



A Test Lab Techno Corp.

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SAR EVALUATION REPORT




Test Report No.	:	0809FS13
Applicant	:	Toshiba Information Systems (UK) Ltd, Mobile Communications Division
FCC ID	:	SP2-CL4-J01
Trade Name	:	TOSHIBA
Model Number	:	830T, CL4-J01
Product Type	:	Mobile Phone
Dates of Test	:	Sep. 10 ~ Oct. 24, 2008
Test Environment	:	Ambient Temperature : $22 \pm 2^{\circ}\text{C}$ Relative Humidity : 40 - 70 %
Test Specification	:	Standard C95.1-1999 IEEE Std. 1528-2003
Max. SAR	:	0.505 W/kg Head SAR 0.553 W/kg Body SAR
Test Lab.	:	Chang-an Lab.



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2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
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Contents

1. Description of Equipment Under Test (EUT)	4
2. Other Accessories	6
3. Introduction	7
4. SAR Definition	8
5. SAR Measurement Setup	9
6. System Components	11
6.1 DASY5 E-Field Probe System	11
6.2 Data Acquisition Electronic (DAE) System	14
6.3 Robot	14
6.4 Measurement Server	14
6.5 Device Holder for Transmitters	15
6.6 Phantom - SAM v4.0	16
6.7 Data Storage and Evaluation	16
7. Test Equipment List	19
8. Tissue Simulating Liquids	20
8.1 Liquid Confirmation	21
9. Measurement Process	22
9.1 Device and Test Conditions	22
9.2 System Performance Check	24
9.3 Dosimetric Assessment Setup	28
9.4 Spatial Peak SAR Evaluation	31
10. Measurement Uncertainty	32
11. SAR Test Results Summary	34
11.1 Head SAR	34
11.2 Body SAR	36
11.3 Setup Photo	41
11.4 Std. C95.1-1999 RF Exposure Limit	44
12. Conclusion	45
13. References	46



Appendix

Appendix A - System Performance Check

Appendix B - SAR Measurement Data

Appendix C - Calibration



1. Description of Equipment Under Test (EUT)

Applicant : **Toshiba Information Systems (UK) Ltd, Mobile Communications Division**
Delta House, The Crescent, Southwood Business Park, Farnborough, GU14 0NL, Hampshire UK

Manufacturer	:	TOSHIBA CORPORATION
Manufacturer Address	:	1-1, Asahigaoka 3-Chome, Hino-Shi, Tokyo 191-8555, Japan
Product Type	:	Mobile Phone
Trade Name	:	TOSHIBA
Model Number	:	830T, CL4-J01
FCC ID	:	SP2-CL4-J01
Test Device	:	Production Unit
Tx Frequency	:	1850.2 - 1909.8 MHz (PCS/GPRS 1900)
Max. RF Conducted Power	:	0.855 W (29.32 dBm) PCS/GPRS 1900
Max. SAR Measurement	:	0.505 W/kg Head SAR 0.553 W/kg Body SAR
HW Version	:	CS-1
SW Version	:	21.0012
Antenna Type	:	Internal Type
Antenna Gain	:	-0.4 dBi (PCS/GPRS 1900)
Device Category	:	Portable
RF Exposure Environment	:	General Population / Uncontrolled
Battery Option	:	Standard
Application Type	:	Certification

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



2. Other Accessories

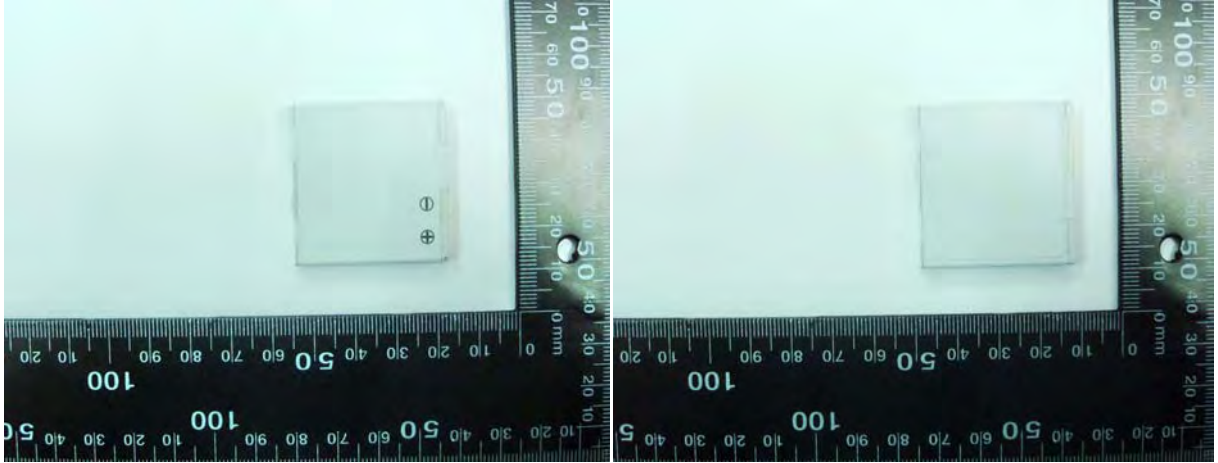


Figure 2. Li-ion Battery (3.7V, 800mAh)



Figure 3. Headset



3. **Introduction**

The A Test Lab Techno Corp. has performed measurements of the maximum potential exposure to the user of **Toshiba Information Systems (UK) Ltd, Mobile Communications Division Trade Name : TOSHIBA Model(s) : 830T, CL4-J01**. The test procedures, as described in American National Standards, Institute C95.1 - 1999 [1] , FCC/OET Bulletin 65 Supplement C [July 2001] were employed and they specify the maximum exposure limit of 1.6mW/g as averaged over any 1 gram of tissue for portable devices being used within 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.



4. SAR Definition

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

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

Figure 4. SAR Mathematical Equation

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

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

Where :

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]



5. SAR Measurement Setup

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

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

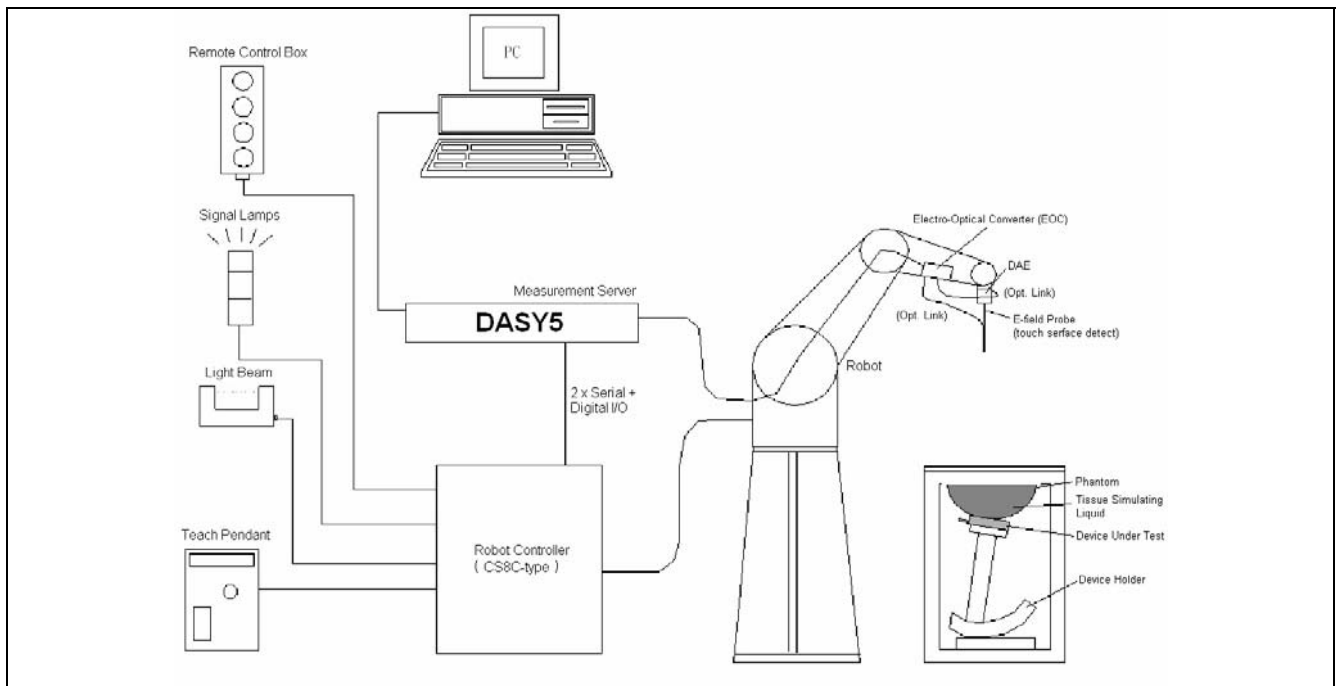


Figure 5. SAR Lab Test Measurement Setup

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



6. System Components

6.1 DASY5 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 DASY5 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped when reaching the maximum.

6.1.1 E-Field Probe Specification

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 900MHz, 1800MHz, 1950MHz, 5200MHz and 5500MHz and 5800MHz (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 μW/g to > 100mW/g; Linearity: ± 0.2dB</p>
Surface Detection	<p>± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surface(EX3DV3 only)</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 6.
E-field Probe



Figure 7.
Probe setup on robot



6.1.2 E-Field Probe Calibration

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

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

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

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

Where :

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).



6.2 Data Acquisition Electronic (DAE) System

Cell Controller

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

Data Converter

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

6.3 Robot

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

6.4 Measurement Server

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

6.5 Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device (POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeat ably positioned according to the IEEE SCC34-SC2 and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).

***Note :** A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations [6] . To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

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



Figure 8. Device Holder

6.6 Phantom - SAM v4.0

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

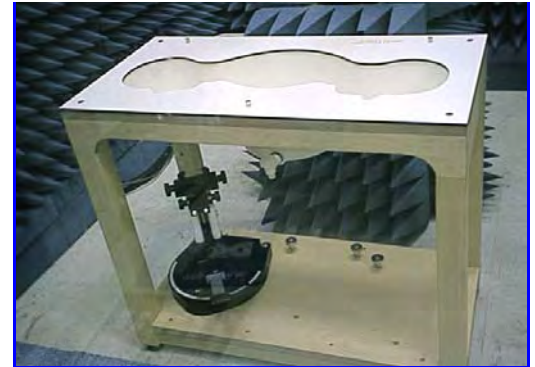


Figure 9. SAM Twin Phantom

Shell Thickness	2 \pm 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	810×1000×500 mm (H×L×W)

Table 1. Specification of SAM v4.0

6.7 Data Storage and Evaluation

6.7.1 Data Storage

The DASY5 software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension .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.



6.7.2 Data Evaluation

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

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



7. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Dosimetric E-Filed Probe	ES3DV3	3150	Jan. 09, 2008	Jan. 09, 2009
SPEAG	1950MHz System Validation Kit	D1950V3	1117	Dec. 20, 2007	Dec. 20, 2008
SPEAG	Data Acquisition Electronics	DAE4	779	Nov. 30, 2007	Nov. 30, 2008
SPEAG	Device Holder	N/A	N/A	NCR	NCR
SPEAG	Phantom	SAM V4.0	TP-1150	NCR	NCR
SPEAG	Robot	Staubli TX90XL	F07/564ZA1/C/01	NCR	NCR
SPEAG	Software	DASY5 V5.0 Build 91	N/A	NCR	NCR
SPEAG	Software	SEMCAD X V12.4 Build 52	N/A	NCR	NCR
SPEAG	Measurement Server	SE UMS 011 AA	1025	NCR	NCR
R & S	Wireless Communication Test Set	CMU200	119369	Jul. 25, 2008	Jul. 25, 2009
Agilent	ENA Series Network Analyzer	E5071B	MY42404650	Feb. 18, 2008	Feb. 18, 2009
Agilent	Dielectric Probe Kit	85070C	US99360094	NCR	NCR
R & S	Power Sensor	NRP-Z22	100179	May. 03, 2008	May. 03, 2009
Agilent	Signal Generator	E8257D	MY44320425	Jul. 03, 2008	Jul. 03, 2009
Agilent	Dual Directional Coupler	778D	50334	NCR	NCR
Mini-Circuits	Power Amplifier	ZHL-42W-SMA	D111103#5	NCR	NCR
Mini-Circuits	Power Amplifier	ZVE-8G-SMA	D042005 671800514	NCR	NCR

Table 2. Test Equipment List



8. Tissue Simulating Liquids

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

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

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

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

Target Frequency	Head		Body	
(MHz)	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

8.1 Liquid Confirmation

8.1.1 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
1950MHz Head	1950MHz	22.0	ϵ_r	40.0	40.5	1.25 %	± 5	Sep. 10, 2008
			σ	1.40	1.38	-1.43 %	± 5	
1950MHz Body	1950MHz	22.0	ϵ_r	53.3	51.6	-3.19 %	± 5	Sep. 11, 2008
			σ	1.52	1.56	2.63 %	± 5	
1950MHz Body	1950MHz	22.0	ϵ_r	53.3	51.6	-3.19 %	± 5	Oct. 24, 2008
			σ	1.52	1.56	2.63 %	± 5	

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

8.1.2 Liquid Depth

The liquid level was during measurement 15cm ±0.5cm.

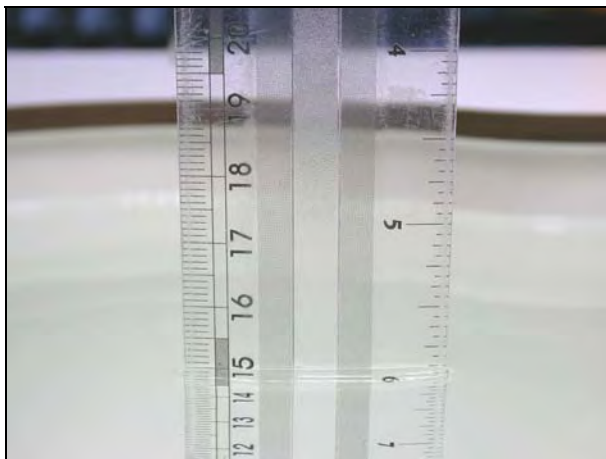


Figure 10. Head-Tissue-Simulating-Liquid

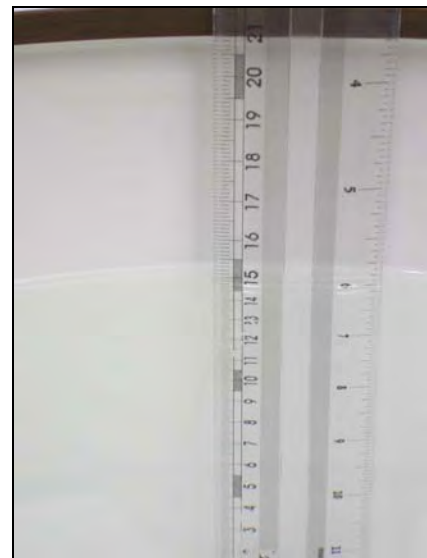


Figure 11. Body-Tissue-Simulating-Liquid



9. Measurement Process

9.1 Device and Test Conditions

The Test Device was provided by **Toshiba Information Systems (UK) Ltd, Mobile Communications Division** for this evaluation. The spatial peak SAR values were assessed for the lowest, middle and highest channels defined by **PCS/GPRS 1900** (#512=1850.2MHz, #661=1880.0MHz, #810=1909.8MHz) systems. The antenna(s), battery and accessories shall be those specified by the manufacturer. The battery shall be fully charged before each measurement and there shall be no external connections.

Usage	Operates with a normal mode.
Simulating human Head/Body	Head & Body
EUT Battery	Fully-charged with Li-ion batteries.

Output power (Peak Power)						
Channel		Frequency (MHz)	Conducted Power (dBm)		Worst Case	
			Before SAR Test	After SAR Test		
PCS1900		Lowest - 512	1850.2	29.05	29.08	<input type="checkbox"/>
		Middle - 661	1880.0	29.21	29.27	<input type="checkbox"/>
		Highest - 810	1909.8	29.32	29.29	<input checked="" type="checkbox"/>
GPRS 1900	3Down2Up	Lowest - 512	1850.2	27.85	27.92	<input checked="" type="checkbox"/>
		Middle - 661	1880.0	27.70	27.74	<input type="checkbox"/>
		Highest - 810	1909.8	27.75	27.82	<input type="checkbox"/>
	3Down1Up	Lowest - 512	1850.2	27.98	29.68	<input checked="" type="checkbox"/>
		Middle - 661	1880.0	27.86	29.55	<input type="checkbox"/>
		Highest - 810	1909.8	27.89	27.74	<input type="checkbox"/>

Test Mode _ Head						
Channel		Frequency (MHz)	Right Cheek	Right Tilted	Left Cheek	Left Tilted
PCS1900	Lowest - 512	1850.2	■	■	■	■
	Middle - 661	1880.0	■	■	■	■
	Highest - 810	1909.8	■	■	■	■
Comment: N/A						

Note: ■ be test, □ not to test.

Test Mode _ Body							
Channel		Frequency (MHz)	EUT open		EUT Close		
			Bottom to phantom	LCD to phantom	Bottom to phantom	Top to phantom	
PCS1900		Lowest - 512	1850.2	■	□	□	□
		Middle - 661	1880.0	■	□	□	□
		Highest - 810	1909.8	■	□	□	□
GPRS 1900	3Down2Up	Lowest - 512	1850.2	■	■	□	□
		Middle - 661	1880.0	■	■	□	□
		Highest - 810	1909.8	■	■	■	■
	3Down1Up	Lowest - 512	1850.2	□	□	□	□
		Middle - 661	1880.0	□	□	□	□
		Highest - 810	1909.8	■	■	□	□
Comment:							
1. The GPRS1900 (3Down2up)'s SAR value was more high than PCS1900 and GPRS1900 (3Down1up) condition.							
2. The GPRS1900 (3Down2up) Highest Channel's SAR value was worst case on GPRS1900 (3Down2up) condition.							

Note: ■ be test, □ not to test.

