Appendix C: RF Exposure

Please refer to the following SAR evaluation.

DECLARATION OF COMPLIANCE
SAR EVALUATION

Test Lab
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Applicant Information
M/A-COM, INC.
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

Rule Part(s):	**FCC §2.1093; IC RSS-102 Issue 1 (Provisional)**
Test Procedure(s):	**FCC OET Bulletin 65 Supplement C (Edition 01-01)**
Device Classification:	**Licensed Non-Broadcast Transmitter Held to Face (TNF)**
Device Type:	**Portable VHF PTT Radio Transceiver**
FCC ID:	**OWDTR-0013-E**
Model Name / No.:	**P7100(IP)**
Modulation:	**FM (VHF)**
Tx Frequency Range:	**136 - 174 MHz**
Max. Conducted Power Tested:	**5.60 Watts**
Antenna Part No.(s):	**KRE1011219/1 (136-151 MHz) / KRE1011219/2 (150-162 MHz)** **KRE1011219/3 (162-174 MHz) / KRE1011219/21 (150-174 MHz)**
Antenna Type(s):	**Helical Coil (KRE1011219/1-3) / Spring Whip (KRE1011219/21)**
Battery Types Tested:	**1. 7.5V Nickel Cadmium – Immersion – Non-Intrinsically Safe (BKB191210/3)** **2. 7.5V Nickel Metal Hydride - Immersion – Non-Intrinsically Safe (BKB191210/4)** **3. 7.5V Nickel Cadmium - Immersion - Intrinsically Safe (BKB191210/5)** **4. 7.5V Nickel Metal Hydride - Immersion - Intrinsically Safe (BKB191210/6)**
Body-Worn Accessories Tested:	**1. Speaker Microphone Antenna Version Plus (KRY1011617/84R1A, KRY1011617/184R1A)** **2. Speaker-Microphone (KRY1011617/83R1A, KRY1011617/183R1A)** **3. Metal Belt-Clip (KRY1011647/1)** **4. Belt-Loop with Swivel (KRY1011609/1)** **5. Leather Case with Belt-Loop (KRY1011638/1)** **6. Leather Case with Swivel & Belt-Loop (KRY1011639/1)** **7. Nylon Case with Swivel & Belt-Loop (KRY1011648/1)** **8. Nylon T-Strap (KRY1011656/1)**
Class II Change(s):	**New Rear Casting with added Shim** **New Wideband Centurion Antenna (150-174MHz); (KRE1011219/21)** **New T-Strap Body-worn accessory (KRY1011656/1)**
Max. SAR Evaluated:	**Face-held: 1.17 W/kg (50% Duty Cycle); Body-worn: 3.88 W/kg (50% Duty Cycle)**

Celltech Labs Inc. declares under its sole responsibility that this device was found to be in 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 (Occupational Environment/Controlled Exposure).

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

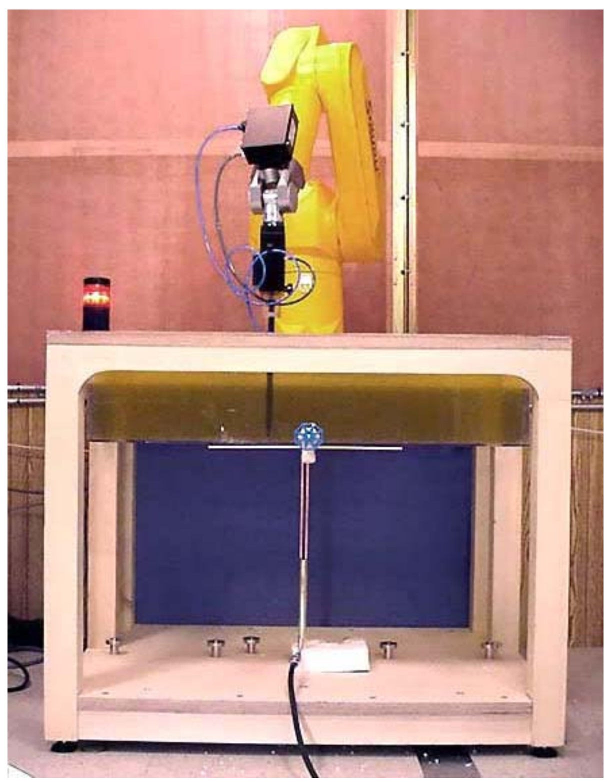
1.0 INTRODUCTION

This measurement report demonstrates that the M/A-COM INC. Model: P7100(IP) Portable VHF PTT Radio Transceiver FCC ID: OWDTR-0013-E complies with FCC 47 CFR §2.1093 (see reference [1]) and Health Canada Safety Code 6 (see reference [2]) (Occupational Environment / Controlled Exposure limits). The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]) and Industry Canada 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 SAR MEASUREMENT SYSTEM

Celltech Research SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The SAR measurement system is comprised of the robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for face and 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 PC plug-in card. The DAE3 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 PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

DASY3 SAR Measurement System with small planar phantom



DASY3 SAR Measurement System with validation phantom

3.0 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

Rule Part(s)	FCC 47 CFR §2.1093; IC RSS-102 Issue 1
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)
Device Classification	Licensed Non-Broadcast Transmitter Held to Face (TNF)
Device Type	Portable VHF PTT Radio Transceiver
FCC ID	OWDTR-0013-E
Model Name / No.	P7100(IP)
Serial No.	Pre-production
Modulation	FM (VHF)
Tx Frequency Range	136 - 174 MHz
Max. RF Conducted Power Tested	5.60 Watts
Antenna Type(s)	Helical Coil, Spring Whip
Antenna Part No.(s)	KRE1011219/1 (136-151 MHz) KRE1011219/2 (150-162 MHz) KRE1011219/3 (162-174 MHz) KRE1011219/21 (150-174 MHz)
Antenna Length(s)	KRE1011219/1 - 172 mm , KRE1011219/2 - 152 mm, KRE1011219/3 - 142 mm, KRE1011219/21 - 222 mm
Battery Type(s) Tested	1. 7.5V Nickel Cadmium - immersible - non-Intrinsically Safe (BKB191210/3) 2. 7.5V Nickel Metal Hydride - immersible - non-Intrinsically Safe (BKB191210/4) 3. 7.5V Nickel Cadmium - immersible - Intrinsically Safe (BKB191210/5) 4. 7.5V Nickel Metal Hydride - immersible - Intrinsically Safe (BKB191210/6)
Additional Battery Type(s) Testing Not Required (electrically & mechanically same as batteries listed above)	1. 7.5V Nickel Cadmium - wind driven rain - non-Intrinsically Safe (BKB191210/23) 2. 7.5V Nickel Metal Hydride - wind driven rain - non-Intrinsically Safe (BKB191210/24) 3. 7.5V Nickel Cadmium - wind driven rain - Intrinsically Safe (BKB191210/25) 4. 7.5V Nickel Metal Hydride - wind driven rain - Intrinsically Safe (BKB191210/26)
Body-Worn Accessories Tested	1. Speaker Microphone Antenna Version Plus (KRY1011617/184R1A) 2. Speaker Microphone (KRY1011617/183R1A) 3. Metal Belt-Clip (KRY1011647/1) 4. Leather Case (Belt-Loop type - KRY1011638/1) 5. Belt-Loop (KRY1011609/1) & Swivel (KRY1011608/2) 6. Leather Case (KRY1011639/1) with Belt-Loop (KRY1011609/1) & Swivel (KRY1011608/2) 7. Nylon (black) Case (KRY1011648/1) with Belt-Loop (KRY1011609/1) 8. Nylon "T" Strap Holder (KRY1011656/1)

(Continued on next page)

DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) (Continued from previous page)

Additional Body-Worn Accessories **Testing Not Required** **1. Same as Item 2 listed above** **2. Same as Item 1 listed above** **3. Same as Item 7 listed above**	1. Speaker Microphone (KRY1011617/183R2A) [1] 2. Speaker Microphone (KRY1011617/183R3A) [1] 3. Speaker Microphone (KRY1011617/183R4A) [1] 4. Speaker Microphone (KRY1011617/183R5A) [1] 5. Speaker Microphone - Immersible - Intrinsically Safe (KRY1011617/283/R1A) [1] 6. Speaker Microphone - Ruggedized - Intrinsically Safe (KRY1011617/383/R1A) [1] 7. Speaker Microphone - Vehicle Charger Compatible - Intrinsically Safe (KRY1011617/185/R2A) [1] 8. Speaker Microphone Antenna Version Plus (KRY1011617/184R2A) [2] 9. Speaker Microphone Antenna Version Plus (KRY1011617/184R3A) [2] 10. Speaker Microphone Antenna Version Plus (KRY1011617/184R4A) [2] 11. Speaker Microphone Antenna Version Plus (KRY1011617/184R5A) [2] 12. Speaker Microphone - Antenna Version - Vehicle Charger Compatible - Intrinsically Safe (KRY1011617/186/R1A) [2] 13. Speaker Microphone - Antenna Version - Immersible - Intrinsically Safe (KRY1011617/284/R1A) [2] 14. Speaker Microphone - Antenna Version - Immersible - Intrinsically Safe, Charger Compatible (KRY1011617/287/R1A) [2] 15. Speaker Microphone - Industrial (OT-V2-10121) [1] 16. Speaker Microphone - Industrial PLUS (OT-V2-10122) [1] 17. Speaker Microphone - Earphone Kit, Black (OT-V1-10520) [1] 18. Speaker Microphone - Earphone Kit, Beige (OT-V1-10521) [1] 19. Speaker Microphone - Earphone Kit, Black (OT-V1-10522) [1] 20. Speaker Microphone - Earphone Kit, Beige (OT-V1-10523) [1] 21. Speaker Microphone - 3-Wire Mini Lapel, Beige (OT-V1-10524) [1] 22. Speaker Microphone - 3-Wire Mini Lapel, Black (OT-V1-10525) [1] 23. Speaker Microphone - Ultra Lite Headset with Inline PTT (OT-V4-10314) [1] 24. Speaker Microphone - Liteweight Headset with Single Speaker (OT-V4-10315) [1] 25. Speaker Microphone - Over-the-head Headset (OT-V4-10316) [1] 26. Speaker Microphone - Behind-the-head Headset (OT-V4-10317) [1] 27. Earpiece Kit for Speaker Microphone - Intrinsically Safe (RLD54107/11) 28. Nylon (orange) Case (KRY1011649/1) with Belt-Loop (KRY1011609/1) [3]

4.0 MEASUREMENT SUMMARY

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the EUT are reported in Appendix A.

FACE-HELD SAR MEASUREMENT RESULTS

Freq. (MHz)	Ch.	Test Mode	Conducted Power (Watts)		Antenna Part No.	Acc. Type	Battery Type	Phantom Section	Sep. Dist. (cm)	Measured SAR (W/kg)		SAR Drift (dB)	Scaled SAR (W/kg)	
			Before	After						00% Dut Cycle	0% Duty Cycle		00% Duty Cycle	0% Duty Cycle
155.00	Mid	CW	5.54	4.98	KRE1011219/21	None	NiMH-IS	Planar	2.5	0.742	0.371	-0.60	0.852	0.426
155.00	Mid	CW	5.55	5.07	KRE1011219/21	None	NiCd-IS	Planar	2.5	0.782	0.391	-0.60	0.898	0.449
155.00	Mid	CW	5.54	5.44	KRE1011219/21	None	NiMH-NIS	Planar	2.5	0.789	0.395	-0.60	0.906	0.453
155.00	Mid	CW	5.55	5.48	KRE1011219/21	None	NiCd-NIS	Planar	2.5	0.871	0.436	-0.60	1.00	0.500
155.00	Mid	CW	5.57	4.99	KRE1011219/2	None	NiMH-IS	Planar	2.5	1.92	0.960	-0.60	2.20	1.10
155.00	Mid	CW	5.57	5.16	KRE1011219/2	None	NiCd-IS	Planar	2.5	1.78	0.890	-0.60	2.04	1.02
155.00	Mid	CW	5.57	5.54	KRE1011219/2	None	NiMH-NIS	Planar	2.5	2.02	1.01	-0.60	2.32	1.16
155.00	Mid	CW	5.55	5.57	KRE1011219/2	None	NiCd-NIS	Planar	2.5	2.04	1.02	-0.60	2.34	1.17
155.00	Mid	CW	5.57	5.55	KRE1011219/21	SM AVP	NiCd-NIS	Planar	2.5	0.823	0.412	-0.60	0.945	0.473

ANSI / IEEE C95.1 1992 - SAFETY LIMIT
BRAIN: 8.0 W/kg (averaged over 1 gram)
Spatial Peak - Controlled Exposure / Occupational

Test Date(s)	06/21/03		**ρ (Kg/m^3)**	1000
Measured Mixture Type	150 MHz Brain		**Relative Humidity**	57 %
Dielectric Constant	**Target**	**Measured**	**Atmospheric Pressure**	100.8 kPa
	52.3 (+/- 5%)	53.4		
Conductivity	**Target**	**Measured**	**Fluid Temperature**	23.3 °C
	0.76 (+/- 5%)	0.73		
Ambient Temp.	22.1 °C		**Fluid Depth**	≥ 15 cm

Note(s):

1. If the SAR measurements performed at the middle 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]).
2. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed were consistent for all measurement periods.
3. The dielectric properties of the simulated brain fluid were verified 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).
4. Abbreviation(s): IS = Intrinsically Safe
   NIS = Non-Intrinsically Safe
   SM AVP = Speaker-Microphone Antenna Version Plus (KRY1011617/184R1A)
5. Antenna Type(s): Helical Coil P/N: KRE1011219/2 (150-162 MHz)
   Spring Whip P/N: KRE1011219/21 (150-174 MHz)

MEASUREMENT SUMMARY (Cont.)

