

Client **C&C Taiwan (Auden)**

**CALIBRATION CERTIFICATE**

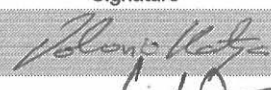
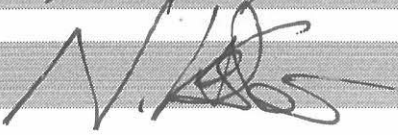
Object(s) **ES3DV2 - SN: 3023**  
 Calibration procedure(s) **QA CAL-01 v2  
Calibration procedure for dosimetric E-field probes**  
 Calibration date: **September 23, 2003**  
 Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

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

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Laboratory Director	
Approved by:	Niels Kuster	Quality Manager	

Date issued: October 5, 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 ES3DV2

## SN:3023

Manufactured: April 15, 2003  
Last calibration: September 23, 2003

**Calibrated for DASY Systems**

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ES3DV2 SN:3023

### Sensitivity in Free Space

NormX	<b>0.85</b> $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	<b>0.94</b> $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	<b>1.01</b> $\mu\text{V}/(\text{V}/\text{m})^2$

### Diode Compression

DCP X	<b>96</b>	mV
DCP Y	<b>96</b>	mV
DCP Z	<b>96</b>	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	<b>6.0</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>6.0</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.33</b>
ConvF Z	<b>6.0</b> $\pm 9.5\%$ (k=2)	Depth <b>1.66</b>

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	<b>4.9</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>4.9</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.23</b>
ConvF Z	<b>4.9</b> $\pm 9.5\%$ (k=2)	Depth <b>2.54</b>

### Boundary Effect

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

Probe Tip to Boundary		<b>1 mm</b>	<b>2 mm</b>
SAR <sub>be</sub> [%] Without Correction Algorithm		5.8	2.8
SAR <sub>be</sub> [%] With Correction Algorithm		0.1	0.3

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

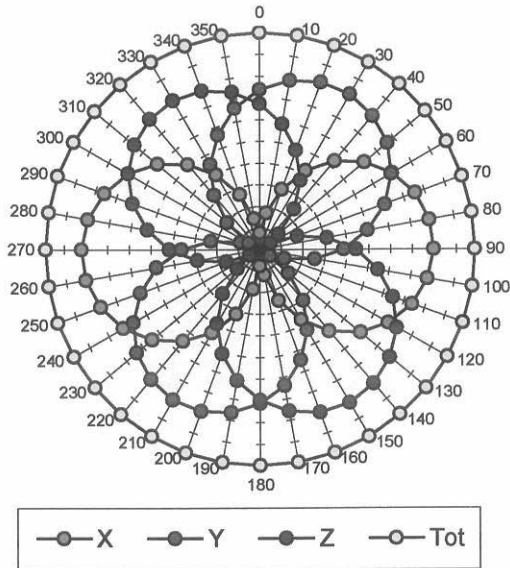
Probe Tip to Boundary		<b>1 mm</b>	<b>2 mm</b>
SAR <sub>be</sub> [%] Without Correction Algorithm		7.7	4.7
SAR <sub>be</sub> [%] With Correction Algorithm		0.1	0.3

### Sensor Offset

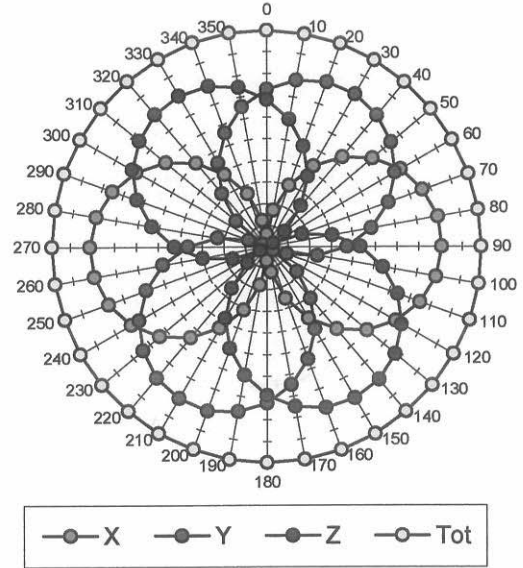
Probe Tip to Sensor Center	<b>2.0</b>	mm
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### Receiving Pattern ( $\phi$ , $\theta = 0^\circ$ )

