

Appendix C: probe calibration parameters

Please see separate attachment

Schmid & Partner Engineering AG

s p e a g

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info@speag.com, <http://www.speag.com>

Probe ET3DV6

SN:1663

Manufactured:	February 8, 2002
Last calibration:	April 16, 2003
Repaired:	September 26, 2003
Recalibrated:	October 10, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1663

October 10, 2003

DASY - Parameters of Probe: ET3DV6 SN:1663

Sensitivity in Free Space

Diode Compression

NormX	2.03 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	95	mV
NormY	1.69 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	95	mV
NormZ	2.09 $\mu\text{V}/(\text{V}/\text{m})^2$	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	6.7 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.7 $\pm 9.5\%$ (k=2)	Alpha	0.30
ConvF Z	6.7 $\pm 9.5\%$ (k=2)	Depth	3.08

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	0.47
ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth	2.72

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR _{be} [%]	Without Correction Algorithm	10.5	6.3
SAR _{be} [%]	With Correction Algorithm	0.5	0.6

Head 1800 MHz Typical SAR gradient: 10 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR _{be} [%]	Without Correction Algorithm	13.4	9.3
SAR _{be} [%]	With Correction Algorithm	0.2	0.2

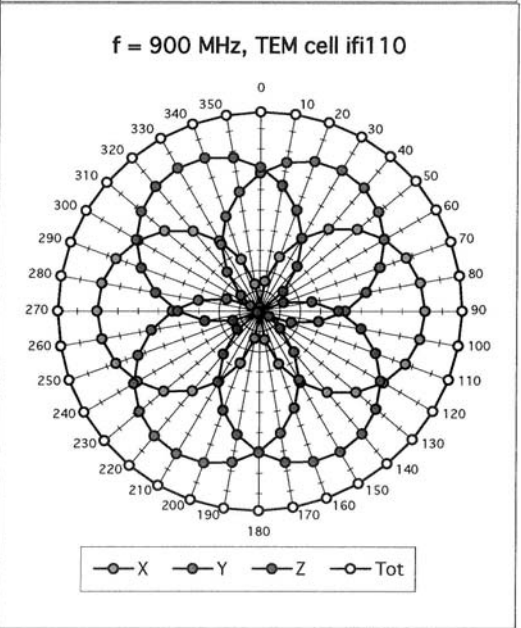
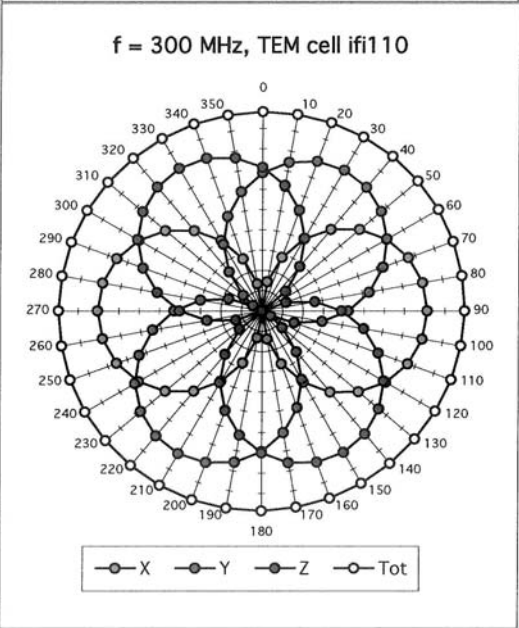
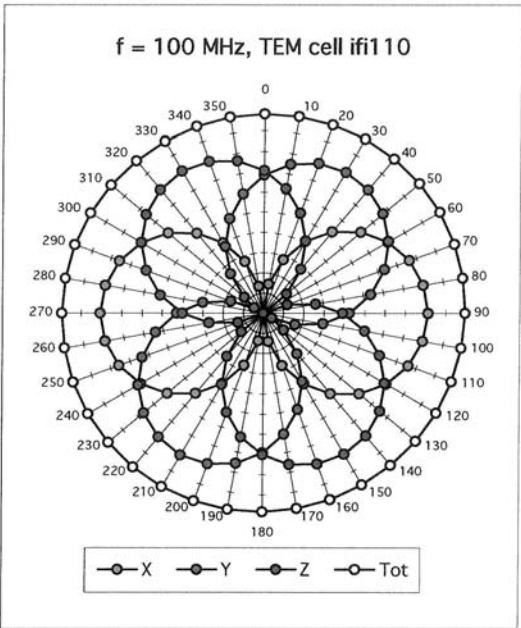
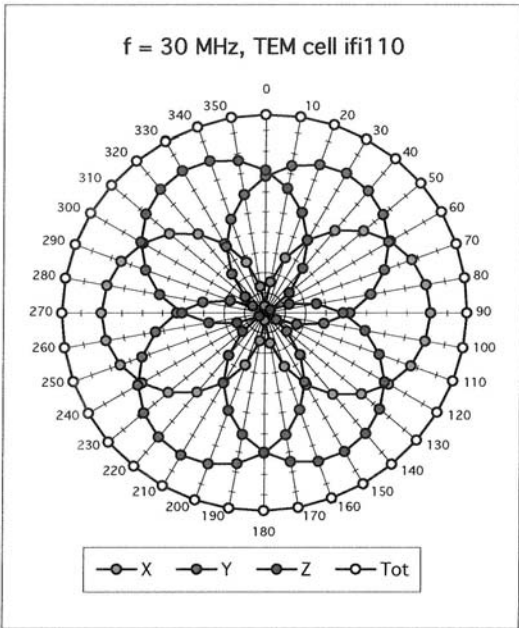
Sensor Offset

