

21_CDMA2000 BC10_RTAP 153.6Kbps_Left Side_10mm_Ch476

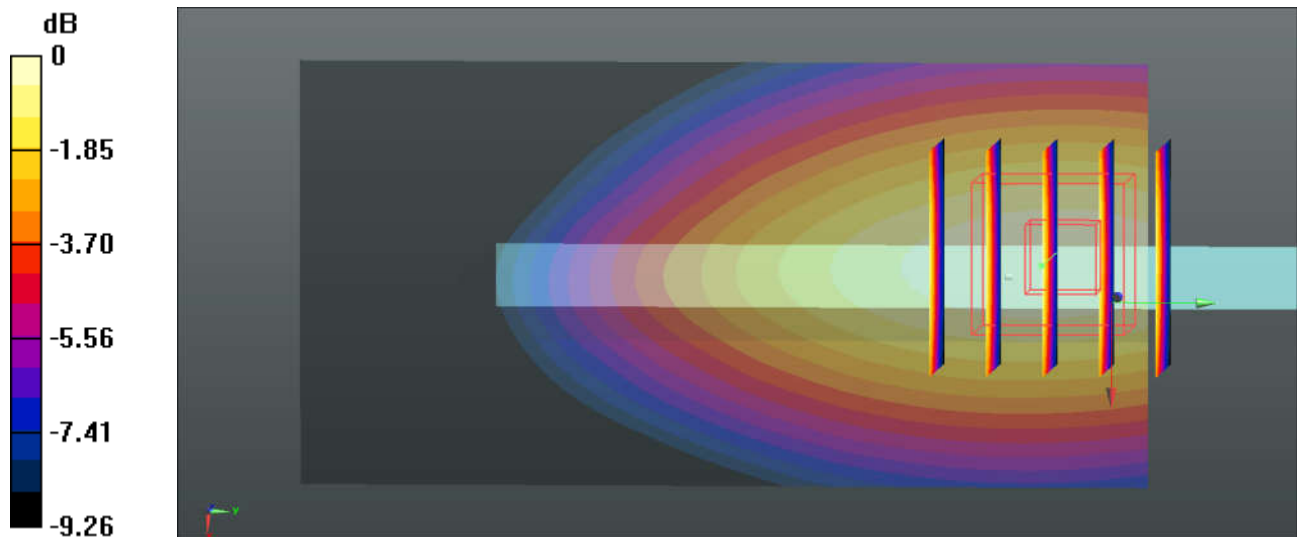
Communication System: UID 0, CDMA2000 (0); Frequency: 817.9 MHz; Duty Cycle: 1:1
Medium: MSL_835 Medium parameters used: $f = 817.9$ MHz; $\sigma = 0.962$ S/m; $\epsilon_r = 54.249$; $\rho = 1000$ kg/m³
Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.25, 9.25, 9.25); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch476/Area Scan (41x81x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm
Maximum value of SAR (interpolated) = 0.691 W/kg

Ch476/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm
Reference Value = 27.07 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.792 W/kg
SAR(1 g) = 0.560 W/kg; SAR(10 g) = 0.390 W/kg
Maximum value of SAR (measured) = 0.684 W/kg



0 dB = 0.684 W/kg = -1.65 dBW/kg

22_CDMA2000 BC0_RTAP 153.6Kbps_Left Side_10mm_Ch1013

Communication System: UID 0, CDMA2000 (0); Frequency: 824.7 MHz; Duty Cycle: 1:1
Medium: MSL_835 Medium parameters used: $f = 825$ MHz; $\sigma = 0.969$ S/m; $\epsilon_r = 54.178$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.25, 9.25, 9.25); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1013/Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.777 W/kg

