

Appendix C for KSCR221200237401

Calibration Certificate

Object	Apply	No	Model	SN	Calibration Date
Dipole	<input type="checkbox"/>	1	CLA150	4025	2021/04/26
	<input type="checkbox"/>	2	D450V3	1103	2021/04/21
	<input type="checkbox"/>	3	D750V3	1188	2022/03/29
	<input type="checkbox"/>	4	D835V2	4d114	2022/03/31
	<input type="checkbox"/>	5	D900V2	1d079	2022/06/07
	<input type="checkbox"/>	6	D1800V2	2d170	2022/03/31
	<input type="checkbox"/>	7	D1900V2	5d136	2022/06/07
	<input type="checkbox"/>	8	D2000V2	1041	2022/06/06
	<input type="checkbox"/>	9	D2300V2	1096	2022/03/31
	<input checked="" type="checkbox"/>	10	D2450V2	817	2022/04/01
	<input type="checkbox"/>	11	D2600V2	1158	2022/03/31
	<input type="checkbox"/>	12	D5GHzV2	1095	2022/06/01
DAE	<input checked="" type="checkbox"/>	13	DAE4	1245	2022/05/30
Probe	<input checked="" type="checkbox"/>	14	EX3DV4	7346	2022/03/30



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1 Dipole

1.1 CLA150 - SN 4025

<p>Calibration Laboratory of Schmid & Partner Engineering AG Ziegelhausstrasse 43, 8004 Zurich, Switzerland</p> <p>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</p> <p>Client: SGS-CN (Auden) Certificate No.: CLA150-4025_Apr21</p> <p style="text-align: right;">Accreditation No.: SCS 0108</p> <hr/> <p style="text-align: center;">CALIBRATION CERTIFICATE</p> <p>Object: CLA150 - SN: 4025</p> <p>Calibration procedure(s): QA CAL-15.09 Calibration Procedure for SAR Validation Sources below 700 MHz</p> <p>Calibration date: April 26, 2021</p> <p>The 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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.</p> <p>Calibration Equipment used (MPE critical for calibration)</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: 8px;"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter NRP</td> <td>SN: 10475</td> <td>09-Apr-21 (No. 217-03201/02320)</td> <td>Apr-22</td> </tr> <tr> <td>Power sensor NRP Z91</td> <td>SN: 10364</td> <td>09-Apr-21 (No. 217-03201)</td> <td>Apr-22</td> </tr> <tr> <td>Power sensor NRP Z91</td> <td>SN: 10365</td> <td>09-Apr-21 (No. 217-03202)</td> <td>Apr-22</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: C22662 (20)</td> <td>09-Apr-21 (No. 217-03343)</td> <td>Apr-22</td> </tr> <tr> <td>Type-N mismatch combination</td> <td>SN: 31095 / 0037</td> <td>09-Apr-21 (No. 217-03344)</td> <td>Apr-22</td> </tr> <tr> <td>Reference Probe EX30N4 (DIE4)</td> <td>SN: 3877</td> <td>30-Dec-20 (No. EX33877_Dec20)</td> <td>Dec-21</td> </tr> <tr> <td></td> <td>SN: 664</td> <td>26-Jun-20 (No. DMS4-656_Jun20)</td> <td>Jun-21</td> </tr> </tbody> </table> <table border="1" style="width: 100%; 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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. <p>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%.</p> <p>Certificate No: CLA150-4025_Apr21 Page 2 of 8</p>		
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 中国·江苏·昆山市留学生创业园伟业路10号 邮编 215300 t(86-512)57355888 f(86-512)57370818 sgs.china@sgs.com

DASY5 Validation Report for Head TSL

Date: 26.04.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: CLA150; Type: CLA150; Serial: CLA150 - SN: 4025

Communication System: UID 0 - CW; Frequency: 150 MHz
 Medium parameters used: $f = 150 \text{ MHz}$; $\sigma = 0.76 \text{ S/m}$; $\epsilon = 51.1$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(12.51, 12.51, 12.51) @ 150 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA54 Sn654; Calibrated: 26.06.2020
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP.1003
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

CLA Calibration for HSL-LF Tissue/CLA150, touch configuration, Pin=1W/Zoom Scan, dist=1.4mm (8x10x8)Cube D: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
 Reference Value = 85.93 W/m; Power Drift = -0.02 dB
 Peak SAR (extrapolated) = 7.36 W/kg
SAR(1 g) = 3.90 W/kg; SAR(10 g) = 2.60 W/kg
 Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 30mm)
 Ratio of SAR at M2 to SAR at M1 = 80.4%
 Maximum value of SAR (measured) = 5.48 W/kg

0 dB = 5.48 W/kg = 7.39 dBW/kg

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1.2 D450V3 - SN 1103

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

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Client: **SGS-CN (Auden)** Certificate 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 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 closest laboratory facility; environment temperature (22 ± 0.1) °C and humidity < 70%.

Calibration Equipment used (MTE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NP#	SN: 104778	09-Apr-21 (No. 217-03021/03030)	Apr-22
Power sensor NP#-Z91	SN: 103244	09-Apr-21 (No. 217-03021)	Apr-22
Reference 20 dB Attenuator	SN: C2582 (200)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N immersion calibration	SN: 310927 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe E3039A	SN: 3077	30-Dec-20 (No. E30-3077_De20)	Dec-21
DAEA	SN: 654	05-Jan-20 (No. 0464-664_Jan20)	Jan-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4418B	SN: GB41200274	06-Apr-16 (in house check Jun-20)	In house check Jun-22
Power sensor E4412A	SN: MY41496027	06-Apr-16 (in house check Jun-20)	In house check Jun-22
Power sensor E4413A	SN: 000100210	06-Apr-16 (in house check Jun-20)	In house check Jun-22
RF generator HP 8648C	SN: US3406017100	06-Apr-19 (in house check Jun-20)	In house check Jun-22
Network Analyzer Agilent E8358A	SN: US41980477	31-Mar-14 (in house check Oct-20)	In house check Oct-21

Calibrated by: **Christoph Leuber** (Function: Laboratory Technician)

Approved by: **Katja Polovic** (Function: Technical Manager)

