



TTI-P-G 158



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## Report



# Dosimetric Assessment of the Portable Device Alcatel One Touch 557A (FCC ID: RAD006) According to the FCC Requirements

July 20, 2004  
IMST GmbH  
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D-47475 Kamp-Lintfort

Customer  
Alcatel Business Systems  
32, avenue Kléber  
F-92707 Colombes Cedex

The test results only relate to the items tested.  
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approval of the testing laboratory.

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)																																		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity &lt; 75%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Model Type</th> <th>ID #</th> <th>Cal Date (Calibrated by, Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter EPM E4419B</td> <td>GB41293874</td> <td>5-May-04 (METAS, No 251-00388)</td> <td>May-05</td> </tr> <tr> <td>Power sensor E4412A</td> <td>MY41495277</td> <td>5-May-04 (METAS, No 251-00388)</td> <td>May-05</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: 5086 (20b)</td> <td>3-May-04 (METAS, No 251-00389)</td> <td>May-05</td> </tr> <tr> <td>Fluke Process Calibrator Type 702</td> <td>SN: 6295803</td> <td>8-Sep-03 (Sintrel SCS No. E-030020)</td> <td>Sep-04</td> </tr> <tr> <td>Power sensor HP 8481A</td> <td>MY41092180</td> <td>18-Sep-02 (SPEAG, in house check Oct-03)</td> <td>In house check: Oct 05</td> </tr> <tr> <td>RF generator HP 8684C</td> <td>US3642U01700</td> <td>4-Aug-99 (SPEAG, in house check Aug-02)</td> <td>In house check: Aug-05</td> </tr> <tr> <td>Network Analyzer HP 8753E</td> <td>US37390585</td> <td>18-Oct-01 (SPEAG, in house check Oct-03)</td> <td>In house check: Oct 05</td> </tr> </tbody> </table>				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
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Calibrated by:	Name Nico Vetterli	Function Technician	Signature 																																
Approved by:	Katja Pokovic	Laboratory Director																																	
			Date issued: May 21, 2004																																
<p>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 &amp; Partner Engineering AG is completed.</p>																																			

# 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		Diode Compression <sup>A</sup>	
NormX	1.72 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	94 mV
NormY	1.66 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	94 mV
NormZ	1.65 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	94 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	8.0	4.1
	SAR <sub>be</sub> [%] With Correction Algorithm	0.0	0.2
Head	1800 MHz	Typical SAR gradient: 10 % per mm	
	Sensor Center to Phantom Surface Distance	3.7 mm	4.7 mm
	SAR <sub>be</sub> [%] Without Correction Algorithm	12.5	8.6
	SAR <sub>be</sub> [%] With Correction Algorithm	0.2	0.2

### Sensor Offset

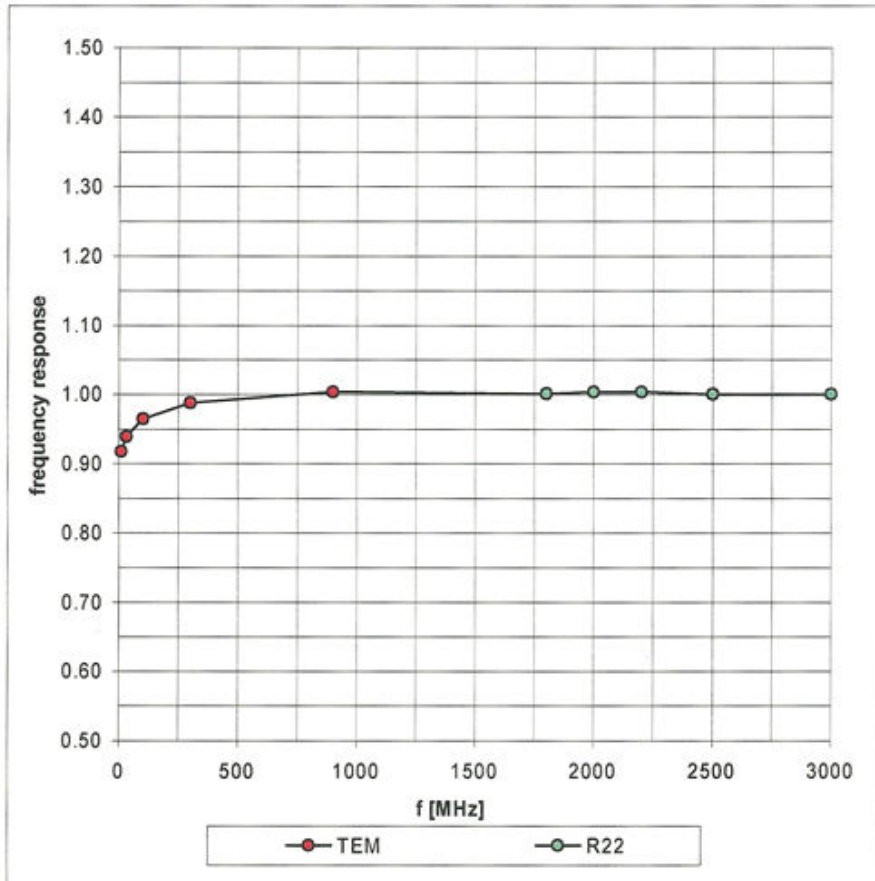
Probe Tip to Sensor Center	2.7 mm
Optical Surface Detection	in tolerance

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%.

