Page 1 of 101



**Produkte Products** 

## **Calibration Certificate of Probe and Dipole**

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





Service suisse d'étalonnage Servizio svizzero di taratura

Swiss Calibration Service

Accreditation No.: SCS 0108

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

| Power meter NRP   | ALIBRATION C                  | ERTIFICATE                  |                                    |                        |
|---|-------------------------------|-----------------------------|------------------------------------|------------------------|
| Calibration procedure for dipole validation kits above 700 MHz  Calibration date:  June 25, 2018  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 certifical All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.  Calibration Equipment used (M&TE critical for calibration)  Primary Standards  ID #  | ject                          | D750V3 - SN:110             | 09                                 |                        |
| This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.  Calibration Equipment used (M&TE critical for calibration)  Primary Standards  ID # Cal Date (Certificate No.) Scheduled Calibration SN: 104778 04-Apr-18 (No. 217-02672/02673) Apr-19 Power meter NRP SN: 103244 04-Apr-18 (No. 217-02672) Apr-19 Power sensor NRP-Z91 SN: 103244 04-Apr-18 (No. 217-02673) Apr-19 Power sensor NRP-Z91 SN: 103245 04-Apr-18 (No. 217-02673) Apr-19 Power sensor NRP-Z91 SN: 103245 04-Apr-18 (No. 217-02682) Apr-19 Power sensor NRP-Z91 SN: 5058 (20k) 04-Apr-18 (No. 217-02682) Apr-19 Power SP SN: 5058 (20k) 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5058 (20k) 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5044 SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5048 SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 (No. 217-02673) Apr-19 Power SP SN: 5047.2 / 06327 04-Apr-18 | libration procedure(s)        |                             | dure for dipole validation kits ab | oove 700 MHz           |
| The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certifical All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.  Calibration Equipment used (M&TE critical for calibration)  Primary Standards  ID # Cal Date (Certificate No.) Scheduled Calibration)  Prower meter NRP  SN: 104778 04-Apr-18 (No. 217-02672/02673) Apr-19  Power sensor NRP-Z91 SN: 103244 04-Apr-18 (No. 217-02672) Apr-19  Power sensor NRP-Z91 SN: 103245 04-Apr-18 (No. 217-02672) Apr-19  Reference 20 dB Attenuator SN: 5058 (20k) 04-Apr-18 (No. 217-02682) Apr-19  Fige-N mismatch combination SN: 5047.2 / 06327 04-Apr-18 (No. 217-02682) Apr-19  Reference Probe EX3DV4 SN: 7349 30-Dec-17 (No. EX3-7349_Dec17) Dec-18  DAE4 SN: 601 26-Oct-17 (No. DAE4-601_Oct17) Oct-18  Secondary Standards  ID # Check Date (in house) Scheduled Check Power sensor HP 8481A SN: US37292783 07-Oct-15 (in house check Oct-16) In house check: Power sensor HP 8481A SN: MY4109221 15-Jun-15 (in house check Oct-16) In house check: Network Analyzer HP 8753E SN: US37390585 18-Oct-01 (in house check Oct-17) In house check: Network Analyzer HP 8753E N: US37390585 18-Oct-01 (in house check Oct-17) In house check: Name Function Signature  | libration date:               | June 25, 2018               |                                    |                        |
| Calibration   Calibration   Calibration   Calibration   |                               |                             |                                    |                        |
| Primary Standards   ID # Cal Date (Certificate No.)   Scheduled Calibration   |                               | 98 000 200 as 1200 to 15    |                                    |                        |
| SN: 104778   O4-Apr-18 (No. 217-02672/02673)   Apr-19   | libration Equipment used (M&T | E critical for calibration) |                                    |                        |
| Power sensor NRP-Z91 SN: 103244 04-Apr-18 (No. 217-02672) Apr-19 Power sensor NRP-Z91 SN: 103245 04-Apr-18 (No. 217-02673) Apr-19 Reference 20 dB Attenuator SN: 5058 (20k) 04-Apr-18 (No. 217-02682) Apr-19 Reference Probe EX3DV4 SN: 5058 (20k) 04-Apr-18 (No. 217-02683) Apr-19 Reference Probe EX3DV4 SN: 7349 30-Dec-17 (No. EX3-7349_Dec17) Dec-18 DAE4 SN: 601 26-Oct-17 (No. DAE4-601_Oct17) Oct-18 Recondary Standards ID # Check Date (in house) Scheduled Check Power meter EPM-442A SN: GB37480704 07-Oct-15 (in house check Oct-16) In house check: Power sensor HP 8481A SN: MY41092317 07-Oct-15 (in house check Oct-16) In house check: RF generator R&S SMT-06 SN: 100972 15-Jun-15 (in house check Oct-16) In house check: Network Analyzer HP 8753E SN: US37390585 18-Oct-01 (in house check Oct-17) In house check: Name Function Signature  | mary Standards                | ID#                         | Cal Date (Certificate No.)         | Scheduled Calibration  |
