

WCDMA850 Body

Date: 7/6/2022

Electronics: DAE4 Sn1331

Medium: Head 750M

Medium parameters used: $f = 846.6 \text{ MHz}$; $\sigma = 0.869 \text{ S/m}$; $\epsilon_r = 45.701$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: WCDMA850(B5) 846.6 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(10.26, 10.26, 10.26)

Area Scan (81x141x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 0.327 W/kg

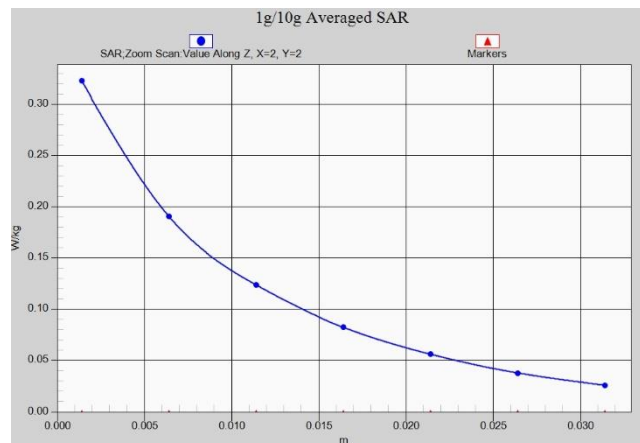
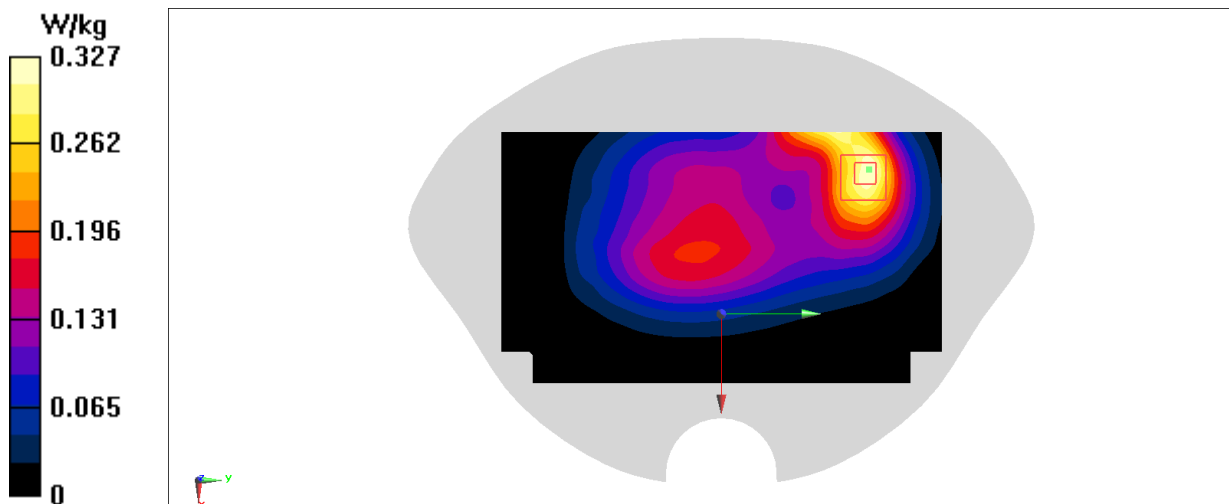
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 13.21 V/m ; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.393 W/kg

SAR(1 g) = 0.228 W/kg ; SAR(10 g) = 0.145 W/kg

Maximum value of SAR (measured) = 0.323 W/kg



WCDMA1900 Head

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 1900M

Medium parameters used: $f=1852.4$ MHz; $\sigma=1.442$ S/m; $\epsilon_r=41.625$; $\rho=1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: WCDMA1900(B2) 1852.4 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(8.18, 8.18, 8.18)

Area Scan (81x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.231 W/kg

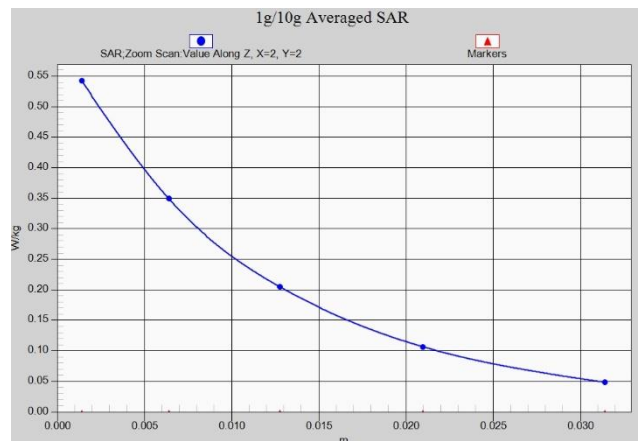
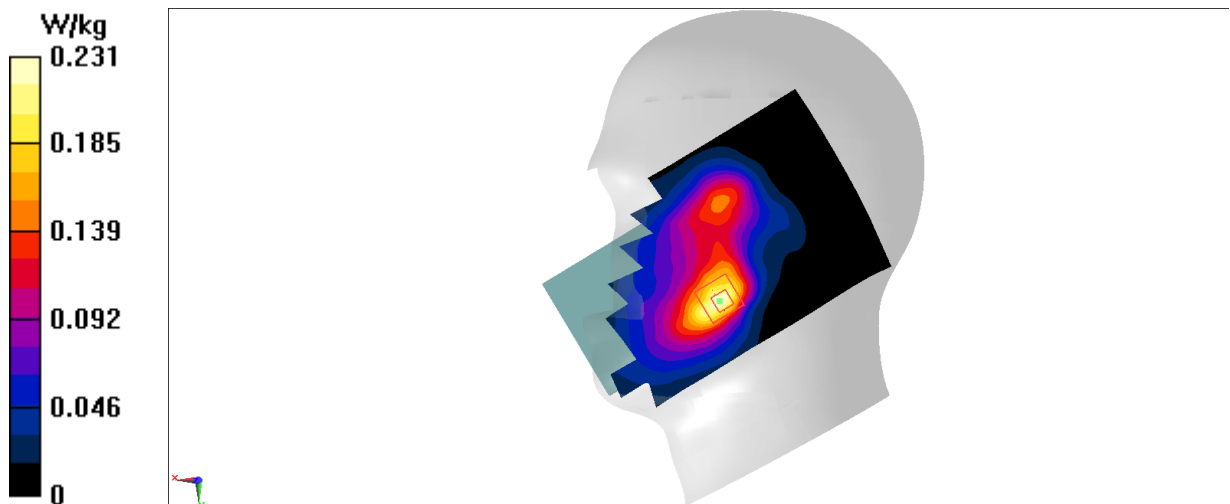
Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.058 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.259 W/kg

SAR(1 g) = 0.161 W/kg; SAR(10 g) = 0.101 W/kg

Maximum value of SAR (measured) = 0.217 W/kg



WCDMA1900 Body

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 1900M

Medium parameters used: $f=1852.4$ MHz; $\sigma=1.458$ S/m; $\epsilon_r=43.228$; $\rho=1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: WCDMA1900(B2) 1852.4 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(8.18, 8.18, 8.18)

Area Scan (81x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.761 W/kg

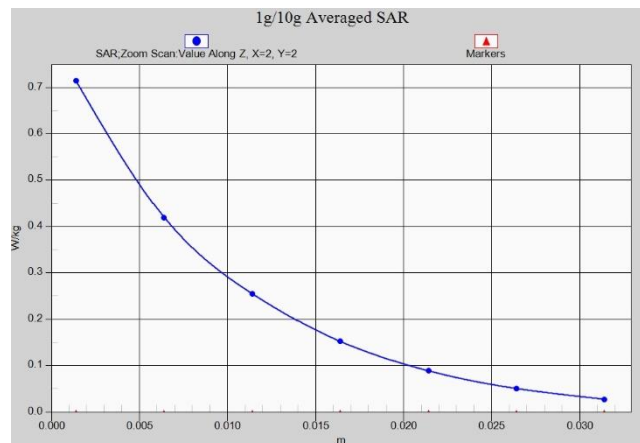
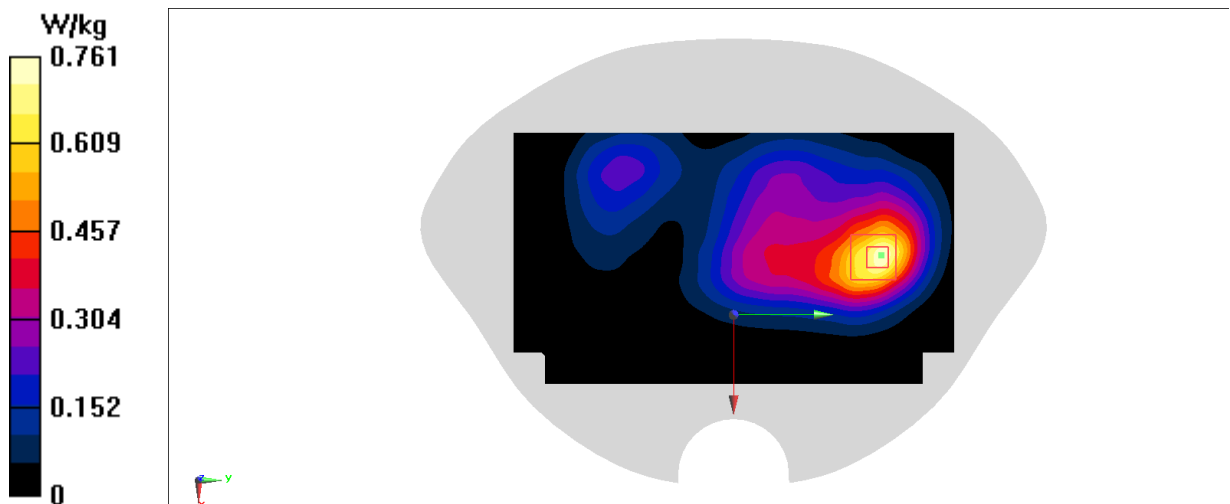
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.51 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.844 W/kg

SAR(1 g) = 0.497 W/kg; SAR(10 g) = 0.293 W/kg

Maximum value of SAR (measured) = 0.714 W/kg



LTE Band5 Head

Date: 7/6/2022

Electronics: DAE4 Sn1331

Medium: Head 900M

Medium parameters used: $f = 844 \text{ MHz}$; $\sigma = 0.875 \text{ S/m}$; $\epsilon_r = 44.099$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: LTE Band5 844 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(9.72, 9.72, 9.72)

Area Scan (81x141x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 0.170 W/kg

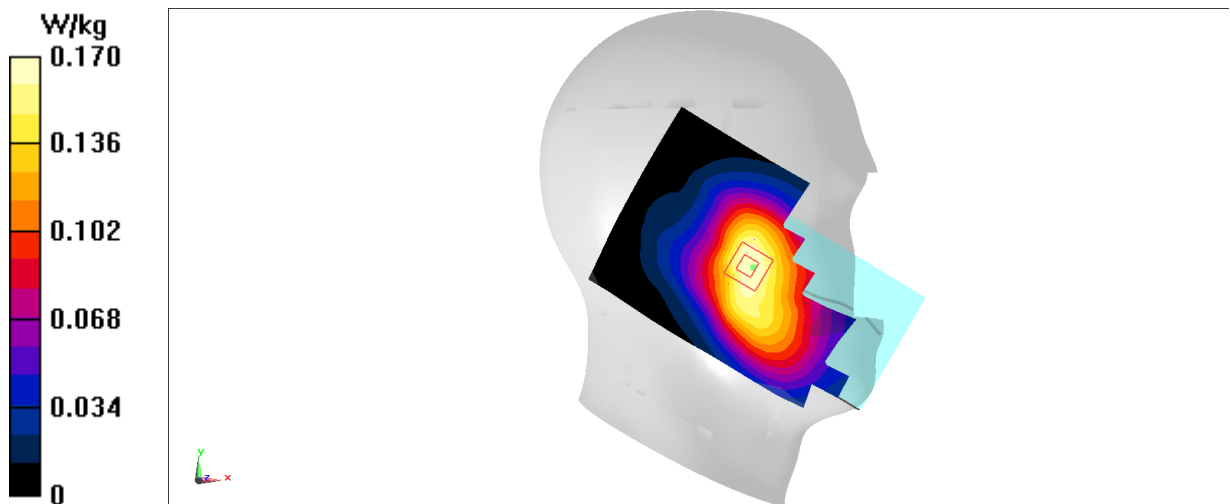
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 4.732 V/m ; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.197 W/kg

SAR(1 g) = 0.143 W/kg ; SAR(10 g) = 0.109 W/kg

Maximum value of SAR (measured) = 0.175 W/kg



LTE Band5 Body

Date: 7/6/2022

Electronics: DAE4 Sn1331

Medium: Head 900M

Medium parameters used: $f = 829 \text{ MHz}$; $\sigma = 0.861 \text{ S/m}$; $\epsilon_r = 45.769$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: LTE Band5 829 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(9.72, 9.72, 9.72)

Area Scan (81x141x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 0.233 W/kg

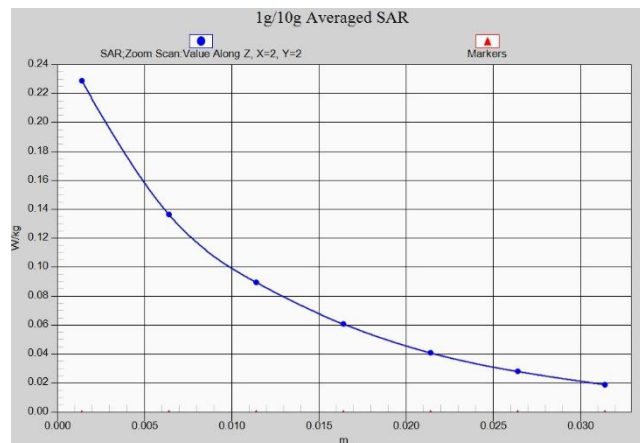
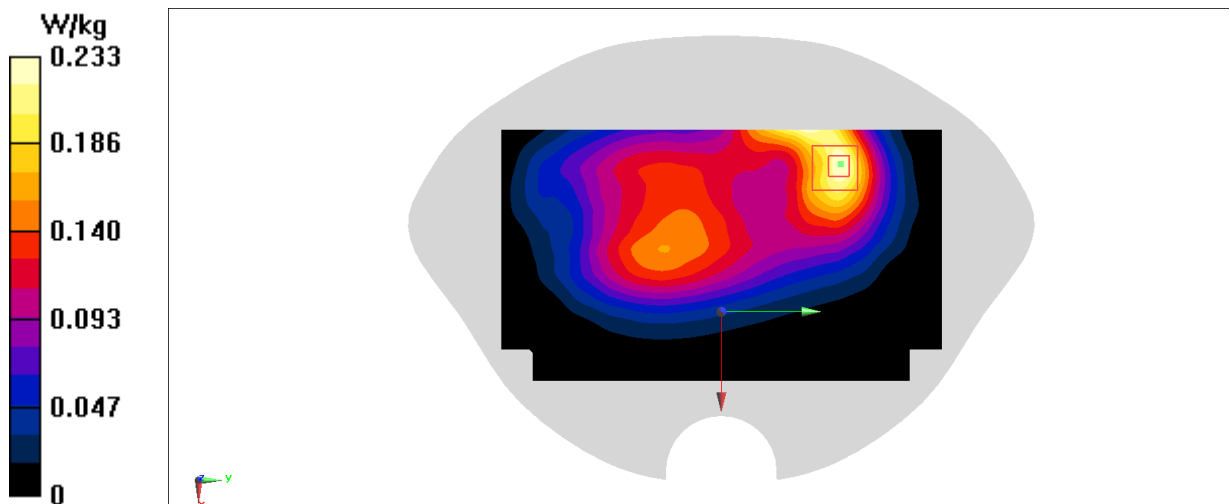
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 11.52 V/m ; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.276 W/kg

