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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 | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 2450 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature         | Permittivity   | Conductivity         |
|---|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 39.2           | 1.80 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 38.4 $\pm$ 6 % | 1.87 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 | 13.4 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 52.4 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 | 6.25 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 24.7 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 | 52.9 $\Omega$ + 4.7 j $\Omega$ |
| Return Loss                          | - 25.5 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.162 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 |
|-----------------|-------|

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:929**

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.87$  S/m;  $\epsilon_r = 38.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.96, 7.96, 7.96) @ 2450 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 31.08.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

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

Reference Value = 115.9 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 26.1 W/kg

**SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.25 W/kg**

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 51.5%

Maximum value of SAR (measured) = 21.8 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 | 55.9 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 | 26.2 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 | 57.0 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 | 27.5 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 | 53.7 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 | 25.1 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 | 34.4 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 | 17.5 W/kg $\pm$ 16.9 % (k=2) |

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

## D2450V2, serial no. 929 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>

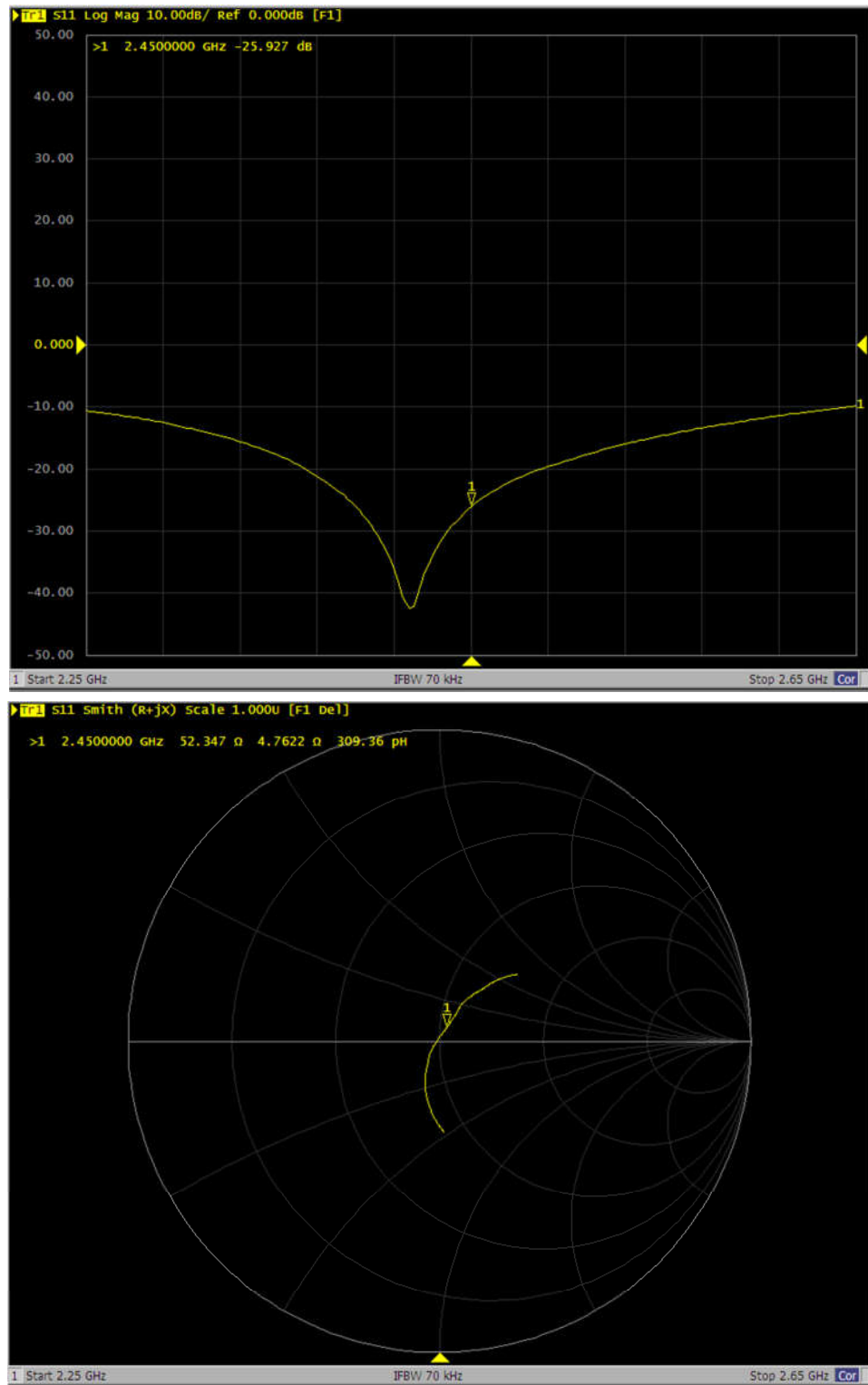
| D2450V2 – serial no. 929    |                  |           |                      |             |                           |             |
|-----------------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
|                             | 2450MHZ          |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 11.21.2022<br>(Cal. Report) | -25.5            |           | 52.9                 |             | 4.7                       |             |
| 11.20.2023<br>(extended)    | -25.9            | 1.57      | 52.3                 | -0.6        | 4.8                       | 0.1         |

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> - D2450 V2, serial no. 929 (Data of Measurement : 11.20.2023)

2450MHz - Head







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Accreditation No.: **SCS 0108**

Client **Sporton**

Certificate No: **D2600V2-1078\_Jun22**

## CALIBRATION CERTIFICATE

Object **D2600V2 - SN:1078**

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

Calibration date: **June 23, 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 |

|                |                |                       |           |
|----------------|----------------|-----------------------|-----------|
|                | Name           | Function              | Signature |
| Calibrated by: | Joanna Lleshaj | Laboratory Technician |           |
| Approved by:   | Sven Kühn      | Technical Manager     |           |

Issued: June 24, 2022

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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 | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 2600 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature         | Permittivity   | Conductivity         |
|---|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 39.0           | 1.96 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 37.8 $\pm$ 6 % | 2.01 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 | 14.1 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 55.4 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 | 6.29 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 24.9 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 | 49.2 $\Omega$ - 7.3 j $\Omega$ |
| Return Loss                          | - 22.6 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 |
|-----------------|-------|



## DASY5 Validation Report for Head TSL

Date: 23.06.2022

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1078**

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.01$  S/m;  $\epsilon_r = 37.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.84, 7.84, 7.84) @ 2600 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

