

S-039-19

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

Client **EMC Technologies**

CALIBRATION CERTIFICATE

Object(s) **ES3DV3 - SN:3029**

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
Fuke 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.

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

Probe ES3DV3

SN:3029

Manufactured:	August 18, 2003
Last calibration:	September 23, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV3 SN:3029

Sensitivity in Free Space

Diode Compression

NormX	0.91 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	98	mV
NormY	1.02 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	98	mV
NormZ	1.04 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	98	mV

Sensitivity in Tissue Simulating Liquid

Body **5200 MHz** $\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\% \text{ mho/m}$

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

ConvF X	2.05 $\pm 16.6\%$ (k=2)	Boundary effect:	
ConvF Y	2.05 $\pm 16.6\%$ (k=2)	Alpha	0.95
ConvF Z	2.05 $\pm 16.6\%$ (k=2)	Depth	1.75

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

Valid for f=5510-6090 MHz with Body Tissue Simulating Liquid according to OET65-SuppC

ConvF X	1.80 $\pm 16.6\%$ (k=2)	Boundary effect:	
ConvF Y	1.80 $\pm 16.6\%$ (k=2)	Alpha	1.10
ConvF Z	1.80 $\pm 16.6\%$ (k=2)	Depth	1.70

Boundary Effect

Body **5200 MHz** **Typical SAR gradient: 25 % per mm**

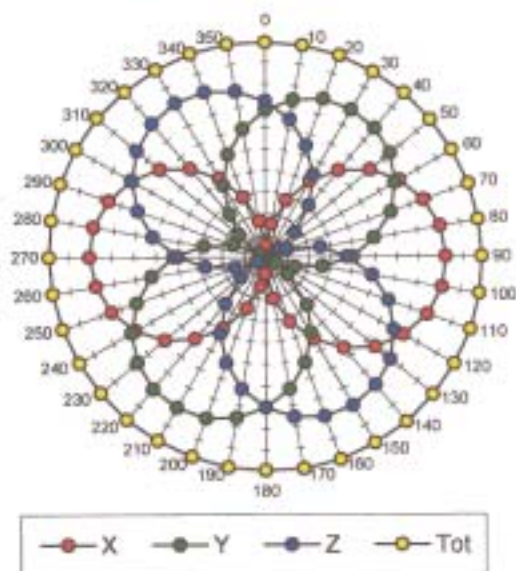
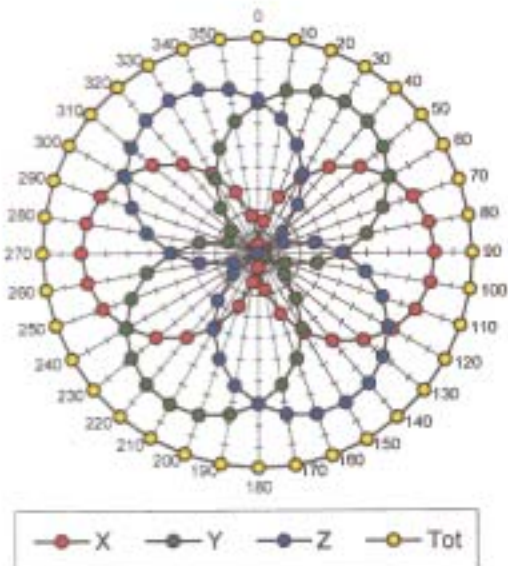
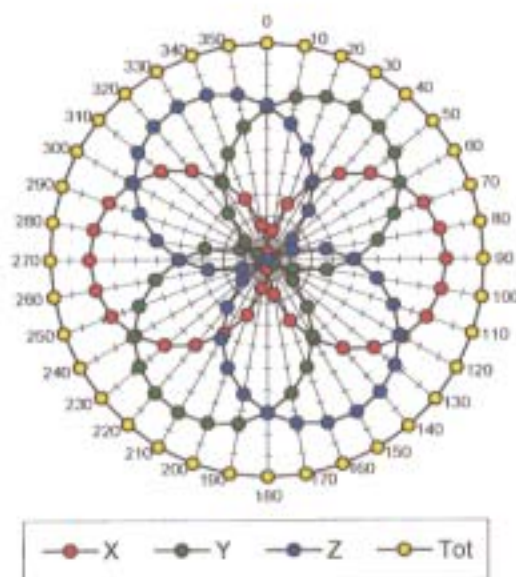
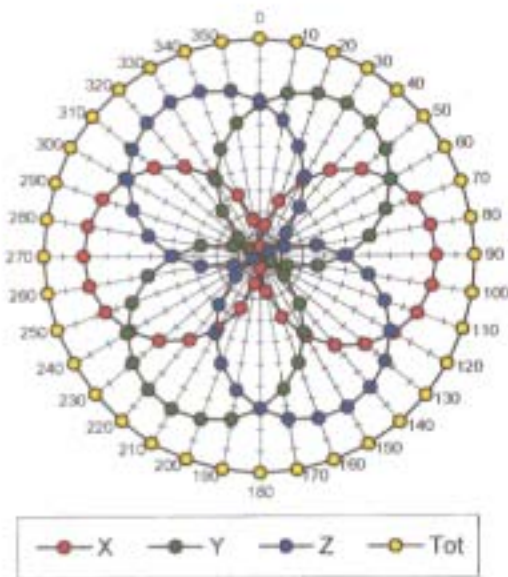
Probe Tip to Boundary		1 mm	2 mm
SAR _{be} [%] Without Correction Algorithm		27.8	10.0
SAR _{be} [%] With Correction Algorithm		0.1	0.0

