

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



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Sporton**

Certificate No: **D750V3-1107\_Jun22**

## CALIBRATION CERTIFICATE

Object **D750V3 - SN:1107**

Calibration procedure(s) **QA CAL-05.v11  
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**

Calibration date: **June 22, 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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 04-Apr-22 (No. 217-03525/03524)   | Apr-23                 |
| Power sensor NRP-Z91            | SN: 103244         | 04-Apr-22 (No. 217-03524)         | Apr-23                 |
| Power sensor NRP-Z91            | SN: 103245         | 04-Apr-22 (No. 217-03525)         | Apr-23                 |
| Reference 20 dB Attenuator      | SN: BH9394 (20k)   | 04-Apr-22 (No. 217-03527)         | Apr-23                 |
| Type-N mismatch combination     | SN: 310982 / 06327 | 04-Apr-22 (No. 217-03528)         | Apr-23                 |
| Reference Probe EX3DV4          | SN: 7349           | 31-Dec-21 (No. EX3-7349_Dec21)    | Dec-22                 |
| DAE4                            | SN: 601            | 02-May-22 (No. DAE4-601_May22)    | May-23                 |
| Secondary Standards             | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B              | SN: GB39512475     | 30-Oct-14 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A           | SN: MY41093315     | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-20) | In house check: Oct-22 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-20) | In house check: Oct-22 |

|                |                       |                                   |               |
|----------------|-----------------------|-----------------------------------|---------------|
| Calibrated by: | Name<br>Michael Weber | Function<br>Laboratory Technician | Signature<br> |
| Approved by:   | Sven Kühn             | Technical Manager                 |               |

Issued: June 24, 2022

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

### 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:

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

### Additional Documentation:

- DASY System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The 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                    | 750 MHz $\pm$ 1 MHz    |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 41.9           | 0.89 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 40.6 $\pm$ 6 % | 0.89 mho/m $\pm$ 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 | 2.15 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 8.54 W/kg $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR measured                                            | 250 mW input power | 1.40 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 5.57 W/kg $\pm$ 16.5 % (k=2) |

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

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 55.1 $\Omega$ - 0.6 j $\Omega$ |
| Return Loss                          | - 26.2 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.031 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 |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 22.06.2022

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1107**

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used:  $f = 750$  MHz;  $\sigma = 0.89$  S/m;  $\epsilon_r = 40.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.11, 10.11, 10.11) @ 750 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- 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 = 60.31 V/m; Power Drift = 0.01 dB

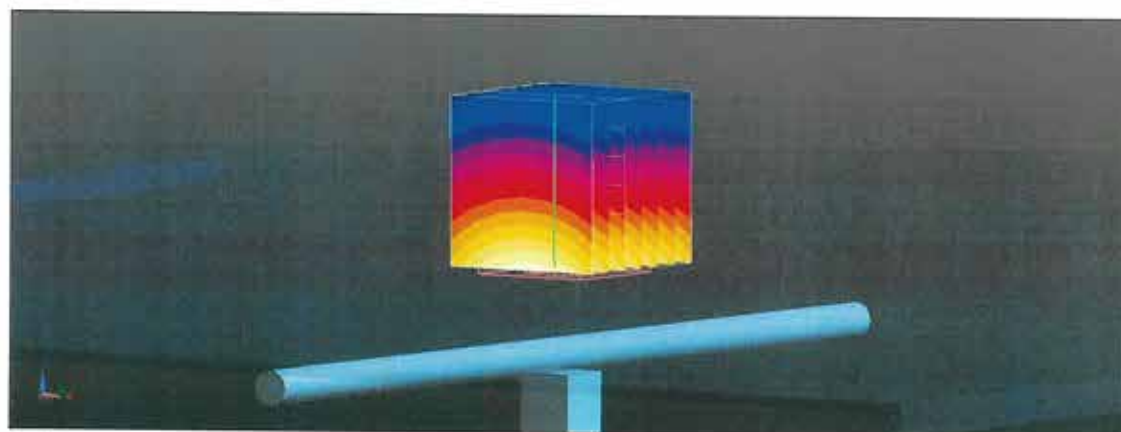
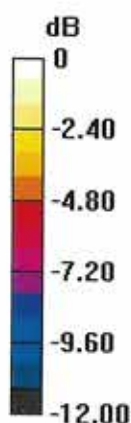
Peak SAR (extrapolated) = 3.29 W/kg

**SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.4 W/kg**

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 15 mm)

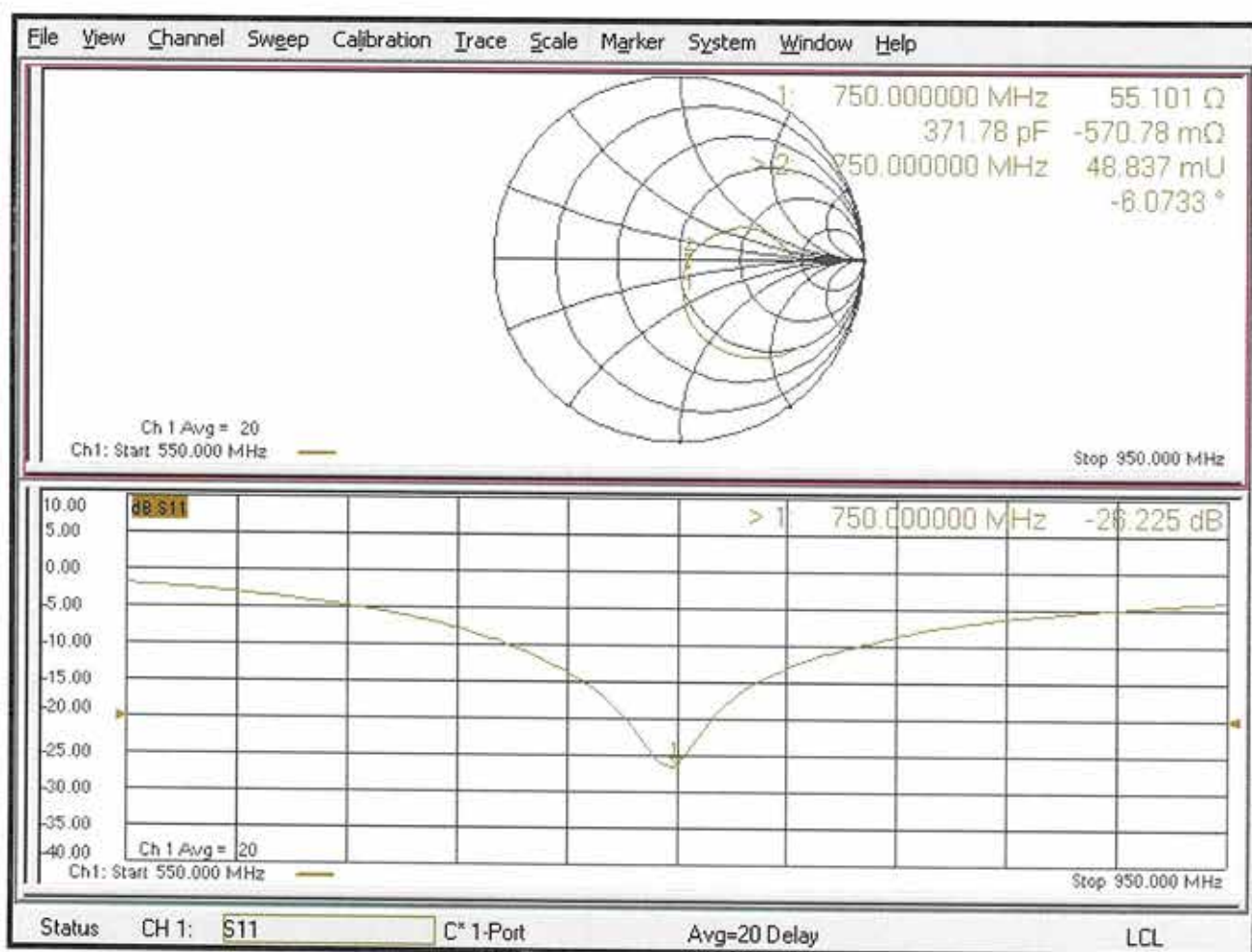
Ratio of SAR at M2 to SAR at M1 = 64.9%

Maximum value of SAR (measured) = 2.90 W/kg



0 dB = 2.90 W/kg = 4.62 dBW/kg

## Impedance Measurement Plot for Head TSL





### D750V3, serial no. 1107 Extended Dipole Calibrations

If dipoles are verified in return loss ( $< -20\text{dB}$ , within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

#### <Justification of the extended calibration>

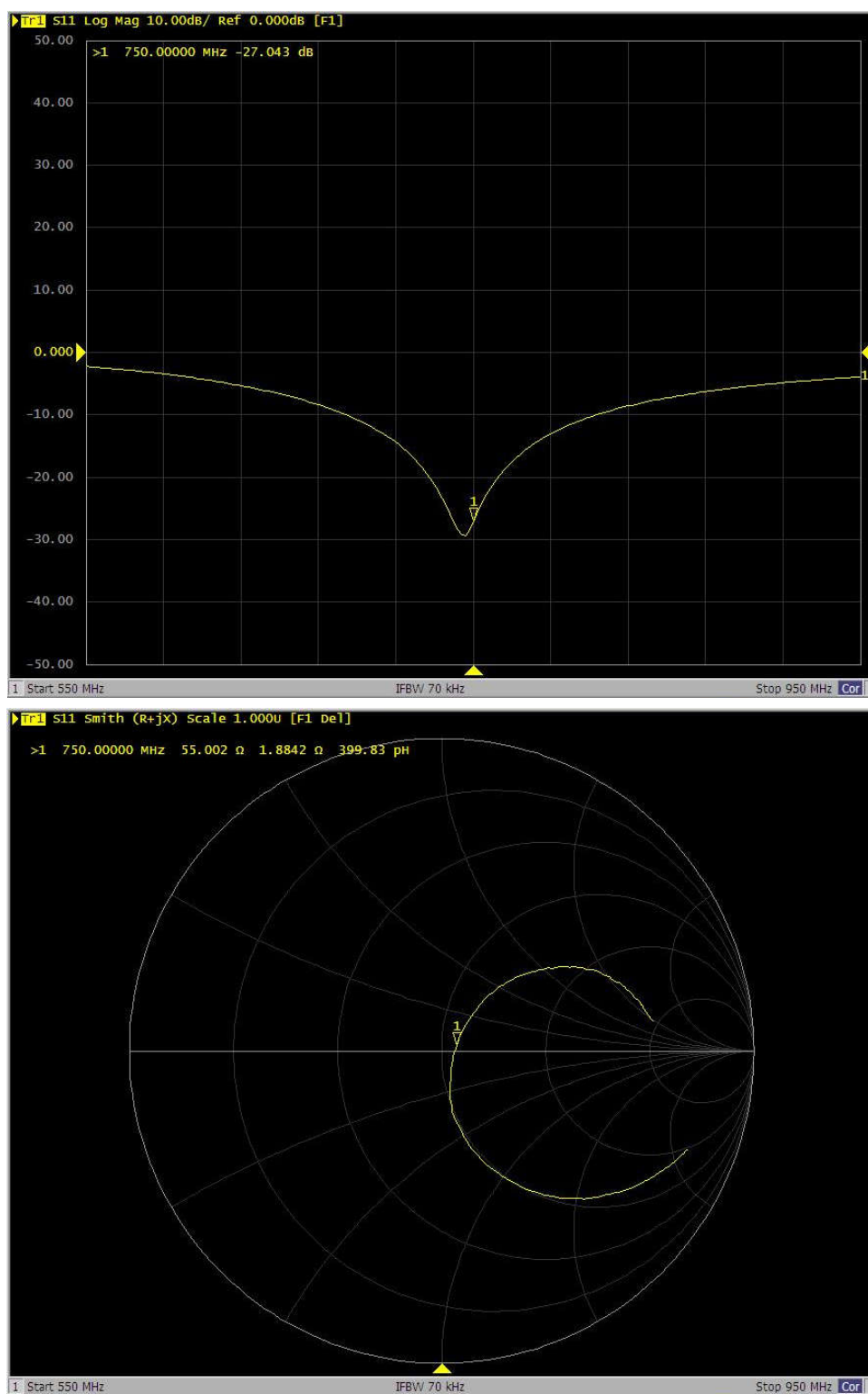
| D750V3 – serial no. 1107    |                  |           |                      |             |                           |             |
|-----------------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
|                             | 750MHZ           |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 06.22.2022<br>(Cal. Report) | -26.225          |           | 55.101               |             | -0.57078                  |             |
| 06.21.2023<br>(extended)    | -27.043          | 3.12      | 55.002               | -0.099      | 1.8842                    | 2.45498     |
| 06.20.2024<br>(extended)    | -27.838          | 6.15      | 53.437               | -1.664      | -1.4792                   | -0.90842    |

The return loss is  $< -20\text{dB}$ , within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.



<Dipole Verification Data> - D750 V3, serial no. 1107(Data of Measurement : 06.21.2023)

750MHz - Head



SPORTON INTERNATIONAL INC.

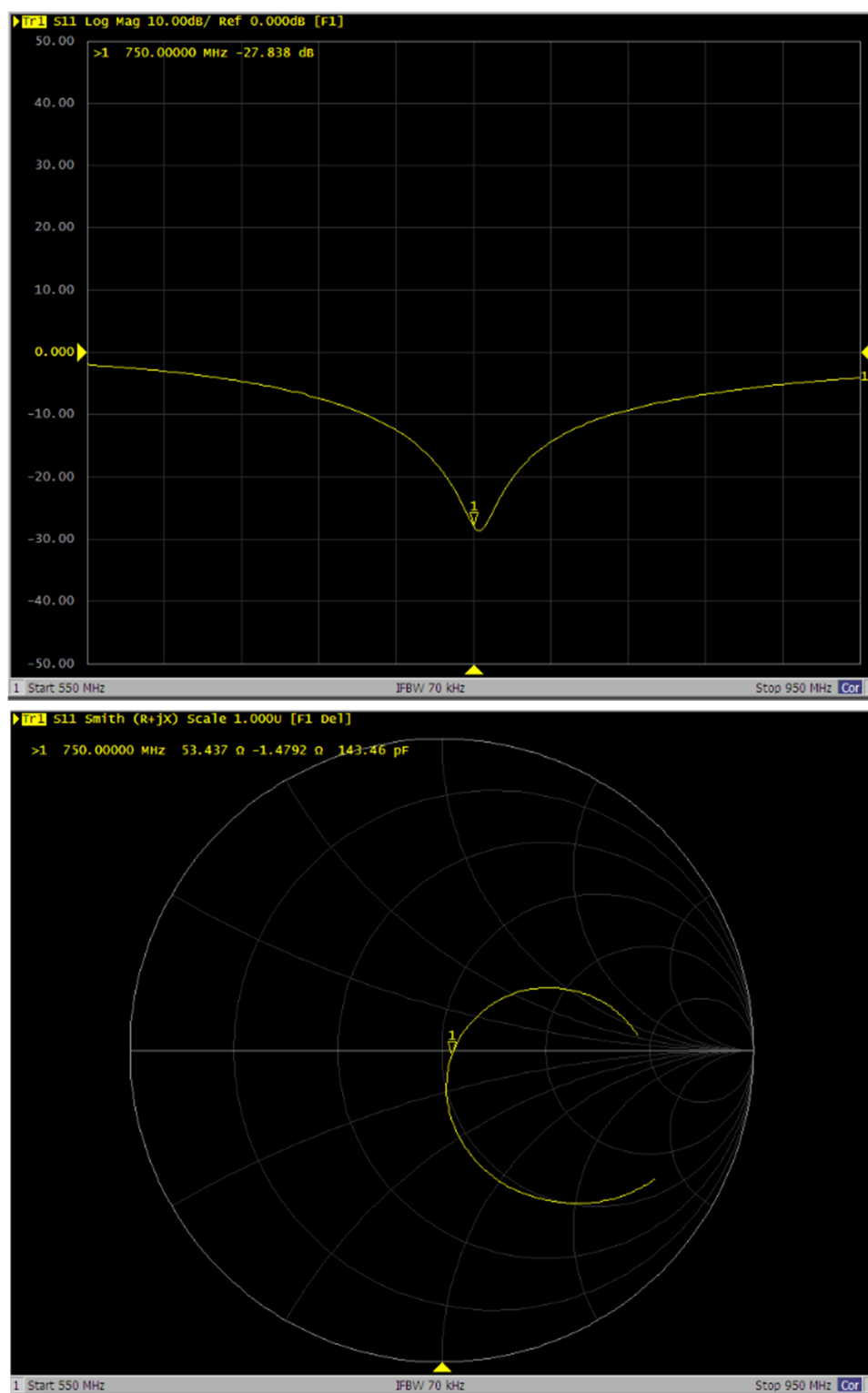
TEL : 886-3-327-3456

FAX : 886-3-328-4978



<Dipole Verification Data> - D750 V3, serial no. 1107 (Data of Measurement : 06.20.2024)

750MHz - Head



SPORTON INTERNATIONAL INC.

