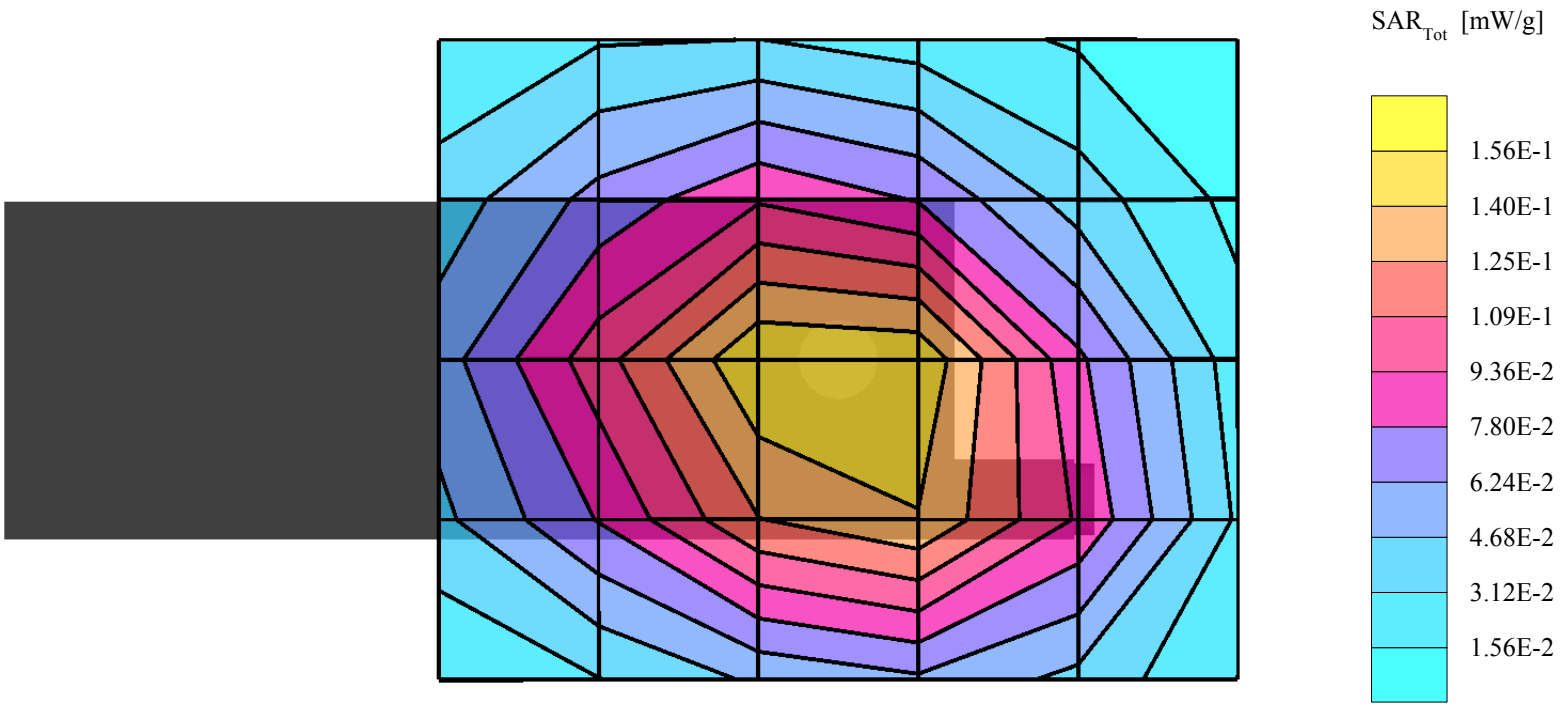
01/10/03

Opal 1x Muscle

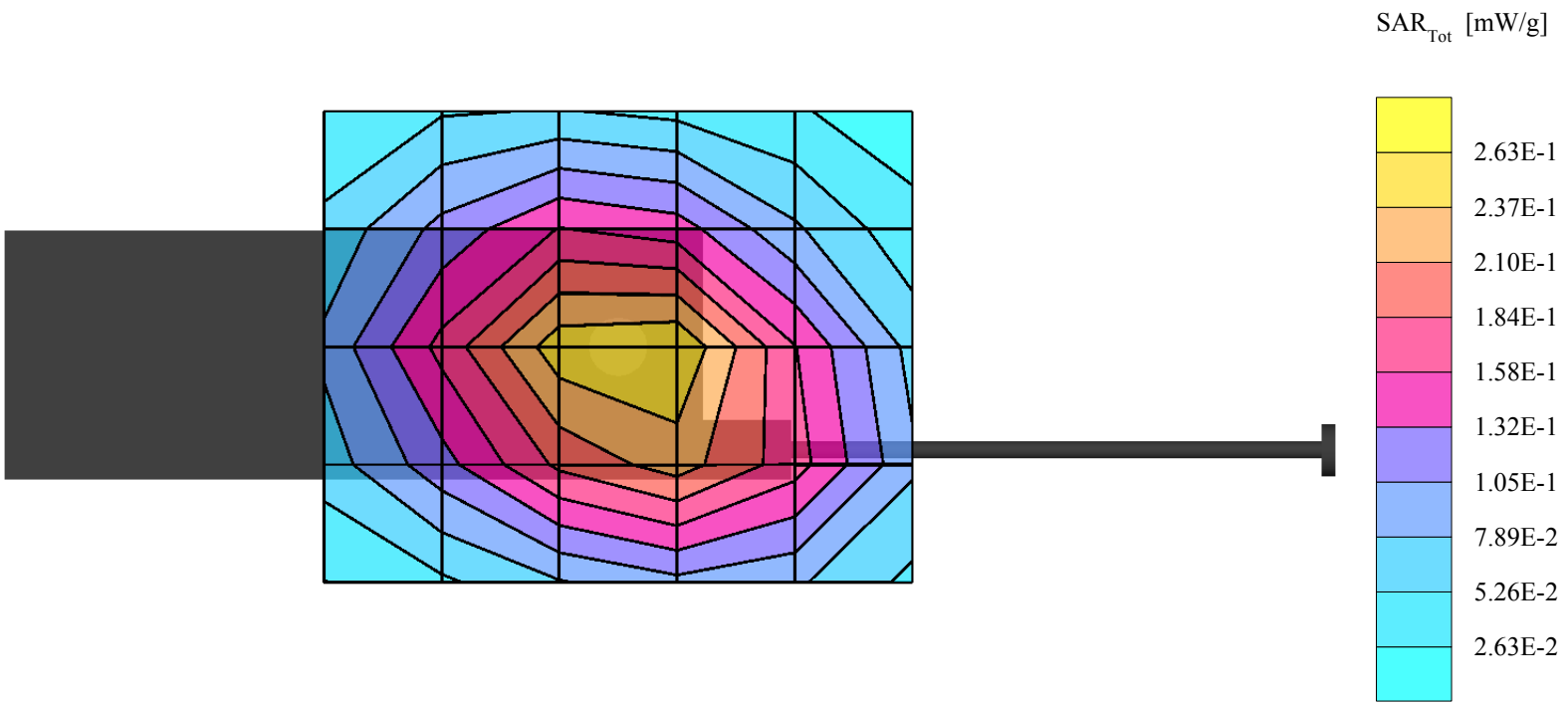
Opal 1X, FCC #R9LW, FM ch991, Flat with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.91$ mho/m $\varepsilon_r = 54.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.164 mW/g, SAR (10g): 0.117 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.02 dB



<ENTER HERE YOUR COMPANY NAME>

Opal 1x Muscle

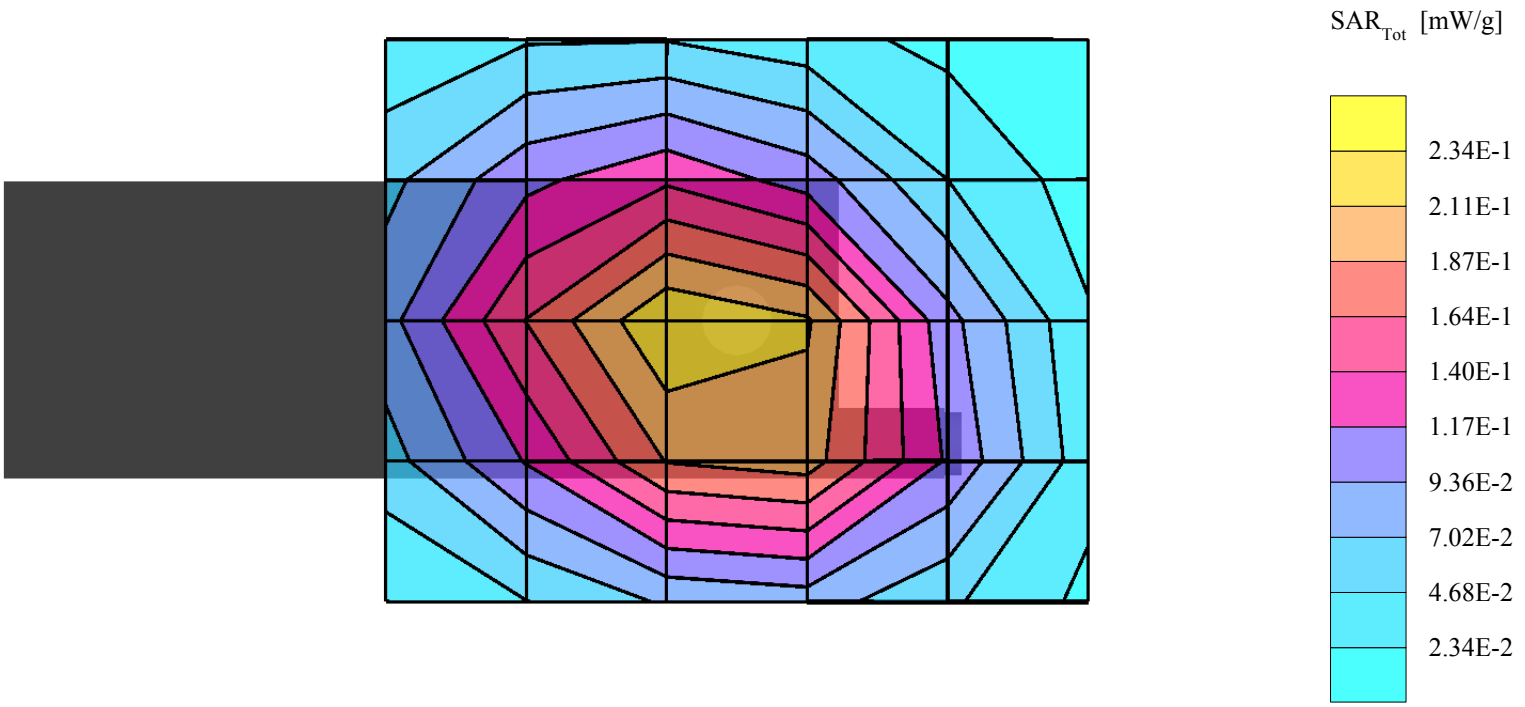
Opal 1X, FCC #R9LW, FM ch991, Flat with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: σ = 0.91 mho/m ε_r = 54.4 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.256 mW/g, SAR (10g): 0.183 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.17 dB



01/10/03

Opal 1x Muscle

Opal 1X, FCC #R9LW, FM ch383 Muscle, with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.91$ mho/m $\varepsilon_r = 54.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.239 mW/g, SAR (10g): 0.170 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.07 dB



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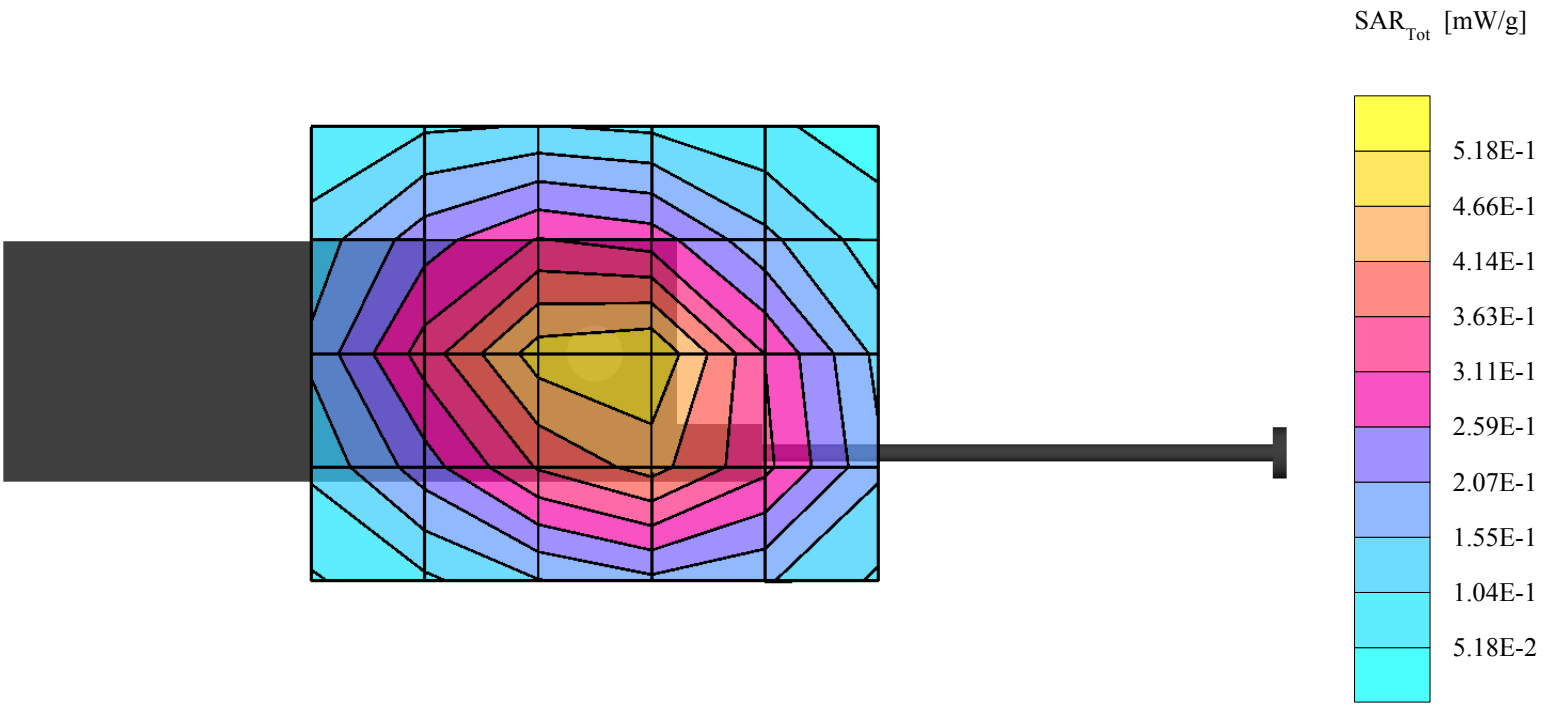
01/10/03