| SN: 103245   O4-Apr-18 (No. 217-02673)   Apr-19     Reference 20 dB Attenuator   SN: 5058 (20k)   O4-Apr-18 (No. 217-02682)   Apr-19     Reference Probe EX3DV4   SN: 5047.2 / 06327   O4-Apr-18 (No. 217-02683)   Apr-19     Reference Probe EX3DV4   SN: 7349   30-Dec-17 (No. EX3-7349_Dec17)   Dec-18     OAE4   SN: 601   26-Oct-17 (No. DAE4-601_Oct17)   Oct-18     Recondary Standards   ID #   Check Date (in house)   Scheduled Check     Cower meter EPM-442A   SN: GB37480704   O7-Oct-15 (in house check Oct-16)   In house check: Ower sensor HP 8481A   SN: US37292783   O7-Oct-15 (in house check Oct-16)   In house check: Ower sensor HP 8481A   SN: MY41092317   O7-Oct-15 (in house check Oct-16)   In house check: RF generator R&S SMT-06   SN: 100972   15-Jun-15 (in house check Oct-16)   In house check: Retwork Analyzer HP 8753E   SN: US37390585   18-Oct-01 (in house check Oct-17)   In house check: Name   Function   Signature   | wer meter NRP                 | SN: 104778                  | 04-Apr-18 (No. 217-02672/02673)    | Apr-19                 |
| SN: 5058 (20k)  | wer sensor NRP-Z91            | SN: 103244                  | 04-Apr-18 (No. 217-02672)          | Apr-19                 |
| SN: 5047.2 / 06327  | wer sensor NRP-Z91            | SN: 103245                  | 04-Apr-18 (No. 217-02673)          | Apr-19                 |
| SN: 7349   30-Dec-17 (No. EX3-7349_Dec17)   Dec-18     SN: 601   26-Oct-17 (No. DAE4-601_Oct17)   Oct-18     Solution   Solution   Signature  | ference 20 dB Attenuator      | SN: 5058 (20k)              | 04-Apr-18 (No. 217-02682)          | Apr-19                 |
| SN: 601   26-Oct-17 (No. DAE4-601_Oct17)   Oct-18   |                               |                             |                                    |                        |
| D# Check Date (in house)   Scheduled Check Date (in house check Oct-16)   In house check: Dower sensor HP 8481A   SN: US37292783   O7-Oct-15 (in house check Oct-16)   In house check: Dower sensor HP 8481A   SN: MY41092317   O7-Oct-15 (in house check Oct-16)   In house check: Date of the c  |                               |                             |                                    |                        |
| Power meter EPM-442A         SN: GB37480704         07-Oct-15 (in house check Oct-16)         In house check:           Power sensor HP 8481A         SN: US37292783         07-Oct-15 (in house check Oct-16)         In house check:           Power sensor HP 8481A         SN: MY41092317         07-Oct-15 (in house check Oct-16)         In house check:           RF generator R&S SMT-06         SN: 100972         15-Jun-15 (in house check Oct-16)         In house check:           Network Analyzer HP 8753E         SN: US37390585         18-Oct-01 (in house check Oct-17)         In house check:           Name         Function         Signature   | E4                            | SN: 601                     | 26-Oct-17 (No. DAE4-601_Oct17)     | Oct-18                 |
| Power sensor HP 8481A SN: US37292783 07-Oct-15 (in house check Oct-16) In house check: Ocwer sensor HP 8481A SN: MY41092317 07-Oct-15 (in house check Oct-16) In house check: RF generator R&S SMT-06 SN: 100972 15-Jun-15 (in house check Oct-16) In house check: Network Analyzer HP 8753E SN: US37390585 18-Oct-01 (in house check Oct-17) In house check: Name Function Signature   | condary Standards             | ID#                         | Check Date (in house)              | Scheduled Check        |
| Power sensor HP 8481A SN: MY41092317 07-Oct-15 (in house check Oct-16) In house check:  RF generator R&S SMT-06 SN: 100972 15-Jun-15 (in house check Oct-16) In house check:  Network Analyzer HP 8753E SN: US37390585 18-Oct-01 (in house check Oct-17) In house check:  Name Function Signature   | wer meter EPM-442A            | SN: GB37480704              | 07-Oct-15 (in house check Oct-16)  | In house check: Oct-18 |
| RF generator R&S SMT-06 SN: 100972 15-Jun-15 (in house check Oct-16) In house check:  Network Analyzer HP 8753E SN: US37390585 18-Oct-01 (in house check Oct-17) In house check:  Name Function Signature   | wer sensor HP 8481A           | SN: US37292783              | 07-Oct-15 (in house check Oct-16)  | In house check: Oct-18 |
| Network Analyzer HP 8753E SN: US37390585 18-Oct-01 (in house check Oct-17) In house check:  Name Function Signature   | wer sensor HP 8481A           | SN: MY41092317              | 07-Oct-15 (in house check Oct-16)  | In house check: Oct-18 |
| Name Function Signature   | generator R&S SMT-06          | SN: 100972                  | 15-Jun-15 (in house check Oct-16)  | In house check: Oct-18 |
|   | twork Analyzer HP 8753E       | SN: US37390585              | 18-Oct-01 (in house check Oct-17)  | In house check: Oct-18 |
| Calibrated by: Jeton Kastrati Laboratory Technician   |                               | Name                        | Function                           | Signature              |
|   | librated by:                  | Jeton Kastrati              | Laboratory Technician (            | Je Ve                  |
| Approved by   | proved by                     | Ketia Dekaria               | Toological Manager                 | 111111                 |
| Approved by: Technical Manager Technical Manager  | proved by:                    | каца Рокоуіс                | i ecnnicai manager                 | ex as                  |

