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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 5200MHz

Impedance, transformed to feed point	57.4Ω- 4.44jΩ
Return Loss	- 21.9dB

Antenna Parameters with Head TSL at 5300MHz

Impedance, transformed to feed point	51.1Ω+ 2.19jΩ	
Return Loss	- 32.4dB	

Antenna Parameters with Head TSL at 5500MHz

Impedance, transformed to feed point	52.0Ω- 0.67jΩ
Return Loss	- 33.5dB

Antenna Parameters with Head TSL at 5600MHz

Impedance, transformed to feed point	56.1Ω+ 4.33jΩ	
Return Loss	- 23.1dB	

Antenna Parameters with Head TSL at 5800MHz

50.4Ω+ 5.52jΩ		
- 25.2dB		

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General Antenna Parameters and Design

The state of the s	1.167 ns
Electrical Delay (one direction)	

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manada of by	

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Date: 2022-09-16

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DASY5 Validation Report for Head TSL

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1190

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz,

Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: f = 5200 MHz; σ = 4.58 S/m; ϵ_r = 35.87; ρ = 1000 kg/m³ Medium parameters used: f = 5300 MHz; σ = 4.687 S/m; ϵ_r = 35.67; ρ = 1000 kg/m³ Medium parameters used: f = 5500 MHz; σ = 4.894 S/m; ϵ_r = 35.31; ρ = 1000 kg/m³ Medium parameters used: f = 5600 MHz; σ = 5 S/m; ϵ_r = 35.09; ρ = 1000 kg/m³

Medium parameters used: f = 5800 MHz; σ = 5.199 S/m; ϵ_r = 34.72; ρ = 1000 kg/m³

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Certificate No: Z22-60392

Probe: EX3DV4 - SN7464; ConvF(5.6, 5.6, 5.6) @ 5200 MHz; ConvF(5.32, 5.32, 5.32) @ 5300 MHz; ConvF(5.11, 5.11, 5.11) @ 5500 MHz; ConvF(4.91, 4.91, 4.91) @ 5600 MHz; ConvF(5, 5, 5) @ 5800 MHz; Calibrated: 2022-01-26

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1556; Calibrated: 2022-01-12

 Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062

DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration /Pin=100mW, d=10mm, f=5200 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 68.15 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 29.4 W/kg

SAR(1 g) = 7.66 W/kg; SAR(10 g) = 2.2 W/kg

Smallest distance from peaks to all points 3 dB below = 6.8 mm

Ratio of SAR at M2 to SAR at M1 = 66.5%

Maximum value of SAR (measured) = 18.1 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.15 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 31.5 W/kg

SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.29 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 65.7%

Maximum value of SAR (measured) = 18.9 W/kg

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Dipole Calibration /Pin=100mW, d=10mm, f=5500 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 69.71 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 35.8 W/kg

SAR(1 g) = 8.46 W/kg; SAR(10 g) = 2.4 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 63.7%

Maximum value of SAR (measured) = 20.7 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 68.27 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 34.8 W/kg

SAR(1 g) = 8.16 W/kg; SAR(10 g) = 2.35 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 63.3%

Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 62.89 V/m; Power Drift = -0.02 dB

