

# Probe EX3DV4

## SN:3893

Manufactured: October 9, 2012  
Calibrated: September 20, 2018

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3893

### Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)     |
|-----------------------------------------------------------|----------|----------|----------|---------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.55     | 0.41     | 0.32     | $\pm 10.1 \%$ |
| DCP (mV) <sup>B</sup>                                     | 103.1    | 101.4    | 100.3    |               |

### Modulation Calibration Parameters

| UID | Communication System Name |   | A<br>dB | B<br>dB/ $\mu\text{V}$ | C   | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----|---------------------------|---|---------|------------------------|-----|---------|----------|---------------------------|
| 0   | CW                        | X | 0.0     | 0.0                    | 1.0 | 0.00    | 175.4    | $\pm 3.3 \%$              |
|     |                           | Y | 0.0     | 0.0                    | 1.0 |         | 190.9    |                           |
|     |                           | Z | 0.0     | 0.0                    | 1.0 |         | 196.1    |                           |

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 Norm X,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3893

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 300                  | 45.3                               | 0.87                            | 12.19   | 12.19   | 12.19   | 0.08               | 1.20                    | ± 13.3 %  |
| 450                  | 43.5                               | 0.87                            | 11.33   | 11.33   | 11.33   | 0.14               | 1.20                    | ± 13.3 %  |
| 750                  | 41.9                               | 0.89                            | 10.63   | 10.63   | 10.63   | 0.49               | 0.80                    | ± 12.0 %  |
| 900                  | 41.5                               | 0.97                            | 9.99    | 9.99    | 9.99    | 0.46               | 0.85                    | ± 12.0 %  |
| 1750                 | 40.1                               | 1.37                            | 9.08    | 9.08    | 9.08    | 0.35               | 0.88                    | ± 12.0 %  |
| 1810                 | 40.0                               | 1.40                            | 8.79    | 8.79    | 8.79    | 0.28               | 0.90                    | ± 12.0 %  |
| 1950                 | 40.0                               | 1.40                            | 8.35    | 8.35    | 8.35    | 0.35               | 0.84                    | ± 12.0 %  |
| 2150                 | 39.7                               | 1.53                            | 8.33    | 8.33    | 8.33    | 0.29               | 0.87                    | ± 12.0 %  |
| 2450                 | 39.2                               | 1.80                            | 7.49    | 7.49    | 7.49    | 0.38               | 0.84                    | ± 12.0 %  |
| 2600                 | 39.0                               | 1.96                            | 7.38    | 7.38    | 7.38    | 0.43               | 0.81                    | ± 12.0 %  |
| 5200                 | 36.0                               | 4.66                            | 5.19    | 5.19    | 5.19    | 0.40               | 1.80                    | ± 13.1 %  |
| 5500                 | 35.6                               | 4.96                            | 5.05    | 5.05    | 5.05    | 0.40               | 1.80                    | ± 13.1 %  |
| 5800                 | 35.3                               | 5.27                            | 4.89    | 4.89    | 4.89    | 0.40               | 1.80                    | ± 13.1 %  |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3893

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 300                  | 58.2                               | 0.92                            | 11.71   | 11.71   | 11.71   | 0.05               | 1.20                    | ± 13.3 %  |
| 450                  | 56.7                               | 0.94                            | 11.55   | 11.55   | 11.55   | 0.08               | 1.20                    | ± 13.3 %  |
| 750                  | 55.5                               | 0.96                            | 10.54   | 10.54   | 10.54   | 0.39               | 0.93                    | ± 12.0 %  |
| 900                  | 55.0                               | 1.05                            | 10.17   | 10.17   | 10.17   | 0.41               | 0.90                    | ± 12.0 %  |
| 1750                 | 53.4                               | 1.49                            | 8.66    | 8.66    | 8.66    | 0.32               | 0.96                    | ± 12.0 %  |
| 1810                 | 53.3                               | 1.52                            | 8.47    | 8.47    | 8.47    | 0.33               | 0.98                    | ± 12.0 %  |
| 1950                 | 53.3                               | 1.52                            | 8.38    | 8.38    | 8.38    | 0.39               | 0.85                    | ± 12.0 %  |
| 2150                 | 53.1                               | 1.66                            | 8.20    | 8.20    | 8.20    | 0.40               | 0.85                    | ± 12.0 %  |
| 2450                 | 52.7                               | 1.95                            | 7.88    | 7.88    | 7.88    | 0.32               | 0.85                    | ± 12.0 %  |
| 2600                 | 52.5                               | 2.16                            | 7.55    | 7.55    | 7.55    | 0.31               | 0.97                    | ± 12.0 %  |
| 5200                 | 49.0                               | 5.30                            | 4.59    | 4.59    | 4.59    | 0.50               | 1.90                    | ± 13.1 %  |
| 5500                 | 48.6                               | 5.65                            | 4.15    | 4.15    | 4.15    | 0.50               | 1.90                    | ± 13.1 %  |
| 5800                 | 48.2                               | 6.00                            | 4.23    | 4.23    | 4.23    | 0.50               | 1.90                    | ± 13.1 %  |

