

APPENDIX 5 : Dosimetric E-Field Probe Calibration (ET3DV6,S/N: 1685)

Schmid & Partner Engineering AG

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

IMPORTANT NOTICE

USAGE OF PROBES IN ORGANIC SOLVENTS

Diethylene Glycol Monobuthy Ether (the basis for liquids above 1 GHz), as many other organic solvents, is a very effective softener for synthetic materials. These solvents can cause irreparable damage to certain SPEAG products, except those which are explicitly declared as compliant with organic solvents.

Compatible Probes:

- ET3DV6
- ET3DV6R
- ES3DV2
- ER3DV6
- H3DV6

Important Note for ET3DV6 Probes:
The ET3DV6 probes shall not be exposed to solvents longer than necessary for the measurements and shall be cleaned daily after use with warm water and stored dry.

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Technical Note 01.06.15-1

June 2002

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone: +81 596 24 8116

Facsimile: +81 596 24 8124

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

Client **UL Apex (MTT)**

CALIBRATION CERTIFICATE			
Object(s)	ET3DV6 - SN:1685		
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes		
Calibration date:	October 10, 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 (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 (Agilent, No. 20020918)	In house check: Oct 03
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 (Agilent, No. 24BR1033101)	In house check: Oct 03
Calibrated by:	Name Nico Vetterli	Function Technician	Signature 
Approved by:	Name Katja Pokovic	Function Laboratory Director	Signature 
Date issued: October 23, 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.			

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Probe ET3DV6

SN:1685

Manufactured:	April 3, 2002
Last calibration:	May 10, 2002
Recalibrated:	October 10, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1685

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DASY - Parameters of Probe: ET3DV6 SN:1685

Sensitivity in Free Space

NormX	1.60 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.65 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.56 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

DCP X	95	mV
DCP Y	95	mV
DCP Z	95	mV

Sensitivity in Tissue Simulating Liquid

Head 900 MHz $\epsilon_r = 41.5 \pm 5\%$ $\sigma = 0.97 \pm 5\%$ mho/m
Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	6.6 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	6.6 $\pm 9.5\%$ (k=2)	Alpha 0.26
ConvF Z	6.6 $\pm 9.5\%$ (k=2)	Depth 3.07

Head 1800 MHz $\epsilon_r = 40.0 \pm 5\%$ $\sigma = 1.40 \pm 5\%$ mho/m
Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	5.2 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	5.2 $\pm 9.5\%$ (k=2)	Alpha 0.41
ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth 2.77

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary	1 mm	2 mm
SAR _{be} [%] Without Correction Algorithm	8.9	5.4
SAR _{be} [%] With Correction Algorithm	0.4	0.5

Head 1800 MHz Typical SAR gradient: 10 % per mm

Probe Tip to Boundary	1 mm	2 mm
SAR _{be} [%] Without Correction Algorithm	11.8	8.4
SAR _{be} [%] With Correction Algorithm	0.4	0.2

