Certificate Number: 1449-01

MOTOROLA

ACCREDITED

CGISS EME Test Laboratory
8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

S.A.R. EME Compliance Test Report
Part 3 of 5

Date of Report:	April 15, 2004
Report Revision:	Rev. A
Manufacturer:	Motorola
Product Description:	CN620; Quad band GSM and Tri band WLAN (802.11a, b, and g)
FCC ID:	**AZ489FT5829**
Device Model:	H77UBH6JA5AA

Test Period:	2/19/04-3/24/04
EME Tech:	Ed Church
Responsible Eng:	Deanna Zakharia (Elect. Principle Staff Eng.)
Author:	Michael Sailsman (Global EME Regulatory Affairs Liaison)

Note: Based on the information and the testing results provided herein, the undersigned certifies that when used as stated in the operating instructions supplied, said product complies with the national and international reference standards and guidelines listed in section 2.0 of this report.

Deanna Zakharia signature on file for Ken Enger — 4/15/04

Ken Enger
Senior Resource Manager, Laboratory Director, CGISS EME Lab

Date Approved

Appendix C: Dipole System Performance Check Results (Continued)

SYSTEM VALIDATION

Date:	09/06/2003	Frequency (MHz):	2450
Lab Location:	CGISS	Mixture Type:	2450-IEEE Head
Robot System:	CGISS-2	Ambient Temp.(°C):	22.9
Probe Serial #:	1383	Tissue Temp.(°C):	21.0
DAE Serial #:	DAE3V1 SN406		

Tissue Characteristics		Phantom Type/SN:	VAL30242005A
Permitivity:	38.0	Distance (mm):	10
Conductivity:	1.85		

Reference Source: Dipole (Dipole/Handset)
Reference SN: 704

Power to Dipole: 250 mW
Power Output (radio): _____ mW

Target SAR Value: 52.4 mW/g, 24.0 mW/g (10g avg.)
(Normalized to 1.0 W)

Measured SAR Value: 13.10 mW/g, 5.99 mW/g (10g avg.)
Power Drift: -0.02 dB

Measured SAR Value: 52.64 mW/g, 24.07 mW/g (10g avg.)
(normalized to 1.0 W,
with drift compensation)

Percent Difference From Target (must be within System Uncertainty): + 0.46 % (1g avg)
+ 0.29 % (10g avg)

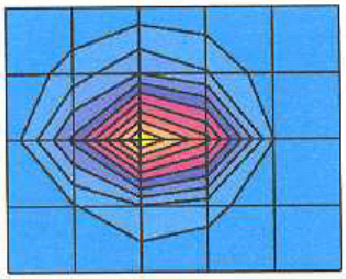
Test performed by: Dave Hopper Initial: WOH

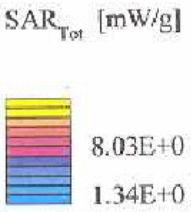
SPEAG DIPOLE D2450V2 ; Test date:09/06/03

Run #: Sys VAL R2-030906-01
Model#: D2450V2
Robot#: CGISS-2
Tx Freq: 2450MHz
Start power: 250mW

Phantom #: VAL30242005A/S12
SN:704
DAE: DAE3V1SN406 (11/11/02)
Tester: Dave Hopper
Simulated tissue temp: 21.0 C

IEEE Targets:
52.4 mW/g for 1g SAR, 24.0 mW/g for 10g SAR.
SAR calculated 1g is 52.64 mW/g percent from target (including drift) is 0.46 %
SAR Calculated 10g is 24.07 mW/g Percent from target (including drift) is 0.29 %
Flat; Probe: ET3DV6 - SN1383 (Cal Date 26 February 2003); ConvF(5.00,5.00,5.00); Crest factor: 1.0; IEEE
HEAD 2450MHz: $\sigma = 1.85$ mho/m $\varepsilon_r = 38.0$ $\rho = 1.00$ g/cm^3
Cubes (2): Peak: 27.2 mW/g ± 0.00 dB, SAR (1g): 13.1 mW/g ± 0.00 dB, SAR (10g): 5.99 mW/g ± 0.01 dB, (Worst-case extrapolation)
Penetration depth: 6.5 (6.3, 7.1) [mm]
Powerdrift: -0.02 dB





SYSTEM PERFORMANCE CHECK TARGET SAR

Date:	09/06/2003	Frequency (MHz):	2450
Lab Location:	CGISS	Mixture Type:	2450-FCC Body
Robot System:	CGISS-2	Ambient Temp.(°C):	22.9
Probe Serial #:	1383	Tissue Temp.(°C):	22.0
DAE Serial #:	DAE3V1 SN406		

Tissue Characteristics		Phantom Type/SN:	40302002A/S10
Permitivity:	53.6	Distance (mm):	10
Conductivity:	2.04		

Reference Source:	Dipole (Dipole)
Reference SN:	704
Power to Dipole:	250 mW

Measured SAR Value:	12.80 mW/g,	5.92 mW/g (10g avg.)
Power Drift:	-0.01 dB	

New Target/Measured SAR Value: (Normalized to 1.0 W, with drift compensation)	51.32 mW/g,	23.73 mW/g (10g avg.)

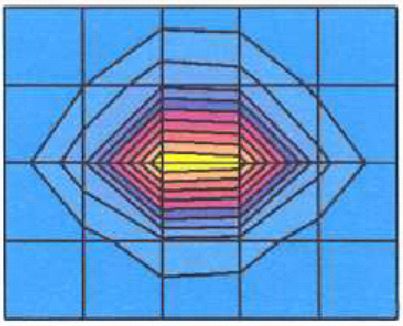
Test performed by: Dave Hopper Initial: WDH

SPEAG DIPOLE D2450V2 ; Test date:09/06/03

Run #: Sys Perf R2-030906-04 Phantom #:40302002A/S10
Model#: D2450V2 SN:704
Robot#: CGISS-2 DAE: DAE3V1SN406 (11/11/02)
Tx Freq: 2450MHz Tester: Dave Hopper
Start power: 250mW Simulated tissue temp: 22.0 C

New Targets:
51.32 mW/g for 1g SAR, 23.73 mW/g for 10g SAR.

