



MOTOROLA



Certificate Number: 1449-01

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: October 26, 2004
Report Revision: Rev. O
Manufacturer: Motorola
Product Description: Distributed Input Output System (DIOS); 100mW UHF 450-470MHz; 12.5KHz
FCC ID: AZ489FT4871
Device Model: F4614A (Piccolo XR), F4604A (PIU Controller)

Test Period: 9/17/04 -10/22/04

Technician: Ed Church (EME Technician Electronics II)

Responsible Eng: Deanna Zakharia (Elect. Principle Staff Eng.)

Author: Michael Sailsman (Global EME Regulatory Affairs Liaison)

Note: This report shall not be reproduced without written approval from an officially designated representative of the Motorola EME Laboratory. 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

10/27/04

Date Approved



Certificate Number: 1449-01

APPENDIX A

Power Slump Data/Shortened Scan



MOTOROLA

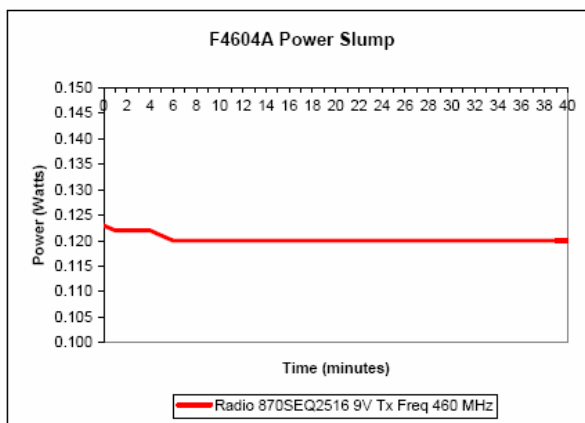


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DUT Power versus time data

PIU device

	Radio
	870SEQ2516
	9V
	Tx Freq 460 MHz
Time(Minutes)	Power (watts)
0	0.123
1	0.122
2	0.122
3	0.122
4	0.122
5	0.121
6	0.120
7	0.120
8	0.120
9	0.120
10	0.120
11	0.120
12	0.120
13	0.120
14	0.120
15	0.120
16	0.120
17	0.120
18	0.120
19	0.120
20	0.120
21	0.120
22	0.120
23	0.120
24	0.120
25	0.120
26	0.120
27	0.120
28	0.120
29	0.120
30	0.120
31	0.120
32	0.120
33	0.120
34	0.120
35	0.120
36	0.120
37	0.120
38	0.120
39	0.120
40	0.120



Shortened Scan Results

FCC ID: AZ489FT4871; Test Date: 9/20/04

Motorola CGISS EME Laboratory

Run #: EC-Ab-R1-040920-11

Model #: F4604A SN: 870SEQ2516

TX Freq: 460 MHz

Sim Temp: 20.6 C

Start Power: 123 mW

Antenna: 8588540V01

Battery Kit: 9 V

Carry Accy: NONE

Audio/Data Acc.: NONE

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

Representative “normal” scan run time was 24 minutes

“Shortened” scan max calculated S.A.R. using S.A.R. drift: 1-g Avg. = 0.32mW/g; 10-g Avg. = 0.21mW/g

“Normal” scan max calculated S.A.R. using S.A.R. drift: 1-g Avg. = 0.32mW/g; 10-g Avg. = 0.21mW/g

(see section 7.1 run # EC-Ab-R1-040920-11)

DUT right side against the phantom

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

Probe: ET3DV6 - SN1384(Cal Date 27 May 04); ConvF(7.40,7.40,7.40); Probe cal date: 27/5/04; Crest factor: 1.0; FCC

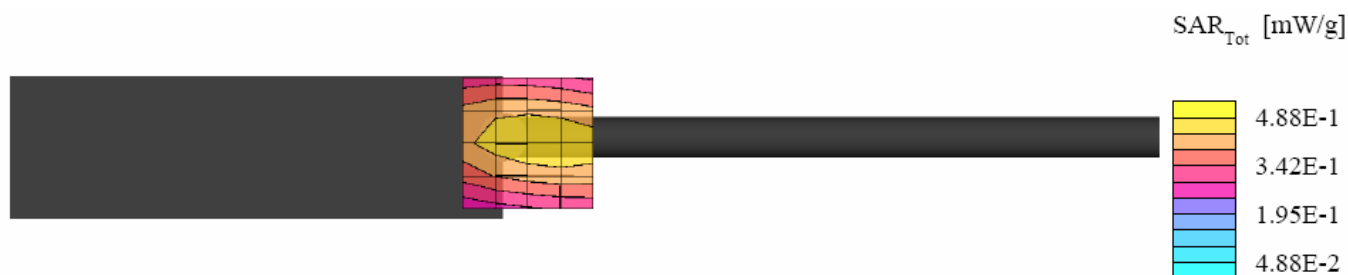
Body 460 MHz: $\sigma = 0.93$ mho/m $\epsilon_r = 54.3$ $\rho = 1.00$ g/cm³; DAE3: 363 DAE Cal Date: 05/26/2004

Cube 5x5x7: SAR (1g): 0.318 mW/g, SAR (10g): 0.212 mW/g * Max outside, (Worst-case extrapolation)

Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0; SAR (1g): 0.318 mW/g, SAR (10g): 0.212 mW/g * Max outside

Power drift: 0.01 dB

Note: “Max outside” has been identified by SPEAG as an unresolved intermittent occurrence with the DASY 3 application even when the entire peak area is captured.





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APPENDIX B

Data Results

FCC ID: AZ489FT4871; Test Date: 9/20/04
Motorola CGISS EME Laboratory

Run #: EC-Ab-R1-040920-10

Model #: F4604A SN: 870SEQ2516

TX Freq: 460 MHz

Sim Temp: 20.6 C

Start Power: 123 mW

Antenna: 8588540V01

Battery Kit: 9 V

Carry: NONE

Audio/Data Acc.: NONE

PIU DUT right side against the phantom

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

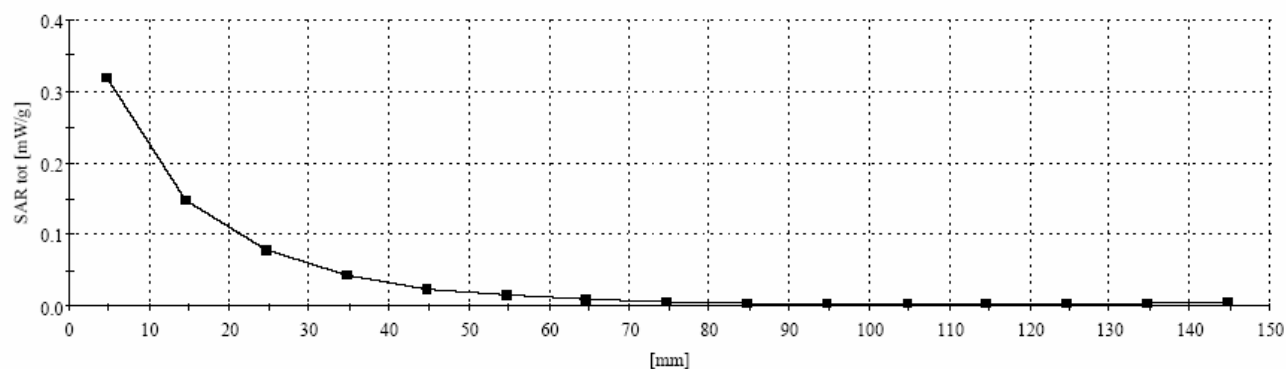
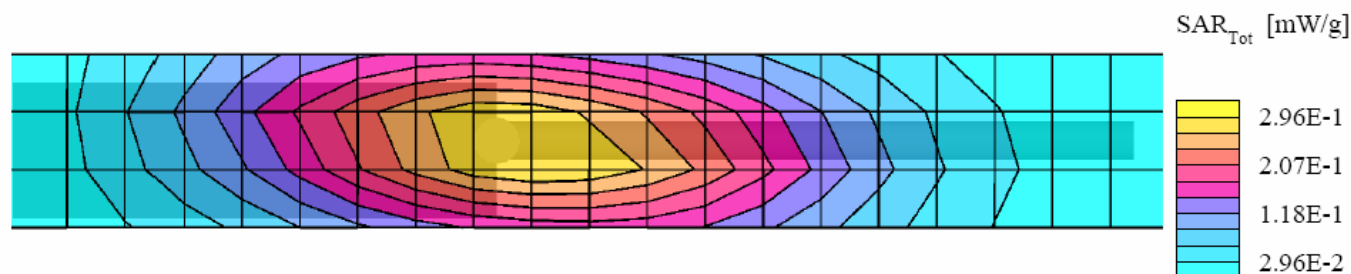
Probe: ET3DV6 - SN1384(Cal Date 27 May 04); ConvF(7.40,7.40,7.40); Probe cal date: 27/5/04; Crest factor: 1.0; FCC