TEL : 886-3-327-3456

FAX : 886-3-328-4978

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Client **Sporton**

Certificate No: **D835V2-4d167\_Nov22/2**

## CALIBRATION CERTIFICATE (Replacement of No: D835V2-4d167\_Nov22)

Object **D835V2 - SN:4d167**

Calibration procedure(s) **QA CAL-05.v11  
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**

Calibration date: **November 24, 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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 04-Apr-22 (No. 217-03525/03524)   | Apr-23                 |
| Power sensor NRP-Z91            | SN: 103244         | 04-Apr-22 (No. 217-03524)         | Apr-23                 |
| Power sensor NRP-Z91            | SN: 103245         | 04-Apr-22 (No. 217-03525)         | Apr-23                 |
| Reference 20 dB Attenuator      | SN: BH9394 (20k)   | 04-Apr-22 (No. 217-03527)         | Apr-23                 |
| Type-N mismatch combination     | SN: 310982 / 06327 | 04-Apr-22 (No. 217-03528)         | Apr-23                 |
| Reference Probe EX3DV4          | SN: 7349           | 31-Dec-21 (No. EX3-7349_Dec21)    | Dec-22                 |
| DAE4                            | SN: 601            | 31-Aug-22 (No. DAE4-601_Aug22)    | Aug-23                 |
| Secondary Standards             | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B              | SN: GB39512475     | 30-Oct-14 (in house check Oct-22) | In house check: Oct-24 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-22) | In house check: Oct-24 |
| Power sensor HP 8481A           | SN: MY41093315     | 07-Oct-15 (in house check Oct-22) | In house check: Oct-24 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-22) | In house check: Oct-24 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-22) | In house check: Oct-24 |

|                |                |                       |           |
|----------------|----------------|-----------------------|-----------|
|                | Name           | Function              | Signature |
| Calibrated by: | Jeton Kastrati | Laboratory Technician |           |
| Approved by:   | Sven Kühn      | Technical Manager     |           |

Issued: January 18, 2023

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Accreditation No.: **SCS 0108**

### 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:

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

### Additional Documentation:

- DASY System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The 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 $\pm$ 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 $\pm$ 0.2) °C | 40.7 $\pm$ 6 % | 0.91 mho/m $\pm$ 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 | 2.48 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 9.80 W/kg $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR measured                                            | 250 mW input power | 1.61 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 6.38 W/kg $\pm$ 16.5 % (k=2) |

**Appendix (Additional assessments outside the scope of SCS 0108)****Antenna Parameters with Head TSL**

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 51.9 $\Omega$ - 2.8 j $\Omega$ |
| Return Loss                          | - 29.5 dB                      |

**General Antenna Parameters and Design**

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.392 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 |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 24.11.2022

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d167**

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

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  S/m;  $\epsilon_r = 40.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 31.08.2022
- 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 = 64.02 V/m; Power Drift = -0.03 dB

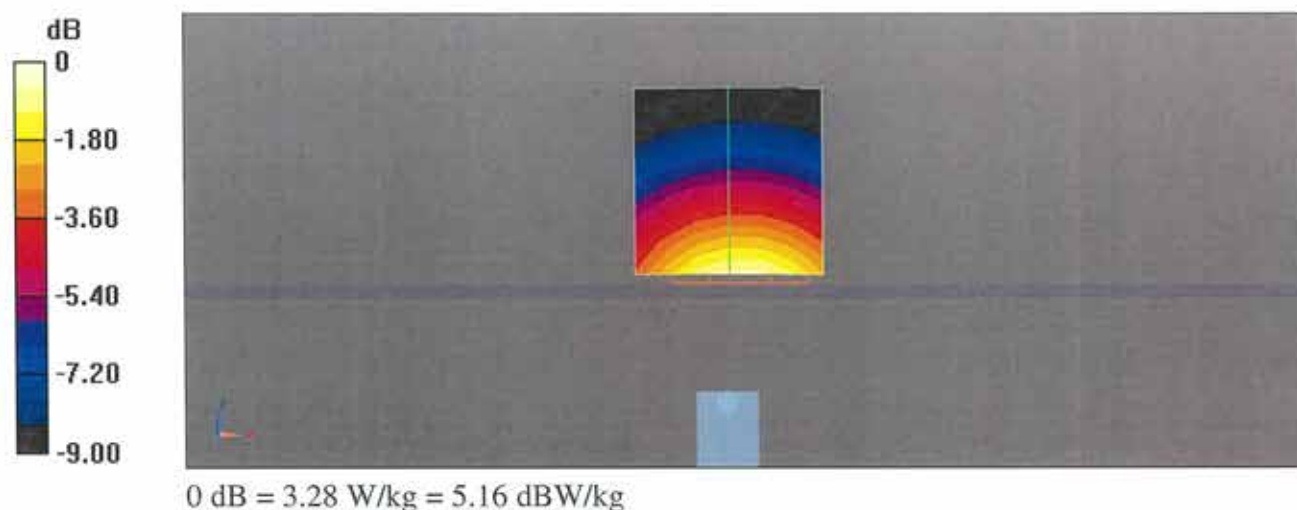
Peak SAR (extrapolated) = 3.69 W/kg

**SAR(1 g) = 2.48 W/kg; SAR(10 g) = 1.61 W/kg**

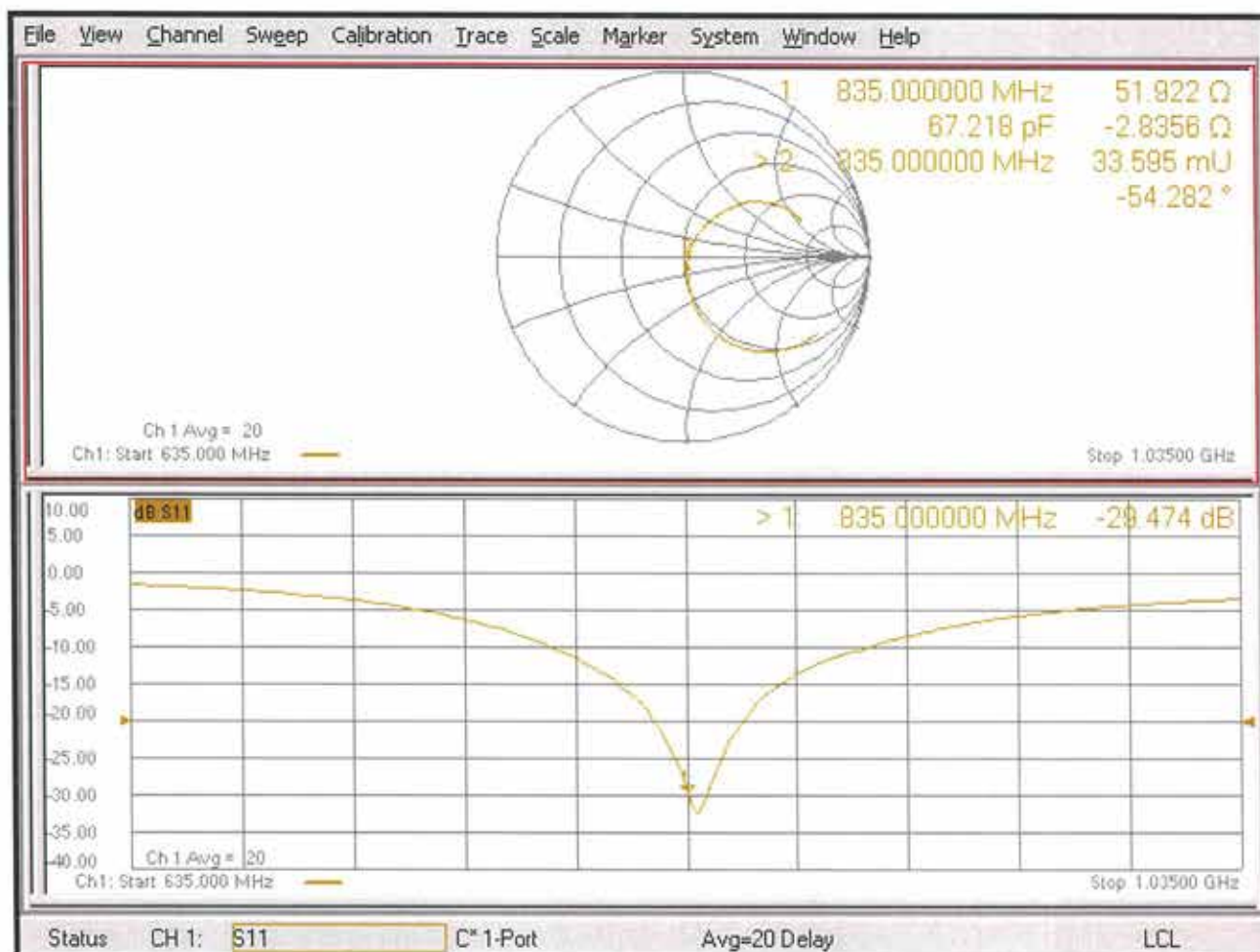
Smallest distance from peaks to all points 3 dB below = 17 mm

Ratio of SAR at M2 to SAR at M1 = 66.8%

Maximum value of SAR (measured) = 3.28 W/kg



## Impedance Measurement Plot for Head TSL



## Appendix: Transfer Calibration at Four Validation Locations on SAM Head<sup>1</sup>

### Evaluation Condition

|         |                  |                             |
|---------|------------------|-----------------------------|
| Phantom | SAM Head Phantom | For usage with cSAR3DV2-R/L |
|---------|------------------|-----------------------------|

### SAR result with SAM Head (Top $\cong$ C0)

|                                                       |                  |                              |
|-------------------------------------------------------|------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition        |                              |
| SAR for nominal Head TSL parameters                   | normalized to 1W | 9.31 W/kg $\pm$ 17.5 % (k=2) |

|                                                         |                  |                              |
|---------------------------------------------------------|------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition        |                              |
| SAR for nominal Head TSL parameters                     | normalized to 1W | 6.16 W/kg $\pm$ 16.9 % (k=2) |

### SAR result with SAM Head (Mouth $\cong$ F90)

|                                                       |                  |                              |
|-------------------------------------------------------|------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition        |                              |
| SAR for nominal Head TSL parameters                   | normalized to 1W | 9.77 W/kg $\pm$ 17.5 % (k=2) |

|                                                         |                  |                              |
|---------------------------------------------------------|------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition        |                              |
| SAR for nominal Head TSL parameters                     | normalized to 1W | 6.57 W/kg $\pm$ 16.9 % (k=2) |

### SAR result with SAM Head (Neck $\cong$ H0)

|                                                       |                  |                              |
|-------------------------------------------------------|------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition        |                              |
| SAR for nominal Head TSL parameters                   | normalized to 1W | 9.29 W/kg $\pm$ 17.5 % (k=2) |

|                                                         |                  |                              |
|---------------------------------------------------------|------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition        |                              |
| SAR for nominal Head TSL parameters                     | normalized to 1W | 6.28 W/kg $\pm$ 16.9 % (k=2) |

### SAR result with SAM Head (Ear $\cong$ D90)

|                                                       |                  |                              |
|-------------------------------------------------------|------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition        |                              |
| SAR for nominal Head TSL parameters                   | normalized to 1W | 7.98 W/kg $\pm$ 17.5 % (k=2) |

|                                                         |                  |                              |
|---------------------------------------------------------|------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition        |                              |
| SAR for nominal Head TSL parameters                     | normalized to 1W | 5.38 W/kg $\pm$ 16.9 % (k=2) |

<sup>1</sup> Additional assessments outside the current scope of SCS 0108



### D835V2, serial no. 4D167 Extended Dipole Calibrations

if dipoles are verified in return loss ( $< -20\text{dB}$ , within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

#### <Justification of the extended calibration>

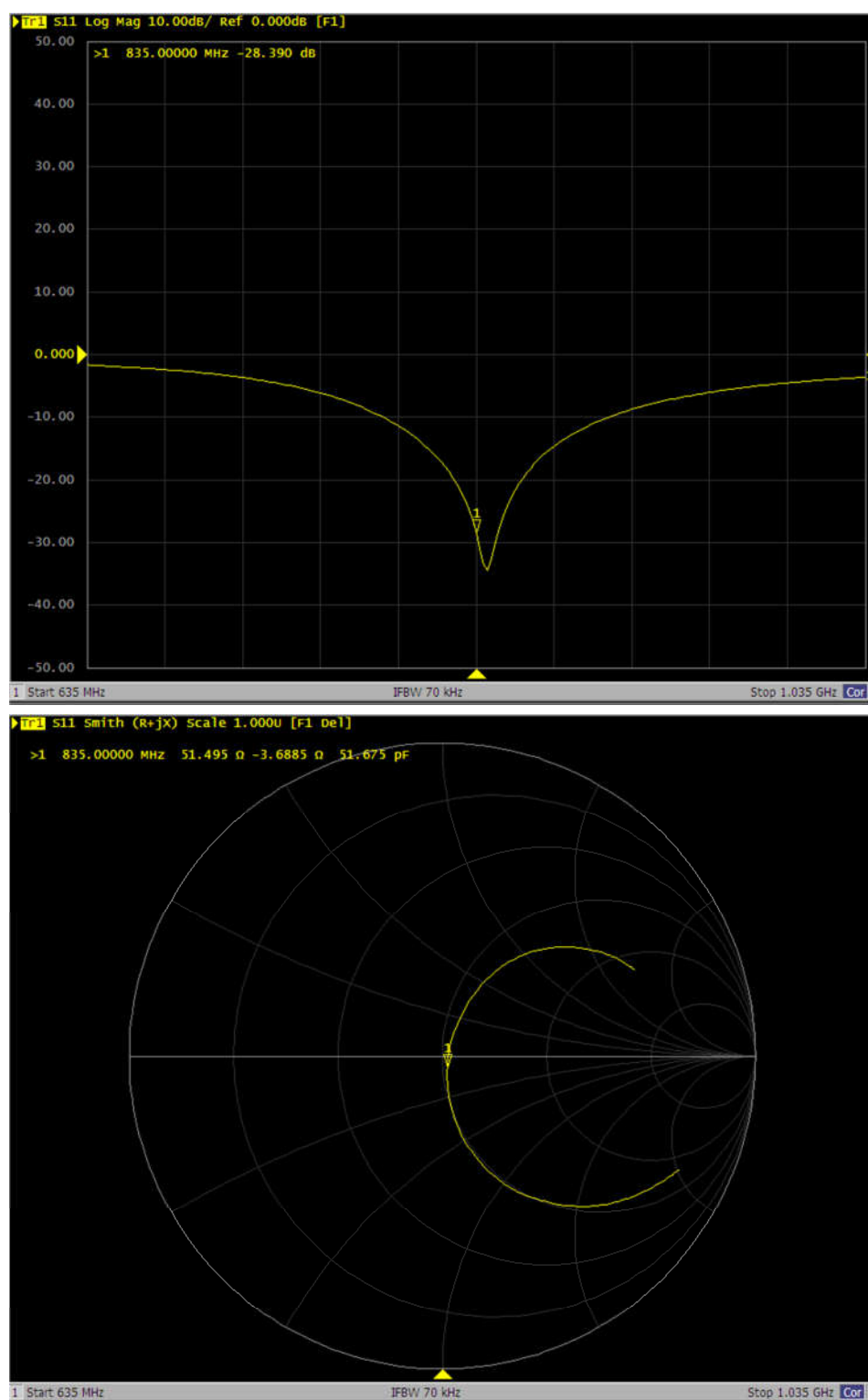
| D835V2 – serial no. 4D167   |                  |           |                      |             |                           |             |
|-----------------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
| 835MHZ                      |                  |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 11.24.2022<br>(Cal. Report) | -29.5            |           | 51.9                 |             | -2.8                      |             |
| 11.23.2023<br>(extended)    | -28.4            | 3.73      | 51.5                 | -0.4        | -3.7                      | -0.9        |
| 11.22.2024<br>(extended)    | -25.503          | 13.55     | 49.352               | -2.548      | -6.3661                   | -3.5661     |

The return loss is  $< -20\text{dB}$ , within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.