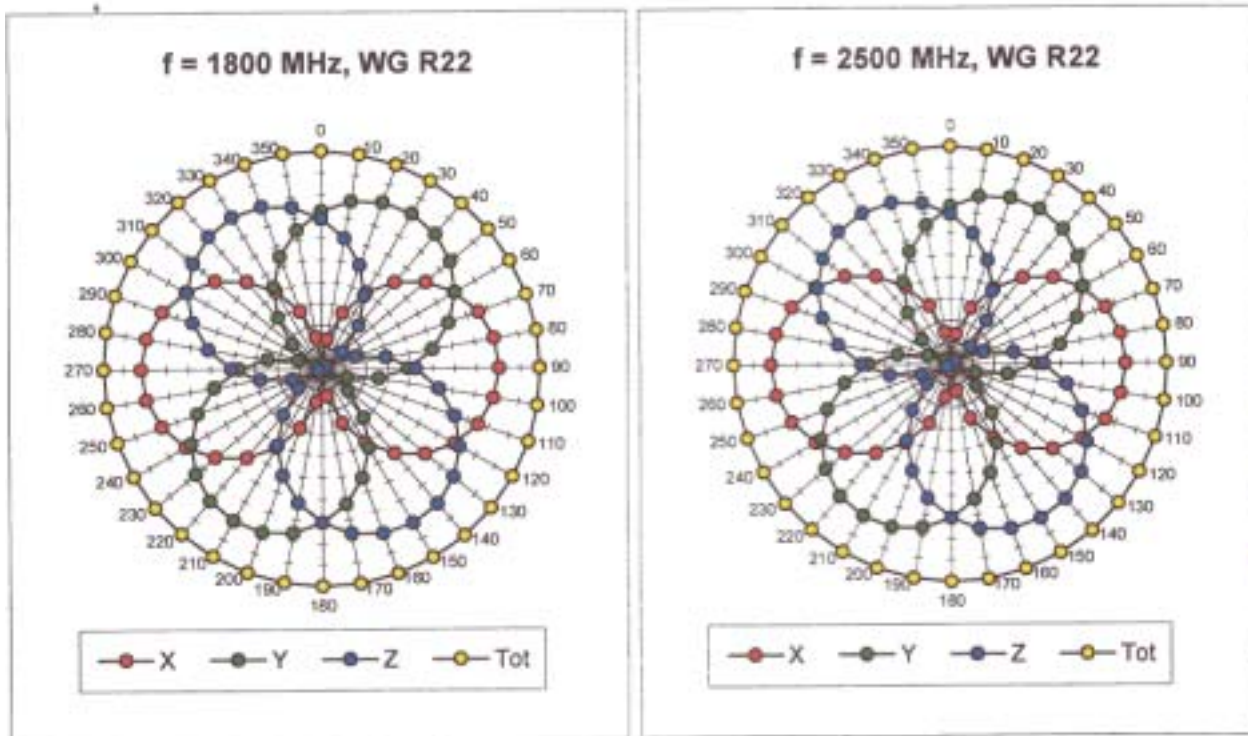
Body **5800 MHz** **Typical SAR gradient: 30 % per mm**