Body 460 MHz: $\sigma = 0.93$ mho/m $\epsilon_r = 54.3$ $\rho = 1.00$ g/cm³; DAE3: 363 DAE Cal Date: 05/26/2004

Cube 7x7x7: SAR (1g): 0.318 mW/g, SAR (10g): 0.212 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 22.5, 130.5, 4.7

Power drift: -0.01 dB



FCC ID: AZ489FT4871; Test Date: 10/21/04

Motorola CGISS EME Laboratory

Run #: EC-Ab-R1-041021-10

Model #: F4614A SN: 870SEQ1926

TX Freq: 460 MHz

Sim Tissue Temp: 21.3 (Celsius)

Start Power: 0.125 W

Antenna: 8588540V01

Battery Kit: 6V power supply

Carry: NONE

Audio/Data Acc.: NONE

Piccolo XR DUT with back side against the phantom

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

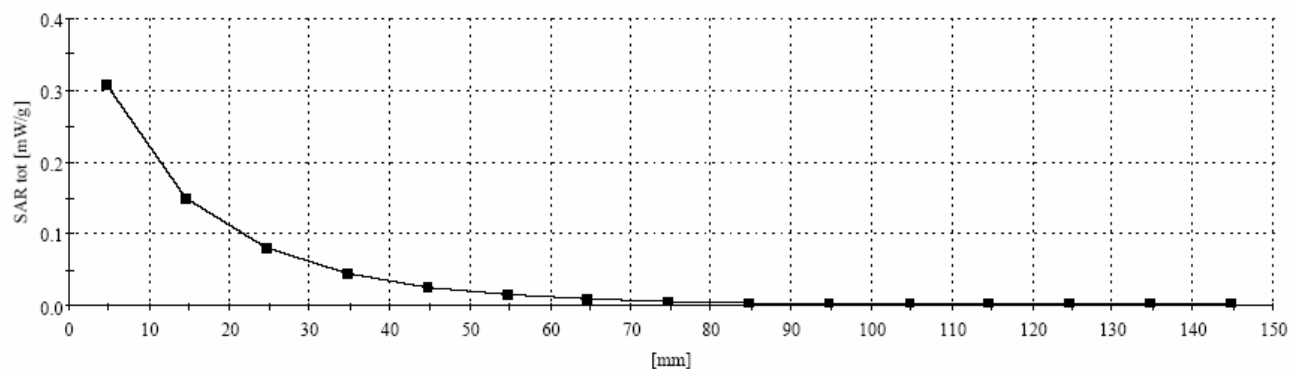
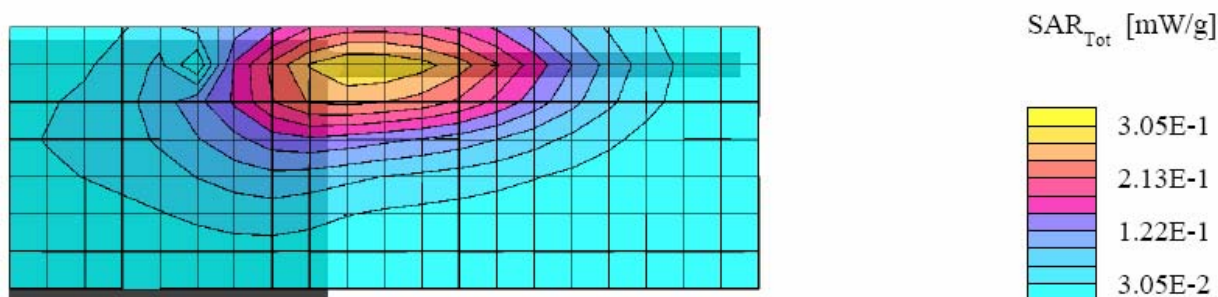
Probe: ET3DV6 - SN1384(Cal Date 27 May 04); ConvF(7.40,7.40,7.40); Probe cal date: 27/5/04; Crest factor: 1.0; FCC

Body 460 MHz: $\sigma = 0.97$ mho/m $\epsilon_r = 56.5$ $\rho = 1.00$ g/cm³; DAE3: 363 DAE Cal Date: 05/26/2004

Cube 7x7x7: SAR (1g): 0.307 mW/g, SAR (10g): 0.210 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 16.5, 139.5, 4.7

Power drift: -0.03 dB



APPENDIX C

Dipole System Performance Check Results

Dipole validation scans at the head from SPEAG are provided in APPENDIX D. 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 450 MHz Dipole; Model D450V2, SN 1002; Test Date: 9/17/04
Motorola CGISS EME Lab

Run #: Sys Perf-R1-040917-01

TX Freq: 450 MHz

Sim Tissue Temp: 21.5 (Celsius)

Start Power: 250mW

SAR target at 1W is 4.71 mW/g (1g avg, including drift)

SAR target at 1W is 3.11 mW/g (10g avg, including drift)

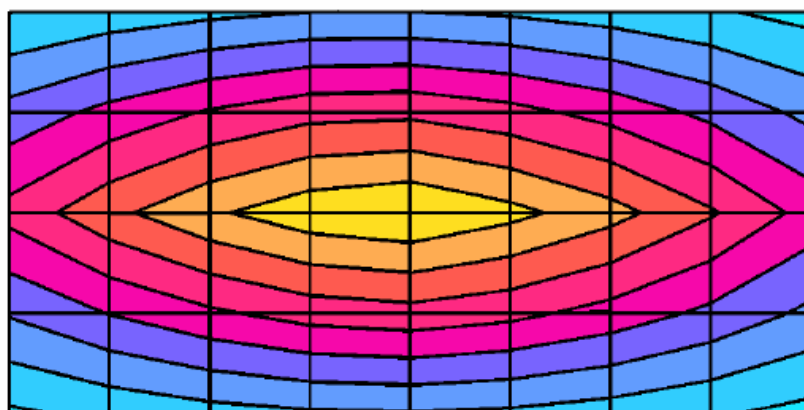
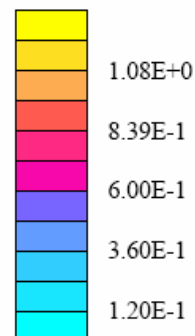
SAR calculated at 1W is 4.80 mW/g (1g avg). Percent from target (including drift) is + 1.91%

SAR calculated at 1W is 3.16 mW/g (10g avg). Percent from target (including drift) is + 1.61%

Flat Phantom; Probe: ET3DV6 - SN1384(Cal Date 27 May 04);Probe Cal Date: 27/5/04ConvF(7.40,7.40,7.40); Crest factor: 1.0; FCC Body 450 MHz: $\sigma = 0.93$ mho/m $\epsilon_r = 54.4$ $\rho = 1.00$ g/cm³; DAE3: SN363 DAE Cal Date: 05/26/2004

Cubes (2): Peak: 1.84 mW/g ± 0.02 dB, SAR (1g): 1.20 mW/g ± 0.02 dB, SAR (10g): 0.790 mW/g ± 0.02 dB, (Worst-case extrapolation)Penetration depth: 12.7 (11.4, 14.4) [mm]

Power drift: -0.00 dB


SAR_{Tot} [mW/g]


SPEAG 450 MHz Dipole; Model D450V2, SN 1002; Test Date: 9/20/04
Motorola CGISS EME Lab

Run #: Sys Perf-R1-040920-01

TX Freq: 450 MHz

Sim Tissue Temp: 20.6 (Celsius)

Start Power; 250mW

SAR target at 1W is 4.71 mW/g (1g avg, including drift)

SAR target at 1W is 3.11 mW/g (10g avg, including drift)

SAR calculated at 1W is 4.41 mW/g (1g avg). Percent from target (including drift) is - 6.37 %

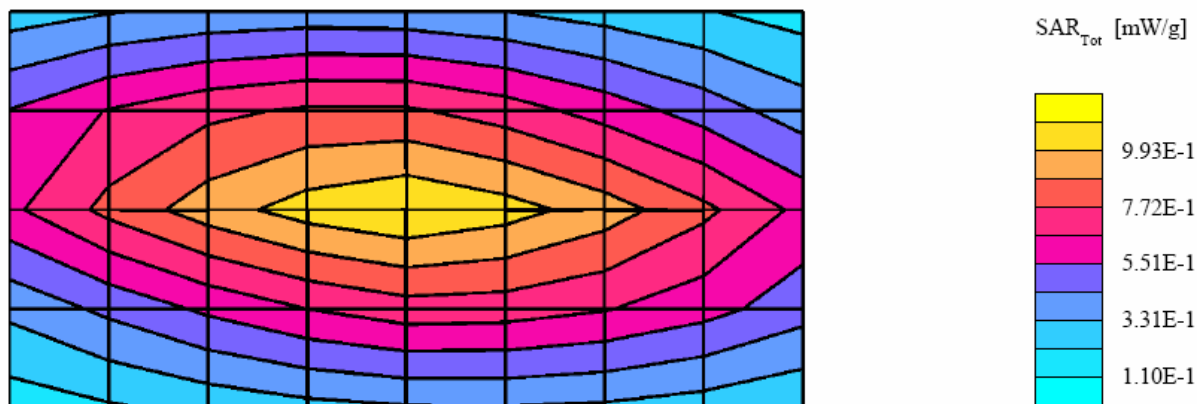
SAR calculated at 1W is 2.92 mW/g (10g avg). Percent from target (including drift) is - 6.02%