<Dipole Verification Data> - D835 V2, serial no. 4d167 (Data of Measurement : 11.23.2023)

835MHz - Head



SPORTON INTERNATIONAL INC.

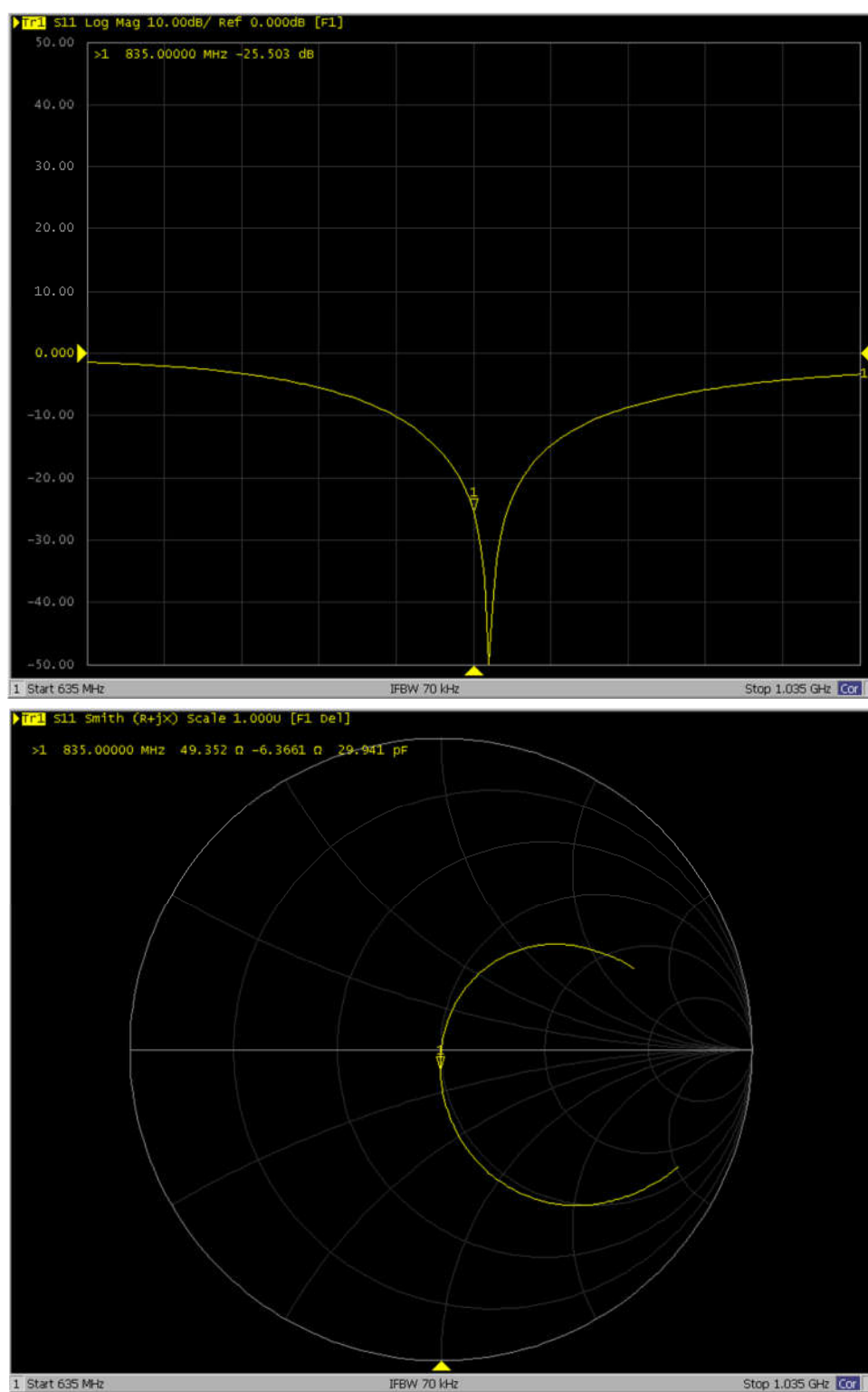
TEL : 886-3-327-3456

FAX : 886-3-328-4978



# <Dipole Verification Data> - D835 V2, serial no. 4D167 (Data of Measurement : 11.22.2024)

## 835 MHz - Head



**SPORTON INTERNATIONAL INC.**

TEL : 886-3-327-3456

FAX : 886-3-328-4978

**Calibration Laboratory of**  
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client

**Sporton**  
Taoyuan City

Certificate No.

**D1750V2-1112\_Feb25**

## CALIBRATION CERTIFICATE

Object

**D1750V2 - SN: 1112**

Calibration procedure(s)

**QA CAL-05.v12**

**Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz**

Calibration date

**February 20, 2025**

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  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards                          | ID         | Cal Date (Certificate No.)             | Scheduled Cal |
|--------------------------------------------|------------|----------------------------------------|---------------|
| Power Sensor R&S NRP-33T                   | SN: 100967 | 28-Mar-24 (No. 217-04038)              | Mar-25        |
| Power Sensor R&S NRP18A                    | SN: 101859 | 06-Feb-25 (No. 4030A315009541)         | Feb-26        |
| Spectrum Analyzer R&S FSV40                | SN: 101832 | 29-Jan-25 (No. 4030A315009658)         | Jan-26        |
| Mismatch; Short [S4188] Attenuator [S4423] | SN: 1152   | 28-Mar-24 (No. 217-04050)              | Mar-25        |
| OCP DAK-12                                 | SN: 1016   | 24-Sept-24 (No. OCP-DAK12-1016_Sep24)  | Sep-25        |
| OCP DAK-3.5                                | SN: 1249   | 23-Sept-24 (No. OCP-DAK3.5-1249_Sep24) | Sep-25        |
| Reference Probe EX3DV4                     | SN: 7349   | 10-Jan-25 (No. EX3-7349_Jan25)         | Jan-26        |
| DAE4ip                                     | SN: 1836   | 28-Oct-24 (No. DAE4ip-1836_Oct24)      | Oct-25        |

| Secondary Standards          | ID         | Check Date (in house)                      | Scheduled Check |
|------------------------------|------------|--------------------------------------------|-----------------|
| ACAD Source Box              | SN: 1000   | 28-May-24 (No. 675-ACAD_Source_Box-240528) | May-25          |
| Signal Generator R&S SMB100A | SN: 182081 | 28-May-24 (No. 675-CAL16-S4588-240528)     | May-25          |
| Mismatch; SMA                | SN: 1102   | 22-May-24 (No. 675-Mismatch_SMA-240522)    | May-25          |

|               |                  |                       |
|---------------|------------------|-----------------------|
|               | Name             | Function              |
| Calibrated by | Krešimir Franjić | Laboratory Technician |
| Approved by   | Sven Kühn        | Technical Manager     |

Signature

Issued: February 20, 2025

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

## 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

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

## Additional Documentation

- DASY System Handbook

## Methods Applied and Interpretation of Parameters

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

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

D1750V2 - SN: 1112

February 20, 2025

## Measurement Conditions

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

|                              |                          |                                     |
|------------------------------|--------------------------|-------------------------------------|
| DASY Version                 | DASY8 Module SAR         | 16.4.0                              |
| Extrapolation                | Advanced Extrapolation   |                                     |
| Phantom                      | Modular Flat Phantom     |                                     |
| Distance Dipole Center - TSL | 10 mm                    | with spacer                         |
| Zoom Scan Resolution         | dx, dy = 6mm; dz = 1.5mm | Graded Ratio = 1.5 mm (Z direction) |
| Frequency                    | 1750MHz $\pm$ 1MHz       |                                     |

## Head TSL parameters at 1750 MHz

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 $\pm$ 0.2)°C | 39.7 $\pm$ 6% | 1.32 mho/m $\pm$ 6% |
| Head TSL temperature change during test | < 0.5 °C           |               |                     |

## SAR result with Head TSL at 1750 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                               |
|-------------------------------------------------------|--------------------|-------------------------------|
| SAR for nominal Head TSL parameters                   | 24 dBm input power | 9.12 W/kg                     |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 36.3 W/kg $\pm$ 17.0% (k = 2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                               |
|---------------------------------------------------------|--------------------|-------------------------------|
| SAR for nominal Head TSL parameters                     | 24 dBm input power | 4.84 W/kg                     |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 19.3 W/kg $\pm$ 16.5% (k = 2) |

D1750V2 - SN: 1112

February 20, 2025

**Appendix (Additional assessments outside the scope of SCS 0108)****Antenna Parameters with Head TSL at 1750 MHz**

|             |                             |
|-------------|-----------------------------|
| Impedance   | $51.2 \Omega + 1.8 j\Omega$ |
| Return Loss | -33.2 dB                    |

**General Antenna Parameters and Design**

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.212 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 |
|-----------------|-------|

D1750V2 - SN: 1112

February 20, 2025

## System Performance Check Report

## Summary

| Dipole           | Frequency (MHz) | TSL | Power (dBm) |
|------------------|-----------------|-----|-------------|
| D1750V2 - SN1112 | 1750            | HSL | 24          |

## Exposure Conditions

| Phantom Section, TSL | Test Distance (mm) | Band | Group, UID | Frequency (MHz), Channel Number | Conversion Factor | TSL Conductivity (S/m) | TSL Permittivity |
|----------------------|--------------------|------|------------|---------------------------------|-------------------|------------------------|------------------|
| Flat                 | 10                 |      | CW, 0--    | 1750, 0                         | 7.96              | 1.32                   | 39.7             |

## Hardware Setup

| Phantom         | TSL, Measured Date | Probe, Calibration Date     | DAE, Calibration Date     |
|-----------------|--------------------|-----------------------------|---------------------------|
| MFP V8.0 Center | HSL, 2025-02-20    | EX3DV4 - SN7345, 2025-01-10 | DAE4ip Sn1836, 2024-10-28 |

## Scans Setup

|                     | Zoom Scan       |
|---------------------|-----------------|
| Grid Extents (mm)   | 10 x 30 x 30    |
| Grid Steps (mm)     | 6.0 x 6.0 x 1.5 |
| Sensor Surface (mm) | 1.4             |
| Graded Grid         | Yes             |
| Grading Ratio       | 1.5             |
| MAIA                | N/A             |
| Surface Detection   | VMS - 6p        |
| Scan Method         | Measured        |

## Measurement Results

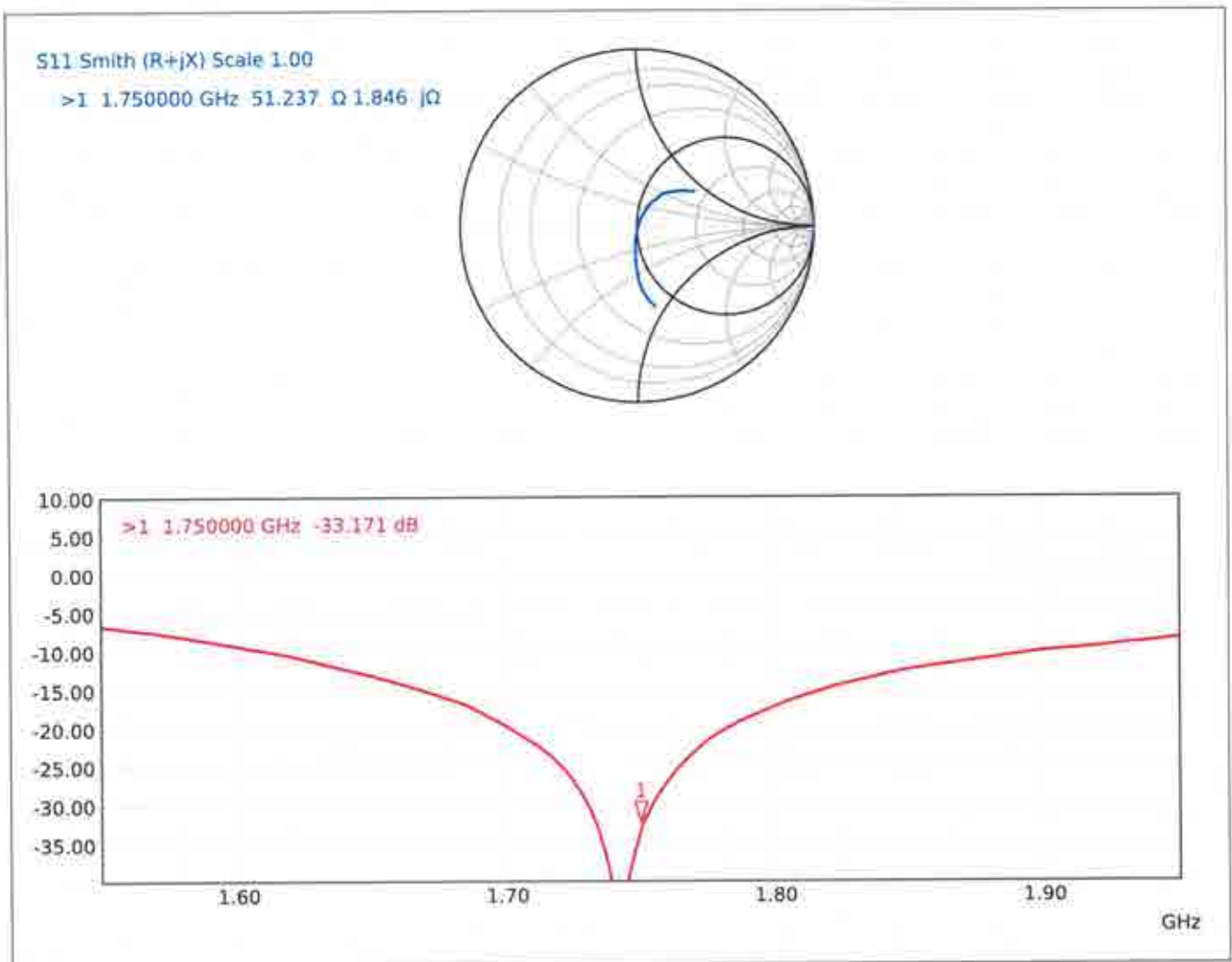
|                     | Zoom Scan           |
|---------------------|---------------------|
| Date                | 2025-02-20          |
| psSAR1g (W/Kg)      | 9.12                |
| psSAR10g (W/Kg)     | 4.84                |
| Power Drift (dB)    | 0.00                |
| Power Scaling       | Disabled            |
| Scaling Factor (dB) |                     |
| TSL Correction      | Positive / Negative |



D1750V2 - SN: 1112

February 20, 2025

## Impedance Measurement Plot for Head TSL



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Accreditation No.: **SCS 0108**

Client **Sporton**  
Taoyuan City

Certificate No. **D1900V2-5d093\_Mar25**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d093**

Calibration procedure(s) **QA CAL-05.v12**  
**Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz**

