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Accreditation No.: **SCS 0108**

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Client **Audix**  
New Taipei City

Certificate No. **D6.5GHzV2-1051\_Sep24**

## CALIBRATION CERTIFICATE

Object **D6.5GHzV2 - SN:1051**

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

Calibration date: **September 17, 2024**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID #             | Cal Date (Certificate No.)     | Scheduled Calibration |
|----------------------------|------------------|--------------------------------|-----------------------|
| Power sensor R&S NRP33T    | SN: 100967       | 28-Mar-24 (No. 217-04038)      | Mar-25                |
| Reference 20 dB Attenuator | SN: BH9394 (20k) | 26-Mar-24 (No. 217-04046)      | Mar-25                |
| Mismatch combination       | SN: 84224 / 360D | 28-Mar-24 (No. 217-04050)      | Mar-25                |
| Reference Probe EX3DV4     | SN: 7405         | 01-Jul-24 (No. EX3-7405_Jul24) | Jul-25                |
| DAE4                       | SN: 908          | 27-Mar-24 (No. DAE4-908_Mar24) | Mar-25                |

| Secondary Standards              | ID #          | Check Date (in house)             | Scheduled Check        |
|----------------------------------|---------------|-----------------------------------|------------------------|
| RF generator Anapico APSIN20G    | SN: 827       | 18-Dec-18 (in house check Jan-24) | In house check: Jan-25 |
| Power sensor NRP-Z23             | SN: 100169    | 10-Jan-19 (in house check Jan-24) | In house check: Jan-25 |
| Power sensor NRP-18T             | SN: 100950    | 28-Sep-22 (in house check Jan-24) | In house check: Jan-25 |
| Network Analyzer Keysight E5063A | SN:MY54504221 | 31-Oct-19 (in house check Oct-22) | In house check: Oct-24 |

|                | Name               | Function              | Signature |
|----------------|--------------------|-----------------------|-----------|
| Calibrated by: | Aidonia Georgiadou | Laboratory Technician |           |
| Approved by:   | Sven Kühn          | Technical Manager     |           |

Issued: September 18, 2024

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



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### 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.

### Additional Documentation:

- b) DASY System Handbook

### Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The 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 absorbed power density (APD):* The absorbed power density is evaluated according to Samaras T, Christ A, Kuster N, "Compliance assessment of the epithelial or absorbed power density above 6 GHz using SAR measurement systems", Bioelectromagnetics, 2021 (submitted). The additional evaluation uncertainty of 0.55 dB (rectangular distribution) is considered.

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                 | DASY6                        | V16.2                            |
| Extrapolation                | Advanced Extrapolation       |                                  |
| Phantom                      | Modular Flat Phantom         |                                  |
| Distance Dipole Center - TSL | 5 mm                         | with Spacer                      |
| Zoom Scan Resolution         | dx, dy = 3.4 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| Frequency                    | 6500 MHz $\pm$ 1 MHz         |                                  |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 34.5           | 6.07 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 34.6 $\pm$ 6 % | 6.24 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 | 29.4 W/kg                                     |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | <b>294 W/kg <math>\pm</math> 24.7 % (k=2)</b> |

|                                                       |                    |                                                |
|-------------------------------------------------------|--------------------|------------------------------------------------|
| SAR averaged over 8 cm <sup>3</sup> (8 g) of Head TSL | Condition          |                                                |
| SAR measured                                          | 100 mW input power | 6.64 W/kg                                      |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | <b>66.5 W/kg <math>\pm</math> 24.4 % (k=2)</b> |

|                                                         |                    |                                                |
|---------------------------------------------------------|--------------------|------------------------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                                                |
| SAR measured                                            | 100 mW input power | 5.45 W/kg                                      |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | <b>54.6 W/kg <math>\pm</math> 24.4 % (k=2)</b> |

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

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 51.3 $\Omega$ - 3.5 j $\Omega$ |
| Return Loss                          | - 28.7 dB                      |

### APD (Absorbed Power Density)

|                                     |                    |                                          |
|-------------------------------------|--------------------|------------------------------------------|
| APD averaged over 1 cm <sup>2</sup> | Condition          |                                          |
| APD measured                        | 100 mW input power | 294 W/m <sup>2</sup>                     |
| APD measured                        | normalized to 1W   | 2940 W/m <sup>2</sup> $\pm$ 29.2 % (k=2) |

|                                     |                    |                                          |
|-------------------------------------|--------------------|------------------------------------------|
| APD averaged over 4 cm <sup>2</sup> | condition          |                                          |
| APD measured                        | 100 mW input power | 133 W/m <sup>2</sup>                     |
| APD measured                        | normalized to 1W   | 1330 W/m <sup>2</sup> $\pm$ 28.9 % (k=2) |

\*The reported APD values have been derived using the psSAR1g and psSAR8g.

