TTI-P-G 158

Appendix for the Report

Dosimetric Assessment of the Advantra AR100 (FCC ID: O33AR100) According to the FCC Requirements

Calibration Data

October 02, 2002

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Flanders Language Valley 90
B-8900 Ieper

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:	**May 3, 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:	[signature]

Probe ET3DV6

SN:1579

Manufactured:	May 7, 2001
Last calibration:	January 29, 2002
Repaired:	April 26, 2002
Recalibrated:	May 3, 2002

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6 SN:1579

Sensitivity in Free Space

NormX	**1.61**	$V/(V/m)^2$
NormY	**1.58**	$V/(V/m)^2$
NormZ	**1.59**	$V/(V/m)^2$

Diode Compression

DCP X	**93**	mV
DCP Y	**93**	mV
DCP Z	**93**	mV

Sensitivity in Tissue Simulating Liquid

Head	**900 MHz**	e_r **= 41.5 ± 5%**	s **= 0.97 ± 5% mho/m**
Head	**835 MHz**	e_r **= 41.5 ± 5%**	s **= 0.90 ± 5% mho/m**

ConvF X	**6.7**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.7**	± 9.5% (k=2)	Alpha	**0.32**
ConvF Z	**6.7**	± 9.5% (k=2)	Depth	**2.54**

Head	**1800 MHz**	e_r **= 40.0 ± 5%**	s **= 1.40 ± 5% mho/m**
Head	**1900 MHz**	e_r **= 40.0 ± 5%**	s **= 1.40 ± 5% mho/m**

ConvF X	**5.4**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.4**	± 9.5% (k=2)	Alpha	**0.45**
ConvF Z	**5.4**	± 9.5% (k=2)	Depth	**2.48**

Boundary Effect

Head **900 MHz** **Typical SAR gradient: 5 % per mm**

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	8.3	4.9
SAR_{be} [%]	With Correction Algorithm	0.3	0.4

Head **1800 MHz** **Typical SAR gradient: 10 % per mm**

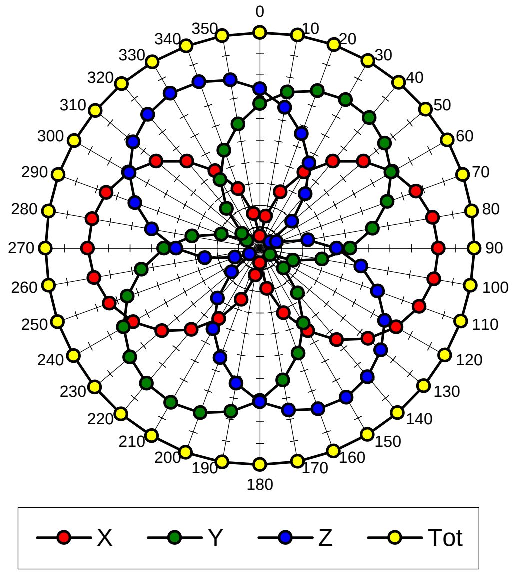
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	11.2	7.6
SAR_{be} [%]	With Correction Algorithm	0.2	0.3

Sensor Offset

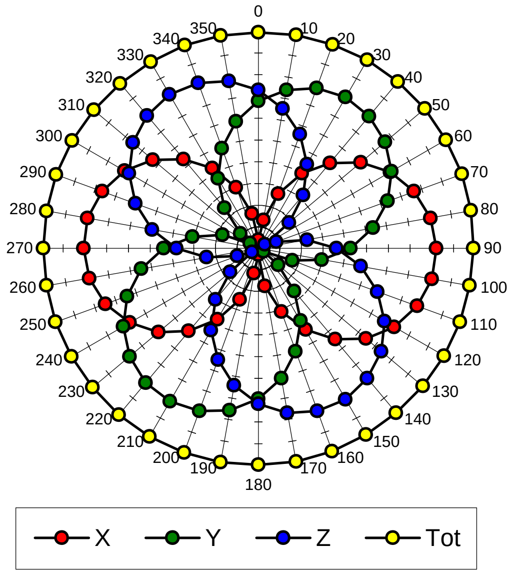
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.5 ± 0.2**	mm

