

# Appendix C

## **Phantom Description**

Schmid & Partner Engineering AG

е a g s р

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#### Certificate of Conformity / First Article Inspection

Item	Oval Flat Phantom ELI 5.0
Type No	QD OVA 002 A
Series No	1108 and higher
Manufacturer	Untersee Composites
	Knebelstrasse 8, CH-8268 Mannenbach, Switzerland

#### Tests

Complete tests were made on the prototype units QD OVA 001 A, pre-series units QD OVA 001 B as well as on some series units QD OVA 001 B. Some tests are made on all series units QD OVA 002 A.

Test	Requirement	Details	Units tested
Shape	Internal dimensions, depth and sagging are compatible with standards	Bottom elliptical 600 x 400 mm, Depth 190 mm, dimension compliant with [1] for f > 375 MHz	Prototypes
Material thickness	Bottom: 2.0mm +/- 0.2mm	dimension compliant with [3] for f > 800 MHz	all
Material parameters	rel. permittivity 2 – 5, loss tangent ≤ 0.05, at f ≤ 6 GHz	rel. permittivity 3.5 +/- 0.5 loss tangent ≤ 0.05	Material samples
Material resistivity	Compatibility with tissue simulating liquids .	Compatible with SPEAG liquids. **	Phantoms, Material sample
Sagging	Sagging of the flat section in tolerance when filled with tissue simulating liquid.	within tolerance for filling height up to 155 mm	Prototypes, samples

Note: Compatibility restrictions apply certain liquid components mentioned in the standard.

containing e.g. DGBE, DGMHE or Triton X-100. Observe technical note on material compatibility

Standards

OET Bulletin 65, Supplement C, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", Edition 01-01
 IEEE 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific

- Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques, December 2003
- [3] IEC 62209-1 ed1.0, "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close
- proximity to the ear (frequency range of 300 MHz to 3 GHz)", 2005-02-18 [4] IEC 62209-2 ed1.0, "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 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)", 2010-03-30

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of body-worn SAR measurements and system performance checks as specified in [1 - 4] and further standards.

Date 25.7.2011

Signature / Stamp

speag Schmid & Partner-Engineering/AG Zeugbarestrasse 43, 8004 Zeich, Smithiand Phone/441 44/255 9708, Few-444 64 44 59779

Doc No 881 - QD OVA 002 A - A

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# System Validation from Original Equipment Supplier