Certificate No: D750V3-1109\_Jun18

Page 1 of 8

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

#### 60415352 002



Produkte Products

Page 2 of 101

### **Calibration Laboratory of**

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





S Schwelzerlscher Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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

#### Glossary:

TSL tissue simulating liquid

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

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

- a) 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
- EC 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
- c) 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
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

e) 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%.

## 60415352 002



Produkte **Products** 

Page 3 of 101

### **Measurement Conditions**

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

| DASY Version                 | DASY5                  | V52.10.1    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 15 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 750 MHz ± 1 MHz        |             |

Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 41.9         | 0.89 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 40.9 ± 6 %   | 0.90 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 2.06 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 8.13 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 1.34 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 5.30 W/kg ± 16.5 % (k=2) |

Body TSL parameters
The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 55.5         | 0.96 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 55.2 ± 6 %   | 0.96 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | 22223        |                  |

## SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 2.13 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 8.51 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 1.41 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 5.64 W/kg ± 16.5 % (k=2) |

### 60415352 002



Produkte Products

Page 4 of 101

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

#### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 55.2 Ω - 1.7 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 25.6 dB       |

### **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 49.3 Ω - 5.4 jΩ |  |
|--------------------------------------|-----------------|--|
| Return Loss                          | - 25.2 dB       |  |

### **General Antenna Parameters and Design**

| Electrical Delay (one direction) | 1.032 ns |
|----------------------------------|----------|

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

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

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

#### **Additional EUT Data**

| Manufactured by | SPEAG            |
|-----------------|------------------|
| Manufactured on | January 21, 2014 |



**Produkte Products** 

Page 5 of 101

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

Date: 25.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1109

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

Medium parameters used: f = 750 MHz;  $\sigma = 0.9 \text{ S/m}$ ;  $\varepsilon_r = 40.9$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY52 Configuration:

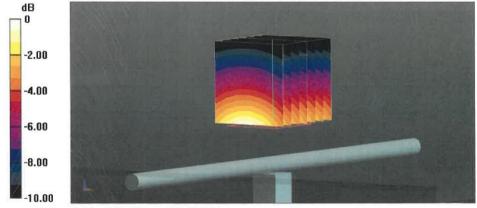
- Probe: EX3DV4 SN7349; ConvF(10.22, 10.22, 10.22) @ 750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 58.62 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.07 W/kg

SAR(1 g) = 2.06 W/kg; SAR(10 g) = 1.34 W/kgMaximum value of SAR (measured) = 2.72 W/kg



