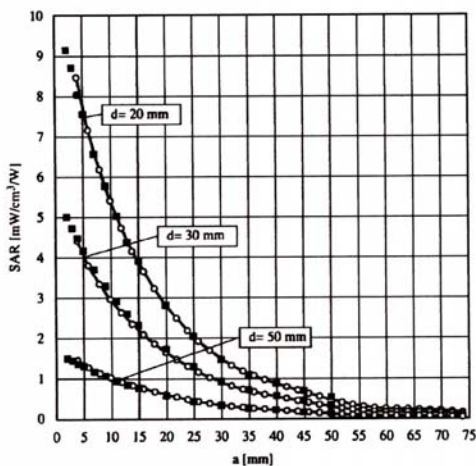


Figure 3.4 E-Field and Temperature measurements at 900 MHz

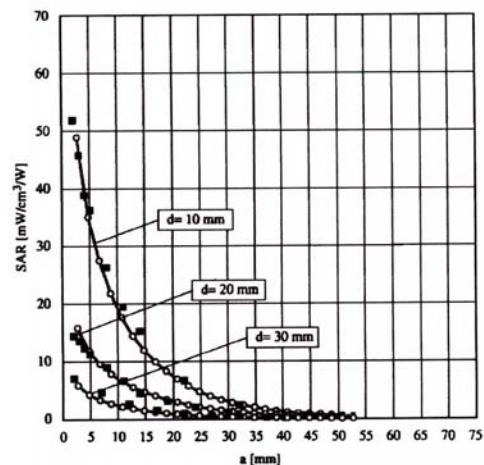


Figure 3.5 E-Field and temperature measurements at 1.8 GHz

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

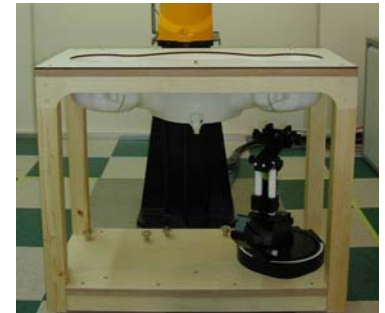


Figure 3.6 SAM Phantom

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

### 3.5 Device Holder for Transmitters

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

Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may 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	DAE4	869	Sep. 03, 2008	Annual	Sep. 03, 2009
SPEAG	DAE3	466	July 17, 2008	Annual	July 17, 2009
SPEAG	E-Field Probe ES3DV3	3161	April 7, 2008	Annual	April 7, 2009
SPEAG	E-Field Probe ES3DV6	1630	Aug. 25, 2008	Annual	Aug. 25, 2009
SPEAG	Validation Dipole D450V2	1007	July 15, 2008	Annual	July 15, 2009
SPEAG	Validation Dipole D835V2	441	May 19, 2008	Annual	May 19, 2009
SPEAG	Validation Dipole D900V2	130	Aug. 25, 2008	Annual	Aug. 25, 2009
SPEAG	Validation Dipole D1800V2	2d007	May 20, 2008	Annual	May 20, 2009
SPEAG	Validation Dipole D1900V2	5d032	July 22, 2008	Annual	July 22, 2009
SPEAG	Validation Dipole D2450V2	743	Aug. 27, 2008	Annual	Aug. 27, 2009
Agilent	Power Meter(F) E4419B	MY41291386	Nov. 05, 2007	Annual	Nov. 05, 2008
Agilent	Power Sensor(G) 8481	MY41090870	Nov. 05, 2007	Annual	Nov. 05, 2008
HP	Dielectric Probe Kit 85070C	00721521	N/A	N/A	N/A
HP	Dual Directional Coupler	16072	Nov. 05, 2007	Annual	Nov. 05, 2008
R&S	Base Station CMU200	110740	July 26, 2008	Annual	July 26, 2009
Agilent	Base Station E5515C	GB44400269	Feb. 10, 2008	Annual	Feb. 10, 2009
HP	Signal Generator E4438C	MY42082646	Dec. 24, 2007	Annual	Dec. 24, 2008
HP	Network Analyzer 8753ES	JP39240221	Apr. 11, 2008	Annual	Apr. 11, 2009
EM POWER	Power Amp BBS3Q7ELU	1009D/C0028	Mar. 1, 2008	Annual	Mar. 1, 2009
Tescom	TC-3000/ Bluetooth	3000A4900112	Jan. 11, 2008	Annual	Jan. 11, 2009

**NOTE:**

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

## 4. SAR MEASUREMENT PROCEDURE

The evaluation was performed with the following procedure:

1. The SAR value at a fixed location above the ear point was measured and was used as a reference value for assessing the power drop.
2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20 mm x 20 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.
3. Around this point, a volume of 32 mm x 32 mm x 34 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.

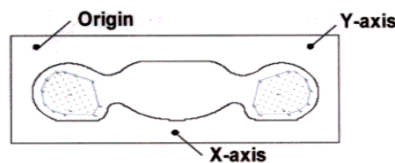


Figure 4.1 SAR Measurement Point in Area Scan

## 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.

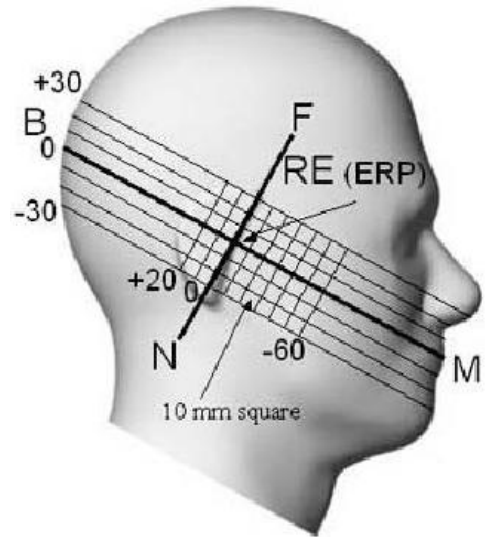


Figure 5.1 Side view of the phantom

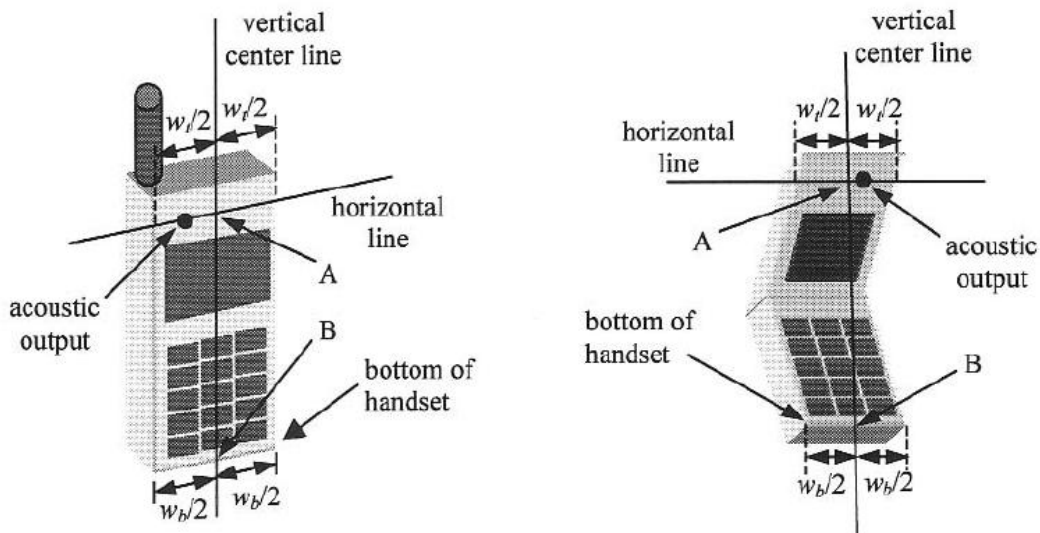


Figure 5.2 Handset vertical and horizontal reference lines

## **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 2.5 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.

## 5.3 Test Configurations

According to KDB 447498, The device that can be connected to a host through a cable must be tested with the device positioned in all applicable orientations against the flat phantom.

Therefore, the EUT was tested in following orientations;

**1) Configuration 1:** Front side of the EUT was tested, and the separation distance between EUT and Phantom is 2.5 cm which is specified in the User Manual.

**2) Configuration 2:** Back side of the EUT was tested, and the separation distance between EUT and Phantom is 2.5 cm which is specified in the User Manual.

**3) Configuration 3:** Right side of the EUT was tested, and the separation distance between EUT and Phantom is 2.5 cm which is specified in the User Manual.

**4) Configuration 4:** Left side of the EUT was tested, and the separation distance between EUT and Phantom is 2.5 cm which is specified in the User Manual.

**5) Configuration 5:** Top side of the EUT was tested, and the separation distance between EUT and Phantom is 2.5 cm which is specified in the User Manual.

Note;

EUT and PC are connected via the Ferrite loaded USB cable.

## 6. MEASUREMENT UNCERTAINTY

Measurement uncertainties in SAR measurements are difficult to quantify due to several variables including biological, physiological, and environmental. However, we estimate the measurement uncertainties in SAR to be less than 15 % - 25 %.

According to ANSI/IEEE C95.3, the overall uncertainties are difficult to assess and will vary with the type of meter and usage situation. However, accuracy's of 1 dB to  $\pm 3$  dB can be expected in practice, with greater uncertainties in near-field situations and at higher frequencies (shorter wavelengths), or areas where large reflecting objects are present. Under optimum measurement conditions, SAR measurement uncertainties of at least  $\pm 2$  dB can be expected.

According to CENELEC, typical worst-case uncertainty of field measurements is 5 dB. For well-defined modulation characteristics the uncertainty can be reduced to  $\pm 3$  dB.