Flat; Probe: ET3DV6 - SN1383 (Cal Date 26 February 2003); ConvF(4.70,4.70,4.70); Crest factor: 1.0; FCC BODY 2450MHz: σ = 2.04 mho/m ε_r = 53.6 ρ = 1.00 g/cm^3
Cubes (2): Peak: 26.0 mW/g ± 0.00 dB, SAR (1g): 12.8 mW/g ± 0.00 dB, SAR (10g): 5.92 mW/g ± 0.00 dB, (Worst-case extrapolation)
Penetration depth: 7.1 (6.8, 8.0) [mm]
Powerdrift: -0.01 dB



SYSTEM VALIDATION

Date:	3/6/2004	Frequency (MHz):	5200
Lab Location:	CGISS	Mixture Type:	Speag
Robot System:	GGISS-1	Ambient Temp.(°C):	21.2
Probe Serial #:	3512	Tissue Temp.(°C):	21
DAE Serial #:	363		

Tissue Characteristics

Permitivity:	34.9	Phantom Type/SN:	SAMTP 1209
Conductivity:	4.70	Distance (mm):	10 (tissue/dipole cnt)

Reference Source: D5GHzV2 (Dipole)
Reference SN: 1010

Power to Dipole: 100 mW
Power Output (radio): mW

Target SAR Value: 84.4 mW/g, 23.6 mW/g (10g avg.)
(normalized to 1.0 W)

Measured SAR Value: 8.29 mW/g, ? mW/g (10g avg.)
Power Drift: 0 dB

Measured SAR Value: 82.90 mW/g, #VALUE! mW/g (10g avg.)
(normalized to 1.0 W, including drift)

Percent Difference From Target (MUST be within System Uncertainty): 1.78 % (1g ave)
#VALUE! % (10g ave)

Test performed by: E. Church Initial: E. C

SPEAG Dipole 5200MHz. Test Date:03/06/04

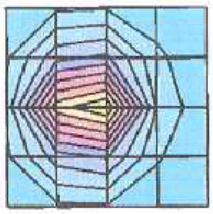
Run #: Sys Perf-R1-040306-01 Phantom #: SAMTP 1209
Model #: D5GHzV2 SN: 1010
Robot: CGISS-1 Tester: E. Church
TX Freq: 5200 MHz Sim Tissue Temp: 21.0 (Celsius)
Start Power: 100 mW
DAE3: SN363-V1 DAE Cal Date: 05/13/2003
- Comments-
SAR target at 1W is 82.9 mW/g (1g avg, including drift)

Measured cube at zero degrees is 8.18 mW/g
Measured cube at ninety degrees is 8.40 mW/g
Average of cubes is 8.29 mW/g

SAR calculated at 1W is 82.90 mW/g (1g avg). Percent from target (including drift) is 0 %

SAM - Expanded;
Probe: EX3DV3 - SN3512;Probe Cal Date: 23/1/04ConvF(5.02,5.02,5.02); Crest factor: 1.0; IEEE Head
5200MHz: σ = 4.70 mho/m ε_r = 34.9 ρ = 1.00 g/cm^3
:, , ()

Powerdrift: -0.00 dB



SAR_{Tot} [mW/g]

1.32E+0

SYSTEM PERFORMANCE CHECK TARGET SAR

Date:	3/19/2004	Frequency (MHz):	5200
Lab Location:	CGISS	Mixture Type:	Speag
Robot System:	CGISS-1	Ambient Temp.(°C):	22.4
Probe Serial #:	3512	Tissue Temp.(°C):	20.9
DAE Serial #:	363		

Tissue Characteristics

Permitivity:	46.7	Phantom Type/SN:	Flat 40302002A-S10
Conductivity:	5.51	Distance (mm):	10 (tissue/dipole cnt)

Reference Source:	D5GHzV2 (Dipole)
Reference SN:	1010

Power to Dipole: 100 mW

Measured SAR Value:	8.62 mW/g,		mW/g (10g avg.)
Power Drift:	0.28 dB		

New Target/Measured SAR Value: (normalized to 1.0 W, including drift)	80.82 mW/g,	0.00	mW/g (10g avg.)

Test performed by: E. Church Initial: E. C

SPEAG Dipole 5200MHz. Test Date:03/19/04

Run #: Sys Perf-R1-040319-14
Model #: D5GHzV2
Robot: CGISS-1
TX Freq: 5200 MHz
Start Power: 100 mW
DAE3: SN363-V1

Phantom #: 40302002A-S10
SN: 1010
Tester: E. Church
Sim Tissue Temp: 20.9 (Celsius)
DAE Cal Date: 05/13/2003

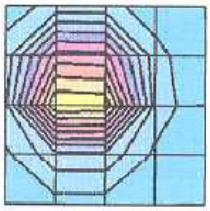
- Comments-
SAR target at 1W is 80.82 mW/g (1g avg, including drift)

Measured cube at zero degrees is 8.58 mW/g
Measured cube at ninety degrees is 8.66 mW/g
Average of cubes is 8.62 mW/g

SAR calculated at 1W is 80.82 mW/g (1g avg). Percent from target (including drift) is + .0 %

Flat Phantom;
Probe: EX3DV3 - SN3512;Probe Cal Date: 23/1/04ConvF(4.25,4.25,4.25); Crest factor: 1.0; FCC Body 5200 MHz: σ = 5.51 mho/m ε_r = 46.7 ρ = 1.00 g/cm^3
: , , ()

Powerdrift: 0.28 dB



SAR_{Tot} [mW/g]

1.22E+0

APPENDIX D

Probe/Dipole Calibration Certificates

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

Client **Motorola CGISS**

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1384
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	May 15, 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
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (Agilent, No. 20020918)	Sep-03
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Network Analyzer HP 8753E	US38432426	3-May-00 (Agilent, No. 8702K064602)	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01 (ELCAL, No.2360)	Sep-03

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: May 15, 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.

DASY - Parameters of Probe: ET3DV6 SN:1384

Sensitivity in Free Space

Diode Compression

NormX	1.76 $\mu V/(V/m)^2$	DCP X	92	mV
NormY	1.72 $\mu V/(V/m)^2$	DCP Y	92	mV
NormZ	1.89 $\mu V/(V/m)^2$	DCP Z	92	mV

Sensitivity in Tissue Simulating Liquid

Head 900 MHz ε_r = 41.5 ± 5% σ = 0.97 ± 5% mho/m

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	6.6 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.6 ± 9.5% (k=2)	Alpha	0.45
ConvF Z	6.6 ± 9.5% (k=2)	Depth	2.42

Head 1800 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

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

ConvF X	5.4 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.4 ± 9.5% (k=2)	Alpha	0.55
ConvF Z	5.4 ± 9.5% (k=2)	Depth	2.56

Boundary Effect

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

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	11.4	6.3
SAR_{be} [%]	With Correction Algorithm	0.4	0.7

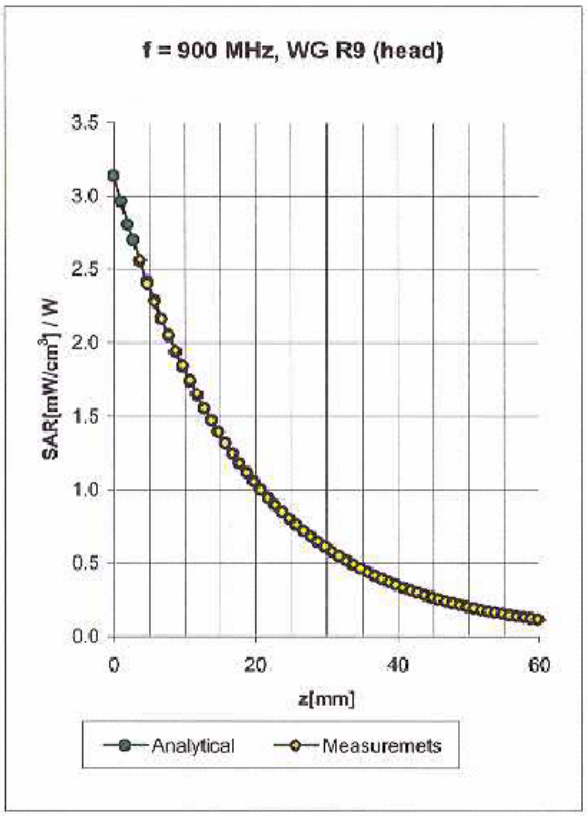
Head 1800 MHz **Typical SAR gradient: 10 % per mm**

