



A Test Lab Techno Corp.

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SAR EVALUATION REPORT

Test Report No.	: 1003FS22
Applicant	: HTC Corporation
Product Type	: Smartphone
IMEI No.	: 352083040010837
FCC ID	: NM8PB76110
Trade Name	: HTC
Model Number	: PB76110
Dates of Test	: Mar. 24, ~ Mar. 29, 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	: 0.898 W/kg Head SAR 1.230 W/kg Body SAR
Test Lab Location	: Chang-an Lab



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Approve Signer

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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	12
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	23
8.1 Device and Test Conditions	23
8.2 Simultaneous Transmitting Evaluate	31
8.3 System Performance Check	32
8.4 Dosimetric Assessment Setup	39
8.5 Spatial Peak SAR Evaluation	41
9. Measurement Uncertainty	42
10. SAR Test Results Summary	44
10.1 GSM 850 - Head SAR	44
10.2 PCS 1900 - Head SAR	45
10.3 WCDMA (RMC 12.2K) Band II - Head SAR	46
10.4 WCDMA (RMC 12.2K) Band V - Head SAR	47
10.5 GSM / GPRS 850 - Body SAR (EUT 15 mm separation to Phantom)	48
10.6 PCS / GPRS 1900 - Body SAR (EUT 15 mm separation to Phantom)	49
10.7 WCDMA (RMC 12.2K)/HSDPA/HSUPA Band II - Body SAR (EUT 15 mm separation to Phantom)	50
10.8 WCDMA(RMC 12.2K)/HSDPA/HSUPA Band V - Body SAR (EUT 15 mm separation to Phantom)	51
10.9 IEEE 802.11b/ IEEE 802.11g - Body SAR (EUT 15 mm separation to Phantom)	52
10.10 Std. C95.1-2005 RF Exposure Limit	53
11. Conclusion	54
12. References	54
Appendix A - System Performance Check	55
Appendix B - SAR Measurement Data	56
Appendix C - Calibration	57



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.	:	352083040010837
FCC ID	:	NM8PB76110
Trade Name	:	HTC
Model Number	:	PB76110
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/HSUPA Band II 826.4 - 846.4 MHz WCDMA(RMC 12.2K)/HSDPA/HSUPA Band V 2412 - 2462 MHz WLAN 802.11b/802.11g 2402 - 2480 MHz Bluetooth 2.1 / Bluetooth EDR
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-Average)	:	0.729 W / 28.63 dBm GSM/GPRS/EGPRS 850 0.383 W / 25.83 dBm PCS/GPRS/EGPRS 1900 0.207 W / 23.15 dBm WCDMA/HSDPA/HSUPA Band II 0.225 W / 23.53 dBm WCDMA/HSDPA/HSUPA Band V 0.067 W / 18.24 dBm IEEE 802.11b/802.11g 0.001 W / 0.732 dBm Bluetooth
Max. SAR Measurement	:	0.898 W/kg Head SAR 1.230 W/kg Body SAR
Antenna Type	:	PIFA Type
Antenna Gain	:	-0.99 dBi (GSM/GPRS/EGPRS 850) 1.63 dBi (PCS/GPRS/EGPRS 1900) 1.63 dBi (WCDMA/HSDPA/HSUPA Band II) -1.21 dBi (WCDMA/HSDPA/HSUPA 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 three 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) : PB76110**. 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 (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Figure 2).

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

Figure 2. SAR Mathematical Equation

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

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

Where :

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m³)

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.

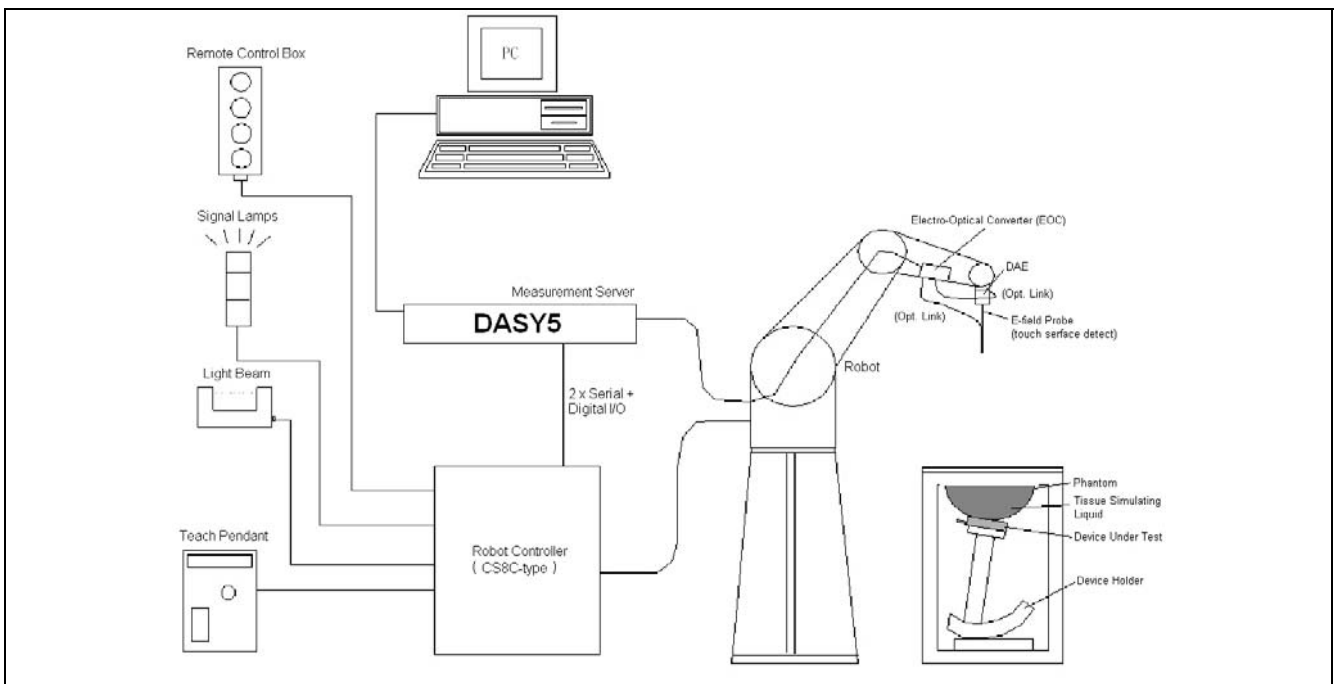


Figure 3. SAR Lab Test Measurement Setup



The DAE4 (or DAE3) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in [3] .



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

Construction	<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>
Calibration	<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 $\pm 8\%$)</p> <p>Calibration for other liquids and frequencies upon request</p>
Frequency	<p>10 MHz to > 6 GHz; Linearity: ± 0.2 dB</p> <p>(30 MHz to 3 GHz)</p>
Directivity	<p>± 0.3 dB in brain tissue (rotation around probe axis)</p> <p>± 0.5 dB in brain tissue (rotation normal probe axis)</p>
Dynamic Range	<p>10 μ W/g to > 100mW/g; Linearity: ± 0.2dB</p>
Surface Detection	<p>± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surface</p>
Dimensions	<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>
Application	<p>General dosimetry up to 6GHz</p> <p>Compliance tests of mobile phones</p> <p>Fast automatic scanning in arbitrary phantoms</p>



Figure 4. E-field Probe

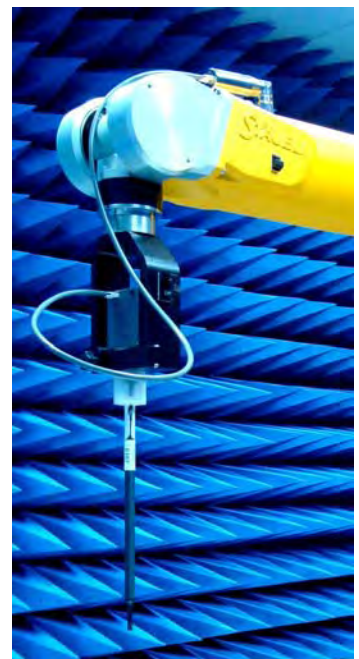


Figure 5. Probe setup on robot



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 :

Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (head or body),

ΔT = Temperature increase due to RF exposure.

Or

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

Where :

σ = Simulated tissue conductivity,

ρ = Tissue density (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 : ± 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 6. 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.

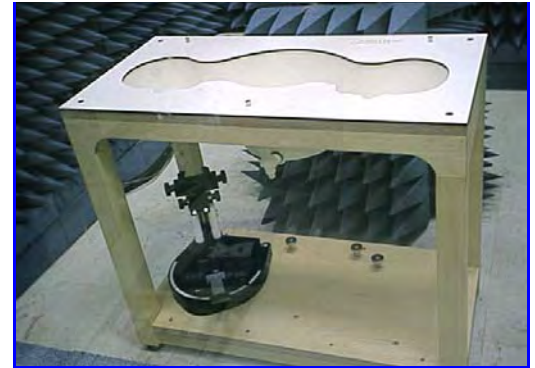


Figure 7. SAM Twin Phantom

Shell Thickness	2 ±0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	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 :

Probe parameters :	- Sensitivity	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	dcp _i
Device parameters :	- Frequency	f
	- Crest factor	cf
Media parameters :	- Conductivity	σ
	- Density	ρ

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

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as :

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

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

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

E-field probes :

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

H-field probes :

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

- with V_i = compensated signal of channel i ($i = x, y, z$)
 $Norm_i$ = sensor sensitivity of channel i ($i = x, y, z$)
 $\mu V/(V/m)^2$ for E-field Probes
 $ConvF$ = sensitivity enhancement in solution
 a_{ij} = sensor sensitivity factors for H-field probes
 f = carrier frequency [GHz]
 E_i = electric field strength of channel i in V/m
 Hi = magnetic field strength of channel i in A/m

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

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

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

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

- with SAR = local specific absorption rate in mW/g
 E_{tot} = total field strength in V/m
 σ = conductivity in [mho/m] or [Siemens/m]
 ρ = equivalent tissue density in g/cm^3

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

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

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

- with P_{pwe} = equivalent power density of a plane wave in mW/cm^2
 E_{tot} = total electric field strength in V/m
 H_{tot} = total magnetic field strength in A/m



6. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Dosimetric E-Field Probe	EX3DV4	3632	Jan. 26, 2010	Jan. 26, 2011
SPEAG	835MHz System Validation Kit	D835V2	4d082	Jul. 13, 2009	Jul. 13, 2010
SPEAG	1900MHz System Validation Kit	D1900V2	5d111	Jul. 14, 2009	Jul. 14, 2010
SPEAG	2450MHz System Validation Kit	D2450V2	712	Feb. 17, 2010	Feb. 17, 2011
SPEAG	Data Acquisition Electronics	DAE4	779	Jan. 21, 2010	Jan. 21, 2011
SPEAG	Device Holder	N/A	N/A	NCR	NCR
SPEAG	Phantom	SAM V4.0	TP-1150	NCR	NCR
SPEAG	Robot	Staubli TX90XL	F07/564ZA1/C/01	NCR	NCR
SPEAG	Software	DASY5 V5.0 Build 125	N/A	NCR	NCR
SPEAG	Software	SEMCAD X V13.4 Build 125	N/A	NCR	NCR
SPEAG	Measurement Server	SE UMS 011 AA	1025	NCR	NCR
R&S	Wireless Communication Test Set	CMU200	109369	Jul. 29, 2009	Jul. 29, 2010
Agilent	Wireless Communication Test Set	E5515C	GB47020167	May 25, 2009	May 25, 2010
Agilent	ENA Series Network Analyzer	E5071B	MY42402996	Nov. 04, 2009	Nov. 04, 2010
Agilent	Dielectric Probe Kit	85070C	US99360094	NCR	NCR
R&S	Power Sensor	NRP-Z22	100179	May 17, 2009	May 17, 2010
Agilent	Signal Generator	E8257D	MY44320425	NCR	NCR
Agilent	Dual Directional Coupler	778D	50334	NCR	NCR
Mini-Circuits	Power Amplifier	ZHL-42W-SMA	D111103#5	NCR	NCR
Mini-Circuits	Power Amplifier	ZVE-8G-SMA	D042005 671800514	NCR	NCR

Table 2. Test Equipment List



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 s

pecified 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	
	ϵ_r	σ (S/m)	ϵ_r	σ (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

(ϵ_r = relative permittivity, σ = 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 H₂O), 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-monobutyl 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 ϵ and $\pm 5\%$ for σ .

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
Goal dielectric parameters		
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
Goal dielectric parameters		
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
Goal dielectric parameters		
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	ϵ_r	41.5	41.00	-1.20%	± 5	Mar. 26,2010
			σ	0.90	0.91	1.11%	± 5	
	835MHz	22.0	ϵ_r	41.5	40.77	-1.76%	± 5	Mar. 26,2010
			σ	0.90	0.93	3.33%	± 5	
	850MHz	22.0	ϵ_r	41.5	40.56	-2.27%	± 5	Mar. 26,2010
			σ	0.90	0.94	4.44%	± 5	
1900MHz Head	1850MHz	22.0	ϵ_r	40.0	38.52	-3.69%	± 5	Mar. 27, 2010
			σ	1.40	1.34	-3.95%	± 5	
	1900MHz	22.0	ϵ_r	40.0	38.39	-4.02%	± 5	Mar. 27, 2010
			σ	1.40	1.39	-0.64%	± 5	
	1950MHz	22.0	ϵ_r	40.0	38.18	-4.56%	± 5	Mar. 27, 2010
			σ	1.40	1.44	2.74%	± 5	

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



Ambient Temperature : 22 ± 2 °C ; Relative Humidity : 40 -70%								
Liquid Type	Frequency	Temp (°C)	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)	Measured Date
835MHz Body	820MHz	22.0	ϵ_r	55.2	53.26	-3.51%	± 5	Mar. 24, 2010
			σ	0.97	0.98	1.13%	± 5	
	835MHz	22.0	ϵ_r	55.2	53.26	-3.51%	± 5	Mar. 24, 2010
			σ	0.97	1.00	2.90%	± 5	
	850MHz	22.0	ϵ_r	55.2	53.19	-3.64%	± 5	Mar. 24, 2010
			σ	0.97	1.01	4.12%	± 5	
1900MHz Body	1850MHz	22.0	ϵ_r	53.3	51.72	-2.96%	± 5	Mar. 24, 2010
			σ	1.52	1.45	-4.67%	± 5	
	1900MHz	22.0	ϵ_r	53.3	51.56	-3.26%	± 5	Mar. 24, 2010
			σ	1.52	1.50	-1.25%	± 5	
	1950MHz	22.0	ϵ_r	53.3	51.41	-3.55%	± 5	Mar. 24, 2010
			σ	1.52	1.55	2.17%	± 5	
2450MHz Body	2400MHz	22.0	ϵ_r	52.7	50.51	-4.16%	± 5	Mar. 29, 2010
			σ	1.95	1.86	-4.75%	± 5	
	2450MHz	22.0	ϵ_r	52.7	50.23	-4.68%	± 5	Mar. 29, 2010
			σ	1.95	1.92	-1.55%	± 5	
	2500MHz	22.0	ϵ_r	52.7	50.22	-4.71%	± 5	Mar. 29, 2010
			σ	1.95	1.97	1.25%	± 5	

Table 5. Measured Tissue dielectric parameters for head and body phantoms - 2

7.3.2 Liquid Depth

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

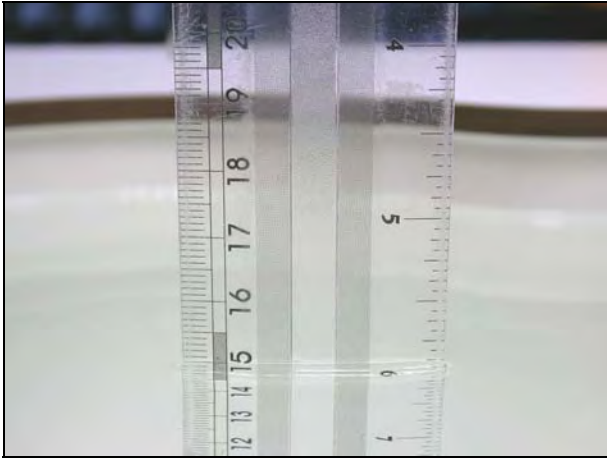


Figure 8. Head-Tissue-Simulating-Liquid



Figure 9. 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 Band II (RMC 12.2K)** (#9262=1852.4MHz, #9400=1880.0MHz, #9538=1907.6MHz) , **WCDMA Band V (RMC 12.2K)** (#4132=826.4MHz, #4183=836.6MHz, #4233=846.4MHz)systems, **WLAN 802.11b / 802.11g** (#1=2412MHz, #6=2437MHz, #11=2462MHz) and **Bluetooth** (#0=2402MHz, #39=2441MHz, #78=2480MHz) systems.

HSDPA Data Devices setup for SAR Measurement.

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1,2)}$	CM (dB) ⁽³⁾	MRP (dB) ⁽³⁾
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	12/15 ⁽⁴⁾	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

- Δ_{ACK} , Δ_{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, Δ_{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 β_c/β_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 6. Setup for Release 5 HSDPA



HSPA Data Devices setup for SAR Measurement.

The following procedures are applicable to HSPA (HSUPA/HSDPA) data devices operating under 3GPP Release 6. Body exposure conditions generally apply to these devices, including handsets and data modems operating in various electronic devices. HSUPA operates in conjunction with WCDMA and HSDPA. SAR is initially measured in WCDMA test configurations without HSPA. The default test configuration is to establish a radio link between the DUT and a communication test set to configure a 12.2 kbps RMC (reference measurement channel) in Test Loop Mode 1. SAR for HSPA is selectively measured with HS-DPCCH, EDPCCH and E-DPDCH, all enabled, along with a 12.2 kbps RMC using the highest SAR configuration in WCDMA with 12.2 kbps RMC only. An FRC is configured according to HSDPCCH Sub-test 1 using H-set 1 and QPSK. HSPA is configured according to E-DCH Subtest 5 requirements. SAR for other HSPA sub-test configurations is also confirmed selectively according to output power, exposure conditions and E-DCH UE Category. Maximum output power is verified according to procedures in applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. The UE Categories for HSDPCCH and HSPA should be clearly identified in the SAR report. The following procedures are applicable only if Maximum Power Reduction (MPR) is implemented according to Cubic Metric (CM) requirements.

When voice transmission and head exposure conditions are applicable to a WCDMA/HSPA data device, head exposure is measured according to the 'Head SAR Measurements' procedures in the 'WCDMA Handsets' section of this document. SAR for body exposure configurations are measured according to the 'Body SAR Measurements' procedures in the 'WCDMA Handsets' section of this document. In addition, body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP is applicable for head exposure, SAR is not required when the maximum output of each RF channel with HSPA is less than ¼ dB higher than that measured using 12.2 kbps RMC; otherwise, the same HSPA configuration used for body measurements should be used to test for head exposure.

Due to inner loop power control requirements in HSPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA should be configured according to the β values indicated below as well as other applicable procedures described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Devices' sections of this document.



The highest body SAR measured in Antenna Extended & Retracted configurations on a channel in 12.2 kbps RMC. The possible channels are the High, Middle & Low channel. Contact the FCC Laboratory for test and approval requirements if the maximum output power measured in E-DCH Sub-test 2 - 4 is higher than Sub-test 5.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	β_{ec}	β_{ed}	Bed (SF)	Bed (codes)	CM ⁽²⁾ (dB)	MPR (dB)	AG ⁽⁴⁾ Index	E-TFCI
1	11/15 ⁽³⁾	15/15 ⁽³⁾	64	11/15 ⁽³⁾	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}: 47/15$ $\beta_{ed2}: 47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	15/15 ⁽⁴⁾	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: $\Delta ACK, \Delta NACK$ and $\Delta CQI = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Table 7. Setup for Release 6 HSPA



Usage:	Operates with a normal mode by client (GSM/PCS/WCDMA) 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)	Time-Average Conducted Power (dBm)		Burst Averaged Conducted Power (dBm)	Worst
				before	After		
GSM850	----	Lowest	824.2	23.91	23.89	33.10	<input type="checkbox"/>
		Middle	836.6	24.01	23.98	33.20	<input type="checkbox"/>
		Highest	848.8	24.11	24.07	33.30	<input checked="" type="checkbox"/>
GPRS 850	4Down1Up	Lowest	824.2	23.81	23.76	33.00	<input type="checkbox"/>
		Middle	836.6	23.91	23.87	33.10	<input type="checkbox"/>
		Highest	848.8	24.01	23.97	33.20	<input type="checkbox"/>
	3Down2Up	Lowest	824.2	26.27	26.19	32.50	<input type="checkbox"/>
		Middle	836.6	26.47	26.42	32.70	<input type="checkbox"/>
		Highest	848.8	26.47	26.43	32.70	<input type="checkbox"/>
	2Down3Up	Lowest	824.2	28.43	28.39	32.90	<input type="checkbox"/>
		Middle	836.6	28.53	28.49	33.00	<input type="checkbox"/>
		Highest	848.8	28.63	28.59	33.10	<input checked="" type="checkbox"/>
	1Down4Up	Lowest	824.2	28.28	28.24	31.50	<input type="checkbox"/>
		Middle	836.6	28.28	28.25	31.50	<input type="checkbox"/>
		Highest	848.8	28.38	28.36	31.60	<input type="checkbox"/>
EGPRS 850	4Down1Up	Lowest	824.2	17.61	17.59	26.80	<input type="checkbox"/>
		Middle	836.6	17.71	17.64	26.90	<input type="checkbox"/>
		Highest	848.8	17.71	17.65	26.90	<input type="checkbox"/>
	3Down2Up	Lowest	824.2	20.07	20.02	26.30	<input type="checkbox"/>
		Middle	836.6	20.17	20.13	26.40	<input type="checkbox"/>
		Highest	848.8	20.17	20.14	26.40	<input type="checkbox"/>
	2Down3Up	Lowest	824.2	21.83	21.76	26.30	<input type="checkbox"/>
		Middle	836.6	21.93	21.88	26.40	<input type="checkbox"/>
		Highest	848.8	21.93	21.87	26.40	<input type="checkbox"/>
	1Down4Up	Lowest	824.2	22.98	22.96	26.20	<input type="checkbox"/>
		Middle	836.6	23.08	23.05	26.30	<input type="checkbox"/>
		Highest	848.8	23.08	23.04	26.30	<input type="checkbox"/>



Band	Mode	CH	Frequency (MHz)	Time-Average Conducted Power (dBm)		Burst Averaged Conducted Power (dBm)	Worst
				before	After		
PCS1900	-----	Lowest	1850.2	21.11	21.06	30.42	■
		Middle	1880.0	21.01	20.96	30.28	□
		Highest	1909.8	20.81	20.76	30.12	□
GPRS 1900	4Down1Up	Lowest	1850.2	21.21	21.15	30.40	□
		Middle	1880.0	21.11	21.08	30.30	□
		Highest	1909.8	20.91	20.86	30.10	□
	3Down2Up	Lowest	1850.2	23.67	23.63	29.90	□
		Middle	1880.0	23.57	23.51	29.80	□
		Highest	1909.8	23.27	23.21	29.50	□
	2Down3Up	Lowest	1850.2	25.83	25.76	30.30	■
		Middle	1880.0	25.73	25.67	30.20	□
		Highest	1909.8	25.53	25.48	30.00	□
	1Down4Up	Lowest	1850.2	25.58	25.52	28.80	□
		Middle	1880.0	25.48	25.41	28.70	□
		Highest	1909.8	25.28	25.19	28.50	□
EGPRS 1900	4Down1Up	Lowest	1850.2	16.81	16.76	26.00	□
		Middle	1880.0	16.71	16.68	25.90	□
		Highest	1909.8	16.51	16.49	25.70	□
	3Down2Up	Lowest	1850.2	19.27	19.22	25.50	□
		Middle	1880.0	19.07	19.02	25.30	□
		Highest	1909.8	18.97	18.91	25.20	□
	2Down3Up	Lowest	1850.2	20.93	20.89	25.40	□
		Middle	1880.0	20.83	20.77	25.30	□
		Highest	1909.8	20.73	20.68	25.20	□
	1Down4Up	Lowest	1850.2	22.28	22.23	25.50	□
		Middle	1880.0	22.08	22.01	25.30	□
		Highest	1909.8	21.98	21.94	25.20	□



Band	Mode / Sub-test	CH	Frequency (MHz)	Average Conducted power (dBm)		Worst
				before	After	
WCDMA II (RMC 12.2K)	---	Lowest	1852.4	23.14	23.11	■
		Middle	1880.0	22.91	22.87	□
		Highest	1907.6	22.35	22.31	□
HSDPA II	1	Lowest	1852.4	23.15	23.10	■
		Middle	1880.0	23.03	23.97	□
		Highest	1907.6	22.29	22.22	□
	2	Lowest	1852.4	23.13	23.08	□
		Middle	1880.0	22.95	22.87	□
		Highest	1907.6	22.25	22.19	□
	3	Lowest	1852.4	22.60	22.54	□
		Middle	1880.0	22.52	22.49	□
		Highest	1907.6	21.79	21.72	□
	4	Lowest	1852.4	22.66	22.61	□
		Middle	1880.0	22.52	22.47	□
		Highest	1907.6	21.73	21.69	□
HSUPA II	1	Lowest	1852.4	22.54	22.50	■
		Middle	1880.0	22.37	22.31	□
		Highest	1907.6	22.07	22.02	□
	2	Lowest	1852.4	20.56	20.51	□
		Middle	1880.0	20.34	20.30	□
		Highest	1907.6	20.05	20.00	□
	3	Lowest	1852.4	21.58	21.52	□
		Middle	1880.0	21.39	21.34	□
		Highest	1907.6	21.08	21.03	□
	4	Lowest	1852.4	20.63	20.599	□
		Middle	1880.0	20.44	20.40	□
		Highest	1907.6	20.12	20.06	□
	5	Lowest	1852.4	22.52	22.48	□
		Middle	1880.0	22.28	22.25	□
		Highest	1907.6	22.02	21.98	□



