



MOTOROLA

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CGISS EME Test Laboratory

8000 West Sunrise Blvd
Fort Lauderdale, FL 33322

S.A.R. EME Compliance Test Report

Part 2 of 2

Date of Report: June 9, 2004
Report Revision: Rev. O
Manufacturer: Motorola
Product Description: MOC4600i 458-470MHz, 0.25/0.50/0.75 Watts,
Service prompter (call box)
FCC ID: AZ489FT4868
Device Model: RLE1062A

Test Period: 05/28/04 – 06/01/04
EME Tech: Kim Uong (Lead EME Engineer)
EME Eng.: Kim Uong (Lead EME Engineer)
Author: Kim Uong (Lead EME Engineer)

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 all applicable national and international reference standards and guidelines.

Signature on file

6/9/04

[Ken Enger]

Date Approved

[Senior Resource Manager, Product Safety and EME Director, Phone: 954-723-6299]

Note: Consistent with the ISO/IEC 17025 recommendation this report shall not be reproduced in part without written approval from an officially designated representative of the Motorola EME Laboratory.

APPENDIX A

Power Slump Data/Shortened Scan

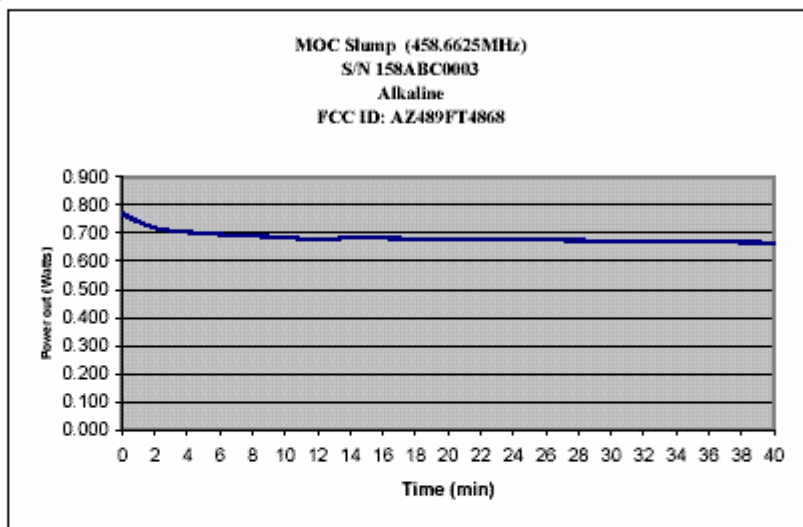
DUT Power versus time data

S/N: 158ABC0003

Channel Frequency(57): 458.6625 MHz

Power
Time (min) Output(W)

0	0.769
2	0.719
4	0.705
6	0.697
8	0.690
10	0.685
12	0.678
14	0.684
16	0.682
18	0.681
20	0.681
22	0.679
24	0.678
26	0.676
28	0.675
30	0.673
32	0.671
34	0.671
36	0.670
38	0.668
40	0.667



Shortened Scan of Highest S.A.R. Configuration

FCC ID:AZ489FT4868; Test Date: 06/01/04

Motorola CGISS EME Laboratory

Run #: KU-R2-040601-09

Model #: RLE1062A

TX Freq: 458.6625MHz

Sim Tissue Temp: 20.3 C

Antenna: Fixed

Battery Kit: C-Alkaline batteries

Carry: None

Audio Acc.: None

Shortened scan reflect highest S.A.R. producing configuration; Run time 7minutes.

Representative “normal” scan run time was 23 minutes

“Shortened” scan max calculated S.A.R. using end power:

1-g Avg. = 1.07 mW/g; 10-g Avg. = 0.74 mW/g

“Normal” scan max calculated S.A.R. using end power:

1-g Avg. = 1.15 mW/g; 10-g Avg. = 0.80 mW/g (see section 7.1 run # KU-R2-040601-05)

DUT front against the phantom

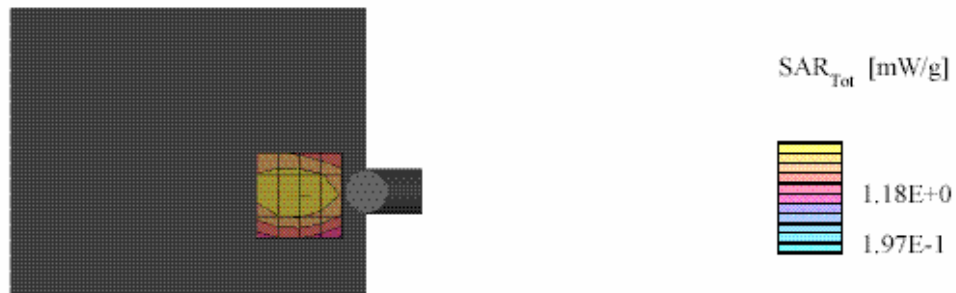
Flat (2) Phantom; Device 2 Section;

Probe: ET3DV6R - SN1545 Probe cal date: 28/08/03; ConvF(7.00,7.00,7.00); Crest factor:1.0;

FCC Body 464: $\sigma = 0.95$ mho/m $\epsilon_r = 54.3$ $\rho = 1.00$ g/cm³; DAE3V1SN406 Cal Date: (11/20/03)

Cube 5x5x7: SAR (1g): 1.35 mW/g, SAR (10g): 0.935 mW/g, (Worst-case extrapolation)

Power drift: -0.34 dB



APPENDIX B

Data Results

FCC ID:AZ489FT4868; Test Date: 06/01/04

Motorola CGISS EME Laboratory

Run #: KU-R2-040601-05

Model #: RLE1062A

TX Freq: 458.6625 MHz

Sim Tissue Temp: 20.2 C

Antenna: Fixed

Battery Kit: C-Alkaline batteries

Carry: None

Audio Acc.: None

DUT front against the phantom

Flat (2) Phantom; Device 2 Section;

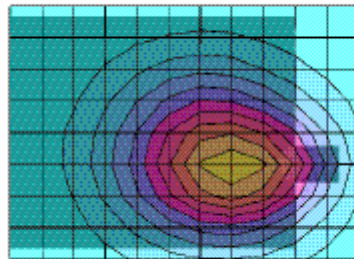
Probe: ET3DV6R - SN1545 Probe cal date: 28/08/03; ConvF(7.00,7.00,7.00); Crest factor:1.0;

FCC Body 464: $\sigma = 0.95$ mho/m $\epsilon_r = 54.3$ $\rho = 1.00$ g/cm³; DAE3V1SN406 Cal Date: (11/20/03)

