

## ANNEX F System Validation

The SAR system must be validated against its performance specifications before it is deployed. When SAR probes, system components or software are changed, upgraded or recalibrated, these must be validated with the SAR system(s) that operates with such components.

Probe SN.	Liquid name	Validation date	Frequency point	Status (OK or Not)			
3846	Head 750MHz	July 20,2024	750MHz	ОК			
3846	Head 900MHz	July 20,2024	900MHz	ОК			
3846	Head 1450MHz	July 20,2024	1450MHz	OK			
3846	Head 1750MHz	July 20,2024	1750MHz	ОК			
3846	Head 1900MHz	July 20,2024	1900MHz	ОК			
3846	Head 2100MHz	July 21,2024	2100MHz	OK			
3846	Head 2300MHz	July 21,2024	2300MHz	ОК			
3846	Head 2450MHz	July 21,2024	2450MHz	OK			
3846	Head 2600MHz	July 21,2024	2600MHz	OK			
3846	Head 3300MHz	July 22,2024	3300MHz	OK			
3846	Head 3500MHz	July 22,2024	3500MHz	OK			
3846	Head 3700MHz	July 22,2024	3700MHz	OK			
3846	Head 3900MHz	July 22,2024	3900MHz	ОК			
3846	Head 4100MHz	July 22,2024	4100MHz	ОК			
3846	Head 4200MHz	July 22,2024	4200MHz	OK			
3846	Head 4400MHz	July 22,2024	4400MHz	ОК			
3846	Head 4600MHz	July 22,2024	4600MHz	ОК			
3846	Head 4800MHz	July 22,2024	4800MHz	ОК			
3846	Head 4950MHz	July 22,2024	4950MHz	ОК			
3846	Head 5250MHz	July 23,2024	5250MHz	OK			
3846	Head 5600MHz	July 23,2024	5600MHz	OK			
3846	Head 5750MHz	July 23,2024	5750MHz	OK			

#### Table F.1: System Validation for 3846

#### Table F.1: System Validation for 7673

Probe SN.	Liquid name	Validation date	Frequency point	Status (OK or Not)
7673	Head 750MHz	July.30,2024	750 MHz	OK
7673	Head 900MHz	July.30,2024	900 MHz	OK
7673	Head 1750MHz	July.30,2024	1750 MHz	OK
7673	Head 1900MHz	July.30,2024	1900 MHz	OK
7673	Head 2000MHz	July.30,2024	2000 MHz	OK
7673	Head 2300MHz	July.30,2024	2300 MHz	OK
7673	Head 2450MHz	July.30,2024	2450 MHz	OK
7673	Head 2600MHz	July.30,2024	2600 MHz	OK
7673	Head 3500MHz	July.30,2024	3500 MHz	OK
7673	Head 3700MHz	July.30,2024	3700 MHz	OK
7673	Head 5250MHz	July.30,2024	5250 MHz	OK
7673	Head 5600MHz	July.30,2024	5600 MHz	OK
7673	Head 5750MHz	July.30,2024	5750 MHz	OK





