

Appendix C for KSCR220700128901

Calibration Certificate

Object	Apply	No	Model	SN	Calibration Date
Dipole	☐	1	CLA150	4025	2021/04/26
	☐	2	D450V3	1103	2021/04/21
	☐	3	D750V3	1188	2022/03/29
	☐	4	D835V2	4d114	2022/03/31
	☐	5	D900V2	1d079	2022/06/07
	☐	6	D1800V2	2d170	2022/03/31
	☐	7	D1900V2	5d1136	2022/06/07
	☐	8	D2000V2	1041	2022/06/06
	☐	9	D2300V2	1096	2022/03/31
	☒	10	D2450V2	817	2022/04/01
	☐	11	D2600V2	1158	2022/03/31
	☐	12	D5GHzV2	1095	2022/06/01
DAE	☒	13	DAE4	1245	2022/05/30
Probe	☒	14	EX3DV4	7346	2022/03/30



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中国·江苏·昆山市留学院创业园伟业路10号 邮编 215300

t(86-512)57355888 f(86-512)57370818 www.sgsgroup.com.cn
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1 Dipole

1.1 CLA150 - SN 4025

Calibration Laboratory of Schmid & Partner Engineering AG Zürcherstrasse 43, 8004 Zurich, Switzerland		S Schweizerischer Kalibrierdienst Service suisse d'étalonnage C Servizio svizzero di taratura S Swiss Calibration Service	
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		Accreditation No.: SCS 0108	
Client: SGS-CN (Auden)		Certificate No: CLA150-4025_Apr21	
CALIBRATION CERTIFICATE			
Object: CLA150 - SN: 4025			
Calibration procedure(s): QA CAL-15.v9 Calibration Procedure for SAR Validation Sources below 700 MHz			
Calibration date: April 26, 2021			
This calibration certificate documents the traceability to national standards, which require 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 ± 2)°C and humidity < 70%.			
Calibration Equipment used (M&T: critical for calibration)			
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104776	09-Apr-21 (No. 217-03201/03202)	Apr-22
Power sensor NRP-Z91	SN: 103344	09-Apr-21 (No. 217-03201)	Apr-22
Power sensor NRP-Z91	SN: 103345	09-Apr-21 (No. 217-03202)	Apr-22
Reference 20 dB Attenuator	SN: C72382 (2036)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310802 / 00307	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EXBNA	SN: 3877	30-Dec-20 (No. EXB3877_Dec20)	Dec-21
US64	SN: 464	26-Jun-20 (No. DMS4-654_Jun20)	Jun-21
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter S4413B	SN: G8413382/4	06-Apr-16 (in house check Jun-20)	In house check: Jun-20
Power sensor E4113A	SN: MY4148007	06-Apr-16 (in house check Jun-20)	In house check: Jun-20
Power sensor E4113A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-20
RF generator HP 8594D	SN: US849401710	04-Aug-09 (in house check Jun-20)	In house check: Jun-20
Network Analyser Agilent E8363A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21
Calibrated by:	Name: Jeffrey Katman	Function: Laboratory Technician	Signature:
Approved by:	Name: Kaja Polevic	Function: Technical Manager	Signature:
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Certificate No: CLA150-4025_Apr21		Page 1 of 6	

Measurement Conditions	
DASY system configuration, as far as not given on page 1.	
DASY Version	V52.10.4
Extrapolation	Advanced Extrapolation
Phantom	ELIA Flat Phantom
EUT Positioning	Touch Position
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm
Frequency	150 MHz ± 1 MHz
Graded Ratio	1.4 (Z direction)

Head TSL parameters	
The following parameters and calculations were applied.	
Nominal Head TSL parameters	Temperature: 22.0 °C
Measured Head TSL parameters	Permittivity: 62.3
Head TSL temperature change during test	Conductivity: 0.75 mho/m
	(22.0 ± 0.2) °C
	51.1 ± 6 %
	0.75 mho/m ± 6 %
	< 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
SAR for nominal Head TSL parameters	3.90 W/kg
	normalized to 1W
	3.88 W/kg ± 13.4 % (k=2)
SAR averaged over 10 cm³ (10 g) of Head TSL	condition
SAR measured	1 W input power
SAR for nominal Head TSL parameters	2.60 W/kg
	normalized to 1W
	2.59 W/kg ± 18.0 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)	
Antenna Parameters with Head TSL	
Impedance, transformed to feed point	47.9 Ω ± 1.5 Ω
Return Loss	-31.4 dB
Additional EUT Data	
Manufactured by	SPEAG

