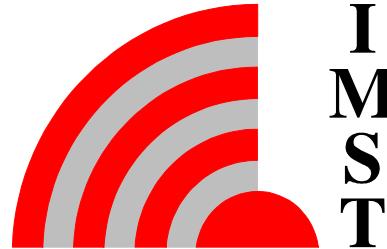




TTI-P-G 158



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## **Appendix for the Report**

### **Dosimetric Assessment of the Siemens C66 (FCC ID: PWX-C66) According to the FCC Requirements**

### **SAR Distribution Plots**

July 28, 2004  
**IMST GmbH**  
**Carl-Friedrich-Gauß-Str. 2**  
**D-47475 Kamp-Lintfort**

Customer  
**Siemens Information & Communication Mobile LLC**  
**16745 West Bernado Drive, Suite 400**  
**San Diego CA-92127**

The test results only relate to the items tested.  
This report shall not be reproduced except in full without the written  
approval of the testing laboratory.

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

**Client** **IMST**

**CALIBRATION CERTIFICATE**

Object(s) **ET3DV6 - SN:1669**

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

Calibration date: **March 18, 2004**

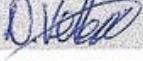
Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

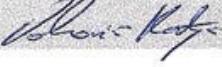
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

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

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS, No. 251-0340)	Apr-04
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator 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

Calibrated by: **Name** **Nico Vetterli** **Function** **Technician** **Signature** 

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

Date issued: March 19, 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.

# Probe ET3DV6

SN:1669

Manufactured:	February 8, 2002
Last calibrated:	March 21, 2003
Recalibrated:	March 18, 2004

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ET3DV6 SN:1669

Sensitivity in Free Space		Diode Compression <sup>A</sup>		
NormX	1.83 $\mu$ V/(V/m) <sup>2</sup>	DCP X	96	mV
NormY	1.93 $\mu$ V/(V/m) <sup>2</sup>	DCP Y	96	mV
NormZ	1.81 $\mu$ V/(V/m) <sup>2</sup>	DCP Z	96	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 <sub>be</sub> [%]      Without Correction Algorithm	9.7	5.2
SAR <sub>be</sub> [%]      With Correction Algorithm	0.1	0.3

Head                    1800 MHz                    Typical SAR gradient: 10 % per mm

Sensor to Surface Distance	3.7 mm	4.7 mm
SAR <sub>be</sub> [%]      Without Correction Algorithm	14.1	9.8
SAR <sub>be</sub> [%]      With Correction Algorithm	0.2	0.2

### Sensor Offset

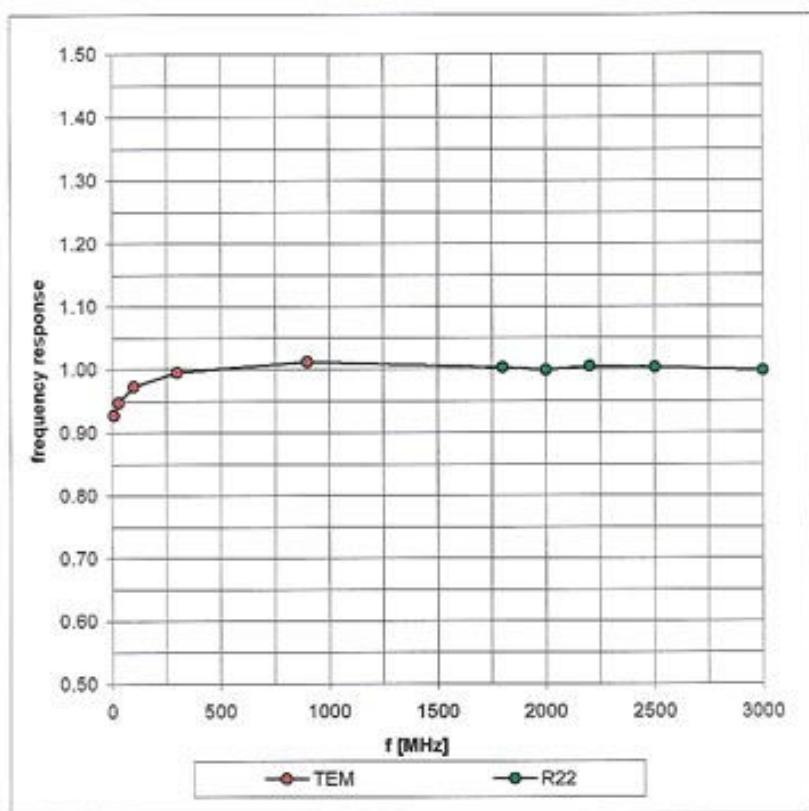
Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	in tolerance	

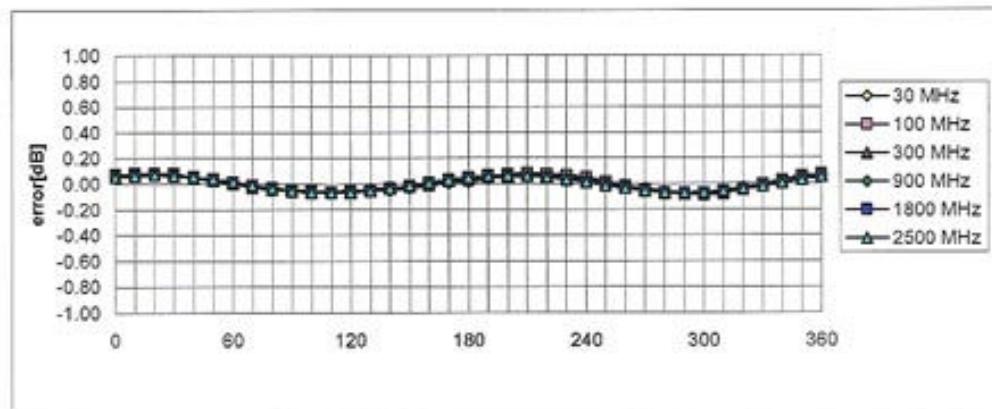
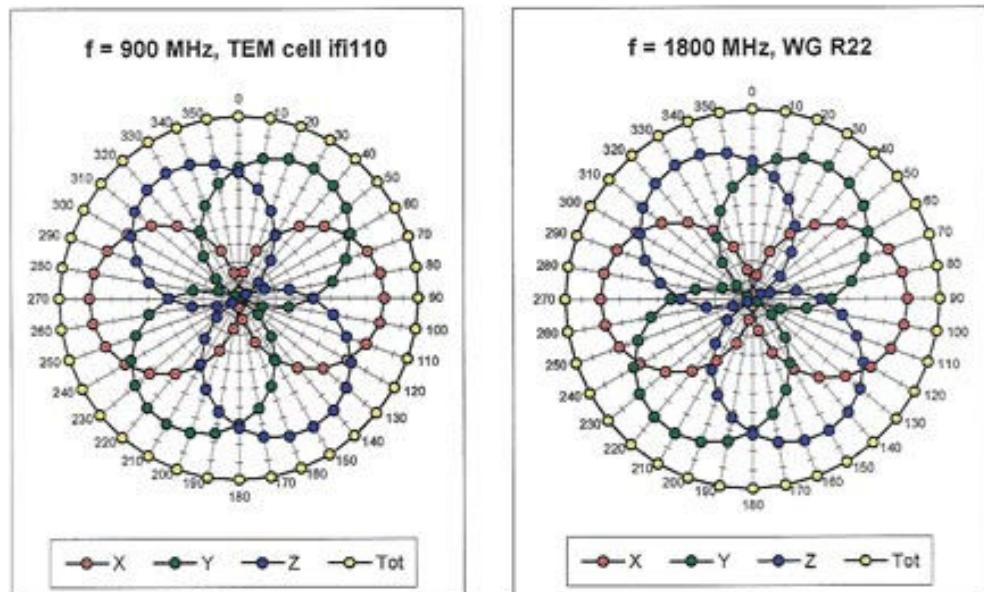
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> numerical linearization parameter: uncertainty not required