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.6 $\pm$ 0.2	mm

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

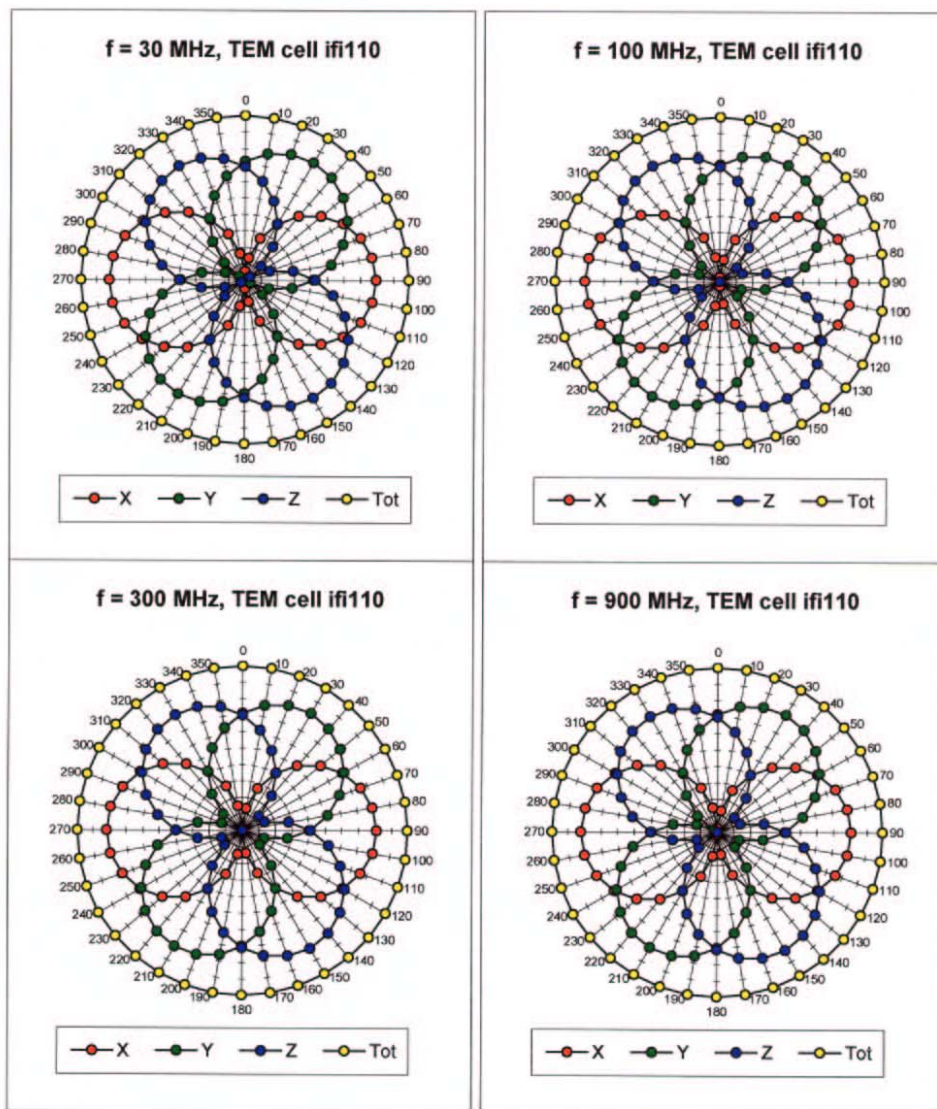
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Receiving Pattern ($\phi, \theta = 0^\circ$)