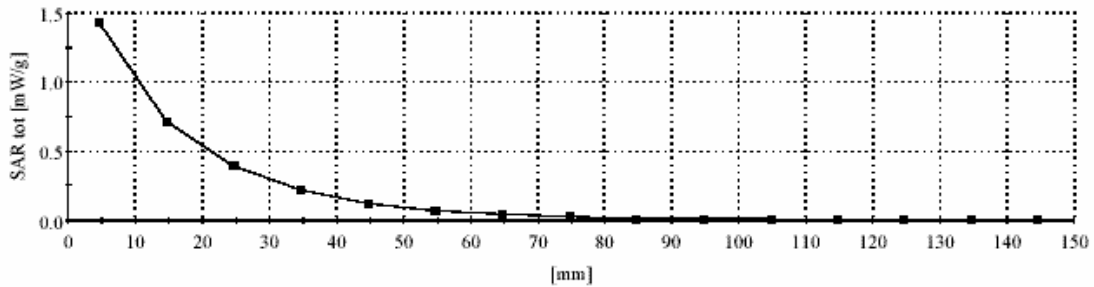
Cube 5x5x7: SAR (1g): 1.43 mW/g, SAR (10g): 0.990 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 76.5, 106.5, 4.7

Power drift: -0.42 dB



SAR_{Tot} [mW/g]



APPENDIX C

Dipole System Performance Check Results

Dipole validations at the head from SPEAG are provided herein. The CGISS EME lab validated the dipole to the applicable IEEE system performance targets. Within the same day system validation was performed using FCC body tissue parameters to generate the system performance target values for body at the applicable frequency. The results of the CGISS EME system performance validation are provided in this appendix.

SPEAG Dipole D450 V2 SN 1002; Test Date: 05/28/04

Motorola CGISS EME Lab

Run #: Sys Perf-R2-040528-01

TX Freq: 450 MHz

Sim Tissue Temp: 19.9C

Start Power: 250mW

Target at 1W is 4.71mW/g (including drift) (1g)

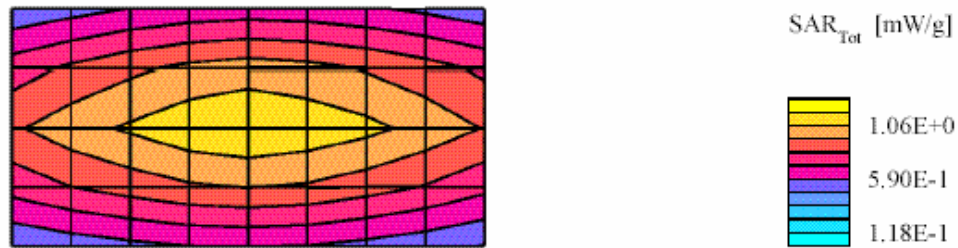
SAR calculated is 4.65 mW/g, Percent from target (including drift) for 1g is -1.2 %

Flat (2); Probe: ET3DV6R - SN1545(cal Date 28 Aug 2003); ConvF(7.00,7.00,7.00); Crest factor: 1.0;

FCC Body 450: $\sigma = 0.94$ mho/m $\epsilon_r = 54.0$ $\rho = 1.00$ g/cm³; DAE3V1SN406 Cal Date: (11/20/03)

Cubes (2): Peak: 1.77 mW/g ± 0.03 dB, SAR (1g): 1.15 mW/g ± 0.04 dB, SAR (10g): 0.763 mW/g ± 0.05 dB, (Worst-case extrapolation)Penetration depth: 12.8 (11.6, 14.4) [mm]

Power drift: -0.05 dB



SPEAG Dipole D450 V2 SN 1002; Test Date: 06/01/04

Motorola CGISS EME Lab

Run #: Sys Perf-R2-040601-01

TX Freq: 450 MHz

Sim Tissue Temp: 20.6C

Start Power: 250mW

Target at 1W is 4.71mW/g (including drift) (1g)

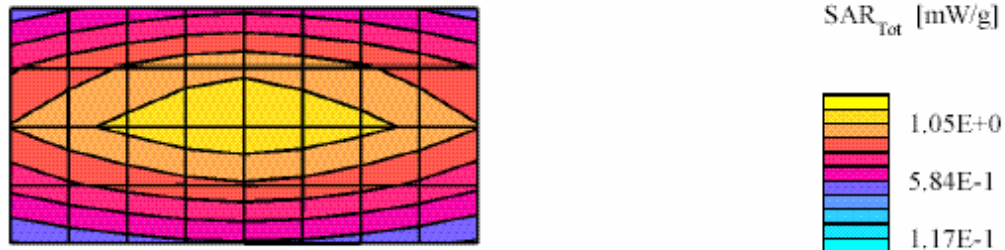
SAR calculated is 4.61 mW/g, Percent from target (including drift) for 1g is -2.11 %

Flat (2); Probe: ET3DV6R - SN1545(cal Date 28 Aug 2003); ConvF(7.00,7.00,7.00); Crest factor: 1.0;

FCC Body 450: $\sigma = 0.94$ mho/m $\epsilon_r = 54.4$ $\rho = 1.00$ g/cm³; DAE3V1SN406 Cal Date: (11/20/03)

Cubes (2): Peak: 1.79 mW/g ± 0.01 dB, SAR (1g): 1.15 mW/g ± 0.03 dB, SAR (10g): 0.760 mW/g ± 0.04 dB,(Worst-case extrapolation) Penetration depth: 12.6 (11.4, 14.1) [mm]

Power drift: -0.01 dB



SYSTEM VALIDATION

Date:	<u>4/14/2004</u>	Frequency (MHz):	<u>450</u>
Lab Location:	<u>CGISS</u>	Mixture Type:	<u>IEEE-Head</u>
Robot System:	<u>2</u>	Ambient Temp.(°C):	<u>23</u>
Probe Serial #:	<u>1545</u>	Tissue Temp.(°C):	<u>20.6</u>
DAE Serial #:	<u>374</u>		

Tissue Characteristics

Permittivity:	<u>44.3</u>	Phantom Type/SN:	<u>80302002C/S6</u>
Conductivity:	<u>0.86</u>	Distance (mm):	<u>15 (tissue/dipole crit)</u>

Reference Source:	<u>D450V2</u>	(Dipole)
Reference SN:	<u>1002</u>	

Power to Dipole:	<u>250</u>	mW
Power Output (radio):	<u>n/a</u>	mW

Target SAR Value:	<u>4.9</u>	mW/g,	<u>3.3</u>	mW/g (10g avg.)
(normalized to 1.0 W)				

