

# A Test Lab Techno Corp.

Changan Lab : No. 140 -1, Changan Street, Bade City, Taoyuan County, Taiwan R.O.C.

Tel : 886-3-271-0188 / Fax : 886-3-271-0190



## SAR EVALUATION REPORT

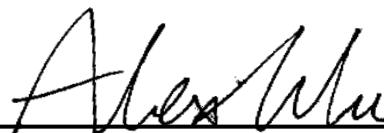
Test Report No.	:	1002FS12
Applicant	:	HTC Corporation
Product Type	:	Smartphone
IMEI No.	:	358986030016347
FCC ID	:	NM8PC70110
Trade Name	:	HTC
Model Number	:	PC70110
Dates of Test	:	Jan. 29, 2010 ~ Feb. 05, 2010
Test Environment	:	Ambient Temperature : 22 ± 2 ° C Relative Humidity : 40 - 70 %
Test Specification	:	Standard C95.1-2005 IEEE Std. 1528-2003 2.1093;FCC/OET Bulletin 65 Supplement C [July 2001] FCC KDB 648474 D01 SAR Handsets Multi Xmitter and Ant FCC KDB 648474 D02 SAR Polcy Handsts Multi Xmitter Ant FCC KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE
Max. SAR	:	1.130 W/kg Head SAR 0.949 W/kg Body SAR
Test Lab Location	:	Chang-an Lab



1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
3. The measurement report has to be written approval of A Test Lab Techno Corp. It may only be reproduced or published in full. This report shall not be reproduced except in full, without the written approval of A Test Lab Techno Corp. The test results in the report only apply to the tested sample.



**Sam Chuang** 20100401  
Approve Signer



**Alex Wu** 20100401  
Testing Engineer



# Contents

1. Description of Equipment under Test (EUT).....	3
2. Introduction.....	4
3. SAR Definition .....	4
4. SAR Measurement Setup.....	5
5. System Components .....	7
5.1 DASY5 E-Field Probe System.....	7
5.2 Data Acquisition Electronic (DAE) System .....	10
5.3 Robot .....	10
5.4 Measurement Server .....	10
5.5 Device Holder for Transmitters.....	11
5.6 Phantom - SAM v4.0 .....	11
5.7 Data Storage and Evaluation.....	12
6. Test Equipment List .....	15
7. Tissue Simulating Liquids.....	16
7.1 Ingredients .....	17
7.2 Recipes.....	17
7.3 Liquid Confirmation.....	20
8. Measurement Process .....	22
8.1 Device and Test Conditions .....	22
8.2 Simultaneous Transmitting Evaluate .....	26
8.3 System Performance Check.....	27
8.4 Dosimetric Assessment Setup.....	32
8.5 Spatial Peak SAR Evaluation .....	34
9. Measurement Uncertainty .....	35
10. SAR Test Results Summary .....	37
10.1 GSM 850 - Head SAR .....	37
10.2 PCS 1900 - Head SAR .....	38
10.3 WCDMA (RMC 12.2K) Band II - Head SAR .....	39
10.4 WCDMA (RMC 12.2K) Band V - Head SAR.....	40
10.5 GSM / GPRS 850 - Body SAR (EUT 15 mm separation to Phantom) .....	41
10.6 PCS / GPRS 1900 - Body SAR (EUT 15 mm separation to Phantom) .....	42
10.7 WCDMA (RMC 12.2K)/HSDPA Band II - Body SAR (EUT 15 mm separation to Phantom) .....	43
10.8 WCDMA (RMC 12.2K)/HSDPA Band V - Body SAR (EUT 15 mm separation to Phantom) .....	44
10.9 IEEE 802.11b - Body SAR (EUT 15 mm separation to Phantom).....	45
10.10 Std. C95.1-2005 RF Exposure Limit.....	46
11. Conclusion.....	47
12. References .....	47
Appendix A - System Performance Check .....	48
Appendix B - SAR Measurement Data .....	53
Appendix C - Calibration .....	99



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

Applicant	:	HTC Corporation
Applicant Address	:	No. 23, Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan
Manufacturer	:	HTC Corporation
Manufacturer Address	:	No. 23, Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan
Product Type	:	Smartphone
IMEI No.	:	358986030016347
FCC ID	:	NM8PC70110
Trade Name	:	HTC
Model Number	:	PC70110
Tx Frequency	:	824.2 - 848.8 MHz GSM/GPRS/EGPRS 850 1850.2 - 1909.8 MHz PCS/GPRS/EGPRS 1900 1852.4 - 1907.6 MHz WCDMA (RMC 12.2K) /HSDPA Band II 826.4 - 846.4 MHz WCDMA (RMC 12.2K) /HSDPA Band V 2412 - 2462 MHz IEEE 802.11b/802.11g 2402 - 2480 MHz Bluetooth
Device Class	:	GPRS/EGPRS Class B
Multi-slot Class	:	GPRS/EGPRS Class 10 (The maximum number of downlink is 4 and maximum number of uplink is 2, total timeslots is 5.)
RF Conducted Power (Time-Avg.)	:	0.362 W / 25.59 dBm GSM/GPRS/EGPRS 850 0.231 W / 23.63 dBm PCS/GPRS/EGPRS 1900 0.217 W / 23.37 dBm WCDMA /HSDPA Band II 0.234 W / 23.70 dBm WCDMA /HSDPA Band V 0.050 W / 17.01 dBm IEEE 802.11b/802.11g 0.000 W / -3.81 dBm Bluetooth
Max. SAR Measurement	:	1.130 W/kg Head SAR 0.949 W/kg Body SAR
Antenna Type	:	Planar Inverted-F Antenna (PIFA)
Antenna Gain	:	0.30 dBi GSM/GPRS/EGPRS 850 1.93 dBi PCS/GPRS/EGPRS 1900 1.91 dBi WCDMA/HSDPA Band II 0.29 dBi WCDMA/HSDPA Band V 0.80 dBi IEEE 802.11b/802.11g 0.80 dBi Bluetooth
Device Category	:	Portable
RF Exposure Environment	:	General Population / Uncontrolled
Battery Option	:	Standard (The battery has two types. The batteries are same specifications, it only differs from manufacturer.)
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 C95.1-2005 and had been tested in accordance with the measurement procedures specified in IEEE Std. 1528-2003.



## 2. Introduction

The A Test Lab Techno Corp. has performed measurements of the maximum potential exposure to the user of **HTC Corporation Trade Name : HTC Model(s) : PC70110**. The test procedures, as described in American National Standards, Institute C95.1 - 2005 [ 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 25cm 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.

## 3. 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 2).

### SAR Mathematical Equation

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

*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 (kg/m<sup>3</sup>)

$E$  = 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 ]

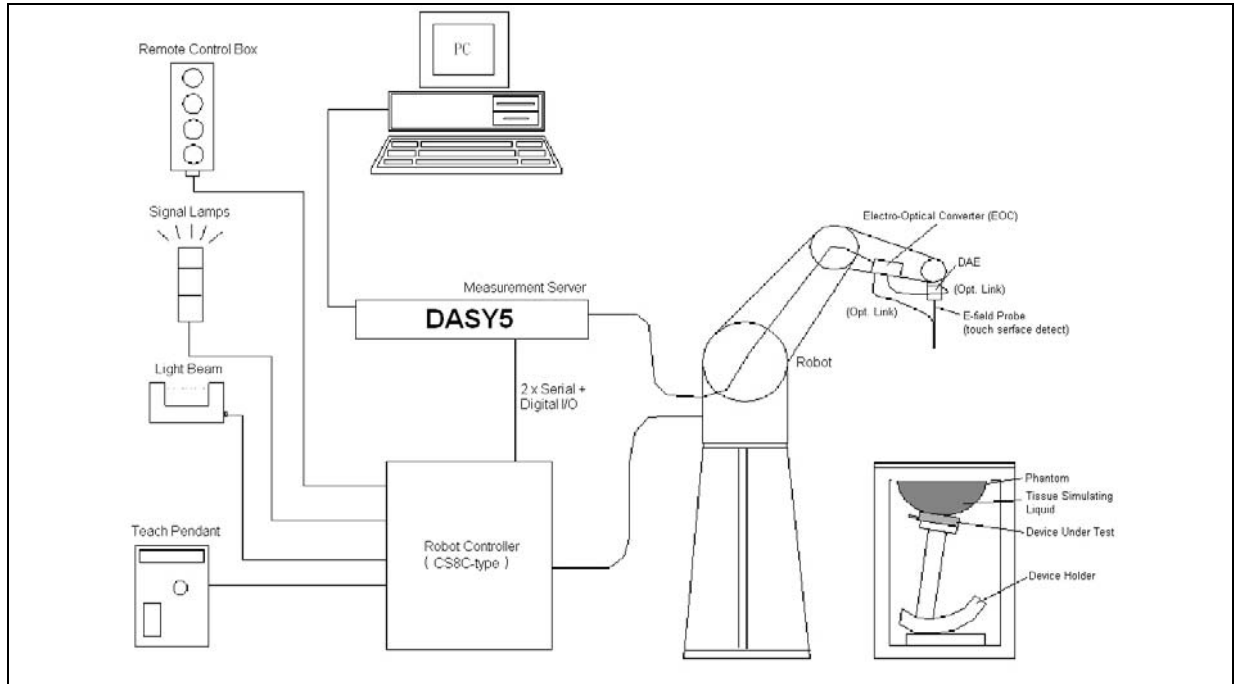


#### **4. SAR Measurement Setup**

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.

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 ] .



**Figure 2. SAR Lab Test Measurement Setup**



## **5. System Components**

### **5.1 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.

### 5.1.1 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 835MHz, 1750MHz, 1900MHz 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</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 3. E-field Probe



Figure 4. Probe setup on robot





### 5.1.2 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 ( $\text{kg/m}^3$ ).



## 5.2 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 125) & SEMCAD X Version 13.4 Build 125  
Connecting Lines : Optical downlink for data and status info  
Optical uplink for commands and clock

## 5.3 Robot

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

## 5.4 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

## 5.5 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.

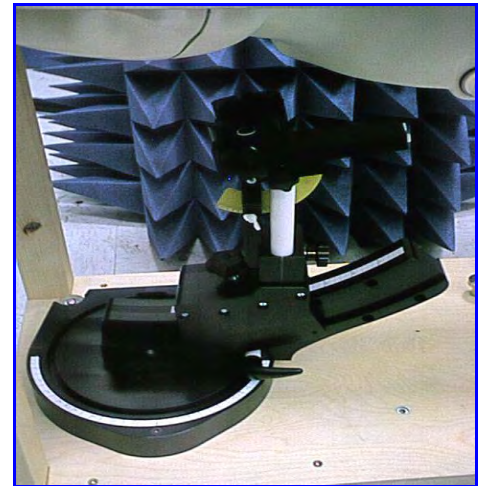


Figure 5. Device Holder

## 5.6 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.

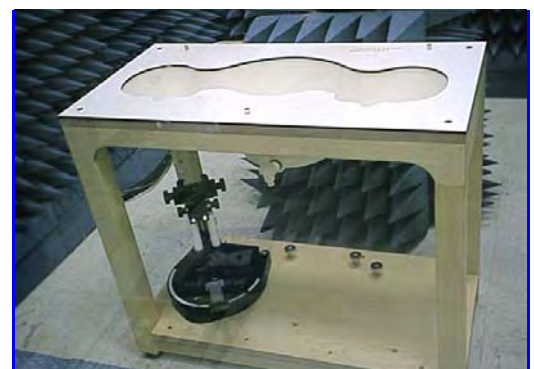


Figure 6. SAM Twin Phantom

<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



## 5.7 Data Storage and Evaluation

### 5.7.1 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 .DA4. The post processing 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.

### 5.7.2 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	dcpi
<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  
 $H_i$  = 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<sup>3</sup>

**\* 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<sup>2</sup>  
 $E_{tot}$  = total electric field strength in V/m  
 $H_{tot}$  = total magnetic field strength in A/m



## 6. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Last Calibration	Remark
SPEAG	Dosimetric E-Field Probe	ES3DV3	3071	06/22/2009	(1)
SPEAG	835MHz System Validation Kit	D835V2	4d082	07/13/2009	(1)
SPEAG	1900MHz System Validation Kit	D1900V2	5d111	07/14/2009	(1)
SPEAG	2450MHz System Validation Kit	D2450V2	712	02/11/2009	(1)
SPEAG	Data Acquisition Electronics	DAE4	905	06/24/2009	(1)
SPEAG	Device Holder	N/A	N/A	NCR	-----
SPEAG	Phantom	SAM V4.0	TP-1150	NCR	-----
SPEAG	Robot	Staubli TX90XL	F07/564ZA1/C/01	NCR	-----
SPEAG	Software	DASY5 V5.0 Build 125	N/A	NCR	-----
SPEAG	Software	SEMCAD X V13.4 Build 125	N/A	NCR	-----
SPEAG	Measurement Server	SE UMS 011 AA	1025	NCR	-----
R&S	Wireless Communication Test Set	CMU200	109369	07/29/2009	(2)
Agilent	Wireless Communication Test Set	E5515C	GB47020167	05/25/2009	(2)
Agilent	ENA Series Network Analyzer	E5071B	MY42402996	11/04/2009	(1)
Agilent	Dielectric Probe Kit	85070C	US99360094	NCR	-----
R&S	Power Sensor	NRP-Z22	100179	05/17/2009	(1)
Agilent	Signal Generator	E8257D	MY44320425	NCR	-----
Agilent	Dual Directional Coupler	778D	50334	NCR	-----
Mini-Circuits	Power Amplifier	ZHL-42W-SMA	D111103#5	NCR	-----
Mini-Circuits	Power Amplifier	ZVE-8G-SMA	D042005 671800514	NCR	-----

Remark: <sup>(1)</sup> Calibration period 1 year. <sup>(2)</sup> Calibration period 2 years.

NOTE: N.C.R. = No Calibration Request.

**Table 2. Test Equipment List**



## 7. 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 E5071B 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 (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ (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**





## 7.1 Ingredients

The following ingredients are used:

- Water: deionized water (pure H<sub>2</sub>O), resistivity  $\geq 16 \text{ M } \Omega$  -as basis for the liquid
- Sugar: refined white sugar (typically 99.7 % sucrose, available as crystal sugar in food shops) to reduce relative permittivity
- Salt: pure NaCl -to increase conductivity
- Cellulose: Hydroxyethyl-cellulose, medium viscosity (75-125 mPa.s, 2% in water, 20° C), CAS # 54290 -to increase viscosity and to keep sugar in solution.
- Preservative: Preventol D-7 Bayer AG, D-51368 Leverkusen, CAS # 55965-84-9 -to prevent the spread of bacteria and molds
- DGBE: Diethylenglycol-monobuthyl ether (DGBE), Fluka Chemie GmbH, CAS # 112-34-5 -to reduce relative permittivity

## 7.2 Recipes

The following tables give the recipes for tissue simulating liquids to be used in different frequency bands.

Note: The goal dielectric parameters (at 22 °C) must be achieved within a tolerance of  $\pm 5\%$  for  $\epsilon$  and  $\pm 5\%$  for  $\sigma$ .

Liquid type	HSL 900-B	
Ingredient	Weight (g)	Weight (%)
Water	532.63	40.29
Sugar	765.49	57.90
Cellulose	3.20	0.24
Salt	18.29	1.38
Preventol	2.40	0.18
Total amount	1,322.00	100.00
Goal dielectric parameters		
Frequency [MHz]	835	900
Relative Permittivity	41.5	41.5
Conductivity [S/m]	0.90	0.97



Liquid type	MSL 900-B	
Ingredient	Weight (g)	Weight (%)
Water	633.91	50.75
Sugar	602.12	50.75
Cellulose	-	0.00
Salt	11.76	0.94
Preventol	1.20	0.10
Total amount	1,249.00	100.00
<b>Goal dielectric parameters</b>		
Frequency [MHz]	835	900
Relative Permittivity	55.2	55.0
Conductivity [S/m]	0.97	1.05

Liquid type	HSL 1800-F	
Ingredient	Weight (g)	Weight (%)
Water	552.42	55.24
DGBE	444.52	44.45
Salt	3.06	0.31
Total amount	1,000.00	100.00
<b>Goal dielectric parameters</b>		
Frequency [MHz]	1800	1900
Relative Permittivity	40.0	40.0
Conductivity [S/m]	1.40	1.40

Liquid type	MSL 1800-B	
Ingredient	Weight (g)	Weight (%)
Water	701.66	70.17
DGBE	294.42	29.44
Salt	3.92	0.39
Total amount	1,000.00	100.00
<b>Goal dielectric parameters</b>		
Frequency [MHz]	1800	1900
Relative Permittivity	53.3	53.3
Conductivity [S/m]	1.52	1.52



Liquid type	HSL 1950-B	
Ingredient	Weight (g)	Weight (%)
Water	554.12	55.41
DGBE	445.08	44.51
Salt	0.80	0.08
Total amount	1,000.00	100.00
Goal dielectric parameters		
Frequency [MHz]	1950	2000
Relative Permittivity	40.0	40.0
Conductivity [S/m]	1.40	1.40

Liquid type	MSL 1950-A	
Ingredient	Weight (g)	Weight (%)
Water	697.94	69.79
DGBE	300.03	30.00
Salt	2.03	0.20
Total amount	1,000.00	100.00
Goal dielectric parameters		
Frequency [MHz]	1950	2000
Relative Permittivity	53.3	53.3
Conductivity [S/m]	1.52	1.52

Liquid type	MSL 2450-B	
Ingredient	Weight (g)	Weight (%)
Water	686.35	68.64
DGBE	313.65	31.37
Salt	-	0.00
Total amount	1,000.00	100.00
Goal dielectric parameters		
Frequency [MHz]	2450	
Relative Permittivity	52.7	
Conductivity [S/m]	1.95	



### 7.3 Liquid Confirmation

#### 7.3.1 Parameters

Liquid Verify (Ambient Temperature : 22 ± 2 °C ; Relative Humidity : 40 -70%)								
Liquid Type	Frequency	Temp (°C)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)	Measured Date
835MHz Head	820MHz	22.0	$\epsilon_r$	41.5	41.8	<b>0.72</b>	± 5	02/04/2010
			$\sigma$	0.90	0.87	<b>-3.33</b>	± 5	
	835MHz	22.0	$\epsilon_r$	41.5	40.7	<b>-1.93</b>	± 5	02/04/2010
			$\sigma$	0.90	0.89	<b>-1.11</b>	± 5	
	850MHz	22.0	$\epsilon_r$	41.5	40.6	<b>-2.17</b>	± 5	02/04/2010
			$\sigma$	0.90	0.90	<b>0.00</b>	± 5	
1900MHz Head	1850MHz	22.0	$\epsilon_r$	40.0	38.5	<b>-3.75</b>	± 5	01/26/2010
			$\sigma$	1.40	1.34	<b>-4.29</b>	± 5	
	1900MHz	22.0	$\epsilon_r$	40.0	38.4	<b>-4.00</b>	± 5	01/26/2010
			$\sigma$	1.40	1.39	<b>-0.71</b>	± 5	
	1950MHz	22.0	$\epsilon_r$	40.0	38.2	<b>-4.50</b>	± 5	01/26/2010
			$\sigma$	1.40	1.44	<b>2.86</b>	± 5	
835MHz Body	820MHz	22.0	$\epsilon_r$	55.2	53.7	-2.72	± 5	01/29/2010
			$\sigma$	0.97	0.98	1.03	± 5	
	835MHz	22.0	$\epsilon_r$	55.2	53.7	-2.72	± 5	01/29/2010
			$\sigma$	0.97	0.99	2.06	± 5	
	850MHz	22.0	$\epsilon_r$	55.2	53.5	-3.08	± 5	01/29/2010
			$\sigma$	0.97	1.01	4.12	± 5	
1900MHz Body	1850MHz	22.0	$\epsilon_r$	53.3	51.7	-3.00	± 5	02/03/2010
			$\sigma$	1.52	1.45	-4.61	± 5	
	1900MHz	22.0	$\epsilon_r$	53.3	51.6	-3.19	± 5	02/03/2010
			$\sigma$	1.52	1.50	-1.32	± 5	
	1950MHz	22.0	$\epsilon_r$	53.3	51.4	-3.56	± 5	02/03/2010
			$\sigma$	1.52	1.55	1.97	± 5	
2450MHz Body	2400MHz	22.0	$\epsilon_r$	52.7	50.5	-4.17	± 5	02/05/2010
			$\sigma$	1.95	1.86	-4.62	± 5	
	2450MHz	22.0	$\epsilon_r$	52.7	50.2	-4.74	± 5	02/05/2010
			$\sigma$	1.95	1.92	-1.54	± 5	
	2500MHz	22.0	$\epsilon_r$	52.7	50.2	-4.74	± 5	02/05/2010
			$\sigma$	1.95	1.97	1.03	± 5	

**Table 4. Measured Tissue dielectric parameters for head and body phantoms - 1**

### 7.3.2 Liquid Depth

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

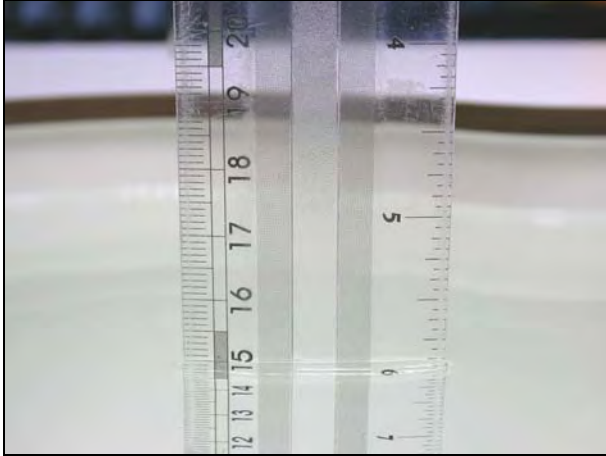


Figure 7. Head-Tissue-Simulating-Liquid



Figure 8. Body-Tissue-Simulating-Liquid



## 8. Measurement Process

### 8.1 Device and Test Conditions

The Test Device was provided by **HTC Corporation** for this evaluation. The spatial peak SAR values were assessed for the lowest, middle and highest channels defined by **GSM 850** (#128=824.2MHz, #190=836.6MHz, #251=848.8MHz), **PCS 1900** (#512=1850.2MHz, #661=1880.0MHz, #810=1909.8MHz), **WCDMA (RMC 12.2K) Band II** (#9262=1852.4MHz, #9400=1880.0MHz, #9538=1907.6MHz) systems, **WCDMA (RMC 12.2K) Band V** (#4132=826.4MHz, #4183=836.6MHz, #4233=846.4MHz) systems, **IEEE 802.11b / 802.11g** (#1=2412MHz, #6=2437MHz, #11=2462MHz) systems, **Bluetooth** (#0=2402MHz, #39=2441MHz, #78=2480MHz) systems..

#### HSDPA Date 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	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	$\beta_{hs}^{(1,2)}$	CM (dB) <sup>(3)</sup>	MRP (dB) <sup>(3)</sup>
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 <sup>(4)</sup>	15/15 <sup>(4)</sup>	64	12/15 <sup>(4)</sup>	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

#### Note

- $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
- For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude(EVM) with HS-DPCCH test in clause 5.13.1A and HSDPA EVM with phase discontinuity in clause 5.13.1AA,  $\Delta_{ACK}$  and  $\Delta_{NACK} = 30/15$  with  $\beta_{hs} = 30/15 * \beta_c$  and  $\Delta_{CQI} = 24/15$  with  $\beta_{hs} = 24/15 * \beta_c$
- CM = 1 for  $\beta_c/\beta_d = 12/15$ ,  $\beta_{hs}/\beta_c = 24/15$ . For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.
- 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**



Usage:	Operates with a normal mode by client (GSM/PCS/WCDMA (RMC 12.2K)) Operates with a test mode by client (802.11b/802.11g)
Simulating human Head/Body:	Head & Body
EUT Battery:	Fully-charged with Li-ion batteries.
Comment:	The SAR test mode is chosen by the max conducted power.

Band	Mode	CH	Frequency (MHz)	Average Conducted power (dBm)		Burst Averaged Conducted Power (dBm)	Worst
				before	After		
GSM850	-----	Lowest	824.2	24.24	24.22	33.43	<input type="checkbox"/>
		Middle	836.6	24.18	24.15	33.37	<input type="checkbox"/>
		Highest	848.8	24.09	24.06	33.28	<input type="checkbox"/>
GPRS 850	4Down1Up	Lowest	824.2	24.26	24.23	33.45	<input type="checkbox"/>
		Middle	836.6	24.22	24.21	33.41	<input type="checkbox"/>
		Highest	848.8	24.17	24.15	33.36	<input type="checkbox"/>
	3Down2Up	Lowest	824.2	25.59	25.56	31.82	<input checked="" type="checkbox"/>
		Middle	836.6	25.57	25.55	31.80	<input type="checkbox"/>
		Highest	848.8	25.50	25.49	31.73	<input type="checkbox"/>
EGPRS 850	4Down1Up	Lowest	824.2	17.21	17.18	26.40	<input type="checkbox"/>
		Middle	836.6	17.16	17.14	26.35	<input type="checkbox"/>
		Highest	848.8	17.11	17.09	26.30	<input type="checkbox"/>
	3Down2Up	Lowest	824.2	20.09	20.05	26.32	<input type="checkbox"/>
		Middle	836.6	20.07	20.04	26.30	<input type="checkbox"/>
		Highest	848.8	20.02	20.00	26.25	<input type="checkbox"/>
PCS1900	-----	Lowest	1850.2	21.06	21.03	30.25	<input type="checkbox"/>
		Middle	1880.0	21.30	21.27	30.49	<input type="checkbox"/>
		Highest	1909.8	21.13	21.11	30.32	<input type="checkbox"/>
GPRS 1900	4Down1Up	Lowest	1850.2	21.05	21.03	30.24	<input type="checkbox"/>
		Middle	1880.0	21.28	21.26	30.47	<input type="checkbox"/>
		Highest	1909.8	21.08	21.06	30.27	<input type="checkbox"/>
	3Down2Up	Lowest	1850.2	23.45	23.42	29.68	<input type="checkbox"/>
		Middle	1880.0	23.63	23.60	29.86	<input checked="" type="checkbox"/>
		Highest	1909.8	23.45	23.42	29.68	<input type="checkbox"/>
EGPRS 1900	4Down1Up	Lowest	1850.2	16.06	16.02	25.25	<input type="checkbox"/>
		Middle	1880.0	16.11	16.08	25.30	<input type="checkbox"/>
		Highest	1909.8	15.91	15.89	25.10	<input type="checkbox"/>
	3Down2Up	Lowest	1850.2	18.97	18.95	25.20	<input type="checkbox"/>
		Middle	1880.0	19.10	19.09	25.33	<input type="checkbox"/>
		Highest	1909.8	18.89	18.86	25.12	<input type="checkbox"/>



Band	Sub-Test	CH	Frequency (MHz)	Average Conducted power (dBm)		Worst
				before	After	
WCDMA (RMC 12.2K) Band II	---	Lowest	1852.4	23.37	23.35	■
		Middle	1880.0	23.13	23.12	□
		Highest	1907.6	23.32	23.29	□
HSDPA Band II	1	Lowest	1852.4	23.35	23.31	□
		Middle	1880.0	23.10	23.08	□
		Highest	1907.6	23.26	23.24	□
	2	Lowest	1852.4	23.34	23.31	□
		Middle	1880.0	23.10	23.08	□
		Highest	1907.6	23.21	23.19	□
	3	Lowest	1852.4	22.91	22.88	□
		Middle	1880.0	22.54	22.48	□
		Highest	1907.6	22.71	22.65	□
	4	Lowest	1852.4	22.84	22.80	□
		Middle	1880.0	22.68	22.63	□
		Highest	1907.6	22.78	22.72	□
WCDMA (RMC 12.2K) Band V	---	Lowest	826.4	23.70	23.68	■
		Middle	836.6	23.61	23.57	□
		Highest	846.4	23.60	23.59	□
HSDPA Band V	1	Lowest	826.4	23.63	23.57	□
		Middle	836.6	23.59	23.54	□
		Highest	846.4	23.60	23.56	□
	2	Lowest	826.4	23.54	23.50	□
		Middle	836.6	23.50	23.43	□
		Highest	846.4	23.53	23.48	□
	3	Lowest	826.4	23.12	23.07	□
		Middle	836.6	23.00	22.95	□
		Highest	846.4	23.10	23.06	□
	4	Lowest	826.4	23.13	23.04	□
		Middle	836.6	23.01	22.95	□
		Highest	846.4	23.10	23.04	□





Band	Data Rate	CH	Frequency (MHz)	Average Conducted power (dBm)		Worst
				before	After	
802.11b	1M	Lowest	2412	16.30	16.28	<input type="checkbox"/>
		Middle	2437	17.01	19.98	<input checked="" type="checkbox"/>
		Highest	2462	16.81	16.79	<input type="checkbox"/>
	2M	Lowest	2412	16.04	16.02	<input type="checkbox"/>
		Middle	2437	16.85	16.83	<input type="checkbox"/>
		Highest	2462	16.43	16.41	<input type="checkbox"/>
	5.5M	Lowest	2412	15.94	15.92	<input type="checkbox"/>
		Middle	2437	16.21	16.19	<input type="checkbox"/>
		Highest	2462	16.18	16.15	<input type="checkbox"/>
	11M	Lowest	2412	15.12	15.10	<input type="checkbox"/>
		Middle	2437	15.95	15.93	<input type="checkbox"/>
		Highest	2462	15.88	15.85	<input type="checkbox"/>
802.11g	6M	Lowest	2412	13.97	13.95	<input type="checkbox"/>
		Middle	2437	13.59	13.57	<input type="checkbox"/>
		Highest	2462	14.38	14.36	<input checked="" type="checkbox"/>
	9M	Lowest	2412	13.24	13.21	<input type="checkbox"/>
		Middle	2437	13.35	13.34	<input type="checkbox"/>
		Highest	2462	14.28	14.26	<input type="checkbox"/>
	12M	Lowest	2412	13.12	13.11	<input type="checkbox"/>
		Middle	2437	13.15	13.13	<input type="checkbox"/>
		Highest	2462	14.16	14.14	<input type="checkbox"/>
	18M	Lowest	2412	13.04	13.01	<input type="checkbox"/>
		Middle	2437	13.01	13.00	<input type="checkbox"/>
		Highest	2462	14.07	14.05	<input type="checkbox"/>
	24M	Lowest	2412	12.92	12.89	<input type="checkbox"/>
		Middle	2437	12.85	12.83	<input type="checkbox"/>
		Highest	2462	12.33	12.31	<input type="checkbox"/>
	36M	Lowest	2412	12.11	12.08	<input type="checkbox"/>
		Middle	2437	12.04	12.02	<input type="checkbox"/>
		Highest	2462	12.08	12.07	<input type="checkbox"/>
	48M	Lowest	2412	11.43	11.41	<input type="checkbox"/>
		Middle	2437	11.62	11.60	<input type="checkbox"/>
		Highest	2462	11.45	11.42	<input type="checkbox"/>
	54M	Lowest	2412	10.21	10.18	<input type="checkbox"/>
		Middle	2437	10.15	10.12	<input type="checkbox"/>
		Highest	2462	10.38	10.36	<input type="checkbox"/>
Bluetooth	Lowest	2402	-5.04	-5.02	<input type="checkbox"/>	
	Middle	2441	-3.81	-3.79	<input checked="" type="checkbox"/>	
	Highest	2480	-3.97	-3.95	<input type="checkbox"/>	



## 8.2 Simultaneous Transmitting Evaluate

### RF Conducted Power:

0.36 W	(25.59 dBm)	GSM/GPRS/EGPRS 850
0.23 W	(23.63 dBm)	PCS/GPRS/EGPRS 1900
0.22 W	(23.37 dBm)	WCDMA (RMC 12.2K) / HSDPA / HSUPA Band II
0.23 W	(23.70 dBm)	WCDMA (RMC 12.2K) / HSDPA / HSUPA Band V
0.05 W	(17.01 dBm)	IEEE 802.11b/802.11g
0.0042 W	(-3.81 dBm)	Bluetooth 2.0 / Bluetooth EDR

### BT and GSM and WLAN simultaneously SAR Description

BT Antenna and WLAN Antenna	0 cm
BT Antenna and GSM/PCS (License) Antenna	8.64 cm
WLAN Antenna and GSM/PCS (License) Antenna	8.64 cm

#### (1) Antenna Distance

1a. BT & GSM 8.64 cm > 5 cm

1b. BT & WLAN 0 cm, can't transmitting at the same time.

