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

Client Motorola MRO (Harvard)

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1523
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	January 17, 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: January 17, 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.

Engineering AG

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

Probe ET3DV6

SN:1523

Manufactured:	March 21, 2000
Last calibration:	January 25, 2002
Recalibrated:	January 17, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1523

Sensitivity in Free Space

NormX	**1.59**	$\mu V/(V/m)^2$	DCP X	**94**	mV
NormY	**1.51**	$\mu V/(V/m)^2$	DCP Y	**94**	mV
NormZ	**1.53**	$\mu V/(V/m)^2$	DCP Z	**94**	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	**6.5** ± 9.5% (k=2)	Boundary effect:		
	ConvF Y	**6.5** ± 9.5% (k=2)	Alpha	**0.52**	
	ConvF Z	**6.5** ± 9.5% (k=2)	Depth	**2.06**	
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	**5.3** ± 9.5% (k=2)	Boundary effect:		
	ConvF Y	**5.3** ± 9.5% (k=2)	Alpha	**0.51**	
	ConvF Z	**5.3** ± 9.5% (k=2)	Depth	**2.66**	

Boundary Effect

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

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	9.7	5.1
SAR_{be} [%]	With Correction Algorithm	0.2	0.4

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

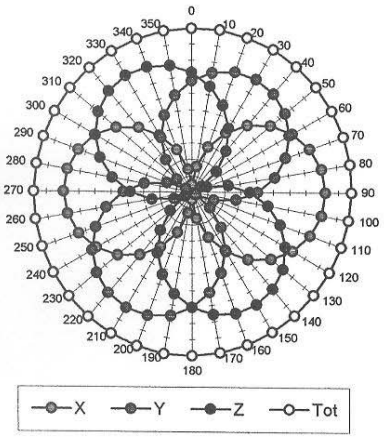
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	14.2	9.5
SAR_{be} [%]	With Correction Algorithm	0.2	0.0

Sensor Offset

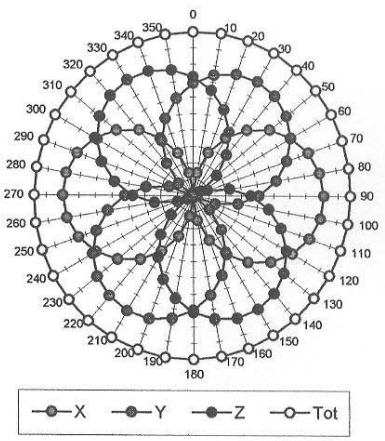
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.5 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