9.2 System Performance Check

9.2.1 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	900, 1800, 1950, 2000, 2450MHz
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	D900V2 : dipole length 149 mm; overall height 330 mm D1800V2 : dipole length 72 mm; overall height 300 mm D1950V2 : dipole length 62 mm; overall height 300 mm D2000V2 : dipole length 65 mm; overall height 300 mm D2450V2 : dipole length 51.5 mm; overall height 300 mm



Figure 12. Validation Kit



9.2.2 Validation

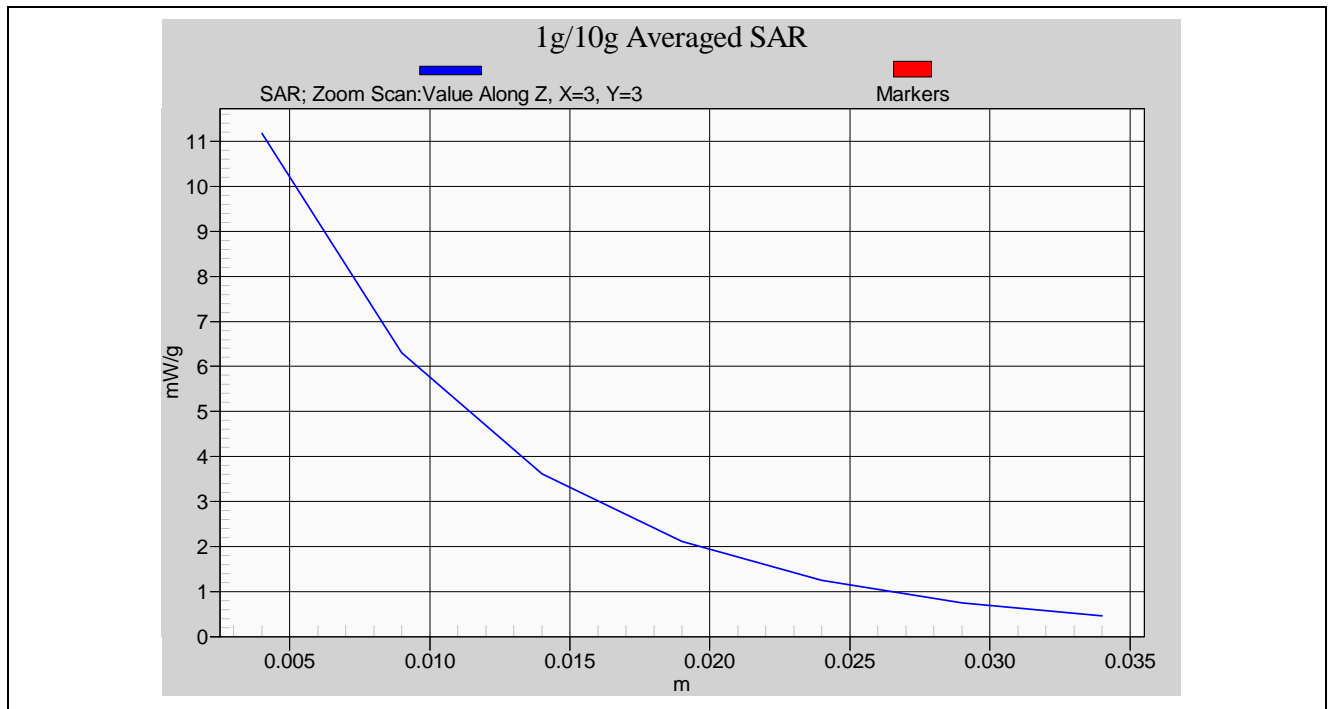
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of $\pm 7\%$. The validation was performed at 1950MHz.

Validation kit		Mixture Type	SAR _{1g} [mW/g]		SAR _{10g} [mW/g]		Date of Calibration
D1950V3-SN1117		Head	40		20.96		Dec. 20, 2007
		Body	41.2		21.76		
Frequency (MHz)	Power (dBm)	SAR _{1g} (mW/g)	SAR _{10g} (mW/g)	Drift (dB)	Difference percentage		Date
					1g	10g	
1950 (Head)	250mW	9.85	5.11	0.011	-1.5 %	-2.5 %	Sep. 10, 2008
	Normalize to 1 Watt	39.4	20.44				
1950 (Body)	250mW	10.5	5.38	-0.077	1.9 %	-1.1 %	Sep. 11, 2008
	Normalize to 1 Watt	42	21.52				
1950 (Body)	250mW	10.5	5.41	0.024	1.9 %	-0.6 %	Oct. 24, 2008
	Normalize to 1 Watt	42	21.64				

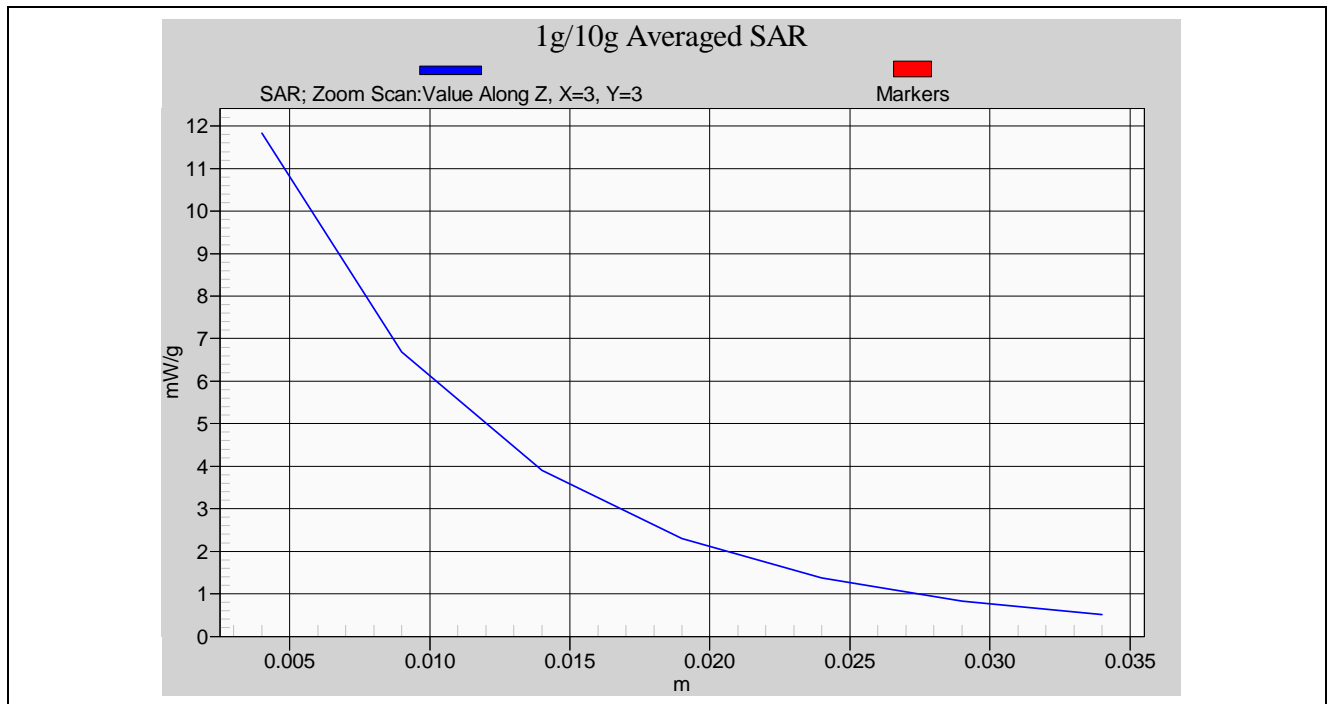
Detail results see Appendix A.



Z-axis Plot of System Performance Check



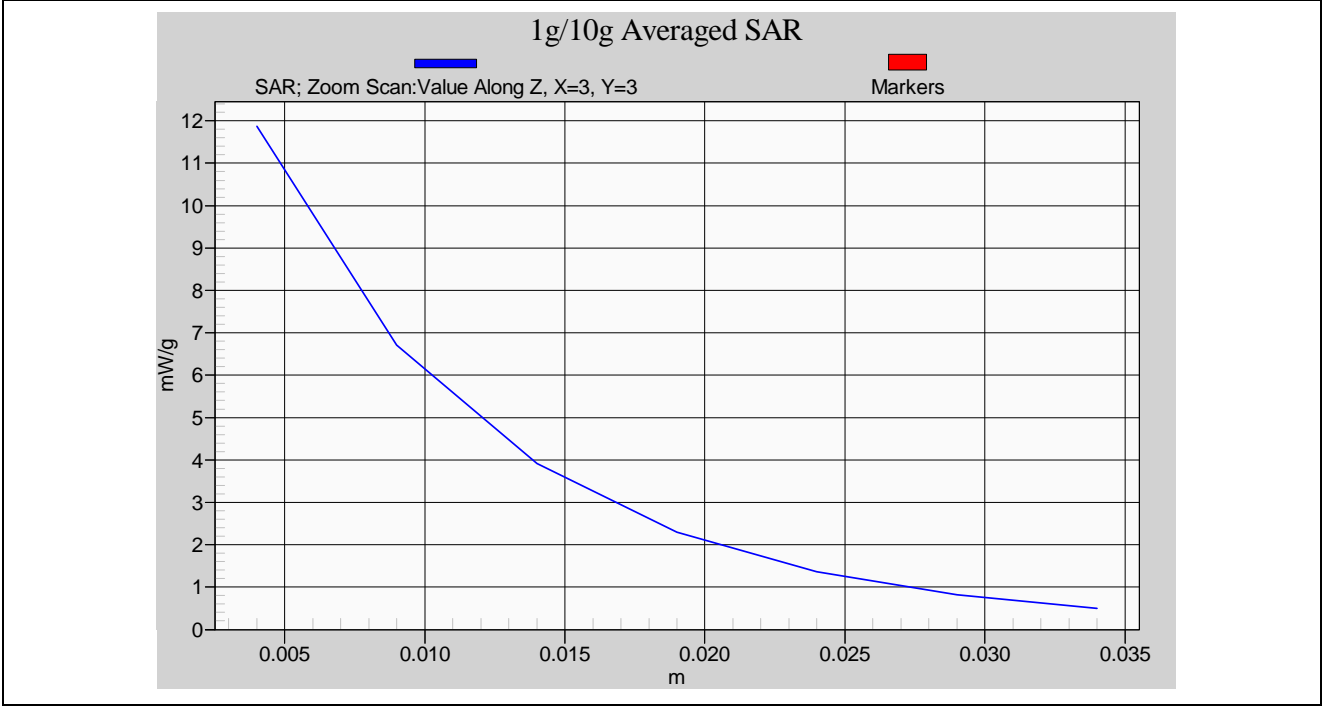
Head-Tissue-Simulating-Liquid 1950MHz (2008/09/10)



Body-Tissue-Simulating-Liquid 1950MHz (2008/09/11)



Z-axis Plot of System Performance Check



Body-Tissue-Simulating-Liquid 1950MHz (2008/10/24)



9.3 Dosimetric Assessment Setup

9.3.1 Headset Test Position - Body Worn

Body-Worn Configuration

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

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

For this test :

- ☐ The EUT is placed into the holster/belt clip and the holster is positioned against the surface of the phantom in a normal operating position.
- ☒ Since this EUT doesn't supply any body-worn accessory to the end user, for **PCS/GPRS 1900 band** 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.)



9.3.2 Measurement Procedures

The evaluation was performed with the following procedures :

- Surface Check :** A surface checks job gathers data used with optical surface detection. It determines the distance from the phantom surface where the reflection from the optical detector has its peak. Any following measurement jobs using optical surface detection will then rely on this value. The surface check performs its search a specified number of times, so that the repeatability can be verified. The probe tip distance is 1.3mm to phantom inner surface during scans.
- Reference :** The reference job measures the field at a specified reference position, at 4 mm from the selected section's grid reference point.
- Area Scan :** The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines can find the maximum locations even in relatively coarse grids. When an area scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. Any following zoom scan within the same procedure will then perform fine scans around these maxima. The area covered the entire dimension of the EUT and the horizontal grid spacing was 15 mm x 15 mm.
- Zoom Scan :** Zoom scans are used to assess the highest averaged SAR for cubic averaging volumes with 1 g and 10 g of simulated tissue. The zoom scan measures 5 x 5 x 7 points in a 32 x 32 x 30 mm cube whose base faces are centered around the maxima returned from a preceding area scan within the same procedure.
- Drift :** The drift job measures the field at the same location as the most recent reference job within the same procedure, with the same settings. The drift measurement gives the field difference in dB from the last reference measurement. Several drift measurements are possible for each reference measurement. This allows monitoring of the power drift of the device in the batch process. If the value changed by more than 5%, the evaluation was repeated.



2 Hot spots

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. The range (in dB) is specified in the standards for compliance testing. The test use 2dB range is required in IEEE 1528-2003, EN50361 and IEC 62209 standards.

If only one Zoom Scan follows the Are Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scan has to be increased accordingly. After measurement is completed, all maxima and their coordinates are listed in the Results property page. The maximum selected in the list is highlighted in the 3-D view. For the secondary maxima returned from an Area Scan, the user can specify a lower limit (peak SAR value), in addition to the Find secondary maxima within xdB condition. Only the primary maximum and any secondary maxima within xdB from the primary maximum and above this limit will be measured.

Area Scan

Grid | Measurement Profile | Results | Report

Maxima

Find secondary maxima dB,
and with a peak SAR value greater than W/kg,
and at least mm away from the global

Maxima

Value...	X	Y	Z	Yaw	Pitch	Roll

Motorola Averaged SAR

☐ Linear fit a: b:
☒ Polynomial fit



9.4 Spatial Peak SAR Evaluation

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

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

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

Interpolation and Extrapolation

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

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



10. Measurement Uncertainty

Measurement uncertainties in SAR measurements are difficult to quantify due to several variables including biological, physiological, and environmental. However, we estimate the measurement uncertainties in SAR to be less than $\pm 21.9\%$ [8] .

According to Std. C95.3 [9] , the overall uncertainties are difficult to assess and will vary with the type of meter and usage situation. However, accuracy's of ± 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	Uncertainty value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) v _{eff}
Measurement System								
Probe Calibration	± 5.9 %	N	1	1	1	± 5.9 %	± 5.9 %	
Axial Isotropy	± 4.7 %	R		0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical Isotropy	± 9.6 %	R	$\sqrt{3}$	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					± 10.9 %	± 10.7 %	387	
Expanded STD Uncertainty					± 21.9 %	± 21.4 %		

Table 5. Uncertainty Budget of DASY



11. SAR Test Results Summary

11.1 Head SAR

11.1.1 PCS 1900 - Head SAR

Ambient :

Temperature (°C) :

22 ± 2

Relative HUMIDITY (%) :

40-70

Liquid :

Mixture Type :

HSL1950

Liquid Temperature (°C) :

22.0

Depth of liquid (cm) :

15

Measurement :

Crest Factor :

8.3

Probe S/N :

3150

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1850.2	512	PCS 1900	29.05	Right-cheek	Internal	N/A	0.401	0.15200	-
1880.0	661	PCS 1900	29.21	Right-cheek	Internal	N/A	0.434	0.15500	-
1909.8	810	PCS 1900	29.32	Right-cheek	Internal	N/A	0.505	-0.06100	-
1850.2	512	PCS 1900	29.05	Right-Tilted	Internal	N/A	0.106	0.06600	-
1880.0	661	PCS 1900	29.21	Right-Tilted	Internal	N/A	0.119	0.05200	-
1909.8	810	PCS 1900	29.32	Right-Tilted	Internal	N/A	0.138	0.04100	-
1850.2	512	PCS 1900	29.05	Left-cheek	Internal	N/A	0.305	0.14400	-
1880.0	661	PCS 1900	29.21	Left-cheek	Internal	N/A	0.323	0.14900	-
1909.8	810	PCS 1900	29.32	Left-cheek	Internal	N/A	0.413	0.07800	-
1850.2	512	PCS 1900	29.05	Left-Tilted	Internal	N/A	0.136	0.17300	-
1880.0	661	PCS 1900	29.21	Left-Tilted	Internal	N/A	0.142	0.15200	-
1909.8	810	PCS 1900	29.32	Left-Tilted	Internal	N/A	0.181	0.00883	-
Std. C95.1-1999 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg (mW/g) Averaged over 1 gram				



Z-axis Plot of SAR Measurement

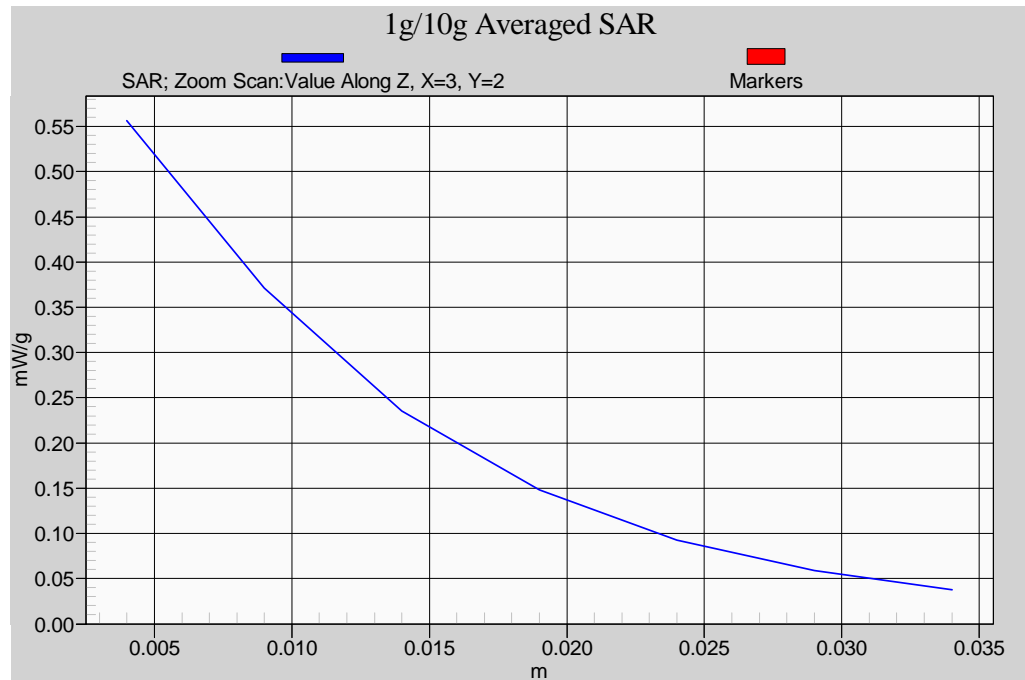


Figure 13. Z-axis Plot of Right-Cheek PCS1900 CH810



11.2 Body SAR

11.2.1 PCS 1900 - Body SAR (15 mm separation)

Ambient :

Temperature (°C) :

22 ± 2

Relative HUMIDITY (%) :

40-70

Liquid :

Mixture Type :

MSL1950

Liquid Temperature (°C) :

22.0

Depth of liquid (cm) :

15

Measurement :

Crest Factor :

8.3

Probe S/N :

3150

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1850.2	512	PCS 1900	29.05	Flat	Internal	Headset	0.269	-0.04300	-
1880.0	661	PCS 1900	29.21	Flat	Internal	Headset	0.258	0.18500	-
1909.8	810	PCS 1900	29.32	Flat	Internal	Headset	0.359	0.16100	-
Std. C95.1-1999 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg (mW/g) Averaged over 1 gram				

Detail results see Appendix B.