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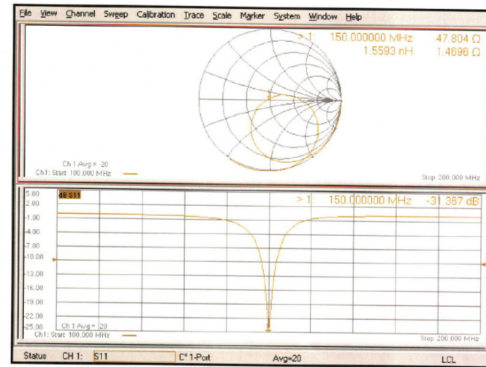
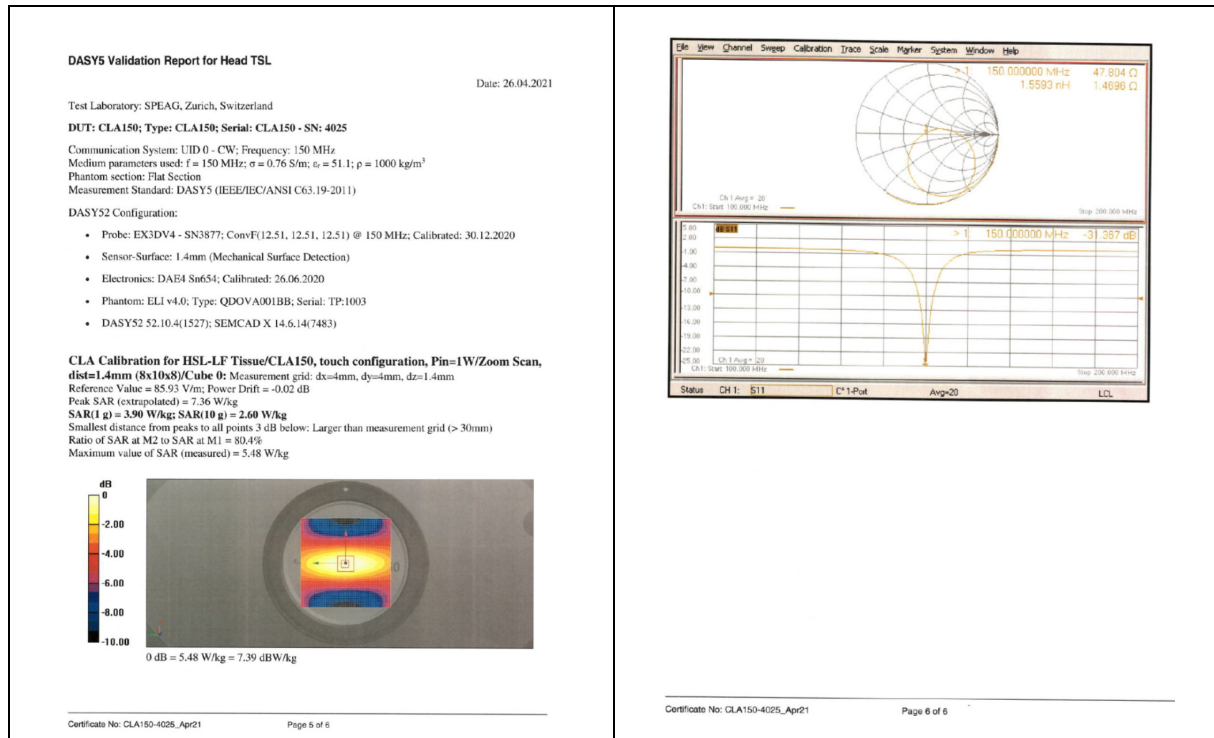


