

APPENDIX D - PROBE CALIBRATION

Client

Celltech Labs

CALIBRATION CERTIFICATE

Object(s)

ET3DV6 - SN: 1387

Calibration procedure(s)

QA CAL-01.v2
Calibration procedure for dosimetric E-field probes

Calibration date:

February 26, 2003

Condition of the calibrated item

In Tolerance (according to the specific calibration document)

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

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

Calibration Equipment used (M&TE critical for calibration)

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

Calibrated by:

Name

Nico Vetterli

Function

Technician

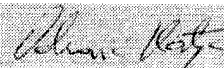
Signature



Approved by:

Katja Pokovic

Laboratory Director



Date issued: February 26, 2003

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

Probe ET3DV6

SN:1387

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

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space

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

Diode Compression

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

Sensitivity in Tissue Simulating Liquid

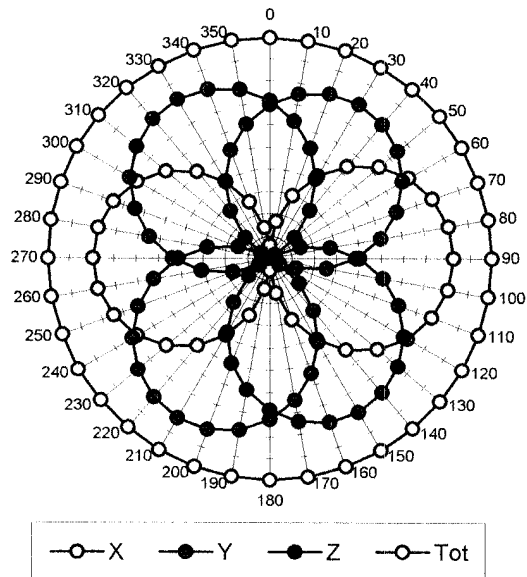
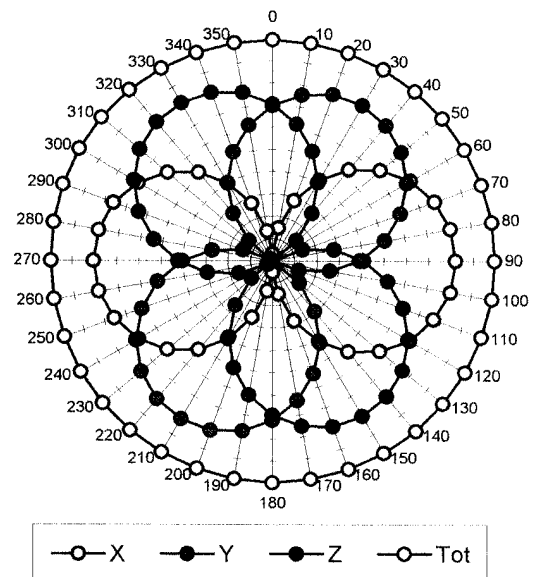
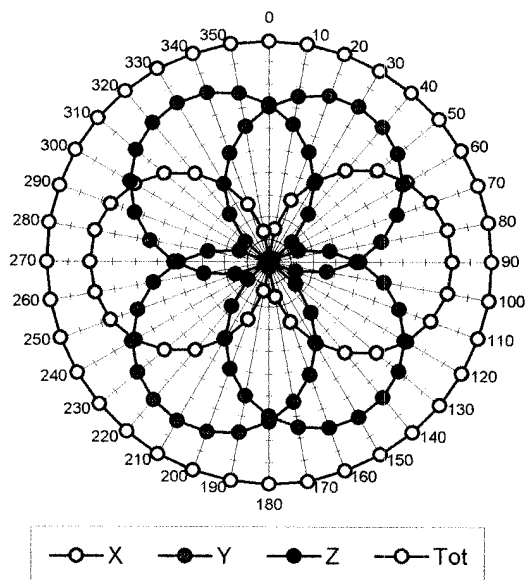
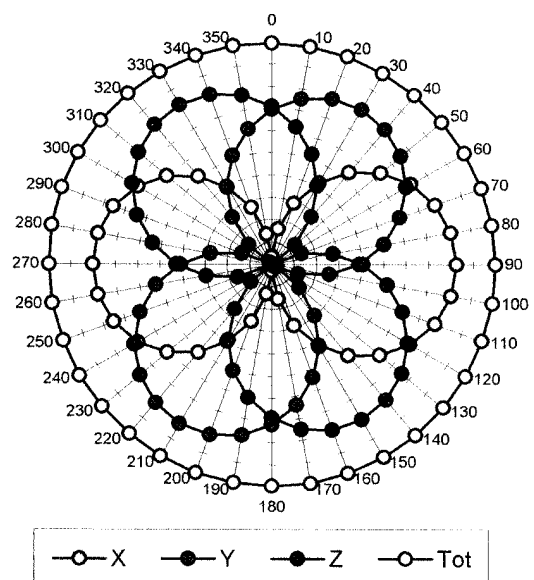
Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
ConvF X	6.6 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.6 $\pm 9.5\%$ (k=2)	Alpha	0.37
ConvF Z	6.6 $\pm 9.5\%$ (k=2)	Depth	2.61
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
ConvF X	5.2 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	5.2 $\pm 9.5\%$ (k=2)	Alpha	0.50
ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth	2.73

