

**CGISS EME Test Laboratory**

8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

S.A.R. EME Compliance Test Report**Part 2 of 2**

Attention: FCC
Date of Report: July 11, 2003
Report Revision: Rev. A
Manufacturer: Motorola South - ARAD
Product Description: Data Terminal w/ 0.6W iDEN
TDMA, 16 QAM; 1mW Bluetooth:
Frequency Hopping Spread Spectrum
(FHSS)
FCC ID: **AZ489FT7007**
Device Model: F4415A (VA00010AB)

Test Period: 2/21/03 – 3/9/03 & 7/9/03
EME Tech: Ed Church
EME Eng.: Deanna Zakharia (Sr. 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.

Signature on file

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

7/14/03

Date Approved

Note: This report shall not be reproduced 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 (FNN5105A battery)

HDT600 with iDEN iO1000
Power Measurements for EME
Model F4415A

Initial Power Measurements iDEN HDT600 iO1000 IMEI 000200047164130			iDEN Power Slump @ 813.5 MHz (Ch. 600)		
Frequency (MHz)	Power (W)	Power (dBm)	Time (min)	Power (W)	Power (dBm)
806.0000	0.707	28.49	0	0.702	28.46
813.5000	0.703	28.47	1	0.713	28.53
820.9875	0.690	28.39	2	0.719	28.57
			3	0.721	28.58
			4	0.726	28.61
			5	0.728	28.62
			6	0.708	28.50
			7	0.722	28.58
			8	0.720	28.57
			9	0.698	28.44
			10	0.701	28.46
			11	0.702	28.46
			12	0.701	28.46
			13	0.704	28.47
			14	0.705	28.48
			15	0.703	28.47
			16	0.706	28.49
			17	0.707	28.49
			18	0.706	28.49
			19	0.709	28.50
			20	0.709	28.51
			21	0.707	28.50
			22	0.710	28.51
			23	0.710	28.51
			24	0.708	28.50
			25	0.711	28.52
			26	0.712	28.52
			27	0.711	28.52
			28	0.695	28.42
			29	0.599	27.77
			30	0.711	28.52
			31	0.607	27.83
			32	0.658	28.18
			33	0.710	28.51
			34	0.586	27.68
			35	0.637	28.04
			36	0.693	28.41
			37	0.619	27.92
			38	0.620	27.92
			39	0.703	28.47
			40	0.674	28.29

Power output measured with
HP438A Power Meter,
with HP8482H Power Sensor.
Calibration date: 12.01.03
Next calibration: 31.12.03
Data recorded with:
HP34970 Data Acquisition
Calibration date: 13.01.03
Next calibration: 31.12.03

Test Mode: TDMA 67.5%

Shortened Scan Results

FCC ID: AZ489FT7007; Test Date: 7/9/03

Motorola CGISS EME Laboratory

Run #: EC-Ab-R1-030709-04

Model #: F4415A (VA00010AB); SN:296SDA0286

SIM TEMP: 20.5 C

TX Freq: 806 MHz

Antenna: FAF5214A internal

Battery Kit: FNN5105A

Carry: None

Audio Acc. None

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

Representative “normal” scan run time was 30 minutes

“Shortened” scan max calculated S.A.R. using S.A.R. drift = 1.50 mW/g

“Normal” scan max calculated S.A.R. using S.A.R. drift = 1.49 mW/g (see section 7.1 run # EC-Ab-R3-030709-06)

DUT back towards phantom

Flat Phantom; Section; Position: (90°,90°);

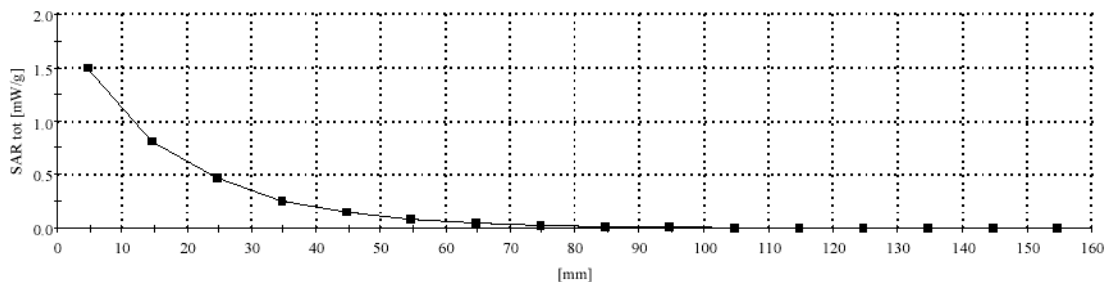
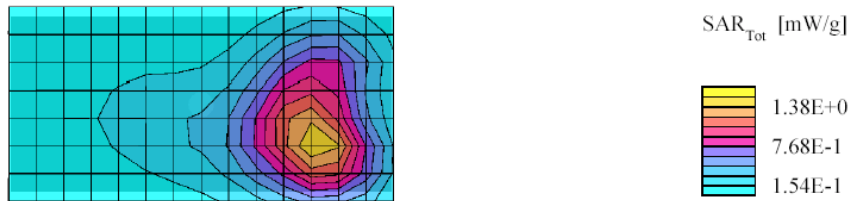
Probe: ET3DV6 - SN1393 (Cal Date 16 April 2003) ; ConvF(6.80,6.80,6.80); Probe cal date: 16/04/03; Crest factor: 1.5;

FCC Body 813.5: $\tilde{u} = 0.98$ mho/m $\tilde{U} = 54.5$ $\epsilon = 1.00$ g/cm³; DAE 374: Cal date 11/11/02

Cube 7x7x7: SAR (1g): 1.49 mW/g, SAR (10g): 1.05 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 75.0, 169.5, 4.7

Power drift: 0.08 dB



APPENDIX B

Data Results

FCC ID: AZ489FT7007; Test Date: 2/21/03

Motorola CGISS EME Laboratory

Run #: EC-Ab-R3-030221-04

Model #: F4415A (VA00010AB); SN: 296SDA0292

SIM TEMP: 22.0 C

TX Freq: 813.5 MHz

Antenna: FAF5214A internal

Battery Kit: FNN5105A

Carry: None

Audio Acc. None

DUT w/ back towards the phantom

Flat Phantom; Section; Position: (90°,90°);

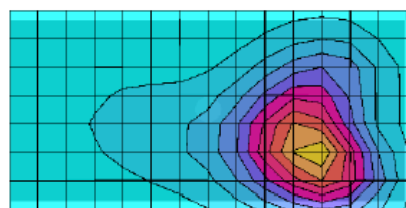
Probe: ET3DV6 - SN1393 (Cal Date 03-22-2002); ConvF(6.90,6.90,6.90); Probe cal date: 3/22/02; Crest factor: 6.0; FCC

Body 813: $\tilde{\sigma} = 0.99$ mho/m $\tilde{U} = 53.0$ $\rho = 1.00$ g/cm³; DAE 406 Cal date 11/11/02

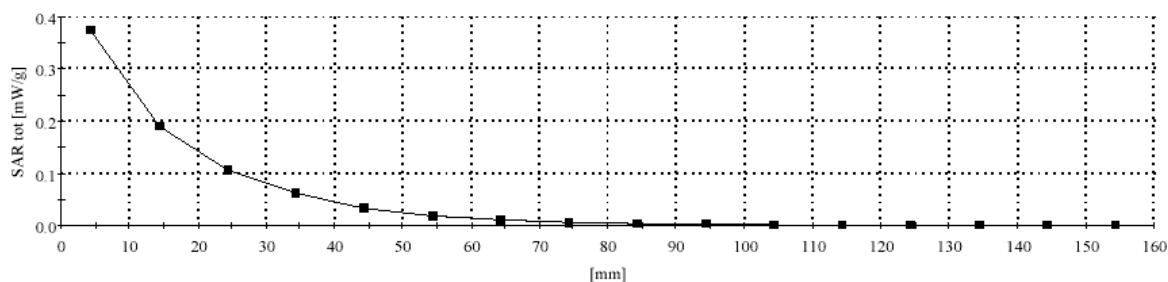
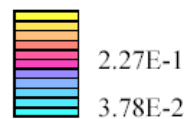
Cube 7x7x7: SAR (1g): 0.361 mW/g, SAR (10g): 0.251 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 76.5, 162.0, 4.4

Power drift: 0.15dB



SAR_{Tot} [mW/g]



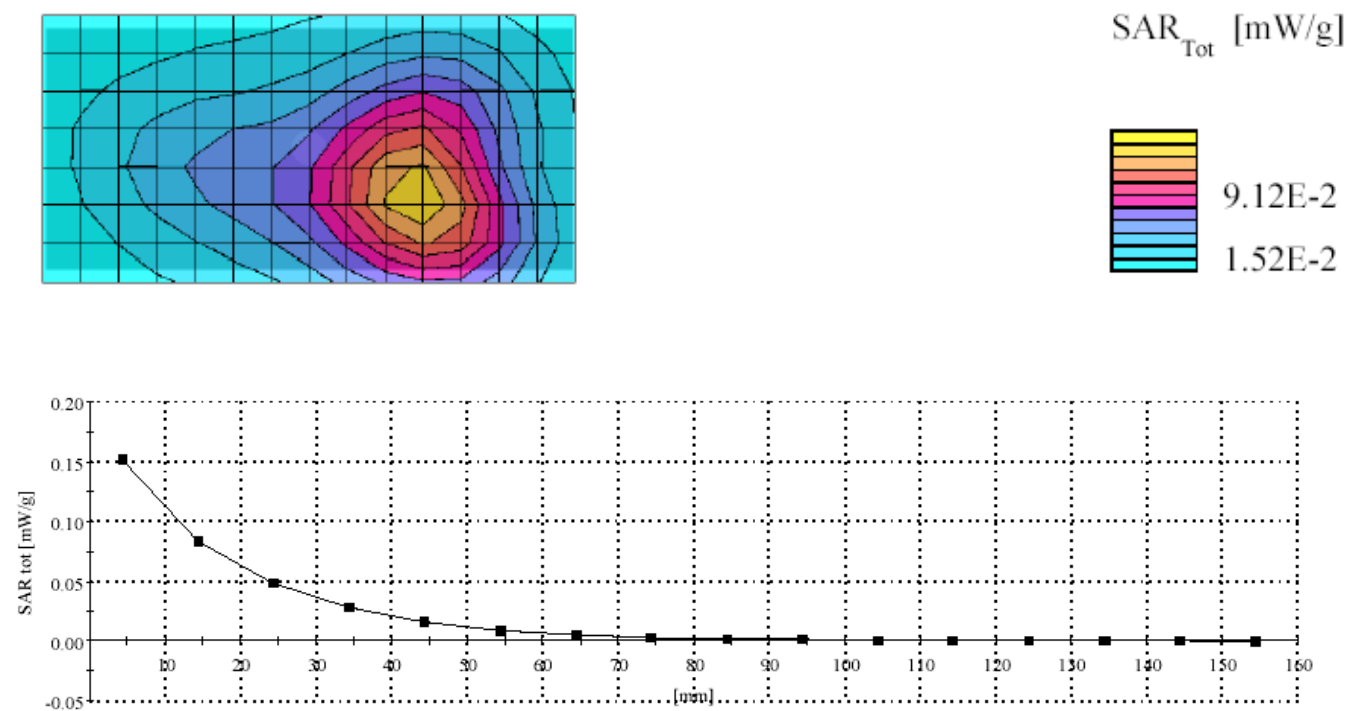
FCC ID: AZ489FT7007; Test Date: 2/24/03
Motorola CGISS EME Laboratory

Run #: EC-Ab-R3-030224-05
Model #: F4415A (VA00010AB); SN: 296SDA0292
SIM TEMP: 21.2 C
TX Freq: 813.5 MHz

Antenna: FAF5214A internal
Battery Kit: FNN5105A
Carry: FHN6396A
Audio Acc. None

DUT w/ carry case against the phantom

Flat Phantom; Section; Position: (90°,90°);
Probe: ET3DV6 - SN1393 (Cal Date 03-22-2002); ConvF(6.90,6.90,6.90); Probe cal date: 3/22/02; Crest factor: 6.0; FCC
Body 813: $\tilde{\mu} = 0.98$ mho/m $\tilde{\rho} = 52.9$ $\rho = 1.00$ g/cm3; DAE 406 Cal date 11/11/02
Cube 7x7x7: SAR (1g): 0.148 mW/g, SAR (10g): 0.107 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 72.0, 147.0, 4.4
Power drift: 0.04 dB



