APPENDIX A: FCC PART 1.1307, 1.1310, 2.1091, 2.1093: RF EXPOSURES

Please refer to the SAR Evaluation that follows.

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 47 CFR §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 UHF PTT Radio Transceiver (P/Ns: T1-LSAR01, T1-LSAR02)**
FCC ID:	**OWDTR-0016-E**
Model Name / No.:	**P7100(IP)**
Modulation:	**FM (UHF Band)**
Tx Frequency Range:	**378 - 430 MHz**
Max. Cond. Power Tested:	**4.41 Watts**
Antenna Part No.(s):	**KRE1011219/9 (378-403 MHz) / KRE1011219/10 (403-430 MHz) / KRE1011223/10 (378-430 MHz)**
Antenna Type(s):	**Helical Coil (KRE1011219/9, KRE1011219/10), Quarter-Wave Whip (KRE1011223/10)**
Battery Type(s) 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 (KRY1011617/184R1A)** **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)**
Max. SAR Measured:	**Face-held: 2.55 W/kg (50% Duty Cycle)** **Body-worn: 5.20 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 (Provisional) for the Occupational / Controlled Exposure Environment. All tests described in this test report were performed in accordance with 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.

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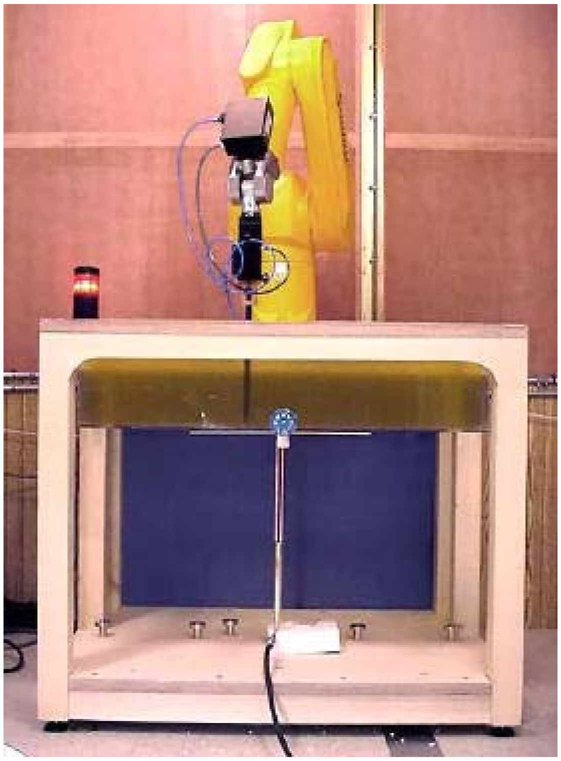
1.0 INTRODUCTION

This measurement report demonstrates that the M/A-COM, Inc. Model: P7100(IP) Portable UHF-L PTT Radio Transceiver FCC ID: OWDTR-0016-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 IEEE 1528-200X (Draft) (see reference [5]), 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 Labs 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/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 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 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 (Edition 01-01)
Device Classification	Licensed Non-Broadcast Transmitter Held to Face (TNF)
Device Type	Portable UHF PTT Radio Transceiver (P/Ns: T1-LSAR01, T1-LSAR02)
FCC ID	OWDTR-0016-E
Model Name / No.	P7100(IP)
Serial No.	Pre-production Unit
Modulation	FM (UHF)
Tx Frequency Range	378 - 430 MHz
Max. Conducted Power Tested	4.41 Watts
Antenna Part No.(s)	KRE1011219/9 (378-403 MHz) KRE1011219/10 (403-430 MHz) KRE1011223/10 (378-430 MHz)
Antenna Type(s)	Helical Coil (KRE1011219/9, KRE1011219/10) Quarter-Wave Whip (KRE1011223/10)
Antenna Length(s)	KRE1011219/9 - 79 mm KRE1011219/10 - 79 mm KRE1011223/10 – 163 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)
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)	Chan.	Test Mode	Conducted Power (Watts)		Antenna Part No.	Radio / Accessory Type / No.	Battery Type	Separ. Dist. (cm)	SAR 1g (W/kg)			
									Without Scaling		Scaled by Drift	
			Before	After					100% Duty Cycle	50% Duty Cycle	100% Duty Cycle	50% Duty Cycle
403.00	Mid	CW	4.39	4.43	KRE1011223/10	T1-LSAR01	NiCd NIS	2.5	5.09	2.55	-	-
403.00	Mid	CW	4.41	4.44	KRE1011223/10	T1-LSAR01	NiMH NIS	2.5	5.05	2.53	-	-
403.00	Mid	CW	4.33	4.33	KRE1011223/10	T1-LSAR01	NiCd IS	2.5	5.00	2.50	-	-
403.00	Mid	CW	4.28	4.26	KRE1011223/10	T1-LSAR01	NiMH IS	2.5	4.63	2.32	4.65	2.33
403.00	Mid	CW	4.39	4.44	KRE1011223/10	T1-LSAR02	NiCd NIS	2.5	4.96	2.48	-	-
403.00	Mid	CW	4.40	4.44	KRE1011223/10	T1-LSAR02	NiMH NIS	2.5	4.92	2.46	-	-
403.00	Mid	CW	4.32	4.35	KRE1011223/10	T1-LSAR02	NiCd IS	2.5	4.98	2.49	-	-
403.00	Mid	CW	4.25	4.24	KRE1011223/10	T1-LSAR02	NiMH IS	2.5	4.54	2.27	4.55	2.28
403.00	Mid	CW	4.29	4.31	KRE1011219/10	T1-LSAR01	NiCd NIS	2.5	4.62	2.31	-	-
403.00	Mid	CW	4.29	4.32	KRE1011219/10	T1-LSAR01	NiMH NIS	2.5	4.42	2.21	-	-
403.00	Mid	CW	4.28	4.33	KRE1011219/10	T1-LSAR01	NiCd IS	2.5	4.40	2.20	-	-
403.00	Mid	CW	4.31	4.35	KRE1011219/10	T1-LSAR01	NiMH IS	2.5	4.38	2.19	-	-
403.00	Mid	CW	4.32	4.38	KRE1011219/9	T1-LSAR01	NiCd NIS	2.5	2.25	1.13	-	-
403.00	Mid	CW	4.32	4.37	KRE1011219/9	T1-LSAR01	NiMH NIS	2.5	2.00	1.00	-	-
403.00	Mid	CW	4.30	4.35	KRE1011219/9	T1-LSAR01	NiCd IS	2.5	1.89	0.945	-	-
403.00	Mid	CW	4.30	4.34	KRE1011219/9	T1-LSAR01	NiMH IS	2.5	1.84	0.920	-	-
403.00	Mid	CW	4.32	4.32	KRE1011223/10	SM AVP	NiCd IS	2.5	2.15	1.08	-	
403.00	Mid	CW	4.27	4.32	KRE1011219/10	SM AVP	NiCd NIS	2.5	2.43	1.22	-	-
403.00	Mid	CW	4.29	4.33	KRE1011219/9	SM AVP	NiCd NIS	2.5	2.61	1.31	-	-

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

Test Date(s)	04/23/03		**ρ (Kg/m^3)**	1000
Measured Mixture Type	450MHz Brain		**Relative Humidity**	47 %
Dielectric Constant ε_r	**IEEE Target**	**Measured**	**Atmospheric Pressure**	100.4 kPa
	43.5 (+/- 5%)	44.0	**Ambient Temperature**	23.5 °C
Conductivity σ (mho/m)	**IEEE Target**	**Measured**	**Fluid Temperature**	23.7 °C
	0.87 (+/- 5%)	0.88	**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
5. Antenna Type(s): Helical Coil P/N: KRE1011219/9 (378-403 MHz)
   Helical Coil P/N: KRE1011219/10 (403-430 MHz)
   Quarter-Wave Whip P/N: KRE1011223/10 (378-430 MHz)

MEASUREMENT SUMMARY (Cont.)

BODY-WORN SAR MEASUREMENT RESULTS – with Metal Belt-Clip & Speaker-Microphone Accessory

Freq. (MHz)	Chan.	Test Mode	Conducted Power (Watts)		Antenna Part No.	Radio Part No.	Battery Type	Access. Separ. Dist. (cm)	SAR 1g (W/kg)			
									Without Scaling		Scaled by Drift	
			Before	After					100% Duty Cycle	50% Duty Cycle	100% Duty Cycle	50% Duty Cycle
403.00	Mid	CW	4.33	4.34	KRE1011223/10	T1-LSAR01	NiCd NIS	1.1	9.67	4.84	-	-
403.00	Mid	CW	4.37	4.40	KRE1011223/10	T1-LSAR01	NiMH NIS	1.1	10.4	5.20	-	-
378.00	Low	CW	4.32	4.25	KRE1011223/10	T1-LSAR01	NiMH NIS	1.1	3.05	1.53	3.10	1.55
430.00	High	CW	4.31	4.00	KRE1011223/10	T1-LSAR01	NiMH NIS	1.1	4.82	2.41	5.19	2.60
403.00	Mid	CW	4.34	4.37	KRE1011223/10	T1-LSAR01	NiCd IS	1.1	10.1	5.05	-	-
403.00	Mid	CW	4.36	4.37	KRE1011223/10	T1-LSAR01	NiMH IS	1.1	10.3	5.15	-	-
403.00	Mid	CW	4.33	4.35	KRE1011223/10	T1-LSAR02	NiCd NIS	1.1	9.28	4.64	-	-
403.00	Mid	CW	4.33	4.37	KRE1011223/10	T1-LSAR02	NiMH NIS	1.1	10.1	5.05	-	-
403.00	Mid	CW	4.34	4.39	KRE1011223/10	T1-LSAR02	NiCd IS	1.1	9.91	4.96	-	-
403.00	Mid	CW	4.33	4.35	KRE1011223/10	T1-LSAR02	NiMH IS	1.1	10.1	5.05	-	-
403.00	Mid	CW	4.36	4.37	KRE1011219/10	T1-LSAR01	NiCd NIS	1.1	7.24	3.62	-	-
403.00	Mid	CW	4.34	4.37	KRE1011219/10	T1-LSAR01	NiMH NIS	1.1	7.10	3.55	-	-
403.00	Mid	CW	4.33	4.36	KRE1011219/10	T1-LSAR01	NiCd IS	1.1	6.17	3.09	-	-
403.00	Mid	CW	4.33	4.35	KRE1011219/10	T1-LSAR01	NiMH IS	1.1	5.20	2.60	-	-
403.00	Mid	CW	4.32	4.38	KRE1011219/9	T1-LSAR01	NiCd NIS	1.1	2.25	1.13	-	-
403.00	Mid	CW	4.34	4.37	KRE1011219/9	T1-LSAR01	NiMH NIS	1.1	2.24	1.12	-	-
403.00	Mid	CW	4.31	4.36	KRE1011219/9	T1-LSAR01	NiCd IS	1.1	2.49	1.25	-	-
403.00	Mid	CW	4.31	4.17	KRE1011219/9	T1-LSAR01	NiMH IS	1.1	2.10	1.05	2.17	1.09

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

Test Date	04/21/03		ρ (Kg/m^3)	1000
Measured Mixture Type	450MHz Body		Relative Humidity	60 %
Dielectric Constant ε_r	IEEE Target	Measured	Atmospheric Pressure	101.1 kPa
	56.7 (+/- 5%)	57.3	Ambient Temperature	23.3 °C
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Temperature	21.8 °C
	0.94 (+/- 5%)	0.91	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 = Non-Intrinsically Safe
   MBC = Metal Belt-Clip
   SM = Speaker-Microphone
5. Antenna Type(s): Helical Coil P/N: KRE1011219/9 (378-403 MHz)
   Helical Coil P/N: KRE1011219/10 (403-430 MHz)
   Quarter-Wave Whip P/N: KRE1011223/10 (378-430 MHz)

MEASUREMENT SUMMARY (Cont.)