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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 Zeughausstrasse 43, 8004 Zurich, Switzerland

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

Glossary:

TSL: Issue simulating liquid sensitivity in TSL / NORM x,y,z

ConvF: not applicable or not measured

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 665664, "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



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

DASY Version	DASY5	V82.10.4
Extrapolation	Advanced Extrapolation	
Phantom	ELJ Flat Phantom	Shell thickness: 2 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	450 MHz ± 1 MHz	

Head TSL parameters
The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	43.5	0.57 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	43.1 ± 0.6 %	0.57 mho/m ± 0 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

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

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	0.757 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	3.06 W/kg ± 17.6 % (k=2)

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Appendix (Additional assessments outside the scope of SCS 0106)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.1 Ω - 2.6 jΩ
Return Loss	-23.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.346 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured. The dipole is made of standard straight 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 set according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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Certificate No: D450V3-1103_Apr21 Page 4 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

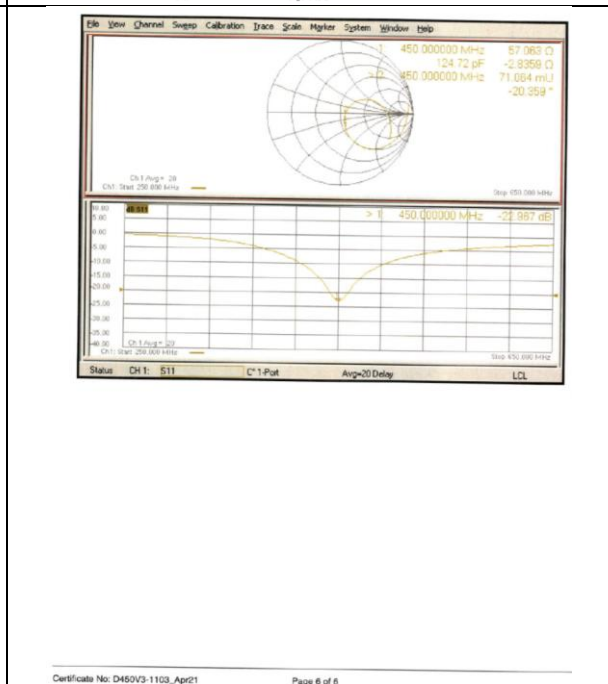
Communication System: UID 0 - CW; Frequency: 450 MHz
Medium parameters used: f = 450 MHz, α = 0.87 S/m; ε_r = 43.1; ρ = 1000 kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(10.64, 10.64, 10.64) @ 450 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 26.06.2020
- Phantom: ELJ v4.0; Type: QDOVA001BB; Serial: TP:1003
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Head Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.18 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.76 W/kg
SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.767 W/kg
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 64.9%
Maximum value of SAR (measured) = 1.53 W/kg

Certificate No: D450V3-1103_Apr21 Page 5 of 6



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1.3 D750V3 - SN 1188

<div style="display: flex; justify-content: space-between;"> </div> <p> Add: No.52 HuaYuanbei Road, Haidian District, Beijing, 100191, China Tel: +86-10-6236633-2112 Fax: +86-10-6236633-2504 E-mail: cti@chinaetl.com http://www.chinaetl.cn </p> <p> Client: SGS-CN Certificate No: Z22-60103 </p> <h3>CALIBRATION CERTIFICATE</h3> <p> Object: D750V3 - SN: 1188 Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits Calibration date: March 28, 2022 </p> <p> 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. </p> <p> All calibrations have been conducted in the closed laboratory facility: environment temperature (22±1)°C and humidity<70%. </p> <p> Calibration Equipment used (M&TE critical for calibration) </p> <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by, Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power Meter NRP2</td> <td>106277</td> <td>24-Sep-21 (CTTL No.J21X08326)</td> <td>Sep-22</td> </tr> <tr> <td>Power sensor NRP88</td> <td>104291</td> <td>24-Sep-21 (CTTL No.J21X08326)</td> <td>Sep-22</td> </tr> <tr> <td>Reference Probe EX30V4</td> <td>SN 7307</td> <td>26-May-21(SPEAG.No.EX3-7307_May21)</td> <td>May-22</td> </tr> <tr> <td>DAE4</td> <td>SN 1556</td> <td>12-Jan-22(CTTL-SPEAG.No.Z22-60007)</td> <td>Jan-23</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by, Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Signal Generator E4439C</td> <td>MY49671430</td> <td>13-Jan-22 (CTTL No.J22X00409)</td> <td>Jan-23</td> </tr> <tr> <td>Network Analyzer E5071C</td> <td>MY46110973</td> <td>14-Jan-22 (CTTL No.J22X00409)</td> <td>Jan-23</td> </tr> </tbody> </table> <p> Calibrated by: Zhao Jing (SAR Test Engineer) Reviewed by: Lin Hao (SAR Test Engineer) Approved by: Qi Dianyuan (SAR Project Leader) </p> <p> Issued: April 3, 2022 This calibration certificate shall not be reproduced except in full without written approval of the laboratory. </p> <p> Certificate No: Z22-60103 Page 1 of 6 </p>	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 NRP88	104291	24-Sep-21 (CTTL No.J21X08326)	Sep-22	Reference Probe EX30V4	SN 7307	26-May-21(SPEAG.No.EX3-7307_May21)	May-22	DAE4	SN 1556	12-Jan-22(CTTL-SPEAG.No.Z22-60007)	Jan-23	Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration	Signal Generator E4439C	MY49671430	13-Jan-22 (CTTL No.J22X00409)	Jan-23	Network Analyzer E5071C	MY46110973	14-Jan-22 (CTTL No.J22X00409)	Jan-23	<div style="display: flex; justify-content: space-between;"> </div> <p> Add: No.52 HuaYuanbei Road, Haidian District, Beijing, 100191, China Tel: +86-10-6236633-2079 Fax: +86-10-6236633-2504 E-mail: cti@chinaetl.com http://www.chinaetl.cn </p> <h3>Glossary:</h3> <p> TSL: tissue simulating liquid ConvF: sensitivity in TSL / NORMx.yz N/A: not applicable or not measured </p> <p> Calibration is Performed According to the Following Standards: </p> <ul style="list-style-type: none"> 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 KDB 865684, "SAR Measurement Requirements for 100 MHz to 6 GHz" <p> Additional Documentation: c) DASY4/5 System Handbook </p> <p> Methods Applied and Interpretation of Parameters: </p> <ul style="list-style-type: none"> 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. <div style="border: 1px solid black; padding: 5px;"> <p>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%.</p> </div> <p> Certificate No: Z22-60103 Page 2 of 6 </p>																												
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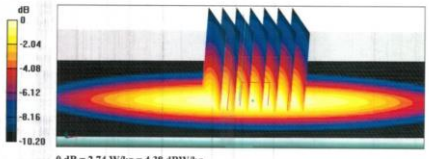
TTL Speaq Calibration Laboratory
 In Collaboration with **CAICT**