Error Description	Uncertainty value [%]	Probability Distribution	Divisor	ci	ci <sup>2</sup>	Standard Uncertainty [%]	Stand Uncert <sup>2</sup>	(Stand Uncert <sup>2</sup> ) X (ci <sup>2</sup> )	Vi & Veff
<b>1. Measurement System</b>									
Probe Calibration	5.5	Normal	1.00	1	1	5.50	30.25	30.25	$\infty$
Axial Isotropy	4.7	Rectangular	1.73	0.7	0.49	2.71	7.36	3.61	$\infty$
Hemispherical Isotropy	9.6	Rectangular	1.73	0.7	0.49	5.54	30.72	15.05	$\infty$
Linearity	4.7	Rectangular	1.73	1	1	2.71	7.36	7.36	$\infty$
System Detection limits	1.0	Rectangular	1.73	1	1	0.58	0.33	0.33	$\infty$
Boundary effect	1.0	Rectangular	1.73	1	1	0.58	0.33	0.33	$\infty$
Response time	0.8	Rectangular	1.73	1	1	0.46	0.21	0.21	$\infty$
RF Ambient conditions	3.0	Rectangular	1.73	1	1	1.73	3.00	3.00	$\infty$
Readout Electronics	0.3	Normal	1.00	1	1	0.30	0.09	0.09	$\infty$
Integration time	2.6	Rectangular	1.73	1	1	1.50	2.25	2.25	$\infty$
Probe positioner	0.4	Rectangular	1.73	1	1	0.23	0.05	0.05	$\infty$
Probe positioning	2.9	Rectangular	1.73	1	1	1.67	2.80	2.80	$\infty$
Maximum SAR evaluation	1.0	Rectangular	1.73	1	1	0.58	0.33	0.33	$\infty$
<b>Sub Total</b>								<b>65.69</b>	
<b>2. Test Sample Related</b>									
Device Positioning	1.8	Normal	1.00	1	1	1.81	3.28	3.28	9
Device Holder	3.6	Normal	1.00	1	1	3.60	12.96	12.96	$\infty$
Power Drift	5.0	Rectangular	1.73	1	1	2.89	8.33	8.33	$\infty$
<b>Sub Total</b>								<b>24.57</b>	
<b>3. Phantom and Setup</b>									
Phantom Uncertainty	4.0	Rectangular	1.73	1	1	2.31	5.33	5.33	$\infty$
Liquid conductivity (target)	5.0	Rectangular	1.73	0.5	0.25	2.89	8.33	2.08	$\infty$
Liquid conductivity (measurement error)	2.5	Normal	1.00	0.5	0.25	2.50	6.25	1.56	$\infty$
Liquid permittivity (target)	5.0	Rectangular	1.73	0.5	0.25	2.89	8.33	2.08	$\infty$
Liquid permittivity (measurement error)	2.5	Normal	1.00	0.5	0.25	2.50	6.25	1.56	$\infty$
<b>Sub Total</b>								<b>12.63</b>	
<b>Combined standard SAR uncertainty [%]</b>						<b>10.14</b>		102.88	-
<b>Expanded uncertainty [k=2, approximately confidence level 95 %]</b>						<b><math>\pm 20.28</math> %</b>			

**Table 6.1 Breakdown of Errors**



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

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

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

**NOTES:**

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

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

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

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

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

## 8. SYSTEM VERIFICATION

### 8.1 Tissue Verification

Freq. [MHz]	Date	Liquid	Liquid Temp.[°C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
835	Nov. 01, 2008	Head	21.2	$\epsilon r$	41.5	41.1	- 0.96	$\pm 5$
				$\sigma$	0.90	0.878	- 2.44	$\pm 5$
835	Nov. 01, 2008	Body	21.2	$\epsilon r$	55.2	55.1	- 0.18	$\pm 5$
				$\sigma$	0.97	0.99	+ 2.06	$\pm 5$
1 900	Nov. 01, 2008	Head	21.2	$\epsilon r$	40.0	40.2	+ 0.50	$\pm 5$
				$\sigma$	1.40	1.39	- 0.71	$\pm 5$
1 900	Nov. 01, 2008	Body	21.2	$\epsilon r$	53.3	53.9	+ 1.13	$\pm 5$
				$\sigma$	1.52	1.55	+ 1.97	$\pm 5$

### 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 mW

Freq. [MHz]	Date	Liquid	Liquid Temp. [°C]	SAR Average	Target Value (SPEAG) (mW/g)	Measured Value (mW/g)	Deviation [%]	Limit [%]
835	Nov. 01, 2008	Head	21.2	1 g	9.17	0.922	+ 0.55	$\pm 10$
1 900	Nov. 01, 2008	Head	21.2	1 g	37.7	3.80	+ 0.80	$\pm 10$

## 9. 3G MEASUREMENT PROCEDURES

### 9.1 Procedures Used To Establish Test Signal

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

### 9.2 SAR Measurement Conditions for CDMA2000 1x

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

#### 9.2.1 Output Power Verification

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

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

Parameters for Max. Power for RC1

Parameter	Units	Value
$\bar{I}_{or}$	dBm/1.23 MHz	-104
$\frac{Pilot E_c}{I_{or}}$	dB	-7
$\frac{Traffic E_c}{I_{or}}$	dB	-7.4

Table. 9.1

Parameters for Max. Power for RC3

Parameter	Units	Value
$\bar{I}_{or}$	dBm/1.23 MHz	-86
$\frac{Pilot E_c}{I_{or}}$	dB	-7
$\frac{Traffic E_c}{I_{or}}$	dB	-7.4

Table. 9.2

#### 9.2.2 Head SAR Measurement

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

### 9.2.3 Body SAR Measurement

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

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

### 9.2.4 Handsets with EV-DO

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

#### Average Output Power Measurement for FCC ID: PH7MV140N

Band	Channel	SO2	SO2	SO55	SO55	TDSO	1xEvDO	1xEvDO	1xEvDO	1xEvDO
		RC1/1	RC3/3	RC1/1	RC3/3	SO32	Rev.0	Rev.0	Rev.A	Rev.A
							(FTAP)	(RTAP)	(FETAP)	(RETAP)
CDMA	1013	24.16	24.16	24.13	24.18	24.17	24.80	24.86	24.66	24.58
	384	23.97	23.84	23.93	23.85	23.83	24.50	24.52	24.43	24.37
	777	23.59	23.49	23.56	23.47	23.49	24.09	24.13	24.09	24.00
PCS	25	23.99	23.93	24.01	23.94	23.94	24.52	24.48	24.48	24.46
	600	23.80	23.76	23.83	23.78	23.72	24.37	24.36	24.36	24.34
	1175	23.59	23.53	23.58	23.55	23.51	24.19	24.11	24.14	24.10

## 10. SAR TEST DATA SUMMARY

### 10.1 Measurement Results (CDMA835 Body SAR)

Frequency		Modulation	Conducted Power (dBm)		Configuration	Separation Distance	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
836.52	384 (Mid)	EVDO	24.52	24.64	Front with Charger	2.5 cm	Intenna	0.597
836.52	384 (Mid)	EVDO	24.52	24.68	Back with Charger	2.5 cm	Intenna	0.476
836.52	384 (Mid)	EVDO	24.52	24.68	Left with Charger	2.5 cm	Intenna	0.153
836.52	384 (Mid)	EVDO	24.52	24.51	Right with Charger	2.5 cm	Intenna	0.198
836.52	384 (Mid)	EVDO	24.52	24.69	Top with Charger	2.5 cm	Intenna	0.052
836.52	384 (Mid)	EVDO	24.52	24.61	Front without Charger	2.5 cm	Intenna	0.574
836.52	384 (Mid)	CDMA835	23.83	23.86	Front with Charger	2.5 cm	Intenna	0.566
<b>ANSI/ IEEE C95.1 2005 – Safety Limit</b>						<b>Body</b>		
<b>Spatial Peak</b>						<b>1.6 W/kg (mW/g)</b>		
<b>Uncontrolled Exposure/ General Population</b>						<small>Averaged over 1 gram</small>		

**NOTES:**

- 1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- 2 All modes of operation were investigated and the worst-case are reported.
- 3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- 4 Tissue parameters and temperatures are listed on the SAR plot.
- 5 Battery Type                     Standard                     Extended                     Slim  
Batteries are fully charged for all readings.
- 6 Test Signal Call Mode        Manual Test cord        Base Station Simulator
- 7 All side of the EUT were tested and the worst-case side is reported.
- 9 Test Configuration            With Holster                 Without Holster
- 10 1x CDMA Body SAR was tested under RC3/SO32.
- 11 EVDO Body SAR was tested under EVDO Rev.0 RTAP.
- 12 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).

## 10.2 Measurement Results (PCS1900 Body SAR)

Frequency		Modulation	Conducted Power (dBm)		Configuration	Separation Distance	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 880.00	600 (Mid)	EVDO	24.36	24.27	Front with Charger	2.5 cm	Intenna	0.518
1 880.00	600 (Mid)	EVDO	24.36	24.37	Back with Charger	2.5 cm	Intenna	0.311
1 880.00	600 (Mid)	EVDO	24.36	24.49	Left with Charger	2.5 cm	Intenna	0.056
1 880.00	600 (Mid)	EVDO	24.36	24.33	Right with Charger	2.5 cm	Intenna	0.149
1 880.00	600 (Mid)	EVDO	24.36	24.52	Top with Charger	2.5 cm	Intenna	0.227
1 880.00	600 (Mid)	EVDO	24.36	24.27	Front without Charger	2.5 cm	Intenna	0.459
1 880.00	600 (Mid)	PCS1900	23.72	23.72	Front with Charger	2.5 cm	Intenna	0.434
<b>ANSI/ IEEE C95.1 2005 – Safety Limit</b>						<b>Body</b>		
<b>Spatial Peak</b>						<b>1.6 W/kg (mW/g)</b>		
<b>Uncontrolled Exposure/ General Population</b>						<small>Averaged over 1 gram</small>		

**NOTES:**

- The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type  Standard  Extended  Slim  
Batteries are fully charged for all readings.
- Test Signal Call Mode  Manual Test cord  Base Station Simulator
- All side of the phone were tested and the worst-case side is reported.
- Test Configuration  With Holster  Without Holster
- 1x CDMA Body SAR was tested under RC3/SO32.
- EVDO Body SAR was tested under EVDO Rev.0 RTAP.
- 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. CONCLUSION

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The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the ANSI/IEEE C95.1 2005.

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

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## Attachment 1. – SAR Test Plots

Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Front with Charger

**DUT: MV140N; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.989$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(5.63, 5.63, 5.63); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 835/900 Phantom ; Type: SAM

**Body CDMA 384/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.635 mW/g

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

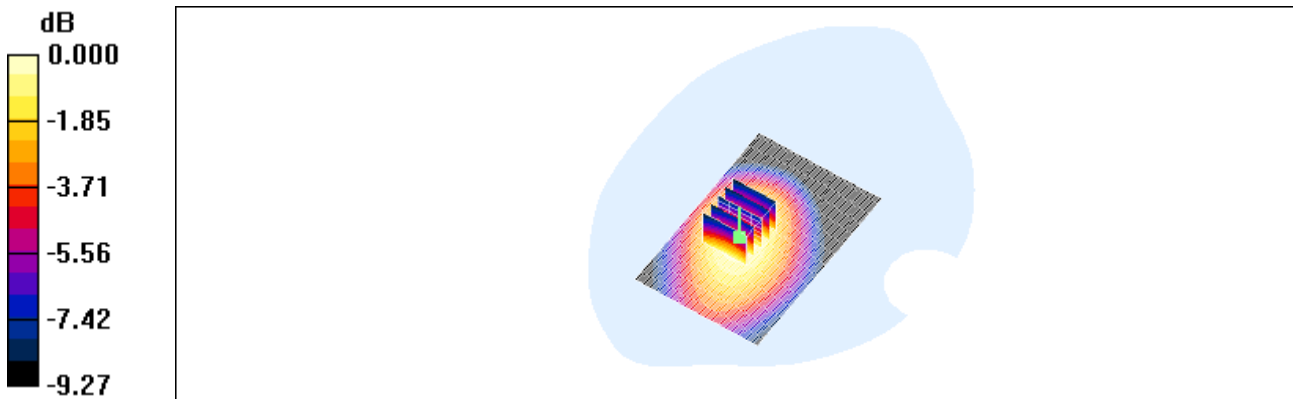
Reference Value = 16.3 V/m; Power Drift = 0.120 dB

