

## DECLARATION OF COMPLIANCE SAR RF EXPOSURE EVALUATION

### Test Lab

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<b>FCC IDENTIFIER:</b>	<b>K7GT8270D</b>
<b>IC IDENTIFIER:</b>	<b>2415B-T8270D</b>
<b>Model(s):</b>	<b>T8260D / T8270D / RT210</b>

<b>Rule Part(s):</b>	<b>FCC 47 CFR §2.1093; IC RSS-102 Issue 1 (Provisional)</b>
<b>Test Procedure(s):</b>	<b>FCC OET Bulletin 65, Supplement C (Edition 01-01)</b>
<b>Device Type:</b>	<b>Portable UHF FRS/GMRS PTT Radio Transceiver</b>

<b>Tx Frequency Range(s):</b>	<b>462.5500 - 462.7250 MHz (GMRS Channels 15-22)</b> <b>462.5625 - 462.7125 MHz (FRS/GMRS Channels 1-7)</b> <b>467.5625 - 467.7125 MHz (FRS Channels 8-14)</b>
<b>Max. RF Output Power Tested:</b>	<b>0.527 Watts (27.22 dBm) ERP (GMRS 462.7125 MHz)</b>
<b>Modulation:</b>	<b>FM (UHF)</b>

<b>Antenna Type(s) Tested:</b>	<b>Fixed Helical</b>
<b>Battery Type(s) Tested:</b>	<b>NiMH (3.6 V, 600 mAh), Alkaline x3 (1.5 V AA)</b> <b>Alkaline Type 1: Duracell Procell (2850 mAh)</b> <b>Alkaline Type 2: Energizer E91 (2850 mAh)</b>
<b>Body-Worn Accessories Tested:</b>	<b>Plastic Swivel Belt-Clip (P/N: KEM-PK10873)</b> <b>Earbud with Boom-Microphone (P/N: KESP-202)</b>

<b>Max. SAR Levels Evaluated:</b>	<b>1.16 W/kg - Face-held (100% duty cycle)</b> <b>1.10 W/kg - Body-worn (100% duty cycle)</b>
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Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01) and Industry Canada RSS-102 Issue 1 (Provisional) for the General Population / Uncontrolled Exposure environment. All measurements were performed in accordance with the SAR system manufacturer recommendations.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc. The results and statements contained in this report pertain only to the device(s) evaluated.



**Russell W. Pipe**  
Senior Compliance Technologist  
Celltech Labs Inc.



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## 1.0 INTRODUCTION

This measurement report demonstrates compliance of the Giant Electronics Ltd. (Models: T8260D/T8270D/RT210) Portable UHF FRS/GMRS PTT Radio Transceiver FCC ID: K7GT8270D with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]), and Health Canada's Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C (Edition 01-01) (see reference [3]) and IC RSS-102 Issue 1 (Provisional) (see reference [4]), were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the provisions of the rules are included within this test report.

## 2.0 DESCRIPTION OF DEVICE UNDER TEST (DUT)

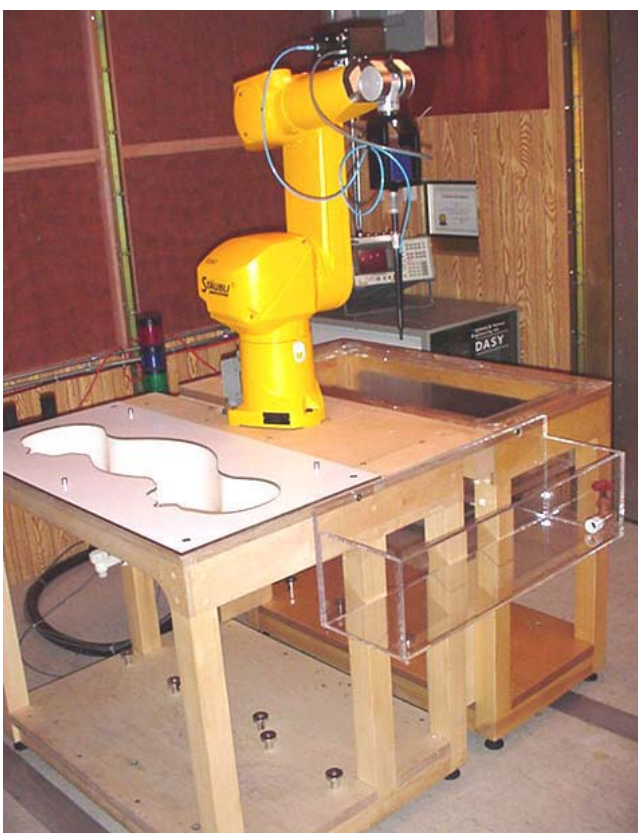
Rule Part(s)	FCC 47 CFR §2.1093		
	IC RSS-102 Issue 1 (Provisional)		
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)		
Device Type	Portable UHF FRS/GMRS PTT Radio Transceiver		
FCC IDENTIFIER	K7GT8270D		
IC IDENTIFIER	2415B-T8270D		
Model(s)	T8260D / T8270D / RT210		
Serial No.	Unit #2	Production Unit	
Modulation	FM (UHF)		
Tx Frequency Range(s)	462.5500 - 462.7250 MHz (GMRS Channels 15-22)		
	462.5625 - 462.7125 MHz (FRS/GMRS Channels 1-7)		
	467.5625 - 467.7125 MHz (FRS Channels 8-14)		
Max. RF Output Power Tested	0.527 Watts (27.22 dBm) ERP (GMRS 462.7125 MHz)		
Battery Type(s) Tested	NiMH	3.6 V	600 mAh
	Alkaline AA (x3)	1.5 V	Duracell Procell 2850 mAh
			Energizer E91 2850 mAh
Antenna Type(s) Tested	Fixed Helical		
Body-Worn Accessories Tested	Plastic Swivel Belt-Clip (P/N: KEM-PK10873)		
	Earbud with Boom-Microphone (P/N: KESP-202)		

### 3.0 SAR MEASUREMENT SYSTEM

Celltech Labs Inc. SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for brain and/or body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server. The DAE4 utilizes 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 DASY4 measurement server 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. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.



DASY4 SAR Measurement System with validation phantom



DASY4 SAR Measurement System with Plexiglas planar phantom

## 4.0 MEASUREMENT SUMMARY

### SAR EVALUATION RESULTS

Test Type	Freq. (MHz)	Chan.	Test Mode	Battery Type	Antenna Position	Body-worn Accessories	Separation Distance to Planar Phantom (cm)	ERP Measured Before Test (dBm)	Measured SAR 1g (W/kg)		SAR Drift During Test (dB)	Scaled SAR 1g (W/kg)		
									Duty Cycle			Duty Cycle		
									100%	50%		100%	50%	
Face	462.7125	7	CW	NiMH	Fixed	--	2.5	27.22	0.890	0.445	-0.514	1.00	0.501	
Face	462.7125	7	CW	Duracell Alkaline	Fixed	--	2.5	27.22	0.958	0.479	-0.427	1.06	0.528	
Face	462.7125	7	CW	Energizer Alkaline	Fixed	--	2.5	27.22	1.03	0.515	-0.514	1.16	0.580	
Body	462.7125	7	CW	NiMH	Fixed	Earbud-Mic Belt-Clip	2.0	27.22	0.993	0.497	-0.445	1.10	0.550	
Body	462.7125	7	CW	Duracell Alkaline	Fixed	Earbud-Mic Belt-Clip	2.0	27.22	0.907	0.454	-0.476	1.01	0.506	
ANSI / IEEE C95.1 1999 - SAFETY LIMIT Spatial Peak - Uncontrolled Exposure / General Population BRAIN / BODY: 1.6 W/kg (averaged over 1 gram)														
Dielectric Constant $\epsilon_r$	450 MHz Brain				450 MHz Body			Atmospheric Pressure		Brain	102.4	Body	102.5	kPa
	IEEE Target		Measured	IEEE Target		Measured	Relative Humidity		Brain	41	Body	41	%	
	43.5	$\pm 5\%$	43.7	56.7	$\pm 5\%$	57.8	Ambient Temperature		Brain	23.7	Body	24.0	°C	
Conductivity $\sigma$ (mho/m)	450 MHz Brain				450 MHz Body			Fluid Temperature		Brain	23.5	Body	22.4	°C
	IEEE Target		Measured	IEEE Target		Measured	Fluid Depth		Brain	$\geq 15$	Body	$\geq 15$	cm	
	0.87	$\pm 5\%$	0.90	0.94	$\pm 5\%$	0.96	$\rho$ (Kg/m <sup>3</sup> )		1000					

Note(s):

- The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
- The transmission band of the DUT is less than 10 MHz, therefore mid channel test data only is reported (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
- The DUT was evaluated for SAR with Duracell Procell alkaline batteries. To report a SAR comparison between alternate alkaline battery types, the maximum SAR level configuration evaluated with Duracell Procell alkaline batteries was repeated using Energizer E91 alkaline batteries.
- The power drifts measured by the DASY4 system for the duration of the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the above table.
- A SAR-versus-Time power drift evaluation was performed for the test configuration that reported the maximum scaled SAR level (Face-held, Energizer alkaline batteries). See Appendix A (SAR Test Plots) for SAR-versus-Time power drift evaluation plot.
- The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures reported were consistent for all measurement periods.
- The dielectric parameters of the simulated tissues were measured prior to the evaluation using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).
- The SAR evaluations were performed within 24 hours of the system performance check.



## 5.0 DETAILS OF SAR EVALUATION

The Giant Electronics Ltd. (Models: T8260D/T8270D/RT210) Portable UHF FRS/GMRS PTT Radio Transceiver FCC ID: K7GT8270D was compliant for localized Specific Absorption Rate (General Population / Uncontrolled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix F.

1. The DUT was evaluated in a face-held configuration with the front of the radio placed parallel to the outer surface of the planar phantom. A 2.5 cm separation distance was maintained between the front side of the DUT and the outer surface of the planar phantom for the duration of the tests.
2. The DUT was tested in a body-worn configuration with the back of the radio placed parallel to the outer surface of the planar phantom. The attached plastic swivel belt-clip accessory was touching the planar phantom and provided a 2.0 cm separation distance from the back of the DUT to the outer surface of the planar phantom. The DUT was evaluated for body-worn SAR with the Earbud/Boom-Microphone accessory connected to the audio port.
3. The conducted output power of the DUT could not be measured prior to the SAR evaluations due to a non-detachable antenna. The DUT was evaluated for SAR at the maximum conducted power level preset by the manufacturer.
4. The DUT was evaluated for SAR at the maximum ERP level measured prior to the SAR evaluation on a 3-meter Open Area Test Site using the signal substitution method in accordance with ANSI TIA/EIA-603-A-2001.
5. The power drifts measured by the DASY4 system for the duration of the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the test data table (page 5).
6. A SAR-versus-Time power drift evaluation was performed for the test configuration that reported the maximum scaled SAR level (Face-held, Energizer alkaline batteries). See Appendix A (SAR Test Plots) for SAR-versus-Time power drift evaluation plot.
7. The area scan evaluation was performed with fully charged batteries. After the area scan was completed the radio was cooled down to room temperature and the batteries were replaced with fully charged batteries prior to the zoom scan evaluation.
8. The DUT was tested in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the transmit key constantly depressed. For a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
9. The SAR evaluations were performed using a Plexiglas planar phantom.
10. A stack of low-density, low-loss dielectric foamed polystyrene was used in place of the device holder.

## 6.0 EVALUATION PROCEDURES

- (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.
- (ii) For body-worn and face-held devices a planar phantom was used.
- The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.

An area scan was determined as follows:

- Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.
- A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.

A 1g and 10g spatial peak SAR was determined as follows:

- Extrapolation is used to find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.4 mm (see probe calibration document in Appendix D). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.
- Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).
- A zoom scan volume of 32 mm x 32 mm x 30 mm (5 x 5 x 7 points) centered at the peak SAR location determined from the area scan is used for all zoom scans for devices with a transmit frequency < 800 MHz. Zoom scans for frequencies ≥ 800 MHz are determined with a scan volume of 30 mm x 30 mm x 30 mm (7 x 7 x 7) to ensure complete capture of the peak spatial-average SAR.

## 7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluation a system check was performed with a Plexiglas planar phantom and 450MHz dipole (see Appendix C for system validation procedures). The dielectric parameters of the simulated brain tissue were measured prior to the system performance check using an HP 85070C Dielectric Probe Kit and HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters). A forward power of 250mW was applied to the dipole and the system was verified to a tolerance of  $\pm 10\%$  (see Appendix B for system performance check test plot).

SYSTEM PERFORMANCE CHECK													
Test Date	450MHz Equiv. Tissue	SAR 1g (W/kg)		Dielectric Constant $\epsilon_r$		Conductivity $\sigma$ (mho/m)		$\rho$ (Kg/m <sup>3</sup> )	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		IEEE Target	Measured	IEEE Target	Measured	IEEE Target	Measured						
08/17/04	Brain	1.23 ( $\pm 10\%$ )	1.32 (+7.3%)	43.5 $\pm 5\%$	43.7	0.87 $\pm 5\%$	0.90	1000	24.1	23.5	$\geq 15$	45	102.4

Note(s):

1. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the system performance check. The temperatures reported in the table above were consistent for all measurement periods.

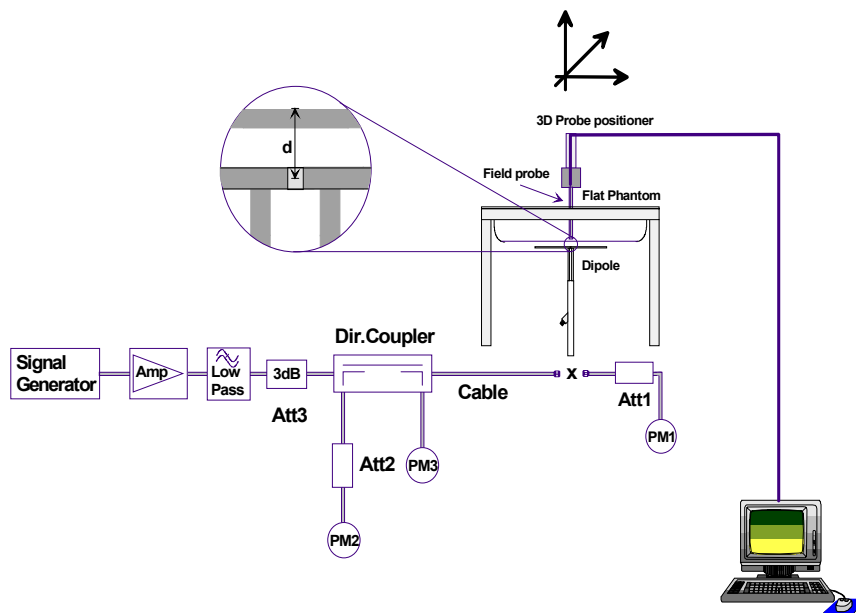


Figure 1. System Performance Check Setup Diagram



450 MHz Dipole Setup

## 8.0 SIMULATED EQUIVALENT TISSUES

The 450MHz brain and body simulated tissue mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. The fluid was prepared according to standardized procedures, and measured for dielectric parameters (permittivity and conductivity).

SIMULATED TISSUE MIXTURES		
INGREDIENT	450MHz Brain (System Check & DUT Evaluation)	450MHz Body (DUT Evaluation)
Water	38.56 %	52.00 %
Sugar	56.32 %	45.65 %
Salt	3.95 %	1.75 %
HEC	0.98 %	0.50 %
Bactericide	0.19 %	0.10 %

## 9.0 SAR SAFETY LIMITS

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10g)	4.0	20.0

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.



