Test Report S/N:	101403-439KBC
Test Date(s):	October 28-31, 2003
Test Type:	FCC/IC SAR Evaluation

DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab

CELLTECH LABS INC.
Testing and Engineering Services
1955 Moss Court
Kelowna, B.C.
Canada V1Y 9L3
Phone: 250-448-7047
Fax: 250-448-7046
e-mail: info@celltechlabs.com
web site: www.celltechlabs.com

Applicant Information

ITRONIX CORPORATION
801 South Stevens Street
Spokane, WA 99210-0179

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)**
FCC Device Classification:	**PCS Licensed Transmitter (PCB)**
IC Device Classification:	**2 GHz Personal Communication Services (RSS-133)** **800MHz CDMA Cellular Transmitter (RSS-129 Issue 2)**
FCC ID:	**KBCIX100AC555**
IC Certification No.:	**1943A-IX100555**
Model(s):	**IX100**
Device Type:	**Rugged Handheld PC (Alpha-numeric & Numeric Keypad types) with Sierra Wireless AirCard 555/550 Dual-Band PCS/Cellular CDMA Modem**
Tx Frequency Range:	**1851.25 - 1908.75 MHz (PCS CDMA)** **824.70 - 848.31 MHz (Cellular CDMA)**
Max. RF Output Power Tested:	**23.0 dBm Conducted (PCS CDMA)** **23.0 dBm Conducted (Cellular CDMA)**
Battery Type:	**7.4V Lithium-ion, 2.8Ah**
Antenna Type:	**¼ Wave Helix (Length: 54 mm)**
Body-Worn Accessories Tested:	**Nylon Carry Case (P/N: 54-0644-001)** **Ear-Microphone (Model: JABRA)**
Max. Body SAR Measured:	**0.917 W/kg (PCS CDMA)** **0.871 W/kg (Cellular CDMA)**

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device was compliant 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.

Russell Pipe
Senior Compliance Technologist
Celltech Labs Inc.

TABLE OF CONTENTS

1.0 INTRODUCTION

This measurement report demonstrates that the ITRONIX CORPORATION Model: IX100 Rugged Handheld PC with Sierra Wireless AirCard 555/550 Dual-Band PCS/Cellular CDMA PCMCIA Modem Card FCC ID: KBCIX100AC555 complies 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 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 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)	RSS-102 Issue 1 (Provisional)
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)
FCC Device Classification	PCS Licensed Transmitter (PCB)
IC Device Classification	2 GHz Personal Communication Services (RSS 133 Issue 2) 800MHz CDMA Cellular Transmitter (RSS-129 Issue 2)
Device Type	Rugged Handheld PC (Alpha-numeric & Numeric Keypad types) with Sierra Wireless AirCard 555/550 Dual-Band CDMA Modem Card
FCC ID	KBCIX100AC555
Model(s)	IX100
Serial No.	Alpha-Numeric Keypad Type: CZGEG3106ZZ9295 (Identical Prototype) Numeric Keypad Type: ZZGEG2337ZZ5869 (Identical Prototype)
Mode(s) of Operation	PCS CDMA / Cellular CDMA
Tx Frequency Range(s)	1851.25 - 1908.75 MHz (PCS CDMA) 824.70 - 848.31 MHz (Cellular CDMA)
Max. RF Output Power Tested	23.0 dBm Conducted (PCS CDMA) 23.0 dBm Conducted (Cellular CDMA)
Antenna Type	¼ Wave Helix (Length: 54 mm)
Battery Type	7.4V Lithium-ion, 2.8Ah
Body-worn Accessories Tested	1. Nylon Carry Case (P/N: 54-0644-001) 2. 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 validation phantom

4.0 MEASUREMENT SUMMARY

BODY SAR MEASUREMENT RESULTS - PCS CDMA

Freq. (MHz)	Chan.	Test Mode	Conducted Power (dBm)		Battery Type	DUT Keypad Type	Body-Worn Accessories Tested	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)	
			Before	After								
1880.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Numeric	None	-	Right Side	0.5		0.646
1880.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Alpha-numeric	None	-	Right Side	0.5		0.667
1880.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Numeric	None	-	Back Side	0.0	P	0.375
											S	0.320
1880.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Alpha-numeric	None	-	Back Side	0.0	P	0.384
											S	0.373
1880.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Front	Right Side	0.0		0.722
1880.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Alpha-numeric	Carry Case & Ear-Mic	Front	Right Side	0.0		0.756
1880.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Front	Front	0.0	P	0.225
											S	0.183
1880.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Alpha-numeric	Carry Case & Ear-Mic	Front	Front	0.0		0.207

ANSI / IEEE C95.1 1992 - SAFETY LIMIT
BODY: 1.6 W/kg (averaged over 1 gram)
Spatial Peak - Uncontrolled Exposure / General Population

Test Date(s)	10/28/03		Relative Humidity	55 %
Measured Fluid Type	1880MHz Body		Atmospheric Pressure	100.2 kPa
Dielectric Constant ε_r	IEEE Target	Measured	Ambient Temperature	22.5 °C
	53.3 ±5%	52.4	Fluid Temperature	21.3 °C
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Depth	≥ 15 cm
	1.52 ±5%	1.57	ρ (Kg/m^3)	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. The DUT was initially tested at the mid channel of the frequency band for both keypad units in each test position. The worst-case keypad unit was subsequently tested at the low and high channels. If the SAR measurements performed at the mid channel were ≥ 3dB 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 peak SAR locations within 2dB of the maximum were evaluated and reported as shown in the table above table and Appendix A (SAR Test Plots) - P = Primary, S = Secondary.
4. SAR measurements performed without the carry case accessory required a 0.5 cm separation distance for the right side (antenna side) of the device. When the device is placed in the carry case, the thickness of the carry case provides a 0.5 cm separation distance and therefore a separation distance was not required from the carry case.
5. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed in the table above were consistent for all measurement periods.
6. The dielectric parameters of the simulated body tissue were measured prior to the evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).

MEASUREMENT SUMMARY (Cont.)

BODY SAR MEASUREMENT RESULTS - PCS CDMA

Freq. (MHz)	Chan	Test Mode	Conducted Power (dBm)		Battery Type	DUT Keypad Type	Body-Worn Accessories Tested	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)
			Before	After							
1880.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Back	Right Side	0.0	0.859
1880.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Alpha-numeric	Carry Case & Ear-Mic	Back	Right Side	0.0	0.680
1851.25	25	PCS CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Back	Right Side	0.0	0.714
1908.75	1175	PCS CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Back	Right Side	0.0	0.917
1800.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Back	Back Side	0.0	0.201
										0.0	0.186
										0.0	0.109
1800.00	600	PCS CDMA	23.0	22.8	Lithium-ion	Alpha-numeric	Carry Case & Ear-Mic	Back	Back Side	0.0	0.257
										0.0	0.171

ANSI / IEEE C95.1 1992 - SAFETY LIMIT
BODY: 1.6 W/kg (averaged over 1 gram)
Spatial Peak - Uncontrolled Exposure / General Population

Test Date(s)	10/29/03		Relative Humidity	50 %
Measured Fluid Type	1880MHz Body		Atmospheric Pressure	102.7 kPa
Dielectric Constant ε_r	IEEE Target	Measured	Ambient Temperature	23.1 °C
	53.3 ±5%	52.0	Fluid Temperature	22.0 °C
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Depth	≥ 15 cm
	1.52 ±5%	1.54	ρ (Kg/m^3)	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. The DUT was initially tested at the mid channel of the frequency band for both keypad units in each test position. The worst-case keypad unit was subsequently tested at the low and high channels. If the SAR measurements performed at the mid channel were ≥ 3dB 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 peak SAR locations within 2dB of the maximum were evaluated and reported as shown in the table above table and Appendix A (SAR Test Plots) - P = Primary, S = Secondary.
4. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed in the table above were consistent for all measurement periods.
5. The dielectric parameters of the simulated body tissue were measured prior to the evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).

MEASUREMENT SUMMARY (Cont.)

BODY SAR MEASUREMENT RESULTS - CELLULAR CDMA											
Freq. (MHz)	Chan.	Test Mode	Conducted Power (dBm)		Battery Type	DUT Keypad Type	Body-Worn Accessories Tested	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)
			Before	After							
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Numeric	None	-	Right Side	0.5	0.742
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Alpha-numeric	None	-	Right Side	0.5	0.736
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Numeric	None	-	Back Side	0.0	0.637
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Alpha-numeric	None	-	Back Side	0.0	0.573
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Alpha-numeric	Carry Case & Ear-Mic	Front	Right Side	0.0	0.658
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Front	Right Side	0.0	0.824
824.70	1013	Cellular CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Front	Right Side	0.0	0.871
848.31	777	Cellular CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Front	Right Side	0.0	0.777
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Front	Front Side	0.0	0.308
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Alpha-Numeric	Carry Case & Ear-Mic	Front	Front Side	0.0	0.308
ANSI / IEEE C95.1 1992 - SAFETY LIMIT BODY: 1.6 W/kg (averaged over 1 gram) Spatial Peak - Uncontrolled Exposure / General Population											

Test Date(s)	10/30/03		Relative Humidity	45%
Measured Fluid Type	835MHz Body		Atmospheric Pressure	103.0 kPa
Dielectric Constant ε_r	IEEE Target	Measured	Ambient Temperature	23.6 °C
	55.2 ±5%	54.6	Fluid Temperature	23.5 °C
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Depth	≥ 15 cm
	0.97 ±5%	1.00	ρ (Kg/m^3)	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. The DUT was initially tested at the mid channel of the frequency band for both keypad units in each test position. The worst-case keypad unit was subsequently tested at the low and high channels. If the SAR measurements performed at the mid channel were ≥ 3dB 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 peak SAR locations within 2dB of the maximum were evaluated and reported as shown in the table above table and Appendix A (SAR Test Plots) - P = Primary, S = Secondary.
4. SAR measurements performed without the carry case accessory required a 0.5 cm separation distance for the right side (antenna side) of the device. When the device is placed in the carry case, the thickness of the carry case provides a 0.5 cm separation distance and therefore a separation distance was not required from the carry case.
5. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed in the table above were consistent for all measurement periods.
6. The dielectric parameters of the simulated body tissue were measured prior to the evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).

MEASUREMENT SUMMARY (Cont.)

BODY SAR MEASUREMENT RESULTS - CELLULAR CDMA											
Freq. (MHz)	Chan.	Test Mode	Conducted Power (dBm)		Battery Type	DUT Keypad Type	Body-Worn Accessories Tested	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)
			Before	After							
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Back	Right Side	0.0	0.845
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Alpha-Numeric	Carry Case & Ear-Mic	Back	Right Side	0.0	0.824
824.70	1013	Cellular CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Back	Right Side	0.0	0.865
848.31	777	Cellular CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Back	Right Side	0.0	0.770
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Numeric	Carry Case & Ear-Mic	Back	Back Side	0.0	0.392
835.89	363	Cellular CDMA	23.0	22.8	Lithium-ion	Alpha-Numeric	Carry Case & Ear-Mic	Back	Back Side	0.0	0.413
ANSI / IEEE C95.1 1992 - SAFETY LIMIT BODY: 1.6 W/kg (averaged over 1 gram) Spatial Peak - Uncontrolled Exposure / General Population											

Test Date(s)	10/31/03		Relative Humidity	51%
Measured Fluid Type	835MHz Body		Atmospheric Pressure	102.6 kPa
Dielectric Constant ε_r	IEEE Target	Measured	Ambient Temperature	24.2 °C
	55.2 ±5%	53.7	Fluid Temperature	21.3 °C
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Depth	≥ 15 cm
	0.97 ±5%	0.99	ρ (Kg/m^3)	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. The DUT was initially tested at the mid channel of the frequency band for both keypad units in each test position. The worst-case keypad unit was subsequently tested at the low and high channels. If the SAR measurements performed at the mid channel were ≥ 3dB 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 peak SAR locations within 2dB of the maximum were evaluated and reported as shown in the table above table and Appendix A (SAR Test Plots) - P = Primary, S = Secondary.
4. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed in the table above were consistent for all measurement periods.
5. The dielectric parameters of the simulated body tissue were measured prior to the evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).

5.0 DETAILS OF SAR EVALUATION

The ITRONIX CORPORATION Model: IX100 Rugged Handheld PC with Sierra Wireless AirCard 555/550 Dual-Band CDMA PCMCIA Modem Card FCC ID: KBCIX100AC555 was found to be compliant for localized Specific Absorption Rate based on the following test provisions and conditions described below. The detailed test setup photographs are shown in Appendix H.

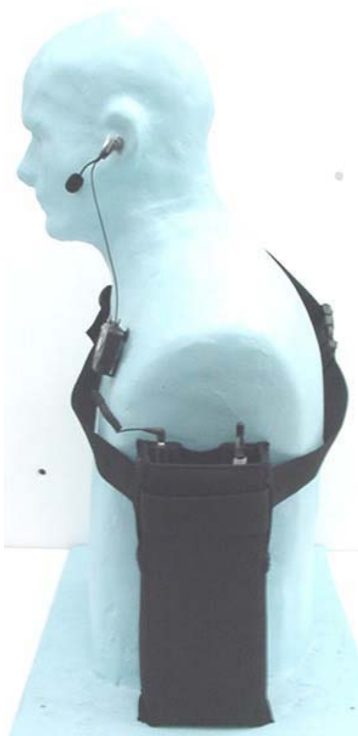
Body-worn Configuration

1. The DUT was tested for body SAR with the right side (antenna side) placed parallel to the outer surface of the planar phantom. A 0.5 cm separation distance was established and maintained between the right side of the DUT (antenna side) and the outer surface of the planar phantom.
2. The DUT was tested for body SAR with the back side (battery side) placed parallel to the outer surface of the planar phantom. A 0.0 cm separation distance was maintained between the back of the DUT and the outer surface of the planar phantom.
3. The DUT was tested for body SAR with shoulder-worn carry case and ear-microphone accessories, and the right side of the DUT (antenna side) placed parallel to the outer surface of the planar phantom with the front of the DUT facing the front of the carry case. A 0.0 cm separation distance was maintained between the right side of the carry case and the outer surface of the planar phantom. See next page for justification of test position (front side of DUT facing body - closest antenna position to right arm).
4. The DUT was tested for body SAR with shoulder-worn carry case and ear-microphone accessories, and the right side of the DUT (antenna side) placed parallel to the outer surface of the planar phantom with the back of the DUT facing the front of the carry case. A 0.0 cm separation distance was maintained between the left side of the carry case and the outer surface of the planar phantom. See next page for justification of test position (back side of DUT facing body - closest antenna position to left arm).
5. The DUT was tested for body SAR with shoulder-worn carry case and ear-microphone accessories, and the front of the DUT (keypad/LCD side) placed parallel to the outer surface of the planar phantom. A 0.0 cm separation distance was maintained between the front of the carry case and the outer surface of the planar phantom.
6. The DUT was tested for body SAR with the shoulder-worn carry case and ear-microphone accessories, and the back of the DUT placed parallel to the outer surface of the planar phantom. A 0.0 cm separation distance was maintained between the front of the carry case and the outer surface of the planar phantom.
7. SAR measurements performed without the carry case accessory required a 0.5 cm separation distance for the right side (antenna side) of the device. When the device is placed in the carry case, the thickness of the carry case provides a 0.5 cm separation distance and therefore a separation distance was not required from the carry case.
8. SAR evaluations were initially performed at the mid channel for both the alphanumeric and numeric keypad units. The worst-case keypad unit was subsequently evaluated at the low and high channels (if the SAR values were ≥ 3dB below the SAR limit per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
9. Secondary peak SAR locations within 2dB of the maximum were evaluated and reported
10. 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.