Opal 1x Muscle

Opal 1X, FCC #R9LW, FM ch383 Muscle, with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.91$ mho/m $\varepsilon_r = 54.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.504 mW/g, SAR (10g): 0.363 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.17 dB

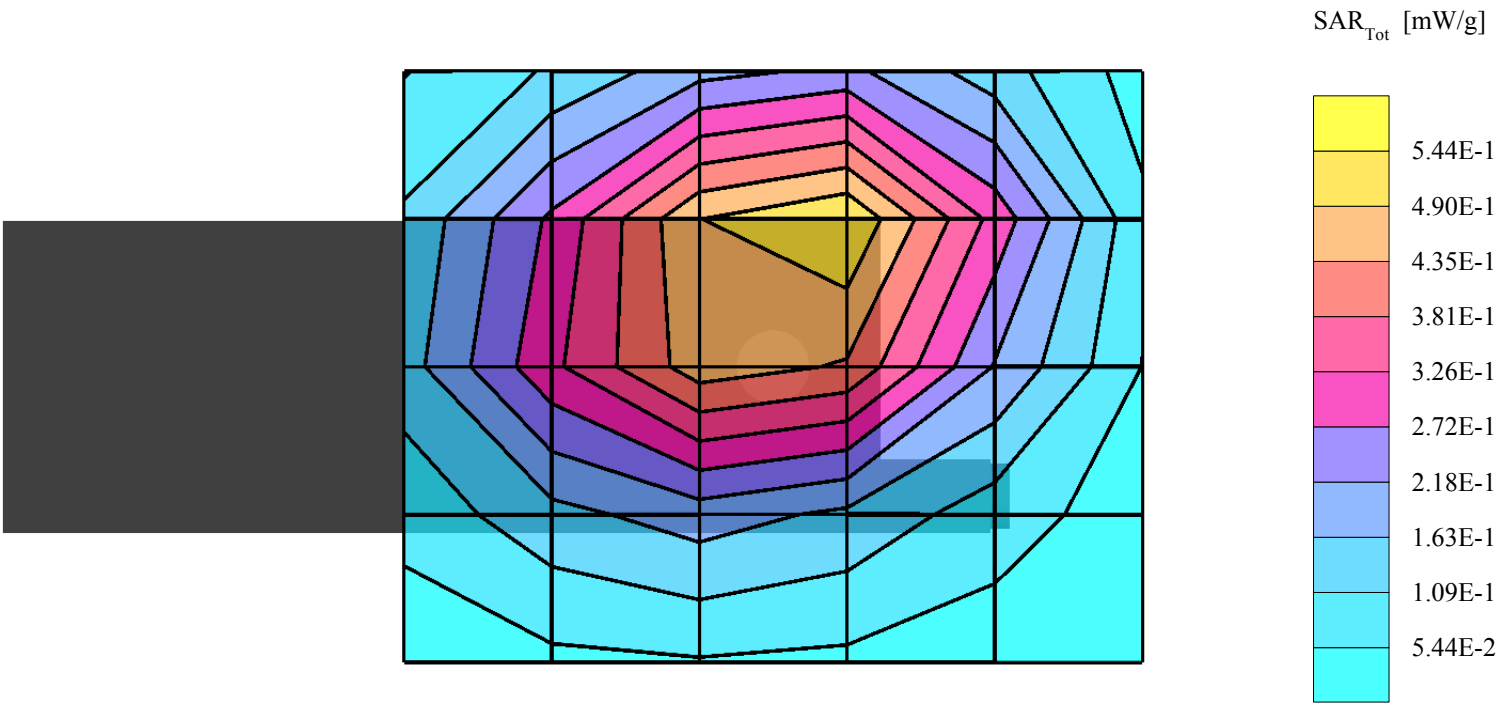


<ENTER HERE YOUR COMPANY NAME>

01/10/03

Opal 1x Muscle

Opal 1X, FCC #R9LW, FM ch799, Flat with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.91$ mho/m $\varepsilon_r = 54.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.545 mW/g, SAR (10g): 0.376 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.01 dB



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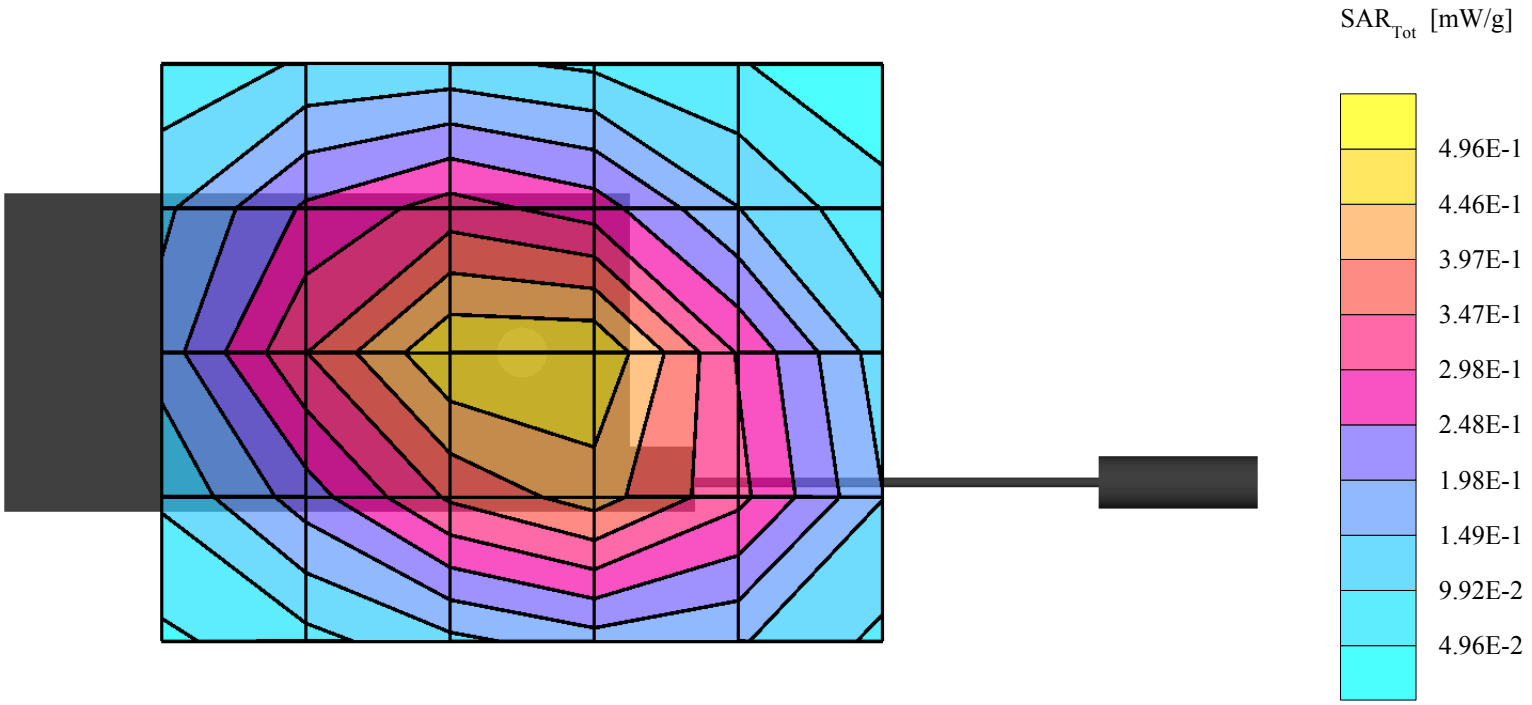
01/29/03

OpalM

Opal 1X, FCC #R9LW, FM ch799, Flat with 13.5mm Air Gap, 01-29-03
Temp. 22.2C, Humidity: 37%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.89$ mho/m $\varepsilon_r = 55.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.490 mW/g, SAR (10g): 0.348 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.26 dB

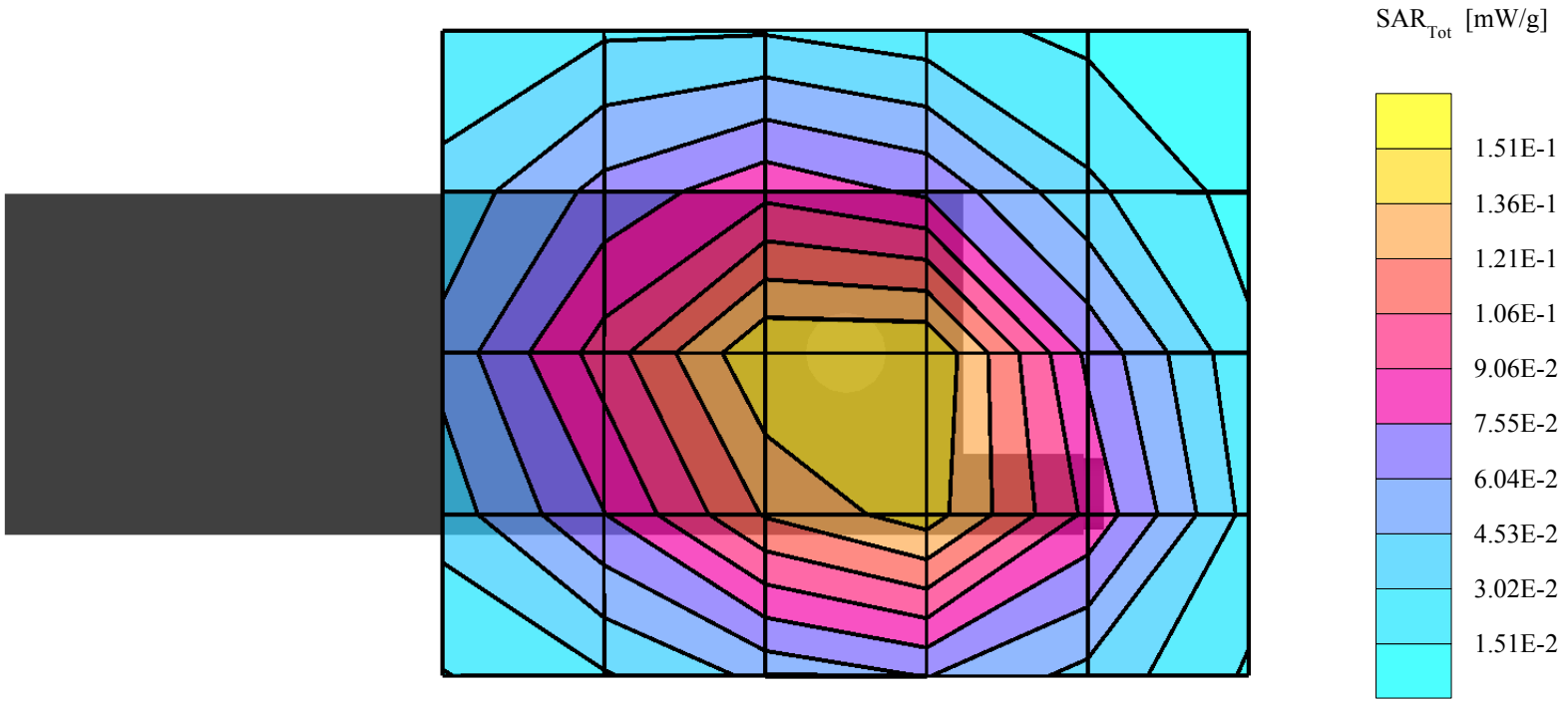


<ENTER HERE YOUR COMPANY NAME>

01/10/03

Opal 1x Muscle

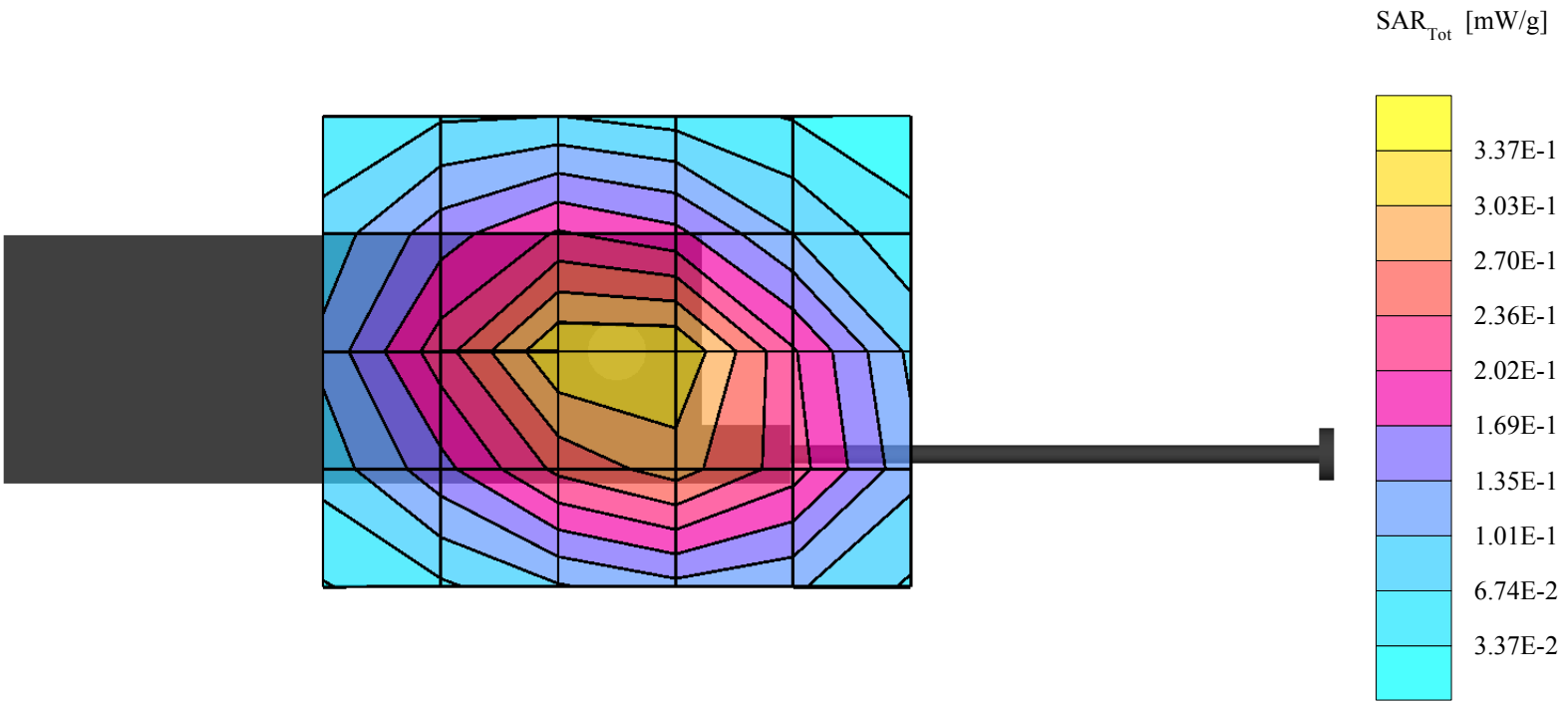
Opal 1X, FCC #R9LW, CDMA ch1013, Flat with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.91$ mho/m $\varepsilon_r = 54.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.169 mW/g, SAR (10g): 0.120 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.06 dB