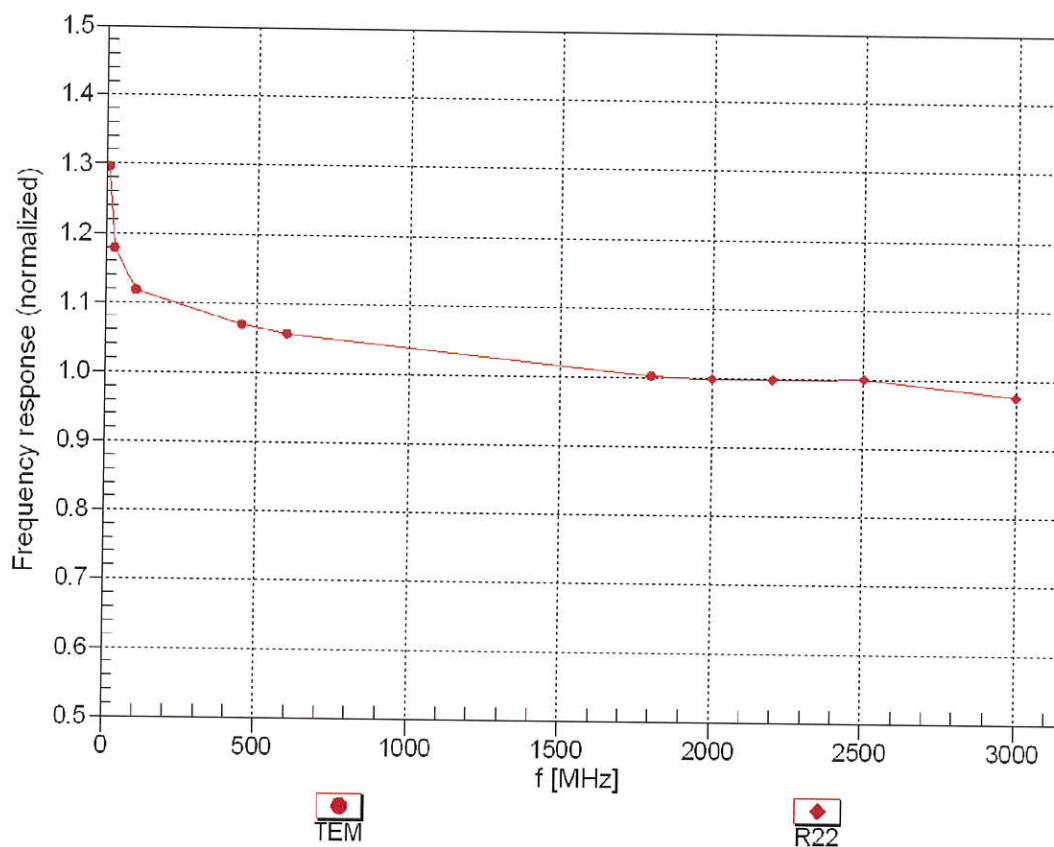
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

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<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