Band	Mode / Sub-test	CH	Frequency (MHz)	Average Conducted power (dBm)		Worst
				before	After	
WCDMA V (RMC 12.2K)	---	Lowest	826.4	23.50	23.45	<input type="checkbox"/>
		Middle	836.6	23.53	23.49	<input checked="" type="checkbox"/>
		Highest	846.4	23.16	23.11	<input type="checkbox"/>
HSDPA V	1	Lowest	826.4	23.03	22.98	<input type="checkbox"/>
		Middle	836.6	23.30	23.25	<input checked="" type="checkbox"/>
		Highest	846.4	22.86	22.81	<input type="checkbox"/>
	2	Lowest	826.4	22.97	22.94	<input type="checkbox"/>
		Middle	836.6	23.25	23.20	<input type="checkbox"/>
		Highest	846.4	22.82	22.78	<input type="checkbox"/>
	3	Lowest	826.4	22.57	22.54	<input type="checkbox"/>
		Middle	836.6	22.77	22.73	<input type="checkbox"/>
		Highest	846.4	22.30	22.25	<input type="checkbox"/>
	4	Lowest	826.4	22.49	22.43	<input type="checkbox"/>
		Middle	836.6	22.74	22.70	<input type="checkbox"/>
		Highest	846.4	22.30	22.25	<input type="checkbox"/>
HSUPA V	1	Lowest	826.4	23.10	23.05	<input checked="" type="checkbox"/>
		Middle	836.6	22.90	22.84	<input type="checkbox"/>
		Highest	846.4	22.30	22.26	<input type="checkbox"/>
	2	Lowest	826.4	21.01	20.97	<input type="checkbox"/>
		Middle	836.6	20.88	20.83	<input type="checkbox"/>
		Highest	846.4	20.31	20.26	<input type="checkbox"/>
	3	Lowest	826.4	22.04	22.00	<input type="checkbox"/>
		Middle	836.6	21.90	21.85	<input type="checkbox"/>
		Highest	846.4	21.23	21.16	<input type="checkbox"/>
	4	Lowest	826.4	21.12	21.06	<input type="checkbox"/>
		Middle	836.6	20.98	20.93	<input type="checkbox"/>
		Highest	846.4	20.36	20.32	<input type="checkbox"/>
	5	Lowest	826.4	23.08	23.05	<input type="checkbox"/>
		Middle	836.6	22.83	22.76	<input type="checkbox"/>
		Highest	846.4	22.26	22.20	<input type="checkbox"/>



Band	Data Rate	CH	Frequency (MHz)	Average Conducted power (dBm)		Worst
				before	After	
IEEE 802.11b	1M	Lowest	2412	16.61	16.59	<input type="checkbox"/>
		Middle	2437	17.08	17.05	<input type="checkbox"/>
		Highest	2462	17.41	17.38	<input checked="" type="checkbox"/>
	2M	Lowest	2412	16.58	16.52	<input type="checkbox"/>
		Middle	2437	17.03	17.00	<input type="checkbox"/>
		Highest	2462	17.37	17.34	<input type="checkbox"/>
	5.5M	Lowest	2412	15.04	15.01	<input type="checkbox"/>
		Middle	2437	15.13	15.08	<input type="checkbox"/>
		Highest	2462	15.54	15.50	<input type="checkbox"/>
	11M	Lowest	2412	15.74	15.70	<input type="checkbox"/>
		Middle	2437	15.88	15.85	<input type="checkbox"/>
		Highest	2462	16.30	16.27	<input type="checkbox"/>
IEEE 802.11g	6M	Lowest	2412	17.59	17.56	<input type="checkbox"/>
		Middle	2437	18.01	17.94	<input type="checkbox"/>
		Highest	2462	18.24	18.20	<input checked="" type="checkbox"/>
	9M	Lowest	2412	17.49	17.41	<input type="checkbox"/>
		Middle	2437	17.94	17.90	<input type="checkbox"/>
		Highest	2462	18.21	18.15	<input type="checkbox"/>
	12M	Lowest	2412	17.43	17.40	<input type="checkbox"/>
		Middle	2437	17.88	17.83	<input type="checkbox"/>
		Highest	2462	18.14	18.10	<input type="checkbox"/>
	18M	Lowest	2412	17.43	17.40	<input type="checkbox"/>
		Middle	2437	17.83	17.79	<input type="checkbox"/>
		Highest	2462	18.12	18.05	<input type="checkbox"/>
	24M	Lowest	2412	17.44	17.40	<input type="checkbox"/>
		Middle	2437	17.82	17.78	<input type="checkbox"/>
		Highest	2462	18.11	18.04	<input type="checkbox"/>
	36M	Lowest	2412	17.36	17.33	<input type="checkbox"/>
		Middle	2437	17.70	17.64	<input type="checkbox"/>
		Highest	2462	18.03	17.99	<input type="checkbox"/>
	48M	Lowest	2412	17.21	17.18	<input type="checkbox"/>
		Middle	2437	17.55	17.49	<input type="checkbox"/>
		Highest	2462	17.94	17.90	<input type="checkbox"/>
	54M	Lowest	2412	17.15	17.10	<input type="checkbox"/>
		Middle	2437	17.53	17.46	<input type="checkbox"/>
		Highest	2462	17.85	17.80	<input type="checkbox"/>
Bluetooth	Lowest	2402	0.732	0.728	<input type="checkbox"/>	
	Middle	2441	0.329	0.325	<input type="checkbox"/>	
	Highest	2480	0.540	0.536	<input type="checkbox"/>	



8.2 Simultaneous Transmitting Evaluate

RF Conducted Power:

Band	dBm	W
GSM/GPRS/EGPRS 850	28.63	0.729
PCS/GPRS/EGPRS 1900	25.83	0.383
WCDMA/HSDPA/HSUPA Band V	23.53	0.225
WCDMA/HSDPA/HSUPA Band II	23.15	0.207
Wi-Fi 802.11b	17.41	0.055
Wi-Fi 802.11g	18.24	0.067
BT	0.732	0.001

BT and GSM and WLAN simultaneously SAR Description

BT Antenna and WLAN Antenna 0 cm

BT Antenna and GSM/PCS (License) Antenna 8.2 cm

WLAN Antenna and GSM/PCS (License) Antenna 8.2 cm

(1) Antenna Distance

1a. BT & GSM 8.2 cm > 2.5 cm

1b. BT & WLAN 0 cm, Use the same antenna, but can not transmitting in 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

$$1.23 + 0.057 = 1.287 \text{ mW/g} < 1.6 \text{ mW/g}$$

8.3 System Performance Check

8.3.1 Symmetric Dipoles for System Validation

Construction	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.
Frequency	835, 1900, 2450 MHz
Return Loss	> 20 dB at specified validation position
Power Capability	> 100 W (f < 1GHz); > 40 W (f > 1GHz)
Options	Dipoles for other frequencies or solutions and other calibration conditions are available upon request
Dimensions	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 10. Validation Kit



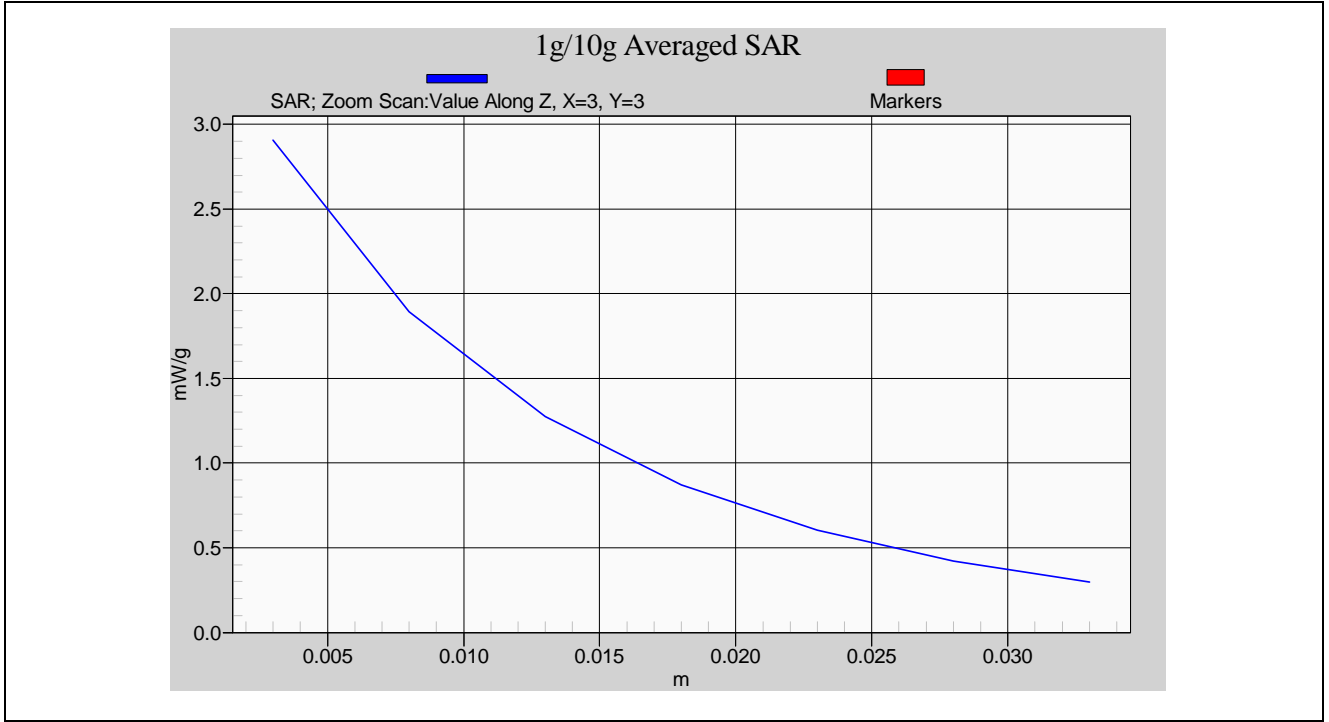
8.3.2 Validation

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.

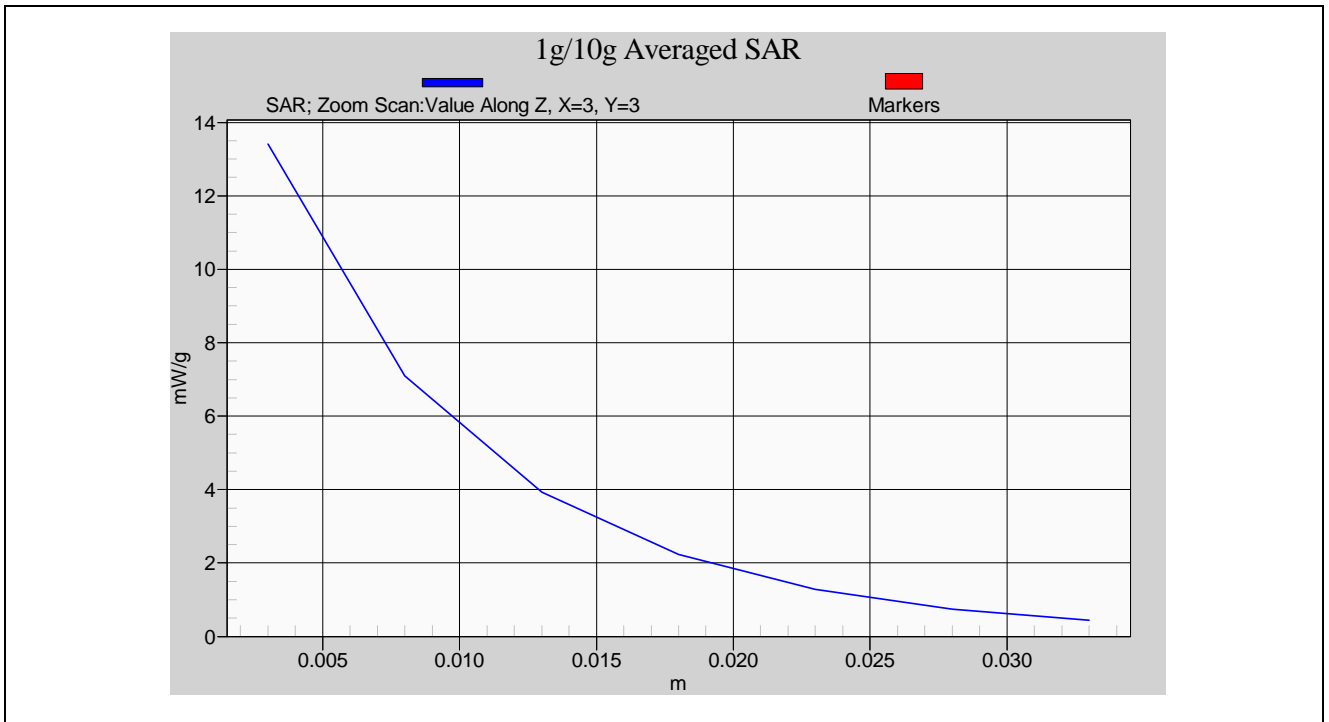
Validation kit		Mixture Type	SAR _{1g} [mW/g]		SAR _{10g} [mW/g]		Date of Calibration
D835V2-SN4d082		Head	9.68		6.32		Jul. 13, 2009
		Body	10.24		6.72		
D1900V2-SN5d111		Head	42.00		21.96		Jul. 14, 2009
		Body	42.80		22.44		
D2450V2-SN712		Body	52.00		23.88		Feb. 19, 2010
Frequency (MHz)	Power (dBm)	SAR _{1g} (mW/g)	SAR _{10g} (mW/g)	Drift (dB)	Difference percentage		Date
					1g	10g	
835 (Head)	250mW	2.47	1.59	-0.168	2.1 %	0.6 %	Mar. 26, 2010
	Normalize to 1 Watt	9.88	6.36				
1900 (Head)	250mW	10.4	5.33	0.105	-1.0 %	-2.9 %	Mar. 27, 2010
	Normalize to 1 Watt	41.6	21.32				
835 (Body)	250mW	2.6	1.69	-0.057	1.6 %	0.6 %	Mar. 24, 2010
	Normalize to 1 Watt	10.4	6.76				
835 (Body)	250mW	2.63	1.71	0.030	2.7 %	1.8 %	Mar. 25, 2010
	Normalize to 1 Watt	10.52	6.84				
835 (Body)	250mW	2.56	1.67	0.00282	0.0 %	-0.6 %	Mar. 29, 2010
	Normalize to 1 Watt	10.24	6.68				
1900 (Body)	250mW	10.8	5.53	0.096	0.9 %	-1.4 %	Mar. 24, 2010
	Normalize to 1 Watt	43.2	22.12				
1900 (Body)	250mW	10.7	5.51	0.053	0.0 %	-1.8 %	Mar. 25, 2010
	Normalize to 1 Watt	42.8	22.04				
1900 (Body)	250mW	10.5	5.42	-0.182	-1.9 %	-3.4 %	Mar. 29, 2010
	Normalize to 1 Watt	42	21.68				
2450 (Body)	250mW	12.9	5.95	0.013	-0.8 %	-0.3 %	Mar. 29, 2010
	Normalize to 1 Watt	51.6	23.8				



Z-axis Plot of System Performance Check



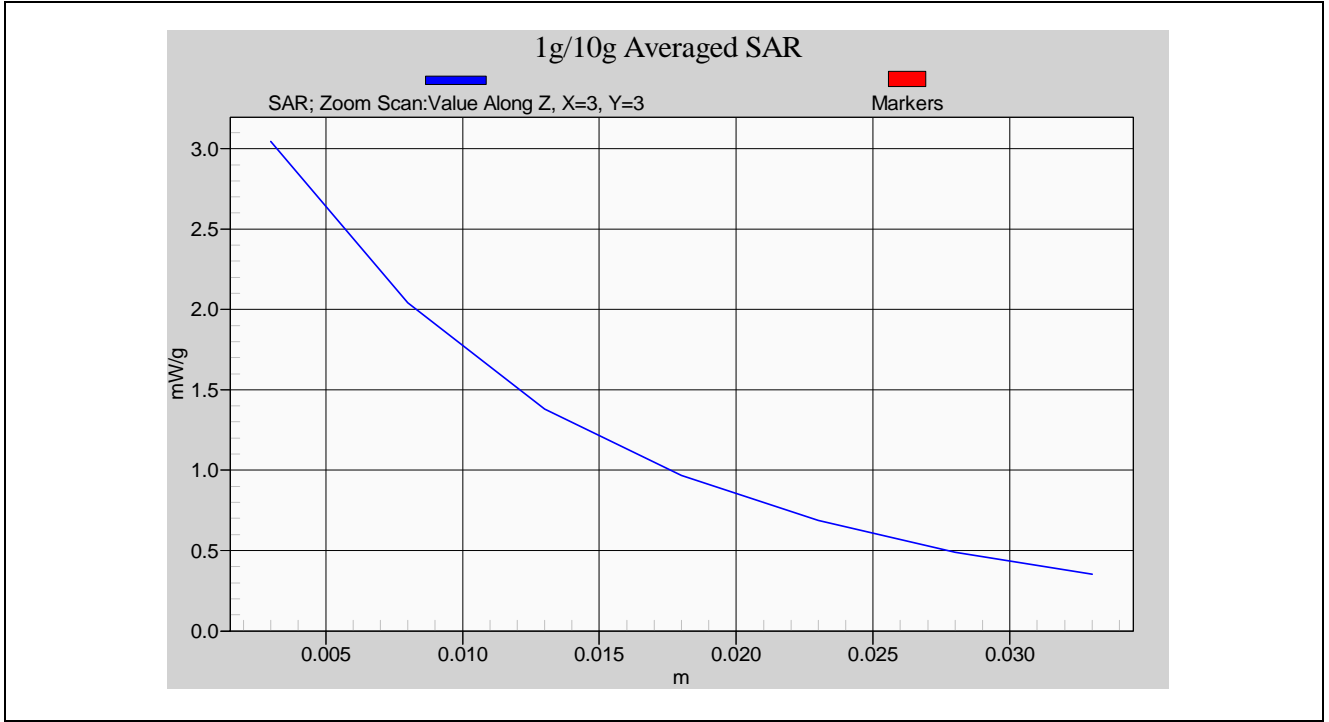
Head-Tissue-Simulating-Liquid 835MHz



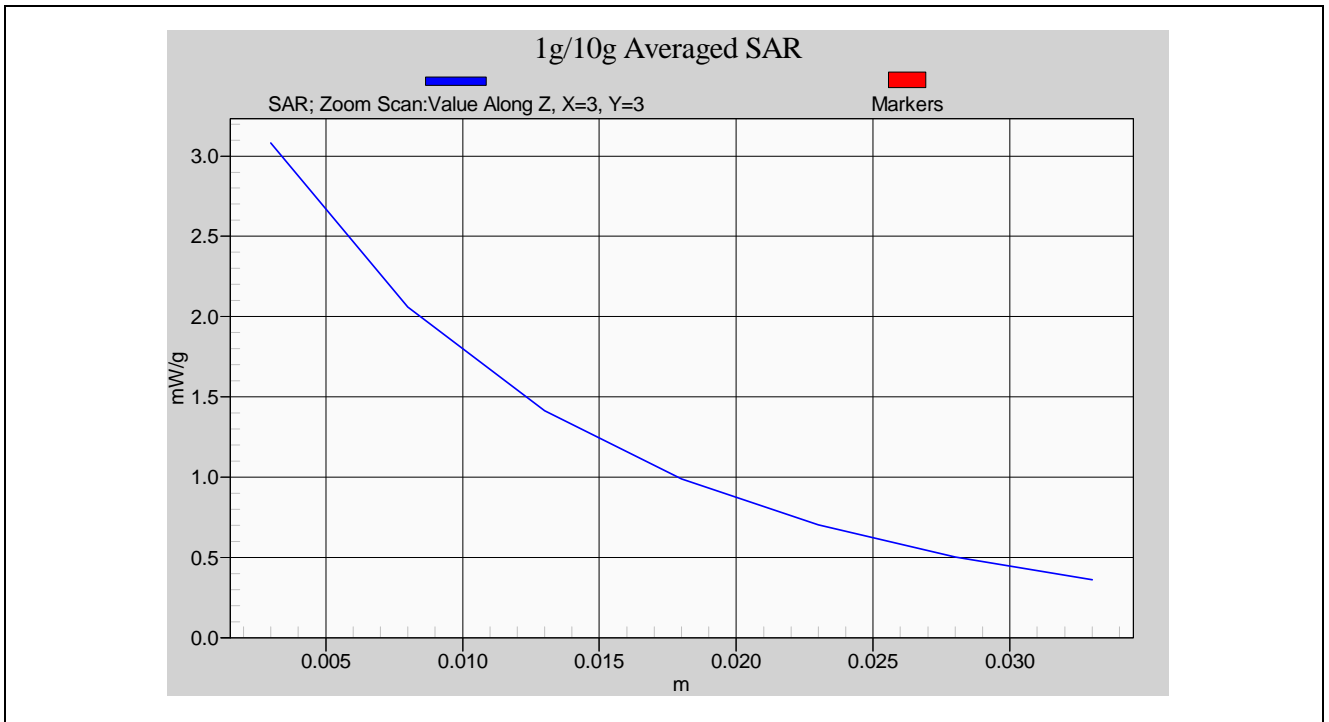
Head-Tissue-Simulating-Liquid 1900MHz



Z-axis Plot of System Performance Check



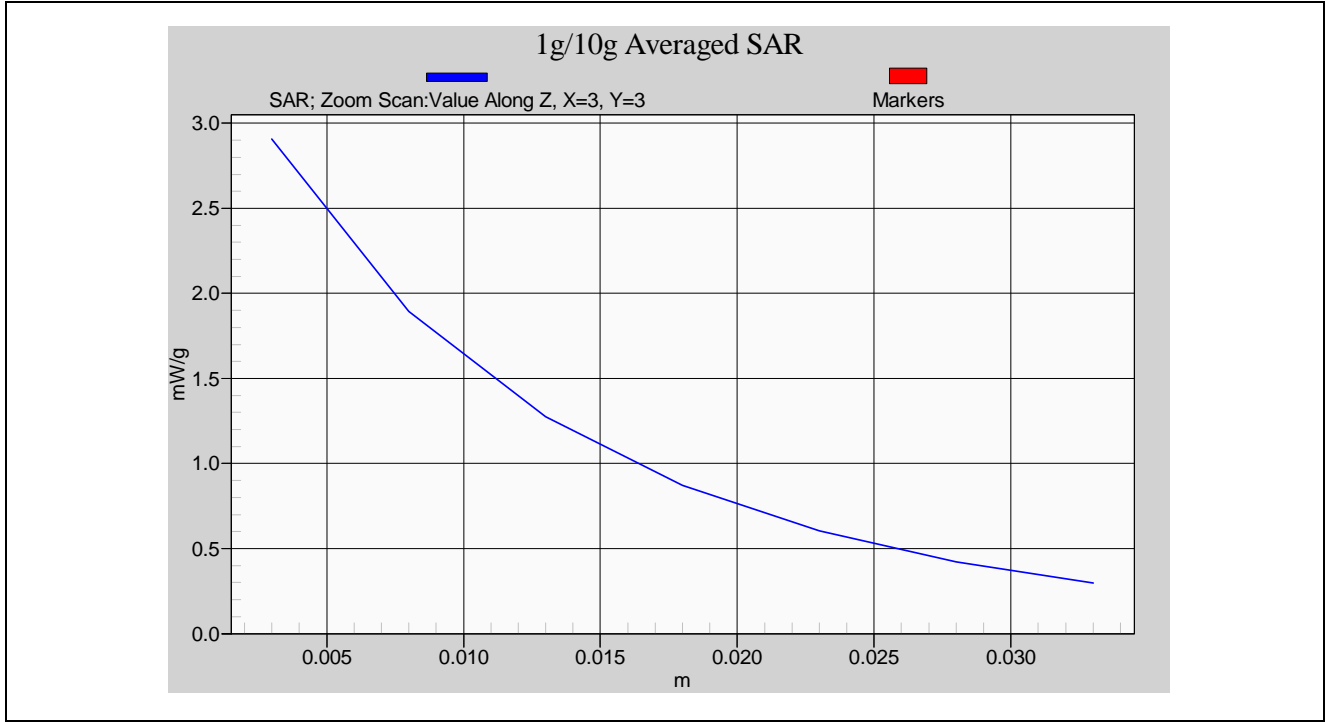
Body-Tissue-Simulating-Liquid 835MHz_2010/03/24



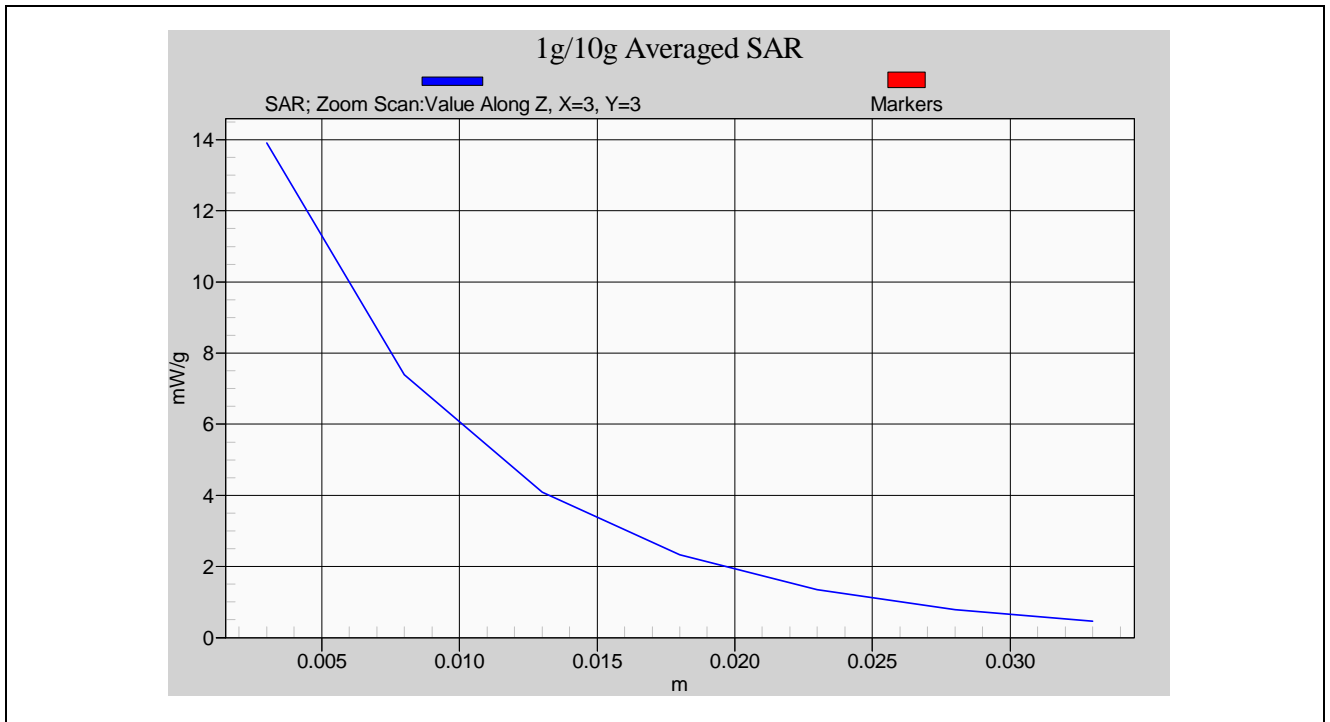
Body-Tissue-Simulating-Liquid 835MHz_2010/03/25