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 E-mail: cti@china.ttl.com http://www.china.ttl.com

DASY5 Validation Report for Head TSL Date: 2022-03-29
 Test Laboratory: CCTL, Beijing, China
 DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1188
 Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.888 \text{ S/m}$; $\epsilon_r = 41.36$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Right Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
 DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(10.31, 10.31, 10.31) @ 750 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2022-01-12
- Phantom: MFP-V5.1C (20kg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52.52.10.4(1535); SEMCADX 14.6.14(7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7) Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 55.06 V/m; Power Drift = 0.00 dB
 Peak SAR (extrapolated) = 2.07 W/kg
 SAR(1 g) = 2.07 W/kg; SAR(10 g) = 1.37 W/kg
 Smallest distance from peaks to all points 3 dB below = 18.9 mm
 Ratio of SAR at M2 to SAR at M1 = 67.1%
 Maximum value of SAR (measured) = 2.74 W/kg



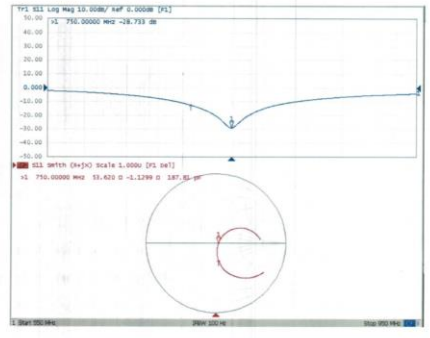
0 dB = 2.74 W/kg = 4.38 dBW/kg

Certificate No: Z22-60103 Page 5 of 6

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Impedance Measurement Plot for Head TSL



Certificate No: Z22-60103 Page 6 of 6

1.4 D835V2 - SN 4d114

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 E-mail: cti@china.ttl.com http://www.china.ttl.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 (M&TE critical for calibration)

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Power sensor NRPBS	104291	24-Sep-21 (CCTL, No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7307	26-May-21 (SPEAG, No.EX3-7307_May21)	May-22
DAE4	SN 1556	12-Jan-22 (CCTL-SPEAG, No.Z22-60007)	Jan-23

Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-22 (CCTL, No.J22X00409)	Jan-23
Network Analyzer E5071C	MY49110673	14-Jan-22 (CCTL, No.J22X00406)	Jan-23

Calibrated by: Zhao Jing, SAR Test Engineer

Reviewed by: Lin Hao, SAR Test Engineer

Approved by: Qi Dianyuan, SAR Project Leader

Issued: April 6, 2022

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Glossary:

- TSL: tissue simulating liquid
- ConvF: sensitivity in TSL / NORMx.yz
- N/A: not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- KDB 685864, "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%.

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Measurement Conditions
DASY system configuration, as far as not given on page 1

DASY Version	DASY52	VS2 10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters
The following parameters and calculations were applied:

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.0 ± 8 %	0.91 mho/m ± 8 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.40 W/kg ± 18.6 % (k=2)
SAR averaged over 10 cm ³ (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)

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.7Ω - j22Ω
Return Loss	-25.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.307 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: 2022-03-31

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d114
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.907 S/m; ε_r = 40.98; ρ = 1000 kg/m³
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(10.13, 10.13, 10.13) @ 835 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA-E4 Sx1556; Calibrated: 2022-01-12
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7) Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.88 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.56 W/kg
SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg
Smallest distance from peaks to all points 3 dB below = 15.8 mm
Ratio of SAR at M2 to SAR at M1 = 66.2%
Maximum value of SAR (measured) = 3.17 W/kg

0 dB = 3.17 W/kg = 5.01 dBW/kg

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Impedance Measurement Plot for Head TSL

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1.5 D900V2 - SN 1d079

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E-mail: cti@china.ttl.com

Date: 2022-06-07

DASY5 Validation Report for Head TSL
 Test Laboratory: CTTI, Beijing, China
 DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 14079
 Communication System: UTD 0, CW; Frequency: 900 MHz; Duty Cycle: 1:1
 Medium parameters used: f = 900 MHz; $\sigma = 0.98$ S/m; $\epsilon_r = 42.05$; $\rho = 1000$ kg/m³
 Phantom section: Right Section
 Measurement Standard: DASY5 (IEE/IEC/ANSI C63.19-2007)
 DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(9.72, 9.72) @ 900 MHz; Calibrated: 2022-01-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronic: DA44 S41556; Calibrated: 2022-01-12
- Phantom: MFP_V5.1C (2ddeg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration/Zoom Scan (7x7) (7x7) Cube 0; Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 59.81 V/m; Power Drift = -0.01 dB
 Peak SAR (extrapolated) = 4.20 W/kg
 SAR(1 g) = 2.78 W/kg; SAR(10 g) = 1.78 W/kg
 Smallest distance from peaks to all points 3 dB below = 16 mm
 Ratio of SAR at M2 to SAR at M1 = 65.8%
 Maximum value of SAR (measured) = 3.71 W/kg

Certificate No: Z22-60184 Page 3 of 6

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Date: 2022-06-07

Impedance Measurement Plot for Head TSL

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1.6 D1800V2 - SN 2d170

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CALIBRATION
CNAS L870

Certificate No: Z22-60105

Client: SGS-CN

CALIBRATION CERTIFICATE

Object: D1800V2 - SN: 2d170

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

Calibration date: March 31, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL No.J21X08326)	Sep-22
Power sensor NRP85	104291	24-Sep-21 (CTTL No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7307	26-May-21 (SPEAG No.JX3-7307_May21)	May-22
DAE4	SN 1506	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	MY48110973	14-Jan-22 (CTTL No.J22X00406)	Jan-23