Probe Tip to Boundary		1 mm	2 mm
SAR _{be} [%] Without Correction Algorithm		30.1	10.1
SAR _{be} [%] With Correction Algorithm		0.1	0.0

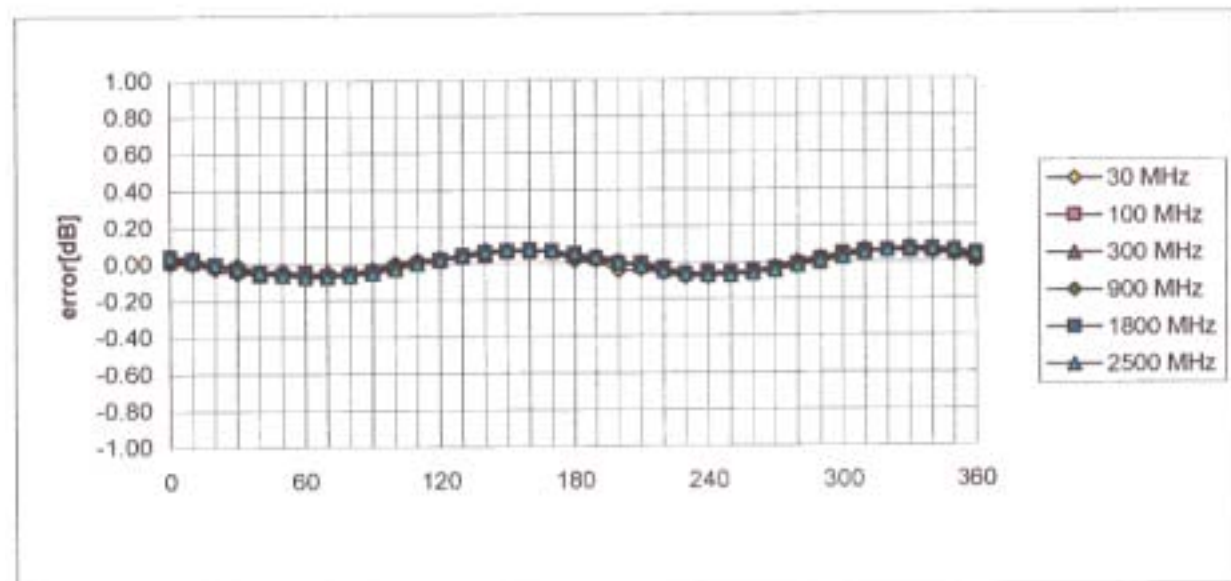
Sensor Offset

Probe Tip to Sensor Center	2.0	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