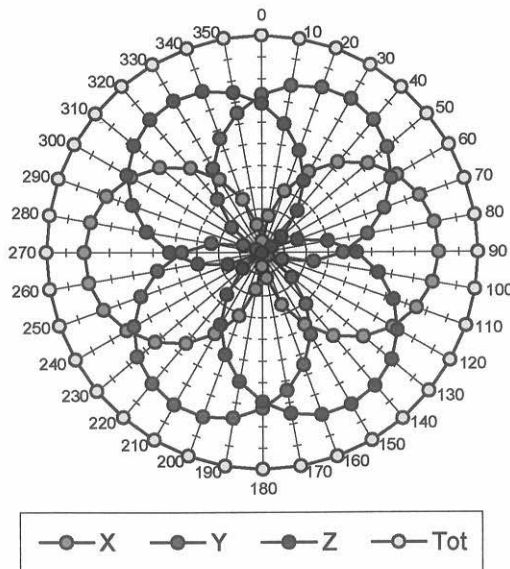
**f = 30 MHz, TEM cell ifi110**



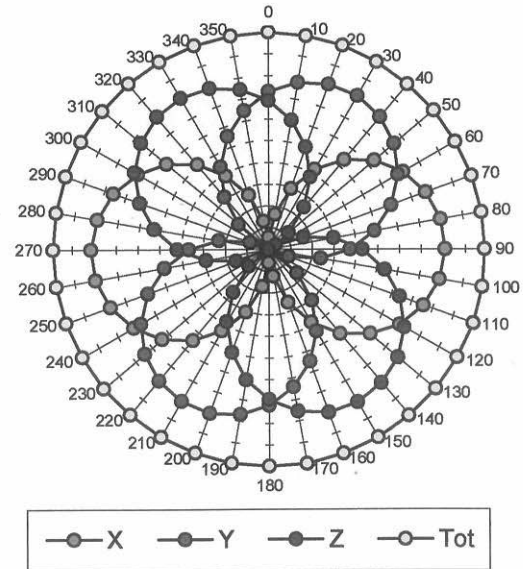
**f = 100 MHz, TEM cell ifi110**

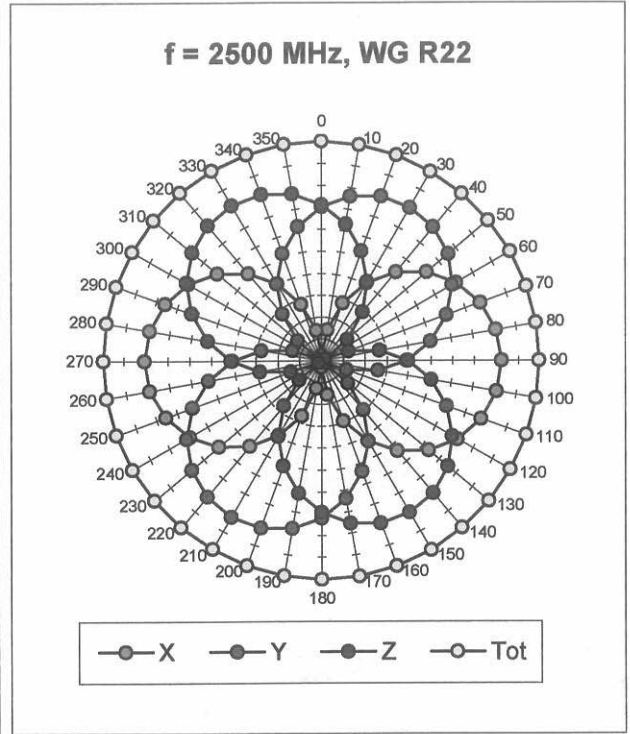
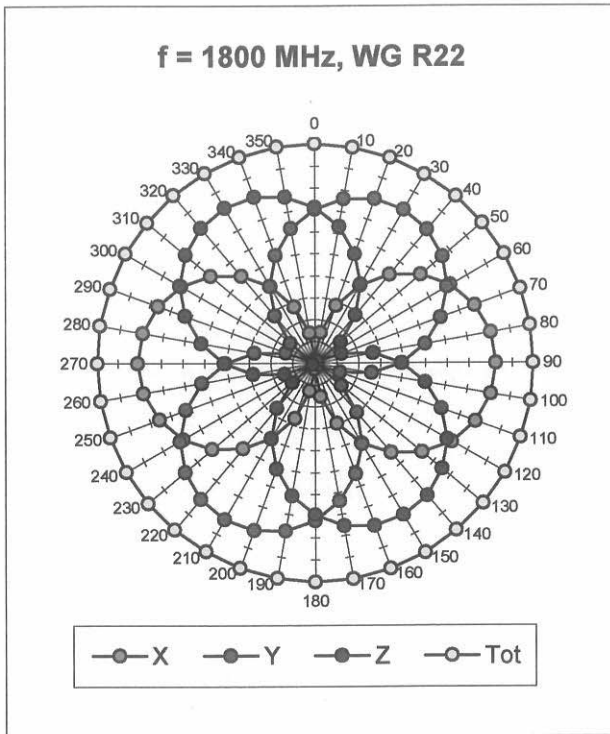