Power Settings & Test Modes

11. The conducted power levels were measured before and after each test using a Gigatronics 8652A Universal Power Meter according to the procedures described in FCC 47 CFR §2.1046.
12. The DUT was placed and controlled in test mode via internal software and the SAR evaluations were performed with the DUT transmitting in the “always up” power control mode with a modulated CDMA signal.
13. The DUT was tested with a fully charged battery.

DETAILS OF SAR EVALUATION (Cont.)



Back Side of DUT facing body - worst-case antenna configuration relative to left arm

Front Side of DUT facing body - worst-case antenna configuration relative to right arm

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 form 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).

7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluation a system check was performed at the planar section of the SAM phantom with an 1800MHz dipole and a 900MHz dipole (see Appendix C for system validation procedures). The fluid dielectric parameters were measured prior to the system check using an 85070C Dielectric Probe Kit and an 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 ±10% (see Appendix B for system performance check test plots).

SYSTEM PERFORMANCE CHECK

Test Date	Equiv. Tissue	SAR 1g (W/kg)		Dielectric Constant ε_r		Conductivity σ (mho/m)		ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		IEEE Target	Measured	IEEE Target	Measured	IEEE Target	Measured						
10/28/03	1800MHz Brain	9.53 (±10%)	9.61 (+0.8%)	40.0 ±5%	39.2	1.40±5%	1.38	1000	21.4	21.5	≥ 15	55	100.2
10/29/03	1800MHz Brain	9.53 (±10%)	9.74 (+2.2%)	40.0 ±5%	39.0	1.40±5%	1.39	1000	22.2	21.6	≥ 15	50	102.7
10/30/03	900MHz Brain	2.70 (±10%)	2.90 (+7.4%)	41.5 ±5%	40.8	0.97±5%	0.98	1000	23.1	22.8	≥ 15	45	103.0
10/31/03	900MHz Brain	2.70 (±10%)	2.91 (+7.8%)	41.5 ±5%	40.1	0.97±5%	0.97	1000	24.2	21.0	≥ 15	51	102.6

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.

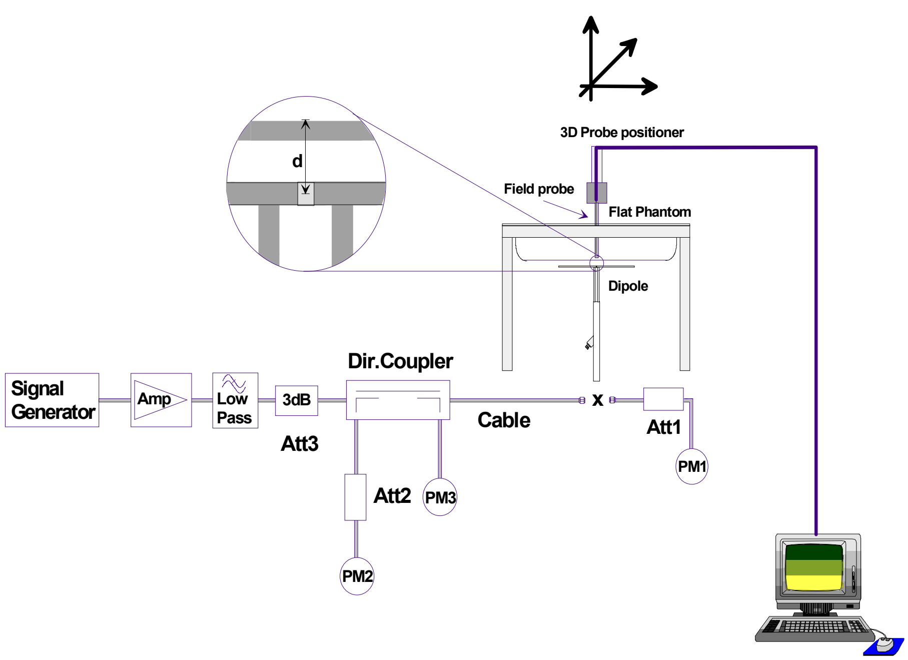


Figure 1. System Performance Check Setup Diagram

1800MHz Dipole Setup

900MHz Dipole Setup

8.0 SIMULATED TISSUE MIXTURES

The 1800MHz and 1880MHz simulated tissue mixtures consist of Glycol-monobutyl, water, and salt. The 835MHz and 900MHz simulated tissue mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide was added and visual inspection was made to ensure air bubbles were not trapped during the mixing process. The fluids were prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

1800MHz & 1880MHZ TISSUE MIXTURES (1 Liter Yields)		
INGREDIENT	1800MHz Brain (System Check)	1880MHz Body (DUT Evaluation)
Water	548.0 g	716.60 g
Glycol Monobutyl	448.5 g	300.70 g
Salt	3.20 g	3.10 g

835MHz & 900MHz TISSUE MIXTURES		
INGREDIENT	900MHz Brain (System Check)	835MHz Body (DUT Evaluation)
Water	40.71 %	53.70 %
Sugar	56.63 %	45.10 %
Salt	1.48 %	0.97 %
HEC	1.00 %	0.13%
Bactericide	0.18 %	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 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.: 1387
Construction: Triangular core fiber optic detection system
Frequency: 10 MHz to 6 GHz
Linearity: ±0.2 dB (30 MHz to 3 GHz)

Phantom(s)

Evaluation Phantom
Type: Planar Phantom
Shell Material: Fiberglass
Thickness: 2.0 ±0.1 mm
Volume: Approx. 72 liters

Validation Phantom
Type: SAM V4.0C
Shell Material: Fiberglass
Thickness: 2.0 ±0.1 mm
Volume: Approx. 20 liters

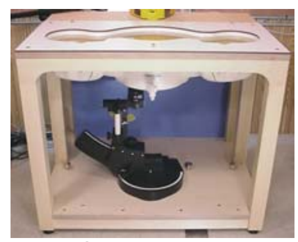
11.0 PROBE SPECIFICATION (ET3DV6)

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 ± 8%)
Frequency:	10 MHz to >6 GHz; Linearity: ±0.2 dB (30 MHz to 3 GHz)
Directivity:	±0.2 dB in brain tissue (rotation around probe axis) ±0.4 dB in brain tissue (rotation normal to probe axis)
Dynamic Range:	5 μW/g to >100 mW/g; Linearity: ±0.2 dB
Surface Detection:	±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 portable devices


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
-ET3DV6 E-Field Probe	1387	Feb 2003
-300MHz Validation Dipole	135	Oct 2003
-450MHz Validation Dipole	136	Nov 2003
-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
HP 85070C Dielectric Probe Kit	N/A	N/A
Gigatronics 8651A Power Meter	8650137	April 2003
Gigatronics 8652A Power Meter	1835267	April 2003
Power Sensor 80701A	1833542	Feb 2003
Power Sensor 80701A	1833699	April 2003
HP E4408B Spectrum Analyzer	US39240170	Dec 2002
HP 8594E Spectrum Analyzer	3543A02721	April 2003
HP 8753E Network Analyzer	US38433013	May 2003
HP 8648D Signal Generator	3847A00611	May 2003
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}
Measurement System						
Probe calibration	± 4.8	Normal	1	1	± 4.8	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5	∞
Integration time	± 1.4	Rectangular	√3	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	√3	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Test Sample Related						
Device positioning	± 6.0	Normal	√3	1	± 6.7	12
Device holder uncertainty	± 5.0	Normal	√3	1	± 5.9	8
Power drift	± 5.0	Rectangular	√3		± 2.9	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty					**± 13.3**	
Expanded Uncertainty (k=2)					**± 26.6**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-200X (Draft - 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}**
Measurement System						
Probe calibration	± 4.8	Normal	1	1	± 4.8	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5	∞
Integration time	± 1.4	Rectangular	√3	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	√3	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Dipole						
Dipole Axis to Liquid Distance	± 2.0	Rectangular	√3	1	± 1.2	∞
Input Power	± 4.7	Rectangular	√3	1	± 2.7	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty					**± 9.9**	
Expanded Uncertainty (k=2)					**± 19.8**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-200X (Draft - 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 Standards Coordinating Committee 34, Std 1528-200X, “DRAFT Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”.

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 10/28/03

DUT: Dipole 1800 MHz; Model: D1800V2; Type: System Performance Check; Serial: 247

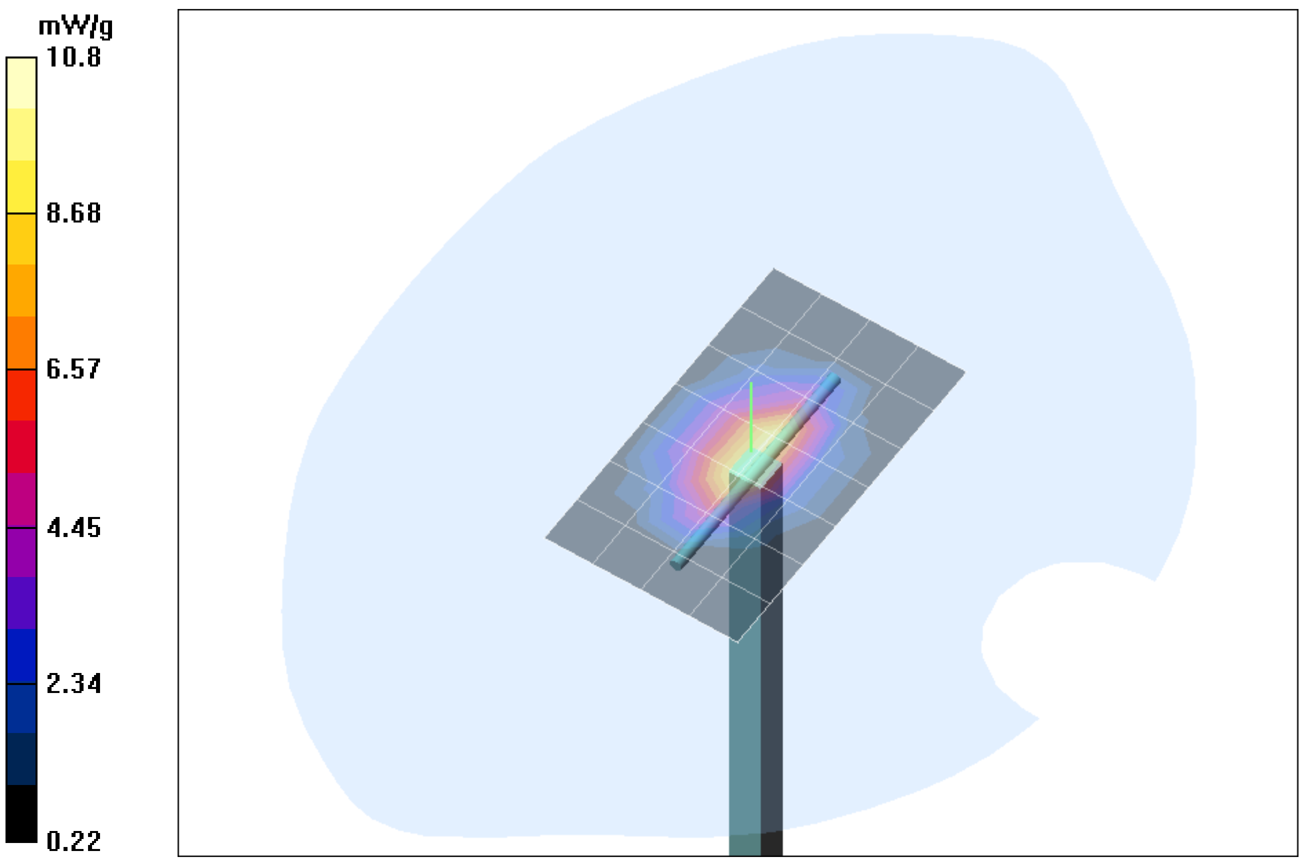
Ambient Temp: 21.4°C; Fluid Temp: 21.5°C; Barometric Pressure: 100.2 kPa; Humidity: 55%

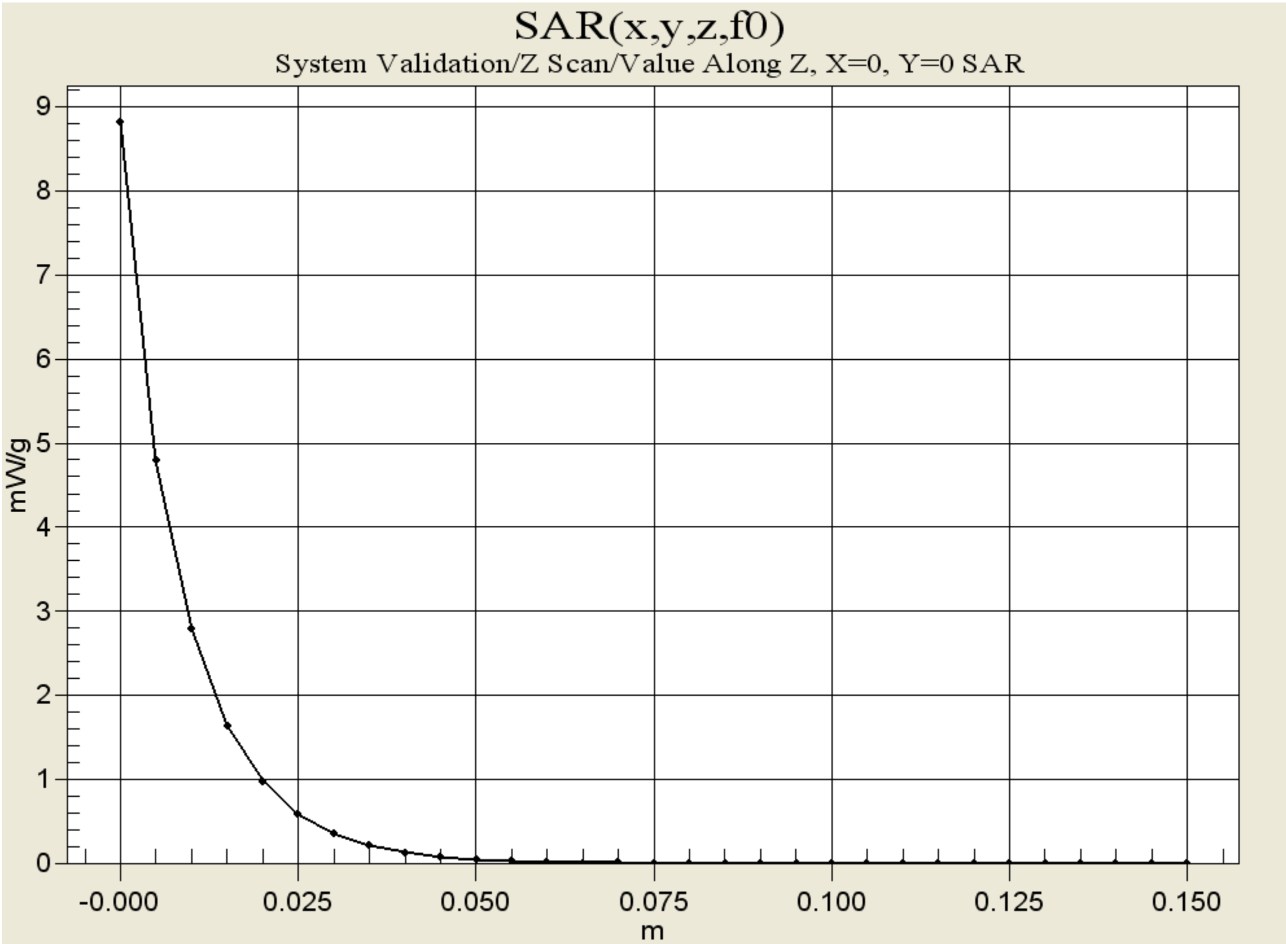
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: HSL1800 (σ = 1.38 mho/m, ε_r = 39.2, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(5.2, 5.2, 5.2); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 13/10/2003
- Phantom: SAM front; Type: SAM 4.0; Serial: 1033
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