Receiving Pattern (f), q = 0°

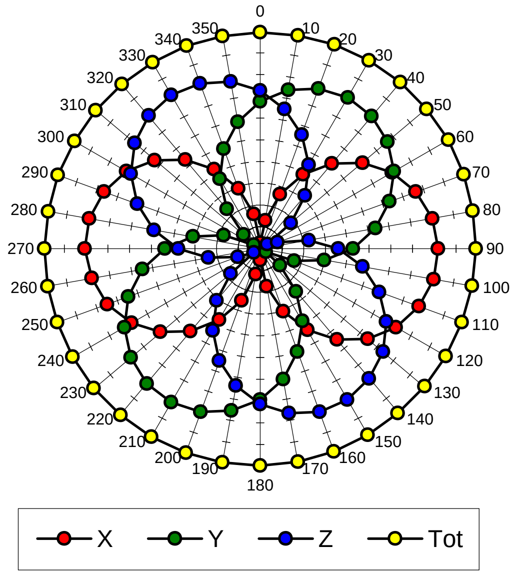
f = 30 MHz, TEM cell ifi110



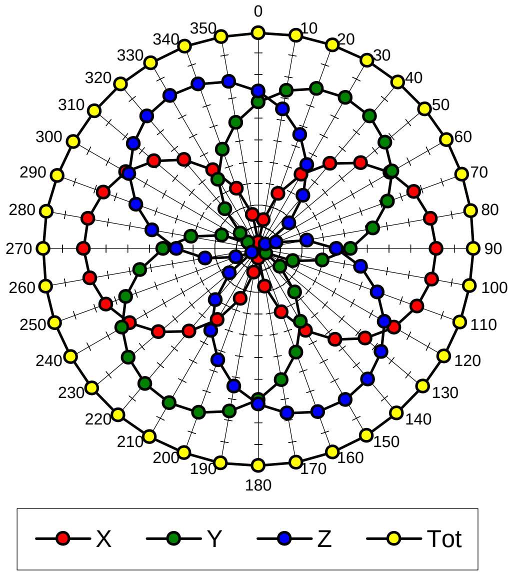
f = 100 MHz, TEM cell ifi110

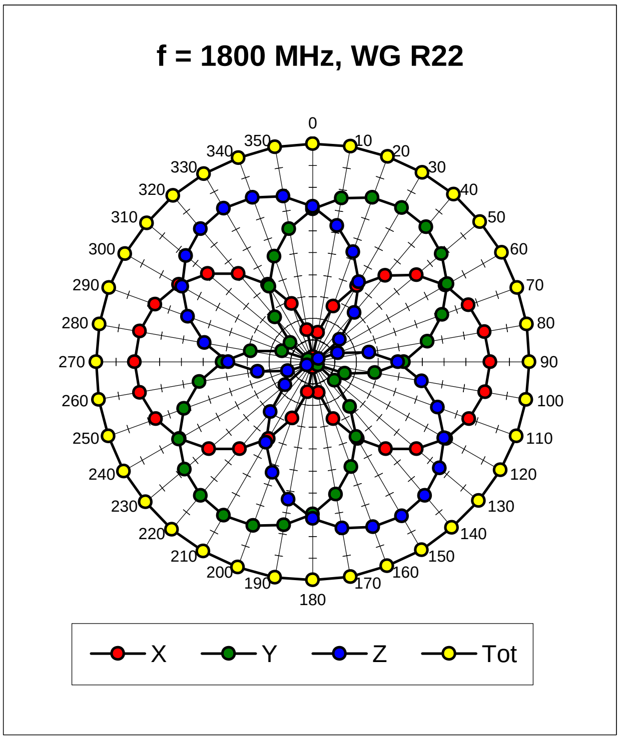


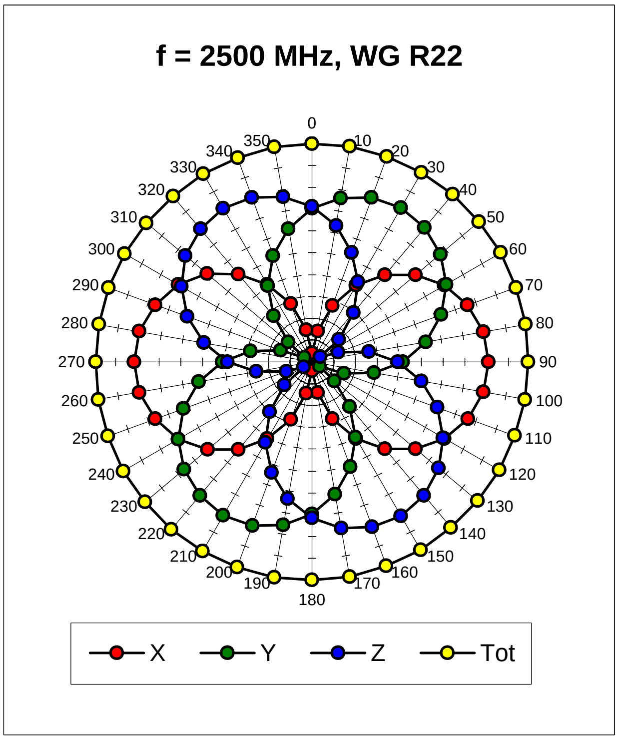