Z-axis Plot of SAR Measurement

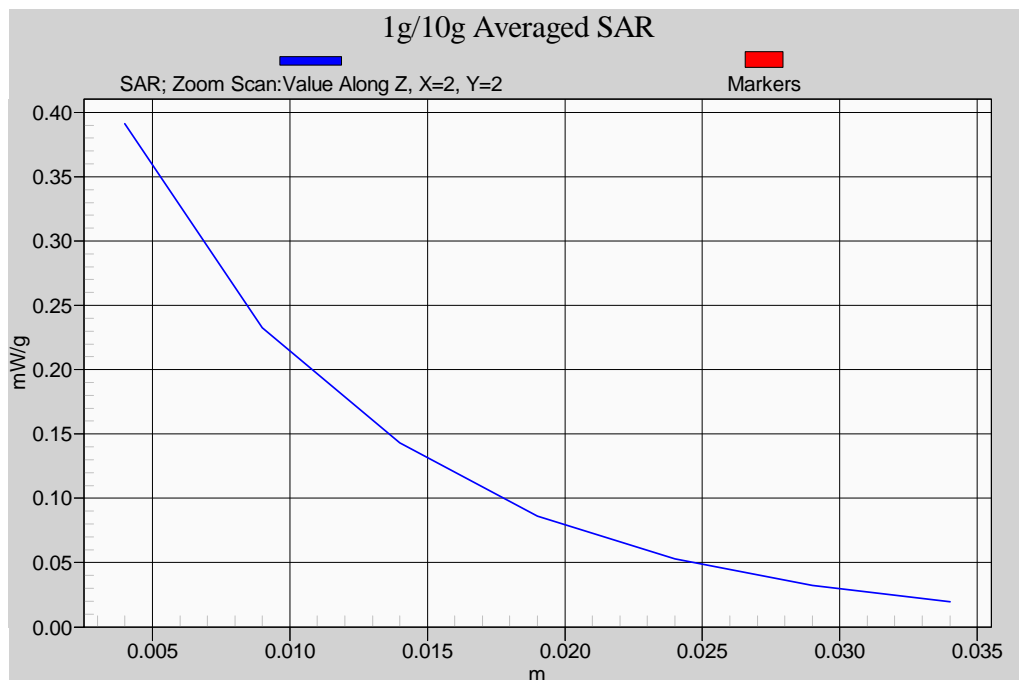


Figure 14. Z-axis Plot of flat PCS CH810



11.2.2 GPRS 1900 - Body SAR (EUT Bottom to Phantom 15 mm separation)

Ambient :

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

Liquid :

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

Measurement :

Crest Factor : 3Down1Up =8.3 Probe S/N : 3150
3Down2Up =4.2

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1850.2	512	GPRS 1900	27.85	Flat	Internal	Headset	0.361	0.14900	3Down2Up EUT Open
1880.0	661	GPRS 1900	27.70	Flat	Internal	Headset	0.381	-0.03700	3Down2Up EUT Open
1909.8	810	GPRS 1900	27.89	Flat	Internal	Headset	0.365	0.17200	3Down1Up EUT Open
1909.8	810	GPRS 1900	27.75	Flat	Internal	Headset	0.446	-0.00368	3Down2Up EUT Open
1909.8	810	GPRS 1900	27.75	Flat	Internal	Headset	0.481	-0.11900	3Down2Up EUT Close
Std. C95.1-1999 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg (mW/g) Averaged over 1 gram				

Detail results see Appendix B.



Z-axis Plot of SAR Measurement

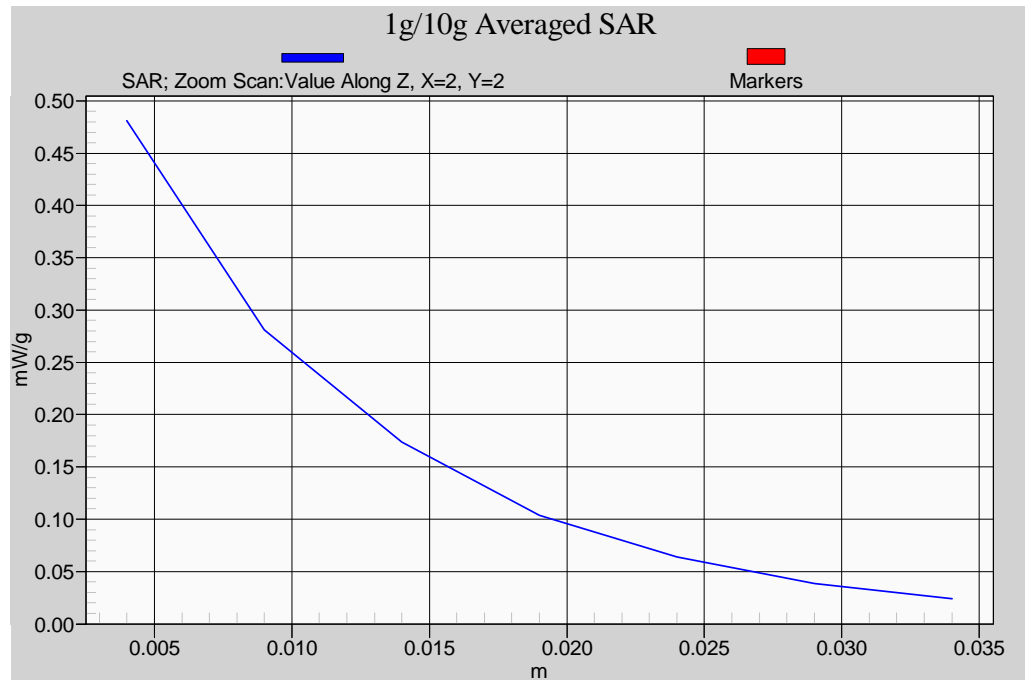


Figure 15.Z-axis Plot of Flat _ GPRS CH810 3Down2Up EUT Close Bottom to Phantom 15mm separation



11.2.3 GPRS 1900 - Body SAR (EUT Open LCD / Close Top to Phantom 15 mm separation)

Ambient :

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

Liquid :

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

Measurement :

Crest Factor : 3Down1Up =8.3 Probe S/N : 3150
3Down2Up =4.2

Frequency		Band	Power (dBm)	Phantom Position	Antenna Position	Accessory	SAR _{1g} [mW/g]	Power Drift (dB)	Remark
MHz	CH								
1850.2	512	GPRS 1900	27.85	Flat	Internal	Headset	0.476	0.16800	3Down2Up EUT Open
1880.0	661	GPRS 1900	27.70	Flat	Internal	Headset	0.516	0.10500	3Down2Up EUT Open
1909.8	810	GPRS 1900	27.89	Flat	Internal	Headset	0.479	0.18000	3Down1Up EUT Open
1909.8	810	GPRS 1900	27.75	Flat	Internal	Headset	0.553	0.08330	3Down2Up EUT Open
1909.8	810	GPRS 1900	27.75	Flat	Internal	Headset	0.182	0.00190	3Down2Up EUT Close
Std. C95.1-1999 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg (mW/g) Averaged over 1 gram				

Detail results see Appendix B.

Z-axis Plot of SAR Measurement

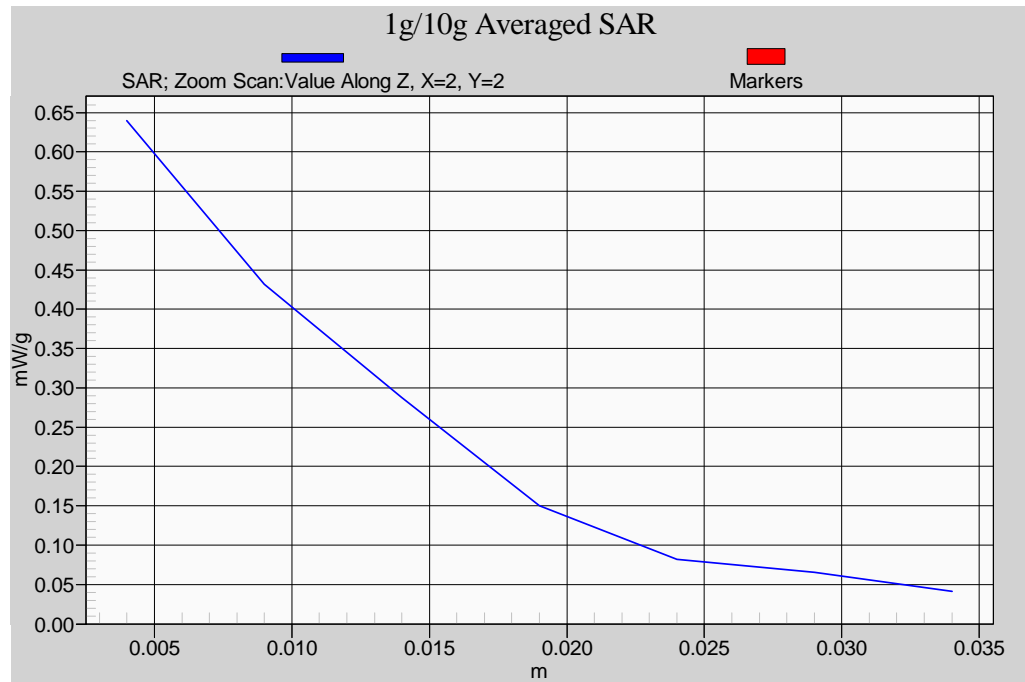


Figure 16. Z-axis Plot of Flat _ GPRS CH810 3Down2Up EUT Open LCD to Phantom 15mm separation

11.3 Setup Photo

Head Setup

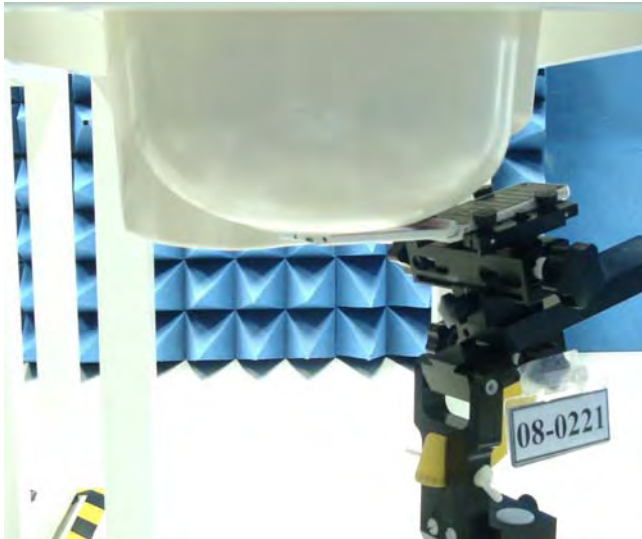


Figure 17.Right Head SAR Test Setup (Cheek)

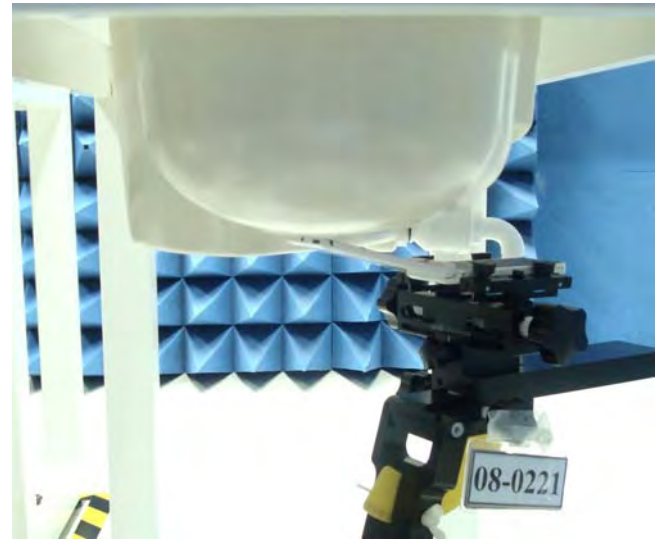


Figure 18.Right Head SAR Test Setup (Tilted)

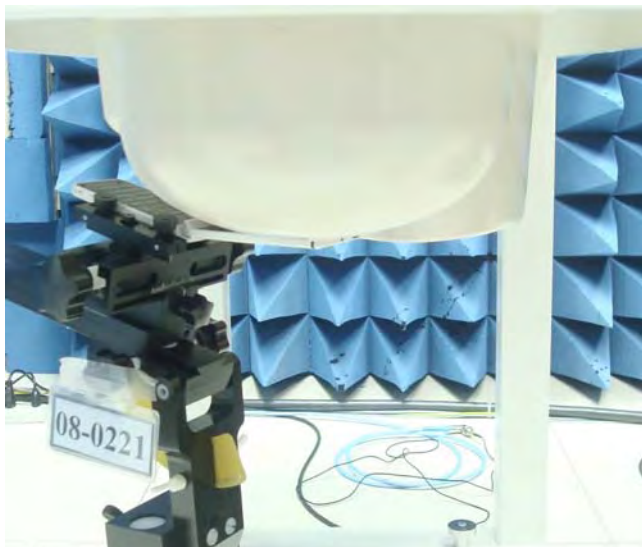


Figure 19.Left Head SAR Test Setup (Cheek)

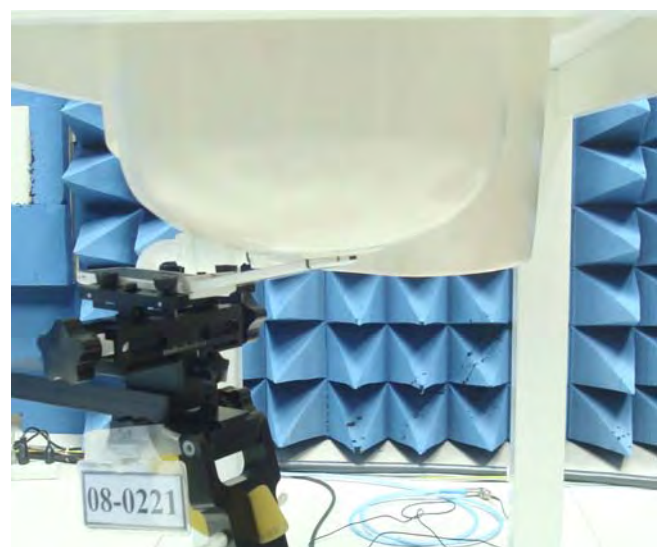


Figure 20.Left Head SAR Test Setup (Tilted)

Body Setup

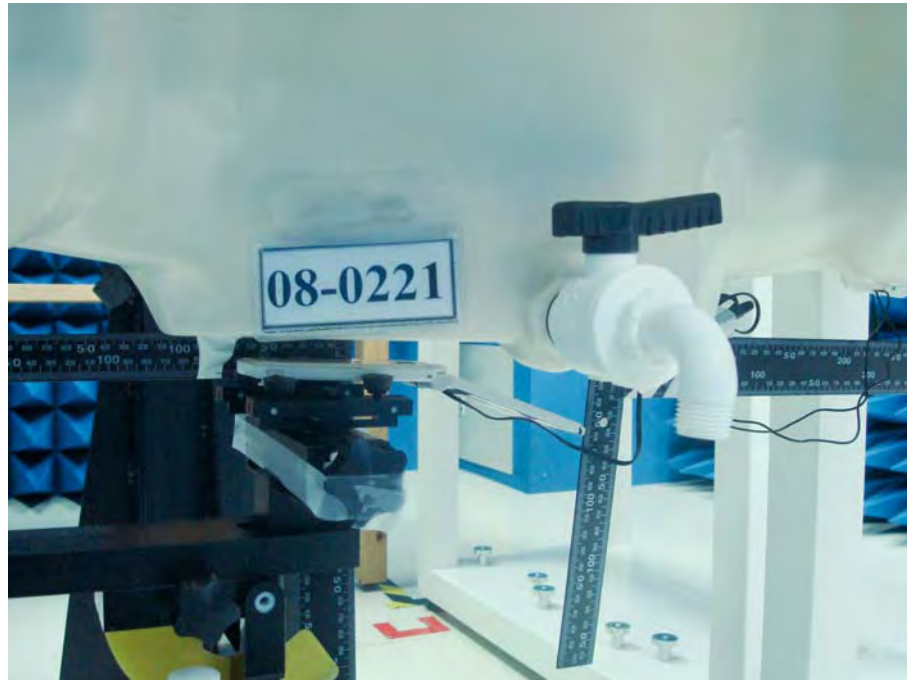


Figure 21.Body SAR Test Setup (Flat Section) _ EUT Open Bottom to Phantom 15 mm separation



Figure 22.Body SAR Test Setup (Flat Section) _ EUT Open LCD to Phantom 15 mm separation

Body Setup

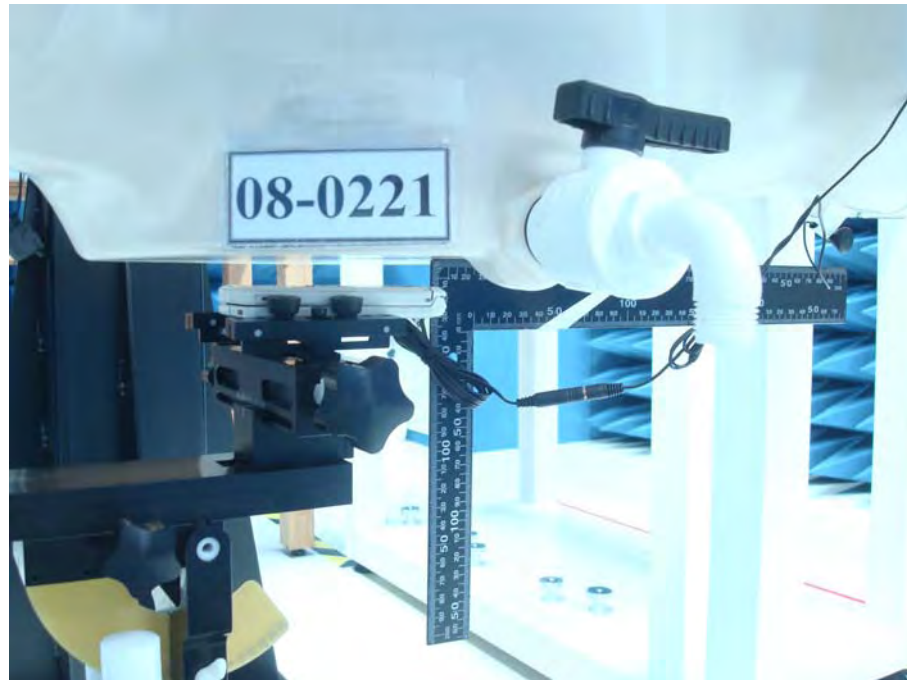


Figure 23.Body SAR Test Setup (Flat Section) _ EUT Close Bottom to Phantom 15 mm separation



Figure 24.Body SAR Test Setup (Flat Section) _ EUT Close Top to Phantom 15 mm separation



11.4 Std. C95.1-1999 RF Exposure Limit

Human Exposure	Population Uncontrolled Exposure (W/kg) or (mW/g)	Occupational Controlled Exposure (W/kg) or (mW/g)
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 6. Safety Limits for Partial Body Exposure

Notes :

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

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

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



12. Conclusion

The SAR test values found for the portable mobile phone **Toshiba Information Systems (UK) Ltd, Mobile Communications Division Trade Name : TOSHIBA Model(s) : 830T, CL4-J01** are below the maximum recommended level of 1.6 W/kg (mW/g).



