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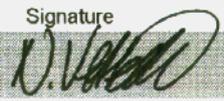Zeughausstrasse 43, 8004 Zurich, Switzerland

Client   JQA (MITC)

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1678
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	February 7, 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

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	
Approved by:	Katja Pokovic	Laboratory Director	
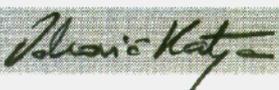
Date issued: February 7, 2003

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:1678

Manufactured:	March 7, 2002
Last calibration:	May 22, 2002
Recalibrated:	February 7, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1678

Sensitivity in Free Space

			Diode Compression		
NormX	1.35	$\mu V/(V/m)^2$	DCP X	96	mV
NormY	1.77	$\mu V/(V/m)^2$	DCP Y	96	mV
NormZ	1.72	$\mu V/(V/m)^2$	DCP Z	96	mV

Sensitivity in Tissue Simulating Liquid

Head	900 MHz		$\varepsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
Head	835 MHz		$\varepsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\%$ mho/m
	ConvF X	6.6 $\pm 9.5\%$ (k=2)	Boundary effect:	
	ConvF Y	6.6 $\pm 9.5\%$ (k=2)	Alpha	0.38
	ConvF Z	6.6 $\pm 9.5\%$ (k=2)	Depth	2.56

Head	1800 MHz		$\varepsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
Head	1900 MHz		$\varepsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
	ConvF X	5.3 $\pm 9.5\%$ (k=2)	Boundary effect:	
	ConvF Y	5.3 $\pm 9.5\%$ (k=2)	Alpha	0.50
	ConvF Z	5.3 $\pm 9.5\%$ (k=2)	Depth	2.71

Boundary Effect

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

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	10.2	5.8
SAR_{be} [%]	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_{be} [%]	Without Correction Algorithm	14.5	9.9
SAR_{be} [%]	With Correction Algorithm	0.2	0.2

Sensor Offset

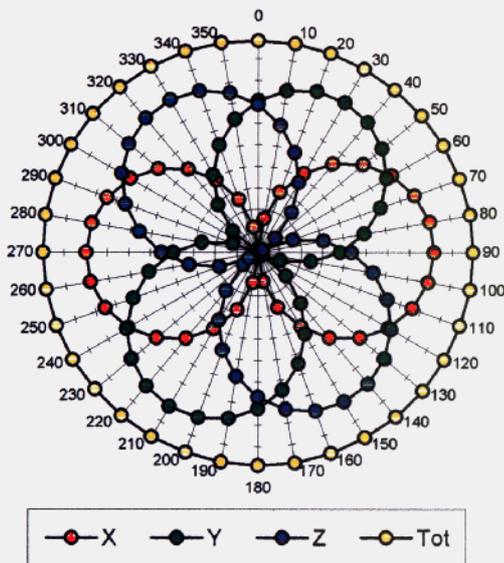|		
Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.5 ± 0.2	mm