## ANNEX G Probe Calibration Certificate

### Probe 3846 Calibration Certificate

LABORATORY	Hac-MR		下互认
d, Haidian District, Beijing, 1	00191, China		BRATION S L0570
http://www.caict.ac.cn			
Part and an and	Cer	tificate No: 24J0	2Z000266
RTIFICATE			
EX3DV4 - SN :	3846		
FE-711-004-02			
	cedures for Dosimetric	E-field Probes	
June 19, 2024			
ents the traceability to natio	nal standards which realize	e the physical units of m	easurements/SI) The
	Calibrated by Certificate	No.) Scheduled Calibr	ation
1		.,	Oct-24
Contraction and Contraction an			Oct-24
			Oct-24
			Jan-25
18N50W-20dB	19-Jan-23(CTTL, No.J23)	X00211)	Jan-25
SN 7464			Jan-25
SN 1555	24-Aug-23(SPEAG, No.D	AE4-1555_Aug23)	Aug-24
ID #	Cal Date(Calibrated by, C	Certificate No.) Sch	eduled Calibration
6201052605			Jun-25
181-33A6D0700-1959	26-Mar-24(CTTL, No.24J	02X002468)	Mar-25
MY46110673	25-Dec-23(CTTL, No.J23	X13425)	Dec-24
BT0520	11-May-23(CTTL, No.J23	3X04061)	May-25
BT0267	11-May-23(CTTL, No.J23	3X04062)	May-25
SN 1174	25-Oct-23(SPEAG, No.O	CP-DAK12-1174_Oct23)	Oct-24
me Funct	ion	Signature	
Yu Zongying SAF	R Test Engineer	15 tet	2
		ALE ALE	
Lin Jun SAR	Test Engineer	-WR	函 ·
			No. of Concession, Name
			rix 1
Qi Dianyuan SAF	R Project Leader	Geb	5
	http://www.caict.ac.en         RTIFICATE         EX3DV4 - SN :         FF-Z11-004-02         Calibration Prov         June 19, 2024         ents the traceability to nation         es with confidence probabilitied in the closed laboratory         critical for calibration         ID #       Cal Date         106277         104291         104292         18N50W-10dB         18N50W-20dB         SN 7464         SN 7464         SN 1555         ID #         6201052605         181-33A6D0700-1959         MY46110673         BT0520         BT0267         SN 1174	e       a       g         NABORATORY       A. Haidian District, Beijing, 100191, China       Interpretain the construction of the constructin on the construction of the constructing the constru	A Haidian District, Beijing, 100191, China http://www.caict.ac.en Certificate No: 24JC RTIFICATE EX3DV4 - SN : 3846 FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes June 19, 2024 ents the traceability to national standards, which realize the physical units of me es with confidence probability are given on the following pages and are part of ead in the closed laboratory facility: environment temperature(22±3)*C and humite Ertical for calibration) D# Cal Date(Calibrated by, Certificate No.) Scheduled Calibr 106277 19-Oct-23(CTTL, No.J23X11026) 104291 19-Oct-23(CTTL, No.J23X11026) 104292 19-Oct-23(CTTL, No.J23X11026) 104292 19-Oct-23(CTTL, No.J23X11026) 104292 19-Oct-23(CTTL, No.J23X11026) 104292 19-Oct-23(CTTL, No.J23X11026) 104292 19-Oct-23(CTTL, No.J23X11026) 104292 19-Oct-23(CTTL, No.J23X1026) 18N50W-10dB 19-Jan-23(CTTL, No.J23X00212) 18N50W-20dB 19-Jan-23(CTTL, No.J23X00211) SN 7464 22-Jan-24(SPEAG, No.DEX-1764, Jan24) SN 1555 24-Aug-23(SPEAG, No.DEX-1555_Aug23) ID # Cal Date(Calibrated by, Certificate No.) Scheduled Calibr 6201052605 12-Jun-24(CTTL, No.J23X00211) SN 7464 22-Jan-24(SPEAG, No.DEX-1555_Aug23) ID # Cal Date(Calibrated by, Certificate No.) Scheduled 6201052605 12-Jun-24(CTTL, No.J23X00211) SN 7464 22-Jan-24(SPEAG, No.DEX-1565_Aug23) ID # Cal Date(Calibrated by, Certificate No.) Scheduled 6201052605 12-Jun-24(CTTL, No.J23X00216) 181-33A6D0700-1959 26-Mar-24(CTTL, No.J23X00202468) MY46110673 25-Dec-23(CTTL, No.J23X04061) BT0520 11-May-23(CTTL, No.J23X04061) BT0520 11-May-23(CTTL, No.J23X04062) SN 1174 25-Oct-23(SPEAG, No.OCP-DAK12-1174_Oct23) me Function Signature

Certificate No: 24J02Z000266

Page 1 of 9









#### Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i
	$\theta=0$ is normal to probe axis

Connector Angle information used in DASY system to align probe sensor X to the robot coordinate system Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

- Methods Applied and Interpretation of Parameters:
- NORMx,y,z: Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)x,y,z = NORMx,y,z\* 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.
- DCPx, y, z: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- Ax, y, z; Bx, y, z; Cx, y, z; VRx, y, z: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z\* 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±50MHz to±100MHz.
- 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.
- Connector Angle: The angle is assessed using the information gained by determining the NORMx (no uncertainty required).

Certificate No:24J02Z000266

Page 2 of 9









## DASY/EASY – Parameters of Probe: EX3DV4 – SN:3846

### **Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(µV/(V/m) <sup>2</sup> ) <sup>A</sup>	0.39	0.47	0.48	±10.0%
DCP(mV) <sup>B</sup>	100.4	101.0	102.4	

### **Modulation Calibration Parameters**

UID	Communication System Name		A dB	B dBõV	C	D dB	VR mV	Unc <sup>E</sup> ( <i>k</i> =2)
0 CW	CW	X	0.0	0.0	1.0	0.00	153.1	±2.0%
		Y	0.0	0.0	1.0		174.2	
		Z	0.0	0.0	1.0		173.4	

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%.

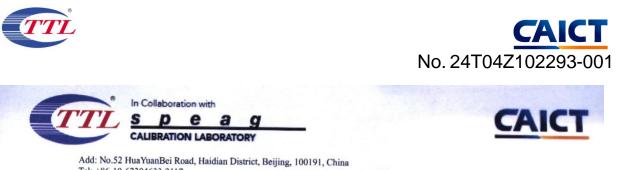
<sup>A</sup> The uncertainties of Norm X, Y, Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 4).

