



CALIBRATIC	IN LABORATORY	- HACEMER CNAS	校准 CALIBRATION
Add: No.52 HuaYuanBei Ros Tel: +86-10-62304633-2117 E-mail: emf@caict.ac.cn	ad, Haidian District, i		CNAS L0570
Ū	Beijing) Technolo		J23Z60264
CALIBRATION CE	ERTIFICAT	E	
Object	D835V2	2 - SN: 4d260	
Calibration Procedure(s)	FF-Z11	003.01	
		tion Procedures for dipole validation kits	
Calibration date:	May 23	, 2023	
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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%.

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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	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 ± 0.2) °C	40.9 ± 6 %	0.92 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	2.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.55 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.32 W/kg ± 18.7 % (<i>k</i> =2)

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.0Ω- 2.94jΩ	
Return Loss	- 30.1dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.301 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: 2023-05-23

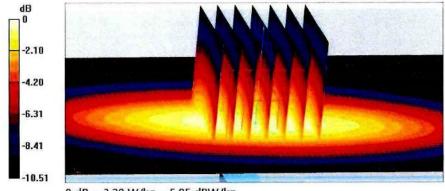
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d260 Communication System: UID 0, CW; Frequency: 835 MHz Medium parameters used: f = 835 MHz; $\sigma = 0.917$ S/m; $\varepsilon_r = 40.9$; $\rho = 1000$ kg/m³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN7517; ConvF(9.84, 8.48, 8.98) @ 835 MHz; Calibrated: 2023-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- 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 = 56.46 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 3.56 W/kg SAR(1 g) = 2.43 W/kg; SAR(10 g) = 1.6 W/kg

SAR(1 g) = 2.45 w/kg; SAR(10 g) = 1.0 w/kg Smallest distance from peaks to all points 3 dB below = 15.5 mm Ratio of SAR at M2 to SAR at M1 = 68.3%Maximum value of SAR (measured) = 3.20 W/kg



0 dB = 3.20 W/kg = 5.05 dBW/kg

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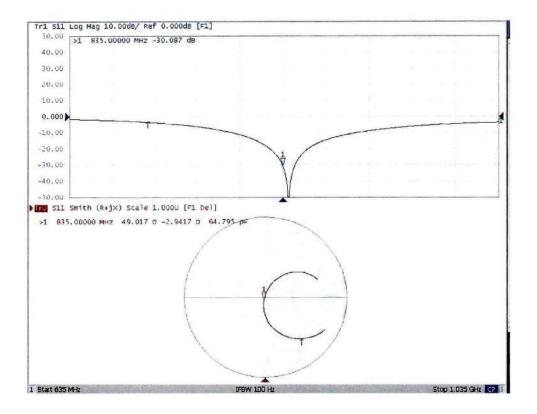








Impedance Measurement Plot for Head TSL



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Schmid & Partner Engineering AG Leughausstrasse 43, 8004 Zurich,	y of Switzerland	RECENTION SC S	Servizio svizzero di taratura Swiss Calibration Service
Accredited by the Swiss Accreditation The Swiss Accreditation Service in Multilateral Agreement for the rec	s one of the signatories	certificates	Accreditation No.: SCS 0108
Beijing			D1750V2-1003_Jul23
CALIBRATION C	D1750V2 - SN:10		
Calibration procedure(s)	QA CAL-05.v12 Calibration Proce	dure for SAR Validation Sources	between 0.7-3 GHz
Calibration date:	July 12, 2023		
The measurements and the uncerta	ainties with confidence pr	onal standards, which realize the physical uni robability are given on the following pages an y facility: environment temperature (22 ± 3)°C	d are part of the certificate.
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Calibration Laboratory of

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



S Schweizerischer Kalibrierdienst C Service suisse d'étalonnage Servizio svizzero di taratura S wiss 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

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%.

Certificate No: D1750V2-1003_Jul23

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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	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.0 ± 6 %	1.34 mho/m ± 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	8.84 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	35.8 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	4.69 W/kg

Certificate No: D1750V2-1003_Jul23

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω - 0.2 jΩ
Return Loss	- 37.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.214 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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Certificate No: D1750V2-1003_Jul23

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DASY5 Validation Report for Head TSL

Date: 12.07.2023

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1003

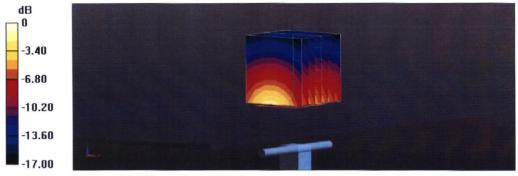
Communication System: UID 0 - CW; Frequency: 1750 MHz Medium parameters used: f = 1750 MHz; σ = 1.34 S/m; ϵ_r = 40; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.67, 8.67, 8.67) @ 1750 MHz; Calibrated: 10.01.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 19.12.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 104.6 V/m; Power Drift = 0.05 dB Peak SAR (extrapolated) = 16.1 W/kg **SAR(1 g) = 8.84 W/kg; SAR(10 g) = 4.69 W/kg** Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 55.4% Maximum value of SAR (measured) = 13.3 W/kg