13. References

- [1] Std. C95.1-1999, "American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300KHz to 100GHz", New York.
- [2] NCRP, National Council on Radiation Protection and Measurements, "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields", NCRP report NO. 86, 1986.
- [3] T. Schmid, O. Egger, and N. Kuster, "Automatic E-field scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp, 105-113, Jan. 1996.
- [4] K. Poković, T. Schmid, and N. Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequency", in ICECOM'97, Dubrovnik, October 15-17, 1997, pp.120-124.
- [5] K. Poković, T. Schmid, and N. Kuster, "E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp.172-175.
- [6] N. Kuster, and Q. Balzano, "Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz", IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.
- [7] Robert J. Renka, "Multivariate Interpolation Of Large Sets Of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988 , pp. 139-148.
- [8] N. Kuster, R. Kastle, T. Schmid, "Dosimetric evaluation of mobile communications equipment with known precision", IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.
- [9] Std. C95.3-1991, "IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, Aug. 1992.
- [10] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency. 10KHz-300GHz, Jan. 1995.



Appendix A - System Performance Check

See following Attached Pages for System Performance Check.



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/10/2008 9:00:09 PM

System Performance Check at 1950MHz_20080910_Head

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

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

Medium parameters used: $f = 1950 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 39.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.84, 4.84, 4.84); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

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

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

Maximum value of SAR (interpolated) = 11.3 mW/g

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

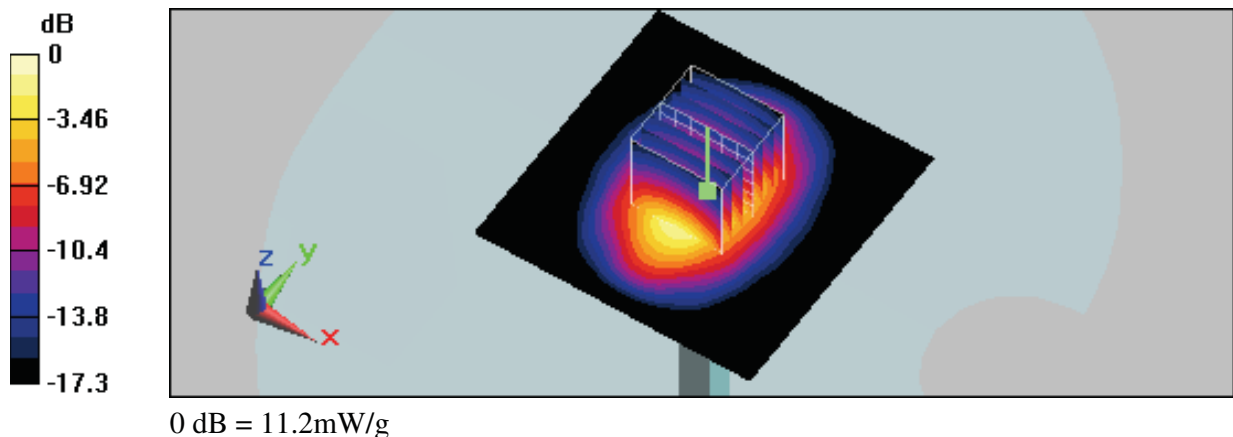
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 90.7 V/m ; Power Drift = 0.011 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.85 mW/g ; SAR(10 g) = 5.11 mW/g

Maximum value of SAR (measured) = 11.2 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 9:50:27 PM

System Performance Check at 1950MHz_20080911_Body

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

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

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

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.55, 4.55, 4.55); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

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

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

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

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

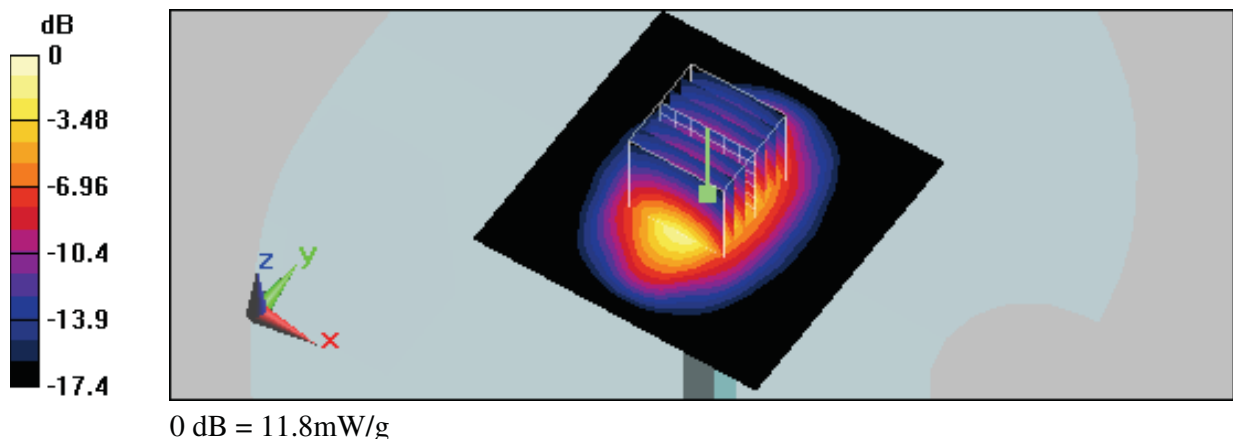
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 89.3 V/m; Power Drift = -0.077 dB

Peak SAR (extrapolated) = 19.3 W/kg

SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.38 mW/g

Maximum value of SAR (measured) = 11.8 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/24/2008 12:58:24 PM

System Performance Check at 1950MHz_20081024_Body

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

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

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

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.55, 4.55, 4.55); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 120; SEMCAD X Version 13.2 Build 87

System Performance Check at 1950MHz/Area Scan (71x71x1):

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

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

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

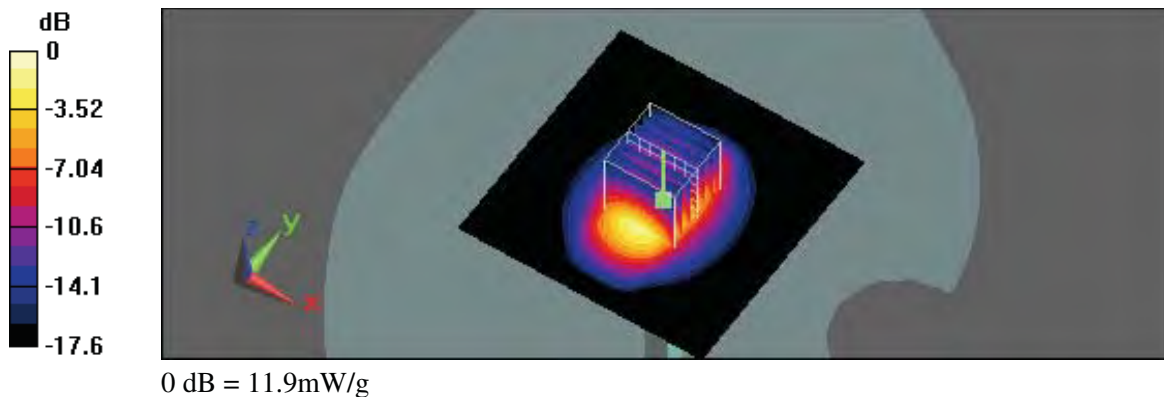
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 88.3 V/m; Power Drift = 0.024 dB

Peak SAR (extrapolated) = 19.3 W/kg

SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.41 mW/g

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





Appendix B - SAR Measurement Data

See following Attached Pages for SAR Measurement Data.



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 2:11:58 AM

RC_PCS CH512

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Right Cheek/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.471 mW/g

Right Cheek/Zoom Scan (5x5x7)/Cube 0:

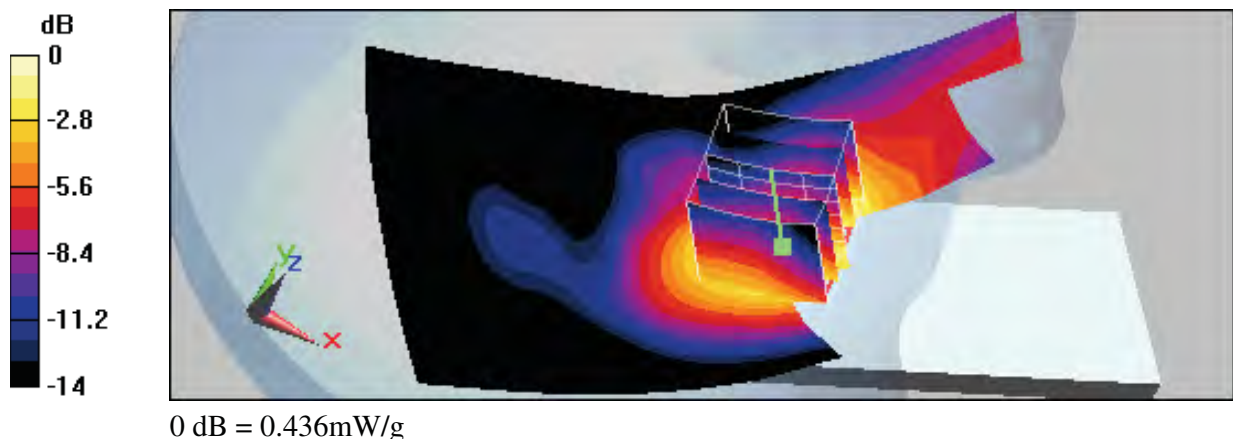
Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 3.28 V/m; Power Drift = 0.152 dB

Peak SAR (extrapolated) = 0.594 W/kg

SAR(1 g) = 0.401 mW/g; SAR(10 g) = 0.247 mW/g

Maximum value of SAR (measured) = 0.436 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 2:30:06 AM

RC_PCS CH661

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.36 \text{ mho/m}$; $\epsilon_r = 39.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Right Cheek/Area Scan (61x151x1):

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

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

Right Cheek/Zoom Scan (5x5x7)/Cube 0:

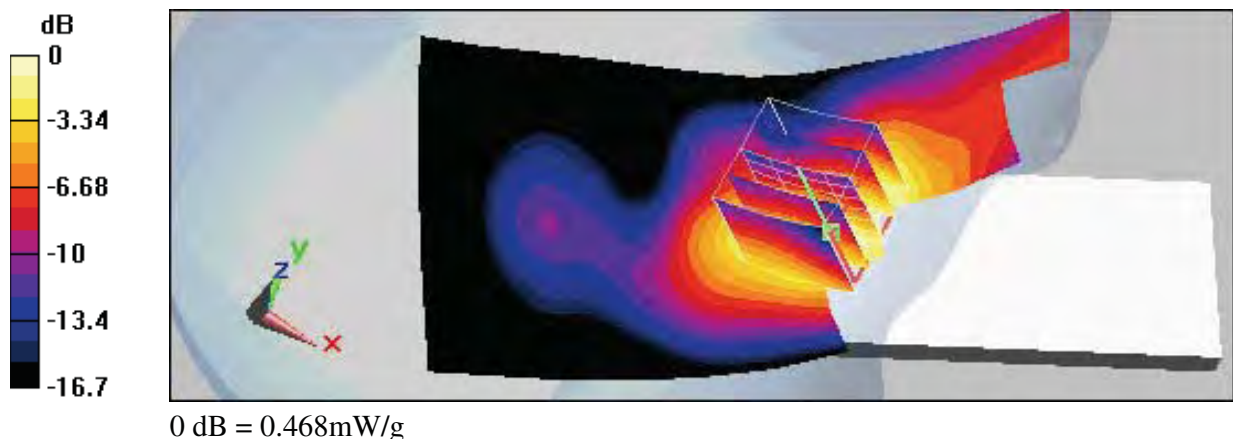
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.63 V/m ; Power Drift = 0.155 dB

Peak SAR (extrapolated) = 0.658 W/kg

SAR(1 g) = 0.434 mW/g ; SAR(10 g) = 0.266 mW/g

Maximum value of SAR (measured) = 0.468 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 2:45:53 AM

RC_PCS CH810

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

Communication System: PCS; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Right Cheek/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.571 mW/g

Right Cheek/Zoom Scan (5x5x7)/Cube 0:

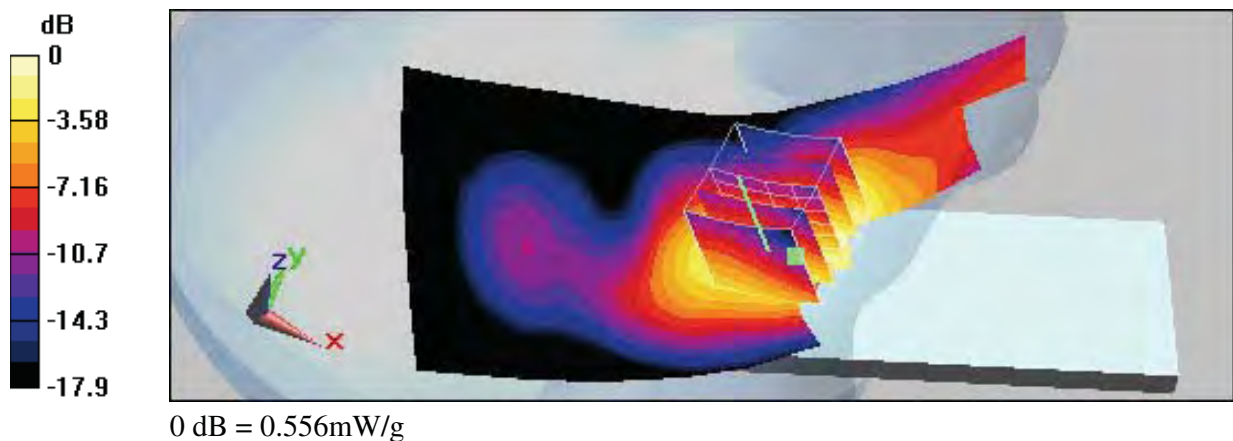
Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 4.43 V/m; Power Drift = -0.061 dB

Peak SAR (extrapolated) = 0.789 W/kg

SAR(1 g) = 0.505 mW/g; SAR(10 g) = 0.307 mW/g

Maximum value of SAR (measured) = 0.556 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 3:02:38 AM

RT_PCS CH512

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Right Tilted/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.115 mW/g

Right Tilted/Zoom Scan (5x5x7)/Cube 0:

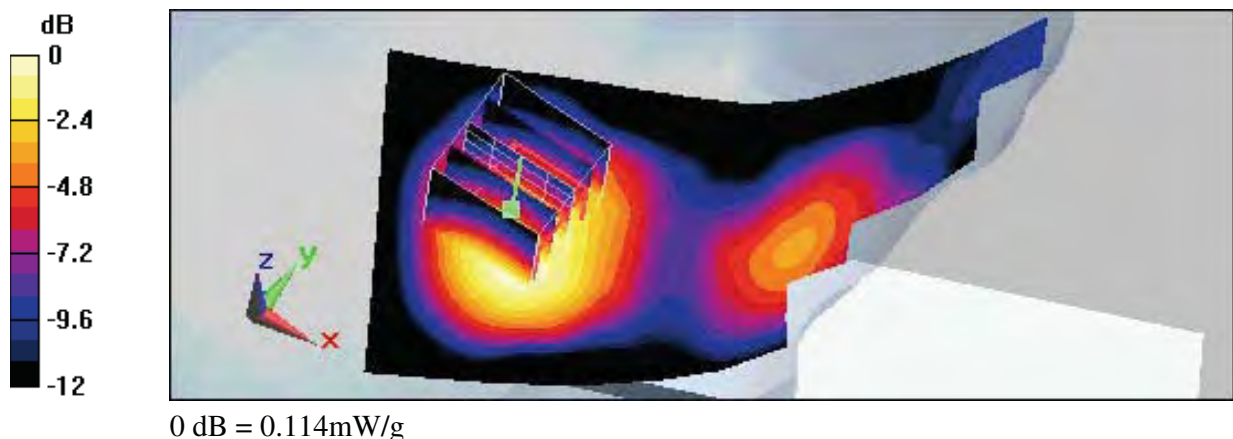
Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 7.13 V/m; Power Drift = 0.066 dB

Peak SAR (extrapolated) = 0.150 W/kg

SAR(1 g) = 0.106 mW/g; SAR(10 g) = 0.069 mW/g

Maximum value of SAR (measured) = 0.114 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 3:17:56 AM

RT_PCS CH661

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.36 \text{ mho/m}$; $\epsilon_r = 39.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Right Tilted/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.135 mW/g

Right Tilted/Zoom Scan (5x5x7)/Cube 0:

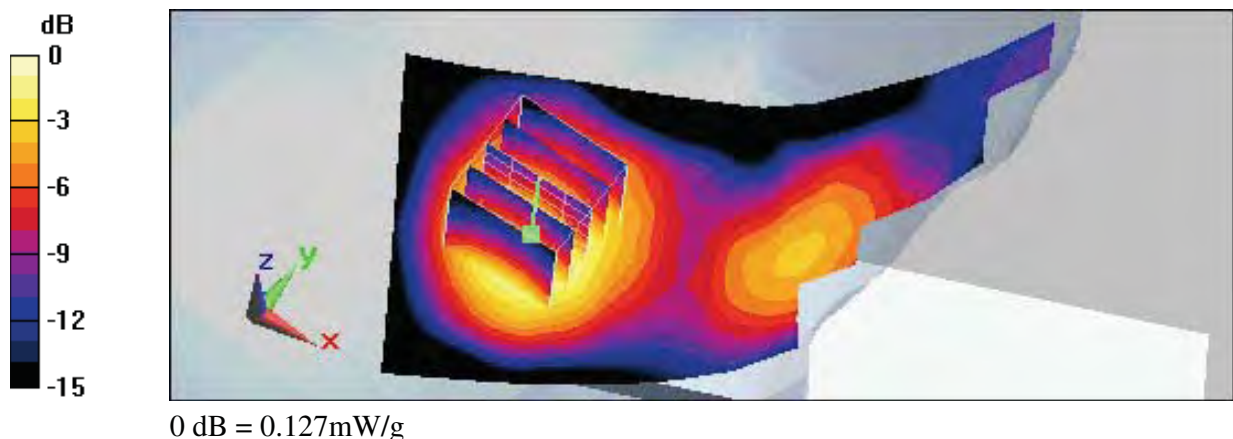
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 7.76 V/m ; Power Drift = 0.052 dB

Peak SAR (extrapolated) = 0.164 W/kg

SAR(1 g) = 0.119 mW/g ; SAR(10 g) = 0.077 mW/g

Maximum value of SAR (measured) = 0.127 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 3:33:06 AM

RT_PCS CH810

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

Communication System: PCS; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Right Tilted/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.156 mW/g

Right Tilted/Zoom Scan (5x5x7)/Cube 0:

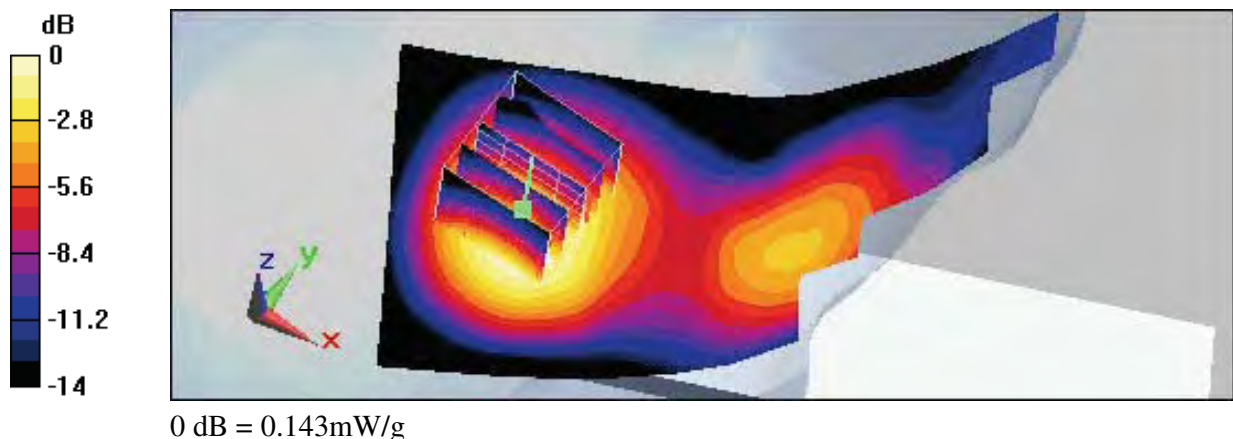
Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 8.77 V/m; Power Drift = 0.041 dB

Peak SAR (extrapolated) = 0.202 W/kg

SAR(1 g) = 0.138 mW/g; SAR(10 g) = 0.087 mW/g

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





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 7:01:09 PM

LC_PCS CH512

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Left Cheek/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.347 mW/g

Left Cheek/Zoom Scan (5x5x7)/Cube 0:

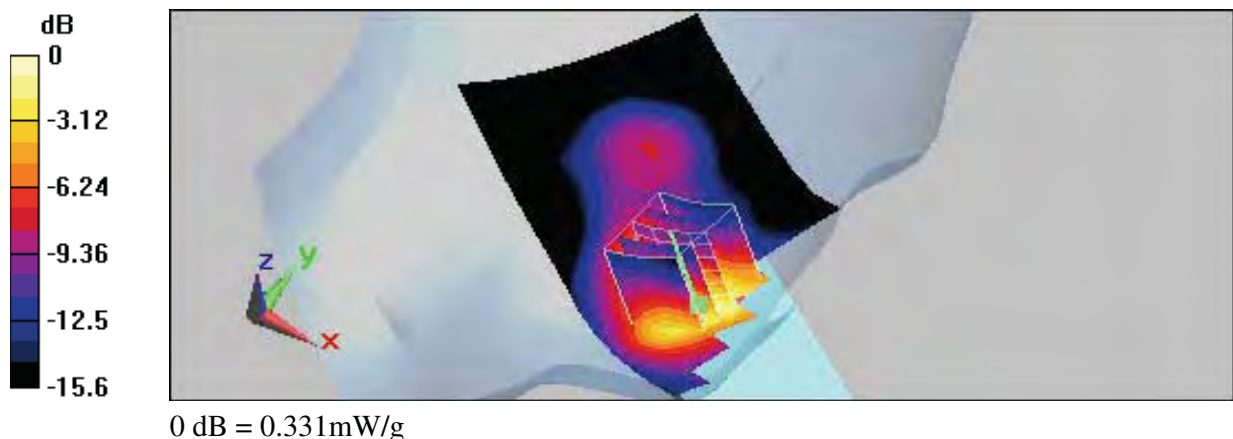
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.56 V/m; Power Drift = 0.144 dB

Peak SAR (extrapolated) = 0.470 W/kg

SAR(1 g) = 0.305 mW/g; SAR(10 g) = 0.187 mW/g

Maximum value of SAR (measured) = 0.331 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 7:16:05 PM

LC_PCS CH661

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.36 \text{ mho/m}$; $\epsilon_r = 39.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Left Cheek/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.366 mW/g

Left Cheek/Zoom Scan (5x5x7)/Cube 0:

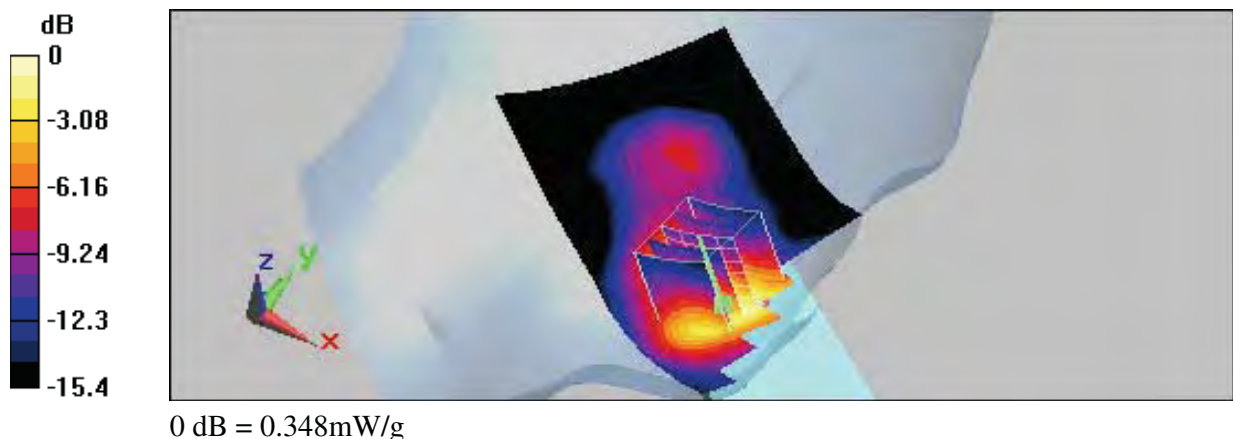
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.56 V/m ; Power Drift = 0.149 dB

Peak SAR (extrapolated) = 0.497 W/kg

SAR(1 g) = 0.323 mW/g ; SAR(10 g) = 0.197 mW/g

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





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 7:31:05 PM

LC_PCS CH810

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

Communication System: PCS; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 1910 \text{ MHz}$; $\sigma = 1.35 \text{ mho/m}$; $\epsilon_r = 39.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Left Cheek/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.456 mW/g

Left Cheek/Zoom Scan (5x5x7)/Cube 0:

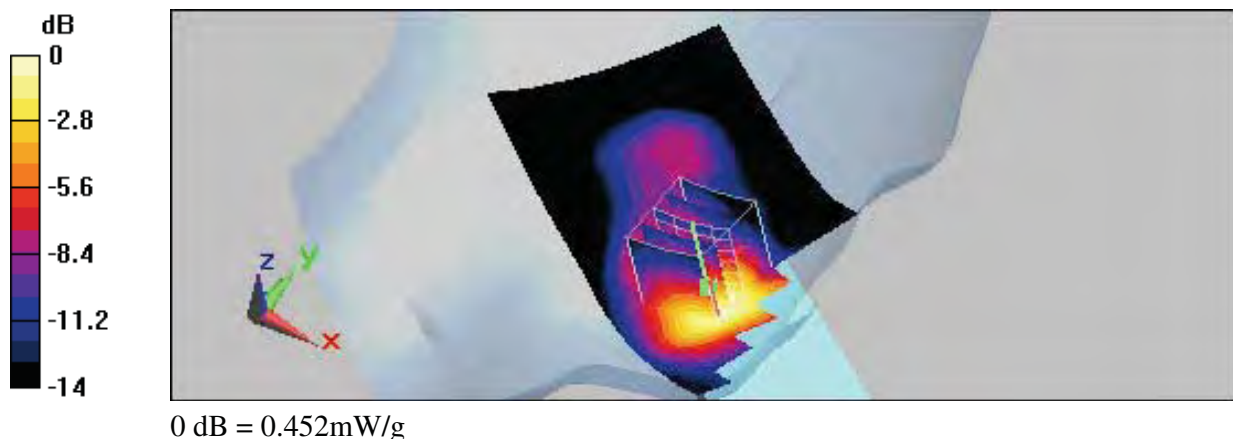
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 4.19 V/m ; Power Drift = 0.078 dB

Peak SAR (extrapolated) = 0.637 W/kg

SAR(1 g) = 0.413 mW/g ; SAR(10 g) = 0.252 mW/g

Maximum value of SAR (measured) = 0.452 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 7:47:15 PM

LT_PCS CH512

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Left Tilted/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.159 mW/g

Left Tilted/Zoom Scan (5x5x7)/Cube 0:

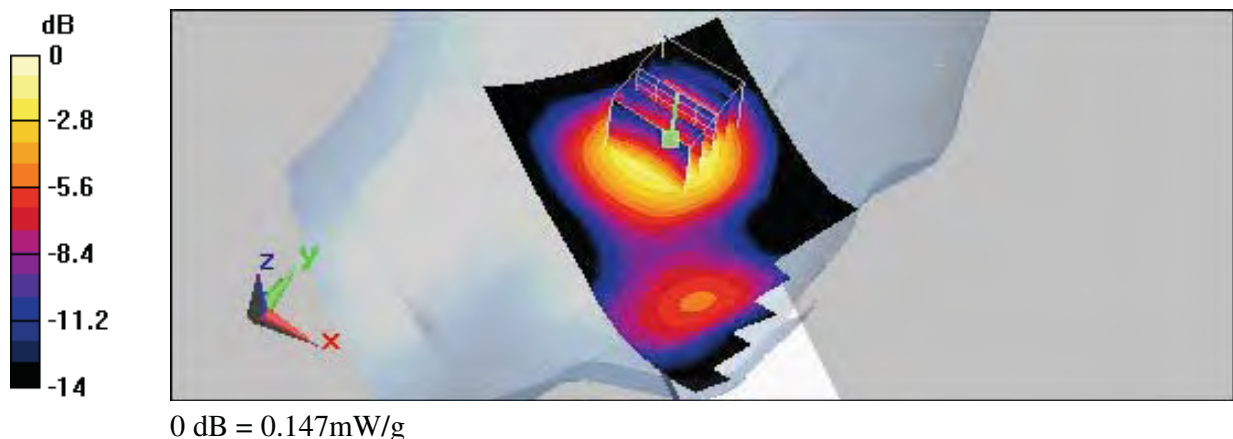
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.68 V/m; Power Drift = 0.173 dB

Peak SAR (extrapolated) = 0.200 W/kg

SAR(1 g) = 0.136 mW/g; SAR(10 g) = 0.085 mW/g

Maximum value of SAR (measured) = 0.147 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 8:02:38 PM

LT_PCS CH661

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.36 \text{ mho/m}$; $\epsilon_r = 39.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Left Tilted/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.181 mW/g

Left Tilted/Zoom Scan (5x5x7)/Cube 0:

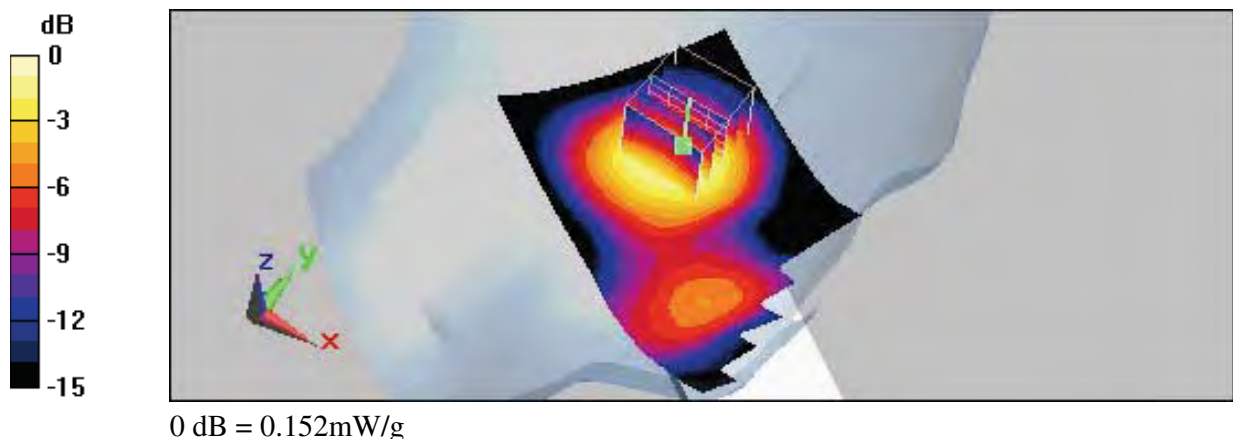
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 6.92 V/m ; Power Drift = 0.152 dB

Peak SAR (extrapolated) = 0.210 W/kg

SAR(1 g) = 0.142 mW/g ; SAR(10 g) = 0.090 mW/g

Maximum value of SAR (measured) = 0.152 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 8:17:52 PM

LT_PCS CH810

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

Communication System: PCS; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(5.11, 5.11, 5.11); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Left Tilted/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.220 mW/g

Left Tilted/Zoom Scan (5x5x7)/Cube 0:

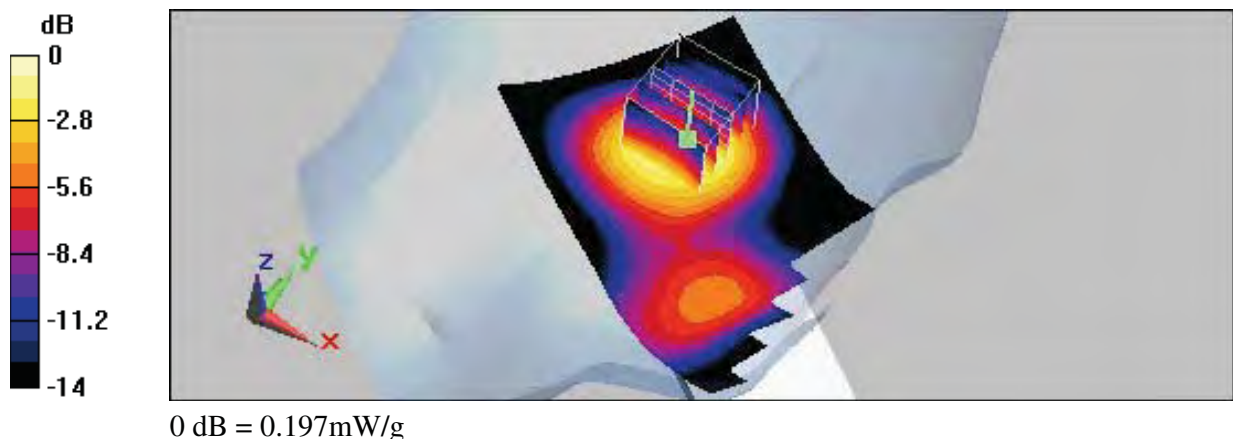
Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 8.03 V/m; Power Drift = 0.00883 dB

Peak SAR (extrapolated) = 0.272 W/kg

SAR(1 g) = 0.181 mW/g; SAR(10 g) = 0.111 mW/g

Maximum value of SAR (measured) = 0.197 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 11:16:32 PM

Flat_PCS CH512_15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.46$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x171x1):

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

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

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

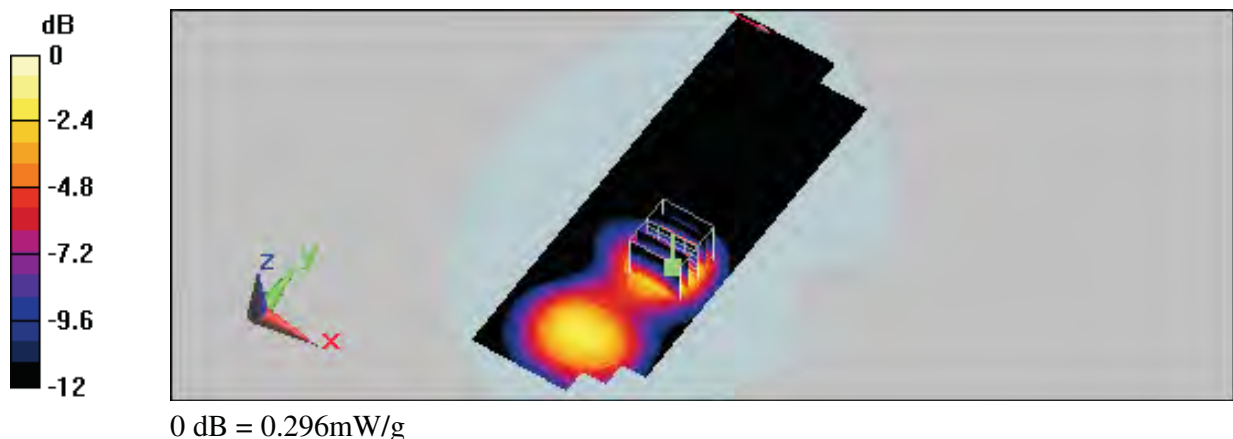
Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 2.54 V/m; Power Drift = -0.043 dB

Peak SAR (extrapolated) = 0.462 W/kg

SAR(1 g) = 0.269 mW/g; SAR(10 g) = 0.153 mW/g

Maximum value of SAR (measured) = 0.296 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/11/2008 11:38:11 PM

Flat_PCS CH661_15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.49$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x171x1):

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

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

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

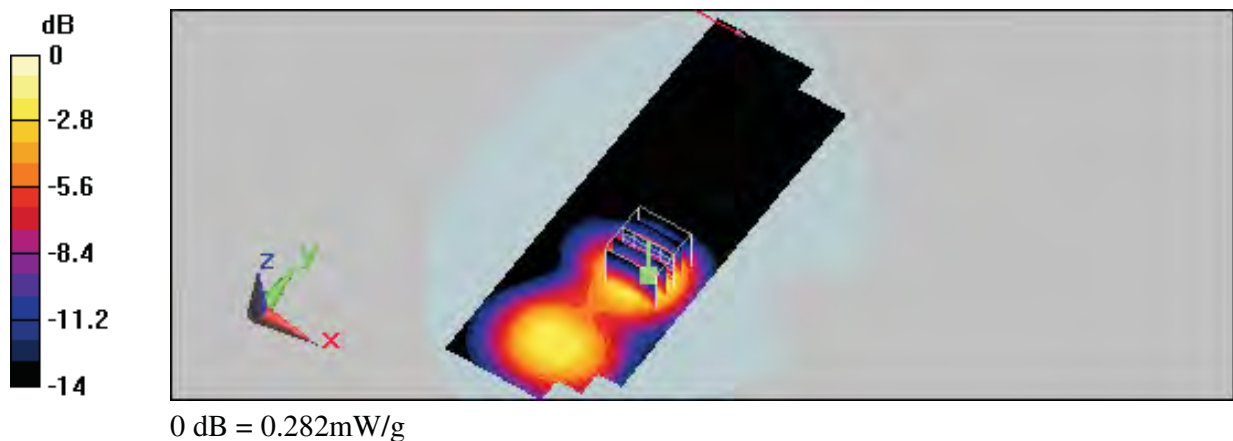
Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 2.59 V/m; Power Drift = 0.185 dB

Peak SAR (extrapolated) = 0.448 W/kg

SAR(1 g) = 0.258 mW/g; SAR(10 g) = 0.146 mW/g

Maximum value of SAR (measured) = 0.282 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/12/2008 1:23:23 AM

Flat_PCS CH810_15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

Communication System: PCS; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.52$ mho/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x171x1):