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

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

Certificate No:24J02Z000266

Page 3 of 9



### DASY/EASY – 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 (S/m) <sup>F</sup>	ConvEX ConvEY C		ConvF Z	Alpha <sup>G</sup>	Depth <sup>G</sup> (mm)	Unct. (k=2)	
750	41.9	0.89	9.89	9.89	9.89	0.20	1.25	±12.7%	
900	41.5	0.97	9.38	9.38	9.38	0.15	1.49	±12.7%	
1450	40.5	1.20	8.62	8.62	8.62	0.17	1.16	±12.7%	
1750	40.1	1.37	8.25	8.25	8.25	0.29	0.99	±12.7%	
1900	40.0	1.40	7.95	7.95	7.95	0.28	1.10	±12.7%	
2100	39.8	1.49	7.80	7.80	7.80	0.25	1.09	±12.7%	
2300	39.5	1.67	7.69	7.69	7.69	0.66	0.69	±12.7%	
2450	39.2	1.80	7.43	7.43	7.43	0.66	0.70	±12.7%	
2600	39.0	1.96	7.28	7.28	7.28	0.66	0.70	±12.7%	
3300	38.2	2.71	6.96	6.96	6.96	0.54	0.88	±13.9%	
3500	37.9	2.91	6.81	6.81	6.81	0.44	1.05	±13.9%	
3700	37.7	3.12	6.71	6.71	6.71	0.46	1.05	±13.9%	
3900	37.5	3.32	6.65	6.65	6.65	0.40	1.25	±13.9%	
4100	37.2	3.53	6.57	6.57	6.57	0.35	1.30	±13.9%	
4200	37.1	3.63	6.45	6.45	6.45	0.35	1.35	±13.9%	
4400	36.9	3.84	6.37	6.37	6.37	0.40	1.25	±13.9%	
4600	36.7	4.04	6.33	6.33	6.33	0.45	1.27	±13.9%	
4800	36.4	4.25	6.26	6.26	6.26	0.45	1.25	±13.9%	
4950	36.3	4.40	6.05	6.05	6.05	0.50	1.19	±13.9%	
5250	35.9	4.71	5.45	5.45	5.45	0.45	1.40	±13.9%	
5600	35.5	5.07	4.75	4.75	4.75	0.55	1.20	±13.9%	
5750	35.4	5.22	4.90	4.90	4.90	0.50	1.30	±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.

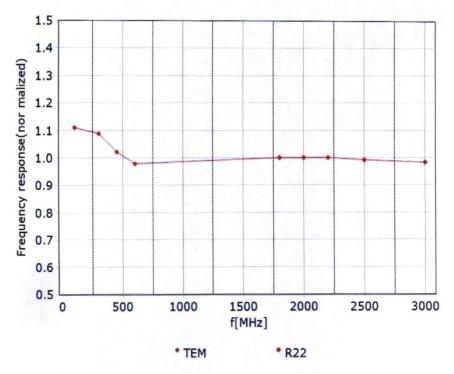
<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than  $\pm$  1% for frequencies below 3 GHz and below  $\pm$  2% for the frequencies between 3-6 GHz at any distance larger than half the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

Certificate No:24J02Z000266

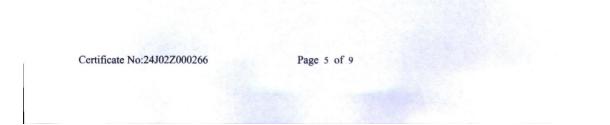
Page 4 of 9



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



Uncertainty of Frequency Response of E-field: ±7.4% (k=2)







0\*

330\*

0.8



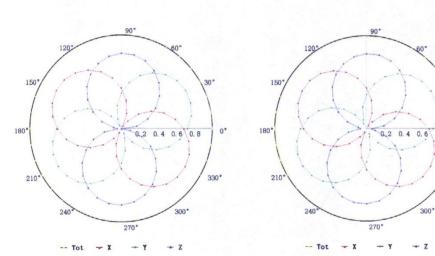


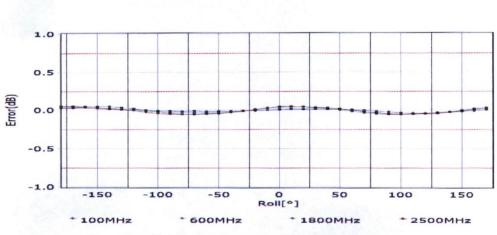
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2117 E-mail: emf@caict.ac.cn http://www.caict.ac.cn

# Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM

f=1800 MHz, R22

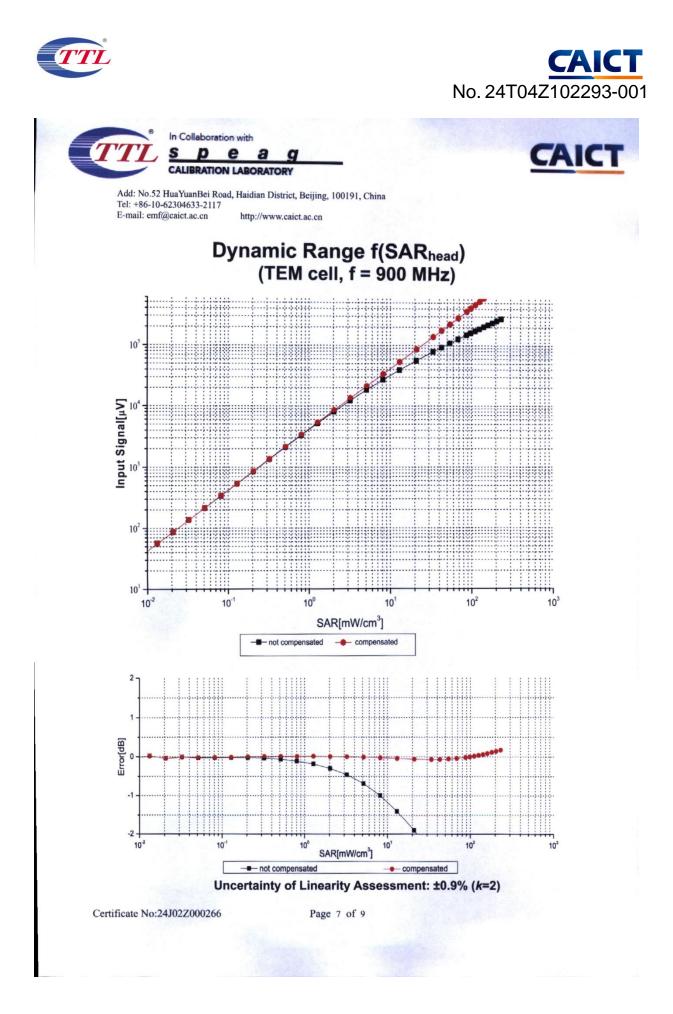




Uncertainty of Axial Isotropy Assessment: ±1.2% (k=2)

Certificate No:24J02Z000266

Page 6 of 9





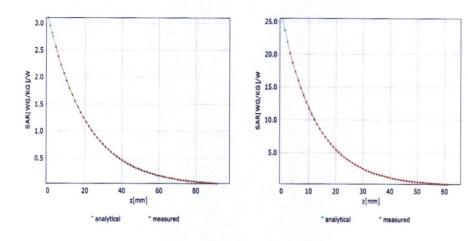




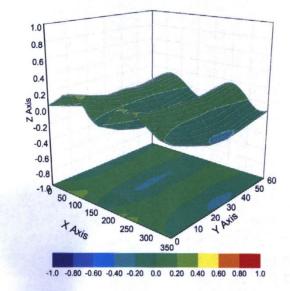
# **Conversion Factor Assessment**

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

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



# **Deviation from Isotropy in Liquid**



#### Uncertainty of Spherical Isotropy Assessment: ±3.2% (k=2)

Certificate No:24J02Z000266

Page 8 of 9

©Copyright. All rights reserved by CTTL.