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

ET3DV6 SN:1663

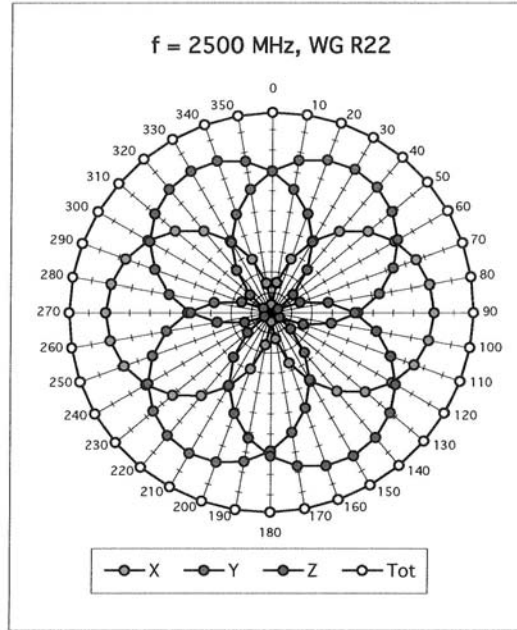
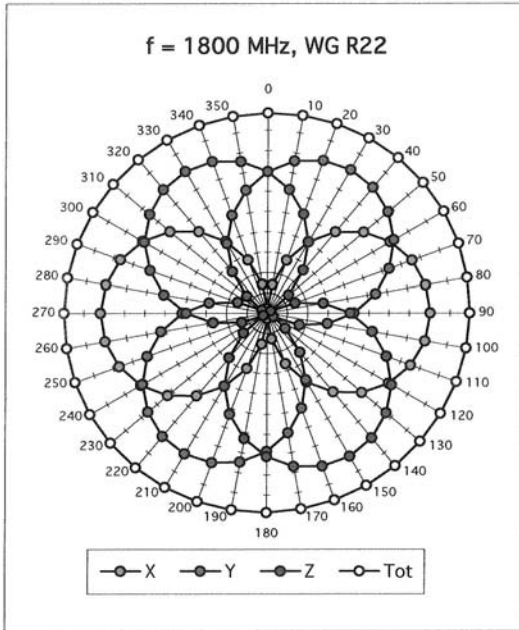
October 10, 2003

