

Client

C&C (Auden)

## CALIBRATION CERTIFICATE

Object(s) ET3DV6 - SN 1762

Calibration procedure(s) QA CAL-01.v2  
Calibration procedure for dosimetric E-field probes

Calibration date: March 31, 2003

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

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

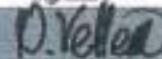
All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

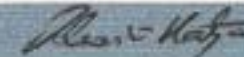
| Model Type                        | ID #         | Cal Date                         | Scheduled Calibration  |
|-----------------------------------|--------------|----------------------------------|------------------------|
| RF generator HP 8684C             | US3642U01700 | 4-Aug-99 (in house check Aug-02) | In house check: Aug-05 |
| Power sensor E4412A               | MY41495277   | Mar-02                           | Mar-03                 |
| Power sensor HP 8481A             | MY41092180   | 18-Sep-02                        | Sep-03                 |
| Power meter EPM E4419B            | GB41293874   | 13-Sep-02                        | Sep-03                 |
| Network Analyzer HP 8753E         | US38432426   | 3-May-00                         | In house check: May 03 |
| Fluke Process Calibrator Type 702 | SN: 6295803  | 3-Sep-01                         | Sep-03                 |

Calibrated by: Name: Nino Valtari  
Function: Technician

Signature



Approved by: Katja Pokovic  
Laboratory Director



Date issued: April 2, 2003

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:1762

|                   |                  |
|-------------------|------------------|
| Manufactured:     | January 20, 2003 |
| Last calibration: | March 31, 2003   |

**Calibrated for DASY Systems**

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ET3DV6 SN:1762

### Sensitivity in Free Space

|       |                                                 |
|-------|-------------------------------------------------|
| NormX | <b>1.90</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | <b>1.78</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | <b>1.82</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

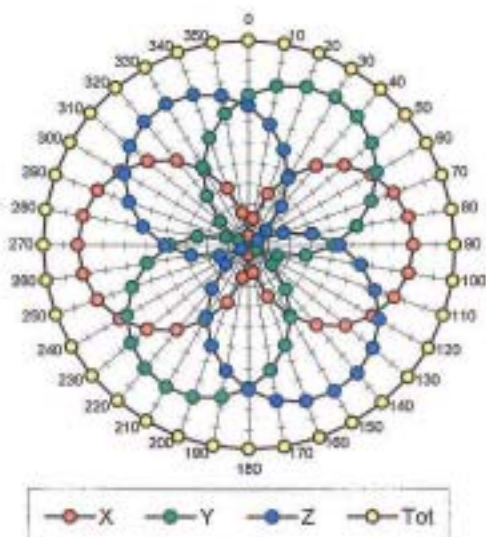
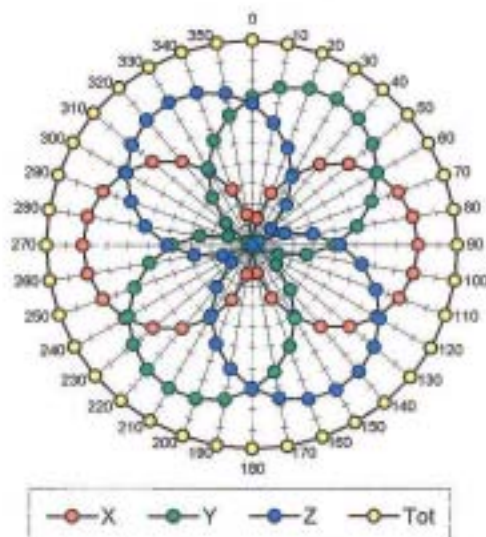
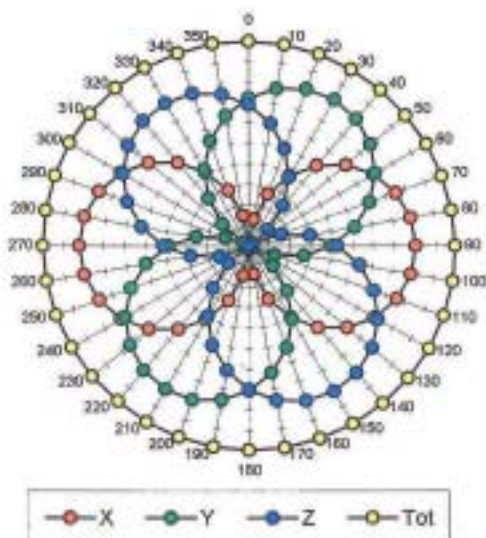
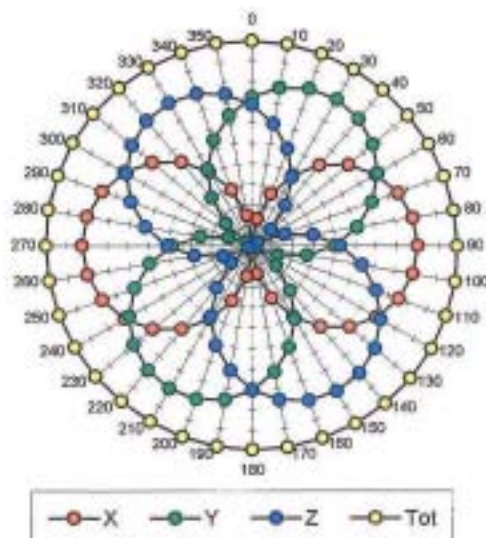
|         |                              |                             |                               |
|---------|------------------------------|-----------------------------|-------------------------------|
| Head    | 900 MHz                      | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.97 \pm 5\%$ mho/m |
| Head    | 835 MHz                      | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.90 \pm 5\%$ mho/m |
| ConvF X | <b>6.7</b> $\pm 9.5\%$ (k=2) | Boundary effect:            |                               |
| ConvF Y | <b>6.7</b> $\pm 9.5\%$ (k=2) | Alpha                       | <b>0.67</b>                   |
| ConvF Z | <b>6.7</b> $\pm 9.5\%$ (k=2) | Depth                       | <b>1.74</b>                   |
| Head    | 1800 MHz                     | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\%$ mho/m |
| Head    | 1900 MHz                     | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\%$ mho/m |
| ConvF X | <b>5.4</b> $\pm 9.5\%$ (k=2) | Boundary effect:            |                               |
| ConvF Y | <b>5.4</b> $\pm 9.5\%$ (k=2) | Alpha                       | <b>0.50</b>                   |
| ConvF Z | <b>5.4</b> $\pm 9.5\%$ (k=2) | Depth                       | <b>2.63</b>                   |

### Boundary Effect

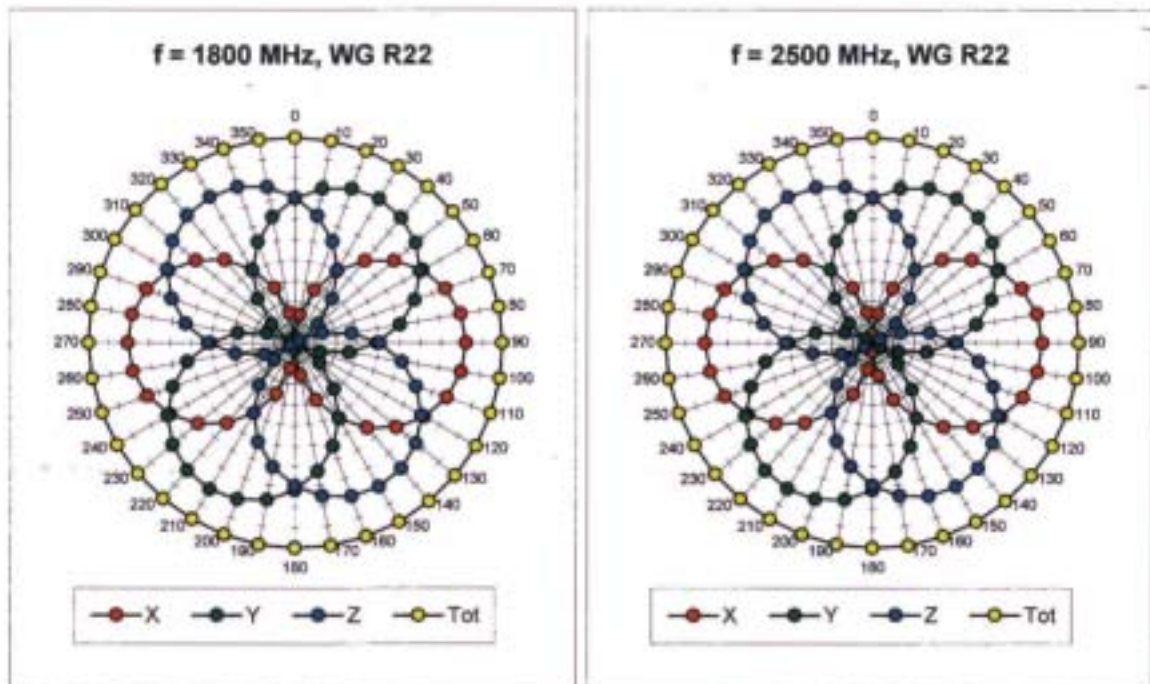
|                       |                              |                                   |      |
|-----------------------|------------------------------|-----------------------------------|------|
| Head                  | 900 MHz                      | Typical SAR gradient: 5 % per mm  |      |
| Probe Tip to Boundary |                              | 1 mm                              | 2 mm |
| SAR <sub>be</sub> [%] | Without Correction Algorithm | 8.8                               | 4.5  |
| SAR <sub>be</sub> [%] | 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 <sub>be</sub> [%] | Without Correction Algorithm | 13.8                              | 9.3  |
| SAR <sub>be</sub> [%] | With Correction Algorithm    | 0.2                               | 0.1  |

### Sensor Offset

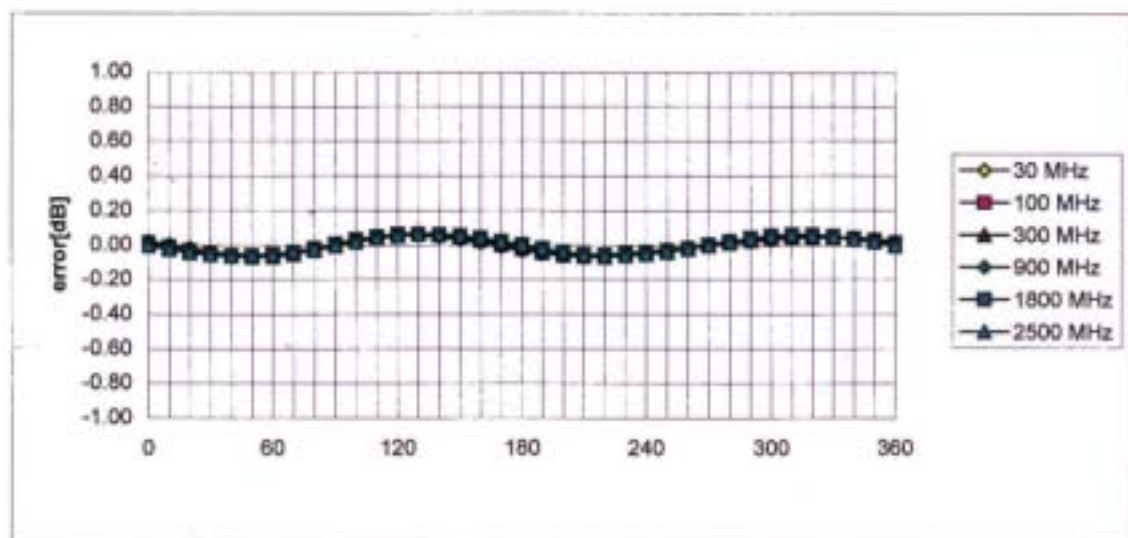
|                            |                                 |    |
|----------------------------|---------------------------------|----|
| Probe Tip to Sensor Center | <b>2.7</b>                      | mm |
| Optical Surface Detection  | <b>1.4 <math>\pm</math> 0.2</b> | mm |

Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$  $f = 30 \text{ MHz}$ , TEM cell if110 $f = 100 \text{ MHz}$ , TEM cell if110 $f = 300 \text{ MHz}$ , TEM cell if110 $f = 900 \text{ MHz}$ , TEM cell if110



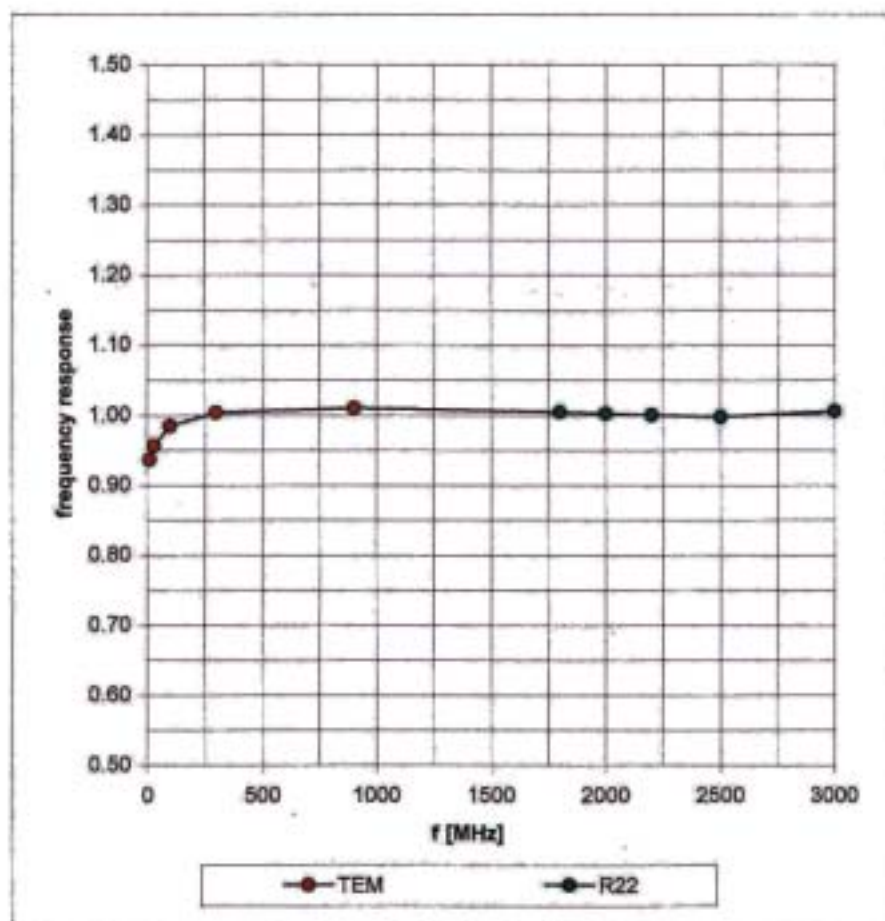


### Isotropy Error ( $\phi$ ), $\theta = 0^\circ$

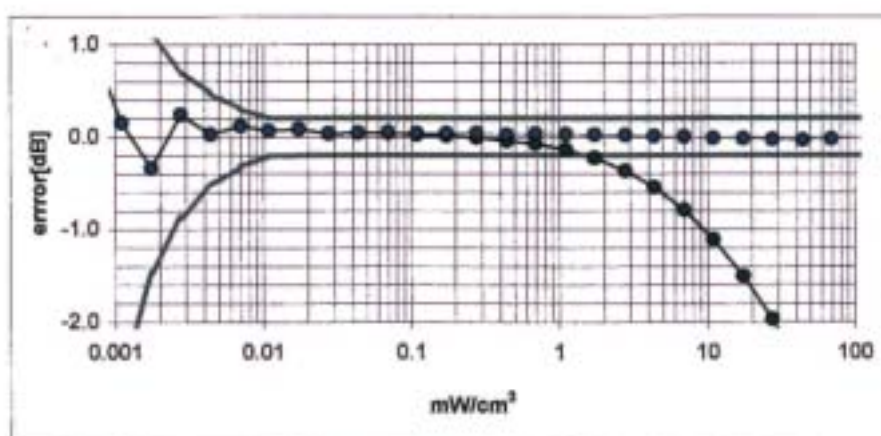
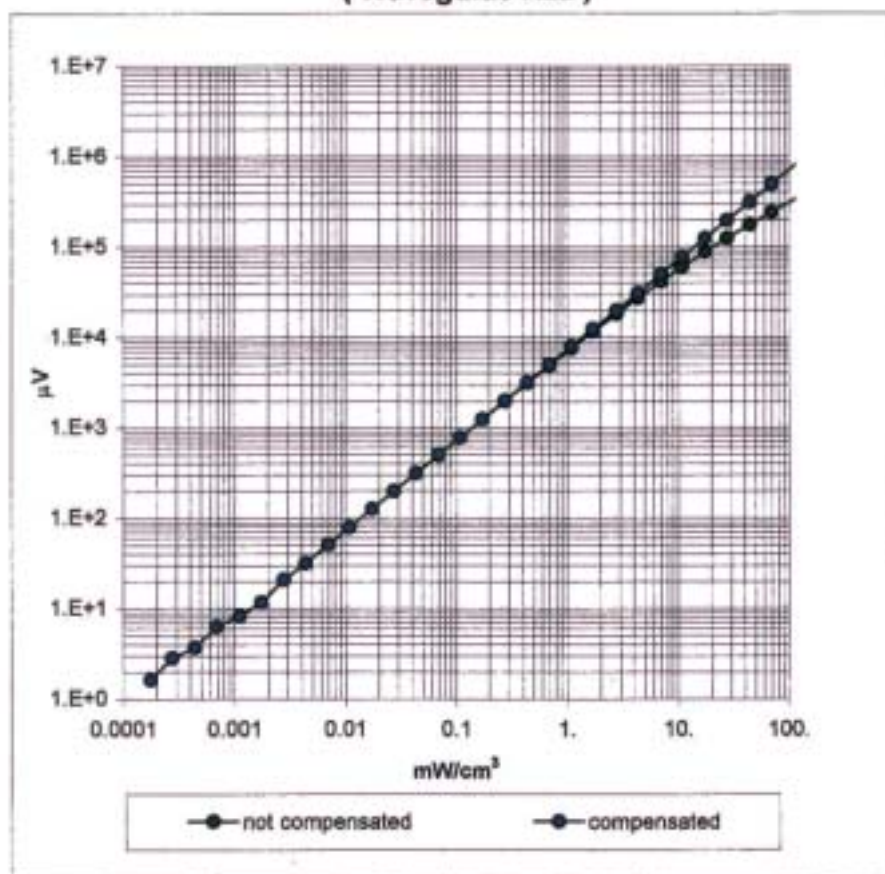


## Frequency Response of E-Field

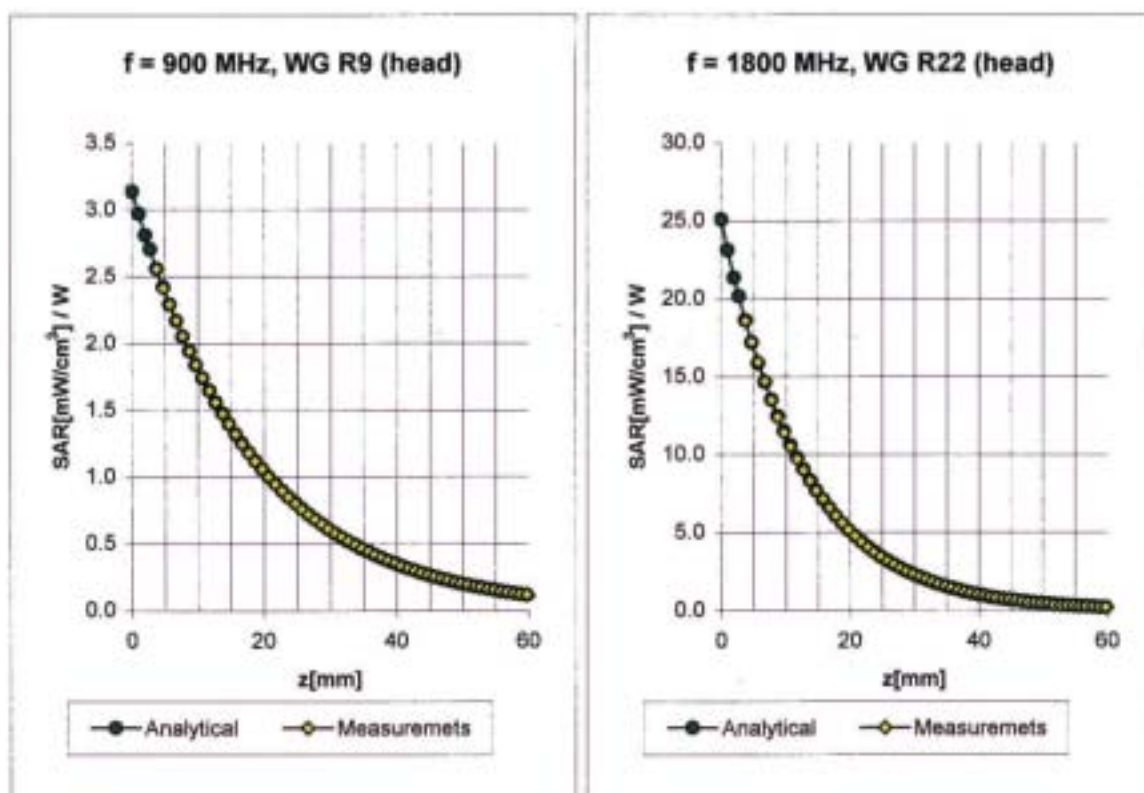
( TEM-Cell:ifi110, Waveguide R22)



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



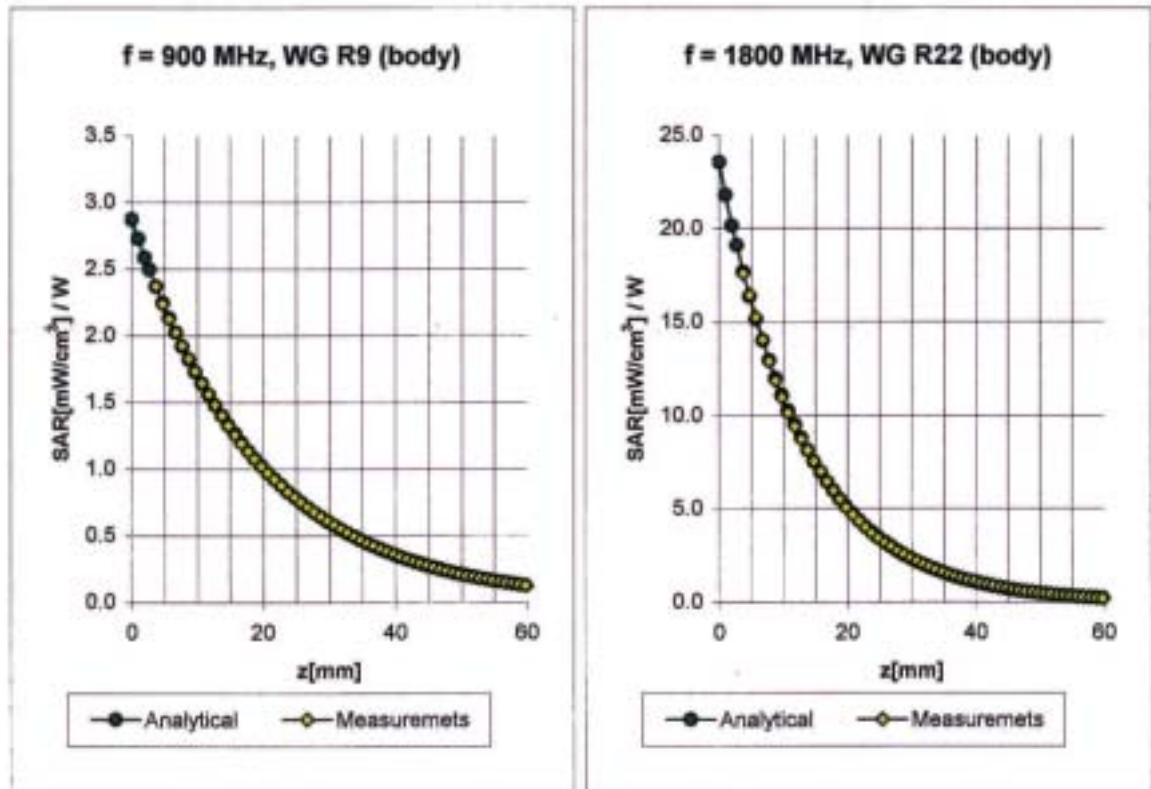
## Conversion Factor Assessment



|      |          |                             |                               |      |
|------|----------|-----------------------------|-------------------------------|------|
| Head | 900 MHz  | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.97 \pm 5\%$ mho/m |      |
| Head | 835 MHz  | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.90 \pm 5\%$ mho/m |      |
|      | ConvF X  | $6.7 \pm 9.5\%$ (k=2)       | Boundary effect:              |      |
|      | ConvF Y  | $6.7 \pm 9.5\%$ (k=2)       | Alpha                         | 0.67 |
|      | ConvF Z  | $6.7 \pm 9.5\%$ (k=2)       | Depth                         | 1.74 |
|      |          |                             |                               |      |
| Head | 1800 MHz | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\%$ mho/m |      |
| Head | 1900 MHz | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\%$ mho/m |      |
|      | ConvF X  | $5.4 \pm 9.5\%$ (k=2)       | Boundary effect:              |      |
|      | ConvF Y  | $5.4 \pm 9.5\%$ (k=2)       | Alpha                         | 0.50 |
|      | ConvF Z  | $5.4 \pm 9.5\%$ (k=2)       | Depth                         | 2.63 |

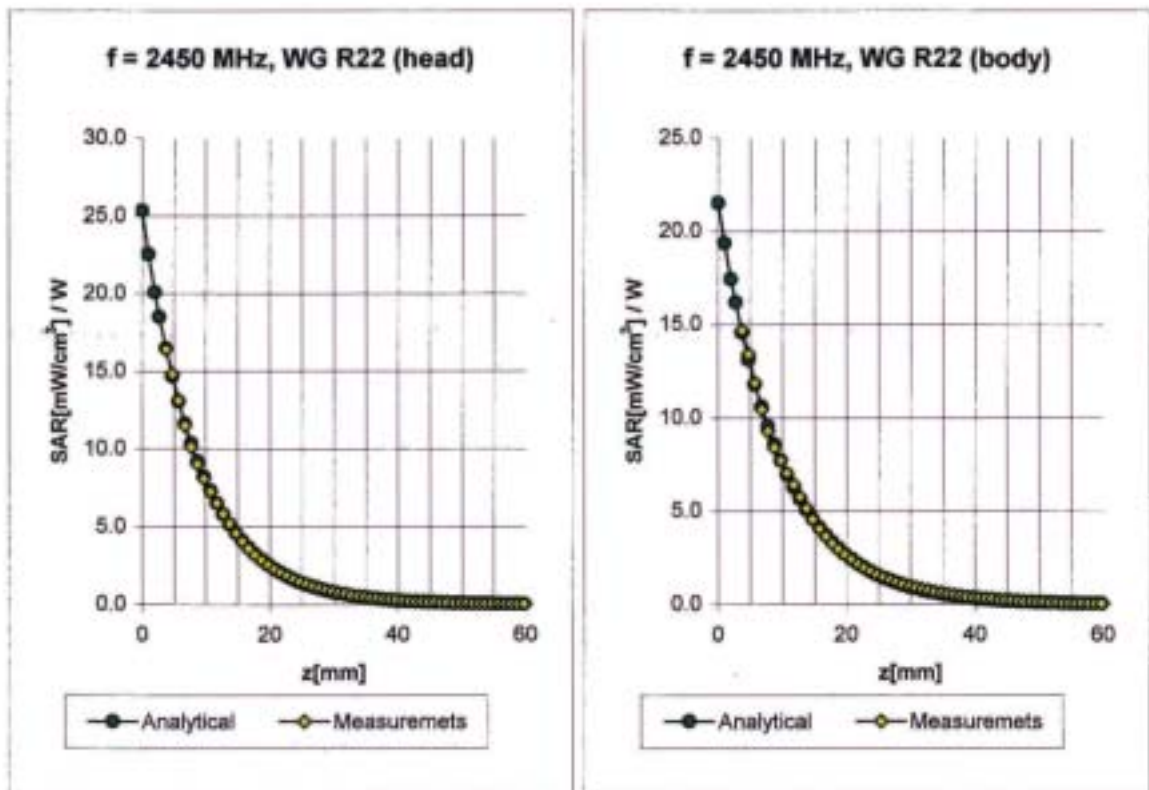


## Conversion Factor Assessment



|      |          |                             |                                       |
|------|----------|-----------------------------|---------------------------------------|
| Body | 900 MHz  | $\epsilon_r = 55.0 \pm 5\%$ | $\sigma = 1.05 \pm 5\% \text{ mho/m}$ |
| Body | 835 MHz  | $\epsilon_r = 55.2 \pm 5\%$ | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
|      | ConvF X  | $6.5 \pm 9.5\% (k=2)$       | Boundary effect:                      |
|      | ConvF Y  | $6.5 \pm 9.5\% (k=2)$       | Alpha <b>0.43</b>                     |
|      | ConvF Z  | $6.5 \pm 9.5\% (k=2)$       | Depth <b>2.34</b>                     |
| Body | 1800 MHz | $\epsilon_r = 53.3 \pm 5\%$ | $\sigma = 1.52 \pm 5\% \text{ mho/m}$ |
| Body | 1900 MHz | $\epsilon_r = 53.3 \pm 5\%$ | $\sigma = 1.52 \pm 5\% \text{ mho/m}$ |
|      | ConvF X  | $5.0 \pm 9.5\% (k=2)$       | Boundary effect:                      |
|      | ConvF Y  | $5.0 \pm 9.5\% (k=2)$       | Alpha <b>0.57</b>                     |
|      | ConvF Z  | $5.0 \pm 9.5\% (k=2)$       | Depth <b>2.65</b>                     |

## Conversion Factor Assessment



**Head      2450      MHz       $\epsilon_r = 39.2 \pm 5\%$        $\sigma = 1.80 \pm 5\%$  mho/m**

ConvF X      **5.1  $\pm 8.9\%$  (k=2)**

Boundary effect:

ConvF Y      **5.1  $\pm 8.9\%$  (k=2)**

Alpha      **1.32**

ConvF Z      **5.1  $\pm 8.9\%$  (k=2)**

Depth      **1.61**

**Body      2450      MHz       $\epsilon_r = 52.7 \pm 5\%$        $\sigma = 1.95 \pm 5\%$  mho/m**

ConvF X      **4.6  $\pm 8.9\%$  (k=2)**

Boundary effect:

ConvF Y      **4.6  $\pm 8.9\%$  (k=2)**

Alpha      **1.39**

ConvF Z      **4.6  $\pm 8.9\%$  (k=2)**

Depth      **1.60**

## Deviation from Isotropy in HSL

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

