



Author Data Daoud S. Attayi	Dates of Test July 18 – August 12, 2002	Test Report No RIM-0207-04
Approved	Rev	FCC ID : L6AR6510IN

APPENDIX A: SAR DISTRIBUTION COMPARISON FOR THE ACCURACY VERIFICATION

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### Dipole 835

SAM 1; Flat

Probe: ET3DV6 - SN1644; ConvF(6.51,6.51,6.51); Crest factor: 1.0; Head 835 MHz:  $\sigma = 0.94$  mho/m  $\epsilon_r = 42.6$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 5x5x7: Peak: 18.5 mW/g, SAR (1g): 11.5 mW/g, SAR (10g): 7.23 mW/g, (Worst-case extrapolation)

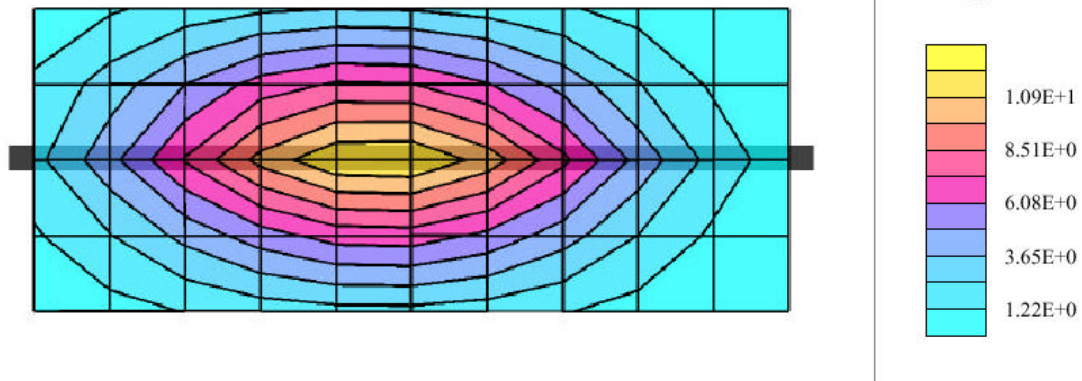
Penetration depth: 11.6 (10.3, 13.5) [mm]

Powerdrift: -0.00 dB

Tested on July 18, 2002

Ambient temperature: 22.7 deg. cel.

Liquid temperature: 21.6 deg. cel.



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### Dipole 835

SAM 1; Flat

Probe: ET3DV6 - SN1642; ConvF(6.50,6.50,6.50); Crest factor: 1.0; Head 835 MHz:  $\sigma = 0.91 \text{ mho/m}$   $\epsilon_r = 40.5$   $\rho = 1.00 \text{ g/cm}^3$

Cube 5x5x7: Peak: 19.0 mW/g, SAR (1g): 11.5 mW/g, SAR (10g): 7.18 mW/g, (Worst-case extrapolation)

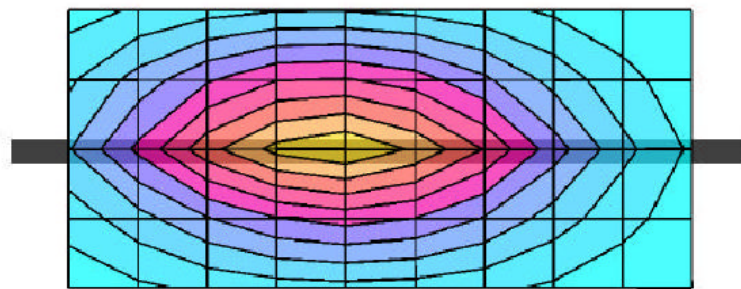
Penetration depth: 11.4 (9.7, 13.7) [mm]

Powerdrift: -0.02 dB

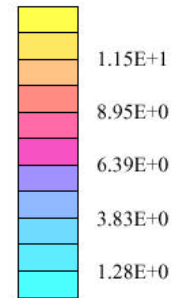
Tested on August 12, 2002

Ambient temperature: 21.8 deg. cel.

Liquid temperature: 21.0 deg. cel.



SAR<sub>Tot</sub> [mW/g]





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APPENDIX B: SAR DISTRIBUTION PLOTS FOR HEAD CONFIGURATION

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## BlackBerry Wireless Handheld Model No. R6510IN

SAM 1; Left Hand

Probe: ET3DV6 - SN1644; ConvF(6.51,6.51,6.51); Crest factor: 3.0; Head 835 MHz:  $\sigma = 0.94$  mho/m  $\epsilon_r = 42.6$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 5x5x7: Peak: 1.27 mW/g, SAR (1g): 0.842 mW/g, SAR (10g): 0.576 mW/g, (Worst-case extrapolation)

Penetration depth: 14.3 (12.6, 16.0) [mm]

Powerdrift: -0.04 dB

Tested on July 19, 2002

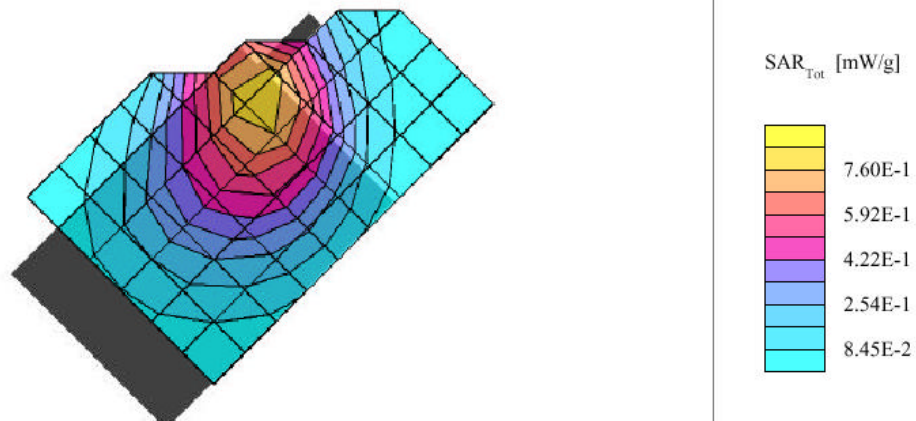
Tilted left side of head

Retracted antenna

Room temp. 21.7 deg. cel.

Liquid temp. 21.5 deg. cel.

Frequency: 806.0125 MHz



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### BlackBerry Wireless Handheld Model No. R6510IN

SAM 1; Left Hand

Probe: ET3DV6 - SN1644; ConvF(6.51,6.51,6.51); Crest factor: 3.0; Head 835 MHz:  $\sigma = 0.94$  mho/m  $\epsilon_r = 42.6$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 5x5x7: Peak: 0.911 mW/g, SAR (1g): 0.590 mW/g, SAR (10g): 0.401 mW/g, (Worst-case extrapolation)

Penetration depth: 13.8 (11.4, 16.9) [mm]

Powerdrift: -0.07 dB

Tested on July 19, 2002

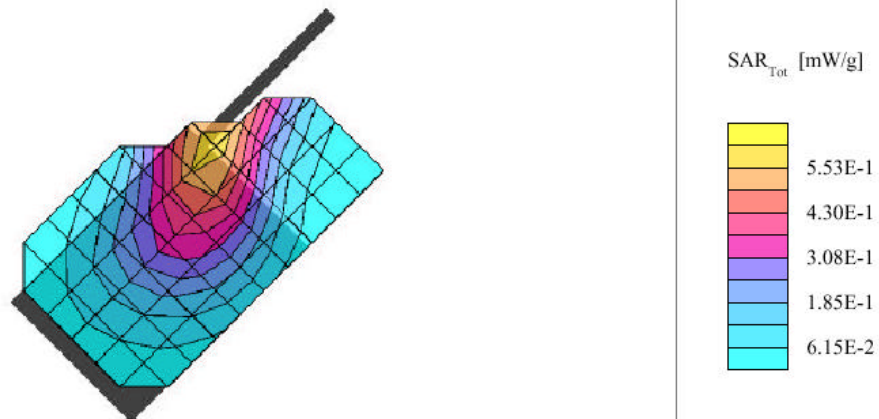
Tilted left side of head

Extended antenna

Room temp. 21.7 deg. cel.

Liquid temp. 21.5 deg. cel.

Frequency: 806.0125 MHz



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## BlackBerry Wireless Handheld Model No. R6510IN

SAM 1; Righ Hand

Probe: ET3DV6 - SN1644; ConvF(6.51,6.51,6.51); Crest factor: 3.0; Head 835 MHz:  $\sigma = 0.94$  mho/m  $\epsilon_r = 42.6$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 5x5x7: Peak: 1.68 mW/g, SAR (1g): 1.03 mW/g, SAR (10g): 0.654 mW/g, (Worst-case extrapolation)

Penetration depth: 12.0 (10.5, 13.9) [mm]

Powerdrift: 0.00 dB

Tested on July 19, 2002

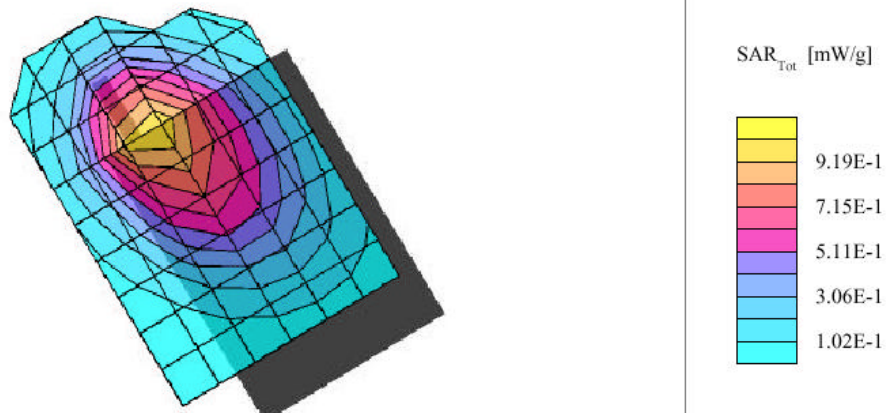
Tilted right side of head

Retracted antenna

Room temp. 22.2 deg. cel.

