# 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 ($\mu V/(V/m)^2$)[A] | 0.55 | 0.41 | 0.32 | ± 10.1 % |
| DCP (mV)[B] | 103.1 | 101.4 | 100.3 | |

## Modulation Calibration Parameters

| UID | Communication System Name | | A dB | B dB√μV | C | D dB | VR mV | Unc[E] (k=2) |
|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 175.4 | ±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%.

[A] The uncertainties of Norm X,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] 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) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (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 % |

[C] 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.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] 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

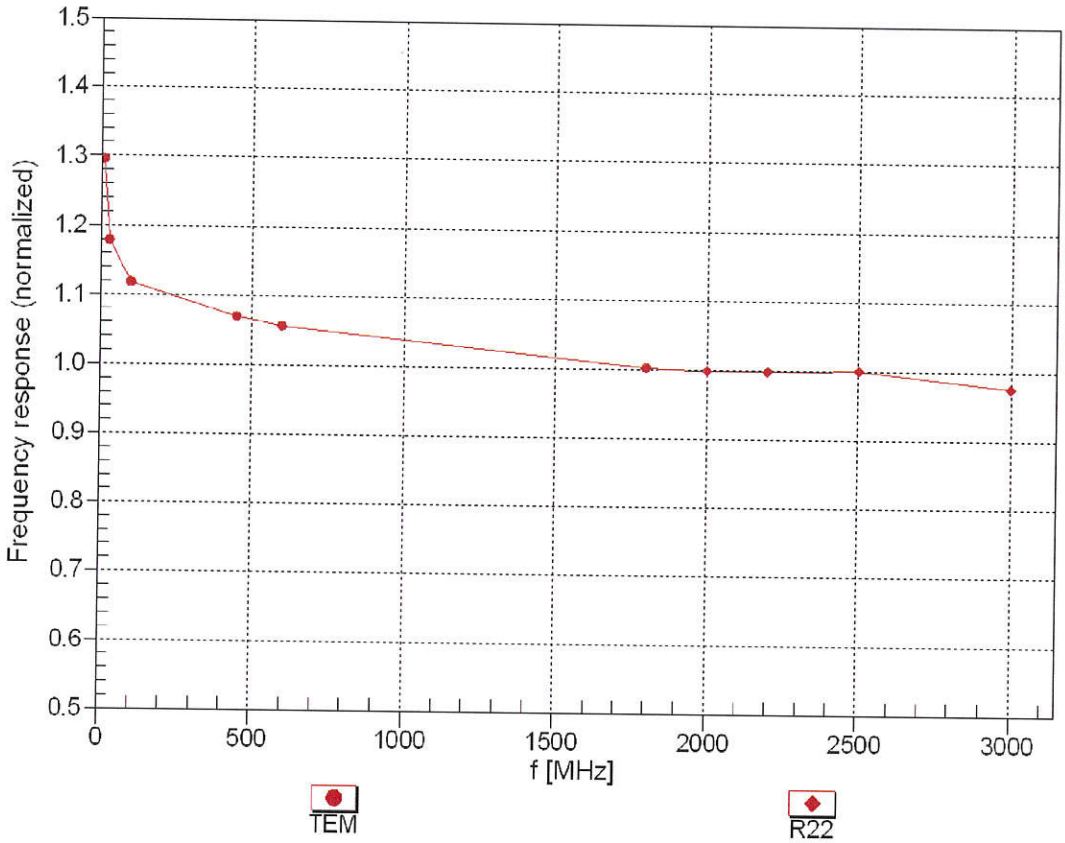
| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (mm) | Unc (k=2) |
|---|---|---|---|---|---|---|---|---|
| 300 | 58.2 | 0.92 | 11.71 | 11.71 | 11.71 | 0.05 | 1.20 | ± 13.3 % |
| 450 | 56.7 | 0.94 | 11.55 | 11.55 | 11.55 | 0.08 | 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 % |

[C] 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.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] 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.