Calibrated by: Zhao Jing, SAR Test Engineer, Signature: [Signature]

Reviewed by: Lin Hao, SAR Test Engineer, Signature: [Signature]

Approved by: Qi Diqiyuan, SAR Project Leader, Signature: [Signature]

Issued: April 6, 2022

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Certificate No: Z22-60105

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:

- 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
- KDB 855664, "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
 DASYS system configuration, as far as not given on page 1

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 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	40.8 ± 8 %	1.41 mho/m ± 8 %
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	9.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	38.9 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.4 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	47.90-2.54jΩ
Return Loss	-29.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.116 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: 2022-03-31
 Test Laboratory: CTTL, Beijing, China
 DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d170
 Communication System: UID 0, CW; Frequency: 1800 MHz; Duty Cycle: 1:1
 Medium parameters used: f = 1800 MHz; σ = 1.411 S/m; ε = 40.62; ρ = 1000 kg/m³
 Phantom section: Right Section
 Measurement Standard: DASY5 (IEEE/ANSI C63.19-2007)
 DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(8.34, 8.34, 8.34) @ 1800 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 = 98.14 V/m; Power Drift = 0.03 dB
 Peak SAR (extrapolated) = 18.2 W/kg
 SAR(1 g) = 9.73 W/kg; SAR(10 g) = 5.11 W/kg
 Smallest distance from peaks to all points 3 dB below = 10 mm
 Ratio of SAR at M2 to SAR at M1 = 54%
 Maximum value of SAR (measured) = 15.2 W/kg

0 dB = 15.2 W/kg = 11.82 dBW/kg

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Impedance Measurement Plot for Head TSL

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1.7 D1900V2 - SN 5d136

<p>Address: No. 52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42204633-2117 E-mail: vt@china.ttl.com</p> <p>Client: SGS-CN Certificate No: Z22-60185</p> <h3>CALIBRATION CERTIFICATE</h3> <p>Object: D1900V2 - SN: 5d136</p> <p>Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits</p> <p>Calibration date: June 7, 2022</p> <p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility; environment temperature (23±3)°C and humidity <70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by, Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power Meter NRP2</td> <td>106277</td> <td>24-Sep-21 (CTTL No. J21X08326)</td> <td>Sep-22</td> </tr> <tr> <td>Power Meter NRP6S</td> <td>104291</td> <td>24-Sep-21 (CTTL No. J21X08326)</td> <td>Sep-22</td> </tr> <tr> <td>Reference Probe EKSDV4</td> <td>SN 7484</td> <td>28-Jan-22 (SPEAG No. EX3-7484_Jan22)</td> <td>Jan-23</td> </tr> <tr> <td>DAEA</td> <td>SN 1656</td> <td>12-Jan-22 (CTTL-SPEAG No. Z22-60007)</td> <td>Jan-23</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by, Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Signal Generator E4438C</td> <td>MY48671430</td> <td>13-Jan-22 (CTTL No. J22X00409)</td> <td>Jan-23</td> </tr> <tr> <td>Network Analyser E5071C</td> <td>MY48110073</td> <td>14-Jan-22 (CTTL No. J22X00406)</td> <td>Jan-23</td> </tr> </tbody> </table> <p>Calibrated by: Zhao Jing, SAR Test Engineer</p> <p>Reviewed by: Lin Hao, SAR Test Engineer</p> <p>Approved by: Qi Diaryuan, SAR Project Leader</p> <p>Issued: June 13, 2022</p> <p>This calibration certificate shall not be reproduced except in full without written approval of the laboratory.</p> <p>Certificate No: Z22-60185 Page 1 of 6</p>	Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration	Power Meter NRP2	106277	24-Sep-21 (CTTL No. J21X08326)	Sep-22	Power Meter NRP6S	104291	24-Sep-21 (CTTL No. J21X08326)	Sep-22	Reference Probe EKSDV4	SN 7484	28-Jan-22 (SPEAG No. EX3-7484_Jan22)	Jan-23	DAEA	SN 1656	12-Jan-22 (CTTL-SPEAG No. Z22-60007)	Jan-23	Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration	Signal Generator E4438C	MY48671430	13-Jan-22 (CTTL No. J22X00409)	Jan-23	Network Analyser E5071C	MY48110073	14-Jan-22 (CTTL No. J22X00406)	Jan-23	<p>Address: No. 52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42204633-2117 E-mail: vt@china.ttl.com</p> <p>Glossary: TSL: tissue simulating liquid ComF: sensitivity in TSL / NORMx.y.z NA: not applicable or not measured</p> <p>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"</p> <p>Additional Documentation: c) DASY4/S System Handbook</p> <p>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.</p> <p>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%.</p> <p>Certificate No: Z22-60185 Page 2 of 6</p>																												
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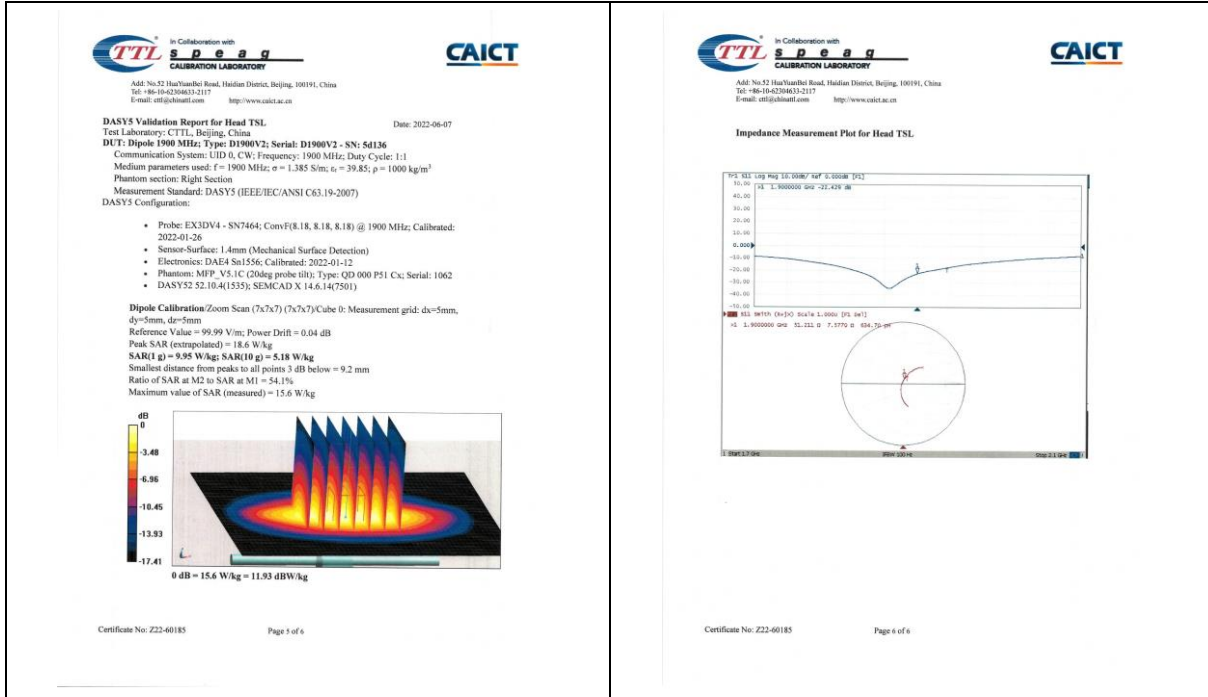


