

CALIBRATION DATA PROBE CALIBRATION DATA

Calibration Laboratory of Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland

ilac-MR/



Schweizerischer Kalibrierdienst Service suisse d'étalonnage С

Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client

AGC (Auden)

Certificate No

ES-3337_Sep22

CALIBRATION CERTIFICATE

Object

ES3DV3 - SN:3337

Calibration procedure(s)

QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v7

Calibration procedure for dosimetric E-field probes

Calibration date

September 26, 2022

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) ℃ 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-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
OCP DAK-3.5 (weighted)	SN: 1249	20-Oct-21 (OCP-DAK3.5-1249_Oct21)	Oct-22
OCP DAK-12	SN: 1016	20-Oct-21 (OCP-DAK12-1016_Oct21)	Oct-22
Reference 20 dB Attenuator	SN: CC2552 (20x)	04-Apr-22 (No. 217-03527)	Apr-23
DAE4	SN: 660	13-Oct-21 (No. DAE4-660_Oct21)	Oct-22
Reference Probe ES3DV2	SN: 3013	27-Dec-21 (No. ES3-3013_Dec21)	Dec-22

ID	Check Date (in house)	Scheduled Check
SN: GB41293874	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
SN: MY41498087	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
SN: 000110210	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
SN: US3642U01700	04-Aug-99 (in house check Jun-22)	In house check: Jun-24
SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22
	SN: GB41293874 SN: MY41498087 SN: 000110210 SN: US3642U01700	SN: GB41293874 06-Apr-16 (in house check Jun-22) SN: MY41498087 06-Apr-16 (in house check Jun-22) SN: 000110210 06-Apr-16 (in house check Jun-22) SN: US3642U01700 04-Aug-99 (in house check Jun-22)

Name Calibrated by Michael Weber Laboratory Technician Approved by Sven Kühn Technical Manager Issued: September 26, 2022 This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: ES-3337 Sep22

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Calibration Laboratory of

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland





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 - Swiss Calibration Service

Accreditation No.: SCS 0108

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Glossary

TSL tissue simulating liquid NORMx,y,z sensitivity in free space sensitivity in TSL / NORMx,y,z ConvF 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.e., $\vartheta=0$ is

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 $\vartheta = 0$ ($f \le 900\,\text{MHz}$ in TEM-cell; $f > 1800\,\text{MHz}$: 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 ConvE
- 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 $f \le 800\,\mathrm{MHz}$) and inside waveguide using analytical field distributions based on power measurements for $f > 800\,\mathrm{MHz}$. 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
- · 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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ES3DV3 - SN:3337 September 26, 2022

Parameters of Probe: ES3DV3 - SN:3337

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc $(k=2)$
Norm $(\mu V/(V/m)^2)$ A	1.25	1.26	1.35	±10.1%
DCP (mV) B	107.9	109.8	110.0	±4.7%

Calibration Results for Modulation Response

UID	Communication System Name		A dB	$dB\sqrt{\mu V}$	С	D dB	VR mV	Max dev.	Max Unc ^E k = 2
0	CW	X	0.00	0.00	1.00	0.00	213.8	±3.8%	±4.7%
		Y	0.00	0.00	1.00		225.4		
		Z	0.00	0.00	1.00		197.7		

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%.

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A The uncertainties of Norm X,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 5).

B Linearization parameter uncertainty for maximum specified field strength.

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



ES3DV3 - SN:3337

September 26, 2022

Parameters of Probe: ES3DV3 - SN:3337

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle	-77.8°
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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ES3DV3 - SN:3337 September 26, 2022

Parameters of Probe: ES3DV3 - SN:3337

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)
150	52.3	0.76	8.03	8.03	8.03	0.00	1.00	±13.3%
450	43.5	0.87	7.23	7.23	7.23	0.16	1.30	±13.3%

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 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.

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indicated target tissue parameters.

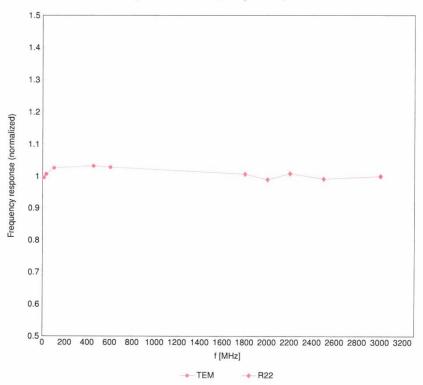
G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 3 GHz and below ±2% for frequencies between 3–6 GHz at any distance larger than half the probe tip diameter from the



