DECLARATION OF COMPLIANCE
SAR EVALUATION

Test Lab	Applicant Information
CELLTECH LABS INC. Testing and Engineering Lab 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	**PERCOMM TECHNOLOGIES INC.** 3999 Henning Drive, Unit 402 Burnaby, BC V5C 6P9 Canada

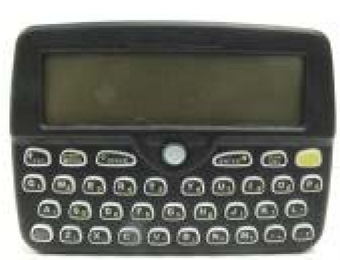
Rule Part(s):	**FCC 47 CFR §2.1093, §24(D)**
Test Procedure(s):	**FCC OET Bulletin 65, Supplement C (01-01)**
Device Classification:	**Part 24 Licensed Portable Transmitter worn on body (PCT)**
Device Type:	**ReFLEX Two-Way Pager**
FCC ID:	**NNT1100**
Model Name:	**e80**
Model No.:	**1100**
Tx Frequency Range:	**901 - 902 MHz**
RF Output Power Tested:	**0.275 Watts ERP (24.4 dBm)**
Nominal Conducted Power:	**1 Watt**
Modulation:	**CPFSK**
Antenna Type(s):	**Internal**
Battery Type(s):	**3.6V Lithium-ion**
Max. SAR Measured:	**Body: 1.07 W/kg (1g average)** **Hand: 1.49 W/kg (10g average)**

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 for the General Population / Uncontrolled Exposure environment.

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

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc. The results and statements contained in this report pertain only to the device(s) evaluated.

Russell Pipe
Senior Compliance Technologist
Celltech Labs Inc.



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1.0 INTRODUCTION

This measurement report demonstrates that the Percomm Technologies Inc. ReFLEX Two-Way Pager FCC ID: NNT1100 complies with the RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [2]) were employed. A description of the product, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 DESCRIPTION of Equipment Under Test (EUT)

FCC Rule Part(s)	47 CFR §2.1093; §24(D)
FCC Test Procedure(s)	OET Bulletin 65, Supplement C (01-01)
FCC Device Classification	Licensed Portable Transmitter worn on body (PCT)
Device Type	ReFLEX Two-Way Pager
FCC ID	NNT1100
Model Name	E80
Model No.	1100
Serial No.	Pre-production
Modulation	CPFSK
Tx Frequency Range	901 - 902 MHz
RF Output Power Tested	0.275 Watts ERP (24.4 dBm)
Nominal Conducted Power	1 Watt
Antenna Type(s)	Internal
Battery Type(s)	3.6V Lithium-ion

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3.0 SAR MEASUREMENT SYSTEM

Celltech Research SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY 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-held and/or body-worn 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 SAM phantom

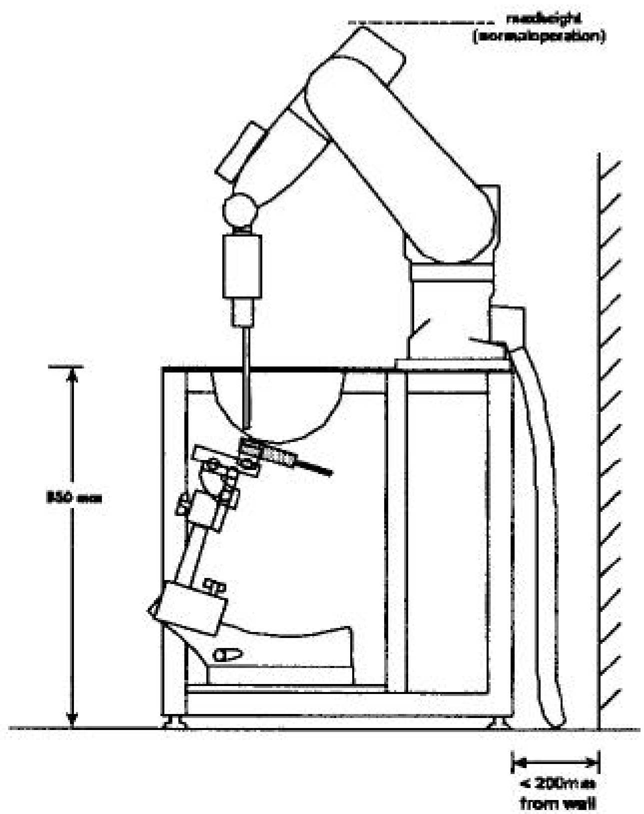

Figure 1. DASY3 Compact Version - Side View

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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.

SAR MEASUREMENT RESULTS										
Freq. (MHz)	Channel	Mode	RF Output Power (ERP)		Phantom Section	EUT Position	Body-Worn Accessory	Separation Distance (cm)	Measured SAR (W/kg)	
			Before (dBm)	Drift (dB)					Body (1g)	Hand (10g)
901.500	Mid	CPFSK	24.4	-0.08	Planar	Front Side	Belt-Clip	1.5	0.248	-
901.500	Mid	CPFSK	24.4	0.11	Planar	Back Side	-	0.5	1.07	-
901.500	Mid	CPFSK	24.4	0.14	Planar	Back Side	-	0.0	-	1.49
ANSI / IEEE C95.1 1992 - SAFETY LIMIT BODY: 1.6 W/kg (averaged over 1 gram) HAND: 4.0 W/kg (averaged over 10 grams) Spatial Peak - Uncontrolled Exposure / General Population										

Test Date(s)	03/05/03		Relative Humidity	55 %
Measured Mixture Type	900MHz Muscle		Atmospheric Pressure	99.7 kPa
Dielectric Constant ε_r	IEEE Target	Measured	Ambient Temperature	23.5 °C
	55.0 ±5%	53.9	Fluid Temperature	21.8 °C
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Depth	≥ 15 cm
	1.05 ±5%	1.03	ρ (Kg/m^3)	1000

Note(s):

1. The EUT could only be placed inside the belt-clip accessory with the keypad side facing the planar phantom.
2. The transmission band of the EUT is less than 10 MHz, therefore mid channel data only is required (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [2]).
3. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed in the table above were consistent for all measurement periods.

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5.0 DETAILS OF SAR EVALUATION

The Percomm Technologies Inc. ReFLEX Two-Way Pager FCC ID: NNT1100 was found to be compliant for localized Specific Absorption Rate based on the test provisions and conditions described below. Detailed photographs of the measurement setup are shown in Appendix G.

1. The EUT was tested in a body-worn configuration placed inside the plastic belt-clip accessory with the front side (keypad side) of the EUT facing parallel to the outer surface of the planar phantom. The belt-clip accessory provided a 1.5 cm separation distance between the front side (keypad side) of the EUT and the outer surface of the planar phantom.
2. The EUT was tested for body SAR with the back side (battery side) of the EUT placed parallel to the outer surface of the planar phantom. A 0.5 cm separation distance was established and maintained between the back side (battery side) of the EUT and the outer surface of the planar phantom.
3. The EUT was tested for hand SAR with the back side (battery side) of the EUT placed parallel to, and touching, the outer surface of the planar phantom.
4. The conducted power level could not be measured for the SAR evaluation. The EUT was evaluated for SAR at the maximum conducted power level set by the manufacturer. ERP measurements were performed using the signal substitution method in accordance with ANSI TIA/EIA-603-A-2001.
5. The EUT was placed in test mode via PC software and serial cable. The EUT was tested in CPFSK mode (Continuous Phase Frequency Shift Keying) with constant envelope and power.
6. The EUT was tested at the maximum duty cycle specified by the manufacturer (25% duty cycle, crest factor 4).
7. The location of the maximum spatial SAR distribution (Hot Spot) was determined relative to the device and its antenna.
8. The EUT was tested with a fully charged Lithium-ion battery.

6.0 EVALUATION PROCEDURES

a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated 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 [4]). 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 [4]).
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.

7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluation a system check was performed in the planar section of the SAM phantom with a 900MHz dipole (see Appendix C for system validation procedures). The dielectric properties of the simulated brain fluid were verified using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix D for printout of measured fluid dielectric parameters). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±10% (see Appendix A for system check test plot).

SYSTEM PERFORMANCE CHECK											
Test Date	Equiv. Tissue (900MHz)	SAR 1g (W/kg)		Dielectric Constant ε_r		Conductivity σ (mho/m)		ρ (Kg/m^3)	Ambient Temp.	Fluid Temp.	Fluid Depth
		IEEE Target	Measured	IEEE Target	Measured	IEEE Target	Measured				
03/05/03	Brain	2.70 ±10%	2.71	41.5 ±5%	41.0	0.97 ±5%	0.97	1000	23.5 °C	21.8 °C	≥ 15 cm

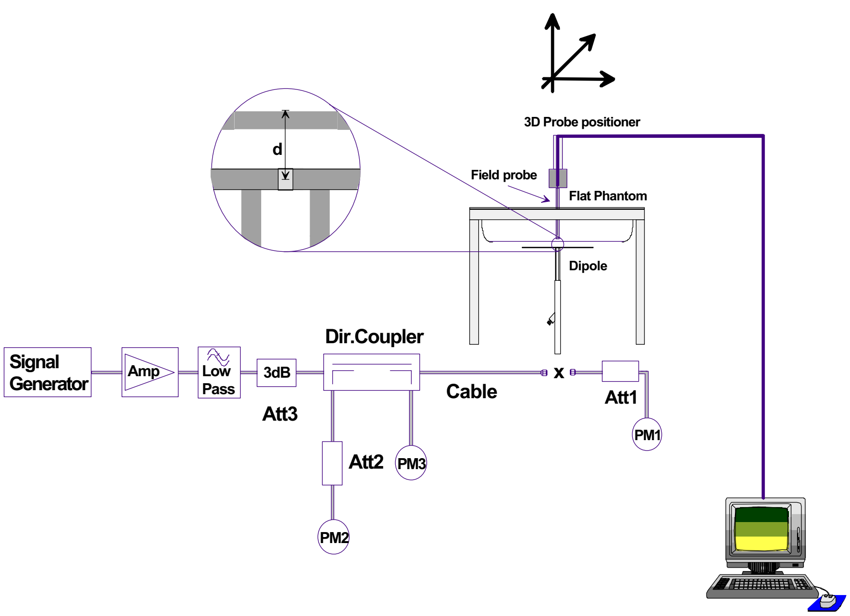

Figure 2. System Check Setup Diagram

900MHz System Check Setup Photograph

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8.0 EQUIVALENT TISSUES

The 900MHz 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	900MHz Brain (System Check)	900MHz Body (EUT Evaluation)
Water	40.71 %	53.70 %
Sugar	56.63 %	45.10 %
Salt	1.48 %	0.97 %
HEC	1.00 %	0.13%
Bactericide	0.18 %	0.10 %