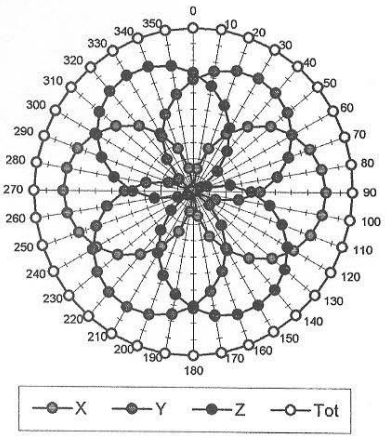
f = 30 MHz, TEM cell ifi110



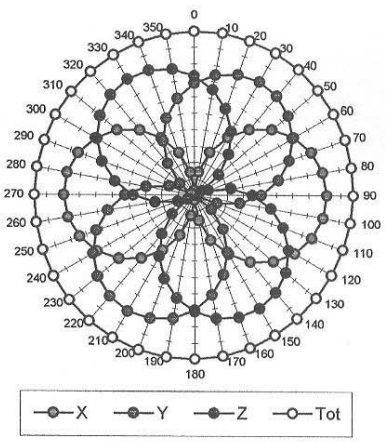
f = 100 MHz, TEM cell ifi110

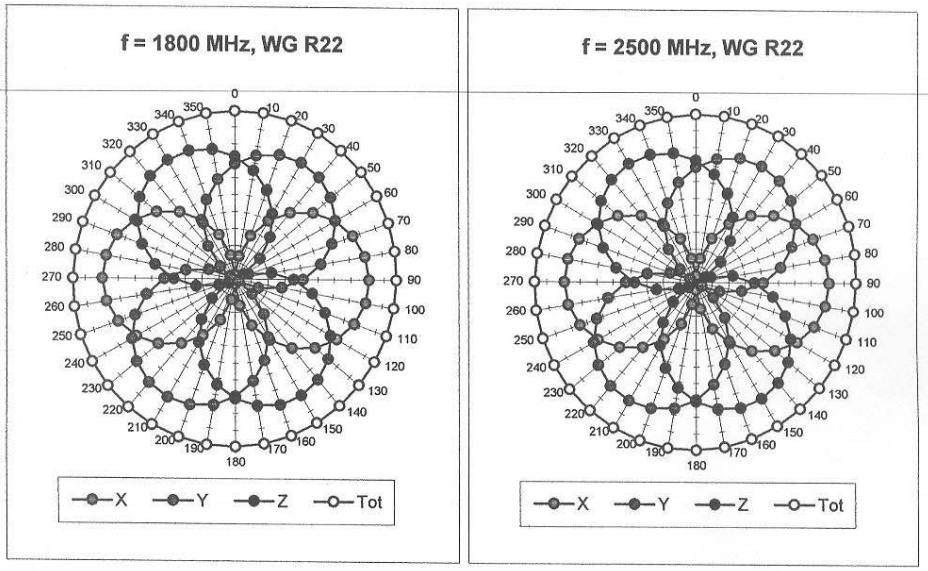


f = 300 MHz, TEM cell ifi110

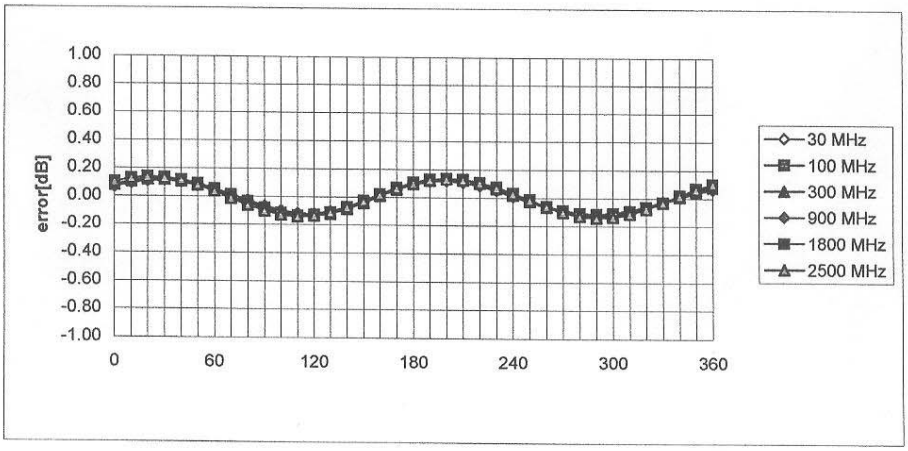