(2) BT Power < Pref and antenna-to-antenna is >2.5 cm. ~ BT Stand alone SAR is not required.

(3) WLAN > 2\*Pref and antenna-to-antenna < 5.0 cm. ~ WLAN Stand alone SAR is required.

(4) Cell/PCS Stand alone SAR is required due to routine evaluation requirements.

(5) WLAN Stand alone SAR and License Device Stand alone SAR

$$1.13 + 0.094 = 1.224 \text{ mW/g} < 1.6 \text{ mW/g}$$

## 8.3 System Performance Check

### 8.3.1 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>	835, 1900, 2450 MHz
<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>	D835V2 : dipole length 150 mm; overall height 330 mm D1900V2 : dipole length 62 mm; overall height 300 mm D2450V2 : dipole length 51.5 mm; overall height 300 mm



Figure 9. Validation Kit

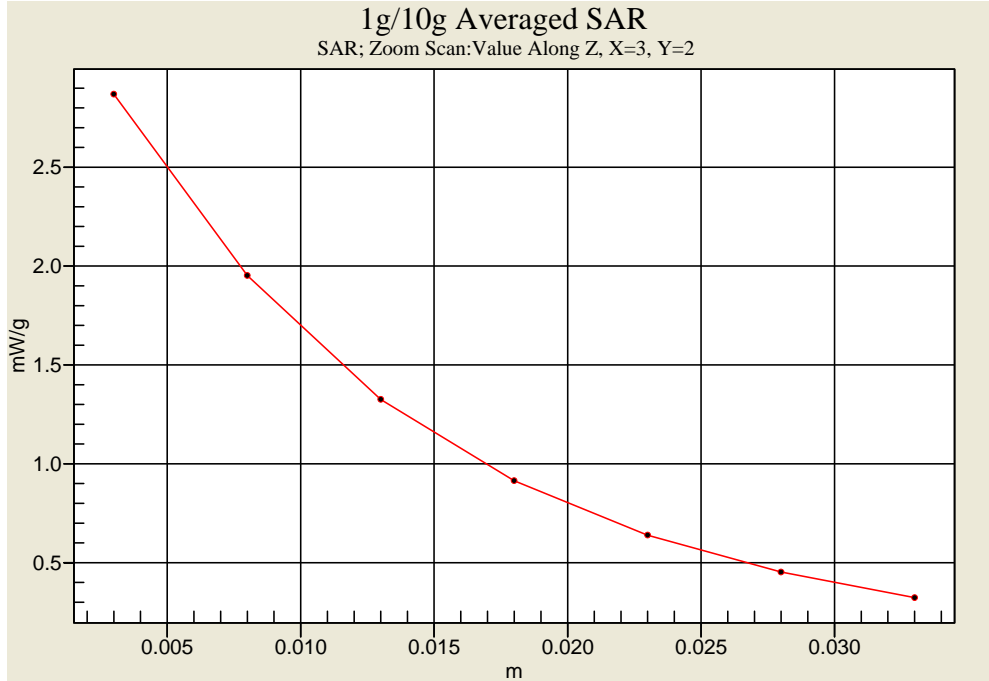


### 8.3.2 Validation

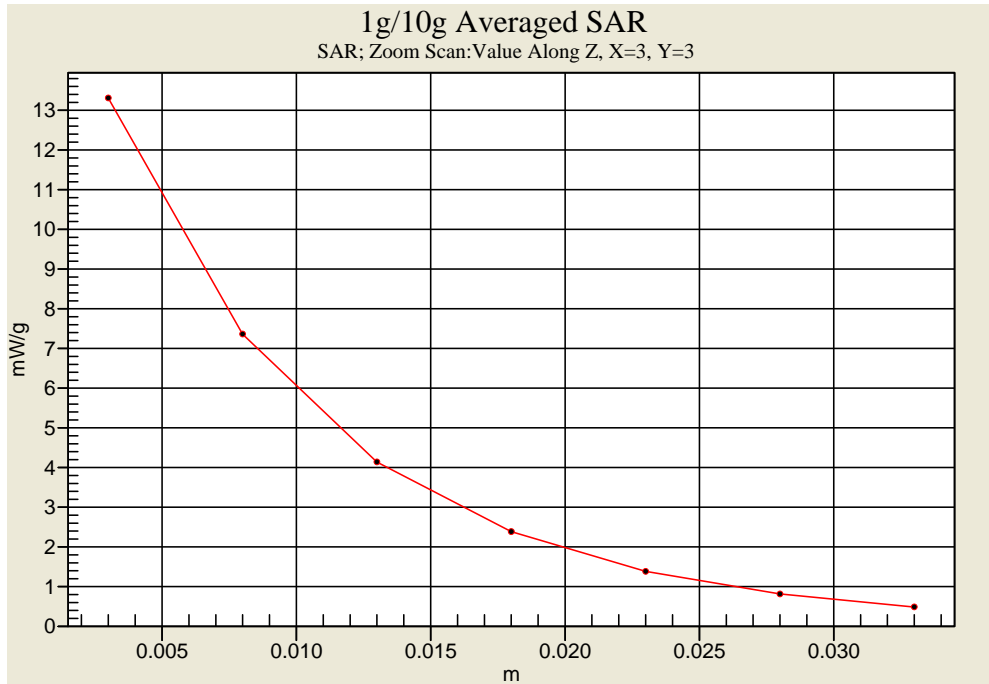
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of  $\pm 7\%$ . The validation was performed at 835MHz, 1750MHz, 1900MHz and 2450MHz.

Validation kit		Mixture Type	SAR <sub>1g</sub> [mW/g]		SAR <sub>10g</sub> [mW/g]		Date of Calibration
D835V2-SN4d082		Head	9.68		6.32		07/13/2009
		Body	10.24		6.72		
D1900V2-SN5d111		Head	42.00		21.96		07/14/2009
		Body	42.80		22.44		
D2450V2-SN712		Body	52.80		24.72		02/11/2009
Frequency (MHz)	Power (dBm)	SAR <sub>1g</sub> (mW/g)	SAR <sub>10g</sub> (mW/g)	Drift (dB)	Difference Percentage		Date of Test
					1g	10g	
835 (Head)	250mW	2.46	1.61	-0.006	1.7 %	1.9 %	Feb. 04, 2010
	Normalize to 1 Watt	9.84	6.44				
1900 (Head)	250mW	10.5	5.45	-0.002	0.0 %	-0.7 %	Jan. 26, 2010
	Normalize to 1 Watt	42	21.8				
835 (Body)	250mW	2.56	1.67	0.197	0.0 %	-0.6 %	Jan. 29, 2010
	Normalize to 1 Watt	10.24	6.68				
1900 (Body)	250mW	11.1	5.79	0.172	3.7 %	3.2 %	Feb. 03, 2010
	Normalize to 1 Watt	44.4	23.16				
2450 (Body)	250mW	13	5.94	-0.042	-1.5 %	-3.9 %	Feb. 05, 2010
	Normalize to 1 Watt	52	23.76				

**Z-axis Plot of System Performance Check**

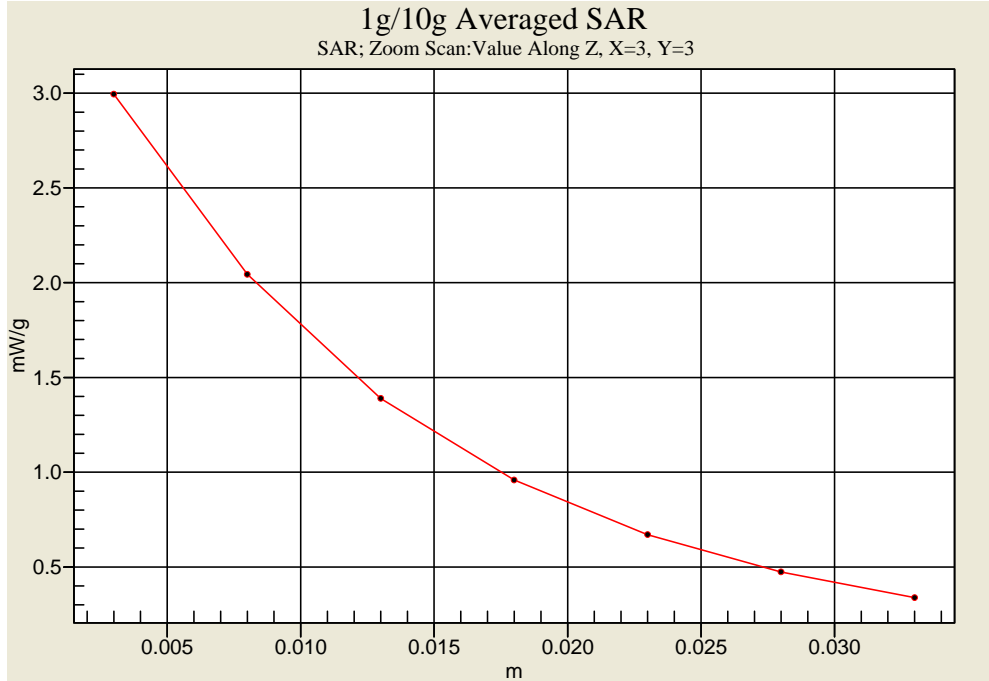


**Head-Tissue-Simulating-Liquid 835MHz**

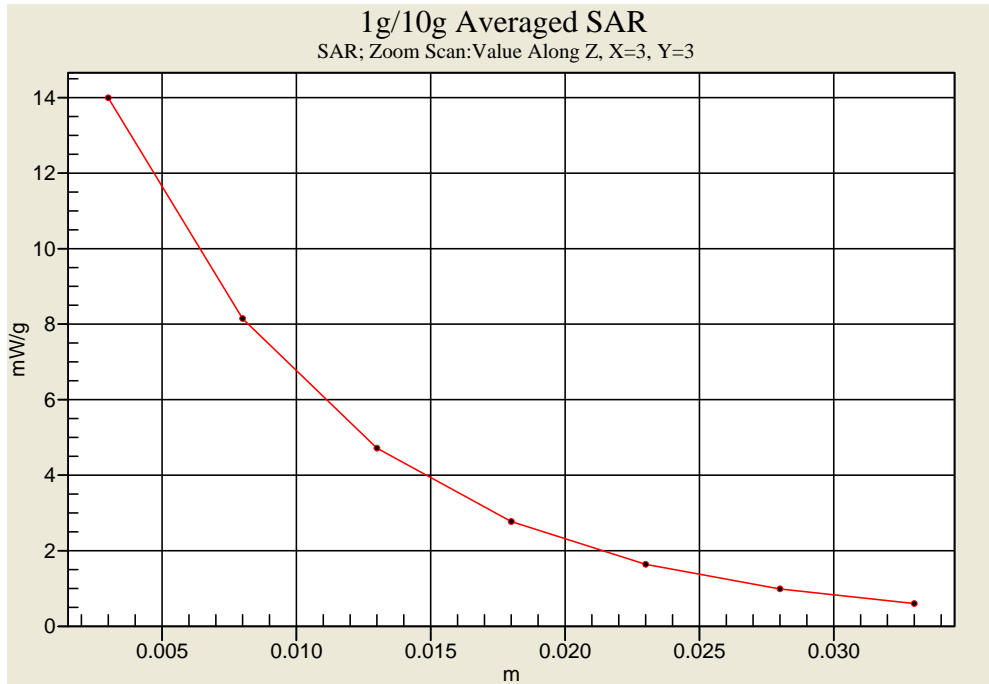


**Head-Tissue-Simulating-Liquid 1900MHz**

**Z-axis Plot of System Performance Check**

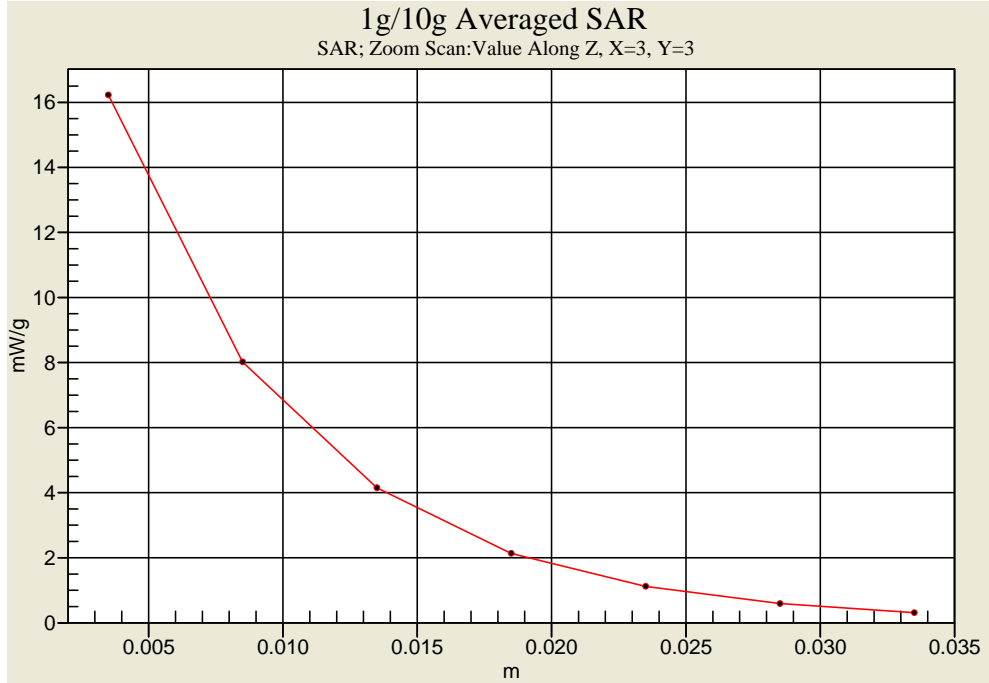


**Body-Tissue-Simulating-Liquid 835MHz**



**Body-Tissue-Simulating-Liquid 1900MHz**

### Z-axis Plot of System Performance Check



Body-Tissue-Simulating-Liquid 2450MHz



## 8.4 Dosimetric Assessment Setup

### 8.4.1 Body 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 headset output should be tested with a headset 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 15 mm 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 **GSM850 / PCS1900 / WCDMA (RMC 12.2K) Band II / WCDMA (RMC 12.2K) Band V / IEEE 802.11b / WLAN 802.11g** the distance of **15 mm** was tested to confirm the necessary "minimum SAR separation distance".  
(\*Note : This distance includes the 2 mm phantom shell thickness.)





## 8.4.2 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 × 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 7 x 7 x 9 points in a 30 x 30 x 24 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.



## 8.5 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].



## 9. **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  $\pm 21.4\%$  [ 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) 1g	(c) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v) v <sub>eff</sub>
<b>Measurement System</b>								
Probe Calibration	± 5.5 %	N	1	1	1	± 5.5 %	± 5.5 %	
Axial Isotropy	± 4.7 %	R		0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical Isotropy	± 9.6 %	R	$\sqrt{3}$	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary Effects	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Linearity	± 4.7 %	R	$\sqrt{3}$	1	1	± 2.7 %	± 2.7 %	∞
System Detection Limits	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Readout Electronics	± 0.3 %	N	1	1	1	± 0.3 %	± 0.3 %	∞
Response Time	± 0.8 %	R	$\sqrt{3}$	1	1	± 0.5 %	± 0.5 %	∞
Integration Time	± 2.6 %	R	$\sqrt{3}$	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Noise	± 3.0 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Reflections	± 3.0 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.4 %	R	$\sqrt{3}$	1	1	± 0.2 %	± 0.2 %	∞
Probe Positioning	± 2.9 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Max. SAR Eval.	± 1.0 %	R	$\sqrt{3}$	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	$\sqrt{3}$	1	1	± 2.9 %	± 2.9 %	∞
<b>Phantom and Setup</b>								
Phantom Uncertainty	± 4.0 %	R	$\sqrt{3}$	1	1	± 2.3 %	2.3 %	∞
Liquid Conductivity (target)	± 5.0 %	R	$\sqrt{3}$	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	$\sqrt{3}$	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>						± 10.7 %	± 10.5 %	387
<b>Expanded STD Uncertainty</b>						± 21.4 %	± 21.0 %	

Table 6. Uncertainty Budget of DASY



## 10. SAR Test Results Summary

Detail results see Appendix B.

### 10.1 GSM 850 - Head SAR

**Ambient :**

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

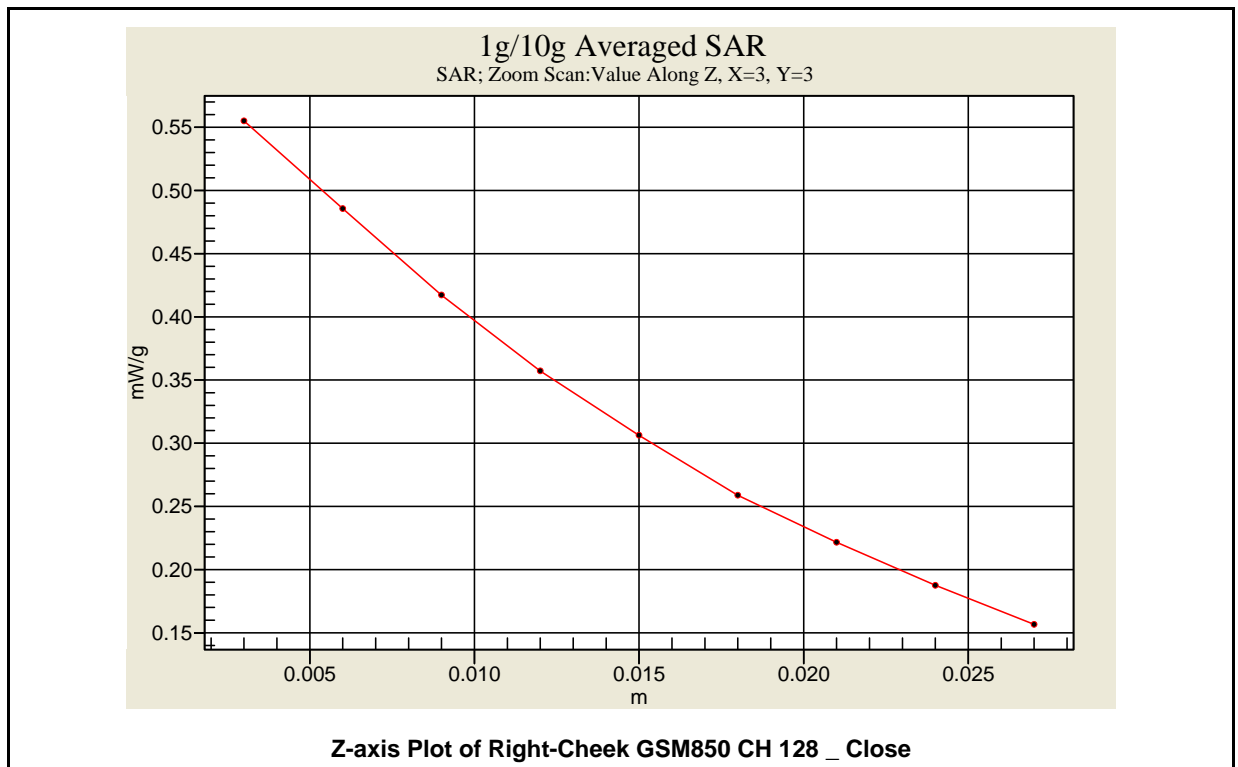
**Liquid :**

Mixture Type : HSL835      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

Duty Cycle : 1:8.3      Probe S/N : 3071

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
824.2	128	GSM 850	24.24	Right-cheek	PIFA	N/A	<b>0.497</b>	0.007	Close
824.2	128	GSM 850	24.24	Right-cheek	PIFA	N/A	0.332	0.019	Open
824.2	128	GSM 850	24.24	Right-Tilted	PIFA	N/A	0.300	-0.028	Close
824.2	128	GSM 850	24.24	Left-cheek	PIFA	N/A	0.422	-0.005	Close
824.2	128	GSM 850	24.24	Left-Tilted	PIFA	N/A	0.284	0.010	Close
<b>Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population</b>						<b>1.6 W/kg (mW/g) Averaged over 1 gram</b>			





## 10.2 PCS 1900 - Head SAR

**Ambient :**

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

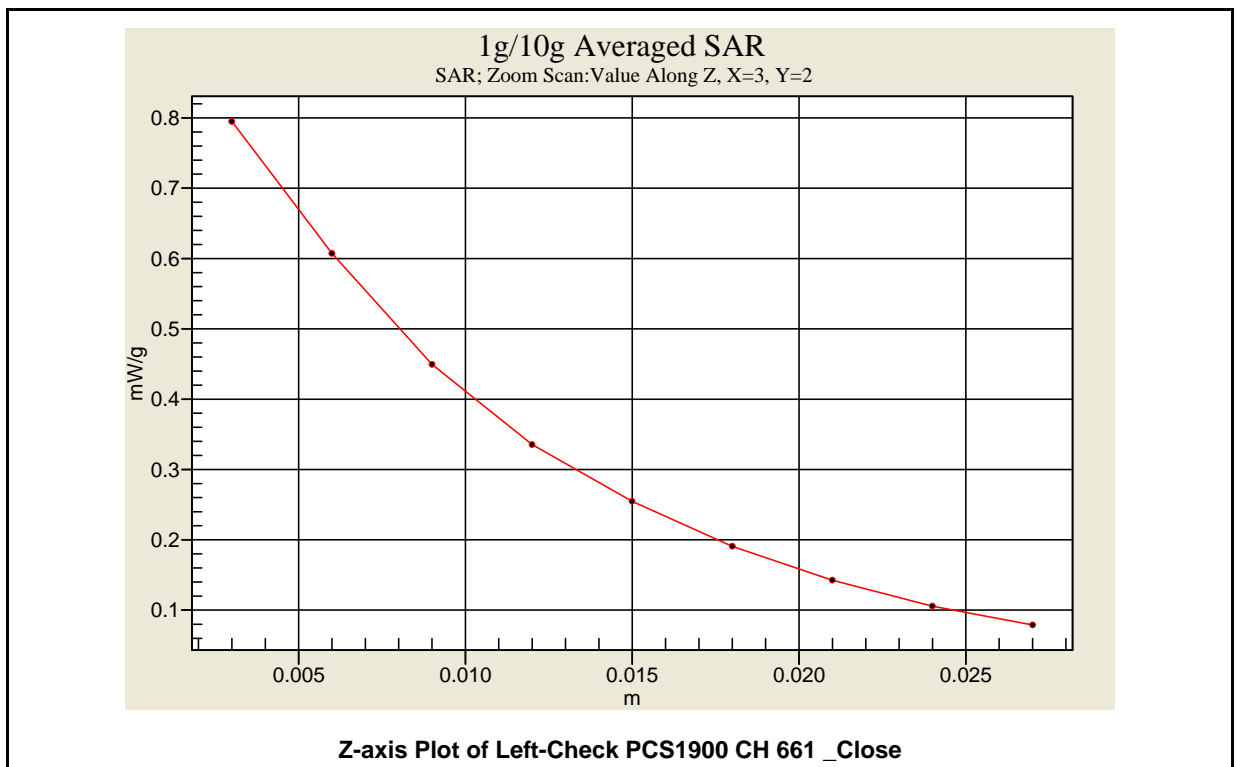
**Liquid :**

Mixture Type : HSL1900      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

Duty Cycle : 1:8.3      Probe S/N : 3071

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1880.0	661	PCS 1900	21.30	Right-cheek	PIFA	N/A	0.415	0.005	Close
1880.0	661	PCS 1900	21.30	Right-cheek	PIFA	N/A	0.296	0.009	Open
1880.0	661	PCS 1900	21.30	Right-Tilted	PIFA	N/A	0.383	0.035	Close
1880.0	661	PCS 1900	21.30	Left-cheek	PIFA	N/A	<b>0.673</b>	-0.001	Close
1880.0	661	PCS 1900	21.30	Left-cheek	PIFA	N/A	0.509	-0.007	Open
1880.0	661	PCS 1900	21.30	Left-Tilted	PIFA	N/A	0.359	0.017	Close
<b>Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population</b>							<b>1.6 W/kg (mW/g) Averaged over 1 gram</b>		





### 10.3 WCDMA (RMC 12.2K) Band II - Head SAR

**Ambient :**

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

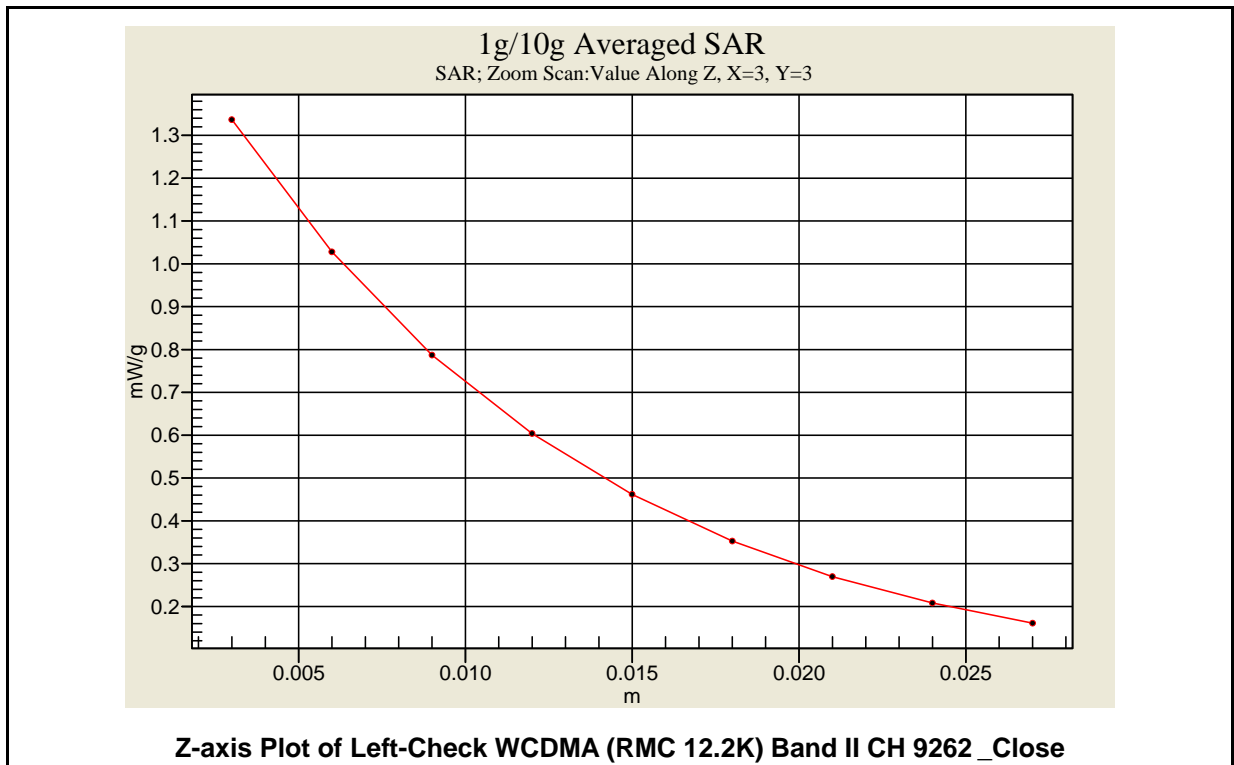
**Liquid :**

Mixture Type : HSL1900      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

Duty Cycle : 1:1      Probe S/N : 3071

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	23.37	Right-cheek	PIFA	N/A	0.772	0.142	Close
1852.4	9262	WCDMA II	23.37	Right-cheek	PIFA	N/A	0.476	0.008	Open
1852.4	9262	WCDMA II	23.37	Right-Tilted	PIFA	N/A	0.600	0.009	Close
1852.4	9262	WCDMA II	23.37	Left-cheek	PIFA	N/A	<b>1.130</b>	0.079	Close
1852.4	9262	WCDMA II	23.37	Left-cheek	PIFA	N/A	0.851	-0.031	Open
1880.0	9400	WCDMA II	23.13	Left-cheek	PIFA	N/A	0.842	0.023	Close
1907.6	9538	WCDMA II	23.32	Left-cheek	PIFA	N/A	0.921	0.035	Close
1852.4	9262	WCDMA II	23.37	Left-Tilted	PIFA	N/A	0.534	-0.005	Close
<b>Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population</b>						<b>1.6 W/kg (mW/g) Averaged over 1 gram</b>			





### 10.4 WCDMA (RMC 12.2K) Band V - Head SAR

**Ambient :**

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

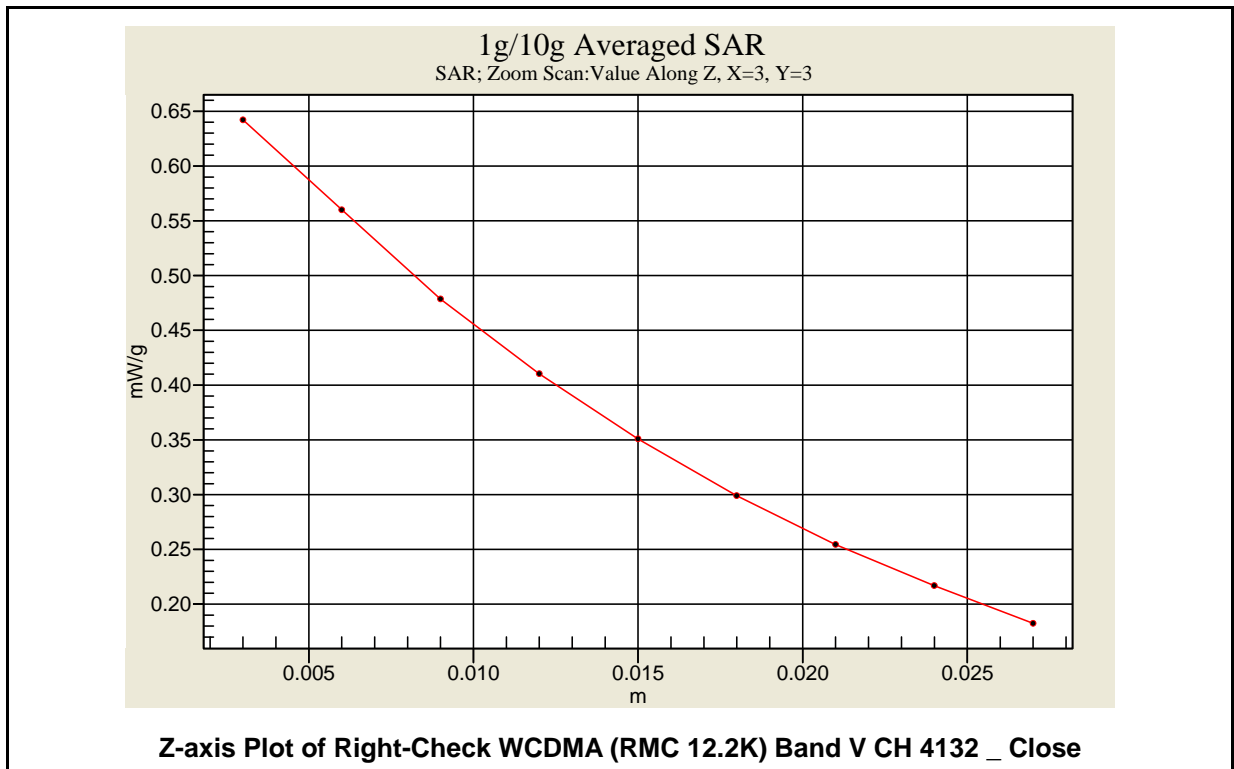
**Liquid :**

Mixture Type : HSL835      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

Duty Cycle : 1:1      Probe S/N : 3071

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
826.4	4132	WCDMA V	23.70	Right-cheek	PIFA	N/A	<b>0.579</b>	-0.053	Close
826.4	4132	WCDMA V	23.70	Right-cheek	PIFA	N/A	0.315	0.045	Open
826.4	4132	WCDMA V	23.70	Right-Tilted	PIFA	N/A	0.366	0.006	Close
826.4	4132	WCDMA V	23.70	Left-cheek	PIFA	N/A	0.556	0.135	Close
826.4	4132	WCDMA V	23.70	Left-Tilted	PIFA	N/A	0.377	0.005	Close
<b>Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population</b>						<b>1.6 W/kg (mW/g) Averaged over 1 gram</b>			