0 dB = 13.3 W/kg = 11.24 dBW/kg

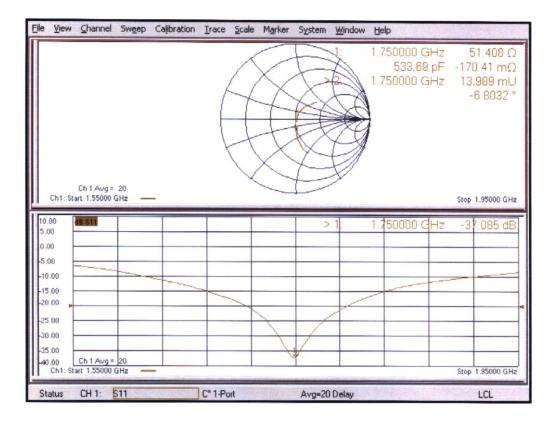
Certificate No: D1750V2-1003_Jul23

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Impedance Measurement Plot for Head TSL



Certificate No: D1750V2-1003_Jul23

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Add: No.52 HuaYuanBei Ros Tel: +86-10-62304633-2117 E-mail: emf@caict.ac.cn	http://www.caict	ac cn	
	Beijing) Technolo		J23Z60267
CALIBRATION CE	ERTIFICAT	E	
Object	D1900\	/2 - SN: 5d234	
Calibration Procedure(s)	FF-Z11		
Calibration date:	Calibra May 22	tion Procedures for dipole validation kits	
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pages and are part of the ce	ertificate.	he closed laboratory facility: environme	
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Certificate No: J23Z60267

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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: J23Z60267

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Measurement Conditions

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

DASY Version	DASY52	52.10.4
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	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.0 ± 6 %	1.39 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	9.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.4 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.0 W/kg ± 18.7 % (k=2)

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.2Ω+ 3.87jΩ
Return Loss	- 28.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.105 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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Certificate No: J23Z60267

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DASY5 Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China

Date: 2023-05-22

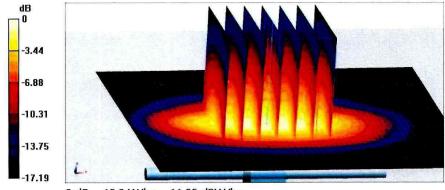
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d234 Communication System: UID 0, CW; Frequency: 1900 MHz Medium parameters used: f = 1900 MHz; $\sigma = 1.385$ S/m; $\varepsilon_r = 41.01$; $\rho = 1000$ kg/m³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN7517; ConvF(8.34, 7.75, 7.97) @ 1900 MHz; Calibrated: 2023-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- 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 = 98.93 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 9.97 W/kg; SAR(10 g) = 5.21 W/kg Smallest distance from peaks to all points 3 dB below = 9.2 mm Ratio of SAR at M2 to SAR at M1 = 55.7% Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg = 11.85 dBW/kg

Certificate No: J23Z60267

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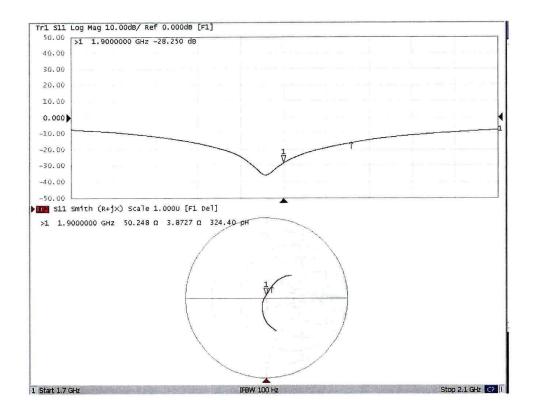