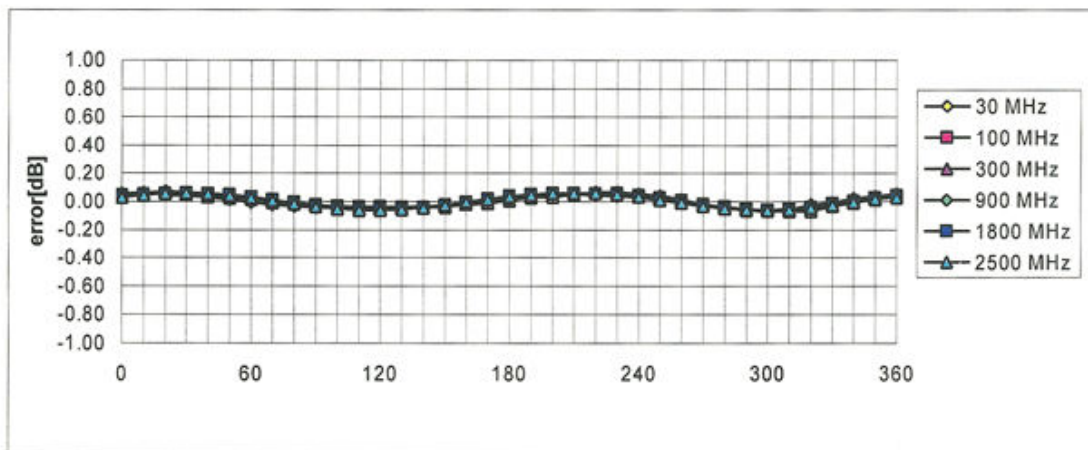
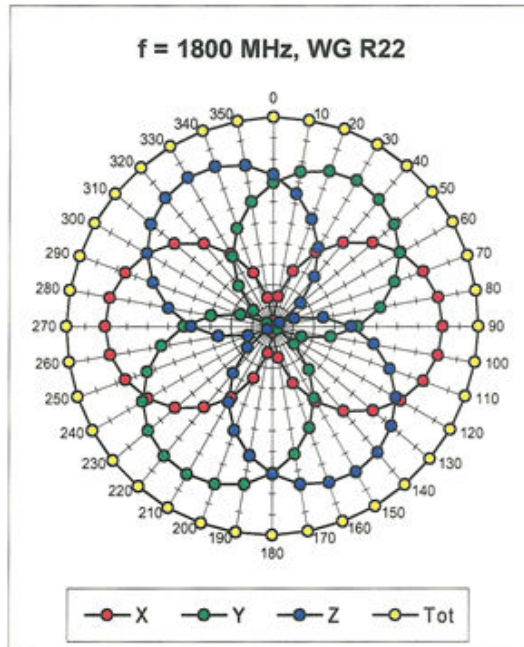
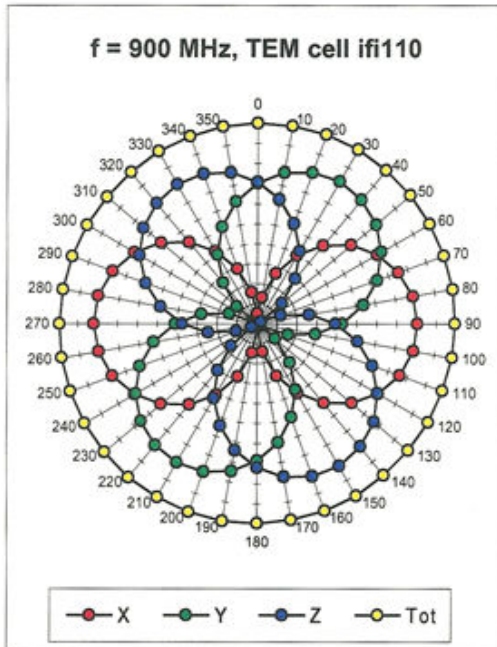
<sup>A</sup> numerical linearization parameter: uncertainty not required

# Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)



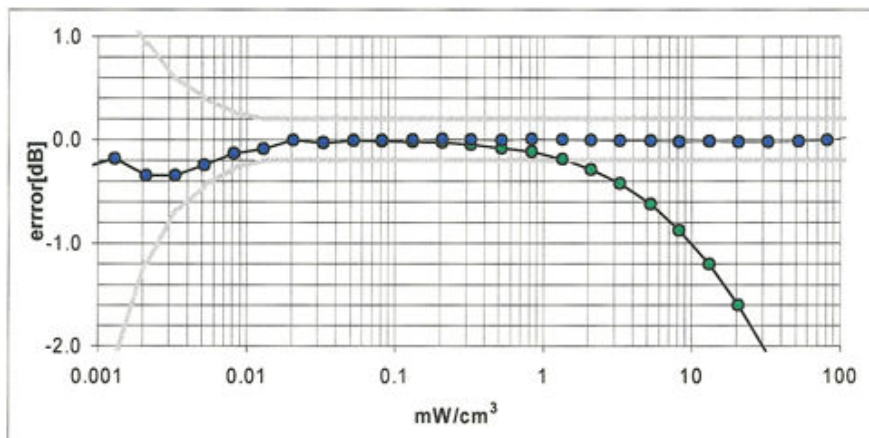
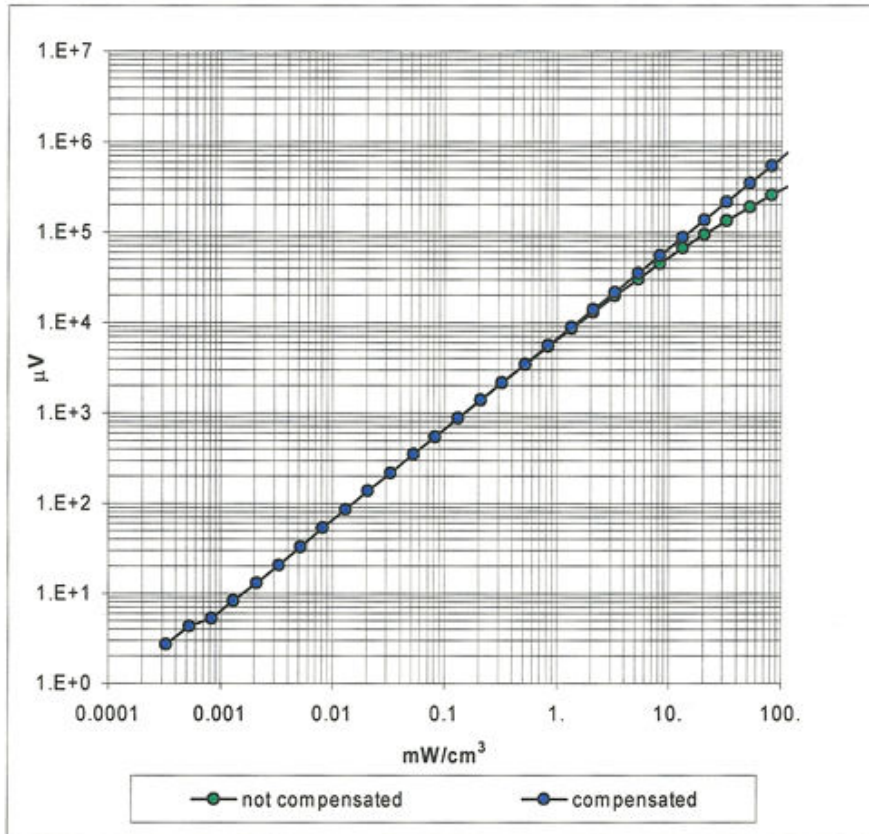
### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