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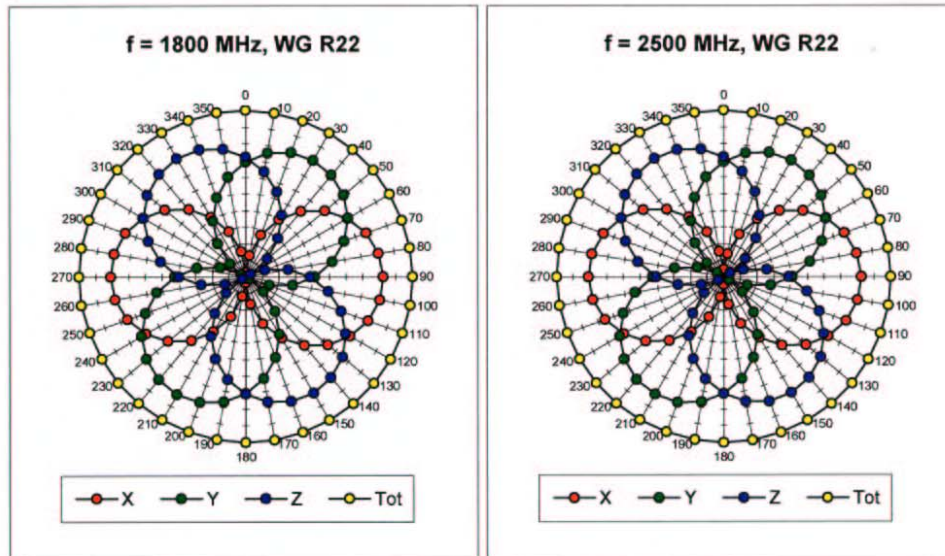
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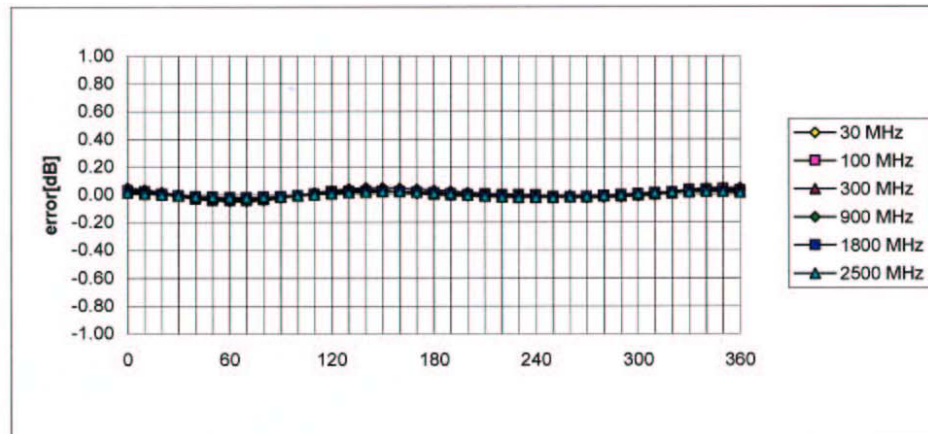
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Isotropy Error (ϕ), $\theta = 0^\circ$

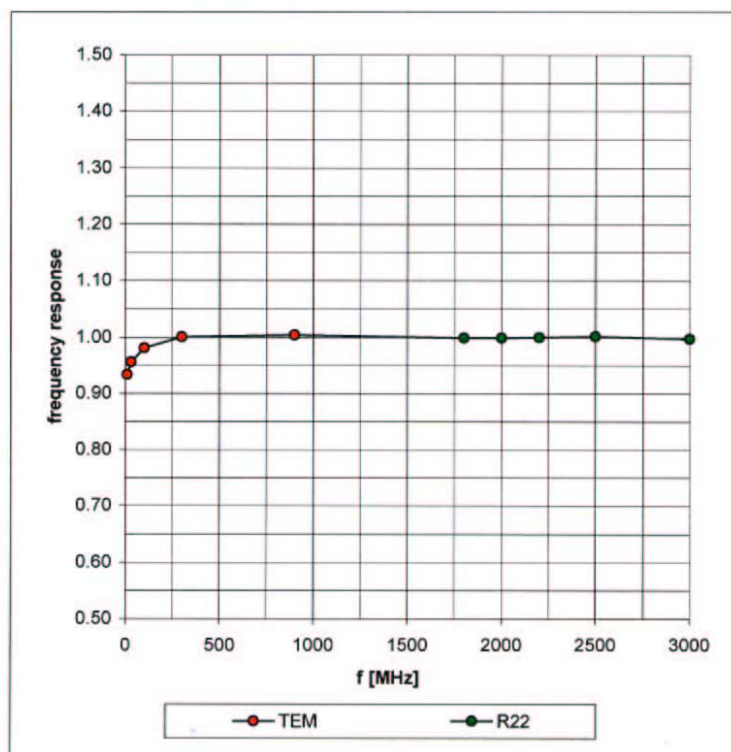


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Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)



