

Test Report S/N:	021104-470BKBC
Test Date(s):	May 31, 2004
Test Type:	FCC/IC SAR Evaluation

## DECLARATION OF COMPLIANCE SAR RF EXPOSURE EVALUATION

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**Rule Part(s):** FCC 47 CFR §2.1093; IC RSS-102 Issue 1 (Provisional)  
**Test Procedure(s):** FCC OET Bulletin 65, Supplement C (Edition 01-01)  
**FCC Device Classification:** Digital Transmission System (DTS)  
**IC Device Classification:** Low Power License-Exempt Radiocommunication Device  
**FCC IDENTIFIER:** KBCIX100XUSIWLBT  
**Model(s):** IX100x  
**Device Type:** Rugged Handheld PC with 802.11b & Bluetooth  
**Internal Transmitter(s):** USI WM-BB-AG-01 802.11b / Bluetooth Combo Module  
**Mode(s) of Operation:** DSSS (Direct Sequence Spread Spectrum) - 802.11b  
**FHSS (Frequency Hopping Spread Spectrum) - Bluetooth**  
**Tx Frequency Range(s):** 2412 - 2462 MHz (802.11b)  
**2402 - 2480 MHz (Bluetooth)**  
**Max. RF Output Power Tested:** 14.0 dBm - Peak Conducted (802.11b)  
**Antenna Type(s) Tested:** Internal - Front Center above LCD Display (802.11b)  
**Battery Type(s) Tested:** Lithium-ion 7.4 V, 3.0 Ah (P/N: 46-0136-001)  
**Body-worn Accessories Tested:** Nylon Carry Case (P/N: 54-0644-001)  
**Ear-Microphone (Model: JABRA)**  
**Max. SAR Level Measured:** 0.054 W/kg (1g average)

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



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## 1.0 INTRODUCTION

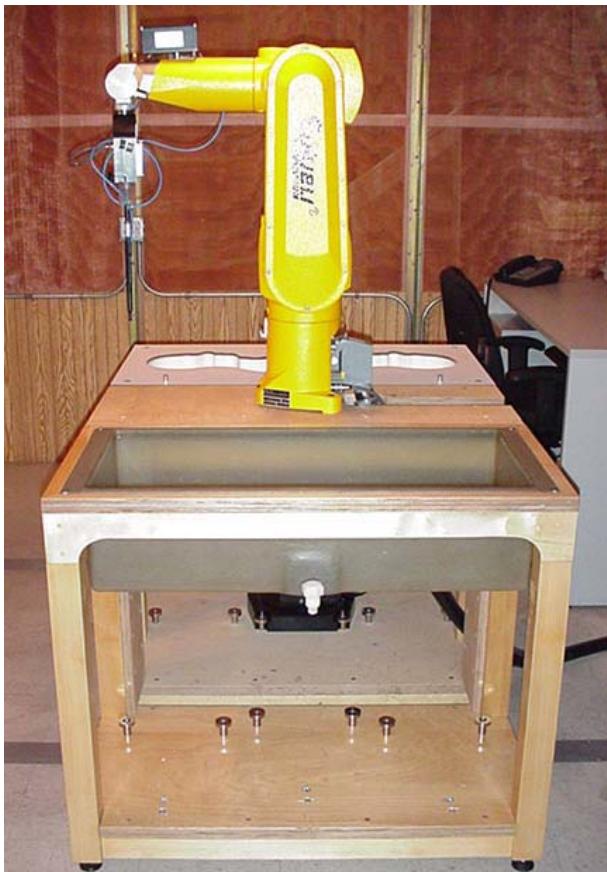
This measurement report demonstrates that the ITRONIX CORPORATION Model: IX100x Rugged Handheld PC FCC ID: KBCIX100XUSIWLBT with internal 802.11b & Bluetooth transmitter complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]), and Health Canada 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, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

## 2.0 DESCRIPTION OF DEVICE UNDER TEST (DUT)

FCC Rule Part(s)	47 CFR §2.1093		
IC Rule Part(s)	IC RSS-102 Issue 1 (Provisional)		
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)		
FCC Device Classification	Digital Transmission System (DTS)		
IC Device Classification	Low Power License-Exempt Radiocommunication Device		
Device Type	Rugged Handheld PC with 802.11b & Bluetooth		
Internal Transmitter(s)	USI WM-BB-AG-01 802.11b / Bluetooth Combo Module		
FCC IDENTIFIER	KBCIX100XUSIWLBT		
Model(s)	IX100x		
Serial No.	510495001-U5103-0025		Identical Prototype
Mode(s) of Operation	802.11b	DSSS	Direct Sequence Spread Spectrum
	Bluetooth	FHSS	Frequency Hopping Spread Spectrum
Tx Frequency Range(s)	802.11b		2412 - 2462 MHz
	Bluetooth		2402 - 2480 MHz
Max. RF Output Power Tested	802.11b	14.0 dBm	Peak Conducted
Antenna Type(s) Tested	802.11b	Internal - Front Center above LCD Display	
Battery Type(s) Tested	Lithium-ion	7.4 V, 3.0 Ah	P/N: 46-0136-001
Body-worn Accessories Tested	Nylon Carry Case (P/N: 54-0644-001)		
	Ear-Microphone (Model: JABRA)		

### 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 planar phantom



DASY4 SAR Measurement System with SAM phantom

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## 4.0 MEASUREMENT SUMMARY

### BODY SAR MEASUREMENT RESULTS

Tx	Test Mode	Freq. (MHz)	Cond. Power Before Test (dBm)	Battery Type	Antenna Type	Body-Worn Accessories	DUT Position Relative to Front of Carry Case	DUT Position Relative to Planar Phantom	Separation Distance to Planar Phantom (cm)	Measured SAR 1g (W/kg)	SAR Drift During Test (dB)	Scaled SAR 1g (W/kg)
802.11b	DSSS	2437	14.0	Li-ion	Internal	Carry Case Ear-Mic	Front Side facing Front of Carry Case	Front Side facing Phantom	0.0	P 0.052 S 0.045	-0.132	P 0.054 S 0.046

**ANSI / IEEE C95.1 1999 - SAFETY LIMIT**  
**Spatial Peak - Uncontrolled Exposure / General Population**  
**BODY: 1.6 W/kg (averaged over 1 gram)**

Test Date(s)		05/31/04		Relative Humidity		39		%	
Measured Fluid Type		2450 MHz Body		Atmospheric Pressure		102.5		kPa	
Dielectric Constant $\epsilon_r$		IEEE Target		Measured		Ambient Temperature		24.7	
		52.7	$\pm 5\%$	50.2		Fluid Temperature		23.9	
Conductivity $\sigma$ (mho/m)		IEEE Target		Measured		Fluid Depth		$\geq 15$	
		1.95	$\pm 5\%$	2.00		$\rho$ (Kg/m <sup>3</sup> )		1000	

#### Note(s):

1. 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.
2. If the SAR levels measured at the mid channel of the frequency band were  $\geq 3$ dB below the SAR limit; SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]).
3. Secondary hotspots were evaluated to report SAR levels within 2 dB of the primary (P = Primary, S = Secondary).
4. The power drift measured by the DASY system for the duration of the SAR evaluation was added to the measured SAR levels to report scaled SAR results as shown in the above table.
5. 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.
6. The dielectric parameters of the simulated body tissue were measured prior to the evaluation using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see attached printout of measured fluid dielectric parameters).
7. The SAR evaluation was performed with 24 hours of the system performance check.

## 5.0 DETAILS OF SAR EVALUATION

The ITRONIX CORPORATION Model: IX100x Rugged Handheld PC FCC ID: KBCIX100XUSIWLBT with internal 802.11b & Bluetooth transmitter was compliant for localized Specific Absorption Rate (Uncontrolled Exposure) based on the following test provisions and conditions described below. The detailed test setup photographs are shown in Appendix H.

### Body SAR Configuration

1. The DUT was tested for body SAR with shoulder-worn carry case and ear-microphone accessories. The front side of the DUT (keypad/LCD side) was placed parallel to the outer surface of the planar phantom with the front side of the DUT facing the front of the carry case. A 0.0 cm separation distance was maintained between the front of the carry case and the outer surface of the planar phantom.
2. Due to the dimensions of the DUT, a stack of low-density, low-loss dielectric foamed polystyrene was used in place of the device holder.
3. 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.
4. The dielectric parameters of the simulated tissue were measured prior to the SAR evaluation using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).
5. The SAR evaluation was performed within 24 hours of the system performance check.

### DUT Test Modes & Power Settings

6. The conducted power of the DUT was measured prior to the SAR evaluation using a Gigatronics 8652A Universal Power Meter according to the procedures described in FCC 47 CFR §2.1046. The power drift measured by the DASY4 system for the duration of the SAR evaluation was added to the measured SAR levels to report scaled SAR results as shown in the test data table (page 5).
7. The DUT was controlled in test mode via internal software. SAR measurements were performed with the DUT transmitting continuously at maximum power with a modulated DSSS signal.
8. The DUT was evaluated with a fully charged battery.

## 6.0 EVALUATION PROCEDURES

- a. (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.
- b. 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:

- c. 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.
- d. 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:

- e. 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.
- f. 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).
- g. 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 in the planar section of the SAM phantom with a 2450MHz dipole (see Appendix C for system validation procedures). The dielectric parameters of the simulated tissue were measured prior to the system performance check using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters). A forward power of 250 mW 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	2450MHz 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						
05/31/04	Brain	13.1 $\pm 10\%$	13.3 (+1.6%)	39.2 $\pm 5\%$	37.3	1.80 $\pm 5\%$	1.86	1000	22.5	23.9	$\geq 15$	39	102.5

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 listed in the table above were consistent for all measurement periods.