FCC ID: AZ489FT7007; Test Date: 3/3/03

Motorola CGISS EME Laboratory

Run #: EC-Ab-R3-030303-11

Model #: F4415A (VA00010AB); SN: 296SDA0292

SIM TEMP: 22.3 C

TX Freq: 813.5 MHz

Antenna: FAF5214A internal

Battery Kit: FNN5105A

Carry: None

Audio Acc. None

DUT w/ back against the phantom

Flat Phantom; Position: (90°,90°);

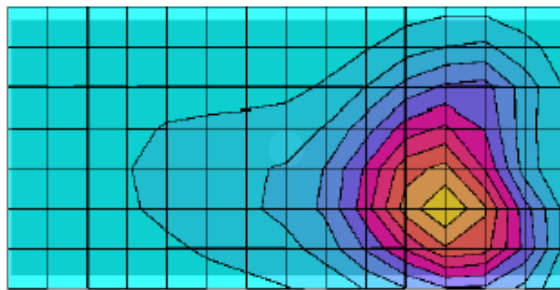
Probe: ET3DV6 - SN1393 (Cal Date 03-22-2002); ConvF(6.90,6.90,6.90); Probe cal date: 3/22/02; Crest factor: 1.5; FCC

Body 814: $\tilde{\sigma} = 0.98$ mho/m $\tilde{U} = 53.4$ $\rho = 1.00$ g/cm³; DAE 406 Cal date 11/11/02

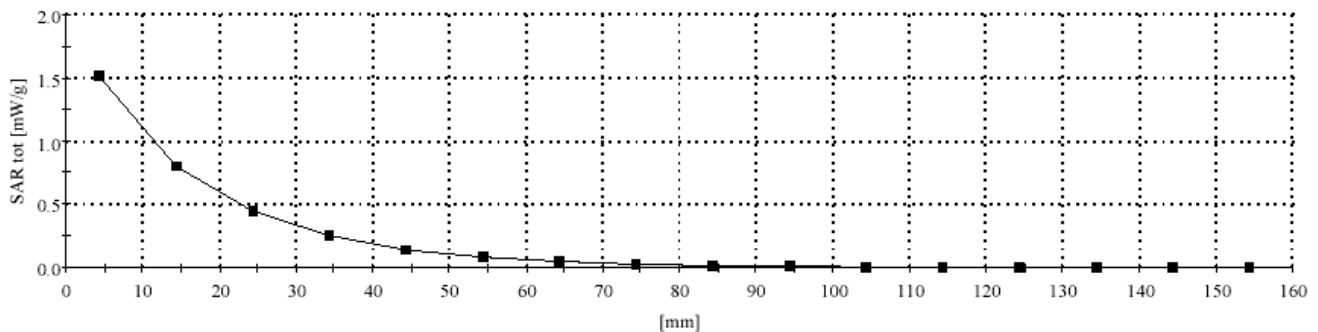
Cube 7x7x7: SAR (1g): 1.46 mW/g, SAR (10g): 1.02 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 75.0, 165.0, 4.4

Power drift: 0.29dB



SAR_{Tot} [mW/g]



FCC ID: AZ489FT7007; Test Date: 3/9/03

Motorola CGISS EME Laboratory

Run #: EC-Ab-R3-030309-05

Model #: F4415A (VA00010AB); SN: 296SDA0292

SIM TEMP: 19.1 C

TX Freq: 813.5 MHz

Antenna: FAF5214A internal

Battery Kit: FNN5105A

Carry: FMN6396A

Audio Acc. None

DUT w/ carry case against the phantom

Flat Phantom; Flat_abdomen Section; Position: (90°,90°);

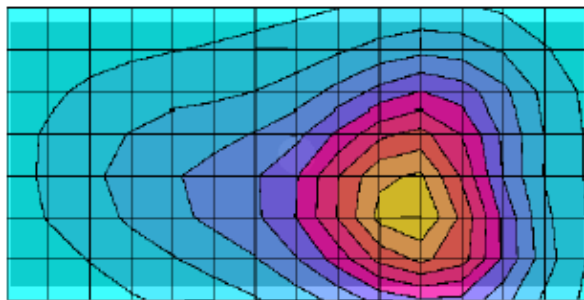
Probe: ET3DV6 - SN1393 (Cal Date 03-22-2002); ConvF(6.90,6.90,6.90); Crest factor: 1.5; FCC

Body 813: $\tilde{\sigma} = 0.98$ mho/m $\tilde{\rho} = 54.5$ $\rho = 1.00$ g/cm³; DAE 406 Cal date 11/11/02

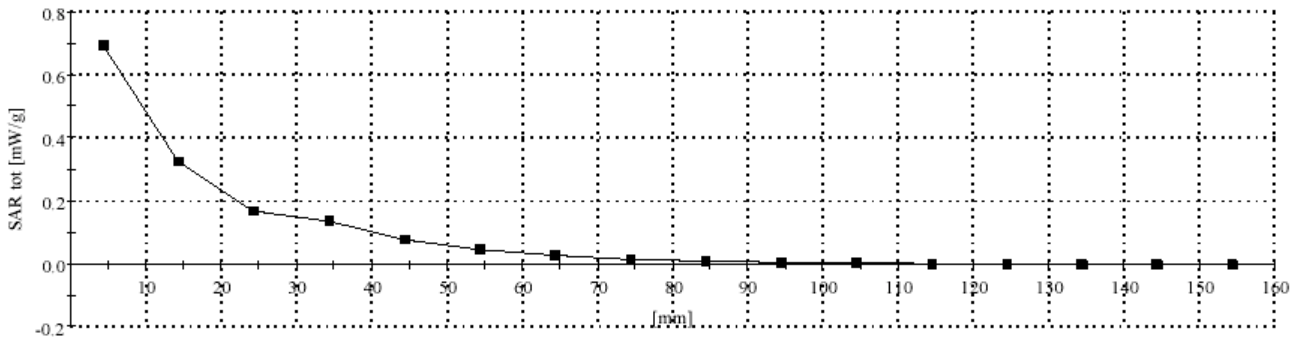
Cube 7x7x7: SAR (1g): 0.720 mW/g, SAR (10g): 0.517 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 72.0, 145.5, 4.4

Power drift: -0.28 dB



SAR_{Tot} [mW/g]



FCC ID: AZ489FT7007; Test Date: 3/4/03

Motorola CGISS EME Laboratory

Run #: EC-Ab-R3-030304-10

Model #: F4415A (VA00010AB); SN: 296SDA0292

SIM TEMP: 22.3 C

TX Freq: 813.5 MHz

Antenna: FAF5214A internal

Battery Kit: FNN5105A

Carry: None

Audio Acc. None

DUT w/ display towards phantom w/ 2.5 cm separation

Flat Phantom; Position: (90°,90°);

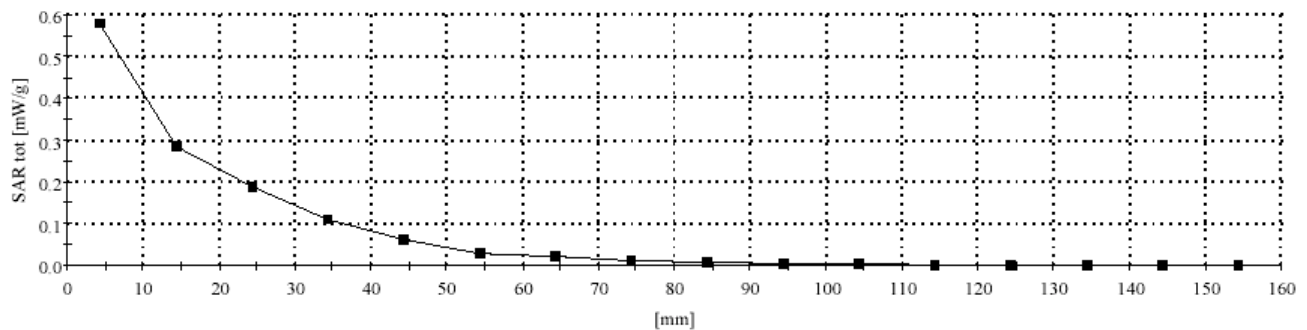
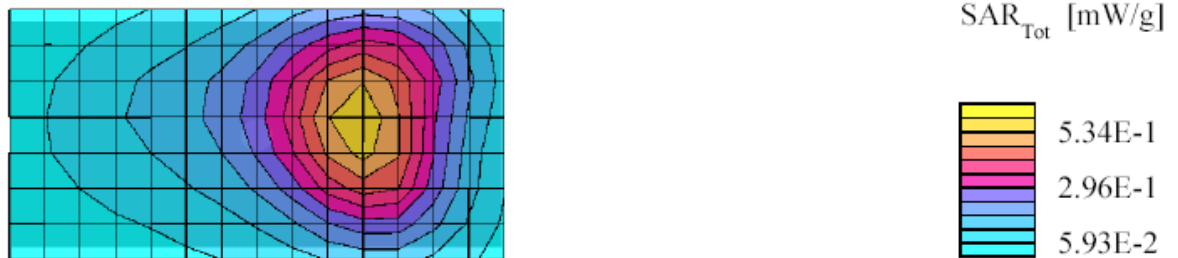
Probe: ET3DV6 - SN1393 (Cal Date 03-22-2002); ConvF(6.90,6.90,6.90); Probe cal date: 3/22/02; Crest factor: 1.5; FCC

Body 814: $\tilde{\sigma} = 0.99\text{mho/m}$ $\tilde{U} = 53.4$ $\rho = 1.00\text{ g/cm}^3$; DAE 406: Cal date 11/11/02

Cube 7x7x7: SAR (1g): 0.584 mW/g, SAR (10g): 0.411 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 46.5, 148.5, 4.4

Power drift: -0.15 dB



APPENDIX C

Dipole System Performance Check Results

SPEAG 835 MHz Dipole; Model D835V2, SN 426; Test Date: 2/21/03

Motorola CGISS EME Lab

Run #: Sys Perf_R3_030221_01

TX Freq: 835 MHz

Sim Tissue Temp: 22.0 (Celsius)

Start Power; 250mW

Target at 1W is 10.65 mW/g (1g)

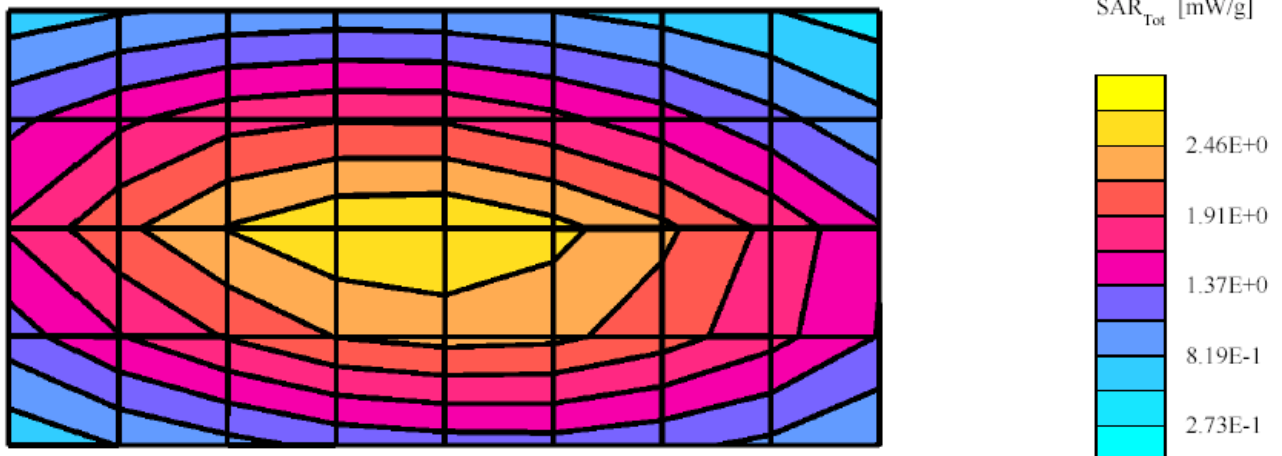
SAR calculated is 10.75 mW/g, Percent from target (including drift) for 1g is 0.98 %

Flat; Probe: ET3DV6 - SN1393 (Cal Date 03-22-2002); Probe Cal Date: 3/22/02 ConvF(6.90,6.90,6.90); Crest factor: 1.0; FCC

