



EX3DV4 - SN:3846

May 31, 2023

**Parameters of Probe: EX3DV4 - SN:3846****Sensor Model Parameters**

	C1 fF	C2 fF	$\alpha$ $V^{-1}$	T1 $msV^{-2}$	T2 $msV^{-1}$	T3 ms	T4 $V^{-2}$	T5 $V^{-1}$	T6
x	58.2	434.80	35.66	16.47	0.12	5.08	1.72	0.27	1.01
y	60.8	458.93	36.20	14.64	0.63	5.08	0.25	0.63	1.01
z	55.2	411.11	35.41	17.17	0.00	5.09	1.93	0.20	1.01

**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle	17.8°
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

**Note:** Measurement distance from surface can be increased to 3–4 mm for an *Area Scan* job.

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f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity <sup>F</sup> (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth <sup>G</sup> (mm)	Unc (k = 2)
13	55.0	0.75	17.76	17.76	17.76	0.00	1.25	±13.3%
64	54.2	0.75	13.68	13.68	13.68	0.00	1.25	±13.3%
150	52.3	0.76	12.35	12.35	12.35	0.00	1.25	±13.3%
300	45.3	0.87	11.38	11.38	11.38	0.09	1.00	±13.3%
450	43.5	0.87	10.64	10.64	10.64	0.16	1.30	±13.3%
750	41.9	0.89	8.98	8.99	10.08	0.43	1.27	±12.0%
835	41.5	0.90	8.50	9.01	9.47	0.43	1.27	±12.0%
900	41.5	0.97	7.98	8.23	9.62	0.42	1.27	±12.0%
1450	40.5	1.20	7.49	7.73	8.40	0.53	1.27	±12.0%
1640	40.2	1.31	7.40	7.67	8.37	0.49	1.27	±12.0%
1750	40.1	1.37	7.47	7.79	8.45	0.31	1.27	±12.0%
1810	40.0	1.40	7.37	7.68	8.24	0.33	1.27	±12.0%
1900	40.0	1.40	7.27	7.55	8.11	0.33	1.27	±12.0%
2000	40.0	1.40	7.02	7.30	7.84	0.33	1.27	±12.0%
2100	39.8	1.49	6.97	7.28	7.79	0.33	1.27	±12.0%
2300	39.5	1.67	6.90	7.19	7.69	0.34	1.27	±12.0%
2450	39.2	1.80	6.80	7.06	7.55	0.34	1.27	±12.0%
2600	39.0	1.96	6.72	7.04	7.50	0.32	1.27	±12.0%
3300	38.2	2.71	6.48	6.85	7.25	0.38	1.27	±14.0%
3500	37.9	2.91	6.50	6.78	7.20	0.37	1.27	±14.0%
3700	37.7	3.12	6.38	6.68	7.11	0.37	1.27	±14.0%
3900	37.5	3.32	6.36	6.63	7.02	0.38	1.27	±14.0%
4100	37.2	3.53	6.31	6.59	6.98	0.38	1.27	±14.0%
4200	37.1	3.63	6.29	6.57	6.96	0.38	1.27	±14.0%
4400	36.9	3.84	6.22	6.52	6.88	0.41	1.27	±14.0%
4600	36.7	4.04	6.15	6.44	6.82	0.41	1.27	±14.0%
4800	36.4	4.25	6.11	6.41	6.76	0.41	1.27	±14.0%
4950	36.3	4.40	5.95	6.21	6.41	0.42	1.36	±14.0%

<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. Validity of ConvF assessed at 6 MHz is 4–9 MHz, and ConvF assessed at 13 MHz is 9–19 MHz. Above 5 GHz frequency validity can be extended to ±110 MHz.

<sup>F</sup> The probes are calibrated using tissue simulating liquids (TSL) that deviate for  $\epsilon$  and  $\sigma$  by less than ±5% from the target values (typically better than ±3%) and are valid for TSL with deviations of up to ±10%. If TSL with deviations from the target of less than ±5% are used, the calibration uncertainties are 11.1% for 0.7 - 3 GHz and 13.1% for 3 - 6 GHz.

<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.

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**Calibration Parameter Determined in Head Tissue Simulating Media**

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity <sup>F</sup> (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth <sup>G</sup> (mm)	Unc (k = 2)
5200	36.0	4.66	5.20	5.41	5.66	0.40	1.51	±14.0%
5250	35.9	4.71	5.05	5.27	5.51	0.42	1.53	±14.0%
5300	35.9	4.76	4.98	5.21	5.33	0.41	1.55	±14.0%
5500	35.6	4.96	4.44	4.64	4.90	0.40	1.70	±14.0%
5600	35.5	5.07	4.27	4.47	4.70	0.39	1.75	±14.0%
5750	35.4	5.22	4.54	4.76	4.98	0.41	1.75	±14.0%
5800	35.3	5.27	4.45	4.64	4.88	0.40	1.78	±14.0%

<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. Validity of ConvF assessed at 6 MHz is 4–9 MHz, and ConvF assessed at 13 MHz is 9–19 MHz. Above 5 GHz frequency validity can be extended to ±110 MHz.