Liquid temp. 21.5 deg. cel.

Frequency: 815.5000 MHz



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## BlackBerry Wireless Handheld Model No. R6510IN

SAM 1; Righ Hand

Probe: ET3DV6 - SN1644; ConvF(6.51,6.51,6.51); Crest factor: 3.0; Head 835 MHz:  $\sigma = 0.94$  mho/m  $\epsilon_r = 42.6$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 5x5x7: Peak: 1.21 mW/g, SAR (1g): 0.755 mW/g, SAR (10g): 0.492 mW/g, (Worst-case extrapolation)

Penetration depth: 12.2 (10.7, 14.4) [mm]

Powerdrift: 0.07 dB

Tested on July 19, 2002

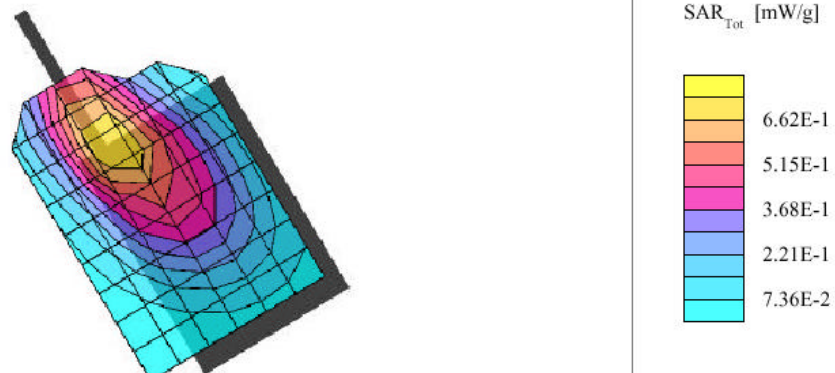
Tilted right side of head

Extended antenna

Room temp. 22.2 deg. cel.

Liquid temp. 21.5 deg. cel.

Frequency: 815.5000 MHz







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APPENDIX C: SAR DISTRIBUTION PLOTS FOR BODY-WORN AND HAND SAR CONFIGURATION

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### BlckBerry Wireless Handheld Model No. R6510IN

SAM 2; Flat

Probe: ET3DV6 - SN1642; ConvF(6.40,6.40,6.40); Crest factor: 3.0; Muscle 835 MHz:  $\sigma = 0.99$  mho/m  $\epsilon_r = 56.5$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 5x5x7: Peak: 0.742 mW/g, SAR (1g): 0.529 mW/g, SAR (10g): 0.386 mW/g, (Worst-case extrapolation)

Penetration depth: 17.0 (14.9, 19.5) [mm]

Powerdrift: -0.12 dB

Tested on August 12, 2002

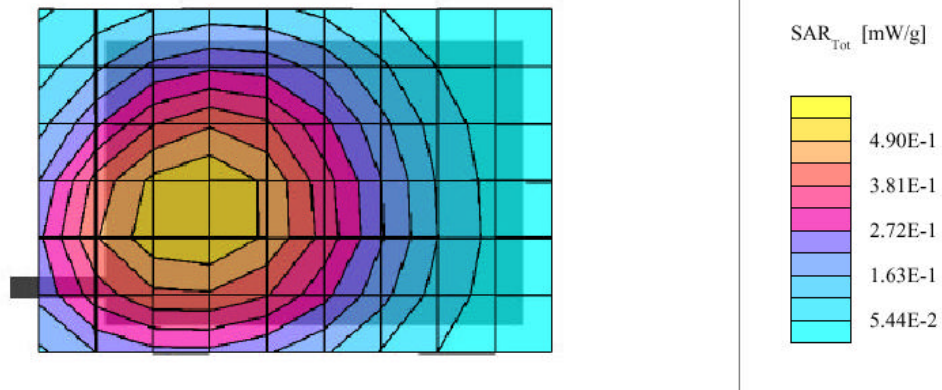
Ambient temperature: 22.7 deg. cel.

Liquid temperature: 20.8 deg. cel.

Body worn with holster

Retracted antenna

Frequency: 806.0125 MHz



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### BlckBerry Wireless Handheld Model No. R6510IN

SAM 2; Flat

Probe: ET3DV6 - SN1642; ConvF(6.40,6.40,6.40); Crest factor: 3.0; Muscle 835 MHz:  $\sigma = 0.99$  mho/m  $\epsilon_r = 56.5$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 5x5x7: Peak: 0.695 mW/g, SAR (1g): 0.465 mW/g, SAR (10g): 0.341 mW/g, (Worst-case extrapolation)

Penetration depth: 18.0 (15.7, 20.4) [mm]

Powerdrift: -0.10 dB

Tested on August 12, 2002

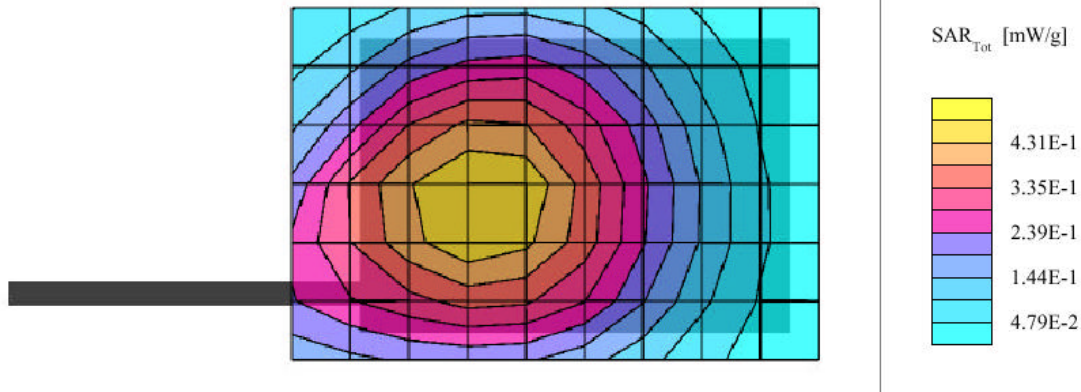
Ambient temperature: 22.7 deg. cel.

Liquid temperature: 20.8 deg. cel.

Body worn with holster

Extended antenna

Frequency: 806.0125 MHz



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### BlckBerry Wireless Handheld Model No. R6510IN

SAM 2; Flat

Probe: ET3DV6 - SN1642; ConvF(6.40,6.40,6.40); Crest factor: 3.0; Muscle 835 MHz:  $\sigma = 0.99$  mho/m  $\epsilon_r = 56.5$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 5x5x7: Peak: 2.60 mW/g, SAR (1g): 1.42 mW/g, SAR (10g): 0.869 mW/g \* Max outside, (Worst-case extrapolation)

Penetration depth: 9.8 (7.8, 13.2) [mm]

Powerdrift: -0.00 dB

Tested on August 12, 2002

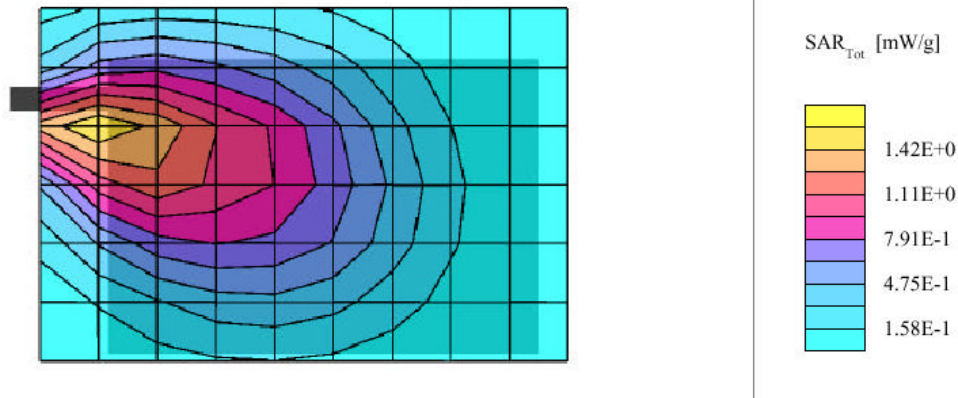
Ambient temperature: 22.9 deg. cel.

Liquid temperature: 20.9 deg. cel.