**Axial Isotropy Error <math>\lt; \pm 0.2 \text{ dB}</math>**

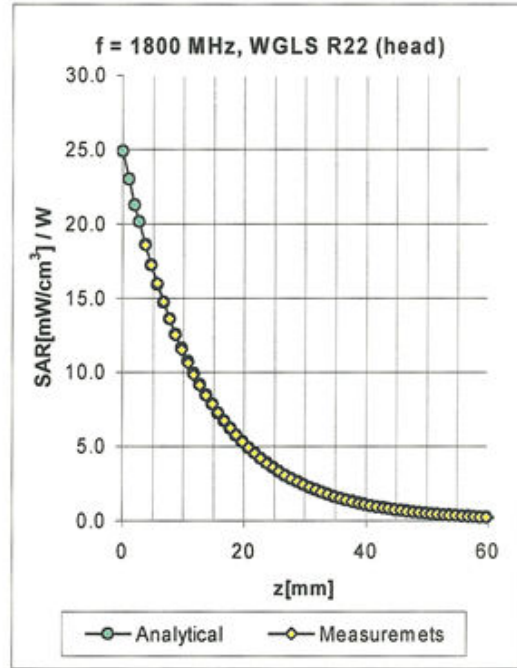
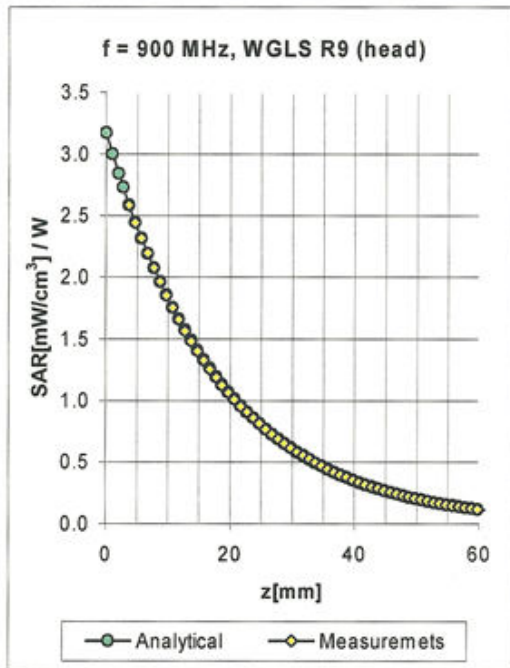


### Dynamic Range f(SAR<sub>head</sub>) ( Waveguide R22 )



Probe Linearity Error < ± 0.2 dB

### Conversion Factor Assessment



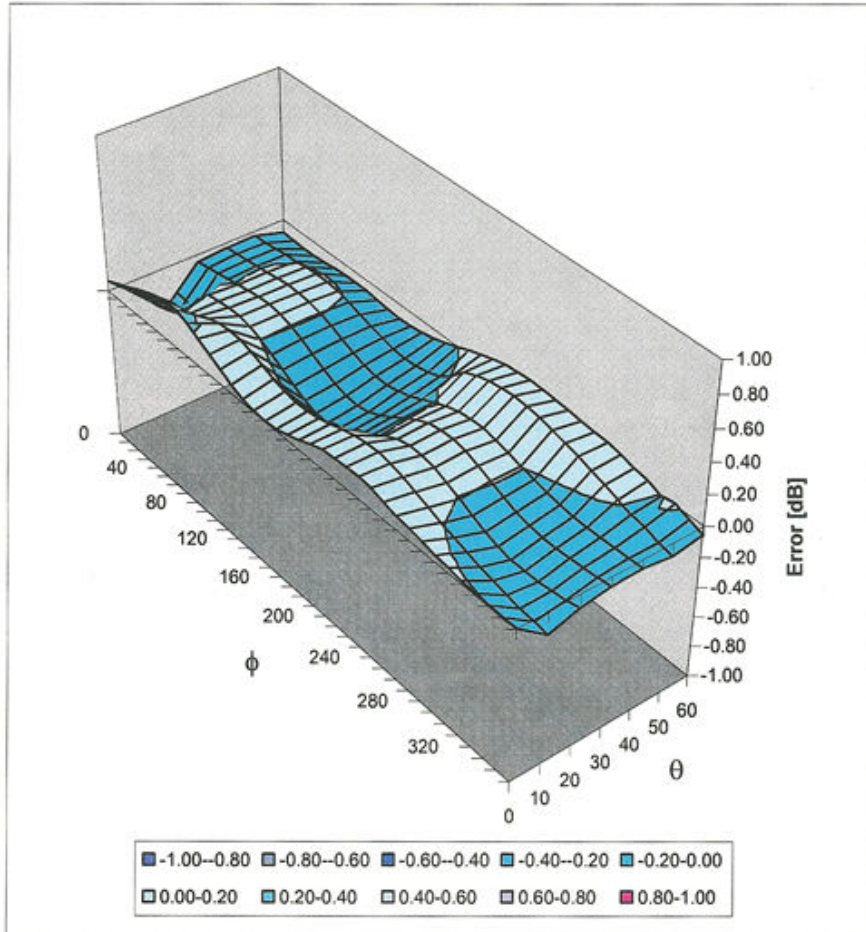
f [MHz]	Validity [MHz] <sup>B</sup>	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	785-885	Head	41.5 ± 5%	0.90 ± 5%	0.49	1.98	6.57 ± 9.7% (k=2)	
900	850-950	Head	41.5 ± 5%	0.97 ± 5%	0.65	1.69	6.35 ± 9.7% (k=2)	
1750	1700-1800	Head	40.0 ± 5%	1.40 ± 5%	0.45	2.63	5.15 ± 9.7% (k=2)	
1900	1850-1950	Head	40.0 ± 5%	1.40 ± 5%	0.49	2.81	4.93 ± 9.7% (k=2)	
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	0.85	2.05	4.37 ± 9.7% (k=2)	
835	785-885	Body	55.2 ± 5%	0.97 ± 5%	0.51	1.94	6.28 ± 9.7% (k=2)	
900	850-950	Body	55.0 ± 5%	1.05 ± 5%	0.56	1.86	6.14 ± 9.7% (k=2)	
1750	1700-1800	Body	53.3 ± 5%	1.52 ± 5%	0.51	2.90	4.59 ± 9.7% (k=2)	
1900	1850-1950	Body	53.3 ± 5%	1.52 ± 5%	0.56	2.82	4.45 ± 9.7% (k=2)	
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	1.05	1.63	4.21 ± 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**

