DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab

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

Applicant Information

KENWOOD USA CORPORATION
3975 John Creek Court, Suite 300
Suwanee, GA 30024
United States

IDENTIFIER(s):	**FCC ID: ALH37683110** **IC: 282D-37683110**
Model(s):	**TK-2212-1**
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 Description:	**Portable FM VHF PTT Radio Transceiver**
Modulation Type:	**FM (VHF)**
Tx Frequency Range:	**136 - 174 MHz**
Max. RF Output Power Measured:	**37.27 dBm Conducted (136.1 MHz)** **37.19 dBm Conducted (155.1 MHz)** **36.99 dBm Conducted (173.9 MHz)**
Antenna Type(s) Tested:	**Long Whip 148 - 162 MHz (P/N: KRA-25)** **Whip 146 - 162 MHz (P/N: KRA-26M)** **Whip 162 - 174 MHz (P/N: KRA-26M2)** **Whip 136 - 150 MHz (P/N: KRA-26M3)** **Stubby 146 - 162 MHz (P/N: KRA-22M)** **Stubby 162 - 174 MHz (P/N: KRA-22M2)** **Stubby 136 - 150 MHz (P/N: KRA-22M3)** **Stubby 148 - 162 MHz (P/N: KRA-16M)** **Stubby 162 - 174 MHz (P/N: KRA-16M2)** **Stubby 130 - 150 MHz (P/N: KRA-16M3)**
Battery Type(s) Tested:	**NiMH 7.5 V, 1500 mAh (P/N: KNB-29N)**
Body-Worn Accessories Tested:	**Plastic Belt-Clip with Metal Spring (P/N: KBH-10)** **Speaker-Microphone (P/N: KMC-17)** **Boom-Mic Headset (P/N: KHS-21)**
Max. SAR Levels Evaluated:	**Face-held: 1.50 W/kg (50% Duty Cycle)** **Body-worn: 3.34 W/kg (50% Duty Cycle)**

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01) and Industry Canada RSS-102 Issue 1 (Provisional) for the Occupational / Controlled Exposure environment. All measurements were performed in accordance with the SAR system manufacturer recommendations.

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

Performed By:

Spencer Watson
Compliance Technologist
Celltech Labs Inc.

Reviewed By:

Russell W. Pipe
Senior Compliance Technologist
Celltech Labs Inc.

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1.0 INTRODUCTION

This measurement report demonstrates compliance of the Kenwood USA Corporation Model: TK-2212-1 Portable FM VHF PTT Radio Transceiver FCC ID: ALH37683110 with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]), and Health Canada Safety Code 6 (see reference [2]) for the Occupational / Controlled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C (Edition 01-01) (see reference [3]) and IC RSS-102 Issue 1 (Provisional) (see reference [4]), were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

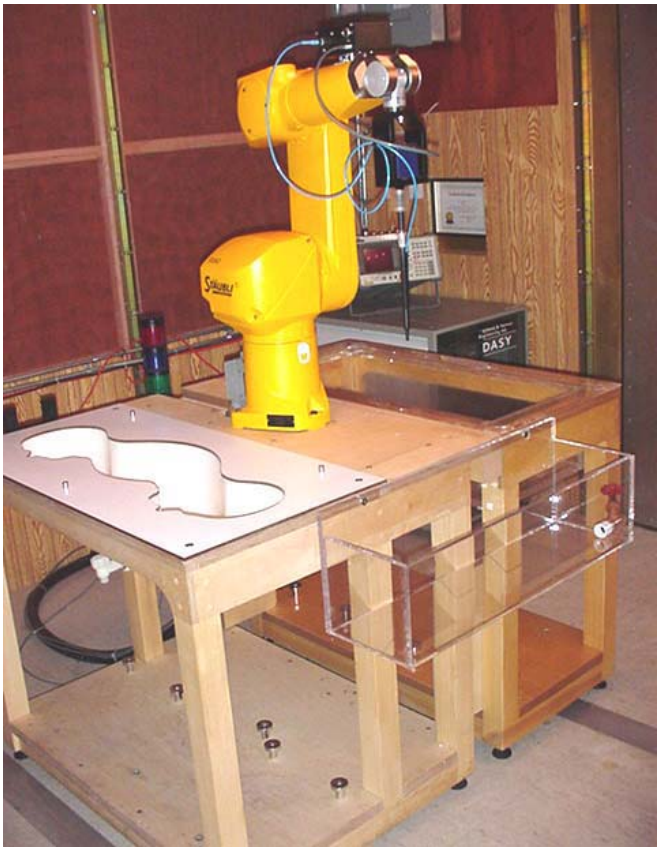
2.0 DESCRIPTION OF DEVICE UNDER TEST (DUT)

FCC Rule Part(s)	FCC 47 CFR §2.1093			
IC Rule Part(s)	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 Description	Portable FM VHF PTT Radio Transceiver			
FCC IDENTIFIER	ALH37683110			
IC IDENTIFER	282D-37683110			
Model(s)	TK-2212-1			
Serial No.	00000002		Identical Prototype	
Modulation	FM (VHF)			
Tx Frequency Range	136 - 174 MHz			
Max. RF Output Power Measured	37.27 dBm	5.33 Watts	136.1 MHz	Conducted
	37.19 dBm	5.24 Watts	155.1 MHz	Conducted
	36.99 dBm	5.00 Watts	173.9 MHz	Conducted
Battery Type(s) Tested	NiMH	7.5 V	1500 mAh	P/N: KNB-29N
Antenna Type(s) Tested	Long Whip	148-162 MHz	Length: 250 mm	P/N: KRA-25
	Whip	146-162 MHz	Length: 170 mm	P/N: KRA-26M
	Whip	162-174 MHz	Length: 170 mm	P/N: KRA-26M2
	Whip	136-150 MHz	Length: 170 mm	P/N: KRA-26M3
	Stubby	146-162 MHz	Length: 113 mm	P/N: KRA-22M
	Stubby	162-174 MHz	Length: 113 mm	P/N: KRA-22M2
	Stubby	136-150 MHz	Length: 113 mm	P/N: KRA-22M3
	Stubby	148-162 MHz	Length: 95 mm	P/N: KNB-16M
	Stubby	162-174 MHz	Length: 86 mm	P/N: KNB-16M2
	Stubby	130-150 MHz	Length: 100 mm	P/N: KNB-16M3
Body-Worn Accessories Tested	Belt-Clip (Plastic with Metal Spring)			P/N: KBH-10
	Speaker-Microphone			P/N: KMC-17
	Boom-Microphone Headset			P/N: KHS-21

3.0 SAR MEASUREMENT SYSTEM

Celltech Labs Inc. SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for brain and/or body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server. The DAE4 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the DASY4 measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

DASY4 SAR Measurement System with validation phantom



DASY4 SAR Measurement System with Plexiglas planar phantom

4.0 MEASUREMENT SUMMARY

FACE-HELD SAR EVALUATION RESULTS

Test Date	Freq. (MHz)	Chan.	Test Mode	Antenna Type	Antenna Part No.	Battery Type	Separation Distance to Planar Phantom (cm)	Cond. Power Before Test (dBm)	Measured SAR 1g (W/kg) Duty Cycle 100%	Measured SAR 1g (W/kg) Duty Cycle 50%	SAR Drift During Test (dB)	Scaled SAR 1g (W/kg) Duty Cycle 100%	Scaled SAR 1g (W/kg) Duty Cycle 50%
Nov-06	155.1	Mid	CW	Long Whip	KRA-25	NiMH	2.5	37.19	2.52	1.26	-0.766	3.01	1.50
Nov-23	136.1	Low	CW	Whip	KRA-26M3	NiMH	2.5	37.22	0.312	0.156	-0.200	0.327	0.163
Nov-06	155.1	Mid	CW	Whip	KRA-26M	NiMH	2.5	37.14	2.42	1.21	-0.595	2.78	1.39
Nov-06	173.9	High	CW	Whip	KRA-26M2	NiMH	2.5	36.90	1.88	0.940	-0.853	2.29	1.14
Nov-06	136.1	Low	CW	Stubby	KRA-22M3	NiMH	2.5	37.27	0.385	0.193	-0.0870	0.393	0.196
Nov-06	155.1	Mid	CW	Stubby	KRA-22M	NiMH	2.5	37.19	1.74	0.870	-0.984	2.18	1.09
Nov-06	173.9	High	CW	Stubby	KRA-22M2	NiMH	2.5	36.99	0.946	0.473	-1.48	1.33	0.665
Nov-06	136.1	Low	CW	Stubby	KRA-16M3	NiMH	2.5	37.20	0.235	0.118	-0.0935	0.240	0.120
Nov-06	155.1	Mid	CW	Stubby	KRA-16M	NiMH	2.5	37.12	0.777	0.389	-0.187	0.811	0.406
Nov-06	173.9	High	CW	Stubby	KRA-16M2	NiMH	2.5	36.93	1.32	0.660	-1.17	1.73	0.864

ANSI / IEEE C95.1 1999 - SAFETY LIMIT
BRAIN: 8.0 W/kg (averaged over 1 gram)
Spatial Peak - Controlled Exposure / Occupational

Measured Fluid Type	150 MHz Brain - Nov. 6			150 MHz Brain - Nov. 23			Test Date(s)	Nov-06	Nov-23	Unit
Dielectric Constant ε_r	IEEE Target		Measured	IEEE Target		Measured	Relative Humidity	33	33	%
	52.3	± 5%	53.1	52.3	± 5%	53.7	Atmospheric Pressure	102.2	102.2	kPa
Conductivity σ (mho/m)	IEEE Target		Measured	IEEE Target		Measured	Ambient Temperature	22.7	23.5	°C
	0.76	± 5%	0.73	0.76	± 5%	0.75	Fluid Temperature	21.7	21.3	°C
ρ (Kg/m^3)	1000						Fluid Depth	≥ 15	≥ 15	cm

Note(s):

1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. The power drifts measured by the DASY4 system for the duration of the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the above table.
3. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures reported were consistent for all measurement periods.
4. The dielectric parameters of the simulated tissue were measured prior to the evaluation using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).
5. The SAR evaluations were performed within 24 hours of the system performance check.

MEASUREMENT SUMMARY (Cont.)

BODY-WORN SAR EVALUATION RESULTS

Test Date	Freq. (MHz)	Chan.	Test Mode	Antenna Type	Antenna Part No.	Battery Type	Body-worn Accessories	Separation Distance to Planar Phantom (cm)	Cond Power Before Test (dBm)	Measured SAR 1g (W/kg) Duty Cycle 100%		Measured SAR 1g (W/kg) Duty Cycle 50%	SAR Drift During Test (dB)	Scaled SAR 1g (W/kg) Duty Cycle 100%		Scaled SAR 1g (W/kg) Duty Cycle 50%
Nov-25	155.1	Mid	CW	Long Whip	KRA-25	NiMH	Speaker-Mic and Belt-Clip	1.1	37.10	4.99		2.50	-0.813	6.02		3.01
Nov-25	155.1	Mid	CW	Long Whip	KRA-25	NiMH	Headset-Mic and Belt-Clip	1.1	37.18	3.64		1.82	-0.767	4.34		2.17
Nov-27	155.1	Mid	CW	Whip	KRA-26M	NiMH	Speaker-Mic and Belt-Clip	1.1	37.09	5.64		2.82	-0.734	6.68		3.34
Nov-27	155.1	Mid	CW	Whip	KRA-26M	NiMH	Headset-Mic and Belt-Clip	1.1	37.14	3.01		2.51	-0.478	3.36		1.68
Nov-27	136.1	Low	CW	Whip	KRA-26M3	NiMH	Speaker-Mic and Belt-Clip	1.1	37.24	1.05		0.525	-1.15	1.37		0.684
Nov-27	173.9	High	CW	Whip	KRA-26M2	NiMH	Speaker-Mic and Belt-Clip	1.1	36.88	1.38		0.690	-0.591	1.58		0.791
Nov-27	155.1	Mid	CW	Stubby	KRA-22M	NiMH	Speaker-Mic and Belt-Clip	1.1	37.11	4.17		2.09	-0.907	5.14		2.57
Nov-27	155.1	Mid	CW	Stubby	KRA-22M	NiMH	Headset-Mic and Belt-Clip	1.1	37.15	2.45		1.23	-0.499	2.75		1.37
Nov-27	136.1	Low	CW	Stubby	KRA-22M3	NiMH	Speaker-Mic and Belt-Clip	1.1	37.20	P	1.04	0.520	-1.51	P	1.47	0.736
									37.26	S	1.23	0.615	-1.39	S	1.69	0.847
Nov-27	173.9	High	CW	Stubby	KRA-22M2	NiMH	Speaker-Mic and Belt-Clip	1.1	36.91	1.05		0.525	-1.14	1.37		0.683
Nov-27	155.1	Mid	CW	Stubby	KRA-16M	NiMH	Speaker-Mic and Belt-Clip	1.1	37.10	3.43		1.72	-0.621	3.96		1.98
Nov-27	155.1	Mid	CW	Stubby	KRA-16M	NiMH	Headset-Mic and Belt-Clip	1.1	37.16	P	1.09	0.545	-0.725	P	1.29	0.644
									37.12	S	1.03	0.515	-0.813	S	1.24	0.621
Nov-27	136.1	Low	CW	Stubby	KRA-16M3	NiMH	Speaker-Mic and Belt-Clip	1.1	37.25	P	1.96	0.980	0.754	P	1.96	0.980
									37.24	S	1.73	0.865	1.06	S	1.73	0.865
Nov-27	173.9	High	CW	Stubby	KRA-16M2	NiMH	Speaker-Mic and Belt-Clip	1.1	36.99	1.19		0.595	-1.27	1.59		0.797

ANSI / IEEE C95.1 1999 - SAFETY LIMIT
BODY: 8.0 W/kg (averaged over 1 gram)
Spatial Peak - Controlled Exposure / Occupational

Measured Fluid Type	150 MHz Body - Nov. 25			150 MHz Body - Nov. 27			Test Date(s)	Nov-25	Nov-27	Unit
Dielectric Constant ε_r	IEEE Target		Measured	IEEE Target		Measured	Relative Humidity	36	32	%
	61.9	± 5%	61.6	61.9	± 5%	61.4	Atmospheric Pressure	101.1	102.2	kPa
Conductivity σ (mho/m)	IEEE Target		Measured	IEEE Target		Measured	Ambient Temperature	23.5	23.5	°C
	0.80	± 5%	0.81	0.80	± 5%	0.79	Fluid Temperature	22.5	22.1	°C
ρ (Kg/m^3)	1000						Fluid Depth	≥ 15	≥ 15	cm

Note(s):
1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. Secondary peak SAR levels within 2 dB of the primary were reported, as shown in the above test data table (P = Primary, S = Secondary).
3. The power drifts measured by the DASY4 system for the duration of the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the above table.
4. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures reported were consistent for all measurement periods.
5. The dielectric parameters of the simulated tissue were measured prior to the evaluation using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).
6. The SAR evaluations were performed within 24 hours of the system performance check.