Body 835: $\mu = 1.01$ mho/m $\epsilon = 52.9$ $\rho = 1.00$ g/cm³; DAE 406 Cal Date: 11/11/02

Cubes (2): Peak: 4.16 mW/g ± 0.04 dB, SAR (1g): 2.67 mW/g ± 0.04 dB, SAR (10g): 1.71 mW/g ± 0.05 dB, (Worst-case extrapolation) Penetration depth: 12.4 (11.3, 13.9) [mm]

Power drift: -0.03 dB



SPEAG 835 MHz Dipole; Model D835V2, SN 426; Test Date: 2/24/03

Motorola CGISS EME Lab

Run #: Sys Perf-R3-030324-01

TX Freq: 835 MHz

Sim Tissue Temp: 21.0 (Celsius)

Start Power; 250mW

Target at 1W is 10.65 mW/g (1g)

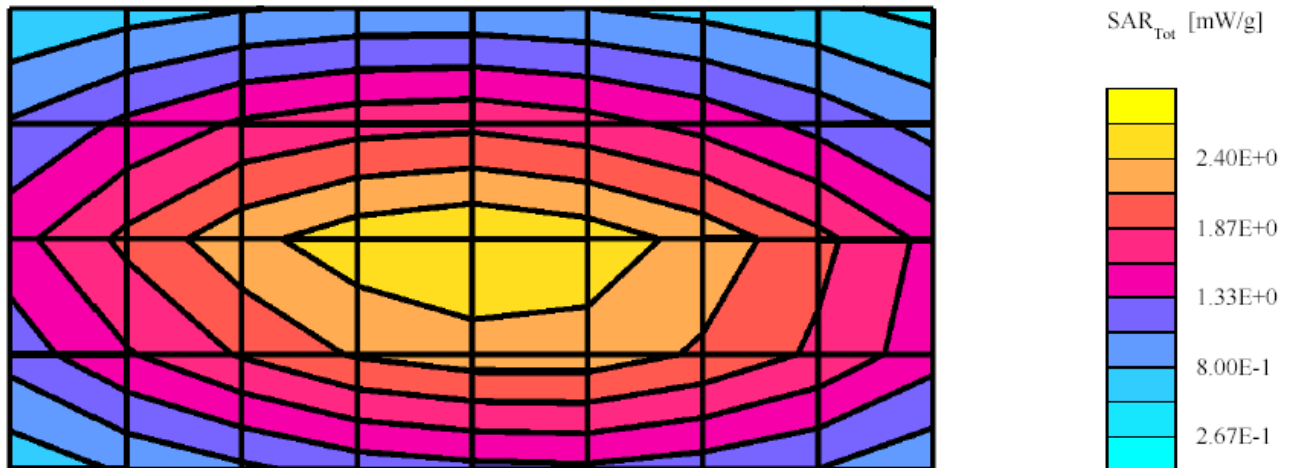
SAR calculated is 10.50 mW/g, Percent from target (including drift) for 1g is 1.37 %

Flat; Probe: ET3DV6 - SN1393 (Cal Date 03-22-2002); Probe Cal Date: 3/22/02 ConvF(6.90,6.90,6.90); Crest factor: 1.0; FCC

Body 835: $\sigma = 1.00$ mho/m $\epsilon = 52.7$ $\rho = 1.00$ g/cm³; DAE 406 Cal Date: 11/11/02

Cubes (2): Peak: 4.08 mW/g $\pm$ 0.05 dB, SAR (1g): 2.62 mW/g $\pm$ 0.05 dB, SAR (10g): 1.68 mW/g $\pm$ 0.06 dB, (Worst-case extrapolation) Penetration depth: 12.4 (11.3, 13.9) [mm]

Power drift: -0.01 dB



SPEAG 835 MHz Dipole; Model D835V2, SN 426; Test Date: 3/03/03

Motorola CGISS EME Lab

Run #: Sys Perf-R3-030303-10

TX Freq: 835 MHz

Sim Tissue Temp: 22.3 (Celsius)

Start Power; 250mW

Target at 1W is 10.65 mW/g (1g)

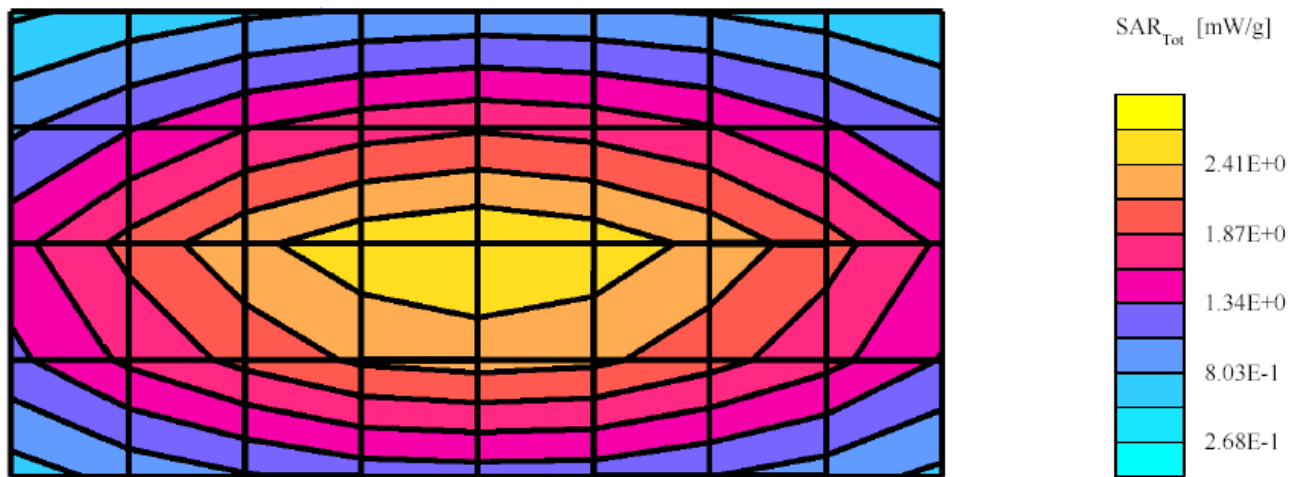
SAR calculated is 10.54 mW/g, Percent from target (including drift) for 1g is 0.99 %

Flat; Probe: ET3DV6 - SN1393 (Cal Date 03-22-2002); Probe Cal Date: 3/22/02 ConvF(6.90,6.90,6.90); Crest factor: 1.0; FCC

Body 835: $\tilde{\mu} = 1.00$ mho/m $\tilde{\epsilon} = 53.2$ $\rho = 1.00$ g/cm³; DAE 406 Cal Date: 11/11/02

Cubes (2): Peak: 4.09 mW/g $\pm$ 0.05 dB, SAR (1g): 2.63 mW/g $\pm$ 0.05 dB, SAR (10g): 1.68 mW/g $\pm$ 0.05 dB, (Worst-case extrapolation) Penetration depth: 12.5 (11.3, 14.0) [mm]

Power drift: -0.01 dB



SPEAG 835 MHz Dipole; Model D835V2, SN 426; Test Date: 3/04/03

Motorola CGISS EME Lab

Run #: Sys Perf-R3-030304-01

TX Freq: 835 MHz

Sim Tissue Temp: 22.5 (Celsius)

Start Power; 250mW

Target at 1W is 10.65 mW/g (1g)

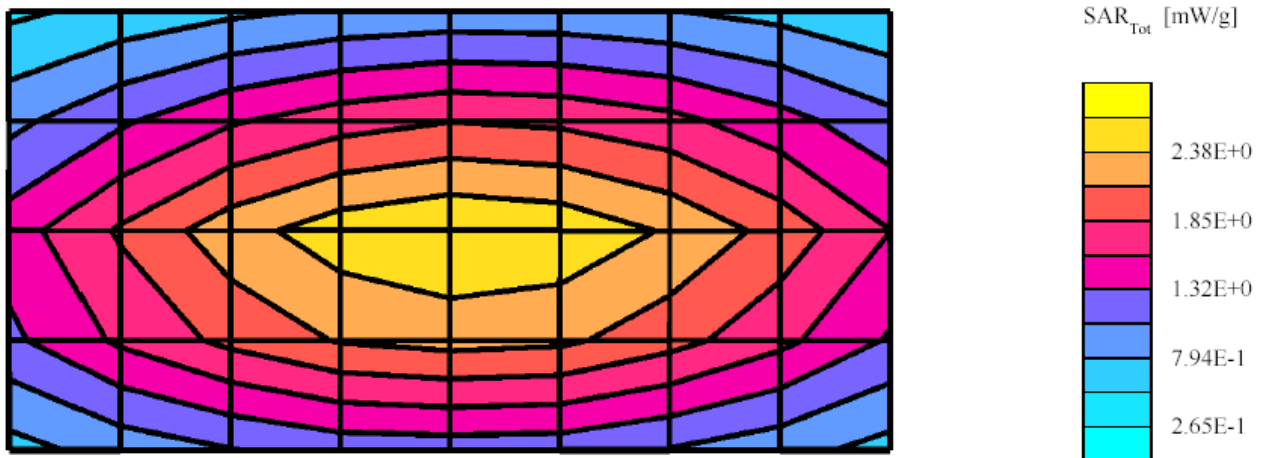
SAR calculated is 10.38 mW/g, Percent from target (including drift) for 1g is - 2.50 %

Flat; Probe: ET3DV6 - SN1393 (Cal Date 03-22-2002); Probe Cal Date: 3/22/02 ConvF(6.90,6.90,6.90); Crest factor: 1.0; FCC

Body 835: $\sigma = 1.01$ mho/m $\rho = 53.1$ $\epsilon = 1.00$ g/cm³; DAE 406 Cal Date: 11/11/02

Cubes (2): Peak: 4.04 mW/g $\pm$ 0.05 dB, SAR (1g): 2.59 mW/g $\pm$ 0.06 dB, SAR (10g): 1.67 mW/g $\pm$ 0.06 dB, (Worst-case extrapolation) Penetration depth: 12.5 (11.3, 14.0) [mm]

Power drift: -0.01 dB



SPEAG 835 MHz Dipole; Model D835V2, SN 426; Test Date: 3/09/03

Motorola CGISS EME Lab

Run #: Sys Perf-R3-030309-01

TX Freq: 835 MHz

Sim Tissue Temp: 19.1 (Celsius)

Start Power; 250mW

Target at 1W is 10.65 mW/g (1g)

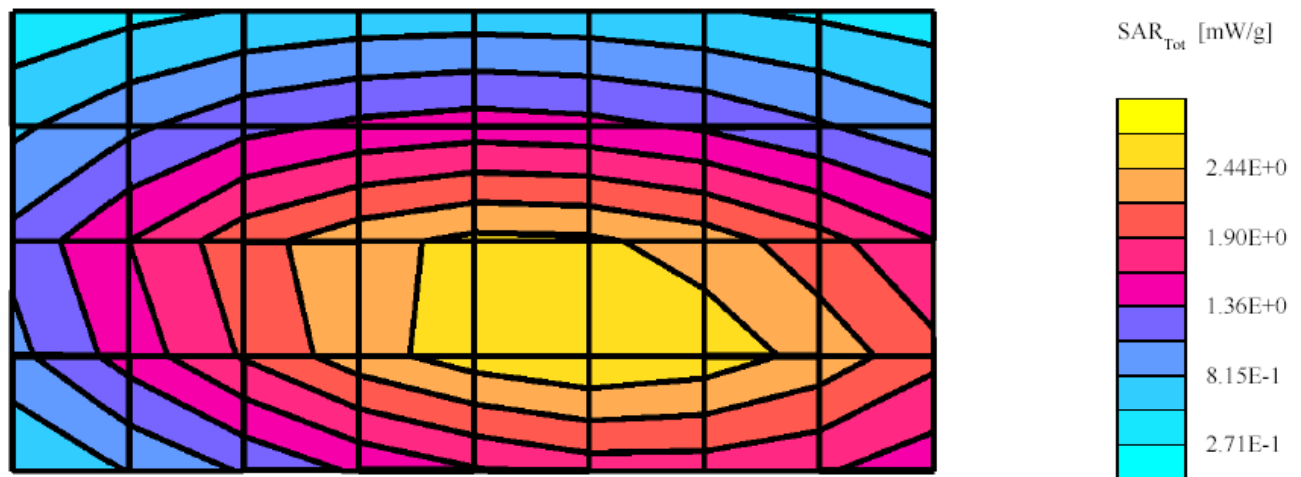
SAR calculated is 10.98 mW/g, Percent from target (including drift) for 1g is 3.06 %

Flat; Probe: ET3DV6 - SN1393 (Cal Date 03-22-2002); Probe Cal Date: 3/22/02 ConvF(6.90,6.90,6.90); Crest factor: 1.0; FCC

Body 835: $\sigma = 1.01$ mho/m $\epsilon = 54.3$ $\rho = 1.00$ g/cm³; DAE 406 Cal Date: 11/11/02

Cubes (2): Peak: 4.16 mW/g $\pm$ 0.03 dB, SAR (1g): 2.70 mW/g $\pm$ 0.04 dB, SAR (10g): 1.75 mW/g $\pm$ 0.04 dB, (Worst-case extrapolation) Penetration depth: 12.7 (11.6, 14.1) [mm]

Power drift: -0.07 dB



SPEAG 835 MHz Dipole; Model D835V2, SN 427; Test Date: 7/09/03

Motorola CGISS EME Lab

Run #: Sys Perf-R3-030709-01

TX Freq: 835 MHz

Sim Tissue Temp: 20.5 (Celsius)

Start Power; 250mW

Target at 1W is 11.09 mW/g (1g) and 7.14 mW/g (10g avg.)