Flat Phantom; Probe: ET3DV6 - SN1384(Cal Date 27 May 04);Probe Cal Date: 27/5/04ConvF(7.40,7.40,7.40); Crest factor:

1.0; FCC Body 450 MHz: $\sigma = 0.92$ mho/m $\epsilon_r = 54.5$ $\rho = 1.00$ g/cm³; DAE3: SN363 DAE Cal Date: 05/26/2004

Cubes (2): Peak: 1.68 mW/g ± 0.04 dB, SAR (1g): 1.10 mW/g ± 0.03 dB, SAR (10g): 0.729 mW/g ± 0.02 dB, (Worst-case extrapolation)Penetration depth: 13.0 (11.6, 14.8) [mm]

Power drift: -0.01 dB



SPEAG 450 MHz Dipole; Model D450V2, SN 1002; Test Date: 9/22/04
Motorola CGISS EME Lab

Run #: Sys Perf-R1-040922-01

TX Freq: 450 MHz

Sim Tissue Temp: 20.7C

Start Power: 250mW

SAR target at 1W is 4.71 mW/g (1g avg, including drift)

SAR target at 1W is 3.11 mW/g (10g avg, including drift)

SAR calculated 1g is 4.59 mW/g percent from target (including drift) is -2.56 %

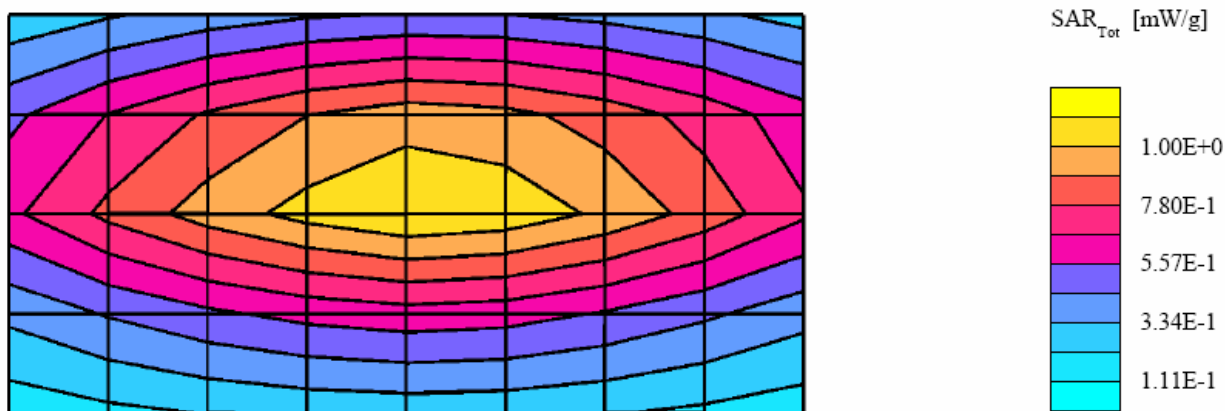
SAR calculated 10g is 3.05 mW/g Percent from target (including drift) is -1.83%

Flat Phantom; Probe: ET3DV6 - SN1384(Cal Date 27 May 04);Probe Cal Date: 27/5/04ConvF(7.40,7.40,7.40); Crest factor:

1.0; FCC Body 450 MHz: $\sigma = 0.93$ mho/m $\epsilon_r = 54.6$ $\rho = 1.00$ g/cm³; DAE3: SN:363 (5/26/04)

Cubes (2): Peak: 1.77 mW/g ± 0.01 dB, SAR (1g): 1.15 mW/g ± 0.00 dB, SAR (10g): 0.765 mW/g ± 0.00 dB, (Worst-case extrapolation) Penetration depth: 13.0 (11.6, 14.7) [mm]

Power drift: 0.01 dB



SPEAG 450 MHz Dipole; Model D450V2, SN 1001; Test Date: 10/20/04
Motorola CGISS EME Lab

Run #: Sys Perf-R1-041020-01

TX Freq: 450 MHz

Sim Tissue Temp: 21.4 C

Start Power: 250mW

SAR target at 1W is 4.58 mW/g (1g avg, including drift)

SAR target at 1W is 3.13 mW/g (10g avg, including drift)

SAR calculated 1g is 4.48 mW/g percent from target (including drift) is - 2.18 %

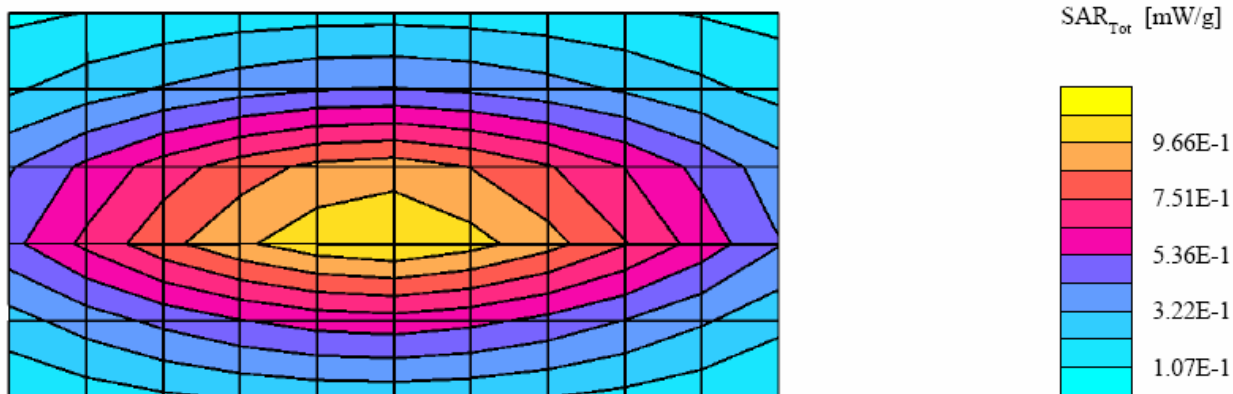
SAR calculated 10g is 2.94 mW/g Percent from target (including drift) is - 6.07 %

Flat Phantom; Probe: ET3DV6 - SN1384(Cal Date 27 May 04);Probe Cal Date: 27/5/04ConvF(7.40,7.40,7.40); Crest factor:

1.0; FCC Body 450 MHz: $\sigma = 0.92$ mho/m $\epsilon_r = 54.4$ $\rho = 1.00$ g/cm³; DAE3: SN:363 (5/26/04)

Cubes (2): Peak: 1.73 mW/g ± 0.00 dB, SAR (1g): 1.12 mW/g ± 0.00 dB, SAR (10g): 0.735 mW/g ± 0.00 dB, (Worst-case extrapolation) Penetration depth: 12.6 (11.3, 14.3) [mm]

Power drift: -0.00 dB



SPEAG 450 MHz Dipole; Model D450V2, SN 1001; Test Date: 10/21/04
Motorola CGISS EME Lab

Run #: Sys Perf-R1-041021-01

TX Freq: 450 MHz

Sim Tissue Temp: 21.4 C

Start Power: 250mW

SAR target at 1W is 4.58 mW/g (1g avg, including drift)

SAR target at 1W is 3.13 mW/g (10g avg, including drift)

SAR calculated 1g is 4.70 mW/g percent from target (including drift) is + 2.58 %

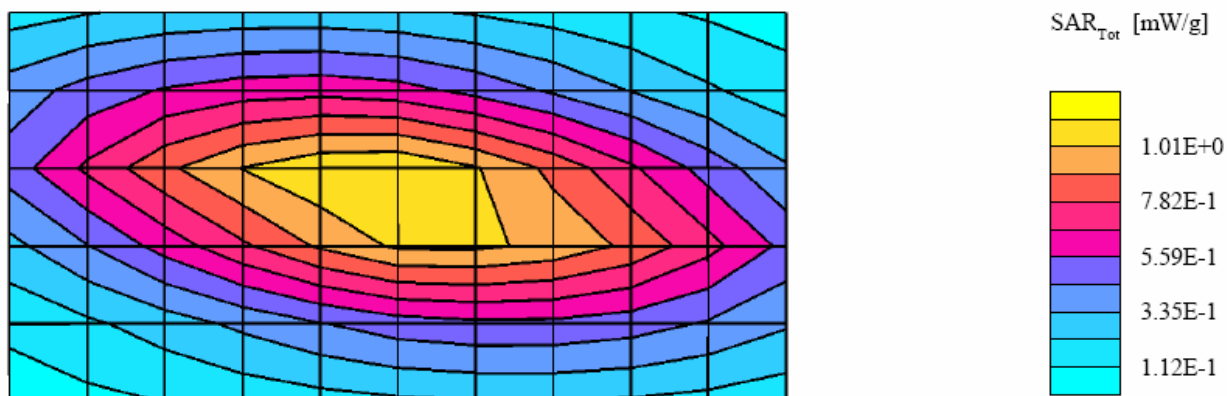
SAR calculated 10g is 3.10 mW/g Percent from target (including drift) is - 0.90 %