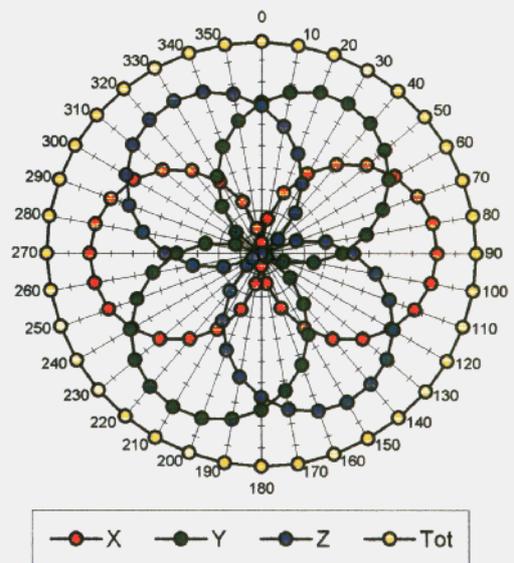# Receiving Pattern (ϕ), $\theta = 0°$

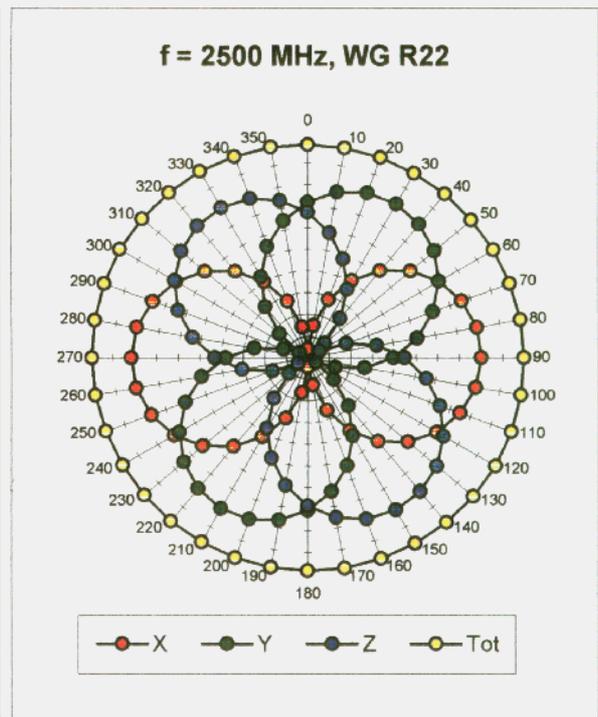

f = 30 MHz, TEM cell ifi110
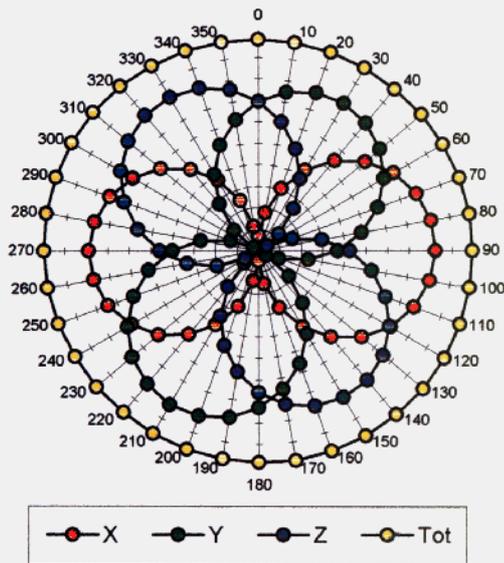
f = 100 MHz, TEM cell ifi110
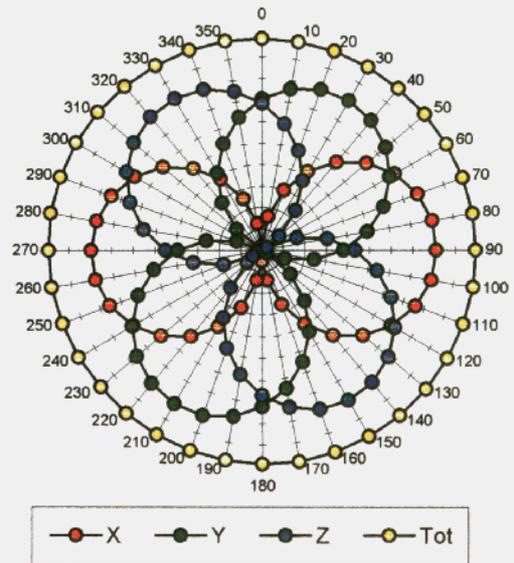
f = 300 MHz, TEM cell ifi110