### 10.5 GSM / GPRS 850 - Body SAR (EUT 15 mm separation to Phantom)

**Ambient :**

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

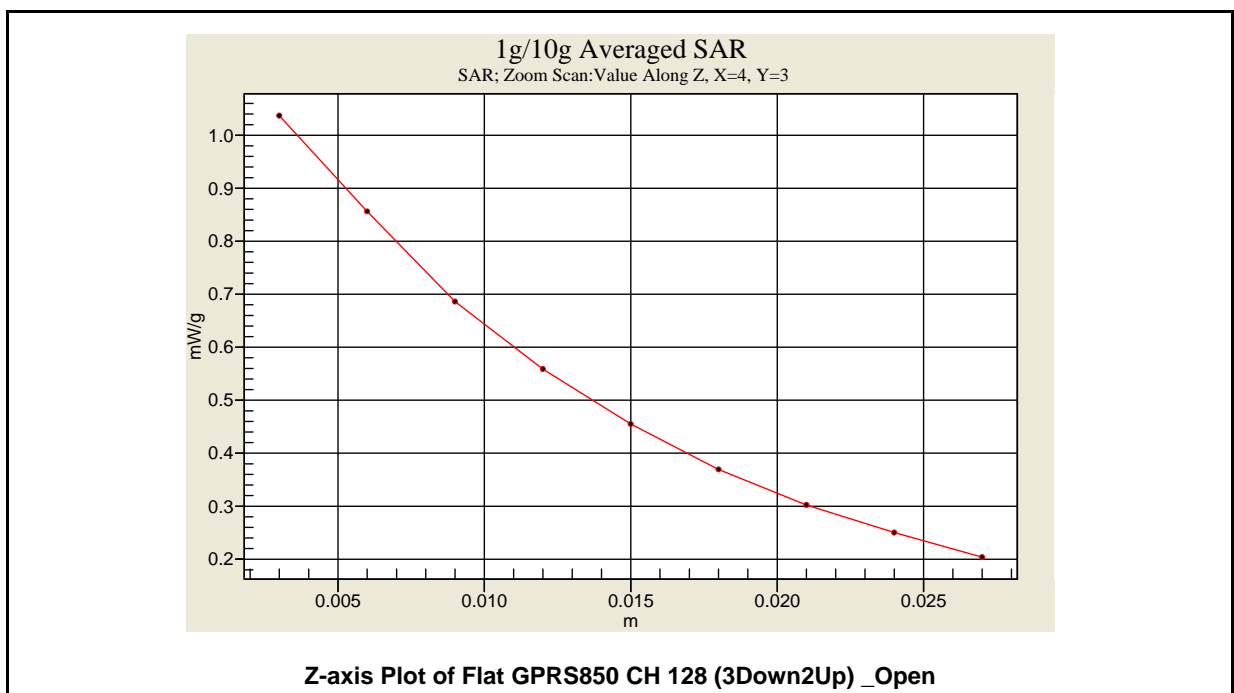
**Liquid :**

Mixture Type : MSL835      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

Duty Cycle : 1:8.3      Probe S/N : 3071  
3Down2Up -- 1:4.2  
4Down1Up -- 1:8.3

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
824.2	128	GSM 850	24.24	Flat	PIFA	N/A	0.596	0.016	Open
824.2	128	GPRS 850 3Down2Up	25.59	Flat	PIFA	N/A	<b>0.907</b>	0.004	Open
824.2	128	GPRS 850 3Down2Up	25.59	Flat	PIFA	N/A	0.611	0.001	Close
824.2	128	GPRS 850 4Down1Up	24.26	Flat	PIFA	N/A	0.602	-0.001	Open
836.6	190	GPRS 850 3Down2Up	25.57	Flat	PIFA	N/A	0.862	-0.048	Open
848.8	251	GPRS 850 3Down2Up	25.50	Flat	PIFA	N/A	0.733	-0.046	Open
<b>Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population</b>						<b>1.6 W/kg (mW/g) Averaged over 1 gram</b>			





### 10.6 PCS / GPRS 1900 - Body SAR (EUT 15 mm separation to Phantom)

**Ambient :**

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

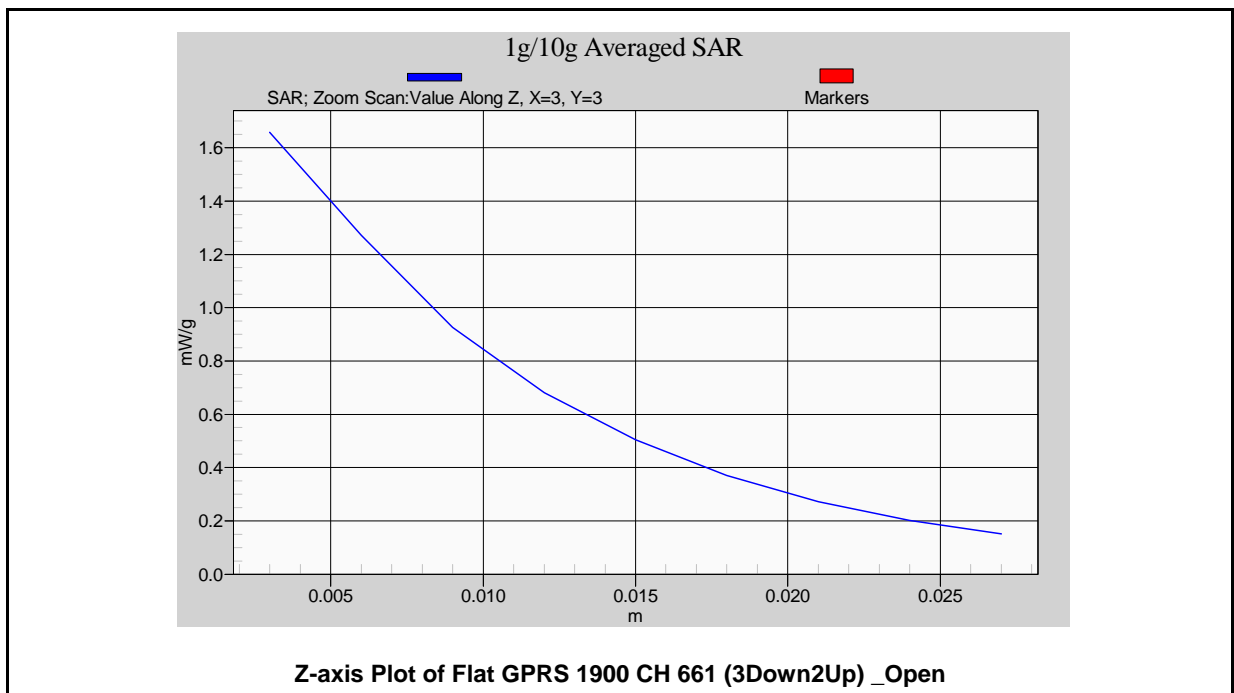
**Liquid :**

Mixture Type : MSL1900      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

Duty Cycle : 1:8.3      Probe S/N : 3071  
3Down2Up -- 1:4.2  
4Down1Up -- 1:8.3

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1880.0	661	PCS 1900	21.30	Flat	PIFA	N/A	0.501	0.029	Open
1850.2	512	GPRS 1900 3Down2Up	23.45	Flat	PIFA	N/A	0.655	0.030	Close
1880.0	661	GPRS 1900 3Down2Up	23.63	Flat	PIFA	N/A	0.796	0.056	Close
1880.0	661	GPRS 1900 3Down2Up	23.63	Flat	PIFA	N/A	<b>0.860</b>	0.007	Open
1880.0	661	GPRS 1900 _4Down1Up	21.28	Flat	PIFA	N/A	0.485	0.008	Open
1909.8	810	GPRS 1900 3Down2Up	23.45	Flat	PIFA	N/A	0.576	0.005	Close
<b>Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population</b>						<b>1.6 W/kg (mW/g) Averaged over 1 gram</b>			





### 10.7 WCDMA (RMC 12.2K)/HSDPA Band II - Body SAR (EUT 15 mm separation to Phantom)

**Ambient :**

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

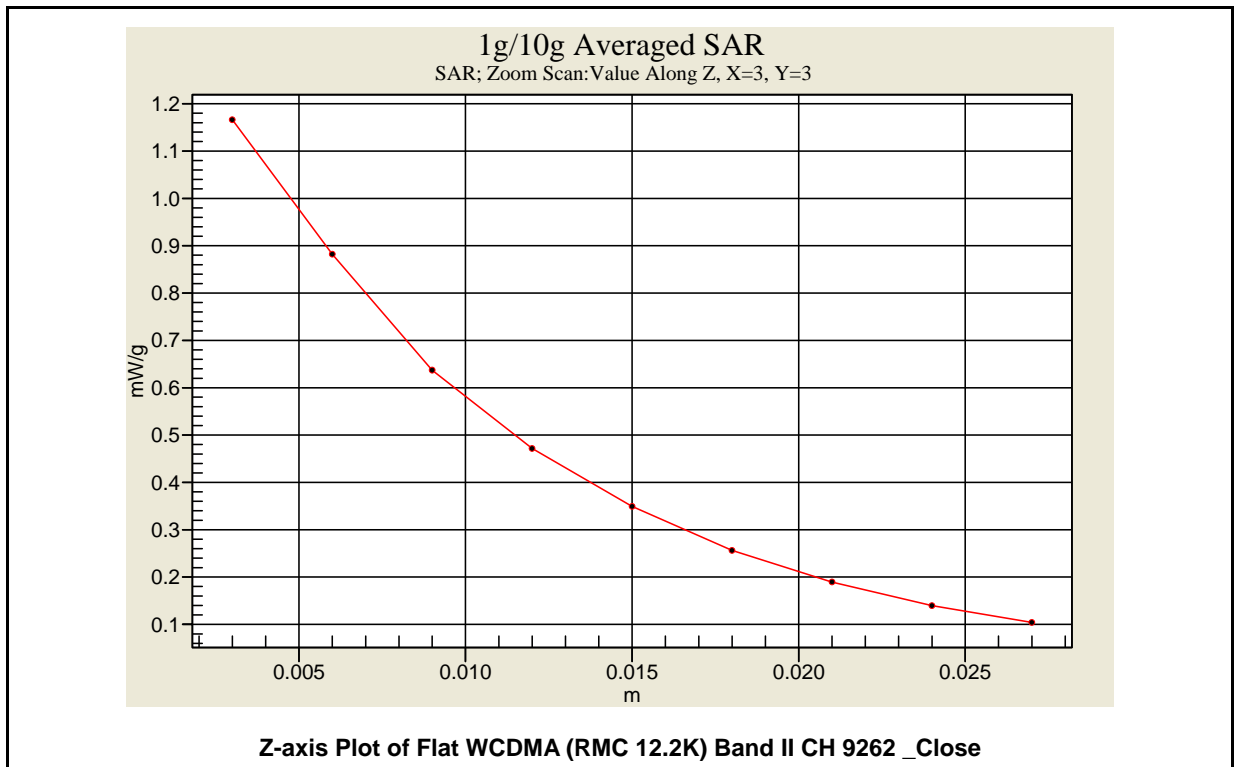
**Liquid :**

Mixture Type : MSL1900      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

Duty Cycle : 1:1      Probe S/N : 3071

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	23.37	Flat	PIFA	N/A	<b>0.949</b>	0.108	Close
1852.4	9262	WCDMA II	23.37	Flat	PIFA	N/A	0.552	0.034	Open
1880.0	9400	WCDMA II	23.13	Flat	PIFA	N/A	0.633	0.061	Close
1907.6	9538	WCDMA II	23.32	Flat	PIFA	N/A	0.618	0.106	Close
1852.4	9262	HSDPA II Sub-test 1	23.35	Flat	PIFA	N/A	0.325	-0.055	Close
<b>Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population</b>						<b>1.6 W/kg (mW/g) Averaged over 1 gram</b>			





### 10.8 WCDMA (RMC 12.2K)/HSDPA Band V - Body SAR (EUT 15 mm separation to Phantom)

**Ambient :**

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

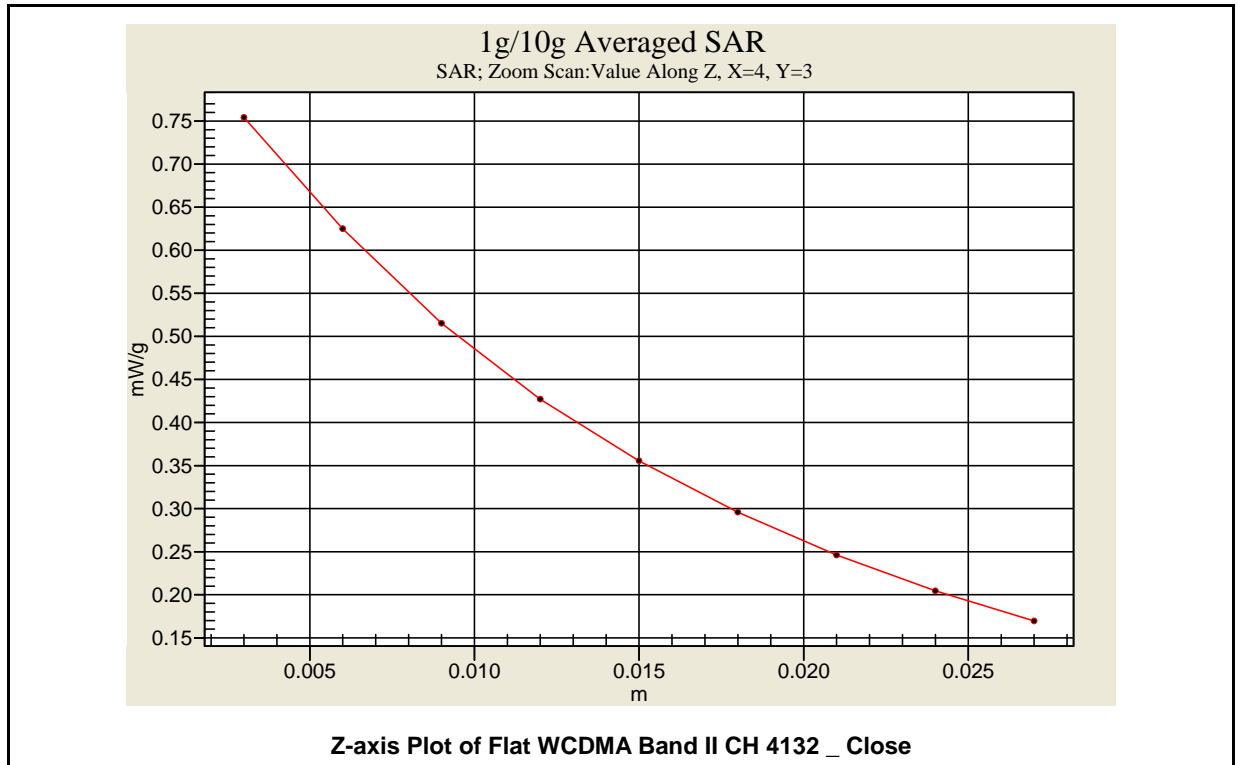
**Liquid :**

Mixture Type : MSL835      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

Duty Cycle : 1:1      Probe S/N : 3071

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
826.4	4132	WCDMA V	23.70	Flat	PIFA	N/A	<b>0.668</b>	-0.004	Close
826.4	4132	WCDMA V	23.70	Flat	PIFA	N/A	0.610	-0.002	Open
826.4	4132	HSDPA V Sub-test 1	23.63	Flat	PIFA	N/A	0.321	0.049	Close
<b>Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population</b>						<b>1.6 W/kg (mW/g) Averaged over 1 gram</b>			





### 10.9 IEEE 802.11b - Body SAR (EUT 15 mm separation to Phantom)

**Ambient :**

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

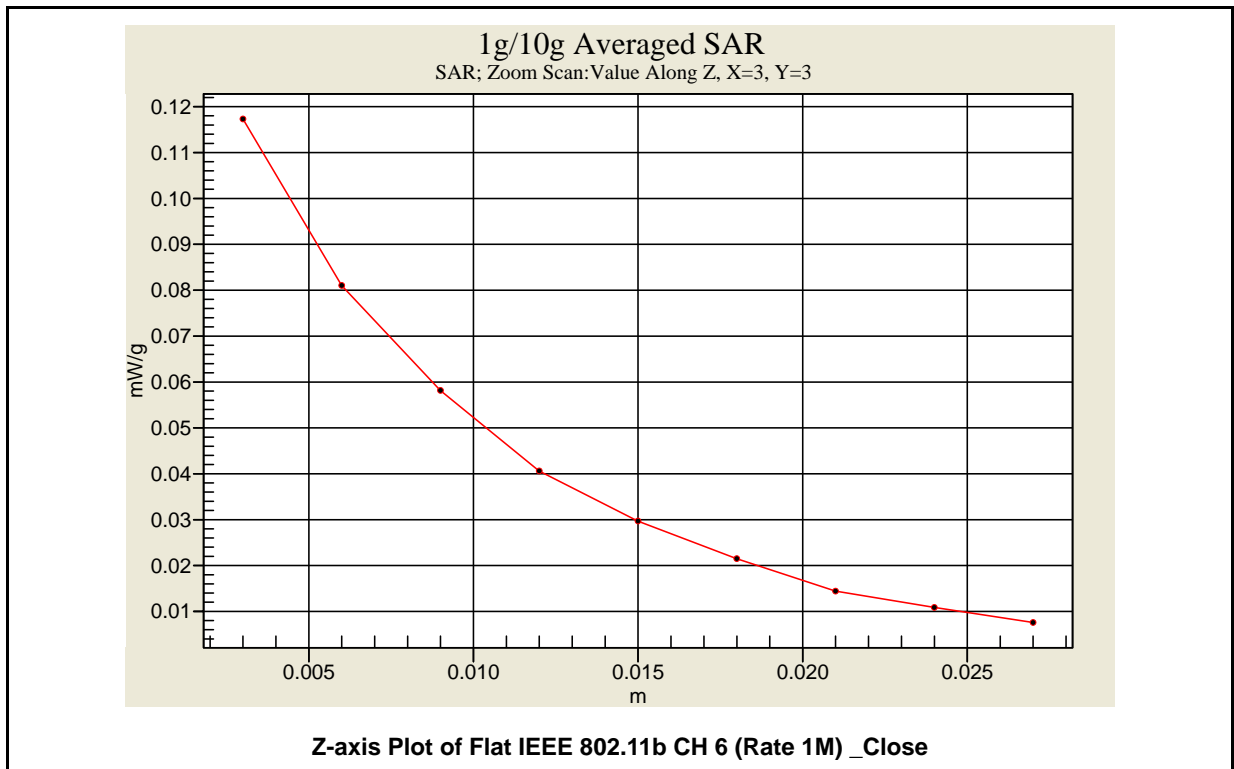
**Liquid :**

Mixture Type : MSL2450      Liquid Temperature (°C) : 22.0  
 Depth of liquid (cm) : 15

**Measurement :**

Duty Cycle : 1:1      Probe S/N : 3071

Frequency		Rate	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR <sub>1g</sub> [mW/g]	Power Drift (dB)	Remark
MHz	CH								
2437	6	1M	17.01	Flat	PIFA	N/A	0.094	0.029	Close
2437	6	1M	17.01	Flat	PIFA	N/A	0.073	0.049	Open
<b>Std. C95.1-2005 - Safety Limit            Spatial Peak            Uncontrolled Exposure/General Population</b>						<b>1.6 W/kg (mW/g)            Averaged over 1 gram</b>			





### 10.10 Std. C95.1-2005 RF Exposure Limit

Human Exposure	Population Uncontrolled	Occupational Controlled
	Exposure	Exposure
	( W/kg ) or (mW/g)	( W/kg ) or (mW/g)
<b>Spatial Peak SAR*</b>	1.60	8.00
(head)		
<b>Spatial Peak SAR**</b>	0.08	0.40
(Whole Body)		
<b>Spatial Peak SAR***</b>	1.60	8.00
(Partial-Body)		
<b>Spatial Peak SAR****</b>	4.00	20.00
(Hands / Feet / Ankle / Wrist )		
<b>Table 7. Safety Limits for Partial Body Exposure</b>		

**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).



## **11. Conclusion**

The SAR test values found for the portable mobile phone **HTC Corporation Trade Name : HTC Model(s) : PC70110** is below the maximum recommended level of 1.6 W/kg (mW/g).

## **12. References**

- [1] Std. C95.1-2005, "American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300KHz to 100GHz", New York.
- [2] NCRP, National Council on Radiation Protection and Measurements, "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields", NCRP report NO. 86, 1986.
- [3] T. Schmid, O. Egger, and N. Kuster, "Automatic E-field scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp, 105-113, Jan. 1996.
- [4] K. Poković, T. Schmid, and N. Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequency", in ICECOM'97, Dubrovnik, October 15-17, 1997, pp.120-124.
- [5] K. Poković, T. Schmid, and N. Kuster, "E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp.172-175.
- [6] N. Kuster, and Q. Balzano, "Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz", IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.
- [7] Robert J. Renka, "Multivariate Interpolation Of Large Sets Of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988 , pp. 139-148.
- [8] N. Kuster, R. Kastle, T. Schmid, "Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.
- [9] Std. C95.3-1991, "IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, Aug. 1992.
- [10] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10KHz-300GHz, Jan. 1995.

## Appendix A - System Performance Check

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 AM 06:50:12

### System Performance Check at 835MHz\_20100204\_Head

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d082**

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

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.887 \text{ mho/m}$ ;  $\epsilon_r = 40.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### System Performance Check at 835MHz/Area Scan (61x121x1):

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

Maximum value of SAR (interpolated) = 2.85 mW/g

### System Performance Check at 835MHz/Zoom Scan (7x7x7)/Cube 0:

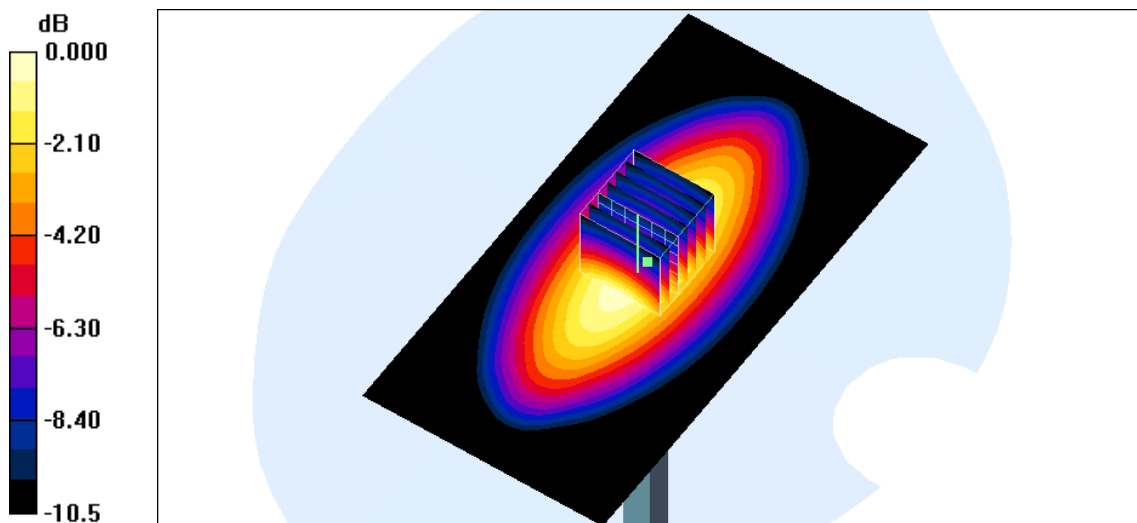
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 58.2 V/m; Power Drift = -0.006 dB

Peak SAR (extrapolated) = 3.56 W/kg

**SAR(1 g) = 2.46 mW/g; SAR(10 g) = 1.61 mW/g**

Maximum value of SAR (measured) = 2.87 mW/g



0 dB = 2.87mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/26 AM 06:46:58

**System Performance Check at 1900MHz\_20100126\_Head**

**DUT: Dipole D1900V2\_SN5d111; Type: D1900V2; Serial: D1900V2 - SN:5d111**

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

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.39 \text{ mho/m}$ ;  $\epsilon_r = 38.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**System Performance Check at 1900MHz/Area Scan (91x91x1):**

Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 13.3 mW/g

**System Performance Check at 1900MHz/Zoom Scan (7x7x7)/Cube 0:**

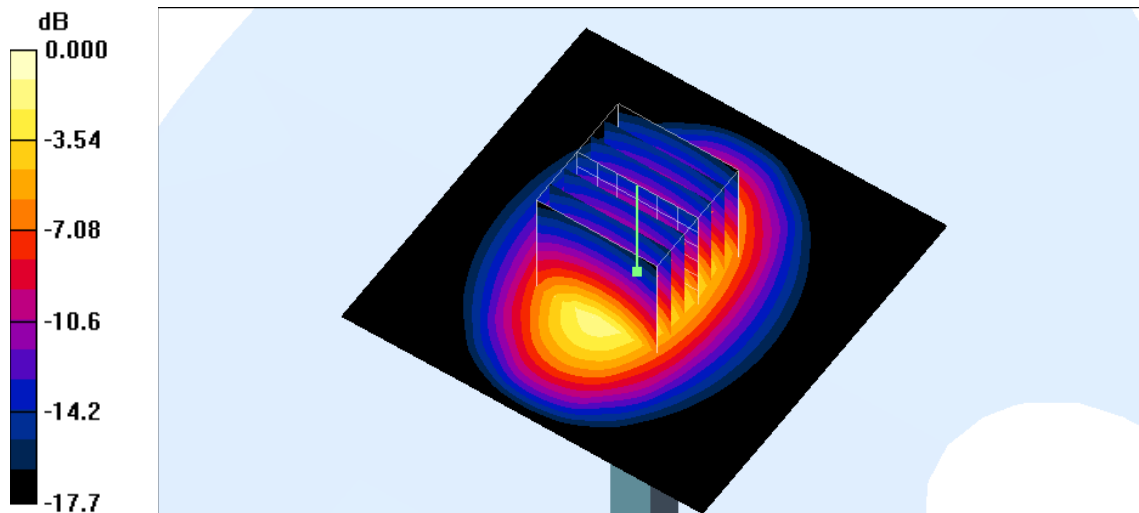
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 100.8 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 19.1 W/kg

**SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.45 mW/g**

Maximum value of SAR (measured) = 13.3 mW/g



0 dB = 13.3mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/29 AM 09:19:51

**System Performance Check at 835MHz\_20100129\_Body**

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d082**

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

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.994 \text{ mho/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.59, 5.59, 5.59); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**System Performance Check at 835MHz/Area Scan (61x121x1):**

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

Maximum value of SAR (interpolated) = 2.99 mW/g

**System Performance Check at 835MHz/Zoom Scan (7x7x7)/Cube 0:**

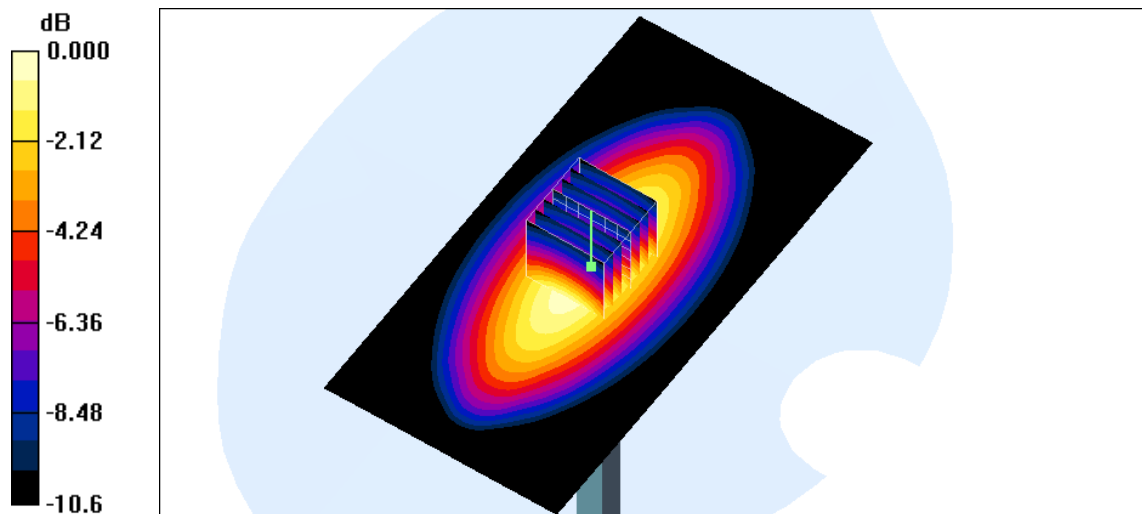
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 56.5 V/m; Power Drift = 0.197 dB

Peak SAR (extrapolated) = 3.70 W/kg

**SAR(1 g) = 2.56 mW/g; SAR(10 g) = 1.67 mW/g**

Maximum value of SAR (measured) = 2.99 mW/g



0 dB = 2.99mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 AM 07:09:32

### System Performance Check at 1900MHz\_20100203\_Body

**DUT: Dipole D1900V2\_SN5d111; Type: D1900V2; Serial: D1900V2 - SN:5d111**

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

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.5$  mho/m;  $\epsilon_r = 51.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### System Performance Check at 1900MHz/Area Scan (91x91x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 13.8 mW/g

### System Performance Check at 1900MHz/Zoom Scan (7x7x7)/Cube 0:

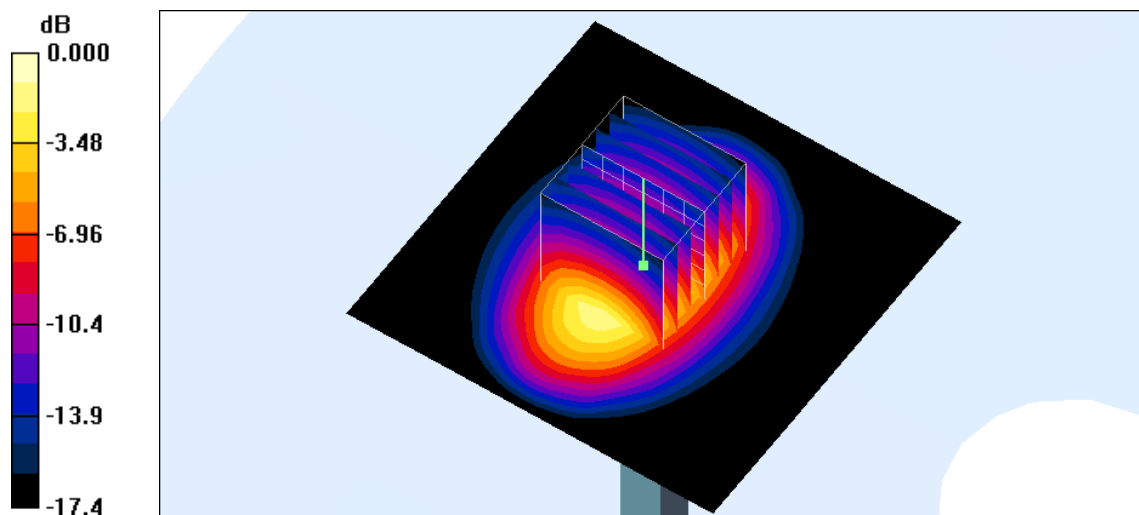
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.5 V/m; Power Drift = 0.172 dB