5.0 DETAILS OF SAR EVALUATION

The Kenwood USA Corporation Model: TK-2212-1 Portable FM VHF PTT Radio Transceiver FCC ID: ALH37683110 was compliant for localized Specific Absorption Rate (Occupational / Controlled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix F.

1. The DUT was evaluated in a face-held configuration with the front of the radio placed parallel to the outer surface of the planar phantom. A 2.5 cm separation distance was maintained between the front side of the DUT and the outer surface of the planar phantom.
2. The DUT was evaluated in a body-worn configuration with the back of the radio placed parallel to the outer surface of the planar phantom. The attached belt-clip accessory was touching the planar phantom. The belt-clip accessory provided a 1.1 cm separation distance between the back of the DUT and the outer surface of the planar phantom. The DUT was evaluated for body-worn SAR with the speaker-microphone and boom-mic headset audio accessories consecutively at mid channel. The worst-case audio accessory was then further evaluated at the low and high channels.
3. The conducted power levels were measured before each test using a Gigatronics 8652A Universal Power Meter according to the procedures described in FCC 47 CFR §2.1046.
4. A SAR-versus-Time power drift evaluation was performed in the test configuration that reported the highest scaled SAR level. See Appendix A (SAR Test Plots) for SAR-versus-Time power drift evaluation plot.
5. The area scan evaluation was performed with a fully charged battery. After the area scan was completed the radio was cooled down to room temperature and the battery was replaced with a fully charged battery prior to the zoom scan evaluation.
6. The DUT was tested in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the transmit key constantly depressed. For a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
7. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures reported were consistent for all measurement periods.
8. The dielectric parameters of the simulated tissue mixtures were measured prior to the evaluation using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).
9. The SAR evaluations were performed using a Plexiglas planar phantom.
10. A stack of low-density, low-loss dielectric foamed polystyrene was used in place of the device holder.

6.0 EVALUATION PROCEDURES

a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.
(ii) For body-worn and face-held devices a planar phantom was used.

b. The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.

An area scan was determined as follows:

c. Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.

d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.

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

e. Extrapolation is used to find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, since the center of the dipoles is 2.7 mm away form the tip of the probe and the distance between the surface and the lowest measuring point is 1.4 mm (see probe calibration document in Appendix D). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.

f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).

g. A zoom scan volume of 32 mm x 32 mm x 30 mm (5 x 5 x 7 points) centered at the peak SAR location determined from the area scan is used for all zoom scans for devices with a transmit frequency < 800 MHz. Zoom scans for frequencies ≥ 800 MHz are determined with a scan volume of 30 mm x 30 mm x 30 mm (7 x 7 x 7) to ensure complete capture of the peak spatial-average SAR.

7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations a system check was performed on a daily basis using a planar phantom with a 300MHz dipole (see Appendix C for system validation procedure). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters). A forward power of 250mW was applied to the dipole and the system was verified to a tolerance of ±10% (see Appendix B for system performance check test plots).

SYSTEM PERFORMANCE CHECK

Test Date	300MHz Equiv. Tissue	SAR 1g (W/kg)		Dielectric Constant ε_r		Conductivity σ (mho/m)		ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		IEEE Target	Measured	IEEE Target	Measured	IEEE Target	Measured						
11/06/04	Brain	**0.750 (±10%)**	0.709 (-5.5%)	**45.3 ±5%**	44.9	**0.87 ±5%**	0.83	1000	21.8	21.4	≥ 15	33	102.2
11/23/04	Brain	**0.750 (±10%)**	0.732 (-2.4%)	**45.3 ±5%**	44.8	**0.87 ±5%**	0.84	1000	22.8	22.2	≥ 15	33	102.2
11/25/04	Brain	**0.750 (±10%)**	0.730 (-2.7%)	**45.3 ±5%**	44.8	**0.87 ±5%**	0.84	1000	23.3	21.8	≥ 15	34	101.0
11/27/04	Brain	**0.750 (±10%)**	0.736 (-1.9%)	**45.3 ±5%**	44.5	**0.87 ±5%**	0.84	1000	23.3	22.1	≥ 15	31	102.2

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

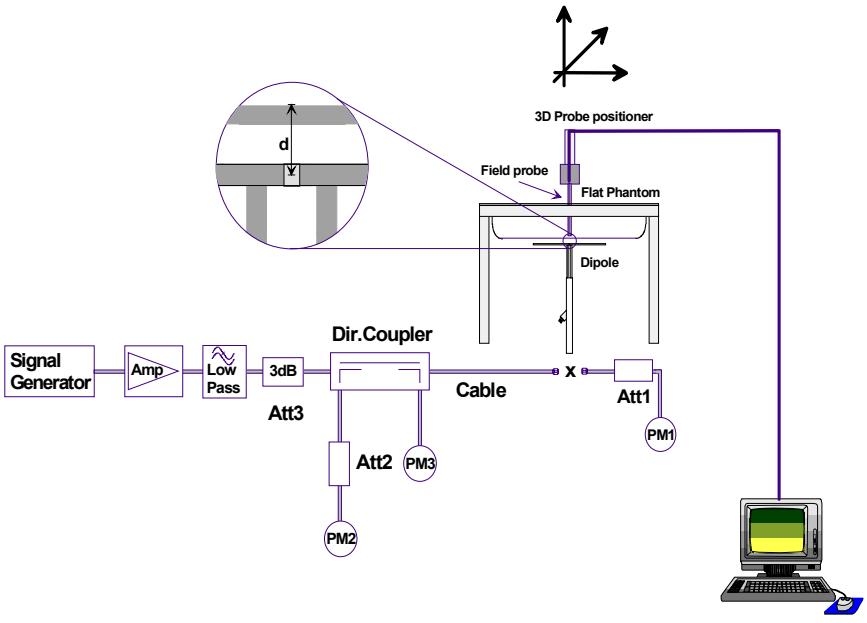


Figure 1. System Performance Check Setup Diagram

300MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

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

SIMULATED TISSUE MIXTURES			
INGREDIENT	300 MHz Brain (%)	150 MHz Brain (%)	150 MHz Body (%)
	System Check	DUT Evaluation	DUT 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 1g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10g)	4.0	20.0

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

10.0 ROBOT SYSTEM SPECIFICATIONS

Specifications

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

Data Acquisition Electronic (DAE) System

Cell Controller

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

Data Converter

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

DASY4 Measurement Server

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

E-Field Probe

Model: ET3DV6
Serial No.: 1387
Construction: Triangular core fiber optic detection system
Frequency: 10 MHz to 6 GHz
Linearity: ±0.2 dB (30 MHz to 3 GHz)

Phantom(s)

Evaluation Phantom

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

Validation Phantom (≤ 450MHz)

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

11.0 PROBE SPECIFICATION (ET3DV6)

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

ET3DV6 E-Field Probe

12.0 PLANAR PHANTOM

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

Planar Phantom

13.0 VALIDATION PLANAR PHANTOM

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

Validation Planar Phantom

14.0 DEVICE HOLDER

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

Device Holder

15.0 TEST EQUIPMENT LIST

TEST EQUIPMENT	SERIAL NO.	CALIBRATION DATE
Schmid & Partner DASY4 System	-	-
DASY4 Measurement Server	1078	N/A
-Robot	599396-01	N/A
-DAE3	353	Dec 2003
-DAE3	370	May 2004
-ET3DV6 E-Field Probe	1387	Mar 2004
-ET3DV6 E-Field Probe	1590	May 2004
-300MHz Validation Dipole	135	Oct 2004
-450MHz Validation Dipole	136	Nov 2004
-835MHz Validation Dipole	411	Mar 2004
-900MHz Validation Dipole	054	June 2004
-1800MHz Validation Dipole	247	June 2004
-1900MHz Validation Dipole	151	June 2004
-2450MHz Validation Dipole	150	Sept 2004
-SAM Phantom V4.0C	1033	N/A
-Barski Planar Phantom	03-01	N/A
-Plexiglas Planar Phantom	161	N/A
-Validation Planar Phantom	137	N/A
HP 85070C Dielectric Probe Kit	N/A	N/A
Gigatronics 8651A Power Meter	8650137	April 2004
Gigatronics 8652A Power Meter	1835267	April 2004
Gigatronics 80701A Power Sensor	1833535	April 2004
Gigatronics 80701A Power Sensor	1833542	April 2004
Gigatronics 80701A Power Sensor	1834350	April 2004
HP 8594E Spectrum Analyzer	3543A02721	April 2004
HP 8753E Network Analyzer	US38433013	April 2004
HP 8648D Signal Generator	3847A00611	April 2004
Amplifier Research 5S1G4 Power Amplifier	26235	N/A

16.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION

Error Description	Uncertainty Value ±%	Probability Distribution	Divisor	c_i 1g	Standard Uncertainty ±% (1g)	v_i or v_{eff}
Measurement System						
Probe calibration	± 4.0	Normal	1	1	± 4.0	∞
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					**± 13.03**	
Expanded Uncertainty (k=2)					**± 26.07**	

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

MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION

Error Description	Uncertainty Value ±%	Probability Distribution	Divisor	c_i 1g	Standard Uncertainty ±% (1g)	v_i or v_{eff}
Measurement System						
Probe calibration	± 4.0	Normal	1	1	± 4.0	∞
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					**± 9.58**	
Expanded Uncertainty (k=2)					**± 19.16**	

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

17.0 REFERENCES

[1] Federal Communications Commission, “Radiofrequency radiation exposure evaluation: portable devices”, Rule Part 47 CFR §2.1093: 1999.

[2] Health Canada, “Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz”, Safety Code 6.

[3] Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.

[4] Industry Canada, “Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada’s Safety Code 6 for Exposure of Humans to Radio Frequency Fields”, Radio Standards Specification RSS-102 Issue 1 (Provisional): September 1999.

[5] IEEE Std 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”: June 2003.

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 11/06/04

System Performance Check - 300 MHz Dipole

DUT: Dipole 300 MHz; Model: D300V2; Type: System Performance Check; Serial: 135; Calibrated: 10/26/2004

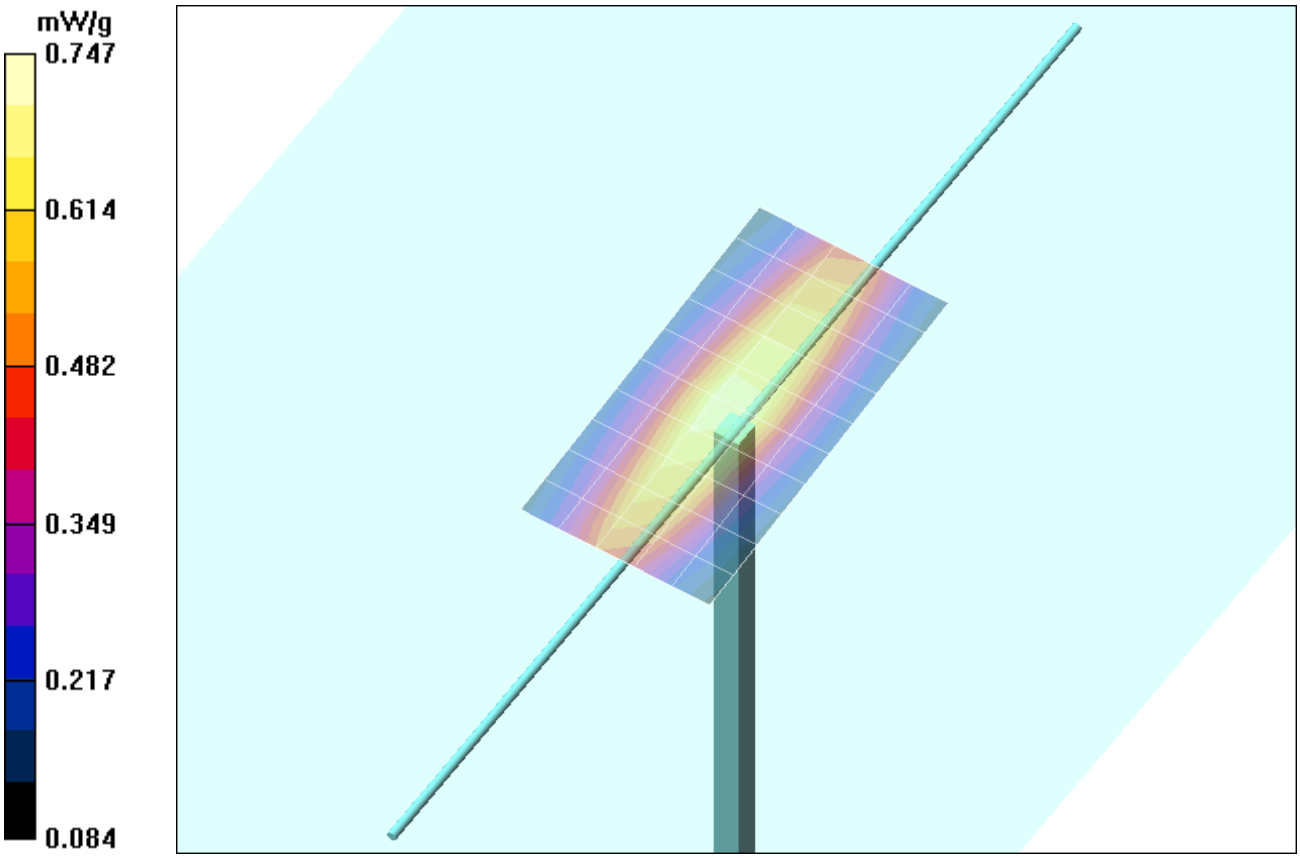
Ambient Temp: 21.8 °C; Fluid Temp: 21.4 °C; Barometric Pressure: 102.2 kPa; Humidity: 33%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 300 MHz; Duty Cycle: 1:1
Medium: 300 HSL (σ = 0.83 mho/m; ε_r = 44.9; ρ = 1000 kg/m^3)