Calibration date **March 20, 2025**

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  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards                          | ID         | Cal Date (Certificate No.)             | Scheduled Cal |
|--------------------------------------------|------------|----------------------------------------|---------------|
| Power Sensor R&S NRP-33T                   | SN: 100967 | 28-Mar-24 (No. 217-04038)              | Mar-25        |
| Power Sensor R&S NRP18A                    | SN: 101859 | 06-Feb-25 (No. 4030A315009541)         | Feb-26        |
| Spectrum Analyzer R&S FSV40                | SN: 101832 | 29-Jan-25 (No. 4030A315009658)         | Jan-26        |
| Mismatch; Short [S4186] Attenuator [S4423] | SN: 1152   | 28-Mar-24 (No. 217-04050)              | Mar-25        |
| OCP DAK-12                                 | SN: 1016   | 24-Sept-24 (No. OCP-DAK12-1016_Sep24)  | Sep-25        |
| OCP DAK-3.5                                | SN: 1249   | 23-Sept-24 (No. OCP-DAK3.5-1249_Sep24) | Sep-25        |
| Reference Probe EX3DV4                     | SN: 7349   | 10-Jan-25 (No. EX3-7349_Jan25)         | Jan-26        |
| DAE4ip                                     | SN: 1836   | 28-Oct-24 (No. DAE4ip-1836_Oct24)      | Oct-25        |

| Secondary Standards          | ID         | Check Date (in house)                      | Scheduled Check |
|------------------------------|------------|--------------------------------------------|-----------------|
| ACAD Source Box              | SN: 1000   | 28-May-24 (No. 675-ACAD_Source_Box-240528) | May-25          |
| Signal Generator R&S SMB100A | SN: 182081 | 28-May-24 (No. 675-CAL16-S4588-240528)     | May-25          |
| Mismatch; SMA                | SN: 1102   | 22-May-24 (No. 675-Mismatch_SMA-240522)    | May-25          |

|               |            |                       |           |
|---------------|------------|-----------------------|-----------|
|               | Name       | Function              | Signature |
| Calibrated by | Paulo Pina | Laboratory Technician |           |
| Approved by   | Sven Kühn  | Technical Manager     |           |

Issued: March 20, 2025

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Accreditation No.: **SCS 0108**

## 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

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

## Additional Documentation

- DASY System Handbook

## Methods Applied and Interpretation of Parameters

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

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

## Measurement Conditions

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

|                              |                          |                                     |
|------------------------------|--------------------------|-------------------------------------|
| DASY Version                 | DASY8 Module SAR         | 16.4.0                              |
| Extrapolation                | Advanced Extrapolation   |                                     |
| Phantom                      | Modular Flat Phantom     |                                     |
| Distance Dipole Center - TSL | 10 mm                    | with spacer                         |
| Zoom Scan Resolution         | dx, dy = 6mm, dz = 1.5mm | Graded Ratio = 1.5 mm (Z direction) |
| Frequency                    | 1900MHz $\pm$ 1MHz       |                                     |

## HSL parameters at 1900 MHz

The following parameters and calculations were applied.

|                                    | Temperature         | Permittivity  | Conductivity        |
|------------------------------------|---------------------|---------------|---------------------|
| Nominal HSL parameters             | 22.0 °C             | 40.0          | 1.40 mho/m          |
| Measured HSL parameters            | (22.0 $\pm$ 0.2) °C | 39.8 $\pm$ 6% | 1.40 mho/m $\pm$ 6% |
| HSL temperature change during test | < 0.5 °C            |               |                     |

## SAR result with HSL at 1900 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of HSL | Condition          |                               |
|--------------------------------------------------|--------------------|-------------------------------|
| SAR for nominal HSL parameters                   | 24 dBm input power | 9.86 W/kg                     |
| SAR for nominal HSL parameters                   | normalized to 1W   | 39.3 W/kg $\pm$ 17.0% (k = 2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of HSL | Condition          |                               |
|----------------------------------------------------|--------------------|-------------------------------|
| SAR for nominal HSL parameters                     | 24 dBm input power | 5.22 W/kg                     |
| SAR for nominal HSL parameters                     | normalized to 1W   | 20.8 W/kg $\pm$ 16.5% (k = 2) |

D1900V2 - SN: 5d093

March 20, 2025

**Appendix (Additional assessments outside the scope of SCS 0108)****Antenna Parameters with HSL at 1900 MHz**

|             |                                |
|-------------|--------------------------------|
| Impedance   | 50.8 $\Omega$ + 6.3 j $\Omega$ |
| Return Loss | -24.0 dB                       |

**General Antenna Parameters and Design**

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.201 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 |
|-----------------|-------|

D1900V2 - SN: 5d093

March 20, 2025

## System Performance Check Report

## Summary

| Dipole            | Frequency [MHz] | TSL | Power [dBm] |
|-------------------|-----------------|-----|-------------|
| D1900V2 - SN5d093 | 1900            | HSL | -24         |

## Exposure Conditions

| Phantom Section, TSL | Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor | TSL Conductivity [S/m] | TSL Permittivity |
|----------------------|--------------------|------|------------|---------------------------------|-------------------|------------------------|------------------|
| Flat                 | 10                 |      | CW, 01     | 1900, 0                         | 7.68              | 1.40                   | 39.8             |

## Hardware Setup

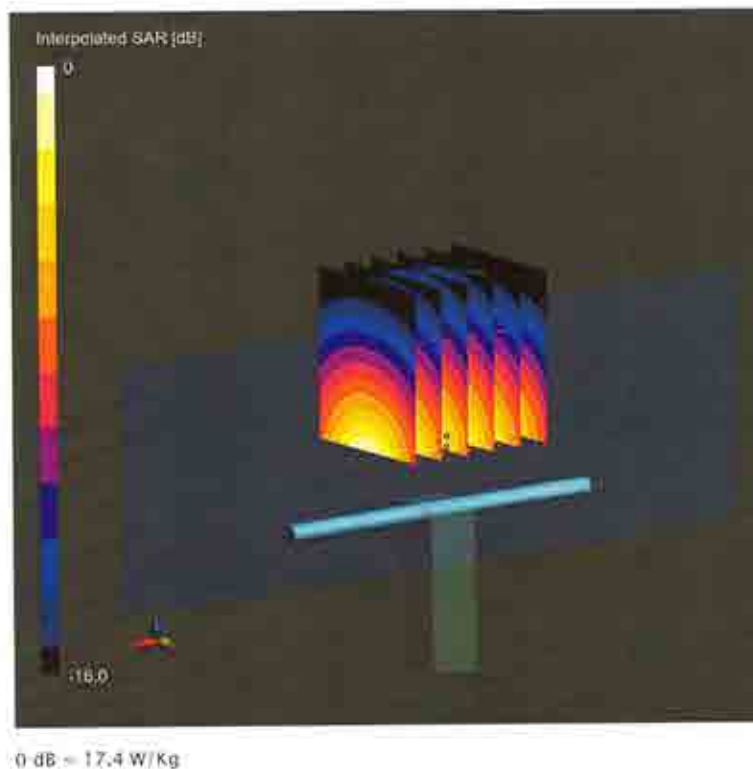
| Phantom        | TSL, Measured Date | Probe, Calibration Date     | DAE, Calibration Date     |
|----------------|--------------------|-----------------------------|---------------------------|
| MEP V&I Center | HSL, 2025-03-20    | EX3DV4 - SN7349, 2025-01-10 | DAE4ip Sn1836, 2024-10-28 |

## Scans Setup

|                     | Zoom Scan       |
|---------------------|-----------------|
| Grid Extents [mm]   | 30 x 30 x 30    |
| Grid Steps [mm]     | 6.0 x 6.0 x 1.5 |
| Sensor Surface [mm] | 1.4             |
| Graded Grid         | Yes             |
| Grading Ratio       | 1.5             |
| MAIA                | N/A             |
| Surface Detection   | VMS - lip       |
| Scan Method         | Measured        |

## Measurement Results

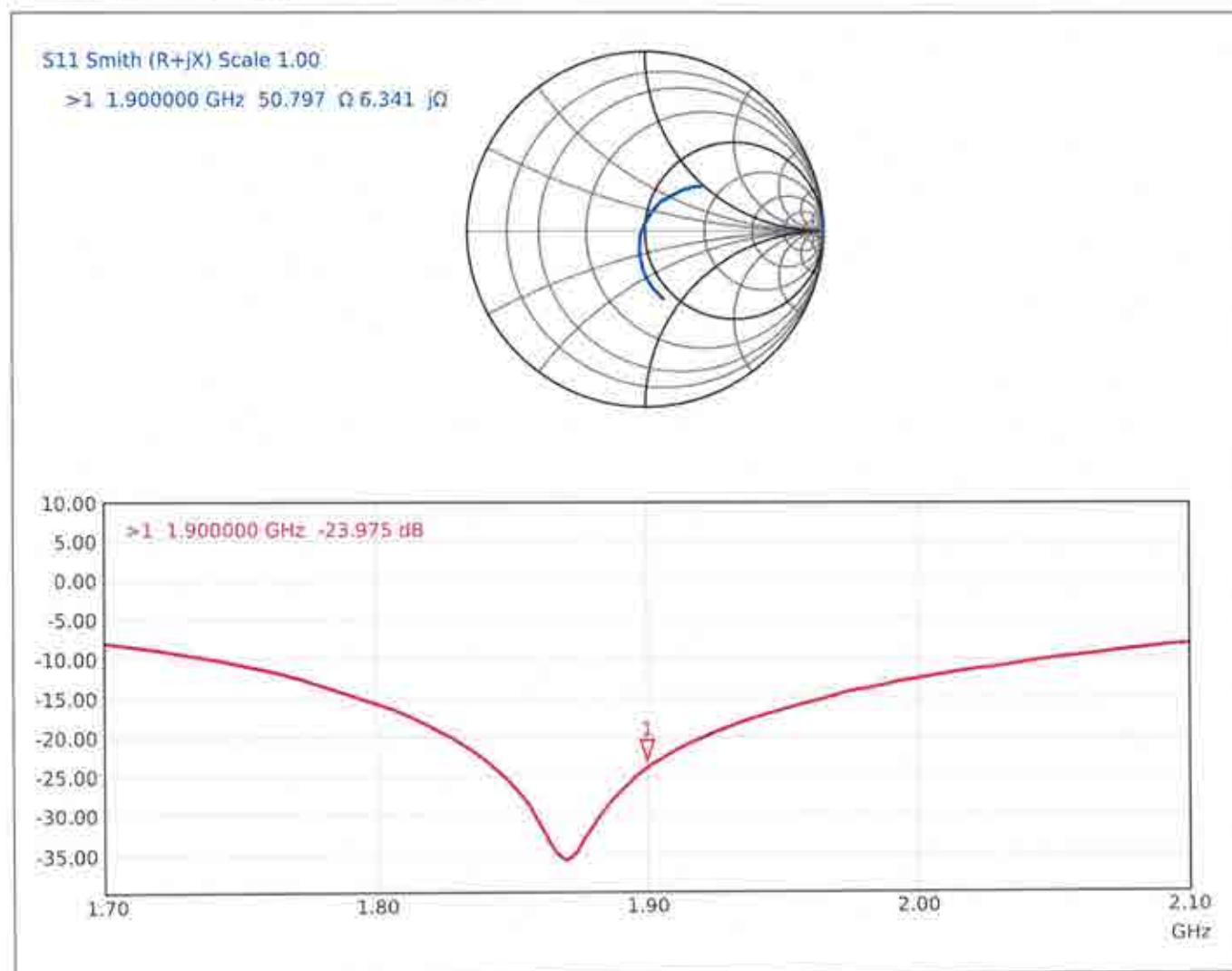
|                     | Zoom Scan           |
|---------------------|---------------------|
| Date                | 2025-03-20          |
| psSAR1g [W/Kg]      | 9.86                |
| psSAR10g [W/Kg]     | 5.22                |
| Power Drift [dB]    | 0.00                |
| Power Scaling       | Disabled            |
| Scaling Factor [dB] |                     |
| TSL Correction      | Positive / Negative |



D1900V2 - SN: 5d093

March 20, 2025

## Impedance Measurement Plot for HSL



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Client

**Sporton**

Taoyuan City

Certificate No.

**D2600V2-1008\_Aug24****CALIBRATION CERTIFICATE**Object **D2600V2 - SN: 1008**Calibration procedure(s) **QA CAL-05.v12  
Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz**Calibration date **August 15, 2024**

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  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards                          | ID         | Cal Date (Certificate No.)            | Scheduled Cal |
|--------------------------------------------|------------|---------------------------------------|---------------|
| Power Sensor R&S NRP-33T                   | SN: 100967 | 28-Mar-24 (No. 217-04038)             | Mar-25        |
| Power Sensor R&S NRP18A                    | SN: 101859 | 21-Mar-24 (No. 4030A315007801)        | Mar-25        |
| Spectrum Analyzer R&S FSV40                | SN: 101832 | 25-Jan-24 (No. 4030-315007551)        | Jan-25        |
| Mismatch; Short [S4188] Attenuator [S4423] | SN: 1152   | 28-Mar-24 (No. 217-04050)             | Mar-25        |
| OCP DAK-12                                 | SN: 1016   | 05-Oct-23 (No. OCP-DAK12-1016_Oct23)  | Oct-24        |
| OCP DAK-3.5                                | SN: 1249   | 05-Oct-23 (No. OCP-DAK3.5-1249_Oct23) | Oct-24        |
| Reference Probe EX3DV4                     | SN: 7349   | 03-Jun-24 (No. EX3-7349_Jun24)        | Jun-25        |
| DAE4ip                                     | SN: 1836   | 10-Jan-24 (No. DAE4ip-1836_Jan24)     | Jan-25        |

| Secondary Standards          | ID         | Check Date (in house)                      | Scheduled Check |
|------------------------------|------------|--------------------------------------------|-----------------|
| ACAD Source Box              | SN: 1000   | 28-May-24 (No. 675-ACAD_Source_Box-240528) | May-25          |
| Signal Generator R&S SMB100A | SN: 182081 | 28-May-24 (No. 0001-300719404)             | May-25          |
| Mismatch; SMA                | SN: 1102   | 22-May-24 (No. 675-Mismatch_SMA-240522)    | May-25          |

|               |                  |                       |           |
|---------------|------------------|-----------------------|-----------|
|               | Name             | Function              | Signature |
| Calibrated by | Krešimir Franjić | Laboratory Technician |           |
| Approved by   | Sven Kühn        | Technical Manager     |           |

Issued: August 16, 2024

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Accreditation No.: **SCS 0108**

## 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

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

## Additional Documentation

- DASY System Handbook

## Methods Applied and Interpretation of Parameters

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

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

D2600V2 - SN: 1008

August 15, 2024

**Measurement Conditions**

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

|                              |                          |                                     |
|------------------------------|--------------------------|-------------------------------------|
| DASY Version                 | DASY8 Module SAR         | 16.4.0                              |
| Extrapolation                | Advanced Extrapolation   |                                     |
| Phantom                      | Modular Flat Phantom     |                                     |
| Distance Dipole Center - TSL | 10 mm                    | with spacer                         |
| Zoom Scan Resolution         | dx, dy = 5mm, dz = 1.5mm | Graded Ratio = 1.5 mm (Z direction) |
| Frequency                    | 2600MHz $\pm$ 1MHz       |                                     |

**Head TSL parameters at 2600 MHz**

The following parameters and calculations were applied.

|                                         | Temperature        | Permittivity  | Conductivity        |
|-----------------------------------------|--------------------|---------------|---------------------|
| Nominal Head TSL parameters             | 22.0 °C            | 39.0          | 1.96 mho/m          |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2)°C | 37.3 $\pm$ 6% | 2.00 mho/m $\pm$ 6% |
| Head TSL temperature change during test | < 0.5 °C           |               |                     |

**SAR result with Head TSL at 2600 MHz**

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                               |
|-------------------------------------------------------|--------------------|-------------------------------|
| SAR for nominal Head TSL parameters                   | 24 dBm input power | 14.0 W/kg                     |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 55.7 W/kg $\pm$ 17.0% (k = 2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                               |
|---------------------------------------------------------|--------------------|-------------------------------|
| SAR for nominal Head TSL parameters                     | 24 dBm input power | 6.35 W/kg                     |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 25.3 W/kg $\pm$ 16.5% (k = 2) |

