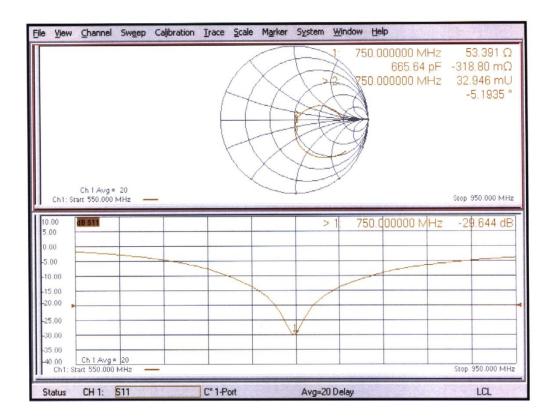


# Impedance Measurement Plot for Head TSL



Certificate No: D750V3-1017\_Jul23

Page 6 of 6





# 835 MHz Dipole Calibration Certificate

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



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

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client CTTL

Certificate No. D835V2-4d069 Jul23

| Calibration procedure(s)  Calibration procedure(s)  Calibration date:  Calibration date:  Calibration date:  Calibration certificate documents the The measurements and the uncertainties and calibrations have been conducted in the Calibration Equipment used (M&TE critical Calibratio | y 14, 2023 e traceability to natic s with confidence pr the closed laborator cal for calibration)  | conal standards, which realize the physical un robability are given on the following pages and y facility: environment temperature (22 ± 3)°(  Cal Date (Certificate No.)  30-Mar-23 (No. 217-03804)  30-Mar-23 (No. 217-03805)  30-Mar-23 (No. 217-03809)  30-Mar-23 (No. 217-03810)  10-Jan-23 (No. EX3-7349_Jan23) | its of measurements (SI). Id are part of the certificate. C and humidity < 70%.  Scheduled Calibration  Mar-24  Mar-24  Mar-24  Mar-24  Mar-24  Jan-24  Jan-24 |
|--|--|---|--|
| Calibration date:  July  This calibration certificate documents the The measurements and the uncertainties. All calibrations have been conducted in the Calibration Equipment used (M&TE critical Cali | y 14, 2023  e traceability to nations with confidence protection (all for calibration)  # I: 104778 I: 103244 I: 103245 I: BH9394 (20k) I: 310982 / 06327 I: 7349                  | conal standards, which realize the physical unrobability are given on the following pages and y facility: environment temperature (22 ± 3)°(  Cal Date (Certificate No.)  30-Mar-23 (No. 217-03804)  30-Mar-23 (No. 217-03805)  30-Mar-23 (No. 217-03809)  30-Mar-23 (No. 217-03810)  10-Jan-23 (No. EX3-7349_Jan23)  | its of measurements (SI). Id are part of the certificate. C and humidity < 70%.  Scheduled Calibration  Mar-24  Mar-24  Mar-24  Mar-24  Mar-24  Jan-24  Jan-24 |
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| ower meter NRP2 SN ower sensor NRP-Z91 SN ower sensor NRP-Z91 SN ower sensor NRP-Z91 SN deference 20 dB Attenuator SN ope-N mismatch combination SN deference Probe EX3DV4 SN over sensor NRP-Z91 SN ower meter E4419B SN ower sensor HP 8481A SN ower sensor HP 8481A SN  | I: 104778<br>I: 103244<br>I: 103245<br>I: BH9394 (20k)<br>I: 310982 / 06327<br>I: 7349   | 30-Mar-23 (No. 217-03804/03805)<br>30-Mar-23 (No. 217-03804)<br>30-Mar-23 (No. 217-03805)<br>30-Mar-23 (No. 217-03809)<br>30-Mar-23 (No. 217-03810)<br>10-Jan-23 (No. EX3-7349_Jan23)   | Mar-24<br>Mar-24<br>Mar-24<br>Mar-24<br>Mar-24<br>Jan-24   |
| Power sensor NRP-Z91         SN           Power sensor NRP-Z91         SN           Reference 20 dB Attenuator         SN           Type-N mismatch combination         SN           Reference Probe EX3DV4         SN           DAE4         SN           Secondary Standards         ID           Power meter E4419B         SN           Power sensor HP 8481A         SN           Power sensor HP 8481A         SN  | I: 103244<br>I: 103245<br>I: BH9394 (20k)<br>I: 310982 / 06327<br>I: 7349  | 30-Mar-23 (No. 217-03804)<br>30-Mar-23 (No. 217-03805)<br>30-Mar-23 (No. 217-03809)<br>30-Mar-23 (No. 217-03810)<br>10-Jan-23 (No. EX3-7349_Jan23)  | Mar-24<br>Mar-24<br>Mar-24<br>Mar-24<br>Jan-24   |