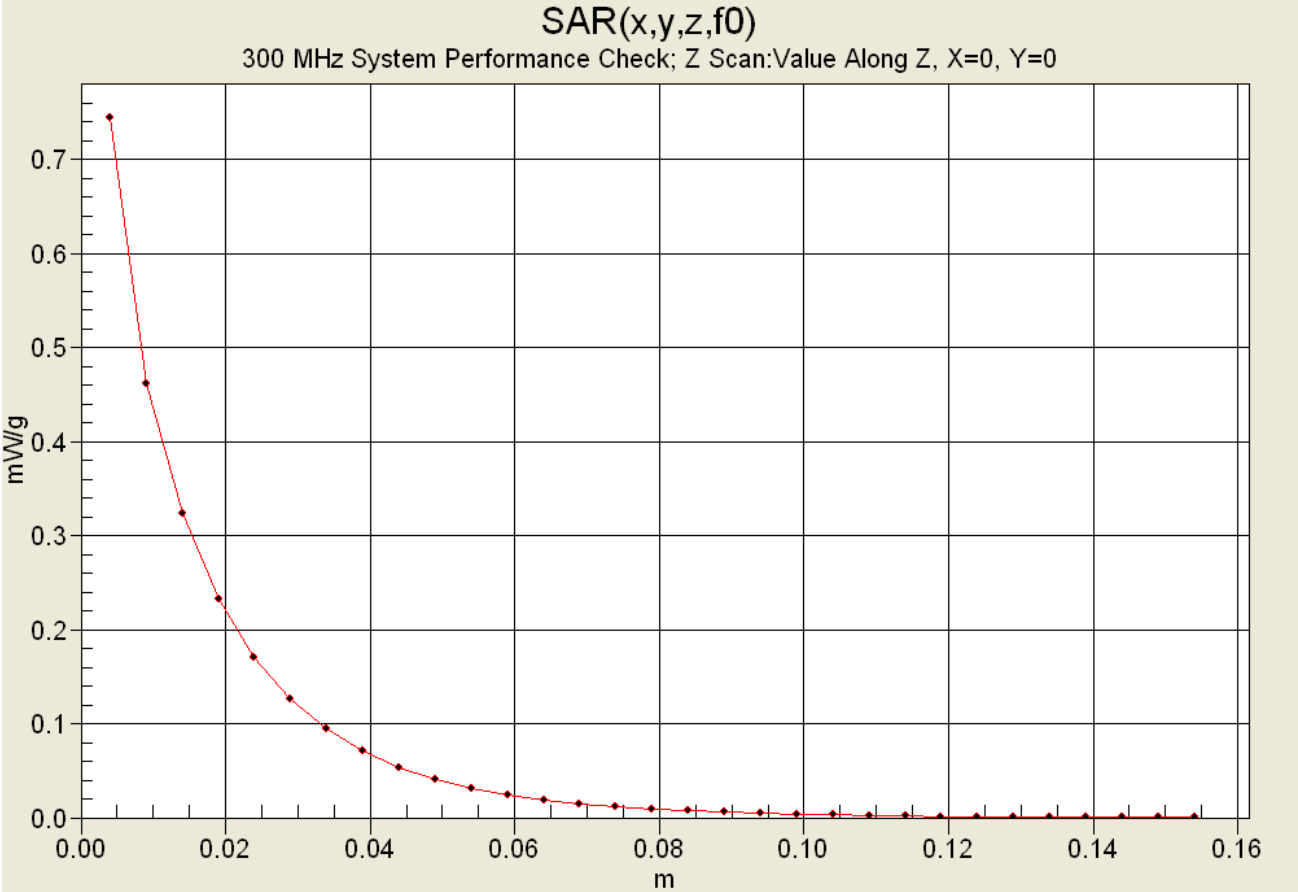
- Probe: ET3DV6 - SN1387; ConvF(7.8, 7.8, 7.8); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 14/05/2004
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

300 MHz Dipole - System Performance Check/Area Scan (6x11x1):
Measurement grid: dx=15mm, dy=15mm

300 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 1.26 W/kg
SAR(1 g) = 0.709 mW/g; SAR(10 g) = 0.462 mW/g



Z-Axis Scan



Date Tested: 11/23/04

System Performance Check - 300 MHz Dipole

DUT: Dipole 300 MHz; Model: D300V2; Type: System Performance Check; Serial: 135; Calibrated: 10/26/2004

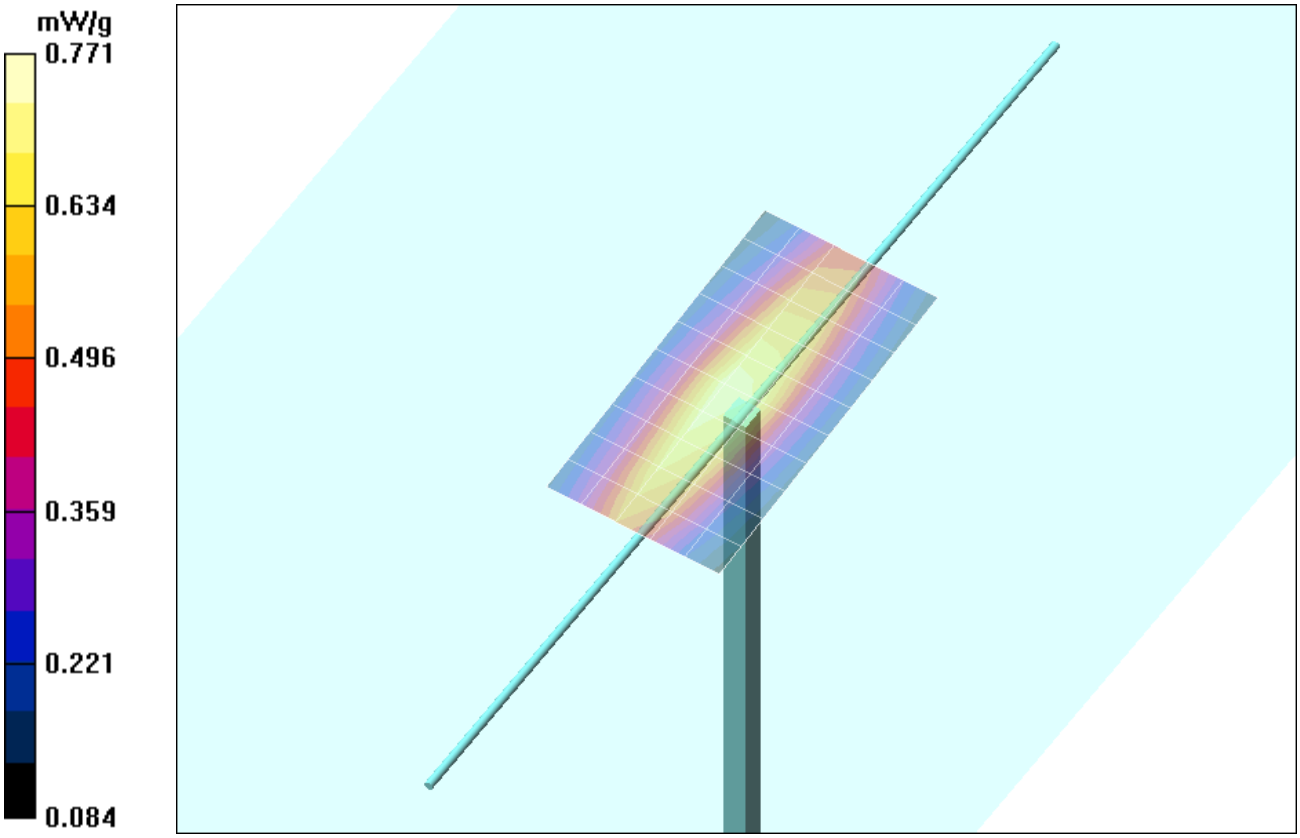
Ambient Temp: 22.8 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 102.2 kPa; Humidity: 33%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 300 MHz; Duty Cycle: 1:1
Medium: 300 HSL (σ = 0.84 mho/m; ε_r = 44.8; ρ = 1000 kg/m^3)

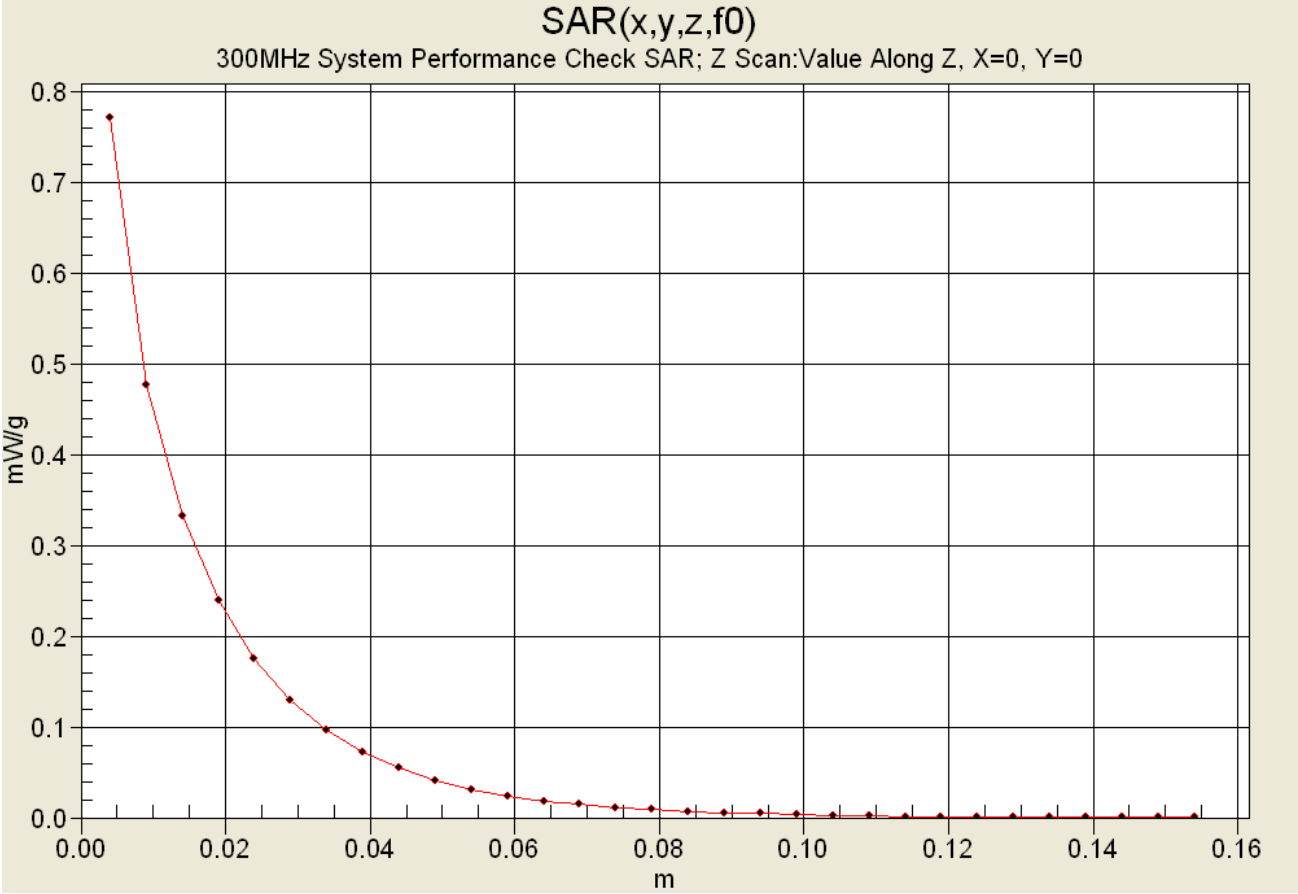
- Probe: ET3DV6 - SN1387; ConvF(7.8, 7.8, 7.8); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 14/05/2004
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

300 MHz Dipole - System Performance Check/Area Scan (6x11x1):
Measurement grid: dx=15mm, dy=15mm

300 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.3 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.3 W/kg
SAR(1 g) = 0.732 mW/g; SAR(10 g) = 0.475 mW/g



Z-Axis Scan



Date Tested: 11/25/04

System Performance Check - 300 MHz Dipole

DUT: Dipole 300 MHz; Model: D300V2; Type: System Performance Check; Serial: 135; Calibrated: 10/26/2004

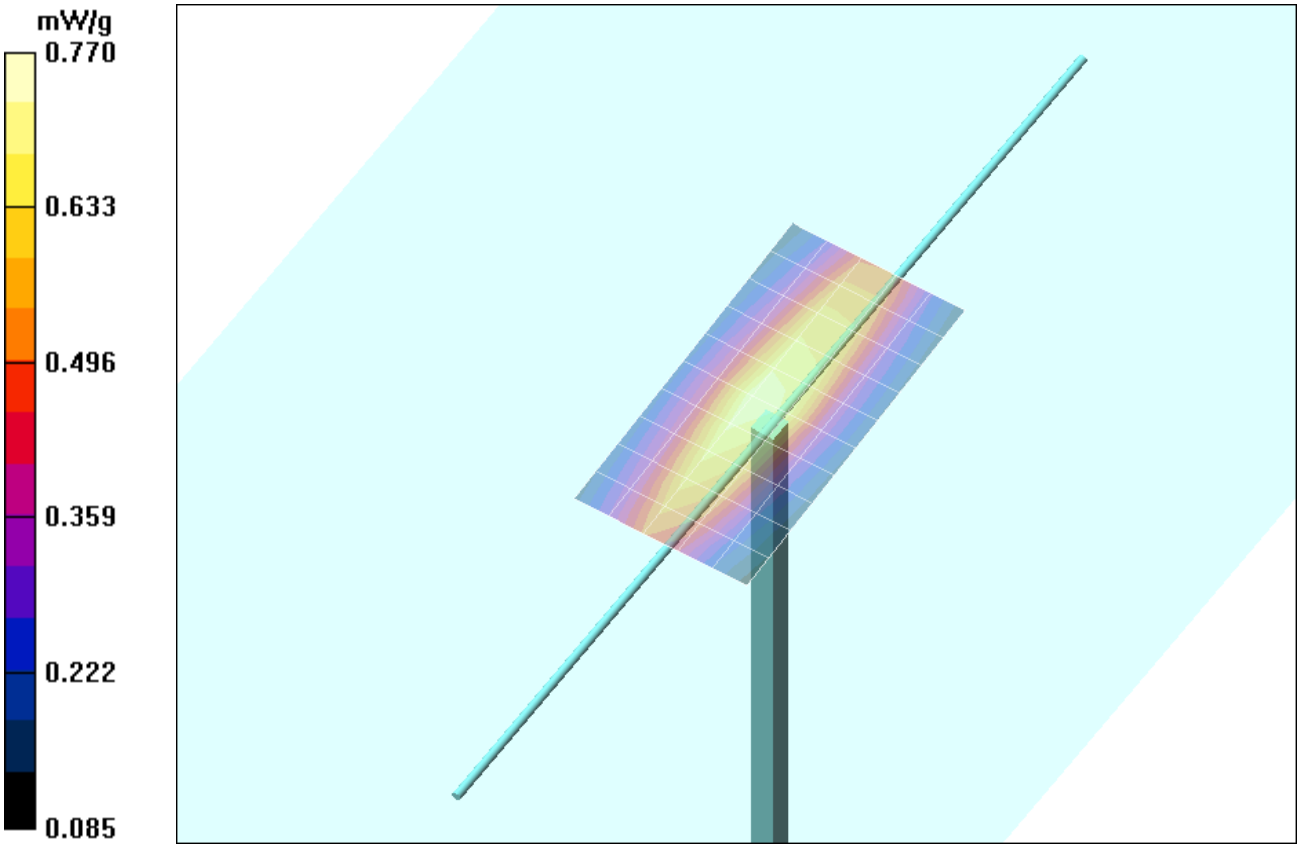
Ambient Temp: 23.3 °C; Fluid Temp: 21.8 °C; Barometric Pressure: 101.0 kPa; Humidity: 34%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 300 MHz; Duty Cycle: 1:1
Medium: 300 HSL (σ = 0.84 mho/m; ε_r = 44.8; ρ = 1000 kg/m^3)