Z-axis Plot of System Performance Check



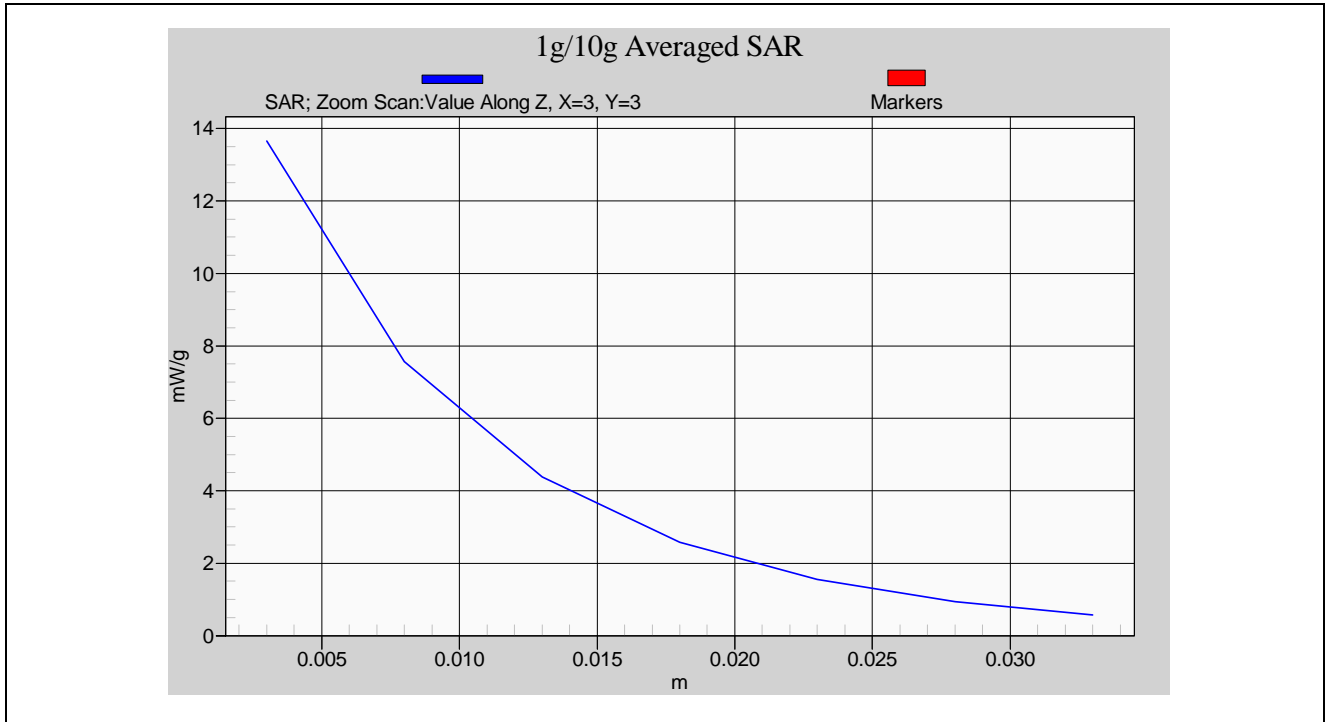
Body-Tissue-Simulating-Liquid 835MHz_2010/03/26



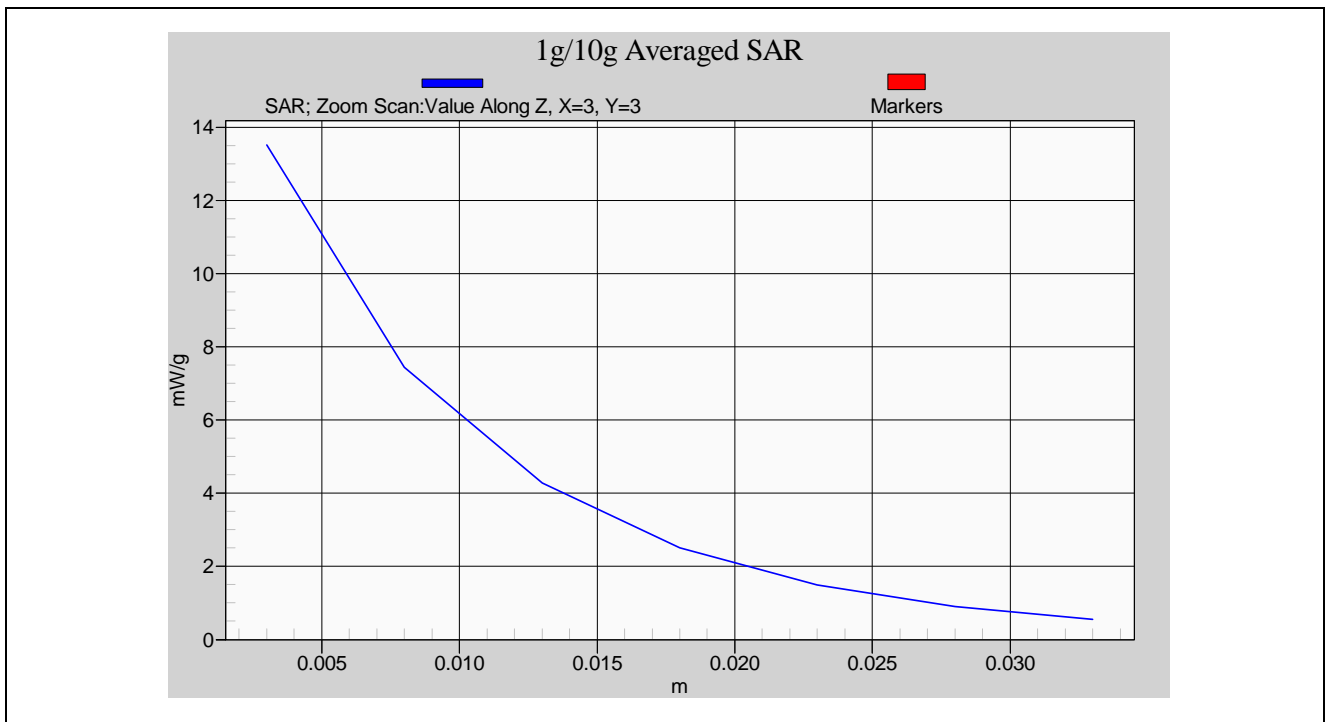
Body-Tissue-Simulating-Liquid 1900MHz_2010/03/24



Z-axis Plot of System Performance Check



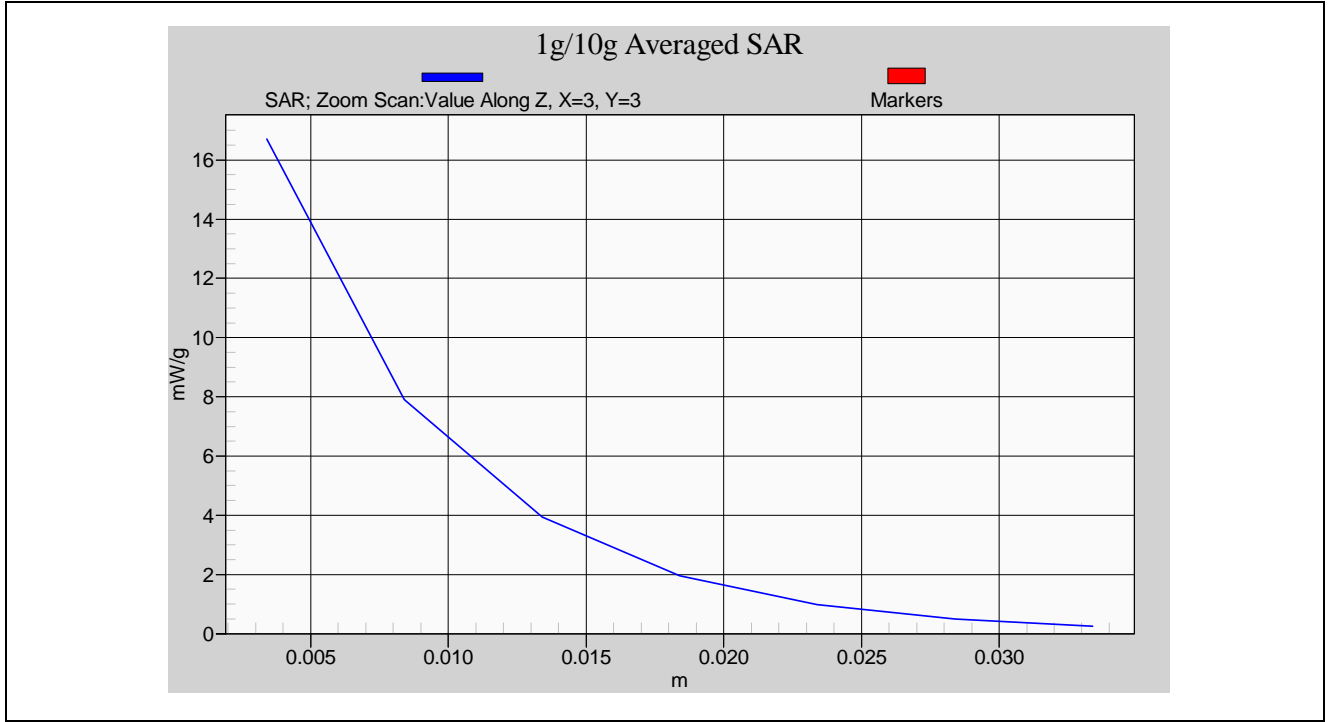
Body-Tissue-Simulating-Liquid 1900MHz_2010/03/25



Body-Tissue-Simulating-Liquid 1900MHz_2010/03/29



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 Band II (RMC 12.2K) / WCDMA Band V (RMC 12.2K) / WLAN 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 x 15 mm.
- Zoom Scan :** Zoom scans are used to assess the highest averaged SAR for cubic averaging volumes with 1 g and 10 g of simulated tissue. The zoom scan measures 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 ± 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 ± 2 dB can be expected.

According to CENELEC [10] , typical worst-case uncertainty of field measurements is ± 5 dB. For well-defined modulation characteristics the uncertainty can be reduced to ± 3 dB.



Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±5.5 %	N	1	1	1	±5.5 %	±5.5 %	∞
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	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 %	∞
Test Sample Related								
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 %	∞
Phantom and Setup								
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 %	∞
Combined Std. Uncertainty						±10.7 %	±10.5 %	387
Expanded STD Uncertainty						±21.4 %	±21.0 %	

Table 8. Uncertainty Budget of DASy



10. SAR Test Results Summary

10.1 GSM 850 - Head SAR

Ambient :

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

Liquid :

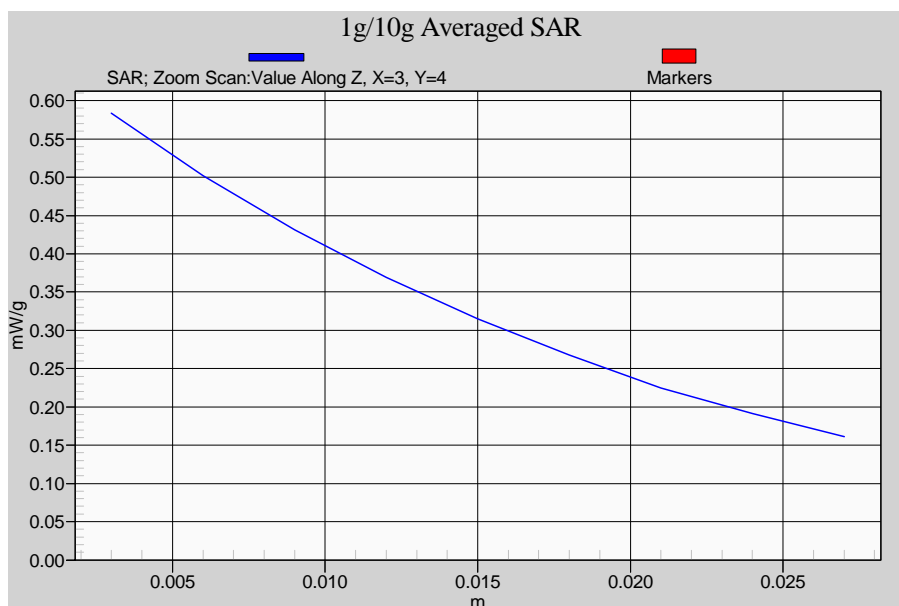
Mixture Type : HSL835 Liquid Temperature (°C) : 22.0
 Depth of liquid (cm) : 15

Measurement :

Duty Cycle : 1:8.3 Probe S/N : 3632

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
848.8	251	GSM 850	24.11	Right-cheek	PIFA	N/A	0.436	0.089	Sample 1 st
848.8	251	GSM 850	24.11	Right-Tilted	PIFA	N/A	0.267	0.031	Sample 1 st
848.8	251	GSM 850	24.11	Left-cheek	PIFA	N/A	0.523	0.038	Sample 1 st
848.8	251	GSM 850	24.11	Left-Tilted	PIFA	N/A	0.287	0.026	Sample 1 st
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population						1.6 W/kg (mW/g) Averaged over 1 gram			

Z-axis Plot of SAR Measurement



Z-axis Plot of Left-Cheek GSM850 CH 251 _ Sample 1st



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 :

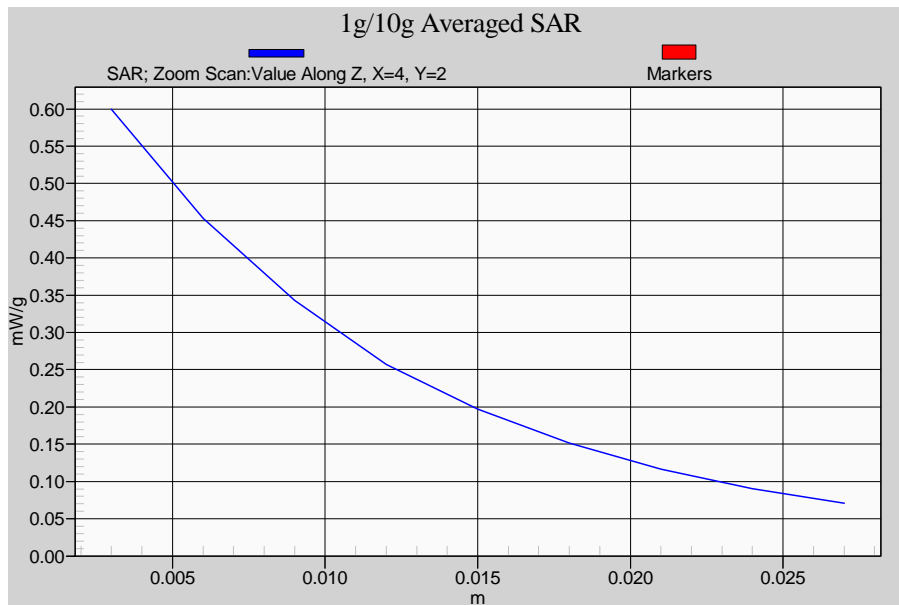
Duty Cycle : 1:8.3

Probe S/N : 3632

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1850.2	512	PCS 1900	21.11	Right-cheek	PIFA	N/A	0.383	-0.047	Sample 1 st
1850.2	512	PCS 1900	21.11	Right-Tilted	PIFA	N/A	0.277	0.090	Sample 1 st
1850.2	512	PCS 1900	21.11	Left-cheek	PIFA	N/A	0.507	-0.017	Sample 1 st
1850.2	512	PCS 1900	21.11	Left-Tilted	PIFA	N/A	0.225	0.016	Sample 1 st
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population						1.6 W/kg (mW/g) Averaged over 1 gram			

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Left-Check PCS1900 CH 512 _ Sample 1st



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 :

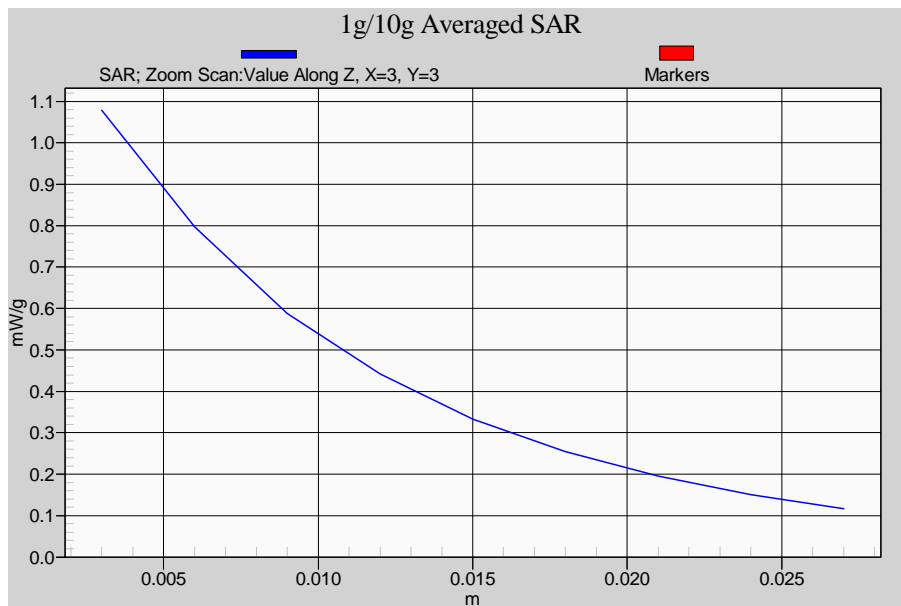
Duty Cycle : 1:1

Probe S/N : 3632

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1852.4	9262	Band II	23.14	Right-cheek	PIFA	N/A	0.676	0.132	Sample 1 st
1852.4	9262	Band II	23.14	Right-Tilted	PIFA	N/A	0.436	0.095	Sample 1 st
1852.4	9262	Band II	23.14	Left-cheek	PIFA	N/A	0.898	-0.004	Sample 1 st
1880.0	9400	Band II	22.91	Left-cheek	PIFA	N/A	0.822	0.001	Sample 1 st
1907.6	9538	Band II	22.35	Left-cheek	PIFA	N/A	0.611	0.020	Sample 1 st
1852.4	9262	Band II	23.14	Left-Tilted	PIFA	N/A	0.337	-0.034	Sample 1 st
<p style="text-align: center;">Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population</p>					<p style="text-align: center;">1.6 W/kg (mW/g) Averaged over 1 gram</p>				

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Left-Check WCDMA Band II (RMC 12.2K) CH 9262 _ Sample 1st



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 :

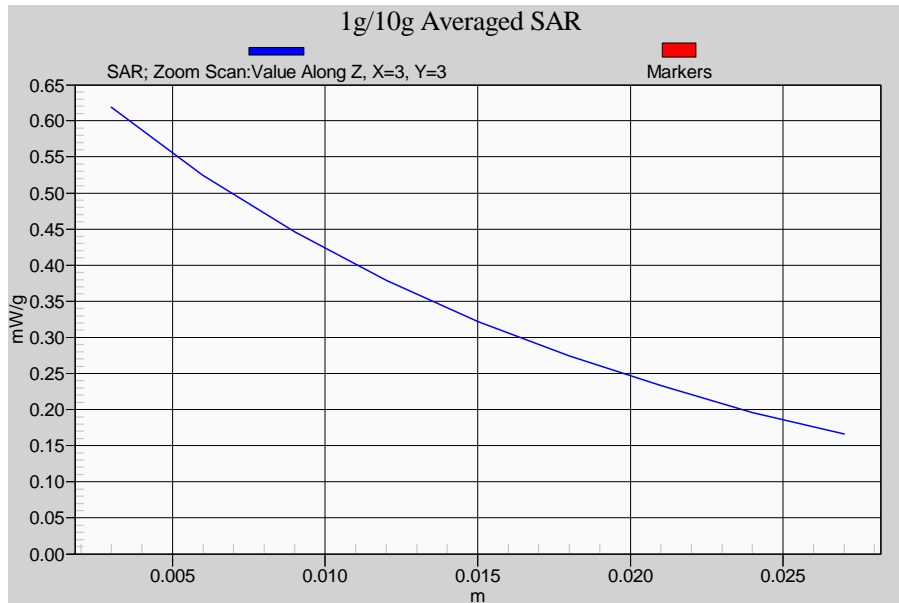
Duty Cycle : 1:1

Probe S/N : 3632

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
836.6	4183	Band V	23.53	Right-cheek	PIFA	N/A	0.466	0.057	Sample 1 st
836.6	4183	Band V	23.53	Right-Tilted	PIFA	N/A	0.311	0.032	Sample 1 st
836.6	4183	Band V	23.53	Left-cheek	PIFA	N/A	0.556	0.029	Sample 1 st
836.6	4183	Band V	23.53	Left-Tilted	PIFA	N/A	0.348	-0.046	Sample 1 st
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg (mW/g) Averaged over 1 gram				

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Left-Check WCDMA Band V (RMC 12.2K) CH 4183 _ Sample 1st



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

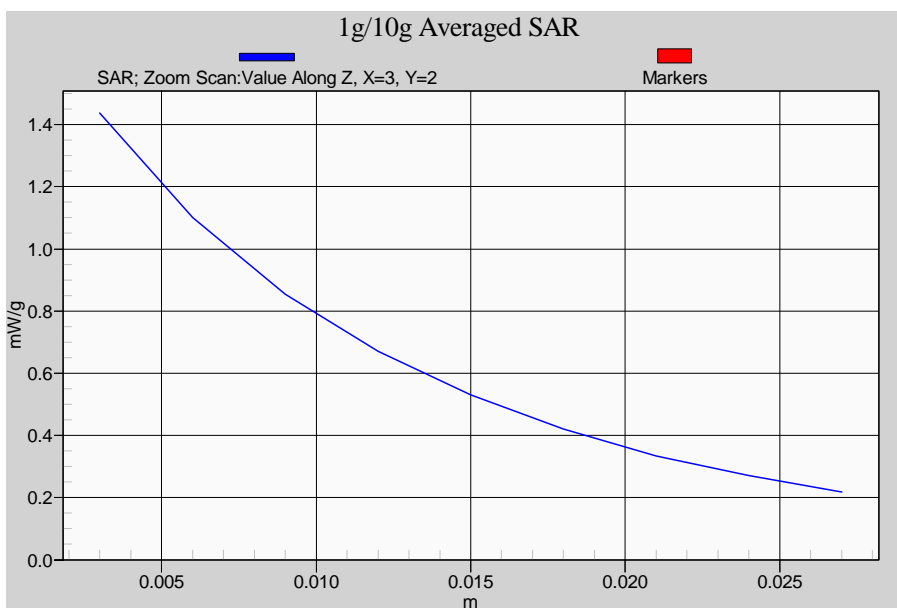
Measurement :

Duty Cycle : 1:8.3 Probe S/N : 3632
2Down3Up -- 1:2.8

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
848.8	251	GSM 850	24.11	Flat	PIFA	Headset	0.542	0.010	Sample 1 st
824.2	128	GPRS 850	28.43	Flat	PIFA	Headset	0.851	-0.036	Sample 1 st 2Down3Up
836.6	190	GPRS 850	28.53	Flat	PIFA	Headset	1.040	-0.024	Sample 1 st 2Down3Up
848.8	251	GPRS 850	28.63	Flat	PIFA	Headset	1.230	-0.049	Sample 1 st 2Down3Up
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population							1.6 W/kg (mW/g) Averaged over 1 gram		

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Flat GPRS850 CH 251 (2Down3Up) _ Sample 1st



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

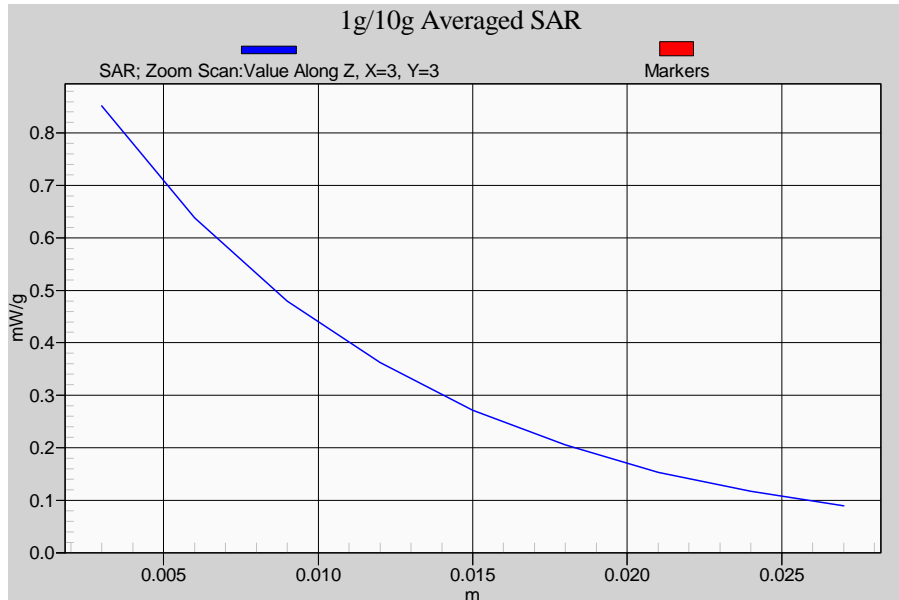
Measurement :