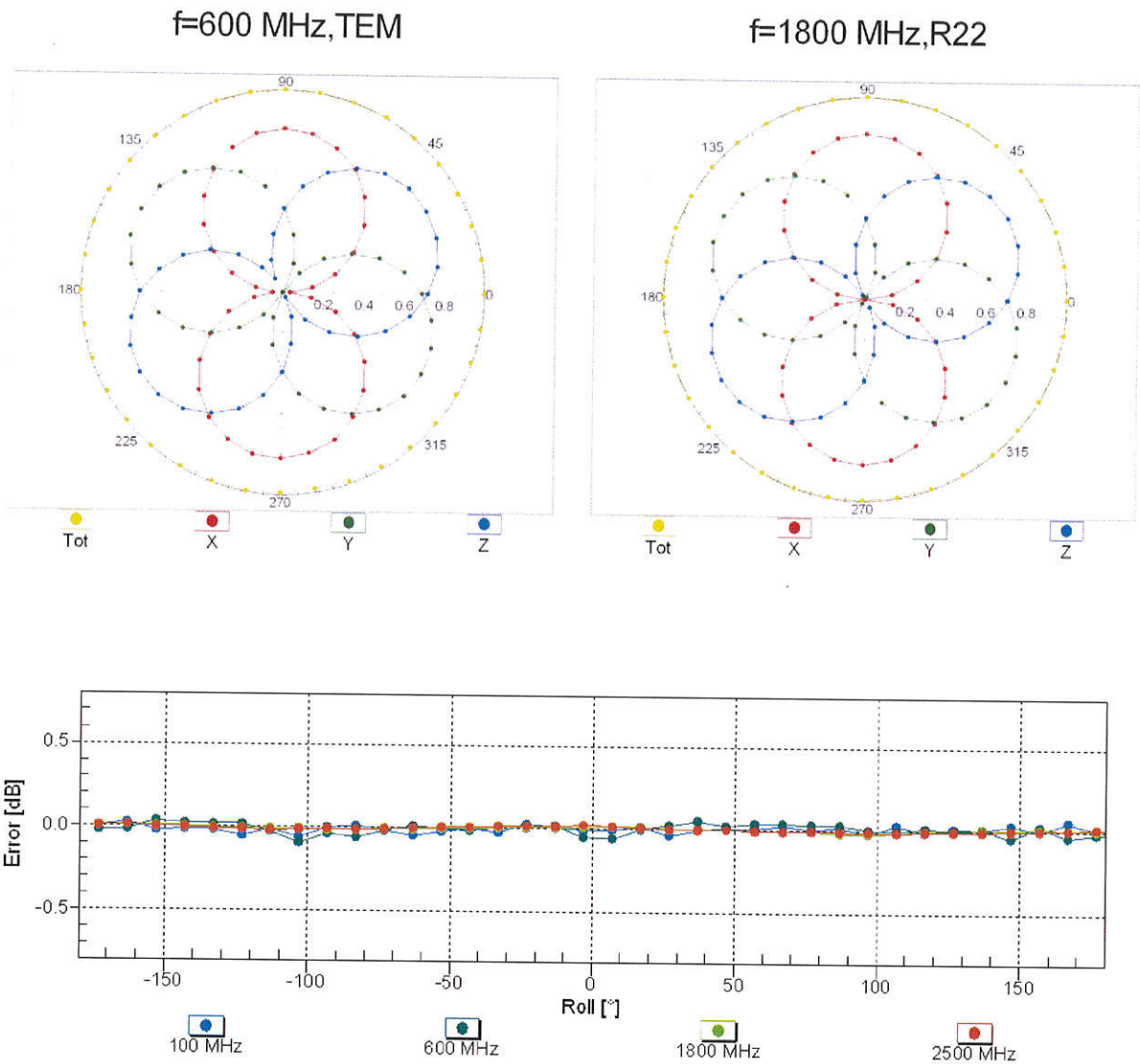
## Frequency Response of E-Field

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



