TTI-P-G 158

Calibration Data and Phantom Information for the Report

Dosimetric Assessment of the Mobicom C 6288i (FCC ID: P8D-C6288i) According to the FCC Requirements

March 20, 2002

IMST GmbH
Carl-Friedrich-Gauß-Str. 2
D-47475 Kamp-Lintfort

Customer
7 layers AG
Borsigstrasse 11
D-40880-Ratingen

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:	**1579**
Place of Calibration:	**Zurich**
Date of Calibration:	**January 29, 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:	Nikolosrki Neviana
Approved by:	Kuric Katja

calibration_data_fcc_supplement_c _2.1.doc/22.02.2002/CH

Probe ET3DV6

SN:1579

Manufactured:	May 7, 2001
Last calibration:	May 11, 2001
Recalibrated:	January 29, 2002

Calibrated for System DASY3

ET3DV6 SN:1579 January 29, 2002

DASY3 - Parameters of Probe: ET3DV6 SN:1579

Sensitivity in Free Space

NormX	1.68	$\mu V/(V/m)^2$
NormY	1.75	$\mu V/(V/m)^2$
NormZ	1.91	$\mu V/(V/m)^2$

Diode Compression

DCP X	99	mV
DCP Y	99	mV
DCP Z	99	mV

Sensitivity in Tissue Simulating Liquid

Head 900 MHz ε_r = 41.5 ± 5% σ = 0.97 ± 5% mho/m
Head 835 MHz ε_r = 41.5 ± 5% σ = 0.90 ± 5% mho/m

ConvF X	6.8	± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.8	± 9.5% (k=2)	Alpha	0.58
ConvF Z	6.8	± 9.5% (k=2)	Depth	1.76

Head 1800 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m
Head 1900 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

ConvF X	5.5	± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.5	± 9.5% (k=2)	Alpha	0.47
ConvF Z	5.5	± 9.5% (k=2)	Depth	2.34

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary	1 mm	2 mm
SAR_{be} [%] Without Correction Algorithm	7.7	4.0
SAR_{be} [%] With Correction Algorithm	0.1	0.2

Head 1800 MHz Typical SAR gradient: 10 % per mm

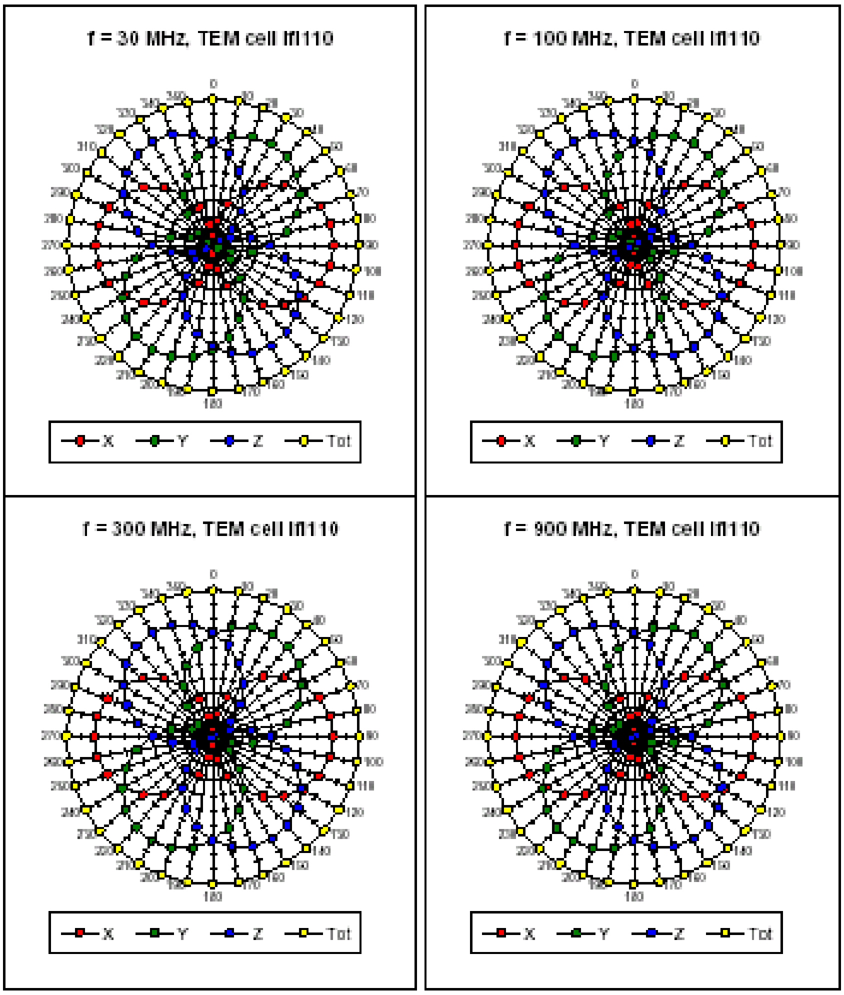
Probe Tip to Boundary	1 mm	2 mm
SAR_{be} [%] Without Correction Algorithm	10.5	7.0
SAR_{be} [%] With Correction Algorithm	0.2	0.2