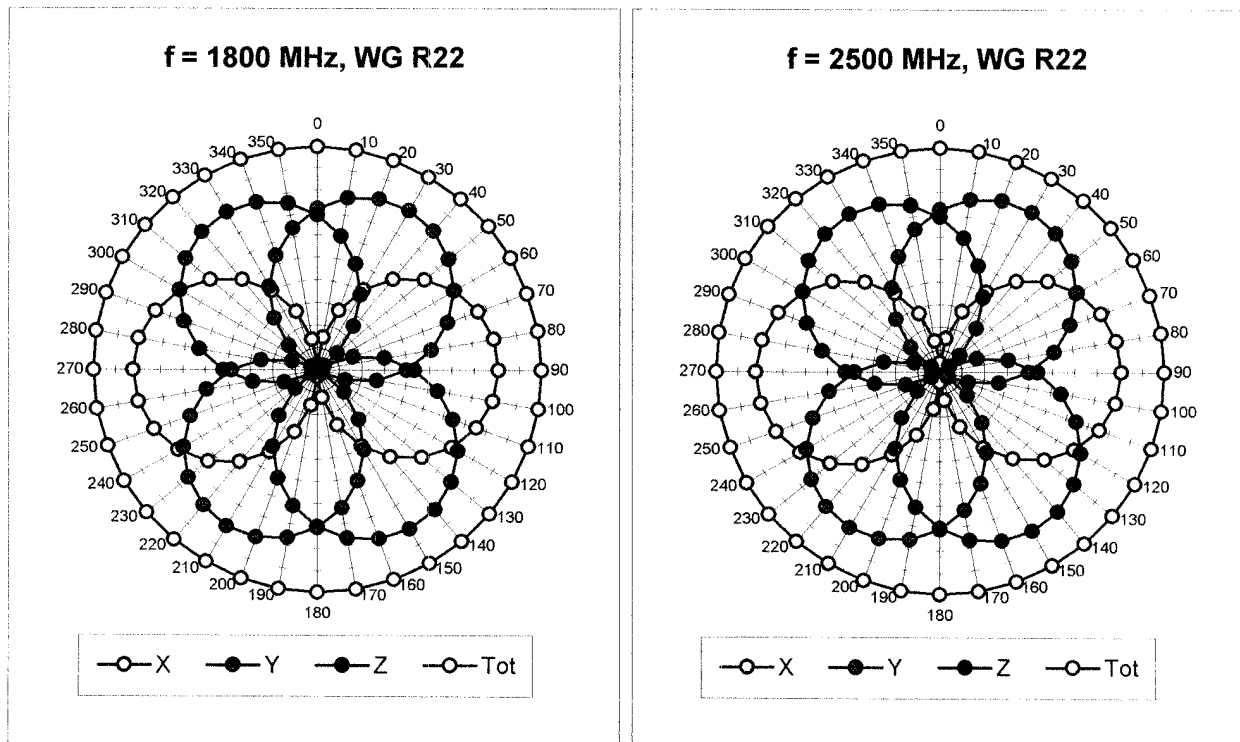
Boundary Effect

Head	900 MHz	Typical SAR gradient: 5 % per mm	
Probe Tip to Boundary		1 mm	2 mm
SAR _{pe} [%]	Without Correction Algorithm	10.2	5.9
SAR _{pe} [%]	With Correction Algorithm	0.4	0.6
Head	1800 MHz	Typical SAR gradient: 10 % per mm	
Probe Tip to Boundary		1 mm	2 mm
SAR _{pe} [%]	Without Correction Algorithm	14.6	9.8
SAR _{pe} [%]	With Correction Algorithm	0.2	0.0

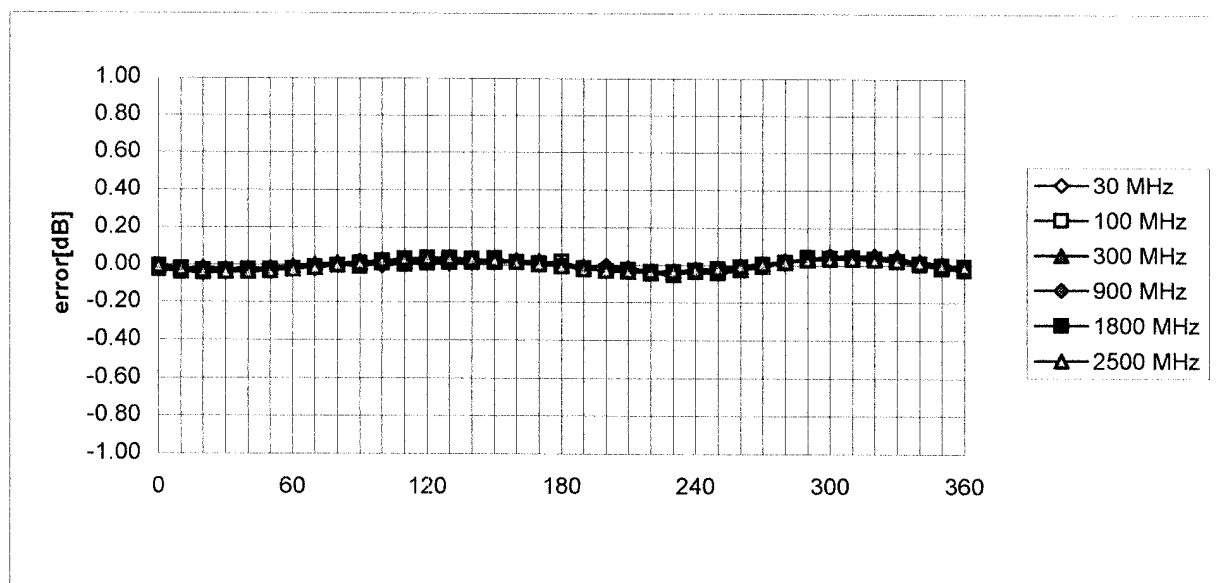
Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.4 $\pm$ 0.2	mm

Receiving Pattern (ϕ), $\theta = 0^\circ$ **f = 30 MHz, TEM cell ifi110****f = 100 MHz, TEM cell ifi110****f = 300 MHz, TEM cell ifi110****f = 900 MHz, TEM cell ifi110**