f = 900 MHz, TEM cell ifi110

f = 1800 MHz, WG R22

f = 2500 MHz, WG R22
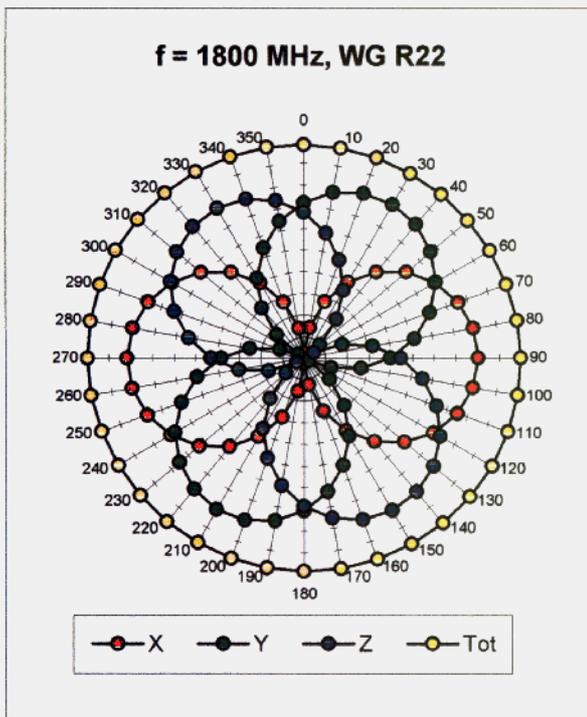
Isotropy Error (φ), θ = 0°