BODY-WORN SAR MEASUREMENT RESULTS (Radio P/N: T1-LSAR01)

Freq. (MHz)	Chan	Test Mode	Conducted Power (Watts)		Antenna Part No.	Accessory Type	Battery Type	Access. Separ. Dist. (cm)	SAR 1g (W/kg)			
									Without Scaling		Scaled by Drift	
			Before	After					100% Duty Cycle	50% Duty Cycle	100% Duty Cycle	50% Duty Cycle
403.00	Mid	CW	4.28	4.29	KRE1011223/10	SM AVP	NiMH IS	1.3	4.37	2.19	-	-
403.00	Mid	CW	4.30	4.33	KRE1011219/10	SM AVP	NiCd NIS	1.3	6.34	3.17	-	-
403.00	Mid	CW	4.29	4.33	KRE1011219/9	SM AVP	NiCd IS	1.3	5.14	2.57	-	-
403.00	Mid	CW	4.28	4.31	KRE1011223/10	Nylon T Strap	NiMH IS	1.6	8.25	4.13	-	-
378.00	Low	CW	4.35	4.39	KRE1011223/10	Nylon T Strap	NiMH IS	1.6	2.93	1.47	-	-
430.00	High	CW	4.34	4.02	KRE1011223/10	Nylon T Strap	NiMH IS	1.6	4.68	2.34	5.05	2.53
403.00	Mid	CW	4.32	4.35	KRE1011219/10	Nylon T Strap	NiCd NIS	1.6	5.70	2.85	-	-
403.00	Mid	CW	4.31	4.36	KRE1011219/9	Nylon T Strap	NiCd IS	1.6	2.00	1.00	-	-
403.00	Mid	CW	4.28	4.31	KRE1011223/10	LC & SM	NiMH IS	1.7	5.16	2.58	-	-
403.00	Mid	CW	4.30	4.35	KRE1011219/10	LC & SM	NiCd NIS	1.7	4.73	2.37	-	-
403.00	Mid	CW	4.29	4.35	KRE1011219/9	LC & SM	NiCd IS	1.7	1.29	0.645	-	-
403.00	Mid	CW	4.31	4.15	KRE1011223/10	BL/S & SM	NiMH IS	3.5	4.16	2.08	4.32	2.16
403.00	Mid	CW	4.31	4.33	KRE1011219/10	BL/S & SM	NiCd NIS	3.5	3.22	1.61	-	-
403.00	Mid	CW	4.30	4.34	KRE1011219/9	BL/S & SM	NiCd IS	3.5	1.22	0.610	-	-
403.00	Mid	CW	4.28	4.31	KRE1011223/10	NC/S & SM	NiMH IS	4.0	3.59	1.80	-	-
403.00	Mid	CW	4.30	4.32	KRE1011219/10	NC/S & SM	NiCd NIS	4.0	2.32	1.16	-	-
403.00	Mid	CW	4.31	4.34	KRE1011219/9	NC/S & SM	NiCd IS	4.0	0.997	0.499	-	-
403.00	Mid	CW	4.30	4.28	KRE1011223/10	LC/SBL & SM	NiMH IS	4.5	2.61	1.31	2.62	1.31
403.00	Mid	CW	4.29	4.34	KRE1011219/10	LC/SBL & SM	NiCd NIS	4.5	2.01	1.01	-	-
403.00	Mid	CW	4.30	4.34	KRE1011219/9	LC/SBL & SM	NiCd IS	4.5	0.697	0.349	-	-

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

Test Date	04/22/03		ρ (Kg/m^3)	1000
Measured Mixture Type	450MHz Body		Relative Humidity	60 %
Dielectric Constant ε_r	IEEE Target	Measured	Atmospheric Pressure	101.1 kPa
	56.7 (+/- 5%)	57.9	Ambient Temperature	21.9 °C
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Temperature	22.0 °C
	0.94 (+/- 5%)	0.91	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 = Non-Intrinsically Safe
   BL = Belt-Loop
   LC = Leather Case
   SBL = Swivel Belt-Loop
   S = Swivel
   SM = Speaker-Microphone
4. Antenna Type(s): Helical Coil P/N: KRE1011219/9 (378-403 MHz)
   Helical Coil P/N: KRE1011219/10 (403-430 MHz)
   Quarter-Wave Whip P/N: KRE1011223/10 (378-430 MHz)

5.0 DETAILS OF SAR EVALUATION

The M/A-COM, Inc. Model: P7100(IP) Portable UHF-L PTT Radio Transceiver FCC ID: OWDTR-0016-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. Both radio samples (P/N: T1-LSAR01, P/N: T1-LSAR02) are electrically and mechanically identical except for the number of keys on the front keypad (see Appendix F for EUT photographs). Face-held SAR measurements were first performed with both radios and the Quarter-Wave Whip Antenna (P/N: KRE1011223/10) using all battery options. Radio P/N: T1-LSAR01 yielded the highest SAR levels for the face-held measurements and therefore the remaining face-held evaluations were performed with radio P/N: T1-LSAR01. For the speaker-microphone antenna version face-held evaluation, each antenna was tested with the worst-case battery configuration from the radio P/N: T1-LSAR01 face-held evaluations. The radio and speaker-microphone antenna version were evaluated for face-held SAR with the front of the device placed parallel to the outer surface of the planar phantom at a 2.5 cm separation distance.
2. Body-worn SAR measurements were first performed with both radios, Quarter-Wave Whip Antenna (P/N: KRE1011223/10), and metal belt-clip accessory with all battery options based on the metal belt-clip being the worst-case configuration (1.1 cm separation distance). Radio P/N: T1-LSAR01 yielded the highest SAR levels for the body-worn measurements in this configuration and therefore the remaining body-worn evaluations were performed with radio P/N: T1-LSAR01 with each antenna and worst-case battery configuration from the radio P/N: T1-LSAR01 body-worn evaluations with metal belt-clip.
3. The EUT was tested in a body-worn configuration with the back of the radio placed parallel to the outer surface of the planar phantom. The attached metal belt-clip was touching the outer surface of the planar phantom and provided a 1.1 cm separation distance between the back of the radio and the outer surface of the planar phantom.
4. The speaker-microphone antenna version 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 antenna version and the outer surface of the planar phantom.
5. The EUT was tested in a body-worn configuration with the nylon "T-Strap" accessory attached, and the back of the radio facing parallel to the outer surface of the planar phantom. The back of the "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 and the outer surface of the planar phantom.
6. The EUT was tested in a body-worn configuration with the radio placed inside the leather case (belt-loop type) and the back of the radio 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 and the outer surface of the planar phantom.
7. The EUT was tested in a body-worn configuration with the belt-loop and swivel accessories attached, and the back of the radio facing parallel to the outer surface of the planar phantom. The belt-loop was touching the outer surface of the planar phantom and provided a 3.5 cm separation distance between the back of the radio and the outer surface of the planar phantom.
8. The EUT was tested in a body-worn configuration with the radio placed inside the nylon case accessory with the rear swivel mount attached to the belt-loop accessory, and the back of the radio facing parallel to the outer surface of the planar phantom. The belt-loop was touching the outer surface of the planar phantom and combined with the nylon case provided a 4.0 cm separation distance between the back of the radio and the outer surface of the planar phantom.
9. The EUT was tested in a body-worn configuration with the radio placed inside the leather case accessory with the rear swivel mount attached to the belt-loop accessory, and the back of the radio 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 combined with the leather case provided a 4.5 cm separation distance between the back of the radio and the outer surface of the planar phantom.
10. The speaker-microphone accessory (P/N: KRY1011617/183R1A) was connected to the EUT for tests #3 & #5 - #9 described above.
11. The conducted power levels were measured before and after each test according to the procedures described in FCC 47 CFR §2.1046. Included in the measurement data tables are scaled SAR values by measured power drift. A thirty-minute SAR versus time evaluation was also performed for the worst-case SAR configuration using a "cold" unit with no turn-on delay (see SAR Test Plots - Appendix A)
12. The EUT was tested with the transmit button constantly depressed and the transmitter 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.

DETAILS OF SAR EVALUATION (Cont.)

13. The EUT was tested with fully charged batteries. The four battery types have the same voltage (7.5V). The NiMH battery has a nominal capacity of 2400mAh and the NiCd battery has a nominal capacity of 1600mAh. The non-immersion rated battery pack is manufactured identically to the immersion rated pack. The only difference involves immersion testing (the immersion rated packs are subjected to statistical sample testing of immersion performance), and warranty (the immersion rated packs are warranted not to leak). The non-immersion battery pack is electrically and mechanically identical to the originally tested immersion type battery packs and does not require additional SAR evaluation. The non-intrinsically safe battery pack uses a copper wire (0Ω?resistance) to connect between the positive terminal of the cell stack and the flex board within the pack. The intrinsically safe battery pack uses a Nichrome wire (0.23Ω resistance) in place of the copper wire. Due to the electrical differences between the intrinsically safe and non-intrinsically safe batteries, both types were tested for the NiCd and NiMH.
14. Due to the size of the EUT, a Plexiglas planar phantom was used in place of the SAM phantom. Please note there is currently no approved phantom available that is twice the dimensions of this device.
15. A stack of low-density, low-loss dielectric foamed polystyrene was used in place of the device holder.

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.

EVALUATION PROCEDURES (Cont.)

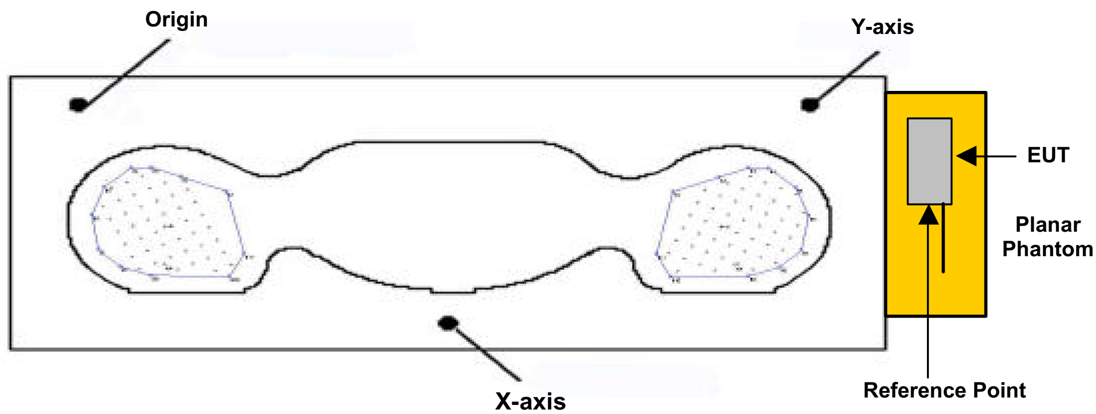


Figure 1. Phantom Reference Point & EUT Positioning
Radio Transceiver - Body-Worn Configuration

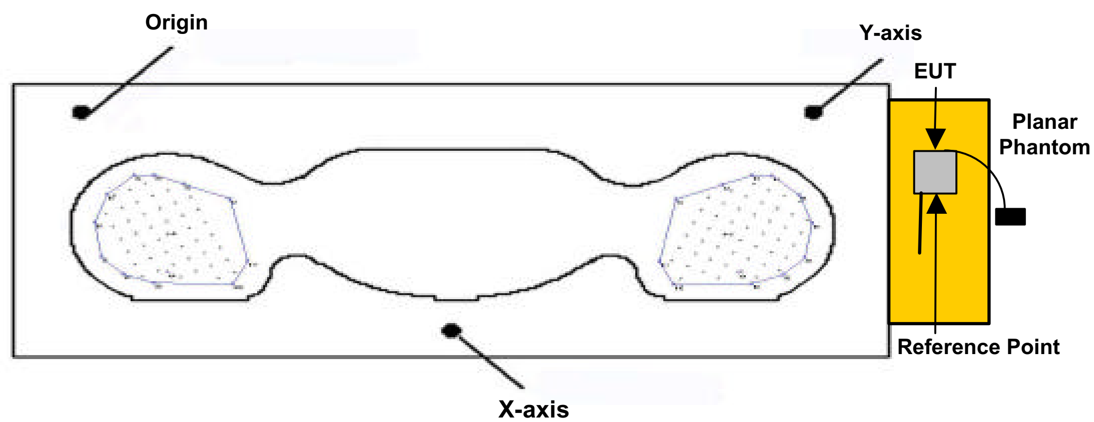


Figure 2. Phantom Reference Point & EUT Positioning
Speaker-Microphone Antenna Version - Face-Held Configuration

7.0 SYSTEM VALIDATION

Prior to the evaluation a system validation was performed using a planar phantom and 450MHz dipole (see Appendix C for system validation procedures). The dielectric parameters of the simulated brain tissue mixture were verified prior to the system validation 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 performance check data).

SYSTEM VALIDATION											
Test Date	450MHz Equiv. Tissue	IEEE 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
				IEEE Target	Measured	IEEE Target	Measured				
04/21/03	Brain	**1.23 (±10%)**	1.27	**43.5 ±5%**	45.0	**0.87 ±5%**	0.91	1000	23.3 °C	22.0 °C	≥ 15 cm
04/22/03			1.26		44.6		0.89		21.9 °C	22.2 °C	
04/23/03			1.23		44.0		0.88		23.5 °C	23.7 °C	

Note(s):
1. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the system validation. The temperatures listed in the table above were consistent for all measurement periods.