f = 300 MHz, TEM cell ifi110



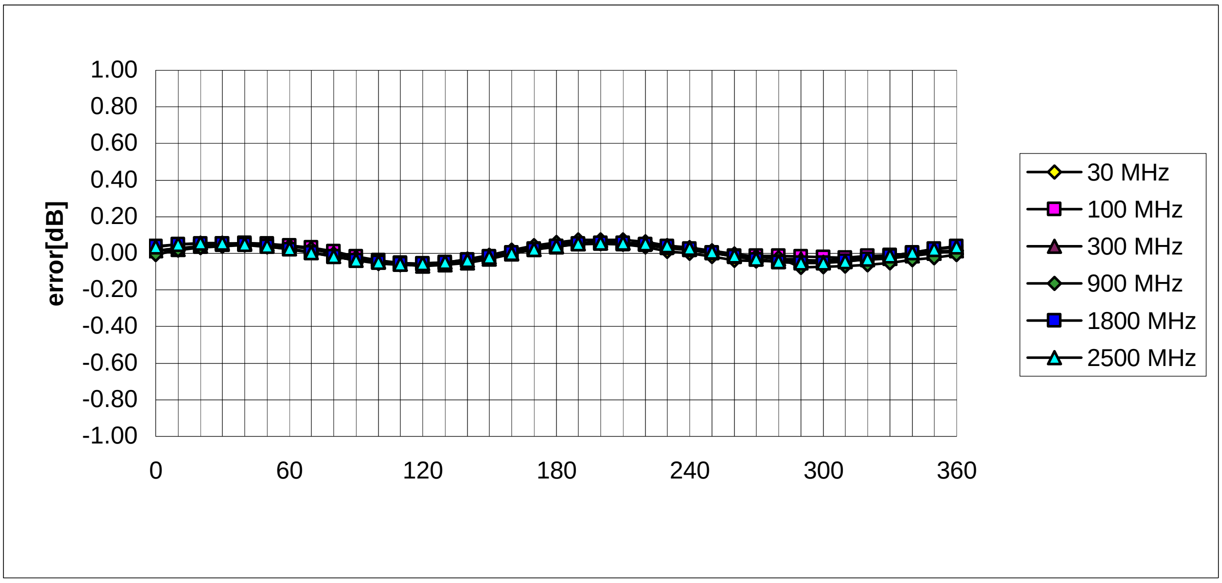
f = 900 MHz, TEM cell ifi110





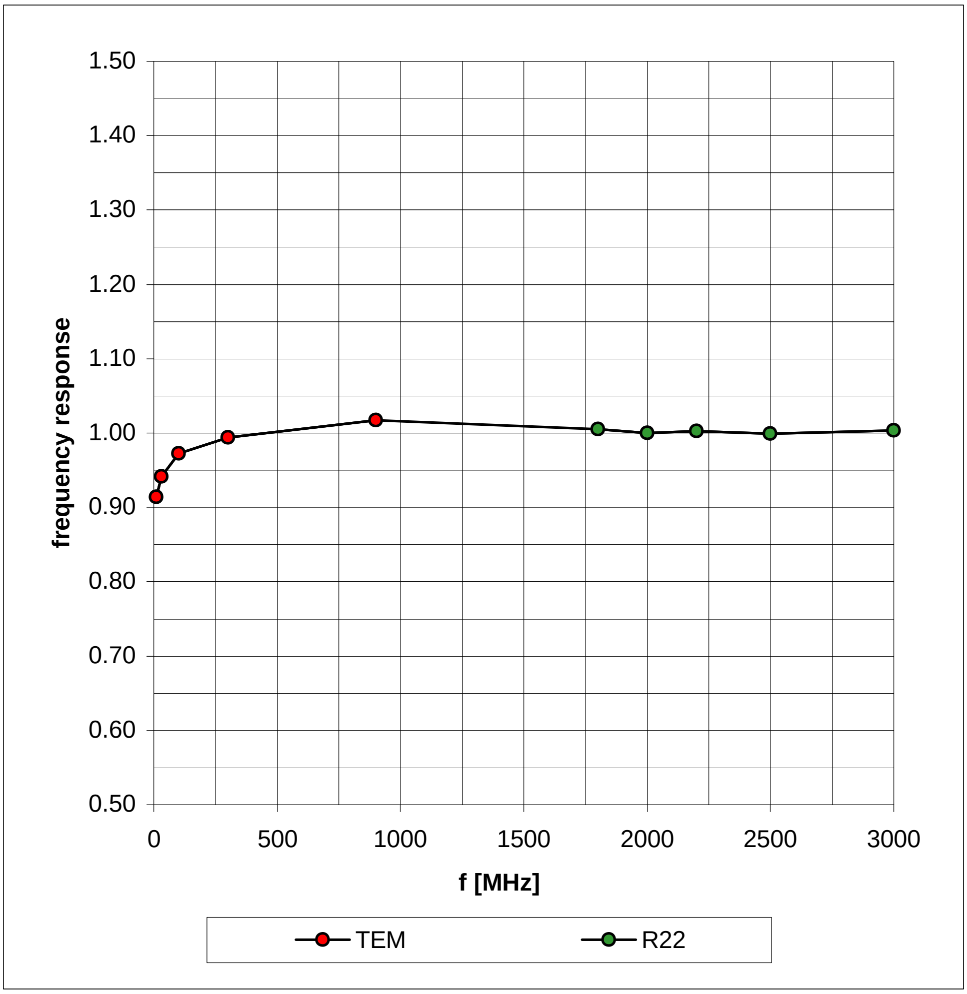


Isotropy Error (f), q = 0°



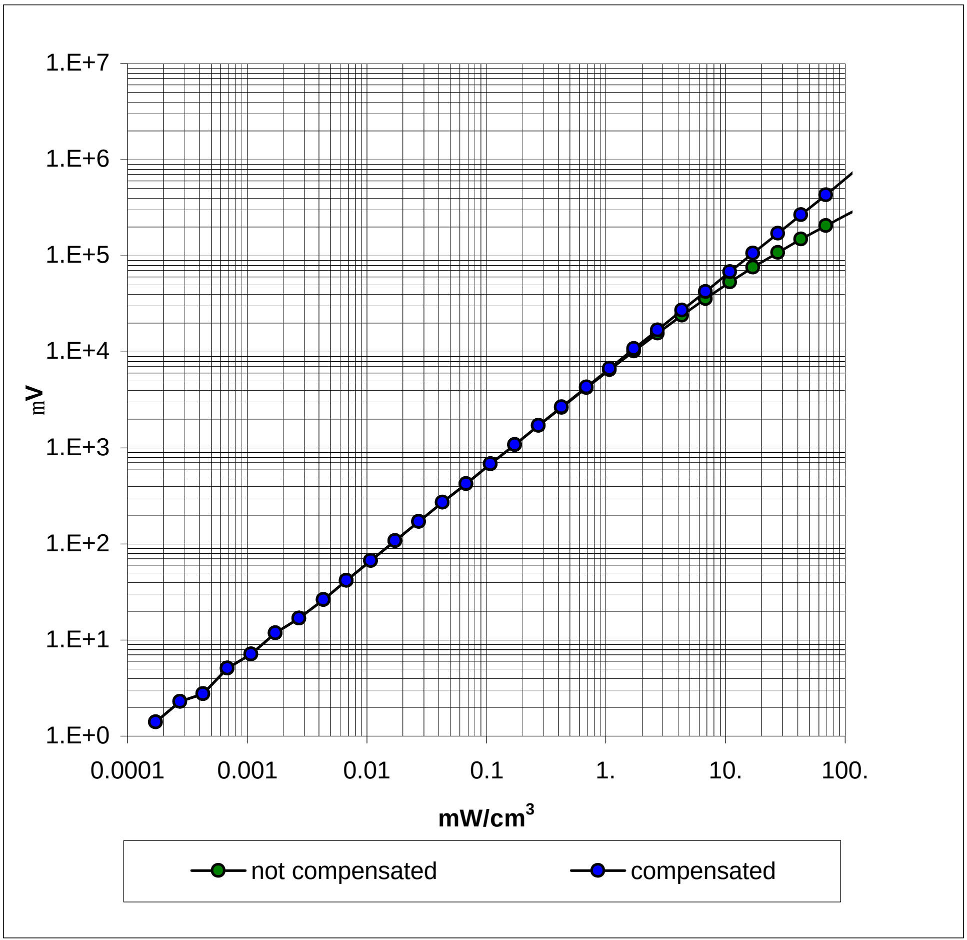