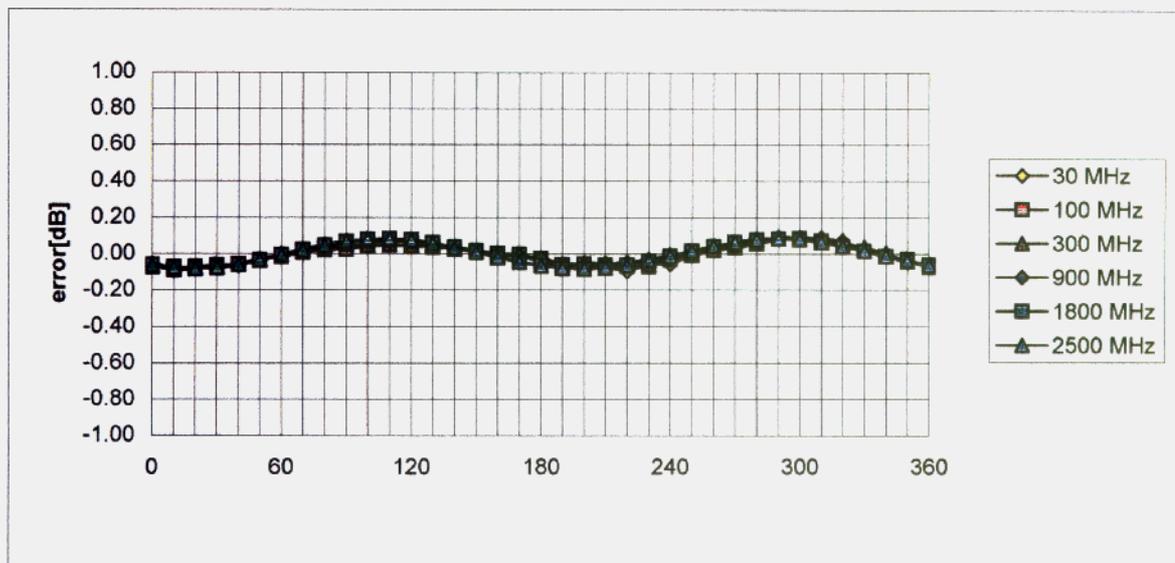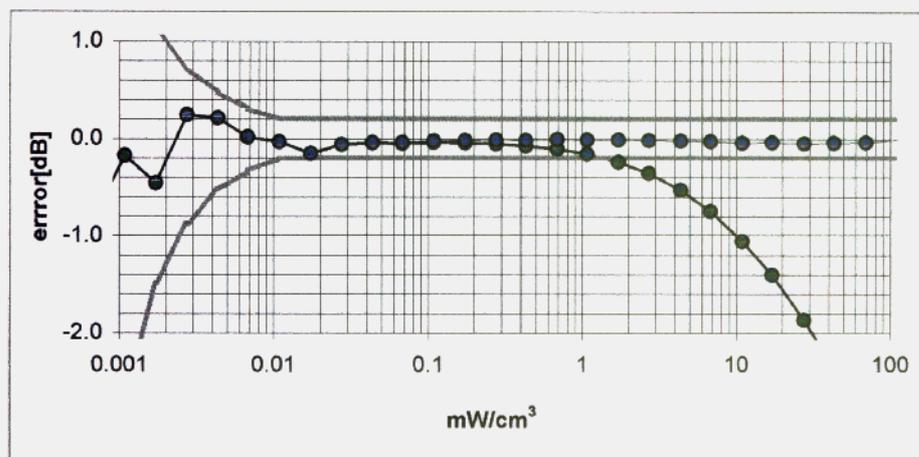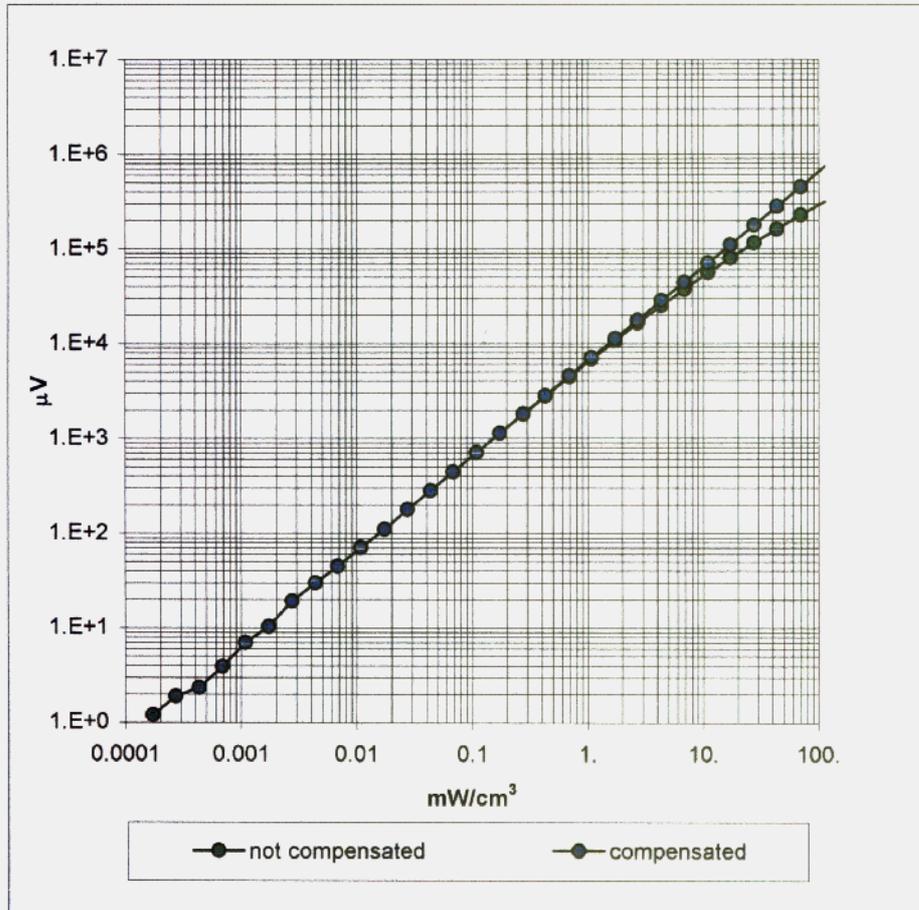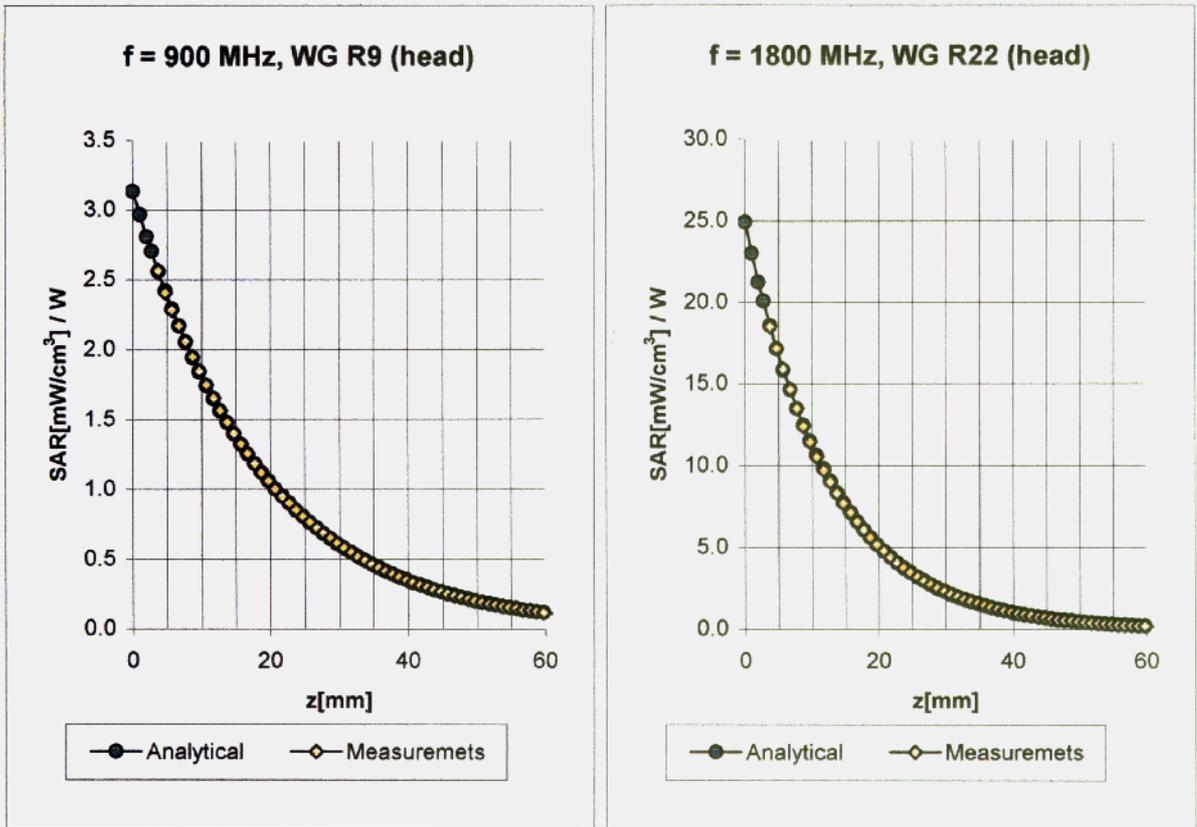
Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)
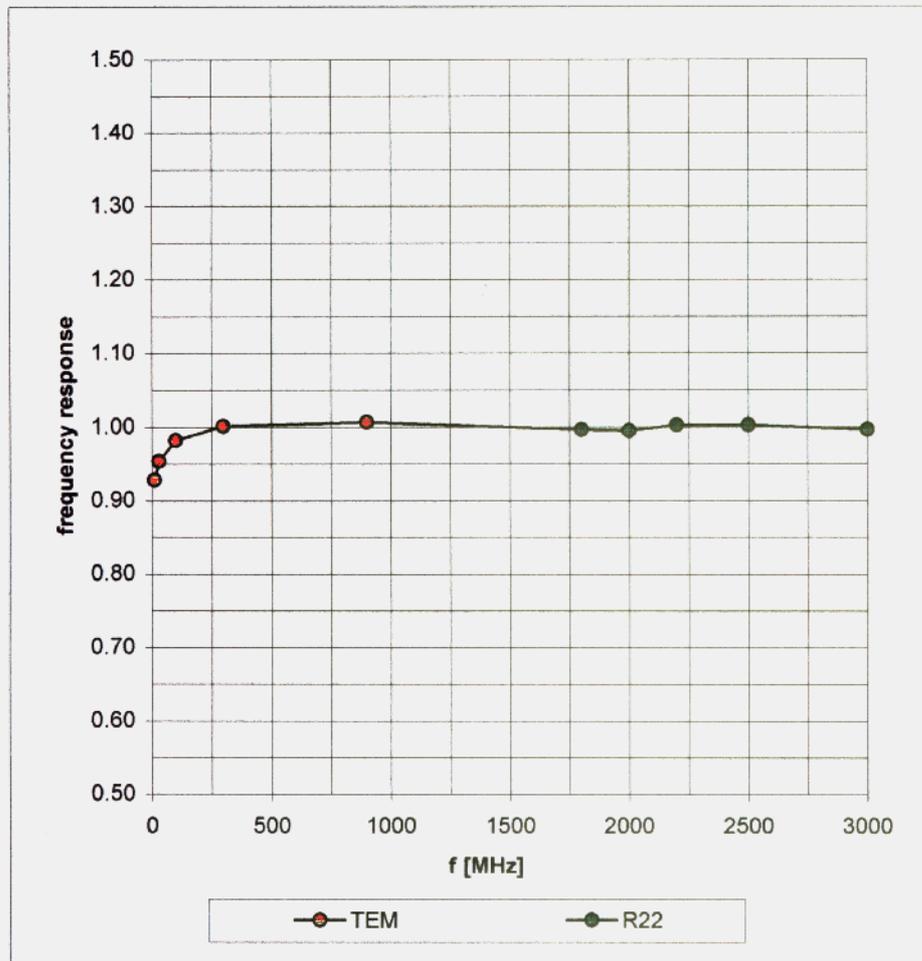
Dynamic Range f(SAR$_{brain}$)

