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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:

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

Additional Documentation:

- c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

| | | |
|------------------------------|------------------------|-------------|
| DASY Version | DASY52 | V52.10.4 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 1800 MHz \pm 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---------------------|----------------|----------------------|
| Nominal Head TSL parameters | 22.0 °C | 40.0 | 1.40 mho/m |
| Measured Head TSL parameters | (22.0 \pm 0.2) °C | 38.8 \pm 6 % | 1.37 mho/m \pm 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

SAR result with Head TSL

| | | |
|---|--------------------|--|
| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 9.49 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 38.2 W/kg \pm 17.0 % (k=2) |

| | | |
|---|--------------------|--|
| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | |
| SAR measured | 250 mW input power | 4.95 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 19.9 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 | 49.5 Ω - 2.6 j Ω |
| Return Loss | - 31.6 dB |

General Antenna Parameters and Design

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

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

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

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

Additional EUT Data

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

DASY5 Validation Report for Head TSL

Date: 30.05.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d210

Communication System: UID 0 - CW; Frequency: 1800 MHz

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.37$ S/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.63, 8.63, 8.63) @ 1800 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 = 108.6 V/m; Power Drift = -0.02 dB

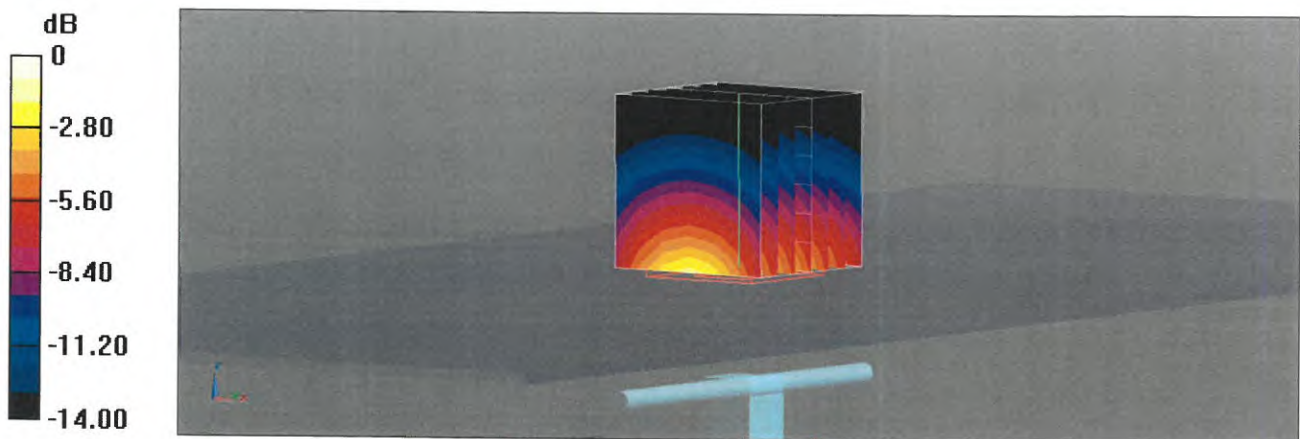
Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.49 W/kg; SAR(10 g) = 4.95 W/kg

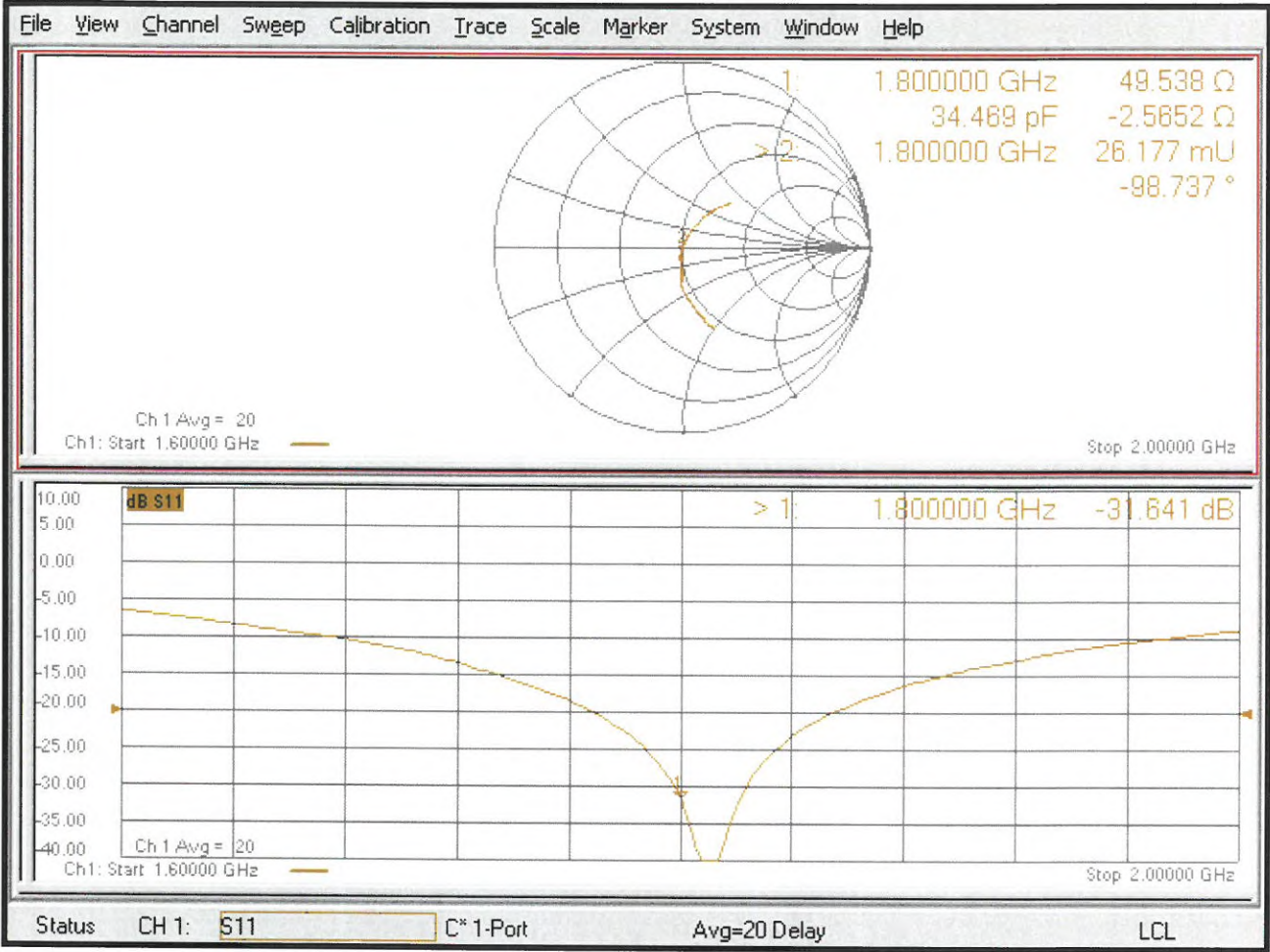
Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 53.5%

Maximum value of SAR (measured) = 14.9 W/kg



Impedance Measurement Plot for Head TSL





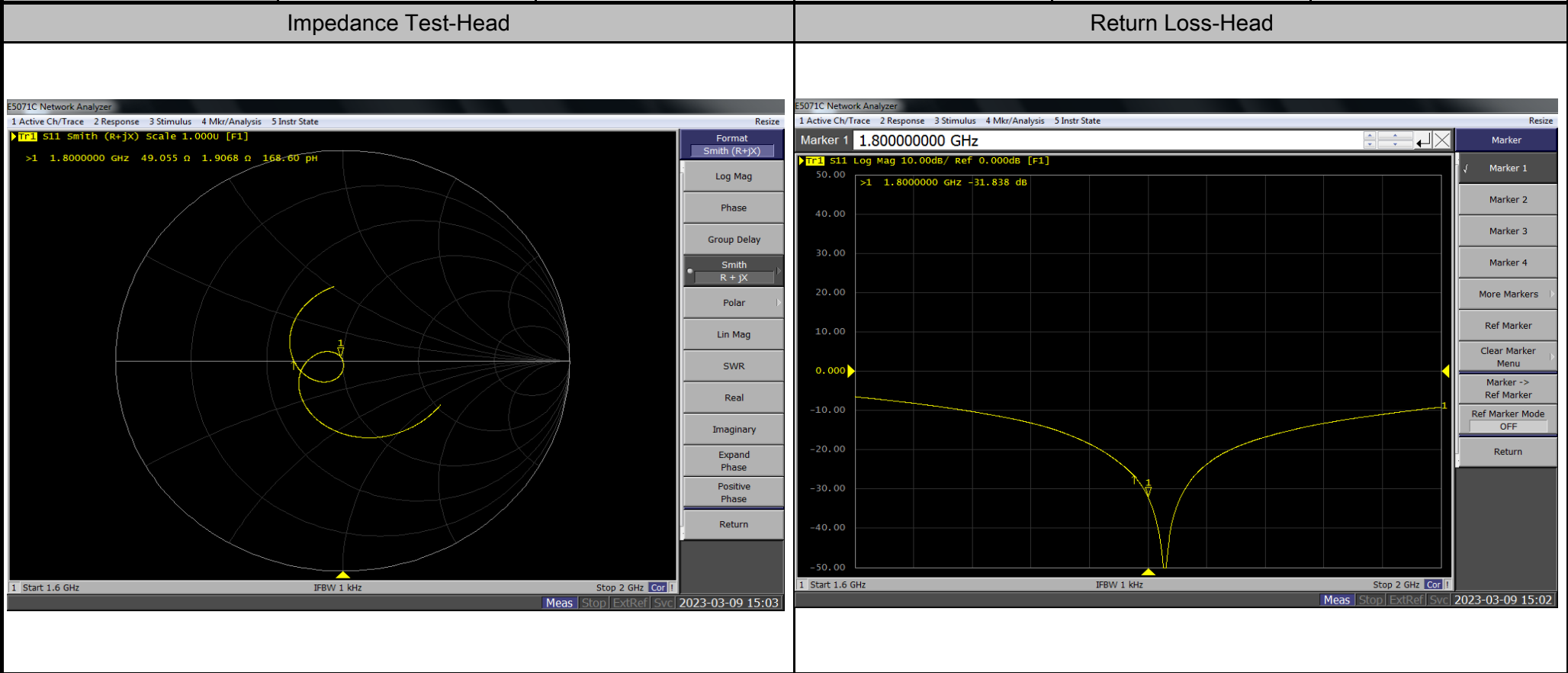
Dipole Internal Calibration Record

| | | | | | |
|---------------|--------------|----------------------|--------------|------------------|--------------|
| Asset No. : | E-533 | Model No. : | D1800MHzV2 | Serial No. : | 2d210 |
| Environmental | 22.8°C, 46 % | Original Cal. Date : | May 30, 2022 | Next Cal. Date : | May 30, 2025 |

| Standard List | | |
|---------------|--------------------|---|
| 1 | IEEE Std 1528-2013 | IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorpton Rate(SAR) in the Human Head from Wireless Communication Devices: Measurement Texhniques, June 2013 |
| 2 | 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 |
| 3 | KDB865664 | SAR Measurement Requirements for 100 MHz to 6 GHz |

| Equipment Information | | | | | |
|-----------------------|----------------|-------------|--------------|--------------------|----------------|
| Equipment : | Manufacturer : | Model No. : | Serial No. : | Cal.Organization : | Cal. Date : |
| Power Amplifier | EMCI | EMC053035 | 980869 | N/A | N/A |
| Power Meter | Anritsu | MA2495A | 1128008 | N/A | June 1, 2022 |
| Power Sensor | Anritsu | MA2411B | 1126001 | N/A | June 1, 2022 |
| Directional Coupler | Woken | TS-PCC0M-05 | 107090019 | N/A | N/A |
| Signal Generator | R & S | SMB100A | 113244 | N/A | July 29, 2022 |
| ENA Network Analyzer | Agilent | E5071C | MY46524658 | N/A | March 21, 2022 |

| Model No | For Head Tissue | | | | |
|----------|--------------------------------------|----------------------|------------------------|-----------|--------|
| D1800V2 | Item | Original Cal. Result | Verified on 2023/03/09 | Deviation | Result |
| | Impedance, transformed to feed point | 49.5Ω-2.6jΩ | 49.1Ω+1.9jΩ | <5Ω | Pass |
| | Return Loss(dB) | -31.6 | -31.8 | -0.6% | Pass |
| | SAR Value for 1g(mW/g) | 9.49 | 9.30 | -2.0% | Pass |
| | SAR Value for 10g(mW/g) | 4.95 | 4.76 | -3.8% | Pass |



Test Laboratory: BTL

Date: 2023/3/9

System Check_H1800

Frequency: 1800 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 23.0°C; Liquid Temperature: 22.0°C

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.416$ S/m; $\epsilon_r = 41.386$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1486; Calibrated: 2022/5/31
- Probe: EX3DV4 - SN7369; ConvF(8.67, 8.67, 8.67) @ 1800 MHz; Calibrated: 2022/5/28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1240

Configuration/Pin=250mW /Area Scan (8x8x1):

Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 11.5 W/kg

Configuration/Pin=250mW /Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 97.00 V/m; Power Drift = 0.00 dB