Frequency Response of E-Field

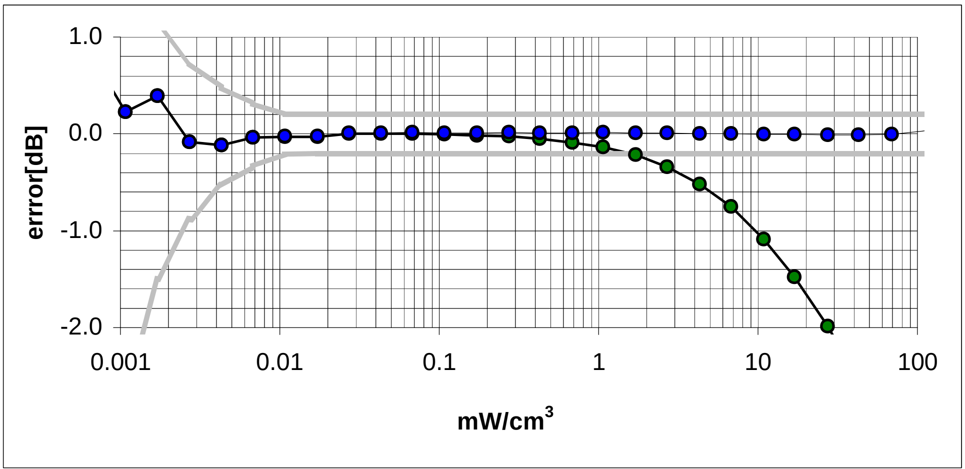
(TEM-Cell:ifi110, Waveguide R22)



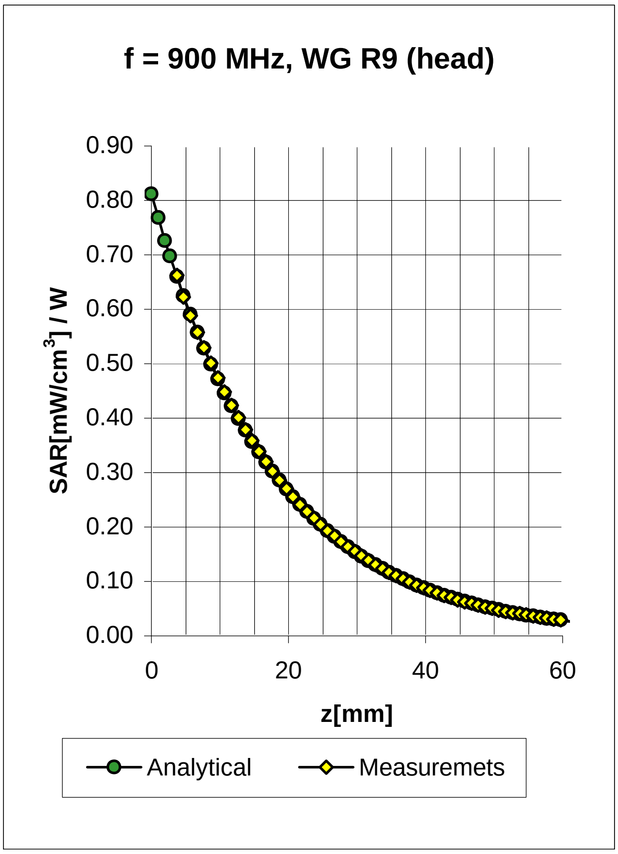
Dynamic Range f(SAR_{brain})

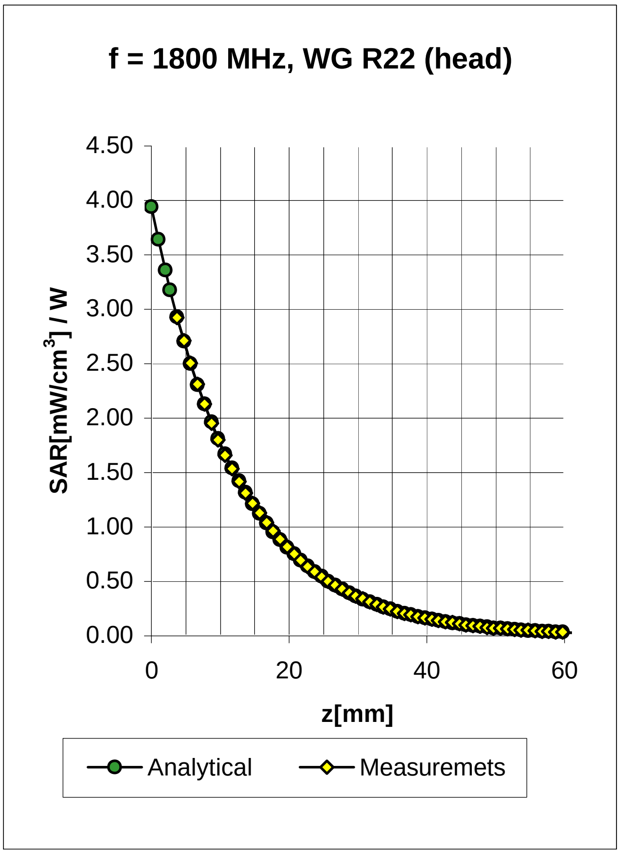
(Waveguide R22)