Peak SAR (extrapolated) = 19.2 W/kg

**SAR(1 g) = 11.1 mW/g; SAR(10 g) = 5.79 mW/g**

Maximum value of SAR (measured) = 14.0 mW/g



0 dB = 14.0mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/5 AM 07:25:24

### System Performance Check at 2450MHz\_20100205\_Body

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:712**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.92$  mho/m;  $\epsilon_r = 50.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4, 4, 4); Calibrated: 2009/6/22
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASYS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### System Performance Check at 2450MHz/Area Scan (91x91x1):

Measurement grid:  $dx=10$ mm,  $dy=10$ mm

Maximum value of SAR (interpolated) = 16.6 mW/g

### System Performance Check at 2450MHz/Zoom Scan (7x7x7)/Cube 0:

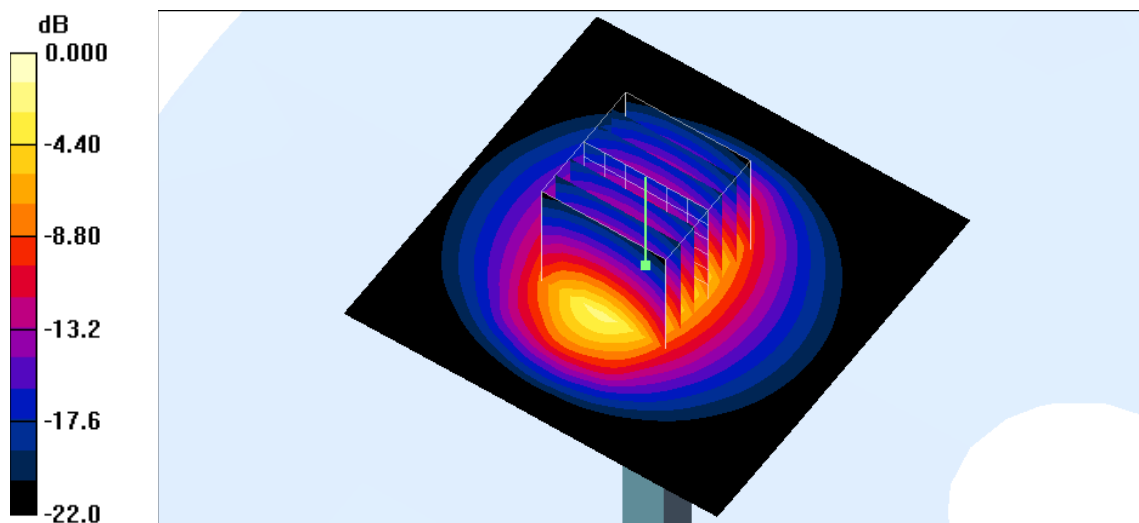
Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

Reference Value = 91.5 V/m; Power Drift = -0.042 dB

Peak SAR (extrapolated) = 27.5 W/kg

**SAR(1 g) = 13 mW/g; SAR(10 g) = 5.94 mW/g**

Maximum value of SAR (measured) = 16.2 mW/g



0 dB = 16.2mW/g

## Appendix B - SAR Measurement Data

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 AM 10:19:24

### RC\_GSM850 CH128\_Close Mode

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 824.2$  MHz;  $\sigma = 0.875$  mho/m;  $\epsilon_r = 40.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Right Check/Area Scan (71x111x1):

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

Maximum value of SAR (interpolated) = 0.554 mW/g

### Right Check/Zoom Scan (7x7x9)/Cube 0:

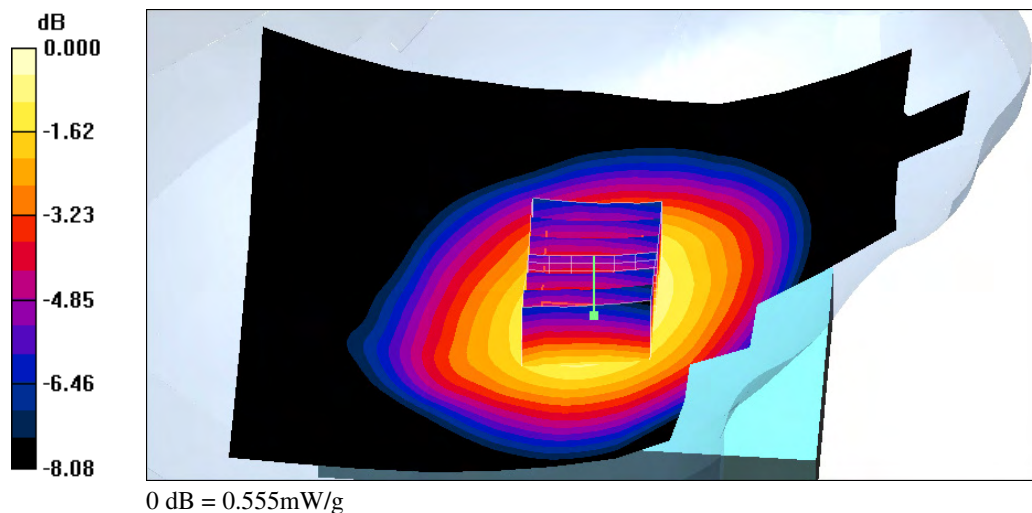
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 10.5 V/m; Power Drift = 0.007 dB

Peak SAR (extrapolated) = 0.623 W/kg

**SAR(1 g) = 0.497 mW/g; SAR(10 g) = 0.363 mW/g**

Maximum value of SAR (measured) = 0.555 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 AM 10:48:52

**RC\_GSM850 CH128\_Open Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 824.2 \text{ MHz}$ ;  $\sigma = 0.875 \text{ mho/m}$ ;  $\epsilon_r = 40.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Check/Area Scan (91x101x1):**

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

Maximum value of SAR (interpolated) = 0.364 mW/g

**Right Check/Zoom Scan (7x7x9)/Cube 0:**

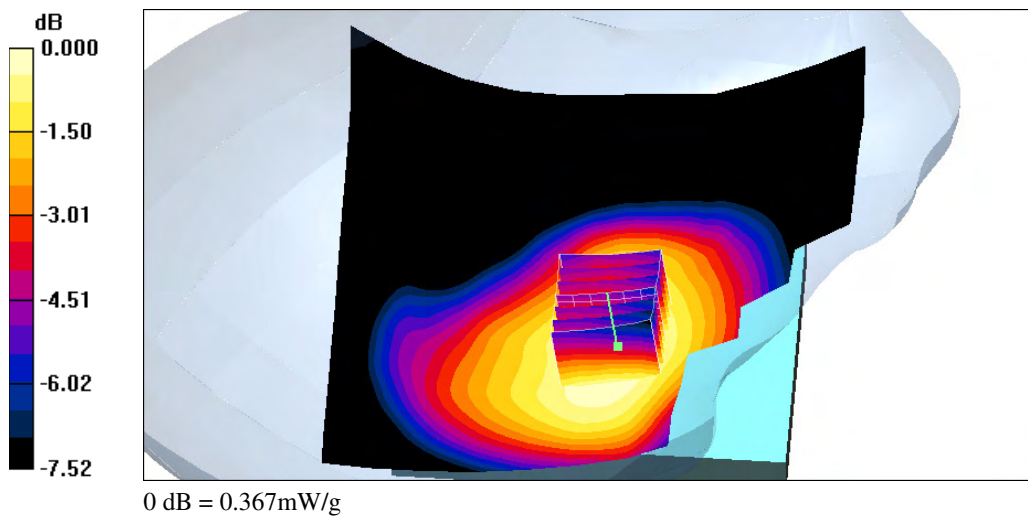
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 10.4 V/m; Power Drift = 0.019 dB

Peak SAR (extrapolated) = 0.412 W/kg

**SAR(1 g) = 0.332 mW/g; SAR(10 g) = 0.253 mW/g**

Maximum value of SAR (measured) = 0.367 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 AM 11:44:18

**RT\_GSM850 CH128\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 824.2 \text{ MHz}$ ;  $\sigma = 0.875 \text{ mho/m}$ ;  $\epsilon_r = 40.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Tilted/Area Scan (71x111x1):**

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

Maximum value of SAR (interpolated) = 0.337 mW/g

**Right Tilted/Zoom Scan (7x7x9)/Cube 0:**

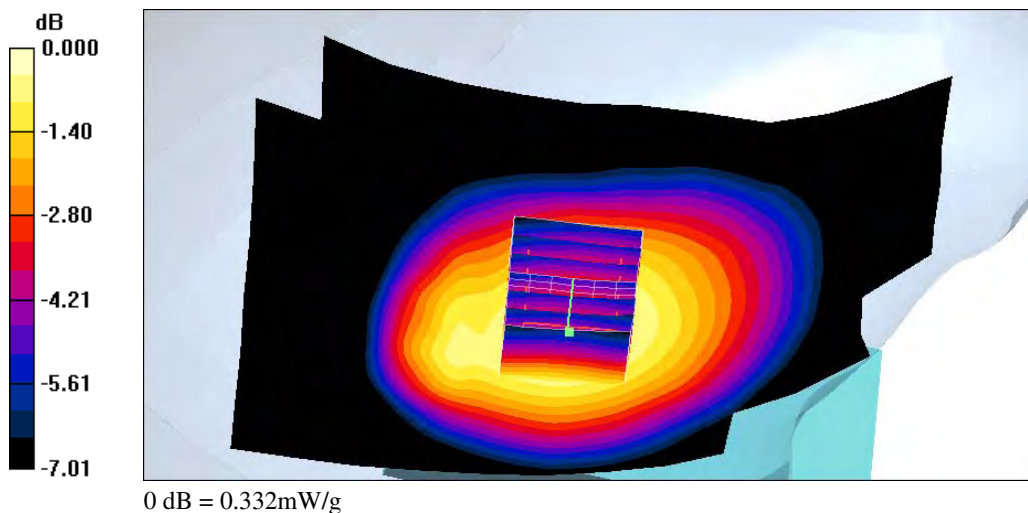
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 16.6 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 0.378 W/kg

**SAR(1 g) = 0.300 mW/g; SAR(10 g) = 0.223 mW/g**

Maximum value of SAR (measured) = 0.332 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 PM 12:19:21

**LC\_GSM850 CH128\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 824.2 \text{ MHz}$ ;  $\sigma = 0.875 \text{ mho/m}$ ;  $\epsilon_r = 40.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Check/Area Scan (71x111x1):**

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

Maximum value of SAR (interpolated) = 0.461 mW/g

**Left Check/Zoom Scan (7x7x9)/Cube 0:**

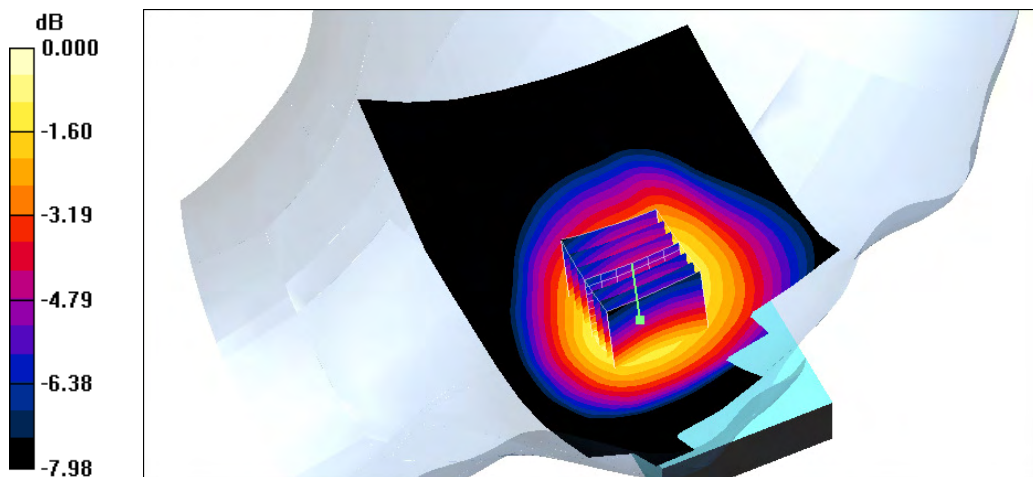
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 9.78 V/m; Power Drift = -0.005 dB

Peak SAR (extrapolated) = 0.551 W/kg

**SAR(1 g) = 0.422 mW/g; SAR(10 g) = 0.305 mW/g**

Maximum value of SAR (measured) = 0.472 mW/g



0 dB = 0.472mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 PM 01:05:34

**LT\_GSM850 CH128\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 824.2 \text{ MHz}$ ;  $\sigma = 0.875 \text{ mho/m}$ ;  $\epsilon_r = 40.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Tilted/Area Scan (71x111x1):**

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

Maximum value of SAR (interpolated) = 0.320 mW/g

**Left Tilted/Zoom Scan (7x7x9)/Cube 0:**

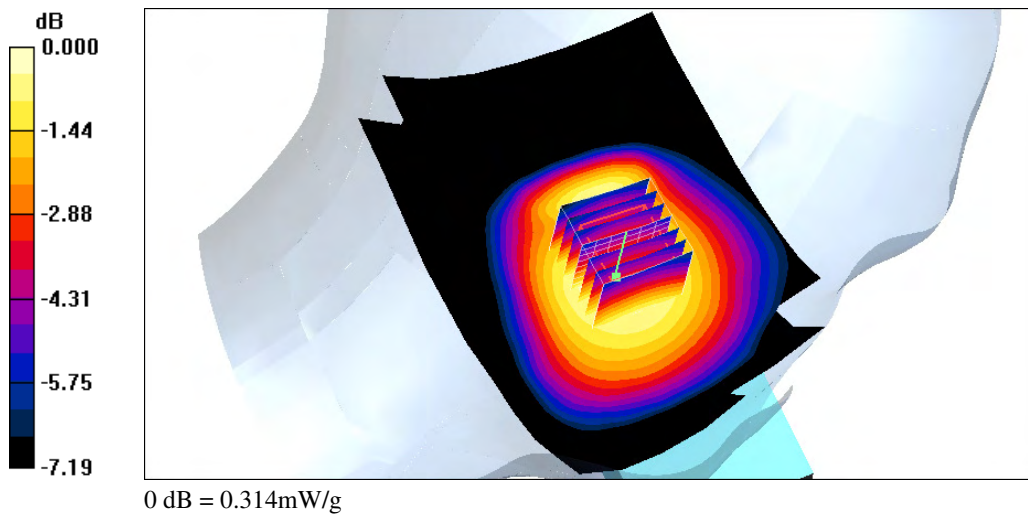
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 16.1 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 0.361 W/kg

**SAR(1 g) = 0.284 mW/g; SAR(10 g) = 0.213 mW/g**

Maximum value of SAR (measured) = 0.314 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/26 AM 10:24:41

### RC\_PCS CH661\_Close Mode

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: PCS; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 38.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Right Check/Area Scan (71x111x1):

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

Maximum value of SAR (interpolated) = 0.484 mW/g

### Right Check/Zoom Scan (7x7x9)/Cube 0:

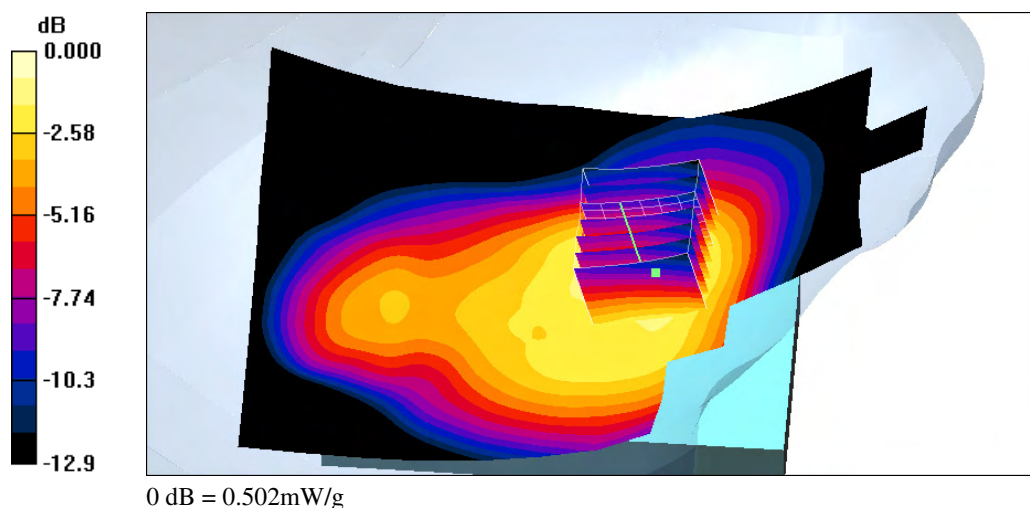
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 12.9 V/m; Power Drift = 0.005 dB

Peak SAR (extrapolated) = 0.679 W/kg

**SAR(1 g) = 0.415 mW/g; SAR(10 g) = 0.258 mW/g**

Maximum value of SAR (measured) = 0.502 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/26 AM 09:33:42

**RC\_PCS CH661\_Open Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: PCS; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.37 \text{ mho/m}$ ;  $\epsilon_r = 38.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Check/Area Scan (81x101x1):**

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

Maximum value of SAR (interpolated) = 0.381 mW/g

**Right Check/Zoom Scan (7x7x9)/Cube 0:**

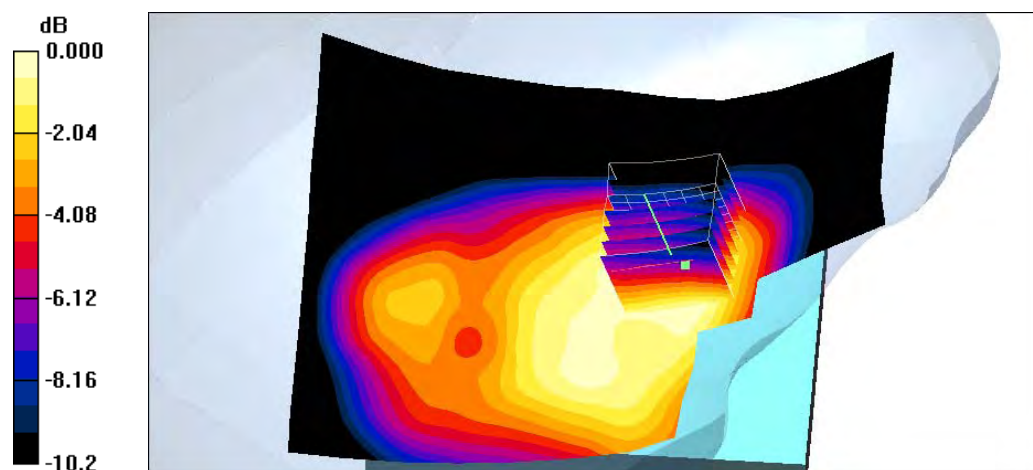
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 12.3 V/m; Power Drift = 0.009 dB

Peak SAR (extrapolated) = 0.599 W/kg

**SAR(1 g) = 0.296 mW/g; SAR(10 g) = 0.201 mW/g**

Maximum value of SAR (measured) = 0.339 mW/g



0 dB = 0.339mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/26 AM 10:50:36

**RT\_PCS CH661\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: PCS; Frequency: 1880 MHz;Duty Cycle: 1:8.3

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.37 \text{ mho/m}$ ;  $\epsilon_r = 38.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Tilted/Area Scan (71x121x1):**

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

Maximum value of SAR (interpolated) = 0.496 mW/g

**Right Tilted/Zoom Scan (7x7x9)/Cube 0:**

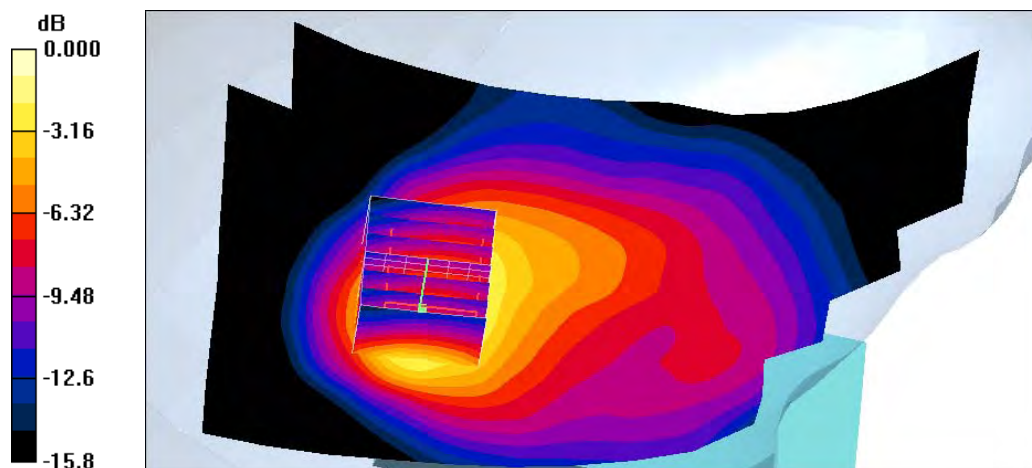
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 19.2 V/m; Power Drift = 0.035 dB

Peak SAR (extrapolated) = 0.606 W/kg

**SAR(1 g) = 0.383 mW/g; SAR(10 g) = 0.215 mW/g**

Maximum value of SAR (measured) = 0.472 mW/g



0 dB = 0.472mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/26 AM 11:17:39

### LC\_PCS CH661\_Close Mode

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: PCS; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 38.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

#### Left Check/Area Scan (71x111x1):

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

Maximum value of SAR (interpolated) = 0.864 mW/g

#### Left Check/Zoom Scan (7x7x9)/Cube 0:

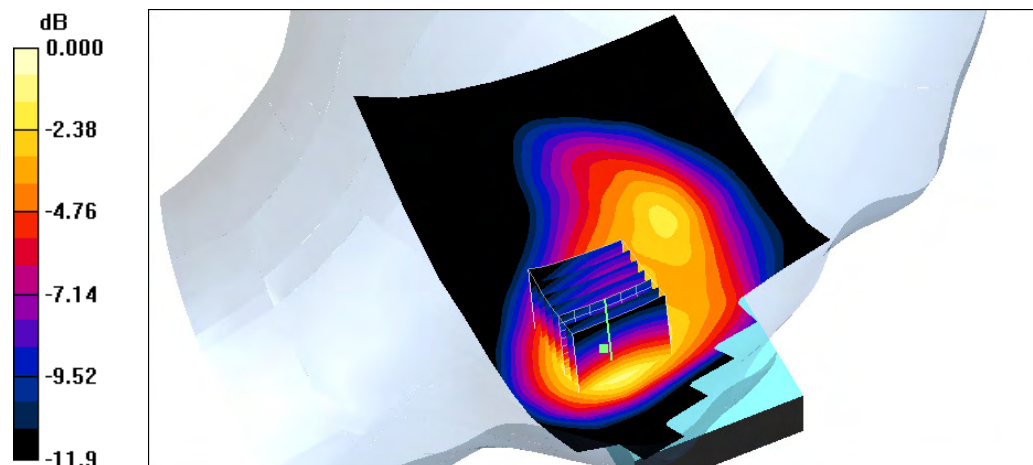
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 10.3 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 1.02 W/kg

**SAR(1 g) = 0.673 mW/g; SAR(10 g) = 0.412 mW/g**

Maximum value of SAR (measured) = 0.795 mW/g



0 dB = 0.795mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/26 PM 01:09:50

**LC\_PCS CH661\_Open Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: PCS; Frequency: 1880 MHz;Duty Cycle: 1:8.3

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.37 \text{ mho/m}$ ;  $\epsilon_r = 38.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Cheek/Area Scan (81x101x1):**

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

Maximum value of SAR (interpolated) = 0.594 mW/g

**Left Cheek/Zoom Scan (7x7x9)/Cube 0:**

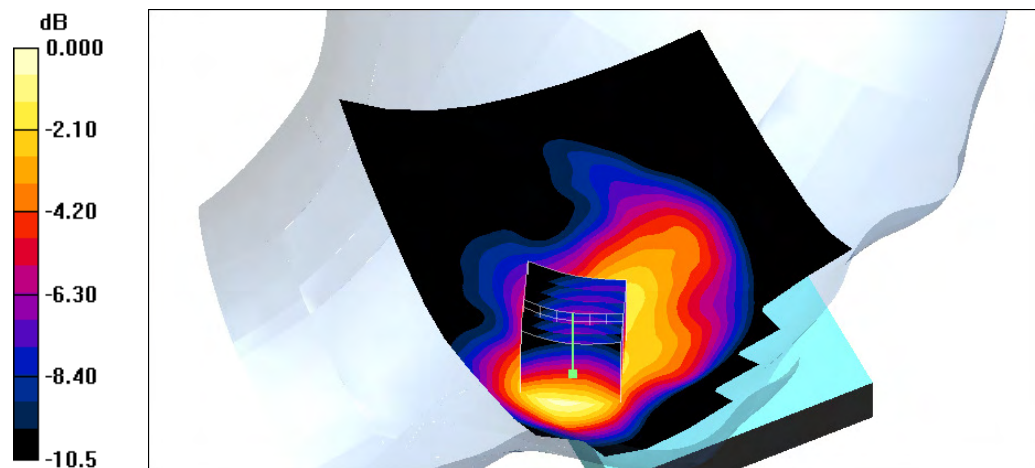
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 7.96 V/m; Power Drift = -0.007 dB

Peak SAR (extrapolated) = 0.684 W/kg

**SAR(1 g) = 0.509 mW/g; SAR(10 g) = 0.319 mW/g**

Maximum value of SAR (measured) = 0.586 mW/g



0 dB = 0.586mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/26 AM 11:42:14

**LT\_PCS CH661\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: PCS; Frequency: 1880 MHz;Duty Cycle: 1:8.3

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.37 \text{ mho/m}$ ;  $\epsilon_r = 38.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Tilted/Area Scan (71x121x1):**

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

Maximum value of SAR (interpolated) = 0.420 mW/g

**Left Tilted/Zoom Scan (7x7x9)/Cube 0:**

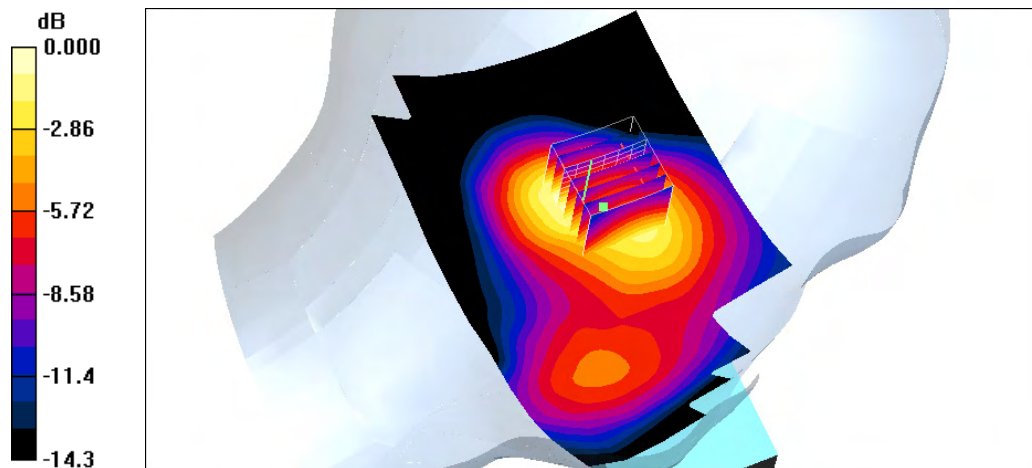
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 17.3 V/m; Power Drift = 0.017 dB

Peak SAR (extrapolated) = 0.551 W/kg

**SAR(1 g) = 0.359 mW/g; SAR(10 g) = 0.214 mW/g**

Maximum value of SAR (measured) = 0.434 mW/g



0 dB = 0.434mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/26 PM 11:55:16

**RC\_WCDMA Band II CH9262\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 38.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Right Section  
 Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

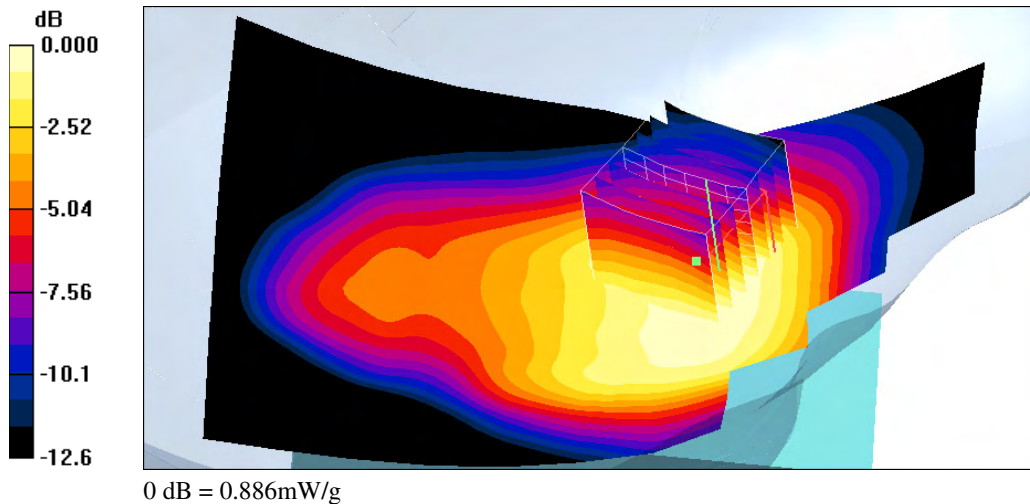
- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Check/Area Scan (71x101x1):**

Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.982 mW/g

**Right Check/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=3mm  
 Reference Value = 14.9 V/m; Power Drift = 0.142 dB  
 Peak SAR (extrapolated) = 1.15 W/kg  
**SAR(1 g) = 0.772 mW/g; SAR(10 g) = 0.502 mW/g**  
 Maximum value of SAR (measured) = 0.886 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/26 PM 11:12:16

**RC\_WCDMA Band II CH9262\_Open Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 38.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Right Section  
 Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Check/Area Scan (81x101x1):**

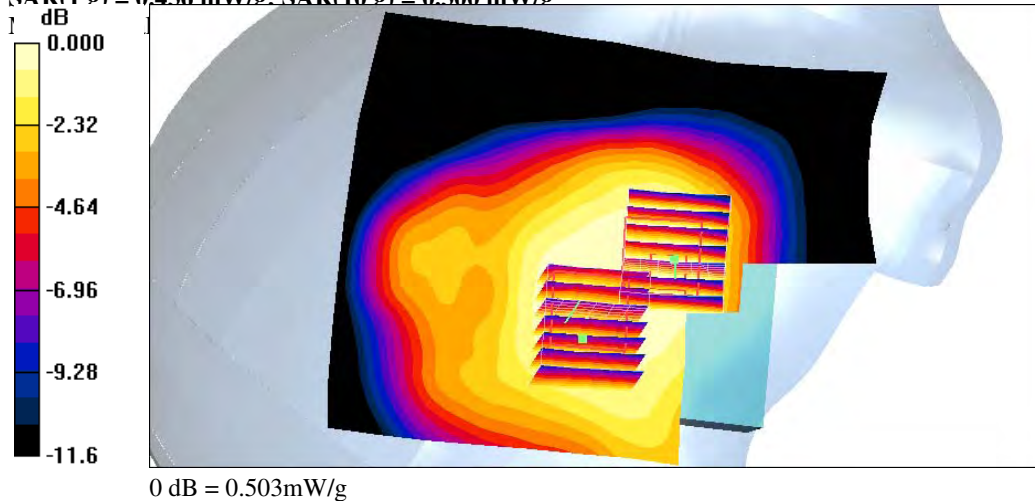
Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.538 mW/g