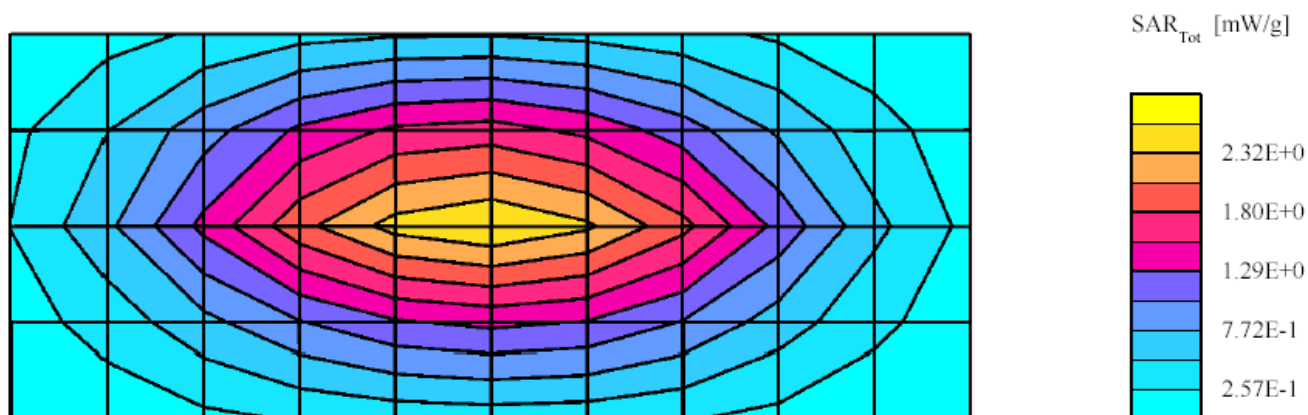
SAR calculated 1g is 10.22 mW/g percent from target (including drift) - 7.88 %

SAR Calculated 10g is 6.70 mW/g Percent from target (including drift) is - 6.70 %

Flat Phantom; Probe: ET3DV6 - SN1393 (Cal Date 16 April 2003) ;Probe Cal Date: 16/04/03ConvF(6.80,6.80,6.80); Crest factor: 1.0; FCC Body 835: $\hat{u} = 1.00$ mho/m $\hat{U} = 54.3$ $\hat{\epsilon} = 1.00$ g/cm³; DAE3: SN:374 DAE Cal Date: 02/19/03

Cubes (3): Peak: 2.59 mW/g $\pm$ 20.02 dB, SAR (1g): 1.71 mW/g $\pm$ 0.00 dB, SAR (10g): 1.12 mW/g $\pm$ 0.00 dB, (Worst-case extrapolation) Penetration depth: 13.0 (12.0, 14.4) [mm]

Power drift: 0.01 dB



SYSTEM PERFORMANCE CHECK TARGET SAR

Date: 5/20/02 Frequency (MHz): 835
Lab Location: CGISS Mixture Type: FCC Body
Robot System: CGISS 2 Ambient Temp.(°C): 21.9
Probe Serial #: 1383 Tissue Temp.(°C): 21.0
DAE Serial #: 374 V2

Tissue Characteristics Phantom Type/SN: ACL40232002B
Permittivity: 53.2 Distance (mm): 15
Conductivity: 0.97

Reference Source: 835 (Dipole)
Reference SN: 426

Power to Dipole: 250 mW

Measured SAR Value: 2.65 mW/g, 1.69 mW/g (10g avg.)
Power Drift: -0.02 dB

New Target/Measured
SAR Value: 10.65 mW/g, 6.79 mW/g (10g avg.)
(normalized to 1.0 W,
with drift compensation)

Test performed by: Kim Uong Initial: KU

Dipole D835V2 SN426; Test date:05/20/02

Run #: 02052001

Phantom #ACL40232002B/S11

Model#: SPEAG dipole D835V2 SN426

Robot#: CGISS-2

DAE: DAE3V1 SN374 (2/11/02)

Tester: Kim Uong

Tx Freq: 835MHz

Simulated tissue temp: 21.6C

Start power: 250mW

Target:

10.5mW/g for 1g-SAR, 6.8mW/g for 10g-SAR, +/-12.1% from SPEAG Dipole certificate 2/11/02

Flat; Probe: ET3DV6 - SN1383; ConvF(6.50,6.50,6.50); Crest factor: 1.0; FCC Body 335: $\sigma = 0.97$ mho/m $\epsilon_r = 53.2$ $\rho = 1.00$ g/cm³

Cube 7x7x7; Peak: 4.25 mW/g, SAR (1g): 2.65 mW/g, SAR (10g): 1.69 mW/g, (Worst-case extrapolation)

Penetration depth: 12.1 (10.6, 14.1) [mm]

Powerdrift: -0.02 dB



SAR_{tot} [mW/g]



Motorola CGISS EME Lab

SYSTEM PERFORMANCE CHECK TARGET SAR

Date:	<u>11/20/2002</u>	Frequency (MHz):	<u>835MHz</u>
Lab Location:	<u>CGISS</u>	Mixture Type:	<u>FCC Body</u>
Robot System:	<u>CGISS R1</u>	Ambient Temp.(°C):	<u>22.1</u>
Probe Serial #:	<u>ET3DV6-1545</u>	Tissue Temp.(°C):	<u>20.6</u>
DAE Serial #:	<u>363</u>		

Tissue Characteristics

Permittivity:	<u>53.3</u>	Phantom Type/SN:	<u>80302002A</u>
Conductivity:	<u>1.01</u>	Distance (mm):	<u>15 (tissue/dipole cnt)</u>

Reference Source:	<u>D835V2</u>	(Dipole)
Reference SN:	<u>427</u>	

Power to Dipole: 250 mW

Measured SAR Value:	<u>2.78 mW/g,</u>	<u>1.79 mW/g (10g avg.)</u>
Power Drift:	<u>0.01 dB</u>	

New Target/Measured

SAR Value:	<u>11.09 mW/g,</u>	<u>7.14 mW/g (10g avg.)</u>
(normalized to 1.0 W, including drift)		

Test performed by: S. Whalen Initial: SW

SPEAG Dipole 835MHz. Test Date:11/20/02

Run #: Sys Perf-R1-021120-02 Phantom #: 80302002A / S8
Model #: D835V2 SN: 427
Robot: CGISS-1 Tester: S. Whalen
TX Freq: 835 MHz Sim Tissue Temp: 20.6 (Celsius)
Start Power: 250mW
DAE3: SN363-V1 DAE Cal Date: 05/23/02
- Comments -
New Target at 1W is mW/g (including drift) (1g)

Flat Phantom; Device

Probe: ET3DV6R(cal date 5-21-02) - SN1545;Probe Cal Date: 21/05/02ConvF(6.00,6.00,6.00); Crest factor: 1.0; FCC Body_835
MHz: $\sigma = 1.01 \text{ nA/m}$, $\mu_r = 53.3$, $\rho = 1.00 \text{ g/cm}^3$
Cubes (2): Peak: 4.31 mW/g $\pm 0.06 \text{ dB}$, SAR (1g): 2.78 mW/g $\pm 0.07 \text{ dB}$, SAR (10g): 1.79 mW/g $\pm 0.07 \text{ dB}$, (Worst-case
extrapolation)
Penetration depth: 12.5 (11.4, 13.9) [mm]
Powerdrift: 0.01 dB



APPENDIX D

Calibration Certificates

Schmid & Partner Engineering AG

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

Calibration Certificate

Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1393

Place of Calibration:

Zurich

Date of Calibration:

March 22, 2002

Calibration Interval:

12 months

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:

D. Vella

Approved by:

Oliver Kofler

DASY3 - Parameters of Probe: ET3DV6 SN:1393**Sensitivity in Free Space**

NormX	$1.80 \mu V/(V/m)^2$
NormY	$1.49 \mu V/(V/m)^2$
NormZ	$1.80 \mu V/(V/m)^2$

Diode Compression

DCP X	95	mV
DCP Y	95	mV
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
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\%$ mho/m
	ConvF X	$7.1 \pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	$7.1 \pm 9.5\%$ (k=2)	Alpha 0.32
	ConvF Z	$7.1 \pm 9.5\%$ (k=2)	Depth 2.56
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
	ConvF X	$5.5 \pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	$5.5 \pm 9.5\%$ (k=2)	Alpha 0.44
	ConvF Z	$5.5 \pm 9.5\%$ (k=2)	Depth 2.49

Boundary Effect

Head	900 MHz	Typical SAR gradient: 5 % per mm		
Probe Tip to Boundary		1 mm	2 mm	
SAR _{tip} [%]	Without Correction Algorithm	8.4	4.8	
SAR _{tip} [%]	With Correction Algorithm	0.3	0.5	
Head	1800 MHz	Typical SAR gradient: 10 % per mm		
Probe Tip to Boundary		1 mm	2 mm	
SAR _{tip} [%]	Without Correction Algorithm	10.7	7.3	
SAR _{tip} [%]	With Correction Algorithm	0.2	0.3	

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.7 ± 0.2	mm

Schmid & Partner Engineering AG

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

Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1393

Place of Assessment:

Zurich

Date of Assessment:

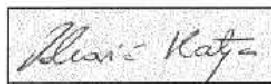
April 24, 2002

Probe Calibration Date:

March 22, 2002

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:



Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 29

Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1393

Place of Assessment:

Zurich

Date of Assessment:

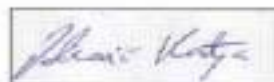
March 25, 2002

Probe Calibration Date:

March 22, 2002

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 ET3DV6 SN:1393

Conversion factor ($\pm$ standard deviation)

835 MHz	ConvF	$7.2 \pm 8\%$	$\epsilon_r = 41.5$ $\sigma = 0.90 \text{ mho/m}$ (head tissue)
835 MHz	ConvF	$6.9 \pm 8\%$	$\epsilon_r = 55.2$ $\sigma = 0.97 \text{ mho/m}$ (body tissue)
900 MHz	ConvF	$6.8 \pm 8\%$	$\epsilon_r = 55.0$ $\sigma = 1.05 \text{ mho/m}$ (body tissue)
1800 MHz	ConvF	$5.1 \pm 8\%$	$\epsilon_r = 53.3$ $\sigma = 1.52 \text{ mho/m}$ (body tissue)
1950 MHz	ConvF	$4.9 \pm 8\%$	$\epsilon_r = 53.3$ $\sigma = 1.52 \text{ mho/m}$ (body tissue)
2450 MHz	ConvF	$4.2 \pm 10\%$	$\epsilon_r = 52.7$ $\sigma = 1.95 \text{ mho/m}$ (body tissue)

Client **Motorola CGISS**

CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN:1393**

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

Calibration date: **April 16, 2003**

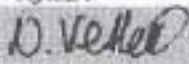
Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

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 8664C	US3642U01760	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	2-Apr-01	Apr-04
Power sensor HP 8481A	MY41092160	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 T02	SN: 6295803	3-Sep-01	Sep-03

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

Date issued: April 16, 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:1393

Sensitivity in Free Space

NormX	$1.80 \mu\text{V}/(\text{V}/\text{m})^2$
NormY	$1.49 \mu\text{V}/(\text{V}/\text{m})^2$
NormZ	$1.80 \mu\text{V}/(\text{V}/\text{m})^2$