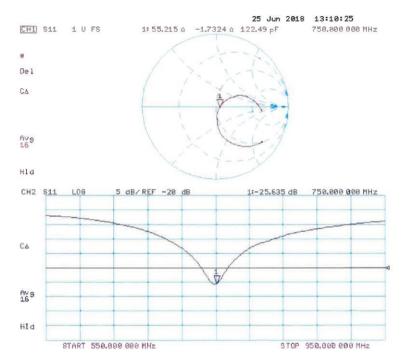
0 dB = 2.72 W/kg = 4.35 dBW/kg

Page 6 of 101



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## Impedance Measurement Plot for Head TSL





**Produkte Products** 

Page 7 of 101

#### **DASY5 Validation Report for Body TSL**

Date: 25.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1109

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

Medium parameters used: f = 750 MHz;  $\sigma = 0.96 \text{ S/m}$ ;  $\varepsilon_r = 55.2$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19) @ 750 MHz; Calibrated: 30.12.2017

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 26.10.2017

Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005

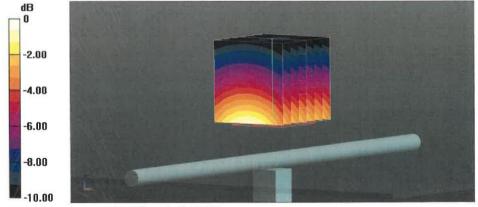
DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 57.88 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 3.18 W/kg

SAR(1 g) = 2.13 W/kg; SAR(10 g) = 1.41 W/kgMaximum value of SAR (measured) = 2.84 W/kg



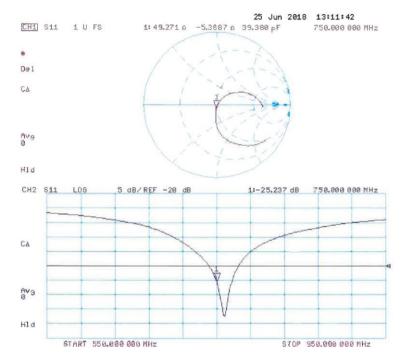
0 dB = 2.84 W/kg = 4.53 dBW/kg

Page 8 of 101



Produkte **Products** 

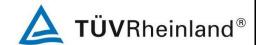
## Impedance Measurement Plot for Body TSL



Certificate No: D750V3-1109\_Jun18

# Page 9 of 101

60415352 002

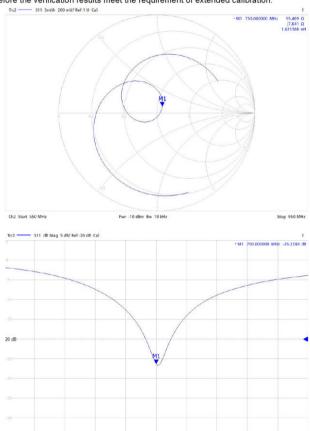


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## Justification for Extended SAR Dipole Calibrations

| Dipole | Date of<br>Measurement | Return Loss<br>(dB) | Delta (%) | Impedance | Delta(ohm) |
|--------|------------------------|---------------------|-----------|-----------|------------|
| Head   | June 25, 2018          | -25.6               | -         | 55.2      | -          |
| 750MHz | June 20,2019           | -26.2               | 2.34      | 55.5      | 0.3        |

Note: The return loss is <-20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification results meet the requirement of extended calibration.



Pwr -10 dBm Bw 10 kHz

Stop 950 MHz

Ch2 Stort 550 MHz

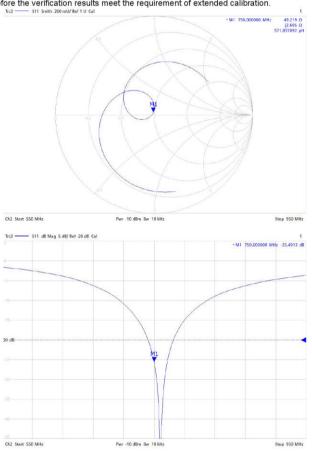
Page 10 of 101



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## Justification for Extended SAR Dipole Calibrations

| Dipole | Date of<br>Measurement | Return Loss<br>(dB) | Delta (%) | Impedance | Delta(ohm) |
|--------|------------------------|---------------------|-----------|-----------|------------|
| Body   | June 25, 2018          | -25.2               | -         | 49.3      | =          |
| 750MHz | June 20,2019           | -25.5               | 1.19      | 49.2      | -0.1       |