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.5 ± 0.2	mm

ET3DV6 SN:1579 January 29, 2002

Receiving Pattern (ϕ), $\theta = 0°$



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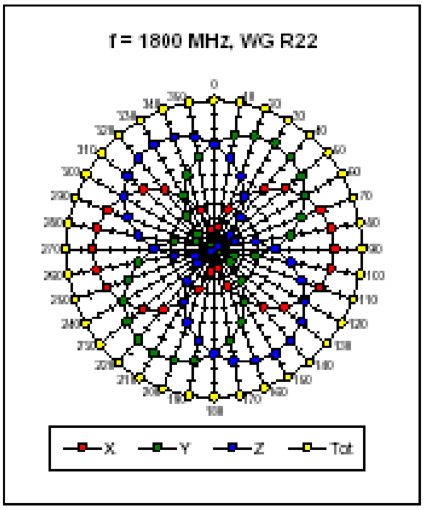
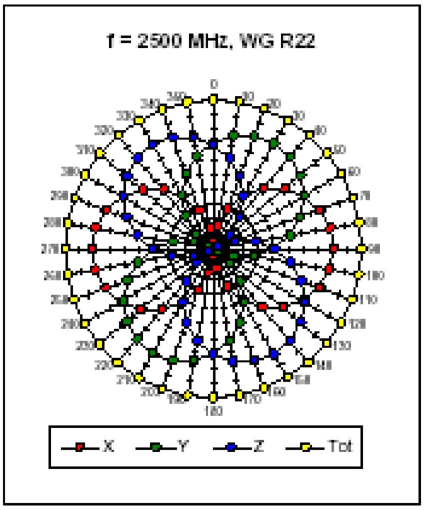
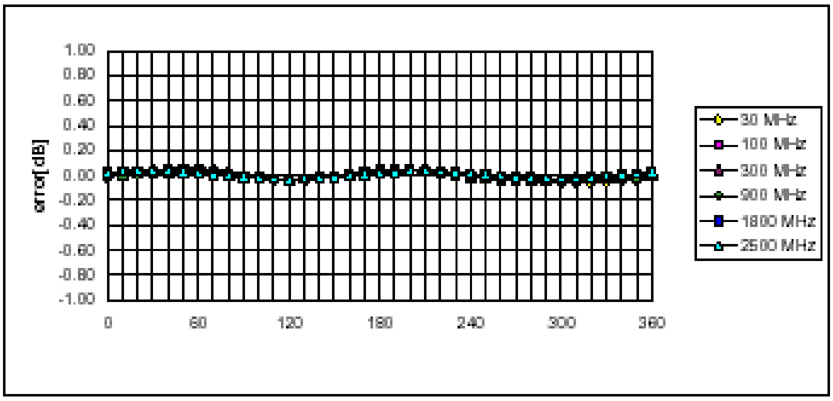




