

Test Laboratory: SGS-SAR Lab

## CRUISE2 5GA 5G NR N77 100M QPSK 1RB1 633334CH Back side 10mm

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, NR (0); Frequency: 3500 MHz; Duty Cycle: 1:1

Medium: HSL3500; Medium parameters used:  $f = 3500$  MHz;  $\sigma = 2.983$  S/m;  $\epsilon_r = 38.27$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(7.05, 7.05, 7.05); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Body/Area Scan (10x19x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.809 W/kg

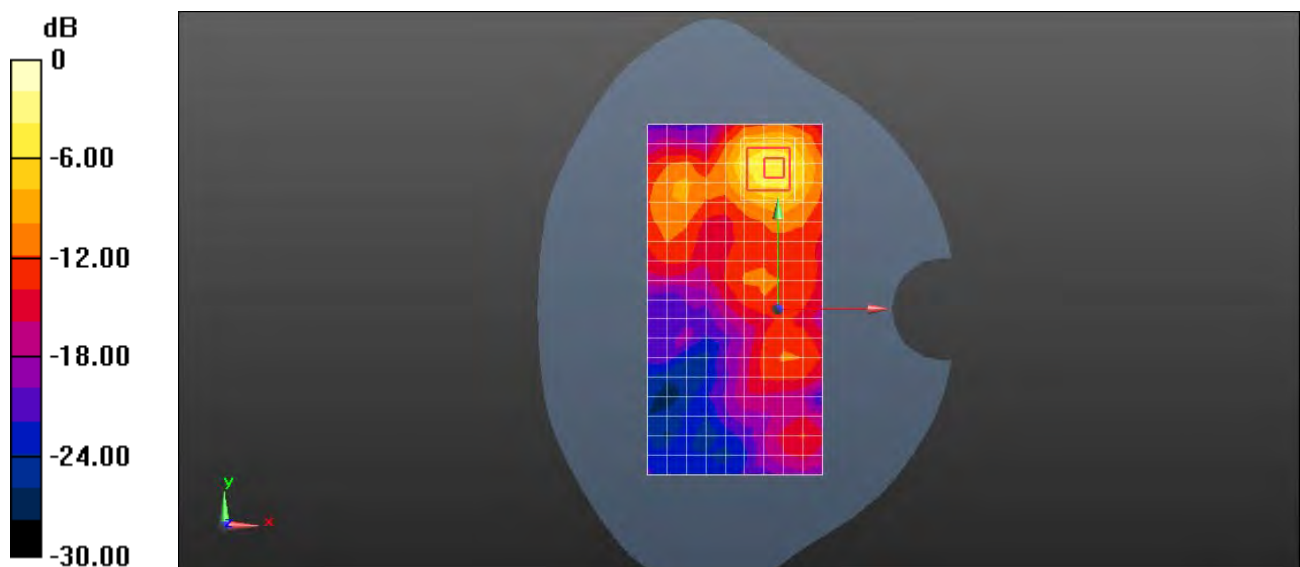
**Configuration/Body/Zoom Scan (9x9x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 3.655 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 1.97 W/kg

**SAR(1 g) = 0.495 W/kg; SAR(10 g) = 0.222 W/kg**

Maximum value of SAR (measured) = 1.96 W/kg



0 dB = 1.96 W/kg = 2.92 dBW/kg

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## CRUISE2 5GA 5G NR N77 100M QPSK 135RB69 633334CH Top side 10mm

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, NR (0); Frequency: 3500 MHz;Duty Cycle: 1:1

Medium: HSL3500;Medium parameters used:  $f = 3500$  MHz;  $\sigma = 2.983$  S/m;  $\epsilon_r = 38.27$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(7.05, 7.05, 7.05); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Head/Area Scan (7x13x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.768 W/kg

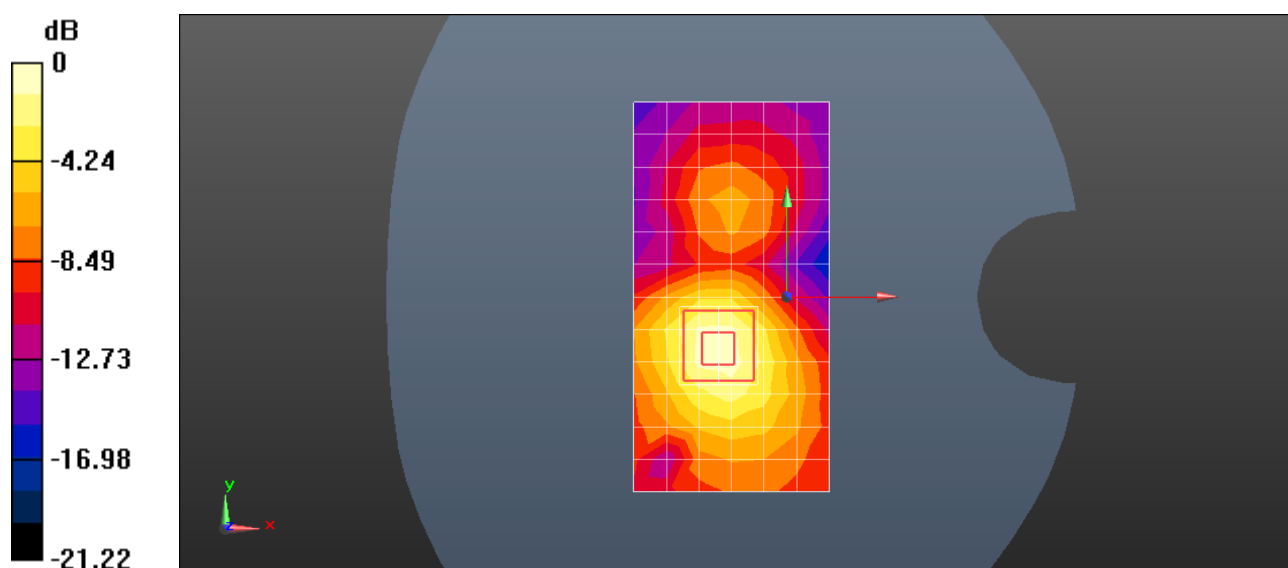
**Configuration/Head/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 8.379 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 1.15 W/kg

**SAR(1 g) = 0.507 W/kg; SAR(10 g) = 0.215 W/kg**

Maximum value of SAR (measured) = 0.885 W/kg



0 dB = 0.885 W/kg = -0.53 dBW/kg

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## CRUISE2 5GA 5G NR N77 100M QPSK 1RB1 656000CH Right cheek

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, NR (0); Frequency: 3840 MHz;Duty Cycle: 1:1

Medium: HSL3900;Medium parameters used:  $f = 3840$  MHz;  $\sigma = 3.382$  S/m;  $\epsilon_r = 37.199$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(6.46, 6.46, 6.46); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Head/Area Scan (9x16x1):** Measurement grid: dx=12mm, dy=12mm  
Maximum value of SAR (measured) = 1.49 W/kg

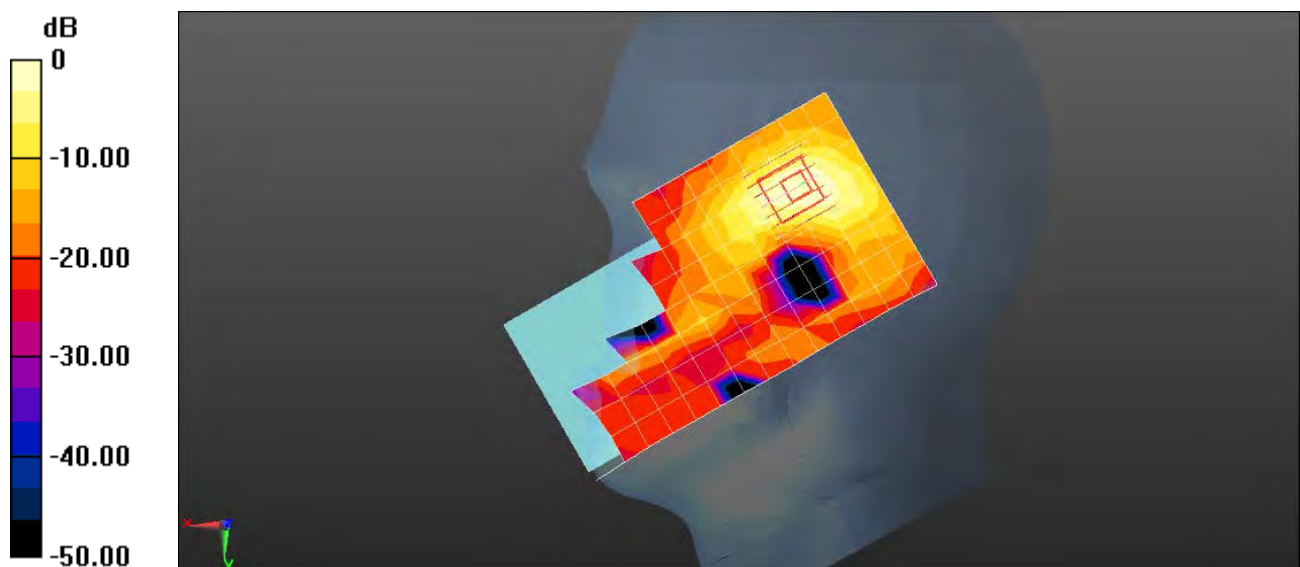
**Configuration/Head/Zoom Scan (7x7x5)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.841 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 2.62 W/kg

**SAR(1 g) = 1.1 W/kg; SAR(10 g) = 0.413 W/kg**

Maximum value of SAR (measured) = 1.80 W/kg



0 dB = 1.80 W/kg = 2.55 dBW/kg

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**CRUISE2 5GA 5G NR N77 100M QPSK 1RB1 656000CH Front side 10mm**

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, NR (0); Frequency: 3840 MHz;Duty Cycle: 1:1

Medium: HSL3900;Medium parameters used:  $f = 3840$  MHz;  $\sigma = 3.382$  S/m;  $\epsilon_r = 37.199$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(6.46, 6.46, 6.46); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Body/Area Scan (9x16x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.598 W/kg

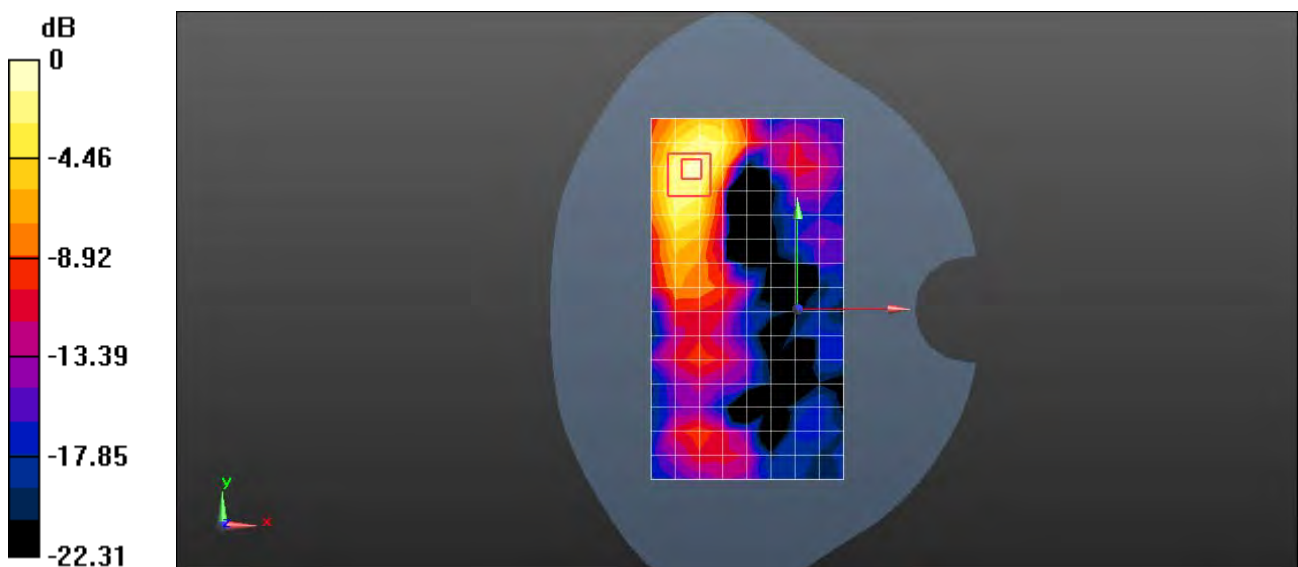
**Configuration/Body/Zoom Scan (7x7x5)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.645 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.941 W/kg