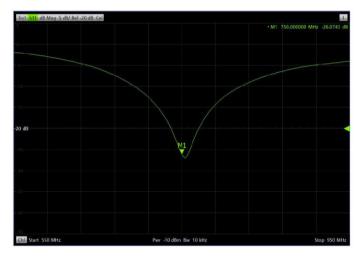
60415352 002 Page 11 of 101

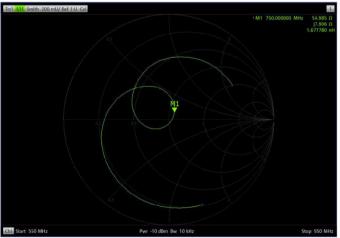


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## Justification for Extended SAR Dipole Calibrations

| Dipole | Date of<br>Measurement | Return Loss<br>(dB) | Delta (%) | Impedance<br>(ohm) | Delta<br>(ohm) |
|--------|------------------------|---------------------|-----------|--------------------|----------------|
| Head   | Jun 25, 2018           | -25.6               | -         | 55.2               | ¥1             |
| 750MHz | May 22, 2020           | -26.1               | 1.84      | 55.0               | -0.22          |





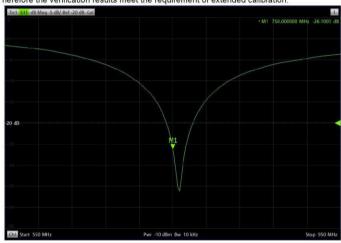
Page 12 of 101

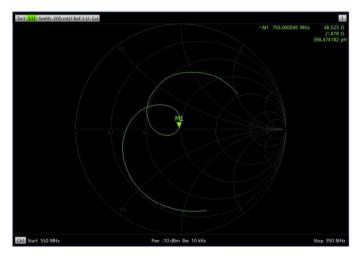


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## Justification for Extended SAR Dipole Calibrations

| Dipole | Date of<br>Measurement | Return Loss<br>(dB) | Delta (%) | Impedance(ohm) | Delta(ohm) |
|--------|------------------------|---------------------|-----------|----------------|------------|
| Body   | Jun 25, 2018           | -25.2               | ~         | 49.3           | (40)       |
| 750MHz | May 22, 2020           | -26.1               | 3.57      | 48.5           | -0.78      |





#### 60415352 002



**Produkte Products** 

Page 13 of 101

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





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

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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

Certificate No: D835V2-4d242\_Jun18

#### TüV China (Auden) **CALIBRATION CERTIFICATE** D835V2 - SN:4d242 Object QA CAL-05.v10 Calibration procedure(s) Calibration procedure for dipole validation kits above 700 MHz A CARLON STATE Calibration date: June 06, 2018 + 4 This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%. Calibration Equipment used (M&TE critical for calibration) ID# Primary Standards Cal Date (Certificate No.) Scheduled Calibration SN: 104778 Power meter NRP 04-Apr-18 (No. 217-02672/02673) Apr-19 Power sensor NRP-Z91 SN: 103244 04-Apr-18 (No. 217-02672) Apr-19 Power sensor NRP-791 SN: 103245 04-Apr-18 (No. 217-02673) Apr-19 Reference 20 dB Attenuator SN: 5058 (20k) 04-Apr-18 (No. 217-02682) Apr-19 Type-N mismatch combination SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Reference Probe EX3DV4 SN: 7349 30-Dec-17 (No. EX3-7349\_Dec17) Dec-18 DAE4 SN: 601 26-Oct-17 (No. DAE4-601\_Oct17) Oct-18 Secondary Standards ID# Check Date (in house) Scheduled Check Power meter EPM-442A SN: GB37480704 07-Oct-15 (in house check Oct-16) In house check: Oct-18 Power sensor HP 8481A SN: US37292783 07-Oct-15 (in house check Oct-16) In house check: Oct-18 Power sensor HP 8481A SN: MY41092317 07-Oct-15 (in house check Oct-16) In house check: Oct-18 RF generator R&S SMT-06 SN: 100972 15-Jun-15 (in house check Oct-16) In house check: Oct-18 Network Analyzer HP 8753E SN: US37390585 18-Oct-01 (in house check Oct-17) In house check: Oct-18 Name Function Signature Laboratory Technician Calibrated by: 対し、または、いい、強力をよって対する。 Katja Pokovic Technical Manager Approved by: inter have to see a side of the Issued: June 6, 2018 This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D835V2-4d242\_Jun18 Page 1 of 8

#### 60415352 002



Produkte Products

Page 14 of 101

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Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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

#### Glossary:

TSL

tissue simulating liquid

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

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

- a) 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
- b) 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
- c) 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
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### **Additional Documentation:**

e) 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%.