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1.2 D450V3 - SN 1103

Calibration Laboratory of Schmid & Partner Engineering AG		S Schweizerischer Kalibrierdienst C Servizio svizzero di taratura S Swiss Calibration Service	
Zeughausstrasse 43, 8004 Zurich, Switzerland		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: SGS-CN (Auden)		Accreditation No.: SCS 0108	
Certificate No: D450V3-1103_Apr21		Accreditation No.: SCS 0108	
CALIBRATION CERTIFICATE			
Object: D450V3 - SN: 1103			
Calibration procedure(s): QA CAL-15-v9 Calibration Procedure for SAR Validation Sources below 700 MHz			
Calibration date: April 21, 2021			
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 ± 2) °C and humidity < 70%.			
Calibration Equipment used (MTE critical for calibration)			
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03021/03020)	Apr-22
Power sensor NRP-291	SN: 103244	09-Apr-21 (No. 217-03021)	Apr-22
Reference 20 dB Attenuator	SN: 103245	09-Apr-21 (No. 217-03020)	Apr-22
Type-N mismatch combination	SN: C2552 (200)	09-Apr-21 (No. 217-03043)	Apr-22
Reference Probe EX3DV4	SN: 31082 / 06327	09-Apr-21 (No. 217-03044)	Apr-22
DAB4	SN: 3077	30-Dec-20 (No. EX3-3077 Dec20)	Dec-21
	SN: 654	26-Jun-20 (No. DAB4-654-Jun20)	Jun-21
Secondary Standards	ID #	Check Date (In house)	Scheduled Check
Power meter E4419B	SN: GB41203074	06-Apr-16 (In house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498027	06-Apr-16 (In house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000100210	06-Apr-16 (In house check Jun-20)	In house check: Jun-22
RF generator HP 8448C	SN: L153460.01700	06-Aug-09 (In house check Jun-20)	In house check: Jun-22
Network Analyzer Agilent E8308A	SN: U841080477	31-Mar-14 (In house check Oct-20)	In house check: Oct-21
Calibrated by:	Name: Claudio Leuber	Function: Laboratory Technician	Signature: [Signature]
Approved by:	Name: Kells Polovic	Function: Technical Manager	Signature: [Signature]
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Certificate No: D450V3-1103_Apr21 Page 1 of 6			

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Client: SGS-CN (Auden)		Accreditation No.: SCS 0108	
Certificate No: D450V3-1103_Apr21		Accreditation No.: SCS 0108	
Glossary:			
TSL	Issue 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) 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 665664, "SAR Measurement Requirements for 100 MHz to 6 GHz"			
Additional Documentation:			
e) 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%.			
Certificate No: D450V3-1103_Apr21 Page 2 of 6			



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Measurement Conditions		
DASY system configuration, as far as not given on page 1.		
DASY Version	DASY5	V62.10.4
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	$dx, dy, dz = 5$ mm	
Frequency	450 MHz ± 1 MHz	

Head TSL parameters			
The following parameters and calculations were applied:			
	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	43.5	0.57 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	43.1 $\pm$ 6 %	0.57 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL		
SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	4.55 W/kg $\pm$ 18.1 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL		
SAR measured	250 mW input power	0.757 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	3.06 W/kg $\pm$ 17.6 % (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	57.1 Ω - 2.6 j Ω	
Return Loss	> 23.0 dB	

General Antenna Parameters and Design	
Electrical Delay (one direction)	1.346 ns

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

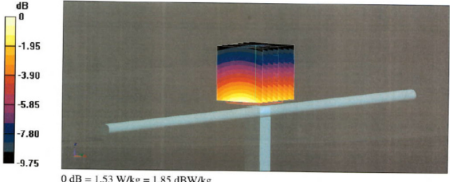
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching 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

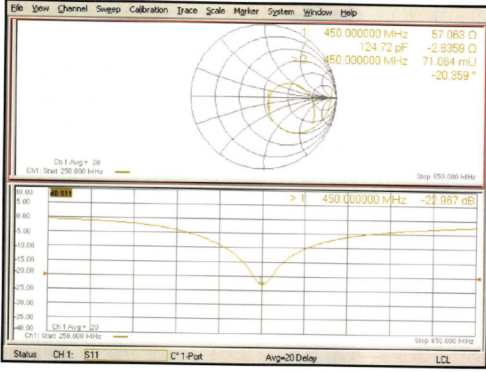
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DASY5 Validation Report for Head TSL	
Test Laboratory: SPEAG, Zurich, Switzerland	
Date: 21.04.2021	
DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1103	
Communication System: UID 0 - CW; Frequency: 450 MHz	
Medium parameters used: $f = 450$ MHz; $\alpha = 0.87$ S/m; $\epsilon_r = 43.1$; $\rho = 1000$ kg/m ³	
Phantom section: Flat Section	
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)	
DASY52 Configuration:	
- Probe: EX3DV4 - SN3877; ConvF(10.64, 10.64, 10.64) @ 450 MHz; Calibrated: 30.12.2020 - Sensor-Surface: 1.4mm (Mechanical Surface Detection) - Electronics: DAE4 Sn654; Calibrated: 26.06.2020 - Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP.1003 - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)	
Dipole Calibration for Head Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:	
Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm	
Reference Value = 39.18 V/m; Power Drift = -0.08 dB	
Peak SAR (extrapolated) = 1.76 W/kg	
SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.767 W/kg	
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid	
Ratio of SAR at M2 to SAR at M1 = 64.9%	
Maximum value of SAR (measured) = 1.53 W/kg	