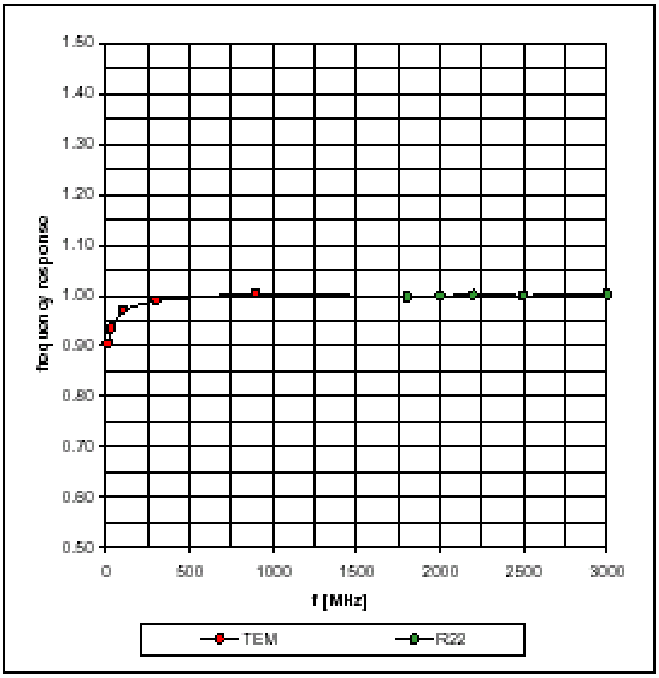
Isotropy Error (ϕ), θ = 0°



ET3DV6 SN:1579 January 29, 2002

Frequency Response of E-Field

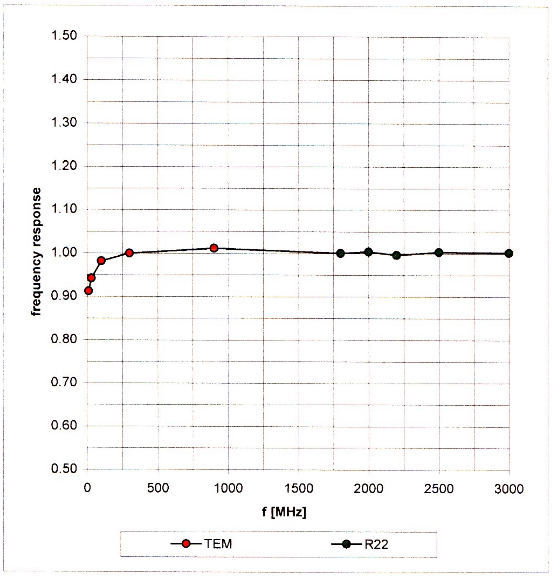
(TEM-Cell:ifi110, Waveguide R22)



ET3DV6 SN:1579

Frequency Response of E-Field

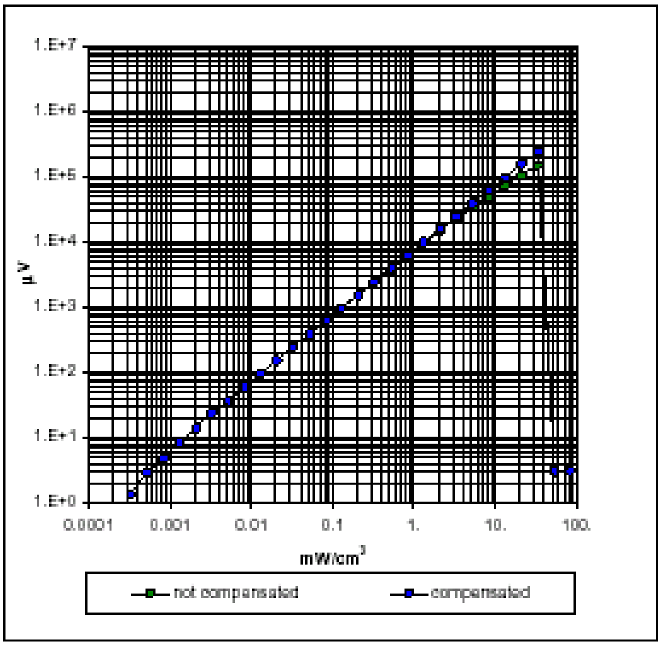
(TEM-Cell:ifi110, Waveguide R22)

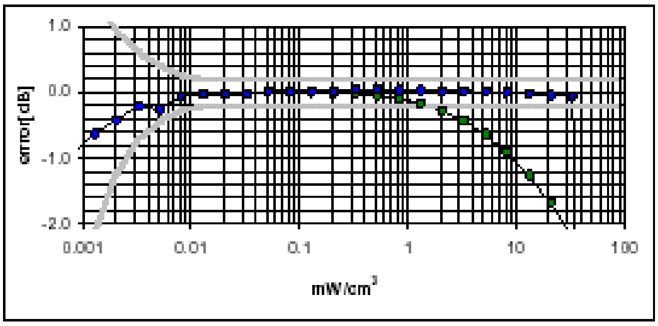


ET3DV6 SN:1579 January 29, 2002

Dynamic Range f(SAR_{brain})

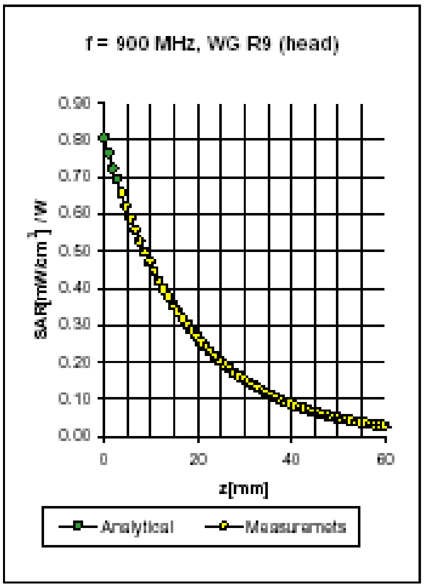
(Waveguide R22)