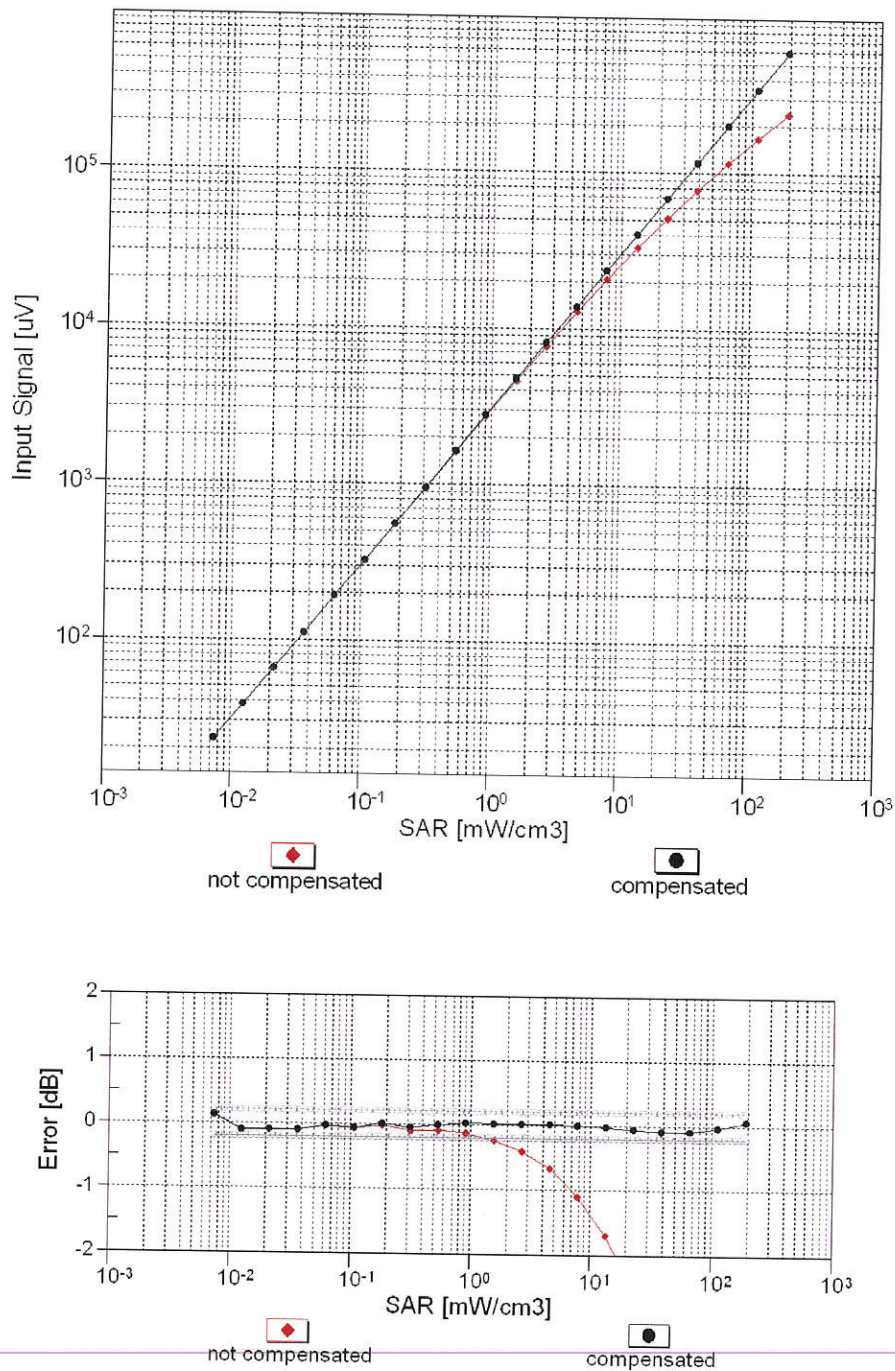
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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