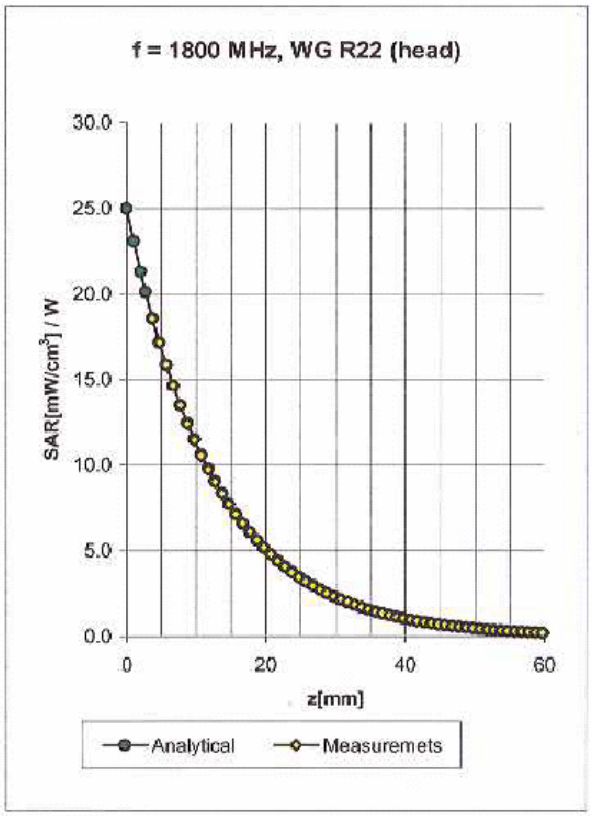
Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	14.7	9.5
SAR_{be} [%]	With Correction Algorithm	0.1	0.0

Sensor Offset

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

Conversion Factor Assessment





Head 900 MHz ε_r = 41.5 ± 5% σ = 0.97 ± 5% mho/m

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

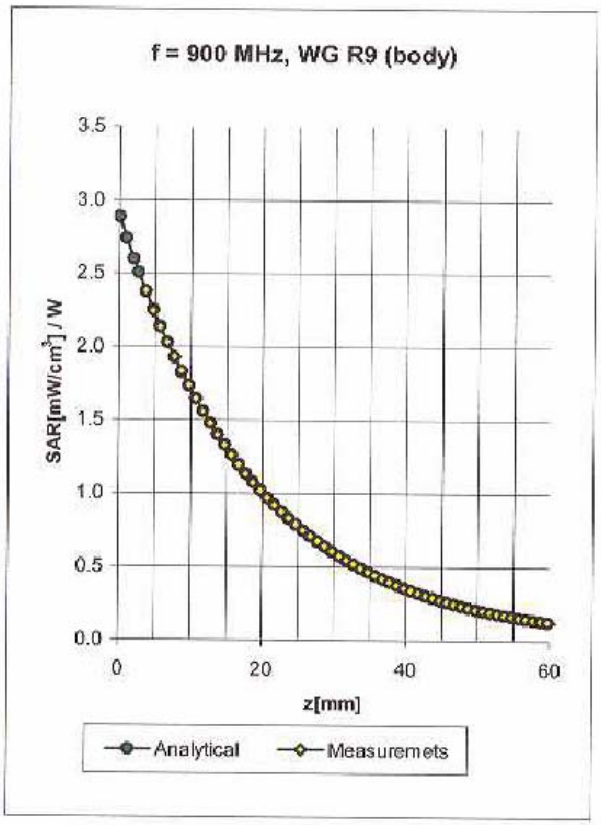
ConvF X	6.6 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.6 ± 9.5% (k=2)	Alpha	**0.45**
ConvF Z	6.6 ± 9.5% (k=2)	Depth	**2.42**

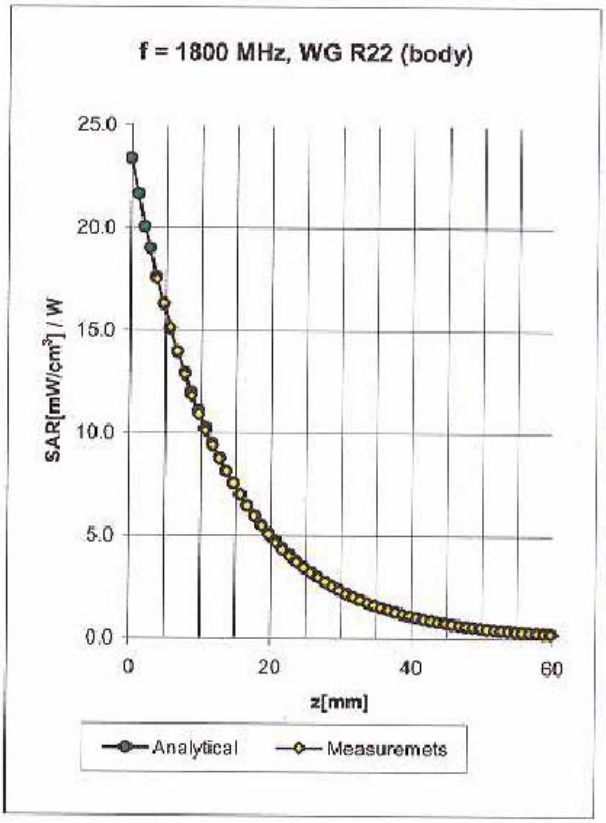
Head 1800 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

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

ConvF X	5.4 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.4 ± 9.5% (k=2)	Alpha	**0.55**
ConvF Z	5.4 ± 9.5% (k=2)	Depth	**2.56**