Peak SAR (extrapolated) = 0.809 W/kg

**SAR(1 g) = 0.597 mW/g; SAR(10 g) = 0.429 mW/g**

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

Maximum value of SAR (measured) = 0.630 mW/g



0 dB = 0.630mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Back with Charger

**DUT: MV140N; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.989$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(5.63, 5.63, 5.63); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 835/900 Phantom ; Type: SAM

**Body CDMA 384/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.513 mW/g

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

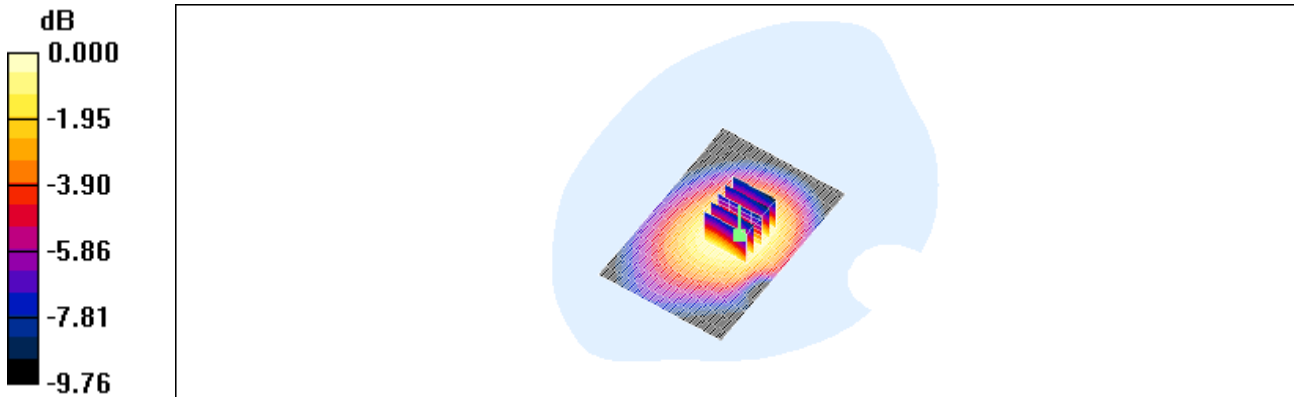
Reference Value = 17.8 V/m; Power Drift = 0.157 dB

Peak SAR (extrapolated) = 0.635 W/kg

**SAR(1 g) = 0.476 mW/g; SAR(10 g) = 0.341 mW/g**

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

Maximum value of SAR (measured) = 0.505 mW/g



0 dB = 0.505mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Left with Charger

**DUT: MV140N; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.989$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(5.63, 5.63, 5.63); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 835/900 Phantom ; Type: SAM

**Body CDMA 384/Area Scan (81x61x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.157 mW/g

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

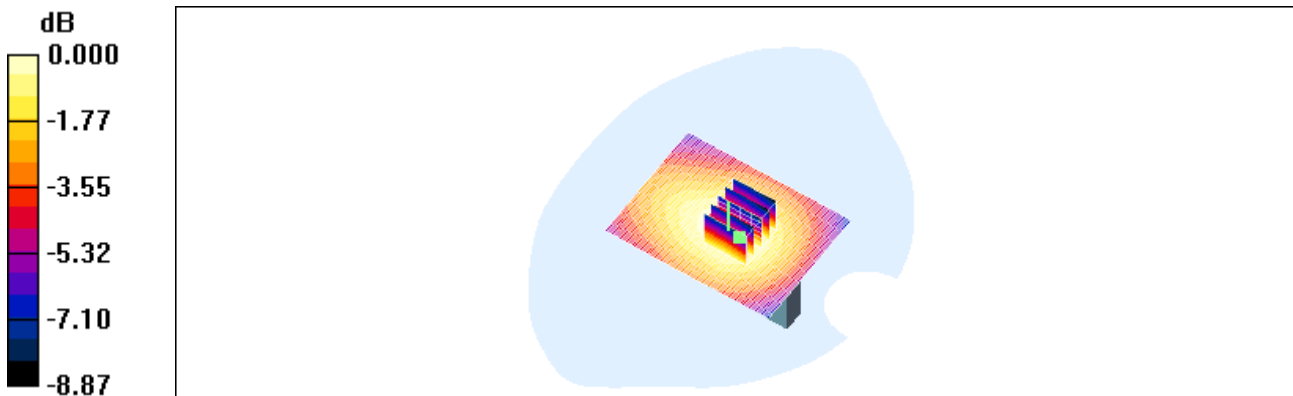
Reference Value = 12.5 V/m; Power Drift = 0.163 dB

Peak SAR (extrapolated) = 0.199 W/kg

**SAR(1 g) = 0.153 mW/g; SAR(10 g) = 0.113 mW/g**

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

Maximum value of SAR (measured) = 0.161 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Right with Charger

**DUT: MV140N; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.989$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(5.63, 5.63, 5.63); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 835/900 Phantom ; Type: SAM

**Body CDMA 384/Area Scan (81x61x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.216 mW/g

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

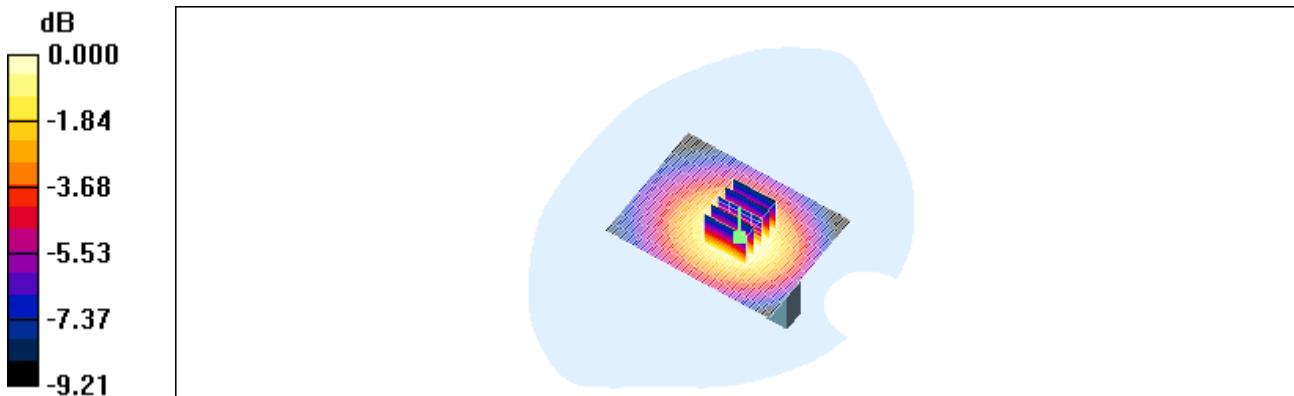
Reference Value = 14.3 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 0.266 W/kg

**SAR(1 g) = 0.198 mW/g; SAR(10 g) = 0.141 mW/g**

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

Maximum value of SAR (measured) = 0.211 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Top with Charger

**DUT: MV140N; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.989$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(5.63, 5.63, 5.63); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 835/900 Phantom ; Type: SAM

**Body CDMA 384/Area Scan (71x61x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.055 mW/g

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

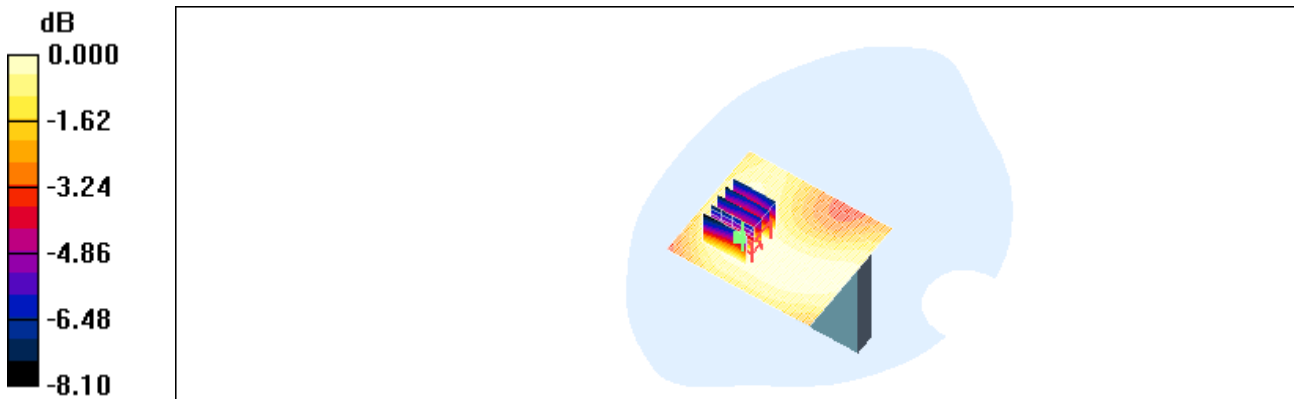
Reference Value = 5.50 V/m; Power Drift = 0.166 dB

Peak SAR (extrapolated) = 0.066 W/kg

**SAR(1 g) = 0.052 mW/g; SAR(10 g) = 0.040 mW/g**

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

Maximum value of SAR (measured) = 0.055 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Front without Charger

**DUT: MV140N; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.989$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(5.63, 5.63, 5.63); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 835/900 Phantom ; Type: SAM

**Body CDMA 384/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.600 mW/g

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

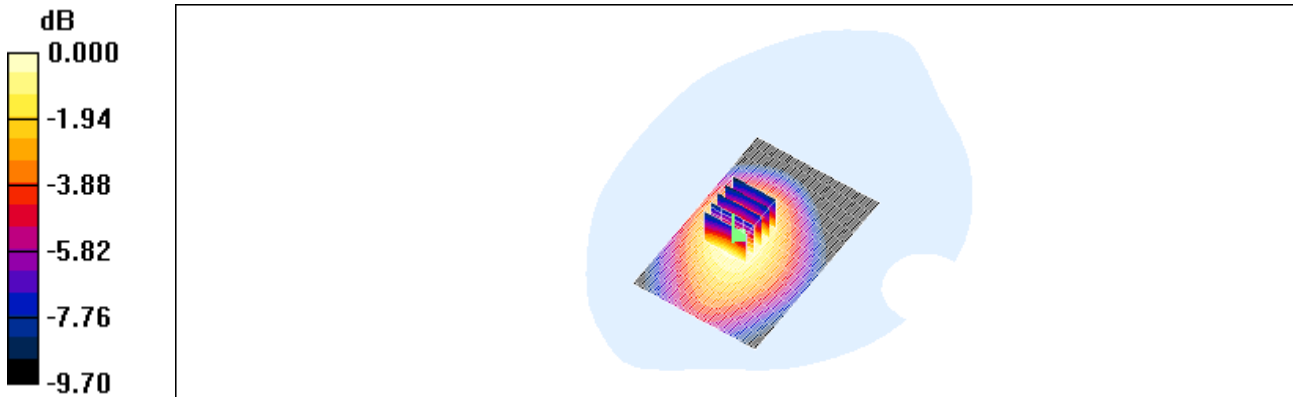
Reference Value = 16.4 V/m; Power Drift = 0.094 dB