**f = 300 MHz, TEM cell ifi110**

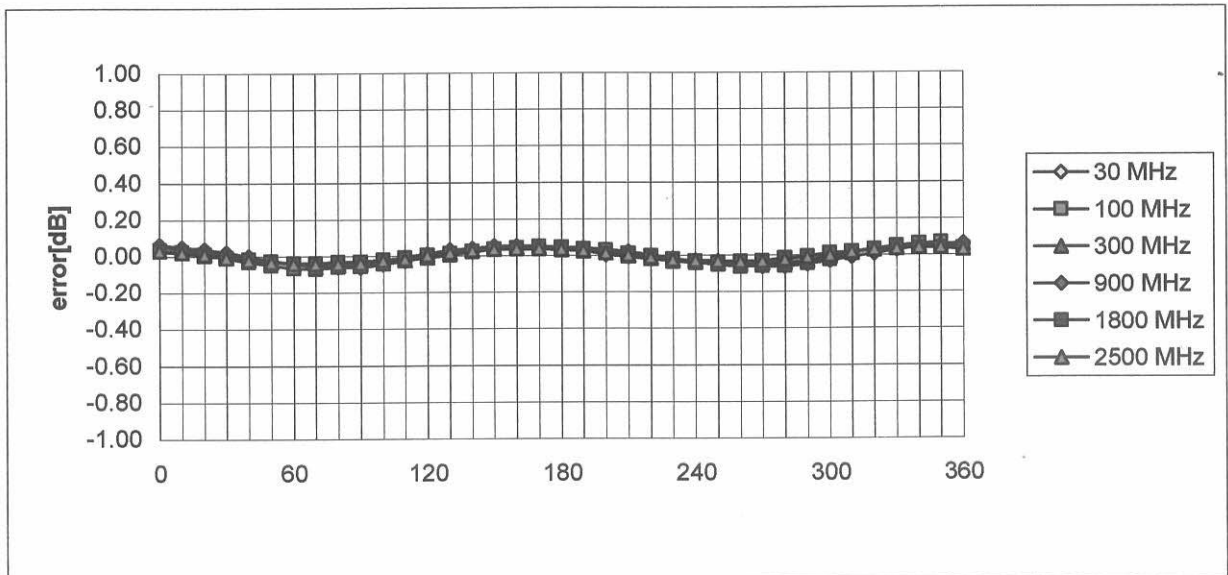


**f = 900 MHz, TEM cell ifi110**



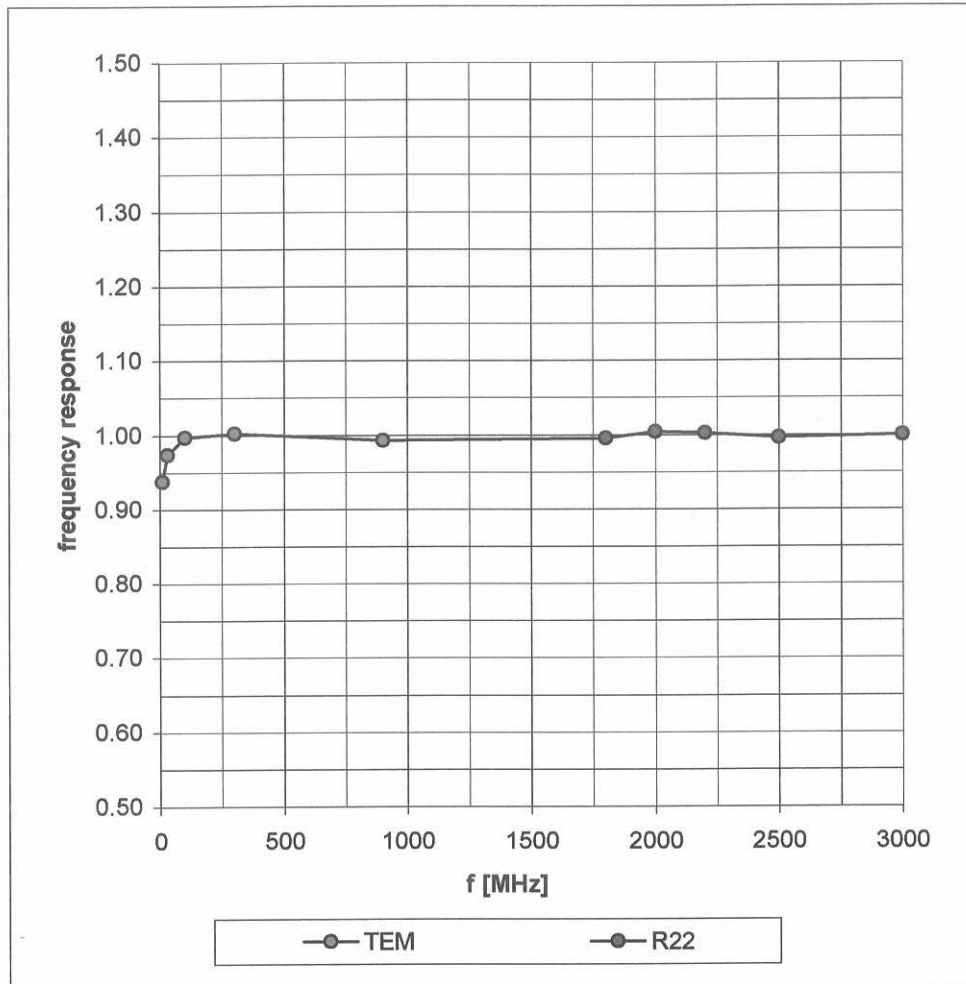


