



# A Test Lab Techno Corp.

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## SAR EVALUATION REPORT

<b>Test Report No.</b>	<b>:</b>	<b>0809FS12</b>
<b>Applicant</b>	<b>:</b>	<b>Acer Incorporated</b>
<b>FCC ID</b>	<b>:</b>	<b>HLZZG53GQ</b>
<b>Trade Name</b>	<b>:</b>	<b>acer</b>
<b>Model Number</b>	<b>:</b>	<b>ZG5, Aspire One</b>
<b>Product Type</b>	<b>:</b>	<b>Notebook PC</b>
<b>Dates of Test</b>	<b>:</b>	<b>Sep. 05 ~ Sep. 08, 2008</b>
<b>Test Environment</b>	<b>:</b>	<b>Ambient Temperature : 22 ± 2 ° C</b> <b>Relative Humidity : 40 - 70 %</b>
<b>Test Specification</b>	<b>:</b>	<b>Standard C95.1-1999</b> <b>2.1093;FCC/OET Bulletin 65 Supplement C [July 2001]</b> <b>IEEE Std. 1528-2003</b>
<b>Max. SAR</b>	<b>:</b>	<b>0.123 W/kg Body SAR</b>
<b>Test Lab</b>	<b>:</b>	<b>Chang-an Lab</b>



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## 1. Description of Equipment Under Test (EUT)

**Applicant :**

**Acer Incorporated**

**8F, 88, Sec.1, Hsin Tai Wu Rd. Hsichih, Taipei Hsien 221 Taiwan, R.O.C.**

**Manufacturer :** Quanta Computer Inc.  
**Manufacturer Address :** No.211, Wen Hwa 2nd Rd., Kuei Shan Hsiang, Tao Yuan Shien, Taiwan, R.O.C.  
**Product Type :** Notebook PC  
**Trade Name :** acer  
**Model Number :** ZG5, Aspire One  
**FCC ID :** HLZZG53GQ  
**Test Device :** Production Unit  
**Tx Frequency :** 824.2 - 848.8 MHz (GPRS/EGPRS 850)  
1850.2 - 1909.8 MHz (GPRS/EGPRS 1900)  
826.6 - 846.4 MHz (WCDMA/HSDPA Band V)  
1852.6 - 1907.4 MHz (WCDMA/HSDPA Band II)  
**Max. RF Conducted Power :** 1.698 W (32.40 dBm) GPRS 850 Class 10  
0.444 W (26.57 dBm) EGPRS 850 Class 10  
0.750 W (28.85 dBm) GPRS 1900 Class 10  
0.370 W (25.78 dBm) EGPRS 1900 Class 10  
0.253 W (24.03 dBm) WCDMA Band V  
0.135 W (21.30 dBm) HSDPA Band V  
0.228 W (23.58 dBm) WCDMA Band II  
0.145 W (21.60 dBm) HSDPA Band II  
**Max. SAR Measurement :** 0.123 W/kg Body SAR  
**HW Version :** F  
**SW Version :** 3114  
**Antenna Type :** Internal Type  
**Antenna Gain :** 0.56 dBi GPRS/EGPRS 850 / WCDMA Band V  
-0.65 dBi GPRS/EGPRS 1900 / WCDMA Band II  
**Device Category :** Portable  
**RF Exposure Environment :** General Population / Uncontrolled  
**Battery Option :** Standard  
**Application Type :** Certification

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment / general population exposure limits specified in Standard C95.1-1999 and had been tested in accordance with the measurement procedures specified in IEEE Std. 1528-2003.



Figure 1. EUT Photo

## 2. Other Accessories



Figure 2. Battery



Figure 3. AC Adapter



### 3. Introduction

The A Test Lab Techno Corp. has performed measurements of the maximum potential exposure to the user of **Acer Incorporated Trade Name : acer Model(s) : ZG5, Aspire One**. The test procedures, as described in American National Standards, Institute C95.1 - 1999 [ 1 ] , FCC/OET Bulletin 65 Supplement C [July 2001] were employed and they specify the maximum exposure limit of 1.6mW/g as averaged over any 1 gram of tissue for portable devices being used within 20cm between user and EUT in the uncontrolled environment. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the equipment used are included within this test report.



#### 4. SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy ( $dw$ ) absorbed by (dissipated in) an incremental mass ( $dm$ ) contained in a volume element ( $dv$ ) of a given density ( $\rho$ ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Figure 4).

$$\text{SAR} = \frac{d}{dt} \left( \frac{dw}{dm} \right) = \frac{d}{dt} \left( \frac{dw}{\rho dv} \right)$$

Figure 4. SAR Mathematical Equation

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

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

Where :

$\sigma$  = conductivity of the tissue (S/m)

$\rho$  = mass density of the tissue ( $\text{kg/m}^3$ )

$E$  = 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 ]

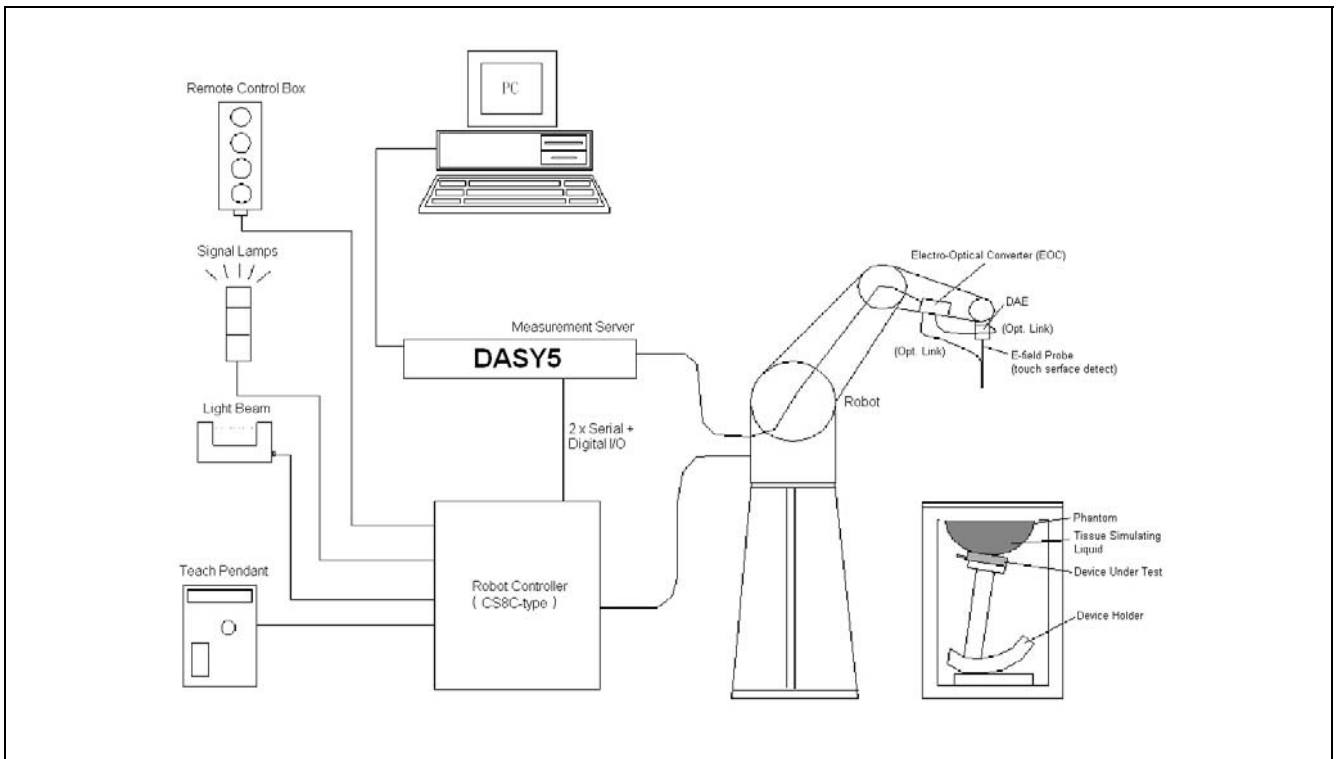




## **5. SAR Measurement Setup**

These measurements were performed with the automated near-field scanning system DASY5 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than  $\pm 0.02\text{mm}$ . Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length = 300mm) to the data acquisition unit.

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Measurement Server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chipdisk and 128MB RAM. The necessary circuits for communication with either the DAE4 (or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY5 I/O-board, which is directly connected to the PC/104 bus of the CPU board. The PC consists of the Intel Core(TM)2 CPU @1.86GHz computer with Windows XP system and SAR Measurement Software DASY5, Post Processor SEMCAD, 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 converter (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the Measurement Server.



**Figure 5. SAR Lab Test Measurement Setup**

The DAE4 (or DAE3) 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 ] .



## **6. System Components**

### **6.1 DASYS E-Field Probe System**

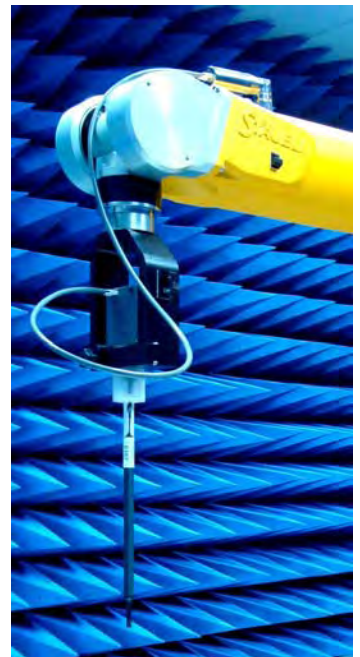
The SAR measurements were conducted with the dosimetric probe ES3DV3 or ET3DV6 (manufactured by SPEAG), designed in the classical triangular configuration [ 3 ] and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber 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 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 DASYS software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped when reaching the maximum.

### 6.1.1 E-Field Probe Specification

<b>Construction</b>	<p>Symmetrical design with triangular core</p> <p>Built-in optical fiber for surface detection System</p> <p>Built-in shielding against static charges</p> <p>PEEK enclosure material</p> <p>(resistant to organic solvents, e.q., glycol)</p>
<b>Calibration</b>	<p>In air from 10 MHz to 6 GHz</p> <p>In brain and muscle simulating tissue at frequencies of 900MHz, 1800MHz, 1950MHz, 2000MHz and 2450MHz (accuracy <math>\pm 8\%</math>)</p> <p>Calibration for other liquids and frequencies upon request</p>
<b>Frequency</b>	<p>10 MHz to &gt; 6 GHz; Linearity: <math>\pm 0.2</math> dB</p> <p>(30 MHz to 3 GHz)</p>
<b>Directivity</b>	<p><math>\pm 0.3</math> dB in brain tissue (rotation around probe axis)</p> <p><math>\pm 0.5</math> dB in brain tissue (rotation normal probe axis)</p>
<b>Dynamic Range</b>	<p>10 <math>\mu</math> W/g to &gt; 100mW/g; Linearity: <math>\pm 0.2</math>dB</p>
<b>Surface Detection</b>	<p><math>\pm 0.2</math> mm repeatability in air and clear liquids over diffuse reflecting surface(EX3DV3 only)</p>
<b>Dimensions</b>	<p>Overall length: 330mm</p> <p>Tip length: 20mm</p> <p>Body diameter: 12mm</p> <p>Tip diameter: 2.5mm</p> <p>Distance from probe tip to dipole centers: 1.0mm</p>
<b>Application</b>	<p>General dosimetry up to 6GHz</p> <p>Compliance tests of mobile phones</p> <p>Fast automatic scanning in arbitrary phantoms</p>



**Figure 6.**  
**E-field Probe**



**Figure 7.**  
**Probe setup on robot**



### 6.1.2 E-Field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure described in [ 4 ] with accuracy better than  $\pm 10\%$ . The spherical isotropy was evaluated with the procedure described in [ 5 ] and found to be better than  $\pm 0.25\text{dB}$ . The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are 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 1GHz, and in a wave guide above 1GHz 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.

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

Where :

- $\Delta t$  = Exposure time (30 seconds),
- $C$  = Heat capacity of tissue (head or body),
- $\Delta T$  = Temperature increase due to RF exposure.

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

Where :

- $\sigma$  = Simulated tissue conductivity,
- $\rho$  = Tissue density ( $\text{kg/m}^3$ ).



## 6.2 Data Acquisition Electronic (DAE) System

### Cell Controller

Processor : Intel Core(TM)2 CPU  
Clock Speed : @ 1.86GHz  
Operating System : Windows XP Professional

### Data Converter

Features : Signal Amplifier, multiplexer, A/D converter, and control logic  
Software : DASY5 v5.0 (Build 119) & SEMCAD X Version 13.2 Build 87  
Connecting Lines : Optical downlink for data and status info  
Optical uplink for commands and clock

## 6.3 Robot

Positioner : Stäubli Unimation Corp. Robot Model: TX90XL  
Repeatability :  $\pm 0.02$  mm  
No. of Axis : 6

## 6.4 Measurement Server

Processor : PC/104 with a 400MHz intel ULV Celeron  
I/O-board : Link to DAE4(or DAE3)  
16-bit A/D converter for surface detection system  
Digital I/O interface  
Serial link to robot  
Direct emergency stop output for robot

## 6.5 Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, 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 repeat ably positioned according to the IEEE SCC34-SC2 and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, and 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 [ 6 ] . To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Larger DUT cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values. Therefore those devices are normally only tested at the flat part of the SAM.



Figure 8. Device Holder

## 6.6 Phantom - SAM v4.0

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.



**Figure 9. SAM Twin Phantom**

<b>Shell Thickness</b>	2 ±0.2 mm
<b>Filling Volume</b>	Approx. 25 liters
<b>Dimensions</b>	810×1000×500 mm (H×L×W)

**Table 1. Specification of SAM v4.0**

## 6.7 Data Storage and Evaluation

### 6.7.1 Data Storage

The DASY5 software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension .DA5. The postprocessing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.