Peak SAR (extrapolated) = 0.772 W/kg

**SAR(1 g) = 0.574 mW/g; SAR(10 g) = 0.413 mW/g**

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

Maximum value of SAR (measured) = 0.606 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: CDMA/ Front with Charger

**DUT: MV140N; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.989$  mho/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(5.63, 5.63, 5.63); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 835/900 Phantom ; Type: SAM

**Body CDMA 384/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.605 mW/g

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

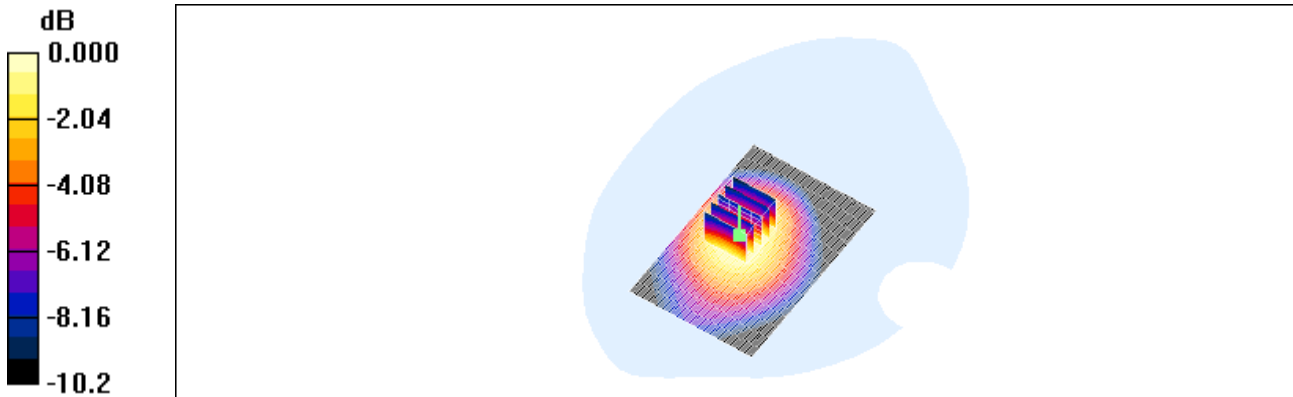
Reference Value = 17.7 V/m; Power Drift = 0.026 dB

Peak SAR (extrapolated) = 0.766 W/kg

**SAR(1 g) = 0.566 mW/g; SAR(10 g) = 0.397 mW/g**

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

Maximum value of SAR (measured) = 0.602 mW/g



0 dB = 0.602mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Front with Charger

**DUT: MV140N; Serial: #1**

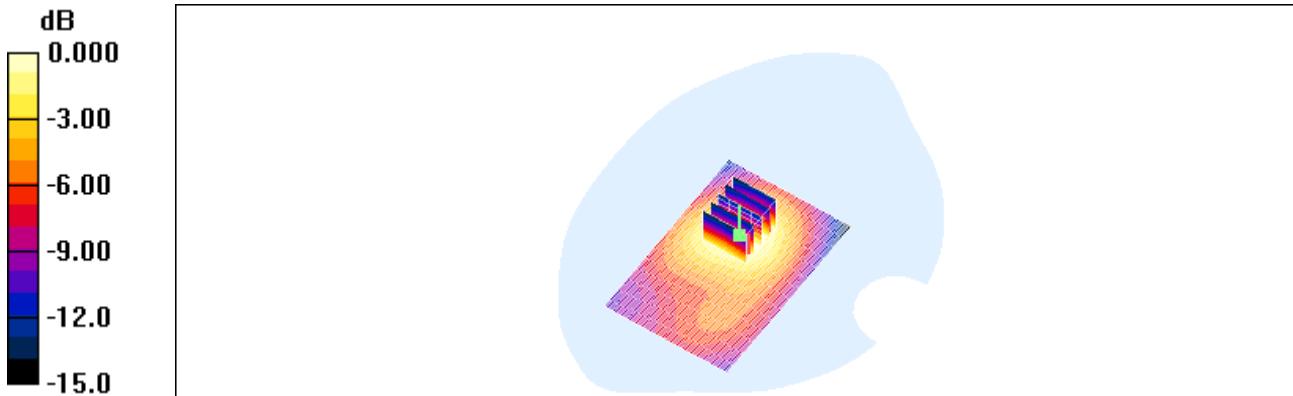
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(4.68, 4.68, 4.68); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 1800/1900 Phantom; Type: SAM

**Body PCS 600/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.552 mW/g

**Body PCS 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 18.0 V/m; Power Drift = -0.094 dB  
Peak SAR (extrapolated) = 0.841 W/kg  
**SAR(1 g) = 0.518 mW/g; SAR(10 g) = 0.318 mW/g**  
Maximum value of SAR (measured) = 0.552 mW/g



Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Back with Charger

**DUT: MV140N; Serial: #1**

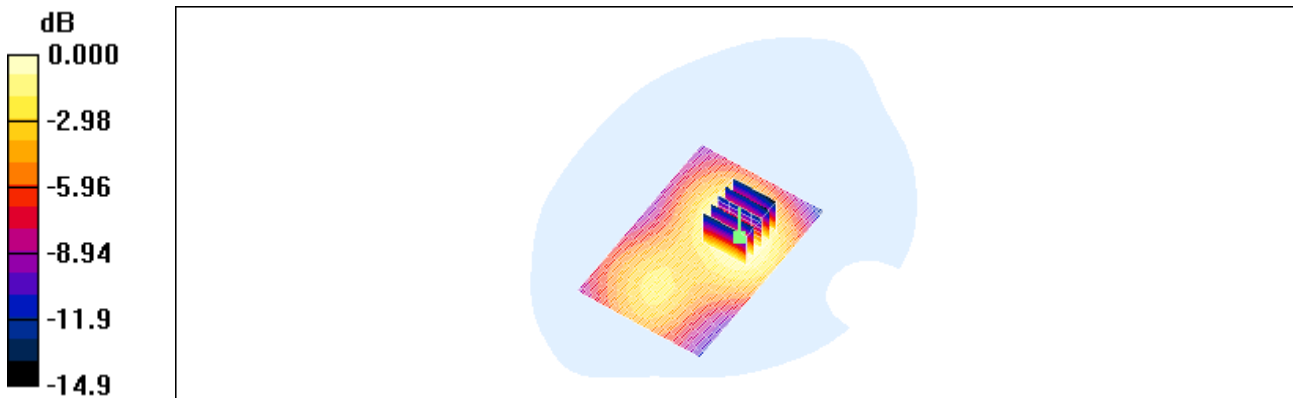
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(4.68, 4.68, 4.68); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 1800/1900 Phantom; Type: SAM

**Body PCS 600/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.325 mW/g

**Body PCS 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 14.1 V/m; Power Drift = 0.014 dB  
Peak SAR (extrapolated) = 0.506 W/kg  
**SAR(1 g) = 0.311 mW/g; SAR(10 g) = 0.193 mW/g**  
Maximum value of SAR (measured) = 0.333 mW/g



0 dB = 0.333mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Left with Charger

**DUT: MV140N; Serial: #1**

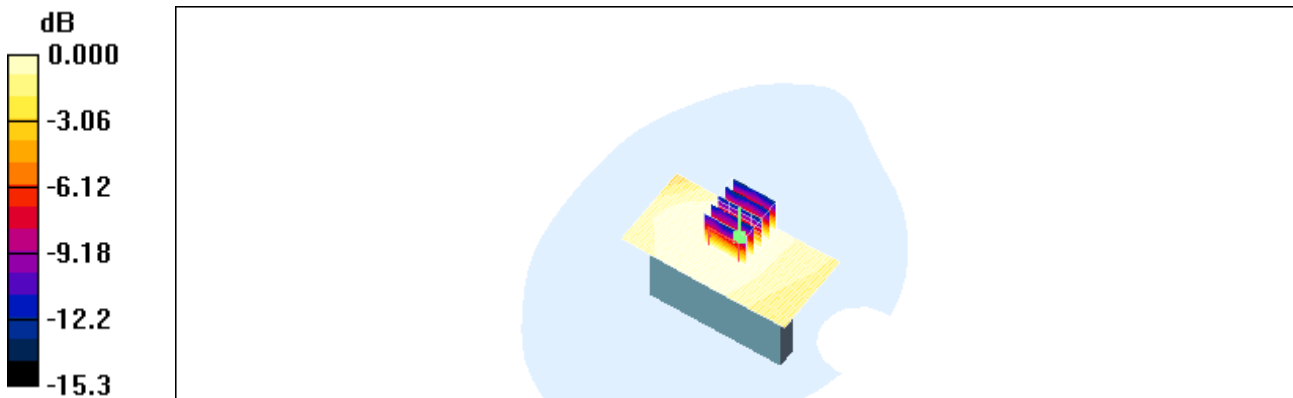
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(4.68, 4.68, 4.68); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 1800/1900 Phantom; Type: SAM

**Body PCS 600/Area Scan (81x41x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.058 mW/g

**Body PCS 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 5.96 V/m; Power Drift = 0.129 dB  
Peak SAR (extrapolated) = 0.089 W/kg  
**SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.036 mW/g**  
Maximum value of SAR (measured) = 0.059 mW/g



0 dB = 0.059mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Right with Charger

**DUT: MV140N; Serial: #1**

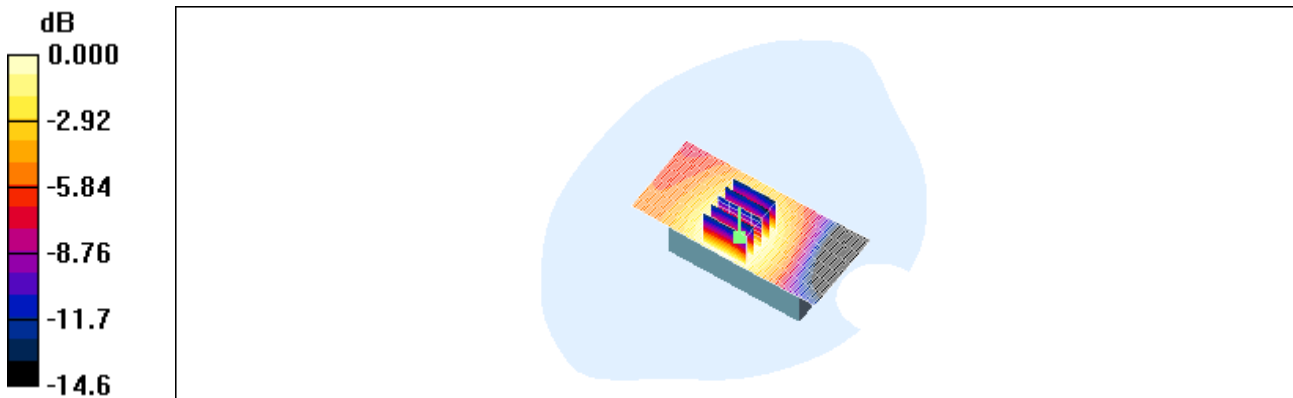
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3161; ConvF(4.68, 4.68, 4.68); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 1800/1900 Phantom; Type: SAM