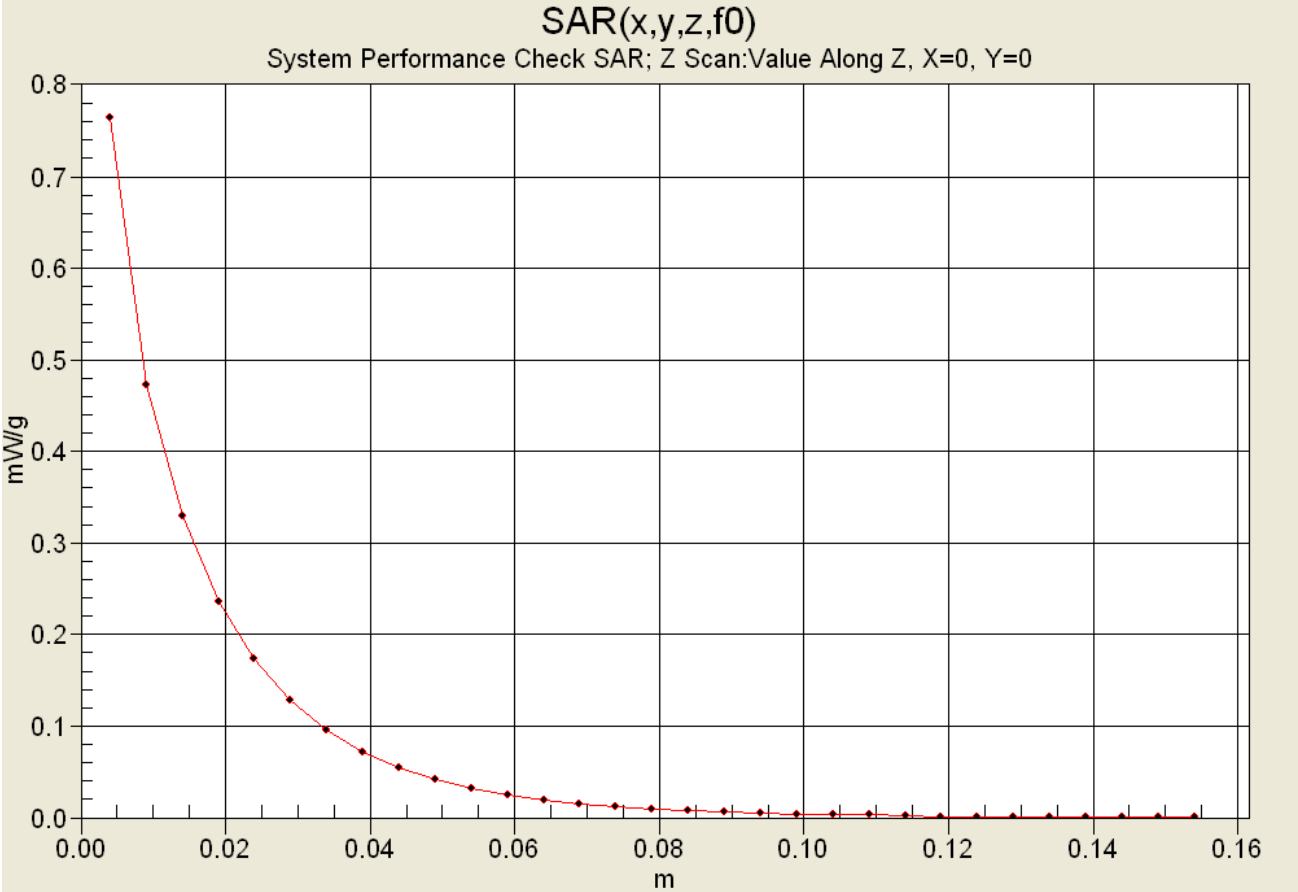
- Probe: ET3DV6 - SN1387; ConvF(7.8, 7.8, 7.8); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 14/05/2004
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

300 MHz Dipole - System Performance Check/Area Scan (6x11x1):
Measurement grid: dx=15mm, dy=15mm

300 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.3 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.3 W/kg
SAR(1 g) = 0.730 mW/g; SAR(10 g) = 0.474 mW/g



Z-Axis Scan



Date Tested: 11/27/04

System Performance Check - 300 MHz Dipole

DUT: Dipole 300 MHz; Model: D300V2; Type: System Performance Check; Serial: 135; Calibrated: 10/26/2004

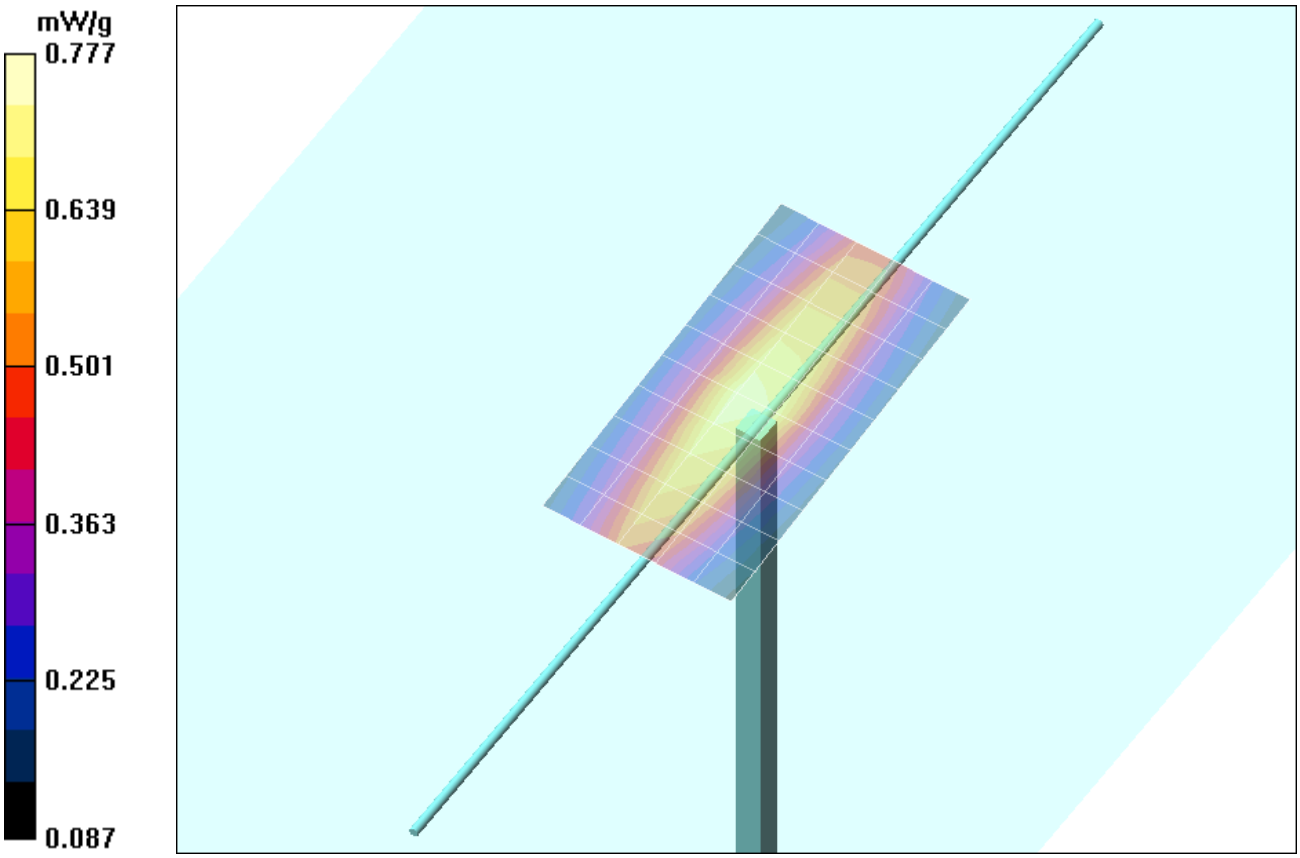
Ambient Temp: 23.3 °C; Fluid Temp: 22.1 °C; Barometric Pressure: 102.2 kPa; Humidity: 31%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 300 MHz; Duty Cycle: 1:1
Medium: 300 HSL (σ = 0.84 mho/m; ε_r = 44.5; ρ = 1000 kg/m^3)

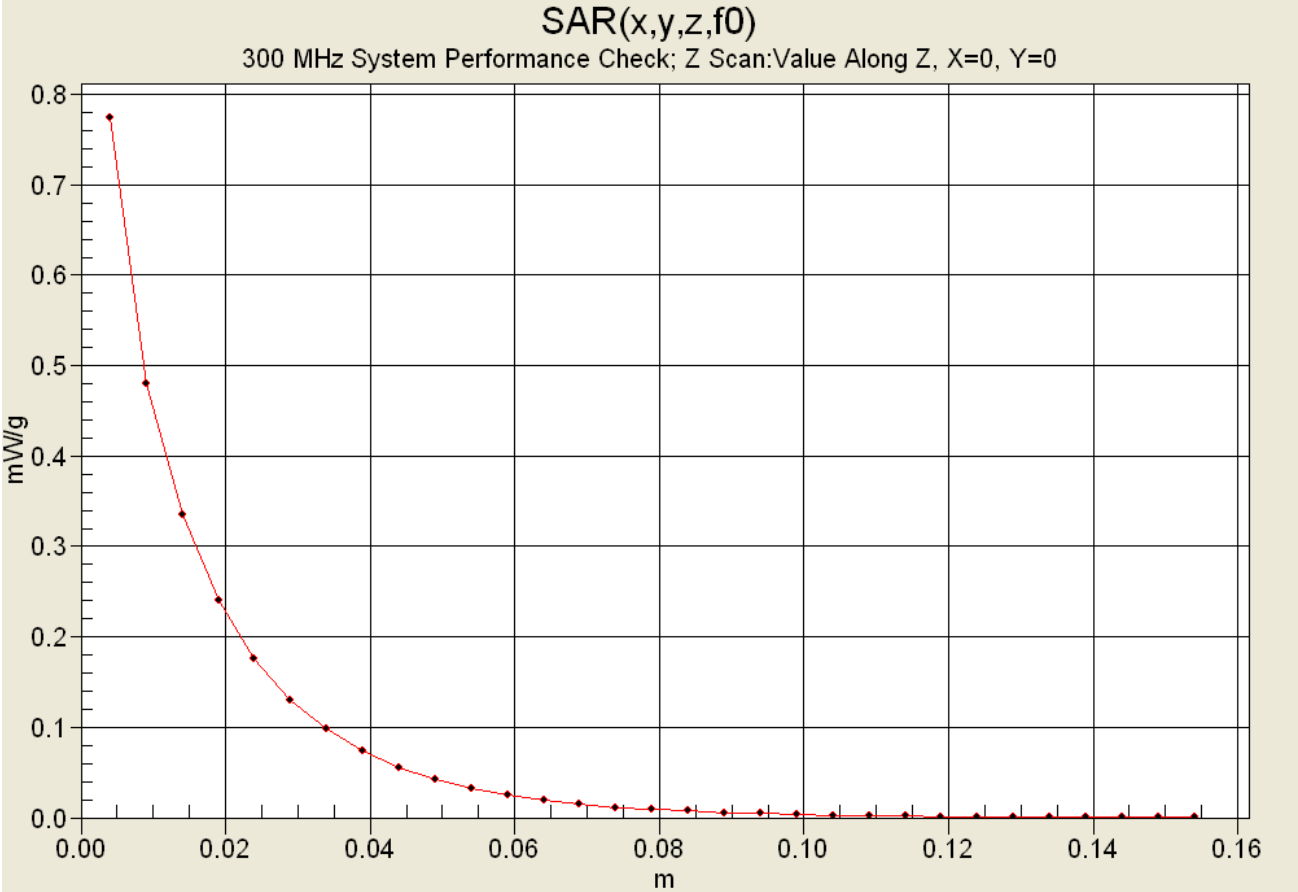
- Probe: ET3DV6 - SN1387; ConvF(7.8, 7.8, 7.8); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 14/05/2004
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

300 MHz Dipole - System Performance Check/Area Scan (6x11x1):
Measurement grid: dx=15mm, dy=15mm

300 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.5 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.736 mW/g; SAR(10 g) = 0.477 mW/g



Z-Axis Scan



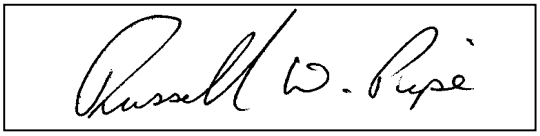
APPENDIX C - SYSTEM VALIDATION

300 MHz SYSTEM VALIDATION DIPOLE

Type:	**300 MHz Validation Dipole**
Serial Number:	**135**
Place of Calibration:	**Celltech Labs Inc.**
Date of Calibration:	**October 26, 2004**

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

Calibrated by: 