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Client: SGS			o: 24J02Z000789
CALIBRATION C	ERTIFICA		0. 243022000789
Object	D750\	/3 - SN: 1015	
Calibration Procedure(s)	FF-71	1-003-01	
		ation Procedures for dipole validation kits	
Calibration date:	Septer	mber 27, 2024	
measurements (SI). The me pages and are part of the c	easurements an ertificate.	traceability to national standards, which real d the uncertainties with confidence probability a the closed laboratory facility: environment to	are given on the following
humidity<70%.			,
Calibration Equipment used	d (M&TE critical		
Calibration Equipment used	I (M&TE critical	for calibration) Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Calibration Equipment used Primary Standards Power Meter NRP2	I (M&TE critical ID # 106276	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107)	Scheduled Calibration May-25
Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A	ID # 106276 101369	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107)	Scheduled Calibration May-25 May-25
Calibration Equipment used Primary Standards Power Meter NRP2	I (M&TE critical ID # 106276	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107)	Scheduled Calibration May-25
Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4	ID # 106276 101369 SN 7464	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 22-Jan-24(SPEAG, No. EX-7464_Jan24) 03-Jan-24(CTTL-SPEAG, No.24J02Z80002)	Scheduled Calibration May-25 May-25 Jan-25
Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4	ID # 106276 101369 SN 7464 SN 1556	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 22-Jan-24(SPEAG, No. EX-7464_Jan24)	Scheduled Calibration May-25 May-25 Jan-25 Jan-25
Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards	ID # 106276 101369 SN 7464 SN 1556 ID #	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 22-Jan-24(SPEAG, No. EX-7464_Jan24) 03-Jan-24(CTTL-SPEAG, No.24J02Z80002) Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration May-25 May-25 Jan-25 Jan-25 Scheduled Calibration
Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	ID # 106276 101369 SN 7464 SN 1556 ID # MY49071430	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 22-Jan-24(SPEAG, No. EX-7464_Jan24) 03-Jan-24(CTTL-SPEAG, No.24J02Z80002) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426)	Scheduled Calibration May-25 May-25 Jan-25 Jan-25 Scheduled Calibration Dec-24
Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C OCP DAK-3.5(weighted)	ID # 106276 101369 SN 7464 SN 1556 ID # MY49071430 MY46110673	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 22-Jan-24(SPEAG, No. EX-7464_Jan24) 03-Jan-24(CTTL-SPEAG, No.24J02Z80002) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426) 25-Dec-23 (CTTL, No. J23X13425)	Scheduled Calibration May-25 May-25 Jan-25 Jan-25 Scheduled Calibration Dec-24 Dec-24
Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C OCP DAK-3.5(weighted)	ID # 106276 101369 SN 7464 SN 1556 ID # MY49071430 MY46110673 1040	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 22-Jan-24(SPEAG, No. EX-7464_Jan24) 03-Jan-24(CTTL-SPEAG, No.24J02Z80002) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426) 25-Dec-23 (CTTL, No. J23X13425) 22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Scheduled Calibration May-25 May-25 Jan-25 Jan-25 Scheduled Calibration Dec-24 Dec-24 Jan-25
Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C OCP DAK-3.5(weighted) Calibrated by:	ID # 106276 101369 SN 7464 SN 1556 ID # MY49071430 MY46110673 1040 Name	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 22-Jan-24(SPEAG, No. EX-7464_Jan24) 03-Jan-24(CTTL-SPEAG, No.24J02Z80002) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426) 25-Dec-23 (CTTL, No. J23X13425) 22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24) Function	Scheduled Calibration May-25 May-25 Jan-25 Jan-25 Scheduled Calibration Dec-24 Dec-24 Jan-25
Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C OCP DAK-3.5(weighted) Calibrated by: Reviewed by:	ID # 106276 101369 SN 7464 SN 1556 ID # MY49071430 MY46110673 1040 Name Zhao Jing	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 22-Jan-24(SPEAG, No. EX-7464_Jan24) 03-Jan-24(CTTL-SPEAG, No.24J02Z80002) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426) 25-Dec-23 (CTTL, No. J23X13425) 22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24) Function SAR Test Engineer	Scheduled Calibration May-25 May-25 Jan-25 Jan-25 Scheduled Calibration Dec-24 Dec-24 Jan-25
Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	I (M&TE critical 106276 101369 SN 7464 SN 1556 ID # MY49071430 MY46110673 1040 Name Zhao Jing Lin Jun	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 22-Jan-24(SPEAG, No. EX-7464_Jan24) 03-Jan-24(CTTL-SPEAG, No.24J02Z80002) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426) 25-Dec-23 (CTTL, No. J23X13425) 22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24) Function SAR Test Engineer SAR Test Engineer	Scheduled Calibration May-25 May-25 Jan-25 Jan-25 Scheduled Calibration Dec-24 Dec-24 Jan-25 Signature

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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 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	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.1 ± 6 %	0.88 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	2.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.51 W/kg ± 18.8 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.68 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	52.3Ω+ 0.01jΩ	
Return Loss	- 32.8dB	

#### General Antenna Parameters and Design

Electrical Delay (one direction)	0.944 ns
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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**

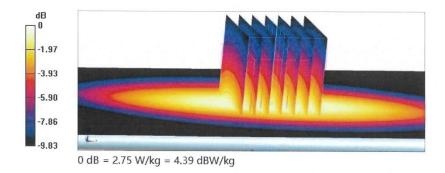
Date: 2024-09-27

Test Laboratory: CTTL, Beijing, China DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1015 Communication System: UID 0, CW; Frequency: 750 MHz Medium parameters used: f = 750 MHz;  $\sigma = 0.882 \text{ S/m}$ ;  $\varepsilon_r = 42.09$ ;  $\rho = 1000 \text{ kg/m}^3$ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) **DASY5** Configuration:

- Probe: EX3DV4 SN7464; ConvF(9.09, 9.18, 9.51) @ 750 MHz; Calibrated: 2024-01-22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2024-01-03
- 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 = 56.00 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 3.03 W/kg SAR(1 g) = 2.11 W/kg; SAR(10 g) = 1.41 W/kg Smallest distance from peaks to all points 3 dB below = 17.5 mm Ratio of SAR at M2 to SAR at M1 = 69.4%Maximum value of SAR (measured) = 2.75 W/kg



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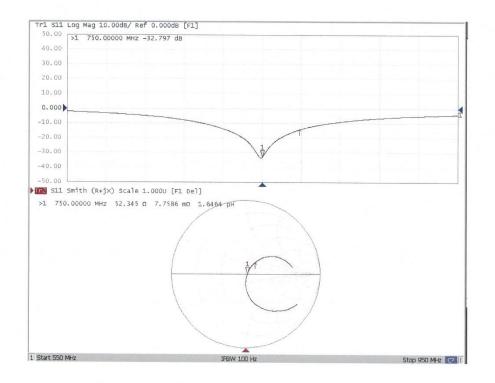
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Impedance Measurement Plot for Head TSL



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## Report No. : TESA2412000853EN Page: 8 of 56

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



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

#### Calibration is Performed According to the Following Standards

- · 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.
- · KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation

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 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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D835V2 - SN: 4d063

September 16, 2024

#### Measurement Conditions

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

DASY Version	DASY8 Module SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	835MHz ±1MHz	

#### Head TSL parameters at 835 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.900 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	43.0 ±6%	0.900 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

#### SAR result with Head TSL at 835 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.40 W/kg ±17.0% (k = 2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	1.52 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.05 W/kg ±16.5% (k = 2)

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D835V2 - SN: 4d063

September 16, 2024

#### Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL at 835 MHz

Impedance	51.4 Ω – 3.6 jΩ
Return Loss	-28.3 dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.392 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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Certificate No: D835V2-4d063 Sep24

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## Report No. : TESA2412000853EN Page: 12 of 56

D835V2 - SN: 4d063

#### September 16, 2024

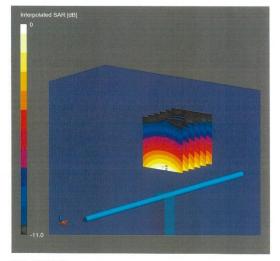
#### System Performance Check Report

	Frequency [MH	Iz] TSL	Power [dBm]		
	835	HSL	24		
5					
Test Distance [mm] Ba	ind Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
15	CW, 0	835,0	9.61	0.90	43.0
TSL, Measured Date	Pro	be, Calibration Date	DAE,	Calibration Date	
HSL, 2024-09-16	EX3	DV4 - SN7349, 2024-06-03	DAE4	p Sn1836, 2024-01-10	
	Test Distance [mm] Ba 15 TSL, Measured Date	835 5 Test Distance [mm] Band Group, UID 15 CW, 0 TSL, Measured Date Pro	835     HSL       S     Test Distance [mm]     Band     Group, UID     Frequency [MHz], Channel Number       15     CW, 0     835, 0       TSL, Measured Date     Probe, Calibration Date	B35     HSL     24       S       Test Distance [mm]     Band     Group, UID     Frequency [MHz], Channel Number     Conversion Factor       15     CW, 0     835, 0     9.61       TSL, Measured Date     Probe, Calibration Date     DAE, 1	HSL 24       S       Test Distance [mm]     Band     Group, UID     Frequency [MHz], Channel Number     Conversion Factor     TSL Conductivity [S/m]       15     CW, 0     835, 0     9.61     0.90       TSL, Measured Date     Probe, Calibration Date

#### Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	6.0 × 6.0 × 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	VMS + 6p
Scan Method	Measured

	Zoom Scan
Date	2024-09-16
psSAR1g [W/Kg]	2.36
psSAR10g [W/Kg]	1.52
Power Drift [dB]	0.01
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 3.65 W/Kg