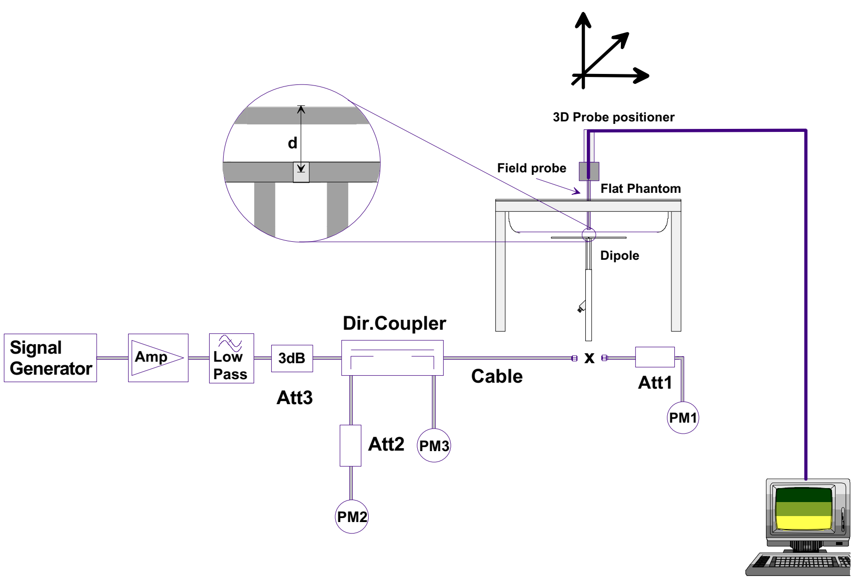


Figure 3. System Validation Setup Diagram

450MHz System Validation Setup Photograph

8.0 EQUIVALENT TISSUES

The 450MHz simulated 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	**450MHz Brain (System Check & EUT Evaluation)**	**450MHz Body (EUT Evaluation)**
Water	38.56 %	52.00 %
Sugar	56.32 %	45.65 %
Salt	3.95 %	1.75 %
HEC	0.98 %	0.50 %
Bactericide	0.19 %	0.10 %

9.0 SAR SAFETY LIMITS

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	**(Occupational / Controlled Exposure Environment)**
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 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.:	1590
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
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
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)
Dynamic Range:	5 µW/g to >100 mW/g; Linearity: ±0.2 dB
Surface 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 PLANAR PHANTOM

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

Planar Phantom

13.0 VALIDATION PLANAR PHANTOM

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

Validation 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		
EQUIPMENT	**SERIAL NO.**	**CALIBRATION DATE**
Schmid & Partner DASY3 System	-	-
-Robot	599396-01	N/A
-ET3DV6 E-Field Probe	1590	Dec 2002
-300MHz Validation Dipole	135	Oct 2002
-450MHz Validation Dipole	136	Oct 2002
-900MHz Validation Dipole	054	June 2001
-1800MHz Validation Dipole	247	June 2001
-2450MHz Validation Dipole	150	Oct 2002
-SAM Phantom V4.0C	N/A	N/A
-Planar Phantom	N/A	N/A
-Validation Planar Phantom	N/A	N/A
HP 85070C Dielectric Probe Kit	N/A	N/A
Gigatronics 8652A Power Meter	1835272	Feb 2003
-Power Sensor 80701A	1833535	Feb 2003
-Power Sensor 80701A	1833542	Mar 2003
HP E4408B Spectrum Analyzer	US39240170	Dec 2002
HP 8594E Spectrum Analyzer	3543A02721	Feb 2003
HP 8753E Network Analyzer	US38433013	Feb 2003
HP 8648D Signal Generator	3847A00611	Feb 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 Std 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 Std 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”.

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

APPENDIX B - SYSTEM VALIDATION DATA

System Validation - 450MHz Dipole

Large Planar Phantom; Planar Section

Probe: ET3DV6 - SN1590; ConvF(7.80,7.80,7.80); Crest factor: 1.0; 450 MHz Brain: $\sigma = 0.91$ mho/m $\varepsilon_r = 45.0$ $\rho = 1.00$ g/cm^3

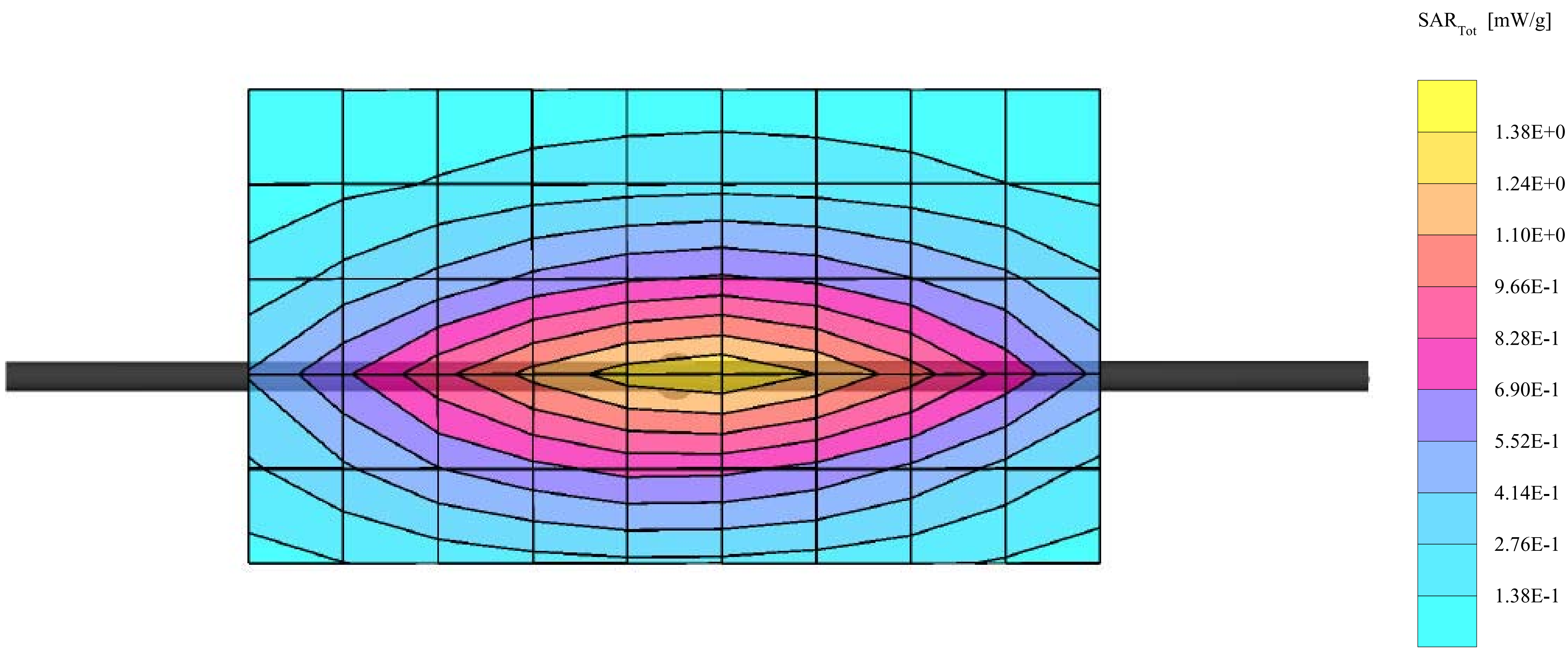
Cube 5x5x7: Peak: 2.06 mW/g, SAR (1g): 1.27 mW/g, SAR (10g): 0.824 mW/g, (Worst-case extrapolation)

Penetration depth: 12.0 (10.2, 14.3) [mm]; Powerdrift: 0.02 dB

Ambient Temp: 23.3°C; Fluid Temp: 22.0°C

Forward Conducted Power: 250 mW

Date Tested: April 21, 2003



System Validation - 450MHz Dipole

Large Planar Phantom; Planar Section

Probe: ET3DV6 - SN1590; ConvF(7.80,7.80,7.80); Crest factor: 1.0; 450 MHz Brain: $\sigma = 0.89$ mho/m $\varepsilon_r = 44.6$ $\rho = 1.00$ g/cm^3

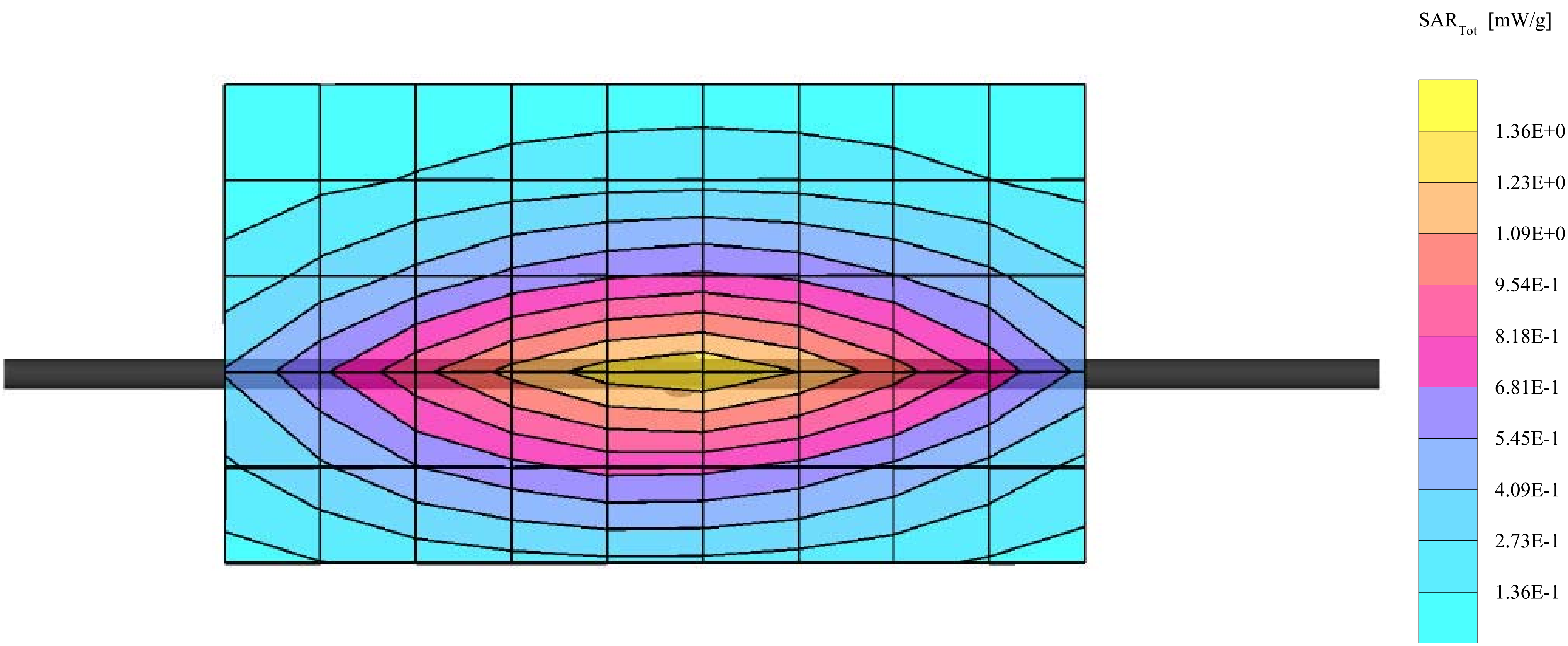
Cube 5x5x7: Peak: 2.04 mW/g, SAR (1g): 1.26 mW/g, SAR (10g): 0.814 mW/g, (Worst-case extrapolation)

Penetration depth: 12.1 (10.1, 14.2) [mm]; Powerdrift: 0.01 dB

Ambient Temp: 21.9°C; Fluid Temp: 22.2°C

Forward Conducted Power: 250 mW

Date Tested: April 22, 2003



System Validation - 450MHz Dipole

Large Planar Phantom; Planar Section

Probe: ET3DV6 - SN1590; ConvF(7.80,7.80,7.80); Crest factor: 1.0; 450 MHz Brain: $\sigma = 0.88$ mho/m $\varepsilon_r = 44.0$ $\rho = 1.00$ g/cm^3