## 6.7.2 Data Evaluation

The DASY5 post processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software :

<b>Probe parameters :</b>	- Sensitivity	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	dcp <sub>i</sub>
<b>Device parameters :</b>	- Frequency	f
	- Crest factor	cf
<b>Media parameters :</b>	- Conductivity	$\sigma$
	- Density	$\rho$

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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 as :

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

- 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 :**

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



**H-field probes :**

$$H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

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 enhancement in solution

$a_{ij}$  = sensor sensitivity factors for H-field probes

$f$  = carrier frequency [GHz]

$E_i$  = electric field strength of channel  $i$  in V/m

$Hi$  = magnetic field strength of channel  $i$  in A/m

The RSS value of the field components gives the total field strength (Hermitian 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 mW/g

$E_{tot}$  = total field strength in V/m

$\sigma$  = conductivity in [mho/m] or [Siemens/m]

$\rho$  = equivalent tissue density in  $g/cm^3$

**\* Note :** that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

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

$$P_{pwe} = \frac{E_{tot}^2}{3770} \quad \text{or} \quad P_{pwe} = \frac{H_{tot}^2}{37.7}$$

with  $P_{pwe}$  = equivalent power density of a plane wave in  $mW/cm^2$

$E_{tot}$  = total electric field strength in V/m

$H_{tot}$  = total magnetic field strength in A/m



## 7. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Dosimetric E-Filed Probe	ES3DV3	3150	Jan. 09, 2008	Jan. 09, 2009
SPEAG	900MHz System Validation Kit	D900V2	SN:1d053	Dec. 12, 2007	Dec. 12, 2008
SPEAG	1800MHz System Validation Kit	D1950V2	1117	Dec. 20, 2007	Dec. 20, 2008
SPEAG	Data Acquisition Electronics	DAE4	779	Nov. 30, 2007	Nov. 30,, 2008
SPEAG	Device Holder	N/A	N/A	NCR	NCR
SPEAG	Phantom	SAM V4.0	TP-1150	NCR	NCR
SPEAG	Robot	Staubli TX90XL	F07/564ZA1/C/01	NCR	NCR
SPEAG	Software	DASY5 V5.0 Build 119	N/A	NCR	NCR
SPEAG	Software	SEMCAD X V13.2 Build 87	N/A	NCR	NCR
SPEAG	Measurement Server	SE UMS 011 AA	1025	NCR	NCR
Agilent	Wireless Communication Test Set	CMU200	112387	Oct. 24, 2007	Oct. 24, 2008
Agilent	ENA Series Network Analyzer	E5071B	MY42402996	Oct. 23, 2007	Oct. 23, 2008
Agilent	Dielectric Probe Kit	85070C	US99360094	NCR	NCR
R&S	Power Sensor	NRP-Z22	100179	May. 03, 2008	May. 03, 2009
Agilent	Signal Generator	E8257D	MY44320425	Jul. 03, 2008	Jul. 03, 2009
Agilent	Dual Directional Coupler	778D	50334	NCR	NCR
Mini-Circuits	Power Amplifier	ZHL-42W-SMA	D111103#5	NCR	NCR
Mini-Circuits	Power Amplifier	ZVE-8G-SMA	D042005 671800514	NCR	NCR

**Table 2. Test Equipment List**



## 8. Tissue Simulating Liquids

The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the tissue.

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an 85070C Dielectric Probe Kit and an 8720ES Network Analyzer.

### IEEE SCC-34/SC-2 in 1528 recommended Tissue Dielectric Parameters

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in human head. Other head and body tissue parameters that have not been specified in 1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equation and extrapolated according to the head parameter specified in 1528.

Target Frequency	Head		Body	
(MHz)	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 - 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(  $\epsilon_r$  = relative permittivity,  $\sigma$  = conductivity and  $\rho = 1000 \text{ kg/m}^3$  )

**Table 3. Tissue dielectric parameters for head and body phantoms**



## 8.1 Liquid Confirmation

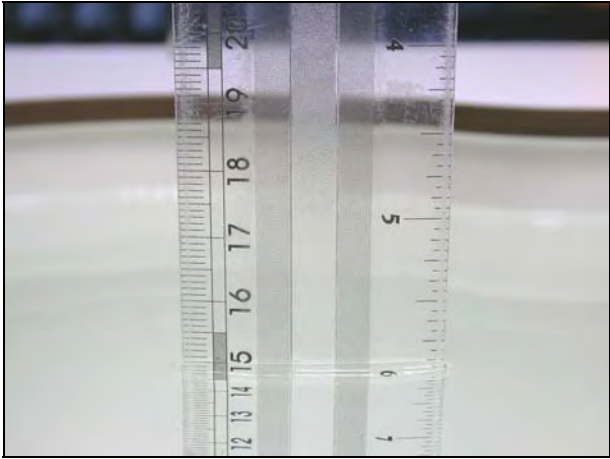
### 8.1.1 Parameters

<b>Liquid Verify</b>								
Ambient Temperature : $22 \pm 2$ °C ; Relative Humidity : 40 -70%								
Liquid Type	Frequency	Temp (°C)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)	Measured Date
900MHz Body	900MHz	22.0	$\epsilon_r$	55.0	<b>53.9</b>	<b>-2.00</b>	$\pm 5$	Sep. 05, 2008
			$\sigma$	1.05	<b>1.04</b>	<b>-0.95</b>	$\pm 5$	
900MHz Body	900MHz	22.0	$\epsilon_r$	55.0	<b>53.9</b>	<b>-2.00</b>	$\pm 5$	Sep. 08, 2008
			$\sigma$	1.05	<b>1.04</b>	<b>-0.95</b>	$\pm 5$	
1950MHz Body	1950MHz	22.0	$\epsilon_r$	53.3	<b>51.6</b>	<b>-3.19</b>	$\pm 5$	Sep. 07, 2008
			$\sigma$	1.52	<b>1.56</b>	<b>2.63</b>	$\pm 5$	

**Table 4. Measured Tissue dielectric parameters for head and body phantoms**

### 8.1.2 Liquid Depth

The liquid level was during measurement 15cm  $\pm$ 0.5cm.



**Figure 10. Head-Tissue-Simulating-Liquid**



**Figure 11. Body-Tissue-Simulating-Liquid**



## 9. Measurement Process

### 9.1 Device and Test Conditions

The Test Device was provided by **Acer Incorporated** for this evaluation. The spatial peak SAR values were assessed for the lowest, middle and highest channels defined by **GSM/GPRS 850** (#128=824.2MHz, #190=836.6MHz, #251=848.8MHz ), **PCS / GPRS 1900** (#512=1850.2MHz, #661=1880.0MHz, #810=1909.8MHz) , **WCDMA Band V** (#4132=826.4MHz, #4183=836.6MHz, #4233=846.6MHz), **WCDMA Band II** (#9262=1852.4MHz, #9400=1880.0MHz, #9538=1907.6MHz) systems . The antenna(s), battery and accessories shall be those specified by the manufacturer. The battery shall be fully charged before each measurement and there shall be no external connections.

#### **HSDPA Data Devices setup for SAR Measurement.**

HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors( $\beta_c$ ,  $\beta_d$ ), and HS-DPCCH power offset parameters ( $\Delta_{ACK}$ ,  $\Delta_{NACK}$ ,  $\Delta_{CQI}$ ) should be set according to values indicated in the Table below.<sup>32</sup> The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.<sup>33</sup>

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

#### Note

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

**Table 5. Setup for Release 5 HSDPA**



Band	Data Rate	CH	Conducted Power		Worst
			Before	After	
GPRS850	3Down 2up	Lowest	32.25	32.24	<input type="checkbox"/>
		Middle	32.28	32.27	<input type="checkbox"/>
		Highest	<b>32.40</b>	32.39	<input checked="" type="checkbox"/>
	3Down 1up	Lowest	31.95	31.93	<input type="checkbox"/>
		Middle	32.00	31.99	<input type="checkbox"/>
		Highest	32.10	32.09	<input type="checkbox"/>
EGPRS850	3Down 2up	Lowest	26.35	26.34	<input type="checkbox"/>
		Middle	26.40	26.38	<input type="checkbox"/>
		Highest	<b>26.57</b>	26.56	<input checked="" type="checkbox"/>
	3Down 1up	Lowest	26.30	26.29	<input type="checkbox"/>
		Middle	26.30	26.29	<input type="checkbox"/>
		Highest	26.40	26.39	<input type="checkbox"/>
GPRS1900	3Down 2up	Lowest	<b>28.85</b>	28.85	<input checked="" type="checkbox"/>
		Middle	28.75	28.74	<input type="checkbox"/>
		Highest	28.65	28.64	<input type="checkbox"/>
	3Down 1up	Lowest	28.35	28.34	<input type="checkbox"/>
		Middle	28.25	28.24	<input type="checkbox"/>
		Highest	28.15	28.14	<input type="checkbox"/>
EGPRS1900	3Down 2up	Lowest	<b>25.78</b>	25.77	<input checked="" type="checkbox"/>
		Middle	25.65	25.64	<input type="checkbox"/>
		Highest	25.60	25.59	<input type="checkbox"/>
	3Down 1up	Lowest	25.55	25.54	<input type="checkbox"/>
		Middle	25.30	25.28	<input type="checkbox"/>
		Highest	25.30	25.29	<input type="checkbox"/>





Band	Date Rate or Sub-test	CH	Conducted Power		Worst
			Before	After	
WCDMA V	---	Lowest	23.63	23.62	<input type="checkbox"/>
		Middle	<b>24.03</b>	24.02	<input checked="" type="checkbox"/>
		Highest	23.99	23.98	<input type="checkbox"/>
HSDPA V	1	Lowest	20.90	20.89	<input type="checkbox"/>
		Middle	<b>21.30</b>	21.29	<input checked="" type="checkbox"/>
		Highest	20.30	20.29	<input type="checkbox"/>
	2	Lowest	20.00	20.00	<input type="checkbox"/>
		Middle	20.30	20.29	<input type="checkbox"/>
		Highest	20.30	20.29	<input type="checkbox"/>
	3	Lowest	18.30	18.29	<input type="checkbox"/>
		Middle	18.60	18.59	<input type="checkbox"/>
		Highest	18.60	18.58	<input type="checkbox"/>
	4	Lowest	17.70	17.69	<input type="checkbox"/>
		Middle	17.90	17.89	<input type="checkbox"/>
		Highest	17.90	17.89	<input type="checkbox"/>
WCDMA II	---	Lowest	<b>23.58</b>	23.57	<input type="checkbox"/>
		Middle	23.31	23.30	<input type="checkbox"/>
		Highest	23.07	23.06	<input type="checkbox"/>
HSDPA II	1	Lowest	21.50	20.49	<input type="checkbox"/>
		Middle	<b>21.60</b>	21.59	<input checked="" type="checkbox"/>
		Highest	21.40	21.39	<input type="checkbox"/>
	2	Lowest	20.50	20.49	<input type="checkbox"/>
		Middle	20.70	20.69	<input type="checkbox"/>
		Highest	20.30	20.29	<input type="checkbox"/>
	3	Lowest	18.80	18.79	<input type="checkbox"/>
		Middle	19.00	18.99	<input type="checkbox"/>
		Highest	18.60	18.59	<input type="checkbox"/>
	4	Lowest	18.20	18.19	<input type="checkbox"/>
		Middle	18.40	18.39	<input type="checkbox"/>
		Highest	18.08	18.06	<input type="checkbox"/>

Note: The EUT take Li-ion batteries as its power source. Each test was preceded under the condition of fully-charged EUT.

## 9.2 System Performance Check

### 9.2.1 Symmetric Dipoles for System Validation

<b>Construction</b>	Symmetrical dipole with 1/4 balun enables measurement of feed point impedance with NWA matched for use near flat phantoms filled with head simulating solutions Includes distance holder and tripod adaptor Calibration Calibrated SAR value for specified position and input power at the flat phantom in head simulating solutions.
<b>Frequency</b>	450, 900, 1800, 1950, 2000 and 2450MHz
<b>Return Loss</b>	> 20 dB at specified validation position
<b>Power Capability</b>	> 100 W (f < 1GHz); > 40 W (f > 1GHz)
<b>Options</b>	Dipoles for other frequencies or solutions and other calibration conditions are available upon request
<b>Dimensions</b>	D450V2 : dipole length 270 mm; overall height 330 mm D900V2 : dipole length 149 mm; overall height 330 mm D1800V2 : dipole length 72 mm; overall height 300 mm D1950V2 : dipole length 62 mm; overall height 300 mm D2000V2 : dipole length 65 mm; overall height 300 mm D2450V2 : dipole length 51.5 mm; overall height 300 mm