0 dB = 1.53 W/kg = 1.85 dBW/kg

Certificate No: D450V3-1103_Apr21 Page 5 of 6



Status: CH 1: S11 C: 1-Port Avg=20 Delay LCL

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1.3 D750V3 - SN 1188

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Client: SGS-CN		Certificate No: Z22-60103	
CALIBRATION CERTIFICATE			
Object	D750V3 - SN: 1188		
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits		
Calibration date:	March 29, 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
Power Meter NRP2	106277	24-Sep-21 (CTTL No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL No.J21X08326)	Sep-22
Reference Probe EX30V4	SN 7307	26-May-21 (SPEAG No EX3-7307_May21)	May-22
DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No Z22-60007)	Jan-23
Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-22 (CTTL No.J22X00409)	Jan-23
Network Analyzer E5071C	MY46110673	14-Jan-22 (CTTL No.J22X00406)	Jan-23
Calibrated by:	Name: Zhao Jing	Function: SAR Test Engineer	Signature: [Signature]
Reviewed by:	Name: Lin Hao	Function: SAR Test Engineer	Signature: [Signature]
Approved by:	Name: Qi Dianyan	Function: SAR Project Leader	Signature: [Signature]
Issued: April 3, 2022			
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Measurement Conditions DASY system configuration, as far as not given on page 1:			
DASY Version	DASY52	V52.10.4	
Extrapolation	Advanced Extrapolation		
Phantom	Triple Flat Phantom 5.1C		
Distance Dipole Center - TSL	15 mm	with Spacer	
Zoom Scan Resolution	dx, dy, dz = 5 mm		
Frequency	750 MHz ± 1 MHz		
Head TSL parameters The following parameters and calculations were applied:			
	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	42.0	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.4 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---
SAR result with Head TSL			
SAR averaged over 1 cm ² (1 g) of Head TSL	Condition		
SAR measured	250 mW input power	2.07 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	8.27 W/kg ± 18.8 % (k=2)	
SAR averaged over 10 cm ² (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	1.37 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	5.48 W/kg ± 18.7 % (k=2)	
Certificate No: Z22-60103		Page 3 of 6	

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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) 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			
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%.			
Certificate No: Z22-60103		Page 2 of 6	