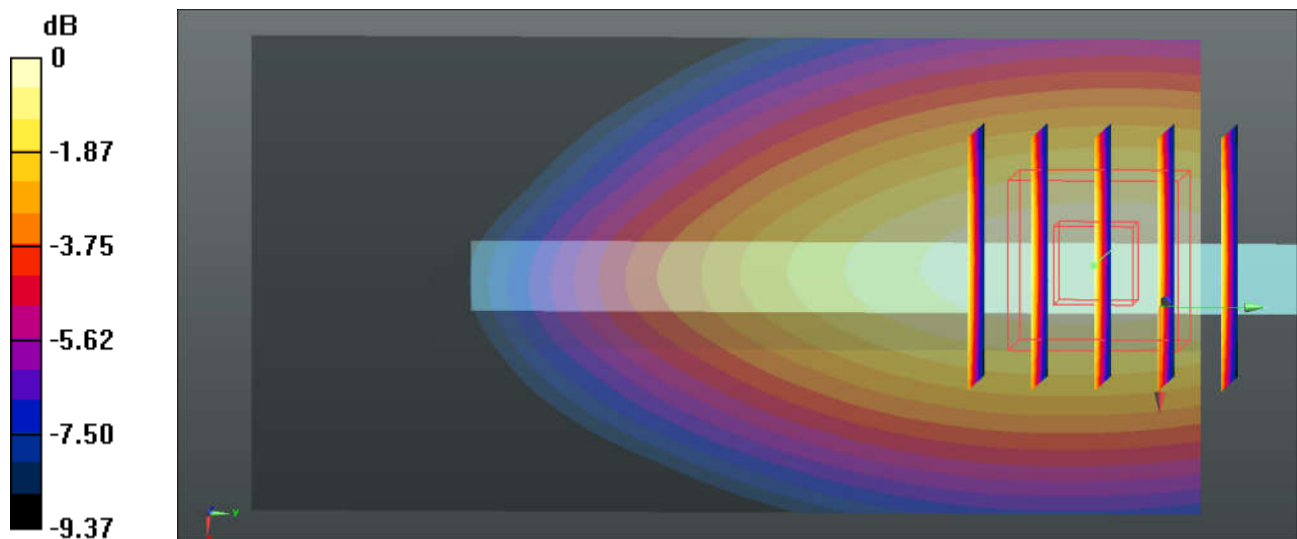
Ch1013/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.71 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.889 W/kg

SAR(1 g) = 0.635 W/kg; SAR(10 g) = 0.439 W/kg

Maximum value of SAR (measured) = 0.778 W/kg



0 dB = 0.778 W/kg = -1.09 dBW/kg

23_CDMA2000 BC1_RTAP153.6Kbps_Bottom Side_10mm_Ch600

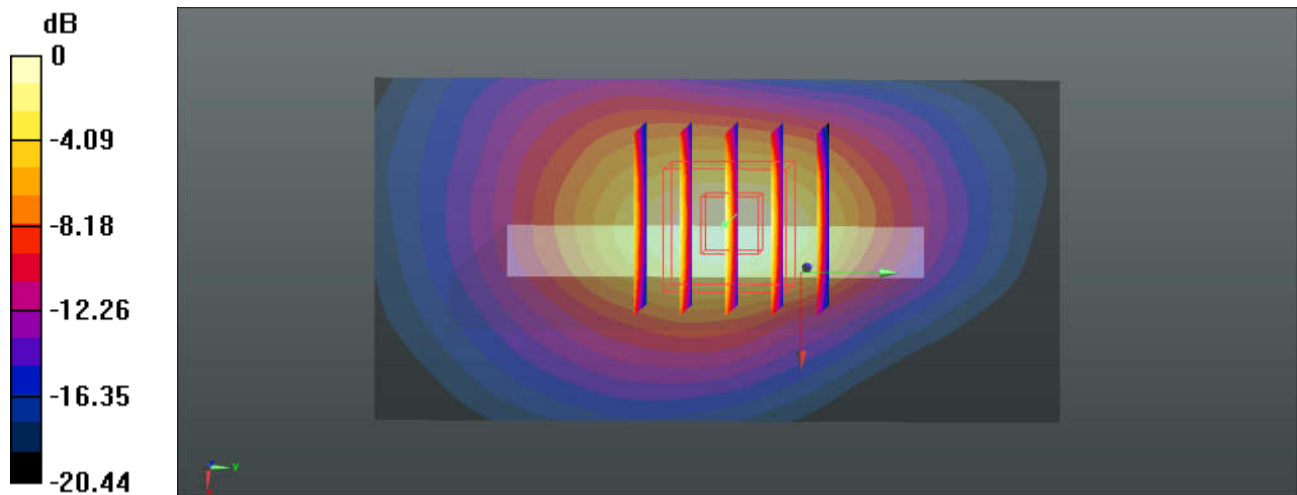
Communication System: UID 0, CDMA2000 (0); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: MSL_1900 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.522$ S/m; $\epsilon_r = 53.281$; $\rho = 1000$ kg/m³
Ambient Temperature : 23.4 °C ; Liquid Temperature : 22.7 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch600/Area Scan (41x81x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm
Maximum value of SAR (interpolated) = 1.11 W/kg

