

Appendix C for KSCR220800147201

Calibration Certificate

Object	Apply	No	Model	SN	Calibration Date
Dipole	☐	1	CLA150	4025	2021/04/26
	☒	2	D450V3	1103	2021/04/21
	☐	3	D750V3	1188	2022/03/29
	☐	4	D835V2	4d114	2022/03/31
	☐	5	D900V2	1d079	2022/06/07
	☐	6	D1800V2	2d170	2022/03/31
	☐	7	D1900V2	5d136	2022/06/07
	☐	8	D2000V2	1041	2022/06/06
	☐	9	D2300V2	1096	2022/03/31
	☐	10	D2450V2	817	2022/04/01
	☐	11	D2600V2	1158	2022/03/31
	☐	12	D5GHzV2	1095	2022/06/01
DAE	☒	13	DAE4	1245	2022/05/30
Probe	☒	14	EX3DV4	3801	2022/07/21



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1 Dipole

1.1 CLA150 - SN 4025

Calibration Laboratory of Schmid & Partner Engineering AG Zugstrasse 43, 8001 Zurich, Switzerland		Schweizerischer Kalibrierdienst S Service suisse d'étalonnage Service suisse d'étalonnage S Swiss Calibration Service	
Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates		Accreditation No.: SCS 0108	
Client: SGS-CN (Auden)		Certificate No.: CLA150-4025_Apr21	
CALIBRATION CERTIFICATE			
Object: CLA150 - SN: 4025			
Calibration procedure(s): QA CAL-15-v9 Calibration Procedure for SAR Validation Sources below 700 MHz			
Calibration date: April 26, 2021			
The calibration certificate documents the traceability to material standards, which define the physical units of measurements (SI). The measurement and the uncertainty with confidence probability are given on the following pages and are part of the certificate.			
All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 2°C and humidity < 70%).			
Calibration equipment used (MATE critical for calibration)			
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN 10478	09-Apr-21 (No. 217-032810320)	Apr-22
Power sensor NRP-Z91	SN 10384	09-Apr-21 (No. 217-03201)	Apr-22
Power sensor NRP-Z91	SN 10384	09-Apr-21 (No. 217-03201)	Apr-22
Reference 20 dB Attenuator	SN C2050 (C10)	09-Apr-21 (No. 217-03343)	Apr-22
Traceable impedance connector	SN 210867 (C037)	09-Apr-21 (No. 217-03343)	Apr-22
Reference Probe EXEINVA	SN 3877	30-Dec-20 (No. EX30377, Dec20)	Dec-21
DAK4	SN 654	10-Jan-19 (No. DAK4-054, Jan20)	Jun-21
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E44-18	SN 034128874	08-Apr-19 (in house check Jun-20)	In house check Jun-22
Power sensor E44-12A	SN M41439097	08-Apr-19 (in house check Jun-20)	In house check Jun-22
Power sensor E44-12A	SN D0110010	08-Apr-19 (in house check Jun-20)	In house check Jun-22
RF generator HP 8548C	SN US845017100	08-Aug-19 (in house check Jun-20)	In house check Jun-22
Network Analyser Agilent E8363A	SN USA1808477	31-Mar-14 (in house check Oct-20)	In house check Oct-21
Calibrated by:	Name: Jeffrey Katsman	Function: Laboratory Technician	Signature:
Approved by:	Krisz Pokovic	Technical Manager	Signature:
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Certificate No.: CLA150-4025_Apr21		Page 1 of 6	

Measurement Conditions	
DASY system configuration, as far as not given on page 1	
DASY Version	DASY V52.10.4
Extrapolation	Advanced Extrapolation
Phantom	ELIA Flat Phantom
EUT Positioning	Touch Position
Zoom Beam Resolution	8k, 0.9 = 4.0 mm, 0.2 = 1.4 mm
Frequency	150 MHz ± 1 MHz

Head TSL parameters	
The following parameters and calculations were spotted:	
Nominal Head TSL parameters	Temperature: 22.6 °C, Permittivity: 62.3, Conductivity: 8.75 mho/m
Measured Head TSL parameters	(22.6 ± 0.2) °C, 51.1 ± 6 %, 0.75 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C

SAR result with Head TSL	
SAR averaged over 1 cm³ (1 g) of Head TSL	Condition
SAR measured	1 W input power, 3.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W, 3.88 W/kg ± 18.4 % (kw)
SAR averaged over 10 cm³ (10 g) of Head TSL	condition
SAR measured	1 W input power, 2.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W, 2.59 W/kg ± 16.0 % (kw)

Appendix (Additional assessments outside the scope of SCS 0108)	
Antenna Parameters with Head TSL	
Impedance, transformed to feed point	47.8 Ω ± 1.5 Ω
Return Loss	-31.4 dB
Additional EUT Data	
Manufactured by	SPEAG

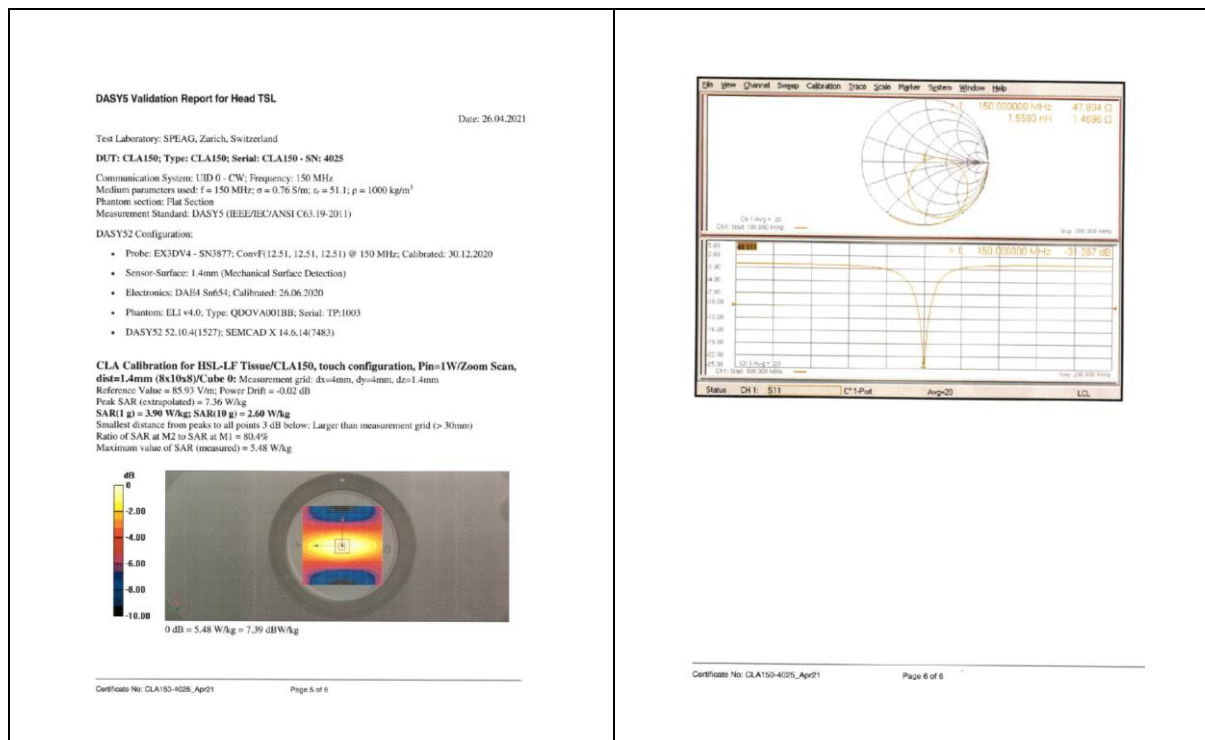
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Compliance Certification Services (Kunshan) Inc.	

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1.2 D450V3 - SN 1103

Calibration Laboratory of Schmid & Partner Engineering AG
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Client: **SGS-CN (Auden)** Calibration No: **D450V3-1103_Apr21**

CALIBRATION CERTIFICATE

Object: **D450V3 - SN:1103**

Calibration procedure(s): **QA CAL-15 v9 Calibration Procedure for SAR Validation Sources below 700 MHz**

Calibration date: **April 21, 2021**

This calibration certificate documents the traceability to national standards, which define the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 0.2 °C and humidity < 70%).

Calibration Equipment used (METS output for calibration):

Primary Standards	Q #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter RMP	SN 104778	09-Apr-21 (No. 217-0201/10020)	Apr-22
Power sensor RMP-291	SN 103244	09-Apr-21 (No. 217-0201/10020)	Apr-22
Power sensor RMP-291	SN 103245	09-Apr-21 (No. 217-0201/10020)	Apr-22
Reference 50 dB Attenuator	SN CC2002 (206)	09-Apr-21 (No. 217-0204)	Apr-22
Type A mismatch contribution	SN 310867 / 06307	09-Apr-21 (No. 217-0204)	Apr-22
Reference Probe EX3DV4	SN 3877	30-Dec-20 (No. 210-0277 Dec20)	Dec-21
DA84	SN 654	06-Jan-20 (No. DA84-654_Jan20)	Jan-21

Secondary Standards

Q #	Check Date (in house)	Scheduled Check
Power meter E4418B	SN: GSA1200274 06-Apr-16 (in house check Jun-20)	In house check Jun-22
Power sensor E4412A	SN: MVA1400007 06-Apr-16 (in house check Jun-20)	In house check Jun-22
Power sensor E4412A	SN: 000110210 06-Apr-16 (in house check Jun-20)	In house check Jun-22
RF generator HP 8446C	SN: L83040211709 04-Aug-09 (in house check Jun-20)	In house check Jun-22
Network Analyzer Agilent E8358A	SN: L841000477 01-Mar-14 (in house check Oct-20)	In house check Oct-21

Calibrated by: **Oliver Lueker** Function: **Laboratory Technician**

Approved by: **Krista Pionick** Technical Manager

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Certificate No: D450V3-1103_Apr21 Page 1 of 6

Calibration Laboratory of Schmid & Partner Engineering AG
Zugstrasse 15, 8001 Zurich, Switzerland

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Client: **SGS-CN (Auden)** Calibration No: **D450V3-1103_Apr21**

Glossary:

TSL: tissue simulating liquid

ConvF: sensitivity in TSL / NORM x,y,z

N/A: not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 856664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

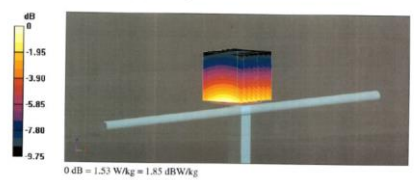
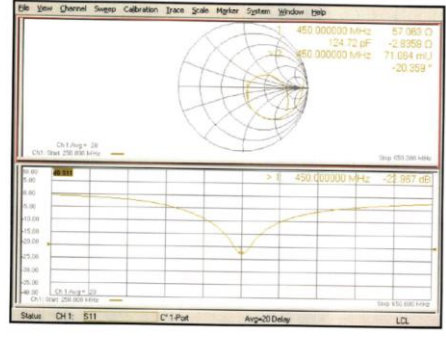
- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: D450V3-1103_Apr21 Page 2 of 6

