



In Collaboration with

**s p e a g**  
CALIBRATION LABORATORY



Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China

Tel: +86-10-62304633-2117

E-mail: emf@caict.ac.cn

http://www.caict.ac.cn

## DASY/EASY – Parameters of Probe: EX3DV4 – SN:3789

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	0.46	0.50	0.51	±10.0%
DCP(mV) <sup>B</sup>	102.6	101.8	100.5	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB/μV	C	D dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	161.9	±1.9%
		Y	0.0	0.0	1.0		171.4	
		Z	0.0	0.0	1.0		173.2	

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 Page 4).

<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.



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### 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)	Unct. (k=2)
750	41.9	0.89	9.10	9.10	9.10	0.13	1.47	± 12.7%
835	41.5	0.90	8.72	8.72	8.72	0.15	1.39	± 12.7%
1450	40.5	1.20	7.96	7.96	7.96	0.21	1.06	± 12.7%
1750	40.1	1.37	7.66	7.66	7.66	0.26	1.06	± 12.7%
1900	40.0	1.40	7.31	7.31	7.31	0.30	0.97	± 12.7%
2300	39.5	1.67	7.11	7.11	7.11	0.39	0.92	± 12.7%
2450	39.2	1.80	6.95	6.95	6.95	0.39	0.95	± 12.7%
2600	39.0	1.96	6.76	6.76	6.76	0.44	0.90	± 12.7%
3300	38.2	2.71	6.61	6.61	6.61	0.48	0.87	± 13.9%
3500	37.9	2.91	6.48	6.48	6.48	0.42	1.03	± 13.9%
3700	37.7	3.12	6.30	6.30	6.30	0.35	1.25	± 13.9%
3900	37.5	3.32	6.25	6.25	6.25	0.35	1.35	± 13.9%
4100	37.2	3.53	6.15	6.15	6.15	0.40	1.15	± 13.9%
4400	36.9	3.84	5.96	5.96	5.96	0.35	1.35	± 13.9%
4600	36.7	4.04	5.92	5.92	5.92	0.55	1.05	± 13.9%
4800	36.4	4.25	5.88	5.88	5.88	0.55	1.10	± 13.9%
5250	35.9	4.71	5.08	5.08	5.08	0.55	1.22	± 13.9%
5600	35.5	5.07	4.48	4.48	4.48	0.55	1.22	± 13.9%
5750	35.4	5.22	4.61	4.61	4.61	0.55	1.22	± 13.9%

<sup>C</sup> Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of 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.

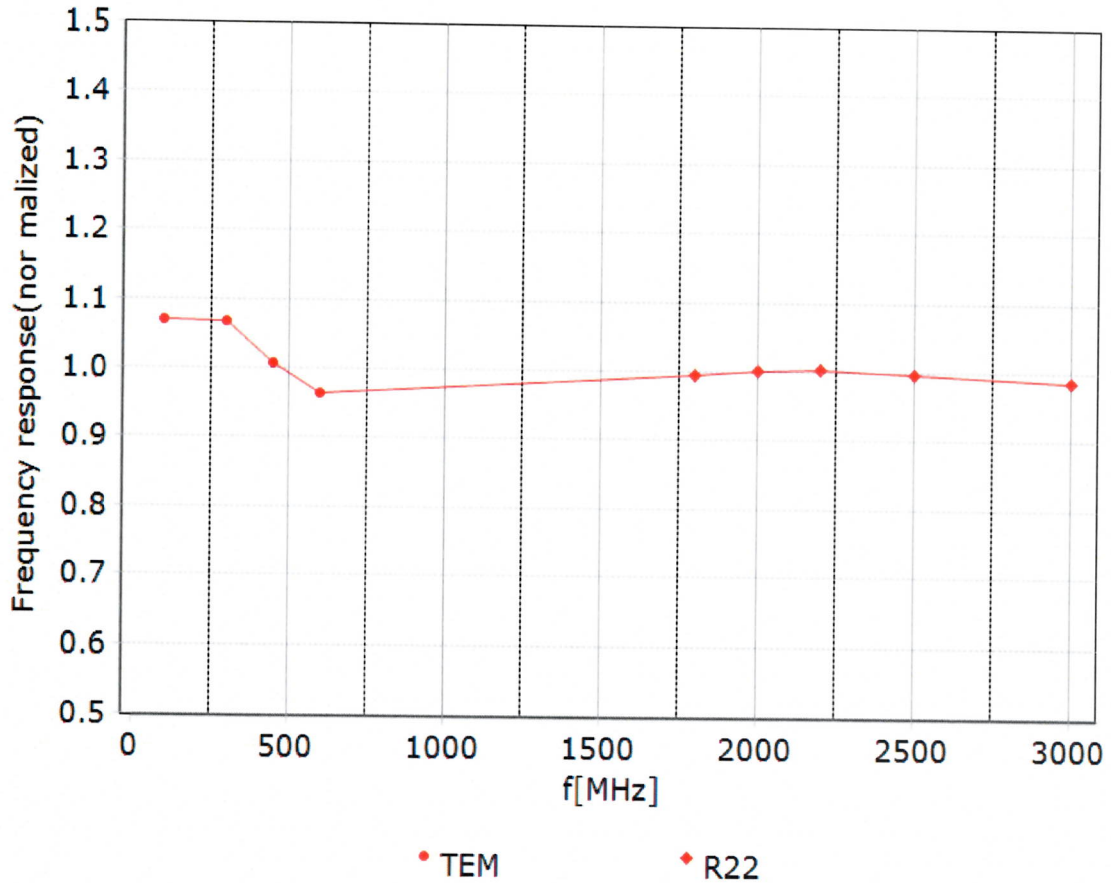
<sup>F</sup> At frequency up to 6 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<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 the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.