**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**


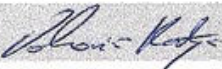
Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

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

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	
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 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	96	mV
NormY	1.93 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	96	mV
NormZ	1.81 $\mu\text{V}/(\text{V}/\text{m})^2$	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**

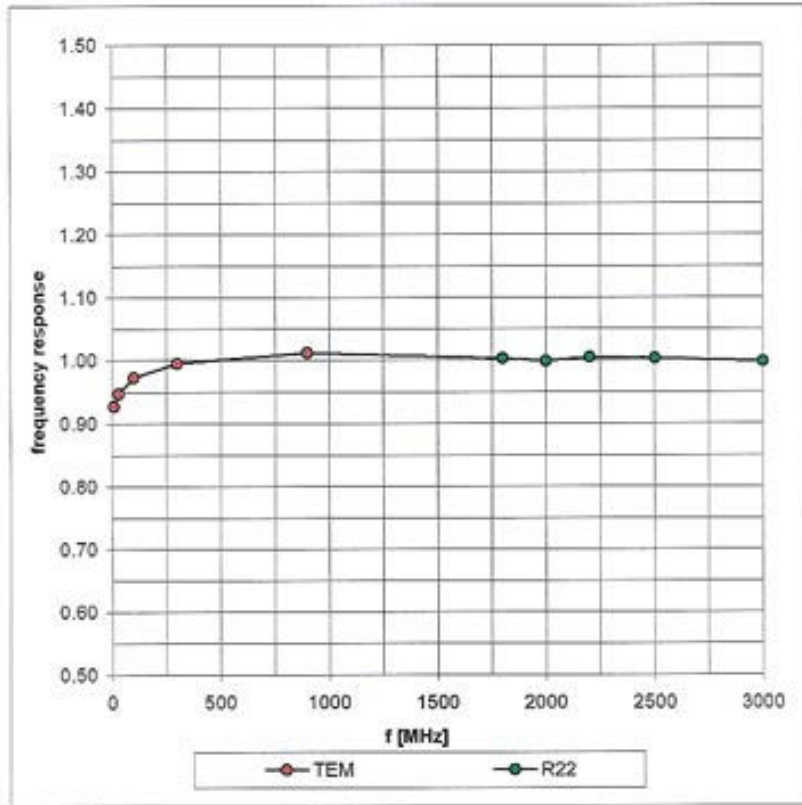
Probe Tip to Sensor Center	2.7 mm
Optical Surface Detection	in tolerance

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

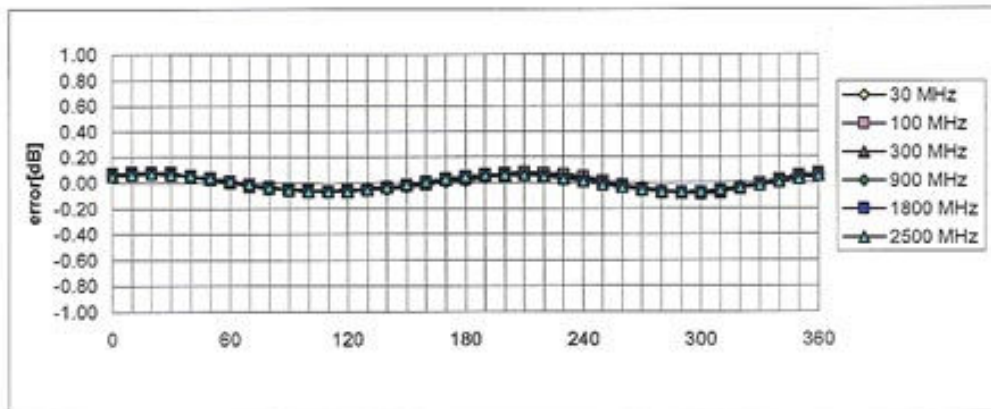
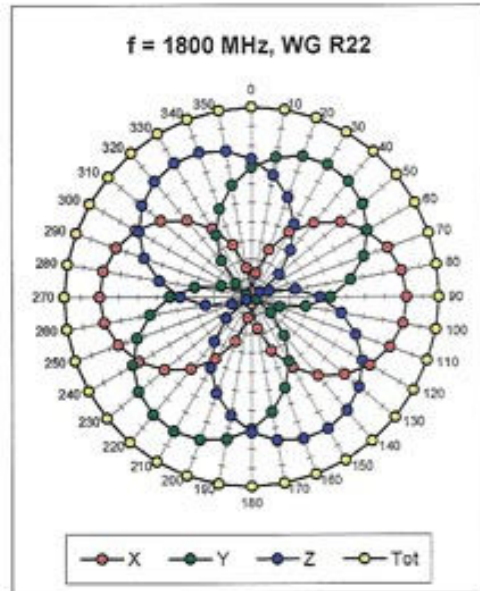
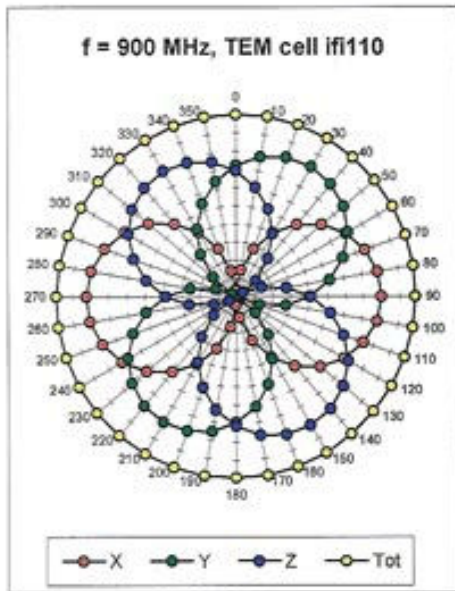
### Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)