BODY-WORN SAR MEASUREMENT RESULTS

Freq. (MHz)	Ch.	Conducted Power (Watts)		Antenna Part No.	Acc. Type	Battery Type	Phantom Section	Sep. Dist. (cm)	Measured SAR (W/kg)		SAR Drift (dB)	Scaled SAR (W/kg)	
		Before	After						00% Duty Cycle	0% Duty Cycle		00% Duty Cycle	0% Duty Cycle
155.00	Mid	5.52	4.82	KRE1011219/21	MBC & SM	NiMH-IS	Planar	1.1	5.85	2.93	-0.60	6.72	3.36
155.00	Mid	5.55	4.94	KRE1011219/21	MBC & SM	NiCd-IS	Planar	1.1	6.04	3.02	-0.60	6.93	3.47
155.00	Mid	5.54	5.27	KRE1011219/21	MBC & SM	NiMH-NIS	Planar	1.1	6.67	3.34	-0.60	7.66	3.83
155.00	Mid	5.53	5.43	KRE1011219/21	MBC & SM	NiCd-NIS	Planar	1.1	P 6.75	3.38	-0.60	7.75	3.88
									S 3.75	1.88	-0.60	4.31	2.16
155.00	Mid	5.54	4.95	KRE1011219/2	MBC & SM	NiMH-IS	Planar	1.1	4.10	2.05	-0.60	4.71	2.36
155.00	Mid	5.54	4.96	KRE1011219/2	MBC & SM	NiCd-IS	Planar	1.1	4.01	1.00	-0.60	4.60	2.30
155.00	Mid	5.57	5.16	KRE1011219/2	MBC & SM	NiMH-NIS	Planar	1.1	4.24	2.12	-0.60	4.87	2.44
155.00	Mid	5.57	5.39	KRE1011219/2	MBC & SM	NiMH-NIS	Planar	1.1	4.21	2.11	-0.60	4.83	2.42
155.00	Mid	5.55	4.83	KRE1011219/21	NT & SM	NiMH-IS	Planar	1.6	2.88	1.44	-0.60	3.31	1.66
155.00	Mid	5.58	5.06	KRE1011219/21	NT & SM	NiCd-IS	Planar	1.6	3.32	1.66	-0.60	3.81	1.91
155.00	Mid	5.58	5.27	KRE1011219/21	NT & SM	NiMH-NIS	Planar	1.6	3.61	1.81	-0.60	4.14	2.07
155.00	Mid	5.58	5.57	KRE1011219/21	NT & SM	NiCd-NIS	Planar	1.6	3.55	1.78	-0.60	4.08	2.04

ANSI / IEEE C95.1 1992 - SAFETY LIMIT
BRAIN: 8.0 W/kg (averaged over 1 gram)
Spatial Peak - Controlled Exposure / Occupational

Test Date(s)	6/19/03		**ρ (Kg/m^3)**	1000
Measured Mixture Type	150 MHz Body		**Relative Humidity**	39%
Dielectric Constant	**Target**	**Measured**	**Atmospheric Pressure**	100.6 kPa
	61.9 (+/- 5%)	61.1		
Conductivity	**Target**	**Measured**	**Fluid Temperature**	23.5 °C
	0.80 (+/- 5%)	0.82		
Ambient Temp.	23.9 °C		**Fluid Depth**	≥ 15 cm

Note(s):

1. If the SAR measurements performed at the middle 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]).
2. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed were consistent for all measurement periods.
3. The dielectric properties of the simulated body fluid were verified 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).
4. Abbreviation(s): IS = Intrinsically Safe
   NIS = Not Intrinsically Safe
   P = Primary Hotspot
   S = Secondary Hotspot
   MBC = Metal Belt-Clip (KRY1011647/1)
   NT = Nylon T-Strap (KRY1011656/1)
   SM = Speaker-Microphone (KRY1011617/183R1A)
5. Antenna Type(s): Spring Whip Antenna P/N: KRE1011219/21
   Helical Coil Antenna P/N: KRE1011219/2

MEASUREMENT SUMMARY (Cont.)

BODY-WORN SAR MEASUREMENT RESULTS

Freq. (MHz)	Ch.	Conducted Power (Watts)		Antenna Part No.	Acc. Type	Battery Type	Phantom Section	Sep. Dist. (cm)	Measured SAR (W/kg)			SAR Drift (dB)	Scaled SAR (W/kg)	
		Before	After							00% Duty Cycle	0% Duty Cycle		00% Duty Cycle	0% Duty Cycle
155.00	Mid	5.59	5.03	KRE1011219/2	NT & SM	NiMH-IS	Planar	1.6		2.61	1.31	-0.60	3.00	1.50
155.00	Mid	5.60	5.18	KRE1011219/2	NT & SM	NiCd-IS	Planar	1.6		2.81	1.41	-0.60	3.23	1.62
155.00	Mid	5.53	5.52	KRE1011219/2	NT & SM	NiMH-NIS	Planar	1.6		2.14	1.07	-0.60	2.46	1.23
155.00	Mid	5.57	5.58	KRE1011219/2	NT & SM	NiCd-NIS	Planar	1.6		2.55	1.28	-0.60	2.93	1.47
155.00	Mid	5.55	5.55	KRE1011219/21	LC & SM	NiCd-NIS	Planar	1.7		2.50	1.25	-0.60	2.87	1.44
155.00	Mid	5.53	5.05	KRE1011219/2	LC & SM	NiMH-NIS	Planar	1.7		2.31	1.16	-0.60	2.65	1.33
155.00	Mid	5.53	5.59	KRE1011219/21	LC/SBL & SM	NiCd-N	Planar	4.5		0.688	0.344	-0.60	0.790	0.395
155.00	Mid	5.55	5.09	KRE1011219/2	LC/SBL & SM	NiMH-NIS	Planar	4.5	P	1.17	0.585	-0.60	1.34	0.670
									S	1.18	0.590	-0.60	1.35	0.675
									T	1.07	0.535	-0.60	1.23	0.615
155.00	Mid	5.54	5.58	KRE1011219/21	NC/SBL & SM	NiCd-NIS	Planar	4.0		1.02	0.510	-0.60	1.17	0.585
155.00	Mid	5.55	5.16	KRE1011219/2	NC/SBL & SM	NiMH-NIS	Planar	4.0	P	1.28	0.640	-0.60	1.47	0.735
									S	0.565	0.283	-0.60	0.649	0.325
155.00	Mid	5.55	5.58	KRE1011219/21	BL/S & SM	NiCd-NIS	Planar	3.5	P	1.69	0.845	-0.60	1.94	0.970
									S	0.722	0.361	-0.60	0.829	0.415
									T	0.800	0.400	-0.60	0.919	0.460
155.00	Mid	5.58	5.58	KRE1011219/2	BL/S & SM	NiMH-NIS	Planar	3.5	P	2.55	1.28	-0.60	2.93	1.47
									S	1.88	0.940	-0.60	2.16	1.08
									T	1.87	0.935	-0.60	2.15	1.08
155.00	Mid	5.58	5.54	KRE1011219/21	SM AVP	NiCd-NIS	Planar	1.3		3.27	1.64	-0.60	3.75	1.88

ANSI / IEEE C95.1 1992 - SAFETY LIMIT
BRAIN: 8.0 W/kg (averaged over 1 gram)
Spatial Peak - Controlled Exposure / Occupational

Test Date(s)	06/20/03		**ρ (Kg/m^3)**	1000
Measured Mixture Type	150 MHz Body		**Relative Humidity**	70 %
Dielectric Constant	**Target**	**Measured**	**Atmospheric Pressure**	100.4 kPa
	61.9 (+/- 5%)	61.2		
Conductivity	**Target**	**Measured**	**Fluid Temperature**	23.4 °C
	0.80 (+/- 5%)	0.78		
Ambient Temp.	22.8 °C		**Fluid Depth**	≥ 15 cm

Note(s):

1. If the SAR measurements performed at the middle 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]).
2. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed were consistent for all measurement periods.
3. The dielectric properties of the simulated body fluid were verified 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).
4. Abbreviation(s):
   IS = Intrinsically Safe
   NIS = Not Intrinsically Safe
   P = Primary Hotspot
   S = Secondary Hotspot
   NT = Nylon T-Strap (KRY1011656/1)
   LC = Leather Case (KRY1011638/1)
   SBL = Swivel Belt-Loop (KRY1011609/1)
   S = Swivel
   BL = Belt-Loop
   SM = Speaker-Microphone (KRY1011617/183R1A)
   SM AVP = Speaker-Microphone Antenna Version Plus (KRY1011617/184R1A)
5. Antenna Type(s):
   Spring Whip Antenna P/N: KRE1011219/21
   Helical Coil Antenna P/N: KRE1011219/2

5.0 DETAILS OF SAR EVALUATION

The M/A-COM INC. Model: P7100(IP) Portable VHF PTT Radio Transceiver FCC ID: OWDTR-0013-E was found to be compliant for localized Specific Absorption Rate (Controlled Exposure) based on the test provisions and conditions described below. Detailed photographs of the measurement setup are shown in Appendix F.

1. The body-worn SAR evaluation of the EUT was first tested with the metal belt-clip and nylon t-strap accessories based on the metal belt-clip and nylon t-strap having close peak SAR levels as worst-case configurations. The battery that yielded the highest SAR level for each antenna with the metal belt-clip accessory was then determined as worst-case for the remainder of the body-worn accessory tests. Additionally, low and high channels were tested if the SAR levels were = 3dB from the SAR limit.
2. The EUT (radio transceiver P/N: RU101219V22) was tested in a face-held configuration with the front of the device placed parallel to the outer surface of the planar phantom and a 2.5 cm separation distance was maintained.
3. The EUT (speaker-microphone with antenna P/N: KRY1011617/84R1A, KRY1011617/184R1A) was tested in a face-held configuration with the front of the device placed parallel to the outer surface of the planar phantom and a 2.5 cm separation distance was maintained.
4. The EUT (speaker-microphone with antenna P/N: KRY1011617/84R1A, KRY1011617/184R1A) was tested in a body-worn configuration with the back of the device placed parallel to the outer surface of the planar phantom. The attached metal lapel-clip was touching the outer surface of the planar phantom and provided a 1.3 cm separation distance between the back of the speaker-microphone and the outer surface of the planar phantom.
5. The EUT was tested in a body-worn configuration with the back of the radio transceiver placed parallel to the outer surface of the planar phantom. The attached metal belt-clip (P/N: KRY1011647/1) was touching the outer surface of the planar phantom and provided a 1.1 cm separation distance between the back of the radio transceiver and the outer surface of the planar phantom.
6. The EUT was tested in a body-worn configuration with the radio transceiver placed inside the nylon "T-Strap" accessory (P/N: KRY1011656/1) and the back of the EUT facing parallel to the outer surface of the planar phantom. The back of the nylon "T-Strap" accessory was touching the outer surface of the planar phantom and provided a 1.6 cm separation distance between the back of the radio transceiver and the outer surface of the planar phantom.
7. The EUT was tested in a body-worn configuration with the radio transceiver placed inside the leather case (P/N: KRY1011638/1) and the back of the EUT facing parallel to the outer surface of the planar phantom. The back of the leather case (belt-loop portion) was touching the outer surface of the planar phantom and provided a 1.7 cm separation distance between the back of the radio transceiver and the outer surface of the planar phantom.
8. The EUT was tested in a body-worn configuration with the radio transceiver placed inside the leather case (P/N: KRY1011639/1) with rear swivel clip (P/N: KRY1011608/2) attached to the belt-loop (P/N: KRY1011609/1), and the back of the EUT facing parallel to the outer surface of the planar phantom. The back of the belt-loop was touching the outer surface of the planar phantom and provided a 4.5 cm separation distance between the back of the radio transceiver and the outer surface of the planar phantom.
9. The EUT was tested in a body-worn configuration with the radio transceiver placed inside the nylon case (P/N: KRY1011648/1) with rear swivel clip (P/N: KRY1011608/2) attached to the belt-loop (P/N: KRY1011609/1), and the back of the EUT facing parallel to the outer surface of the planar phantom. The back of the belt-loop was touching the outer surface of the planar phantom and provided a 4.0 cm separation distance between the back of the radio transceiver and the outer surface of the planar phantom.
10. The EUT was tested in a body-worn configuration with the back of the radio transceiver placed parallel to the outer surface of the planar phantom. The attached belt-loop with swivel (P/N: KRY1011609/1) was touching the outer surface of the planar phantom and provided a 3.5 cm separation distance between the back of the radio transceiver and the outer surface of the planar phantom.
11. A speaker-microphone accessory (P/N: KRY1011617/83R1A, KRY1011617/183R1A) was attached to the EUT for tests #4-#9.

5.0 DETAILS OF SAR EVALUATION (Cont)

12. The EUT was evaluated for body SAR at maximum power and no turn-on delay. The conducted power levels were checked before and after each test according to the procedures described in FCC Part 2.1046. The power drift measured after each test was > 5% of the initial power measured before each test. A SAR versus time evaluation was subsequently performed over a thirty-minute period for the test configuration in which the highest power drift was measured, with the radio in a “cold” state and no turn-on delay. The SAR versus time evaluation measured a lower drift (dB) than the highest measured conducted power drift, therefore the highest measured conducted power drift (dB) was added to the measured SAR values to show worst-case results (see measured and scaled SAR values in the test data tables on pages 6-8). The SAR versus time evaluation plot is shown in Appendix A (SAR Test Plots).
13. The EUT was tested with the transmit button depressed and the transmitter placed in unmodulated continuous transmit mode (Continuous Wave at 100% duty cycle) throughout the SAR evaluation. This is a push-to-talk device; therefore the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
14. The location of the maximum spatial SAR distribution (Hot Spot) was determined relative to the EUT and its antenna.
15. The EUT was tested with fully charged with intrinsically and non-intrinsically safe NiCd and NiMH batteries.

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 in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01) 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 DASY3 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 20mm x 20mm.
c. Based on the area scan data, the area of maximum absorption was determined by spline interpolation. Around this point, a volume of 40 x 40 x 35 mm (fine resolution volume scan, zoom scan) was assessed by measuring 5 x 5 x 7 points.
d. The 1g and 10g spatial peak SAR was determined as follows:
1. The first step was an extrapolation 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 1.3 mm (see probe calibration document in Appendix D). The extrapolation was based on a least square algorithm [W. Gander, Computermathematik, p.168-180] (see reference [6]). Through the points in the first 3 cm in all z-axis, polynomials of the fourth order were calculated. This polynomial was then used to evaluate the points between the surface and the probe tip.
2. The next step used 3D-spline interpolation to get all points within the measured volume in a 1mm grid (35000 points). The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff] (see reference [6]).
3. The maximal interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-spline interpolation algorithm. 8000 points (20x20x20) were interpolated to calculate the average.