**Right Check/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=3mm  
 Reference Value = 14.1 V/m; Power Drift = 0.008 dB  
 Peak SAR (extrapolated) = 0.713 W/kg  
**SAR(1 g) = 0.476 mW/g; SAR(10 g) = 0.311 mW/g**  
 Maximum value of SAR (measured) = 0.559 mW/g

**Right Check/Zoom Scan (7x7x9)/Cube 1:**

Measurement grid: dx=5mm, dy=5mm, dz=3mm  
 Reference Value = 14.1 V/m; Power Drift = 0.008 dB  
 Peak SAR (extrapolated) = 0.599 W/kg  
**SAR(1 g) = 0.436 mW/g; SAR(10 g) = 0.300 mW/g**



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/27 AM 12:19:09

**RT\_WCDMA Band II CH9262\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 38.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Right Section  
 Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

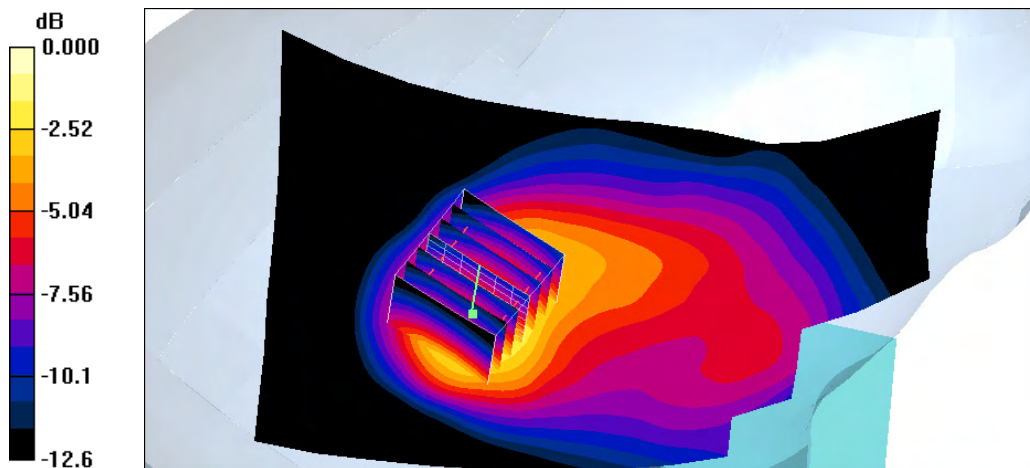
- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Tilted/Area Scan (71x111x1):**

Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.743 mW/g

**Right Tilted/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=3mm  
 Reference Value = 24.2 V/m; Power Drift = 0.009 dB  
 Peak SAR (extrapolated) = 0.952 W/kg  
**SAR(1 g) = 0.600 mW/g; SAR(10 g) = 0.344 mW/g**  
 Maximum value of SAR (measured) = 0.748 mW/g



0 dB = 0.748mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/27 AM 01:23:28

**LC\_WCDMA Band II CH9262\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 38.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Left Section  
 Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

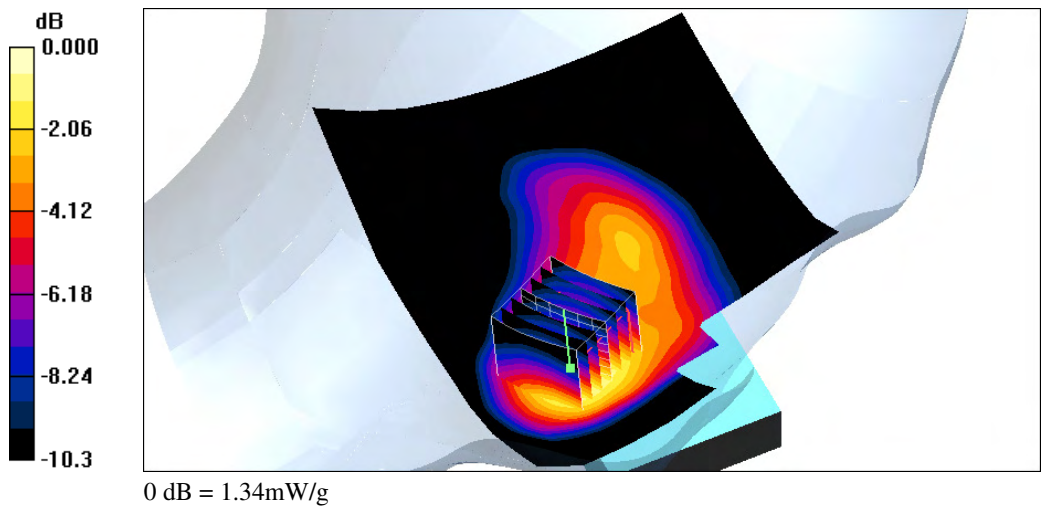
- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Check/Area Scan (81x101x1):**

Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 1.41 mW/g

**Left Check/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=3mm  
 Reference Value = 11.8 V/m; Power Drift = 0.079 dB  
 Peak SAR (extrapolated) = 1.70 W/kg  
**SAR(1 g) = 1.13 mW/g; SAR(10 g) = 0.695 mW/g**  
 Maximum value of SAR (measured) = 1.34 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/27 AM 03:33:18

**LC\_WCDMA Band II CH9262\_Open Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 38.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Left Section  
 Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

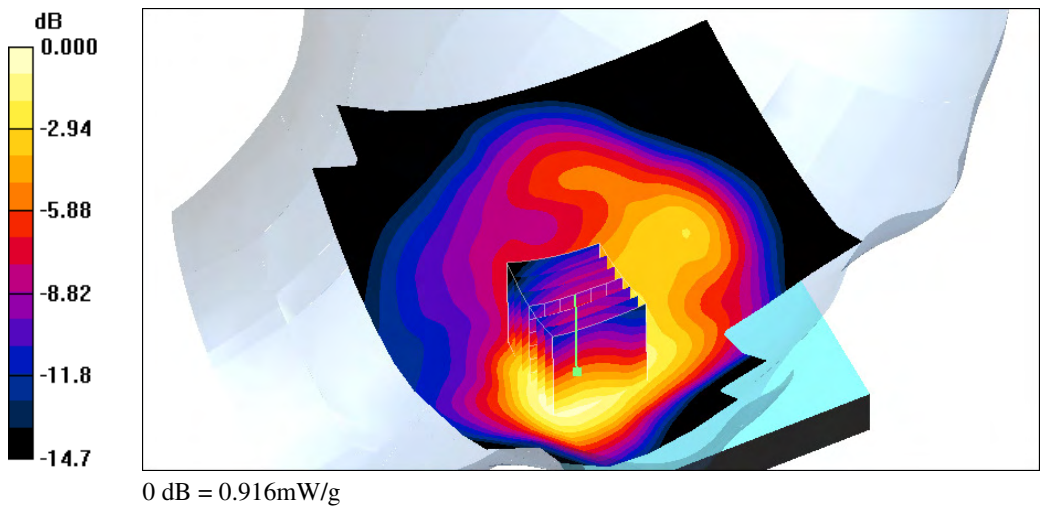
- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Check/Area Scan (91x101x1):**

Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.958 mW/g

**Left Check/Zoom Scan (7x7x7)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 12.3 V/m; Power Drift = -0.031 dB  
 Peak SAR (extrapolated) = 1.19 W/kg  
**SAR(1 g) = 0.851 mW/g; SAR(10 g) = 0.558 mW/g**  
 Maximum value of SAR (measured) = 0.916 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/27 AM 02:13:00

**LC\_WCDMA Band II CH9400\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1880 MHz;Duty Cycle: 1:1  
 Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.37 \text{ mho/m}$ ;  $\epsilon_r = 38.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Check/Area Scan (71x101x1):**

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

Maximum value of SAR (interpolated) = 1.06 mW/g

**Left Check/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 14.3 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 1.23 W/kg

**SAR(1 g) = 0.842 mW/g; SAR(10 g) = 0.527 mW/g**

Maximum value of SAR (measured) = 0.994 mW/g

**Left Check/Zoom Scan (7x7x9)/Cube 1:**

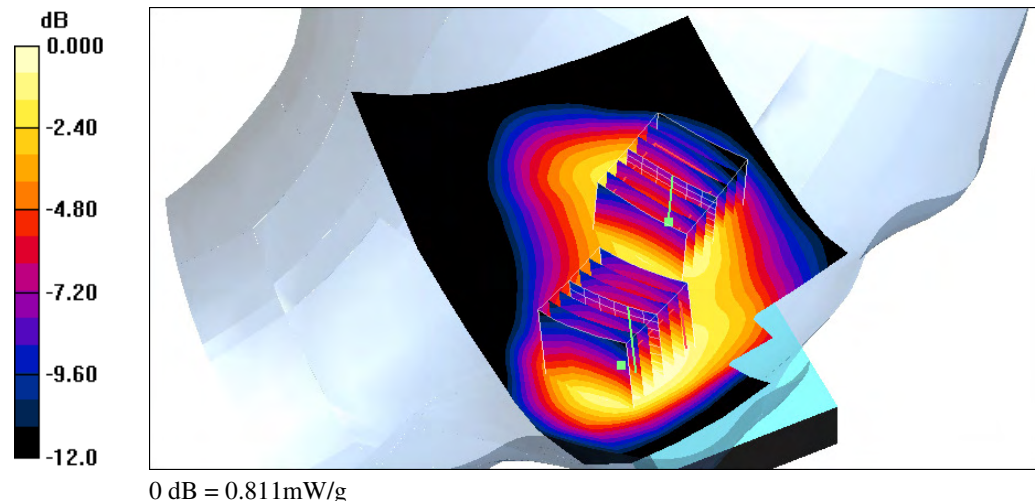
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 14.3 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 1.01 W/kg

**SAR(1 g) = 0.693 mW/g; SAR(10 g) = 0.435 mW/g**

Maximum value of SAR (measured) = 0.811 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/27 AM 02:52:32

**LC\_WCDMA Band II CH9538\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1907.6 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 1907.6 \text{ MHz}$ ;  $\sigma = 1.4 \text{ mho/m}$ ;  $\epsilon_r = 38.3$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Check/Area Scan (71x101x1):**

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

Maximum value of SAR (interpolated) = 1.19 mW/g

**Left Check/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 14.5 V/m; Power Drift = 0.035 dB

Peak SAR (extrapolated) = 1.38 W/kg

**SAR(1 g) = 0.921 mW/g; SAR(10 g) = 0.571 mW/g**

Maximum value of SAR (measured) = 1.10 mW/g

**Left Check/Zoom Scan (7x7x9)/Cube 1:**

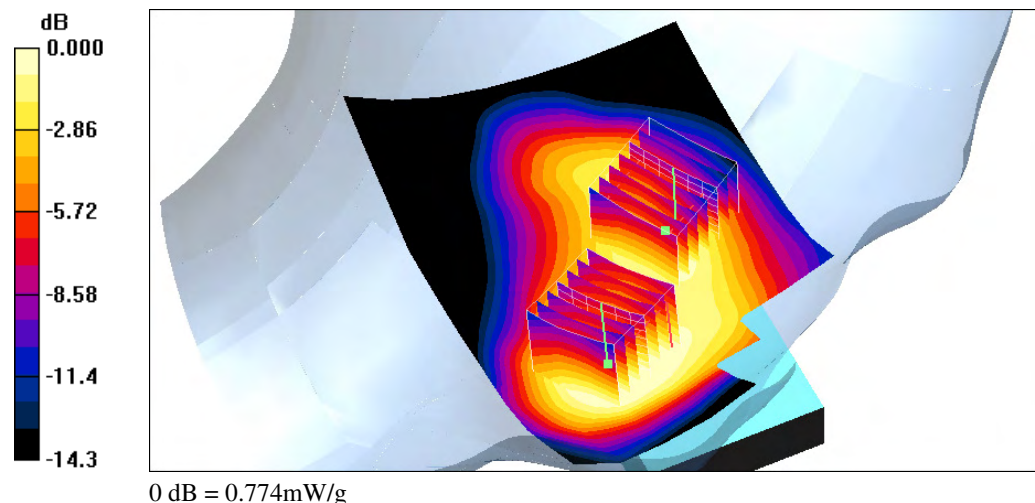
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 14.5 V/m; Power Drift = 0.035 dB

Peak SAR (extrapolated) = 1.00 W/kg

**SAR(1 g) = 0.664 mW/g; SAR(10 g) = 0.417 mW/g**

Maximum value of SAR (measured) = 0.774 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/27 AM 01:48:51

### LT\_WCDMA Band II CH9262\_Close Mode

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.35$  mho/m;  $\epsilon_r = 38.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.63, 4.63, 4.63); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

#### Left Tilted/Area Scan (71x101x1):

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

Maximum value of SAR (interpolated) = 0.691 mW/g

#### Left Tilted/Zoom Scan (7x7x9)/Cube 0:

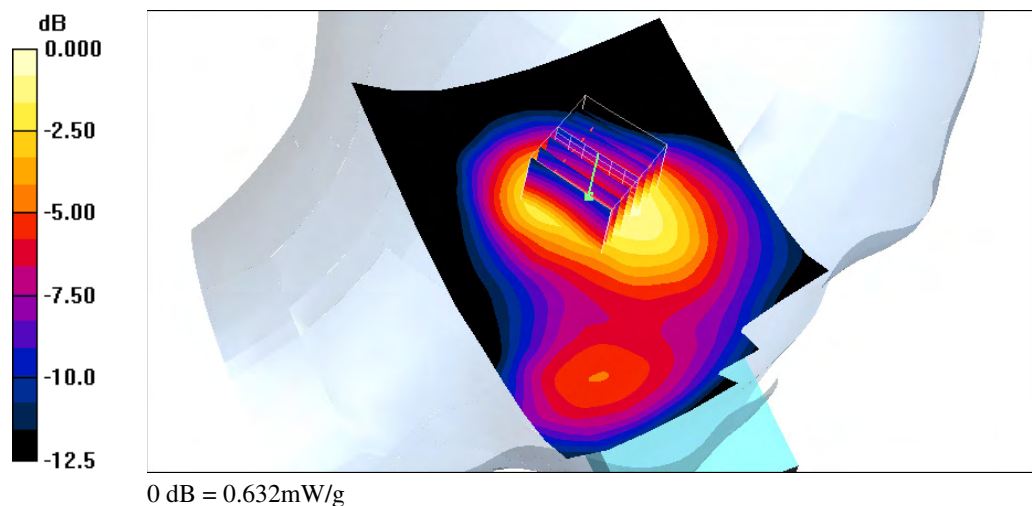
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 21.1 V/m; Power Drift = -0.005 dB

Peak SAR (extrapolated) = 0.787 W/kg

**SAR(1 g) = 0.534 mW/g; SAR(10 g) = 0.327 mW/g**

Maximum value of SAR (measured) = 0.632 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 PM 01:33:32

**RC\_WCDMA Band V CH4132\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 826.4 \text{ MHz}$ ;  $\sigma = 0.877 \text{ mho/m}$ ;  $\epsilon_r = 40.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Check/Area Scan (71x111x1):**

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

Maximum value of SAR (interpolated) = 0.634 mW/g

**Right Check/Zoom Scan (7x7x9)/Cube 0:**

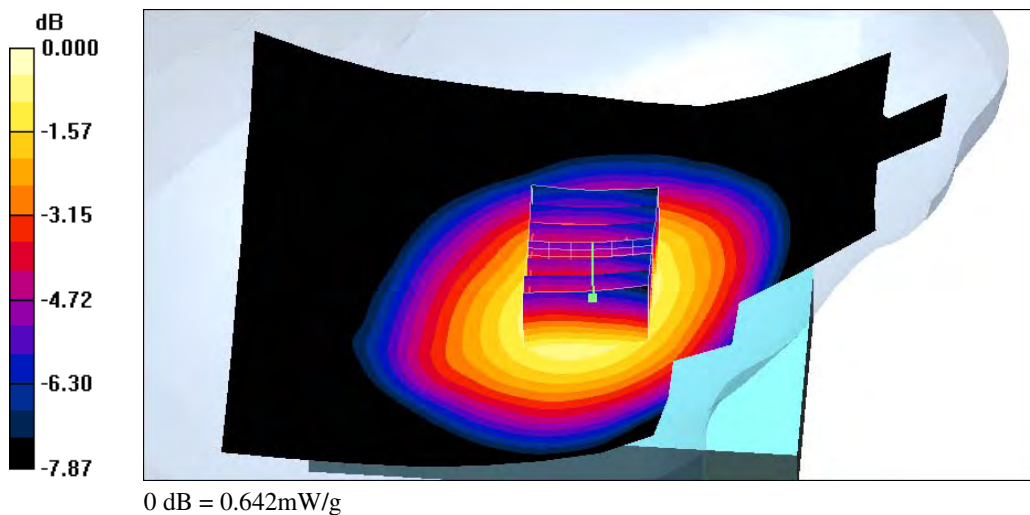
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 10.8 V/m; Power Drift = -0.053 dB

Peak SAR (extrapolated) = 0.739 W/kg

**SAR(1 g) = 0.579 mW/g; SAR(10 g) = 0.427 mW/g**

Maximum value of SAR (measured) = 0.642 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 PM 01:57:38

**RC\_WCDMA Band V CH4132\_Open Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 826.4 \text{ MHz}$ ;  $\sigma = 0.877 \text{ mho/m}$ ;  $\epsilon_r = 40.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASYS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Check/Area Scan (91x101x1):**

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

Maximum value of SAR (interpolated) = 0.338 mW/g

**Right Check/Zoom Scan (7x7x9)/Cube 0:**

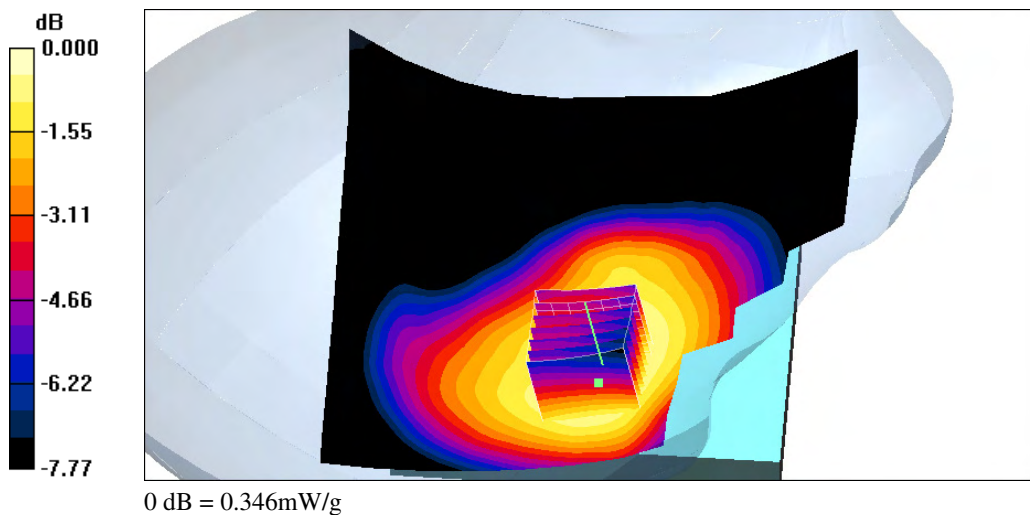
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 9.99 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 0.392 W/kg

**SAR(1 g) = 0.315 mW/g; SAR(10 g) = 0.237 mW/g**

Maximum value of SAR (measured) = 0.346 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 PM 04:34:00

**RT\_WCDMA Band V CH4132\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 826.4 \text{ MHz}$ ;  $\sigma = 0.877 \text{ mho/m}$ ;  $\epsilon_r = 40.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Right Section  
 Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

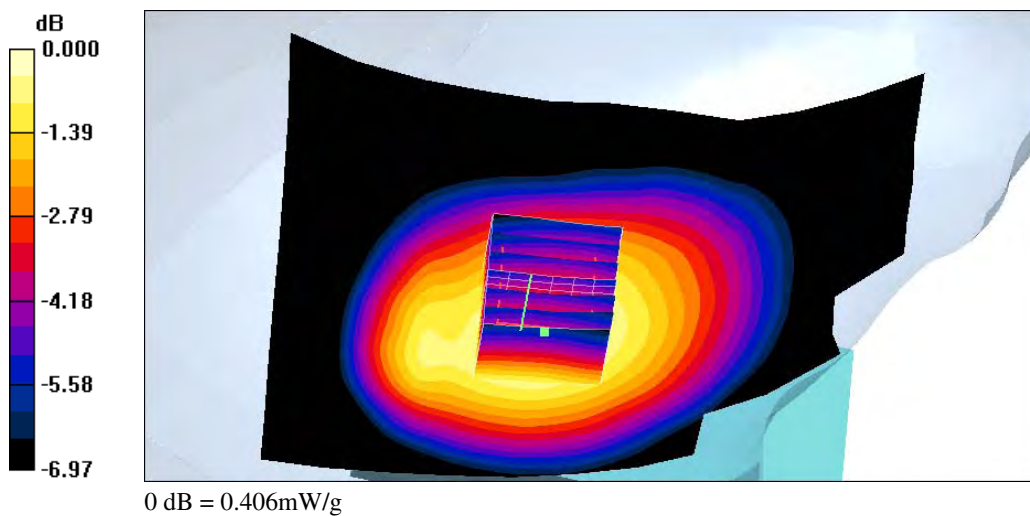
- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Right Tilted/Area Scan (71x101x1):**

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.406 mW/g

**Right Tilted/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$   
 Reference Value = 17.8 V/m; Power Drift = 0.006 dB  
 Peak SAR (extrapolated) = 0.458 W/kg  
**SAR(1 g) = 0.366 mW/g; SAR(10 g) = 0.274 mW/g**  
 Maximum value of SAR (measured) = 0.406 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 PM 03:42:12

### LC\_WCDMA Band V CH4132\_Close Mode

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 826.4$  MHz;  $\sigma = 0.877$  mho/m;  $\epsilon_r = 40.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

#### Left Check/Area Scan (71x111x1):

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

Maximum value of SAR (interpolated) = 0.610 mW/g

#### Left Check/Zoom Scan (7x7x9)/Cube 0:

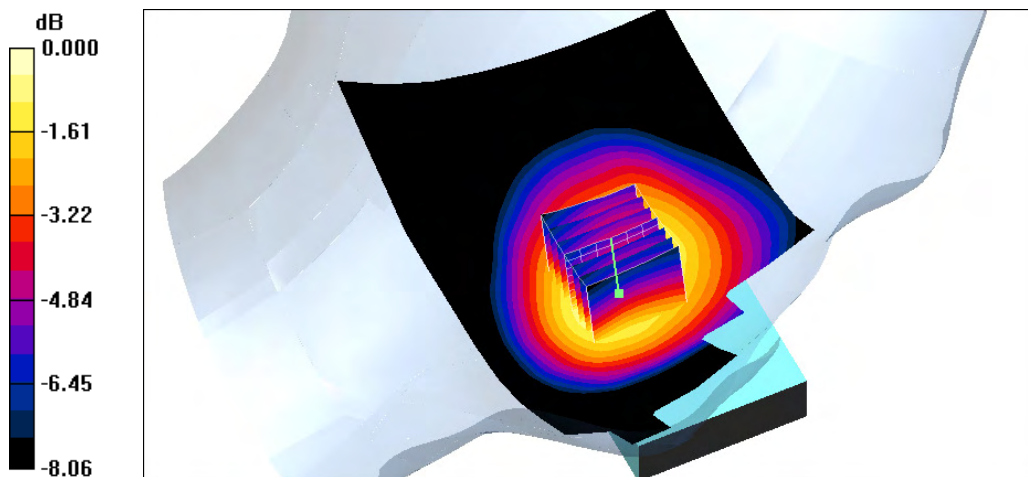
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 11.5 V/m; Power Drift = 0.135 dB

Peak SAR (extrapolated) = 0.719 W/kg

**SAR(1 g) = 0.556 mW/g; SAR(10 g) = 0.398 mW/g**

Maximum value of SAR (measured) = 0.620 mW/g



0 dB = 0.620mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/4 PM 04:09:39

**LT\_WCDMA Band V CH4132\_Close Mode**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 826.4 \text{ MHz}$ ;  $\sigma = 0.877 \text{ mho/m}$ ;  $\epsilon_r = 40.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.58, 5.58, 5.58); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Left Tilted/Area Scan (71x111x1):**

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

Maximum value of SAR (interpolated) = 0.405 mW/g

**Left Tilted/Zoom Scan (7x7x9)/Cube 0:**

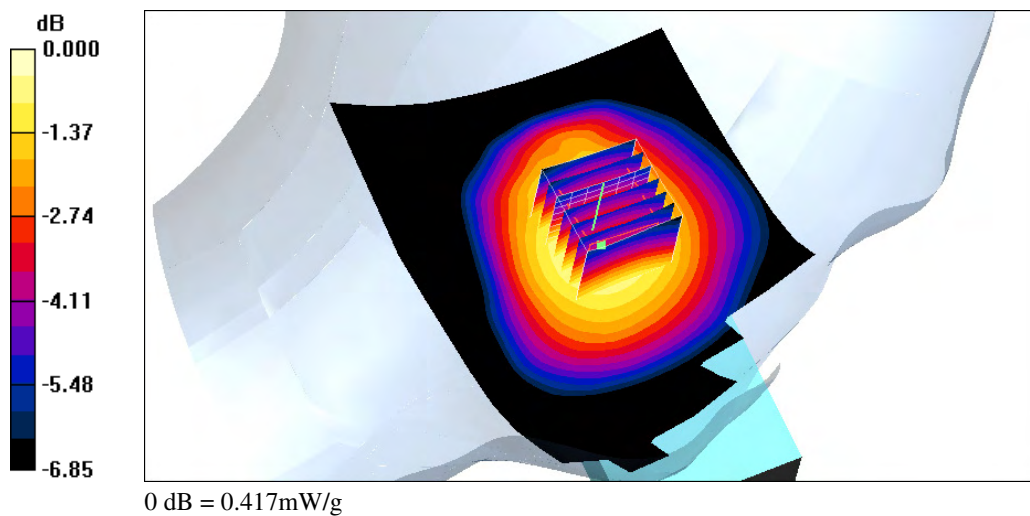
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 19.7 V/m; Power Drift = 0.005 dB

Peak SAR (extrapolated) = 0.472 W/kg

**SAR(1 g) = 0.377 mW/g; SAR(10 g) = 0.282 mW/g**

Maximum value of SAR (measured) = 0.417 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/29 PM 04:46:50

**Flat\_GSM850 CH128\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 824.2 \text{ MHz}$ ;  $\sigma = 0.983 \text{ mho/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.59, 5.59, 5.59); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x111x1):**

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

Maximum value of SAR (interpolated) = 0.671 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

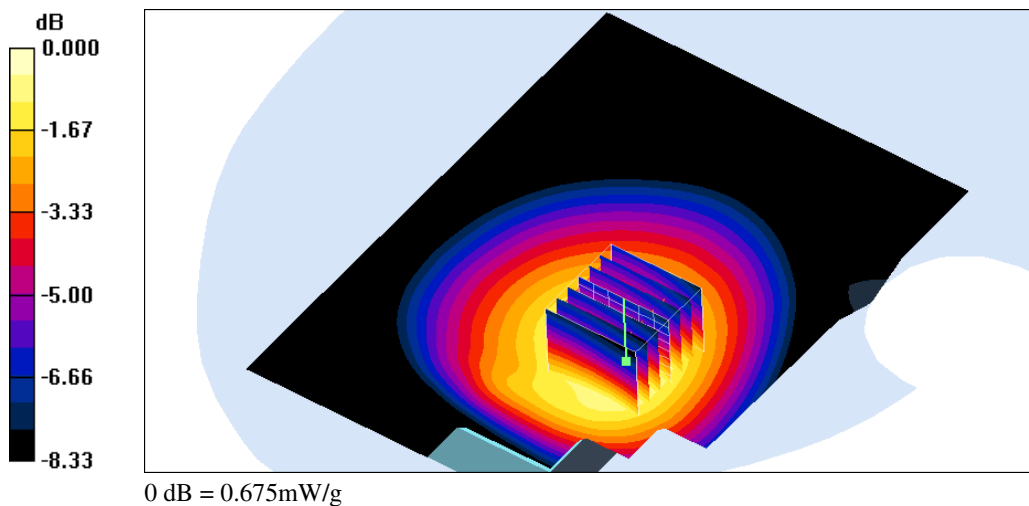
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 9.71 V/m; Power Drift = 0.016 dB

Peak SAR (extrapolated) = 0.799 W/kg

**SAR(1 g) = 0.596 mW/g; SAR(10 g) = 0.421 mW/g**

Maximum value of SAR (measured) = 0.675 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/29 PM 12:47:14

**Flat\_GPRS850 CH128\_3Down2Up\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GPRS 850 (3Down, 2Up); Frequency: 824.2 MHz; Duty Cycle: 1:4.2  
Medium parameters used (interpolated):  $f = 824.2$  MHz;  $\sigma = 0.983$  mho/m;  $\epsilon_r = 53.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

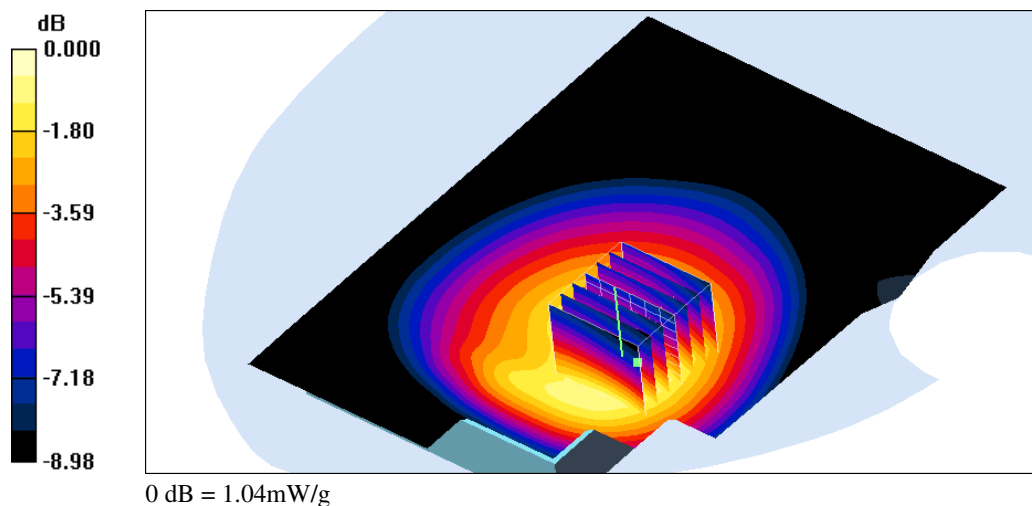
- Probe: ES3DV3 - SN3071; ConvF(5.59, 5.59, 5.59); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x111x1):**

Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.03 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=3mm  
Reference Value = 11.0 V/m; Power Drift = 0.004 dB  
Peak SAR (extrapolated) = 1.26 W/kg  
**SAR(1 g) = 0.907 mW/g; SAR(10 g) = 0.629 mW/g**  
Maximum value of SAR (measured) = 1.04 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/29 AM 11:24:08