### Isotropy Error ( $\phi$ ), $\theta = 0^\circ$

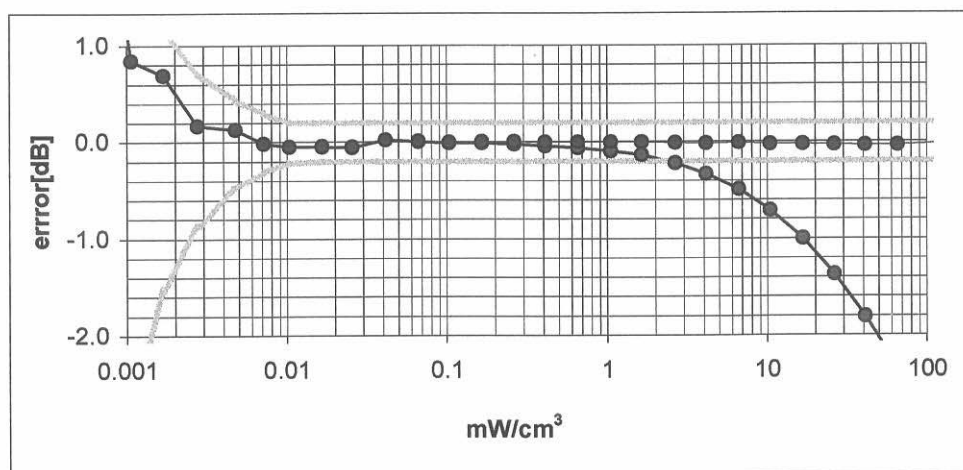
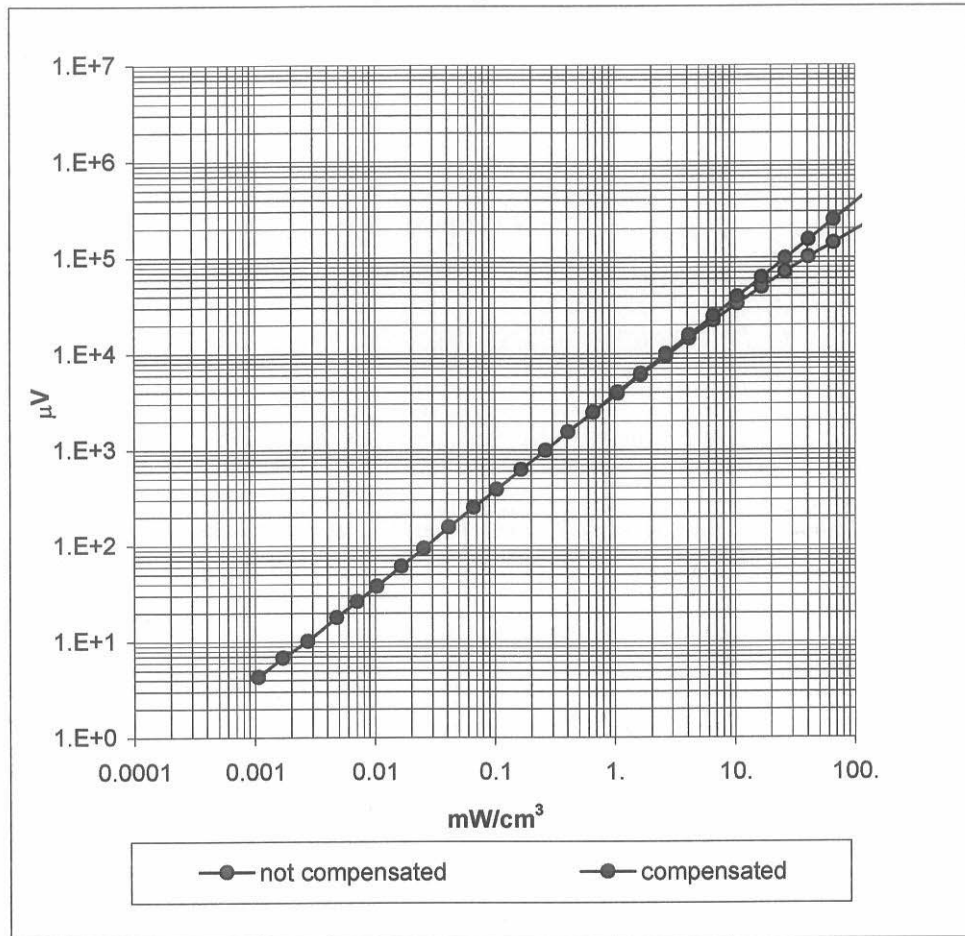