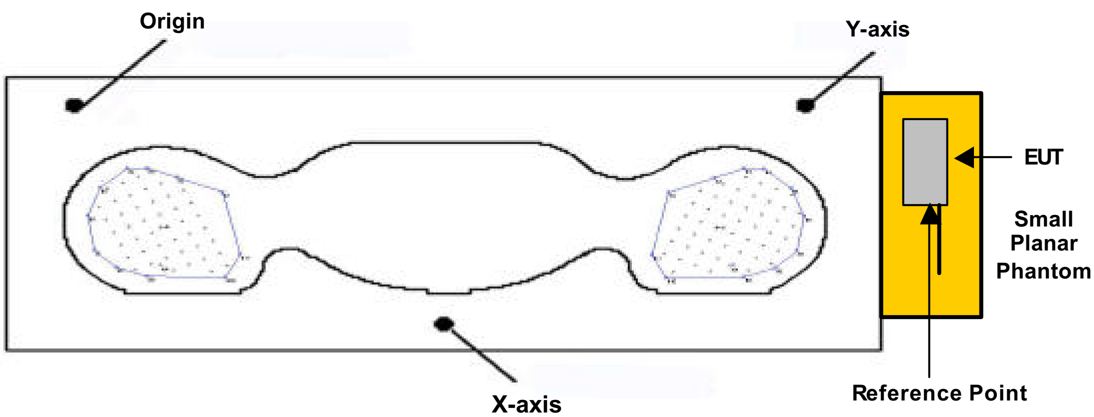


Figure 1. Phantom Reference Point & EUT Positioning
Radio Transceiver - Body-Worn Configuration

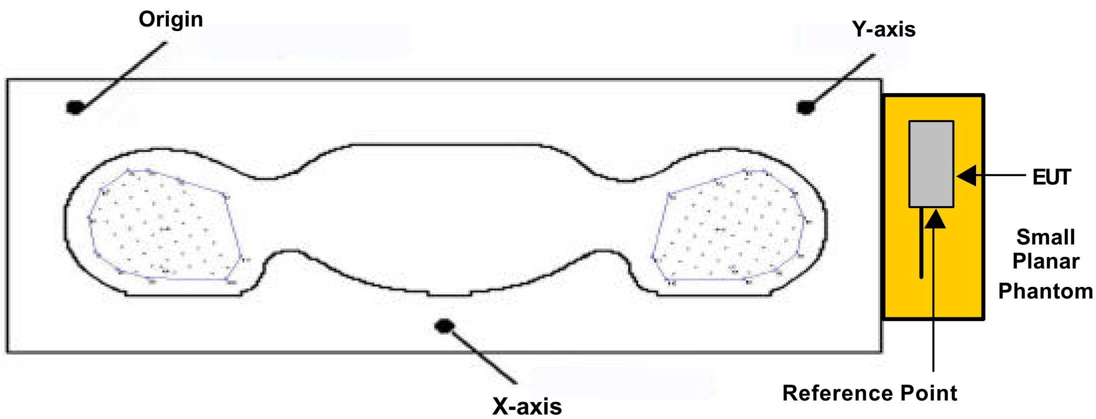


Figure 2. Phantom Reference Point & EUT Positioning
Speaker-Microphone with Antenna – Face-Held Configuration

7.0 SYSTEM PERFORMANCE CHECK

Prior to the evaluation a system performance check was performed using a planar phantom and a 300MHz dipole (see Appendix C for system validation procedure). The simulated tissue fluids were verified prior to the performance 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 system was verified to a tolerance of ±10% (see Appendix B for performance check data).

SYSTEM PERFORMANCE CHECK

Test Date	Equiv. Tissue	Target SAR 1g (w/kg)	Measured SAR 1g (w/kg)	Dielectric Constant ε_r		Conductivity σ (mho/m)		ρ (Kg/m³)	Ambient Temp.	Fluid Temp.	Fluid Depth
				Target	Measured	Target	Measured				
06/19/02	300MHz (Brain)	**0.750**	0.794	**45.3 ±5%**	45.5	**0.87 ±5%**	0.89	1000	23.3 °C	22.9 °C	≥ 15 cm
06/20/02			0.799		45.2		0.90		22.5 °C	23.7 °C	
06/21/02			0.795		44.9		0.90		21.9 °C	22.8 °C	

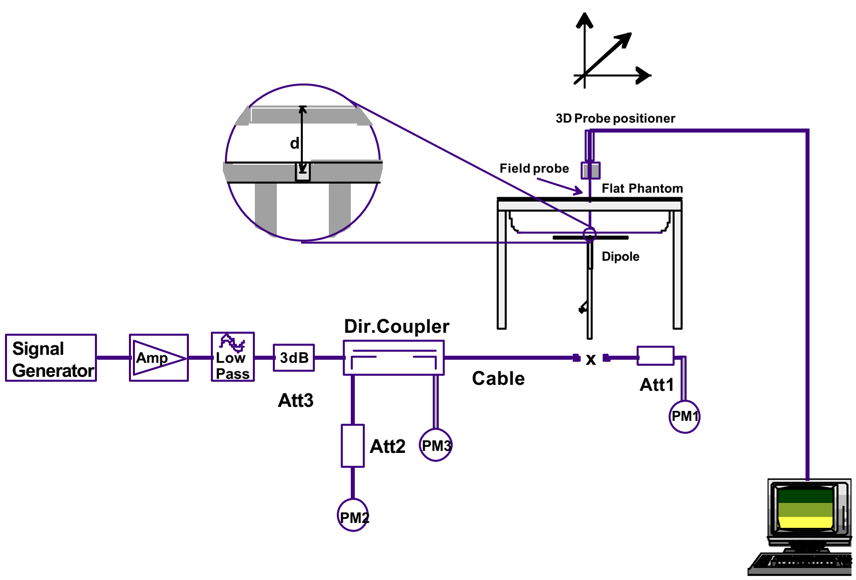


Figure 3. System Check Measurement Setup Diagram

300MHz System Check Setup Photograph

8.0 EQUIVALENT TISSUES

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

TISSUE MIXTURES			
INGREDIENT	**300MHz Brain (%) (System Check)**	**150MHz Brain (%) (EUT Evaluation)**	**150MHz Body (%) (EUT Evaluation)**
Water	37.56	38.35	46.6
Sugar	55.32	55.5	49.7
Salt	5.95	5.15	2.6
HEC	0.98	0.9	1.0
Bactericide	0.19	0.1	0.1

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:	Pentium III
Clock Speed:	450 MHz
Operating System:	Windows NT
Data Card:	DASY3 PC-Board

Data Converter

Features:	Signal Amplifier, multiplexer, A/D converter, and control logic
Software:	DASY3 software
Connecting Lines:	Optical downlink for data and status info. Optical uplink for commands and clock

PC Interface Card

Function:	24 bit (64 MHz) DSP for real time processing Link to DAE3 16-bit A/D converter for surface detection system serial link to robot direct emergency stop output for robot

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)

Evaluation Phantom

Type:	Planar Phantom (Small)
Shell Material:	Plexiglas
Bottom Thickness:	2.0 mm ± 0.1mm
Dimensions:	Box: 36.5cm (L) x 22.5cm (W) x 20.3cm (H); Back Plane: 25.3cm (H)

Validation Phantom (≤ 450MHz)

Type:	Planar Phantom (Large)
Shell Material:	Plexiglas
Bottom Thickness:	6.2 mm ± 0.1mm
Dimensions:	86.0cm (L) x 39.5cm (W) x 21.8cm (H)

11.0 PROBE SPECIFICATION (ET3DV6)

Construction: Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g. glycol)
Calibration: In air from 10 MHz to 2.5 GHz
In brain simulating tissue at frequencies of 900 MHz
and 1.8 GHz (accuracy ± 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)
Dynam. Rnge: 5 µW/g to >100 mW/g; Linearity: ±0.2 dB
Srfce. Detect. ±0.2 mm repeatability in air and clear liquids over
diffuse reflecting surfaces
Dimensions: Overall length: 330 mm
Tip length: 16 mm
Body diameter: 12 mm
Tip diameter: 6.8 mm
Distance from probe tip to dipole centers: 2.7 mm
Application: General dosimetry up to 3 GHz
Compliance tests of mobile phone

ET3DV6 E-Field Probe

12.0 SMALL PLANAR PHANTOM

The small planar phantom is constructed of Plexiglas material with a 2.0mm shell thickness for face-held and body-worn SAR evaluations. The small planar phantom is mounted onto the outside left head section of the DASY3 system.

Small Planar Phantom

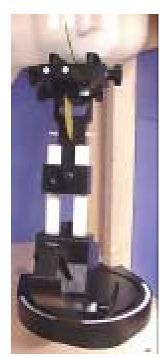
13.0 LARGE PLANAR PHANTOM

The large planar phantom is constructed of Plexiglas material with a 6.0 mm shell thickness for SAR validations at 450MHz and below. The large planar phantom is mounted in the DASY3 compact system in place of the SAM phantom.

Large Planar Phantom

14.0 DEVICE HOLDER

The DASY3 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

SAR MEASUREMENT SYSTEM		
TEST EQUIPMENT	**SERIAL NO.**	**CALIBRATION DATE**
Schmid & Partner DASY3 System	-	-
-Robot	599396-01	N/A
-ET3DV6 E-Field Probe	1387	Feb 2003
-300MHz Validation Dipole	135	Oct 2002
-450MHz Validation Dipole	136	Oct 2002
-900MHz Validation Dipole	054	June 2003
-1800MHz Validation Dipole	247	June 2003
-2450MHz Validation Dipole	150	Oct 2002
-SAM Phantom V4.0C	N/A	N/A
-Planar Phantom	N/A	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

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 permitivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permitivity (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 Std 1528 (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”.

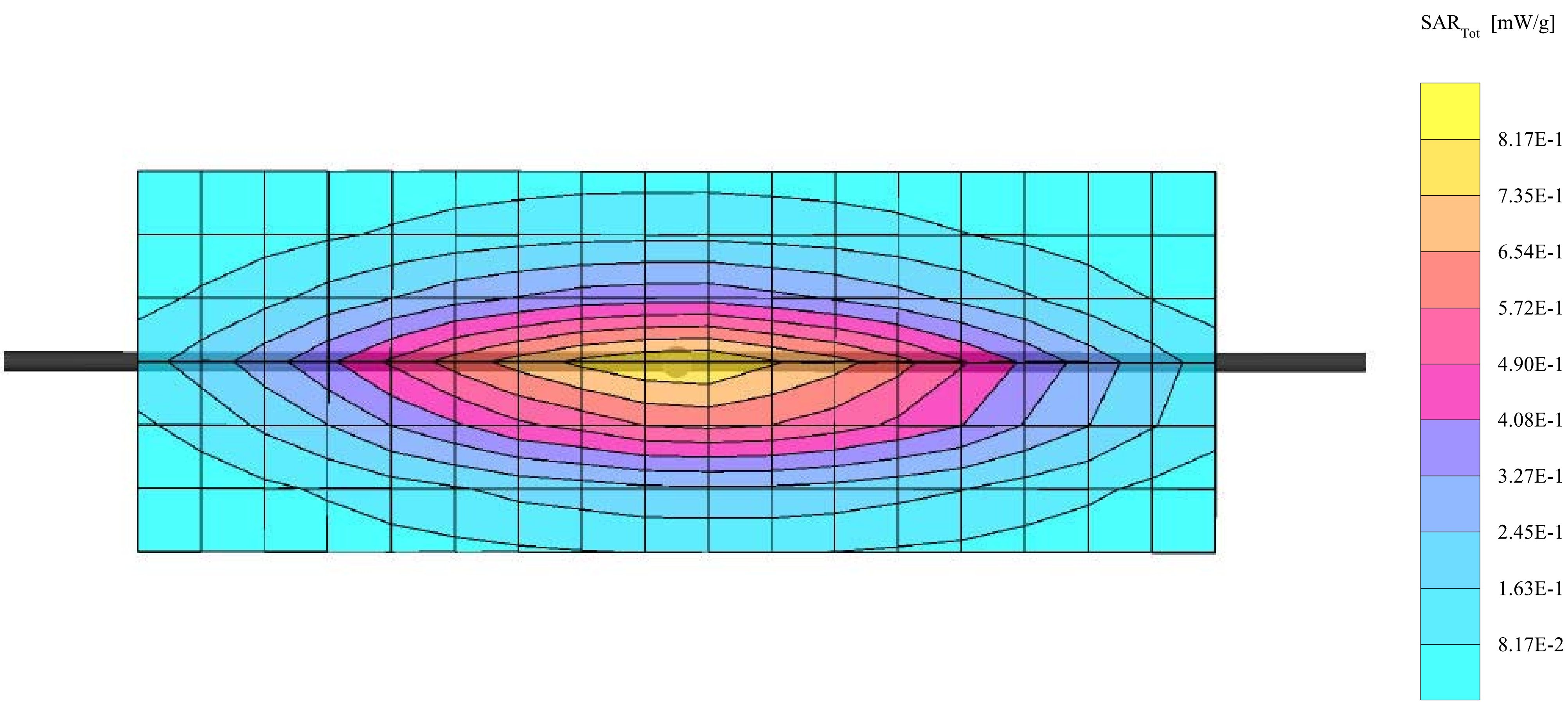
[6] W. Gander, *Computermathematick*, Birkhaeuser, Basel: 1992.

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Dipole 300 MHz

Large Planar Phantom; Planar Section
Probe: ET3DV6 - SN1387; ConvF(7.90,7.90,7.90); Crest factor: 1.0; 300 MHz Brain: $\sigma = 0.89$ mho/m $\varepsilon_r = 45.5$ $\rho = 1.00$ g/cm^3
Cube 5x5x7: Peak: 1.29 mW/g, SAR (1g): 0.794 mW/g, SAR (10g): 0.520 mW/g, (Worst-case extrapolation)
Penetration depth: 12.2 (10.2, 14.8) [mm]; Ambient Temp. 23.3°C; Fluid Temp. 22.9°C
Powerdrift: 0.02 dB

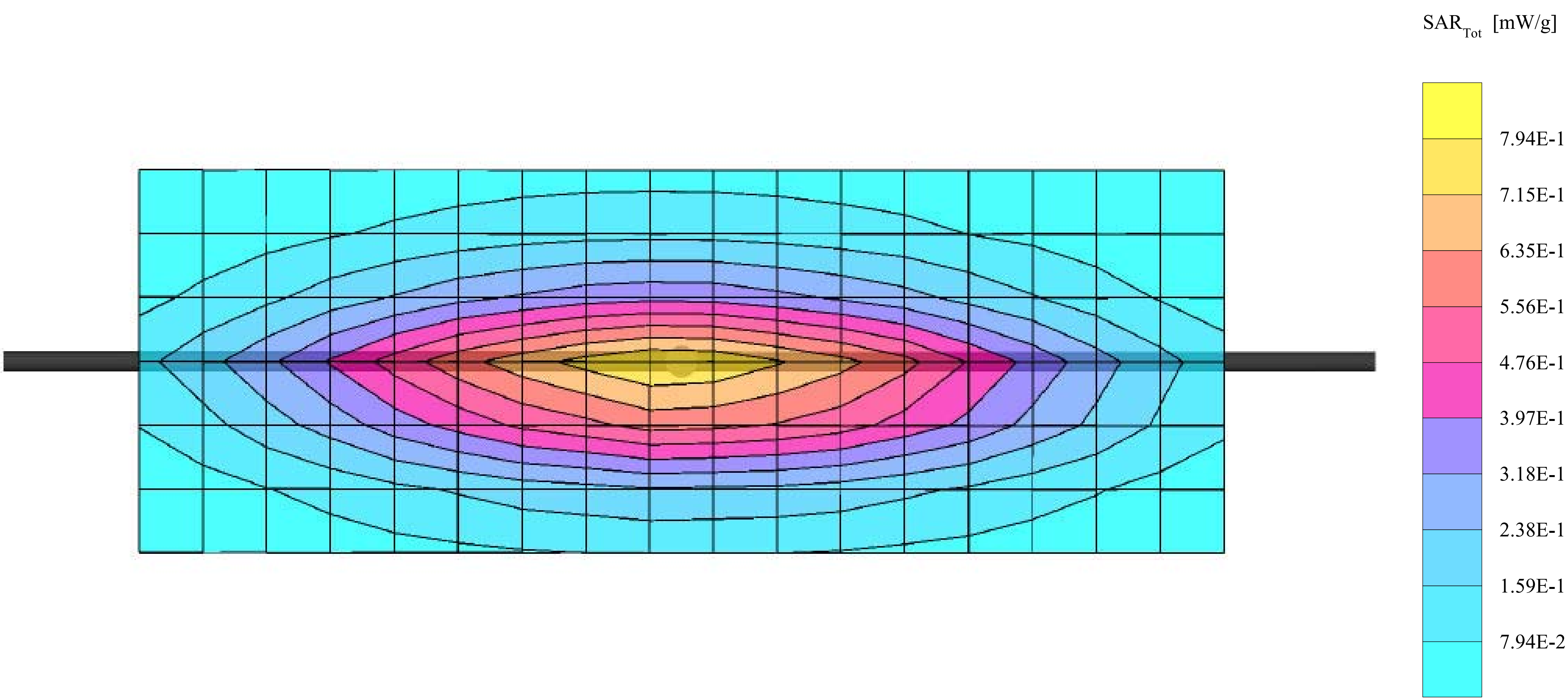
Date Tested: June 19, 2003
Conducted Power: 250 mW