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

Maximum value of SAR (interpolated) = 0.413 mW/g

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

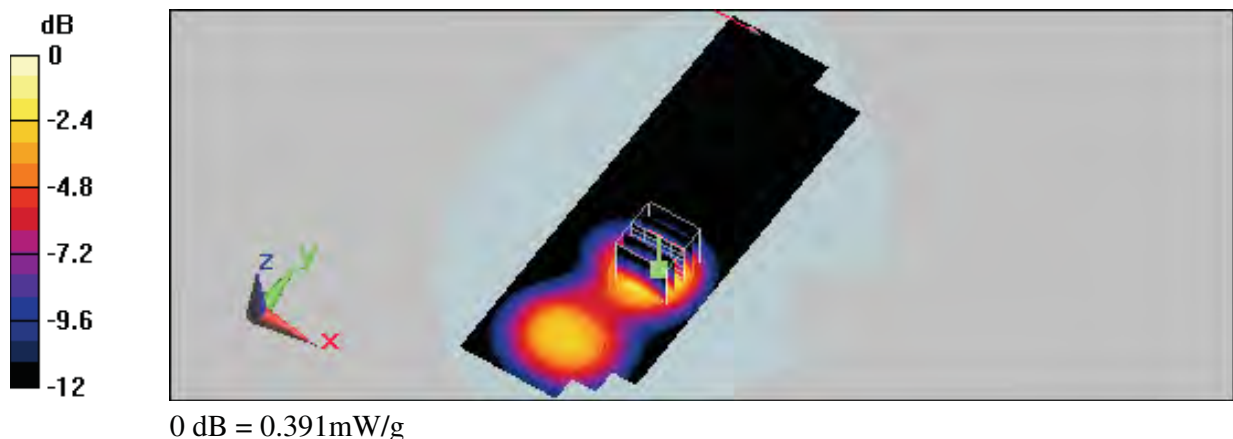
Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 3.55 V/m; Power Drift = 0.161 dB

Peak SAR (extrapolated) = 0.617 W/kg

SAR(1 g) = 0.359 mW/g; SAR(10 g) = 0.202 mW/g

Maximum value of SAR (measured) = 0.391 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/12/2008 2:12:54 AM

Flat_PCS GPRS CH512_3Down2Up_EUT Open Bottom to Phantom 15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

Communication System: PCS GPRS(3Down,2Up); Frequency: 1850.2 MHz; Duty Cycle: 1:4.2
Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.46$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x171x1):

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

Maximum value of SAR (interpolated) = 0.409 mW/g

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

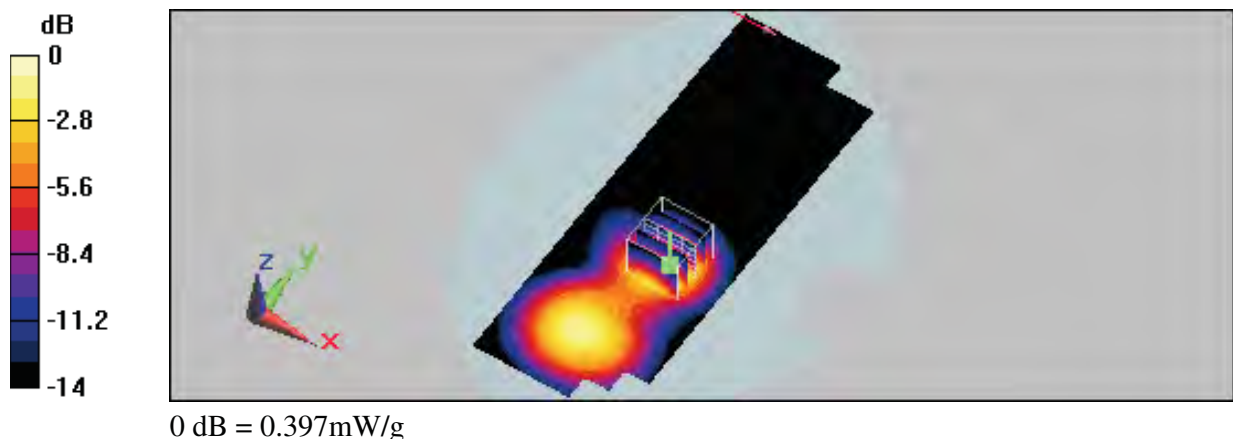
Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 3.43 V/m; Power Drift = 0.149 dB

Peak SAR (extrapolated) = 0.627 W/kg

SAR(1 g) = 0.361 mW/g; SAR(10 g) = 0.202 mW/g

Maximum value of SAR (measured) = 0.397 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/12/2008 2:38:29 AM

Flat_PCS GPRS CH661_3Down2Up_EUT Open Bottom to Phantom 15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.49 \text{ mho/m}$; $\epsilon_r = 51.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x171x1):

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

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

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

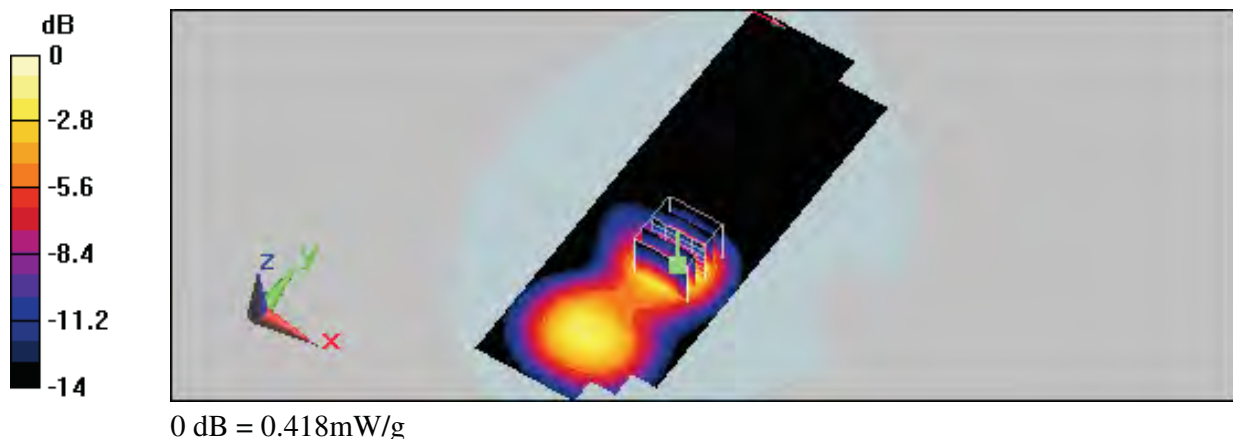
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.63 V/m; Power Drift = -0.037 dB

Peak SAR (extrapolated) = 0.664 W/kg

SAR(1 g) = 0.381 mW/g; SAR(10 g) = 0.214 mW/g

Maximum value of SAR (measured) = 0.418 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/12/2008 4:09:43 AM

Flat_PCS GPRS CH810_3Down1Up_EUT Open Bottom to Phantom 15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

Communication System: PCS GPRS(3Down,1Up); Frequency: 1909.8 MHz;Duty Cycle: 1:8.3

Medium parameters used: $f = 1910 \text{ MHz}$; $\sigma = 1.52 \text{ mho/m}$; $\epsilon_r = 51.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x171x1):

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

Maximum value of SAR (interpolated) = 0.423 mW/g

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

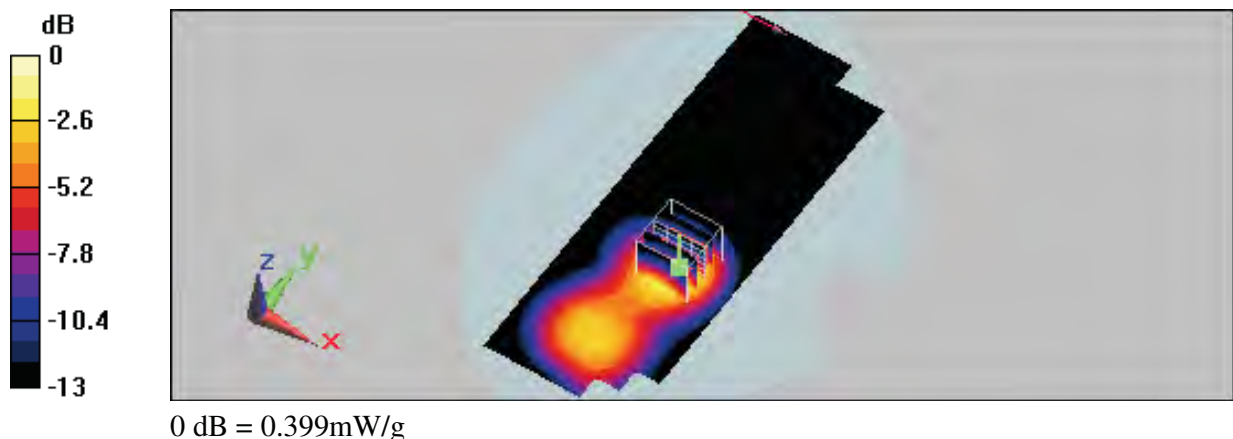
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.43 V/m ; Power Drift = 0.172 dB

Peak SAR (extrapolated) = 0.638 W/kg

SAR(1 g) = 0.365 mW/g ; SAR(10 g) = 0.204 mW/g

Maximum value of SAR (measured) = 0.399 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 9/12/2008 2:58:58 AM

Flat_PCS GPRS CH810_3Down2Up_EUT Open Bottom to Phantom 15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.52$ mho/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x171x1):

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

Maximum value of SAR (interpolated) = 0.497 mW/g

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

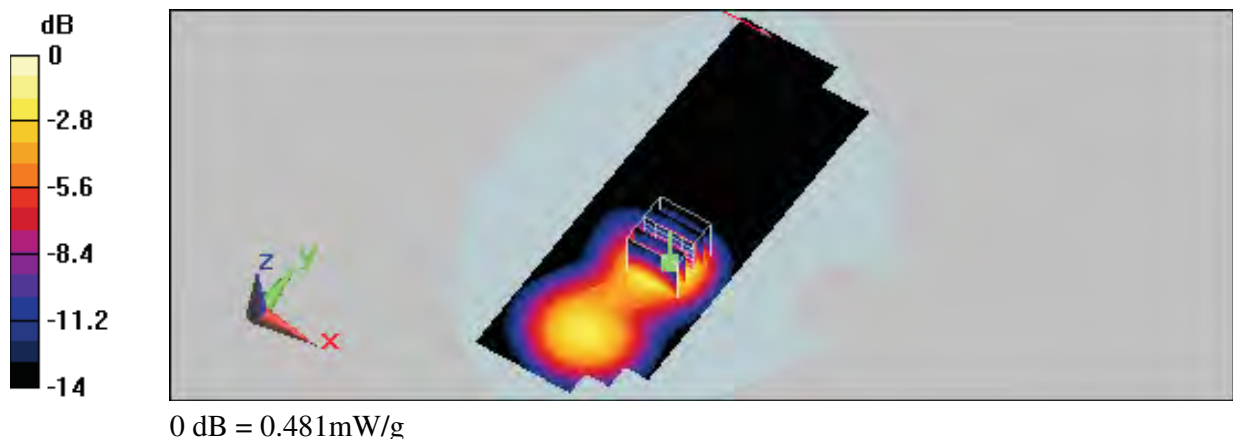
Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 4.37 V/m; Power Drift = -0.00368 dB

Peak SAR (extrapolated) = 0.775 W/kg

SAR(1 g) = 0.446 mW/g; SAR(10 g) = 0.251 mW/g

Maximum value of SAR (measured) = 0.481 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/24/2008 3:35:35 PM

Flat_PCS GPRS CH810_3Down2Up_EUT Close Bottom to Phantom 15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.52$ mho/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x91x1):

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

Maximum value of SAR (interpolated) = 0.557 mW/g

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

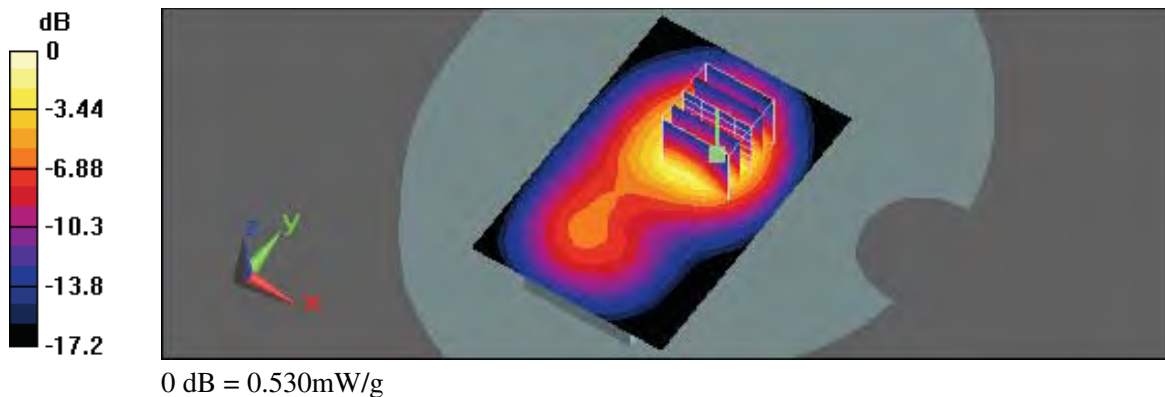
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.1 V/m; Power Drift = -0.119 dB

Peak SAR (extrapolated) = 0.851 W/kg

SAR(1 g) = 0.481 mW/g; SAR(10 g) = 0.266 mW/g

Maximum value of SAR (measured) = 0.530 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/24/2008 4:06:58 PM

Flat_PCS GPRS CH512_3Down2Up_EUT Open LCD to Phantom 15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

Communication System: PCS GPRS(3Down,2Up); Frequency: 1850.2 MHz;Duty Cycle: 1:4.2
Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.46$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x151x1):

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

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

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

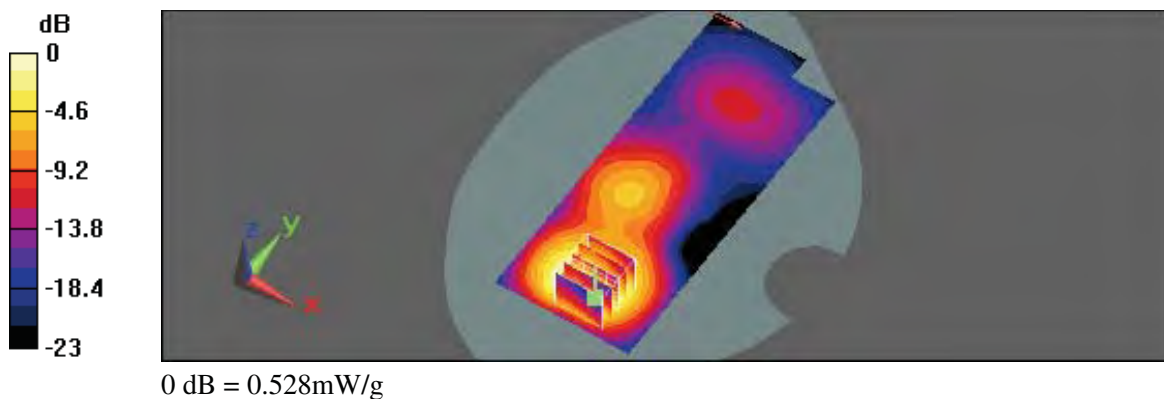
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.62 V/m; Power Drift = 0.168 dB

Peak SAR (extrapolated) = 0.625 W/kg

SAR(1 g) = 0.476 mW/g; SAR(10 g) = 0.293 mW/g

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





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/24/2008 4:27:11 PM

Flat_PCS GPRS CH661_3Down2Up_EUT Open LCD to Phantom 15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.49 \text{ mho/m}$; $\epsilon_r = 51.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 120; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.599 mW/g

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

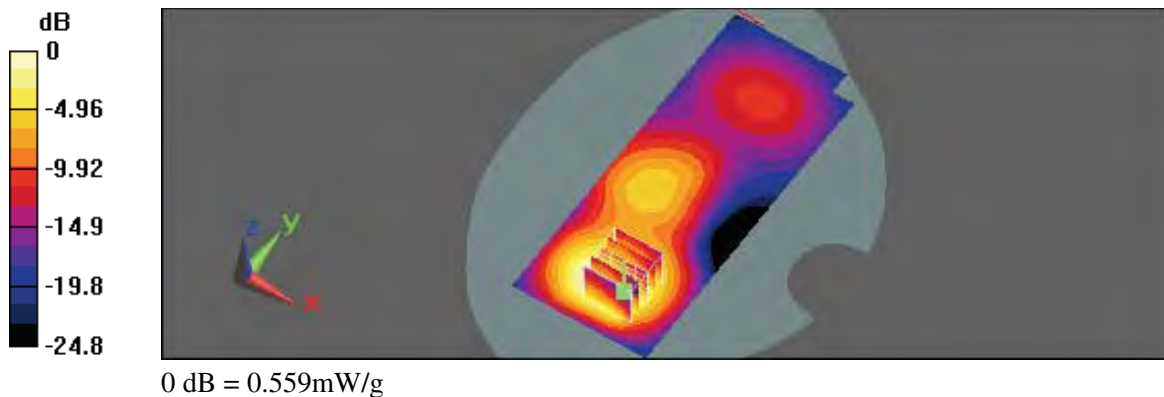
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 8.02 V/m; Power Drift = 0.105 dB

Peak SAR (extrapolated) = 0.793 W/kg

SAR(1 g) = 0.516 mW/g; SAR(10 g) = 0.324 mW/g

Maximum value of SAR (measured) = 0.559 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/24/2008 4:48:05 PM

Flat_PCS GPRS CH810_3Down1Up_EUT Open LCD to Phantom 15mm_Headset

DUT 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

Communication System: PCS GPRS(3Down,1Up); Frequency: 1909.8 MHz;Duty Cycle: 1:8.3

Medium parameters used: $f = 1910 \text{ MHz}$; $\sigma = 1.52 \text{ mho/m}$; $\epsilon_r = 51.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 120; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.556 mW/g

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

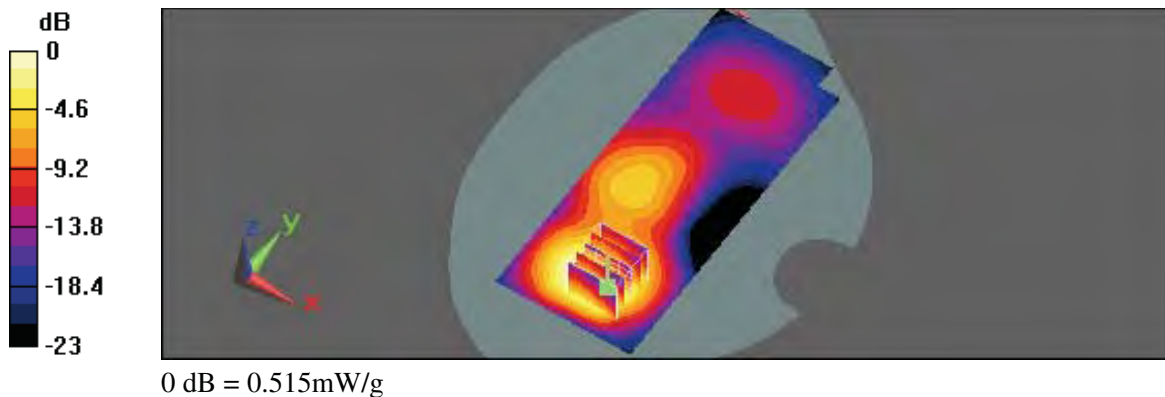
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 7.62 V/m; Power Drift = 0.180 dB