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



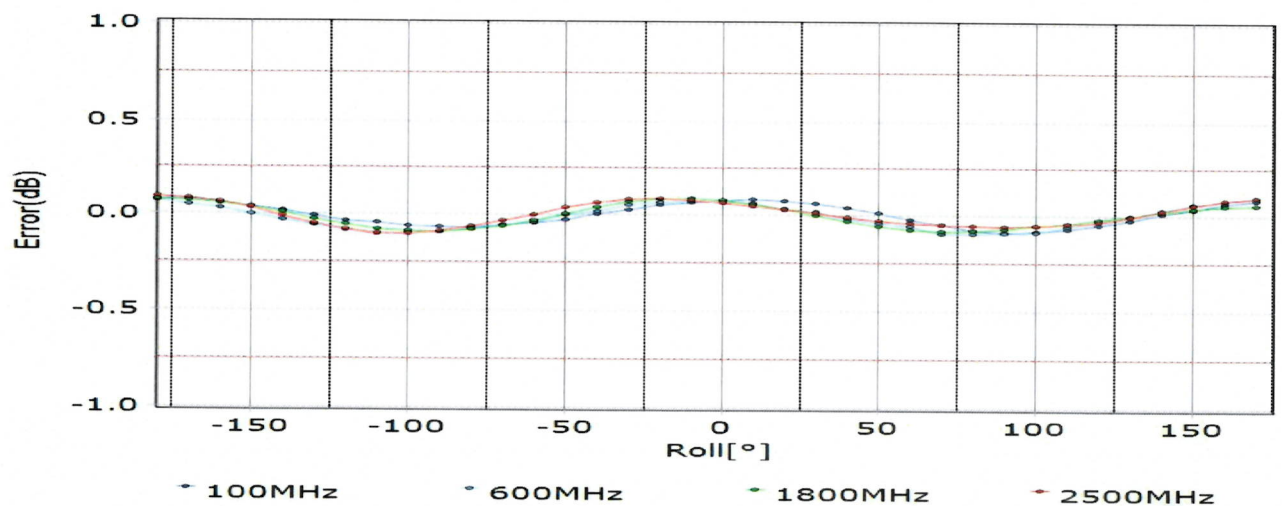
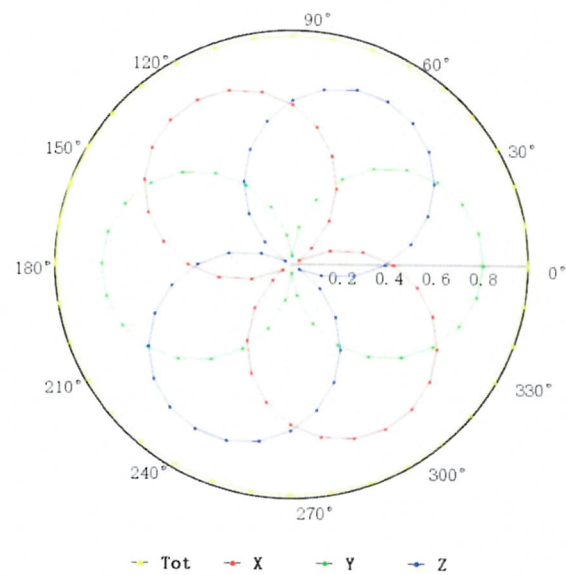
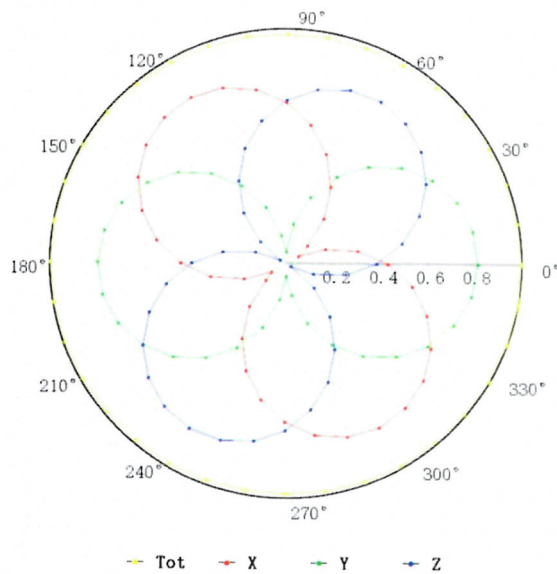
Uncertainty of Frequency Response of E-field:  $\pm 7.4\%$  ( $k=2$ )