SAR(1 g) = 0.162 W/kg ; SAR(10 g) = 0.104 W/kg

Maximum value of SAR (measured) = 0.229 W/kg



LTE Band7 Head

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 2600M

Medium parameters used: $f = 2560$ MHz; $\sigma = 2$ S/m; $\epsilon_r = 41.552$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: LTE Band7-20M 2560 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.64, 7.64, 7.64)

Area Scan (101x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 1.69 W/kg

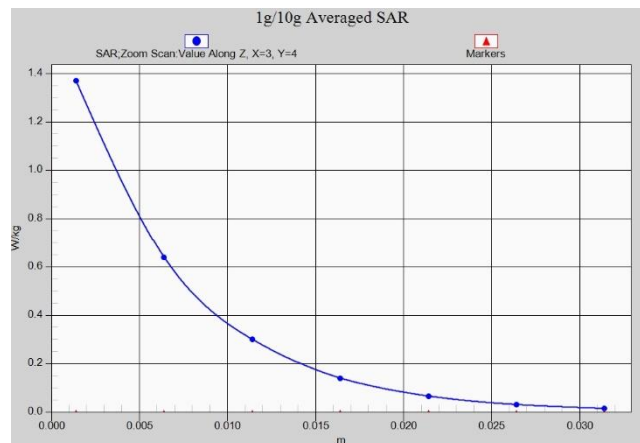
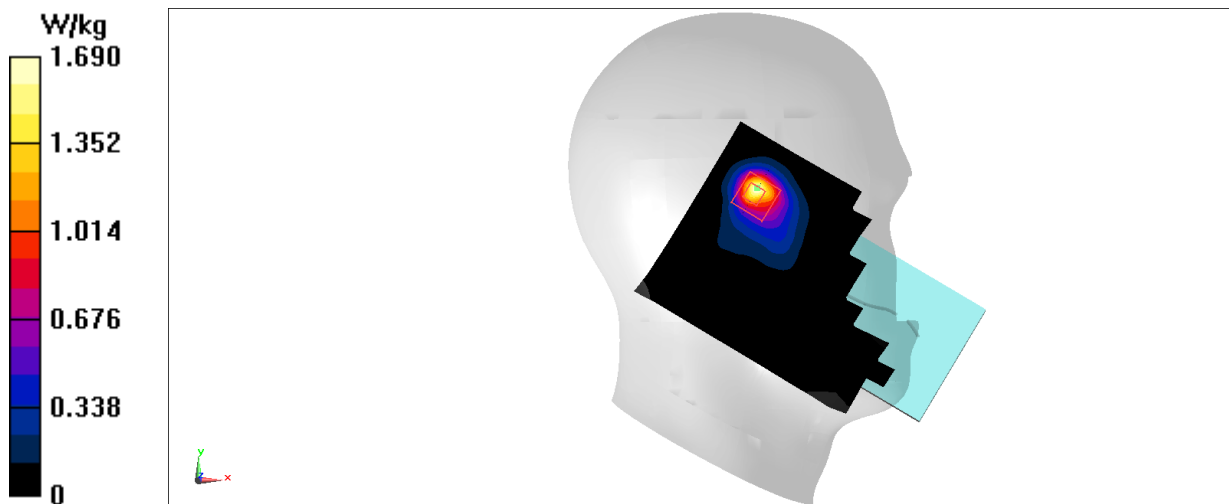
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.369 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 1.73 W/kg

SAR(1 g) = 0.861 W/kg; SAR(10 g) = 0.400 W/kg

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



LTE Band7 Body

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 2600M

Medium parameters used: $f = 2535$ MHz; $\sigma = 1.997$ S/m; $\epsilon_r = 41.887$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: LTE Band7 2535 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.64, 7.64, 7.64)

Area Scan (101x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 1.01 W/kg

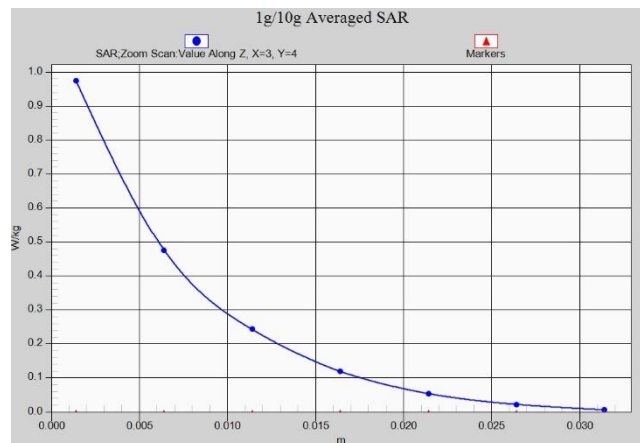
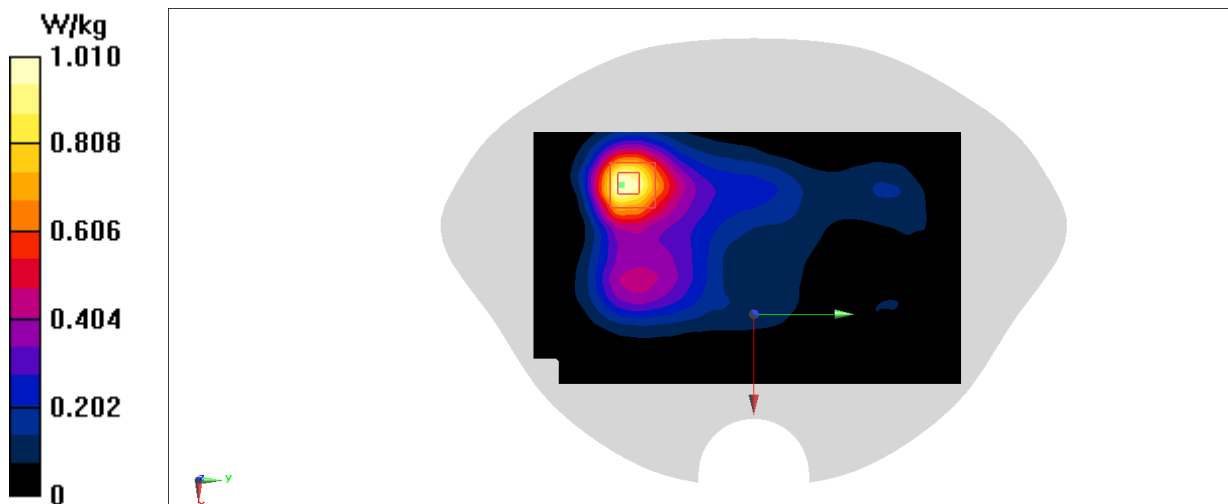
Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.778 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 1.26 W/kg

SAR(1 g) = 0.612 W/kg; SAR(10 g) = 0.307 W/kg

Maximum value of SAR (measured) = 0.974 W/kg



LTE Band41 PC2 Head

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 2600M

Medium parameters used: $f=2636.5$ MHz; $\sigma=2.079$ S/m; $\epsilon_r=40.452$; $\rho=1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: LTE Band41 2636.5 MHz Duty Cycle: 1:1.5787

Probe: EX3DV4 - SN7464 ConvF(7.64, 7.64, 7.64)

Area Scan (101x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

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

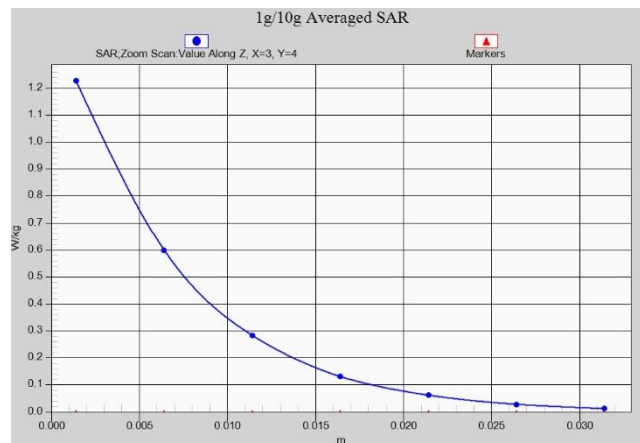
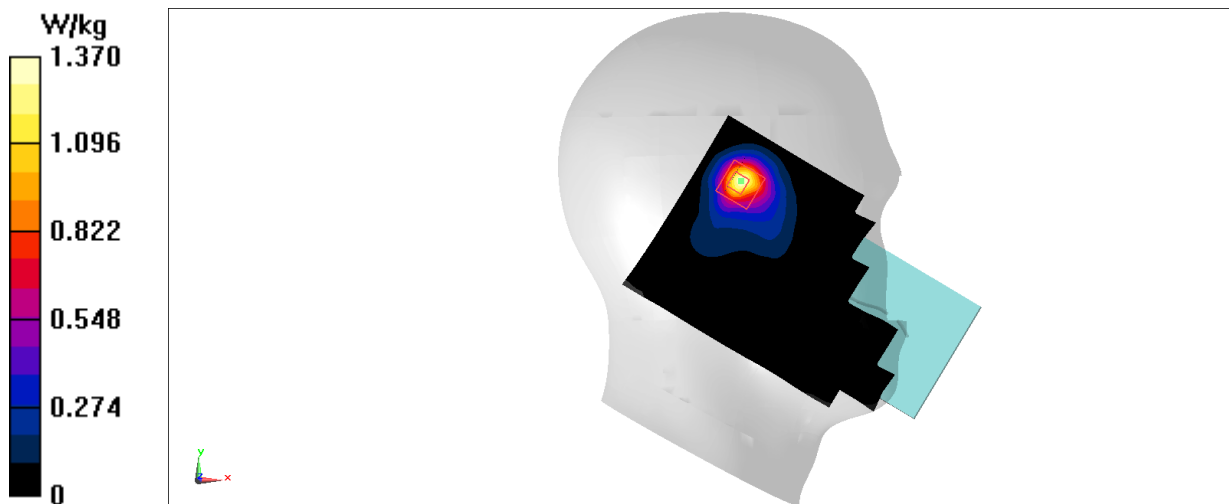
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.45 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 1.55 W/kg

SAR(1 g) = 0.782 W/kg; SAR(10 g) = 0.366 W/kg

Maximum value of SAR (measured) = 1.23 W/kg



LTE Band41 PC2 Body

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 2600M

Medium parameters used: $f = 2593$ MHz; $\sigma = 2.053$ S/m; $\epsilon_r = 41.765$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: LTE Band41 2593 MHz Duty Cycle: 1:1.5787

Probe: EX3DV4 - SN7464 ConvF(7.64, 7.64, 7.64)

Area Scan (101x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.606 W/kg

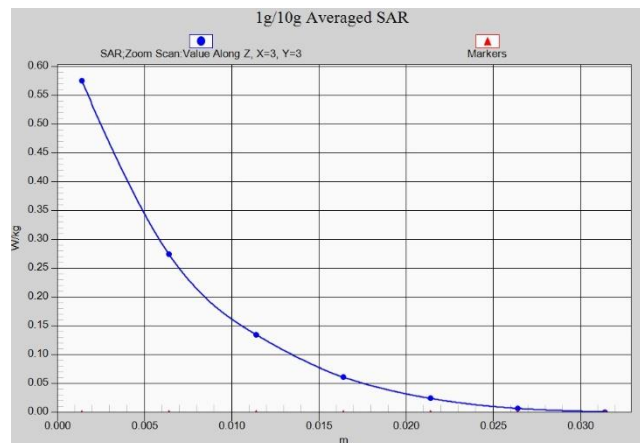
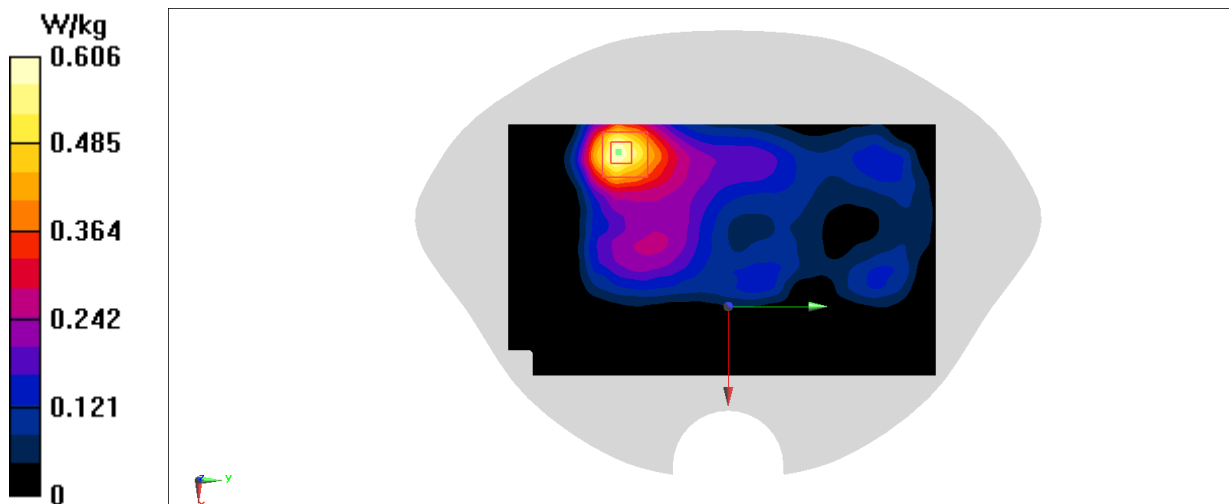
Zoom Scan (8x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.859 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 0.720 W/kg

SAR(1 g) = 0.359 W/kg; SAR(10 g) = 0.182 W/kg

Maximum value of SAR (measured) = 0.575 W/kg



5G NR N5 Head

Date: 7/6/2022

Electronics: DAE4 Sn1331

Medium: Head 900M

Medium parameters used: $f = 846.5 \text{ MHz}$; $\sigma = 0.876 \text{ S/m}$; $\epsilon_r = 44.092$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: 5G N5 846.5 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(9.72, 9.72, 9.72)