1800 MHz System Performance Check/Area Scan (5x8x1):
Measurement grid: dx=15mm, dy=15mm

1800 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 16.4 W/kg
SAR(1 g) = 9.61 mW/g; SAR(10 g) = 5.07 mW/g
Reference Value = 93.1 V/m
Power Drift = -0.04 dB




SAR(x,y,z,f0)
System Validation/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
9
8
7
6
5
4
3
2
1
0
-0.000
0.025
0.050
0.075
0.100
0.125
0.150
m

Date Tested: 10/29/03

DUT: Dipole 1800 MHz; Model: D1800V2; Type: System Performance Check; Serial: 247

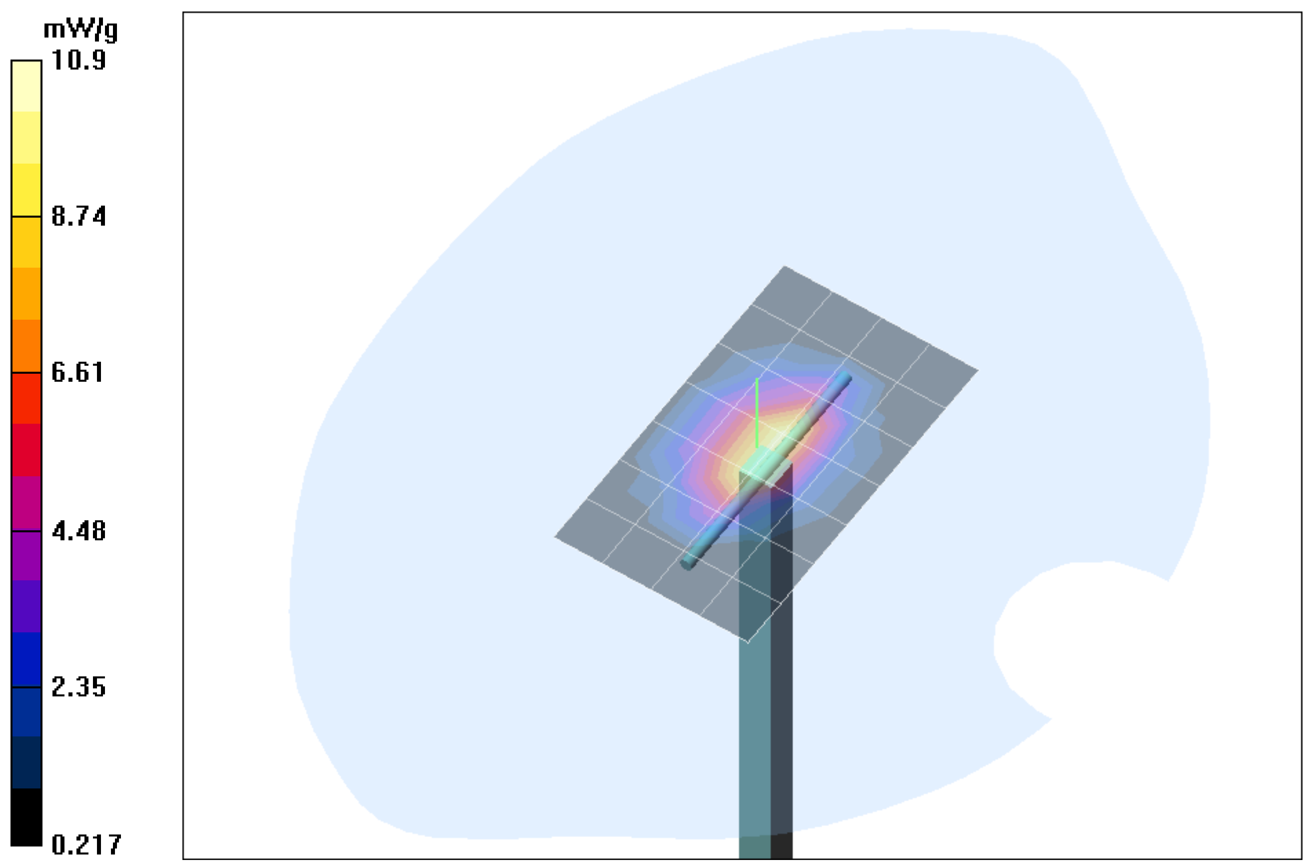
Ambient Temp: 22.2°C; Fluid Temp: 21.6°C; Barometric Pressure: 102.7 kPa; Humidity: 50%

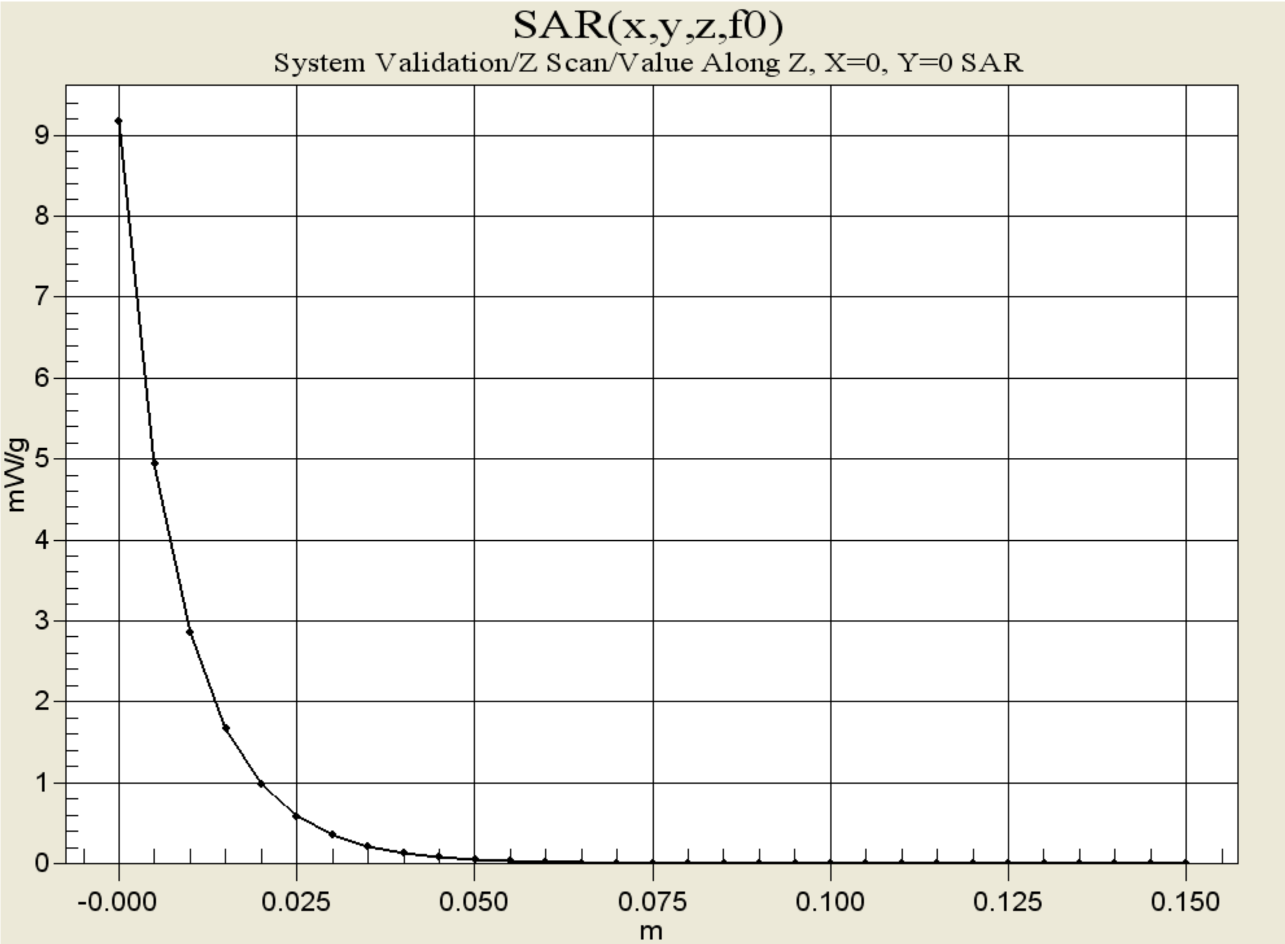
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: HSL1800 (σ = 1.39 mho/m, ε_r = 39.0, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(5.2, 5.2, 5.2); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 13/10/2003
- Phantom: SAM front; Type: SAM 4.0; Serial: 1033
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

1800 MHz System Performance Check/Area Scan (5x8x1):
Measurement grid: dx=15mm, dy=15mm

1800 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.74 mW/g; SAR(10 g) = 5.1 mW/g
Reference Value = 92.7 V/m
Power Drift = 0.02 dB





SAR(x,y,z,f0)
System Validation/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
9
8
7
6
5
4
3
2
1
0
-0.000
0.025
0.050
0.075
0.100
0.125
0.150
m

Date Tested: 10/30/03

DUT: Dipole 900 MHz; Model: D900V2; Type: System Performance Check; Serial: 054

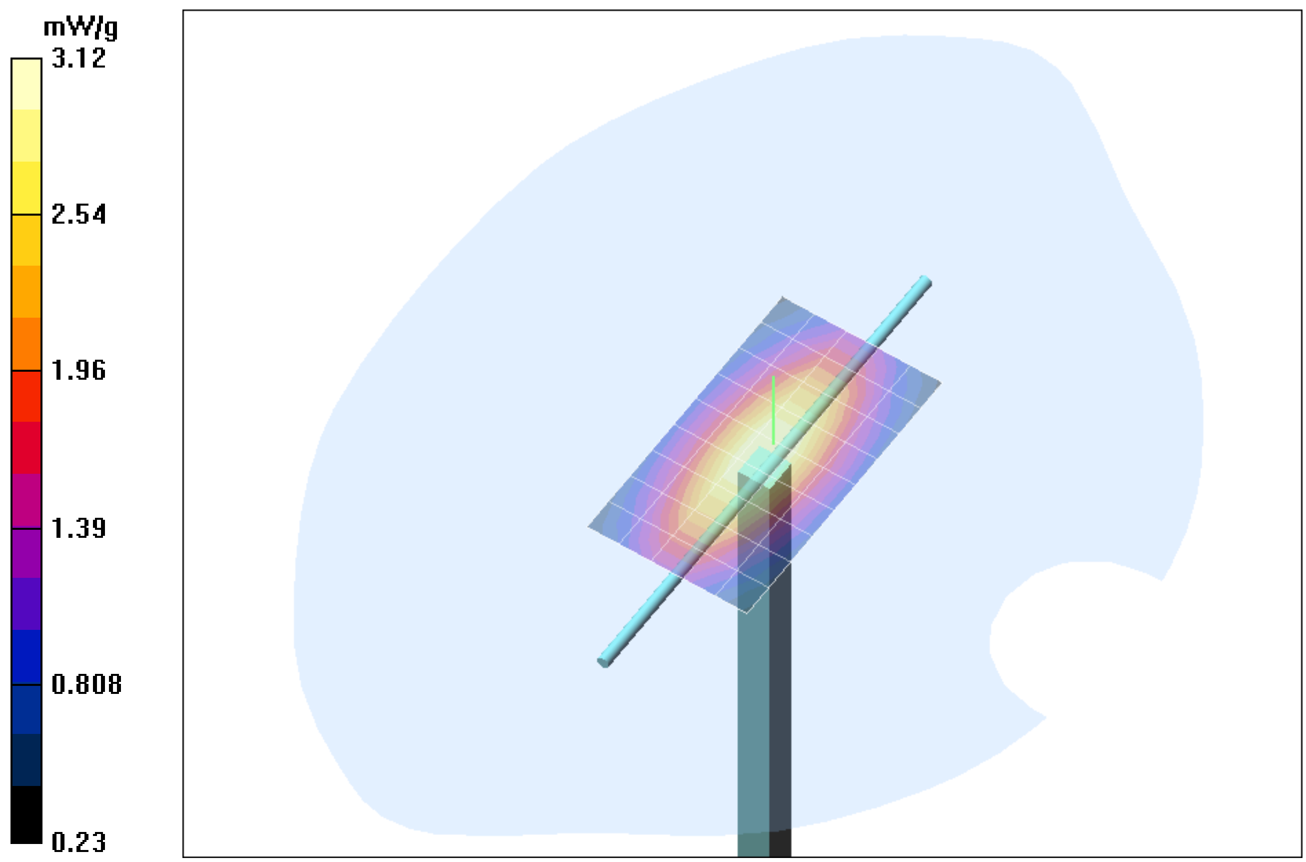
Ambient Temp: 23.1°C; Fluid Temp: 22.8°C; Barometric Pressure: 103.0 kPa; Humidity: 45%