9.0 SAR SAFETY LIMITS

EXPOSURE LIMITS	SAR LIMIT (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)

Phantom

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

11.0 PROBE SPECIFICATION (ET3DV6)

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


ET3DV6 E-Field Probe

12.0 SAM PHANTOM V4.0C

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


SAM Phantom

13.0 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

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14.0 TEST EQUIPMENT LIST

SAR MEASUREMENT SYSTEM		
EQUIPMENT	**SERIAL NO.**	**CALIBRATION DATE**
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
-Small Planar Phantom	N/A	N/A
-Medium Planar Phantom	N/A	N/A
-Large Planar Phantom	N/A	N/A
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
E4408B Spectrum Analyzer	US39240170	Nov 2002
8594E Spectrum Analyzer	3543A02721	Feb 2003
8753E Network Analyzer	US38433013	Feb 2003
8648D Signal Generator	3847A00611	Feb 2003
5S1G4 Amplifier Research Power Amplifier	26235	N/A

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15.0 MEASUREMENT UNCERTAINTIES

Error Description	Uncertainty Value ±%	Probability Distribution	Divisor	c_i 1g	Standard Uncertainty ±% (1g)	v_i or v_{eff}
Measurement System						
Probe calibration	± 4.8	Normal	1	1	± 4.8	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5	∞
Integration time	± 1.4	Rectangular	√3	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	√3	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Test Sample Related						
Device positioning	± 6.0	Normal	√3	1	± 6.7	12
Device holder uncertainty	± 5.0	Normal	√3	1	± 5.9	8
Power drift	± 5.0	Rectangular	√3		± 2.9	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty					**± 13.7**	
Expanded Uncertainty (k=2)					**± 27.5**	

Measurement Uncertainty Table in accordance with IEEE Std 1528 (Draft - see reference [3])

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16.0 REFERENCES

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

[2] 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.

[3] 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".

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

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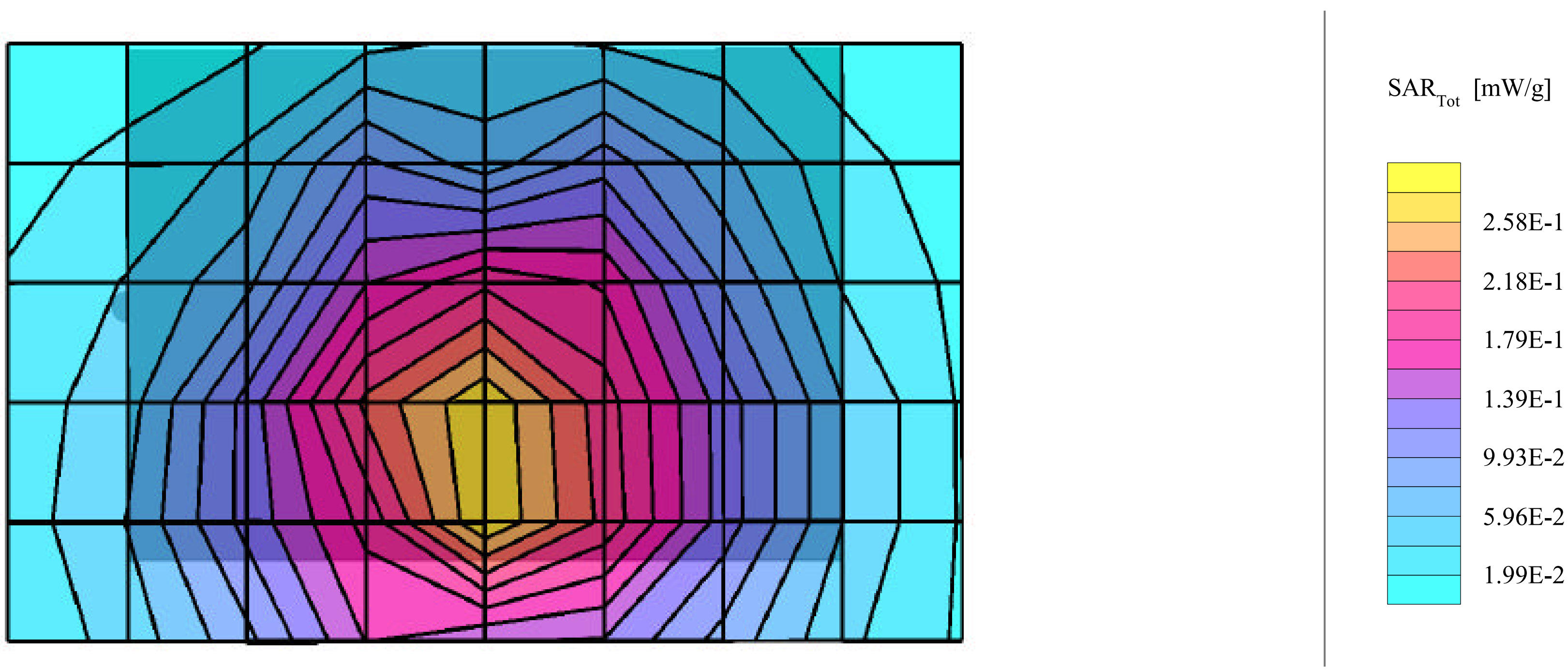
APPENDIX A - SAR MEASUREMENT DATA

Percomm Technologies Inc. FCC ID: NNT1100

SAM Phantom; Flat Section; Position: (270°,90°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 4.0
900 MHz Muscle: σ = 1.03 mho/m ε_r = 53.9 ρ = 1.00 g/cm^3
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.08 dB
SAR (1g): 0.248 mW/g, SAR (10g): 0.150 mW/g

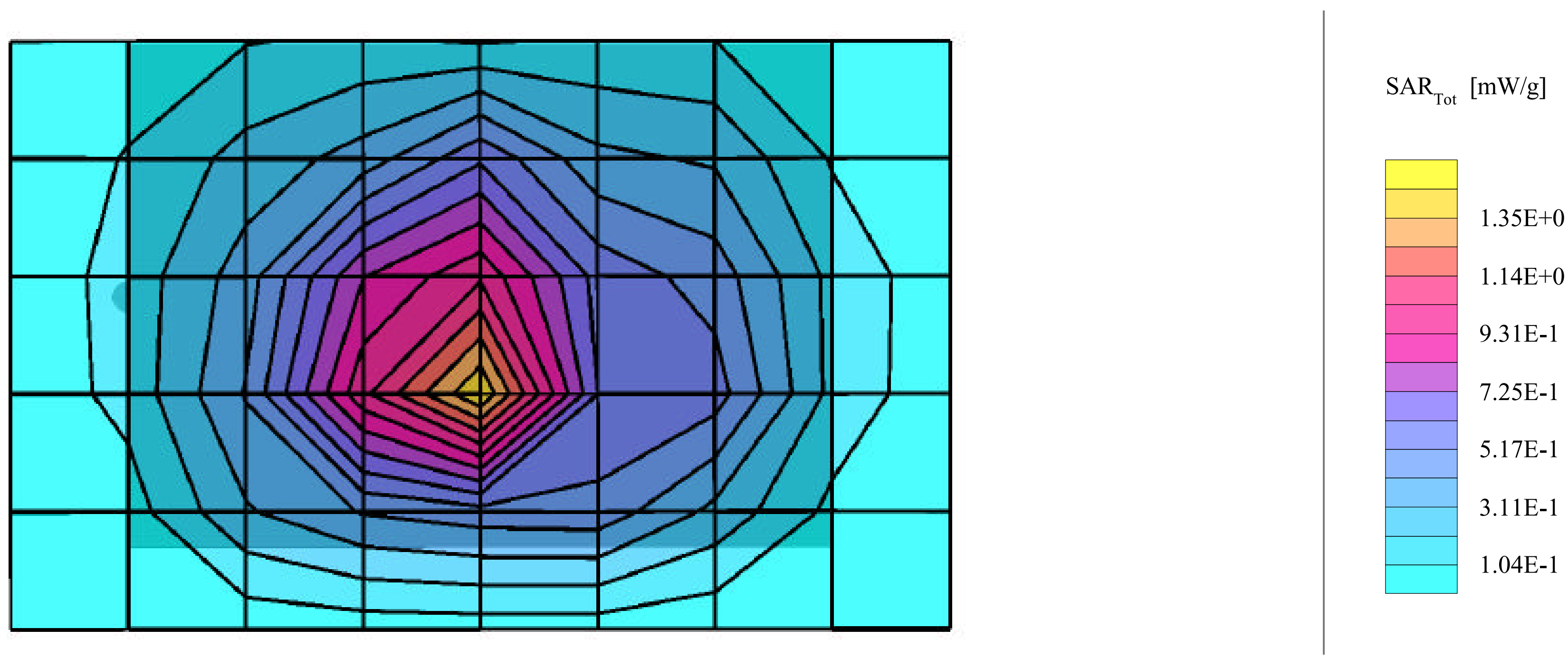
Body SAR - 1.5 cm Belt-Clip Separation Distance - Front of EUT
ReFLEX Two-Way Pager Model: E80 1100
CPFSK Mode
Frequency: 901.500 MHz
RF Output Power: 24.4 dBm (ERP)
Ambient Temp. 23.5°C; Fluid Temp. 21.8°C
Date Tested: March 05, 2003



Percomm Technologies Inc. FCC ID: NNT1100

SAM Phantom; Flat Section; Position: (270°,90°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 4.0
900 MHz Muscle: σ = 1.03 mho/m ε_r = 53.9 ρ = 1.00 g/cm³
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.14 dB
SAR (1g): 1.07 mW/g, SAR (10g): 0.683 mW/g

Body SAR - 0.5 cm Separation Distance - Back of EUT
ReFLEX Two-Way Pager Model: E80 1100
CPFSK Mode
Frequency: 901.500 MHz
RF Output Power: 24.4 dBm (ERP)
Ambient Temp. 23.5°C; Fluid Temp. 21.8°C
Date Tested: March 05, 2003