Certificate No: D835V2-4d063\_Sep24

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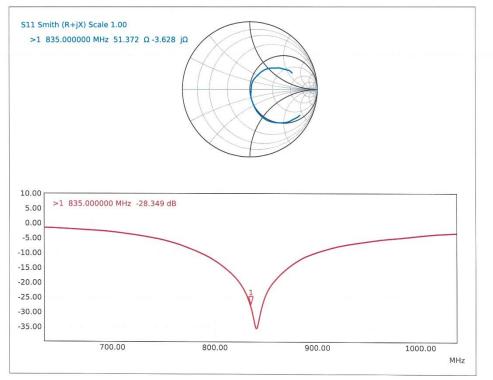


## Report No. : TESA2412000853EN Page: 13 of 56

D835V2 - SN: 4d063

September 16, 2024

Impedance Measurement Plot for Head TSL



Certificate No: D835V2-4d063 Sep24

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SGS	Report No. : TESA241200 Page : 14 of 56				
	Add: No.52 Hua YuanBei Ro Tel: +86-10-62304633-2117 E-mail: em@caict.ac.cn Client SGS	e a g	Beijing, 100191	BRATION S L0570	
	CALIBRATION CE	ERTIFICAT	ſE		
	Object	D1750	V2 - SN: 1158		
	Calibration Procedure(s)		-003-01 tion Procedures for dipole validation kits		
	Calibration date:	August	20, 2024		
			traceability to national standards, which real the uncertainties with confidence probability a		
	pages and are part of the ce	rtificate.	the uncertainties with confidence probability a	are given on the following	
	pages and are part of the ce All calibrations have been humidity<70%. Calibration Equipment used	conducted in t	the uncertainties with confidence probability a the closed laboratory facility: environment to or calibration)	are given on the following emperature (22±3)℃ and	
	pages and are part of the ce All calibrations have been humidity<70%.	rtificate.	the uncertainties with confidence probability a	are given on the following emperature (22±3)°C and Scheduled Calibration	
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## Report No. : TESA2412000853EN Page: 15 of 56





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#### Glossary:

TSL ConvF N/A

tissue simulating liquid sensitivity in TSL / NORMx,y,z 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: 24J02Z000514

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#### **Measurement Conditions**

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	1750 MHz ± 1 MHz	

#### Head TSL parameters

	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	41.0 ± 6 %	1.35 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	8.96 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.3 W/kg ± 18.8 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.6 W/kg ± 18.7 % (k=2)

Certificate No: 24J02Z000514

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#### Appendix (Additional assessments outside the scope of CNAS L0570)

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.4Ω- 0.88jΩ	
Return Loss	- 30.9dB	

#### **General Antenna Parameters and Design**

Electrical Delay (one direction)	1.125 ns	
----------------------------------	----------	--

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

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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## Report No. : TESA2412000853EN Page: 18 of 56





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

Date: 2024-08-20

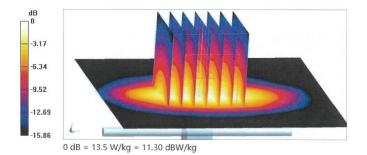
DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1158 Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1750 MHz;  $\sigma$  = 1.354 S/m;  $\epsilon_r$  = 41.01;  $\rho$  = 1000 kg/m^3 Phantom section: Right Section

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

- Probe: EX3DV4 SN7464; ConvF(7.99, 8.13, 8.29) @ 1750 MHz; Calibrated: 2024-01-22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- . Electronics: DAE4 Sn1556; Calibrated: 2024-01-03
- 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 = 94.45 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 15.8 W/kg SAR(1 g) = 8.96 W/kg; SAR(10 g) = 4.85 W/kg Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 57.6% Maximum value of SAR (measured) = 13.5 W/kg