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

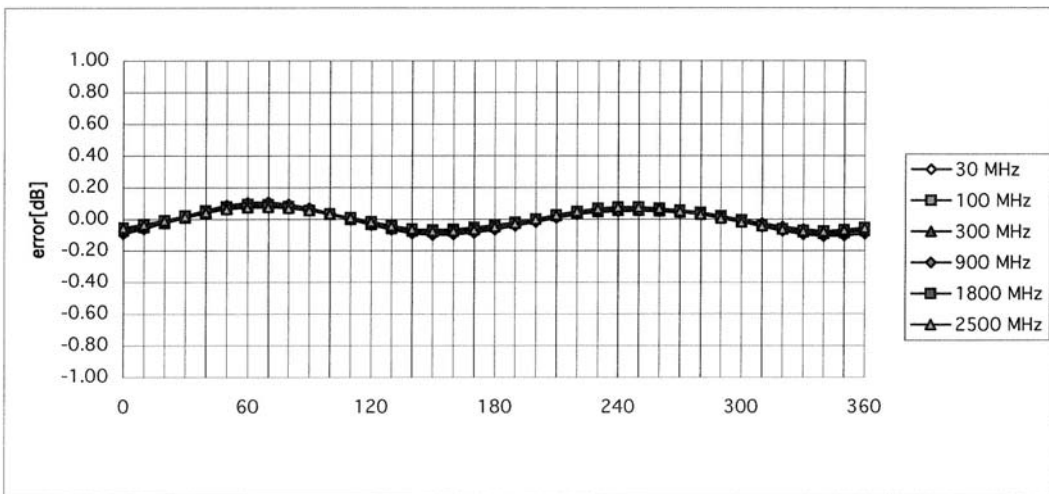


ET3DV6 SN:1663

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

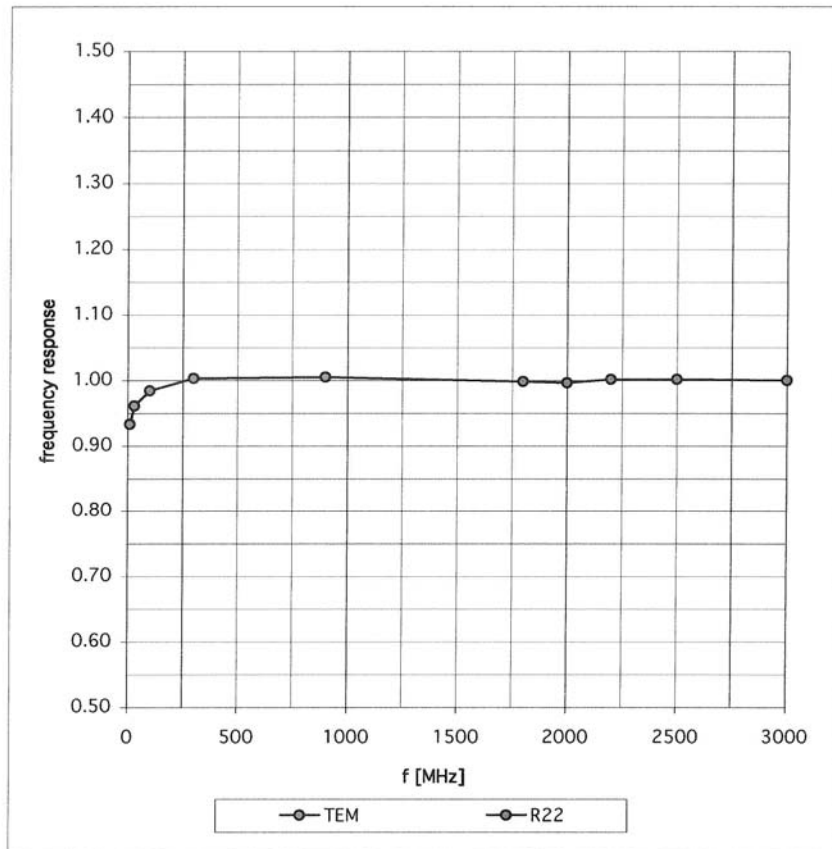


ET3DV6 SN:1663

October 10, 2003

Frequency Response of E-Field

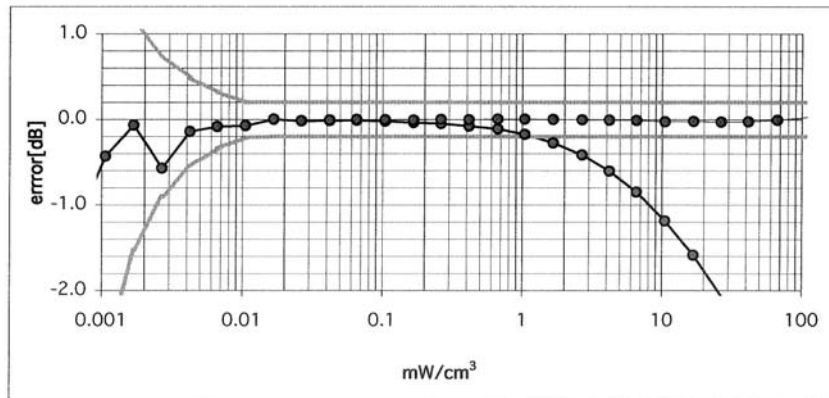
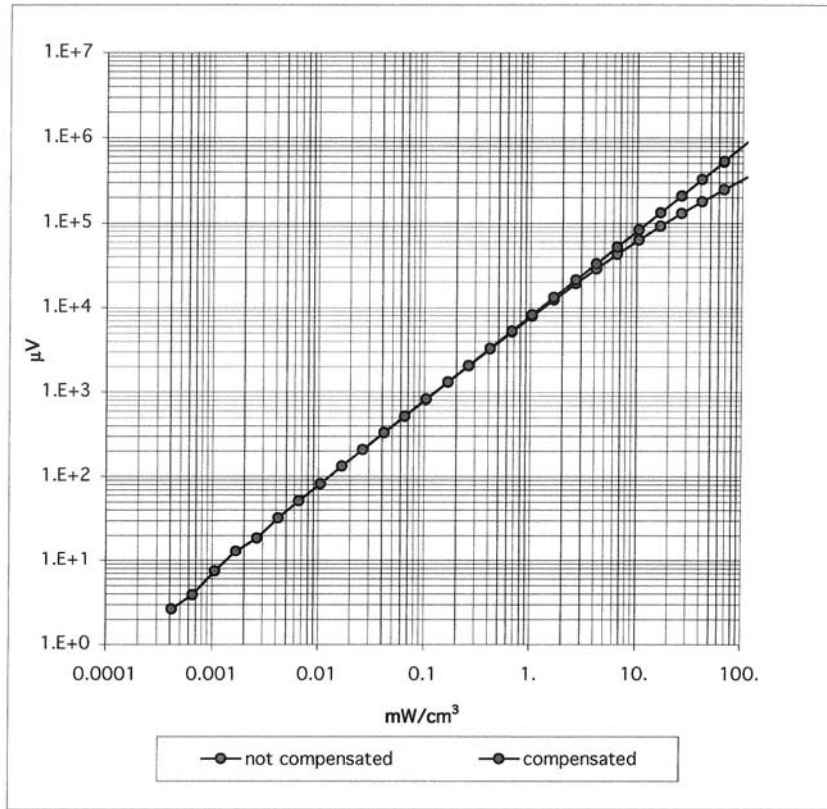
(TEM-Cell:ifi110, Waveguide R22)



