

Appendix G

Phantom Description

Schmid & Parmer Engineering AG s e

ugheunstresse 43, 8004 Zurich, Switzeller one +41 1 245 9700; Fax +41 1 245 9779 HOGEDING COTT. HITS:/ WW speed con

Certificate of Conformity / First Article Inspection

item	SAM Twin Phantom V4.0
Type No.	QD 000 P40 C
Series No	TP-1150 and higher
Manufacturer	SPEAG Zeughausstrasse 43 CH-8004 Zürich Switzeriand

Tests The series production process used allows line irmitation to test of first articles.

Complete tests were made on the pre-series Type No. QD 000 P40 AA. Serial No. TP-1001 and on the sories first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been released using further series items (salled samples) or are tested at each item

Test	Requirement	Details	Units tested
Dimensions	Compliant with the geametry according to the CAD model.	(T'IS CAD File (*)	First article, Samples
Material thickness of shell	Compliant with the requirements according to the standards	2mm +/- 0.2mm in flat and specific areas of head section	First article, Samples, TP-1314 ff.
Material thickness at ERP	Compliant with the requirements according to the standards	6mm +/- 0.2mm at ERP	First article, Al items
Material parameters	Dielectric parameters for required frequencies	300 MHz - 0 GHz: Relative parmittivity < 5. Loss tangent < 0.05	Material samples
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions. Observe technical Note for material compatibility.	DEGMBE based simulating liquids	Pre-series, First article, Material samples
Segging	Compliant with the requirements according to the standards. Sagging of the flat section when filled with fissue simulating liquid.	< 1% typical < 0.8% if filled with 155mm of HSL900 and without DUT below	Prototypes, Sample testing

Standards

- CENELEC EN 50361 IEEE 8td 1528-2003

- 13] IEC 62209 Part 1 FCC OET Sulletin 65, Supplement C, Edition 01-01
- The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of the other documents.

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainity requirements of SAR measurements apacified in standards [1] to [4]

07.07.2005

Date

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Signature / Stamp

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Doc He. MIT - 00 000 P40 C - #

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f (886-2) 2298-0488



System Validation from Original Equipment Supplier

Engineering AG Leughausstrasse 43, 8004 Zurich	y of n, Switzerland		S Schweizerischer Kalibrierdienst C Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service
Accredited by the Swiss Accreditation The Swiss Accreditation Service Aultilateral Agreement for the re-	is one of the signatorie		Accreditation No.: SCS 0108
Client SGS Taoyuan City		Certificate No	D900V2-178_Apr24
CALIBRATION C	ERTIFICAT	E	
Object	D900V2 - SN:17	8	
Calibration procedure(s)	QA CAL-05.v12 Calibration Proce	edure for SAR Validation Source	es between 0.7-3 GHz
Calibration date:	April 18, 2024		
All calibrations have been conducte	ed in the closed laborato	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	
Calibration Equipment used (M&TE	critical for calibration)		
Calibration Equipment used (M&TE Primary Standards	critical for calibration)	Cal Date (Certificate No.)	Scheduled Calibration
Calibration Equipment used (M&TE Primary Standards Power meter NRP2	critical for calibration)	Cal Date (Certificate No.) 26-Mar-24 (No. 217-04036/04037)	Scheduled Calibration Mar-25
Calibration Equipment used (M&TE Primary Standards Power meter NRP2 Power sensor NRP-Z91	ID # SN: 104778 SN: 103244	Cal Date (Certificale No.) 26-Mar-24 (No. 217-04036/04037) 26-Mar-24 (No. 217-04036)	Scheduled Calibration Mar-25 Mar-25
Calibration Equipment used (M&TE Primary Standards Power meter NRP2 Power sensor NRP-Z91 Power sensor NRP-Z91	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245	Cal Date (Certificale No.) 26-Mar-24 (No. 217-04036/04037) 26-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04037)	Scheduled Calibration Mar-25 Mar-25 Mar-25
Calibration Equipment used (M&TE Primary Standards Power meter NRP2 Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20K)	Cal Date (Certificate No.) 26-Mar-24 (No. 217-D4036/04037) 28-Mar-24 (No. 217-04036) 28-Mar-24 (No. 217-04037) 26-Mar-24 (No. 217-04046)	Scheduled Calibration Mar-25 Mar-25 Mar-25 Mar-25
Calibration Equipment used (M&TE Primary Standards Power meter NRP2 Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245	Cal Date (Certificale No.) 26-Mar-24 (No. 217-04036/04037) 26-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04037) 26-Mar-24 (No. 217-04046) 26-Mar-24 (No. 217-04047)	Scheduled Calibration Mar-25 Mar-25 Mar-25 Mar-25 Mar-25
Calibration Equipment used (M&TE Primary Standards Power meter NRP-2 Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	eritical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH3394 (20k) SN: 310982 / 06327	Cal Date (Certificate No.) 26-Mar-24 (No. 217-D4036/04037) 28-Mar-24 (No. 217-04036) 28-Mar-24 (No. 217-04037) 26-Mar-24 (No. 217-04046)	Scheduled Calibration Mar-25 Mar-25 Mar-25 Mar-25
Calibration Equipment used (M&TE Primary Standards Power meter NRP-2 Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 3H-9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID #	Cal Date (Certificate No.) 26-Mar-24 (No. 217-04036/04037) 26-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04037) 26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7348 Nov23) 30-Jan-24 (No. DAE4-501 Jan24) Check Data (in house)	Scheduled Calibration Mar-25 Mar-25 Mar-25 Mar-25 Mar-25 Nov-25 Nov-24
Calibration Equipment used (M&TE Primary Standards Power meter NRP2 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	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 03245 SN: 9H9394 (20k) SN: 310982 / 06327 SN: 310982 / 06327 SN: 601 ID # SN: GB39512475	Cal Date (Certificale No.) 26-Mar-24 (No. 217-04036/04037) 26-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04037) 26-Mar-24 (No. 217-04047) 26-Mar-24 (No. 217-04047) 03-Nor-23 (No. EX3-3748 Nov23) 30-Jan-24 (No. DAE4-501 Jan24) Check Date (in house) 30-Oct-14 (in house check Oct-22) 30-Oct-24 (in house check Oct-22)	Scheduled Calibration Mar-25 Mar-25 Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Oct-24
Calibration Equipment used (M&TE Primary Standards Power meter NRP2 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 Power meter E4419B	ID # ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: 10492 / 06327 SN: 310982 / 06327 SN: 601 ID # SN: 0532512475 SN: US37292783	Cal Date (Certificate No.) 26-Mar-24 (No. 217-04036/04037) 26-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04037) 26-Mar-24 (No. 217-04047) 03-Nor-23 (No. EX3-7349 Nov23) 30-Jan-24 (No. DAE4-501 Jan24) Check Data (in house) 30-Oct-14 (in house check Oct-22) 07-Oct-15 (in house check Oct-22)	Scheduled Calibration Mar-25 Mar-25 Mar-25 Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Oct-24 In house check: Oct-24
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 Power sensor HP 8481A Power sensor HP 8481A	ID # SN: 103244 SN: 103244 SN: 103244 SN: 103245 SN: 8149394 (20k) SN: 7349 SN: 601 ID # SN: 1033512475 SN: US37292783 SN: MY41093315	Cal Date (Certificale No.) 26-Mar-24 (No. 217-04036/04037) 25-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04047) 26-Mar-24 (No. 217-04047) 26-Mar-24 (No. 217-04047) 26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7348 Nov23) 30-Jan-24 (No. DAE4-501 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)	Scheduled Calibration Mar-25 Mar-25 Mar-25 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
Calibration Equipment used (M&TE Primary Standards Power meter NRP2 Power sensor NRP-291 Power sensor NRP-291 Paterence 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power sensor HP 848TA Power sensor HP 848TA	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 03245 SN: 310982 / 06327 SN: 310982 / 06327 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: M/41093315 SN: 10972	Cal Date (Certificale No.) 26-Mar-24 (No. 217-04036/04037) 26-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04037) 26-Mar-24 (No. 217-04037) 26-Mar-24 (No. 217-04047) 03-Nor-23 (No. EX3-7348 Nov23) 30-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 10, EX3-7348 Nov23) 30-Jan-24 (No. 70, 217-04047) 03-Jan-24 (No. 10, EX3-7348 Nov23) 30-Jan-24 (No. 10, 217-04047) 03-Jan-24 (No. 10, EX3-7348 Nov23) 30-Jan-24 (No. 10, 217-04047) 03-Jan-24 (No. 10, EX3-7348 Nov23) 30-Jan-24 (No. 10, 217-04047) 03-Jan-24 (No. 10, EX3-7348 Nov23) 30-Jan-24 (No. 10, 217-04047) 30-Jan-24 (No. 10, No EX3-748 Nov23) 30-Jan-24 (No. 10, 00, 20, 20, 20, 20, 20, 20, 20, 20, 2	Scheduled Calibration Mar-25 Mar-25 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
Calibration Equipment used (M&TE Primary Standards Power meter NRP-29 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 Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	ID # SN: 103244 SN: 103244 SN: 103244 SN: 103245 SN: 8149394 (20k) SN: 7349 SN: 601 ID # SN: 1033512475 SN: US37292783 SN: MY41093315	Cal Date (Certificale No.) 26-Mar-24 (No. 217-04036/04037) 25-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04047) 26-Mar-24 (No. 217-04047) 26-Mar-24 (No. 217-04047) 26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7348 Nov23) 30-Jan-24 (No. DAE4-501 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)	Scheduled Calibration Mar-25 Mar-25 Mar-25 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
Calibration Equipment used (M&TE Primary Standards Power meder 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 E44198 Power sensor HP 8481A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	critical for calibration) ID # SN: 103778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 601 ID # SN: 603 SN: US37292783 SN: US37292783 SN: 100972 SN: US41080477 Name	Cal Date (Certificale No.) 26-Mar-24 (No. 217-04036/04037) 26-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04037) 26-Mar-24 (No. 217-04037) 26-Mar-24 (No. 217-04047) 03-Nor-23 (No. EX3-7348 Nov23) 30-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 10, EX3-7348 Nov23) 30-Jan-24 (No. 70, 217-04047) 03-Jan-24 (No. 10, EX3-7348 Nov23) 30-Jan-24 (No. 10, 217-04047) 03-Jan-24 (No. 10, EX3-7348 Nov23) 30-Jan-24 (No. 10, 217-04047) 03-Jan-24 (No. 10, EX3-7348 Nov23) 30-Jan-24 (No. 10, 217-04047) 03-Jan-24 (No. 10, EX3-7348 Nov23) 30-Jan-24 (No. 10, 217-04047) 30-Jan-24 (No. 10, No EX3-748 Nov23) 30-Jan-24 (No. 10, 00, 20, 20, 20, 20, 20, 20, 20, 20, 2	Scheduled Calibration Mar-25 Mar-25 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
Calibration Equipment used (M&TE Primary Standards Power meder 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 E44198 Power sensor HP 8481A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	Critical for calibration) ID # SN: 103244 SN: 103244 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: 0539512475 SN: US37292783 SN: 100972 SN: US41080477	Cal Date (Certificale No.) 26-Mar-24 (No. 217-04036/04037) 25-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04045) 25-Mar-24 (No. 217-04045) 26-Mar-24 (No. 217-04047) 26-Mar-24 (No. 217-04047) 03-Nov-23 (No. EX3-7349 Nov23) 30-Jan-24 (No. 2A7-40477) 30-02t-14 (In house) 30-02t-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)	Scheduled Calibration Mar-25 Mar-25 Mar-25 Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Oct-24 In house check: Oct-24
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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 Power sensor HP 8481A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by:	ID # ID # SN: 103244 SN: 103244 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 601 ID # SN: 661 SN: W4/1083315 SN: 10972 SN: US41080477 Name Paulo Pina	Cal Date (Certificate No.) 26-Mar-24 (No. 217-04036/04037) 26-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04036) 26-Mar-24 (No. 217-04047) 26-Mar-24 (No. 217-04047) 03-Nor-23 (No. EX3-7348 Nov23) 30-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 03-Jan-24 (No. 217-04047) 05-Jan-14 (in house check Oct-22) 07-Oct-15 (in house check Oct-22) 07-Oct-15 (in house check Oct-22) 15-Jun-16 (in house check Oct-22) 15-Jun-15 (in house check Oct-22) 15-Jun-16 (in house check Oct-22) 15-Jun-15 (in house check Oct-22) 15-Jun-16 (in house check Oct-22) 15-Jun-15 (in house check Oct-22) 15-Jun-16 (in house check Oct-22) 15-Jun-15 (in house check Oct-22) 15-Jun-16 (in house check Oct-22) 15-Jun-16 (in house check Oct-22) 15-Jun-16 (in house check Oct-22) 16-Mar-14 (in house check Oct-22) 15-Jun-16 (in house check Oct-22)	Scheduled Calibration Mar-25 Mar-25 Mar-25 Mar-25 Mar-25 Nov-24 Jan-25 Scheduled Check In house check: Oct-24 In house check: Oct-24

Certificate No: D900V2-178_Apr24

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f (886-2) 2298-0488



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Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland Accredited by the Swiss Accreditation Service (SAS) Iac-MRA



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Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

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

Glossary: TSL

ConvF

N/A

tissue simulating liquid sensitivity in TSL / NORM x,y,z not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEC/IEE 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: D900V2-178_Apr24

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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	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 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	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.4 ± 6 %	0.95 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	2.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	11.2 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	1.76 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	48.7 Ω - 1.9 jΩ	
Return Loss	- 32,7 dB	

General Antenna Parameters and Design

1.401115	Electrical Delay (one direction)	1.401 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 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: 18.04.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:178

Communication System: UID 0 - CW; Frequency: 900 MHz Medium parameters used: f = 900 MHz; $\sigma = 0.95$ S/m; $s_r = 42.4$; p = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

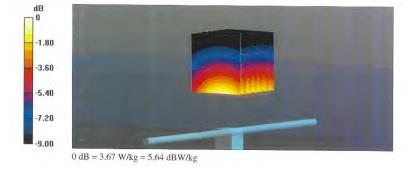
DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(9.62, 9.62, 9.62) @ 900 MHz; Calibrated: 03.11.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2024
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0;

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 65.28 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 4.17 W/kg SAR(1 g) = 2.73 W/kg; SAR(10 g) = 1.76 W/kg Smallest distance from peaks to all points 3 dB below = 15.8 mm Ratio of SAR at M2 to SAR at M1 = 65.7% Maximum value of SAR (measured) = 3.67 W/kg





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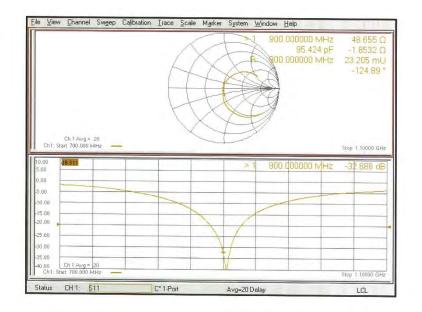
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Impedance Measurement Plot for Head TSL



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Add: No.52 HuaYuanBei Ro Tel: +86-10-62304633-2117 E-mail: emf@caict.ac.cn	e a g ON LABORATORY Dad, Haidian District	Beijing, 100191	中国认可 国际互认 校准 CALIBRATION CNAS L0570
CALIBRATION C	ERTIFICAT		+3022000790
Object	D1750	V2 - SN: 1008	
Calibration Procedure(s)		1-003-01 ation Procedures for dipole validation kits	
Calibration date:	Septer	nber 27, 2024	
pages and are part of the ce	ertificate.		ty are given on the followi
	conducted in	the closed laboratory facility: environmen for calibration)	
All calibrations have been humidity<70%.	conducted in	for calibration)	t temperature (22±3)℃ a
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2	conducted in	for calibration) Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107)	
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All calibrations have been humidity<70%. 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:	conducted in I (M&TE critical f 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_Jan2 Function SAR Test Engineer SAR Test Engineer SAR Project Leader	t temperature (22±3)°C a Scheduled Calibratio May-25 May-25 Jan-25) Jan-25 Scheduled Calibratio Dec-24 Dec-24 4) Jan-25

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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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Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2117 http://www.caict.ac.cn E-mail: emf@caict.ac.cn

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

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	40.9 ± 6 %	1.37 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	9.01 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	4.88 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.6 W/kg ± 18.7 % (k=2)

Certificate No: 24J02Z000790

Page 3 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	47.9Ω+ 0.24jΩ
Return Loss	- 33.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.127 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	Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

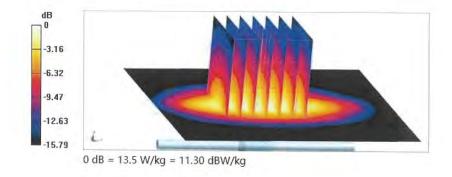
Date: 2024-09-27

Test Laboratory: CTTL, Beijing, China DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1008 Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1750 MHz; σ = 1.365 S/m; ε_r = 40.87; ρ = 1000 kg/m³ 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 = 98.11 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 15.8 W/kg SAR(1 g) = 9.01 W/kg; SAR(10 g) = 4.88 W/kg Smallest distance from peaks to all points 3 dB below = 9.8 mm Ratio of SAR at M2 to SAR at M1 = 57.9% Maximum value of SAR (measured) = 13.5 W/kg



Certificate No: 24J02Z000790

Page 5 of 6

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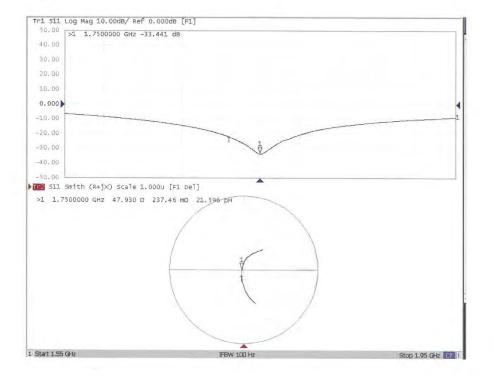






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Impedance Measurement Plot for Head TSL



Certificate No: 24J02Z000790

Page 6 of 6

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SGS				ort No. : TESA241 ² e: 14 of 37
	TTL s p		, Beijing, 100191	中国认可 国际互认 CALIBRATION CNAS L0570
	CALIBRATION C	ERTIFICA	ΓE	
	Object	D1900	V2 - SN: 5d056	
	Calibration Procedure(s)		1-003-01 ation Procedures for dipole validation kits	
	Calibration date:	Augus	t 19, 2024	
	All calibrations have been humidity<70%. Calibration Equipment used		the closed laboratory facility: environm	nent temperature (22±3)°C and
	Primary Standards	ID #	Cal Date (Calibrated by, Certificate N	o.) Scheduled Calibration
	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 DAE4	SN 7464 SN 1556	22-Jan-24(SPEAG, No. EX-7464_Jan2 03-Jan-24(CTTL-SPEAG, No.24J02Z800	
	Secondary Standards	ID#	Cal Date (Calibrated by, Certificate No.) Scheduled Calibration
	Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	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_J	an24) Jan-25
		Name	Function	Signature
	Calibrated by:	Zhao Jing	SAR Test Engineer	委竟
	Reviewed by:	Lin Jun	SAR Test Engineer	-mg
	Approved by:	Qi Dianyuan	SAR Project Leader	and
	This calibration certificate s	hall not be repro	Issued: / duced except in full without written appro	August 30, 2024 oval of the laboratory.

Certificate No: 24J02Z000515

Page 1 of 6

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Report No. : TESA2411000837ES



Report No. : TESA2411000837ES Page: 15 of 37





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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: 241027000515

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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	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 %	1.43 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	9.89 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.3 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.8 W/kg ± 18.7 % (k=2)

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Page 3 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	50.3Ω+ 5.68jΩ	
Return Loss	- 24.9dB	_

General Antenna Parameters and Design

lectrical Delay (one direction)	1.110 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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Report No. : TESA2411000837ES Page: 18 of 37





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DASY5 Validation Report for Head TSL

Date: 2024-08-19

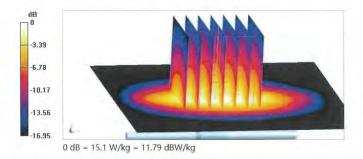
Test Laboratory: CTTL, Beijing, China DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d056 Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz; $\sigma = 1.427 \text{ S/m}$; $\varepsilon_r = 41.03$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Right Section

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

- DASY5 Configuration:
 - Probe: EX3DV4 SN7464; ConvF(7.64, 7.81, 7.99) @ 1900 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 = 99.21 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 17.8 W/kg SAR(1 g) = 9.89 W/kg; SAR(10 g) = 5.21 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mmRatio of SAR at M2 to SAR at M1 = 56.4% Maximum value of SAR (measured) = 15.1 W/kg



Certificate No: 24J02Z000515

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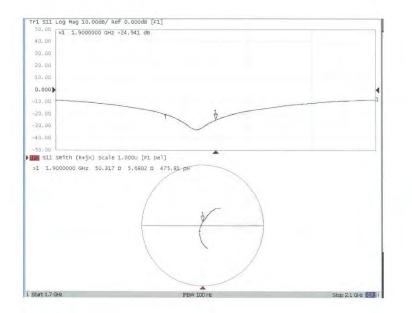
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Impedance Measurement Plot for Head TSL



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CALIBRATION C	ERTIFICAT		
Object	D2000V	/2 - SN: 1015	
Calibration Procedure(s)	FF-Z11- Calibrat	-003-01 ion Procedures for dipole validation kits	
Calibration date:	Septem	ber 27, 2024	
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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	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	2000 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	40.7 ± 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	10.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	41.2 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	-
SAR measured	250 mW input power	5.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.3 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	48.8Ω- 2.80jΩ	
Return Loss	- 30.2dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.098 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

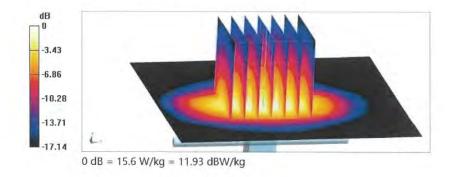
Date: 2024-09-27

Test Laboratory: CTTL, Beijing, China DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2 - SN: 1015 Communication System: UID 0, CW; Frequency: 2000 MHz Medium parameters used: f = 2000 MHz; σ = 1.388 S/m; ϵ_r = 40.74; ρ = 1000 kg/m^3 Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) **DASY5** Configuration:

- Probe: EX3DV4 SN7464; ConvF(7.57, 7.71, 7.88) @ 2000 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 = 92.35 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 18.3 W/kg SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.29 W/kg Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 56.7% Maximum value of SAR (measured) = 15.6 W/kg



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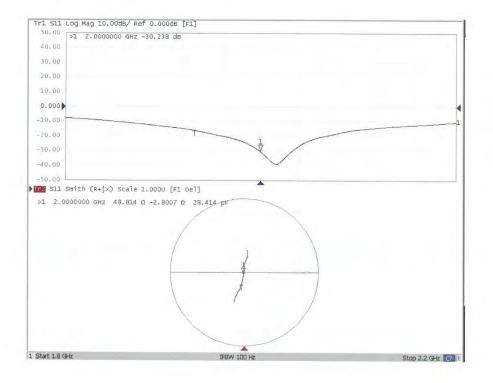
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Impedance Measurement Plot for Head TSL



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Certificate No: 24J02Z000792

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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	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	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	40.2 ± 6 %	1.68 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	12.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	49.3 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.99 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.0 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	47.3Ω- 1.14jΩ	
Return Loss	- 30.5dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.077 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 Test Laboratory: CTTL, Beijing, China

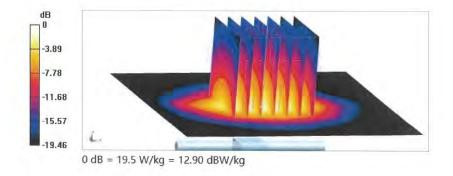
Date: 2024-09-27

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1023 Communication System: UID 0, CW; Frequency: 2300 MHz Medium parameters used: f = 2300 MHz; $\sigma = 1.68 \text{ S/m}$; $\varepsilon_r = 40.23$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) **DASY5** Configuration:

- Probe: EX3DV4 SN7464; ConvF(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 = 103.0 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 23.1 W/kg SAR(1 g) = 12.3 W/kg; SAR(10 g) = 5.99 W/kg Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 54.1% Maximum value of SAR (measured) = 19.5 W/kg



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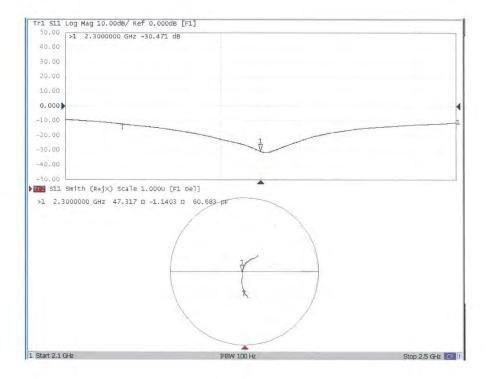
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Impedance Measurement Plot for Head TSL



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Report No. : TESA2411000837ES Page: 32 of 37

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ccredited by the Swiss Accreditation Service			Accreditation No.: SCS 0108
Iultilateral Agreement for the re	cognition of calibration	certificates	
Client SGS	-	Certificate N	o. D2600V2-1005 Jan24
Taoyuan City			D2000V2-1005_Janz4
CALIBRATION C	EDTIFICATI		
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Object	D2600V2 - SN:1	005	
Calibration procedure(s)	QA CAL-05.v12		
	Calibration Proce	dure for SAR Validation Source	es between 0.7-3 GHz
Calibration date:	January 22, 2024	A MARCHAN COMPANY	
This calibration certificate document	nts the traceability to nati	onal standards, which realize the physical (inite of managements (PI)
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		y facility: environment temperature (22 ± 3)⁰C and humidity < 70%.
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Calibration Equipment used (M&TE Primary Standards Power meter NRP2 Power sensor NRP-Z91	E critical for calibration) ID # SN: 104778 SN: 103244	Cal Date (Certificate No.) 30-Mar-23 (No. 217-03804/03805) 30-Mar-23 (No. 217-03804)	Scheduled Calibration Mar-24 Mar-24
Calibration Equipment used (M&TE Primary Standards Power meter NRP2 Power sensor NRP-Z91 Power sensor NRP-Z91	E critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245	Cal Date (Certificate No.) 30-Mar-23 (No. 217-03804/03805) 30-Mar-23 (No. 217-03804) 30-Mar-23 (No. 217-03805)	Scheduled Calibration Mar-24 Mar-24 Mar-24
Calibration Equipment used (M&TE Primary Standards Power meter NRP2 Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator	E critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k)	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. 217-03809)	Scheduled Calibration Mar-24 Mar-24 Mar-24 Mar-24
Calibration Equipment used (M&TE Primary Standards 20wer meter NRP2 20wer sensor NRP-291 20wer sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH3394 (20k) SN: 310982 / 06327	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. 217-03809) 30-Mar-23 (No. 217-03810)	Scheduled Calibration Mar-24 Mar-24 Mar-24 Mar-24 Mar-24 Mar-24
Calibration Equipment used (M&TE Primary Standards Power meter NRP-2 Yower sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349	Cai 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. 217-03809) 30-Mar-23 (No. 217-03810) 03-Nov-23 (No. EX3-7349_Nov23)	Scheduled Calibration Mar-24 Mar-24 Mar-24 Mar-24 Mar-24 Nov-24 Nov-24
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	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH3394 (20k) SN: 310982 / 06327	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. 217-03809) 30-Mar-23 (No. 217-03810)	Scheduled Calibration Mar-24 Mar-24 Mar-24 Mar-24 Mar-24 Mar-24
Calibration Equipment used (M&TE Primary Standards Power metter NRP2 Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards	Critical for calibration) ID # SN: 103778 SN: 103244 SN: 103245 SN: 5H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID #	Cai 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. 217-03809) 30-Mar-23 (No. 217-03810) 03-Nov-23 (No. EX3-7349_Nov23)	Scheduled Calibration Mar-24 Mar-24 Mar-24 Mar-24 Mar-24 Nov-24 Nov-24
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Calibration Equipment used (M&TE Primary Standards Power ensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E44198 Power sensor HP 8481A	Critical for calibration) ID # SN: 103778 SN: 103244 SN: 103245 SN: 5H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID #	Cal Date (Certificate No.) 30-Mar-23 (No. 217-03804/03805) 30-Mar-23 (No. 217-03804) 30-Mar-23 (No. 217-03809) 30-Mar-23 (No. 217-03810) 03-Nov-23 (No. EX3-7349_Nov23) 03-Oct-23 (No. DAE4-601_Oct23) Check Date (in house)	Scheduled Calibration Mar-24 Mar-24 Mar-24 Mar-24 Mar-24 Nav-24 Nov-24 Oct-24 Scheduled Check
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Calibration Equipment used (M&TE Primary Standards Power meter NRP-2 Power sensor NRP-291 Power sensor NRP-291 Power sensor NRP-291 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 Power sensor HP 8481A Power Sensor HP 8481A RE generator R&S SMT-06	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H3394 (20k) SN: 310982 / 66327 SN: 7349 SN: 7349 SN: 601 ID # SN: G839512475 SN: US37292783	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. 217-03809) 30-Mar-23 (No. 217-03810) 03-Nov-23 (No. DAE4-601_0c23) 03-Oct-23 (No. DAE4-601_0c23) Check Date (in house) 30-Oct-14 (in house check Oct-22) 07-Oct-15 (in house check Oct-22)	Scheduled Calibration Mar-24 Mar-24 Mar-24 Mar-24 Mar-24 Nov-24 Oct-24 Scheduled Check In house check: Oct-24 In house check: Oct-24
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Calibration Equipment used (M&TE Primary Standards Power meter NRP2 Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E44198 Power sensor HP 8481A	Critical for calibration) ID # SN: 103778 SN: 103244 SN: 103244 SN: 5H9394 (20k) SN: 310982 / 06827 SN: 310982 / 06827 SN: 6B39512475 SN: GB39512475 SN: US37292783 SN: W74108315 SN: US37192 SN: US41080477 Name	Cai Date (Certificate No.) 30-Mar-23 (No. 217-03804/03805) 30-Mar-23 (No. 217-03806) 30-Mar-23 (No. 217-03806) 30-Mar-23 (No. 217-03809) 30-Mar-23 (No. 217-03809) 30-Mar-23 (No. 217-038010) 03-Nov-23 (No. EX3-7349_Nov23) 03-Oct-23 (No. DAE4-601_Oct23) 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 thouse check Oct-22)	Scheduled Calibration Mar-24 Mar-24 Mar-24 Mar-24 Nov-24 Oct-24 Scheduled Check In house check: Oct-24 In house check: Oct-24
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Certificate No: D2600V2-1005_Jan24

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



Schweizerischer Kalibrierdienst Service suisse d'étalonnage С Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

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Glossary: TSL ConvF N/A

tissue simulating liquid 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%.

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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	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	2.02 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	14.3 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	56.0 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	6.36 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	48.8 Ω - 3.4 jΩ
Return Loss	- 28.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 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: 22.01.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1005

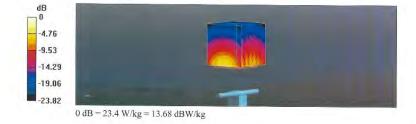
Communication System: UID 0 - CW; Frequency: 2600 MHz Medium parameters used: f = 2600 MHz; σ = 2.02 S/m; ϵ_r = 37.9; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.84, 7.84, 7.84) @ 2600 MHz; Calibrated: 03.11.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 03.10.2023
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001 ٠
- 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 = 116.7 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 28.4 W/kg SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.36 W/kg Smallest distance from peaks to all points 3 dB below = 8.9 mmRatio of SAR at M2 to SAR at M1 = 50.1%Maximum value of SAR (measured) = 23.4 W/kg



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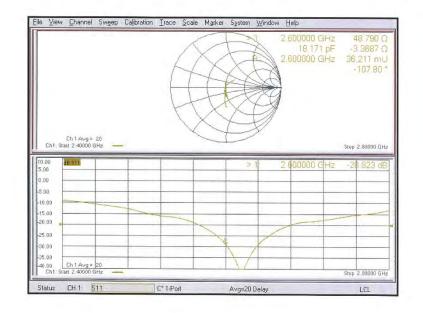
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Impedance Measurement Plot for Head TSL



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- End of report -

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No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan/新北市五股區新北產業園區五工路 134 號

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488

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