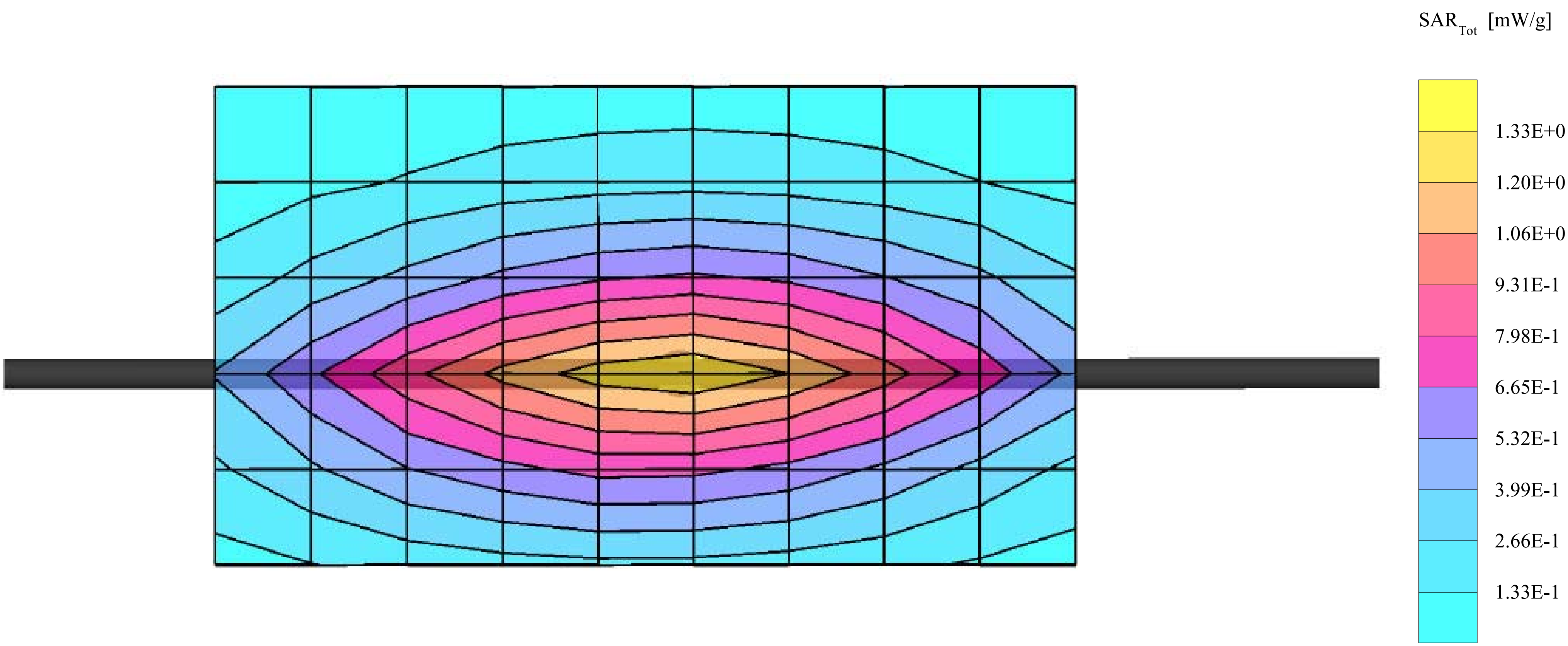
Cube 5x5x7: Peak: 1.99 mW/g, SAR (1g): 1.23 mW/g, SAR (10g): 0.794 mW/g, (Worst-case extrapolation)

Penetration depth: 12.0 (10.2, 14.3) [mm]; Powerdrift: -0.01 dB

Ambient Temp: 23.5°C; Fluid Temp: 23.7°C

Forward Conducted Power: 250 mW

Date Tested: April 23, 2003



APPENDIX C - SYSTEM VALIDATION PROCEDURES

Celltech
Testing and Engineering Services Lab

450MHz SYSTEM VALIDATION DIPOLE

Type:	**450MHz Validation Dipole**
Serial Number:	**136**
Place of Calibration:	**Celltech Research Inc.**
Date of Calibration:	**October 17, 2002**

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

Calibrated by: Russell W. Pipe

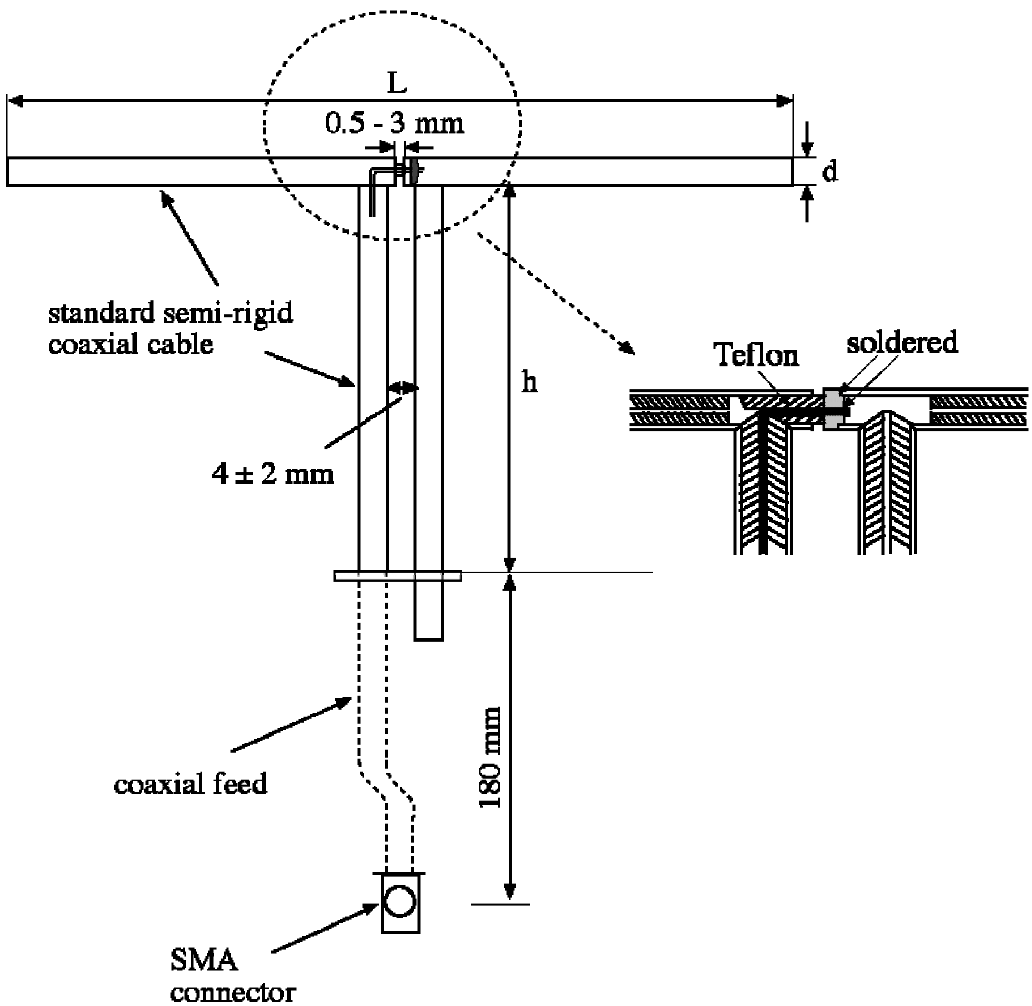
Approved by:

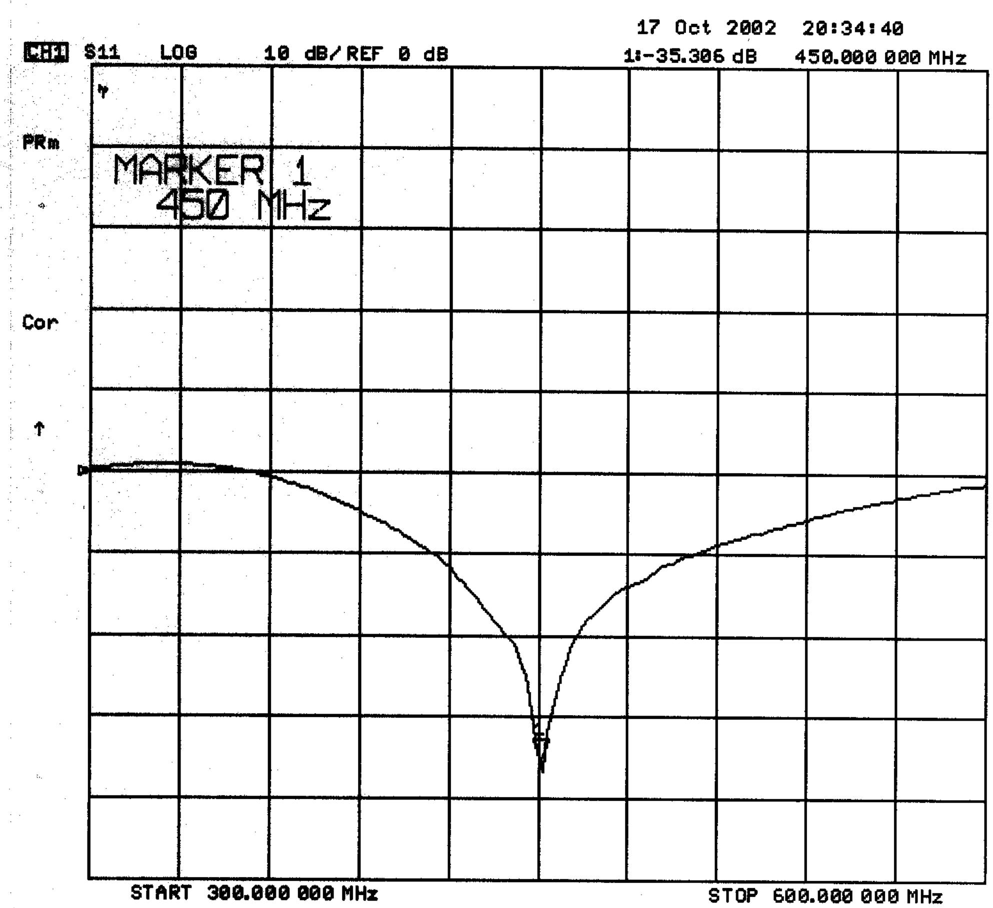
Celltech Research Inc. 1955 Moss Court, Kelowna, B.C. Canada V1Y 9L3
Tel. 250-448-7047 • Fax. 250-448-7046 • e-mail: info@celltechlabs.com
www.celltechlabs.com

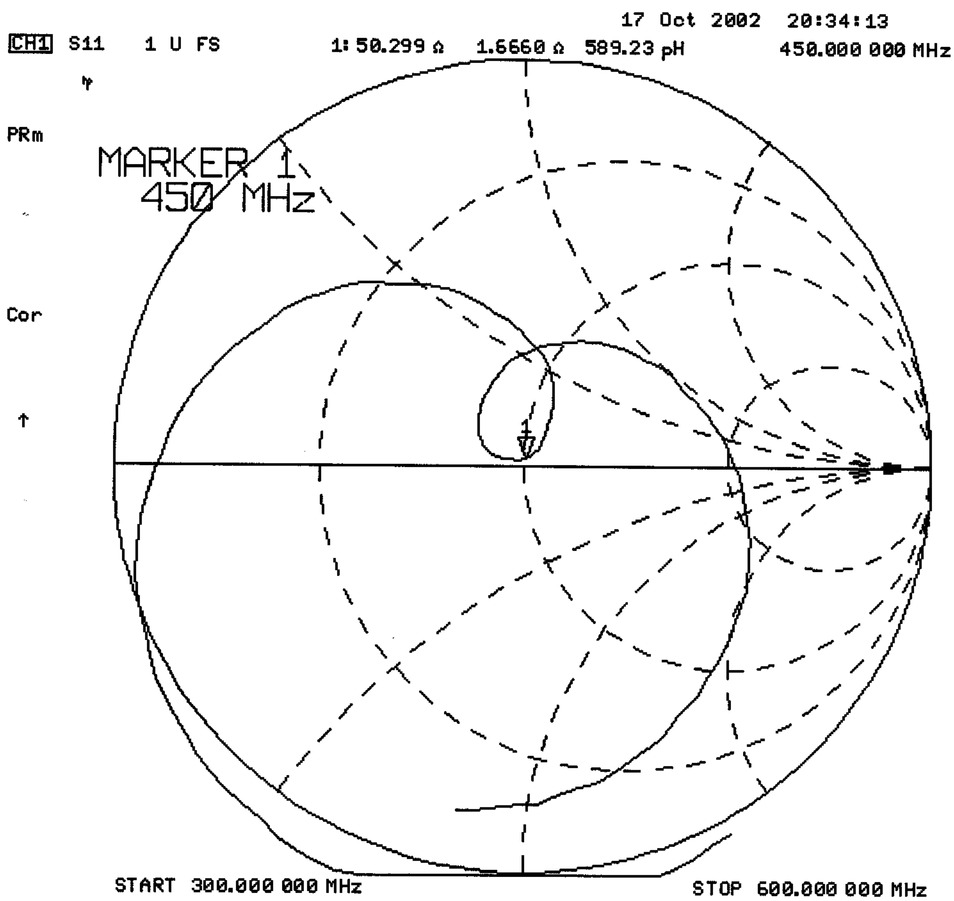
1. Dipole Construction & Electrical Characteristics