D2600V2 - SN: 1008

August 15, 2024

**Appendix (Additional assessments outside the scope of SCS 0108)****Antenna Parameters with Head TSL at 2600 MHz**

|             |                                |
|-------------|--------------------------------|
| Impedance   | 49.0 $\Omega$ – 3.7 j $\Omega$ |
| Return Loss | -28.2 dB                       |

**General Antenna Parameters and Design**

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.153 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 |
|-----------------|-------|

D2600V2 - SN: 1008

August 15, 2024

## System Performance Check Report

## Summary

| Dipole           | Frequency [MHz] | TSL | Power [dBm] |
|------------------|-----------------|-----|-------------|
| D2600V2 - SN1008 | 2600            | HSL | 24          |

## Exposure Conditions

| Phantom Section, TSL | Test Distance [mm] | Band    | Group, UID | Frequency [MHz], Channel Number | Conversion Factor | TSL Conductivity [S/m] | TSL Permittivity |
|----------------------|--------------------|---------|------------|---------------------------------|-------------------|------------------------|------------------|
| Flat                 | 10                 | CW, 0-- |            | 2600, 0                         | 7.29              | 2.00                   | 37.3             |

## Hardware Setup

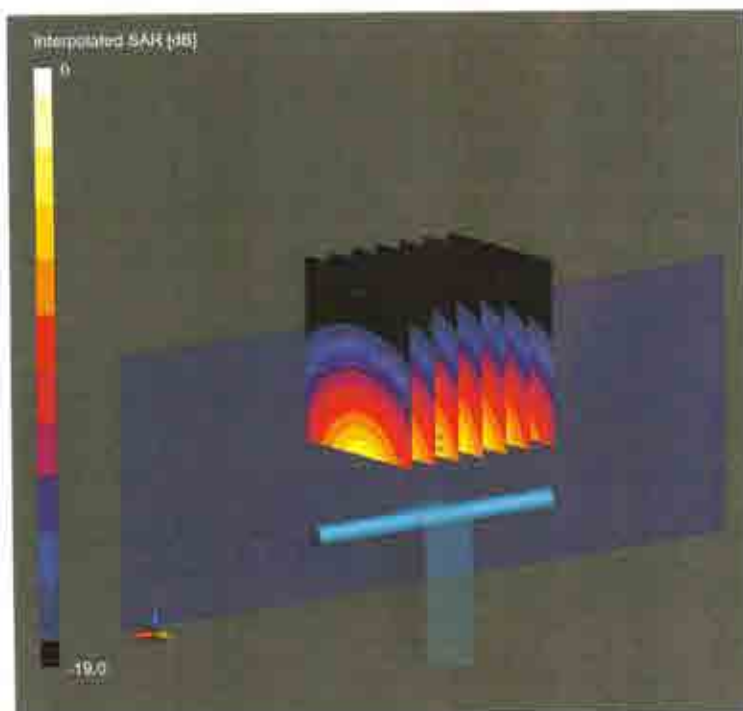
| Phantom         | TSL, Measured Date | Probe, Calibration Date     | DAE, Calibration Date     |
|-----------------|--------------------|-----------------------------|---------------------------|
| MFP V8.0 Center | HSL, 2024-08-15    | EX3DV4 - SN7349, 2024-06-03 | DAE4ip Sn1836, 2024-01-10 |

## Scans Setup

|                     | Zoom Scan       |
|---------------------|-----------------|
| Grid Extents [mm]   | 30 x 30 x 30    |
| Grid Steps [mm]     | 5.0 x 5.0 x 1.5 |
| Sensor Surface [mm] | 1.4             |
| Graded Grid         | Yes             |
| Grading Ratio       | 1.5             |
| MAIA                | N/A             |
| Surface Detection   | VMS + 6p        |
| Scan Method         | Measured        |

## Measurement Results

|                     | Zoom Scan           |
|---------------------|---------------------|
| Date                | 2024-08-15          |
| psSAR1g [W/Kg]      | 14.0                |
| psSAR10g [W/Kg]     | 6.35                |
| Power Drift [dB]    | 0.00                |
| Power Scaling       | Disabled            |
| Scaling Factor [dB] |                     |
| TSL Correction      | Positive / Negative |

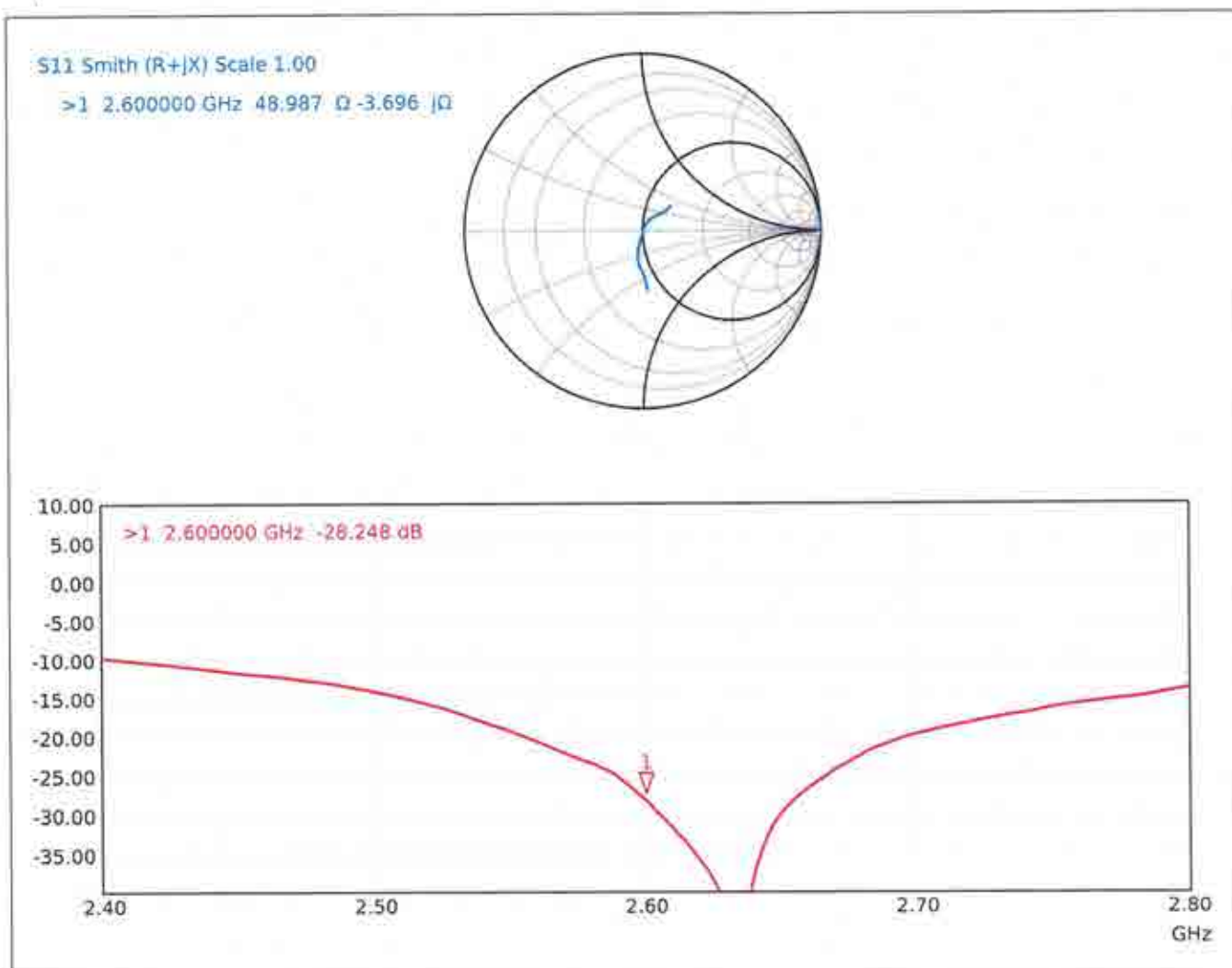


0 dB = 30.2 W/Kg

D2600V2 - SN: 1008

August 15, 2024

## Impedance Measurement Plot for Head TSL



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



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client

**Sporton**  
 Taoyuan City

Certificate No.

**D3500V2-1014\_Jan25****CALIBRATION CERTIFICATE**

Object

**D3500V2 - SN: 1014**

Calibration procedure(s)

**QA CAL-22.v7****Calibration Procedure for SAR Validation Sources between 3 - 10 GHz**

Calibration date

**January 15, 2025**

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  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards                          | ID         | Cal Date (Certificate No.)             | Scheduled Cal |
|--------------------------------------------|------------|----------------------------------------|---------------|
| Power Sensor R&S NRP-33T                   | SN: 100967 | 28-Mar-24 (No. 217-04038)              | Mar-25        |
| Power Sensor R&S NRP18A                    | SN: 101859 | 22-Jul-24 (No. 4030A315008547)         | Jul-25        |
| Spectrum Analyzer R&S FSV40                | SN: 101832 | 25-Jan-24 (No. 4030-315007551)         | Jan-25        |
| Mismatch; Short [S4188] Attenuator [S4423] | SN: 1152   | 28-Mar-24 (No. 217-04050)              | Mar-25        |
| OCP DAK-12                                 | SN: 1016   | 24-Sept-24 (No. OCP-DAK12-1016_Sep24)  | Sep-25        |
| OCP DAK-3.5                                | SN: 1249   | 23-Sept-24 (No. OCP-DAK3.5-1249_Sep24) | Sep-25        |
| Reference Probe EX3DV4                     | SN: 7349   | 10-Jan-25 (No. EX3-7349_Jan25)         | Jan-26        |
| DAE4ip                                     | SN: 1836   | 28-Oct-24 (No. DAE4ip-1836_Oct24)      | Oct-25        |

| Secondary Standards          | ID         | Check Date (in house)                      | Scheduled Check |
|------------------------------|------------|--------------------------------------------|-----------------|
| ACAD Source Box              | SN: 1000   | 28-May-24 (No. 675-ACAD_Source_Box-240528) | May-25          |
| Signal Generator R&S SMB100A | SN: 182081 | 28-May-24 (No. 675-CAL16-S4588-240528)     | May-25          |
| Mismatch; SMA                | SN: 1102   | 22-May-24 (No. 675-Mismatch_SMA-240522)    | May-25          |

|               | Name       | Function              | Signature |
|---------------|------------|-----------------------|-----------|
| Calibrated by | Paulo Pina | Laboratory Technician |           |
| Approved by   | Sven Kühn  | Technical Manager     |           |

Issued: January 16, 2025

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

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

Accreditation No.: **SCS 0108**

## Glossary

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

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

## Additional Documentation

- DASY System Handbook

## Methods Applied and Interpretation of Parameters

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

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

D3500V2 - SN: 1014

January 15, 2025

## Measurement Conditions

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

|                              |                          |                                     |
|------------------------------|--------------------------|-------------------------------------|
| DASY Version                 | DASY8 Module SAR         | 16.4.0                              |
| Extrapolation                | Advanced Extrapolation   |                                     |
| Phantom                      | Modular Flat Phantom     |                                     |
| Distance Dipole Center - TSL | 10 mm                    | with spacer                         |
| Zoom Scan Resolution         | dx, dy = 5mm, dz = 1.4mm | Graded Ratio = 1.5 mm (Z direction) |
| Frequency                    | 3500MHz $\pm$ 1MHz       |                                     |

## Head TSL parameters at 3500 MHz

The following parameters and calculations were applied.

|                                         | Temperature        | Permittivity  | Conductivity        |
|-----------------------------------------|--------------------|---------------|---------------------|
| Nominal Head TSL parameters             | 22.0 °C            | 37.9          | 2.91 mho/m          |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2)°C | 37.9 $\pm$ 6% | 2.93 mho/m $\pm$ 6% |
| Head TSL temperature change during test | < 0.5 °C           |               |                     |

## SAR result with Head TSL at 3500 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                               |
|-------------------------------------------------------|--------------------|-------------------------------|
| SAR for nominal Head TSL parameters                   | 20 dBm input power | 6.57 W/kg                     |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 65.7 W/kg $\pm$ 19.9% (k = 2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                               |
|---------------------------------------------------------|--------------------|-------------------------------|
| SAR for nominal Head TSL parameters                     | 20 dBm input power | 2.49 W/kg                     |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 24.9 W/kg $\pm$ 19.5% (k = 2) |

D3500V2 - SN: 1014

January 15, 2025

**Appendix (Additional assessments outside the scope of SCS 0108)****Antenna Parameters with Head TSL at 3500 MHz**

|             |                                |
|-------------|--------------------------------|
| Impedance   | 54.0 $\Omega$ – 4.1 j $\Omega$ |
| Return Loss | -25.2 dB                       |

**General Antenna Parameters and Design**

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.133 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 |
|-----------------|-------|

D3500V2 - SN: 1014

January 15, 2025

## System Performance Check Report

## Summary

| Dipole           | Frequency [MHz] | TSL | Power [dBm] |
|------------------|-----------------|-----|-------------|
| D3500V2 - SN1014 | 3500            | HSL | 20          |

## Exposure Conditions

| Phantom Section, TSL | Test Distance [mm] | Band      | Group, UID | Frequency [MHz], Channel Number | Conversion Factor | TSL Conductivity [S/m] | TSL Permittivity |
|----------------------|--------------------|-----------|------------|---------------------------------|-------------------|------------------------|------------------|
| Flat                 | 10                 | CW, 0---- |            | 3500, 0                         | 6.63              | 2.93                   | 37.0             |

## Hardware Setup

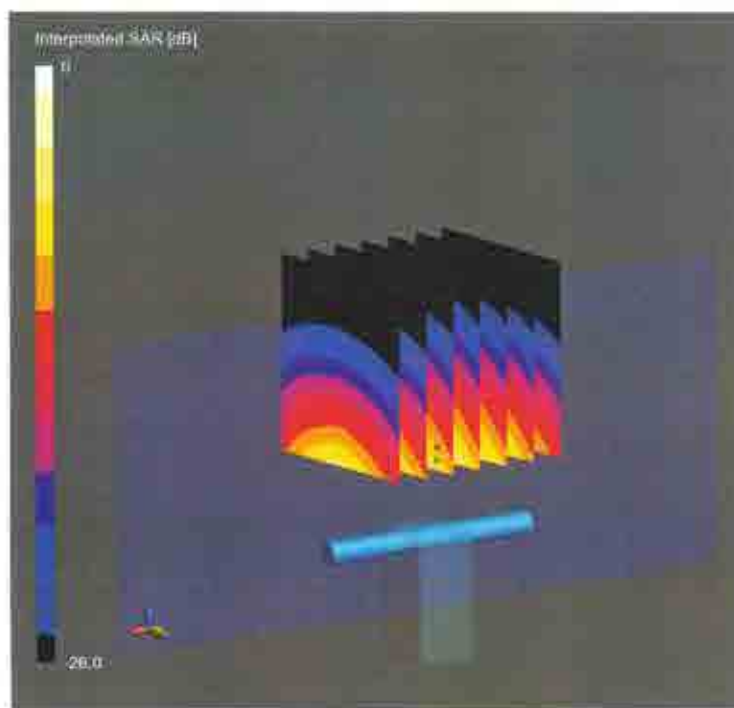
| Phantom         | TSL, Measured Date | Probe, Calibration Date     | DAE, Calibration Date     |
|-----------------|--------------------|-----------------------------|---------------------------|
| MFP V8.0 Center | HSL, 2025-01-15    | EX3DV4 - SN7349, 2025-01-10 | DAE4ip Sn1836, 2024-10-28 |

## Scans Setup

|                     | Zoom Scan       |
|---------------------|-----------------|
| Grid Extents [mm]   | 28 x 28 x 28    |
| Grid Steps [mm]     | 5.0 x 5.0 x 1.4 |
| Sensor Surface [mm] | 1.4             |
| Graded Grid         | Yes             |
| Grading Ratio       | 1.5             |
| MAIA                | N/A             |
| Surface Detection   | VMS = 6p        |
| Scan Method         | Measured        |