ET3DV6 SN:1663

October 10, 2003

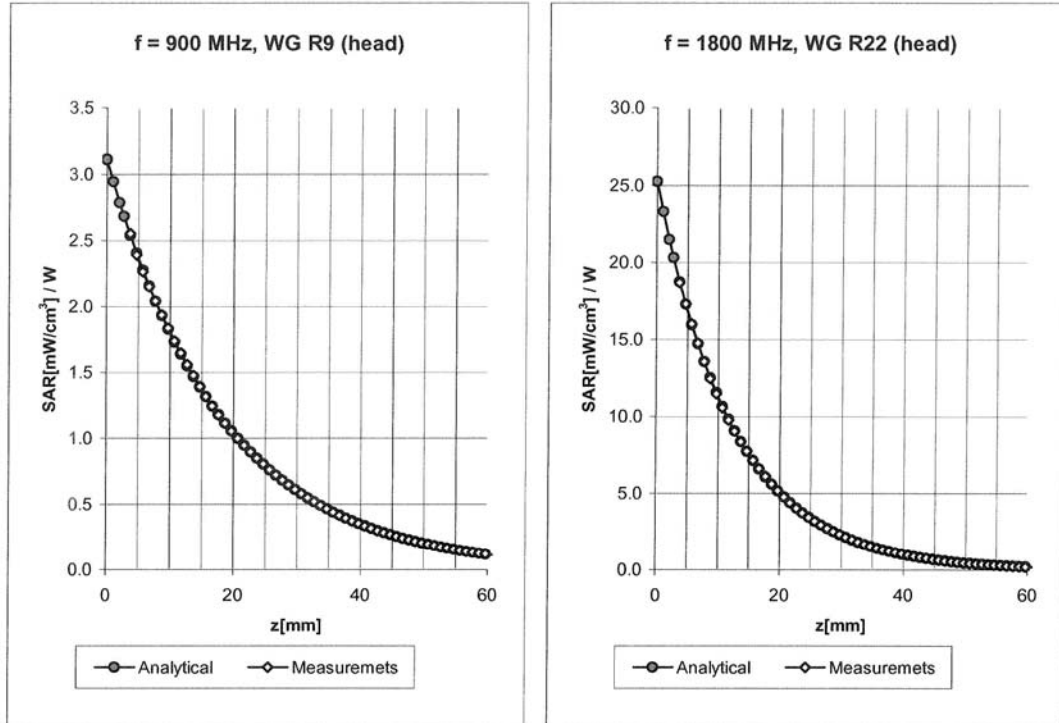
Dynamic Range f(SARhead) (Waveguide R22)



ET3DV6 SN:1663

October 10, 2003

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	6.7 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.7 $\pm 9.5\%$ (k=2)	Alpha	0.30
ConvF Z	6.7 $\pm 9.5\%$ (k=2)	Depth	3.08

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

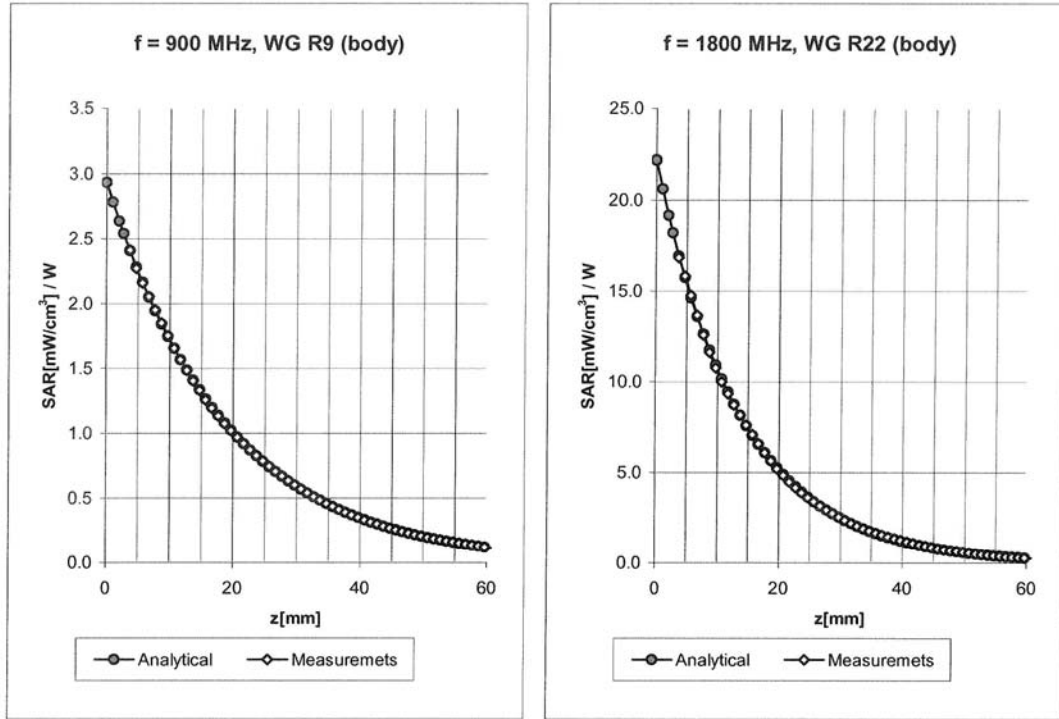
Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	5.2 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	5.2 $\pm 9.5\%$ (k=2)	Alpha	0.47
ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth	2.72

ET3DV6 SN:1663

October 10, 2003

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	0.39
ConvF Z	6.4 $\pm 9.5\%$ (k=2)	Depth	2.62