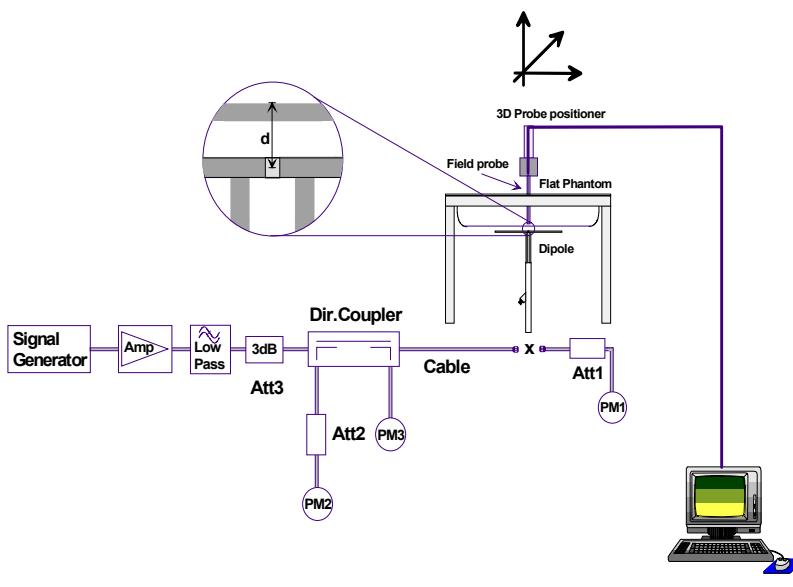


Figure 1. System Performance Check Setup Diagram



2450MHz Dipole Setup

## 8.0 SIMULATED EQUIVALENT TISSUES

The 2450MHz simulated tissue mixtures consist of Glycol-monobutyl, water, and salt (body mixture only). The fluids were prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

SIMULATED TISSUE MIXTURES		
INGREDIENT	2450 MHz Brain	2450 MHz Body
	System Performance Check	DUT Evaluation
Water	52.00 %	69.98 %
Glycol Monobutyl	48.00 %	30.00 %
Salt	-	0.02 %

## 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 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	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:** Fiberglass  
**Thickness:**  $2.0 \pm 0.1$  mm  
**Volume:** Approx. 72 liters

#### Validation Phantom

**Type:** SAM V4.0C  
**Shell Material:** Fiberglass  
**Thickness:**  $2.0 \pm 0.1$  mm  
**Volume:** Approx. 20 liters

## 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
Application:	Distance from probe tip to dipole centers: 2.7 mm General dosimetry up to 3 GHz Compliance tests of mobile phone



ET3DV6 E-Field Probe

## 12.0 SAM PHANTOM V4.0C

The SAM phantom V4.0C is a fiberglass shell phantom with a 2.0 mm (+/-0.2 mm) shell thickness for left and right head and flat planar area integrated in a wooden table. The shape of the fiberglass shell corresponds to the phantom defined by SCC34-SC2. The device holder positions are adjusted to the standard measurement positions in the three sections (see Appendix F for specifications of the SAM phantom V4.0C).



SAM Phantom

## 13.0 PLANAR PHANTOM

The planar phantom is a fiberglass shell phantom with a 2.0 mm (+/-0.2mm) thick device measurement area at the center of the phantom for SAR evaluations of devices with a larger surface area than the planar section of the SAM phantom. The planar phantom is integrated in a wooden table (see Appendix G for dimensions and specifications of the planar phantom).



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°. 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 2003
-1800MHz Validation Dipole	247	June 2003
-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 ±%	Probability Distribution	Divisor	$c_i$ 1g	Standard Uncertainty ±% (1g)	$v_i$ or $v_{eff}$
<b>Measurement System</b>						
Probe calibration	± 4.85	Normal	1	1	± 4.85	∞
Axial isotropy of the probe	± 4.7	Rectangular	$\sqrt{3}$	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	$\sqrt{3}$	$(c_p)$	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	$\sqrt{3}$	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Integration time	± 1.4	Rectangular	$\sqrt{3}$	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	$\sqrt{3}$	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	$\sqrt{3}$	1	± 2.3	∞
<b>Test Sample Related</b>						
Device positioning	± 6.0	Normal	$\sqrt{3}$	1	± 6.7	12
Device holder uncertainty	± 5.0	Normal	$\sqrt{3}$	1	± 5.9	8
Power drift	± 5.0	Rectangular	$\sqrt{3}$		± 2.9	∞
<b>Phantom and Setup</b>						
Phantom uncertainty	± 4.0	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
<b>Combined Standard Uncertainty</b>						
<b>Expanded Uncertainty (k=2)</b>						
± 13.32						
± 26.64						

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 ±%	Probability Distribution	Divisor	$c_i$ 1g	Standard Uncertainty ±% (1g)	$v_i$ or $v_{eff}$
<b>Measurement System</b>						
Probe calibration	± 4.85	Normal	1	1	± 4.85	∞
Axial isotropy of the probe	± 4.7	Rectangular	$\sqrt{3}$	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	$\sqrt{3}$	$(c_p)$	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	$\sqrt{3}$	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Integration time	± 1.4	Rectangular	$\sqrt{3}$	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	$\sqrt{3}$	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	$\sqrt{3}$	1	± 2.3	∞
<b>Dipole</b>						
Dipole Axis to Liquid Distance	± 2.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Input Power	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
<b>Phantom and Setup</b>						
Phantom uncertainty	± 4.0	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
<b>Combined Standard Uncertainty</b>					± 9.97	
<b>Expanded Uncertainty (k=2)</b>					± 19.93	

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 Radiofrequency 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".

Test Report S/N:	021104-470BKBC
Test Date(s):	May 31, 2004
Test Type:	FCC/IC SAR Evaluation

## APPENDIX A - SAR MEASUREMENT DATA

## Body-Worn SAR - 2437 MHz - Front Side of DUT (Antenna Side) with Carry Case Accessory

DUT: Itronix Corporation; Model: IX100x; Type: Rugged Handheld PC with 802.11b/Bluetooth; Serial: 510495001-U5103-0025

### Body-Worn Accessories: Nylon Carry Case (P/N: 54-0644-001), Ear-Microphone (Model: JABRA)

Ambient Temp: 24.7°C; Fluid Temp: 23.9°C; Barometric Pressure: 102.5 kPa; Humidity: 39%

Lithium-ion 7.4V 3.0 Ah Battery

Communication System: DSSS

Frequency: 2437 MHz; Duty Cycle: 1:1

RF Output Power: 14.0 dBm (Peak Conducted)

Medium: M2450 ( $\sigma = 2 \text{ mho/m}$ ;  $\epsilon_r = 50.2$ ;  $\rho = 1000 \text{ kg/m}^3$ )

- Probe: ET3DV6 - SN1387; ConvF(4.5, 4.5, 4.5); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

### Body-Worn - Front Side of DUT & Carry Case - 0.0 cm Separation Distance - Mid Channel - 2437 MHz

Area Scan (10x19x1): Measurement grid: dx=15mm, dy=15mm

### Body-Worn - Front Side of DUT & Carry Case - 0.0 cm Separation Distance - Mid Channel - 2437 MHz

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.69 V/m; Power Drift = -0.132 dB

Peak SAR (extrapolated) = 0.095 W/kg

**SAR(1 g) = 0.052 mW/g; SAR(10 g) = 0.035 mW/g**

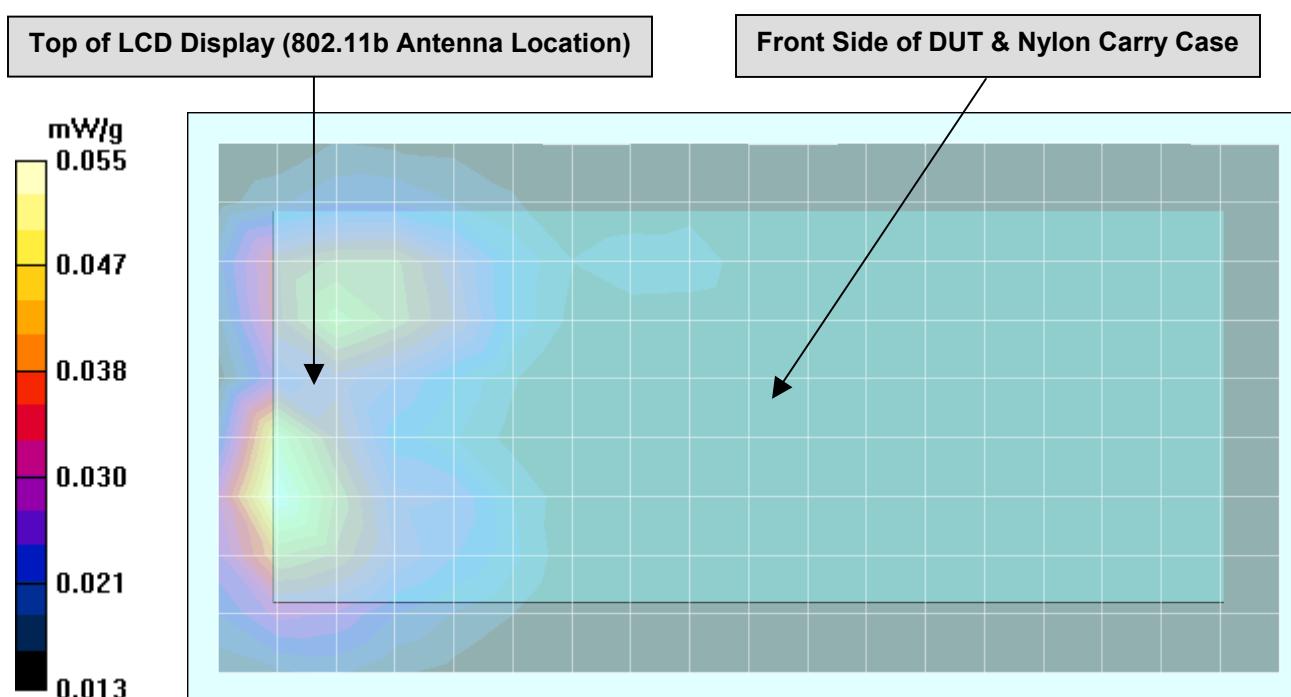
### Body-Worn - Front Side of DUT & Carry Case - 0.0 cm Separation Distance - Mid Channel - 2437 MHz