Measured SAR Value:	<u>1.18</u>	mW/g,	<u>0.778</u>	mW/g (10g avg.)
Power Drift:	<u>-0.01</u>	dB		

Measured SAR Value:	<u>4.73</u>	mW/g,	<u>3.12</u>	mW/g (10g avg.)
(normalized to 1.0 W, including drift)				

Percent Difference From Target (MUST be within System Uncertainty):	<u>3.45 % (1g ave)</u>
	<u>5.48 % (10g ave)</u>

Test performed by:	<u>C. Miller</u>	Initial:	
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Dipole D450V2 SN1002; Test date:04/14/04

Run #: Sys Per/R2-040414-01

Phantom #: 80302002B/S6

Model #: D450V2 SN: 1002

Robot: CGISS-2

DAE3: SN: 374 (3/23/04)

Tester: C. Miller

TX Freq: 450 MHz

Sim Tissue Temp: 20.6 °C

Start Power: 250mW

SAR calculated 1g is 4.73 mW/g

SAR Calculated 10g is 3.12 mW/g

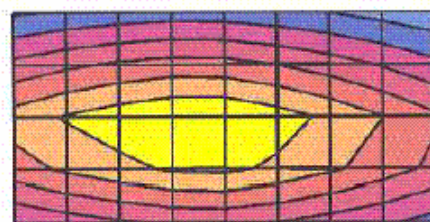
Flat (2): Probe: ET3DV6R - SN1545(cal Date 28 Aug 2003); ConvF(7.00,7.00,7.00); Crest factor: 1.0; IEEE

Head 450 MHz: $\sigma = 0.86 \text{ mho/m}$, $\epsilon = 44.3$ $\rho = 1.00 \text{ g/cm}^3$

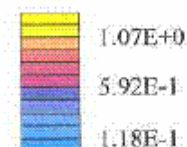
Cubes (2): Peak: $1.83 \text{ mW/g} \pm 0.08 \text{ dB}$, SAR (1g): $1.18 \text{ mW/g} \pm 0.07 \text{ dB}$, SAR (10g): $0.778 \text{ mW/g} \pm 0.07 \text{ dB}$, (Worst-case extrapolation)

Penetration depth: 12.6 (11.3, 14.4) [mm]

Powerdrift: -0.01 dB



SAR_{Tot} [mW/g]



Motorola CGISS EME Lab

SYSTEM PERFORMANCE CHECK TARGET SAR

Date:	4/14/2004	Frequency (MHz):	450
Lab Location:	CGISS	Mixture Type:	FCC Body
Robot System:	2	Ambient Temp. (°C):	23
Probe Serial #:	1545	Tissue Temp. (°C):	20.6
DAE Serial #:	374		

Tissue Characteristics			
Permittivity:	56.3	Phantom Type/SN:	80302002A/S8
Conductivity:	0.94	Distance (mm):	15 (tissue/dipole cnt)

Reference Source:	D450V2	(Dipole)
Reference SN:	1002	

Power to Dipole: 250 mW

Measured SAR Value:	1.17 mW/g.	0.773 mW/g (10g avg.)
Power Drift:	-0.03 dB	

New Target/Measured		
SAR Value:	4.71 mW/g.	3.11 mW/g (10g avg.)
(normalized to 1.0 W, including drift)		

Test performed by: C. Miller Initial: 

Dipole D450V2 SN1002; Test date:04/14/04

Run #: Sys Perf R2-040414-02

Phantom #: 80302002B/S6

Model #: D450V2 SN: 1002

Robot: CGISS-2

DAE3: SN: 374 (3/23/04)

Tester: C Miller

TX Freq: 450 MHz

Sim Tissue Temp: 20.6 °C

Start Power: 250mW

SAR calculated 1g is 4.71 mW/g

SAR Calculated 10g is 3.11 mW/g

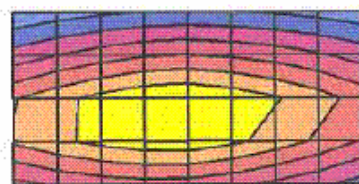
Flat (2); Probe: ET3DV6R - SN1545(cal Date 28 Aug 2003); ConvF(7.00,7.00,7.00); Crest factor: 1.0; FCC

Body 450; $\sigma = 0.94$ mho/m $\epsilon_r = 56.3$ $\rho = 1.00$ g/cm³

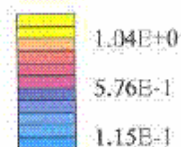
Cubes (2): Peak: 1.79 mW/g ± 0.09 dB, SAR (1g): 1.17 mW/g ± 0.08 dB, SAR (10g): 0.773 mW/g ± 0.07 dB, (Worst-case extrapolation)

Penetration depth: 13.0 (11.5, 14.8) [mm]

Powerdrift: -0.03 dB



SAR_{tot} [mW/g]



Motorola CGISS EME Lab

APPENDIX D
Calibration Certificates

Client **Motorola CGISS**

CALIBRATION CERTIFICATE

Object(s) **ET3DV6R - SN:1545**

Calibration procedure(s) **QA CAL-01.v2
Calibration procedure for dosimetric E-field probes**

Calibration date: **August 28, 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	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01 (ELCAL, No.2360)	Sep-03

Calibrated by: **Nico Vetterli** **Technician** 

Approved by: **Katja Pokovic** **Laboratory Director** 

Date issued: August 28, 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 ET3DV6R

SN:1545

Manufactured:	October 16, 2000
Last calibration:	May 21, 2002
Recalibrated:	August 28, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6R SN:1545**Sensitivity in Free Space****Diode Compression**

NormX	2.06 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	95	mV
NormY	2.14 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	95	mV
NormZ	1.81 $\mu\text{V}/(\text{V}/\text{m})^2$	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, P1 528-200X

ConvF X	6.1 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.1 $\pm 9.5\%$ (k=2)	Alpha	0.35
ConvF Z	6.1 $\pm 9.5\%$ (k=2)	Depth	2.84

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, P1 528-200X

ConvF X	4.9 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	4.9 $\pm 9.5\%$ (k=2)	Alpha	0.50
ConvF Z	4.9 $\pm 9.5\%$ (k=2)	Depth	2.63