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1.8 D2000V2 - SN 1041



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E-mail: ott@ttnatt.com http://www.ttnatt.com

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

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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	40.2 ± 0.5 %	1.39 mho/m ± 0.6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1g) 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 % (k=2)
SAR averaged over 10 cm ³ (10g) 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 % (k=2)

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Appendix (Additional assessments outside the scope of CNAS L6570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.4Ω ± 0.74jΩ
Return Loss	-34.9dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.088 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 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, spiral and 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: 2022-06-06

Test Laboratory: CTTL, Beijing, China
DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2 - SN: 1041
Communication System: LIID 0; CW; Frequency: 2000 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2000 MHz; σ = 1.392 S/m; ε_r = 40.21; ρ = 1000 kg/m³
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(R,2, 8.2, 8.2) @ 2000 MHz; Calibrated: 2022-01-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA64 Sn1556; Calibrated: 2022-01-12
- Phantom: MFP_V5.1C (20dkg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52: S2.10.4(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 = 103.4 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 19.6 W/kg
SAR(1g) = 10.4 W/kg; SAR(10g) = 5.3 W/kg
Smallest distance from peaks 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

0 dB = 16.3 W/kg = 12.12 dBW/kg

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Impedance Measurement Plot for Head TSL

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1.9 D2300V2 - SN 1096

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<p>Client: SGS-CN Certificate No: Z22-60106</p>			
<p>CALIBRATION CERTIFICATE</p>			
Object	D2300V2 - SN: 1096		
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits		
Calibration date:	March 31, 2022		
<p>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.</p>			
<p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity <70%.</p>			
<p>Calibration Equipment used (M&TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
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Power sensor NRP8S	104291	24-Sep-21 (CTTL No.J21X08328)	Sep-22
Reference Probe EX30V4	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 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 Diaryuan	SAR Project Leader	
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Certificate No: Z22-60106		Page 1 of 6	

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<p>Measurement Conditions DASY system configuration, as far as not given on page 1</p>			
DASY Version	DASY2	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		
<p>Head TSL parameters The following parameters and calculations were applied:</p>			
	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	—	—
<p>SAR result with Head TSL</p>			
SAR averaged over 1 cm ² (1 g) of Head TSL	Condition		
SAR measured	250 mW input power	12.4 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	49.2 W/kg ± 18.8 % (k=2)	
SAR averaged over 10 cm ² (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	5.88 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	23.4 W/kg ± 18.7 % (k=2)	
Certificate No: Z22-60106		Page 3 of 6	

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<p>Glossary:</p>			
TSL	Issue simulating liquid		
ConvF	sensitivity in TSL / NCFMx,y,z		
N/A	not applicable or not measured		
<p>Calibration is Performed According to the Following Standards:</p>			
<p>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</p>			
<p>b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"</p>			
<p>Additional Documentation:</p>			
<p>c) DASY4/5 System Handbook</p>			
<p>Methods Applied and Interpretation of Parameters:</p>			
<ul style="list-style-type: none"> 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. 			
<p>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%.</p>			
Certificate No: Z22-60106		Page 2 of 6	

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<p>Appendix (Additional assessments outside the scope of CNAS L0570)</p>			
<p>Antenna Parameters with Head TSL</p>			
Impedance, transformed to feed point	49.20 - 4.56(j)		
Return Loss	-26.6dB		
<p>General Antenna Parameters and Design</p>			
Electrical Delay (one direction)	1.083 ns		
<p>After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p>			
<p>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 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.</p>			
<p>Additional EUT Data</p>			
Manufactured by	SPEAG		
Certificate No: Z22-60106		Page 4 of 6	