f = 900 MHz, TEM cell ifi110



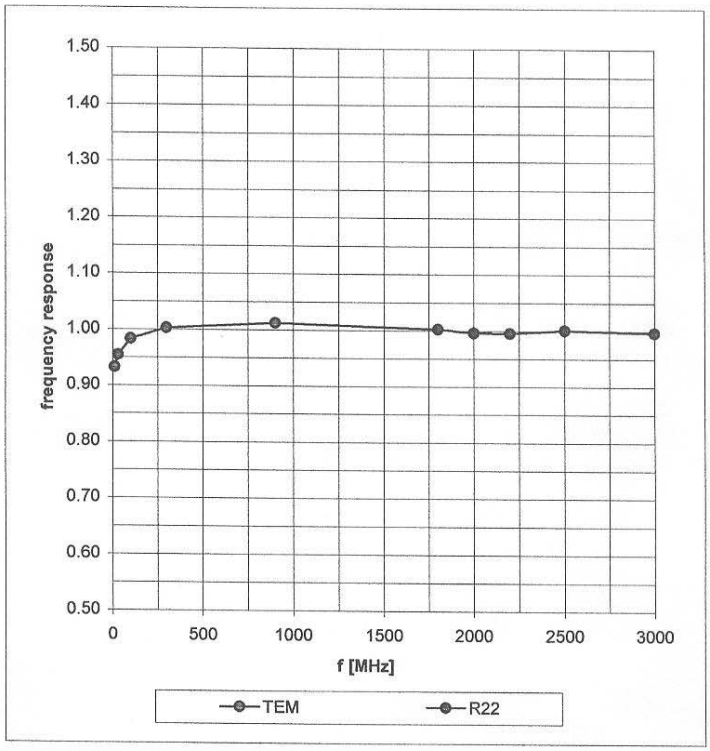


Isotropy Error (ϕ), θ = 0°



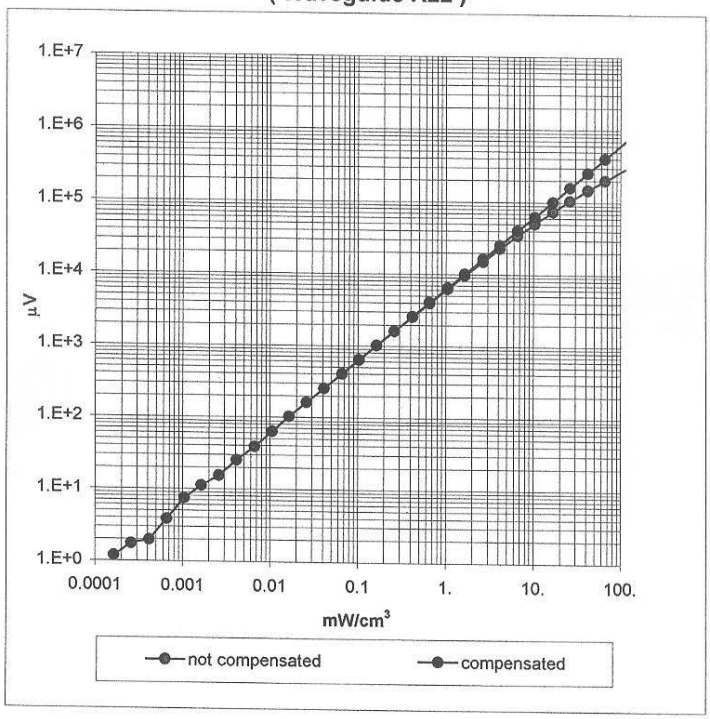
Frequency Response of E-Field

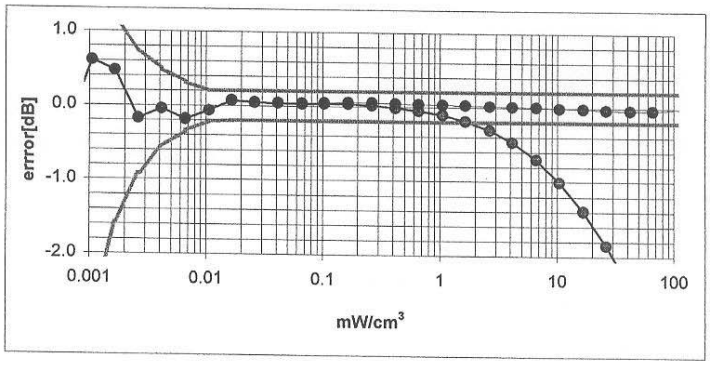
(TEM-Cell:ifi110, Waveguide R22)