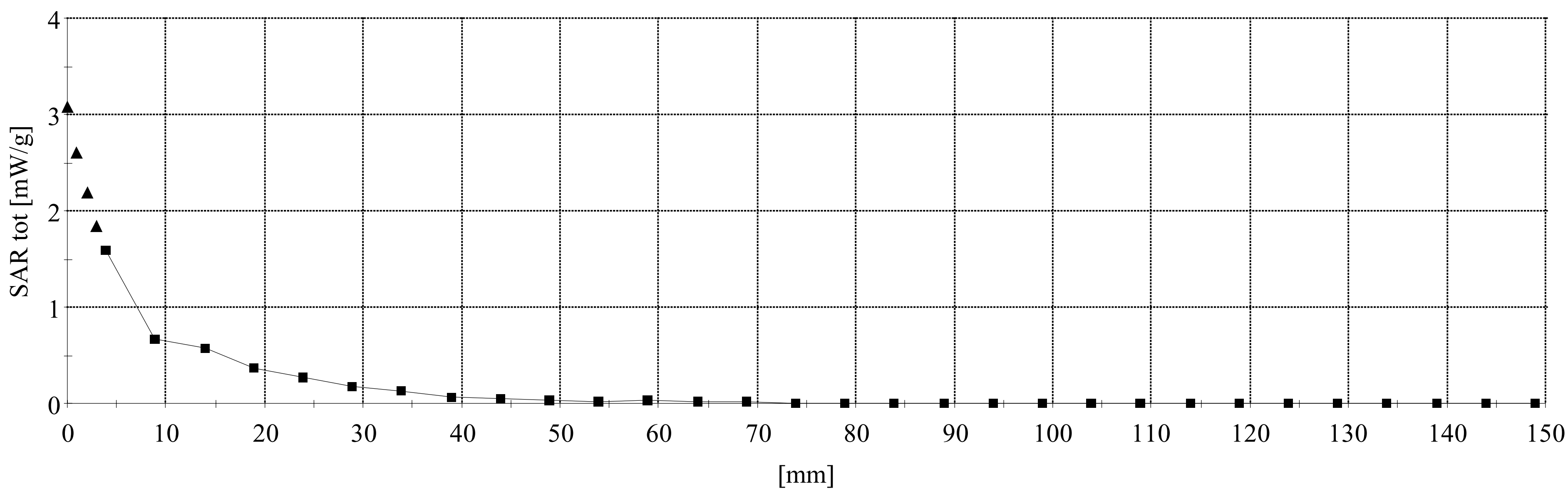


Percomm Technologies Inc. FCC ID: NNT1100

SAM Phantom; Planar Section
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 4.0
900 MHz Muscle: σ = 1.03 mho/m ε_r = 53.9 ρ = 1.00 g/cm^3

Z-Axis Extrapolation at Peak SAR Location

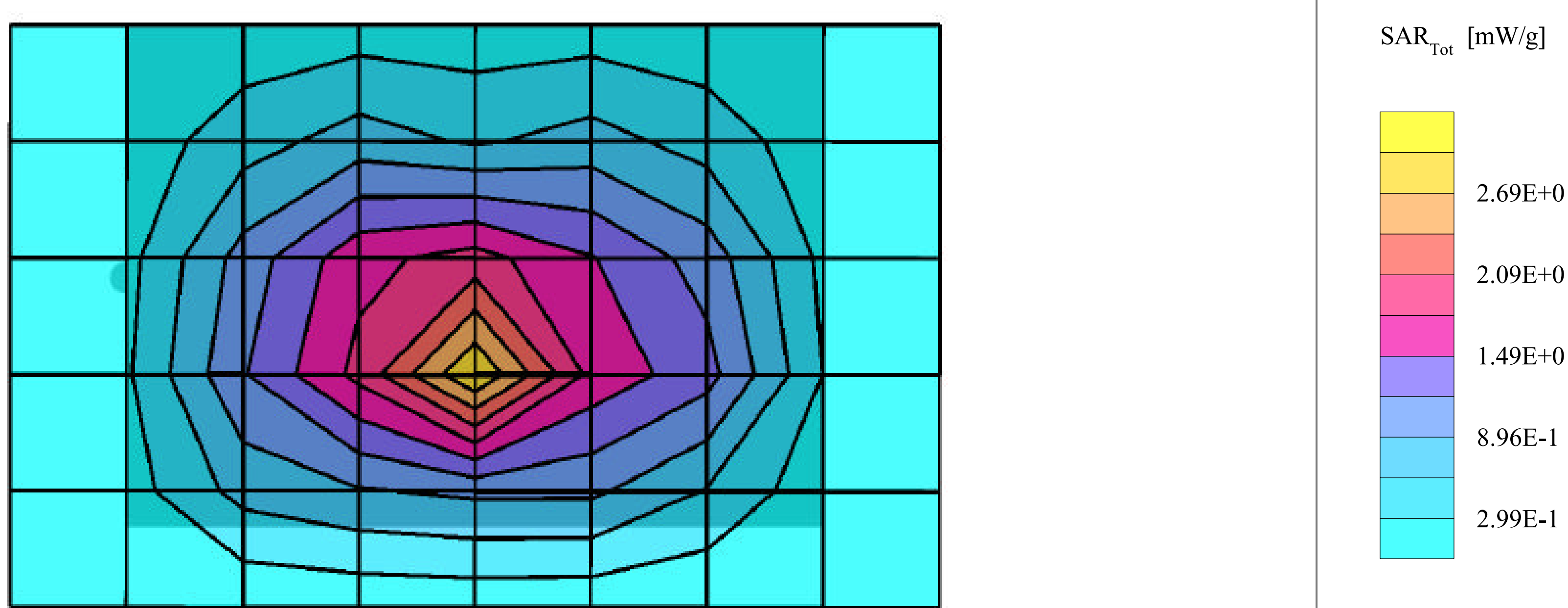
Body SAR - 0.5 cm Separation Distance - Back of EUT
ReFLEX Two-Way Pager Model: E80 1100
CPFSK Mode
Frequency: 901.500 MHz
RF Output Power: 24.4 dBm (ERP)
Ambient Temp. 23.5°C; Fluid Temp. 21.8°C
Date Tested: March 05, 2003



Percomm Technologies Inc. FCC ID: NNT1100

SAM Phantom; Flat Section; Position: (270°,90°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 4.0
900 MHz Muscle: σ = 1.03 mho/m ε_r = 53.9 ρ = 1.00 g/cm³
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: 0.11 dB
SAR (10g): 1.49 mW/g

Hand SAR - 0.0 cm Separation Distance - Back of EUT
ReFLEX Two-Way Pager Model: E80 1100
CPFSK Mode
Frequency: 901.500 MHz
RF Output Power: 24.4 dBm (ERP)
Ambient Temp. 23.5°C; Fluid Temp. 21.8°C
Date Tested: March 05, 2003



APPENDIX B - SYSTEM CHECK DATA

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System Performance Check - 900MHz Dipole

SAM Phantom; Flat Section

Probe: ET3DV6 - SN1590; ConvF(6.90,6.90,6.90); Crest factor: 1.0; 900 MHz Brain: $\sigma = 0.97$ mho/m $\varepsilon_r = 41.0$ $\rho = 1.00$ g/cm^3

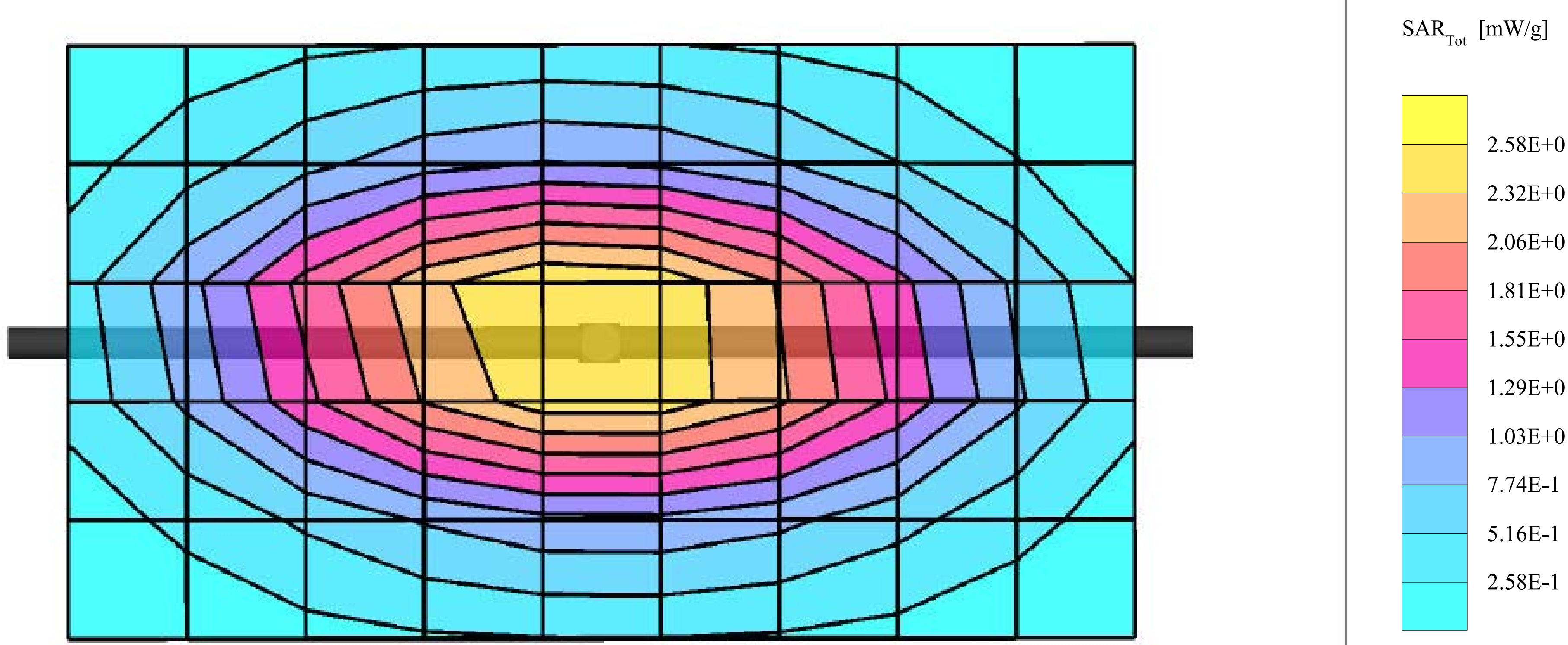
Cube 5x5x7: Peak: 4.40 mW/g, SAR (1g): 2.71 mW/g, SAR (10g): 1.70 mW/g, (Worst-case extrapolation)

Penetration depth: 11.3 (10.2, 12.8) [mm]; Powerdrift: -0.05 dB

Ambient Temp. 23.5°C; Fluid Temp. 21.8°C

Forward Conducted Power: 250 mW

Date Tested: March 05, 2003



APPENDIX C - SYSTEM VALIDATION

Schmid & Partner
Engineering AG

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

Calibration Certificate

900 MHz System Validation Dipole

Type:	**D900V2**
Serial Number:	**054**
Place of Calibration:	**Zurich**
Date of Calibration:	**June 20, 2001**
Calibration Interval:	**24 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:

Approved by:

Schmid & Partner
Engineering AG

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

DASY

Dipole Validation Kit

Type: D900V2

Serial: 054

Manufactured: August 25, 1999
Calibrated: June 20, 2001

1. Measurement Conditions

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

Relative Dielectricity	**42.4**	± 5%
Conductivity	**0.97 mho/m**	± 5%

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.27 at 900 MHz) was used for the measurements.