**Body PCS 600/Area Scan (91x41x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.162 mW/g

**Body PCS 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 9.93 V/m; Power Drift = -0.028 dB  
Peak SAR (extrapolated) = 0.235 W/kg  
**SAR(1 g) = 0.149 mW/g; SAR(10 g) = 0.094 mW/g**  
Maximum value of SAR (measured) = 0.160 mW/g



0 dB = 0.160mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Top with Charger

**DUT: MV140N; Serial: #1**

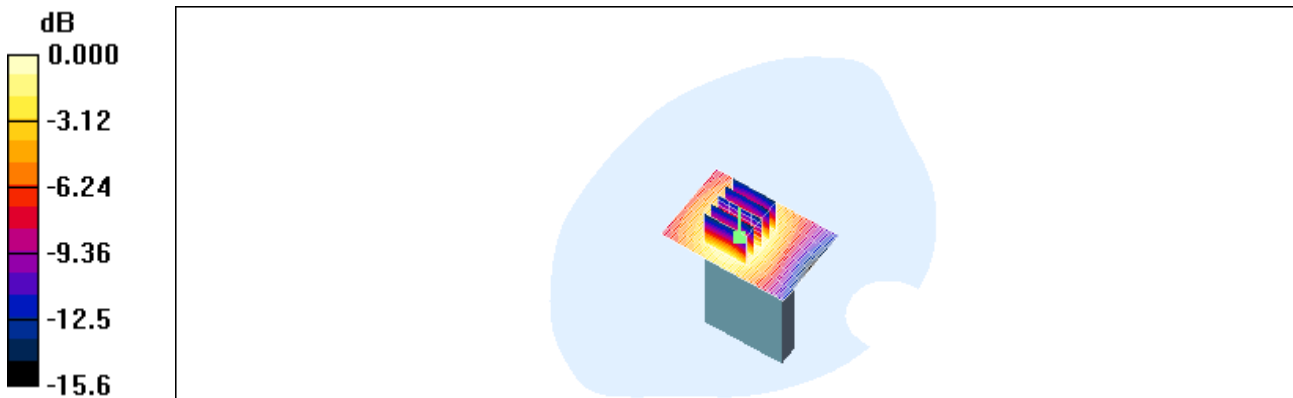
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(4.68, 4.68, 4.68); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 1800/1900 Phantom; Type: SAM

**Body PCS 600/Area Scan (61x41x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.248 mW/g

**Body PCS 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 12.3 V/m; Power Drift = 0.162 dB  
Peak SAR (extrapolated) = 0.373 W/kg  
**SAR(1 g) = 0.227 mW/g; SAR(10 g) = 0.138 mW/g**  
Maximum value of SAR (measured) = 0.246 mW/g



0 dB = 0.246mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Front without charger

**DUT: MV140N; Serial: #1**

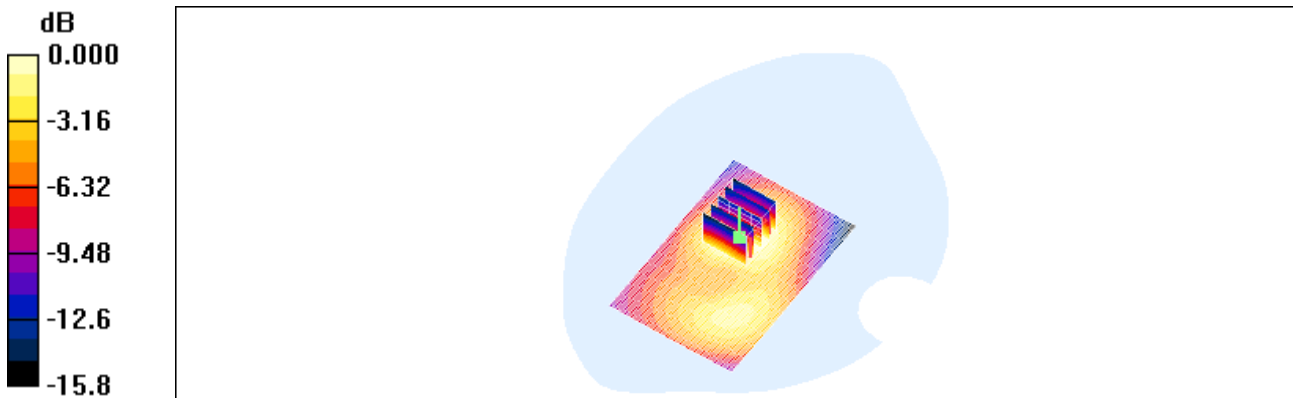
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(4.68, 4.68, 4.68); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 1800/1900 Phantom; Type: SAM

**Body PCS 600/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.507 mW/g

**Body PCS 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 16.8 V/m; Power Drift = -0.087 dB  
Peak SAR (extrapolated) = 0.757 W/kg  
**SAR(1 g) = 0.459 mW/g; SAR(10 g) = 0.278 mW/g**  
Maximum value of SAR (measured) = 0.489 mW/g



0 dB = 0.489mW/g

Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Front with Charger

**DUT: MV140N; Serial: #1**

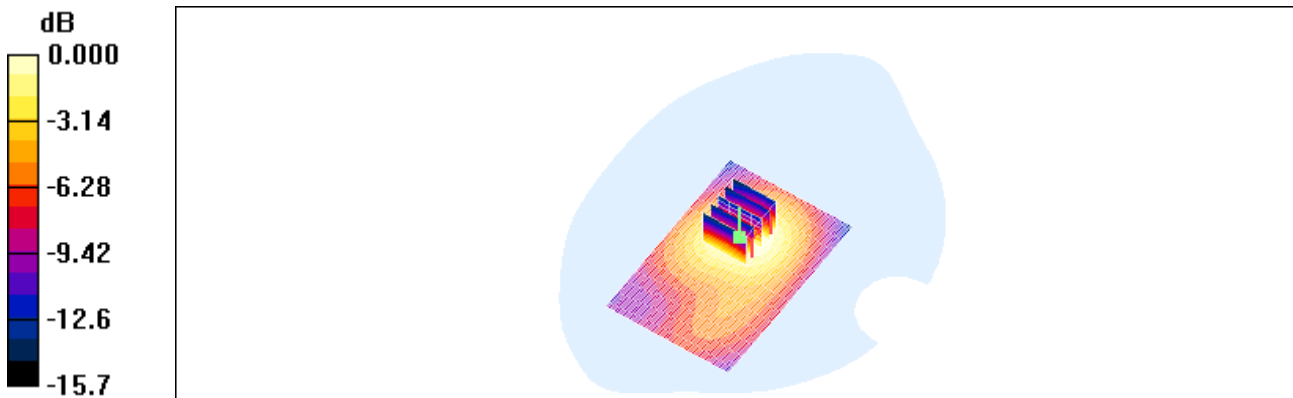
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(4.68, 4.68, 4.68); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 1800/1900 Phantom; Type: SAM

**Body PCS 600/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.478 mW/g

**Body PCS 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 17.1 V/m; Power Drift = 0.003 dB  
Peak SAR (extrapolated) = 0.709 W/kg  
**SAR(1 g) = 0.434 mW/g; SAR(10 g) = 0.266 mW/g**  
Maximum value of SAR (measured) = 0.461 mW/g



0 dB = 0.461mW/g

Test Laboratory: HCT CO., LTD  
 EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
 Liquid Temperature: 21.2 °C  
 Ambient Temperature: 21.4 °C  
 Test Date: Nov. 01, 2008  
 Configuration: Front with Charger

**DUT: MV140N; Serial: #1**

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 836.52 \text{ MHz}$ ;  $\sigma = 0.989 \text{ mho/m}$ ;  $\epsilon_r = 55.1$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

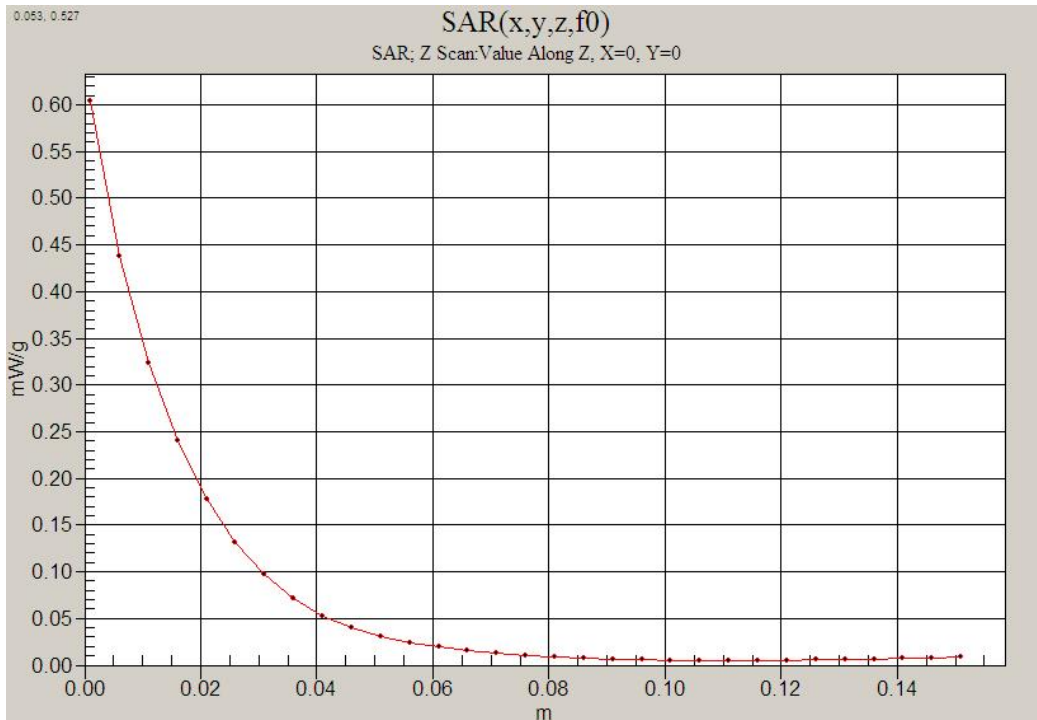
DASY4 Configuration:  
 - Probe: ES3DV3 - SN3161; ConvF(5.63, 5.63, 5.63); Calibrated: 2008-04-07  
 - Sensor-Surface: 4mm (Mechanical Surface Detection)  
 - Electronics: DAE4 Sn869; Calibrated: 2008-09-03  
 - Phantom: 835/900 Phantom ; Type: SAM