**Figure 12. Validation Kit**



### 9.2.2 Validation

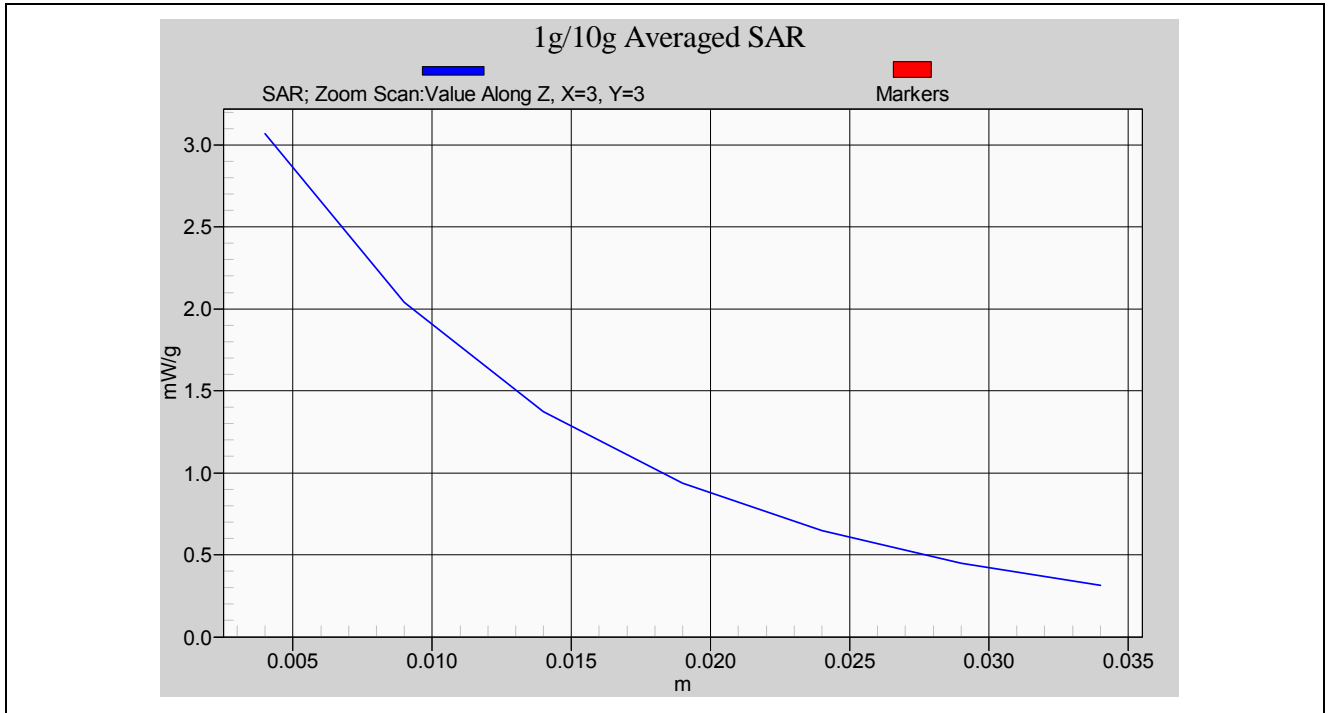
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of  $\pm 7\%$ . The validation was performed at 900MHz and 1950MHz.

Validation kit		Mixture Type	SAR <sub>1g</sub> [mW/g]		SAR <sub>10g</sub> [mW/g]		Date of Calibration
D900V2-SN1d053		Body	11.56		7.48		Dec. 12, 2007
D1950V2-SN1117		Body	41.2		21.76		Dec. 20, 2007
Frequency (MHz)	Power	SAR <sub>1g</sub> (mW/g)	SAR <sub>10g</sub> (mW/g)	Drift (dB)	Difference percentage		Date
					1g	10g	
900 (Body)	250mW	2.82	1.8	-0.020	-2.4 %	-3.7 %	Sep. 05, 2008
	Normalize to 1 Watt	11.28	7.2				
900 (Body)	250mW	2.9	1.89	-0.057	0.3 %	1.1 %	Sep. 08, 2008
	Normalize to 1 Watt	11.6	7.56				
1950 (Body)	250mW	10.5	5.39	-0.031	1.9 %	-0.9 %	Sep. 07, 2008
	Normalize to 1 Watt	42	21.56				

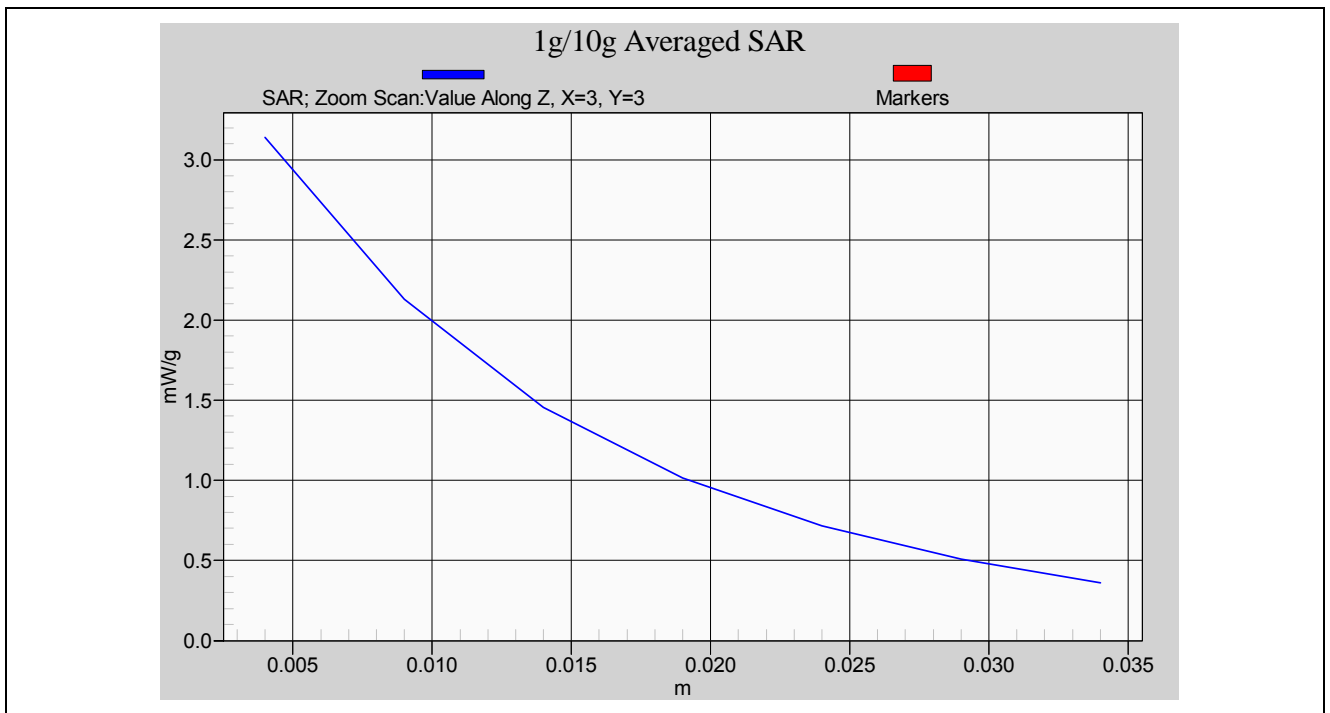
Detail results see Appendix A.



### Z-axis Plot of System Performance Check



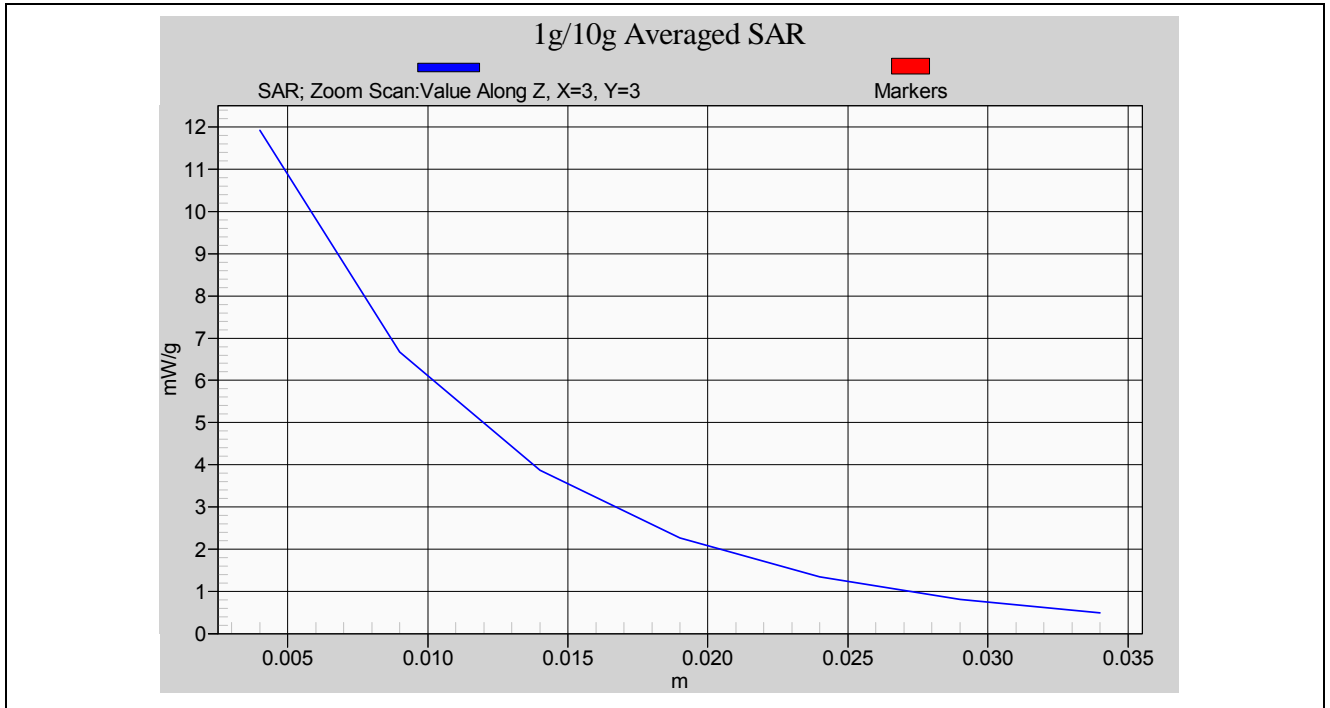
Head-Tissue-Simulating-Liquid 900MHz (2008.09.05)



Head-Tissue-Simulating-Liquid 900MHz (2008.09.08)



### Z-axis Plot of System Performance Check



**Body-Tissue-Simulating-Liquid 1950MHz**



## 9.3 Dosimetric Assessment Setup

### 9.3.1 Body Worn Test Position

#### Body-Worn Configuration

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a handset output should be tested with a handset connected to the device.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances.

For this test :

- The EUT is placed into the holster/belt clip and the holster is positioned against the surface of the phantom in a normal operating position.
- Since this EUT doesn't supply any body-worn accessory to the end user, for **EUT Bottom to phantom mode** the distance of **2 mm** was tested to confirm the necessary "minimum SAR separation distance".  
(\* Note : This distance includes the 2 mm phantom shell thickness.)



### 9.3.2 Measurement Procedures

The evaluation was performed with the following procedures :

**Surface Check :** A surface checks job gathers data used with optical surface detection. It determines the distance from the phantom surface where the reflection from the optical detector has its peak. Any following measurement jobs using optical surface detection will then rely on this value. The surface check performs its search a specified number of times, so that the repeatability can be verified. The probe tip distance is 1.3mm to phantom inner surface during scans.

**Reference :** The reference job measures the field at a specified reference position, at 4 mm from the selected section's grid reference point.

**Area Scan :** The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines can find the maximum locations even in relatively coarse grids. When an area scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. Any following zoom scan within the same procedure will then perform fine scans around these maxima. The area covered the entire dimension of the EUT and the horizontal grid spacing was 15 mm x 15 mm.

**Zoom Scan :** Zoom scans are used to assess the highest averaged SAR for cubic averaging volumes with 1 g and 10 g of simulated tissue. The zoom scan measures 5 x 5 x 7 points in a 32 x 32 x 30 mm cube whose base faces are centered around the maxima returned from a preceding area scan within the same procedure.

**Drift :** The drift job measures the field at the same location as the most recent reference job within the same procedure, with the same settings. The drift measurement gives the field difference in dB from the last reference measurement. Several drift measurements are possible for each reference measurement. This allows monitoring of the power drift of the device in the batch process. If the value changed by more than 5%, the evaluation was repeated.



## 9.4 Spatial Peak SAR Evaluation

The DASY5 software includes all numerical procedures necessary to evaluate the spatial peak SAR values. Based on the Draft: SCC-34, SC-2, WG-2 - Computational Dosimetry, IEEE P1529/D0.0 (Draft Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) Associated with the Use of Wireless Handsets - Computational Techniques), a new algorithm has been implemented. The spatial-peak SAR can be computed over any required mass.

The base for the evaluation is a "cube" measurement in a volume of  $(32 \times 32 \times 30) \text{mm}^3$  ( $5 \times 5 \times 7$  points). The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan. If the 10g cube or both cubes are not entirely inside the measured volumes, the system issues a warning regarding the evaluated spatial peak values within the Postprocessing engine (SEMCAD). This means that if the measured volume is shifted, higher values might be possible. To get the correct values you can use a finer measurement grid for the area scan. In complicated field distributions, a large grid spacing for the area scan might miss some details and give an incorrectly interpolated peak location.

The entire evaluation of the spatial peak values is performed within the Postprocessing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into three stages:

### Interpolation and Extrapolation

The probe is calibrated at the center of the dipole sensors which is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated.

In DASY5, the choice of the coordinate system defining the location of the measurement points has no influence on the uncertainty of the interpolation, Maxima Search and SAR extrapolation routines. The interpolation, Maxima Search and extrapolation routines are all based on the modified Quadratic Shepard's method [7].





## **10. 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  $\pm 21.9\%$  [ 8 ] .

According to Std. C95.3 [ 9 ] , the overall uncertainties are difficult to assess and will vary with the type of meter and usage situation. However, accuracy's of  $\pm 1$  to 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 [ 10 ] , typical worst-case uncertainty of field measurements is  $\pm 5$  dB. For well-defined modulation characteristics the uncertainty can be reduced to  $\pm 3$  dB.