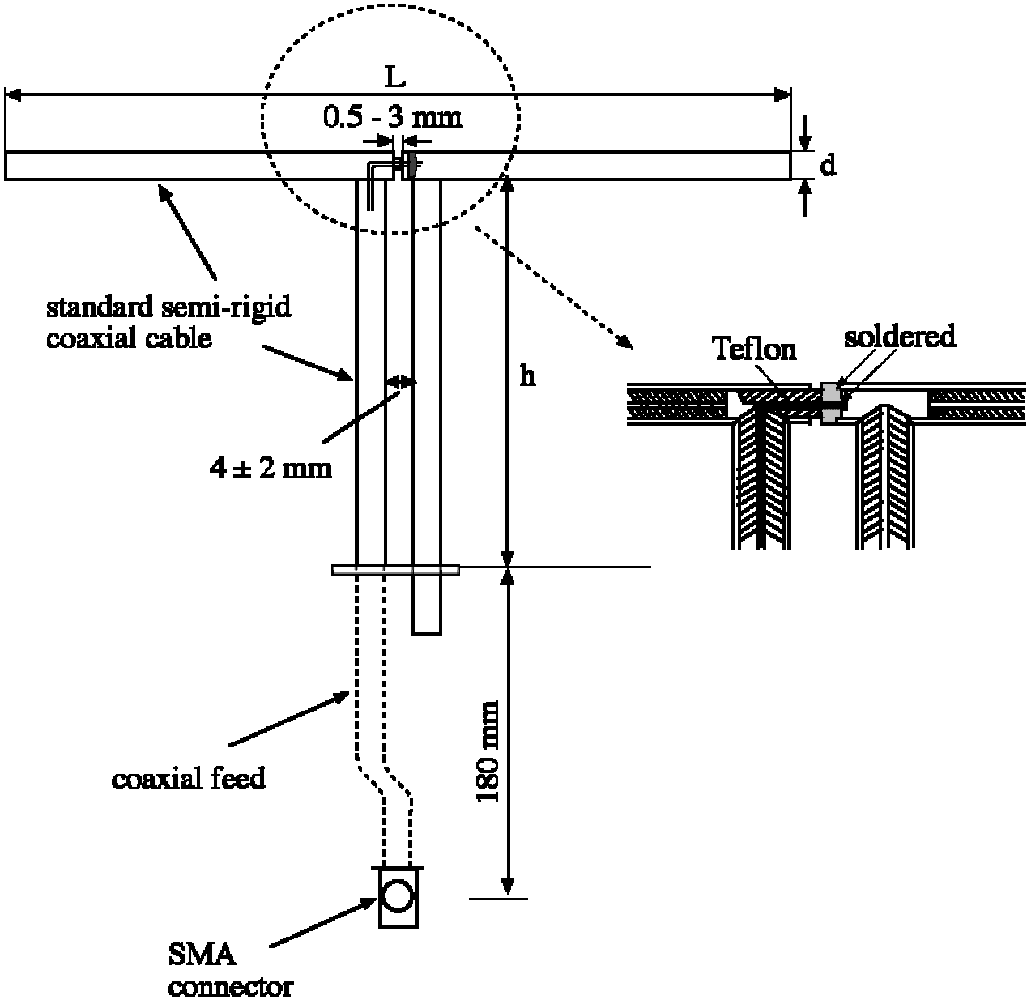
Approved by: 

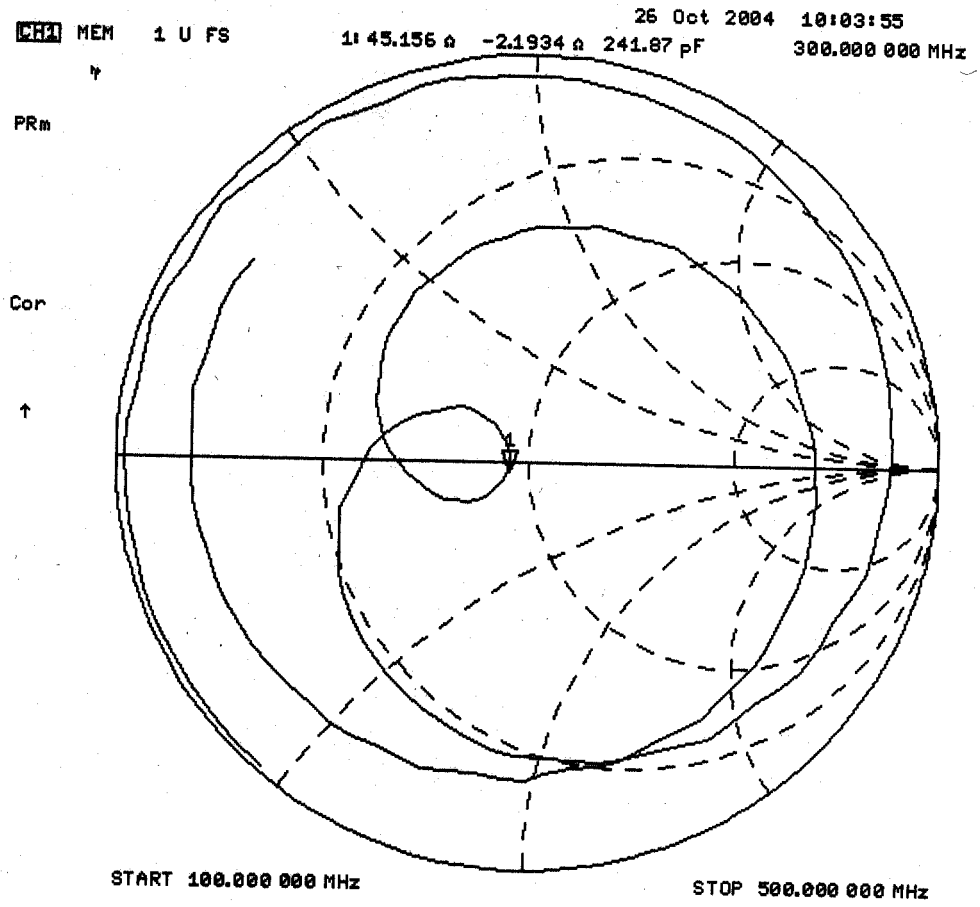
Celltech Labs Inc. 1955 Moss Court, Kelowna, B.C. Canada V1Y 9L3
Tel. 250-448-7047 • Fax. 250-448-7046 • e-mail: info@celltechlabs.com
www.celltechlabs.com

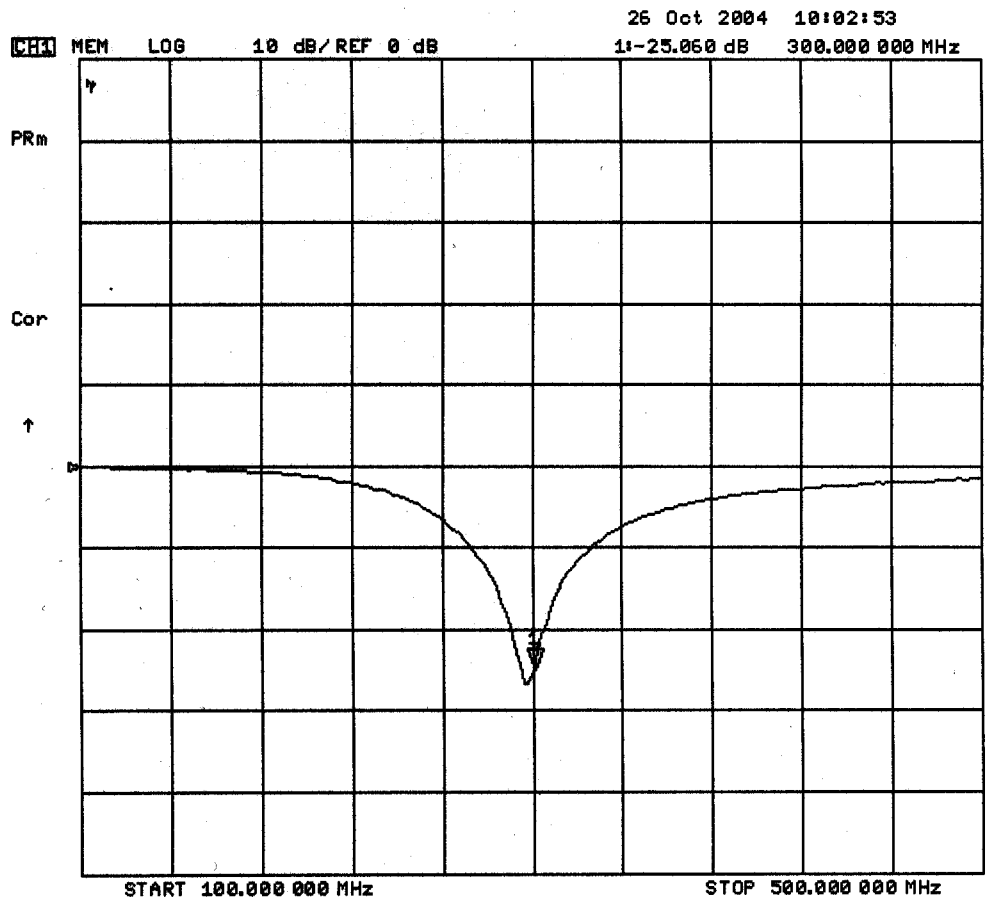
1. Validation Dipole Construction & Electrical Characteristics

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} = 45.156Ω
	Im{Z} = -2.1934Ω
Return Loss at 300MHz	-25.060dB




CH1 MEM 1 U FS
1: 45.156 Ω -2.1934 Ω 241.87 pF
26 Oct 2004 10:03:55
300.000 000 MHz
PRm
Cor
START 100.000 000 MHz
STOP 500.000 000 MHz


26 Oct 2004 10:02:53
CH1 MEM LOG 10 dB/ REF 0 dB
1:-25.060 dB 300.000 000 MHz
PRm
Cor
START 100.000 000 MHz
STOP 500.000 000 MHz

2. Validation Dipole Dimensions

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

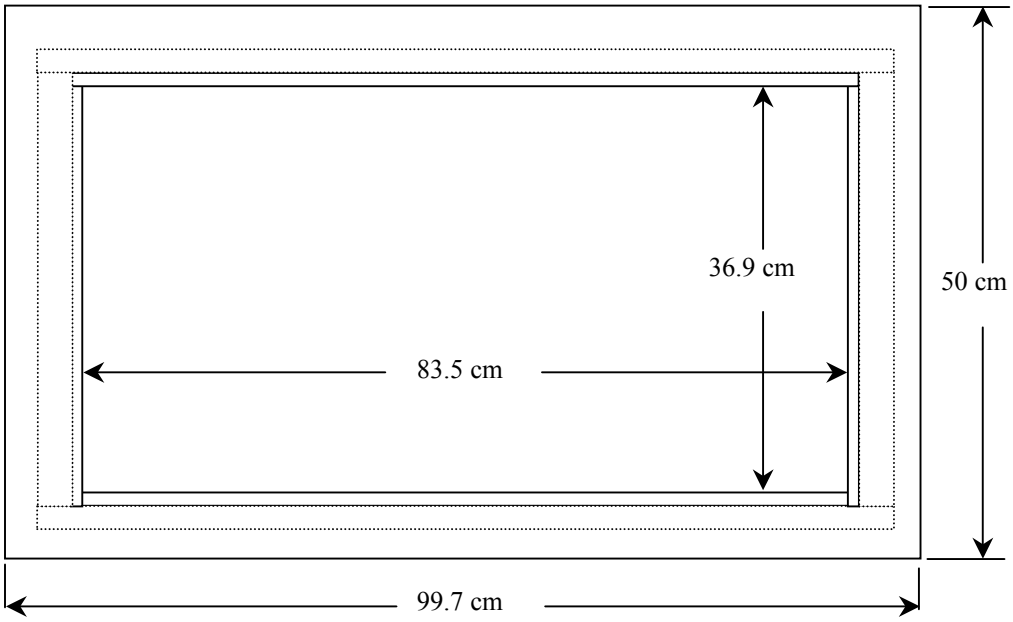
3. Validation Phantom

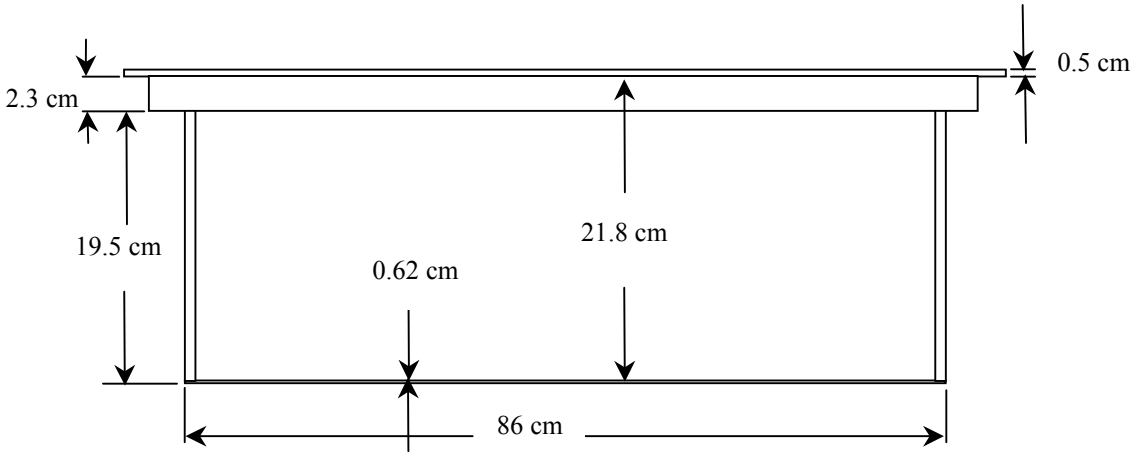
The validation phantom was constructed using relatively low-loss tangent Plexiglas material. The inner dimensions of the phantom are as follows:

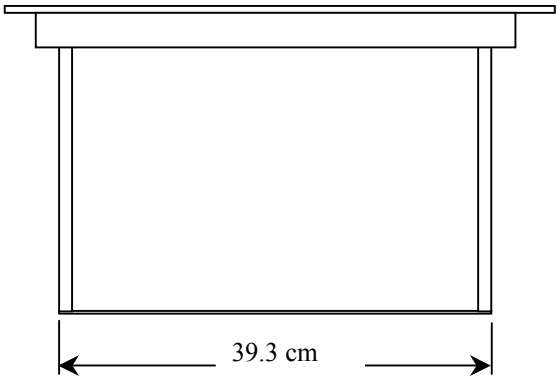
Length: 83.5 cm
Width: 36.9 cm
Height: 21.8 cm