## 60415352 002



Produkte **Products** 

## Page 15 of 101

### **Measurement Conditions**

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

| DASY Version                 | DASY5                  | V52.10.1    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 15 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, $dy$ , $dz = 5 mm$ |             |
| Frequency                    | 835 MHz ± 1 MHz        |             |

Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 41.5         | 0.90 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 40.8 ± 6 %   | 0.92 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 2.35 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 9.21 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 1.52 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 5.99 W/kg ± 16.5 % (k=2) |

## **Body TSL parameters**

o parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 55.2         | 0.97 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 54.6 ± 6 %   | 0.99 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        |              |                  |

## SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 2.44 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 9.59 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 1.60 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 6.31 W/kg ± 16.5 % (k=2) |

### 60415352 002



Produkte Products

Page 16 of 101

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

#### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 51.0 Ω - 4.2 jΩ |  |  |
|--------------------------------------|-----------------|--|--|
| Return Loss                          | - 27.3 dB       |  |  |

### Antenna Parameters with Body TSL

| Impedance, transformed to feed point | 46.8 Ω - 6.5 jΩ |  |
|--------------------------------------|-----------------|--|
| Return Loss                          | - 22.5 dB       |  |

#### General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.395 ns |
|----------------------------------|----------|
|----------------------------------|----------|

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

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

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

### **Additional EUT Data**

| Manufactured by | SPEAG         |  |
|-----------------|---------------|--|
| Manufactured on | June 02, 2017 |  |



**Produkte Products** 

Page 17 of 101

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

Date: 06.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d242

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

Medium parameters used: f = 835 MHz;  $\sigma = 0.92$  S/m;  $\varepsilon_r = 40.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

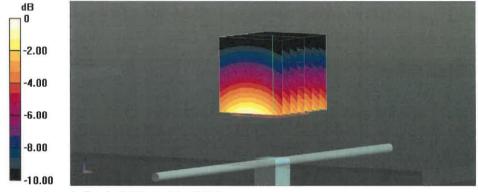
#### DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(9.9, 9.9, 9.9) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 61.68 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 3.60 W/kg

SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.52 W/kgMaximum value of SAR (measured) = 3.17 W/kg



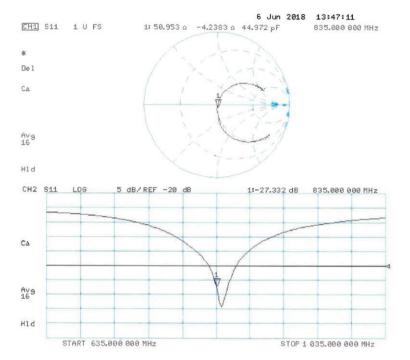
0 dB = 3.17 W/kg = 5.01 dBW/kg

60415352 002 Page 18 of 101



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## Impedance Measurement Plot for Head TSL





Page 19 of 101



**Produkte Products** 

### **DASY5 Validation Report for Body TSL**

Date: 06.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

## DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d242

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

Medium parameters used: f = 835 MHz;  $\sigma = 0.99$  S/m;  $\varepsilon_r = 54.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

#### DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.05, 10.05, 10.05) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

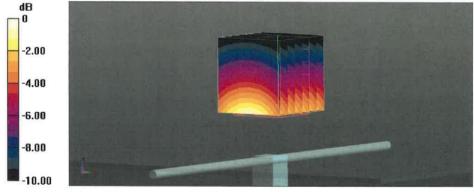
### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 60.80 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 3.63 W/kg

SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.6 W/kg

Maximum value of SAR (measured) = 3.24 W/kg



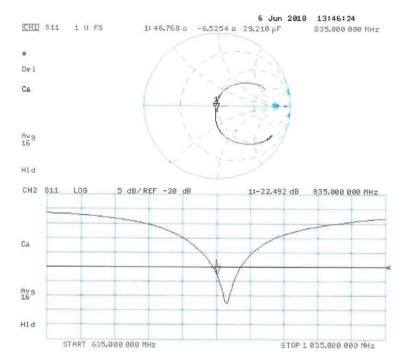
0 dB = 3.24 W/kg = 5.11 dBW/kg

60415352 002 Page 20 of 101



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## Impedance Measurement Plot for Body TSL