Flat Phantom; Probe: ET3DV6 - SN1384(Cal Date 27 May 04);Probe Cal Date: 27/5/04ConvF(7.40,7.40,7.40); Crest factor:

1.0; FCC Body 450 MHz: $\sigma = 0.97\text{mho/m}$ $\epsilon_r = 56.7$ $\rho = 1.00 \text{ g/cm}^3$; DAE3: SN:363 (5/26/04)

Cubes (2): Peak: 1.83 mW/g $\pm 0.02 \text{ dB}$, SAR (1g): 1.18 mW/g $\pm 0.02 \text{ dB}$, SAR (10g): 0.779 mW/g $\pm 0.01 \text{ dB}$, (Worst-case extrapolation)Penetration depth: 12.6 (11.3, 14.2) [mm]

Power drift: 0.02 dB



SPEAG 450 MHz Dipole; Model D450V2, SN 1001; Test Date: 10/22/04
Motorola CGISS EME Lab

Run #: Sys Perf-R1-041022-01

TX Freq: 450 MHz

Sim Tissue Temp: 21.4 C

Start Power: 250mW

SAR target at 1W is 4.58 mW/g (1g avg, including drift)

SAR target at 1W is 3.13 mW/g (10g avg, including drift)

SAR calculated 1g is 4.73 mW/g percent from target (including drift) is + 3.29 %

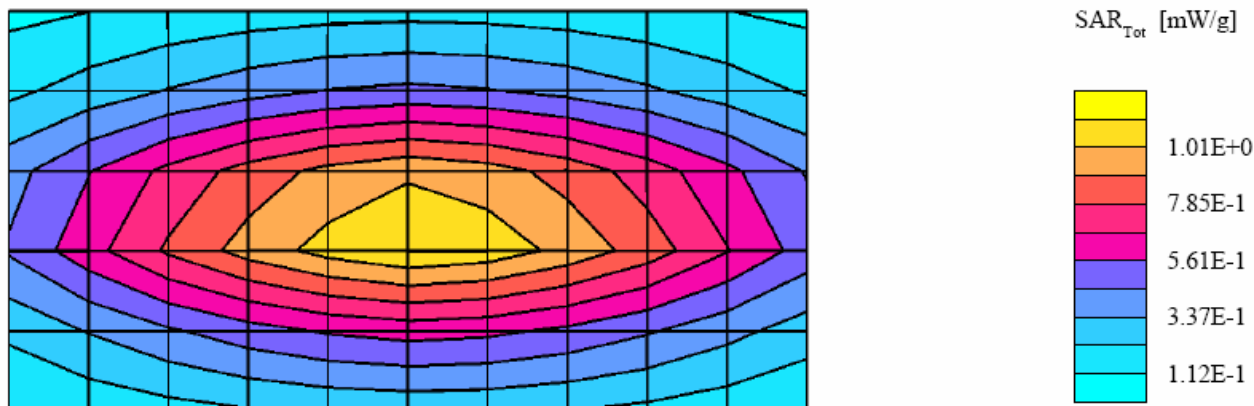
SAR calculated 10g is 3.12 mW/g Percent from target (including drift) is - 0.47 %

Flat Phantom; Probe: ET3DV6 - SN1384(Cal Date 27 May 04);Probe Cal Date: 27/5/04ConvF(7.40,7.40,7.40); Crest factor:

1.0; FCC Body 450 MHz: $\sigma = 0.96$ mho/m $\epsilon_r = 54.3$ $\rho = 1.00$ g/cm³; DAE3: SN:363 (5/26/04)

Cubes (2): Peak: 1.83 mW/g ± 0.01 dB, SAR (1g): 1.18 mW/g ± 0.02 dB, SAR (10g): 0.777 mW/g ± 0.02 dB, (Worst-case extrapolation)Penetration depth: 12.6 (11.2, 14.3) [mm]

Power drift: -0.01 dB





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Certificate Number: 1449-01

SYSTEM VALIDATION

Date:	<u>08/05/2004</u>	Frequency (MHz):	<u>450</u>
Lab Location:	<u>CGISS</u>	Mixture Type:	<u>450-IEEE Head</u>
Robot System:	<u>CGISS-2</u>	Ambient Temp.(°C):	<u>20.9</u>
Probe Serial #:	<u>1393</u>	Tissue Temp.(°C):	<u>20.4</u>
DAE Serial #:	<u>DAE3V1 SN374</u>		

Tissue Characteristics	Phantom Type/SN:	<u>80302002B/S6</u>
Permittivity: <u>43.6</u>	Distance (mm):	<u>15</u>
Conductivity: <u>0.85</u>		

Reference Source: Dipole (Dipole/Handset)
Reference SN: 1001

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

Target SAR Value: 4.90 mW/g (1g avg.), 3.30 mW/g (10g avg.)
(Normalized to 1.0 W)

Measured SAR Value: 1.18 mW/g (1g avg.), 0.785 mW/g (10g avg.)
Power Drift: -0.03 dB

Measured SAR Value: 4.75 mW/g (1g avg.), 3.16 mW/g (10g avg.)
(normalized to 1.0 W,
with drift compensation)

Percent Difference From Target (must be within System Uncertainty): 3.0 % (1g avg)
4.2 % (10g avg)

Test performed by: Kim Uong

Initial: 



08/05/04

Dipole D450V2 ; Test date:08/05/04

Run #: Sys Perf-R2-040805-12

Phantom #: 80302002B/S6

Model #: D450V2 SN: 1001

Tester: K. Uong

Robot: CGISS-2

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

TX Freq: 450 MHz

Sim Tissue Temp: 20.4C

Start Power: 250mW

Target:

4.75 mW/g for 1g SAR, 3.16 mW/g for 10g SAR +/- 10% from system performance target

Flat; Probe: ET3DV6 - SN1393 (Cal Date 28/04/04); ConvF(7.70,7.70,7.70); Crest factor: 1.0; IEEE Head
450 MHz: $\sigma = 0.85$ mho/m $\epsilon_r = 43.6$ $\rho = 1.00$ g/cm³

Cubes (2): Peak: 1.82 mW/g ± 0.01 dB, SAR (1g): 1.18 mW/g ± 0.02 dB, SAR (10g): 0.785 mW/g ± 0.02 dB, (Worst-case extrapolation)

Penetration depth: 12.8 (11.6, 14.4) [mm]

Powerdrift: -0.03 dB



SAR_{Tot} [mW/g]





MOTOROLA



Certificate Number: 1449-01

SYSTEM PERFORMANCE CHECK TARGET SAR

Date:	<u>08/05/2004</u>	Frequency (MHz):	<u>450</u>
Lab Location:	<u>CGISS</u>	Mixture Type:	<u>450-FCC Body</u>
Robot System:	<u>CGISS-2</u>	Ambient Temp.(°C):	<u>20.7</u>
Probe Serial #:	<u>1393</u>	Tissue Temp.(°C):	<u>20.3</u>
DAE Serial #:	<u>DAE3V1 SN374</u>		

Tissue Characteristics		Phantom Type/SN:	<u>80602002C/S7</u>
Permittivity:	<u>55.8</u>	Distance (mm):	<u>15</u>
Conductivity:	<u>0.92</u>		

Reference Source:	<u>Dipole (Dipole)</u>
Reference SN:	<u>1001</u>
Power to Dipole:	<u>250 mW</u>

Measured SAR Value:	<u>1.15 mW/g (1g avg.), 0.768 mW/g (10g avg.)</u>
Power Drift:	<u>0.02 dB</u>

New Target/Measured SAR Value:	<u>4.58 mW/g (1g avg.), 3.13 mW/g (10g avg.)</u>
(Normalized to 1.0 W, with drift compensation)	

Test performed by: Kim Uong

Initial: KU



08/05/04

Dipole D450V2 ; Test date:08/05/04

Run #: Sys Perf-R2-040805-02

Phantom #: 80302002C/S7

Model #: D450V2 SN: 1001

Tester: K. Uong

Robot: CGISS-2

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

TX Freq: 450 MHz

Sim Tissue Temp: 20.3 C

Start Power: 250mW

Target:

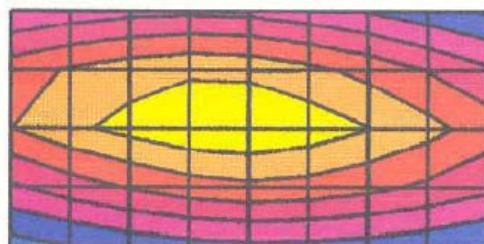
4.58 mW/g for 1g SAR, 3.13 mW/g for 10g SAR +/- 10% from system performance target

Flat (2); Probe: ET3DV6 - SN1393 (Cal Date 28/04/04); ConvF(7.70,7.70,7.70); Crest factor: 1.0; FCC Body 450: $\sigma = 0.92$ mho/m $\epsilon_r = 55.8$ $\rho = 1.00$ g/cm³

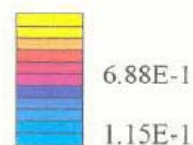
Cubes (2): Peak: 1.74 mW/g ± 0.02 dB, SAR (1g): 1.15 mW/g ± 0.03 dB, SAR (10g): 0.768 mW/g ± 0.03 dB, (Worst-case extrapolation)

Penetration depth: 13.2 (11.9, 14.9) [mm]

Powerdrift: 0.02 dB



SAR_{Tot} [mW/g]



**MOTOROLA**

Certificate Number: 1449-01

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 cnt)</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.)
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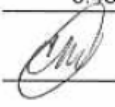
(normalized to 1.0 W)

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.)
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(normalized to 1.0 W, including drift)

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

Test performed by:	<u>C. Miller</u>	Initial:	<u></u>
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MOTOROLA



Certificate Number: 1449-01

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

Run #: Sys Perf 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

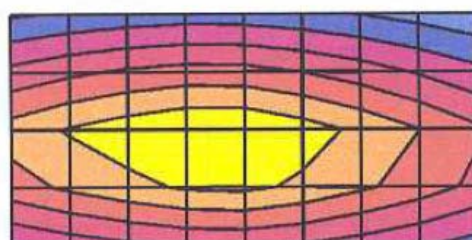
Flat (2); Probe: ET3DV6R - SN1545(cal Date 28 Aug 2003); ConvF(7.00,7.00,7.00); Crest factor: 1.0; IEEE

Head 450 MHz: $\sigma = 0.86$ mho/m $\epsilon_r = 44.3$ $\rho = 1.00$ g/cm³

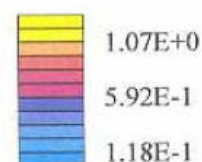
Cubes (2): Peak: 1.83 mW/g ± 0.08 dB, SAR (1g): 1.18 mW/g ± 0.07 dB, SAR (10g): 0.778 mW/g ± 0.07 dB, (Worst-case extrapolation)

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

Powerdrift: -0.01 dB



SAR_{Tot} [mW/g]



Motorola CGISS EME Lab

**MOTOROLA**

Certificate Number: 1449-01

SYSTEM PERFORMANCE CHECK TARGET SAR

Date:	<u>4/14/2004</u>	Frequency (MHz):	<u>450</u>
Lab Location:	<u>CGISS</u>	Mixture Type:	<u>FCC Body</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>56.3</u>	Phantom Type/SN:	<u>80302002A/S8</u>
Conductivity:	<u>0.94</u>	Distance (mm):	<u>15 (tissue/dipole cnt)</u>

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

Power to Dipole: 250 mW

Measured SAR Value:	<u>1.17</u> mW/g,	<u>0.773</u> mW/g (10g avg.)
Power Drift:	<u>-0.03</u> 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: 



MOTOROLA



Certificate Number: 1449-01

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

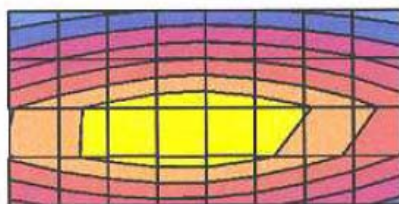
Flat (2); Probe: ET3DV6R - SN1545(cal Date 28 Aug 2003); ConvF(7.00,7.00,7.00); Crest factor: 1.0; FCC

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

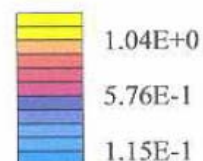
Cubes (2): Peak: 1.79 mW/g ± 0.09 dB, SAR (1g): 1.17 mW/g ± 0.08 dB, SAR (10g): 0.773 mW/g ± 0.07 dB, (Worst-case extrapolation)

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

Powerdrift: -0.03 dB



SAR_{Tot} [mW/g]



Motorola CGISS EME Lab



Certificate Number: 1449-01

APPENDIX D

Probe/Dipole Calibration Certificates

**MOTOROLA**

Certificate Number: 1449-01

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 27, 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	5-May-04 (METAS, No 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No 251-00388)	May-05
Reference 20 dB Attenuator	SN: 5086 (20b)	3-May-04 (METAS, No 251-00389)	May-05
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 HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (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: May 27, 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.



ET3DV6 SN:1384

May 27, 2004

DASY - Parameters of Probe: ET3DV6 SN:1384

Sensitivity in Free Space

Diode Compression^A

NormX	1.78 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.76 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.91 $\mu\text{V}/(\text{V}/\text{m})^2$

DCP X	92	mV
DCP Y	92	mV
DCP Z	92	mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	9.9	4.9
SAR _{be} [%]	With Correction Algorithm	0.1	0.4

Head 1800 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	14.1	9.0
SAR _{be} [%]	With Correction Algorithm	0.3	0.1

Sensor Offset

Probe Tip to Sensor Center	2.7 mm
Optical Surface Detection	in tolerance

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



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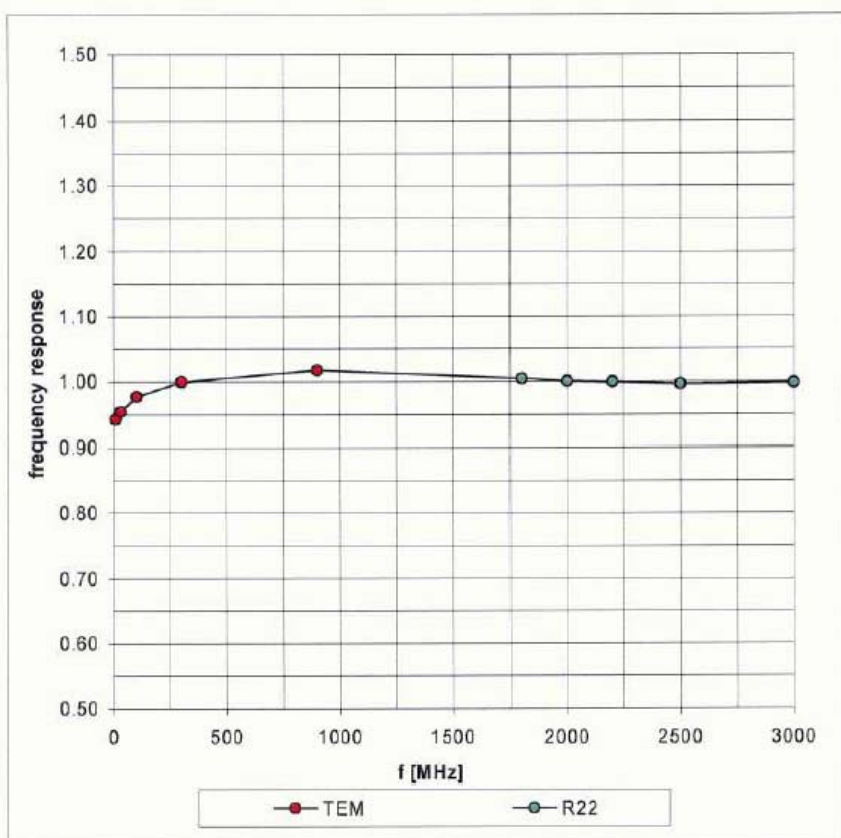
Certificate Number: 1449-01

ET3DV6 SN:1384

May 27, 2004

Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)