Duty Cycle : 1:8.3 Probe S/N : 3632
2Down3Up -- 1:2.8

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1850.2	512	PCS 1900	21.11	Flat	PIFA	Headset	0.263	0.077	Sample 1 st
1850.2	512	GPRS 1900	25.83	Flat	PIFA	Headset	0.715	-0.136	Sample 1 st 2Down3Up
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population						1.6 W/kg (mW/g) Averaged over 1 gram			

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Flat GPRS 1900 CH 512 (2Down3Up) _ Sample 1st



10.7 WCDMA (RMC 12.2K)/HSDPA/HSUPA 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

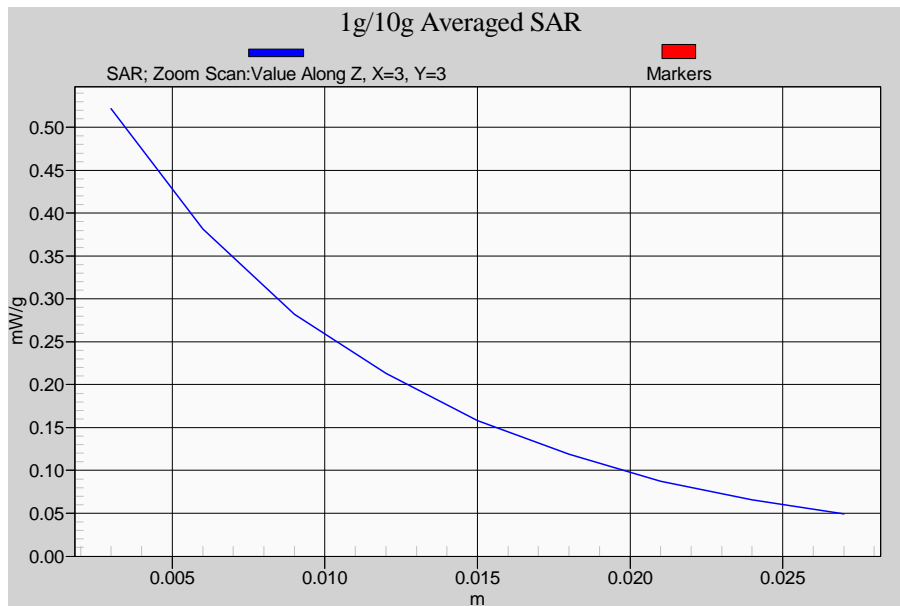
Measurement :

Duty Cycle : 1:1 Probe S/N : 3632

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1852.4	9262	WCDMA Band II	23.14	Flat	PIFA	Headset	0.430	-0.063	Sample 1 st
1852.4	9262	HSDPA Band II	23.15	Flat	PIFA	Headset	0.401	-0.037	Sample 1 st Sub-Test 1
1852.4	9262	HSUPA Band II	22.54	Flat	PIFA	Headset	0.317	0.006	Sample 1 st Sub-Test 1
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population							1.6 W/kg (mW/g) Averaged over 1 gram		

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Flat WCDMA Band II (RMC 12.2K) CH 9262 _ Sample 1st



10.8 WCDMA(RMC 12.2K)/HSDPA/HSUPA 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

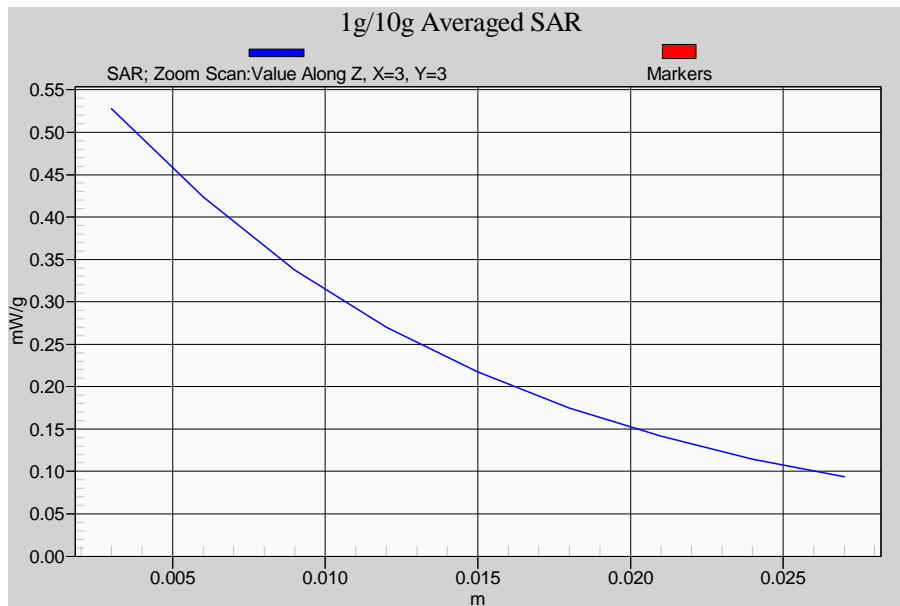
Measurement :

Duty Cycle : 1:1 Probe S/N : 3632

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
836.6	4183	WCDMA Band V	23.53	Flat	PIFA	Headset	0.459	-0.032	Sample 1 st
836.6	4183	HSDPA Band V	23.30	Flat	PIFA	Headset	0.193	0.035	Sample 1 st Sub-Test 1
836.6	4183	HSUPA Band V	23.10	Flat	PIFA	Headset	0.146	-0.050	Sample 1 st Sub-Test 1
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population							1.6 W/kg (mW/g) Averaged over 1 gram		

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Flat WCDMA Band V (RMC 12.2K) CH 4183 _ Sample 1st



10.9 IEEE 802.11b/ IEEE 802.11g - 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

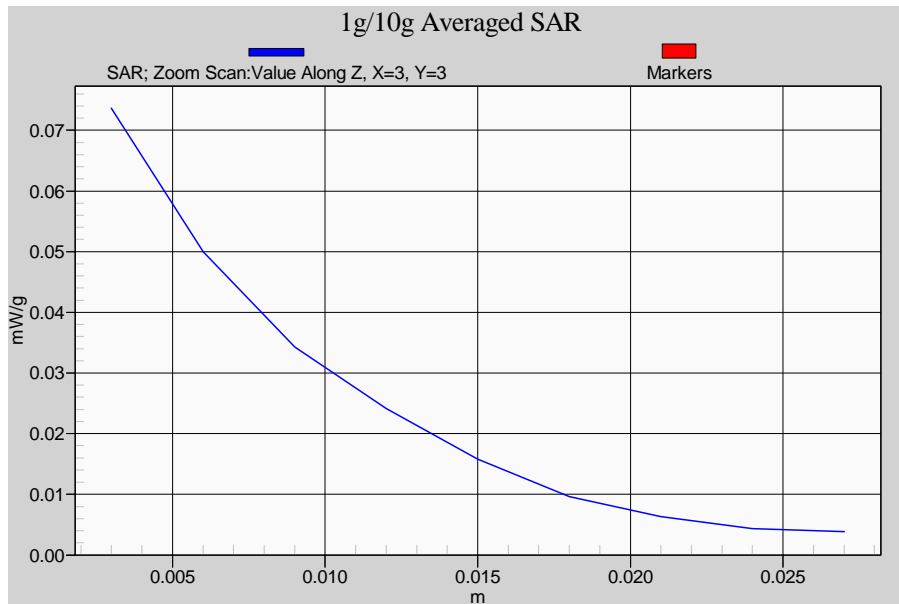
Measurement :

Duty Cycle : 1:1 Probe S/N : 3632

Frequency		Band/Rate	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
2462	11	802.11b/1M	17.41	Flat	PIFA	Headset	0.057	0.098	Sample 1 st
2462	11	802.11g/6M	18.24	Flat	PIFA	Headset	0.057	0.082	Sample 1 st
Std. C95.1-2005 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population							1.6 W/kg (mW/g) Averaged over 1 gram		

Detail results see Appendix B.

Z-axis Plot of SAR Measurement



Z-axis Plot of Flat WLAN 802.11b CH 11 (Rate 1M) _ Sample 1st



10.10 Std. C95.1-2005 RF Exposure Limit

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

Table 9. Safety Limits for Partial Body Exposure

Notes :

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

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

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



11. Conclusion

The SAR test values found for the portable mobile phone **HTC Corporation Trade Name : HTC Model(s) : PB76110** 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.
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- [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.
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- [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: 3/26/2010 9:38:21 AM

System Performance Check at 835MHz_20100326_Head

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

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.928 \text{ mho/m}$; $\epsilon_r = 40.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.11, 9.11, 9.11); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

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

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

Maximum value of SAR (interpolated) = 2.95 mW/g

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

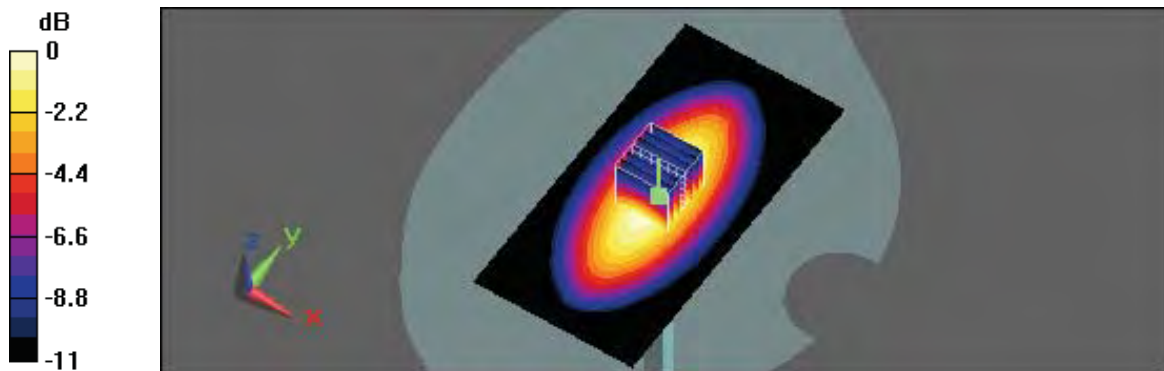
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 57.1 V/m; Power Drift = -0.168 dB

Peak SAR (extrapolated) = 3.81 W/kg

SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.59 mW/g

Maximum value of SAR (measured) = 2.91 mW/g



0 dB = 2.91mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/24/2010 10:05:12 AM

System Performance Check at 835MHz_20100324_Body

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

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.998 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.17, 9.17, 9.17); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

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

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

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

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

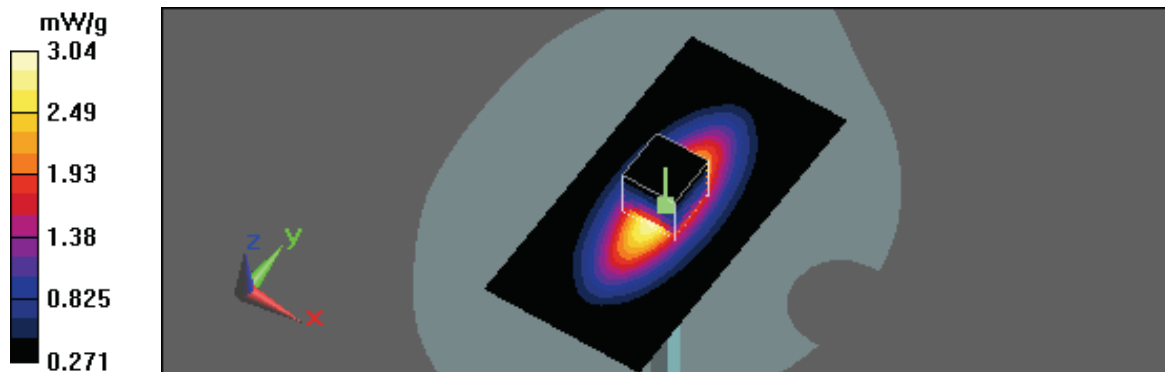
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.8 V/m; Power Drift = -0.057 dB

Peak SAR (extrapolated) = 3.85 W/kg

SAR(1 g) = 2.6 mW/g; SAR(10 g) = 1.69 mW/g

Maximum value of SAR (measured) = 3.04 mW/g



0 dB = 3.04mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/25/2010 11:00:15 AM

System Performance Check at 835MHz_20100325_Body

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

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.998 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.17, 9.17, 9.17); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

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

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

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

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

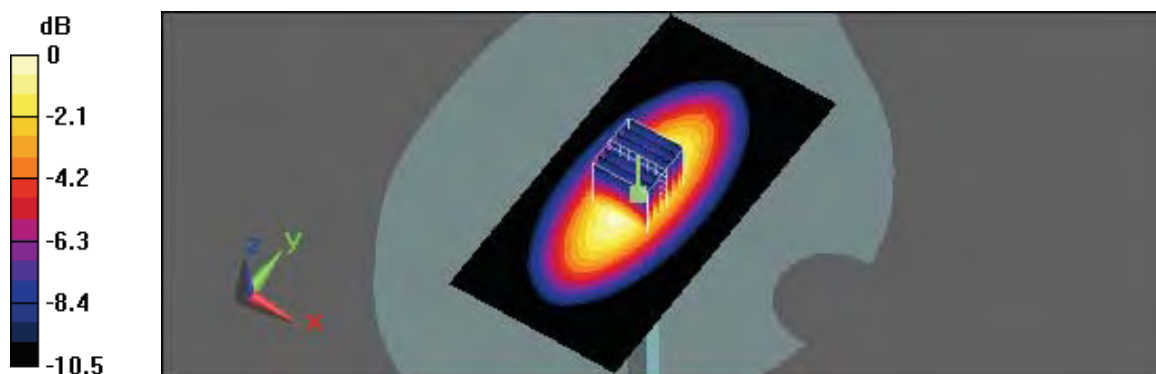
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.6 V/m; Power Drift = 0.030 dB

Peak SAR (extrapolated) = 3.96 W/kg

SAR(1 g) = 2.63 mW/g; SAR(10 g) = 1.71 mW/g

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



0 dB = 3.08mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/29/2010 9:27:22 AM

System Performance Check at 835MHz_20100329_Body

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

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.998 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.17, 9.17, 9.17); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

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

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

Maximum value of SAR (interpolated) = 3.1 mW/g

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

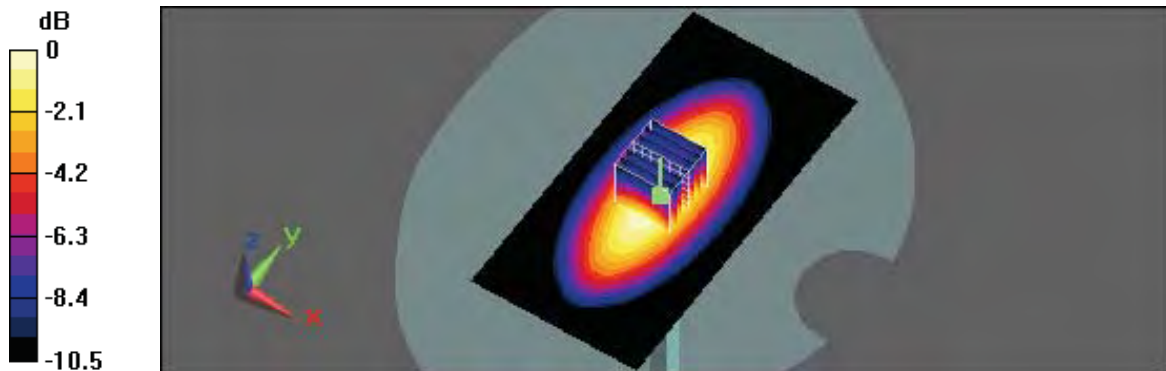
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 56.3 V/m; Power Drift = 0.00282 dB

Peak SAR (extrapolated) = 3.87 W/kg

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

Maximum value of SAR (measured) = 3.01 mW/g



0 dB = 3.01mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 10:14:50 AM

System Performance Check at 1900MHz_20100327_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: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

System Performance Check at 1900MHz/Area Scan (61x61x1):

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

Maximum value of SAR (interpolated) = 13.1 mW/g

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

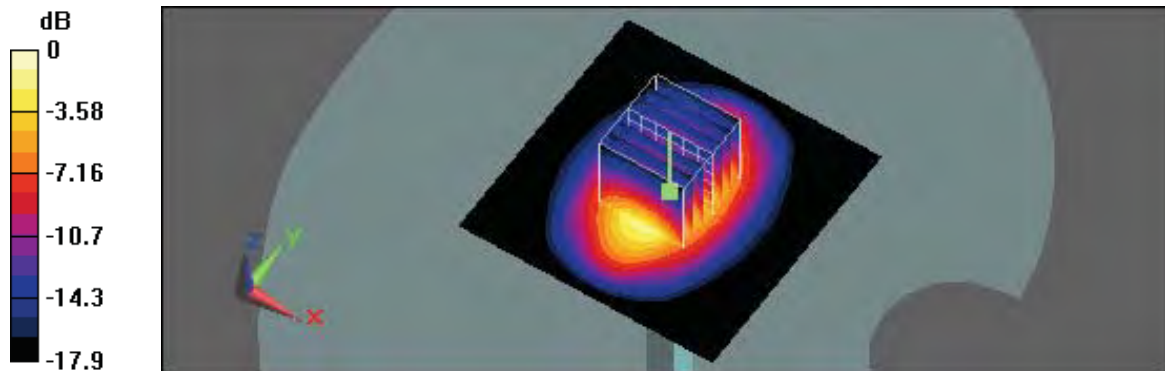
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 97.4 V/m; Power Drift = 0.105 dB

Peak SAR (extrapolated) = 20.1 W/kg

SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.33 mW/g

Maximum value of SAR (measured) = 13.4 mW/g



0 dB = 13.4mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/24/2010 11:13:25 AM

System Performance Check at 1900MHz_20100324_Body

DUT: Dipole D1900V2_SN5d111; Type: D1900V2; Serial: D1900V2 - SN:5d111

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

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.5 \text{ mho/m}$; $\epsilon_r = 51.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.57, 7.57, 7.57); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

System Performance Check at 1900MHz/Area Scan (61x61x1):

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

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

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

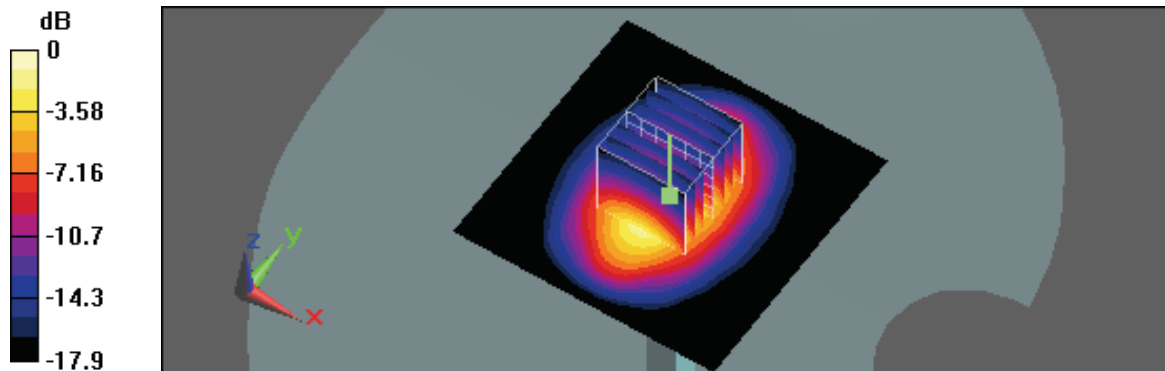
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 94.5 V/m; Power Drift = 0.096 dB

Peak SAR (extrapolated) = 20.7 W/kg

SAR(1 g) = 10.8 mW/g; SAR(10 g) = 5.53 mW/g

Maximum value of SAR (measured) = 13.9 mW/g



0 dB = 13.9mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/25/2010 2:10:40 PM

System Performance Check at 1900MHz_20100325_Body

DUT: Dipole D1900V2_SN5d111; Type: D1900V2; Serial: D1900V2 - SN:5d111

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

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.5 \text{ mho/m}$; $\epsilon_r = 51.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.57, 7.57, 7.57); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

System Performance Check at 1900MHz/Area Scan (61x61x1):

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

Maximum value of SAR (interpolated) = 13.6 mW/g

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

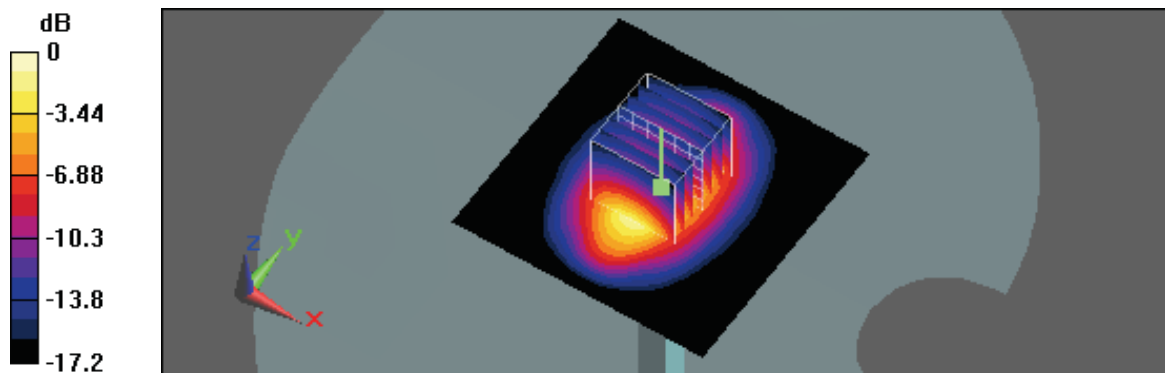
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 95.5 V/m; Power Drift = 0.053 dB

Peak SAR (extrapolated) = 19.8 W/kg

SAR(1 g) = 10.7 mW/g; SAR(10 g) = 5.51 mW/g

Maximum value of SAR (measured) = 13.7 mW/g



0 dB = 13.7mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/29/2010 1:17:15 PM

System Performance Check at 1900MHz_20100329_Body

DUT: Dipole D1900V2_SN5d111; Type: D1900V2; Serial: D1900V2 - SN:5d111

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

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.5 \text{ mho/m}$; $\epsilon_r = 51.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.57, 7.57, 7.57); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

System Performance Check at 1900MHz/Area Scan (61x61x1):

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

Maximum value of SAR (interpolated) = 13.1 mW/g

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

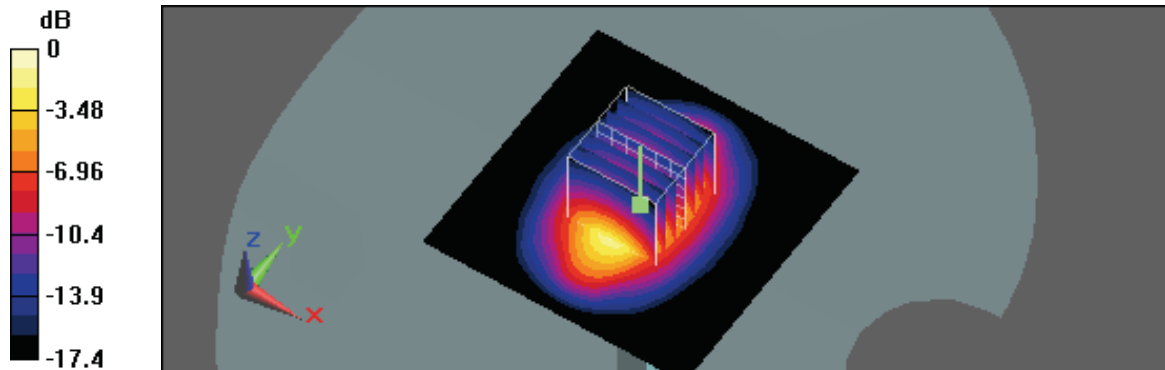
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 98.4 V/m; Power Drift = -0.182 dB

Peak SAR (extrapolated) = 19.7 W/kg

SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.42 mW/g

Maximum value of SAR (measured) = 13.5 mW/g



0 dB = 13.5mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/29/2010 4:15:09 PM

System Performance Check at 2450MHz_20100329_Body

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

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

Medium parameters used: $f = 2450 \text{ MHz}$; $\sigma = 1.92 \text{ mho/m}$; $\epsilon_r = 50.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.4, 7.4, 7.4); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

System Performance Check at 2450MHz/Area Scan (61x61x1):

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

Maximum value of SAR (interpolated) = 17.2 mW/g

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

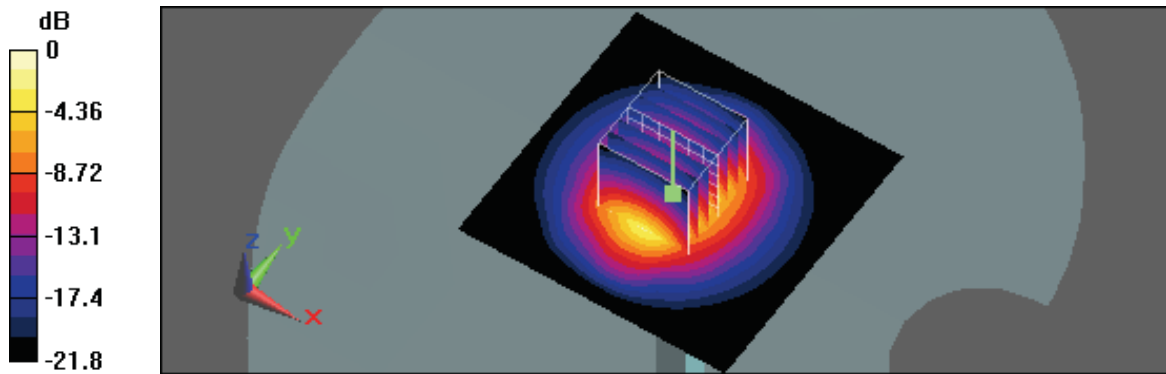
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 94.5 V/m; Power Drift = 0.013 dB