Error Description	Uncertainty value	Prob. Dist.	Div.	(c <sub>i</sub> ) 1g	(c <sub>i</sub> ) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v <sub>i</sub> ) v <sub>eff</sub>
<b>Measurement System</b>								
Probe Calibration	± 5.9 %	N	1	1	1	± 5.9 %	± 5.9 %	
Axial Isotropy	± 4.7 %	R		0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical Isotropy	± 9.6 %	R	√3	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary Effects	± 1.0 %	R	√3	1	1	± 0.6 %	± 0.6 %	∞
Linearity	± 4.7 %	R	√3	1	1	± 2.7 %	± 2.7 %	∞
System Detection Limits	± 1.0 %	R	√3	1	1	± 0.6 %	± 0.6 %	∞
Readout Electronics	± 0.3 %	N	1	1	1	± 0.3 %	± 0.3 %	∞
Response Time	± 0.8 %	R	√3	1	1	± 0.5 %	± 0.5 %	∞
Integration Time	± 2.6 %	R	√3	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Noise	± 3.0 %	R	√3	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Reflections	± 3.0 %	R	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.4 %	R	√3	1	1	± 0.2 %	± 0.2 %	∞
Probe Positioning	± 2.9 %	R	√3	1	1	± 1.7 %	± 1.7 %	∞
Max. SAR Eval.	± 1.0 %	R	√3	1	1	± 0.6 %	± 0.6 %	∞
<b>Test Sample Related</b>								
Device Positioning	± 2.9 %	N	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6 %	N	1	1	1	± 3.6 %	± 3.6 %	5
Power Drift	± 5.0 %	R	√3	1	1	± 2.9 %	± 2.9 %	∞
<b>Phantom and Setup</b>								
Phantom Uncertainty	± 4.0 %	R	√3	1	1	± 2.3 %	2.3 %	∞
Liquid Conductivity (target)	± 5.0 %	R	√3	0.64	0.43	± 1.8 %	1.2 %	∞
Liquid Conductivity (meas.)	± 2.5 %	N	1	0.64	0.43	± 1.6 %	1.1 %	∞
Liquid Permittivity (target)	± 5.0 %	R	√3	0.6	0.49	± 1.7 %	1.4 %	∞
Liquid Permittivity (meas.)	± 2.5 %	N	1	0.6	0.49	± 1.5 %	1.2 %	∞
<b>Combined Std. Uncertainty</b>						± 10.9 %	± 10.7 %	387
<b>Expanded STD Uncertainty</b>						± 21.9 %	± 21.4 %	

Table 6. Uncertainty Budget of DASY



## 11. SAR Test Results Summary

### 11.1 GPRS/EGPRS 850 Results \_ EUT Bottom to phantom 2mm space

**Ambient :**

Temperature (°C) : 22 ± 2      Relative HUMIDITY (%) : 40-70

**Liquid :**

Mixture Type : MSL900      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

Crest Factor : 4.2(3Down2Up)      Probe S/N : 3150  
8.3(3Down1up)

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
824.2	128	GPRS 850	32.25	Flat	Internal	N/A	0.035	0.040	3Down2Up
836.6	190	GPRS 850	32.28	Flat	Internal	N/A	0.046	0.156	3Down2Up
848.8	251	GPRS 850	32.40	Flat	Internal	N/A	0.066	0.020	3Down2Up
848.8	251	EGPRS 850	26.40	Flat	Internal	N/A	0.021	0.000	3Down1Up
848.8	251	GPRS 850	32.10	Flat	Internal	N/A	0.035	-0.137	3Down1Up
848.8	251	EGPRS 850	26.40	Flat	Internal	N/A	0.010	0.000	3Down1Up
Std. C95.1-1999 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg (mW/g) Averaged over 1 gram				

Detail results see Appendix B.



### Z-axis Plot of SAR Measurement

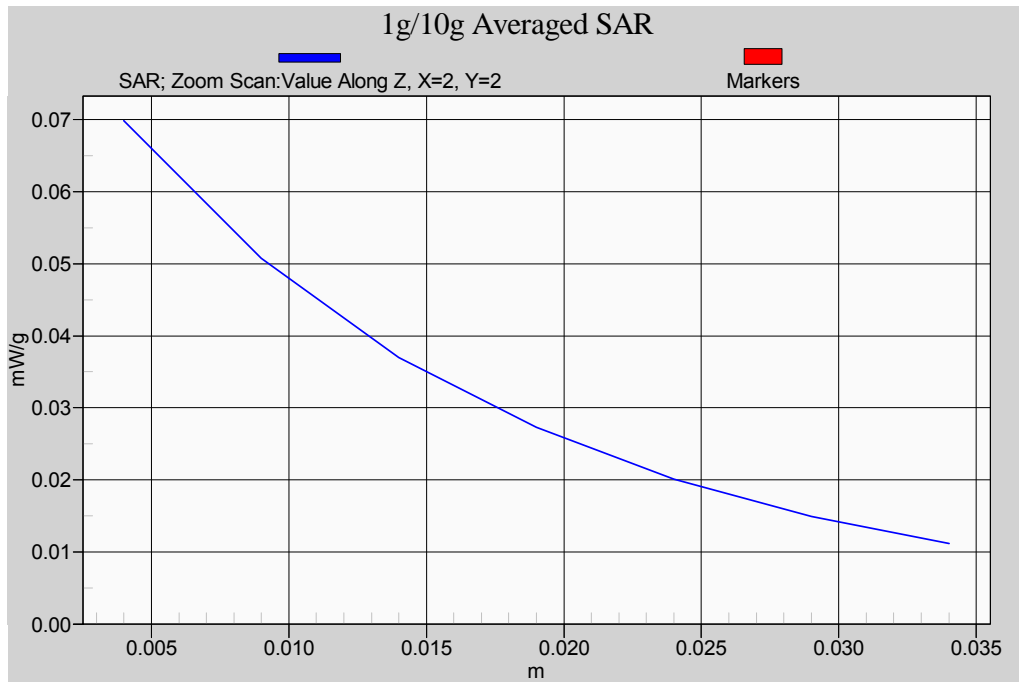


Figure 13. Z-axis Plot of Flat GPRS 850 CH251 (3Down2Up)



## 11.2 GPRS/EGPRS 1900 Results \_ EUT Bottom to phantom 2mm space

### Ambient :

Temperature (°C) : 22 ± 2      Relative HUMIDITY (%) : 40-70

### Liquid :

Mixture Type : MSL1950      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

### Measurement :

Crest Factor : 4.2(3Down2Up)      Probe S/N : 3150  
8.3(3Down1up)

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1850.2	512	GPRS 1900	28.85	Flat	Internal	N/A	0.100	-0.049	3Down2Up
1850.2	512	EGPRS 1900	25.78	Flat	Internal	N/A	0.040	-0.021	3Down2Up
1850.2	512	GPRS 1900	28.35	Flat	Internal	N/A	0.052	0.176	3Down1Up
1850.2	512	EGPRS 1900	25.55	Flat	Internal	N/A	0.021	0.000	3Down1Up
1880.0	661	GPRS 1900	28.75	Flat	Internal	N/A	0.094	0.115	3Down2Up
1909.8	810	GPRS 1900	28.65	Flat	Internal	N/A	0.079	0.071	3Down2Up
Std. C95.1-1999 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg (mW/g) Averaged over 1 gram				

Detail results see Appendix B.

### Z-axis Plot of SAR Measurement

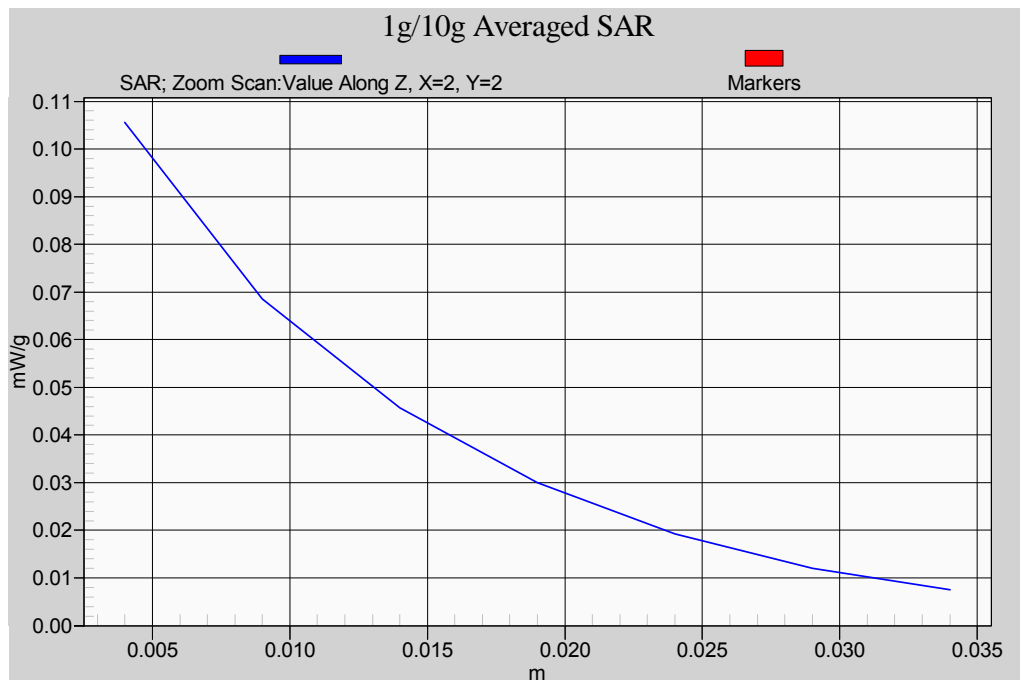


Figure 14. Z-axis Plot of Flat GPRS1900 CH512 (3Down2Up)



### 11.3 WCDMA/HSDPA Band V \_ EUT Bottom to phantom 2mm space

**Ambient :**

Temperature (°C) : 22 ± 2      Relative HUMIDITY (%) : 40-70

**Liquid :**

Mixture Type : MSL900      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

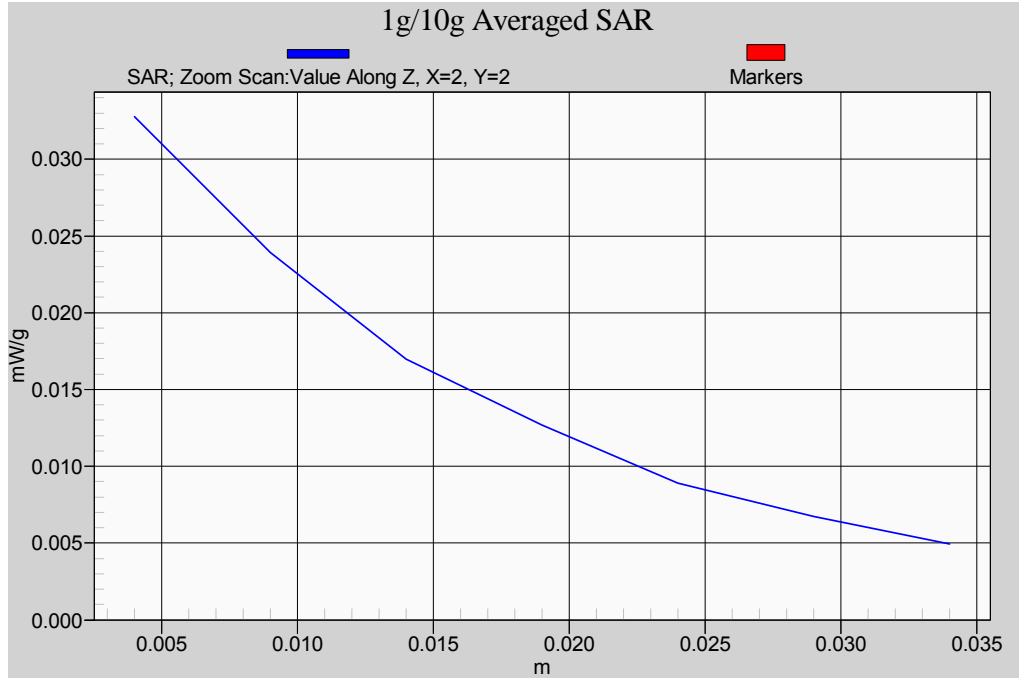
**Measurement :**

Crest Factor : 1      Probe S/N : 3150

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
826.6	4132	WCDMA V	23.63	Flat	Internal	N/A	0.025	0.139	-
836.0	4183	WCDMA V	24.03	Flat	Internal	N/A	0.034	0.097	-
836.0	4183	HSDPA V	21.30	Flat	Internal	N/A	0.031	0.196	-
846.6	4233	WCDMA V	23.99	Flat	Internal	N/A	0.030	0.180	-
<b>Std. C95.1-1999 - Safety Limit            Spatial Peak            Uncontrolled Exposure/General Population</b>					<b>1.6 W/kg (mW/g)            Averaged over 1 gram</b>				

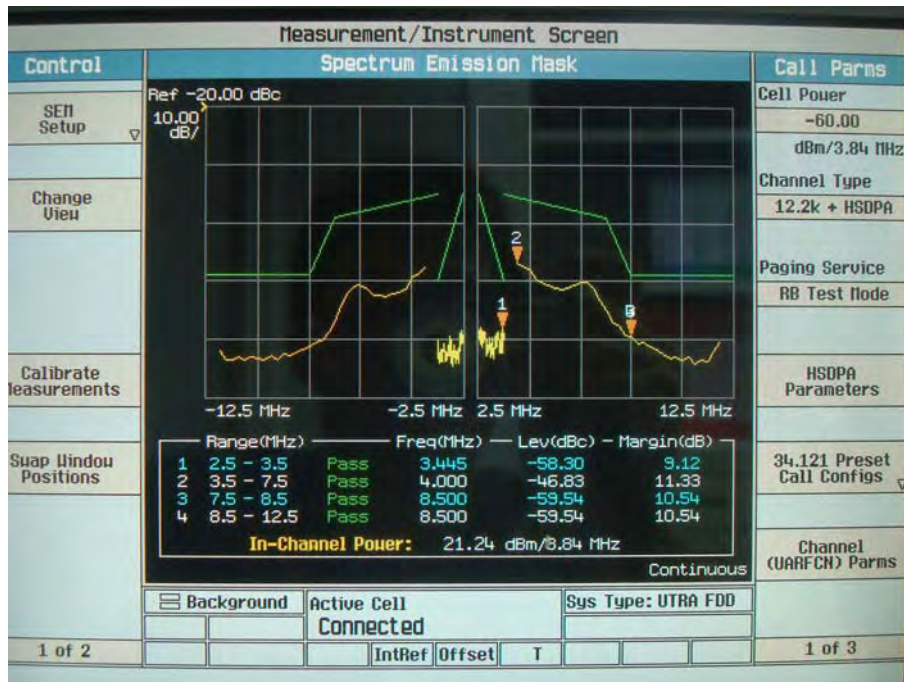
Detail results see Appendix B.