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

Reference Value = 117.7 V/m; Power Drift = 0.07 dB

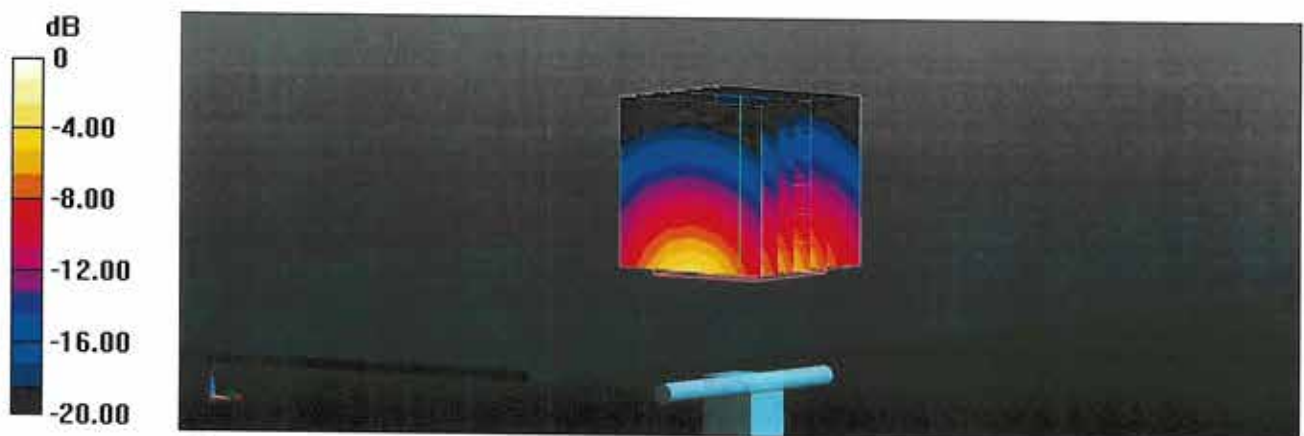
Peak SAR (extrapolated) = 28.0 W/kg

**SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.29 W/kg**

Smallest distance from peaks to all points 3 dB below = 9 mm

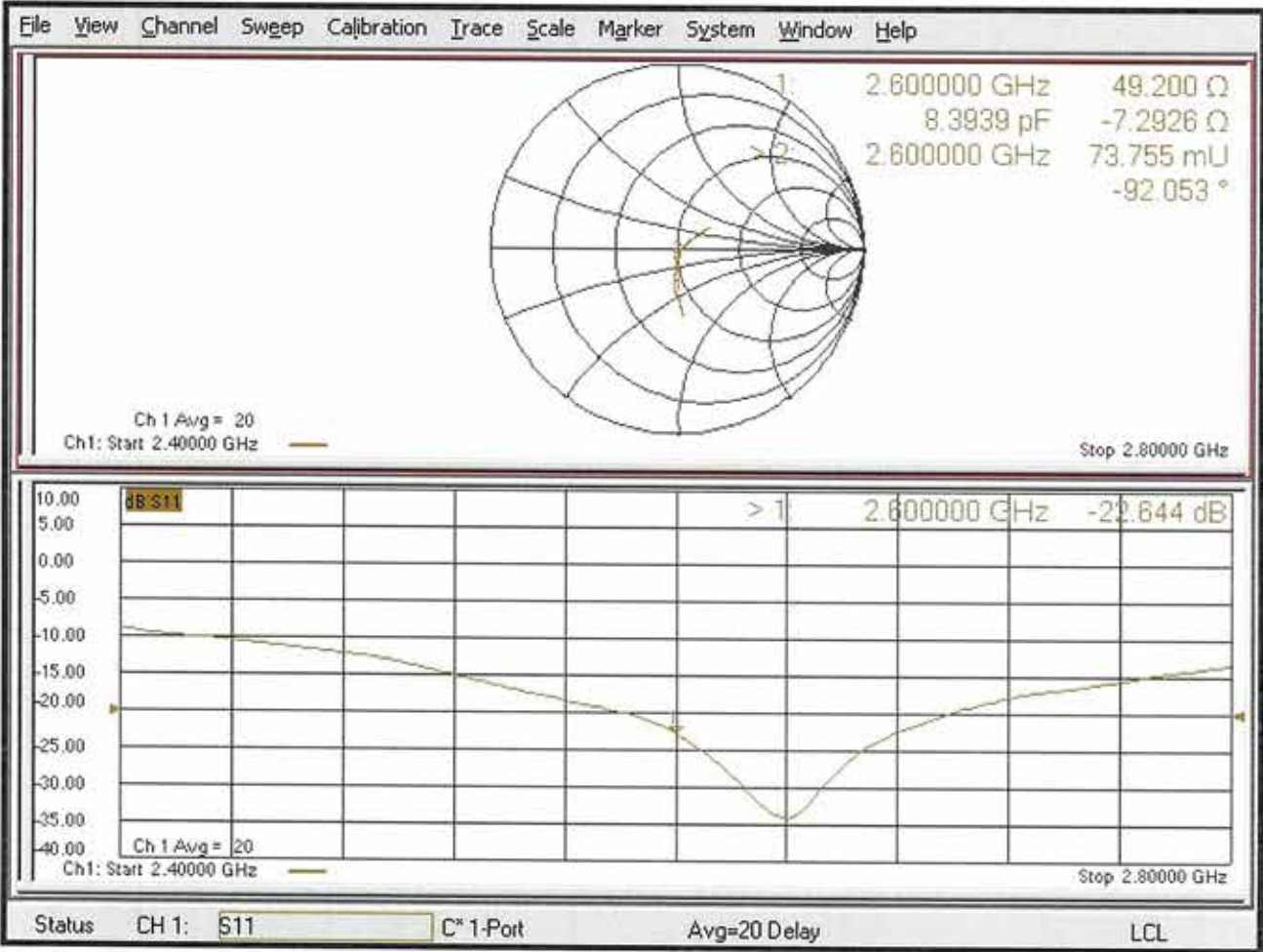
Ratio of SAR at M2 to SAR at M1 = 50.5%

Maximum value of SAR (measured) = 23.5 W/kg



0 dB = 23.5 W/kg = 13.71 dBW/kg

Impedance Measurement Plot for Head TSL



## D2600V2, serial no. 1078 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>

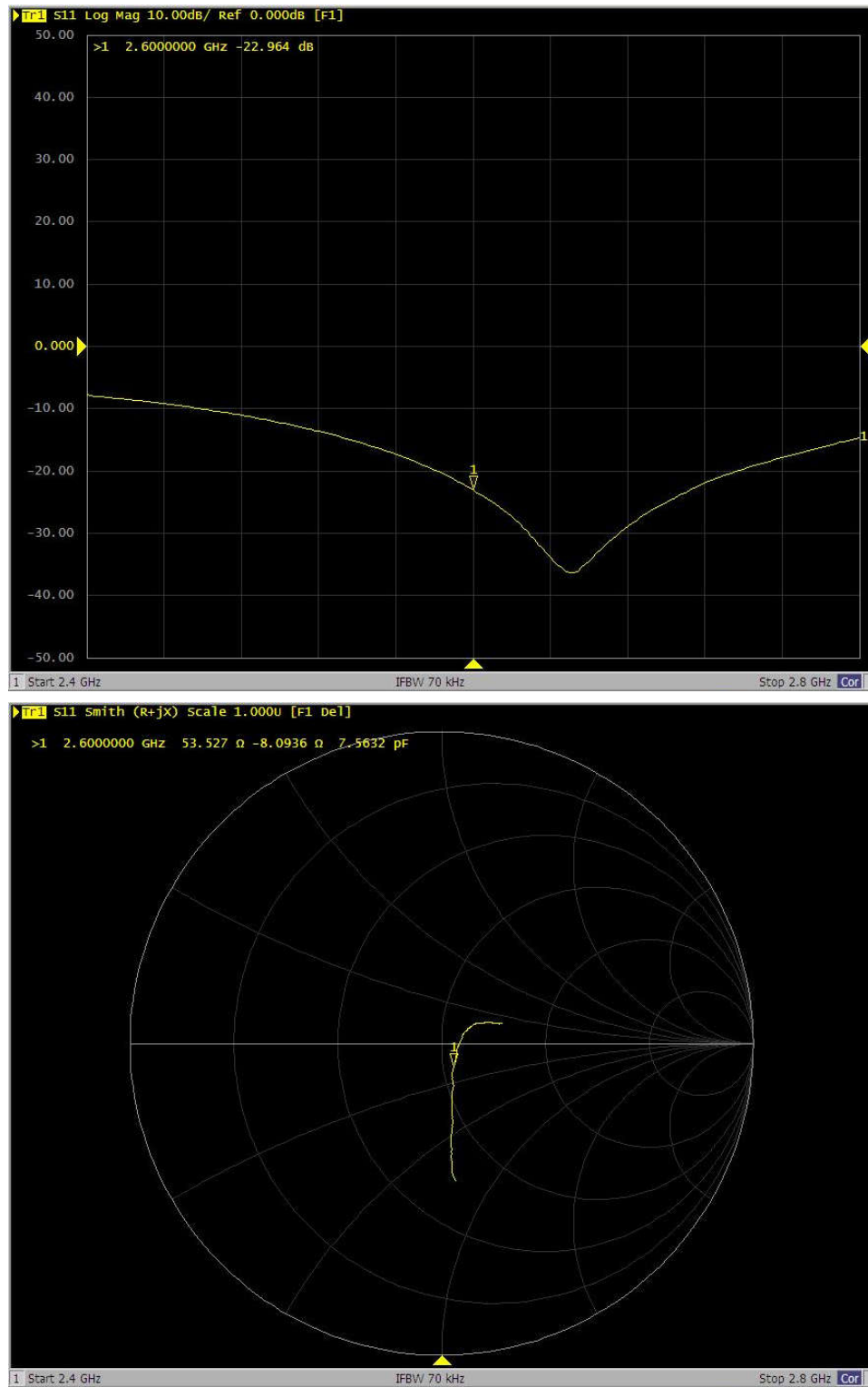
| D2600V2 – serial no. 1078   |                  |           |                      |             |                           |             |
|-----------------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
|                             | 2600MHZ          |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 06.23.2022<br>(Cal. Report) | -22.644          |           | 49.200               |             | -7.2926                   |             |
| 06.22.2023<br>(extended)    | -22.964          | -1.41     | 53.527               | 4.327       | -8.0936                   | -0.801      |

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> - D2600 V2, serial no. 1078(Data of Measurement : 06.22.2023)

2600MHz - Head





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Accreditation No.: **SCS 0108**

Client **Sporton**

Certificate No: **D3500V2-1014\_Jan22**

## CALIBRATION CERTIFICATE

Object **D3500V2 - SN:1014**

Calibration procedure(s) **QA CAL-22.v6  
Calibration Procedure for SAR Validation Sources between 3-10 GHz**

Calibration date: **January 17, 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         | 09-Apr-21 (No. 217-03291/03292) | Apr-22                |
| Power sensor NRP-Z91        | SN: 103244         | 09-Apr-21 (No. 217-03291)       | Apr-22                |
| Power sensor NRP-Z91        | SN: 103245         | 09-Apr-21 (No. 217-03292)       | Apr-22                |
| Reference 20 dB Attenuator  | SN: BH9394 (20k)   | 09-Apr-21 (No. 217-03343)       | Apr-22                |
| Type-N mismatch combination | SN: 310982 / 06327 | 09-Apr-21 (No. 217-03344)       | Apr-22                |
| Reference Probe EX3DV4      | SN: 3503           | 31-Dec-21 (No. EX3-3503_Dec21)  | Dec-22                |
| DAE4                        | SN: 601            | 01-Nov-21 (No. DAE4-601_Nov21)  | Nov-22                |

| 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             | Deputy Manager                    |               |

Issued: January 20, 2022

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Accreditation No.: **SCS 0108**

**Glossary:**

|       |                                 |
|-------|---------------------------------|
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| ConvF | sensitivity in TSL / NORM x,y,z |
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- 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 | 10 mm                      | with Spacer                      |
| Zoom Scan Resolution         | dx, dy = 4 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| Frequency                    | 3500 MHz $\pm$ 1 MHz       |                                  |

## Head TSL parameters

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 | 37.2 $\pm$ 6 % | 2.91 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  | 100 mW input power | 6.75 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 67.2 W/kg $\pm$ 19.9 % (k=2) |

|   |                    |                              |
|---|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured  | 100 mW input power | 2.52 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 25.1 W/kg $\pm$ 19.5 % (k=2) |

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

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 54.7 $\Omega$ - 4.4 j $\Omega$ |
| Return Loss                          | - 24.2 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 |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 17.01.2022

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN:1014**

Communication System: UID 0 - CW; Frequency: 3500 MHz

Medium parameters used:  $f = 3500$  MHz;  $\sigma = 2.91$  S/m;  $\epsilon_r = 37.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.91, 7.91, 7.91) @ 3500 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- 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=3500MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 69.66 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 18.5 W/kg