Peak SAR (extrapolated) = 26.5 W/kg

SAR(1 g) = 12.9 mW/g; SAR(10 g) = 5.95 mW/g

Maximum value of SAR (measured) = 17.1 mW/g



0 dB = 17.1mW/g



Appendix B - SAR Measurement Data

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/26/2010 11:10:47 AM

RC_GSM850_CH251_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: GSM850; Frequency: 848.8 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 849$ MHz; $\sigma = 0.942$ mho/m; $\epsilon_r = 40.6$; $\rho = 1000$ kg/m³
Phantom section: Right Section
Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

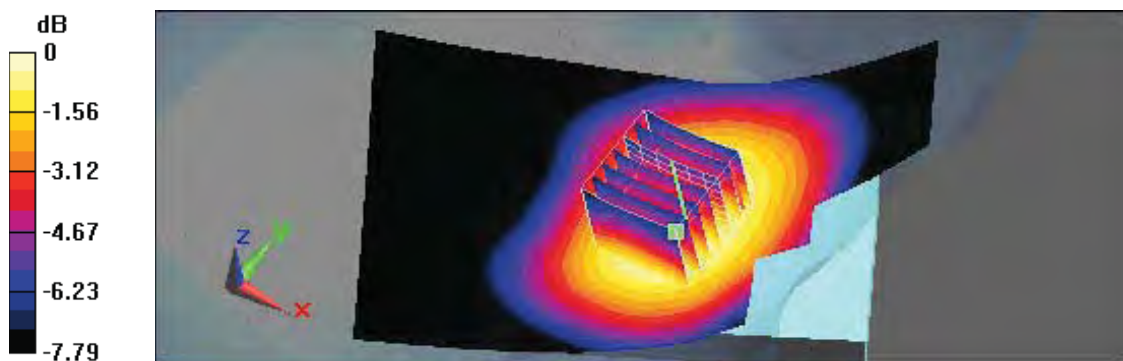
- Probe: EX3DV4 - SN3632; ConvF(9.11, 9.11, 9.11); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Right Cheek/Area Scan (61x101x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.487 mW/g

Right Cheek/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 7.59 V/m; Power Drift = 0.089 dB
Peak SAR (extrapolated) = 0.558 W/kg
SAR(1 g) = 0.436 mW/g; SAR(10 g) = 0.321 mW/g
Maximum value of SAR (measured) = 0.480 mW/g



0 dB = 0.480mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/26/2010 11:42:43 AM

RT_GSM850_CH251_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: GSM850; Frequency: 848.8 MHz; Duty Cycle: 1:8.3
 Medium parameters used: $f = 849 \text{ MHz}$; $\sigma = 0.942 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Right Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

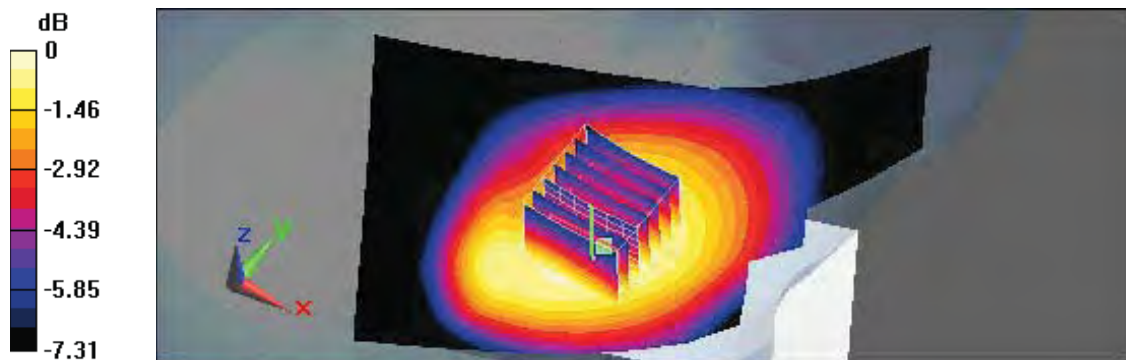
- Probe: EX3DV4 - SN3632; ConvF(9.11, 9.11, 9.11); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Right Tilted/Area Scan (61x101x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 0.302 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 = 13 V/m; Power Drift = 0.031 dB
 Peak SAR (extrapolated) = 0.351 W/kg
SAR(1 g) = 0.267 mW/g; SAR(10 g) = 0.199 mW/g
 Maximum value of SAR (measured) = 0.295 mW/g



0 dB = 0.295mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/26/2010 1:17:35 PM

LC_GSM850_CH251_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: GSM850; Frequency: 848.8 MHz; Duty Cycle: 1:8.3
 Medium parameters used: $f = 849 \text{ MHz}$; $\sigma = 0.942 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Left Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

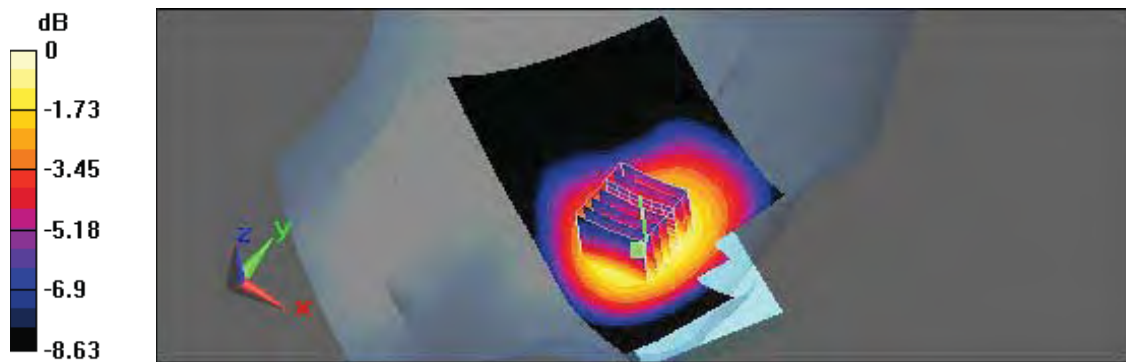
- Probe: EX3DV4 - SN3632; ConvF(9.11, 9.11, 9.11); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (61x101x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 0.580 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 = 7.21 V/m; Power Drift = 0.038 dB
 Peak SAR (extrapolated) = 0.686 W/kg
SAR(1 g) = 0.523 mW/g; SAR(10 g) = 0.381 mW/g
 Maximum value of SAR (measured) = 0.584 mW/g



0 dB = 0.584mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/26/2010 1:55:10 PM

LT_GSM850 CH251_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: GSM850; Frequency: 848.8 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 849$ MHz; $\sigma = 0.942$ mho/m; $\epsilon_r = 40.6$; $\rho = 1000$ kg/m³
Phantom section: Left Section
Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

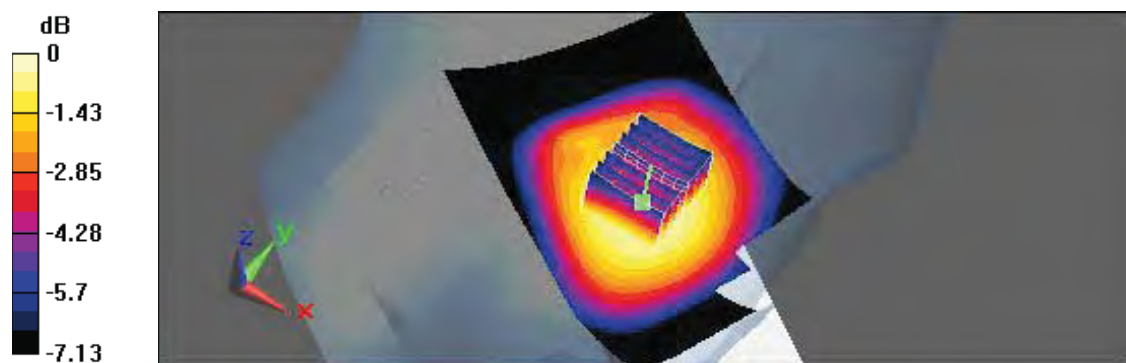
- Probe: EX3DV4 - SN3632; ConvF(9.11, 9.11, 9.11); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left Tilted/Area Scan (61x101x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.319 mW/g

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

Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 12.8 V/m; Power Drift = 0.026 dB
Peak SAR (extrapolated) = 0.373 W/kg
SAR(1 g) = 0.287 mW/g; SAR(10 g) = 0.214 mW/g
Maximum value of SAR (measured) = 0.318 mW/g



0 dB = 0.318mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 12:57:19 PM

RC_PCS CH512_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: PCS; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1850.2 \text{ MHz}$; $\sigma = 1.34 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Right Cheek/Area Scan (91x151x1):

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

Maximum value of SAR (interpolated) = 0.451 mW/g

Right Cheek/Zoom Scan (7x7x9)/Cube 0:

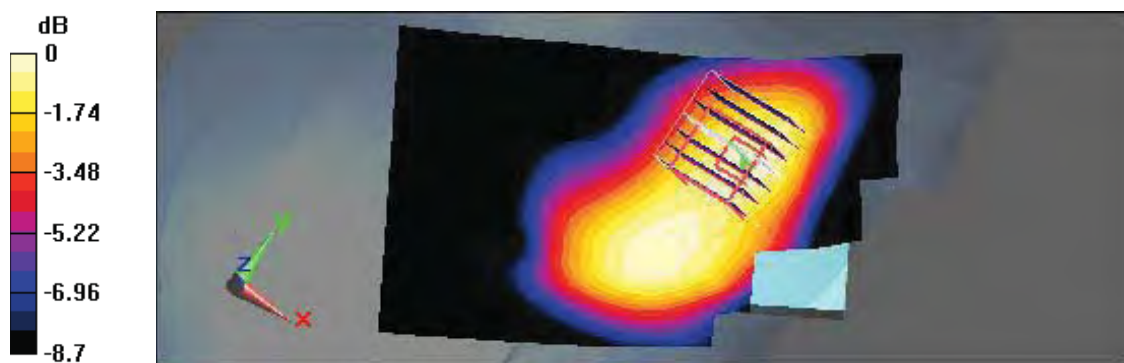
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 4.13 V/m; Power Drift = -0.047 dB

Peak SAR (extrapolated) = 0.560 W/kg

SAR(1 g) = 0.383 mW/g; SAR(10 g) = 0.247 mW/g

Maximum value of SAR (measured) = 0.450 mW/g



0 dB = 0.450mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 1:40:07 PM

RT_PCS CH512_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: PCS; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3
 Medium parameters used (interpolated): $f = 1850.2 \text{ MHz}$; $\sigma = 1.34 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Right Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

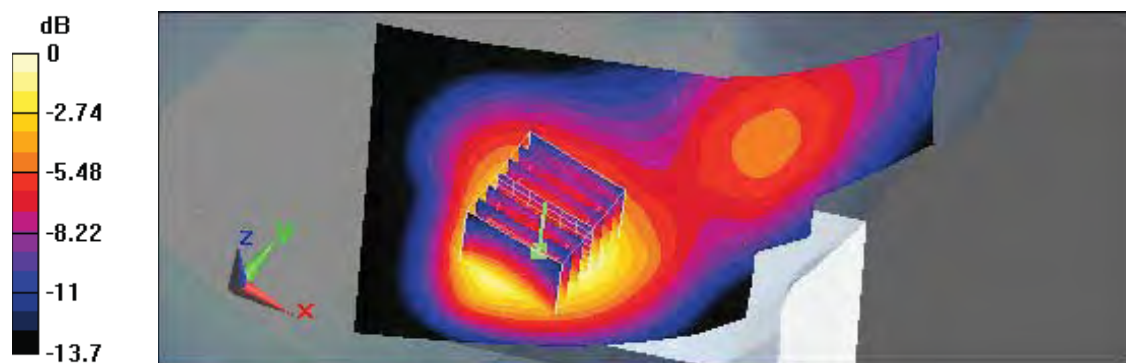
- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Right Tilted/Area Scan (61x101x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 0.340 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 = 8.77 V/m; Power Drift = 0.090 dB
 Peak SAR (extrapolated) = 0.422 W/kg
SAR(1 g) = 0.277 mW/g; SAR(10 g) = 0.172 mW/g
 Maximum value of SAR (measured) = 0.324 mW/g



0 dB = 0.324mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 2:07:01 PM

LC_PCS CH512_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: PCS; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.34$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (61x101x1):

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

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

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

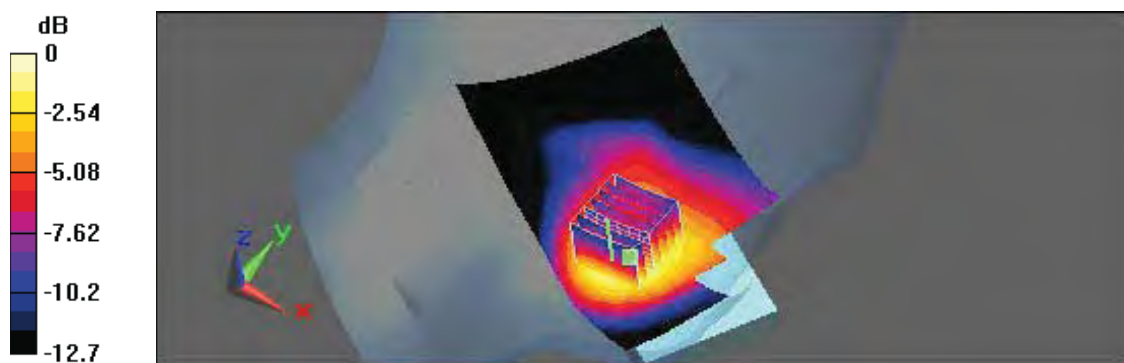
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 5.17 V/m; Power Drift = -0.017 dB

Peak SAR (extrapolated) = 0.813 W/kg

SAR(1 g) = 0.507 mW/g; SAR(10 g) = 0.319 mW/g

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



0 dB = 0.600mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 2:31:52 PM

LT_PCS CH512_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: PCS; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3
 Medium parameters used (interpolated): $f = 1850.2 \text{ MHz}$; $\sigma = 1.34 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Left Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

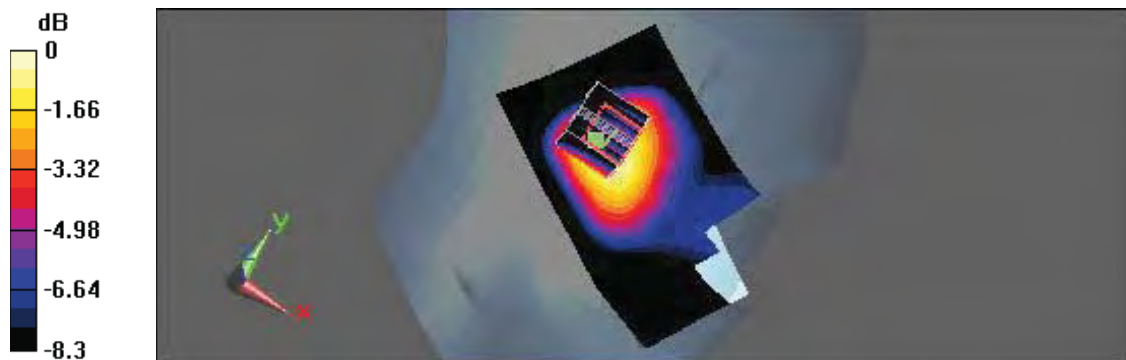
- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left Tilted/Area Scan (61x101x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 0.287 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 = 9.99 V/m; Power Drift = 0.016 dB
 Peak SAR (extrapolated) = 0.332 W/kg
SAR(1 g) = 0.225 mW/g; SAR(10 g) = 0.142 mW/g
 Maximum value of SAR (measured) = 0.263 mW/g



0 dB = 0.263mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 3:02:59 PM

RC_WCDMA Band II CH9262_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 1852.4 \text{ MHz}$; $\sigma = 1.35 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Right Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Right Cheek/Area Scan (61x101x1):

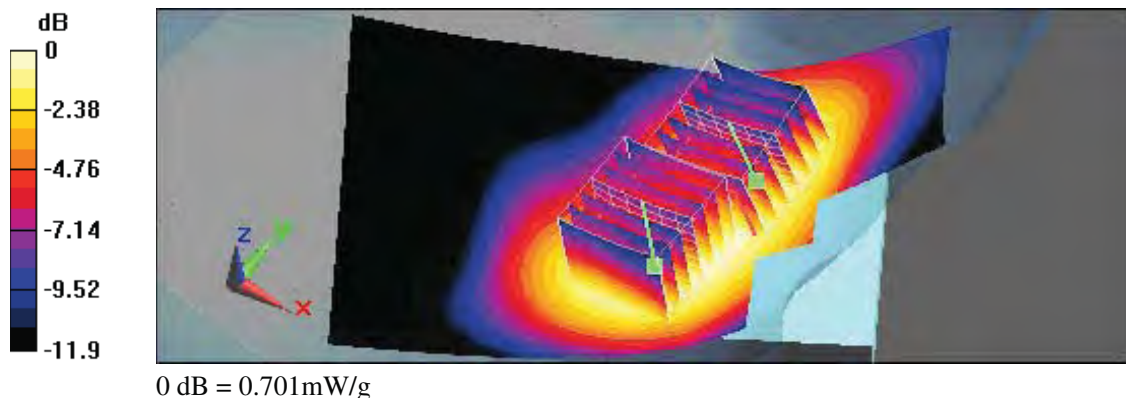
Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 0.795 mW/g

Right Cheek/Zoom Scan (7x7x9)/Cube 0:

Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$
 Reference Value = 4.51 V/m; Power Drift = 0.132 dB
 Peak SAR (extrapolated) = 1 W/kg
SAR(1 g) = 0.676 mW/g; SAR(10 g) = 0.437 mW/g
 Maximum value of SAR (measured) = 0.786 mW/g

Right Cheek/Zoom Scan (7x7x9)/Cube 1:

Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$
 Reference Value = 4.51 V/m; Power Drift = 0.132 dB
 Peak SAR (extrapolated) = 0.869 W/kg
SAR(1 g) = 0.608 mW/g; SAR(10 g) = 0.402 mW/g
 Maximum value of SAR (measured) = 0.701 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 3:46:25 PM

RT_WCDMA Band II CH9262_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 1852.4 \text{ MHz}$; $\sigma = 1.35 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Right Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

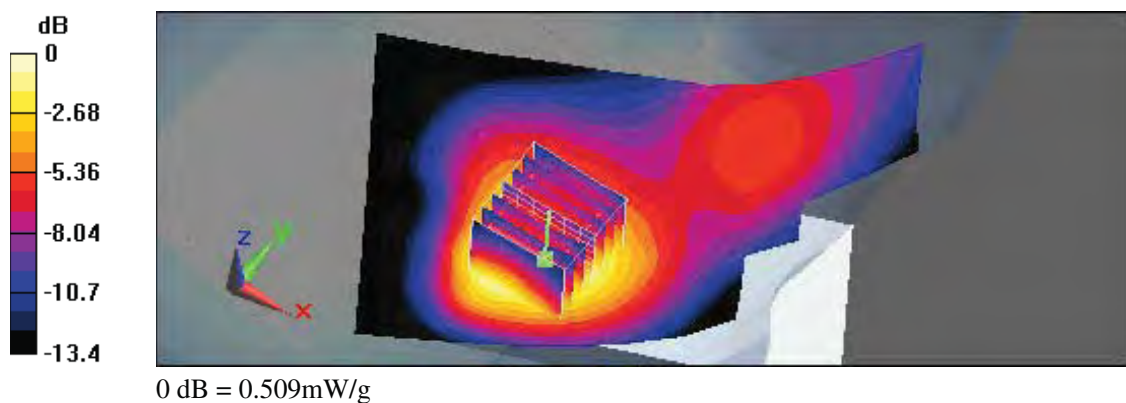
- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Right Tilted/Area Scan (61x101x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 0.534 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 = 9.55 V/m; Power Drift = 0.095 dB
 Peak SAR (extrapolated) = 0.650 W/kg
SAR(1 g) = 0.436 mW/g; SAR(10 g) = 0.272 mW/g
 Maximum value of SAR (measured) = 0.509 mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 5:40:43 PM

LC_WCDMA Band II CH9262_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 1852.4 \text{ MHz}$; $\sigma = 1.35 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Left Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

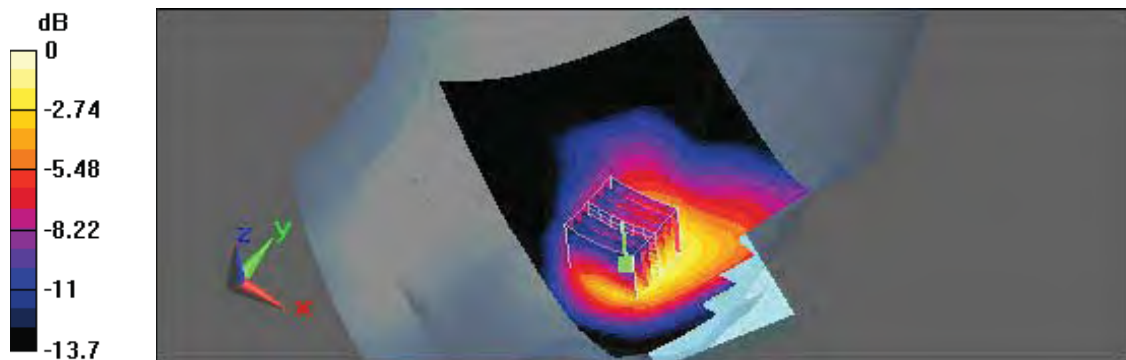
- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (71x101x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 1.17 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 = 5.98 V/m; Power Drift = -0.00391 dB
 Peak SAR (extrapolated) = 1.49 W/kg
SAR(1 g) = 0.898 mW/g; SAR(10 g) = 0.550 mW/g
 Maximum value of SAR (measured) = 1.08 mW/g



0 dB = 1.08mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 6:35:00 PM

LC_WCDMA Band II CH9400_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: WCDMA Band II; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.37$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³
Phantom section: Left Section
Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

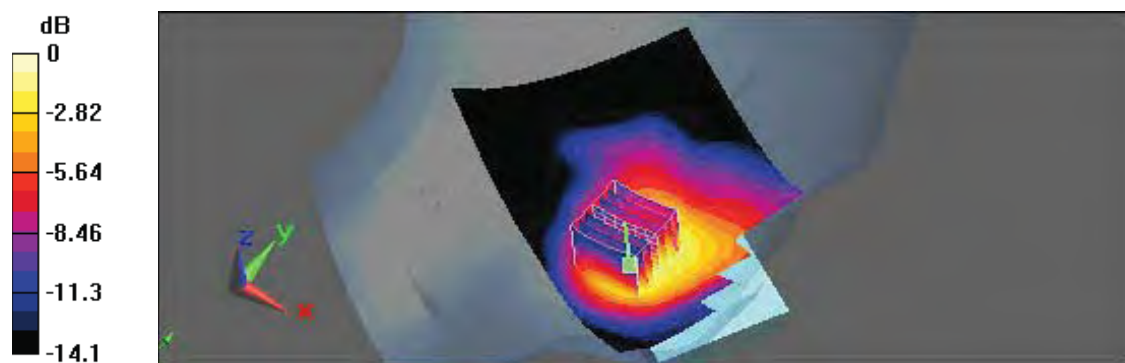
- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (71x101x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.09 mW/g

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

Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 5.39 V/m; Power Drift = 0.00109 dB
Peak SAR (extrapolated) = 1.41 W/kg
SAR(1 g) = 0.822 mW/g; SAR(10 g) = 0.497 mW/g
Maximum value of SAR (measured) = 0.993 mW/g



0 dB = 0.993mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 7:00:38 PM

LC_WCDMA Band II CH9538_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

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

Medium parameters used: $f = 1908 \text{ MHz}$; $\sigma = 1.4 \text{ mho/m}$; $\epsilon_r = 38.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (71x101x1):

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

Maximum value of SAR (interpolated) = 0.826 mW/g

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

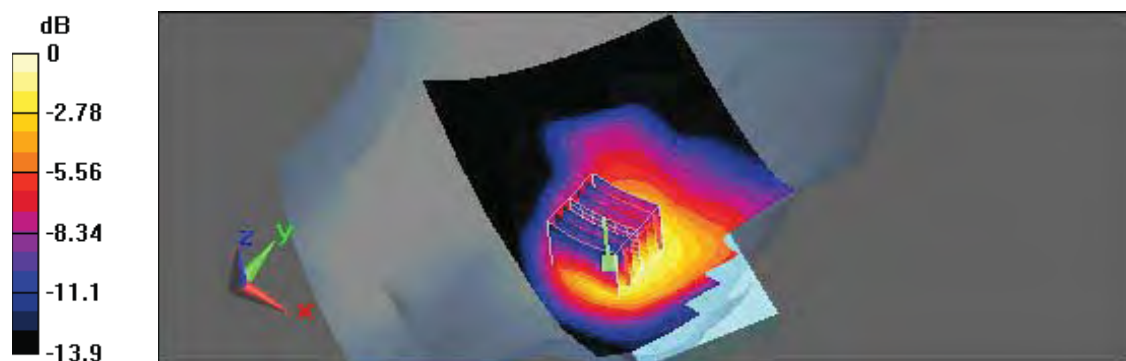
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 5.52 V/m; Power Drift = 0.020 dB

Peak SAR (extrapolated) = 1.04 W/kg

SAR(1 g) = 0.611 mW/g; SAR(10 g) = 0.371 mW/g

Maximum value of SAR (measured) = 0.736 mW/g



0 dB = 0.736mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/27/2010 7:20:49 PM