Conversion Factor Assessment

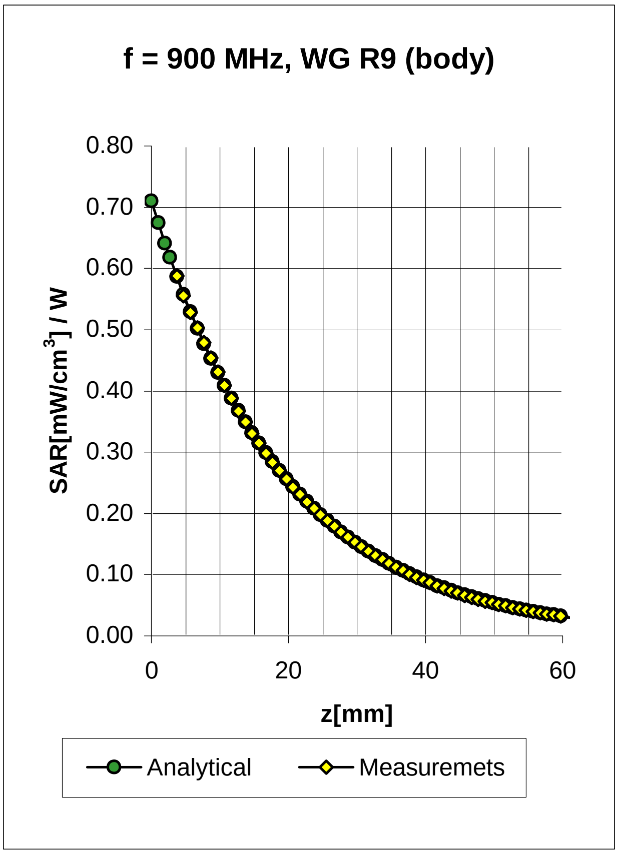


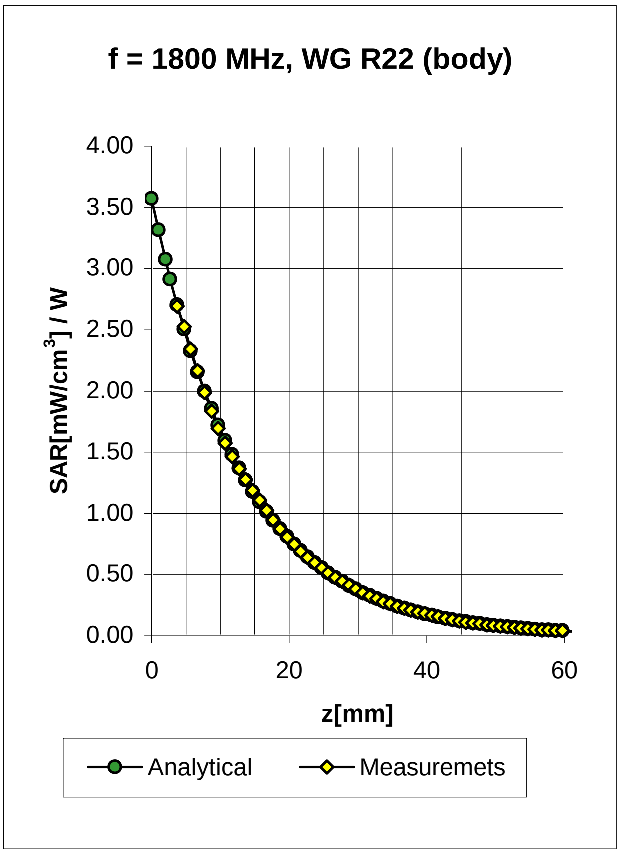


Head	**900 MHz**		e_r = **41.5 ± 5%**	s = **0.97 ± 5% mho/m**	
Head	**835 MHz**		e_r = **41.5 ± 5%**	s = **0.90 ± 5% mho/m**	
	ConvF X	**6.7**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.7**	± 9.5% (k=2)	Alpha	**0.32**
	ConvF Z	**6.7**	± 9.5% (k=2)	Depth	**2.54**

Head	**1800 MHz**		e_r = **40.0 ± 5%**	s = **1.40 ± 5% mho/m**	
Head	**1900 MHz**		e_r = **40.0 ± 5%**	s = **1.40 ± 5% mho/m**	
	ConvF X	**5.4**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.4**	± 9.5% (k=2)	Alpha	**0.45**
	ConvF Z	**5.4**	± 9.5% (k=2)	Depth	**2.48**