<ENTER HERE YOUR COMPANY NAME>

Opal 1x Muscle

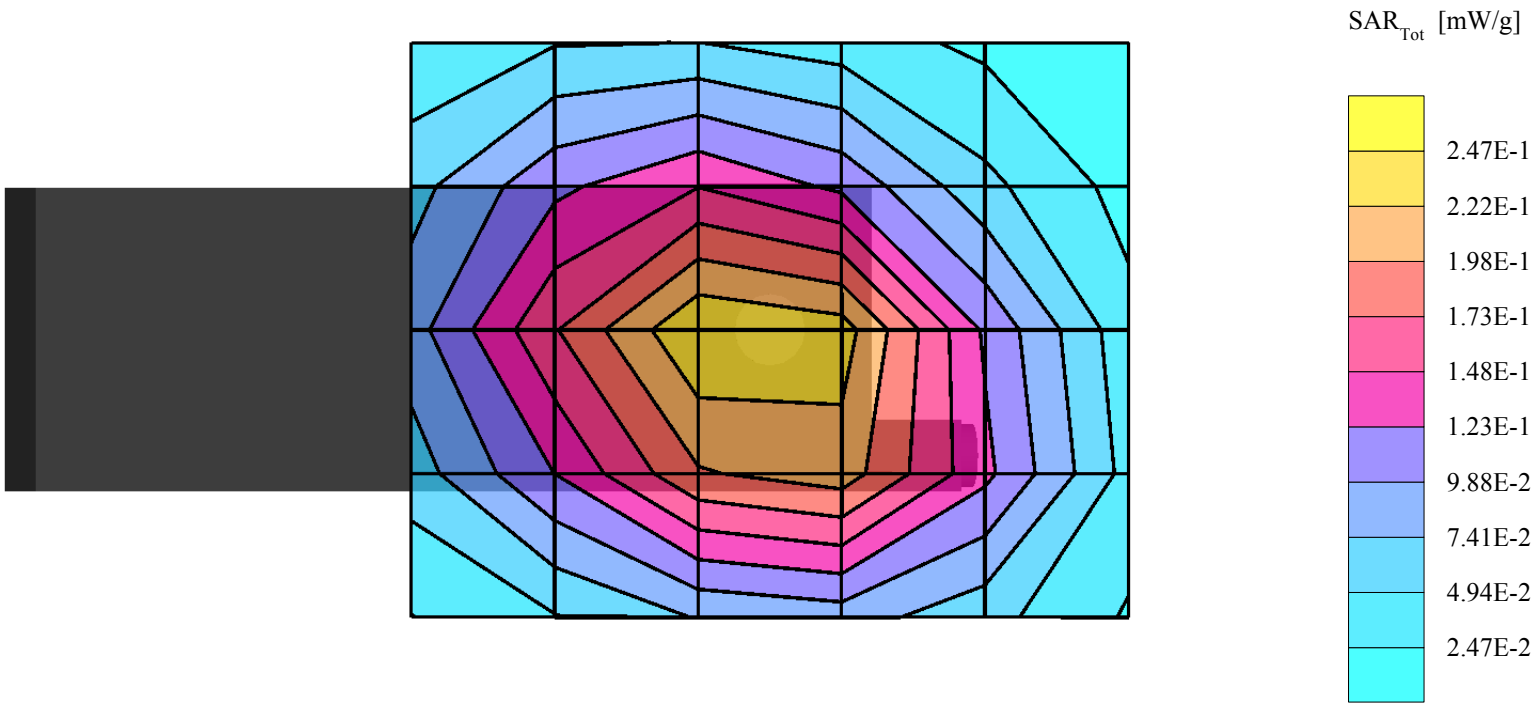
Opal 1X, FCC #R9LW, CDMA ch1013, Flat with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.91$ mho/m $\varepsilon_r = 54.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.340 mW/g, SAR (10g): 0.242 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.01 dB



01/10/03

Opal 1x Muscle

Opal 1X, FCC #R9LW, CDMA ch383, Flat with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (79°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.91$ mho/m $\varepsilon_r = 54.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.253 mW/g, SAR (10g): 0.180 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.05 dB

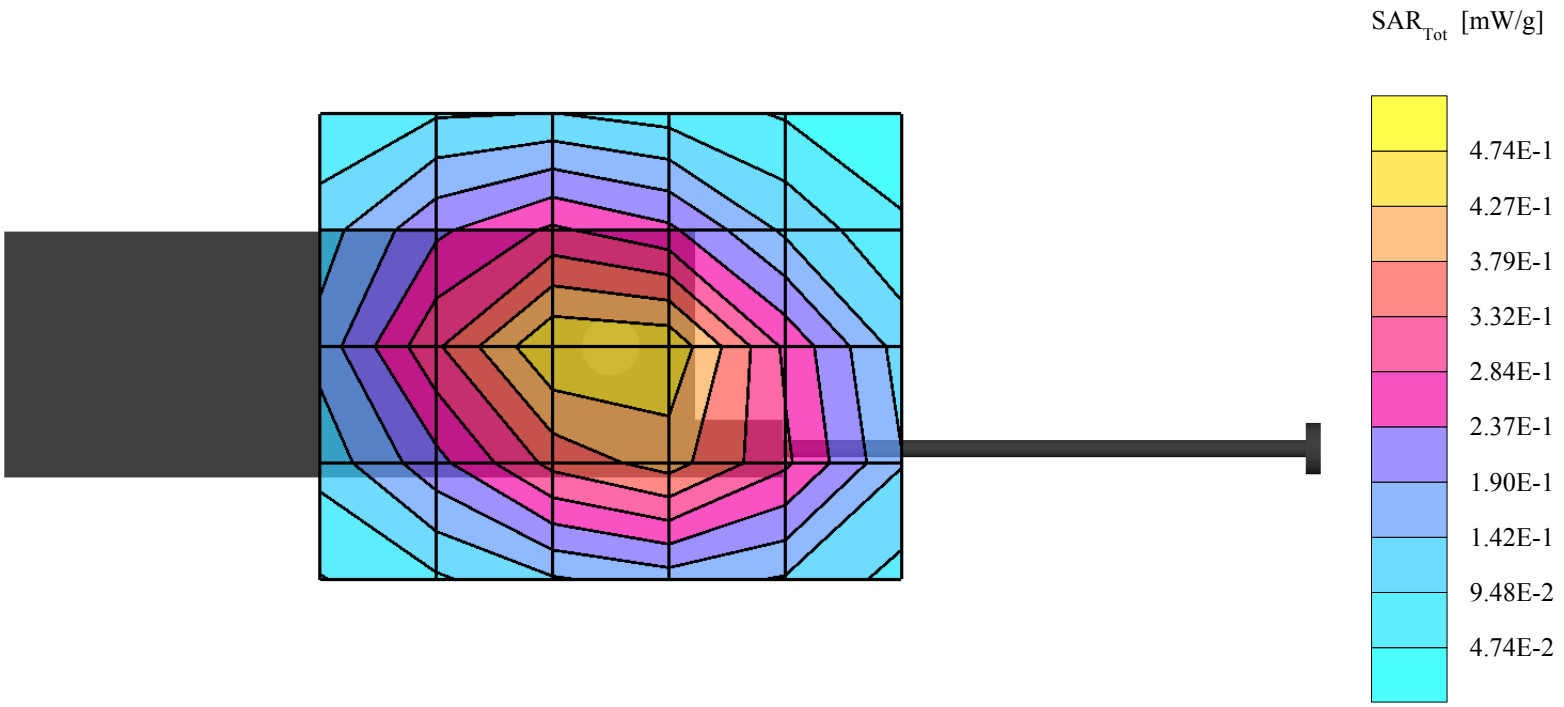


<ENTER HERE YOUR COMPANY NAME>

01/10/03

Opal 1x Muscle

Opal 1X, FCC #R9LW, CDMA ch383, Flat with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.91$ mho/m $\varepsilon_r = 54.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.468 mW/g, SAR (10g): 0.334 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.12 dB



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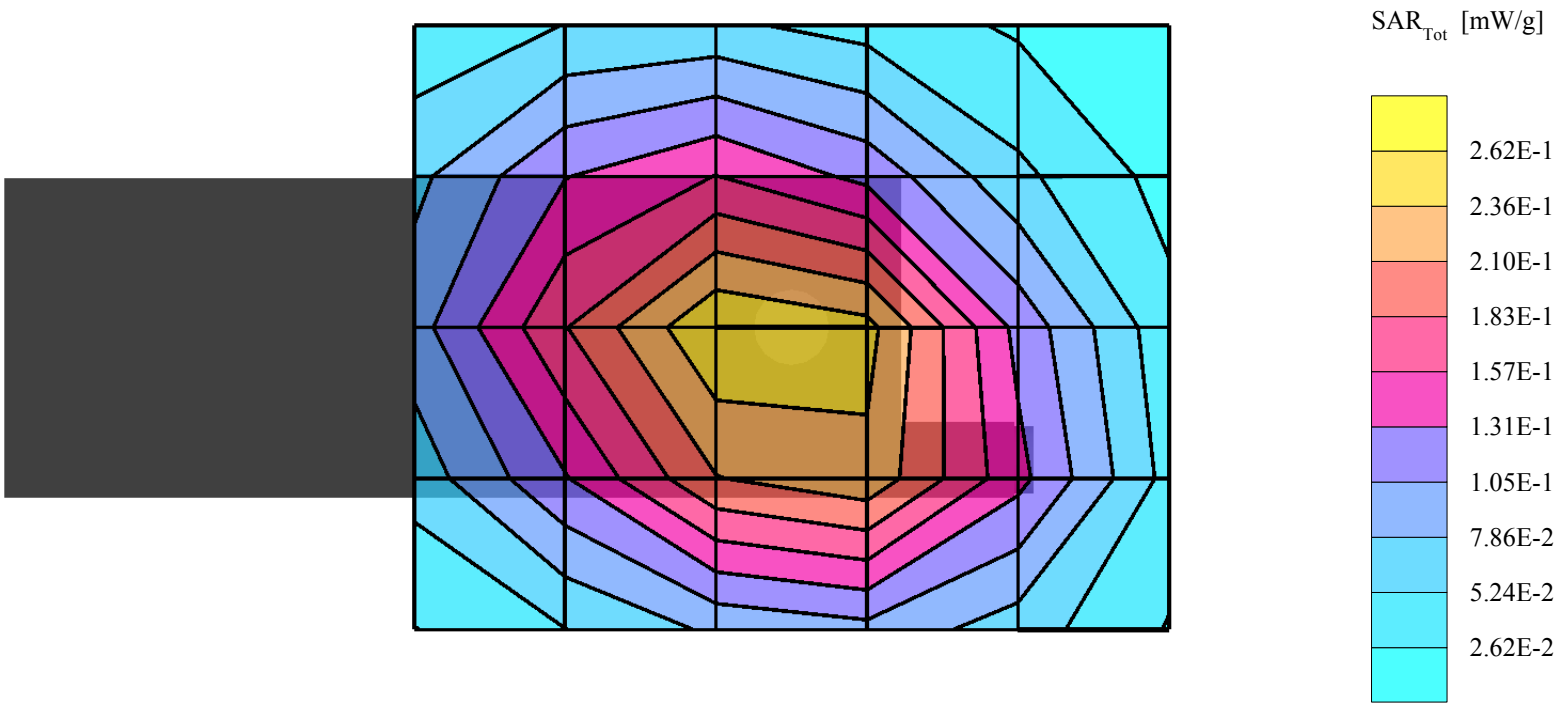
01/10/03

Opal 1x Muscle

Opal 1X, FCC #R9LW, CDMA ch777, Flat with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.91$ mho/m $\varepsilon_r = 54.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.262 mW/g, SAR (10g): 0.186 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.04 dB