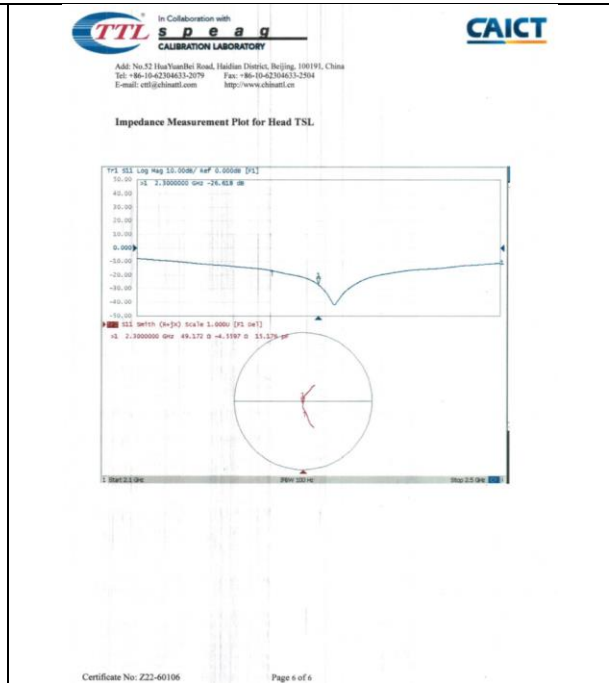
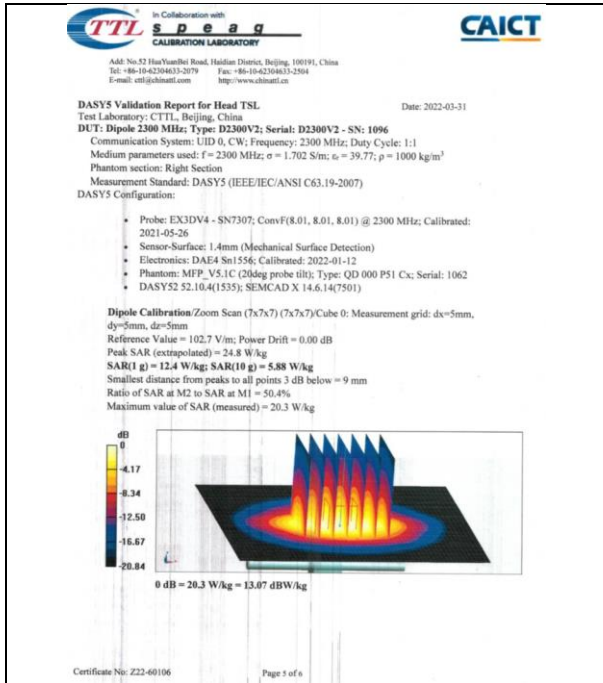


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t(86-512)57355888 f(86-512)57370818 sgs.china@sgs.com



1.10 D2450V2 - SN 817

Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter NRP2	108277	24-Sep-21 (CCTL No.J21X08320)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CCTL No.J21X08320)	Sep-22
Reference Probe EX3DV4	SN 7307	26-May-21(SPEAG.No.EX3-7307_May21)	May-22
DAE4	SN 1556	12-Jan-22(CCTL-SPEAG.No.Z22-60007)	Jan-23
Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-22 (CCTL No. J22X00406)	Jan-23
Network Analyzer E5071C	MY46110873	14-Jan-22 (CCTL No. J22X00406)	Jan-23

Client: SGS-CN **Certificate No.:** Z22-60107

Object: D2450V2 - SN 817

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

Calibration date: April 1, 2022

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 855664, "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.

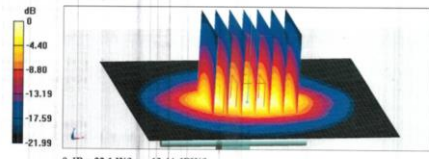
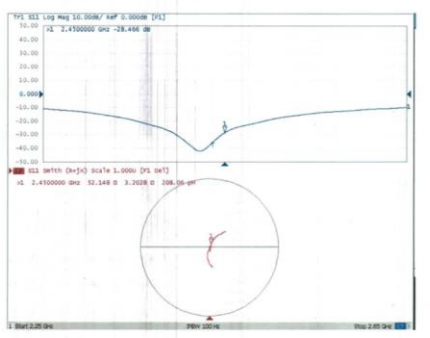
The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor $k=2$, which for a normal distribution Corresponds to a coverage probability of approximately 95%.



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<p>TTL Speag CALIBRATION LABORATORY</p> <p>Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42304633-2079 Fax: +86-10-42304633-2504 E-mail: cti@china.ttl.com http://www.china.ttl.com</p> <p>CAICT</p> <p>Measurement Conditions DASY system configuration, as far as not given on page 1</p> <table border="1"> <tr> <td>DASY Version</td> <td>DASY52</td> <td>52.10.4</td> </tr> <tr> <td>Extrapolation</td> <td>Advanced Extrapolation</td> <td></td> </tr> <tr> <td>Phantom</td> <td>Triple Flat Phantom 5.1C</td> <td></td> </tr> <tr> <td>Distance Dipole Center - TSL</td> <td>10 mm</td> <td>with Spacer</td> </tr> <tr> <td>Zoom Scan Resolution</td> <td>dx, dy, dz = 5 mm</td> <td></td> </tr> <tr> <td>Frequency</td> <td>2450 MHz ± 1 MHz</td> <td></td> </tr> </table> <p>Head TSL parameters The following parameters and calculations were applied.</p> <table border="1"> <tr> <td>Nominal Head TSL parameters</td> <td>Temperature</td> <td>Permittivity</td> <td>Conductivity</td> </tr> <tr> <td>Measured Head TSL parameters</td> <td>22.0 °C</td> <td>39.2</td> <td>1.80 mho/m</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td>(22.0 ± 0.2) °C</td> <td>39.5 ± 6 %</td> <td>1.79 mho/m ± 6 %</td> </tr> <tr> <td></td> <td><+1.0 °C</td> <td>---</td> <td>---</td> </tr> </table> <p>SAR result with Head TSL</p> <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>13.2 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>53.0 W/kg ± 18.8 % (k=2)</td> </tr> <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>6.15 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>24.7 W/kg ± 18.7 % (k=2)</td> </tr> </table> <p>Certificate No: Z22-60107 Page 3 of 6</p>	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	2450 MHz ± 1 MHz		Nominal Head TSL parameters	Temperature	Permittivity	Conductivity	Measured Head TSL parameters	22.0 °C	39.2	1.80 mho/m	Head TSL temperature change during test	(22.0 ± 0.2) °C	39.5 ± 6 %	1.79 mho/m ± 6 %		<+1.0 °C	---	---	SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition		SAR measured	250 mW input power	13.2 W/kg	SAR for nominal Head TSL parameters	normalized to 1W	53.0 W/kg ± 18.8 % (k=2)	SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition		SAR measured	250 mW input power	6.15 W/kg	SAR for nominal Head TSL parameters	normalized to 1W	24.7 W/kg ± 18.7 % (k=2)	<p>TTL Speag CALIBRATION LABORATORY</p> <p>Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42304633-2079 Fax: +86-10-42304633-2504 E-mail: cti@china.ttl.com http://www.china.ttl.com</p> <p>CAICT</p> <p>Appendix (Additional assessments outside the scope of CNAS L0570)</p> <p>Antenna Parameters with Head TSL</p> <table border="1"> <tr> <td>Impedance, transformed to feed point</td> <td>52.10 ± 3.20Ω</td> </tr> <tr> <td>Return Loss</td> <td>-28.5dB</td> </tr> </table> <p>General Antenna Parameters and Design</p> <table border="1"> <tr> <td>Electrical Delay (one direction)</td> <td>1.066 ns</td> </tr> </table> <p>After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p> <p>The dipole is made of standard serringid 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.</p> <p>Additional EUT Data</p> <table border="1"> <tr> <td>Manufactured by</td> <td>SPEAG</td> </tr> </table> <p>Certificate No: Z22-60107 Page 4 of 6</p>	Impedance, transformed to feed point	52.10 ± 3.20Ω	Return Loss	-28.5dB	Electrical Delay (one direction)	1.066 ns	Manufactured by	SPEAG
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1.11 D2600V2 - SN 1158