**Flat\_GPRS850 CH128\_3Down2Up\_Close Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GPRS 850 (3Down, 2Up); Frequency: 824.2 MHz; Duty Cycle: 1:4.2  
 Medium parameters used (interpolated):  $f = 824.2 \text{ MHz}$ ;  $\sigma = 0.983 \text{ mho/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section  
 Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

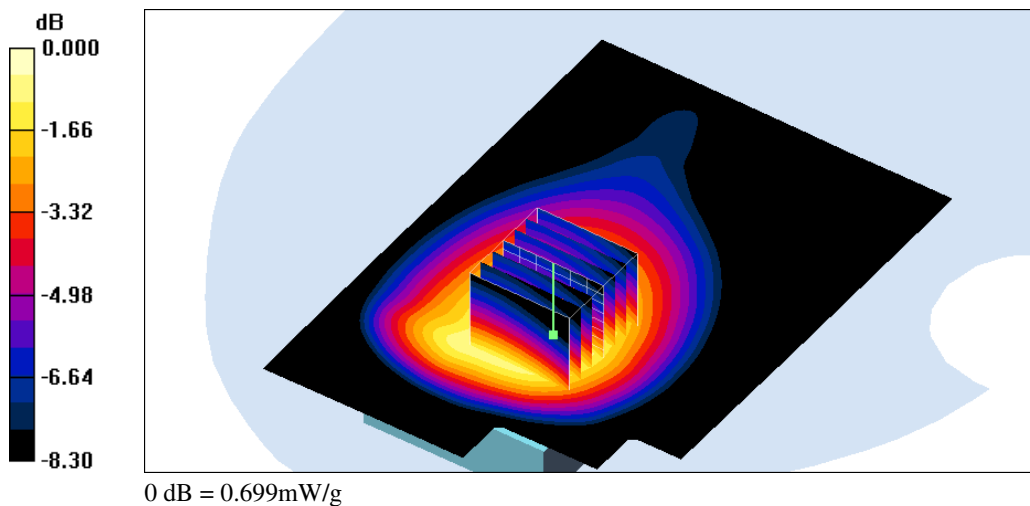
- Probe: ES3DV3 - SN3071; ConvF(5.59, 5.59, 5.59); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (71x101x1):**

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.707 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$   
 Reference Value = 10.9 V/m; Power Drift = 0.001 dB  
 Peak SAR (extrapolated) = 0.853 W/kg  
**SAR(1 g) = 0.611 mW/g; SAR(10 g) = 0.423 mW/g**  
 Maximum value of SAR (measured) = 0.699 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/29 PM 12:19:29

**Flat\_GPRS850 CH128\_4Down1Up\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GSM 850 GPRS(4Down, 1Up); Frequency: 824.2 MHz;Duty Cycle: 1:8.3  
 Medium parameters used (interpolated):  $f = 824.2$  MHz;  $\sigma = 0.983$  mho/m;  $\epsilon_r = 53.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Flat Section  
 Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

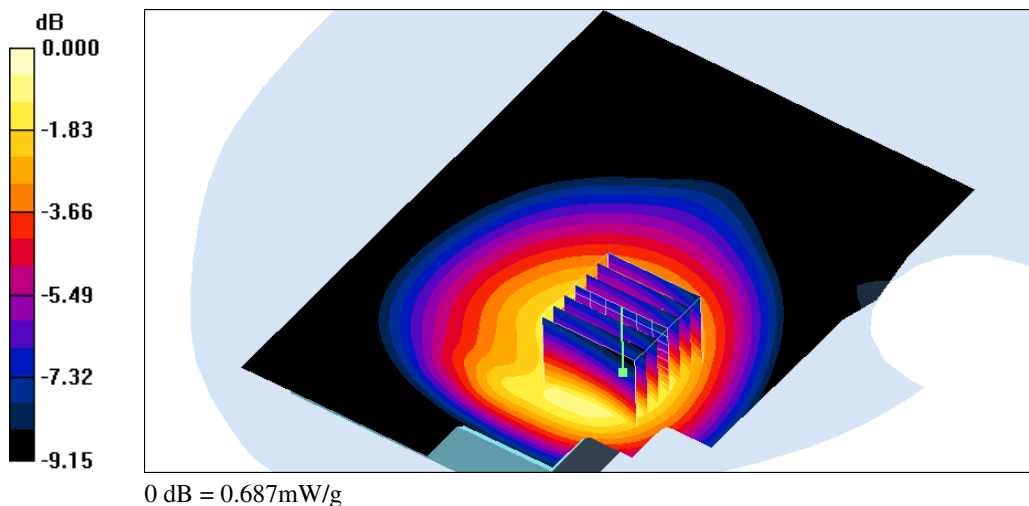
- Probe: ES3DV3 - SN3071; ConvF(5.59, 5.59, 5.59); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x111x1):**

Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.685 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=3mm  
 Reference Value = 8.94 V/m; Power Drift = -0.001 dB  
 Peak SAR (extrapolated) = 0.827 W/kg  
**SAR(1 g) = 0.602 mW/g; SAR(10 g) = 0.414 mW/g**  
 Maximum value of SAR (measured) = 0.687 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/29 PM 02:59:42

**Flat\_GPRS850 CH190\_3Down2Up\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GPRS 850 (3Down, 2Up); Frequency: 836.6 MHz;Duty Cycle: 1:4.2  
 Medium parameters used:  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.997 \text{ mho/m}$ ;  $\epsilon_r = 53.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.59, 5.59, 5.59); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASYS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x111x1):**

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

Maximum value of SAR (interpolated) = 0.980 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

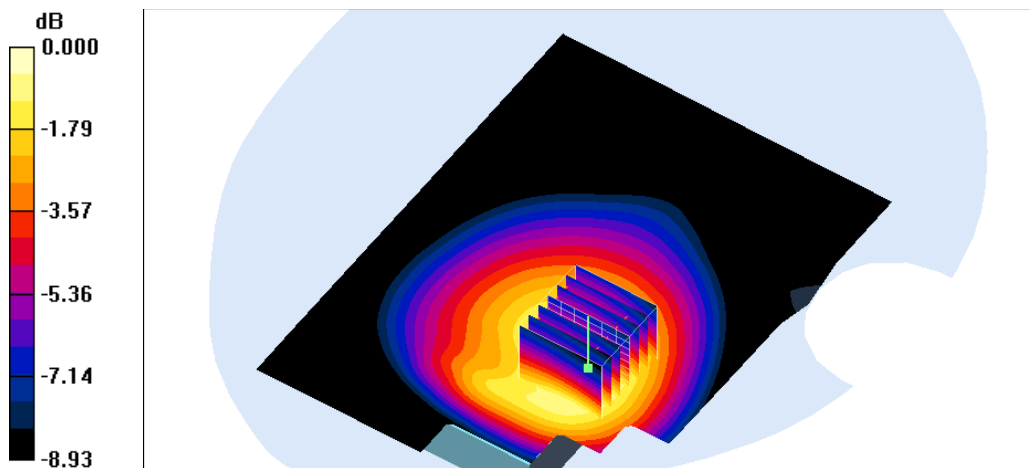
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 10.7 V/m; Power Drift = -0.048 dB

Peak SAR (extrapolated) = 1.18 W/kg

**SAR(1 g) = 0.862 mW/g; SAR(10 g) = 0.592 mW/g**

Maximum value of SAR (measured) = 0.992 mW/g



0 dB = 0.992mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/29 PM 04:13:23

**Flat\_GPRS850 CH251\_3Down2Up\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GPRS 850 (3Down, 2Up); Frequency: 848.8 MHz; Duty Cycle: 1:4.2  
 Medium parameters used:  $f = 848.8 \text{ MHz}$ ;  $\sigma = 1.01 \text{ mho/m}$ ;  $\epsilon_r = 53.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.59, 5.59, 5.59); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x111x1):**

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

Maximum value of SAR (interpolated) = 0.824 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

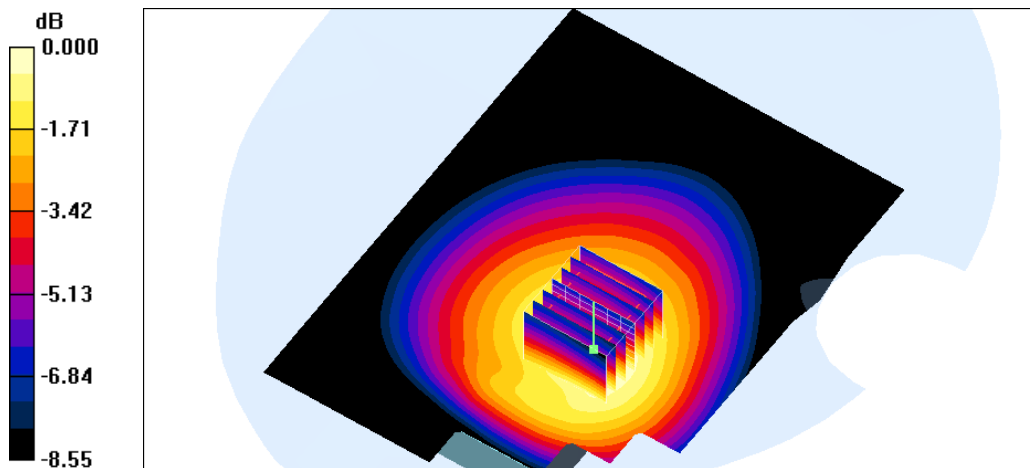
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 12.5 V/m; Power Drift = -0.046 dB

Peak SAR (extrapolated) = 0.971 W/kg

**SAR(1 g) = 0.733 mW/g; SAR(10 g) = 0.519 mW/g**

Maximum value of SAR (measured) = 0.828 mW/g



0 dB = 0.828mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 PM 01:33:59

**Flat\_PCS CH661\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: PCS; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x91x1):**

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

Maximum value of SAR (interpolated) = 0.664 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

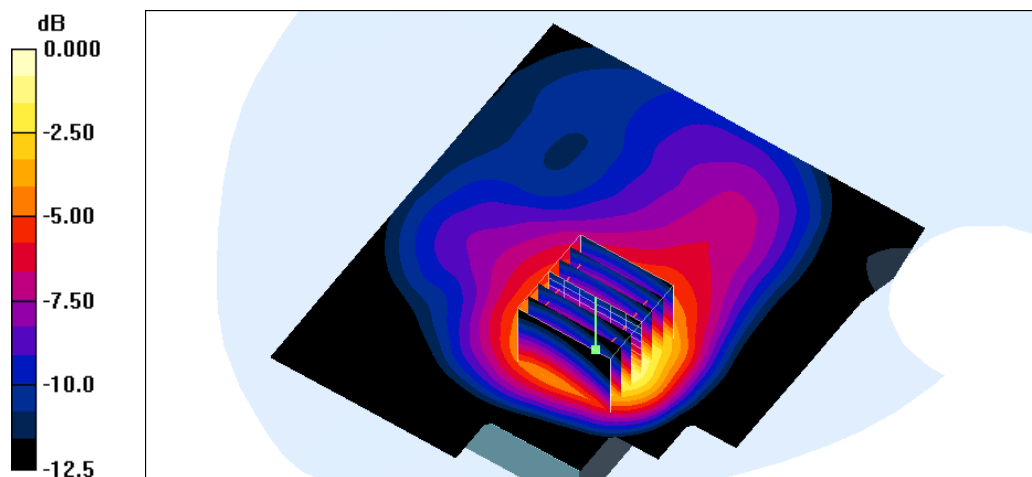
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 7.39 V/m; Power Drift = 0.029 dB

Peak SAR (extrapolated) = 0.798 W/kg

**SAR(1 g) = 0.501 mW/g; SAR(10 g) = 0.286 mW/g**

Maximum value of SAR (measured) = 0.626 mW/g



0 dB = 0.626mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 PM 12:24:24

**Flat\_GPRS PCS CH512\_3Down2Up\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GPRS PCS (3Down,2Up); Frequency: 1850.2 MHz;Duty Cycle: 1:4.2  
 Medium parameters used (interpolated):  $f = 1850.2 \text{ MHz}$ ;  $\sigma = 1.45 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x91x1):**

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

Maximum value of SAR (interpolated) = 0.821 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

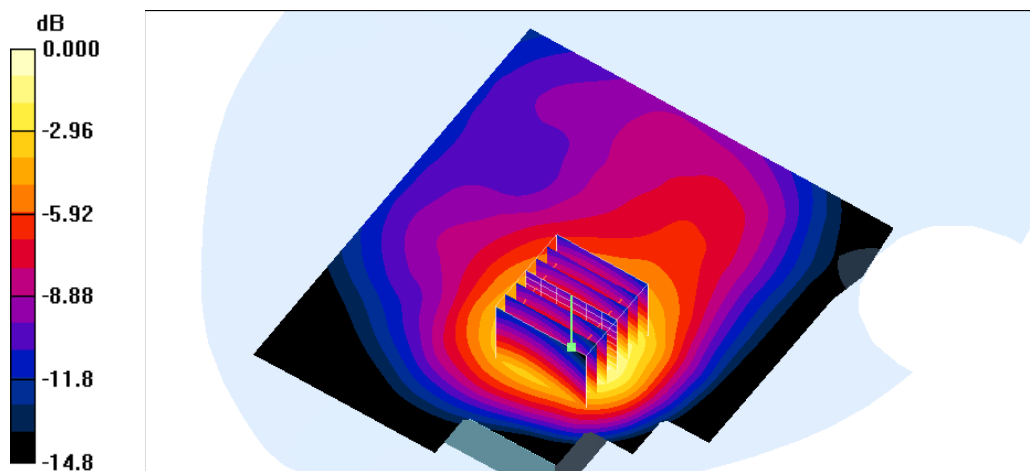
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 9.01 V/m; Power Drift = 0.030 dB

Peak SAR (extrapolated) = 1.49 W/kg

**SAR(1 g) = 0.655 mW/g; SAR(10 g) = 0.381 mW/g**

Maximum value of SAR (measured) = 0.787 mW/g



0 dB = 0.787mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 AM 10:53:23

**Flat\_GPRS PCS CH661\_3Down2Up\_Close Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (71x91x1):**

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

Maximum value of SAR (interpolated) = 0.993 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

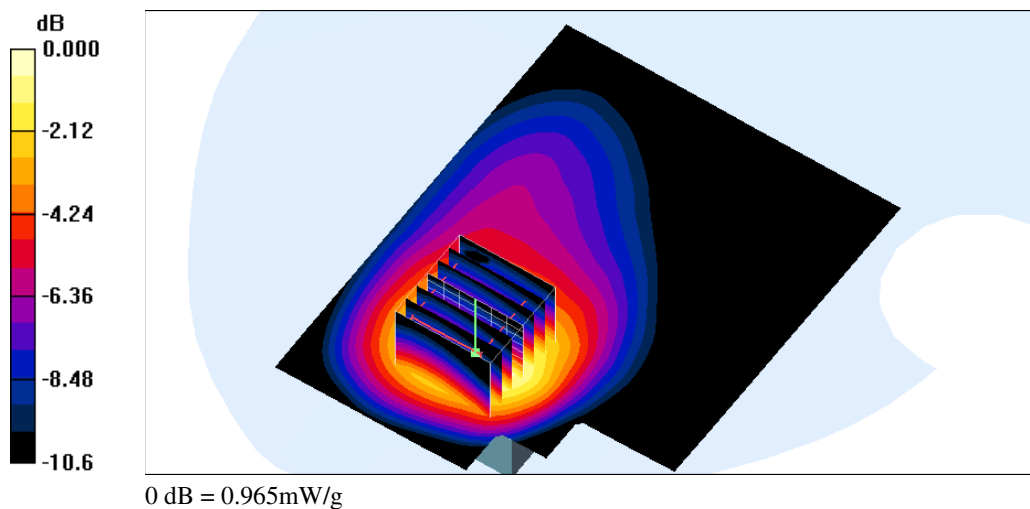
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 7.07 V/m; Power Drift = 0.056 dB

Peak SAR (extrapolated) = 1.22 W/kg

**SAR(1 g) = 0.796 mW/g; SAR(10 g) = 0.474 mW/g**

Maximum value of SAR (measured) = 0.965 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 AM 11:40:27

**Flat\_GPRS PCS CH661\_3Down2Up\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

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

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.48$  mho/m;  $\epsilon_r = 51.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x91x1):**

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

Maximum value of SAR (interpolated) = 1.17 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

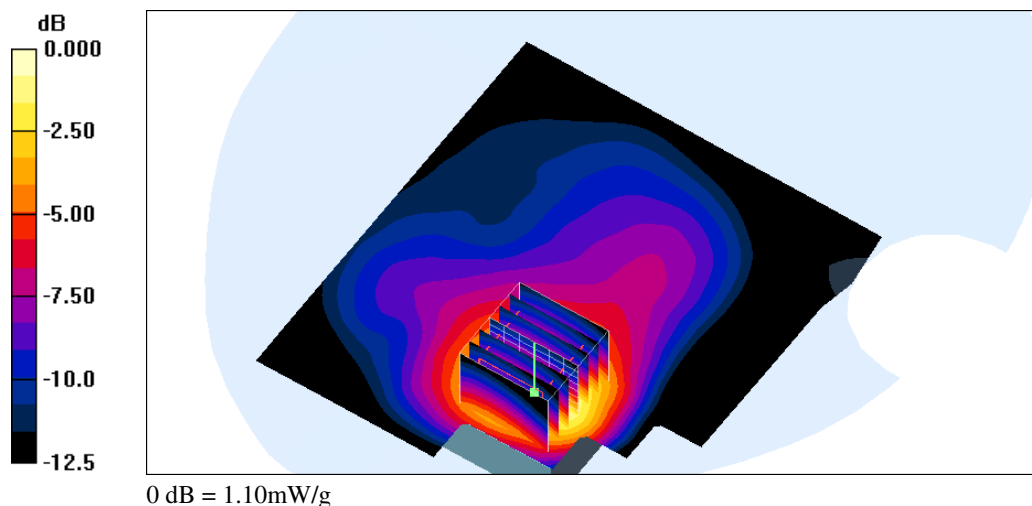
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 8.00 V/m; Power Drift = 0.007 dB

Peak SAR (extrapolated) = 1.36 W/kg

**SAR(1 g) = 0.860 mW/g; SAR(10 g) = 0.486 mW/g**

Maximum value of SAR (measured) = 1.10 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 PM 01:10:56

**Flat\_GPRS PCS CH661\_4Down1Up\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GPRS PCS (4Down,1Up); Frequency: 1880 MHz;Duty Cycle: 1:8.3

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.48$  mho/m;  $\epsilon_r = 51.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x91x1):**

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

Maximum value of SAR (interpolated) = 0.636 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

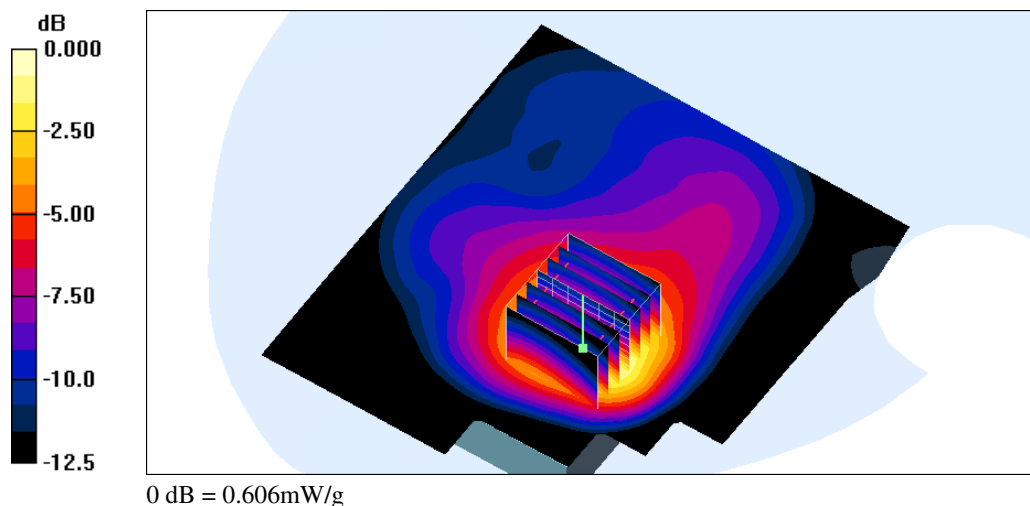
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 7.11 V/m; Power Drift = 0.008 dB

Peak SAR (extrapolated) = 0.768 W/kg

**SAR(1 g) = 0.485 mW/g; SAR(10 g) = 0.277 mW/g**

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



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 PM 12:48:21

**Flat\_GPRS PCS CH810\_3Down2Up\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: GPRS PCS (3Down,2Up); Frequency: 1909.8 MHz;Duty Cycle: 1:4.2  
 Medium parameters used:  $f = 1909.8 \text{ MHz}$ ;  $\sigma = 1.51 \text{ mho/m}$ ;  $\epsilon_r = 51.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x91x1):**

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

Maximum value of SAR (interpolated) = 0.741 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

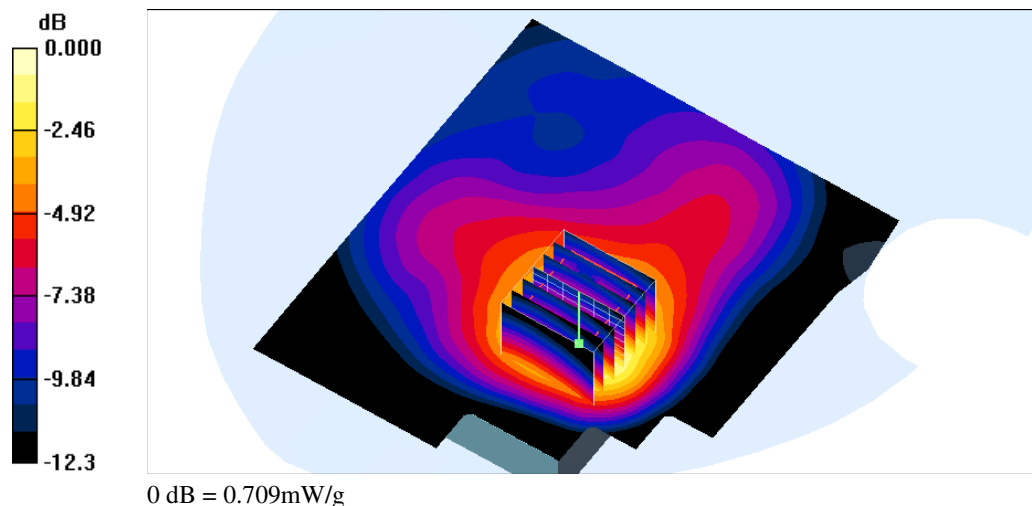
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 8.08 V/m; Power Drift = 0.005 dB

Peak SAR (extrapolated) = 0.905 W/kg

**SAR(1 g) = 0.576 mW/g; SAR(10 g) = 0.335 mW/g**

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





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 AM 08:38:44

**Flat\_WCDMA Band II CH9262\_Close Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 1852.4 \text{ MHz}$ ;  $\sigma = 1.45 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section  
 Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

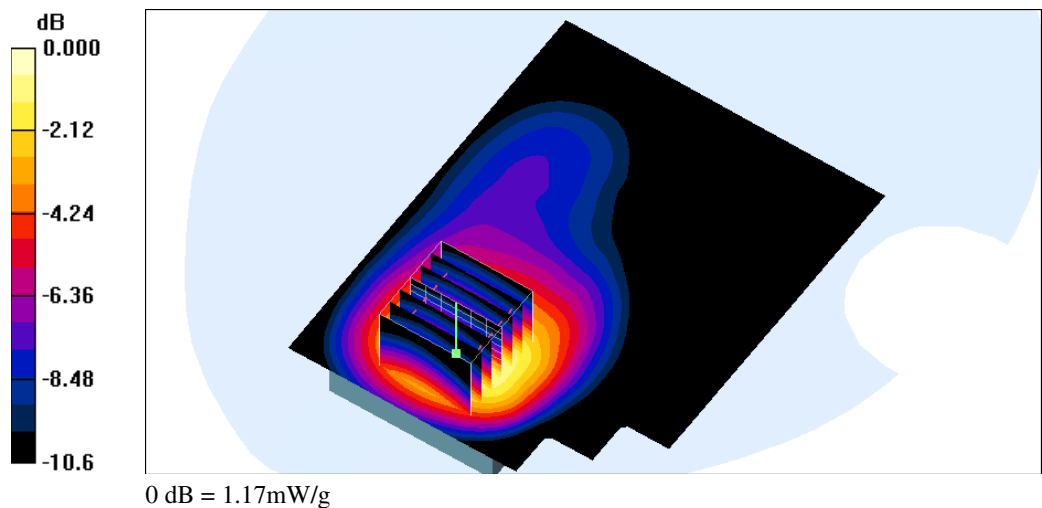
- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (71x91x1):**

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 1.10 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$   
 Reference Value = 8.97 V/m; Power Drift = 0.108 dB  
 Peak SAR (extrapolated) = 1.44 W/kg  
**SAR(1 g) = 0.949 mW/g; SAR(10 g) = 0.559 mW/g**  
 Maximum value of SAR (measured) = 1.17 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 AM 09:06:02

**Flat\_WCDMA Band II CH9262\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 1852.4 \text{ MHz}$ ;  $\sigma = 1.45 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section  
 Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

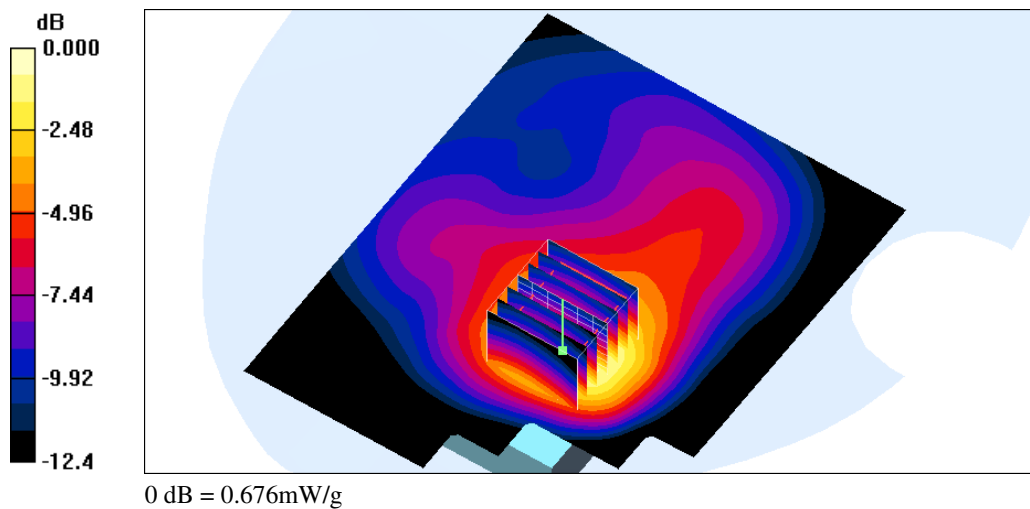
- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x101x1):**

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.661 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$   
 Reference Value = 8.83 V/m; Power Drift = 0.034 dB  
 Peak SAR (extrapolated) = 0.839 W/kg  
**SAR(1 g) = 0.552 mW/g; SAR(10 g) = 0.323 mW/g**  
 Maximum value of SAR (measured) = 0.676 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 AM 09:33:03

**Flat\_WCDMA Band II CH9400\_Close Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1880 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (71x91x1):**

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

Maximum value of SAR (interpolated) = 0.777 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

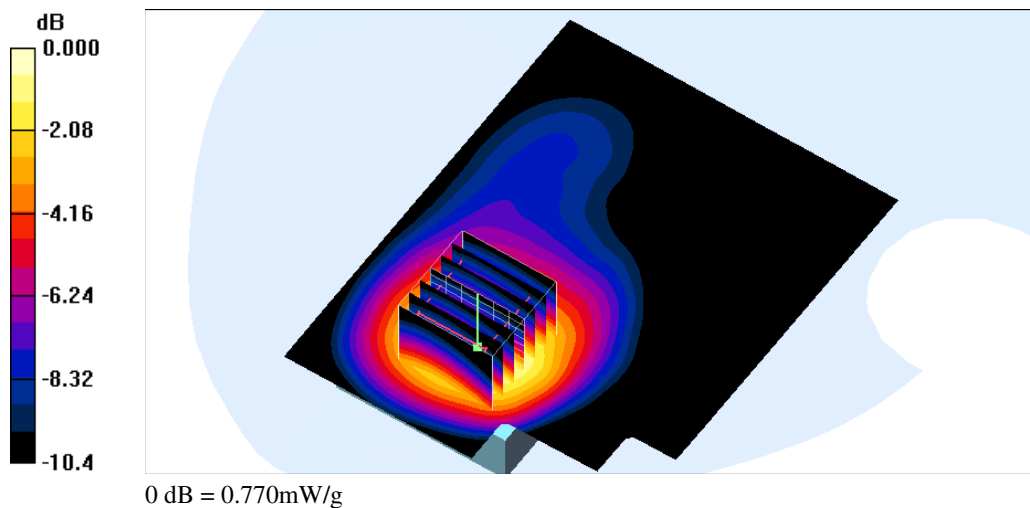
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 7.28 V/m; Power Drift = 0.061 dB

Peak SAR (extrapolated) = 0.966 W/kg

**SAR(1 g) = 0.633 mW/g; SAR(10 g) = 0.376 mW/g**

Maximum value of SAR (measured) = 0.770 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 AM 09:59:50

**Flat\_WCDMA Band II CH9538\_Close Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band II; Frequency: 1907.6 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 1907.6 \text{ MHz}$ ;  $\sigma = 1.51 \text{ mho/m}$ ;  $\epsilon_r = 51.5$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section  
 Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

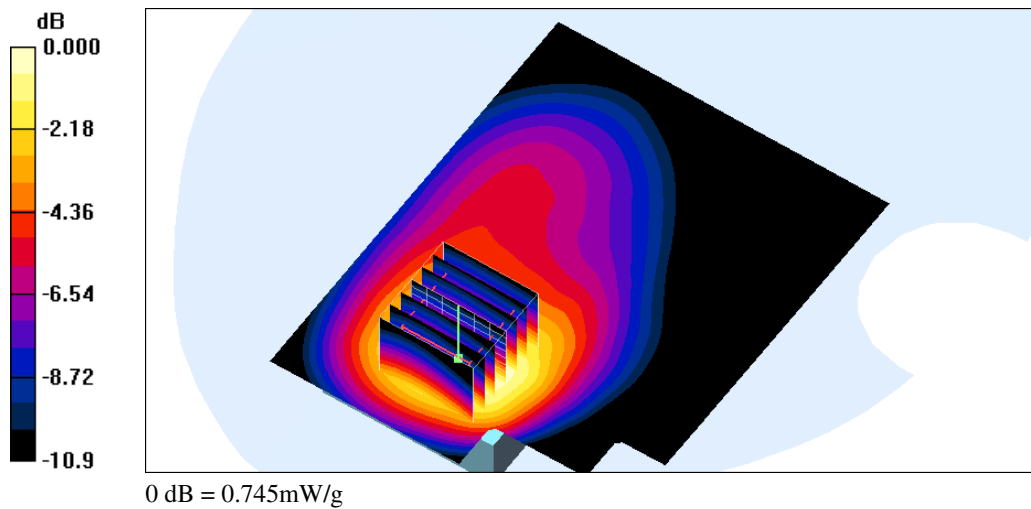
- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (71x91x1):**

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.741 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$   
 Reference Value = 7.84 V/m; Power Drift = 0.106 dB  
 Peak SAR (extrapolated) = 0.941 W/kg  
**SAR(1 g) = 0.618 mW/g; SAR(10 g) = 0.371 mW/g**  
 Maximum value of SAR (measured) = 0.745 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/3 AM 10:27:23