Hand SAR, device back touching flat phantom

Retracted antenna

Frequency: 806.0125 MHz





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APPENDIX D: PROBES AND VALIDATION DIPOLE CALIBRATION

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## 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:

**1642**

Place of Calibration:

**Zurich**

Date of Calibration:

**July 26, 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. Vetter*

Approved by:

*Alain Vetter*



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**Schmid & Partner  
Engineering AG**

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

# Probe ET3DV6

## SN:1642

**Manufactured:** November 7, 2001  
**Last calibration:** November 26, 2001  
**Recalibrated:** July 26, 2002

**Calibrated for System DASY3**



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ET3DV6 SN:1642

July 26, 2002

### DASY3 - Parameters of Probe: ET3DV6 SN:1642

#### Sensitivity in Free Space

NormX	1.62 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.85 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.61 $\mu\text{V}/(\text{V}/\text{m})^2$

#### Diode Compression

DCP X	96	mV
DCP Y	96	mV
DCP Z	96	mV

#### Sensitivity in Tissue Simulating Liquid

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

ConvF X	6.5 $\pm 8.9\%$ (k=2)	Boundary effect:
ConvF Y	6.5 $\pm 8.9\%$ (k=2)	Alpha            0.34
ConvF Z	6.5 $\pm 8.9\%$ (k=2)	Depth            2.68

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

ConvF X	5.4 $\pm 8.9\%$ (k=2)	Boundary effect:
ConvF Y	5.4 $\pm 8.9\%$ (k=2)	Alpha            0.53
ConvF Z	5.4 $\pm 8.9\%$ (k=2)	Depth            2.33

#### Boundary Effect

Head                    900 MHz                    Typical SAR gradient: 5 % per mm

Probe Tip to Boundary	1 mm	2 mm
SAR <sub>90</sub> [%] Without Correction Algorithm	9.9	5.7
SAR <sub>90</sub> [%] With Correction Algorithm	0.4	0.5

Head                    1800 MHz                    Typical SAR gradient: 10 % per mm

Probe Tip to Boundary	1 mm	2 mm
SAR <sub>90</sub> [%] Without Correction Algorithm	12.0	7.8
SAR <sub>90</sub> [%] With Correction Algorithm	0.2	0.2

#### Sensor Offset

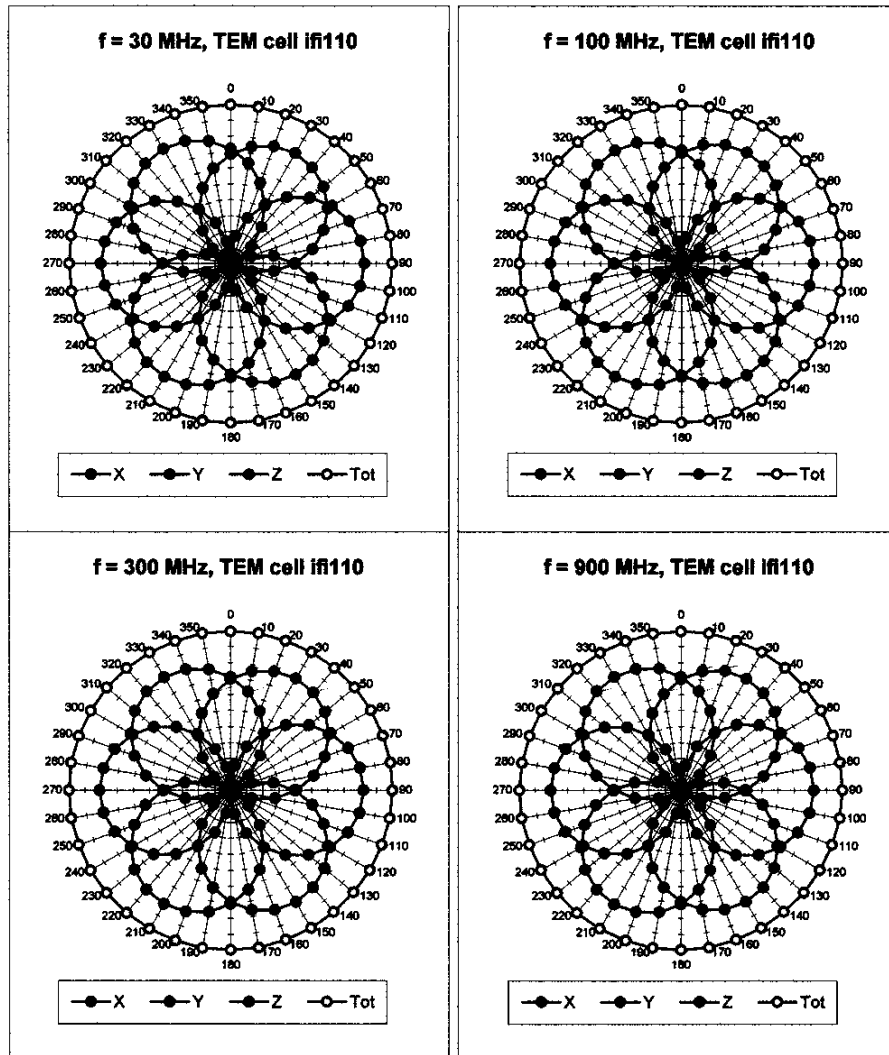
Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.1 $\pm 0.2$	mm



ET3DV6 SN:1642

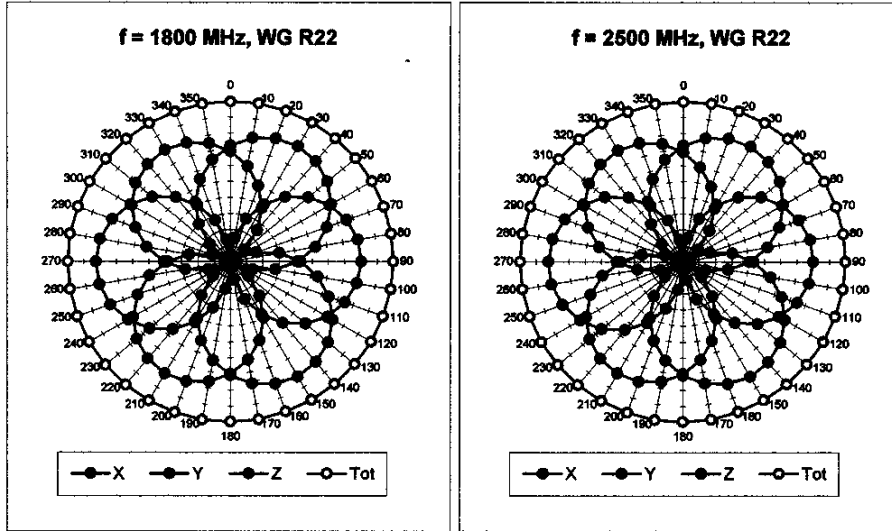
July 26, 2002

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

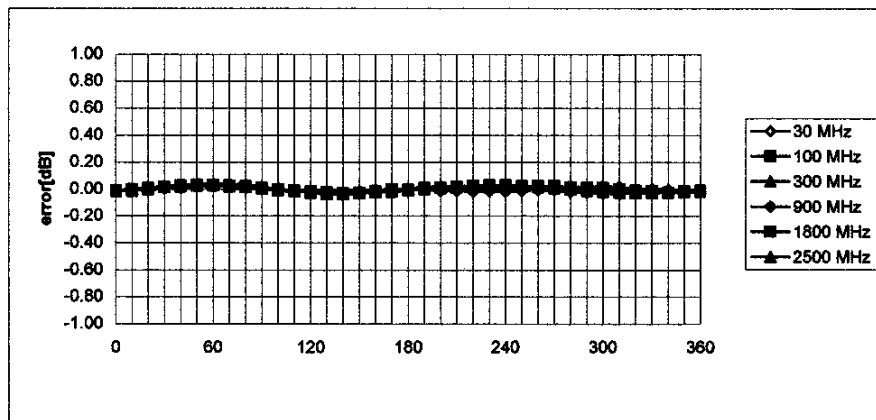


ET3DV6 SN:1642

July 26, 2002



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



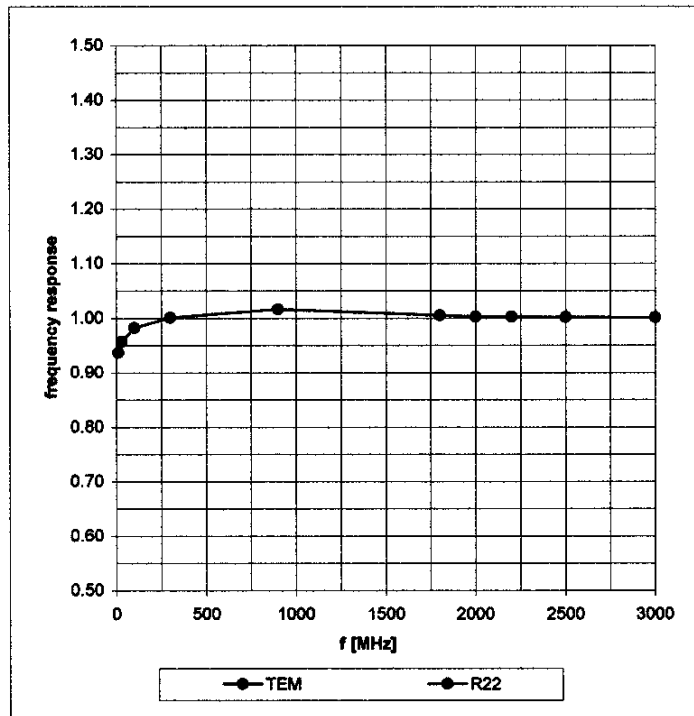


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### Frequency Response of E-Field ( TEM-Cell:ifi110, Waveguide R22)