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 450MHz	Re{Z} = 50.299Ω
	Im{Z} = 1.6660Ω
Return Loss at 450MHz	-35.306dB




17 Oct 2002 20:34:40
CH1 S11 LOG 10 dB/ REF 0 dB 1:-35.306 dB 450.000 000 MHz
PRm
Cor
MARKER 1
450 MHz
START 300.000 000 MHz
STOP 600.000 000 MHz


17 Oct 2002 20:34:13
CH1 S11 1 U FS
1: 50.299 Ω 1.6660 Ω 589.23 pH
450.000 000 MHz
PRm
Cor
MARKER 1
450 MHz
START 300.000 000 MHz
STOP 600.000 000 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

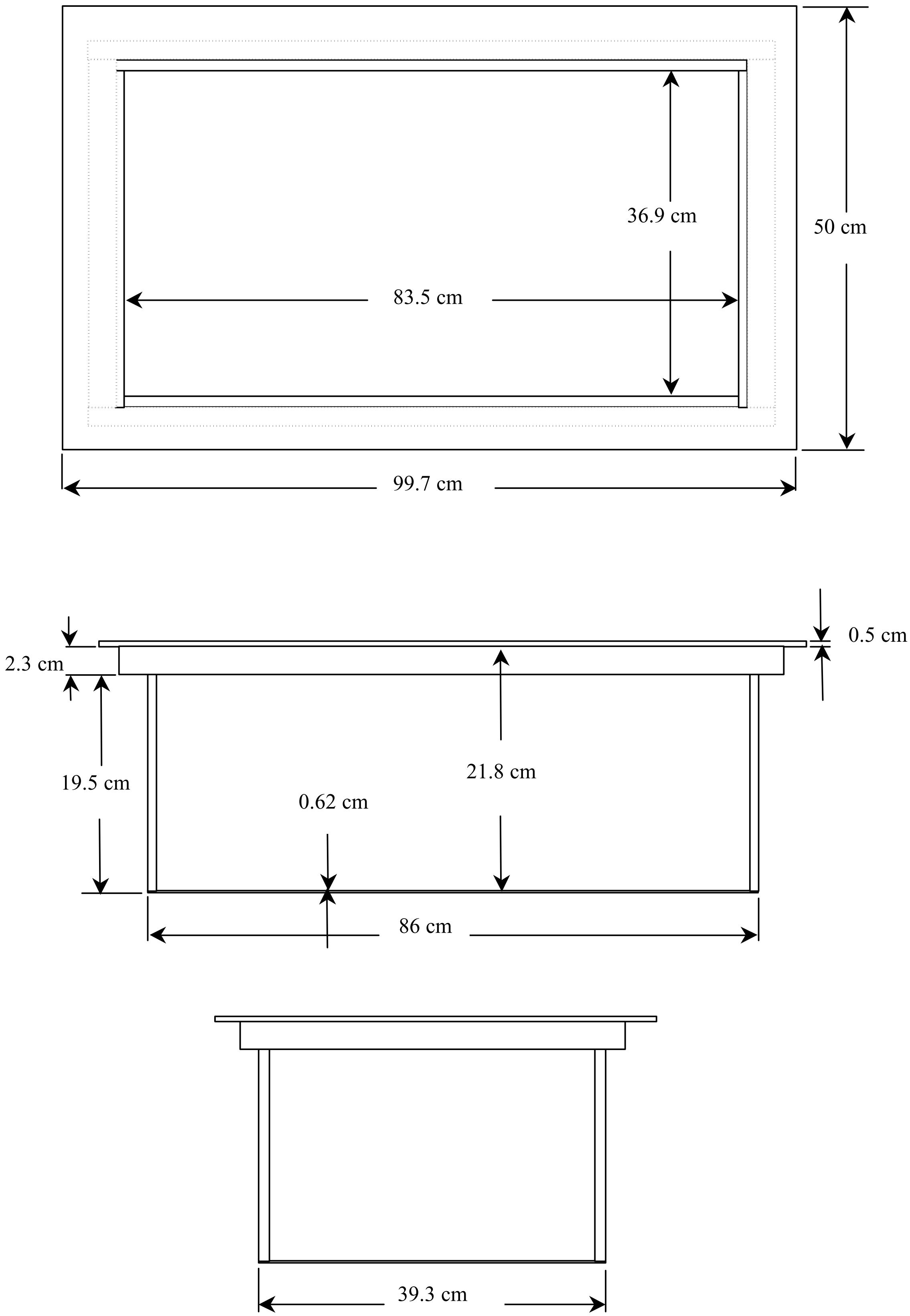
2. Validation Phantom

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



450MHz System Validation Setup

450MHz System Validation Setup

3. Measurement Conditions

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

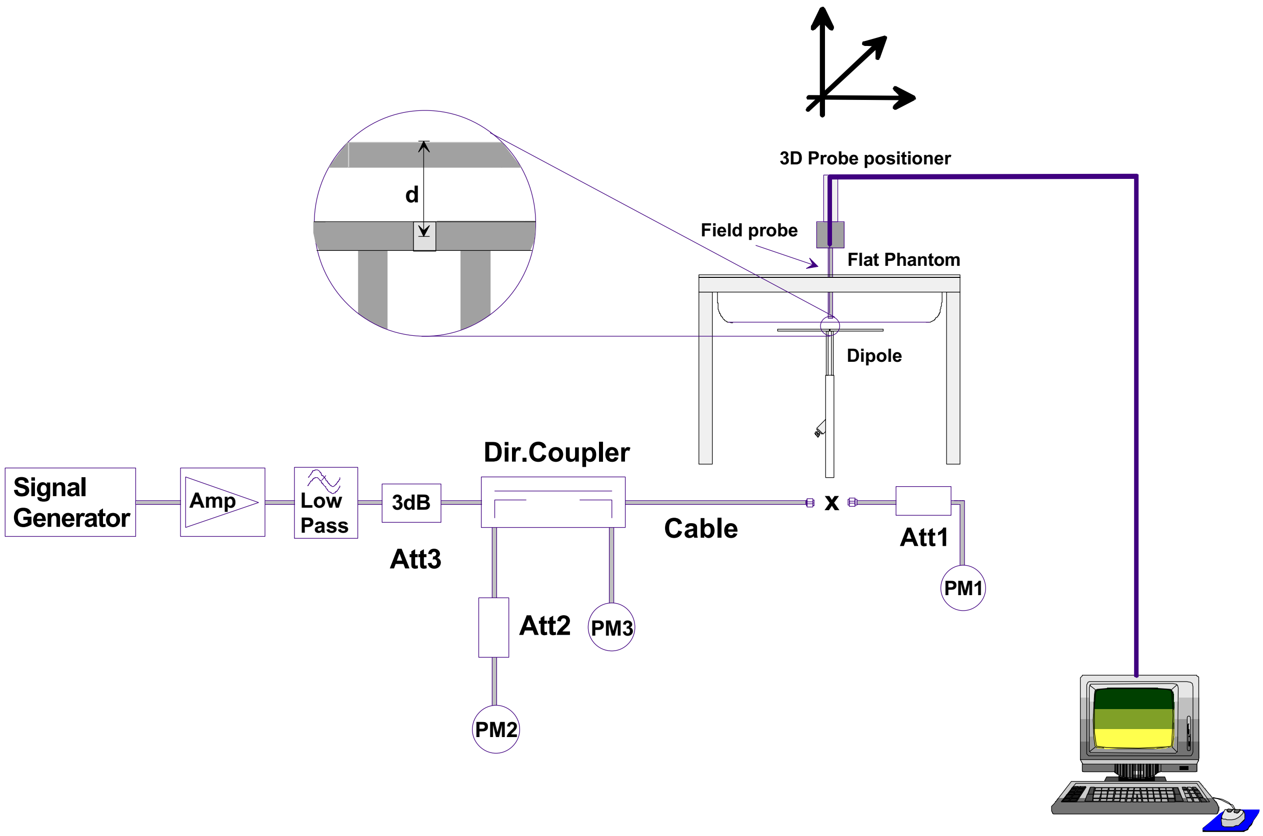
Relative Permittivity:	44.1
Conductivity:	0.88 mho/m
Ambient Temperature:	23.3 °C
Fluid Temperature:	22.2 °C
Fluid Depth:	≥ 15.0 cm

The 450MHz simulating tissue consists of the following ingredients:

Ingredient	Percentage by weight
Water	38.56%
Sugar	56.32%
Salt	3.95%
HEC	0.98%
Dowicil 75	0.19%
Target Dielectric Parameters at 22°C	ε_r = 43.5 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	1.32	5.28	0.887	3.55	2.20
Test 2	1.26	5.04	0.856	3.42	2.09
Test 3	1.38	5.52	0.931	3.72	2.30
Test 4	1.36	5.44	0.917	3.67	2.27
Test 5	1.37	5.48	0.922	3.69	2.28
Test 6	1.33	5.32	0.896	3.58	2.22
Test 7	1.34	5.36	0.902	3.61	2.24
Test 8	1.33	5.32	0.895	3.58	2.21
Test 9	1.39	5.56	0.931	3.72	2.31
Test10	1.36	5.44	0.917	3.67	2.27
Average Value	1.34	5.38	0.905	3.62	2.24

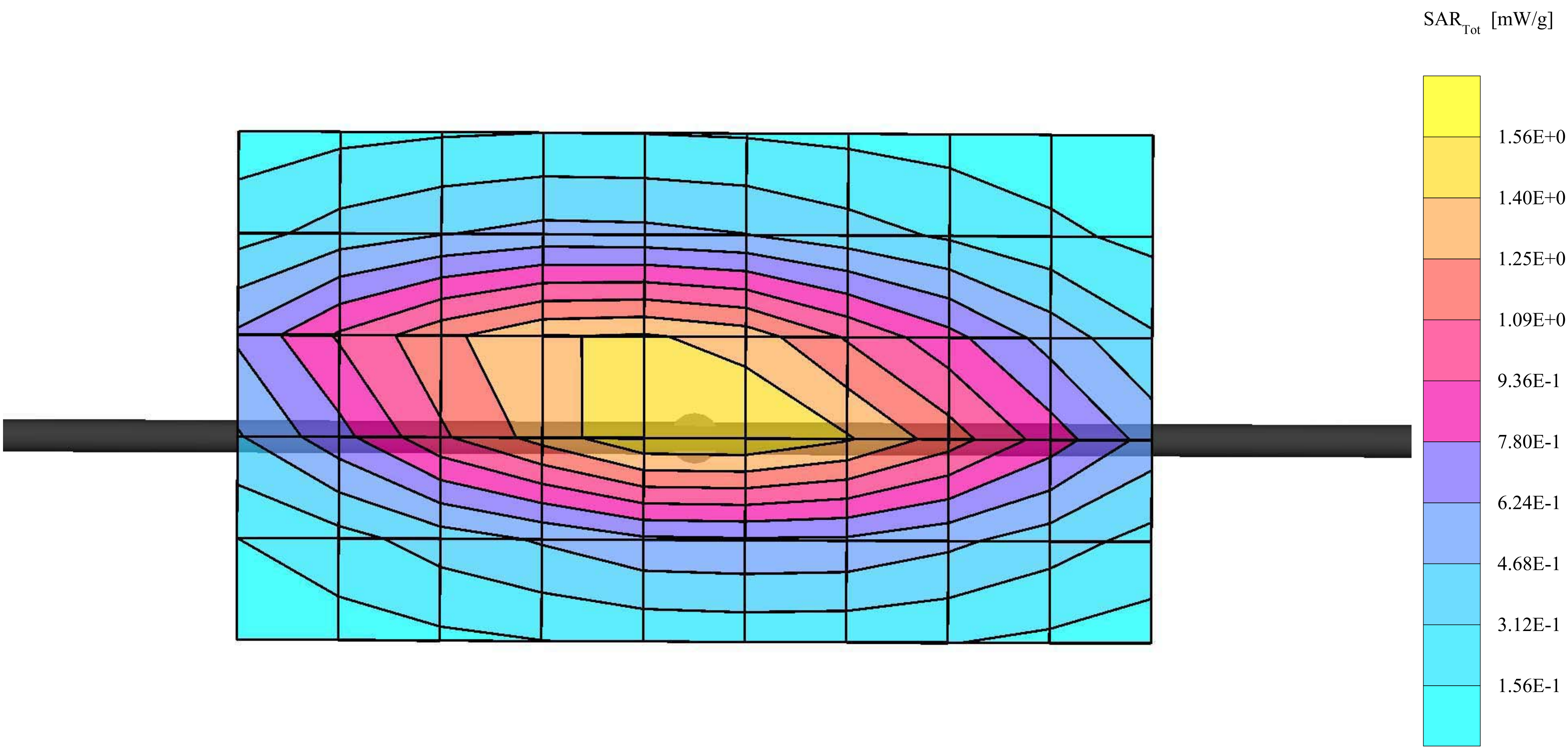
The results have been normalized to 1W (forward power) into the dipole.

