

**APPENDIX 5  
CALIBRATION DATA  
FOR RFI TEST REPORT SERIAL NO:  
RFI/SARB1/RP44198JD02A**

Test Of: Danger Inc.  
Hiptop Mobile Telephone Handset with Colour Display

To: OET Bulletin 65 Supplement C: (2001-01)

**RADIO FREQUENCY INVESTIGATION LTD.**

**Calibration Data**

**S.No. RFI/SARB1/RP44198JD02A**

**Issue Date: 10 January 2003**

**Test Of:      Danger Inc.**

**Hiptop Mobile Telephone Handset with Colour Display**

**To:            OET Bulletin 65 Supplement C: (2001-01)**

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**Calibration Data**

This section contains the calibration data and certificates.

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# Schmid & Partner Engineering AG

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## Calibration Certificate

### Dosimetric E-Field Probe

*Checked 20-6-2  
Andrew (P. J. J.)*

Type:

**ET3DV6**

Serial Number:

**1529**

Place of Calibration:

**Zurich**

Date of Calibration:

**June 13, 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:

*Blanca Katz*

# Probe ET3DV6

## SN:1529

|                   |                |
|-------------------|----------------|
| Manufactured:     | March 21, 2000 |
| Last calibration: | May 23, 2001   |
| Repaired:         | June 6, 2002   |
| Recalibrated:     | June 13, 2002  |

Calibrated for System DASY3

**DASY3 - Parameters of Probe: ET3DV6 SN:1529****Sensitivity in Free Space**

|       |                                                 |
|-------|-------------------------------------------------|
| NormX | <b>1.66</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | <b>1.95</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | <b>1.71</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |

**Diode Compression**

|       |           |    |
|-------|-----------|----|
| DCP X | <b>96</b> | mV |
| DCP Y | <b>96</b> | mV |
| DCP Z | <b>96</b> | mV |

**Sensitivity in Tissue Simulating Liquid**

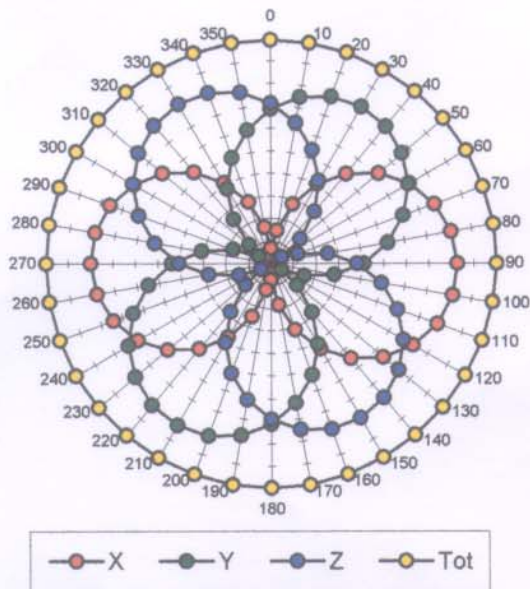
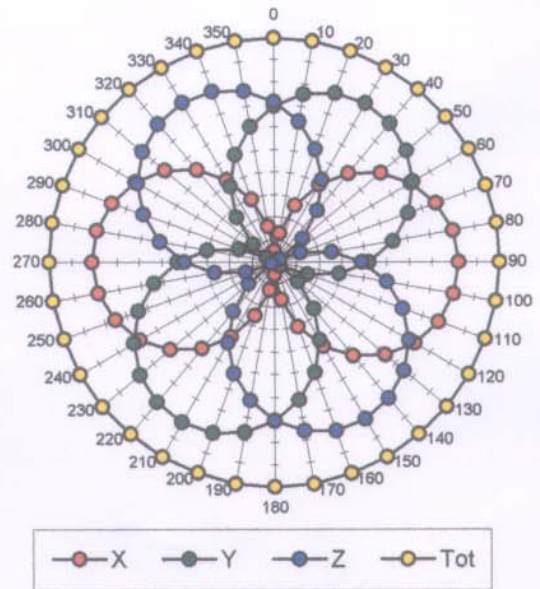
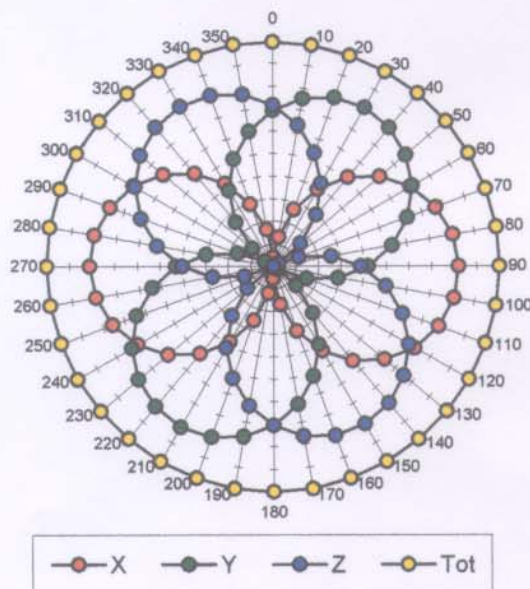
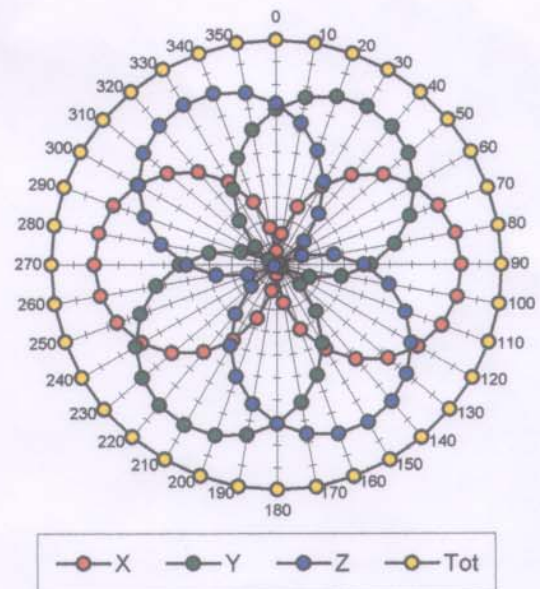
|         |                              |                             |                                       |
|---------|------------------------------|-----------------------------|---------------------------------------|
| Head    | <b>900 MHz</b>               | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
| Head    | <b>835 MHz</b>               | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.90 \pm 5\% \text{ mho/m}$ |
| ConvF X | <b>6.3</b> $\pm 9.5\%$ (k=2) | Boundary effect:            |                                       |
| ConvF Y | <b>6.3</b> $\pm 9.5\%$ (k=2) | Alpha                       | <b>0.28</b>                           |
| ConvF Z | <b>6.3</b> $\pm 9.5\%$ (k=2) | Depth                       | <b>3.32</b>                           |
| Head    | <b>1800 MHz</b>              | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| Head    | <b>1900 MHz</b>              | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| ConvF X | <b>5.2</b> $\pm 9.5\%$ (k=2) | Boundary effect:            |                                       |
| ConvF Y | <b>5.2</b> $\pm 9.5\%$ (k=2) | Alpha                       | <b>0.54</b>                           |
| ConvF Z | <b>5.2</b> $\pm 9.5\%$ (k=2) | Depth                       | <b>2.34</b>                           |

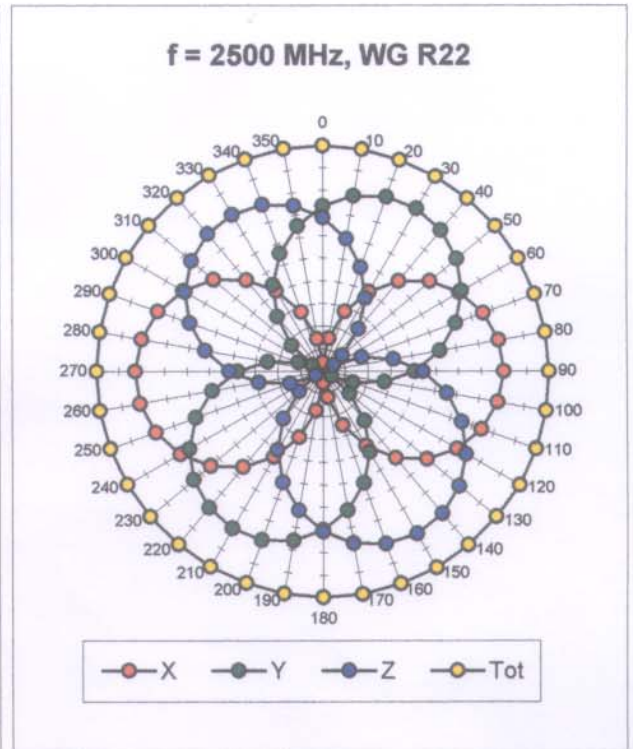
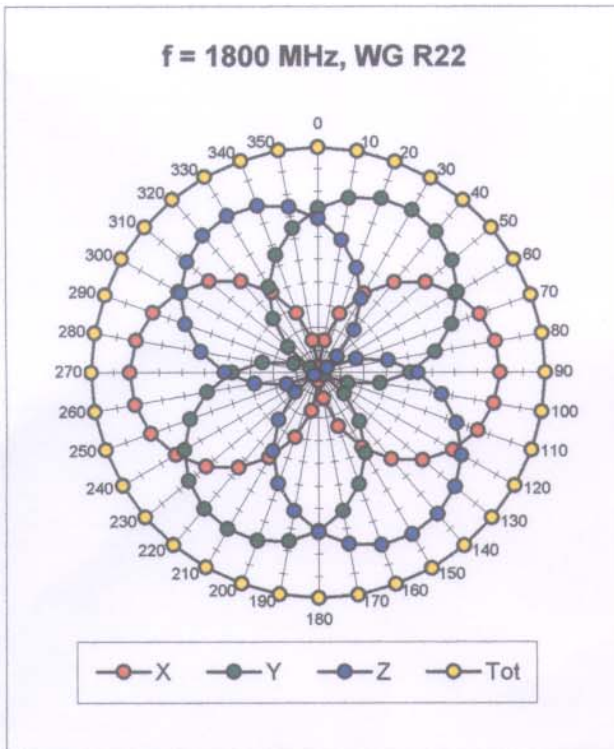
**Boundary Effect**

|                                                    |                 |                                          |             |
|----------------------------------------------------|-----------------|------------------------------------------|-------------|
| Head                                               | <b>900 MHz</b>  | <b>Typical SAR gradient: 5 % per mm</b>  |             |
| Probe Tip to Boundary                              |                 | <b>1 mm</b>                              | <b>2 mm</b> |
| SAR <sub>be</sub> [%] Without Correction Algorithm |                 | 10.7                                     | 6.6         |
| SAR <sub>be</sub> [%] With Correction Algorithm    |                 | 0.6                                      | 0.6         |
| Head                                               | <b>1800 MHz</b> | <b>Typical SAR gradient: 10 % per mm</b> |             |
| Probe Tip to Boundary                              |                 | <b>1 mm</b>                              | <b>2 mm</b> |
| SAR <sub>be</sub> [%] Without Correction Algorithm |                 | 12.2                                     | 8.0         |
| SAR <sub>be</sub> [%] With Correction Algorithm    |                 | 0.2                                      | 0.2         |

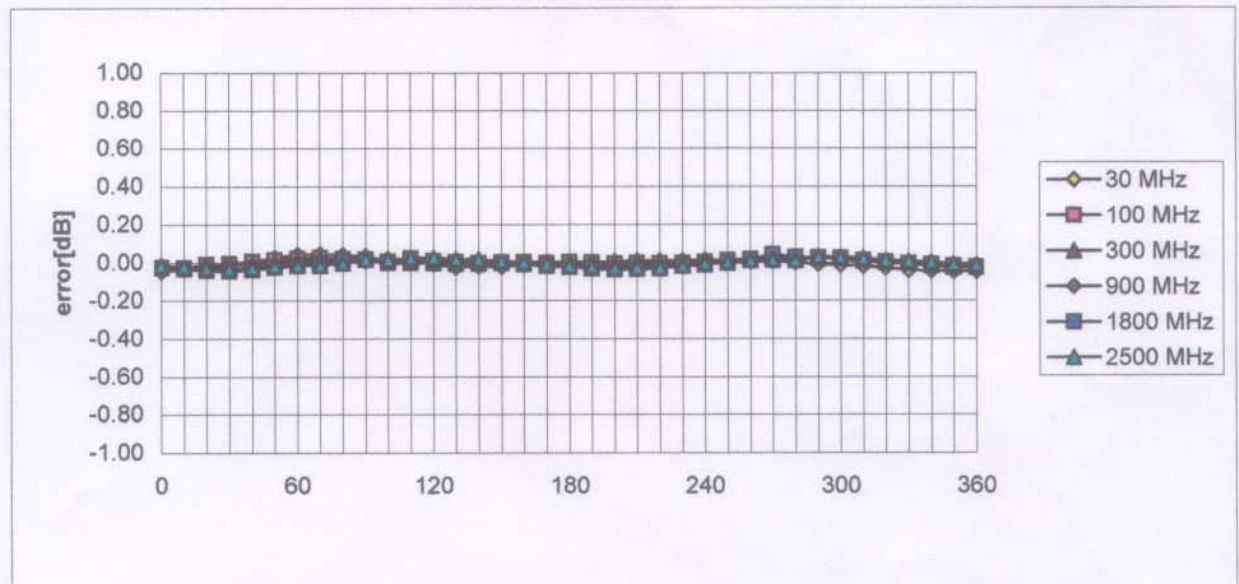
**Sensor Offset**

|                            |                                 |    |
|----------------------------|---------------------------------|----|
| Probe Tip to Sensor Center | <b>2.7</b>                      | mm |
| Optical Surface Detection  | <b>1.3 <math>\pm</math> 0.2</b> | mm |

Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$  $f = 30 \text{ MHz}$ , TEM cell ifi110 $f = 100 \text{ MHz}$ , TEM cell ifi110 $f = 300 \text{ MHz}$ , TEM cell ifi110 $f = 900 \text{ MHz}$ , TEM cell ifi110

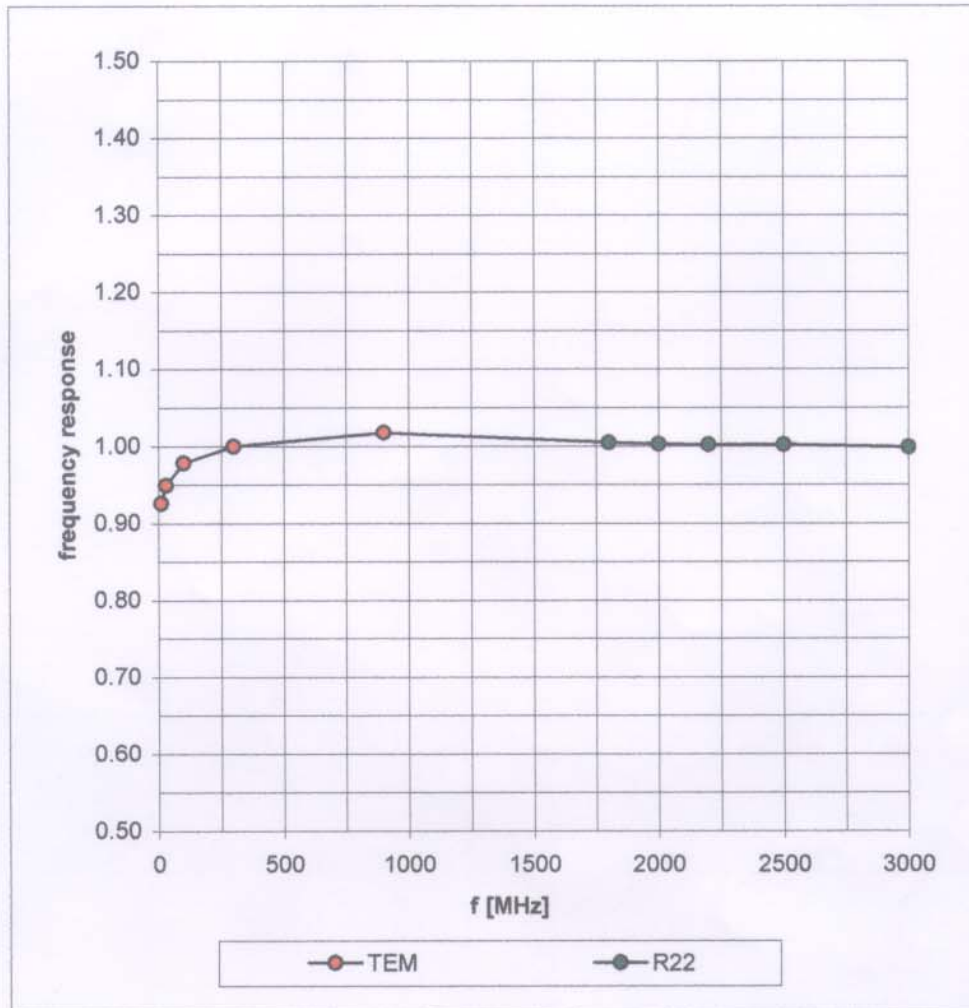


### Isotropy Error ( $\phi$ ), $\theta = 0^\circ$

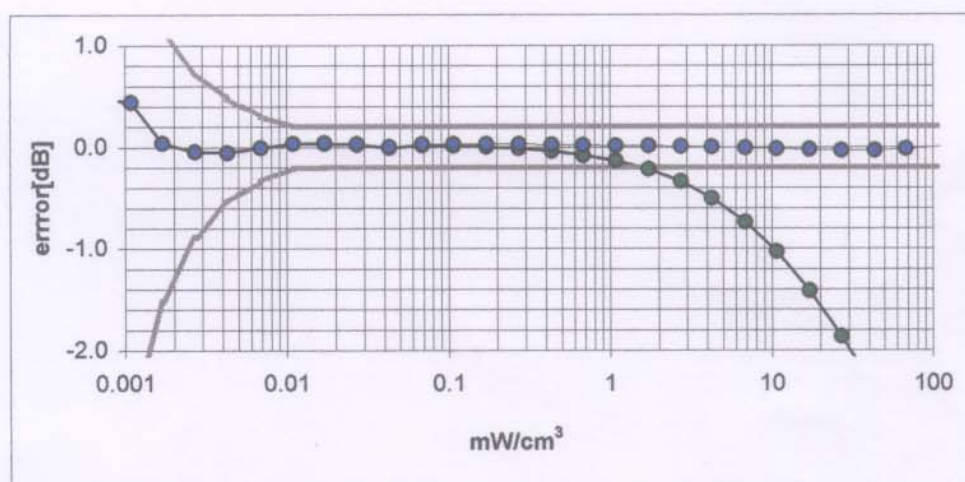
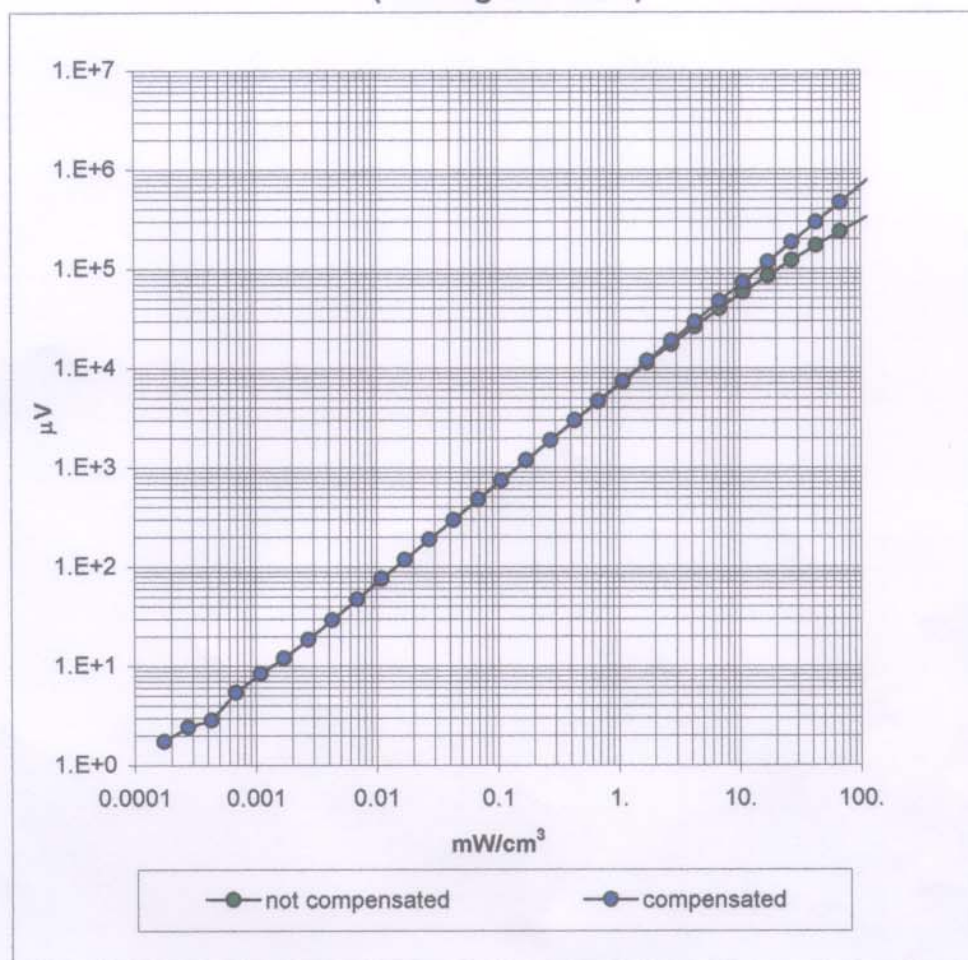


## Frequency Response of E-Field

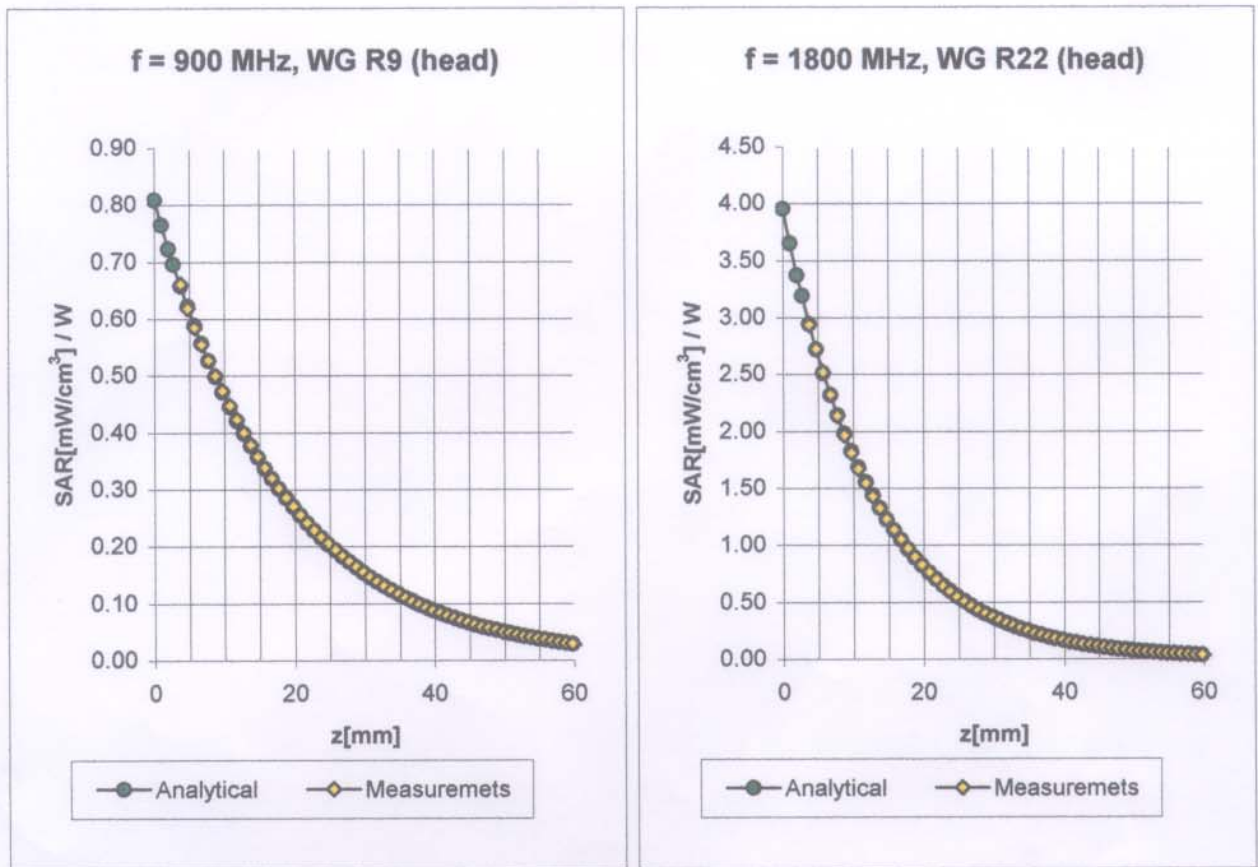
( TEM-Cell:ifi110, Waveguide R22)



# Dynamic Range $f(\text{SAR}_{\text{brain}})$ ( Waveguide R22 )

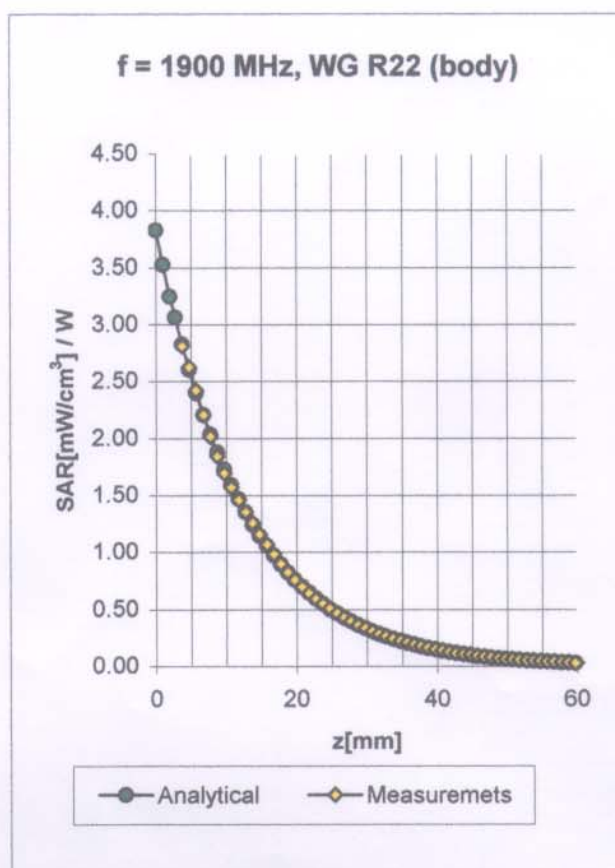


## Conversion Factor Assessment



|      |          |                             |                                       |
|------|----------|-----------------------------|---------------------------------------|
| Head | 900 MHz  | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
| Head | 835 MHz  | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.90 \pm 5\% \text{ mho/m}$ |
|      | ConvF X  | $6.3 \pm 9.5\% (k=2)$       | Boundary effect:                      |
|      | ConvF Y  | $6.3 \pm 9.5\% (k=2)$       | Alpha <b>0.28</b>                     |
|      | ConvF Z  | $6.3 \pm 9.5\% (k=2)$       | Depth <b>3.32</b>                     |
| Head | 1800 MHz | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| Head | 1900 MHz | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
|      | ConvF X  | $5.2 \pm 9.5\% (k=2)$       | Boundary effect:                      |
|      | ConvF Y  | $5.2 \pm 9.5\% (k=2)$       | Alpha <b>0.54</b>                     |
|      | ConvF Z  | $5.2 \pm 9.5\% (k=2)$       | Depth <b>2.34</b>                     |

## Conversion Factor Assessment



Body

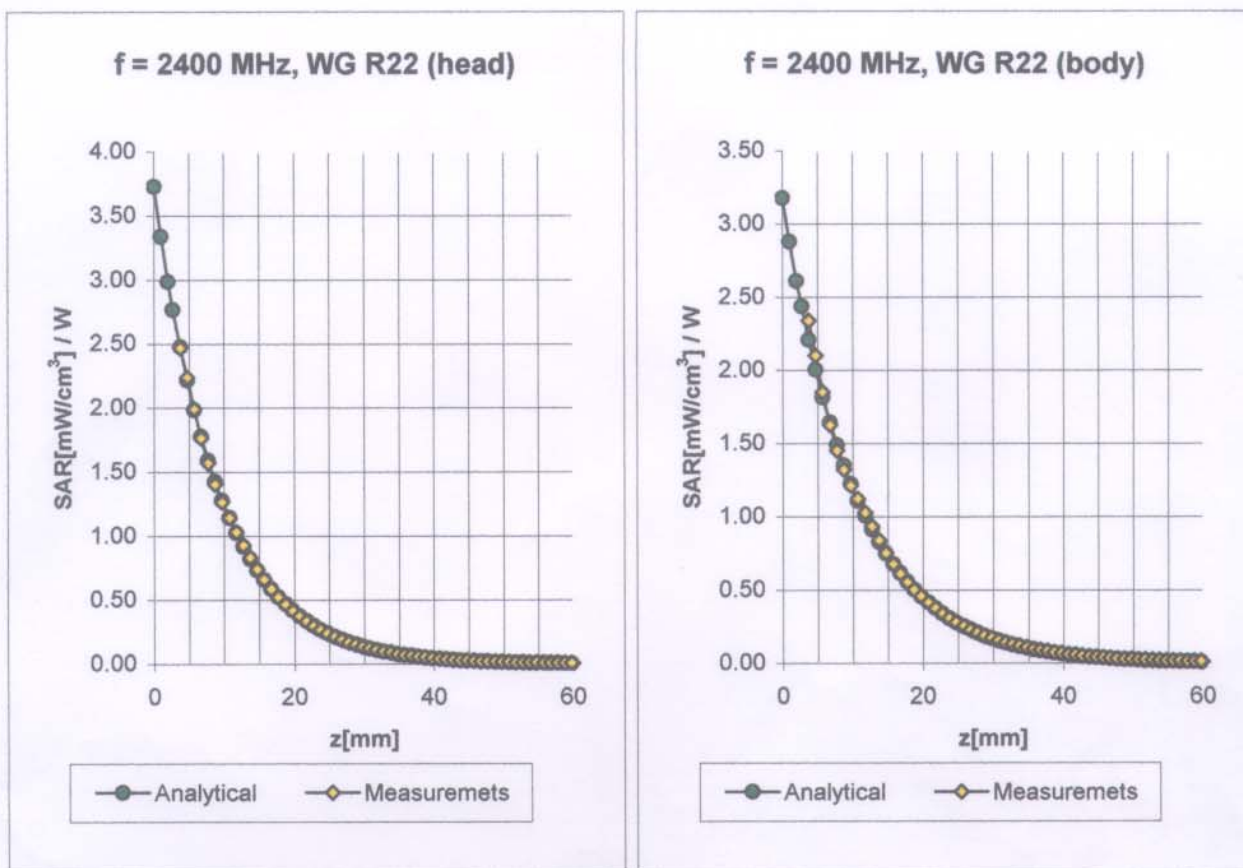
1900 MHz

 $\epsilon_r = 53.3 \pm 5\%$  $\sigma = 1.52 \pm 5\% \text{ mho/m}$ ConvF X **4.7**  $\pm 8.9\%$  (k=2)

Boundary effect:

ConvF Y **4.7**  $\pm 8.9\%$  (k=2)Alpha **0.80**ConvF Z **4.7**  $\pm 8.9\%$  (k=2)Depth **2.04**

## Conversion Factor Assessment



Head

2400 MHz

 $\epsilon_r = 39.2 \pm 5\%$  $\sigma = 1.80 \pm 10\% \text{ mho/m}$ ConvF X **4.9**  $\pm 8.9\%$  (k=2)ConvF Y **4.9**  $\pm 8.9\%$  (k=2)ConvF Z **4.9**  $\pm 8.9\%$  (k=2)

Boundary effect:

Alpha **0.94**Depth **1.96**

Body

2400 MHz

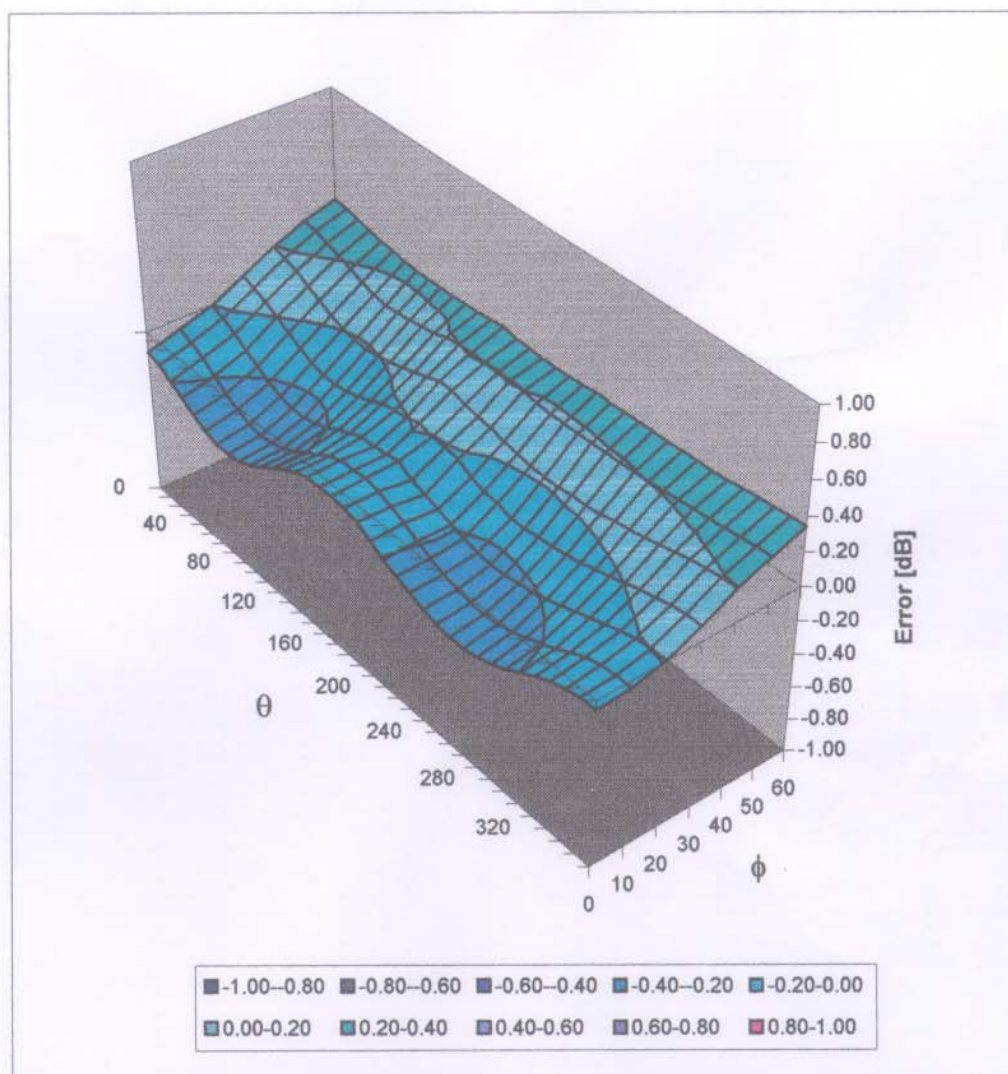
 $\epsilon_r = 52.7 \pm 5\%$  $\sigma = 1.95 \pm 10\% \text{ mho/m}$ ConvF X **4.3**  $\pm 8.9\%$  (k=2)ConvF Y **4.3**  $\pm 8.9\%$  (k=2)ConvF Z **4.3**  $\pm 8.9\%$  (k=2)

Boundary effect:

Alpha **1.00**Depth **1.57**

## Deviation from Isotropy in HSL

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

**540**

Place of Calibration:

**Zurich**

Date of Calibration:

**August 6, 2001**

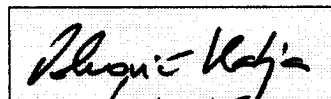
Calibration Interval:

**24 months**

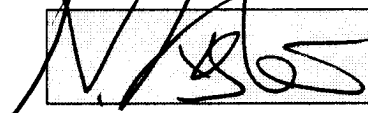
Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

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:



**DASY3**

**Dipole Validation Kit**

**Type: D1900V2**

**Serial: 540**

**Manufactured: July 26, 2001**

**Calibrated: August 6, 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 permittivity | <b>39.5</b>       | $\pm 5\%$  |
| Conductivity          | <b>1.47 mho/m</b> | $\pm 10\%$ |

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  $\pm 3\%$ . 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 <sup>3</sup> (1 g) of tissue:   | <b>42.4 mW/g</b> |
| averaged over 10 cm <sup>3</sup> (10 g) of tissue: | <b>21.5 mW/g</b> |

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:    | <b>1.214 ns</b> | (one direction)                       |
| Transmission factor: | <b>0.997</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\} = $ <b>45.1 <math>\Omega</math></b> |
|                                  | $\text{Im}\{Z\} = $ <b>-9.6 <math>\Omega</math></b> |
| Return Loss at 1900 MHz          | <b>- 19.0 dB</b>                                    |

### **4. Handling**

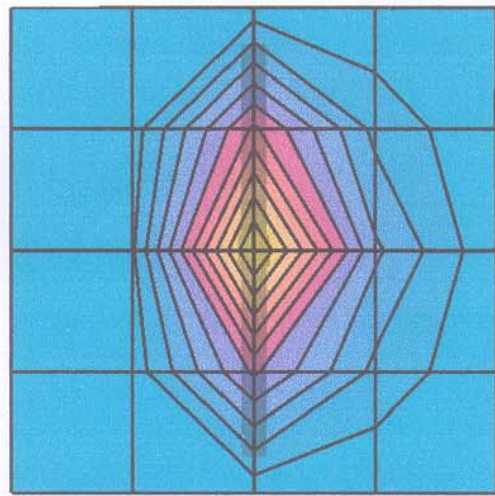
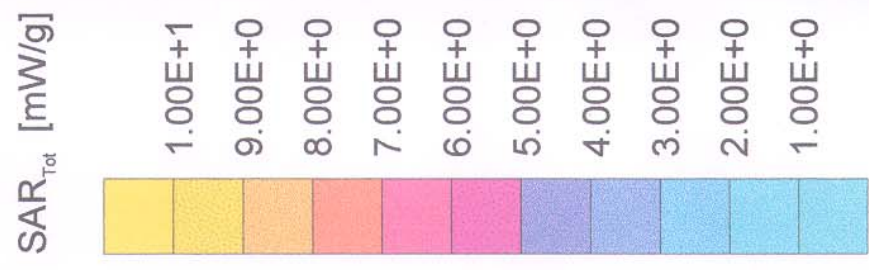
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

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.

# Validation Dipole D1900V2 SN:540, d = 10 mm

Frequency: 1900 MHz; Antenna Input Power: 250 [mW]  
SAM Phantom; Flat - SAM Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0  
Probe: ET3DV6 - SN1507; ConvF(5.57,5.57,5.57) at 1800 MHz;  $\sigma = 1.47$  mho/m  $\epsilon_r = 39.5$   $\rho = 1.00$  g/cm<sup>3</sup>  
Cubes (2): Peak: 20.4 mW/g  $\pm$  0.01 dB, SAR (1g): 10.6 mW/g  $\pm$  0.02 dB, SAR (10g): 5.38 mW/g  $\pm$  0.04 dB, (Worst-case extrapolation)  
Penetration depth: 7.9 (7.4, 8.9) [mm]  
Powerdrift: -0.06 dB



5 Aug 2001 18:18:01

CH1 S11 1 U FS

1: 45.068  $\Omega$  -9.5801  $\Omega$  8.7437 pF

1 900.000 000 MHz

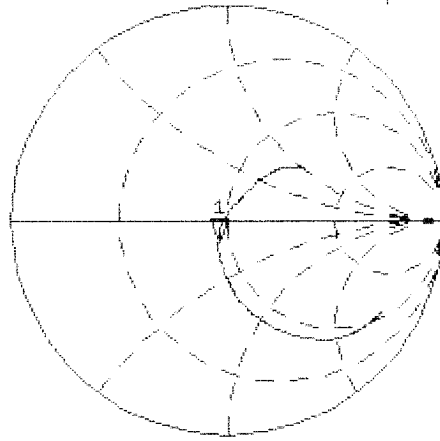
↑

De i

PRm

Cor  
Avg  
16

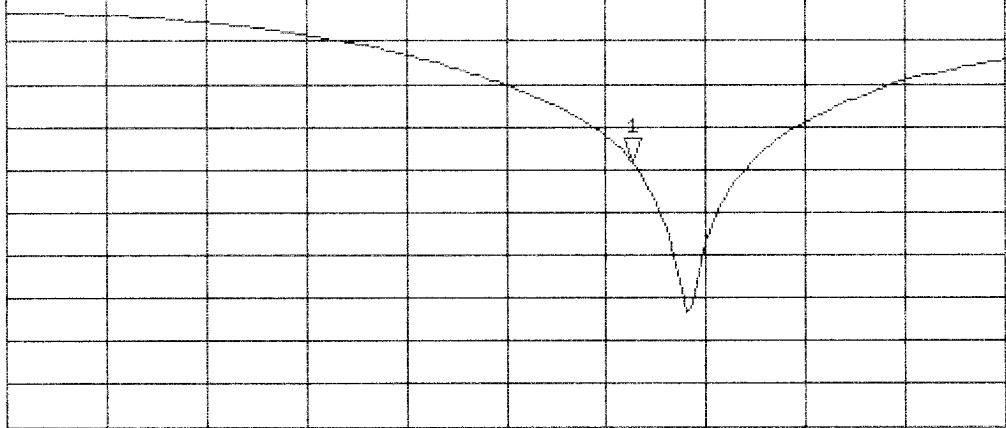
↑



CH2 S11 LOG 5 dB/REF 0 dB 1:-19.023 dB 1 900.000 000 MHz

PRm  
Cor

↑



START 1 400.000 000 MHz

STOP 2 200.000 000 MHz