**SAR(1 g) = 0.449 W/kg; SAR(10 g) = 0.211 W/kg**

Maximum value of SAR (measured) = 0.749 W/kg



0 dB = 0.749 W/kg = -1.26 dBW/kg

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## CRUISE2 5GA 5G NR N77 100M QPSK 1RB1 656000CH Top side 10mm

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, NR (0); Frequency: 3840 MHz;Duty Cycle: 1:1

Medium: HSL3900;Medium parameters used:  $f = 3840$  MHz;  $\sigma = 3.382$  S/m;  $\epsilon_r = 37.199$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(6.46, 6.46, 6.46); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Body/Area Scan (6x11x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.755 W/kg

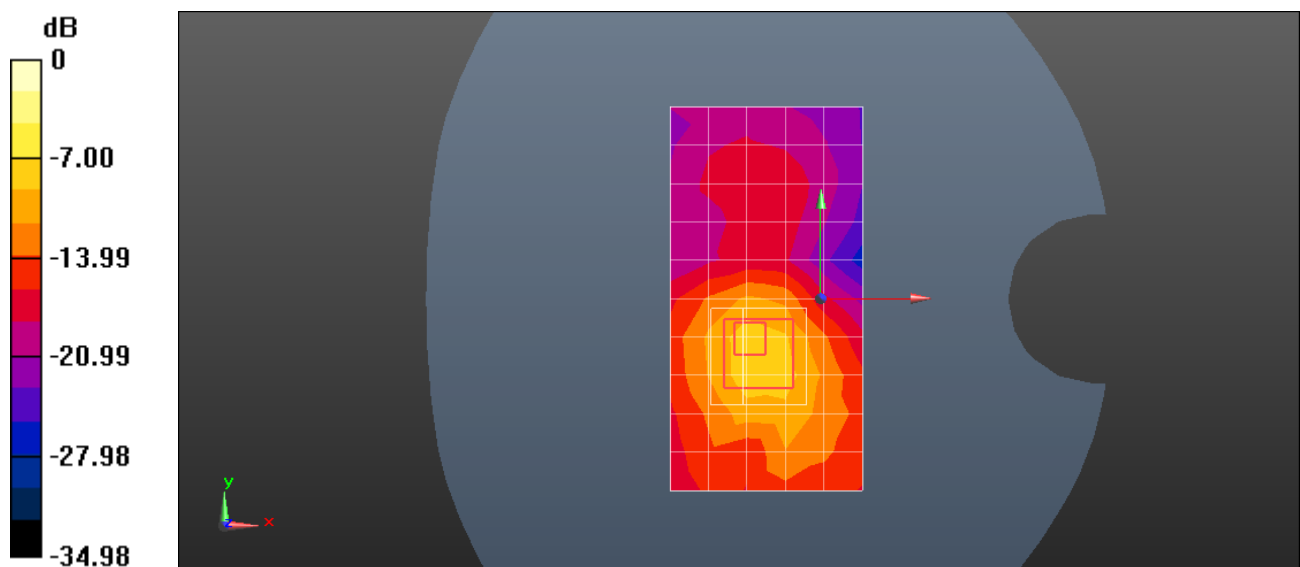
**Configuration/Body/Zoom Scan (7x7x5)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.895 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 16.8 W/kg

**SAR(1 g) = 0.573 W/kg; SAR(10 g) = 0.202 W/kg**

Maximum value of SAR (measured) = 4.49 W/kg



0 dB = 4.49 W/kg = 6.52 dBW/kg

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## CRUISE2 5GA WIFI 2.4G 802.11b 1CH Left cheek

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, WI-FI(2.4GHz) (0); Frequency: 2412 MHz;Duty Cycle: 1:1.01

Medium: HSL2450;Medium parameters used:  $f = 2412$  MHz;  $\sigma = 1.756$  S/m;  $\epsilon_r = 38.94$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN7620; ConvF(8.29, 8.29, 8.29); Calibrated: 2021-08-24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 2021-11-05
- Phantom: SAM 6; Type: SAM; Serial: 1824
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Head/Area Scan (9x17x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.113 W/kg

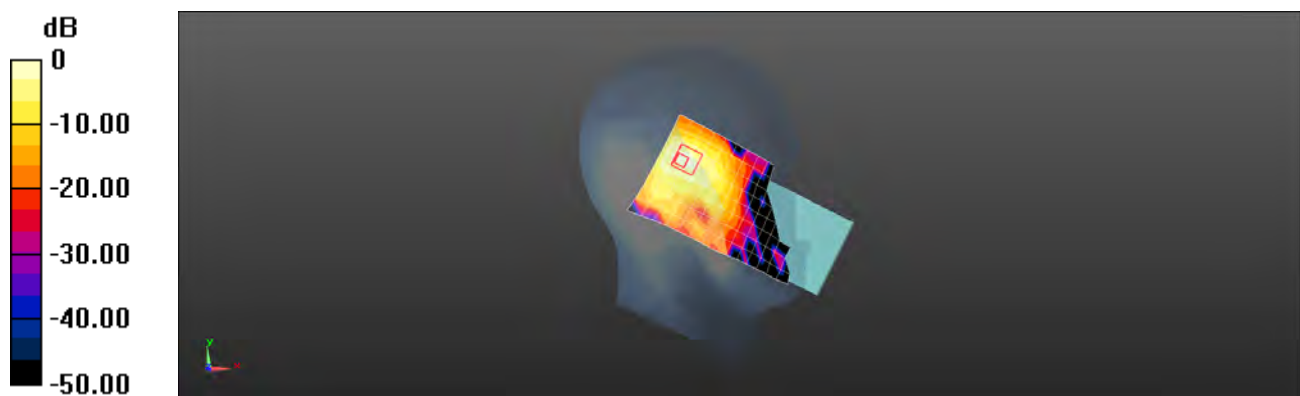
**Configuration/Head/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.669 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.195 W/kg

**SAR(1 g) = 0.057 W/kg; SAR(10 g) = 0.027 W/kg**

Maximum value of SAR (measured) = 0.142 W/kg



0 dB = 0.142 W/kg = -8.48 dBW/kg

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## CRUISE2 5GA WIFI 2.4G 802.11b 1CH Back side 10mm

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, WI-FI(2.4GHz) (0); Frequency: 2412 MHz;Duty Cycle: 1:1.01

Medium: HSL2450;Medium parameters used:  $f = 2412$  MHz;  $\sigma = 1.756$  S/m;  $\epsilon_r = 38.94$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN7620; ConvF(8.29, 8.29, 8.29); Calibrated: 2021-08-24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 2021-11-05
- Phantom: SAM 6; Type: SAM; Serial: 1824
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Body/Area Scan (10x17x1):** Measurement grid: dx=12mm, dy=12mm  
Maximum value of SAR (measured) = 0.122 W/kg

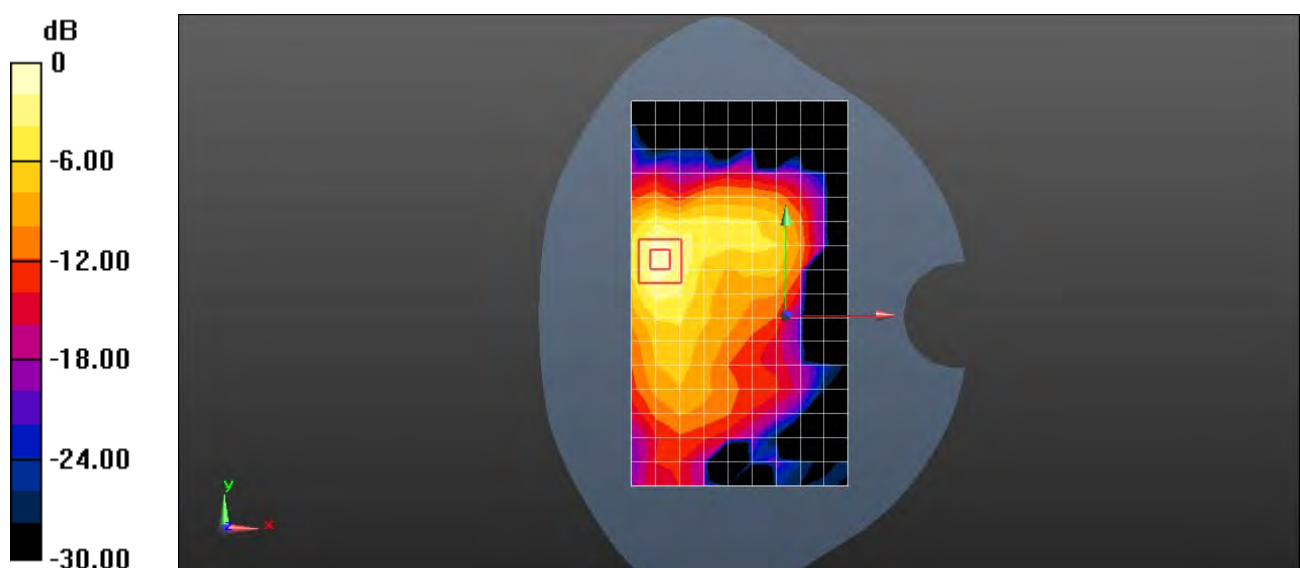
**Configuration/Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.529 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.171 W/kg

**SAR(1 g) = 0.082 W/kg; SAR(10 g) = 0.037 W/kg**

Maximum value of SAR (measured) = 0.137 W/kg



0 dB = 0.137 W/kg = -8.63 dBW/kg

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## CRUISE2 5GA WLAN5GHz 802.11n-HT40 62CH Right tilted

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5310 MHz;Duty Cycle: 1:1.043

Medium: HSL5000;Medium parameters used:  $f = 5310$  MHz;  $\sigma = 4.934$  S/m;  $\epsilon_r = 36.472$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(5.51, 5.51, 5.51); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Head/Area Scan (12x20x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.176 W/kg

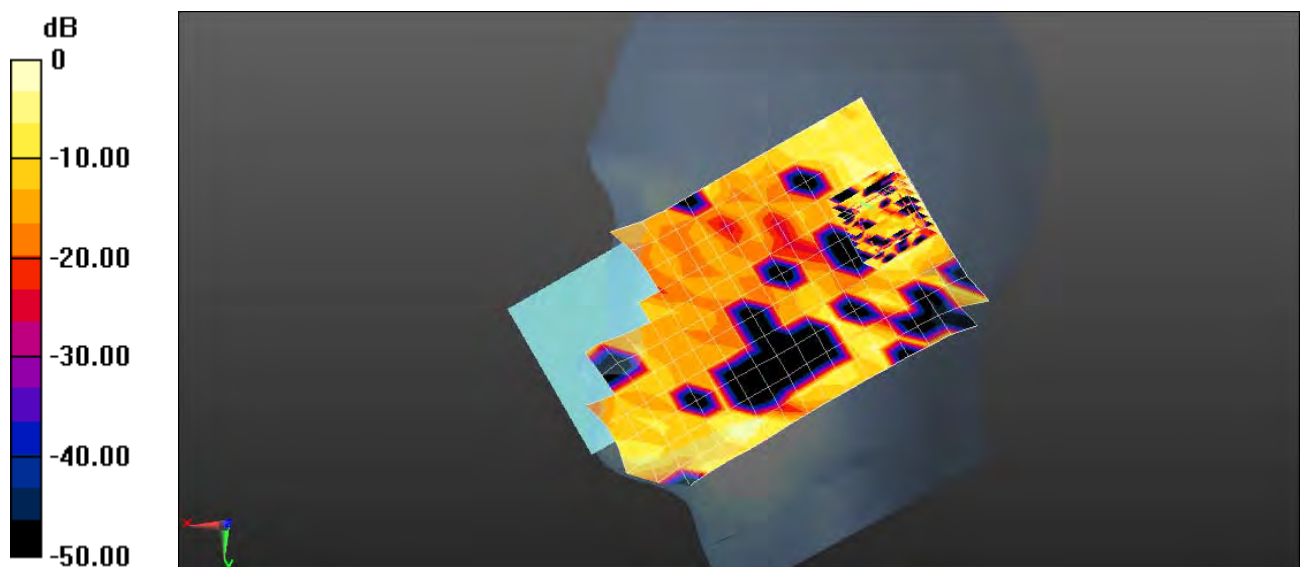
**Configuration/Head/Zoom Scan (9x9x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 3.336 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.611 W/kg