### DASY/EASY – Parameters of Probe: EX3DV4 – SN:3846

#### **Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	16.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

Certificate No:24J02Z000266

Page 9 of 9





### Probe 7673 Calibration Certificate

Add: No.52 HuaYuanBei Ro Tel: +86-10-62304633-2117 E-mail: emf@caict.ac.cn	http://www.caict.ac.cn	100191, China	IBRATION As L0570				
Client CTTL		Certificate No: 24J	02Z000429				
CALIBRATION CI	EDTIEICATE						
CALIBRATION CI	EKTIFICATE						
Ohiast	Number of Street						
Object	EX3DV4 - SN	: 7673					
Calibration Procedure(s)							
	FF-Z11-004-02						
	Calibration Procedures for Dosimetric E-field Probes						
Calibration date:	July 29, 2024	Construction of the second second					
This calibration Certificate docur	ments the traceability to nation	onal standards, which realize the physical units of m	easurements(SI). The				
measurements and the uncertain	nties with confidence probab	pility are given on the following pages and are part of	f the certificate.				
All calibrations have been condu	icted in the closed laborator	y facility: environment temperature(22±3)°C and humi	dity<70%.				
Calibration Equipment used (M&	TE critical for calibration)						
Primary Standards	ID # Cal Dat	te(Calibrated by, Certificate No.) Scheduled Calib	ration				
Power Meter NRP2	106277	19-Oct-23(CTTL, No.J23X11026)	Oct-24				
Power sensor NRP8S	104291	19-Oct-23(CTTL, No.J23X11026)	Oct-24				
Power sensor NRP8S	104292	19-Oct-23(CTTL, No.J23X11026)	Oct-24				
Reference 10dBAttenuator	18N50W-10dB	19-Jan-23(CTTL, No.J23X00212)	Jan-25				
Relefence ToubAllenualoi							
Reference 20dBAttenuator	18N50W-20dB	19-Jan-23(CTTL, No.J23X00211)	Jan-25				
	18N50W-20dB SN 7307	19-Jan-23(CTTL, No.J23X00211) 28-May-24(SPEAG, No.EX-7307_May24)	Jan-25 May-25				
Reference 20dBAttenuator							
Reference 20dBAttenuator Reference Probe EX3DV4	SN 7307	28-May-24(SPEAG, No.EX-7307_May24) 24-Aug-23(SPEAG, No.DAE4-1555_Aug23)	May-25				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4	SN 7307 SN 1555	28-May-24(SPEAG, No.EX-7307_May24) 24-Aug-23(SPEAG, No.DAE4-1555_Aug23)	May-25 Aug-24				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards	SN 7307 SN 1555 ID #	28-May-24(SPEAG, No.EX-7307_May24)         24-Aug-23(SPEAG, No.DAE4-1555_Aug23)         Cal Date(Calibrated by, Certificate No.)         Sch	May-25 Aug-24 reduled Calibration				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards SignalGenerator MG3700A	SN 7307 SN 1555 ID # 6201052605	28-May-24(SPEAG, No.EX-7307_May24)         24-Aug-23(SPEAG, No.DAE4-1555_Aug23)         Cal Date(Calibrated by, Certificate No.)         Sch         12-Jun-24(CTTL, No.24J02X005419)	May-25 Aug-24 reduled Calibration Jun-25				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards SignalGenerator MG3700A SignalGenerator APSIN26G	SN 7307 SN 1555 ID # 6201052605 181-33A6D0700-1959	28-May-24(SPEAG, No.EX-7307_May24)           24-Aug-23(SPEAG, No.DAE4-1555_Aug23)           Cal Date(Calibrated by, Certificate No.)           Sch           12-Jun-24(CTTL, No.24J02X005419)           26-Mar-24(CTTL, No.24J02X002468)	May-25 Aug-24 eduled Calibration Jun-25 Mar-25				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards SignalGenerator MG3700A SignalGenerator APSIN26G Network Analyzer E5071C Reference 10dBAttenuator Reference 20dBAttenuator	SN 7307 SN 1555 ID # 6201052605 181-33A6D0700-1959 MY46110673 BT0520 BT0267	28-May-24(SPEAG, No.EX-7307_May24)         24-Aug-23(SPEAG, No.DAE4-1555_Aug23)         Cal Date(Calibrated by, Certificate No.)       Sch         12-Jun-24(CTTL, No.24J02X005419)       26-Mar-24(CTTL, No.24J02X002468)         25-Dec-23(CTTL, No.J23X13425)       11-May-23(CTTL, No.J23X04061)         11-May-23(CTTL, No.J23X04062)	May-25 Aug-24 eduled Calibration Jun-25 Mar-25 Dec-24 May-25 May-25				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards SignalGenerator MG3700A SignalGenerator APSIN26G Network Analyzer E5071C Reference 10dBAttenuator Reference 20dBAttenuator OCP DAK-12	SN 7307 SN 1555 ID # 6201052605 181-33A6D0700-1959 MY46110673 BT0520 BT0267 SN 1174	28-May-24(SPEAG, No.EX-7307_May24)         24-Aug-23(SPEAG, No.DAE4-1555_Aug23)         Cal Date(Calibrated by, Certificate No.)       Sch         12-Jun-24(CTTL, No.24J02X005419)       26-Mar-24(CTTL, No.24J02X002468)         25-Dec-23(CTTL, No.J23X13425)       11-May-23(CTTL, No.J23X04061)         11-May-23(CTTL, No.J23X04062)       25-Oct-23(SPEAG, No.OCP-DAK12-1174_Oct23)	May-25 Aug-24 eduled Calibration Jun-25 Mar-25 Dec-24 May-25 May-25				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards SignalGenerator MG3700A SignalGenerator APSIN266 Network Analyzer E5071C Reference 10dBAttenuator Reference 20dBAttenuator OCP DAK-12	SN 7307 SN 1555 ID # 6201052605 181-33A6D0700-1959 MY46110673 BT0520 BT0267	28-May-24(SPEAG, No.EX-7307_May24)         24-Aug-23(SPEAG, No.DAE4-1555_Aug23)         Cal Date(Calibrated by, Certificate No.)       