**Body CDMA 384/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)  
 Maximum value of SAR (interpolated) = 0.635 mW/g

**Body CDMA 384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 16.3 V/m; Power Drift = 0.120 dB  
 Peak SAR (extrapolated) = 0.809 W/kg  
**SAR(1 g) = 0.597 mW/g; SAR(10 g) = 0.429 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)  
 Maximum value of SAR (measured) = 0.630 mW/g





Test Laboratory: HCT CO., LTD  
EUT Type: CDMA/PCS CDMA 1xEVDO Wireless Broadband USB Modem  
Liquid Temperature: 21.2 °C  
Ambient Temperature: 21.4 °C  
Test Date: Nov. 01, 2008  
Configuration: Front with Charger

**DUT: MV140N; Serial: #1**

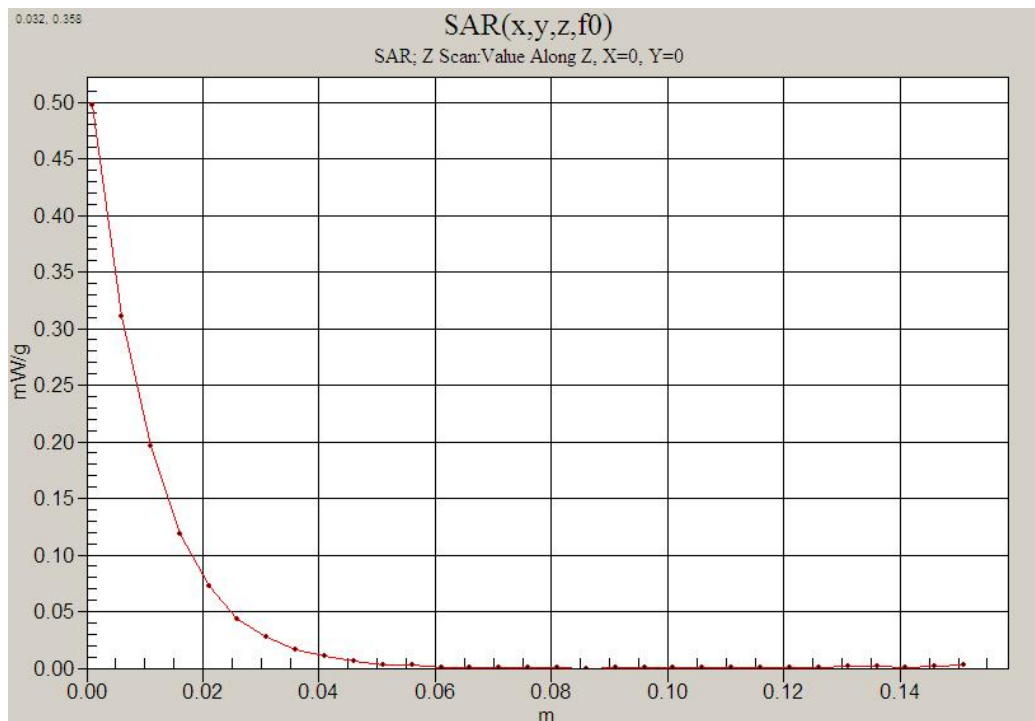
Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

## DASY4 Configuration:

- Probe: ES3DV3 - SN3161; ConvF(4.68, 4.68, 4.68); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 1800/1900 Phantom; Type: SAM

**Body PCS 600/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.552 mW/g

**Body PCS 600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 18.0 V/m; Power Drift = -0.094 dB  
Peak SAR (extrapolated) = 0.841 W/kg  
**SAR(1 g) = 0.518 mW/g; SAR(10 g) = 0.318 mW/g**  
Maximum value of SAR (measured) = 0.552 mW/g



## Attachment 2. – Dipole Validation Plots

## ■ Validation Data (835 MHz Head)

Test Laboratory: HCT CO., LTD  
Input Power 100 W (20 dBm)  
Liquid Temp: 21.2 °C  
Test Date: Nov. 01, 2008

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

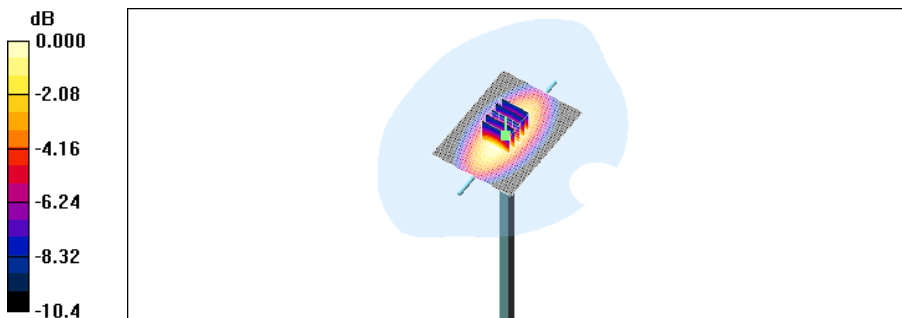
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.878$  mho/m;  $\epsilon_r = 41.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 176

DASY4 Configuration:

- Probe: ES3DV3 – SN3161; ConvF(6.07, 6.07, 6.07); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 835/900 Phantom ; Type: SAM

**Validation 835 MHz/Area Scan (61x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.01 mW/g

**Validation 835 MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 34.1 V/m; Power Drift = -0.007 dB  
Peak SAR (extrapolated) = 1.35 W/kg  
**SAR(1 g) = 0.922 mW/g; SAR(10 g) = 0.607 mW/g**  
Maximum value of SAR (measured) = 0.996 mW/g



0 dB = 0.996mW/g

## ■ Validation Data (1900 MHz Head)

Test Laboratory: HCT CO., LTD  
Input Power 100 W (20 dBm)  
Liquid Temp: 21.2 °C  
Test Date: Nov. 01, 2008

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

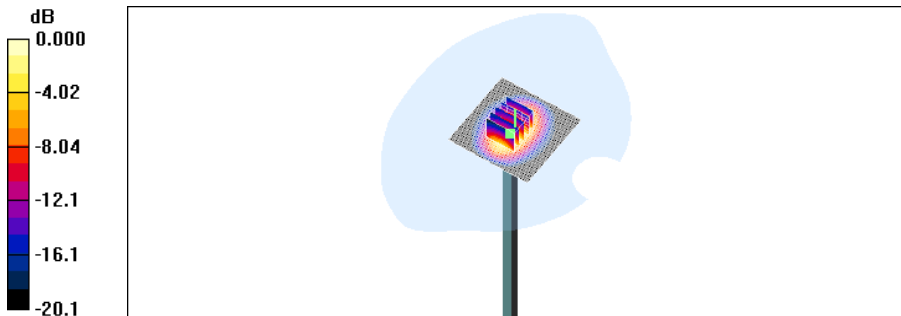
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.39$  mho/m;  $\epsilon_r = 40.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section ; Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8  
Build 176

DASY4 Configuration:

- Probe: ES3DV3 – SN3161; ConvF(5.04, 5.04, 5.04); Calibrated: 2008-04-07
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2008-09-03
- Phantom: 1800/1900 Phantom; Type: SAM

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

**Validation 1900MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 53.9 V/m; Power Drift = 0.000 dB  
Peak SAR (extrapolated) = 7.44 W/kg  
**SAR(1 g) = 3.8 mW/g; SAR(10 g) = 1.93 mW/g**  
Maximum value of SAR (measured) = 4.17 mW/g



0 dB = 4.17mW/g

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

Title MV140N  
SubTitle CDMA835(Head)  
Test Date Nov. 01, 2008

Frequency	e'	e''
800000000	41.6388	18.9241
805000000	41.5965	18.9094
810000000	41.4618	18.8878
815000000	41.3470	18.8934
820000000	41.3089	18.8626
825000000	41.1911	18.8857
830000000	41.1673	18.8620
835000000	41.0577	18.9043
840000000	40.9692	18.9041
845000000	40.9328	18.9001
850000000	40.9178	18.8592
855000000	40.8459	18.9065
860000000	40.7950	18.8608
865000000	40.7193	18.8328
870000000	40.6747	18.8573
875000000	40.6443	18.8221
880000000	40.5773	18.7977
885000000	40.5845	18.7673
890000000	40.5041	18.7774
895000000	40.4344	18.7350
900000000	40.3815	18.7474

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

Title MV140N  
SubTitle CDMA835(Body)  
Test Date Nov. 01, 2008

Frequency	e'	e''
800000000	55.4980	21.3682
805000000	55.4397	21.3526
810000000	55.3758	21.3336
815000000	55.3268	21.3208
820000000	55.2494	21.2737
825000000	55.1583	21.2770
830000000	55.1268	21.2418
835000000	55.1082	21.2685
840000000	55.0270	21.2135
845000000	54.9652	21.2069
850000000	54.9355	21.1665
855000000	54.8305	21.1550
860000000	54.8462	21.1574
865000000	54.7094	21.1265
870000000	54.6652	21.1359
875000000	54.6697	21.0889
880000000	54.6282	21.0866
885000000	54.5548	21.0544
890000000	54.5015	21.0571
895000000	54.4230	21.0067
900000000	54.3999	20.9874

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

Title MV140N  
SubTitle PCS1900(Head)  
Test Date Nov. 01, 2008

Frequency	e'	e''
1850000000	40.4312	12.9573
1855000000	40.4062	12.9786
1860000000	40.4113	13.0227
1865000000	40.4054	13.0165
1870000000	40.3592	13.0453
1875000000	40.3604	13.0586
1880000000	40.3228	13.0670
1885000000	40.3091	13.0840
1890000000	40.2892	13.1050
1895000000	40.2709	13.1459
1900000000	40.2310	13.1352
1905000000	40.2003	13.1334
1910000000	40.1834	13.1795
1915000000	40.1406	13.2037
1920000000	40.1135	13.2059
1925000000	40.0858	13.2293
1930000000	40.0825	13.2217
1935000000	40.0354	13.2373
1940000000	39.9818	13.2870
1945000000	39.9531	13.2847
1950000000	39.9446	13.3252

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

Title MV140N  
SubTitle PCS1900(Body)  
Test Date Nov. 01, 2008

Frequency	e'	e''
1850000000	54.0481	14.5988
1855000000	54.0312	14.6237
1860000000	54.0973	14.6615
1865000000	54.0795	14.6762
1870000000	54.0530	14.6728
1875000000	54.0588	14.6917
1880000000	54.0696	14.6835
1885000000	54.0309	14.6697
1890000000	54.0055	14.6657
1895000000	53.9683	14.6842
1900000000	53.9410	14.7008
1905000000	53.8993	14.7017
1910000000	53.8771	14.6991
1915000000	53.8563	14.7250
1920000000	53.7996	14.7555
1925000000	53.7759	14.7732
1930000000	53.7616	14.8119
1935000000	53.7366	14.8311
1940000000	53.7534	14.8624
1945000000	53.7362	14.9078
1950000000	53.7480	14.9288



## Attachment 3. – Probe Calibration Data

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **H-CT (Dymstec)**

Certificate No: **ES3-3161\_Apr08**

**CALIBRATION CERTIFICATE**

Object **ES3DV3 - SN:3161**

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

Calibration date: **April 7, 2008**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 654	20-Apr-07 (No. DAE4-654_Apr07)	Apr-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: April 7, 2008

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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
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

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

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

**Methods Applied and Interpretation of Parameters:**

- NORM<sub>x,y,z</sub>:** Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<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 (no uncertainty required). DCP does not depend on frequency nor media.
- 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.