Ch600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm
Reference Value = 25.50 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.39 W/kg
SAR(1 g) = 0.792 W/kg; SAR(10 g) = 0.404 W/kg
Maximum value of SAR (measured) = 1.12 W/kg



0 dB = 1.12 W/kg = 0.49 dBW/kg

24_LTE Band 12_10M_QPSK_1RB_25Offset_Front_10mm_Ch23095

Communication System: UID 0, FDD_LTE (0); Frequency: 707.5 MHz; Duty Cycle: 1:1

Medium: MSL_750 Medium parameters used: $f = 707.5$ MHz; $\sigma = 0.943$ S/m; $\epsilon_r = 55.833$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.45, 9.45, 9.45); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch23095/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.437 W/kg

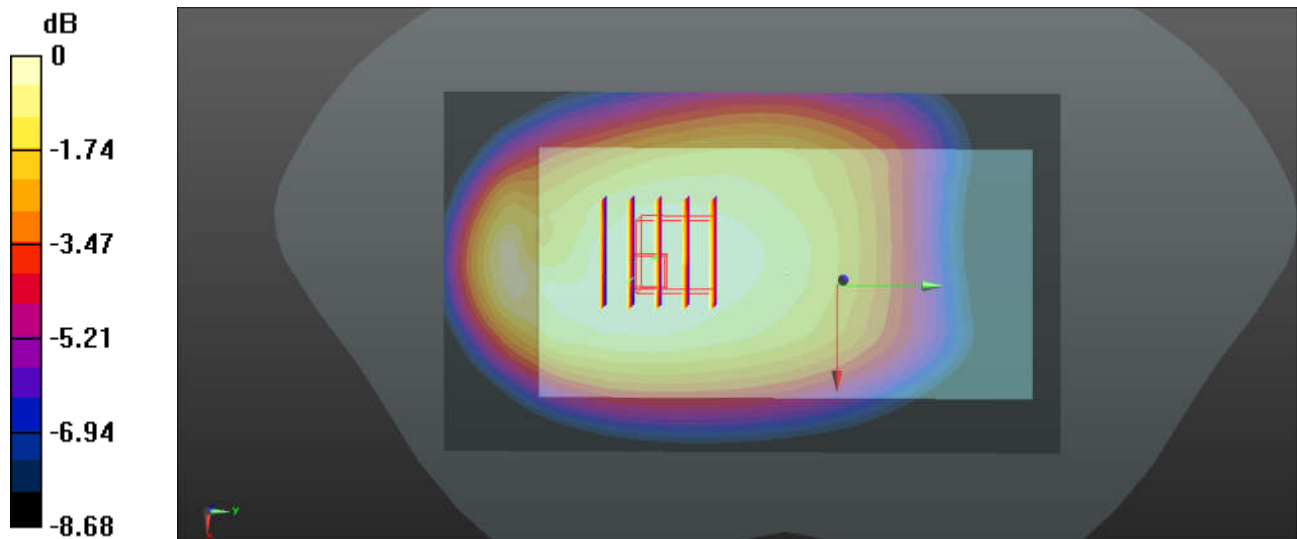
Ch23095/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.93 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.480 W/kg