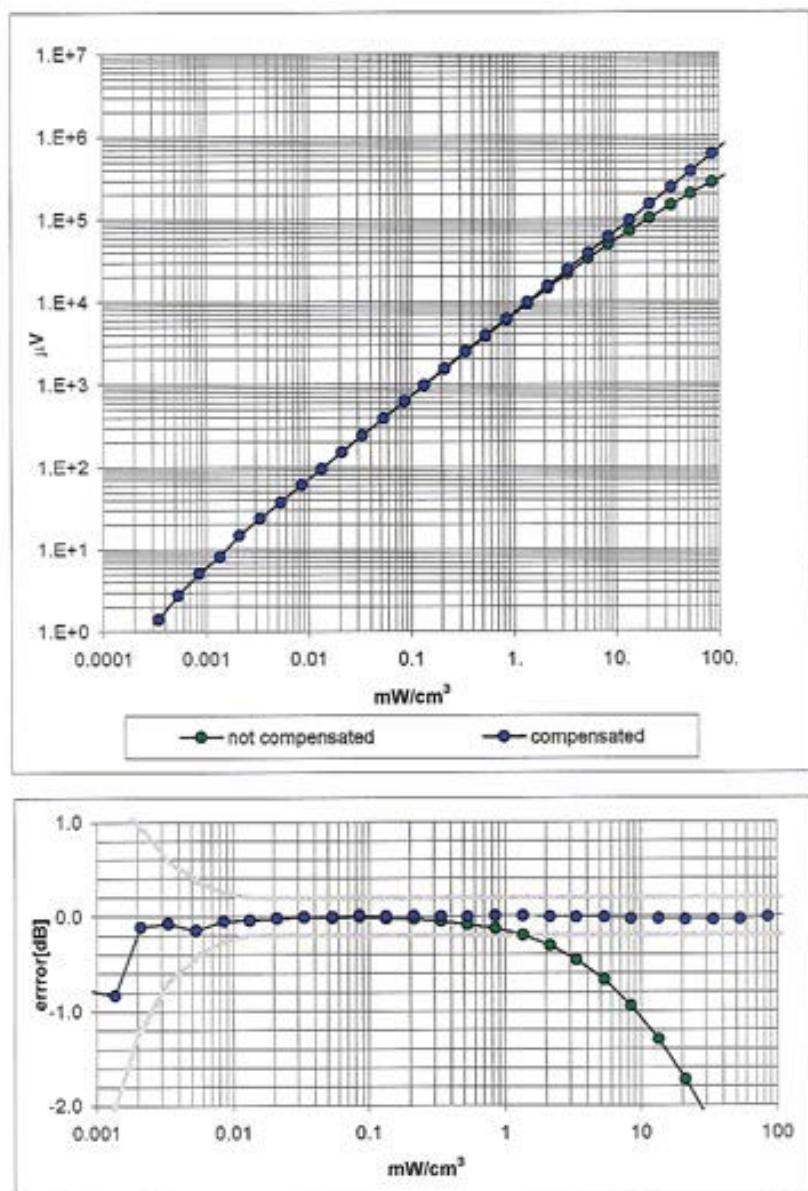
## Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)



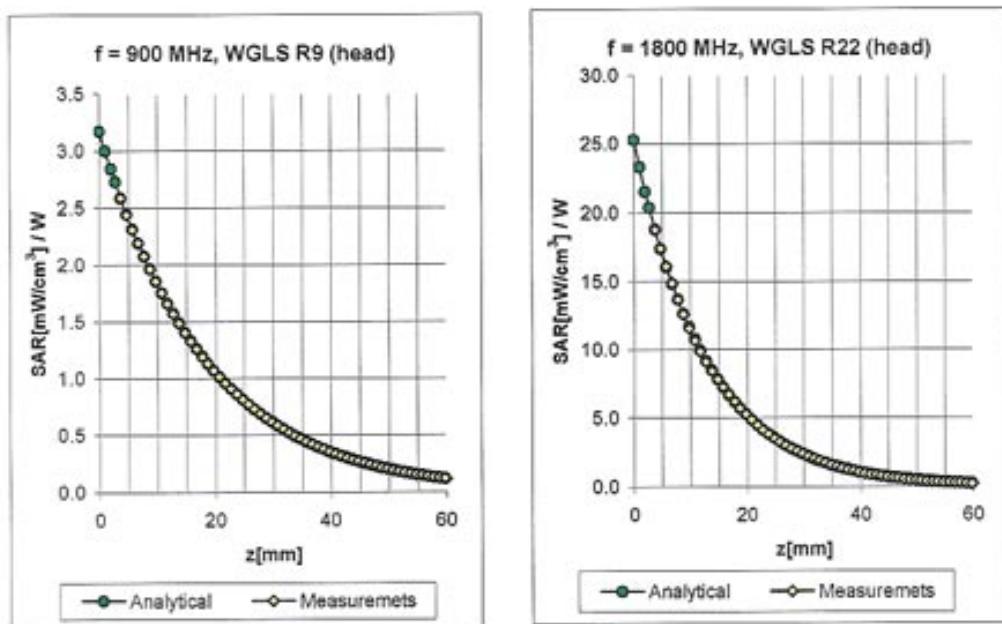
Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$ Axial Isotropy Error  $< \pm 0.2$  dB