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

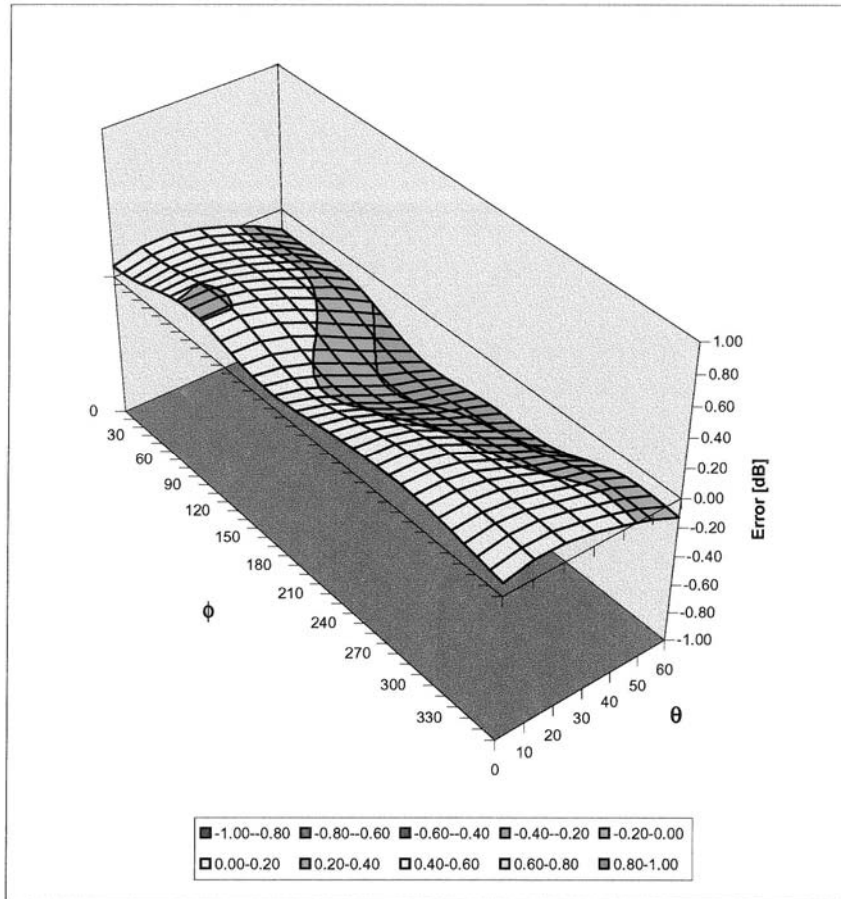
Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	4.9 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	4.9 $\pm 9.5\%$ (k=2)	Alpha	0.54
ConvF Z	4.9 $\pm 9.5\%$ (k=2)	Depth	2.75

ET3DV6 SN:1663

October 10, 2003

Deviation from Isotropy in HSL
 Error (θ, ϕ), $f = 900$ MHz



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Probe ET3DV6

SN:1712

Manufactured: August 7, 2002
Last calibration: September 6, 2002
Recalibrated: September 19, 2003

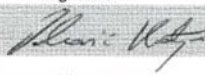

Calibrated for DASYS Systems

(Note: non-compatible with DASYS2 system!)

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

Client **Kyocera Wireless USA**

CALIBRATION CERTIFICATE																																			
Object(s)	ET3DV6 - SN:1712																																		
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes																																		
Calibration date:	September 19, 2003																																		
Condition of the calibrated item	In Tolerance (according to the specific calibration document)																																		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Model Type</th> <th>ID #</th> <th>Cal Date (Calibrated by, Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter EPM E4419B</td> <td>GB41293874</td> <td>2-Apr-03 (METAS, No 252-0250)</td> <td>Apr-04</td> </tr> <tr> <td>Power sensor E4412A</td> <td>MY41495277</td> <td>2-Apr-03 (METAS, No 252-0250)</td> <td>Apr-04</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: 5086 (20b)</td> <td>3-Apr-03 (METAS No. 251-0340)</td> <td>Apr-04</td> </tr> <tr> <td>Fluke Process Calibrator Type 702</td> <td>SN: 6295803</td> <td>8-Sep-03 (Sintrel SCS No. E-030020)</td> <td>Sep-04</td> </tr> <tr> <td>Power sensor HP 8481A</td> <td>MY41092180</td> <td>18-Sep-02 (Agilent, No. 20020918)</td> <td>In house check: Oct 03</td> </tr> <tr> <td>RF generator HP 8684C</td> <td>US3642U01700</td> <td>4-Aug-99 (SPEAG, in house check Aug-02)</td> <td>In house check: Aug-05</td> </tr> <tr> <td>Network Analyzer HP 8753E</td> <td>US37390585</td> <td>18-Oct-01 (Agilent, No. 24BR1033101)</td> <td>In house check: Oct 03</td> </tr> </tbody> </table>				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
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Calibrated by:	Name Katja Pokovic	Function Laboratory Director	Signature 																																
Approved by:	Name Fin Bornhoit	Function R&D Director	Signature 																																
Date issued: September 19, 2003																																			
<p>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.</p>																																			

ET3DV6 SN:1712

September 19, 2003

DASY - Parameters of Probe: ET3DV6 SN:1712

Sensitivity in Free Space

NormX	1.60 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.53 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.62 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

DCP X	94	mV
DCP Y	94	mV
DCP Z	94	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	6.5 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	6.5 $\pm 9.5\%$ (k=2)	Alpha 0.30
ConvF Z	6.5 $\pm 9.5\%$ (k=2)	Depth 3.12

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	5.3 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	5.3 $\pm 9.5\%$ (k=2)	Alpha 0.46
ConvF Z	5.3 $\pm 9.5\%$ (k=2)	Depth 2.72

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR _{be} [%]	Without Correction Algorithm	10.6	6.5
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	13.1	9.1
SAR _{be} [%]	With Correction Algorithm	0.2	0.2