Conversion Factor Assessment





Body 900 MHz ε_r = 55.0 ± 5% σ = 1.05 ± 5% mho/m

Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

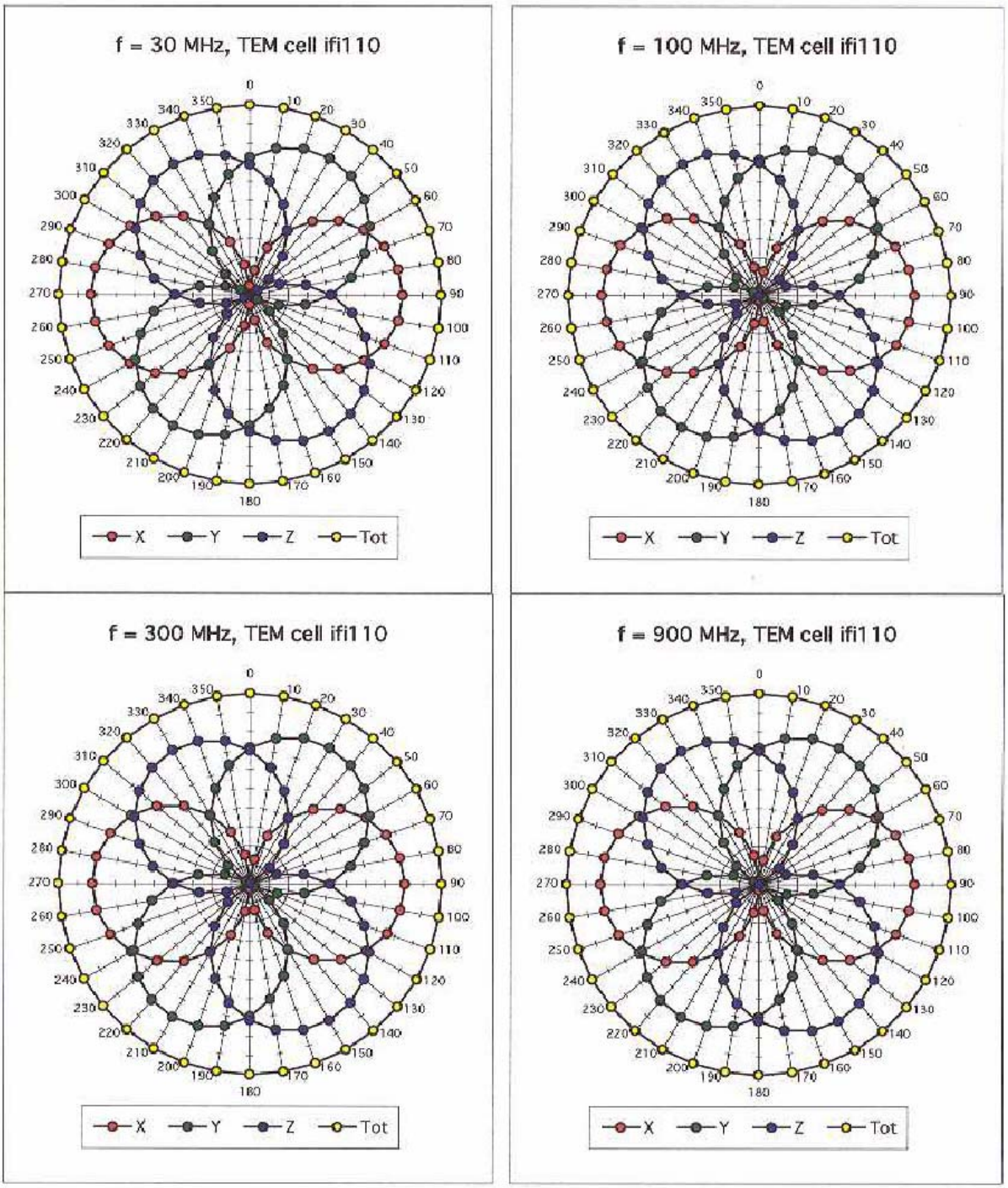
ConvF X	6.5 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.5 ± 9.5% (k=2)	Alpha	**0.44**
ConvF Z	6.5 ± 9.5% (k=2)	Depth	**2.51**

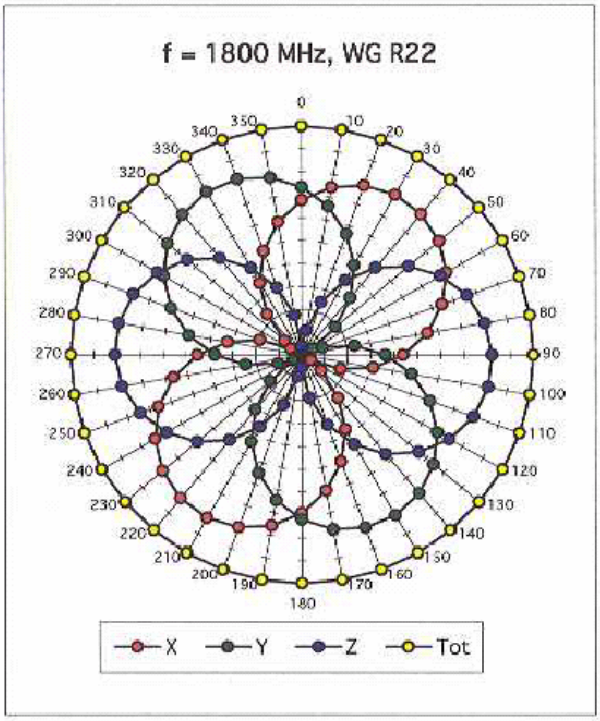
Body 1800 MHz ε_r = 53.3 ± 5% σ = 1.52 ± 5% mho/m

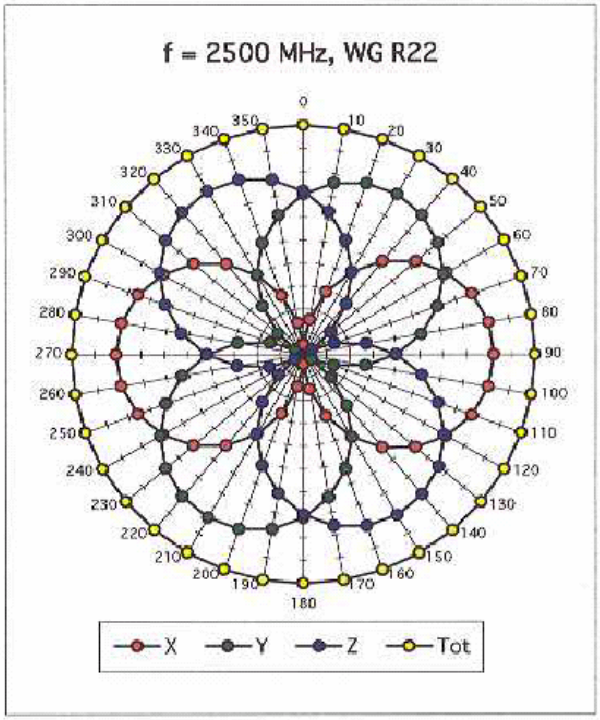
Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	5.0 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.0 ± 9.5% (k=2)	Alpha	**0.64**
ConvF Z	5.0 ± 9.5% (k=2)	Depth	**2.49**