**SAR(1 g) = 0.097 W/kg; SAR(10 g) = 0.035 W/kg**

Maximum value of SAR (measured) = 0.211 W/kg



0 dB = 0.211 W/kg = -6.76 dBW/kg



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## CRUISE2 5GA WLAN5GHz 802.11n-HT40 110CH Right tilted

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5550 MHz;Duty Cycle: 1:1.043

Medium: HSL5000;Medium parameters used:  $f = 5550$  MHz;  $\sigma = 5.21$  S/m;  $\epsilon_r = 36.042$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(4.81, 4.81, 4.81); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Head/Area Scan (11x14x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.256 W/kg

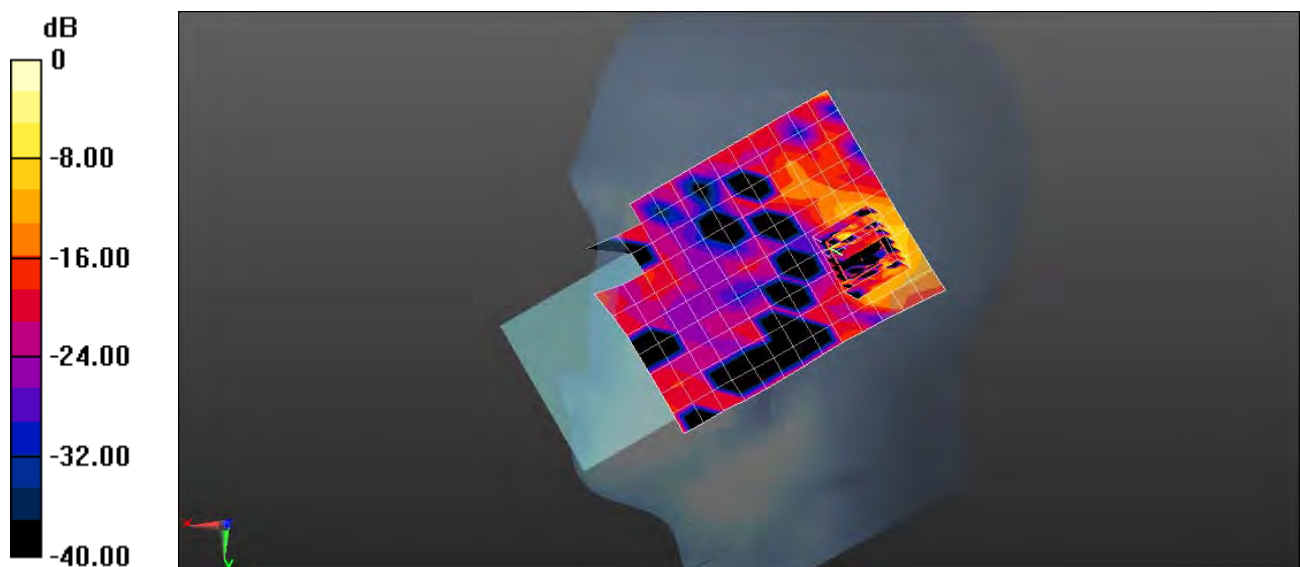
**Configuration/Head/Zoom Scan (8x8x4)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=5mm

Reference Value = 1.701 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 2.45 W/kg

**SAR(1 g) = 0.110 W/kg; SAR(10 g) = 0.026 W/kg**

Maximum value of SAR (measured) = 1.37 W/kg



0 dB = 1.37 W/kg = 1.37 dBW/kg

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## CRUISE2 5GA WLAN5GHz 802.11n-HT40 151CH Right tilted

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5755 MHz;Duty Cycle: 1:1.043

Medium: HSL5000;Medium parameters used:  $f = 5755$  MHz;  $\sigma = 5.472$  S/m;  $\epsilon_r = 35.806$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(4.9, 4.9, 4.9); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Head/Area Scan (11x20x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.473 W/kg

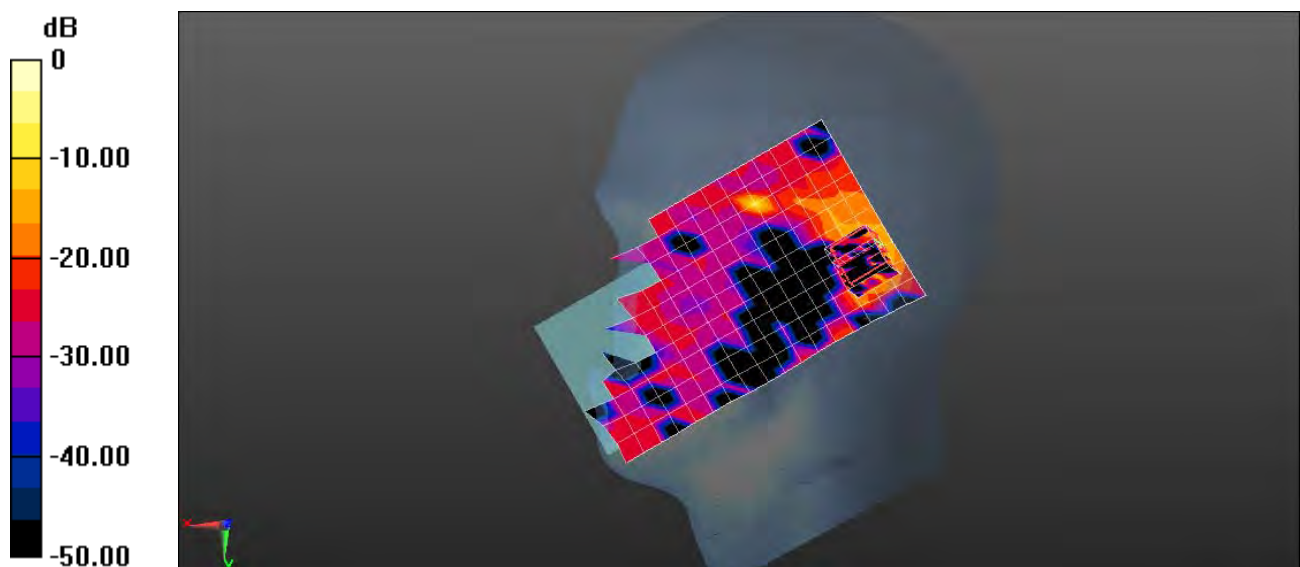
**Configuration/Head/Zoom Scan (7x7x4)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=5mm

Reference Value = 1.584 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 6.81 W/kg

**SAR(1 g) = 0.156 W/kg; SAR(10 g) = 0.032 W/kg**

Maximum value of SAR (measured) = 3.49 W/kg



0 dB = 3.49 W/kg = 5.43 dBW/kg

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## CRUISE2 5GA WLAN5GHz 802.11n-HT40 46CH Back side 10mm

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5230 MHz;Duty Cycle: 1:1.043

Medium: HSL5000;Medium parameters used:  $f = 5230$  MHz;  $\sigma = 4.862$  S/m;  $\epsilon_r = 36.776$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(5.51, 5.51, 5.51); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Body/Area Scan (12x19x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.480 W/kg

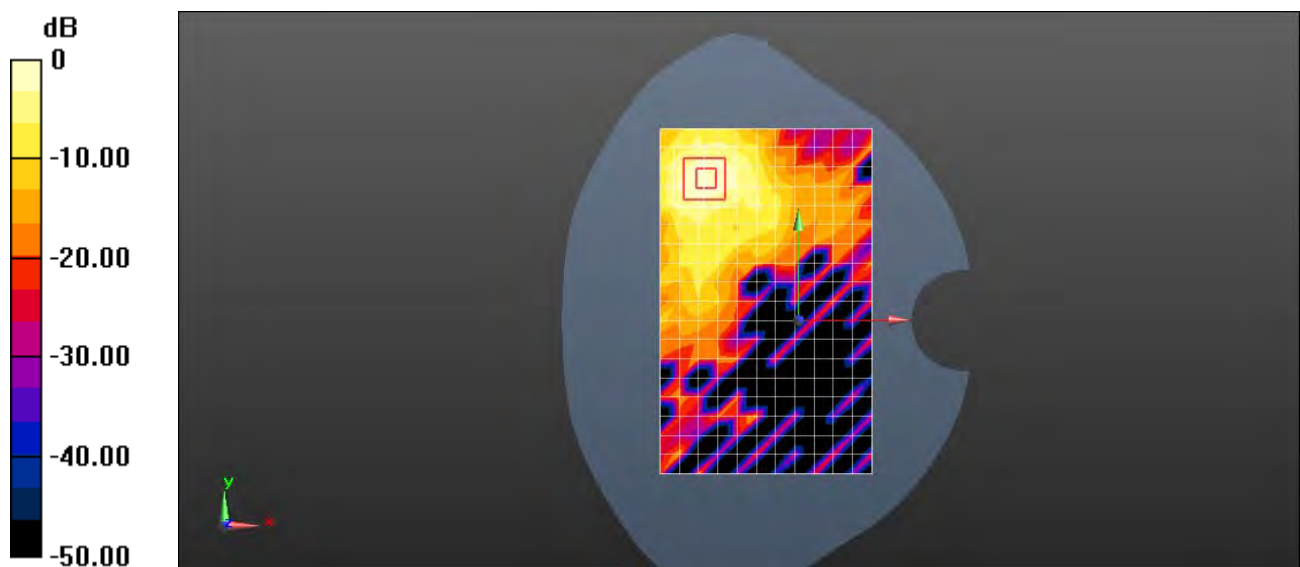
**Configuration/Body/Zoom Scan (9x9x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 1.544 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.850 W/kg

**SAR(1 g) = 0.269 W/kg; SAR(10 g) = 0.108 W/kg**

Maximum value of SAR (measured) = 0.561 W/kg



0 dB = 0.561 W/kg = -2.51 dBW/kg

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## CRUISE2 5GA WLAN5GHz 802.11n-HT40 110CH Back side 10mm

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5550 MHz;Duty Cycle: 1:1.043

Medium: HSL5000;Medium parameters used:  $f = 5550$  MHz;  $\sigma = 5.21$  S/m;  $\epsilon_r = 36.042$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(4.81, 4.81, 4.81); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Body/Area Scan (12x20x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.347 W/kg