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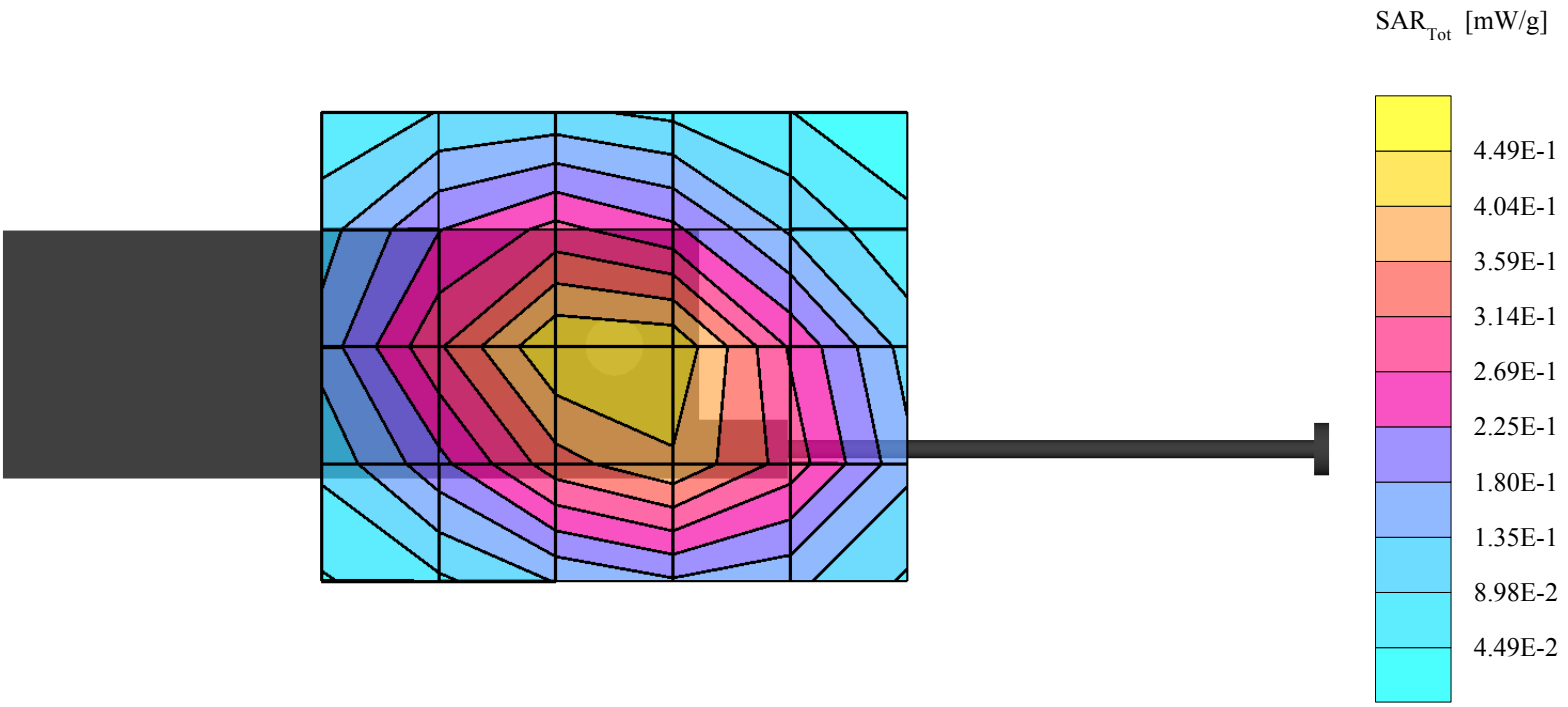
Opal 1x Muscle

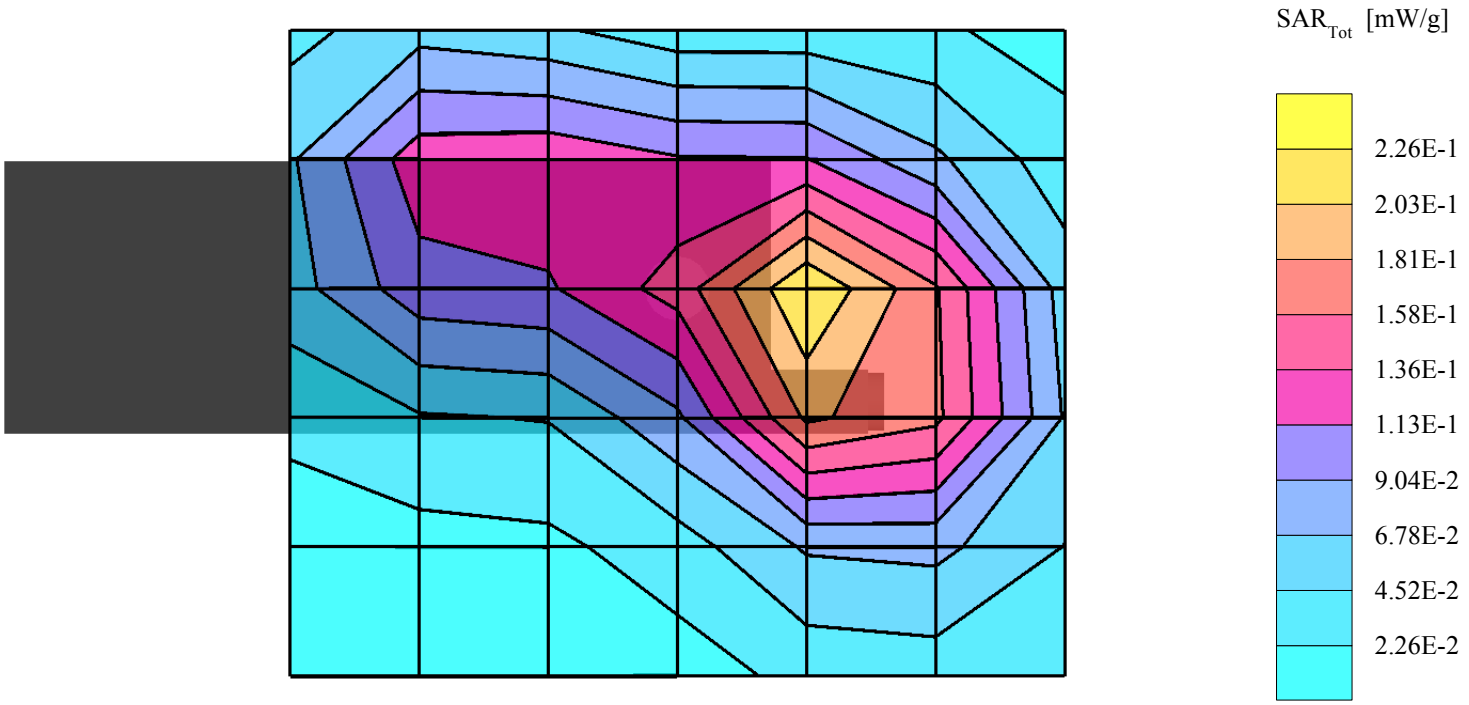
Opal 1X, FCC #R9LW, CDMA ch777, Flat with 13.5mm Air Gap, 01-10-03
Temp. 22.2C, Humidity: 36%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1618; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 835 MHz Muscle: $\sigma = 0.91$ mho/m $\varepsilon_r = 54.4$ $\rho = 1.00$ g/cm^3
Cube 7x7x7: SAR (1g): 0.443 mW/g, SAR (10g): 0.315 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.17 dB



01/14/03

Opal 1X

Opal 1X, FCC #R9LW, PCS ch25, Flat with 13.5mm Air Gap, 01-14-03
Temp. 22.2C, Humidity: 37%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1618; ConvF(4.77,4.77,4.77); Crest factor: 1.0; 1900 MHz Muscle: σ = 1.49 mho/m ε_r = 53.6 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.223 mW/g, SAR (10g): 0.137 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.07 dB



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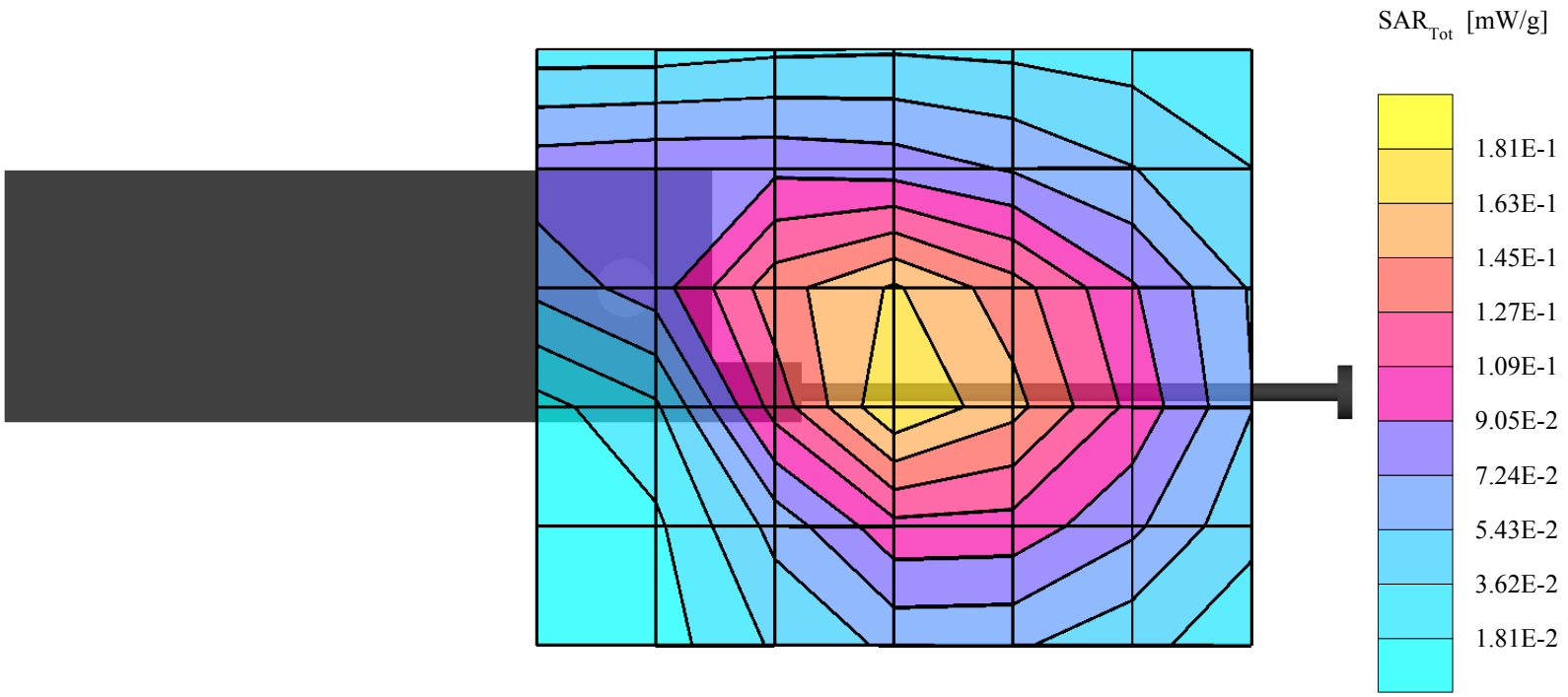
01/14/03

Opal 1X

Opal 1X, FCC #R9LW, PCS ch25, Flat with 13.5mm Air Gap, 01-14-03
Temp. 22.2C, Humidity: 37%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1618; ConvF(4.77,4.77,4.77); Crest factor: 1.0; 1900 MHz Muscle: σ = 1.49 mho/m ε_r = 53.6 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.170 mW/g, SAR (10g): 0.108 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.21 dB

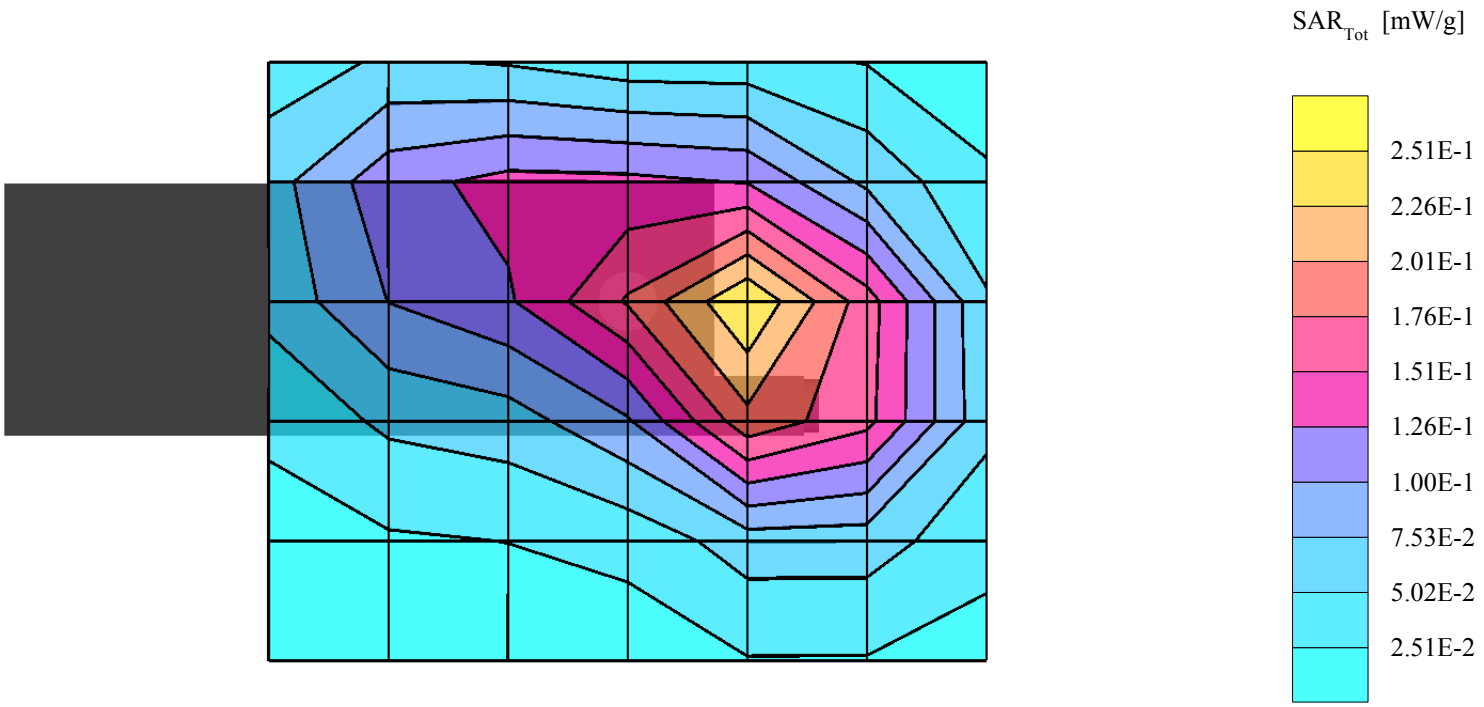


<ENTER HERE YOUR COMPANY NAME>

01/14/03

Opal 1X

Opal 1X, FCC #R9LW, PCS ch600, Flat with 13.5mm Air Gap, 01-14-03
Temp. 22.2C, Humidity: 37%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1618; ConvF(4.77,4.77,4.77); Crest factor: 1.0; 1900 MHz Muscle: σ = 1.49 mho/m ε_r = 53.6 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.243 mW/g, SAR (10g): 0.148 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.11 dB