Dipole 300 MHz

Large Planar Phantom; Planar Section
Probe: ET3DV6 - SN1387; ConvF(7.90,7.90,7.90); Crest factor: 1.0; 300 MHz Brain: $\sigma = 0.90$ mho/m $\varepsilon_r = 45.2$ $\rho = 1.00$ g/cm^3
Cube 5x5x7: Peak: 1.27 mW/g, SAR (1g): 0.799 mW/g, SAR (10g): 0.524 mW/g, (Worst-case extrapolation)
Penetration depth: 12.3 (10.6, 14.5) [mm]; Ambient Temp. 22.5°C; Fluid Temp. 23.7°C
Powerdrift: -0.01 dB

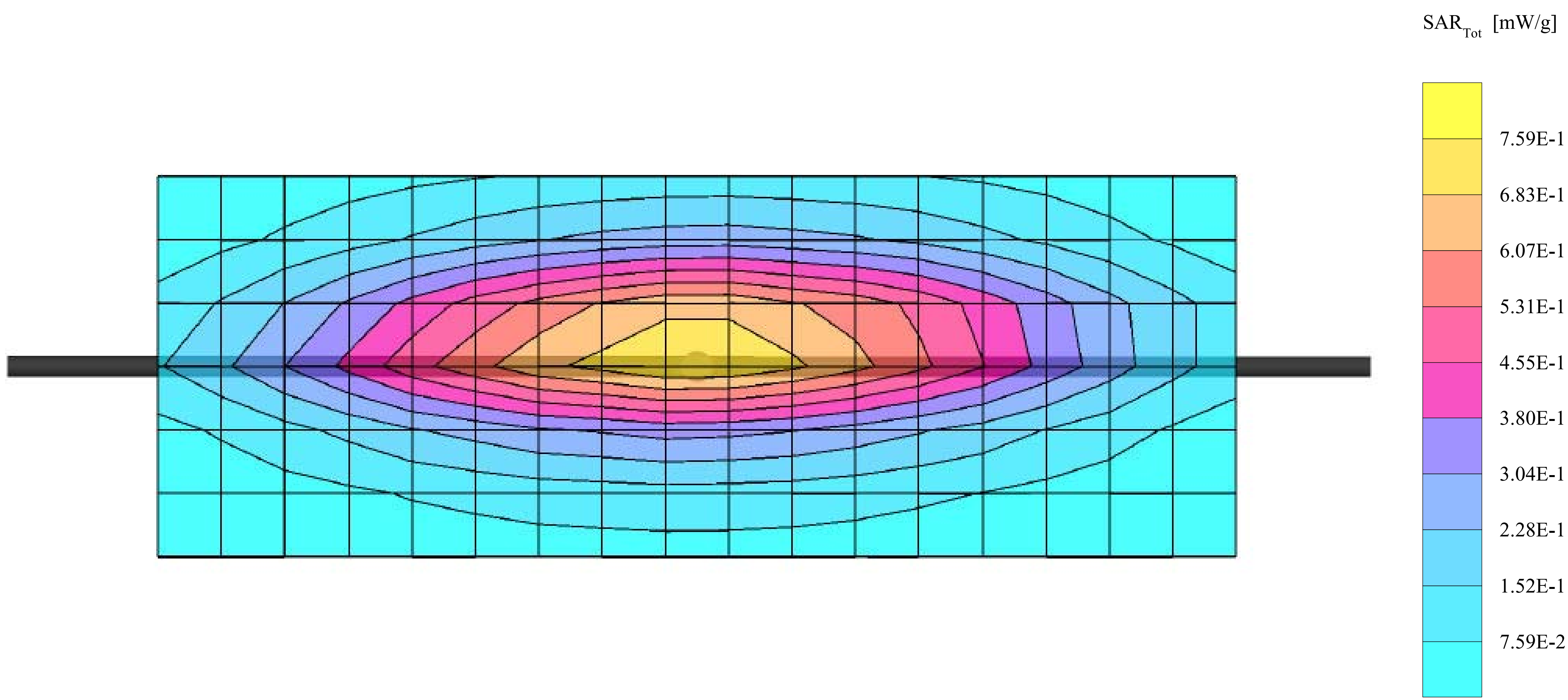
Date Tested: June 20, 2003
Forward Conducted Power: 250 mW



Dipole 300 MHz

Large Phantom Phantom; Planar Section
Probe: ET3DV6 - SN1387; ConvF(7.90,7.90,7.90); Crest factor: 1.0; Brain 300 MHz: $\sigma = 0.90$ mho/m $\varepsilon_r = 44.9$ $\rho = 1.00$ g/cm^3
Cube 5x5x7: Peak: 1.31 mW/g, SAR (1g): 0.795 mW/g, SAR (10g): 0.516 mW/g, (Worst-case extrapolation)
Penetration depth: 12.0 (9.9, 14.9) [mm]; Ambient Temp. 21.9°C; Fluid Temp. 22.8°C
Powerdrift: -0.03 dB

Date Tested: June 21, 2003
Conducted Power: 250 mW



APPENDIX C - SYSTEM VALIDATION

Celltech
Testing and Engineering Services Lab

300MHz SYSTEM VALIDATION DIPOLE

Type:	**300MHz Validation Dipole**
Serial Number:	**135**
Place of Calibration:	**Celltech Research Inc.**
Date of Calibration:	**October 15, 2002**

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

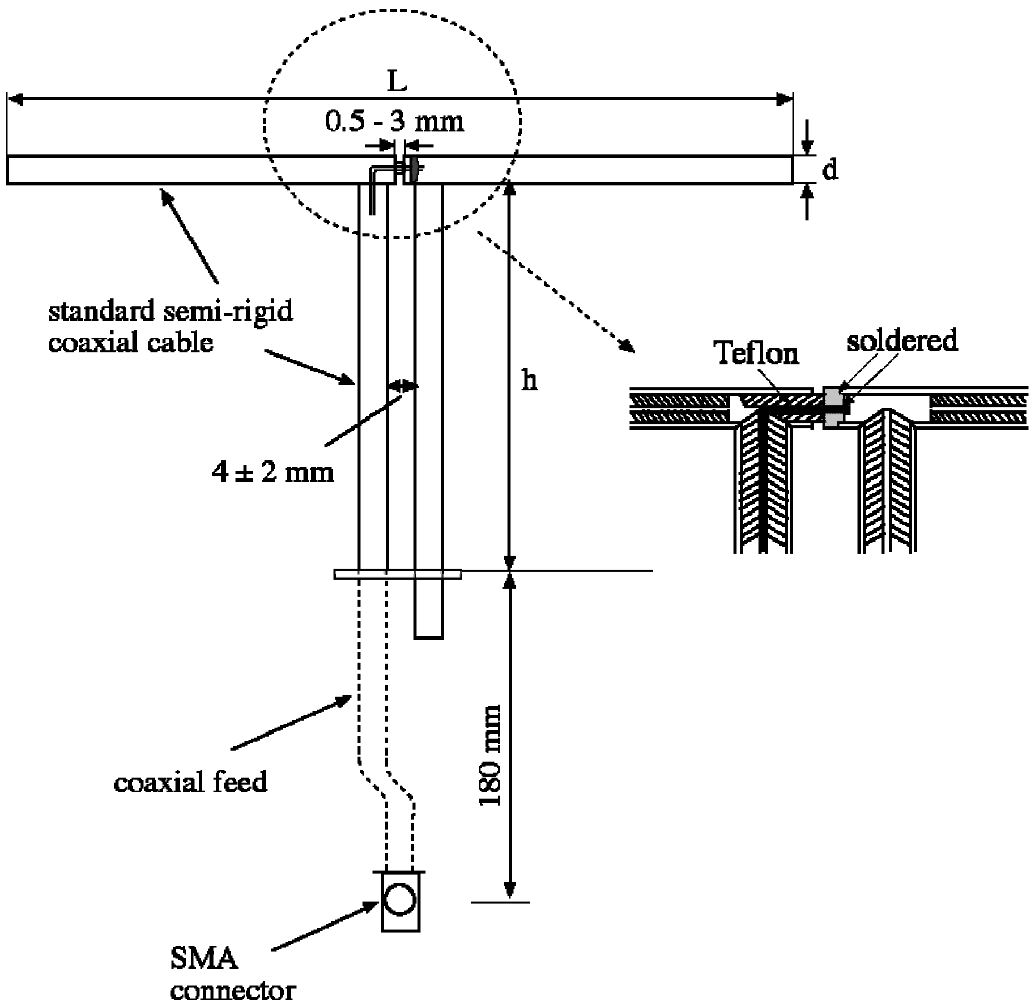
Calibrated by:	Russell W. Pipe
Approved by:	

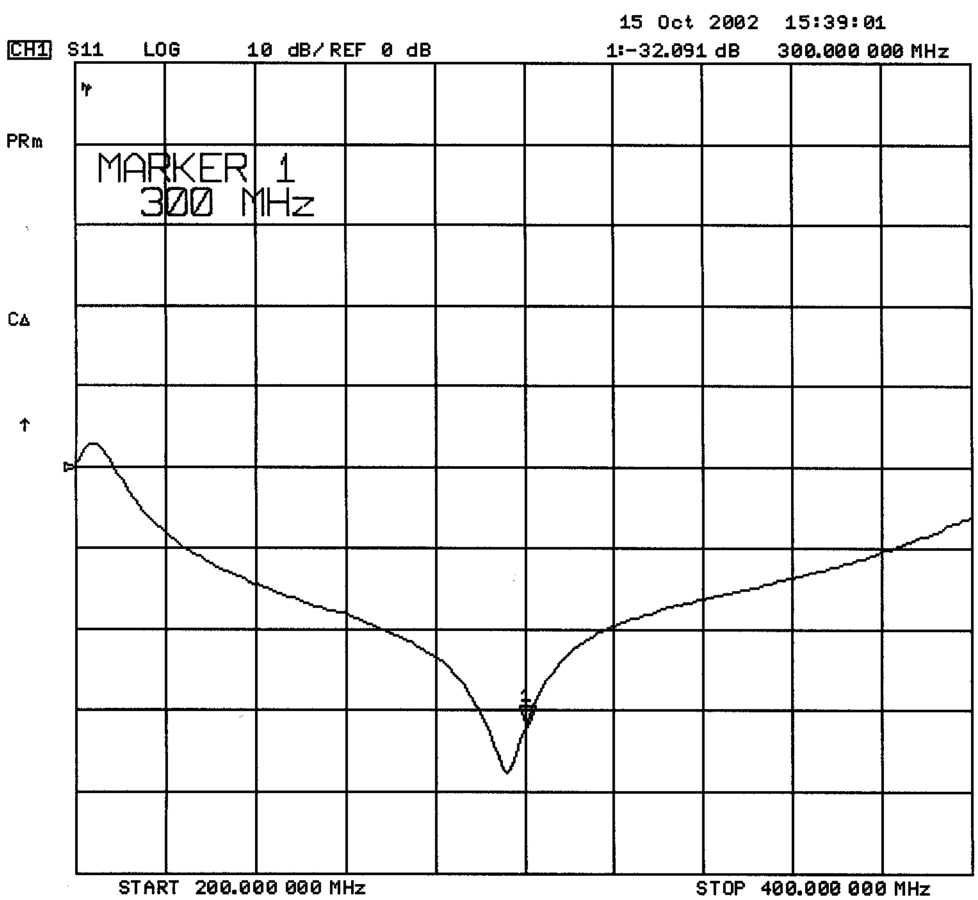
Celltech Research Inc. 1955 Moss Court, Kelowna, B.C. Canada V1Y 9L3
Tel. 250-448-7047 • Fax. 250-448-7046 • e-mail: info@celltechlabs.com
www.celltechlabs.com

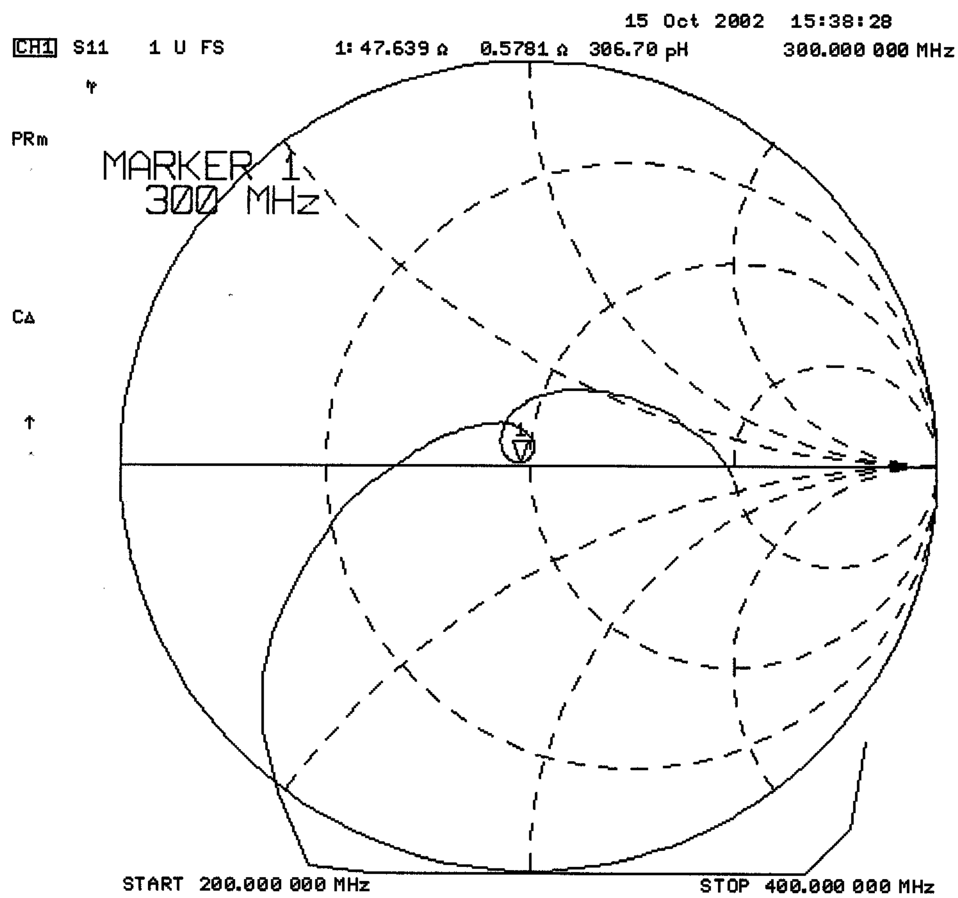
1. Dipole Construction & Electrical Characteristics