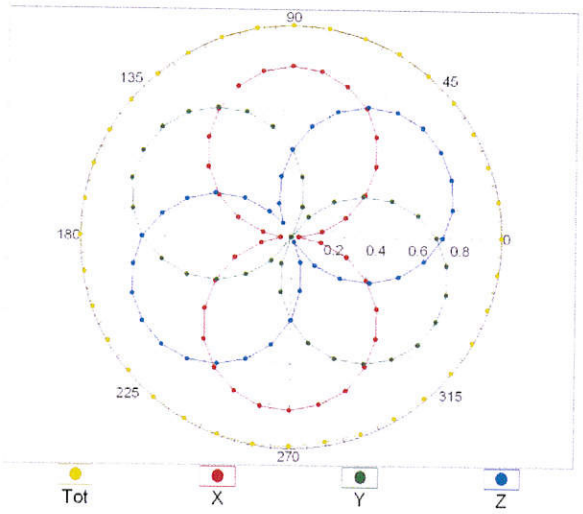
# Frequency Response of E-Field
## (TEM-Cell:ifi110 EXX, Waveguide: R22)



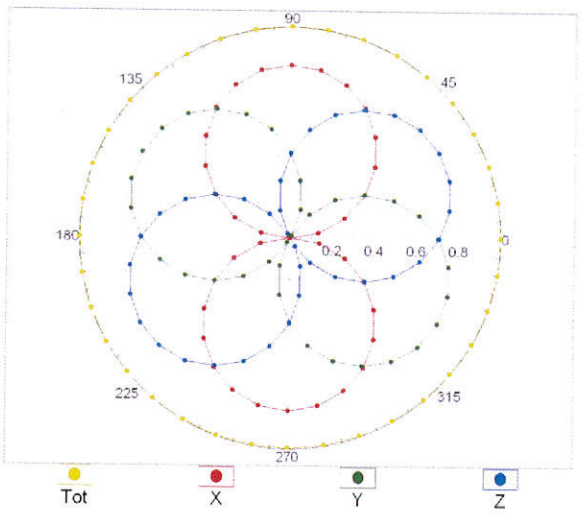

**Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)**

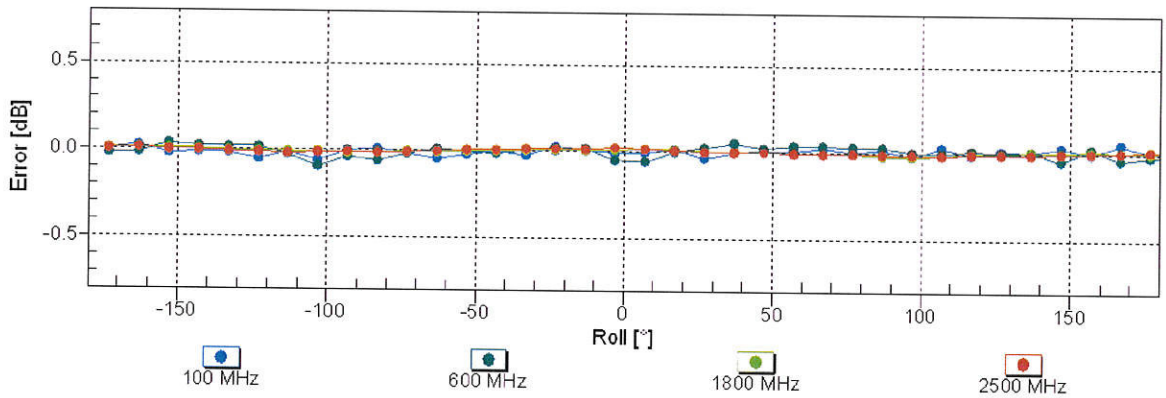
# Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM




f=1800 MHz,R22

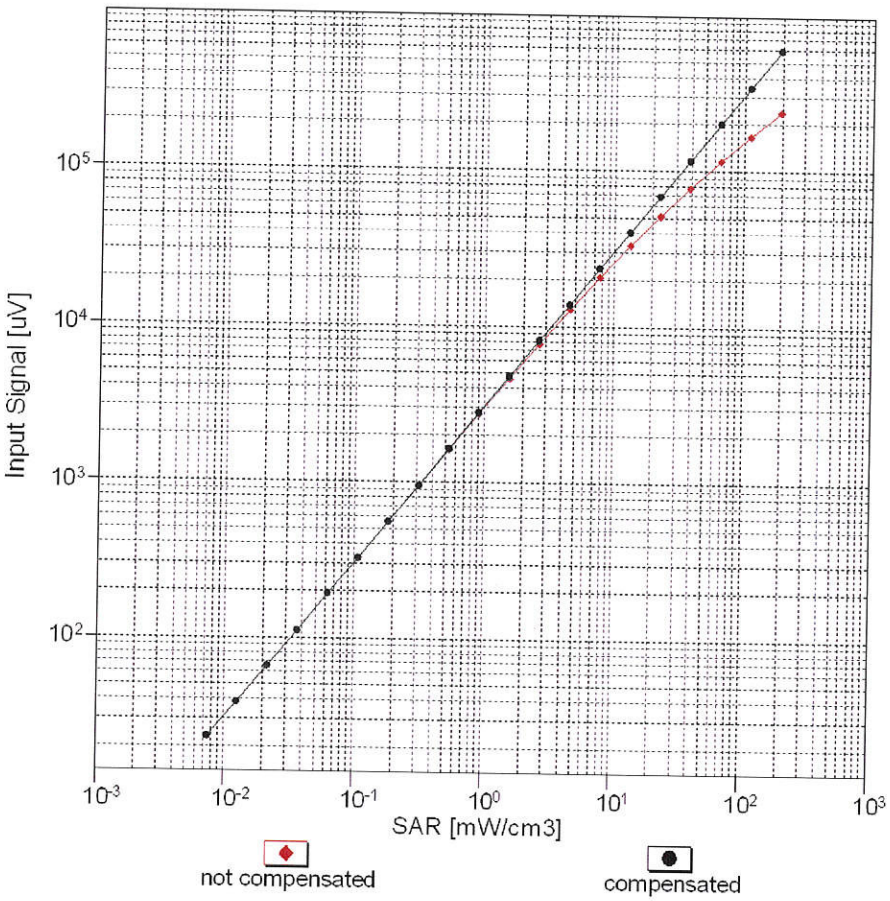


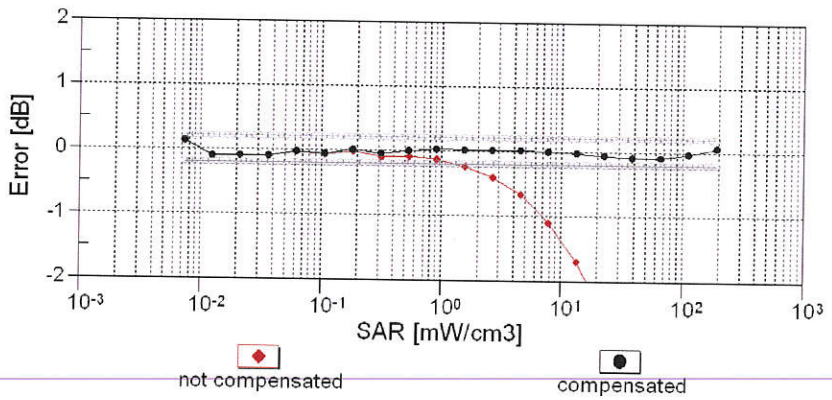




**Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)**

# Dynamic Range f(SAR$_{head}$)

**(TEM cell , $f_{eval}$= 1900 MHz)**

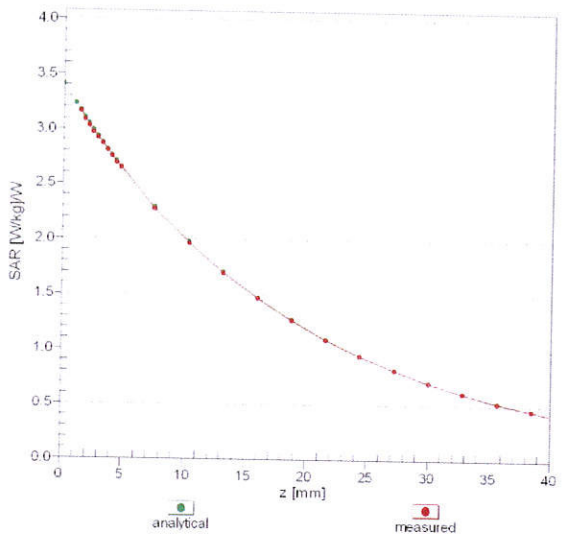


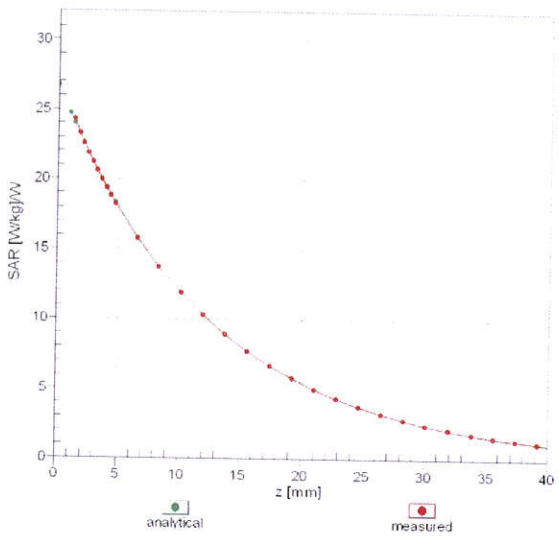