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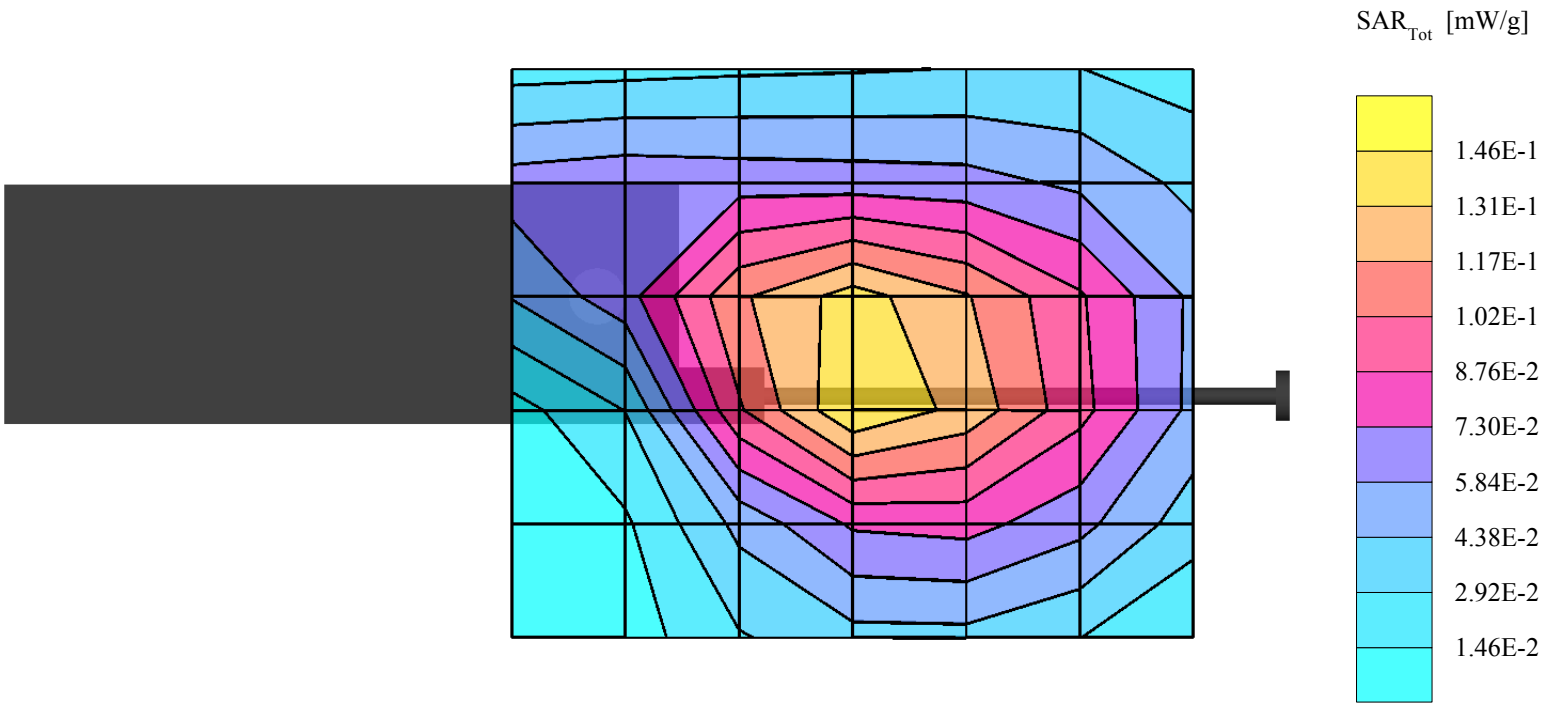
01/14/03

Opal 1X

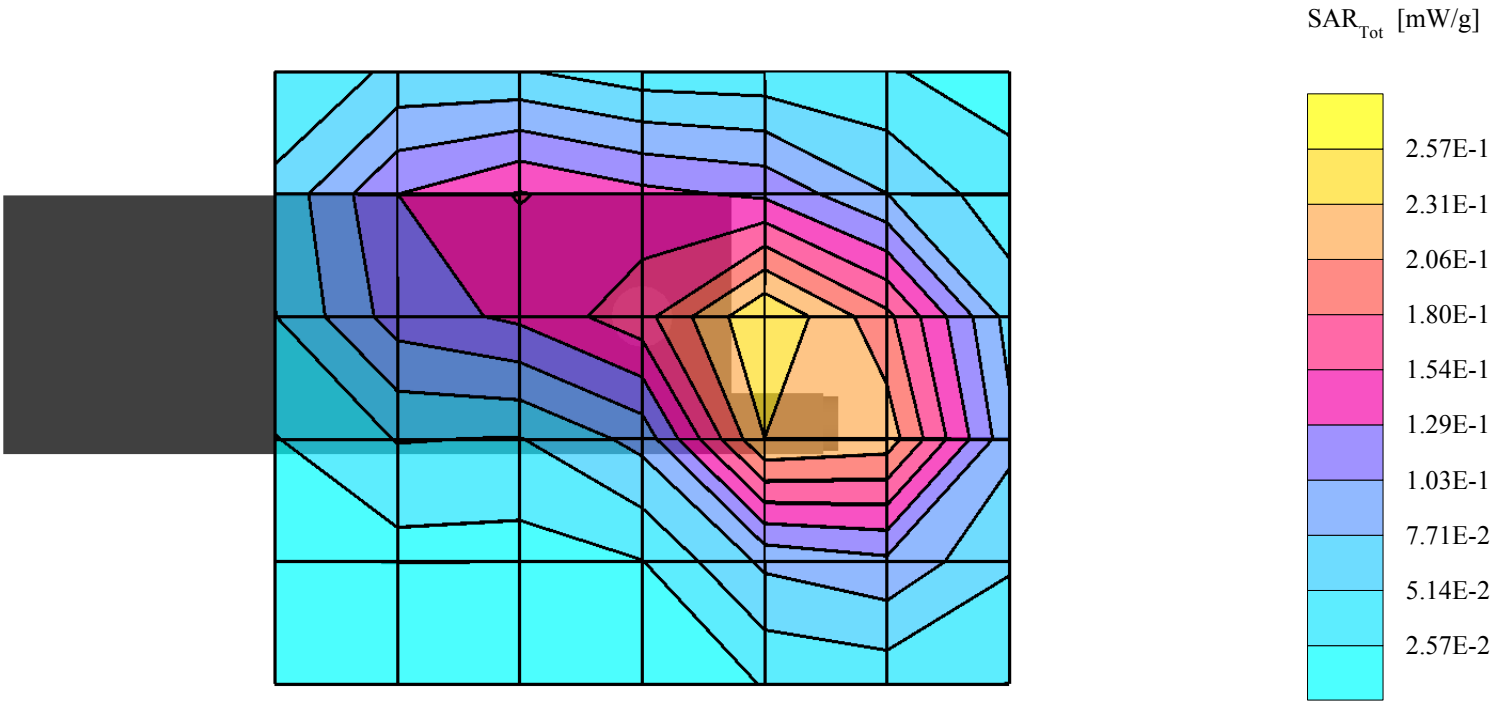
Opal 1X, FCC #R9LW, PCS ch600, Flat with 13.5mm Air Gap, 01-14-03
Temp. 22.2C, Humidity: 37%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1618; ConvF(4.77,4.77,4.77); Crest factor: 1.0; 1900 MHz Muscle: σ = 1.49 mho/m ε_r = 53.6 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.145 mW/g, SAR (10g): 0.0913 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.07 dB



01/14/03

Opal 1X

Opal 1X, FCC #R9LW, PCS ch1175, Flat with 13.5mm Air Gap, 01-14-03
Temp. 22.2C, Humidity: 37%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1618; ConvF(4.77,4.77,4.77); Crest factor: 1.0; 1900 MHz Muscle: σ = 1.49 mho/m ε_r = 53.6 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.268 mW/g, SAR (10g): 0.162 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.02 dB

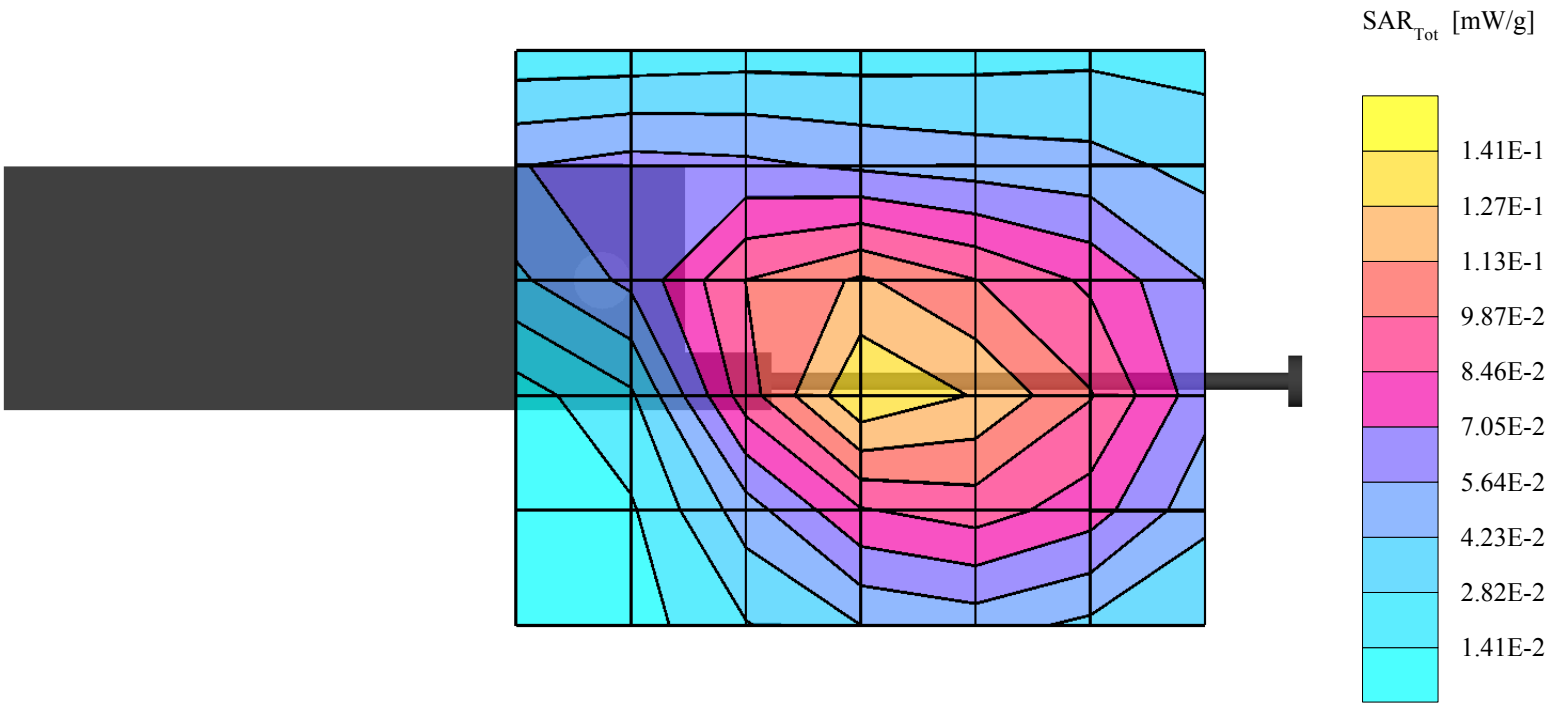


<ENTER HERE YOUR COMPANY NAME>

01/14/03

Opal 1X

Opal 1X, FCC #R9LW, PCS ch1175, Flat with 13.5mm Air Gap, 01-14-03
Temp. 22.2C, Humidity: 37%
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1618; ConvF(4.77,4.77,4.77); Crest factor: 1.0; 1900 MHz Muscle: σ = 1.49 mho/m ε_r = 53.6 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.144 mW/g, SAR (10g): 0.0903 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.05 dB



<ENTER HERE YOUR COMPANY NAME>

APPENDIX C: PROBE CALIBRATION CERTIFICATE

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:	**454**
Place of Calibration:	**Zurich**
Date of Calibration:	**February 11, 2002**
Calibration Interval:	**24 months**

asset# 039925

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: D835V2

Serial: 454

Manufactured: January 31, 2002
Calibrated: February 11, 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 835 MHz:

Relative Dielectricity	**41.9**	± 5%
Conductivity	**0.89 mho/m**	± 5%

The DASY3 System (Software version 3.1c) 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 ± 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:	**10.4 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**6.64 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.