Impedance Measurement Plot for Head TSL



Certificate No: J23Z60267

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Engineering AG Zeughausstrasse 43, 8004 Zurich Accredited by the Swiss Accreditat			Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service
The Swiss Accreditation Service Multilateral Agreement for the re	is one of the signatorie		Accreditation No.: SCS 0108
Client CTTL		Certificate No.	D2300V2-1018_Jul23
Beijing CALIBRATION C	ERTIFICAT	E	
Object	D2300V2 - SN:1	018	
Calibration procedure(s)	QA CAL-05.v12 Calibration Proce	edure for SAR Validation Sources	s between 0.7-3 GHz
Calibration date:	July 11, 2023		
	ainties with confidence p	robability are given on the following pages ar	nd are part of the certificate.
The measurements and the uncert	ainties with confidence p ed in the closed laborator	robability are given on the following pages ar γ facility: environment temperature (22 ± 3)%	nd are part of the certificate.
The measurements and the uncert All calibrations have been conduct	ainties with confidence p ed in the closed laborator	robability are given on the following pages ar y facility: environment temperature $(22 \pm 3)^{\circ}$	nd are part of the certificate. C and humidity < 70%.
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The measurements and the uncert All calibrations have been conduct Calibration Equipment used (M&TE Primary Standards Power meter NRP2 Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination	ainties with confidence p ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	robability are given on the following pages ar ry facility: environment temperature (22 ± 3)*(<u>Cal Date (Certificate No.)</u> 30-Mar-23 (No. 217-03804/03805) 30-Mar-23 (No. 217-03805) 30-Mar-23 (No. 217-03809) 30-Mar-23 (No. 217-03810)	nd are part of the certificate. C and humidity < 70%. Scheduled Calibration Mar-24 Mar-24 Mar-24 Mar-24 Mar-24 Mar-24 Mar-24
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The measurements and the uncert All calibrations have been conduct Calibration Equipment used (M&TE Primary Standards Power meter NRP-2 Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B	ainties with confidence p ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103245 SN: 81H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601	Cal Date (Certificate No.) 30-Mar-23 (No. 217-03804/03805) 30-Mar-23 (No. 217-03804) 30-Mar-23 (No. 217-03805) 30-Mar-23 (No. 217-03805) 30-Mar-23 (No. 217-03809) 30-Mar-23 (No. 217-03809) 30-Mar-23 (No. 217-03810) 10-Jan-23 (No. EX3-7349_Jan23) 19-Dec-22 (No. DAE4-601_Dec22)	nd are part of the certificate. C and humidity < 70%. Scheduled Calibration Mar-24 Mar-24 Mar-24 Mar-24 Mar-24 Jan-24 Jan-24 Dec-23
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Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst
 S Service suisse d'étalonnage
 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

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	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2300 MHz ± 1 MHz	

Head TSL parameters The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.5	1.67 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.3 ± 6 %	1.68 mho/m ± 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	12.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	49.1 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	6.03 W/kg

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.5 Ω - 2.7 jΩ
Return Loss	- 30.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.169 ns	
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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

Date: 11.07.2023

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1018

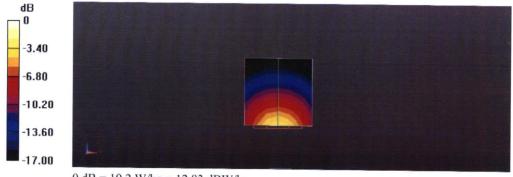
Communication System: UID 0 - CW; Frequency: 2300 MHz Medium parameters used: f = 2300 MHz; σ = 1.68 S/m; ϵ_r = 38.3; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.98, 7.98, 7.98) @ 2300 MHz; Calibrated: 10.01.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 19.12.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 116.0 V/m; Power Drift = 0.02 dB Peak SAR (extrapolated) = 22.1 W/kg **SAR(1 g) = 12.4 W/kg; SAR(10 g) = 6.03 W/kg** Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 56.2% Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.2 W/kg = 12.83 dBW/kg

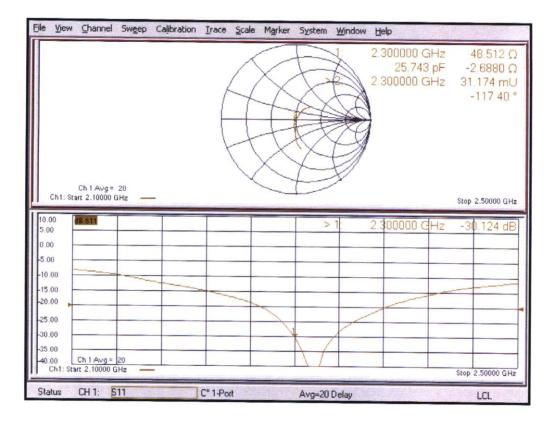
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Impedance Measurement Plot for Head TSL