## 10.0 ROBOT SYSTEM SPECIFICATIONS

### Specifications

**POSITIONER:** Stäubli Unimation Corp. Robot Model: RX60L  
**Repeatability:** 0.02 mm  
**No. of axis:** 6

### Data Acquisition Electronic (DAE) System

#### Cell Controller

**Processor:** AMD Athlon XP 2400+  
**Clock Speed:** 2.0 GHz  
**Operating System:** Windows XP Professional

#### Data Converter

**Features:** Signal Amplifier, multiplexer, A/D converter, and control logic  
**Software:** DASY4 software  
**Connecting Lines:** Optical downlink for data and status info.  
 Optical uplink for commands and clock

### DASY4 Measurement Server

**Function:** Real-time data evaluation for field measurements and surface detection  
**Hardware:** PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM  
**Connections:** COM1, COM2, DAE, Robot, Ethernet, Service Interface

### E-Field Probe

**Model:** ET3DV6  
**Serial No.:** 1590  
**Construction:** Triangular core fiber optic detection system  
**Frequency:** 10 MHz to 6 GHz  
**Linearity:**  $\pm 0.2$  dB (30 MHz to 3 GHz)

### Phantom(s)

#### Evaluation Phantom

**Type:** Planar Phantom  
**Shell Material:** Plexiglas  
**Bottom Thickness:** 2.0 mm  $\pm$  0.1 mm  
**Outer Dimensions:** 75.0 cm (L) x 22.5 cm (W) x 20.5 cm (H); Back Plane: 25.7 cm (H)

#### Validation Phantom ( $\leq 450$ MHz)

**Type:** Planar Phantom  
**Shell Material:** Plexiglas  
**Bottom Thickness:** 6.2 mm  $\pm$  0.1 mm  
**Outer Dimensions:** 86.0 cm (L) x 39.5 cm (W) x 21.8 cm (H)

## 11.0 PROBE SPECIFICATION (ET3DV6)

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy $\pm 8\%$ )
Frequency:	10 MHz to $> 6$ GHz; Linearity: $\pm 0.2$ dB (30 MHz to 3 GHz)
Directivity:	$\pm 0.2$ dB in brain tissue (rotation around probe axis) $\pm 0.4$ dB in brain tissue (rotation normal to probe axis)
Dynamic Range:	5 $\mu$ W/g to $> 100$ mW/g; Linearity: $\pm 0.2$ dB
Surface Detection:	$\pm 0.2$ mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 3 GHz Compliance tests of mobile phone



ET3DV6 E-Field Probe

## 12.0 PLANAR PHANTOM

The planar phantom is constructed of Plexiglas material with a 2.0 mm shell thickness for face-held and body-worn SAR evaluations of handheld radio transceivers. The planar phantom is mounted on the side of the DASY4 compact system table.



Plexiglas Planar Phantom

## 13.0 VALIDATION PLANAR PHANTOM

The validation planar phantom is constructed of Plexiglas material with a 6.0 mm shell thickness for SAR validations at 450MHz and below. The validation planar phantom is mounted in the table of the DASY4 compact system.



Validation Planar Phantom

## 14.0 DEVICE HOLDER

The DASY4 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of  $65^\circ$ . The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.



Device Holder

## 15.0 TEST EQUIPMENT LIST

TEST EQUIPMENT	SERIAL NO.	CALIBRATION DATE
Schmid & Partner DASY4 System	-	-
DASY4 Measurement Server	1078	N/A
-Robot	599396-01	N/A
DAE3	353	Dec 2003
DAE3	370	May 2004
-ET3DV6 E-Field Probe	1387	Mar 2004
-ET3DV6 E-Field Probe	1590	May 2004
-300MHz Validation Dipole	135	Oct 2003
-450MHz Validation Dipole	136	Nov 2003
-835MHz Validation Dipole	411	Mar 2004
-900MHz Validation Dipole	054	June 2004
-1800MHz Validation Dipole	247	June 2004
-2450MHz Validation Dipole	150	Sept 2003
-SAM Phantom V4.0C	1033	N/A
-Barski Planar Phantom	03-01	N/A
-Plexiglas Planar Phantom	161	N/A
-Validation Planar Phantom	137	N/A
HP 85070C Dielectric Probe Kit	N/A	N/A
Gigatronics 8651A Power Meter	8650137	April 2004
Gigatronics 8652A Power Meter	1835267	April 2004
Gigatronics 80701A Power Sensor	1833535	April 2004
Gigatronics 80701A Power Sensor	1833542	April 2004
Gigatronics 80701A Power Sensor	1834350	April 2004
HP E4408B Spectrum Analyzer	US39240170	Dec 2003
HP 8594E Spectrum Analyzer	3543A02721	April 2004
HP 8753E Network Analyzer	US38433013	April 2004
HP 8648D Signal Generator	3847A00611	April 2004
Amplifier Research 5S1G4 Power Amplifier	26235	N/A

## 16.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION						
Error Description	Uncertainty Value $\pm\%$	Probability Distribution	Divisor	$C_i$ 1g	Standard Uncertainty $\pm\%$ (1g)	$v_i$ or $v_{eff}$
<b>Measurement System</b>						
Probe calibration	$\pm 4.0$	Normal	1	1	$\pm 4.0$	$\infty$
Axial isotropy of the probe	$\pm 4.7$	Rectangular	$\sqrt{3}$	$(1-c_p)$	$\pm 1.9$	$\infty$
Spherical isotropy of the probe	$\pm 9.6$	Rectangular	$\sqrt{3}$	$(c_p)$	$\pm 3.9$	$\infty$
Spatial resolution	$\pm 0.0$	Rectangular	$\sqrt{3}$	1	$\pm 0.0$	$\infty$
Boundary effects	$\pm 5.5$	Rectangular	$\sqrt{3}$	1	$\pm 3.2$	$\infty$
Probe linearity	$\pm 4.7$	Rectangular	$\sqrt{3}$	1	$\pm 2.7$	$\infty$
Detection limit	$\pm 1.0$	Rectangular	$\sqrt{3}$	1	$\pm 0.6$	$\infty$
Readout electronics	$\pm 1.0$	Normal	1	1	$\pm 1.0$	$\infty$
Response time	$\pm 0.8$	Rectangular	$\sqrt{3}$	1	$\pm 0.5$	$\infty$
Integration time	$\pm 1.4$	Rectangular	$\sqrt{3}$	1	$\pm 0.8$	$\infty$
RF ambient conditions	$\pm 3.0$	Rectangular	$\sqrt{3}$	1	$\pm 1.7$	$\infty$
Mech. constraints of robot	$\pm 0.4$	Rectangular	$\sqrt{3}$	1	$\pm 0.2$	$\infty$
Probe positioning	$\pm 2.9$	Rectangular	$\sqrt{3}$	1	$\pm 1.7$	$\infty$
Extrapolation & integration	$\pm 3.9$	Rectangular	$\sqrt{3}$	1	$\pm 2.3$	$\infty$
<b>Test Sample Related</b>						
Device positioning	$\pm 6.0$	Normal	$\sqrt{3}$	1	$\pm 6.7$	12
Device holder uncertainty	$\pm 5.0$	Normal	$\sqrt{3}$	1	$\pm 5.9$	8
Power drift	$\pm 5.0$	Rectangular	$\sqrt{3}$		$\pm 2.9$	$\infty$
<b>Phantom and Setup</b>						
Phantom uncertainty	$\pm 4.0$	Rectangular	$\sqrt{3}$	1	$\pm 2.3$	$\infty$
Liquid conductivity (target)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
Liquid conductivity (measured)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
Liquid permittivity (target)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
Liquid permittivity (measured)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
<b>Combined Standard Uncertainty</b>					<b><math>\pm 13.03</math></b>	
<b>Expanded Uncertainty (k=2)</b>					<b><math>\pm 26.07</math></b>	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])

## MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION						
Error Description	Uncertainty Value $\pm\%$	Probability Distribution	Divisor	$C_i$ 1g	Standard Uncertainty $\pm\%$ (1g)	$v_i$ or $v_{eff}$
<b>Measurement System</b>						
Probe calibration	$\pm 4.0$	Normal	1	1	$\pm 4.0$	$\infty$
Axial isotropy of the probe	$\pm 4.7$	Rectangular	$\sqrt{3}$	$(1-c_p)$	$\pm 1.9$	$\infty$
Spherical isotropy of the probe	$\pm 9.6$	Rectangular	$\sqrt{3}$	$(c_p)$	$\pm 3.9$	$\infty$
Spatial resolution	$\pm 0.0$	Rectangular	$\sqrt{3}$	1	$\pm 0.0$	$\infty$
Boundary effects	$\pm 5.5$	Rectangular	$\sqrt{3}$	1	$\pm 3.2$	$\infty$
Probe linearity	$\pm 4.7$	Rectangular	$\sqrt{3}$	1	$\pm 2.7$	$\infty$
Detection limit	$\pm 1.0$	Rectangular	$\sqrt{3}$	1	$\pm 0.6$	$\infty$
Readout electronics	$\pm 1.0$	Normal	1	1	$\pm 1.0$	$\infty$
Response time	$\pm 0.8$	Rectangular	$\sqrt{3}$	1	$\pm 0.5$	$\infty$
Integration time	$\pm 1.4$	Rectangular	$\sqrt{3}$	1	$\pm 0.8$	$\infty$
RF ambient conditions	$\pm 3.0$	Rectangular	$\sqrt{3}$	1	$\pm 1.7$	$\infty$
Mech. constraints of robot	$\pm 0.4$	Rectangular	$\sqrt{3}$	1	$\pm 0.2$	$\infty$
Probe positioning	$\pm 2.9$	Rectangular	$\sqrt{3}$	1	$\pm 1.7$	$\infty$
Extrapolation & integration	$\pm 3.9$	Rectangular	$\sqrt{3}$	1	$\pm 2.3$	$\infty$
<b>Dipole</b>						
Dipole Axis to Liquid Distance	$\pm 2.0$	Rectangular	$\sqrt{3}$	1	$\pm 1.2$	$\infty$
Input Power	$\pm 4.7$	Rectangular	$\sqrt{3}$	1	$\pm 2.7$	$\infty$
<b>Phantom and Setup</b>						
Phantom uncertainty	$\pm 4.0$	Rectangular	$\sqrt{3}$	1	$\pm 2.3$	$\infty$
Liquid conductivity (target)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
Liquid conductivity (measured)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
Liquid permittivity (target)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
Liquid permittivity (measured)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
<b>Combined Standard Uncertainty</b>						
					<b><math>\pm 9.58</math></b>	
<b>Expanded Uncertainty (k=2)</b>						
					<b><math>\pm 19.16</math></b>	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])



## 17.0 REFERENCES

- [1] Federal Communications Commission, "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093: 1999.
- [2] Health Canada, "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz", Safety Code 6.
- [3] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.
- [4] Industry Canada, "Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields", Radio Standards Specification RSS-102 Issue 1 (Provisional): September 1999.
- [5] IEEE Standard 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques".

## APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 08/17/04

## Face-Held SAR - NiMH Battery Pack

**DUT: Giant Electronics Model: RT210; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: Unit #2**

Ambient Temp: 23.7 °C; Fluid Temp: 23.5 °C; Barometric Pressure: 102.4 kPa; Humidity: 41%

3.6V 600mAh NiMH Battery Pack

Communication System: FM (UHF)

RF Output Power: 27.22 dBm (ERP)

Frequency: 462.7125 MHz; Channel 7; Duty Cycle: 1:1

Medium: HSL450 ( $\sigma = 0.90$  mho/m;  $\epsilon_r = 43.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

- Probe: ET3DV6 - SN1590; ConvF(7.5, 7.5, 7.5); Calibrated: 24/05/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 14/05/2004
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

### Face-Held - 2.5 cm Separation Distance to Planar Phantom/Area Scan (7x14x1):

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

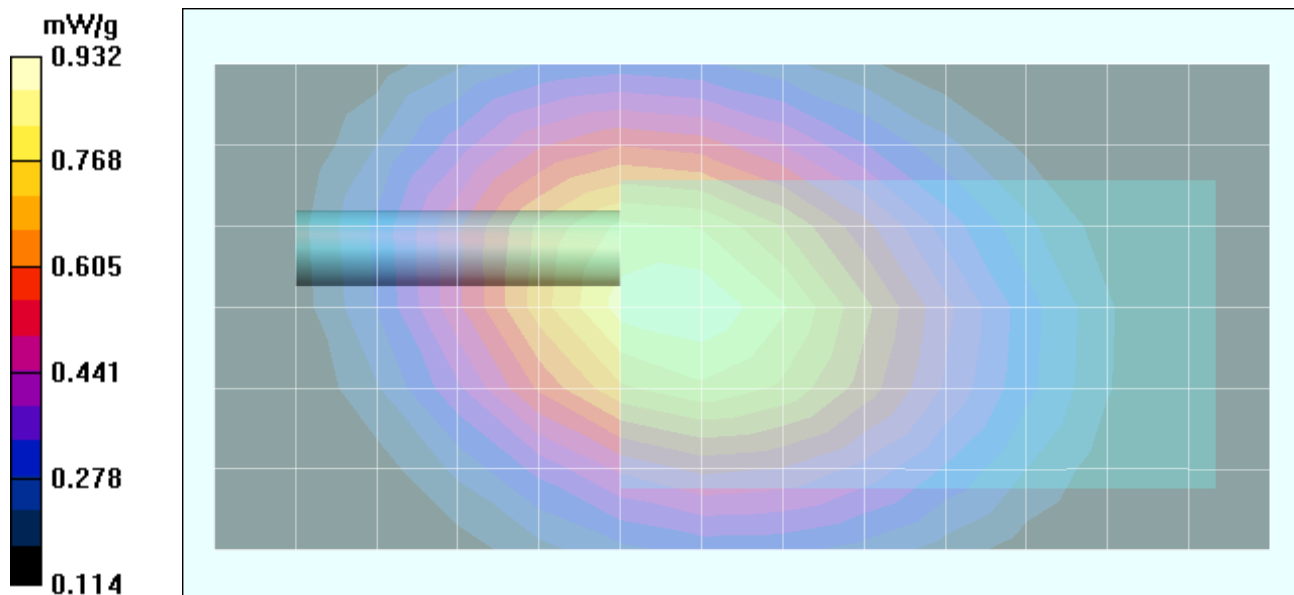
### Face-Held - 2.5 cm Separation Distance to Planar Phantom/Zoom Scan (5x5x7)/Cube 0:

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

Reference Value = 32.4 V/m; Power Drift = -0.514 dB

Peak SAR (extrapolated) = 1.36 W/kg

**SAR(1 g) = 0.890 mW/g; SAR(10 g) = 0.630 mW/g**



Date Tested: 08/17/04

## Face-Held SAR - Alkaline Batteries (Duracell Procell)

**DUT: Giant Electronics Model: RT210; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: Unit #2**

Ambient Temp: 23.7 °C; Fluid Temp: 23.5 °C; Barometric Pressure: 102.4 kPa; Humidity: 41%

1.5V 2850mAh Duracell ProCell AA Alkaline Batteries (x3)

Communication System: FM (UHF)

RF Output Power: 27.22 dBm (ERP)