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

4. Dimensions of Plexiglas Planar Phantom







5. 300 MHz System Validation Setup

300 MHz Validation Dipole Setup

6. Measurement Conditions

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

Relative Permittivity:	45.9
Conductivity:	0.87 mho/m
Fluid Temperature:	22.8 °C
Fluid Depth:	≥ 15 cm

Environmental Conditions:

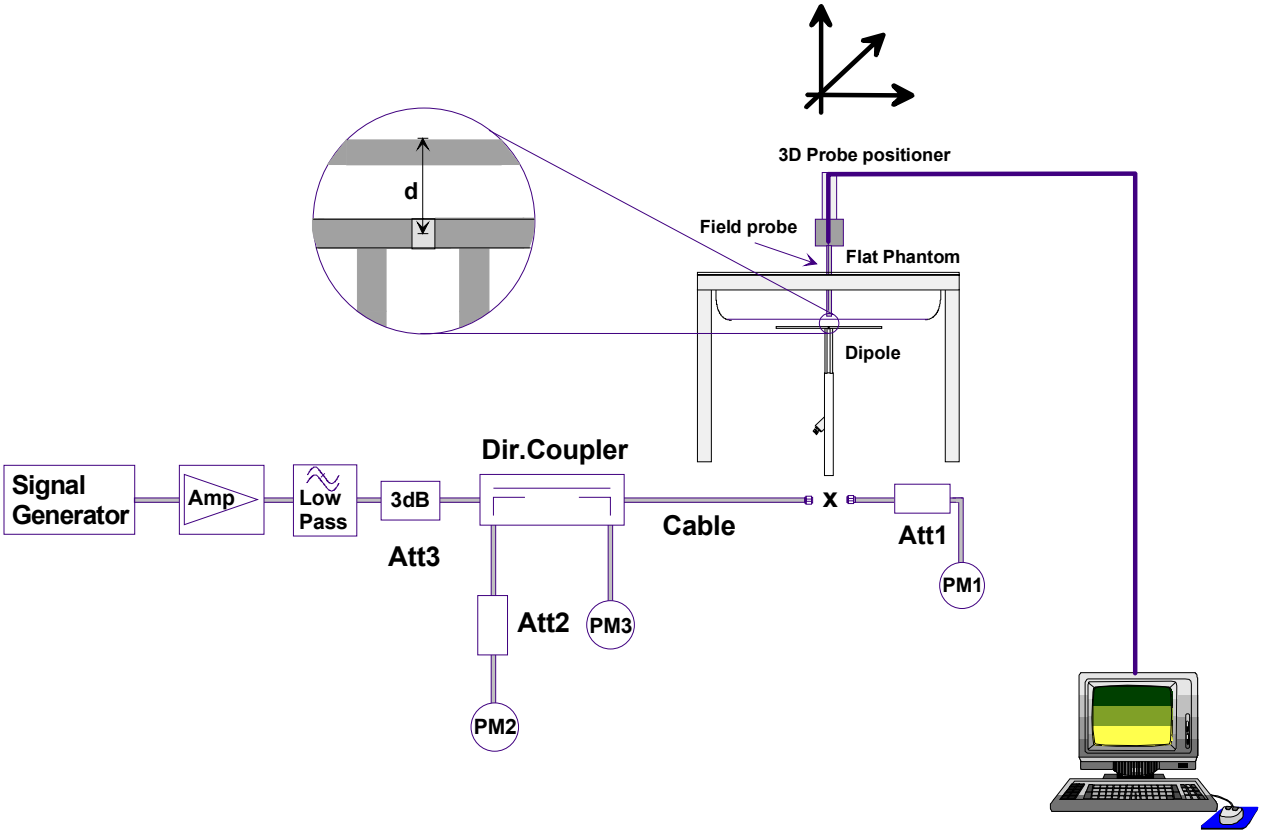
Ambient Temperature:	23.7 °C
Humidity:	33 %
Barometric Pressure:	101.9 kPa

The 300 MHz simulated brain tissue mixture 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%
300 MHz Target Dielectric Parameters at 22°C	ε_r = 45.3 σ = 0.87 S/m

7. SAR Measurement

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



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

8. Validation Dipole SAR Test Results

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

Validation Measurement	SAR @ 0.25W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.25W Input averaged over 10g	SAR @ 1W Input averaged over 10g	Peak SAR @ 0.25W Input
Test 1	0.740	2.96	0.478	1.91	0.779
Test 2	0.736	2.94	0.475	1.90	0.773
Test 3	0.747	2.99	0.482	1.93	0.790
Test 4	0.735	2.94	0.476	1.90	0.776
Test 5	0.743	2.97	0.480	1.92	0.781
Test 6	0.741	2.96	0.479	1.92	0.782
Test 7	0.742	2.97	0.480	1.92	0.780
Test 8	0.740	2.96	0.478	1.91	0.777
Test 9	0.748	2.99	0.484	1.94	0.787
Test 10	0.744	2.98	0.481	1.92	0.781
Average Value	0.742	2.97	0.479	1.92	0.781

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

IEEE Target over $1cm^3$ (1g) of tissue: 3.0 mW/g (+/- 10%)

Averaged over $1cm^3$ (1g) of tissue: 2.97 mW/g (-3% deviation)

IEEE Target over $10cm^3$ (10g) of tissue: 2.0 mW/g (+/- 10%)

Averaged over $10cm^3$ (10g) of tissue: 1.92 mW/g (-4% deviation)

300 MHz System Validation - October 26, 2004

DUT: Dipole 300 MHz; Model: D300V2; Serial: 135; Calibrated: 10/26/04
Ambient Temp: 23.7 °C; Fluid Temp: 22.8 °C; Barometric Pressure: 101.9 kPa; Humidity: 33%

Communication System: CW
Frequency: 300 MHz; Duty Cycle: 1:1
Medium: 300 HSL (σ = 0.87 mho/m; ε_r = 45.9; ρ = 1000 kg/m^3)
- Probe: ET3DV6 - SN1387; ConvF(7.8, 7.8, 7.8); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 14/05/2004
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

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

300 MHz System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.740 mW/g; SAR(10 g) = 0.478 mW/g

300 MHz System Validation/Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.8 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.736 mW/g; SAR(10 g) = 0.475 mW/g

300 MHz System Validation/Zoom Scan 3 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 1.34 W/kg
SAR(1 g) = 0.747 mW/g; SAR(10 g) = 0.482 mW/g

300 MHz System Validation/Zoom Scan 4 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.8 V/m; Power Drift = 0.005 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.735 mW/g; SAR(10 g) = 0.476 mW/g

300 MHz System Validation/Zoom Scan 5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.33 W/kg
SAR(1 g) = 0.743 mW/g; SAR(10 g) = 0.480 mW/g

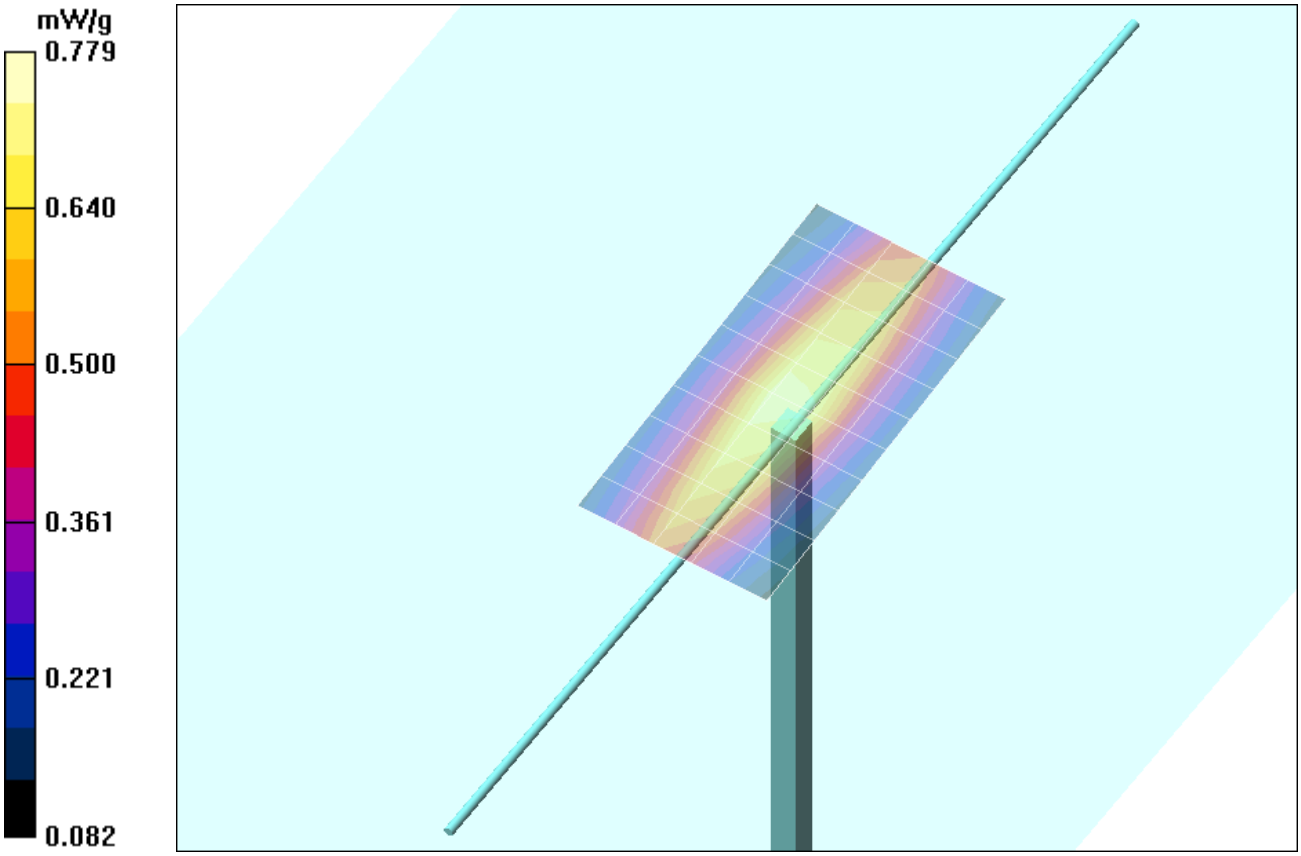
300 MHz System Validation/Zoom Scan 6 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.33 W/kg
SAR(1 g) = 0.741 mW/g; SAR(10 g) = 0.479 mW/g

300 MHz System Validation/Zoom Scan 7 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.742 mW/g; SAR(10 g) = 0.480 mW/g

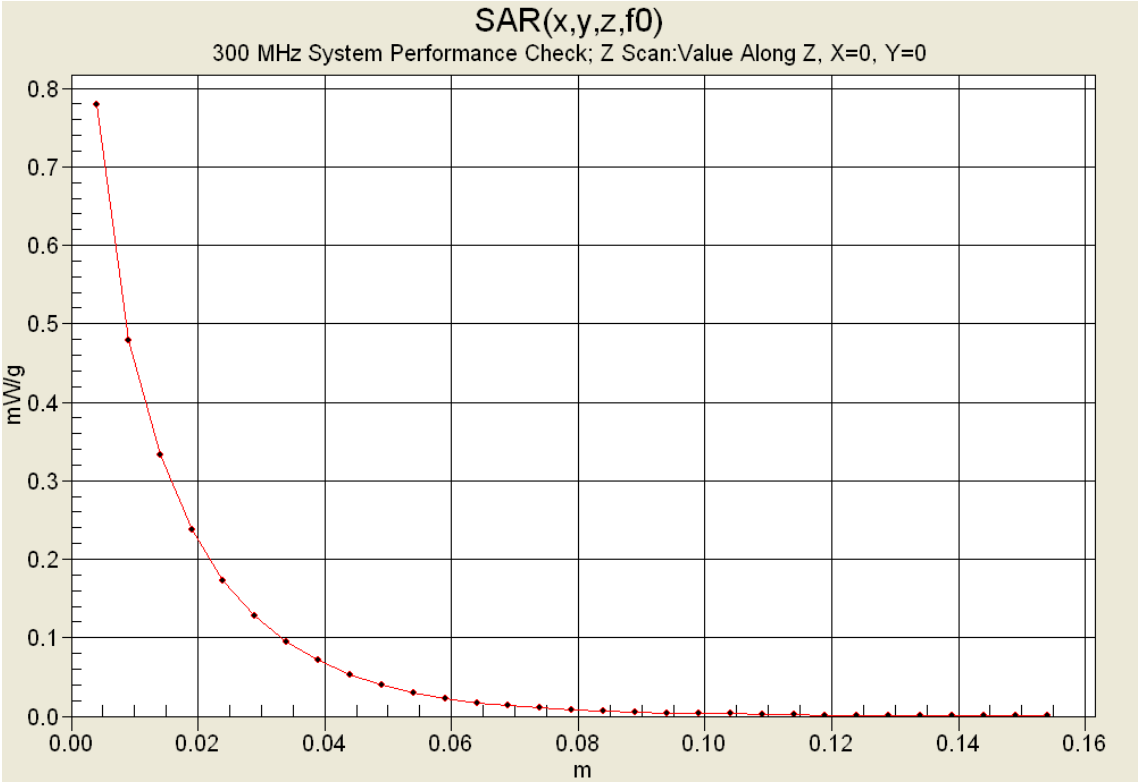
300 MHz System Validation/Zoom Scan 8 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.9 V/m; Power Drift = 4e-005 dB
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.740 mW/g; SAR(10 g) = 0.478 mW/g

300 MHz System Validation/Zoom Scan 9 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 1.34 W/kg
SAR(1 g) = 0.748 mW/g; SAR(10 g) = 0.484 mW/g

300 MHz Validation/Zoom Scan 10 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.9 V/m; Power Drift = 0.005 dB
Peak SAR (extrapolated) = 1.33 W/kg
SAR(1 g) = 0.744 mW/g; SAR(10 g) = 0.481 mW/g



1 g average of 10 measurements: 0.742 mW/g
10 g average of 10 measurements: 0.479 mW/g



300 MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

October 26, 2004

Frequency	e'	e"
200.000000 MHz	49.9683	70.5699
210.000000 MHz	49.2757	67.8974
220.000000 MHz	49.0561	65.5986
230.000000 MHz	48.5199	63.5063
240.000000 MHz	47.9983	61.3980
250.000000 MHz	47.6116	59.5294
260.000000 MHz	47.1692	57.8735
270.000000 MHz	46.7769	56.3204
280.000000 MHz	46.4409	54.8280
290.000000 MHz	46.0613	53.4572
300.000000 MHz	45.8972	52.0989
310.000000 MHz	45.6039	51.0027
320.000000 MHz	45.2697	49.7697
330.000000 MHz	44.7890	48.6923
340.000000 MHz	44.3811	47.7213
350.000000 MHz	44.0222	46.8979
360.000000 MHz	43.6368	46.0075
370.000000 MHz	43.3432	45.1665
380.000000 MHz	43.1554	44.4459
390.000000 MHz	42.9327	43.7340
400.000000 MHz	42.6580	43.0434

APPENDIX D - PROBE CALIBRATION

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

Client **Celltech**

CALIBRATION CERTIFICATE

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

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

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS, No. 251-0340)	Apr-04
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05

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

Date issued: March 18, 2004

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

Probe ET3DV6

SN:1387

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

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space

Diode Compression[A]

NormX	**1.62** $\mu V/(V/m)^2$	DCP X	**92**	mV
NormY	**1.71** $\mu V/(V/m)^2$	DCP Y	**92**	mV
NormZ	**1.71** $\mu V/(V/m)^2$	DCP Z	**92**	mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Plese see Page 7.

Boundary Effect

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

Sensor Cener to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	9.3	4.4
SAR_{be} [%]	With Correction Algorithm	0.0	0.1

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

Sensor to Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	14.8	10.0
SAR_{be} [%]	With Correction Algorithm	0.2	0.0

Sensor Offset

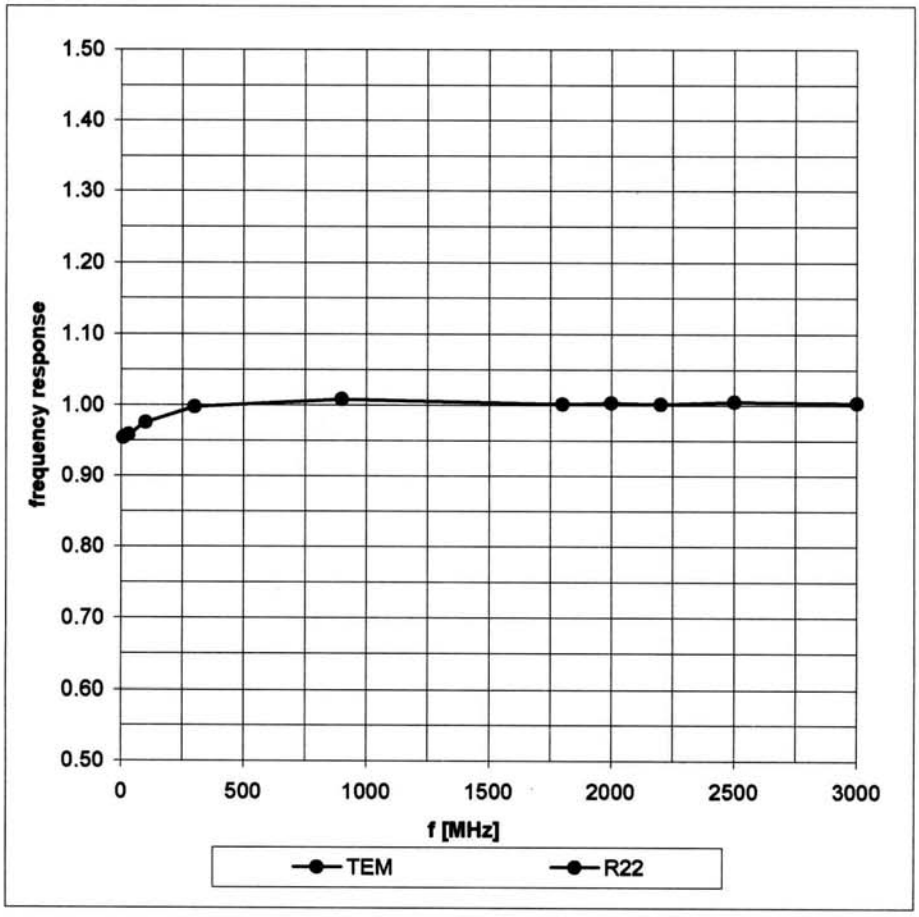
Probe Tip to Sensor Center	**2.7** mm
Optical Surface Detection	**in tolerance**

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

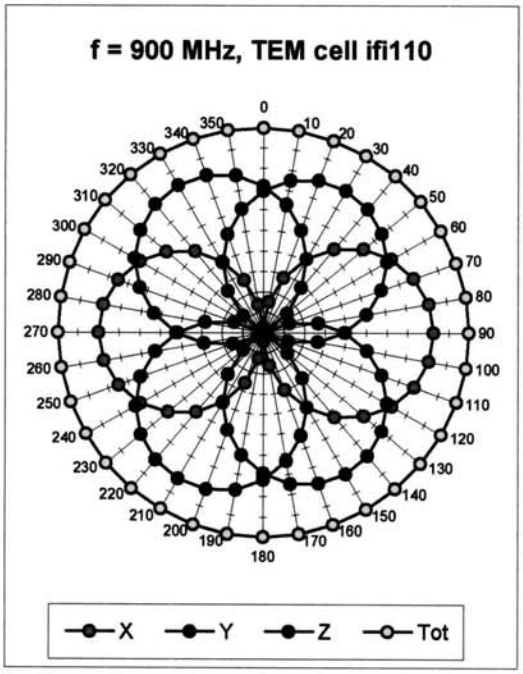
[A] numerical linearization parameter: uncertainty not required

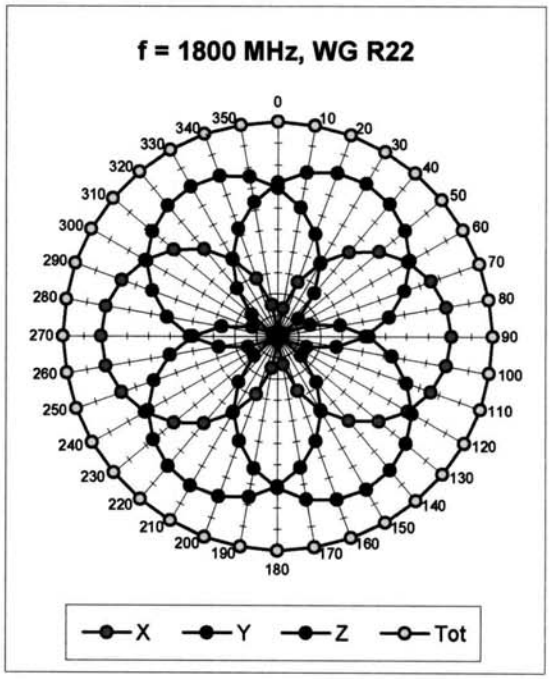
Frequency Response of E-Field

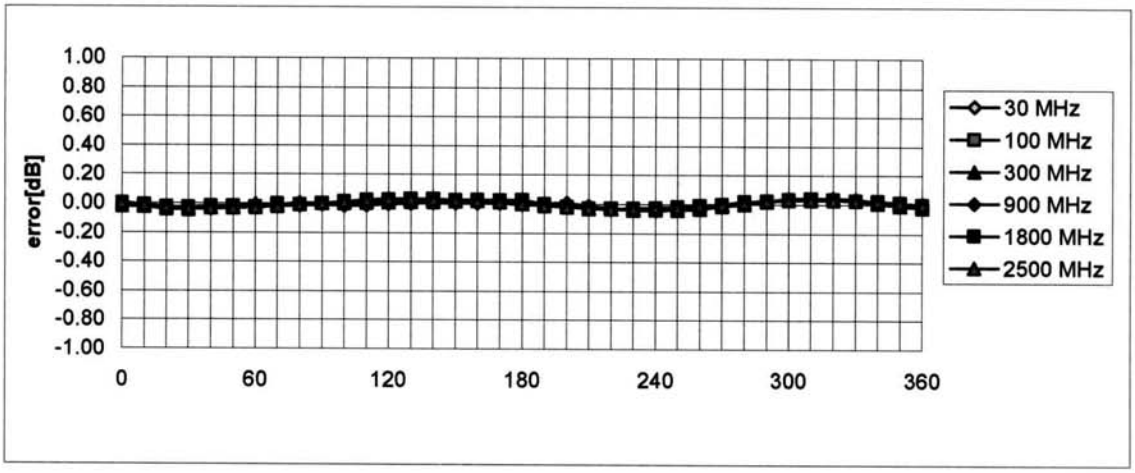
(TEM-Cell:ifi110, Waveguide R22)



Receiving Pattern (ϕ) , θ = 0°



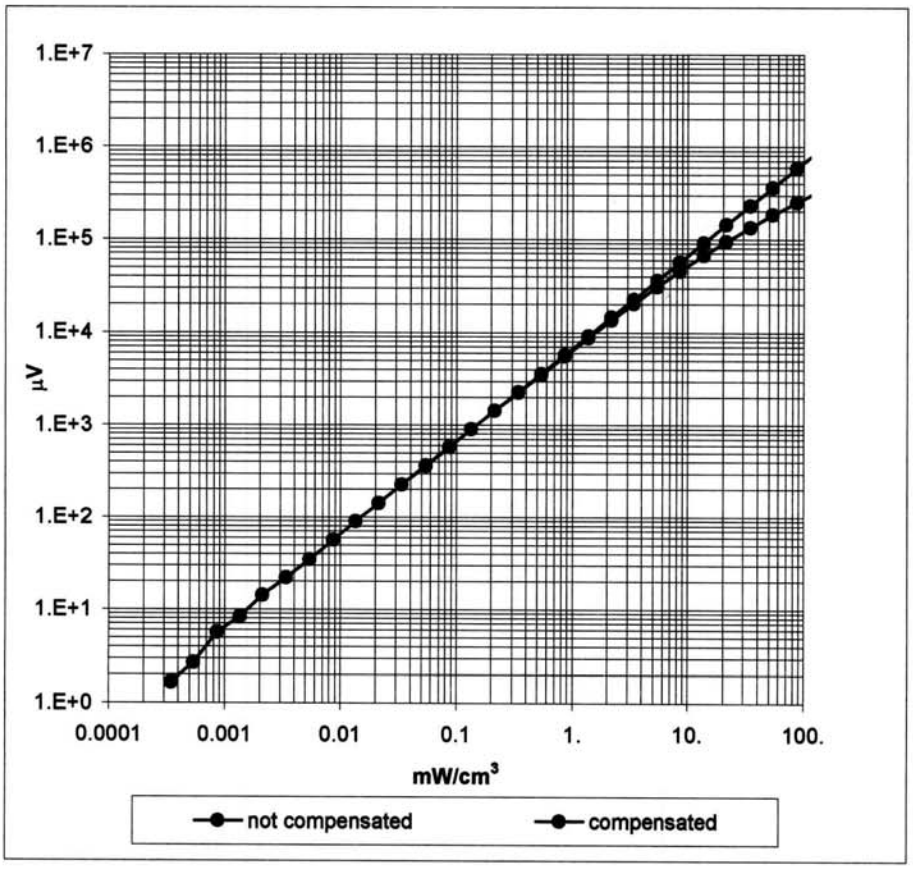


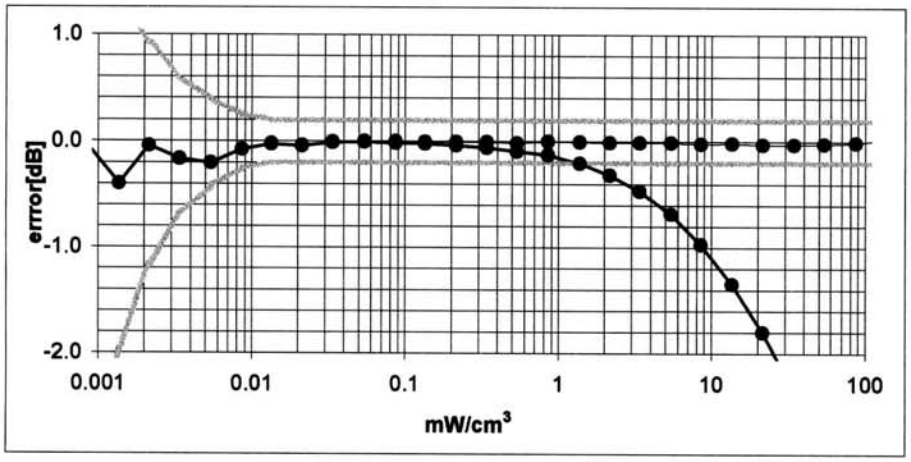


Axial Isotropy Error < ± 0.2 dB

Dynamic Range f(SAR_{head})

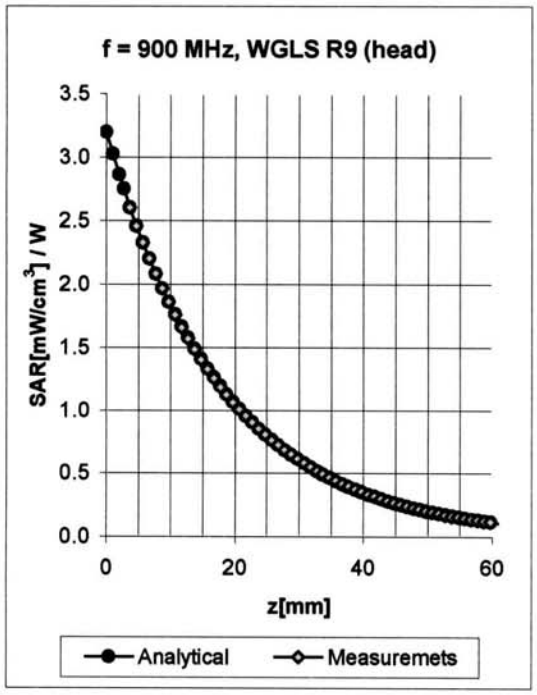
(Waveguide R22)