Area Scan (81x141x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 0.131 W/kg

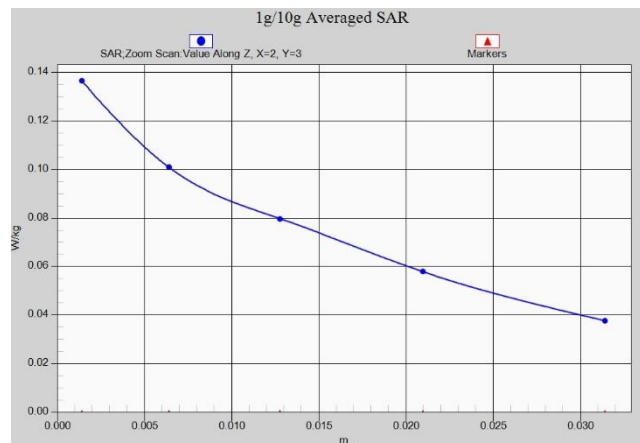
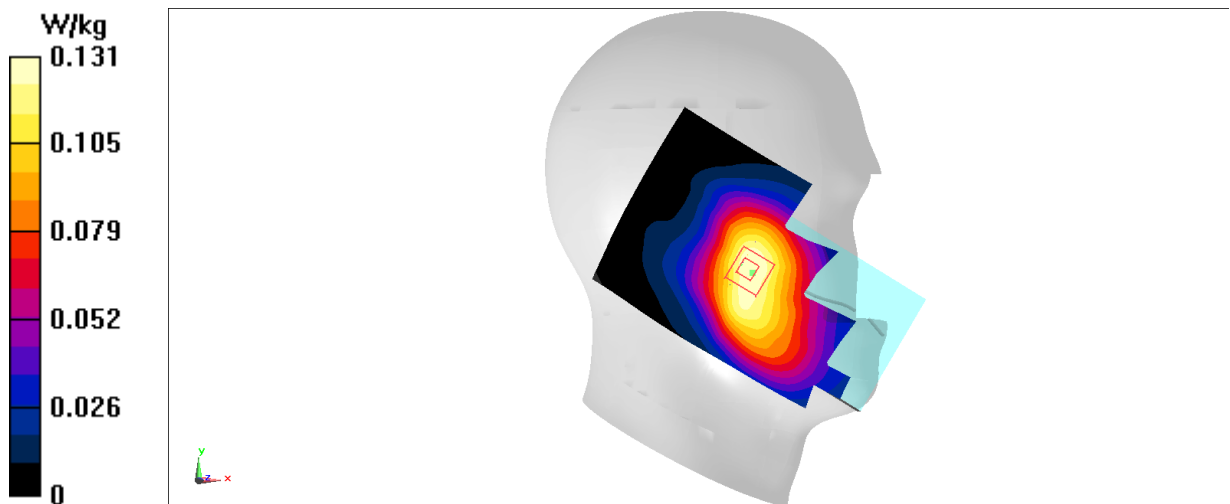
Zoom Scan (5x5x5)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 4.126 V/m ; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.152 W/kg

SAR(1 g) = 0.111 W/kg ; SAR(10 g) = 0.086 W/kg

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



5G NR N5 Body

Date: 7/6/2022

Electronics: DAE4 Sn1331

Medium: Head 900M

Medium parameters used: $f = 836.5$ MHz; $\sigma = 0.865$ S/m; $\epsilon_r = 45.739$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: 5G N5 836.5 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(9.72, 9.72, 9.72)

Area Scan (81x141x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.296 W/kg

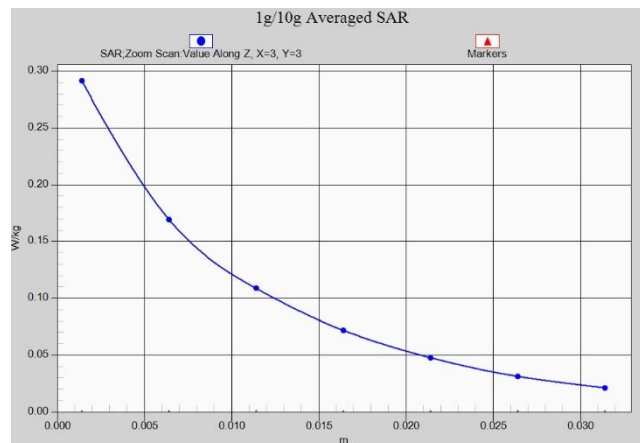
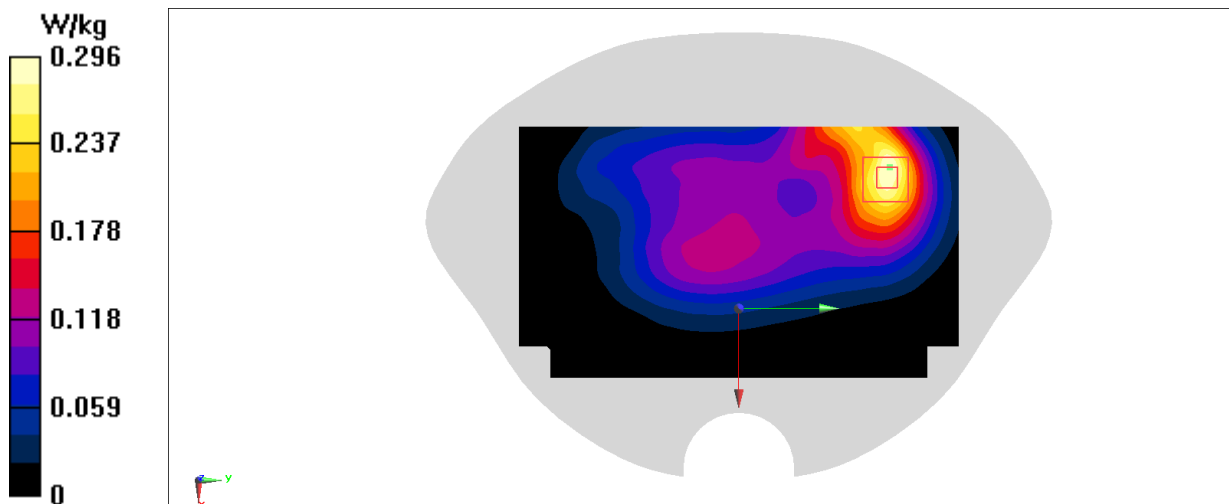
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.50 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.352 W/kg

SAR(1 g) = 0.207 W/kg; SAR(10 g) = 0.130 W/kg

Maximum value of SAR (measured) = 0.291 W/kg



5G NR N7 Head

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 2600M

Medium parameters used: $f=2567.5$ MHz; $\sigma=2.029$ S/m; $\epsilon_r=41.819$; $\rho=1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: 5G N7 2567.5 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.64, 7.64, 7.64)

Area Scan (101x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 1.56 W/kg

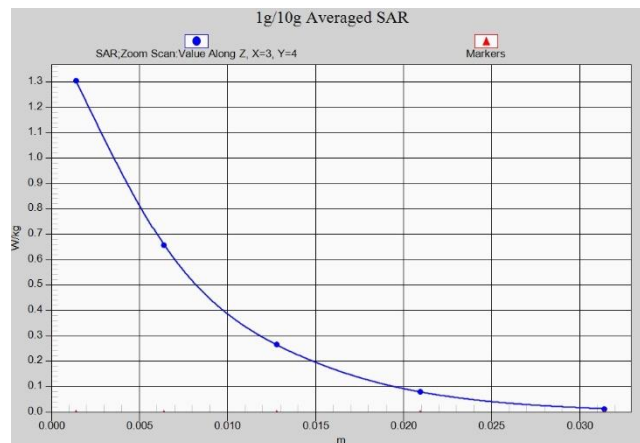
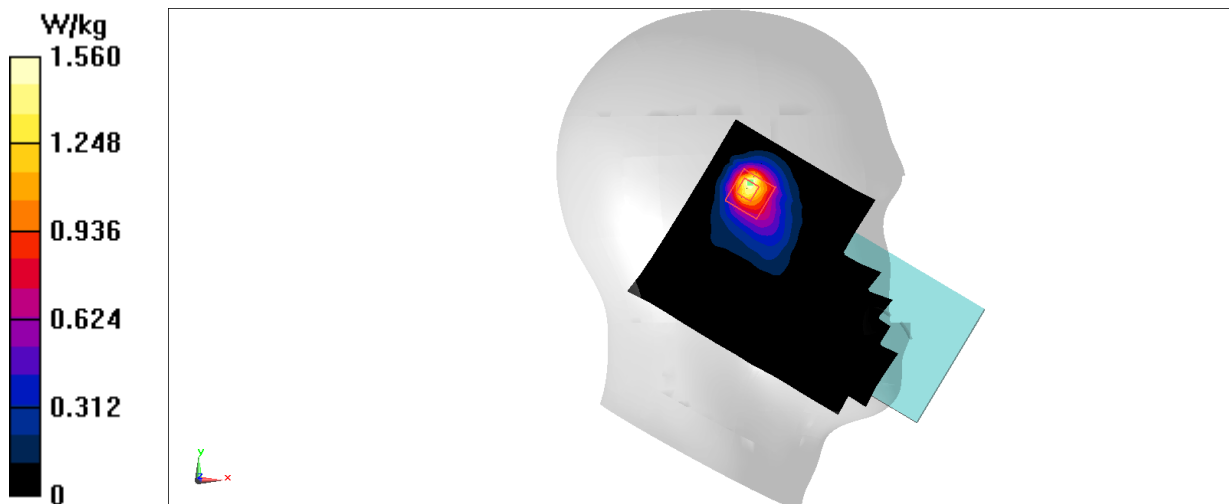
Zoom Scan (8x8x5)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.438 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 1.62 W/kg

SAR(1 g) = 0.708 W/kg; SAR(10 g) = 0.341 W/kg

Maximum value of SAR (measured) = 1.30 W/kg



5G NR N7 Body

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 2600M

Medium parameters used: $f=2567.5$ MHz; $\sigma=2.029$ S/m; $\epsilon_r=41.819$; $\rho=1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: 5G N7 2567.5 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.64, 7.64, 7.64)

Area Scan (101x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.930 W/kg

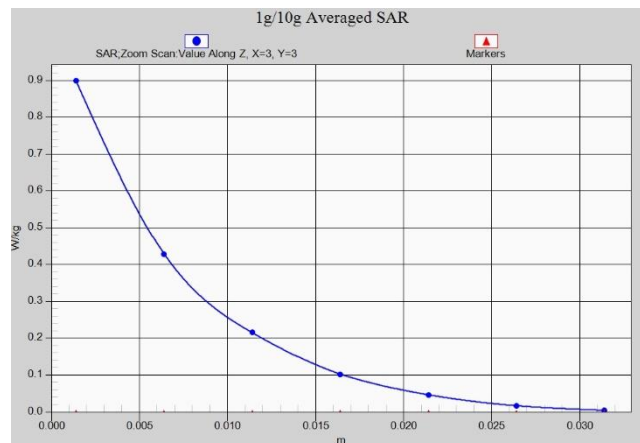
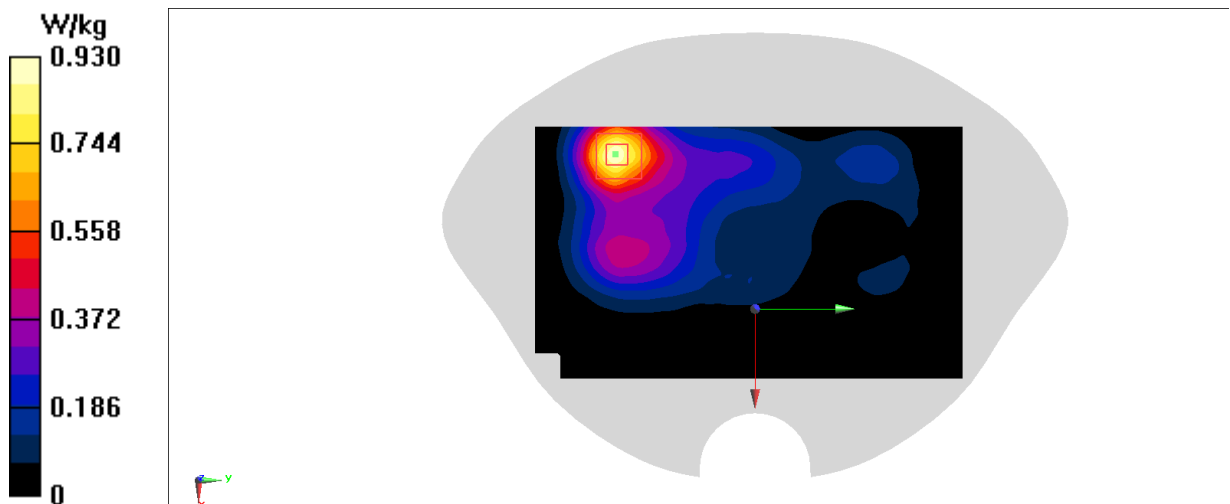
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.269 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 1.13 W/kg

SAR(1 g) = 0.553 W/kg; SAR(10 g) = 0.278 W/kg

Maximum value of SAR (measured) = 0.899 W/kg



5G NR N41 Head

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 2600M

Medium parameters used: $f = 2635$ MHz; $\sigma = 2.11$ S/m; $\epsilon_r = 41.51$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: 5G N41 2636.49 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.64, 7.64, 7.64)