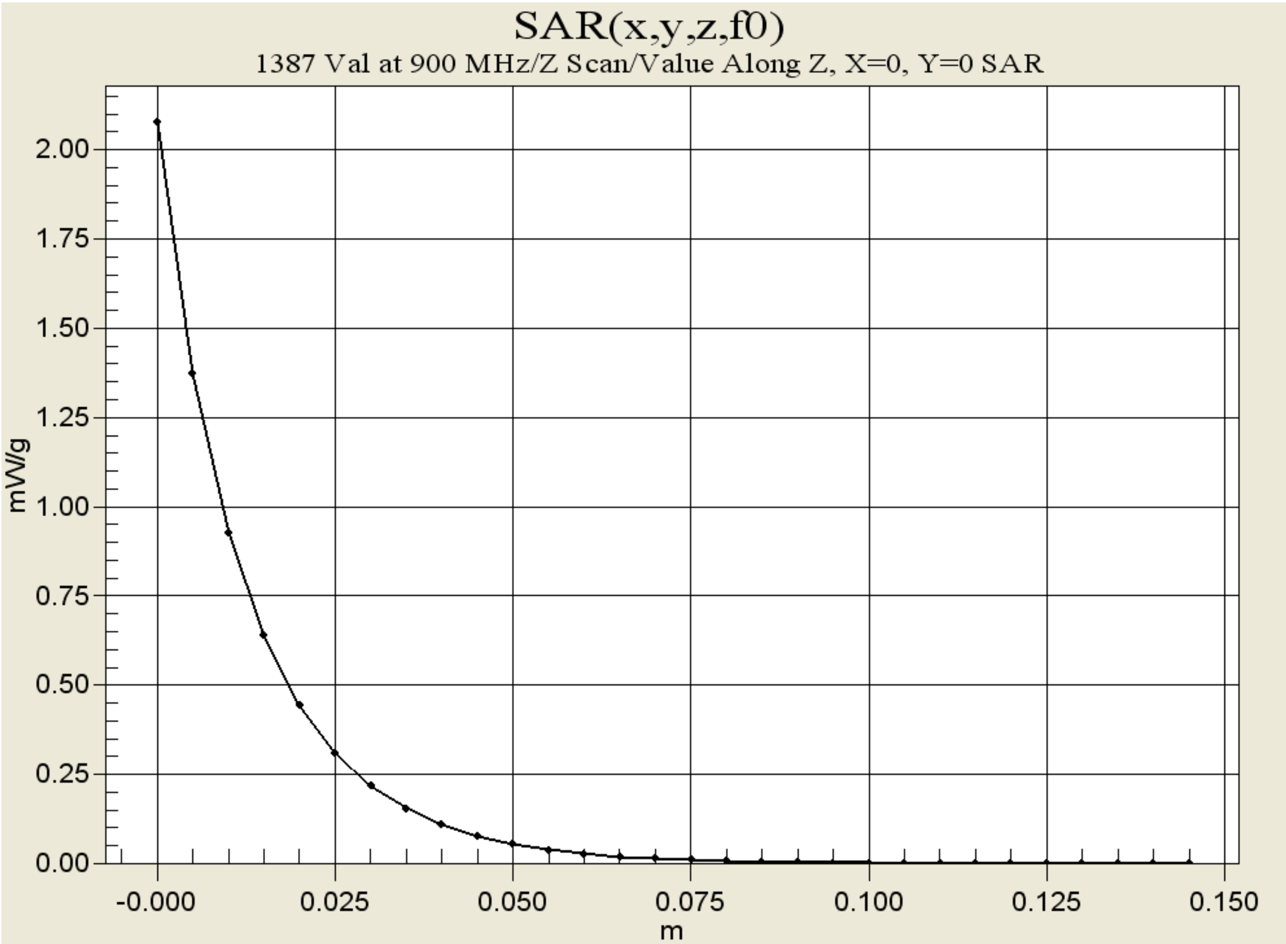
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL900 (σ = 0.98 mho/m, ε_r = 40.8, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(6.6, 6.6, 6.6); 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

900 MHz System Performance Check/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm

900 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 4.4 W/kg
SAR(1 g) = 2.9 mW/g; SAR(10 g) = 1.82 mW/g
Reference Value = 58 V/m
Power Drift = 0.003 dB




SAR(x,y,z,f0)
1387 Val at 900 MHz/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
-0.000
0.025
0.050
0.075
0.100
0.125
0.150
m

Date Tested: 10/31/03

DUT: Dipole 900 MHz; Model: D900V2; Type: System Performance Check; Serial: 054

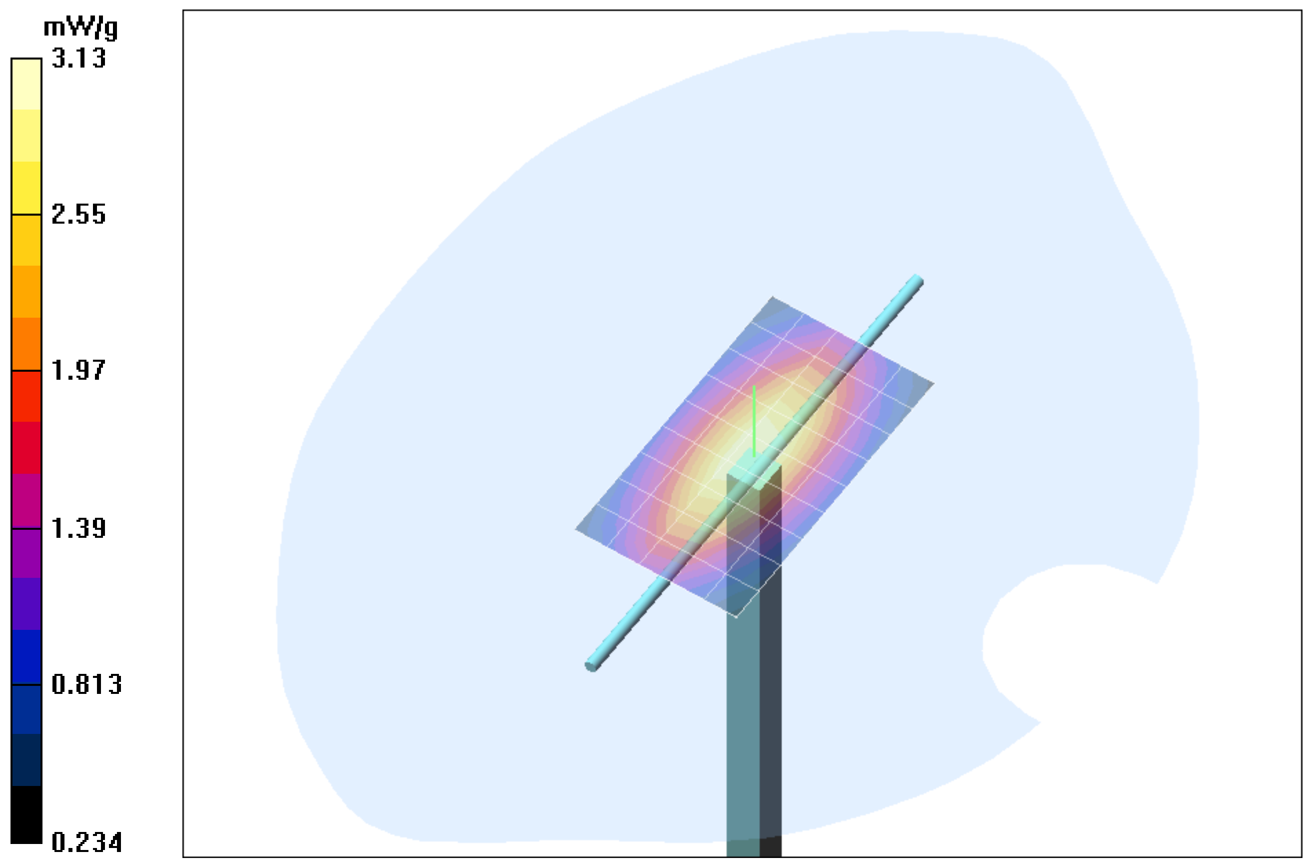
Ambient Temp: 24.2°C; Fluid Temp: 21.0°C; Barometric Pressure: 102.6 kPa; Humidity: 51%

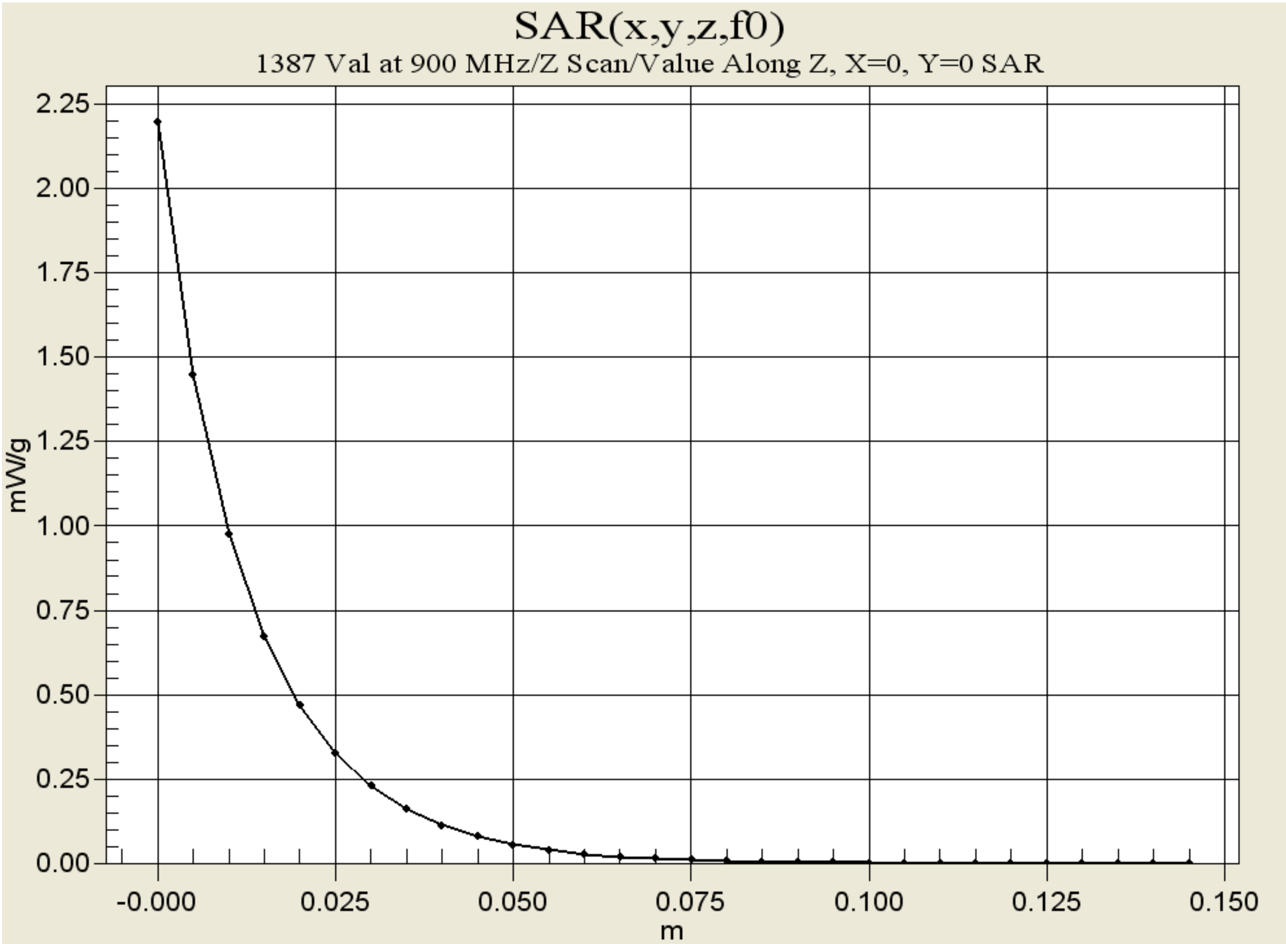
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL900 (σ = 0.97 mho/m, ε_r = 40.1, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(6.6, 6.6, 6.6); 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

900 MHz System Performance Check/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm

900 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 4.28 W/kg
SAR(1 g) = 2.91 mW/g; SAR(10 g) = 1.85 mW/g
Reference Value = 59.5 V/m
Power Drift = -0.008 dB




SAR(x,y,z,f0)
1387 Val at 900 MHz/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
-0.000
0.025
0.050
0.075
0.100
0.125
0.150
m

APPENDIX C - SYSTEM VALIDATION

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

Client Celltech Labs

CALIBRATION CERTIFICATE

Object(s)	D1800V2 - SN:247
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	June 4, 2003
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

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
RF generator R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03

	Name	Function	Signature
Calibrated by:	Judith Mueller	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: June 4, 2003

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.

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

DASY

Dipole Validation Kit

Type: D1800V2

Serial: 247

Manufactured: August 25, 1999
Calibrated: June 4, 2003

1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with **head simulating solution** of the following electrical parameters at 1800 MHz:

Relative Dielectricity	**39.2**	± 5%
Conductivity	**1.36 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.3 at 1800 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance spacer was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **39.6 mW/g** ± 16.8 % (k=2)[1]

averaged over 10 cm^3 (10 g) of tissue: **20.9 mW/g** ± 16.2 % (k=2)[1]

[1] validation uncertainty

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1.190 ns**	(one direction)
Transmission factor:	**0.998**	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance spacer was in place during impedance measurements.

Feedpoint impedance at 1800 MHz:	Re{Z} = **48.5 Ω**
	Im {Z} = **-6.5 Ω**
Return Loss at 1800 MHz	**-23.3 dB**

4. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

5. Design

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

6. Power Test

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Date/Time: 06/04/03 14:55:26

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN247_SN1507_HSL1800_040603.da4

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN247
Program: Dipole Calibration

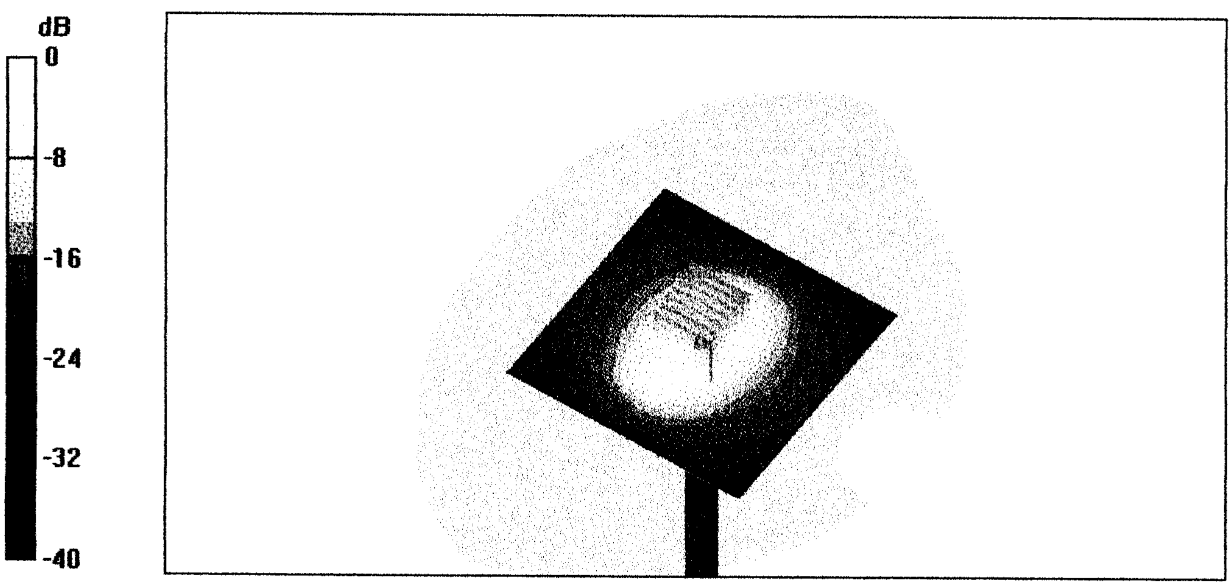
Communication System: CW-1800; Frequency: 1800 MHz;Duty Cycle: 1:1
Medium: HSL 1800 MHz (σ = 1.36 mho/m, ε_r = 39.22, ρ = 1000 kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