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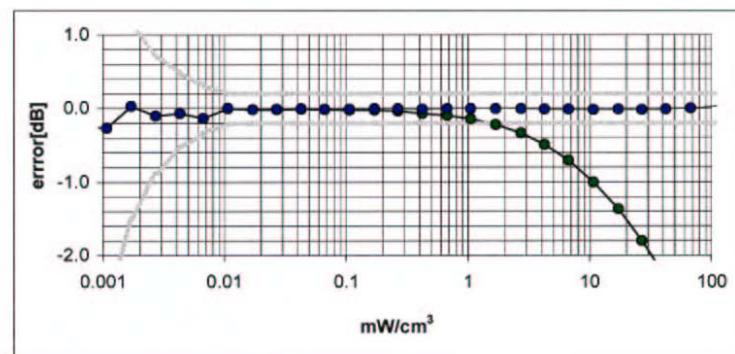
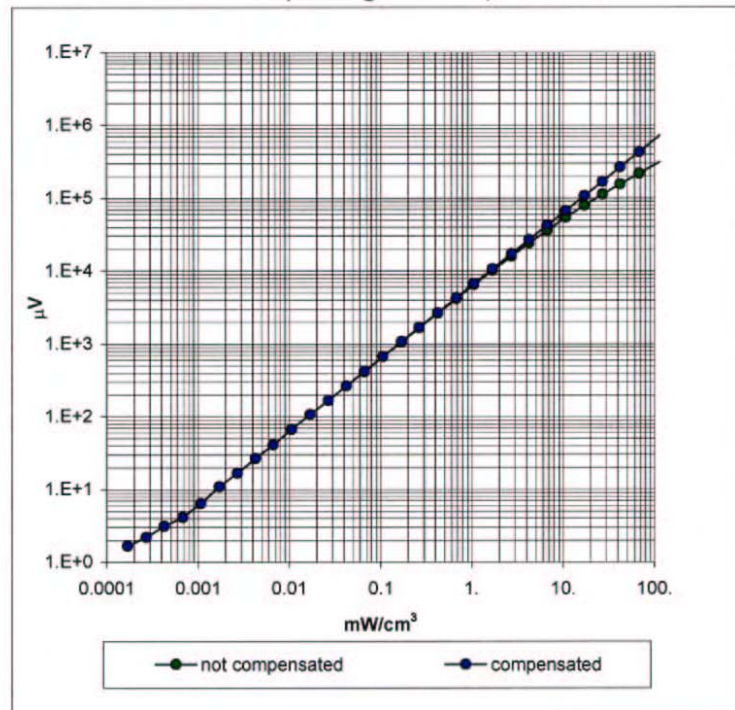
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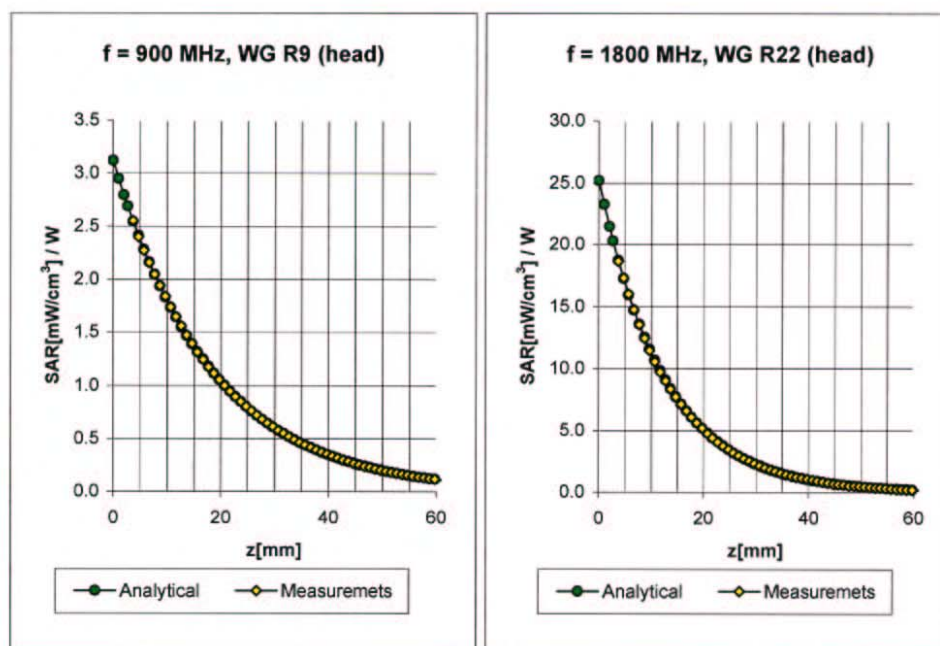
Dynamic Range f(SAR_{brain})
(Waveguide R22)