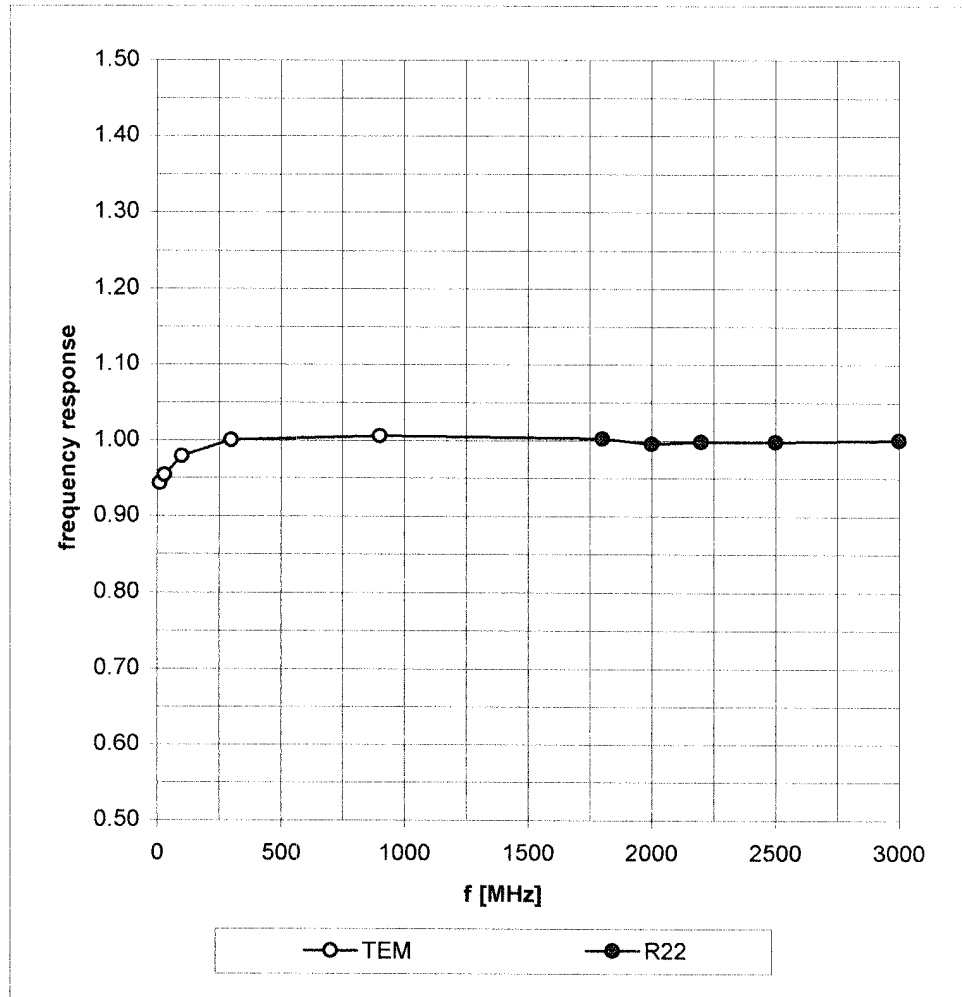


Isotropy Error (ϕ), $\theta = 0^\circ$

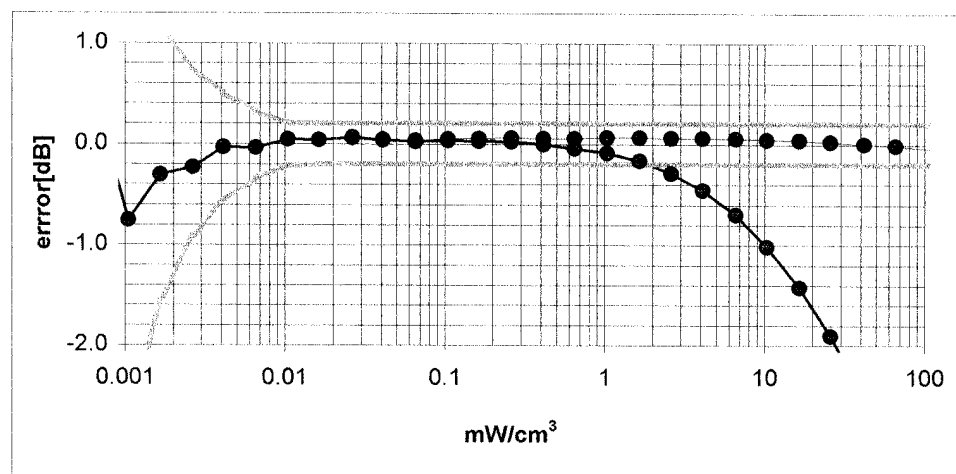
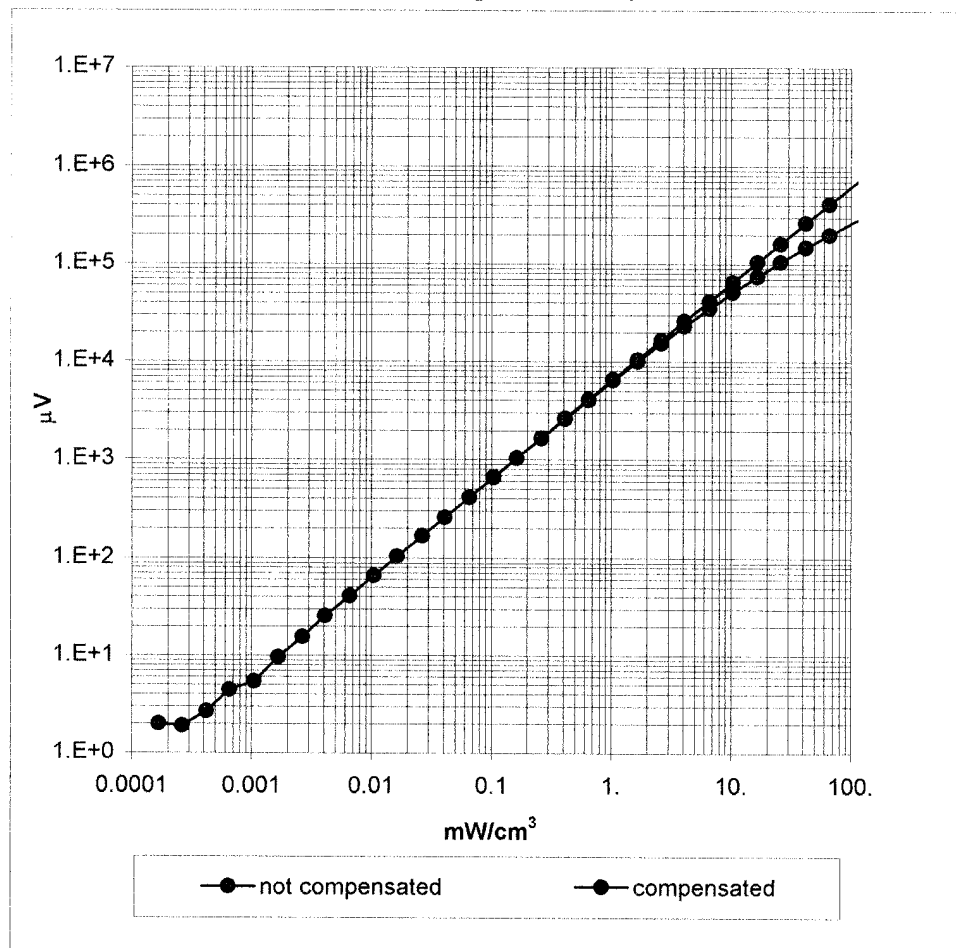


Frequency Response of E-Field

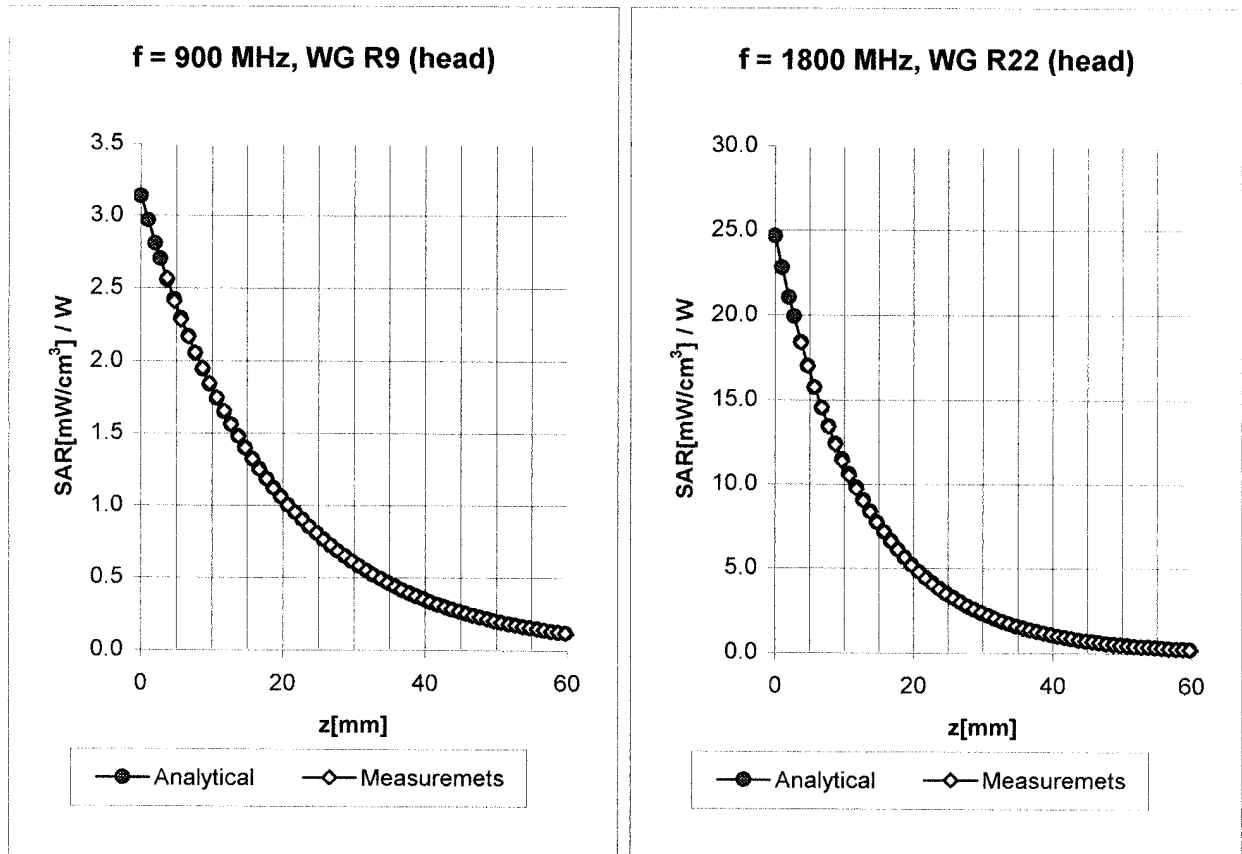
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR_{brain}) (Waveguide R22)