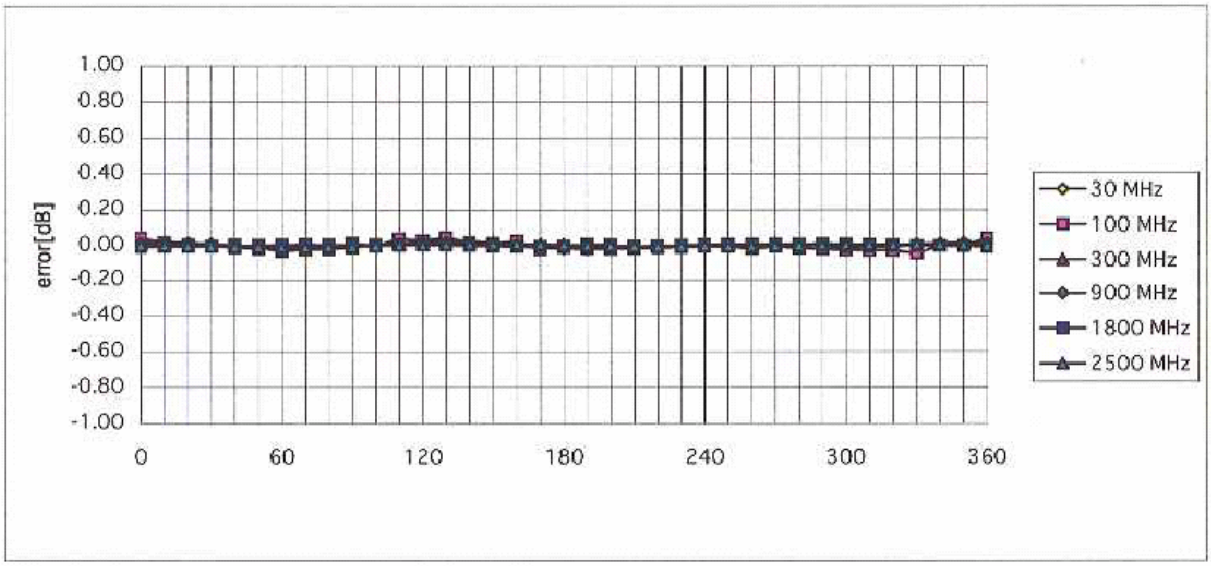
Receiving Pattern (ϕ), θ = 0°





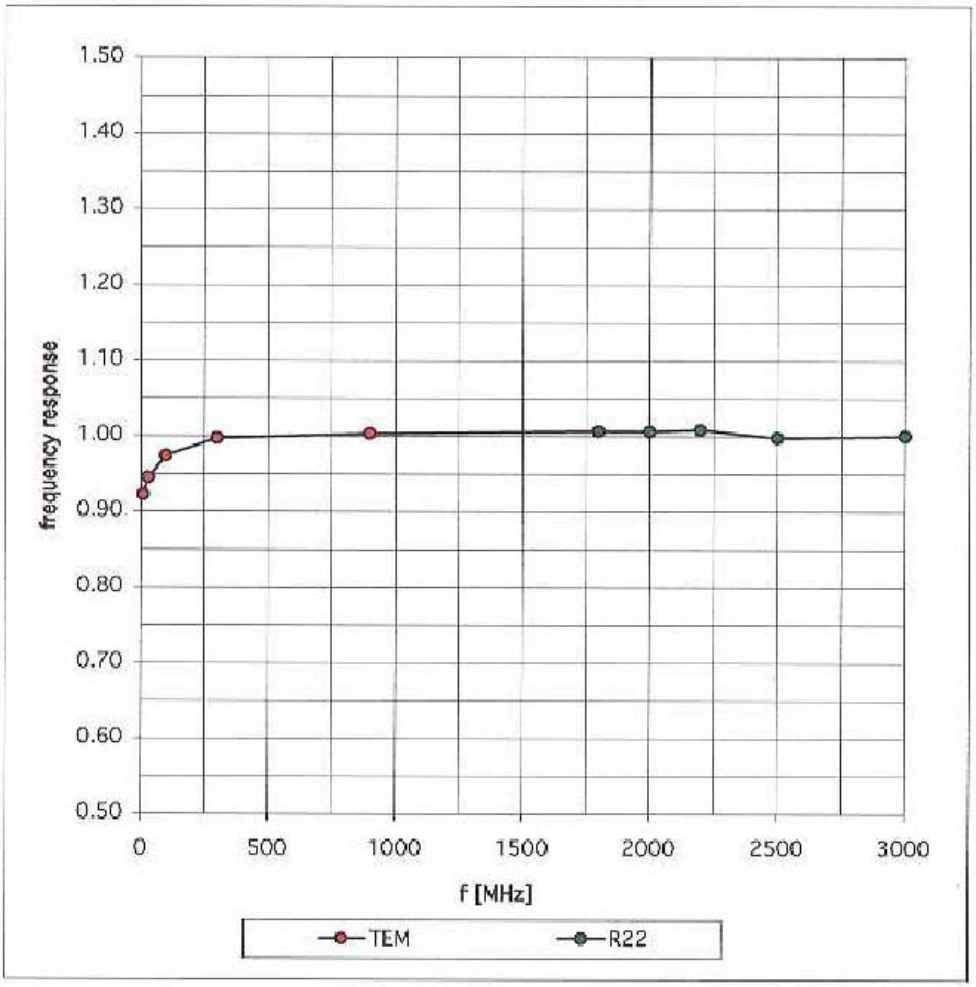


Isotropy Error (ϕ), θ = 0°



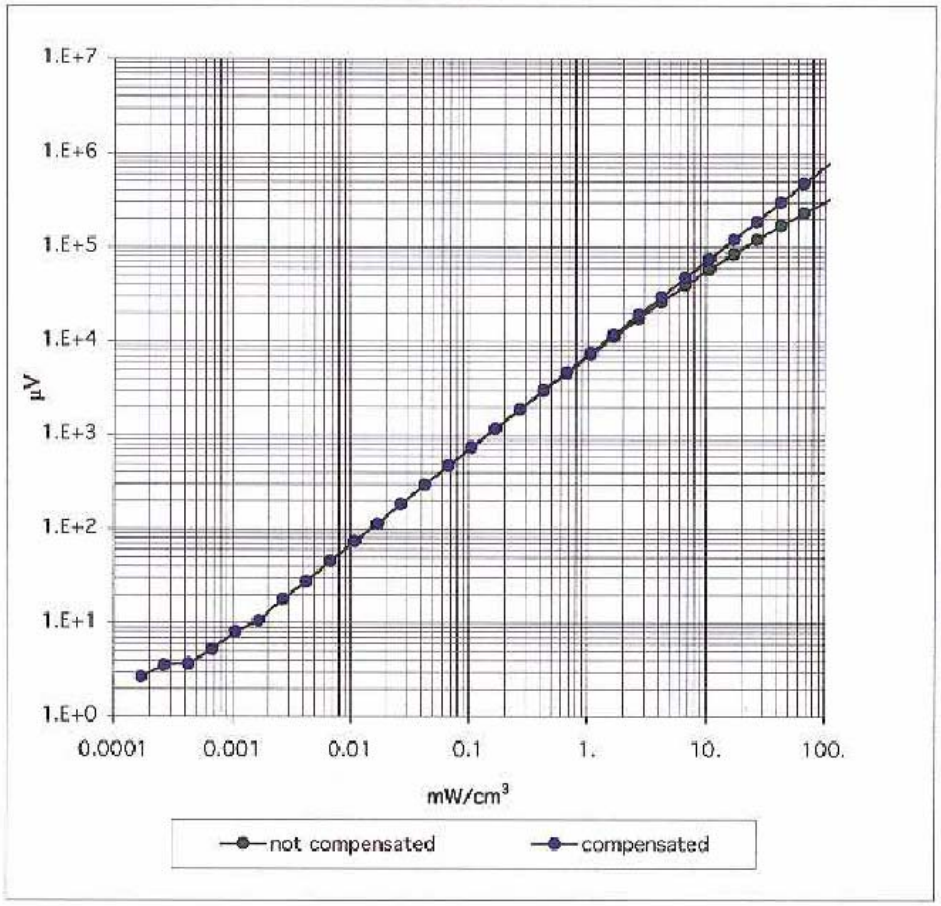
Frequency Response of E-Field

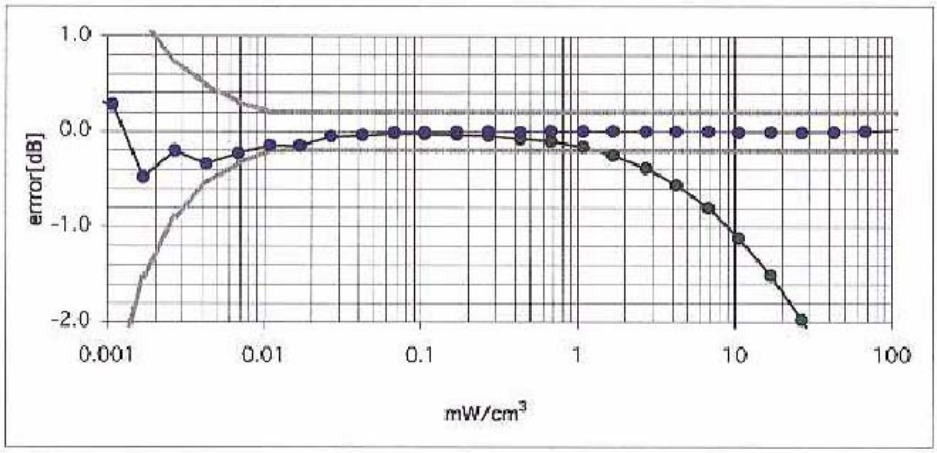
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR_{brain})

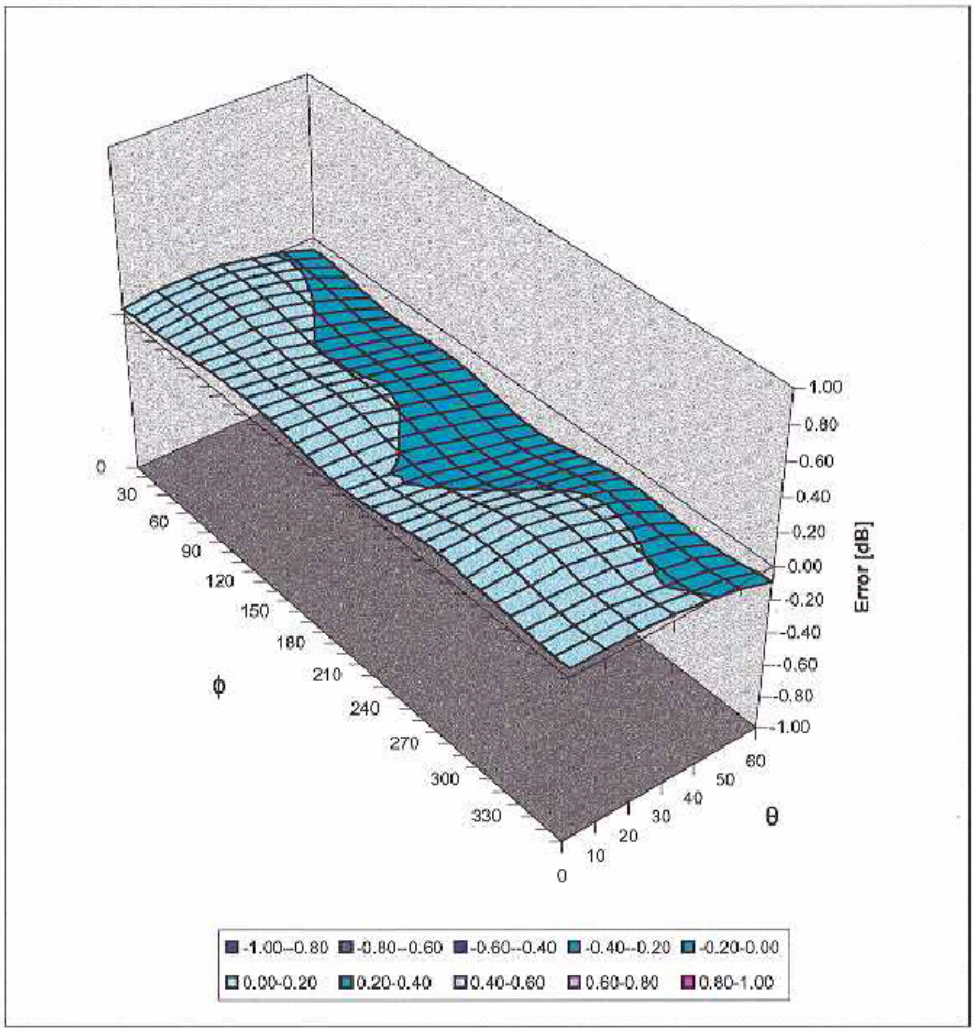
(Waveguide R22)





Deviation from Isotropy in HSL

Error (θ,φ), f = 900 MHz



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

Client **Motorola CGISS**

CALIBRATION CERTIFICATE

Object(s)	EX3DV3 - SN:3512
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	January 23, 2004
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

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 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator R&S SMT06	100058	23-May-01 (SPEAG, in house check May-03)	In house check: May-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: January 26, 2004

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.

DASY - Parameters of Probe: EX3DV3 SN:3512

Sensitivity in Free Space

Diode Compression[A]

NormX	0.62 $\mu V/(V/m)^2$	DCP X	98	mV
NormY	0.61 $\mu V/(V/m)^2$	DCP Y	98	mV
NormZ	0.70 $\mu V/(V/m)^2$	DCP Z	98	mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Plese see Page 7.

Boundary Effect

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

Sensor Cener to Phantom Surface Distance		2.0 mm	3.0 mm
SAR_{be} [%]	Without Correction Algorithm	2.5	0.6
SAR_{be} [%]	With Correction Algorithm	0.9	0.4

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

Sensor to Surface Distance		2.0 mm	3.0 mm
SAR_{be} [%]	Without Correction Algorithm	4.9	3.1
SAR_{be} [%]	With Correction Algorithm	1.3	0.8