| Power sensor NRP-Z91         SN           Reference 20 dB Attenuator         SN           Type-N mismatch combination         SN           Reference Probe EX3DV4         SN           DAE4         SN           Secondary Standards         ID           Power meter E4419B         SN           Power sensor HP 8481A         SN           Power sensor HP 8481A         SN  | I: 103245<br>I: BH9394 (20k)<br>I: 310982 / 06327<br>I: 7349   | 30-Mar-23 (No. 217-03805)<br>30-Mar-23 (No. 217-03809)<br>30-Mar-23 (No. 217-03810)<br>10-Jan-23 (No. EX3-7349_Jan23)   | Mar-24<br>Mar-24<br>Mar-24<br>Jan-24   |
| Reference 20 dB Attenuator   | I: BH9394 (20k)<br>I: 310982 / 06327<br>I: 7349  | 30-Mar-23 (No. 217-03809)<br>30-Mar-23 (No. 217-03810)<br>10-Jan-23 (No. EX3-7349_Jan23)  | Mar-24<br>Mar-24<br>Jan-24   |
| Type-N mismatch combination         SN           Reference Probe EX3DV4         SN           DAE4         SN           Secondary Standards         ID           Power meter E4419B         SN           Power sensor HP 8481A         SN           Power sensor HP 8481A         SN  | l: 310982 / 06327<br>l: 7349   | 30-Mar-23 (No. 217-03810)<br>10-Jan-23 (No. EX3-7349_Jan23)   | Mar-24<br>Jan-24   |
| Reference Probe EX3DV4         SN           DAE4         SN           Secondary Standards         ID           Power meter E4419B         SN           Power sensor HP 8481A         SN           Power sensor HP 8481A         SN   | I: 7349  | 10-Jan-23 (No. EX3-7349_Jan23)  | Jan-24   |
| DAE4         SN           Secondary Standards         ID           Power meter E4419B         SN           Power sensor HP 8481A         SN           Power sensor HP 8481A         SN   |  |   |  |
| Secondary Standards         ID           Power meter E4419B         SN           Power sensor HP 8481A         SN           Power sensor HP 8481A         SN   | 1: 601   |   |  |
| Power meter E4419B         SN           Power sensor HP 8481A         SN           Power sensor HP 8481A         SN  |  | 19-Dec-22 (No. DAE4-601_Dec22)  | Dec-23   |
| Power sensor HP 8481A SN<br>Power sensor HP 8481A SN   |  | Check Date (in house)   | Scheduled Check  |
| Power sensor HP 8481A SN   | I: GB39512475  | 30-Oct-14 (in house check Oct-22)   | In house check: Oct-24   |
|  | I: US37292783  | 07-Oct-15 (in house check Oct-22)   | In house check: Oct-24   |
| HF generator H&S SM I-06 SN  | I: MY41093315  | 07-Oct-15 (in house check Oct-22)   | In house check: Oct-24   |
| Notwork Applyzor Agilant Eggens  | I: 100972<br>I: US41080477   | 15-Jun-15 (in house check Oct-22)   | In house check: Oct-24   |
| Network Analyzer Agilent E8358A SN   | 1: US41080477  | 31-Mar-14 (in house check Oct-22)   | In house check: Oct-24   |
| Na   | me   | Function  | Signature  |
| Calibrated by: Mic   | chael Weber  | Laboratory Technician   | WIIW_~   |
|  |  |   | 17.102   |
| Approved by: Sve   | en Kühn  | Technical Manager   | M.Weer<br>SE   |
|  |  |   | 25   |
|  |  |   |  |