Sch         12-Jun-24(CTTL, No.24J02X005419)       26-Mar-24(CTTL, No.24J02X002468)         25-Dec-23(CTTL, No.J23X13425)       11-May-23(CTTL, No.J23X04061)         11-May-23(CTTL, No.J23X04062)       25-Oct-23(SPEAG, No.OCP-DAK12-1174_Oct23)	May-25 Aug-24 eduled Calibration Jun-25 Mar-25 Dec-24 May-25 May-25				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards SignalGenerator MG3700A SignalGenerator APSIN26G Network Analyzer E5071C Reference 10dBAttenuator Reference 20dBAttenuator OCP DAK-12	SN 7307 SN 1555 ID # 6201052605 181-33A6D0700-1959 MY46110673 BT0520 BT0267 SN 1174 Iame Func	28-May-24(SPEAG, No.EX-7307_May24)         24-Aug-23(SPEAG, No.DAE4-1555_Aug23)         Cal Date(Calibrated by, Certificate No.)       Sch         12-Jun-24(CTTL, No.24J02X005419)       26-Mar-24(CTTL, No.24J02X002468)         25-Dec-23(CTTL, No.J23X13425)       11-May-23(CTTL, No.J23X04061)         11-May-23(CTTL, No.J23X04062)       25-Oct-23(SPEAG, No.OCP-DAK12-1174_Oct23)	May-25 Aug-24 eduled Calibration Jun-25 Mar-25 Dec-24 May-25 May-25				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards SignalGenerator MG3700A SignalGenerator APSIN26G Network Analyzer E5071C Reference 10dBAttenuator Reference 20dBAttenuator OCP DAK-12	SN 7307           SN 1555           ID #           6201052605           181-33A6D0700-1959           MY46110673           BT0520           BT0267           SN 1174           Iame         Func           Yu Zongying         SA	28-May-24(SPEAG, No.EX-7307_May24)           24-Aug-23(SPEAG, No.DAE4-1555_Aug23)           Cal Date(Calibrated by, Certificate No.)         Sch           12-Jun-24(CTTL, No.24J02X005419)         Sch           26-Mar-24(CTTL, No.24J02X002468)         25-Dec-23(CTTL, No.J23X13425)           11-May-23(CTTL, No.J23X04061)         11-May-23(CTTL, No.J23X04062)           25-Oct-23(SPEAG, No.OCP-DAK12-1174_Oct23)         Ctrastration           tion         Signature	May-25 Aug-24 eduled Calibration Jun-25 Mar-25 Dec-24 May-25 May-25				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards SignalGenerator MG3700A SignalGenerator APSIN26G Network Analyzer E5071C Reference 10dBAttenuator Reference 20dBAttenuator OCP DAK-12	SN 7307           SN 1555           ID #           6201052605           181-33A6D0700-1959           MY46110673           BT0520           BT0267           SN 1174           ame         Func           Yu Zongying         SA	28-May-24(SPEAG, No.EX-7307_May24)           24-Aug-23(SPEAG, No.DAE4-1555_Aug23)           Cal Date(Calibrated by, Certificate No.)         Sch           12-Jun-24(CTTL, No.24J02X005419)         Sch           26-Mar-24(CTTL, No.24J02X002468)         25-Dec-23(CTTL, No.J23X13425)           11-May-23(CTTL, No.J23X04061)         11-May-23(CTTL, No.J23X04062)           25-Oct-23(SPEAG, No.OCP-DAK12-1174_Oct23)         Ctrastration           tion         Signature	May-25 Aug-24 eduled Calibration Jun-25 Mar-25 Dec-24 May-25 May-25				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards SignalGenerator MG3700A SignalGenerator APSIN26G Network Analyzer E5071C Reference 10dBAttenuator Reference 20dBAttenuator OCP DAK-12 N Calibrated by:	SN 7307           SN 1555           ID #           6201052605           181-33A6D0700-1959           MY46110673           BT0520           BT0267           SN 1174           Iame         Func           Yu Zongying         SA           Lin Jun         SAF	28-May-24(SPEAG, No.EX-7307_May24)         24-Aug-23(SPEAG, No.DAE4-1555_Aug23)         Cal Date(Calibrated by, Certificate No.)       Sch         12-Jun-24(CTTL, No.24J02X005419)         26-Mar-24(CTTL, No.24J02X002468)         25-Dec-23(CTTL, No.J23X13425)         11-May-23(CTTL, No.J23X04061)         11-May-23(CTTL, No.J23X04062)         25-Oct-23(SPEAG, No.OCP-DAK12-1174_Oct23)         ction       Signature         R Test Engineer         R Test Engineer	May-25 Aug-24 eduled Calibration Jun-25 Mar-25 Dec-24 May-25 May-25				
Reference 20dBAttenuator Reference Probe EX3DV4 DAE4 Secondary Standards SignalGenerator MG3700A SignalGenerator APSIN26G Network Analyzer E5071C Reference 10dBAttenuator Reference 20dBAttenuator OCP DAK-12	SN 7307           SN 1555           ID #           6201052605           181-33A6D0700-1959           MY46110673           BT0520           BT0267           SN 1174           Iame         Func           Yu Zongying         SA           Lin Jun         SAF	28-May-24(SPEAG, No.EX-7307_May24)         24-Aug-23(SPEAG, No.DAE4-1555_Aug23)         Cal Date(Calibrated by, Certificate No.)       Sch         12-Jun-24(CTTL, No.24J02X005419)       26-Mar-24(CTTL, No.24J02X002468)         25-Dec-23(CTTL, No.23X13425)       11-May-23(CTTL, No.J23X04061)         11-May-23(CTTL, No.J23X04062)       25-Oct-23(SPEAG, No.OCP-DAK12-1174_Oct23)         tion       Signature         R Test Engineer       24-Aug-23	May-25 Aug-24 eduled Calibration Jun-25 Mar-25 Dec-24 May-25 May-25				