Averaged over 1cm (1g) of tissue: 5.38 mW/g

Averaged over 10cm (10g) of tissue: 3.62 mW/g

Dipole 450MHz, d = 15 mm

Frequency: 450 MHz; Antenna Input Power: 250 [mW]
Large Planar Phantom; Planar Section
Probe: ET3DV6 - SN1387; ConvF(7.30,7.30,7.30); Crest factor: 1.0; 450 MHz Brain: $\sigma = 0.88$ mho/m $\varepsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Cube 5x5x7: Peak: 2.24 mW/g, SAR (1g): 1.34 mW/g, SAR (10g): 0.905 mW/g, (Worst-case extrapolation)
Penetration depth: 12.0 (10.5, 14.0) [mm]; Powerdrift: 0.01 dB; Ambient Temp.: 23.3°C; Fluid Temp.: 22.2°C
Calibration Date: October 17, 2002



450MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

October 17, 2002

Frequency	e'	e''
350.000000 MHz	46.6334	40.6323
360.000000 MHz	46.3629	40.0034
370.000000 MHz	46.1498	39.3672
380.000000 MHz	45.8833	38.6723
390.000000 MHz	45.5947	38.0484
400.000000 MHz	45.3226	37.4538
410.000000 MHz	45.0977	36.9636
420.000000 MHz	44.8241	36.4841
430.000000 MHz	44.5839	35.9541
440.000000 MHz	44.3183	35.5098
450.000000 MHz	44.0572	35.0854
460.000000 MHz	43.8600	34.7069
470.000000 MHz	43.6544	34.3371
480.000000 MHz	43.4507	33.9296
490.000000 MHz	43.2880	33.5147
500.000000 MHz	43.0921	33.1731
510.000000 MHz	42.8781	32.7813
520.000000 MHz	42.6765	32.4193
530.000000 MHz	42.5864	32.1000
540.000000 MHz	42.4644	31.7180
550.000000 MHz	42.3042	31.4503

APPENDIX D - PROBE CALIBRATION

Schmid & Partner Engineering AG

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

Calibration Certificate

Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1590**
Place of Calibration:	**Zurich**
Date of Calibration:	**December 1, 2002**
Calibration Interval:	**12 months**

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:	[signature]
Approved by:	[signature]

Schmid & Partner
Engineering AG

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

Probe ET3DV6

SN:1590

Manufactured:	March 19, 2001
Last calibration:	April 26, 2002
Recalibrated:	December 1, 2002

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1590

Sensitivity in Free Space

NormX	**1.75**	$\mu V/(V/m)^2$
NormY	**1.89**	$\mu V/(V/m)^2$
NormZ	**1.63**	$\mu V/(V/m)^2$

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	**6.9**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.9**	± 9.5% (k=2)	Alpha	**0.30**
ConvF Z	**6.9**	± 9.5% (k=2)	Depth	**2.71**

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	**5.6**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.6**	± 9.5% (k=2)	Alpha	**0.42**
ConvF Z	**5.6**	± 9.5% (k=2)	Depth	**2.56**

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	8.7	5.0
SAR_{be} [%]	With Correction Algorithm	0.3	0.5

Head 1800 MHz Typical SAR gradient: 10 % per mm

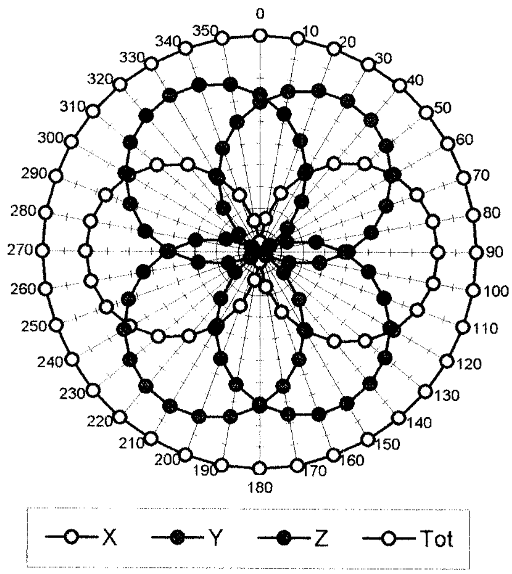
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	10.7	7.4
SAR_{be} [%]	With Correction Algorithm	0.1	0.3

Sensor Offset

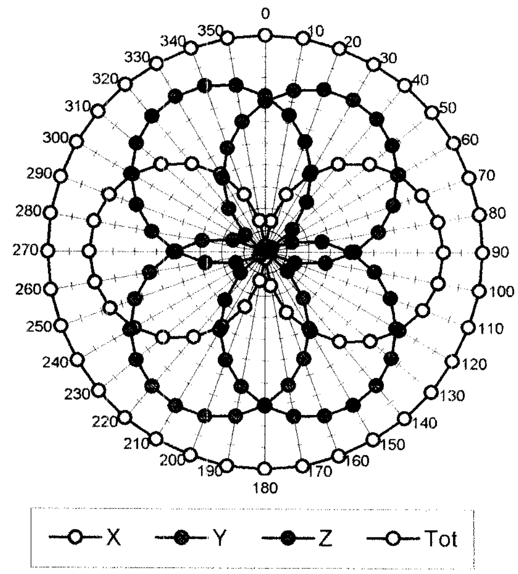
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.2 ± 0.2**	mm