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

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 1. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm^3 (1 g) of tissue: **11.12 mW/g**

averaged over 10 cm^3 (10 g) of tissue: **7.04 mW/g**

Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well.

3. Dipole Impedance and Return Loss

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

Electrical delay:	**1.413 ns**	(one direction)
Transmission factor:	**0.989**	(voltage transmission, one direction)

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

Feedpoint impedance at 900 MHz:	Re{Z} = **51.3 Ω**
	Im {Z} = **-0.5 Ω**
Return Loss at 900 MHz	**-36.9 dB**

4. Measurement Conditions

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

Relative Dielectricity	**41.0**	± 5%
Conductivity	**0.86 mho/m**	± 5%

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.22 at 900 MHz) was used for the measurements.

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

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

5. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 4. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm^3 (1 g) of tissue:	**10.12 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**6.52 mW/g**

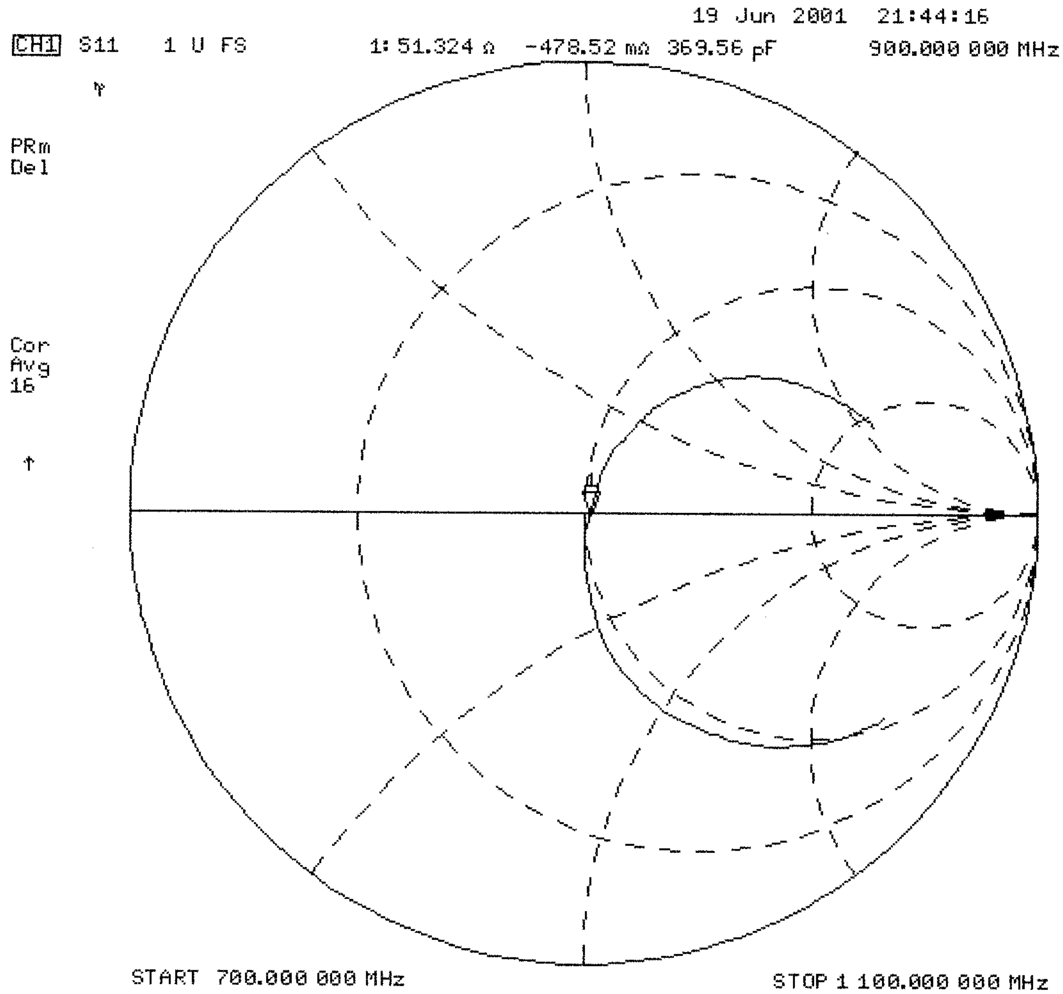
Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well.

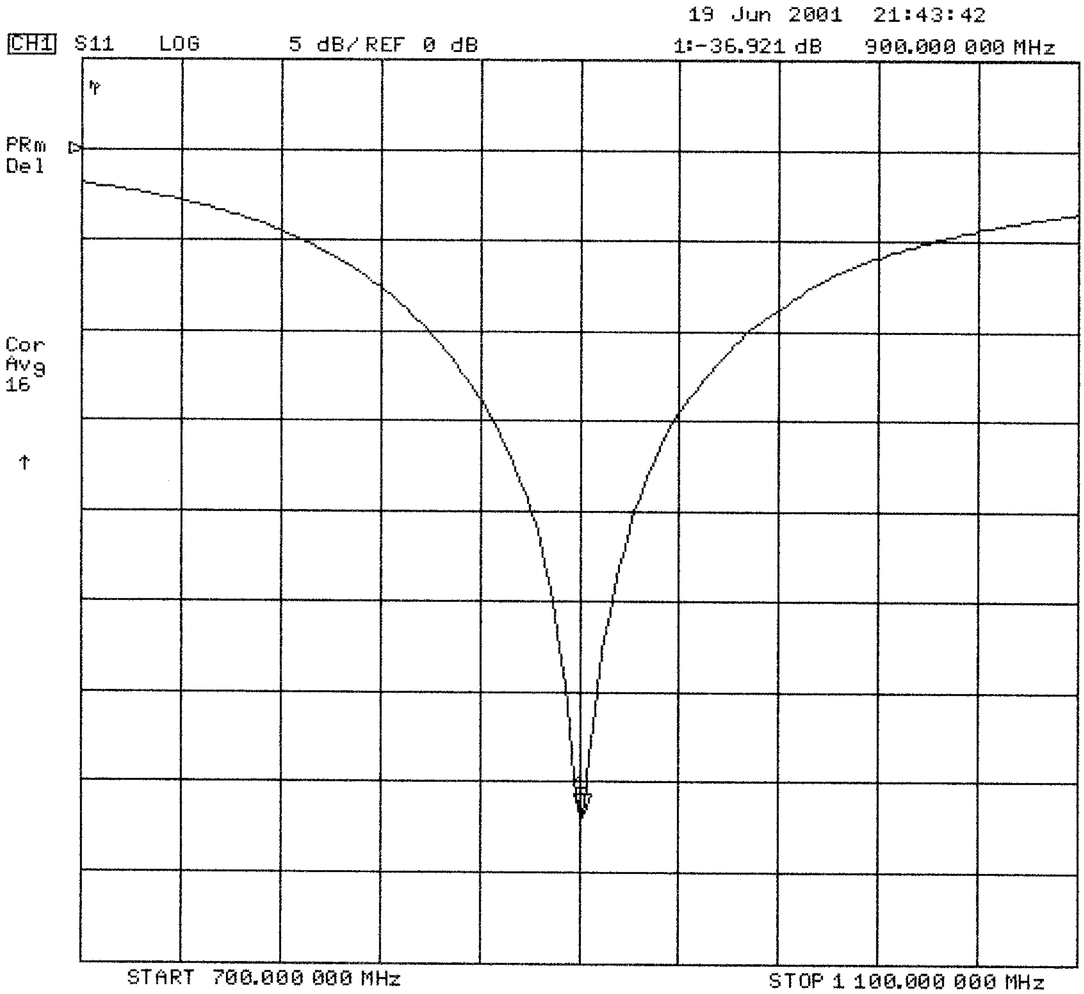
6. Handling

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

Do not apply excessive force to the dipole arms, because they might bend. If the dipole arms have to be bent back, take care to release stress to the soldered connections near the feedpoint; they might come off.