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 IEEE P1528-200X

ConvF X	7.0 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	7.0 ± 9.5% (k=2)	Alpha	0.31
ConvF Z	7.0 ± 9.5% (k=2)	Depth	2.71

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 IEEE P1528-200X

ConvF X	5.5 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.5 ± 9.5% (k=2)	Alpha	0.48
ConvF Z	5.5 ± 9.5% (k=2)	Depth	2.51

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary	1 mm	2 mm
SAR _{bs} [%] Without Correction Algorithm	9.0	5.3
SAR _{bs} [%] With Correction Algorithm	0.3	0.5

Head 1800 MHz Typical SAR gradient: 10 % per mm

Probe Tip to Boundary	1 mm	2 mm
SAR _{bs} [%] Without Correction Algorithm	12.2	8.3
SAR _{bs} [%] With Correction Algorithm	0.1	0.3

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	0.9 ± 0.2	mm

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1393

Place of Assessment:

Zurich

Date of Assessment:

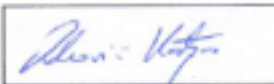
April 21, 2003

Probe Calibration Date:

April 16, 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 ET3DV6 SN:1393

Conversion factor ($\pm$ standard deviation)

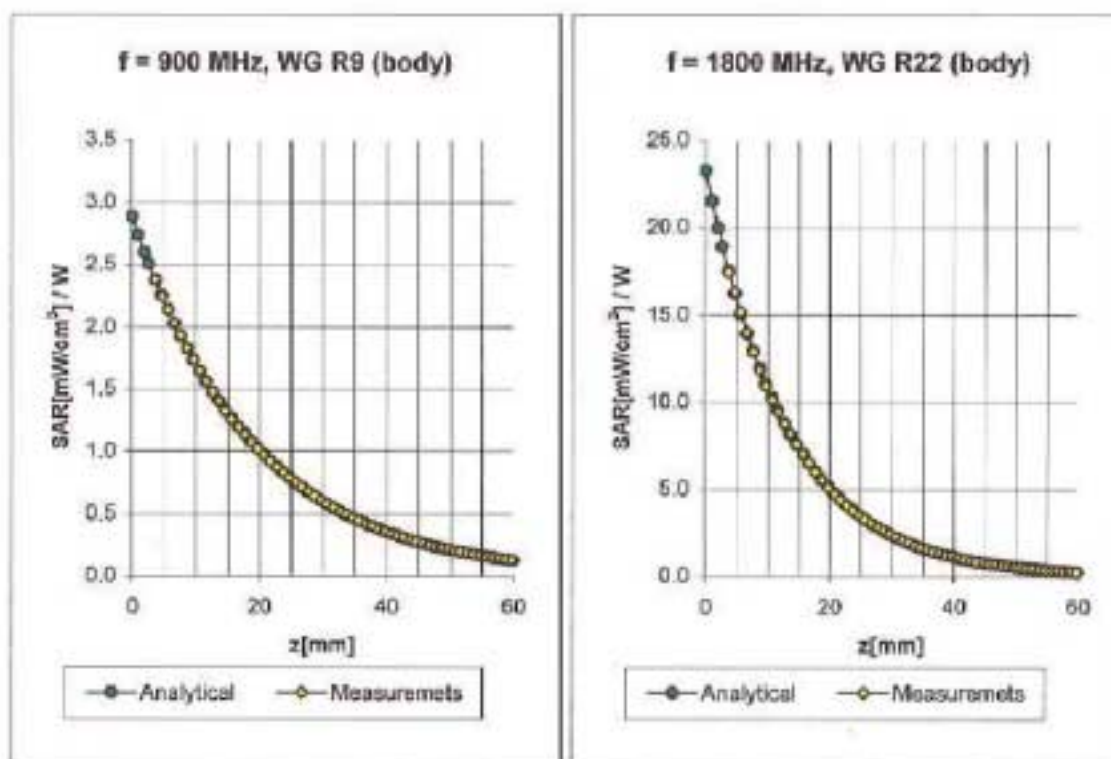
150 MHz	ConvF	8.8 $\pm$ 8 %	$\epsilon_r = 61.9$ $\sigma = 0.80$ mho/m (body tissue)
236 MHz	ConvF	8.6 $\pm$ 8 %	$\epsilon_r = 59.8$ $\sigma = 0.87$ mho/m (body tissue)
300 MHz	ConvF	8.4 $\pm$ 8 %	$\epsilon_r = 58.2$ $\sigma = 0.92$ mho/m (body tissue)
350 MHz	ConvF	8.4 $\pm$ 8 %	$\epsilon_r = 57.7$ $\sigma = 0.93$ mho/m (body tissue)
450 MHz	ConvF	8.0 $\pm$ 8 %	$\epsilon_r = 56.7$ $\sigma = 0.94$ mho/m (body tissue)
784 MHz	ConvF	7.0 $\pm$ 8 %	$\epsilon_r = 55.4$ $\sigma = 0.97$ mho/m (body tissue)
1450 MHz	ConvF	5.6 $\pm$ 8 %	$\epsilon_r = 54.0$ $\sigma = 1.30$ mho/m (body tissue)

Dosimetric E-Field Probe ET3DV6 SN:1393

Conversion factor ($\pm$ standard deviation)

150 MHz	ConvF	9.7 $\pm$ 8%	$\epsilon_r = 52.3$ $\sigma = 0.76$ mho/m (head tissue)
236 MHz	ConvF	8.8 $\pm$ 8%	$\epsilon_r = 48.3$ $\sigma = 0.82$ mho/m (head tissue)
300 MHz	ConvF	8.5 $\pm$ 8%	$\epsilon_r = 45.3$ $\sigma = 0.87$ mho/m (head tissue)
350 MHz	ConvF	8.5 $\pm$ 8%	$\epsilon_r = 44.7$ $\sigma = 0.87$ mho/m (head tissue)
400 MHz	ConvF	8.1 $\pm$ 8%	$\epsilon_r = 44.4$ $\sigma = 0.87$ mho/m (head tissue - CENELEC)
450 MHz	ConvF	8.1 $\pm$ 8%	$\epsilon_r = 43.5$ $\sigma = 0.87$ mho/m (head tissue)
784 MHz	ConvF	7.3 $\pm$ 8%	$\epsilon_r = 41.8$ $\sigma = 0.90$ mho/m (head tissue)

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

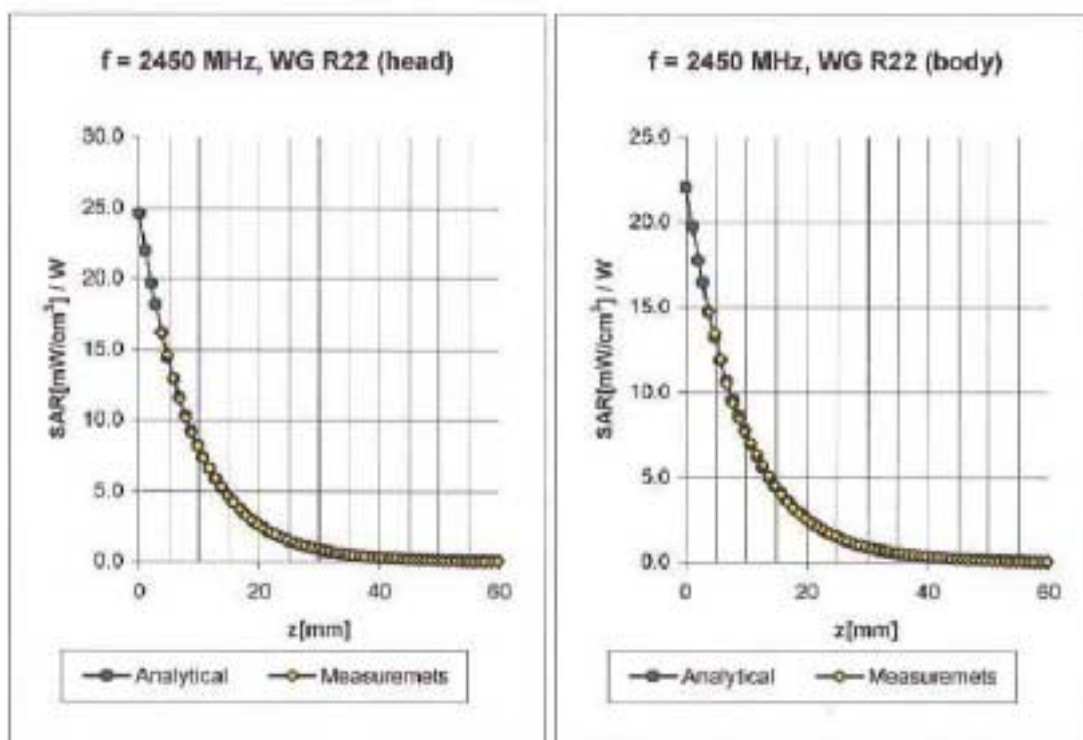
ConvF X	6.8 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	6.8 $\pm 9.5\%$ (k=2)	Alpha 0.35
ConvF Z	6.8 $\pm 9.5\%$ (k=2)	Depth 2.48

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	5.1 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	5.1 $\pm 9.5\%$ (k=2)	Alpha 0.51
ConvF Z	5.1 $\pm 9.5\%$ (k=2)	Depth 2.79

Conversion Factor Assessment



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

ConvF X **5.0** $\pm 8.9\%$ (k=2)

Boundary effect:

ConvF Y **5.0** $\pm 8.9\%$ (k=2)

Alpha **0.85**

ConvF Z **5.0** $\pm 8.9\%$ (k=2)

Depth **1.96**

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

ConvF X **4.5** $\pm 8.9\%$ (k=2)

Boundary effect:

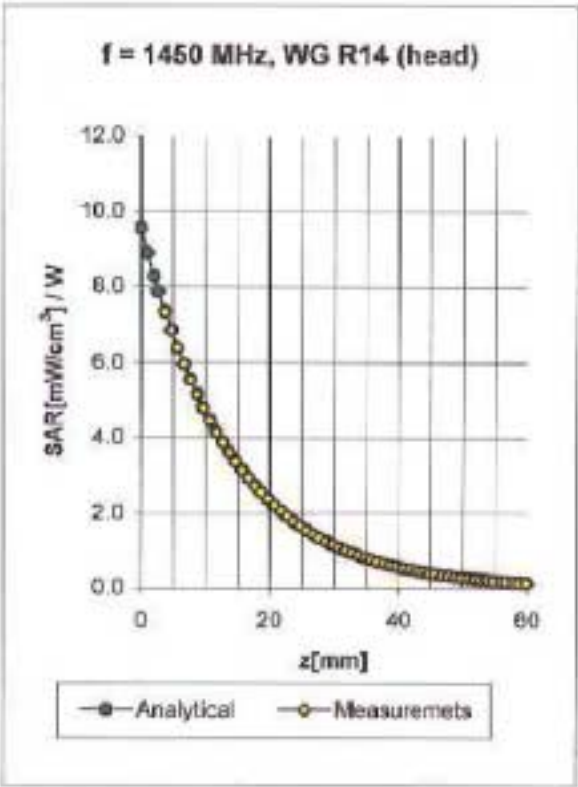
ConvF Y **4.5** $\pm 8.9\%$ (k=2)

Alpha **1.24**

ConvF Z **4.5** $\pm 8.9\%$ (k=2)