Frequency: 462.7125 MHz; Channel 7; Duty Cycle: 1:1

Medium: HSL450 ( $\sigma = 0.90$  mho/m;  $\epsilon_r = 43.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

- Probe: ET3DV6 - SN1590; ConvF(7.5, 7.5, 7.5); Calibrated: 24/05/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 14/05/2004
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

### Face-Held - 2.5 cm Separation Distance to Planar Phantom/Area Scan (7x14x1):

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

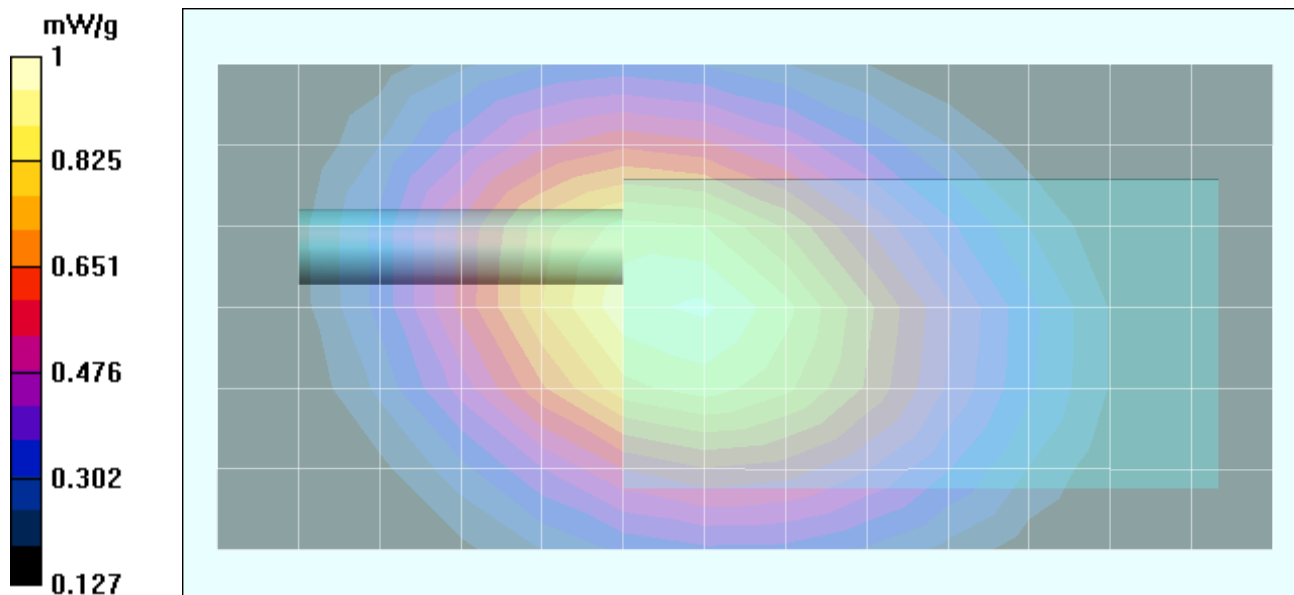
### Face-Held - 2.5 cm Separation Distance to Planar Phantom/Zoom Scan (5x5x7)/Cube 0:

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

Reference Value = 33.2 V/m; Power Drift = -0.427 dB

Peak SAR (extrapolated) = 1.46 W/kg

**SAR(1 g) = 0.958 mW/g; SAR(10 g) = 0.677 mW/g**



Date Tested: 08/17/04

## Face-Held SAR - Alkaline Batteries (Energizer E91)

**DUT: Giant Electronics Model: RT210; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: Unit #2**

Ambient Temp: 23.7 °C; Fluid Temp: 23.5 °C; Barometric Pressure: 102.4 kPa; Humidity: 41%

1.5V 2850mAh Energizer E91 AA Alkaline Batteries (x3)

Communication System: FM (UHF)

RF Output Power: 27.22 dBm (ERP)

Frequency: 462.7125 MHz; Channel 7; Duty Cycle: 1:1

Medium: HSL450 ( $\sigma = 0.90$  mho/m;  $\epsilon_r = 43.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

- Probe: ET3DV6 - SN1590; ConvF(7.5, 7.5, 7.5); Calibrated: 24/05/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 14/05/2004
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

### Face-Held - 2.5 cm Separation Distance to Planar Phantom/Area Scan (7x14x1):

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

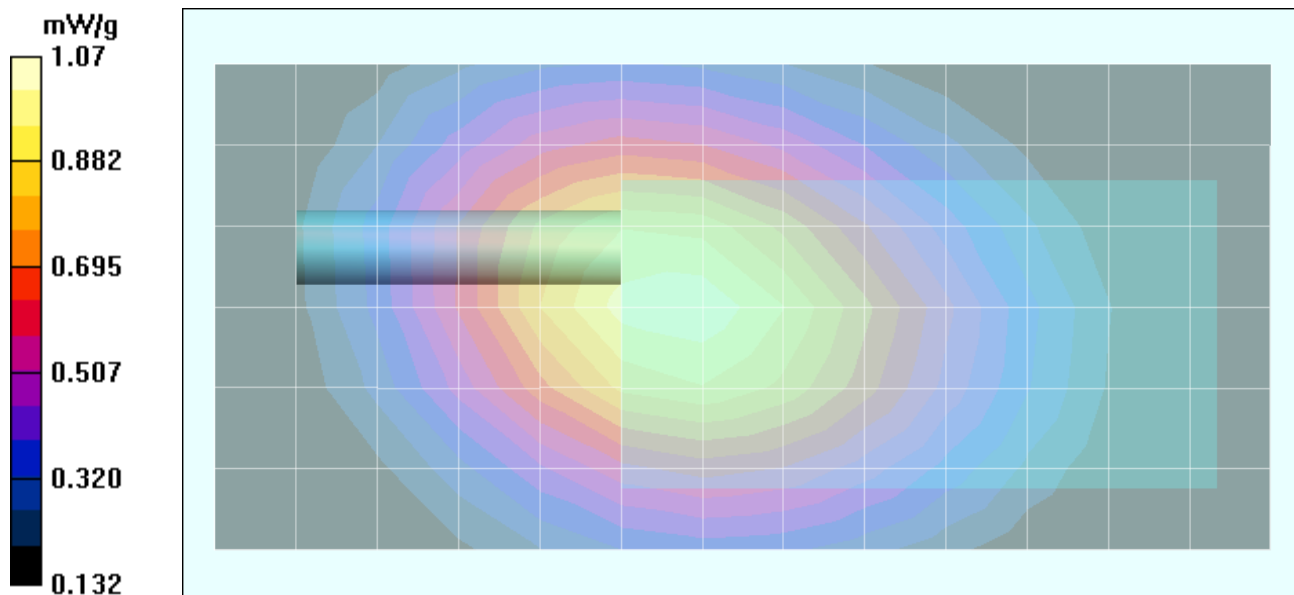
### Face-Held - 2.5 cm Separation Distance to Planar Phantom/Zoom Scan (5x5x7)/Cube 0:

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

Reference Value = 34.9 V/m; Power Drift = -0.514 dB

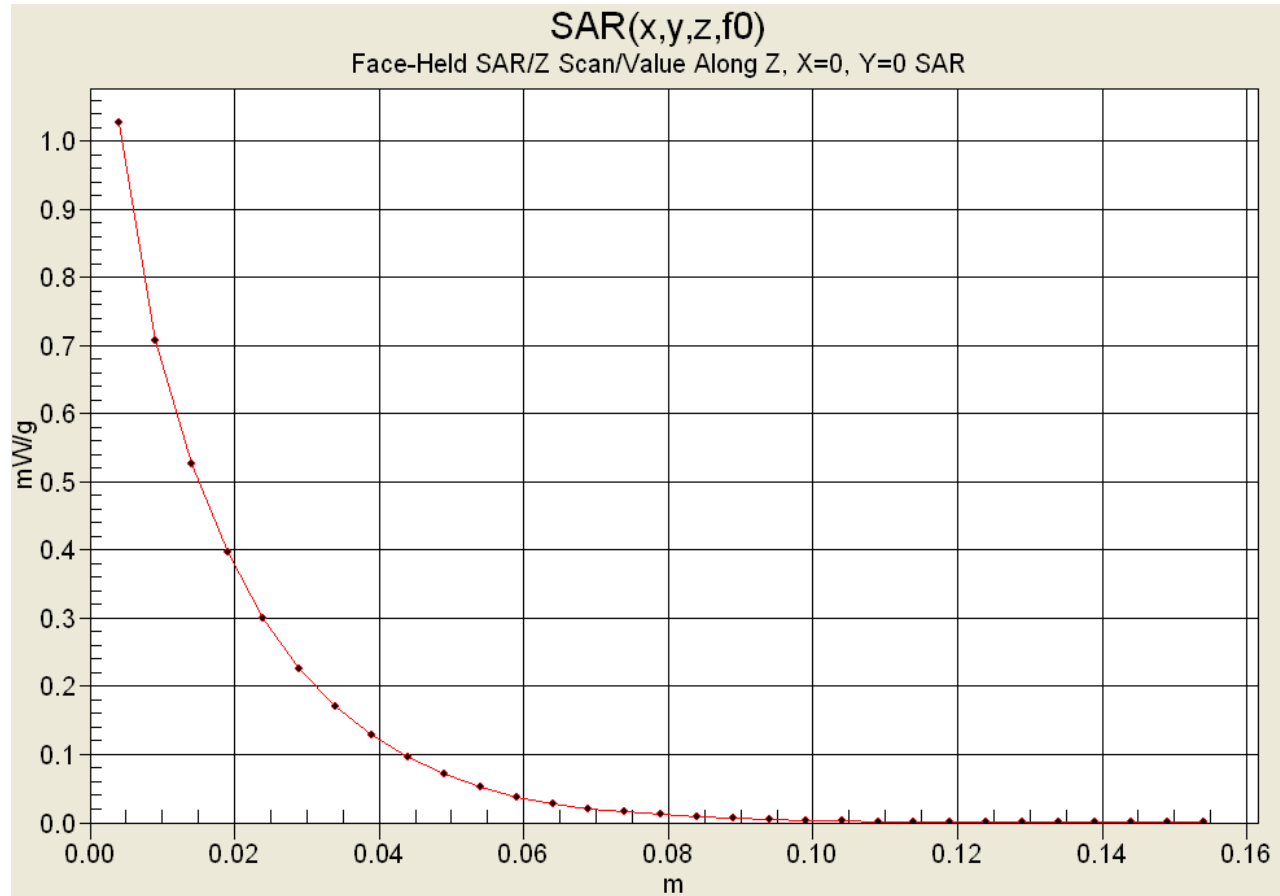
Peak SAR (extrapolated) = 1.56 W/kg

**SAR(1 g) = 1.03 mW/g; SAR(10 g) = 0.728 mW/g**





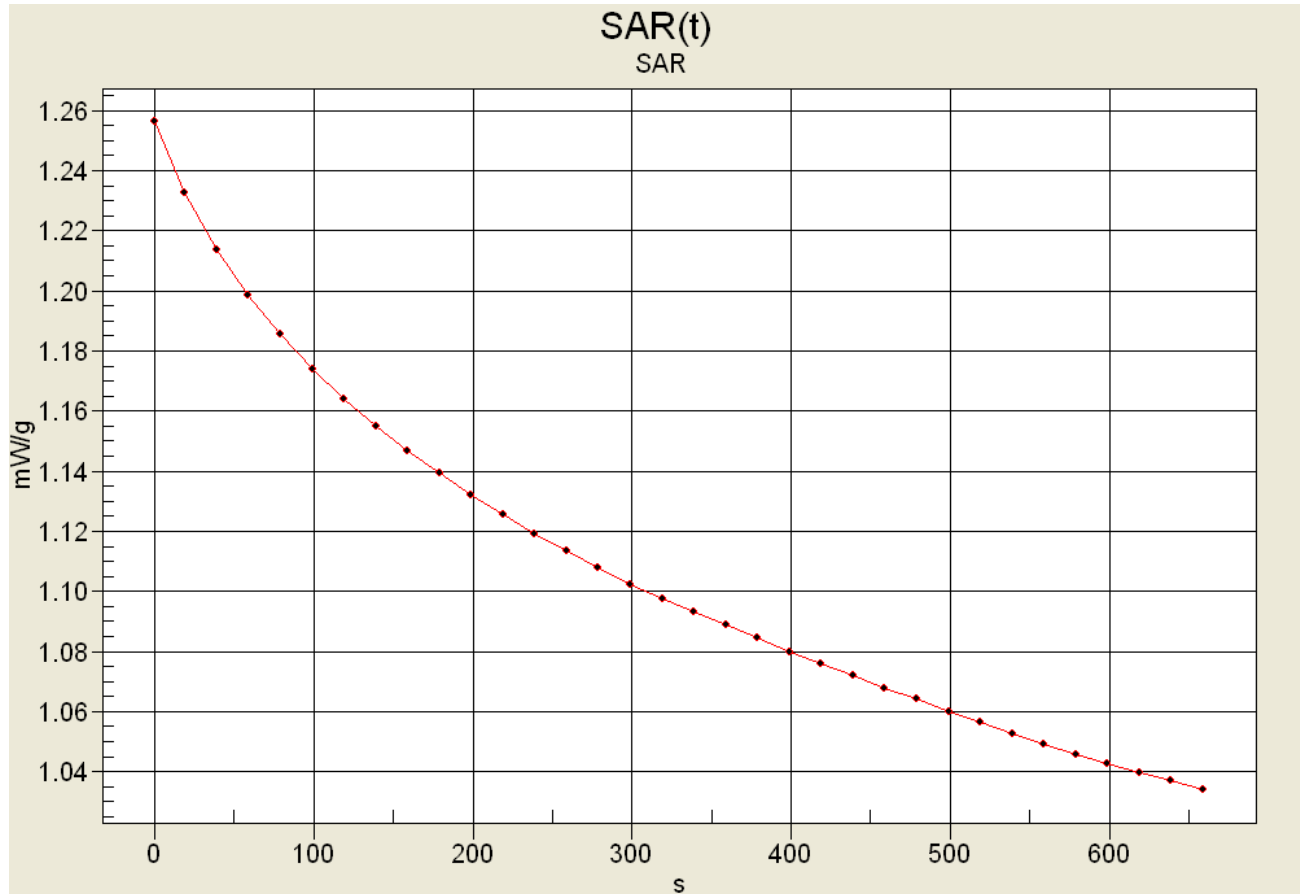
## Z-Axis Scan



## SAR-versus-Time Power Drift Evaluation

Face-Held Configuration

Energizer E91 Alkaline Batteries



**Initial SAR: 1.25628 mW/g**

**Final SAR: 1.03415 mW/g (-0.8450dB)**

**SAR after 340s: 1.0932 mW/g (-0.6039dB)**

**(340s = Zoom Scan Duration)**

**(660s = Area Scan Duration)**

Date Tested: 08/17/04

## Body-Worn SAR - NiMH Battery Pack - with Earbud/Boom-Microphone

**DUT: Giant Electronics Model: RT210; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: Unit #2**

**Body-Worn Accessories: Plastic Swivel Belt-Clip (P/N: KEM-PK10873), Earbud/Boom-Microphone (P/N: KESP-202)**

Ambient Temp: 24.0 °C; Fluid Temp: 22.4 °C; Barometric Pressure: 102.5 kPa; Humidity: 41%

3.6V 600mAh NiMH Battery Pack

Communication System: FM (UHF)