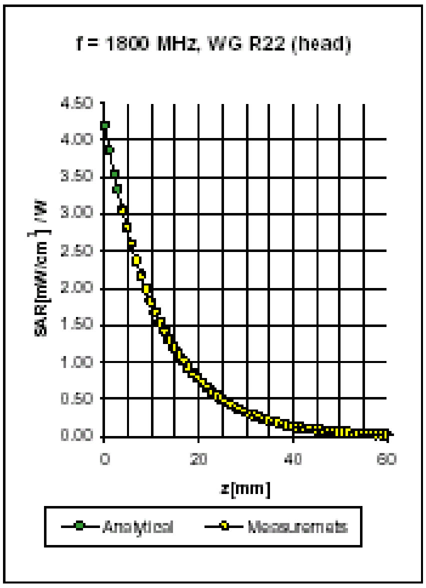




ET3DV6 SN:1579 January 29, 2002

Conversion Factor Assessment



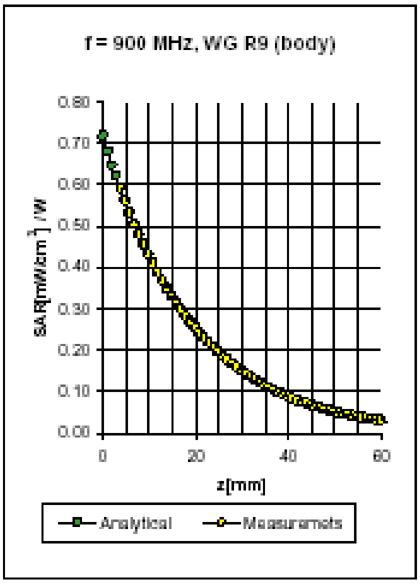


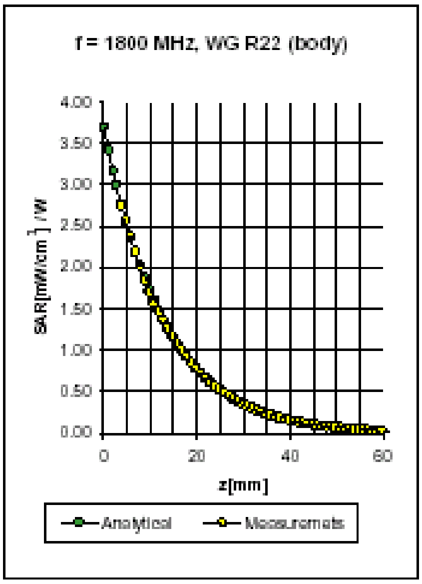
Head	900 MHz		ε_r = 41.5 ± 5%	σ = 0.97 ± 5% mho/m
Head	835 MHz		ε_r = 41.5 ± 5%	σ = 0.90 ± 5% mho/m
ConvF X	6.8	± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.8	± 9.5% (k=2)	Alpha	0.58
ConvF Z	6.8	± 9.5% (k=2)	Depth	1.76

Head	1800 MHz		ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m
Head	1900 MHz		ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m
ConvF X	5.5	± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.5	± 9.5% (k=2)	Alpha	0.47
ConvF Z	5.5	± 9.5% (k=2)	Depth	2.34

ET3DV6 SN:1579 January 29, 2002

Conversion Factor Assessment





Body	900 MHz		ε_r = 55.0 ± 5%	σ = 1.05 ± 5% mho/m	
Body	835 MHz		ε_r = 55.2 ± 5%	σ = 0.97 ± 5% mho/m	
	ConvF X	6.6 ± 9.5% (k=2)		Boundary effect:	
	ConvF Y	6.6 ± 9.5% (k=2)		Alpha	0.48
	ConvF Z	6.6 ± 9.5% (k=2)		Depth	2.06

Body	1800 MHz		ε_r = 53.3 ± 5%	σ = 1.52 ± 5% mho/m	
Body	1900 MHz		ε_r = 53.3 ± 5%	σ = 1.52 ± 5% mho/m	
	ConvF X	5.0 ± 9.5% (k=2)		Boundary effect:	
	ConvF Y	5.0 ± 9.5% (k=2)		Alpha	0.60
	ConvF Z	5.0 ± 9.5% (k=2)		Depth	2.23

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:	**Apr. 24, 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:

Schmid & Partner
ngineering AG

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

DASY3

Dipole Validation Kit

Type: D1900V2

Serial: 535

Manufactured: March 22, 2001
Calibrated: April 24, 2001

1. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with brain simulating sugar solution of the following electrical parameters at 1900 MHz:

Relative permitivity	**39.2**	± 5%
Conductivity	**1.47 mho/m**	± 10%

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, conversion factor 5.57 at 1800 MHz) was used for the measurements.

The dipole feedpoint was positioned below the center marking and 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 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 head phantom according to the measurement conditions described in section 1. The results (see figure) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm^3 (1 g) of tissue:	**43.2 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**21.9 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. The estimated sensitivities of SAR-values and penetration depths to the liquid parameters are listed in the DASY Application Note 4: 'SAR Sensitivities'.

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:	**1.204 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 1900 MHz:	Re{Z} = **51.0 Ω**
	Im {Z} = **-0.1 Ω**
Return Loss at 1900 MHz	**- 40.3 dB**

4. Handling

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.