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:	**1.379 ns**	(one direction)
Transmission factor:	**0.989**	(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:	Re{Z} = **50.0 Ω**
	Im {Z} = **-3.4 Ω**
Return Loss at 835 MHz	**-29.5 dB**

4. Handling

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

5. Design

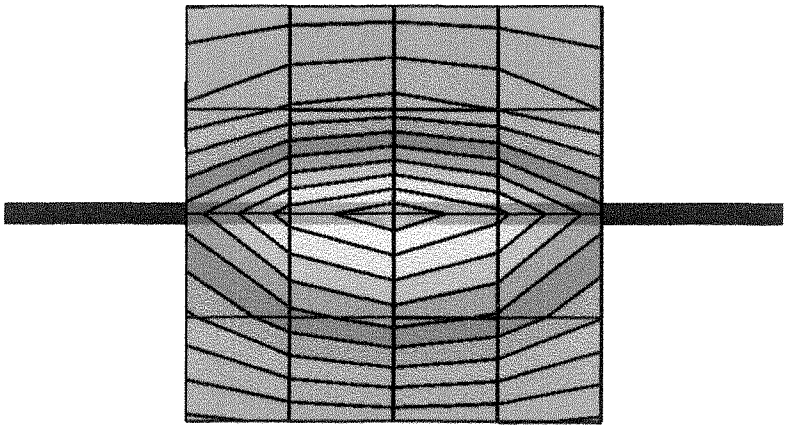
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

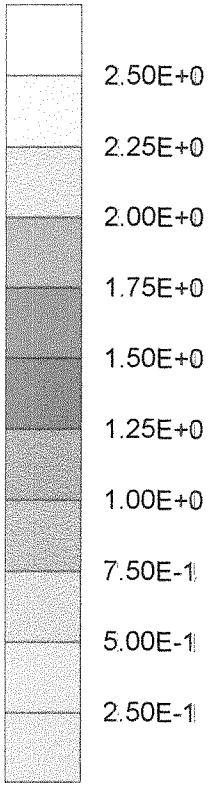
6. Power Test

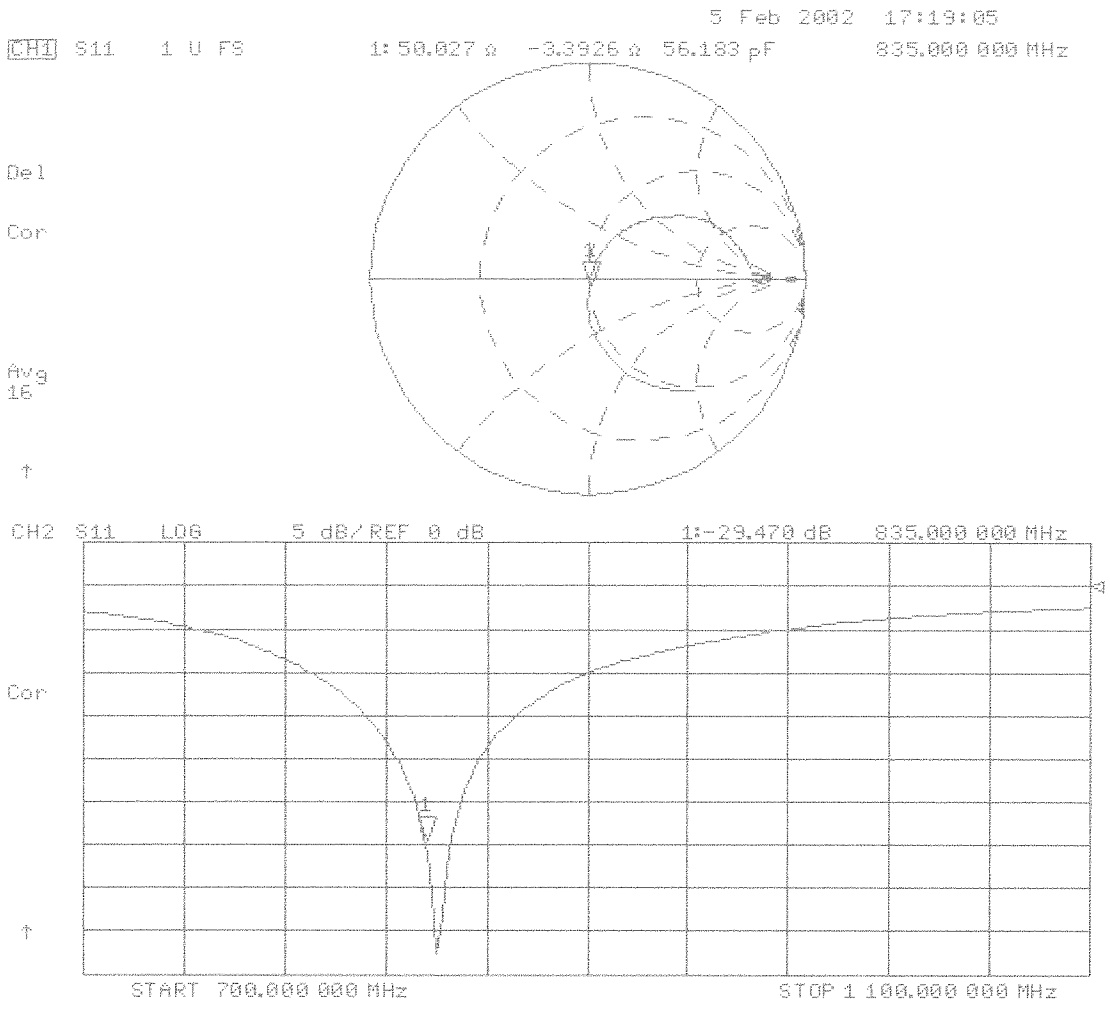
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

idation Dipole D835V2 SN:454, d = 15 mm

uency: 835 MHz; Antenna Input Power: 250 [mW]
Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
e: ET3DV6 - SN1507; ConvF(6.50,6.50,6.50) at 900 MHz; IEEE1528 835 MHz; σ = 0.89 mho/m ε_r = 41.9 ρ = 1.00 g/cm^3
es (2): Peak: 4.14 mW/g ± 0.03 dB, SAR (1g): 2.59 mW/g ± 0.00 dB, SAR (10g): 1.66 mW/g ± 0.02 dB, (Worst-case extrapolation)
tration depth: 12.2 (10.8, 13.9) [mm]
erdrift: -0.03 dB






5 Feb 2002 17:19:05
CH1 S11 1 U FS
1: 50.027 Ω -3.3926 Ω 56.183 pF
835.000 000 MHz
Del
Cor
Avg
16
↑
CH2 S11 LOG 5 dB/ REF 0 dB
1:-29.470 dB 835.000 000 MHz
Cor
↑
START 700.000 000 MHz
STOP 1 100.000 000 MHz

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:	**5d003**
Place of Calibration:	**Zurich**
Date of Calibration:	**February 20, 2002**
Calibration Interval:	**24 months**

asset # 039924

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:	Nico Vetterli
Approved by:	Niels Kuster

Schmid & Partner
Engineering 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: 5d003

Manufactured: February 14, 2002
Calibrated: February 20, 2002

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	**39.1**	± 5%
Conductivity	**1.47 mho/m**	± 10%

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, conversion factor 5.3) 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 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 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:	**45.6 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**23.0 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:	**1.185 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} = **51.2 Ω**
	Im {Z} = **0.9 Ω**
Return Loss at 1900 MHz	**- 36.7 dB**

4. Handling

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

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.

5. Design

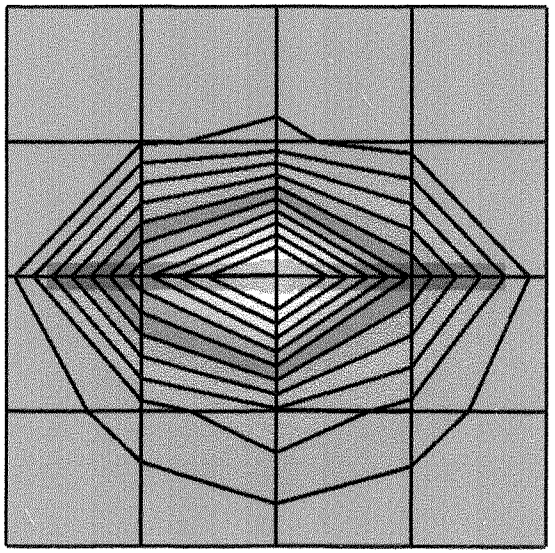
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

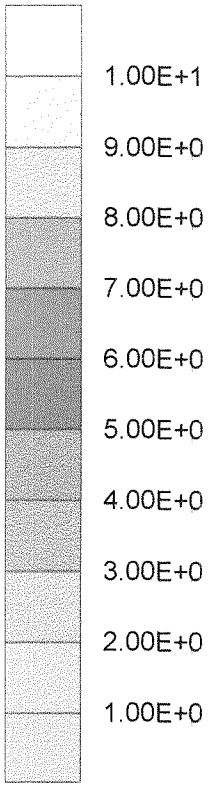
6. Power Test

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

idation Dipole D1900V2 SN:5d003, d = 10 mm

uency: 1900 MHz; Antenna Input Power: 250 [mW]
Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
e: ET3DV6 - SN1507; ConvF(5.30,5.30,5.30) at 1800 MHz; IEEE1528 1900 MHz ; σ = 1.47 mho/m ε_r = 39.1 ρ = 1.00 g/cm^3
s (2): Peak: 22.0 mW/g ± 0.06 dB, SAR (1g): 11.4 mW/g ± 0.01 dB, SAR (10g): 5.76 mW/g ± 0.03 dB, (Worst-case extrapolation)
tration depth: 7.9 (7.5, 8.8) [mm]
erdrift: -0.04 dB





20 Feb 2002 17:32:36

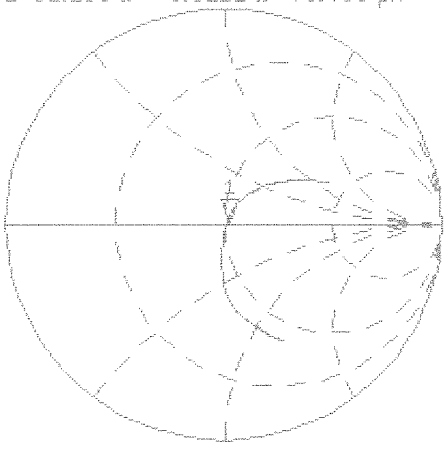
CH1 S11 1 U FS 1: 51.156 Ω 0.3121 Ω 76.403 pH 1 900.000 000 MHz

Del

Cor

Avg
16

↑

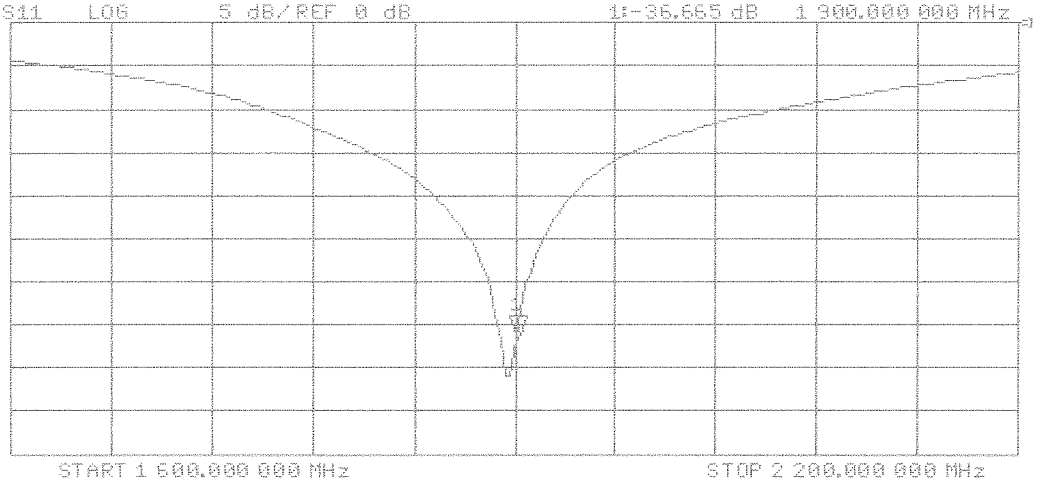


CH2 S11 LOG 5 dB/ REF 0 dB 1: -36.665 dB 1 900.000 000 MHz

Cor

Avg
16

↑



START 1 500.000 000 MHz STOP 2 200.000 000 MHz

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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:	1618
Place of Calibration:	Zurich
Date of Calibration:	February 21, 2002
Calibration Interval:	12 months

asset# 039926

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, Telephone +41 1 245 97 00, Fax +41 1 245 97 79

Probe ET3DV6

SN:1618

Manufactured: January 25, 2002
Last calibration: February 21, 2002

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6 SN:1618

Sensitivity in Free Space

Diode Compression

NormX	**1.80**	$\mu V/(V/m)^2$	DCP X	**97**	mV
NormY	**1.75**	$\mu V/(V/m)^2$	DCP Y	**97**	mV
NormZ	**1.88**	$\mu V/(V/m)^2$	DCP Z	**97**	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	**0.32**
ConvF Z	**6.8**	± 9.5% (k=2)	Depth	**2.69**

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	**5.3**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.3**	± 9.5% (k=2)	Alpha	**0.45**
ConvF Z	**5.3**	± 9.5% (k=2)	Depth	**2.37**

Boundary Effect

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

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	9.3	5.4
SAR_{be} [%]	With Correction Algorithm	0.3	0.5

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

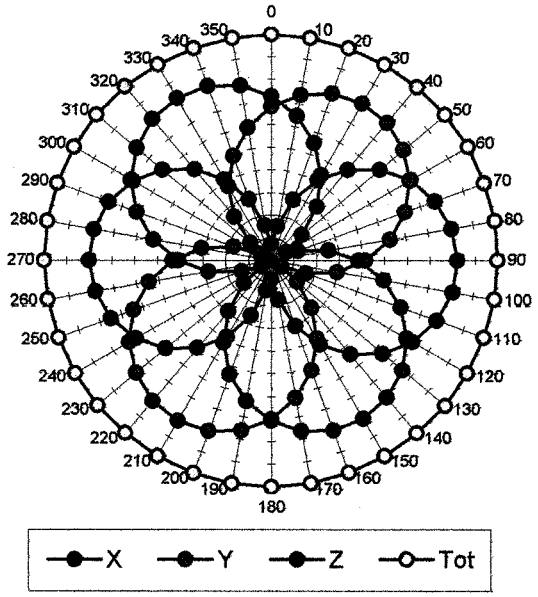
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	10.2	6.7
SAR_{be} [%]	With Correction Algorithm	0.2	0.2

Sensor Offset

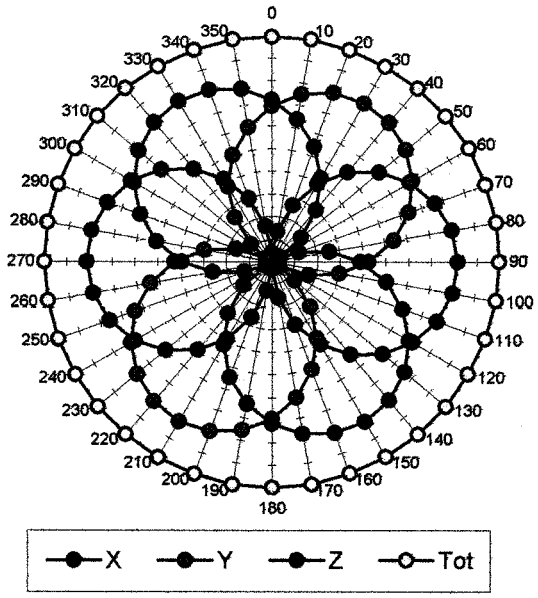
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.3 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

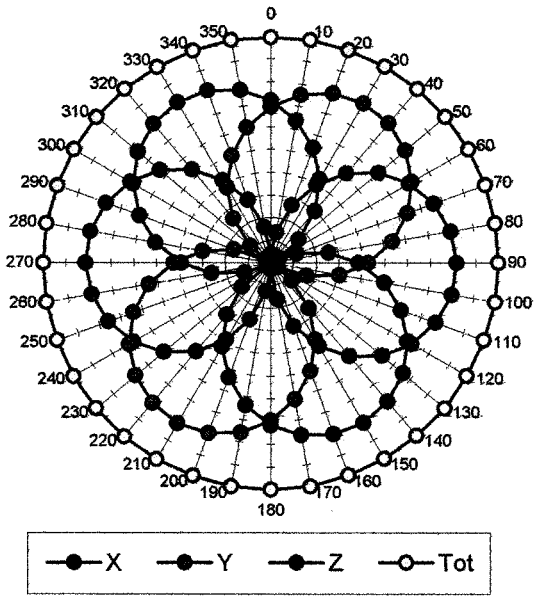
f = 30 MHz, TEM cell ifi110



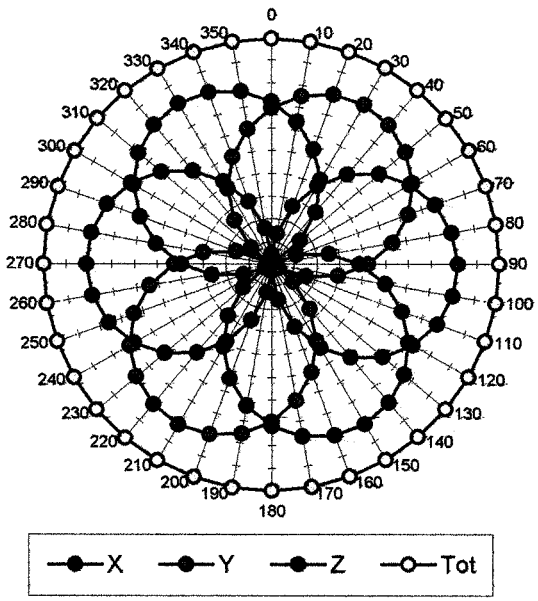
f = 100 MHz, TEM cell ifi110

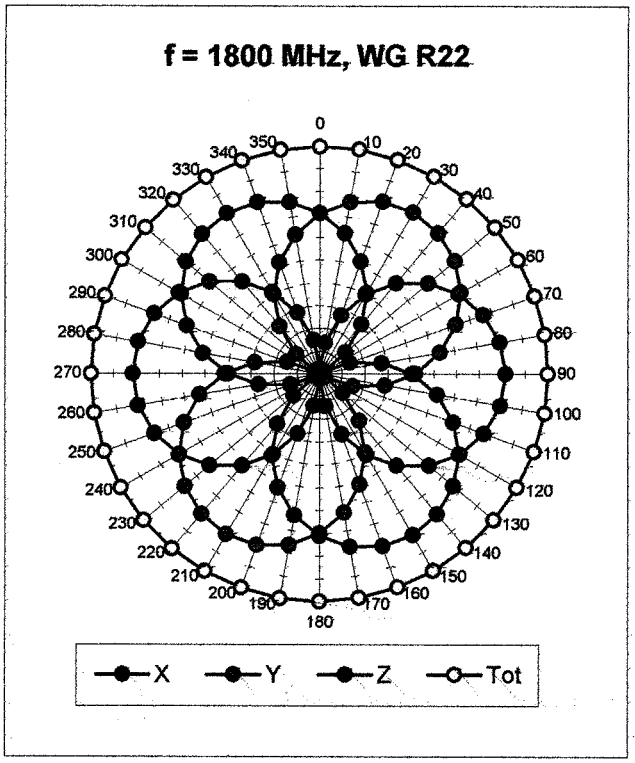


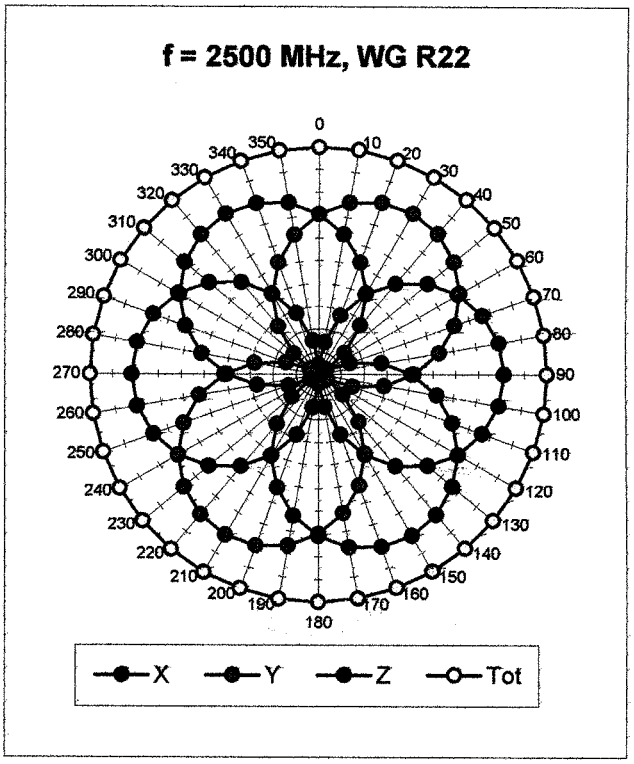
f = 300 MHz, TEM cell ifi110



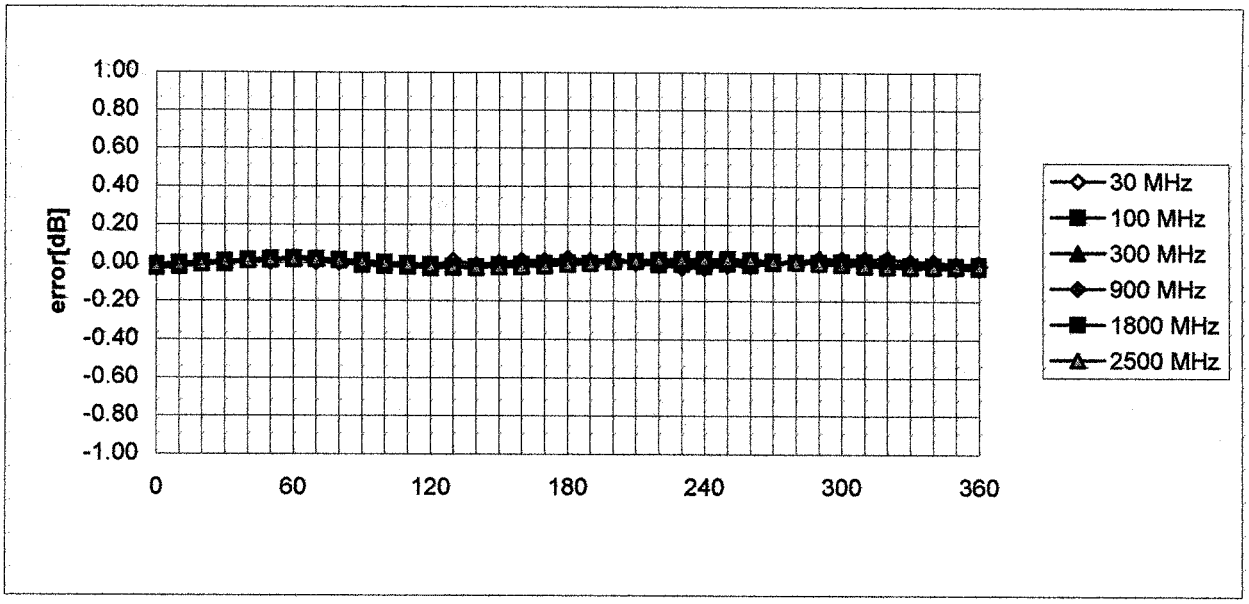
f = 900 MHz, TEM cell ifi110





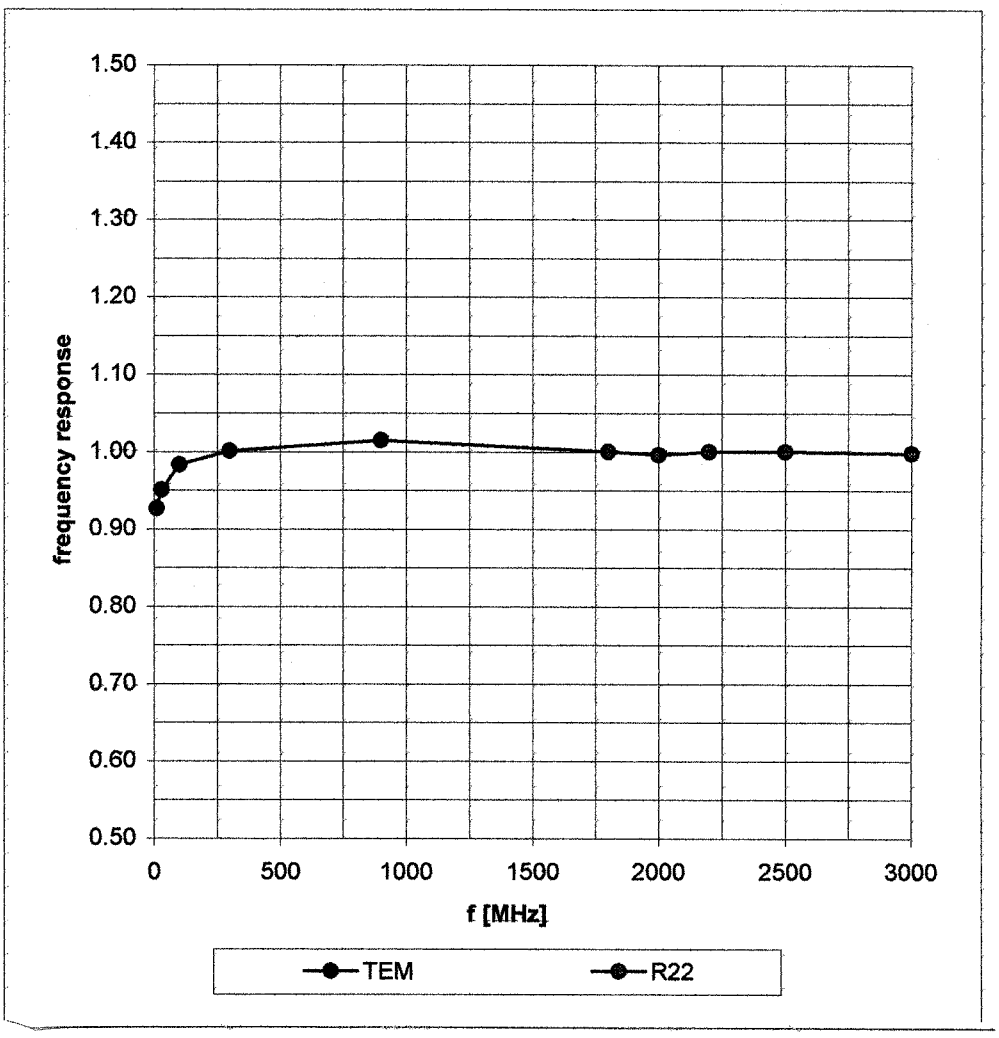


Isotropy Error (ϕ), θ = 0°



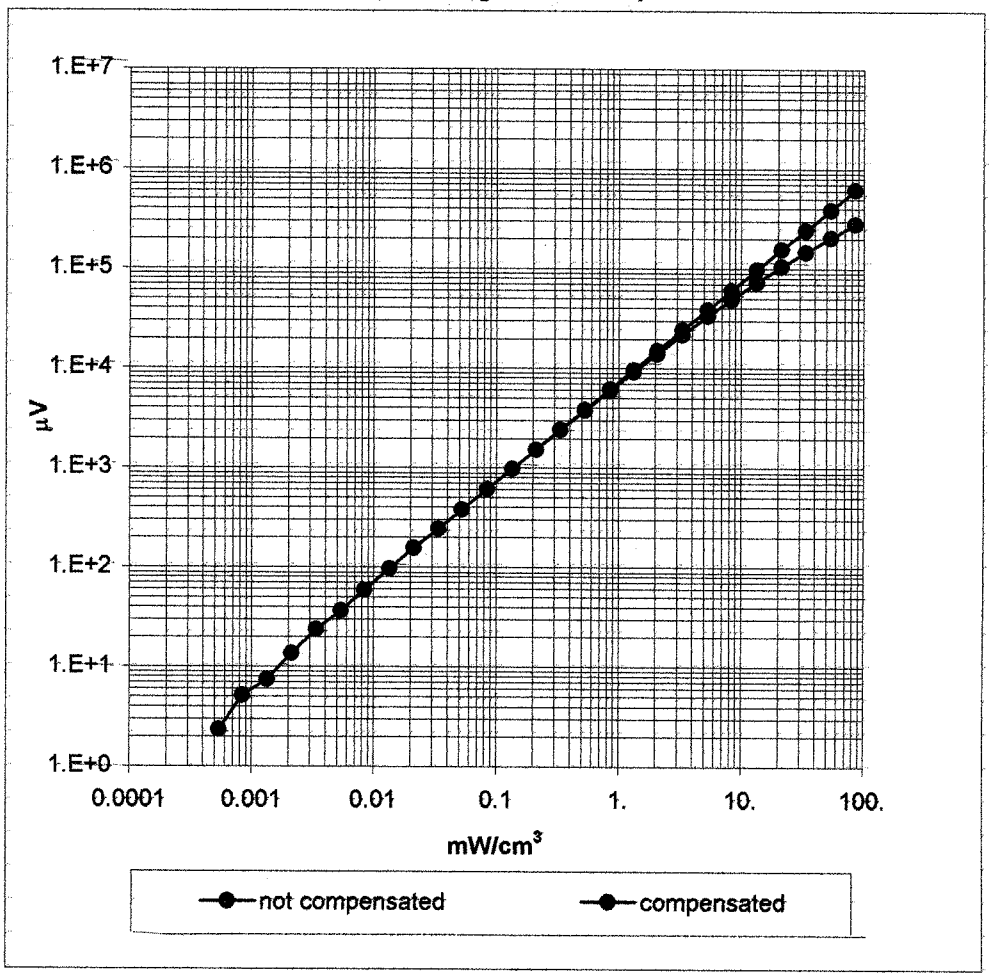
Frequency Response of E-Field

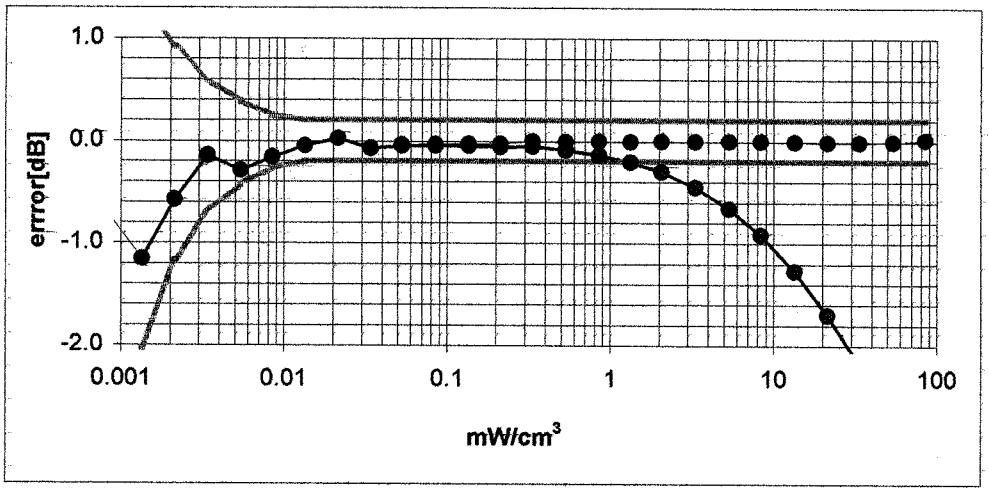
(TEM-Cell:ifi110, Waveguide R22)