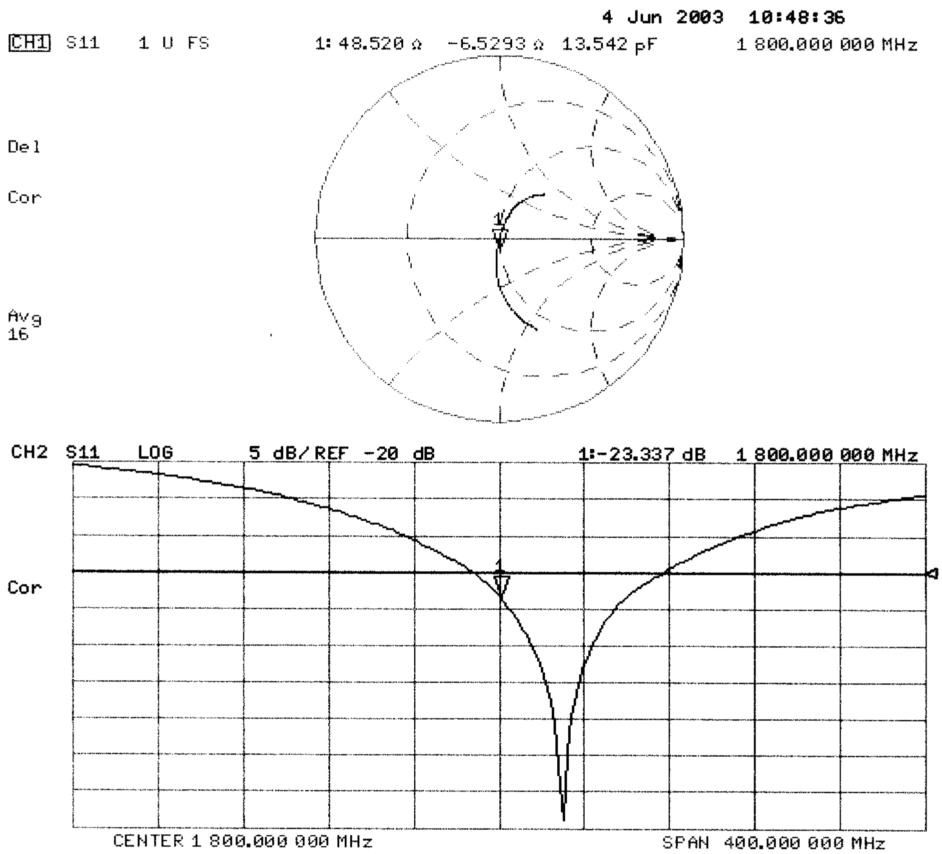
- Probe: ET3DV6 - SN1507; ConvF(5.3, 5.3, 5.3); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- *Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115*

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 96 V/m
Power Drift = -0.004 dB
Maximum value of SAR = 11 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 16.9 W/kg
SAR(1 g) = 9.9 mW/g; SAR(10 g) = 5.22 mW/g
Reference Value = 96 V/m
Power Drift = -0.004 dB
Maximum value of SAR = 11.1 mW/g



0 dB = 11.1mW/g


4 Jun 2003 10:48:36
CH1 S11 1 U FS
1: 48.520 Ω -6.5293 Ω 13.542 pF
1 800.000 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF -20 dB
1:-23.337 dB 1 800.000 000 MHz
Cor
CENTER 1 800.000 000 MHz
SPAN 400.000 000 MHz

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

Client Celltech Labs

CALIBRATION CERTIFICATE

Object(s)	D900V2 - SN:054
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	June 3, 2003
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

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
RF generator R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03

	Name	Function	Signature
Calibrated by:	Judith Mueller	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: June 3, 2003

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.

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

DASY

Dipole Validation Kit

Type: D900V2

Serial: 054

Manufactured: August 25, 1999
Calibrated: June 3, 2003

1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with head simulating solution of the following electrical parameters at 900 MHz:

Relative Dielectricity	**42.1**	± 5%
Conductivity	**0.95 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.6 at 900 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.
The dipole input power (forward power) was 250 mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**10.6 mW/g** ± 16.8 % (k=2)[1]
averaged over 10 cm^3 (10 g) of tissue:	**6.84 mW/g** ± 16.2 % (k=2)[1]

[1] validation uncertainty

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1.397 ns**	(one direction)
Transmission factor:	**0.991**	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 900 MHz:	Re{Z} = **49.9 Ω**
	Im {Z} = **-2.0 Ω**
Return Loss at 900 MHz	**-33.9 dB**

4. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

5. Design

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

6. Power Test

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

Date/Time: 06/03/03 12:00:32

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN054_SN1507_HSL900_030603.da4

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN054
Program: Dipole Calibration

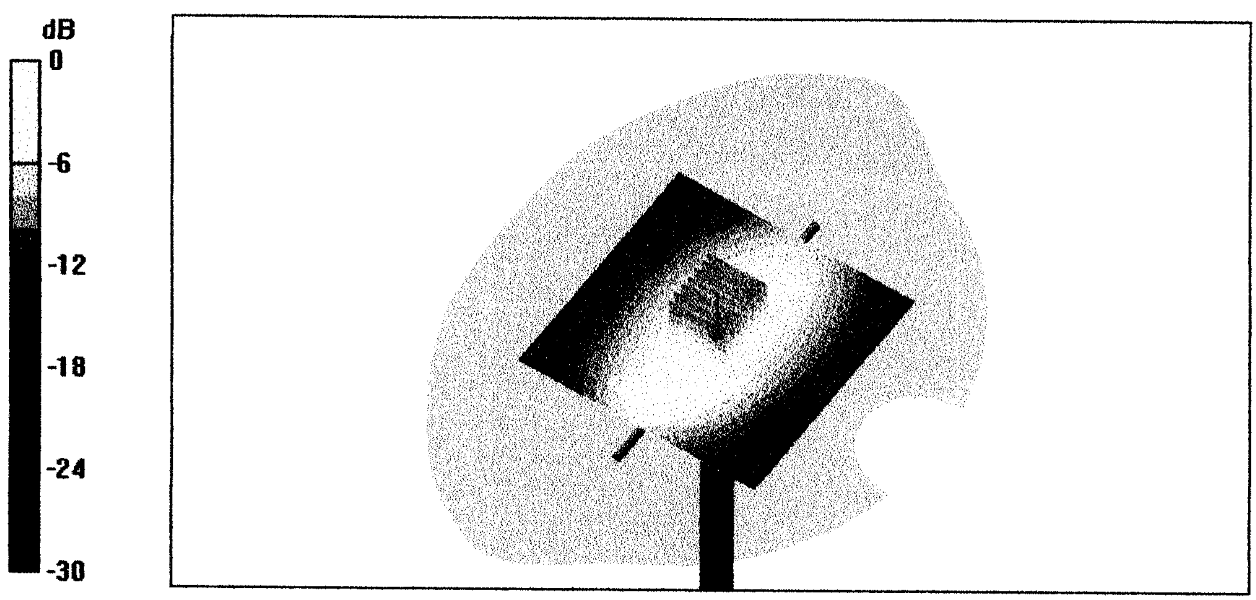
Communication System: CW-900; Frequency: 900 MHz;Duty Cycle: 1:1
Medium: HSL 900 MHz (σ = 0.95 mho/m, ε_r = 42.07, ρ = 1000 kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

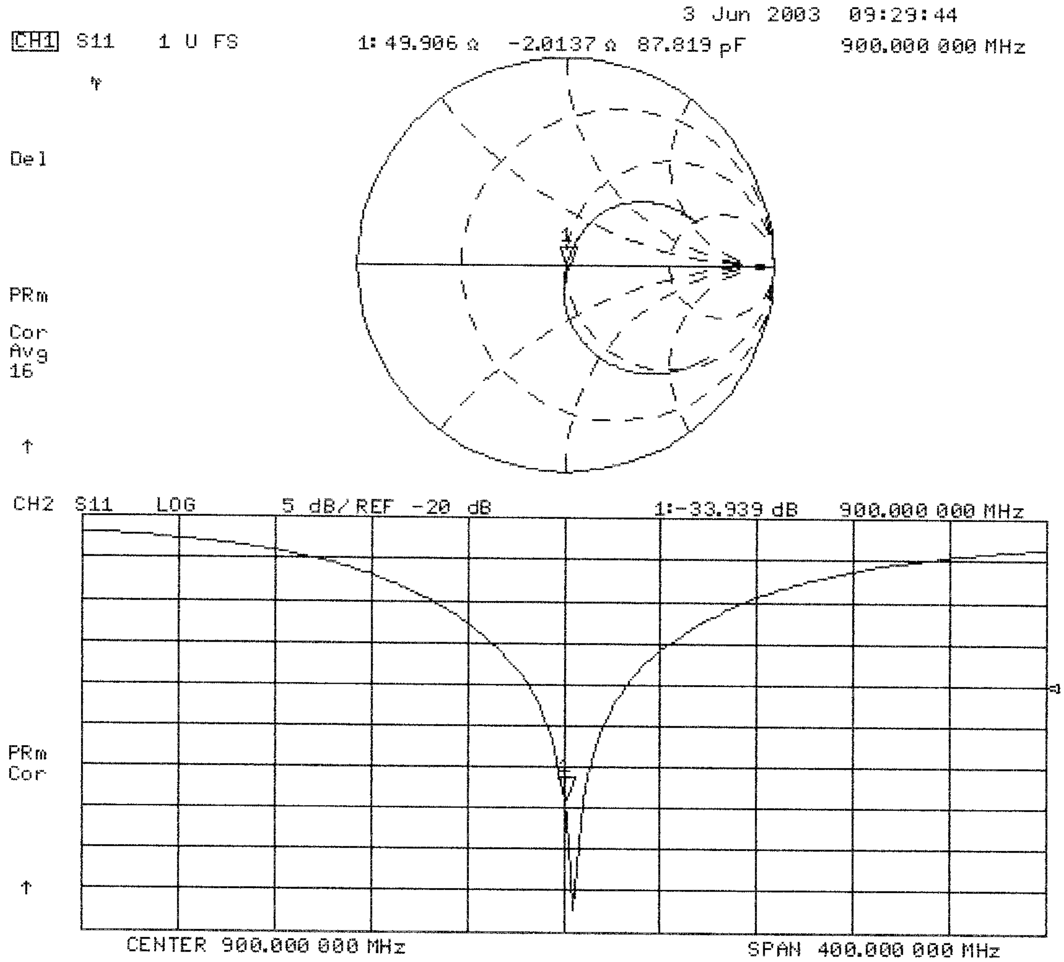
- Probe: ET3DV6 - SN1507; ConvF(6.6, 6.6, 6.6); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 *Build* 47; Postprocessing SW: SEMCAD, V1.6 *Build 115*

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 56.9 V/m
Power Drift = 0.0004 dB
Maximum value of SAR = 2.84 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.92 W/kg
SAR(1 g) = 2.66 mW/g; SAR(10 g) = 1.71 mW/g
Reference Value = 56.9 V/m
Power Drift = 0.0004 dB
Maximum value of SAR = 2.85 mW/g



0 dB = 2.85mW/g


3 Jun 2003 09:29:44
CH1 S11 1 U FS
1: 49.906 Ω -2.0137 Ω 87.819 pF 900.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF -20 dB 1:-33.939 dB 900.000 000 MHz
PRm
Cor
CENTER 900.000 000 MHz
SPAN 400.000 000 MHz

APPENDIX D - PROBE CALIBRATION

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

Client Celltech Labs

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1387
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	February 26, 2003
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

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	Scheduled Calibration
RF generator HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	8-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

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

Date issued: February 26, 2003

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.

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Probe ET3DV6

SN:1387

Manufactured:	September 21, 1999
Last calibration:	February 22, 2002
Recalibrated:	February 26, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space

NormX	**1.55**	$\mu V/(V/m)^2$
NormY	**1.65**	$\mu V/(V/m)^2$
NormZ	**1.64**	$\mu V/(V/m)^2$

Diode Compression

DCP X	**92**	mV
DCP Y	**92**	mV
DCP Z	**92**	mV

Sensitivity in Tissue Simulating Liquid

Head **900 MHz** ε_r **= 41.5 ± 5%** σ **= 0.97 ± 5% mho/m**

Head **835 MHz** ε_r **= 41.5 ± 5%** σ **= 0.90 ± 5% mho/m**

ConvF X	**6.6**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.6**	± 9.5% (k=2)	Alpha	**0.37**
ConvF Z	**6.6**	± 9.5% (k=2)	Depth	**2.61**

Head **1800 MHz** ε_r **= 40.0 ± 5%** σ **= 1.40 ± 5% mho/m**

Head **1900 MHz** ε_r **= 40.0 ± 5%** σ **= 1.40 ± 5% mho/m**

ConvF X	**5.2**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.2**	± 9.5% (k=2)	Alpha	**0.50**
ConvF Z	**5.2**	± 9.5% (k=2)	Depth	**2.73**

Boundary Effect

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

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	10.2	5.9
SAR_{be} [%]	With Correction Algorithm	0.4	0.6

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

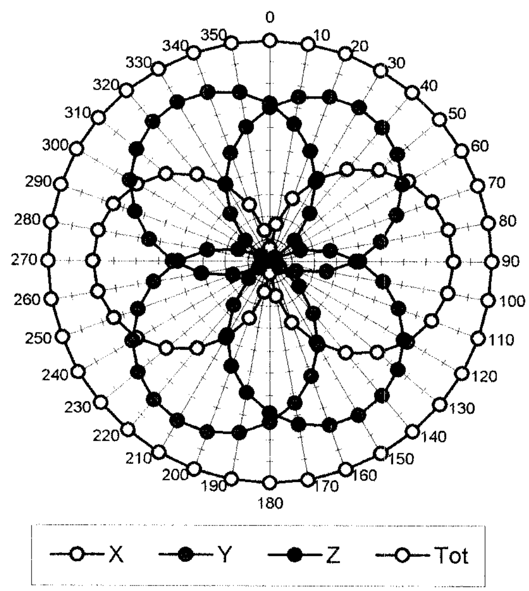
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	14.6	9.8
SAR_{be} [%]	With Correction Algorithm	0.2	0.0

Sensor Offset

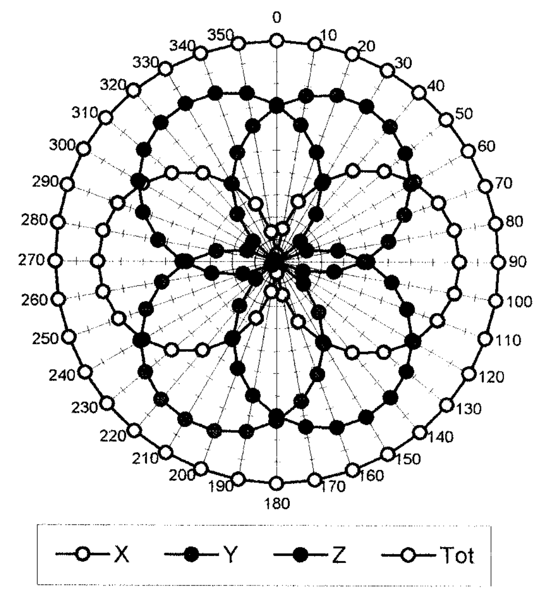
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.4 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