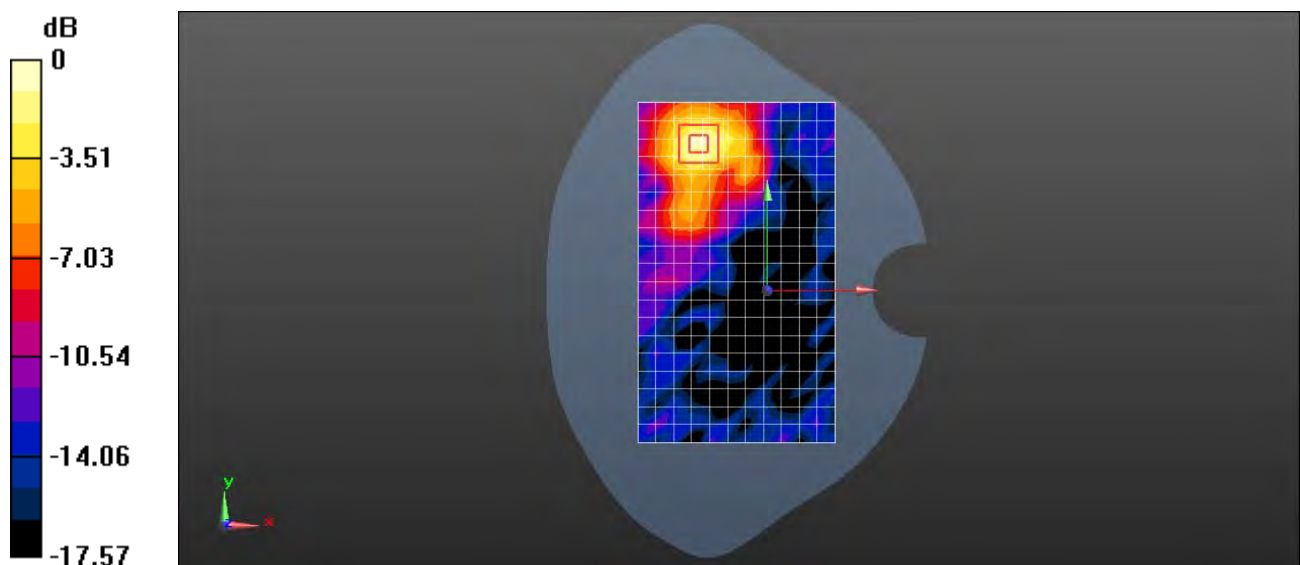
**Configuration/Body/Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 0.6610 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.699 W/kg

**SAR(1 g) = 0.194 W/kg; SAR(10 g) = 0.075 W/kg**

Maximum value of SAR (measured) = 0.426 W/kg



0 dB = 0.426 W/kg = -3.71 dBW/kg

Test Laboratory: SGS-SAR Lab

## CRUISE2 5GA WLAN5GHz 802.11n-HT40 151CH Back side 10mm

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5755 MHz;Duty Cycle: 1:1.043

Medium: HSL5000;Medium parameters used:  $f = 5755$  MHz;  $\sigma = 5.472$  S/m;  $\epsilon_r = 35.806$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(4.9, 4.9, 4.9); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Body/Area Scan (11x19x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.387 W/kg

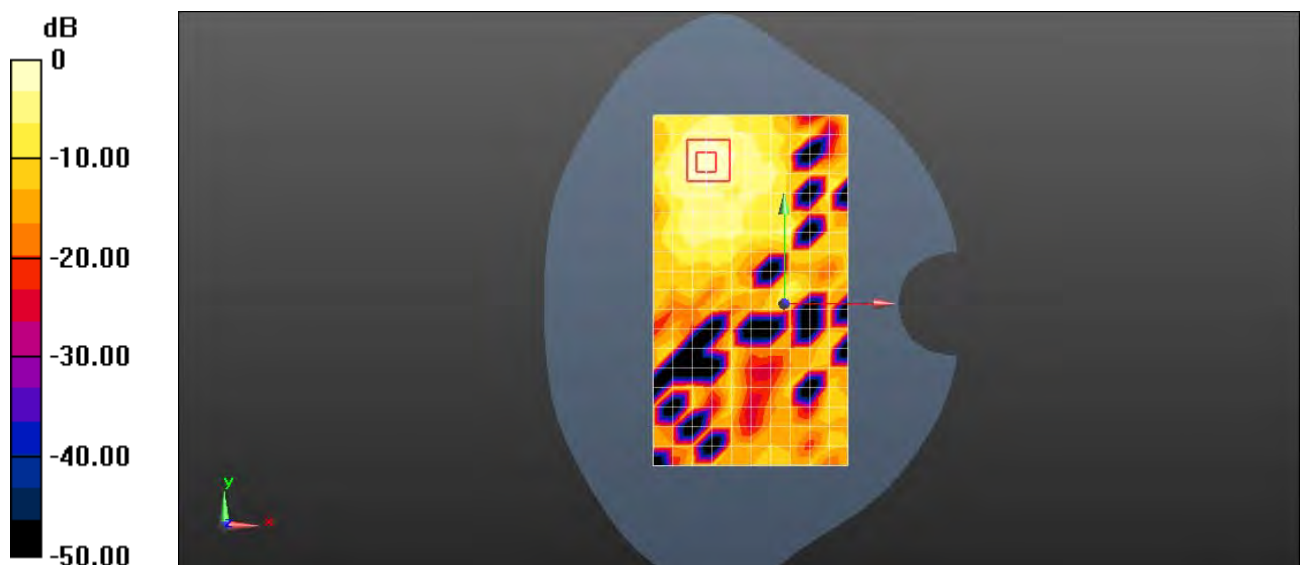
**Configuration/Body/Zoom Scan (9x9x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 1.864 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.811 W/kg

**SAR(1 g) = 0.193 W/kg; SAR(10 g) = 0.071 W/kg**

Maximum value of SAR (measured) = 0.454 W/kg



0 dB = 0.454 W/kg = -3.43 dBW/kg

Test Laboratory: SGS-SAR Lab

## CRUISE2 5GA WLAN5GHz 802.11n-HT40 62CH Top side 0mm

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5310 MHz;Duty Cycle: 1:1.043

Medium: HSL5000;Medium parameters used:  $f = 5310$  MHz;  $\sigma = 4.934$  S/m;  $\epsilon_r = 36.472$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(5.51, 5.51, 5.51); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Body/Area Scan (7x13x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 4.91 W/kg

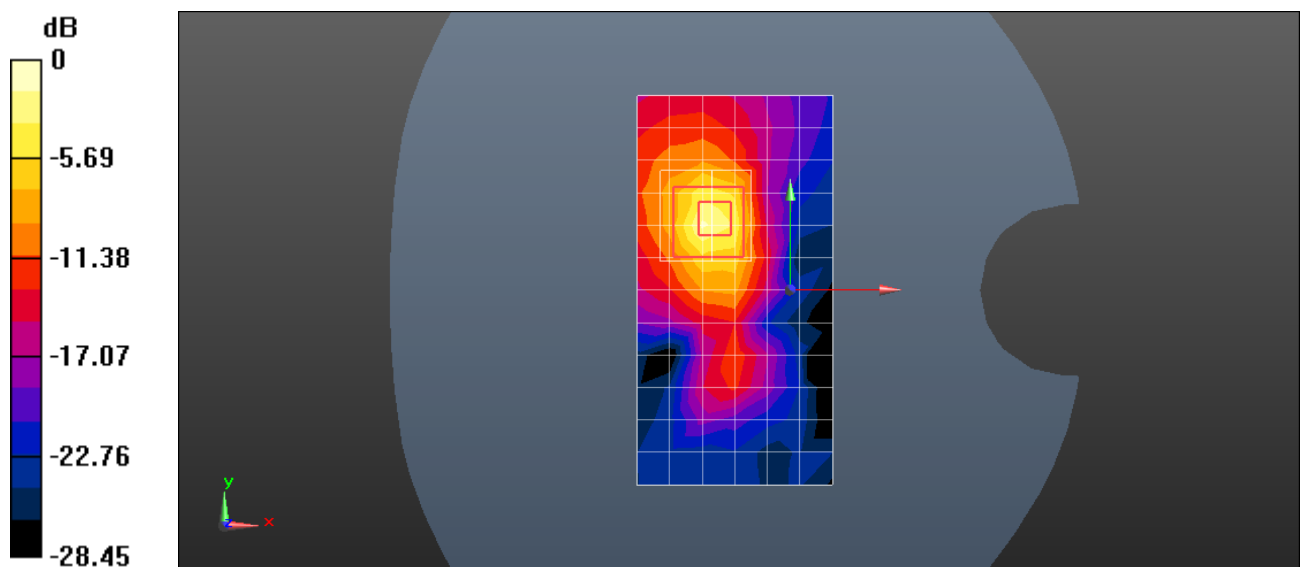
**Configuration/Body/Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 9.772 V/m; Power Drift = 0.73 dB

Peak SAR (extrapolated) = 10.1 W/kg

**SAR(1 g) = 2.72 W/kg; SAR(10 g) = 0.757 W/kg**

Maximum value of SAR (measured) = 6.82 W/kg



0 dB = 6.82 W/kg = 8.34 dBW/kg

Test Laboratory: SGS-SAR Lab

## CRUISE2 5GA WLAN5GHz 802.11n-HT40 110CH Back side 0mm

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5550 MHz;Duty Cycle: 1:1.043

Medium: HSL5000;Medium parameters used:  $f = 5550$  MHz;  $\sigma = 5.21$  S/m;  $\epsilon_r = 36.042$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(4.81, 4.81, 4.81); Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2021-06-22
- Phantom: SAM 2; Type: SAM; Serial: 1563
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Body/Area Scan (12x19x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 1.88 W/kg

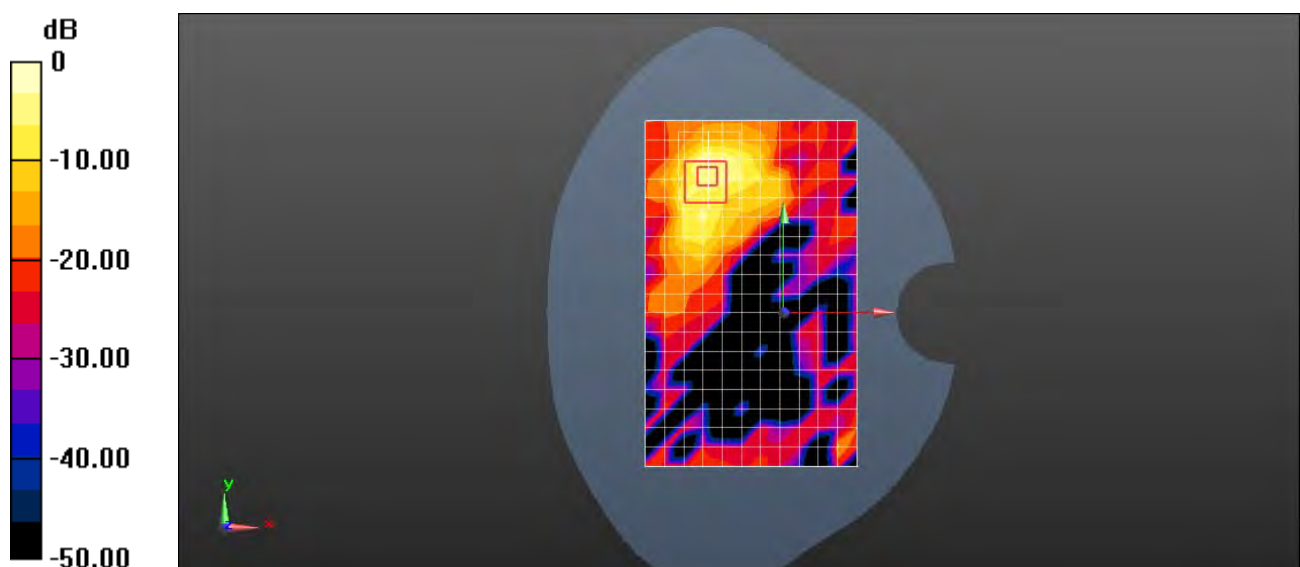
**Configuration/Body/Zoom Scan (9x11x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 1.535 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 4.99 W/kg