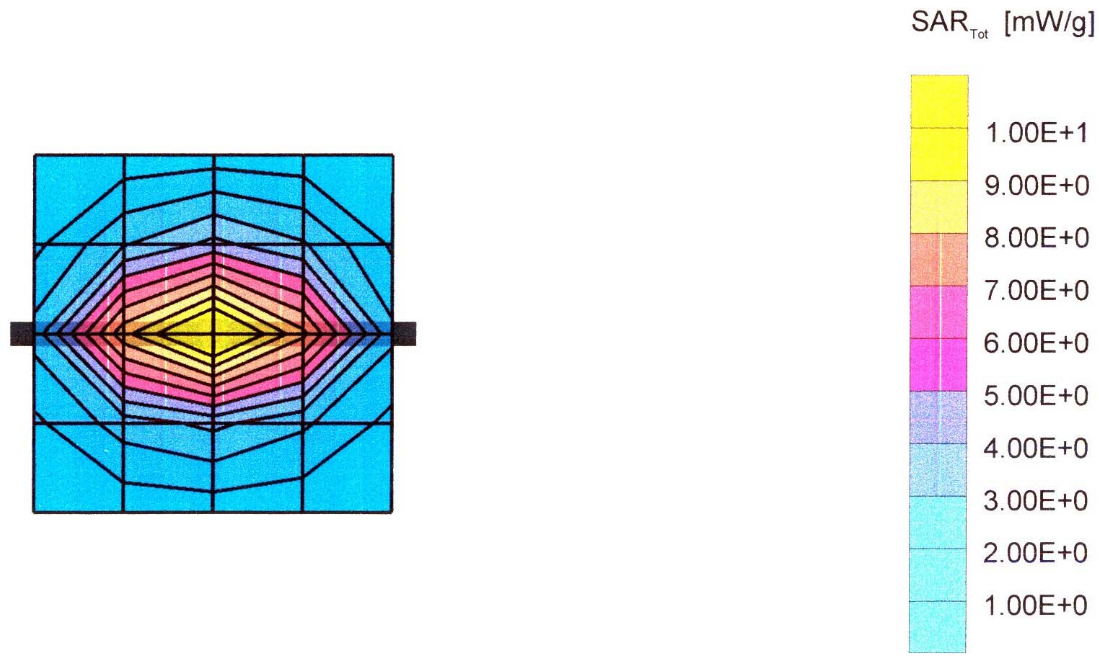
Do not apply excessive force to the dipole arms, because they might bend. If the dipole arms have to be bent back, take care to release stress to the soldered connections near the feedpoint; they might come off.