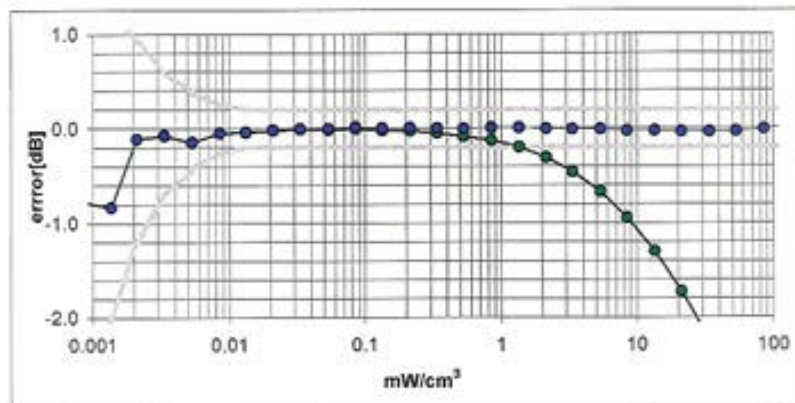
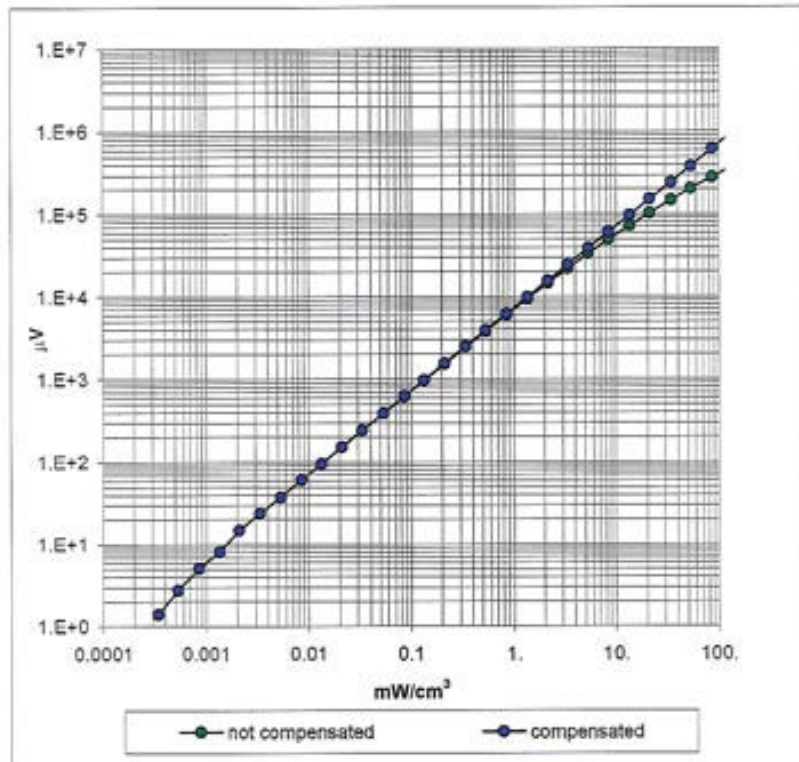


### Receiving Pattern ( $\phi$ ) , $\theta = 0^\circ$



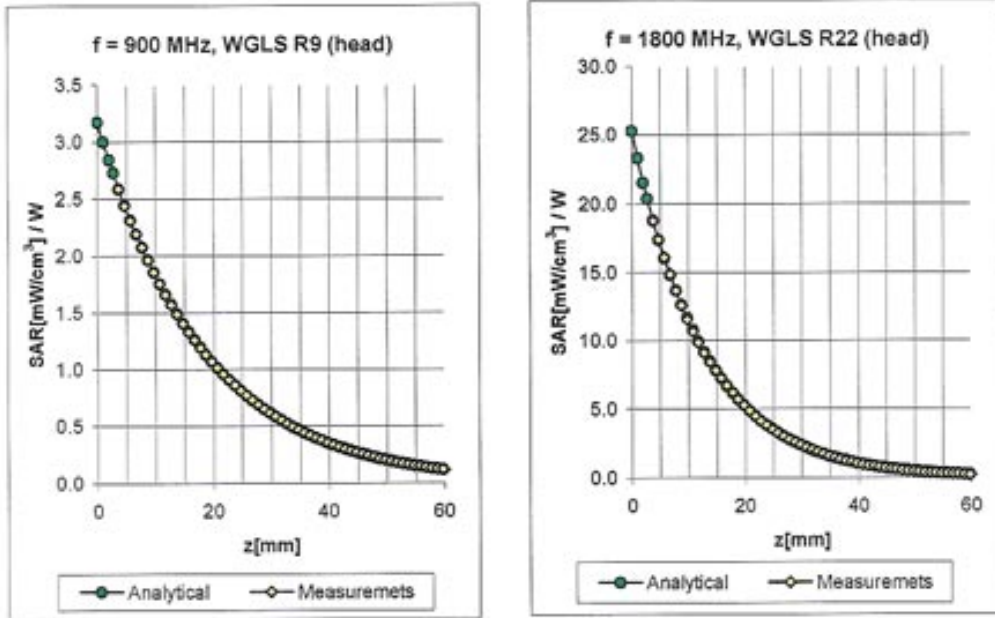
**Axial Isotropy Error  $< \pm 0.2$  dB**