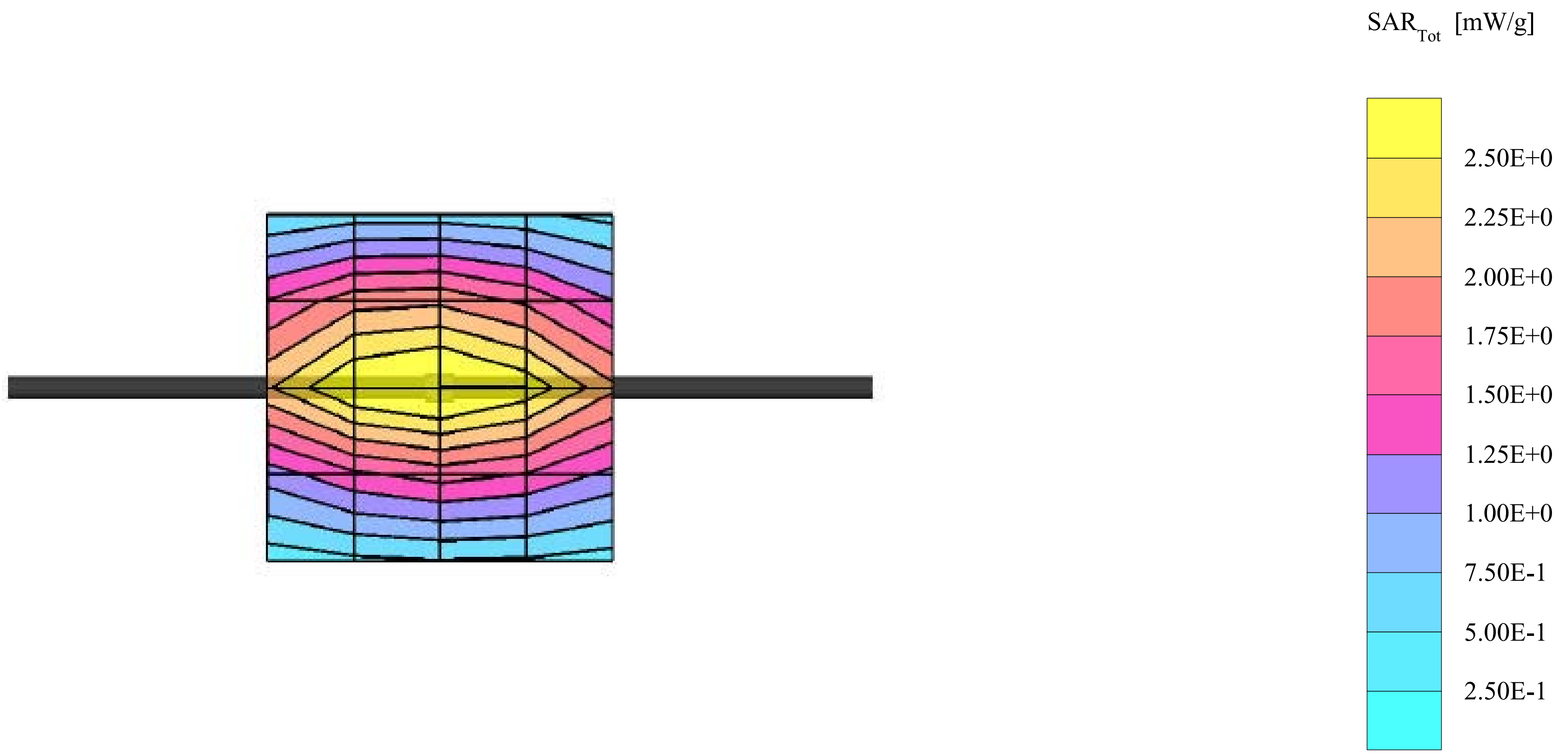
After prolonged use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.


19 Jun 2001 21:44:16
CH1 S11 1 U FS
1: 51.324 Ω -478.52 mΩ 369.56 pF 900.000 000 MHz
PRm
Del
Cor
Avg
16
START 700.000 000 MHz
STOP 1 100.000 000 MHz


19 Jun 2001 21:43:42
CH1 S11 LOG 5 dB/ REF 0 dB 1:-36.921 dB 900.000 000 MHz
PRm
Del
Cor
Avg
16
START 700.000 000 MHz
STOP 1 100.000 000 MHz

Validation Dipole D900V2 SN:054, d = 15 mm

Frequency: 900 MHz; Antenna Input Power: 250 [mW]
Generic Twin Phantom; Flat Section; Grid Spacing:Dx = 15.0, Dy = 15.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(6.27,6.27,6.27); Crest factor: 1.0; IEEE1528 900 MHz: $\sigma = 0.97$ mho/m $\varepsilon_r = 42.4$ $\rho = 1.00$ g/cm³
Cubes (2): Peak: 4.47 mW/g ± 0.05 dB, SAR (1g): 2.78 mW/g ± 0.04 dB, SAR (10g): 1.76 mW/g ± 0.02 dB, (Worst-case extrapolation)
Penetration depth: 11.5 (10.3, 13.2) [mm]
Powerdrift: -0.00 dB



APPENDIX D - PROBE CALIBRATION

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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:	D. Vetter
Approved by:	[illegible]

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

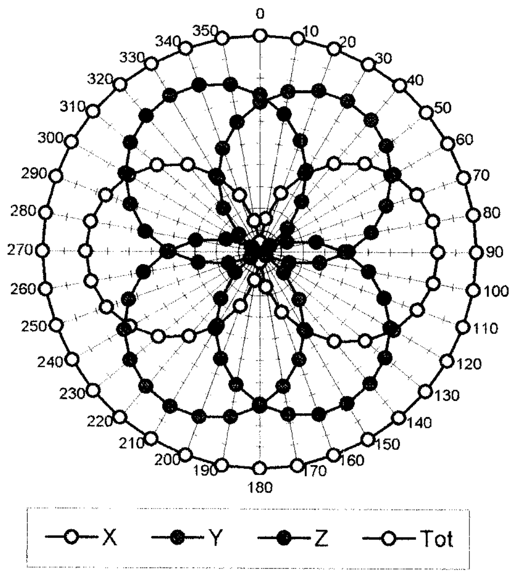
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	10.7	7.4
SAR_{be} [%]	With Correction Algorithm	0.1	0.3

Sensor Offset

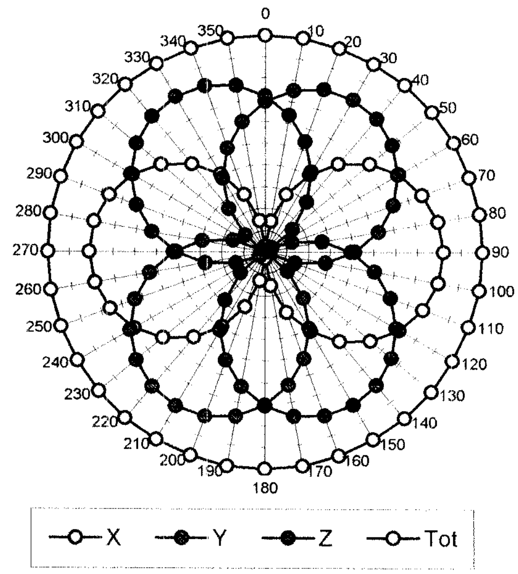
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.2 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