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

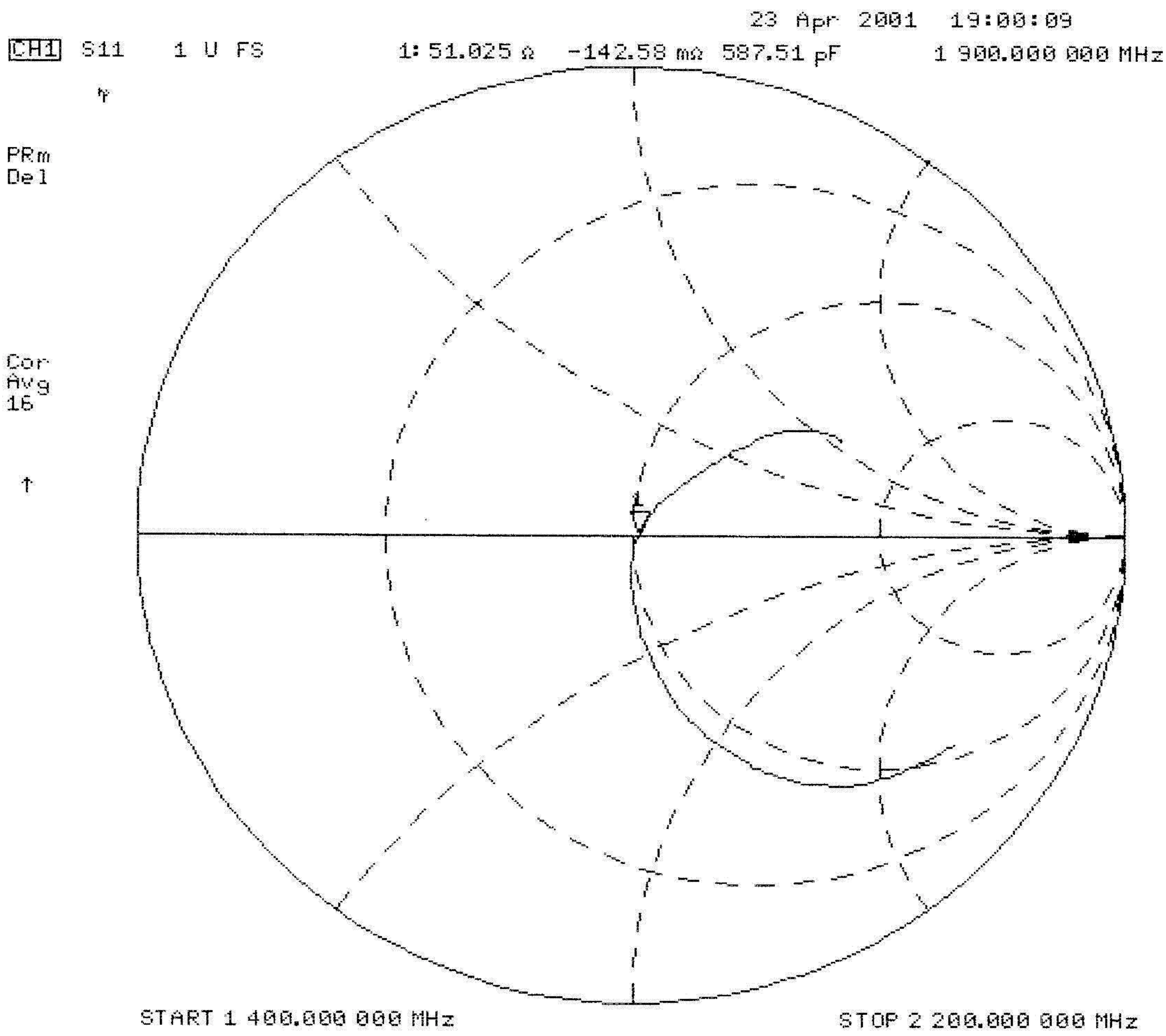
04/23/01

Validation Dipole D1900V2 SN:535, d = 10 mm

Frequency: 1900 MHz; Antenna Input Power: 250 [mW]
Generic Twin Phantom; Flat Section; Grid Spacing: Dx = 15.0, Dy = 15.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.57,5.57,5.57) at 1800 MHz; IEEE1528 1900 MHz ; σ = 1.47 mho/m ε_r = 39.2 ρ = 1.00 g/cm^3
Cubes (2): Peak: 20.8 mW/g ± 0.04 dB, SAR (1g): 10.8 mW/g ± 0.03 dB, SAR (10g): 5.48 mW/g ± 0.02 dB, (Worst-case extrapolation)
Penetration depth: 7.8 (7.4, 8.9) [mm]
Powerdrift: 0.01 dB



Schmid & Partner Engineering AG, Zurich, Switzerland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CH1 S11 1 U FS
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PRm
Del
Cor
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16
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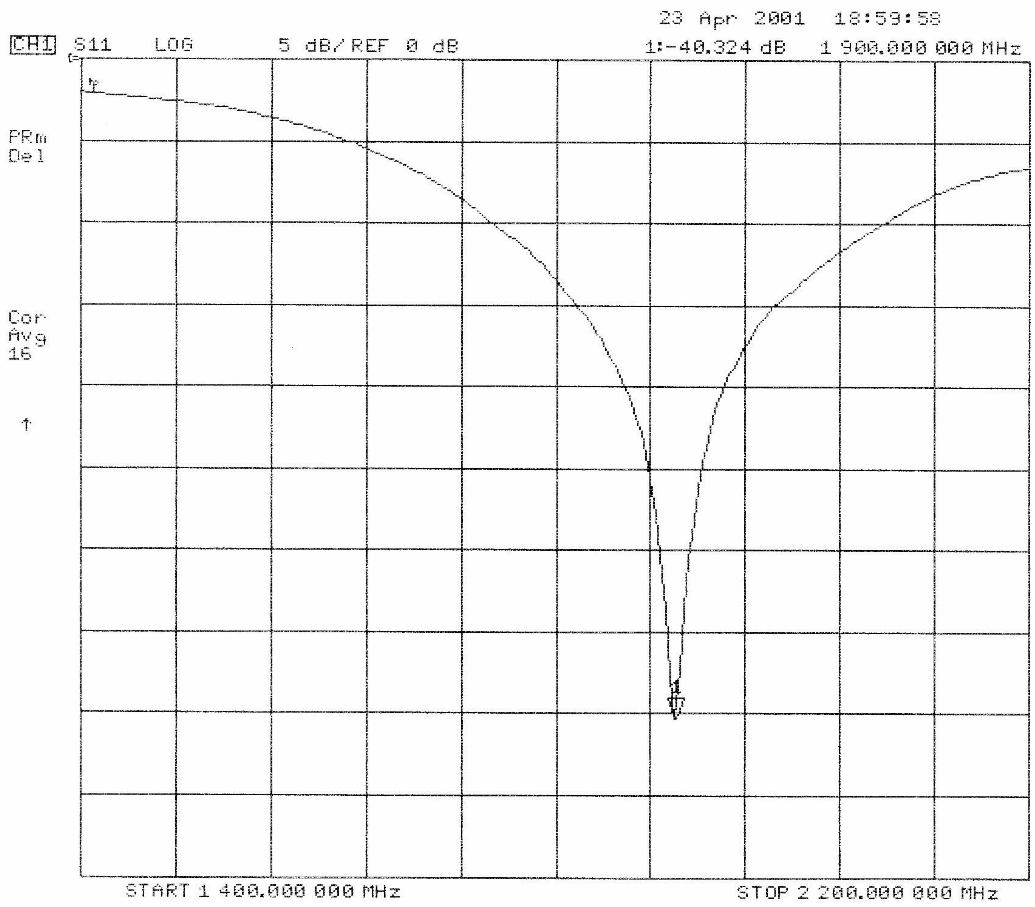
STOP 2 200.000 000 MHz