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

**f=600 MHz, TEM**

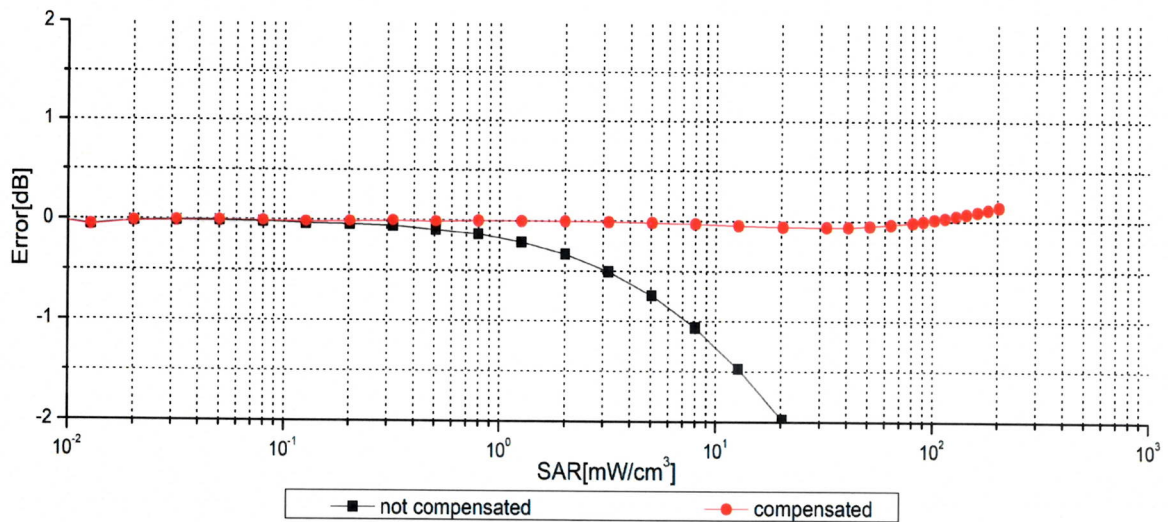
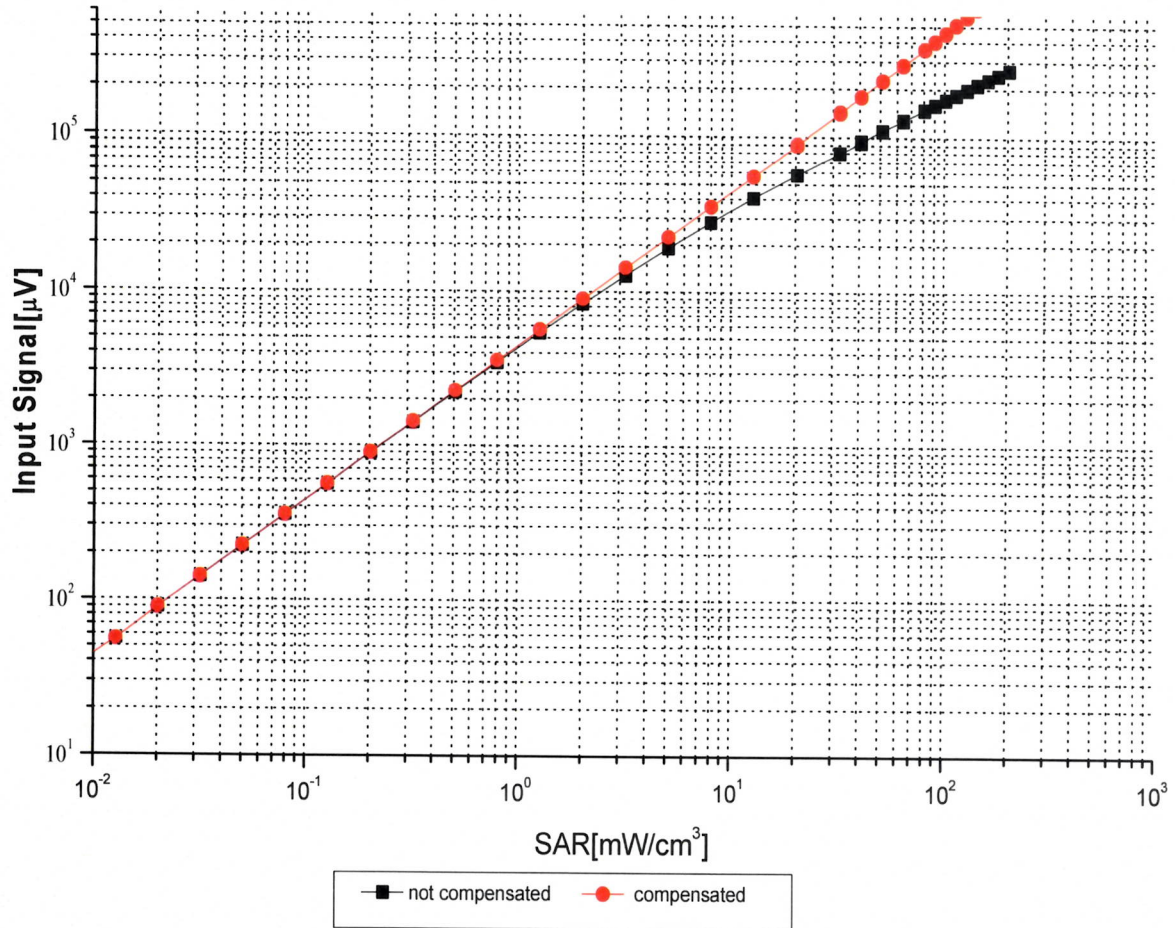
**f=1800 MHz, R22**



Uncertainty of Axial Isotropy Assessment:  $\pm 1.2\%$  ( $k=2$ )

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## Dynamic Range f(SAR<sub>head</sub>) (TEM cell, f = 900 MHz)