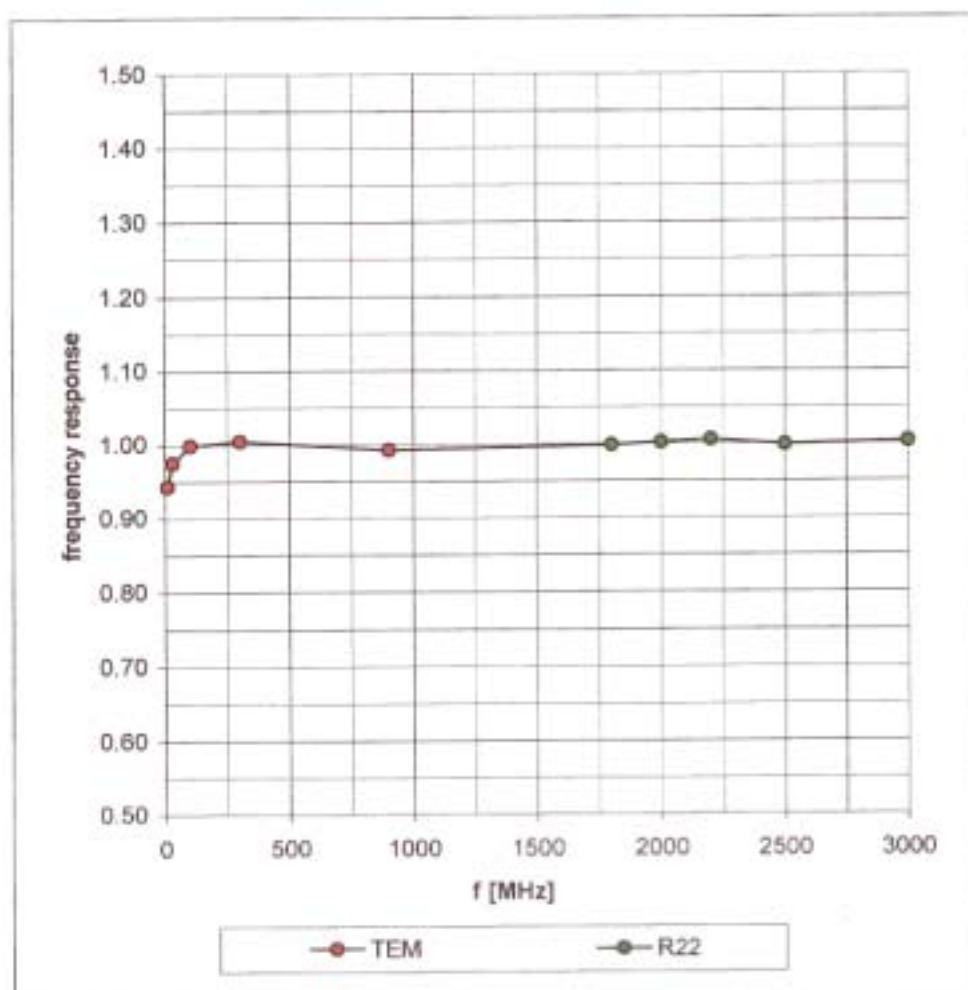


Isotropy Error (ϕ), $\theta = 0^\circ$