LT_WCDMA Band II CH9262_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: WCDMA Band II; Frequency: 1852.4 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 1852.4 \text{ MHz}$; $\sigma = 1.35 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Left Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

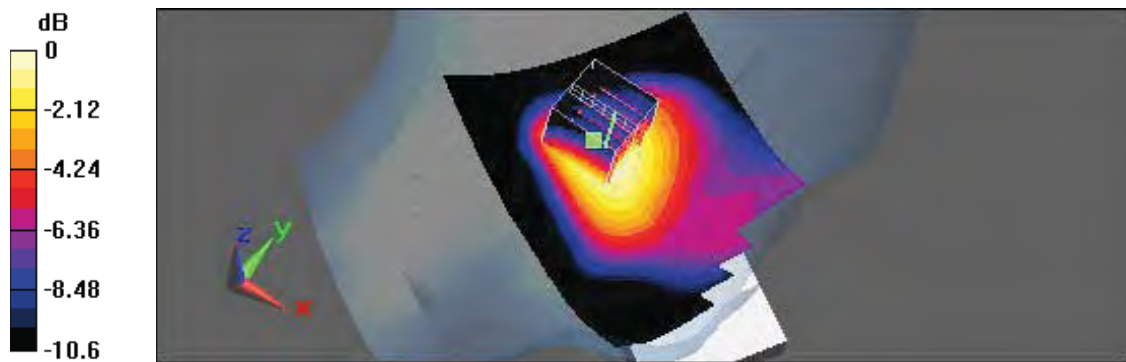
- Probe: EX3DV4 - SN3632; ConvF(7.81, 7.81, 7.81); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (71x101x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 0.414 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 = 11.5 V/m; Power Drift = -0.034 dB
 Peak SAR (extrapolated) = 0.496 W/kg
SAR(1 g) = 0.337 mW/g; SAR(10 g) = 0.210 mW/g
 Maximum value of SAR (measured) = 0.394 mW/g



0 dB = 0.394mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/26/2010 2:42:14 PM

RC_WCDMA Band V CH4183_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

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

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 0.93 \text{ mho/m}$; $\epsilon_r = 40.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.11, 9.11, 9.11); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Right Cheek/Area Scan (61x101x1):

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

Maximum value of SAR (interpolated) = 0.524 mW/g

Right Cheek/Zoom Scan (7x7x9)/Cube 0:

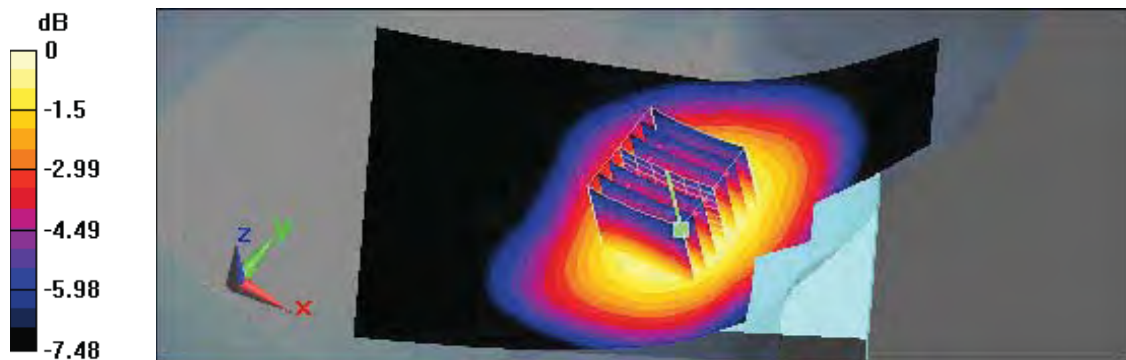
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 8.23 V/m; Power Drift = 0.057 dB

Peak SAR (extrapolated) = 0.589 W/kg

SAR(1 g) = 0.466 mW/g; SAR(10 g) = 0.344 mW/g

Maximum value of SAR (measured) = 0.519 mW/g



0 dB = 0.519mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/26/2010 3:16:45 PM

RT_WCDMA Band V CH4183_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

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

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 0.93 \text{ mho/m}$; $\epsilon_r = 40.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.11, 9.11, 9.11); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Right Tilted/Area Scan (61x101x1):

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

Maximum value of SAR (interpolated) = 0.348 mW/g

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

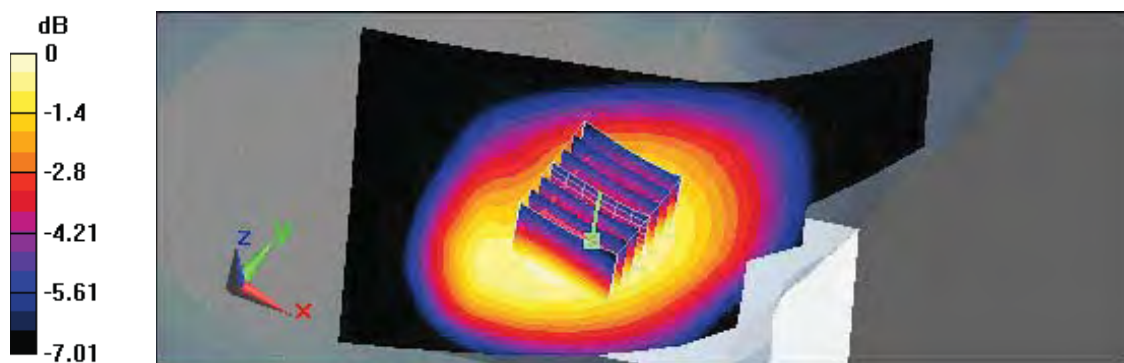
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 15.1 V/m; Power Drift = 0.032 dB

Peak SAR (extrapolated) = 0.406 W/kg

SAR(1 g) = 0.311 mW/g; SAR(10 g) = 0.232 mW/g

Maximum value of SAR (measured) = 0.343 mW/g



0 dB = 0.343mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/26/2010 4:04:59 PM

LC_WCDMA Band V CH4183_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

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

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 0.93 \text{ mho/m}$; $\epsilon_r = 40.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.11, 9.11, 9.11); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left Cheek/Area Scan (61x101x1):

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

Maximum value of SAR (interpolated) = 0.625 mW/g

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

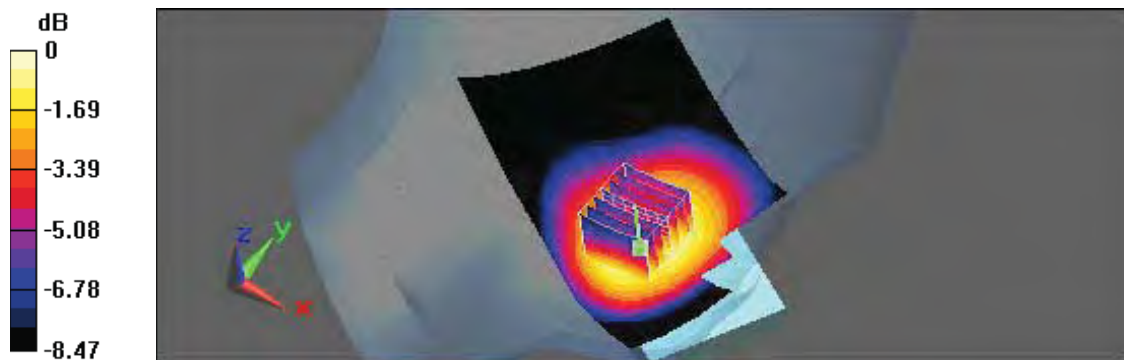
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 7.75 V/m; Power Drift = 0.029 dB

Peak SAR (extrapolated) = 0.753 W/kg

SAR(1 g) = 0.556 mW/g; SAR(10 g) = 0.408 mW/g

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



0 dB = 0.619mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/26/2010 4:32:49 PM

LT_WCDMA Band V CH4183_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

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

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 0.93 \text{ mho/m}$; $\epsilon_r = 40.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.11, 9.11, 9.11); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left Tilted/Area Scan (61x101x1):

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

Maximum value of SAR (interpolated) = 0.387 mW/g

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

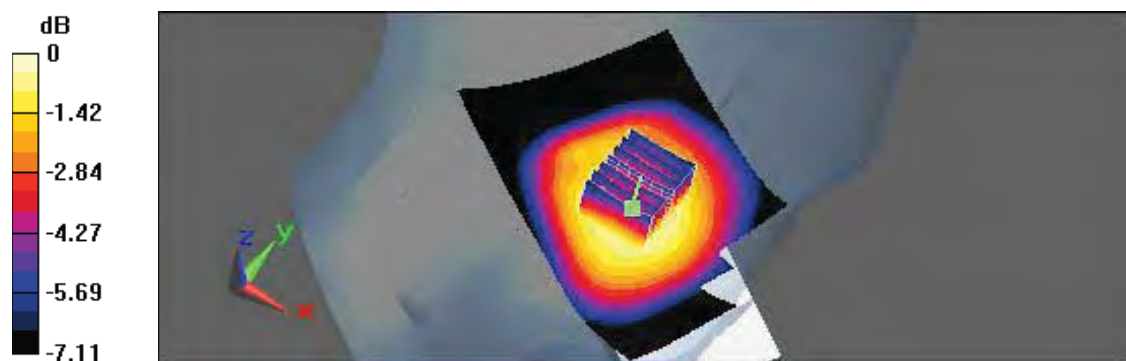
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 14.5 V/m; Power Drift = -0.046 dB

Peak SAR (extrapolated) = 0.450 W/kg

SAR(1 g) = 0.348 mW/g; SAR(10 g) = 0.259 mW/g

Maximum value of SAR (measured) = 0.387 mW/g



0 dB = 0.387mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/25/2010 11:43:18 AM

Flat_GSM850 CH251 Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: GSM850; Frequency: 848.8 MHz; Duty Cycle: 1:8.3
 Medium parameters used: $f = 849 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 53.2$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.17, 9.17, 9.17); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):

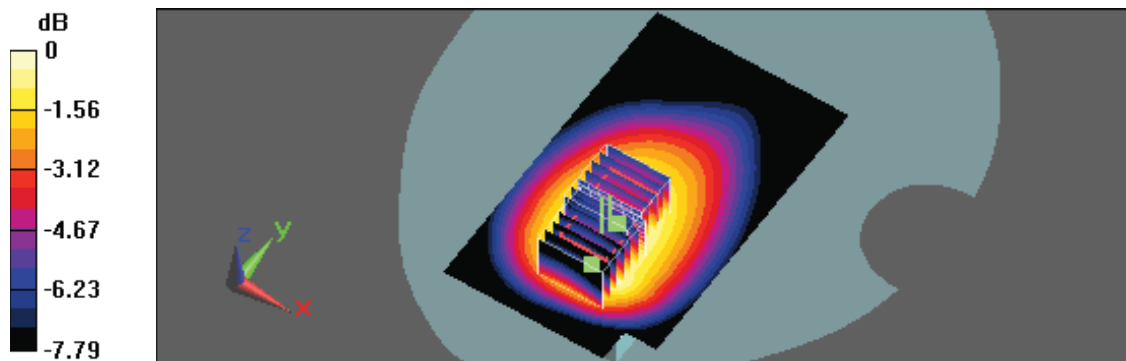
Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 0.650 mW/g

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

Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$
 Reference Value = 12.2 V/m; Power Drift = 0.00971 dB
 Peak SAR (extrapolated) = 0.775 W/kg
SAR(1 g) = 0.524 mW/g; SAR(10 g) = 0.371 mW/g
 Maximum value of SAR (measured) = 0.597 mW/g

Flat/Zoom Scan (7x7x9)/Cube 1:

Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$
 Reference Value = 12.2 V/m; Power Drift = 0.00971 dB
 Peak SAR (extrapolated) = 0.715 W/kg
SAR(1 g) = 0.542 mW/g; SAR(10 g) = 0.397 mW/g
 Maximum value of SAR (measured) = 0.604 mW/g



0 dB = 0.604mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/24/2010 1:11:05 PM

Flat_GPRS 850 CH128_2Down3Up_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: GPRS 850 (2Down, 3Up); Frequency: 824.2 MHz; Duty Cycle: 1:2.8
 Medium parameters used (interpolated): $f = 824.2$ MHz; $\sigma = 0.986$ mho/m; $\epsilon_r = 53.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

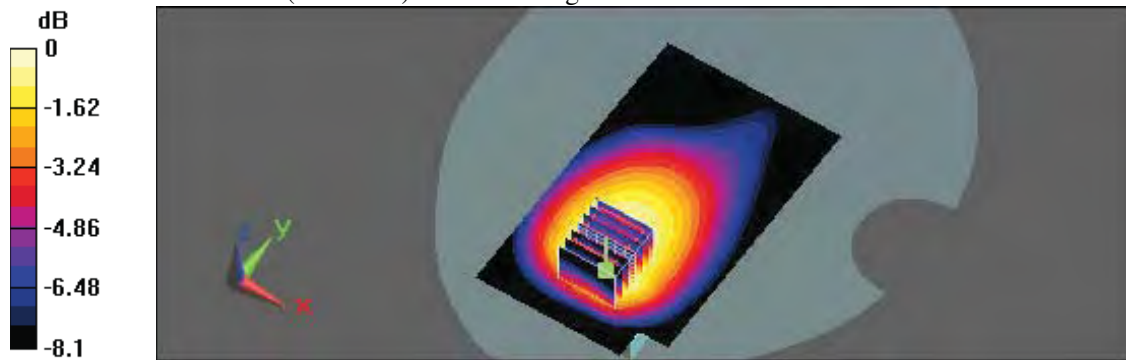
- Probe: EX3DV4 - SN3632; ConvF(9.17, 9.17, 9.17); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):

Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (interpolated) = 1.08 mW/g

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

Measurement grid: dx=5mm, dy=5mm, dz=3mm
 Reference Value = 15 V/m; Power Drift = -0.036 dB
 Peak SAR (extrapolated) = 1.27 W/kg
SAR(1 g) = 0.851 mW/g; SAR(10 g) = 0.600 mW/g
 Maximum value of SAR (measured) = 0.978 mW/g



0 dB = 0.978mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/24/2010 1:59:56 PM

Flat_GPRS 850 CH190_2Down3Up_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: GPRS 850 (2Down, 3Up); Frequency: 836.6 MHz; Duty Cycle: 1:2.8

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 1 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.17, 9.17, 9.17); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):

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

Maximum value of SAR (interpolated) = 1.33 mW/g

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

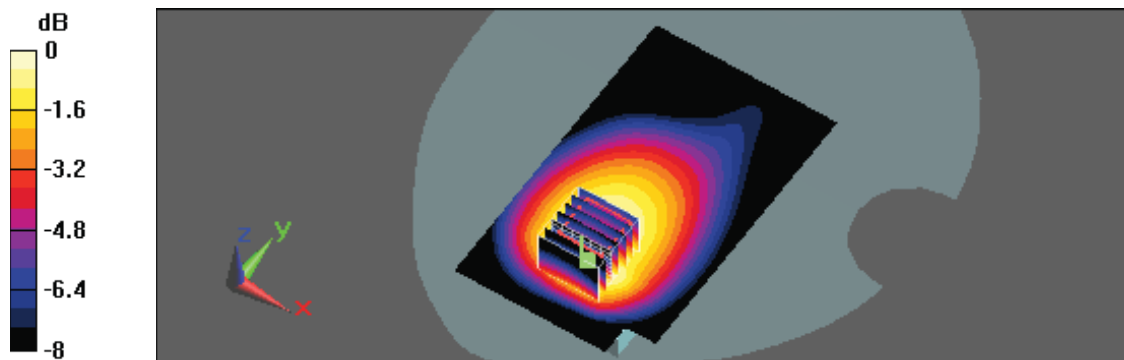
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 15.4 V/m; Power Drift = -0.024 dB

Peak SAR (extrapolated) = 1.58 W/kg

SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.726 mW/g

Maximum value of SAR (measured) = 1.21 mW/g



0 dB = 1.21mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/24/2010 2:26:49 PM

Flat_GPRS 850 CH251_2Down3Up_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: GPRS 850 (2Down, 3Up); Frequency: 848.8 MHz; Duty Cycle: 1:2.8

Medium parameters used: $f = 849$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 53.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.17, 9.17, 9.17); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):

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

Maximum value of SAR (interpolated) = 1.62 mW/g

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

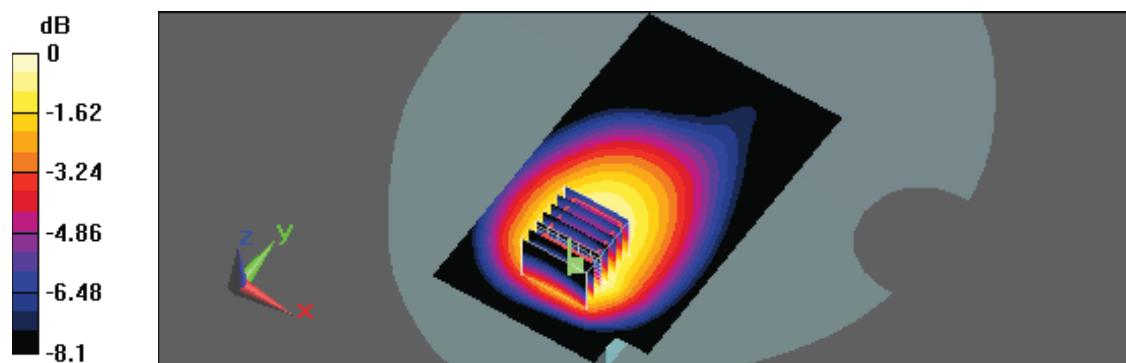
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 16 V/m; Power Drift = -0.049 dB

Peak SAR (extrapolated) = 1.9 W/kg

SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.853 mW/g

Maximum value of SAR (measured) = 1.44 mW/g



0 dB = 1.44mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/25/2010 3:03:06 PM

Flat_PCS CH512_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: PCS; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.57, 7.57, 7.57); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):

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

Maximum value of SAR (interpolated) = 0.321 mW/g

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

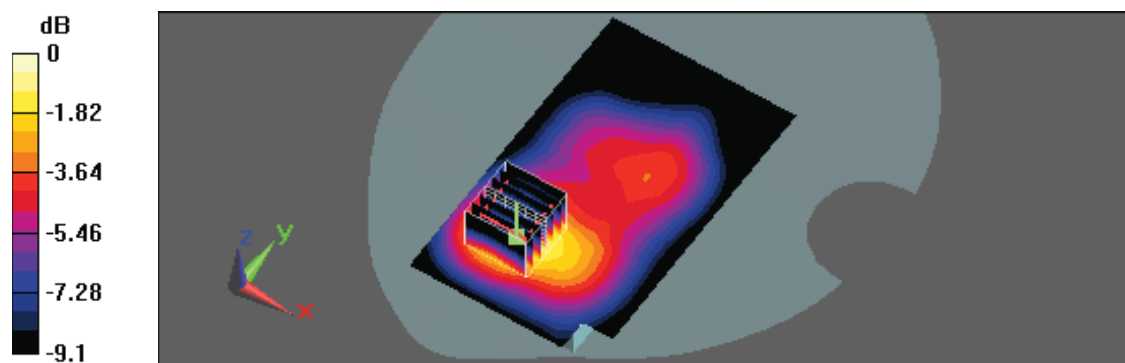
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 6.37 V/m; Power Drift = 0.077 dB

Peak SAR (extrapolated) = 0.441 W/kg

SAR(1 g) = 0.263 mW/g; SAR(10 g) = 0.154 mW/g

Maximum value of SAR (measured) = 0.318 mW/g



0 dB = 0.318mW/g



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/24/2010 4:41:53 PM

Flat_GPRS PCS CH512_2Down3Up_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: GPRS PCS (2Down,3Up); Frequency: 1850.2 MHz;Duty Cycle: 1:2.8
Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(7.57, 7.57, 7.57); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125;SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):

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

Maximum value of SAR (interpolated) = 0.877 mW/g

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

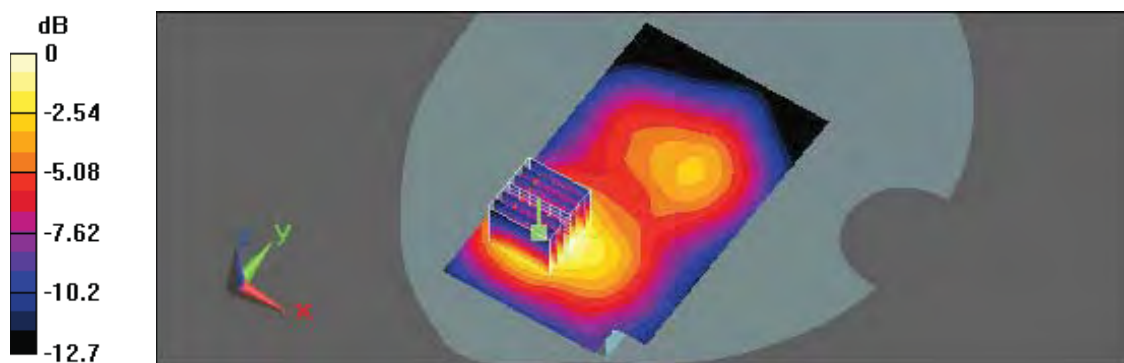
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 12.3 V/m; Power Drift = -0.136 dB

Peak SAR (extrapolated) = 1.16 W/kg

SAR(1 g) = 0.715 mW/g; SAR(10 g) = 0.426 mW/g

Maximum value of SAR (measured) = 0.852 mW/g



0 dB = 0.852mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/25/2010 2:35:37 PM

Flat_PCS CH512_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: WCDMA 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/m³
 Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

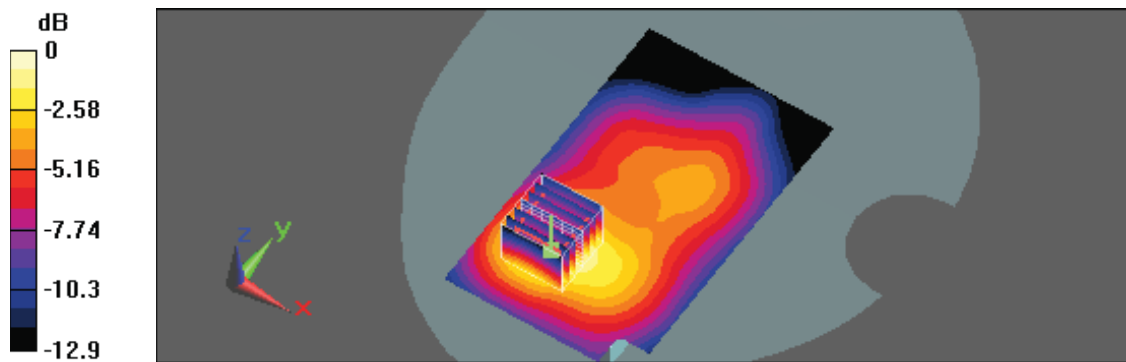
- Probe: EX3DV4 - SN3632; ConvF(7.57, 7.57, 7.57); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):

Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (interpolated) = 0.522 mW/g

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

Measurement grid: dx=5mm, dy=5mm, dz=3mm
 Reference Value = 8.38 V/m; Power Drift = -0.063 dB
 Peak SAR (extrapolated) = 0.718 W/kg
SAR(1 g) = 0.430 mW/g; SAR(10 g) = 0.254 mW/g
 Maximum value of SAR (measured) = 0.522 mW/g



0 dB = 0.522mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/29/2010 1:47:00 PM

Flat_HSDPA Band II CH9262_Sub_test1_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

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/m³
 Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

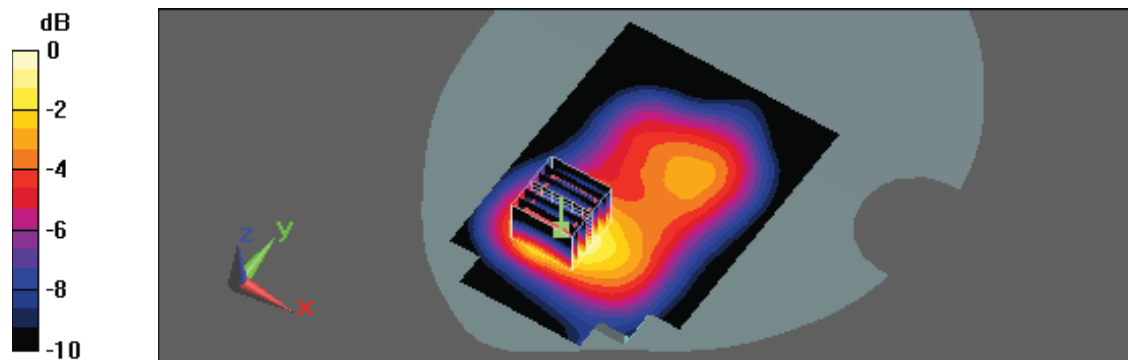
- Probe: EX3DV4 - SN3632; ConvF(7.57, 7.57, 7.57); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x101x1):

Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (interpolated) = 0.499 mW/g

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

Measurement grid: dx=5mm, dy=5mm, dz=3mm
 Reference Value = 7.63 V/m; Power Drift = -0.037 dB
 Peak SAR (extrapolated) = 0.668 W/kg
SAR(1 g) = 0.401 mW/g; SAR(10 g) = 0.235 mW/g
 Maximum value of SAR (measured) = 0.487 mW/g



0 dB = 0.487mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/29/2010 2:17:13 PM

Flat_HSUPA Band II CH9262_Sub_test1_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: HSUPA WCDMA 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/m³
 Phantom section: Flat Section
 Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