**SAR(1 g) = 1.13 W/kg; SAR(10 g) = 0.264 W/kg**

Maximum value of SAR (measured) = 3.46 W/kg



0 dB = 3.46 W/kg = 5.39 dBW/kg

Test Laboratory: SGS-SAR Lab

## CRUISE2 BT DH5 39CH Left cheek

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz; Duty Cycle: 1:1.302

Medium: HSL2450; Medium parameters used:  $f = 2441$  MHz;  $\sigma = 1.784$  S/m;  $\epsilon_r = 38.827$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN7620; ConvF(8.29, 8.29, 8.29); Calibrated: 2021-08-24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 2021-11-05
- Phantom: SAM 6; Type: SAM; Serial: 1824
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Head/Area Scan (9x16x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0231 W/kg

**Configuration/Head/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.550 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.0380 W/kg

**SAR(1 g) = 0.016 W/kg; SAR(10 g) = 0.00624 W/kg**

Maximum value of SAR (measured) = 0.0243 W/kg



0 dB = 0.0243 W/kg = -16.14 dBW/kg



Test Laboratory: SGS-SAR Lab

## CRUISE2 BT DH5 39CH Back side 10mm

**DUT: CRUISE2 5GA; Type: mobile phone**

Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz; Duty Cycle: 1:1.302

Medium: HSL2450; Medium parameters used:  $f = 2441$  MHz;  $\sigma = 1.784$  S/m;  $\epsilon_r = 38.827$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN7620; ConvF(8.29, 8.29, 8.29); Calibrated: 2021-08-24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 2021-11-05
- Phantom: SAM 6; Type: SAM; Serial: 1824
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Configuration/Body/Area Scan (9x17x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.00773 W/kg

**Configuration/Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.0160 W/kg

**SAR(1 g) = 0.00327 W/kg; SAR(10 g) = 0.00101 W/kg**

Maximum value of SAR (measured) = 0.00859 W/kg



0 dB = 0.00859 W/kg = -20.66 dBW/kg

# Appendix C

## Calibration certificate

1. Dipole
D750V3-SN 1160
D835V2-SN 4d256
D1750V2-SN 1105
D1900V2- SN 5d114
D2450V2-SN 1038
D2600V2-SN 1180
D3500V2-SN 1082
D3900V2-SN 1071
D5GHzV2-SN 1313
2. DAE
DAE4-SN 1327
DAE4-SN 1324
DAE4-SN 1428
DAE4-SN 1374
3. Probe
EX3DV4-SN 7620
EX3DV4-SN 3962
EX3DV4-SN 3789
EX3DV4-SN 3982



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CNAS L0570

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Client

SGS

Certificate No:

Z19-60152

## CALIBRATION CERTIFICATE

Object D750V3 - SN: 1160

Calibration Procedure(s) FF-Z11-003-01  
Calibration Procedures for dipole validation kits

Calibration date: May 22, 2019

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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Power sensor NRP8S	104291	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Reference Probe EX3DV4	SN 3617	31-Jan-19(SPEAG,No.EX3-3617_Jan19)	Jan-20
DAE4	SN 1331	06-Feb-19(SPEAG,No.DAE4-1331_Feb19)	Feb-20
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-19 (CTTL, No.J19X00336)	Jan-20
NetworkAnalyzer E5071C	MY46116073	24-Jan-19 (CTTL, No.J19X00547)	Jan-20

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: May 25, 2019

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 <sub>x,y,z</sub>
N/A	not applicable or not measured

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

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

#### Additional Documentation:

- DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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



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### Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	42.3 $\pm$ 6 %	0.91 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

### SAR result with Head TSL

SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>8.39 W/kg <math>\pm</math> 18.8 % (k=2)</b>
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>5.63 W/kg <math>\pm</math> 18.7 % (k=2)</b>

### 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 $\pm$ 0.2) °C	56.9 $\pm$ 6 %	0.95 mho/m $\pm$ 6 %
Body TSL temperature change during test	<1.0 °C	----	----

### SAR result with Body TSL

SAR averaged over 1 $cm^3$ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>8.62 W/kg <math>\pm</math> 18.8 % (k=2)</b>
SAR averaged over 10 $cm^3$ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.39 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>5.63 W/kg <math>\pm</math> 18.7 % (k=2)</b>



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8Ω- 3.06jΩ
Return Loss	- 29.1dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.1Ω- 3.83jΩ
Return Loss	- 27.2dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	0.897 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
-----------------	-------



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**DASY5 Validation Report for Head TSL**

Date: 05.22.2019

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1160**

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 750$  MHz;  $\sigma = 0.905$  S/m;  $\epsilon_r = 42.28$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(10.03, 10.03, 10.03) @ 750 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

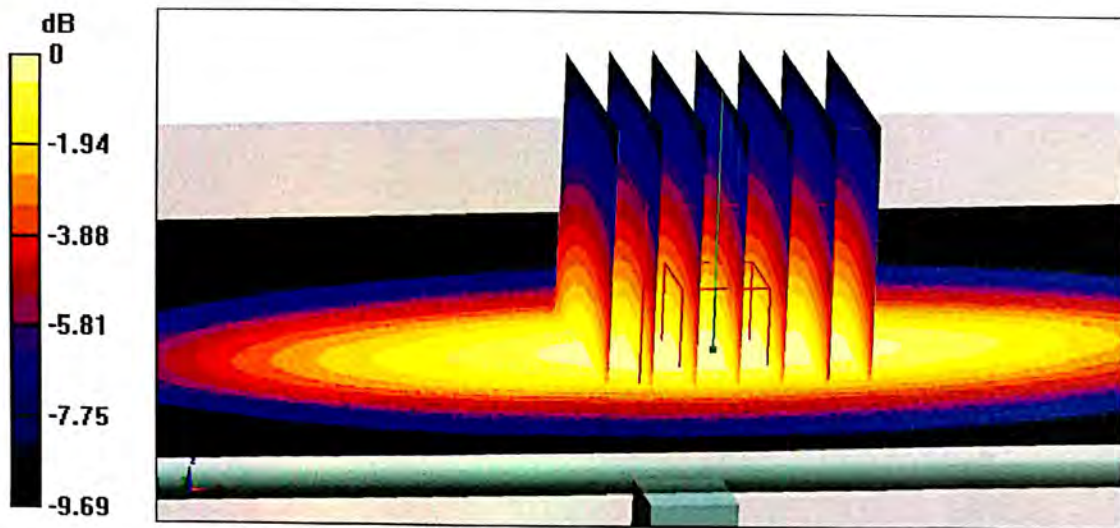
**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.91 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 3.06 W/kg

SAR(1 g) = 2.12 W/kg; SAR(10 g) = 1.42 W/kg

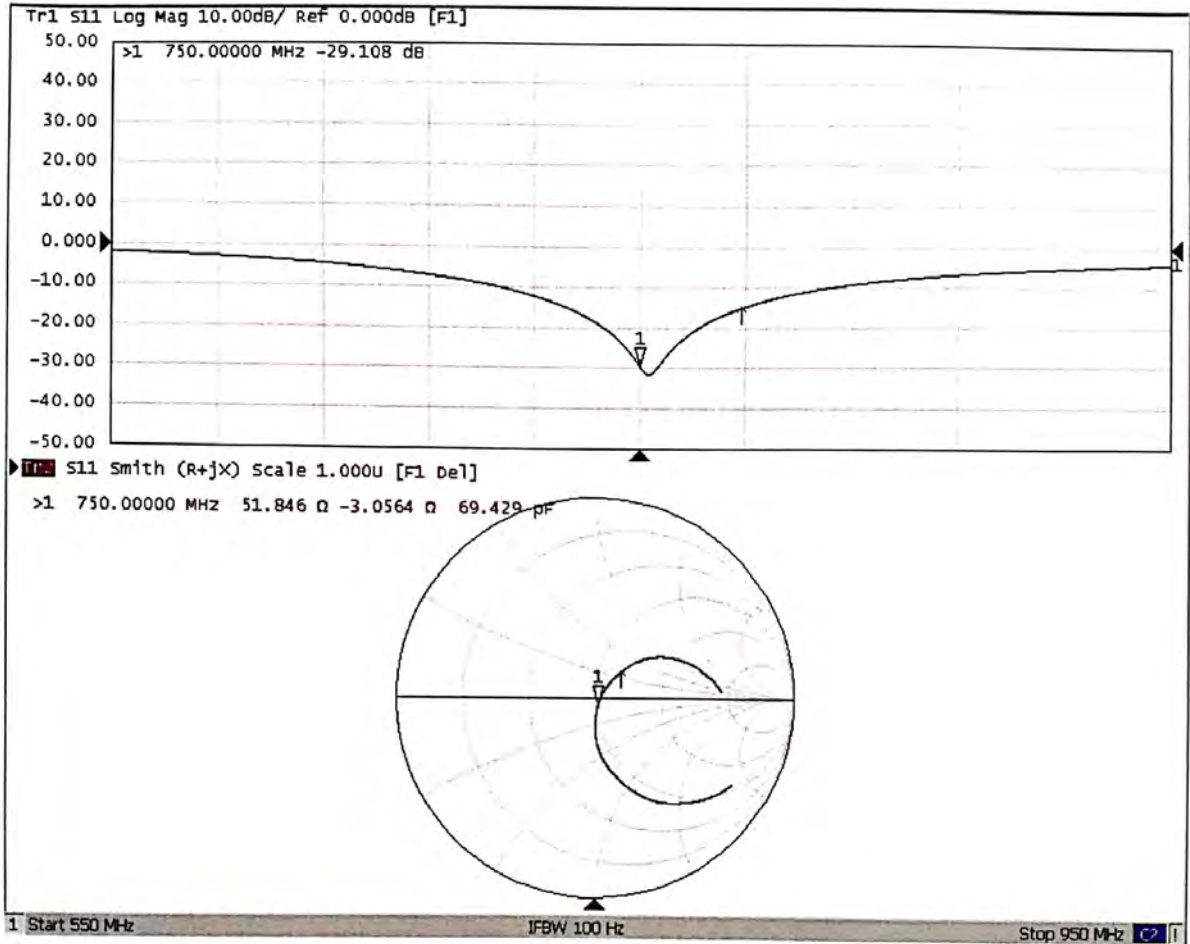
Maximum value of SAR (measured) = 2.76 W/kg





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### Impedance Measurement Plot for Head TSL







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E-mail: [cttl@chinattl.com](mailto:cttl@chinattl.com) <http://www.chinattl.cn>

**DASY5 Validation Report for Body TSL**

Date: 05.22.2019

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1160**

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 750$  MHz;  $\sigma = 0.946$  S/m;  $\epsilon_r = 56.92$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.85, 9.85, 9.85) @ 750 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

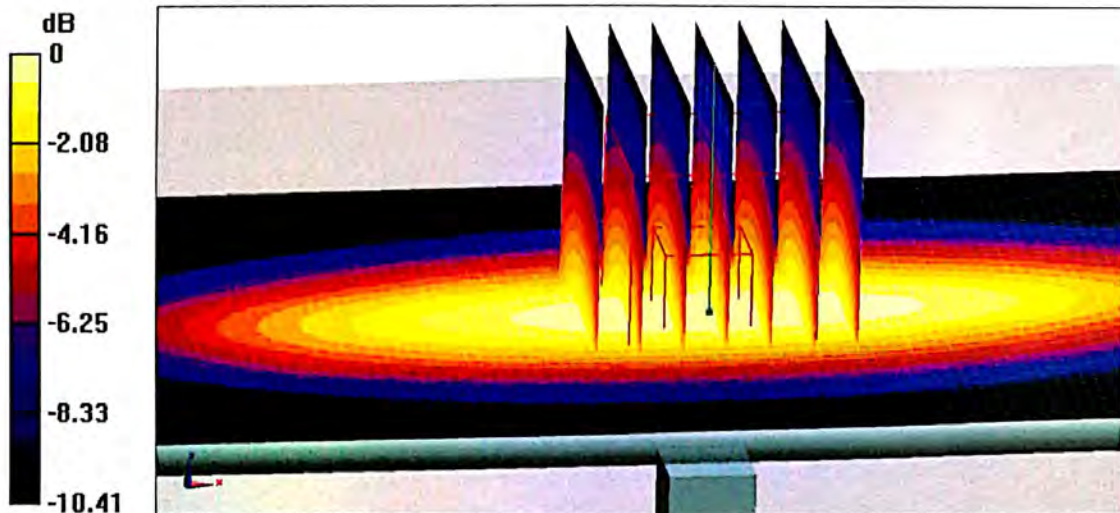
**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.99 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.22 W/kg