 		 																							
Client: SGS-CN Certificate No: Z22-60108		Client: SGS-CN Certificate No: Z22-60108																							
CALIBRATION CERTIFICATE		Glossary: TSL: tissue simulating liquid ConvF: sensitivity in TSL / NORMx.y.z N/A: not applicable or not measured																							
Object: D2600V2 - SN: 1158		Calibration is Performed According to the Following Standards: a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices - Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020 b) KDB 865864, "SAR Measurement Requirements for 100 MHz to 6 GHz" Additional Documentation: c) DASY4/S System Handbook																							
Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits		Methods Applied and Interpretation of Parameters: <ul style="list-style-type: none"> 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. 																							
Calibration date: March 31, 2022		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%.																							
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±3)°C and humidity<70%.																									
Calibration Equipment used (M&TE critical for calibration)																									
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 E-mail: cti@china.ttl.com http://www.china.ttl.com

Date: 2022-03-31

DASY5 Validation Report for Head TSL
 Test Laboratory: CTTL, Beijing, China
 DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1158
 Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
 Phantom parameters used: $f = 2600$ MHz; $\sigma = 1.955$ S/m; $\epsilon_r = 38.68$; $\rho = 1000$ kg/m³
 Phantom section: Right Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
 DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(7.5, 7.5, 7.5) @ 2600 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2022-01-12
- Phantom: MFP-V5.1C (2dkg probe fill); 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 = 103.3 V/m; Power Drift = 0.04 dB
 Peak SAR (extrapolated) = 29.9 W/kg
 SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.12 W/kg
 Smallest distance from peaks to all points 3 dB below = 8.9 mm
 Ratio of SAR at M2 to SAR at M1 = 47.5%
 Maximum value of SAR (measured) = 23.4 W/kg

0 dB = 23.4 W/kg = 13.69 dBW/kg

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Impedance Measurement Plot for Head TSL

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1.12 D5GHzV2 - SN 1095

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 E-mail: cti@china.ttl.com http://www.china.ttl.com

Client: **SGS-CN** Certificate No: **Z22-60187**

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN: 1095

Calibration Procedure(s): FF-Z11-003-01
 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.

All calibrations have been conducted in the closed laboratory facility: environment temperature (23±)°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	106277	24-Sep-21 (CTTL No. J211008326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL No. J211008328)	Sep-22
Reference Probe EX3DV4	SN 7464	26-Jan-22(SPEAG No. EX3-7464_Jan22)	Jan-23
DAE4	SN 1556	12-Jan-22(CTTL-SPEAG No. Z22-60007)	Jan-23

Secondary Standards	ID #	Cal Date (Calibrated by: Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY46071430	13-Jan-22 (CTTL No. J22X00406)	Jan-23
Network Analyzer E5071C	MY46110673	14-Jan-22 (CTTL No. J22X00406)	Jan-23

Calibrated by: Zhao Jing, SAR Test Engineer

Reviewed by: Lin Hao, SAR Test Engineer

Approved by: Qi Dianyan, SAR Project Leader

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:

- 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
- KDB 665664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/G 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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<p>Certificate No: Z22-60187 Page 5 of 10</p>																			

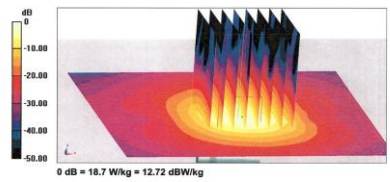
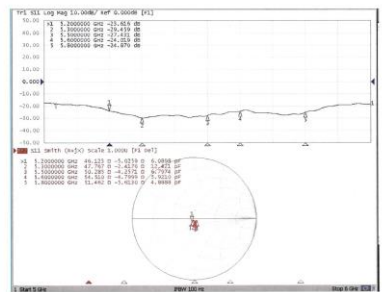
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<p>Appendix (Additional assessments outside the scope of CNAS L0570)</p>					
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<p>Certificate No: Z22-60187 Page 6 of 10</p>					