# Frequency Response of E-Field

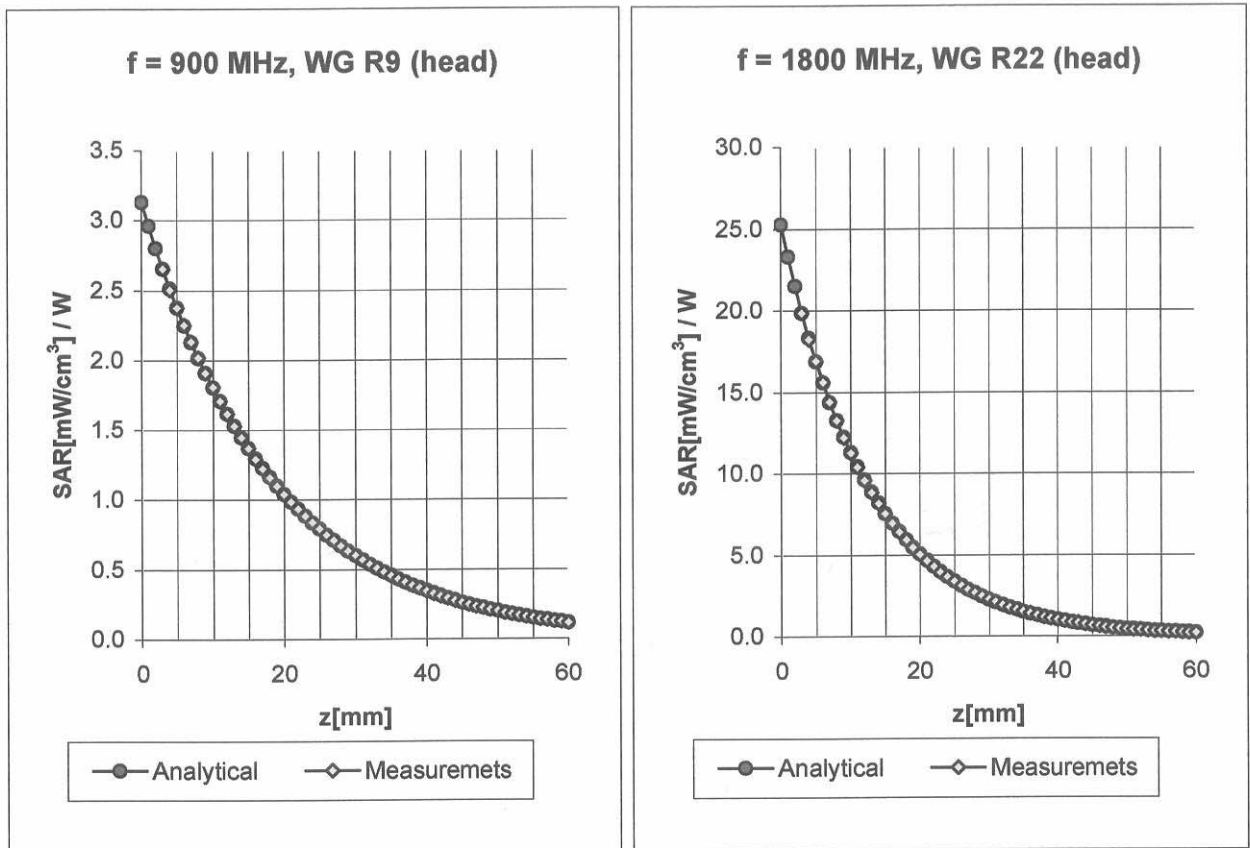
( TEM-Cell:ifi1110, Waveguide R22)



## Dynamic Range f(SAR<sub>brain</sub>) ( Waveguide R22 )



## Conversion Factor Assessment



**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	<b>6.0</b> $\pm$ 9.5% (k=2)	Boundary effect:
ConvF Y	<b>6.0</b> $\pm$ 9.5% (k=2)	Alpha <b>0.33</b>
ConvF Z	<b>6.0</b> $\pm$ 9.5% (k=2)	Depth <b>1.66</b>

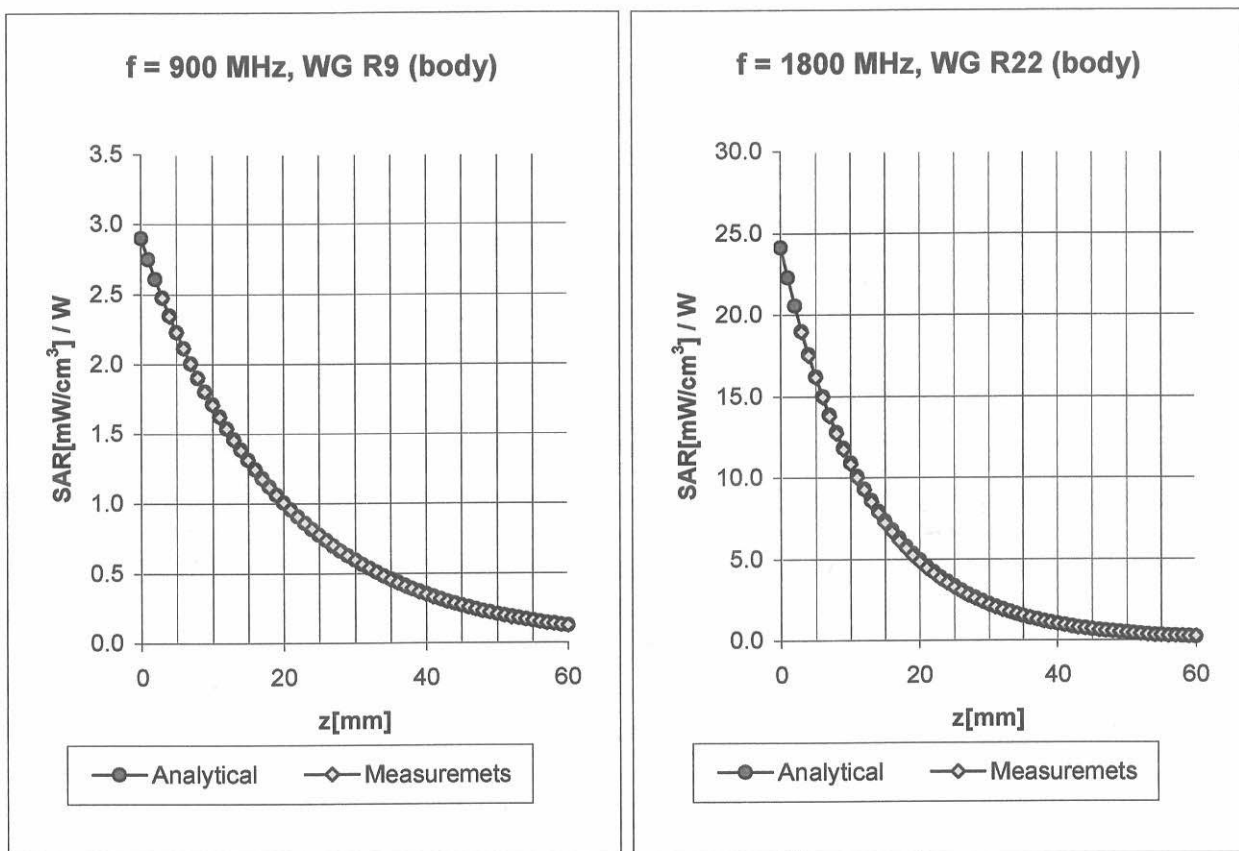
**Head                      1800 MHz                       $\epsilon_r = 40.0 \pm 5\%$                        $\sigma = 1.40 \pm 5\%$  mho/m**

**Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X**

ConvF X	<b>4.9</b> $\pm$ 9.5% (k=2)	Boundary effect:
ConvF Y	<b>4.9</b> $\pm$ 9.5% (k=2)	Alpha <b>0.23</b>
ConvF Z	<b>4.9</b> $\pm$ 9.5% (k=2)	Depth <b>2.54</b>



## 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**

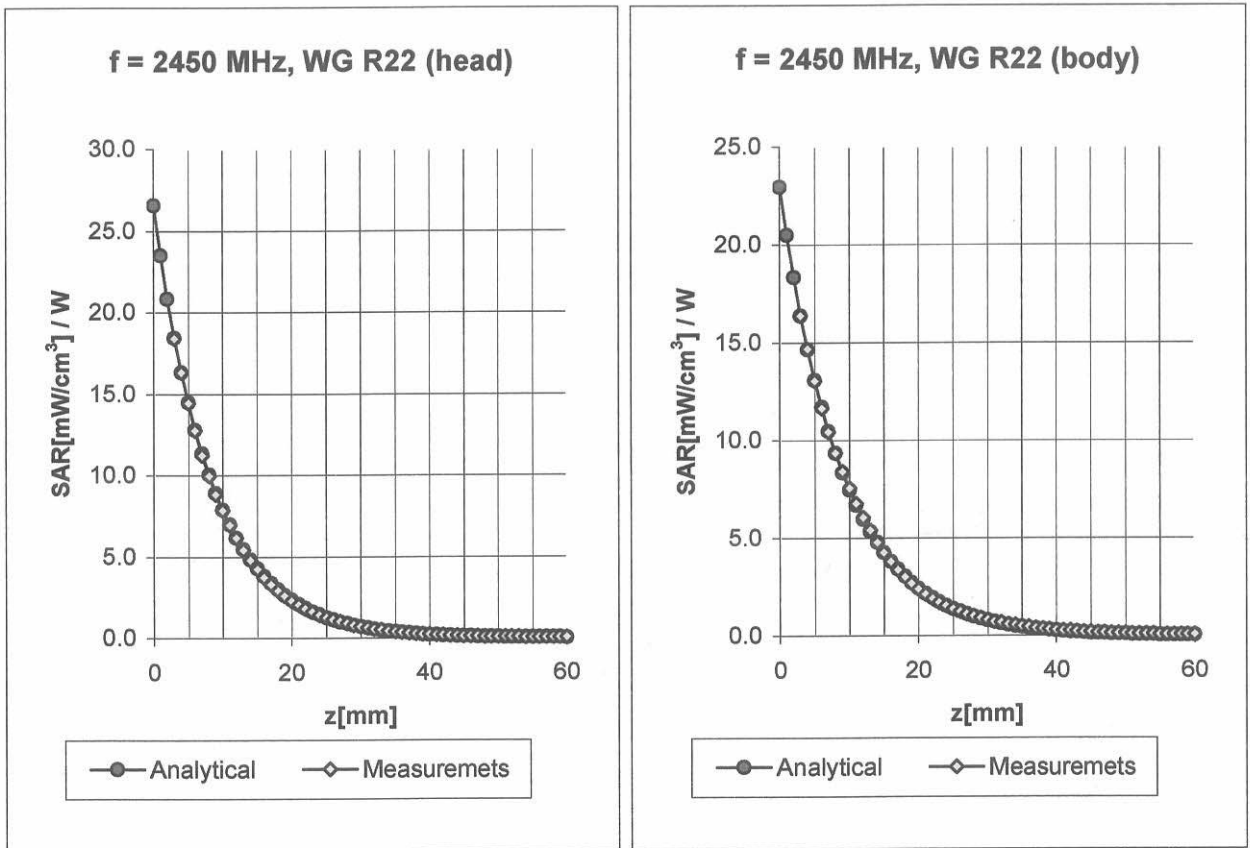
ConvF X	<b>6.0</b> $\pm$ 9.5% (k=2)	Boundary effect:
ConvF Y	<b>6.0</b> $\pm$ 9.5% (k=2)	Alpha <b>0.43</b>
ConvF Z	<b>6.0</b> $\pm$ 9.5% (k=2)	Depth <b>1.44</b>