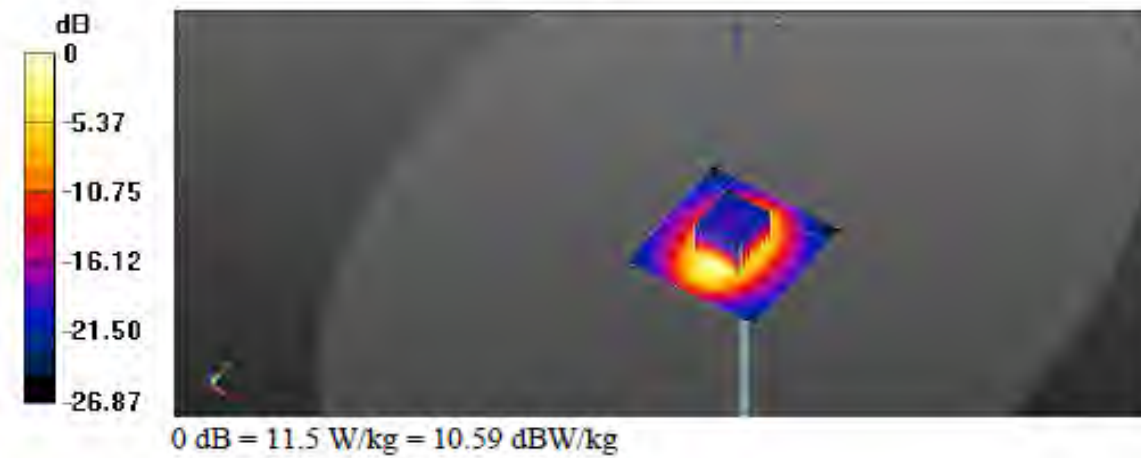
Peak SAR (extrapolated) = 17.7 W/kg

SAR(1 g) = 9.3 W/kg; SAR(10 g) = 4.76 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 52.6%

Maximum value of SAR (measured) = 14.7 W/kg



Calibrator:

Jerry Chang

Approver:

Peter Chen



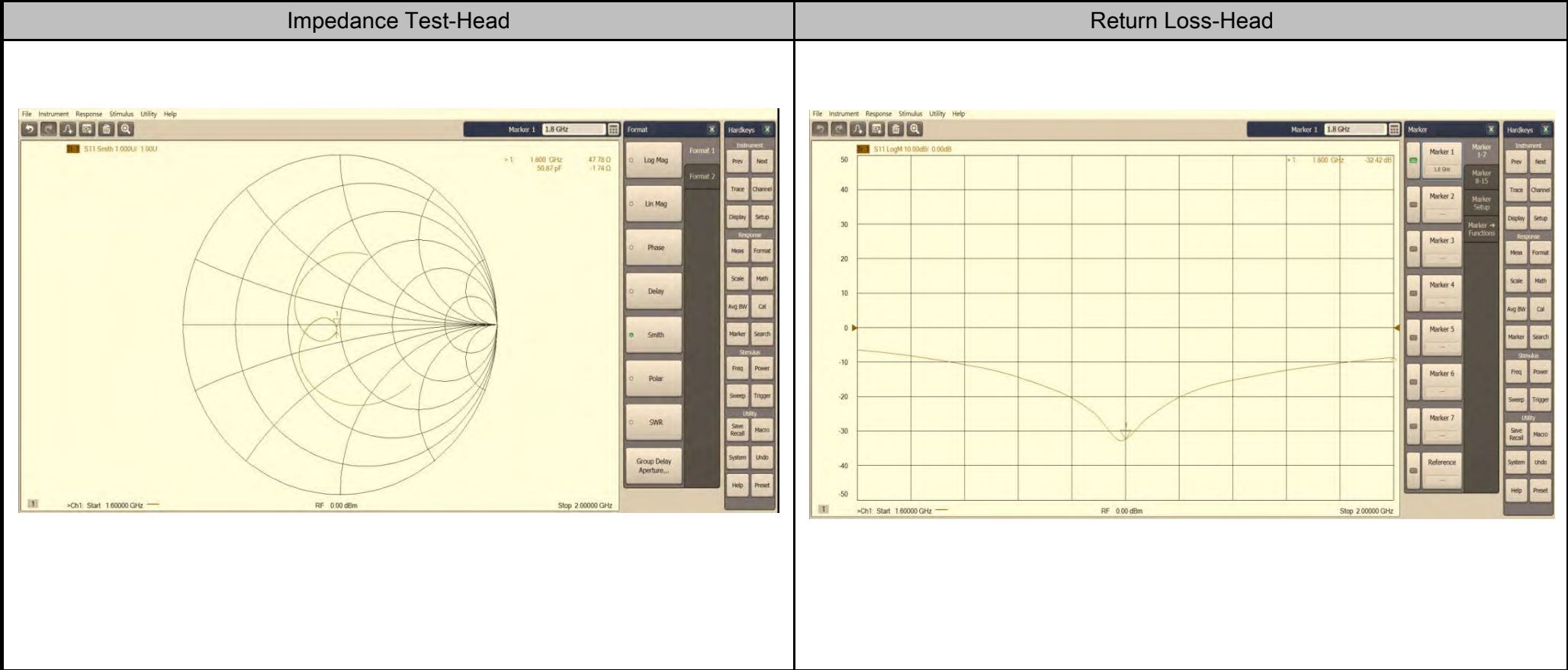
Dipole Internal Calibration Record

| | | | | | |
|---------------|--------------|----------------------|--------------|------------------|--------------|
| Asset No. : | E-533 | Model No. : | D1800MHzV2 | Serial No. : | 2d210 |
| Environmental | 23.1°C, 48 % | Original Cal. Date : | May 30, 2022 | Next Cal. Date : | May 30, 2025 |

| Standard List | | |
|---------------|--------------------|---|
| 1 | IEEE Std 1528-2013 | IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorpton Rate(SAR) in the Human Head from Wireless Communication Devices: Measurement Texhniques, June 2013 |
| 2 | 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 |
| 3 | KDB865664 | SAR Measurement Requirements for 100 MHz to 6 GHz |

| Equipment Information | | | | | |
|-----------------------|----------------|-------------|--------------|--------------------|----------------|
| Equipment : | Manufacturer : | Model No. : | Serial No. : | Cal.Organization : | Cal. Date : |
| Power Amplifier | EMCI | EMC053035 | 980869 | N/A | N/A |
| Power Meter | Anritsu | ML2495A | 1128008 | N/A | May 12, 2023 |
| Power Sensor | Anritsu | MA2411B | 1126001 | N/A | May 12, 2023 |
| Directional Coupler | Woken | TS-PCC0M-05 | 107090019 | N/A | N/A |
| Signal Generator | R & S | SMB100A | 113244 | N/A | June 13, 2023 |
| ENA Network Analyzer | Agilent | E5071C | MY46524658 | N/A | March 17, 2023 |

| Model No | For Head Tissue | | | | |
|----------|--------------------------------------|----------------------|------------------------|-----------|--------|
| D1800V2 | Item | Original Cal. Result | Verified on 2024/03/07 | Deviation | Result |
| | Impedance, transformed to feed point | 49.5Ω-2.6jΩ | 47.8Ω-1.7jΩ | <5Ω | Pass |
| | Return Loss(dB) | -31.6 | -32.4 | -2.5% | Pass |
| | SAR Value for 1g(mW/g) | 9.49 | 9.89 | 4.2% | Pass |
| | SAR Value for 10g(mW/g) | 4.95 | 5.07 | 2.4% | Pass |



Test Laboratory: BTL

Date: 2024/3/7

System Check_H1800

Frequency: 1800 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 23.0°C; Liquid Temperature: 22.0°C

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.408$ S/m; $\epsilon_r = 41.711$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1486; Calibrated: 2023/6/16
- Probe: EX3DV4 - SN7369; ConvF(8.59, 8.59, 8.59) @ 1800 MHz; Calibrated: 2023/5/22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1240

Configuration/Pin=250mW/Area Scan (8x8x1):

Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 12.1 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 100.5 V/m; Power Drift = -0.01 dB

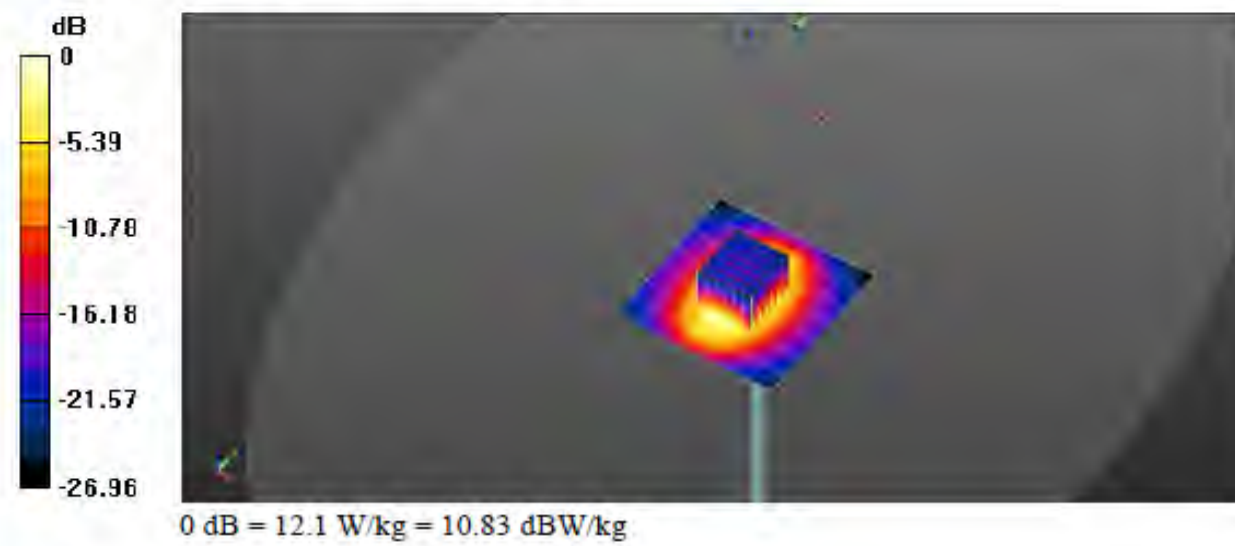
Peak SAR (extrapolated) = 18.6 W/kg

SAR(1 g) = 9.89 W/kg; SAR(10 g) = 5.07 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 53%

Maximum value of SAR (measured) = 15.6 W/kg



Calibrator:

Jerry Chang

Approver:

Peter Chen



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Client **BTL**

Certificate No: **D1900V2-5d208_May22**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d208**

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|-----------------------------|--------------------|---------------------------------|-----------------------|
| Power meter NRP | SN: 104778 | 04-Apr-22 (No. 217-03525/03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-22 (No. 217-03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-22 (No. 217-03525) | Apr-23 |
| Reference 20 dB Attenuator | SN: BH9394 (20k) | 04-Apr-22 (No. 217-03527) | Apr-23 |
| Type-N mismatch combination | SN: 310982 / 06327 | 04-Apr-22 (No. 217-03528) | Apr-23 |
| Reference Probe EX3DV4 | SN: 7349 | 31-Dec-21 (No. EX3-7349_Dec21) | Dec-22 |
| DAE4 | SN: 601 | 02-May-22 (No. DAE4-601_May22) | May-23 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---------------------------------|----------------|-----------------------------------|------------------------|
| Power meter E4419B | SN: GB39512475 | 30-Oct-14 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A | SN: MY41093315 | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-20) | In house check: Oct-22 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-20) | In house check: Oct-22 |

Calibrated by: **Michael Weber** Name: **Michael Weber** Function: **Laboratory Technician**

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

Signature

Issued: May 30, 2022

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



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Accreditation No.: **SCS 0108**

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

| | |
|-------|---------------------------------|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|--|---------------------|---------------------|----------------------|
| Nominal Head TSL parameters | 22.0 °C | 40.0 | 1.40 mho/m |
| Measured Head TSL parameters | (22.0 \pm 0.2) °C | 39.0 \pm 6 % | 1.40 mho/m \pm 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

SAR result with Head TSL

| | | |
|---|--------------------|--|
| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 10.1 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 40.2 W/kg \pm 17.0 % (k=2) |

| | | |
|---|--------------------|--|
| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
| SAR measured | 250 mW input power | 5.23 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 20.8 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 | 53.4 Ω + 4.6 j Ω |
| Return Loss | - 25.2 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.203 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: 23.05.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d208

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.4$ S/m; $\epsilon_r = 39$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43) @ 1900 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 = 110.4 V/m; Power Drift = 0.08 dB

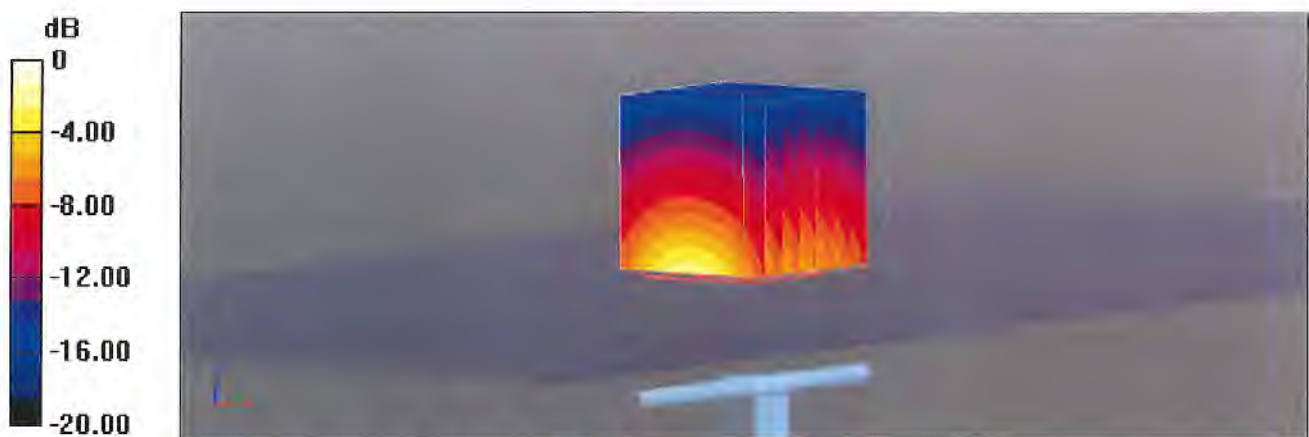
Peak SAR (extrapolated) = 19.0 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.23 W/kg