(Waveguide R22)

Conversion Factor Assessment

Head	900 MHz	$\varepsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
Head	835 MHz	$\varepsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\%$ mho/m

ConvF X	**6.6** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.6** ± 9.5% (k=2)	Alpha	**0.38**
ConvF Z	**6.6** ± 9.5% (k=2)	Depth	**2.56**

Head	1800 MHz	$\varepsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
Head	1900 MHz	$\varepsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m

ConvF X	**5.3** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.3** ± 9.5% (k=2)	Alpha	**0.50**
ConvF Z	**5.3** ± 9.5% (k=2)	Depth	**2.71**

Conversion Factor Assessment

f = 900 MHz, WG R9 (body)

f = 1800 MHz, WG R22 (body)
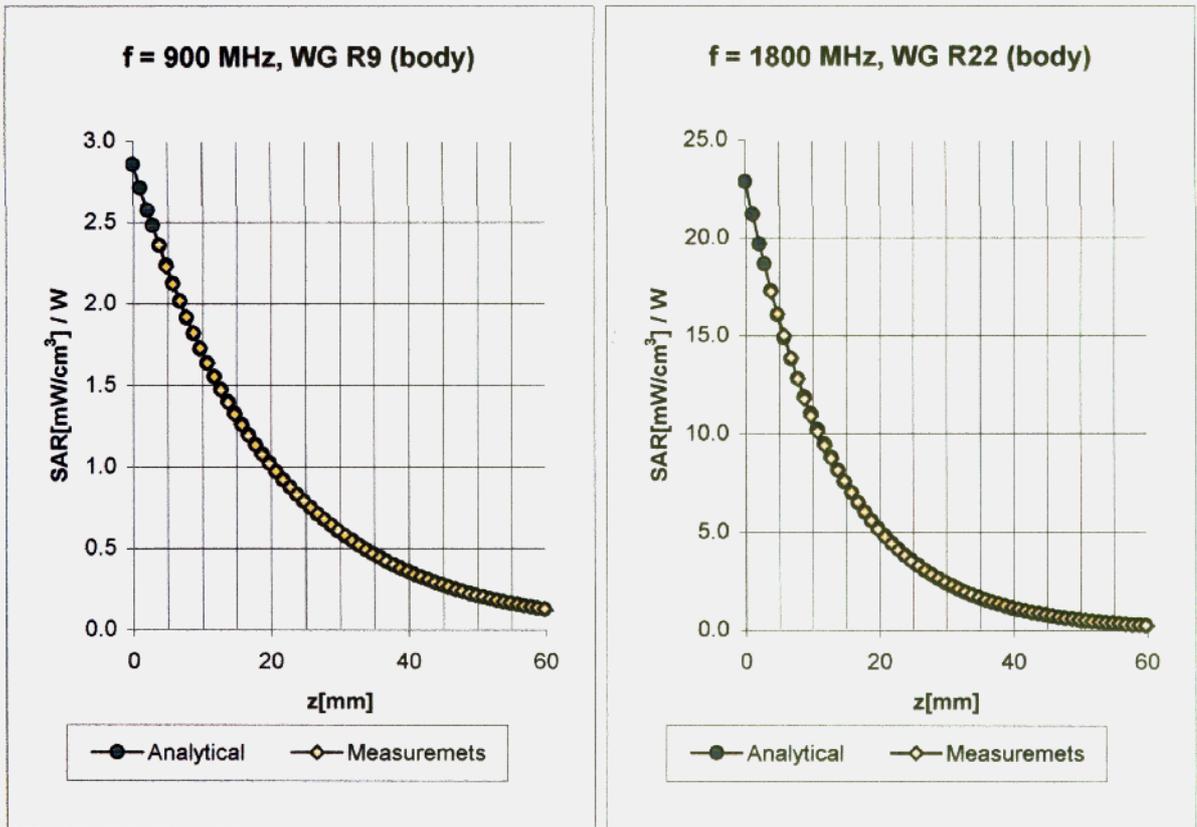
Body	900 MHz	ε_r = 55.0 ± 5%	σ = 1.05 ± 5% mho/m
Body	835 MHz	ε_r = 55.2 ± 5%	σ = 0.97 ± 5% mho/m