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<div style="display: flex; justify-content: space-between; align-items: center;"> </div> <p style="font-size: 8px;">In Collaboration with TTL CALIBRATION LABORATORY</p> <p style="font-size: 8px;">Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62021117 E-mail: ott@ttsnet.com http://www.ttsnet.com</p> <p>General Antenna Parameters and Design</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Electrical Delay (one direction)</td> <td style="width: 30%;">1.101 ns</td> </tr> </table> <p style="font-size: 8px;">After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p> <p style="font-size: 8px;">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.</p> <p>Additional EUT Data</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Manufactured by</td> <td style="width: 40%;">SPEAG</td> </tr> </table> <p style="font-size: 8px;">Certificate No: Z22-60187 Page 7 of 10</p>	Electrical Delay (one direction)	1.101 ns	Manufactured by	SPEAG	<div style="display: flex; justify-content: space-between; align-items: center;"> </div> <p style="font-size: 8px;">In Collaboration with TTL CALIBRATION LABORATORY</p> <p style="font-size: 8px;">Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62021117 E-mail: ott@ttsnet.com http://www.ttsnet.com</p> <p style="text-align: right;">Date: 2022-06-01</p> <p>DASY5 Validation Report for Head TSL</p> <p style="font-size: 8px;">Test Laboratory: CCTL, Beijing, China DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1095</p> <p style="font-size: 8px;">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; σ = 4.62 S/m; ϵ_r = 35.38; ρ = 1000 kg/m³ Medium parameters used: f = 5300 MHz; σ = 4.73 S/m; ϵ_r = 35.19; ρ = 1000 kg/m³ Medium parameters used: f = 5500 MHz; σ = 4.939 S/m; ϵ_r = 34.83; ρ = 1000 kg/m³ Medium parameters used: f = 5600 MHz; σ = 5.051 S/m; ϵ_r = 34.68; ρ = 1000 kg/m³ Medium parameters used: f = 5800 MHz; σ = 5.247 S/m; ϵ_r = 34.42; ρ = 1000 kg/m³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) DASY5 Configuration:</p> <ul style="list-style-type: none"> • Probe: EX3DV4 - SN7484; 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) • 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) <p style="font-size: 8px;">Dipole Calibration /Pin=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) = 7.73 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) = 18.3 W/kg</p> <p style="font-size: 8px;">Dipole Calibration /Pin=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</p> <p style="font-size: 8px;">Certificate No: Z22-60187 Page 8 of 10</p>
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2 DAE4 - SN 1245

<div style="text-align: center; border-bottom: 1px solid black; margin-bottom: 10px;"> </div> <p>IMPORTANT NOTICE</p> <p>USAGE OF THE DAE4</p> <p>The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:</p> <p>Battery Exchange: The battery cover of the DAE4 unit is fixed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.</p> <p>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.</p> <p>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 E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.</p> <p>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.</p> <p>DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.</p> <p>Important Note: Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.</p> <p>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.</p> <p>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.</p> <p style="font-size: small; margin-top: 20px;">TN_EH160306AE_DAE4.docx 07.03.2019</p>	<div style="text-align: center; border-bottom: 1px solid black; margin-bottom: 10px;"> </div> <p>Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland</p> <p style="text-align: right;"> Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service </p> <p style="font-size: x-small;"> 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 </p> <p style="text-align: right; font-size: x-small;"> Accreditation No.: SCS 0108 Client: SGS-CN (Auden) Certificate No.: DAE4-1245_May22 </p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; margin: 0;">CALIBRATION CERTIFICATE</p> <p style="margin: 0;">Object: DAE4 - SD 000 D04 BM - SN: 1245</p> <p style="margin: 0;">Calibration procedure(s): QA CAL-06 v30 Calibration procedure for the data acquisition electronics (DAE)</p> <p style="margin: 0;">Calibration date: May 30, 2022</p> </div> <p style="font-size: x-small;"> This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). 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Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range	Reading (µV)	Difference (µV)	Error (%)
Channel X + Input	19994.45	1.52	0.00
Channel X + Input	20004.58	2.22	0.01
Channel X - Input	-20000.14	1.12	-0.01
Channel Y + Input	19994.72	1.58	0.00
Channel Y + Input	20001.22	-1.00	-0.00
Channel Y - Input	-20003.05	-1.57	0.01
Channel Z + Input	19992.84	0.19	0.00
Channel Z + Input	20003.09	0.58	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	0.02
Channel X + Input	202.54	0.65	0.32
Channel X - Input	-197.86	0.07	-0.04
Channel Y + Input	2002.05	0.58	0.03
Channel Y + Input	201.27	-0.57	-0.28
Channel Y - Input	-199.23	-0.06	0.03
Channel Z + Input	2001.98	0.08	0.00
Channel Z + Input	200.09	-1.53	-0.76
Channel Z - Input	-199.89	-1.57	0.79

2. Common mode sensitivity

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

Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	-200	-3.87
	-200	9.12
Channel Y	200	-8.68
	-200	8.52
Channel Z	200	-5.36
	-200	3.58

3. Channel separation

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

Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)	
Channel X	200	-	4.07	-3.14
Channel Y	200	9.36	-	4.27
Channel Z	200	10.11	7.14	-

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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	16562	16768
Channel Z	16035	15668

5. Input Offset Measurement

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

Input 10MΩ

	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	-2.61	0.58	0.60

6. Input Offset Current

Nominal input circuitry offset current on all channels: $-25nA$

7. Input Resistance (Typical values for information)

	Zeroing (ΩOhm)	Measuring (MΩhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

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

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+8	+14
Supply (- Vcc)	-0.01	-8	-9

Certificate No: DAE4-1245_May22 Page 5 of 5

3 EX3DV4 - SN 7346

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Client: **Auden** Certificate No: **EX3-7346_Mar22**

CALIBRATION CERTIFICATE

Object: **EX3DV4 - SN 7346**

Calibration procedure(s): **QA CAL-01 v6; QA CAL-14 v6; QA CAL-23 v5; QA CAL-25 v7**
Calibration procedure for dosimetric E-field probes

Calibration date: **March 30, 2022**

This calibration certificate documents the traceability to national standards, which make 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 (Certificate No.)	Scheduled Calibration
Power meter NMP	SR_10478	09-Apr-21 (No. 211-0251-0252)	Apr-22
Power sensor NMP-291	SR_10324	09-Apr-21 (No. 211-0251)	Apr-22
Power sensor NMP-291	SR_10343	09-Apr-21 (No. 211-0252)	Apr-22
Reference 20dB attenuator	SR_C2252 (20)	09-Apr-21 (No. 211-0243)	Apr-22
DAE4	SR_460	13-Oct-21 (No. DAE4-085_04011)	Oct-22
Reference Probe ES302	SR_3013	27-Oct-21 (No. ES3-3013_04011)	Dec-22

Calibrated by: **Benjamin** Function: **Laboratory Technician** Signature: *[Signature]*

Approved by: **Benjamin** Function: **Quality Manager** Signature: *[Signature]*

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Certificate No: EX3-7346_Mar22 Page 1 of 24

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