23 Apr 2001 18:59:58
CH1 S11 LOG 5 dB/ REF 0 dB
1:-40.324 dB 1 900.000 000 MHz
PRm
Del
Cor
Avg
16
START 1 400.000 000 MHz
STOP 2 200.000 000 MHz

Schmid & Partner
ngineering 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 (Muscle Tissue)

Type:	**D1900V2**
Serial Number:	**535**
Place of Calibration:	**Zurich**
Date of Calibration:	**August 23, 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:

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: D1900V2

Serial: 535

Manufactured: March 22, 2001
Calibrated: August 23, 2001

1. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with muscle simulating solution of the following electrical parameters at 1900 MHz:

Relative Dielectricity	**53.5**	± 5%
Conductivity	**1.46 mho/m**	± 5%

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.0 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 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement

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

averaged over 1 cm^3 (1 g) of tissue:	**40.8 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**21.2 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. The estimated sensitivities of SAR-values and penetration depths to the liquid parameters are listed in the DASY Application Note 4: 'SAR Sensitivities'.

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:	**1.203 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 1900 MHz:	Re{Z} = **42.0 Ω**
	Im {Z} = **-9.5 Ω**
Return Loss at 1900 MHz	**-17.5 dB**

4. Handling

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.

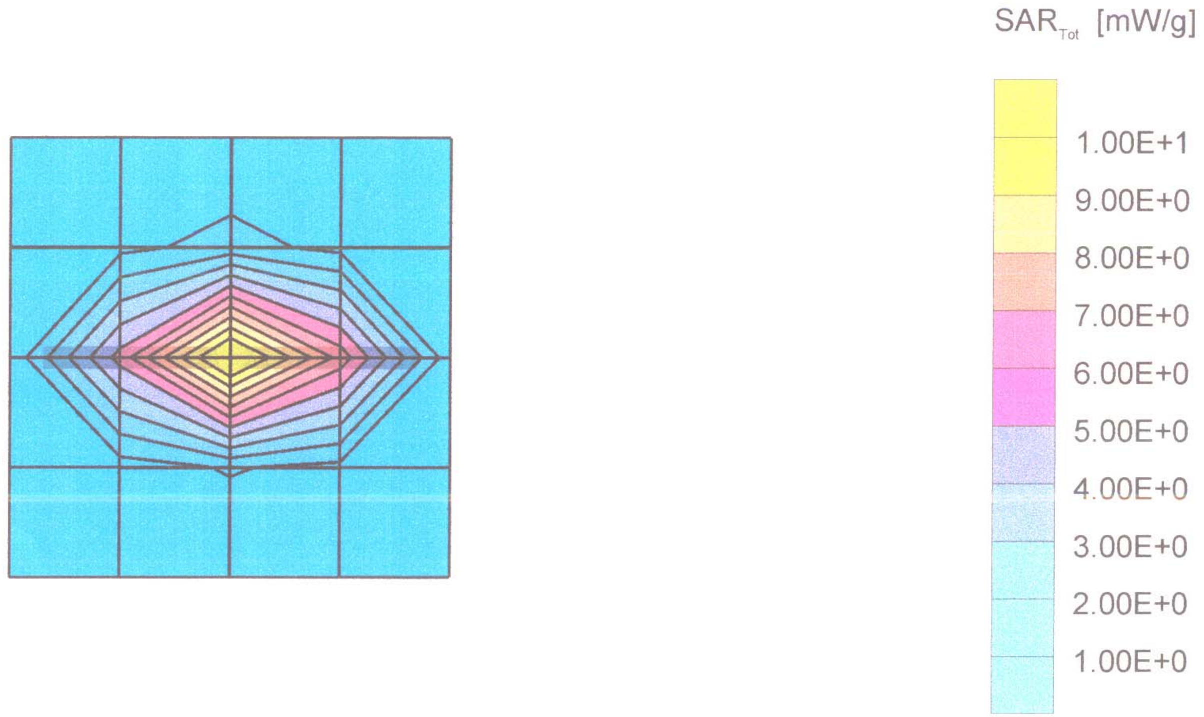
Do not apply excessive force to the dipole arms, because they might bend. If the dipole arms have to be bent back, take care to release stress to the soldered connections near the feedpoint; they might come off.