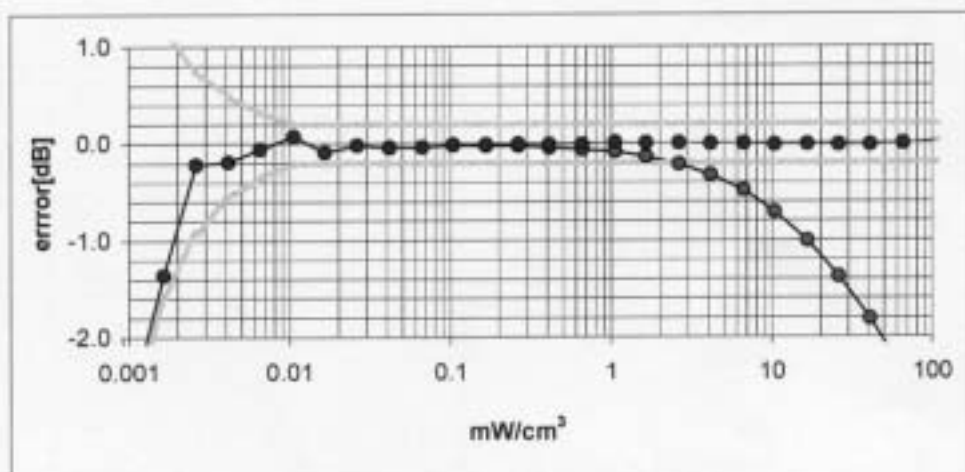
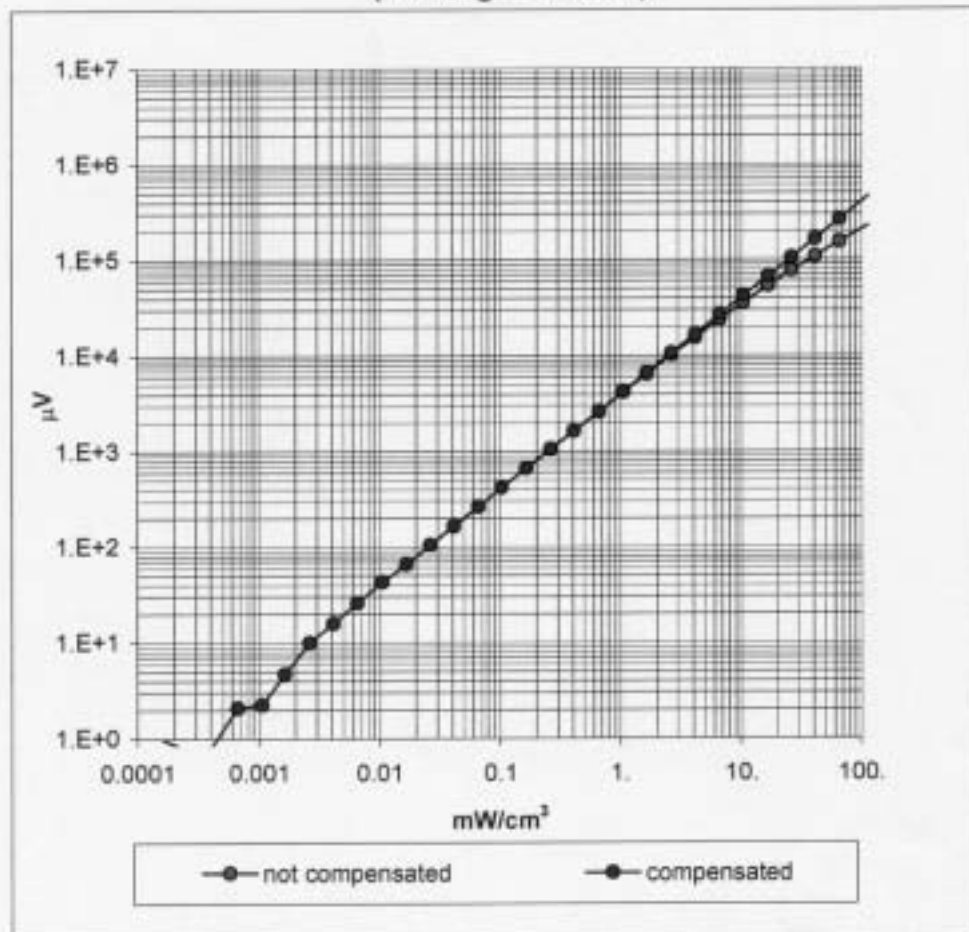