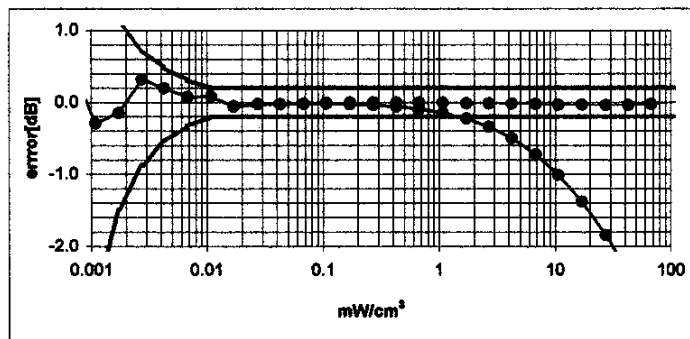
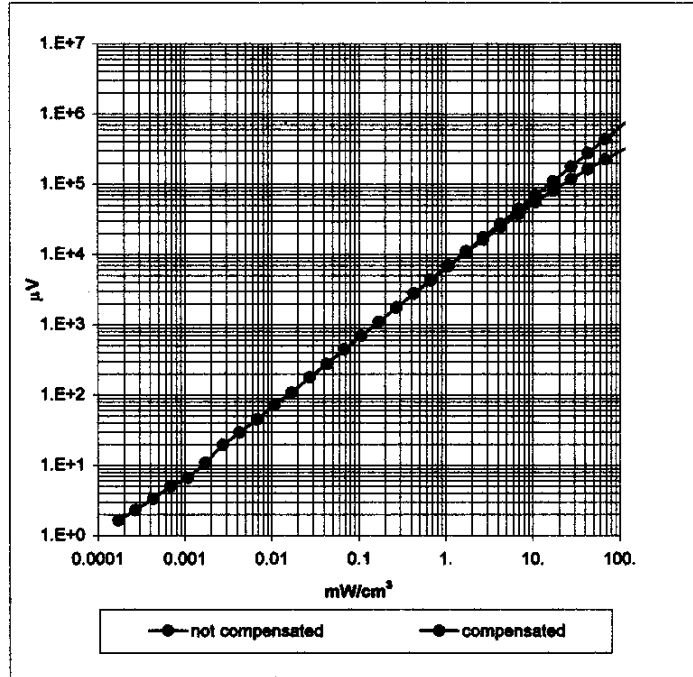


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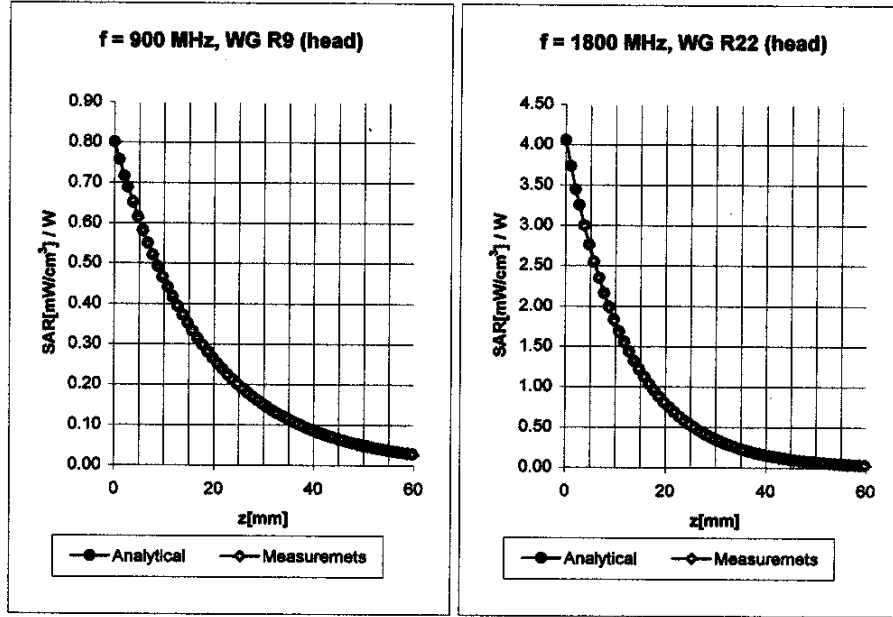
### Dynamic Range $f(\text{SAR}_{\text{brain}})$ ( Waveguide R22 )



ET3DV6 SN:1642

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### Conversion Factor Assessment

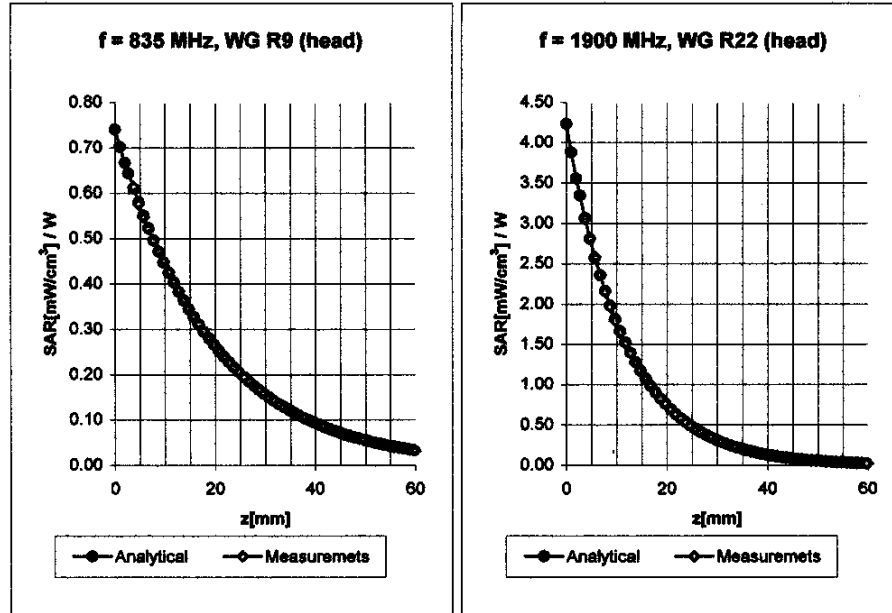


<b>Head</b>	<b>900 MHz</b>	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
	ConvF X	<b>6.5</b> $\pm 8.9\%$ (k=2)	Boundary effect:
	ConvF Y	<b>6.5</b> $\pm 8.9\%$ (k=2)	Alpha <b>0.34</b>
	ConvF Z	<b>6.5</b> $\pm 8.9\%$ (k=2)	Depth <b>2.68</b>
<b>Head</b>	<b>1800 MHz</b>	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
	ConvF X	<b>5.4</b> $\pm 8.9\%$ (k=2)	Boundary effect:
	ConvF Y	<b>5.4</b> $\pm 8.9\%$ (k=2)	Alpha <b>0.53</b>
	ConvF Z	<b>5.4</b> $\pm 8.9\%$ (k=2)	Depth <b>2.33</b>

ET3DV6 SN:1642

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### Conversion Factor Assessment

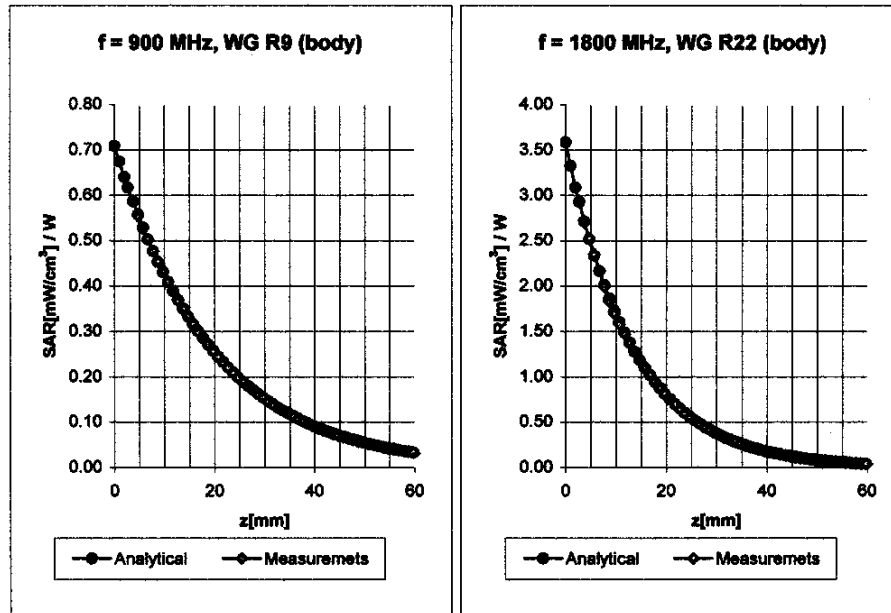


<b>Head</b>	<b>835 MHz</b>	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
	ConvF X	$6.5 \pm 8.9\% (k=2)$	Boundary effect:
	ConvF Y	$6.5 \pm 8.9\% (k=2)$	Alpha <b>0.34</b>
	ConvF Z	$6.5 \pm 8.9\% (k=2)$	Depth <b>2.65</b>
<b>Head</b>	<b>1900 MHz</b>	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
	ConvF X	$5.3 \pm 8.9\% (k=2)$	Boundary effect:
	ConvF Y	$5.3 \pm 8.9\% (k=2)$	Alpha <b>0.57</b>
	ConvF Z	$5.3 \pm 8.9\% (k=2)$	Depth <b>2.28</b>