**Z-axis Plot of SAR Measurement**



**Figure 15. Z-axis Plot of Flat WCDMA Band V CH4180**

**Spectrum Analyzer Setup Photo**



**Figure 16. Spectrum Analyzer Flat HSDPA Band V CH4183**



### 11.4 WCDMA/HSDPA Band II \_ EUT Bottom to phantom 2mm space

**Ambient :**

Temperature (°C) : 22 ± 2      Relative HUMIDITY (%) : 40-70

**Liquid :**

Mixture Type : MSL1950      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

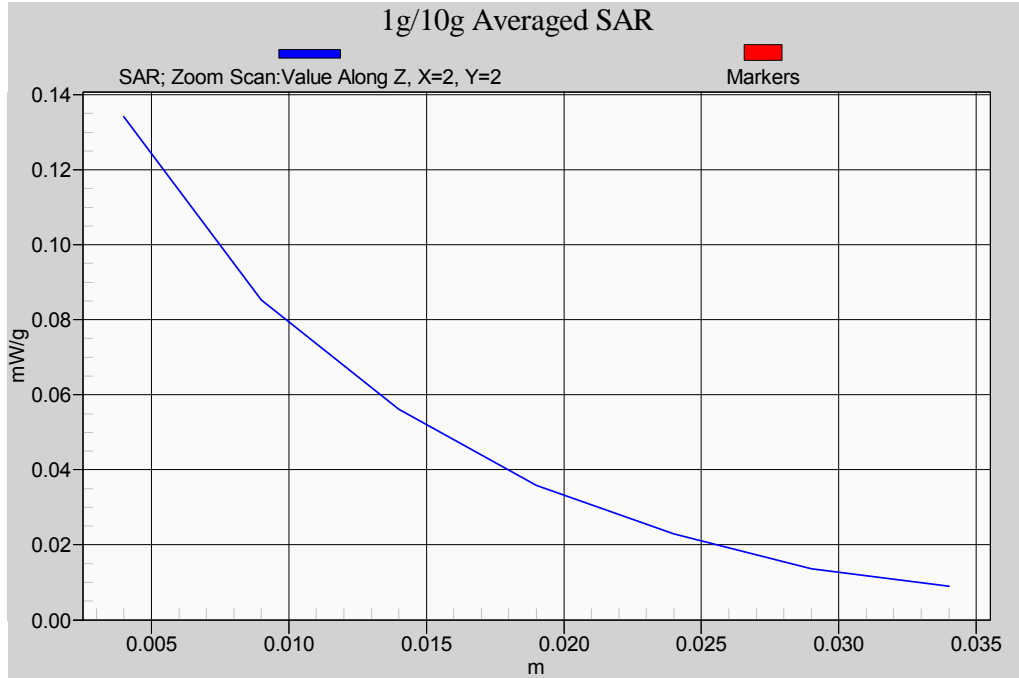
Crest Factor : 1      Probe S/N : 3150

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1852.4	9262	WCDMA II	23.58	Flat	Internal	N/A	0.123	0.105	-
1852.4	9262	HSDPA II	21.50	Flat	Internal	N/A	0.107	0.165	-
1880.0	9400	WCDMA II	23.31	Flat	Internal	N/A	0.120	0.103	-
1907.6	9538	WCDMA II	23.07	Flat	Internal	N/A	0.101	0.059	-
<b>Std. C95.1-1999 - Safety Limit            Spatial Peak            Uncontrolled Exposure/General Population</b>					<b>1.6 W/kg (mW/g)            Averaged over 1 gram</b>				

Detail results see Appendix B.



**Z-axis Plot of SAR Measurement**



**Figure 17. Z-axis Plot of Flat WCDMA Band II CH9262**

**Spectrum Analyzer Setup Photo**



**Figure 18. Spectrum Analyzer Flat HSDPA Band II CH9262**

## 11.5 Setup Photo



Figure 19. Body SAR Test Setup (Flat Section) \_ EUT Bottom to Phantom 2mm space  
( 3G Antenna to phantom 81.54mm space )



## 11.6 Std. C95.1-1999 RF Exposure Limit

Human Exposure	Population Uncontrolled Exposure ( W/kg ) or (mW/g)	Occupational Controlled Exposure ( W/kg ) or (mW/g)
<b>Spatial Peak SAR*</b> (head)	1.60	8.00
<b>Spatial Peak SAR**</b> (Whole Body)	0.08	0.40
<b>Spatial Peak SAR***</b> (Partial-Body)	1.60	8.00
<b>Spatial Peak SAR****</b> (Hands / Feet / Ankle / Wrist )	4.00	20.00

**Table 7. Safety Limits for Partial Body Exposure**

### Notes :

- \* The Spatial Peak value of the SAR averaged over any 1 gram 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 Average value of the SAR averaged over the partial – body.
- \*\*\*\* The Spatial Peak value of the SAR averaged over any 10 grams of tissue.  
( defined as a tissue volume in the shape of a cube ) and over the appropriate averaging time.

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

**Occupational / 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).



## **12. Conclusion**

The SAR test values found for the portable mobile phone **Acer Incorporated Trade Name : acer Model(s) : ZG5, Aspire One** are below the maximum recommended level of 1.6 W/kg (mW/g).



### 13. References

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***Appendix A - System Performance Check***

See following Attached Pages for System Performance Check.



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/5/2008 11:23:07 AM

### System Performance Check at 900MHz\_20080905\_Body

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:1d053**

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 900 \text{ MHz}$ ;  $\sigma = 1.04 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

### System Performance Check at 900MHz/Area Scan (61x121x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 3.08 mW/g

### System Performance Check at 900MHz/Zoom Scan (7x7x7)/Cube 0:

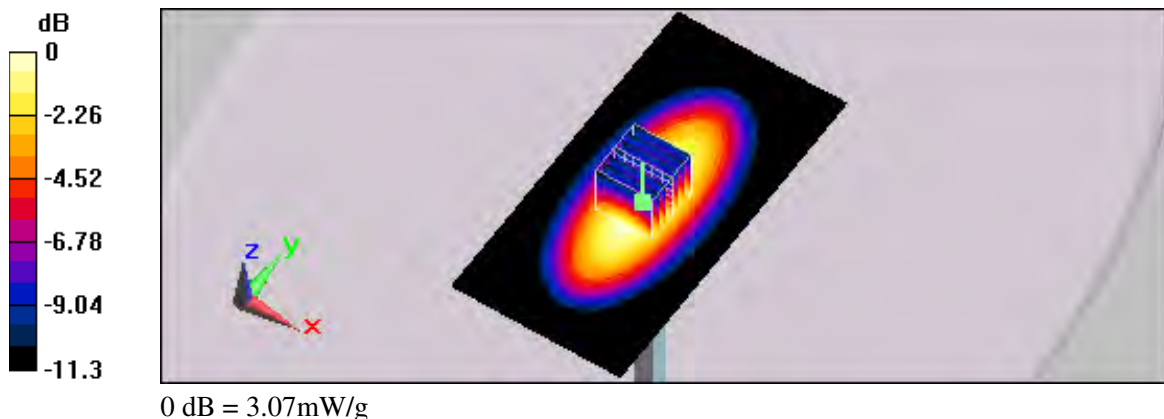
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 55.3 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 4.24 W/kg

**SAR(1 g) = 2.82 mW/g; SAR(10 g) = 1.8 mW/g**

Maximum value of SAR (measured) = 3.07 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/8/2008 10:11:34 AM

### System Performance Check at 900MHz\_20080908\_Body

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:1d053**

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 900 \text{ MHz}$ ;  $\sigma = 1.04 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

### System Performance Check at 900MHz/Area Scan (61x121x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 3.17 mW/g

### System Performance Check at 900MHz/Zoom Scan (7x7x7)/Cube 0:

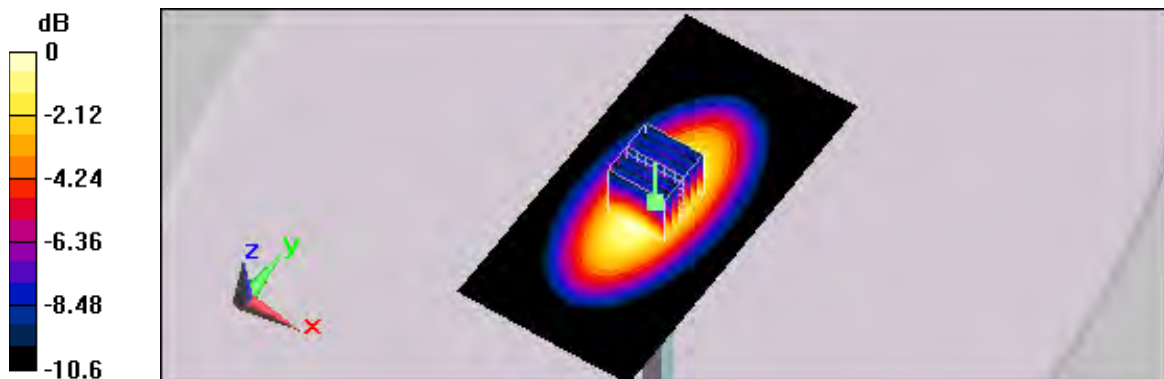
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 56.3 V/m; Power Drift = -0.057 dB

Peak SAR (extrapolated) = 4.24 W/kg

**SAR(1 g) = 2.9 mW/g; SAR(10 g) = 1.89 mW/g**

Maximum value of SAR (measured) = 3.14 mW/g



0 dB = 3.14mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 6:47:35 AM

### System Performance Check at 1950MHz\_20080907\_Body

**DUT: Dipole 1950 MHz; Type: D1950V3; Serial: D1950V3 - SN:1117**

Communication System: CW; Frequency: 1950 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1950 \text{ MHz}$ ;  $\sigma = 1.56 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.55, 4.55, 4.55); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

### System Performance Check at 1950MHz/Area Scan (61x61x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 12 mW/g

### System Performance Check at 1950MHz/Zoom Scan (7x7x7)/Cube 0:

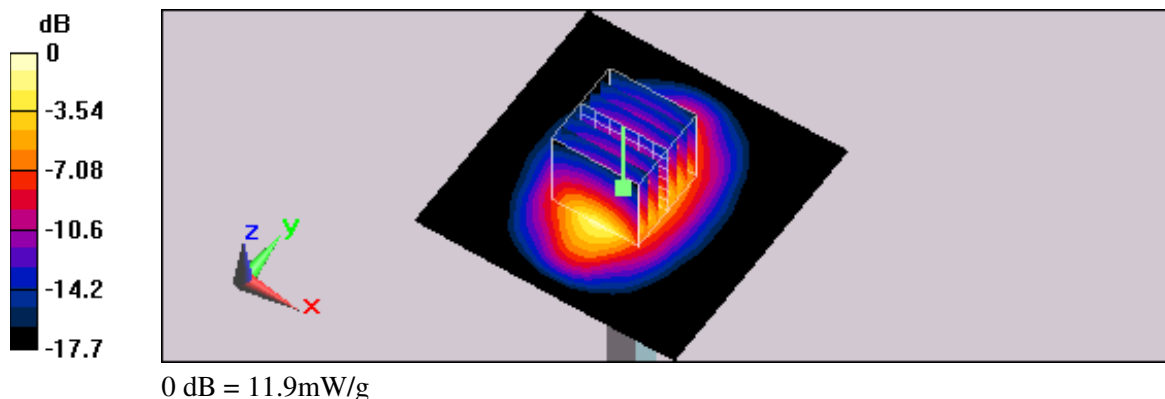
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 89.2 V/m; Power Drift = -0.031 dB

Peak SAR (extrapolated) = 19.6 W/kg

**SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.39 mW/g**

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





***Appendix B - SAR Measurement Data***

See following Attached Pages for SAR Measurement Data.