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

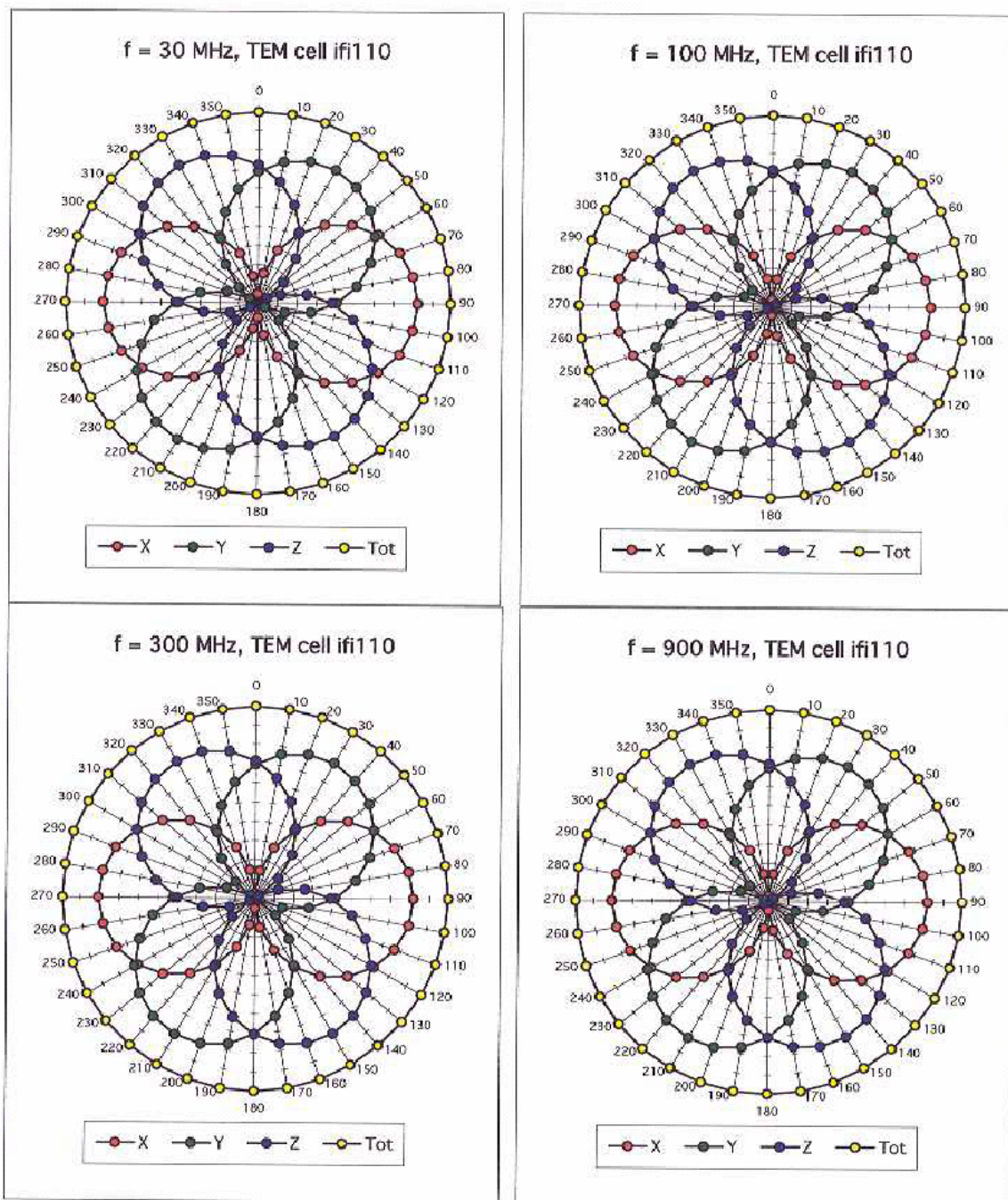
Probe Tip to Boundary		1 mm	2 mm
SAR _{be} [%]	Without Correction Algorithm	11.1	6.5
SAR _{be} [%]	With Correction Algorithm	0.5	0.6

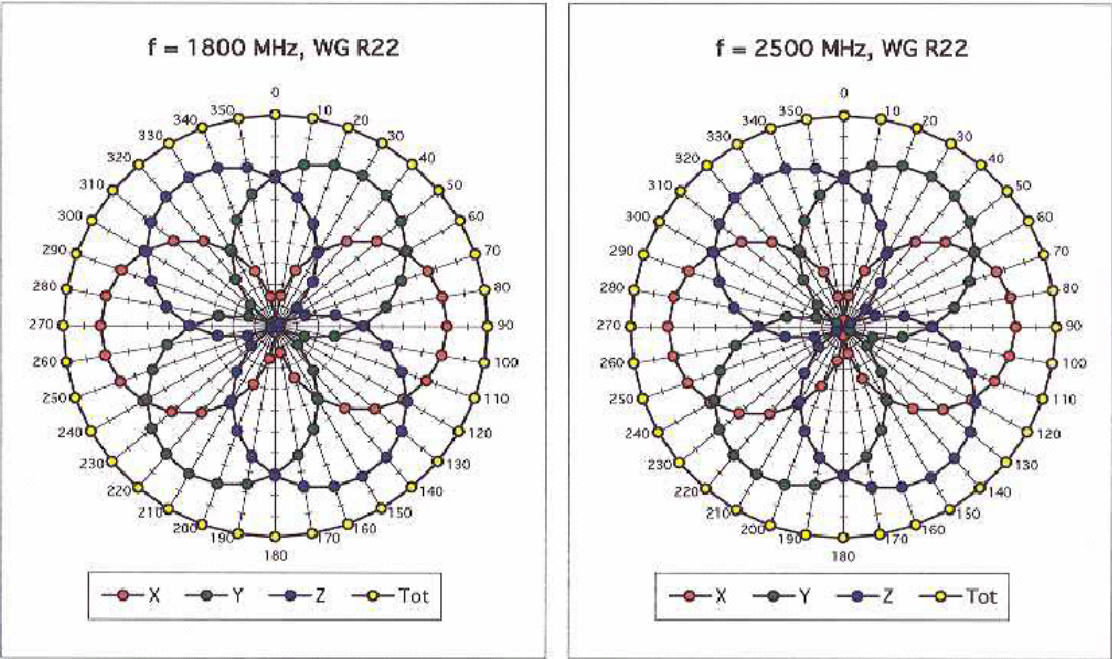
Head 1800 MHz Typical SAR gradient: 10 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR _{be} [%]	Without Correction Algorithm	13.8	9.3
SAR _{be} [%]	With Correction Algorithm	0.2	0.1