**SAR(1 g) = 6.75 W/kg; SAR(10 g) = 2.52 W/kg**

Smallest distance from peaks to all points 3 dB below = 8.4 mm

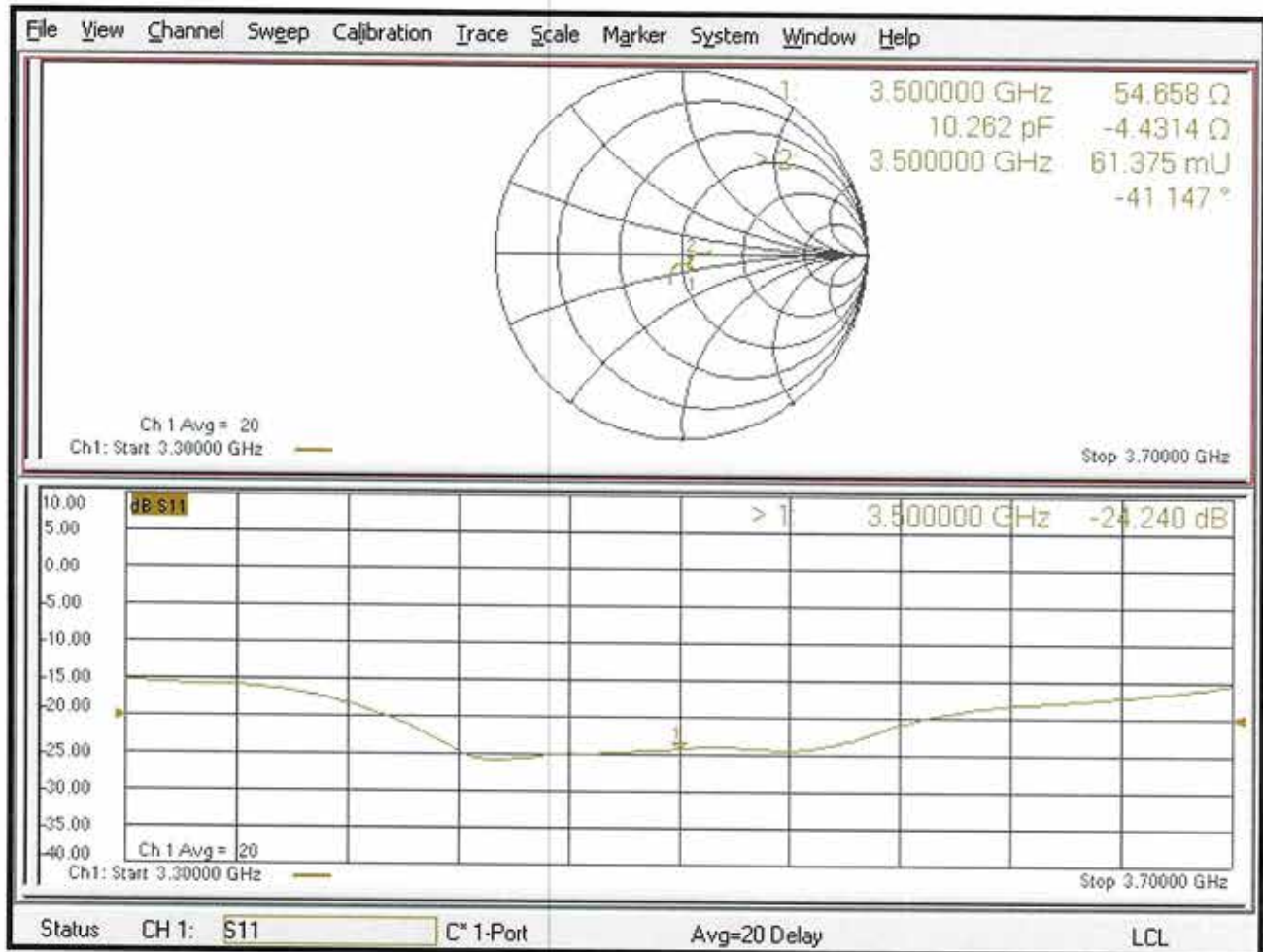
Ratio of SAR at M2 to SAR at M1 = 74.5%

Maximum value of SAR (measured) = 13.0 W/kg



0 dB = 13.0 W/kg = 11.12 dBW/kg

## Impedance Measurement Plot for Head TSL





## D3500V2, serial no. 1014 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.

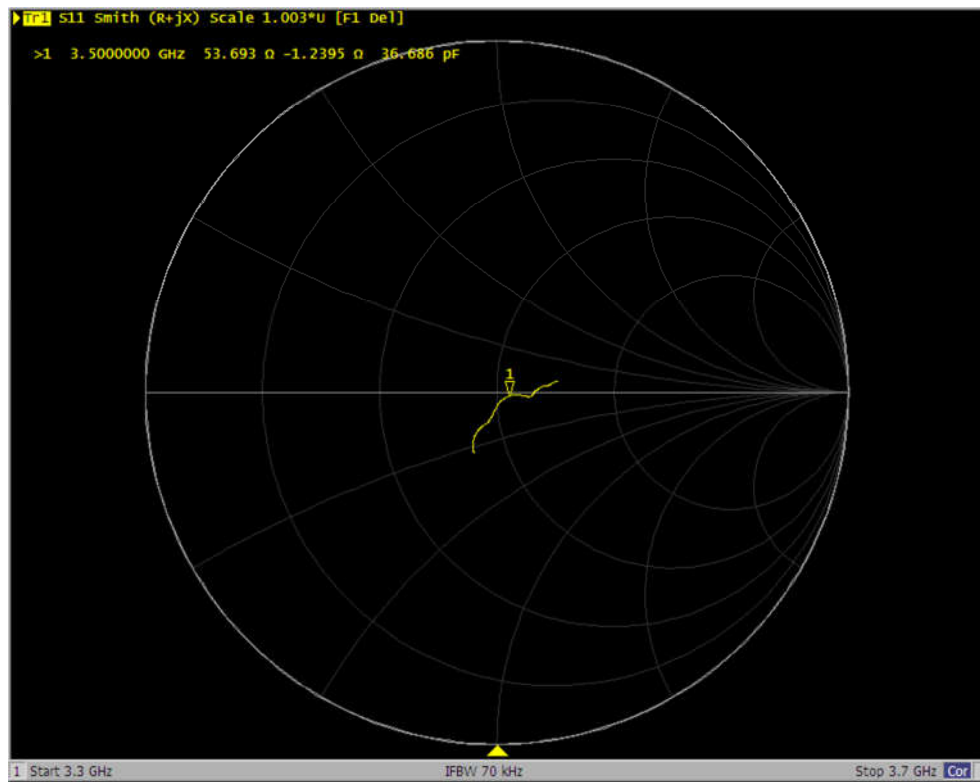
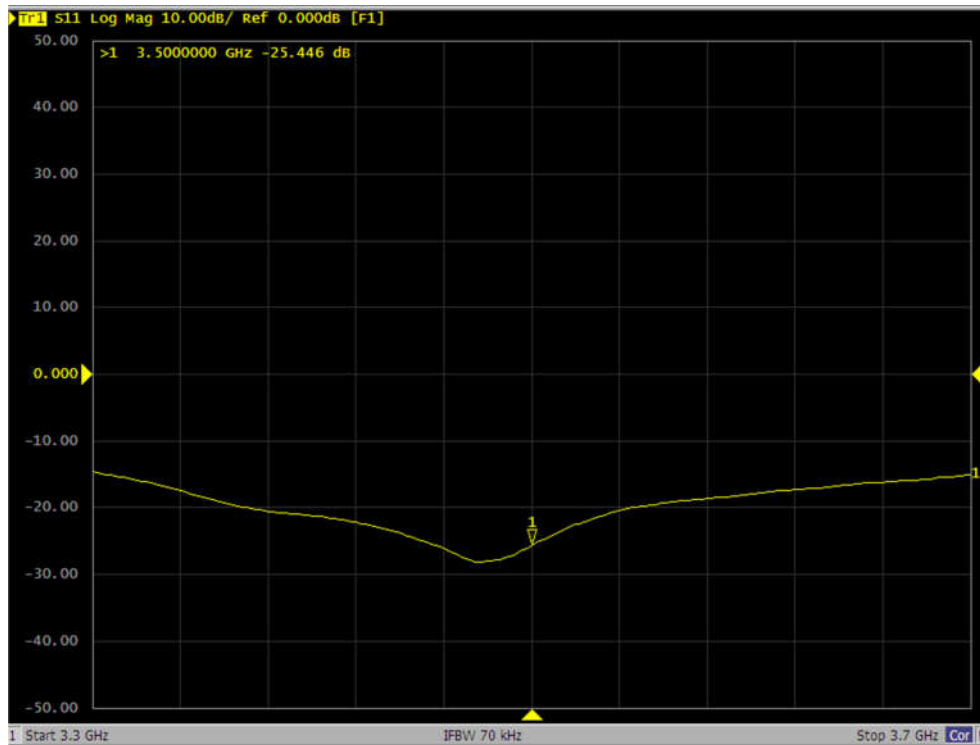
### <Justification of the extended calibration>

| D3500V2 – serial no. 1014   |                  |           |                      |             |                           |             |
|-----------------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
|                             | 3500MHZ          |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 01.17.2022<br>(Cal. Report) | -24.24           |           | 54.658               |             | -4.4314                   |             |
| 01.16.2023<br>(extended)    | -25.446          | 4.739     | 53.693               | -0.965      | -1.2395                   | 3.1919      |
| 01.15.2024<br>(extended)    | -26.377          | 8.816     | 53.5                 | -1.16       | -1.1166                   | 3.3148      |

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.

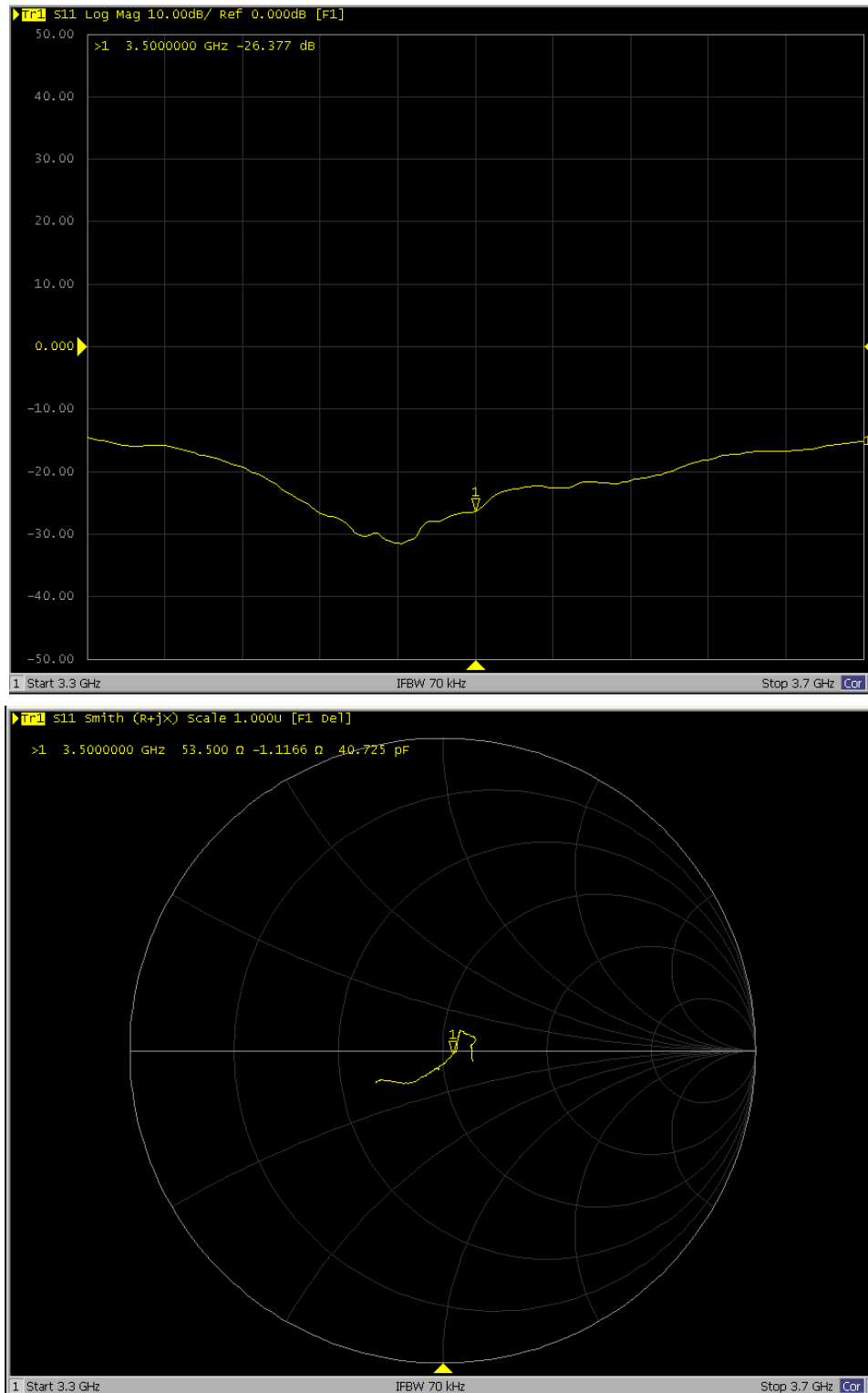
<Dipole Verification Data> - D3500 V2, serial no.1014 (Data of Measurement : 01.16.2023)