Area Scan (121x211x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.27 W/kg

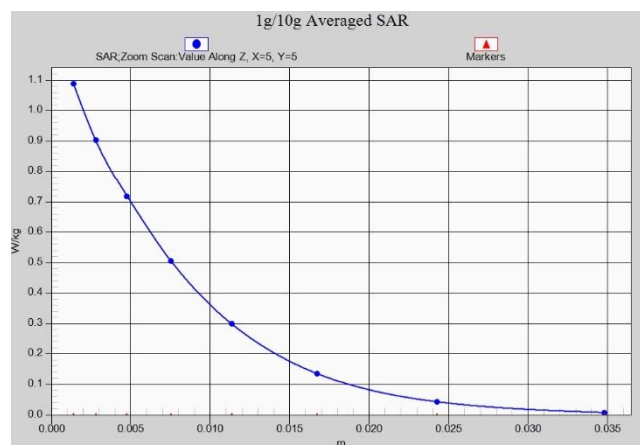
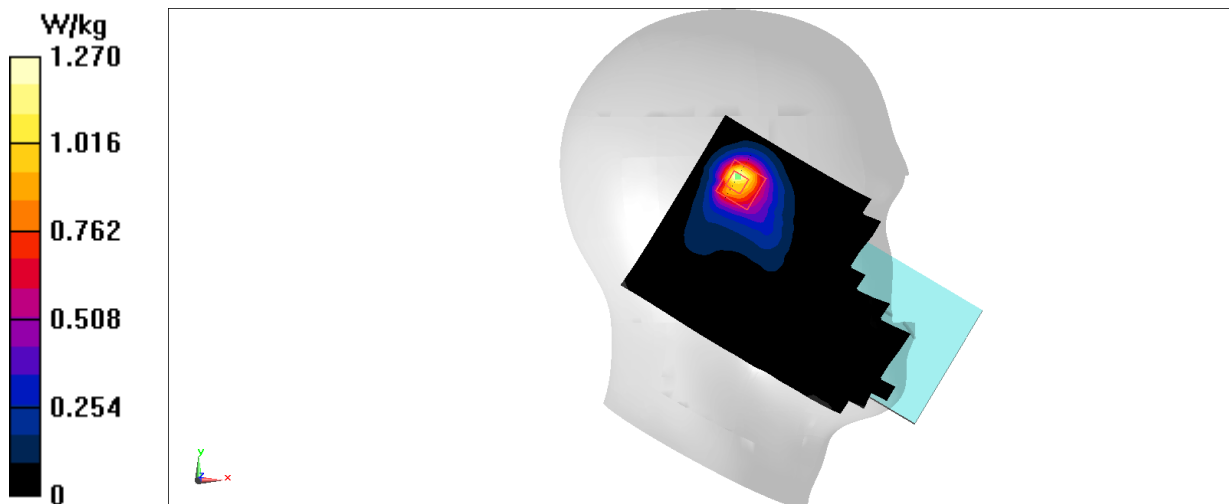
Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 9.151 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.34 W/kg

SAR(1 g) = 0.604 W/kg; SAR(10 g) = 0.286 W/kg

Maximum value of SAR (measured) = 1.09 W/kg



5G NR N41 Body

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 2600M

Medium parameters used: $f = 2550$ MHz; $\sigma = 2.011$ S/m; $\epsilon_r = 41.854$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: 5G N41 2549.51 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.64, 7.64, 7.64)

Area Scan (101x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.476 W/kg

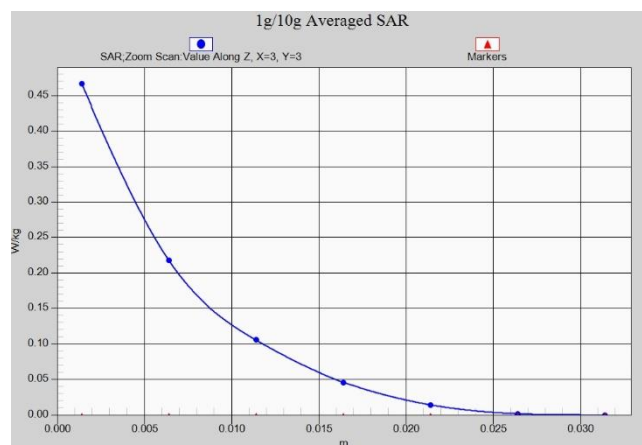
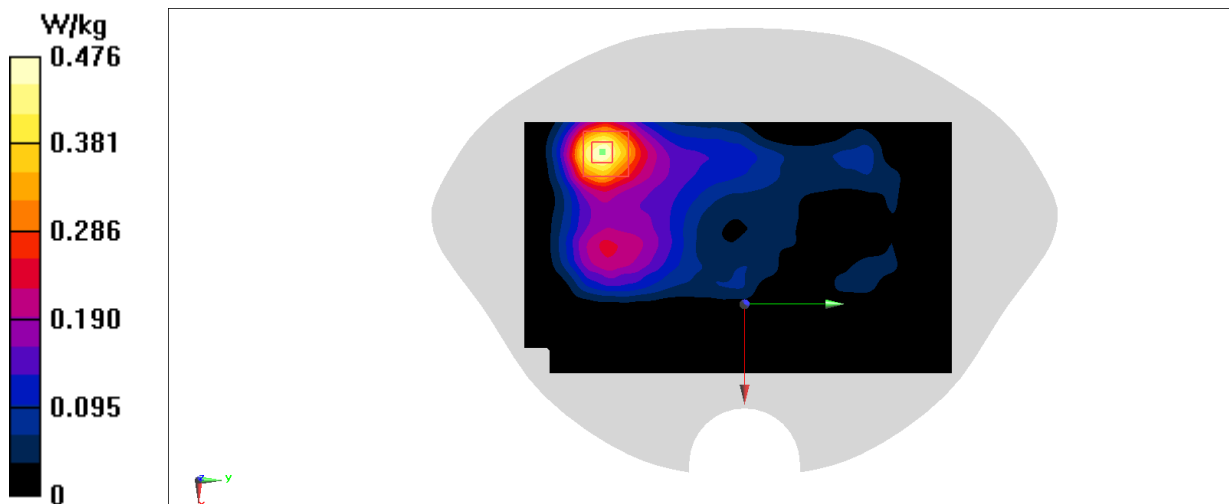
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.604 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 0.588 W/kg

SAR(1 g) = 0.284 W/kg; SAR(10 g) = 0.138 W/kg

Maximum value of SAR (measured) = 0.466 W/kg



5G NR N77 Head

Date: 7/27/2022

Electronics: DAE4 Sn1331

Medium: Head 3900M

Medium parameters used: $f = 3814$ MHz; $\sigma = 3.212$ S/m; $\epsilon_r = 39.084$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: N77 3814 MHz Duty Cycle: 1:2.49977

Probe: EX3DV4 – SN7464 ConvF(6.76, 6.76, 6.76)

Area Scan (121x211x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.571 W/kg

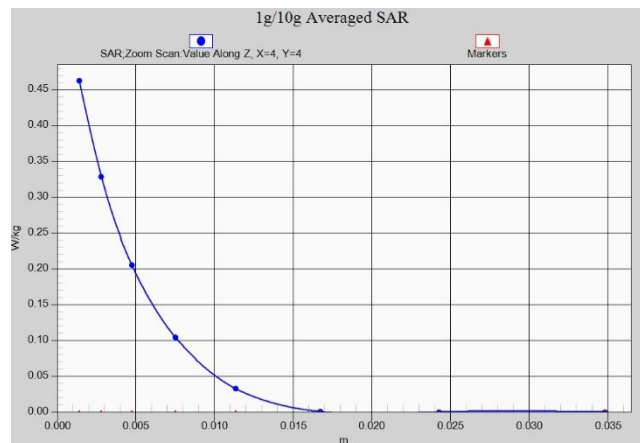
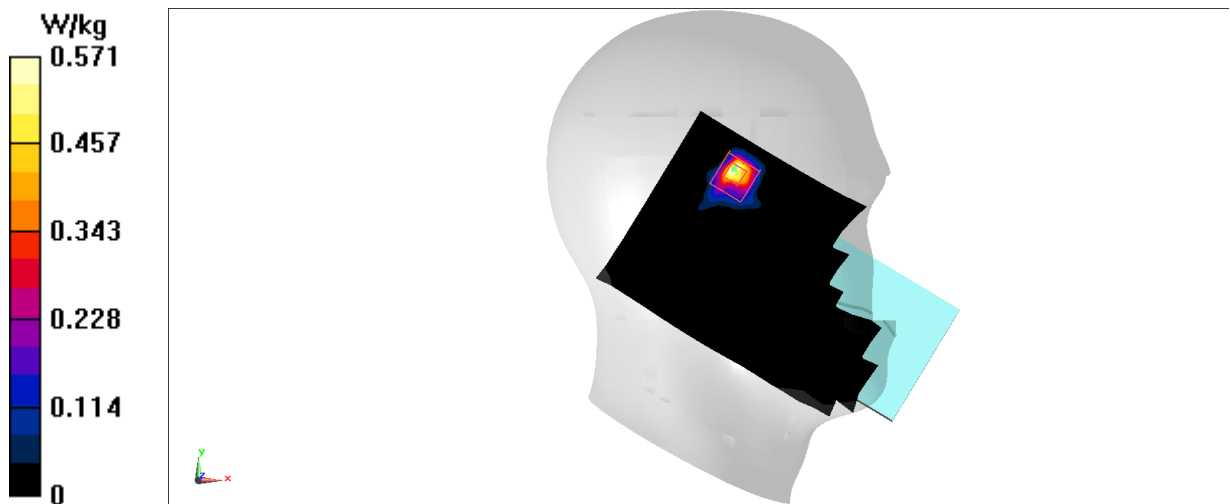
Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 2.768 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.650 W/kg

SAR(1 g) = 0.207 W/kg; SAR(10 g) = 0.063 W/kg

Maximum value of SAR (measured) = 0.462 W/kg



5G NR N77 Body

Date: 7/27/2022

Electronics: DAE4 Sn1331

Medium: Head 3900M

Medium parameters used: $f = 3814$ MHz; $\sigma = 3.212$ S/m; $\epsilon_r = 39.084$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: N77 3814 MHz Duty Cycle: 1:2.49977

Probe: EX3DV4 - SN7464 ConvF(6.76, 6.76, 6.76)

Area Scan (121x211x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.794 W/kg

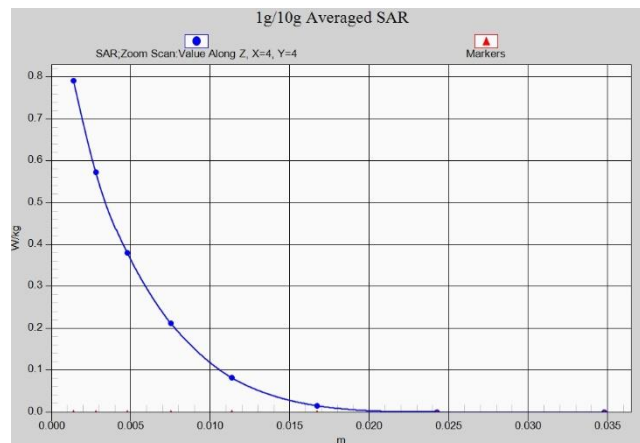
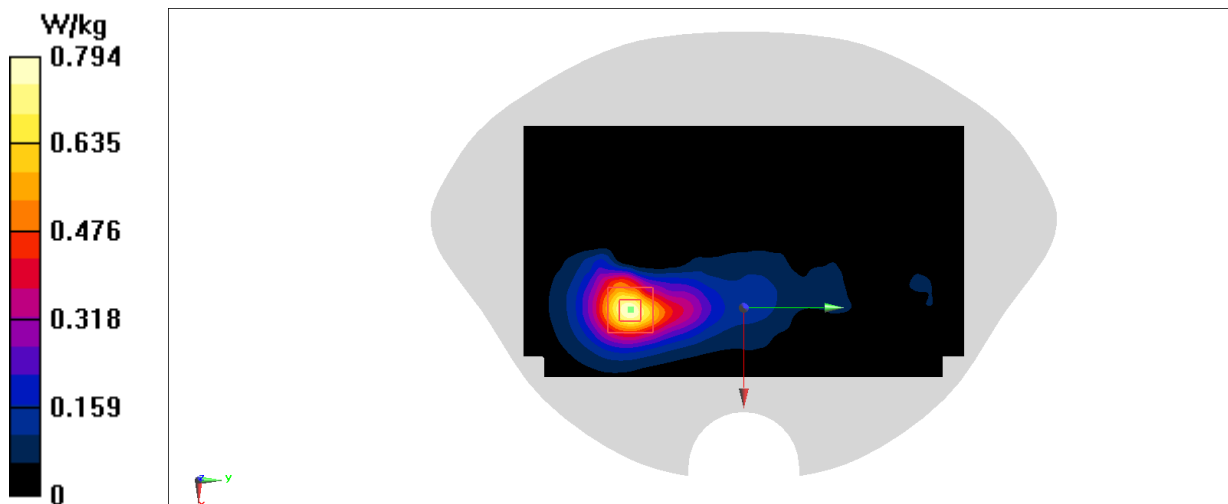
Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 5.979 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 1.11 W/kg

SAR(1 g) = 0.408 W/kg; SAR(10 g) = 0.161 W/kg

Maximum value of SAR (measured) = 0.791 W/kg



5G NR N77 Body

Date: 7/27/2022

Electronics: DAE4 Sn1331

Medium: Head 3900M

Medium parameters used: $f = 3814$ MHz; $\sigma = 3.212$ S/m; $\epsilon_r = 39.084$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: N77 3814 MHz Duty Cycle: 1:2.49977

Probe: EX3DV4 - SN7464 ConvF(6.76, 6.76, 6.76)

Area Scan (101x211x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

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

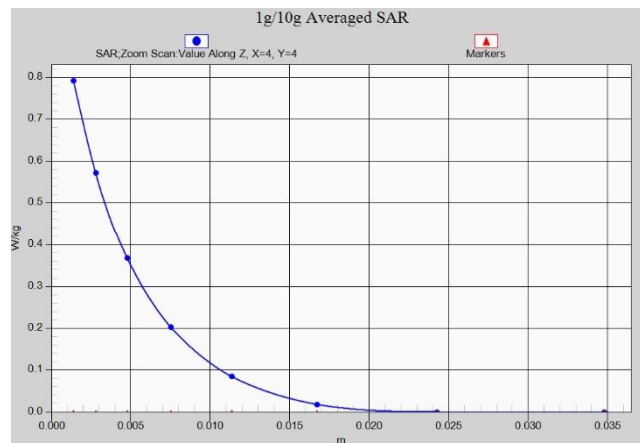
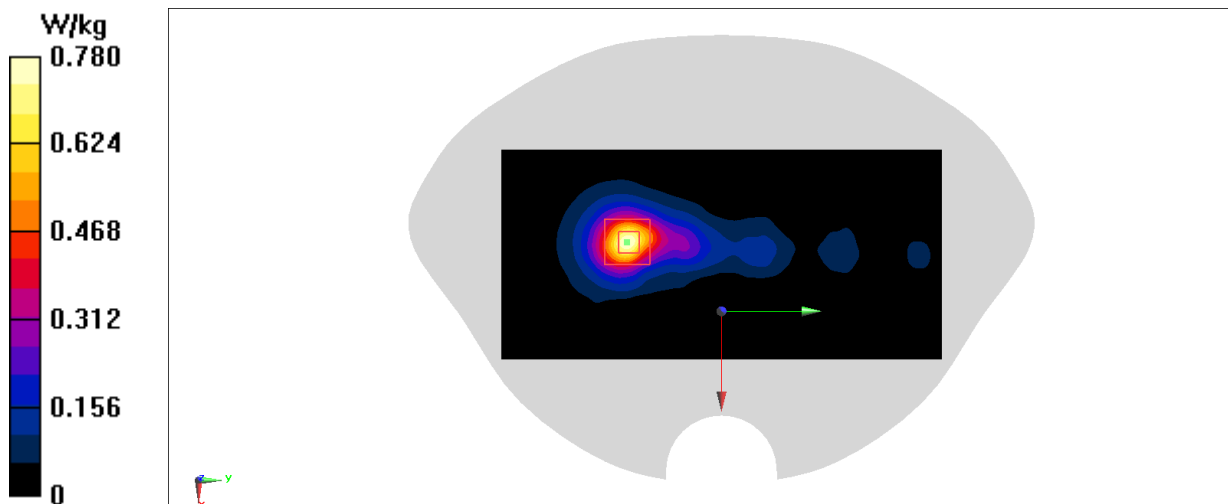
Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 3.730 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 1.13 W/kg