Receiving Pattern (ϕ), $\theta = 0°$

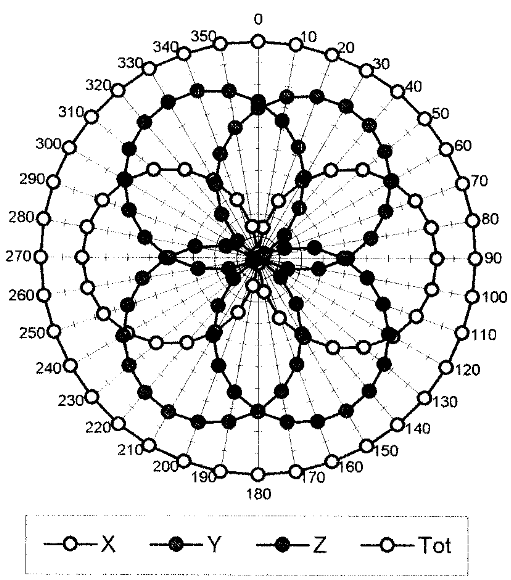
f = 30 MHz, TEM cell ifi110



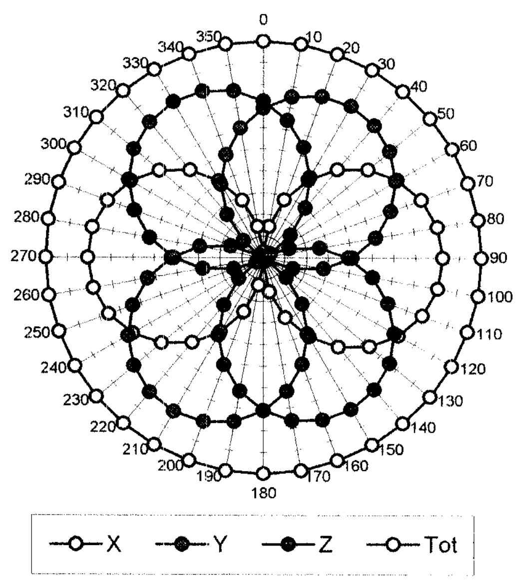
f = 100 MHz, TEM cell ifi110

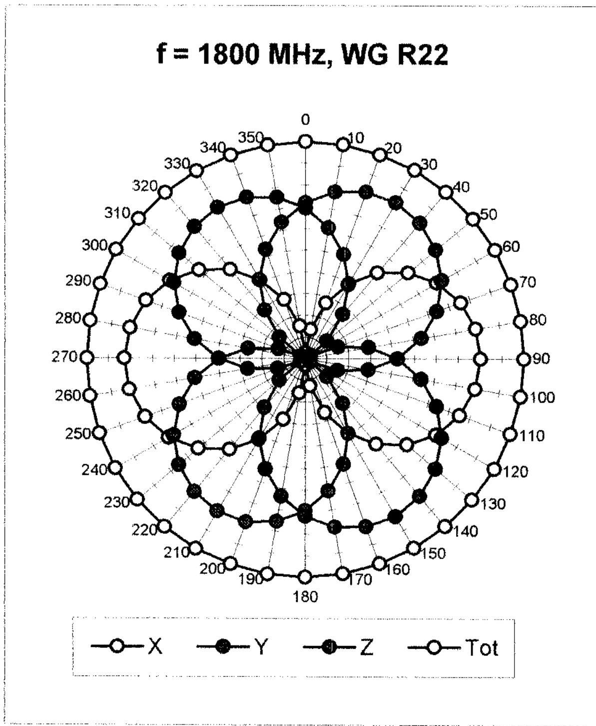


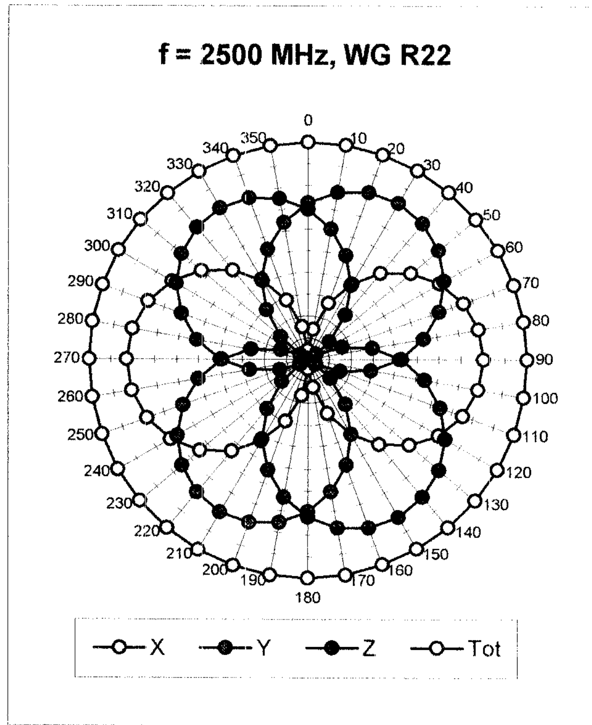
f = 300 MHz, TEM cell ifi110



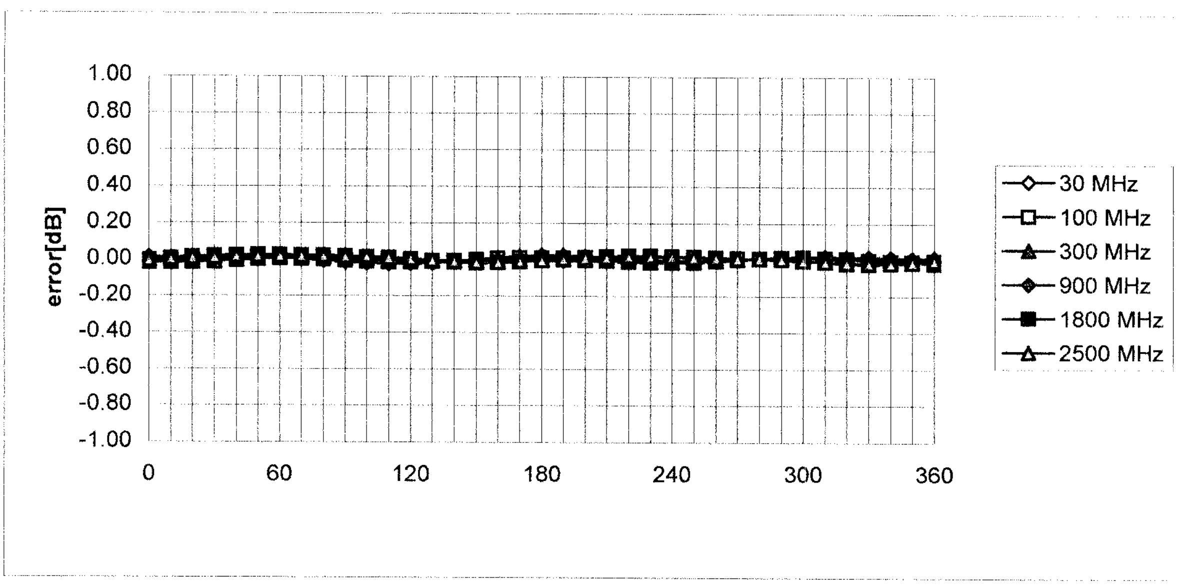
f = 900 MHz, TEM cell ifi110





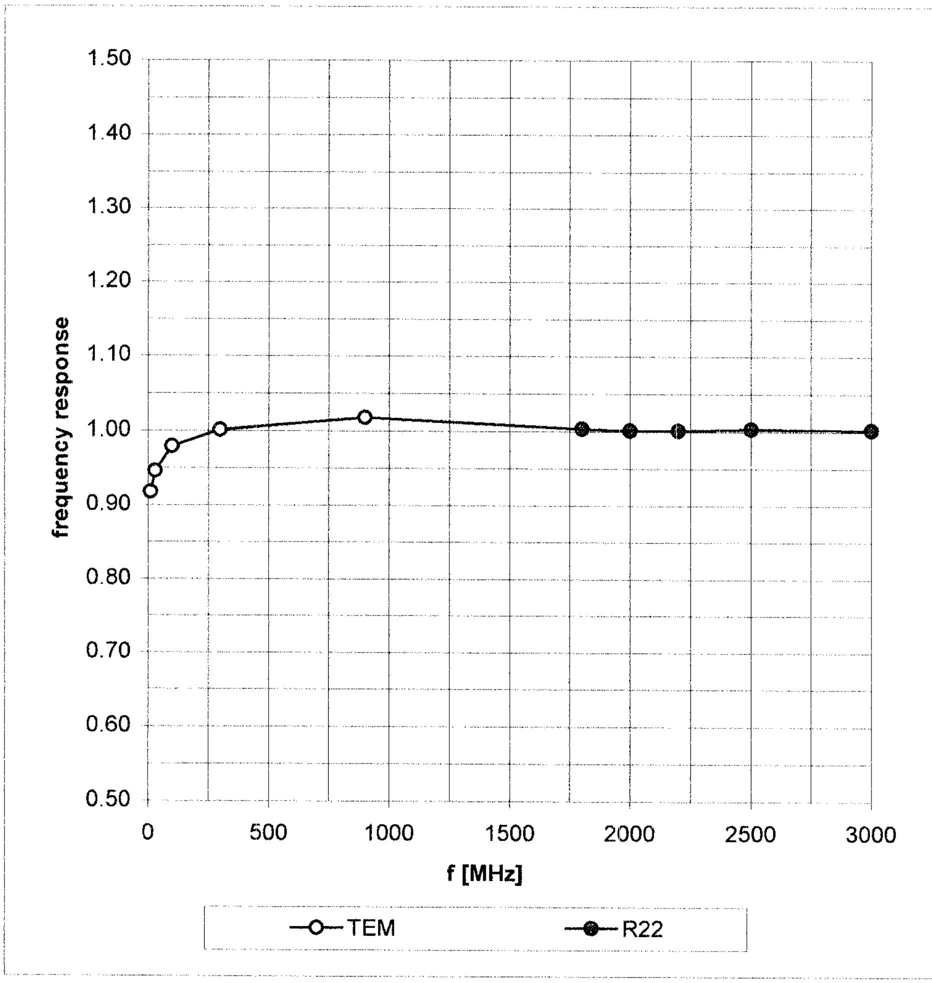


Isotropy Error (ϕ), θ = 0°



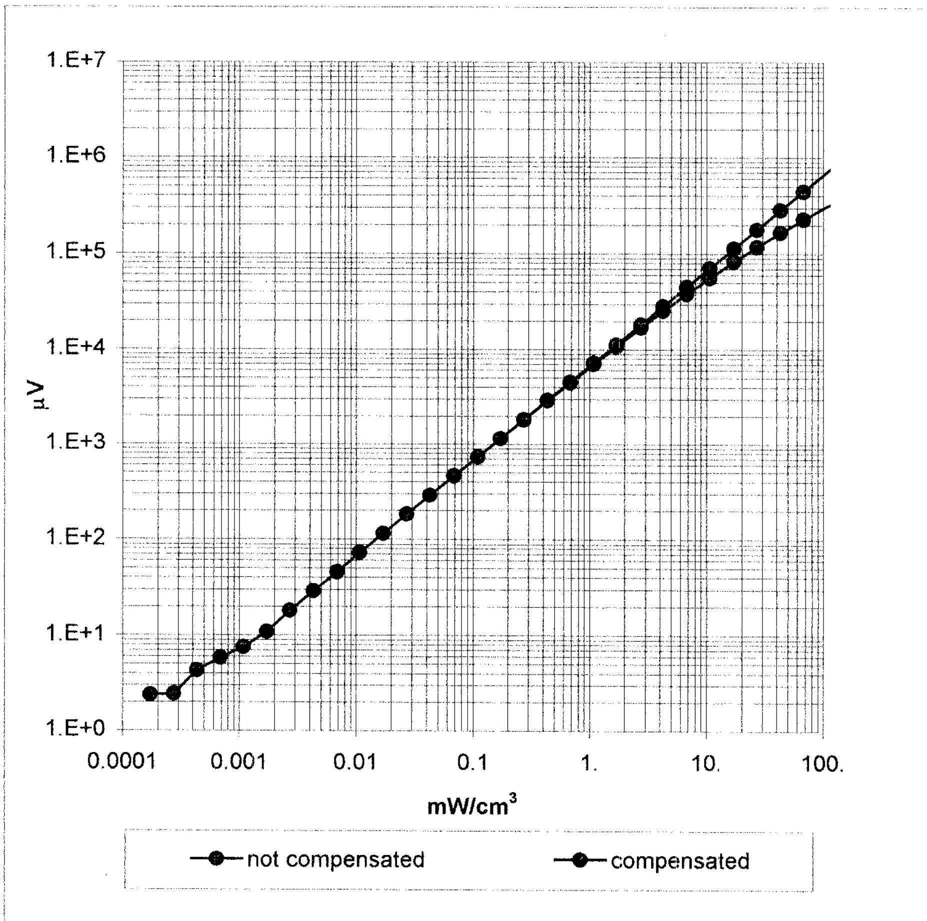
Frequency Response of E-Field

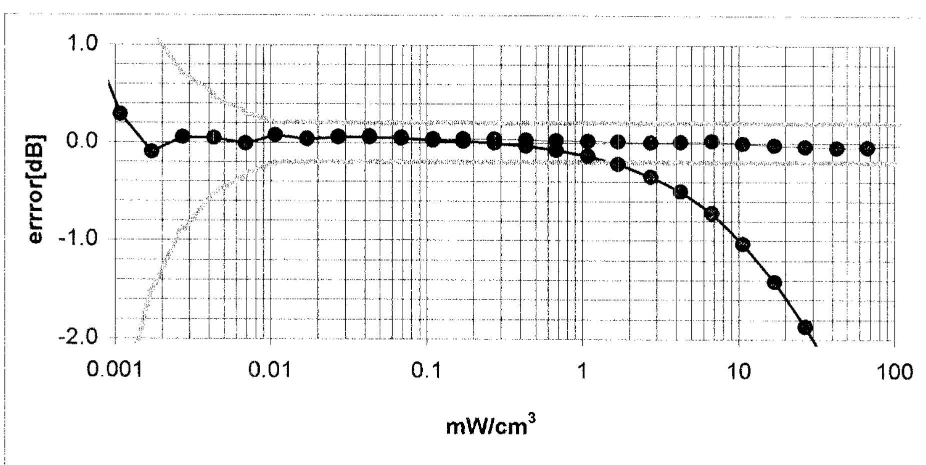
(TEM-Cell:ifi110, Waveguide R22)



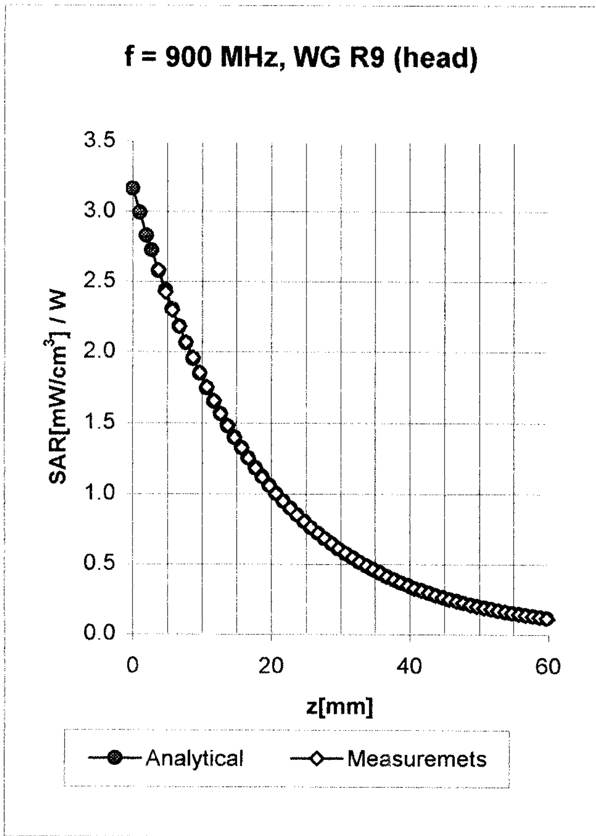
Dynamic Range f(SAR_{brain})

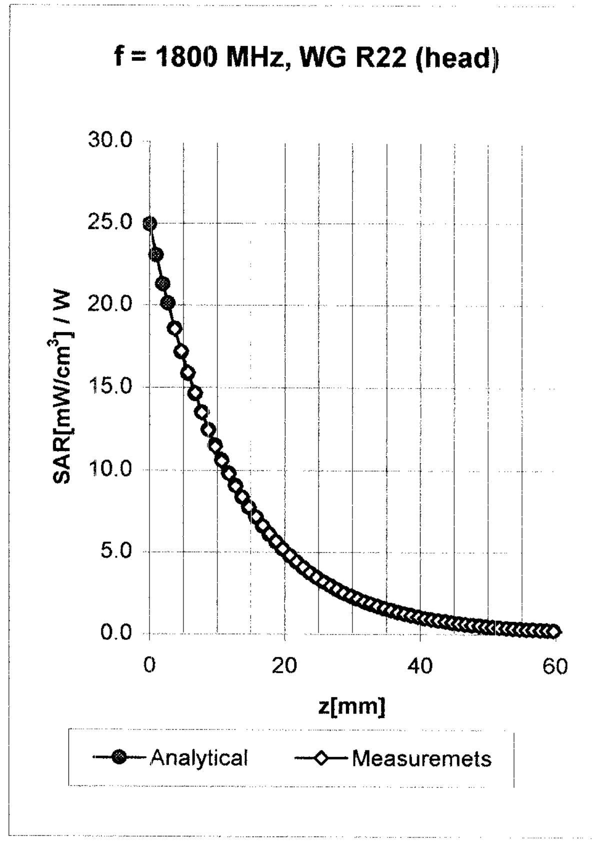
(Waveguide R22)