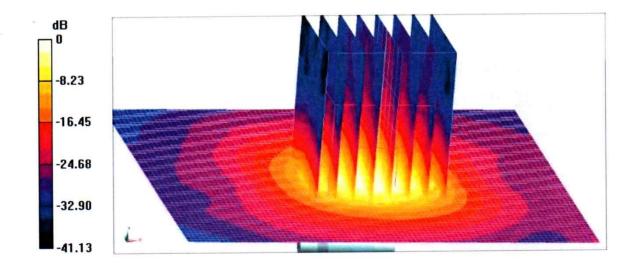
Peak SAR (extrapolated) = 35.3 W/kg

SAR(1 g) = 7.97 W/kg; SAR(10 g) = 2.28 W/kg

Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 61.4%

Maximum value of SAR (measured) = 19.6 W/kg



0 dB = 19.6 W/kg = 12.92 dBW/kg

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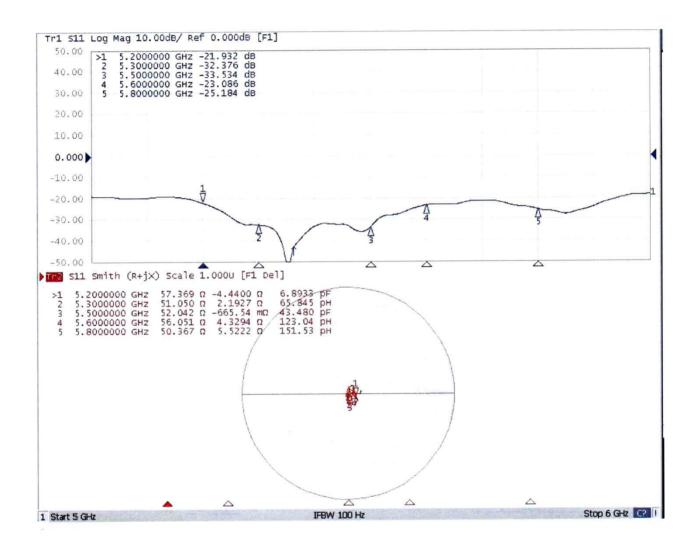


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Impedance Measurement Plot for Head TSL



Calibration Laboratory of Schmid & Partner

Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura

Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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Client

CTB

Certificate No

EX-7769_Sep10

CALIBRATION CERTIFICATE

Object

EX3DV4 - SN:7769

Calibration procedure(s)

QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v6, QA CAL-23.v5,

QA CAL-25.v7

Calibration procedure for dosimetric E-field probes

Calibration date

September 10, 2023

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.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3) °C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-23 (No. 217-03525/03524)	Apr-24
Power sensor NRP-Z91	SN: 103244	04-Apr-23 (No. 217-03524)	Apr-24
OCP DAK-3.5 (weighted)	SN: 1249	20-Oct-2:2 (OCP-DAK3.5-1249_Oct21)	Oct-23
OCP DAK-12	SN: 1016	20-Oct-22 (OCP-DAK12-1016_Oct21)	Oct-23
Reference 20 dB Attenuator	SN: CC2552 (20x)	04-Apr-23 (No. 217-03527)	Apr-24
DAE4	SN: 660	13-Oct-22 (No. DAE4-660_Oct21)	Oct-23
Reference Probe ES3DV2	SN: 3013	27-Dec-22 (No. ES3-3013_Dec21)	Dec-23

Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	ver meter E4419B SN: GB41293874 06-Apr-16 (in l		In house check: Jun-24
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-22)	In house check: Jun-24
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Name Function Signature

Calibrated by Jeffrey Katzman Laboratory Technician

Approved by Sven Kühn Technical Manager

Issued: September 12, 2023

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Calibration Laboratory of

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland





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Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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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 votation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ 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) 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-Worn Wireless Communication Devices – Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- b) 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 ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E²-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 with CW signal. 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; Dx,y,z; VRx,y,z: A, B, C, D 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 $f \le 800\,\text{MHz}$) and inside waveguide using analytical field distributions based on power measurements for $f > 800\,\text{MHz}$. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values 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 $\pm 50\,\text{MHz}$ to $\pm 100\,\text{MHz}$.
- 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).

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EX3DV4 - SN:7769 September 10, 2023

Parameters of Probe: EX3DV4 - SN:7769

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k = 2)
Norm $(\mu V/(V/m)^2)^A$	0.51	0.54	0.53	±10.1%
DCP (mV) B	100.5	104.8	103.6	±4.7%

Calibration Results for Modulation Response

UID	Communication System Name		A dB	$^{ m B}_{ m dB}\sqrt{\mu V}$	С	D dB	VR mV	Max dev.	Max Unc ^E k = 2
0	CW	Х	0.00	0.00	1.00	0.00	147.8	±2.7%	±4.7%
		Υ	0.00	0.00	1.00		154.6		
1		Z	0.00	0.00	1.00		156.3		

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 E²-field uncertainty inside TSL (see Page 5).

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

EX3DV4 - SN:7769 September 10, 2023

Parameters of Probe: EX3DV4 - SN:7769

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle	129.9°
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.

Certificate No: EX-7769_Sep10 Page 4 of 9

EX3DV4 - SN:7769 September 10, 2023

Parameters of Probe: EX3DV4 - SN:7769

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity ^F (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k = 2)
750	41.9	0.89	10.96	10.96	10.96	0.31	0.80	±12.0%
2450	39.2	1.80	7.70	7.70	7.70	0.27	0.90	±12.0%
5250	35.9	4.71	5.35	5.35	5.35	0.40	1.80	±13.1%
5600	35.5	5.07	4.65	4.65	4.65	0.40	1.80	±13.1%
5750	35.4	5.22	4.85	4.85	4.85	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. 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 and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency validity and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency validity and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency validity and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency validity and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency validity and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency validity and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency validity and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency validity and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency validity and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency validity and the second of the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency and the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency and the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency and the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency and the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency and the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency and the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency and the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency and the convF assessed at 6 MHz is 4–9 MHz. Above 5 GHz frequency and the convF assessed at 6 MHz