SAR(1 g) = 0.397 W/kg; SAR(10 g) = 0.150 W/kg

Maximum value of SAR (measured) = 0.792 W/kg



5G NR N78 Head

Date: 7/27/2022

Electronics: DAE4 Sn1331

Medium: Head 3900M

Medium parameters used: $f = 3795$ MHz; $\sigma = 3.197$ S/m; $\epsilon_r = 38.995$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: 5G NR 3795 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(6.76, 6.76, 6.76)

Area Scan (121x211x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.487 W/kg

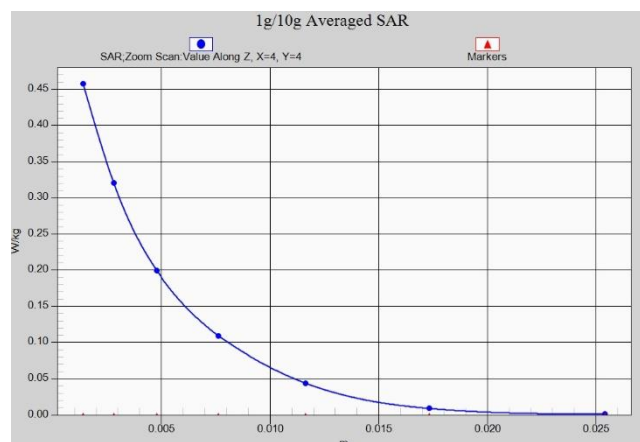
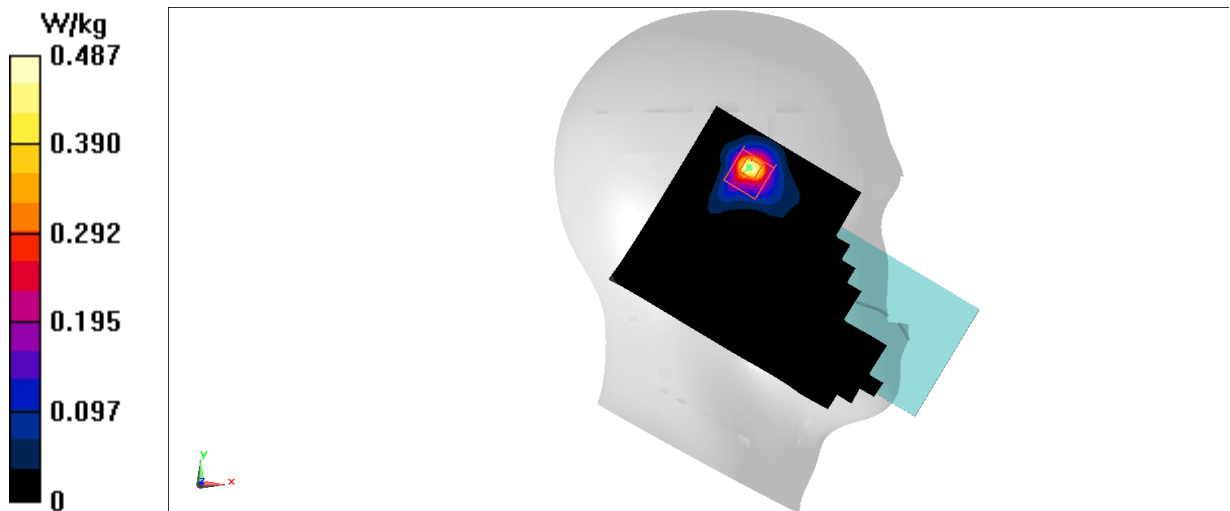
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 3.069 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.689 W/kg

SAR(1 g) = 0.224 W/kg; SAR(10 g) = 0.079 W/kg

Maximum value of SAR (measured) = 0.458 W/kg



5G NR N78 Body

Date: 7/27/2022

Electronics: DAE4 Sn1331

Medium: Head 3900M

Medium parameters used: $f = 3795$ MHz; $\sigma = 3.192$ S/m; $\epsilon_r = 39.117$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: 5G N78 3795 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(6.76, 6.76, 6.76)

Area Scan (101x211x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.519 W/kg

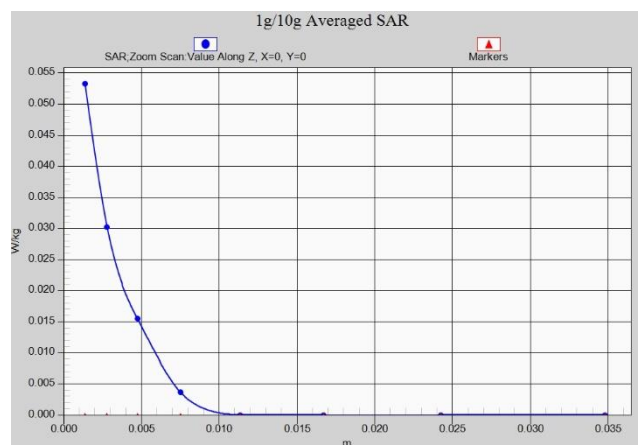
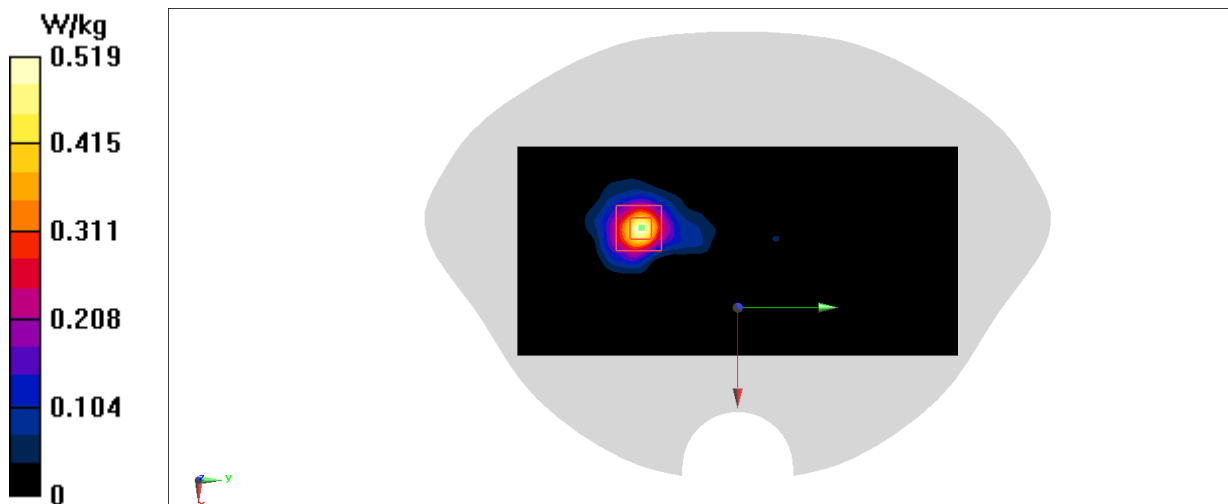
Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 0 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.725 W/kg

SAR(1 g) = 0.249 W/kg; SAR(10 g) = 0.083 W/kg

Maximum value of SAR (measured) = 0.511 W/kg



WLAN 2.4G Head

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 2450M

Medium parameters used: $f = 2437$ MHz; $\sigma = 1.908$ S/m; $\epsilon_r = 42.062$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: WIFI 2450 2437 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.77, 7.77, 7.77)

Area Scan (101x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.374 W/kg

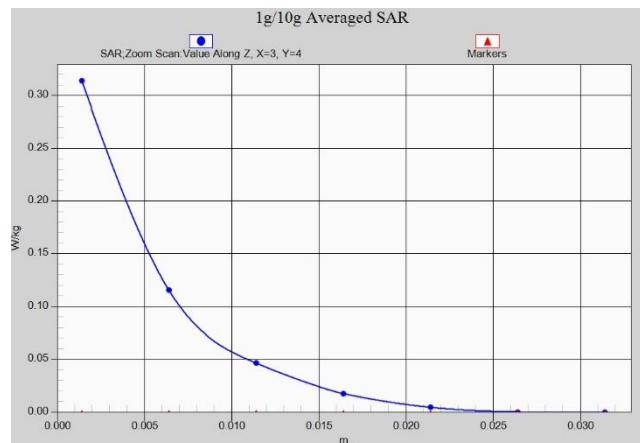
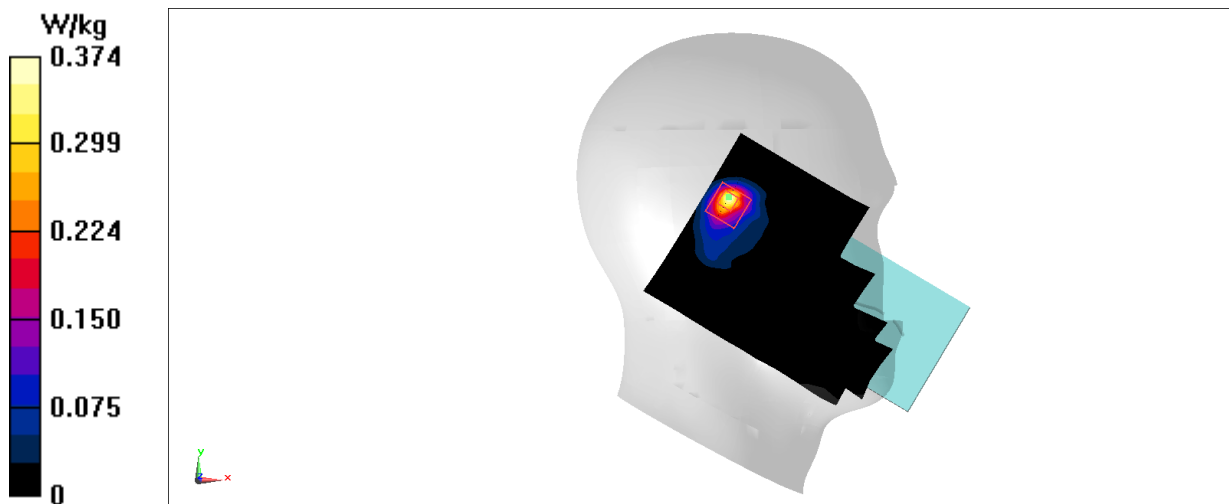
Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.947 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.441 W/kg

SAR(1 g) = 0.172 W/kg; SAR(10 g) = 0.067 W/kg

Maximum value of SAR (measured) = 0.314 W/kg



WLAN 2.4G Body

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: Head 2450M

Medium parameters used: $f = 2437$ MHz; $\sigma = 1.908$ S/m; $\epsilon_r = 42.062$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: WIFI 2450 2437 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.77, 7.77, 7.77)

Area Scan (61x111x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.224 W/kg

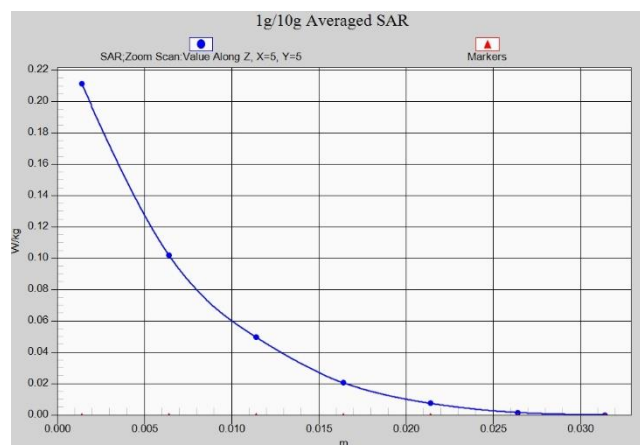
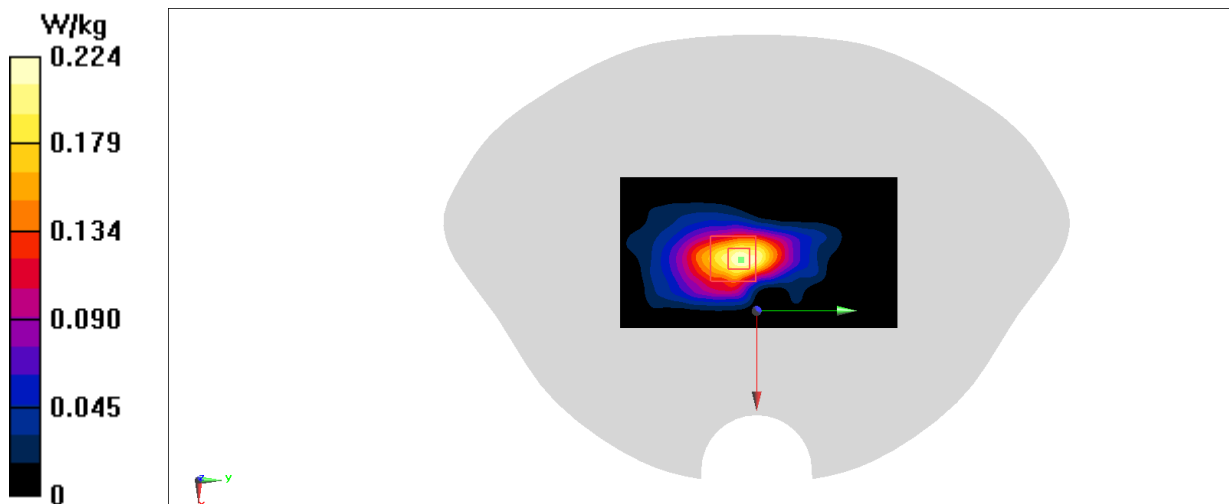
Zoom Scan (9x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.609 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.263 W/kg

SAR(1 g) = 0.129 W/kg; SAR(10 g) = 0.061 W/kg

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



WLAN 5G Head

Date: 7/28/2022

Electronics: DAE4 Sn1331

Medium: Head 5600M

Medium parameters used: $f = 5580$ MHz; $\sigma = 5.182$ S/m; $\epsilon_r = 35.468$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: WLAN 11a 5580 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(4.91, 4.91, 4.91)

Area Scan (121x211x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.513 W/kg