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/8/2008 12:21:23 PM

**Flat\_GSM850 GPRS CH128\_Open 90\_3Down2Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: GSM 850 GPRS(3Down, 2Up); Frequency: 824.2 MHz;Duty Cycle: 1:4.2  
Medium parameters used (interpolated):  $f = 824.2$  MHz;  $\sigma = 0.955$  mho/m;  $\epsilon_r = 54.7$ ;  $\rho = 1000$

kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.037 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

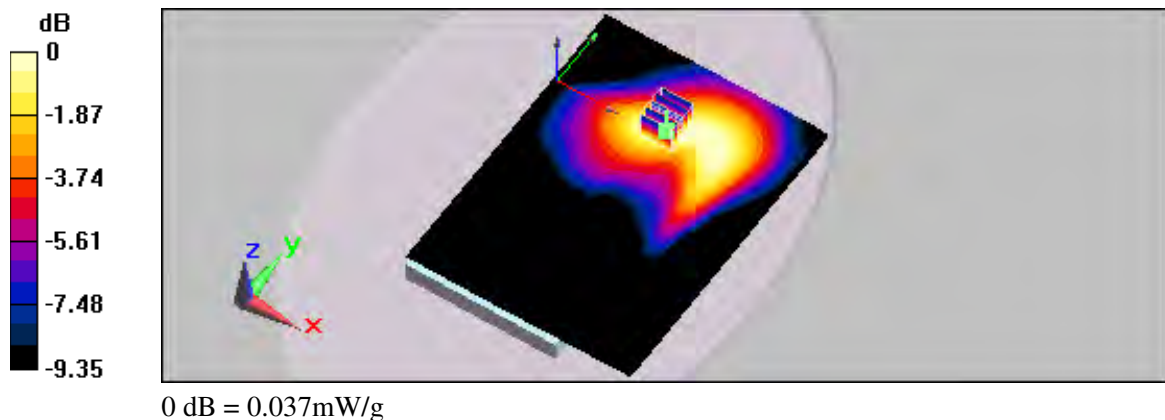
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.830 V/m; Power Drift = 0.040 dB

Peak SAR (extrapolated) = 0.048 W/kg

**SAR(1 g) = 0.035 mW/g; SAR(10 g) = 0.025 mW/g**

Maximum value of SAR (measured) = 0.037 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/8/2008 1:18:10 PM

**Flat\_GSM850 GPRS CH190\_Open 90\_3Down2Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: GSM 850 GPRS(3Down, 2Up); Frequency: 836.6 MHz;Duty Cycle: 1:4.2  
Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.968$  mho/m;  $\epsilon_r = 54.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.049 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

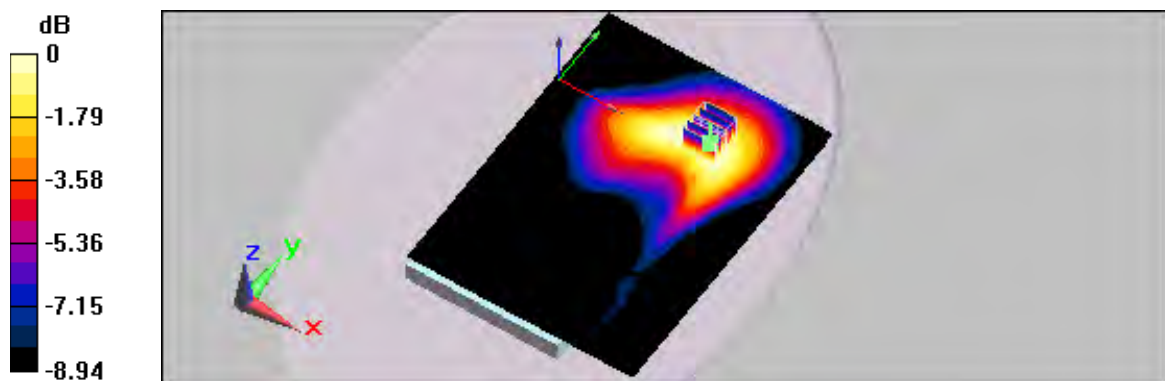
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.838 V/m; Power Drift = 0.156 dB

Peak SAR (extrapolated) = 0.063 W/kg

**SAR(1 g) = 0.046 mW/g; SAR(10 g) = 0.033 mW/g**

Maximum value of SAR (measured) = 0.049 mW/g



0 dB = 0.049mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/8/2008 2:07:57 PM

**Flat\_GSM850 GPRS CH251\_Open 90\_3Down2Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: GSM 850 GPRS(3Down, 2Up); Frequency: 848.8 MHz;Duty Cycle: 1:4.2  
Medium parameters used:  $f = 849$  MHz;  $\sigma = 0.982$  mho/m;  $\epsilon_r = 54.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.070 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

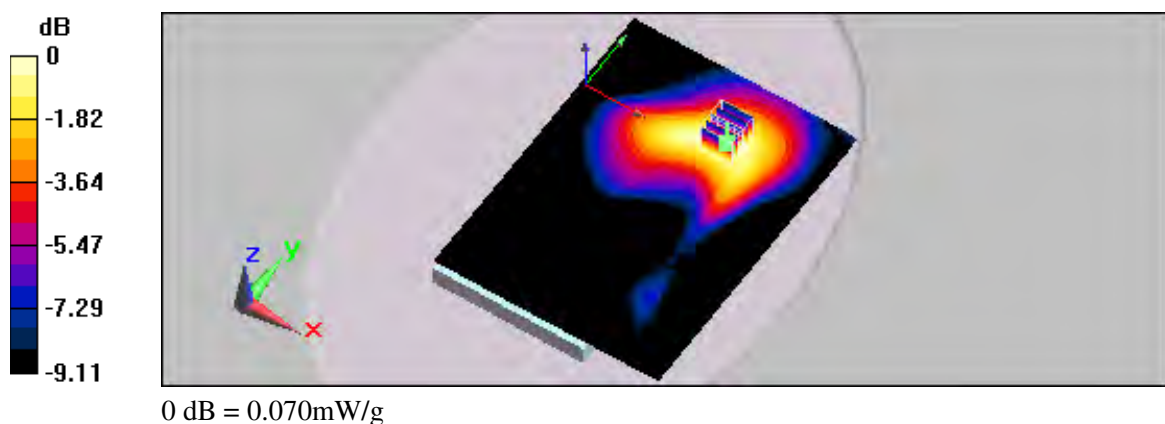
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.36 V/m; Power Drift = 0.020 dB

Peak SAR (extrapolated) = 0.091 W/kg

**SAR(1 g) = 0.066 mW/g; SAR(10 g) = 0.047 mW/g**

Maximum value of SAR (measured) = 0.070 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/8/2008 4:38:16 PM

**Flat\_GSM850 EGPRS CH251\_Open 90\_3Down2Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: GSM 850 EGPRS (3Down, 2Up); Frequency: 848.8 MHz; Duty Cycle: 1:4.2

Medium parameters used:  $f = 849 \text{ MHz}$ ;  $\sigma = 0.982 \text{ mho/m}$ ;  $\epsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.021 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

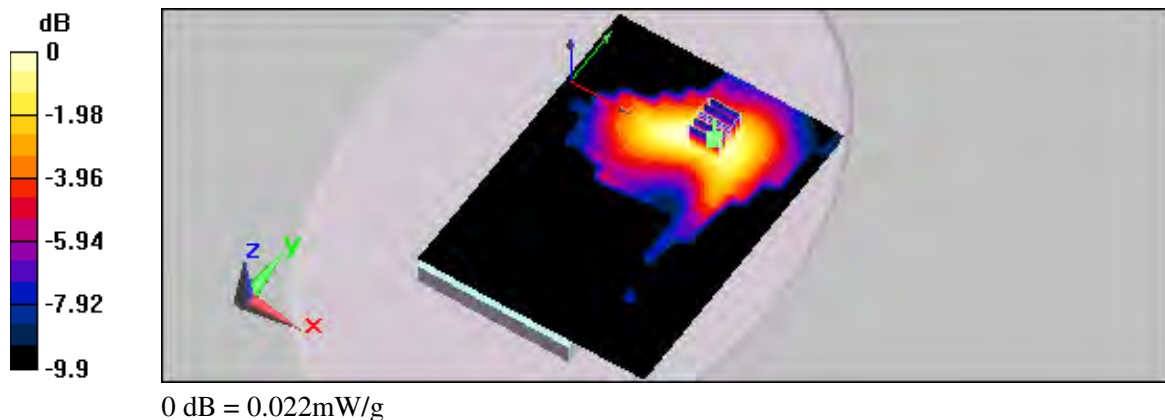
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 0 V/m; Power Drift = 0 dB

Peak SAR (extrapolated) = 0.029 W/kg

**SAR(1 g) = 0.021 mW/g; SAR(10 g) = 0.015 mW/g**

Maximum value of SAR (measured) = 0.022 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/8/2008 2:57:41 PM

**Flat\_GSM850 GPRS CH251\_Open 90\_3Down1Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: GSM 850 GPRS(3Down, 1Up); Frequency: 848.8 MHz;Duty Cycle: 1:8.3  
Medium parameters used:  $f = 849$  MHz;  $\sigma = 0.982$  mho/m;  $\epsilon_r = 54.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.037 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

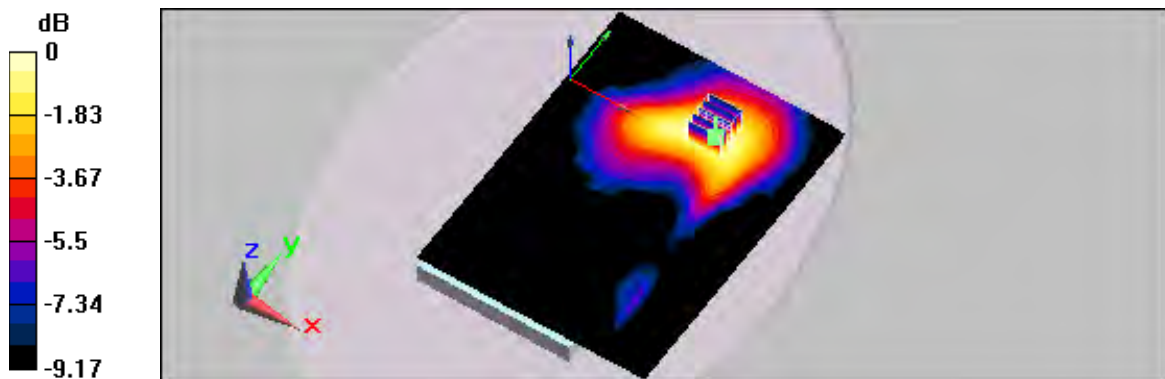
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.116 V/m; Power Drift = -0.137 dB

Peak SAR (extrapolated) = 0.047 W/kg

**SAR(1 g) = 0.035 mW/g; SAR(10 g) = 0.025 mW/g**

Maximum value of SAR (measured) = 0.037 mW/g



0 dB = 0.037mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/8/2008 5:27:28 PM

### Flat\_GSM850 EGPRS CH251\_Open 90\_3Down1Up\_Bottom of the Base\_ with 0mm Gap

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: GSM 850 EGPRS (3Down, 1Up); Frequency: 848.8 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 849$  MHz;  $\sigma = 0.982$  mho/m;  $\epsilon_r = 54.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

#### Flat/Area Scan (151x201x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.011 mW/g

#### Flat/Zoom Scan (5x5x7)/Cube 0:

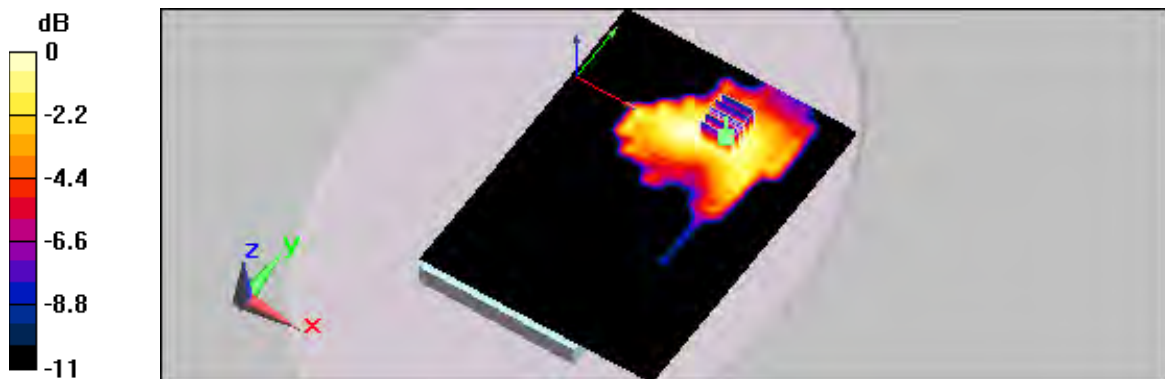
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0 V/m; Power Drift = 0 dB

Peak SAR (extrapolated) = 0.015 W/kg

**SAR(1 g) = 0.010 mW/g; SAR(10 g) = 0.00724 mW/g**

Maximum value of SAR (measured) = 0.011 mW/g



0 dB = 0.011mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 1:52:00 PM

**Flat\_PCS GPRS CH512\_Open 90\_3Down2Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: PCS GPRS(3Down,2Up); Frequency: 1850.2 MHz;Duty Cycle: 1:4.2  
Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$

kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.104 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

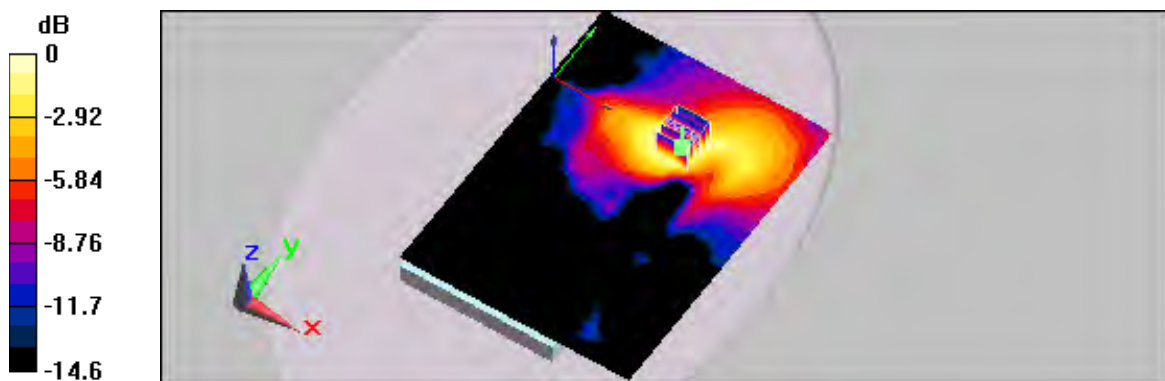
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.300 V/m; Power Drift = -0.049 dB