Certificate No: 24J02Z000514

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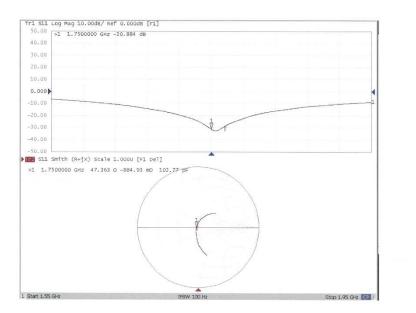
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Impedance Measurement Plot for Head TSL



Certificate No: 24J02Z000514

Page 6 of 6

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## Report No. : TESA2412000853EN Page: 20 of 56

Engineering AG Zeughausstrasse 43, 8004 Zurich,	, Switzerland		Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service
Accredited by the Swiss Accreditation The Swiss Accreditation Service i Multilateral Agreement for the rec	is one of the signatories		Accreditation No.: SCS 0108
Client SGS Taoyuan City		Certificate No.	D1900V2-5d173_Apr24
	ERTIFICATE		
Object	D1900V2 - SN:50	1173	
Calibration procedure(s)	QA CAL-05.v12 Calibration Proce	dure for SAR Validation Sources	between 0.7-3 GHz
Calibration date:	April 25, 2024		
Calibration Equipment used (M&TE Primary Standards	critical for calibration)	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	26-Mar-24 (No. 217-04036/04037)	Mar-25
Power sensor NRP-Z91	SN: 103244	26-Mar-24 (No. 217-04036)	
Power sensor NRP-Z91	SN: 103245	26-Mar-24 (No. 217-04037)	Mar-25
Reference 20 dB Attenuator	SN: BH9394 (20k)		Mar-25 Mar-25
Hereience zu ub Attenuator		26-Mar-24 (No. 217-04046)	
Type-N mismatch combination	SN: 310982 / 06327	26-Mar-24 (No. 217-04046) 26-Mar-24 (No. 217-04047)	Mar-25
Type-N mismatch combination Reference Probe EX3DV4	SN: 310982 / 06327 SN: 7349		Mar-25 Mar-25 Mar-25 Nov-24
Type-N mismatch combination		26-Mar-24 (No. 217-04047)	Mar-25 Mar-25 Mar-25
Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards	SN: 7349 SN: 601 ID #	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349_Nov23)	Mar-25 Mar-25 Mar-25 Nov-24
Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B	SN: 7349 SN: 601 ID # SN: GB39512475	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349_Nov23) 30-Jan-24 (No. DAE4-601_Jan24) Check Date (in house) 30-Oct-14 (in house check Oct-22)	Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Oct-24
Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A	SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349_Nov23) 30-Jan-24 (No. DAE4-601_Jan24) Check Date (in house) 30-Oct-14 (in house check Oct-22) 07-Oct-15 (in house check Oct-22)	Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Oct-24 In house check: Oct-24
Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A	SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349_Nov23) 30-Jan-24 (No. DAE4-601_Jan24) 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-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Oct-24 In house check: Oct-24 In house check: Oct-24
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: 7349 SN: 601 SN: GB39512475 SN: US37292783 SN: US37292783 SN: MY41093315 SN: 100972	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349_Nov23) 30-Jan-24 (No. DAE4-601_Jan24) 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)	Mar-25 Mar-25 Nov-24 Jan-25 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
Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A	SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349_Nov23) 30-Jan-24 (No. DAE4-601_Jan24) 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-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Cot-24 In house check: Cot-24 In house check: Cot-24
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: 7349 SN: 601 D # SN: GB39512475 SN: US37292783 SN: US37292783 SN: 10972 SN: US41080477 Name	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349, Nov23) 30-Jan-24 (No. DAE4-601_Jan24) 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) 31-Mar-14 (in house check Oct-22) Function	Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Oct-24 In house check: Oct-24 In house check: Oct-24 In house check: Oct-24
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: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349_Nov23) 30-Jan-24 (No. DAE4-601_Jan24) 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) 31-Mar-14 (in house check Oct-22)	Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Cot-24 In house check: Cot-24
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: 7349 SN: 601 D # SN: GB39512475 SN: US37292783 SN: US37292783 SN: 10972 SN: US41080477 Name	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349, Nov23) 30-Jan-24 (No. DAE4-601_Jan24) 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) 31-Mar-14 (in house check Oct-22) Function	Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Cot-24 In house check: Cot-24
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 Calibrated by:	SN: 7349 SN: 601 D # SN: US37292783 SN: US37292783 SN: 100972 SN: US41080477 Name Paulo Pina	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349_Nov23) 30-Jan-24 (No. DAE4-601_Jan24) Check Date (in house) 30-Oct-16 (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) 31-Mar-14 (in house check Oct-22) Function Laboratory Technician	Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Cot-24 In house check: Cot-24
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 Calibrated by:	SN: 7349 SN: 601 D # SN: US37292783 SN: US37292783 SN: US37292783 SN: US41080477 Name Paulo Pina	26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349_Nov23) 30-Jan-24 (No. DAE4-601_Jan24) Check Date (in house) 30-Oct-16 (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) 31-Mar-14 (in house check Oct-22) Function Laboratory Technician	Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Cot-24 In house check: Cot-24