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



Probe Linearity < ± 0.2 dB

### Conversion Factor Assessment

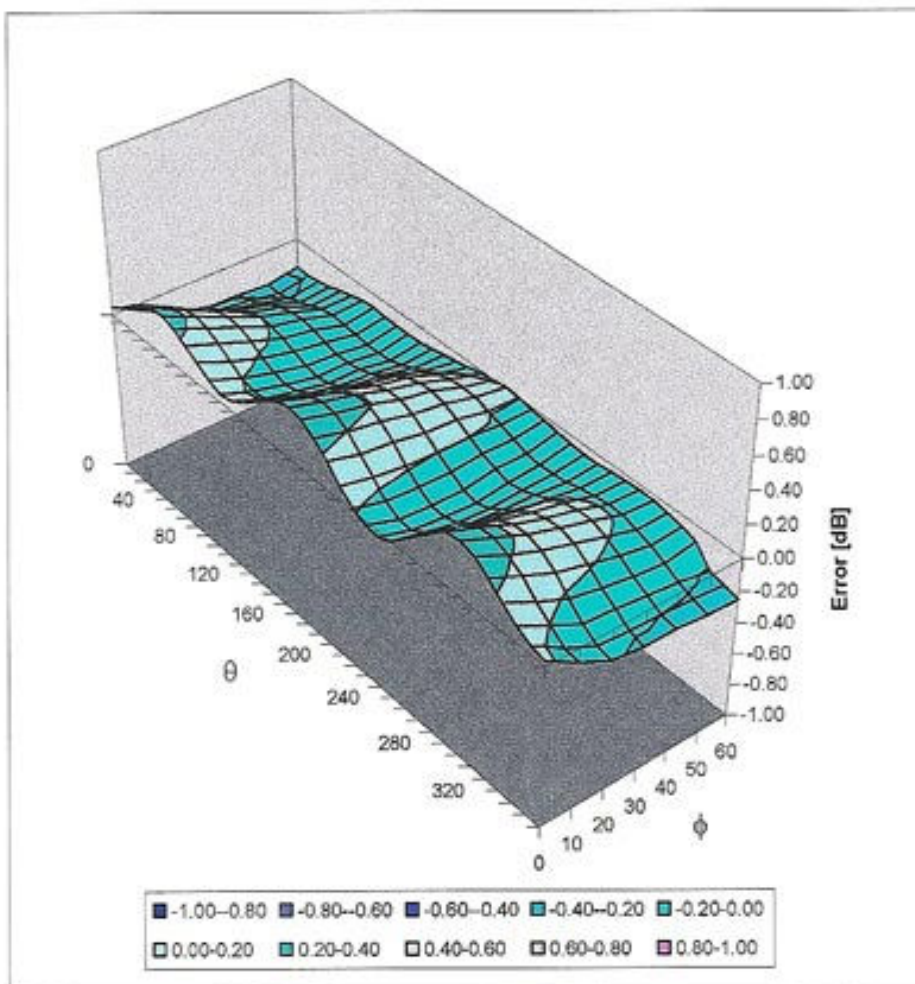


f [MHz]	Validity [MHz] <sup>8</sup>	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	785-885	Head	41.5 ± 5%	0.90 ± 5%	0.54	2.00	6.67 ± 9.7% (k=2)
900	850-950	Head	41.5 ± 5%	0.97 ± 5%	0.61	1.91	6.47 ± 9.7% (k=2)
1750	1700-1800	Head	40.0 ± 5%	1.40 ± 5%	0.48	2.73	5.38 ± 9.7% (k=2)
1900	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	56.2 ± 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>8</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 <math>\lt; \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. Vetterli

Approved by:

R. Kistler



# 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:

Thomas Katz

**Schmid & Partner  
Engineering AG**

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

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**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 250mW  $\pm 3\%$ . The results are normalized to 1W input power.

## 2. SAR Measurement with DASY4 System

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

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

### 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: **1.438 ns** (one direction)  
Transmission factor: **0.988** (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 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 **55.9**  $\pm 5\%$   
Conductivity **0.96 mho/m**  $\pm 5\%$

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 250mW  $\pm 3\%$ . The results are normalized to 1W input power.







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

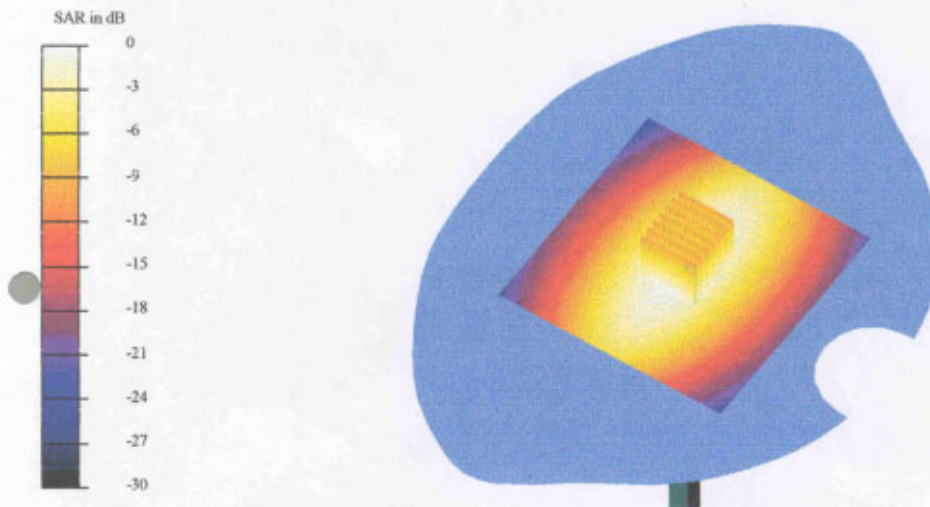
**DUT: Dipole 835 MHz Type & Serial Number: D835V2 - SN437**  
**Program: Dipole Calibration; Pin = 250 mW; d = 10 mm**