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Conversion Factor Assessment



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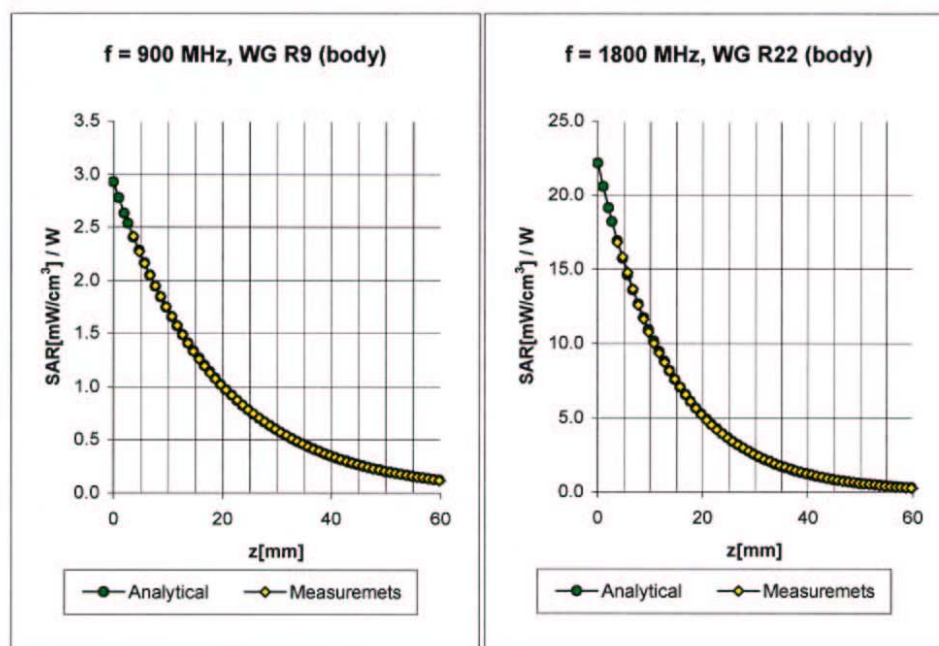
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Conversion Factor Assessment



Body 900 MHz $\epsilon_r = 55.0 \pm 5\%$ $\sigma = 1.05 \pm 5\%$ mho/m

Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	6.4 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	6.4 $\pm 9.5\%$ (k=2)	Alpha 0.27
ConvF Z	6.4 $\pm 9.5\%$ (k=2)	Depth 3.22

Body 1800 MHz $\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\%$ mho/m

Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	4.7 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	4.7 $\pm 9.5\%$ (k=2)	Alpha 0.48
ConvF Z	4.7 $\pm 9.5\%$ (k=2)	Depth 2.94