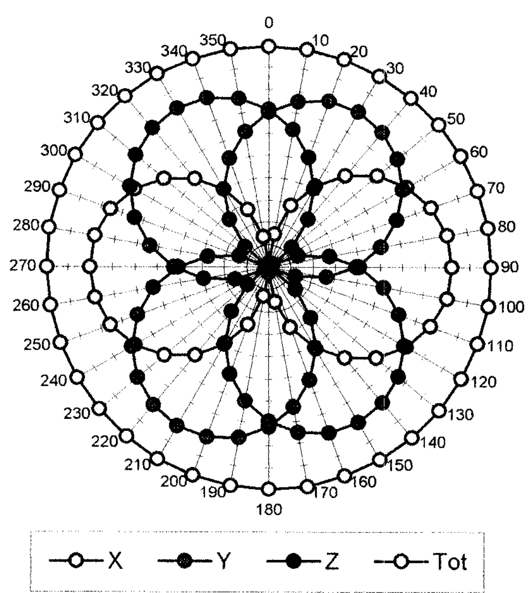
f = 30 MHz, TEM cell ifi110



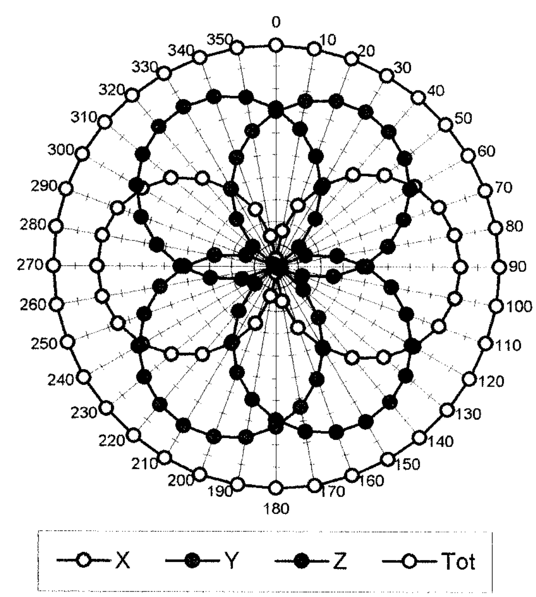
f = 100 MHz, TEM cell ifi110

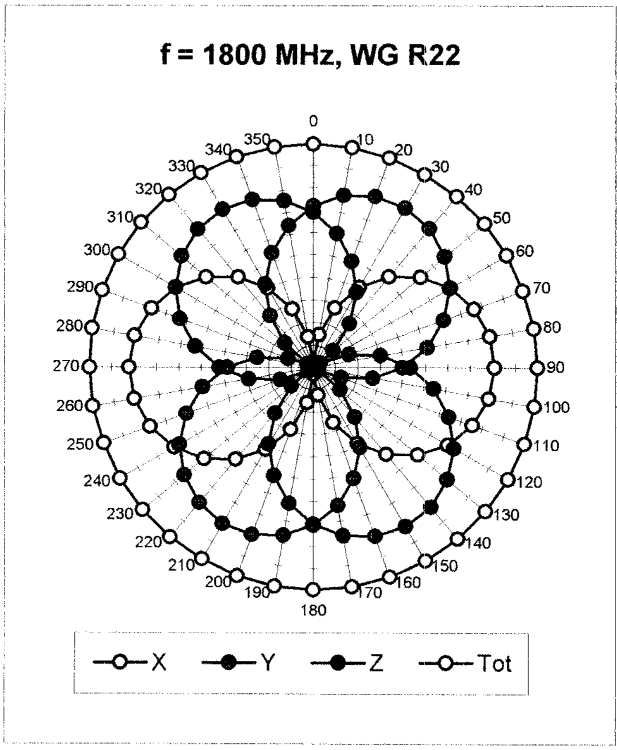


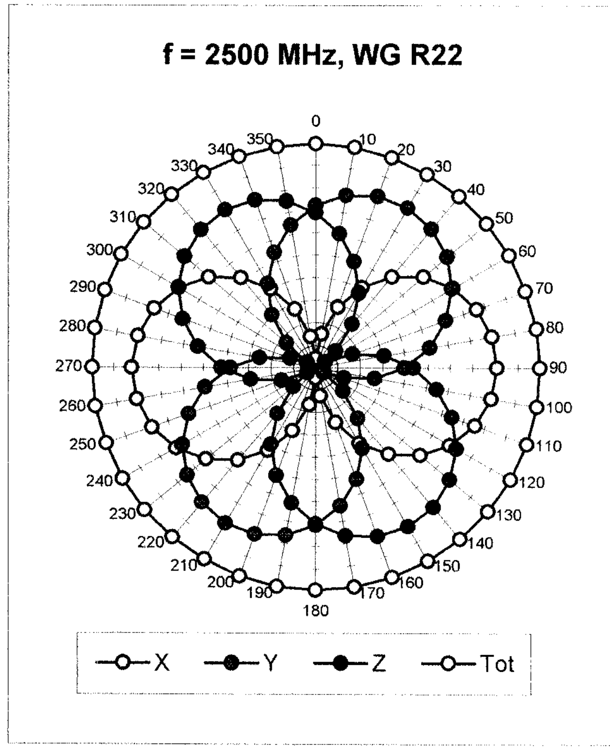
f = 300 MHz, TEM cell ifi110



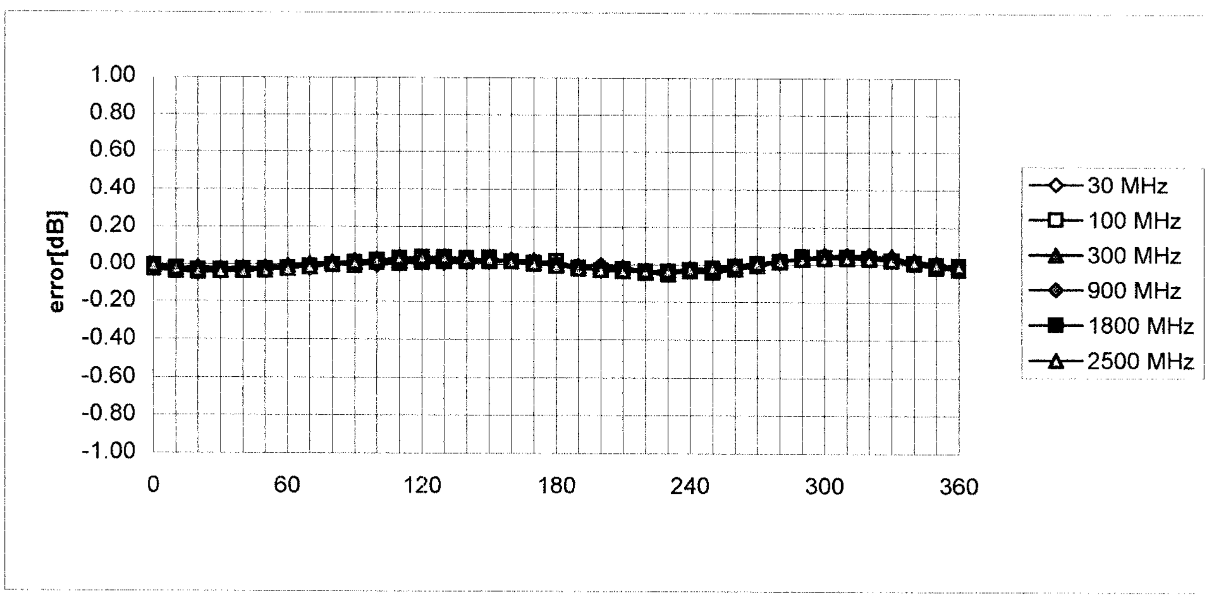
f = 900 MHz, TEM cell ifi110





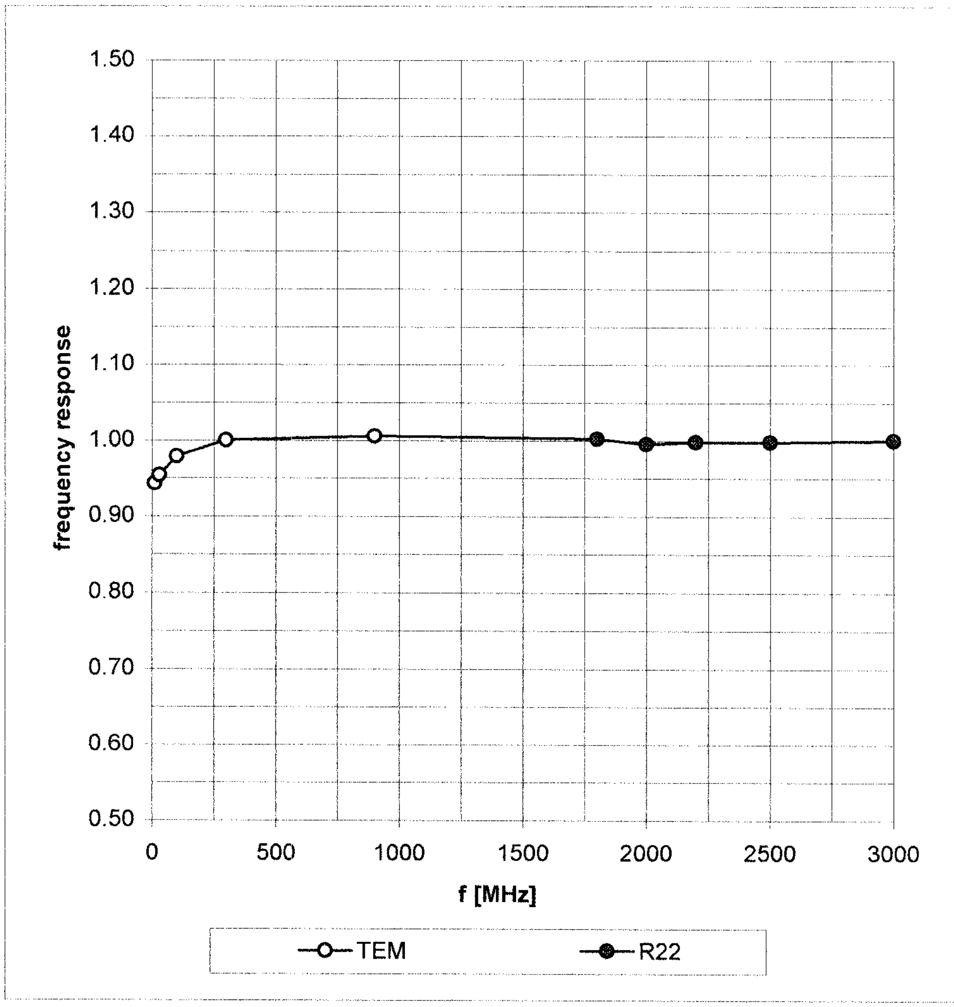


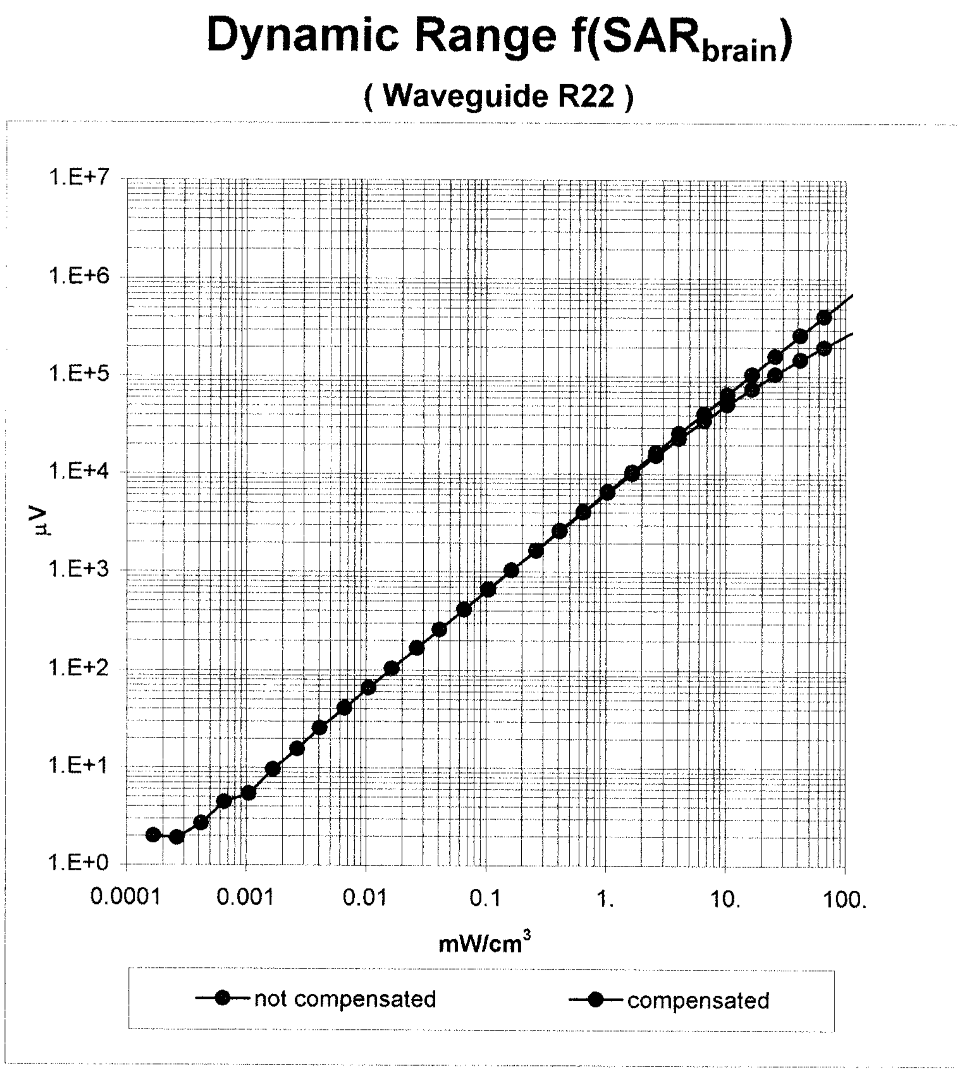
Isotropy Error (ϕ), θ = 0°

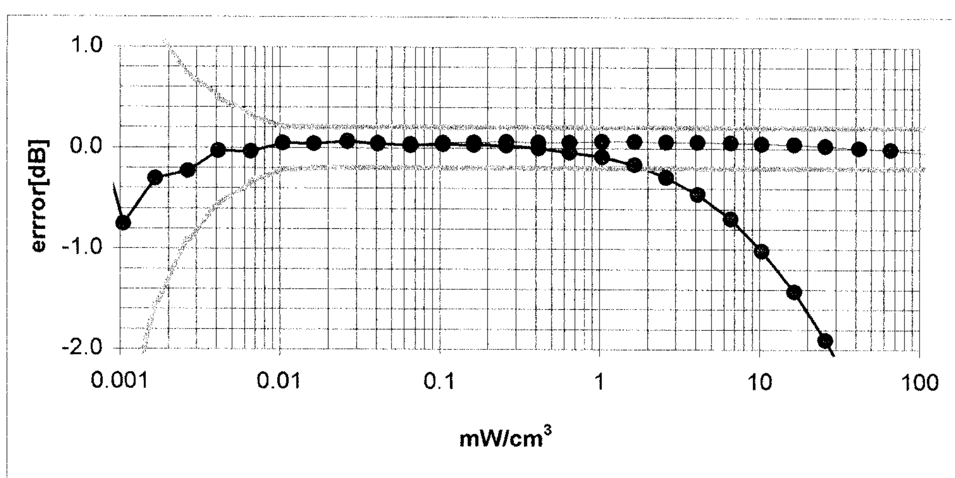


Frequency Response of E-Field

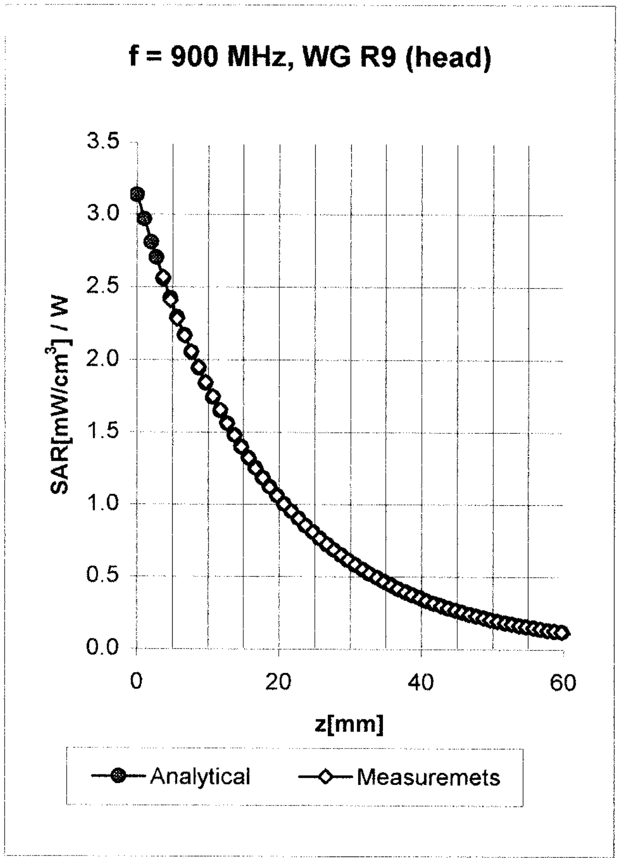
(TEM-Cell:ifi110, Waveguide R22)