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



13 Nov 2002 11:23:23

CH1 S11 1 U FS

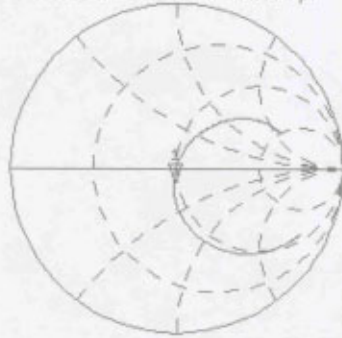
1: 47.918  $\Omega$  -7.6328  $\Omega$  24.972 pF

835.000 000 MHz

Del

PRn  
Cor  
Avg  
16

↑



CH2 S11 LOG 5 dB/REF 0 dB 1: -21.896 dB 835.000 000 MHz

PRn  
Cor

↑



START 635.000 000 MHz

STOP 1 835.000 000 MHz

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 ( $\sigma = 0.96$  mho/m,  $\epsilon = 55.87$ ,  $\rho = 1000$  kg/m<sup>3</sup>)  
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

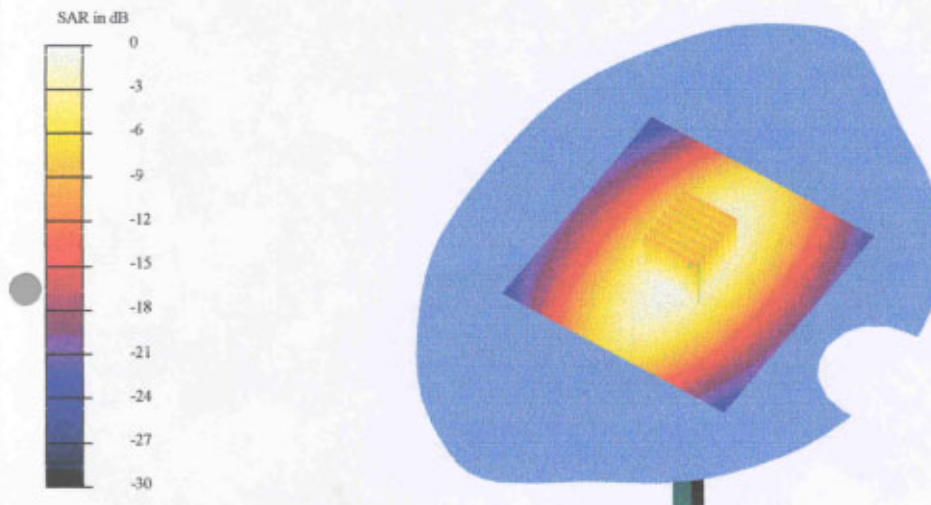
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm

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

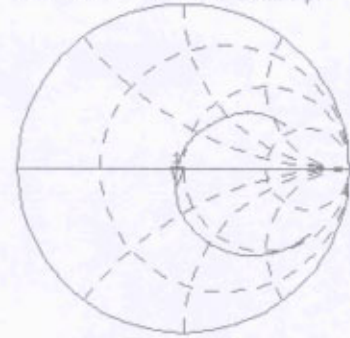


Muscle

13 Nov 2002 16:55:27

CHI S11 1 U FS 1:44.605 a -9.4473 a 20.176 pF 035.000 000 MHz

De1  
PRn  
Cor  
Avg  
16  
↑



CH2 S11 LOG 5 dB/REF 0 dB 1: -18.866 dB 035.000 000 MHz

PRn  
Cor  
↑



START 635.000 000 MHz

STOP 1 035.000 000 MHz

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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:	<b>40.8 mW/g</b>
averaged over $10\text{ cm}^3$ (10 g) of tissue:	<b>20.7 mW/g</b>

### 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>1.2184 ns</b>	(one direction)
Transmission factor:	<b>0.995</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 1900 MHz:	$\text{Re}\{Z\} = 50.9 \Omega$
	$\text{Im}\{Z\} = 3.6 \Omega$
Return Loss at 1900 MHz	<b>-28.6 dB</b>

### 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	<b>52.2</b>	$\pm 5\%$
Conductivity	<b>1.57 mho/m</b>	$\pm 5\%$

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 250mW  $\pm 3\%$ . 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:	<b>41.2 mW/g</b>
averaged over 10 cm <sup>3</sup> (10 g) of tissue:	<b>21.0 mW/g</b>

## **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:	$\text{Re}\{Z\} = 46.5 \Omega$
	$\text{Im}\{Z\} = 3.4 \Omega$
Return Loss at 1900 MHz	<b>-26.0 dB</b>

## **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

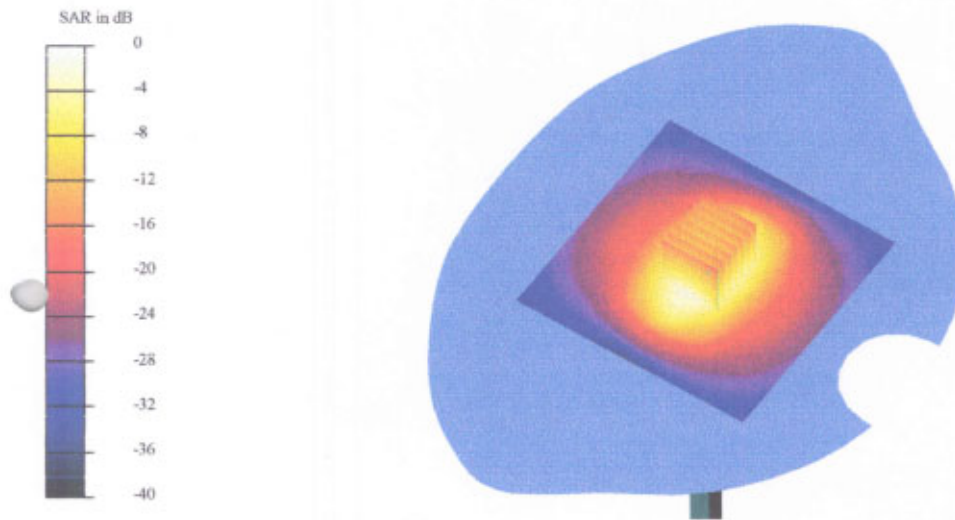
**DUT: Dipole 1900 MHz Type & Serial Number: D1900V2 - SN535**  
**Program: Dipole Calibration; Pin = 250 mW; d = 10 mm**