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

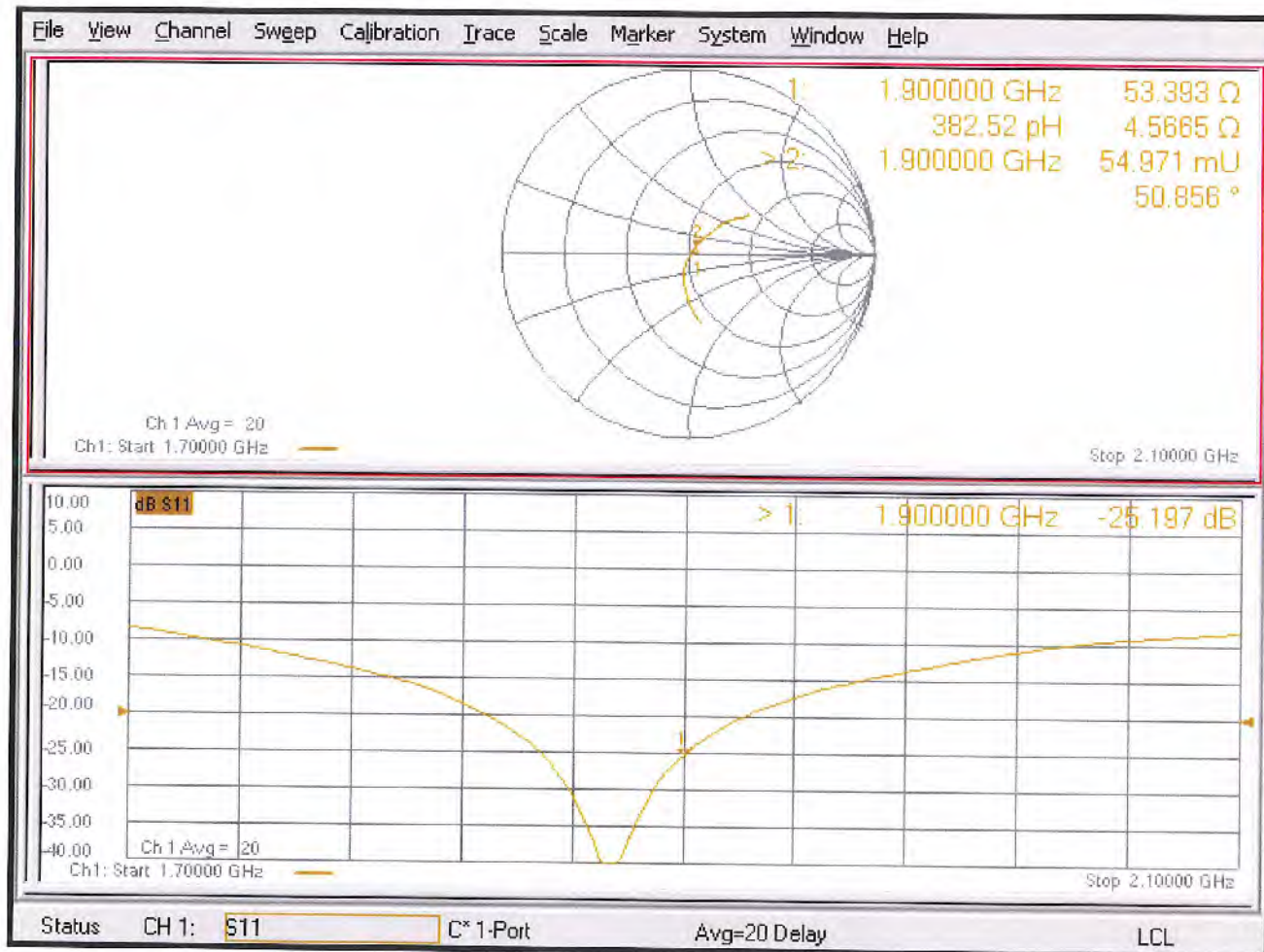
Ratio of SAR at M2 to SAR at M1 = 53.7%

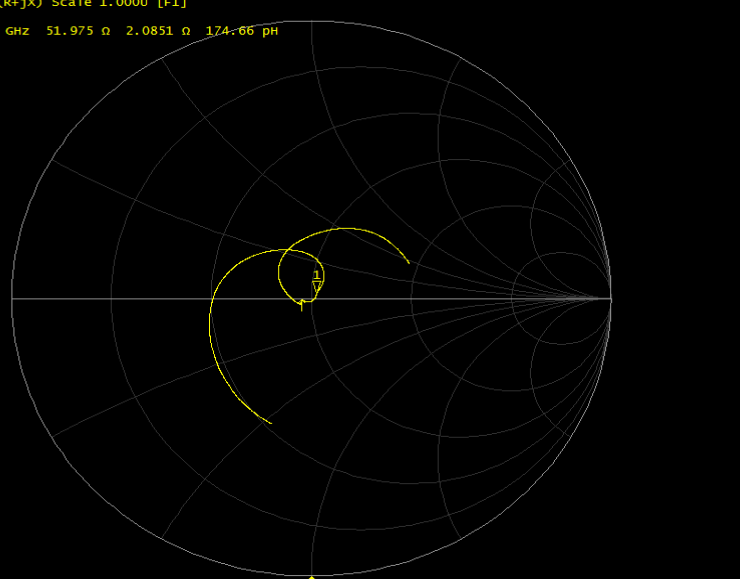
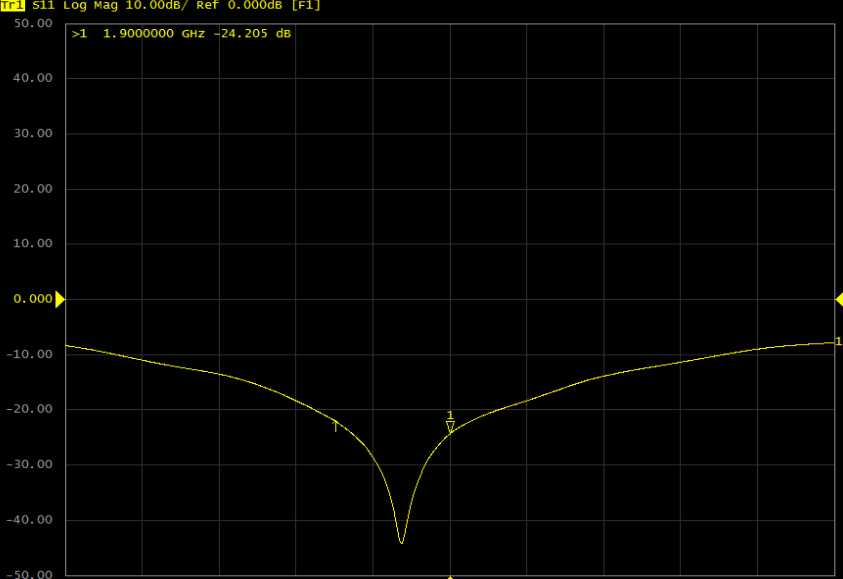
Maximum value of SAR (measured) = 15.8 W/kg



0 dB = 15.8 W/kg = 11.99 dBW/kg

Impedance Measurement Plot for Head TSL



| | | | | | |
|--|--------------------------------------|---|--|--------------------|----------------|
| <div><div><div></div><div></div><div></div></div><div>Dipole Internal Calibration Record</div></div> | | | | | |
| Asset No. : | E-535 | Model No. : | D1900MHzV2 | Serial No. : | 5d208 |
| Environmental | 23.9°C, 53 % | Original Cal. Date : | May 23, 2022 | Next Cal. Date : | May 23, 2025 |
| Standard List | | | | | |
| 1 | IEEE Std 1528-2013 | IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorpton Rate(SAR) in the Human Head from Wireless Communication Devices: Measurement Texhniques, June 2013 | | | |
| 2 | 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 | | | |
| 3 | KDB865664 | SAR Measurement Requirements for 100 MHz to 6 GHz | | | |
| Equipment Information | | | | | |
| Equipment : | Manufacturer : | Model No. : | Serial No. : | Cal.Organization : | Cal. Date : |
| Power Amplifier | EMCI | EMC053035 | 980869 | N/A | N/A |
| Power Meter | Anritsu | MA2495A | 1128008 | N/A | June 1, 2022 |
| Power Sensor | Anritsu | MA2411B | 1126001 | N/A | June 1, 2022 |
| Directional Coupler | Woken | TS-PCC0M-05 | 107090019 | N/A | N/A |
| Signal Generator | R & S | SMB100A | 113244 | N/A | July 29, 2022 |
| ENA Network Analyzer | Agilent | E5071C | MY46524658 | N/A | March 21, 2022 |
| Model No | For Head Tissue | | | | |
| D1900V2 | Item | Original Cal. Result | Verified on 2023/03/03 | Deviation | Result |
| | Impedance, transformed to feed point | 53.4Ω+4.6jΩ | 52.0Ω+2.1jΩ | <5Ω | Pass |
| | Return Loss(dB) | -25.2 | -24.2 | 4.0% | Pass |
| | SAR Value for 1g(mW/g) | 10.1 | 10.1 | 0.0% | Pass |
| | SAR Value for 10g(mW/g) | 5.23 | 5.33 | 1.9% | Pass |
| Impedance Test-Head | | | Return Loss-Head | | |
| <div><div>E5071C Network Analyzer</div><div>1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State</div><div>▶ S11 Smith (R+jX) Scale 1.0000 [F1]</div><div>>1 1.9000000 GHz 51.975 Ω 2.0851 Ω 174.66 pF</div><div></div><div>1 Start 1.7 GHz IFBW 1 kHz Stop 2.1 GHz Cor I</div><div>Meas Stop ExtRef Sync 2023-03-03 10:29</div></div> | | | <div><div>E5071C Network Analyzer</div><div>1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State</div><div>▶ S11 Log Mag 10.00dB/ Ref 0.000dB [F1]</div><div>>1 1.9000000 GHz -24.205 dB</div><div></div><div>1 Start 1.7 GHz IFBW 1 kHz Stop 2.1 GHz Cor I</div><div>Meas Stop ExtRef Sync 2023-03-03 10:14</div></div> | | |

Test Laboratory: BTL

Date: 2023/3/3

System Check_H1900

Frequency: 1900 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 23.0°C; Liquid Temperature: 22.0°C

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.412$ S/m; $\epsilon_r = 41.054$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1486; Calibrated: 2022/5/31
- Probe: EX3DV4 - SN7369; ConvF(8.3, 8.3, 8.3) @ 1900 MHz; Calibrated: 2022/5/28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1240

Configuration/Pin=250mW /Area Scan (7x7x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 14.9 W/kg

Configuration/Pin=250mW /Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 100.7 V/m; Power Drift = 0.01 dB

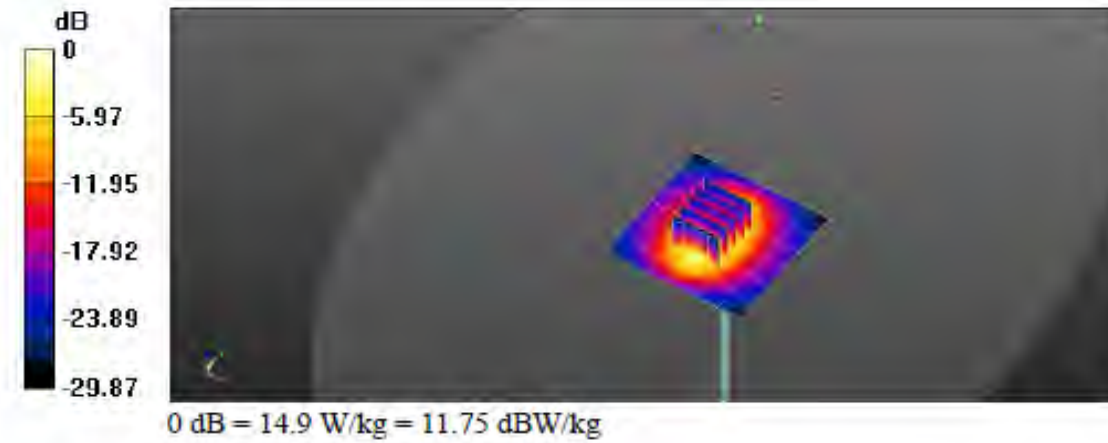
Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.33 W/kg

Smallest distance from peaks to all points 3 dB below = 10.1 mm

Ratio of SAR at M2 to SAR at M1 = 55.5%

Maximum value of SAR (measured) = 15.4 W/kg



Calibrator:

Jerry Chang

Approver:

Peter Chen



Dipole Internal Calibration Record

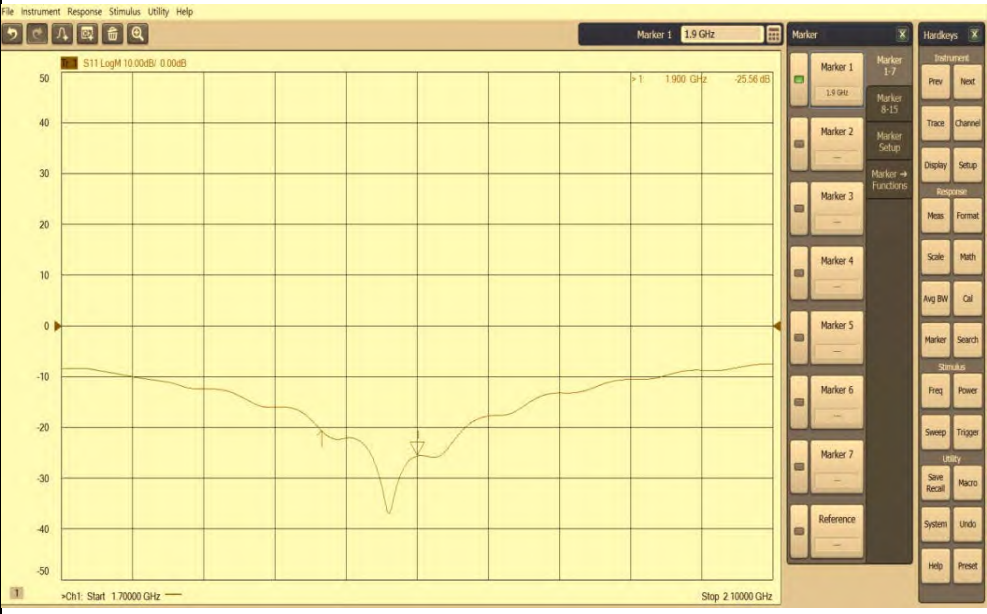
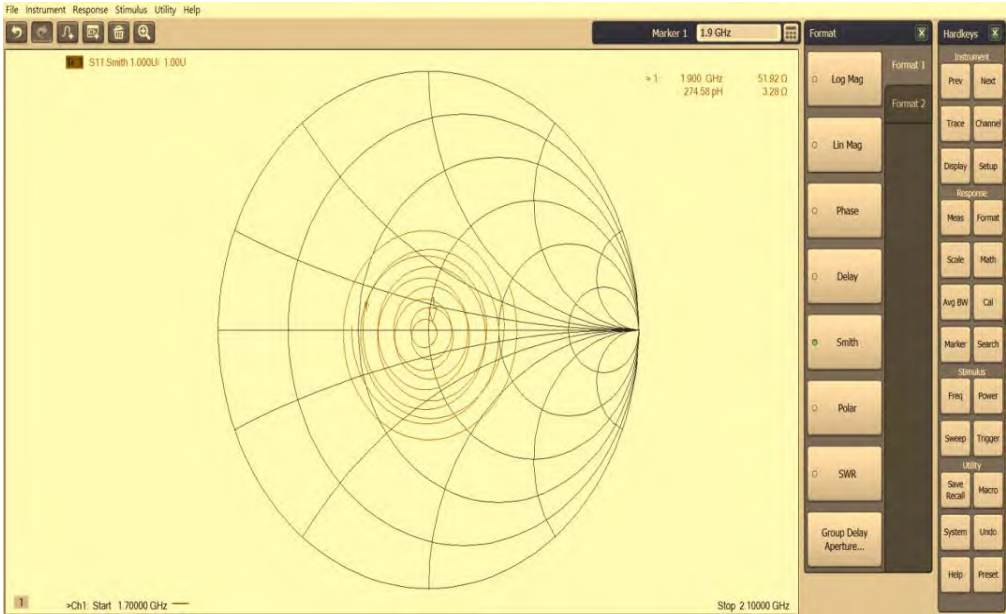
| | | | | | |
|---------------|--------------|----------------------|--------------|------------------|--------------|
| Asset No. : | E-535 | Model No. : | D1900MHzV2 | Serial No. : | 5d208 |
| Environmental | 23.4°C, 49 % | Original Cal. Date : | May 23, 2022 | Next Cal. Date : | May 23, 2025 |

| Standard List | | |
|---------------|--------------------|---|
| 1 | IEEE Std 1528-2013 | IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorpton Rate(SAR) in the Human Head from Wireless Communication Devices: Measurement Texhniques, June 2013 |
| 2 | 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 |
| 3 | KDB865664 | SAR Measurement Requirements for 100 MHz to 6 GHz |

| Equipment Information | | | | | |
|-----------------------|----------------|-------------|--------------|--------------------|----------------|
| Equipment : | Manufacturer : | Model No. : | Serial No. : | Cal.Organization : | Cal. Date : |
| Power Amplifier | EMCI | EMC053035 | 980869 | N/A | N/A |
| Power Meter | Anritsu | ML2495A | 1128008 | N/A | May 12, 2023 |
| Power Sensor | Anritsu | MA2411B | 1126001 | N/A | May 12, 2023 |
| Directional Coupler | Woken | TS-PCC0M-05 | 107090019 | N/A | N/A |
| Signal Generator | R & S | SMB100A | 113244 | N/A | June 13, 2023 |
| ENA Network Analyzer | Agilent | E5071C | MY46524658 | N/A | March 17, 2023 |

| Model No | For Head Tissue | | | | |
|----------|--------------------------------------|----------------------|------------------------|-----------|--------|
| D1900V2 | Item | Original Cal. Result | Verified on 2024/03/01 | Deviation | Result |
| | Impedance, transformed to feed point | 53.4Ω+4.6jΩ | 51.9Ω+3.3jΩ | <5Ω | Pass |
| | Return Loss(dB) | -25.2 | -25.6 | -1.6% | Pass |
| | SAR Value for 1g(mW/g) | 10.1 | 9.8 | -3.0% | Pass |
| | SAR Value for 10g(mW/g) | 5.23 | 5.45 | 4.2% | Pass |

| Impedance Test-Head | Return Loss-Head |
|---------------------|------------------|
|---------------------|------------------|



Test Laboratory: BTL

Date: 2024/3/1

System Check_H1900

Frequency: 1900 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 23.0°C; Liquid Temperature: 22.0°C

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.414$ S/m; $\epsilon_r = 41.293$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1486; Calibrated: 2023/6/16
- Probe: EX3DV4 - SN7369; ConvF(8.26, 8.26, 8.26) @ 1900 MHz; Calibrated: 2023/5/22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1240

Configuration/Pin=250mW/Area Scan (7x7x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 14.1 W/kg

Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 98.30 V/m; Power Drift = -0.09 dB

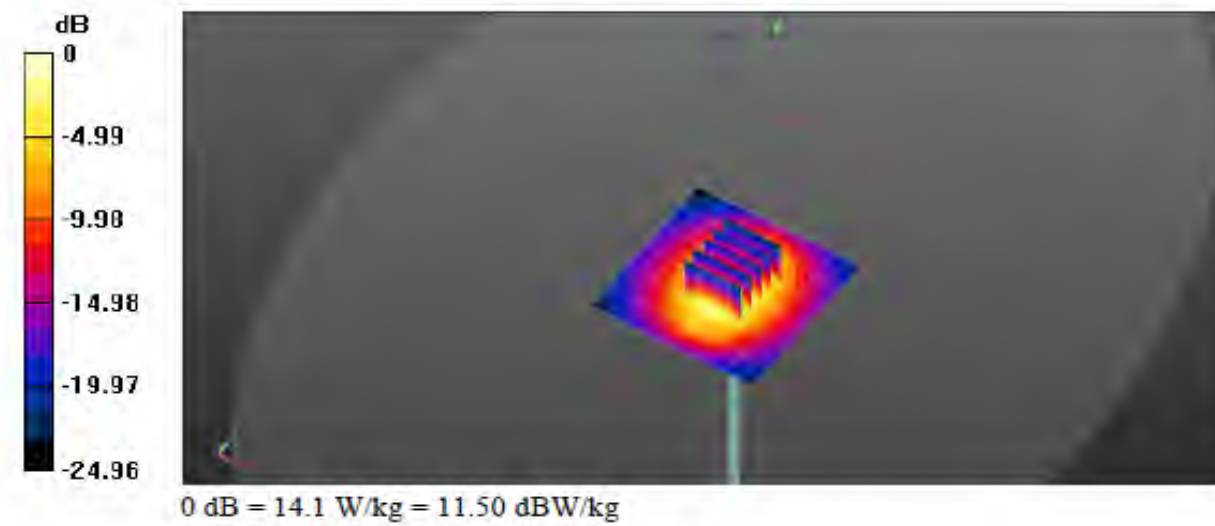
Peak SAR (extrapolated) = 16.8 W/kg

SAR(1 g) = 9.8 W/kg; SAR(10 g) = 5.45 W/kg

Smallest distance from peaks to all points 3 dB below = 12.8 mm

Ratio of SAR at M2 to SAR at M1 = 58.2%

Maximum value of SAR (measured) = 14.4 W/kg



Calibrator:

Jerry Chang

Approver:

Peter Chen



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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

Client **BTL**

Certificate No: **D2300V2-1054_May22**

CALIBRATION CERTIFICATE

Object **D2300V2 - SN:1054**

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

Calibration date: **May 25, 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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|-----------------------------|--------------------|---------------------------------|-----------------------|
| Power meter 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: | Aidonia Georgiadou | Laboratory Technician | |

| | | | |
|--------------|-----------|-------------------|--|
| Approved by: | Sven Kühn | Technical Manager | |
|--------------|-----------|-------------------|--|

Issued: May 30, 2022

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



Accredited by the Swiss Accreditation Service (SAS)

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

Accreditation No.: **SCS 0108**

Glossary:

| | |
|-------|---------------------------------|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The 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 | 2300 MHz \pm 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|--|---------------------|----------------|----------------------|
| Nominal Head TSL parameters | 22.0 °C | 39.5 | 1.67 mho/m |
| Measured Head TSL parameters | (22.0 \pm 0.2) °C | 38.7 \pm 6 % | 1.69 mho/m \pm 6 % |
| Head TSL temperature change during test | < 0.5 °C | ----- | ----- |

SAR result with Head TSL

| | | |
|---|--------------------|--|
| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 12.2 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 48.2 W/kg \pm 17.0 % (k=2) |

| | | |
|---|--------------------|--|
| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
| SAR measured | 250 mW input power | 5.80 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 23.1 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 | 48.1 Ω - 5.6 j Ω |
| Return Loss | - 24.5 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.170 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: 25.05.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1054

Communication System: UID 0 - CW; Frequency: 2300 MHz

Medium parameters used: $f = 2300$ MHz; $\sigma = 1.69$ S/m; $\epsilon_r = 38.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.98, 7.98, 7.98) @ 2300 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 = 114.6 V/m; Power Drift = 0.02 dB