**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	<b>4.5</b> $\pm$ 9.5% (k=2)	Boundary effect:
ConvF Y	<b>4.5</b> $\pm$ 9.5% (k=2)	Alpha <b>0.26</b>
ConvF Z	<b>4.5</b> $\pm$ 9.5% (k=2)	Depth <b>2.61</b>

## Conversion Factor Assessment



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

**Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X**

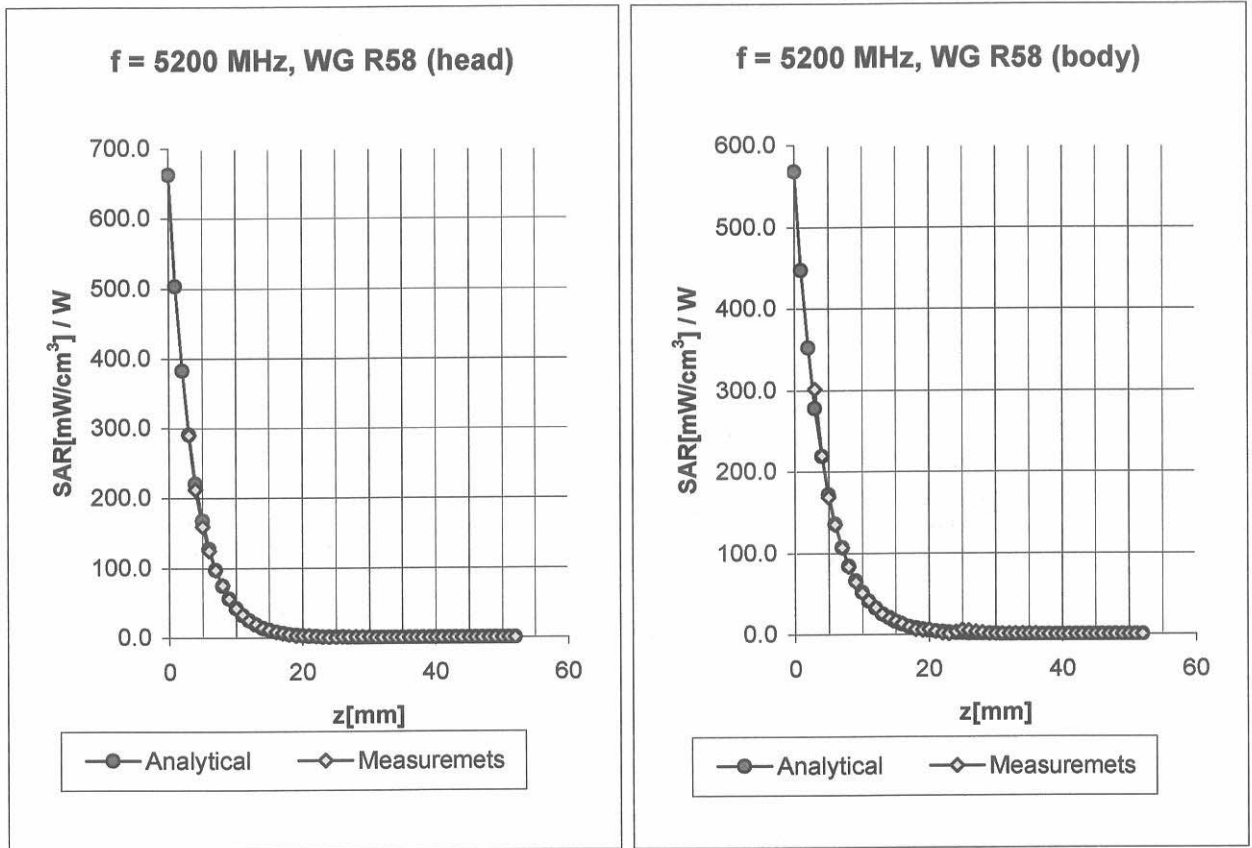
ConvF X	<b>4.4</b> $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	<b>4.4</b> $\pm 9.5\%$ (k=2)	Alpha	<b>0.38</b>
ConvF Z	<b>4.4</b> $\pm 9.5\%$ (k=2)	Depth	<b>1.66</b>

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

**Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C**

ConvF X	<b>4.1</b> $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	<b>4.1</b> $\pm 9.5\%$ (k=2)	Alpha	<b>0.35</b>
ConvF Z	<b>4.1</b> $\pm 9.5\%$ (k=2)	Depth	<b>1.94</b>

## Conversion Factor Assessment



**Head                      5200 MHz                       $\epsilon_r = 36.0 \pm 5\%$                        $\sigma = 4.66 \pm 5\%$  mho/m**