ES3DV3 SN:3161

April 7, 2008

# Probe ES3DV3

## SN:3161

Manufactured: October 8, 2007  
Calibrated: April 7, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ES3DV3 SN:3161

April 7, 2008

**DASY - Parameters of Probe: ES3DV3 SN:3161**

Sensitivity in Free Space<sup>A</sup>

Diode Compression<sup>B</sup>

NormX	1.09 ± 10.1%	μV/(V/m) <sup>2</sup>	DCP X	90 mV
NormY	1.26 ± 10.1%	μV/(V/m) <sup>2</sup>	DCP Y	92 mV
NormZ	0.94 ± 10.1%	μV/(V/m) <sup>2</sup>	DCP Z	94 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL                      900 MHz      Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	9.7	5.5
SAR <sub>be</sub> [%]	With Correction Algorithm	0.8	0.5

TSL                      1810 MHz      Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	10.8	6.5
SAR <sub>be</sub> [%]	With Correction Algorithm	0.9	0.8

Sensor Offset

Probe Tip to Sensor Center                      2.0 mm

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 Page 8).

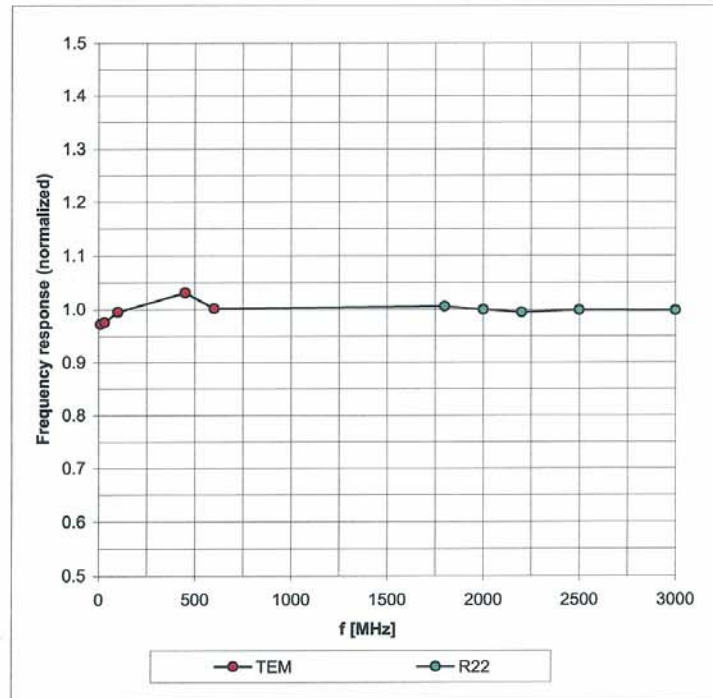
<sup>B</sup> Numerical linearization parameter: uncertainty not required.

ES3DV3 SN:3161

April 7, 2008

### Frequency Response of E-Field

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

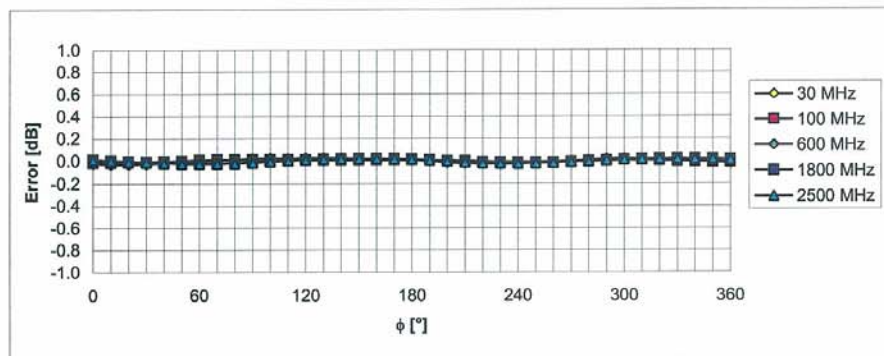
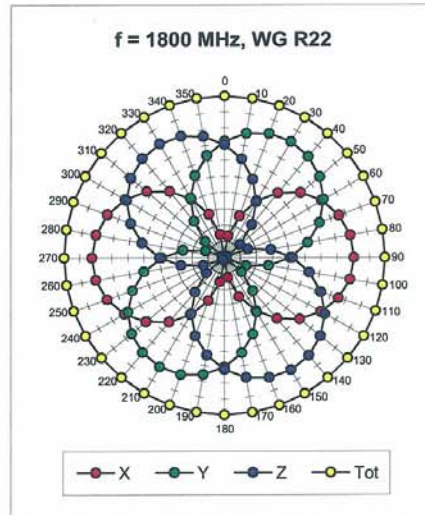
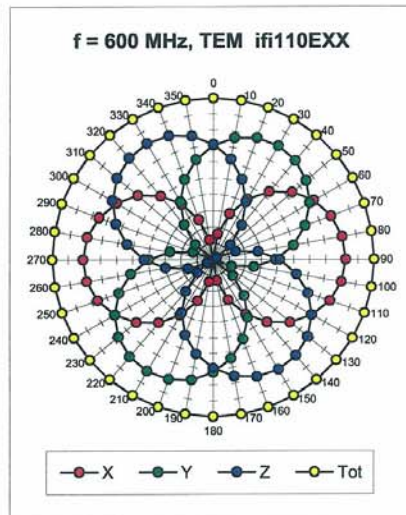


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

ES3DV3 SN:3161

April 7, 2008

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

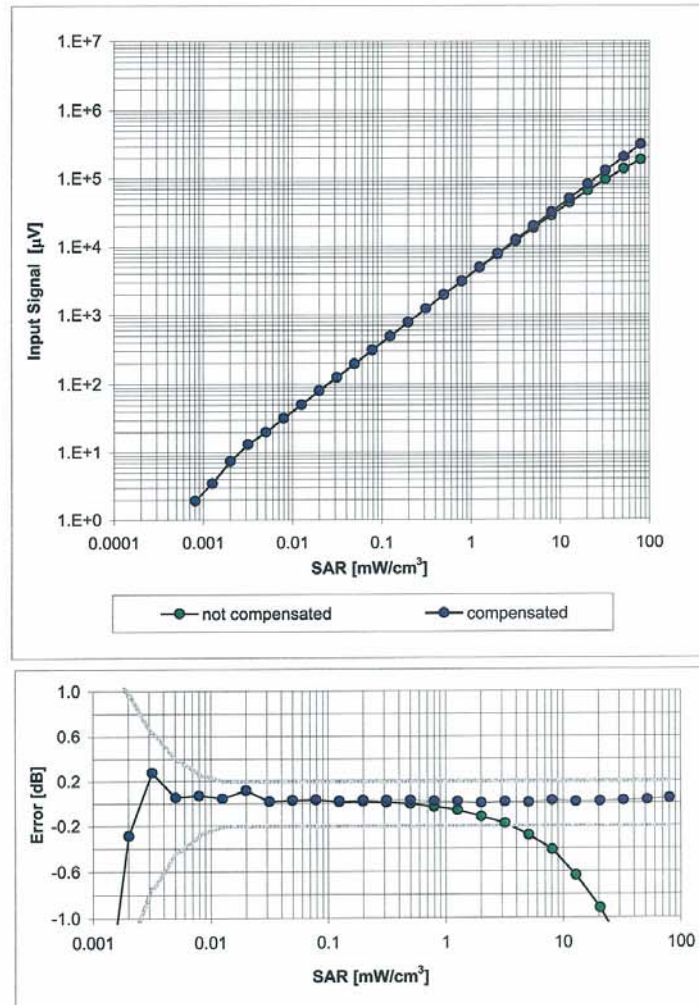


**Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)**

ES3DV3 SN:3161

April 7, 2008

**Dynamic Range f(SAR<sub>head</sub>)**  
(Waveguide R22, f = 1800 MHz)



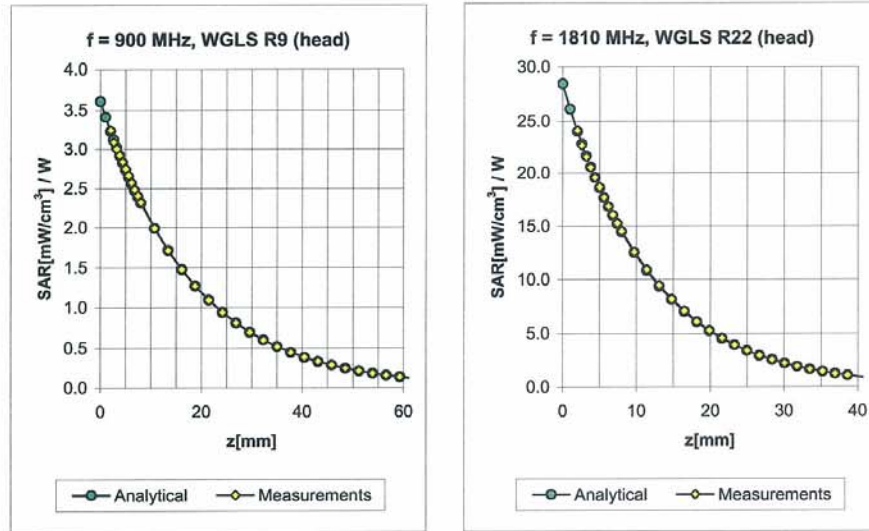
Uncertainty of Linearity Assessment: ± 0.6% (k=2)



ES3DV3 SN:3161

April 7, 2008

### Conversion Factor Assessment



f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	1.00	1.12	6.07 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.86	1.19	5.04 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.76	1.26	4.77 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.70	1.32	4.47 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	1.00	1.17	5.63 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.81	1.22	5.07 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.74	1.31	4.68 ± 11.0% (k=2)
2300	± 50 / ± 100	Body	52.8 ± 5%	1.85 ± 5%	0.56	1.65	4.32 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.60	1.52	4.15 ± 11.0% (k=2)
2600	± 50 / ± 100	Body	52.5 ± 5%	2.16 ± 5%	0.61	1.50	3.97 ± 11.0% (k=2)