Certificate No: EX-7769_ Sep10 Pa

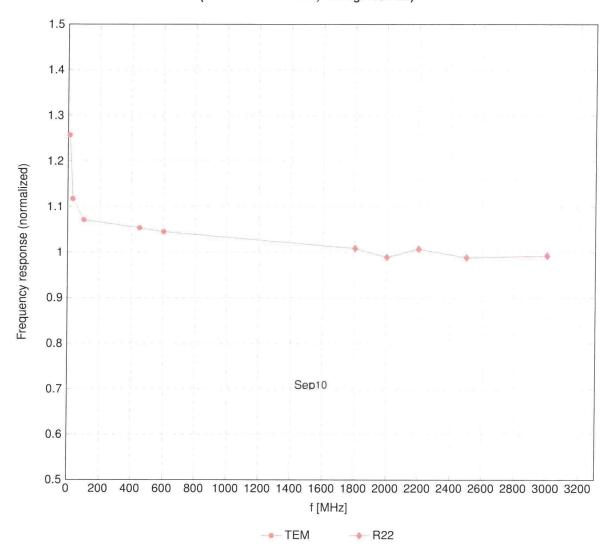
F At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to $\pm 10\%$ if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to $\pm 5\%$. The uncertainty is the RSS of the 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.

EX3DV4 - SN:7769 September 20, 2022

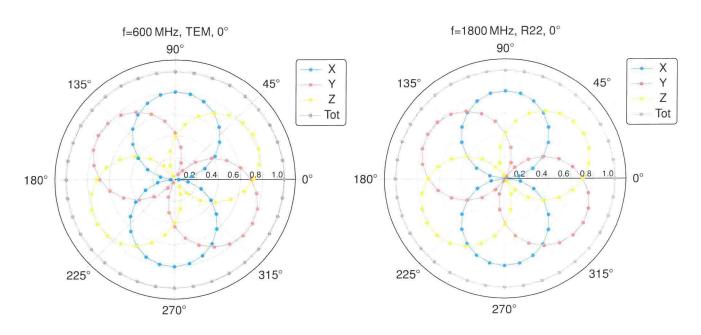
Frequency Response of E-Field

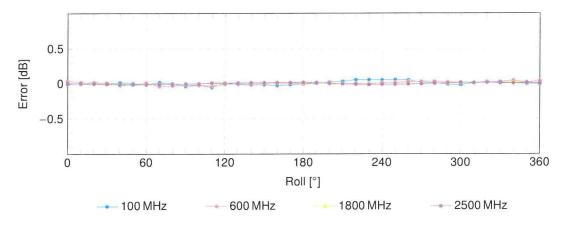
(TEM-Cell:ifi110 EXX, Waveguide:R22)



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

Receiving Pattern (ϕ), $\theta = 0^{\circ}$



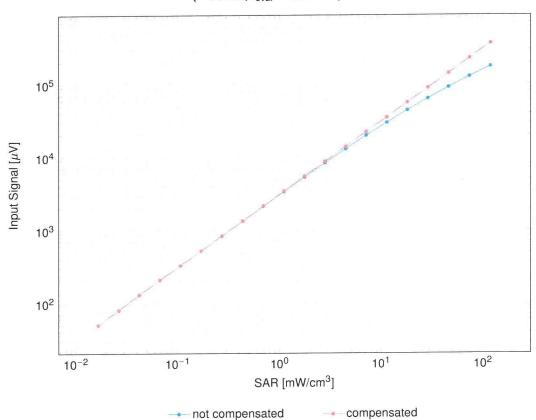


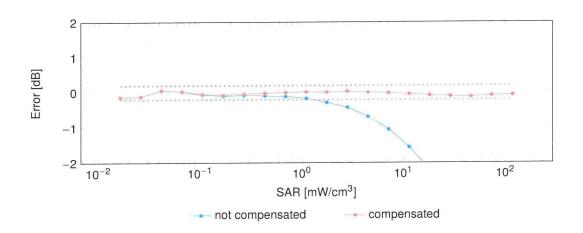
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

EX3DV4 - SN:7769 September 10, 2023

Dynamic Range f(SAR_{head})