Certificate No: 24J02Z000429

Page 1 of 9



		No. 24T04Z102293-007
•	In Collaboration with	
TTL	spea	
	CALIBRATION LABORATO	
Add: No.52	HuaYuanBei Road, Haidian Dis	trict, Beijing, 100191, China
E-mail: emf(	62304633-2117 @caict.ac.cn http://www	.caict.ac.cn
Glossary:		
TSL	tissue simulating liquid	
NORMx,y,z	sensitivity in free space	
ConvF	sensitivity in TSL / NO	
CF	diode compression po crest factor (1/duty_cy	
A,B,C,D		t linearization parameters
Polarization Φ	Φ rotation around prol	
Polarization 0		ixis that is in the plane normal to probe axis (at measurement center),
Stanzation V	$\theta=0$ is normal to probe	
Connector Angle	information used in D/	ASY system to align probe sensor X to the robot coordinate system
Calibration is I	Performed According	g to the Following Standards:
a) IEEE Std 152	28-2013, "IEEE Recom	mended Practice for Determining the Peak Spatial-Averaged
		the Human Head from Wireless Communications Devices:
	Techniques", June 2013	
		re for the assessment of Specific Absorption Rate (SAR) from
	body-mounted devices	used next to the ear (frequency range of 300 MHz to 6 GHz)",
July 2016		the Constitute Absorption Date (CAD) for windows communication
) IEC 62209-2,	Procedure to determine	the Specific Absorption Rate (SAR) for wireless communication
	in close proximity to the	e human body (frequency range of 30 MHz to 6 GHz)", March
2010	SAP Moscurement Po	quirements for 100 MHz to 6 GHz"
	ed and Interpretation	
NOPMY V7	Accorded for E field pol	arization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide).
NORMX, y, Z.	are only intermediate va	lues, i.e., the uncertainties of NORMx,y,z does not effect the
	ertainty inside TSL (see	ncy_response (see Frequency Response Chart). This
NORM(f)x,y,	is implemented in DAS	Y4 software versions later than 4.2. The uncertainty of the
frequency ro	sponse is included in th	e stated uncertainty of ConvF.
DCPx.v.z: D	CP are numerical lineari	zation parameters assessed based on the data of power sweep
(no uncertair	nty required). DCP does	not depend on frequency nor media.
		atio that is not calibrated but determined based on the signal
characteristi	CS.	
Ax, y, z; Bx, y,	z; Cx,y,z;VRx,y,z:A,B,C	are numerical linearization parameters assessed based on the
		dulation signal. The parameters do not depend on frequency nor
		on range expressed in RMS voltage across the diode.
		ters: Assessed in flat phantom using E-field (or Temperature
		d inside waveguide using analytical field distributions based on
power meas	urements for f >800MHz	z. The same setups are used for assessment of the parameters
		(alpha, depth) of which typical uncertainty valued are given.
		Y4 software to improve probe accuracy close to the boundary.
		o NORMx,y,z* ConvF whereby the uncertainty corresponds to
	ding the validity from±5	pendent ConvF is used in DASY version 4.4 and higher which
		<i>n isotropy):</i> in a field of low gradients realized using a flat
	bosed by a patch antenr	
		responds to the offset of virtual measurement center from the
	probe axis). No toleran	
		ssed using the information gained by determining the NORMx
	nty required).	
Certificate No:24	4J02Z000429	Page 2 of 9

©Copyright. All rights reserved by CTTL.

CAICT









## DASY/EASY – Parameters of Probe: EX3DV4 – SN:7673

### **Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(µV/(V/m) <sup>2</sup> ) <sup>A</sup>	0.62	0.63	0.60	±10.0%
DCP(mV) <sup>B</sup>	109.4	111.6	108.0	

### **Modulation Calibration Parameters**

UID	Communication System Name		A dB	B dBõV	c	D dB	VR mV	Unc <sup>E</sup> ( <i>k</i> =2)
0 CW	CW	X	0.0	0.0	1.0	0.00	214.8	±2.1%
		Y	0.0	0.0	1.0		218.1	
		Z	0.0	0.0	1.0		207.9	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 Page 4).

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

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

Certificate No:24J02Z000429

Page 3 of 9









## DASY/EASY – Parameters of Probe: EX3DV4 – SN:7673

### 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. ( <i>k</i> =2)
750	41.9	0.89	10.45	10.45	10.45	0.23	1.09	±12.7%
900	41.5	0.97	10.03	10.03	10.03	0.21	1.24	±12.7%
1450	40.5	1.20	8.74	8.74	8.74	0.18	1.04	±12.7%
1750	40.1	1.37	8.45	8.45	8.45	0.25	1.02	±12.7%
1900	40.0	1.40	8.10	8.10	8.10	0.25	1.04	±12.7%
2000	40.0	1.40	8.15	8.15	8.15	0.26	1.05	±12.7%
2300	39.5	1.67	7.85	7.85	7.85	0.58	0.69	±12.7%
2450	39.2	1.80	7.60	7.60	7.60	0.57	0.71	±12.7%
2600	39.0	1.96	7.44	7.44	7.44	0.64	0.67	±12.7%
3300	38.2	2.71	6.93	6.93	6.93	0.47	0.88	±13.9%
3500	37.9	2.91	6.73	6.73	6.73	0.45	1.00	±13.9%
3700	37.7	3.12	6.48	6.48	6.48	0.35	1.20	±13.9%
3900	37.5	3.32	6.44	6.44	6.44	0.30	1.52	±13.99
4100	37.2	3.53	6.43	6.43	6.43	0.35	1.25	±13.9%
4200	37.1	3.63	6.33	6.33	6.33	0.30	1.52	±13.99
4400	36.9	3.84	6.23	6.23	6.23	0.30	1.52	±13.9%
4600	36.7	4.04	6.18	6.18	6.18	0.35	1.40	±13.99
4800	36.4	4.25	6.07	6.07	6.07	0.35	1.55	±13.99
4950	36.3	4.40	5.74	5.74	5.74	0.35	1.55	±13.9%
5250	35.9	4.71	5.18	5.18	5.18	0.40	1.52	±13.9%
5600	35.5	5.07	4.60	4.60	4.60	0.40	1.52	±13.9%
5750	35.4	5.22	4.71	4.71	4.71	0.40	1.55	±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 ( $\varepsilon$  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  $\pm$  1% for frequencies below 3 GHz and below  $\pm$  2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Certificate No:24J02Z000429