Depth **1.68**

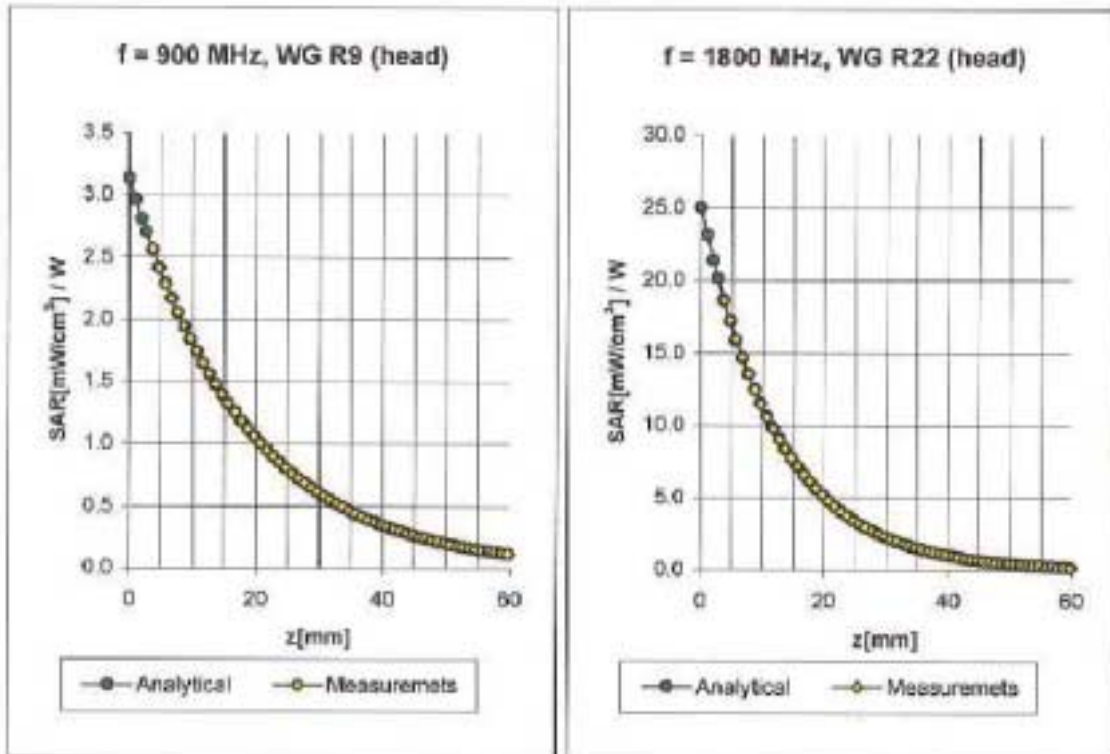
Conversion Factor Assessment



Head 1450 MHz $\epsilon_r = 40.5 \pm 5\%$ $\sigma = 1.20 \pm 5\%$ mho/m

ConvF X	6.0 $\pm 8.9\%$ (k=2)	Boundary effect:
ConvF Y	6.0 $\pm 8.9\%$ (k=2)	Alpha 0.43
ConvF Z	6.0 $\pm 8.9\%$ (k=2)	Depth 2.77

Conversion Factor Assessment



Head 900 MHz $\epsilon_r = 41.5 \pm 5\%$ $\sigma = 0.97 \pm 5\%$ mho/m

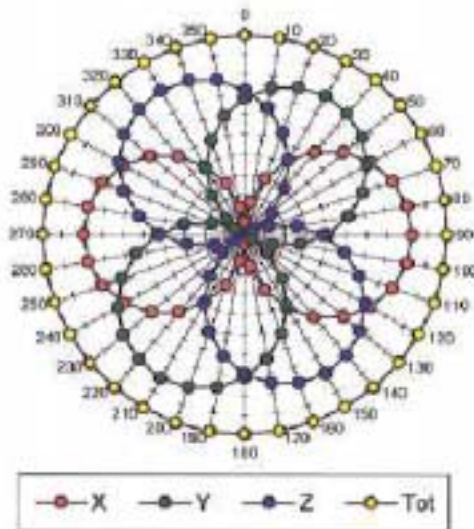
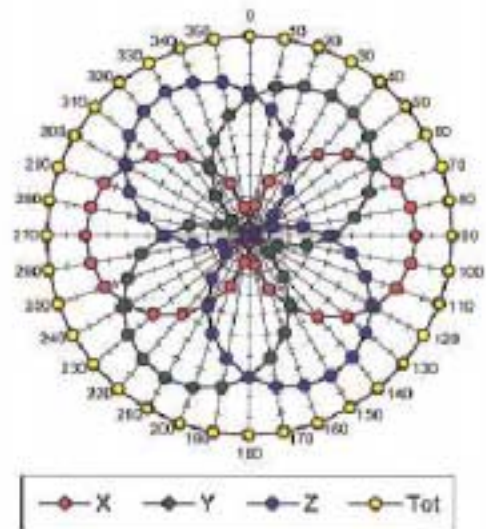
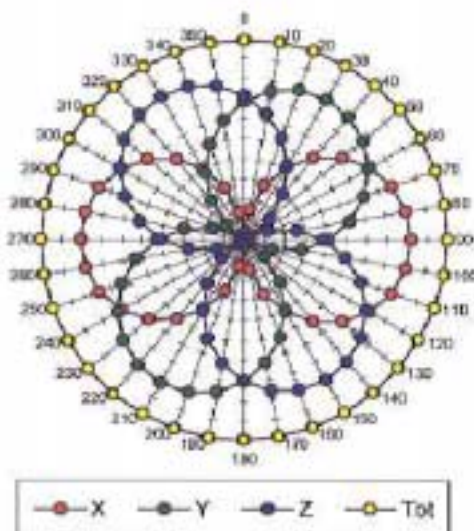
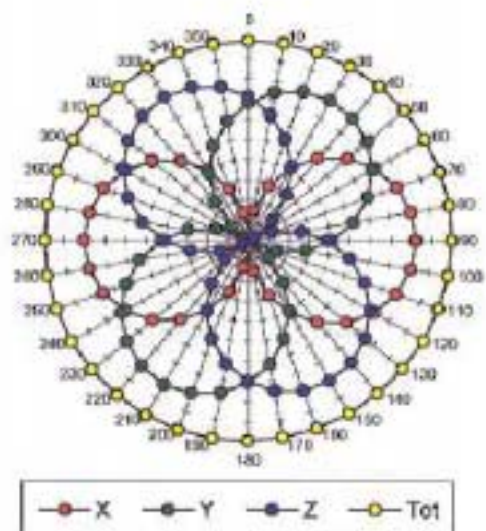
Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to IEEE P1528-200X

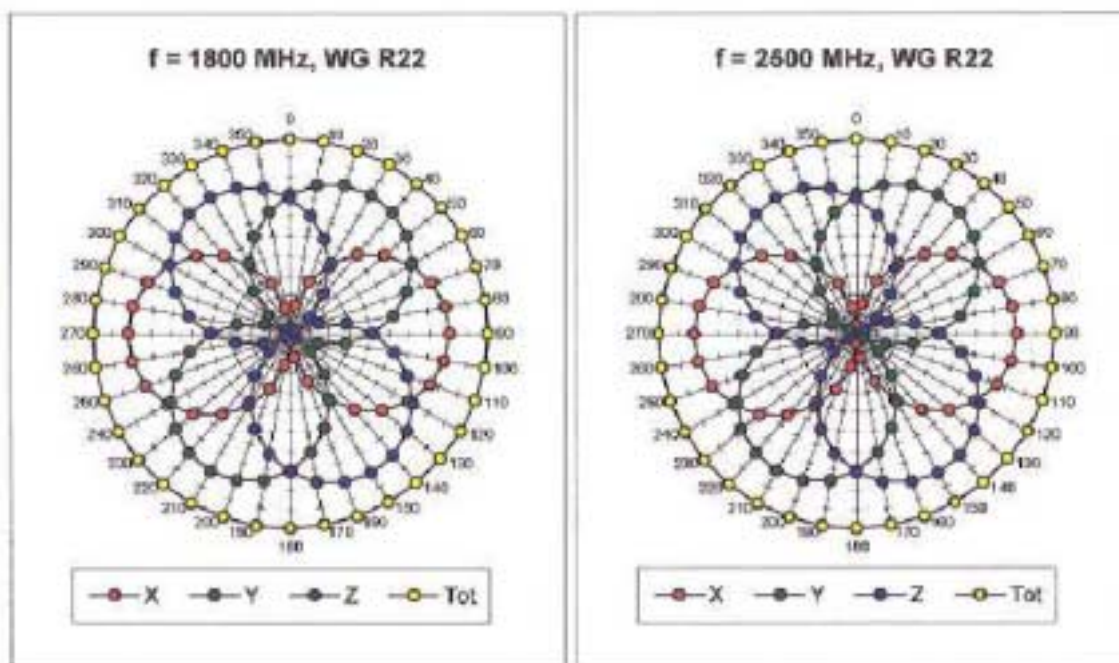
ConvF X	$7.0 \pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	$7.0 \pm 9.5\%$ (k=2)	Alpha	0.31
ConvF Z	$7.0 \pm 9.5\%$ (k=2)	Depth	2.71

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

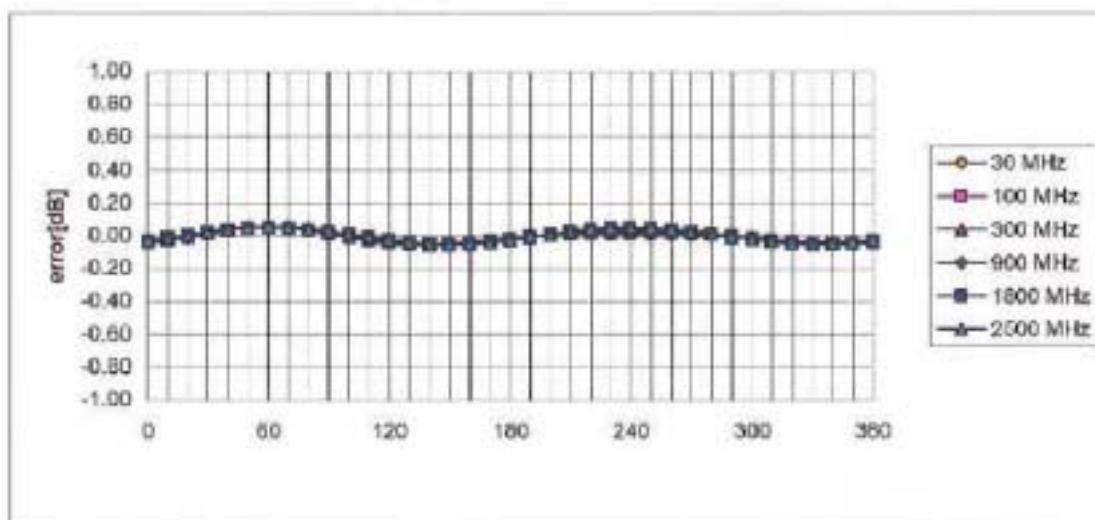
Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to IEEE P1528-200X

ConvF X	$5.5 \pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	$5.5 \pm 9.5\%$ (k=2)	Alpha	0.48
ConvF Z	$5.5 \pm 9.5\%$ (k=2)	Depth	2.51