RF Output Power: 27.22 dBm (ERP)

Frequency: 462.7125 MHz; Channel 7; Duty Cycle: 1:1

Medium: M450 ( $\sigma = 0.96$  mho/m;  $\epsilon_r = 57.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

- Probe: ET3DV6 - SN1590; ConvF(7.7, 7.7, 7.7); Calibrated: 24/05/2004

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn370; Calibrated: 14/05/2004

- Phantom: Planar; Type: Plexiglas; Serial: 161

- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

### Body-Worn - 2.0 cm Belt-Clip Separation Distance to Planar Phantom/Area Scan (7x14x1):

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

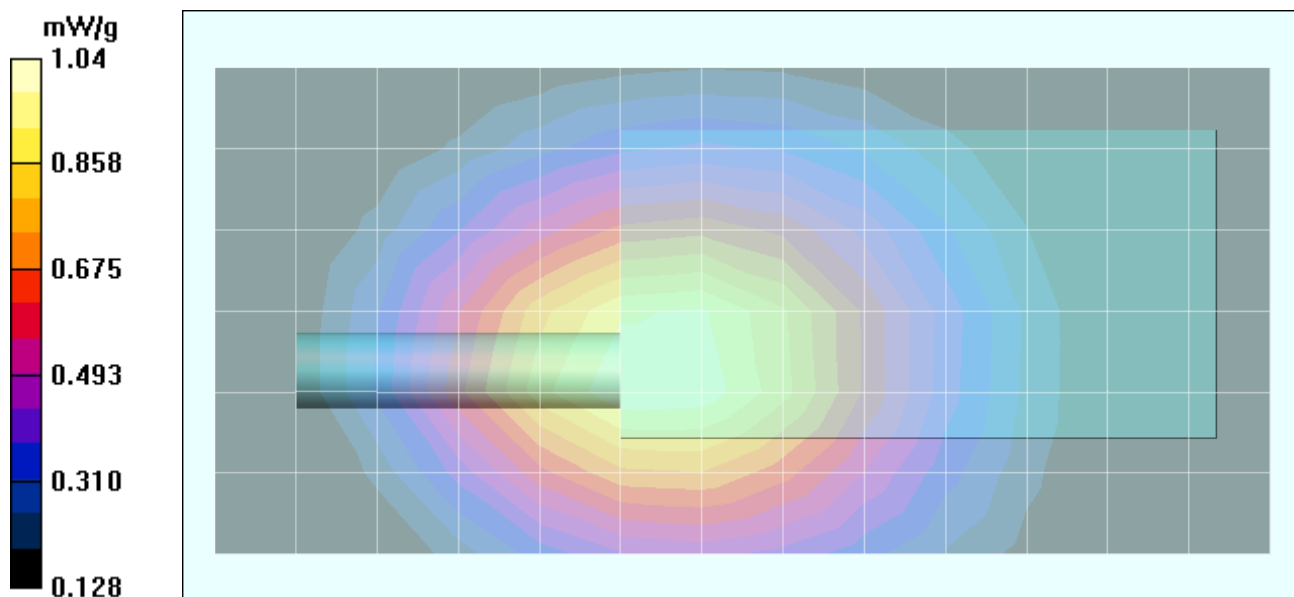
### Body-Worn - 2.0 cm Belt-Clip Separation Distance to Planar Phantom/Zoom Scan (5x5x7)/Cube 0:

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

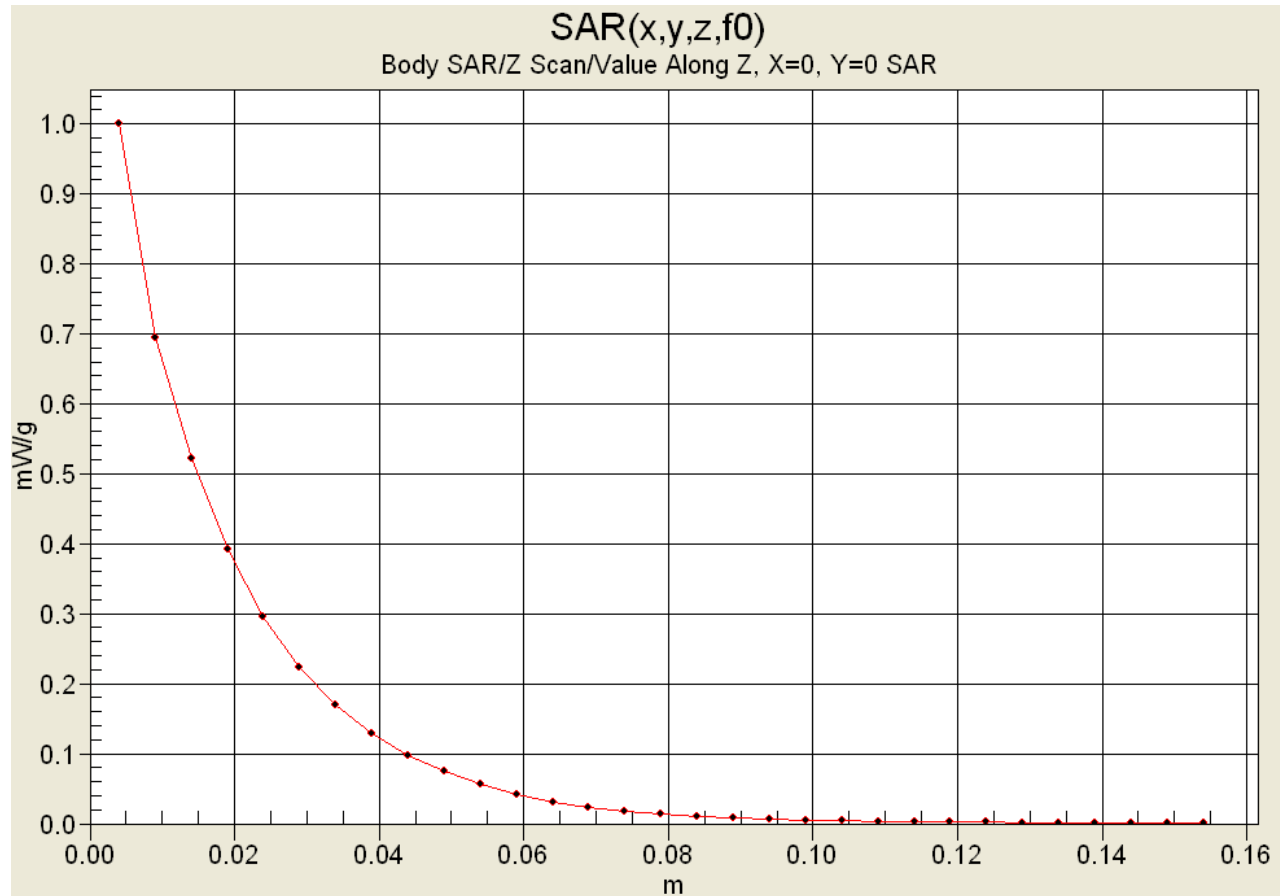
Reference Value = 31.3 V/m; Power Drift = -0.445 dB

Peak SAR (extrapolated) = 1.51 W/kg

**SAR(1 g) = 0.993 mW/g; SAR(10 g) = 0.705 mW/g**



## Z-Axis Scan



Date Tested: 08/17/04

## Body-Worn SAR - Alkaline Batteries (Duracell Procell) - with Earbud/Boom-Microphone

**DUT: Giant Electronics Model: RT210; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: Unit #2**

**Body-Worn Accessories: Plastic Swivel Belt-Clip (P/N: KEM-PK10873), Earbud/Boom-Microphone (P/N: KESP-202)**

Ambient Temp: 24.0 °C; Fluid Temp: 22.4 °C; Barometric Pressure: 102.5 kPa; Humidity: 41%

1.5V 2850mAh Duracell ProCell AA Alkaline Batteries (x3)

Communication System: FM (UHF)

RF Output Power: 27.22 dBm (ERP)

Frequency: 462.7125 MHz; Channel 7; Duty Cycle: 1:1

Medium: M450 ( $\sigma = 0.96$  mho/m;  $\epsilon_r = 57.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

- Probe: ET3DV6 - SN1590; ConvF(7.7, 7.7, 7.7); Calibrated: 24/05/2004

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn370; Calibrated: 14/05/2004

- Phantom: Planar; Type: Plexiglas; Serial: 161

- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

### Body-Worn - 2.0 cm Belt-Clip Separation Distance to Planar Phantom/Area Scan (7x14x1):

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

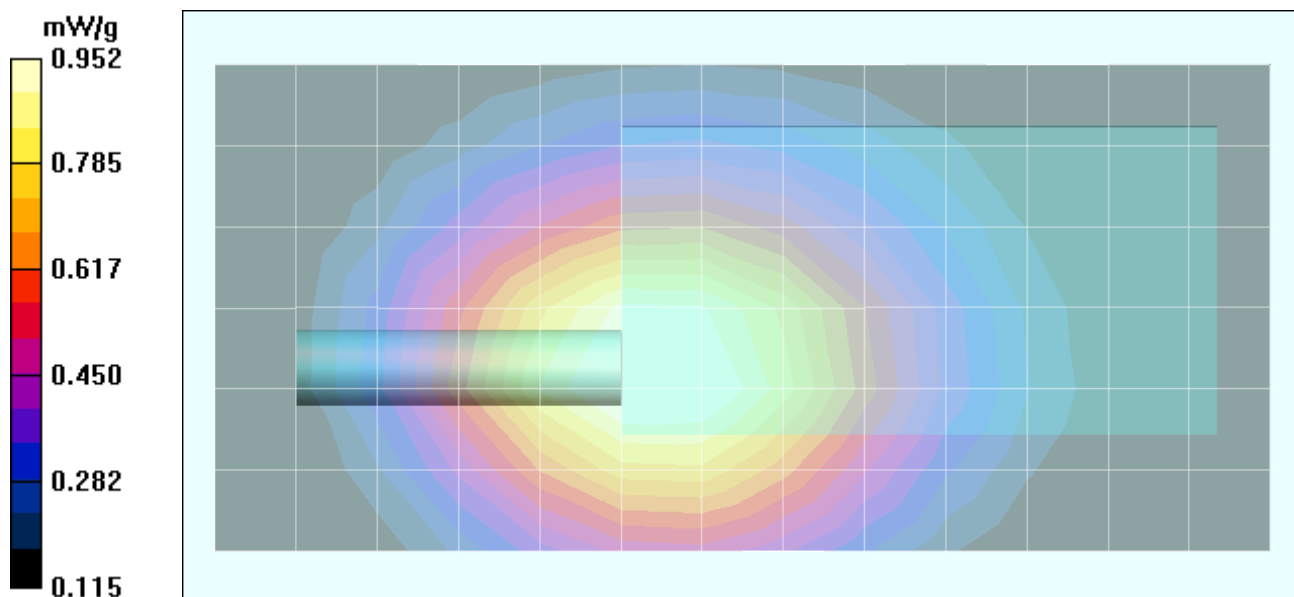
### Body-Worn - 2.0 cm Belt-Clip Separation Distance to Planar Phantom/Zoom Scan (5x5x7)/Cube 0:

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

Reference Value = 29.7 V/m; Power Drift = -0.476 dB

Peak SAR (extrapolated) = 1.38 W/kg

**SAR(1 g) = 0.907 mW/g; SAR(10 g) = 0.642 mW/g**





## APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 08/17/04

## System Performance Check - 450 MHz Dipole

**DUT: Dipole 450 MHz; Model: D450V2; Type: System Performance Check; Serial: 136; Calibrated: 11/04/2003**

Ambient Temp: 23.5 °C; Fluid Temp: 24.1 °C; Barometric Pressure: 102.4 kPa; Humidity: 45%

Communication System: CW

Forward Conducted Power: 250mW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 ( $\sigma = 0.90$  mho/m;  $\epsilon_r = 43.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

- Probe: ET3DV6 - SN1590; ConvF(7.5, 7.5, 7.5); Calibrated: 24/05/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 14/05/2004
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

### 450 MHz System Performance Check/Area Scan (6x11x1):

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

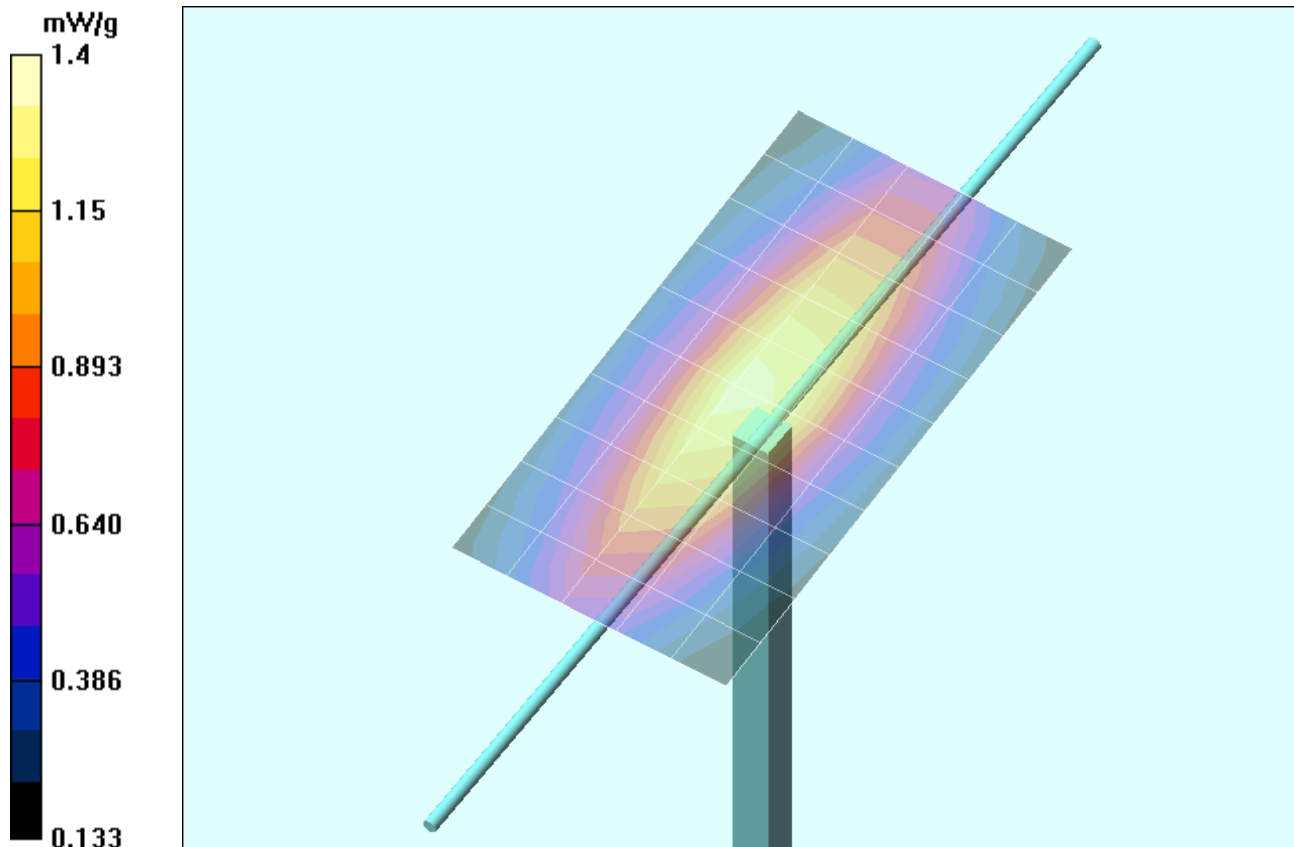
### 450 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:

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

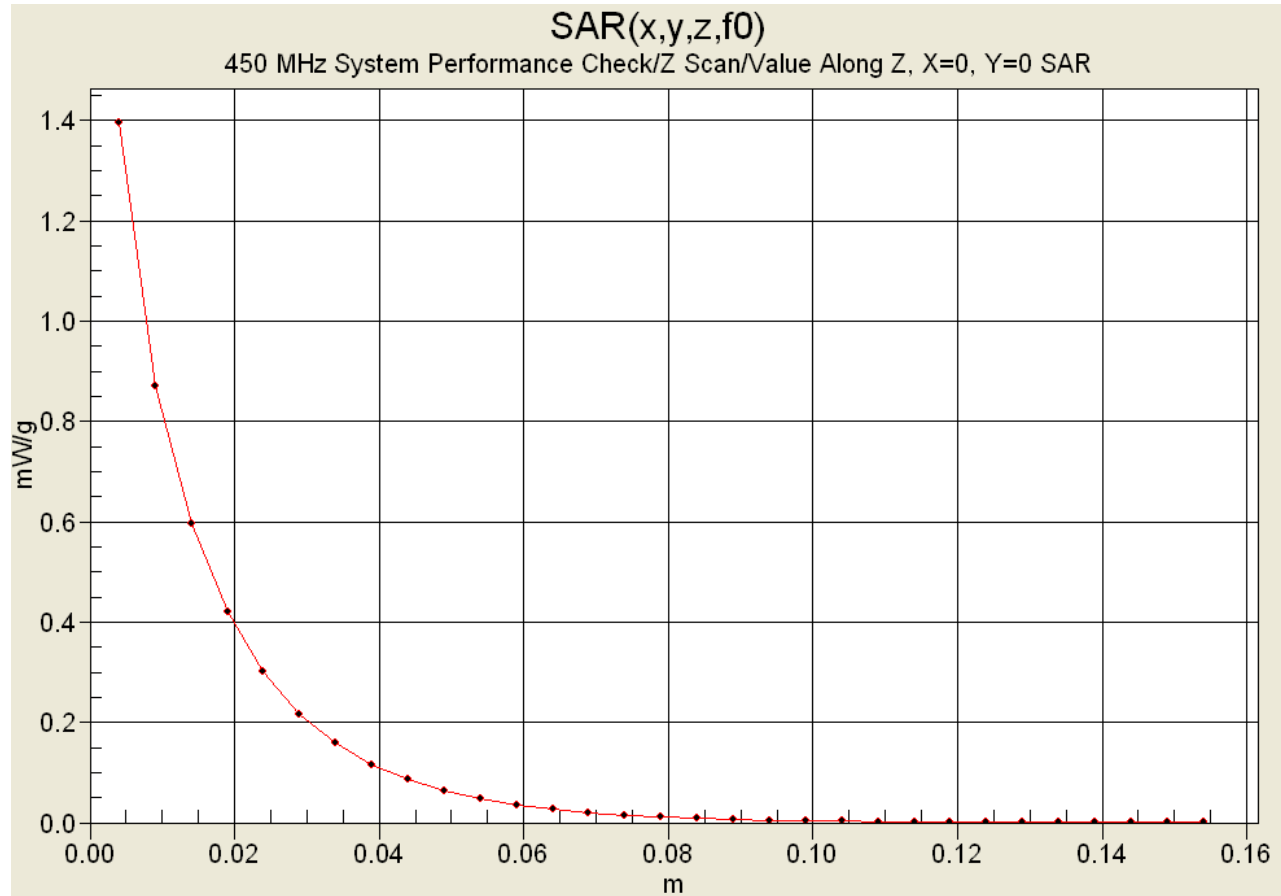
Reference Value = 39.4 V/m; Power Drift = -0.0006 dB

Peak SAR (extrapolated) = 2.27 W/kg

**SAR(1 g) = 1.32 mW/g; SAR(10 g) = 0.847 mW/g**



## Z-Axis Scan



## APPENDIX C - SYSTEM VALIDATION

## 450MHz SYSTEM VALIDATION DIPOLE

Type:

**450MHz Validation Dipole**

Serial Number:

**136**

Place of Calibration:

**Celltech Labs Inc.**

Date of Calibration:

**November 4, 2003**

**Celltech Labs Inc. hereby certifies that this device has been calibrated on the date indicated above.**

Calibrated by:

*Spencer Watson*

Approved by:

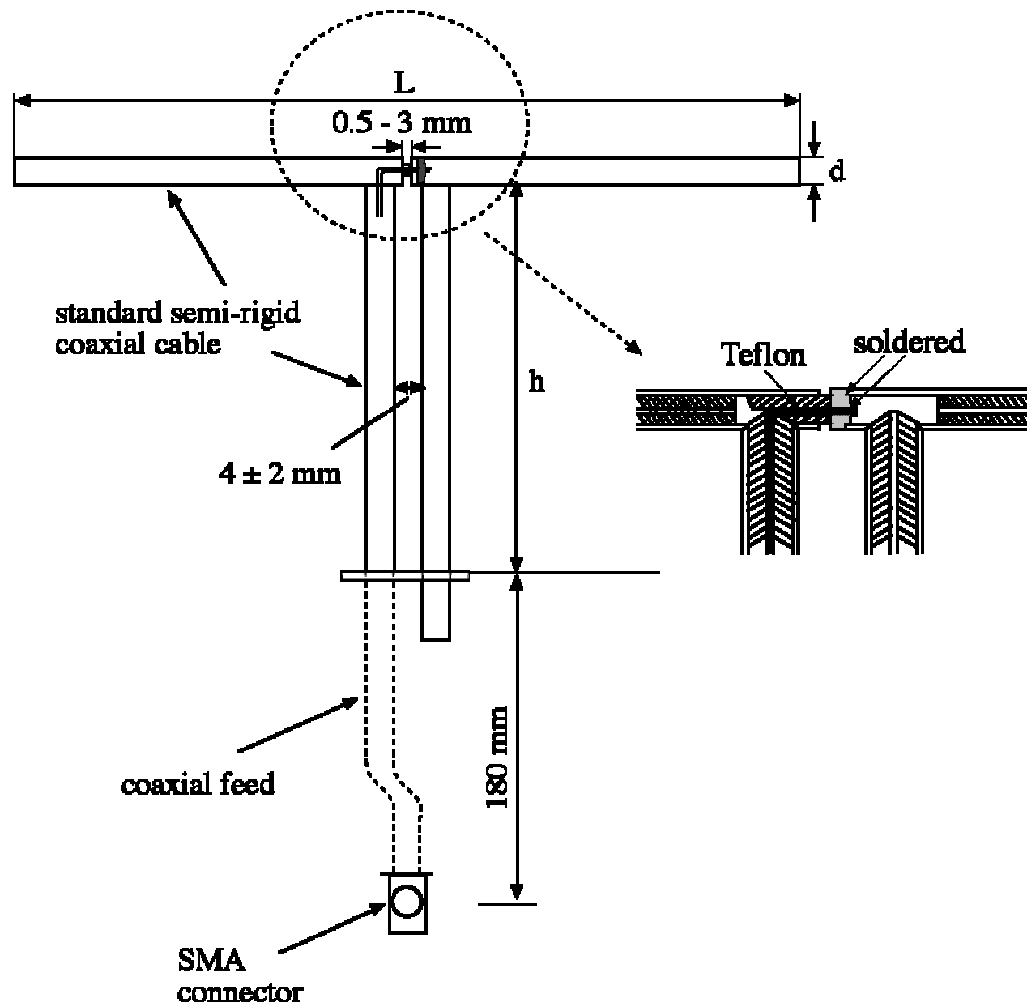
*Russell W. Pope*



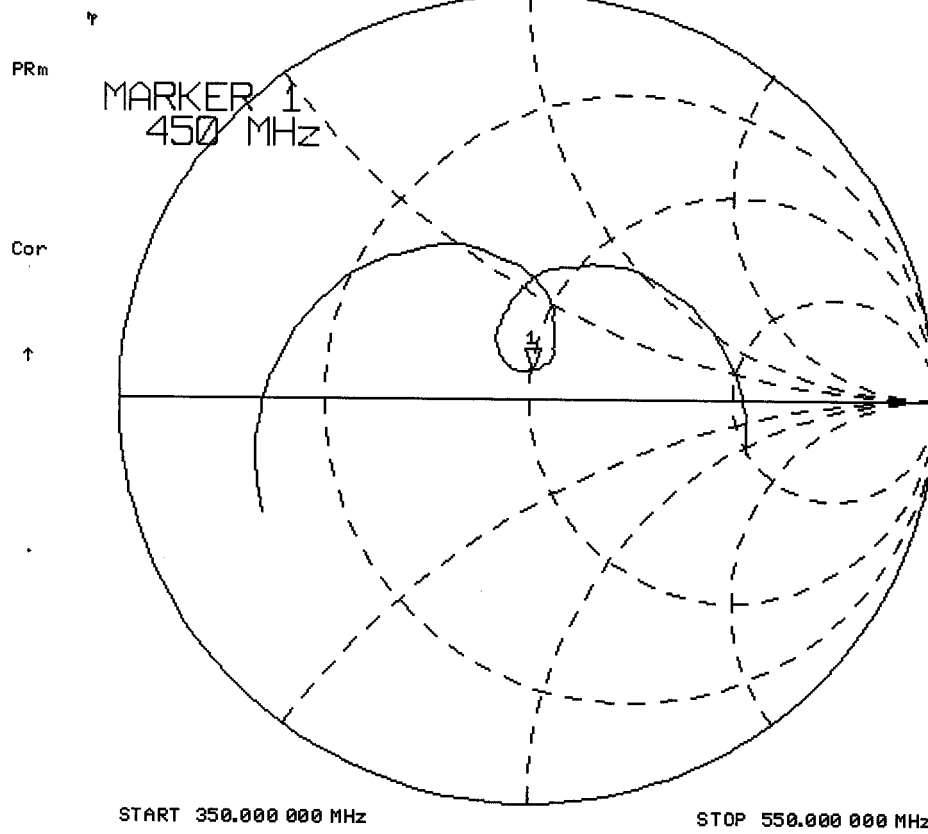
## 1. Dipole Construction & Electrical Characteristics

The validation dipole was constructed in accordance with the IEEE Std “Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”. The electrical properties were measured using an HP 8753E Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 15.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

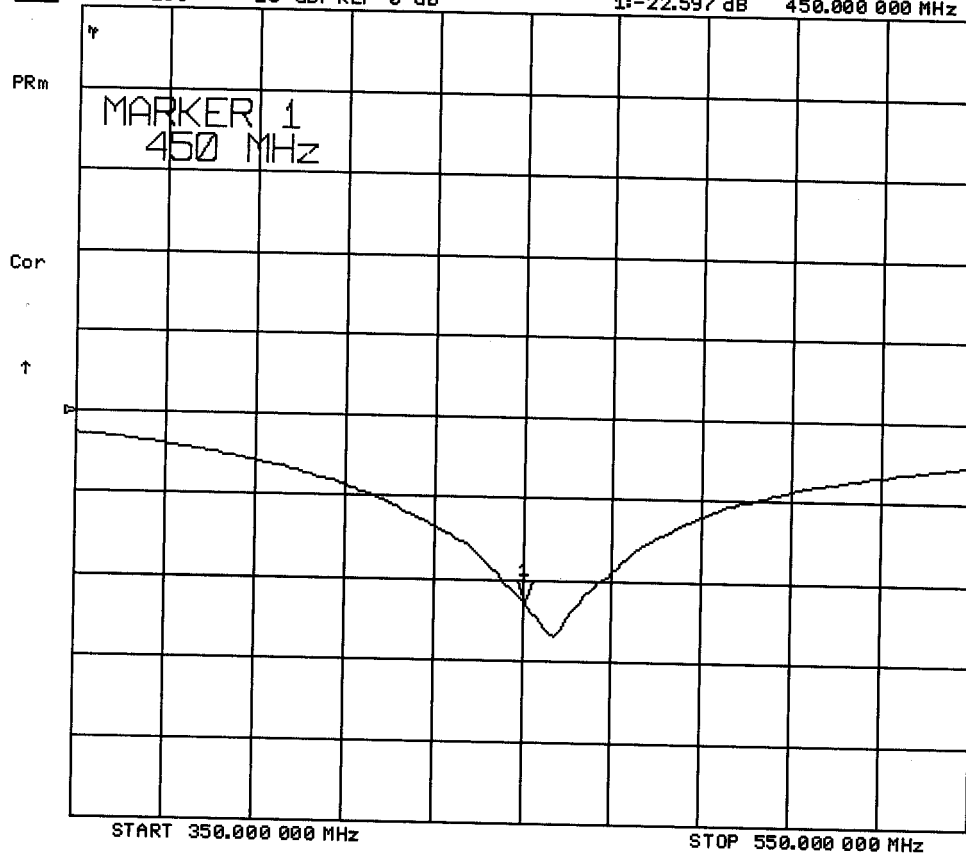
Feed point impedance at 450MHz	$\text{Re}\{Z\} = 49.982\Omega$ $\text{Im}\{Z\} = 7.2324\Omega$
Return Loss at 450MHz	-22.597dB



CH1 S11 1 U FS 1: 49.982  $\Omega$  7.2324  $\Omega$  2.5579 nH 4 Nov 2003 12:04:21 450.000 000 MHz



4 Nov 2003 12:06:24  
[CH1] S11 LOG 10 dB/REF 0 dB 1:-22.597 dB 450.000 000 MHz



## 2. Validation Dipole Dimensions

Frequency (MHz)	L (mm)	h (mm)	d (mm)
300	420.0	250.0	6.2
450	288.0	167.0	6.2
835	161.0	89.8	3.6
900	149.0	83.3	3.6
1450	89.1	51.7	3.6
1800	72.0	41.7	3.6
1900	68.0	39.5	3.6
2000	64.5	37.5	3.6
2450	51.8	30.6	3.6
3000	41.5	25.0	3.6