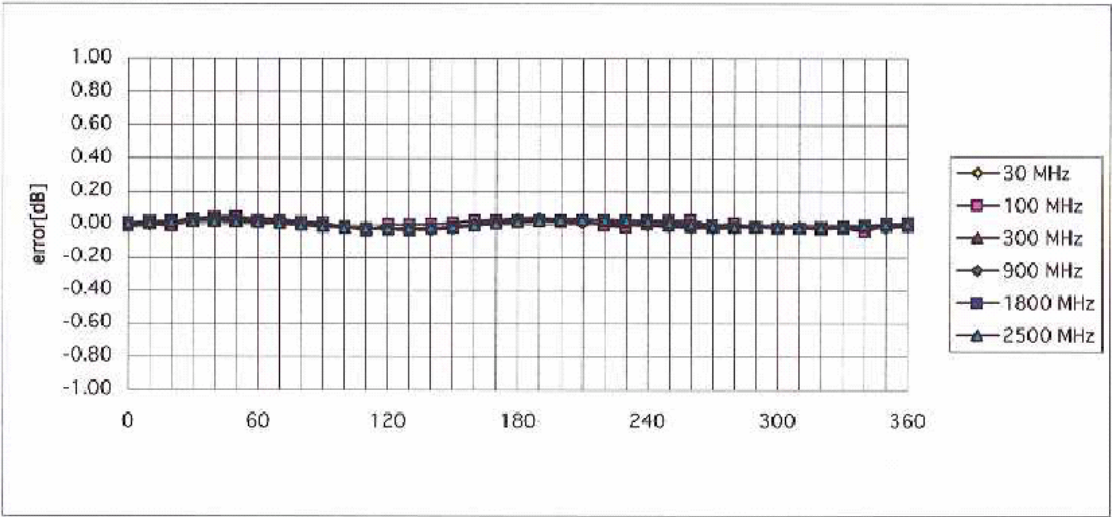
Sensor Offset

Probe Tip to Sensor Center **2.7** mm

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

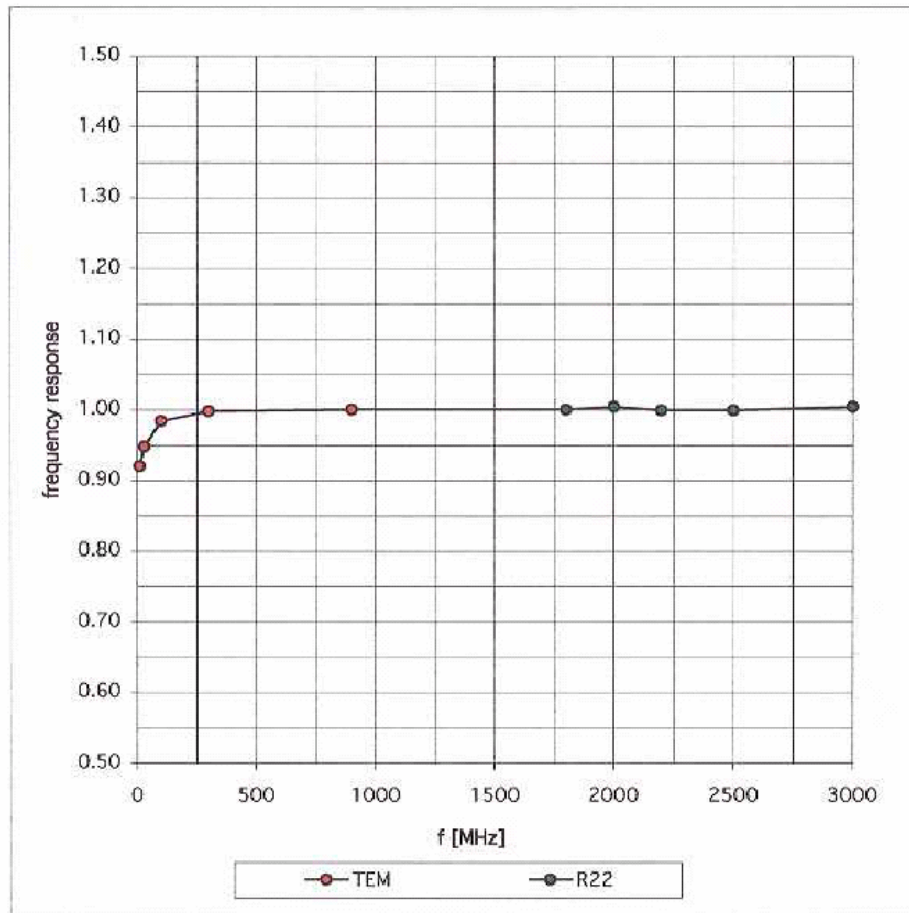


Isotropy Error (ϕ), $\theta = 0^\circ$

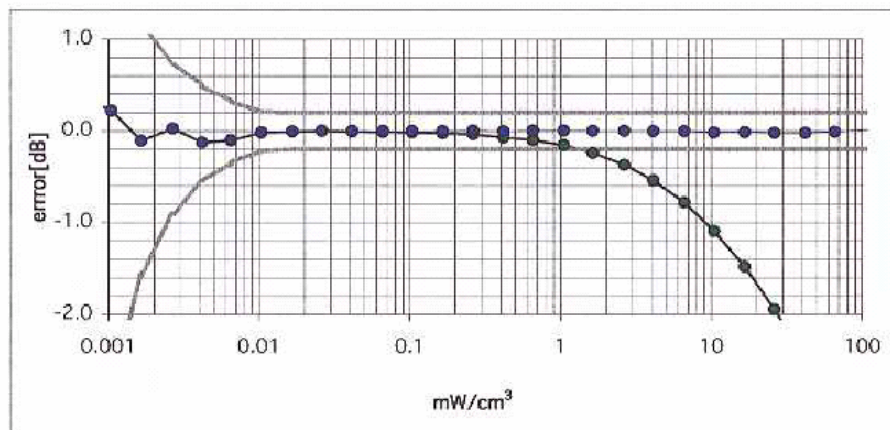
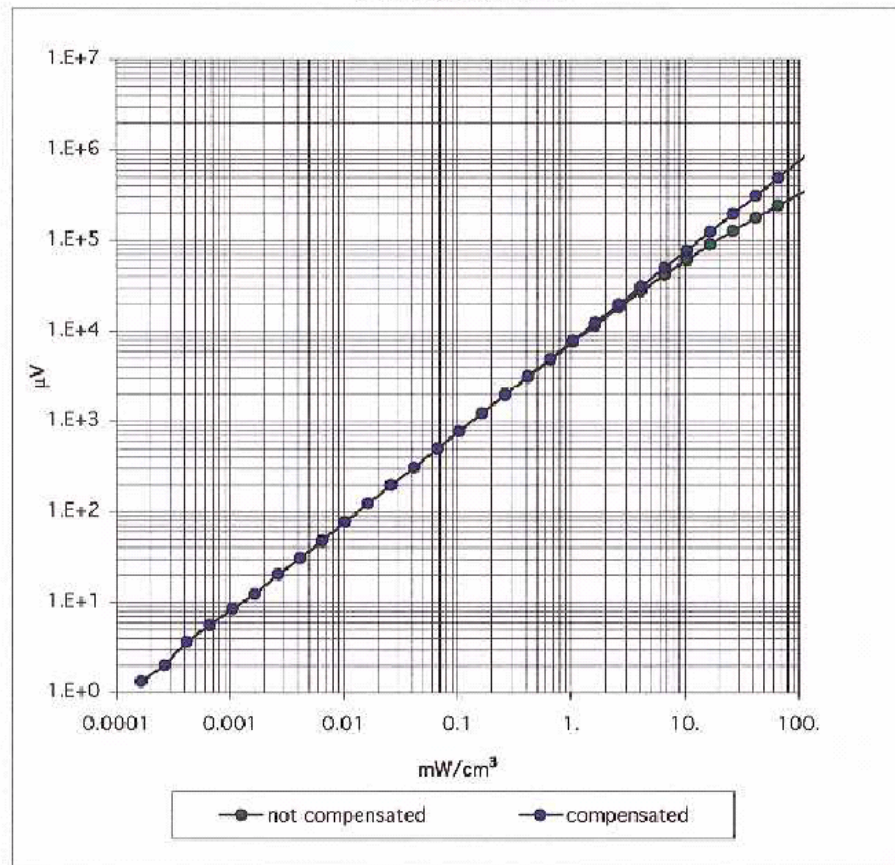