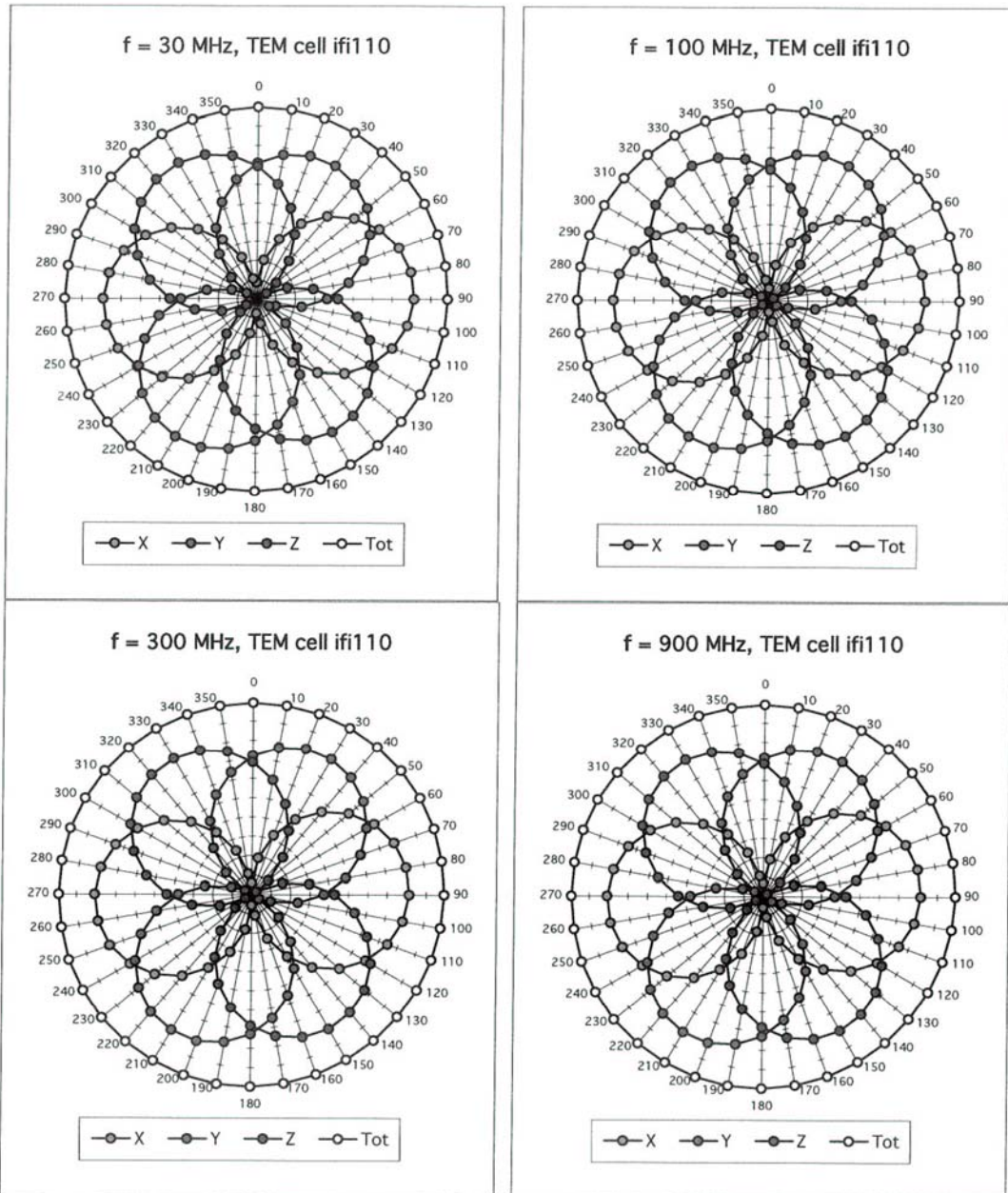
Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.4 \pm 0.2	mm

ET3DV6 SN:1712

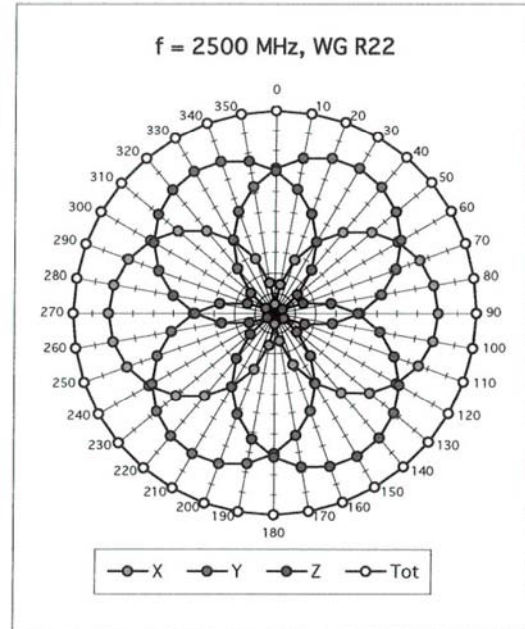
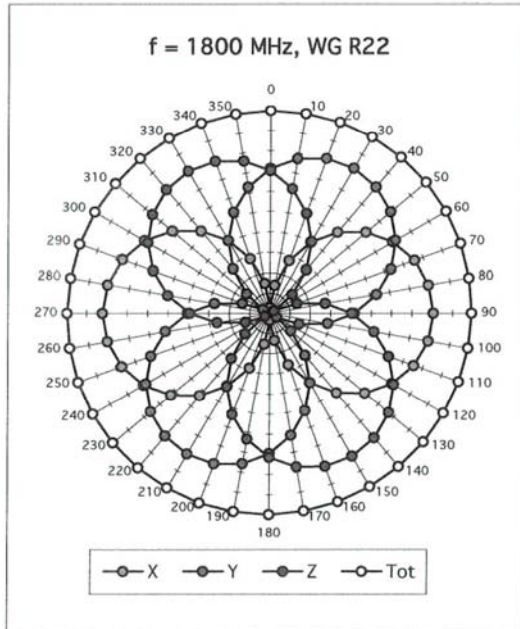
September 19, 2003