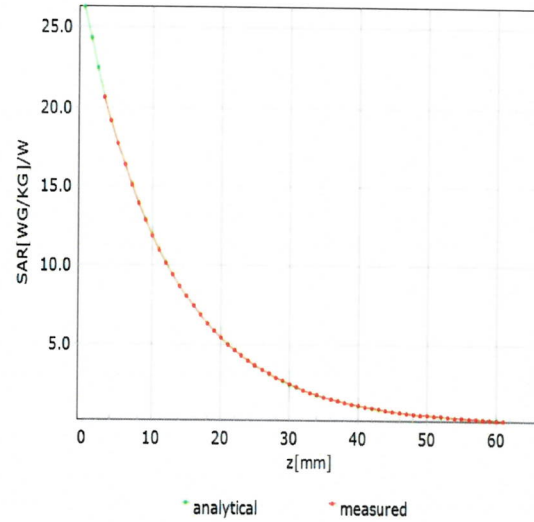
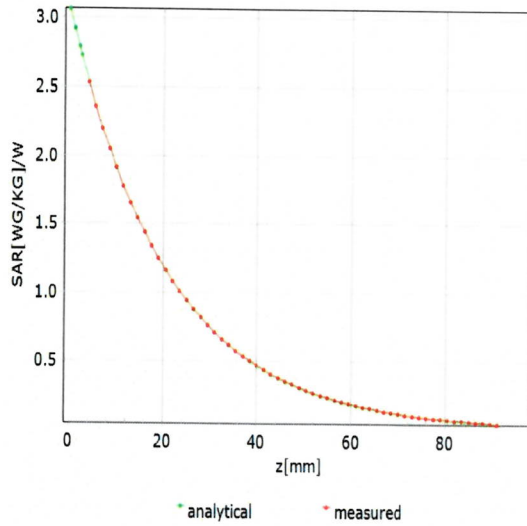
**Uncertainty of Linearity Assessment: ±0.9% (k=2)**

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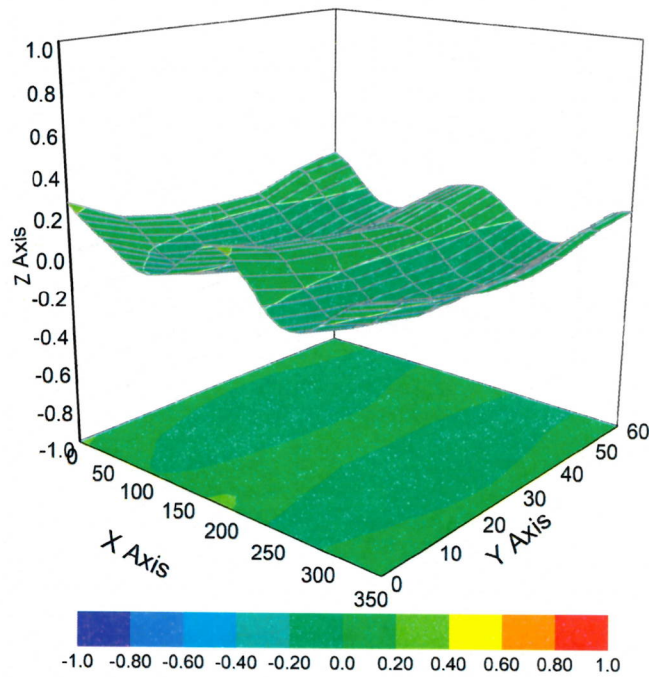
## Conversion Factor Assessment

**f=750 MHz, WGLS R9(H\_convF)**

**f=1750 MHz, WGLS R22(H\_convF)**



## Deviation from Isotropy in Liquid



**Uncertainty of Spherical Isotropy Assessment:  $\pm 3.2\%$  ( $k=2$ )**



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### Other Probe Parameters

<b>Sensor Arrangement</b>	<b>Triangular</b>
<b>Connector Angle (°)</b>	<b>43.6</b>
<b>Mechanical Surface Detection Mode</b>	<b>enabled</b>
<b>Optical Surface Detection Mode</b>	<b>disable</b>
<b>Probe Overall Length</b>	<b>337mm</b>
<b>Probe Body Diameter</b>	<b>10mm</b>
<b>Tip Length</b>	<b>9mm</b>
<b>Tip Diameter</b>	<b>2.5mm</b>
<b>Probe Tip to Sensor X Calibration Point</b>	<b>1mm</b>
<b>Probe Tip to Sensor Y Calibration Point</b>	<b>1mm</b>
<b>Probe Tip to Sensor Z Calibration Point</b>	<b>1mm</b>
<b>Recommended Measurement Distance from Surface</b>	<b>1.4mm</b>

Dipole D2450V2 SN 733				
Head Liquid				
Date of Measurement	Return Loss(dB)	$\Delta$ %	Impedance ( $\Omega$ )	$\Delta\Omega()$
2022/11/2	-28.7	/	50.2	/
2023/11/1	-28.4	1.06%	50.4	0.2 $\Omega$