Conversion Factor Assessment



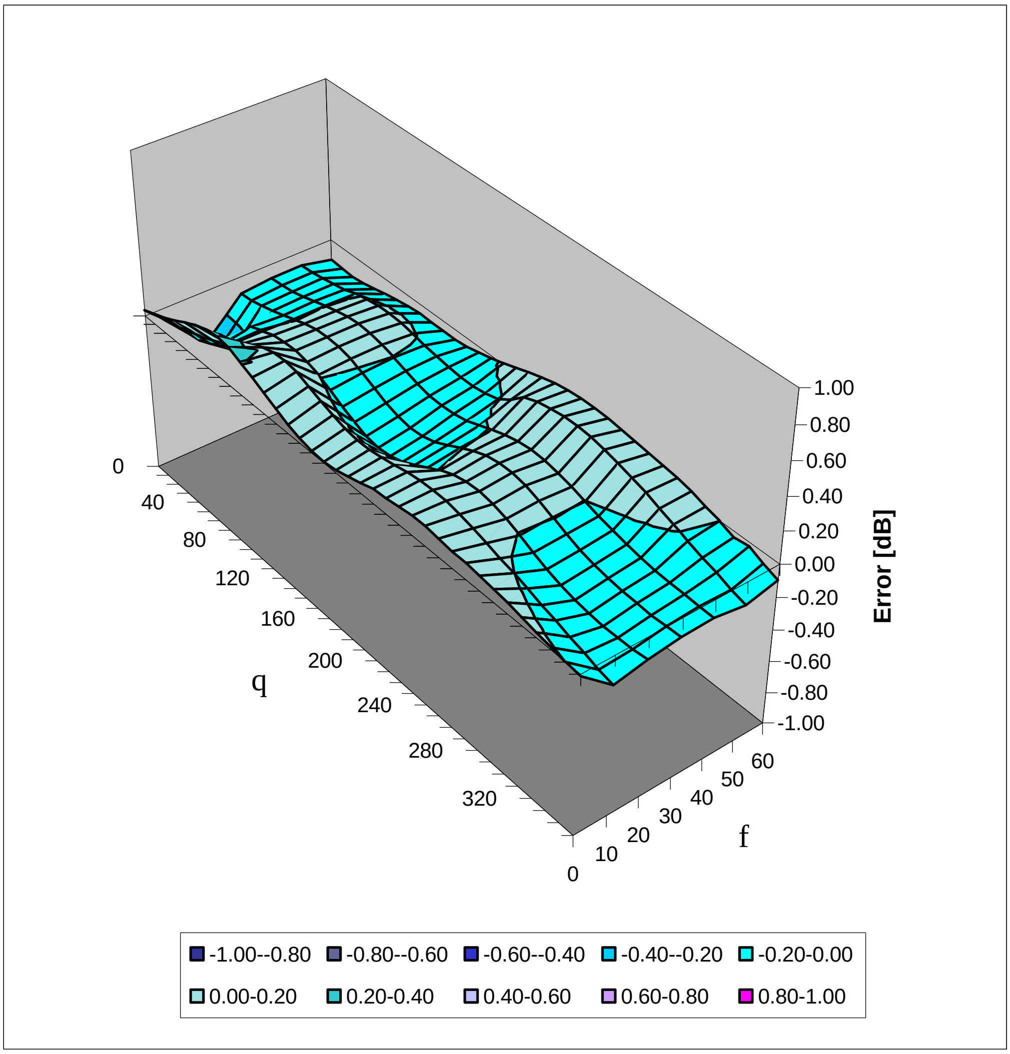


Body	**900 MHz**			e_r = **55.0 ± 5%**	s = **1.05 ± 5% mho/m**	
Body	**835 MHz**			e_r = **55.2 ± 5%**	s = **0.97 ± 5% mho/m**	
	ConvF X	**6.4**	± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**6.4**	± 9.5% (k=2)		Alpha	**0.33**
	ConvF Z	**6.4**	± 9.5% (k=2)		Depth	**2.60**

Body	**1800 MHz**			e_r = **53.3 ± 5%**	s = **1.52 ± 5% mho/m**	
Body	**1900 MHz**			e_r = **53.3 ± 5%**	s = **1.52 ± 5% mho/m**	
	ConvF X	**5.1**	± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**5.1**	± 9.5% (k=2)		Alpha	**0.56**
	ConvF Z	**5.1**	± 9.5% (k=2)		Depth	**2.39**

Deviation from Isotropy in HSL

Error (q, f), f = 900 MHz



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Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1579**
Place of Assessment:	**Zurich**
Date of Assessment:	**May 8, 2002**
Probe Calibration Date:	**May 3, 2002**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by: Hlari Katja

Dosimetric E-Field Probe ET3DV6 SN:1579

Conversion factor (± standard deviation)

835 MHz	ConvF	**6.8 ± 8%**	**ε_r = 41.5 ± 5%** **σ = 0.90 ± 5% mho/m** (head tissue)
835 MHz	ConvF	**6.6 ± 8%**	**ε_r = 55.2 ± 5%** **σ = 0.97 ± 5% mho/m** (body tissue)
1900 MHz	ConvF	**5.2 ± 8%**	**ε_r = 40.0 ± 5%** **σ = 1.40 ± 5% mho/m** (head tissue)
1900 MHz	ConvF	**4.8 ± 8%**	**ε_r = 53.3 ± 5%** **σ = 1.52 ± 5% mho/m** (body tissue)

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Calibration Certificate

900 MHz System Validation Dipole

Type:	**D900V2**
Serial Number:	**006**
Place of Calibration:	**Zurich**
Date of Calibration:	**August 29, 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:	[signature]

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: D900V2

Serial: 006

Manufactured: January 15, 1998
Calibrated: August 29, 2002

1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with head simulating solution of the following electrical parameters at 900 MHz:

Relative Dielectricity	**41.7**	$\pm$ 5%
Conductivity	**0.97 mho/m**	$\pm$ 5%

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.5 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 $\pm$ 3 %. The results are normalized to 1W input power.

2.1. SAR Measurement with DASY3 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 worst-case extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **11.1 mW/g**

averaged over 10 cm^3 (10 g) of tissue: **7.04 mW/g**

2.2 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^3 (1 g) of tissue: **10.4 mW/g**

averaged over 10 cm^3 (10 g) of tissue: **6.72 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:	**1.395 ns**	(one direction)
Transmission factor:	**0.994**	(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 900 MHz:	Re{Z} = **50.3** W
	Im {Z} = **-1.3** W
Return Loss at 900 MHz	**-37.8 dB**

4. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with body simulating solution of the following electrical parameters at 900 MHz:

Relative Dielectricity	**54.8**	± 5%
Conductivity	**1.02 mho/m**	± 5%

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.2 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.

5.1. SAR Measurement with DASY3 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 worst-case extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**11.1 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**7.08 mW/g**

5.2 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^3 (1 g) of tissue:	**10.1 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**6.68 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 900 MHz:	Re{Z} = **45.8** W
	Im {Z} = **-4.6** W
Return Loss at 900 MHz	**-23.8 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.