ES3DV3 - SN:3337 September 26, 2022

Frequency Response of E-Field

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



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

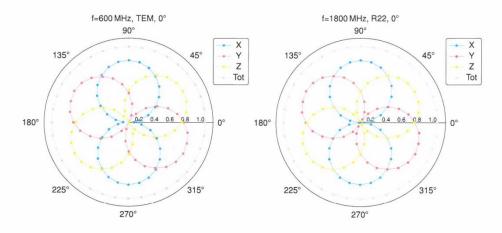
Certificate No: ES-3337_Sep22 Page 6 of 9

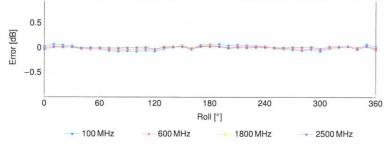
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Receiving Pattern (ϕ), $\theta = 0^{\circ}$



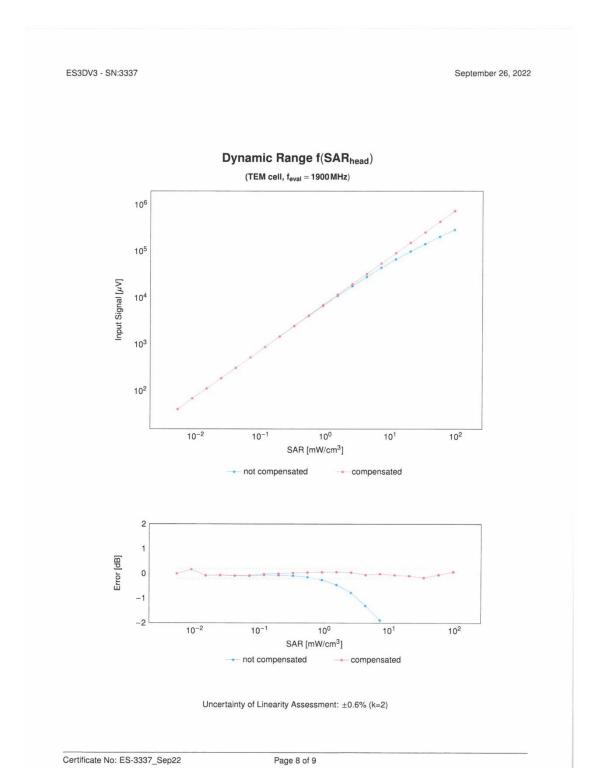


Uncertainty of Axial Isotropy Assessment: ±0.5% (k=2)

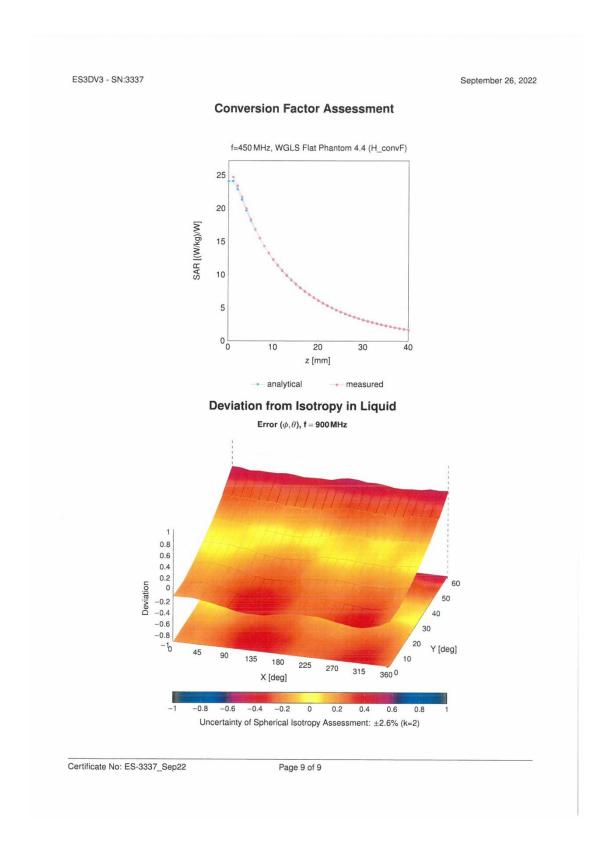
Certificate No: ES-3337_Sep22

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DAE CALIBRATION DATA



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agc-cert

Certificate No: Z22-60161

中国认可

CNAS L0570

CALIBRATION CERTIFICATE

Object

DAE4 - SN: 1398

Calibration Procedure(s)

Client:

FF-Z11-002-01

Calibration Procedure for the Data Acquisition Electronics

(DAEx)

Calibration date:

May 17, 2022

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**

Process Calibrator 753 1971018

15-Jun-21 (CTTL, No.J21X04465)

Jun-22

Calibrated by:

Name Function Yu Zongying SAR Test Engineer

Signature

Reviewed by:

Lin Hao SAR Test Engineer

Approved by:

Qi Dianyuan SAR Project Leader

Issued: May 23, 2022

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Glossary:

DAE data acquisition electronics

Connector angle information used in DASY system to align probe sensor X

to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- Connector angle: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: $1LSB = 6.1 \mu V$, full range = -100...+300 m Low Range: 1LSB = 61nV, full range = -1......+3mV DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec -100...+300 mV

Calibration Factors	х	Υ	z
High Range	404.210 ± 0.15% (k=2)	404.196 ± 0.15% (k=2)	403.652 ± 0.15% (k=2)
Low Range	3.97376 ± 0.7% (k=2)	3.99193 ± 0.7% (k=2)	3.96908 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	48° ± 1 °
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DIPOLE CALIBRATION DATA

Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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Client AGC-CERT

Shenzhen, China

Certificate No.

CLA150-4008_Mar23

Object	CLA150 - SN: 4008					
Calibration procedure(s)	QA CAL-15.v10 Calibration Proce	edure for SAR Validation Sources	below 700 MHz			
Calibration date:	March 21, 2023					
The measurements and the uncerta	ainties with confidence pr	conal standards, which realize the physical unitrobability are given on the following pages and y facility: environment temperature $(22 \pm 3)^{\circ}$ C	d are part of the certificate.			
	LID #					
Primary Standards	ID#	Cal Date (Certificate No.)	Scheduled Calibration			
	SN: 104778	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524)	Scheduled Calibration Apr-23			
Power meter NRP			Scheduled Calibration Apr-23 Apr-23			
Power meter NRP Power sensor NRP-Z91	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91	SN: 104778 SN: 103244	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524)	Apr-23 Apr-23			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator	SN: 104778 SN: 103244 SN: 103245	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525)	Apr-23 Apr-23 Apr-23			
ower meter NRP ower sensor NRP-Z91 ower sensor NRP-Z91 ower sensor NRP-Z91 deference 20 dB Attenuator oppe-N mismatch combination	SN: 104778 SN: 103244 SN: 103245 SN: CC2552 (20x)	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527)	Apr-23 Apr-23 Apr-23 Apr-23			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	SN: 104778 SN: 103244 SN: 103245 SN: CC2552 (20x) SN: 310982 / 06327	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23			
Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards	SN: 104778 SN: 103244 SN: 103245 SN: CC2552 (20x) SN: 310982 / 06327 SN: 3877	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 06-Jan-23 (No. EX3-3877_Jan23)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Jan-24			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter NRP2	SN: 104778 SN: 103244 SN: 103245 SN: CC2552 (20x) SN: 310982 / 06327 SN: 3877 SN: 654	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 06-Jan-23 (No. EX3-3877_Jan23) 27-Jan-23 (No. DAE4-654_Jan23)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Jan-24 Jan-24			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter NRP2 Power sensor NRP-Z91	SN: 104778 SN: 103244 SN: 103245 SN: CC2552 (20x) SN: 310982 / 06327 SN: 3877 SN: 654	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 06-Jan-23 (No. EX3-3877_Jan23) 27-Jan-23 (No. DAE4-654_Jan23) Check Date (in house)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Jan-24 Jan-24 Scheduled Check			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter NRP2 Power sensor NRP-Z91 Power sensor NRP-Z91	SN: 104778 SN: 103244 SN: 103245 SN: CC2552 (20x) SN: 310982 / 06327 SN: 3877 SN: 654 ID# SN: 107193 SN: 100922 SN: 100418	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 06-Jan-23 (No. EX3-3877_Jan23) 27-Jan-23 (No. DAE4-654_Jan23) Check Date (in house)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Jan-24 Jan-24 Scheduled Check In house check: Dec-24			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter NRP2 Power sensor NRP-Z91 Power sensor NRP-Z91 RF generator HP 8648C	SN: 104778 SN: 103244 SN: 103245 SN: CC2552 (20x) SN: 310982 / 06327 SN: 3877 SN: 654 ID # SN: 107193 SN: 100922 SN: 100418 SN: US3642U01700	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 06-Jan-23 (No. EX3-3877_Jan23) 27-Jan-23 (No. DAE4-654_Jan23) Check Date (in house)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Jan-24 Jan-24 Scheduled Check In house check: Dec-24 In house check: Dec-24			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Decendary Standards Power meter NRP2 Power sensor NRP-Z91 Power sensor NRP-Z91 RF generator HP 8648C	SN: 104778 SN: 103244 SN: 103245 SN: CC2552 (20x) SN: 310982 / 06327 SN: 3877 SN: 654 ID# SN: 107193 SN: 100922 SN: 100418	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 06-Jan-23 (No. EX3-3877_Jan23) 27-Jan-23 (No. DAE4-654_Jan23) Check Date (in house) 08-Nov-21 (in house check Dec-22) 15-Dec-09 (in house check Dec-22) 01-Jan-04 (in house check Dec-22)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Jan-24 Jan-24 Scheduled Check In house check: Dec-24 In house check: Dec-24 In house check: Dec-24			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter NRP2 Power sensor NRP-Z91 Power sensor NRP-Z91 RF generator HP 8648C	SN: 104778 SN: 103244 SN: 103245 SN: CC2552 (20x) SN: 310982 / 06327 SN: 3877 SN: 654 ID # SN: 107193 SN: 100922 SN: 100418 SN: US3642U01700	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 06-Jan-23 (No. EX3-3877_Jan23) 27-Jan-23 (No. DAE4-654_Jan23) Check Date (in house) 08-Nov-21 (in house check Dec-22) 15-Dec-09 (in house check Dec-22) 01-Jan-04 (in house check Dec-22) 04-Aug-99 (in house check Jun-22)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Jan-24 Jan-24 Scheduled Check In house check: Dec-24 In house check: Dec-24 In house check: Dec-24 In house check: Jan-24			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4	SN: 104778 SN: 103244 SN: 103245 SN: CC2552 (20x) SN: 310982 / 06327 SN: 3877 SN: 654 ID # SN: 107193 SN: 100922 SN: 100418 SN: US3642U01700 SN: US41080477	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 06-Jan-23 (No. EX3-3877_Jan23) 27-Jan-23 (No. DAE4-654_Jan23) Check Date (in house) 08-Nov-21 (in house check Dec-22) 15-Dec-09 (in house check Dec-22) 01-Jan-04 (in house check Dec-22) 04-Aug-99 (in house check Dec-22) 31-Mar-14 (in house check Oct-22)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Jan-24 Jan-24 Scheduled Check In house check: Dec-24 In house check: Dec-24 In house check: Dec-24 In house check: Jun-24 In house check: Jun-24			