**Flat\_WCDMA HSDPA Band II CH9262\_Close Mode\_Headset\_To Phantom 15mm\_Sub**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA HSDPA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 51.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Flat Section  
 Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

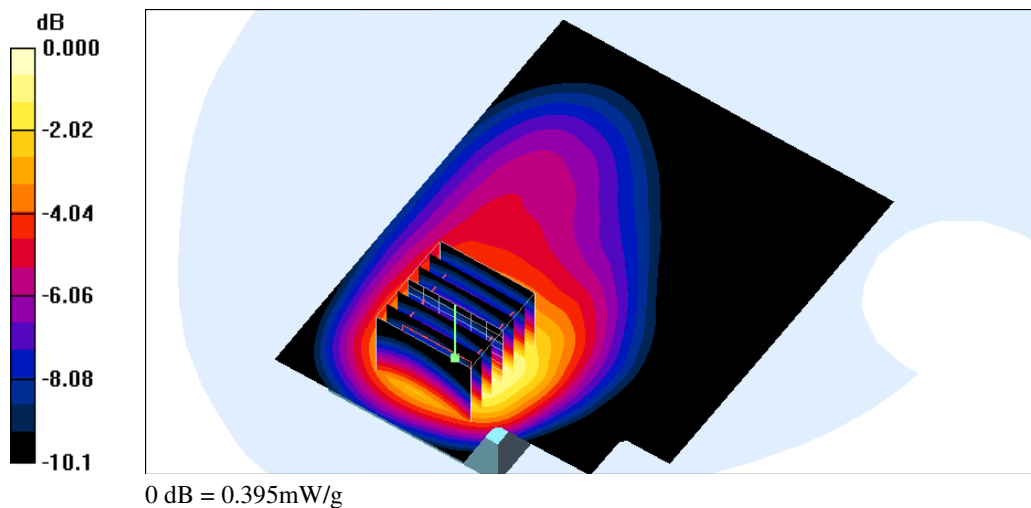
- Probe: ES3DV3 - SN3071; ConvF(4.26, 4.26, 4.26); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (71x91x1):**

Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.386 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=3mm  
 Reference Value = 5.90 V/m; Power Drift = -0.055 dB  
 Peak SAR (extrapolated) = 0.490 W/kg  
**SAR(1 g) = 0.325 mW/g; SAR(10 g) = 0.194 mW/g**  
 Maximum value of SAR (measured) = 0.395 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/29 PM 09:08:06

**Flat\_WCDMA Band V CH4132\_Close Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 826.4 \text{ MHz}$ ;  $\sigma = 0.986 \text{ mho/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.59, 5.59, 5.59); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (71x101x1):**

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

Maximum value of SAR (interpolated) = 0.738 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

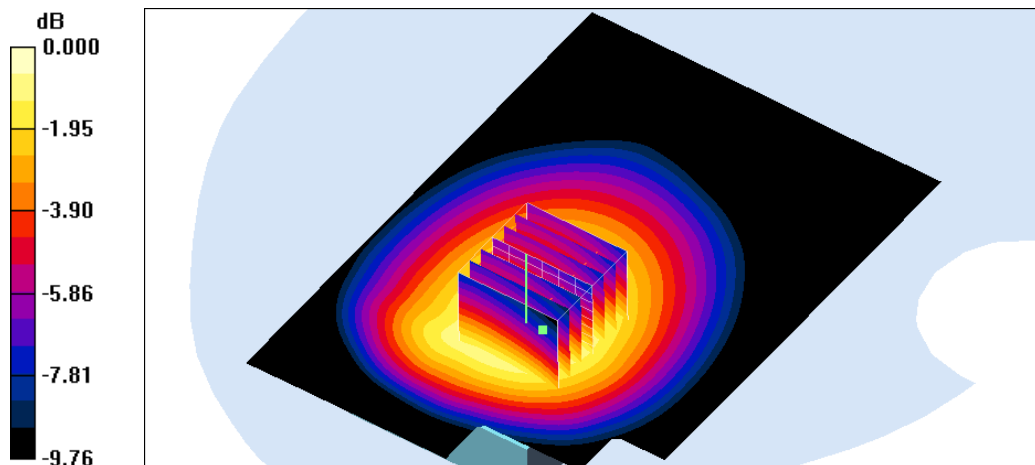
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 8.47 V/m; Power Drift = -0.004 dB

Peak SAR (extrapolated) = 0.892 W/kg

**SAR(1 g) = 0.668 mW/g; SAR(10 g) = 0.475 mW/g**

Maximum value of SAR (measured) = 0.754 mW/g



0 dB = 0.754mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/29 PM 09:41:18

**Flat\_WCDMA Band V CH4132\_Open Mode\_Headset\_To Phantom 15mm**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 826.4 \text{ MHz}$ ;  $\sigma = 0.986 \text{ mho/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3071; ConvF(5.59, 5.59, 5.59); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x101x1):**

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

Maximum value of SAR (interpolated) = 0.652 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

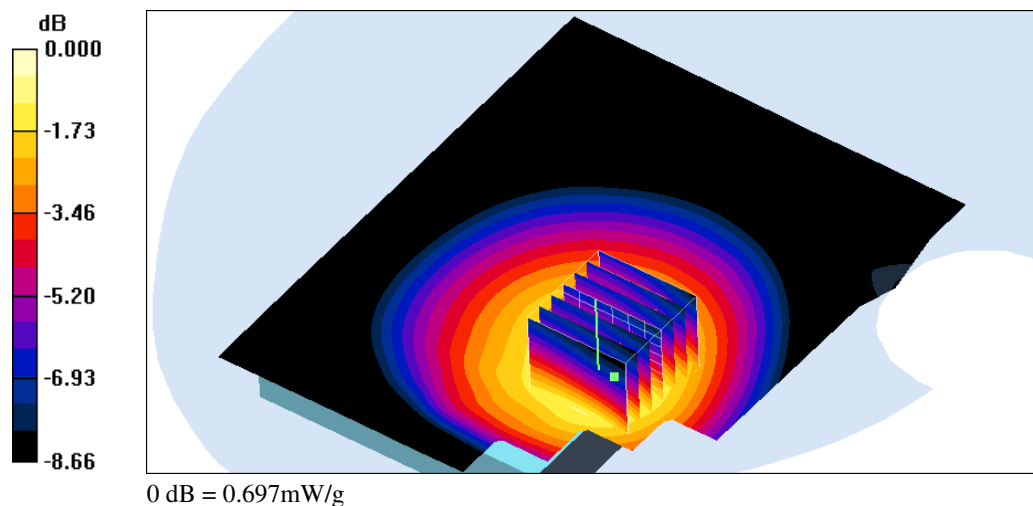
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 7.37 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 0.838 W/kg

**SAR(1 g) = 0.610 mW/g; SAR(10 g) = 0.423 mW/g**

Maximum value of SAR (measured) = 0.697 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/1/29 PM 11:56:40

**Flat\_WCDMA HSDPA Band V CH4132\_Close Mode\_Headset\_To Phantom 15mm\_Sub**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: WCDMA HSDPA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 826.4 \text{ MHz}$ ;  $\sigma = 0.986 \text{ mho/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section  
 Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

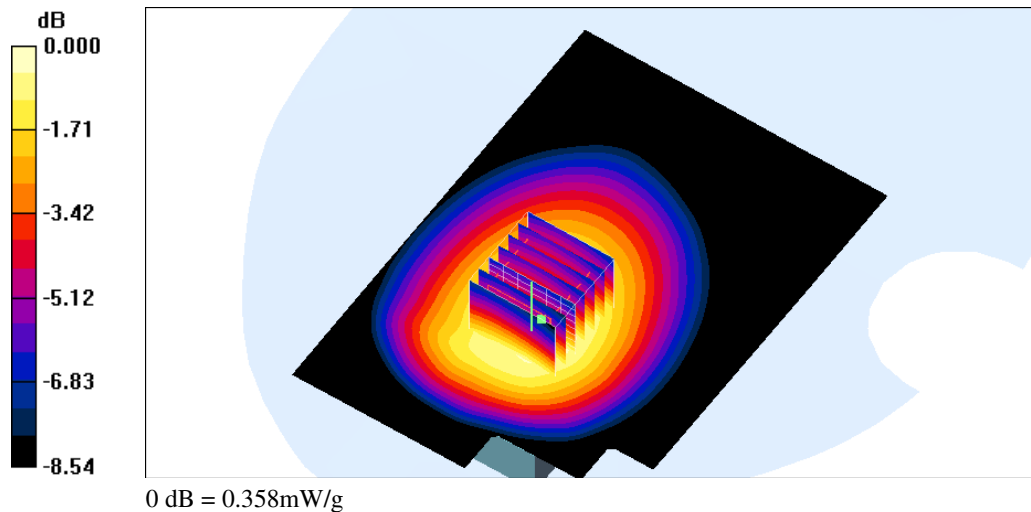
- Probe: ES3DV3 - SN3071; ConvF(5.59, 5.59, 5.59); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (71x101x1):**

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
 Maximum value of SAR (interpolated) = 0.358 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=3\text{mm}$   
 Reference Value = 6.82 V/m; Power Drift = 0.049 dB  
 Peak SAR (extrapolated) = 0.421 W/kg  
**SAR(1 g) = 0.321 mW/g; SAR(10 g) = 0.230 mW/g**  
 Maximum value of SAR (measured) = 0.358 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/5 PM 05:20:18

**Flat\_802.11b CH6\_1M\_Close Mode\_To Phantom15mm\_Headset**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1  
 Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.9$  mho/m;  $\epsilon_r = 50.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Flat Section  
 Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

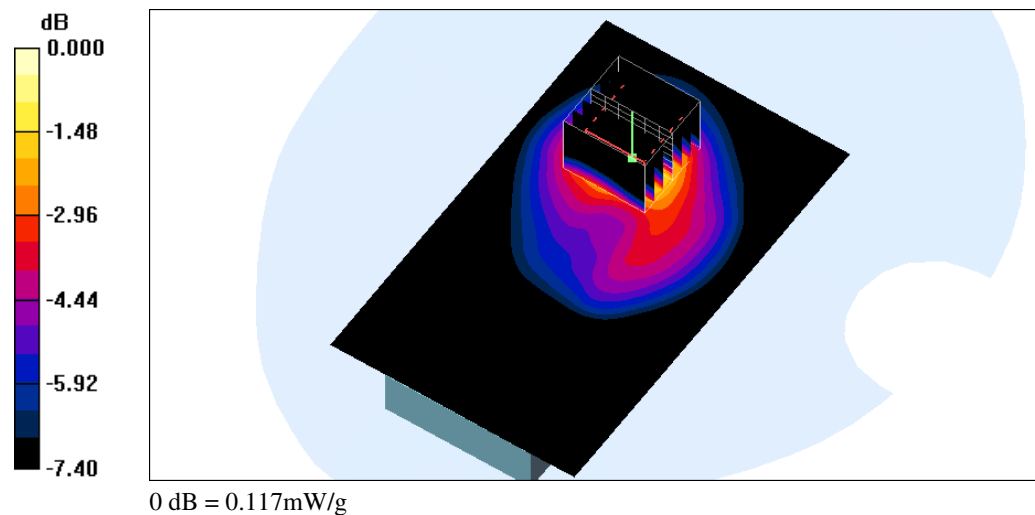
- Probe: ES3DV3 - SN3071; ConvF(4, 4, 4); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASYS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (61x101x1):**

Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.107 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=3mm  
 Reference Value = 7.54 V/m; Power Drift = 0.029 dB  
 Peak SAR (extrapolated) = 0.176 W/kg  
**SAR(1 g) = 0.094 mW/g; SAR(10 g) = 0.049 mW/g**  
 Maximum value of SAR (measured) = 0.117 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2010/2/5 PM 06:25:45

**Flat\_802.11b CH6\_1M\_Open Mode\_To Phantom15mm\_Headset**

**DUT: PC70110; Type: Smartphone; FCC ID:NM8PC70110**

Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1  
 Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.9$  mho/m;  $\epsilon_r = 50.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Flat Section  
 Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

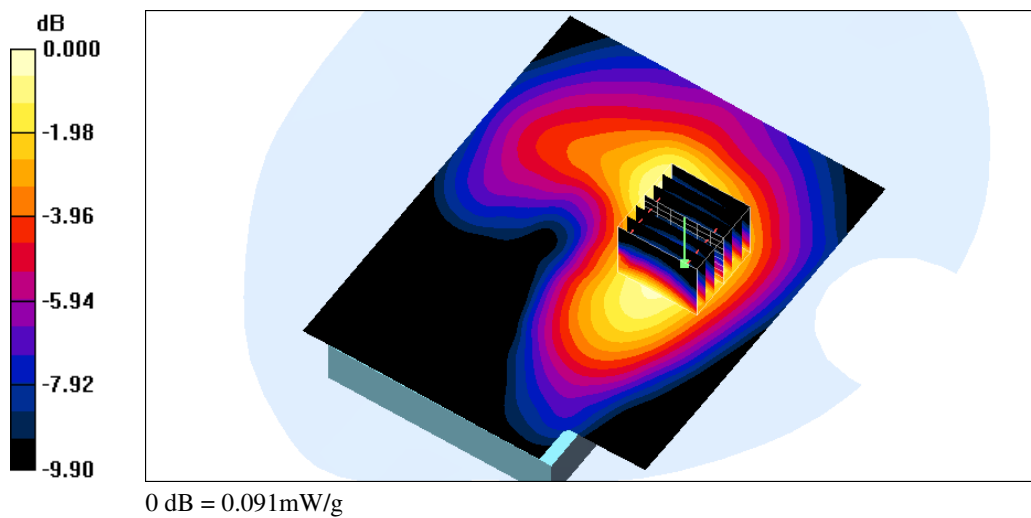
- Probe: ES3DV3 - SN3071; ConvF(4, 4, 4); Calibrated: 2009/6/22
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2009/6/24
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Flat/Area Scan (81x101x1):**

Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.094 mW/g

**Flat/Zoom Scan (7x7x9)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=3mm  
 Reference Value = 5.72 V/m; Power Drift = 0.049 dB  
 Peak SAR (extrapolated) = 0.135 W/kg  
**SAR(1 g) = 0.073 mW/g; SAR(10 g) = 0.042 mW/g**  
 Maximum value of SAR (measured) = 0.091 mW/g





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

All of the instruments Calibration information are listed below.

- Dipole \_ D835V2 SN:4d082 Calibration No.D835V2-4d082 \_Jul09
- Dipole \_ D1900V2 SN:5d111 Calibration No.D1900V-5d111 \_Jul09
- Dipole \_ D2450V2 SN:712 Calibration No.D2450V-712 \_Feb10
- Probe \_ ES3DV3 SN:3071 Calibration No.ES3-3071 \_Jun09
- DAE \_ DAE4 SN:905 Calibration No.DAE4-905\_ Jun09



**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 **ATL (Auden)**

Certificate No: **D835V2-4d082\_Jul09**

## CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d082**

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

Calibration date: **July 13, 2009**

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 EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV2	SN: 3025	30-Apr-09 (No. ES3-3025_Apr09)	Apr-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10
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-08)	In house check: Oct-09

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

Issued: July 13, 2009

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

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



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

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

Accreditation No.: **SCS 108**

**Glossary:**

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

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

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

**Additional Documentation:**

- d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

### Measurement Conditions

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

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.4 $\pm$ 6 %	0.89 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.2 $\pm$ 0.2) °C	---	---

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.42 mW / g
SAR normalized	normalized to 1W	9.68 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>9.71 mW / g <math>\pm</math> 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 mW / g
SAR normalized	normalized to 1W	6.32 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>6.34 mW / g <math>\pm</math> 16.5 % (k=2)</b>

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

### Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.0 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature during test	(22.5 ± 0.2) °C	---	---

### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.56 mW / g
SAR normalized	normalized to 1W	10.2 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>10.0 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.68 mW / g
SAR normalized	normalized to 1W	6.72 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>6.61 mW / g ± 16.5 % (k=2)</b>

<sup>2</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"



## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.3 $\Omega$ - 2.5 j $\Omega$
Return Loss	- 29.5 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3 $\Omega$ - 4.3 j $\Omega$
Return Loss	- 26.6 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.390 ns
----------------------------------	----------

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

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

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

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 17, 2008



## DASY5 Validation Report for Head TSL

Date/Time: 13.07.2009 11:31:45

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d082**

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

Medium: HSL 900 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.89$  mho/m;  $\epsilon_r = 40.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

### DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.86, 5.86, 5.86); Calibrated: 30.04.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

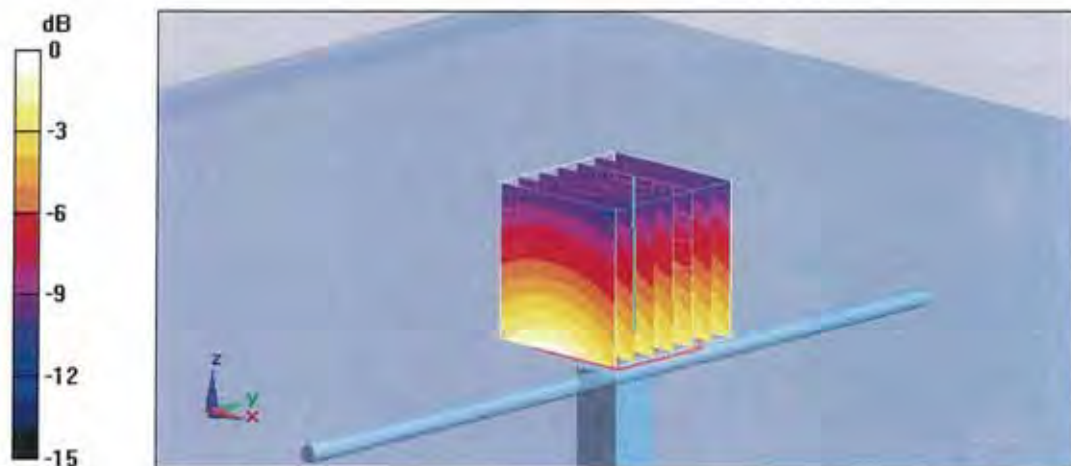
**Pin=250mW; dip=15mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.4 V/m; Power Drift = 0.00639 dB

Peak SAR (extrapolated) = 3.62 W/kg

**SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.58 mW/g**

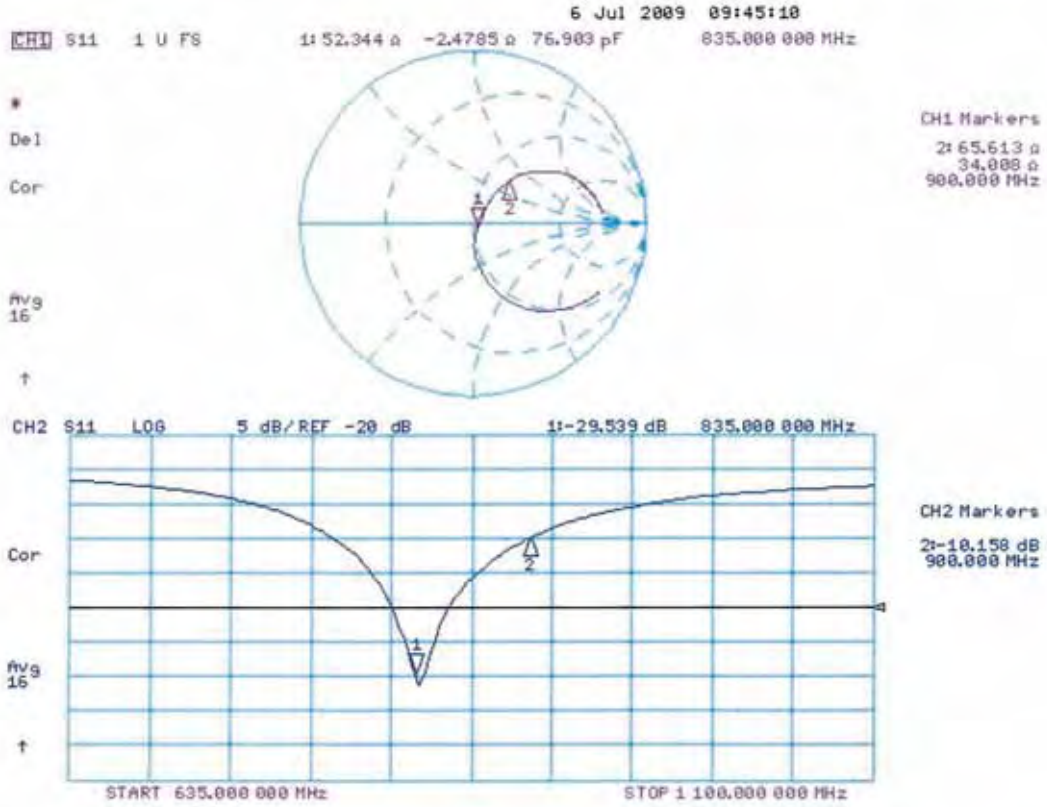
Maximum value of SAR (measured) = 2.8 mW/g



0 dB = 2.8mW/g



### Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date/Time: 13.07.2009 11:50:13

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d082**

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

Medium: MSL900

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.99$  mho/m;  $\epsilon_r = 53$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

### DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.79, 5.79, 5.79); Calibrated: 30.04.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

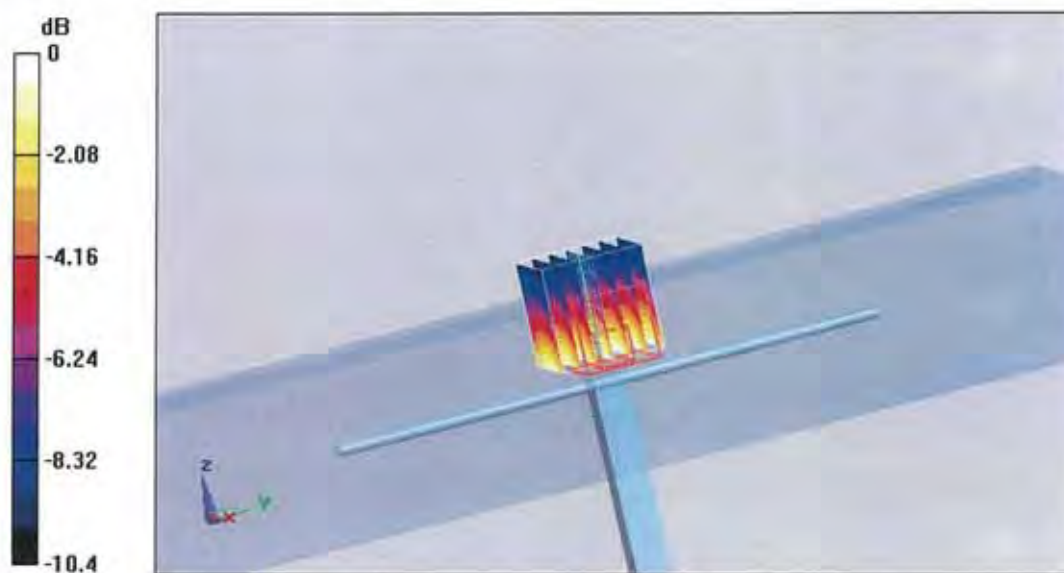
**Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.4 V/m; Power Drift = 0.013 dB

Peak SAR (extrapolated) = 3.76 W/kg

**SAR(1 g) = 2.56 mW/g; SAR(10 g) = 1.68 mW/g**

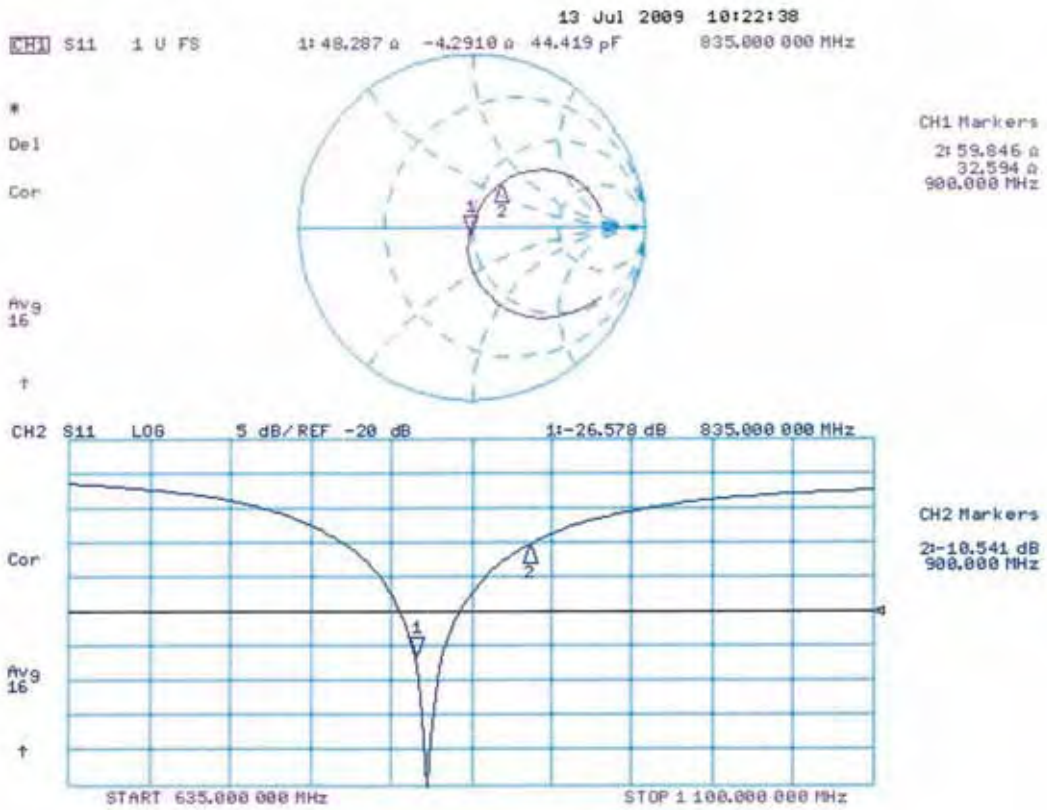
Maximum value of SAR (measured) = 2.97 mW/g



0 dB = 2.97mW/g



### Impedance Measurement Plot for Body 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 **ATL (Auden)**

Certificate No: **D1900V2-5d111\_Jul09**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d111**

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

Calibration date: **July 14, 2009**

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	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV2	SN: 3025	30-Apr-09 (No. ES3-3025_Apr09)	Apr-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10
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-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 14, 2009

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

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



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

Accredited by the Swiss Accreditation Service (SAS)

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

Accreditation No.: **SCS 108**

#### Glossary:

TSL	tissue simulating liquid
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.

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

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.9 $\pm$ 6 %	1.43 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.0 $\pm$ 0.2) °C	----	----

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	condition	
SAR measured	250 mW input power	10.5 mW / g
SAR normalized	normalized to 1W	42.0 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>41.7 mW / g <math>\pm</math> 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.49 mW / g
SAR normalized	normalized to 1W	22.0 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>21.9 mW / g <math>\pm</math> 16.5 % (k=2)</b>

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



## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.5 ± 6 %	1.55 mho/m ± 6 %
Body TSL temperature during test	(21.1 ± 0.2) °C	----	----

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.7 mW / g
SAR normalized	normalized to 1W	42.8 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>42.4 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.61 mW / g
SAR normalized	normalized to 1W	22.4 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>22.3 mW / g ± 16.5 % (k=2)</b>

<sup>2</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"





## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1 $\Omega$ + 4.8 j $\Omega$
Return Loss	- 26.3 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.3 $\Omega$ + 6.4 j $\Omega$
Return Loss	- 21.6 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.200 ns
----------------------------------	----------

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

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

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

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 28, 2008

## DASY5 Validation Report for Head TSL

Date/Time: 07.07.2009 15:32:44

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d111**

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

Medium: HSL U11 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.43$  mho/m;  $\epsilon_r = 40.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.88, 4.88, 4.88); Calibrated: 30.04.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

**Pin = 250 mW; dip = 10 mm, scan at 3.0 mm/Zoom Scan (dist=3.0 mm, probe 0deg)  
(7x7x7)/Cube 0:**

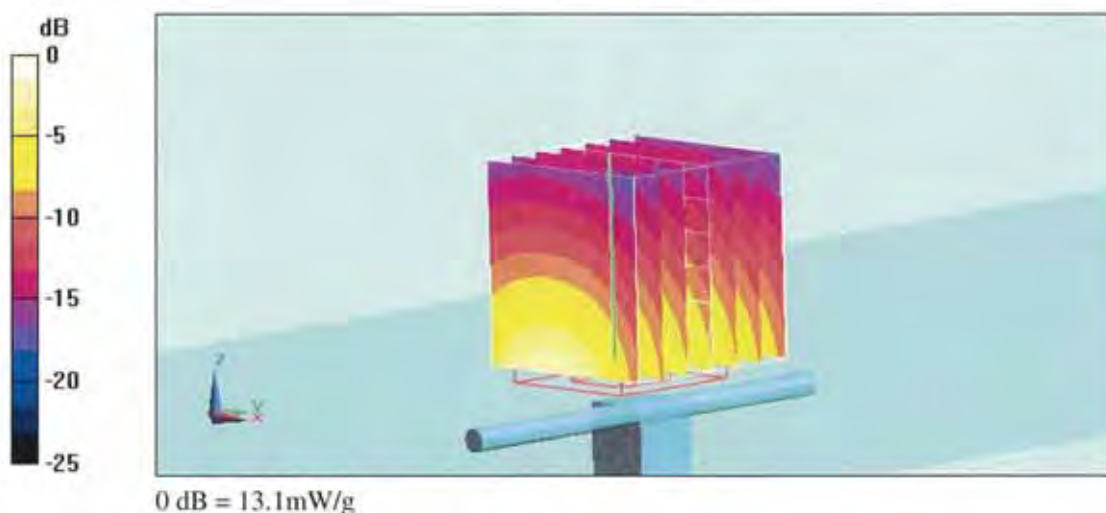
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.7 V/m; Power Drift = 0.109 dB

Peak SAR (extrapolated) = 19.1 W/kg

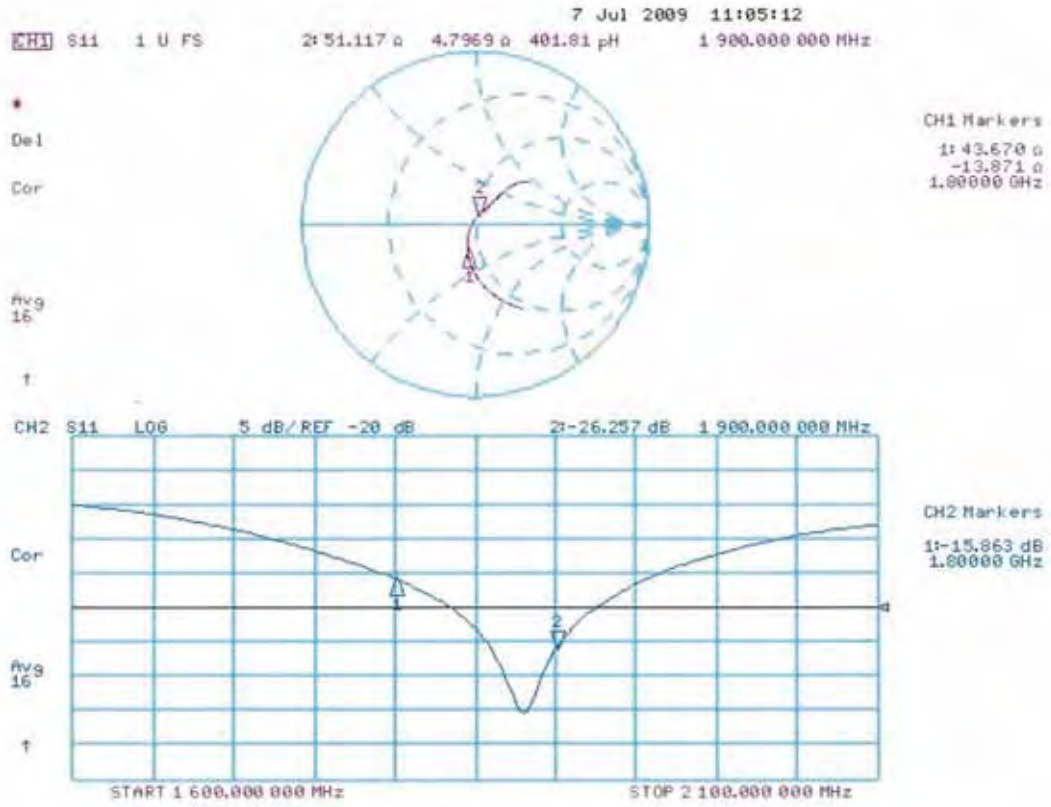
**SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.49 mW/g**