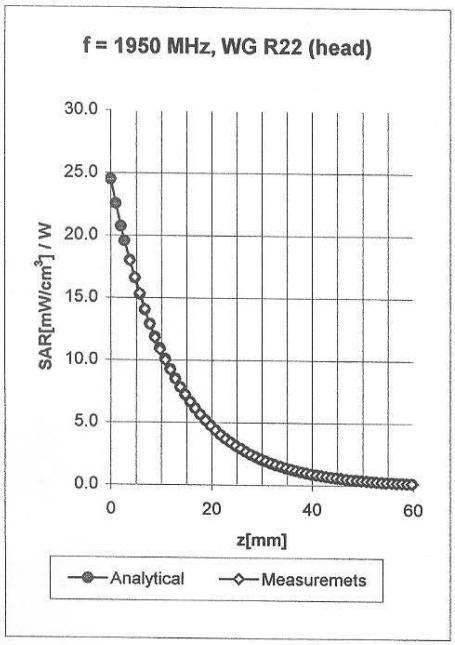
Dynamic Range f(SAR_{brain})

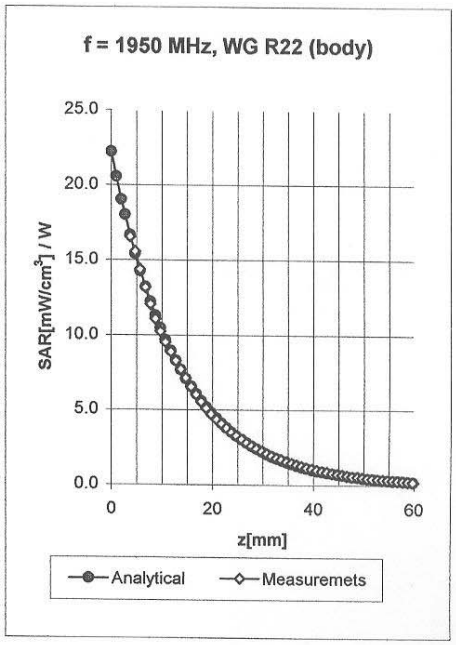
(Waveguide R22)





Conversion Factor Assessment





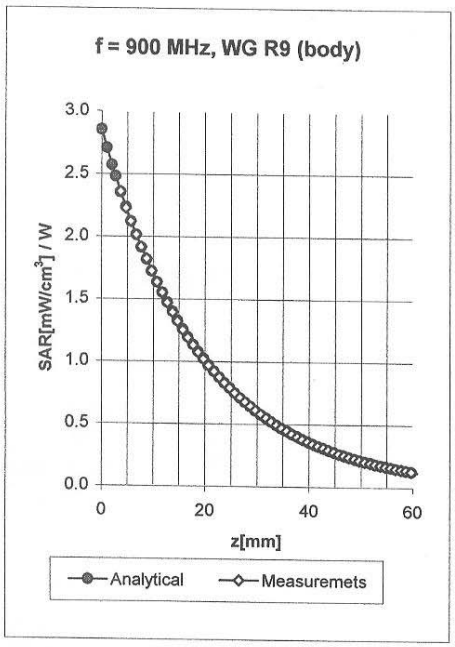
Head	**1950**	**MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**

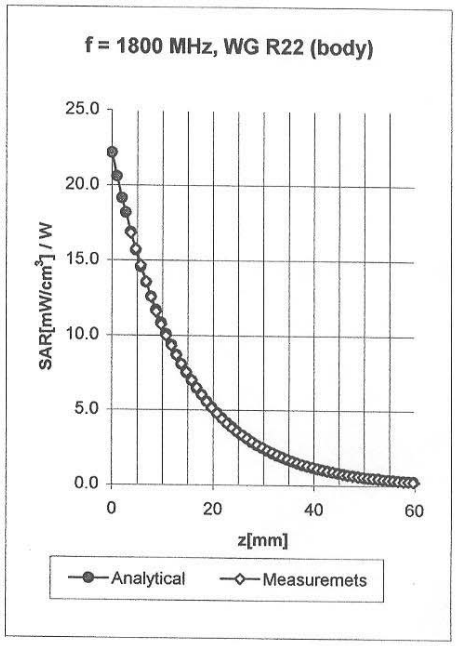
ConvF X	**4.9** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**4.9** ± 8.9% (k=2)	Alpha	**0.54**
ConvF Z	**4.9** ± 8.9% (k=2)	Depth	**2.57**