Frequency Response of E-Field

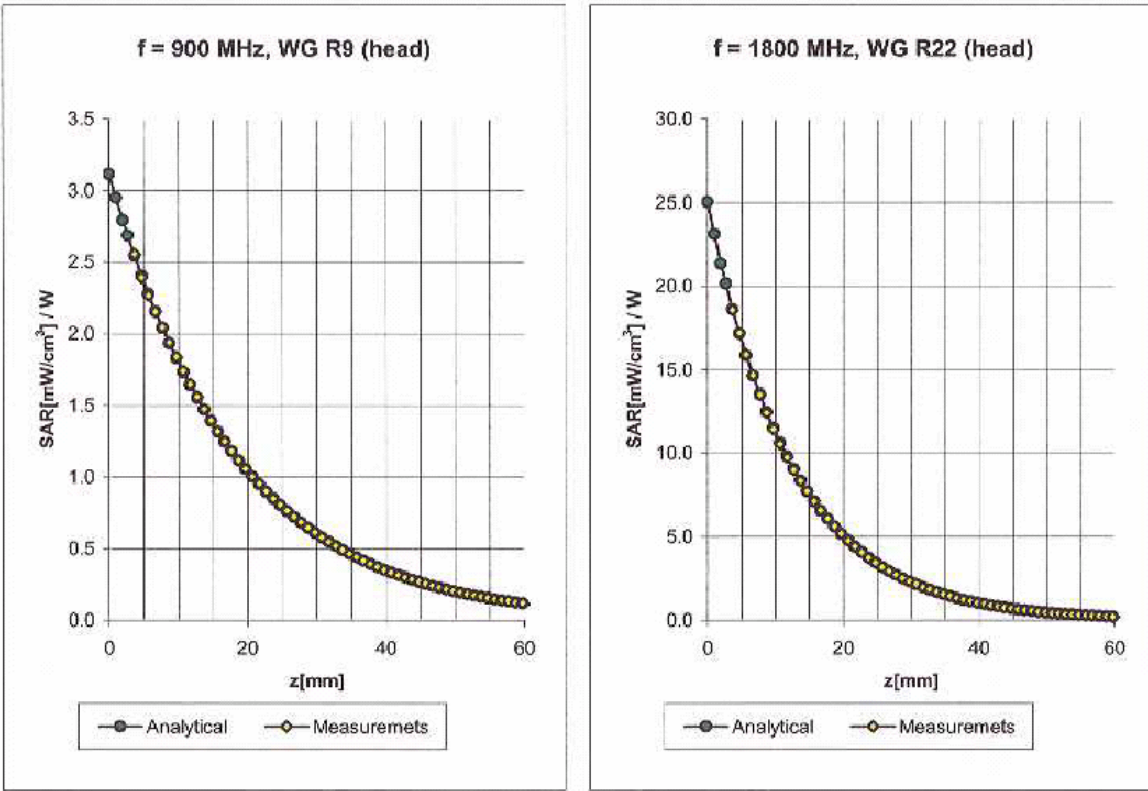
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SARhead) (Waveguide R22)



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

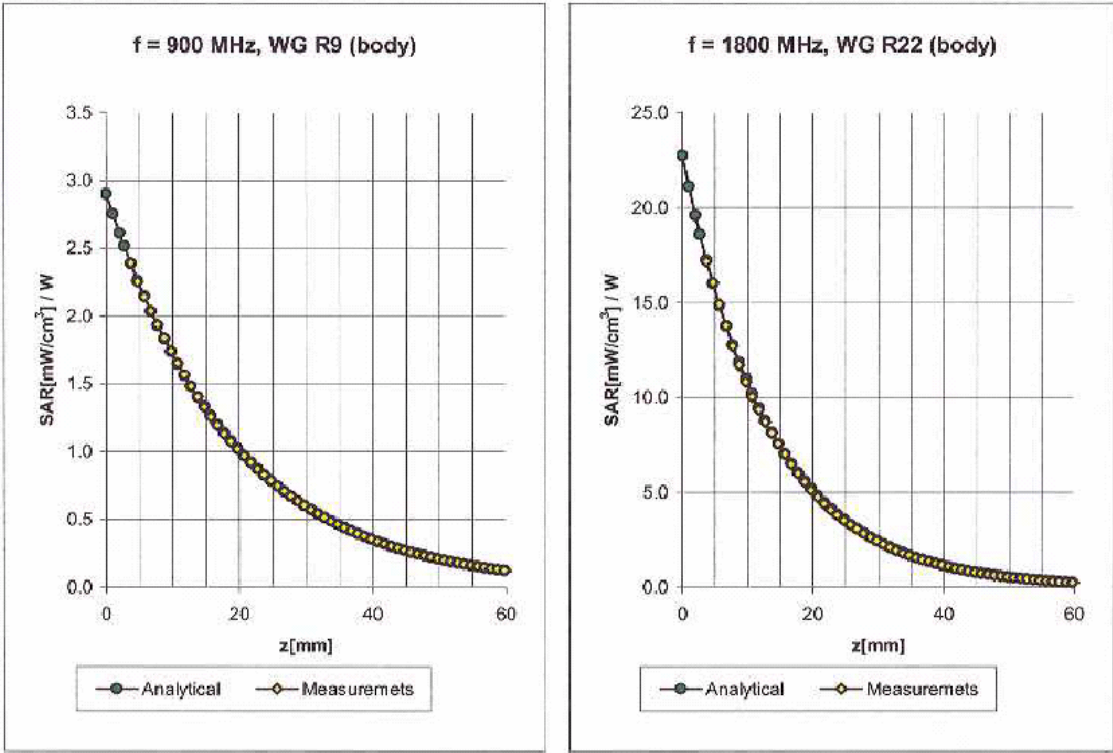
ConvF X	6.1 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.1 $\pm 9.5\%$ (k=2)	Alpha	0.35
ConvF Z	6.1 $\pm 9.5\%$ (k=2)	Depth	2.84