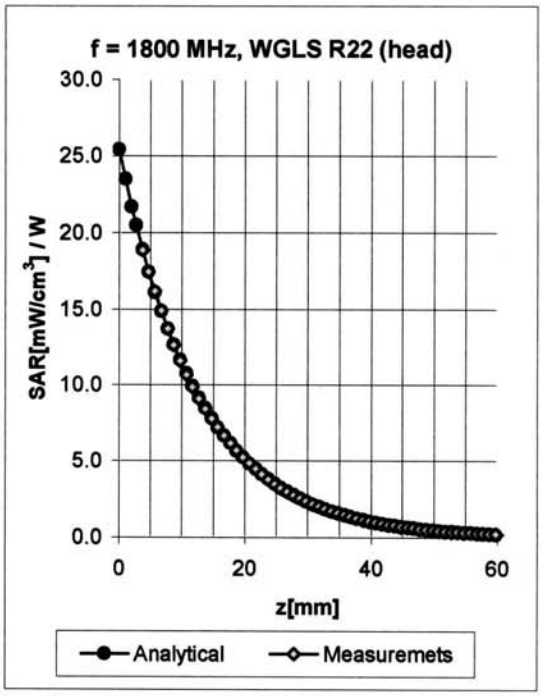




Probe Linearity < ± 0.2 dB

Conversion Factor Assessment



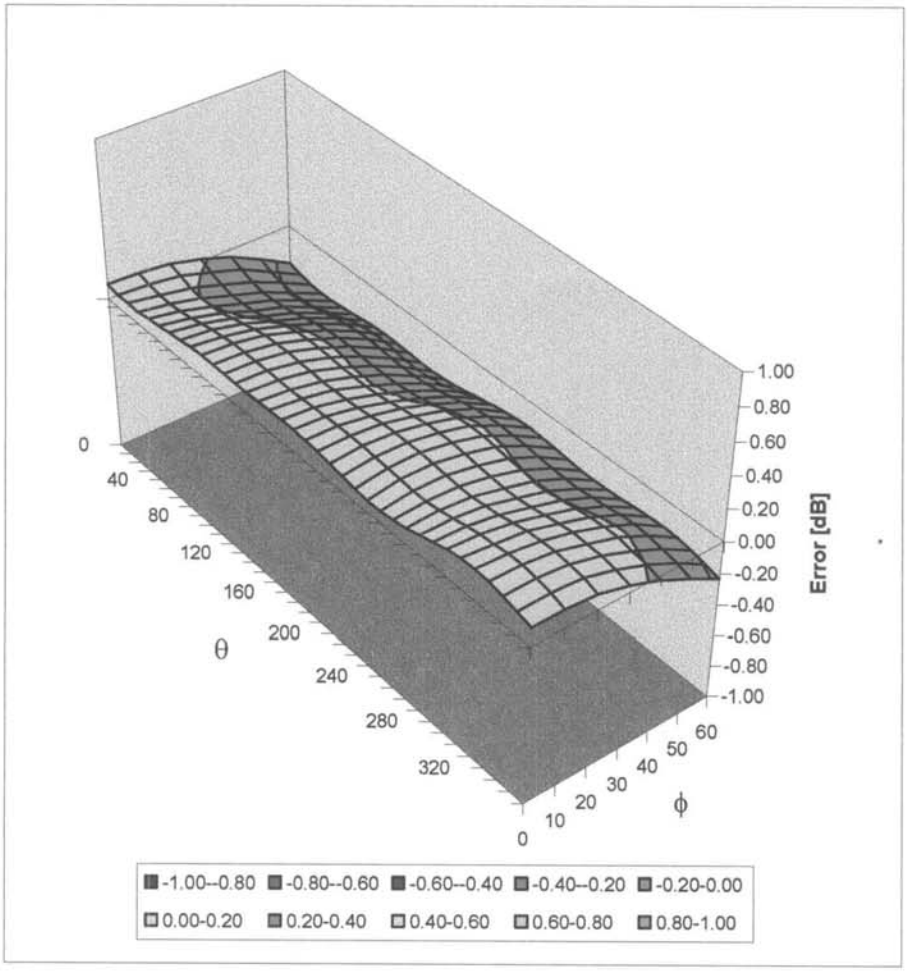


f [MHz]	Validity [MHz][B]	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	750-950	Head	41.5 ± 5%	0.90 ± 5%	0.72	1.78	6.71 ± 11.9% (k=2)
1750	1700-1800	Head	40.0 ± 5%	1.40 ± 5%	0.51	2.67	5.38 ± 9.7% (k=2)
1900	1850-1950	Head	40.0 ± 5%	1.40 ± 5%	0.55	2.66	5.25 ± 9.7% (k=2)
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	0.99	1.89	4.77 ± 9.7% (k=2)
835	750-950	Body	55.2 ± 5%	0.97 ± 5%	0.56	2.04	6.24 ± 11.9% (k=2)
1750	1700-1800	Body	53.3 ± 5%	1.52 ± 5%	0.58	2.82	4.68 ± 9.7% (k=2)
1900	1850-1950	Body	53.3 ± 5%	1.52 ± 5%	0.62	2.77	4.57 ± 9.7% (k=2)
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	1.75	1.28	4.50 ± 9.7% (k=2)

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

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



Spherical Isotropy Error < ± 0.4 dB

Schmid & Partner Engineering AG

s p e a g

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

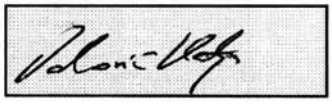
Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1387**
Place of Assessment:	**Zurich**
Date of Assessment:	**March 22, 2004**
Probe Calibration Date:	**March 18, 2004**

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

Assessed by:



Schmid & Partner Engineering AG

s p e a g

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

Dosimetric E-Field Probe ET3DV6 SN:1387

Conversion factor (± standard deviation)

150 MHz	ConvF	**9.1 ± 8%**	ε_r = 52.3 ± 5% σ = 0.76 ± 5% mho/m (head tissue)
300 MHz	ConvF	**7.8 ± 8%**	ε_r = 45.3 ± 5% σ = 0.87 ± 5% mho/m (head tissue)
450 MHz	ConvF	**7.5 ± 8%**	ε_r = 43.5 ± 5% σ = 0.87 ± 5% mho/m (head tissue)
150 MHz	ConvF	**8.7 ± 8%**	ε_r = 61.9 ± 5% σ = 0.80 ± 5% mho/m (body tissue)
450 MHz	ConvF	**7.6 ± 8%**	ε_r = 56.7 ± 5% σ = 0.94 ± 5% mho/m (body tissue)

Important Note:

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

Please see also Section 4.7 of the DASY4 Manual.

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

300 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

November 06, 2004

Frequency	e'	e"
200.000000 MHz	49.0438	66.6557
210.000000 MHz	48.4825	64.1790
220.000000 MHz	47.8156	62.2357
230.000000 MHz	47.2684	60.0781
240.000000 MHz	46.7464	58.2192
250.000000 MHz	46.3679	56.4969
260.000000 MHz	45.9034	54.9944
270.000000 MHz	45.6868	53.5496
280.000000 MHz	45.4028	52.2277
290.000000 MHz	45.1433	51.0082
300.000000 MHz	44.8899	49.7297
310.000000 MHz	44.4292	48.6764
320.000000 MHz	44.0916	47.5727
330.000000 MHz	43.6958	46.4923
340.000000 MHz	43.2971	45.5506
350.000000 MHz	42.9951	44.7606
360.000000 MHz	42.7500	43.9383
370.000000 MHz	42.5456	43.1780
380.000000 MHz	42.2997	42.4628
390.000000 MHz	41.9993	41.7483
400.000000 MHz	41.6697	41.2011

150 MHz DUT Evaluation (Face)

Measured Fluid Dielectric Parameters (Brain)

November 06, 2004

Frequency	e'	e"
50.000000 MHz	63.8258	231.0476
60.000000 MHz	62.7275	195.1618
70.000000 MHz	60.9497	168.4896
80.000000 MHz	59.9659	149.4577
90.000000 MHz	58.2103	134.2257
100.000000 MHz	57.1674	122.6578
110.000000 MHz	56.2149	113.1478
120.000000 MHz	55.1249	105.1591
130.000000 MHz	54.2933	98.1661
140.000000 MHz	53.9429	92.2574
150.000000 MHz	53.1139	87.2950
160.000000 MHz	52.5946	82.8560
170.000000 MHz	52.1365	78.8353
180.000000 MHz	51.7445	75.0705
190.000000 MHz	51.3567	71.7188
200.000000 MHz	50.9656	68.8839
210.000000 MHz	50.5144	66.2625
220.000000 MHz	50.0916	63.8942
230.000000 MHz	49.5817	61.7024
240.000000 MHz	48.9843	59.7360
250.000000 MHz	48.5000	58.0504

300 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

November 23, 2004

Frequency	e'	e"
200.000000 MHz	49.0953	67.8410
210.000000 MHz	48.5154	65.3107
220.000000 MHz	48.0762	63.3362
230.000000 MHz	47.4389	61.0129
240.000000 MHz	46.8813	59.1529
250.000000 MHz	46.4422	57.4822
260.000000 MHz	45.9729	55.8956
270.000000 MHz	45.7093	54.4076
280.000000 MHz	45.5505	53.1031
290.000000 MHz	45.1622	51.8817
300.000000 MHz	44.8159	50.5990
310.000000 MHz	44.3065	49.4035
320.000000 MHz	43.9657	48.2007
330.000000 MHz	43.7051	47.2396
340.000000 MHz	43.3438	46.1617
350.000000 MHz	43.0884	45.2413
360.000000 MHz	42.8508	44.3816
370.000000 MHz	42.6309	43.5887
380.000000 MHz	42.4456	42.9106
390.000000 MHz	42.1750	42.2674
400.000000 MHz	41.8315	41.6244

150 MHz DUT Evaluation (Face)

Measured Fluid Dielectric Parameters (Brain)

November 23, 2004

Frequency	e'	e"
50.000000 MHz	63.0187	240.5844
60.000000 MHz	60.6600	202.6254
70.000000 MHz	60.7789	175.3663
80.000000 MHz	59.4293	155.2965
90.000000 MHz	57.9930	139.8186
100.000000 MHz	56.9999	127.0082
110.000000 MHz	56.3246	116.8749
120.000000 MHz	55.3639	108.4035
130.000000 MHz	54.9459	101.3913
140.000000 MHz	54.3797	95.1479
150.000000 MHz	53.6653	89.9596
160.000000 MHz	53.0375	85.2587
170.000000 MHz	52.5258	81.2698
180.000000 MHz	52.1678	77.3899
190.000000 MHz	51.5671	74.1494
200.000000 MHz	51.1170	71.2617
210.000000 MHz	50.6516	68.5896
220.000000 MHz	50.2187	66.4200
230.000000 MHz	49.8050	63.9680
240.000000 MHz	49.3516	61.9994
250.000000 MHz	48.9205	60.1696

300 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

November 25, 2004

Frequency	e'	e"
200.000000 MHz	49.0182	67.6418
210.000000 MHz	48.4345	65.2781
220.000000 MHz	47.9398	63.2728
230.000000 MHz	47.4125	61.1228
240.000000 MHz	46.7091	59.1511
250.000000 MHz	46.2348	57.5674
260.000000 MHz	45.8594	55.8745
270.000000 MHz	45.6120	54.3556
280.000000 MHz	45.2902	53.0254
290.000000 MHz	44.9329	51.7474
300.000000 MHz	44.7621	50.3544
310.000000 MHz	44.3409	49.2246
320.000000 MHz	43.9456	48.0200
330.000000 MHz	43.5483	46.9783
340.000000 MHz	43.1699	46.0462
350.000000 MHz	42.8990	45.2639
360.000000 MHz	42.6190	44.3981
370.000000 MHz	42.3729	43.6208
380.000000 MHz	42.1366	42.9277
390.000000 MHz	41.9190	42.3006
400.000000 MHz	41.5733	41.5948

150 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

November 25, 2004

Frequency	e'	e"
50.000000 MHz	70.1472	270.3890
60.000000 MHz	67.7061	226.8206
70.000000 MHz	66.6989	194.6999
80.000000 MHz	65.8253	172.5758
90.000000 MHz	65.3763	154.0075
100.000000 MHz	64.1900	139.6993
110.000000 MHz	63.7581	128.0931
120.000000 MHz	63.1748	118.5161
130.000000 MHz	62.4379	110.4102
140.000000 MHz	62.1557	102.8338
150.000000 MHz	61.6196	96.7395
160.000000 MHz	61.4298	91.2428
170.000000 MHz	61.0532	86.7361
180.000000 MHz	60.9708	82.3508
190.000000 MHz	60.7693	78.6434
200.000000 MHz	60.3560	75.4213
210.000000 MHz	59.9821	72.4377
220.000000 MHz	59.5903	70.0827
230.000000 MHz	59.3195	67.4798
240.000000 MHz	58.8990	65.2268
250.000000 MHz	58.5994	63.1375

300 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

November 27, 2004

Frequency	e'	e"
200.000000 MHz	48.4817	68.1350
210.000000 MHz	47.9530	65.8652
220.000000 MHz	47.6051	63.7502
230.000000 MHz	46.8321	61.6751
240.000000 MHz	46.2665	59.7929
250.000000 MHz	45.7871	58.1051
260.000000 MHz	45.3394	56.4496
270.000000 MHz	45.1413	54.8935
280.000000 MHz	44.9241	53.3740
290.000000 MHz	44.6392	51.9644
300.000000 MHz	44.5363	50.3228
310.000000 MHz	44.3145	49.1062
320.000000 MHz	44.0316	47.9712
330.000000 MHz	43.6929	46.9110
340.000000 MHz	43.2902	46.0199
350.000000 MHz	42.9393	45.1991
360.000000 MHz	42.5108	44.4697
370.000000 MHz	42.2395	43.7398
380.000000 MHz	41.8469	43.0976
390.000000 MHz	41.5403	42.3927
400.000000 MHz	41.2356	41.7662

150 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

November 27, 2004

Frequency	e'	e"
50.000000 MHz	69.6350	266.6447
60.000000 MHz	67.7961	223.2742
70.000000 MHz	66.5564	192.4257
80.000000 MHz	65.7017	169.6110
90.000000 MHz	64.8722	151.9806
100.000000 MHz	63.7815	138.1188
110.000000 MHz	63.6320	126.4933
120.000000 MHz	62.6105	117.1091
130.000000 MHz	62.2257	108.5852
140.000000 MHz	62.0276	101.3989
150.000000 MHz	61.4335	95.3213
160.000000 MHz	61.3380	90.0610
170.000000 MHz	60.9678	85.6953
180.000000 MHz	60.7275	81.4041
190.000000 MHz	60.3868	77.8038
200.000000 MHz	60.0095	74.6222
210.000000 MHz	59.7153	71.7498
220.000000 MHz	59.3805	69.1555
230.000000 MHz	58.8687	66.8373
240.000000 MHz	58.6441	64.8187
250.000000 MHz	58.2732	62.6380