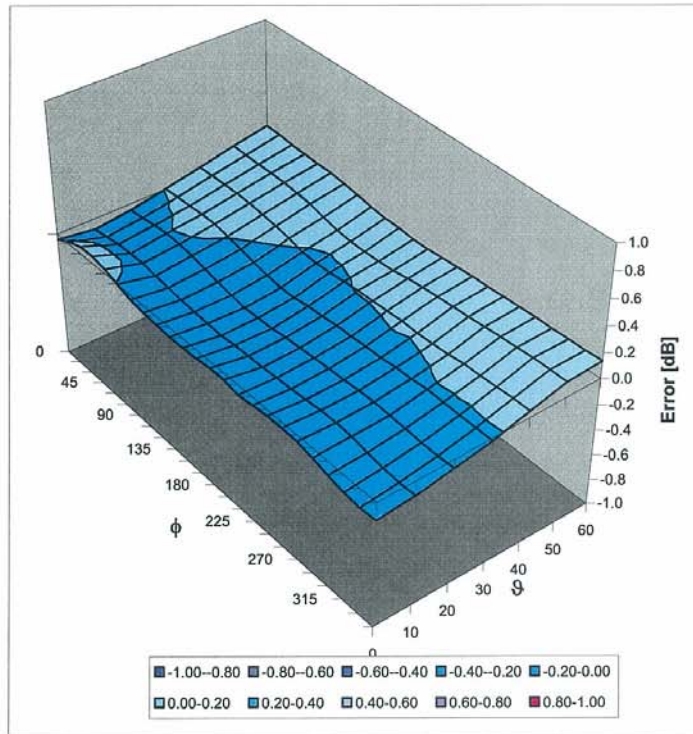
<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ES3DV3 SN:3161

April 7, 2008

### Deviation from Isotropy in HSL

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



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

## Attachment 4. – Dipole Calibration Data

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Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **D835V2-441\_May08**

**CALIBRATION CERTIFICATE**

Object: **D835V2 - SN: 441**

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

Calibration date: **May 19, 2008**

Condition of the calibrated item: **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Type-N mismatch combination	SN: 5047.2 / 06327	08-Aug-07 (No. 217-00721)	Aug-08
Reference Probe ES3DV2	SN: 3025	28-Apr-08 (No. ES3-3025_Apr08)	Apr-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41082317	18-Oct-02 (SPEAG, in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	04-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

Calibrated by: **Claudio Leubler** (Name), **Laboratory Technician** (Function), *[Signature]* (Signature)

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

Issued: May 20, 2008

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Accreditation No.: **SCS 108**

**Glossary:**

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

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

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

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

**Measurement Conditions**

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

<b>DASY Version</b>	DASY4	V4.7
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V4.9	
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	835 MHz $\pm$ 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	41.5	0.90 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	41.1 $\pm$ 6 %	0.91 mho/m $\pm$ 6 %
<b>Head TSL temperature during test</b>	(21.5 $\pm$ 0.2) °C	---	----

**SAR result with Head TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	2.32 mW / g
SAR normalized	normalized to 1W	9.28 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>9.17 mW / g <math>\pm</math> 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	1.53 mW / g
SAR normalized	normalized to 1W	6.12 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>6.07 mW / g <math>\pm</math> 16.5 % (k=2)</b>

<sup>1</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.4 $\Omega$ - 7.6 $j\Omega$
Return Loss	-22.4 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.377 ns
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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

**DASY4 Validation Report for Head TSL**

Date/Time: 19.05.2008 12:17:50

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: HSL 900 MHz;

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.909$  mho/m;  $\epsilon_r = 41.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

**DASY4 Configuration:**

- Probe: ES3DV2 - SN3025; ConvF(5.97, 5.97, 5.97); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

**Pin=250mW; dip=15mm; dist=3.4mm/Zoom Scan (7x7x7)/Cube 0:**

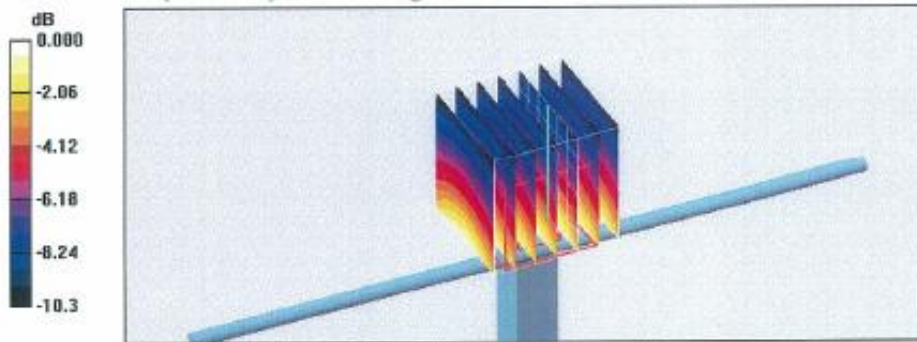
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.1 V/m; Power Drift = -0.008 dB

Peak SAR (extrapolated) = 3.38 W/kg

**SAR(1 g) = 2.32 mW/g; SAR(10 g) = 1.53 mW/g**

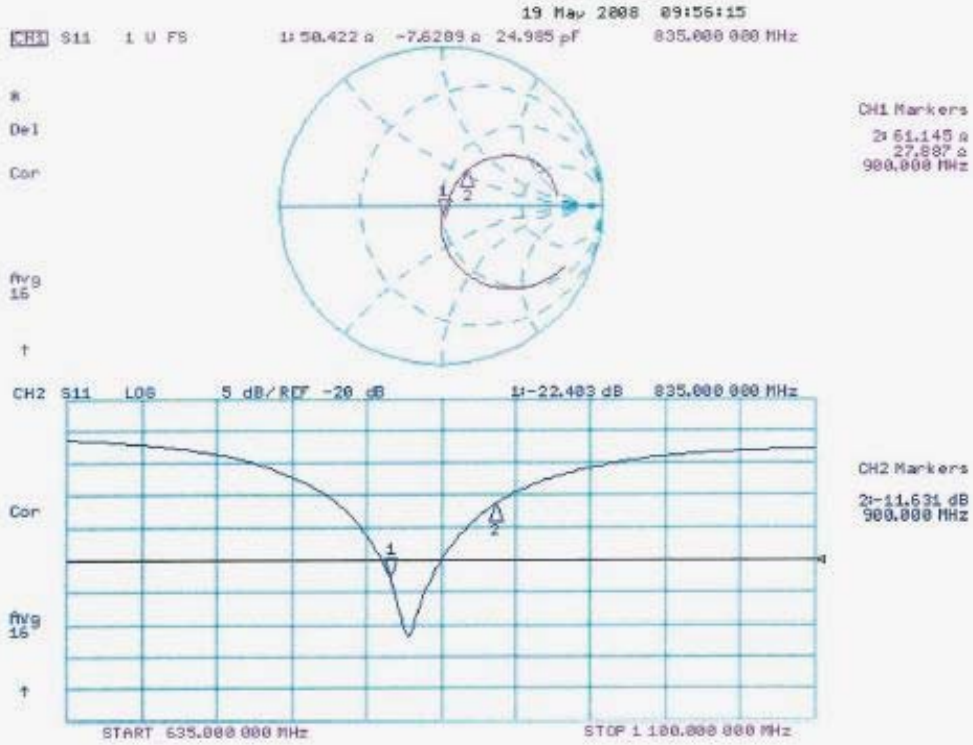
Maximum value of SAR (measured) = 2.62 mW/g



0 dB = 2.62mW/g



### Impedance Measurement Plot for Head TSL



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



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**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 **H-CT (Dymstec)**

Certificate No: **D1900V2-5d032-Jul08**

**CALIBRATION CERTIFICATE**

Object **D1900V2 - SN: 5d032**

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

Calibration date: **July 22, 2008**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	01-Jul-08 (No. 217-00864)	Jul-09
Type-N mismatch combination	SN: 5047.2 / 06327	01-Jul-08 (No. 217-00867)	Jul-09
Reference Probe ES3DV2	SN: 3025	28-Apr-08 (No. ES3-3025_Apr08)	Apr-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

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

Issued: July 22, 2008

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

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



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
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Accreditation No.: **SCS 108**

**Glossary:**

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

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

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- 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.

<b>DASY Version</b>	DASY4	V4.7
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V5.0	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1900 MHz $\pm$ 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	40.0	1.40 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	38.8 $\pm$ 6 %	1.47 mho/m $\pm$ 6 %
<b>Head TSL temperature during test</b>	(22.0 $\pm$ 0.2) °C	---	---

**SAR result with Head TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	9.82 mW / g
SAR normalized	normalized to 1W	39.3 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>37.7 mW / g <math>\pm</math> 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	5.05 mW / g
SAR normalized	normalized to 1W	20.2 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>19.7 mW / g <math>\pm</math> 16.5 % (k=2)</b>

<sup>1</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

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

Impedance, transformed to feed point	53.5 $\Omega$ + 4.9 j $\Omega$
Return Loss	- 24.8 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.185 ns
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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

**DASY4 Validation Report for Head TSL**

Date/Time: 22.07.2008 10:06:43

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: HSL U10 BB;

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.47$  mho/m;  $\epsilon_r = 38.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

**DASY4 Configuration:**

- Probe: ES3DV2 - SN3025; ConvF(4.9, 4.9, 4.9); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

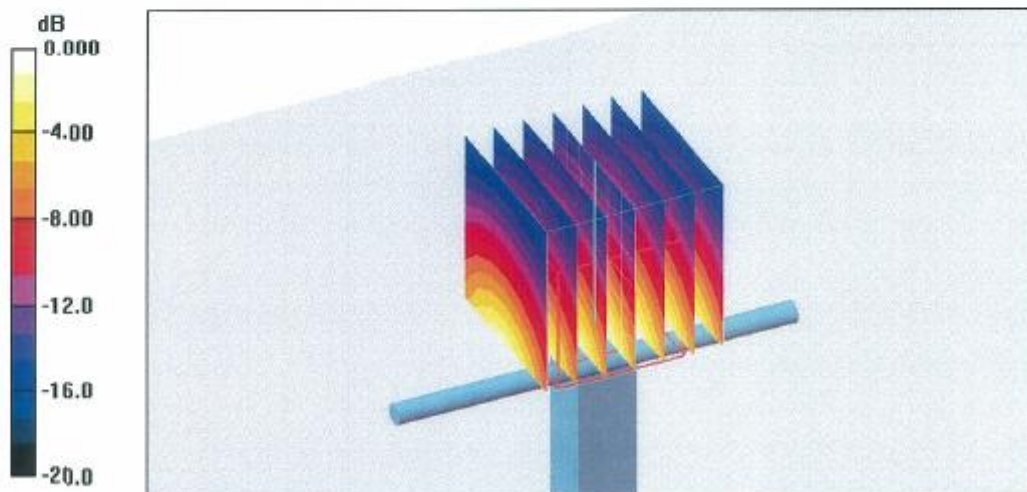
**Pin = 250 mW; dip = 10 mm, scan at 3.4mm/Zoom Scan (dist=3.4mm, probe 0deg)****(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm**

Reference Value = 92.2 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 18.2 W/kg

**SAR(1 g) = 9.82 mW/g; SAR(10 g) = 5.05 mW/g**

Maximum value of SAR (measured) = 11.9 mW/g



0 dB = 11.9mW/g

**Impedance Measurement Plot for Head TSL**