SAR(1 g) = 0.371 W/kg; SAR(10 g) = 0.291 W/kg

Maximum value of SAR (measured) = 0.425 W/kg



25_LTE Band 13_10M_QPSK_1RB_25Offset_Left Side_10mm_Ch23230

Communication System: UID 0, FDD_LTE (0); Frequency: 782 MHz; Duty Cycle: 1:1

Medium: MSL_750 Medium parameters used: $f = 782$ MHz; $\sigma = 1.002$ S/m; $\epsilon_r = 54.462$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.45, 9.45, 9.45); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch23230/Area Scan (41x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.638 W/kg

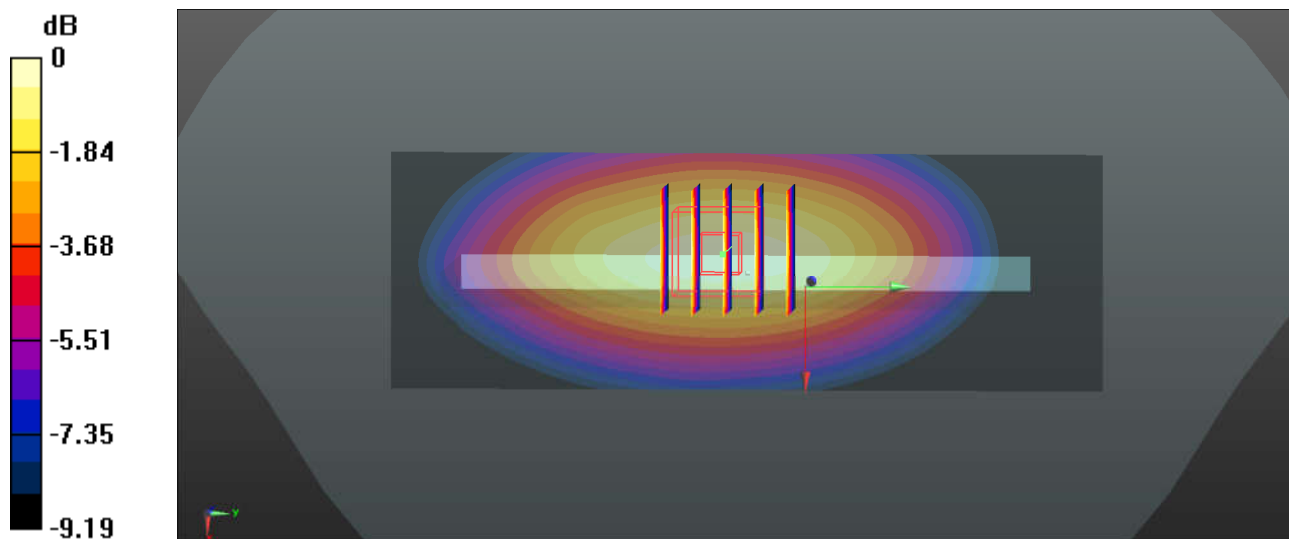
Ch23230/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.22 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.760 W/kg

SAR(1 g) = 0.539 W/kg; SAR(10 g) = 0.374 W/kg

Maximum value of SAR (measured) = 0.667 W/kg



0 dB = 0.667 W/kg = -1.76 dBW/kg

26_LTE Band 26_15M_QPSK_1RB_37Offset_Left Side_10mm_Ch26865

Communication System: UID 0, FDD_LTE (0); Frequency: 831.5 MHz; Duty Cycle: 1:1

Medium: MSL_835 Medium parameters used: $f = 831.5$ MHz; $\sigma = 0.976$ S/m; $\epsilon_r = 54.116$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.25, 9.25, 9.25); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch26865/Area Scan (41x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.646 W/kg