Certificate No: D1900V2-5d173 Apr24

Page 1 of 6

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## Report No. : TESA2412000853EN Page: 21 of 56

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





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#### Glossary: TSL

Con

N/A

	tissue simulating liquid
ivF	sensitivity in TSL / NORM x,y,z
	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: D1900V2-5d173\_Apr24

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## Report No. : TESA2412000853EN Page: 22 of 56

#### 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	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	41.1 ± 6 %	1.40 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	12222	

#### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.92 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.9 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 250 mW input power	5.22 W/kg

Certificate No: D1900V2-5d173\_Apr24

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## Report No. : TESA2412000853EN Page: 23 of 56

#### Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 Ω + 4.5 jΩ
Return Loss	- 26.5 dB

#### **General Antenna Parameters and Design**

Electrical Delay (one direction)	1.199 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

L	Manufactured by	SPEAG
- L		Received and a second se

Certificate No: D1900V2-5d173\_Apr24

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## Report No. : TESA2412000853EN Page: 24 of 56

#### **DASY5 Validation Report for Head TSL**

Date: 25.04.2024

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d173

Communication System: UID 0 - CW; Frequency: 1900 MHz Medium parameters used: f = 1900 MHz;  $\sigma = 1.4 \text{ S/m}$ ;  $\varepsilon_r = 41.1$ ;  $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

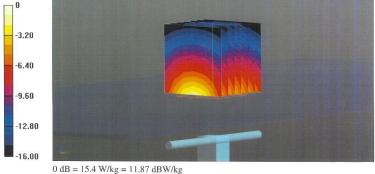
DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.43, 8.43, 8.43) @ 1900 MHz; Calibrated: 03.11.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- . Electronics: DAE4 Sn601: Calibrated: 30.01.2024
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; 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 = 110.3 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 18.4 W/kg SAR(1 g) = 9.92 W/kg; SAR(10 g) = 5.22 W/kg Smallest distance from peaks to all points 3 dB below = 9.2 mmRatio of SAR at M2 to SAR at M1 = 54.9%Maximum value of SAR (measured) = 15.4 W/kg





Certificate No: D1900V2-5d173\_Apr24

Page 5 of 6

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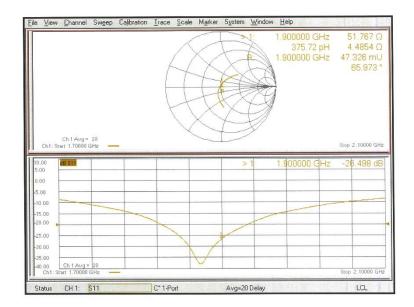
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Impedance Measurement Plot for Head TSL