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



Probe Linearity  $< \pm 0.2 \text{ dB}$

## Conversion Factor Assessment



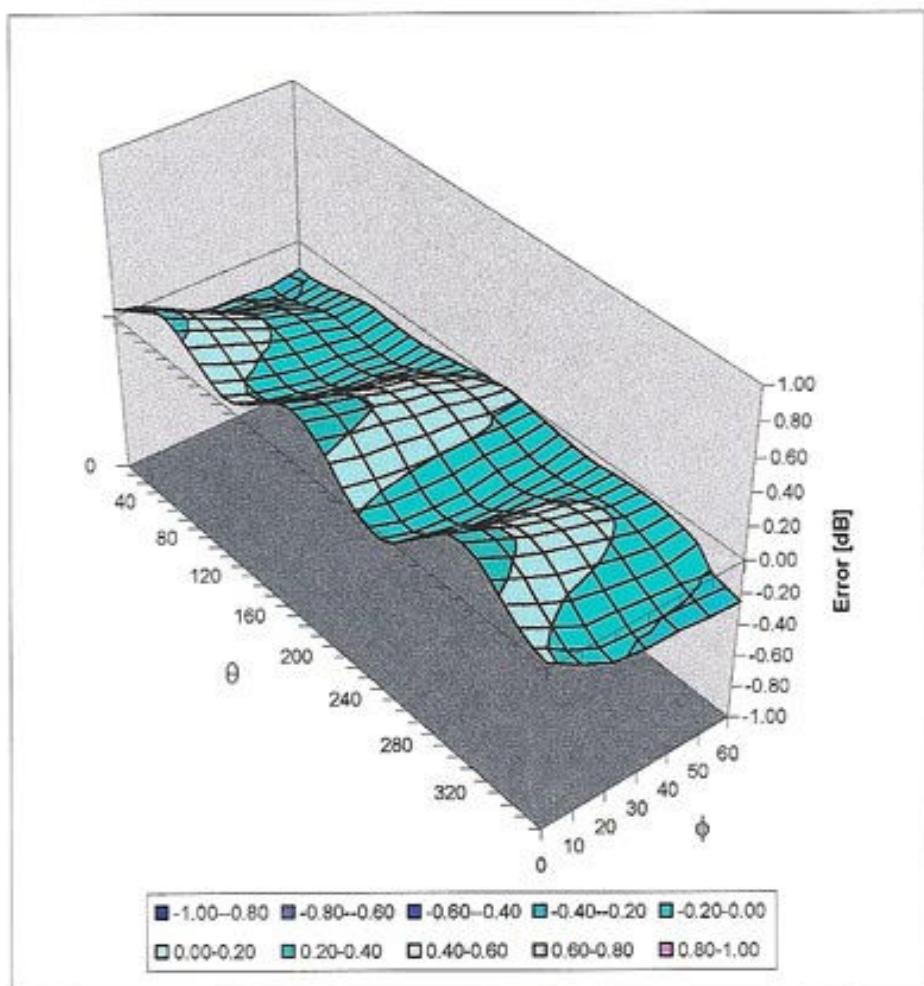
f [MHz]	Validity [MHz] <sup>a</sup>	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	785-885	Head	41.5 ± 5%	0.90 ± 5%	0.54	2.00	6.67	± 9.7% (k=2)
900	850-950	Head	41.5 ± 5%	0.97 ± 5%	0.61	1.91	6.47	± 9.7% (k=2)
1750	1700-1800	Head	40.0 ± 5%	1.40 ± 5%	0.48	2.73	5.38	± 9.7% (k=2)
1900	1850-1950	Head	40.0 ± 5%	1.40 ± 5%	0.51	2.81	5.19	± 9.7% (k=2)
1950	1900-2000	Head	40.0 ± 5%	1.40 ± 5%	0.53	2.73	4.88	± 9.7% (k=2)

835	785-885	Body	55.2 ± 5%	0.97 ± 5%	0.41	2.51	6.32	± 9.7% (k=2)
900	850-950	Body	55.0 ± 5%	1.05 ± 5%	0.48	2.23	6.13	± 9.7% (k=2)
1750	1700-1800	Body	53.3 ± 5%	1.52 ± 5%	0.56	2.85	4.66	± 9.7% (k=2)
1900	1850-1950	Body	53.3 ± 5%	1.52 ± 5%	0.61	2.80	4.54	± 9.7% (k=2)
1950	1900-2000	Body	53.3 ± 5%	1.52 ± 5%	0.67	2.46	4.35	± 9.7% (k=2)

<sup>a</sup> The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

## Deviation from Isotropy in HSL

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



Spherical Isotropy Error  $< \pm 0.4$  dB

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

Client

IMST

## CALIBRATION CERTIFICATE

Object(s) ET3DV6 - SN:1579

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

Calibration date: May 21, 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

Calibrated by: Name Nico Vetterli Function Technician Signature 

Approved by: Name Katja Pokovic Function Laboratory Director Signature 

Date issued: May 21, 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.

# Probe ET3DV6

SN:1579

Manufactured: May 7, 2001  
Last calibrated: May 15, 2003  
Recalibrated: May 21, 2004

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ET3DV6 SN:1579

### Sensitivity in Free Space

NormX	<b>1.72</b> $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	<b>1.66</b> $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	<b>1.65</b> $\mu\text{V}/(\text{V}/\text{m})^2$

### Diode Compression<sup>A</sup>

DCP X	<b>94</b>	mV
DCP Y	<b>94</b>	mV
DCP Z	<b>94</b>	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	<b>3.7</b> mm	<b>4.7</b> mm
SAR <sub>be</sub> [%]      Without Correction Algorithm	<b>8.0</b>	<b>4.1</b>
SAR <sub>be</sub> [%]      With Correction Algorithm	<b>0.0</b>	<b>0.2</b>

Head                    1800 MHz                    Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance	<b>3.7</b> mm	<b>4.7</b> mm
SAR <sub>be</sub> [%]      Without Correction Algorithm	<b>12.5</b>	<b>8.6</b>
SAR <sub>be</sub> [%]      With Correction Algorithm	<b>0.2</b>	<b>0.2</b>

### Sensor Offset

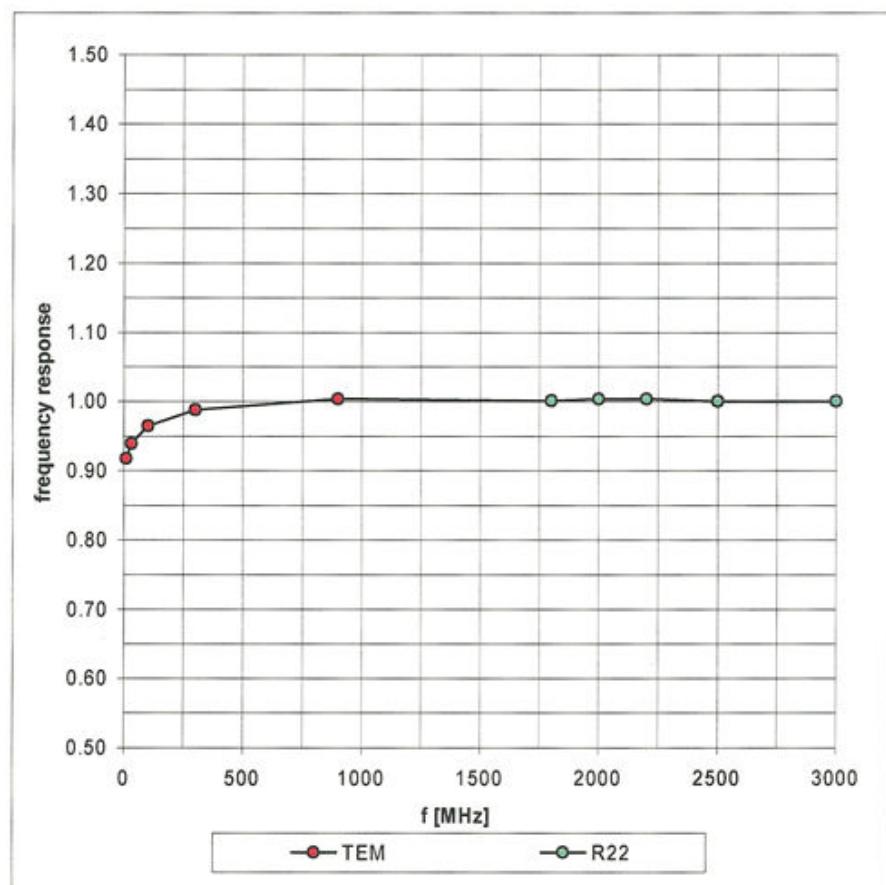
Probe Tip to Sensor Center	<b>2.7</b> mm
Optical Surface Detection	<b>in tolerance</b>

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%.