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Engineering AG Zeughausstrasse 43, 8004 Zuric Accredited by the Swiss Accreditat	tion Service (SAS)		S Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service Accreditation No.: SCS 0108
The Swiss Accreditation Service Multilateral Agreement for the re			
Client CTTL	or grinten of calibration		
Beijing		Certificate No	D2450V2-853_Jul23
CALIBRATION C	ERTIFICAT	E	Exercise of the second s
Object	D2450V2 - SN:8	53	
Calibration procedure(s)	QA CAL-05.v12		
	Calibration Proce	edure for SAR Validation Source	es between 0.7-3 GHz
Calibration date:	July 11, 2023		
All calibrations have been conduct Calibration Equipment used (M&TE		y facility: environment temperature (22 ± 3)*	°C and humidity < 70%.
Primary Standards	ID #	Cal Data (Cadifacta No.)	
Power meter NRP2	SN: 104778	Cal Date (Certificate No.) 30-Mar-23 (No. 217-03804/03805)	Scheduled Calibration Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
	SN: 103245	30-Mar-23 (No. 217-03805)	
Power sensor NRP-Z91			Mar-24
	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24 Mar-24
Reference 20 dB Attenuator Type-N mismatch combination	SN: BH9394 (20k) SN: 310982 / 06327	30-Mar-23 (No. 217-03809) 30-Mar-23 (No. 217-03810)	
Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	SN: 310982 / 06327 SN: 7349		Mar-24
Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24 Mar-24
Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards	SN: 310982 / 06327 SN: 7349	30-Mar-23 (No. 217-03810) 10-Jan-23 (No. EX3-7349_Jan23)	Mar-24 Mar-24 Jan-24
Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B	SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475	30-Mar-23 (No. 217-03810) 10-Jan-23 (No. EX3-7349_Jan23) 19-Dec-22 (No. DAE4-601_Dec22) Check Date (in house) 30-Oct-14 (in house check Oct-22)	Mar-24 Mar-24 Jan-24 Dec-23
Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A	SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783	30-Mar-23 (No. 217-03810) 10-Jan-23 (No. EX3-7349_Jan23) 19-Dec-22 (No. DAE4-601_Dec22) Check Date (in house) 30-Oct-14 (in house check Oct-22) 07-Oct-15 (in house check Oct-22)	Mar-24 Mar-24 Jan-24 Dec-23 Scheduled Check
Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A	SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	30-Mar-23 (No. 217-03810) 10-Jan-23 (No. EX3-7349_Jan23) 19-Dec-22 (No. DAE4-601_Dec22) Check Date (in house) 30-Oct-14 (in house check Oct-22) 07-Oct-15 (in house check Oct-22) 07-Oct-15 (in house check Oct-22)	Mar-24 Mar-24 Jan-24 Dec-23 Scheduled Check In house check: Oct-24 In house check: Oct-24 In house check: Oct-24
Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E44198 Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Anilent E8358A	SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972	30-Mar-23 (No. 217-03810) 10-Jan-23 (No. EX3-7349_Jan23) 19-Dec-22 (No. DAE4-601_Dec22) Check Date (in house) 30-Oct-14 (in house check Oct-22) 07-Oct-15 (in house check Oct-22) 07-Oct-15 (in house check Oct-22) 15-Jun-15 (in house check Oct-22)	Mar-24 Mar-24 Jan-24 Dec-23 Scheduled Check In house check: Oct-24 In house check: Oct-24 In house check: Oct-24 In house check: Oct-24
Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A	SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	30-Mar-23 (No. 217-03810) 10-Jan-23 (No. EX3-7349_Jan23) 19-Dec-22 (No. DAE4-601_Dec22) Check Date (in house) 30-Oct-14 (in house check Oct-22) 07-Oct-15 (in house check Oct-22) 07-Oct-15 (in house check Oct-22)	Mar-24 Mar-24 Jan-24 Dec-23 Scheduled Check In house check: Oct-24 In house check: Oct-24 In house check: Oct-24
Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972	30-Mar-23 (No. 217-03810) 10-Jan-23 (No. EX3-7349_Jan23) 19-Dec-22 (No. DAE4-601_Dec22) Check Date (in house) 30-Oct-14 (in house check Oct-22) 07-Oct-15 (in house check Oct-22) 15-Jun-15 (in house check Oct-22) 31-Mar-14 (in house check Oct-22) Function	Mar-24 Mar-24 Jan-24 Dec-23 Scheduled Check In house check: Oct-24 In house check: Oct-24 In house check: Oct-24 In house check: Oct-24
Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477 Name	30-Mar-23 (No. 217-03810) 10-Jan-23 (No. EX3-7349_Jan23) 19-Dec-22 (No. DAE4-601_Dec22) Check Date (in house) 30-Oct-14 (in house check Oct-22) 07-Oct-15 (in house check Oct-22) 15-Jun-15 (in house check Oct-22) 31-Mar-14 (in house check Oct-22)	Mar-24 Mar-24 Jan-24 Dec-23 Scheduled Check In house check: Oct-24 In house check: Oct-24 In house check: Oct-24 In house check: Oct-24 In house check: Oct-24
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