Certificate No: D1900V2-5d173\_Apr24

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measurements (SI). The measurements and the uncertainties with confidence probability are given on the follo bages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C humidity<70%.
Client:       SGS       Certificate No: 24J02Z000517         CALIBRATION CERTIFICATE       D2300V2 - SN: 1009         Deject       D2300V2 - SN: 1009         Calibration Procedure(s)       FF-Z11-003-01 Calibration Procedures for dipole validation kits         Calibration Certificate documents the traceability to national standards, which realize the physical un measurements (SI). The measurements and the uncertainties with confidence probability are given on the followages and are part of the certificate.         All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C numidity<70%.
CALIBRATION CERTIFICATE         Object       D2300V2 - SN: 1009         Calibration Procedure(s)       FF-Z11-003-01         Calibration Procedures for dipole validation kits         Calibration date:       August 22, 2024         This calibration Certificate documents the traceability to national standards, which realize the physical un measurements (SI). The measurements and the uncertainties with confidence probability are given on the followages and are part of the certificate.         All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C numidity<70%.
Dbject       D2300V2 - SN: 1009         Calibration Procedure(s)       FF-Z11-003-01 Calibration Procedures for dipole validation kits         Calibration date:       August 22, 2024         This calibration Certificate documents the traceability to national standards, which realize the physical un measurements (SI). The measurements and the uncertainties with confidence probability are given on the folio bages and are part of the certificate.         All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3) conumidity<70%.
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Salisfation Equipment used (Marte Childan of Calisfation)
Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibr
Power Meter NRP2 106276 17-May-24 (CTTL, No. J24X04107) May-25
Power sensor NRP6A 101369 17-May-24 (CTTL, No. J24X04107) May-25
Reference Probe EX3DV4 SN 7464 22-Jan-24(SPEAG, No. EX-7464 Jan24) Jan-25
DAE4 SN 1556 03-Jan-24(CTTL-SPEAG, No.24J02Z80002) Jan-25
Secondary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibra
Signal Generator E4438C MY49071430 25-Dec-23 (CTTL, No. J23X13426) Dec-24
NetworkAnalyzer E5071C MY46110673 25-Dec-23 (CTTL, No. J23X13425) Dec-24
NetworkAnalyzer E5071C MY46110673 25-Dec-23 (CTTL, No. J23X13425) Dec-24
OCP DAK-3.5(weighted)         1040         22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)         Jan-25
OCP DAK-3.5(weighted) 1040 22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24) Jan-25 Name Function Signature
OCP DAK-3.5(weighted)         1040         22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)         Jan-25           Name         Function         Signature           Calibrated by:         A         A

Certificate No: 24J02Z000517

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#### Glossarv:

TSL ConvF N/A

tissue simulating liquid sensitivity in TSL / NORMx,y,z 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 52.10.4 Extrapolation Advanced Extrapolation Triple Flat Phantom 5.1C Phantom **Distance Dipole Center - TSL** 10 mm with Spacer Zoom Scan Resolution dx, dy, dz = 5 mm

#### Head TSL parameters

Frequency

he 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	40.3 ± 6 %	1.63 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

2300 MHz ± 1 MHz

#### SAR result with Head TSL

SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	49.7 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.9 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	46.6Ω- 1.65jΩ
Return Loss	- 28.1dB

#### **General Antenna Parameters and Design**

Electrical Delay (one direction)	1.075 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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Date: 2024-08-22

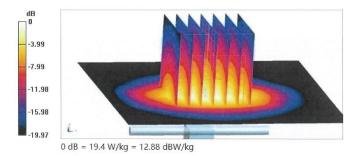
**DASY5 Validation Report for Head TSL** Test Laboratory: CTTL, Beijing, China DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1009 Communication System: UID 0, CW; Frequency: 2300 MHz Medium parameters used: f = 2300 MHz;  $\sigma$  = 1.628 S/m;  $\epsilon_r$  = 40.31;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

**DASY5** Configuration:

- Probe: EX3DV4 SN7464; ConvF(7.46, 7.6, 7.77) @ 2300 MHz; Calibrated: 2024-01-22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2024-01-03
- 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 = 98.33 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 23.3 W/kg

SAR(1 g) = 12.2 W/kg; SAR(10 g) = 5.91 W/kg Smallest distance from peaks to all points 3 dB below = 8.9 mm Ratio of SAR at M2 to SAR at M1 = 53.5% Maximum value of SAR (measured) = 19.4 W/kg



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