Body	**1950**	**MHz**	ε_r = **53.3 ± 5%**	σ = **1.52 ± 5% mho/m**

ConvF X	**4.5** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**4.5** ± 8.9% (k=2)	Alpha	**0.75**
ConvF Z	**4.5** ± 8.9% (k=2)	Depth	**2.23**

Conversion Factor Assessment

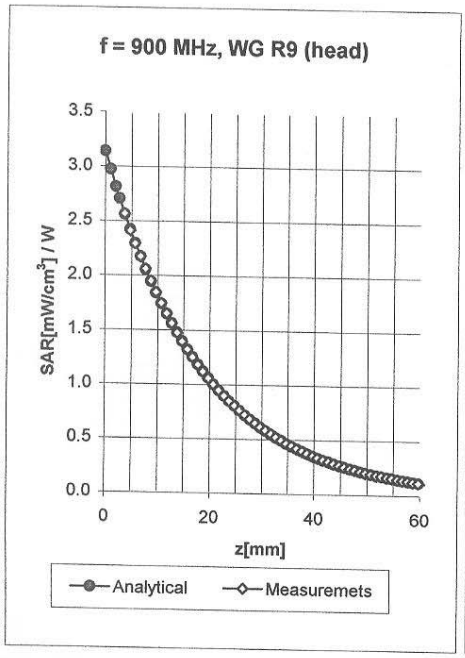


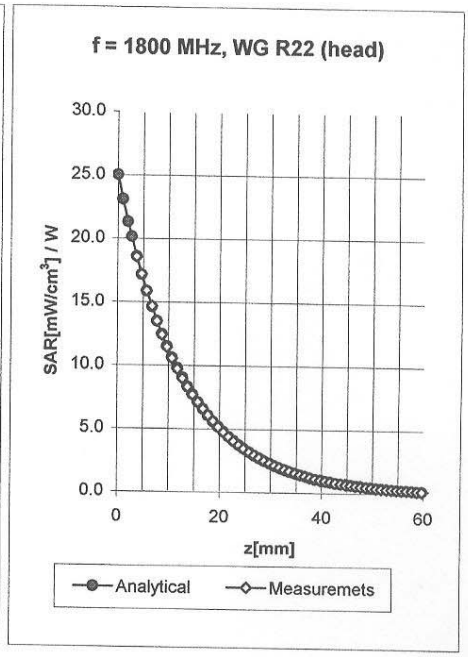


Body	**900 MHz**		ε_r = **55.0 ± 5%**	σ = **1.05 ± 5% mho/m**
Body	**835 MHz**		ε_r = **55.2 ± 5%**	σ = **0.97 ± 5% mho/m**
	ConvF X	**6.2** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**6.2** ± 9.5% (k=2)		Alpha **0.46**
	ConvF Z	**6.2** ± 9.5% (k=2)		Depth **2.35**

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 **0.57**
	ConvF Z	**4.8** ± 9.5% (k=2)		Depth **2.65**

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	**6.5** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**6.5** ± 9.5% (k=2)		Alpha **0.52**
	ConvF Z	**6.5** ± 9.5% (k=2)		Depth **2.06**

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	**5.3** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**5.3** ± 9.5% (k=2)		Alpha **0.51**
	ConvF Z	**5.3** ± 9.5% (k=2)		Depth **2.66**