Page 4 of 9

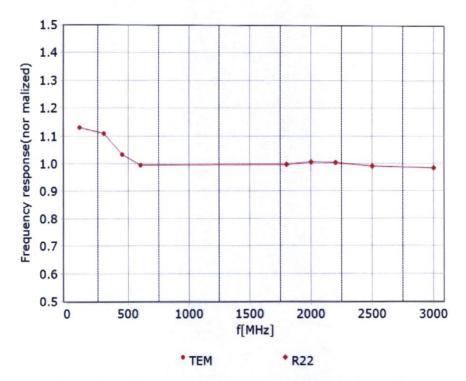








## Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



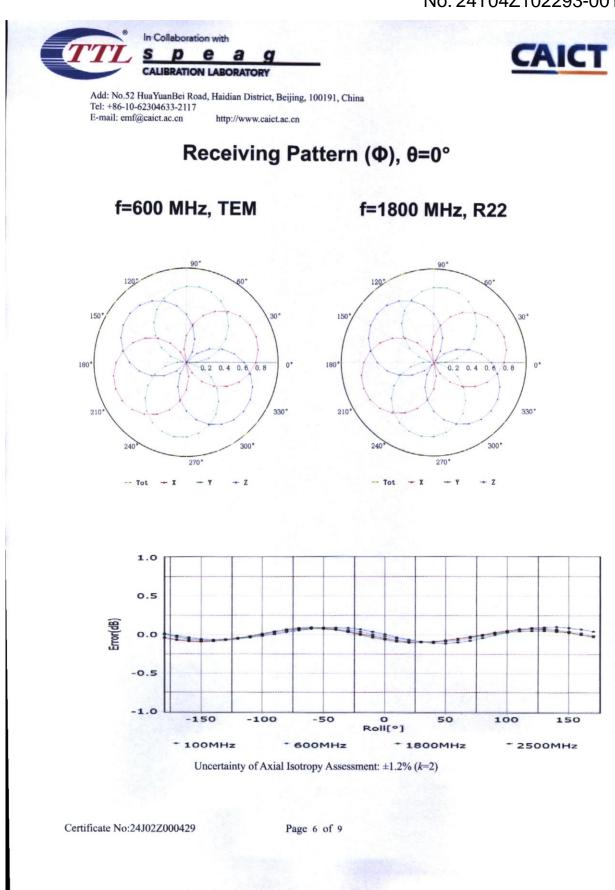
Uncertainty of Frequency Response of E-field: ±7.4% (k=2)

Certificate No:24J02Z000429

Page 5 of 9

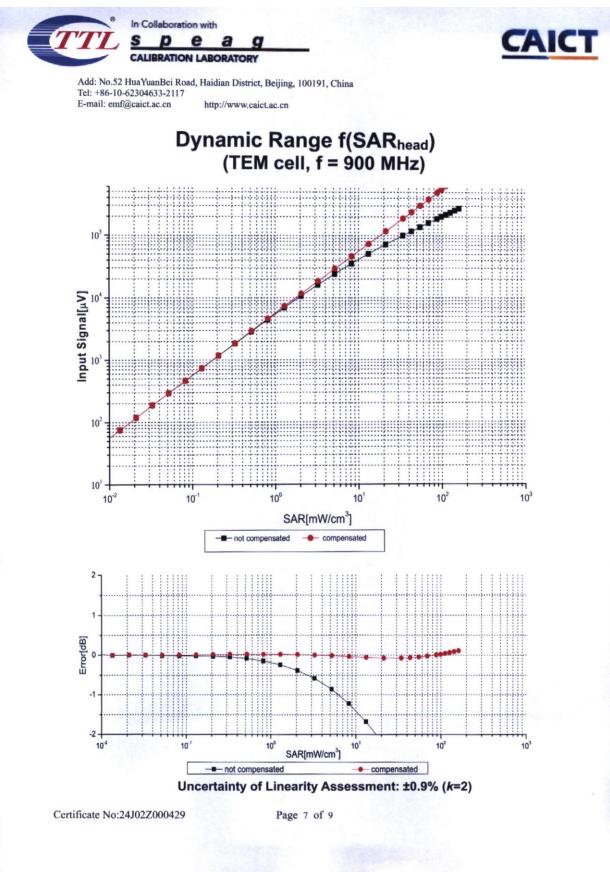












Page 86 of 138







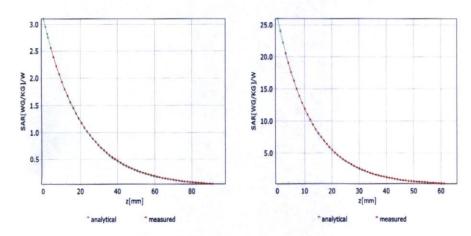
CAICT

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

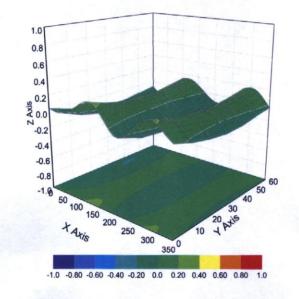
# **Conversion Factor Assessment**

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

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



# **Deviation from Isotropy in Liquid**



#### Uncertainty of Spherical Isotropy Assessment: ±3.2% (k=2)

Certificate No:24J02Z000429

Page 8 of 9

Page 87 of 138