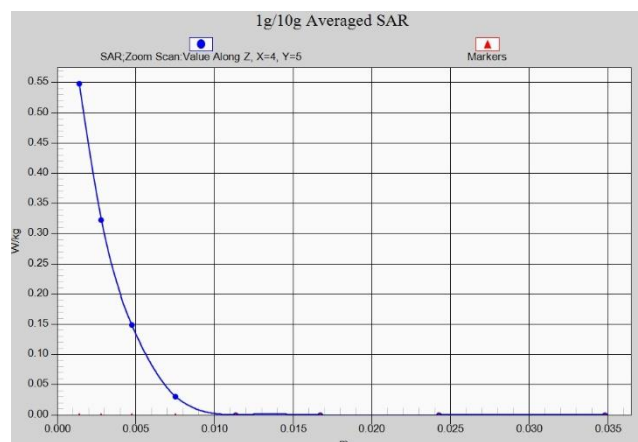
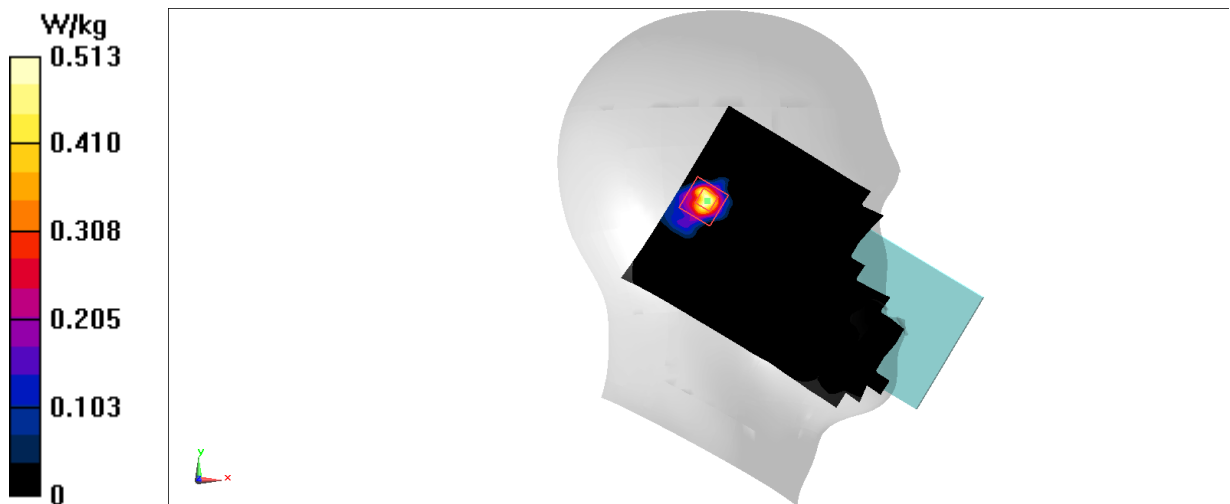
Zoom Scan (9x10x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 7.819 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.830 W/kg

SAR(1 g) = 0.174 W/kg; SAR(10 g) = 0.048 W/kg

Maximum value of SAR (measured) = 0.548 W/kg



WLAN 5G Body

Date: 7/28/2022

Electronics: DAE4 Sn1331

Medium: Head 5250M

Medium parameters used: $f = 5320$ MHz; $\sigma = 4.895$ S/m; $\epsilon_r = 36.01$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: WLAN 11a 5320 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(5.43, 5.43, 5.43)

Area Scan (121x211x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.531 W/kg

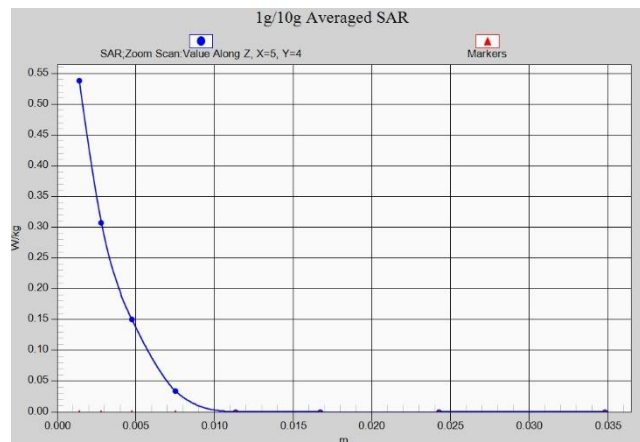
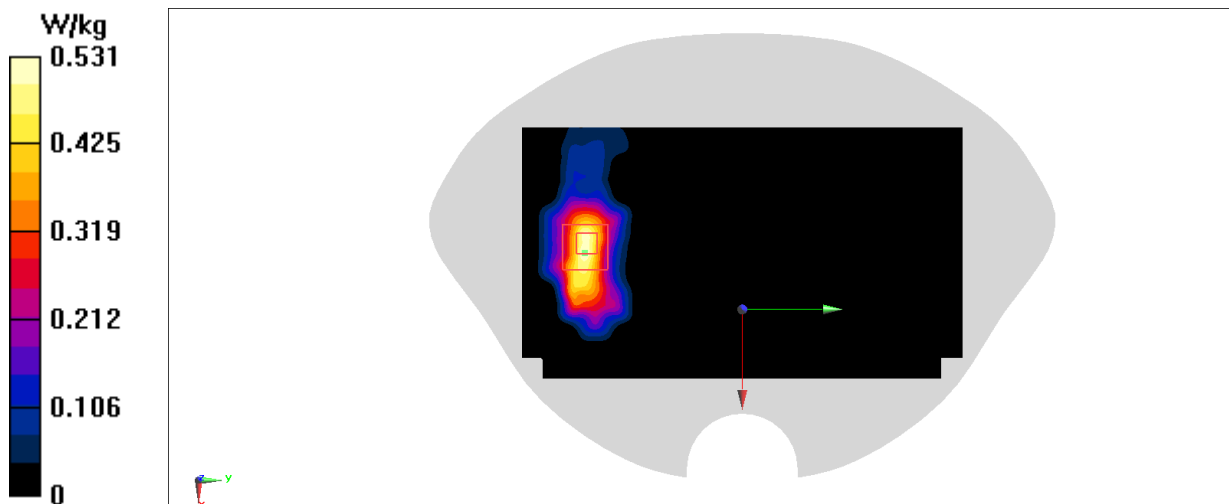
Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 0 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.881 W/kg

SAR(1 g) = 0.201 W/kg; SAR(10 g) = 0.070 W/kg

Maximum value of SAR (measured) = 0.538 W/kg



J.6 System Verification results

750MHz

Date: 7/6/2022

Electronics: DAE4 Sn1331

Medium: H750

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.8351 \text{ S/m}$; $\epsilon_r = 44.32$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CW Frequency: 750 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(10.26, 10.26, 10.26)

Area Scan (51x141x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 44.51 V/m; Power Drift = 0.09 dB

SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.41 W/kg

Maximum value of SAR (interpolated) = 2.83 W/kg

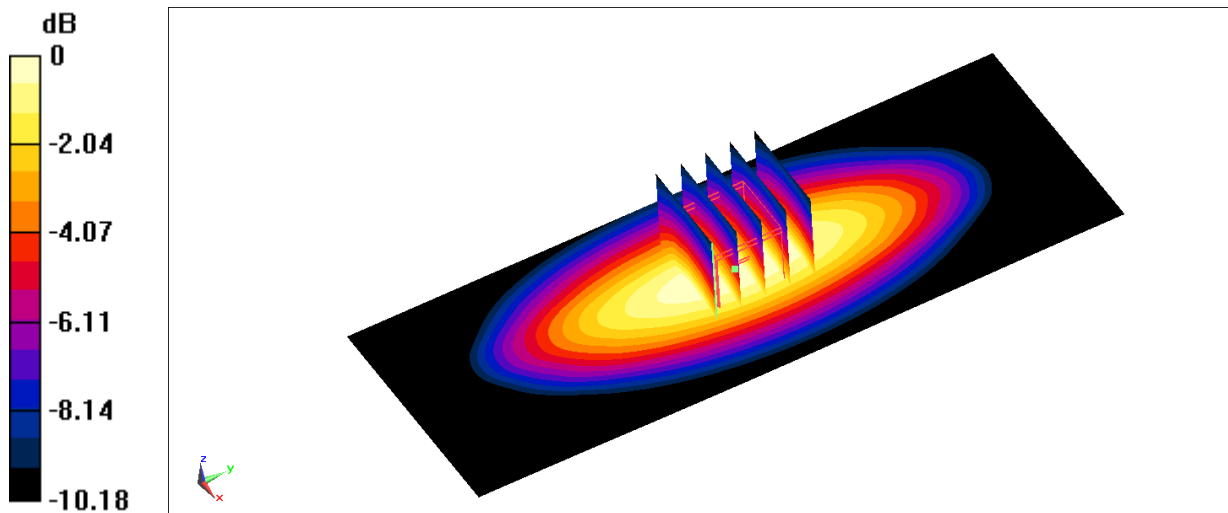
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 44.51 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 3.28 W/kg

SAR(1 g) = 2.17 W/kg; SAR(10 g) = 1.4 W/kg

Maximum value of SAR (measured) = 2.81 W/kg



0 dB = 2.81 W/kg = 4.49 dBW/kg

900MHz

Date: 7/6/2022

Electronics: DAE4 Sn1331

Medium: H900

Medium parameters used: $f = 900 \text{ MHz}$; $\sigma = 0.9003 \text{ S/m}$; $\epsilon_r = 43.92$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CW Frequency: 900 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(9.72, 9.72, 9.72)

Area Scan (51x131x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 68.24 V/m ; Power Drift = -0.02 dB

SAR(1 g) = 2.82 W/kg ; SAR(10 g) = 1.75 W/kg

Maximum value of SAR (interpolated) = 5.18 W/kg

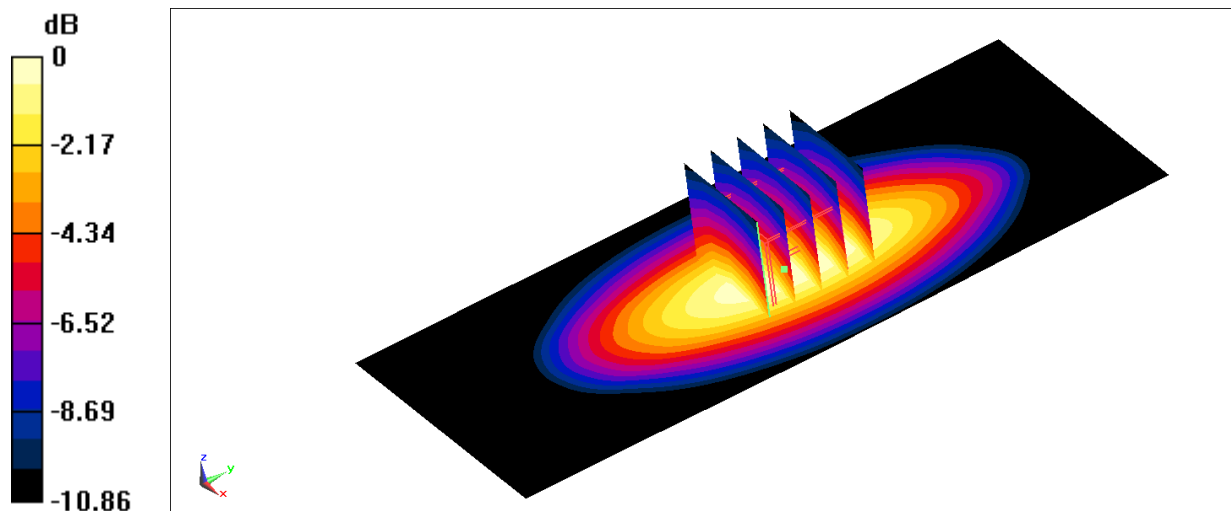
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 68.24 V/m ; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 6.11 W/kg

SAR(1 g) = 2.81 W/kg ; SAR(10 g) = 1.72 W/kg

Maximum value of SAR (measured) = 5.21 W/kg



0 dB = 5.21 W/kg = 7.17 dBW/kg

1800MHz

Date: 7/6/2022

Electronics: DAE4 Sn1331

Medium: H1800r

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.408$ S/m; $\epsilon_r = 41.73$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CW Frequency: 1800 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(8.2, 8.2, 8.2)

Area Scan (51x101x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Reference Value = 75.45 V/m; Power Drift = 0.11 dB

SAR(1 g) = 9.85 W/kg; SAR(10 g) = 5.11 W/kg

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

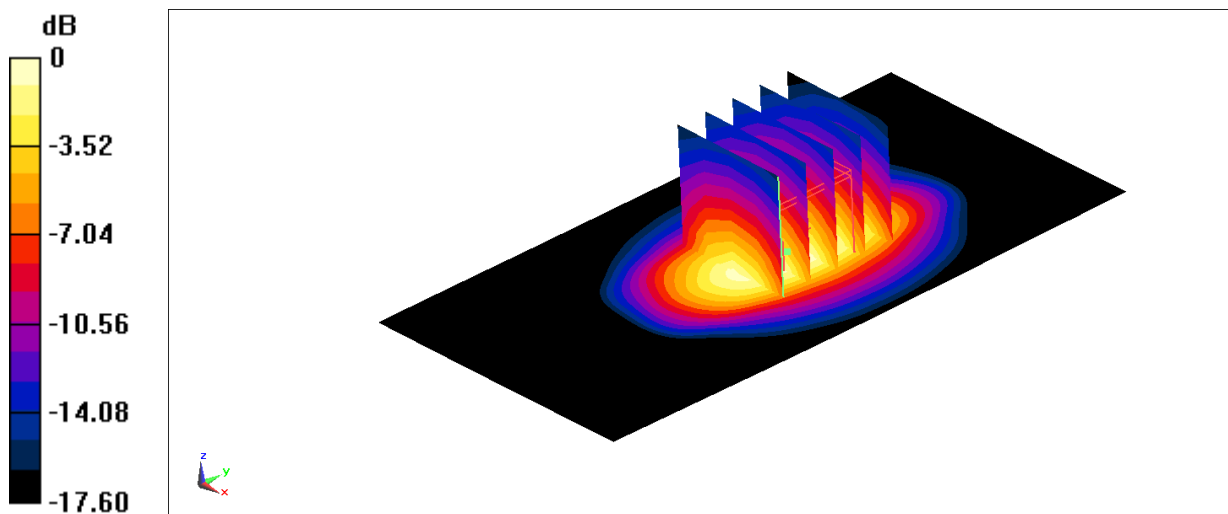
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 75.45 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 18.2 W/kg

SAR(1 g) = 9.77 W/kg; SAR(10 g) = 5.05 W/kg

Maximum value of SAR (measured) = 14.5 W/kg



0 dB = 14.5 W/kg = 11.61 dBW/kg

1900MHz

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: H1900

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.473$ S/m; $\epsilon_r = 41.58$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(8.18, 8.18, 8.18)

Area Scan (51x101x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Reference Value = 81.15 V/m; Power Drift = -0.12 dB