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**

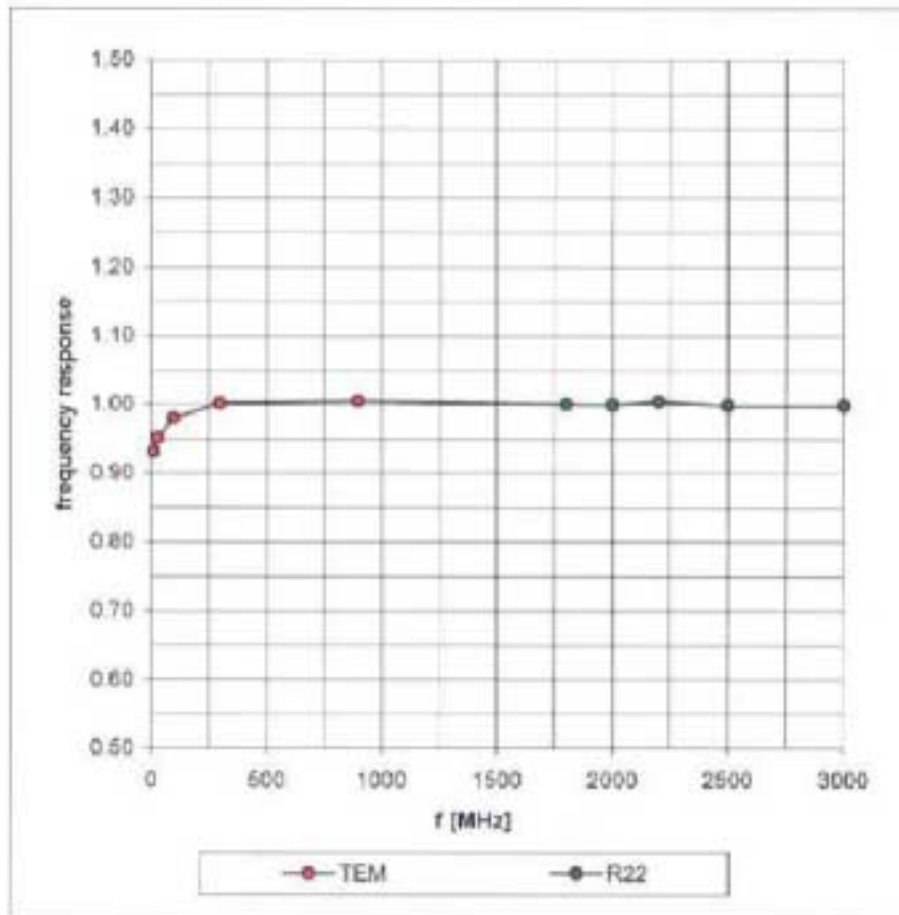


Isotropy Error (ϕ), $\theta = 0^\circ$

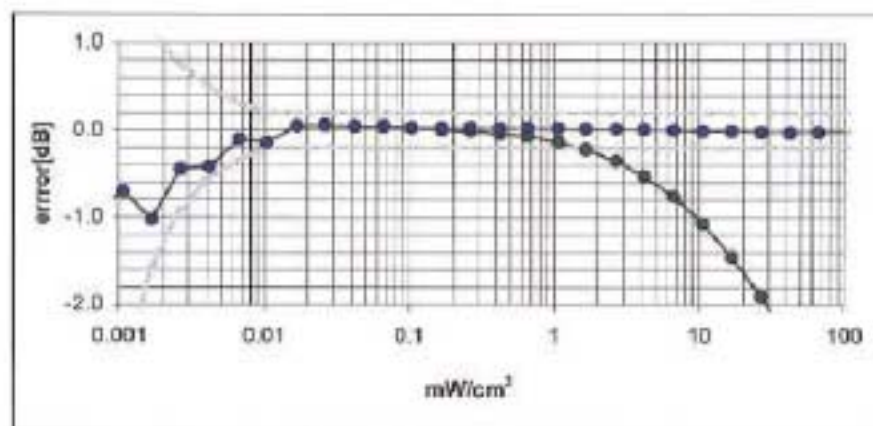
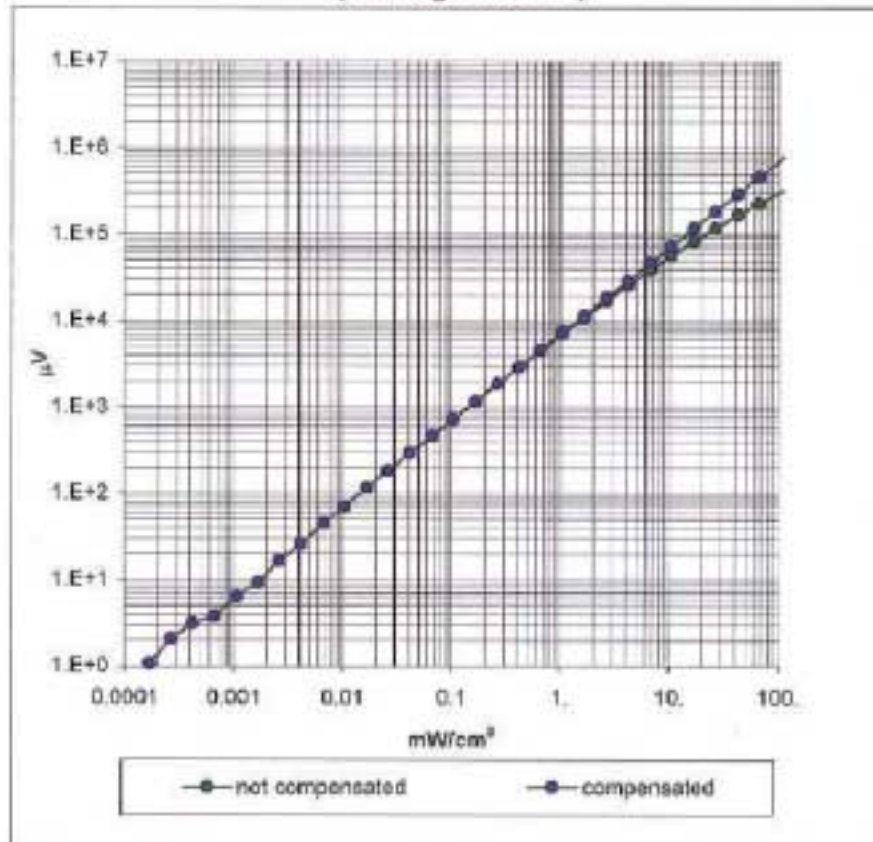


Frequency Response of E-Field

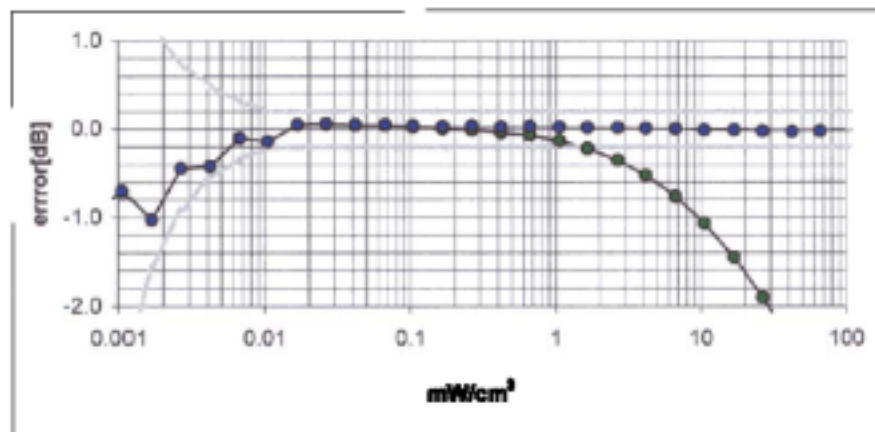
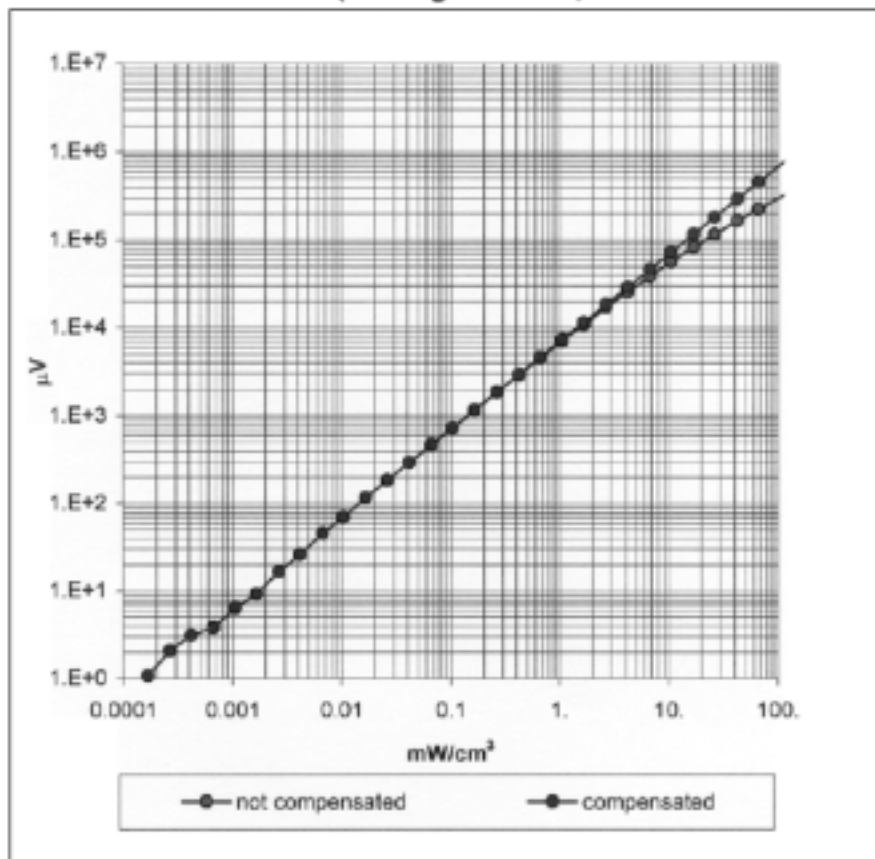
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR_{brain}) (Waveguide R22)

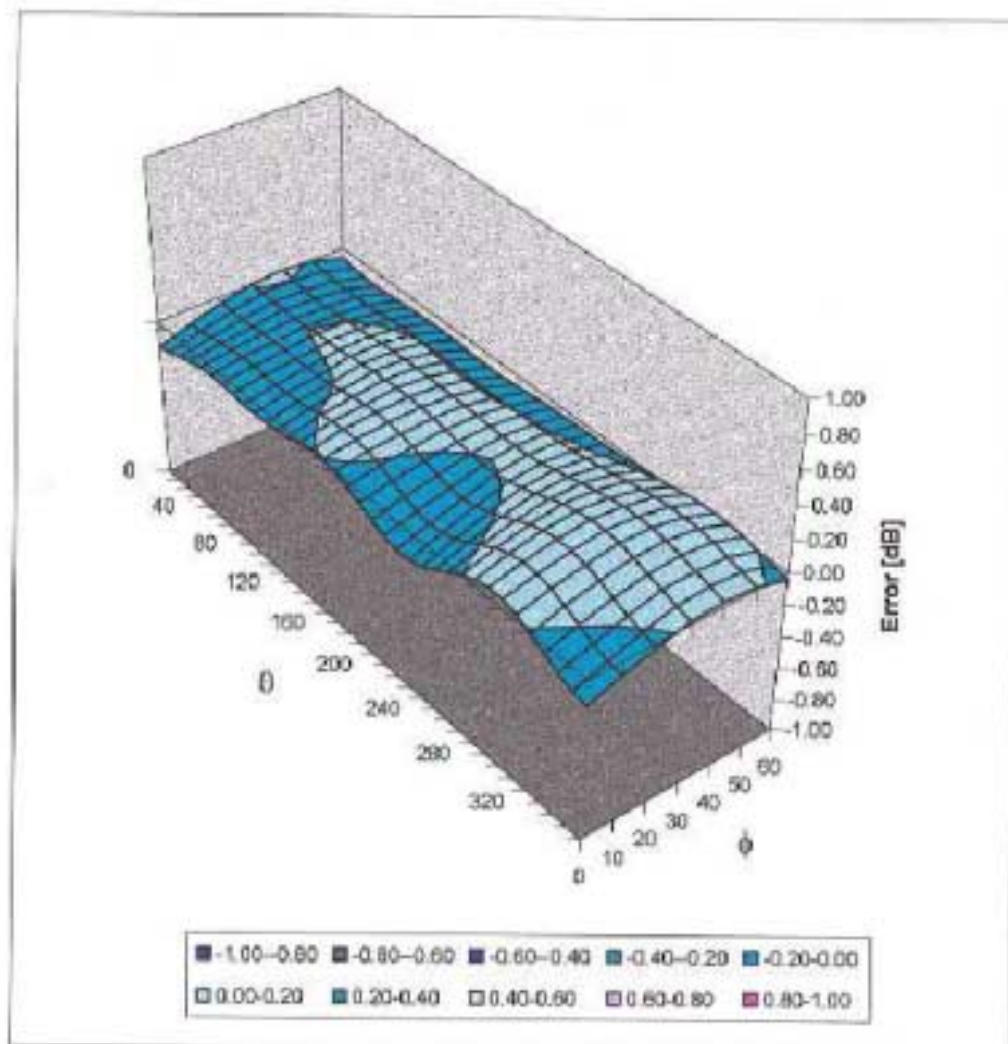


Dynamic Range $f(\text{SAR}_{\text{brain}})$ (Waveguide R22)



Deviation from Isotropy in HSL

Error (θ), $f = 900$ MHz



Client **Motorola CGISS**

CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN:1383**

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

Calibration date: **February 26, 2003**

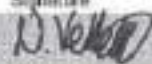
Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

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	U53642UD1799	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	9-Mar-02	Mar-03
Power sensor HP 8481A	MY41002180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	U538432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295603	3-Sep-01	Sep-03

Calibrated by:	Name Neo Vyterli	Function Technician	Signature 
Approved by:	Name Katja Pokorski	Function Laboratory Director	Signature 

Date issued: February 26, 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:1383**Sensitivity in Free Space**

NormX	1.80 $\mu\text{V}/(\text{V/m})^2$
NormY	1.55 $\mu\text{V}/(\text{V/m})^2$
NormZ	1.62 $\mu\text{V}/(\text{V/m})^2$