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Appendix (Additional assessments outside the scope of CNAS L0570)			
Antenna Parameters with Head TSL			
Impedance, transformed to feed point	53.60-1.13jΩ		
Return Loss	-28.7dB		
General Antenna Parameters and Design			
Electrical Delay (one direction)	0.947 ns		
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		
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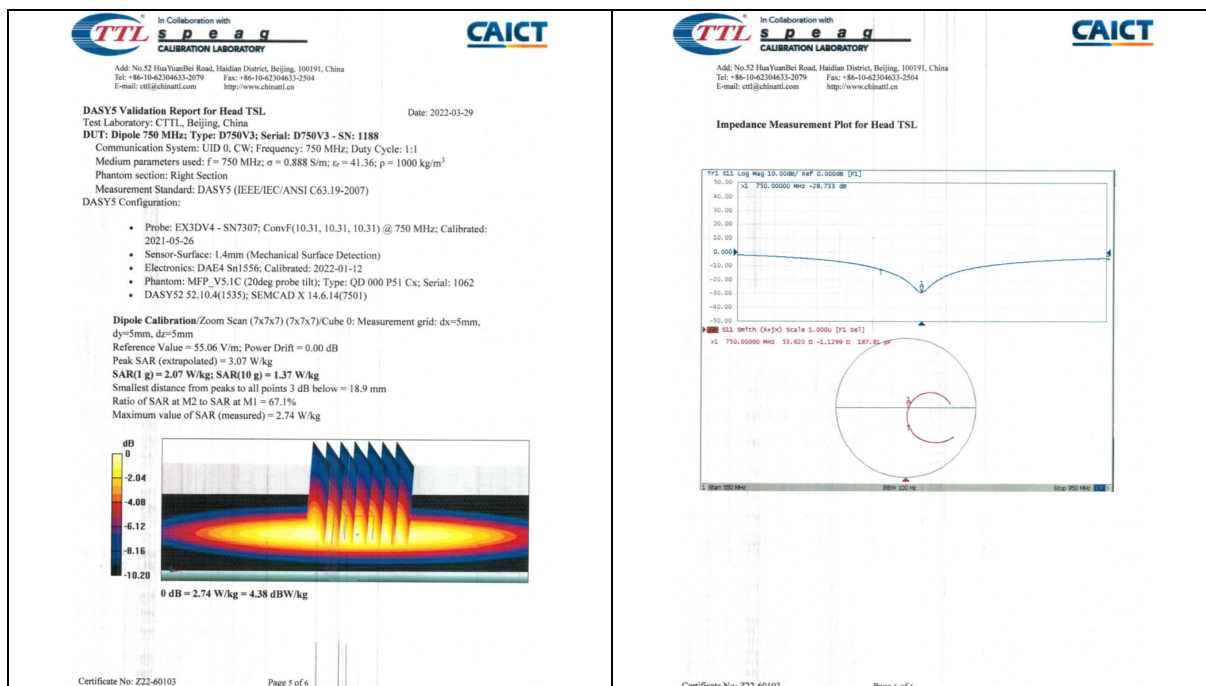


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1.4 D835V2 - SN 4d114

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Client: SGS-CN Certificate No: Z22-60104

CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d114

Calibration Procedure(s): FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: March 31, 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
Power Meter NRP2	106277	24-Sep-21 (CTTL No.J21X08326)	Sep-22
Power sensor NRPBS	104281	24-Sep-21 (CTTL No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7307	26-May-21 (SPEAG No.EX3-7307_May21)	May-22
DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No.Z22-60007)	Jan-23

Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-22 (CTTL No.J22X00409)	Jan-23
Network Analyzer E5071C	MY46110673	14-Jan-22 (CTTL No.J22X00406)	Jan-23

Calibrated by: Zhao Jing SAR Test Engineer

Reviewed by: Lin Hao SAR Test Engineer

Approved by: Qi Dianyan SAR Project Leader

Signature: [Signatures]

Issued: April 6, 2022

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Certificate No: Z22-60104 Page 1 of 6

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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) 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

b) KDB 865864, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

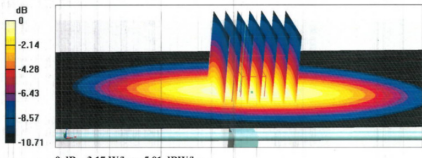
Methods Applied and Interpretation of Parameters:

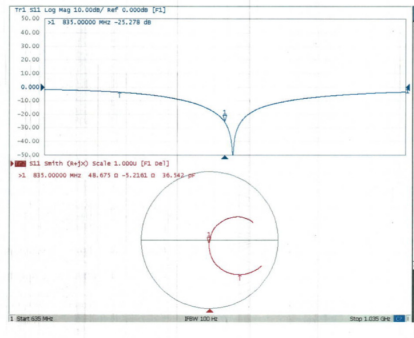
- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the 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 as 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	DASY52	VS2 10.4	
Extrapolation	Advanced Extrapolation		
Phantom	Triple Flat Phantom 5.1C		
Distance Dipole Center - TSL	15 mm	with Spacer	
Zoom Scan Resolution	dx, dy, dz = 5 mm		
Frequency	835 MHz ± 1 MHz		
Head TSL parameters The following parameters and calculations were applied.			
	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.0 $\pm$ 6 %	0.91 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	---	---
SAR result with Head TSL			
SAR averaged over 1 cm ² (1 g) of Head TSL	Condition	2.37 W/kg	
SAR measured	250 mW input power	2.37 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	9.40 W/kg $\pm$ 18.5 % (k=2)	
SAR averaged over 10 cm ² (10 g) of Head TSL	Condition	1.54 W/kg	
SAR measured	250 mW input power	1.54 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	6.12 W/kg $\pm$ 18.7 % (k=2)	
Appendix (Additional assessments outside the scope of CNAS L0570)			
Antenna Parameters with Head TSL			
Impedance, transformed to feed point	48.70 - j 22.0 Ω		
Return Loss	-25.3dB		
General Antenna Parameters and Design			
Electrical Delay (one direction)	1.307 ns		
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		
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DASY5 Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China Date: 2022-03-31 DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d114 Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz; σ = 0.907 S/m; ϵ_r = 40.98; ρ = 1000 kg/m ³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/EC/ANSI C63.19-2007) DASY5 Configuration:			
- Probe: EX3DV4 - SN7307; ConvF(10.13, 10.13, 10.13) @ 835 MHz; Calibrated: 2021-05-26 - 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/Zoom Scan (7x7x7) (7x7x7) Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 57.88 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 3.56 W/kg SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg Smallest distance from peaks to all points 3 dB below = 15.8 mm Ratio of SAR at M2 to SAR at M1 = 66.2% Maximum value of SAR (measured) = 3.17 W/kg			
			
Certificate No: Z22-60104		Page 5 of 6	

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Impedance Measurement Plot for Head TSL			
			
Certificate No: Z22-60104		Page 6 of 6	

1.5 D900V2 - SN 1d079

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Client: SGS-CN		Certificate No: Z22-60184																					
CALIBRATION CERTIFICATE																							
Object: D900V2 - SN: 1d079																							
Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits																							
Calibration date: June 7, 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 (23±2)°C and humidity <70%.																							
Calibration Equipment used (M&TE critical for calibration)																							
<table border="1"><thead><tr><th>Primary Standards</th><th>ID #</th><th>Cal Date (Calibrated by Certificate No.)</th><th>Scheduled Calibration</th></tr></thead><tbody><tr><td>Power Meter NRP2</td><td>106277</td><td>24-Sep-21 (CTTL No.J21X08326)</td><td>Sep-22</td></tr><tr><td>Power sensor NRP8S</td><td>104291</td><td>24-Sep-21 (CTTL No.J21X08326)</td><td>Sep-22</td></tr><tr><td>Reference Probe EX3DV4</td><td>SN 7464</td><td>26-Jan-22 (SPEAG No EX3-7464_Jan22)</td><td>Jan-23</td></tr><tr><td>DAE4</td><td>SN 1556</td><td>12-Jan-22 (CTTL-SPEAG No Z22-60007)</td><td>Jan-23</td></tr></tbody></table>				Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration	Power Meter NRP2	106277	24-Sep-21 (CTTL No.J21X08326)	Sep-22	Power sensor NRP8S	104291	24-Sep-21 (CTTL No.J21X08326)	Sep-22	Reference Probe EX3DV4	SN 7464	26-Jan-22 (SPEAG No EX3-7464_Jan22)	Jan-23	DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No Z22-60007)	Jan-23
Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration																				
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Calibrated by: Zhao Jing SAR Test Engineer Signature																							
Reviewed by: Lin Hao SAR Test Engineer Signature																							
Approved by: Qi Danyuan SAR Project Leader Signature																							
Issued: June 13, 2022																							
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Measurement Conditions
DASY system configuration, as far as not given on page 1.

DASY Version	Condition	Value
Extrapolation	Advanced Extrapolation	52.10.4
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	5x, 4x, 3x, 2x, 1x	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters
The following parameters and calculations were applied.

Parameter	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.1 ± 6 %	0.96 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ² (1 g) of Head TSL	Condition	Value
SAR measured	250 mW input power	2.70 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	11.0 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm ² (10 g) of Head TSL	Condition	Value
SAR measured	250 mW input power	1.78 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	7.09 W/kg ± 18.7 % (k=2)

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Parameter	Value
Impedance, transformed to feed point	48.10 - 6.49j
Return Loss	-23.3 dB

General Antenna Parameters and Design

Parameter	Value
Electrical Delay (one direction)	1.312 ns

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

Parameter	Value
Manufactured by	SPEAG