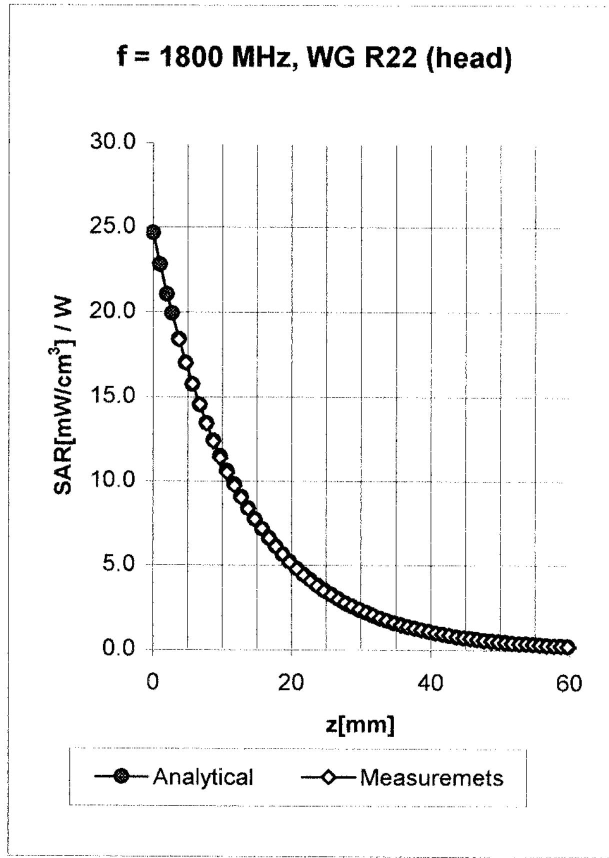



Dynamic Range f(SAR$_{brain}$)
(Waveguide R22)
1.E+7
1.E+6
1.E+5
1.E+4
1.E+3
1.E+2
1.E+1
1.E+0
µV
0.0001
0.001
0.01
0.1
1.
10.
100.
mW/cm³
not compensated
compensated


1.0
0.0
-1.0
-2.0
error[dB]
0.001
0.01
0.1
1
10
100
mW/cm³

Conversion Factor Assessment

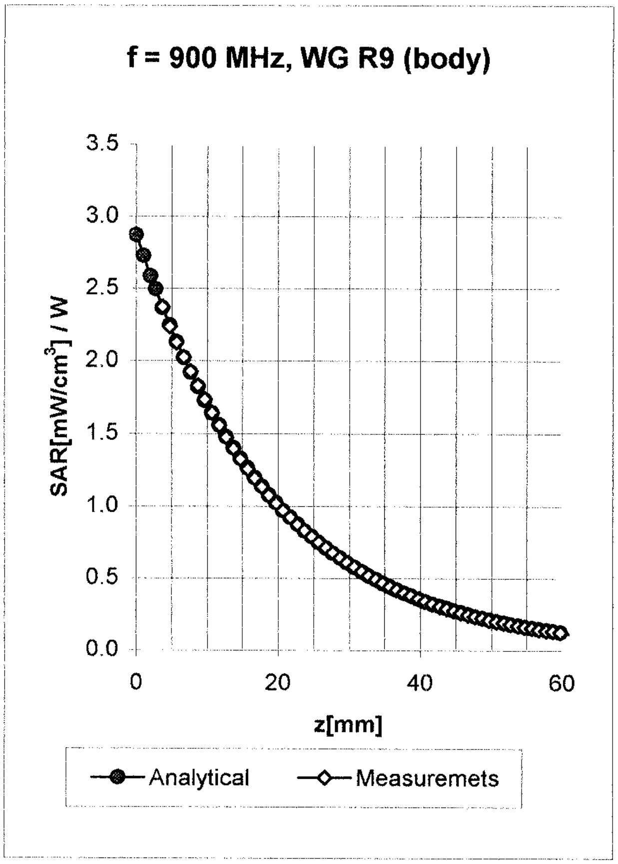


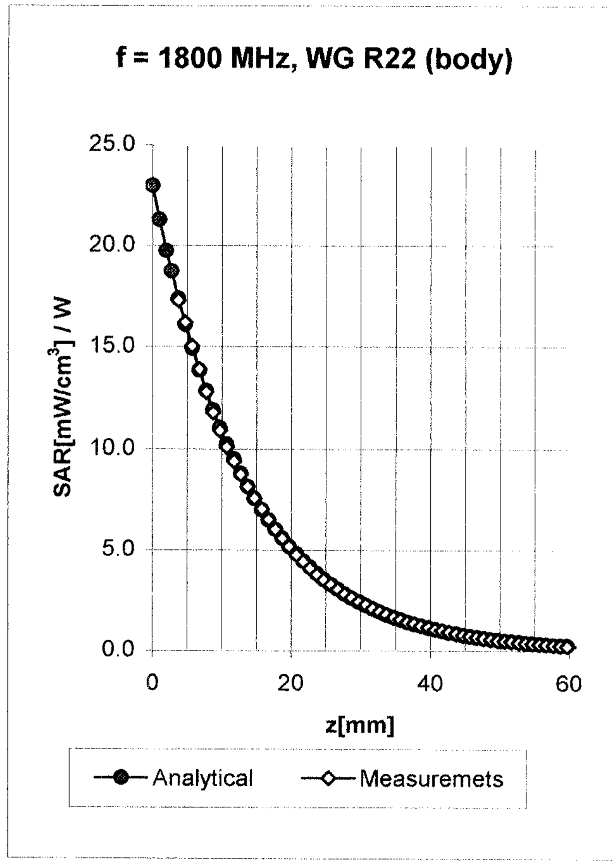


Head	**900 MHz**	ε_r = **41.5 ± 5%**	σ = **0.97 ± 5% mho/m**	
Head	**835 MHz**	ε_r = **41.5 ± 5%**	σ = **0.90 ± 5% mho/m**	
	ConvF X	**6.6** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.6** ± 9.5% (k=2)	Alpha	**0.37**
	ConvF Z	**6.6** ± 9.5% (k=2)	Depth	**2.61**

Head	**1800 MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**	
Head	**1900 MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**	
	ConvF X	**5.2** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.2** ± 9.5% (k=2)	Alpha	**0.50**
	ConvF Z	**5.2** ± 9.5% (k=2)	Depth	**2.73**

Conversion Factor Assessment

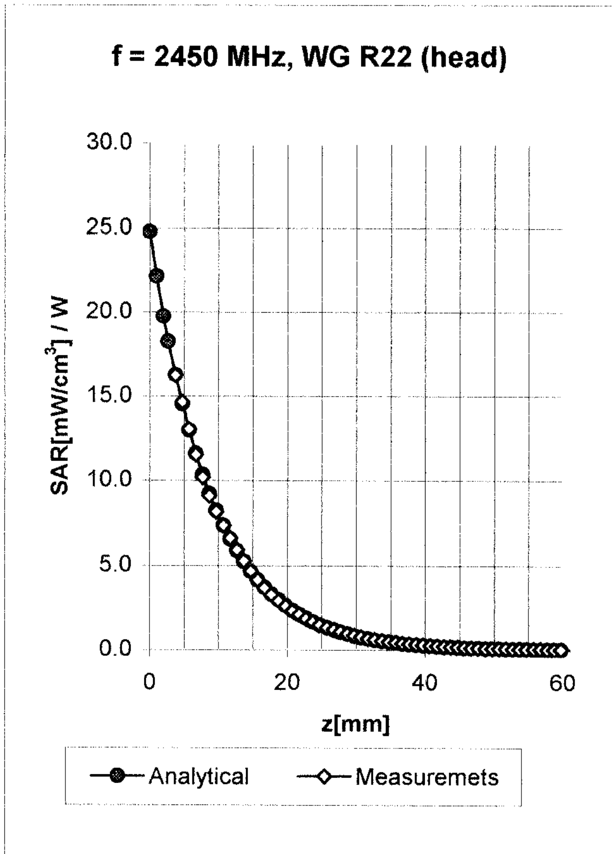


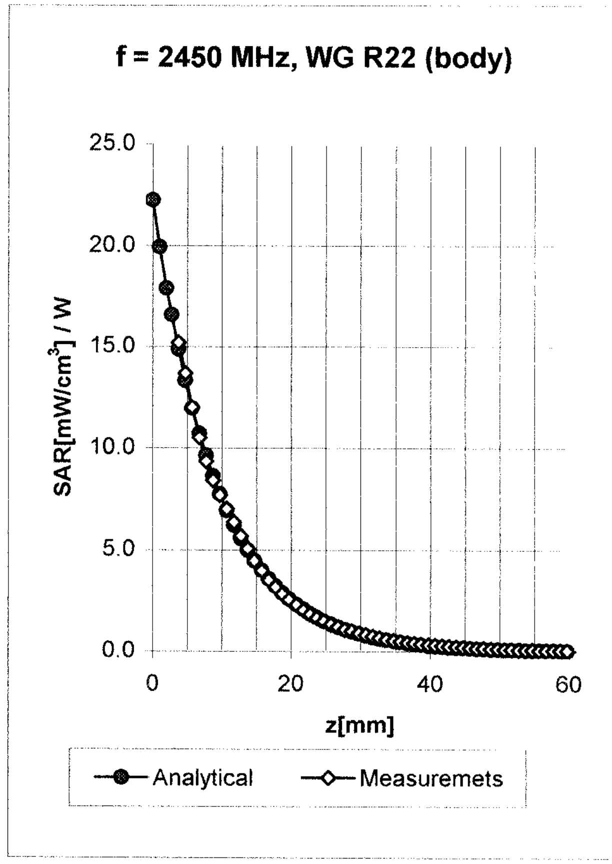


Body	**900 MHz**	ε_r = **55.0 ± 5%**	σ = **1.05 ± 5% mho/m**	
Body	**835 MHz**	ε_r = **55.2 ± 5%**	σ = **0.97 ± 5% mho/m**	
	ConvF X	**6.4** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.4** ± 9.5% (k=2)	Alpha	**0.45**
	ConvF Z	**6.4** ± 9.5% (k=2)	Depth	**2.35**

Body	**1800 MHz**	ε_r = **53.3 ± 5%**	σ = **1.52 ± 5% mho/m**	
Body	**1900 MHz**	ε_r = **53.3 ± 5%**	σ = **1.52 ± 5% mho/m**	
	ConvF X	**4.9** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**4.9** ± 9.5% (k=2)	Alpha	**0.60**
	ConvF Z	**4.9** ± 9.5% (k=2)	Depth	**2.59**

Conversion Factor Assessment



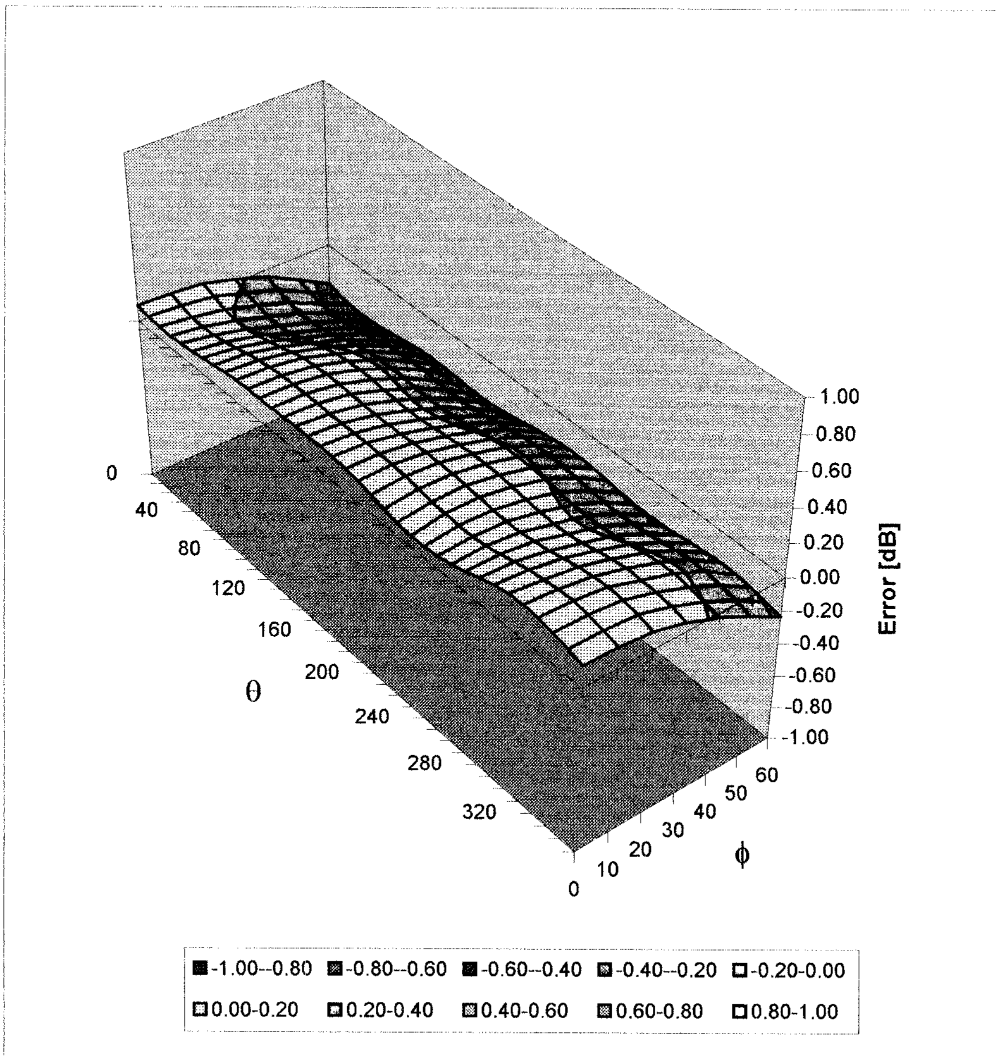


Head	**2450**	**MHz**	ε_r **= 39.2 ± 5%**	σ **= 1.80 ± 5% mho/m**
	ConvF X	**5.0** ± 8.9% (k=2)		Boundary effect:
	ConvF Y	**5.0** ± 8.9% (k=2)		Alpha **1.04**
	ConvF Z	**5.0** ± 8.9% (k=2)		Depth **1.85**