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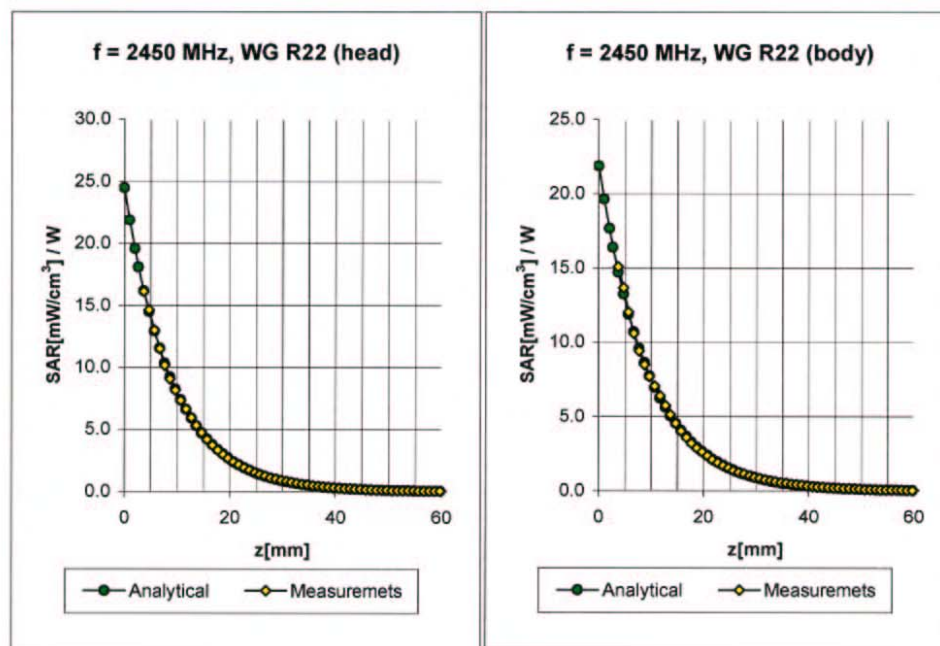
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Conversion Factor Assessment



Head	2450 MHz	$\epsilon_r = 39.2 \pm 5\%$	$\sigma = 1.80 \pm 5\% \text{ mho/m}$
Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X			
ConvF X	4.7 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	4.7 $\pm 9.5\%$ (k=2)	Alpha	0.78
ConvF Z	4.7 $\pm 9.5\%$ (k=2)	Depth	2.04
Body	2450 MHz	$\epsilon_r = 52.7 \pm 5\%$	$\sigma = 1.95 \pm 5\% \text{ mho/m}$
Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C			
ConvF X	4.3 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	4.3 $\pm 9.5\%$ (k=2)	Alpha	0.80
ConvF Z	4.3 $\pm 9.5\%$ (k=2)	Depth	1.89

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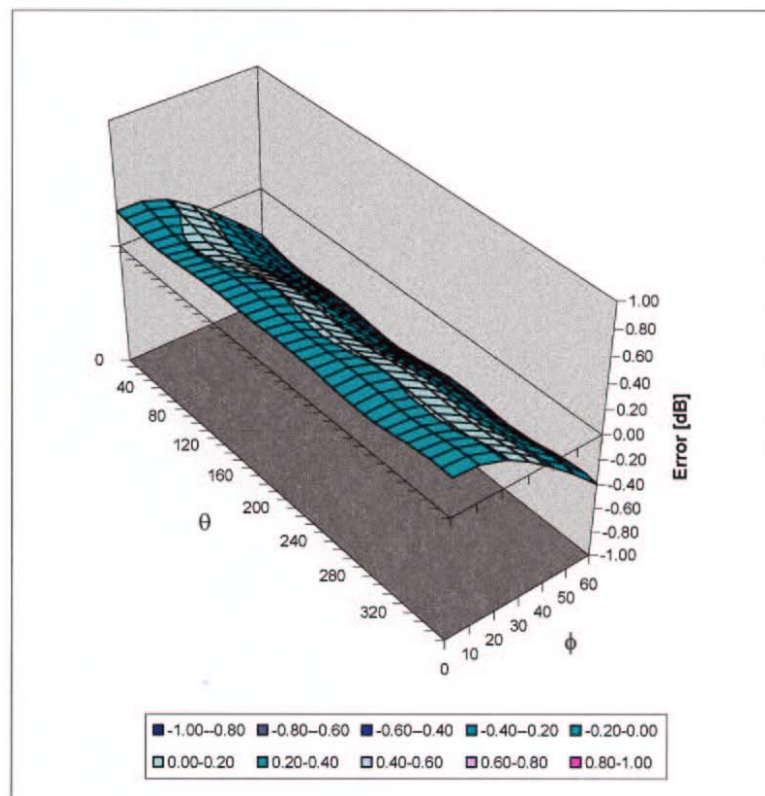
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Deviation from Isotropy in HSL

Error ($\theta\phi$), $f = 900$ MHz



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