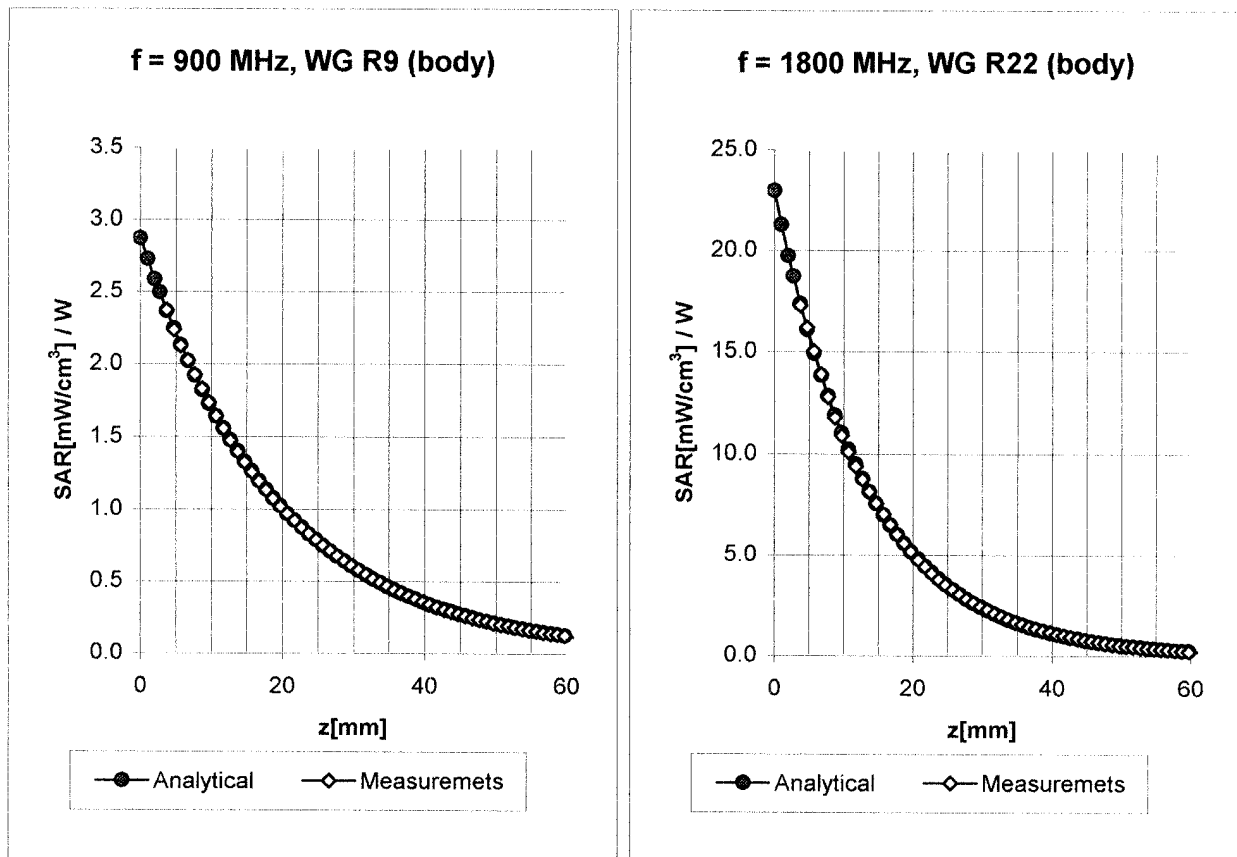


Conversion Factor Assessment



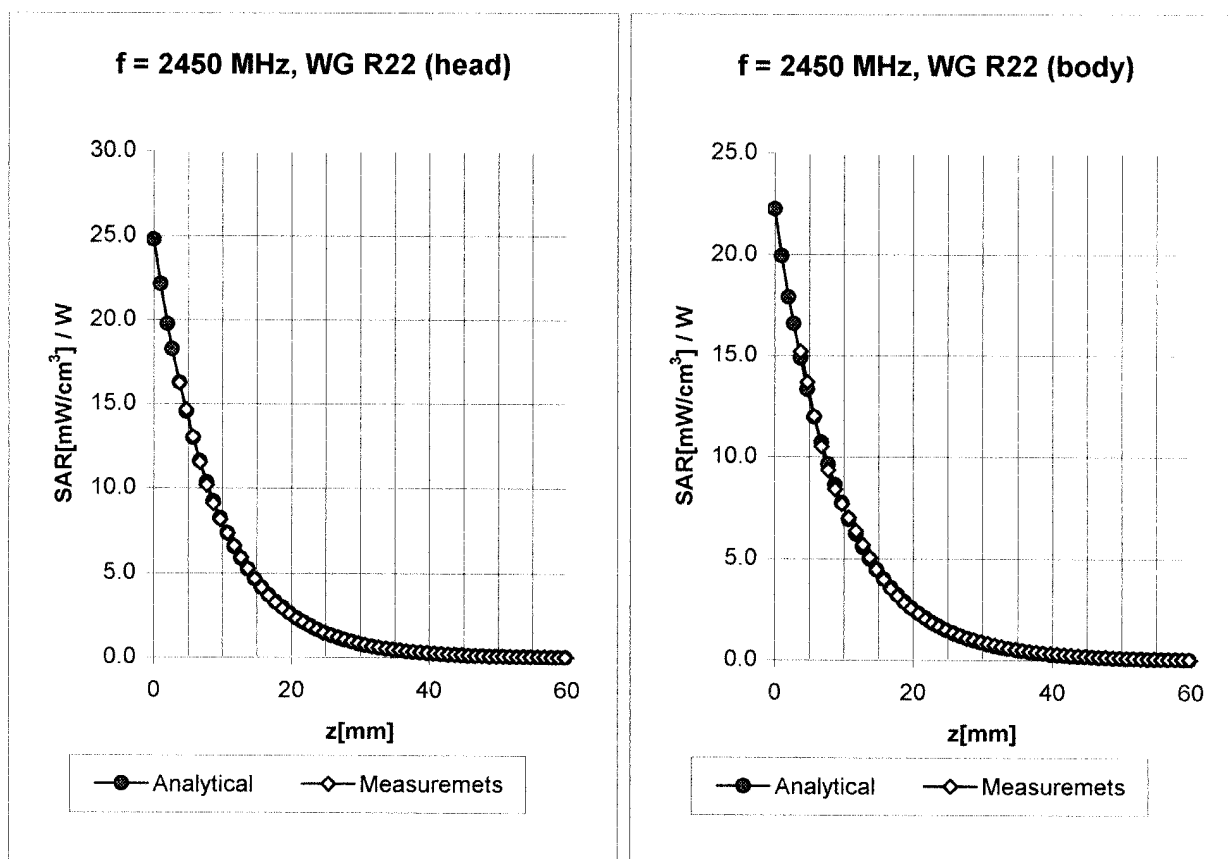
Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
	ConvF X	6.6 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	6.6 $\pm 9.5\%$ (k=2)	Alpha 0.37
	ConvF Z	6.6 $\pm 9.5\%$ (k=2)	Depth 2.61
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
	ConvF X	5.2 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	5.2 $\pm 9.5\%$ (k=2)	Alpha 0.50
	ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth 2.73

Conversion Factor Assessment



Body	900 MHz	$\epsilon_r = 55.0 \pm 5\%$	$\sigma = 1.05 \pm 5\% \text{ mho/m}$
Body	835 MHz	$\epsilon_r = 55.2 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
	ConvF X	6.4 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	6.4 $\pm 9.5\%$ (k=2)	Alpha 0.45
	ConvF Z	6.4 $\pm 9.5\%$ (k=2)	Depth 2.35
Body	1800 MHz	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
Body	1900 MHz	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
	ConvF X	4.9 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	4.9 $\pm 9.5\%$ (k=2)	Alpha 0.60
	ConvF Z	4.9 $\pm 9.5\%$ (k=2)	Depth 2.59