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	4.9 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	4.9 $\pm 9.5\%$ (k=2)	Alpha	0.50
ConvF Z	4.9 $\pm 9.5\%$ (k=2)	Depth	2.63

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

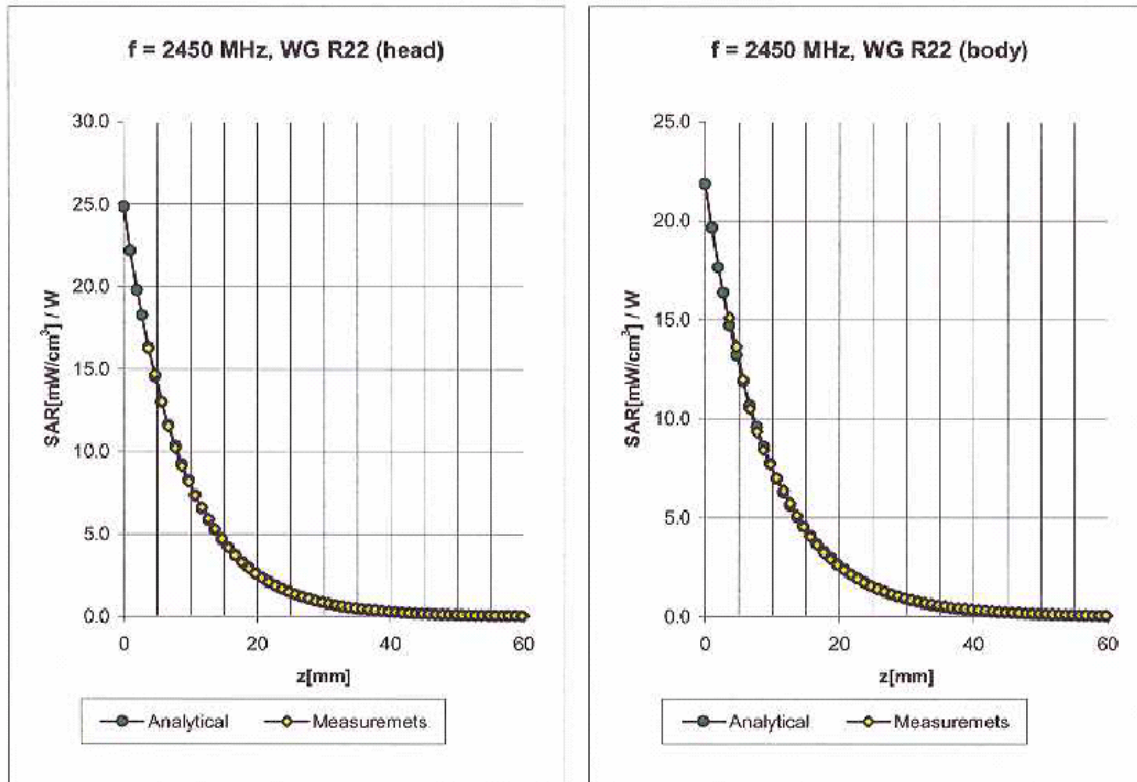
ConvF X	5.9 $\pm$ 9.5% (k=2)	Boundary effect:	
ConvF Y	5.9 $\pm$ 9.5% (k=2)	Alpha	0.42
ConvF Z	5.9 $\pm$ 9.5% (k=2)	Depth	2.54

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	4.6 $\pm$ 9.5% (k=2)	Boundary effect:	
ConvF Y	4.6 $\pm$ 9.5% (k=2)	Alpha	0.57
ConvF Z	4.6 $\pm$ 9.5% (k=2)	Depth	2.65

Conversion Factor Assessment



Head 2450 MHz $\epsilon_r = 39.2 \pm 5\%$ $\sigma = 1.80 \pm 5\%$ mho/m

Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

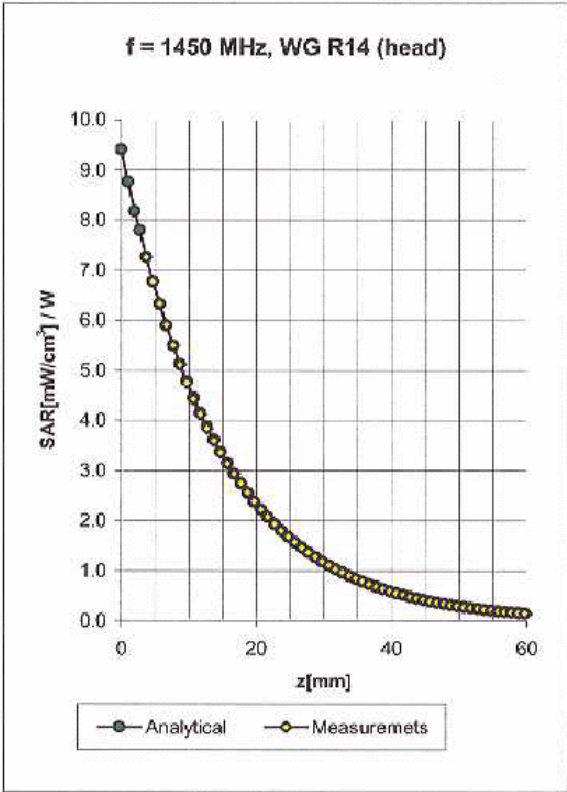
ConvF X	4.5 $\pm 8.9\%$ (k=2)	Boundary effect:	
ConvF Y	4.5 $\pm 8.9\%$ (k=2)	Alpha	1.11
ConvF Z	4.5 $\pm 8.9\%$ (k=2)	Depth	1.76