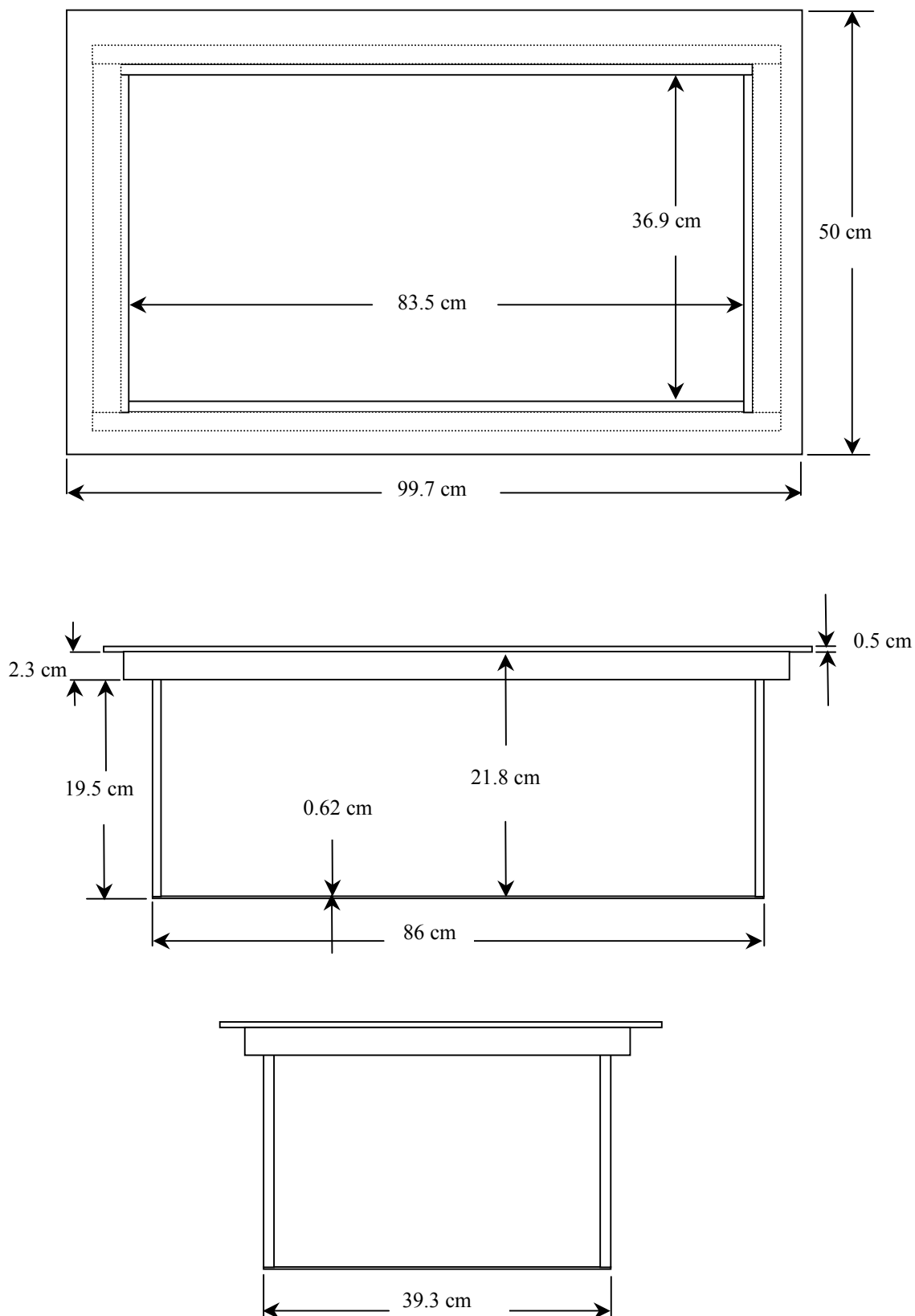
## 3. Validation Phantom

The validation phantom was constructed using relatively low-loss tangent Plexiglas material. The inner dimensions of the phantom are as follows:

Length: 83.5 cm  
Width: 36.9 cm  
Height: 21.8 cm

The bottom section of the validation phantom is constructed of  $6.2 \pm 0.1$ mm Plexiglas.

#### 4. Dimensions of Plexiglas Planar Phantom



## 5. 450MHz System Validation Setup



**450MHz System Validation Setup**



## 6. Measurement Conditions

The planar phantom was filled with brain simulating tissue having the following parameters at 450MHz:

Relative Permittivity: 43.7  
 Conductivity: 0.88 mho/m  
 Fluid Temperature: 22.0 °C  
 Fluid Depth:  $\geq 15.0$  cm

Environmental Conditions:

Ambient Temperature: 22.1 °C  
 Humidity: 49 %  
 Barometric Pressure: 102.8 kPa

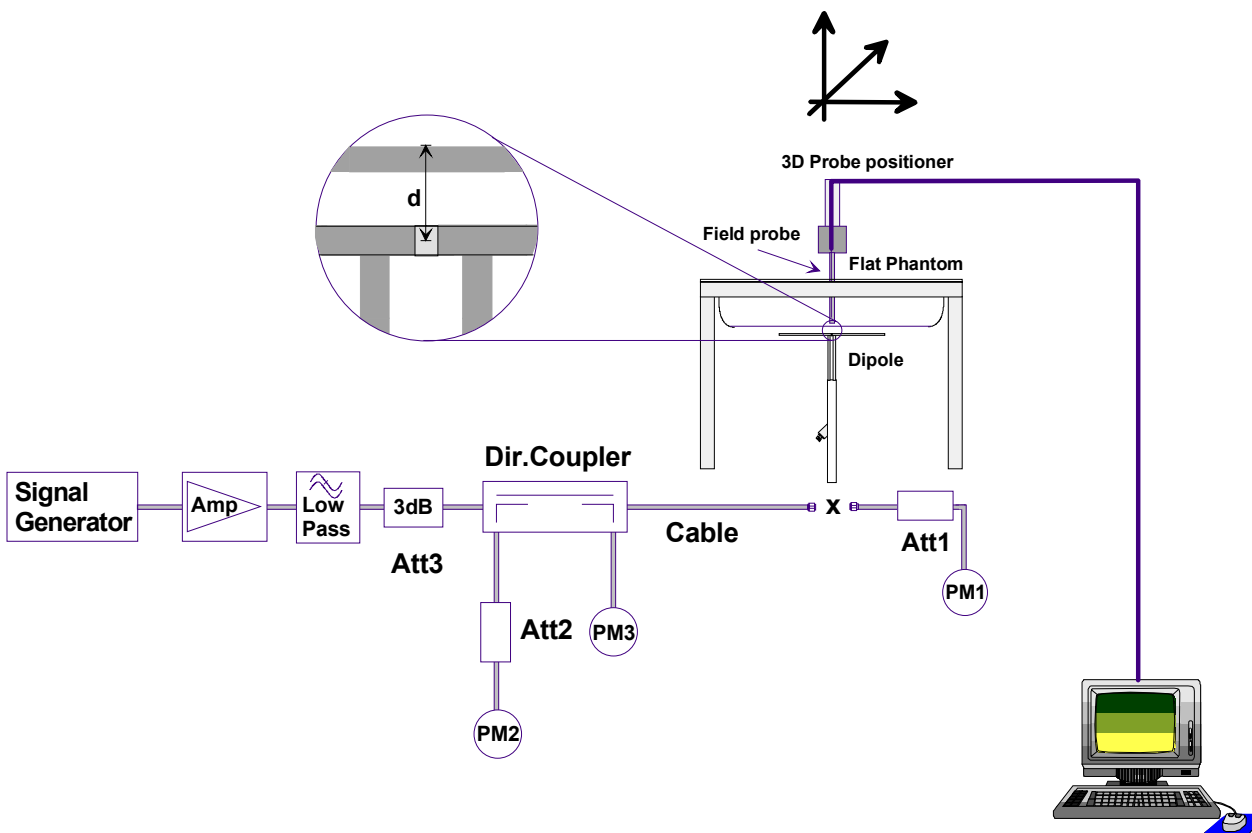
The 450MHz simulated brain tissue mixture consists of the following ingredients:

Ingredient	Percentage by weight
Water	38.56%
Sugar	56.32%
Salt	3.95%
HEC	0.98%
Dowicil 75	0.19%
450MHz Target Dielectric Parameters at 22 °C	$\epsilon_r = 43.5$ $\sigma = 0.87$ S/m



## 7. SAR Measurement

The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the following procedures.



First the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of Att1) as read by power meter PM2. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at PM2 must be taken into consideration. PM3 records the reflected power from the dipole to ensure that the value is not changed from the previous value. The reflected power should be 20dB below the forward power.

## 8. Validation Dipole SAR Test Results

Ten SAR measurements were performed in order to achieve repeatability and to establish an average target value.

Validation Measurement	SAR @ 0.25W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.25W Input averaged over 10g	SAR @ 1W Input averaged over 10g	Peak SAR @ 0.25W Input
Test 1	1.29	5.16	0.810	3.24	2.28
Test 2	1.31	5.24	0.827	3.31	2.31
Test 3	1.30	5.20	0.823	3.29	2.29
Test 4	1.30	5.20	0.822	3.29	2.29
Test 5	1.29	5.16	0.819	3.28	2.28
Test 6	1.30	5.20	0.826	3.30	2.28
Test 7	1.31	5.24	0.826	3.30	2.30
Test 8	1.31	5.24	0.829	3.32	2.30
Test 9	1.30	5.20	0.822	3.29	2.28
Test 10	1.31	5.24	0.822	3.29	2.33
Average Value	1.30	5.21	0.823	3.29	2.29

The results have been normalized to 1W (forward power) into the dipole.

IEEE Target over 1cm<sup>3</sup> (1g) of tissue: 1.23 mW/g (+/- 10%)

Averaged over 1cm (1g) of tissue: 5.21 mW/g

Averaged over 10cm (10g) of tissue: 3.29 mW/g

Test Date: 11/04/03

DUT: Dipole 450MHz; Model: D450V2; Type: System Performance Check; Serial: 136

Ambient Temp: 22.1°C; Fluid Temp: 22.0°C; Barometric Pressure: 102.8 kPa; Humidity: 49%

Communication System: CW

Forward Conducted Power: 250 mW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 ( $\sigma = 0.88 \text{ mho/m}$ ,  $\epsilon_r = 43.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

**450 MHz Validation/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 39 V/m

Power Drift = -0.08 dB

Maximum value of SAR = 1.3 mW/g

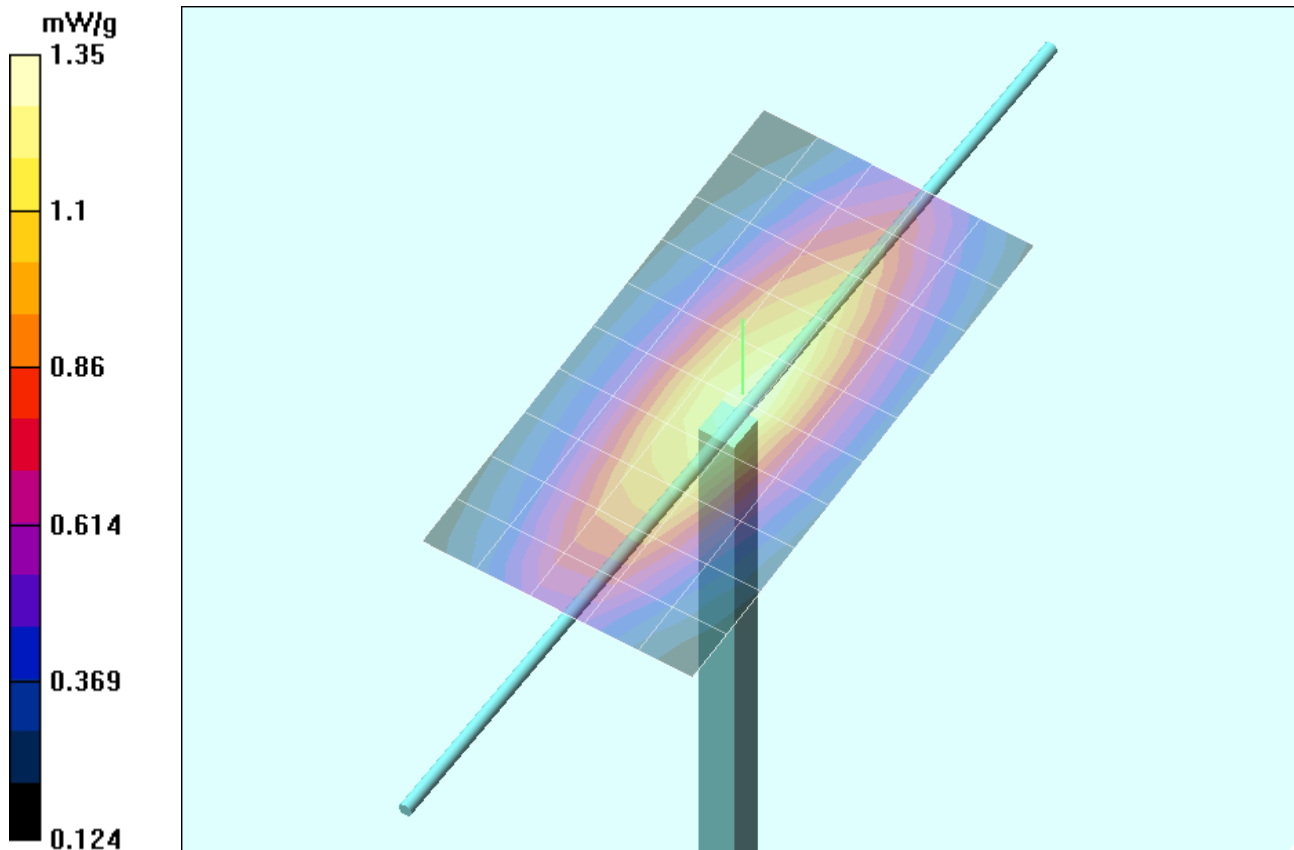
**450 MHz Validation/Zoom Scan 8 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