<sup>F</sup> The probes are calibrated using tissue simulating liquids (TSL) that deviate for  $\epsilon$  and  $\sigma$  by less than ±5% from the target values (typically better than ±3%) and are valid for TSL with deviations of up to ±10%. If TSL with deviations from the target of less than ±5% are used, the calibration uncertainties are 11.1% for 0.7 - 3 GHz and 13.1% for 3 - 6 GHz.

<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.



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**Parameters of Probe: EX3DV4 - SN:3846****Calibration Parameter Determined in Head Tissue Simulating Media**

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity <sup>F</sup> (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth <sup>G</sup> (mm)	Unc (k = 2)
6500	34.5	6.07	5.15	5.59	5.71	0.20	2.00	±18.6%
7000	33.9	6.65	5.39	5.83	5.88	0.20	2.00	±18.6%

<sup>C</sup> Frequency validity at 6.5 GHz is -600/+700 MHz, and ±700 MHz at or above 7 GHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> The probes are calibrated using tissue simulating liquids (TSL) that deviate for  $\epsilon$  and  $\sigma$  by less than ±10% from the target values (typically better than ±6%) and are valid for TSL with deviations of up to ±10%.

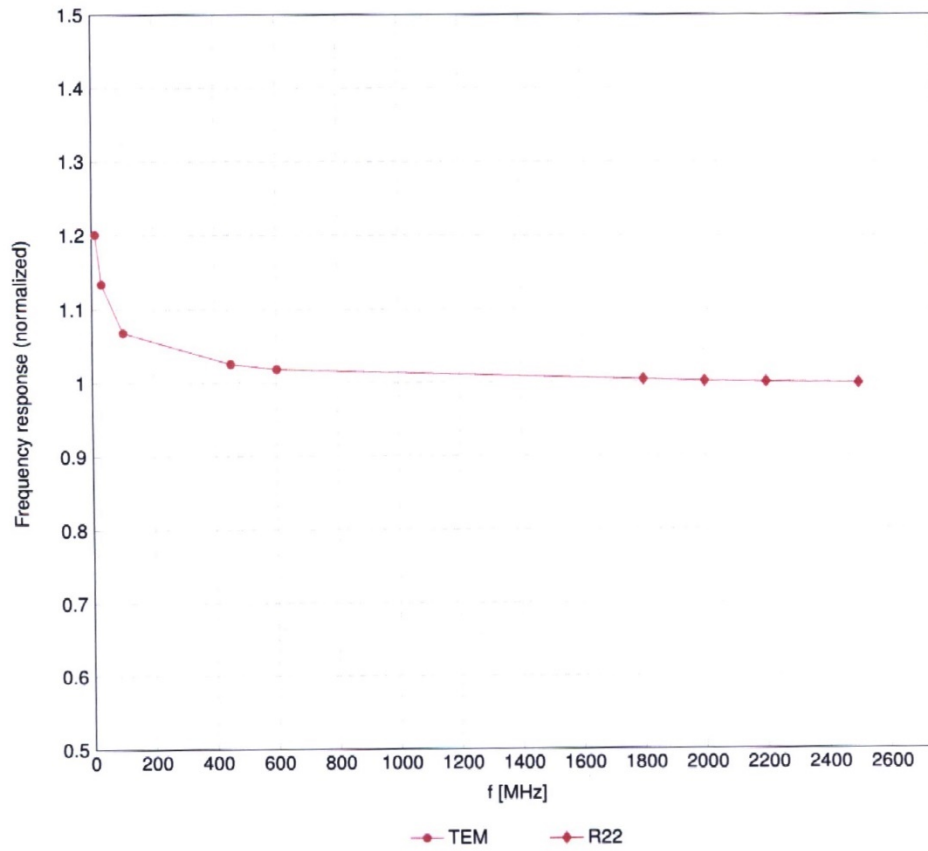
<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 3 GHz; below ±2% for frequencies between 3–6 GHz; and below ±4% for frequencies between 6–10 GHz at any distance larger than half the probe tip diameter from the boundary.