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

Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	4.2 $\pm 8.9\%$ (k=2)	Boundary effect:	
ConvF Y	4.2 $\pm 8.9\%$ (k=2)	Alpha	1.41
ConvF Z	4.2 $\pm 8.9\%$ (k=2)	Depth	1.45

Conversion Factor Assessment



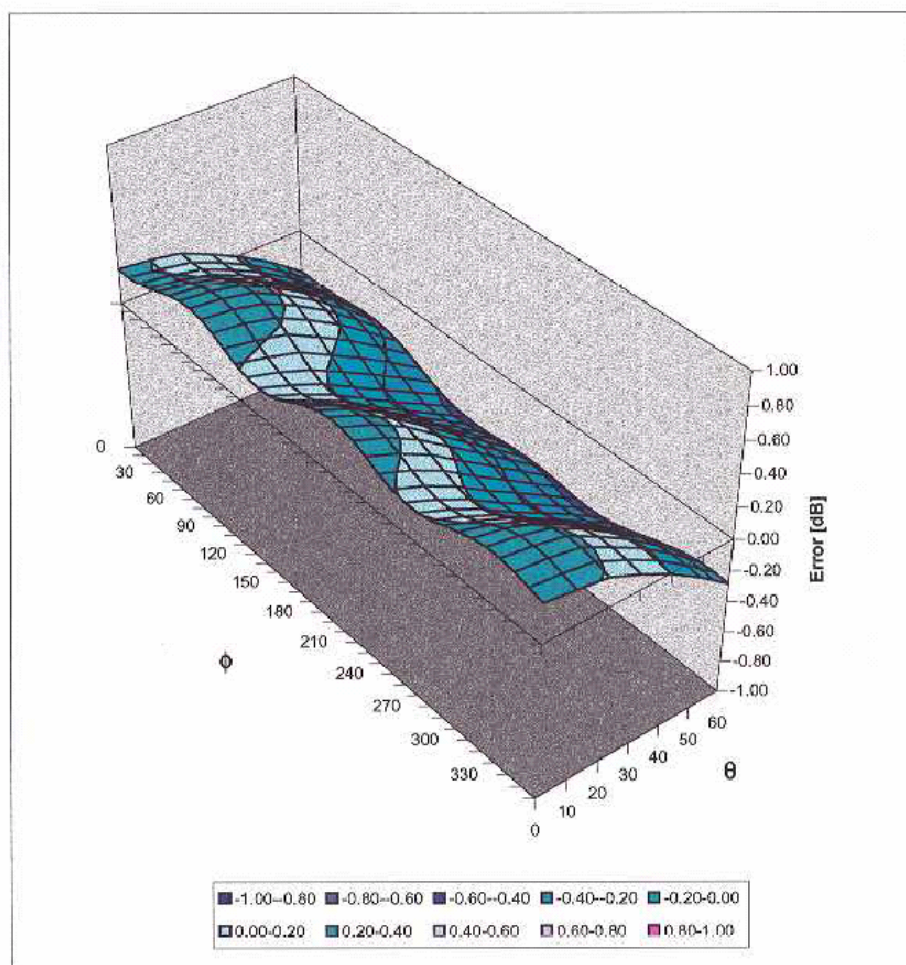
Head 1450 MHz $\epsilon_r = 41.0 \pm 5\%$ $\sigma = 1.20 \pm 5\%$ mho/m

Valid for f=1350-1550 MHz with Head Tissue Simulating Liquid according to EN 50361, P1 528-200X

ConvF X	5.3 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.3 ± 9.5% (k=2)	Alpha	0.62
ConvF Z	5.3 ± 9.5% (k=2)	Depth	2.15

Deviation from Isotropy in HSL

Error (θ, ϕ) , $f = 900$ MHz



Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ET3DV6R

Serial Number:

1545

Place of Assessment:

Zurich

Date of Assessment:

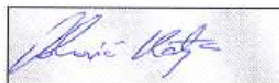
September 1, 2003

Probe Calibration Date:

August 28, 2003

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:



Dosimetric E-Field Probe ET3DV6R SN:1545

Conversion factor ($\pm$ standard deviation)

150 MHz	ConvF	7.6 $\pm$ 8 %	$\epsilon_r = 61.9$ $\sigma = 0.80 \text{ mho/m}$ (body tissue)
236 MHz	ConvF	7.4 $\pm$ 8 %	$\epsilon_r = 59.8$ $\sigma = 0.87 \text{ mho/m}$ (body tissue)
300 MHz	ConvF	7.3 $\pm$ 8 %	$\epsilon_r = 58.2$ $\sigma = 0.92 \text{ mho/m}$ (body tissue)
350 MHz	ConvF	7.3 $\pm$ 8 %	$\epsilon_r = 57.7$ $\sigma = 0.93 \text{ mho/m}$ (body tissue)
450 MHz	ConvF	7.0 $\pm$ 8 %	$\epsilon_r = 56.7$ $\sigma = 0.94 \text{ mho/m}$ (body tissue)
784 MHz	ConvF	6.1 $\pm$ 8 %	$\epsilon_r = 55.4$ $\sigma = 0.97 \text{ mho/m}$ (body tissue)
1450 MHz	ConvF	5.0 $\pm$ 8 %	$\epsilon_r = 54.0$ $\sigma = 1.30 \text{ mho/m}$ (body tissue)

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Conversion factor ($\pm$ standard deviation)

150 MHz	ConvF	$8.4 \pm 8\%$	$\epsilon_r = 52.3$ $\sigma = 0.76 \text{ mho/m}$ (head tissue)
236 MHz	ConvF	$7.6 \pm 8\%$	$\epsilon_r = 48.3$ $\sigma = 0.82 \text{ mho/m}$ (head tissue)
300 MHz	ConvF	$7.4 \pm 8\%$	$\epsilon_r = 45.3$ $\sigma = 0.87 \text{ mho/m}$ (head tissue)
350 MHz	ConvF	$7.4 \pm 8\%$	$\epsilon_r = 44.7$ $\sigma = 0.87 \text{ mho/m}$ (head tissue)
400 MHz	ConvF	$7.0 \pm 8\%$	$\epsilon_r = 44.4$ $\sigma = 0.87 \text{ mho/m}$ (head tissue - CENELEC)
450 MHz	ConvF	$7.0 \pm 8\%$	$\epsilon_r = 43.5$ $\sigma = 0.87 \text{ mho/m}$ (head tissue)
784 MHz	ConvF	$6.3 \pm 8\%$	$\epsilon_r = 41.8$ $\sigma = 0.90 \text{ mho/m}$ (head tissue)