3500MHz - Head



<Dipole Verification Data> - D3500 V2, serial no. 1014 (Data of Measurement : 01.15.2024)

3500 MHz - Head





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Accreditation No.: SCS 0108

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Multilateral Agreement for the recognition of calibration certificates

Client **Sporton**

Certificate No: **D3700V2-1006\_Jun22**

## CALIBRATION CERTIFICATE

Object **D3700V2 - SN:1006**

Calibration procedure(s) **QA CAL-22.v6  
Calibration Procedure for SAR Validation Sources between 3-10 GHz**

Calibration date: **June 20, 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: 3503           | 08-Mar-22 (No. EX3-3503_Mar22)  | Mar-23                |
| 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: **Jeffrey Katzman**      Name: **Jeffrey Katzman**      Function: **Laboratory Technician**

Approved by: **Sven Kühn**      Name: **Sven Kühn**      Function: **Technical Manager**

Issued: June 27, 2022

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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 | 10 mm                      | with Spacer                      |
| Zoom Scan Resolution         | dx, dy = 4 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| Frequency                    | 3700 MHz $\pm$ 1 MHz       |                                  |

## Head TSL parameters

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 | 37.0 $\pm$ 6 % | 3.07 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  | 100 mW input power | 6.56 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 65.6 W/kg $\pm$ 19.9 % (k=2) |

|   |                    |                              |
|---|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured  | 100 mW input power | 2.38 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 23.7 W/kg $\pm$ 19.5 % (k=2) |

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

### Antenna Parameters with Head TSL

|                                      |                                 |
|--------------------------------------|---------------------------------|
| Impedance, transformed to feed point | 50.6 $\Omega$ - 10.0 j $\Omega$ |
| Return Loss                          | - 20.0 dB                       |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.137 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: 20.06.2022

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN:1006**

Communication System: UID 0 - CW; Frequency: 3700 MHz

Medium parameters used:  $f = 3700$  MHz;  $\sigma = 3.07$  S/m;  $\epsilon_r = 37$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.73, 7.73, 7.73) @ 3700 MHz; Calibrated: 08.03.2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- 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=3700MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 68.96 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 18.6 W/kg

**SAR(1 g) = 6.56 W/kg; SAR(10 g) = 2.38 W/kg**

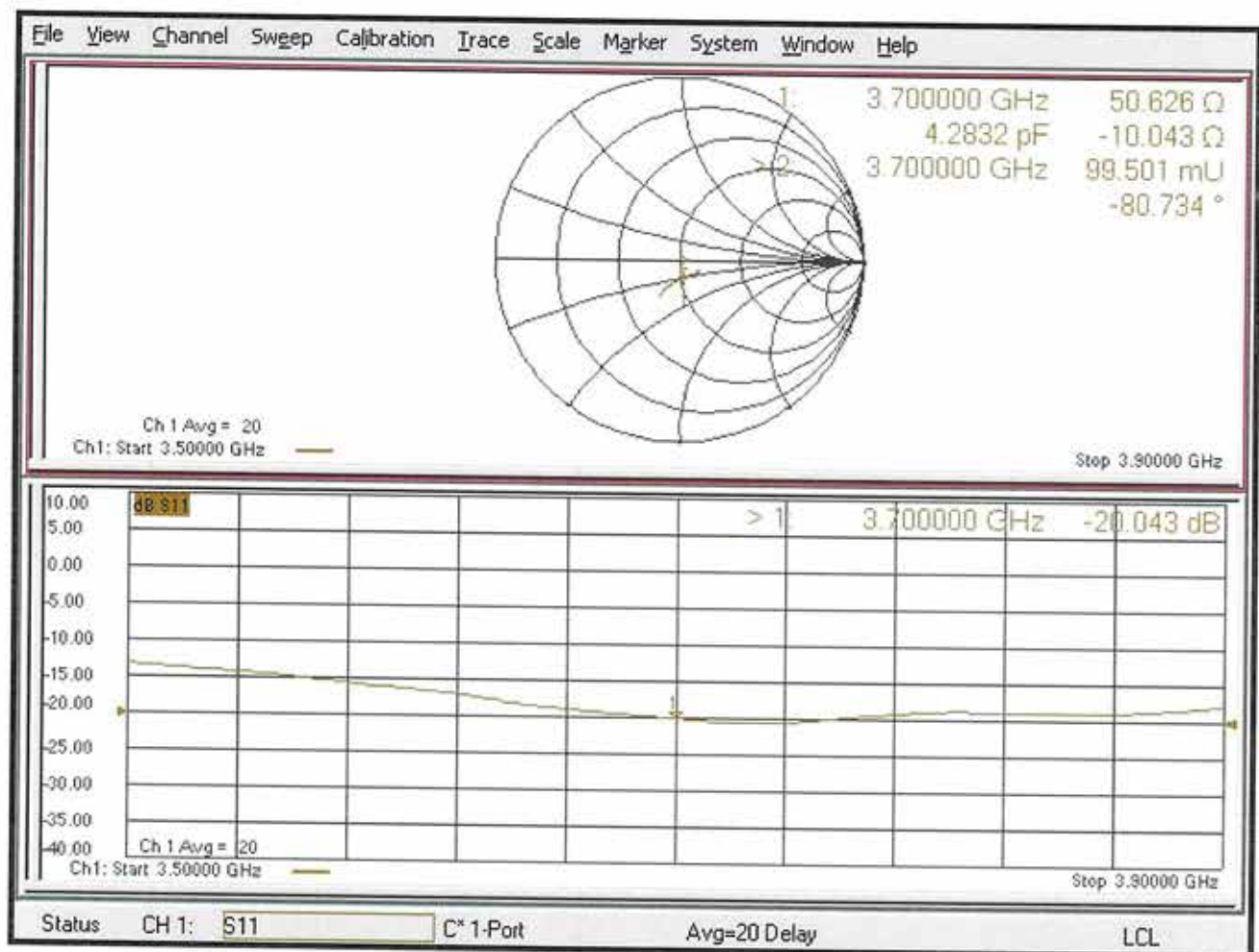
Smallest distance from peaks to all points 3 dB below = 8 mm

Ratio of SAR at M2 to SAR at M1 = 73.4%

Maximum value of SAR (measured) = 12.8 W/kg



## Impedance Measurement Plot for Head TSL



## D3700V2, serial no. 1006 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.

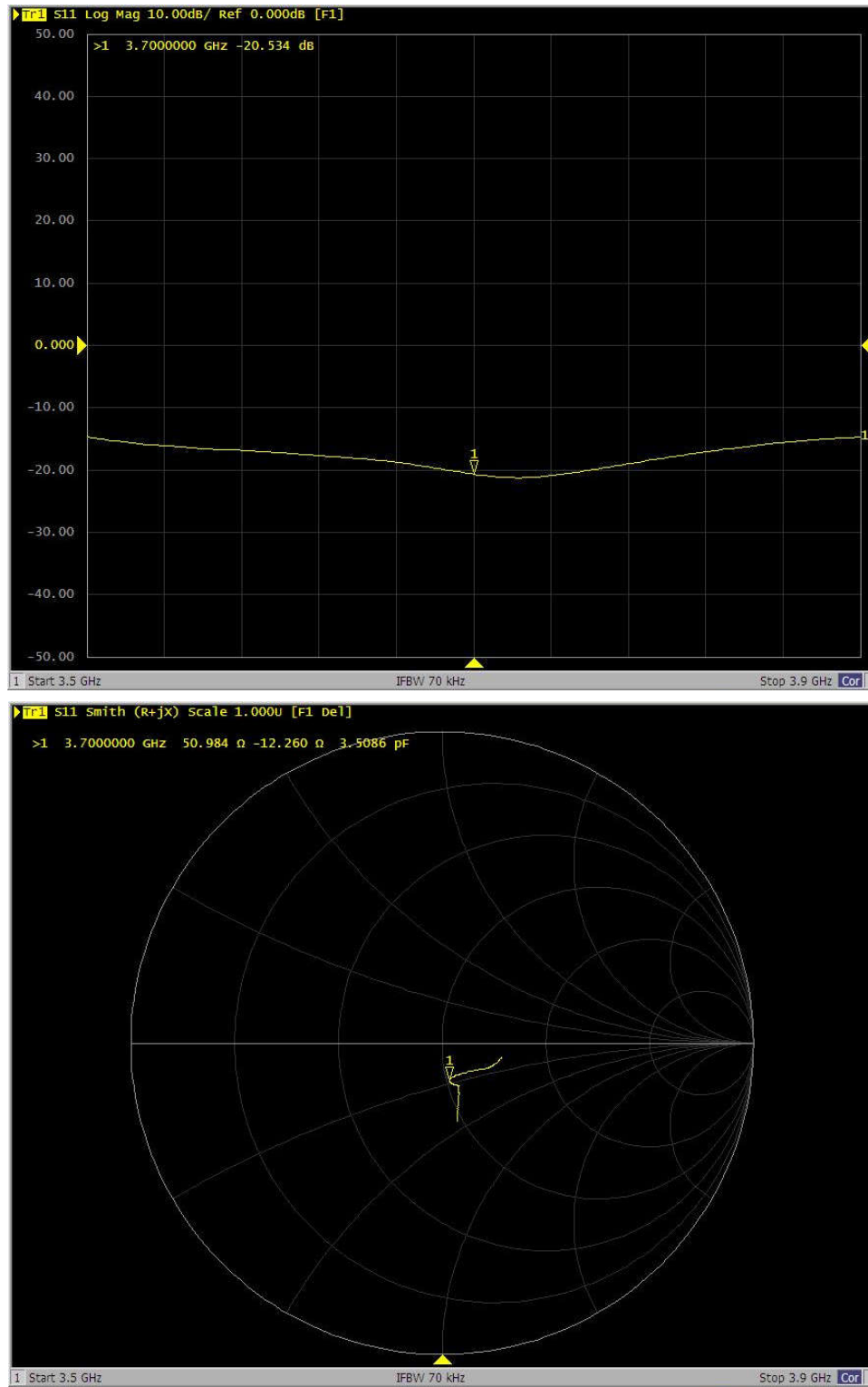
### <Justification of the extended calibration>

| D3700V2 – serial no. 1006   |                  |           |                      |             |                           |             |
|-----------------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
|                             | 3700MHZ          |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 06.20.2022<br>(Cal. Report) | -20.043          |           | 50.626               |             | -10.043                   |             |
| 06.19.2023<br>(extended)    | -20.534          | -2.45     | 50.984               | 0.358       | -12.260                   | -2.217      |

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> - D3700 V2, serial no. 1006(Data of Measurement : 06.19.2023)

3700MHz - Head







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Accreditation No.: **SCS 0108**