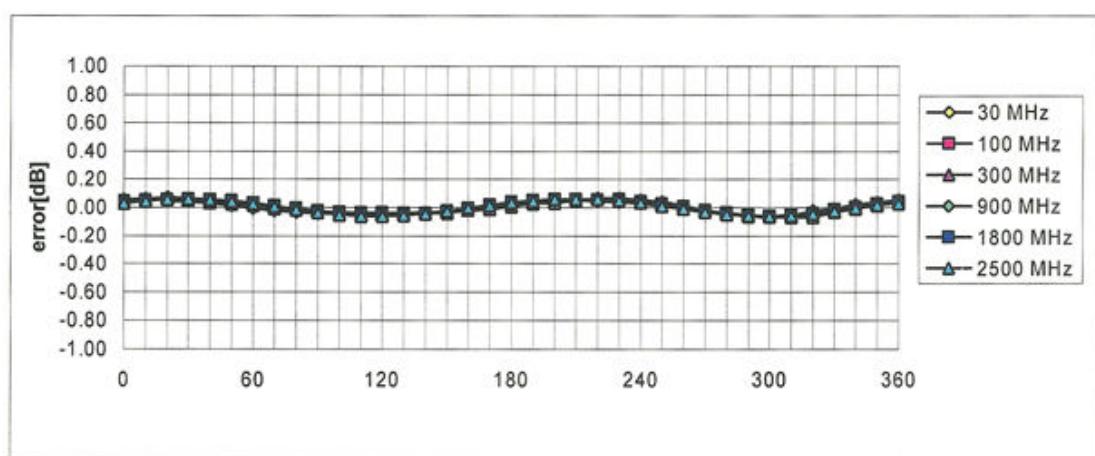
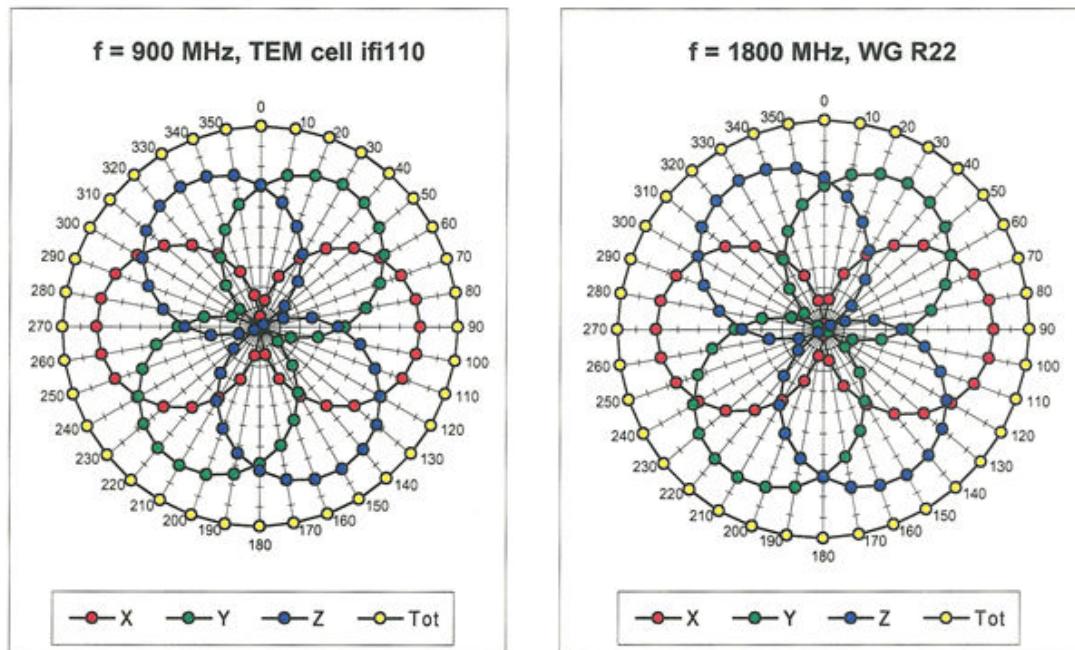
<sup>A</sup> numerical linearization parameter: uncertainty not required

## Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)

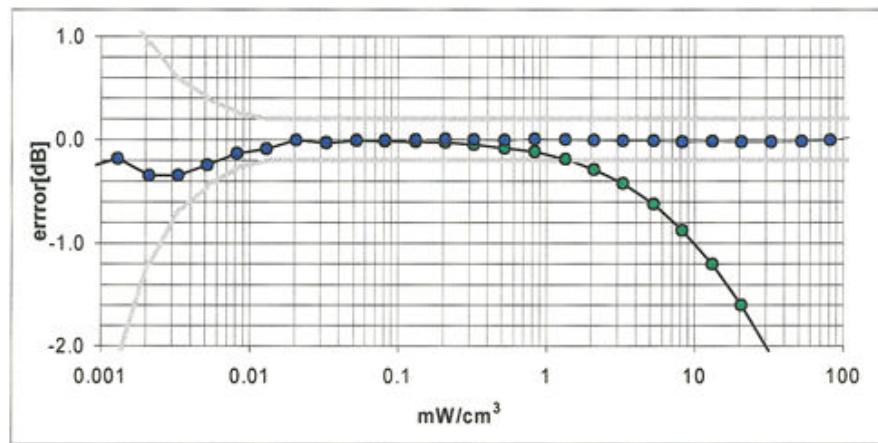
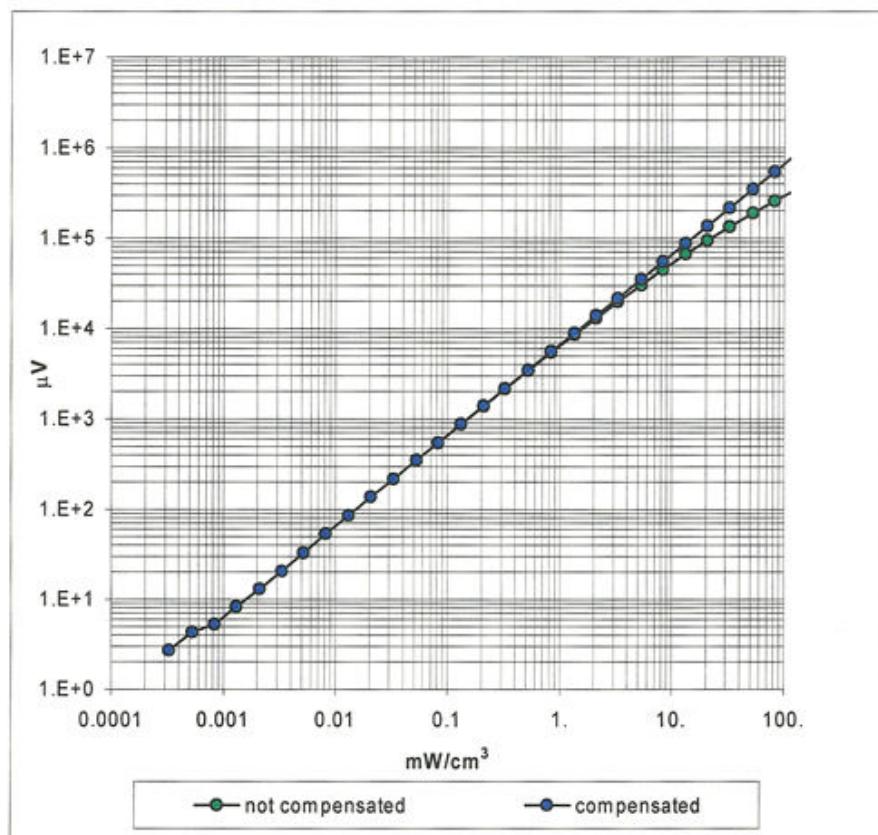


### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



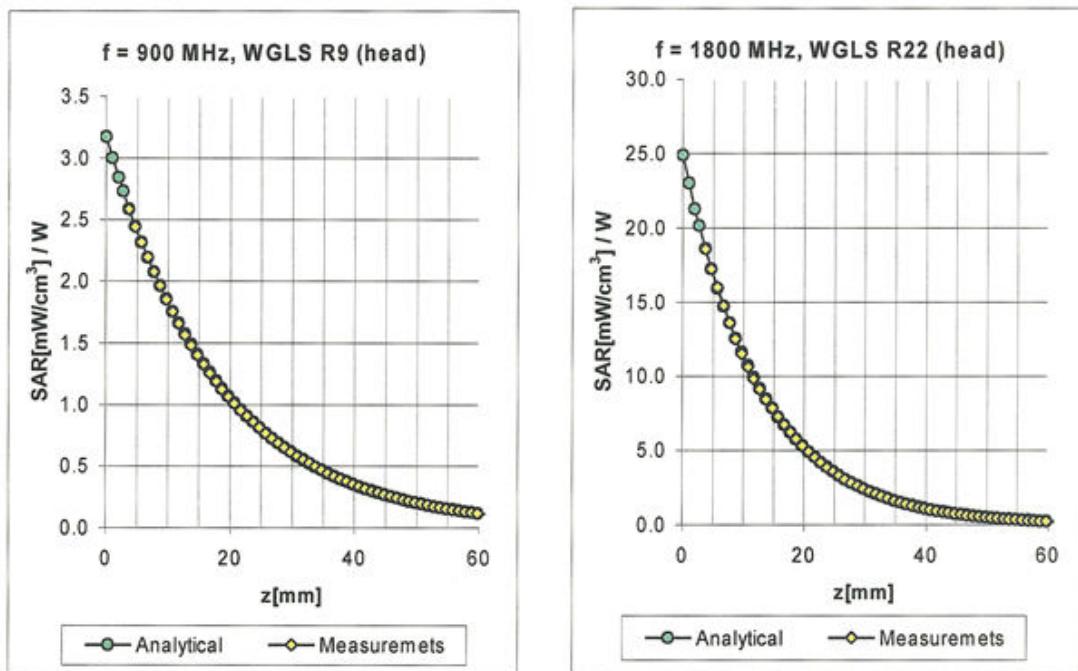
Axial Isotropy Error  $< \pm 0.2$  dB

### Dynamic Range f(SAR<sub>head</sub>) ( Waveguide R22 )



Probe Linearity Error  $< \pm 0.2 \text{ dB}$

## Conversion Factor Assessment



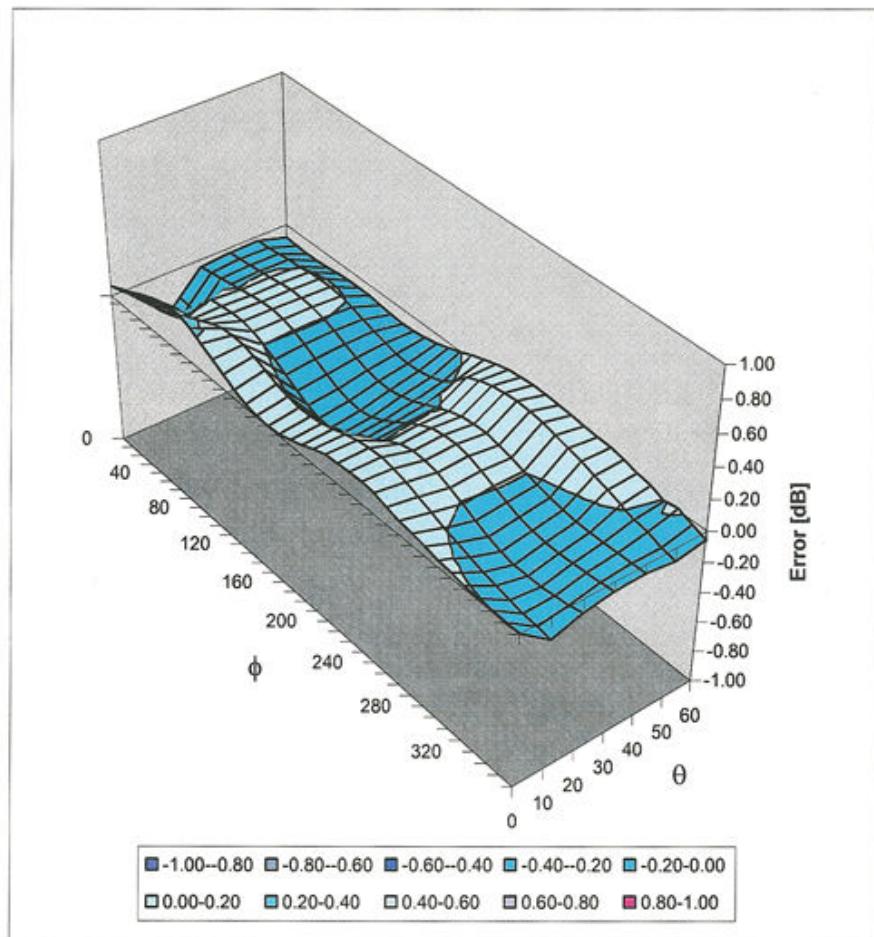
f [MHz]	Validity [MHz] <sup>B</sup>	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	785-885	Head	$41.5 \pm 5\%$	$0.90 \pm 5\%$	0.49	1.98	6.57	$\pm 9.7\% (k=2)$
900	850-950	Head	$41.5 \pm 5\%$	$0.97 \pm 5\%$	0.65	1.69	6.35	$\pm 9.7\% (k=2)$
1750	1700-1800	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	0.45	2.63	5.15	$\pm 9.7\% (k=2)$
1900	1850-1950	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	0.49	2.81	4.93	$\pm 9.7\% (k=2)$
2450	2400-2500	Head	$39.2 \pm 5\%$	$1.80 \pm 5\%$	0.85	2.05	4.37	$\pm 9.7\% (k=2)$

f [MHz]	Validity [MHz] <sup>B</sup>	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	785-885	Body	$55.2 \pm 5\%$	$0.97 \pm 5\%$	0.51	1.94	6.28	$\pm 9.7\% (k=2)$
900	850-950	Body	$55.0 \pm 5\%$	$1.05 \pm 5\%$	0.56	1.86	6.14	$\pm 9.7\% (k=2)$
1750	1700-1800	Body	$53.3 \pm 5\%$	$1.52 \pm 5\%$	0.51	2.90	4.59	$\pm 9.7\% (k=2)$
1900	1850-1950	Body	$53.3 \pm 5\%$	$1.52 \pm 5\%$	0.56	2.82	4.45	$\pm 9.7\% (k=2)$
2450	2400-2500	Body	$52.7 \pm 5\%$	$1.95 \pm 5\%$	1.05	1.63	4.21	$\pm 9.7\% (k=2)$

<sup>B</sup> The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

## Deviation from Isotropy in HSL

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



Spherical Isotropy Error  $< \pm 0.4$  dB

**Schmid & Partner  
Engineering AG**

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

**Calibration Certificate**

**1900 MHz System Validation Dipole**

Type:

**D1900V2**

Serial Number:

**535**

Place of Calibration:

**Zurich**

Date of Calibration:

**November 14, 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. Veller**

Approved by:

**R. Kett**

**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:

**437**

Place of Calibration:

**Zurich**

Date of Calibration:

**November 13, 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:

**Florian Kägi**

**Schmid & Partner  
Engineering AG**

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

# DASY

• Dipole Validation Kit

Type: D835V2

• Serial: 437

Manufactured: December 15, 2000  
Calibrated: November 13, 2002

## **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	<b>43.05</b>	$\pm 5\%$
Conductivity	<b>0.90 mho/m</b>	$\pm 5\%$

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 20mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

The dipole input power (forward power) was  $250\text{mW} \pm 3\%$ . 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  $1\text{ cm}^3$  (1 g) of tissue: **9.64 mW/g**

averaged over  $10\text{ cm}^3$  (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:	<b>1.438 ns</b>	(one direction)
Transmission factor:	<b>0.988</b>	(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:  $\text{Re}\{Z\} = 47.9 \Omega$

$\text{Im}\{Z\} = -7.6 \Omega$

Return Loss at 835 MHz  $-21.9 \text{ dB}$

### **4. Measurement Conditions**

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

Relative Dielectricity	<b>55.9</b>	$\pm 5\%$
Conductivity	<b>0.96 mho/m</b>	$\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.2 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 20mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

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

## 5. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 4. 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<sup>3</sup> (1 g) of tissue: **9.76 mW/g**

averaged over 10 cm<sup>3</sup> (10 g) of tissue: **6.40 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} = 44.6 Ω**

**Im {Z} = -9.4 Ω**

Return Loss at 835 MHz **-18.9 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.

Date/Time: 11/13/02 16:06:15

Test Laboratory: SPEAG, Zurich, Switzerland  
File Name: SN437\_SN1507\_HSL835\_131102.da4

**DUT: Dipole 835 MHz Type & Serial Number: D835V2 - SN437**  
**Program: Dipole Calibration; Pin = 250 mW; d = 10 mm**

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium: HSL 835 MHz ( $\sigma = 0.9$  mho/m,  $\epsilon = 43.05$ ,  $\rho = 1000$  kg/m<sup>3</sup>)  
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=15mm, dy=15mm

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm

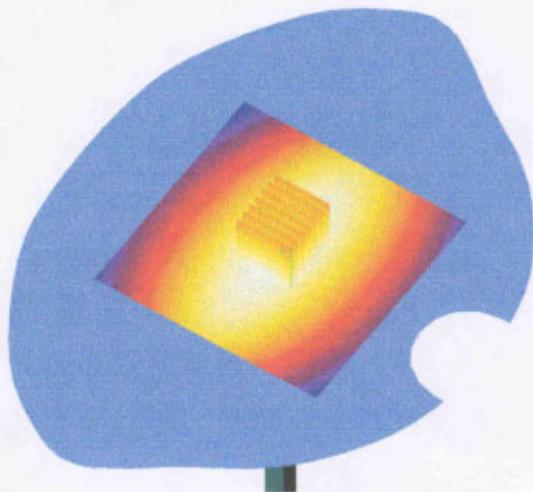
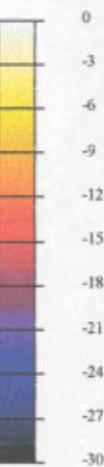
Reference Value = 55.6 V/m

Peak SAR = 3.59 mW/g

SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.55 mW/g

Power Drift = 0.02 dB

SAR in dB



CH1 S11 1 U FS 13 Nov 2002 11:23:23  
1: 47.918  $\Omega$  -7.6328  $\Omega$  24.972 pF 835.000 000 MHz

†

Del

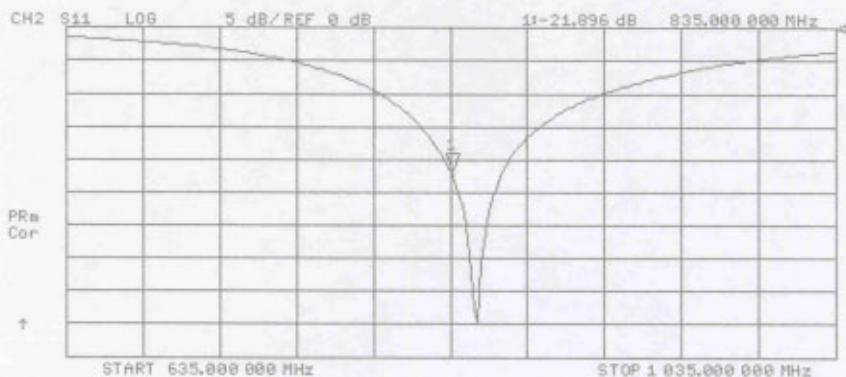
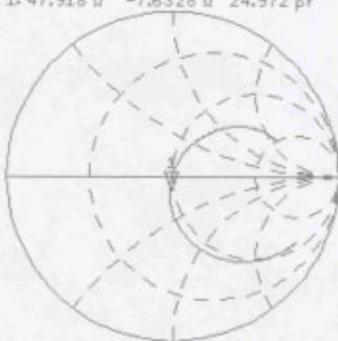
PRm

Cor

Avg

16

†



Date/Time: 11/13/02 19:20:06

Test Laboratory: SPEAG, Zurich, Switzerland  
File Name: SN437\_SN1507\_M835\_131102.da4

**DUT: Dipole 835 MHz Type & Serial Number: D835V2 - SN437**  
**Program: Dipole Calibration; Pin = 250 mW; d = 10 mm**

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium: Muscle 835 MHz ( $\sigma = 0.96 \text{ mho/m}$ ,  $\epsilon = 55.87$ ,  $\rho = 1000 \text{ kg/m}^3$ )  
Phantom section: FlatSection

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.2, 6.2, 6.2); 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=15mm, dy=15mm

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm

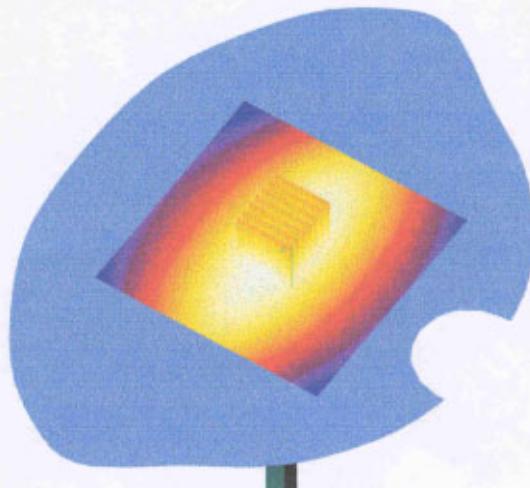
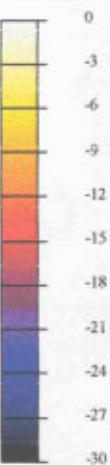
Reference Value = 55 V/m