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

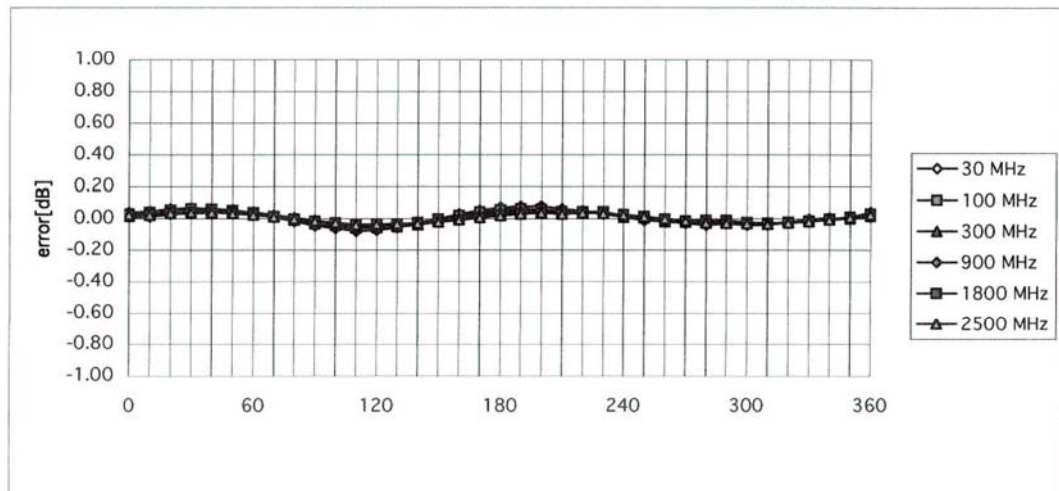


ET3DV6 SN:1712

September 19, 2003



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

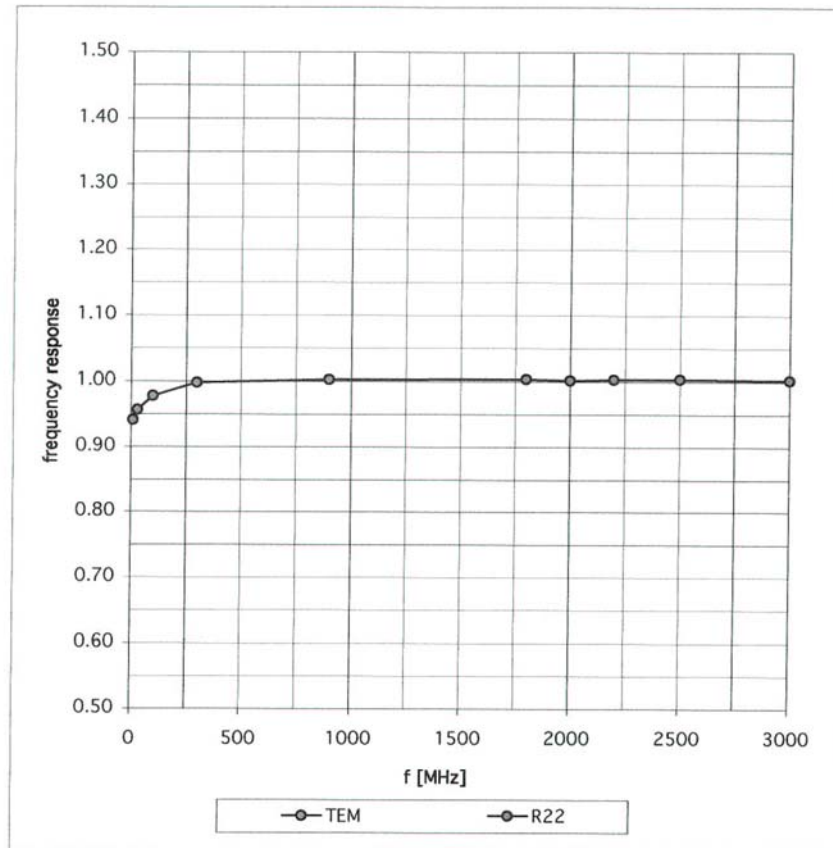


ET3DV6 SN:1712

September 19, 2003

Frequency Response of E-Field

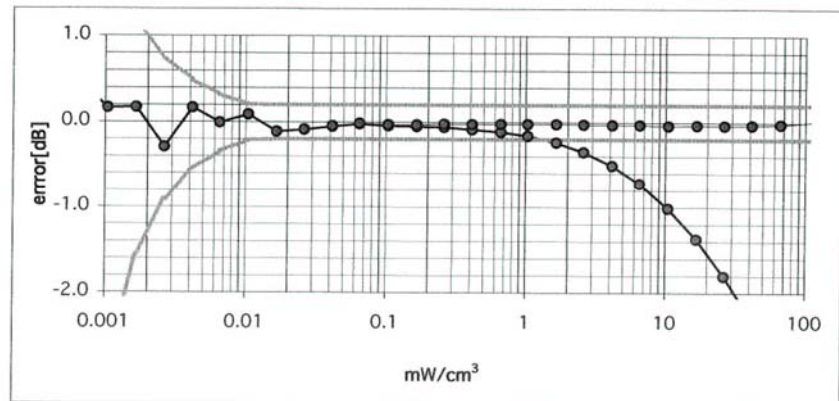
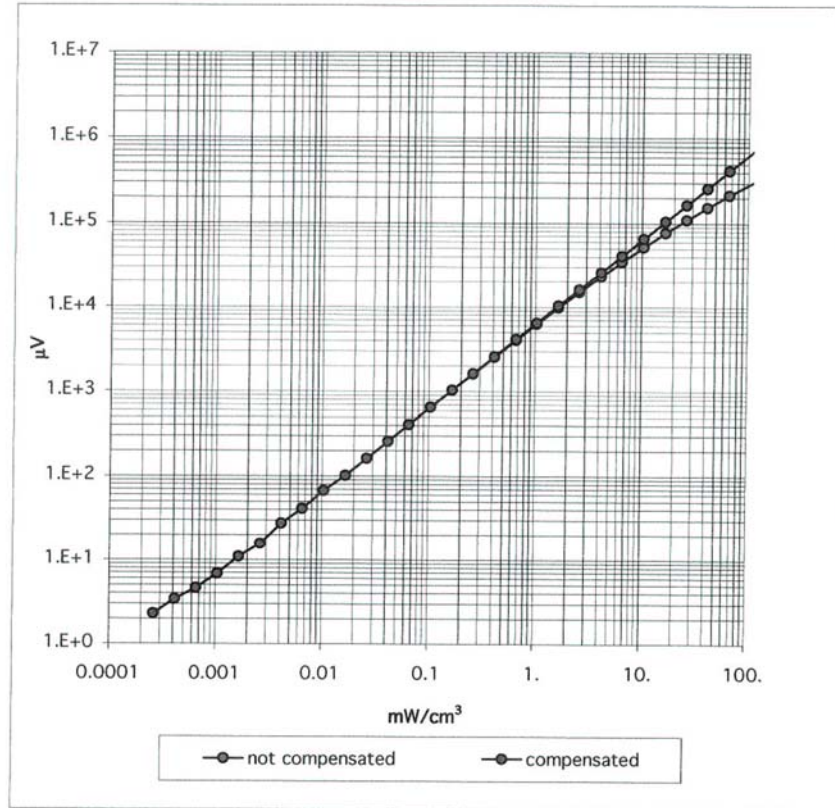