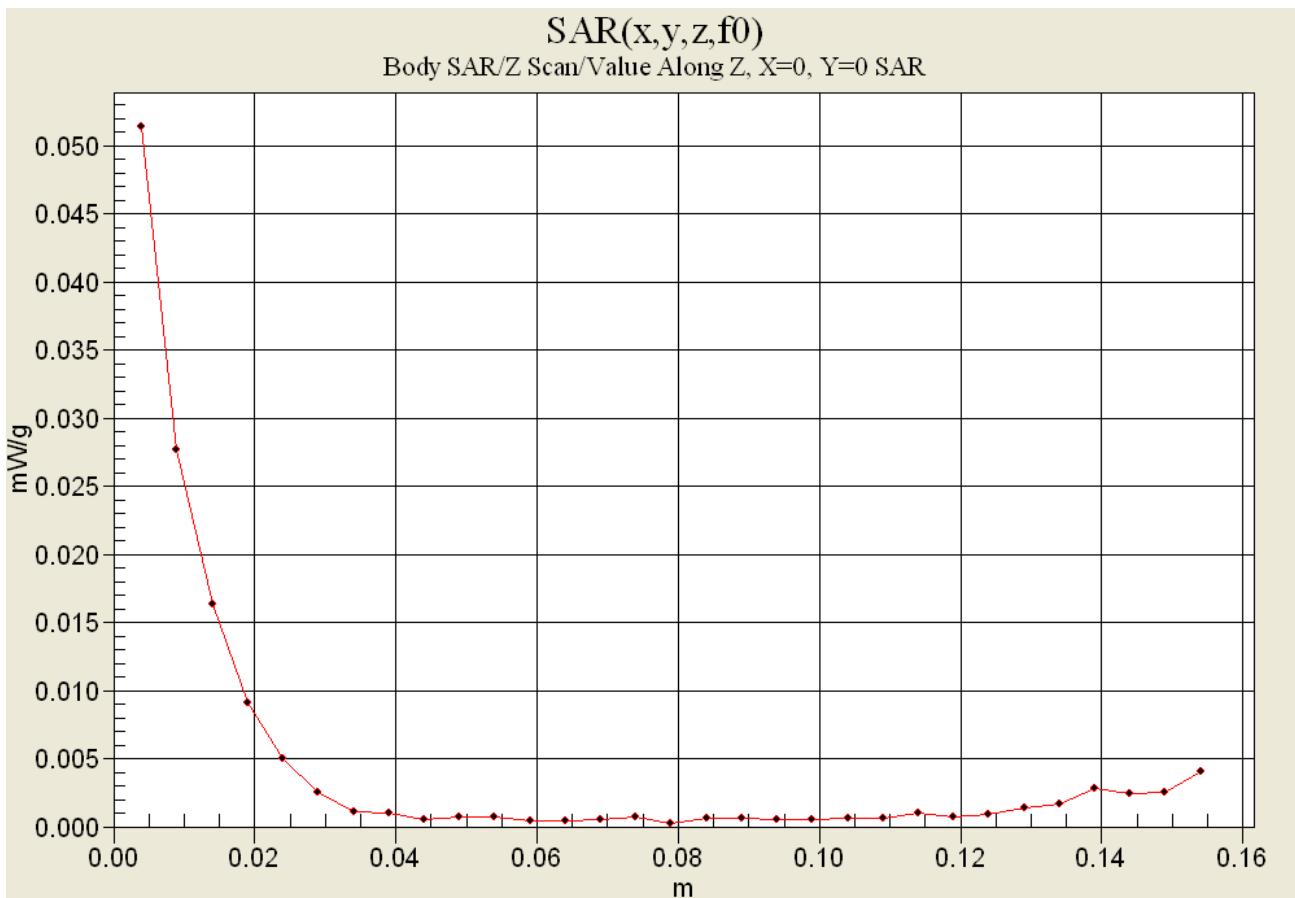
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.69 V/m; Power Drift = -0.132 dB

Peak SAR (extrapolated) = 0.080 W/kg

**SAR(1 g) = 0.045 mW/g; SAR(10 g) = 0.031 mW/g**



**Z-Axis Scan**

**APPENDIX B - SYSTEM PERFORMANCE CHECK DATA**

## System Performance Check - 2450 MHz Dipole

Date Tested: 05/31/04

DUT: Dipole 2450 MHz; Model: D2450V2; Type: System Performance Check Serial: 150

Ambient Temp: 22.5°C; Fluid Temp: 23.9°C; Barometric Pressure: 102.5 kPa; Humidity: 39%

Communication System: CW

Forward Conducted Power: 250mW

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL2450 ( $\sigma = 1.86 \text{ mho/m}$ ;  $\epsilon_r = 37.3$ ;  $\rho = 1000 \text{ kg/m}^3$ )

- Probe: ET3DV6 - SN1387; ConvF(4.77, 4.77, 4.77); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

### 2450 MHz System Performance Check/Area Scan (6x10x1):

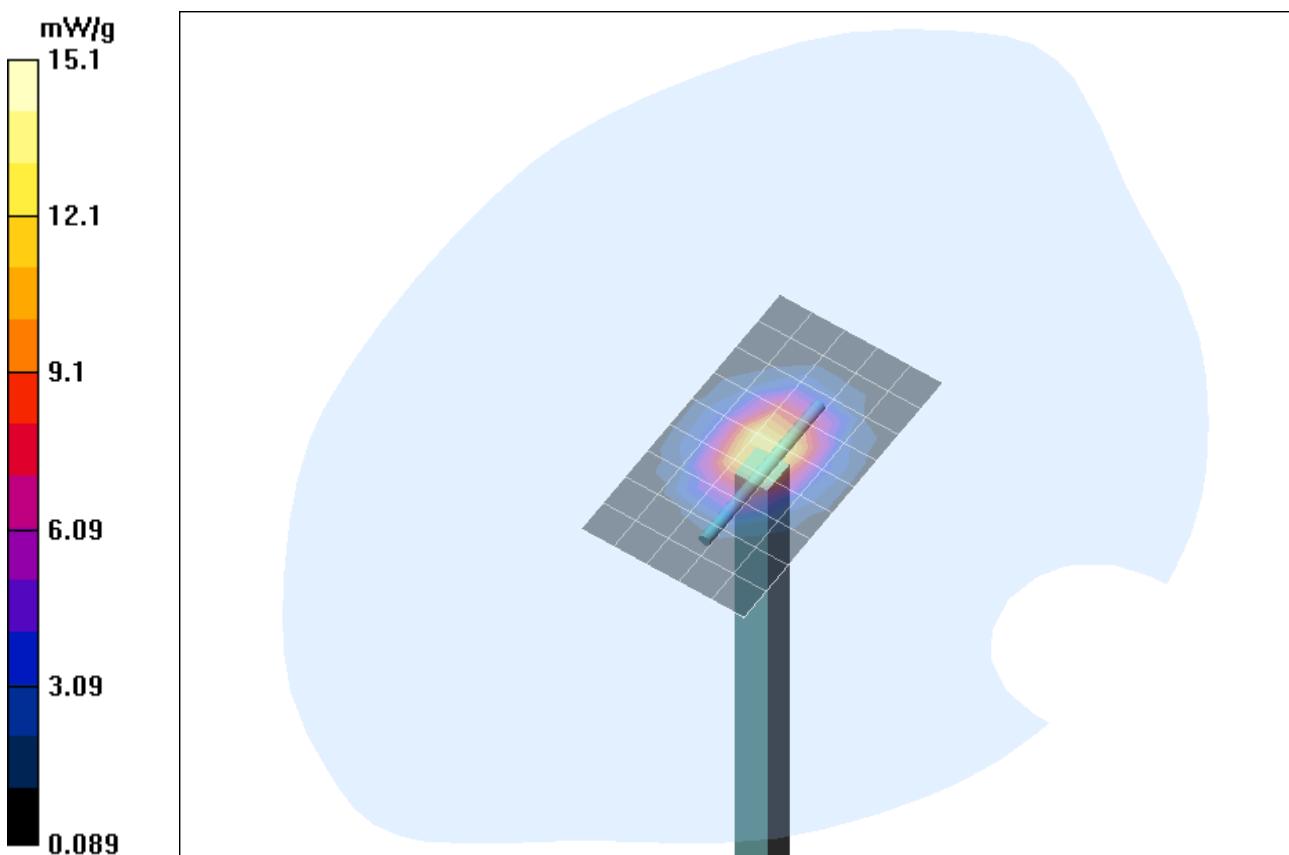
Measurement grid: dx=10mm, dy=10mm

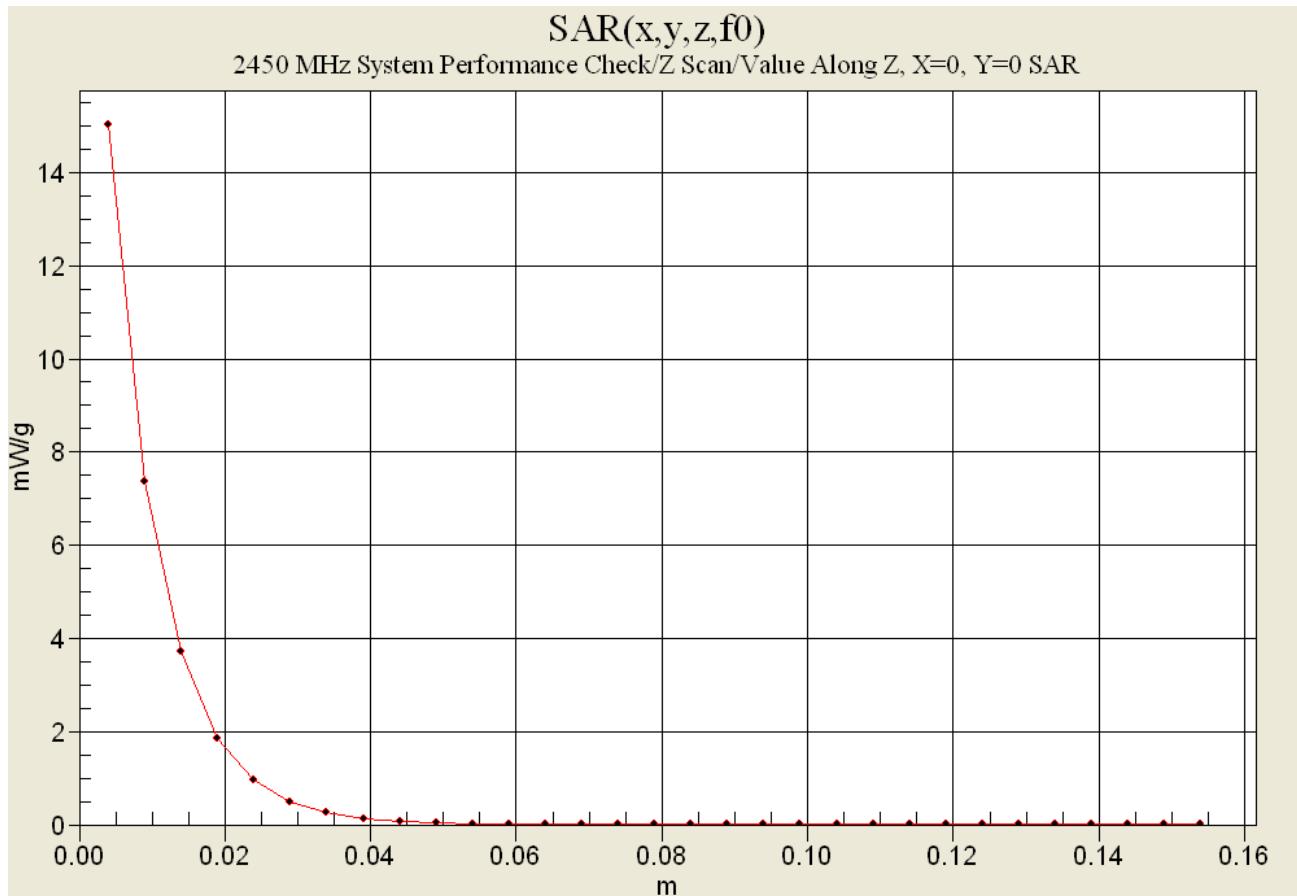
### 2450 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 96 V/m; Power Drift = 0.0 dB

**SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.1 mW/g**



**Z-Axis Scan**

Test Report S/N:	021104-470BKBC
Test Date(s):	May 31, 2004
Test Type:	FCC/IC SAR Evaluation

## APPENDIX C - SYSTEM VALIDATION

## 2450MHz SYSTEM VALIDATION DIPOLE

Type:

**2450MHz Validation Dipole**

Serial Number:

**150**

Place of Calibration:

**Celltech Labs Inc.**

Date of Calibration:

**September 17, 2003**

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

Calibrated by:



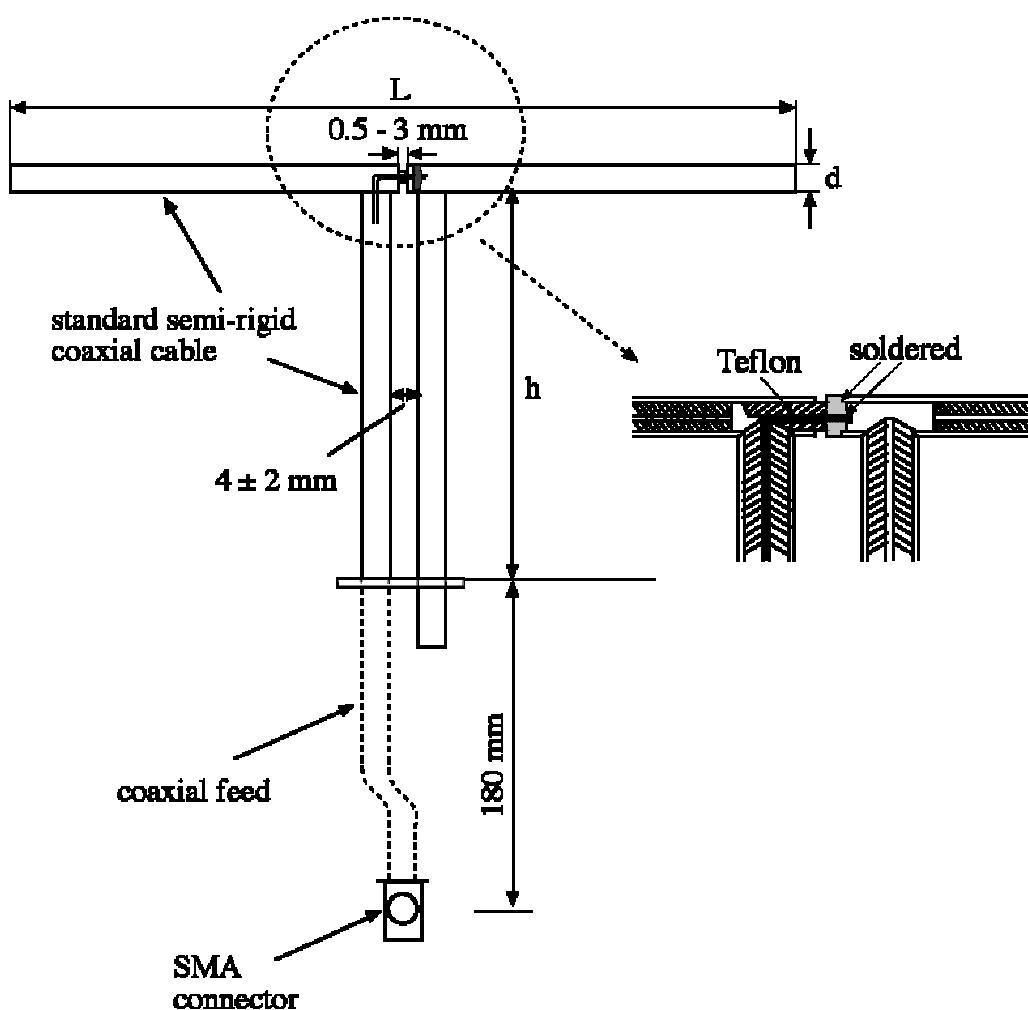
Approved by:

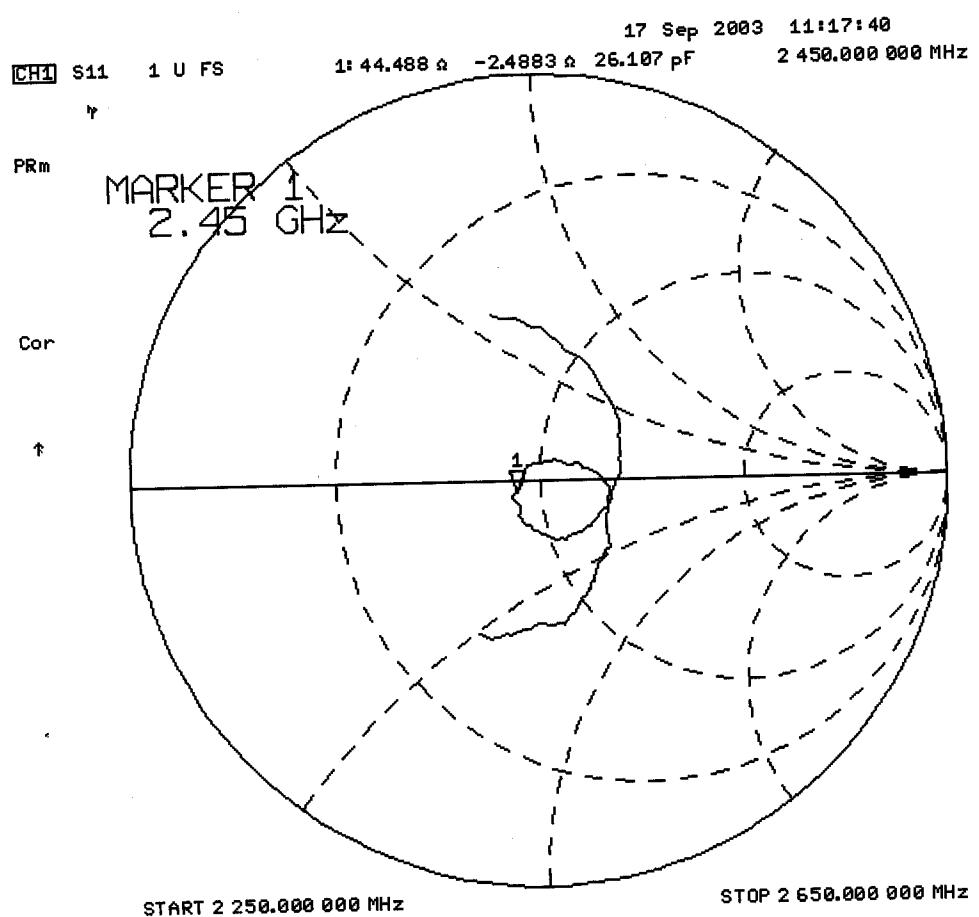


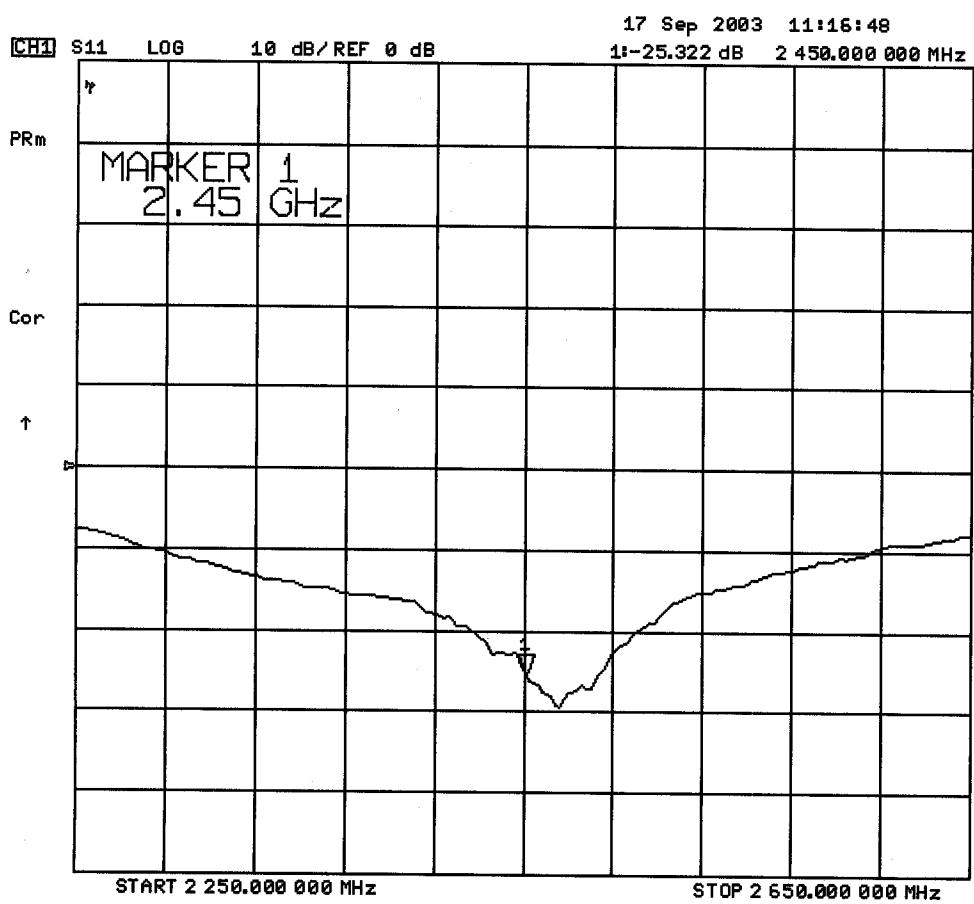
## 1. Dipole Construction & Electrical Characteristics

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 10.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

Feed point impedance at 2450MHz	$\text{Re}\{Z\} = 44.488\Omega$
	$\text{Im}\{Z\} = -2.4883\Omega$
Return Loss at 2450MHz	-25.322 dB







## 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

## 2. Validation Phantom

The validation phantom is the SAM (Specific Anthropomorphic Mannequin) phantom manufactured by Schmid & Partner Engineering AG. The SAM phantom is a Fiberglass shell integrated in a wooden table. The shape of the shell corresponds to the phantom defined by SCC34-SC2. 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 in the robot.