Page 21 of 101

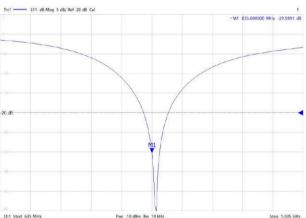


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## Justification for Extended SAR Dipole Calibrations

| Dipole | Date of<br>Measurement | Return Loss<br>(dB) | Delta (%) | Impedance | Delta(ohm) |
|--------|------------------------|---------------------|-----------|-----------|------------|
| Head   | June 06, 2018          | -27.3               | -         | 51.0      | -          |
| 835MHz | June 03, 2019          | -30.0               | 9.89      | 47.4      | -3.6       |





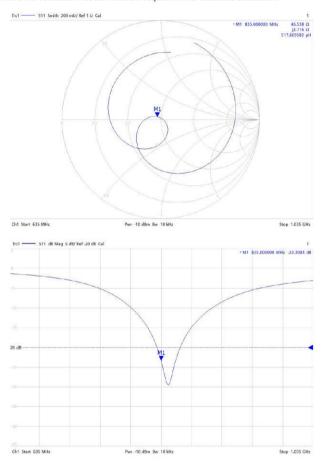
## 60415352 002 Page 22 of 101



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## Justification for Extended SAR Dipole Calibrations

| Dipole | Date of<br>Measurement | Return Loss<br>(dB) | Delta (%) | Impedance | Delta(ohm) |
|--------|------------------------|---------------------|-----------|-----------|------------|
| Body   | June 06, 2018          | -22.5               | -         | 46.8      | -          |
| 835MHz | June 03, 2019          | -23.3               | 3.56      | 46.5      | -0.3       |



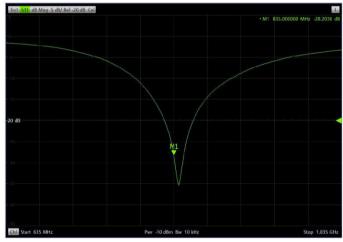
Page 23 of 101

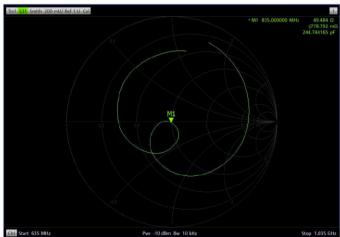


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## Justification for Extended SAR Dipole Calibrations

| Dipole | Date of<br>Measurement | Return Loss<br>(dB) | Delta (%) | Impedance(ohm) | Delta(ohm) |
|--------|------------------------|---------------------|-----------|----------------|------------|
| Head   | Jun 06, 2018           | -27.3               | -         | 51.0           | (40)       |
| 835MHz | May 22, 2020           | -28.2               | 3.30      | 49.5           | -1.52      |





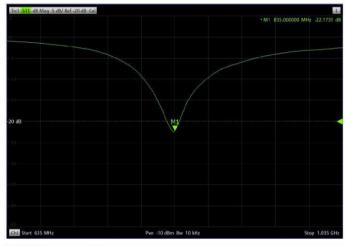
Page 24 of 101

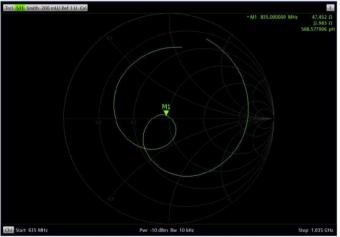


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Justification for Extended SAR Dipole Calibrations

| Dipole | Date of<br>Measurement | Return Loss<br>(dB) | Delta (%) | Impedance(ohm) | Delta(ohm) |
|--------|------------------------|---------------------|-----------|----------------|------------|
| Body   | Jun 06, 2018           | -22.5               | ~         | 46.8           | 1400       |
| 835MHz | May 22, 2020           | -22.2               | -1.47     | 47.5           | 0.65       |





#### 60415352 002



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Page 25 of 101 **Products** 

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TüV China (Auden)