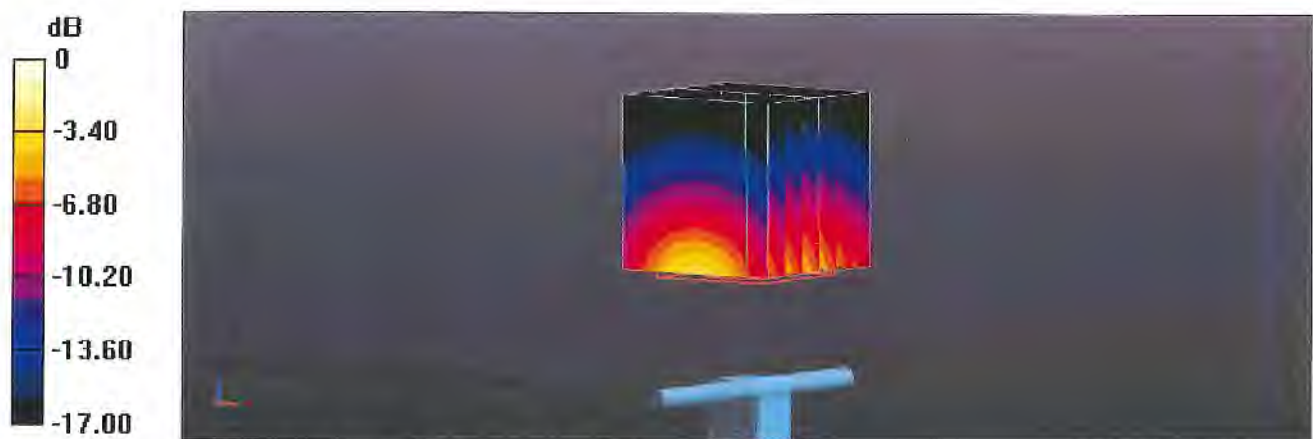
Peak SAR (extrapolated) = 22.8 W/kg

SAR(1 g) = 12.2 W/kg; SAR(10 g) = 5.80 W/kg

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

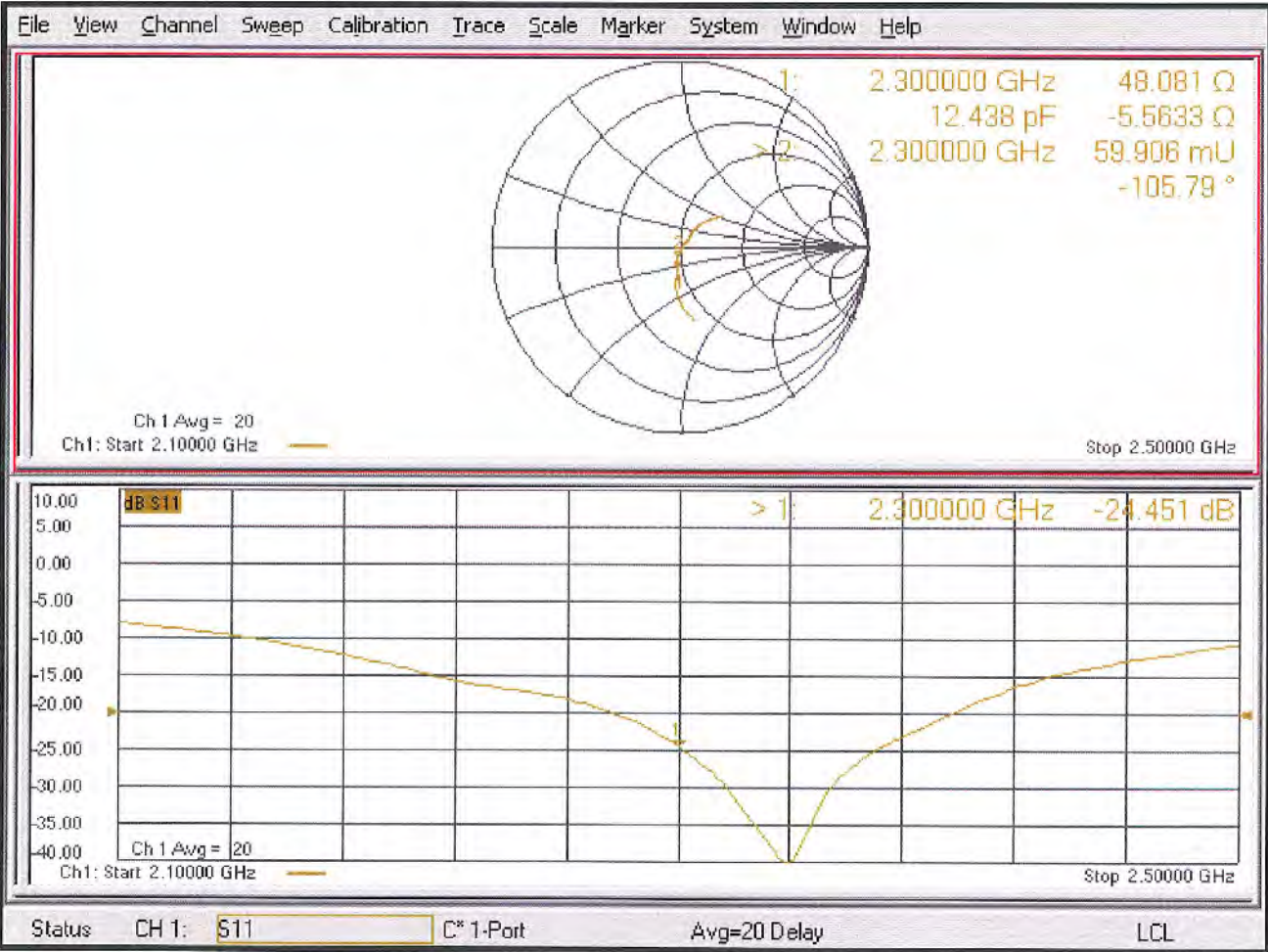
Ratio of SAR at M2 to SAR at M1 = 53.3%

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



0 dB = 19.6 W/kg = 12.91 dBW/kg

Impedance Measurement Plot for Head TSL





Dipole Internal Calibration Record

| | | | | | |
|---------------|--------------|----------------------|--------------|------------------|--------------|
| Asset No. : | E-536 | Model No. : | D2300MHzV2 | Serial No. : | 1064 |
| Environmental | 23.7°C, 51 % | Original Cal. Date : | May 25, 2022 | Next Cal. Date : | May 25, 2025 |

Standard List

| | | |
|---|--------------------|---|
| 1 | IEEE Std 1528-2013 | IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorpton Rate(SAR) in the Human Head from Wireless Communication Devices: Measurement Texhniques, June 2013 |
| 2 | 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 |
| 3 | KDB865664 | SAR Measurement Requirements for 100 MHz to 6 GHz |

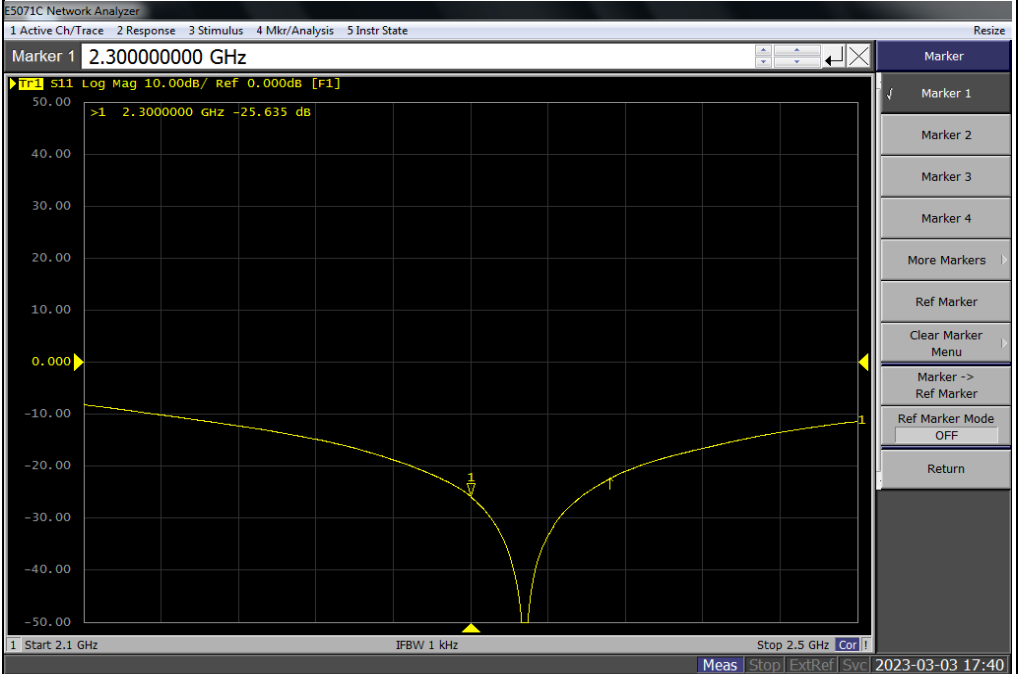
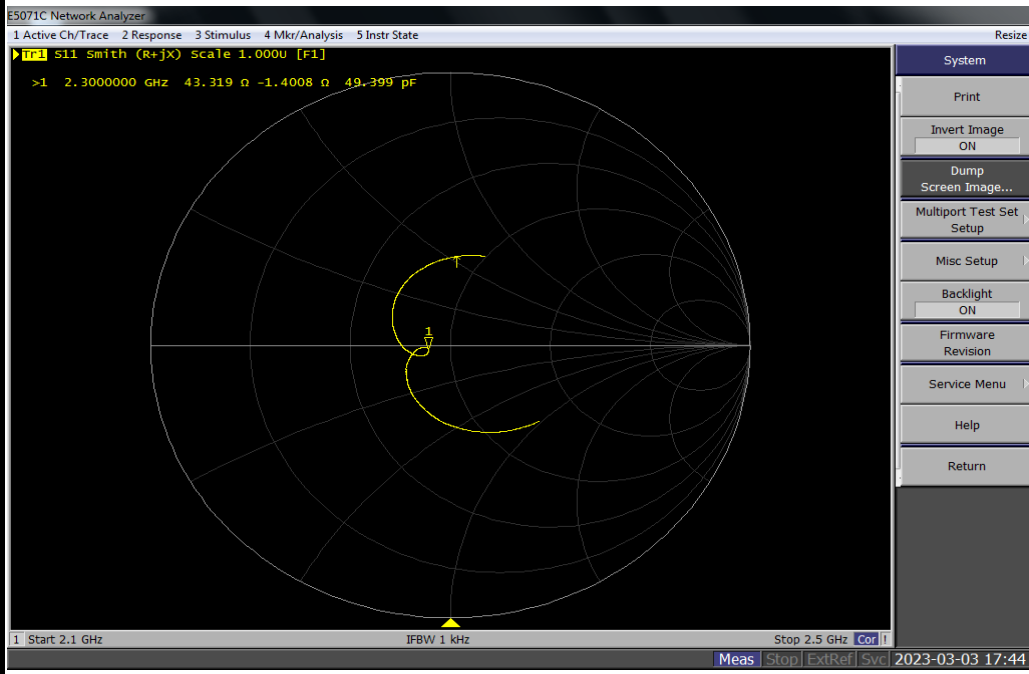
Equipment Information

| | | | | | |
|----------------------|----------------|-------------|--------------|--------------------|----------------|
| Equipment : | Manufacturer : | Model No. : | Serial No. : | Cal.Organization : | Cal. Date : |
| Power Amplifier | EMCI | EMC053035 | 980869 | N/A | N/A |
| Power Meter | Anritsu | MA2495A | 1128008 | N/A | June 1, 2022 |
| Power Sensor | Anritsu | MA2411B | 1126001 | N/A | June 1, 2022 |
| Directional Coupler | Woken | TS-PCC0M-05 | 107090019 | N/A | N/A |
| Signal Generator | R & S | SMB100A | 113244 | N/A | July 29, 2022 |
| ENA Network Analyzer | Agilent | E5071C | MY46524658 | N/A | March 21, 2022 |

| Model No | For Head Tissue | | | | |
|----------|--------------------------------------|----------------------|------------------------|-----------|--------|
| D2300V2 | Item | Original Cal. Result | Verified on 2023/03/03 | Deviation | Result |
| | Impedance, transformed to feed point | 48.1Ω-5.6jΩ | 43.3Ω-1.4jΩ | <5Ω | Pass |
| | Return Loss(dB) | -24.5 | -25.6 | -4.5% | Pass |
| | SAR Value for 1g(mW/g) | 12.2 | 12.8 | 4.9% | Pass |
| | SAR Value for 10g(mW/g) | 5.80 | 6.17 | 6.4% | Pass |

Impedance Test-Head

Return Loss-Head



Test Laboratory: BTL

Date: 2023/3/3

System Check_H2300

Frequency: 2300 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 23.0°C; Liquid Temperature: 22.0°C

Medium parameters used: $f = 2300$ MHz; $\sigma = 1.646$ S/m; $\epsilon_r = 38.477$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1486; Calibrated: 2022/5/31
- Probe: EX3DV4 - SN7369; ConvF(7.93, 7.93, 7.93) @ 2300 MHz; Calibrated: 2022/5/28
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1240

Configuration/Pin=250mW /Area Scan (9x9x1):

Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 18.0 W/kg

Configuration/Pin=250mW /Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 106.6 V/m; Power Drift = 0.04 dB

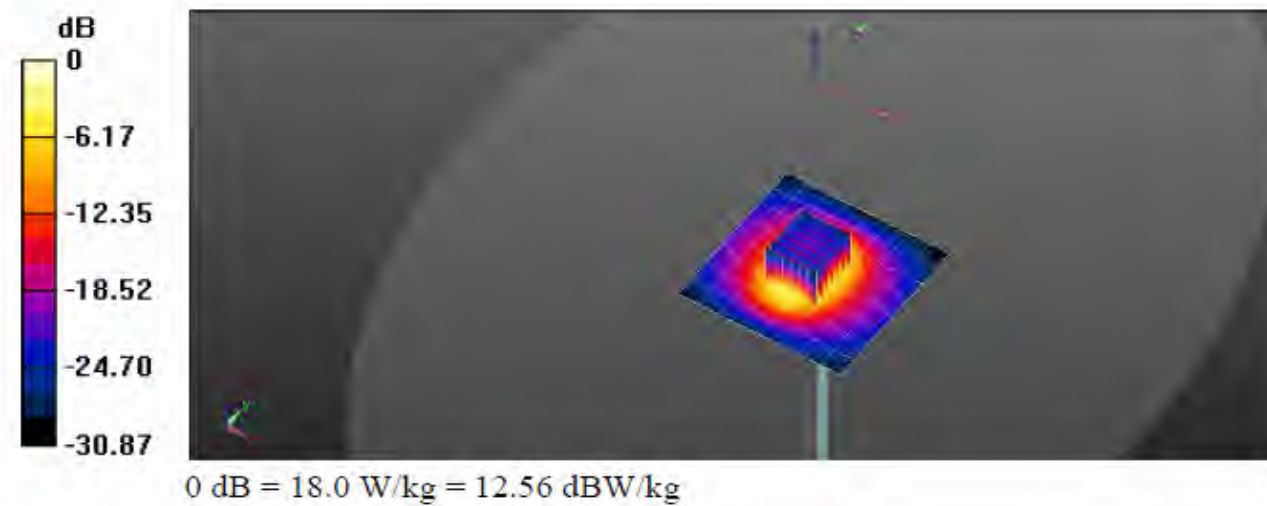
Peak SAR (extrapolated) = 25.1 W/kg

SAR(1 g) = 12.8 W/kg; SAR(10 g) = 6.17 W/kg

Smallest distance from peaks to all points 3 dB below = 9.2 mm

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

Maximum value of SAR (measured) = 19.1 W/kg



Calibrator:

Jerry Chang

Approver:

Peter Chen



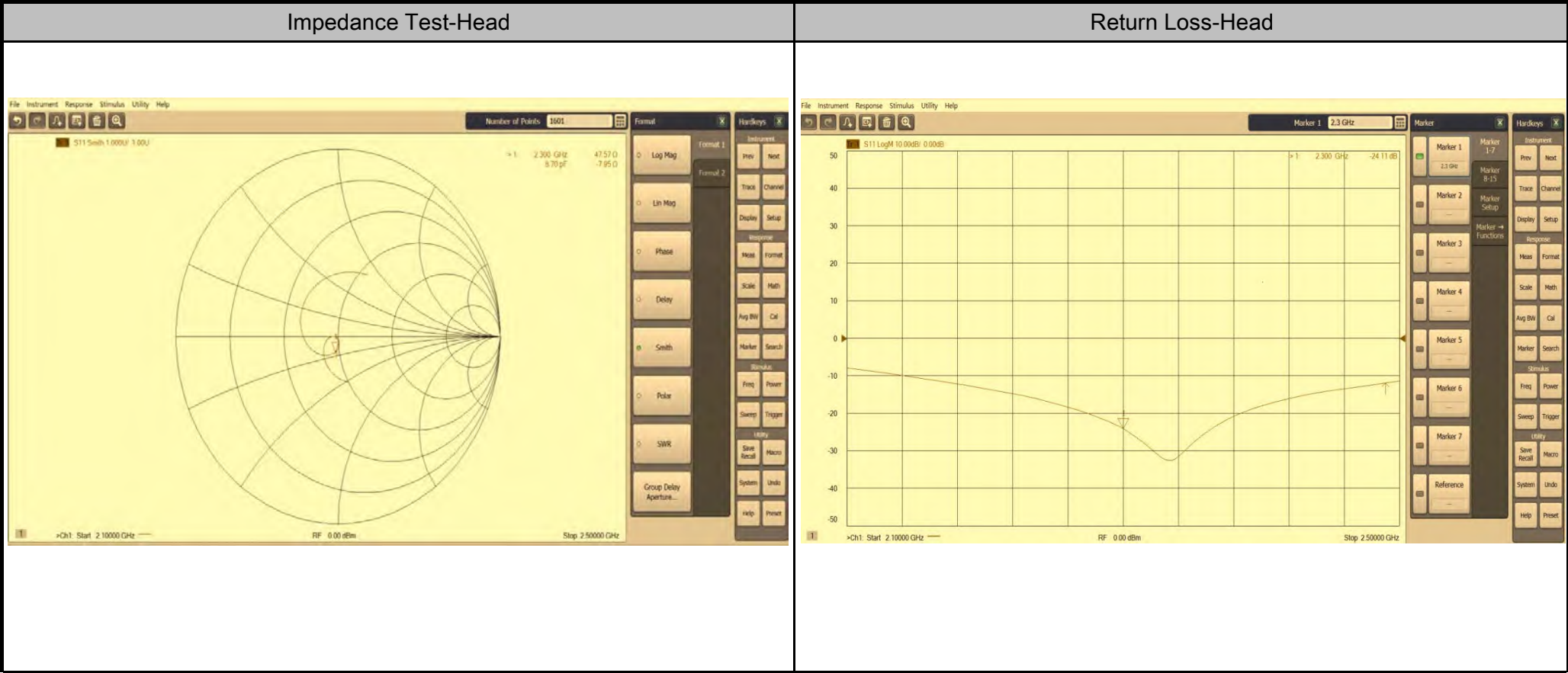
Dipole Internal Calibration Record

| | | | | | |
|---------------|--------------|----------------------|--------------|------------------|--------------|
| Asset No. : | E-536 | Model No. : | D2300MHzV2 | Serial No. : | 1064 |
| Environmental | 23.1°C, 48 % | Original Cal. Date : | May 25, 2022 | Next Cal. Date : | May 25, 2025 |

| Standard List | | |
|---------------|--------------------|---|
| 1 | IEEE Std 1528-2013 | IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorpton Rate(SAR) in the Human Head from Wireless Communication Devices: Measurement Texhniques, June 2013 |
| 2 | 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 |
| 3 | KDB865664 | SAR Measurement Requirements for 100 MHz to 6 GHz |

| Equipment Information | | | | | |
|-----------------------|----------------|-------------|--------------|--------------------|----------------|
| Equipment : | Manufacturer : | Model No. : | Serial No. : | Cal.Organization : | Cal. Date : |
| Power Amplifier | EMCI | EMC053035 | 980869 | N/A | N/A |
| Power Meter | Anritsu | ML2495A | 1128008 | N/A | May 12, 2023 |
| Power Sensor | Anritsu | MA2411B | 1126001 | N/A | May 12, 2023 |
| Directional Coupler | Woken | TS-PCC0M-05 | 107090019 | N/A | N/A |
| Signal Generator | R & S | SMB100A | 113244 | N/A | June 13, 2023 |
| ENA Network Analyzer | Agilent | E5071C | MY46524658 | N/A | March 17, 2023 |

| Model No | For Head Tissue | | | | |
|----------|--------------------------------------|----------------------|------------------------|-----------|--------|
| D2300V2 | Item | Original Cal. Result | Verified on 2024/02/27 | Deviation | Result |
| | Impedance, transformed to feed point | 48.1Ω-5.6jΩ | 47.8Ω-8.0jΩ | <5Ω | Pass |
| | Return Loss(dB) | -24.5 | -24.1 | 1.6% | Pass |
| | SAR Value for 1g(mW/g) | 12.2 | 12.0 | -1.6% | Pass |
| | SAR Value for 10g(mW/g) | 5.80 | 5.72 | -1.4% | Pass |



Test Laboratory: BTL

Date: 2024/2/27

System Check_H2300

Frequency: 2300 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 23.0°C; Liquid Temperature: 22.0°C

Medium parameters used: $f = 2300$ MHz; $\sigma = 1.704$ S/m; $\epsilon_r = 40.344$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1486; Calibrated: 2023/6/16
- Probe: EX3DV4 - SN7369; ConvF(7.89, 7.89, 7.89) @ 2300 MHz; Calibrated: 2023/5/22
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1240

Configuration/Pin=250mW/Area Scan (9x9x1):

Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 17.4 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 103.3 V/m; Power Drift = -0.00 dB

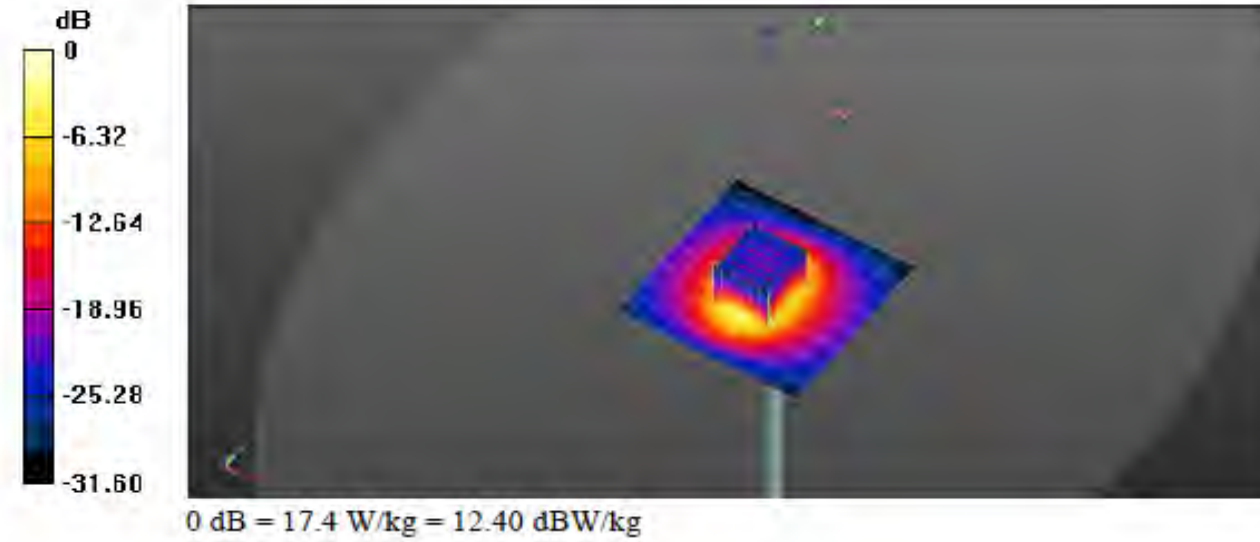
Peak SAR (extrapolated) = 24.0 W/kg

SAR(1 g) = 12 W/kg; SAR(10 g) = 5.72 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 50.2%

Maximum value of SAR (measured) = 18.0 W/kg



Calibrator:

Jerry Chang

Approver:

Peter Chen



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

Auden
Taoyuan City

Certificate No.

D2600V2-1077_Apr25

CALIBRATION CERTIFICATE

Object **D2600V2 - SN: 1077**

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

Calibration date **April 15, 2025**

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID | Cal Date (Certificate No.) | Scheduled Cal |
|-----------------------------|------------|--|---------------|
| Power Sensor R&S NRP-33T | SN: 100967 | 26-Mar-25 (No. 217-04290) | Mar-26 |
| Power Sensor R&S NRP18A | SN: 101859 | 06-Feb-25 (No. 4030A315009541) | Feb-26 |
| Spectrum Analyzer R&S FSV40 | SN: 101832 | 29-Jan-25 (No. 4030A315009658) | Jan-26 |
| 3.5mm mismatch combination | SN: 1152 | 24-Mar-25 (No. 217-04293) | Mar-26 |
| OCP DAK-12 | SN: 1016 | 24-Sept-24 (No. OCP-DAK12-1016_Sep24) | Sep-25 |
| OCP DAK-3.5 | SN: 1249 | 23-Sept-24 (No. OCP-DAK3.5-1249_Sep24) | Sep-25 |
| Reference Probe EX3DV4 | SN: 7349 | 10-Jan-25 (No. EX3-7349_Jan25) | Jan-26 |
| DAE4ip | SN: 1836 | 28-Oct-24 (No. DAE4ip-1836_Oct24) | Oct-25 |

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

| | | | |
|---------------|--------------|-----------------------|---|
| | Name | Function | Signature |
| Calibrated by | Leif Klysner | Laboratory Technician |  |
| Approved by | Sven Kühn | Technical Manager |  |

Issued: April 15, 2025

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Multilateral Agreement for the recognition of calibration certificates**

Accreditation No.: SCS 0108

Glossary

| | |
|-------|---------------------------------|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

Calibration is Performed According to the Following Standards

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

Additional Documentation

- DASY System Handbook

Methods Applied and Interpretation of Parameters

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

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

Measurement Conditions

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

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

HSL parameters at 2600 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|------------------------------------|--------------------|---------------|---------------------|
| Nominal HSL parameters | 22.0 °C | 39.0 | 1.96 mho/m |
| Measured HSL parameters | (22.0 \pm 0.2)°C | 37.3 \pm 6% | 2.02 mho/m \pm 6% |
| HSL temperature change during test | < 0.5 °C | | |

SAR result with HSL at 2600 MHz

| SAR averaged over 1 cm ³ (1 g) of HSL | Condition | |
|--|--------------------|-------------------------------|
| SAR for nominal HSL parameters | 24 dBm input power | 14.1 W/kg |
| SAR for nominal HSL parameters | normalized to 1W | 56.1 W/kg \pm 17.0% (k = 2) |

| SAR averaged over 10 cm ³ (10 g) of HSL | Condition | |
|--|--------------------|-------------------------------|
| SAR for nominal HSL parameters | 24 dBm input power | 6.29 W/kg |
| SAR for nominal HSL parameters | normalized to 1W | 25.0 W/kg \pm 16.5% (k = 2) |

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

| | |
|-------------|--------------------------------|
| Impedance | 50.0 Ω – 5.3 j Ω |
| Return Loss | -25.5 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.151 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 |
|-----------------|-------|

System Performance Check Report

Summary

| Dipole | Frequency [MHz] | TSL | Power [dBm] |
|------------------|-----------------|-----|-------------|
| D2600V2 - SN1077 | 2600 | HSL | 24 |

Exposure Conditions

| Phantom Section, TSL | Test Distance [mm] | Band | Group, UID | Frequency [MHz], Channel Number | Conversion Factor | TSL Conductivity [S/m] | TSL Permittivity |
|----------------------|--------------------|------|------------|---------------------------------|-------------------|------------------------|------------------|
| Flat | 10 | | CW, 0-- | 2600, 0 | 7.26 | 2.02 | 37.3 |