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

Certificate No. **D5GHzV2-1006\_May23**

## CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1006**

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

Calibration date: **May 25, 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 ( $22 \pm 3$ )°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>Krešimir Franjić</b> | Function<br>Laboratory Technician | Signature<br> |
| Approved by:   | <b>Sven Kühn</b>                | Technical Manager                 |               |

Issued: May 25, 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:**

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

**Additional Documentation:**

- c) DASY System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

## Measurement Conditions

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

|                                     |  |                                  |
|-------------------------------------|--|----------------------------------|
| <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>                    | 5250 MHz $\pm$ 1 MHz<br>5600 MHz $\pm$ 1 MHz<br>5750 MHz $\pm$ 1 MHz<br>5850 MHz $\pm$ 1 MHz |                                  |

## Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

|  | Temperature         | Permittivity   | Conductivity         |
|--|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 35.9           | 4.71 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 34.8 $\pm$ 6 % | 4.60 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL at 5250 MHz

|   |                    |  |
|---|--------------------|--|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |  |
| SAR measured  | 100 mW input power | 8.18 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>81.2 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 | 2.34 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 5600 MHz

The following parameters and calculations were applied.

|  | Temperature         | Permittivity   | Conductivity         |
|--|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 35.5           | 5.07 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 34.6 $\pm$ 6 % | 4.97 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL at 5600 MHz

|   |                    |  |
|---|--------------------|--|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |  |
| SAR measured  | 100 mW input power | 8.52 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>84.7 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 | 2.44 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>24.2 W/kg <math>\pm</math> 19.5 % (k=2)</b> |



### Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.4         | 5.22 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.4 ± 6 %   | 5.08 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Head TSL at 5750 MHz

|   |                    |                                 |
|---|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                 |
| SAR measured  | 100 mW input power | 8.15 W/kg                       |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>80.9 W/kg ± 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>22.9 W/kg ± 19.5 % (k=2)</b> |

### Head TSL parameters at 5850 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.2         | 5.32 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.2 ± 6 %   | 5.15 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Head TSL at 5850 MHz

|   |                    |                                 |
|---|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                 |
| SAR measured  | 100 mW input power | 8.24 W/kg                       |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>81.8 W/kg ± 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 | 2.34 W/kg                       |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>23.2 W/kg ± 19.5 % (k=2)</b> |

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

### Antenna Parameters with Head TSL at 5250 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 54.4 $\Omega$ - 7.5 j $\Omega$ |
| Return Loss                          | - 21.6 dB                      |

### Antenna Parameters with Head TSL at 5600 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 57.1 $\Omega$ - 7.3 j $\Omega$ |
| Return Loss                          | - 20.5 dB                      |

### Antenna Parameters with Head TSL at 5750 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 59.1 $\Omega$ + 4.1 j $\Omega$ |
| Return Loss                          | - 20.8 dB                      |

### Antenna Parameters with Head TSL at 5850 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 52.7 $\Omega$ + 0.8 j $\Omega$ |
| Return Loss                          | - 31.4 dB                      |

## General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.200 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 |
|-----------------|-------|

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1006**

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5850 MHz

Medium parameters used:  $f = 5250$  MHz;  $\sigma = 4.6$  S/m;  $\epsilon_r = 34.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5600$  MHz;  $\sigma = 4.97$  S/m;  $\epsilon_r = 34.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5750$  MHz;  $\sigma = 5.08$  S/m;  $\epsilon_r = 34.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5850$  MHz;  $\sigma = 5.15$  S/m;  $\epsilon_r = 34.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.5, 5.5, 5.5) @ 5250 MHz, ConvF(5.1, 5.1, 5.1) @ 5600 MHz, ConvF(5.08, 5.08, 5.08) @ 5750 MHz, ConvF(4.99, 4.99, 4.99) @ 5850 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: QD000P50AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

## **Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid:  $dx=4$ mm,  $dy=4$ mm,  $dz=1.4$ mm

Reference Value = 76.81 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 27.7 W/kg

**SAR(1 g) = 8.18 W/kg; SAR(10 g) = 2.34 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 71.2%

Maximum value of SAR (measured) = 18.5 W/kg

## **Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid:  $dx=4$ mm,  $dy=4$ mm,  $dz=1.4$ mm

Reference Value = 75.46 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 31.1 W/kg

**SAR(1 g) = 8.52 W/kg; SAR(10 g) = 2.44 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 68.6%

Maximum value of SAR (measured) = 19.8 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 73.42 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 31.5 W/kg

**SAR(1 g) = 8.15 W/kg; SAR(10 g) = 2.31 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.4 mm

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

Maximum value of SAR (measured) = 19.3 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5850 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 73.29 V/m; Power Drift = 0.06 dB

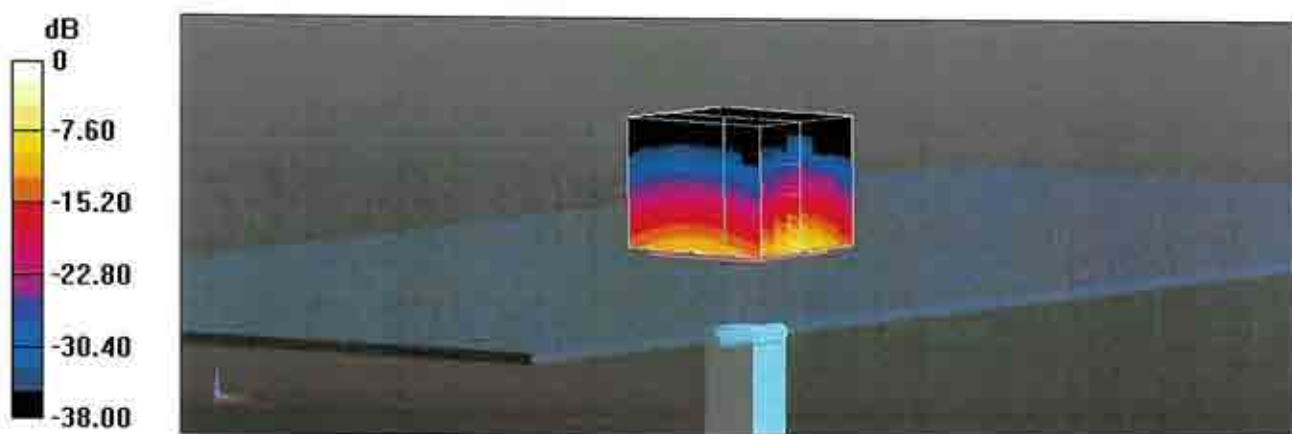
Peak SAR (extrapolated) = 32.6 W/kg

**SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.34 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.4 mm

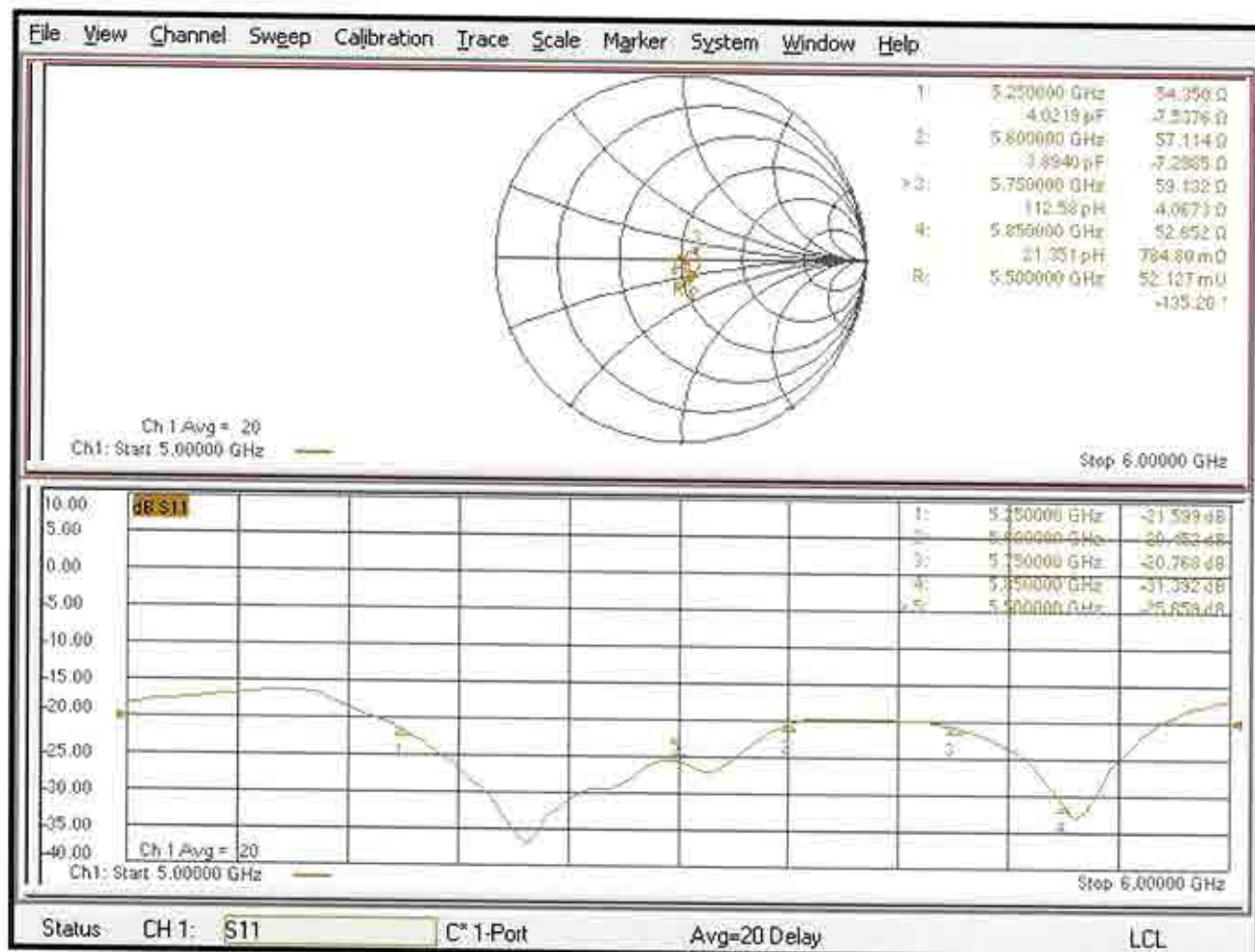
Ratio of SAR at M2 to SAR at M1 = 65.8%

Maximum value of SAR (measured) = 20.0 W/kg



0 dB = 20.0 W/kg = 13.01 dBW/kg

## Impedance Measurement Plot for Head TSL







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

Accreditation No.: **SCS 0108**

Client **Sporton**

Certificate No: **D5GHzV2-1171\_Apr21**

## CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1171**

Calibration procedure(s) **QA CAL-22.v6**  
**Calibration Procedure for SAR Validation Sources between 3-10 GHz**