ET3DV6 SN:1642

July 26, 2002

### Conversion Factor Assessment

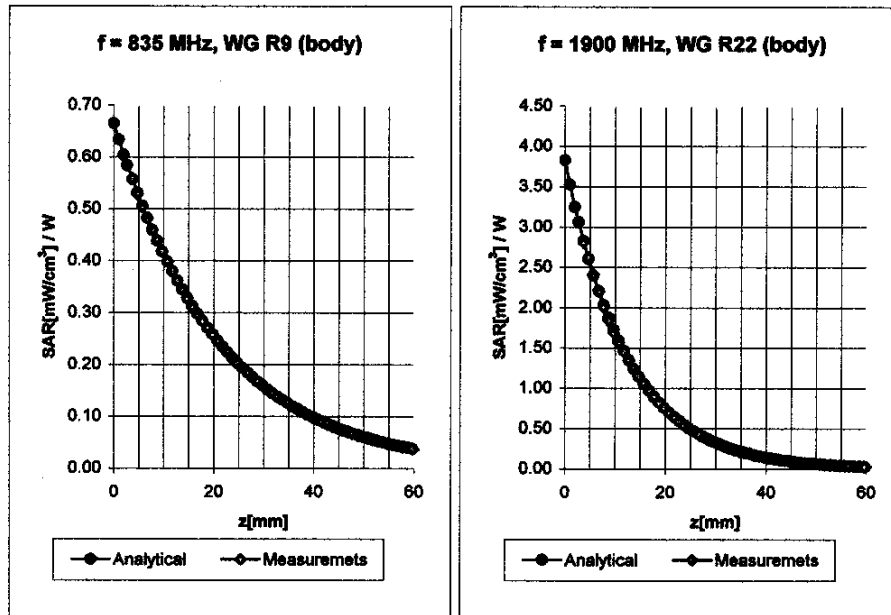


<b>Body</b>	<b>900 MHz</b>	$\epsilon_r = 55.2 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
	ConvF X	<b>6.3</b> $\pm 8.9\%$ (k=2)	Boundary effect:
	ConvF Y	<b>6.3</b> $\pm 8.9\%$ (k=2)	Alpha <b>0.36</b>
	ConvF Z	<b>6.3</b> $\pm 8.9\%$ (k=2)	Depth <b>2.63</b>
<b>Body</b>	<b>1800 MHz</b>	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\%$ mho/m
	ConvF X	<b>5.2</b> $\pm 8.9\%$ (k=2)	Boundary effect:
	ConvF Y	<b>5.2</b> $\pm 8.9\%$ (k=2)	Alpha <b>0.61</b>
	ConvF Z	<b>5.2</b> $\pm 8.9\%$ (k=2)	Depth <b>2.30</b>

ET3DV6 SN:1642

July 26, 2002

### Conversion Factor Assessment



<b>Body</b>	<b>835 MHz</b>	$\epsilon_r = 55.0 \pm 5\%$	$\sigma = 1.05 \pm 5\% \text{ mho/m}$
	ConvF X	$6.4 \pm 8.9\% (k=2)$	Boundary effect:
	ConvF Y	$6.4 \pm 8.9\% (k=2)$	Alpha <b>0.36</b>
	ConvF Z	$6.4 \pm 8.9\% (k=2)$	Depth <b>2.66</b>
<b>Body</b>	<b>1900 MHz</b>	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
	ConvF X	$4.8 \pm 8.9\% (k=2)$	Boundary effect:
	ConvF Y	$4.8 \pm 8.9\% (k=2)$	Alpha <b>0.74</b>
	ConvF Z	$4.8 \pm 8.9\% (k=2)$	Depth <b>2.07</b>



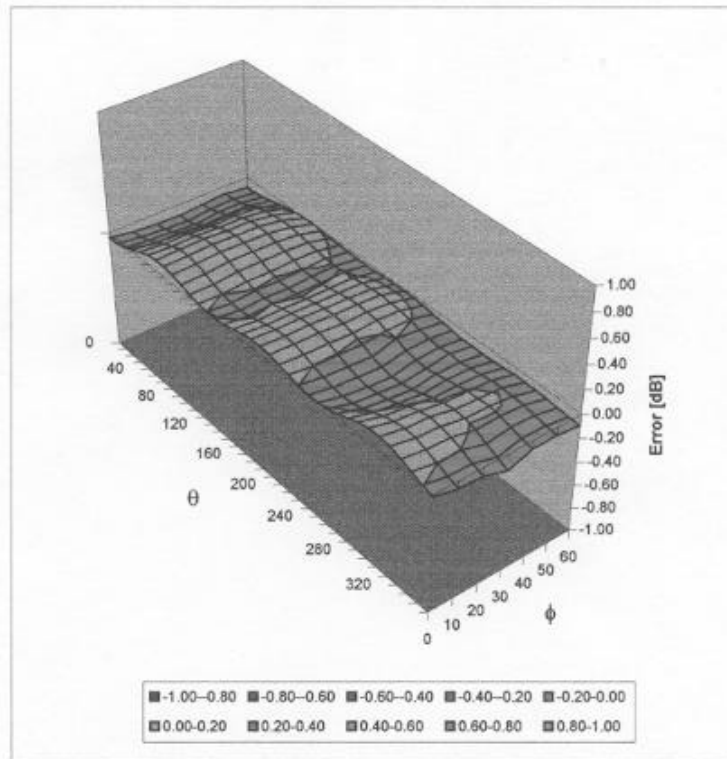
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### Deviation from Isotropy in HSL

Error ( $\theta, \phi$ ),  $f = 900$  MHz





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## Schmid & Partner Engineering AG

Zeuhausstrasse 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:

1644

Place of Calibration:

Zurich

Date of Calibration:

November 26, 2001

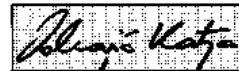
Calibration Interval:

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:



Approved by:





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**Schmid & Partner  
Engineering AG**

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

# Probe ET3DV6

## SN:1644

**Manufactured:** November 7, 2001  
**Calibrated:** November 26, 2001

**Calibrated for System DASY3**



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ET3DV6 SN:1644

### DASY3 - Parameters of Probe: ET3DV6 SN:1644

#### Sensitivity in Free Space

NormX	1.77 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.91 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.85 $\mu\text{V}/(\text{V}/\text{m})^2$

#### Diode Compression

DCP X	98 mV
DCP Y	98 mV
DCP Z	98 mV

#### Sensitivity in Tissue Simulating Liquid

Head                    450 MHz                     $\epsilon_r = 43.5 \pm 5\%$                      $\sigma = 0.87 \pm 10\%$  mho/m

ConvF X	7.07 extrapolated	Boundary effect:
ConvF Y	7.07 extrapolated	Alpha            0.37
ConvF Z	7.07 extrapolated	Depth            2.27

Head                    800 - 1000 MHz                     $\epsilon_r = 39.0 - 43.5$                      $\sigma = 0.80 - 1.10$  mho/m

ConvF X	6.51 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	6.51 $\pm 9.5\%$ (k=2)	Alpha            0.43
ConvF Z	6.51 $\pm 9.5\%$ (k=2)	Depth            2.25

Head                    1500 MHz                     $\epsilon_r = 40.4 \pm 5\%$                      $\sigma = 1.23 \pm 10\%$  mho/m

ConvF X	5.76 interpolated	Boundary effect:
ConvF Y	5.76 interpolated	Alpha            0.52
ConvF Z	5.76 interpolated	Depth            2.22

Head                    1700 - 1910 MHz                     $\epsilon_r = 39.5 - 41.0$                      $\sigma = 1.20 - 1.55$  mho/m

ConvF X	5.39 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	5.39 $\pm 9.5\%$ (k=2)	Alpha            0.56
ConvF Z	5.39 $\pm 9.5\%$ (k=2)	Depth            2.20