### General Antenna Parameters and Design

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

DASY6 Validation Report for Head TSL

Measurement Report for D6.5GHz-1051, UID 0 -, Channel 6500 (6500.0MHz)

Device under Test Properties

| Name, Manufacturer | Dimensions [mm]    | IMEI     | DUT Type |
|--------------------|--------------------|----------|----------|
| D6.5GHz            | 16.0 x 6.0 x 300.0 | SN: 1051 | -        |

Exposure Conditions

| Phantom<br>Section, TSL | Position, Test<br>Distance<br>[mm] | Band | Group,<br>UID | Frequency<br>[MHz] | Conversion<br>Factor | TSL Cond.<br>[S/m] | TSL<br>Permittivity |
|-------------------------|------------------------------------|------|---------------|--------------------|----------------------|--------------------|---------------------|
| Flat, HSL               | 5.00                               | Band | CW,           | 6500               | 5.14                 | 6.24               | 34.6                |

Hardware Setup

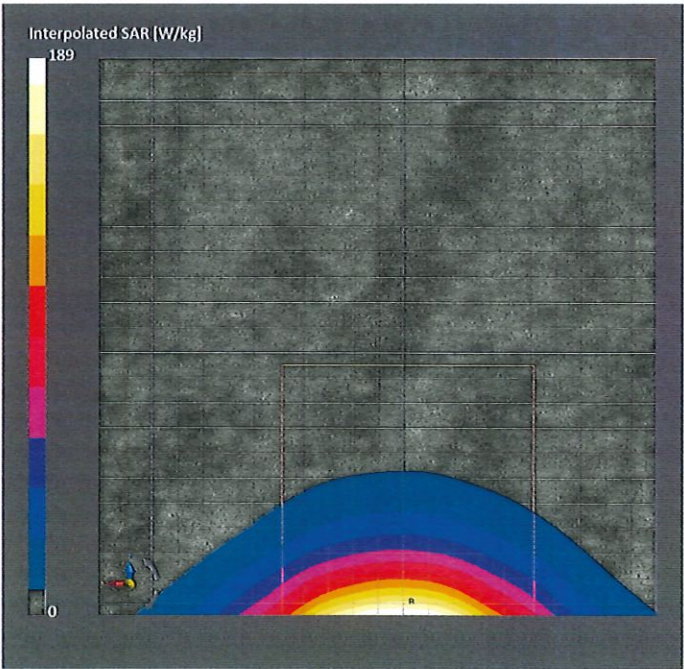
| Phantom                | TSL             | Probe, Calibration Date     | DAE, Calibration Date  |
|------------------------|-----------------|-----------------------------|------------------------|
| MFP V8.0 Center - 1182 | HBBL600-10000V6 | EX3DV4 - SN7405, 2024-07-01 | DAE4 Sn908, 2024-03-27 |

Scan Setup

|                     | Zoom Scan          |
|---------------------|--------------------|
| Grid Extents [mm]   | 22.0 x 22.0 x 22.0 |
| Grid Steps [mm]     | 3.4 x 3.4 x 1.4    |
| Sensor Surface [mm] | 1.4                |
| Graded Grid         | Yes                |
| Grading Ratio       | 1.4                |
| MAIA                | N/A                |
| Surface Detection   | VMS + 6p           |
| Scan Method         | Measured           |

Measurement Results

|                     | Zoom Scan         |
|---------------------|-------------------|
| Date                | 2024-09-17, 13:07 |
| psSAR1g [W/Kg]      | 29.4              |
| psSAR8g [W/Kg]      | 6.64              |
| psSAR10g [W/Kg]     | 5.45              |
| Power Drift [dB]    | -0.02             |
| Power Scaling       | Disabled          |
| Scaling Factor [dB] |                   |
| TSL Correction      | No correction     |
| M2/M1 [%]           | 50.4              |
| Dist 3dB Peak [mm]  | 4.6               |



# Impedance Measurement Plot for Head TSL