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium: HSL 1900 MHz ( $\sigma = 1.45$  mho/m,  $\epsilon = 39.75$ ,  $\rho = 1000$  kg/m<sup>3</sup>)  
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



14 Nov 2002 16:58:38

CH1 S11 1 U FS 1: 58.945  $\omega$  3.6445  $\omega$  305.29 pH 1 900.000 000 MHz

y

Del

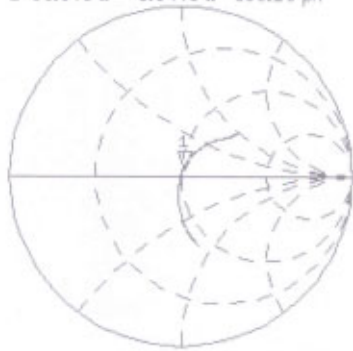
PRn

Cor

Avg

15

↑

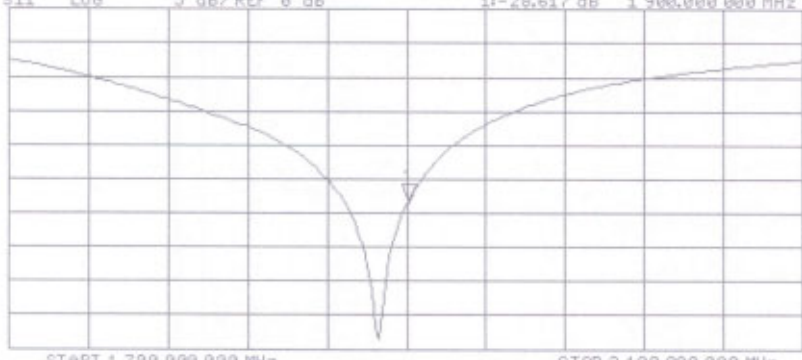


CH2 S11 LOG 5 dB/REF 0 dB 1: -28.617 dB 1 900.000 000 MHz

PRn

Cor

↑



START 1 700.000 000 MHz

STOP 2 100.000 000 MHz



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 - TP:1006
- Software: DASY4, V4.0 Build 35

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

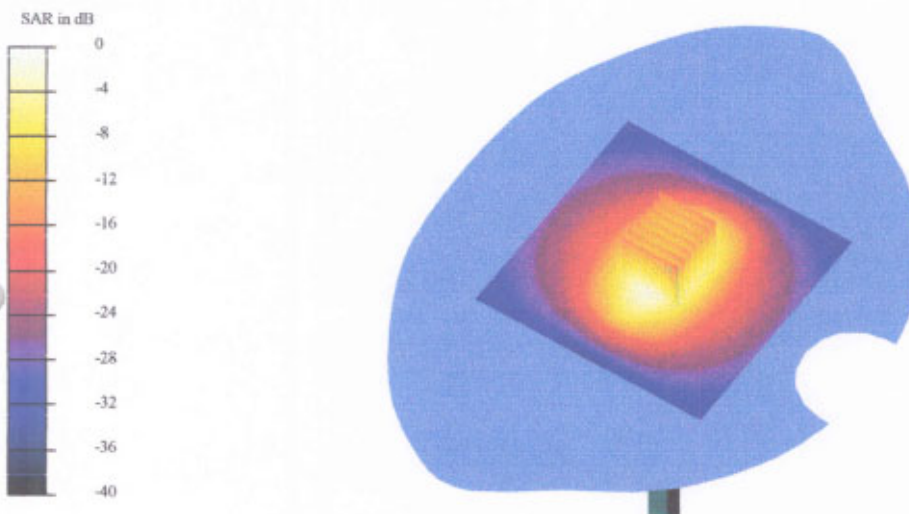
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm

Reference Value = 90.7 V/m

Peak SAR = 18.8 mW/g

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

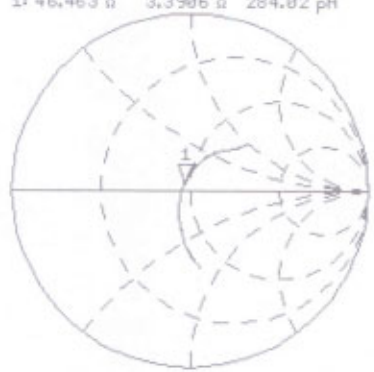
Power Drift = -0.03 dB



Muscle

14 Nov 2002 18:07:45  
CH1 S11 1 U FS 1: 46.463  $\Omega$  3.3906  $\Omega$  284.82  $\mu$ H 1 900.000 000 MHz

De1

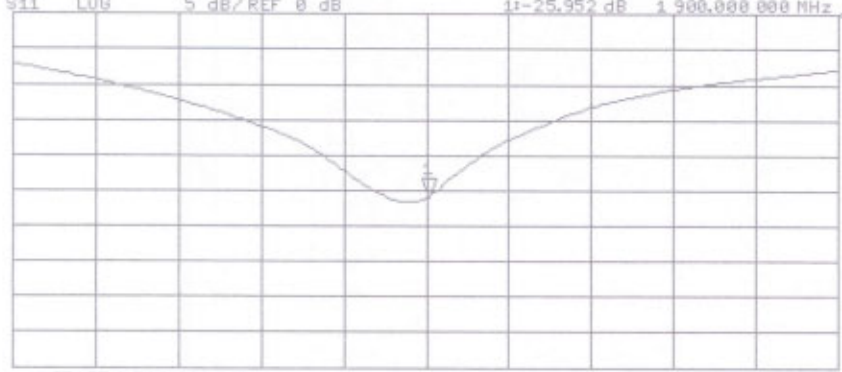


PRM  
Cor  
Avg  
15

↑

CH2 S11 LOG 5 dB/REF 0 dB 1:-25.952 dB 1 900.000 000 MHz

PRM  
Cor



↑

START 1 700.000 000 MHz

STOP 2 1 900.000 000 MHz