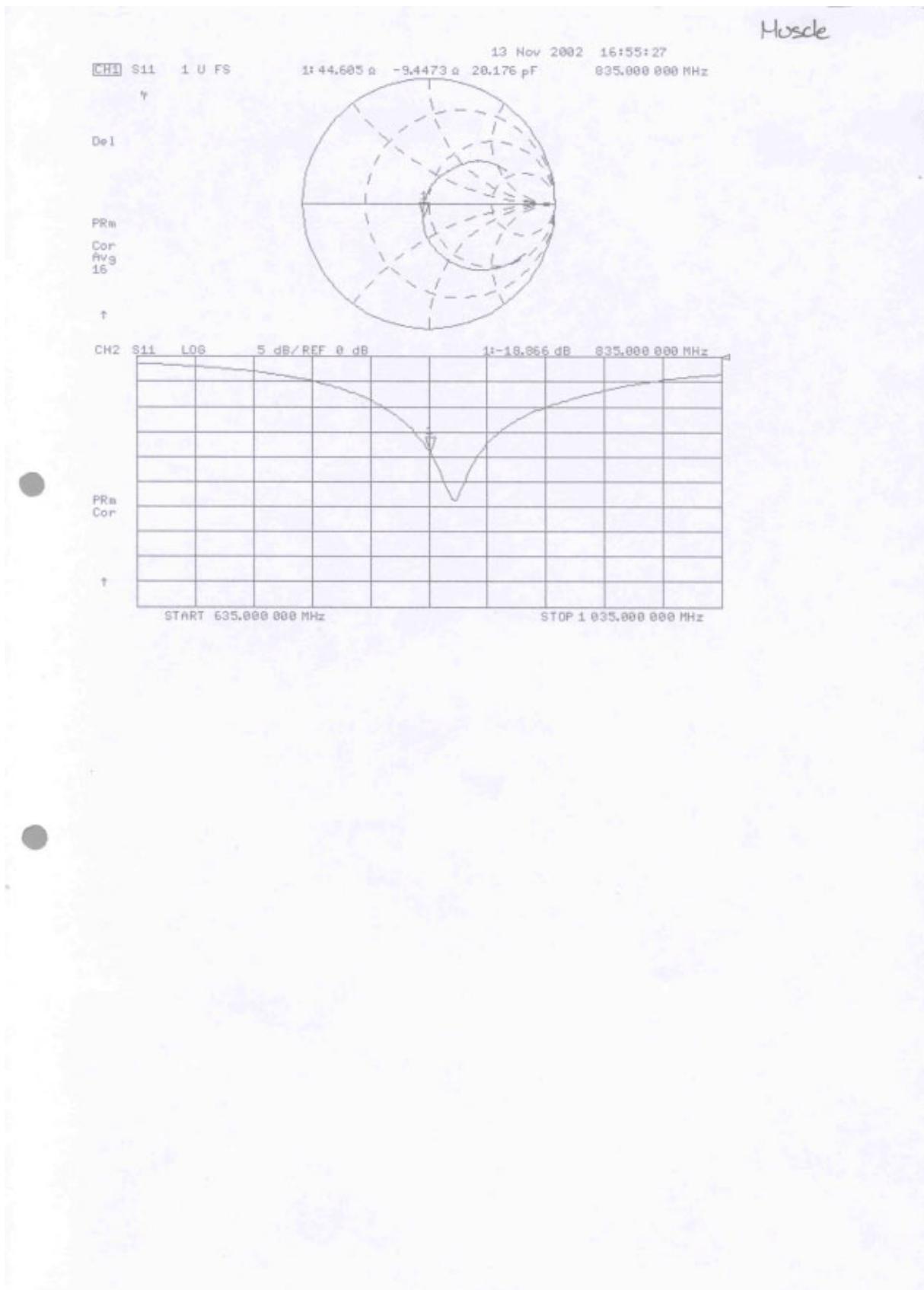
Peak SAR = 3.4 mW/g

SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g

Power Drift = 0.002 dB

SAR in dB





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# DASY

Dipole Validation Kit

Type: D1900V2

Serial: 535

Manufactured: March 22, 2001

Calibrated: November 14, 2002

## 1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with head simulating glycol solution of the following electrical parameters at 1900 MHz:

Relative Dielectricity	<b>39.8</b>	$\pm 5\%$
Conductivity	<b>1.45 mho/m</b>	$\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.2 at 1900 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 10mm 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  $250\text{mW} \pm 3\%$ . 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  $1\text{ cm}^3$  (1 g) of tissue: **40.8 mW/g**

averaged over  $10\text{ cm}^3$  (10 g) of tissue: **20.7 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: **1.2184 ns** (one direction)  
Transmission factor: **0.995** (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 1900 MHz:  $\text{Re}\{Z\} = 50.9 \Omega$

$\text{Im}\{Z\} = 3.6 \Omega$

Return Loss at 1900 MHz **-28.6 dB**

### 4. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with body simulating glycol solution of the following electrical parameters at 1900 MHz:

Relative Dielectricity **52.2**  $\pm 5\%$   
Conductivity **1.57 mho/m**  $\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 4.9 at 1900 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 10mm 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  $250\text{mW} \pm 3\%$ . The results are normalized to 1W input power.

## **5. SAR Measurement with DASY4 System**

Standard SAR-measurements were performed according to the measurement conditions described in section 4. 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<sup>3</sup> (1 g) of tissue: **41.2 mW/g**

averaged over 10 cm<sup>3</sup> (10 g) of tissue: **21.0 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 1900 MHz: **Re{Z} = 46.5 Ω**

**Im {Z} = 3.4 Ω**

Return Loss at 1900 MHz **-26.0 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.

Small end caps have been added to the dipole arms in order to improve matching when loaded according to the position as explained in Section 1. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

## **9. Power Test**

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Test Laboratory: SPEAG, Zurich, Switzerland  
File Name: SN535caps\_SN1507\_HSL1900\_141102.da4

**DUT: Dipole 1900 MHz Type & Serial Number: D1900V2 - SN535**  
**Program: Dipole Calibration; Pin = 250 mW; d = 10 mm**

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium: HSL 1900 MHz ( $\sigma = 1.45 \text{ mho/m}$ ,  $\epsilon = 39.75$ ,  $\rho = 1000 \text{ kg/m}^3$ )  
Phantom section: FlatSection

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5.2, 5.2, 5.2); 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=15mm, dy=15mm

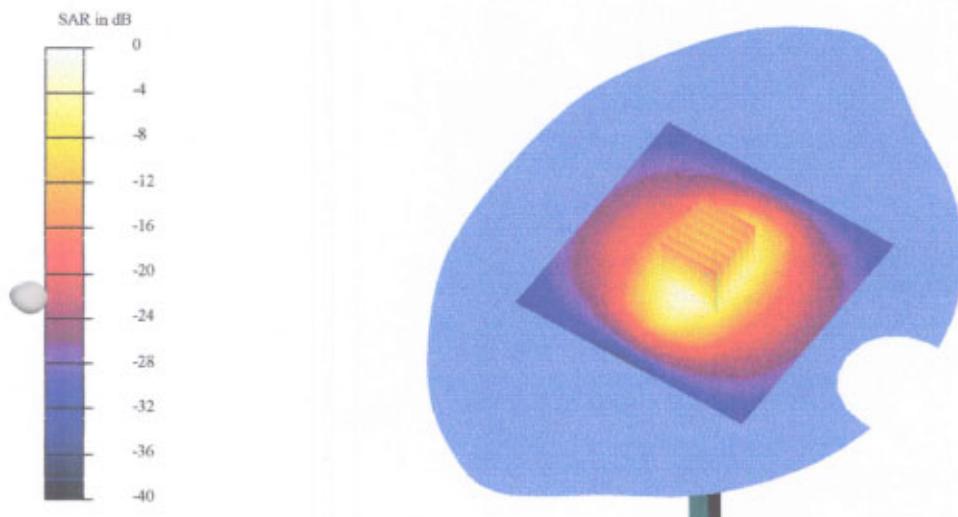
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm

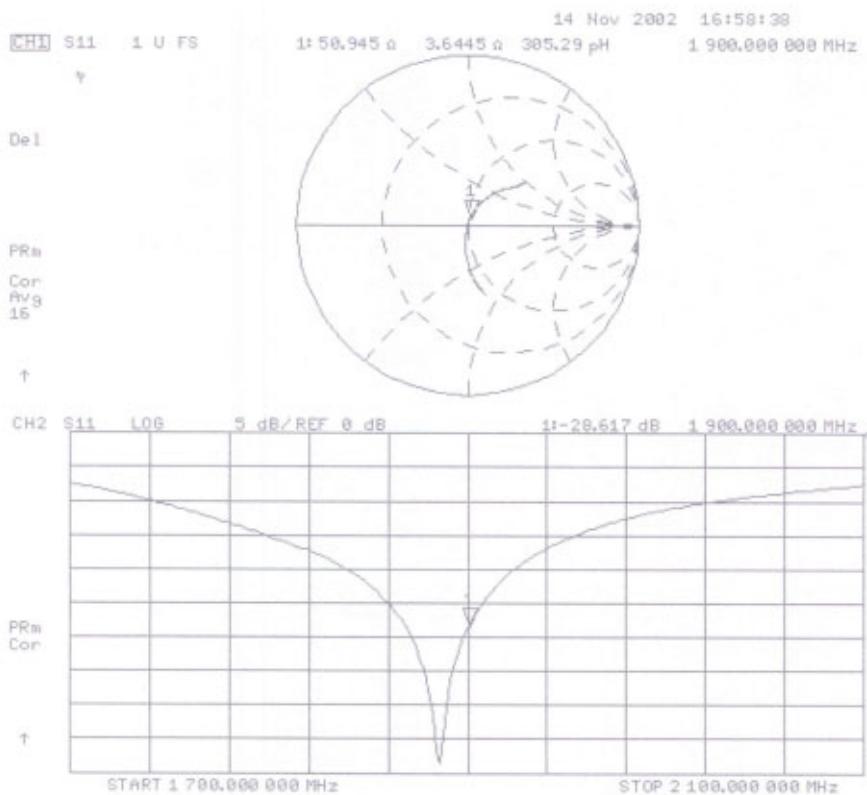
Reference Value = 94 V/m

Peak SAR = 18.5 mW/g

SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.18 mW/g

Power Drift = -0.01 dB





Test Laboratory: SPEAG, Zurich, Switzerland  
File Name: SN535\_SN1507\_M1900\_141102.da4

**DUT: Dipole 1900 MHz Type & Serial Number: D1900V2 - SN535**  
**Program: Dipole Calibration; Pin = 250 mW; d = 10 mm**

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium: Muscle 1900 MHz ( $\sigma = 1.57$  mho/m,  $\epsilon = 52.15$ ,  $\rho = 1000$  kg/m<sup>3</sup>)  
Phantom section: FlatSection

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(4.9, 4.9, 4.9); Calibrated: 1/24/2002
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP1006
- Software: DASY4, V4.0 Build 35

**Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

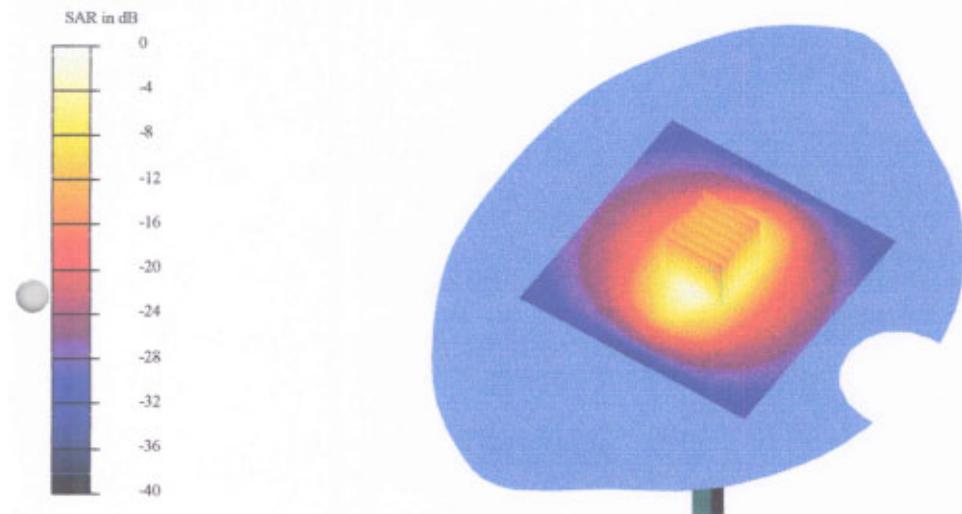
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm

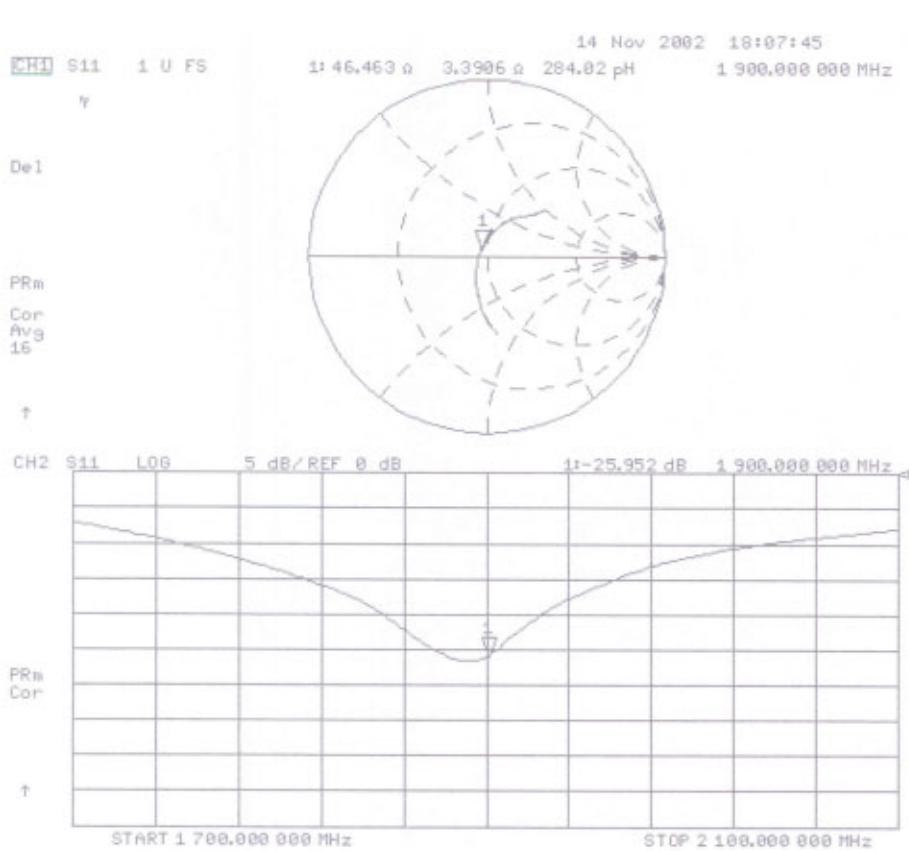
Reference Value = 90.7 V/m

Peak SAR = 18.8 mW/g

SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.26 mW/g

Power Drift = -0.03 dB





Muscle