Hardware Setup

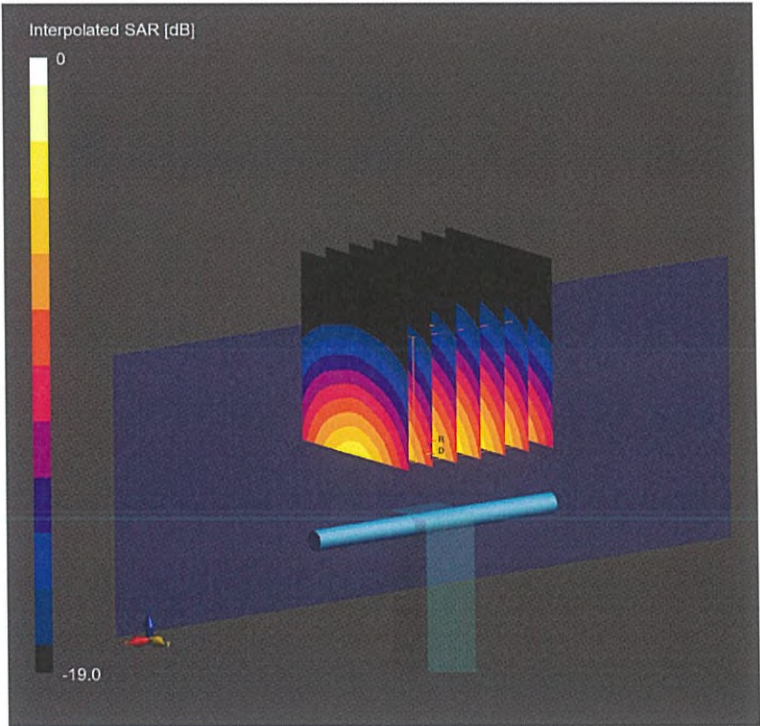
| Phantom | TSL, Measured Date | Probe, Calibration Date | DAE, Calibration Date |
|-----------------|--------------------|-----------------------------|---------------------------|
| MFP V8.0 Center | HSL, 2025-04-15 | EX3DV4 - SN7349, 2025-01-10 | DAE4ip Sn1836, 2024-10-28 |

Scans Setup

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

Measurement Results

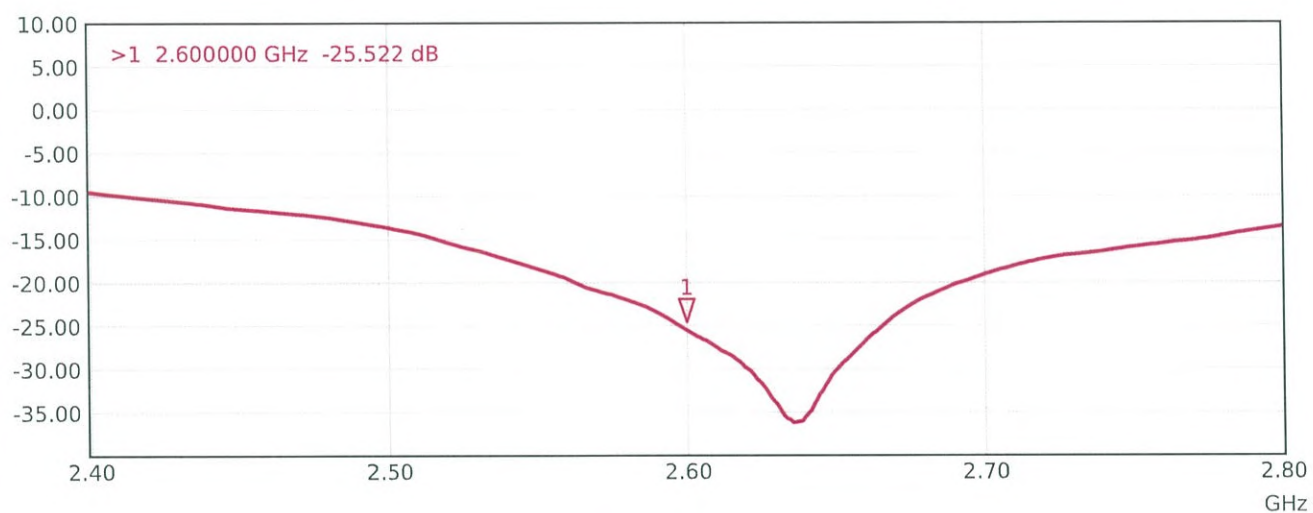
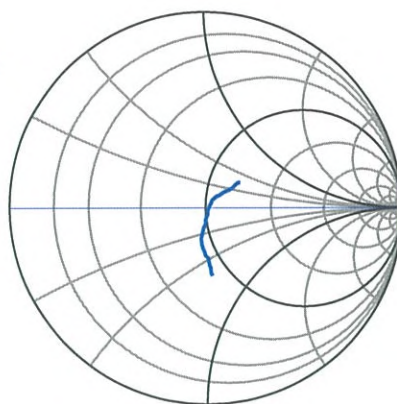
| | Zoom Scan |
|---------------------|---------------------|
| Date | 2025-04-15 |
| psSAR1g [W/Kg] | 14.1 |
| psSAR10g [W/Kg] | 6.29 |
| Power Drift [dB] | 0.00 |
| Power Scaling | Disabled |
| Scaling Factor [dB] | |
| TSL Correction | Positive / Negative |



0 dB = 30.3 W/Kg

Impedance Measurement Plot for HSL

S11 Smith (R+jX) Scale 1.00

>1 2.600000 GHz 49.951 Ω -5.300 $j\Omega$ 



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Client **BTL**
 New Taipei City

Certificate No. **D3500V2-1096_Aug23**

CALIBRATION CERTIFICATE

Object **D3500V2 - SN:1096**

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

Calibration date: **August 15, 2023**

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|-----------------------------|--------------------|---------------------------------|-----------------------|
| Power meter NRP2 | SN: 104778 | 30-Mar-23 (No. 217-03804/03805) | Mar-24 |
| Power sensor NRP-Z91 | SN: 103244 | 30-Mar-23 (No. 217-03804) | Mar-24 |
| Power sensor NRP-Z91 | SN: 103245 | 30-Mar-23 (No. 217-03805) | Mar-24 |
| Reference 20 dB Attenuator | SN: BH9394 (20k) | 30-Mar-23 (No. 217-03809) | Mar-24 |
| Type-N mismatch combination | SN: 310982 / 06327 | 30-Mar-23 (No. 217-03810) | Mar-24 |
| Reference Probe EX3DV4 | SN: 3503 | 07-Mar-23 (No. EX3-3503_Mar23) | Mar-24 |
| DAE4 | SN: 601 | 19-Dec-22 (No. DAE4-601_Dec22) | Dec-23 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---------------------------------|----------------|-----------------------------------|------------------------|
| Power meter E4419B | SN: GB39512475 | 30-Oct-14 (in house check Oct-22) | In house check: Oct-24 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-22) | In house check: Oct-24 |
| Power sensor HP 8481A | SN: MY41093315 | 07-Oct-15 (in house check Oct-22) | In house check: Oct-24 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-22) | In house check: Oct-24 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-22) | In house check: Oct-24 |

Calibrated by: **Michael Weber** Name: **Michael Weber** Function: **Laboratory Technician**

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

Signature



Issued: August 22, 2023

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Accreditation No.: **SCS 0108**

Glossary:

| | |
|-------|---------------------------------|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

| | | |
|------------------------------|--|----------------------------------|
| DASY Version | DASY52 | V52.10.4 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom 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 | 3400 MHz \pm 1 MHz 3500 MHz \pm 1 MHz | |

Head TSL parameters at 3400 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---------------------|----------------|----------------------|
| Nominal Head TSL parameters | 22.0 °C | 38.0 | 2.81 mho/m |
| Measured Head TSL parameters | (22.0 \pm 0.2) °C | 36.8 \pm 6 % | 2.86 mho/m \pm 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

SAR result with Head TSL at 3400 MHz

| | | |
|---|--------------------|------------------------------|
| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
| SAR measured | 100 mW input power | 6.73 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 66.5 W/kg \pm 19.9 % (k=2) |

| | | |
|---|--------------------|------------------------------|
| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | |
| SAR measured | 100 mW input power | 2.54 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 25.2 W/kg \pm 19.5 % (k=2) |

Head TSL parameters at 3500 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---------------------|----------------|----------------------|
| Nominal Head TSL parameters | 22.0 °C | 37.9 | 2.91 mho/m |
| Measured Head TSL parameters | (22.0 \pm 0.2) °C | 36.7 \pm 6 % | 2.93 mho/m \pm 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

SAR result with Head TSL at 3500 MHz

| | | |
|---|--------------------|------------------------------|
| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
| SAR measured | 100 mW input power | 6.71 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 66.5 W/kg \pm 19.9 % (k=2) |

| | | |
|---|--------------------|------------------------------|
| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | |
| SAR measured | 100 mW input power | 2.51 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 24.9 W/kg \pm 19.5 % (k=2) |

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 3400 MHz

| | |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 43.7 Ω - 1.8 j Ω |
| Return Loss | - 23.1 dB |

Antenna Parameters with Head TSL at 3500 MHz

| | |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 47.7 Ω + 3.6 j Ω |
| Return Loss | - 27.2 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.135 ns |
|----------------------------------|----------|

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

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

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

Additional EUT Data

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

DASY5 Validation Report for Head TSL

Date: 15.08.2023

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN:1096

Communication System: UID 0 - CW; Frequency: 3500 MHz, Frequency: 3400 MHz

Medium parameters used: $f = 3500$ MHz; $\sigma = 2.93$ S/m; $\epsilon_r = 36.7$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 3400$ MHz; $\sigma = 2.86$ S/m; $\epsilon_r = 36.8$; $\rho = 1000$ kg/m³

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, ConvF(7.91, 7.91, 7.91) @ 3400 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=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 = 68.95 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 18.2 W/kg

SAR(1 g) = 6.71 W/kg; SAR(10 g) = 2.51 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 75.1%

Maximum value of SAR (measured) = 12.7 W/kg

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3400MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 69.98 V/m; Power Drift = 0.06 dB