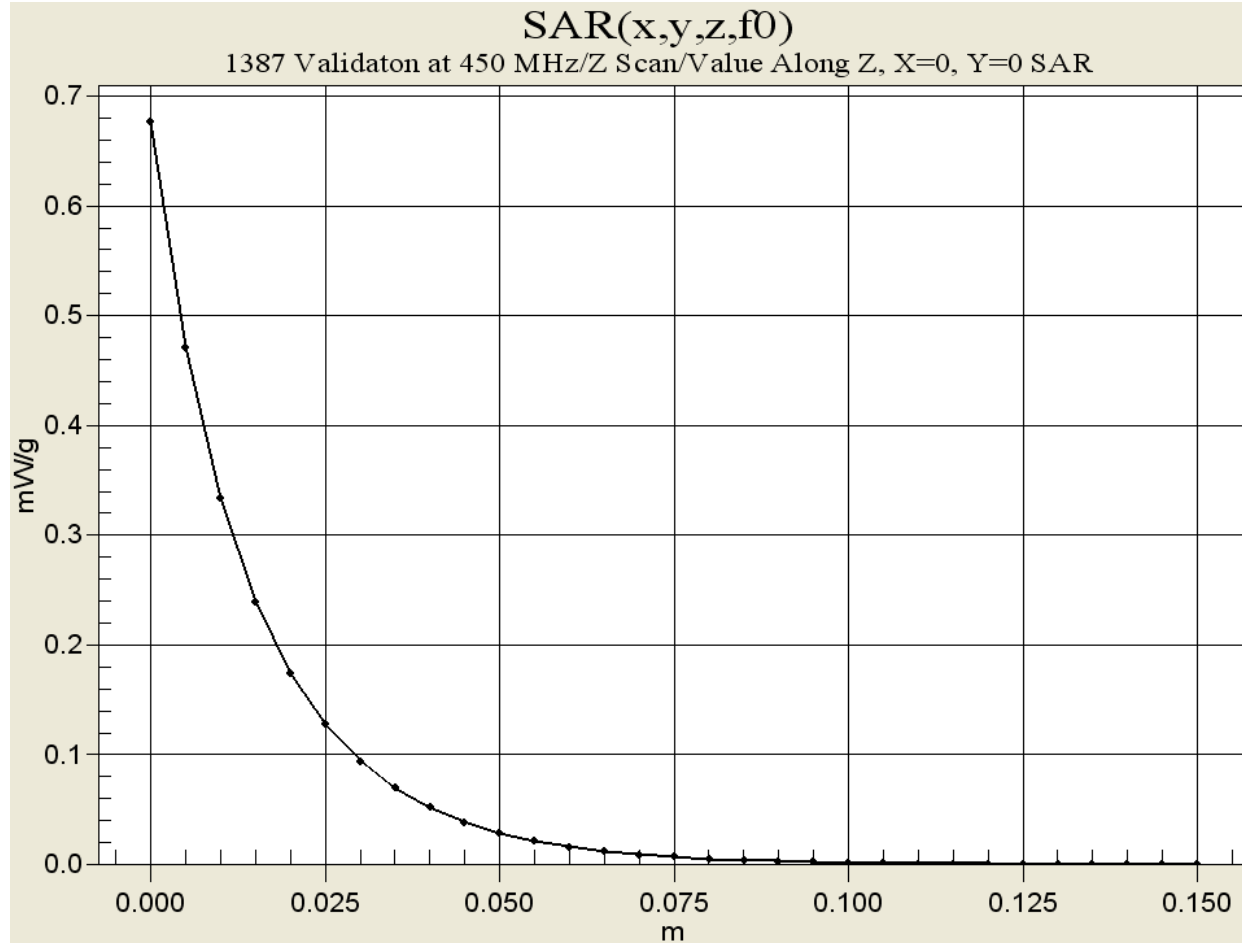
Peak SAR (extrapolated) = 2.28 W/kg

**SAR(1 g) = 1.3 mW/g; SAR(10 g) = 0.822 mW/g**

Reference Value = 39 V/m

Power Drift = 0.08 dB





# 450MHz System Validation

## Measured Fluid Dielectric Parameters (Brain)

November 04, 2003

Frequency	e'	e''
350.000000 MHz	46.2660	40.8224
360.000000 MHz	45.9937	40.0986
370.000000 MHz	45.7556	39.4543
380.000000 MHz	45.5625	38.7387
390.000000 MHz	45.2820	38.1140
400.000000 MHz	45.0146	37.4981
410.000000 MHz	44.7508	36.9734
420.000000 MHz	44.5046	36.4917
430.000000 MHz	44.2494	35.9460
440.000000 MHz	43.9621	35.5647
450.000000 MHz	43.7384	35.2106
460.000000 MHz	43.5513	34.7930
470.000000 MHz	43.2846	34.3970
480.000000 MHz	43.0654	33.9576
490.000000 MHz	42.8566	33.6391
500.000000 MHz	42.6744	33.2270
510.000000 MHz	42.5036	32.8459
520.000000 MHz	42.3492	32.5261
530.000000 MHz	42.1783	32.1727
540.000000 MHz	41.9985	31.7385
550.000000 MHz	41.8097	31.4862

## APPENDIX D - PROBE CALIBRATION

**Client**

**Celltech Labs**

## CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN:1590**

Calibration procedure(s) **QA CAL-01.v2**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **May 24, 2004**

Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

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 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	5-May-04 (METAS, No 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No 251-00388)	May-05
Reference 20 dB Attenuator	SN: 5086 (20b)	3-May-04 (METAS, No 251-00389)	May-05
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: May 24, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

# Probe ET3DV6

SN:1590

Manufactured:	March 19, 2001
Last calibrated:	May 15, 2003
Recalibrated:	May 24, 2004

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)



## DASY - Parameters of Probe: ET3DV6 SN:1590

### Sensitivity in Free Space

NormX	$1.85 \mu\text{V}/(\text{V}/\text{m})^2$
NormY	$2.01 \mu\text{V}/(\text{V}/\text{m})^2$
NormZ	$1.73 \mu\text{V}/(\text{V}/\text{m})^2$

### Diode Compression<sup>A</sup>

DCP X	91	mV
DCP Y	91	mV
DCP Z	91	mV

### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

### Boundary Effect

Head                      900 MHz      Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	8.0	4.4
SAR <sub>be</sub> [%]	With Correction Algorithm	0.1	0.2

Head                      1800 MHz      Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	12.2	8.5
SAR <sub>be</sub> [%]	With Correction Algorithm	0.2	0.1

### Sensor Offset

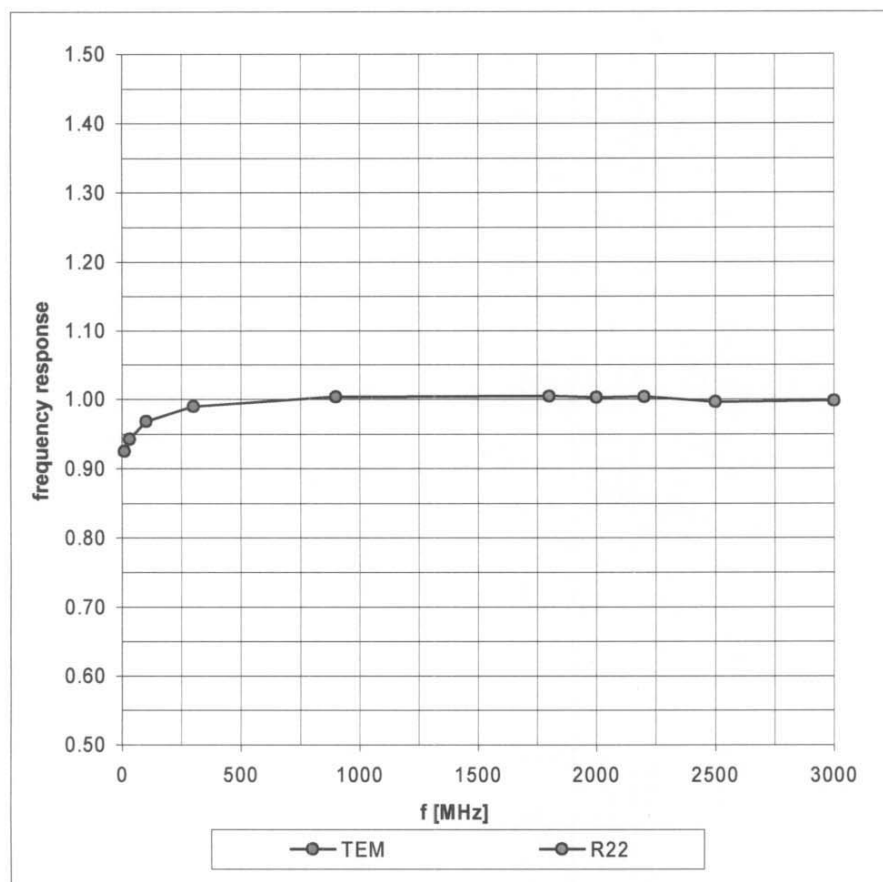
Probe Tip to Sensor Center	2.7 mm
Optical Surface Detection	in tolerance

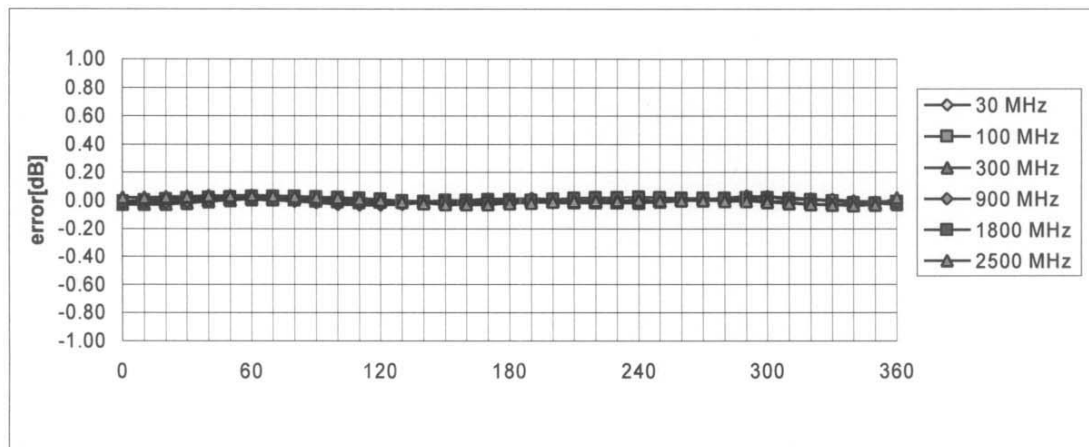
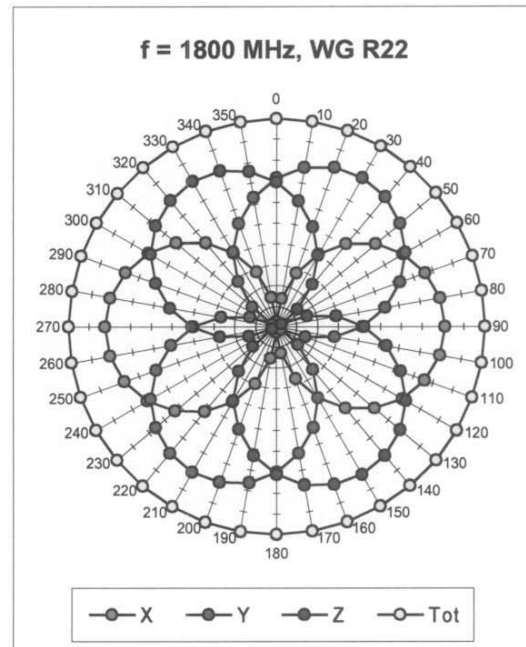
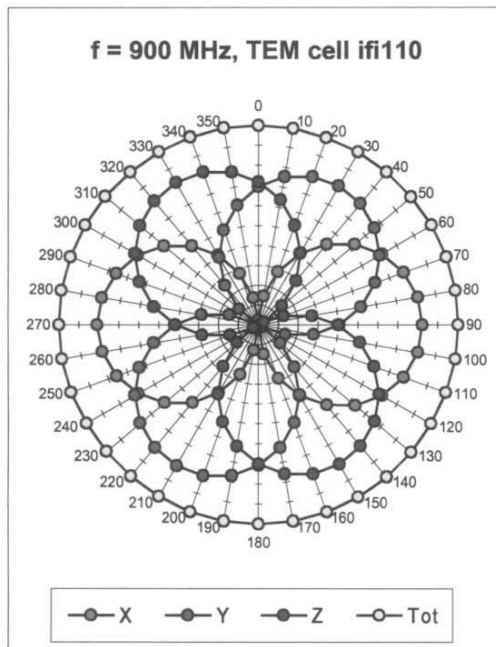
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> numerical linearization parameter: uncertainty not required

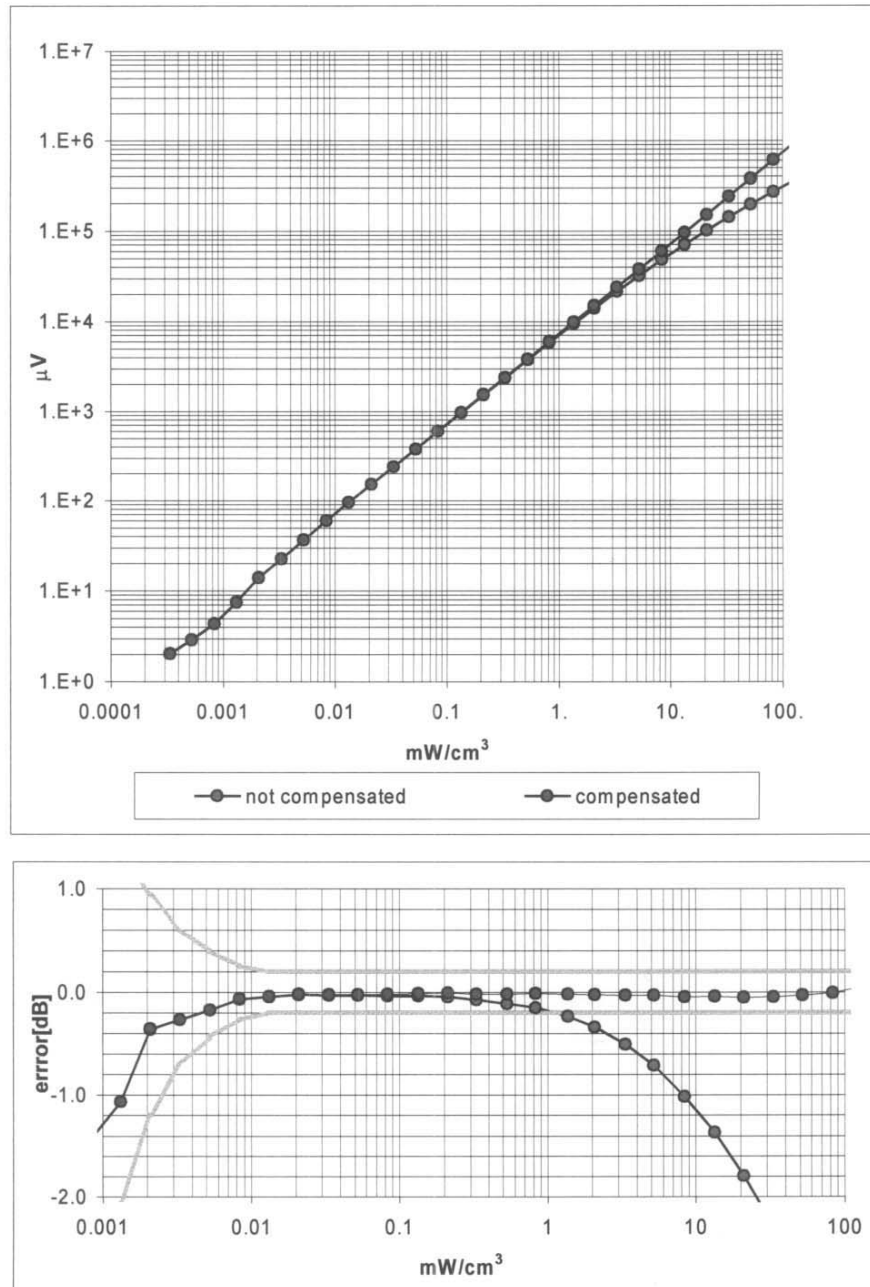
## Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)



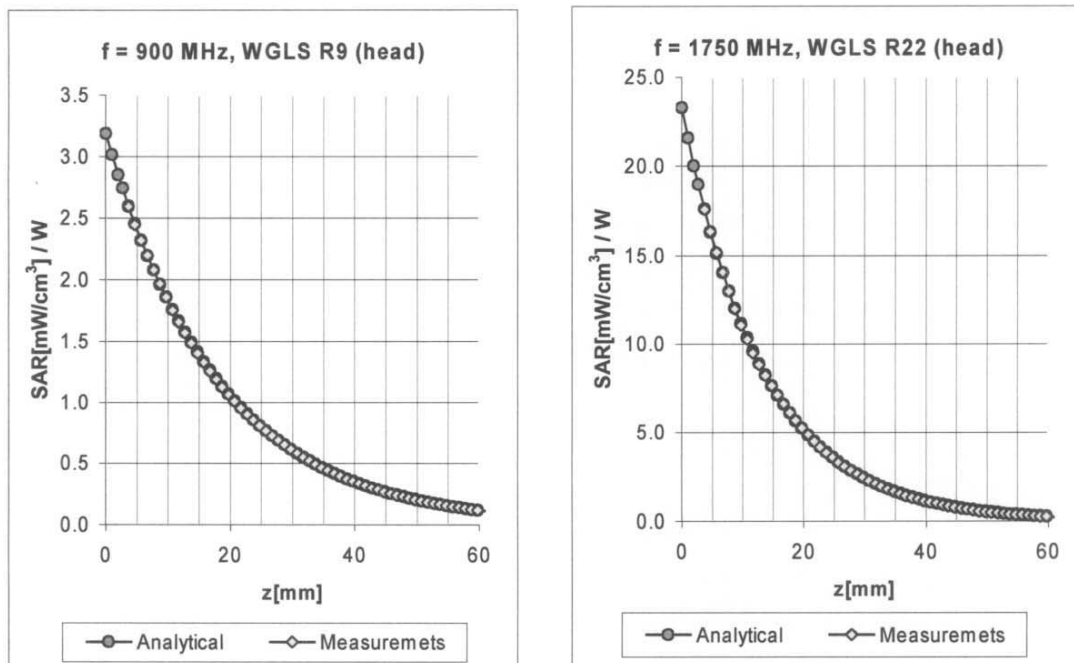
Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$ Axial Isotropy Error  $< \pm 0.2$  dB