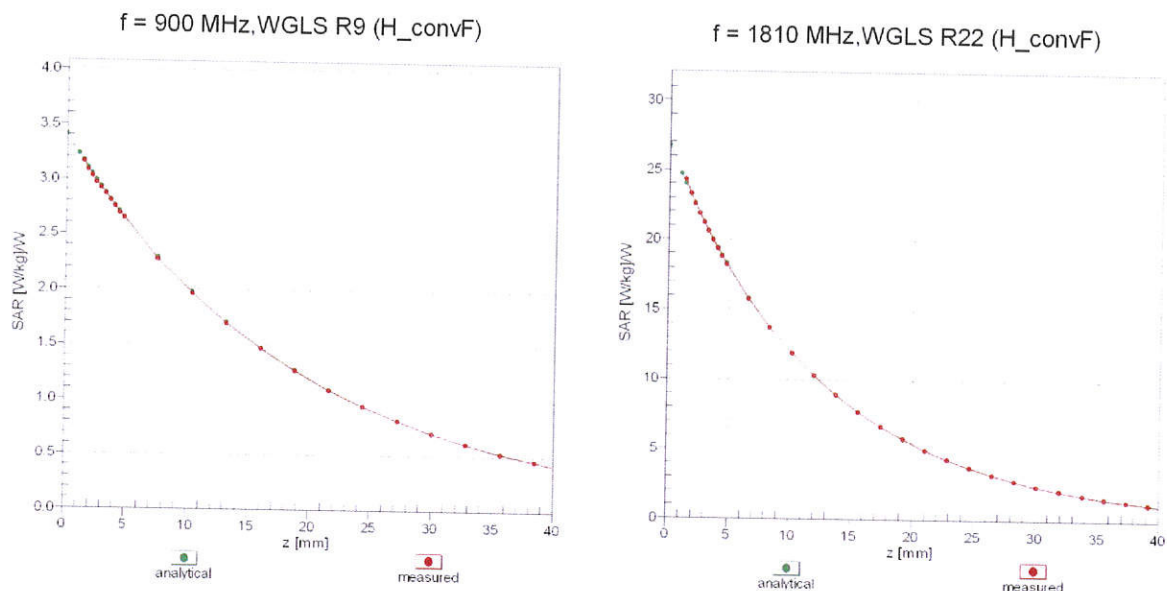
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

## Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell , $f_{\text{eval}} = 1900 \text{ MHz}$ )



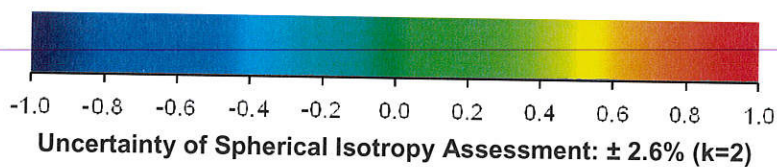
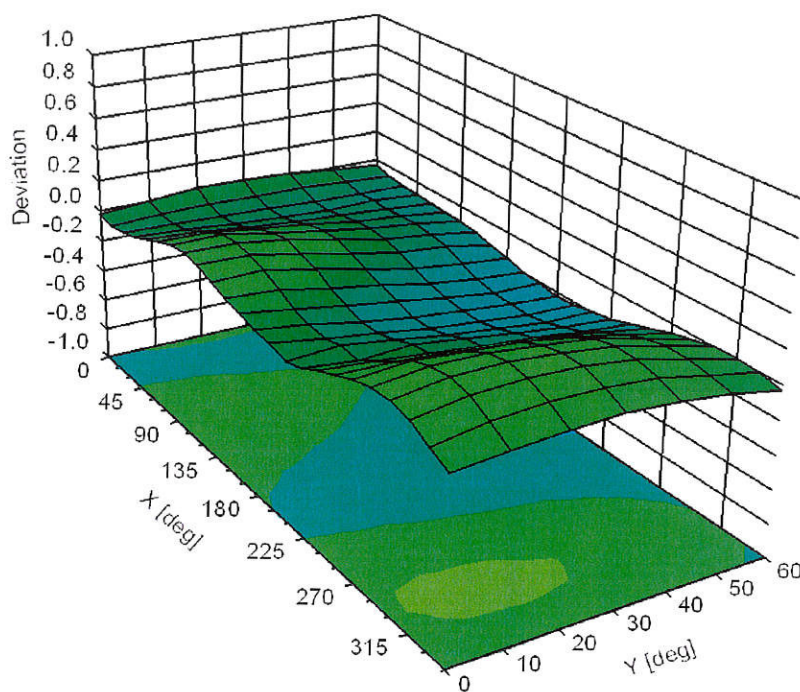
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

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



## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3893

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -23.2      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 1.4 mm     |