**SAR(1 g) = 2.12 W/kg; SAR(10 g) = 1.39 W/kg**

Maximum value of SAR (measured) = 2.85 W/kg

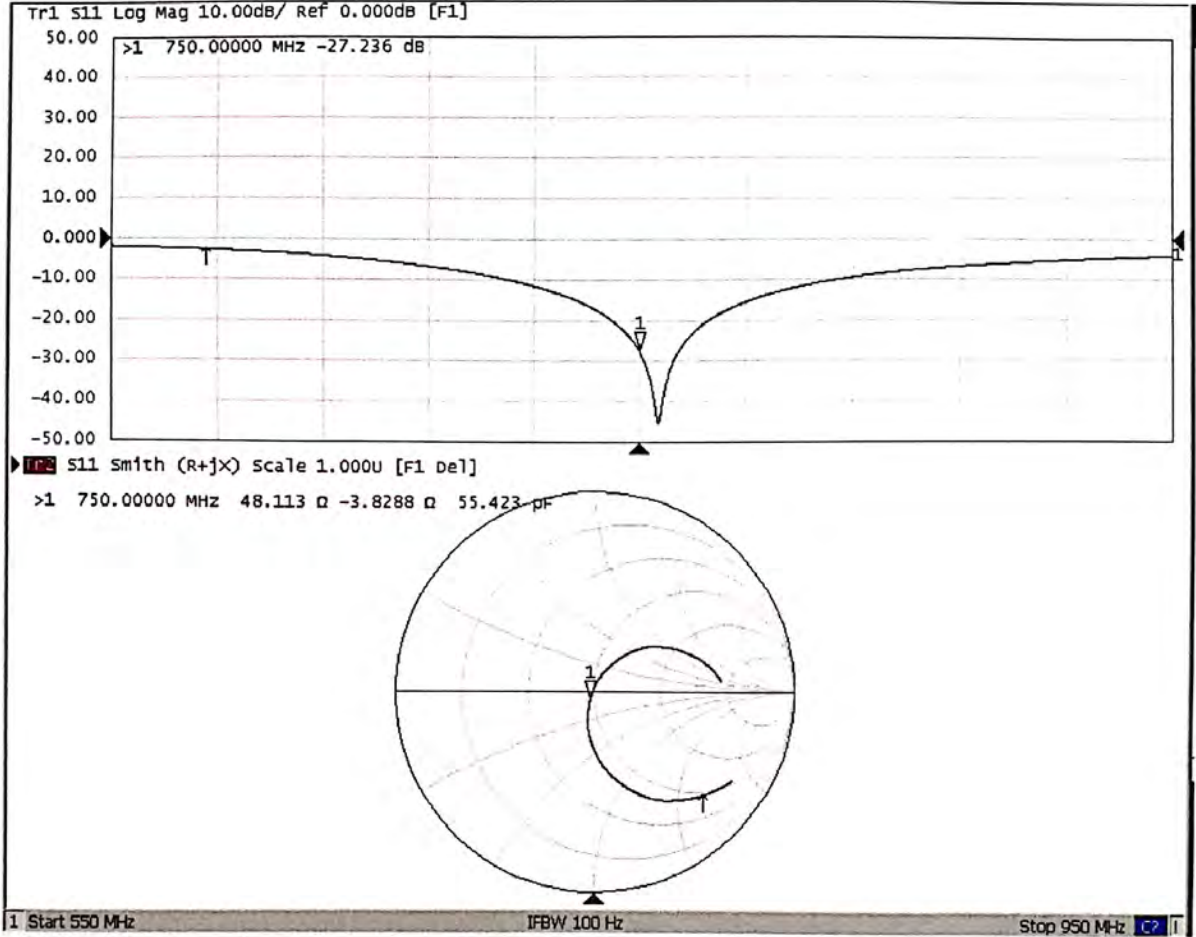


0 dB = 2.85 W/kg = 4.55 dBW/kg



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### Impedance Measurement Plot for Body TSL





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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 **SGS-CN (Auden)**

Certificate No: **D835V2-4d256\_Apr20**

## CALIBRATION CERTIFICATE

Object **D835V2 - SN:4d256**

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

Calibration date: **April 15, 2020**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 7349	31-Dec-19 (No. EX3-7349_Dec19)	Dec-20
DAE4	SN: 601	27-Dec-19 (No. DAE4-601_Dec19)	Dec-20
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-19)	In house check: Oct-20

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 17, 2020

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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:**

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

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

## Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.10.4
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	835 MHz ± 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	41.5	0.90 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	42.2 ± 6 %	0.92 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>9.52 W/kg ± 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	1.56 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>6.17 W/kg ± 16.5 % (k=2)</b>

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

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.5 $\Omega$ - 2.1 j $\Omega$
Return Loss	- 33.2 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.385 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
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# DASY5 Validation Report for Head TSL

Date: 15.04.2020

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d256**

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

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.92$  S/m;  $\epsilon_r = 42.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.89, 9.89, 9.89) @ 835 MHz; Calibrated: 31.12.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

## 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 = 62.76 V/m; Power Drift = -0.01 dB

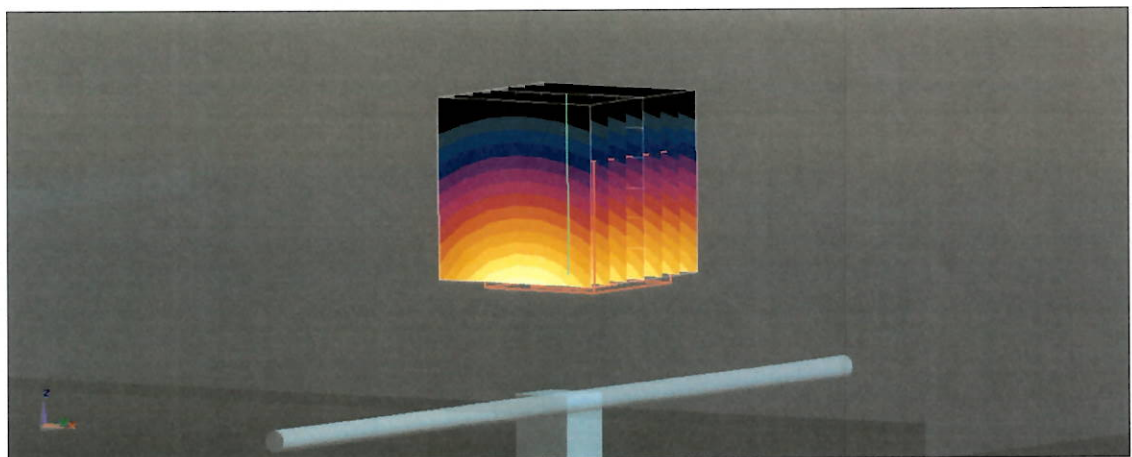
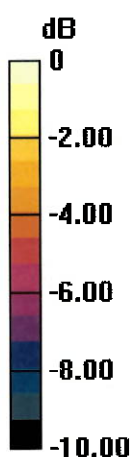
Peak SAR (extrapolated) = 3.63 W/kg

**SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.56 W/kg**

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

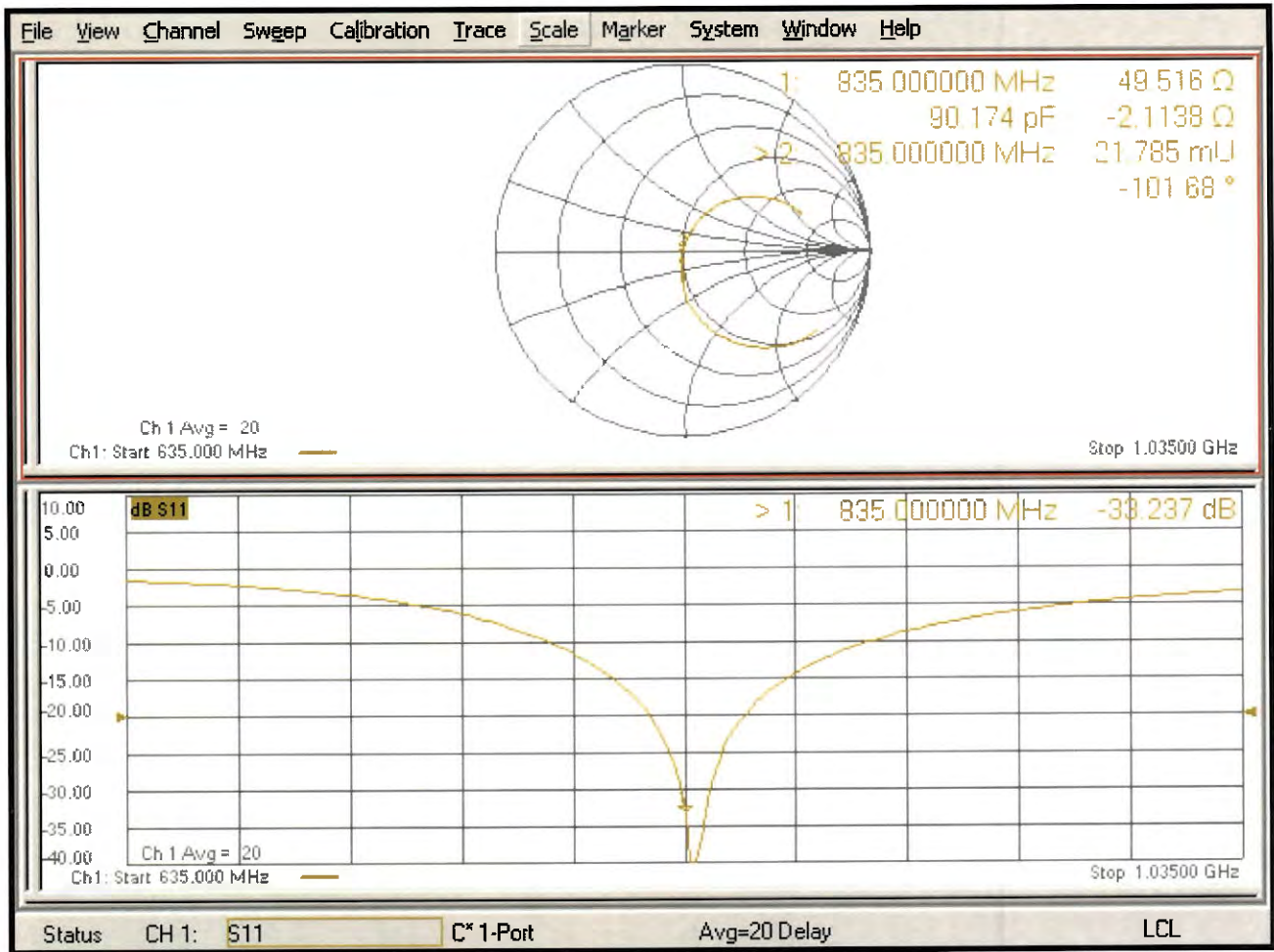
Ratio of SAR at M2 to SAR at M1 = 66.6%

Maximum value of SAR (measured) = 3.19 W/kg



0 dB = 3.19 W/kg = 5.04 dBW/kg

# Impedance Measurement Plot for Head TSL





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

### Evaluation Condition

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

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

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>9.01 W/kg <math>\pm</math> 17.5 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>5.93 W/kg <math>\pm</math> 16.9 % (k=2)</b>