Sensor Offset

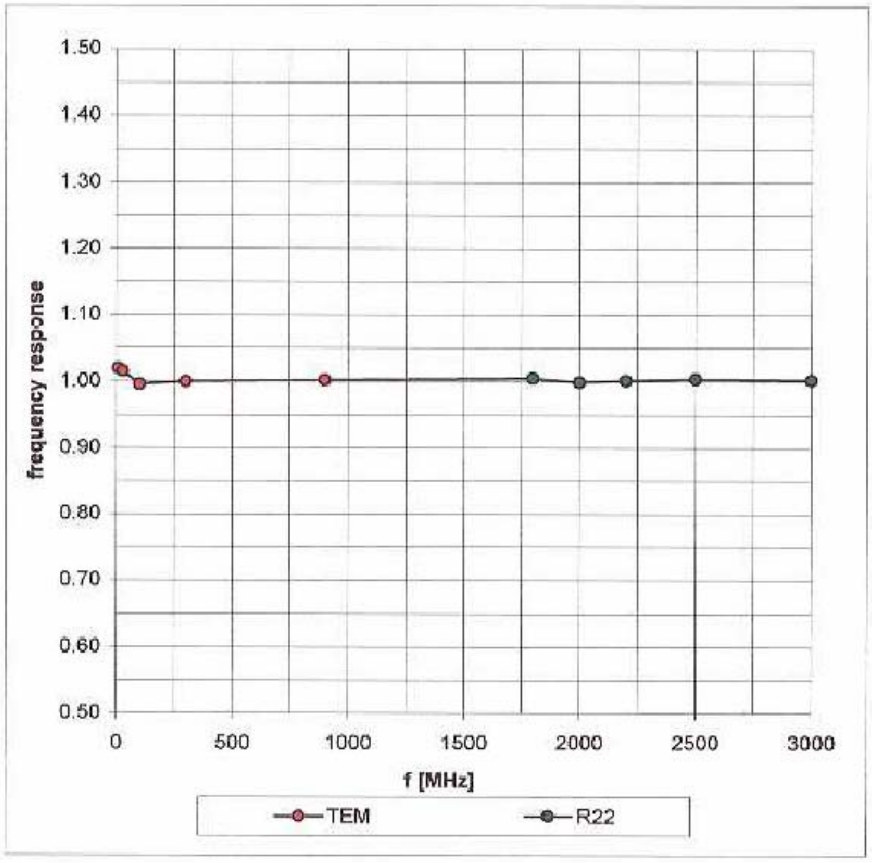
Probe Tip to Sensor Center	1.0	mm

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

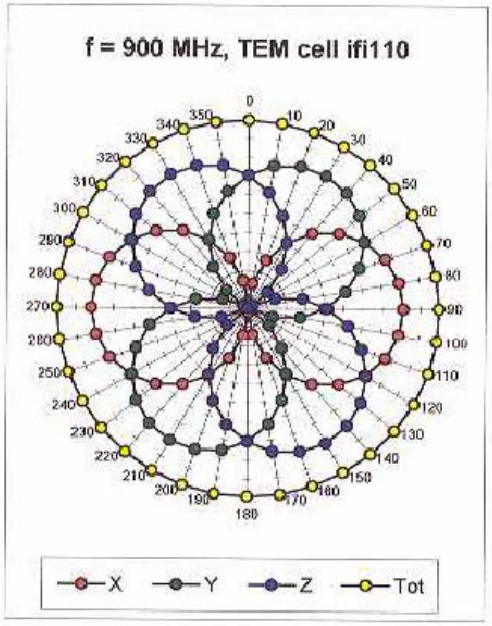
[A] numerical linearization parameter: uncertainty not required

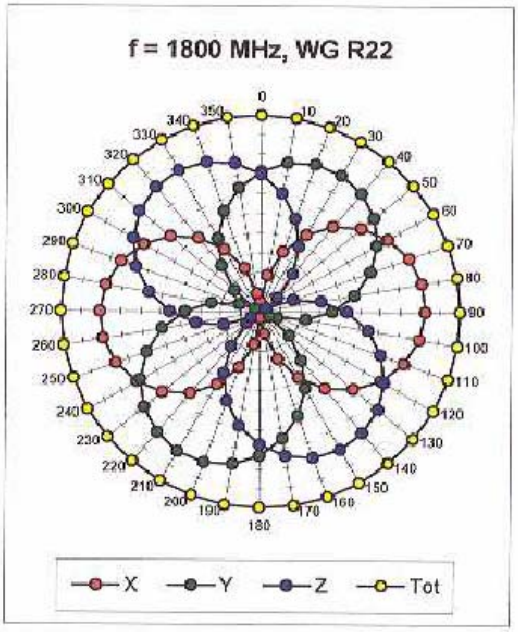
Frequency Response of E-Field

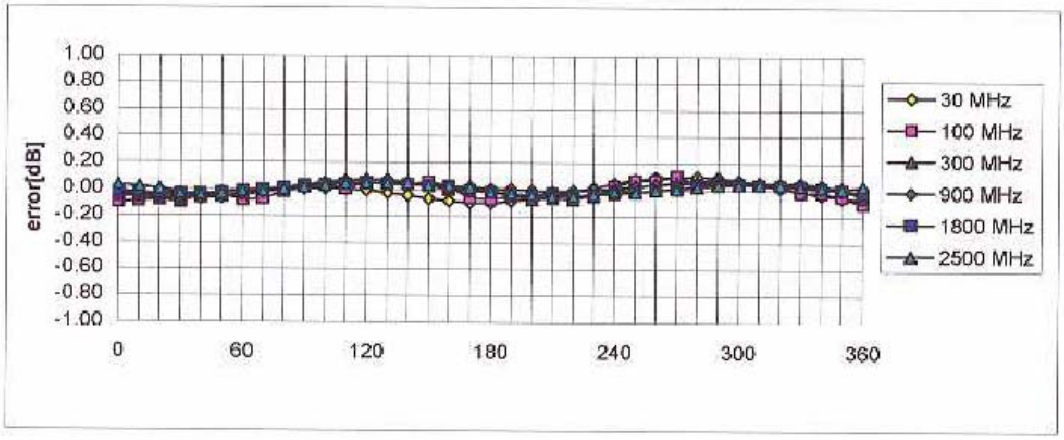
(TEM-Cell:ifi110, Waveguide R22)