Conversion Factor Assessment

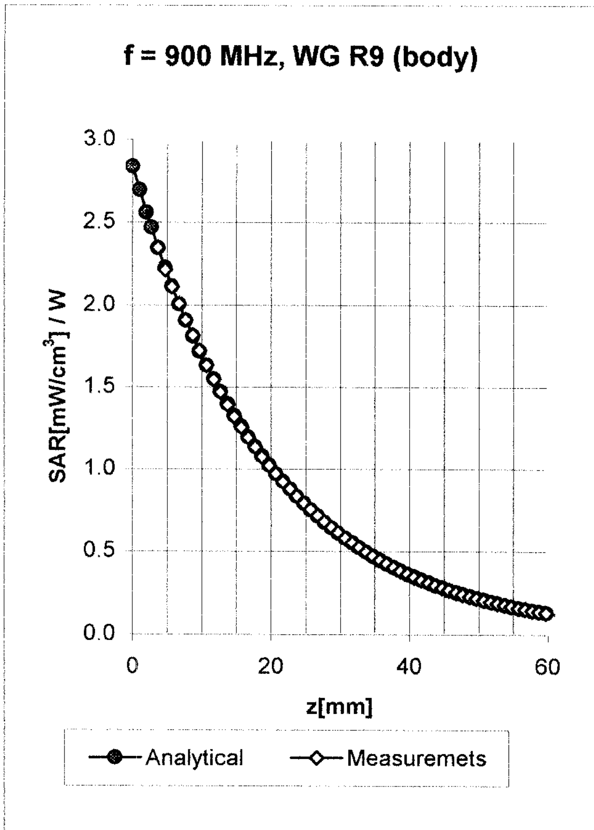


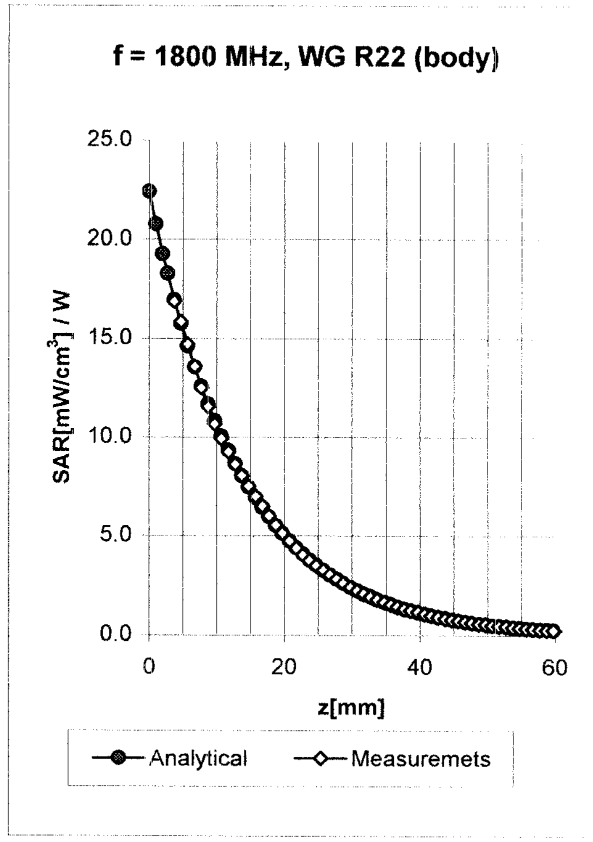


Head	**900 MHz**		ε_r = **41.5 ± 5%**	σ = **0.97 ± 5% mho/m**	
Head	**835 MHz**		ε_r = **41.5 ± 5%**	σ = **0.90 ± 5% mho/m**	
	ConvF X	**6.9**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.9**	± 9.5% (k=2)	Alpha	**0.30**
	ConvF Z	**6.9**	± 9.5% (k=2)	Depth	**2.71**

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	**5.6**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.6**	± 9.5% (k=2)	Alpha	**0.42**
	ConvF Z	**5.6**	± 9.5% (k=2)	Depth	**2.56**

Conversion Factor Assessment



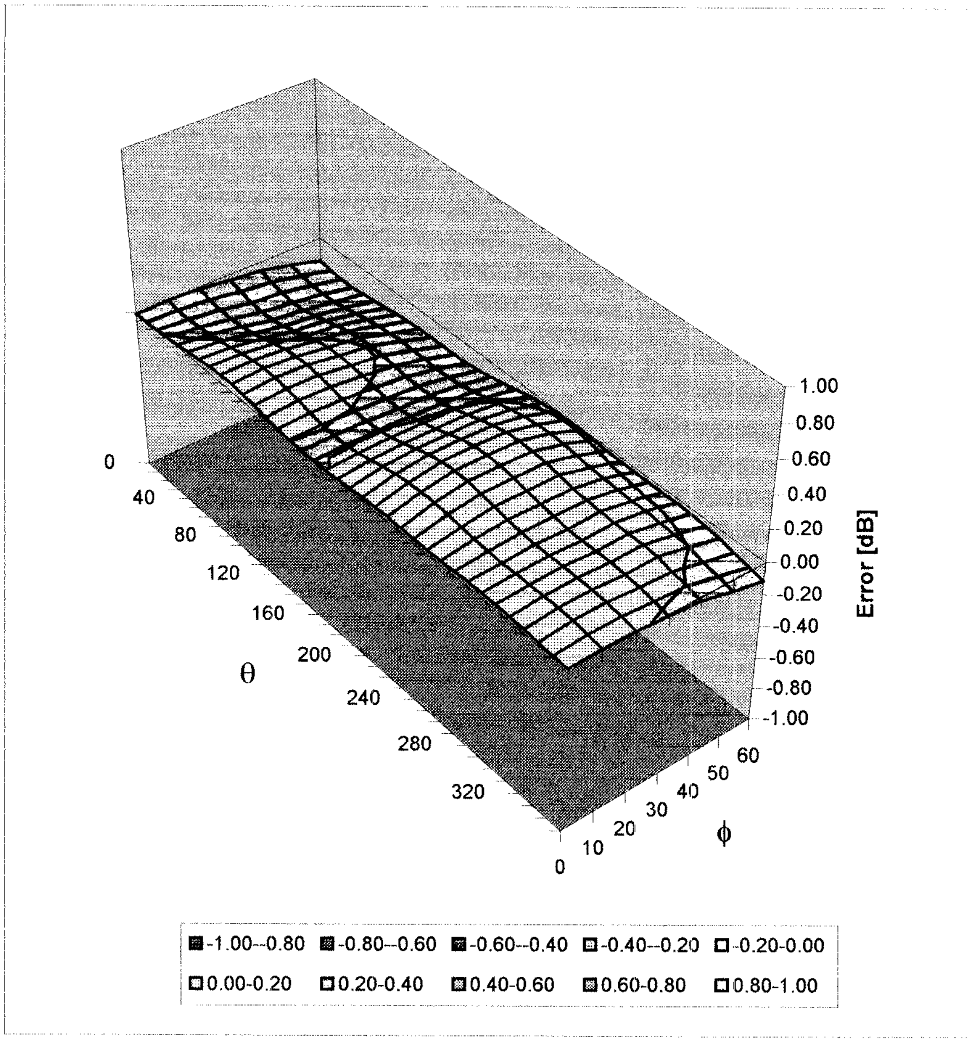


Body	**900 MHz**		ε_r **= 55.0 ± 5%**	σ **= 1.05 ± 5% mho/m**		
Body	**835 MHz**		ε_r **= 55.2 ± 5%**	σ **= 0.97 ± 5% mho/m**		
	ConvF X	**6.7**	± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**6.7**	± 9.5% (k=2)		Alpha	**0.34**
	ConvF Z	**6.7**	± 9.5% (k=2)		Depth	**2.57**

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	**5.3**	± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**5.3**	± 9.5% (k=2)		Alpha	**0.52**
	ConvF Z	**5.3**	± 9.5% (k=2)		Depth	**2.46**

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:	**1590**
Place of Assessment:	**Zurich**
Date of Assessment:	**May 1, 2002**
Probe Calibration Date:	**April 26, 2002**

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

Assessed by:

Dosimetric E-Field Probe ET3DV6 SN:1590

Conversion factor (± standard deviation)

150 MHz	ConvF	**9.4 ± 8%**	**ε_r = 52.3** **σ = 0.76 mho/m** (head tissue)
300 MHz	ConvF	**8.2 ± 8%**	**ε_r = 45.3** **σ = 0.87 mho/m** (head tissue)
450 MHz	ConvF	**7.8 ± 8%**	**ε_r = 43.5** **σ = 0.87mho/m** (head tissue)
150 MHz	ConvF	**9.1 ± 8%**	**ε_r = 61.9** **σ = 0.80 mho/m** (body tissue)
450 MHz	ConvF	**7.9 ± 8%**	**ε_r = 56.7** **σ = 0.94 mho/m** (body tissue)
2450 MHz	ConvF	**4.5 ± 8%**	**ε_r = 39.2** **σ = 1.80 mho/m** (head tissue)
2450 MHz	ConvF	**4.1 ± 8%**	**ε_r = 52.7** **σ = 1.95 mho/m** (body tissue)

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

450MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

April 21, 2003

Frequency	e'	e''
350.000000 MHz	47.6543	42.1530
360.000000 MHz	47.3254	41.4746
370.000000 MHz	47.0954	40.7407
380.000000 MHz	46.8395	40.1480
390.000000 MHz	46.6129	39.4522
400.000000 MHz	46.3088	38.8865
410.000000 MHz	46.0218	38.3466
420.000000 MHz	45.8097	37.8219
430.000000 MHz	45.5320	37.2627
440.000000 MHz	45.3088	36.7981
450.000000 MHz	45.0240	36.3643
460.000000 MHz	44.8842	35.9546
470.000000 MHz	44.6453	35.5148
480.000000 MHz	44.4223	35.0644
490.000000 MHz	44.2468	34.6421
500.000000 MHz	43.9889	34.3025
510.000000 MHz	43.7995	33.9146
520.000000 MHz	43.6408	33.5695
530.000000 MHz	43.4426	33.2446
540.000000 MHz	43.3092	32.8001
550.000000 MHz	43.0906	32.5132

450MHz EUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

April 21, 2003

Frequency	e'	e''
350.000000 MHz	59.1440	42.5785
360.000000 MHz	58.9546	41.8307
370.000000 MHz	58.8193	41.0199
380.000000 MHz	58.6535	40.3314
390.000000 MHz	58.5035	39.5745
400.000000 MHz	58.3339	38.9197
410.000000 MHz	58.1669	38.3561
420.000000 MHz	57.9169	37.8537
430.000000 MHz	57.7567	37.2966
440.000000 MHz	57.5391	36.8134
450.000000 MHz	57.3308	36.4253
460.000000 MHz	57.1776	35.9858
470.000000 MHz	57.0917	35.5307
480.000000 MHz	56.9186	35.0747
490.000000 MHz	56.7660	34.6847
500.000000 MHz	56.6555	34.2995
510.000000 MHz	56.5445	33.8935
520.000000 MHz	56.4156	33.5389
530.000000 MHz	56.2628	33.2020
540.000000 MHz	56.2435	32.7875
550.000000 MHz	56.0472	32.5323

450MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

April 22, 2003

Frequency	e'	e''
350.000000 MHz	47.1821	41.0122
360.000000 MHz	46.8664	40.3066
370.000000 MHz	46.6554	39.6818
380.000000 MHz	46.3752	39.0440
390.000000 MHz	46.0787	38.4307
400.000000 MHz	45.8372	37.8198
410.000000 MHz	45.5784	37.3027
420.000000 MHz	45.2782	36.8370
430.000000 MHz	45.0776	36.3592
440.000000 MHz	44.8725	35.9230
450.000000 MHz	44.6009	35.4886
460.000000 MHz	44.3863	35.1110
470.000000 MHz	44.1845	34.7025
480.000000 MHz	43.9886	34.2836
490.000000 MHz	43.7996	33.8634
500.000000 MHz	43.6031	33.4613
510.000000 MHz	43.3889	33.1118
520.000000 MHz	43.1611	32.8283
530.000000 MHz	42.9795	32.4833
540.000000 MHz	42.8067	32.1097
550.000000 MHz	42.6797	31.8276

450MHz EUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

April 22, 2003

Frequency	e'	e''
350.000000 MHz	59.6218	42.8485
360.000000 MHz	59.5137	42.0173
370.000000 MHz	59.2818	41.2482
380.000000 MHz	59.1969	40.5023
390.000000 MHz	58.9787	39.7928
400.000000 MHz	58.8681	39.1605
410.000000 MHz	58.7223	38.5416
420.000000 MHz	58.5156	38.0019
430.000000 MHz	58.3486	37.4681
440.000000 MHz	58.1735	37.0071
450.000000 MHz	57.9251	36.5707
460.000000 MHz	57.8361	36.1288
470.000000 MHz	57.7151	35.6916
480.000000 MHz	57.5190	35.1785
490.000000 MHz	57.4100	34.7898
500.000000 MHz	57.2397	34.3416
510.000000 MHz	57.1382	33.9450
520.000000 MHz	56.9671	33.5949
530.000000 MHz	56.8482	33.2281
540.000000 MHz	56.7534	32.8430
550.000000 MHz	56.5923	32.5985

450MHz System Validation & EUT Evaluation (Face)

Measured Fluid Dielectric Parameters (Brain)

April 23, 2003

Frequency	e'	e''
350.000000 MHz	46.6012	40.9335
360.000000 MHz	46.3931	40.2309
370.000000 MHz	46.1311	39.5615
380.000000 MHz	45.8916	38.8912
390.000000 MHz	45.6726	38.2951
400.000000 MHz	45.3993	37.6944
410.000000 MHz	45.1502	37.1814
420.000000 MHz	44.8672	36.6381
430.000000 MHz	44.5541	36.1449
440.000000 MHz	44.2708	35.6995
450.000000 MHz	44.0262	35.3066
460.000000 MHz	43.8723	34.8985
470.000000 MHz	43.6568	34.4632
480.000000 MHz	43.4707	34.0504
490.000000 MHz	43.3305	33.6641
500.000000 MHz	43.1618	33.2807
510.000000 MHz	42.9743	32.9491
520.000000 MHz	42.8542	32.5858
530.000000 MHz	42.5960	32.2441
540.000000 MHz	42.4328	31.8511
550.000000 MHz	42.1652	31.5464