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

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>9.46 W/kg <math>\pm</math> 17.5 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>6.31 W/kg <math>\pm</math> 16.9 % (k=2)</b>

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

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>8.99 W/kg <math>\pm</math> 17.5 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>6.03 W/kg <math>\pm</math> 16.9 % (k=2)</b>

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

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>7.72 W/kg <math>\pm</math> 17.5 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>5.17 W/kg <math>\pm</math> 16.9 % (k=2)</b>

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



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Client **SGS**

Certificate No: **Z20-60326**

## CALIBRATION CERTIFICATE

Object **D1750V2 - SN: 1105**

Calibration Procedure(s) **FF-Z11-003-01**  
**Calibration Procedures for dipole validation kits**

Calibration date: **August 29, 2020**

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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 3617	30-Jan-20(SPEAG, No.EX3-3617_Jan20)	Jan-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG, No.Z20-60017)	Feb-21
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: September 3, 2020

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### Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
N/A	not applicable or not measured

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

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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



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**Measurement Conditions**

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

<b>DASY Version</b>	DASY52	V52.10.4
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Triple Flat Phantom 5.1C	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1750 MHz ± 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	40.1	1.37 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	39.8 ± 6 %	1.38 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	<1.0 °C	----	----

**SAR result with Head TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	8.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>35.3 W/kg ± 18.8 % (k=2)</b>
<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	4.69 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>18.7 W/kg ± 18.7 % (k=2)</b>



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.5Ω- 2.54 jΩ
Return Loss	- 30.8 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.080 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
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**DASY5 Validation Report for Head TSL**

Date: 08.29.2020

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1105**

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.383$  S/m;  $\epsilon_r = 39.75$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(8.41, 8.41, 8.41) @ 1750 MHz; Calibrated: 2020-01-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:**

$dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

Reference Value = 89.77 V/m; Power Drift = -0.07 dB

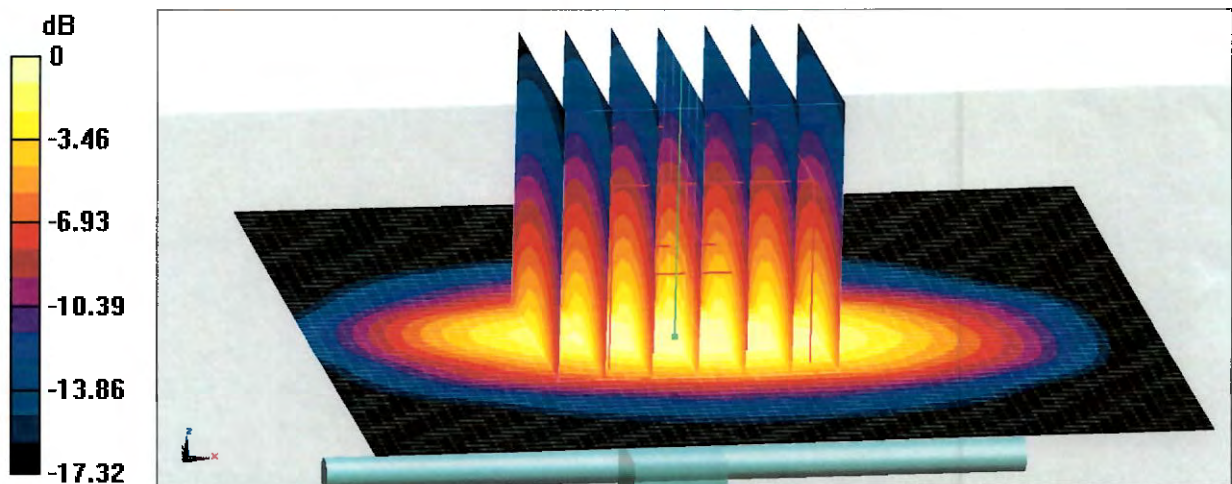
Peak SAR (extrapolated) = 16.9 W/kg

**SAR(1 g) = 8.9 W/kg; SAR(10 g) = 4.69 W/kg**

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

Ratio of SAR at M2 to SAR at M1 = 52.8%

Maximum value of SAR (measured) = 13.9 W/kg

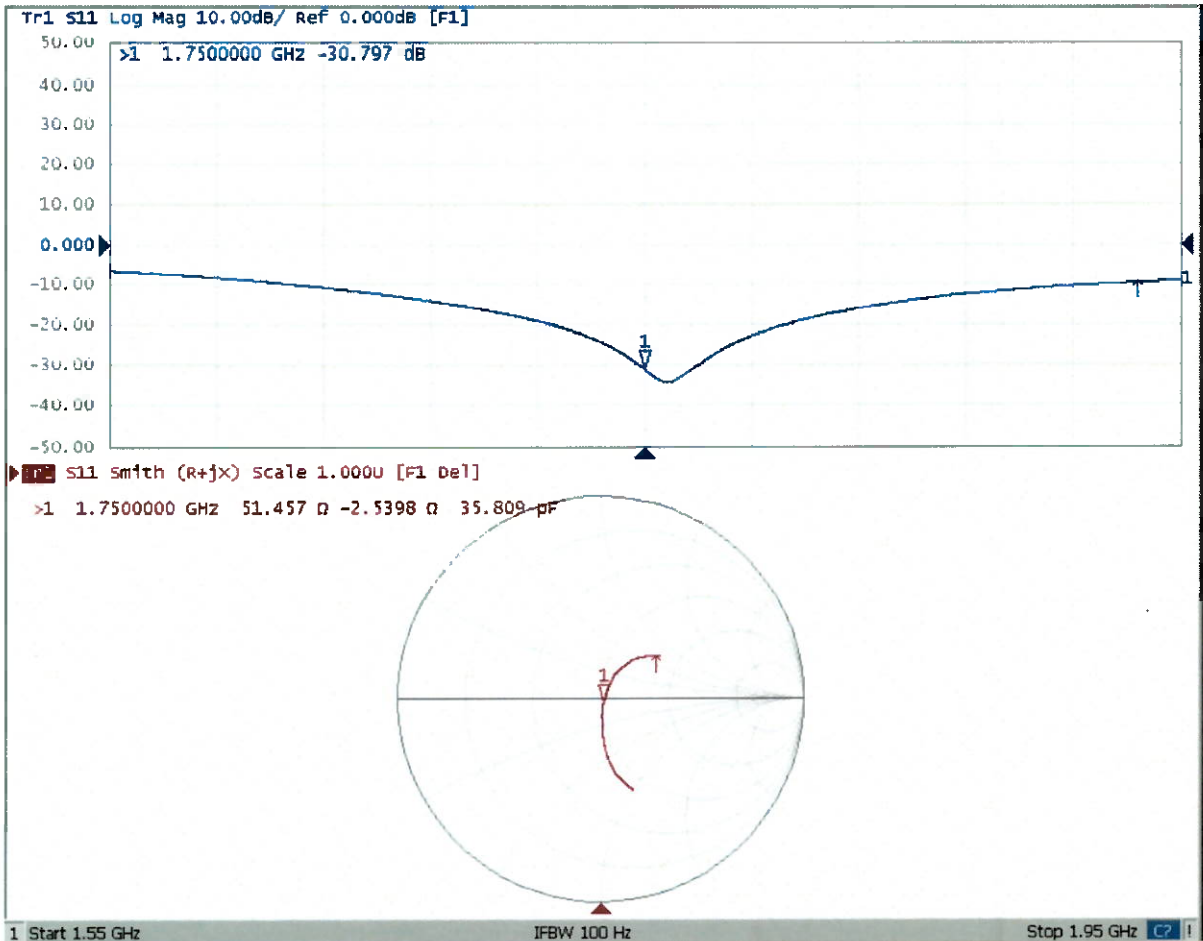


**0 dB = 13.9 W/kg = 11.43 dBW/kg**



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### Impedance Measurement Plot for Head TSL





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Client **SGS**

Certificate No: **Z20-60327**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d114**

Calibration Procedure(s) **FF-Z11-003-01**  
**Calibration Procedures for dipole validation kits**

Calibration date: **August 27, 2020**

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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 3617	30-Jan-20(SPEAG,No.EX3-3617_Jan20)	Jan-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: September 3, 2020

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#### Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
N/A	not applicable or not measured

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

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

#### Additional Documentation:

- DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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



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### Measurement Conditions

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

<b>DASY Version</b>	DASY52	V52.10.4
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Triple Flat Phantom 5.1C	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1900 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	40.0	1.40 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	41.1 ± 6 %	1.40 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	<1.0 °C	---	---

### SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	9.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>39.7 W/kg ± 18.8 % (k=2)</b>
<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	5.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>20.3 W/kg ± 18.7 % (k=2)</b>



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.9Ω+ 6.78jΩ
Return Loss	- 23.2dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.067 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
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### DASY5 Validation Report for Head TSL

Date: 08.27.2020

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d114**

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.404$  S/m;  $\epsilon_r = 41.12$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(8.14, 8.14, 8.14) @ 1900 MHz; Calibrated: 2020-01-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:**

$dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

Reference Value = 98.97 V/m; Power Drift = -0.07 dB

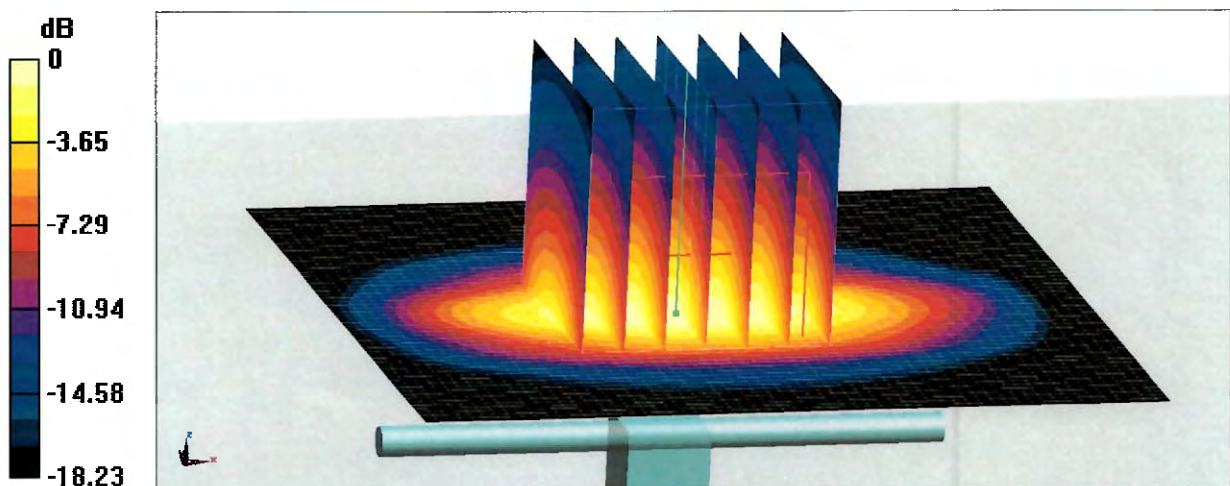
Peak SAR (extrapolated) = 19.0 W/kg

**SAR(1 g) = 9.87 W/kg; SAR(10 g) = 5.06 W/kg**

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

Ratio of SAR at M2 to SAR at M1 = 52%

Maximum value of SAR (measured) = 15.7 W/kg

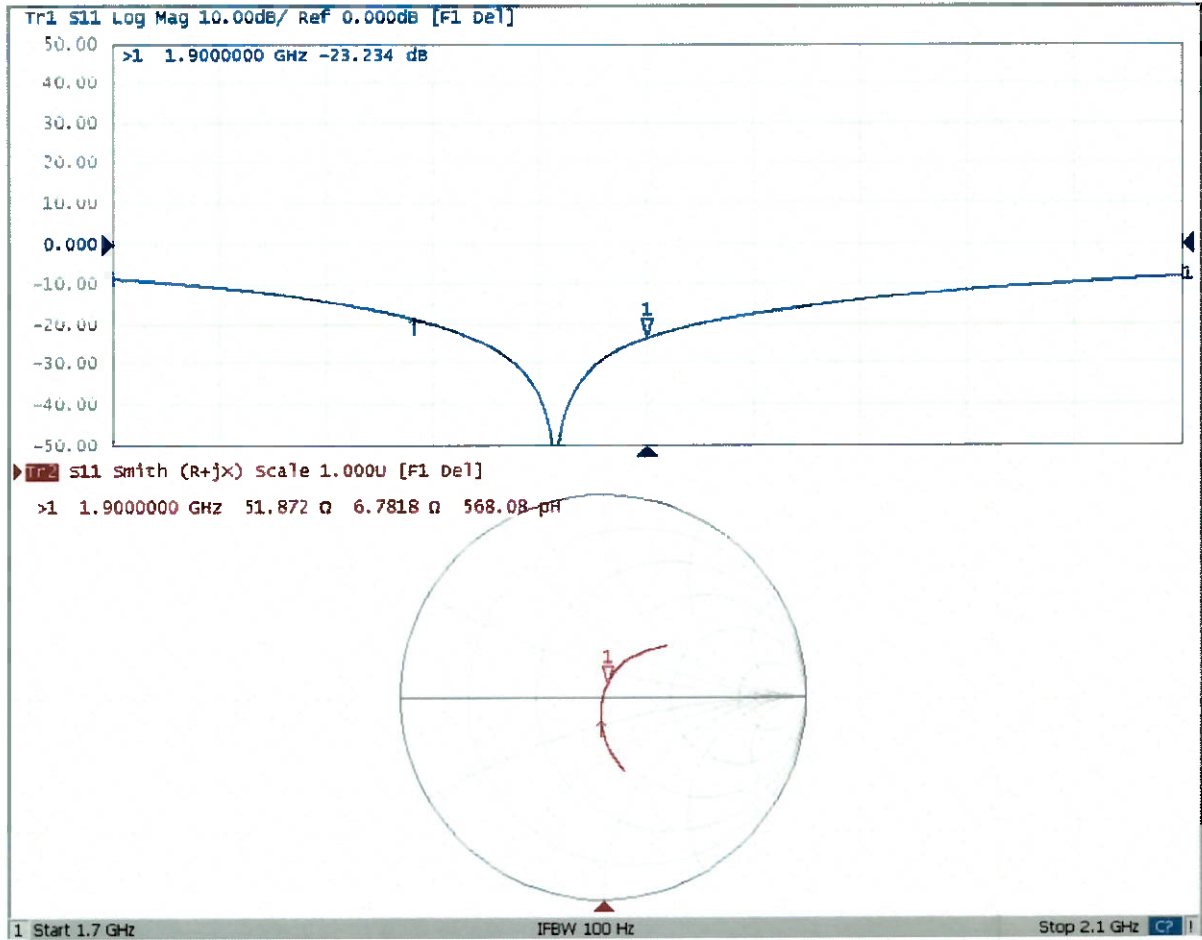


**0 dB = 15.7 W/kg = 11.96 dBW/kg**



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### Impedance Measurement Plot for Head TSL





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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 **SGS-CN (Auden)**

Certificate No: **D2450V2-1038\_Apr20**

## CALIBRATION CERTIFICATE

Object **D2450V2 - SN:1038**

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

Calibration date: **April 08, 2020**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 7349	31-Dec-19 (No. EX3-7349_Dec19)	Dec-20
DAE4	SN: 601	27-Dec-19 (No. DAE4-601_Dec19)	Dec-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-19)	In house check: Oct-20

	Name	Function	Signature
Calibrated by:	Jeffrey Katzman	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 20, 2020

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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:

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

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.10.4
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	2450 MHz ± 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	39.2	1.80 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	38.6 ± 6 %	1.86 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>52.2 W/kg ± 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	6.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>24.5 W/kg ± 16.5 % (k=2)</b>



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

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.3 $\Omega$ + 2.0 j $\Omega$
Return Loss	- 30.5 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.162 ns
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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
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# DASY5 Validation Report for Head TSL

Date: 08.04.2020

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:1038**

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

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.86$  S/m;  $\epsilon_r = 38.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.98, 7.98, 7.98) @ 2450 MHz; Calibrated: 31.12.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

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

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

Reference Value = 116.6 V/m; Power Drift = -0.05 dB

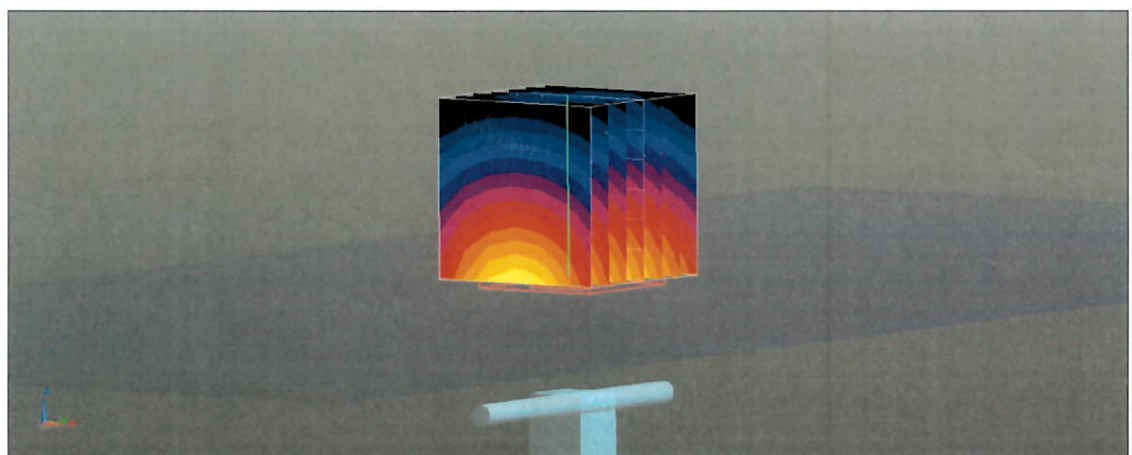
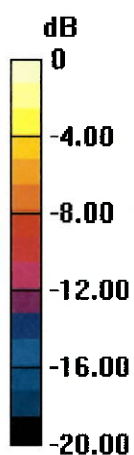
Peak SAR (extrapolated) = 26.2 W/kg

**SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.18 W/kg**

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

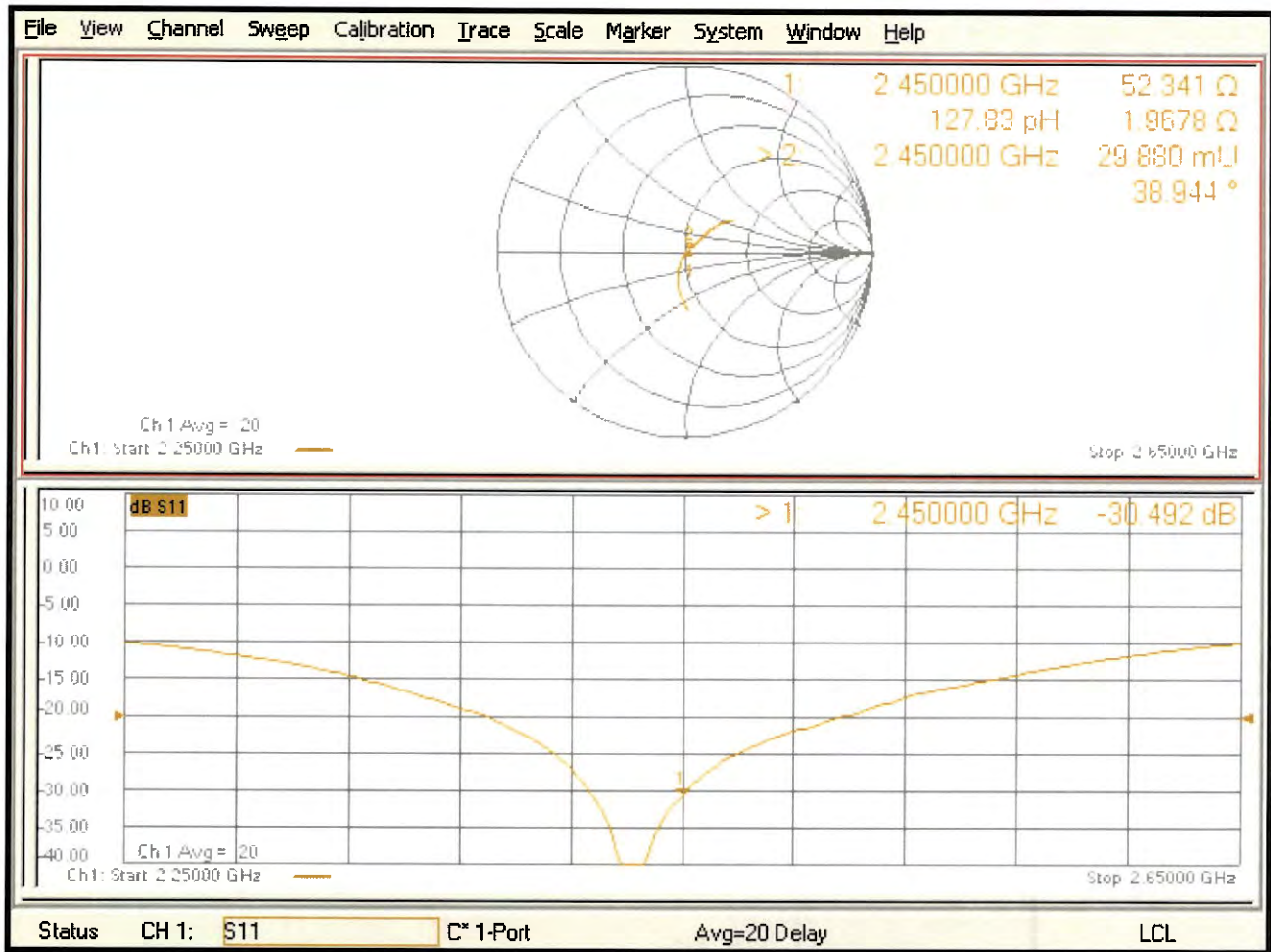
Ratio of SAR at M2 to SAR at M1 = 50.8%

Maximum value of SAR (measured) = 21.9 W/kg



0 dB = 21.9 W/kg = 13.40 dBW/kg

# Impedance Measurement Plot for Head TSL



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

## Evaluation Condition

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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### SAR result with SAM Head (Top $\cong$ C0)

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>55.7 W/kg <math>\pm</math> 17.5 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>26.6 W/kg <math>\pm</math> 16.9 % (k=2)</b>

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

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>56.8 W/kg <math>\pm</math> 17.5 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>28.0 W/kg <math>\pm</math> 16.9 % (k=2)</b>

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

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>53.5 W/kg <math>\pm</math> 17.5 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>25.5 W/kg <math>\pm</math> 16.9 % (k=2)</b>

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

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>34.3 W/kg <math>\pm</math> 17.5 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR for nominal Head TSL parameters	normalized to 1W	<b>17.8 W/kg <math>\pm</math> 16.9 % (k=2)</b>

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



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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 **SGS (Auden)**

Certificate No: **D2600V2-1180\_May21**

## CALIBRATION CERTIFICATE

Object **D2600V2 - SN:1180**

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

Calibration date: **May 12, 2021**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  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	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 7349	28-Dec-20 (No. EX3-7349_Dec20)	Dec-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Jeffrey Katzman	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 21, 2021

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



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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:

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

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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

### Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.10.4
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	2600 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	39.0	1.96 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	37.2 ± 6 %	2.04 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	14.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>57.1 W/kg ± 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	6.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>25.4 W/kg ± 16.5 % (k=2)</b>

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

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.2 $\Omega$ - 1.5 j $\Omega$
Return Loss	- 29.8 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.155 ns
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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
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