Receiving Pattern (ϕ) , θ = 0°



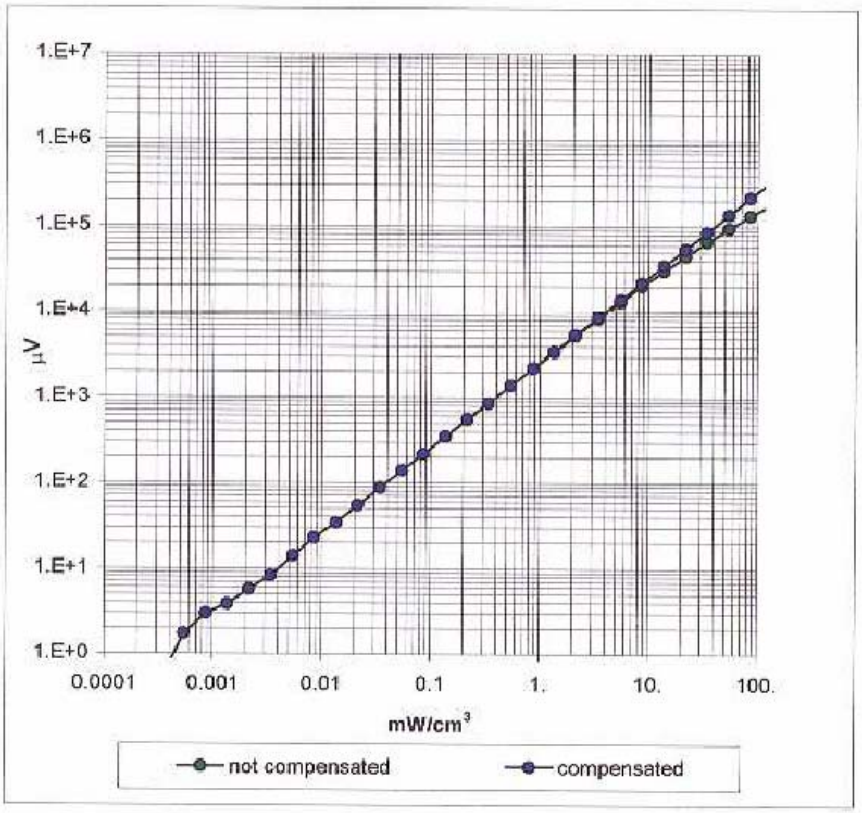


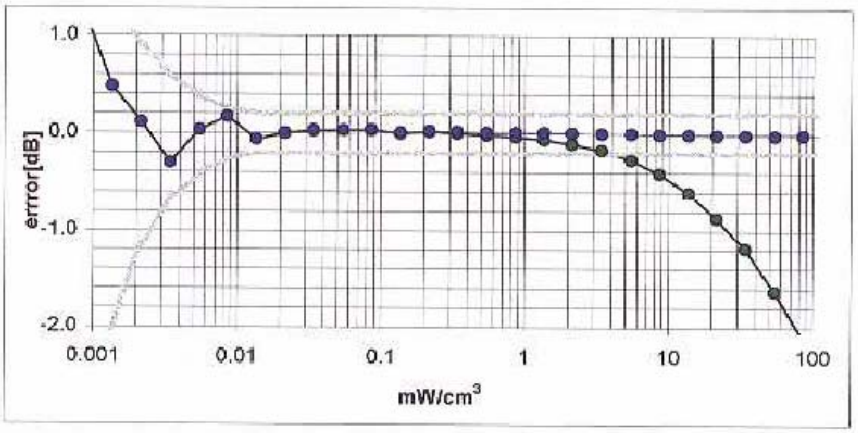


Axial Isotropy Error < ± 0.2 dB

Dynamic Range f(SAR_{head})

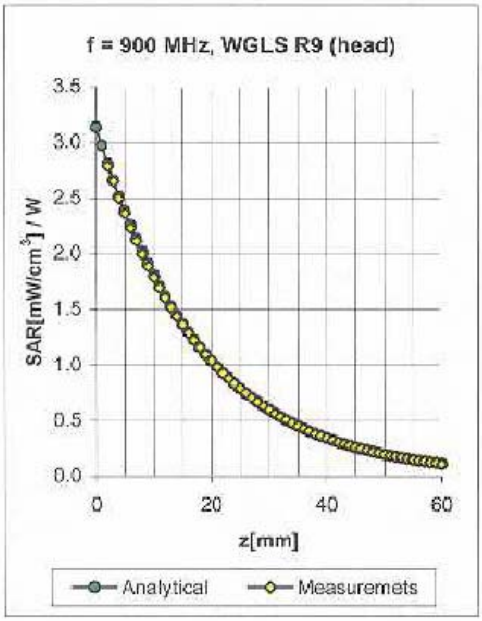
(Waveguide R22)

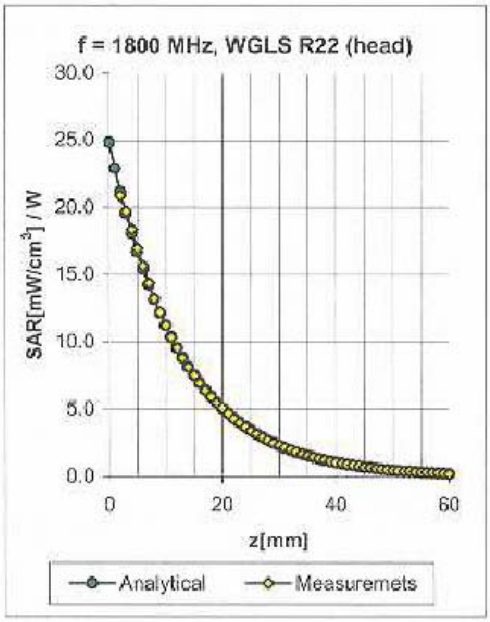




Probe Linearity < ± 0.2 dB

Conversion Factor Assessment



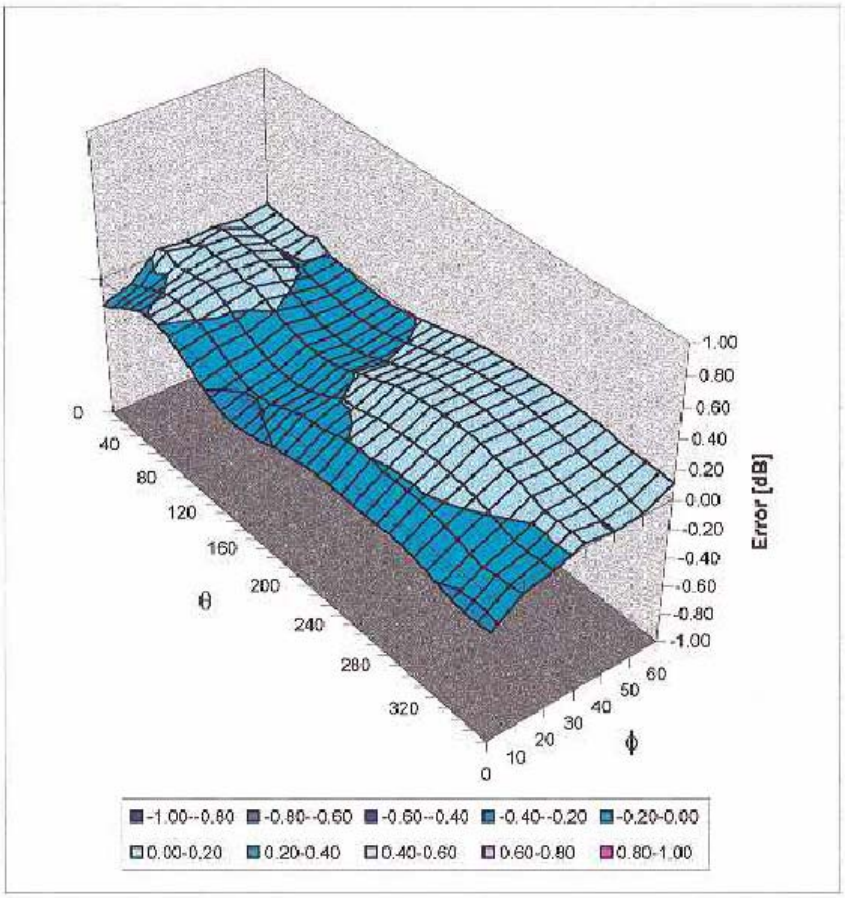


f [MHz]	Validity [MHz][B]	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	800-1000	Head	41.5 ± 5%	0.97 ± 5%	0.40	0.80	10.02 ± 9.5% (k=2)
1800	1710-1910	Head	40.0 ± 5%	1.40 ± 5%	0.40	1.05	8.60 ± 9.5% (k=2)
5200	4940-5460	Head	36.0 ± 5%	4.66 ± 5%	0.42	1.80	5.02 ± 21.8% (k=2)
5800	5510-6090	Head	35.3 ± 5%	5.27 ± 5%	0.42	1.80	4.54 ± 23.4% (k=2)
5200	4940-5460	Body	49.0 ± 5%	5.30 ± 5%	0.45	1.90	4.25 ± 21.8% (k=2)
5800	5510-6090	Body	48.2 ± 5%	6.00 ± 5%	0.40	1.90	4.02 ± 23.4% (k=2)

[B] The stated uncertainty of calibration is assessed according to IP1528.

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



Spherical Isotropy Error < ± 0.4 dB