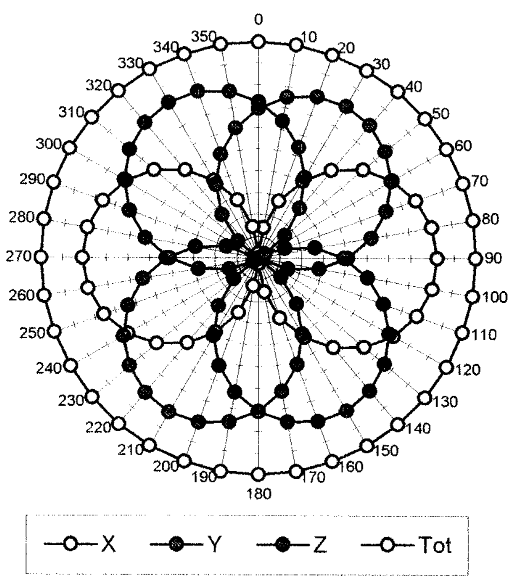
f = 30 MHz, TEM cell ifi110



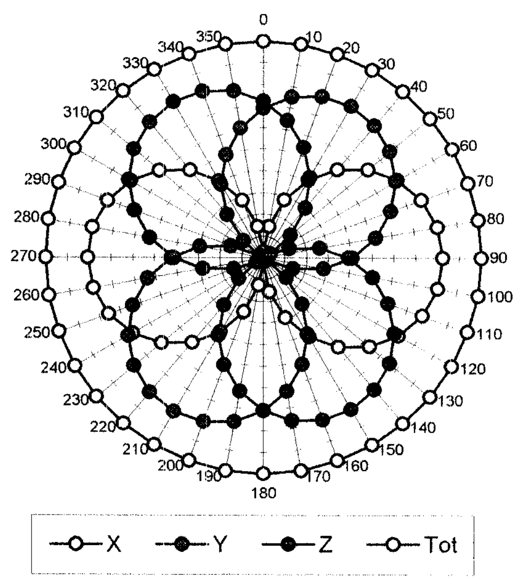
f = 100 MHz, TEM cell ifi110

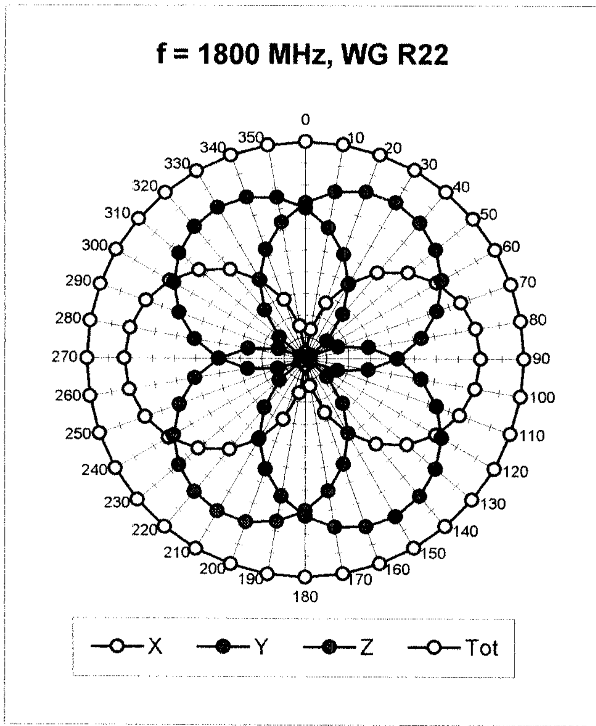


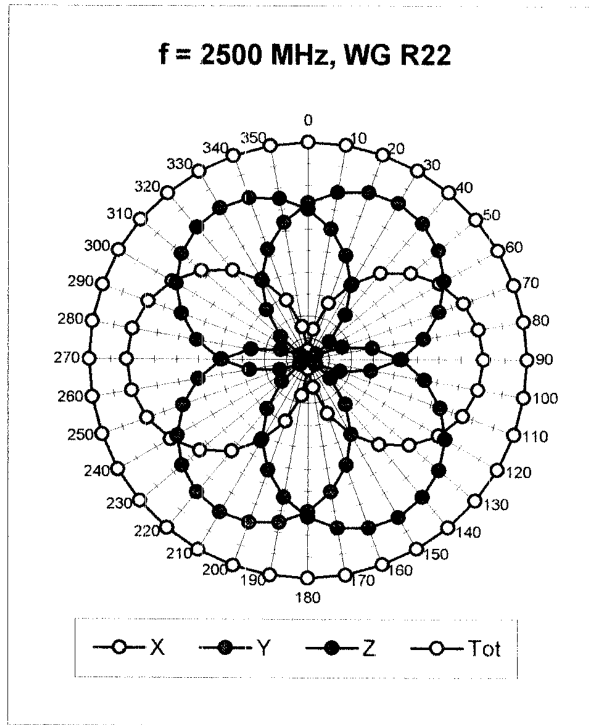
f = 300 MHz, TEM cell ifi110



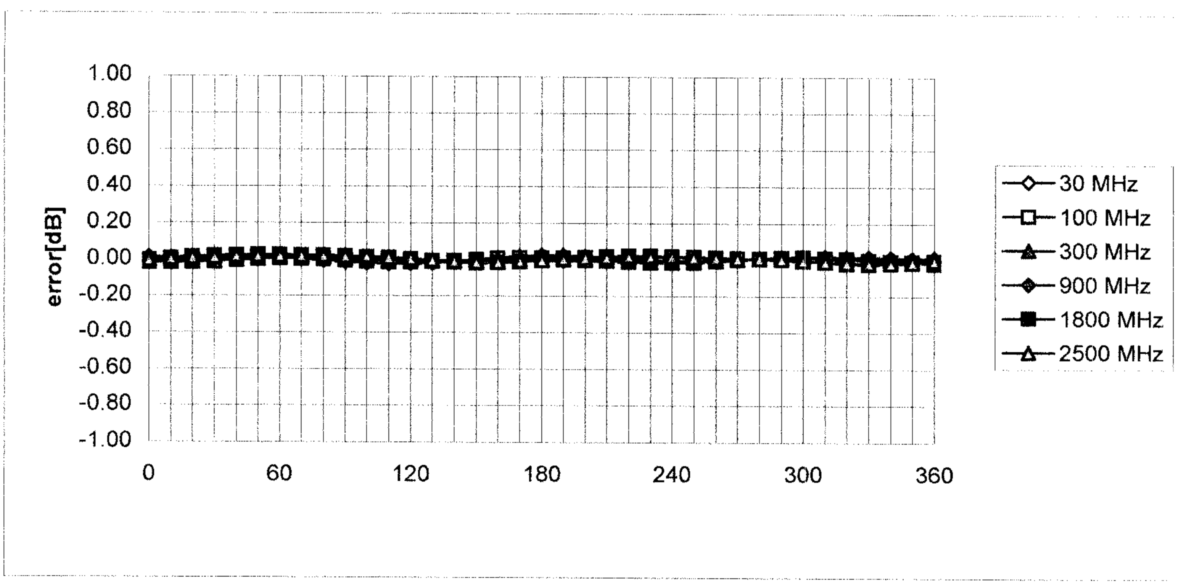
f = 900 MHz, TEM cell ifi110





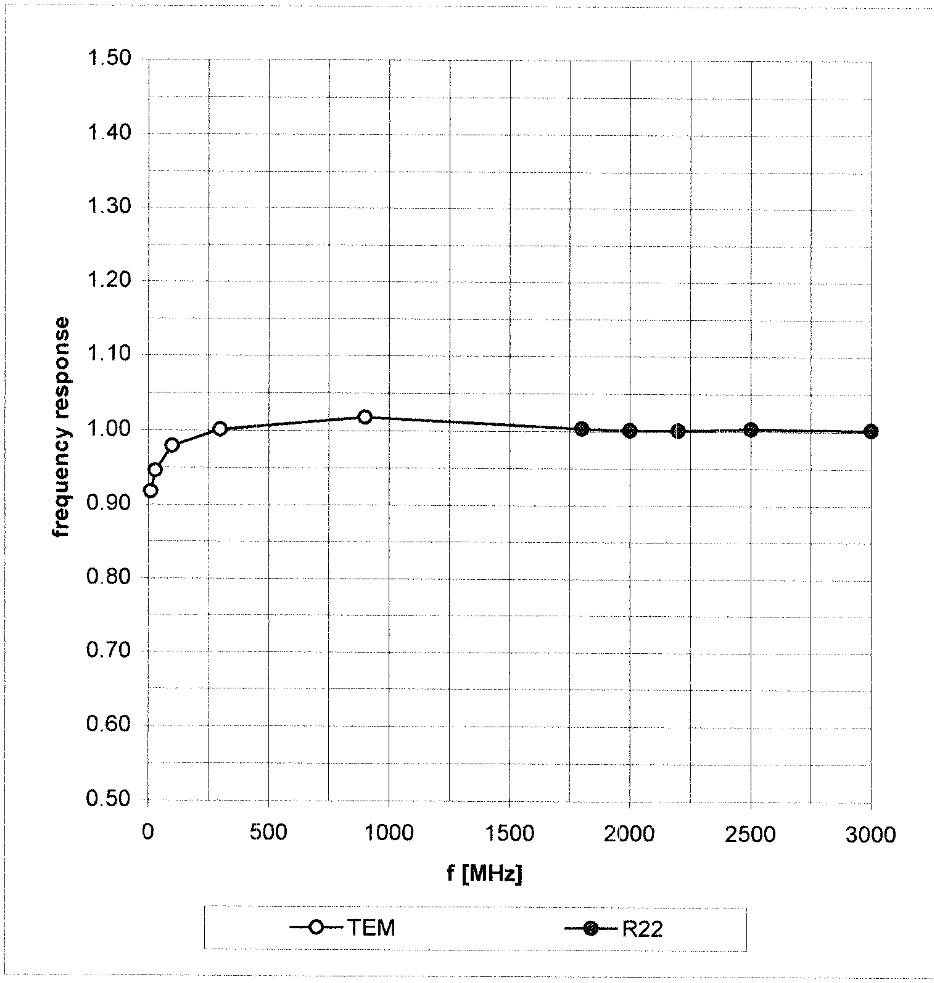


Isotropy Error (ϕ), θ = 0°



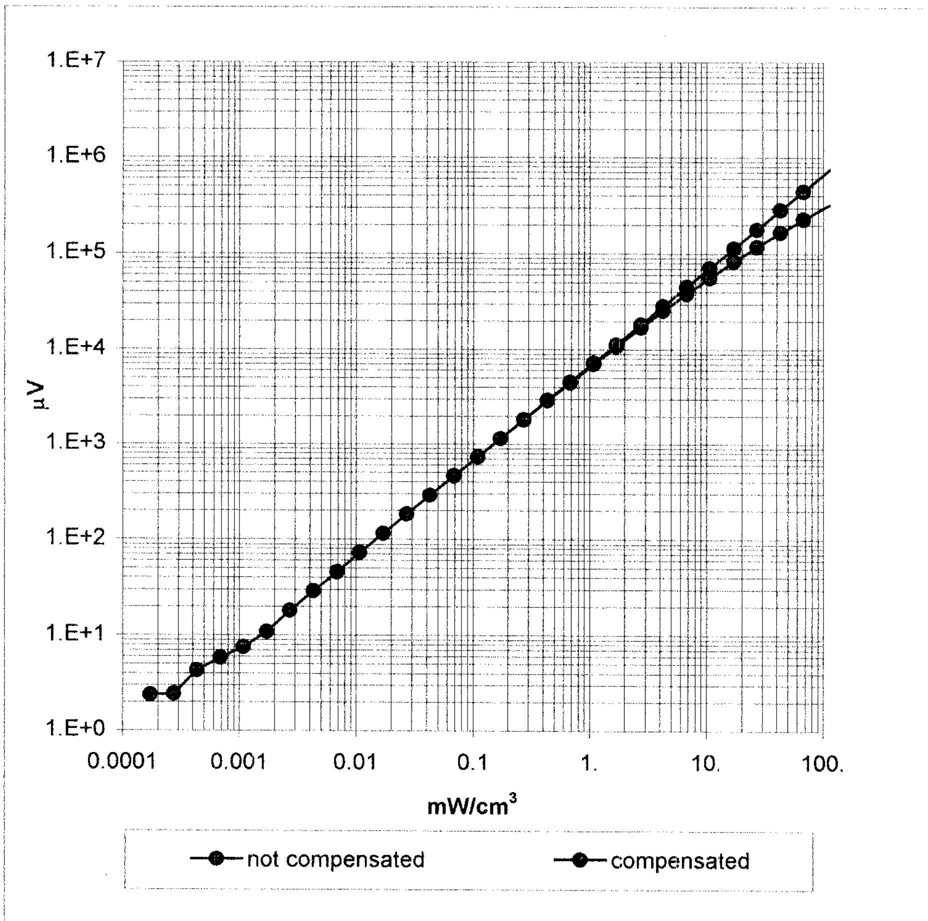
Frequency Response of E-Field

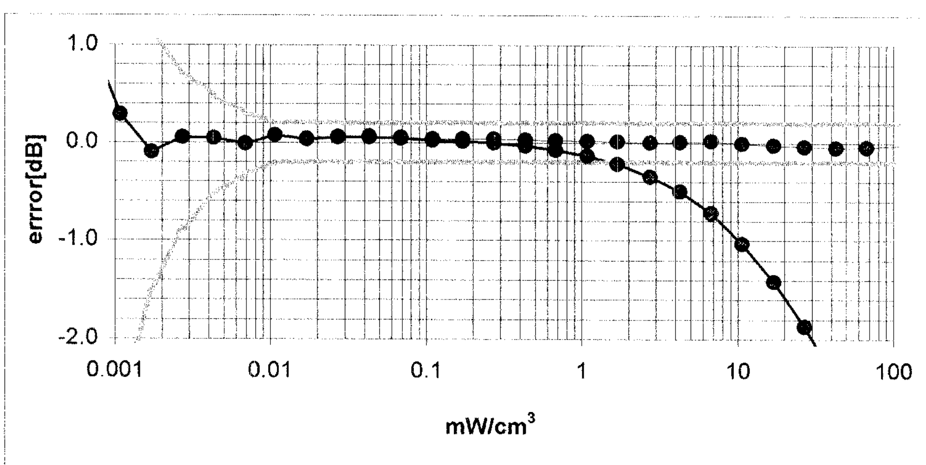
(TEM-Cell:ifi110, Waveguide R22)



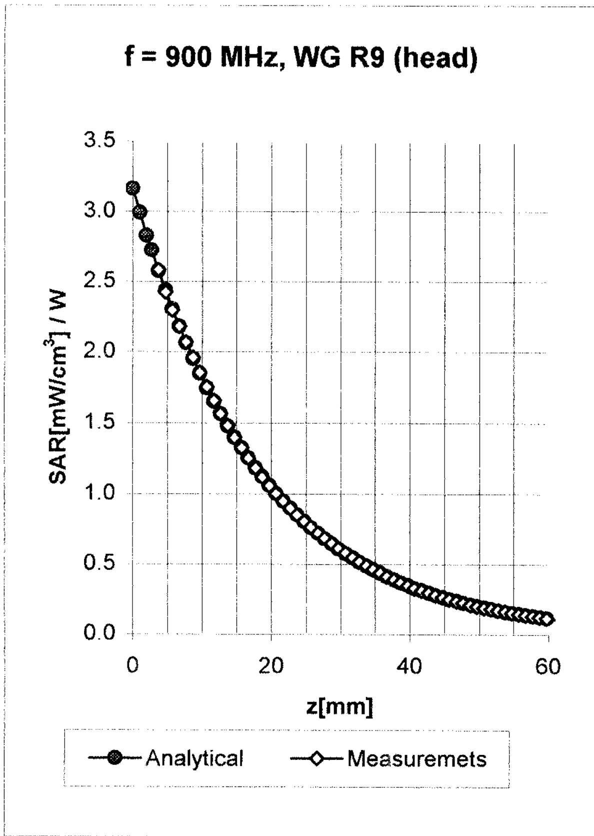
Dynamic Range f(SAR_{brain})