**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

# Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

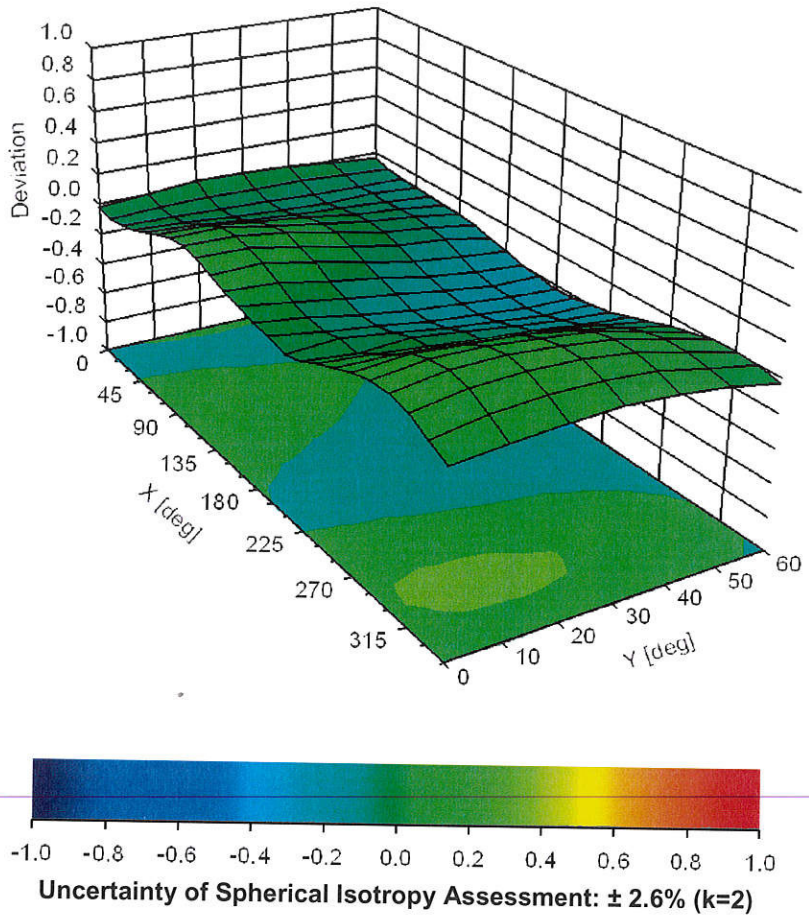



f = 1810 MHz,WGLS R22 (H_convF)




# Deviation from Isotropy in Liquid

**Error (ϕ, ϑ), f = 900 MHz**







**Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)**

# 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 |