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

Feed point impedance at 300MHz	Re{Z} = 47.639Ω
	Im{Z} = 0.5781Ω
Return Loss at 300MHz	-32.091dB




15 Oct 2002 15:39:01
CH1 S11 LOG 10 dB/ REF 0 dB 1:-32.091 dB 300.000 000 MHz
PRm
CΔ
MARKER 1
300 MHz
START 200.000 000 MHz
STOP 400.000 000 MHz


15 Oct 2002 15:38:28
CH1 S11 1 U FS 1: 47.639 Ω 0.5781 Ω 306.70 pH 300.000 000 MHz
PRm
MARKER 1
300 MHz
CΔ
START 200.000 000 MHz
STOP 400.000 000 MHz

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

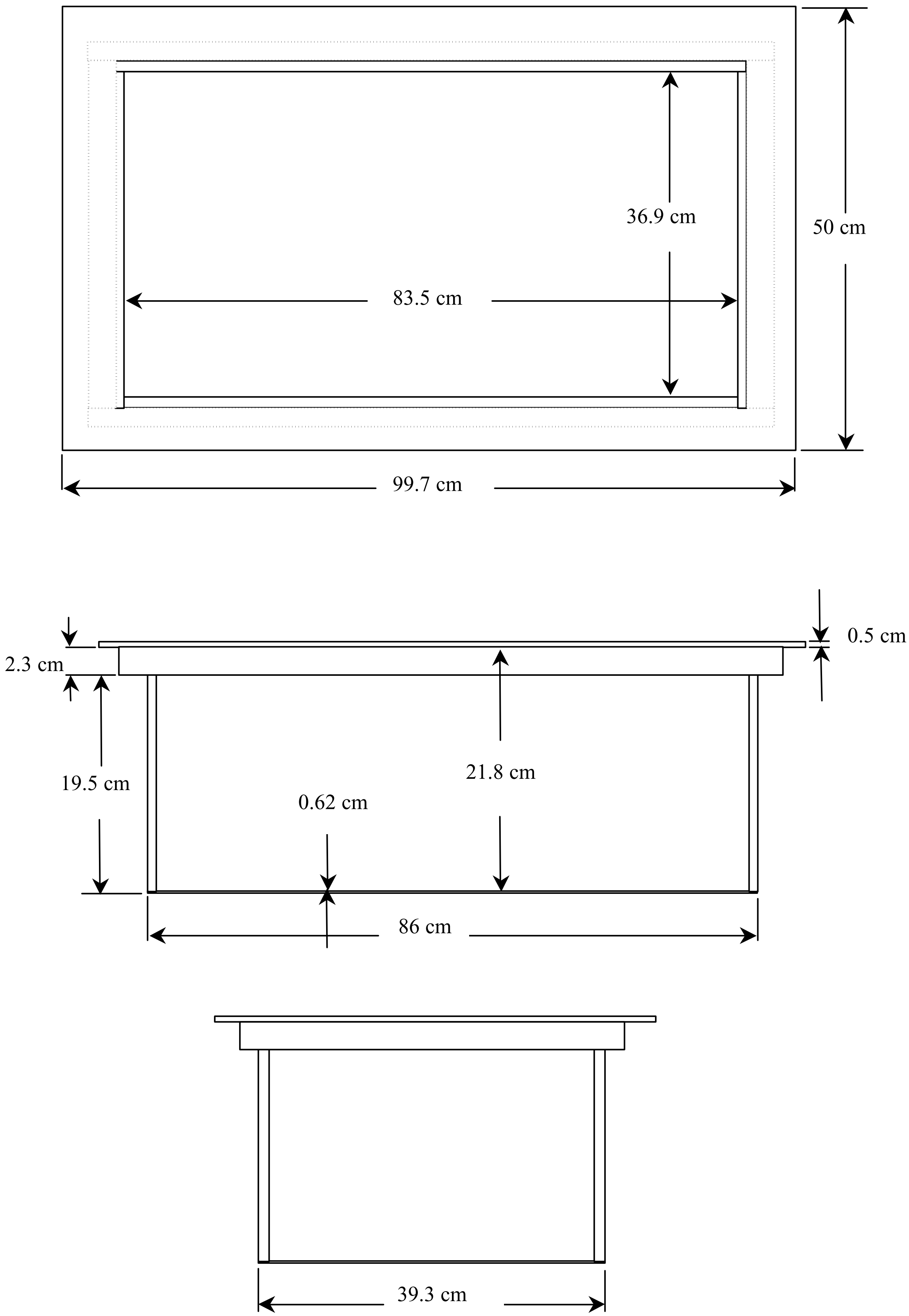
2. Validation Phantom

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

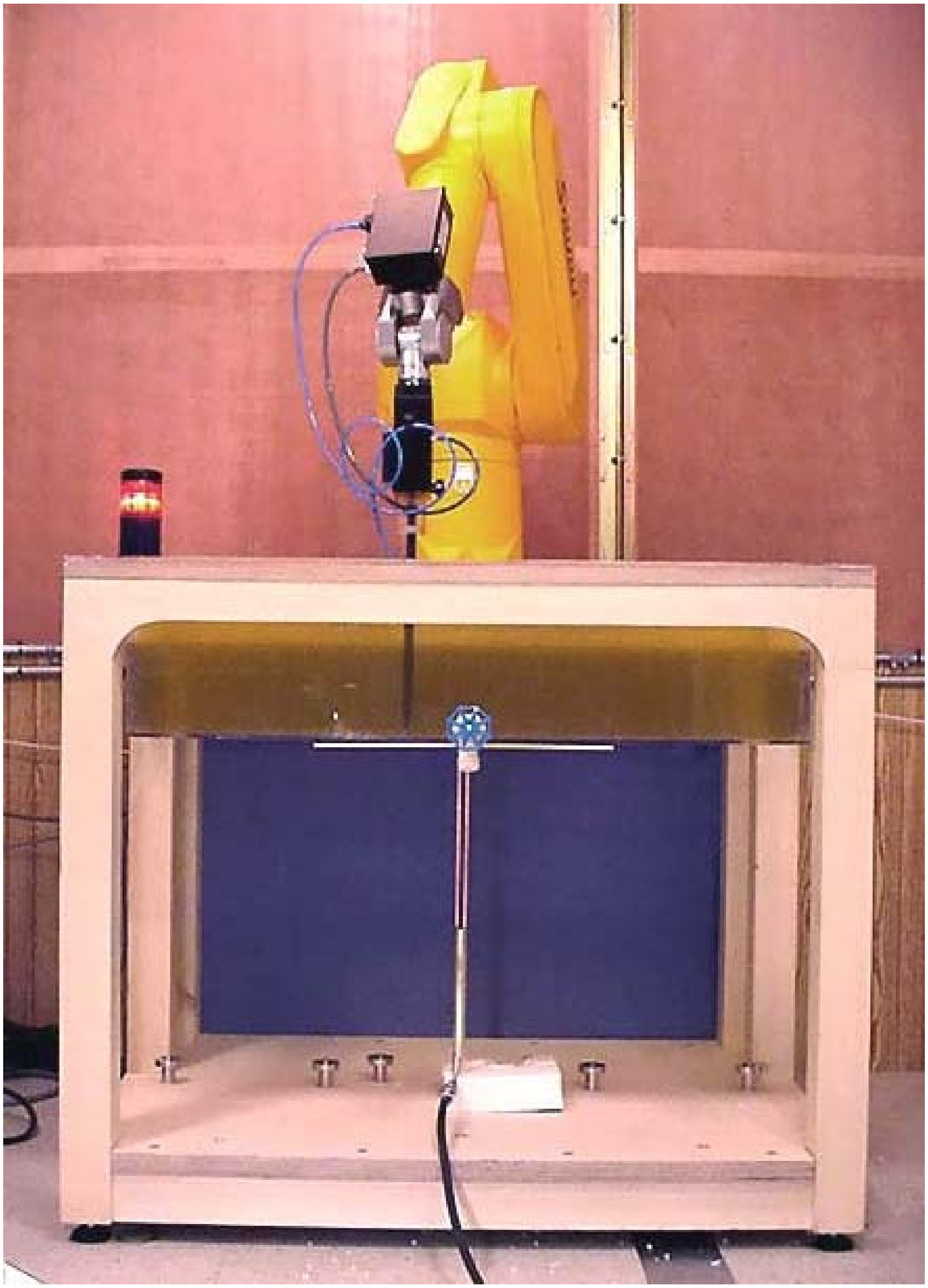
Length: 83.5 cm
Width: 36.9 cm
Height: 21.8 cm

The bottom of the phantom is constructed of 6.2 ± 0.1mm Plexiglas.

Dimensions of Plexiglas Planar Phantom



300MHz System Validation Setup



300MHz System Validation Setup

3. Measurement Conditions

The planar phantom was filled with brain simulating tissue having the following electrical parameters at 300MHz:

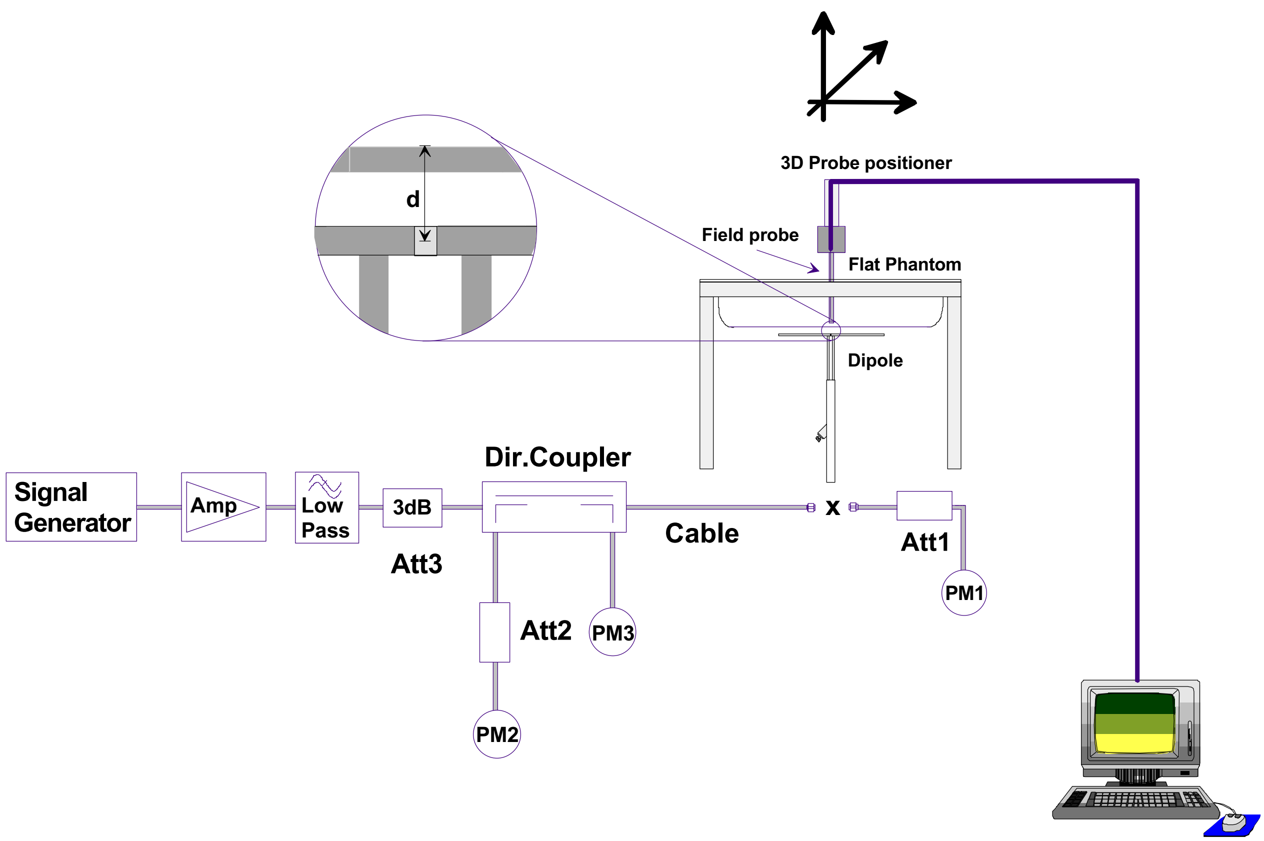
Relative Permittivity:	45.3
Conductivity:	0.90 mho/m
Ambient Temperature:	23.3°C
Fluid Temperature:	23.0°C
Fluid Depth:	≥ 15cm

The 300MHz simulating tissue consists of the following ingredients:

Ingredient	Percentage by weight
Water	37.56%
Sugar	55.32%
Salt	5.95%
HEC	0.98%
Dowicil 75	0.19%
300MHz Target Dielectric Parameters at 22°C	ε_r = 45.3 σ = 0.87 S/m

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	0.755	3.02	0.496	1.98	1.21
Test 2	0.757	3.03	0.497	1.99	1.22
Test 3	0.750	3.00	0.493	1.97	1.21
Test 4	0.763	3.05	0.500	2.00	1.23
Test 5	0.769	3.08	0.505	2.02	1.24
Test 6	0.755	3.02	0.496	1.98	1.21
Test 7	0.718	2.87	0.472	1.89	1.16
Test 8	0.730	2.92	0.479	1.92	1.18
Test 9	0.717	2.87	0.471	1.88	1.15
Test10	0.726	2.90	0.477	1.91	1.17
Average Value	0.744	2.98	0.488	1.95	1.20

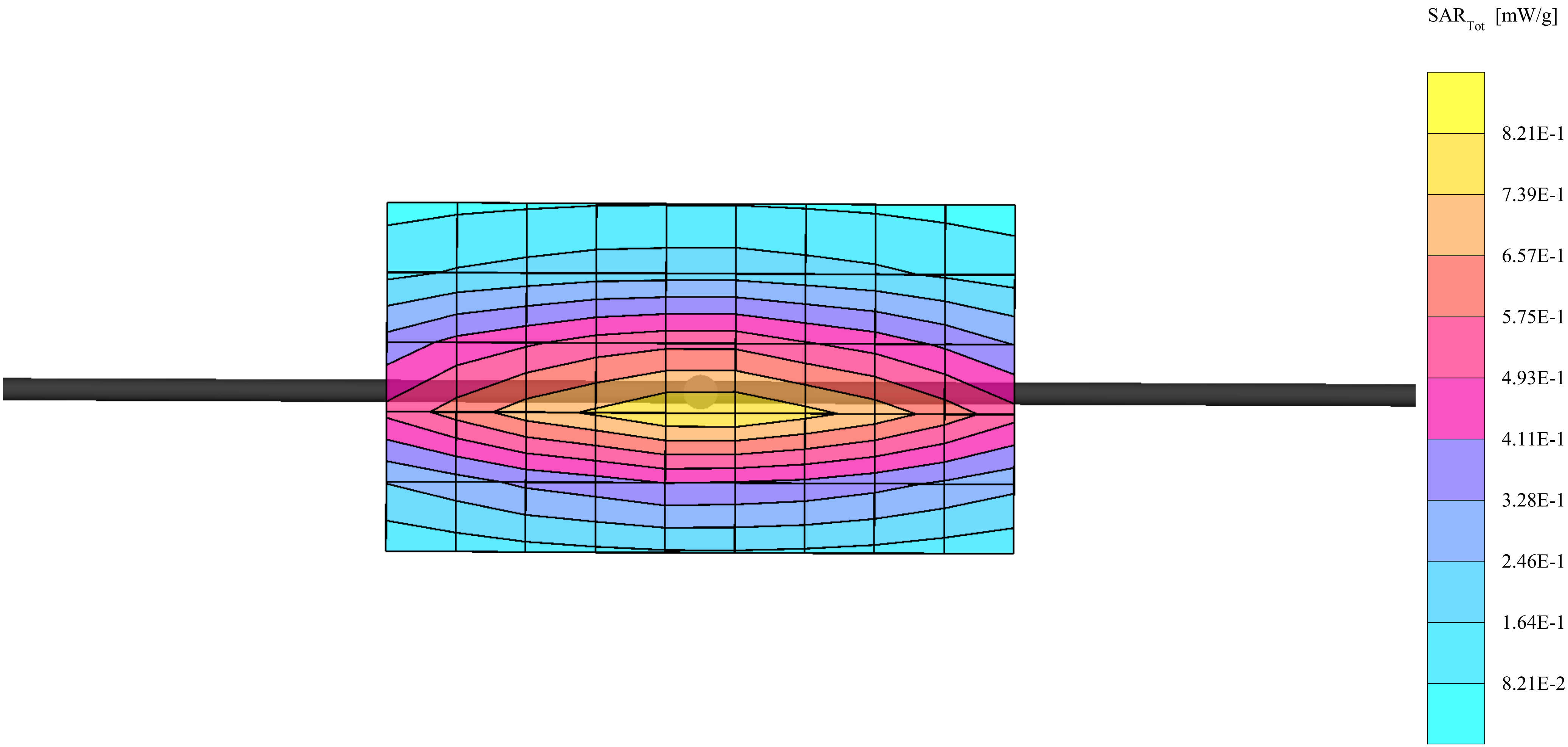
The results have been normalized to 1W (forward power) into the dipole.

Averaged over 1cm (1g) of tissue: 2.98 mW/g

Averaged over 10cm (10g) of tissue: 1.95 mW/g

Dipole 300 MHz

Frequency: 300 MHz; Conducted Input Power: 250 [mW]
Large Planar Phantom; Planar Section
Probe: ET3DV6 - SN1387; ConvF(8.00,8.00,8.00); Crest factor: 1.0; 300 MHz Brain: $\sigma = 0.90$ mho/m $\varepsilon_r = 45.3$ $\rho = 1.00$ g/cm³
Cubes (10): Peak: 1.20 mW/g ± 0.16 dB, SAR (1g): 0.744 mW/g ± 0.15 dB, SAR (10g): 0.488 mW/g ± 0.15 dB, (Worst-case extrapolation)
Penetration depth: 12.3 (10.4, 14.7) [mm]; Powerdrift: 0.01 dB; Ambient Temp.: 23.3°C; Fluid Temp.: 23.0°C
Calibration Date: October 15, 2002



300MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

October 15, 2002

Frequency	e'	e''
200.000000 MHz	49.2984	73.0807
210.000000 MHz	48.7479	70.3637
220.000000 MHz	48.4051	67.9145
230.000000 MHz	47.9112	65.6173
240.000000 MHz	47.3854	63.6189
250.000000 MHz	47.0619	61.6629
260.000000 MHz	46.6549	60.0248
270.000000 MHz	46.2913	58.4424
280.000000 MHz	45.9411	56.9567
290.000000 MHz	45.6495	55.4516
300.000000 MHz	45.3231	54.0358
310.000000 MHz	44.9246	52.8278
320.000000 MHz	44.6796	51.6396
330.000000 MHz	44.3563	50.4677
340.000000 MHz	44.0723	49.4102
350.000000 MHz	43.7189	48.3852
360.000000 MHz	43.4393	47.4561
370.000000 MHz	43.2292	46.5343
380.000000 MHz	43.0035	45.6962
390.000000 MHz	42.7120	44.8767
400.000000 MHz	42.5081	44.1512

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

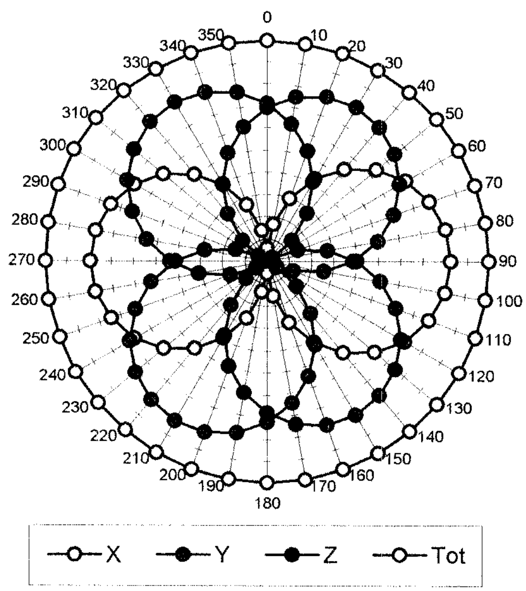
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	14.6	9.8
SAR_{be} [%]	With Correction Algorithm	0.2	0.0

Sensor Offset

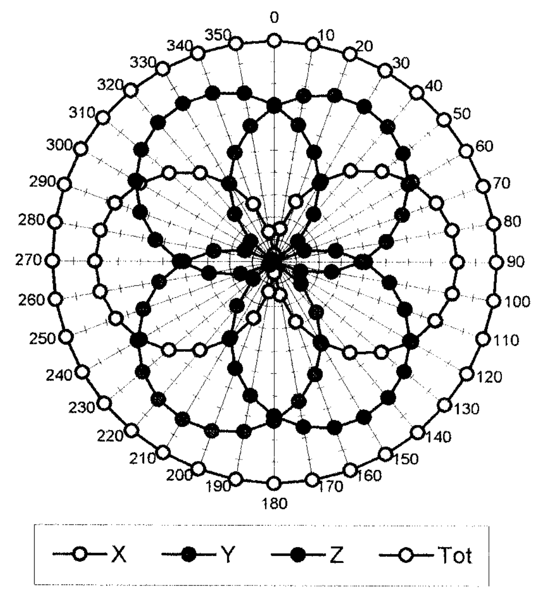
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.4 ± 0.2**	mm