ConvF X	**6.5** ± 9.5% (k=2)		Boundary effect:
ConvF Y	**6.5** ± 9.5% (k=2)	Alpha	**0.45**
ConvF Z	**6.5** ± 9.5% (k=2)	Depth	**2.29**

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	**4.8** ± 9.5% (k=2)		Boundary effect:
ConvF Y	**4.8** ± 9.5% (k=2)	Alpha	**0.55**
ConvF Z	**4.8** ± 9.5% (k=2)	Depth	**2.72**

Conversion Factor Assessment
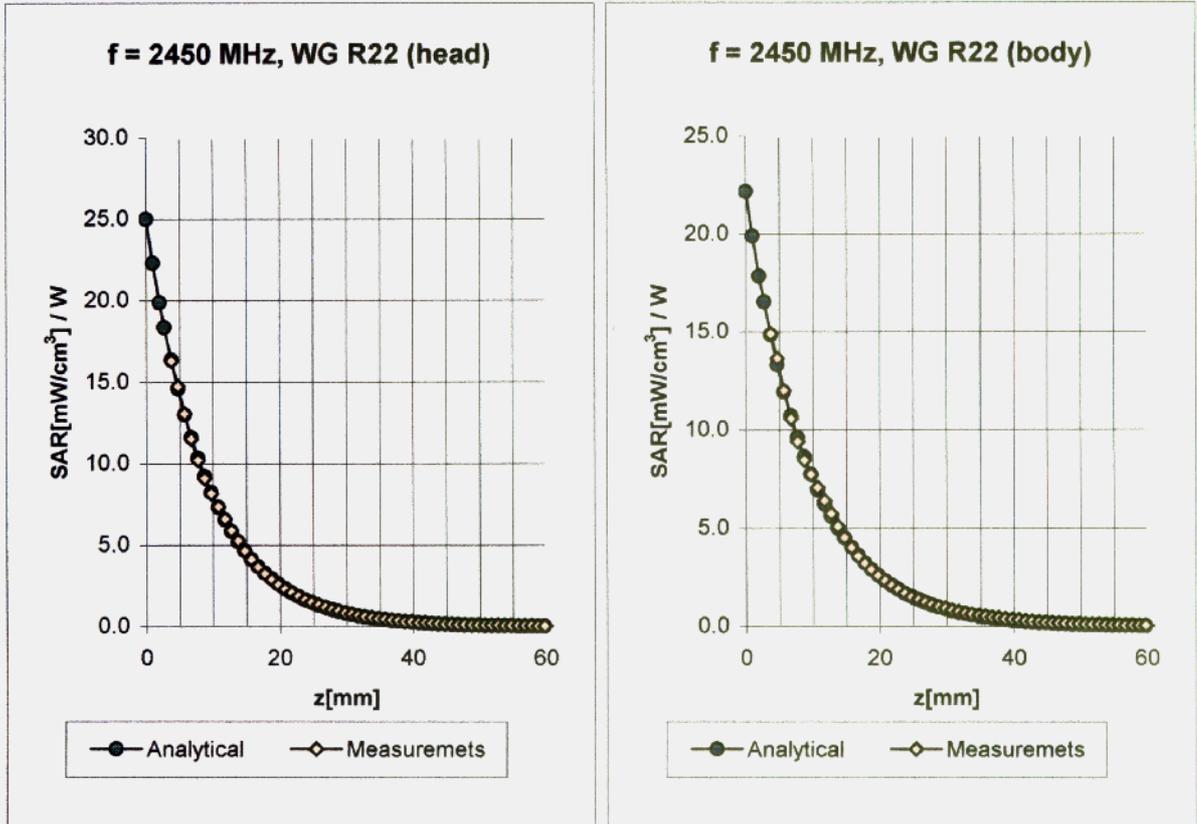
2450	Head	MHz	$\varepsilon_r = 39.2 \pm 5\%$	$\sigma = 1.80 \pm 5\%$ mho/m

ConvF X	**5.0** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**5.0** ± 8.9% (k=2)	Alpha	**0.97**
ConvF Z	**5.0** ± 8.9% (k=2)	Depth	**1.88**

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

ConvF X	**4.6** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**4.6** ± 8.9% (k=2)	Alpha	**1.48**
ConvF Z	**4.6** ± 8.9% (k=2)	Depth	**1.53**

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz