

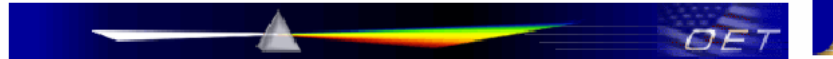
|                                                                                  |                                            |                                                    |                                                        |                                                                                    |
|----------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------|
|  | Date(s) of Evaluation<br>May 12 & 15, 2009 | Test Report Serial No.<br>051109ALH-T966-S90V      | Test Report Revision No.<br>Rev. 1.0 (Initial Release) |  |
|                                                                                  | Test Report Issue Date<br>May 20, 2009     | Description of Test(s)<br>Specific Absorption Rate | RF Exposure Category<br>Occupational (Controlled)      |                                                                                    |

Test Lab Certificate No. 2470.01

## APPENDIX E - DIPOLE CALIBRATION (FCC KDB 250418) & PROBE CALIBRATION



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### Office of Engineering and Technology

#### Inquiry:

Uploading 300 MHz and 450 MHz Dipole Calibration Reports

#### Response:

FCC confirmation attached for Celltech Labs Dipoles with following identifications:

Serial #: 136 / 450 MHz / Head Tissue-Equivalent Medium / Expires 02/28/2010

Serial #: 135 / 300 MHz / Head Tissue-Equivalent Medium / Expires 02/28/2010

A copy of the confirmation and corresponding Dipole Report(s) are required to be included in SAR reports of applicable equipment certification filings. Each filing must have KDB tracking number 250418 included on 731 Form.



The dipoles listed below have prior coordination with the FCC Lab for use in SAR system validation and verification by Celltech Labs through February 2010. The SAR target values, specific operating parameters and identifications are indicated below. SAR measurements using these dipoles must be in accordance with the parameters specified below; for example, phantom shell and tissue dielectric requirements etc. These will be verified during each equipment certification by the FCC or TCB, according to measurement protocols required for testing the specific device and wireless technology, to support the test methodologies and measurement results.

This confirmation and copies of the dipole calibration reports are required to be included in SAR reports for equipment certification containing SAR system verification results involving these dipoles. The information is available and can be verified through the KDB inquiry tracking number provided to Celltech Labs. The same tracking number must also be included on the 731 Form of the corresponding equipment certifications.

| Dipole Serial Number                                           | 136                          | 135                          |
|----------------------------------------------------------------|------------------------------|------------------------------|
| Calibration Document No.                                       | DC450H-021209-R1.2           | DC300H-021209-R1.2           |
| Frequency                                                      | 450 MHz                      | 300 MHz                      |
| Dipole Impedance                                               | 58.21 + j 5.69 Ohms          | 46.39 + j 6.25 Ohms          |
| Dipole Return Loss                                             | -20.7 dB                     | -22.6 dB                     |
| Tissue-Equivalent Dielectric Type                              | Head                         |                              |
| Tissue Dielectric Constant                                     | 43.5                         | 45.3                         |
| Tissue Conductivity                                            | 0.87 S/m                     | 0.87 S/m                     |
| Phantom Shell Thickness                                        | 6.0 mm Plexiglas             |                              |
| Phantom Shell Dielectric Constant                              | 2.7                          |                              |
| Dipole Axis to Tissue Medium Separation Distance               | 15.175 mm                    |                              |
| Numerical Simulation:                                          | FDTD                         |                              |
| 1-g SAR Target Value                                           | 4.893 W/kg @ 1.0 W           | 3.019 W/kg @ 1.0 W           |
| 10-g SAR Target Value                                          | 3.263 W/kg @ 1.0 W           | 2.051 W/kg @ 1.0 W           |
| SAR at Phantom Surface above Dipole Feed-Point                 | 6.845 W/kg @ 1.0 W           | 4.046 W/kg @ 1.0 W           |
| SAR at Phantom Surface at 2.0 cm offset from Dipole Feed-Point | 3.101 W/kg @ 1.0 W           | 2.049 W/kg @ 1.0 W           |
| Experimental Verification:                                     | SAR Measurements             |                              |
| 1-g SAR Target Value                                           | 1.21 ~ 1.23 W/kg @ 0.25 W    | 0.753 ~ 0.765 W/kg @ 0.25 W  |
| 10-g SAR Target Value                                          | 0.787 ~ 0.803 W/kg @ 0.25 W  | 0.503 ~ 0.509 W/kg @ 0.25 W  |
| SAR at Phantom Surface above Dipole Feed-Point                 | 1.93 W/kg (average) @ 0.25 W | 1.20 W/kg (average) @ 0.25 W |
| SAR at Phantom Surface at 2.0 cm offset from Dipole Feed-Point | 0.79 W/kg @ 0.25 W           | 0.56 W/kg @ 0.25 W           |

Expires February 2010

Celltech Labs Inc.

February 13, 2009

|                         |                                                |                                                                                                                      |                           |         |             |               |
|-------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|---------------------------|---------|-------------|---------------|
| Applicant:              | Kenwood USA Corporation                        | Models:                                                                                                              | TK-2300-1, TK-2300-2      | FCC ID: | ALH413501   | KENWOOD       |
| DUT Type:               | Portable FM VHF Push-To-Talk Radio Transceiver |                                                                                                                      | Transmit Frequency Range: |         | 150-174 MHz |               |
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|                                                                                   |                         |                         |                                  |         |                    |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|---------|--------------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: |         | DC300H-021209-R1.2 |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz | Fluid Type:        | Head |

## 300 MHz Dipole Calibration

Type:

**300 MHz Validation Dipole**

Asset Number:

**00023**

Serial Number:

**135**

Place of Calibration:

**Celltech Labs Inc.**

Date of Calibration:

**Jan. 26 & Feb. 09, 2009**

Celltech Labs Inc. certifies that the 300 MHz Dipole Calibration was performed on the date(s) indicated above.

Validated by:

**Sean Johnston**

Signature:



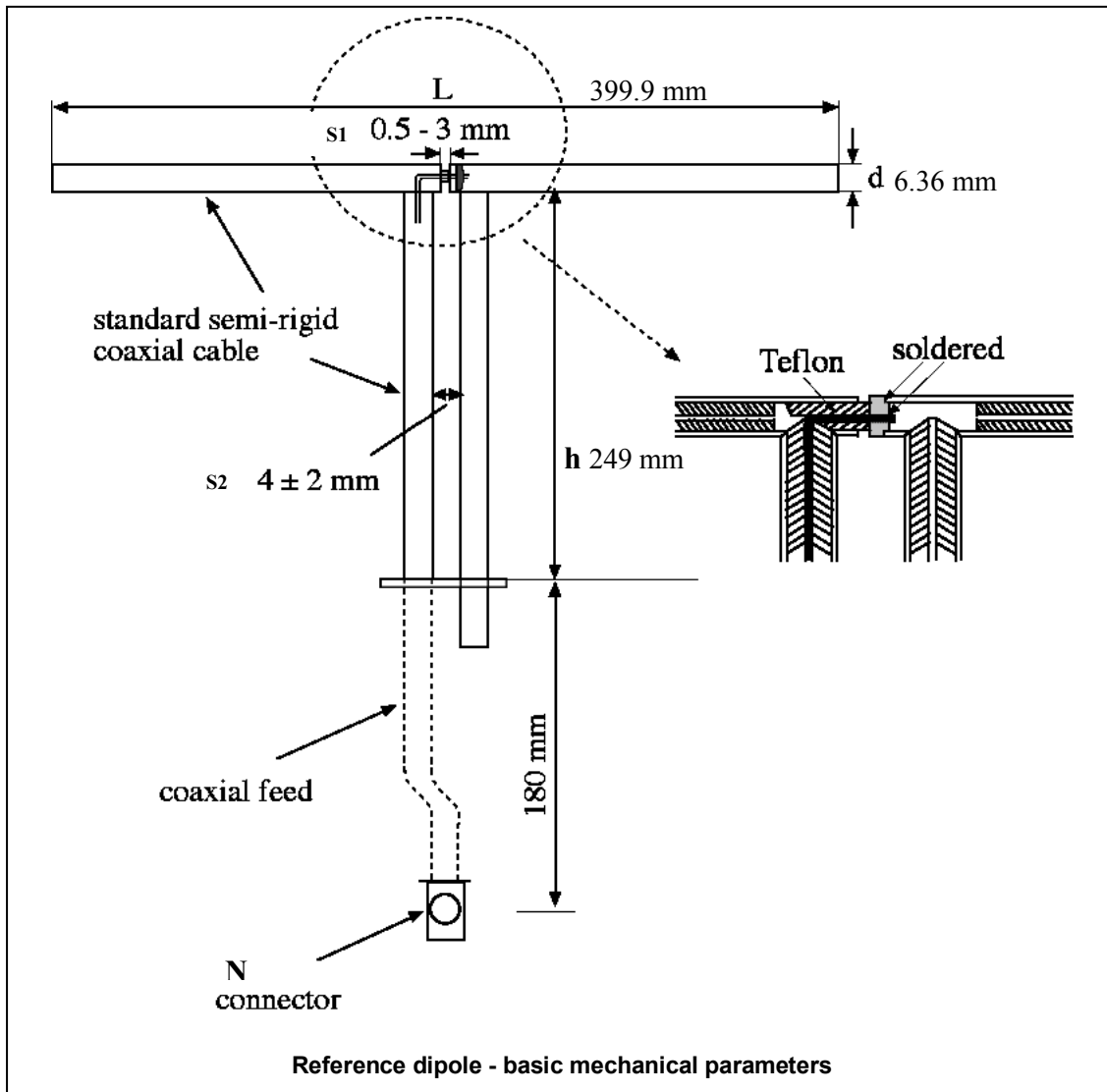
|                                                                                   |                         |                         |                                  |                    |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            |
|                                                                                   |                         |                         | Fluid Type:                      | Head               |

## 1. Dipole Construction & Electrical Characteristics

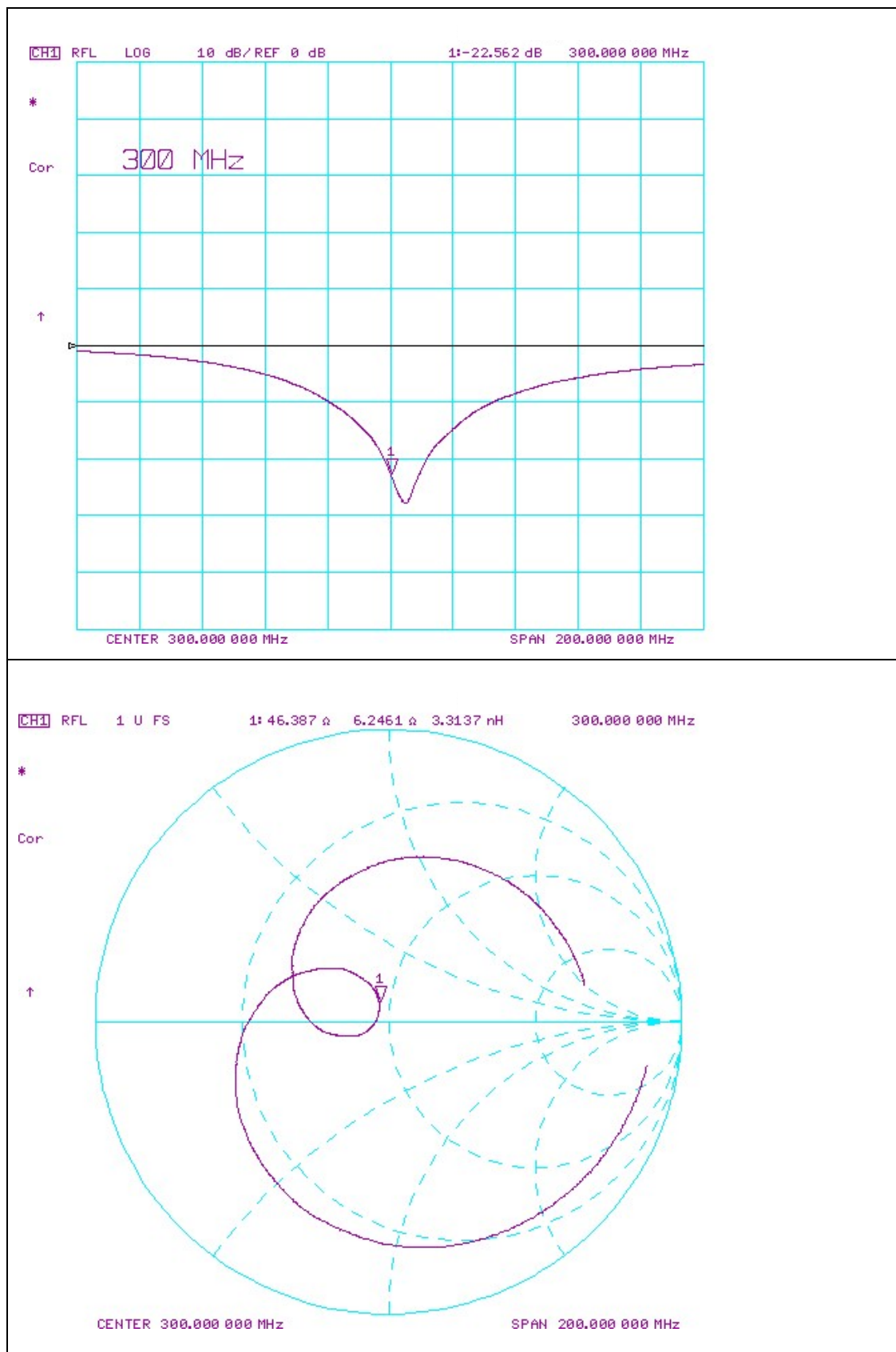
The validation dipole was constructed in accordance with the requirements specified in IEEE Standard 1528-2003 and International Standard IEC 62209-1:2005. The electrical properties were measured using an HP 8753ET Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 15.1mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

Feed point impedance at 300 MHz  
 $\text{Re}\{Z\} = 46.387\Omega$   
 $\text{Im}\{Z\} = 6.2461\Omega$

Return Loss at 300 MHz  
 -22.562dB



## 2. Validation Dipole VSWR Data



|                                                                                   |                         |                         |                                  |                    |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            |
|                                                                                   |                         |                         | Fluid Type:                      | Head               |

### 3. Validation Dipole Dimensions

| Dimension | IEEE 1528 (mm) | Measured (mm) | Difference (mm) | Tolerance (1528 1%) |
|-----------|----------------|---------------|-----------------|---------------------|
| L (mm)    | 396.0          | 399.9         | +3.9            | +0.98%              |
| h (mm)    | 250.0          | 249.0         | -1.0            | -0.4%               |
| d (mm)    | 6.35           | 6.36          | +0.01           | +0.2%               |

The L, h and d dimensions should be within  $\pm 1\%$  tolerance per 1528-2003.

### 4. Validation Phantom

The validation phantom (planar) was constructed using relatively low-loss tangent Plexiglas material. The dielectric constant used for the numerical analysis was 2.7. The typical range of 2.5 - 3 was selected and the mean of this value used.

The inner dimensions of the validation phantom are as follows:

Length: 83.5 cm  
Width: 36.9 cm  
Height: 21.8 cm

The bottom section of the validation phantom is constructed of  $6.0 \pm 0.1\text{mm}$  Plexiglas.

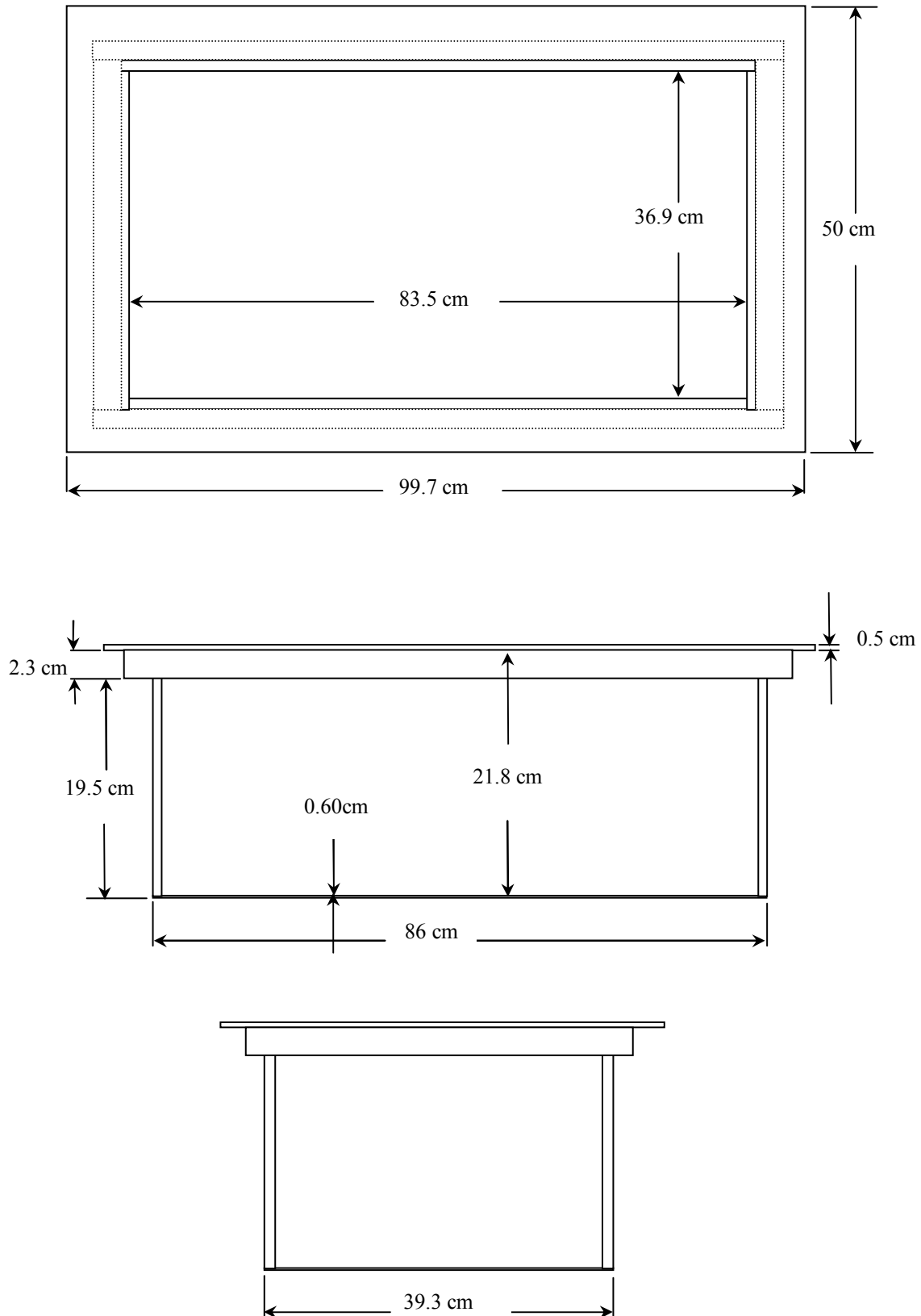
$$s = 3.175\text{mm}(d/2) + 6.0\text{mm}(\text{phantom}) + 6.0\text{mm}(\text{spacer}) = 15.175\text{mm}$$

### 5. Test Equipment List

| TEST EQUIPMENT                              | ASSET NO. | SERIAL NO. | DATE OF CAL. | CAL. DUE DATE |
|---------------------------------------------|-----------|------------|--------------|---------------|
| SPEAG DASY4 Measurement Server              | 00158     | 1078       | CNR          | CNR           |
| SPEAG Robot                                 | 00046     | 599396-01  | CNR          | CNR           |
| SPEAG DAE4                                  | 00019     | 353        | 22Apr08      | 22Apr09       |
| SPEAG ET3DV6 E-Field Probe                  | 00017     | 1590       | 21Jul08      | 21Jul09       |
| Plexiglas Validation Planar Phantom         | 00157     | 137        | CNR          | CNR           |
| HP 85070C Dielectric Probe Kit              | 00033     | US39240170 | CNR          | CNR           |
| Gigatronics 8652A Power Meter               | 00007     | 1835272    | 23Apr08      | 23Apr09       |
| Gigatronics 80701A Power Sensor             | 00014     | 1833699    | 23Apr08      | 23Apr09       |
| HP 8753ET Network Analyzer                  | 00134     | US39170292 | 28Apr08      | 28Apr09       |
| HP 8648D Signal Generator                   | 00005     | 3847A00611 | CNR          | CNR           |
| Amplifier Research 10W1000C Power Amplifier | 00041     | 27887      | CNR          | CNR           |
| CNR = Calibration Not Required              |           |            |              |               |

|                                                                                   |                         |                         |                                  |         |                    |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|---------|--------------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: |         | DC300H-021209-R1.2 |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz | Fluid Type:        | Head |

## 6. Dimensions of Plexiglas Planar Phantom



|                                                                                   |                         |                         |                                  |                    |             |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|-------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |             |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            | Fluid Type: | Head |

## 7. Plexiglas Planar Validation Phantom



|                                                                                   |                         |                         |                                  |                    |             |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|-------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |             |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            | Fluid Type: | Head |

## 8. 300 MHz Validation Dipole



|                                                                                   |                         |                         |                                  |         |                    |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|---------|--------------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: |         | DC300H-021209-R1.2 |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz | Fluid Type:        | Head |

## 9. SAR Target Validation

| Parameter         |                 |                      |                    |                    |                                       |                                   |                              |                                        |                     |                                                 |             |               |               |               |                                               |                                                | Result           |                   |                                         |                                                        |  |
|-------------------|-----------------|----------------------|--------------------|--------------------|---------------------------------------|-----------------------------------|------------------------------|----------------------------------------|---------------------|-------------------------------------------------|-------------|---------------|---------------|---------------|-----------------------------------------------|------------------------------------------------|------------------|-------------------|-----------------------------------------|--------------------------------------------------------|--|
| SEMCAD Simulation | Frequency (MHz) | Shell thickness (mm) | Shell permittivity | Shell permeability | Shell Conductivity ( $\sigma$ ) (S/m) | Phantom dimensions (mm) [x, y, z] | Liquid Relative permittivity | Liquid Conductivity ( $\sigma$ ) (S/m) | Liquid permeability | Reference dipole distances from the liquid (mm) | Spacer (mm) | Dipole L (mm) | Dipole h (mm) | Dipole d (mm) | Distance between dipole feedpoint gap S1 (mm) | Distance between dipole balun elements S2 (mm) | 1 g SAR (1 Watt) | 10 g SAR (1 Watt) | Local SAR at surface (above feed-point) | Local SAR at surface (y = 2 cm offset from feed-point) |  |
|                   | 300             | 6                    | 2.7                | 1                  | 0                                     | 1000, 800, 170                    | 45.3                         | 0.87                                   | 1                   | 15.175                                          | 6           | 396           | 250           | 6.35          | 1                                             | 4                                              | 3.019            | 2.051             | 4.046                                   | 2.049                                                  |  |
|                   |                 |                      |                    |                    |                                       |                                   |                              |                                        |                     |                                                 |             |               |               |               |                                               |                                                | CELLTECH TARGET  |                   |                                         |                                                        |  |
|                   |                 |                      |                    |                    |                                       |                                   |                              |                                        |                     |                                                 |             |               |               |               |                                               |                                                | 0.755 W/kg       |                   | 1g                                      | 0.25 W                                                 |  |
|                   |                 |                      |                    |                    |                                       |                                   |                              |                                        |                     |                                                 |             |               |               |               |                                               |                                                | 0.513 W/kg       |                   | 10g                                     | 0.25 W                                                 |  |

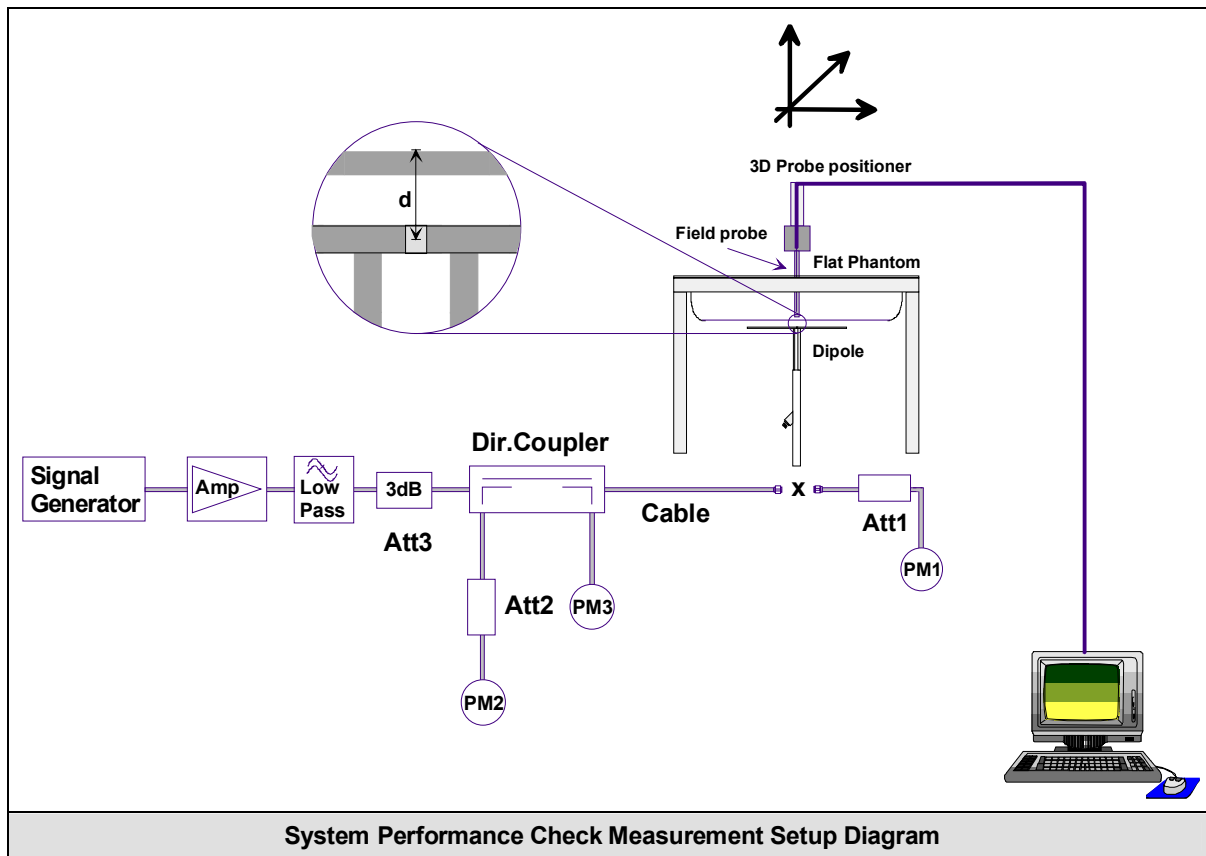
- Standard dipole dimensions used in simulation per 1528-2003 mechanical dimensions of the reference dipole.
- Reference distance from liquid is actual measured distance.

|                                                                                   |                         |                         |                                  |                    |             |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|-------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |             |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            | Fluid Type: | Head |

## 10. SAR Measurement

Measurements were made using a dosimetric E-field probe ET3DV6 (S/N: 1590, Conversion Factor 8.0). The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the procedures described below.

First the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of Att1) as read by power meter PM2. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at PM2 must be taken into consideration. PM3 records the reflected power from the dipole to ensure that the value is not changed from the previous value. The reflected power should be 20dB below the forward power.



|                                                                                   |                         |                         |                                  |                    |             |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|-------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |             |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            | Fluid Type: | Head |

## 11. Measurement Conditions

The validation phantom was filled with 300 MHz Head tissue simulant.

Relative Permittivity: 44.9 (-1.0% deviation from target)  
 Conductivity: 0.85 mho/m (-2.3% deviation from target)  
 Fluid Temperature: 21.8 °C (Start of Test) / 22.0 °C (End of Test)  
 Fluid Depth:  $\geq 15$  cm

Environmental Conditions:

Ambient Temperature: 23.0 °C  
 Barometric Pressure: 100.7 kPa  
 Humidity: 34%

The 300 MHz Head tissue simulant consisted of the following ingredients:

| Ingredient                                       | Percentage by weight          |                                        |
|--------------------------------------------------|-------------------------------|----------------------------------------|
| Water                                            | 37.56%                        |                                        |
| Sugar                                            | 55.32%                        |                                        |
| Salt                                             | 5.95%                         |                                        |
| HEC                                              | 0.98%                         |                                        |
| Dowicil 75                                       | 0.19%                         |                                        |
| IEEE/IEC Target Dielectric Parameters (300 MHz): | $\epsilon_r = 45.3 (+/- 5\%)$ | $\sigma = 0.87 \text{ S/m } (+/- 5\%)$ |

## 12. System Performance Check SAR Results

| SAR @ 0.25W Input averaged over 1g (W/kg)  |         |          |           | SAR @ 1W Input averaged over 1g (W/kg)  |         |          |           |
|--------------------------------------------|---------|----------|-----------|-----------------------------------------|---------|----------|-----------|
| Validation Target (300)                    |         | Measured | Deviation | Validation Target (300)                 |         | Measured | Deviation |
| 0.755                                      | +/- 10% | 0.760    | +0.7%     | 3.020                                   | +/- 10% | 3.040    | +0.7%     |
| SAR @ 0.25W Input averaged over 10g (W/kg) |         |          |           | SAR @ 1W Input averaged over 10g (W/kg) |         |          |           |
| Validation Target (300)                    |         | Measured | Deviation | Validation Target (300)                 |         | Measured | Deviation |
| 0.513                                      | +/- 10% | 0.506    | -1.36%    | 2.052                                   | +/- 10% | 2.024    | -1.36%    |

|                                                                                   |                         |                         |                                  |         |                    |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|---------|--------------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: |         | DC300H-021209-R1.2 |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz | Fluid Type:        | Head |

| 300 MHz System Performance Check @ 250mW (1g) |               |                                                                      |       |       |                             |
|-----------------------------------------------|---------------|----------------------------------------------------------------------|-------|-------|-----------------------------|
|                                               | SAR<br>(mW/g) | Deviation<br>From 300 MHz<br>Numerical<br>Simulation<br>(0.755 mW/g) | STDEV | Mean  | Coefficient of<br>Variation |
| Test 1                                        | 0.763         | 1.73%                                                                | 0.004 | 0.760 | 0.005                       |
| Test 2                                        | 0.762         | 1.60%                                                                |       |       |                             |
| Test 3                                        | 0.759         | 1.20%                                                                |       |       |                             |
| Test 4                                        | 0.761         | 1.47%                                                                |       |       |                             |
| Test 5                                        | 0.763         | 1.73%                                                                |       |       |                             |
| Test 6                                        | 0.762         | 1.60%                                                                |       |       |                             |
| Test 7                                        | 0.753         | 0.40%                                                                |       |       |                             |
| Test 8                                        | 0.760         | 1.33%                                                                |       |       |                             |
| Test 9                                        | 0.754         | 0.53%                                                                |       |       |                             |
| Test 10                                       | 0.765         | 2.00%                                                                |       |       |                             |
|                                               | 0.760         | 1.36%                                                                |       |       |                             |

| 300 MHz System Performance Check @ 250mW (10g) |               |                                                                      |       |       |                             |
|------------------------------------------------|---------------|----------------------------------------------------------------------|-------|-------|-----------------------------|
|                                                | SAR<br>(mW/g) | Deviation<br>From 300 MHz<br>Numerical<br>Simulation<br>(0.513 mW/g) | STDEV | Mean  | Coefficient of<br>Variation |
| Test 1                                         | 0.507         | -1.17%                                                               | 0.002 | 0.506 | 0.004                       |
| Test 2                                         | 0.507         | -1.17%                                                               |       |       |                             |
| Test 3                                         | 0.505         | -1.56%                                                               |       |       |                             |
| Test 4                                         | 0.505         | -1.56%                                                               |       |       |                             |
| Test 5                                         | 0.507         | -1.17%                                                               |       |       |                             |
| Test 6                                         | 0.507         | -1.17%                                                               |       |       |                             |
| Test 7                                         | 0.503         | -1.95%                                                               |       |       |                             |
| Test 8                                         | 0.508         | -0.97%                                                               |       |       |                             |
| Test 9                                         | 0.504         | -1.75%                                                               |       |       |                             |
| Test 10                                        | 0.509         | -0.78%                                                               |       |       |                             |
|                                                | 0.506         | -1.33%                                                               |       |       |                             |

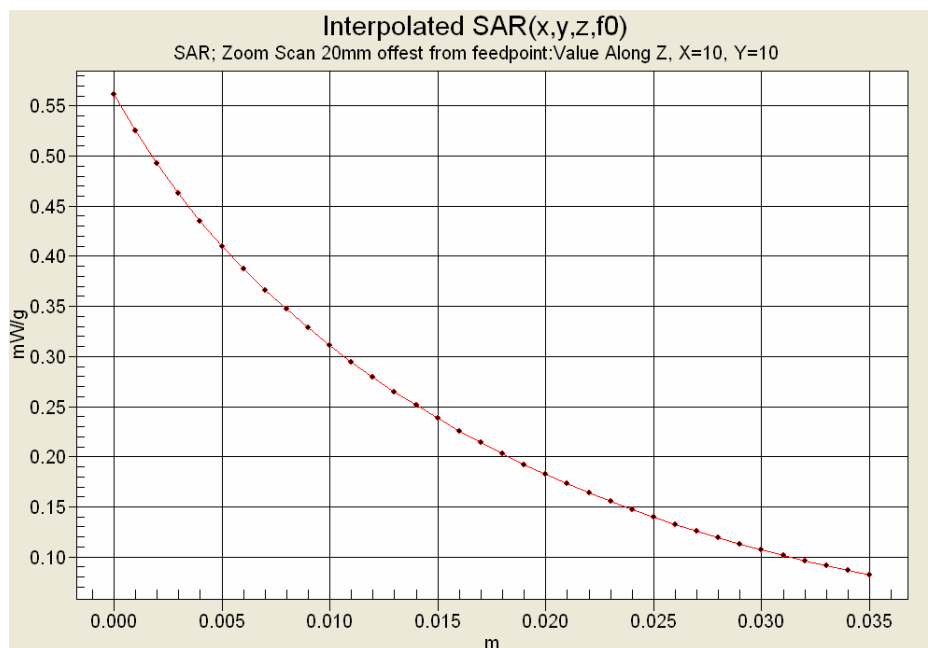
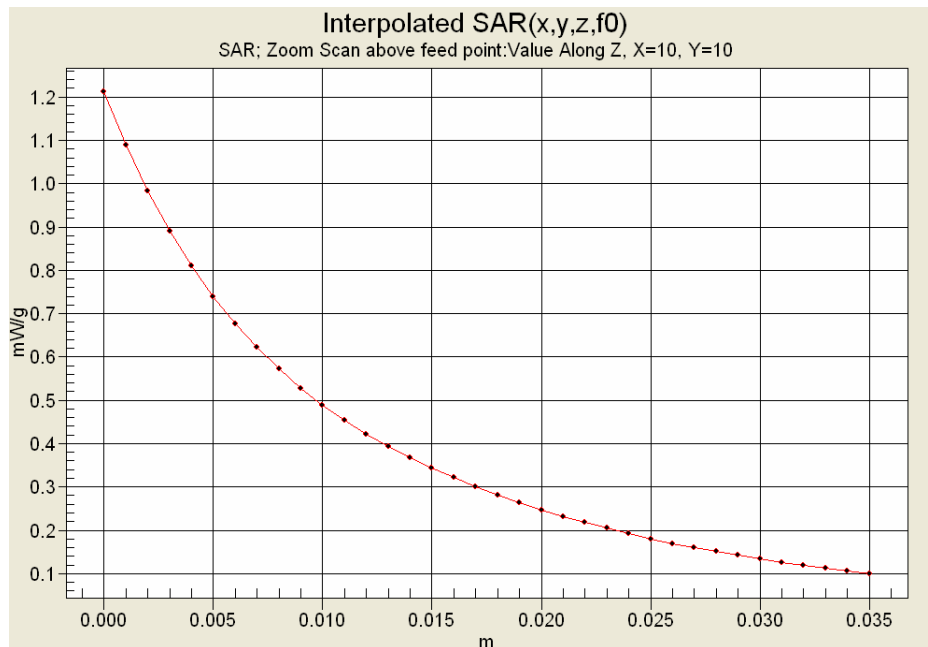
|                                                                                   |                         |                         |                                  |                    |             |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|-------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |             |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            | Fluid Type: | Head |

## b) Extrapolation Routine:

The zoom scan routine was used to extrapolate the peak SAR above the feed point and offset at 20mm. Two zoom scans were used, the first centered above the feedpoint and the second offset 20mm. The interpolated SAR at these points are shown in the table below. Note: Center of zoom scan located at  $x=10$ ,  $y=10$ .

| Measurement Location | Measured SAR mW/g | SAR 1W Normalized | Peak Target mW/g | Deviation | System Performance Check Expanded Uncertainty +/-% |
|----------------------|-------------------|-------------------|------------------|-----------|----------------------------------------------------|
| Feed Point           | 1.20*             | 4.80              | 4.05             | 18.5%     | 21.98                                              |
| 2 cm Offset          | 0.56              | 2.24              | 2.05             | 9.3%      | 21.98                                              |

\*Note: measured SAR level is the average from the 10 evaluations



|                                                                                   |                         |                         |                                  |                    |             |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|-------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |             |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            | Fluid Type: | Head |

## System Performance Check - 300 MHz Dipole - HSL

**DUT: Dipole 300 MHz; Asset: 00023; Serial: 135**

Ambient Temp: 23.0°C; Fluid Temp: 21.8°C; Barometric Pressure: 100.7 kPa; Humidity: 34%  
 Communication System: CW  
 Frequency: 300 MHz; Duty Cycle: 1:1  
 Medium: 300 HSL Medium parameters used:  $f = 300 \text{ MHz}$ ;  $\sigma = 0.85 \text{ mho/m}$ ;  $\epsilon_r = 44.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 - Probe: ET3DV6 - SN1590; ConvF(8, 8, 8); Calibrated: 21/07/2008  
 - Sensor-Surface: 5mm (Mechanical Surface Detection)  
 - Electronics: DAE4 Sn353; Calibrated: 22/04/2008  
 - Phantom: Validation Planar; Type: Plexiglas; Serial: TE#137  
 - Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

**300 MHz Area Scan (6x11x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.699 mW/g

**300 MHz Zoom Scan 1 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 29.4 V/m; Power Drift = -0.012 dB

Peak SAR (extrapolated) = 1.21 W/kg

**SAR(1 g) = 0.763 mW/g; SAR(10 g) = 0.507 mW/g**

Maximum value of SAR (measured) = 0.743 mW/g

**300 MHz Zoom Scan 2 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 29.3 V/m; Power Drift = 0.000 dB

Peak SAR (extrapolated) = 1.21 W/kg

**SAR(1 g) = 0.762 mW/g; SAR(10 g) = 0.507 mW/g**

Maximum value of SAR (measured) = 0.740 mW/g

**300 MHz Zoom Scan 3 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 29.3 V/m; Power Drift = 0.002 dB

Peak SAR (extrapolated) = 1.20 W/kg

**SAR(1 g) = 0.759 mW/g; SAR(10 g) = 0.505 mW/g**

Maximum value of SAR (measured) = 0.736 mW/g

**300 MHz Zoom Scan 4 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 29.3 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 1.21 W/kg

**SAR(1 g) = 0.761 mW/g; SAR(10 g) = 0.505 mW/g**

Maximum value of SAR (measured) = 0.741 mW/g

**300 MHz Zoom Scan 5 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 29.4 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 1.21 W/kg

**SAR(1 g) = 0.763 mW/g; SAR(10 g) = 0.507 mW/g**

Maximum value of SAR (measured) = 0.742 mW/g

**300 MHz Zoom Scan 6 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 29.4 V/m; Power Drift = -0.062 dB

Peak SAR (extrapolated) = 1.21 W/kg

**SAR(1 g) = 0.762 mW/g; SAR(10 g) = 0.507 mW/g**

Maximum value of SAR (measured) = 0.741 mW/g

**300 MHz Zoom Scan 7 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 29.4 V/m; Power Drift = -0.064 dB

Peak SAR (extrapolated) = 1.18 W/kg

**SAR(1 g) = 0.753 mW/g; SAR(10 g) = 0.503 mW/g**

Maximum value of SAR (measured) = 0.715 mW/g

**300 MHz Zoom Scan 8 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 29.3 V/m; Power Drift = -0.027 dB

Peak SAR (extrapolated) = 1.19 W/kg

**SAR(1 g) = 0.760 mW/g; SAR(10 g) = 0.508 mW/g**

Maximum value of SAR (measured) = 0.723 mW/g

**300 MHz Zoom Scan 9 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 29.4 V/m; Power Drift = -0.056 dB

Peak SAR (extrapolated) = 1.17 W/kg

**SAR(1 g) = 0.754 mW/g; SAR(10 g) = 0.504 mW/g**

Maximum value of SAR (measured) = 0.707 mW/g

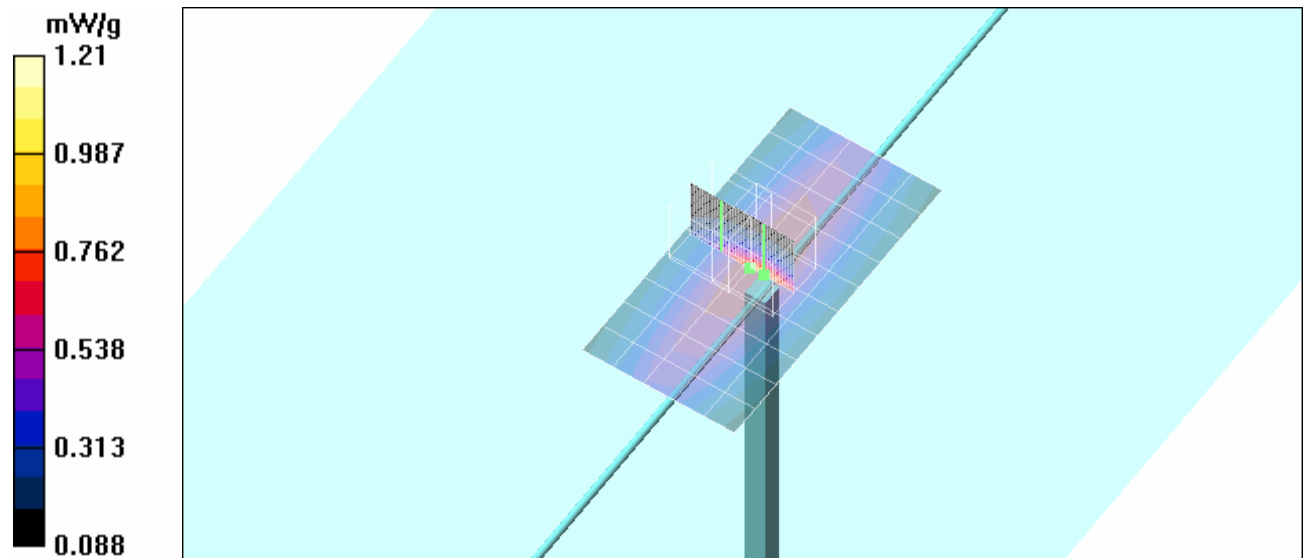
**300 MHz Zoom Scan 10 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 29.5 V/m; Power Drift = 0.001 dB

Peak SAR (extrapolated) = 1.20 W/kg

**SAR(1 g) = 0.765 mW/g; SAR(10 g) = 0.509 mW/g**

Maximum value of SAR (measured) = 0.714 mW/g



|                                                                                   |                         |                         |                                  |         |                    |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|---------|--------------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: |         | DC300H-021209-R1.2 |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz | Fluid Type:        | Head |

### 13. Measured Fluid Dielectric Parameters

#### 300 MHz (Head)

\*\*\*\*\*

Celltech Labs Inc.

Test Result for UIM Dielectric Parameter

26/Jan/2009

Frequency (GHz)

IEEE\_eH IEEE 1528-2003 Limits for Head Epsilon

IEEE\_sH IEEE 1528-2003 Limits for Head Sigma

Test\_e Epsilon of UIM

Test\_s Sigma of UIM

\*\*\*\*\*

| Freq   | FCC_eH | FCC_sH | Test_e | Test_s |
|--------|--------|--------|--------|--------|
| 0.2000 | 49.97  | 0.80   | 50.36  | 0.75   |
| 0.2100 | 49.50  | 0.80   | 48.48  | 0.78   |
| 0.2200 | 49.03  | 0.81   | 48.95  | 0.77   |
| 0.2300 | 48.57  | 0.82   | 47.15  | 0.79   |
| 0.2400 | 48.10  | 0.83   | 46.67  | 0.79   |
| 0.2500 | 47.63  | 0.83   | 47.33  | 0.80   |
| 0.2600 | 47.17  | 0.84   | 47.88  | 0.81   |
| 0.2700 | 46.70  | 0.85   | 47.19  | 0.81   |
| 0.2800 | 46.23  | 0.86   | 46.24  | 0.83   |
| 0.2900 | 45.77  | 0.86   | 44.89  | 0.83   |
| 0.3000 | 45.30  | 0.87   | 44.85  | 0.85   |
| 0.3100 | 45.18  | 0.87   | 44.70  | 0.85   |
| 0.3200 | 45.06  | 0.87   | 45.13  | 0.88   |
| 0.3300 | 44.94  | 0.87   | 44.44  | 0.87   |
| 0.3400 | 44.82  | 0.87   | 43.21  | 0.87   |
| 0.3500 | 44.70  | 0.87   | 43.24  | 0.89   |
| 0.3600 | 44.58  | 0.87   | 43.79  | 0.91   |
| 0.3700 | 44.46  | 0.87   | 43.54  | 0.91   |
| 0.3800 | 44.34  | 0.87   | 42.64  | 0.91   |
| 0.3900 | 44.22  | 0.87   | 42.01  | 0.92   |
| 0.4000 | 44.10  | 0.87   | 41.81  | 0.94   |

|                                                                                   |                         |                         |                                  |                    |             |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|-------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |             |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            | Fluid Type: | Head |

## 14. Measurement Uncertainties

| UNCERTAINTY BUDGET FOR SYSTEM PERFORMANCE CHECK                                                                      |                   |                           |                          |             |       |        |                                |                                 |                    |
|----------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------|--------------------------|-------------|-------|--------|--------------------------------|---------------------------------|--------------------|
| Uncertainty Component                                                                                                | IEEE 1528 Section | Uncertainty Value $\pm\%$ | Probability Distribution | Divisor     | ci 1g | ci 10g | Uncertainty Value $\pm\%$ (1g) | Uncertainty Value $\pm\%$ (10g) | $V_i$ or $V_{eff}$ |
| <b>Measurement System</b>                                                                                            |                   |                           |                          |             |       |        |                                |                                 |                    |
| Probe Calibration (300 MHz)                                                                                          | E.2.1             | 9                         | Normal                   | 1           | 1     | 1      | 9                              | 9                               | $\infty$           |
| Axial Isotropy                                                                                                       | E.2.2             | 4.7                       | Rectangular              | 1.732050808 | 1     | 1      | 2.7                            | 2.7                             | $\infty$           |
| Hemispherical Isotropy                                                                                               | E.2.2             | 0                         | Rectangular              | 1.732050808 | 1     | 1      | 0.0                            | 0.0                             | $\infty$           |
| Boundary Effect                                                                                                      | E.2.3             | 2.5                       | Rectangular              | 1.732050808 | 1     | 1      | 1.4                            | 1.4                             | $\infty$           |
| Linearity                                                                                                            | E.2.4             | 4.7                       | Rectangular              | 1.732050808 | 1     | 1      | 2.7                            | 2.7                             | $\infty$           |
| System Detection Limits                                                                                              | E.2.5             | 1                         | Rectangular              | 1.732050808 | 1     | 1      | 0.6                            | 0.6                             | $\infty$           |
| Readout Electronics                                                                                                  | E.2.6             | 0.3                       | Normal                   | 1           | 1     | 1      | 0.3                            | 0.3                             | $\infty$           |
| Response Time                                                                                                        | E.2.7             | 0                         | Rectangular              | 1.732050808 | 1     | 1      | 0.0                            | 0.0                             | $\infty$           |
| Integration Time                                                                                                     | E.2.8             | 0                         | Rectangular              | 1.732050808 | 1     | 1      | 0.0                            | 0.0                             | $\infty$           |
| RF Ambient Conditions                                                                                                | E.6.1             | 3                         | Rectangular              | 1.732050808 | 1     | 1      | 1.7                            | 1.7                             | $\infty$           |
| Probe Positioner Mechanical Tolerance                                                                                | E.6.2             | 0.4                       | Rectangular              | 1.732050808 | 1     | 1      | 0.2                            | 0.2                             | $\infty$           |
| Probe Positioning wrt Phantom Shell                                                                                  | E.6.3             | 2.9                       | Rectangular              | 1.732050808 | 1     | 1      | 1.7                            | 1.7                             | $\infty$           |
| Extrapolation, interpolation & integration algorithms for max. SAR evaluation                                        | E.5               | 1                         | Rectangular              | 1.732050808 | 1     | 1      | 0.6                            | 0.6                             | $\infty$           |
| <b>Dipole</b>                                                                                                        |                   |                           |                          |             |       |        |                                |                                 |                    |
| Dipole Positioning                                                                                                   | E.4.2             | 2                         | Normal                   | 1.732050808 | 1     | 1      | 1.2                            | 1.2                             | $\infty$           |
| SAR Drift Measurement                                                                                                | 6.6.2             | 1.5                       | Normal                   | 1.732050808 | 1     | 1      | 0.9                            | 0.9                             | $\infty$           |
| <b>Phantom and Tissue Parameters</b>                                                                                 |                   |                           |                          |             |       |        |                                |                                 |                    |
| Phantom Uncertainty                                                                                                  | E.3.1             | 4                         | Rectangular              | 1.732050808 | 1     | 1      | 2.3                            | 2.3                             | $\infty$           |
| Liquid Conductivity (target)                                                                                         | E.3.2             | 5                         | Rectangular              | 1.732050808 | 0.64  | 0.43   | 1.8                            | 1.2                             | $\infty$           |
| Liquid Conductivity (measured)                                                                                       | E.3.3             | 2.3                       | Normal                   | 1           | 0.64  | 0.43   | 1.5                            | 1.0                             | $\infty$           |
| Liquid Permittivity (target)                                                                                         | E.3.2             | 5                         | Rectangular              | 1.732050808 | 0.6   | 0.49   | 1.7                            | 1.4                             | $\infty$           |
| Liquid Permittivity (measured)                                                                                       | E.3.3             | 1                         | Normal                   | 1           | 0.6   | 0.49   | 0.6                            | 0.5                             | $\infty$           |
| <b>Combined Standard Uncertainty</b>                                                                                 |                   |                           | <b>RSS</b>               |             |       |        | <b>10.99</b>                   | <b>10.80</b>                    |                    |
| <b>Expanded Uncertainty (95% Confidence Interval)</b>                                                                |                   |                           | <b>k=2</b>               |             |       |        | <b>21.98</b>                   | <b>21.60</b>                    |                    |
| Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 and IEC International Standard 62209-1:2005 |                   |                           |                          |             |       |        |                                |                                 |                    |

|                                                                                   |                         |                         |                                  |                    |             |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|-------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |             |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            | Fluid Type: | Head |

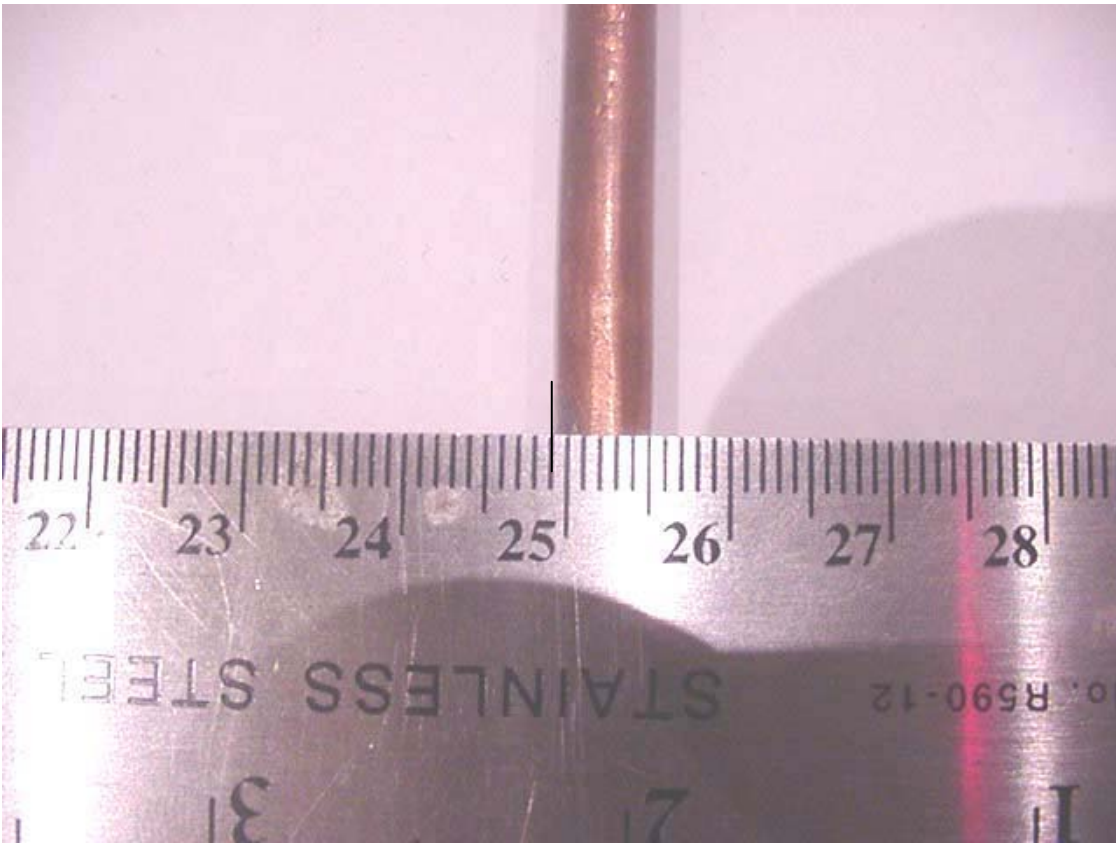
## 15. Dipole Calibration History

| 300 MHz Dipole Calibration History                                      |                       |                    |                       |                               |                                                     |                                                                 |                       |          |         |           |
|-------------------------------------------------------------------------|-----------------------|--------------------|-----------------------|-------------------------------|-----------------------------------------------------|-----------------------------------------------------------------|-----------------------|----------|---------|-----------|
| Dipole Calibration Date                                                 | SAR Probe Information |                    |                       | Celltech Measured Data        |                                                     |                                                                 |                       |          |         |           |
|                                                                         | Serial Number         | Calibration Factor | Calibration Procedure | SAR (W/kg) Measured at 250 mW | % Deviation from IEEE 1528 Target (0.750 W/kg @ 1W) | % Deviation from Target Validated by Celltech (3.019 W/kg @ 1W) | Dielectric Parameters |          | RL (dB) | Impedance |
|                                                                         |                       |                    |                       |                               |                                                     |                                                                 | $\epsilon_r$          | $\sigma$ |         |           |
| 2003                                                                    | 1387                  | 7.9                | Numerical             | 0.782                         | 4.27%                                               |                                                                 | 45.7                  | 0.88     | -21.70  | 43.59     |
| 2004                                                                    | 1387                  | 7.8                | Numerical             | 0.742                         | -1.07%                                              |                                                                 | 45.9                  | 0.87     | -25.00  | 45.20     |
| 2005                                                                    | 1387                  | 7.9                | Numerical             | 0.750                         | 0.00%                                               |                                                                 | 44.3                  | 0.84     | -24.30  | 44.40     |
| 2006                                                                    | 1387                  | 7.8                | Numerical             | 0.760                         | 1.33%                                               |                                                                 | 45.4                  | 0.85     | -24.30  | 44.40     |
| 2007                                                                    | 1387                  | 7.3                | Numerical             | 0.768                         | 2.40%                                               |                                                                 | 45.2                  | 0.89     | -20.30  | 45.80     |
| 2008                                                                    | 1387                  | 7.8                | Measured              | 0.794                         |                                                     | 5.20%                                                           | 45.6                  | 0.90     | -20.20  | 46.70     |
| 2008                                                                    | 1590                  | 8.0                | Measured              | 0.768                         |                                                     | 1.76%                                                           | 43.5                  | 0.89     | -22.50  | 46.70     |
| 2008                                                                    | 1590                  | 8.0                | Measured              | 0.777                         |                                                     | 2.95%                                                           | 44.9                  | 0.85     | -22.50  | 46.40     |
| Target Dielectric Parameters: $\epsilon_r = 45.3$ , $\sigma = 0.87$ s/m |                       |                    |                       |                               |                                                     |                                                                 |                       |          |         |           |

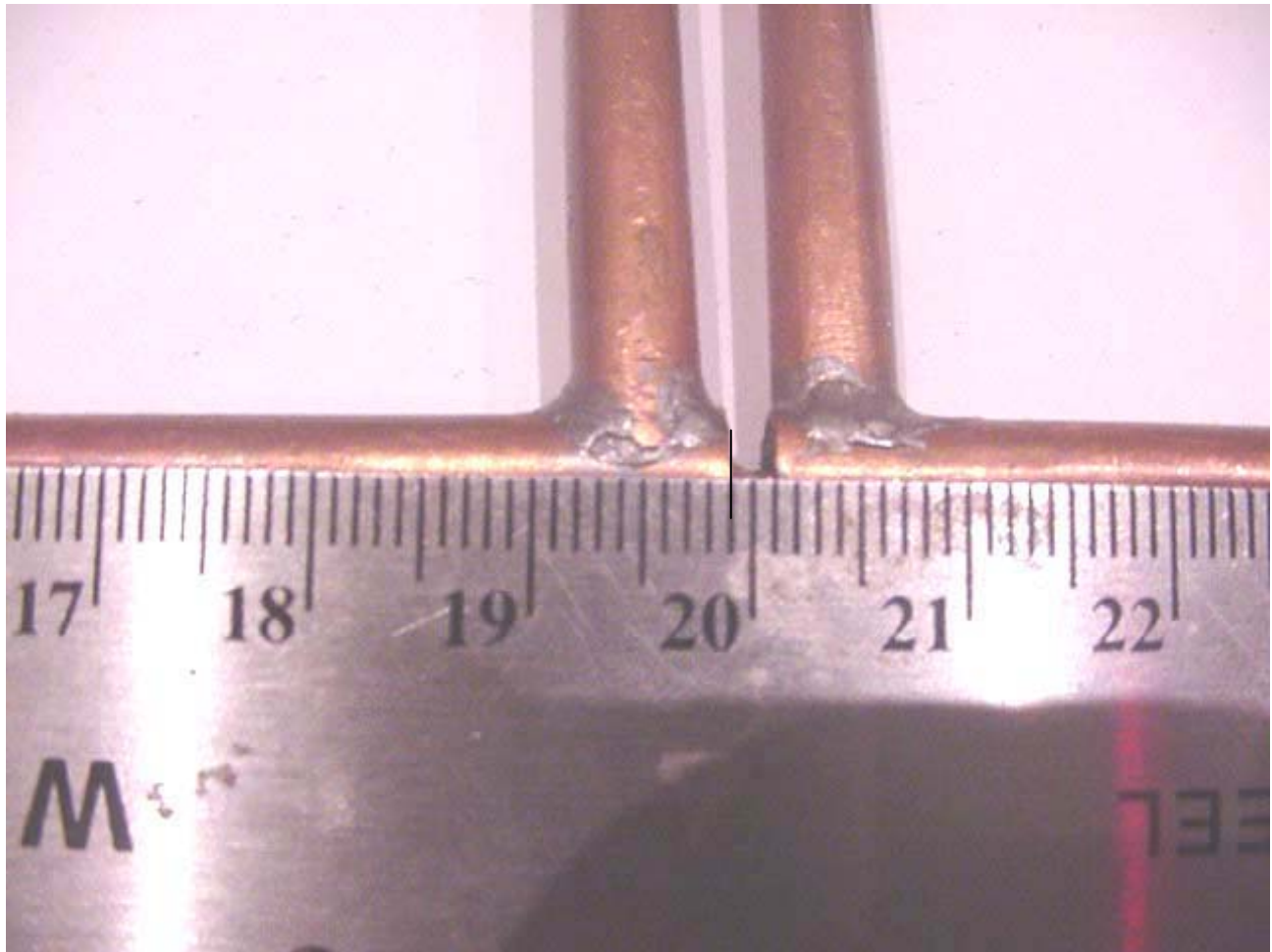
|                                                                                   |                         |                         |                                  |         |                    |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|---------|--------------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: |         | DC300H-021209-R1.2 |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz | Fluid Type:        | Head |

## APPENDIX A - PHOTOGRAPHS

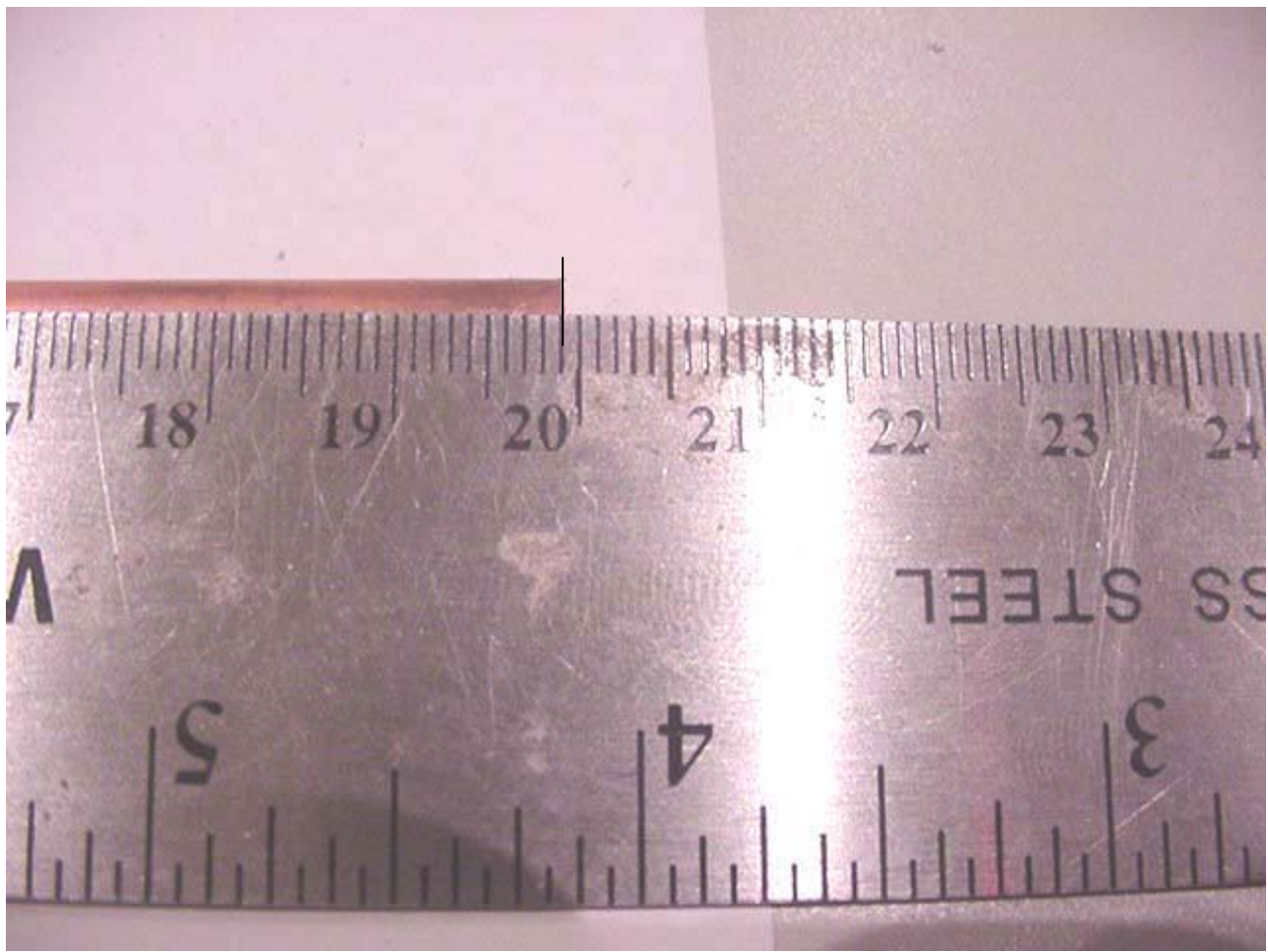
|                                                                                   |                         |                         |                                  |                    |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            |
|                                                                                   |                         |                         | Fluid Type:                      | Head               |



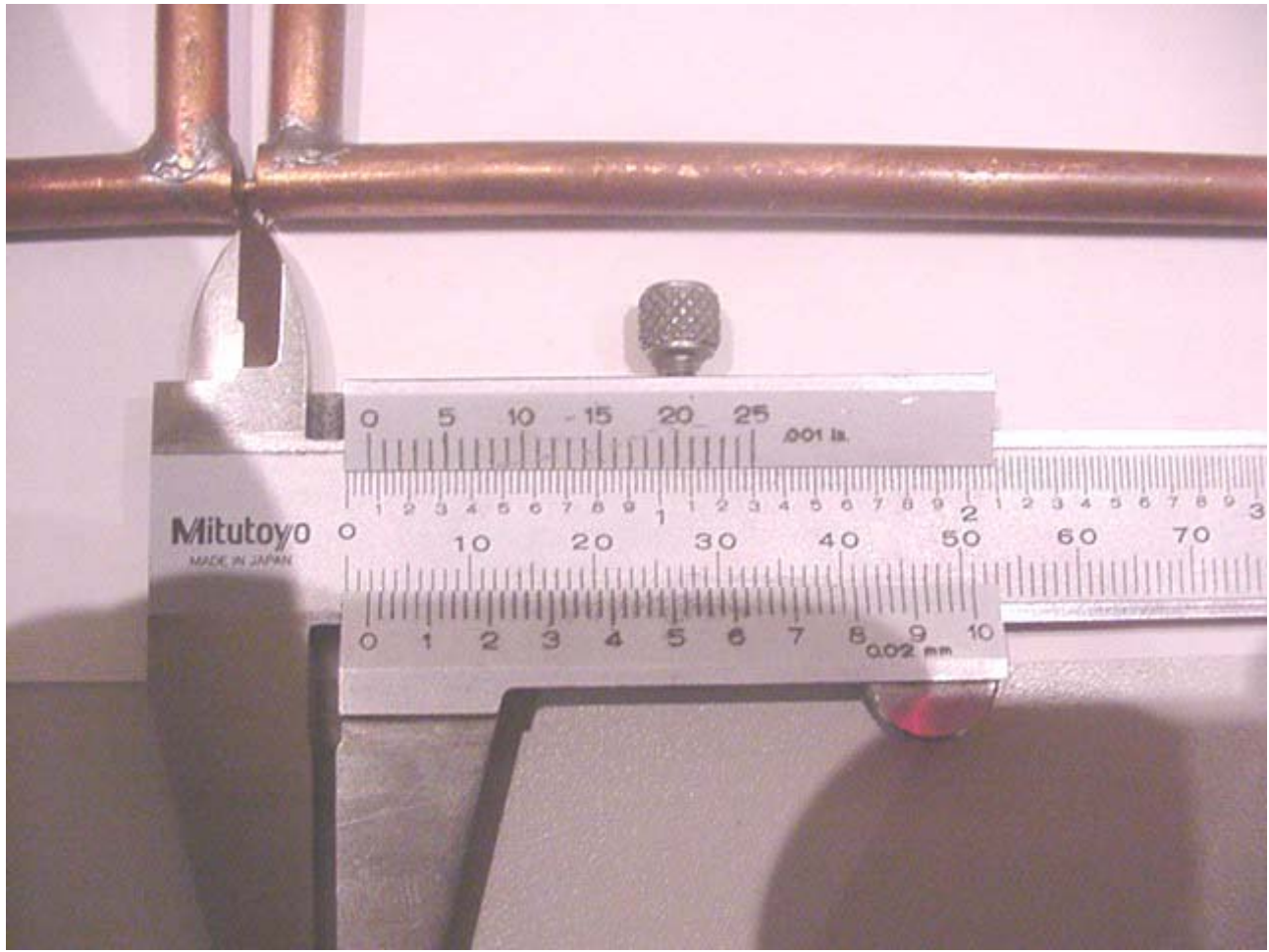
**Dipole Dimension  $h = 249\text{mm}$**



**Right Element = 199mm**

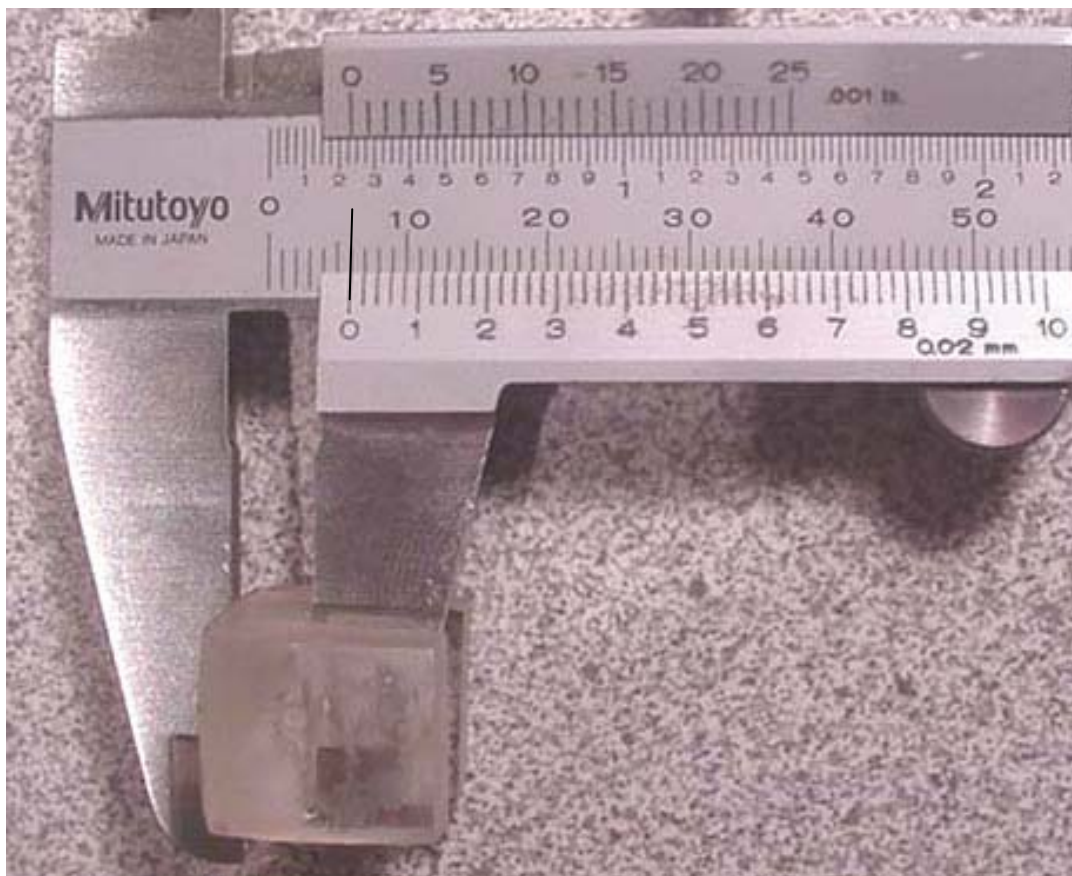
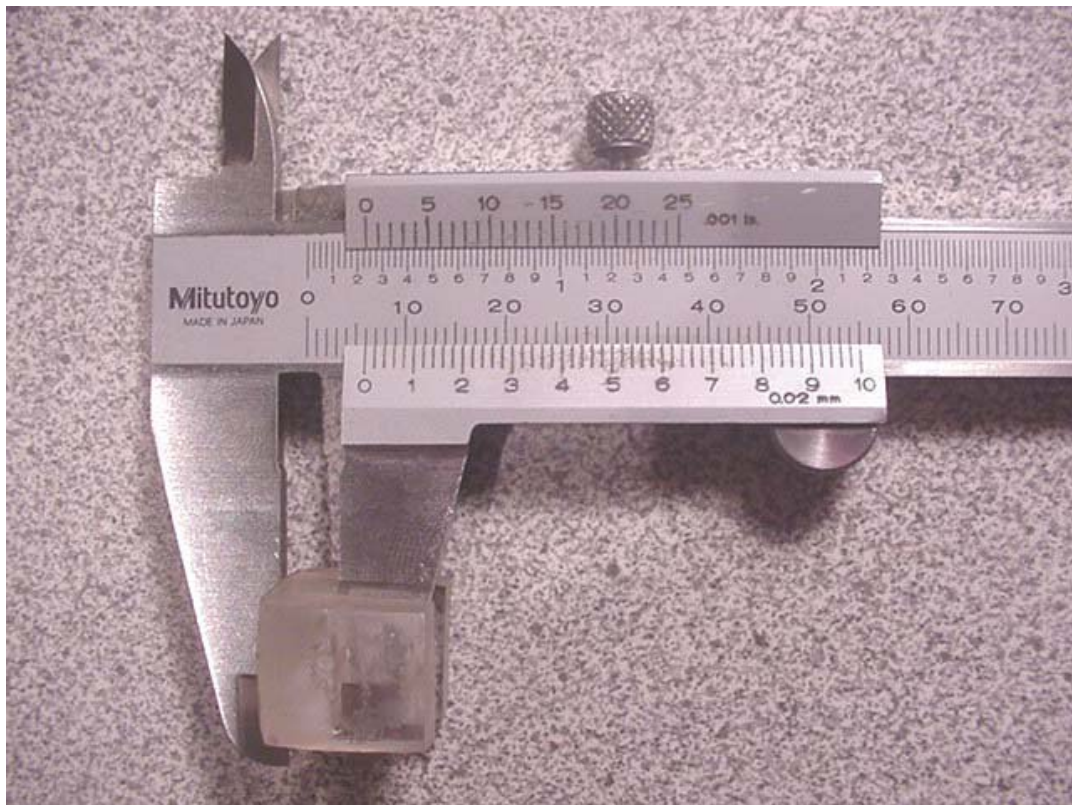


Left Element = 199mm



**Dimension Between Elements = 1.88mm**

**Total Dimension L: 199mm + 199mm + 1.88mm = 399.9mm**



**Dipole Spacer Dimension = 6.0mm**

|                                                                                   |                         |                         |                                  |         |                    |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|---------|--------------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: |         | DC300H-021209-R1.2 |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz | Fluid Type:        | Head |

## APPENDIX B - SEMCAD SIMULATION LOG FILE

|                                                                                   |                         |                         |                                  |                    |             |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|--------------------|-------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |             |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            | Fluid Type: | Head |

iSolve X, Version 13.4, Build 34, 64Bit Windows, Single Precision  
Simulation name 'Dielectric Const = 2.7'  
Maxwell Solver started the 2009-Feb-09 10:40:13.  
Initializing FDTD (x1 CFL) Harmonic Simulation at 300 MHz

Overall discretization:  
Smallest number of cells per wavelength = 29.6948, largest = 395.114, average = 163.379  
Simulation time-step = 1.257e-012 s  
Simulation time-step / minimum of CFL criteria = 0.998584  
Maximum of CFL criteria / minimum of CFL criteria = 51.1583  
Average of CFL criteria / minimum of CFL criteria = 9.93237

Discretization by solids:  
Background: epsr = 1, mur = 1, sigma = 0, sigma\* = 0 - smallest number of cells per wavelength = 199.862, largest = 395.114, average = 205.114  
Phantom/Shell: epsr = 2.7, mur = 1, sigma = 0, sigma\* = 0 - smallest number of cells per wavelength = 122.674, largest = 240.458, average = 141.978  
Phantom/Liquid: epsr = 45.3, mur = 1, sigma = 0.87, sigma\* = 0 - smallest number of cells per wavelength = 29.6948, largest = 64.3059, average = 31.9627

Boundary conditions:  
Side X-: U-PML(8)  
Side X+: U-PML(8)  
Side Y-: U-PML(8)  
Side Y+: U-PML(8)  
Side Z-: U-PML(8)  
Side Z+: U-PML(8)

Grid:  
Number of nodes=323x275x177, number of voxels=15528128

Excitations:  
Initializing (Voltage) edge source Quelle  
Overall duration : 4.33333e-008 s or 34474 iterations

Probes & Sensors:  
Initializing near-field sensor lg  
Initializing near-field sensor 10g  
Initializing near to far field transformation  
Initializing near-field sensor Overall Field  
Initializing near-field sensor Unnamed  
Initializing port sensor Sensor of Quelle  
Initializing port sensor TDSensor  
Initializing port sensor FDSensor  
Initializing port sensor ObererSensor

Enable monitoring:  
Sensor of Quelle, V(t)  
Sensor of Quelle, I(t)  
TDSensor, V(t)  
TDSensor, I(t)  
FDSensor, V(t)  
FDSensor, I(t)  
ObererSensor, V(t)  
ObererSensor, I(t)

Checking out the license feature ISOLVEX\_SOLVER\_FDTD, expiring the 1-mar-2009, version 10.0, (1).

Calculating update coefficients:  
Created thread pool with 2 thread(s).  
Calculating update coefficients: completed. Time: 24 seconds.

Hardware acceleration not used, please contact SPEAG for more information.  
Yee (explicit) iterations starting using U-PML Boundary Condition.  
0% - iterations: 5 / 34473 - [8.47 MCells/s] - Estimated time to completion: 17:33:11  
0% - iterations: 11 / 34473 - [7.76 MCells/s] - Estimated time to completion: 19:08:44  
0% - iterations: 17 / 34473 - [7.76 MCells/s] - Estimated time to completion: 19:08:32  
0% - iterations: 23 / 34473 - [8.47 MCells/s] - Estimated time to completion: 17:32:38  
0% - iterations: 32 / 34473 - [11.6 MCells/s] - Estimated time to completion: 12:45:21  
0% - iterations: 41 / 34473 - [12.7 MCells/s] - Estimated time to completion: 11:41:23  
0% - iterations: 53 / 34473 - [16.9 MCells/s] - Estimated time to completion: 08:45:51

0% - iterations: 63 / 34473 - [14.1 MCells/s] - Estimated time to completion: 10:30:51  
0% - iterations: 73 / 34473 - [14.1 MCells/s] - Estimated time to completion: 10:30:40  
0% - iterations: 82 / 34473 - [11.6 MCells/s] - Estimated time to completion: 12:44:14  
0% - iterations: 88 / 34473 - [8.47 MCells/s] - Estimated time to completion: 17:30:39  
0% - iterations: 95 / 34473 - [9.88 MCells/s] - Estimated time to completion: 15:00:22  
0% - iterations: 102 / 34473 - [9.88 MCells/s] - Estimated time to completion: 15:00:11  
0% - iterations: 108 / 34473 - [7.17 MCells/s] - Estimated time to completion: 20:40:57  
0% - iterations: 114 / 34473 - [7.76 MCells/s] - Estimated time to completion: 19:05:18  
0% - iterations: 120 / 34473 - [7.17 MCells/s] - Estimated time to completion: 20:40:31  
0% - iterations: 126 / 34473 - [7.76 MCells/s] - Estimated time to completion: 19:04:54  
0% - iterations: 131 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:59:12  
0% - iterations: 136 / 34473 - [6.47 MCells/s] - Estimated time to completion: 22:53:28  
0% - iterations: 140 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:59:42  
0% - iterations: 144 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:59:29  
0% - iterations: 149 / 34473 - [5.97 MCells/s] - Estimated time to completion: 24:47:22  
0% - iterations: 154 / 34473 - [6.47 MCells/s] - Estimated time to completion: 22:52:45  
0% - iterations: 160 / 34473 - [8.47 MCells/s] - Estimated time to completion: 17:28:27  
0% - iterations: 166 / 34473 - [8.47 MCells/s] - Estimated time to completion: 17:28:16  
1% - iterations: 173 / 34473 - [9.06 MCells/s] - Estimated time to completion: 16:19:59  
1% - iterations: 179 / 34473 - [7.76 MCells/s] - Estimated time to completion: 19:03:08  
1% - iterations: 184 / 34473 - [6.47 MCells/s] - Estimated time to completion: 22:51:33  
1% - iterations: 189 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:57:04  
1% - iterations: 194 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:56:53  
1% - iterations: 198 / 34473 - [5.18 MCells/s] - Estimated time to completion: 28:33:45  
1% - iterations: 203 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:56:34  
1% - iterations: 210 / 34473 - [9.06 MCells/s] - Estimated time to completion: 16:18:56  
1% - iterations: 217 / 34473 - [9.06 MCells/s] - Estimated time to completion: 16:18:44  
1% - iterations: 223 / 34473 - [7.17 MCells/s] - Estimated time to completion: 20:36:48  
1% - iterations: 227 / 34473 - [5.18 MCells/s] - Estimated time to completion: 28:32:18  
1% - iterations: 235 / 34473 - [11.3 MCells/s] - Estimated time to completion: 13:04:37  
1% - iterations: 244 / 34473 - [11.6 MCells/s] - Estimated time to completion: 12:40:38  
1% - iterations: 248 / 34473 - [5.18 MCells/s] - Estimated time to completion: 28:31:15  
1% - iterations: 252 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:53:38  
1% - iterations: 256 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:53:25  
1% - iterations: 261 / 34473 - [6.47 MCells/s] - Estimated time to completion: 22:48:28  
1% - iterations: 266 / 34473 - [6.47 MCells/s] - Estimated time to completion: 22:48:16  
1% - iterations: 269 / 34473 - [4.23 MCells/s] - Estimated time to completion: 34:50:14  
1% - iterations: 273 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:52:30  
1% - iterations: 278 / 34473 - [6.47 MCells/s] - Estimated time to completion: 22:47:48  
1% - iterations: 283 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:53:38  
1% - iterations: 288 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:53:27  
1% - iterations: 293 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:53:16  
1% - iterations: 298 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:53:05  
1% - iterations: 304 / 34473 - [7.76 MCells/s] - Estimated time to completion: 18:58:58  
1% - iterations: 310 / 34473 - [8.47 MCells/s] - Estimated time to completion: 17:23:52  
1% - iterations: 315 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:52:27  
1% - iterations: 319 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:50:00  
1% - iterations: 323 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:49:47  
1% - iterations: 327 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:49:34  
1% - iterations: 331 / 34473 - [5.65 MCells/s] - Estimated time to completion: 26:04:50  
1% - iterations: 336 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:51:41  
1% - iterations: 340 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:48:52  
1% - iterations: 345 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:51:21  
1% - iterations: 350 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:51:10  
1% - iterations: 355 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:50:59  
1% - iterations: 362 / 34473 - [9.06 MCells/s] - Estimated time to completion: 16:14:35  
1% - iterations: 369 / 34473 - [9.88 MCells/s] - Estimated time to completion: 14:53:12  
1% - iterations: 375 / 34473 - [7.76 MCells/s] - Estimated time to completion: 18:56:36  
1% - iterations: 381 / 34473 - [7.76 MCells/s] - Estimated time to completion: 18:56:24  
1% - iterations: 388 / 34473 - [9.06 MCells/s] - Estimated time to completion: 16:13:51  
1% - iterations: 395 / 34473 - [9.06 MCells/s] - Estimated time to completion: 16:13:39  
1% - iterations: 400 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:49:20  
1% - iterations: 405 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:49:09  
1% - iterations: 409 / 34473 - [4.44 MCells/s] - Estimated time to completion: 33:07:04  
1% - iterations: 413 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:44:55  
1% - iterations: 417 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:44:42  
1% - iterations: 421 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:44:29  
1% - iterations: 425 / 34473 - [4.78 MCells/s] - Estimated time to completion: 30:44:16  
1% - iterations: 430 / 34473 - [7.06 MCells/s] - Estimated time to completion: 20:48:14  
1% - iterations: 437 / 34473 - [9.06 MCells/s] - Estimated time to completion: 16:12:27  
1% - iterations: 444 / 34473 - [9.06 MCells/s] - Estimated time to completion: 16:12:15

|                                                                                   |                         |                         |                                  |         |                    |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|---------|--------------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: |         | DC300H-021209-R1.2 |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz | Fluid Type:        | Head |

72% - iterations: 24653 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:20:02  
72% - iterations: 24663 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:59:51  
72% - iterations: 24673 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:59:40  
72% - iterations: 24683 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:59:29  
72% - iterations: 24692 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:19:14  
72% - iterations: 24702 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:59:08  
72% - iterations: 24712 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:58:57  
72% - iterations: 24722 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:58:46  
72% - iterations: 24731 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:18:26  
72% - iterations: 24741 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:58:25  
72% - iterations: 24751 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:58:14  
72% - iterations: 24761 / 34473 - [12.9 MCells/s] - Estimated time to completion: 03:14:14  
72% - iterations: 24771 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:57:52  
72% - iterations: 24781 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:57:41  
72% - iterations: 24791 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:57:30  
72% - iterations: 24800 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:17:02  
72% - iterations: 24810 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:57:09  
72% - iterations: 24820 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:56:58  
72% - iterations: 24829 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:16:27  
72% - iterations: 24839 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:56:37  
72% - iterations: 24849 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:56:26  
72% - iterations: 24859 / 34473 - [12.9 MCells/s] - Estimated time to completion: 03:12:16  
72% - iterations: 24869 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:56:04  
72% - iterations: 24879 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:55:53  
72% - iterations: 24888 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:15:15  
72% - iterations: 24898 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:55:32  
72% - iterations: 24908 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:55:21  
72% - iterations: 24918 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:55:10  
72% - iterations: 24927 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:14:27  
72% - iterations: 24937 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:54:49  
72% - iterations: 24947 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:54:38  
72% - iterations: 24957 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:54:27  
72% - iterations: 24966 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:13:39  
72% - iterations: 24976 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:54:06  
72% - iterations: 24986 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:53:55  
73% - iterations: 24995 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:13:04  
73% - iterations: 25005 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:53:34  
73% - iterations: 25015 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:53:23  
73% - iterations: 25025 / 34473 - [12.9 MCells/s] - Estimated time to completion: 03:08:57  
73% - iterations: 25035 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:53:01  
73% - iterations: 25045 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:52:50  
73% - iterations: 25055 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:52:39  
73% - iterations: 25064 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:11:39  
73% - iterations: 25074 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:52:18  
73% - iterations: 25084 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:52:07  
73% - iterations: 25094 / 34473 - [12.9 MCells/s] - Estimated time to completion: 03:07:34  
73% - iterations: 25104 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:51:45  
73% - iterations: 25114 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:51:34  
73% - iterations: 25123 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:10:27  
73% - iterations: 25133 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:51:14  
73% - iterations: 25143 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:51:03  
73% - iterations: 25153 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:50:52  
73% - iterations: 25162 / 34473 - [12.7 MCells/s] - Estimated time to completion: 03:09:40  
73% - iterations: 25172 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:50:31  
73% - iterations: 25182 / 34473 - [14.1 MCells/s] - Estimated time to completion: 02:50:20  
73% - iterations: 25192 / 34473 - [12.9 MCells/s] - Estimated time to completion: 03:05:37

Steady state detected at iteration: 25195 - the simulation will end shortly.

Please wait ... saving the sensor 'Overall Field' (E-fields) on disk.

Please wait ... saving the sensor 'Overall Field' (H-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (E-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (H-fields) on disk.

97% - iterations: 25195 / 25858 - [0.0214 MCells/s] - Estimated time to completion: 133:42:18  
97% - iterations: 25205 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:11:58  
98% - iterations: 25215 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:11:47  
98% - iterations: 25225 / 25858 - [12.9 MCells/s] - Estimated time to completion: 00:12:39  
98% - iterations: 25235 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:11:25  
98% - iterations: 25245 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:11:14  
98% - iterations: 25255 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:11:03  
98% - iterations: 25264 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:12:06  
98% - iterations: 25274 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:10:42



|                         |                         |                                  |                    |             |      |
|-------------------------|-------------------------|----------------------------------|--------------------|-------------|------|
| Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: | DC300H-021209-R1.2 |             |      |
| Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz            | Fluid Type: | Head |

98% - iterations: 25284 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:10:31  
98% - iterations: 25294 / 25858 - [12.9 MCells/s] - Estimated time to completion: 00:11:16  
98% - iterations: 25304 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:10:09  
98% - iterations: 25314 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:09:58  
98% - iterations: 25324 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:09:47  
98% - iterations: 25333 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:10:41  
98% - iterations: 25343 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:09:26  
98% - iterations: 25352 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:10:18  
98% - iterations: 25362 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:09:05  
98% - iterations: 25372 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:08:54  
98% - iterations: 25381 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:09:43  
98% - iterations: 25391 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:08:33  
98% - iterations: 25401 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:08:22  
98% - iterations: 25410 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:09:07  
98% - iterations: 25420 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:08:01  
98% - iterations: 25428 / 25858 - [10.4 MCells/s] - Estimated time to completion: 00:10:45  
98% - iterations: 25437 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:08:34  
98% - iterations: 25446 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:08:23  
98% - iterations: 25456 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:07:22  
98% - iterations: 25466 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:07:11  
99% - iterations: 25476 / 25858 - [12.9 MCells/s] - Estimated time to completion: 00:07:38  
99% - iterations: 25486 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:06:49  
99% - iterations: 25496 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:06:38  
99% - iterations: 25506 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:06:27  
99% - iterations: 25515 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:06:59  
99% - iterations: 25525 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:06:06  
99% - iterations: 25535 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:05:55  
99% - iterations: 25544 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:06:23  
99% - iterations: 25554 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:05:34  
99% - iterations: 25564 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:05:23  
99% - iterations: 25574 / 25858 - [12.9 MCells/s] - Estimated time to completion: 00:05:40  
99% - iterations: 25584 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:05:01  
99% - iterations: 25594 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:04:50  
99% - iterations: 25604 / 25858 - [12.9 MCells/s] - Estimated time to completion: 00:05:04  
99% - iterations: 25614 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:04:28  
99% - iterations: 25624 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:04:17  
99% - iterations: 25634 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:04:06  
99% - iterations: 25643 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:04:22  
99% - iterations: 25653 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:03:45  
99% - iterations: 25663 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:03:34  
99% - iterations: 25673 / 25858 - [12.9 MCells/s] - Estimated time to completion: 00:03:42  
99% - iterations: 25683 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:03:12  
99% - iterations: 25693 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:03:01  
99% - iterations: 25703 / 25858 - [12.9 MCells/s] - Estimated time to completion: 00:03:06  
99% - iterations: 25713 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:02:39  
99% - iterations: 25723 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:02:28  
100% - iterations: 25733 / 25858 - [12.9 MCells/s] - Estimated time to completion: 00:02:30  
100% - iterations: 25743 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:02:06  
100% - iterations: 25753 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:01:55  
100% - iterations: 25763 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:01:44  
100% - iterations: 25771 / 25858 - [11.3 MCells/s] - Estimated time to completion: 00:01:59  
100% - iterations: 25779 / 25858 - [10.4 MCells/s] - Estimated time to completion: 00:01:58  
100% - iterations: 25787 / 25858 - [10.4 MCells/s] - Estimated time to completion: 00:01:46  
100% - iterations: 25795 / 25858 - [11.3 MCells/s] - Estimated time to completion: 00:01:26  
100% - iterations: 25805 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:00:58  
100% - iterations: 25814 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:00:53  
100% - iterations: 25824 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:00:37  
100% - iterations: 25834 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:00:26  
100% - iterations: 25844 / 25858 - [14.1 MCells/s] - Estimated time to completion: 00:00:15  
100% - iterations: 25853 / 25858 - [12.7 MCells/s] - Estimated time to completion: 00:00:06  
Please wait ... saving the sensor 'Overall Field' (E-fields) on disk.

Please wait ... saving the sensor 'Overall Field' (H-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (E-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (H-fields) on disk.

100% - iterations: 25858 / 25858 - [0.0357 MCells/s] - Estimated time to completion: 00:00:00

Convert time-domain data to frequency-domain data.

Maxwell Solver run ended the 2009-Feb-10 00:57:28. Total simulation time was 14:17:15 (hh:mm:ss, wall-clock time).

|                                                                                   |                         |                         |                                  |         |                    |      |
|-----------------------------------------------------------------------------------|-------------------------|-------------------------|----------------------------------|---------|--------------------|------|
|  | Date(s) of Evaluations: | Jan. 26 & Feb. 09, 2009 | Calibration Document Serial No.: |         | DC300H-021209-R1.2 |      |
|                                                                                   | Evaluation Type:        | Dipole Calibration      | Dipole Frequency:                | 300 MHz | Fluid Type:        | Head |

## APPENDIX C - PROBE CALIBRATION REPORT



Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Celltech**

Certificate No: **ET3-1590\_Jul08**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1590**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v5 and QA CAL-23.v3  
 Calibration procedure for dosimetric E-field probes**

Calibration date: **July 21, 2008**

Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID #            | Cal Date (Certificate No.)    | Scheduled Calibration |
|----------------------------|-----------------|-------------------------------|-----------------------|
| Power meter E4419B         | GB41293874      | 1-Apr-08 (No. 217-00788)      | Apr-09                |
| Power sensor E4412A        | MY41495277      | 1-Apr-08 (No. 217-00788)      | Apr-09                |
| Power sensor E4412A        | MY41498087      | 1-Apr-08 (No. 217-00788)      | Apr-09                |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 1-Jul-08 (No. 217-00865)      | Jul-09                |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 31-Mar-08 (No. 217-00787)     | Apr-09                |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 1-Jul-08 (No. 217-00866)      | Jul-09                |
| Reference Probe ES3DV2     | SN: 3013        | 2-Jan-08 (No. ES3-3013_Jan08) | Jan-09                |
| DAE4                       | SN: 660         | 3-Sep-07 (No. DAE4-660_Sep07) | Sep-08                |

| Secondary Standards       | ID #         | Check Date (in house)             | Scheduled Check        |
|---------------------------|--------------|-----------------------------------|------------------------|
| RF generator HP 8648C     | US3642U01700 | 4-Aug-99 (in house check Oct-07)  | In house check: Oct-09 |
| Network Analyzer HP 8753E | US37390585   | 18-Oct-01 (in house check Oct-07) | In house check: Oct-08 |

|                |                      |                          |           |
|----------------|----------------------|--------------------------|-----------|
|                | Name                 | Function                 | Signature |
| Calibrated by: | <b>Katja Pokovic</b> | <b>Technical Manager</b> |           |
| Approved by:   | <b>Niels Kuster</b>  | <b>Quality Manager</b>   |           |

Issued: July 21, 2008

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

### Glossary:

|                          |                                                                                                                                                      |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                             |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                            |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                           |
| DCP                      | diode compression point                                                                                                                              |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                    |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

# Probe ET3DV6

## SN:1590

|                  |                |
|------------------|----------------|
| Manufactured:    | March 19, 2001 |
| Last calibrated: | May 20, 2005   |
| Recalibrated:    | July 21, 2008  |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

**DASY - Parameters of Probe: ET3DV6 SN:1590****Sensitivity in Free Space<sup>A</sup>****Diode Compression<sup>B</sup>**

|       |              |                 |       |       |
|-------|--------------|-----------------|-------|-------|
| NormX | 1.81 ± 10.1% | $\mu V/(V/m)^2$ | DCP X | 87 mV |
| NormY | 2.00 ± 10.1% | $\mu V/(V/m)^2$ | DCP Y | 92 mV |
| NormZ | 1.72 ± 10.1% | $\mu V/(V/m)^2$ | DCP Z | 85 mV |

**Sensitivity in Tissue Simulating Liquid (Conversion Factors)**

Please see Page 8.

**Boundary Effect****TSL                      835 MHz      Typical SAR gradient: 5 % per mm**

|                                           |                              |               |               |
|-------------------------------------------|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>3.7 mm</b> | <b>4.7 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 10.7          | 7.2           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.8           | 0.5           |

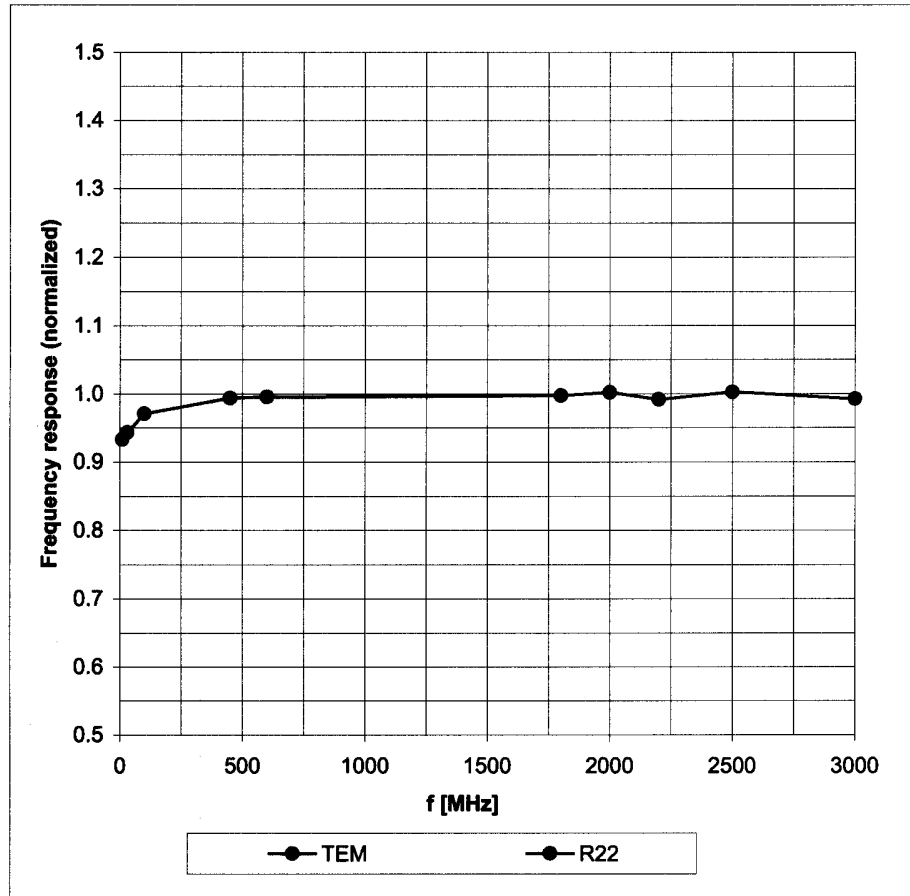
**Sensor Offset**Probe Tip to Sensor Center                      **2.7 mm**

**The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.**

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).<sup>B</sup> Numerical linearization parameter: uncertainty not required.

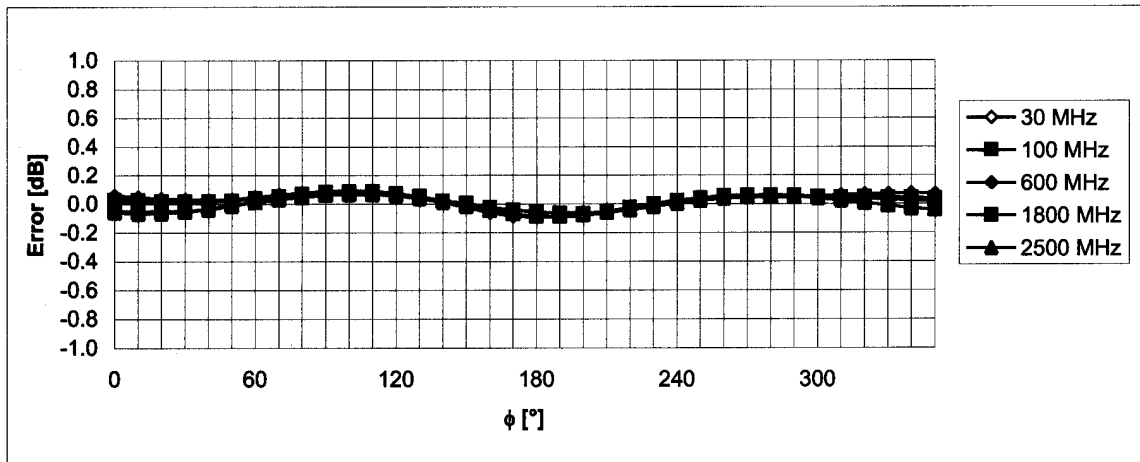
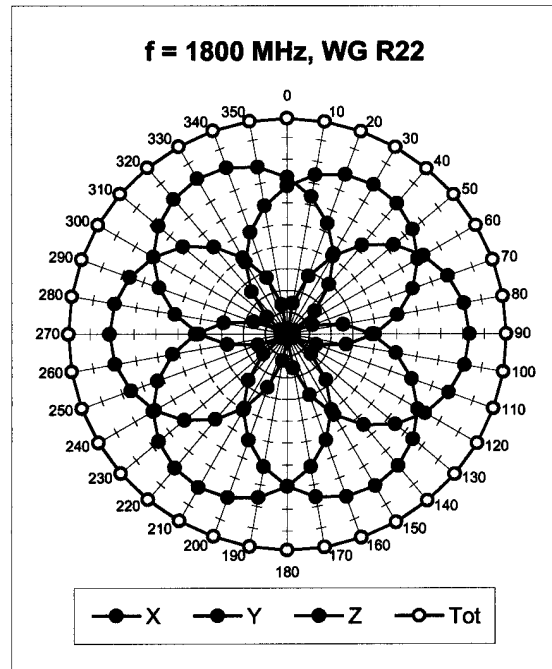
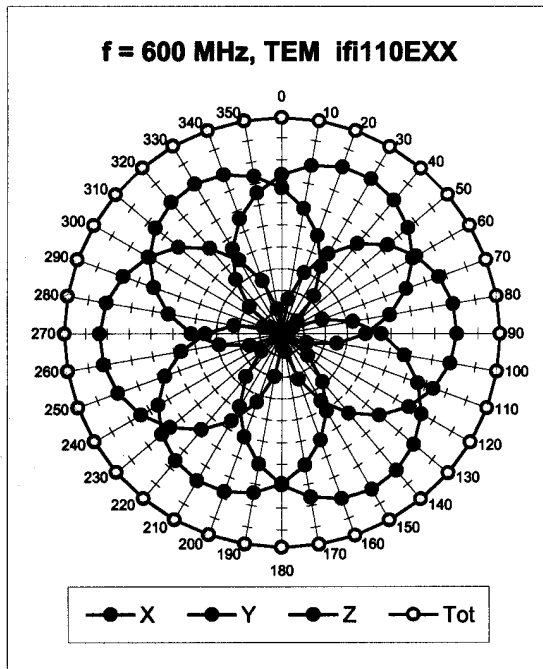
## Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

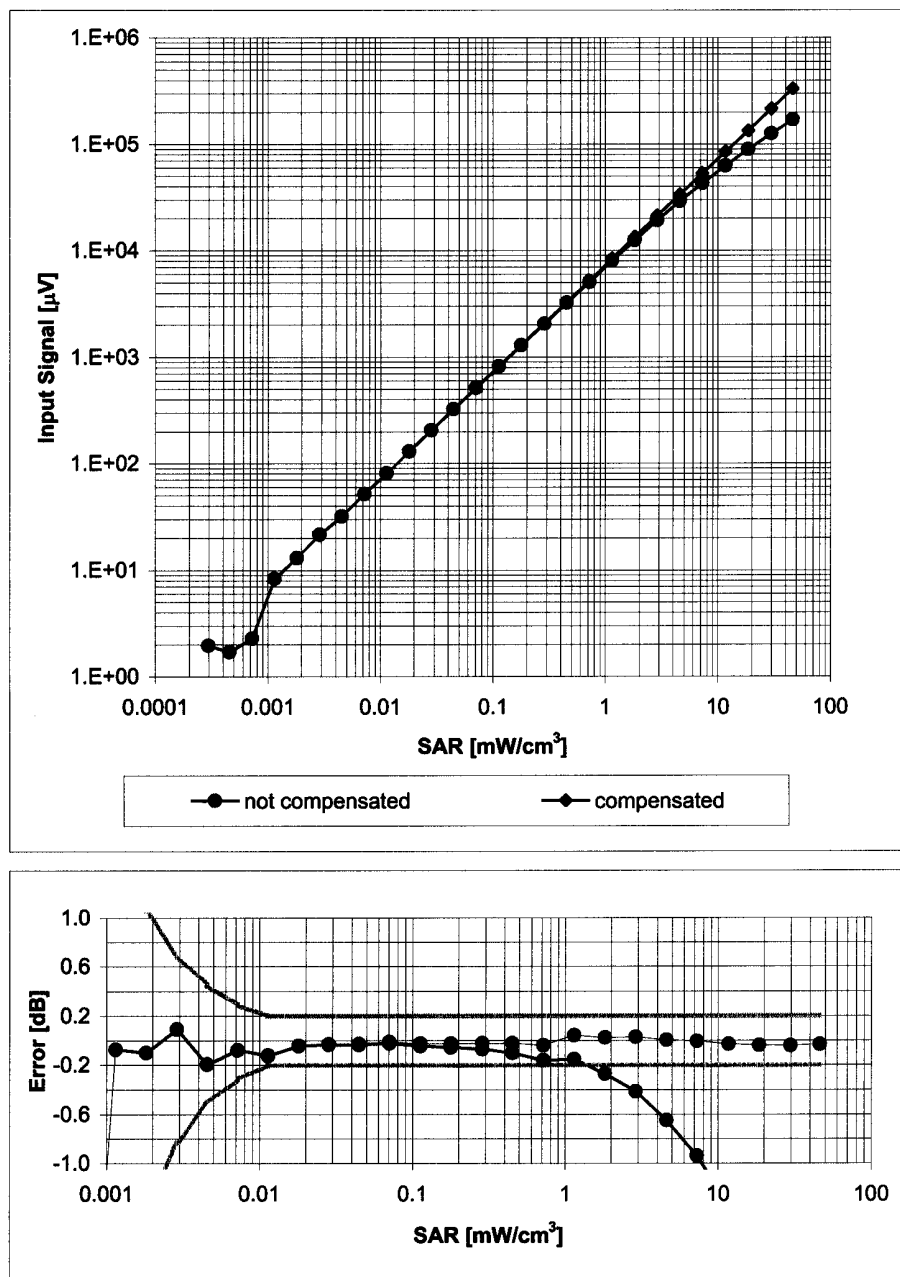
## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

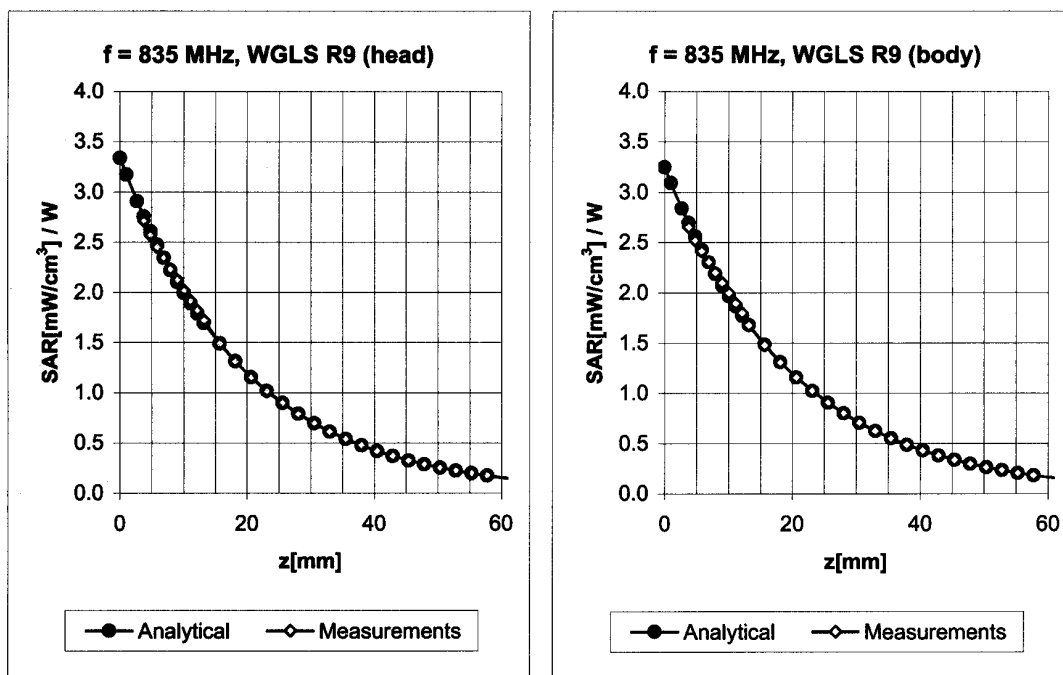
# Dynamic Range f(SAR<sub>head</sub>)

(Waveguide R22, f = 1800 MHz)



Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

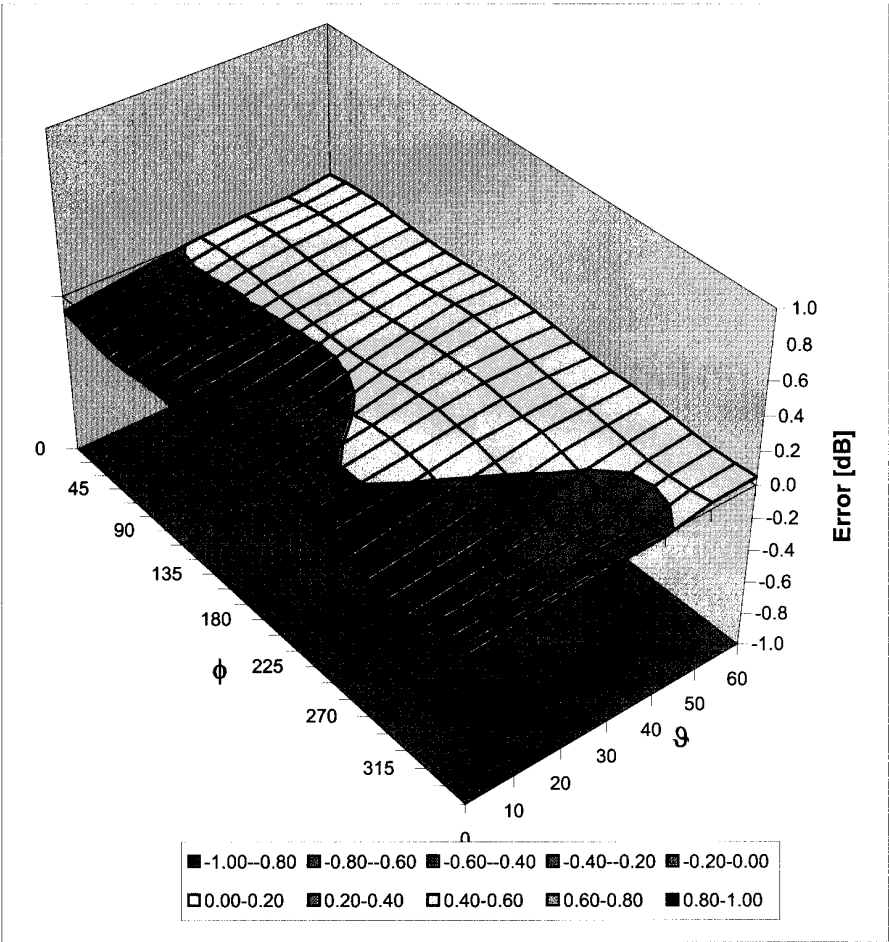
## Conversion Factor Assessment



| f [MHz] | Validity [MHz] <sup>c</sup> | TSL  | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty  |
|---------|-----------------------------|------|--------------|--------------|-------|-------|--------------------|
| 450     | ± 50 / ± 100                | Head | 43.5 ± 5%    | 0.87 ± 5%    | 0.34  | 1.75  | 7.66 ± 13.3% (k=2) |
| 835     | ± 50 / ± 100                | Head | 41.5 ± 5%    | 0.90 ± 5%    | 0.32  | 3.52  | 6.54 ± 11.0% (k=2) |
| 450     | ± 50 / ± 100                | Body | 56.7 ± 5%    | 0.94 ± 5%    | 0.28  | 1.77  | 8.27 ± 13.3% (k=2) |
| 835     | ± 50 / ± 100                | Body | 55.2 ± 5%    | 0.97 ± 5%    | 0.36  | 3.31  | 6.39 ± 11.0% (k=2) |

<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL  
Error ( $\phi, \vartheta$ ),  $f = 900 \text{ MHz}$



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )

## **Additional Conversion Factors**

**for Dosimetric E-Field Probe**

Type:

**ET3DV6**

Serial Number:

**1590**

Place of Assessment:

**Zurich**

Date of Assessment:

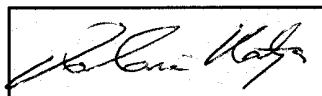
**July 23, 2008**

Probe Calibration Date:

**July 21, 2008**

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 450 and 835 MHz.

Assessed by:



**Dosimetric E-Field Probe ET3DV6 SN:1590**Conversion factor ( $\pm$  standard deviation)**150 MHz**      *ConvF*       **$8.9 \pm 10\%$** 

$\epsilon_r = 52.3$   
 $\sigma = 0.76 \text{ mho/m}$   
(head tissue)

**300 MHz**      *ConvF*       **$8.0 \pm 9\%$** 

$\epsilon_r = 45.3$   
 $\sigma = 0.87 \text{ mho/m}$   
(head tissue)

**150 MHz**      *ConvF*       **$8.5 \pm 10\%$** 

$\epsilon_r = 61.9$   
 $\sigma = 0.80 \text{ mho/m}$   
(body tissue)

**Important Note:**

**For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.**

**Please see also Section 4.7 of the DASY4 Manual.**