Certificate No: D1750V2-1166\_Jun18

Accreditation No.: SCS 0108

Issued: June 11, 2018

#### **CALIBRATION CERTIFICATE** Object D1750V2 - SN:1166 QA CAL-05.v10 Calibration procedure(s) Calibration procedure for dipole validation kits above 700 MHz Calibration date: June 11, 2018 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 $(22 \pm 3)^{\circ}$ 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 Apr-19 04-Apr-18 (No. 217-02672/02673) Power sensor NRP-Z91 SN: 103244 04-Apr-18 (No. 217-02672) Apr-19 Power sensor NRP-791 SN: 103245 04-Apr-18 (No. 217-02673) Apr-19 Reference 20 dB Attenuator SN: 5058 (20k) 04-Apr-18 (No. 217-02682) Apr-19 Type-N mismatch combination SN: 5047.2 / 06327 04-Apr-18 (No. 217-02683) Apr-19 Reference Probe EX3DV4 SN: 7349 30-Dec-17 (No. EX3-7349\_Dec17) Dec-18 DAF4 SN: 601 26-Oct-17 (No. DAE4-601\_Oct17) Oct-18 Secondary Standards Check Date (in house) Scheduled Check Power meter EPM-442A SN: GB37480704 07-Oct-15 (in house check Oct-16) In house check: Oct-18 Power sensor HP 8481A SN: US37292783 07-Oct-15 (in house check Oct-16) In house check: Oct-18 SN: MY41092317 Power sensor HP 8481A 07-Oct-15 (in house check Oct-16) In house check: Oct-18 RF generator R&S SMT-06 SN: 100972 15-Jun-15 (in house check Oct-16) In house check: Oct-18 Network Analyzer HP 8753E SN: US37390585 18-Oct-01 (in house check Oct-17) In house check: Oct-18 Signature Calibrated by: Katja Pokovic Technical Manager Approved by:

Certificate No: D1750V2-1166\_Jun18 Page 1 of 8

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#### 60415352 002



Produkte Products

Page 26 of 101

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S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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

#### Glossary:

TSL tissue simulating liquid

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

## Calibration is Performed According to the Following Standards:

- a) 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
- EC 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
- c) 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
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### **Additional Documentation:**

e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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

Certificate No: D1750V2-1166\_Jun18 Page 2 of 8

## 60415352 002



Produkte **Products** 

## Page 27 of 101

#### **Measurement Conditions**

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

| DASY Version                 | DASY5                  | V52.10.1    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 1750 MHz ± 1 MHz       |             |

Head TSL parameters
The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 40.1         | 1.37 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 39.0 ± 6 %   | 1.36 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 8.89 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 35.5 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 4.72 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 18.9 W/kg ± 16.5 % (k=2) |

Body TSL parameters
The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 53.4         | 1.49 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 53.6 ± 6 %   | 1.47 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        |              |                  |

## SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 8.89 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 35.9 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm³ (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured                                | 250 mW input power | 4.78 W/kg                |
| SAR for nominal Body TSL parameters         | normalized to 1W   | 19.2 W/kg ± 16.5 % (k=2) |

### 60415352 002



Produkte Products

Page 28 of 101

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

#### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 50.5 Ω - 0.8 jΩ |  |
|--------------------------------------|-----------------|--|
| Return Loss                          | - 40.1 dB       |  |

#### Antenna Parameters with Body TSL

| Impedance, transformed to feed point | 45.2 Ω - 0.4 jΩ |  |
|--------------------------------------|-----------------|--|
| Return Loss                          | - 25.9 dB       |  |

### **General Antenna Parameters and Design**

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

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

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

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

#### **Additional EUT Data**

| Manufactured by | SPEAG          |  |
|-----------------|----------------|--|
| Manufactured on | March 07, 2016 |  |

Page 29 of 101

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

Date: 11.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

## DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1166

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

Medium parameters used: f = 1750 MHz;  $\sigma = 1.36 \text{ S/m}$ ;  $\varepsilon_r = 39$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 26.10.2017

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

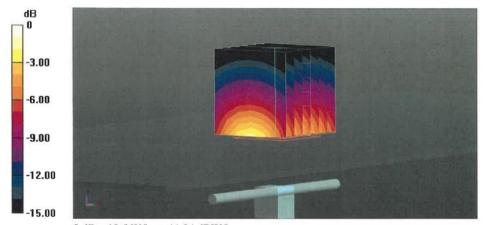
DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

## 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 = 105.1 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 16.1 W/kg

SAR(1 g) = 8.89 W/kg; SAR(10 g) = 4.72 W/kgMaximum value of SAR (measured) = 13.6 W/kg



0 dB = 13.6 W/kg = 11.34 dBW/kg



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Page 30 of 101

## Impedance Measurement Plot for Head TSL