## Measurement Results

|                     | Zoom Scan           |
|---------------------|---------------------|
| Date                | 2025-01-15          |
| psSAR1g [W/Kg]      | 6.57                |
| psSAR10g [W/Kg]     | 2.49                |
| Power Drift [dB]    | -0.04               |
| Power Scaling       | Disabled            |
| Scaling Factor [dB] |                     |
| TSL Correction      | Positive / Negative |

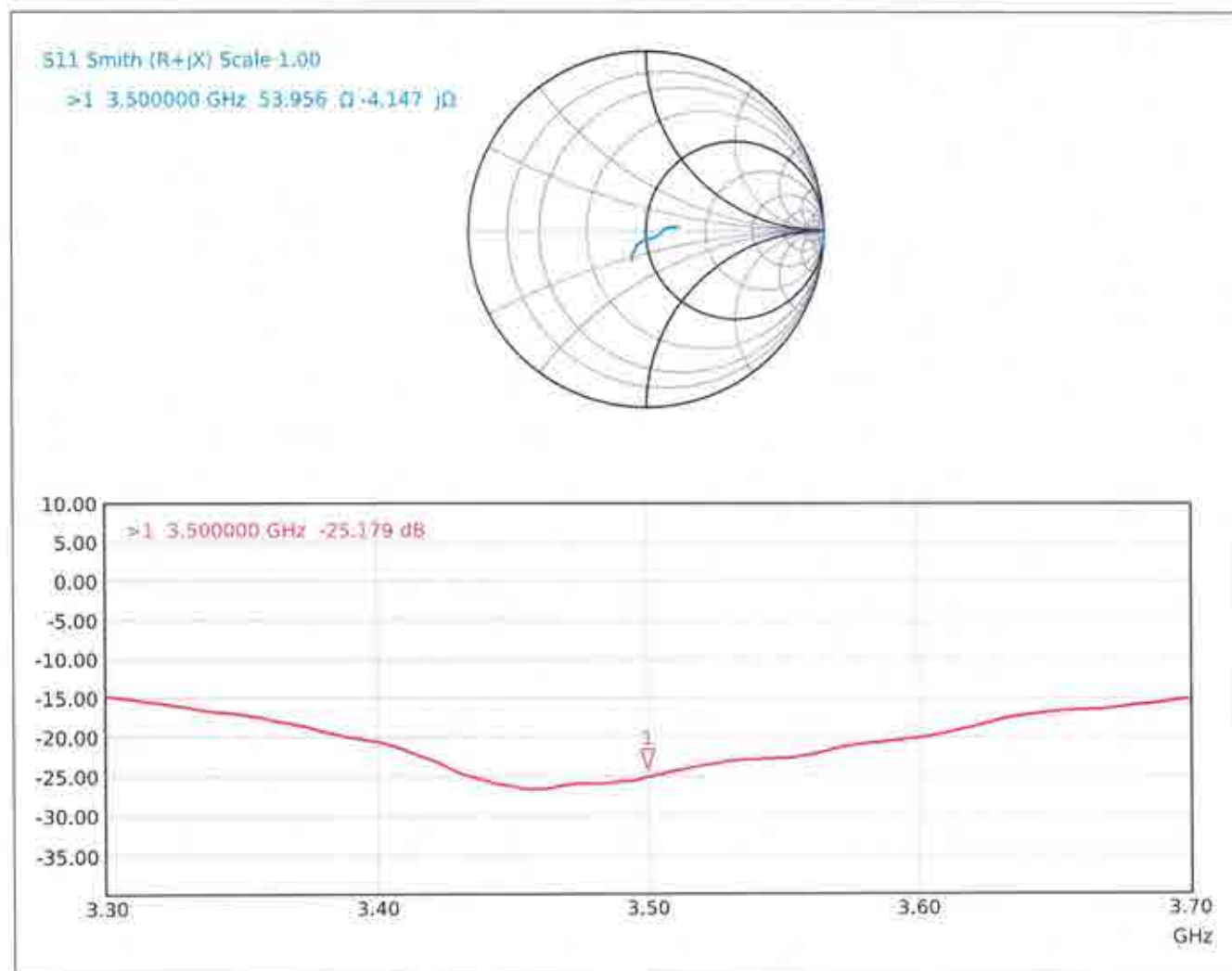


0 dB = 17.2 W/Kg

D3500V2 - SN: 1014

January 15, 2025

## Impedance Measurement Plot for Head TSL



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Client

**Sporton**  
Taoyuan City

Certificate No.

**D3700V2-1022\_Jul24****CALIBRATION CERTIFICATE**Object **D3700V2 - SN: 1022**Calibration procedure(s) **QA CAL-22.v7**  
**Calibration Procedure for SAR Validation Sources between 3 - 10 GHz**Calibration date **July 10, 2024**

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  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards                          | ID         | Cal Date (Certificate No.)            | Scheduled Cal |
|--------------------------------------------|------------|---------------------------------------|---------------|
| Power Sensor R&S NRP-33T                   | SN: 100967 | 28-Mar-24 (No. 217-04038)             | Mar-25        |
| Power Sensor R&S NRP18A                    | SN: 101859 | 21-Mar-24 (No. 4030A315007801)        | Mar-25        |
| Spectrum Analyzer R&S FSV40                | SN: 101832 | 25-Jan-24 (No. 4030-315007551)        | Jan-25        |
| Mismatch; Short [S4188] Attenuator [S4423] | SN: 1152   | 28-Mar-24 (No. 217-04050)             | Mar-25        |
| OCP DAK-12                                 | SN: 1016   | 05-Oct-23 (No. OCP-DAK12-1016_Oct23)  | Oct-24        |
| OCP DAK-3.5                                | SN: 1249   | 05-Oct-23 (No. OCP-DAK3.5-1249_Oct23) | Oct-24        |
| Reference Probe EX3DV4                     | SN: 7349   | 03-Jun-24 (No. EX3-7349_Jun24)        | Jun-25        |
| DAE4ip                                     | SN: 1836   | 10-Jan-24 (No. DAE4ip-1836_Jan24)     | Jan-25        |

| Secondary Standards          | ID         | Check Date (in house)                      | Scheduled Check |
|------------------------------|------------|--------------------------------------------|-----------------|
| ACAD Source Box              | SN: 1000   | 28-May-24 (No. 675-ACAD_Source_Box-240528) | May-25          |
| Signal Generator R&S SMB100A | SN: 182081 | 28-May-24 (No. 0001-300719404)             | May-25          |
| Mismatch; SMA                | SN: 1102   | 22-May-24 (No. 675-Mismatch_SMA-240522)    | May-25          |

|                                                                                                                 | Name       | Function              | Signature |
|-----------------------------------------------------------------------------------------------------------------|------------|-----------------------|-----------|
| Calibrated by                                                                                                   | Paulo Pina | Laboratory Technician |           |
| Approved by                                                                                                     | Sven Kühn  | Technical Manager     |           |
| Issued: July 10, 2024                                                                                           |            |                       |           |
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**S** Swiss Calibration Service

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

Accreditation No.: **SCS 0108**

## 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

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

## Additional Documentation

- DASY System Handbook

## Methods Applied and Interpretation of Parameters

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

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

D3700V2 - SN: 1022

July 10, 2024

## Measurement Conditions

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

|                              |                          |                                     |
|------------------------------|--------------------------|-------------------------------------|
| DASY Version                 | DASY8 Module SAR         | 16.4.0                              |
| Extrapolation                | Advanced Extrapolation   |                                     |
| Phantom                      | Modular Flat Phantom     |                                     |
| Distance Dipole Center - TSL | 10 mm                    | with spacer                         |
| Zoom Scan Resolution         | dx, dy = 5mm, dz = 1.4mm | Graded Ratio = 1.5 mm (Z direction) |
| Frequency                    | 3700MHz $\pm$ 1MHz       |                                     |

## Head TSL parameters at 3700 MHz

The following parameters and calculations were applied.

|                                         | Temperature        | Permittivity  | Conductivity        |
|-----------------------------------------|--------------------|---------------|---------------------|
| Nominal Head TSL parameters             | 22.0 °C            | 37.7          | 3.12 mho/m          |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2)°C | 38.2 $\pm$ 6% | 3.08 mho/m $\pm$ 6% |
| Head TSL temperature change during test | < 0.5 °C           |               |                     |

## SAR result with Head TSL at 3700 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                               |
|-------------------------------------------------------|--------------------|-------------------------------|
| SAR for nominal Head TSL parameters                   | 20 dBm input power | 6.81 W/kg                     |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 68.1 W/kg $\pm$ 19.9% (k = 2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                               |
|---------------------------------------------------------|--------------------|-------------------------------|
| SAR for nominal Head TSL parameters                     | 20 dBm input power | 2.52 W/kg                     |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 25.2 W/kg $\pm$ 19.5% (k = 2) |

D3700V2 - SN: 1022

July 10, 2024

**Appendix (Additional assessments outside the scope of SCS 0108)****Antenna Parameters with Head TSL at 3700 MHz**

|             |                                |
|-------------|--------------------------------|
| Impedance   | 52.3 $\Omega$ – 5.3 j $\Omega$ |
| Return Loss | -25.0 dB                       |

**General Antenna Parameters and Design**

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

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

D3700V2 - SN: 1022

July 10, 2024

System Performance Check Report

Summary

| Dipole           | Frequency [MHz] | TSL | Power [dBm] |
|------------------|-----------------|-----|-------------|
| D3700V2 - SN1022 | 3700            | HSL | 20          |

Exposure Conditions

| Phantom Section, TSL | Test Distance [mm] | Band    | Group, UID | Frequency [MHz], Channel Number | Conversion Factor | TSL Conductivity [S/m] | TSL Permittivity |
|----------------------|--------------------|---------|------------|---------------------------------|-------------------|------------------------|------------------|
| Flat                 | 10                 | CW, 0-- |            | 3700, 0                         | 6.34              | 3.08                   | 38.2             |

Hardware Setup

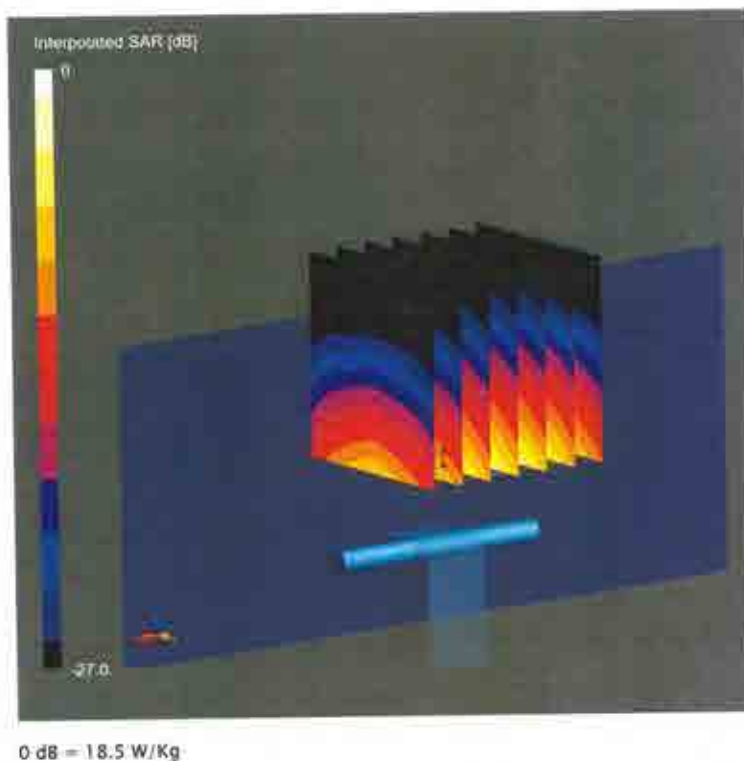
| Phantom        | TSL, Measured Date | Probe, Calibration Date     | DAE, Calibration Date     |
|----------------|--------------------|-----------------------------|---------------------------|
| MFP V8.0 Right | HSL, 2024-07-10    | EX3DV4 - SN7349, 2024-06-03 | DAE4ip Sn1836, 2024-01-10 |

Scans Setup

|                     | Zoom Scan       |
|---------------------|-----------------|
| Grid Extents [mm]   | 28 x 28 x 28    |
| Grid Steps [mm]     | 5.0 x 5.0 x 3.4 |
| Sensor Surface [mm] | 1.4             |
| Graded Grid         | Yes             |
| Grading Ratio       | 1.5             |
| MAIA                | N/A             |
| Surface Detection   | VMS + 6p        |
| Scan Method         | Measured        |

Measurement Results

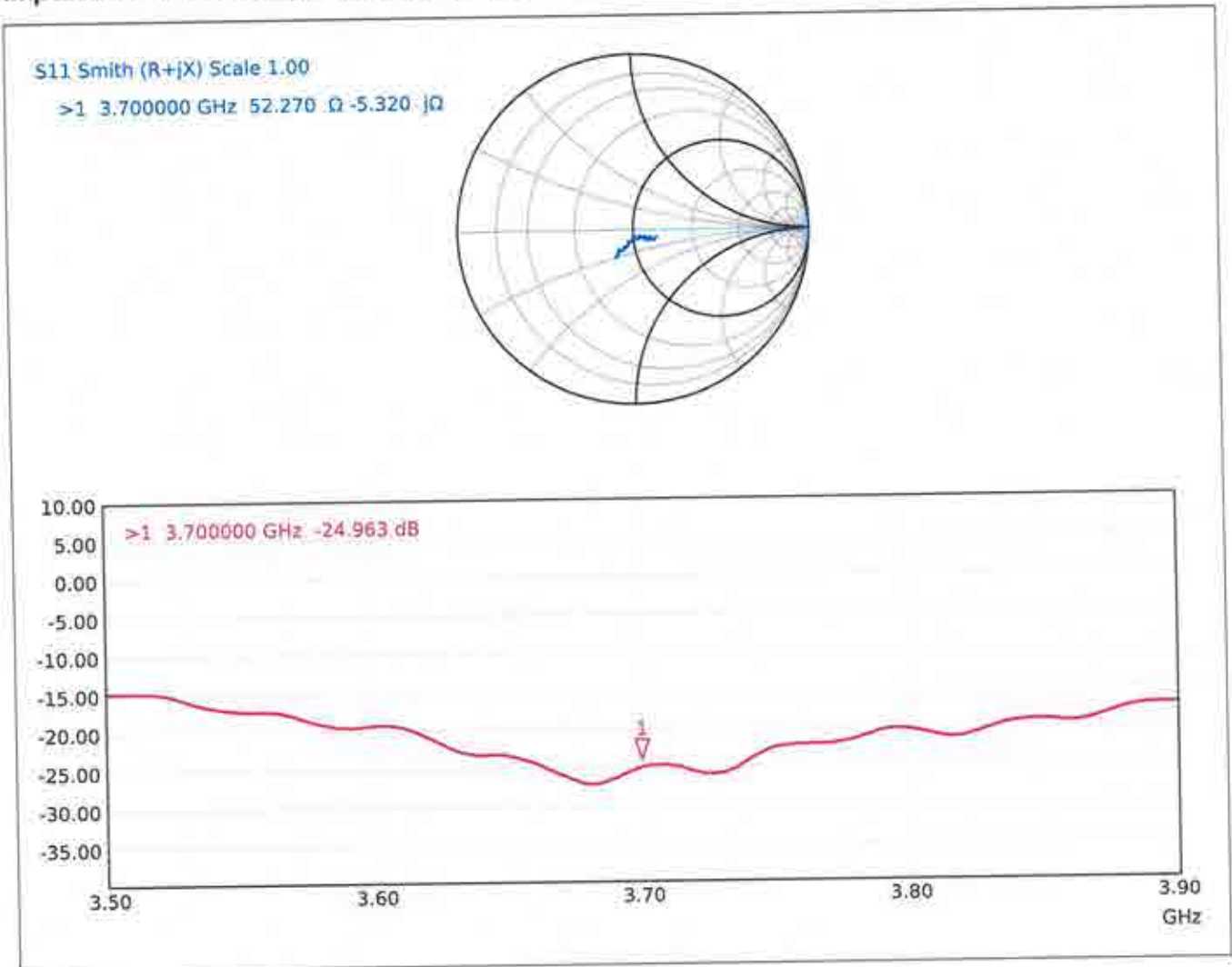
|                     | Zoom Scan           |
|---------------------|---------------------|
| Date                | 2024-07-10          |
| psSAR1g [W/Kg]      | 6.81                |
| psSAR10g [W/Kg]     | 2.52                |
| Power Drift [dB]    | -0.01               |
| Power Scaling       | Disabled            |
| Scaling Factor [dB] |                     |
| TSL Correction      | Positive / Negative |