Frequency Response of E-Field

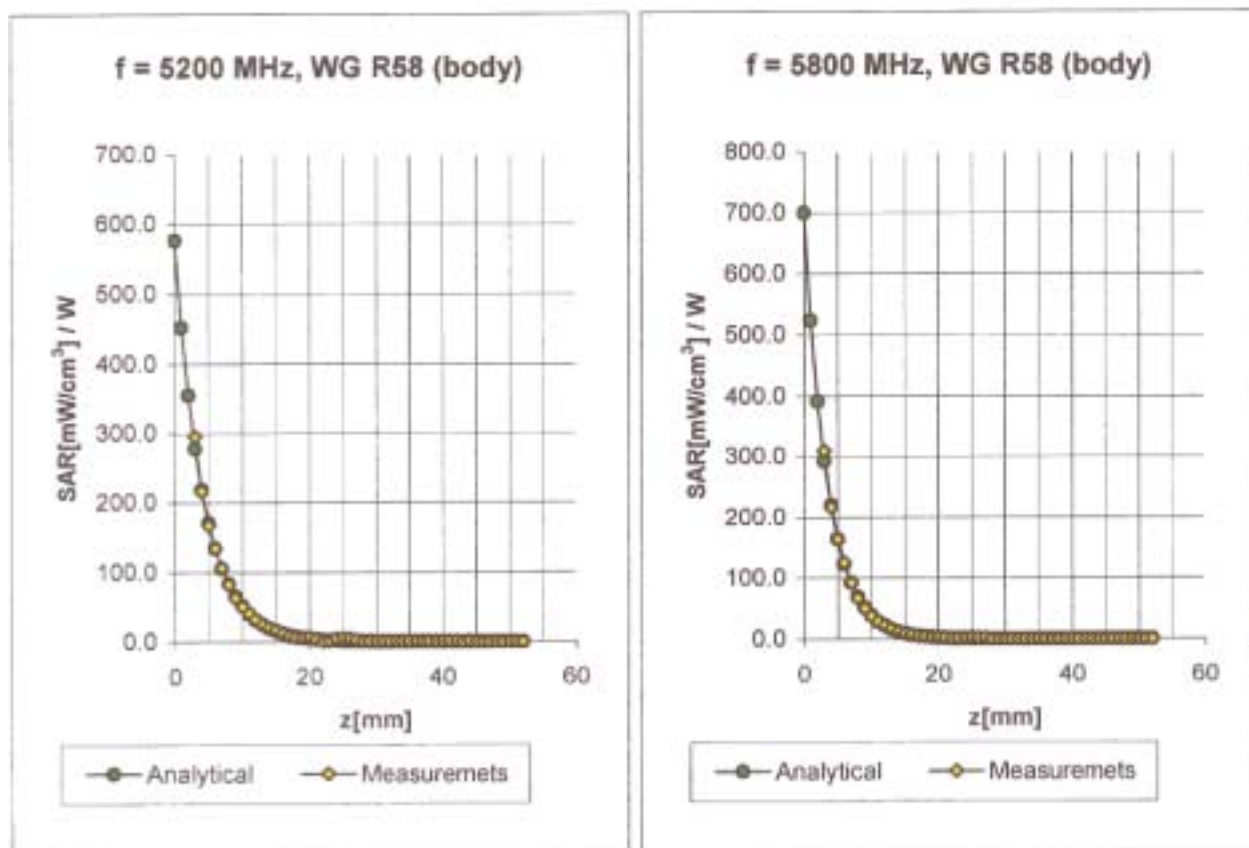
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range $f(\text{SAR}_{\text{brain}})$ (Waveguide R22)



Conversion Factor Assessment



Body 5200 MHz $\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\%$ mho/m

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

ConvF X	2.05 $\pm 16.6\%$ (k=2)	Boundary effect:
ConvF Y	2.05 $\pm 16.6\%$ (k=2)	Alpha 0.95
ConvF Z	2.05 $\pm 16.6\%$ (k=2)	Depth 1.75

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

Valid for f=5510-6090 MHz with Body Tissue Simulating Liquid according to OET65-SuppC

ConvF X	1.80 $\pm 16.6\%$ (k=2)	Boundary effect:
ConvF Y	1.80 $\pm 16.6\%$ (k=2)	Alpha 1.10
ConvF Z	1.80 $\pm 16.6\%$ (k=2)	Depth 1.70

Deviation from Isotropy in HSL

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