**Shell Thickness:** 2.0 ± 0.1 mm  
**Filling Volume:** Approx. 20 liters  
**Dimensions:** 50 cm (W) x 100 cm (L)

**2450MHz Dipole Calibration**



**2450MHz Dipole Calibration**



### **3. Measurement Conditions**

The planar phantom was filled with brain simulating tissue having the following electrical parameters at 2450MHz:

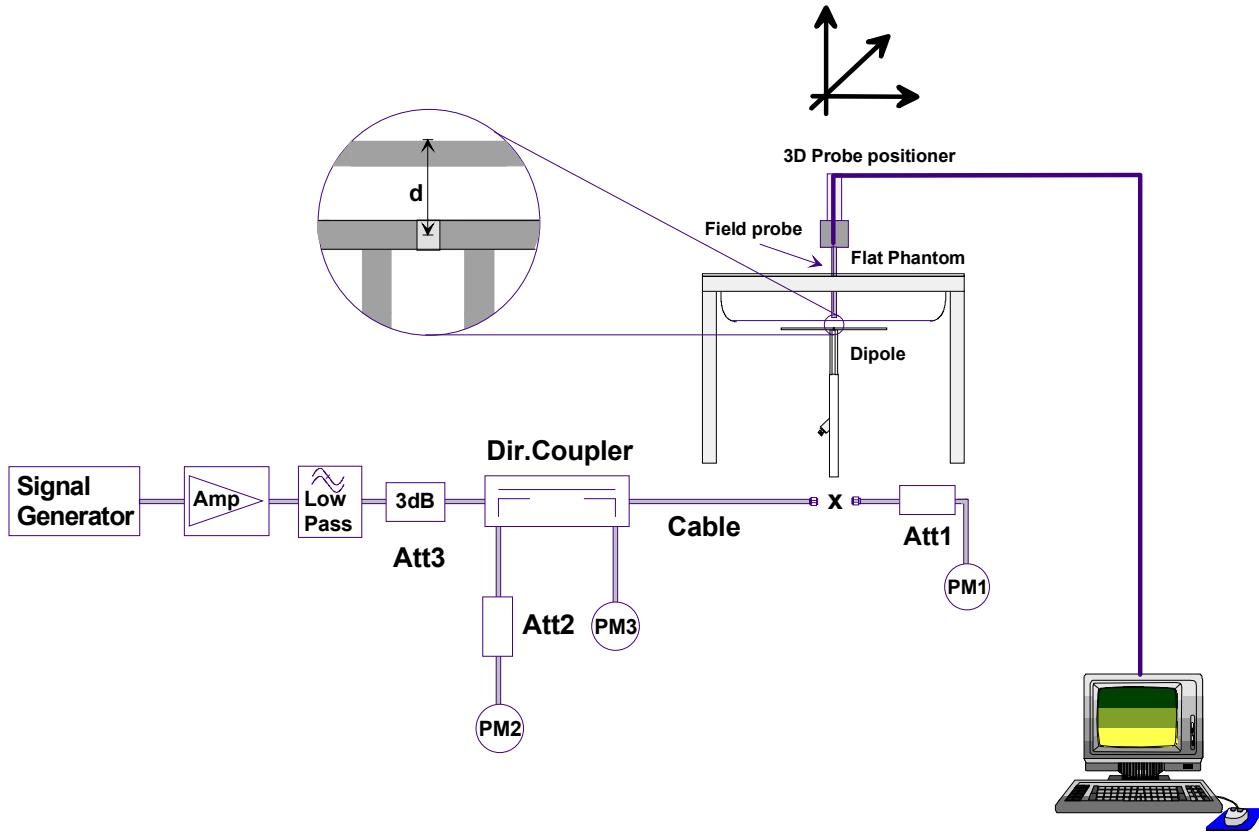
Relative Permittivity:	37.3
Conductivity:	1.88 mho/m
Ambient Temperature:	21.6°C
Fluid Temperature:	23.9°C
Fluid Depth:	≥ 15cm

The 2450MHz simulating tissue consists of the following ingredients:

Ingredient	Percentage by weight
Water	52.00%
Glycol Monobutyl	48.00%
Target Dielectric Parameters at 22°C	$\epsilon_r = 39.2$ (+/-5%) $\sigma = 1.80$ S/m (+/-5%)

#### 4. 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.

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

### Validation Dipole SAR Test Results

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	13.9	55.6	6.27	25.08	29.5
Test 2	13.9	55.6	6.25	25.00	29.1
Test 3	13.9	55.6	6.24	24.96	28.9
Test 4	14.0	56.0	6.31	25.24	29.1
Test 5	14.0	56.0	6.27	25.08	29.7
Test 6	13.8	55.2	6.25	25.00	29.3
Test 7	13.9	55.6	6.22	24.88	29.3
Test 8	13.9	55.6	6.24	24.96	29.4
Test 9	14.0	56.0	6.29	25.16	30.0
Test10	13.8	55.2	6.17	24.68	29.3
Average Value	13.91	55.64	6.251	25.00	29.36

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

Averaged over 1cm (1g) of tissue: 55.64 mW/g

Averaged over 10cm (10g) of tissue: 25.00 mW/g

Test Date: 09/17/03

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:150**

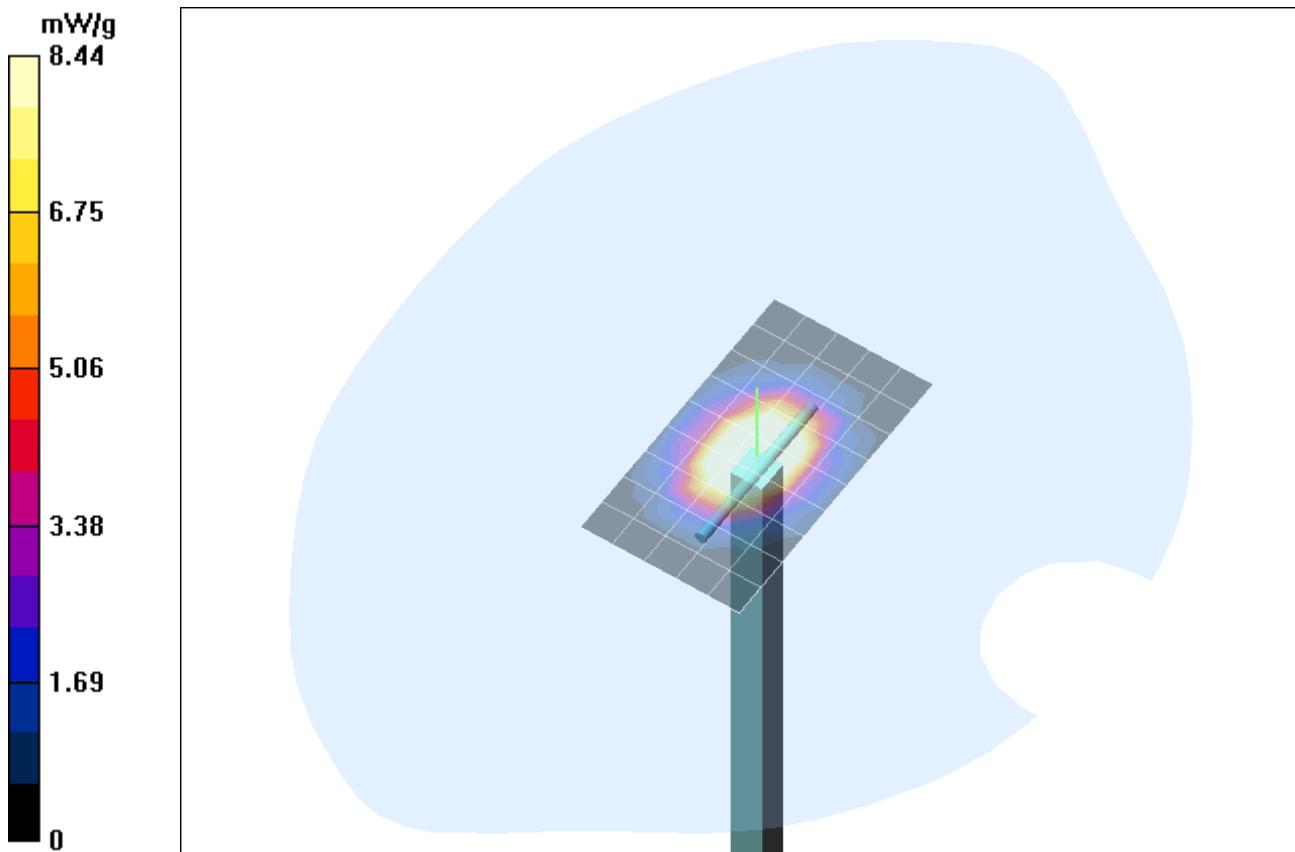
Ambient Temp: 22.2C; Fluid Temp: 23.8C  
 Barometric Pressure: 101.9 kPa; Humidity: 52%

Communication System: CW  
 Frequency: 2450 MHz; Duty Cycle: 1:1  
 Medium: HSL2450 ( $\sigma = 1.88 \text{ mho/m}$ ,  $\epsilon_r = 37.3$ ,  $\rho = 1000 \text{ kg/m}^3$ )

- Probe: ET3DV6 - SN1387; ConvF(5, 5, 5); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: SAM front; Type: SAM 4.0; Serial: 1033
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

**Probe SN1387 Validation at 2450 MHz/Area Scan (6x10x1):** Measurement grid: dx=10mm, dy=10mm

**Probe SN1387 Validation at 2450 MHz/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Peak SAR (extrapolated) = 29.5 W/kg  
**SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.27 mW/g**  
 Reference Value = 96.7 V/m  
 Power Drift = -0.08 dB





# 2450MHz System Validation

## Measured Fluid Dielectric Parameters (Brain)

September 17, 2003

Frequency	e'	e"
2.350000000 GHz	37.7457	13.5170
2.360000000 GHz	37.7101	13.5534
2.370000000 GHz	37.6951	13.5903
2.380000000 GHz	37.6613	13.6228
2.390000000 GHz	37.6411	13.6368
2.400000000 GHz	37.5853	13.6598
2.410000000 GHz	37.5236	13.6742
2.420000000 GHz	37.4573	13.7091
2.430000000 GHz	37.4063	13.7484
2.440000000 GHz	37.3419	13.7798
2.450000000 GHz	37.2875	13.8226
2.460000000 GHz	37.2447	13.8618
2.470000000 GHz	37.2198	13.8951
2.480000000 GHz	37.1940	13.9293
2.490000000 GHz	37.1679	13.9423
2.500000000 GHz	37.1333	13.9571
2.510000000 GHz	37.0990	13.9745
2.520000000 GHz	37.0410	14.0116
2.530000000 GHz	36.9938	14.0375
2.540000000 GHz	36.9185	14.0546
2.550000000 GHz	36.8657	14.0912

Test Report S/N:	021104-470BKBC
Test Date(s):	May 31, 2004
Test Type:	FCC/IC SAR Evaluation

## APPENDIX D - PROBE CALIBRATION

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

**Client**

**Celltech**

## **CALIBRATION CERTIFICATE**

Object(s)	ET3DV6 - SN:1387
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	March 18, 2004
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

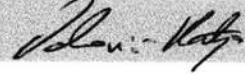
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

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	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS, No. 251-0340)	Apr-04
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

Calibrated by: **Name** **Function** **Signature**  
Nico Vetterli Technician 

Approved by: **Name** **Function** **Signature**  
Katja Pokovic Laboratory Director 

Date issued: March 18, 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:1387

Manufactured:	September 21, 1999
Last calibrated:	February 26, 2003
Recalibrated:	March 18, 2004

**Calibrated for DASY Systems**

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space		Diode Compression <sup>A</sup>		
NormX	<b>1.62</b> $\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	<b>92</b>	mV
NormY	<b>1.71</b> $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	<b>92</b>	mV
NormZ	<b>1.71</b> $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	<b>92</b>	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	<b>3.7</b> mm	<b>4.7</b> mm
SAR <sub>be</sub> [%]       Without Correction Algorithm	<b>9.3</b>	<b>4.4</b>
SAR <sub>be</sub> [%]       With Correction Algorithm	<b>0.0</b>	<b>0.1</b>

Head                   **1800 MHz**           Typical SAR gradient: 10 % per mm

Sensor to Surface Distance	<b>3.7</b> mm	<b>4.7</b> mm
SAR <sub>be</sub> [%]       Without Correction Algorithm	<b>14.8</b>	<b>10.0</b>
SAR <sub>be</sub> [%]       With Correction Algorithm	<b>0.2</b>	<b>0.0</b>

### Sensor Offset

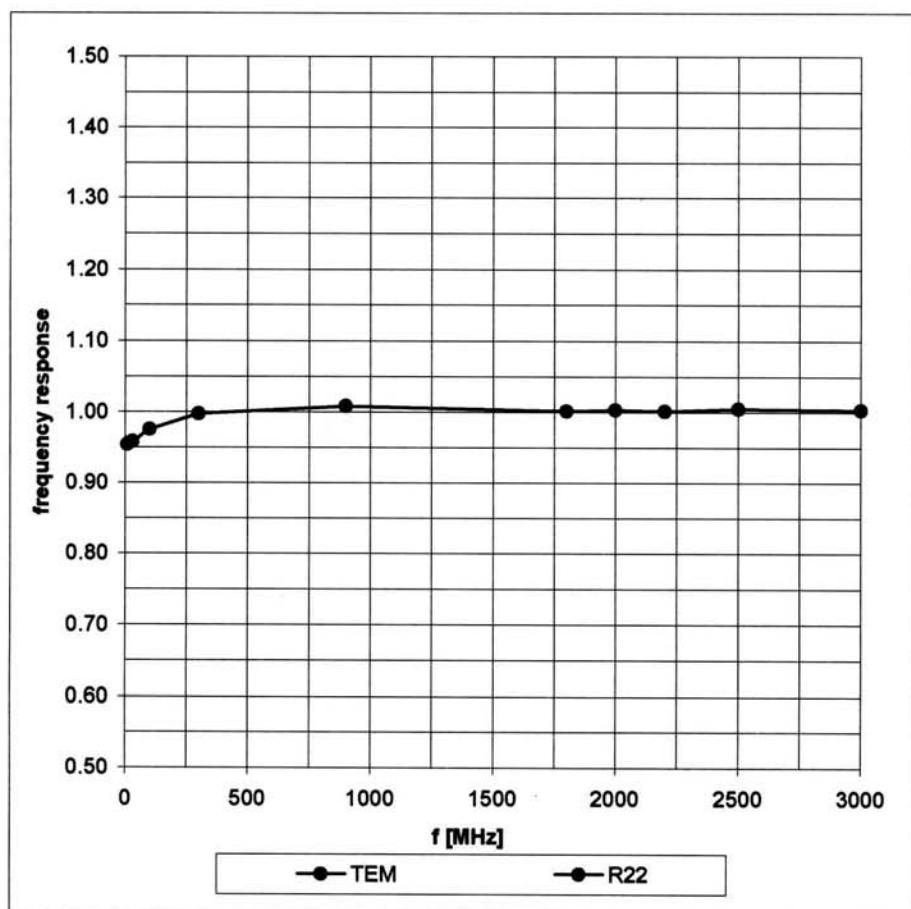
Probe Tip to Sensor Center	<b>2.7</b> mm
Optical Surface Detection	<b>in tolerance</b>

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%.

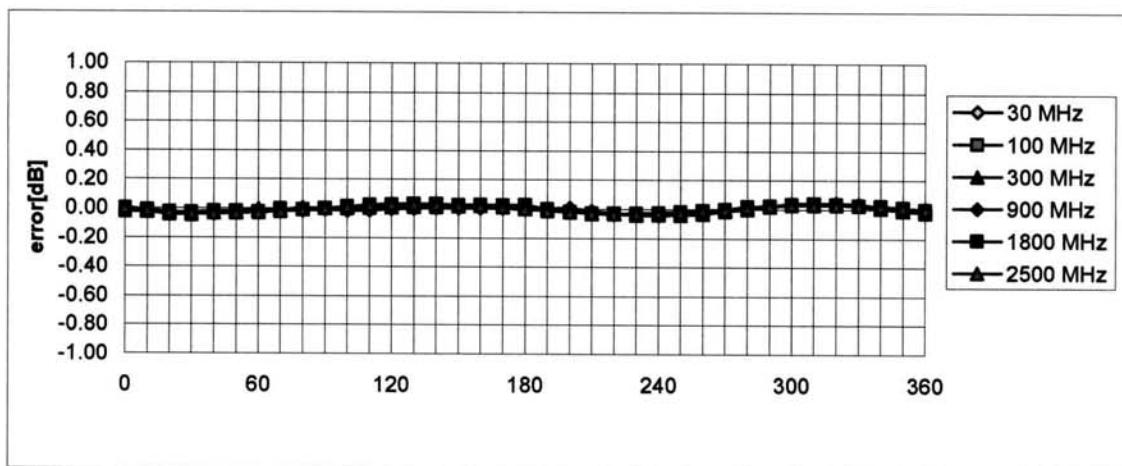
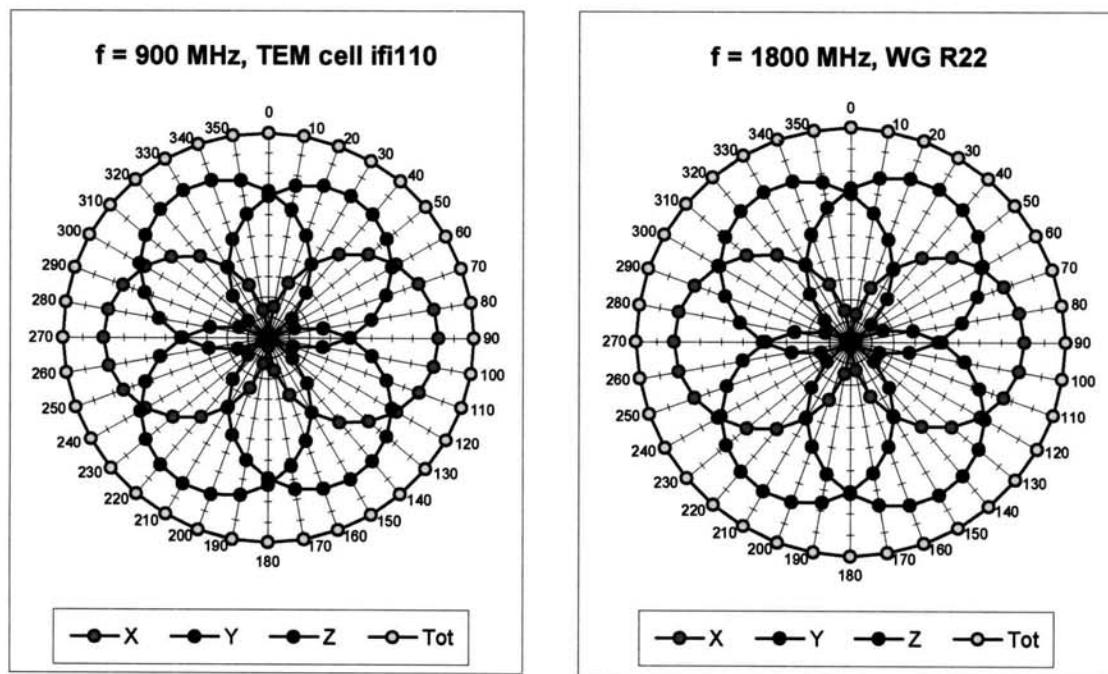
<sup>A</sup> numerical linearization parameter: uncertainty not required

## Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)