Receiving Pattern (ϕ), $\theta = 0°$

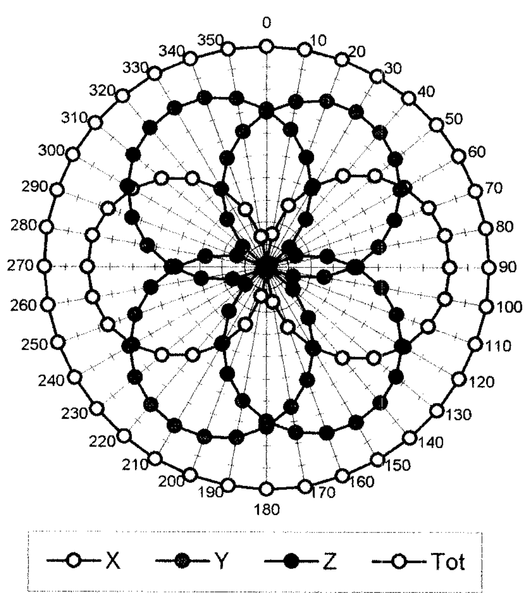
f = 30 MHz, TEM cell ifi110



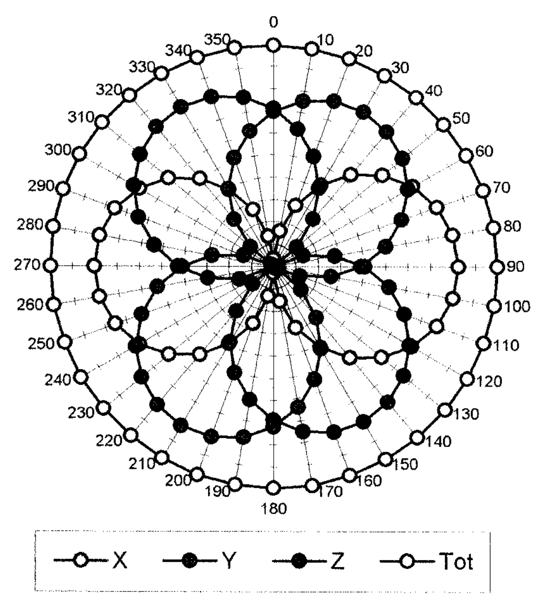
f = 100 MHz, TEM cell ifi110

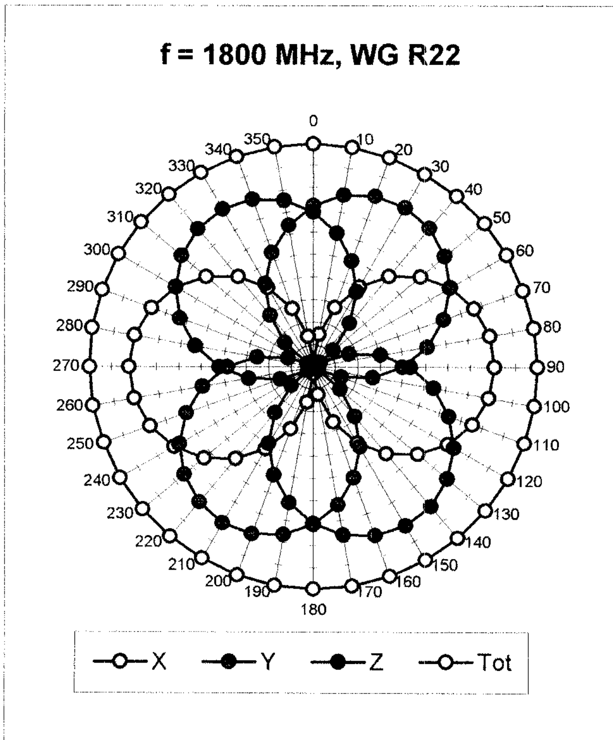


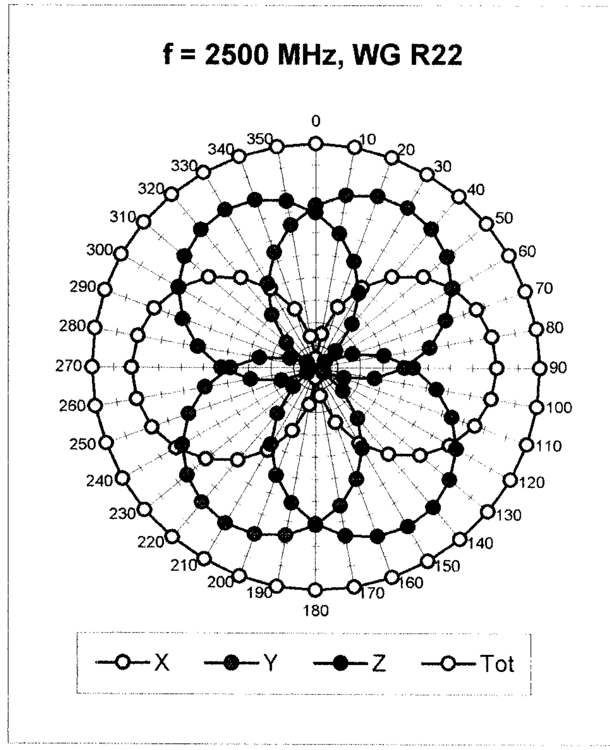
f = 300 MHz, TEM cell ifi110



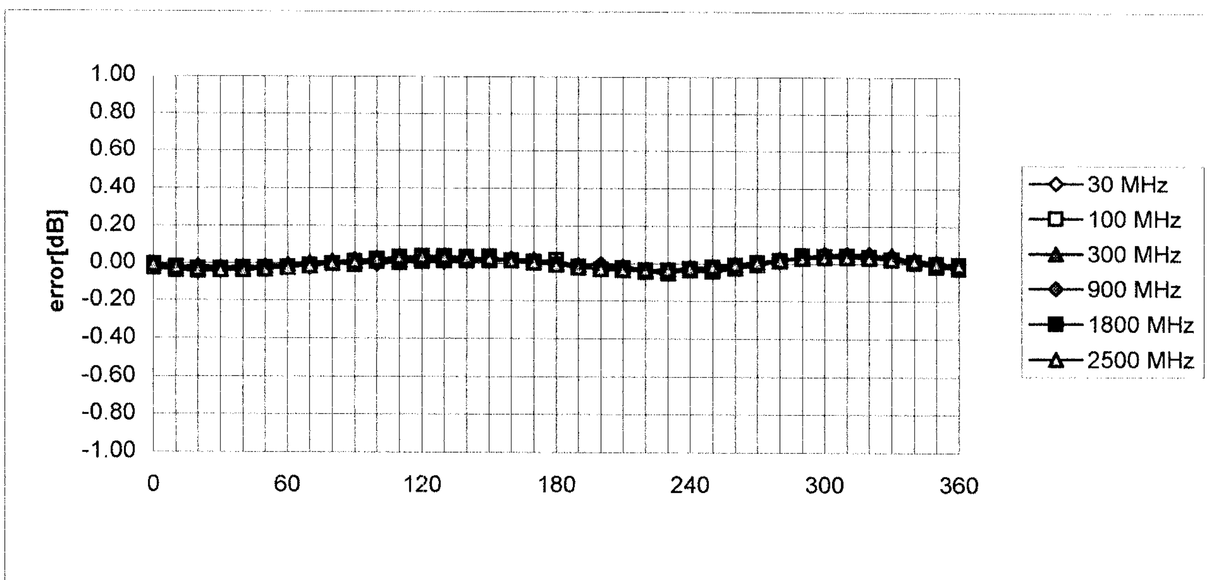
f = 900 MHz, TEM cell ifi110





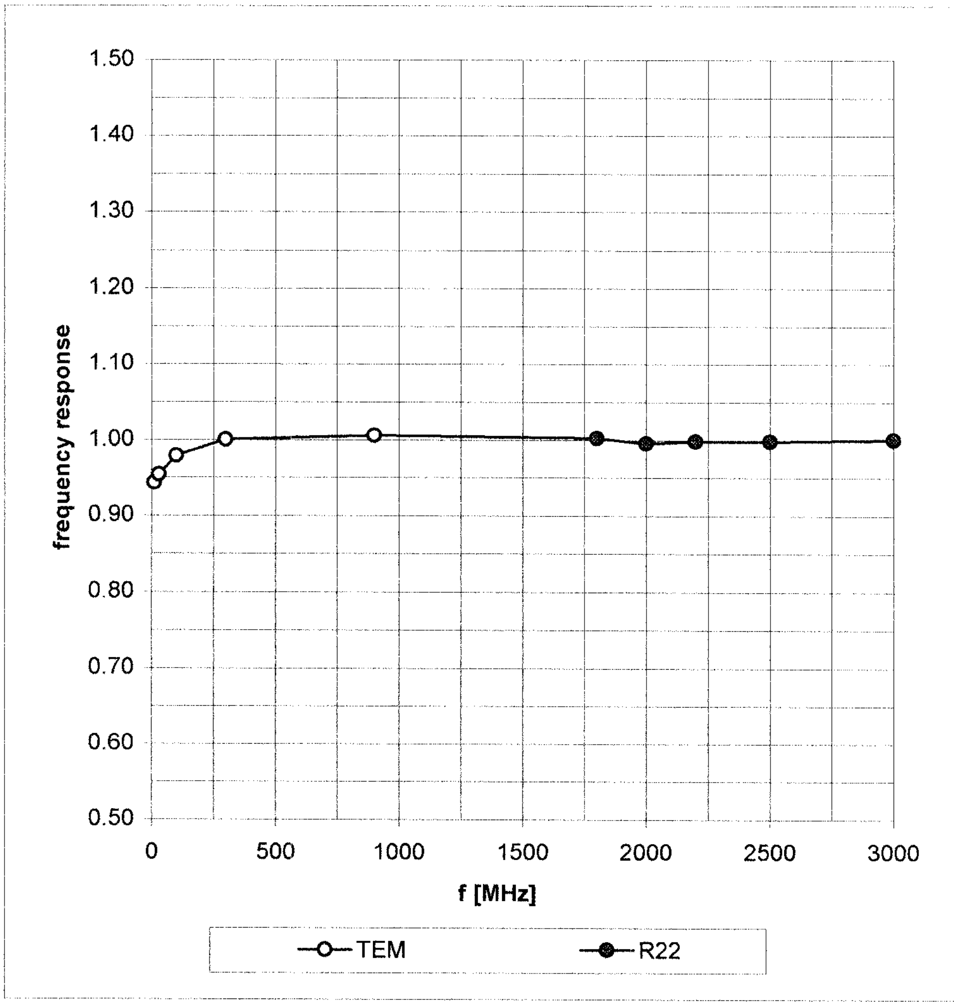


Isotropy Error (ϕ), θ = 0°



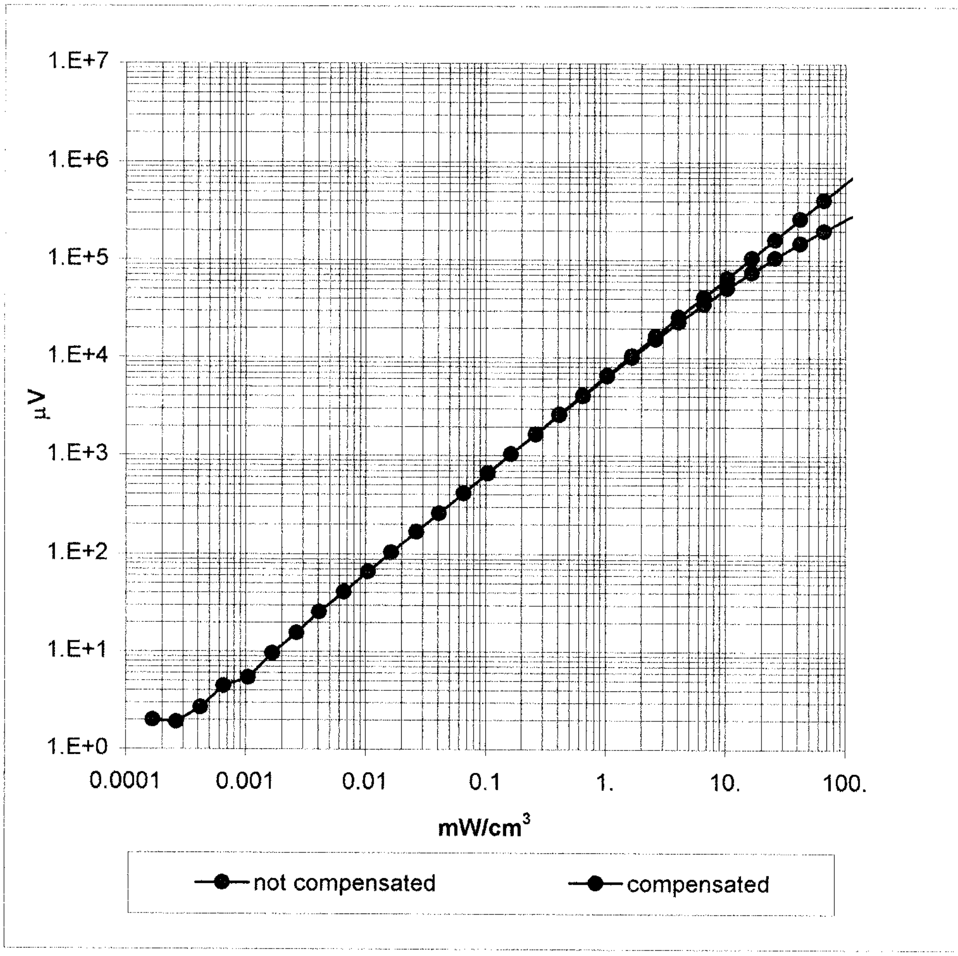
Frequency Response of E-Field

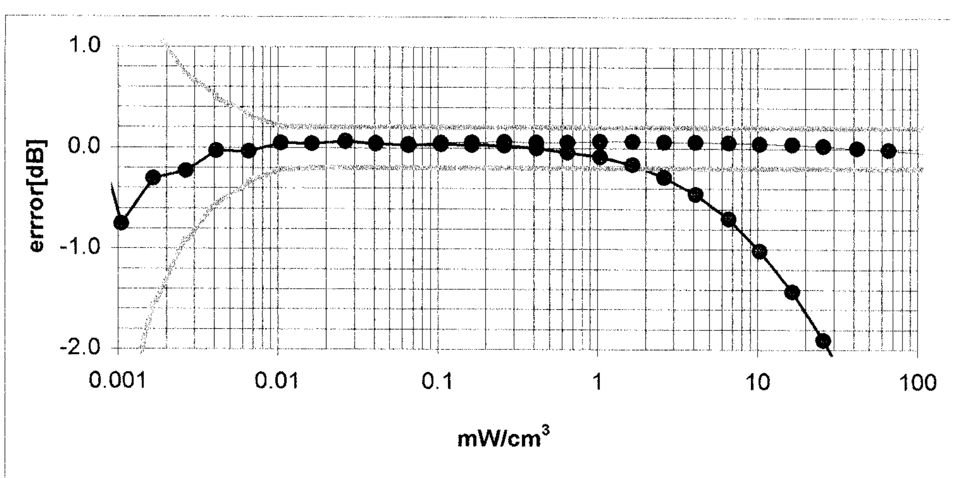
(TEM-Cell:ifi110, Waveguide R22)



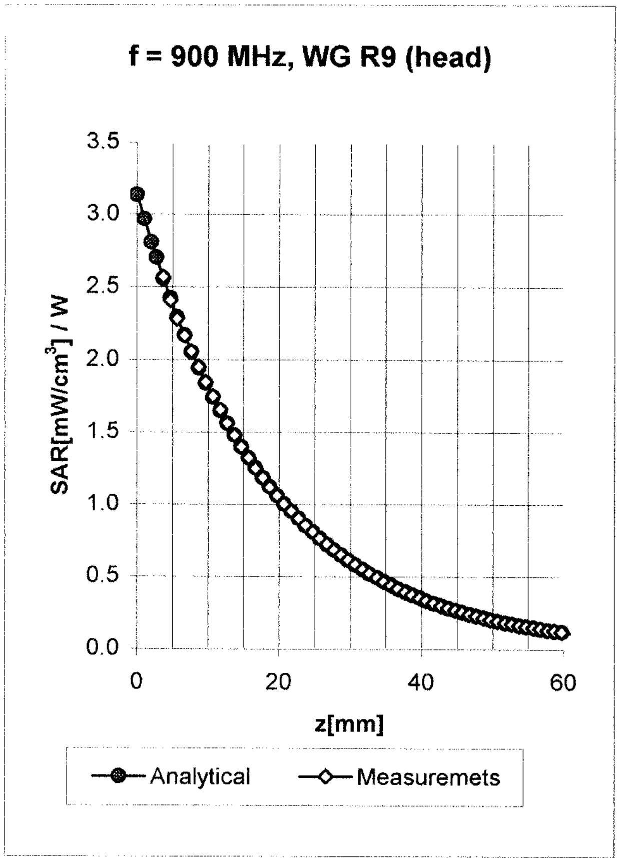
Dynamic Range f(SAR_{brain})

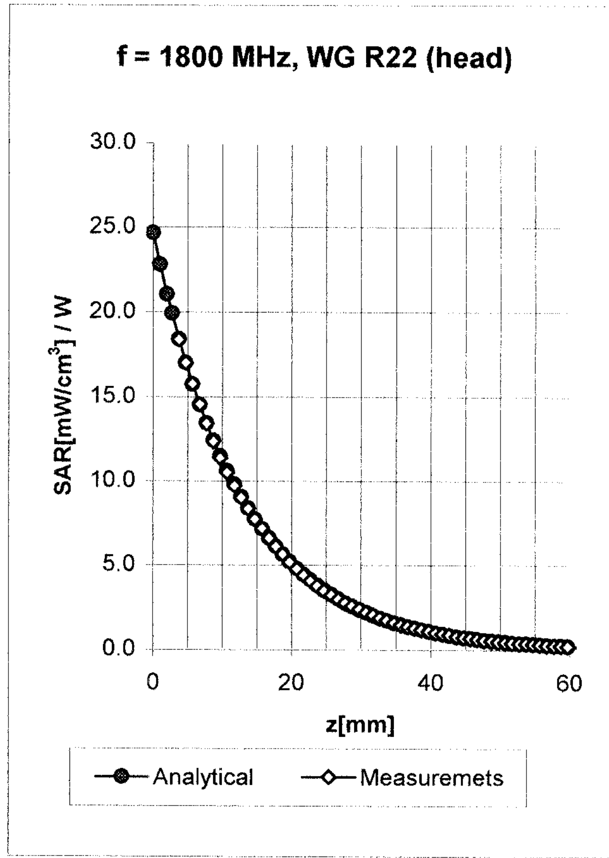
(Waveguide R22)





Conversion Factor Assessment

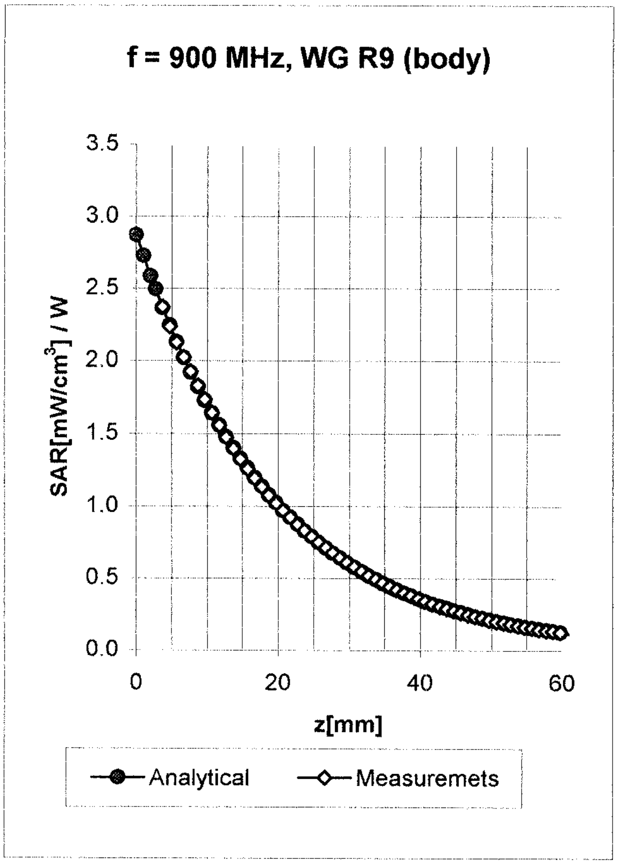


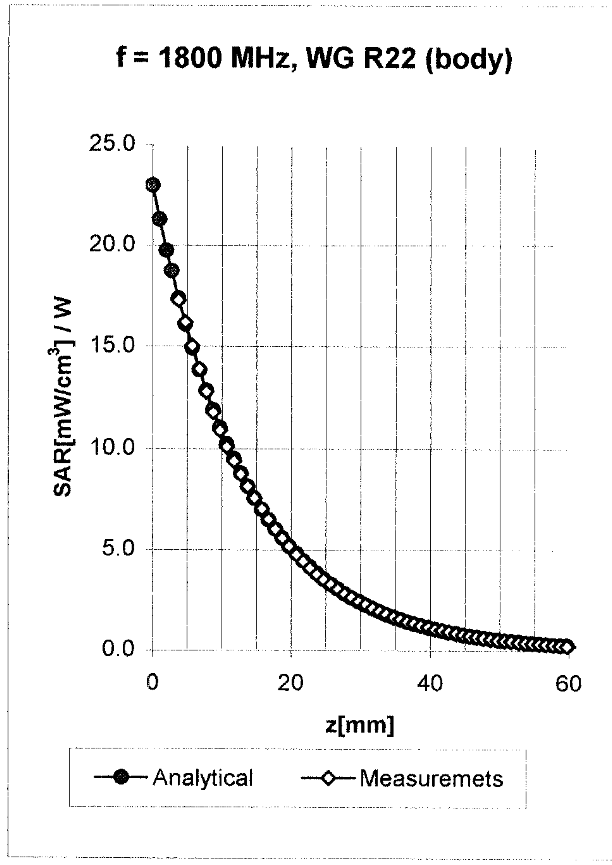


Head	**900 MHz**		**ε_r = 41.5 ± 5%**	**σ = 0.97 ± 5% mho/m**		
Head	**835 MHz**		**ε_r = 41.5 ± 5%**	**σ = 0.90 ± 5% mho/m**		
	ConvF X	**6.6**	± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**6.6**	± 9.5% (k=2)		Alpha	**0.37**
	ConvF Z	**6.6**	± 9.5% (k=2)		Depth	**2.61**