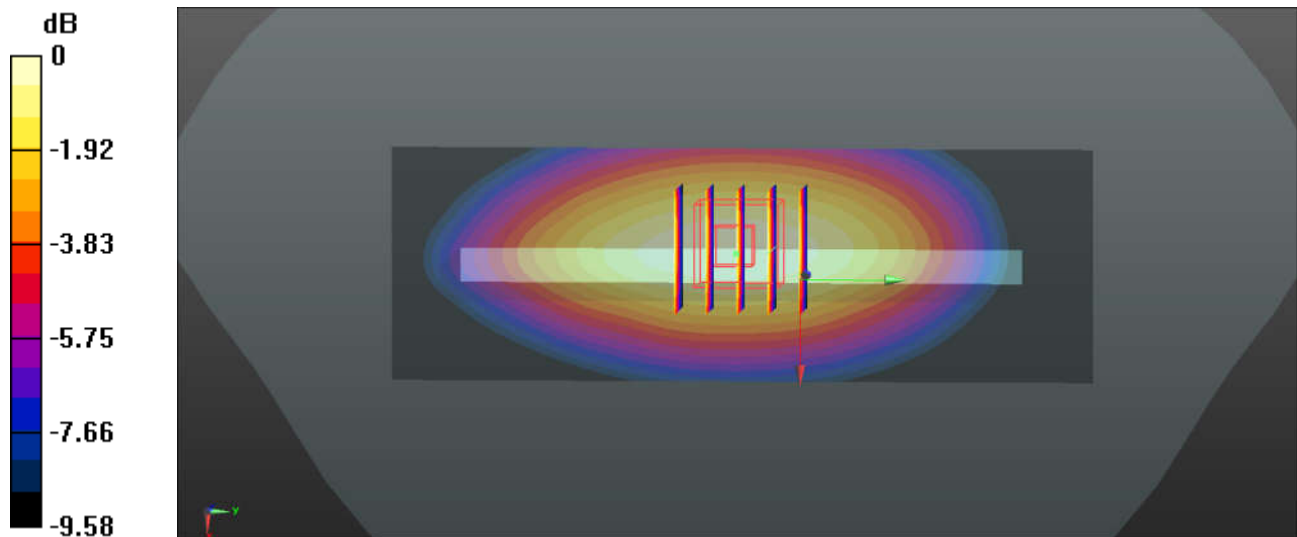
Ch26865/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.88 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.745 W/kg

SAR(1 g) = 0.530 W/kg; SAR(10 g) = 0.368 W/kg

Maximum value of SAR (measured) = 0.650 W/kg



0 dB = 0.650 W/kg = -1.87 dBW/kg

27_LTE Band 66_20M_QPSK_1RB_49Offset_Bottom Side_10mm_Ch132572

Communication System: UID 0, FDD_LTE (0); Frequency: 1770 MHz; Duty Cycle: 1:1

Medium: MSL_1750 Medium parameters used: $f = 1770$ MHz; $\sigma = 1.502$ S/m; $\epsilon_r = 54.039$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.4 °C ; Liquid Temperature : 22.7 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.81, 7.81, 7.81); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch132572/Area Scan (31x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.42 W/kg

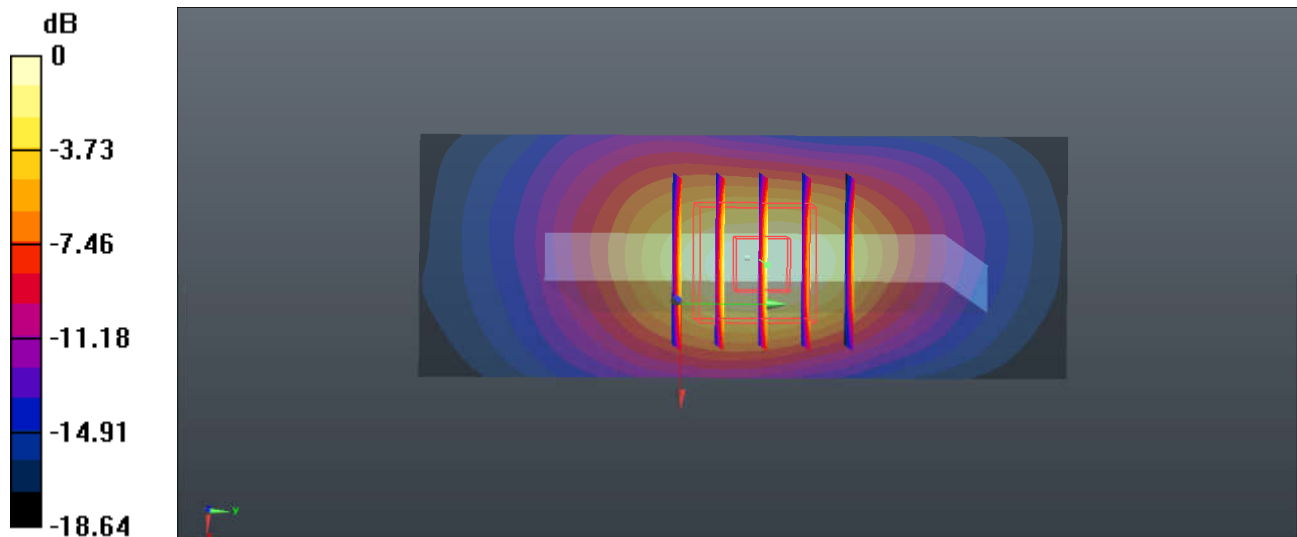
Ch132572/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 29.61 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 1.68 W/kg