Maximum value of SAR (measured) = 13.1 mW/g





### Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date/Time: 14.07.2009 16:37:13

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d111**

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

Medium: MSL U10 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.46, 4.46, 4.46); Calibrated: 30.04.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

**Pin = 250 mW; dip = 10 mm, scan at 3.0mm/Zoom Scan (dist=3.0mm, probe 0deg)  
(7x7x7)/Cube 0:**

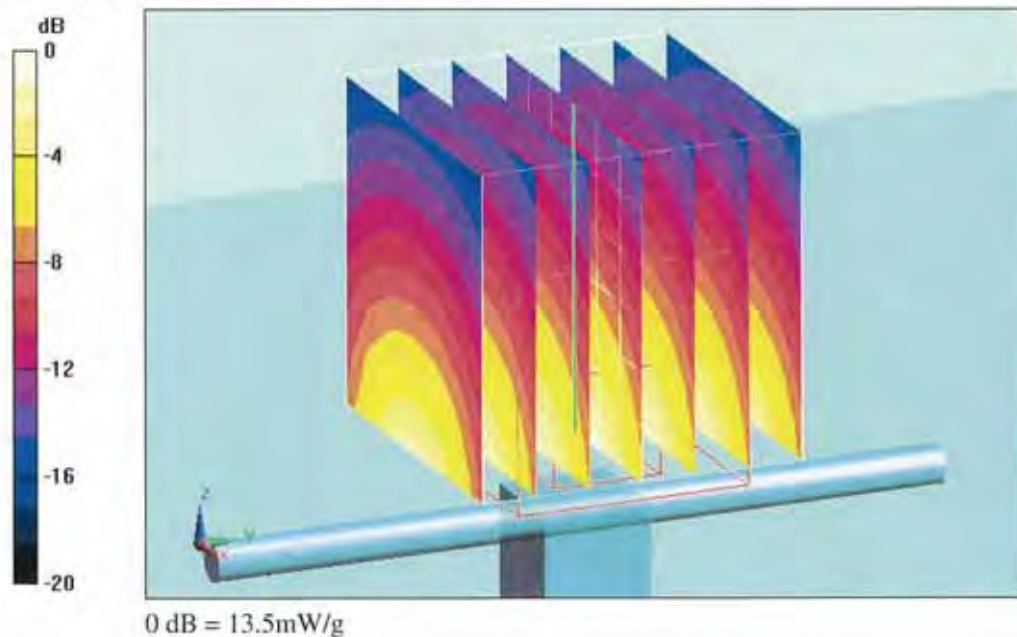
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.2 V/m; Power Drift = -0.00871 dB

Peak SAR (extrapolated) = 18.8 W/kg

**SAR(1 g) = 10.7 mW/g; SAR(10 g) = 5.61 mW/g**

Maximum value of SAR (measured) = 13.5 mW/g





### Impedance Measurement Plot for Body TSL

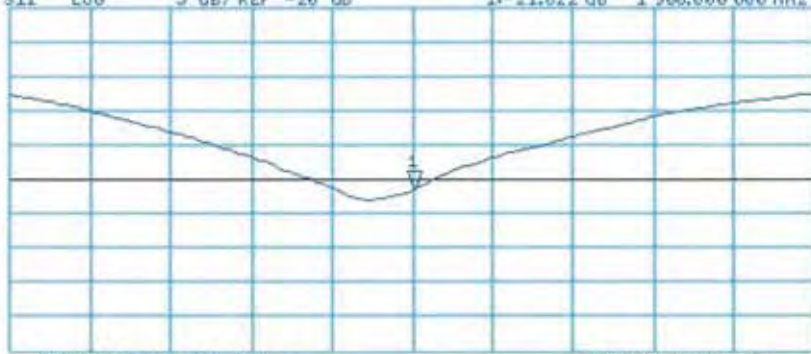
14 Jul 2009 11:50:17  
[CH1] S11 1 U FS 1: 45.289  $\Omega$  6.3691  $\mu$  533.52 pF 1 900.000 000 MHz

De1  
CA  
Avg  
16  
↑



CH2 S11 L06 5 dB/REF -20 dB 1: -21.622 dB 1 900.000 000 MHz

De1  
CA  
Avg  
16  
↑





**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 **ATL (Auden)**

Certificate No: **D2450V2-712\_Feb09**

## CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 712**

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

Calibration date: **February 11, 2009**

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 EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: S5086 (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-08)	In house check: Oct-09

Calibrated by:	Name	Function	Signature
	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 11, 2009

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

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



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

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

**Glossary:**

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

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

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

**Additional Documentation:**

- d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

### Measurement Conditions

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

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.0 ± 6 %	1.82 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.1 mW / g
SAR normalized	normalized to 1W	52.4 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>51.8 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.13 mW / g
SAR normalized	normalized to 1W	24.5 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>24.3 mW / g ± 16.5 % (k=2)</b>

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





### Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.9 ± 6 %	2.00 mho/m ± 6 %
Body TSL temperature during test	(21.1 ± 0.2) °C	----	----

### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR normalized	normalized to 1W	52.8 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>52.3 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.18 mW / g
SAR normalized	normalized to 1W	24.7 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>24.7 mW / g ± 16.5 % (k=2)</b>

<sup>2</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"



## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.7 $\Omega$ + 1.1 j $\Omega$
Return Loss	- 25.2 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.5 $\Omega$ + 5.0 j $\Omega$
Return Loss	- 26.0 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.158 ns
----------------------------------	----------

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

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

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

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 5, 2002

## DASY5 Validation Report for Head TSL

Date/Time: 04.02.2009 12:44:28

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN712**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.82$  mho/m;  $\epsilon_r = 38$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.4, 4.4, 4.4); 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; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:**

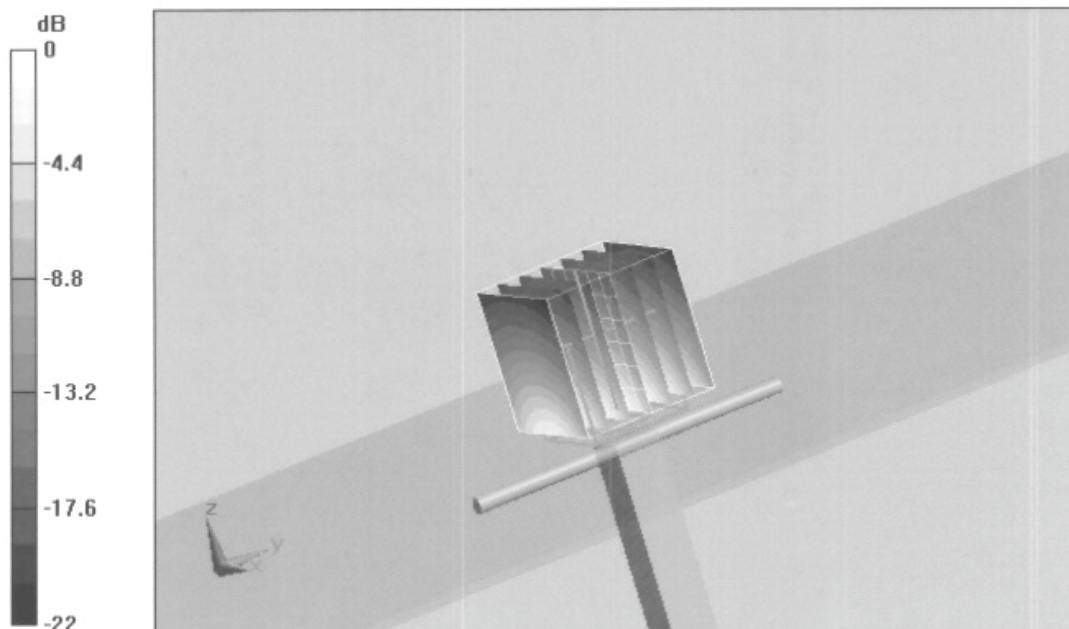
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.6 V/m; Power Drift = 0.00522 dB

Peak SAR (extrapolated) = 27.5 W/kg

**SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.13 mW/g**

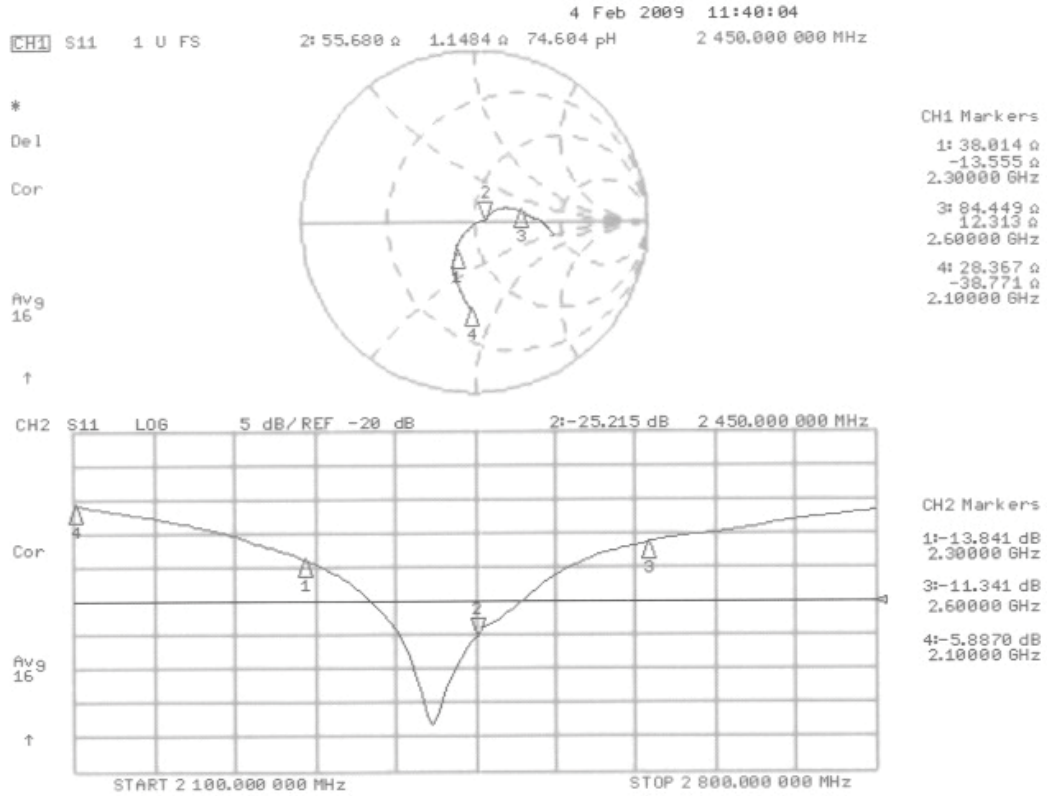
Maximum value of SAR (measured) = 15.8 mW/g



0 dB = 15.8mW/g



### Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date/Time: 11.02.2009 11:51:07

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:712**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.01$  mho/m;  $\epsilon_r = 54$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.07, 4.07, 4.07); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:**

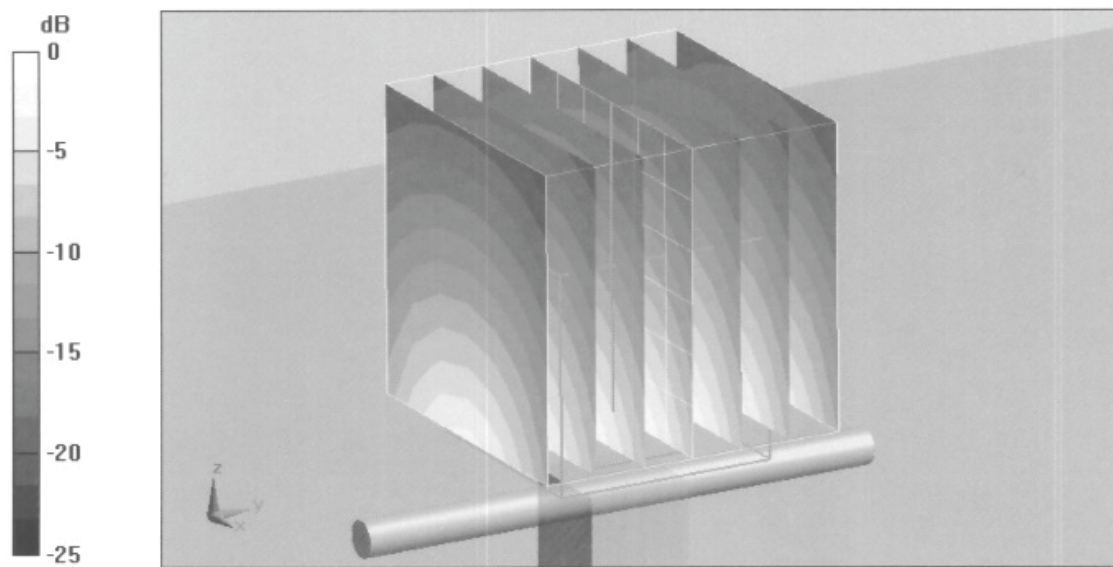
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.8 V/m; Power Drift = 0.00271 dB

Peak SAR (extrapolated) = 26.7 W/kg

**SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.18 mW/g**

Maximum value of SAR (measured) = 16.4 mW/g



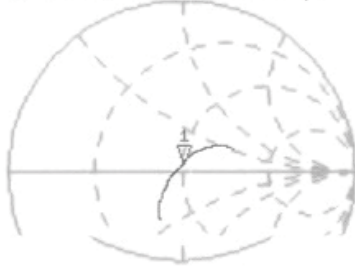
0 dB = 16.4mW/g



### Impedance Measurement Plot for Body TSL

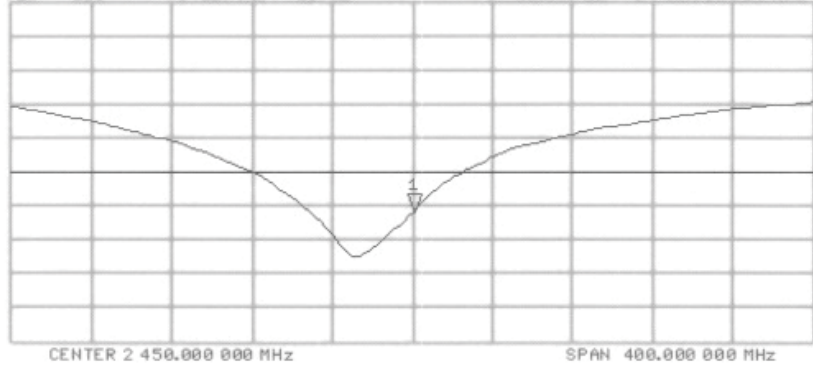
11 Feb 2009 11:01:58  
[CH1] S11 1 U FS 1: 50.471  $\Omega$  5.0469  $\Omega$  327.85  $\rho H$  2 450.000 000 MHz

\*  
De1  
CA



CH2 S11 L06 5 dB/REF -20 dB 1:-25.950 dB 2 450.000 000 MHz

CA  
Avg  
16





**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 **Auden**

Certificate No: **ES3-3071\_Jun09**

### CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3071**

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

Calibration date: **June 22, 2009**

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-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

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-08)	In house check: Oct-09

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

Issued: June 22, 2009

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

Certificate No: ES3-3071\_Jun09

Page 1 of 9

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



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

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

Accreditation No.: **SCS 108**

**Glossary:**

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
Polarization $\phi$	$\phi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

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

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

**Methods Applied and Interpretation of Parameters:**

- **NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- **NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* *frequency\_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- **DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep (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:3071

June 22, 2009

# Probe ES3DV3

## SN:3071

Manufactured:	December 14, 2004
Last calibrated:	July 23, 2008
Repaired:	June 8, 2009
Recalibrated:	June 22, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)



ES3DV3 SN:3071

June 22, 2009

## DASY - Parameters of Probe: ES3DV3 SN:3071

Sensitivity in Free Space <sup>A</sup>			Diode Compression <sup>B</sup>	
NormX	1.30 ± 10.1%	μV/(V/m) <sup>2</sup>	DCP X	94 mV
NormY	1.25 ± 10.1%	μV/(V/m) <sup>2</sup>	DCP Y	93 mV
NormZ	1.00 ± 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		<b>3.0 mm</b>	<b>4.0 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	10.3	5.9
SAR <sub>be</sub> [%]	With Correction Algorithm	0.9	0.5

TSL                    1750 MHz      Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		<b>3.0 mm</b>	<b>4.0 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	9.0	5.2
SAR <sub>be</sub> [%]	With Correction Algorithm	0.8	0.5

### Sensor Offset

Probe Tip to Sensor Center                    **2.0 mm**

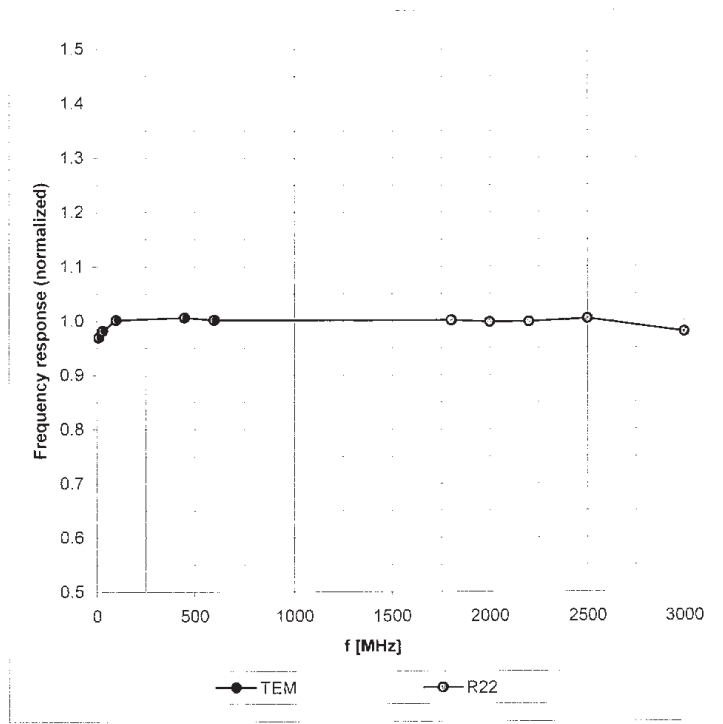
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

<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.

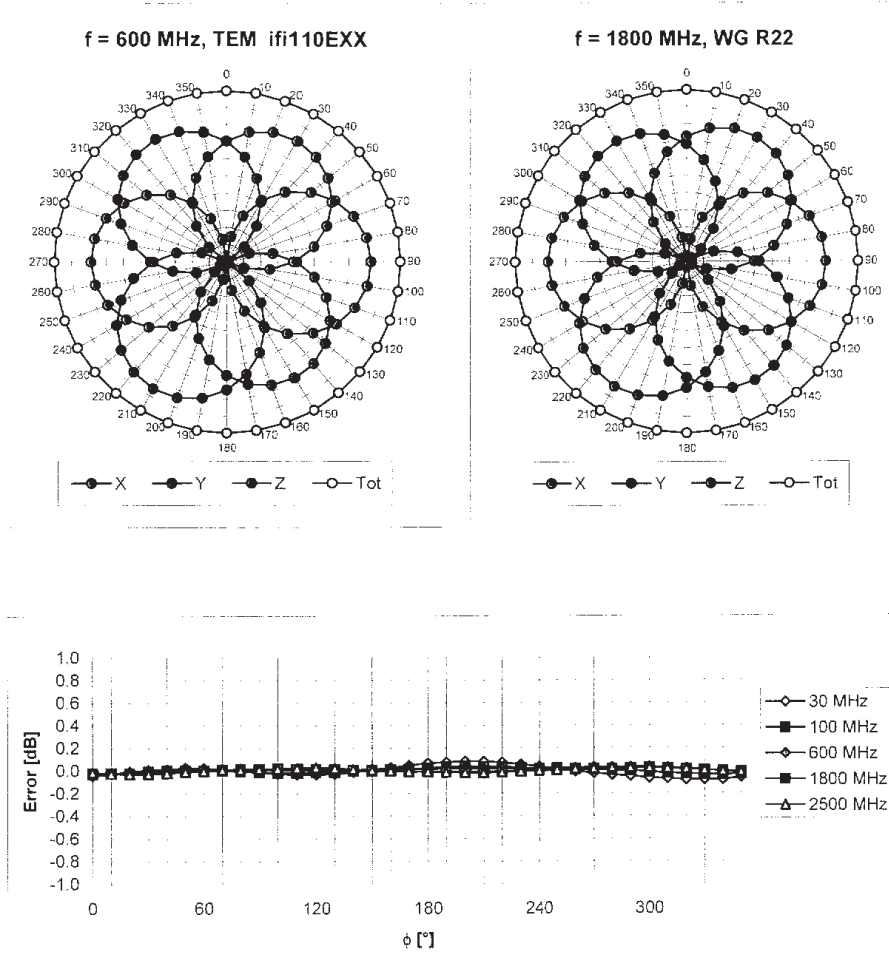
### Frequency Response of E-Field

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



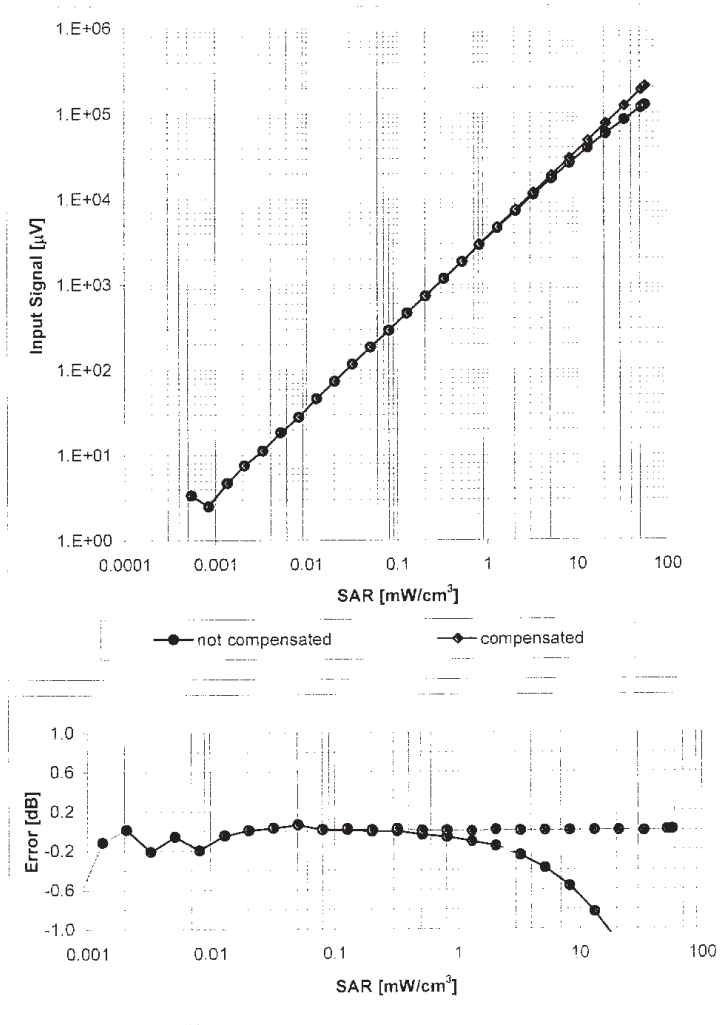
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

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



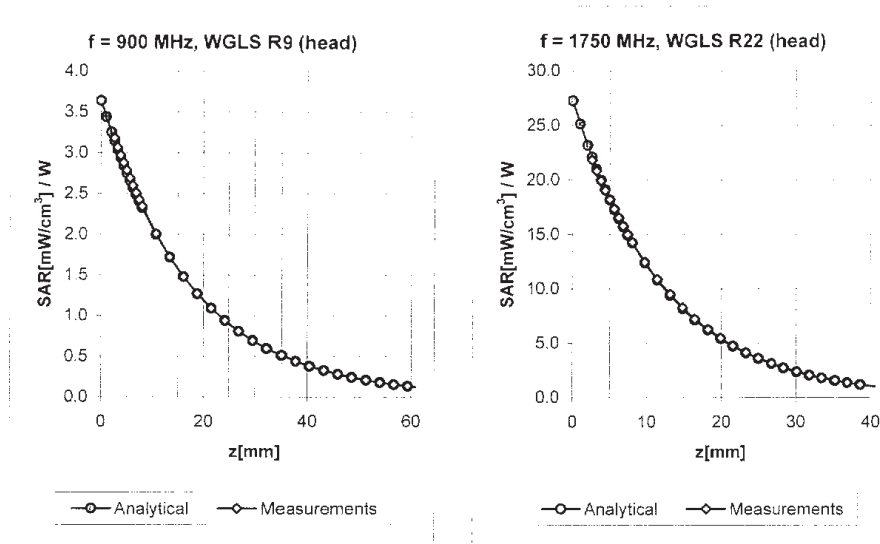
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

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



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

### Conversion Factor Assessment

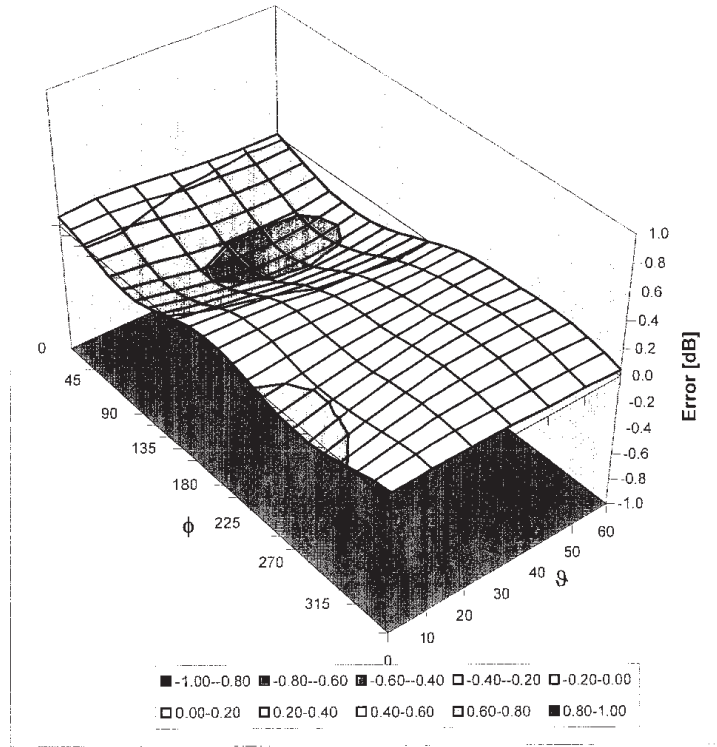


f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.99	1.07	5.58 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.89	1.10	5.41 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.48	1.50	4.82 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.48	1.52	4.63 ± 11.0% (k=2)
2000	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.51	1.47	4.53 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.51	1.58	4.13 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.95	1.12	5.59 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.99	1.09	5.44 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.34	2.03	4.48 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.29	2.64	4.26 ± 11.0% (k=2)
2000	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.34	2.25	4.32 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.92	1.12	4.00 ± 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.

### Deviation from Isotropy in HSL

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



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



**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 **Auden**

Certificate No: **DAE4-905\_Jun09**

## CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BK - SN: 905**

Calibration procedure(s) **QA CAL-06.v12  
Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **June 24, 2009**

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
Fluke Process Calibrator Type 702	SN: 6295803	30-Sep-08 (No: 7673)	Sep-09
Keithley Multimeter Type 2001	SN: 0810278	30-Sep-08 (No: 7670)	Sep-09
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	05-Jun-09 (in house check)	In house check: Jun-10

Calibrated by:	Name Andrea Guntli	Function Technician	Signature 
Approved by:	Fin Bornholt	R&D Director	

Issued: June 24, 2009

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



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



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

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

Accreditation No.: **SCS 108**

## Glossary

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

## Methods Applied and Interpretation of Parameters

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



### DC Voltage Measurement

A/D - Converter Resolution nominal

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

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

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

Calibration Factors	X	Y	Z
High Range	404.217 $\pm$ 0.1% (k=2)	404.768 $\pm$ 0.1% (k=2)	404.344 $\pm$ 0.1% (k=2)
Low Range	3.96064 $\pm$ 0.7% (k=2)	3.96162 $\pm$ 0.7% (k=2)	3.94181 $\pm$ 0.7% (k=2)

### Connector Angle

Connector Angle to be used in DASY system	224 $^{\circ}$ $\pm$ 1 $^{\circ}$
---	-----------------------------------



## Appendix

### 1. DC Voltage Linearity

High Range	Input ( $\mu\text{V}$ )	Reading ( $\mu\text{V}$ )	Error (%)
Channel X + Input	200000	199999.8	0.00
Channel X + Input	20000	20006.37	0.03
Channel X - Input	20000	-20001.53	0.01
Channel Y + Input	200000	200000.2	0.00
Channel Y + Input	20000	20007.65	0.04
Channel Y - Input	20000	-20004.14	0.02
Channel Z + Input	200000	199999.8	0.00
Channel Z + Input	20000	20004.62	0.02
Channel Z - Input	20000	-20006.32	0.03

Low Range	Input ( $\mu\text{V}$ )	Reading ( $\mu\text{V}$ )	Error (%)
Channel X + Input	2000	2000	0.00
Channel X + Input	200	200.19	0.09
Channel X - Input	200	-199.93	-0.03
Channel Y + Input	2000	1999.9	0.00
Channel Y + Input	200	199.73	-0.13
Channel Y - Input	200	-200.49	0.25
Channel Z + Input	2000	2000.1	0.00
Channel Z + Input	200	199.32	-0.34
Channel Z - Input	200	-201.09	0.55

### 2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading ( $\mu\text{V}$ )	Low Range Average Reading ( $\mu\text{V}$ )
Channel X	200	8.73	8.55
	-200	-8.62	-8.40
Channel Y	200	8.12	8.42
	-200	-9.55	-9.70
Channel Z	200	1.20	1.94
	-200	-3.81	-3.79

### 3. Channel separation

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

	Input Voltage (mV)	Channel X ( $\mu\text{V}$ )	Channel Y ( $\mu\text{V}$ )	Channel Z ( $\mu\text{V}$ )
Channel X	200	-	0.64	-0.52
Channel Y	200	0.59	-	3.21
Channel Z	200	-0.99	-1.28	-



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

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

	High Range (LSB)	Low Range (LSB)
Channel X	15874	16893
Channel Y	16121	14432
Channel Z	16378	17173

**5. Input Offset Measurement**

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

Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.28	-0.63	1.52	0.30
Channel Y	-0.58	-1.70	1.19	0.27
Channel Z	-0.85	-2.59	0.78	0.43

**6. Input Offset Current**

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

**7. Input Resistance**

	Zeroing (MΩ)	Measuring (MΩ)
Channel X	0.1999	200.7
Channel Y	0.1999	199.0
Channel Z	0.1999	199.7

**8. Low Battery Alarm Voltage** (verified during pre test)

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

**9. Power Consumption** (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9