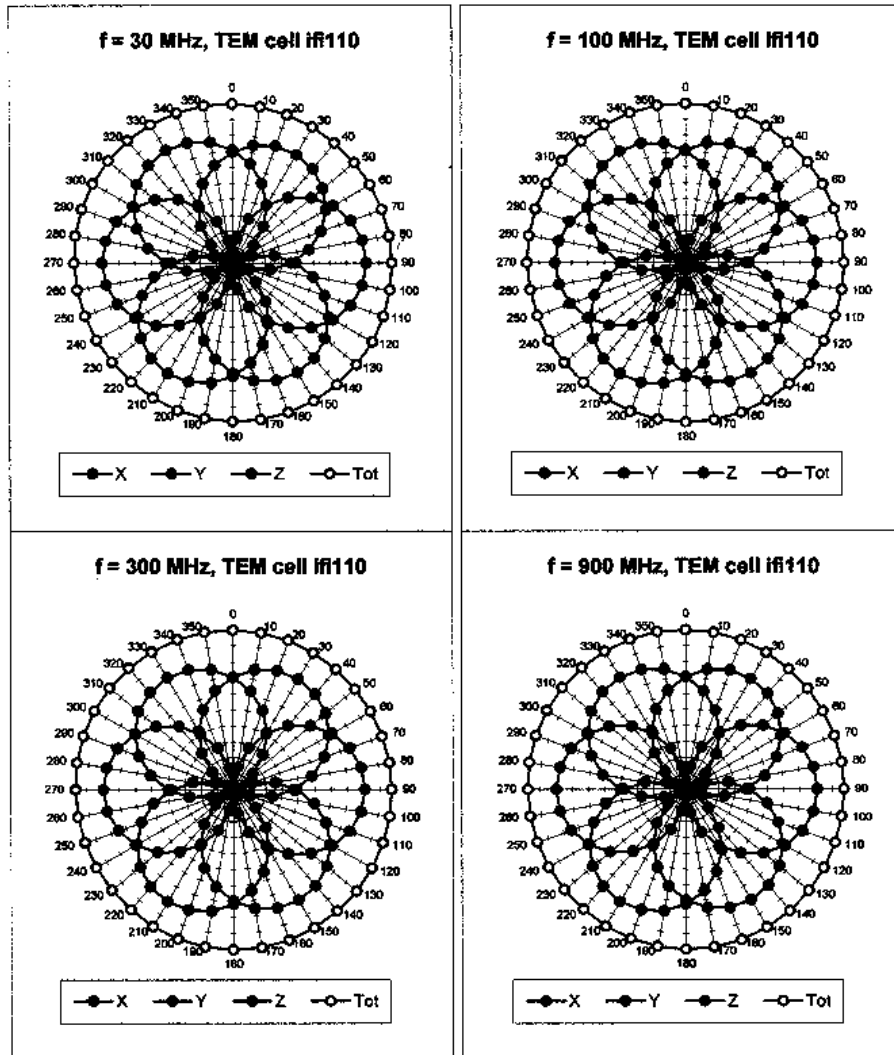
#### Sensor Offset

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

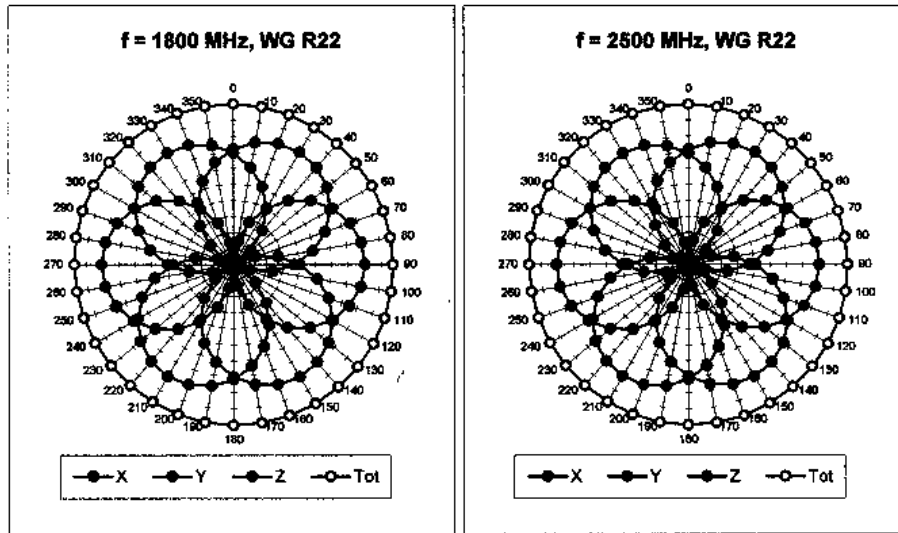
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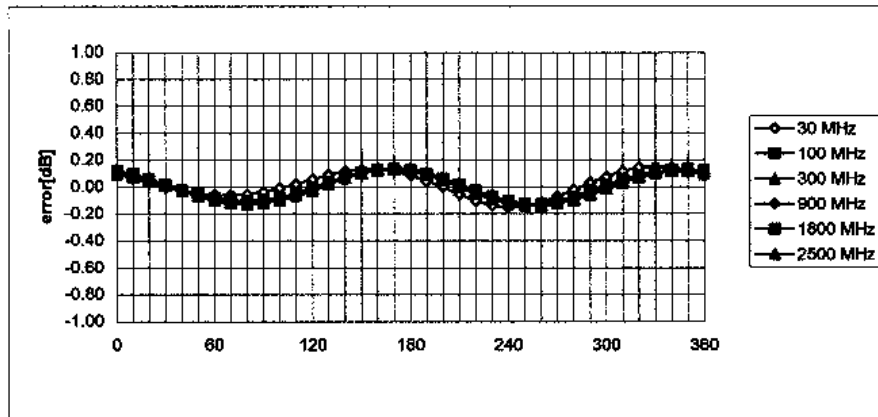
### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



ET3DV6 SN:1644



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



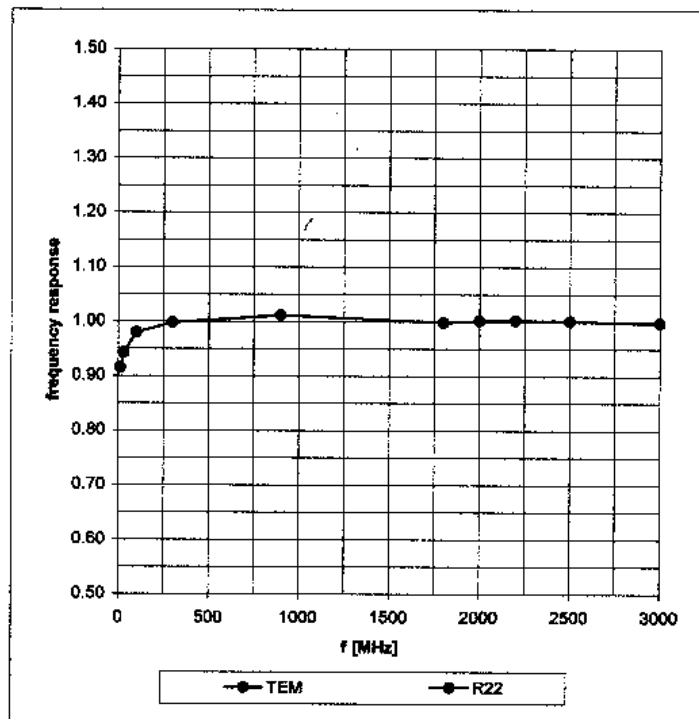


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### Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)



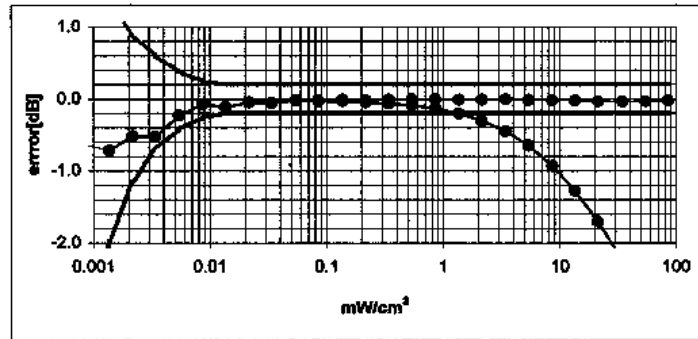
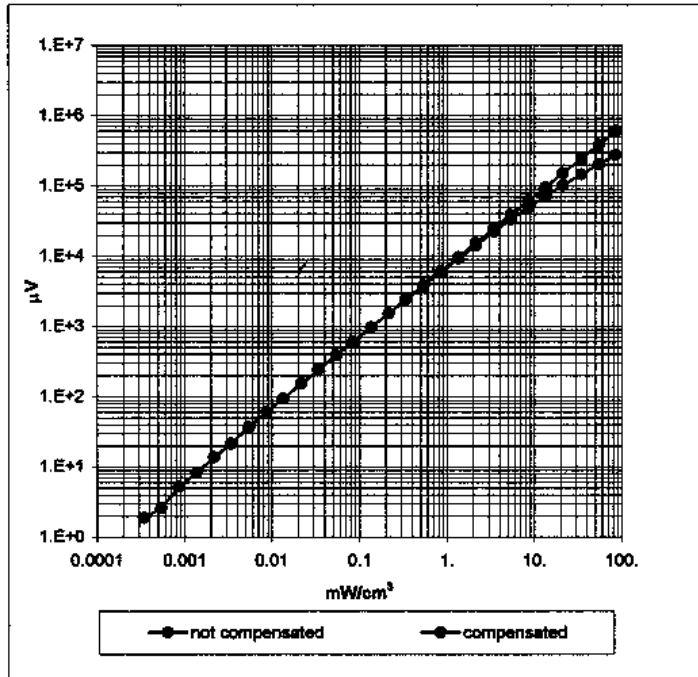




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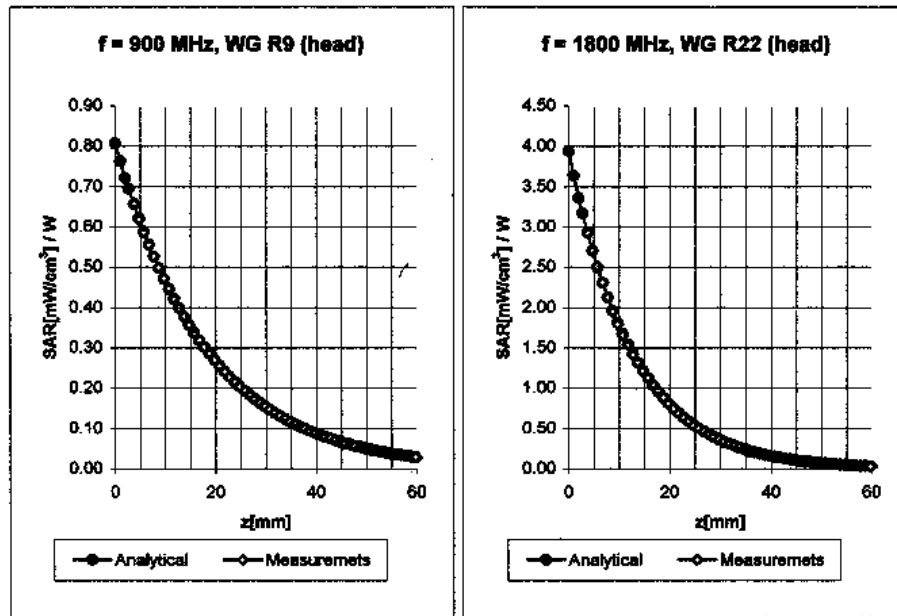
ET3DV6 SN:1644

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



ET3DV6 SN:1644

### Conversion Factor Assessment



Head 800 - 1000 MHz  $\epsilon_r = 39.0 - 43.6$   $\sigma = 0.80 - 1.10$  mho/m

ConvF X	<b>6.51</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>6.51</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.43</b>
ConvF Z	<b>6.51</b> $\pm 9.5\%$ (k=2)	Depth <b>2.25</b>