Peak SAR (extrapolated) = 0.153 W/kg

**SAR(1 g) = 0.100 mW/g; SAR(10 g) = 0.063 mW/g**

Maximum value of SAR (measured) = 0.106 mW/g



0 dB = 0.106mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 6:26:30 PM

**Flat\_PCS EGPRS CH512\_Open 90\_3Down2Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: PCS EGPRS (3Down, 2Up); Frequency: 1850.2 MHz; Duty Cycle: 1:4.2  
Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$

kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.043 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

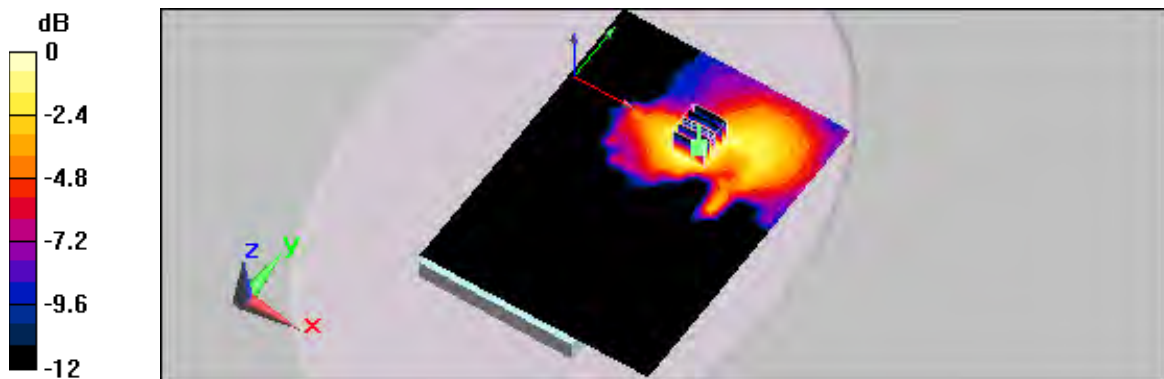
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.341 V/m; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 0.062 W/kg

**SAR(1 g) = 0.040 mW/g; SAR(10 g) = 0.025 mW/g**

Maximum value of SAR (measured) = 0.043 mW/g



0 dB = 0.043mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 5:11:17 PM

**Flat\_PCS GPRS CH512\_Open 90\_3Down1Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: PCS GPRS(3Down,1Up); Frequency: 1850.2 MHz;Duty Cycle: 1:8.3  
Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$

kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.058 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

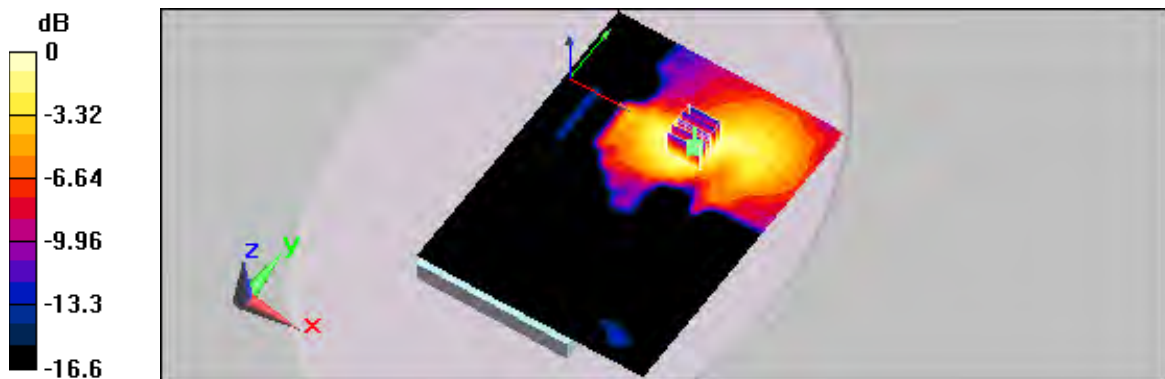
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.301 V/m; Power Drift = 0.176 dB

Peak SAR (extrapolated) = 0.081 W/kg

**SAR(1 g) = 0.052 mW/g; SAR(10 g) = 0.033 mW/g**

Maximum value of SAR (measured) = 0.056 mW/g



0 dB = 0.056mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 8:13:45 PM

**Flat\_PCS EGPRS CH512\_Open 90\_3Down1Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: PCS EGPRS (3Down, 1Up); Frequency: 1850.2 MHz; Duty Cycle: 1:8.3  
Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$

kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.023 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

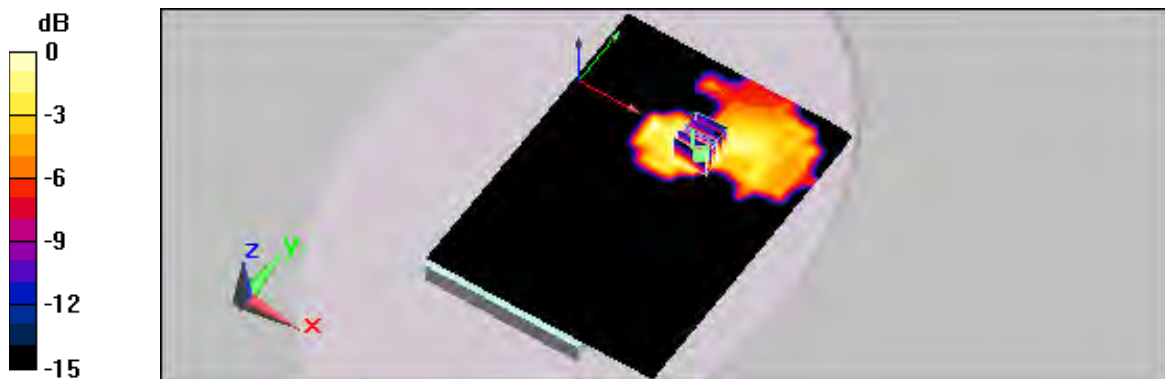
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0 V/m; Power Drift = 0 dB

Peak SAR (extrapolated) = 0.032 W/kg

**SAR(1 g) = 0.021 mW/g; SAR(10 g) = 0.013 mW/g**

Maximum value of SAR (measured) = 0.022 mW/g



0 dB = 0.022mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 3:16:24 PM

**Flat\_PCS GPRS CH661\_Open 90\_3Down2Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: PCS GPRS(3Down,2Up); Frequency: 1880 MHz;Duty Cycle: 1:4.2

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.49$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.101 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

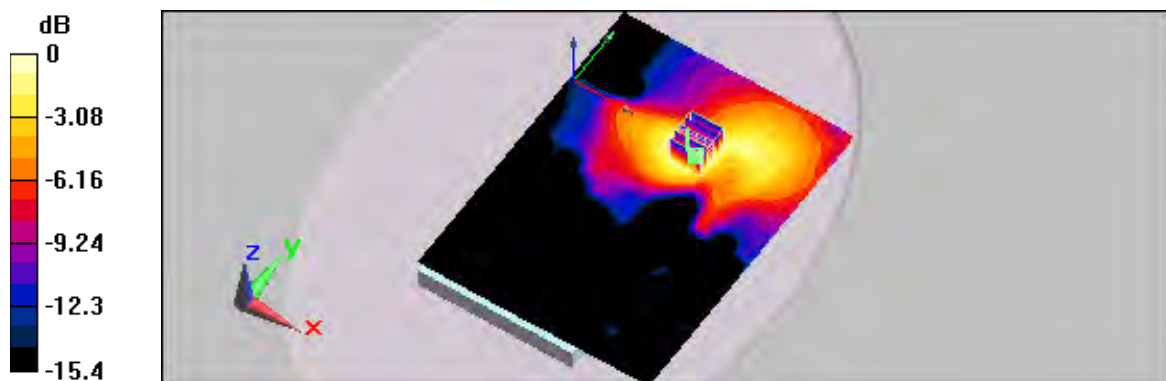
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.476 V/m; Power Drift = 0.115 dB

Peak SAR (extrapolated) = 0.148 W/kg

**SAR(1 g) = 0.094 mW/g; SAR(10 g) = 0.058 mW/g**

Maximum value of SAR (measured) = 0.106 mW/g



0 dB = 0.106mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 4:14:34 PM

**Flat\_PCS GPRS CH810\_Open 90\_3Down2Up\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: PCS GPRS(3Down,2Up); Frequency: 1909.8 MHz;Duty Cycle: 1:4.2

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 51.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

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

**Flat/Zoom Scan (5x5x7)/Cube 0:**

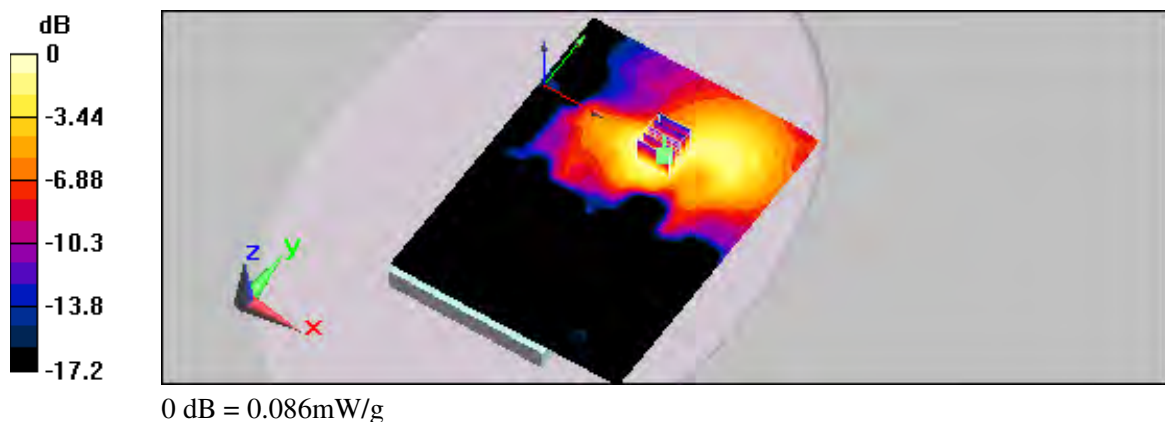
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.691 V/m; Power Drift = 0.071 dB

Peak SAR (extrapolated) = 0.123 W/kg

**SAR(1 g) = 0.079 mW/g; SAR(10 g) = 0.049 mW/g**

Maximum value of SAR (measured) = 0.086 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/5/2008 2:49:17 PM

### **Flat\_WCDMA Band V CH4132\_Open 90\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 826.4$  MHz;  $\sigma = 0.956$  mho/m;  $\epsilon_r = 54.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

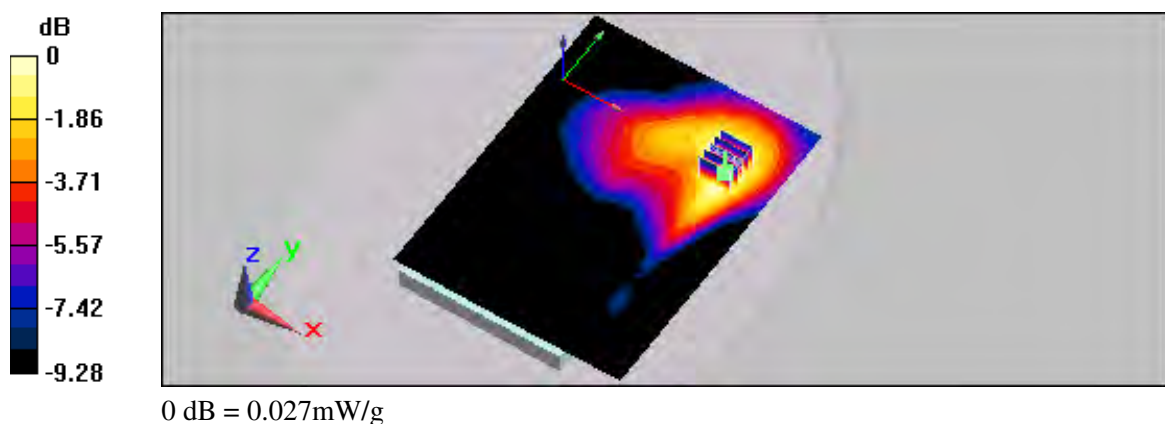
- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

#### **Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.028 mW/g

#### **Flat/Zoom Scan (5x5x7)/Cube 0:**

Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 0.733 V/m; Power Drift = 0.139 dB  
Peak SAR (extrapolated) = 0.035 W/kg  
**SAR(1 g) = 0.025 mW/g; SAR(10 g) = 0.017 mW/g**  
Maximum value of SAR (measured) = 0.027 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/5/2008 3:44:21 PM

**Flat\_WCDMA Band V CH4183\_Open 90\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: WCDMA Band V; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.968$  mho/m;  $\epsilon_r = 54.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

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

**Flat/Zoom Scan (5x5x7)/Cube 0:**

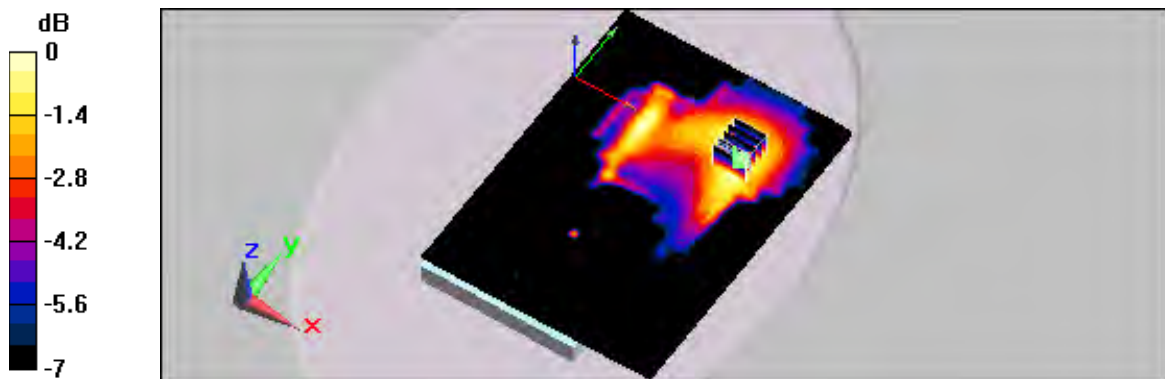
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.19 V/m; Power Drift = 0.097 dB