SAR(1 g) = 10.08 W/kg; SAR(10 g) = 5.33 W/kg

Maximum value of SAR (interpolated) = 15.5 W/kg

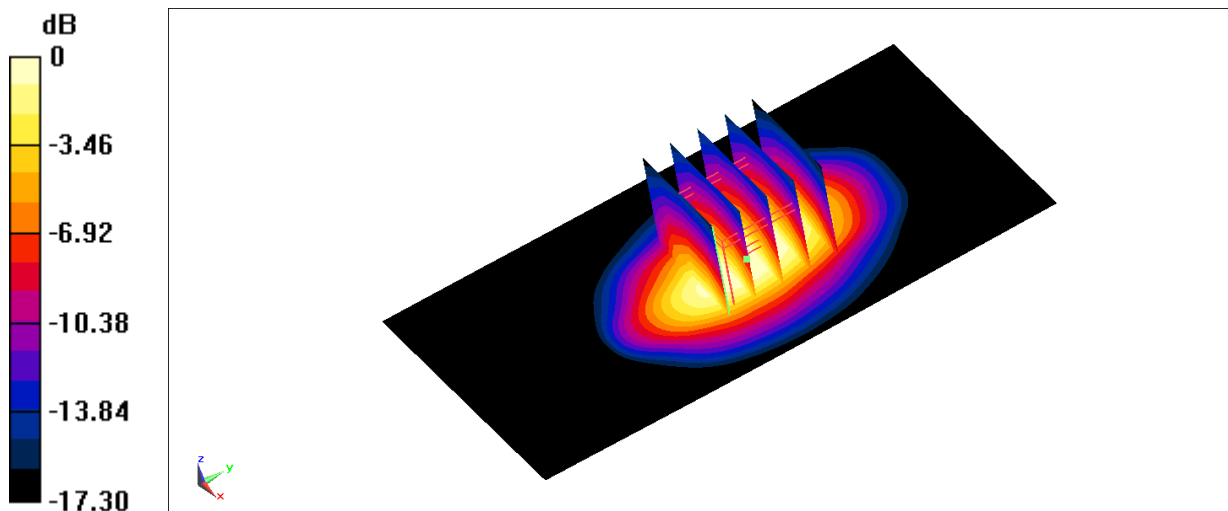
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 81.15 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 18.56 W/kg

SAR(1 g) = 10.03 W/kg; SAR(10 g) = 5.31 W/kg

Maximum value of SAR (measured) = 15.0 W/kg



0 dB = 15.0 W/kg = 11.76 dBW/kg

2450MHz

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: H2450

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.905$ S/m; $\epsilon_r = 40.49$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.77, 7.77, 7.77)

Area Scan (61x81x1): Interpolated grid: $dx=1.200$ mm, $dy=1.200$ mm

SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.18 W/kg

Maximum value of SAR (interpolated) = 21.5 W/kg

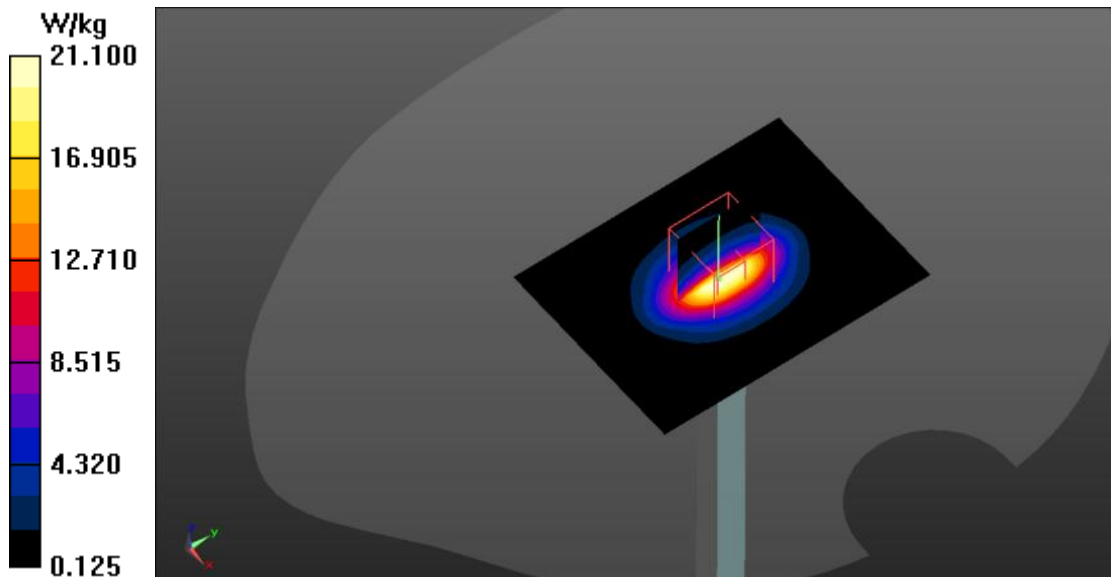
Zoom Scan (7x7x5)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 117.0 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 26.3 W/kg

SAR(1 g) = 13.56 W/kg; SAR(10 g) = 6.15 W/kg

Maximum value of SAR (measured) = 21.1 W/kg



0 dB = 21.1 W/kg = 13.24 dBW/kg

2600MHz

Date: 7/7/2022

Electronics: DAE4 Sn1331

Medium: H2600

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.035$ S/m; $\epsilon_r = 41.48$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CW Frequency: 2600 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.64, 7.64, 7.64)

Area Scan (61x81x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Reference Value = 110.5 V/m; Power Drift = 0.08 dB

SAR(1 g) = 14.47 W/kg; SAR(10 g) = 6.32 W/kg

Maximum value of SAR (interpolated) = 24.8 W/kg

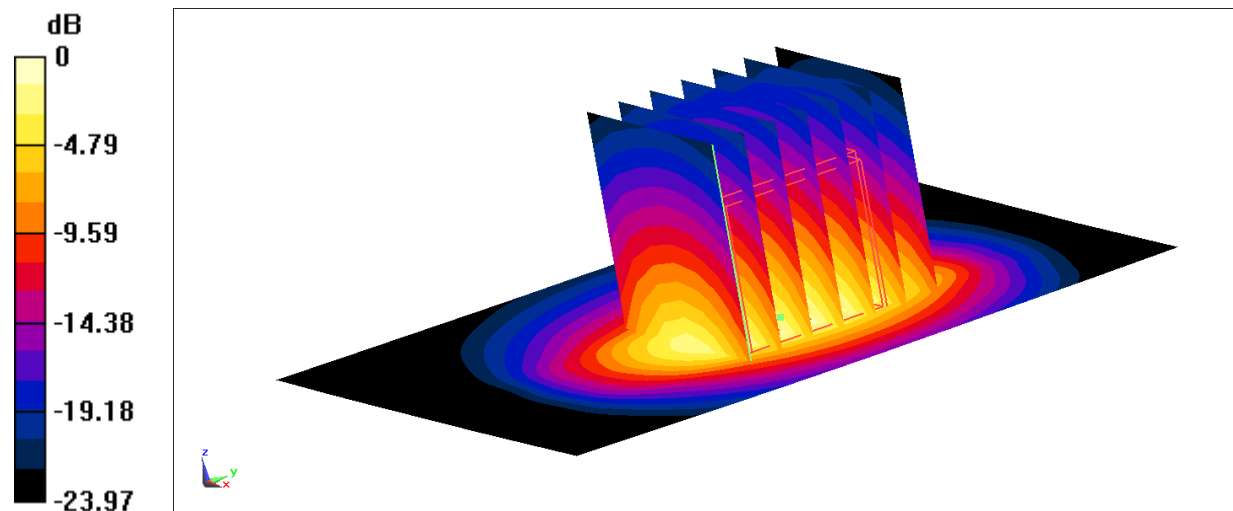
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 110.5 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 30.8 W/kg

SAR(1 g) = 14.65 W/kg; SAR(10 g) = 6.37 W/kg

Maximum value of SAR (measured) = 23.4 W/kg



0 dB = 23.4 W/kg = 13.69 dBW/kg

3500MHz

Date: 7/27/2022

Electronics: DAE4 Sn1331

Medium: Head3G

Medium parameters used: $f = 3500\text{MHz}$; $\sigma = 2.874 \text{ mho/m}$; $\epsilon_r = 38.53$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CW Frequency: 3500MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(7.2, 7.2, 7.2)

Area Scan (81x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy= 1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 12.35 W/kg

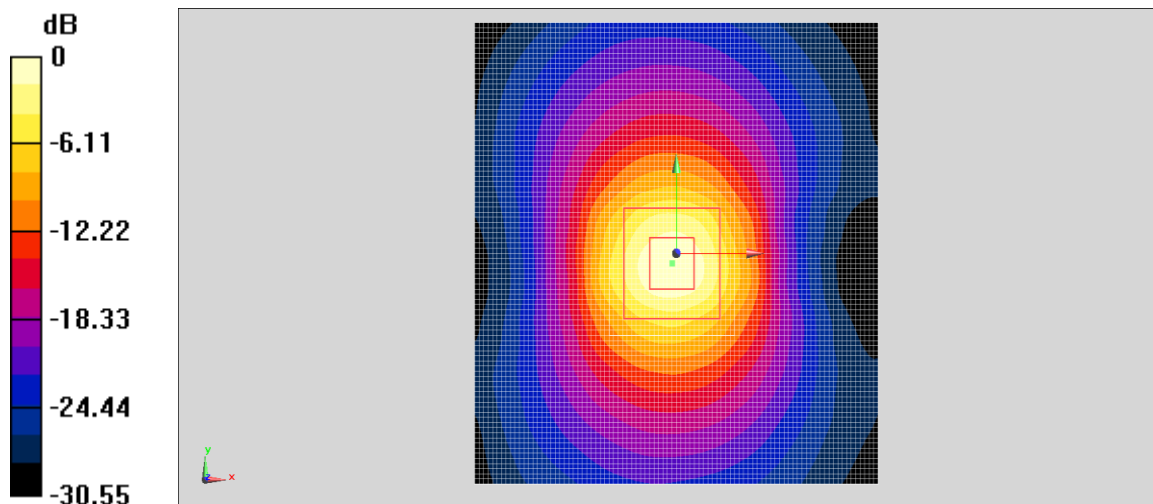
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$

Reference Value = 69.04 V/m ; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 16.65 W/kg

SAR(1 g) = 6.5 W/kg ; SAR(10 g) = 2.45 W/kg

Maximum value of SAR (measured) = 12.35 W/kg



0 dB = 12.56 W/kg = 10.99 dBW/kg

3900MHz

Date: 7/27/2022

Electronics: DAE4 Sn1331

Medium: Head3G

Medium parameters used: $f = 3900\text{MHz}$; $\sigma = 3.26 \text{ mho/m}$; $\epsilon_r = 37.75$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CW Frequency: 3900MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(6.76, 6.76, 6.76)

Area Scan (81x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 13.4 W/kg

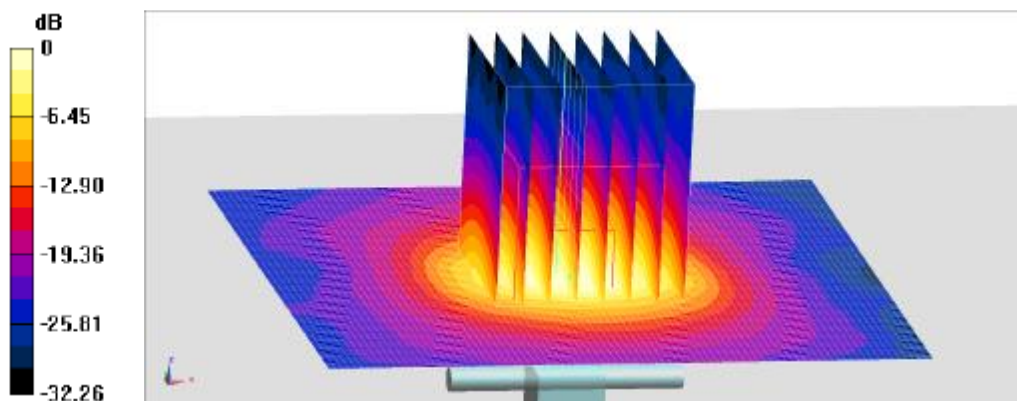
Zoom Scan (8x8x7)/Cube 0: : Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$

Reference Value = 70.5 V/m ; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 19.0 W/kg

SAR(1 g) = 6.72 W/kg ; SAR(10 g) = 2.35 W/kg

Maximum value of SAR (measured) = 13.2 W/kg



0 dB = $13.2 \text{ W/kg} = 11.21 \text{ dBW/kg}$

5250MHz

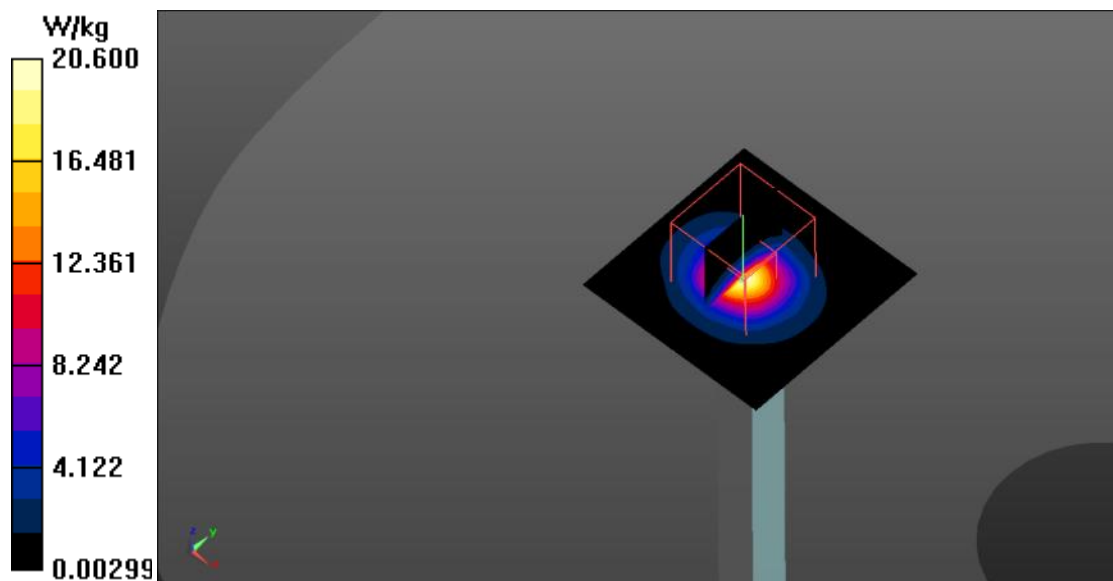
Date: 7/28/2022

Electronics: DAE4 Sn1331

Medium: H5G

Medium parameters used: $f = 5250\text{MHz}$; $\sigma = 4.819\text{ mho/m}$; $\epsilon_r = 36.13$; $\rho = 1000\text{ kg/m}^3$ Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C Communication System: CW Frequency: 5250MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(5.43, 5.43, 5.43)