**Valid for f=4940-5460 MHz with Head Tissue Simulating Liquid according to OET65-SuppC**

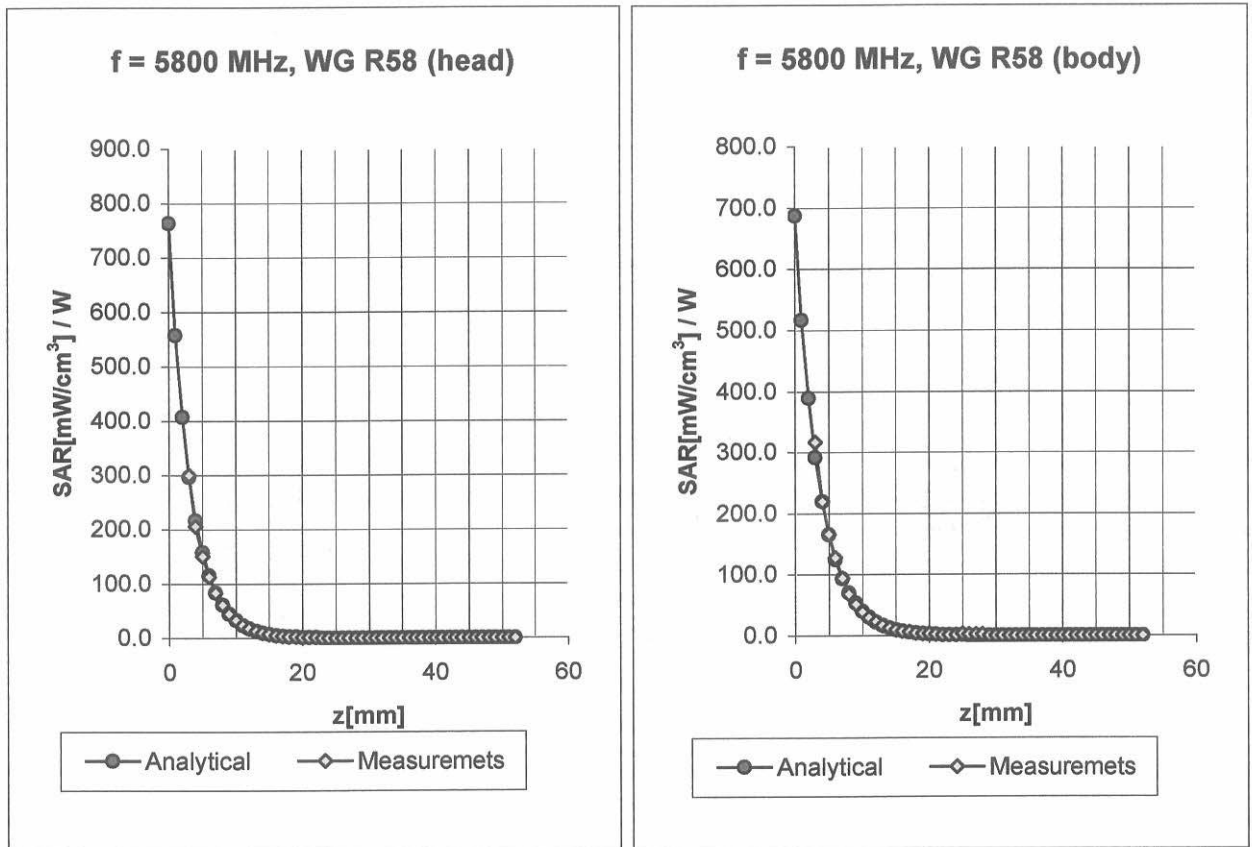
ConvF X	<b>2.70</b> $\pm 16.6\%$ (k=2)	Boundary effect:	
ConvF Y	<b>2.70</b> $\pm 16.6\%$ (k=2)	Alpha	<b>0.75</b>
ConvF Z	<b>2.70</b> $\pm 16.6\%$ (k=2)	Depth	<b>1.45</b>

**Body                      5200 MHz                       $\epsilon_r = 49.0 \pm 5\%$                        $\sigma = 5.30 \pm 5\%$  mho/m**

**Valid for f=4940-5460 MHz with Body Tissue Simulating Liquid according to OET65-SuppC**

ConvF X	<b>1.82</b> $\pm 16.6\%$ (k=2)	Boundary effect:	
ConvF Y	<b>1.82</b> $\pm 16.6\%$ (k=2)	Alpha	<b>0.90</b>
ConvF Z	<b>1.82</b> $\pm 16.6\%$ (k=2)	Depth	<b>1.70</b>

## Conversion Factor Assessment



**Head                      5800 MHz                       $\epsilon_r = 35.3 \pm 5\%$                        $\sigma = 5.27 \pm 5\%$  mho/m**

**Valid for f=4940-5460 MHz with Head Tissue Simulating Liquid according to OET65-SuppC**

ConvF X	<b>2.40</b> $\pm 16.6\%$ (k=2)	Boundary effect:
ConvF Y	<b>2.40</b> $\pm 16.6\%$ (k=2)	Alpha <b>0.89</b>
ConvF Z	<b>2.40</b> $\pm 16.6\%$ (k=2)	Depth <b>1.30</b>

**Body                      5800 MHz                       $\epsilon_r = 48.2 \pm 5\%$                        $\sigma = 6.0 \pm 5\%$  mho/m**

**Valid for f=4940-5460 MHz with Body Tissue Simulating Liquid according to OET65-SuppC**

ConvF X	<b>1.50</b> $\pm 16.6\%$ (k=2)	Boundary effect:
ConvF Y	<b>1.50</b> $\pm 16.6\%$ (k=2)	Alpha <b>1.01</b>
ConvF Z	<b>1.50</b> $\pm 16.6\%$ (k=2)	Depth <b>1.85</b>

# Deviation from Isotropy in HSL

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