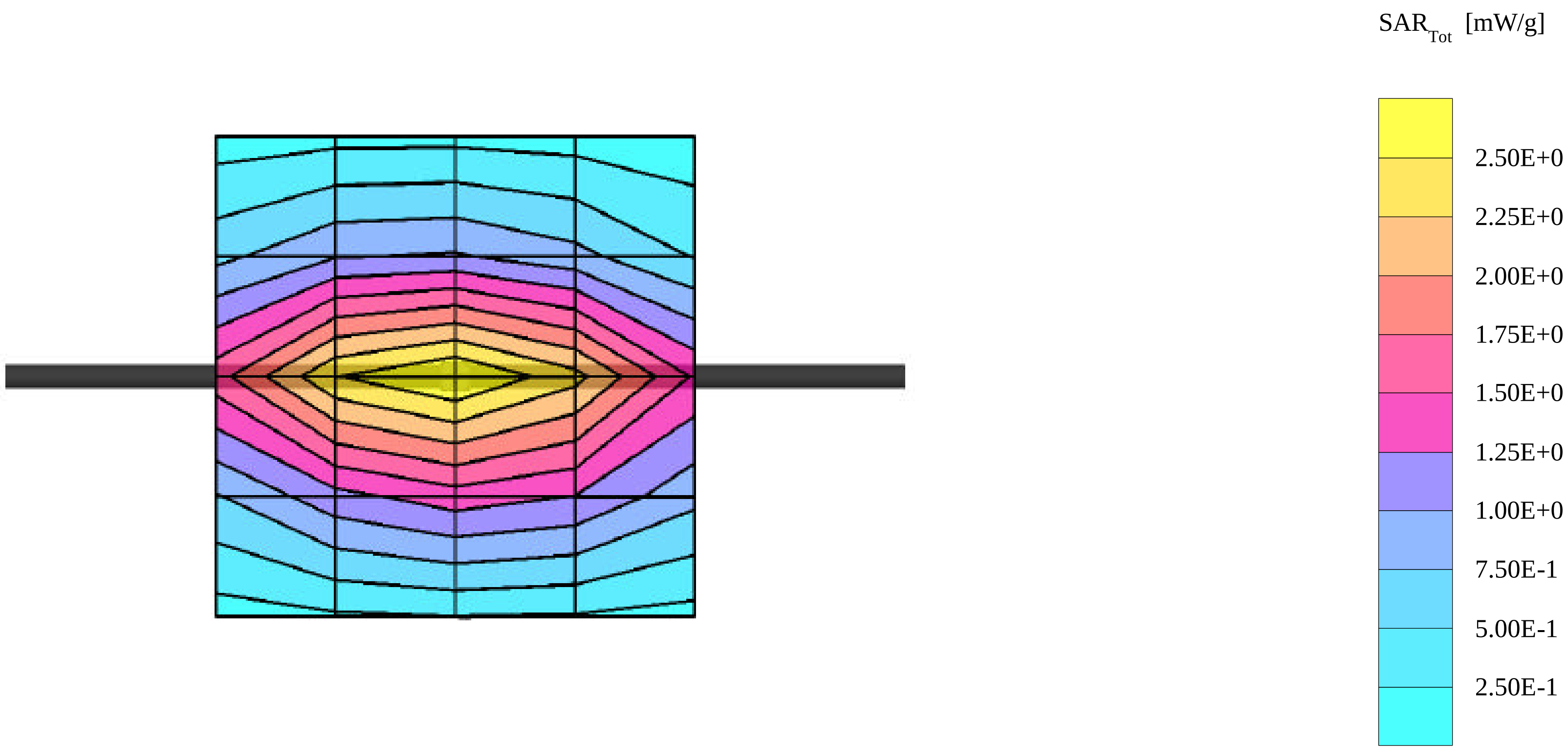
9. Power Test

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

08/27/02

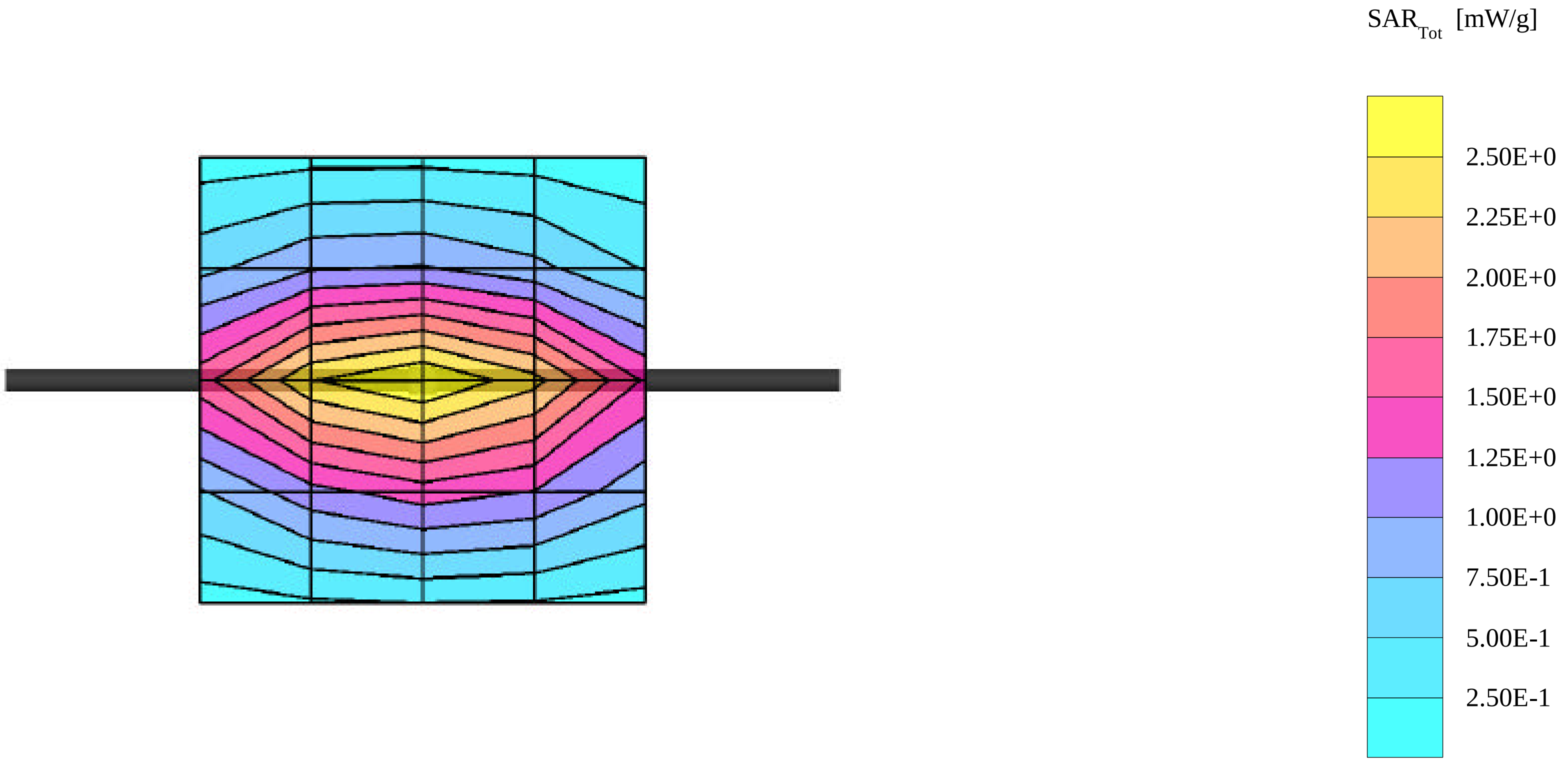
Validation Dipole D900V2 SN:006, d = 15mm