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

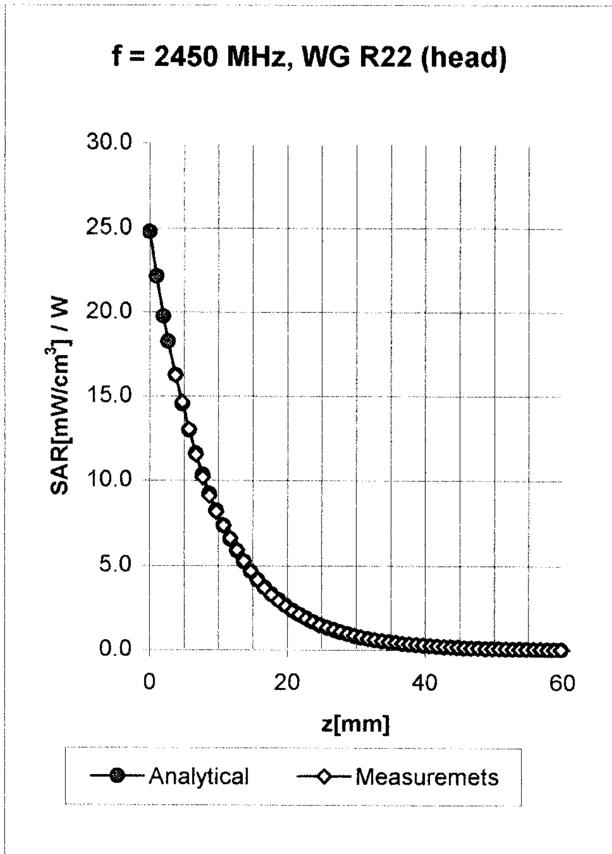


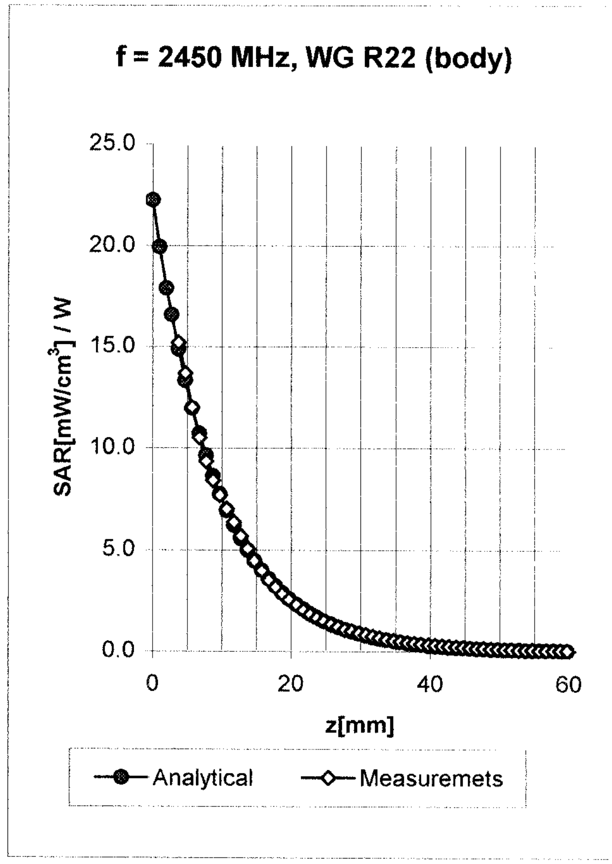


Body	**900 MHz**		ε_r = **55.0 ± 5%**	σ = **1.05 ± 5% mho/m**	
Body	**835 MHz**		ε_r = **55.2 ± 5%**	σ = **0.97 ± 5% mho/m**	
	ConvF X	**6.4**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.4**	± 9.5% (k=2)	Alpha	**0.45**
	ConvF Z	**6.4**	± 9.5% (k=2)	Depth	**2.35**

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



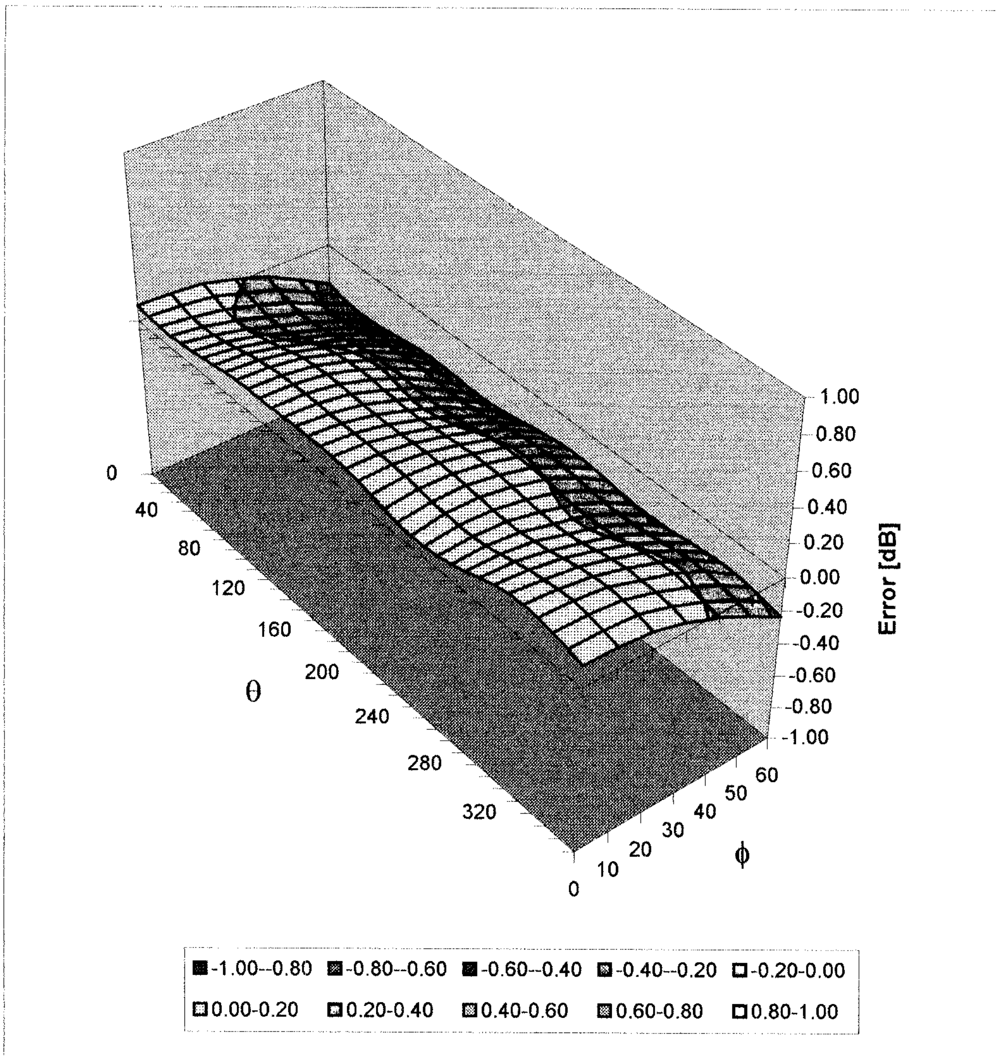


Head	**2450**	**MHz**	ε_r **= 39.2 ± 5%**	σ **= 1.80 ± 5% mho/m**
	ConvF X	**5.0** ± 8.9% (k=2)	Boundary effect:	
	ConvF Y	**5.0** ± 8.9% (k=2)	Alpha	**1.04**
	ConvF Z	**5.0** ± 8.9% (k=2)	Depth	**1.85**

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

300 MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

June 19, 2003

Frequency	e'	e''
200.000000 MHz	49.6937	72.0571
210.000000 MHz	49.1416	69.3848
220.000000 MHz	48.8159	66.9744
230.000000 MHz	48.2404	64.6310
240.000000 MHz	47.7816	62.4387
250.000000 MHz	47.2850	60.6583
260.000000 MHz	46.8403	58.9470
270.000000 MHz	46.4749	57.4791
280.000000 MHz	46.1336	56.0541
290.000000 MHz	45.8051	54.7262
300.000000 MHz	45.5196	53.2582
310.000000 MHz	45.1429	52.0975
320.000000 MHz	44.8142	50.9655
330.000000 MHz	44.5305	49.8717
340.000000 MHz	44.2161	48.7339
350.000000 MHz	43.9492	47.7885
360.000000 MHz	43.6490	46.8645
370.000000 MHz	43.4629	45.9306
380.000000 MHz	43.2159	45.0864
390.000000 MHz	42.9679	44.1656
400.000000 MHz	42.7381	43.4800

150 MHz EUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

June 19, 2003

Frequency	e'	e''
50.000000 MHz	66.0460	276.1477
60.000000 MHz	63.7130	232.3399
70.000000 MHz	64.1638	199.0660
80.000000 MHz	63.9727	176.1924
90.000000 MHz	63.7010	157.2796
100.000000 MHz	62.8205	142.7294
110.000000 MHz	62.4086	130.7878
120.000000 MHz	61.7942	120.7284
130.000000 MHz	61.5522	111.9591
140.000000 MHz	61.6142	104.4055
150.000000 MHz	61.0809	98.4338
160.000000 MHz	60.9297	92.8090
170.000000 MHz	60.6368	88.2102
180.000000 MHz	60.4920	83.7537
190.000000 MHz	60.1611	79.9028
200.000000 MHz	59.8818	76.5706
210.000000 MHz	59.4931	73.5195
220.000000 MHz	59.3237	70.8135
230.000000 MHz	59.0530	68.2185
240.000000 MHz	58.7343	66.1016
250.000000 MHz	58.4610	63.9770

300 MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

June 20, 2003

Frequency	e'	e''
200.000000 MHz	49.4887	73.3970
210.000000 MHz	48.9006	70.7858
220.000000 MHz	48.4586	68.3254
230.000000 MHz	48.0893	65.9997
240.000000 MHz	47.4917	63.8351
250.000000 MHz	46.9949	62.0197
260.000000 MHz	46.5214	60.3110
270.000000 MHz	46.1388	58.7832
280.000000 MHz	45.8838	57.2772
290.000000 MHz	45.4590	55.8483
300.000000 MHz	45.1775	54.2478
310.000000 MHz	44.7916	52.9783
320.000000 MHz	44.5567	51.7193
330.000000 MHz	44.2683	50.5931
340.000000 MHz	43.9625	49.5352
350.000000 MHz	43.7481	48.5270
360.000000 MHz	43.4187	47.5766
370.000000 MHz	43.2039	46.6984
380.000000 MHz	42.9515	45.8150
390.000000 MHz	42.6213	45.0199
400.000000 MHz	42.3570	44.2996

150 MHz EUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

June 20, 2003

Frequency	e'	e''
50.000000 MHz	67.2449	259.6978
60.000000 MHz	65.2124	219.0025
70.000000 MHz	64.5143	187.6007
80.000000 MHz	64.0545	165.5913
90.000000 MHz	63.8928	148.4790
100.000000 MHz	63.2102	134.9104
110.000000 MHz	62.7845	123.2957
120.000000 MHz	62.2897	114.0132
130.000000 MHz	61.7492	105.5799
140.000000 MHz	61.5312	98.8752
150.000000 MHz	61.2254	93.2208
160.000000 MHz	60.6961	88.0987
170.000000 MHz	60.4958	83.7884
180.000000 MHz	60.1515	79.5223
190.000000 MHz	60.0058	76.0056
200.000000 MHz	59.7184	72.8645
210.000000 MHz	59.3485	70.0433
220.000000 MHz	59.0885	67.4246
230.000000 MHz	58.7543	65.0896
240.000000 MHz	58.4548	62.9584
250.000000 MHz	58.0596	61.0713

300 MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

June 21, 2003

Frequency	e'	e''
200.000000 MHz	49.0230	72.9987
210.000000 MHz	48.5359	70.1835
220.000000 MHz	48.0895	67.7523
230.000000 MHz	47.5367	65.4691
240.000000 MHz	47.1071	63.4183
250.000000 MHz	46.7007	61.5462
260.000000 MHz	46.1967	59.9399
270.000000 MHz	45.8953	58.3572
280.000000 MHz	45.5673	56.8148
290.000000 MHz	45.1850	55.4420
300.000000 MHz	44.9202	53.9387
310.000000 MHz	44.6293	52.7378
320.000000 MHz	44.4087	51.4591
330.000000 MHz	44.0381	50.2611
340.000000 MHz	43.7538	49.1366
350.000000 MHz	43.5293	48.1175
360.000000 MHz	43.2279	47.1756
370.000000 MHz	42.9887	46.2659
380.000000 MHz	42.6830	45.4684
390.000000 MHz	42.3773	44.6581
400.000000 MHz	42.0759	43.9526

150 MHz EUT Evaluation (Face)

Measured Fluid Dielectric Parameters (Brain)

June 21, 2003

Frequency	e'	e''
50.000000 MHz	63.4889	233.6333
60.000000 MHz	61.7764	197.0720
70.000000 MHz	61.1217	170.1558
80.000000 MHz	59.4802	151.2953
90.000000 MHz	58.2666	135.5723
100.000000 MHz	56.8713	124.1712
110.000000 MHz	56.0851	114.2616
120.000000 MHz	55.4417	106.0235
130.000000 MHz	54.6130	98.8373
140.000000 MHz	54.0782	92.5697
150.000000 MHz	53.3718	87.4965
160.000000 MHz	52.8016	82.8933
170.000000 MHz	52.3487	79.1096
180.000000 MHz	51.9358	75.1930
190.000000 MHz	51.4577	71.9055
200.000000 MHz	50.9037	69.1357
210.000000 MHz	50.3312	66.6507
220.000000 MHz	49.9833	64.3726
230.000000 MHz	49.5410	62.2452
240.000000 MHz	48.9487	60.4639
250.000000 MHz	48.5930	58.6718