Measurement Conditions		Appendix (Additional assessments outside the scope of SCS 0106)																							
DASY system configuration, as far as not given on page 1. <table border="1"> <tr> <td>DASY Version</td> <td>DASY5</td> <td>V52.10.4</td> </tr> <tr> <td>Extrapolation</td> <td>Advanced Extrapolation</td> <td></td> </tr> <tr> <td>Phantom</td> <td>ELN Flat Phantom</td> <td>Shell thickness: 2 ± 0.2 mm</td> </tr> <tr> <td>Distance Dipole Center - TSL</td> <td>15 mm</td> <td>with Spacer</td> </tr> <tr> <td>Zoom Scan Resolution</td> <td>dx: dy: dz = 6 mm</td> <td></td> </tr> <tr> <td>Frequency</td> <td>450 MHz ± 1 MHz</td> <td></td> </tr> </table>		DASY Version	DASY5	V52.10.4	Extrapolation	Advanced Extrapolation		Phantom	ELN Flat Phantom	Shell thickness: 2 ± 0.2 mm	Distance Dipole Center - TSL	15 mm	with Spacer	Zoom Scan Resolution	dx: dy: dz = 6 mm		Frequency	450 MHz ± 1 MHz		Antenna Parameters with Head TSL <table border="1"> <tr> <td>Impedance, transformed to feed point</td> <td>57.1 Ω ± 2.8 Ω</td> </tr> <tr> <td>Return Loss</td> <td>-23.0 dB</td> </tr> </table>		Impedance, transformed to feed point	57.1 Ω ± 2.8 Ω	Return Loss	-23.0 dB
DASY Version	DASY5	V52.10.4																							
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Head TSL parameters The following parameters and calculations were applied: <table border="1"> <tr> <th></th> <th>Temperature</th> <th>Permittivity</th> <th>Conductivity</th> </tr> <tr> <td>Nominal Head TSL parameters</td> <td>22.0 °C</td> <td>43.5</td> <td>0.57 mho/m</td> </tr> <tr> <td>Measured Head TSL parameters</td> <td>(22.6 ± 0.2) °C</td> <td>43.1 ± 6 %</td> <td>0.57 mho/m ± 6 %</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td>< 0.5 °C</td> <td>—</td> <td>—</td> </tr> </table>			Temperature	Permittivity	Conductivity	Nominal Head TSL parameters	22.0 °C	43.5	0.57 mho/m	Measured Head TSL parameters	(22.6 ± 0.2) °C	43.1 ± 6 %	0.57 mho/m ± 6 %	Head TSL temperature change during test	< 0.5 °C	—	—	General Antenna Parameters and Design <table border="1"> <tr> <td>Electrical Delay (one direction)</td> <td>1.546 ns</td> </tr> </table> 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.		Electrical Delay (one direction)	1.546 ns				
	Temperature	Permittivity	Conductivity																						
Nominal Head TSL parameters	22.0 °C	43.5	0.57 mho/m																						
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Head TSL temperature change during test	< 0.5 °C	—	—																						
Electrical Delay (one direction)	1.546 ns																								
SAR result with Head TSL <table border="1"> <tr> <td>SAR averaged over 1 cm³ (1 g) of Head TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>1.14 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>4.88 W/kg ± 18.1 % (bad)</td> </tr> </table> <table border="1"> <tr> <td>SAR averaged over 10 cm³ (10 g) of Head TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>0.707 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>3.06 W/kg ± 17.6 % (bad)</td> </tr> </table>		SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition		SAR measured	250 mW input power	1.14 W/kg	SAR for nominal Head TSL parameters	normalized to 1W	4.88 W/kg ± 18.1 % (bad)	SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition		SAR measured	250 mW input power	0.707 W/kg	SAR for nominal Head TSL parameters	normalized to 1W	3.06 W/kg ± 17.6 % (bad)	Additional EUT Data <table border="1"> <tr> <td>Manufactured by</td> <td>SPEAG</td> </tr> </table>		Manufactured by	SPEAG		
SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition																								
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Manufactured by	SPEAG																								
Certificate No: D450V3-1103_Apr21 Page 3 of 6 DASY5 Validation Report for Head TSL Test Laboratory: SPEAG, Zurich, Switzerland Date: 21.04.2021 DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1103 Communication System: UTD 0 - CW; Frequency: 450 MHz Medium parameters used: f = 450 MHz; α = 0.87 S/m; ε_r = 43.1; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/EC/ANSI C63.19-2011) DASY52 Configuration: - Probe: EX3DV4 - SN3877; CovFl: 10.64, 10.64, 10.64 @ 450 MHz; Calibrated: 30.12.2020 - Sensor Surface: 1.4mm (Mechanical Surface Detection) - Electronics: DA54 Sa654; Calibrated: 26.06.2020 - Phantom: ELJ v4.0; Type: QDOVA001BB; Serial: TP:1003 - DASY52 52.10.4 (527); SEMCAD X 14.6.14 (7483) Dipole Calibration for Head Tissue (d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 6: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 39.18 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 1.76 W/kg SAR1 (g) = 1.14 W/kg; SAR10 (g) = 0.767 W/kg Smallest distance from peaks to all points 3 dB below: Larger than measurement grid Ratio of SAR at M2 to SAR at M1 = 64.5% Maximum value of SAR (measured) = 1.53 W/kg  0 dB = 1.53 W/kg = 1.85 dBW/kg		Certificate No: D450V3-1103_Apr21 Page 4 of 6 																							
Certificate No: D450V3-1103_Apr21 Page 5 of 6		Certificate No: D450V3-1103_Apr21 Page 6 of 6																							

1.3 D750V3 - SN 1188

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Client: SGS-CN Certificate No: Z22-60103			
CALIBRATION CERTIFICATE			
Object: D750V3 - SN: 1188			
Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits			
Calibration date: March 29, 2022			
This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.			
All calibrations have been conducted in the closed laboratory facility: environment temperature (22±1)°C and humidity<70%.			
Calibration Equipment used (MATE critical for calibration)			
Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter: NRP2	106277	24-Sep-21 (CTTL No.J21X08326)	Sep-22
Power sensor: NRP2	104291	24-Sep-21 (CTTL No.J21X08326)	Sep-22
Reference Probe: EX302V4	SN 7307	26-May-21 (SPEAG No.EK3-7307, May21)	May-22
DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No.Z22-60007)	Jan-23
Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator: S4438C	MY46071430	13-Jan-22 (CTTL No.Z22X0409)	Jan-23
Network Analyzer: E5071C	MY46110673	14-Jan-22 (CTTL No.Z22X0406)	Jan-23
Calibrated by: Zhao Jing SAR Test Engineer			
Reviewed by: Lin Hao SAR Test Engineer			
Approved by: Qi Dianyan SAR Project Leader			
Issued April 3, 2022			
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Certificate No: Z22-60103 Page 1 of 5			
Measurement Conditions DASY system configuration, as far as not given on page 1.			
DASY Version	V52.10.4		
Extrapolation	Advanced Extrapolation		
Phantom	Triple Flat Phantom S.1C		
Distance Dipole Center - TSL	15 mm	with Spacer	
Zoom Scan Resolution	dx, dy, dz = 5 mm		
Frequency	750 MHz ± 1 MHz		
Head TSL parameters The following parameters and calculations were applied.			
	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	42.0	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.4 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	—	—
SAR result with Head TSL			
SAR averaged over 1 cm ² (1 g) of Head TSL	Condition		
SAR measured	250 mW input power	2.07 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	8.27 W/kg ± 18.5 % (k=2)	
SAR averaged over 10 cm ² (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	1.37 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	5.48 W/kg ± 18.7 % (k=2)	

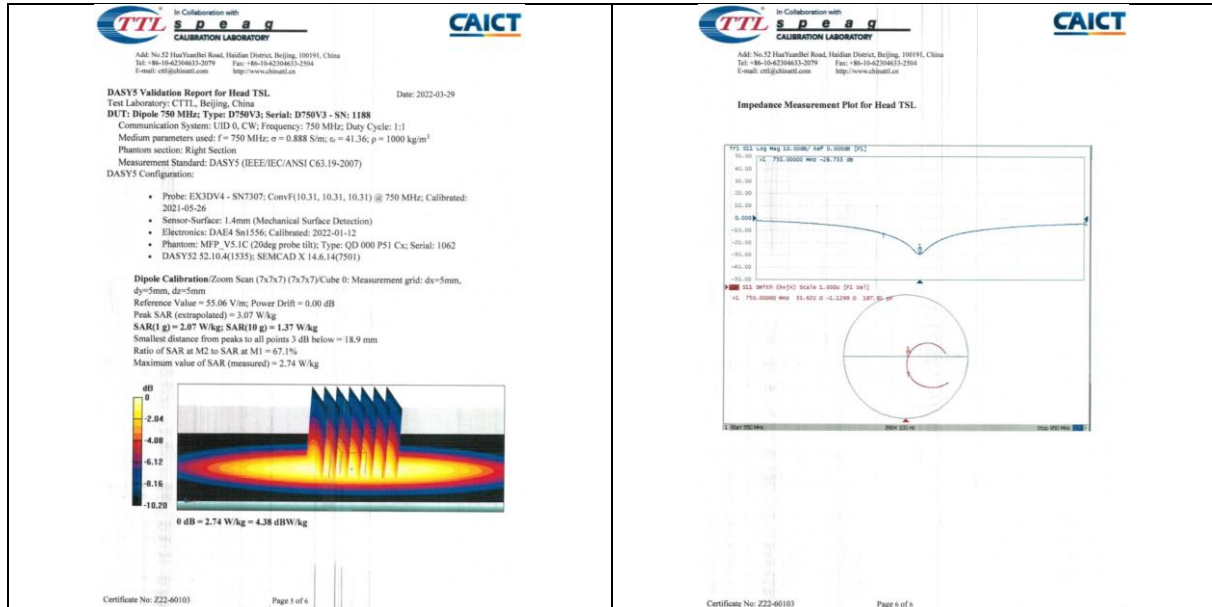
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Certificate No: Z22-60103 Page 2 of 5			
Appendix (Additional assessments outside the scope of CNAS L0570)			
Antenna Parameters with Head TSL			
Impedance, transformed to feed point	53.60 - 1.13jΩ		
Return Loss	-28.7dB		
General Antenna Parameters and Design			
Electrical Delay (one direction)	0.947 ns		
After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.			
The dipole is made of standard semi-rigid 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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1.4 D835V2 - SN 4d114

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E-mail: cti@sgs.com.cn http://www.sgslab.com

Client: **SGS-CN** Certificate No: **Z22-60104**

CALIBRATION CERTIFICATE

Object: **D835V2 - SN: 4d114**

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

Calibration date: **March 31, 2022**

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.

Calibration Equipment used (MATE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL No.J21X08328)	Sep-22
Power sensor NRP6	104291	24-Sep-21 (CTTL No.J21X08328)	Sep-22
Reference Probe EX3DV4	SN 7307	26-May-21 (SPEAG No EX3-7307_May21)	May-22
DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No.Z22-60007)	Jan-23

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

Calibrated by:	Name	Function	Signature
	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyan	SAR Project Leader	

Issued: April 6, 2022

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Glossary:
TSL: tissue simulating liquid
ConvF: sensitivity in TSL / NORMx,y,z
N/A: not applicable or not measured

Calibration is Performed According to the Following Standards:
a) IEC/IEEE 62209-1528: "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:
c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