(TEM-Cell:ifi110, Waveguide R22)



ET3DV6 SN:1712

September 19, 2003

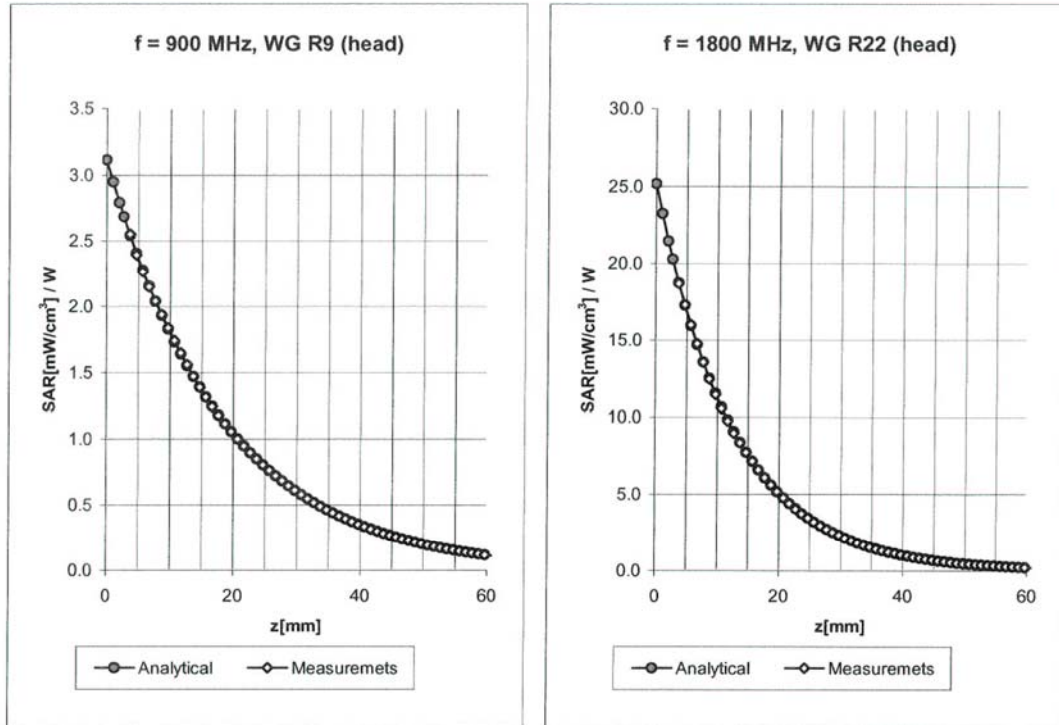
Dynamic Range f(SARhead) (Waveguide R22)



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September 19, 2003

Conversion Factor Assessment



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ET3DV6 SN:1712

September 19, 2003

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz