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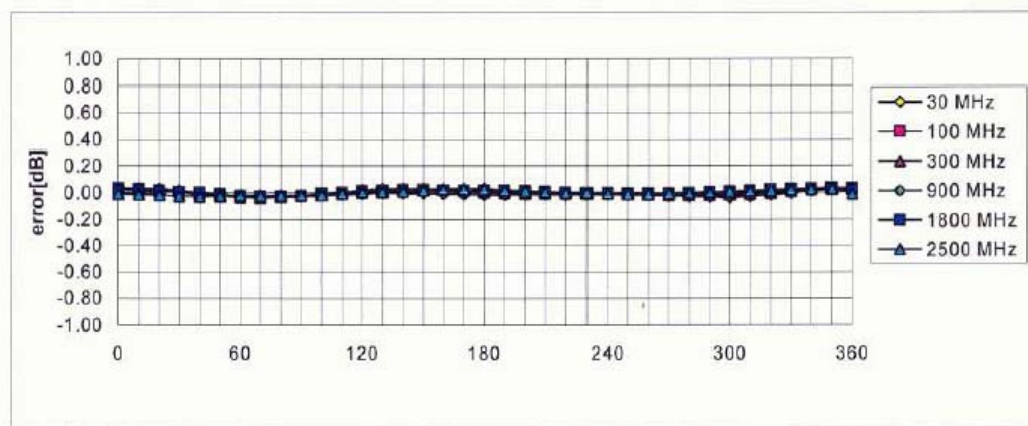
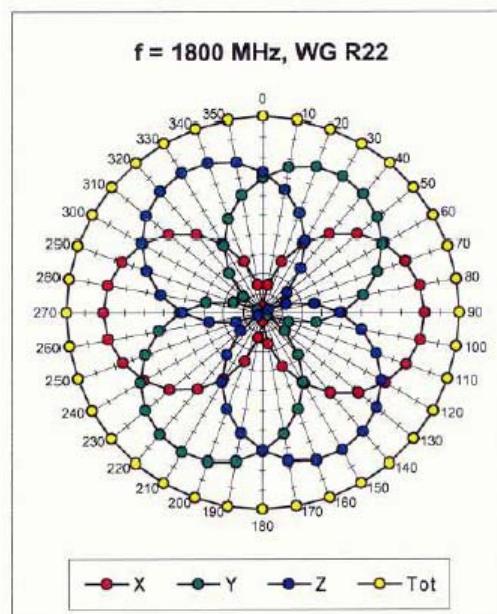
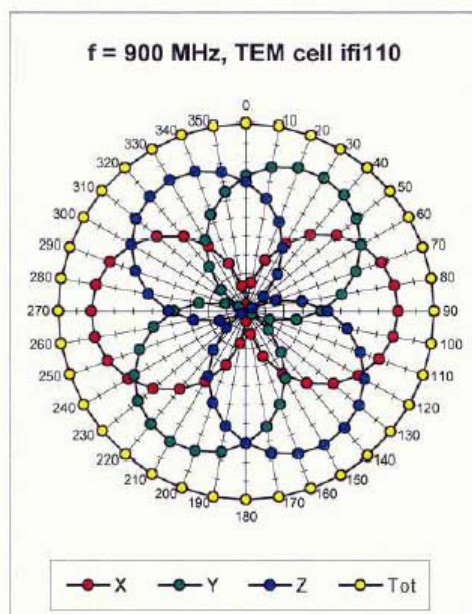


Certificate Number: 1449-01

ET3DV6 SN:1384

May 27, 2004

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



Axial Isotropy Error $< \pm 0.2$ dB



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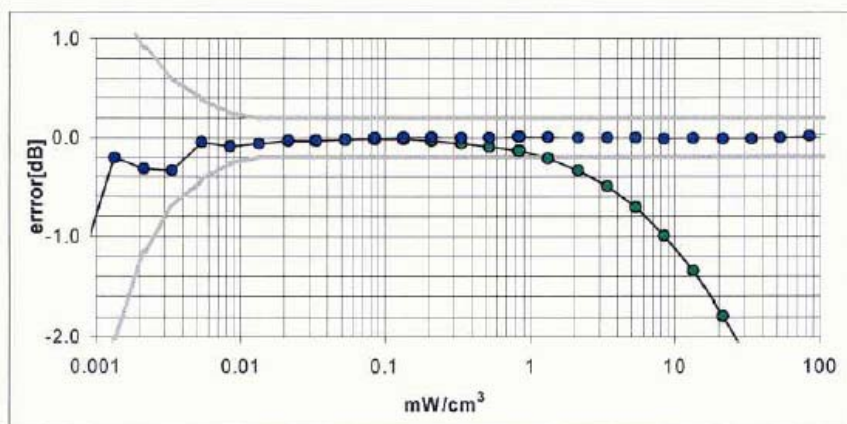
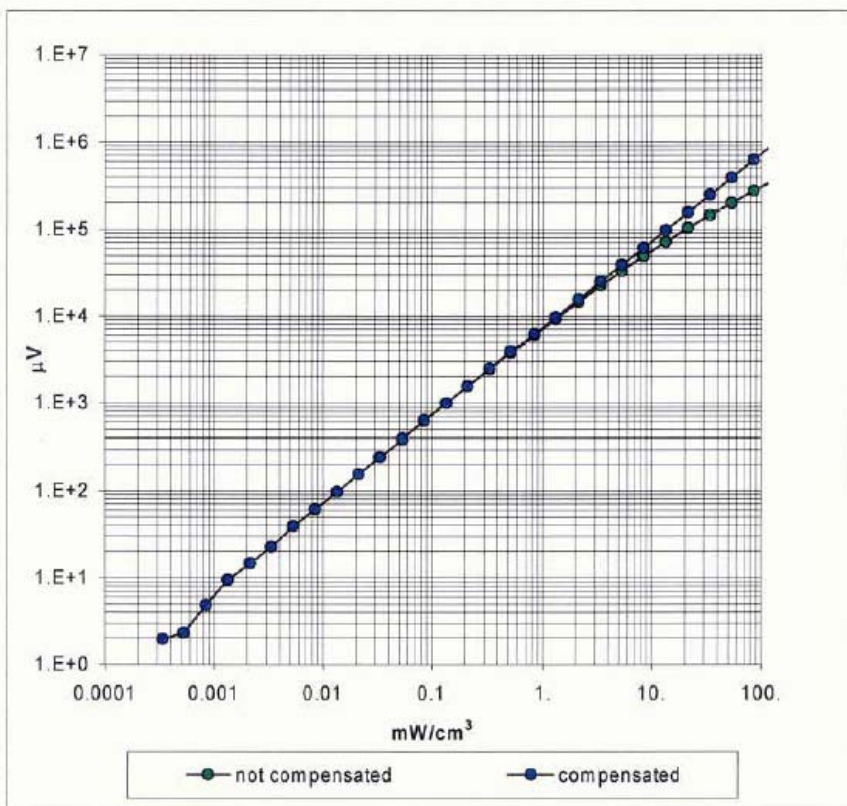


Certificate Number: 1449-01

ET3DV6 SN:1384

May 27, 2004

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



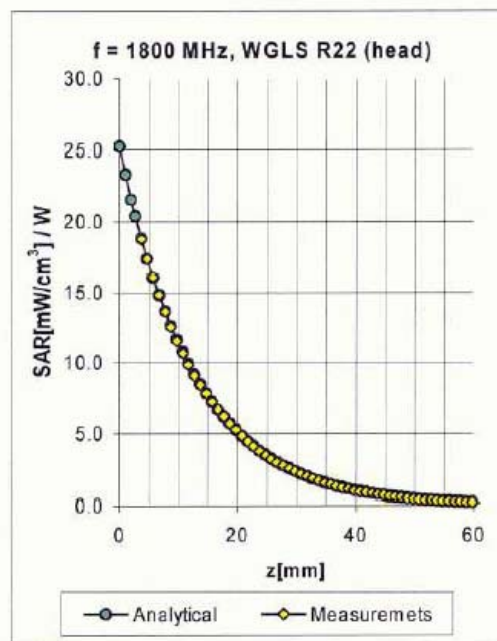
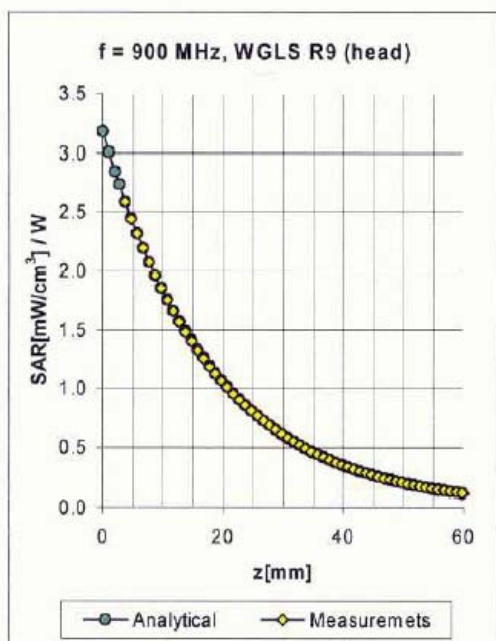
Probe Linearity Error $< \pm 0.2$ dB



ET3DV6 SN:1384

May 27, 2004

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%	0.79	1.71	6.53 ± 9.5% (k=2)
1800	1710-1910	Head	40.0 ± 5%	1.40 ± 5%	0.58	2.42	5.32 ± 9.5% (k=2)
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	1.05	1.94	4.70 ± 9.5% (k=2)
900	800-1000	Body	55.0 ± 5%	1.05 ± 5%	0.61	2.06	6.09 ± 9.5% (k=2)
1800	1710-1910	Body	53.3 ± 5%	1.52 ± 5%	0.63	2.64	4.81 ± 9.5% (k=2)
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	1.81	1.29	4.64 ± 9.5% (k=2)

^B The stated uncertainty of calibration is according to P1528.