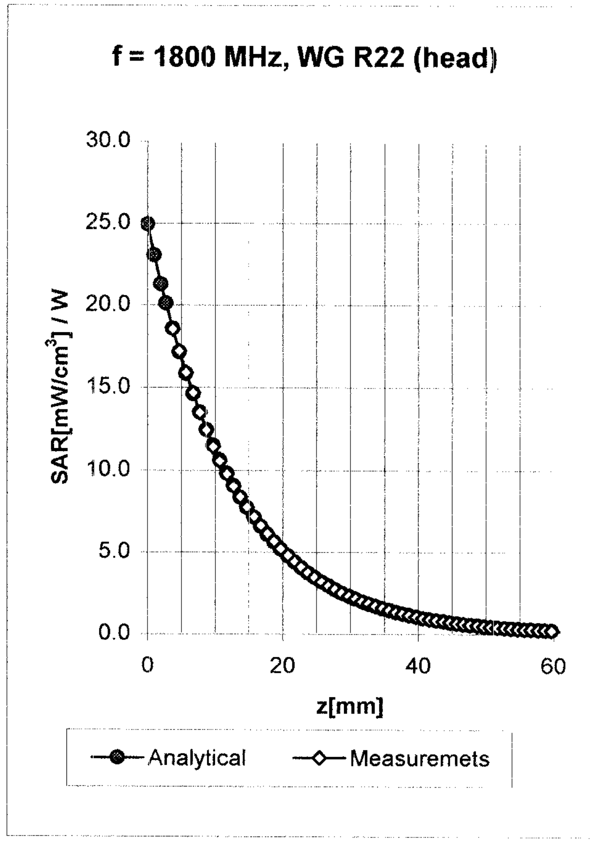
(Waveguide R22)





Conversion Factor Assessment

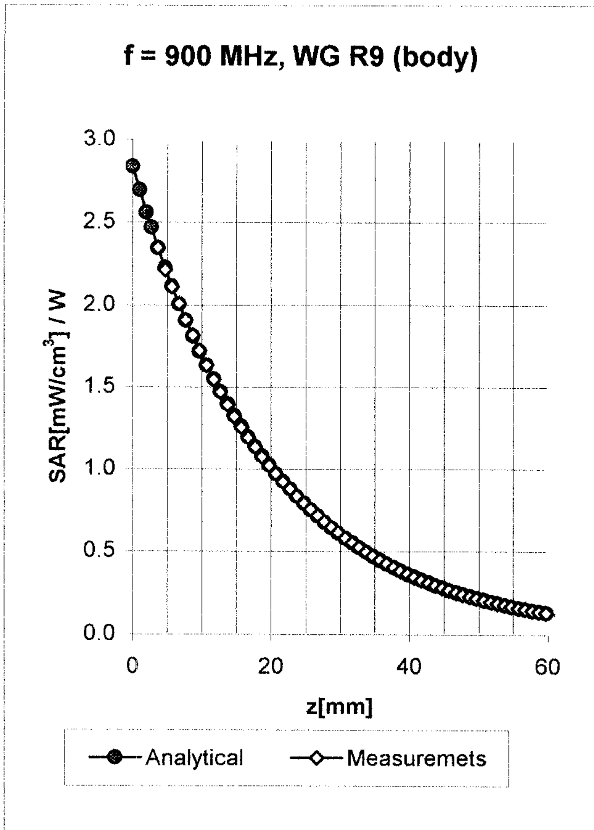


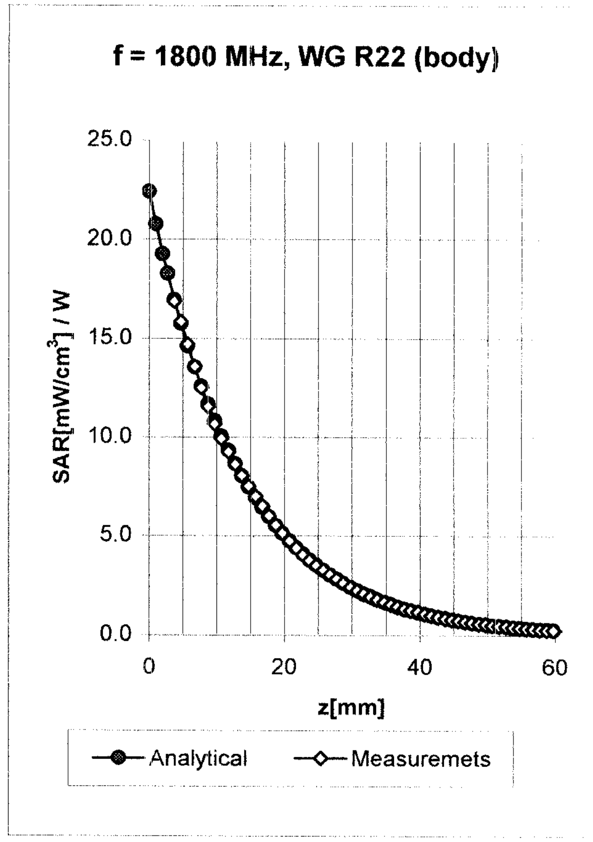


Head	**900 MHz**		ε_r **= 41.5 ± 5%**	σ **= 0.97 ± 5% mho/m**	
Head	**835 MHz**		ε_r **= 41.5 ± 5%**	σ **= 0.90 ± 5% mho/m**	
	ConvF X	**6.9**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.9**	± 9.5% (k=2)	Alpha	**0.30**
	ConvF Z	**6.9**	± 9.5% (k=2)	Depth	**2.71**

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



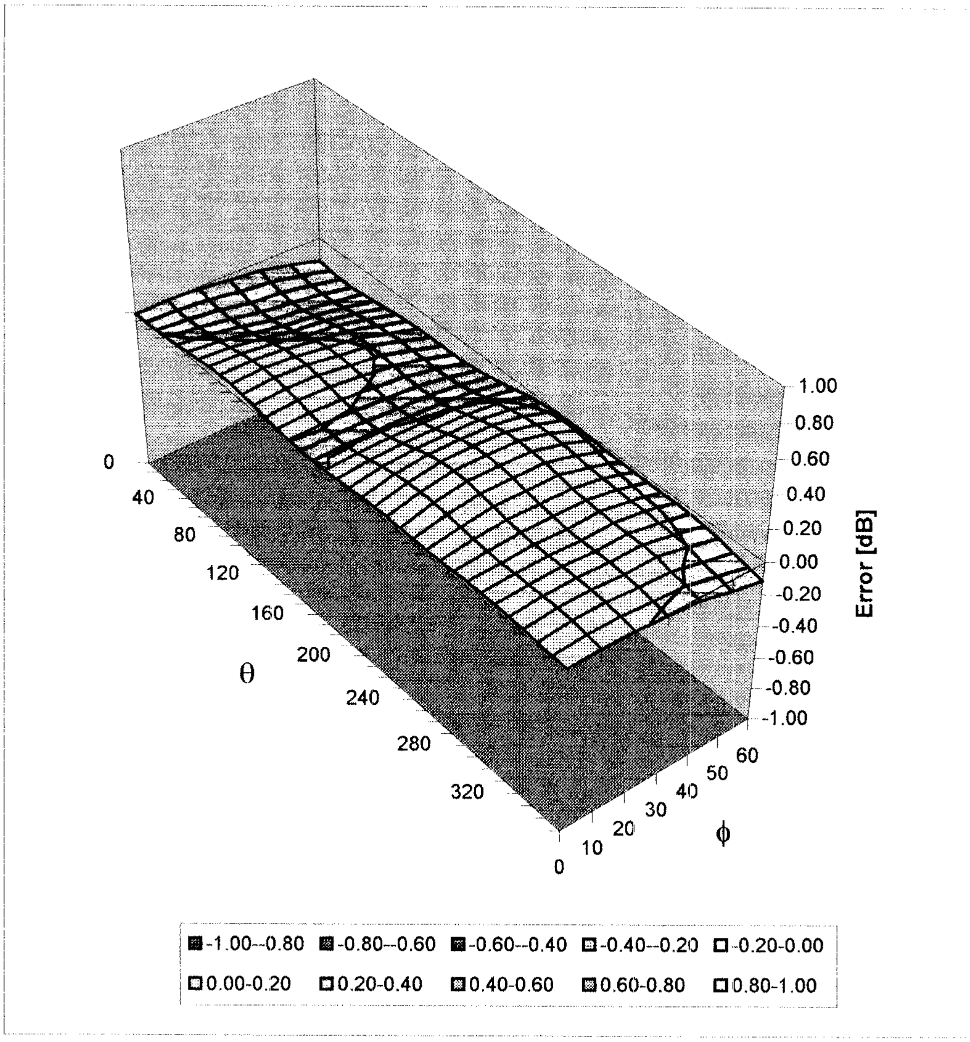


Body	**900 MHz**			ε_r **= 55.0 ± 5%**	σ **= 1.05 ± 5% mho/m**	
Body	**835 MHz**			ε_r **= 55.2 ± 5%**	σ **= 0.97 ± 5% mho/m**	
	ConvF X	**6.7**	± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**6.7**	± 9.5% (k=2)		Alpha	**0.34**
	ConvF Z	**6.7**	± 9.5% (k=2)		Depth	**2.57**

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: [signature]

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

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900MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

March 05, 2003

Frequency	e'	e''
800.000000 MHz	42.1740	19.7156
810.000000 MHz	42.0933	19.7013
820.000000 MHz	41.9317	19.6725
830.000000 MHz	41.8074	19.6084
840.000000 MHz	41.6626	19.5887
850.000000 MHz	41.5291	19.5567
860.000000 MHz	41.4146	19.5412
870.000000 MHz	41.2620	19.4866
880.000000 MHz	41.1726	19.4965
890.000000 MHz	41.0479	19.4769
900.000000 MHz	40.9714	19.3895
910.000000 MHz	40.8670	19.3664
920.000000 MHz	40.7501	19.2749
930.000000 MHz	40.6708	19.2660
940.000000 MHz	40.5484	19.2325
950.000000 MHz	40.4001	19.2273
960.000000 MHz	40.3158	19.2033
970.000000 MHz	40.1948	19.1730
980.000000 MHz	40.0876	19.1766
990.000000 MHz	39.9922	19.1632
1.000000000 GHz	39.9056	19.0976