Certificate No: CLA150-4008_Mar23

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Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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C 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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Glossary:

TSL tissue simulating liquid

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

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"

Additional Documentation:

c) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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%.

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Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
EUT Positioning	Touch Position	
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	150 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	52.3	0.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	51.4 ± 6 %	0.78 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
SAR measured	1 W input power	4.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	3.96 W/kg ± 18.4 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	1 W input power	2.72 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	2.66 W/kg ± 18.0 % (k=2)

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	43.0 Ω - 6.0 jΩ
Return Loss	- 20.1 dB

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL

Date: 21.03.2023

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: CLA150; Type: CLA150; Serial: CLA150 - SN: 4008

Communication System: UID 0 - CW; Frequency: 150 MHz

Medium parameters used: f = 150 MHz; σ = 0.78 S/m; ϵ_r = 51.4; ρ = 1000 kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

Probe: EX3DV4 - SN3877; ConvF(12.51, 12.51, 12.51) @ 150 MHz; Calibrated: 06.01.2023

- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 27.01.2023
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2034
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

CLA Calibration for HSL-LF Tissue/CLA150, touch configuration, Pin=1W/Zoom Scan,

dist=1.4mm (8x10x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 84.39 V/m; Power Drift = -0.07 dB

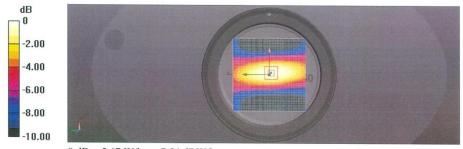
Peak SAR (extrapolated) = 7.52 W/kg

SAR(1 g) = 4.06 W/kg; SAR(10 g) = 2.72 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 14 mm)

Ratio of SAR at M2 to SAR at M1 = 81%

Maximum value of SAR (measured) = 5.67 W/kg



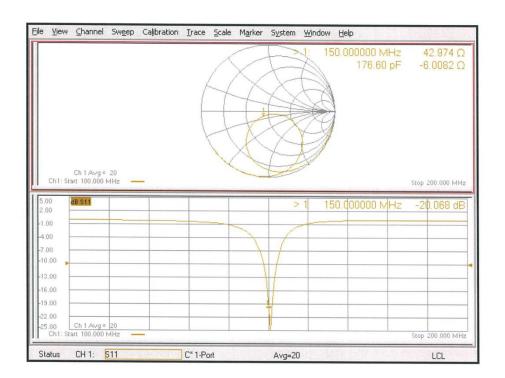
0 dB = 5.67 W/kg = 7.54 dBW/kg

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Impedance Measurement Plot for Head TSL



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