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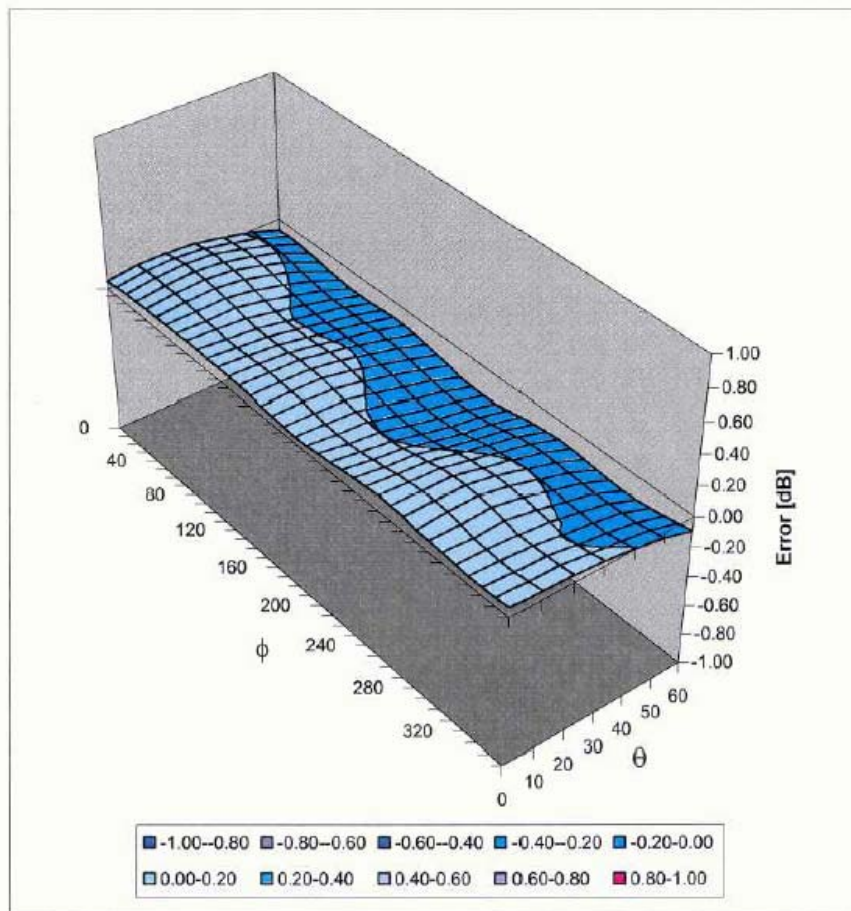
Certificate Number: 1449-01

ET3DV6 SN:1384

May 27, 2004

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



Spherical Isotropy Error $< \pm 0.4$ dB

**MOTOROLA**

Certificate Number: 1449-01

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

Client **Motorola CGISS**

CALIBRATION CERTIFICATE

Object(s) **D450V2 - SN:1001**

Calibration procedure(s) **QA CAL-15.v2**
Calibration procedure for dipole validation kits below 800 MHz

Calibration date: **May 22, 2004**

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

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	5-May-04 (METAS, No 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No 251-00388)	May-05
Reference 20 dB Attenuator	SN: 5086 (20b)	3-May-04 (METAS, No 251-00389)	May-05
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 HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Laboratory Director	
Approved by:	Fin Bomholt	R&D Director	

Date issued: May 24, 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.



D450V2- SN:1001

1. Measurement Conditions

The measurements were performed in the 6mm thick flat phantom filled with head simulating liquid of the following electrical parameters at 450 MHz:

Relative Dielectricity	45.1	± 5%
Conductivity	0.85 mho/m	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.45 at 450 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center of the flat phantom and the dipole was oriented parallel to the longer side of the phantom. The standard measuring distance was 15mm from dipole center to the liquid surface including the 6mm thick phantom shell. The included distance spacer 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 398 mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement with DASY 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:	5.28 mW/g ± 20.7 % (k=2) ¹
averaged over 10 cm ³ (10 g) of tissue:	3.52 mW/g ± 20.2 % (k=2) ¹



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:	1.346 ns	(one direction)
Transmission factor:	0.991	(voltage transmission, one direction)

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

Feedpoint impedance at 450 MHz:	$\text{Re}\{Z\} = 53.0 \Omega$
---------------------------------	--------------------------------

	$\text{Im}\{Z\} = -11.1 \Omega$
--	---------------------------------

Return Loss at 450 MHz	-19.2 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.



MOTOROLA



Certificate Number: 1449-01

Test Laboratory: SPEAG, Zurich, Switzerland
DUT: Dipole 450 MHz; Serial: D450V2 - SN:1001

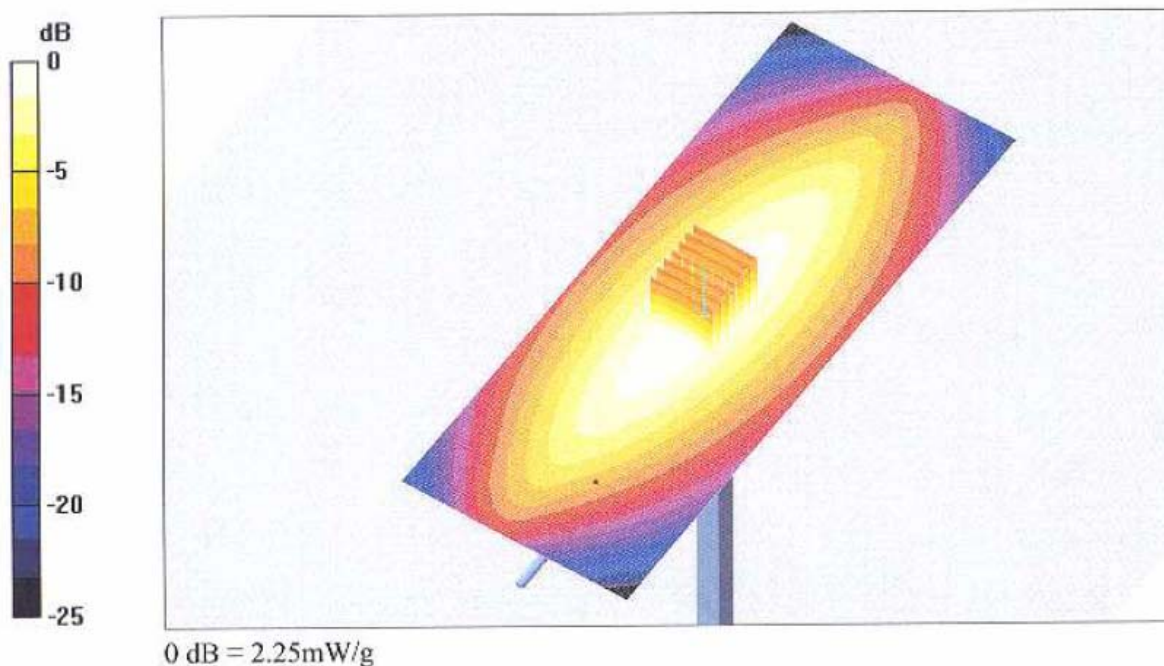
Communication System: CW; Duty Cycle: 1:1; Medium: HSL450
Medium parameters used: $f = 450 \text{ MHz}$; $\sigma = 0.85 \text{ mho/m}$; $\epsilon_r = 45.1$; $\rho = 1000 \text{ kg/m}^3$
Phantom: Flat Phantom 4.4; Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.45, 6.45, 6.45);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 600; Calibrated: 9/30/2003
- Measurement SW: DASY4, V4.2 Build 44;

d=15mm, Pin=398mW/Area Scan (71x181x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Reference Value = 52.5 V/m; Power Drift = -0.0 dB
Maximum value of SAR (interpolated) = 2.21 mW/g

d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
Reference Value = 52.5 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 2.25 mW/g
Peak SAR (extrapolated) = 3.18 W/kg
SAR(1 g) = 2.1 mW/g; SAR(10 g) = 1.4 mW/g





MOTOROLA



Certificate Number: 1449-01

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

Client **Motorola CGISS**

CALIBRATION CERTIFICATE

Object(s) **D450V2 - SN:1002**

Calibration procedure(s) **QA CAL-15.v2
Calibration procedure for dipole validation kits below 800 MHz**

Calibration date: **March 13, 2004**

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

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS No. 251-0340)	Apr-04
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 HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Laboratory Director	

	Name	Function	Signature
Approved by:	Fin Bonholt	R&D Director	

Date issued: March 13, 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.