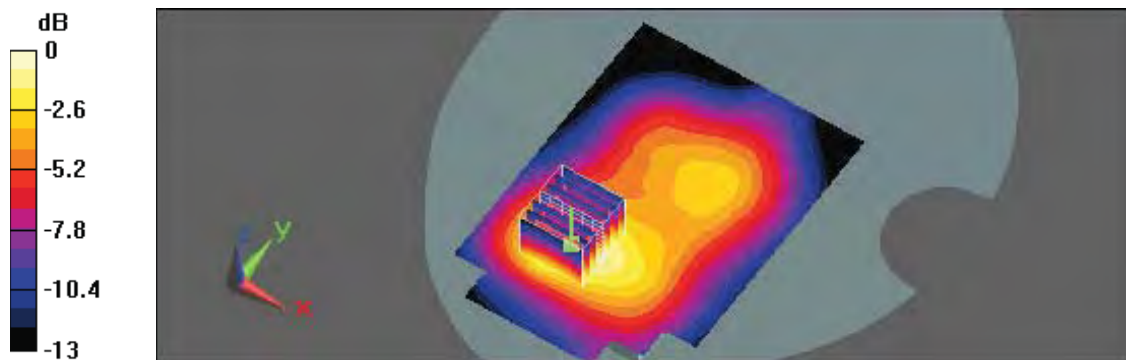
- Probe: EX3DV4 - SN3632; ConvF(7.57, 7.57, 7.57); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x101x1):

Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (interpolated) = 0.395 mW/g

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

Measurement grid: dx=5mm, dy=5mm, dz=3mm
 Reference Value = 6.91 V/m; Power Drift = 0.0057 dB
 Peak SAR (extrapolated) = 0.525 W/kg
SAR(1 g) = 0.317 mW/g; SAR(10 g) = 0.186 mW/g
 Maximum value of SAR (measured) = 0.383 mW/g



0 dB = 0.383mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/25/2010 1:13:44 PM

Flat_WCDMA Band V CH4183_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

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

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 1 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.17, 9.17, 9.17); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (61x101x1):

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

Maximum value of SAR (interpolated) = 0.593 mW/g

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

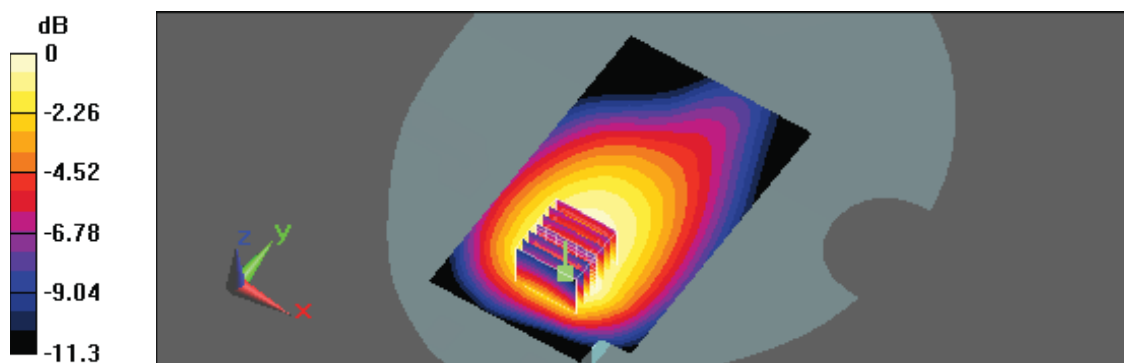
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 11.6 V/m; Power Drift = -0.032 dB

Peak SAR (extrapolated) = 0.695 W/kg

SAR(1 g) = 0.459 mW/g; SAR(10 g) = 0.322 mW/g

Maximum value of SAR (measured) = 0.528 mW/g



0 dB = 0.528mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/29/2010 10:17:06 AM

Flat_HSDPA Band V CH4183_Sub_test1_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

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

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 1 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: EX3DV4 - SN3632; ConvF(9.17, 9.17, 9.17); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x101x1):

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

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

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

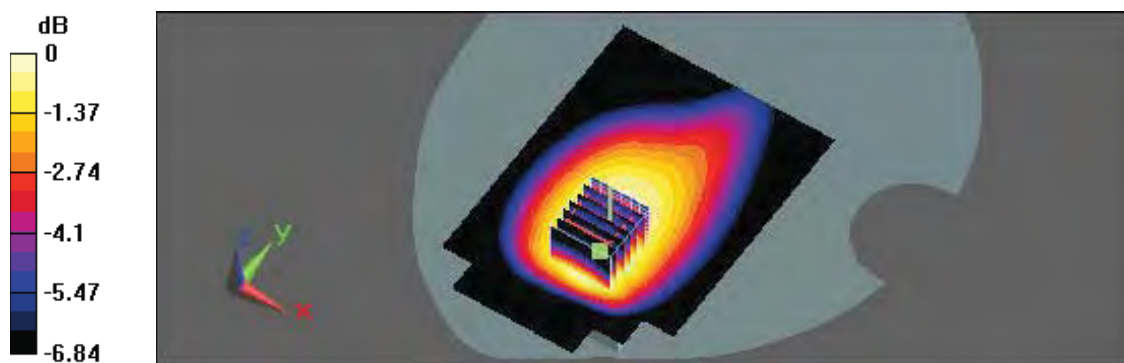
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$

Reference Value = 9.11 V/m; Power Drift = 0.035 dB

Peak SAR (extrapolated) = 0.278 W/kg

SAR(1 g) = 0.193 mW/g; SAR(10 g) = 0.138 mW/g

Maximum value of SAR (measured) = 0.217 mW/g



0 dB = 0.217mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/29/2010 11:02:57 AM

Flat_HSUPA Band V CH4132_Sub_test1_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: HSUPA WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 0.988$ mho/m; $\epsilon_r = 53.3$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

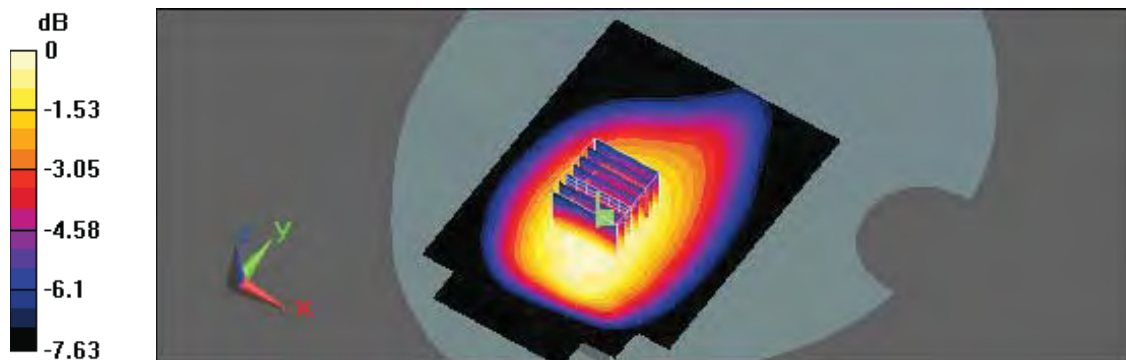
- Probe: EX3DV4 - SN3632; ConvF(9.17, 9.17, 9.17); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x101x1):

Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (interpolated) = 0.160 mW/g

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

Measurement grid: dx=5mm, dy=5mm, dz=3mm
 Reference Value = 7.51 V/m; Power Drift = -0.050 dB
 Peak SAR (extrapolated) = 0.191 W/kg
SAR(1 g) = 0.146 mW/g; SAR(10 g) = 0.108 mW/g
 Maximum value of SAR (measured) = 0.162 mW/g



0 dB = 0.162mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/29/2010 4:55:28 PM

Flat_802.11b CH11_1M_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 2462 \text{ MHz}$; $\sigma = 1.93 \text{ mho/m}$; $\epsilon_r = 50.2$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section
 Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

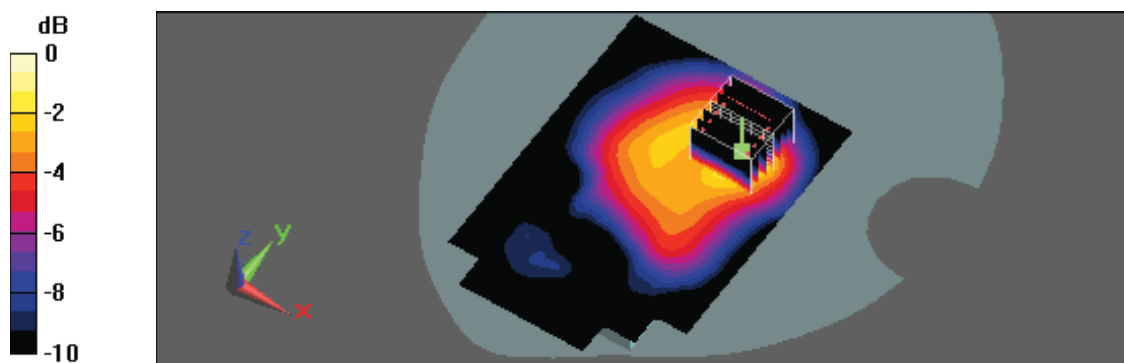
- Probe: EX3DV4 - SN3632; ConvF(7.4, 7.4, 7.4); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x101x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 0.073 mW/g

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

Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$
 Reference Value = 4.35 V/m; Power Drift = 0.098 dB
 Peak SAR (extrapolated) = 0.114 W/kg
SAR(1 g) = 0.057 mW/g; SAR(10 g) = 0.029 mW/g
 Maximum value of SAR (measured) = 0.074 mW/g



0 dB = 0.074mW/g

Test Laboratory: A Test Lab Techno Corp.

Date/Time: 3/29/2010 5:27:04 PM

Flat_802.11g CH11_6M_Headset_To Phantom 15mm_Main

DUT: PB76110_Sample 1st; Type: Smartphone; FCC ID: NM8PB76110

Communication System: IEEE 802.11g; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2462$ MHz; $\sigma = 1.93$ mho/m; $\epsilon_r = 50.2$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

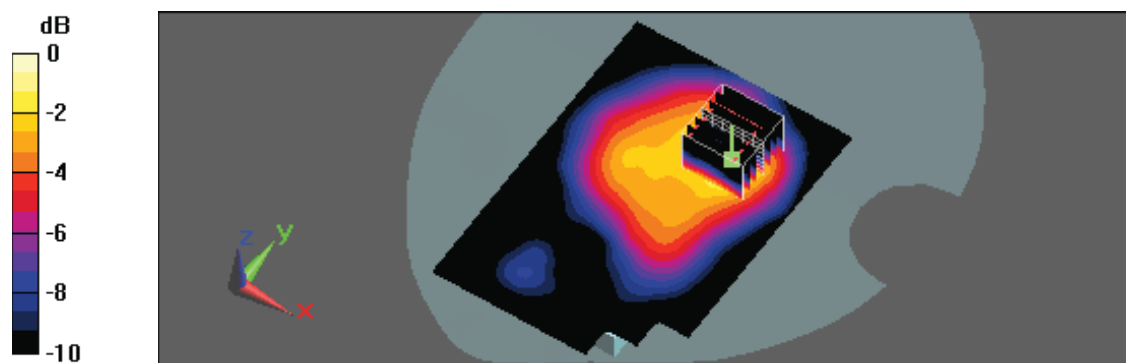
- Probe: EX3DV4 - SN3632; ConvF(7.4, 7.4, 7.4); Calibrated: 1/26/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 1/21/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Flat/Area Scan (71x101x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.063 mW/g

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

Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 4.46 V/m; Power Drift = 0.082 dB
Peak SAR (extrapolated) = 0.110 W/kg
SAR(1 g) = 0.057 mW/g; SAR(10 g) = 0.029 mW/g
Maximum value of SAR (measured) = 0.074 mW/g



0 dB = 0.074mW/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_Feb09
- Probe _ EX3DV4 SN:3632 Calibration No.EX3-3632_Jan10
- DAE _ DAE4 SN:779 Calibration No.DAE4-779_ Jan10



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 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

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

Issued: July 13, 2009

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V5.0
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 ³ (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 ¹	normalized to 1W	9.71 mW /g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (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 ¹	normalized to 1W	6.34 mW /g \pm 16.5 % (k=2)

¹ 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 ³ (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 ²	normalized to 1W	10.0 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (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 ²	normalized to 1W	6.61 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"



Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.3 Ω - 2.5 j Ω
Return Loss	- 29.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3 Ω - 4.3 j Ω
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: $f = 835 \text{ MHz}$; $\sigma = 0.89 \text{ mho/m}$; $\epsilon_r = 40.5$; $\rho = 1000 \text{ kg/m}^3$

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

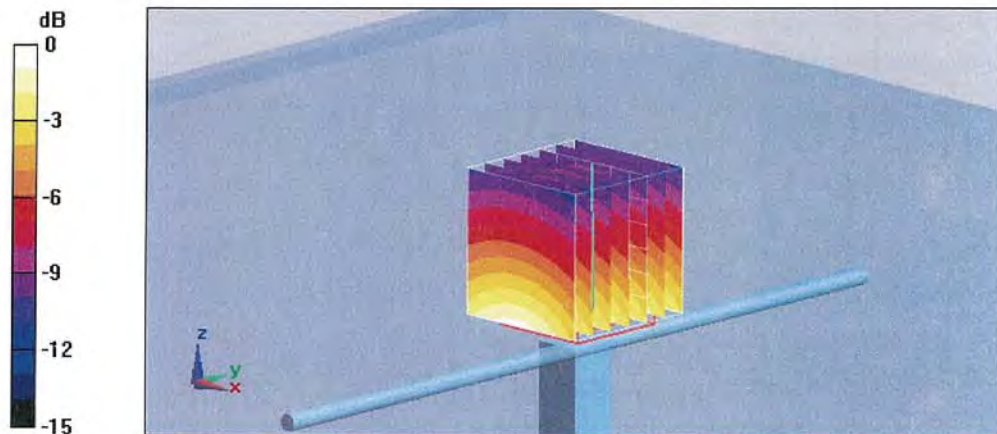
Pin=250mW; dip=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

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

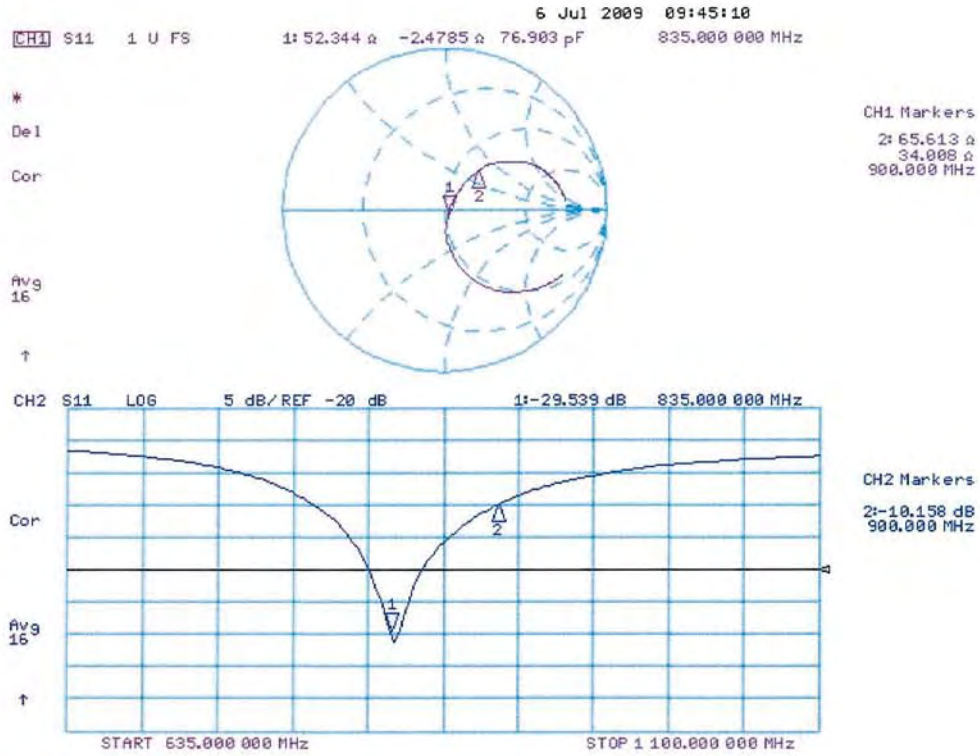
Maximum value of SAR (measured) = 2.8 mW/g



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: $f = 835 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53$; $\rho = 1000 \text{ kg/m}^3$

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

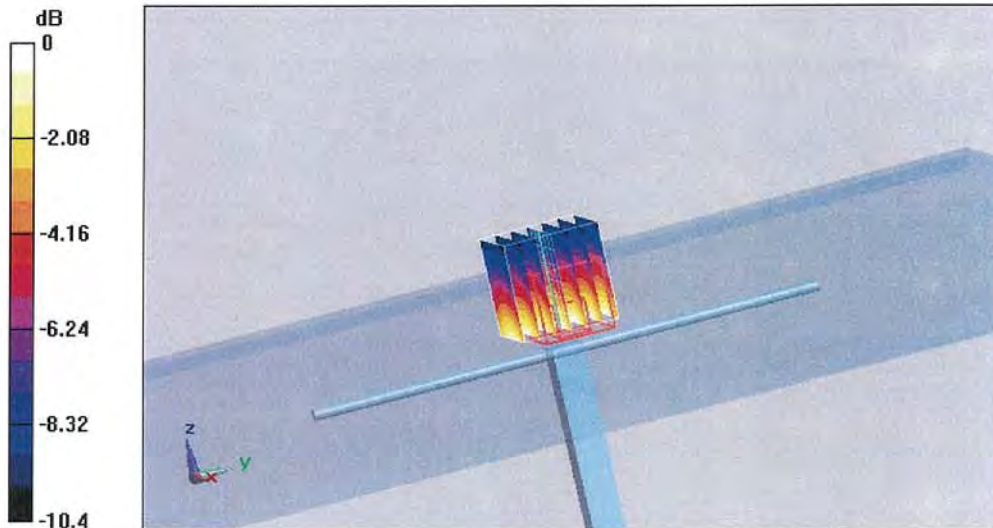
Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

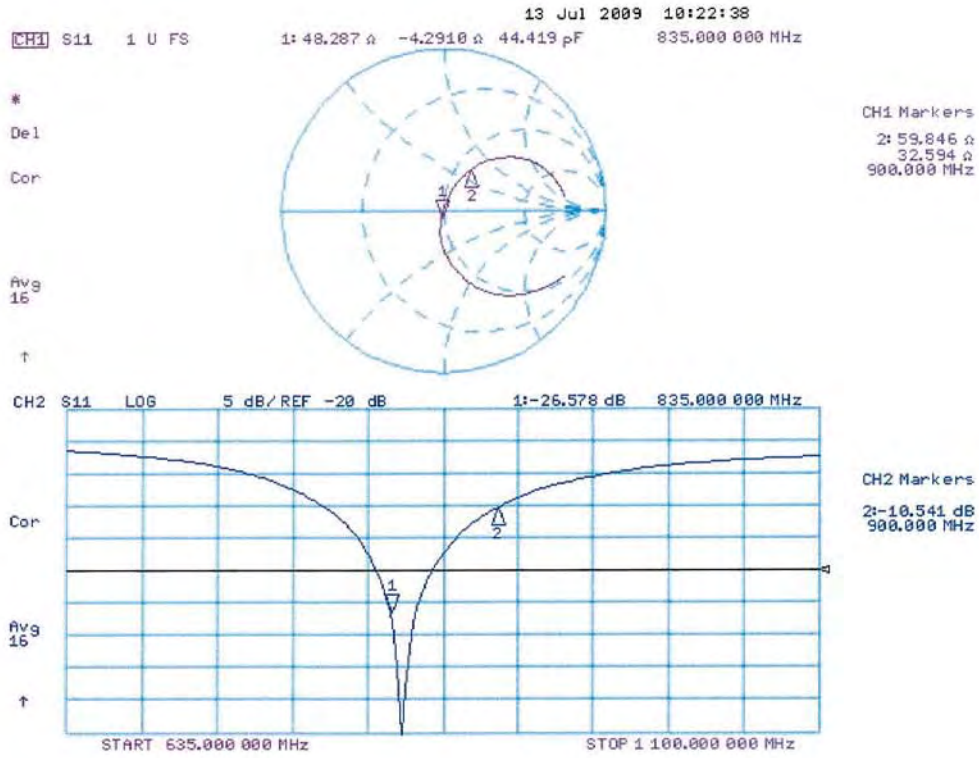
Maximum value of SAR (measured) = 2.97 mW/g



0 dB = 2.97mW/g



Impedance Measurement Plot for Body TSL





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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

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

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 cm³ (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 ¹	normalized to 1W	41.7 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm³ (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 ¹	normalized to 1W	21.9 mW / g \pm 16.5 % (k=2)

¹ 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 ³ (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 ²	normalized to 1W	42.4 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (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 ²	normalized to 1W	22.3 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"



Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1 Ω + 4.8 j Ω
Return Loss	- 26.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.3 Ω + 6.4 j Ω
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/m³

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:**

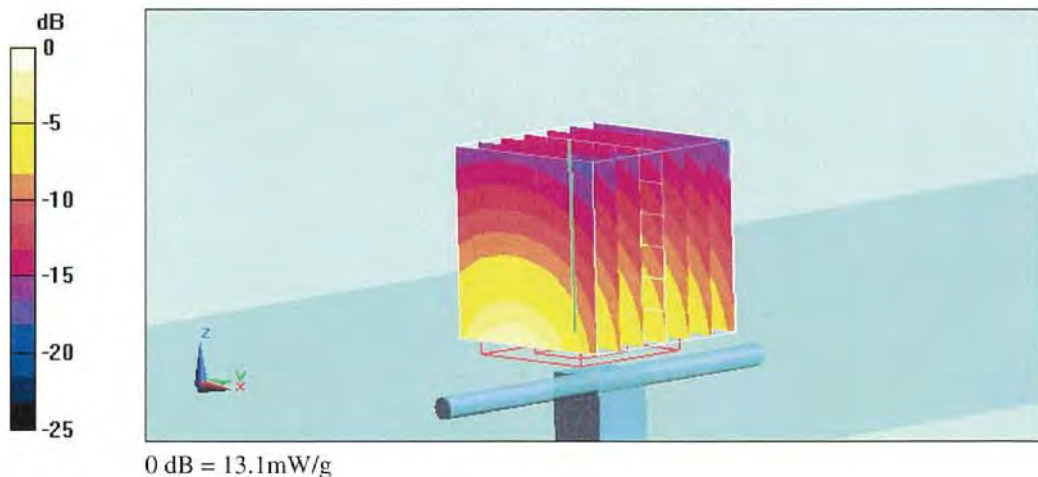
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.7 V/m; Power Drift = 0.109 dB

Peak SAR (extrapolated) = 19.1 W/kg

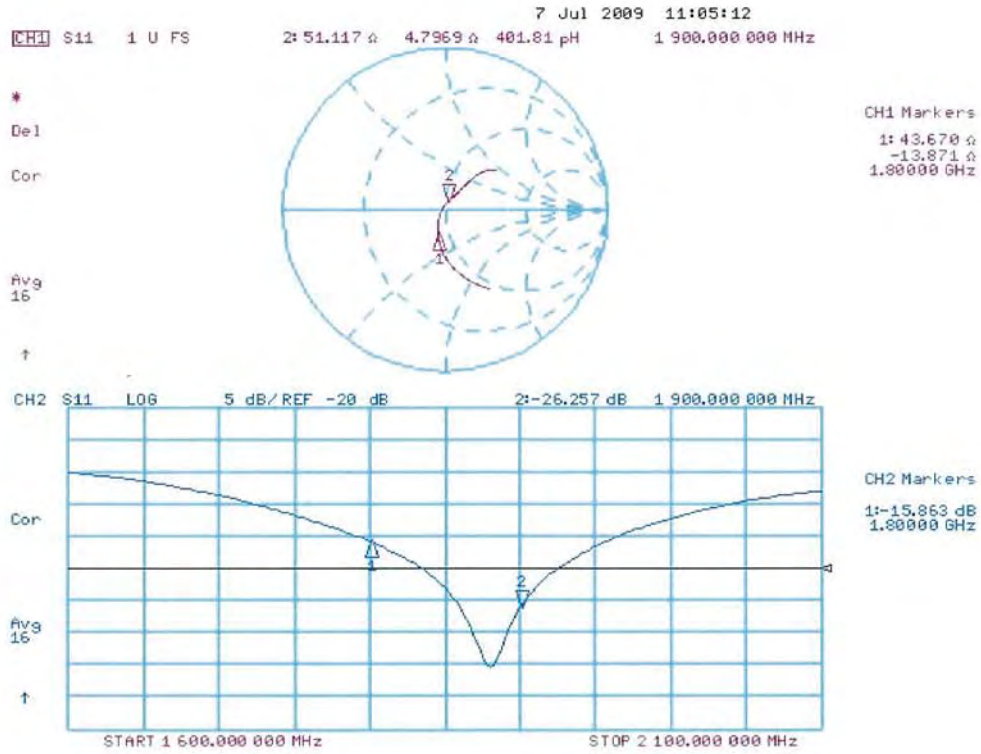
SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.49 mW/g

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/m³

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:**

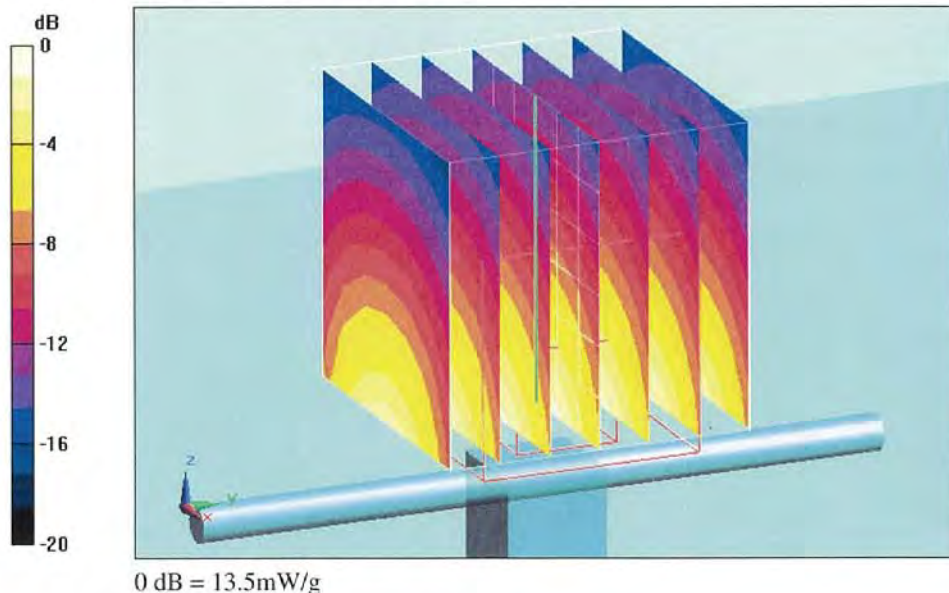
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.2 V/m; Power Drift = -0.00871 dB