Diode Compression

DCP X	93	mV
DCP Y	93	mV
DCP Z	93	mV

Sensitivity in Tissue Simulating Liquid

Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
ConvF X	6.5 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.5 $\pm 9.5\%$ (k=2)	Alpha	0.59
ConvF Z	6.5 $\pm 9.5\%$ (k=2)	Depth	1.97
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
ConvF X	5.2 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	5.2 $\pm 9.5\%$ (k=2)	Alpha	0.57
ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth	2.54

Boundary Effect

Head	900 MHz	Typical SAR gradient: 5 % per mm		
Probe Tip to Boundary		1 mm	2 mm	
SAR _{ex} [%]	Without Correction Algorithm	10.0	5.2	
SAR _{ex} [%]	With Correction Algorithm	0.1	0.5	
Head	1800 MHz	Typical SAR gradient: 10 % per mm		
Probe Tip to Boundary		1 mm	2 mm	
SAR _{ex} [%]	Without Correction Algorithm	15.1	9.9	
SAR _{ex} [%]	With Correction Algorithm	0.2	0.6	

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	0.5 $\pm$ 0.2	mm

Dosimetric E-Field Probe ET3DV6 SN:1383

Conversion factor ($\pm$ standard deviation)

150 MHz ✓	ConvF	8.1 $\pm$ 8%	$\epsilon_r = 61.9$ $\sigma = 0.80$ mho/m (body tissue)
236 MHz ✓	ConvF	7.9 $\pm$ 8%	$\epsilon_r = 59.8$ $\sigma = 0.87$ mho/m (body tissue)
300 MHz ✓	ConvF	7.8 $\pm$ 8%	$\epsilon_r = 58.2$ $\sigma = 0.92$ mho/m (body tissue)
350 MHz ✓	ConvF	7.8 $\pm$ 8%	$\epsilon_r = 57.7$ $\sigma = 0.93$ mho/m (body tissue)
450 MHz ✓	ConvF	7.5 $\pm$ 8%	$\epsilon_r = 56.7$ $\sigma = 0.94$ mho/m (body tissue)
784 MHz ✓	ConvF	6.5 $\pm$ 8%	$\epsilon_r = 55.4$ $\sigma = 0.97$ mho/m (body tissue)
1450 MHz ✓	ConvF	5.3 $\pm$ 8%	$\epsilon_r = 54.0$ $\sigma = 1.30$ mho/m (body tissue)

Dosimetric E-Field Probe ET3DV6 SN:1383

Conversion factor ($\pm$ standard deviation)

150 MHz ✓	ConvF	9.0 $\pm$ 8%	$\epsilon_r = 52.3$ $\sigma = 0.76$ mho/m (head tissue)
236 MHz ✓	ConvF	8.2 $\pm$ 8%	$\epsilon_r = 48.3$ $\sigma = 0.82$ mho/m (head tissue)
300 MHz ✓	ConvF	7.7 $\pm$ 8%	$\epsilon_r = 45.3$ $\sigma = 0.87$ mho/m (head tissue)
350 MHz ✓	ConvF	7.7 $\pm$ 8%	$\epsilon_r = 44.7$ $\sigma = 0.87$ mho/m (head tissue)
400 MHz ✓	ConvF	7.5 $\pm$ 8%	$\epsilon_r = 44.4$ $\sigma = 0.87$ mho/m (head tissue - CENELEC)
450 MHz ✓	ConvF	7.5 $\pm$ 8%	$\epsilon_r = 43.5$ $\sigma = 0.87$ mho/m (head tissue)
784 MHz ✓	ConvF	6.7 $\pm$ 8%	$\epsilon_r = 41.8$ $\sigma = 0.90$ mho/m (head tissue)

Schmid & Partner Engineering AG

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

Calibration Certificate

835 MHz System Validation Dipole

Type:

D835V2

Serial Number:

426

Place of Calibration:

Zurich

Date of Calibration:

February 11, 2002

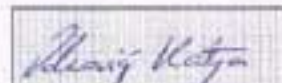
Calibration Interval:

24 months

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:



Approved by:



1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with head simulating solution of the following electrical parameters at 835 MHz:

Relative Dielectricity	41.9	± 5%
Conductivity	0.89 mho/m	± 5%

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.5) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.

The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 1. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm ³ (1 g) of tissue:	10.2 mW/g
averaged over 10 cm ³ (10 g) of tissue:	6.56 mW/g

Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well.

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	1.375 ns	(one direction)
Transmission factor:	0.997	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 835 MHz:	$\text{Re}\{Z\} = 50.3 \, \Omega$
	$\text{Im}\{Z\} = -2.1 \, \Omega$
Return Loss at 835 MHz	-33.8 dB

4. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with body simulating solution of the following electrical parameters at 835 MHz:

Relative Dielectricity	55.4	$\pm 5\%$
Conductivity	0.96 mho/m	$\pm 5\%$

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.2) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.

The dipole input power (forward power) was 250mW $\pm 3\%$. The results are normalized to 1W input power.

5. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 4. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm³ (1 g) of tissue: **10.5 mW/g**

averaged over 10 cm³ (10 g) of tissue: **6.80 mW/g**

6. Dipole Impedance and Return Loss

The dipole was positioned at the flat phantom sections according to section 4 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 835 MHz: **Re{Z} = 46.0 Ω**

Im {Z} = -4.6 Ω

Return Loss at 835 MHz **-24.1 dB**

7. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

8. Design

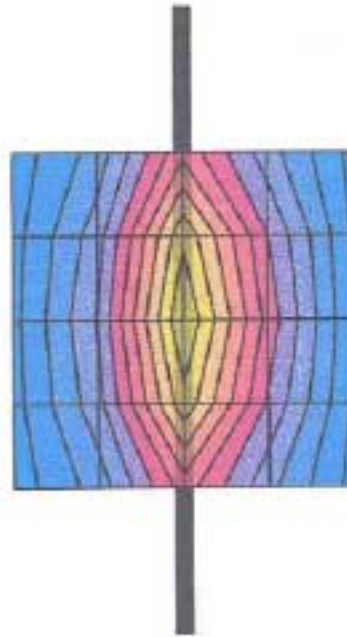
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

9. Power Test

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Validation Dipole D835V2 SN:426, d = 15 mm

Frequency: 835 MHz; Antenna Input Power: 250 [mW]
 SMM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
 Probe: ET3DV8 - SN1507; ComF(8.50,8.50,6.50) at 900 MHz; IEEE1528 835 MHz: $\sigma = 0.88$ mho/m, $\epsilon_r = 41.9$, $\rho = 1.00$ g/cm³
 Cubes (2): Peak: 4.09 mW/g $\pm$ 0.04 dB, SAR (1g): 2.56 mW/g $\pm$ 0.03 dB, SAR (10g): 1.64 mW/g $\pm$ 0.02 dB, (Worst-case extrapolation)
 Penetration depth: 11.9 (10.5, 13.6) [mm]
 Power/drift: -0.00 dB



Validation Dipole D835V2 SN:426, d = 15 mm

Frequency: 835 MHz; Antenna Input Power: 250 [mW]
SAM Phantom: Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ETSDVB - SN1507; ConnF(8 20.6 20.6 20) at 900 MHz; Muscle 835 MHz; $\sigma = 0.96$ mho/m $\epsilon_r = 55.4$ $\rho = 1.00$ g/cm³
Cubes (2): Peak: 4.16 mW/g ± 0.01 dB, SAR (1g): 2.63 mW/g ± 0.00 dB, SAR (10g): 1.70 mW/g ± 0.01 dB, (Worst-case extrapolation)
Penetration depth: 12.5 (11.0, 14.4) [mm]
Powerdrift: -0.01 dB



Schmid & Partner Engineering AG

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

Calibration Certificate

835 MHz System Validation Dipole

Type:

D835V2

Serial Number:

427

Place of Calibration:

Zurich

Date of Calibration:

October 15, 2002

Calibration Interval:

24 months

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:

D. Vetter

Approved by:

Christian Klatte

1. Measurement Conditions

The measurements were performed in the flat section of the new SAM twin phantom filled with head simulating solution of the following electrical parameters at 835 MHz:

Relative Dielectricity	41.3	$\pm 5\%$
Conductivity	0.88 mho/m	$\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.6 at 835 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

The dipole input power (forward power) was 250mW $\pm 3\%$. The results are normalized to 1W input power.

2 SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm ³ (1 g) of tissue:	9.64 mW/g
averaged over 10 cm ³ (10 g) of tissue:	6.20 mW/g

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	1.420 ns	(one direction)
Transmission factor:	0.992	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 835 MHz:	$\text{Re}\{Z\} = 52.1 \, \Omega$
	$\text{Im}\{Z\} = 0.4 \, \Omega$
Return Loss at 835 MHz	-33.3 dB

4. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

5. Design

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

6. Power Test

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN427_SN1507_HSL835_151002.da4

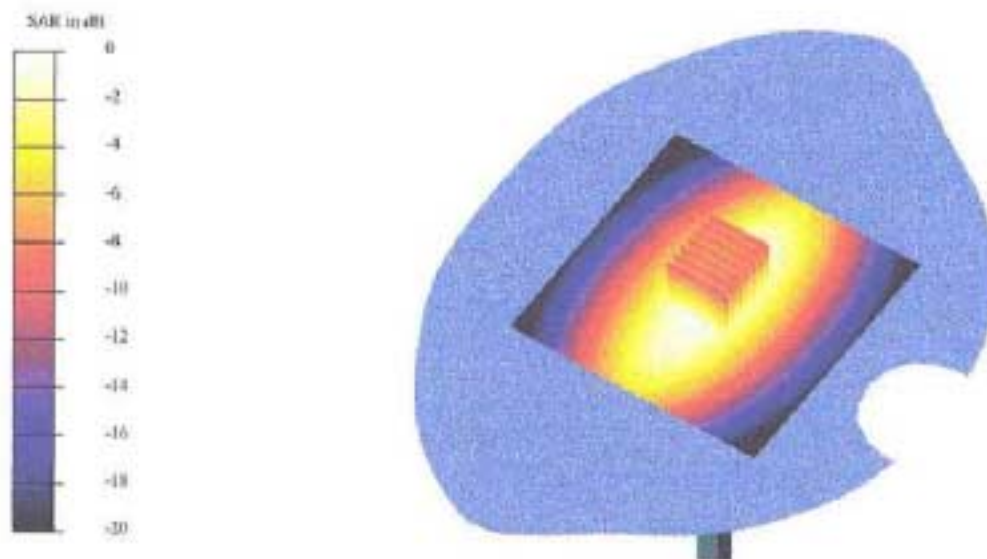
DUT: Dipole 835 MHz Type & Serial Number: D835V2 - SN427
Program: Dipole Calibration; $P_{in} = 250 \text{ mW}$; $d = 10 \text{ mm}$

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL 835 MHz ($\sigma = 0.88 \text{ mho/m}$, $\epsilon = 41.3$, $\rho = 1000 \text{ kg/m}^3$)
Phantom section: FlatSection

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6,6, 6,6, 6,6); Calibrated: 1/24/2002
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 35

Area Scan (81x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$
Reference Value = 56.3 V/m
Peak SAR = 3.61 mW/g
SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.55 mW/g
Power Drift = 0.01 dB



APPENDIX E
Illustration of Body-Worn Accessories

The purpose of this appendix is to illustrate the body-worn carry accessories for FCC ID: AZ489FT7007. The sample that was used in the following photos represents the product used to obtain the results presented herein and was used in this section to demonstrate the different body-worn accessories.



Photo 1.
Model FHN6394A
Back View



Photo 2.
Model FHN6394A
Front View



Photo 3.
Model FHN6394A
Side View



Photo 4.
Model FHN6395A
Back View



Photo 5.
Model FHN6395A
Front View



Photo 6.
Model FHN6395A
Side View



Photo 7.
Model FHN6396A
Back View



Photo 8.
Model FHN6396A
Front View



Photo 9.
Model FHN6396A
Side View

Appendix F

Accessories and options test status and separation distances

The following table summarizes the body spacing distance provided by each of the body-worn accessories:

Carry Case Model	Tested ?	Separation distances between device and phantom surface. Range (mm)	Comments
FHN6394A	No	11- 40	Similar to FHN6395A; No opening for the display and keypad
FHN6395A	Yes	11 - 40	NA
FHN6396A	Yes	12 - 16	NA