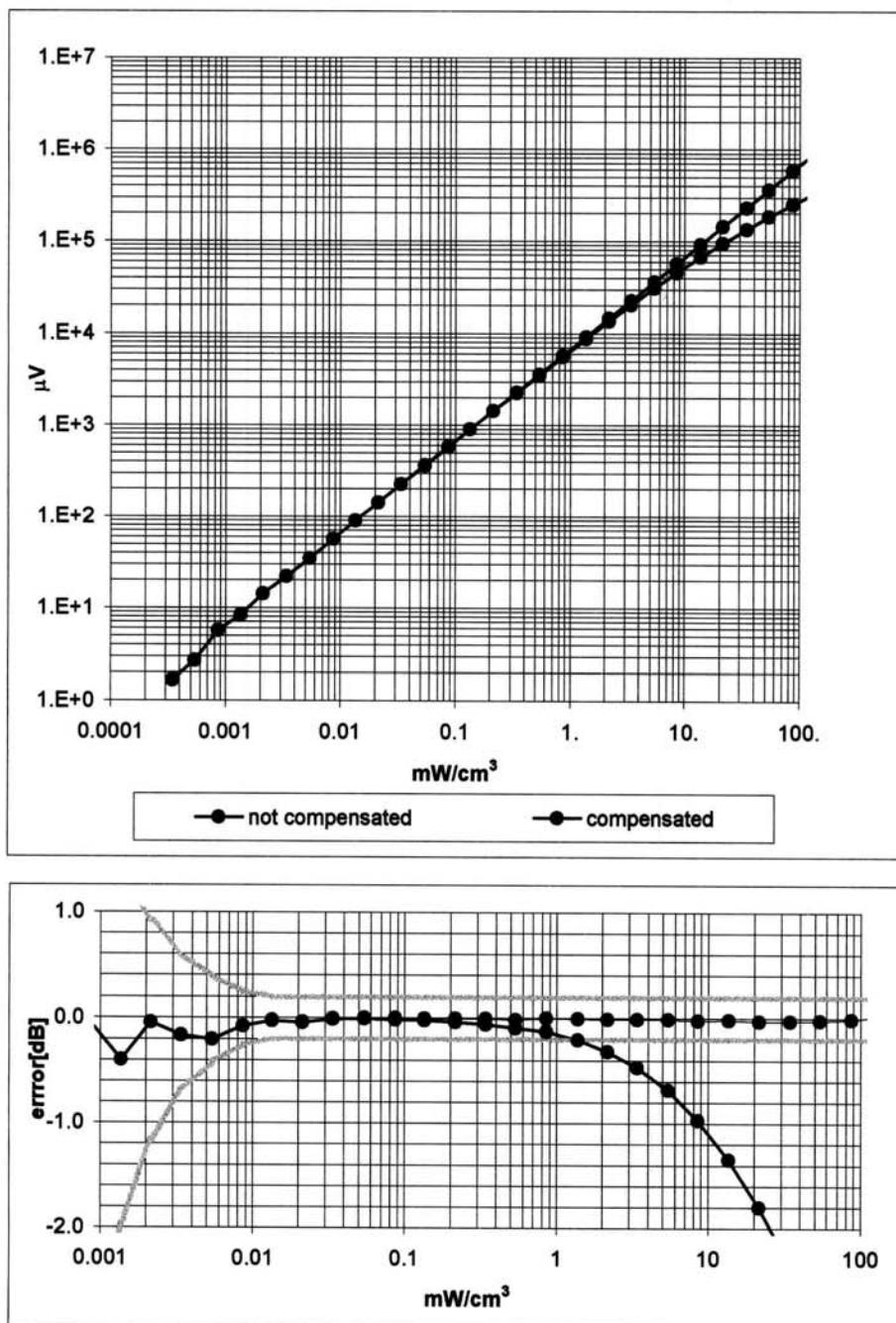


## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



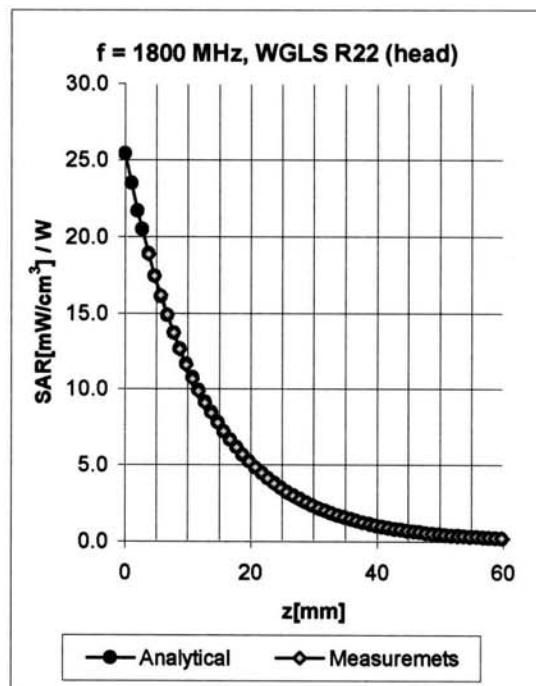
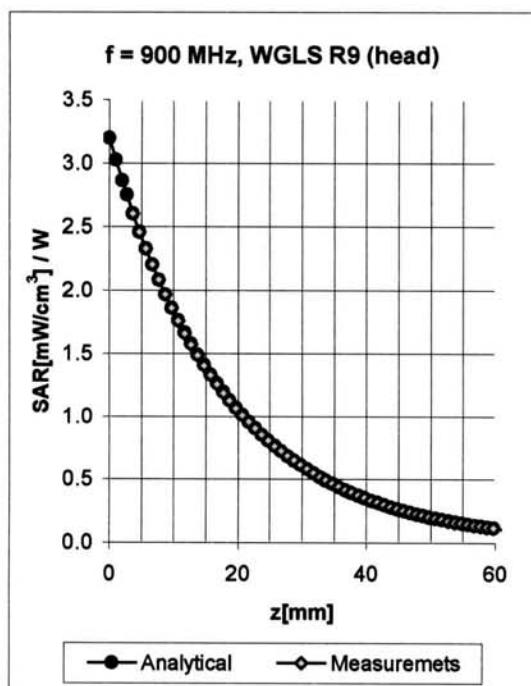
Axial Isotropy Error  $< \pm 0.2$  dB

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



Probe Linearity  $< \pm 0.2 \text{ dB}$

## Conversion Factor Assessment



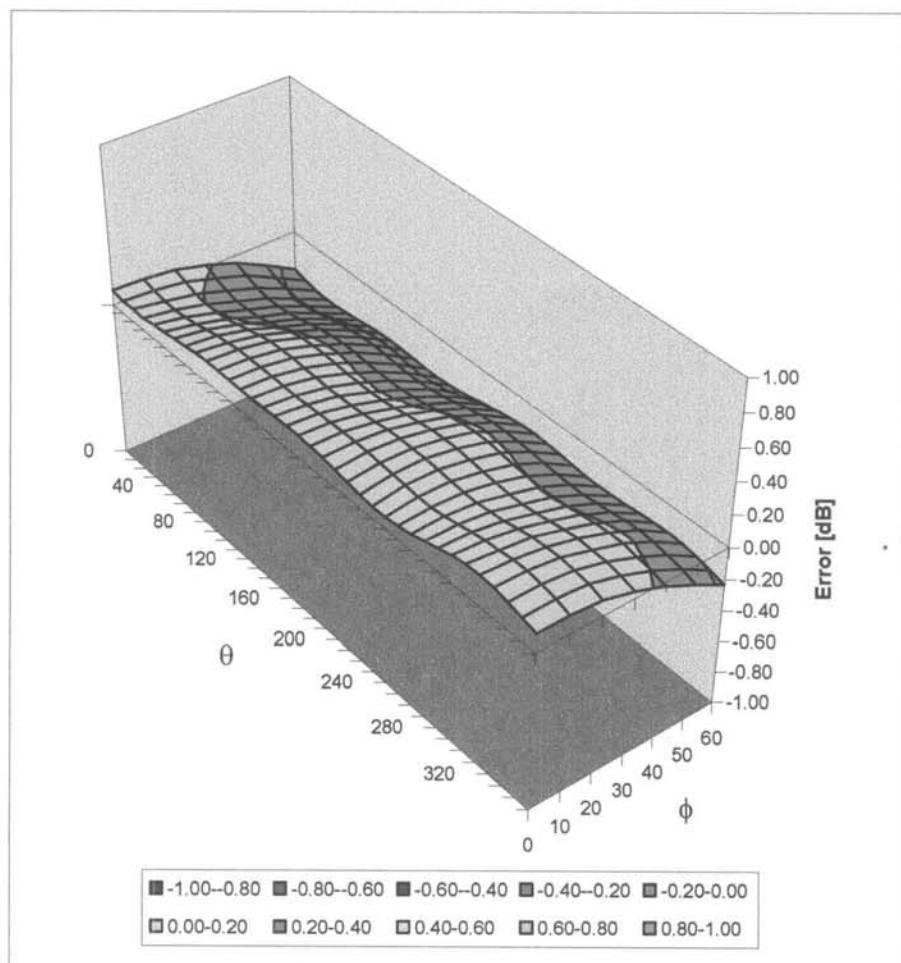
f [MHz]	Validity [MHz] <sup>B</sup>	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	750-950	Head	$41.5 \pm 5\%$	$0.90 \pm 5\%$	0.72	1.78	6.71	$\pm 11.9\% \text{ (k=2)}$
1750	1700-1800	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	0.51	2.67	5.38	$\pm 9.7\% \text{ (k=2)}$
1900	1850-1950	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	0.55	2.66	5.25	$\pm 9.7\% \text{ (k=2)}$
2450	2400-2500	Head	$39.2 \pm 5\%$	$1.80 \pm 5\%$	0.99	1.89	4.77	$\pm 9.7\% \text{ (k=2)}$

835	750-950	Body	$55.2 \pm 5\%$	$0.97 \pm 5\%$	0.56	2.04	6.24	$\pm 11.9\% \text{ (k=2)}$
1750	1700-1800	Body	$53.3 \pm 5\%$	$1.52 \pm 5\%$	0.58	2.82	4.68	$\pm 9.7\% \text{ (k=2)}$
1900	1850-1950	Body	$53.3 \pm 5\%$	$1.52 \pm 5\%$	0.62	2.77	4.57	$\pm 9.7\% \text{ (k=2)}$
2450	2400-2500	Body	$52.7 \pm 5\%$	$1.95 \pm 5\%$	1.75	1.28	4.50	$\pm 9.7\% \text{ (k=2)}$

<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:

1387

Place of Assessment:

Zurich

Date of Assessment:

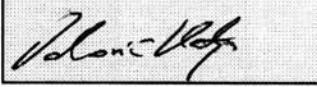
March 22, 2004

Probe Calibration Date:

March 18, 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:1387

Conversion factor ( $\pm$  standard deviation)

<b>150 MHz</b>	ConvF	<b>9.1 <math>\pm</math> 8%</b>	$\epsilon_r = 52.3 \pm 5\%$ $\sigma = 0.76 \pm 5\%$ mho/m (head tissue)
<b>300 MHz</b>	ConvF	<b>7.8 <math>\pm</math> 8%</b>	$\epsilon_r = 45.3 \pm 5\%$ $\sigma = 0.87 \pm 5\%$ mho/m (head tissue)
<b>450 MHz</b>	ConvF	<b>7.5 <math>\pm</math> 8%</b>	$\epsilon_r = 43.5 \pm 5\%$ $\sigma = 0.87 \pm 5\%$ mho/m (head tissue)
<b>150 MHz</b>	ConvF	<b>8.7 <math>\pm</math> 8%</b>	$\epsilon_r = 61.9 \pm 5\%$ $\sigma = 0.80 \pm 5\%$ mho/m (body tissue)
<b>450 MHz</b>	ConvF	<b>7.6 <math>\pm</math> 8%</b>	$\epsilon_r = 56.7 \pm 5\%$ $\sigma = 0.94 \pm 5\%$ 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**

# 2450 MHz System Performance Check

## Measured Fluid Dielectric Parameters (Brain)

May 31, 2004

Frequency	e'	e"
2.350000000 GHz	37.6517	13.3491
2.360000000 GHz	37.6148	13.3843
2.370000000 GHz	37.5820	13.4164
2.380000000 GHz	37.5455	13.4462
2.390000000 GHz	37.5128	13.4623
2.400000000 GHz	37.4801	13.4841
2.410000000 GHz	37.4254	13.5045
2.420000000 GHz	37.3778	13.5603
2.430000000 GHz	37.3527	13.5849
2.440000000 GHz	37.3014	13.6198
2.450000000 GHz	37.2759	13.6722
2.460000000 GHz	37.2389	13.6989
2.470000000 GHz	37.2125	13.7443
2.480000000 GHz	37.1935	13.7678
2.490000000 GHz	37.1555	13.7933
2.500000000 GHz	37.1135	13.8195
2.510000000 GHz	37.0705	13.8335
2.520000000 GHz	37.0105	13.8751
2.530000000 GHz	36.9631	13.9014
2.540000000 GHz	36.8978	13.9374
2.550000000 GHz	36.8602	13.9670

# 2450 MHz DUT Evaluation (Body)

## Measured Fluid Dielectric Parameters (Muscle)

May 31, 2004

Frequency	e'	e"
2.350000000 GHz	50.5123	14.2813
2.360000000 GHz	50.4653	14.3062
2.370000000 GHz	50.4461	14.3568
2.380000000 GHz	50.4101	14.3917
2.390000000 GHz	50.3771	14.4308
2.400000000 GHz	50.3433	14.4679
2.410000000 GHz	50.3014	14.5152
2.420000000 GHz	50.2568	14.5771
2.430000000 GHz	50.2425	14.6146
2.440000000 GHz	50.1905	14.6435
2.450000000 GHz	50.1713	14.6953
2.460000000 GHz	50.1363	14.7268
2.470000000 GHz	50.1087	14.7572
2.480000000 GHz	50.0935	14.7877
2.490000000 GHz	50.0483	14.8192
2.500000000 GHz	50.0071	14.8646
2.510000000 GHz	49.9664	14.9063
2.520000000 GHz	49.9056	14.9629
2.530000000 GHz	49.8754	15.0078
2.540000000 GHz	49.8213	15.0322
2.550000000 GHz	49.7887	15.0962

Test Report S/N:	021104-470BKBC
Test Date(s):	May 31, 2004
Test Type:	FCC/IC SAR Evaluation

**APPENDIX F - SAM PHANTOM CERTIFICATE OF CONFORMITY**

# Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

## Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

### Tests

The series production process used allows the limitation to test of first articles. Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

### Standards

- [1] CENELEC EN 50361
- [2] IEEE P1528-200x draft 6.5
- [3] IEC PT 62209 draft 0.9

(\*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

### Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 18.11.2001

Signature / Stamp

  
**Schmid & Partner**  
**Engineering AG**

Zeughausstrasse 43, CH-8004 Zurich  
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

Test Report S/N:	021104-470BKBC
Test Date(s):	May 31, 2004
Test Type:	FCC/IC SAR Evaluation

**APPENDIX G - PLANAR PHANTOM CERTIFICATE OF CONFORMITY**

2378 Westlake Road  
Kelowna, B.C. Canada  
V1Z-2V2



Ph. # 250-769-6848  
Fax # 250-769-6334  
E-mail: [barskiind@shaw.ca](mailto:barskiind@shaw.ca)  
Web: [www.bcfiberglass.com](http://www.bcfiberglass.com)

## FIBERGLASS FABRICATORS

### Certificate of Conformity

Item : Flat Planar Phantom Unit # 03-01  
Date: June 16, 2003  
Manufacturer: Barski Industries (1985 Ltd)

Test	Requirement	Details
Shape	Compliance to geometry according to drawing	Supplied CAD drawing
Material Thickness	Compliant with the requirements	2mm +/- 0.2mm in measurement area
Material Parameters	Dielectric parameters for required frequencies Based on Dow Chemical technical data	100 MHz-5 GHz Relative permittivity < 5 Loss Tangent < 0.05

### Conformity

Based on the above information, we certify this product to be compliant to the requirements specified.

Signature: A handwritten signature in black ink, appearing to read 'Daniel Chailler', is placed over a horizontal line.

Daniel Chailler



**Fiberglass Planar Phantom - Top View**



**Fiberglass Planar Phantom - Front View**



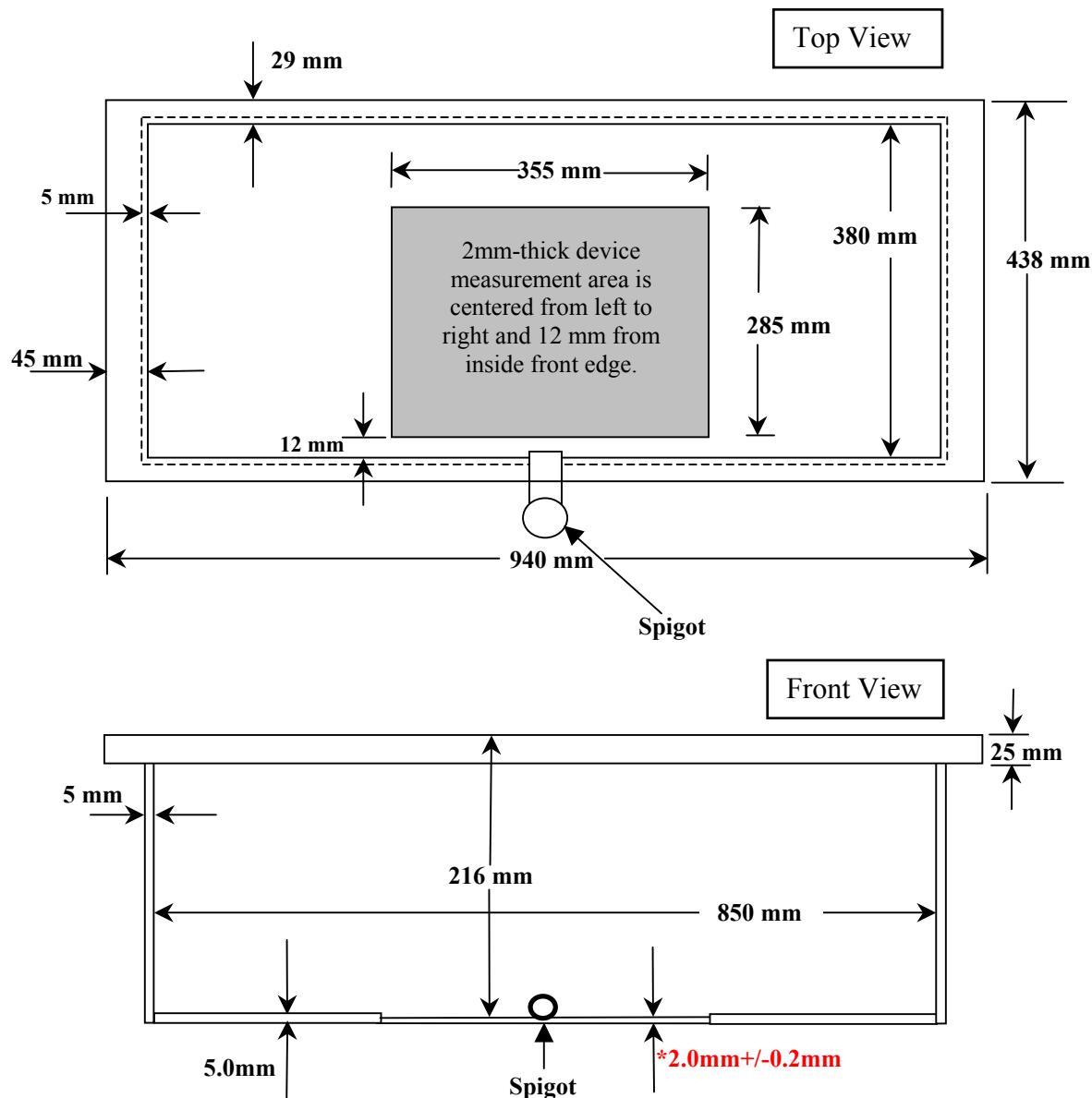
**Fiberglass Planar Phantom - Back View**



**Fiberglass Planar Phantom - Bottom View**

## Dimensions of Fiberglass Planar Phantom

(Manufactured by Barski Industries Ltd. - Unit# 03-01)



**Note:** Measurements that aren't repeated for the opposite sides are the same as the side measured.  
This drawing is not to scale.

Test Report S/N:	021104-470BKBC
Test Date(s):	May 31, 2004
Test Type:	FCC/IC SAR Evaluation

**APPENDIX H - SAR TEST SETUP PHOTOGRAPHS**

### BODY SAR TEST SETUP PHOTOGRAPHS

0.0 cm Separation Distance from Front of Carry Case to Planar Phantom

(Front Side of DUT & 802.11b Antenna facing Planar Phantom)

Nylon Carry Case (P/N: 54-0644-001) & Ear-Microphone (Model: JABRA) Accessories