D3700V2 - SN: 1022

July 10, 2024

## Impedance Measurement Plot for Head TSL



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



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Accreditation No.: **SCS 0108**

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Client **Sporton**  
**Taoyuan City**

Certificate No. **D3900V2-1092\_May23**

## CALIBRATION CERTIFICATE

Object **D3900V2 - SN:1092**

Calibration procedure(s) **QA CAL-22.v7**  
**Calibration Procedure for SAR Validation Sources between 3-10 GHz**

Calibration date: **May 15, 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  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP2                | SN: 104778         | 30-Mar-23 (No. 217-03804/03805)   | Mar-24                 |
| Power sensor NRP-Z91            | SN: 103244         | 30-Mar-23 (No. 217-03804)         | Mar-24                 |
| Power sensor NRP-Z91            | SN: 103245         | 30-Mar-23 (No. 217-03805)         | Mar-24                 |
| Reference 20 dB Attenuator      | SN: BH9394 (20k)   | 30-Mar-23 (No. 217-03809)         | Mar-24                 |
| Type-N mismatch combination     | SN: 310982 / 06327 | 30-Mar-23 (No. 217-03810)         | Mar-24                 |
| Reference Probe EX3DV4          | SN: 3503           | 07-Mar-23 (No. EX3-3503_Mar23)    | Mar-24                 |
| DAE4                            | SN: 601            | 19-Dec-22 (No. DAE4-601_Dec22)    | Dec-23                 |
| Secondary Standards             | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B              | SN: GB39512475     | 30-Oct-14 (in house check Oct-22) | In house check: Oct-24 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-22) | In house check: Oct-24 |
| Power sensor HP 8481A           | SN: MY41093315     | 07-Oct-15 (in house check Oct-22) | In house check: Oct-24 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-22) | In house check: Oct-24 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-22) | In house check: Oct-24 |

|                |                               |                                          |
|----------------|-------------------------------|------------------------------------------|
| Calibrated by: | Name<br><b>Jeton Kastrati</b> | Function<br><b>Laboratory Technician</b> |
| Approved by:   | <b>Sven Kühn</b>              | <b>Technical Manager</b>                 |

Signature

Issued: May 17, 2023

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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

### 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:

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

### Additional Documentation:

- DASY System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The 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.

|                                     |                                              |                                  |
|-------------------------------------|----------------------------------------------|----------------------------------|
| <b>DASY Version</b>                 | DASY52                                       | V52.10.4                         |
| <b>Extrapolation</b>                | Advanced Extrapolation                       |                                  |
| <b>Phantom</b>                      | Modular Flat Phantom V5.0                    |                                  |
| <b>Distance Dipole Center - TSL</b> | 10 mm                                        | with Spacer                      |
| <b>Zoom Scan Resolution</b>         | dx, dy = 4.0 mm, dz = 1.4 mm                 | Graded Ratio = 1.4 (Z direction) |
| <b>Frequency</b>                    | 3900 MHz $\pm$ 1 MHz<br>4100 MHz $\pm$ 1 MHz |                                  |

## Head TSL parameters at 3900 MHz

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 37.5           | 3.32 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 37.0 $\pm$ 6 % | 3.23 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL at 3900 MHz

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 100 mW input power | 6.69 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>67.0 W/kg <math>\pm</math> 19.9 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 100 mW input power | 2.32 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>23.2 W/kg <math>\pm</math> 19.5 % (k=2)</b> |

## Head TSL parameters at 4100 MHz

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 37.2           | 3.53 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 36.7 $\pm$ 6 % | 3.40 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL at 4100 MHz

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 100 mW input power | 6.67 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>66.8 W/kg <math>\pm</math> 19.9 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 100 mW input power | 2.31 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>23.0 W/kg <math>\pm</math> 19.5 % (k=2)</b> |

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

### Antenna Parameters with Head TSL at 3900 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 49.2 $\Omega$ - 4.0 j $\Omega$ |
| Return Loss                          | - 27.7 dB                      |

### Antenna Parameters with Head TSL at 4100 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 56.0 $\Omega$ + 5.0 j $\Omega$ |
| Return Loss                          | - 22.6 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.112 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 |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 15.05.2023

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 3900 MHz; Type: D3900V2; Serial: D3900V2 - SN:1092**

Communication System: UID 0 - CW; Frequency: 3900 MHz, Frequency: 4100 MHz

Medium parameters used:  $f = 3900$  MHz;  $\sigma = 3.23$  S/m;  $\epsilon_r = 37.0$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 4100$  MHz;  $\sigma = 3.40$  S/m;  $\epsilon_r = 36.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.39, 7.39, 7.39) @ 3900 MHz, ConvF(7.26, 7.26, 7.26) @ 4100 MHz; Calibrated: 07.03.2023
- 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=100 mW, d=10mm, f=3900MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.57 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 18.8 W/kg

**SAR(1 g) = 6.69 W/kg; SAR(10 g) = 2.32 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.9 mm

Ratio of SAR at M2 to SAR at M1 = 74.2%

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

**Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=4100MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 68.75 V/m; Power Drift = -0.00 dB

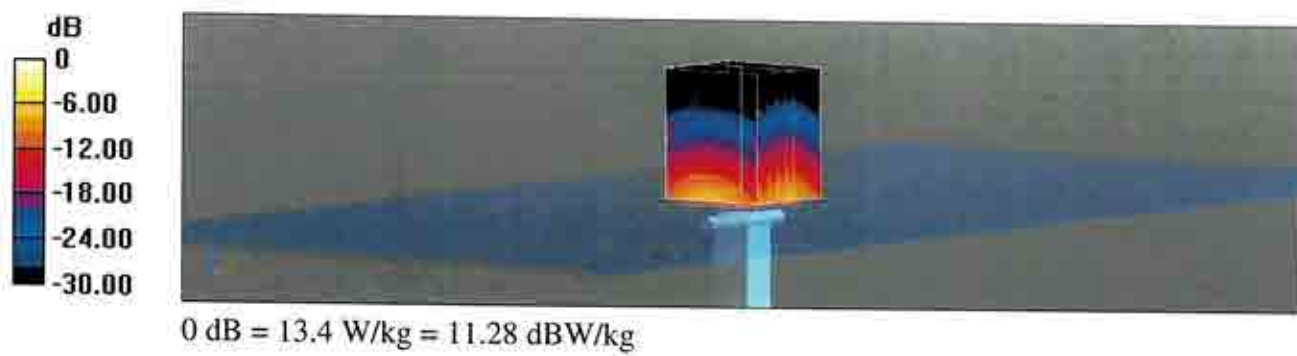
Peak SAR (extrapolated) = 18.9 W/kg

**SAR(1 g) = 6.67 W/kg; SAR(10 g) = 2.31 W/kg**

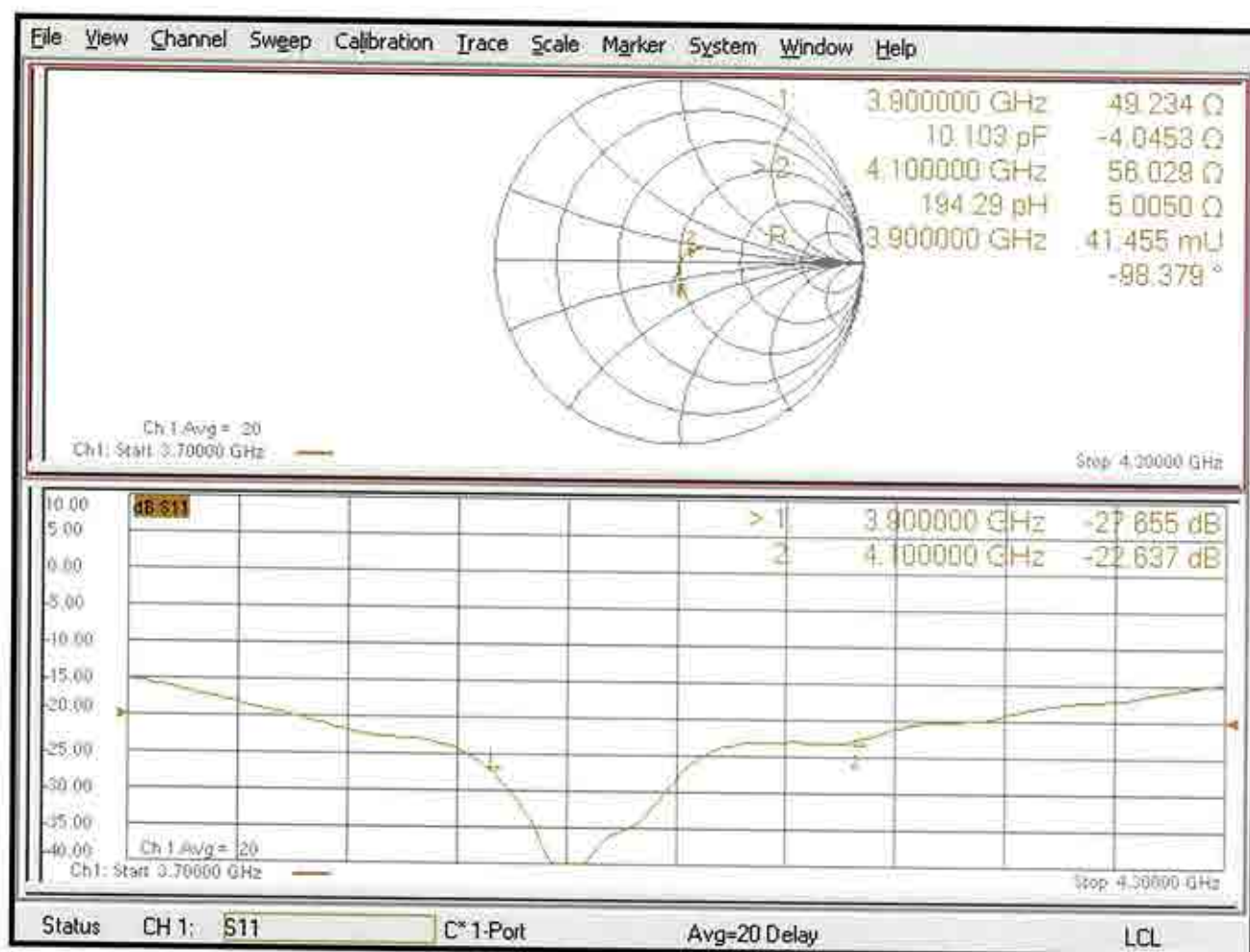
Smallest distance from peaks to all points 3 dB below = 7.9 mm

Ratio of SAR at M2 to SAR at M1 = 74%

Maximum value of SAR (measured) = 13.4 W/kg



## Impedance Measurement Plot for Head TSL





### D3900V2, serial no. 1092 Extended Dipole Calibrations

If dipoles are verified in return loss ( $< -20\text{dB}$ , within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

#### <Justification of the extended calibration>

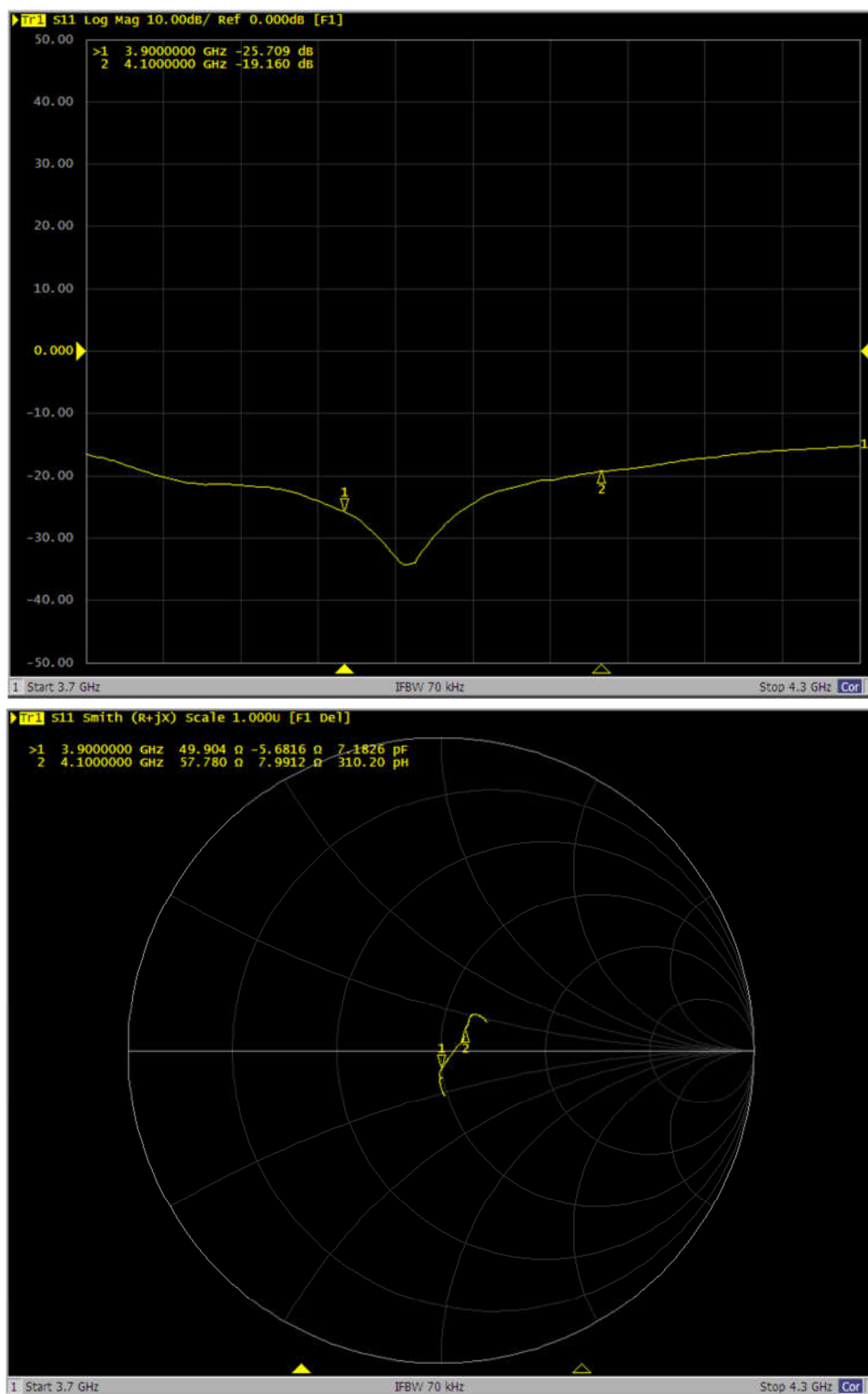
| D3900V2 – serial no. 1092   |                  |           |                      |             |                           |             |
|-----------------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
| 3900MHZ                     |                  |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 05.15.2023<br>(Cal. Report) | -27.7            |           | 49.2                 |             | -4.0                      |             |
| 05.14.2024<br>(extended)    | -25.7            | -7.22     | 49.9                 | 0.7         | -5.7                      | -1.7        |
| 4100MHZ                     |                  |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 05.15.2023<br>(Cal. Report) | -22.6            |           | 56.0                 |             | 5.0                       |             |
| 05.14.2024<br>(extended)    | -19.2            | -15.04    | 57.8                 | 1.8         | 8.0                       | 3.0         |

The return loss is  $< -20\text{dB}$ , within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.