Certificate No: Z22-60104 Page 2 of 6

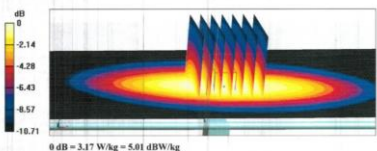


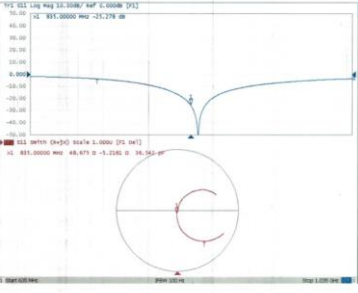
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Measurement Conditions DASY system configuration, as far as not given on page 1.			
DASY Version	DASY52	VSZ 10.4	
Extrapolation	Advanced Extrapolation		
Phantom	Triple Flat Phantom 5.1C		
Distance Dipole Center - TSL	15 mm	with Spacer	
Zoom Scan Resolution	dx, dy, dz = 5 mm		
Frequency	835 MHz ± 1 MHz		
Head TSL parameters The following parameters and calculations were applied:			
Nominal Head TSL parameters	Temperature	Permittivity	Conductivity
	22.0 °C	41.5	0.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.0 ± 0.5 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	+1.0 °C		
SAR result with Head TSL			
SAR averaged over 1 cm ² (1 g) of Head TSL	Condition		
SAR measured	250 mW input power	3.37 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	9.40 W/kg ± 18.8 % (k=2)	
SAR averaged over 10 cm ² (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	1.54 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	6.12 W/kg ± 18.7 % (k=2)	
Appendix (Additional assessments outside the scope of CNAS L0570)			
Antenna Parameters with Head TSL			
Impedance, transformed to feed point	46.70 - 5.22jΩ		
Return Loss	-25.3dB		
General Antenna Parameters and Design			
Electrical Delay (one direction)	1.307 ns		
After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.			
The dipole is made of standard weaving 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 DUT: Dipole 835 MHz; Type: DKMSV2; Serial: 40114 Communication System: UTD 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz; σ = 0.907 S/m; ε ₀ = 40.98; ρ = 1000 kg/m ³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) DASY5 Configuration: - Probe: EX3DV4 - SN7307; Conf(F(10.13, 10.13, 10.13) @ 835 MHz; Calibrated: 2021-05-26 - Sensor-Surface: 1.4mm (Mechanical Surface Detection) - Electronics: DAE4 Sn1556; Calibrated: 2022-01-12 - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062 - DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501) Dipole Calibration/Zoom Scan (7x7x7) (7x7x7) Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 57.88 V/m; Power Drift = 0.04 dB Peak SAR (extrapolated) = 3.56 W/kg SAR(1 g) = 3.37 W/kg; SAR(10 g) = 1.54 W/kg Smallest distance from peaks to all points 3 dB below = 15.8 mm Ratio of SAR at MZ to SAR at MI = 66.2% Maximum value of SAR (measured) = 3.17 W/kg			
			

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Impedance Measurement Plot for Head TSL			
			

1.5 D900V2 - SN 1d079

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Client: SGS-CN Certificate No: Z22-60184			
CALIBRATION CERTIFICATE			
Object: D900V2 - SN: 1d079			
Calibration Procedure(s): FF-211-003-01 Calibration Procedures for dipole validation site			
Calibration date: June 7, 2022			
This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.			
All calibrations have been conducted in the closed laboratory facility environment temperature (23±1°C) and humidity <70%.			
Calibration Equipment used (MTE critical for calibration)			
Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter NRP2	110277	24-Sep-21 (CTTL No. Z21X08326)	Sep-22
Power sensor NRP85	104291	24-Sep-21 (CTTL No. Z21X08326)	Sep-22
Reference Probe EX3DVA	SN 7484	28-Jan-22 (SPEAG No. EX3-7484-Jan22)	Jan-23
DNA	SN 1598	12-Jan-22 (CTTL SPEAG No. Z22-60007)	Jan-23
Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY48071430	15-Jan-22 (CTTL No. Z22A04049)	Jan-23
Network Analyser E5071C	MY48119673	16-Jan-22 (CTTL No. Z22B04049)	Jan-23
Calibrated by:	Name: Zhao Jing	Function: SAR Test Engineer	Signature: [Signature]
Reviewed by:	Name: Lin Hao	Function: SAR Test Engineer	Signature: [Signature]
Approved by:	Name: Qi Dianyan	Function: SAR Project Leader	Signature: [Signature]
Issued: June 13, 2022			
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Glossary:			
TSL	Tissue simulating liquid		
Conf	sensitivity in TSL / NORM _{xy,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 865564, "SAR Measurement Requirements for 100 MHz to 6 GHz"			
Additional Documentation:			
c) DAS445 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 feed phantom section, with the arms oriented parallel to the body axis.			
• Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.			
• Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.			
• SAR measured: SAR as measured at the stated antenna input power.			
• SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.			
• SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.			
The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.			
Certificate No: Z22-60184		Page 2 of 6	

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Measurement Conditions			
DASY system configuration, as far as not given on page 1.			
DASY Version	DASY52		52.10.4
Extrapolation	Advanced Extrapolation		
Phantom	Triple Flat Phantom 5.1C		
Distance Dipole Center - TSL	15 mm		with Spacer
Zoom Scan Resolution	dx, dy, dz: 0.5 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	42.1 ± 0.5 %	0.98 mho/m ± 0.5 %
Head TSL temperature during test	+1.0 °C	—	—
SAR result with Head TSL			
SAR averaged over 1 cm ² (1 g) of Head TSL	Condition:		
SAR measured	250 mW input power	2.79 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	11.6 W/kg ± 18.5 % (k=2)	
SAR averaged over 10 cm ² (10 g) of Head TSL	Condition:		
SAR measured	250 mW input power	1.78 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	7.08 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	48.10; 5.40j		
Return Loss	-23.3 dB		
General Antenna Parameters and Design			
Electrical Delay (one direction)	1.312 ns		
After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.			
The dipole is made of standard spring-coiled 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		
Certificate No: Z22-60184		Page 4 of 6	

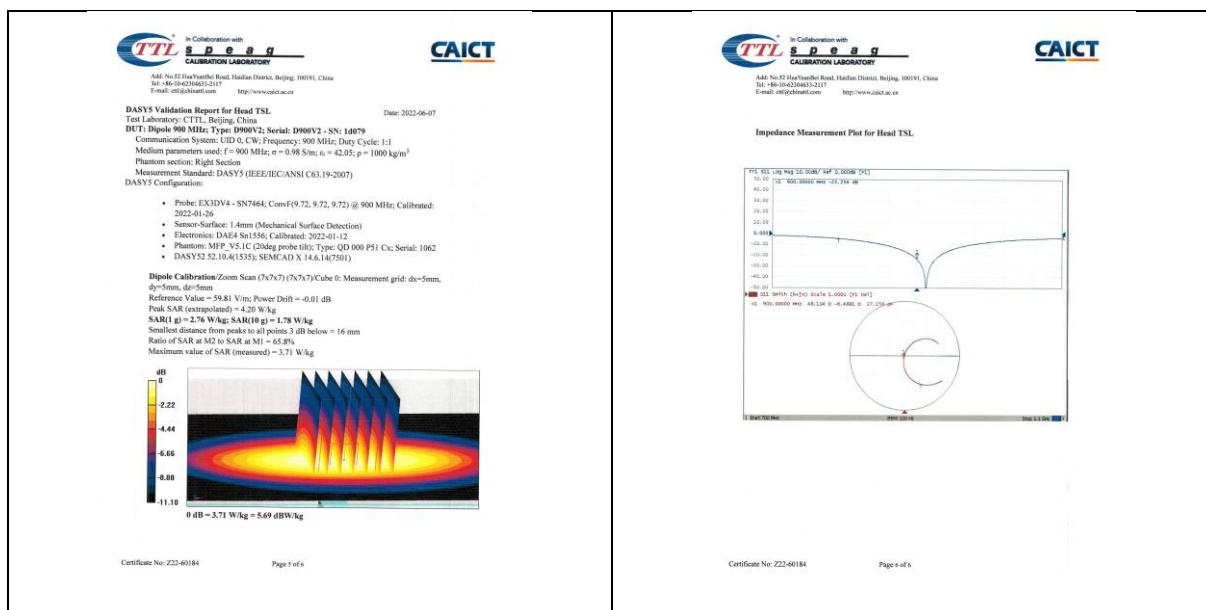


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1.6 D1800V2 - SN 2d170

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Client: SGS-CN

Certificate No: Z22-40105

CALIBRATION CERTIFICATE

Object: D1800V2 - SN: 2d170

Calibration Procedure(s): FF-211-003-01
Calibration Procedures for dipole validation kits

Calibration date: March 31, 2022

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (S). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±1)°C and humidity <70%.

Calibration Equipment used (M&E critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL No. J21X08328)	Sep-22
Power sensor NRP85	104291	24-Sep-21 (CTTL No. J21X08328)	Sep-22
Reference Probe EX3DV4	SN 7307	26-May-21 (SPEAQ No. EX3-7307_May21)	May-22
DAE4	SN 1856	12-Jan-22 (CTTL-SPEAQ No. Z22-40007)	Jan-23

Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY48071430	13-Jan-22 (CTTL No. J22X00408)	Jan-23
Network Analyzer E5071C	MY48110673	14-Jan-22 (CTTL No. J22X00408)	Jan-23

Calibrated by: Zhao Jing, SAR Test Engineer

Reviewed by: Lin Hao, SAR Test Engineer

Approved by: Qi Diqian, SAR Project Leader

Issued: April 6, 2022

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Glossary:

TSL: tissue simulating liquid

ConvF: sensitivity in TSL / NORM_{M,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/S 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 started is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

Certificate No: Z22-40105

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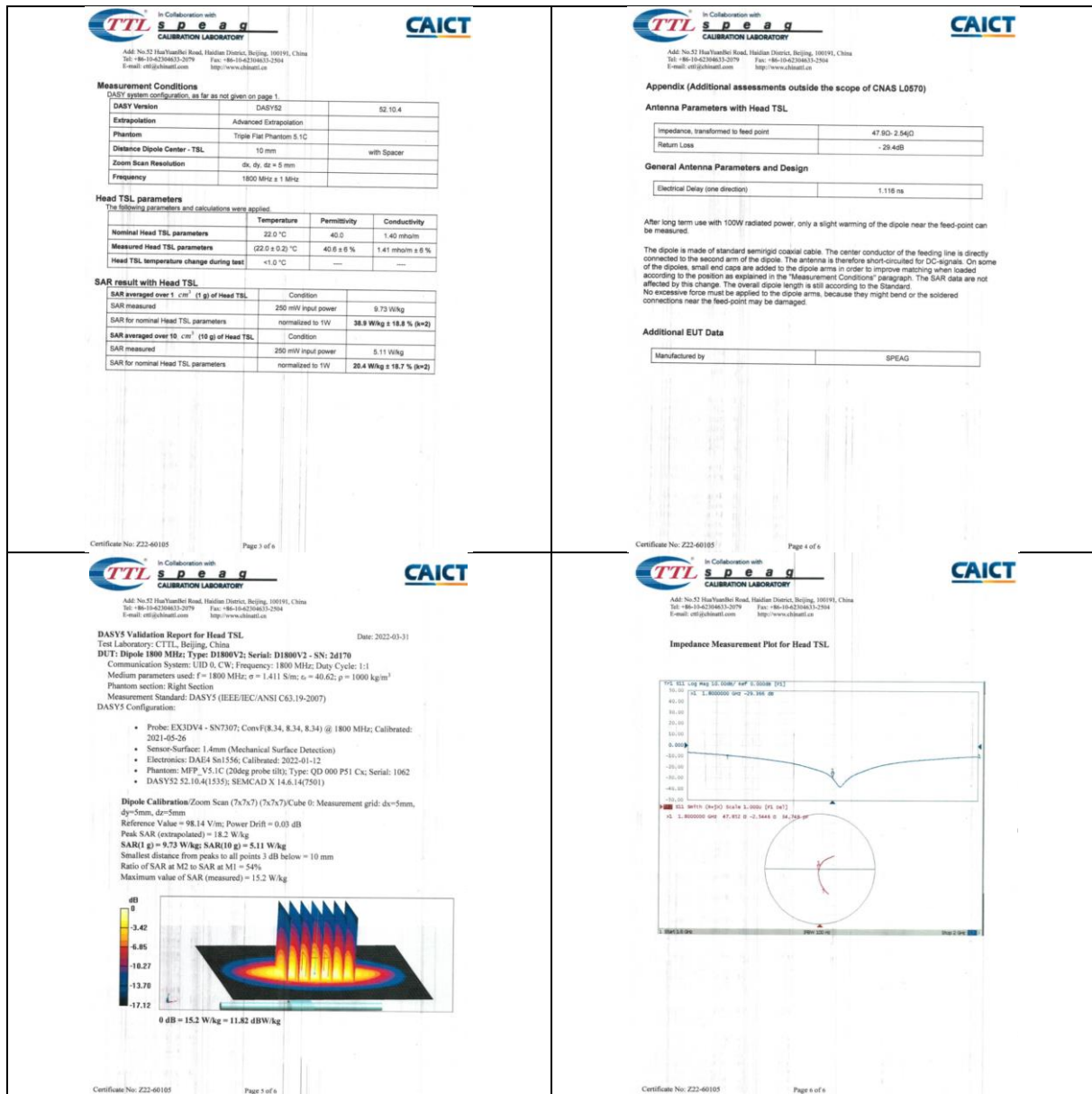


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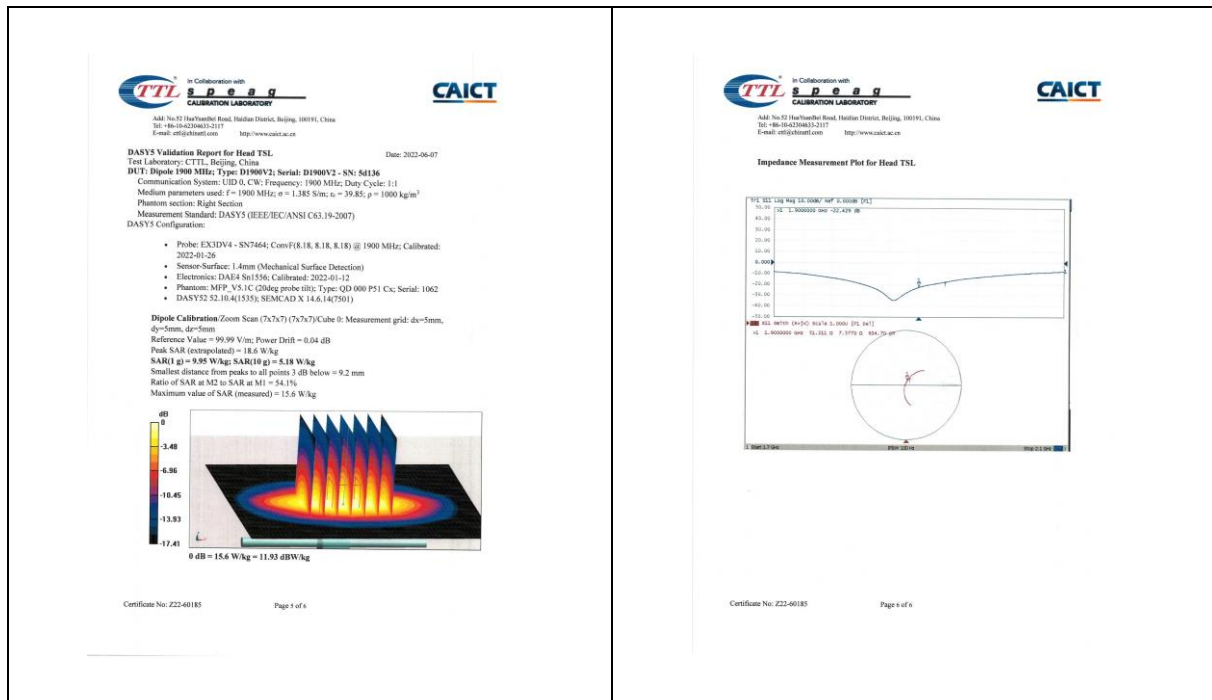
1.7 D1900V2 - SN 5d136

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Client: SGS-CN Certificate No: 222-60185																							
CALIBRATION CERTIFICATE																							
Object: D1900V2 - SN 5d136																							
Calibration Procedure(s): FF-211-003-01 Calibration Procedures for dipole validation kits																							
Calibration date: June 7, 2022																							
This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.																							
All calibrations have been conducted in the closed laboratory facility environment temperature (23±1)°C and humidity <70%.																							
Calibration Equipment used (MATE critical for calibration)																							
<table border="1"><thead><tr><th>Primary Standards</th><th>ID #</th><th>Cal Date (Calibrated by Certificate No.)</th><th>Scheduled Calibration</th></tr></thead><tbody><tr><td>Power Meter NRP2</td><td>104277</td><td>24-Sep-21 (CTTL No. 221X08328)</td><td>Sep-22</td></tr><tr><td>Power sensor NRPB</td><td>104281</td><td>24-Sep-21 (CTTL No. 221X08328)</td><td>Sep-22</td></tr><tr><td>Reference Probe EXDVA</td><td>SN 7484</td><td>26-Jan-22 (SPEAG No. EX3-7484-Jan22)</td><td>Jan-23</td></tr><tr><td>DNA</td><td>BN 1856</td><td>12-Jan-22 (CTTL-SPEAG No. 222-60007)</td><td>Jan-23</td></tr></tbody></table>				Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration	Power Meter NRP2	104277	24-Sep-21 (CTTL No. 221X08328)	Sep-22	Power sensor NRPB	104281	24-Sep-21 (CTTL No. 221X08328)	Sep-22	Reference Probe EXDVA	SN 7484	26-Jan-22 (SPEAG No. EX3-7484-Jan22)	Jan-23	DNA	BN 1856	12-Jan-22 (CTTL-SPEAG No. 222-60007)	Jan-23
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Calibrated by: Zhao Jing SAR Test Engineer																							
Reviewed by: Lin Hao SAR Test Engineer																							
Approved by: Qi Dianyan SAR Project Leader																							
Issued: June 13, 2022																							
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Certificate No: 222-60185 Page 1 of 6																							

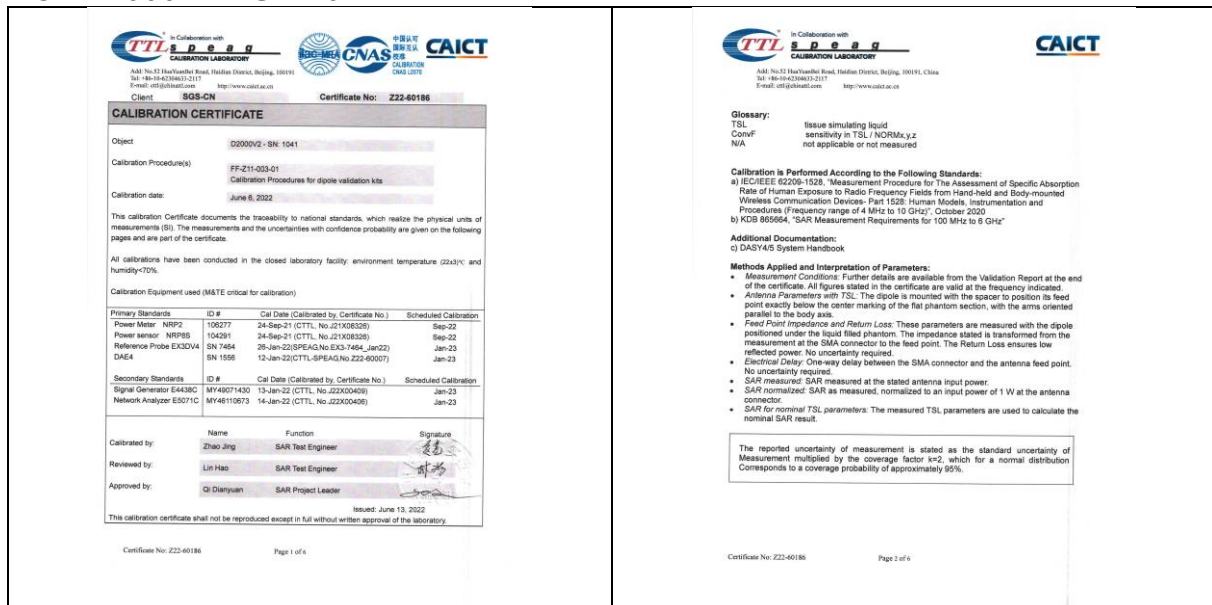
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Glossary: TSL: tissue simulating liquid Comp: sensitivity in TSL, NORMix.y.z N/A: not applicable or not measured			
Calibration is Performed According to the Following Standards: a) IEC/IEEE 62209-1:2018, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1:2018 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" c) DASV4/5 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: 222-60185 Page 2 of 6			

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Certificate No: 222-60185 Page 3 of 6																					

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<table border="1"><thead><tr><th>Parameter</th><th>Value</th></tr></thead><tbody><tr><td>Electrical Delay (one direction)</td><td>1.109 ns</td></tr></tbody></table>				Parameter	Value	Electrical Delay (one direction)	1.109 ns		
Parameter	Value								
Electrical Delay (one direction)	1.109 ns								
After long term use with 1000W radiated power, only a slight warming of the dipole near the feed-point can be measured.									
The dipole is made of standard semi-rigid 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									
<table border="1"><thead><tr><th>Manufacturer by</th><th>SPEAG</th></tr></thead><tbody><tr><td></td><td></td></tr></tbody></table>				Manufacturer by	SPEAG				
Manufacturer by	SPEAG								
Certificate No: 222-60185 Page 4 of 6									



1.8 D2000V2 - SN 1041



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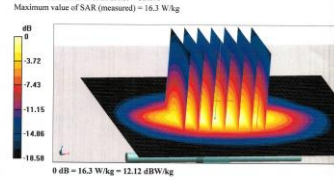
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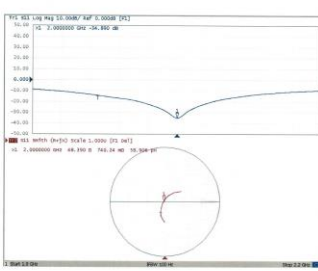
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Measurement Conditions DASY2 system configuration, as far as not given on page 1.			
DASY2 Version		DASY202	
Extrapolation		Advanced Extrapolation	
Phantom		Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL		10 mm with Spacer	
Zoom Scan Resolution		dx, dy, dz = 5 mm	
Frequency		2000 MHz ± 1 MHz	
Head TSL parameters The following parameters and calculations were applied:			
Nominal Head TSL parameters		Temperature	Permittivity
		22.0 °C	40.0
Measured Head TSL parameters		(22.0 ± 0.2) °C	
Head TSL temperature change during test		+1.0 °C	
SAR result with Head TSL			
SAR averaged over 1 cm³ (1 g) of Head TSL		Condition	
SAR measured		250 mW input power	10.4 W/kg
SAR for nominal Head TSL parameters		normalized to 1W	41.8 W/kg ± 18.8 % (n=2)
SAR averaged over 10 cm³ (10 g) of Head TSL		Condition	
SAR measured		250 mW input power	5.30 W/kg
SAR for nominal Head TSL parameters		normalized to 1W	21.3 W/kg ± 18.7 % (n=2)
Certificate No: Z22-40186 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		48.42 ± 0.74 Ω	
Return Loss		-34.9 dB	
General Antenna Parameters and Design			
Electrical Delay (one direction)		1.088 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 serring coil cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited to 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. The SAR data are not affected by this change. 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	
Certificate No: Z22-40186 Page 4 of 6			

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DASY2 Validation Report for Head TSL Test Laboratory: TTL, Beijing, China Date: 2022-09-08 DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2-SN: 1841 Communication System: U/D: 0; CW; Frequency: 2000 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2000 MHz; n = 1.392; Sinc; a = 40.25; p = 1000 kg/m ³ Phantom section: Right Section Measurement Standard: DASY2 (IEEE/IEC/ANSI C37.19-2007) DASY2 Configuration: • Probe: EX3DV4 - SN7464; Conn: F(K,2, K,2) @ 2000 MHz; Calibrated: 2022-01-26 • Sensor Surface: 1.4mm (Mechanical Surface Detection) • Electronics: DA64-961556; Calibrated: 2022-01-12 • Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cc; Serial: 1062 • DASY2: 52.10.4(1535); SEMCAD X 14.6.14(7501) Dipole Calibration/Zoom Scan (7x7x7) (7x7x7) Cube @; Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 103.4 W/kg; Power Drift = -0.03 dB Peak SAR (extrapolated) = 19.6 W/kg SAR(1 g) = 16.4 W/kg; SAR(10 g) = 5.3 W/kg Smallest distance from probe to all points 3 dB below = 9.1 mm Ratio of SAR at M2 to SAR at M1 = 53.6% Maximum value of SAR (measured) = 16.3 W/kg			
			
Certificate No: Z22-40186 Page 5 of 6			

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Impedance Measurement Plot for Head TSL			
			
Certificate No: Z22-40186 Page 6 of 6			

1.9 D2300V2 - SN 1096

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Client: SGS-CN		Certificate No: Z22-60106																																			
CALIBRATION CERTIFICATE Object: D2300V2 - SN 1096 Calibration Procedure(s): FF-Z11-003-01 Calibration date: March 31, 2022 This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%. Calibration Equipment used (MATE critical for calibration): Primary Standards: ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Power Meter: NRP2 106277 24-Sep-21 (CTTL No.J21X08328) Sep-22 Power sensor: NRP48 104291 24-Sep-21 (CTTL No.J21X08328) Sep-22 Reference Probe: EK3DV4 SN 7307 26-May-21 (SPEAG No.EK3-7307_May21) May-22 DAE4 SN 1556 12-Jan-22 (CTTL/PEAG No.Z22-60007) Jan-23 Secondary Standards: ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Signal Generator: S4434C MY4801430 13-Jan-22 (CTTL No.J22X00408) Jan-23 Network Analyzer: E5071C MY48110673 14-Jan-22 (CTTL No.J22X00408) Jan-23 Calibrated by: Zhao Jing SAR Test Engineer Reviewed by: Lin Hao SAR Test Engineer Approved by: Qi Danyun SAR Project Leader Issued: April 6, 2022 This calibration certificate shall not be reproduced except in full without written approval of the laboratory.																																					
Certificate No: Z22-60106		Page 1 of 5		Certificate No: Z22-60106																																	
Measurement Conditions DASY system configuration, as far as not given on page 1: DASY Version: DASY32 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: <table border="1"> <thead> <tr> <th></th> <th>Temperature</th> <th>Permittivity</th> <th>Conductivity</th> </tr> </thead> <tbody> <tr> <td>Nominal Head TSL parameters</td> <td>22.0 °C</td> <td>39.5</td> <td>1.67 mho/m</td> </tr> <tr> <td>Measured Head TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>39.8 ± 0.6</td> <td>1.70 mho/m ± 6 %</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td>< 1.0 °C</td> <td>—</td> <td>—</td> </tr> </tbody> </table>					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	39.8 ± 0.6	1.70 mho/m ± 6 %	Head TSL temperature change during test	< 1.0 °C	—	—																
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Manufactured by																																					
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Certificate No: Z22-60106		Page 1 of 5		Certificate No: Z22-60106																																	

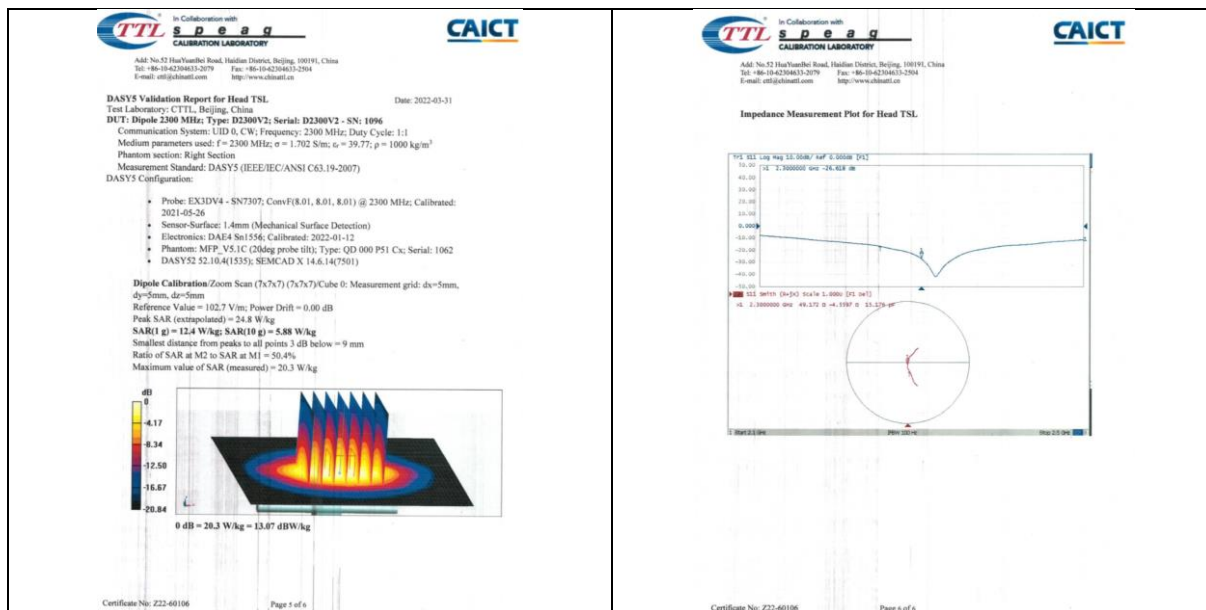


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1.10 D2450V2 - SN 817

Left Page: CALIBRATION CERTIFICATE

Client: TTT Speaq Calibration Laboratory
Address: No.52 Huayue Road, Haidian District, Beijing, 100191, China
Tel: +86-10-4236613-2079 Fax: +86-10-4236613-2084
E-mail: cti@china-test.com.cn http://www.china-test.com

Client: SGS-CN
Certificate No.: Z22-40107

Object: D2450V2 - SN 817

Calibration Procedure(s): FF-21-003-01
Calibration date: April 1, 2022

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility; environment temperature (22±1)°C and humidity <70%.

Calibration Equipment used (MATE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter: NRP2	106277	24-Sep-21 (CTTL No. J21X08330)	Sep-22
Power sensor: NRP8	104291	24-Sep-21 (CTTL No. J21X08330)	Sep-22
Reference Probe EX3DV4	SN 7307	25-May-21 (SPEAG No. EX3-7307_May21)	May-22
DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No. Z22-60007)	Jan-23

Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-22 (CTTL No. J22X0406)	Jan-23
Network Analyzer E5071C	MY49110673	14-Jan-22 (CTTL No. J22X0406)	Jan-23

Calibrated by: Zhao Jing, SAR Test Engineer
Reviewed by: Lin Hao, SAR Test Engineer
Approved by: Qi Dianyan, SAR Project Leader

Issued: April 6, 2022

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Right Page: Glossary and Additional Documentation

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"
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.

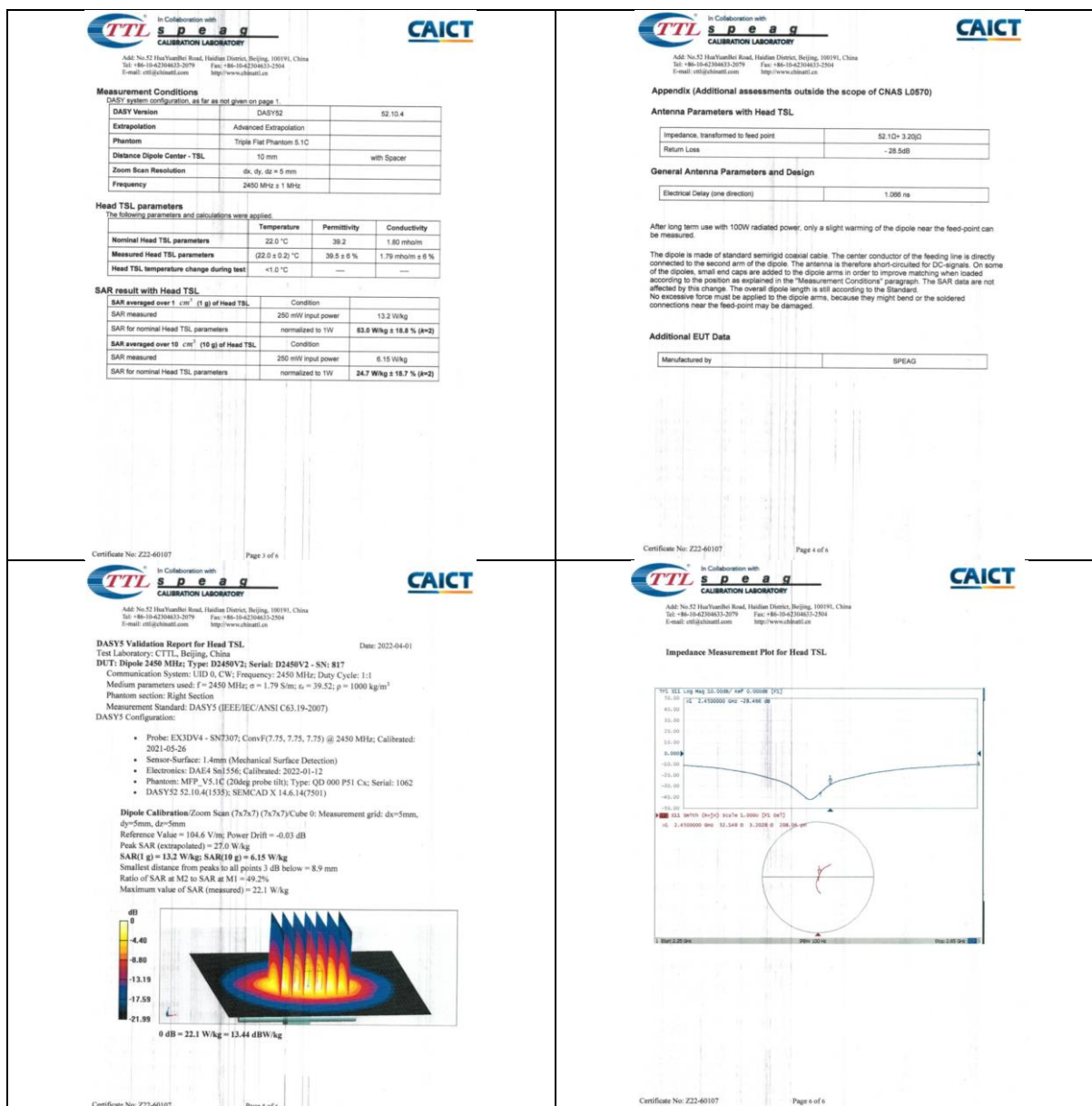
The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.



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1.11 D2600V2 - SN 1158

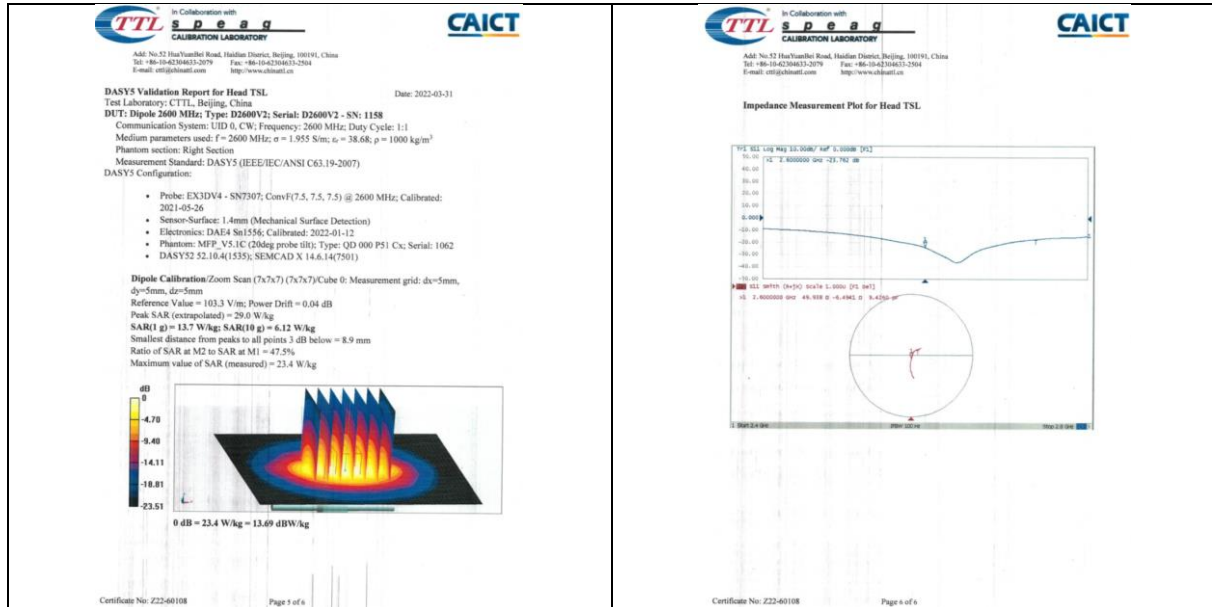
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Client: SGS-CN Certificate No: Z22-60108			
CALIBRATION CERTIFICATE			
Object	D2600V2 - SN: 1158		
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits		
Calibration date:	March 31, 2022		
This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.			
All calibrations have been conducted in the closed laboratory facility: environment temperature (22±1)°C and humidity <70%.			
Calibration Equipment used (MATE critical for calibration)			
Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter: NRP2	106277	24-Sep-21 (CTTL No.J21X08328)	Sep-22
Power sensor: NRP8	104291	24-Sep-21 (CTTL No.J21X08328)	Sep-22
Reference Probe EX3DV4	SN 7307	26-May-21 (SPEAG No.EIC3-7307, May21)	May-22
DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No.Z22-40007)	Jan-23
Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator: S443AC	MY4801430	13-Jan-22 (CTTL No.J22X00409)	Jan-23
Network Analyzer: E5071C	MY48110673	14-Jan-22 (CTTL No.J22X00409)	Jan-23
Calibrated by:	Name: Zhao Jing	Function: SAR Test Engineer	Signature: [Signature]
Reviewed by:	Name: Lin Hao	Function: SAR Test Engineer	Signature: [Signature]
Approved by:	Name: Qi Dianyuan	Function: SAR Project Leader	Signature: [Signature]
Issued: April 6, 2022			
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Certificate No: Z22-60108 Page 1 of 6			
Measurement Conditions DAISY system configuration, as far as not given on page 1.			
DAISY Version	DA1913	62.10.4	
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	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	38.7 ± 6 %	1.96 mho/m ± 6 %
Head TSL temperature change during test	<+1.0 °C	—	—
SAR result with Head TSL			
SAR averaged over 1 cm² (1 g) of Head TSL	Condition		
SAR measured	250 mW input power	13.7 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	54.8 W/kg ± 18.8 % (k=2)	
SAR averaged over 10 cm² (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	6.12 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	24.5 W/kg ± 18.7 % (k=2)	
Certificate No: Z22-60108 Page 2 of 6			
Glossary: TSL: Issue simulating liquid Conf: sensitivity in TSL / NORM x,y,z N/A: not applicable or not measured			
Calibration is Performed According to the Following Standards: a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020 b) KDB 865984, "SAR Measurement Requirements for 100 MHz to 6 GHz" c) DAISY415 System Handbook			
Methods Applied and Interpretation of Parameters: • Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated. • Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis. • Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required. • Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required. • SAR measured: SAR measured at the stated antenna input power. • SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector. • SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.			
The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.			
Certificate No: Z22-60108 Page 2 of 6			
Appendix (Additional assessments outside the scope of CNAS L0570)			
Antenna Parameters with Head TSL			
Impedance, transformed to feed point	49.90-6.48jΩ		
Return Loss	-23.8dB		
General Antenna Parameters and Design			
Electrical Delay (one direction)	1.053 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		
Certificate No: Z22-60108 Page 3 of 6			



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1.12 D5GHzV2 - SN 1095

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Client: SGS-CN		Certificate No: 222-60187																					
CALIBRATION CERTIFICATE																							
Object: D5GHzV2 - SN 1095																							
Calibration Procedure(s): FF-211-005-01 Calibration Procedures for dipole validation kits																							
Calibration date: June 1, 2022																							
This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.																							
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Calibration Equipment used (MATE critical for calibration)																							
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Calibrated by: Zhao Jing SAR Test Engineer																							
Reviewed by: Lin Hao SAR Test Engineer																							
Approved by: Qi Dianqun SAR Project Leader																							
Issued: June 6, 2022																							
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Glossary: TSL: Issue 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" c) DASY5 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 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: 222-60187		Page 2 of 10	



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Measurement Conditions DASY system configuration, as far as not given on page 1.			
DASY Version	DASY2	52.10.4	
Extrapolation	Advanced Extrapolation		
Phantom	Triple Flat Phantom 5.1C		
Distance Dipole Center - TSL	10 cm	with Spacer	
Zoom Scan Resolution	5x, 4x, 4 mm, 3x = 1.4 mm	Graded Ratio = 1.4 (2 direction)	
Frequency	5200 MHz ± 1 MHz 5200 MHz ± 1 MHz 5200 MHz ± 1 MHz 5200 MHz ± 1 MHz 5200 MHz ± 1 MHz		
Head TSL parameters at 5200MHz The following parameters and calculations were applied.			
Nominal Head TSL parameters	Temperature	Permittivity	Conductivity
Measured Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Head TSL temperature change during test	(22.0 ± 0.2) °C	35.2 ± 6 %	4.73 mho/m ± 6 %
SAR result with Head TSL at 5200MHz The following parameters and calculations were applied.			
SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition		
SAR measured	100 mW input power	7.94 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	75.1 W/kg ± 24.4 % (M2)	
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition		
SAR measured	100 mW input power	2.27 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	22.8 W/kg ± 24.2 % (M2)	
Head TSL parameters at 5500MHz The following parameters and calculations were applied.			
Nominal Head TSL parameters	Temperature	Permittivity	Conductivity
Measured Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Head TSL temperature change during test	(22.0 ± 0.2) °C	34.8 ± 6 %	4.94 mho/m ± 6 %
SAR result with Head TSL at 5500MHz The following parameters and calculations were applied.			
SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition		
SAR measured	100 mW input power	6.29 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	82.8 W/kg ± 24.4 % (M2)	
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition		
SAR measured	100 mW input power	2.34 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	23.3 W/kg ± 24.2 % (M2)	
Certificate No: Z22-60187 Page 4 of 10			

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Head TSL parameters at 5800MHz The following parameters and calculations were applied.			
Nominal Head TSL parameters	Temperature	Permittivity	Conductivity
Measured Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Head TSL temperature change during test	(22.0 ± 0.2) °C	34.7 ± 6 %	5.08 mho/m ± 6 %
SAR result with Head TSL at 5800MHz The following parameters and calculations were applied.			
SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition		
SAR measured	100 mW input power	8.12 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	80.8 W/kg ± 24.4 % (M2)	
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition		
SAR measured	100 mW input power	2.30 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	22.9 W/kg ± 24.2 % (M2)	
Head TSL parameters at 5800MHz The following parameters and calculations were applied.			
Nominal Head TSL parameters	Temperature	Permittivity	Conductivity
Measured Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Head TSL temperature change during test	(22.0 ± 0.2) °C	34.4 ± 6 %	5.25 mho/m ± 6 %
SAR result with Head TSL at 5800MHz The following parameters and calculations were applied.			
SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition		
SAR measured	100 mW input power	7.71 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	78.7 W/kg ± 24.4 % (M2)	
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition		
SAR measured	100 mW input power	2.16 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	21.8 W/kg ± 24.2 % (M2)	
Certificate No: Z22-60187 Page 5 of 10			

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Appendix (Additional assessments outside the scope of CNAS L0570)			
Antenna Parameters with Head TSL at 5200MHz			
Impedance, transformed to feed point	46.10 - 5.03j		
Return Loss	-23.6dB		
Antenna Parameters with Head TSL at 5300MHz			
Impedance, transformed to feed point	47.80 - 2.42j		
Return Loss	-26.5dB		
Antenna Parameters with Head TSL at 5500MHz			
Impedance, transformed to feed point	50.30 - 4.26j		
Return Loss	-27.4dB		
Antenna Parameters with Head TSL at 5600MHz			
Impedance, transformed to feed point	54.50 - 4.80j		
Return Loss	-28.0dB		
Antenna Parameters with Head TSL at 5800MHz			
Impedance, transformed to feed point	51.50 - 5.61j		
Return Loss	-24.9dB		
Certificate No: Z22-60187 Page 6 of 10			

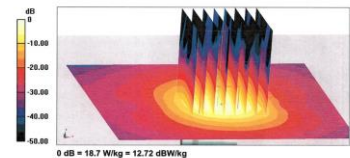
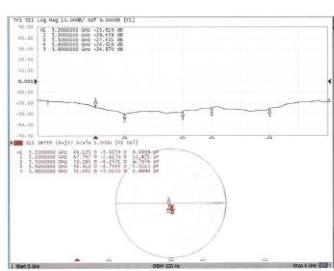


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In Collaboration with TTL S p e a a g CALIBRATION LABORATORY Address: No. 52 Huayuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62020117 E-mail: cti@sgs.com.cn http://www.sgscn.com.cn CAICT General Antenna Parameters and Design <table border="1"><tr><td>Electrical Delay (one direction)</td><td>1.101 ns</td></tr></table> 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 semi-rigid 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 <table border="1"><tr><td>Manufactured by</td><td>SPEAG</td></tr></table> Certificate No: Z22-60187 Page 1 of 10	Electrical Delay (one direction)	1.101 ns	Manufactured by	SPEAG	In Collaboration with TTL S p e a a g CALIBRATION LABORATORY Address: No. 52 Huayuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62020117 E-mail: cti@sgs.com.cn http://www.sgscn.com.cn CAICT DASY Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China DUT: Dipole SGRZ Type: DSGHzV2 - SN: 1095 Communication System: CW; Frequency: 5200 MHz; Frequency: 5300 MHz; Frequency: 5500 MHz; Frequency: 5600 MHz; Frequency: 5800 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5200 MHz; $\sigma = 4.62$ S/m; $\epsilon = 35.38$; $\rho = 1000$ kg/m³ Medium parameters used: f = 5300 MHz; $\sigma = 4.73$ S/m; $\epsilon = 35.19$; $\rho = 1000$ kg/m³ Medium parameters used: f = 5500 MHz; $\sigma = 4.839$ S/m; $\epsilon = 34.83$; $\rho = 1000$ kg/m³ Medium parameters used: f = 5600 MHz; $\sigma = 5.051$ S/m; $\epsilon = 34.65$; $\rho = 1000$ kg/m³ Medium parameters used: f = 5800 MHz; $\sigma = 5.247$ S/m; $\epsilon = 34.42$; $\rho = 1000$ kg/m³ Phantom section: Right Section Measurement Standard: DASY (IEEE/IEC/ANSI C33.19-2007) DASY Configuration: - Probe: EX3DV4 - SN7464; ConvF(5.6, 5.6, 5.6) @ 5200 MHz; ConvF(5.32, 5.32, 5.32) @ 5300 MHz; ConvF(5.11, 5.11, 5.11) @ 5500 MHz; ConvF(4.91, 4.91, 4.91) @ 5600 MHz; ConvF(5, 5, 5) @ 5800 MHz; Calibrated: 2022-01-26 - Sensor Surface: 1.4mm (Mechanical Surface Detection) - Electronic: DAESA S11556; Calibrated: 2022-01-12 - Phantom: MFP_V5.1C (20deg probe III); Type: QD 000 P51 Cx; Serial: 1062 - DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501) Dipole Calibration (P=100mW, d=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm) Reference Value = 60.80 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 29.8 W/kg SAR(1 g) = 7.79 W/kg; SAR(10 g) = 2.22 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 66.8% Maximum value of SAR (measured) = 19.3 W/kg Dipole Calibration (P=100mW, d=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm) Reference Value = 61.08 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 31.5 W/kg SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.27 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 65.5% Maximum value of SAR (measured) = 19.0 W/kg Certificate No: Z22-60187 Page 9 of 10
Electrical Delay (one direction)	1.101 ns				
Manufactured by	SPEAG				
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2 DAE4 - SN 1245

Schmid & Partner Engineering AG Zugspitzstrasse 65, 8054 Zweis, Switzerland Phone: +41 (0) 58 250 70 00, Fax: +41 (0) 58 250 70 79 www.sps-ag.ch, info@sp-ag.ch s p e a g IMPORTANT NOTICE USAGE OF THE DAE4 The DAE4 unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE4. Special attention shall be given to the following points: Battery Exchange: The battery cover of the DAE4 unit is fixed using a screw, over tightening the screw may cause the threads inside the DAE4 to wear out. Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an anti-static bag. This anti-static bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside. E-stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent future failure, the customer shall always inspect the probe to the DAE4 carefully and keep the DAE4 unit in a non-dusty environment if not used for measurements. Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect. DASY Configuration Files: Since the exact values of the DAE4 input resistances, as measured during the calibration procedure of a DAE4 unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file. Important Note: Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer. Important Note: Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure. Important Note: To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE. TN_EH190306AE_DAE4.docx 07.03.2019	Calibration Laboratory of Schmid & Partner Engineering AG Zugspitzstrasse 65, 8054 Zweis, Switzerland Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates Accreditation No.: SCS 0108 Client: SGS-CN (Austria) Certificate No.: DAE4-1245_May22 CALIBRATION CERTIFICATE Object: DAE4 - SD 000 D04 BM - SN: 1245 Calibration procedure(s): DA CAL-06 v30 Calibration procedure for the data acquisition electronics (DAE) Calibration date: May 30, 2022 This calibration certificate documents the traceability to national standards, which makes the physical units of measurements (SI). The measurement and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the client laboratory facility: environment temperature (22 ± 3°C and humidity < 70%. Calibration Equipment used (DAE4 TE critical for calibration) <table border="1"><thead><tr><th>Primary Standards</th><th>Cal Date (Certificate No.)</th><th>Scheduled Calibration</th></tr></thead><tbody><tr><td>Kentley Multimeter Type 2002</td><td>SN: 0810178 31-Aug-21 (no: 31386)</td><td>Aug-22</td></tr><tr><th>Secondary Standards</th><th>Cal Date (in house)</th><th>Scheduled Check</th></tr><tr><td>Auto DAE Calibration Unit</td><td>SE UNIS 002 AA 1001 24-Jan-22 (in house check)</td><td>In house check Jan-23</td></tr><tr><td>Calibrator Box V2.1</td><td>SE UNIS 002 AA 1002 24-Jan-22 (in house check)</td><td>In house check Jan-23</td></tr></tbody></table> Calibrated by: Name Dominique Steiner Function Laboratory Technician Signature [Signature] Approved by: Sven Köhn Technical Manager [Signature] This calibration certificate shall not be reproduced except in full without written approval of the laboratory. Issued: May 30, 2022 Certificate No.: DAE4-1245_May22 Page 1 of 5	Primary Standards	Cal Date (Certificate No.)	Scheduled Calibration	Kentley Multimeter Type 2002	SN: 0810178 31-Aug-21 (no: 31386)	Aug-22	Secondary Standards	Cal Date (in house)	Scheduled Check	Auto DAE Calibration Unit	SE UNIS 002 AA 1001 24-Jan-22 (in house check)	In house check Jan-23	Calibrator Box V2.1	SE UNIS 002 AA 1002 24-Jan-22 (in house check)	In house check Jan-23
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Auto DAE Calibration Unit	SE UNIS 002 AA 1001 24-Jan-22 (in house check)	In house check Jan-23														
Calibrator Box V2.1	SE UNIS 002 AA 1002 24-Jan-22 (in house check)	In house check Jan-23														
Calibration Laboratory of Schmid & Partner Engineering AG Zugspitzstrasse 65, 8054 Zweis, Switzerland Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates Accreditation No.: SCS 0108 Glossary DAE: data acquisition electronics Connector angle: information used in DASY system to align probe sensor X to the robot coordinate system. Methods Applied and Interpretation of Parameters • DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range. • Connector angle: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required. • The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty. • DC Voltage Measurement Linearity: Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement. • Common mode sensitivity: Influence of a positive or negative common mode voltage on the differential measurement. • Channel separation: Influence of a voltage on the neighbor channels not subject to an input voltage. • AD Converter Values with inputs shorted: Values on the internal AD converter corresponding to zero input voltage • Input Offset Measurement: Output voltage and statistical results over a large number of zero voltage measurements. • Input Offset Current: Typical value for information; Maximum channel input offset current, not considering the input resistance. • Input resistance: Typical value for information; DAE input resistance at the connector, during internal auto-zeroing and during measurement. • Low Battery Alarm Voltage: Typical value for information. Below this voltage, a battery alarm signal is generated. • Power consumption: Typical value for information. Supply currents in various operating modes. Certificate No.: DAE4-1245_May22 Page 2 of 5	DC Voltage Measurement AD - Converter Resolution nominal High Range: 1LSB = 6.1µV full range = -100...+300 mV Low Range: 1LSB = 61µV full range = -1...+3mV DASY measurement parameter: Auto Zero Time: 3 sec; Measuring time: 3 sec <table border="1"><thead><tr><th>Calibration Factors</th><th>X</th><th>Y</th><th>Z</th></tr></thead><tbody><tr><td>High Range</td><td>405.285 ± 0.02% (k=2)</td><td>403.074 ± 0.02% (k=2)</td><td>406.002 ± 0.02% (k=2)</td></tr><tr><td>Low Range</td><td>3.99534 ± 1.50% (k=2)</td><td>3.99608 ± 1.50% (k=2)</td><td>4.01015 ± 1.50% (k=2)</td></tr></tbody></table> Connector Angle <table border="1"><thead><tr><th>Connector Angle to be used in DASY system</th><th>30.0 ± 1°</th></tr></thead></table> Certificate No.: DAE4-1245_May22 Page 3 of 5	Calibration Factors	X	Y	Z	High Range	405.285 ± 0.02% (k=2)	403.074 ± 0.02% (k=2)	406.002 ± 0.02% (k=2)	Low Range	3.99534 ± 1.50% (k=2)	3.99608 ± 1.50% (k=2)	4.01015 ± 1.50% (k=2)	Connector Angle to be used in DASY system	30.0 ± 1°	
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Attention: To check the authenticity of testing / inspection report & certificate, please contact us at telephone: (86-755) 8307 1443, or email: CN.Doccheck@sgs.com

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Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

DC Voltage Linearity				
		Reading (μV)	Difference (μV)	Error (%)
High Range				
Channel X	+ Input	19999.93	1.83	0.00
Channel X	+ Input	20004.59	2.23	0.01
Channel X	- Input	-20000.14	1.13	-0.01
Channel Y	+ Input	199994.72	1.96	0.00
Channel Y	+ Input	20001.32	-1.50	-0.00
Channel Y	- Input	-20000.05	-1.57	0.01
Channel Z	+ Input	199992.84	6.19	0.00
Channel Z	+ Input	20003.09	0.98	0.00
Channel Z	- Input	-20001.73	-0.27	0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2001.91	0.41	0.09
Channel X	+ Input	2002.54	0.06	0.00
Channel X	- Input	-197.86	0.07	-0.04
Channel Y	+ Input	2002.95	0.58	0.09
Channel Y	+ Input	2001.27	-0.57	-0.28
Channel Y	- Input	-196.23	-0.06	0.03
Channel Z	+ Input	2001.36	0.06	0.00
Channel Z	+ Input	2000.09	-1.53	-0.76
Channel Z	- Input	-199.85	-1.82	-0.92

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

AXY Measurement	Common Mode Input Voltage (mV)	High Range Average Reading (μ V)	Low Range Average Reading (μ V)
Channel X	200	-5.87	-7.69
	-200	9.12	7.79
Channel Y	200	-8.68	-9.28
	-200	8.52	8.36
Channel Z	200	-5.36	-5.60
	-200	3.58	3.08

3. Channel separation

Channel separation
DASY measurement parameters: Auto Zero Time: 3 sec; Measurement time: 3 sec

	Input Voltage (mV)	Channel X (μ V)	Channel Y (μ V)	Channel Z (μ V)
Channel X	200	-	4.07	-3.14
Channel Y	200	9.36	-	4.27
Channel Z	200	10.88	3.14	-

Certificate No: DAF4-1245 May22

Page 4 of 5

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15984	17040
Channel Y	15662	15768
Channel Z	16036	15068

5. Input Offset Measurement

Input Offset Measurement
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	1.00	-0.15	1.93	0.45
Channel Y	-0.18	-1.28	0.94	0.45
Channel Z	-0.58	-2.51	0.58	0.60

6. Input Offset Current

Input Offset Current
Nominal input circuitry offset current on all channels: $<25\mu\text{A}$

Input Resistance (Typical values for information)		
	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

B. Low Battery Alarm Voltage (Typical values for information)

Low Battery Alarm Voltage (Typical values for information)	
2000mAh	2.9V
1000mAh	2.9V
500mAh	2.9V

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.8

9. Power Consumption (Typical values for information)

Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Receive (- Vcc)	-0.01	0	0

Certificate No: DAE4-1245 May20

Page 5 of 5

3 EX3DV4 - SN 3801

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DCP 1641 v41	SI 1411	24-02-2022 21 055503004	Apr 23																																																																																																																																																																																		
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Certificate No: BX-2001-1472

Page 5 of 77

**Calibration Laboratory of
Schalt & Partner
Engineering AG**

Ingolfshausen 4, 8054 Zürich, Switzerland

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The Swiss Accreditation Service is one of the authorities to the EA
Multilateral Agreement for the recognition of calibration results



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Dienst**
Service suisse d'attestation
Servicio Suizo de Acreditación
Swiss SAS Calibration Service

Accreditation No. **CO 1016**

Glossary

NORMA 321 means emitting light
sensitivity is the ratio of
the signal to the input
DOP double constant point
ice-constant 11609, purity of the signal
modulation dependent inactivation parameters
A, B, C, D
Polarization
Polarization of the plane normal to the
polarization probe axis
Calibration
Calibration is performed according to the
concepts: Angle

Calibration is Performed according to the Following Standards:

all IECSES (European Committee for Standardization) for the Measurement of Spectral Response Ratio C/N Quantum Efficiency
To Measure Frequency from Hand Held and Body Motion Instruments (IEC 61014), Part 1: 1038 Hz
To Measure Frequency from Hand Held and Body Motion Instruments (IEC 61014), Part 2: 1038 Hz
VDE 8659-4, 3rd Measurement Requirements, for VDE 8659-5: 1038 Hz

Methods Applied and Instrumentation:

- **NORMA 321**: Assumed $F = F_{\text{value}} \text{ (pm)} = 0.97 \pm 0.00001 \pm 1 \text{ TEM} \text{ (Hz)} = 7.3030014 \times 10^6 \text{ Hz}$; wavelength, NORMA 321 are very intermediate values, i.e. the uncertainties of NORMA 321 are not added to the $F = F_{\text{value}}$ uncertainty; mass m is assumed to be 1000 mg
- **NORMA 321** = NORMA 321 frequency response (see Frequency Response Chart). This inactivation is implemented in the software of the NORMA 321. The uncertainty of the frequency response is assumed to be 0.00001 Hz
- **Conf.**
 - NORMA 321 are universal inactivation parameters assessed based on the data of power spectra with CW signal, which are not dependent of frequency m
 - RMS (RMS) is not used and not calibrated but determined based on the data of power spectra
 - $A_{\text{RMS}} = B_{\text{RMS}} = C_{\text{RMS}} = D_{\text{RMS}} = 0.00001 \pm 1 \text{ dB}$; C/N data of power spectra parameters assessed based on the data of power spectra
 - $A_{\text{RMS}} = B_{\text{RMS}} = C_{\text{RMS}} = D_{\text{RMS}} = 0.00001 \pm 1 \text{ dB}$; C/N data of power spectra parameters assessed based on the data of power spectra
 - A constant $A_{\text{RMS}} = 0.00001 \pm 1 \text{ dB}$ and a higher order value $A_{\text{RMS}} = 0.00001 \pm 1 \text{ dB}$ are used
- **1038 Hz**: Assumed $F = F_{\text{value}} \text{ (pm)} = 0.97 \pm 0.00001 \pm 1 \text{ TEM} \text{ (Hz)} = 7.3030014 \times 10^6 \text{ Hz}$; wavelength, NORMA 321 are very intermediate values, i.e. the uncertainties of NORMA 321 are not added to the $F = F_{\text{value}}$ uncertainty; mass m is assumed to be 1000 mg
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- **1038 Hz**: Assumed $F =$

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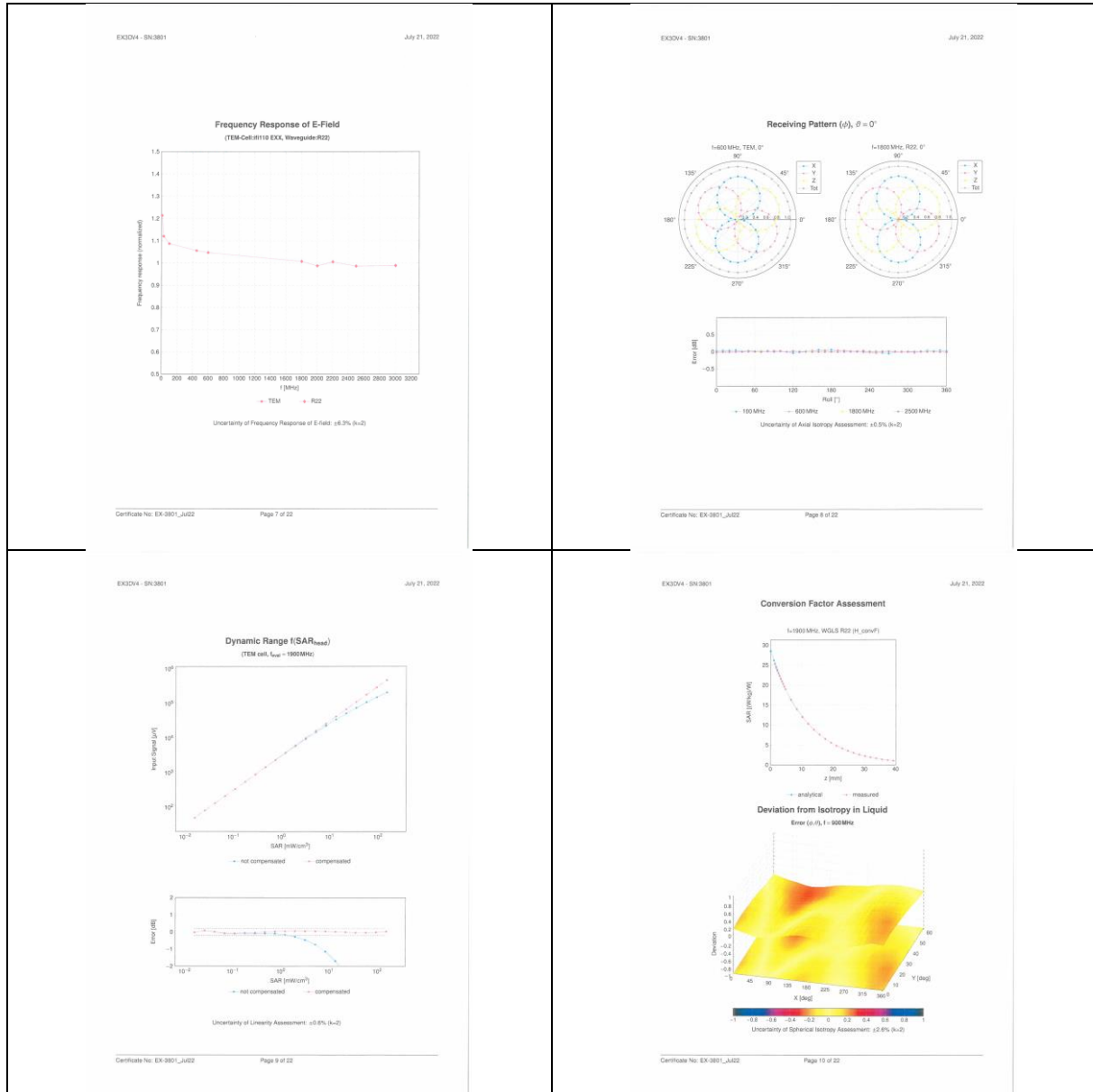
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EX3DV4 - SN:3801		July 21, 2022							
Parameters of Probe: EX3DV4 - SN:3801									
Basic Calibration Parameters									
Norm. $\mu V/(V/m)^2$ A	0.51	0.58	0.42						
DCP (mm) B	103.3	101.7	104.5						
Unc. (k = 2)									
±10.1%									
Calibration Results for Modulation Response									
UID	Communication System Name	A	B	C	D	VW	Max. dev.	Max. Unc. (k = 2)	
0	OW	3	0.00	0.00	0.00	144.0	±2.7%	±4.7%	
10302	Pulse Waveform (200Hz, 10%)	3	20.00	30.90	21.87	10.00	80.0	±3.2%	±8.6%
10303	Pulse Waveform (200Hz, 20%)	3	20.00	30.90	21.87	10.00	80.0	±3.2%	±8.6%
10304	Pulse Waveform (200Hz, 40%)	3	20.00	30.90	21.87	10.00	80.0	±3.2%	±8.6%
10305	Pulse Waveform (200Hz, 60%)	3	20.00	30.90	21.87	10.00	80.0	±3.2%	±8.6%
10306	Pulse Waveform (200Hz, 80%)	3	20.00	30.90	21.87	10.00	80.0	±3.2%	±8.6%
10307	QPSK Waveform, 1 MHz	3	20.00	30.90	21.87	10.00	80.0	±3.2%	±8.6%
10308	QPSK Waveform, 10 MHz	3	20.00	30.90	21.87	10.00	80.0	±3.2%	±8.6%
10309	64-QAM Waveform, 100 MHz	3	20.00	30.90	21.87	10.00	80.0	±3.2%	±8.6%
10310	64-QAM Waveform, 40 MHz	3	20.00	30.90	21.87	10.00	80.0	±3.2%	±8.6%
10311	WLAN QOFDM, 64-QAM, 40 MHz	3	20.00	30.90	21.87	10.00	80.0	±3.2%	±8.6%
Note: For details on UID parameters see Appendix									
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%.									
A: The uncertainty of Norm. X Y Z is not affected by the E-field frequency, mode T1 (see Page 3 and 4).									
B: Uncertainty parameter uncertainty for modulus specified has been given.									
C: Uncertainty is determined using the max. deviation technique, response applying weighting distribution and is expressed for the square of the total value.									
Certificate No.: EX-0811_J402									
Page 3 of 22									

EX3DV4 - SN:3801		July 21, 2022						
Parameters of Probe: EX3DV4 - SN:3801								
Calibration Parameter Determined in Head Tissue Simulating Media								
f (MHz) ¹	Relative Permittivity ²	Conductivity ³ (S/m)	Conf. X	Conf. Y	Conf. Z	Alpha ⁴	Depth ⁵ (mm)	Unc. (k = 2)
150	52.3	0.76	11.26	11.26	11.26	0.08	1.00	±13.3%
450	43.5	0.87	10.04	10.04	10.04	0.16	1.30	±13.2%
750	41.9	0.89	9.37	9.37	9.37	0.46	1.00	±12.2%
800	41.5	0.90	9.22	9.22	9.22	0.54	0.90	±12.2%
850	41.5	0.87	9.13	9.13	9.13	0.49	0.87	±12.2%
1450	40.5	1.20	8.26	8.26	8.26	0.56	0.80	±12.2%
1750	40.1	1.37	8.16	8.16	8.16	0.33	0.88	±12.2%
1800	40.0	1.40	7.89	7.89	7.89	0.36	0.86	±12.2%
2100	39.6	1.49	7.84	7.84	7.84	0.33	0.88	±12.2%
2300	39.5	1.67	7.47	7.47	7.47	0.41	0.90	±12.2%
2450	39.2	1.80	7.34	7.34	7.34	0.41	0.90	±12.2%
2600	39.0	1.96	7.11	7.11	7.11	0.49	0.90	±12.2%
3300	38.2	2.71	6.55	6.55	6.55	0.30	1.30	±13.1%
3500	37.9	2.91	6.49	6.49	6.49	0.35	1.30	±13.1%
3700	37.7	3.12	6.40	6.40	6.40	0.35	1.30	±13.1%
3900	37.5	3.32	6.34	6.34	6.34	0.40	1.60	±13.1%
4100	37.2	3.53	6.20	6.20	6.20	0.40	1.60	±13.1%
4200	37.1	3.63	5.97	5.97	5.97	0.40	1.60	±13.1%
4400	36.9	3.84	5.76	5.76	5.76	0.40	1.70	±13.1%
4600	36.7	4.04	5.70	5.70	5.70	0.40	1.70	±13.1%
4800	36.4	4.26	5.67	5.67	5.67	0.40	1.60	±13.1%
4950	36.3	4.40	5.33	5.33	5.33	0.40	1.80	±13.1%
5250	35.9	4.71	5.17	5.17	5.17	0.40	1.80	±13.1%
5600	35.5	5.07	4.58	4.58	4.58	0.40	1.80	±13.1%
5750	35.4	5.22	4.88	4.88	4.88	0.40	1.80	±13.1%
Certificate No.: EX-0811_J402								
Page 5 of 22								

EX3DV4 - SN:3801		July 21, 2022						
Parameters of Probe: EX3DV4 - SN:3801								
Calibration Parameter Determined in Head Tissue Simulating Media								
f (MHz) ¹	Relative Permittivity ²	Conductivity ³ (S/m)	Conf. X	Conf. Y	Conf. Z	Alpha ⁴	Depth ⁵ (mm)	Unc. (k = 2)
6000	34.5	6.87	5.80	5.80	5.80	0.20	2.50	±18.4%
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Page 6 of 22								



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EX-004 - SN-001		July 21, 2022	
Appendix: Modulation Calibration Parameters			
IME	Ref	Communication System Name	Group
10001	CA	CA: 10001	10001
10002	CA	CA: 10002	10002
10003	CA	CA: 10003	10003
10004	CA	CA: 10004	10004
10005	CA	CA: 10005	10005
10006	CA	CA: 10006	10006
10007	CA	CA: 10007	10007
10008	CA	CA: 10008	10008
10009	CA	CA: 10009	10009
10010	CA	CA: 10010	10010
10011	CA	CA: 10011	10011
10012	CA	CA: 10012	10012
10013	CA	CA: 10013	10013
10014	CA	CA: 10014	10014
10015	CA	CA: 10015	10015
10016	CA	CA: 10016	10016
10017	CA	CA: 10017	10017
10018	CA	CA: 10018	10018
10019	CA	CA: 10019	10019
10020	CA	CA: 10020	10020
10021	CA	CA: 10021	10021
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4 Impedance and return loss

Dipole CLA150 SN 4025				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2021/4/26	-31.4	/	47.8	/
2022/4/26	-30.9	1.59%	47.2	0.6
Dipole D450V3 SN 1103				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2021/4/21	-23	/	57.1	/
2022/4/21	-22.9	0.43%	56.9	0.2



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