Peak SAR (extrapolated) = 0.745 W/kg

SAR(1 g) = 0.479 mW/g; SAR(10 g) = 0.299 mW/g

Maximum value of SAR (measured) = 0.515 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/24/2008 2:35:12 PM

Flat_PCS GPRS CH810_3Down2Up_EUT Open LCD to Phantom 15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.52$ mho/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 120; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x151x1):

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

Maximum value of SAR (interpolated) = 0.712 mW/g

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

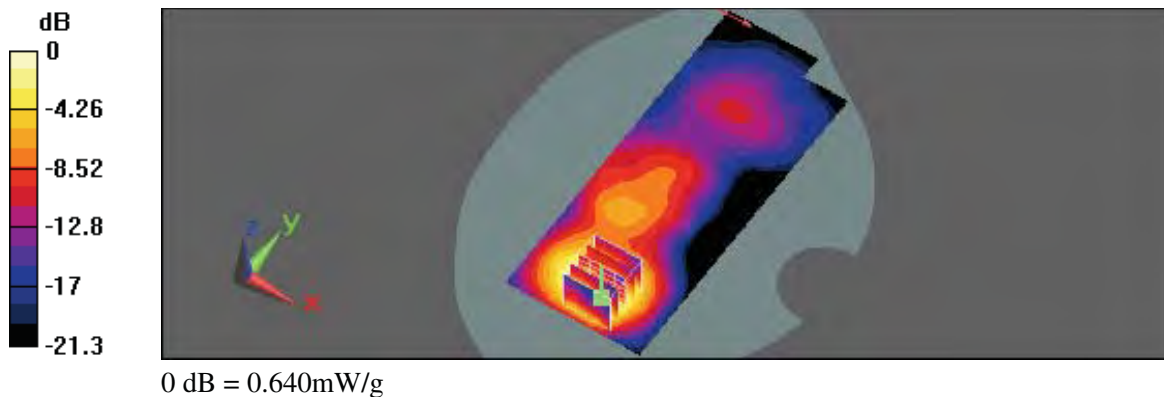
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.52 V/m; Power Drift = 0.0833 dB

Peak SAR (extrapolated) = 0.791 W/kg

SAR(1 g) = 0.553 mW/g; SAR(10 g) = 0.343 mW/g

Maximum value of SAR (measured) = 0.640 mW/g





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 10/24/2008 3:16:03 PM

Flat_PCS GPRS CH810_3Down2Up_EUT Close Top to Phantom 15mm_Headset

DUT: 830T, CL4-J01; Type: Mobile Phone; FCC ID: SP2-CL4-J01

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

Medium parameters used: $f = 1910 \text{ MHz}$; $\sigma = 1.52 \text{ mho/m}$; $\epsilon_r = 51.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3150; ConvF(4.95, 4.95, 4.95); Calibrated: 1/9/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1150 and higher
- Measurement SW: DASYS, V5.0 Build 120; SEMCAD X Version 13.2 Build 87

Flat/Area Scan (61x91x1):

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

Maximum value of SAR (interpolated) = 0.200 mW/g

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

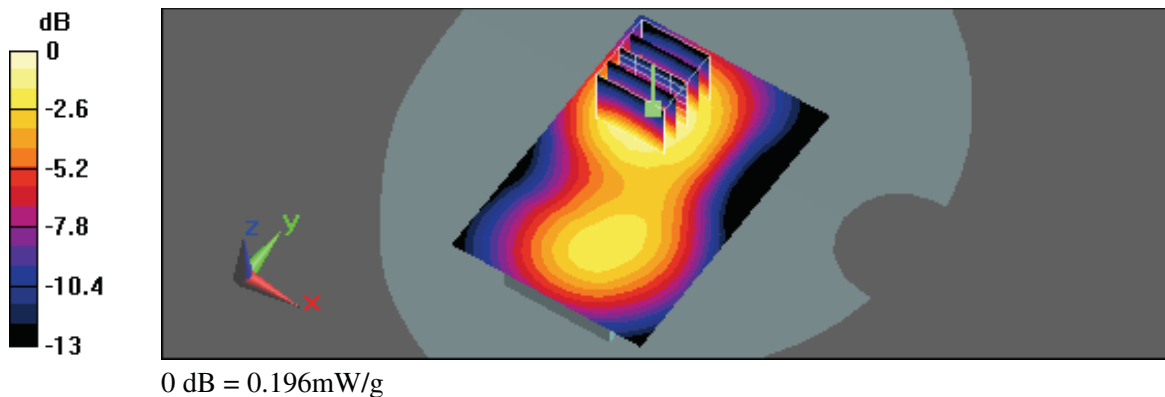
Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 9.8 V/m; Power Drift = 0.0019 dB

Peak SAR (extrapolated) = 0.296 W/kg

SAR(1 g) = 0.182 mW/g; SAR(10 g) = 0.111 mW/g

Maximum value of SAR (measured) = 0.196 mW/g





Appendix C - Calibration

All of the instruments Calibration information are listed below.

- Dipole _ D1950V3 SN: 1117 Calibration No.D1950V3-1117_Dec07
- Probe _ ES3DV3 SN:3150 Calibration No.ES3-3150_Jan08
- DAE _ DAE4 SN:779 Calibration No.DAE4-779_ Nov07



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

Accreditation No.: **SCS 108**

Client **ATL (Auden)**

Certificate No: **D1950V3-1117_Dec07**

CALIBRATION CERTIFICATE

Object **D1950V3 - SN: 1117**

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

Calibration date: **December 20, 2007**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference Probe ET3DV6 (HF)	SN 1507	26-Oct-07 (SPEAG, No. ET3-1507_Oct07)	Oct-08
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

Calibrated by: **Name** **Function** **Signature**
Marcel Fehr **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Issued: December 20, 2007

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



Accredited by the Swiss Accreditation Service (SAS)

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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- d) DASY4 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	DASY4	V4.7
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	1950 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	39.0 \pm 6 %	1.38 mho/m \pm 6 %
Head TSL temperature during test	(21.4 \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	10.0 mW / g
SAR normalized	normalized to 1W	40.0 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	39.8 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	5.24 mW / g
SAR normalized	normalized to 1W	21.0 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	20.8 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	52.9 ± 6 %	1.51 mho/m ± 6 %
Body TSL temperature during test	(21.8 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	condition	
SAR measured	250 mW input power	10.3 mW / g
SAR normalized	normalized to 1W	41.2 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	41.2 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.44 mW / g
SAR normalized	normalized to 1W	21.8 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	21.7 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	49.7 Ω - 2.8 j Ω
Return Loss	- 31.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.3 Ω - 2.1 j Ω
Return Loss	- 25.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.197 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 20, 2006

DASY4 Validation Report for Head TSL

Date/Time: 17.12.2007 12:12:25

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1950 MHz; Type: D1950V3; Serial: D1950V3 - SN1117

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

Medium: HSL1950;

Medium parameters used: $f = 1950$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 39$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.78, 4.78, 4.78); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

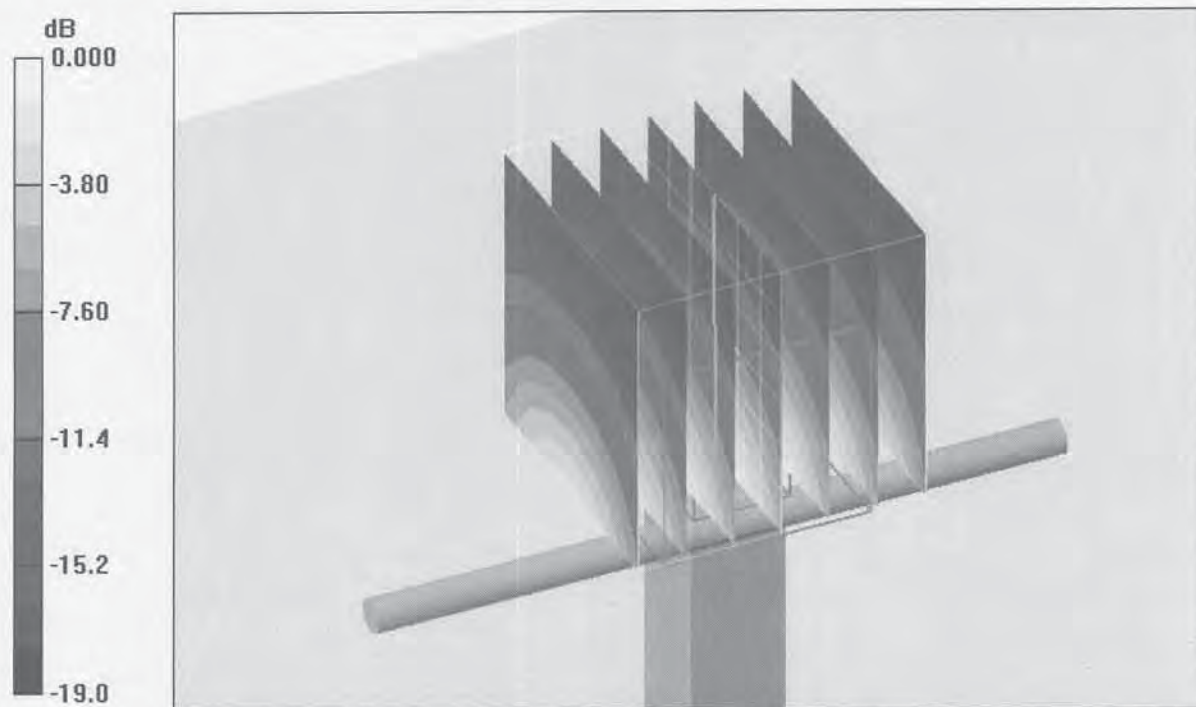
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.8 V/m; Power Drift = 0.012 dB

Peak SAR (extrapolated) = 17.3 W/kg

SAR(1 g) = 10 mW/g; SAR(10 g) = 5.24 mW/g

Maximum value of SAR (measured) = 11.3 mW/g

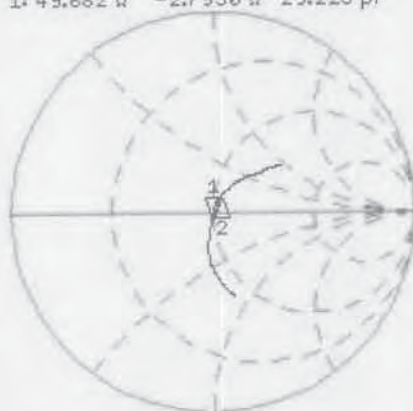


0 dB = 11.3mW/g

Impedance Measurement Plot for Head TSL

17 Dec 2007 11:46:41
 CH1 S11 1 U FS 1: 49.682 Ω -2.7930 Ω 29.223 pF 1 950.000 000 MHz

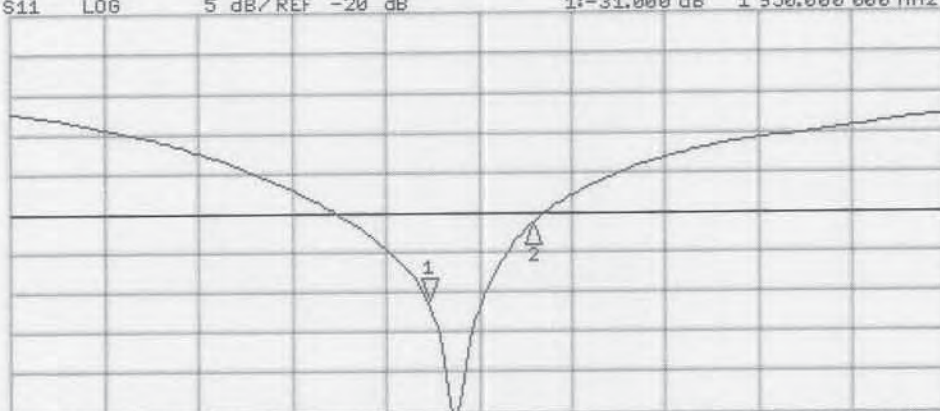
*
 Del
 Cor
 Avg
 16
 ↑



CH1 Markers
 2: 52.941 Ω
 8.2344 Ω
 2.00000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1:-31.000 dB 1 950.000 000 MHz

Cor
 Avg
 16
 ↑



CH2 Markers
 2:-21.442 dB
 2.00000 GHz

DASY4 Validation Report for Body TSL

Date/Time: 20.12.2007 14:08:46

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1950 MHz; Type: D1950V3; Serial: D1950V3 - SN1117

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

Medium: MSL1950;

Medium parameters used: $f = 1950$ MHz; $\sigma = 1.51$ mho/m; $\epsilon_r = 52.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.33, 4.33, 4.33); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

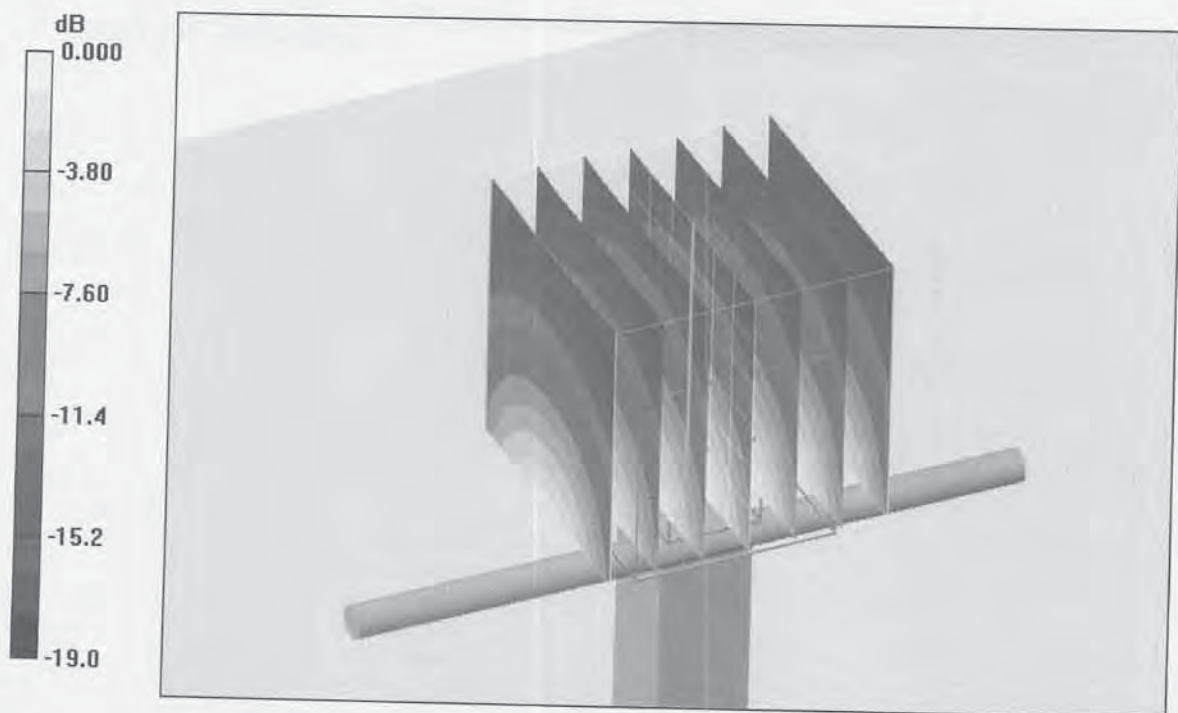
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.9 V/m; Power Drift = -0.007 dB

Peak SAR (extrapolated) = 18.0 W/kg

SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.44 mW/g

Maximum value of SAR (measured) = 11.7 mW/g



0 dB = 11.7mW/g

Impedance Measurement Plot for Body TSL

20 Dec 2007 14:10:31
 CH1 S11 1 U FS 1: 45.281 Ω -2.1367 Ω 38.198 pF 1 950.000 000 MHz

*
 De1
 Cor



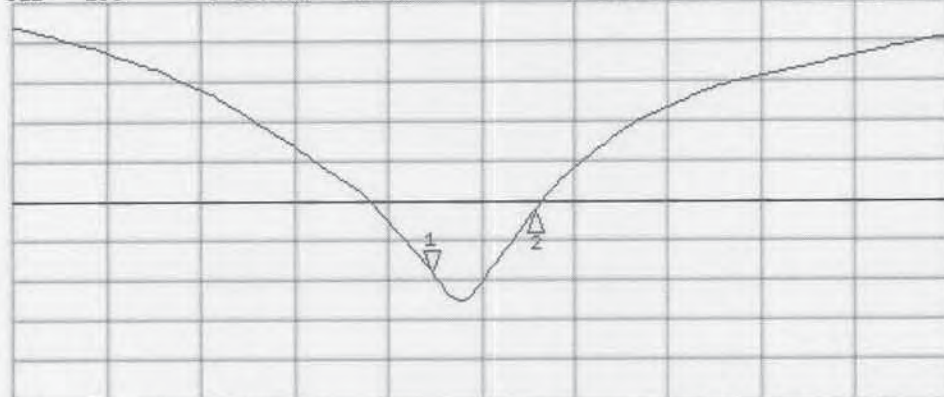
CH1 Markers
 2: 48.936 Ω
 8.9180 Ω
 2.00000 GHz

Avg
 16
 ↑

CH2 S11 LOG 3 dB/REF -20 dB 1: -25.296 dB 1 950.000 000 MHz

Cor

Avg
 16
 ↑



CH2 Markers
 2: -20.876 dB
 2.00000 GHz

START 1 750.000 000 MHz

STOP 2 200.000 000 MHz



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Accreditation No.: **SCS 108**

Client **ATL (Auden)**

Certificate No: **ES3-3150_Jan08**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3150**

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

Calibration date: **January 9, 2008**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (SPEAG, No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08

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

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	

	Name	Function
Approved by:	Fin Bomholt	R&D Director

Issued: January 10, 2008

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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
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 (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{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.