Frequency: 900 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(6.50,6.50,6.50) at 900 MHz; HSL 900 MHz: = 0.97 mho/m $_r$ = 41.7 = 1.00 g/cm^3
Cubes (2): Peak: 4.38 mW/g ± 0.02 dB, SAR (1g): 2.77 mW/g ± 0.02 dB, SAR (10g): 1.76 mW/g ± 0.02 dB, (Worst-case extrapolation)
Penetration depth: 11.7 (10.8, 12.8) [mm]
Powerdrift: 0.01 dB



Validation Dipole D900V2 SN:006, d = 15mm

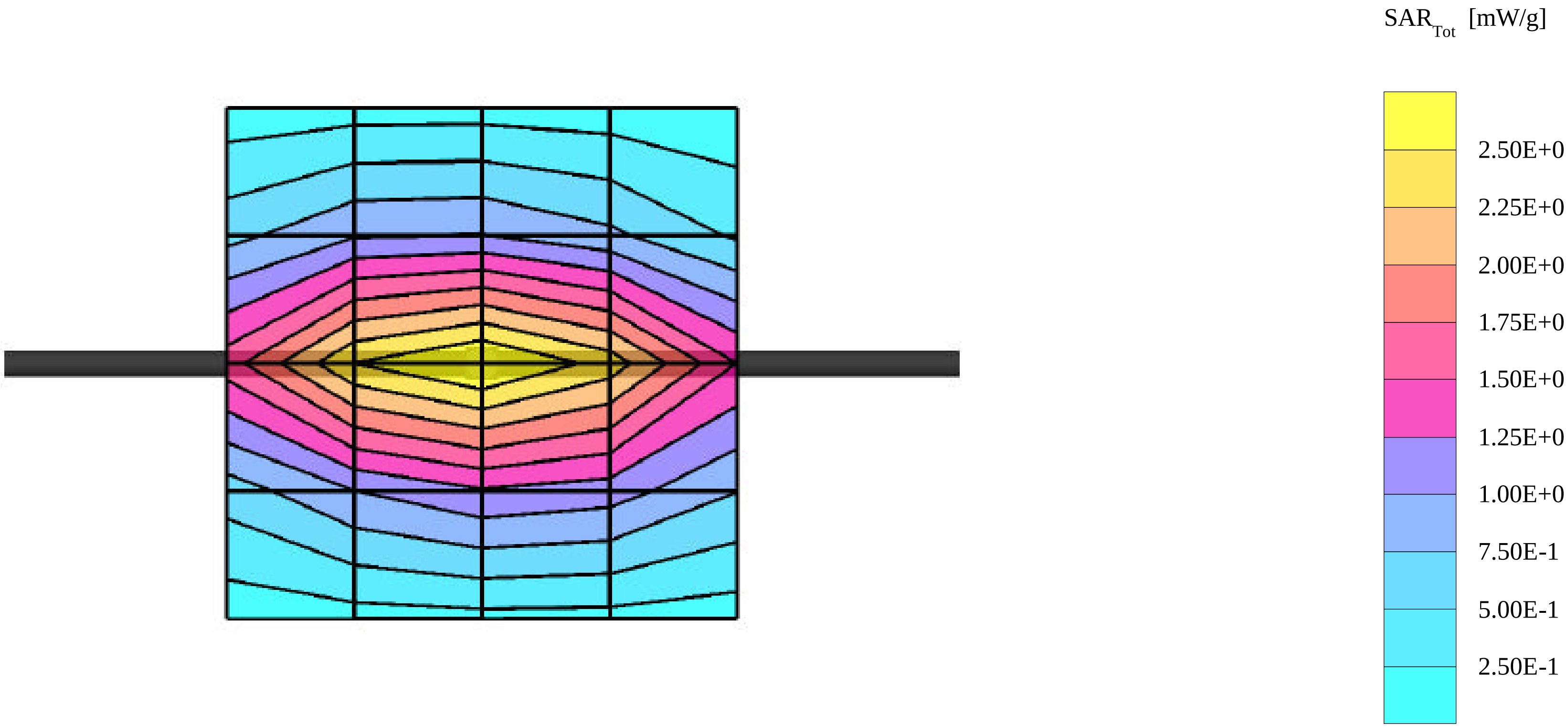
Frequency: 900 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(6.50,6.50,6.50) at 900 MHz; HSL 900 MHz: = 0.97 mho/m $_r$ = 41.7 = 1.00 g/cm^3
Cubes (2): Peak: 3.88 mW/g ± 0.02 dB, SAR (1g): 2.60 mW/g ± 0.02 dB, SAR (10g): 1.68 mW/g ± 0.02 dB, (Advanced extrapolation)
Penetration depth: 12.6 (12.4, 13.0) [mm]
Powerdrift: 0.01 dB



08/29/02

Validation Dipole D900V2 SN:006, d = 15mm

Frequency: 900 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(6.20,6.20,6.20) at 900 MHz; Muscle 900 MHz: = 1.02 mho/m $_r$ = 54.8   = 1.00 g/cm^3
Cubes (2): Peak: 4.32   mW/g ± 0.02 dB, SAR (1g): 2.77   mW/g ± 0.02 dB, SAR (10g): 1.77   mW/g ± 0.02 dB, (Worst-case extrapolation)
Penetration depth: 12.2 (11.2, 13.5) [mm]
Powerdrift: -0.00 dB



08/29/02

Validation Dipole D900V2 SN:006, d = 15mm

Frequency: 900 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(6.20,6.20,6.20) at 900 MHz; Muscle 900 MHz: = 1.02 mho/m $_r$ = 54.8 = 1.00 g/cm³
Cubes (2): Peak: 3.65 mW/g ± 0.02 dB, SAR (1g): 2.52 mW/g ± 0.02 dB, SAR (10g): 1.67 mW/g ± 0.02 dB, (Advanced extrapolation)
Penetration depth: 13.6 (13.6, 13.8) [mm]
Powerdrift: -0.00 dB