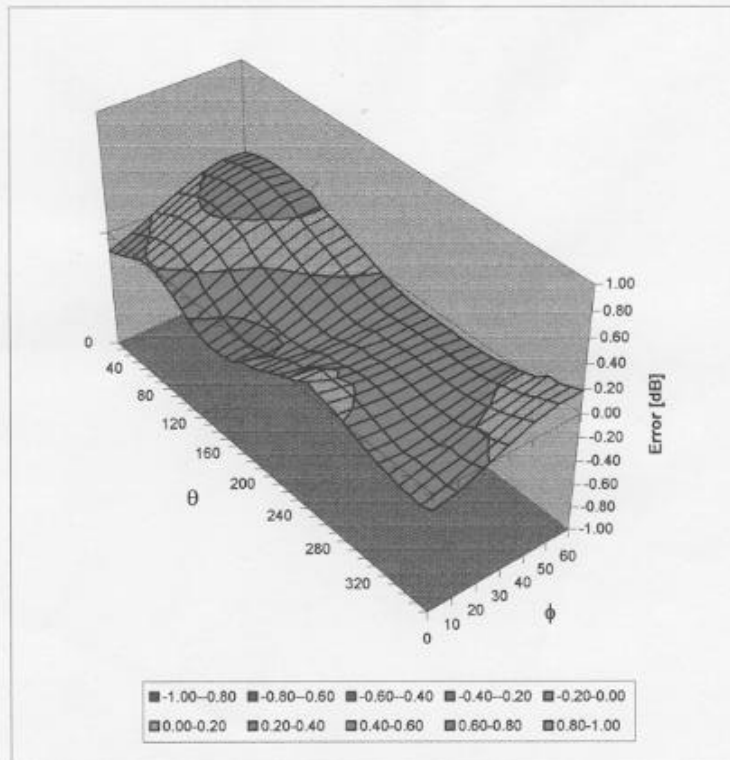
Head 1700 - 1810 MHz  $\epsilon_r = 39.5 - 41.0$   $\sigma = 1.20 - 1.55$  mho/m

ConvF X	<b>5.39</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>5.39</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.56</b>
ConvF Z	<b>5.39</b> $\pm 9.5\%$ (k=2)	Depth <b>2.20</b>

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**Deviation from Isotropy in HSL**  
Error ( $\theta, \phi$ ),  $f = 900$  MHz



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**Schmid & Partner  
Engineering AG**

Zaughausstrasse 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:

**446**

Place of Calibration:

**Zurich**

Date of Calibration:

**November 12, 2001**

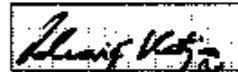
Calibration Interval:

**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:





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**Schmid & Partner  
Engineering AG**

**Zeughausstrasse 49, 8004 Zurich, Switzerland, Phone +41 1 248 97 00, Fax +41 1 245 97 79**

# DASY

## Dipole Validation Kit

**Type: D835V2**

**Serial: 446**

**Manufactured: October 24, 2001**  
**Calibrated: November 12, 2001**



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## 1. Measurement Conditions

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

Relative Dielectricity	42.3	± 5%
Conductivity	0.91 mho/m	± 5%

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.27 at 900 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 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 <sup>3</sup> (1 g) of tissue:	10.7 mW/g
averaged over 10 cm <sup>3</sup> (10 g) of tissue:	6.84 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.



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### 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: 1.401 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 holder was in place during impedance measurements.

Feedpoint impedance at 835 MHz:  $\text{Re}\{Z\} = 49.8 \Omega$   
 $\text{Im}\{Z\} = -4.8 \Omega$   
Return Loss at 835 MHz: -26.4 dB

### 4. Handling

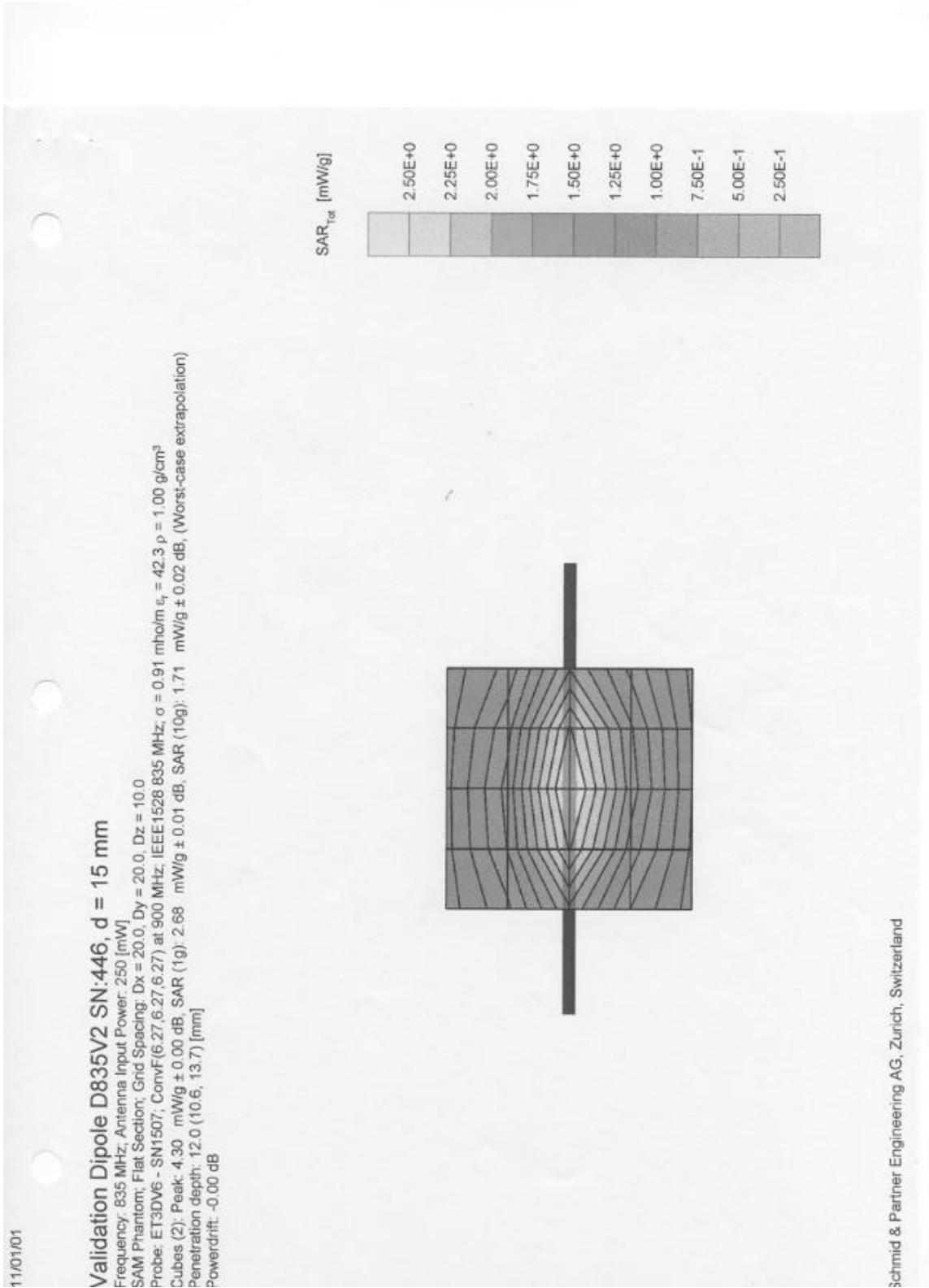
Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

### 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

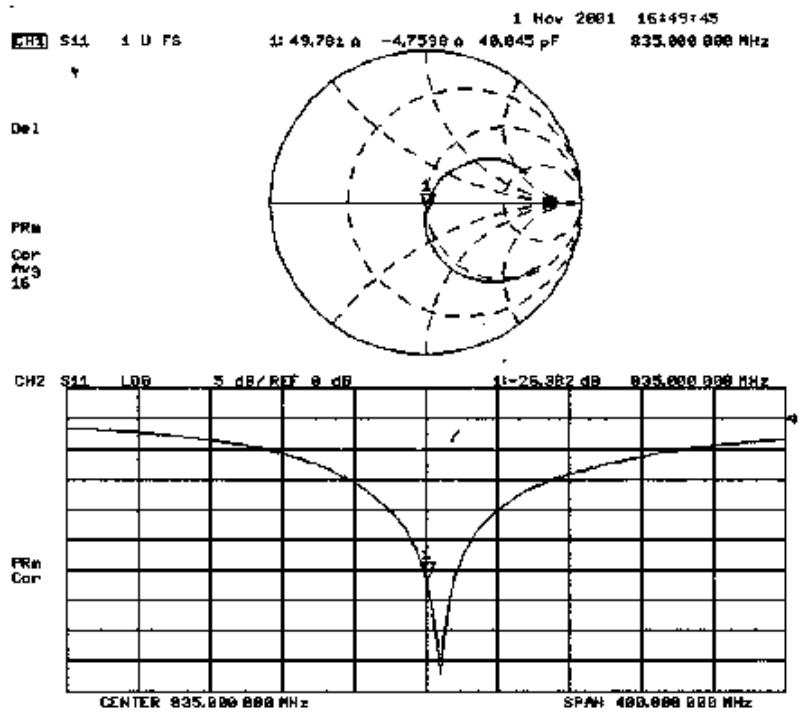
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.