Peak SAR (extrapolated) = 18.8 W/kg

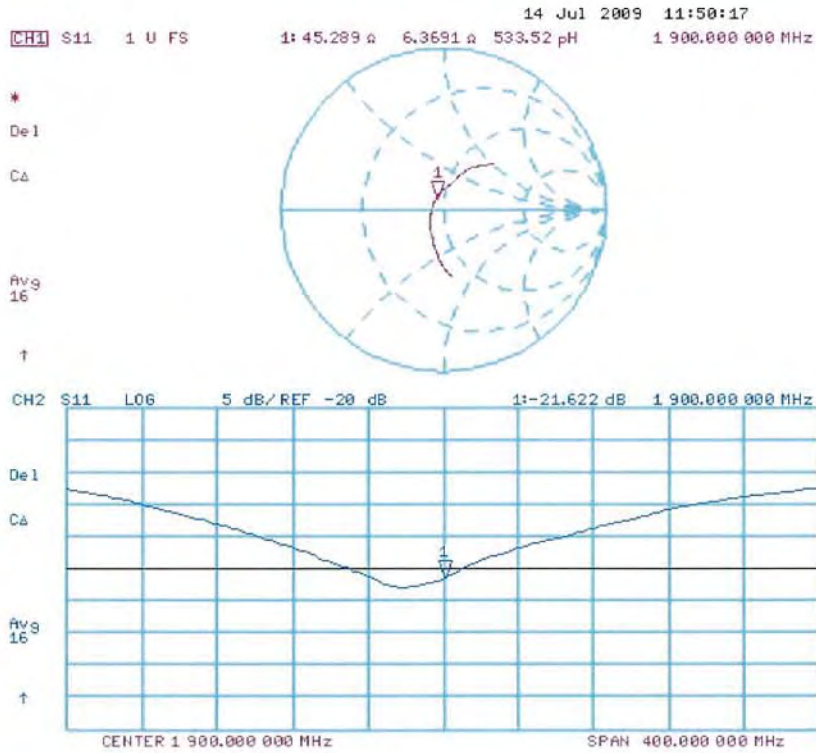
SAR(1 g) = 10.7 mW/g; SAR(10 g) = 5.61 mW/g

Maximum value of SAR (measured) = 13.5 mW/g





Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

Client **ATL (Auden)**

Certificate No: **D2450V2-712_Feb10**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 712		
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits		
Calibration date:	February 19, 2010		
<p>This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	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 ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-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-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10
Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature
			Issued: February 19, 2010
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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



Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
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	38.5 ± 6 %	1.76 mho/m ± 6 %
Head TSL temperature during test	(21.0 ± 0.2) °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 mW / g
SAR normalized	normalized to 1W	53.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	53.5 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.24 mW / g
SAR normalized	normalized to 1W	25.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	25.0 mW / g ± 16.5 % (k=2)



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	51.7 ± 6 %	2.00 mho/m ± 6 %
Body TSL temperature during test	(21.2 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR normalized	normalized to 1W	52.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	51.1 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.97 mW / g
SAR normalized	normalized to 1W	23.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	23.7 mW / g ± 16.5 % (k=2)



Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.2 Ω + 1.9 j Ω
Return Loss	- 27.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.1 Ω + 5.2 j Ω
Return Loss	- 25.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.144 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 05, 2002

DASY5 Validation Report for Head TSL

Date/Time: 17.02.2010 13:12:38

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: HSL U11 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.77$ mho/m; $\epsilon_r = 38.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 26.06.2009
- 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, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

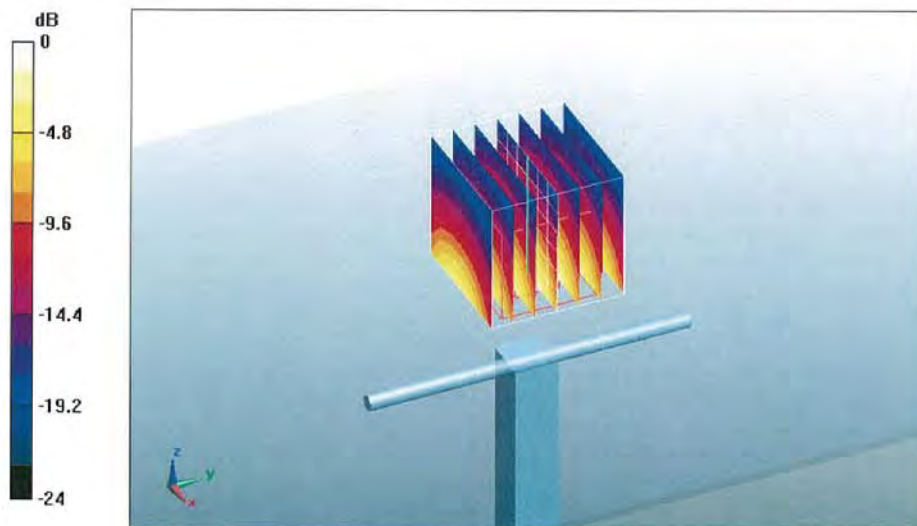
Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.1 V/m; Power Drift = 0.032 dB

Peak SAR (extrapolated) = 27.2 W/kg

SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.24 mW/g

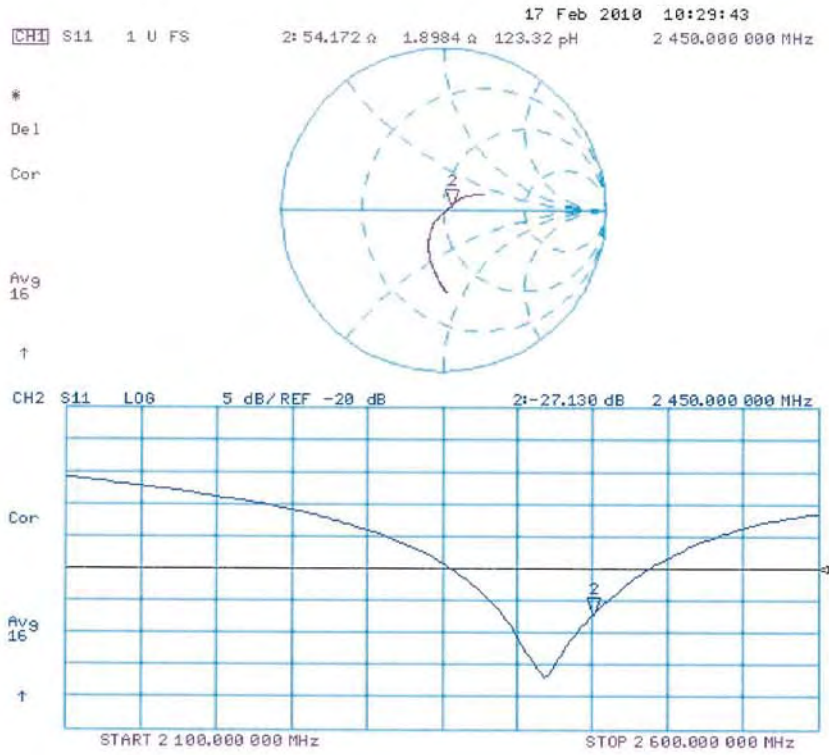
Maximum value of SAR (measured) = 17.1 mW/g



0 dB = 17.1mW/g



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 19.02.2010 13:05:49

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; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 26.06.2009
- 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, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

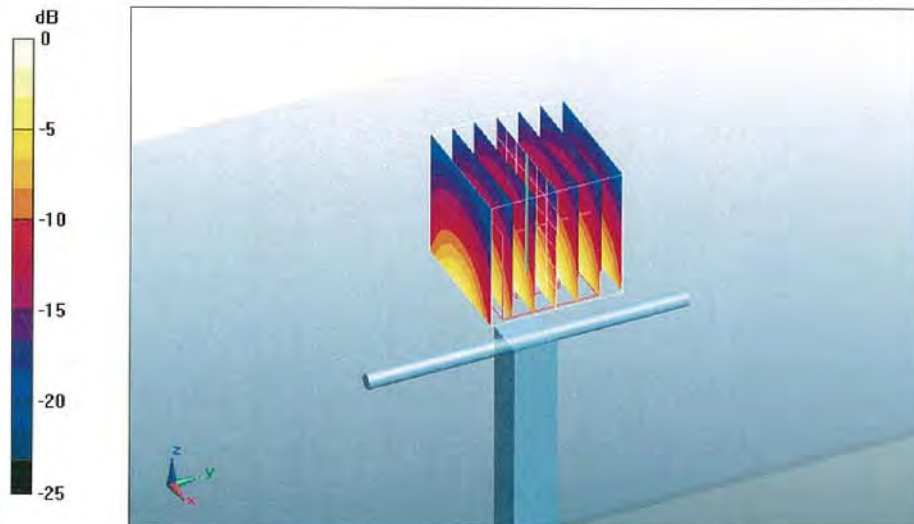
Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.5 V/m; Power Drift = 0.015 dB

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 13 mW/g; SAR(10 g) = 5.97 mW/g

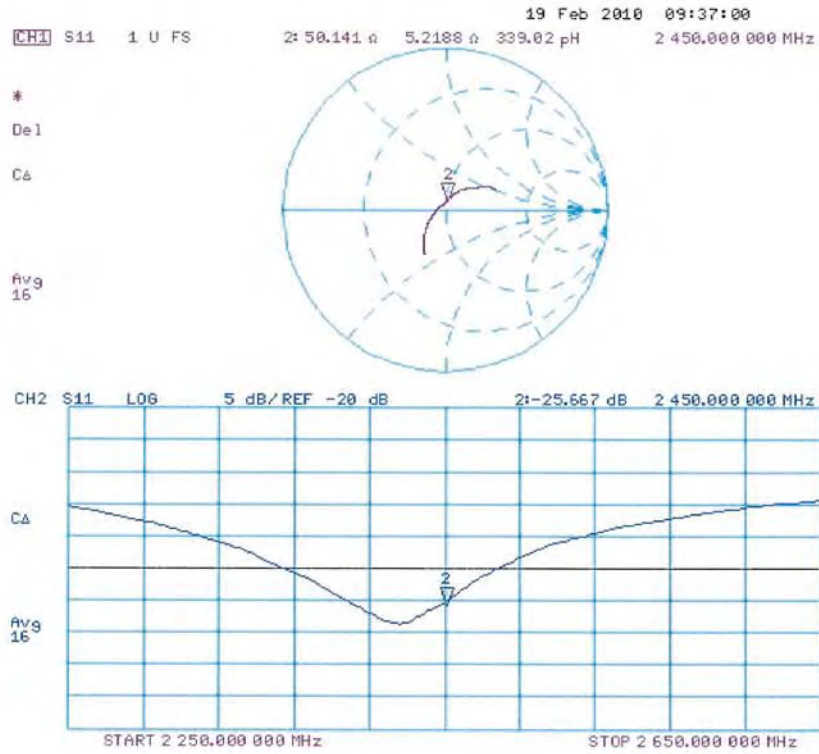
Maximum value of SAR (measured) = 17 mW/g



0 dB = 17mW/g



Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

Client **ATL (Auden)**

Certificate No: **EX3-3632_Jan10**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3632**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v6, QA CAL-23.v3 and QA CAL-25.v2
Calibration procedure for dosimetric E-field probes**

Calibration date: **January 26, 2010**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter 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	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bornholt	R&D Director	

Issued: January 26, 2010

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Certificate No: EX3-3632_Jan10

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * 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_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * 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 ± 50 MHz to ± 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.



EX3DV4 SN:3632

January 26, 2010

Probe EX3DV4

SN:3632

Manufactured:	November 1, 2007
Last calibrated:	January 13, 2009
Recalibrated:	January 26, 2010

Calibrated for DASYS Systems

(Note: non-compatible with DASYS2 system!)



EX3DV4 SN:3632

January 26, 2010

DASY - Parameters of Probe: EX3DV4 SN:3632

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$) ^A	0.46	0.44	0.39	$\pm 10.1\%$
DCP (mV) ^B	88.1	83.7	91.9	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	$\pm 1.5\%$
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

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%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value.



EX3DV4 SN:3632

January 26, 2010

DASY - Parameters of Probe: EX3DV4 SN:3632

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	43.5 ± 5%	0.87 ± 5%	9.64	9.64	9.64	0.24	1.00 ± 13.3%
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	9.11	9.11	9.11	0.63	0.67 ± 11.0%
1810	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	7.80	7.80	7.80	0.64	0.66 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	7.81	7.81	7.81	0.76	0.59 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	7.16	7.16	7.16	0.41	0.82 ± 11.0%

^c 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.



EX3DV4 SN:3632

January 26, 2010

DASY - Parameters of Probe: EX3DV4 SN:3632

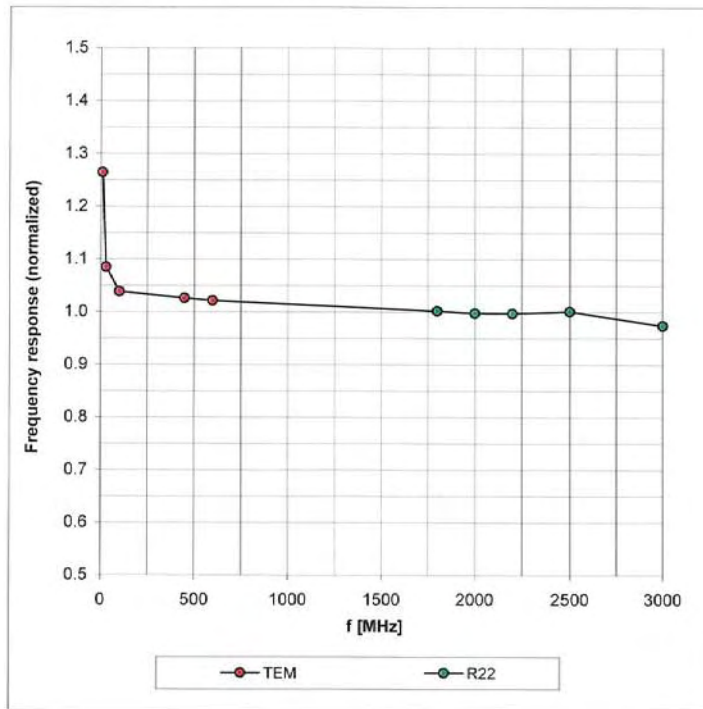
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] [□]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	56.7 ± 5%	0.94 ± 5%	10.57	10.57	10.57	0.32	0.47 ± 13.3%
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	9.17	9.17	9.17	0.59	0.73 ± 11.0%
1810	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	7.84	7.84	7.84	0.68	0.68 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	7.57	7.57	7.57	0.82	0.60 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	7.40	7.40	7.40	0.45	0.80 ± 11.0%

[□] 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.

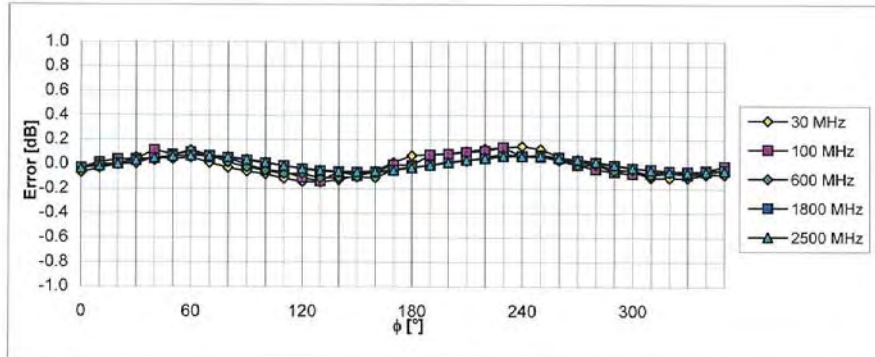
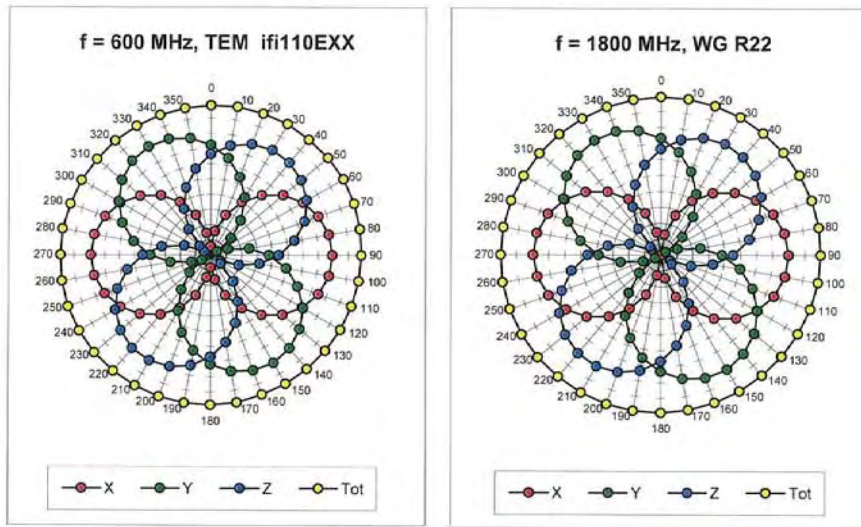
Frequency Response of E-Field

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



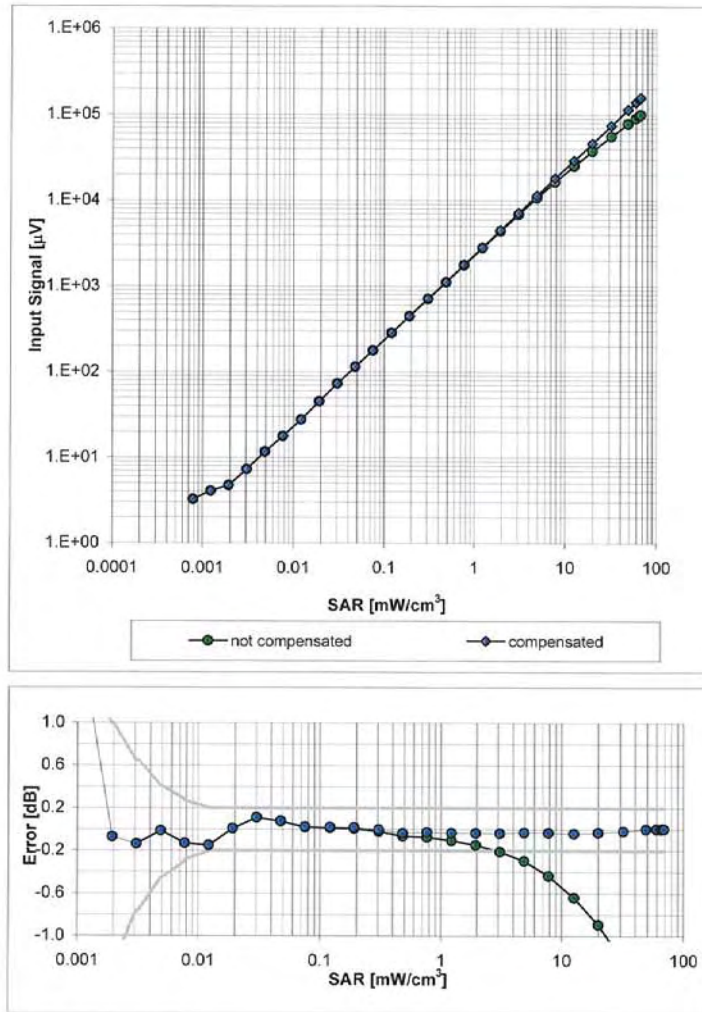
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$



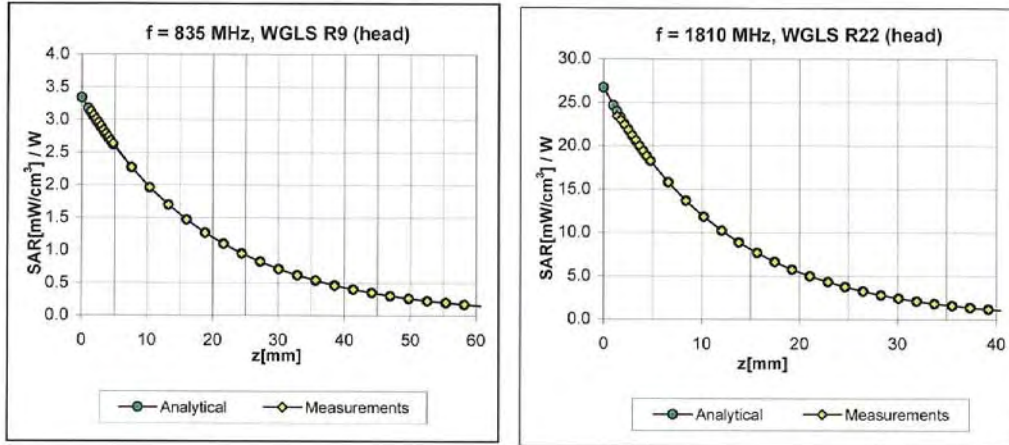
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head})
 (Waveguide R22, f = 1800 MHz)



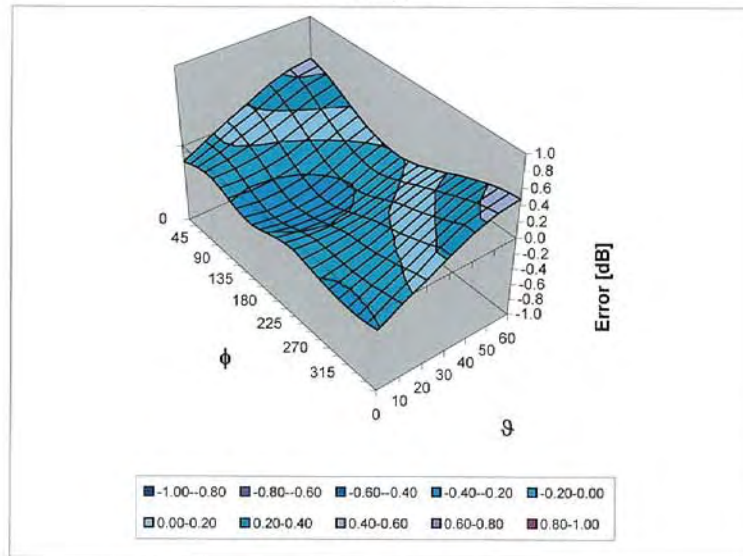
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ, θ), f = 900 MHz



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



EX3DV4 SN:3632

January 26, 2010

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm



**Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **ATL (Auden)**

Certificate No: **DAE4-779_Jan10**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BJ - SN: 779**

Calibration procedure(s) **QA CAL-06.v12
Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **January 21, 2010**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	1-Oct-09 (No: 9055)	Oct-10
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	05-Jun-09 (in house check)	In house check: Jun-10

Calibrated by:	Name Andrea Guntli	Function Technician	Signature
Approved by:	Name Fin Bomholt	Function R&D Director	Signature

Issued: January 21, 2010

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

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Accreditation No.: **SCS 108**

Glossary

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - *DC Voltage Measurement Linearity*: Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - *Common mode sensitivity*: Influence of a positive or negative common mode voltage on the differential measurement.
 - *Channel separation*: Influence of a voltage on the neighbor channels not subject to an input voltage.
 - *AD Converter Values with inputs shorted*: Values on the internal AD converter corresponding to zero input voltage
 - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
 - *Input Offset Current*: Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - *Input resistance*: 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 μ 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	404.487 \pm 0.1% (k=2)	403.723 \pm 0.1% (k=2)	403.948 \pm 0.1% (k=2)
Low Range	3.97046 \pm 0.7% (k=2)	3.98719 \pm 0.7% (k=2)	4.00014 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	84.5 $^{\circ}$ \pm 1 $^{\circ}$
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Appendix

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200010.5	1.14	0.00
Channel X + Input	20003.28	3.68	0.02
Channel X - Input	-19997.24	3.06	-0.02
Channel Y + Input	200009.6	0.87	0.00
Channel Y + Input	19999.83	0.43	0.00
Channel Y - Input	-19998.10	2.10	-0.01
Channel Z + Input	199998.4	0.15	0.00
Channel Z + Input	20000.44	1.04	0.01
Channel Z - Input	-19997.62	-0.01	-0.01

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	1999.6	-0.33	-0.02
Channel X + Input	199.84	-0.16	-0.08
Channel X - Input	-200.02	-0.22	0.11
Channel Y + Input	2000.1	0.05	0.00
Channel Y + Input	198.87	-1.13	-0.56
Channel Y - Input	-201.72	-1.62	0.81
Channel Z + Input	2000.2	0.14	0.01
Channel Z + Input	199.12	-1.18	-0.59
Channel Z - Input	-200.60	-0.60	0.30

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 (μV)	Low Range Average Reading (μV)
Channel X	200	-3.75	-5.42
	- 200	6.52	4.96
Channel Y	200	14.47	13.94
	- 200	-14.47	-14.52
Channel Z	200	3.70	3.28
	- 200	-3.73	-3.84

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	2.60	0.09
Channel Y	200	1.31	-	3.04
Channel Z	200	2.43	-2.04	-

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	15621	15863
Channel Y	15831	16095
Channel Z	16132	15816

5. Input Offset Measurement

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

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	-0.14	-1.27	1.10	0.43
Channel Y	-0.91	-2.36	0.81	0.61
Channel Z	-1.02	-1.92	0.28	0.44

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.1999	202.7
Channel Y	0.1999	202.5
Channel Z	0.2000	202.7

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