1. Measurement Conditions

The measurements were performed in the 6mm thick flat phantom filled with **head** simulating liquid of the following electrical parameters at 450 MHz:

Relative Dielectricity	45.1	$\pm 5\%$
Conductivity	0.85 mho/m	$\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.45 at 450 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center of the flat phantom and the dipole was oriented parallel to the longer side of the phantom. The standard measuring distance was 15mm from dipole center to the liquid surface including the 6mm thick phantom shell. The included distance spacer 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 $398 \text{ mW} \pm 3 \%$. The results are normalized to 1W input power.

2. SAR Measurement with DASY 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:	5.33 mW/g $\pm 20.7 \%$ $(k=2)^1$
averaged over 10 cm^3 (10 g) of tissue:	3.55 mW/g $\pm 20.2 \%$ $(k=2)^1$



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:	1.351 ns	(one direction)
Transmission factor:	0.993	(voltage transmission, one direction)

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

Feedpoint impedance at 450 MHz:	$\text{Re}\{Z\} = 54.0 \, \Omega$
---------------------------------	-----------------------------------

	$\text{Im}\{Z\} = -8.5 \, \Omega$
--	-----------------------------------

Return Loss at 450 MHz	-21.1 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.



Date/Time: 03/13/04 14:31:46

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 450 MHz; Serial: D450V2 - SN:1002

Communication System: CW; Duty Cycle: 1:1; Medium: HSL450

Medium parameters used: $f = 450 \text{ MHz}$; $\sigma = 0.85 \text{ mho/m}$; $\epsilon_r = 45.1$; $\rho = 1000 \text{ kg/m}^3$ **DASY4 Configuration:**

- Probe: ET3DV6 - SN1507; ConvF(6.45, 6.45, 6.45); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 600; Calibrated: 9/30/2003
- Phantom: Flat Phantom 4.4; Phantom section: Flat Section
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

d=15mm, Pin=398mW/Area Scan (61x161x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Reference Value = 53 V/m; Power Drift = -0.0 dB

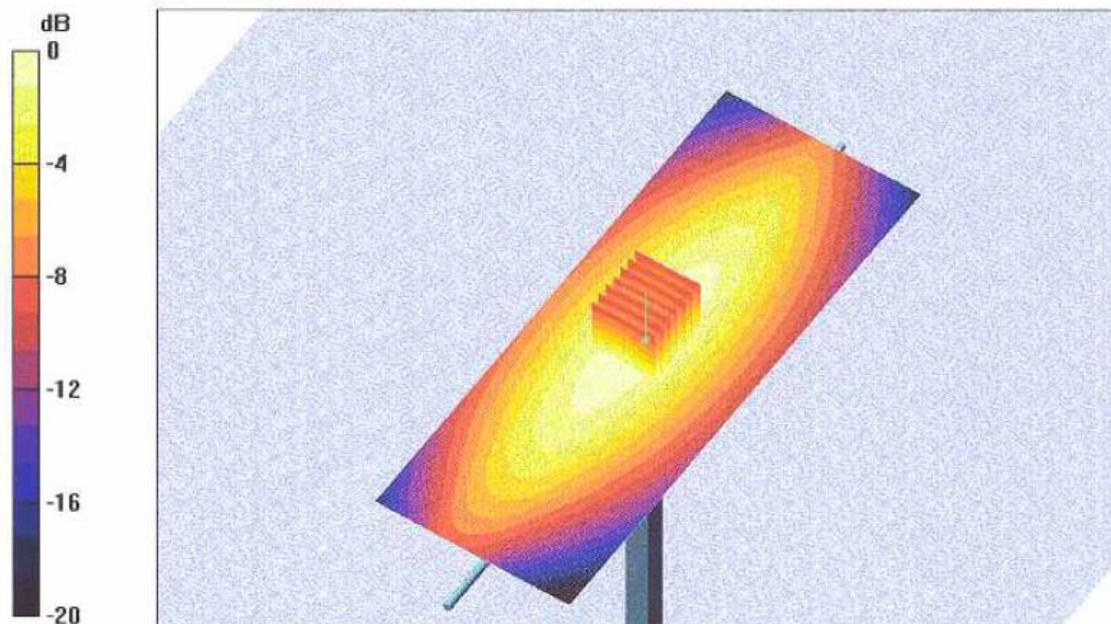
Maximum value of SAR (interpolated) = 2.25 mW/g

d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 2.28 mW/g

Peak SAR (extrapolated) = 3.24 W/kg

SAR(1 g) = 2.12 mW/g; SAR(10 g) = 1.41 mW/g



Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 450 MHz; Serial: D450V2 - SN:1002

Communication System: CW; Duty Cycle: 1:1; Medium: HSL450

Medium parameters used: $f = 450 \text{ MHz}$; $\sigma = 0.85 \text{ mho/m}$; $\epsilon_r = 45.1$; $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.45, 6.45, 6.45); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 600; Calibrated: 9/30/2003
- Phantom: Flat Phantom 4.4; Phantom section: Flat Section
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

d=15mm, Pin=398mW/Area Scan (61x161x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 53 V/m; Power Drift = -0.0 dB

Maximum value of SAR (interpolated) = 2.25 mW/g

d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

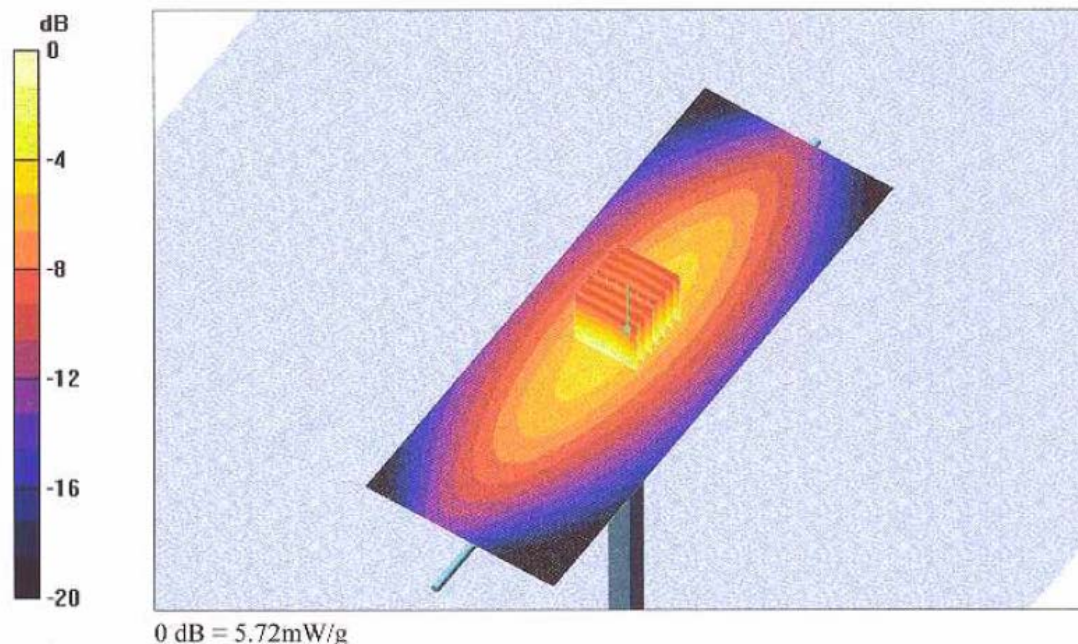
Reference Value = 53 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 5.72 mW/g

Peak SAR (extrapolated) = 8.13 W/kg

SAR(1 g) = 5.33 mW/g; SAR(10 g) = 3.55 mW/g

Normalized to target power = 1 W and actual power = 0.398 W



APPENDIX E

Illustration of Body-Worn Accessories

The purpose of this appendix is to illustrate the body-worn carry accessory offered for FCC ID: AZ489FT4871. The sample that was used in the following photos represents the product used to obtain the results presented herein.



Photo 1.
Model 5687511V73A
Front View



Photo 2.
Model 5687511V73A
Back View



Photo 3.
Model 5687511V73A
Side View

Appendix F

Accessories and options test status and separation distances

The following table summarizes the test status and separation distance provided by each of the body-worn accessories:

Carry Case Models	Tested ?	Min. Separation distances between DUT antenna and phantom surface. (mm)	Comments
5687511V73	Yes	24-35	NA

Data cable Models	Tested ?	Separation distances between DUT antenna and phantom surface. (mm)	Comments
FKN8171A	Yes	NA	NA
FTN6597A	Yes	NA	NA
FTN6625A	Yes	NA	NA
FKN8199A	No	NA	Similar to FKN8171A

Other attachment models	Tested ?	Separation distances between DUT antenna and phantom surface. (mm)	Comments
FKN8203A	No	NA	PIU to PIU cable – used for programming other PIUs
FKN8204A	No	NA	3 pin battery cable – installation part
FKN8250A	No	NA	DC power cable – installation part
FCN6538A	No	NA	PIU DC adaptor used when hardwired in the field