Body	**2450**	**MHz**	ε_r **= 52.7 ± 5%**	σ **= 1.95 ± 5% mho/m**
	ConvF X	**4.6** ± 8.9% (k=2)		Boundary effect:
	ConvF Y	**4.6** ± 8.9% (k=2)		Alpha **1.20**
	ConvF Z	**4.6** ± 8.9% (k=2)		Depth **1.60**

Deviation from Isotropy in HSL

Error (θ,φ), f = 900 MHz



Schmid & Partner Engineering AG

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

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1387**
Place of Assessment:	**Zurich**
Date of Assessment:	**February 28, 2003**
Probe Calibration Date:	**February 26, 2003**

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 (± standard deviation)

150 MHz	ConvF	**9.1 ± 8%**	**ε_r = 52.3** **σ = 0.76 mho/m** (head tissue)
300 MHz	ConvF	**7.9 ± 8%**	**ε_r = 45.3** **σ = 0.87 mho/m** (head tissue)
450 MHz	ConvF	**7.5 ± 8%**	**ε_r = 43.5** **σ = 0.87 mho/m** (head tissue)
150 MHz	ConvF	**8.8 ± 8%**	**ε_r = 61.9** **σ = 0.80 mho/m** (body tissue)
300 MHz	ConvF	**8.0 ± 8%**	**ε_r = 58.2** **σ = 0.92 mho/m** (body tissue)
450 MHz	ConvF	**7.7 ± 8%**	**ε_r = 56.7** **σ = 0.94 mho/m** (body tissue)

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

1800MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

October 28, 2003

Frequency	e'	e"
1.700000000 GHz	39.6412	13.4197
1.710000000 GHz	39.6030	13.4644
1.720000000 GHz	39.5770	13.4897
1.730000000 GHz	39.5253	13.5327
1.740000000 GHz	39.4718	13.5861
1.750000000 GHz	39.4307	13.6261
1.760000000 GHz	39.3670	13.6670
1.770000000 GHz	39.3290	13.7022
1.780000000 GHz	39.2763	13.7308
1.790000000 GHz	39.2279	13.7540
1.800000000 GHz	39.1760	13.7794
1.810000000 GHz	39.1372	13.8093
1.820000000 GHz	39.0741	13.8418
1.830000000 GHz	39.0262	13.8473
1.840000000 GHz	38.9927	13.8894
1.850000000 GHz	38.9556	13.9037
1.860000000 GHz	38.9255	13.9229
1.870000000 GHz	38.8749	13.9457
1.880000000 GHz	38.8316	13.9880
1.890000000 GHz	38.7929	14.0068
1.900000000 GHz	38.7487	14.0292

1880MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

October 28, 2003

Frequency	e'	e''
1.800000000 GHz	52.6906	14.7798
1.810000000 GHz	52.6334	14.8198
1.820000000 GHz	52.5968	14.8389
1.830000000 GHz	52.5424	14.8774
1.840000000 GHz	52.5203	14.9172
1.850000000 GHz	52.4993	14.9309
1.860000000 GHz	52.4592	14.9580
1.870000000 GHz	52.4282	14.9809
1.880000000 GHz	52.4038	15.0092
1.890000000 GHz	52.3591	15.0450
1.900000000 GHz	52.3235	15.0767
1.910000000 GHz	52.2731	15.1258
1.920000000 GHz	52.2416	15.1617
1.930000000 GHz	52.2111	15.2043
1.940000000 GHz	52.1859	15.2388
1.950000000 GHz	52.1436	15.2605
1.960000000 GHz	52.1100	15.2818
1.970000000 GHz	52.0493	15.3070
1.980000000 GHz	52.0140	15.3344
1.990000000 GHz	51.9534	15.3789
2.000000000 GHz	51.9327	15.4367

1800MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

October 29, 2003

Frequency	e'	e"
1.700000000 GHz	39.4468	13.5950
1.710000000 GHz	39.4270	13.6203
1.720000000 GHz	39.3773	13.6346
1.730000000 GHz	39.3216	13.6742
1.740000000 GHz	39.2658	13.7108
1.750000000 GHz	39.2158	13.7442
1.760000000 GHz	39.1676	13.7889
1.770000000 GHz	39.1166	13.8262
1.780000000 GHz	39.0600	13.8515
1.790000000 GHz	39.0202	13.8824
1.800000000 GHz	38.9650	13.8951
1.810000000 GHz	38.9121	13.9250
1.820000000 GHz	38.8651	13.9423
1.830000000 GHz	38.8143	13.9562
1.840000000 GHz	38.7676	13.9949
1.850000000 GHz	38.7398	13.9983
1.860000000 GHz	38.7007	14.0206
1.870000000 GHz	38.6585	14.0361
1.880000000 GHz	38.6193	14.0498
1.890000000 GHz	38.5769	14.0805
1.900000000 GHz	38.5349	14.1052

1880MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

October 29, 2003

Frequency	e'	e"
1.800000000 GHz	52.4508	14.6339
1.810000000 GHz	52.2699	14.5887
1.820000000 GHz	52.4138	14.8283
1.830000000 GHz	52.3410	15.0144
1.840000000 GHz	52.3769	14.8817
1.850000000 GHz	52.2866	14.8699
1.860000000 GHz	52.1887	14.8475
1.870000000 GHz	52.1176	14.8171
1.880000000 GHz	52.0341	14.7914
1.890000000 GHz	52.0196	14.8095
1.900000000 GHz	51.9455	14.7912
1.910000000 GHz	51.8655	15.0088
1.920000000 GHz	51.9344	15.0930
1.930000000 GHz	52.0543	15.0797
1.940000000 GHz	52.0719	15.0436
1.950000000 GHz	52.0040	14.9996
1.960000000 GHz	51.9947	15.0639
1.970000000 GHz	51.9740	14.9483
1.980000000 GHz	51.8323	15.0977
1.990000000 GHz	51.7468	15.1627
2.000000000 GHz	51.7386	15.3606

900MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

October 30, 2003

Frequency	e'	e"
800.000000 MHz	41.9998	19.9595
810.000000 MHz	41.9188	19.9330
820.000000 MHz	41.7917	19.8825
830.000000 MHz	41.6290	19.8807
840.000000 MHz	41.4990	19.8656
850.000000 MHz	41.3485	19.8366
860.000000 MHz	41.1916	19.7697
870.000000 MHz	41.0607	19.7792
880.000000 MHz	40.9378	19.7669
890.000000 MHz	40.8383	19.7186
900.000000 MHz	40.7982	19.6095
910.000000 MHz	40.6938	19.5607
920.000000 MHz	40.5599	19.5174
930.000000 MHz	40.4925	19.4748
940.000000 MHz	40.3546	19.4451
950.000000 MHz	40.2545	19.4337
960.000000 MHz	40.1532	19.4235
970.000000 MHz	40.0127	19.3982
980.000000 MHz	39.8738	19.4109
990.000000 MHz	39.8014	19.4033
1.000000000 GHz	39.6943	19.3935

835MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

October 30, 2003

Frequency	e'	e''
735.000000 MHz	55.5904	22.0228
745.000000 MHz	55.4796	21.9718
755.000000 MHz	55.3592	21.8775
765.000000 MHz	55.2620	21.8721
775.000000 MHz	55.1301	21.7852
785.000000 MHz	55.0351	21.7573
795.000000 MHz	54.9680	21.6971
805.000000 MHz	54.9072	21.6128
815.000000 MHz	54.8346	21.5339
825.000000 MHz	54.7499	21.4887
835.000000 MHz	54.6493	21.4946
845.000000 MHz	54.5284	21.4478
855.000000 MHz	54.4238	21.3745
865.000000 MHz	54.2773	21.3512
875.000000 MHz	54.1931	21.3375
885.000000 MHz	54.0813	21.3242
895.000000 MHz	54.0407	21.2258
905.000000 MHz	53.9491	21.1907
915.000000 MHz	53.8734	21.1345
925.000000 MHz	53.8001	21.0887
935.000000 MHz	53.6745	21.0446

900MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

October 31, 2003

Frequency	e'	e''
800.000000 MHz	41.4337	19.7623
810.000000 MHz	41.3924	20.0056
820.000000 MHz	41.3557	19.8148
830.000000 MHz	40.9659	19.8199
840.000000 MHz	40.8571	19.8972
850.000000 MHz	40.8365	19.9387
860.000000 MHz	40.7235	19.7890
870.000000 MHz	40.6388	19.9100
880.000000 MHz	40.6878	19.5663
890.000000 MHz	40.2823	19.5098
900.000000 MHz	40.1444	19.4589
910.000000 MHz	40.2109	19.5069
920.000000 MHz	40.0994	19.4111
930.000000 MHz	40.0493	19.5115
940.000000 MHz	39.7329	19.4799
950.000000 MHz	39.8224	19.5752
960.000000 MHz	39.7687	19.3535
970.000000 MHz	39.4735	19.3316
980.000000 MHz	39.3932	19.2966
990.000000 MHz	39.2166	19.2835
1.000000000 GHz	39.0210	19.2550

835MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

October 31, 2003

Frequency	e'	e''
735.000000 MHz	55.1222	21.8234
745.000000 MHz	54.5217	21.5186
755.000000 MHz	54.8262	22.1046
765.000000 MHz	54.5037	21.7282
775.000000 MHz	54.7725	22.1076
785.000000 MHz	54.8020	21.6879
795.000000 MHz	54.7648	21.3500
805.000000 MHz	54.4286	21.4822
815.000000 MHz	54.3522	21.3363
825.000000 MHz	54.3174	21.2057
835.000000 MHz	53.7291	21.3677
845.000000 MHz	53.7762	21.4306
855.000000 MHz	53.6944	21.4303
865.000000 MHz	53.6829	21.6624
875.000000 MHz	53.8584	21.4978
885.000000 MHz	53.7231	21.0018
895.000000 MHz	53.3563	21.3455
905.000000 MHz	53.0750	21.2630
915.000000 MHz	53.2080	20.6448
925.000000 MHz	53.4391	21.1619
935.000000 MHz	53.2450	21.6479

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

APPENDIX G - PLANAR PHANTOM CERTIFICATE OF CONFORMITY

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

BARSKI INDUSTRIES (1985) LTD.

Ph. # 250-769-6848
Fax # 250-769-6334
E-mail: barskiind@shaw.ca
Web: 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: ____________________

Daniel Chailler


Fiberglass Planar Phantom - Top View

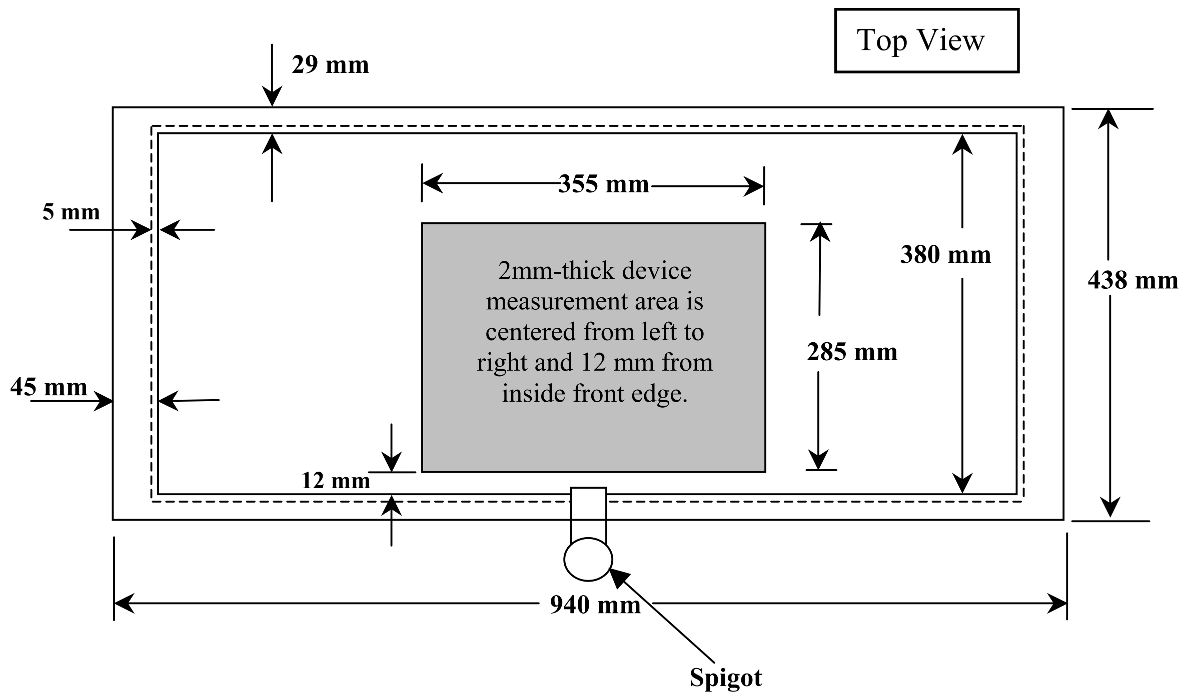

Fiberglass Planar Phantom - Front View

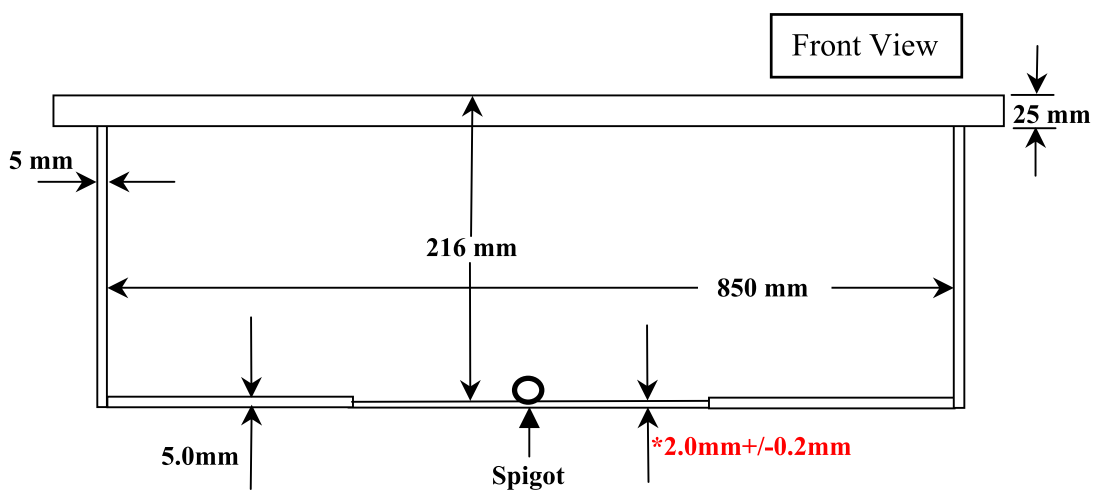

Fiberglass Planar Phantom - Back View


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.