Certificate No: D835V2-4d069\_Jul23

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### Calibration Laboratory of

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





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

**Swiss Calibration Service** 

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

## Glossary:

**TSL** tissue simulating liquid

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

## Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

c) DASY System Handbook

## Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

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



# **Measurement Conditions**

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

| DASY Version                 | DASY52                 | V52.10.4    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 15 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, $dy$ , $dz = 5 mm$ |             |
| Frequency                    | 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 | 41.9 ± 6 %   | 0.92 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 2.44 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 9.62 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 1.58 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 6.25 W/kg ± 16.5 % (k=2) |

Certificate No: D835V2-4d069\_Jul23

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

### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 51.3 Ω - 1.2 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 35.2 dB       |

## General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.393 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### **Additional EUT Data**

| Manufactured by | SPEAG |
|-----------------|-------|

Certificate No: D835V2-4d069\_Jul23

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

Date: 14.07.2023

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d069

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: f = 835 MHz;  $\sigma = 0.92 \text{ S/m}$ ;  $\varepsilon_r = 41.9$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

## DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(9.69, 9.69, 9.69) @ 835 MHz; Calibrated: 10.01.2023

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 19.12.2022

Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001

DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 63.54 V/m; Power Drift = -0.05 dB

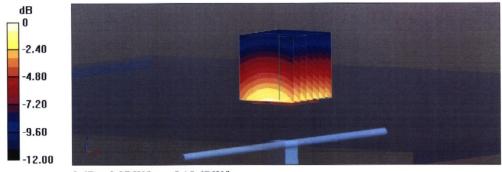
Peak SAR (extrapolated) = 3.68 W/kg

SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.58 W/kg

Smallest distance from peaks to all points 3 dB below = 16.8 mm

Ratio of SAR at M2 to SAR at M1 = 65.9%

Maximum value of SAR (measured) = 3.27 W/kg



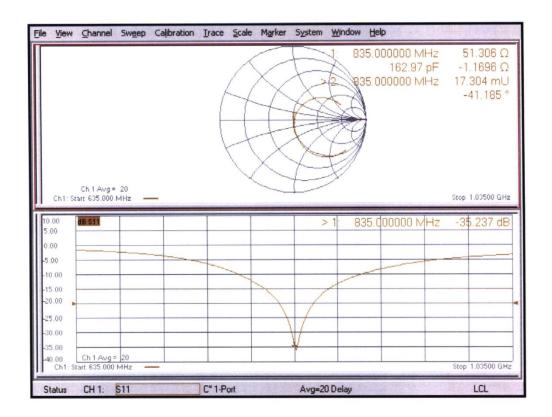
0 dB = 3.27 W/kg = 5.15 dBW/kg

Certificate No: D835V2-4d069\_Jul23

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## Impedance Measurement Plot for Head TSL