Conversion Factor Assessment



Head 2450 MHz $\epsilon_r = 39.2 \pm 5\%$ $\sigma = 1.80 \pm 5\%$ mho/m

ConvF X **5.0** $\pm 8.9\%$ (k=2)

Boundary effect:

ConvF Y **5.0** $\pm 8.9\%$ (k=2)

Alpha **1.04**

ConvF Z **5.0** $\pm 8.9\%$ (k=2)

Depth **1.85**

Body 2450 MHz $\epsilon_r = 52.7 \pm 5\%$ $\sigma = 1.95 \pm 5\%$ mho/m

ConvF X **4.6** $\pm 8.9\%$ (k=2)

Boundary effect:

ConvF Y **4.6** $\pm 8.9\%$ (k=2)

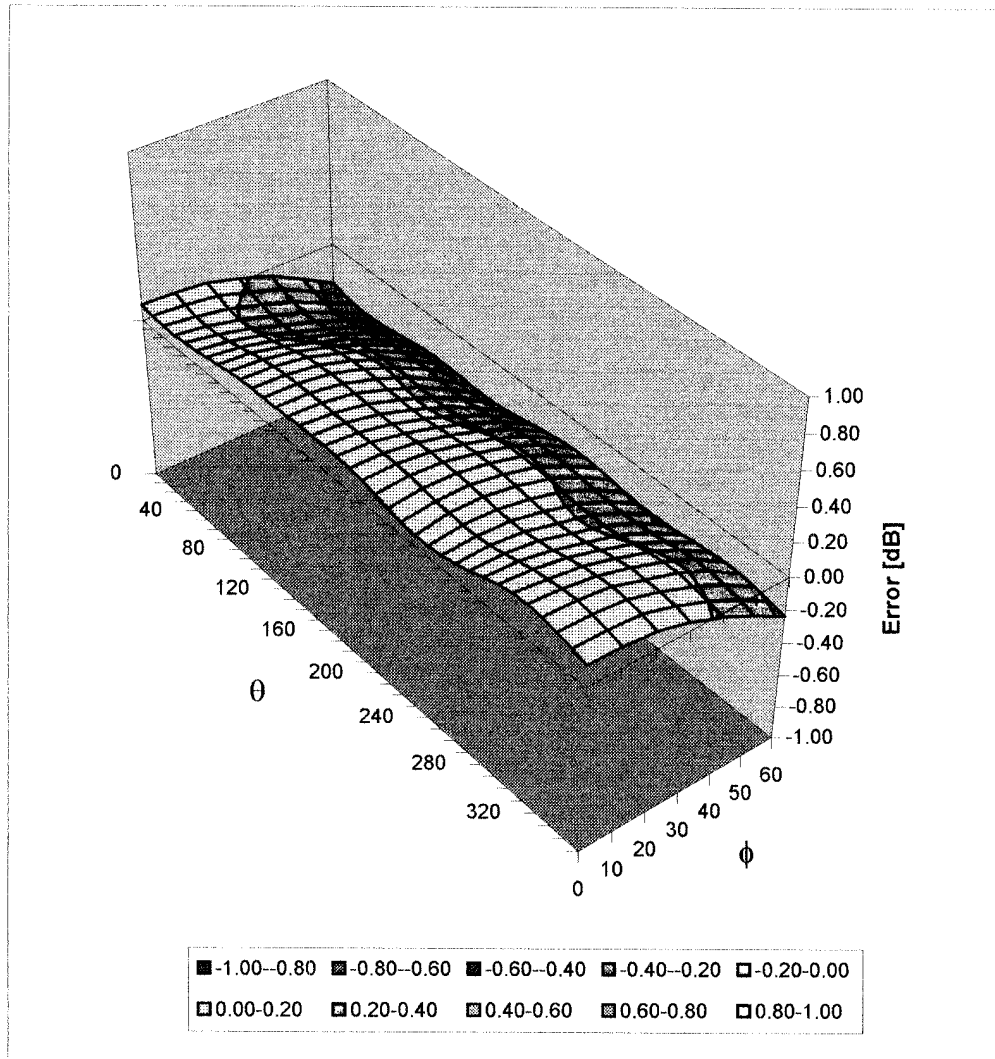
Alpha **1.20**

ConvF Z **4.6** $\pm 8.9\%$ (k=2)

Depth **1.60**

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1387

Place of Assessment:

Zurich

Date of Assessment:

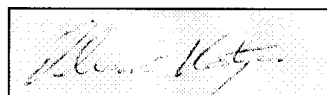
February 28, 2003

Probe Calibration Date:

February 26, 2003

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

Assessed by:



Dosimetric E-Field Probe ET3DV6 SN:1387

Conversion factor ($\pm$ standard deviation)

150 MHz	ConvF	$9.1 \pm 8\%$	$\epsilon_r = 52.3$ $\sigma = 0.76 \text{ mho/m}$ (head tissue)
300 MHz	ConvF	$7.9 \pm 8\%$	$\epsilon_r = 45.3$ $\sigma = 0.87 \text{ mho/m}$ (head tissue)
450 MHz	ConvF	$7.5 \pm 8\%$	$\epsilon_r = 43.5$ $\sigma = 0.87 \text{ mho/m}$ (head tissue)
150 MHz	ConvF	$8.8 \pm 8\%$	$\epsilon_r = 61.9$ $\sigma = 0.80 \text{ mho/m}$ (body tissue)
300 MHz	ConvF	$8.0 \pm 8\%$	$\epsilon_r = 58.2$ $\sigma = 0.92 \text{ mho/m}$ (body tissue)
450 MHz	ConvF	$7.7 \pm 8\%$	$\epsilon_r = 56.7$ $\sigma = 0.94 \text{ mho/m}$ (body tissue)

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

1800 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

November 27, 2003

Frequency	e'	e''
1.700000000 GHz	39.0922	13.8027
1.710000000 GHz	39.0411	13.8187
1.720000000 GHz	38.9891	13.8199
1.730000000 GHz	38.9298	13.8440
1.740000000 GHz	38.8625	13.8790
1.750000000 GHz	38.8018	13.9013
1.760000000 GHz	38.7509	13.9489
1.770000000 GHz	38.7082	13.9765
1.780000000 GHz	38.6486	13.9988
1.790000000 GHz	38.6126	14.0228
1.800000000 GHz	38.5538	14.0419
1.810000000 GHz	38.5043	14.0801
1.820000000 GHz	38.4666	14.0692
1.830000000 GHz	38.4206	14.0936
1.840000000 GHz	38.3916	14.0991
1.850000000 GHz	38.3620	14.1020
1.860000000 GHz	38.3175	14.1081
1.870000000 GHz	38.2786	14.1318
1.880000000 GHz	38.2506	14.1520
1.890000000 GHz	38.2036	14.1927
1.900000000 GHz	38.1818	14.2240

1880 MHz DUT Evaluation (Head)

Measured Fluid Dielectric Parameters (Brain)