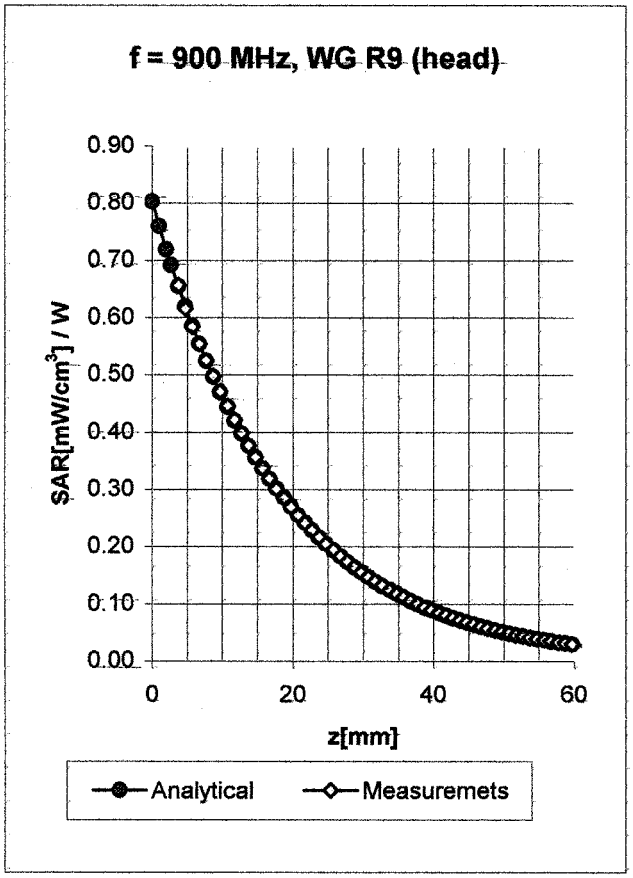
Dynamic Range f(SAR_{brain})

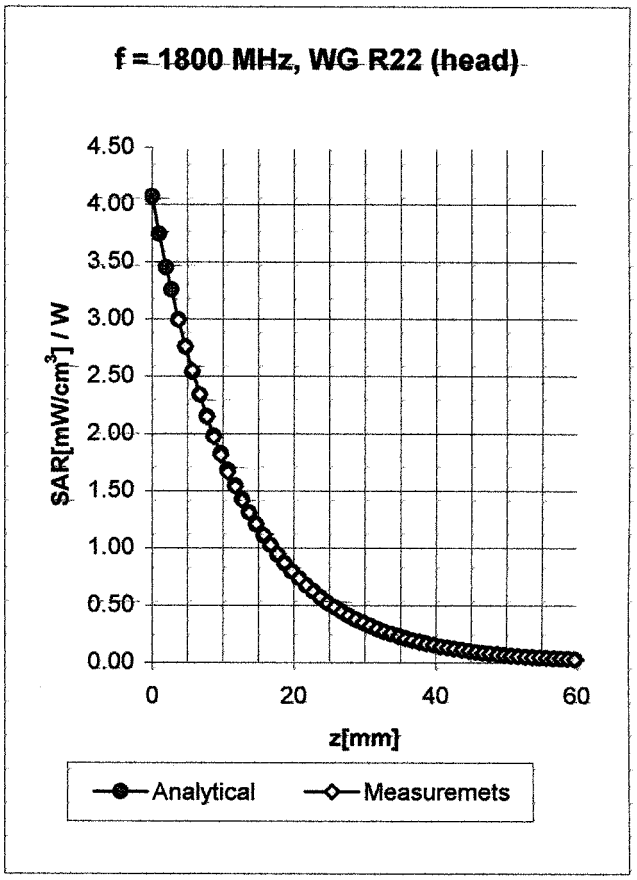
(Waveguide R22)





Conversion Factor Assessment



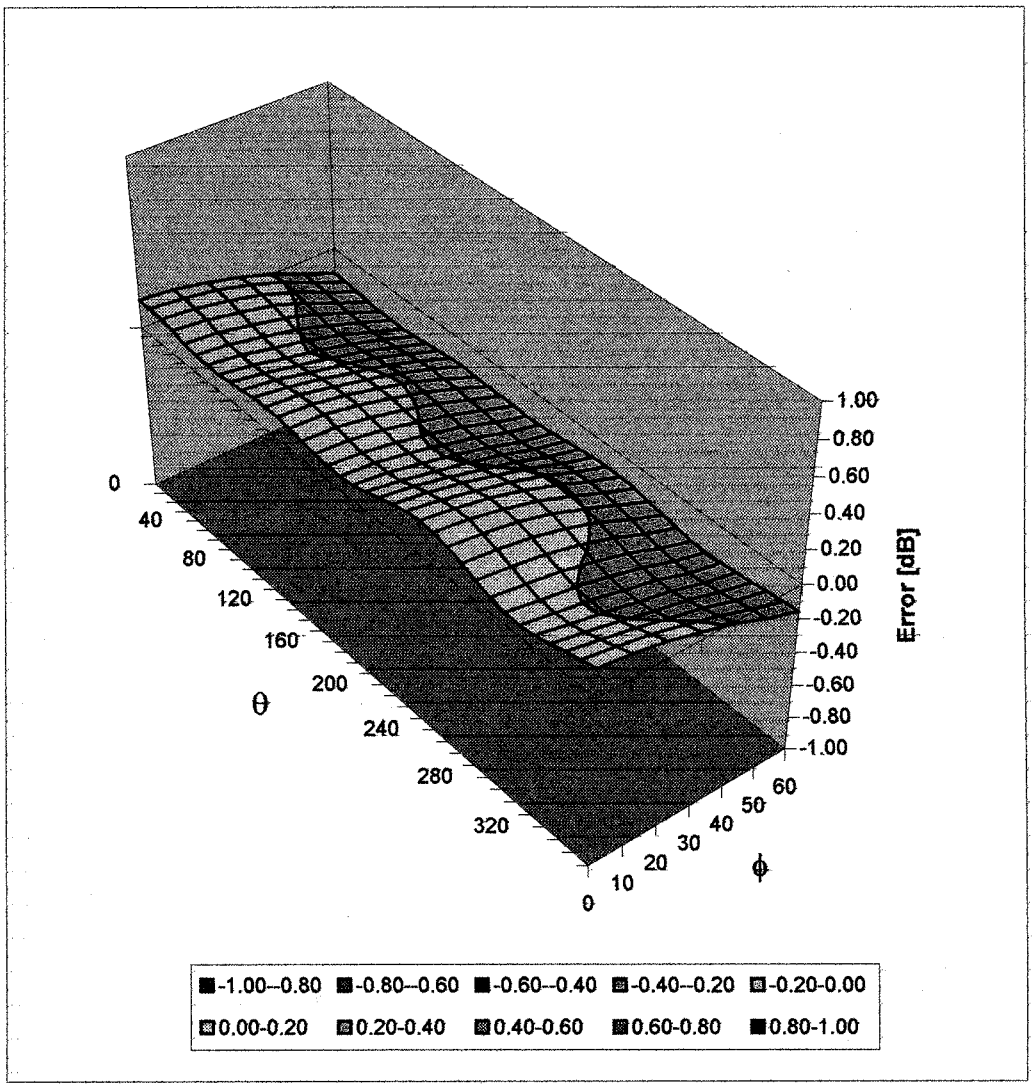


Head	**900 MHz**	ε_r **= 41.5 ± 5%**	σ **= 0.97 ± 5% mho/m**	
Head	**835 MHz**	ε_r **= 41.5 ± 5%**	σ **= 0.90 ± 5% mho/m**	
	ConvF X	**6.8** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.8** ± 9.5% (k=2)	Alpha	**0.32**
	ConvF Z	**6.8** ± 9.5% (k=2)	Depth	**2.69**

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	**5.3** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.3** ± 9.5% (k=2)	Alpha	**0.45**
	ConvF Z	**5.3** ± 9.5% (k=2)	Depth	**2.37**

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



Schmid & Partner
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DASY - DOSIMETRIC ASSESSMENT SYSTEM

CALIBRATION REPORT

DATA ACQUISITION ELECTRONICS

MODEL:	**DAE3 V1**
SERIAL NUMBER:	**322**

This Data Acquisition Unit was calibrated and tested using a FLUKE 702 Process Calibrator. Calibration and verification were performed at an ambient temperature of 23 ± 5 °C and a relative humidity of < 70%.

Measurements were performed using the standard DASY software for converting binary values, offset compensation and noise filtering. Software settings are indicated in the reports.

Results from this calibration relate only to the unit calibrated.

Calibrated by:	**Storchenegger**
Calibration Date:	**27. 08. 2002**
DASY Software Version:	**DASY3 V3.1c**

1. DC Voltage Measurement

DA - Converter Values from DAE

High Range:	1LSB =	6.1μV ,	full range =	400 mV
Low Range:	1LSB =	61nV ,	full range =	4 mV

Software Set-up: Calibration time: 3 sec Measuring time: 3 sec

Setup	X	Y	Z
High Range	505.6543152	505.2965119	505.8000844
Low Range	4.95075	4.93903	4.97937
Connector Position	70°		

High Range	Input	Reading in μV	% Error
Channel X + Input	200mV	199999.3	0.00
	20mV	20001.44	0.01
Channel X - Input	20mV	-19997.52	-0.01
Channel Y + Input	200mV	200000	0.00
	20mV	19997.7	-0.01
Channel Y - Input	20mV	-20000.7	0.00
Channel Z + Input	200mV	200000.1	0.00
	20mV	19997.22	-0.01
Channel Z - Input	20mV	-19999.95	0.00

Low Range	Input	Reading in μV	% Error
Channel X + Input	2mV	1999.96	0.00
	0.2mV	199.807	-0.10
Channel X - Input	0.2mV	-200.643	0.32
Channel Y + Input	2mV	2000.08	0.00
	0.2mV	198.787	-0.61
Channel Y - Input	0.2mV	-201.666	0.83
Channel Z + Input	2mV	2000.098	0.00
	0.2mV	200.068	0.03
Channel Z - Input	0.2mV	-201.3425	0.67

2. Common mode sensitivity

Software Set-up
Calibration time: 3 sec, Measuring time: 3 sec
High/Low Range

in μV	Common mode Input Voltage	High Range Reading	Low Range Reading
Channel X	200mV	9.683006	8.217361
	- 200mV	-9.044056	-8.82462
Channel Y	200mV	2.605308	2.827746
	- 200mV	-4.240534	-5.371011
Channel Z	200mV	1.720822	1.251813
	- 200mV	-3.80517	-4.013216

3. Channel separation

Software Set-up
Calibration time: 3 sec, Measuring time: 3 sec
High Range

in μV	Input Voltage	Channel X	Channel Y	Channel Z
Channel X	200mV	-	-1.374695	-1.037235
Channel Y	200mV	1.78353	-	-0.1708968
Channel Z	200mV	1.40332	-1.022386	-

4. AD-Converter Values with inputs shorted

in LSB	Low Range	High Range
Channel X	12715.08	12443.77
Channel Y	12917.59	12444.66
Channel Z	13003.69	12609.97

5. Input Offset Measurement

Measured after 15 min warm-up time of the Data Acquisition Electronic.
Every Measurement is preceded by a calibration cycle.

Software set-up:

Calibration time:	3 sec
Measuring time:	3 sec
Number of measurements:	100, Low Range

Input 10MΩ

in μV	Average	min. Offset	max. Offset	Std. Deviation
Channel X	-3.66	-5.15	-1.64	0.58
Channel Y	-0.38	-2.82	0.46	0.49
Channel Z	-2.06	-3.26	-0.84	0.42

Input shorted

in μV	Average	min. Offset	max. Offset	Std. Deviation
Channel X	-2.54	-4.00	-1.58	0.39
Channel Y	-0.29	-1.26	0.07	0.20
Channel Z	-1.07	-2.33	-0.49	0.29

6. Input Offset Current

in fA	Input Offset Current
Channel X	< 25
Channel Y	< 25
Channel Z	< 25

7. Input Resistance

	Calibrating	Measuring
Channel X	200 kΩ	200 MΩ
Channel Y	200 kΩ	200 MΩ
Channel Z	200 kΩ	200 MΩ

8. Low Battery Alarm Voltage

in V	Alarm Level
Supply (+ Vcc)	7.65 V
Supply (- Vcc)	-7.51 V

9. Power Consumption

in mA	Switched off	Stand by	Transmitting
Supply (+ Vcc)	0.002	5.41	14.4
Supply (- Vcc)	-0.020	-8.31	-9.45

10. Functional test

Touch async pulse 1	ok
Touch async pulse 2	ok
Touch status bit 1	ok
Touch status bit 2	ok
Remote power off	ok
Remote analog Power control	ok

Date: 27.08.02 Signature: .....