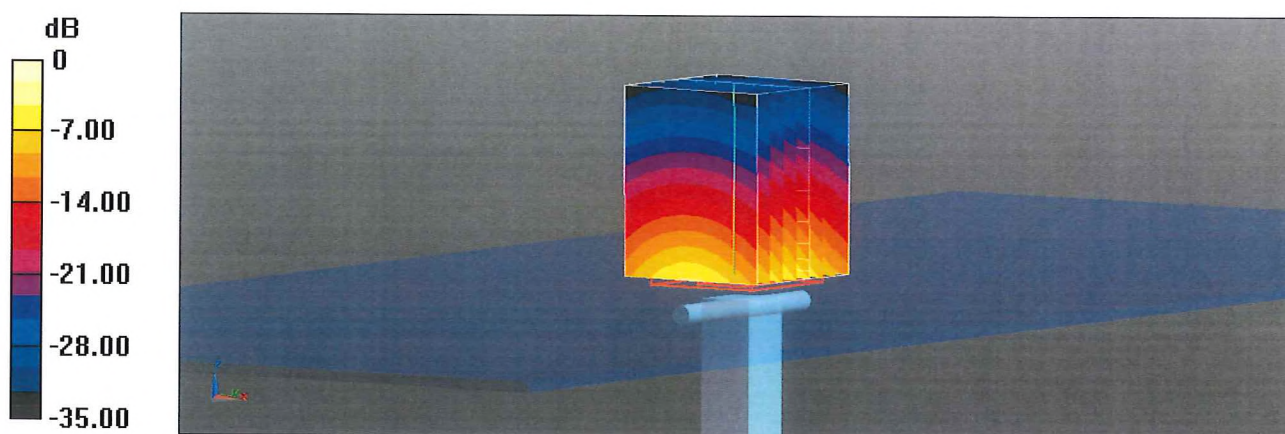
Peak SAR (extrapolated) = 18 W/kg

SAR(1 g) = 6.73 W/kg; SAR(10 g) = 2.54 W/kg

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

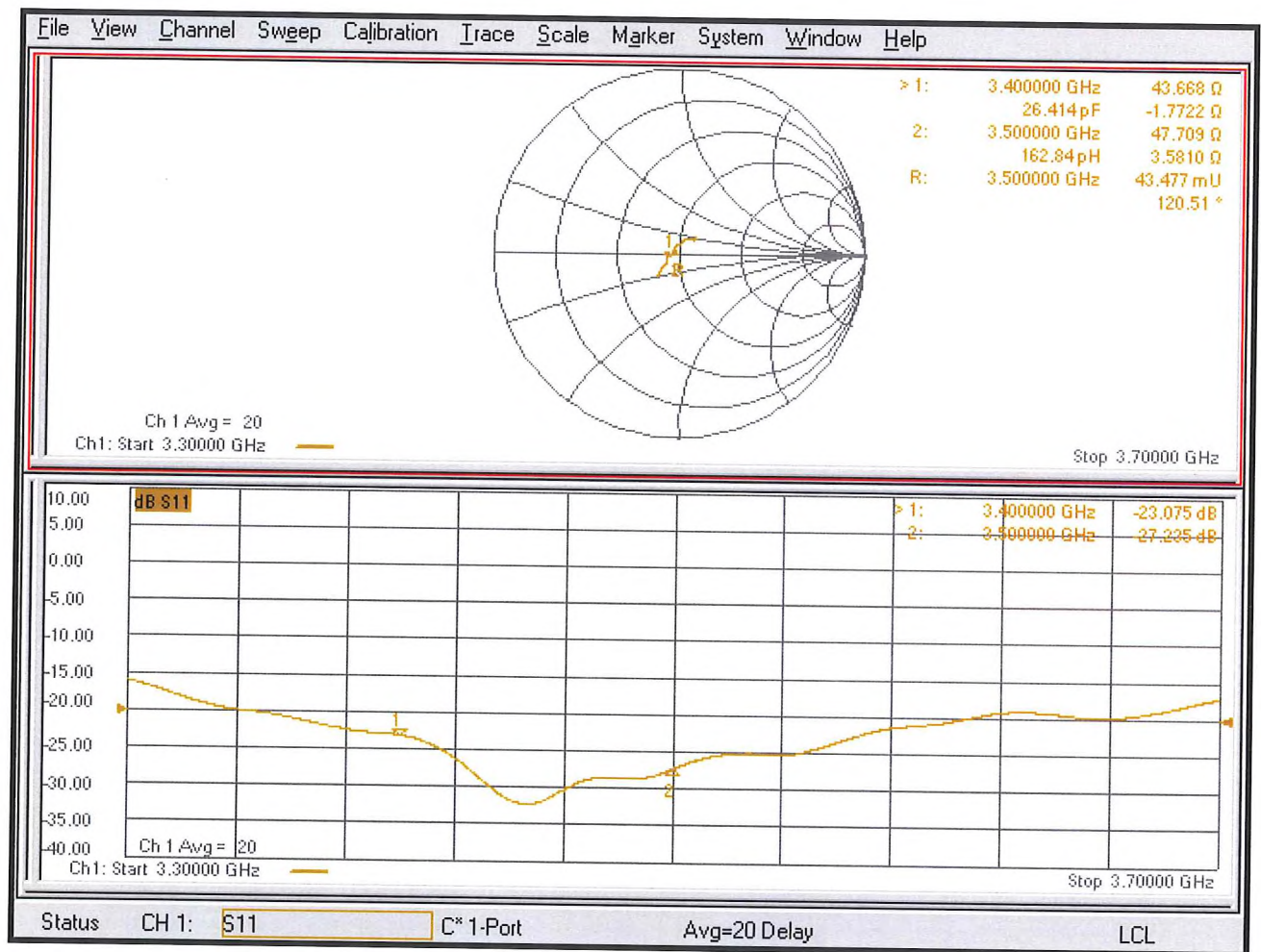
Ratio of SAR at M2 to SAR at M1 = 75.8%

Maximum value of SAR (measured) = 12.5 W/kg



0 dB = 12.5 W/kg = 10.97 dBW/kg

Impedance Measurement Plot for Head TSL



| | | | | | |
|---|--------------------------------------|---|------------------------|--------------------|-----------------|
| <div><div><div></div><div></div><div></div></div><div>Dipole Internal Calibration Record</div></div> | | | | | |
| Asset No. : | E-982 | Model No. : | D3500MHzV2 | Serial No. : | 1096 |
| Environmental | 23.3°C, 45 % | Original Cal. Date : | August 13, 2024 | Next Cal. Date : | August 13, 2025 |
| Standard List | | | | | |
| 1 | IEEE Std 1528-2013 | IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorpton Rate(SAR) in the Human Head from Wireless Communication Devices: Measurement Texhniques, June 2013 | | | |
| 2 | 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 | | | |
| 3 | KDB865664 | SAR Measurement Requirements for 100 MHz to 6 GHz | | | |
| Equipment Information | | | | | |
| Equipment : | Manufacturer : | Model No. : | Serial No. : | Cal.Organization : | Cal. Date : |
| Power Amplifier | EMCI | EMC053035 | 980869 | N/A | N/A |
| Power Meter | Anritsu | ML2495A | 1128008 | N/A | May 11, 2024 |
| Power Sensor | Anritsu | MA2411B | 1126001 | N/A | May 11, 2024 |
| Directional Coupler | Woken | TS-PCC0M-05 | 107090019 | N/A | N/A |
| Signal Generator | R & S | SMB100A | 113244 | N/A | June 18, 2024 |
| Vector network analyzer | Keysight | P5002A | MY58301034 | N/A | March 6, 2024 |
| For Head Tissue | | | | | |
| Frequency | Item | Original Cal. Result | Verified on 2024/08/13 | Deviation | Result |
| 3400MHz | Impedance, transformed to feed point | 43.7Ω-1.8jΩ | 47.4Ω-6.5jΩ | <5Ω | Pass |
| | Return Loss(dB) | -23.1 | -23.48 | -1.6% | Pass |
| | SAR Value for 1g(mW/g) | 6.73 | 6.73 | 0.0% | Pass |
| | SAR Value for 10g(mW/g) | 2.54 | 2.47 | -2.8% | Pass |
| 3500MHz | Impedance, transformed to feed point | 47.7Ω+3.6jΩ | 51.3Ω+5.8jΩ | <5Ω | Pass |
| | Return Loss(dB) | -27.2 | -27.31 | -0.4% | Pass |
| | SAR Value for 1g(mW/g) | 6.71 | 7.24 | 7.9% | Pass |
| | SAR Value for 10g(mW/g) | 2.51 | 2.66 | 6.0% | Pass |
| Impedance Test-Head | | | Return Loss-Head | | |
| <div><div><div>FileInstrumentResponseStimulusUtilityHelp</div><div><div>SoundSR</div><div>Save Recall</div><div>Save Calibr...</div><div>Save Data...</div><div>Save Screen...</div><div>Save User Preset...</div><div>Manage Files...</div></div><div><div>Recall</div><div>Save State</div><div>Save Offset</div><div>Display</div><div>Help</div><div>Format</div><div>Scale</div><div>Math</div><div>Avx BW</div><div>Cal</div><div>Marker</div><div>Search</div><div>Stop</div><div>Pres</div><div>Power</div><div>Sweep</div><div>Trigger</div><div>Utility</div><div>Save Recall</div><div>System</div><div>Undo</div><div>Help</div><div>Print</div></div><div><div>Environment</div><div>Trace</div><div>Channel</div><div>Response</div><div>Setup</div><div>Response</div><div>Format</div><div>Scale</div><div>Math</div><div>Avx BW</div><div>Cal</div><div>Marker</div><div>Search</div><div>Stop</div><div>Pres</div><div>Power</div><div>Sweep</div><div>Trigger</div><div>Utility</div><div>Save Recall</div><div>System</div><div>Undo</div><div>Help</div><div>Print</div></div></div></div> <div><div>SR</div><div>S11 Log10 10.00dB/ 0.00dB</div><div><div>1: 3.500 GHz -27.31 dB</div><div>2: 3.400 GHz -23.48 dB</div></div><div><div>+Ch1: Start 3.30000 GHz</div><div>RF 0.00 dBm</div><div>Stop 3.70000 GHz</div></div></div> | | | | | |

Test Laboratory: BTL

Date: 2024/8/13

System Check_H3400

Frequency: 3400 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 23.0°C; Liquid Temperature: 22.0°C

Medium parameters used: $f = 3400$ MHz; $\sigma = 2.803$ S/m; $\epsilon_r = 38.282$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1486; Calibrated: 2024/5/16
- Probe: EX3DV4 - SN7369; ConvF(6.9, 6.96, 6.48) @ 3400 MHz; Calibrated: 2024/6/3
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1240

Configuration/Pin=100mW/Area Scan (10x10x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 11.0 W/kg

Configuration/Pin=100mW 1/Zoom Scan (7x7x12)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 66.54 V/m; Power Drift = -0.04 dB

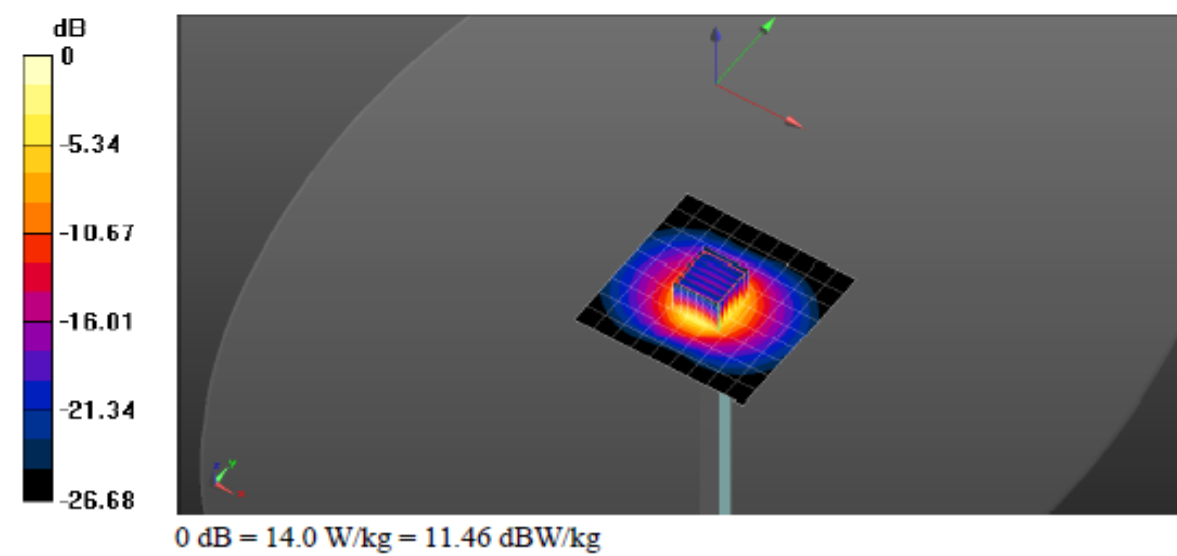
Peak SAR (extrapolated) = 19.4 W/kg

SAR(1 g) = 6.73 W/kg; SAR(10 g) = 2.47 W/kg

Smallest distance from peaks to all points 3 dB below = 8.6 mm

Ratio of SAR at M2 to SAR at M1 = 63%

Maximum value of SAR (measured) = 14.0 W/kg



Calibrator:

Jerry Chang

Approver:

Peter Chen

Test Laboratory: BTL

Date: 2024/8/13

System Check_H3500

Frequency: 3500 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 23.0°C; Liquid Temperature: 22.0°C

Medium parameters used: $f = 3500$ MHz; $\sigma = 2.919$ S/m; $\epsilon_r = 37.951$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1486; Calibrated: 2024/5/16
- Probe: EX3DV4 - SN7369; ConvF(6.87, 6.96, 6.44) @ 3500 MHz; Calibrated: 2024/6/3
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1240

Configuration/Pin=100mW/Area Scan (10x10x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 11.8 W/kg

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 67.63 V/m; Power Drift = -0.04 dB

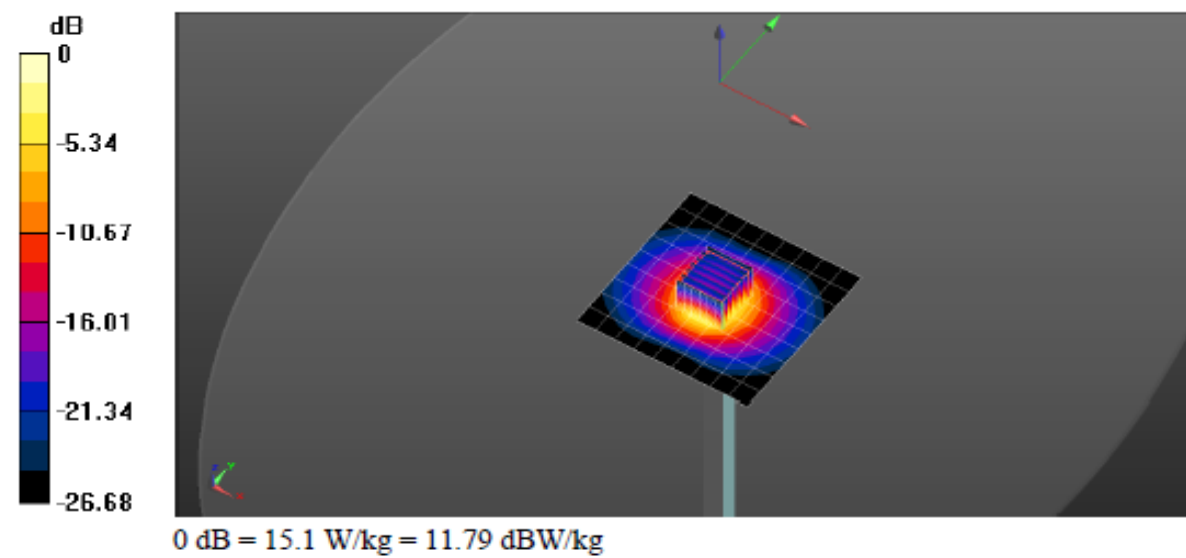
Peak SAR (extrapolated) = 20.9 W/kg

SAR(1 g) = 7.24 W/kg; SAR(10 g) = 2.66 W/kg

Smallest distance from peaks to all points 3 dB below = 8.6 mm

Ratio of SAR at M2 to SAR at M1 = 63%

Maximum value of SAR (measured) = 15.1 W/kg



Calibrator:

Jerry Chang

Approver:

Peter Chen



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

Accreditation No.: **SCS 0108**

Client **BTL**
New Taipei City

Certificate No. **D3700V2-1065_Aug23**

CALIBRATION CERTIFICATE

Object **D3700V2 - SN:1065**

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

Calibration date: **August 15, 2023**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 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: **Michael Weber** Name: **Michael Weber** Function: **Laboratory Technician**

Approved by: **Sven Kühn** Technical Manager

Signature

Issued: August 22, 2023

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

Additional Documentation:

- c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

| | | |
|------------------------------|----------------------------|----------------------------------|
| DASY Version | DASY52 | V52.10.4 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom | |
| Distance Dipole Center - TSL | 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 | 36.5 \pm 6 % | 3.08 mho/m \pm 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

SAR result with Head TSL

| | | |
|---|--------------------|--|
| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
| SAR measured | 100 mW input power | 6.80 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 67.7 W/kg \pm 19.9 % (k=2) |

| | | |
|---|--------------------|--|
| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | |
| SAR measured | 100 mW input power | 2.47 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 24.5 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 | 47.0 Ω - 0.7 j Ω |
| Return Loss | - 29.8 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.139 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 |
|-----------------|-------|