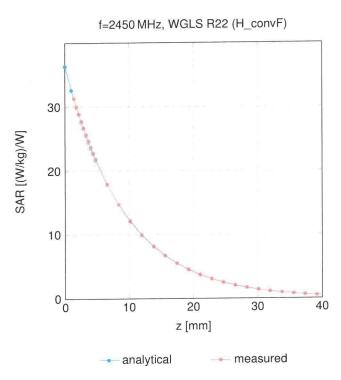
(TEM cell, $f_{eval} = 1900\,\text{MHz})$



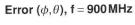


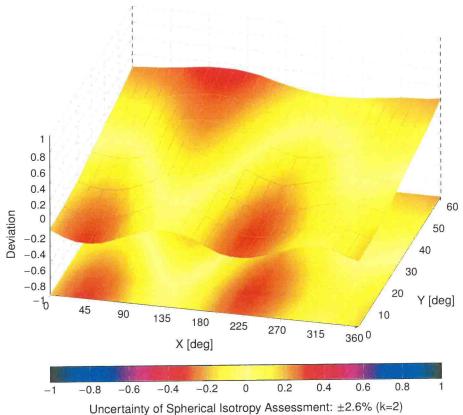
Uncertainty of Linearity Assessment: ±0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid







In Collaboration with

Fax: +86-10-62304633-2504

http://www.chinattl.cn



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2079 E-mail: cttl@chinattl.com

> **Certificate No:** Z23-60014

CALIBRATION CERTIFICATE

CTB

Object

D2600V2 - SN: 1101

Calibration Procedure(s)

Client

FF-Z11-003-01

Calibration Procedures for dipole validation kits

Calibration date:

January 12, 2023

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.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID#	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May- 22(CTTL, No.J20X02965)	May-23
Power sensor NRP6A	101369	12-May-22(CTTL, No.J20X02965)	May-23
Reference Probe EX3DV4	SN 7600	30-Nov-22(CTTL-SPEAG,No.Z20-60421)	Nov-23
DAE4	SN 771	10-Feb-22(CTTL-SPEAG,No.Z20-60017)	Feb-23
Secondary Standards	ID#	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Feb-22 (CTTL, No.J20X00516)	Feb-23
Network Analyzer E5071C	MY46110673	10-Feb-22 (CTTL, No.J20X00515)	Feb-23

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	是是
Reviewed by:	Lin Hao	SAR Test Engineer	排光
Approved by:	Qi Dianvuan	SAR Project Leader	216

Issued: January 15, 2023

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Certificate No: Z23-60014

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Glossary:

TSL tissue simulating liquid

ConvF sensitivity in TSL / NORMx,y,z N/A not applicable or not measured

Calibration is Performed According to the Following Standards:

a) I EC/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

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

Additional Documentation:

c) 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%.



Measurement Conditions

DASY system configuration, as far as not given on page 1.

PAST System configuration, as far as	That given on page 1.	
DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.1 ± 6 %	1.95 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	57.3 W/kg ± 18.8 % (<i>k</i> =2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.1 W/kg ± 18.7 % (<i>k</i> =2)

Certificate No: Z23-60014 Page 3 of 6

Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.4Ω- 6.46jΩ	
Return Loss	- 23.4dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.065 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1101

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2600 MHz; $\sigma = 1.952$ S/m; $\varepsilon_r = 40.06$; $\rho = 1000$ kg/m³

Phantom section: Center Section

DASY5 Configuration:

 Probe: EX3DV4 - SN7600; ConvF(7.67, 7.67, 7.67) @ 2600 MHz; Calibrated: 2022-11-30

Date: 01.12.2023

- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2022-02-10
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm,

dy=5mm, dz=5mm

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Reference Value = 106.6 V/m; Power Drift = -0.05 dB

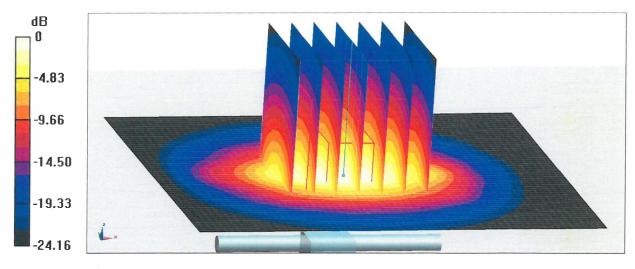
Peak SAR (extrapolated) = 31.1 W/kg

SAR(1 g) = 14.2 W/kg; SAR(10 g) = 6.25 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 45.2%

Maximum value of SAR (measured) = 24.7 W/kg



0 dB = 24.7 W/kg = 13.93 dBW/kg



Impedance Measurement Plot for Head TSL