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APPENDIX E: SAR SET UP PHOTOS

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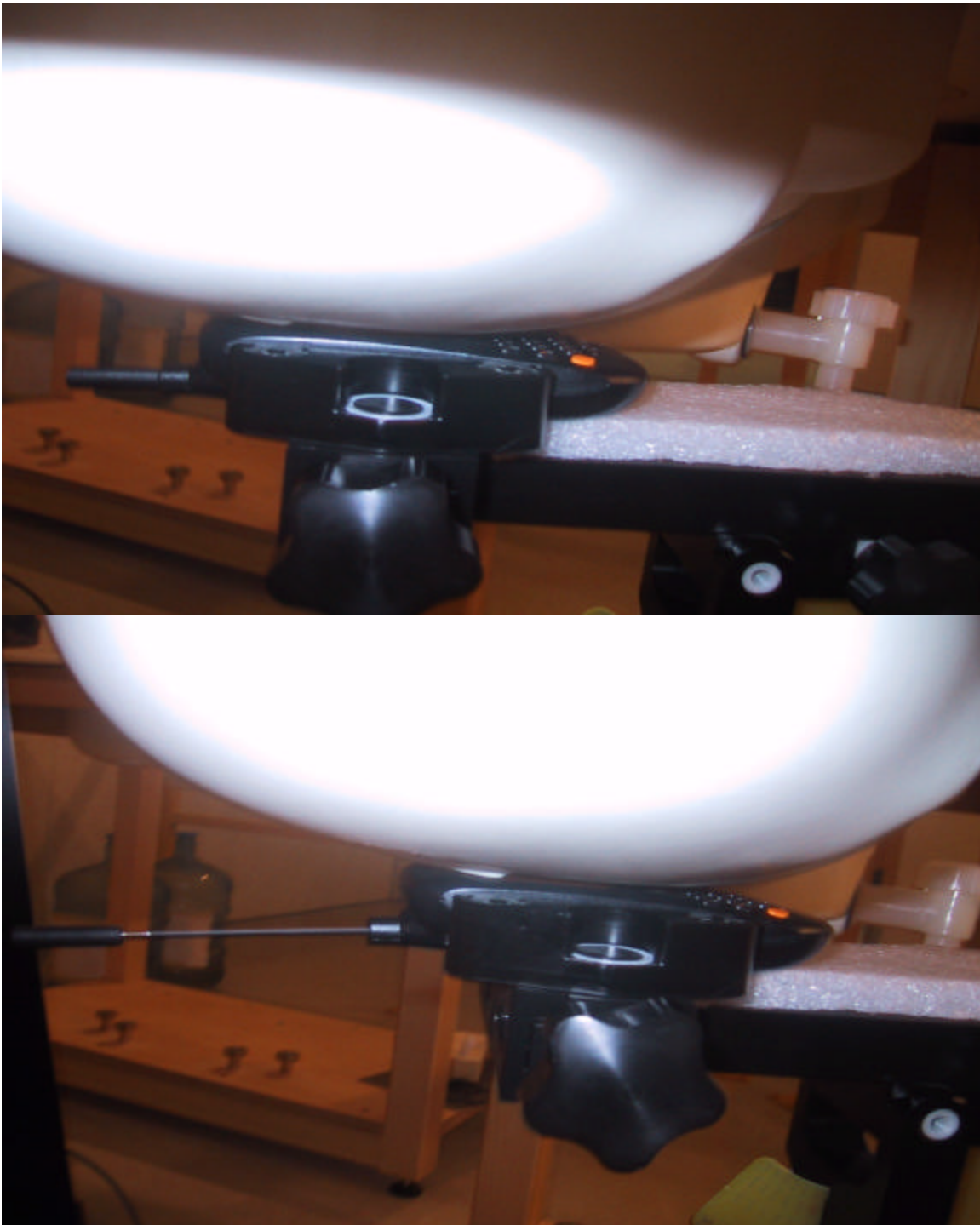
**Figure E1. Left ear touch configuration**

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**Figure E2. Left ear tilted configuration**

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**Figure E3. Right ear touch configuration**

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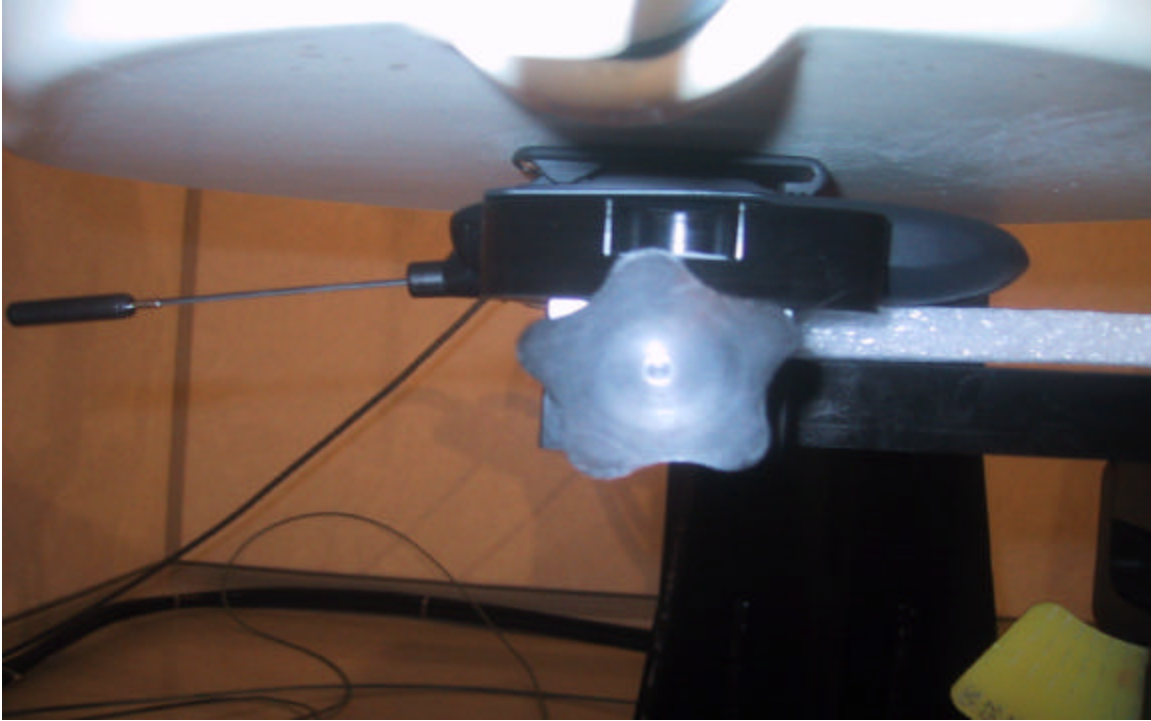
**Figure E4. Right ear tilted configuration**

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**Figure E5. Body worn configuration retracted antenna with holster and headset**

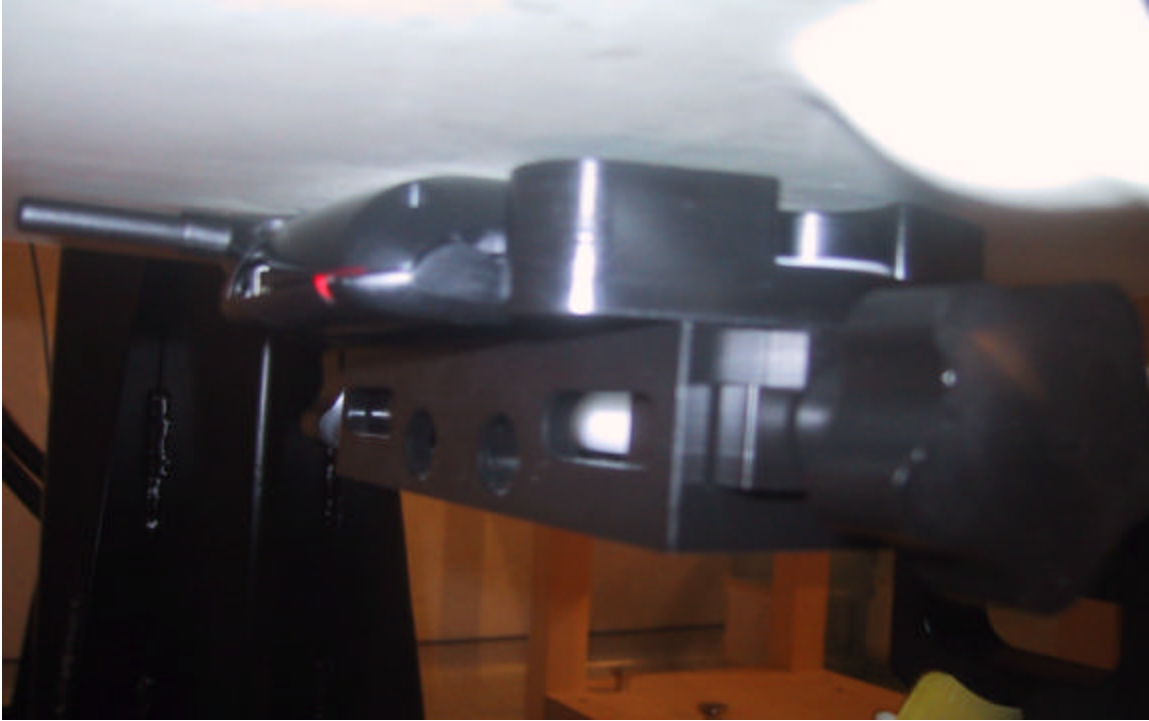
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**Figure E6. Body worn configuration extended antenna with holster and headset**



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**Figure E7. Hand SAR configuration, unit back touching flat phantom**