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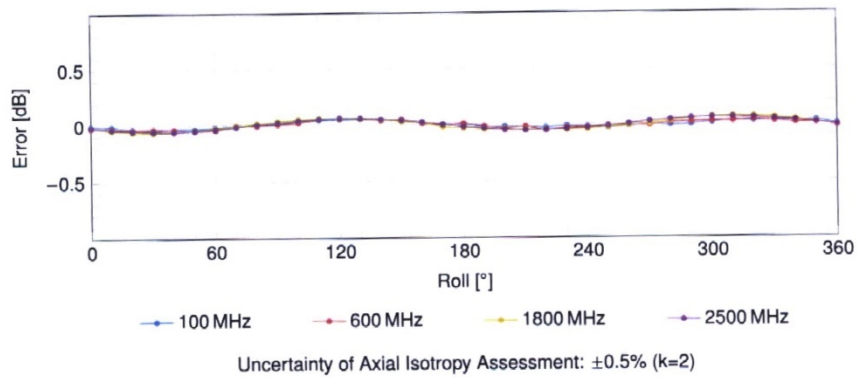
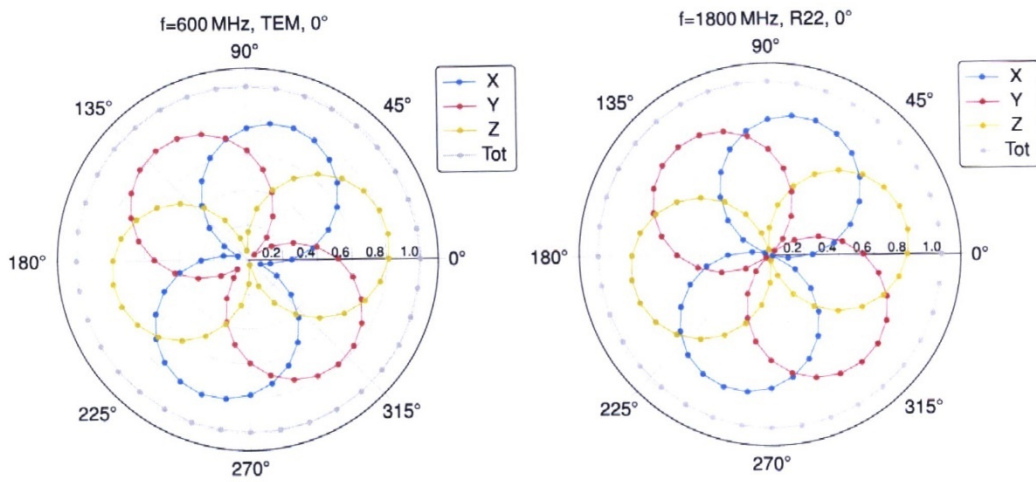
### Frequency Response of E-Field

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

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

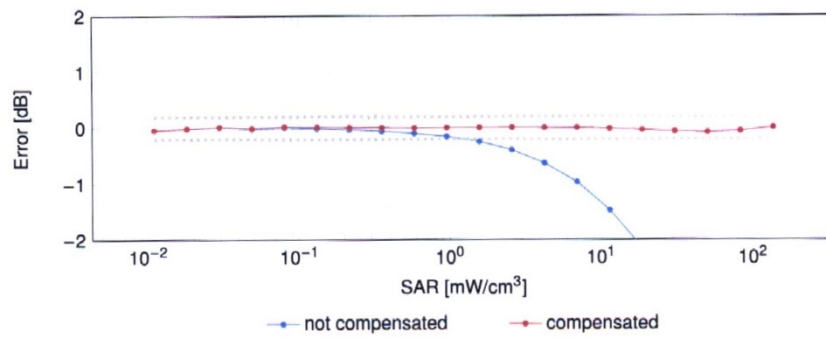
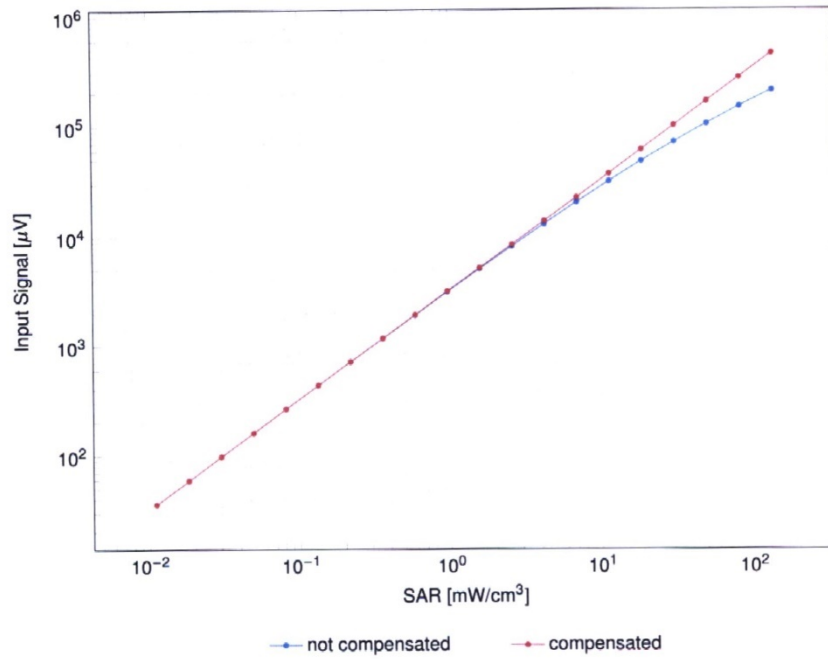


Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$



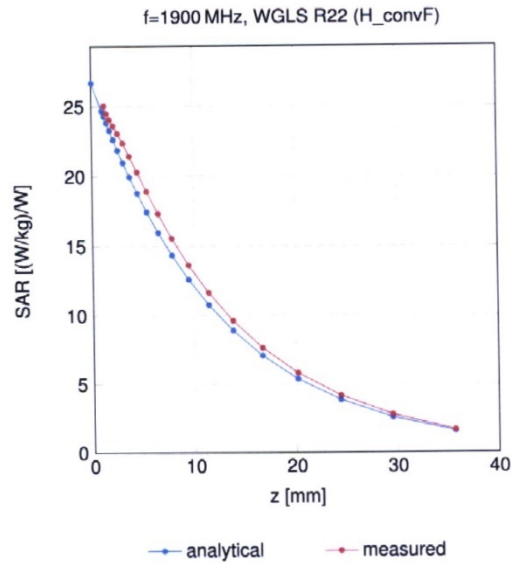
### Dynamic Range f(SAR<sub>head</sub>)

(TEM cell, f<sub>eval</sub> = 1900MHz)



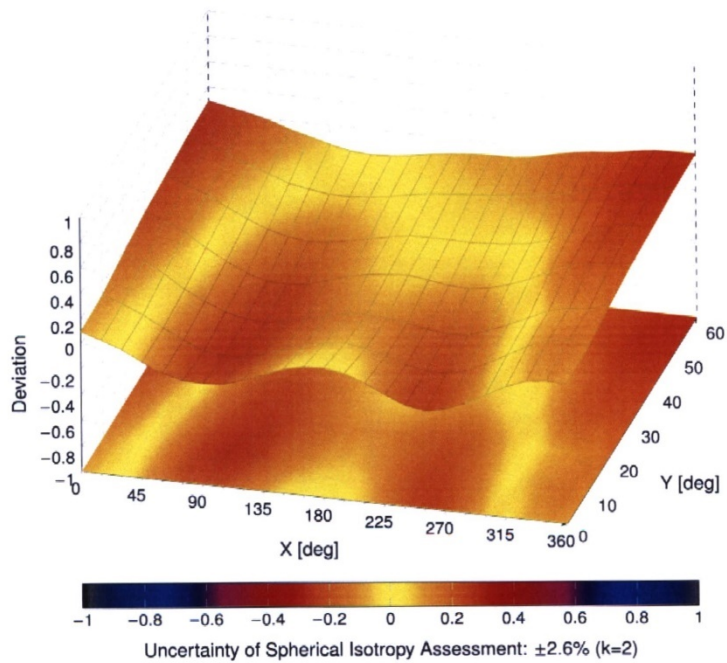
Uncertainty of Linearity Assessment: ±0.6% (k=2)

### Conversion Factor Assessment



### Deviation from Isotropy in Liquid

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







# ANNEX G Dipole Calibration Certificate

## 750 MHz Dipole Calibration Certificate



中国认可  
国际互认  
校准  
CALIBRATION  
CNAS L0570



Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191  
Tel: +86-10-62304633-2117  
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Client **Potin (Beijing) Technology Co.,Ltd**

Certificate No: **J23Z60263**

CALIBRATION CERTIFICATE			
Object	D750V3 - SN: 1196		
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits		
Calibration date:	May 24, 2023		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity&lt;70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	22-Sep-22 (CTTL, No.J22X09561)	Sep-23
Power sensor NRP8S	104291	22-Sep-22 (CTTL, No.J22X09561)	Sep-23
Reference Probe EX3DV4	SN 3617	31-Mar-23(CTTL-SPEAG,No.Z23-60161)	Mar-24
DAE4	SN 1556	11-Jan-23(CTTL-SPEAG,No.Z23-60034)	Jan-24
Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	05-Jan-23 (CTTL, No. J23X00107)	Jan-24
Network Analyzer E5071C	MY46110673	10-Jan-23 (CTTL, No. J23X00104)	Jan-24
Calibrated by:	Name Zhao Jing	Function SAR Test Engineer	Signature 
Reviewed by:	Name Lin Hao	Function SAR Test Engineer	Signature 
Approved by:	Name Qi Dianyuan	Function SAR Project Leader	Signature 
Issued: May 30, 2023			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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>

**Glossary:**

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
N/A	not applicable or not measured

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

- IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

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%.