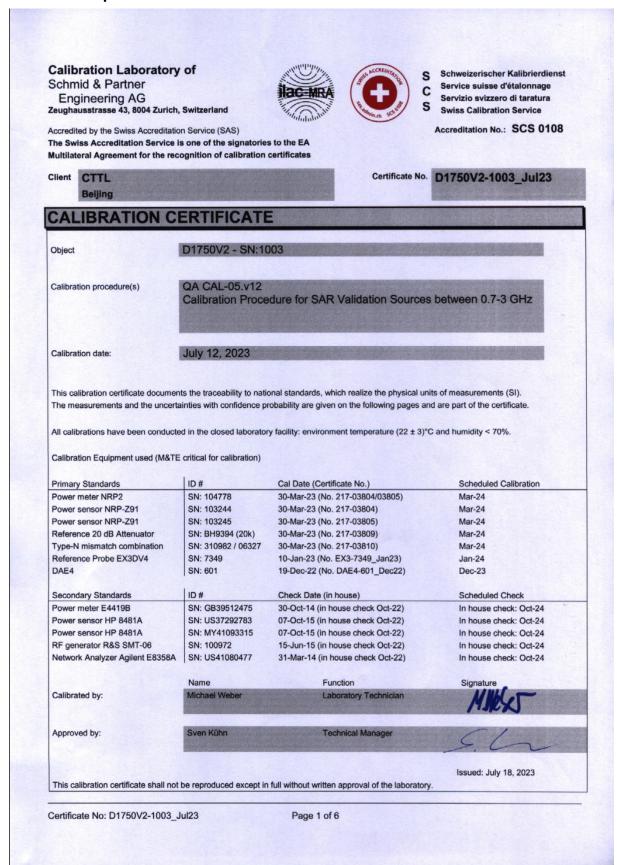






No. 23T04Z80619-013

# 1750 MHz Dipole Calibration Certificate







#### Calibration Laboratory of

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





Schweizerischer Kalibrierdienst Service suisse d'étalonnage

Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108



Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL tissue simulating liquid

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

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

- a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### **Additional Documentation:**

c) DASY System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

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

Certificate No: D1750V2-1003 Jul23

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## **Measurement Conditions**

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

| DASY Version                 | DASY52                 | V52.10.4    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 1750 MHz ± 1 MHz       |             |

## **Head TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 40.1         | 1.37 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 40.0 ± 6 %   | 1.34 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 8.84 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 35.8 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured                                | 250 mW input power | 4.69 W/kg                |
| SAR for nominal Head TSL parameters         | normalized to 1W   | 18.9 W/kg ± 16.5 % (k=2) |

Certificate No: D1750V2-1003\_Jul23





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

### Antenna Parameters with Head TSL

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

## General Antenna Parameters and Design

| - |                                  |          |
|---|----------------------------------|----------|
|   | Electrical Delay (one direction) | 1.214 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

## **Additional EUT Data**

| Manufactured by | SPEAG  |
|-----------------|--------|
| Manufactured by | SI LAG |

Certificate No: D1750V2-1003\_Jul23 Page 4 of 6



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

Date: 12.07.2023

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: f = 1750 MHz;  $\sigma = 1.34 \text{ S/m}$ ;  $\varepsilon_r = 40$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

## DASY52 Configuration:

• Probe: EX3DV4 - SN7349; ConvF(8.67, 8.67, 8.67) @ 1750 MHz; Calibrated: 10.01.2023

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 19.12.2022

• Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001

• DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.6 V/m; Power Drift = 0.05 dB

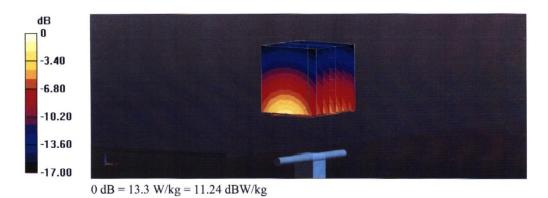
Peak SAR (extrapolated) = 16.1 W/kg

SAR(1 g) = 8.84 W/kg; SAR(10 g) = 4.69 W/kg

Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 55.4%

Maximum value of SAR (measured) = 13.3 W/kg

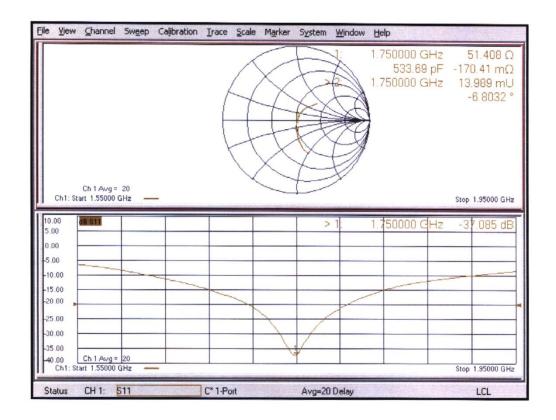


Certificate No: D1750V2-1003\_Jul23

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# Impedance Measurement Plot for Head TSL