Peak SAR (extrapolated) = 0.047 W/kg

**SAR(1 g) = 0.034 mW/g; SAR(10 g) = 0.024 mW/g**

Maximum value of SAR (measured) = 0.036 mW/g



0 dB = 0.036mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/8/2008 10:45:05 PM

**Flat\_HSDPA Band V CH4183\_Open 90\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: WCDMA HSDPA Band V; Frequency: 836.6 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.968$  mho/m;  $\epsilon_r = 54.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.032 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

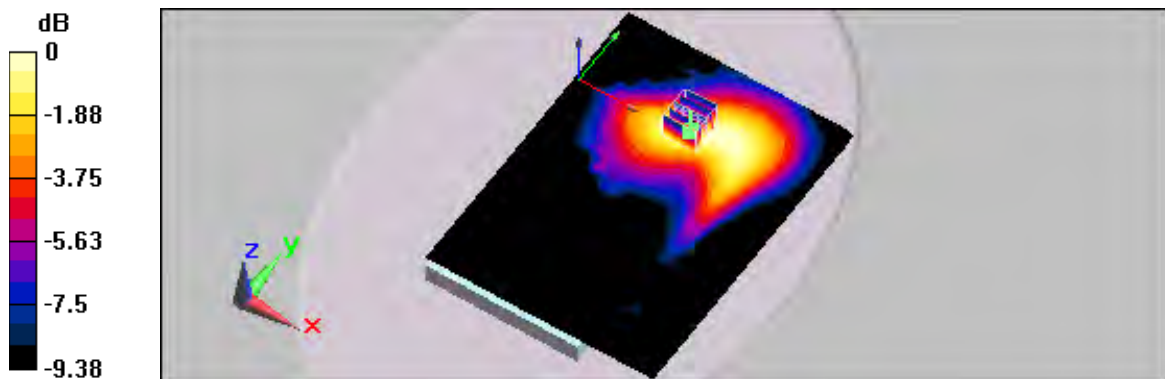
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.755 V/m; Power Drift = 0.196 dB

Peak SAR (extrapolated) = 0.041 W/kg

**SAR(1 g) = 0.031 mW/g; SAR(10 g) = 0.022 mW/g**

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



0 dB = 0.033mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/5/2008 4:30:31 PM

### Flat\_WCDMA Band V CH4233\_Open 90\_Bottom of the Base\_ with 0mm Gap

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: WCDMA Band V; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 847$  MHz;  $\sigma = 0.979$  mho/m;  $\epsilon_r = 54.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(6, 6, 6); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

#### Flat/Area Scan (151x201x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.032 mW/g

#### Flat/Zoom Scan (5x5x7)/Cube 0:

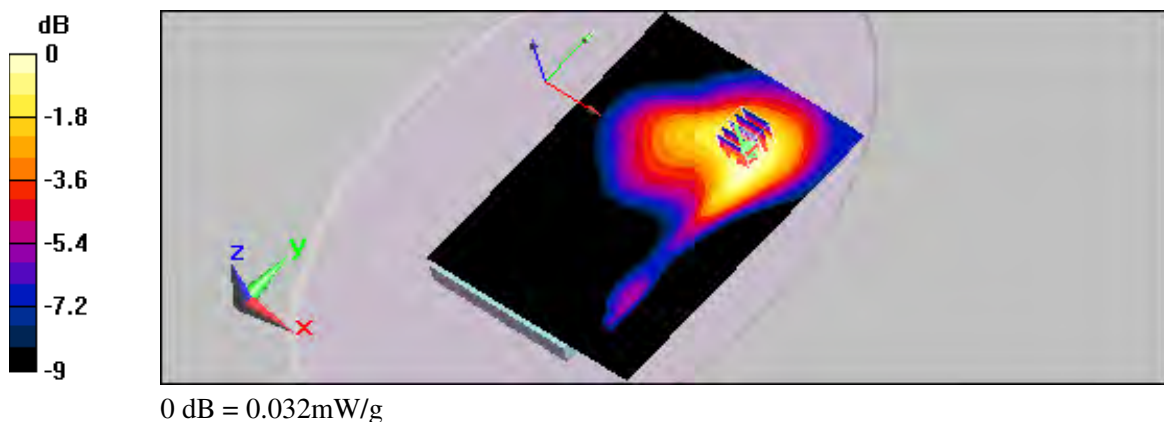
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.24 V/m; Power Drift = 0.180 dB

Peak SAR (extrapolated) = 0.040 W/kg

**SAR(1 g) = 0.030 mW/g; SAR(10 g) = 0.022 mW/g**

Maximum value of SAR (measured) = 0.032 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 8:12:00 AM

**Flat\_WCDMA Band II CH9262\_Open 90\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$

kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

**Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.129 mW/g

**Flat/Zoom Scan (5x5x7)/Cube 0:**

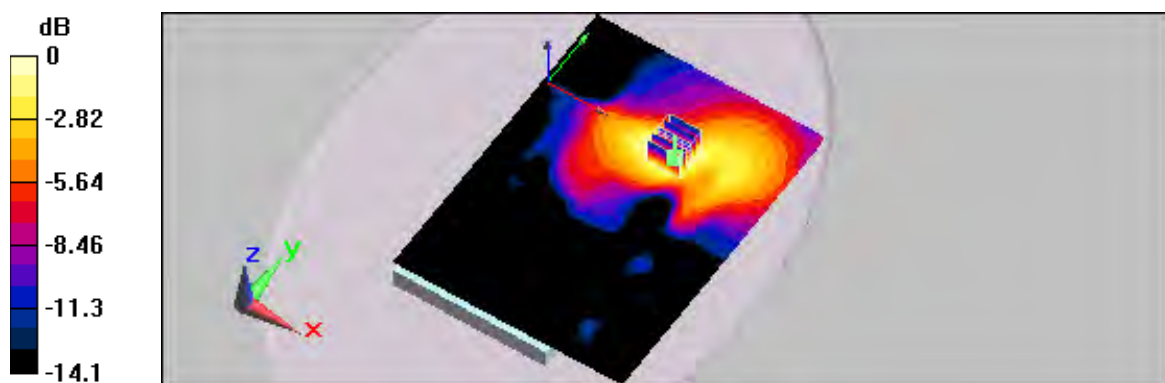
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.17 V/m; Power Drift = 0.105 dB

Peak SAR (extrapolated) = 0.194 W/kg

**SAR(1 g) = 0.123 mW/g; SAR(10 g) = 0.077 mW/g**

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



0 dB = 0.134mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 12:03:00 PM

### Flat\_HSDPA Band II CH9262\_Open 90\_Bottom of the Base\_ with 0mm Gap

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: WCDMA HSDPA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$

kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

#### Flat/Area Scan (151x201x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.112 mW/g

#### Flat/Zoom Scan (5x5x7)/Cube 0:

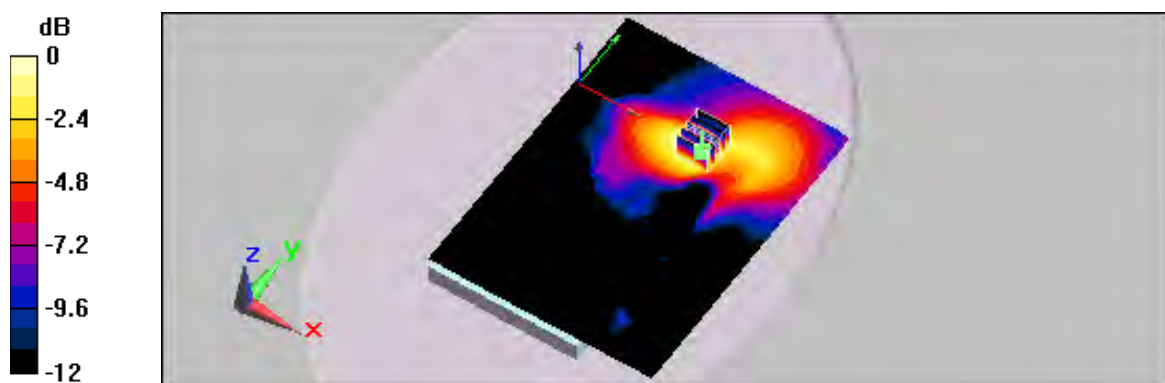
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.540 V/m; Power Drift = 0.165 dB

Peak SAR (extrapolated) = 0.169 W/kg

**SAR(1 g) = 0.107 mW/g; SAR(10 g) = 0.067 mW/g**

Maximum value of SAR (measured) = 0.117 mW/g



0 dB = 0.117mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 8:29:23 AM

### **Flat\_WCDMA Band II CH9400\_Open 90\_Bottom of the Base\_ with 0mm Gap**

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: WCDMA Band II; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.49$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

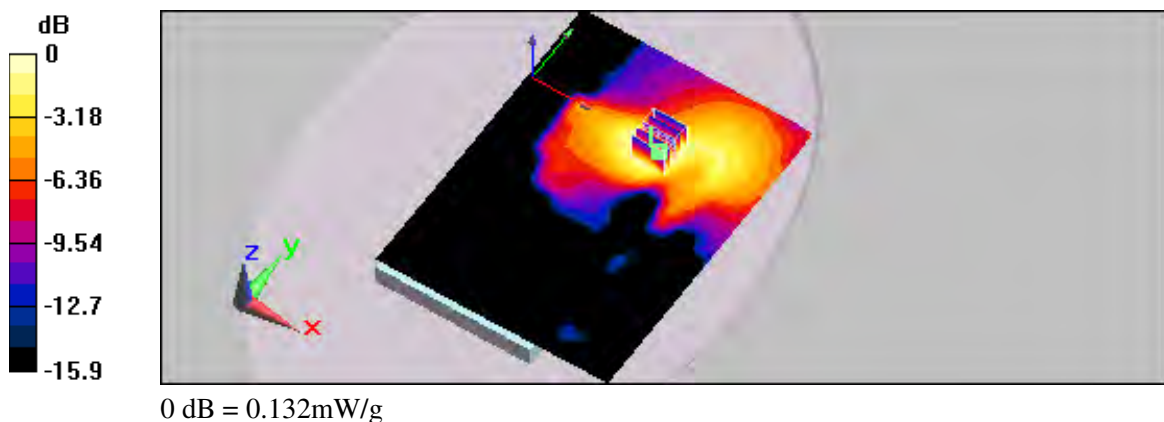
- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

#### **Flat/Area Scan (151x201x1):**

Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.128 mW/g

#### **Flat/Zoom Scan (5x5x7)/Cube 0:**

Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 0.601 V/m; Power Drift = 0.103 dB  
Peak SAR (extrapolated) = 0.189 W/kg  
**SAR(1 g) = 0.120 mW/g; SAR(10 g) = 0.073 mW/g**  
Maximum value of SAR (measured) = 0.132 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/7/2008 9:48:05 AM

### Flat\_WCDMA Band II CH9538\_Open 90\_Bottom of the Base\_ with 0mm Gap

**DUT: ZG5; Type: Notebook PC; FCC ID: HLZZG53GQ**

Communication System: WCDMA Band II; Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1908$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 51.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1036
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

#### Flat/Area Scan (151x201x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.103 mW/g

#### Flat/Zoom Scan (5x5x7)/Cube 0:

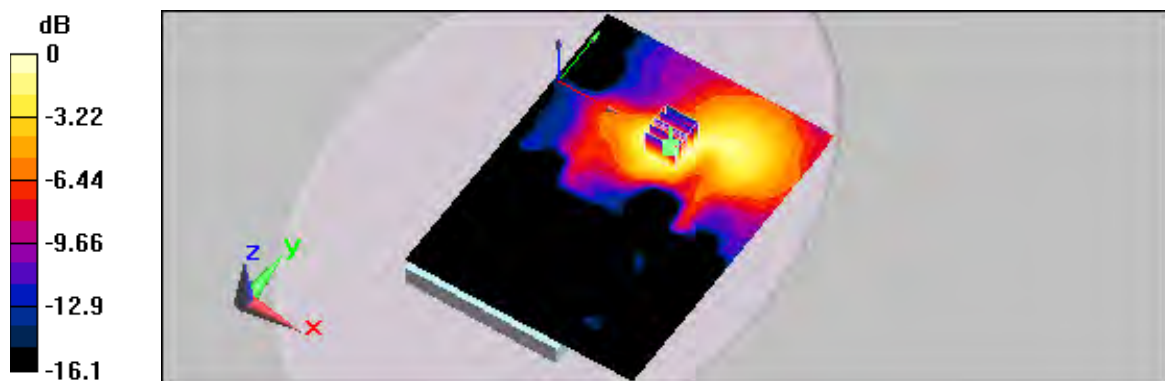
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.515 V/m; Power Drift = 0.059 dB

Peak SAR (extrapolated) = 0.160 W/kg

**SAR(1 g) = 0.101 mW/g; SAR(10 g) = 0.062 mW/g**

Maximum value of SAR (measured) = 0.111 mW/g



0 dB = 0.111mW/g



## ***Appendix C - Calibration***

All of the instruments Calibration information are listed below.

- Dipole \_ D900V2 SN:1d053 Calibration No.D900V2-1d053\_ Dec07
- Dipole \_ D1950V2 SN: 1117 Calibration No.D1950V1117\_ Dec07
- Probe \_ ES3DV3 SN:3150 Calibration No.ES3-3150\_Jan08
- DAE \_ DAE4 SN:779 Calibration No.DAE4-779\_Nov07