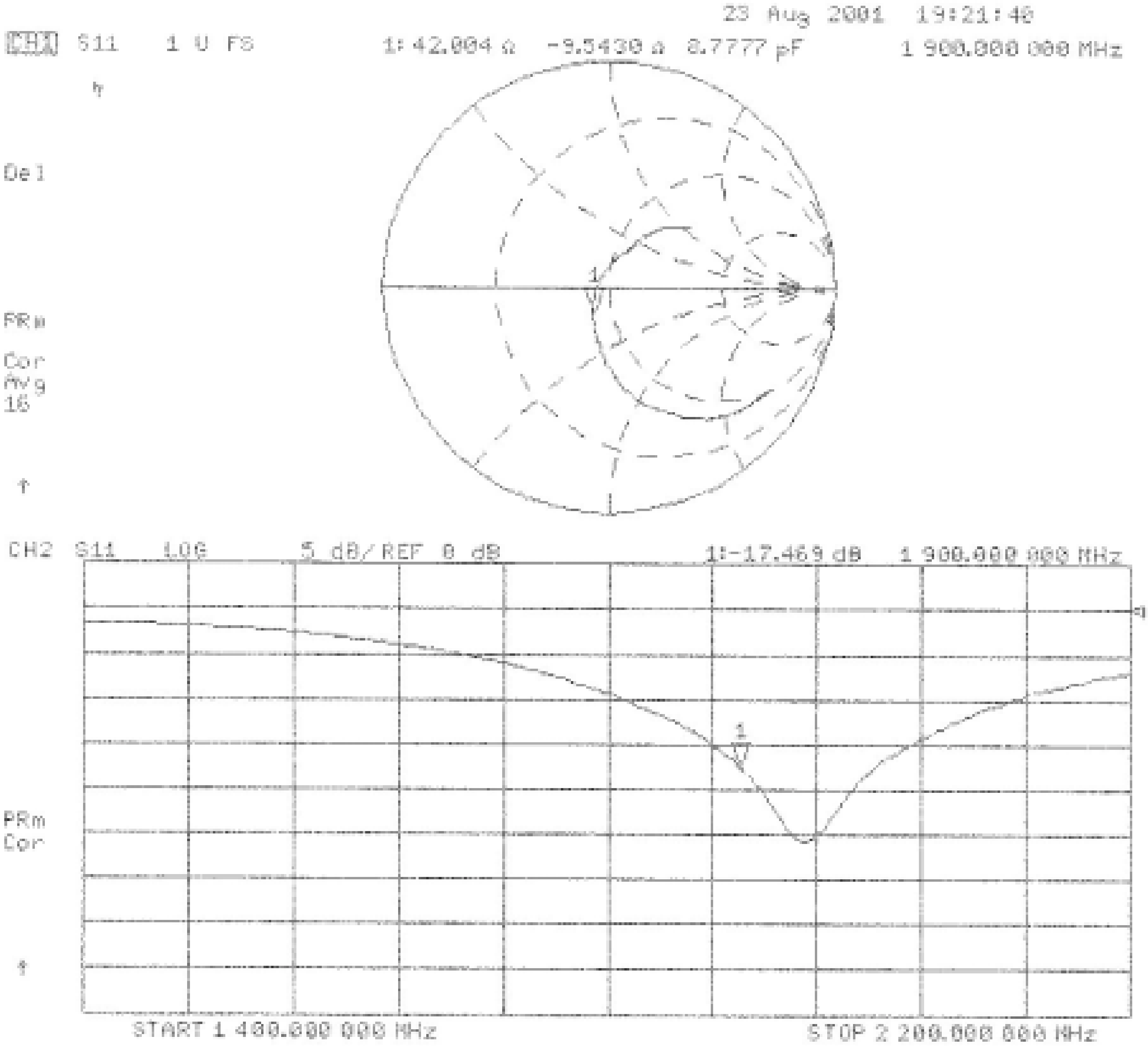
After prolonged use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

08/23/01

Validation Dipole D1900V2 SN:535, d = 10 mm

Frequency: 1900 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.00,5.00,5.00) at 1900 MHz; Muscle 1900 MHz; σ = 1.46 mho/m ε_r = 53.5 ρ = 1.00 g/cm³
Cubes (2): Peak: 19.1 mW/g ± 0.04 dB, SAR (1g): 10.2 mW/g ± 0.03 dB, SAR (10g): 5.29 mW/g ± 0.03 dB, (Worst-case extrapolation)
Penetration depth: 8.8 (7.9, 10.5) [mm]
Powerdrift: 0.01 dB




23 Aug 2001 19:21:40
CH1 S11 1 U FS
1: 42.004 Ω -9.5430 Ω 8.7777 pF 1 900.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF 0 dB 1:-17.469 dB 1 900.000 000 MHz
PRm
Cor
START 1 400.000 000 MHz
STOP 2 200.000 000 MHz

Schmid & Partner
Engineering AG

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

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

[1] CENELEC EN 50361
[2] IEEE P1528-200x draft 6.5
[3] IEC PT 62209 draft 0.9
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 18.11.2001

Signature / Stamp

Schmid & Partner
Engineering AG
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79