Calibration date: **April 20, 2021**

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

All calibrations have been conducted in the 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         | 09-Apr-21 (No. 217-03291/03292) | Apr-22                |
| Power sensor NRP-Z91        | SN: 103244         | 09-Apr-21 (No. 217-03291)       | Apr-22                |
| Power sensor NRP-Z91        | SN: 103245         | 09-Apr-21 (No. 217-03292)       | Apr-22                |
| Reference 20 dB Attenuator  | SN: BH9394 (20k)   | 09-Apr-21 (No. 217-03343)       | Apr-22                |
| Type-N mismatch combination | SN: 310982 / 06327 | 09-Apr-21 (No. 217-03344)       | Apr-22                |
| Reference Probe EX3DV4      | SN: 3503           | 30-Dec-20 (No. EX3-3503_Dec20)  | Dec-21                |
| DAE4                        | SN: 601            | 02-Nov-20 (No. DAE4-601_Nov20)  | Nov-21                |

| 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: MY41092317 | 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-21 |

|                | Name          | Function              | Signature |
|----------------|---------------|-----------------------|-----------|
| Calibrated by: | Michael Weber | Laboratory Technician |           |
| Approved by:   | Katja Pokovic | Technical Manager     |           |

Issued: April 20, 2021

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



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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:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

|                              |  |                                  |
|------------------------------|--|----------------------------------|
| DASY Version                 | DASY5  | V52.10.4                         |
| Extrapolation                | Advanced Extrapolation   |                                  |
| Phantom                      | Modular Flat Phantom V5.0  |                                  |
| Distance Dipole Center - TSL | 10 mm  | with Spacer                      |
| Zoom Scan Resolution         | dx, dy = 4.0 mm, dz = 1.4 mm   | Graded Ratio = 1.4 (Z direction) |
| Frequency                    | 5250 MHz $\pm$ 1 MHz<br>5600 MHz $\pm$ 1 MHz<br>5750 MHz $\pm$ 1 MHz<br>5850 MHz $\pm$ 1 MHz |                                  |

## Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

|   | Temperature         | Permittivity   | Conductivity         |
|---|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 35.9           | 4.71 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 34.9 $\pm$ 6 % | 4.57 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL at 5250 MHz

|   |                    |                              |
|---|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                              |
| SAR measured  | 100 mW input power | 8.08 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 80.3 W/kg $\pm$ 19.9 % (k=2) |

|   |                    |                              |
|---|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured  | 100 mW input power | 2.32 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 23.0 W/kg $\pm$ 19.5 % (k=2) |



### Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.5         | 5.07 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.4 ± 6 %   | 4.93 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Head TSL at 5600 MHz

|   |                    |                                 |
|---|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                 |
| SAR measured  | 100 mW input power | 8.41 W/kg                       |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>83.4 W/kg ± 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 | 2.39 W/kg                       |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>23.7 W/kg ± 19.5 % (k=2)</b> |

### Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.4         | 5.22 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.1 ± 6 %   | 5.09 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Head TSL at 5750 MHz

|   |                    |                                 |
|---|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                 |
| SAR measured  | 100 mW input power | 8.11 W/kg                       |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>80.4 W/kg ± 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 | 2.30 W/kg                       |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>22.8 W/kg ± 19.5 % (k=2)</b> |

## Head TSL parameters at 5850 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.2         | 5.32 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.0 ± 6 %   | 5.19 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

## SAR result with Head TSL at 5850 MHz

|   |                    |                                 |
|---|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                 |
| SAR measured  | 100 mW input power | 8.29 W/kg                       |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>82.3 W/kg ± 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 | 2.34 W/kg                       |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>23.1 W/kg ± 19.5 % (k=2)</b> |



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

### Antenna Parameters with Head TSL at 5250 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.4 $\Omega$ - 9.7 j $\Omega$ |
| Return Loss                          | - 20.3 dB                      |

### Antenna Parameters with Head TSL at 5600 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 55.5 $\Omega$ - 4.5 j $\Omega$ |
| Return Loss                          | - 23.5 dB                      |

### Antenna Parameters with Head TSL at 5750 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 55.9 $\Omega$ - 5.8 j $\Omega$ |
| Return Loss                          | - 22.1 dB                      |

### Antenna Parameters with Head TSL at 5850 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 57.7 $\Omega$ - 6.6 j $\Omega$ |
| Return Loss                          | - 20.5 dB                      |

## General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.206 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 |
|-----------------|-------|

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1171**

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5850 MHz

Medium parameters used:  $f = 5250 \text{ MHz}$ ;  $\sigma = 4.57 \text{ S/m}$ ;  $\epsilon_r = 34.9$ ;  $\rho = 1000 \text{ kg/m}^3$ ,Medium parameters used:  $f = 5600 \text{ MHz}$ ;  $\sigma = 4.93 \text{ S/m}$ ;  $\epsilon_r = 34.4$ ;  $\rho = 1000 \text{ kg/m}^3$ ,Medium parameters used:  $f = 5750 \text{ MHz}$ ;  $\sigma = 5.09 \text{ S/m}$ ;  $\epsilon_r = 34.1$ ;  $\rho = 1000 \text{ kg/m}^3$ ,Medium parameters used:  $f = 5850 \text{ MHz}$ ;  $\sigma = 5.19 \text{ S/m}$ ;  $\epsilon_r = 34$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.5, 5.5, 5.5) @ 5250 MHz, ConvF(5.1, 5.1, 5.1) @ 5600 MHz, ConvF(5.08, 5.08, 5.08) @ 5750 MHz, ConvF(4.99, 4.99, 4.99) @ 5850 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 76.43 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 27.7 W/kg

**SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.32 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 71.2%

Maximum value of SAR (measured) = 18.2 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 77.80 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 31.0 W/kg

**SAR(1 g) = 8.41 W/kg; SAR(10 g) = 2.39 W/kg**

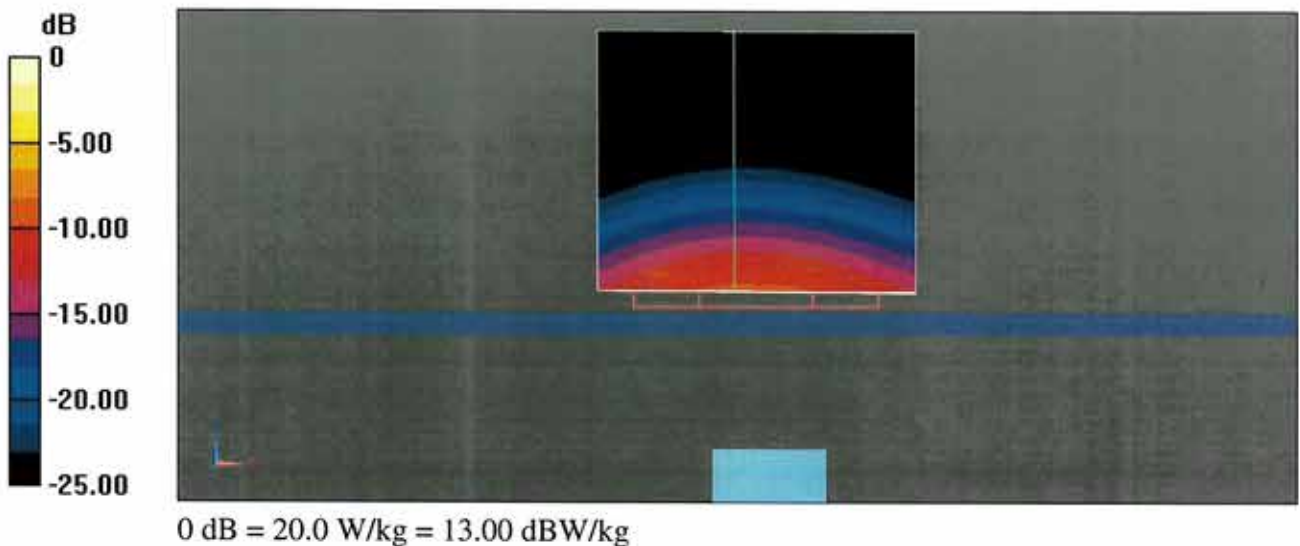
Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 68.6%

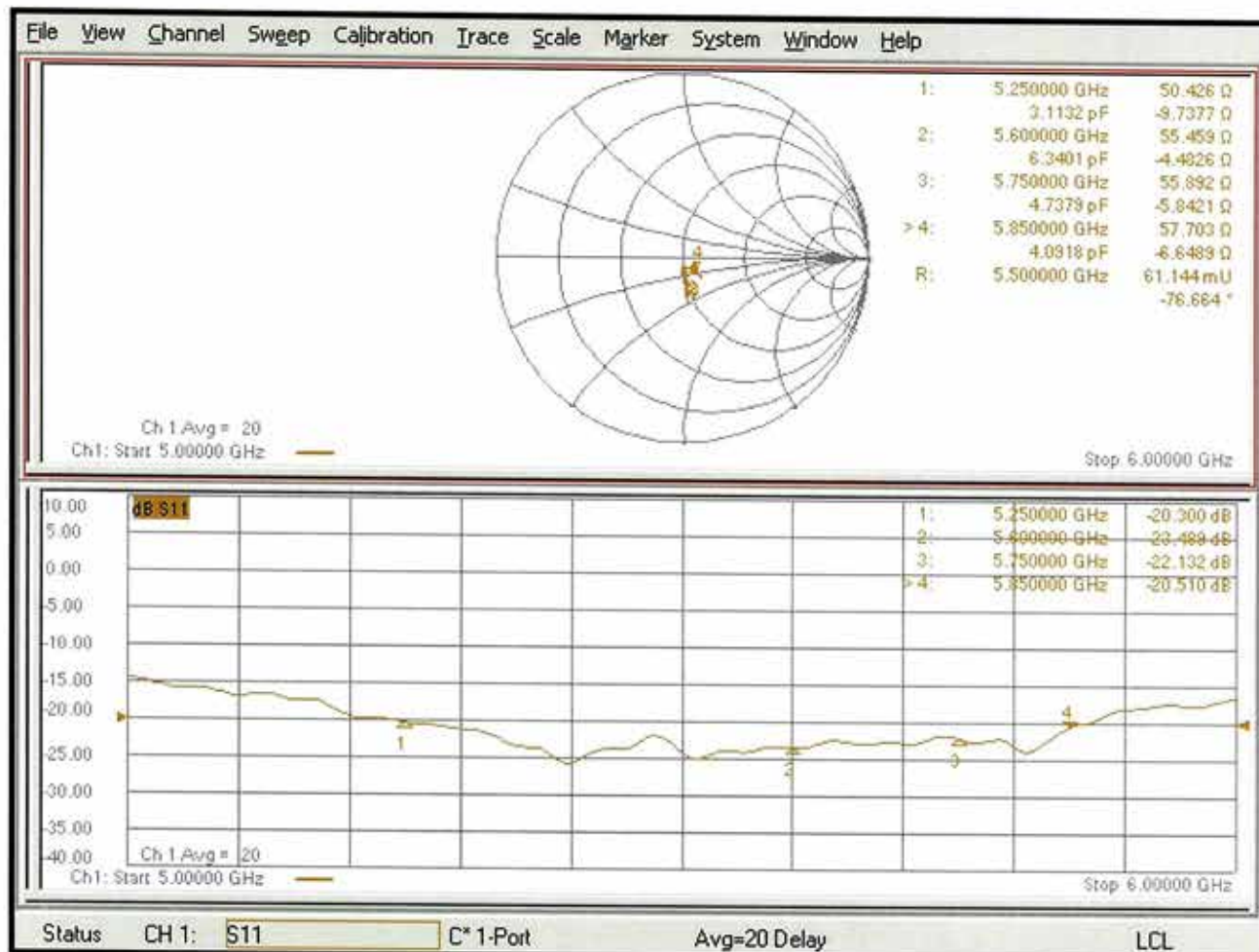
Maximum value of SAR (measured) = 19.6 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
Reference Value = 75.01 V/m; Power Drift = 0.07 dB  
Peak SAR (extrapolated) = 31.5 W/kg  
**SAR(1 g) = 8.11 W/kg; SAR(10 g) = 2.30 W/kg**  
Smallest distance from peaks to all points 3 dB below = 7.4 mm  
Ratio of SAR at M2 to SAR at M1 = 66.9%  
Maximum value of SAR (measured) = 19.2 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5850 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
Reference Value = 76.40 V/m; Power Drift = 0.06 dB  
Peak SAR (extrapolated) = 33.2 W/kg  
**SAR(1 g) = 8.29 W/kg; SAR(10 g) = 2.34 W/kg**  
Smallest distance from peaks to all points 3 dB below = 7.2 mm  
Ratio of SAR at M2 to SAR at M1 = 65.7%  
Maximum value of SAR (measured) = 20.0 W/kg