900MHz EUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

March 05, 2003

Frequency	e'	e''
800.000000 MHz	54.8812	21.0013
810.000000 MHz	54.7993	20.9600
820.000000 MHz	54.6875	20.9022
830.000000 MHz	54.5803	20.9052
840.000000 MHz	54.4494	20.8458
850.000000 MHz	54.3278	20.8283
860.000000 MHz	54.2022	20.7591
870.000000 MHz	54.0987	20.7369
880.000000 MHz	54.0249	20.7251
890.000000 MHz	53.9200	20.7047
900.000000 MHz	53.9059	20.6126
910.000000 MHz	53.8087	20.5803
920.000000 MHz	53.7133	20.5429
930.000000 MHz	53.6538	20.4970
940.000000 MHz	53.5348	20.4964
950.000000 MHz	53.4613	20.4978
960.000000 MHz	53.3442	20.4576
970.000000 MHz	53.2486	20.4593
980.000000 MHz	53.1564	20.4599
990.000000 MHz	53.0700	20.4195
1.000000000 GHz	52.9761	20.3880

APPENDIX F - SAM PHANTOM CERTIFICATE OF CONFORMITY

Schmid & Partner
Engineering AG

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

Certificate of conformity / First Article Inspection

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

Tests

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

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

Standards

[1] CENELEC EN 50361
[2] IEEE P1528-200x draft 6.5
[3] IEC PT 62209 draft 0.9
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

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

Date 18.11.2001

Signature / Stamp

Schmid & Partner
Engineering AG
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

APPENDIX G - SAR TEST SETUP & EUT PHOTOGRAPHS

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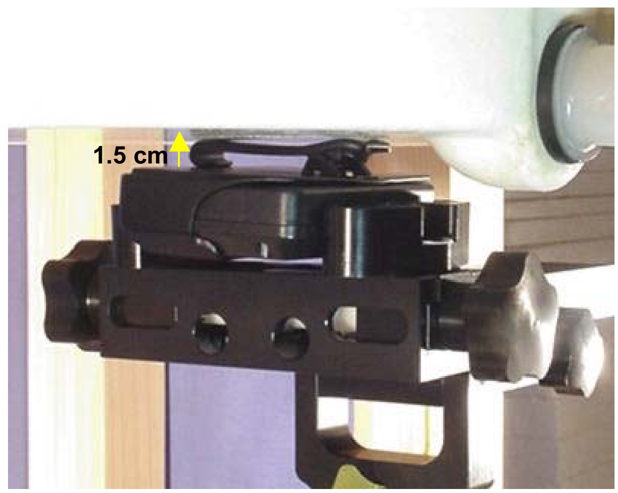
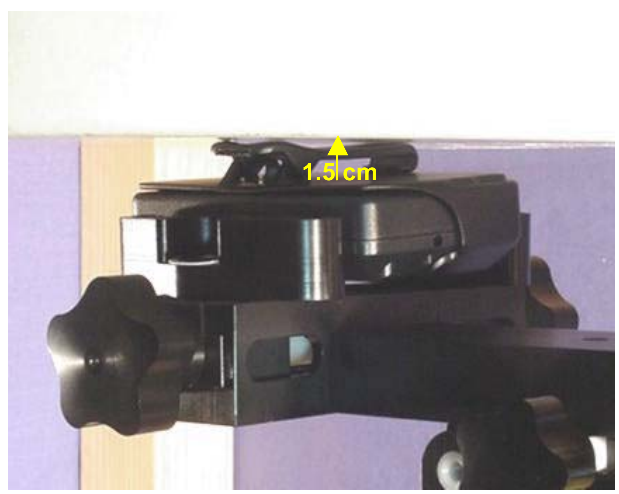
BODY SAR TEST SETUP PHOTOGRAPHS

Front Side of EUT with Belt-Clip Accessory
(1.5cm Belt-Clip Separation Distance to Planar Phantom)





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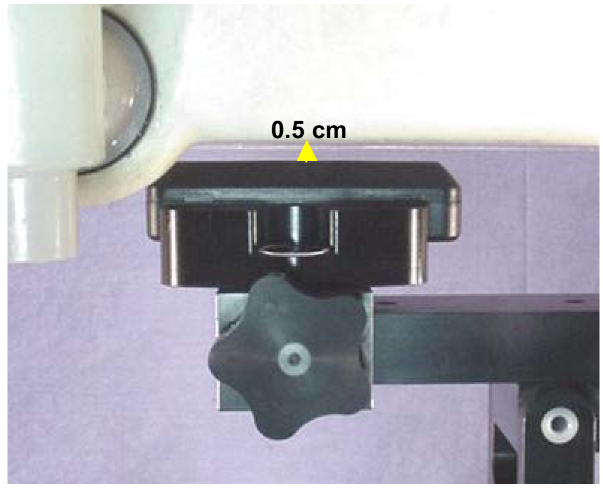
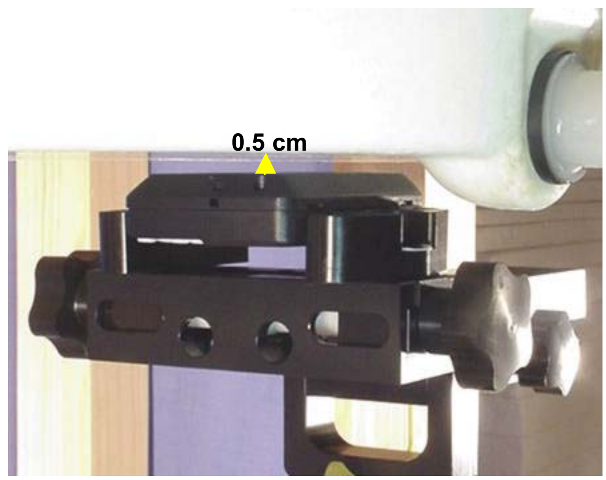
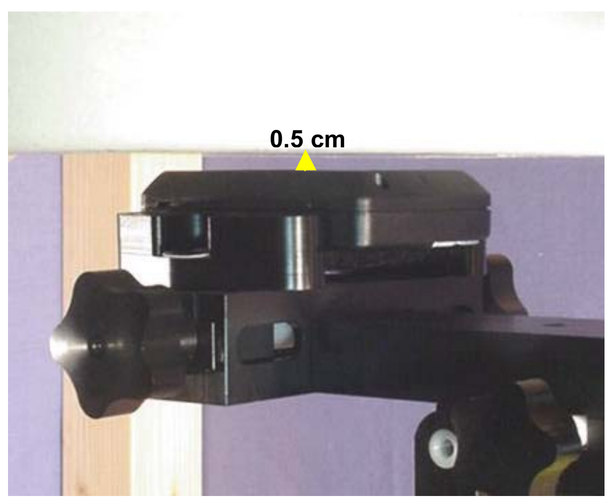
BODY SAR TEST SETUP PHOTOGRAPHS

Back Side of EUT - 0.5cm Separation Distance







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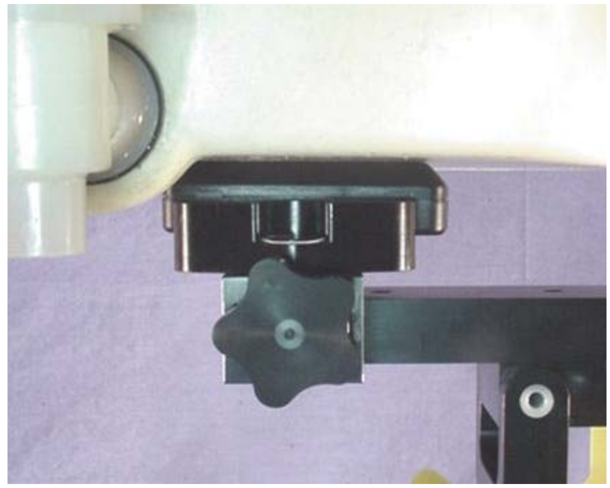
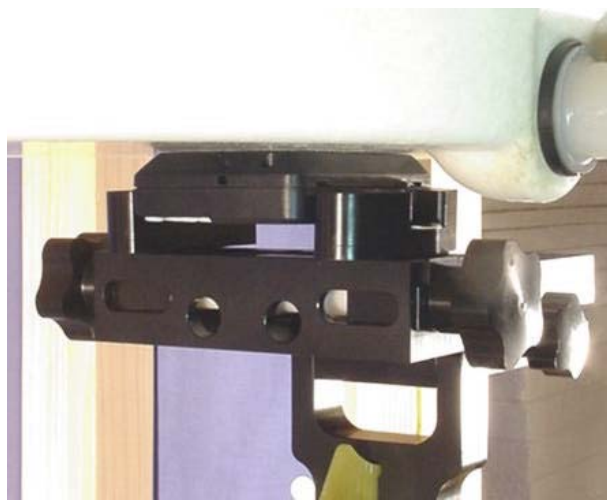
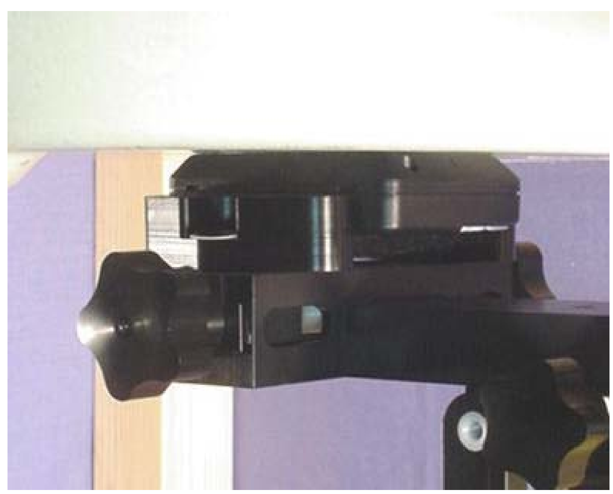
HAND SAR TEST SETUP PHOTOGRAPHS

Back Side of EUT - 0.0cm Separation Distance







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EUT PHOTOGRAPHS

EUT PHOTOGRAPHS

with Belt-Clip Accessory

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