Certificate No: D1750V2-1003\_Jul23

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# 1900 MHz Dipole Calibration Certificate

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





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

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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

Client CTTL

Beijing

Certificate No. D1900V2-5d101\_Jul23

Object

D1900V2 - SN:5d101

Calibration procedure(s)

QA CAL-05.v12

Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date:

July 17, 2023

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)

| ID#                | Cal Date (Certificate No.)  | Scheduled Calibration  |
|--------------------|---|--|
| SN: 104778         |   | Mar-24   |
| SN: 103244         |   | Mar-24   |
| SN: 103245         | 30-Mar-23 (No. 217-03805)   | Mar-24   |
| SN: BH9394 (20k)   | 30-Mar-23 (No. 217-03809)   | Mar-24   |
| SN: 310982 / 06327 | 30-Mar-23 (No. 217-03810)   | Mar-24   |
| SN: 7349           | 10-Jan-23 (No. EX3-7349 Jan23)  | Jan-24   |
| SN: 601            | 19-Dec-22 (No. DAE4-601_Dec22)  | Dec-23   |
| ID#                | Check Date (in house)   | Scheduled Check  |
| SN: GB39512475     | 30-Oct-14 (in house check Oct-22)   | In house check: Oct-24   |
| SN: US37292783     | 07-Oct-15 (in house check Oct-22)   | In house check: Oct-24   |
| SN: MY41093315     | 07-Oct-15 (in house check Oct-22)   | In house check: Oct-24   |
| SN: 100972         | 15-Jun-15 (in house check Oct-22)   | In house check: Oct-24   |
| SN: US41080477     | 31-Mar-14 (in house check Oct-22)   | In house check: Oct-24   |
| Name               | Function  | Signature  |
| Michael Weber      | Laboratory Technician   | NWGC   |
| Sven Kühn          | Technical Manager   |  |
|                    | SN: 104778<br>SN: 103244<br>SN: 103245<br>SN: BH9394 (20k)<br>SN: 310982 / 06327<br>SN: 7349<br>SN: 601<br>ID #<br>SN: GB39512475<br>SN: US37292783<br>SN: MY41093315<br>SN: 100972<br>SN: US41080477 | SN: 104778 30-Mar-23 (No. 217-03804/03805) SN: 103244 30-Mar-23 (No. 217-03804) SN: 103245 30-Mar-23 (No. 217-03805) SN: BH9394 (20k) 30-Mar-23 (No. 217-03809) SN: 310982 / 06327 30-Mar-23 (No. 217-03810) SN: 7349 10-Jan-23 (No. EX3-7349_Jan23) SN: 601 19-Dec-22 (No. DAE4-601_Dec22)  ID # Check Date (in house) SN: GB39512475 30-Oct-14 (in house check Oct-22) SN: US37292783 07-Oct-15 (in house check Oct-22) SN: MY41093315 07-Oct-15 (in house check Oct-22) SN: US41080477 31-Mar-14 (in house check Oct-22) SN: US41080477 31-Mar-14 (in house check Oct-22) |

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## Calibration Laboratory of

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





Schweizerischer Kalibrierdienst Service suisse d'étalonnage

Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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

## Glossary:

TSL tissue simulating liquid

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

## Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## **Additional Documentation:**

c) DASY System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end
  of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- · SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

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

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|-------------------------------------|-------------|--|
|                                     |             |  |
|                                     |             |  |
|                                     |             |  |
|                                     |             |  |





## **Measurement Conditions**

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

| DASY Version                 | DASY52                 | V52.10.4    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, $dy$ , $dz = 5 mm$ |             |
| Frequency                    | 1900 MHz ± 1 MHz       |             |

## **Head TSL parameters**

The following parameters and calculations were applied.

| The following parameters and saledianes were approximately | 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 | 39.4 ± 6 %   | 1.38 mho/m ± 6 % |
| Head TSL temperature change during test                    | < 0.5 °C        |              |                  |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.89 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 39.8 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.17 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 20.7 W/kg ± 16.5 % (k=2) |

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|-------------------------------------|-------------|--|