## Dynamic Range f(SAR<sub>head</sub>) ( Waveguide R22 )



Probe Linearity Error  $< \pm 0.2$  dB

## Conversion Factor Assessment

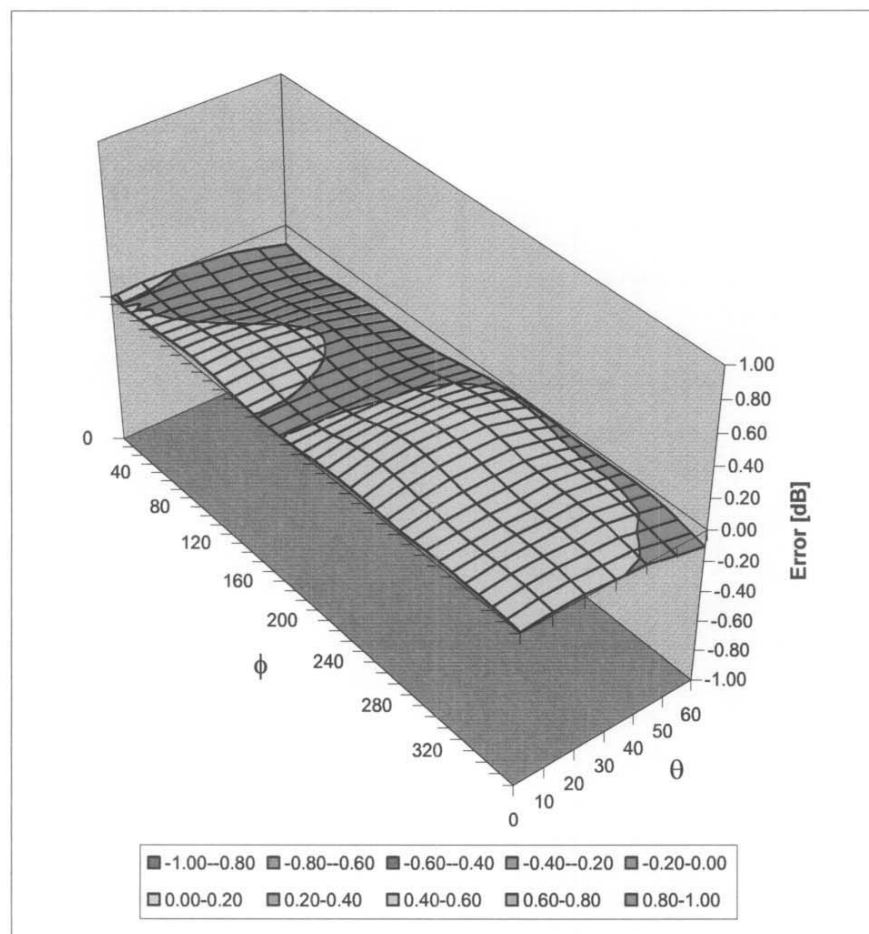


f [MHz]	Validity [MHz] <sup>B</sup>	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	750-950	Head	41.5 ± 5%	0.90 ± 5%	0.68	1.64	6.71 ± 11.9% (k=2)
1750	1700-1800	Head	40.0 ± 5%	1.40 ± 5%	0.43	2.67	5.28 ± 9.7% (k=2)
1900	1850-1950	Head	40.0 ± 5%	1.40 ± 5%	0.46	2.81	5.03 ± 9.7% (k=2)
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	0.81	1.95	4.44 ± 9.7% (k=2)
835	750-950	Body	55.2 ± 5%	0.97 ± 5%	0.49	1.99	6.54 ± 11.9% (k=2)
1750	1700-1800	Body	53.3 ± 5%	1.52 ± 5%	0.50	2.87	4.68 ± 9.7% (k=2)
1900	1850-1950	Body	53.3 ± 5%	1.52 ± 5%	0.52	2.93	4.58 ± 9.7% (k=2)
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	0.91	1.78	4.22 ± 9.7% (k=2)

<sup>B</sup> The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

## Deviation from Isotropy in HSL

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



**Spherical Isotropy Error  $< \pm 0.4$  dB**

## **Additional Conversion Factors**

**for Dosimetric E-Field Probe**

Type:

**ET3DV6**

Serial Number:

**1590**

Place of Assessment:

**Zurich**

Date of Assessment:

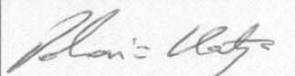
**May 25, 2004**

Probe Calibration Date:

**May 24, 2004**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:



## Dosimetric E-Field Probe ET3DV6 SN:1590

Conversion factor ( $\pm$  standard deviation)

150 MHz	ConvF	$9.1 \pm 8\%$	$\epsilon_r = 52.3 \pm 5\%$ $\sigma = 0.76 \pm 5\% \text{ mho/m}$ (head tissue)
300 MHz	ConvF	$7.9 \pm 8\%$	$\epsilon_r = 45.3 \pm 5\%$ $\sigma = 0.87 \pm 5\% \text{ mho/m}$ (head tissue)
450 MHz	ConvF	$7.5 \pm 8\%$	$\epsilon_r = 43.5 \pm 5\%$ $\sigma = 0.87 \pm 5\% \text{ mho/m}$ (head tissue)
150 MHz	ConvF	$8.8 \pm 8\%$	$\epsilon_r = 61.9 \pm 5\%$ $\sigma = 0.80 \pm 5\% \text{ mho/m}$ (body tissue)
450 MHz	ConvF	$7.7 \pm 8\%$	$\epsilon_r = 56.7 \pm 5\%$ $\sigma = 0.94 \pm 5\% \text{ mho/m}$ (body tissue)

### Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also Section 4.7 of the DASY4 Manual.



## APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

# 450 MHz System Performance Check & DUT Evaluation (Face)

## Measured Fluid Dielectric Parameters (Brain)

August 17, 2004

Frequency	e'	e''
350.000000 MHz	46.1265	41.9587
360.000000 MHz	45.7758	41.2628
370.000000 MHz	45.5184	40.5478
380.000000 MHz	45.2597	39.9037
390.000000 MHz	44.9807	39.1880
400.000000 MHz	44.7115	38.6120
410.000000 MHz	44.5036	38.0969
420.000000 MHz	44.3278	37.6016
430.000000 MHz	44.1390	37.1016
440.000000 MHz	43.9270	36.5891
450.000000 MHz	43.6568	36.1368
460.000000 MHz	43.4904	35.6887
470.000000 MHz	43.2595	35.2517
480.000000 MHz	43.0256	34.7983
490.000000 MHz	42.8083	34.3962
500.000000 MHz	42.5790	33.9783
510.000000 MHz	42.3302	33.5976
520.000000 MHz	42.1732	33.3157
530.000000 MHz	42.0073	32.9488
540.000000 MHz	41.8612	32.5281
550.000000 MHz	41.7035	32.2816

# 450 MHz DUT Evaluation (Body)

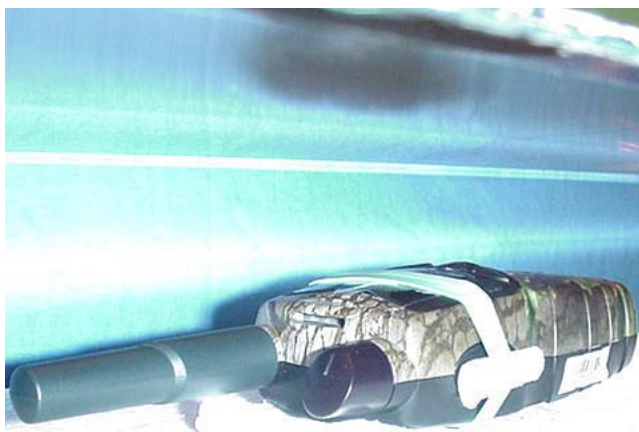
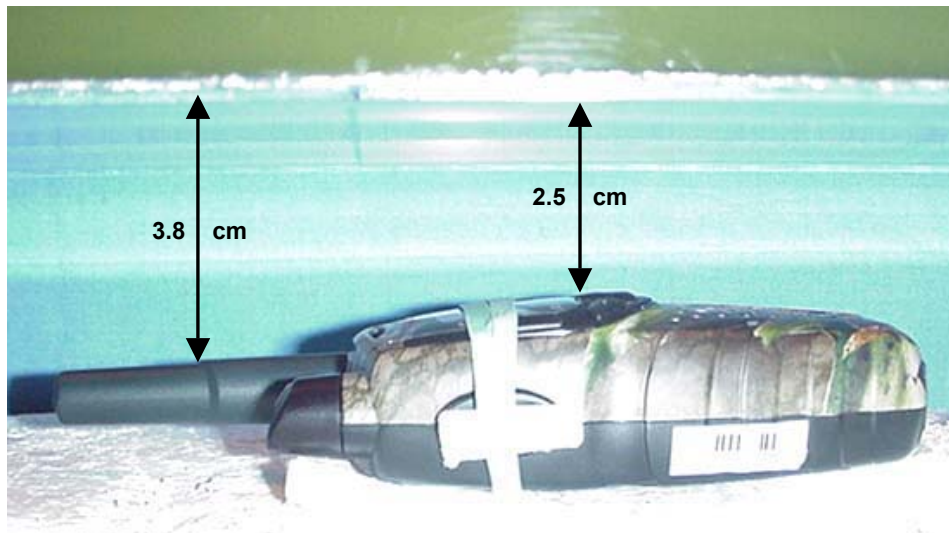
## Measured Fluid Dielectric Parameters (Muscle)

August 17, 2004

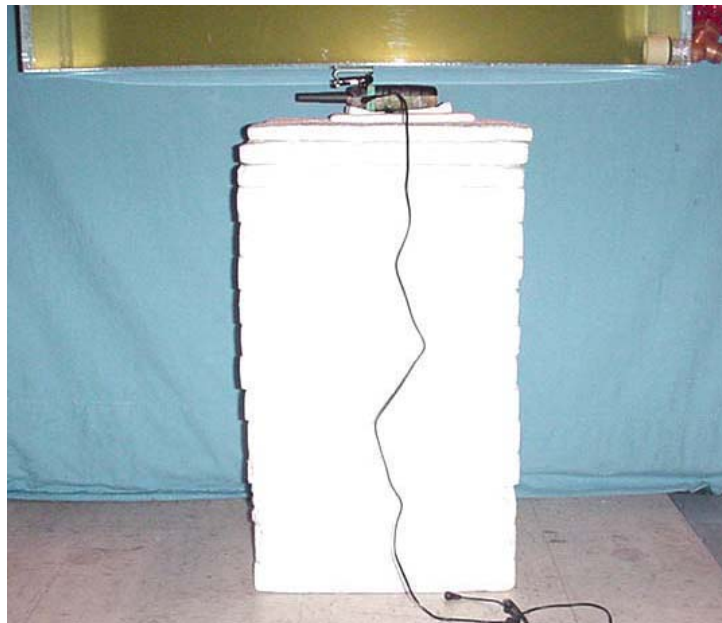
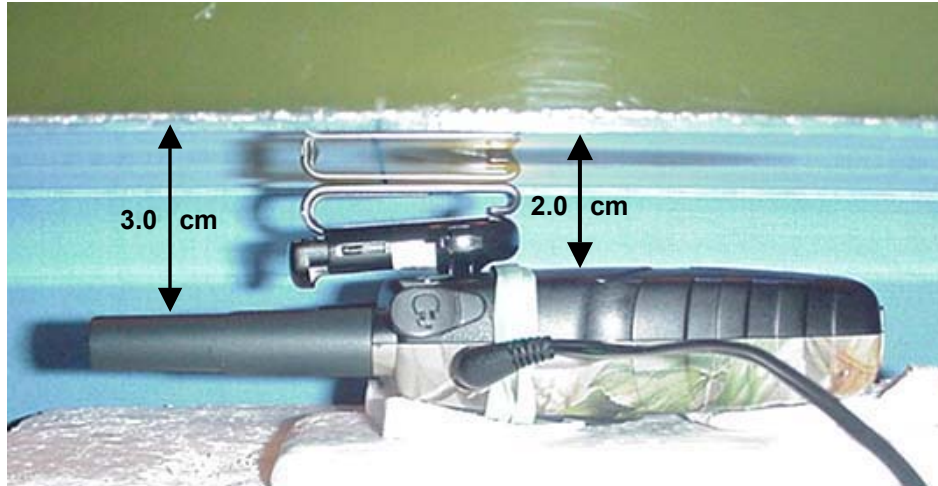
Frequency	e'	e''
350.000000 MHz	59.3442	45.2615
360.000000 MHz	59.1196	44.3429
370.000000 MHz	58.9368	43.5562
380.000000 MHz	58.7761	42.7931
390.000000 MHz	58.6619	42.0140
400.000000 MHz	58.4681	41.3705
410.000000 MHz	58.3922	40.7552
420.000000 MHz	58.2489	40.0967
430.000000 MHz	58.0669	39.4738
440.000000 MHz	57.9412	38.9544
450.000000 MHz	57.7872	38.4134
460.000000 MHz	57.7065	37.9259
470.000000 MHz	57.4483	37.3739
480.000000 MHz	57.2576	36.8845
490.000000 MHz	57.1091	36.4761
500.000000 MHz	56.9618	36.0473
510.000000 MHz	56.8355	35.6120
520.000000 MHz	56.7437	35.2344
530.000000 MHz	56.5673	34.9060
540.000000 MHz	56.5227	34.4509
550.000000 MHz	56.3901	34.1601

## APPENDIX F - SAR TEST SETUP & DUT PHOTOGRAPHS

**FACE-HELD SAR TEST SETUP PHOTOGRAPHS**  
2.5 cm Separation Distance from Front of Radio to Planar Phantom



**BODY-WORN SAR TEST SETUP PHOTOGRAPHS**  
2.0 cm Plastic Swivel Belt-Clip Separation Distance to Planar Phantom  
with Earbud/Boom-Microphone Accessory





## DUT PHOTOGRAPHS



Front of DUT



Back of DUT



Back of DUT  
with Plastic Swivel Belt-Clip

## DUT PHOTOGRAPHS



Top of DUT



Bottom of DUT



## DUT PHOTOGRAPHS



Left Side of DUT with Plastic Swivel Belt-Clip



Right Side of DUT with Plastic Swivel Belt-Clip



Plastic Swivel Belt-Clip Accessory (P/N: KEM-PK10873)

## DUT PHOTOGRAPHS



DUT with Earbud/Boom-Microphone Accessory (P/N: KESP-202)

## DUT PHOTOGRAPHS



DUT Battery Compartment



DUT with NiMH Battery Pack



DUT with Duracell Procell  
AA Alkaline Batteries



DUT with Energizer E91  
AA Alkaline Batteries



NiMH Battery Pack