Area Scan (51x51x1): Interpolated grid: $dx=1.000\text{ mm}$, $dy=1.000\text{ mm}$ Maximum value of SAR (interpolated) = 20.4 W/kg **Zoom Scan (7x7x6)/Cube 0:** Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$ Reference Value = 71.33 V/m ; Power Drift = -0.12 dB Peak SAR (extrapolated) = 33.5 W/kg **SAR(1 g) = 7.89 W/kg ; SAR(10 g) = 2.24 W/kg** Maximum value of SAR (measured) = 20.6 W/kg  $0\text{ dB} = 20.6\text{ W/kg} = 13.14\text{ dBW/kg}$

5600MHz

Date: 7/28/2022

Electronics: DAE4 Sn1331

Medium: H5G

Medium parameters used: $f = 5600\text{MHz}$; $\sigma = 5.207 \text{ mho/m}$; $\epsilon_r = 35.43$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CW Frequency: 5600MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7464 ConvF(4.91, 4.91, 4.91)

Area Scan (61x61x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 21.0 W/kg

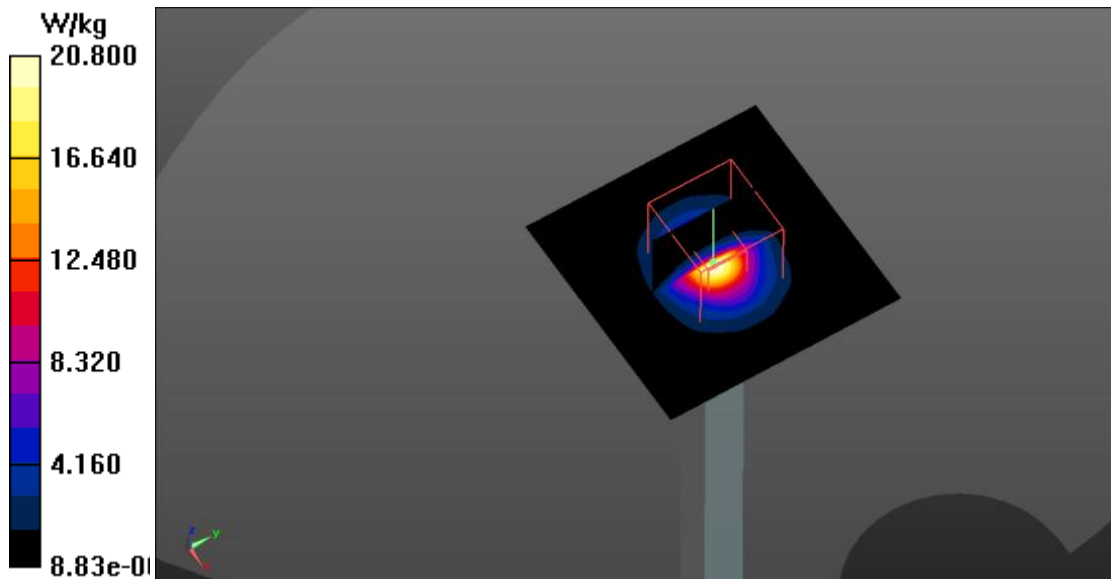
Zoom Scan (9x9x6)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 69.80 V/m ; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 35.0 W/kg

SAR(1 g) = 8.23 W/kg ; SAR(10 g) = 2.35 W/kg

Maximum value of SAR (measured) = 20.8 W/kg



0 dB = 20.8 W/kg = 13.18 dBW/kg

J.7 MAIN TEST INSTRUMENTS

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	E5071C	MY46110673	January 14, 2022	One year
02	Power sensor	NRP110T	101139	January 13, 2022	One year
03	Power sensor	NRP110T	101159	January 13, 2022	One year
04	Signal Generator	E4438C	MY49071430	January 13, 2022	One year
05	Amplifier	60S1G4	0331848	No Calibration Requested	
06	BTS	CMW500	159850	January 24, 2022	One year
07	E-field Probe	EX3DV4	7464	January 26, 2022	One year
08	DAE	SPEAG DAE4	1331	September 1, 2021	One year
09	Dipole Validation Kit	SPEAG D750V3	1017	July 12,,2021	One year
10	Dipole Validation Kit	SPEAG D900V2	1d051	July 12, 2021	One year
11	Dipole Validation Kit	SPEAG D1800V2	2d145	July 12, 2021	One year
12	Dipole Validation Kit	SPEAG D1900V2	5d101	July 15,2021	One year
13	Dipole Validation Kit	SPEAG D2450V2	853	July 26,2021	One year
14	Dipole Validation Kit	SPEAG D2600V2	1012	July 26,2021	One year
15	Dipole Validation Kit	SPEAG D3300V2	1011	June 21,2021	Three years
16	Dipole Validation Kit	SPEAG D3500V2	1016	June 21,2021	Three years
17	Dipole Validation Kit	SPEAG D3700V2	1004	June 21,2021	Three years
18	Dipole Validation Kit	SPEAG D3900V2	1024	June 21,2021	Three years
19	Dipole Validation Kit	SPEAG D5GHzV2	1262	January 27, 2022	One year

J.8 Dipole Calibration Certificate

900 MHz Dipole Calibration Certificate

Calibration Laboratory of
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Accreditation No.: SCS 0108

Client **CTTL (Auden)**

Certificate No: **D900V2-1d051_Jul21**

CALIBRATION CERTIFICATE

Object: **D900V2 - SN:1d051**
 Calibration procedure(s): **QA CAL-05.v11
 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**
 Calibration date: **July 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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 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

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

Issued: July 15, 2021

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	42.0 \pm 6 %	0.96 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	2.72 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	11.0 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	1.74 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	7.01 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	49.7 Ω - 0.2 j Ω
Return Loss	- 47.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.407 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: 12.07.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:1d051

Communication System: UID 0 - CW; Frequency: 900 MHz

Medium parameters used: $f = 900$ MHz; $\sigma = 0.96$ S/m; $\epsilon_r = 42.0$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.62, 9.62, 9.62) @ 900 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 65.07 V/m; Power Drift = -0.00 dB

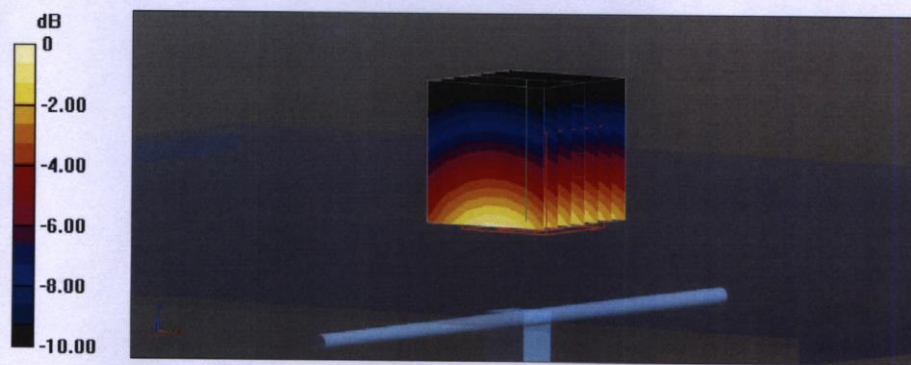
Peak SAR (extrapolated) = 4.19 W/kg

SAR(1 g) = 2.72 W/kg; SAR(10 g) = 1.74 W/kg

Smallest distance from peaks to all points 3 dB below = 16 mm

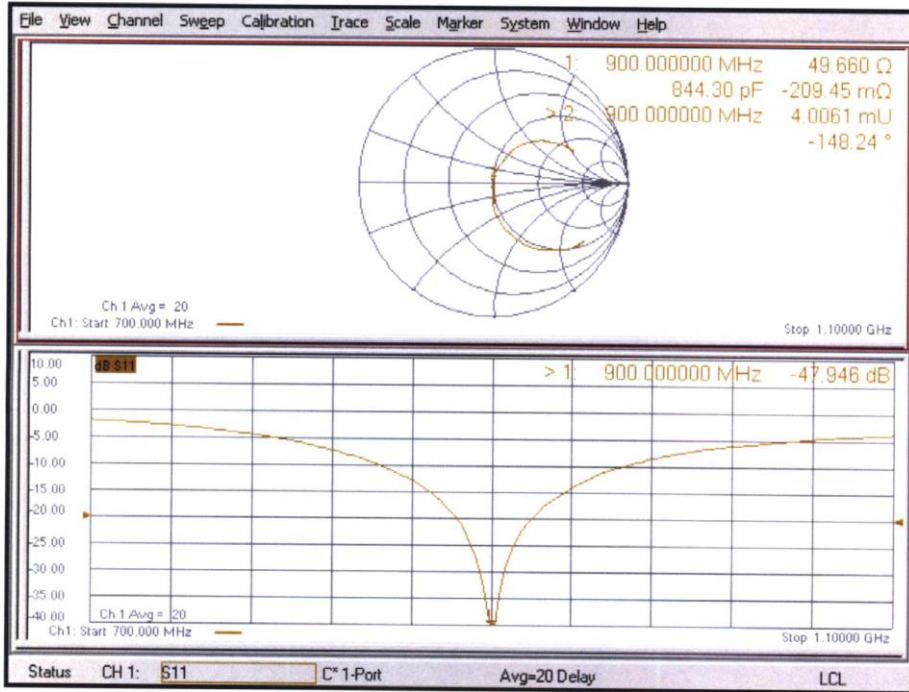
Ratio of SAR at M2 to SAR at M1 = 65.1%

Maximum value of SAR (measured) = 3.65 W/kg



0 dB = 3.65 W/kg = 5.62 dBW/kg

Impedance Measurement Plot for Head TSL



1800 MHz Dipole Calibration Certificate

Calibration Laboratory of
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Accreditation No.: **SCS 0108**

Client **CTTL (Auden)**

Certificate No: **D1800V2-2d145_Jul21**

CALIBRATION CERTIFICATE

Object **D1800V2 - SN:2d145**

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

Calibration date: **July 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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 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: July 15, 2021

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	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	40.4 \pm 6 %	1.39 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	9.51 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	38.3 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	47.9 Ω - 2.8 j Ω
Return Loss	- 28.8 dB

General Antenna Parameters and Design

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

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

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

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

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 12.07.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d145

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

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.39$ S/m; $\epsilon_r = 40.4$; $\rho = 1000$ 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: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(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 = 107.9 V/m; Power Drift = 0.04 dB

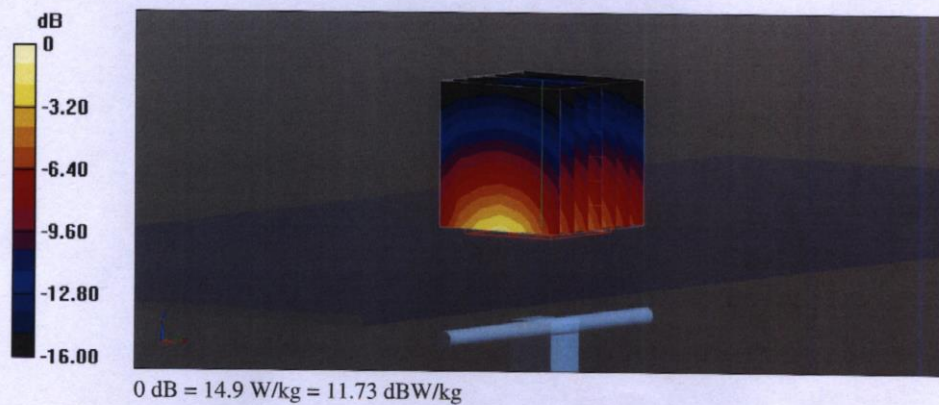
Peak SAR (extrapolated) = 17.7 W/kg

SAR(1 g) = 9.51 W/kg; SAR(10 g) = 4.95 W/kg

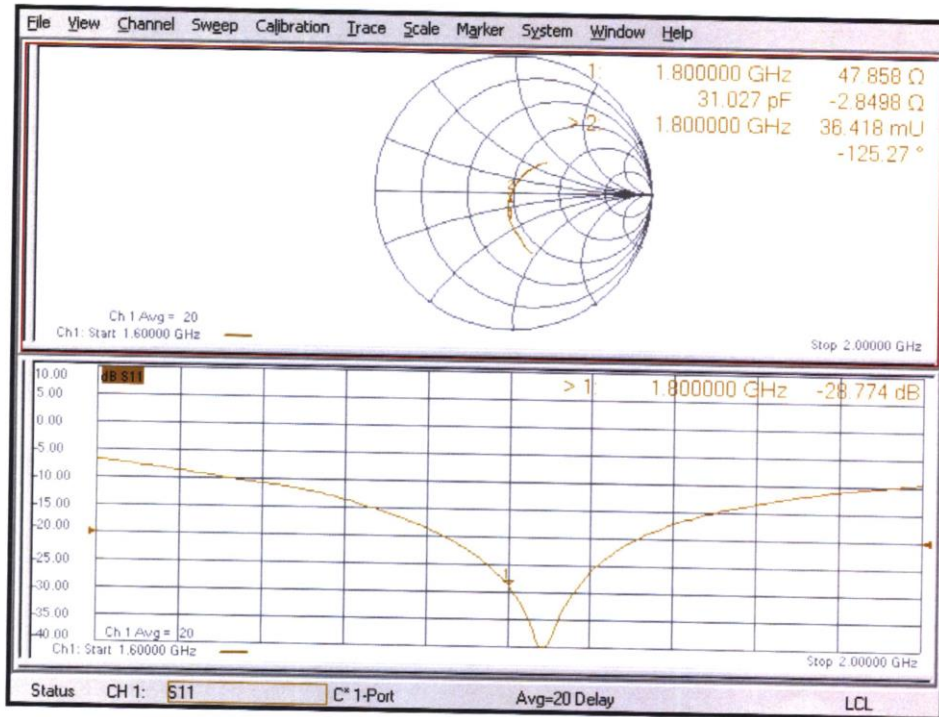
Smallest distance from peaks to all points 3 dB below = 9.5 mm

Ratio of SAR at M2 to SAR at M1 = 54.3%

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



Impedance Measurement Plot for Head TSL



5 GHz Dipole Calibration Certificate

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Accreditation No.: **SCS 0108**

Client **CTTL (Auden)**

Certificate No: **D5GHzV2-1262_Jan22**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1262**

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

Calibration date: **January 27, 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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 3503	31-Dec-21 (No. EX3-3503_Dec21)	Dec-22
DAE4	SN: 601	01-Nov-21 (No. DAE4-601_Nov21)	Nov-22
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Aldonia Georgiadou	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	

Issued: January 27, 2022

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	4.52 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.1 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.4 ± 6 %	4.87 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.51 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	84.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.9 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	5.02 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.8 W/kg ± 19.5 % (k=2)