## Impedance Measurement Plot for Head TSL



## D5000V2, serial no. 1171 Extended Dipole Calibrations

Referring to KDB 865664, 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>

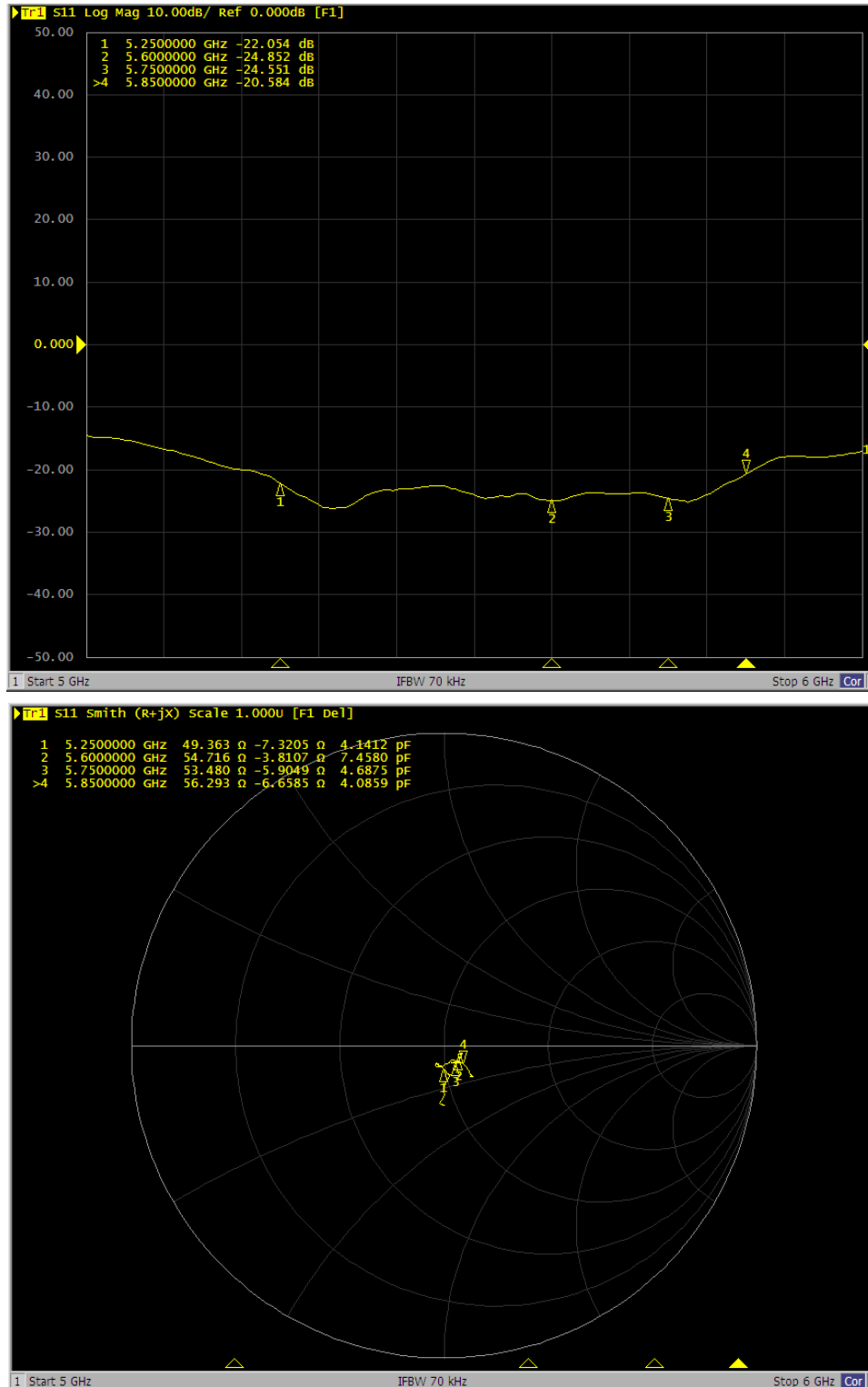
| D5000V2 – serial no. 1171   |                  |           |                      |             |                           |             |
|-----------------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
| 5250MHZ                     |                  |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 04.20.2021<br>(Cal. Report) | -20.3            |           | 50.4                 |             | -9.7                      |             |
| 04.19.2022<br>(extended)    | -22.054          | 8.6       | 49.363               | -1.037      | -7.3205                   | 2.3795      |
| 5600MHZ                     |                  |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 04.20.2021<br>(Cal. Report) | -23.5            |           | 55.5                 |             | -4.5                      |             |
| 04.19.2022<br>(extended)    | -24.852          | 5.8       | 54.716               | -0.784      | -3.8107                   | 0.6893      |
| 5750MHZ                     |                  |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 04.20.2021<br>(Cal. Report) | -22.1            |           | 55.9                 |             | -5.8                      |             |
| 04.19.2022<br>(extended)    | -24.551          | 11.1      | 53.48                | -2.42       | -5.9049                   | -0.1049     |
| 5850MHZ                     |                  |           |                      |             |                           |             |
| Date of Measurement         | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 04.20.2021<br>(Cal. Report) | -20.5            |           | 57.7                 |             | -6.6                      |             |
| 04.19.2022<br>(extended)    | -20.584          | 0.4       | 56.293               | -1.407      | -6.6585                   | -0.0585     |

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> - D5000 V2, serial no. 1171 (Data of Measurement : 04.19.2022)

5000 MHz - Head





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Multilateral Agreement for the recognition of calibration certificates

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

Certificate No. **CLA13-1011\_Jul23**

## CALIBRATION CERTIFICATE

Object **CLA13 - SN: 1011**

Calibration procedure(s) **QA CAL-15.v10**  
**Calibration Procedure for SAR Validation Sources below 700 MHz**

Calibration date: **July 10, 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 ( $22 \pm 3$ )°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: CC2552 (20x)   | 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: 3877           | 06-Jan-23 (No. EX3-3877_Jan23)    | Jan-24                 |
| DAE4                            | SN: 654            | 27-Jan-23 (No. DAE4-654_Jan23)    | Jan-24                 |
| Secondary Standards             | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter NRP2                | SN: 107193         | 08-Nov-21 (in house check Dec-22) | In house check: Dec-24 |
| Power sensor NRP-Z91            | SN: 100922         | 15-Dec-09 (in house check Dec-22) | In house check: Dec-24 |
| Power sensor NRP-Z91            | SN: 100418         | 01-Jan-04 (in house check Dec-22) | In house check: Dec-24 |
| RF generator HP 8648C           | SN: US3642U01700   | 04-Aug-99 (in house check Jun-22) | In house check: Jun-24 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-22) | In house check: Oct-24 |

Calibrated by: **Jeffrey Katzman** **Laboratory Technician**

Approved by: **Sven Kühn** **Technical Manager**

Signature

Issued: July 19, 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:**

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

**Additional Documentation:**

- c) DASY System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

## Measurement Conditions

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

|                      |                                  |                                  |
|----------------------|----------------------------------|----------------------------------|
| DASY Version         | DASY5                            | V52.10.4                         |
| Extrapolation        | Advanced Extrapolation           |                                  |
| Phantom              | ELI4 Flat Phantom                | Shell thickness: $2 \pm 0.2$ mm  |
| EUT Positioning      | Touch Position                   |                                  |
| Zoom Scan Resolution | $dx, dy = 4.0$ mm, $dz = 1.4$ mm | Graded Ratio = 1.4 (Z direction) |
| Frequency            | $13$ MHz $\pm 1$ MHz             |                                  |

## Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature         | Permittivity   | Conductivity           |
|---|---------------------|----------------|------------------------|
| Nominal Head TSL parameters             | $22.0$ °C           | 55.0           | 0.75 mho/m             |
| Measured Head TSL parameters            | $(22.0 \pm 0.2)$ °C | $53.1 \pm 6$ % | $0.72$ 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  | 1 W input power  | 0.531 W/kg                                      |
| SAR for nominal Head TSL parameters                     | normalized to 1W | <b>0.544 W/kg <math>\pm 18.4</math> % (k=2)</b> |

|   |                  |   |
|---|------------------|---|
| SAR averaged over $10$ cm <sup>3</sup> (10 g) of Head TSL | condition        |   |
| SAR measured  | 1 W input power  | 0.332 W/kg                                      |
| SAR for nominal Head TSL parameters                       | normalized to 1W | <b>0.340 W/kg <math>\pm 18.0</math> % (k=2)</b> |

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

### Antenna Parameters with Head TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $50.4 \Omega - 0.3 j\Omega$ |
| Return Loss                          | - 45.9 dB                   |

### Additional EUT Data

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



# DASY5 Validation Report for Head TSL

Date: 10.07.2023

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: CLA13; Type: CLA13; Serial: CLA13 - SN: 1011**

Communication System: UID 0 - CW; Frequency: 13 MHz

Medium parameters used:  $f = 13 \text{ MHz}$ ;  $\sigma = 0.72 \text{ S/m}$ ;  $\epsilon_r = 53.1$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(15.33, 15.33, 15.33) @ 13 MHz; Calibrated: 06.01.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 27.01.2023
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2034
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**CLA Calibration for HSL-LF Tissue/CLA-13, touch configuration, Pin=1W/Zoom Scan, dist=1.4mm (8x10x8)/Cube 0:**

Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=1.4\text{mm}$

Reference Value = 30.74 V/m; Power Drift = 0.05 dB

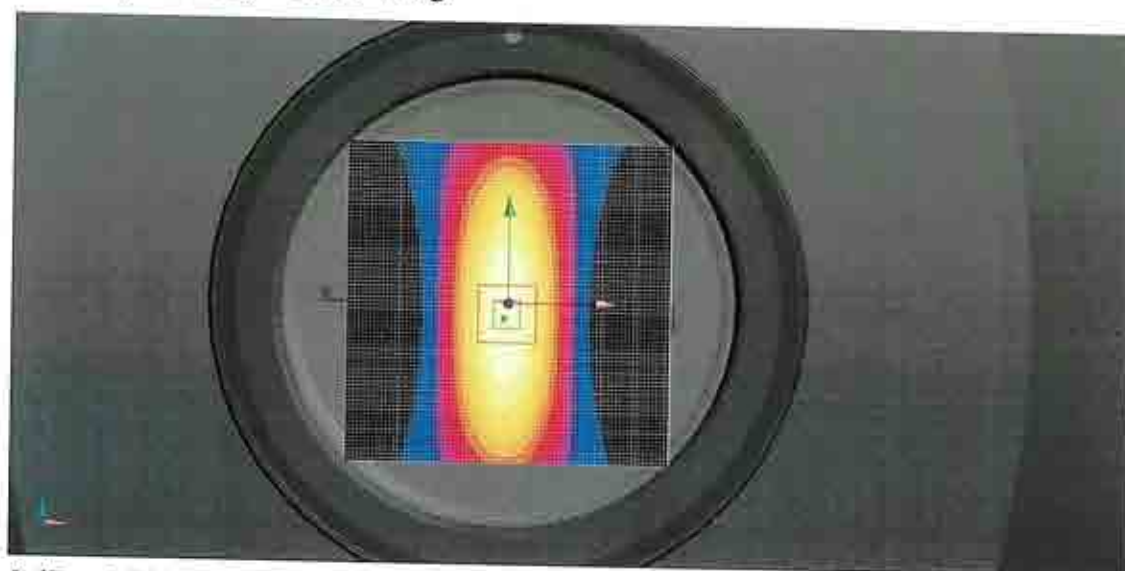
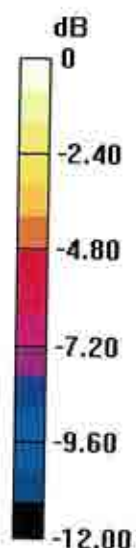
Peak SAR (extrapolated) = 1.05 W/kg

**SAR(1 g) = 0.531 W/kg; SAR(10 g) = 0.332 W/kg**

Smallest distance from peaks to all points 3 dB below = 20.9 mm

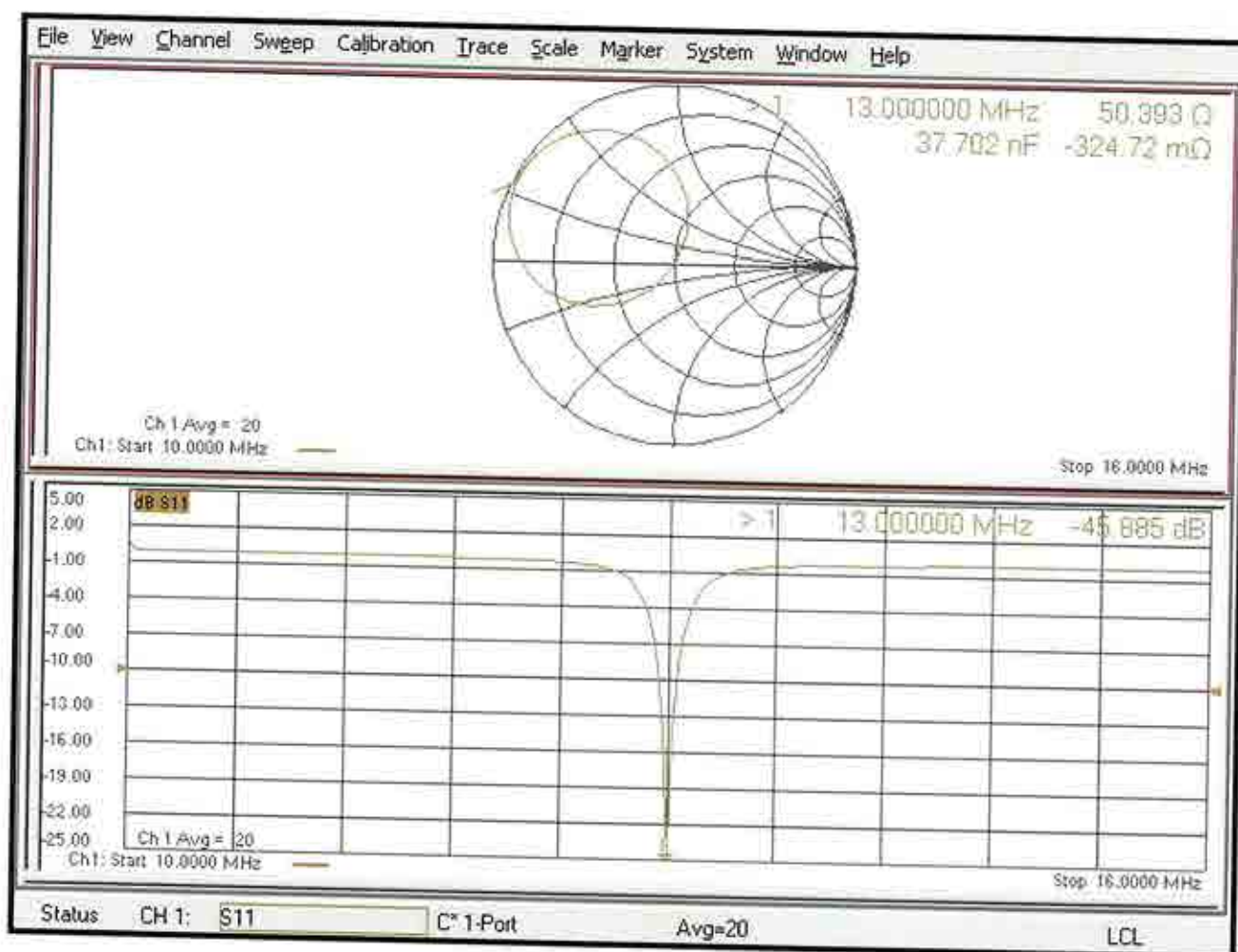
Ratio of SAR at M2 to SAR at M1 = 79.4%

Maximum value of SAR (measured) = 0.780 W/kg



0 dB = 0.780 W/kg = -1.08 dBW/kg

## Impedance Measurement Plot for Head TSL





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Accreditation No.: **SCS 0108**

Client **Sporton**  
Taoyuan City

Certificate No: **DAE4-316\_Jan24**

## CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 316**

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

Calibration date: **January 18, 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        | 29-Aug-23 (No:37421)       | Aug-24                 |
| Secondary Standards           | ID #               | Check Date (in house)      | Scheduled Check        |
| Auto DAE Calibration Unit     | SE UWS 053 AA 1001 | 27-Jan-23 (in house check) | In house check: Jan-24 |
| Calibrator Box V2.1           | SE UMS 006 AA 1002 | 27-Jan-23 (in house check) | In house check: Jan-24 |

Calibrated by: **Dominique Steffen** **Laboratory Technician** **Signature**

Approved by: **Sven Kühn** **Technical Manager**

Issued: January 18, 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 =  $6.1\mu\text{V}$  , full range = -100...+300 mV

Low Range: 1LSB =  $61\text{nV}$  , full range = -1.....+3mV

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

| Calibration Factors | X                          | Y                          | Z                          |
|---------------------|----------------------------|----------------------------|----------------------------|
| High Range          | $404.258 \pm 0.02\% (k=2)$ | $404.370 \pm 0.02\% (k=2)$ | $404.253 \pm 0.02\% (k=2)$ |
| Low Range           | $3.97129 \pm 1.50\% (k=2)$ | $3.96548 \pm 1.50\% (k=2)$ | $3.96688 \pm 1.50\% (k=2)$ |

## Connector Angle

|   |                           |
|---|---------------------------|
| Connector Angle to be used in DASY system | $349.5^\circ \pm 1^\circ$ |
|---|---------------------------|



## 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 | 200033.19                 | -3.11                        | -0.00     |
| Channel X + Input | 20011.48                  | 5.25                         | 0.03      |
| Channel X - Input | -20005.69                 | 0.73                         | -0.00     |
| Channel Y + Input | 200033.59                 | -2.75                        | -0.00     |
| Channel Y + Input | 20010.97                  | 4.86                         | 0.02      |
| Channel Y - Input | -20009.36                 | -2.91                        | 0.01      |
| Channel Z + Input | 200038.83                 | 2.72                         | 0.00      |
| Channel Z + Input | 20010.20                  | 4.10                         | 0.02      |
| Channel Z - Input | -20010.56                 | -4.07                        | 0.02      |

| Low Range         | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 2001.28                   | -0.02                        | -0.00     |
| Channel X + Input | 201.11                    | -0.04                        | -0.02     |
| Channel X - Input | -199.22                   | -0.27                        | 0.14      |
| Channel Y + Input | 2000.89                   | -0.20                        | -0.01     |
| Channel Y + Input | 200.18                    | -0.70                        | -0.35     |
| Channel Y - Input | -200.34                   | -1.44                        | 0.72      |
| Channel Z + Input | 2001.05                   | -0.16                        | -0.01     |
| Channel Z + Input | 200.03                    | -0.78                        | -0.39     |
| Channel Z - Input | -199.79                   | -1.01                        | 0.51      |

### 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                            | 6.10   | 4.41  |
|           | - 200                          | -4.17  | -5.67                                       |
| Channel Y | 200                            | -2.20  | -1.79                                       |
|           | - 200                          | -0.68  | -0.63                                       |
| Channel Z | 200                            | -14.80                                       | -15.14                                      |
|           | - 200                          | 13.81  | 13.60                                       |

### 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                | -                           | -1.63                       | -2.12                       |
| Channel Y | 200                | 4.96                        | -                           | -0.27                       |
| Channel Z | 200                | 7.14                        | 1.79                        | -                           |

#### 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 | 16018            | 15985           |
| Channel Y | 16073            | 16074           |
| Channel Z | 16151            | 15420           |

#### 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 | 0.58               | -0.45                  | 1.38                   | 0.38                      |
| Channel Y | -0.69              | -1.54                  | 0.05                   | 0.36                      |
| Channel Z | -0.29              | -1.34                  | 0.50                   | 0.37                      |

#### 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                |