Probe ES3DV3

SN:3150

Manufactured:

June 12, 2007

Calibrated:

January 9, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV3 SN:3150

Sensitivity in Free Space^A

NormX	1.24 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.25 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.24 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression^B

DCP X	89 mV
DCP Y	93 mV
DCP Z	98 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL **900 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance	3.0 mm	4.0 mm
SAR _{be} [%] Without Correction Algorithm	11.0	6.8
SAR _{be} [%] With Correction Algorithm	0.8	0.5

TSL **1810 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance	3.0 mm	4.0 mm
SAR _{be} [%] Without Correction Algorithm	11.5	7.2
SAR _{be} [%] With Correction Algorithm	0.3	0.6

Sensor Offset

Probe Tip to Sensor Center **2.0 mm**

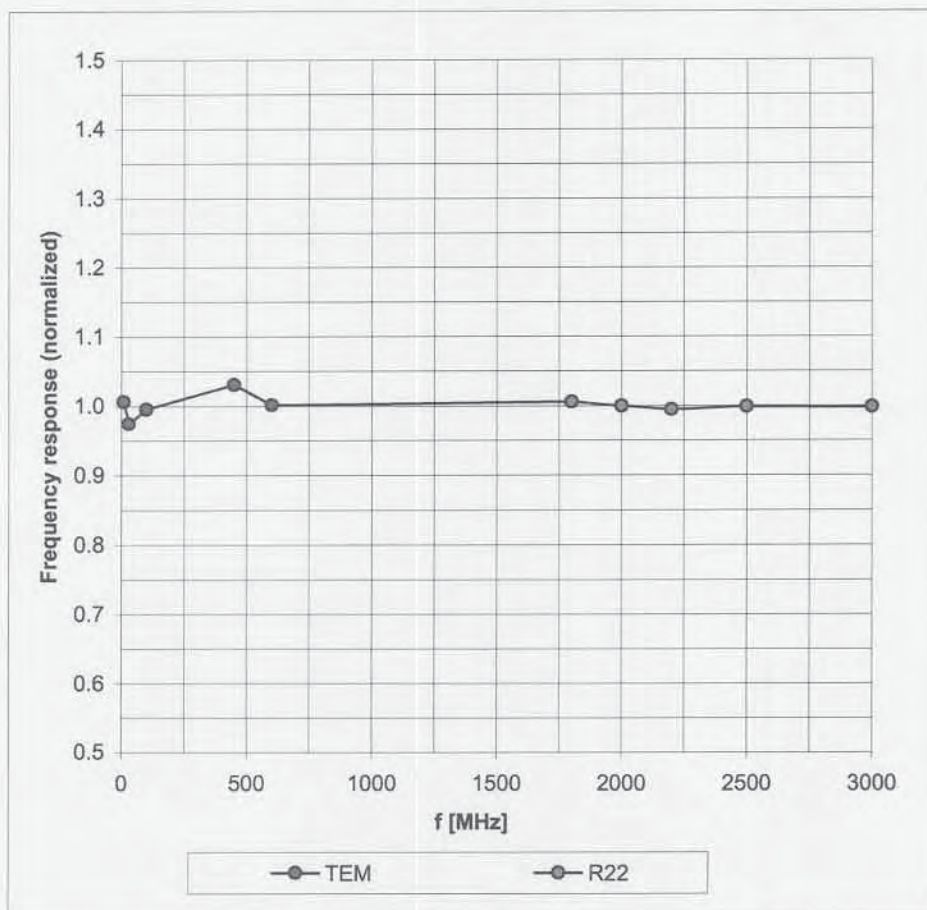
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Page 8).

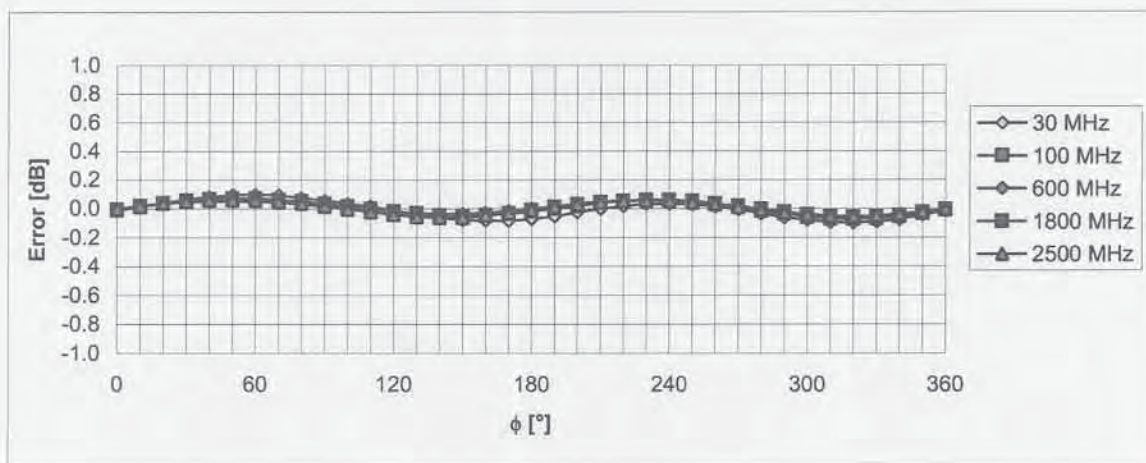
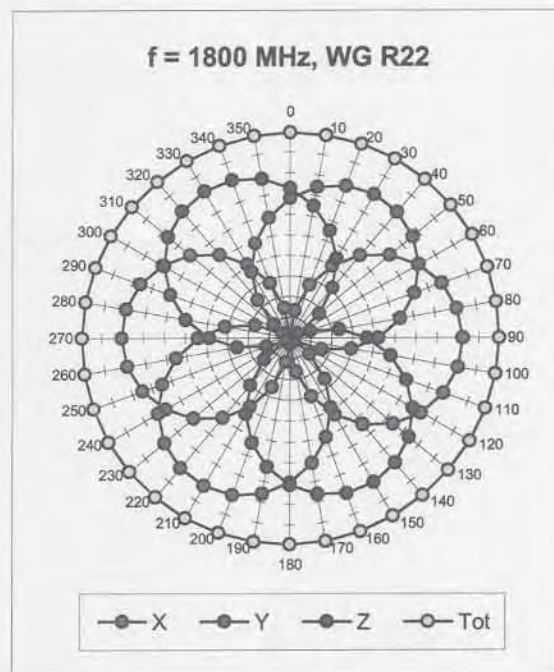
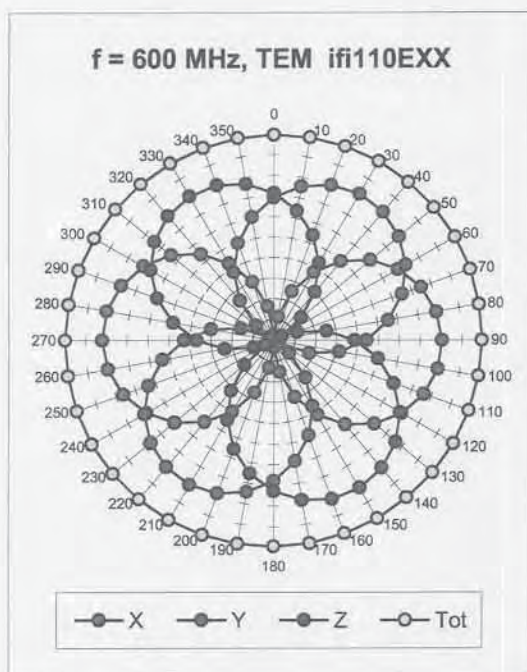
^B Numerical linearization parameter: uncertainty not required.

Frequency Response of E-Field

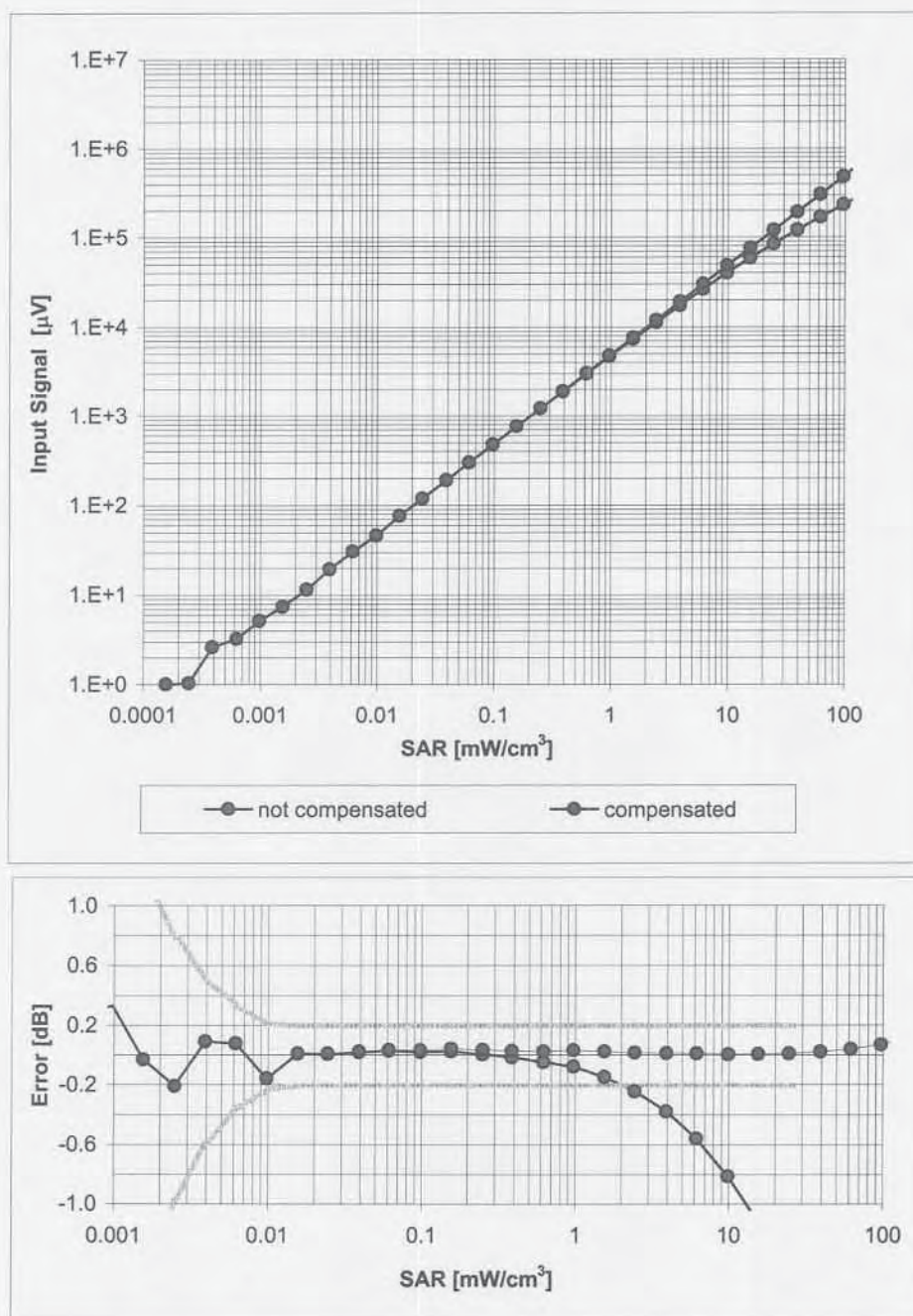
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

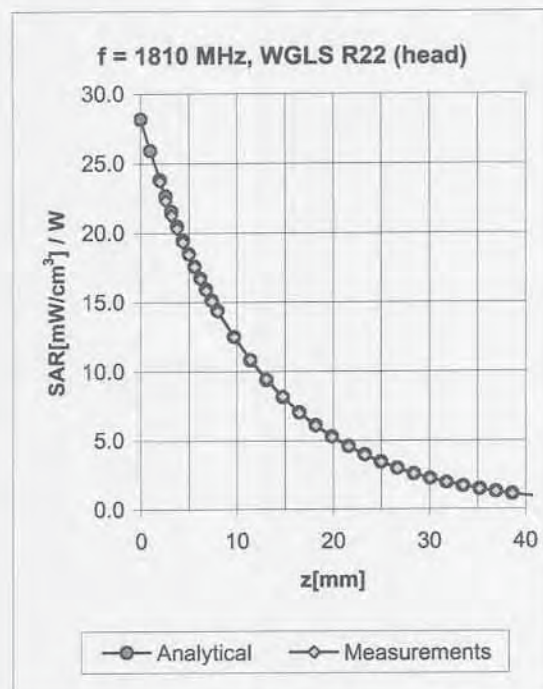
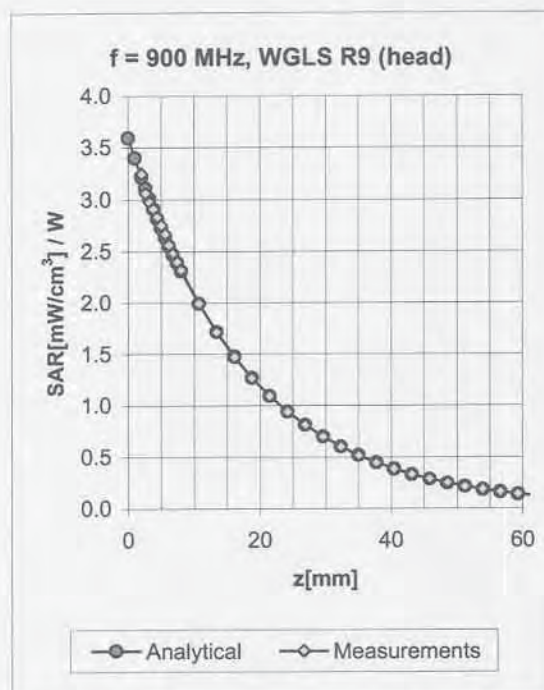
Receiving Pattern (ϕ), $\vartheta = 0^\circ$ Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$)



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

Conversion Factor Assessment

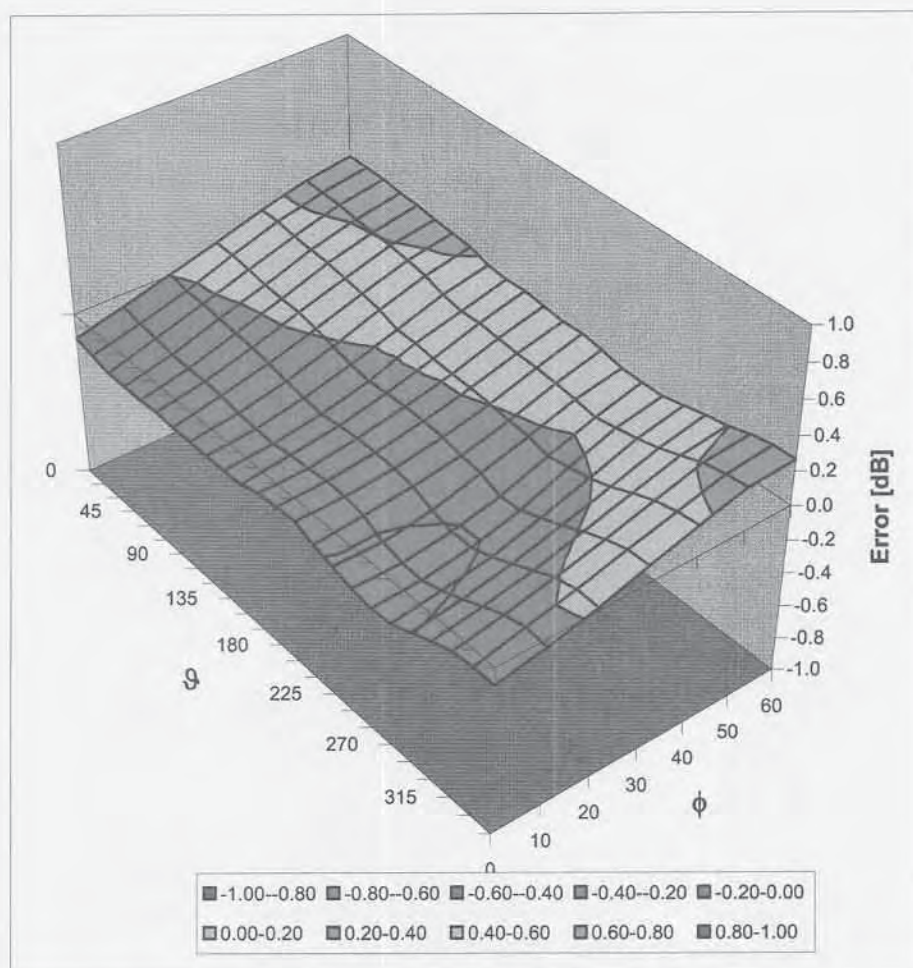


f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.77	1.35	6.23	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.89	1.24	5.11	± 11.0% (k=2)
2000	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.66	1.48	4.84	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.63	1.52	4.54	± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.80	1.30	6.00	± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.96	1.12	4.95	± 11.0% (k=2)
2000	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.76	1.29	4.55	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.63	1.48	4.19	± 11.8% (k=2)

^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.

Deviation from Isotropy in HSL

Error (ϕ , ϑ), $f = 900$ MHz



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



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Accreditation No.: **SCS 108**

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Client

ATL (Auden)

Certificate No: **DAE4-779_Nov07**

CALIBRATION CERTIFICATE

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

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

Calibration date: **November 30, 2007**

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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	04-Oct-07 (Elcal AG, No: 6467)	Oct-08
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-07 (Elcal AG, No: 6465)	Oct-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	25-Jun-07 (SPEAG, in house check)	In house check Jun-08

Calibrated by: **Dominique Steffen** **Technician** **Signature**

Approved by: **Fin Bornholt** **R&D Director**

Issued: November 30, 2007

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	404.367 \pm 0.1% (k=2)	403.591 \pm 0.1% (k=2)	403.822 \pm 0.1% (k=2)
Low Range	3.97765 \pm 0.7% (k=2)	3.96449 \pm 0.7% (k=2)	3.98429 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	83 ° \pm 1 °
---	----------------

Appendix

1. DC Voltage Linearity

High Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	200000	200000.1	0.00
Channel X	+ Input	20000	20006.71	0.03
Channel X	- Input	20000	-20000.39	0.00
Channel Y	+ Input	200000	200000.5	0.00
Channel Y	+ Input	20000	20003.40	0.02
Channel Y	- Input	20000	-19997.93	-0.01
Channel Z	+ Input	200000	200000.1	0.00
Channel Z	+ Input	20000	20004.76	0.02
Channel Z	- Input	20000	-20002.27	0.01

Low Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	2000	2000.1	0.00
Channel X	+ Input	200	200.18	0.09
Channel X	- Input	200	-200.54	0.27
Channel Y	+ Input	2000	1999.9	0.00
Channel Y	+ Input	200	200.20	0.10
Channel Y	- Input	200	-200.13	0.06
Channel Z	+ Input	2000	2000.1	0.00
Channel Z	+ Input	200	198.86	-0.57
Channel Z	- Input	200	-200.95	0.47

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	-4.93	-6.03
	- 200	6.78	5.47
Channel Y	200	13.74	12.68
	- 200	-14.43	-14.38
Channel Z	200	2.46	1.41
	- 200	-3.80	-4.27

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	-	2.10	-0.74
Channel Y	200	0.76	-	2.81
Channel Z	200	-1.70	-0.57	-

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	15628	16435
Channel Y	15822	16748
Channel Z	16264	16116

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	-0.15	-1.88	1.72	0.52
Channel Y	-1.21	-3.52	1.65	0.67
Channel Z	-1.21	-2.77	-0.09	0.40

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.1999	201.5
Channel Y	0.1999	201.2
Channel Z	0.2000	201.4

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