November 27, 2003

Frequency	e'	e''
1.800000000 GHz	38.8409	13.3663
1.810000000 GHz	38.8025	13.3985
1.820000000 GHz	38.7307	13.4176
1.830000000 GHz	38.7092	13.4487
1.840000000 GHz	38.6654	13.4455
1.850000000 GHz	38.6123	13.4452
1.860000000 GHz	38.5855	13.4471
1.870000000 GHz	38.5386	13.4584
1.880000000 GHz	38.4927	13.4840
1.890000000 GHz	38.4687	13.5288
1.900000000 GHz	38.4223	13.5638
1.910000000 GHz	38.3788	13.6205
1.920000000 GHz	38.3478	13.6432
1.930000000 GHz	38.3289	13.7021
1.940000000 GHz	38.3011	13.7169
1.950000000 GHz	38.2718	13.7415
1.960000000 GHz	38.2286	13.7517
1.970000000 GHz	38.1952	13.7530
1.980000000 GHz	38.1277	13.7763
1.990000000 GHz	38.0825	13.8145
2.000000000 GHz	38.0284	13.8327

1800 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

November 28, 2003

Frequency	e'	e''
1.700000000 GHz	38.8839	13.8932
1.710000000 GHz	38.8467	13.8990
1.720000000 GHz	38.7724	13.8916
1.730000000 GHz	38.7258	13.9093
1.740000000 GHz	38.6490	13.9258
1.750000000 GHz	38.5904	13.9721
1.760000000 GHz	38.5338	14.0297
1.770000000 GHz	38.4826	14.0781
1.780000000 GHz	38.4361	14.1056
1.790000000 GHz	38.3979	14.1345
1.800000000 GHz	38.3357	14.1774
1.810000000 GHz	38.3007	14.1865
1.820000000 GHz	38.2429	14.1910
1.830000000 GHz	38.1978	14.1945
1.840000000 GHz	38.1549	14.1849
1.850000000 GHz	38.1216	14.1849
1.860000000 GHz	38.0694	14.1815
1.870000000 GHz	38.0364	14.1936
1.880000000 GHz	37.9929	14.2211
1.890000000 GHz	37.9595	14.2780
1.900000000 GHz	37.9417	14.3196

1880 MHz DUT Evaluation (Head)

Measured Fluid Dielectric Parameters (Brain)

November 28, 2003

Frequency	e'	e''
1.800000000 GHz	38.6460	13.3574
1.810000000 GHz	38.6115	13.3852
1.820000000 GHz	38.5501	13.3958
1.830000000 GHz	38.5052	13.3971
1.840000000 GHz	38.4656	13.4103
1.850000000 GHz	38.4390	13.4039
1.860000000 GHz	38.4027	13.4095
1.870000000 GHz	38.3443	13.4256
1.880000000 GHz	38.3229	13.4667
1.890000000 GHz	38.2778	13.4957
1.900000000 GHz	38.2463	13.5546
1.910000000 GHz	38.2177	13.5970
1.920000000 GHz	38.1892	13.6422
1.930000000 GHz	38.1630	13.6889
1.940000000 GHz	38.1375	13.7117
1.950000000 GHz	38.0959	13.7301
1.960000000 GHz	38.0509	13.7277
1.970000000 GHz	37.9962	13.7405
1.980000000 GHz	37.9540	13.7485
1.990000000 GHz	37.8700	13.7661
2.000000000 GHz	37.8321	13.8179

1800 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

December 01, 2003

Frequency	e'	e''
1.700000000 GHz	39.0123	13.7879
1.710000000 GHz	38.9739	13.8096
1.720000000 GHz	38.9212	13.8146
1.730000000 GHz	38.8594	13.8343
1.740000000 GHz	38.7855	13.8734
1.750000000 GHz	38.7283	13.9124
1.760000000 GHz	38.6678	13.9535
1.770000000 GHz	38.6229	13.9980
1.780000000 GHz	38.5620	14.0334
1.790000000 GHz	38.5267	14.0633
1.800000000 GHz	38.4778	14.0830
1.810000000 GHz	38.4200	14.1322
1.820000000 GHz	38.3675	14.1364
1.830000000 GHz	38.3199	14.1469
1.840000000 GHz	38.2772	14.1487
1.850000000 GHz	38.2324	14.1552
1.860000000 GHz	38.1848	14.1753
1.870000000 GHz	38.1396	14.1824
1.880000000 GHz	38.1005	14.2128
1.890000000 GHz	38.0511	14.2583
1.900000000 GHz	38.0269	14.2946

1880 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

December 01, 2003

Frequency	e'	e''
1.800000000 GHz	51.8893	14.7615
1.810000000 GHz	51.8550	14.7936
1.820000000 GHz	51.7889	14.8240
1.830000000 GHz	51.7643	14.8629
1.840000000 GHz	51.7232	14.8801
1.850000000 GHz	51.6834	14.8966
1.860000000 GHz	51.6560	14.9171
1.870000000 GHz	51.6108	14.9318
1.880000000 GHz	51.5679	14.9592
1.890000000 GHz	51.5440	15.0061
1.900000000 GHz	51.5164	15.0386
1.910000000 GHz	51.4670	15.0764
1.920000000 GHz	51.4602	15.1159
1.930000000 GHz	51.4174	15.1450
1.940000000 GHz	51.3978	15.1858
1.950000000 GHz	51.3780	15.2125
1.960000000 GHz	51.3242	15.2313
1.970000000 GHz	51.2936	15.2579
1.980000000 GHz	51.2580	15.2966
1.990000000 GHz	51.2044	15.3523
2.000000000 GHz	51.1718	15.3748

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

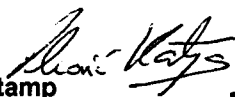
- [1] CENELEC EN 50361
- [2] IEEE P1528-200x draft 6.5
- [3] IEC PT 62209 draft 0.9
- (*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

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 & DUT PHOTOGRAPHS

HEAD SAR TEST SETUP PHOTOGRAPHS

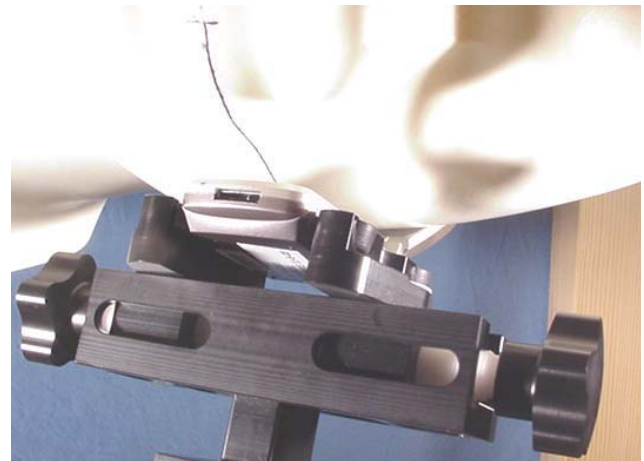
Left Head Section / Cheek-Touch Position