<Dipole Verification Data> - D3900V2, serial no. 1092 (Data of Measurement : 05.14.2024)

3900MHz - Head



SPORTON INTERNATIONAL INC.

TEL : 886-3-327-3456

FAX : 886-3-328-4978

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Accreditation No.: **SCS 0108**

Client **Sporton**  
Taoyuan City

Certificate No: **DAE4-1647\_Oct24**

## CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BO - SN: 1647**

Calibration procedure(s) **QA CAL-06.v30**  
**Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **October 15, 2024**

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  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards                                | ID #               | Cal Date (Certificate No.) | Scheduled Calibration  |
|--------------------------------------------------|--------------------|----------------------------|------------------------|
| Keithley Multimeter Type 2001                    | SN: 0810278        | 27-Aug-24 (No:40547)       | Aug-25                 |
| Secondary Standards                              | ID #               | Check Date (in house)      | Scheduled Check        |
| Auto DAE Calibration Unit<br>Calibrator Box V2.1 | SE UWS 053 AA 1001 | 23-Jan-24 (in house check) | In house check: Jan-25 |
|                                                  | SE UMS 006 AA 1002 | 23-Jan-24 (in house check) | In house check: Jan-25 |

|                |                                  |                                          |
|----------------|----------------------------------|------------------------------------------|
| Calibrated by: | Name<br><b>Dominique Steffen</b> | Function<br><b>Laboratory Technician</b> |
| Approved by:   | <b>Sven Kühn</b>                 | <b>Technical Manager</b>                 |

Signature

Issued: October 15, 2024

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Accreditation No.: **SCS 0108**

## Glossary

**DAE** data acquisition electronics  
**Connector angle** information used in DASY system to align probe sensor X to the robot coordinate system.

## Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
  - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
  - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
  - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
  - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
  - **Power consumption:** Typical value for information. Supply currents in various operating modes.

## DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.....+3mV

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

| Calibration Factors | X                         | Y                         | Z                         |
|---------------------|---------------------------|---------------------------|---------------------------|
| High Range          | 405.036 $\pm$ 0.02% (k=2) | 405.010 $\pm$ 0.02% (k=2) | 404.897 $\pm$ 0.02% (k=2) |
| Low Range           | 4.01971 $\pm$ 1.50% (k=2) | 3.98933 $\pm$ 1.50% (k=2) | 3.99066 $\pm$ 1.50% (k=2) |

## Connector Angle

|                                           |                                     |
|-------------------------------------------|-------------------------------------|
| Connector Angle to be used in DASY system | 126.0 $^{\circ}$ $\pm$ 1 $^{\circ}$ |
|-------------------------------------------|-------------------------------------|

## Appendix (Additional assessments outside the scope of SCS0108)

### 1. DC Voltage Linearity

| High Range        | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 200036.77                 | -0.84                        | -0.00     |
| Channel X + Input | 20006.61                  | 0.73                         | 0.00      |
| Channel X - Input | -20005.70                 | 1.51                         | -0.01     |
| Channel Y + Input | 200037.20                 | 0.24                         | 0.00      |
| Channel Y + Input | 20004.45                  | -1.28                        | -0.01     |
| Channel Y - Input | -20008.76                 | -1.41                        | 0.01      |
| Channel Z + Input | 200034.15                 | -2.91                        | -0.00     |
| Channel Z + Input | 20004.19                  | -1.56                        | -0.01     |
| Channel Z - Input | -20008.29                 | -0.89                        | 0.00      |

| Low Range         | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 2000.63                   | -0.16                        | -0.01     |
| Channel X + Input | 200.89                    | 0.28                         | 0.14      |
| Channel X - Input | -199.41                   | -0.28                        | 0.14      |
| Channel Y + Input | 2000.74                   | 0.05                         | 0.00      |
| Channel Y + Input | 199.85                    | -0.64                        | -0.32     |
| Channel Y - Input | -200.29                   | -0.93                        | 0.46      |
| Channel Z + Input | 2000.54                   | -0.17                        | -0.01     |
| Channel Z + Input | 200.65                    | 0.18                         | 0.09      |
| Channel Z - Input | -200.10                   | -0.82                        | 0.41      |

### 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 ( $\mu\text{V}$ ) | Low Range Average Reading ( $\mu\text{V}$ ) |
|-----------|--------------------------------|----------------------------------------------|---------------------------------------------|
| Channel X | 200                            | -4.19                                        | -5.23                                       |
|           | - 200                          | 5.91                                         | 4.44                                        |
| Channel Y | 200                            | 7.01                                         | 7.12                                        |
|           | - 200                          | -9.05                                        | -9.29                                       |
| Channel Z | 200                            | -9.84                                        | -9.53                                       |
|           | - 200                          | 8.87                                         | 9.09                                        |

### 3. Channel separation

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

|           | Input Voltage (mV) | Channel X ( $\mu\text{V}$ ) | Channel Y ( $\mu\text{V}$ ) | Channel Z ( $\mu\text{V}$ ) |
|-----------|--------------------|-----------------------------|-----------------------------|-----------------------------|
| Channel X | 200                | -                           | 0.67                        | -2.53                       |
| Channel Y | 200                | 5.44                        | -                           | 2.56                        |
| Channel Z | 200                | 8.53                        | 2.93                        | -                           |

#### 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 | 16027            | 16103           |
| Channel Y | 15899            | 15814           |
| Channel Z | 15874            | 14288           |

#### 5. Input Offset Measurement

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

Input 10M $\Omega$

|           | Average ( $\mu$ V) | min. Offset ( $\mu$ V) | max. Offset ( $\mu$ V) | Std. Deviation ( $\mu$ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | 0.53               | -1.16                  | 1.39                   | 0.39                      |
| Channel Y | -0.48              | -1.34                  | 0.16                   | 0.29                      |
| Channel Z | -0.03              | -0.81                  | 0.86                   | 0.36                      |

#### 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

#### 7. Input Resistance (Typical values for information)

|           | Zeroing (kOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| 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             | +6            | +14               |
| Supply (- Vcc) | -0.01             | -8            | -9                |

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**S** Swiss Calibration Service

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**The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates**Accreditation No.: **SCS 0108**

Client

**Sporton**  
Taoyuan City

Certificate No.

**EX-7814\_Jun24****CALIBRATION CERTIFICATE**

Object

**EX3DV4 - SN:7814**

Calibration procedure(s)

**QA CAL-01.v10, QA CAL-12.v10, QA CAL-14.v7, QA CAL-23.v6,  
QA CAL-25.v8  
Calibration procedure for dosimetric E-field probes**

Calibration date

**June 20, 2024**

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  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID               | Cal Date (Certificate No.)        | Scheduled Calibration |
|----------------------------|------------------|-----------------------------------|-----------------------|
| Power meter NRP2           | SN: 104778       | 26-Mar-24 (No. 217-04036/04037)   | Mar-25                |
| Power sensor NRP-Z91       | SN: 103244       | 26-Mar-24 (No. 217-04036)         | Mar-25                |
| OCP DAK-3.5 (weighted)     | SN: 1249         | 05-Oct-23 (OCP-DAK3.5-1249_Oct23) | Oct-24                |
| OCP DAK-12                 | SN: 1016         | 05-Oct-23 (OCP-DAK12-1016_Oct23)  | Oct-24                |
| Reference 20 dB Attenuator | SN: CC2552 (20x) | 26-Mar-24 (No. 217-04046)         | Mar-25                |
| DAE4                       | SN: 660          | 23-Feb-24 (No. DAE4-660_Feb24)    | Feb-25                |
| Reference Probe EX3DV4     | SN: 7349         | 03-Nov-23 (No. EX3-7349_Nov23)    | Nov-24                |

| Secondary Standards     | ID               | Check Date (in house)             | Scheduled Check        |
|-------------------------|------------------|-----------------------------------|------------------------|
| Power meter E4419B      | SN: GB41293874   | 06-Apr-16 (in house check Jun-22) | In house check: Jun-24 |
| Power sensor E4412A     | SN: MY41498087   | 06-Apr-16 (in house check Jun-22) | In house check: Jun-24 |
| Power sensor E4412A     | SN: 000110210    | 06-Apr-16 (in house check Jun-22) | In house check: Jun-24 |
| RF generator HP 8648C   | SN: US3642U01700 | 04-Aug-99 (in house check Jun-22) | In house check: Jun-24 |
| Network Analyzer E8358A | SN: US41080477   | 31-Mar-14 (in house check Oct-22) | In house check: Oct-24 |

|                                                                                                                 |                |                       |           |
|-----------------------------------------------------------------------------------------------------------------|----------------|-----------------------|-----------|
|                                                                                                                 | Name           | Function              | Signature |
| Calibrated by                                                                                                   | Joanna Lieshaj | Laboratory Technician |           |
| Approved by                                                                                                     | Sven Kühn      | Technical Manager     |           |
| Issued: June 20, 2024                                                                                           |                |                       |           |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |                |                       |           |

**Calibration Laboratory of  
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Accreditation No.: **SCS 0108**

## Glossary

|                        |                                                                                                                                                |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                    | tissue simulating liquid                                                                                                                       |
| NORM <sub>x,y,z</sub>  | sensitivity in free space                                                                                                                      |
| ConvF                  | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                     |
| DCP                    | diode compression point                                                                                                                        |
| CF                     | crest factor (1/duty_cycle) of the RF signal                                                                                                   |
| A, B, C, D             | modulation dependent linearization parameters                                                                                                  |
| Polarization $\varphi$ | $\varphi$ rotation around probe axis                                                                                                           |
| Polarization $\theta$  | $\theta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\theta = 0$ is normal to probe axis |
| Connector Angle        | information used in DASY system to align probe sensor X to the robot coordinate system                                                         |

## Calibration is Performed According to the Following Standards:

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

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\theta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the  $E^2$ -field uncertainty inside TSL (see below ConvF).
- NORM( $f$ )<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal. DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: In a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

EX3DV4 - SN:7814

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## Parameters of Probe: EX3DV4 - SN:7814

## Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc ( $k = 2$ ) |
|-----------------------------------------------------------|----------|----------|----------|-----------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.60     | 0.62     | 0.66     | $\pm 10.1\%$    |
| DCP (mV) <sup>B</sup>                                     | 108.1    | 104.2    | 105.1    | $\pm 4.7\%$     |

## Calibration Results for Modulation Response

| UID   | Communication System Name   |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C     | D<br>dB | VR<br>mV | Max<br>dev. | Max<br>Unc <sup>E</sup><br>$k = 2$ |
|-------|-----------------------------|---|---------|------------------------------|-------|---------|----------|-------------|------------------------------------|
| 0     | CW                          | X | 0.00    | 0.00                         | 1.00  | 0.00    | 145.2    | $\pm 1.0\%$ | $\pm 4.7\%$                        |
|       |                             | Y | 0.00    | 0.00                         | 1.00  |         | 132.8    |             |                                    |
|       |                             | Z | 0.00    | 0.00                         | 1.00  |         | 125.4    |             |                                    |
| 10352 | Pulse Waveform (200Hz, 10%) | X | 2.59    | 66.47                        | 10.73 | 10.00   | 60.0     | $\pm 2.8\%$ | $\pm 9.6\%$                        |
|       |                             | Y | 1.60    | 61.35                        | 7.37  |         | 60.0     |             |                                    |
|       |                             | Z | 1.85    | 62.36                        | 7.69  |         | 60.0     |             |                                    |
| 10353 | Pulse Waveform (200Hz, 20%) | X | 1.56    | 65.11                        | 9.31  | 6.99    | 80.0     | $\pm 2.5\%$ | $\pm 9.6\%$                        |
|       |                             | Y | 0.80    | 60.00                        | 5.70  |         | 80.0     |             |                                    |
|       |                             | Z | 0.80    | 60.00                        | 5.53  |         | 80.0     |             |                                    |
| 10354 | Pulse Waveform (200Hz, 40%) | X | 0.71    | 62.80                        | 7.65  | 3.98    | 95.0     | $\pm 2.0\%$ | $\pm 9.6\%$                        |
|       |                             | Y | 4.00    | 68.00                        | 7.00  |         | 95.0     |             |                                    |
|       |                             | Z | 26.00   | 76.00                        | 9.00  |         | 95.0     |             |                                    |
| 10355 | Pulse Waveform (200Hz, 60%) | X | 0.36    | 61.18                        | 6.68  | 2.22    | 120.0    | $\pm 1.3\%$ | $\pm 9.6\%$                        |
|       |                             | Y | 0.26    | 60.00                        | 4.45  |         | 120.0    |             |                                    |
|       |                             | Z | 0.26    | 60.00                        | 3.89  |         | 120.0    |             |                                    |
| 10387 | QPSK Waveform, 1 MHz        | X | 0.64    | 60.00                        | 9.11  | 1.00    | 150.0    | $\pm 4.3\%$ | $\pm 9.6\%$                        |
|       |                             | Y | 0.60    | 60.00                        | 9.50  |         | 150.0    |             |                                    |
|       |                             | Z | 0.61    | 60.37                        | 9.85  |         | 150.0    |             |                                    |
| 10388 | QPSK Waveform, 10 MHz       | X | 1.24    | 61.37                        | 10.70 | 0.00    | 150.0    | $\pm 1.3\%$ | $\pm 9.6\%$                        |
|       |                             | Y | 1.21    | 61.44                        | 11.13 |         | 150.0    |             |                                    |
|       |                             | Z | 1.25    | 62.18                        | 11.77 |         | 150.0    |             |                                    |
| 10396 | 64-QAM Waveform, 100 kHz    | X | 1.75    | 62.49                        | 13.75 | 3.01    | 150.0    | $\pm 1.1\%$ | $\pm 9.6\%$                        |
|       |                             | Y | 1.60    | 61.82                        | 13.95 |         | 150.0    |             |                                    |
|       |                             | Z | 1.58    | 62.18                        | 14.43 |         | 150.0    |             |                                    |
| 10399 | 64-QAM Waveform, 40 MHz     | X | 2.70    | 63.76                        | 13.05 | 0.00    | 150.0    | $\pm 1.9\%$ | $\pm 9.6\%$                        |
|       |                             | Y | 2.68    | 63.90                        | 13.43 |         | 150.0    |             |                                    |
|       |                             | Z | 2.73    | 64.29                        | 13.77 |         | 150.0    |             |                                    |
| 10414 | WLAN CCDF, 64-QAM, 40 MHz   | X | 3.76    | 64.02                        | 13.72 | 0.00    | 150.0    | $\pm 3.5\%$ | $\pm 9.6\%$                        |
|       |                             | Y | 3.97    | 65.08                        | 14.53 |         | 150.0    |             |                                    |
|       |                             | Z | 4.03    | 65.31                        | 14.77 |         | 150.0    |             |                                    |

Note: For details on UID parameters see Appendix

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

<sup>A</sup> The uncertainties of Norm X,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Linearization parameter uncertainty for maximum specified field strength.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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**Parameters of Probe: EX3DV4 - SN:7814****Sensor Model Parameters**

|   | C1<br>fF | C2<br>fF | $\alpha$<br>$V^{-1}$ | T1<br>$ms V^{-2}$ | T2<br>$ms V^{-1}$ | T3<br>ms | T4<br>$V^{-2}$ | T5<br>$V^{-1}$ | T6   |
|---|----------|----------|----------------------|-------------------|-------------------|----------|----------------|----------------|------|
| x | 11.9     | 85.39    | 32.39                | 5.36              | 0.00              | 4.96     | 0.66           | 0.00           | 1.00 |
| y | 12.2     | 89.24    | 33.41                | 2.75              | 0.00              | 4.90     | 0.28           | 0.00           | 1.00 |
| z | 13.0     | 94.92    | 33.57                | 2.98              | 0.00              | 4.91     | 0.18           | 0.01           | 1.01 |

**Other Probe Parameters**

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle                               | 17.5°      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 1.4 mm     |

**Note:** Measurement distance from surface can be increased to 3–4 mm for an *Area Scan* job.