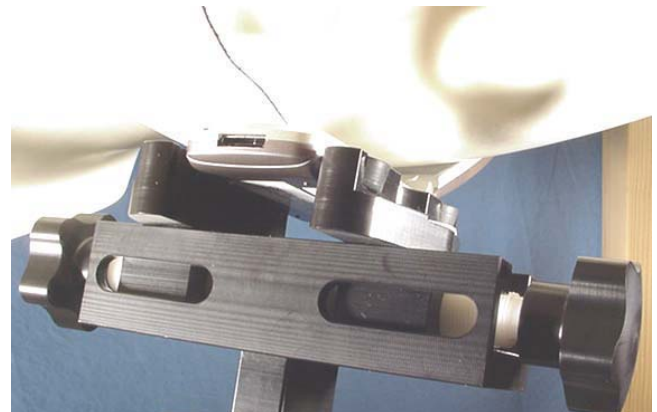
with Standard Battery



with Slim Battery



with Standard Battery



with Slim Battery

SAR TEST SETUP PHOTOGRAPHS

Left Head Section / Ear-Tilt Position (15°)



with Standard Battery



with Slim Battery



with Standard Battery



with Slim Battery

SAR TEST SETUP PHOTOGRAPHS

Right Head Section / Cheek-Touch Position



with Standard Battery



with Slim Battery



with Standard Battery



with Slim Battery

SAR TEST SETUP PHOTOGRAPHS

Right Head Section / Ear-Tilt Position (15°)



with Standard Battery



with Slim Battery

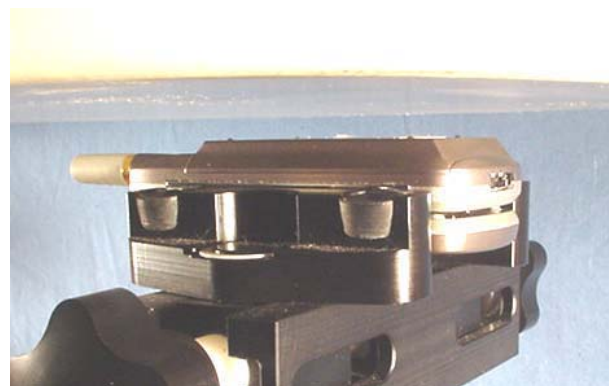
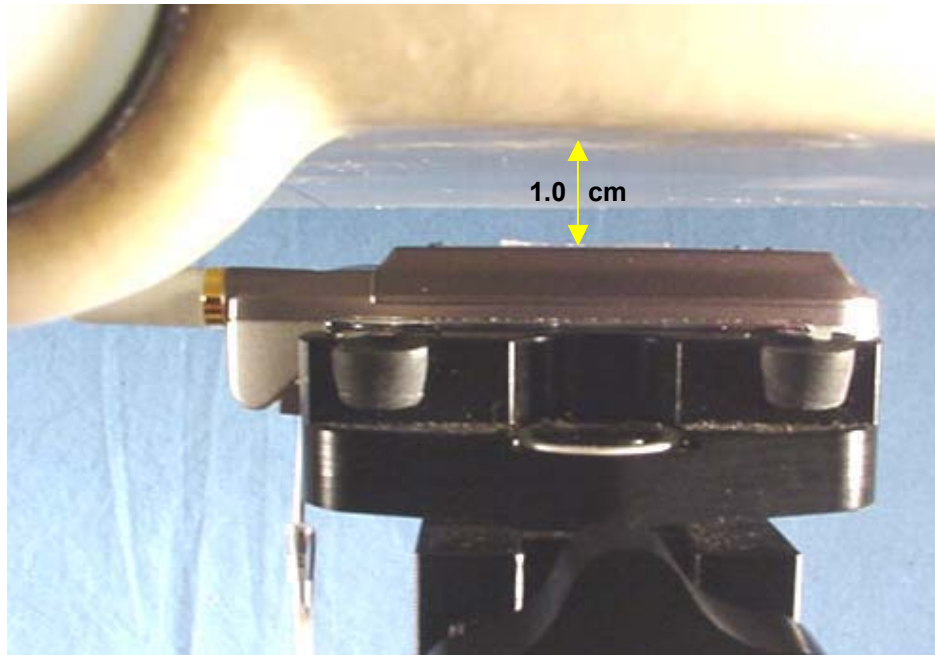


with Standard Battery



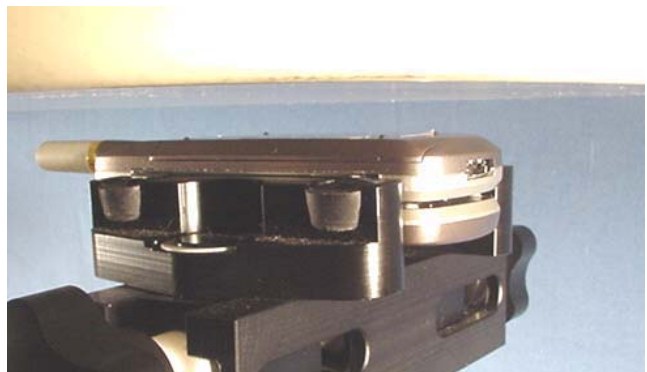
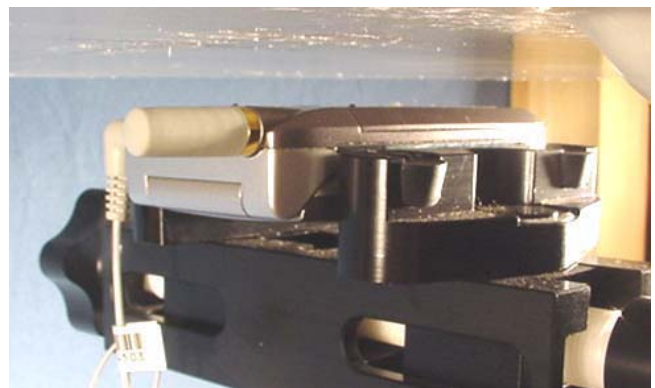
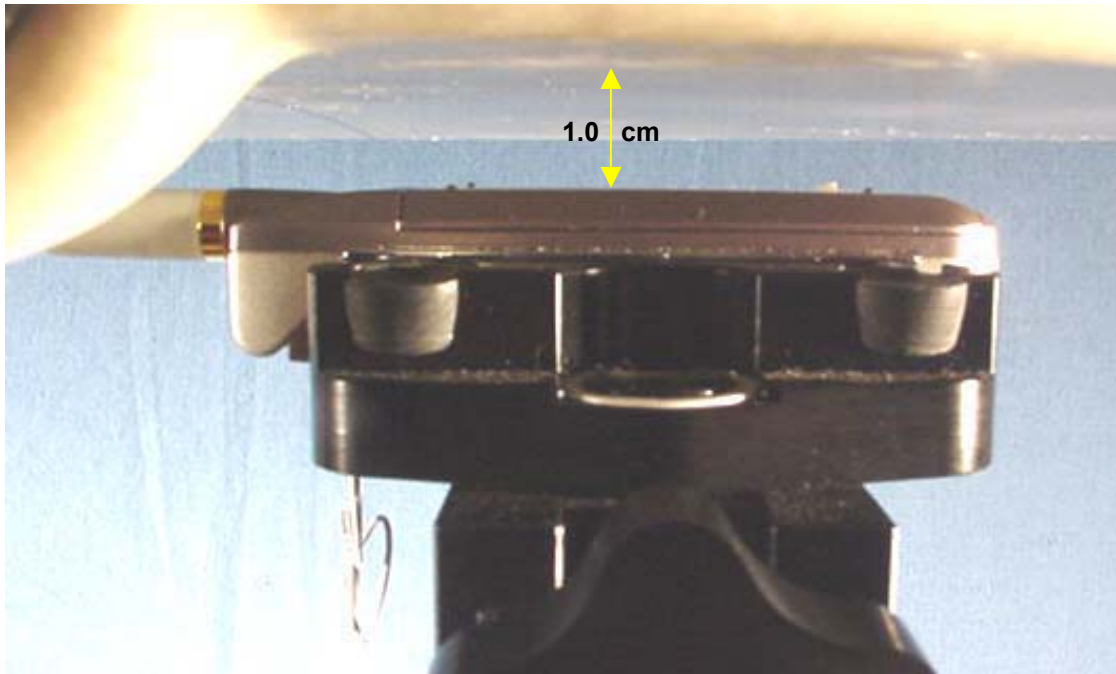
with Slim Battery

BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Back of Device with Standard Battery & Ear-Microphone Accessory
1.0 cm Separation Distance to Planar Phantom

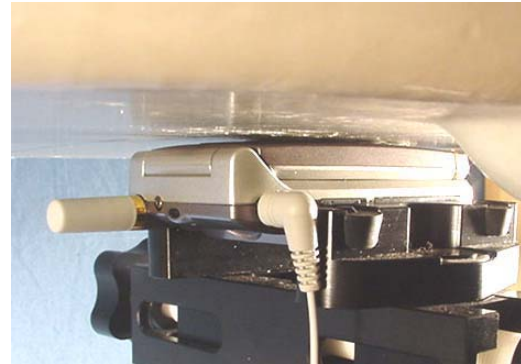


BODY-WORN SAR TEST SETUP PHOTOGRAPHS

Back of Device with Slim Battery & Ear-Microphone Accessory
1.0 cm Separation Distance to Planar Phantom

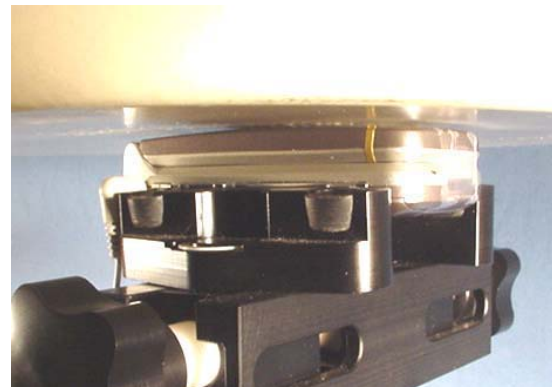
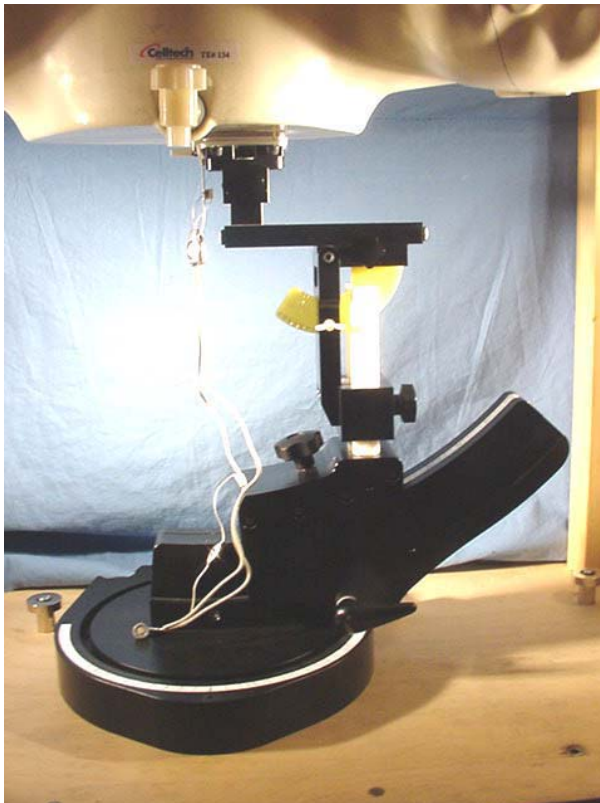
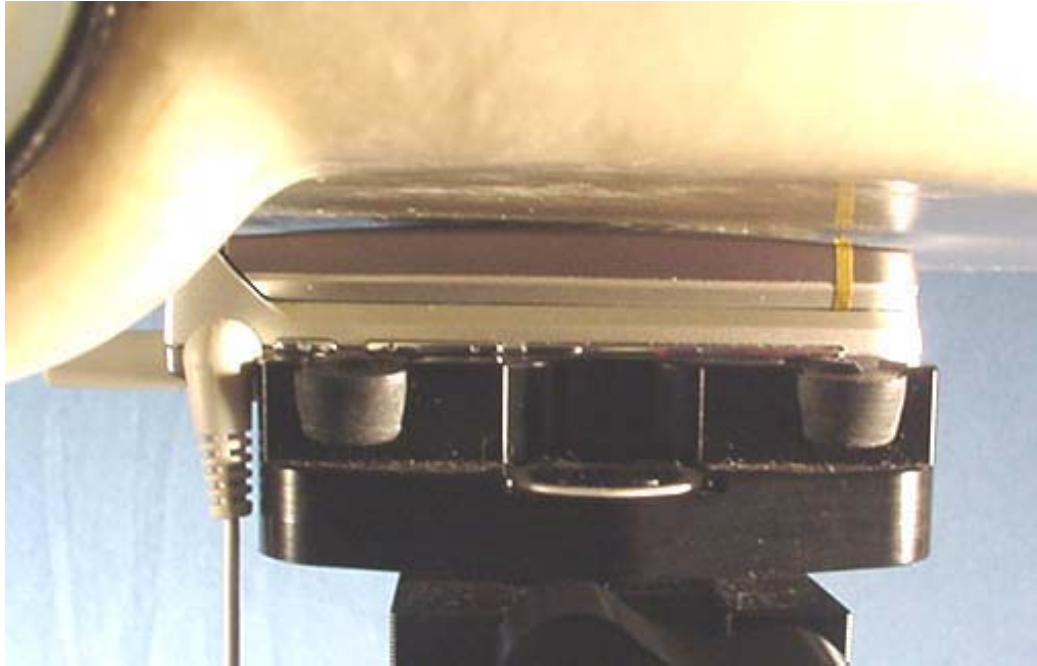


BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Front of Device with Standard Battery & Ear-Microphone Accessory
0.0 cm Separation Distance to Planar Phantom



BODY-WORN SAR TEST SETUP PHOTOGRAPHS

Front of Device with Slim Battery & Ear-Microphone Accessory
0.0 cm Separation Distance to Planar Phantom



DUT PHOTOGRAPHS



DUT PHOTOGRAPHS



with Standard Battery



with Standard Battery



with Slim Battery



with Slim Battery



with Standard Battery



with Slim Battery

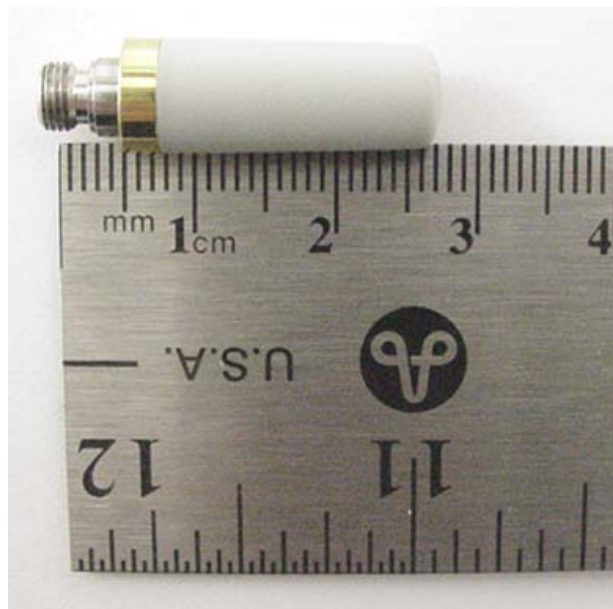
DUT PHOTOGRAPHS



Front Side/Bottom View



Front Side/Top View



Stubby Antenna

DUT PHOTOGRAPHS



with Standard Battery



with Slim Battery



without battery



Standard Battery Pack



Standard Battery Pack



Slim Battery Pack



Slim Battery Pack

DUT PHOTOGRAPHS



with Ear-Microphone Accessory