SAR(1 g) = 0.951 W/kg; SAR(10 g) = 0.501 W/kg

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



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

28_LTE Band 25_20M_QPSK_100RB_0Offset_Bottom Side_10mm_Ch26340

Communication System: UID 0, FDD_LTE (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: MSL_1900 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.522$ S/m; $\epsilon_r = 53.281$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.4 °C ; Liquid Temperature : 22.7 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch26340/Area Scan (31x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.17 W/kg

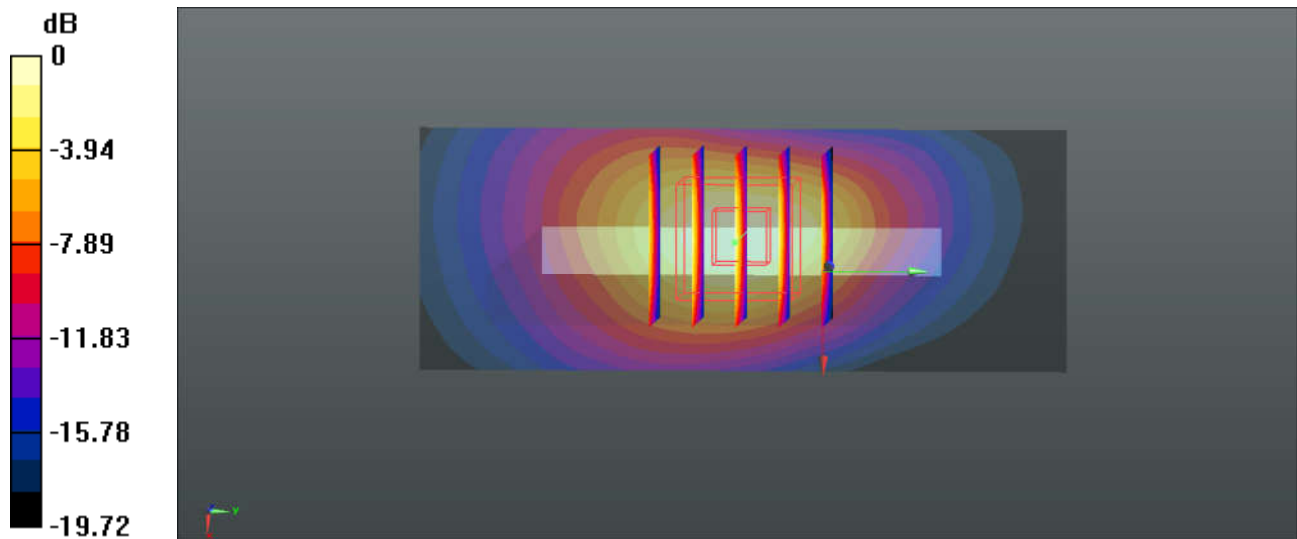
Ch26340/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 27.14 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 1.40 W/kg

SAR(1 g) = 0.800 W/kg; SAR(10 g) = 0.405 W/kg

Maximum value of SAR (measured) = 1.13 W/kg



0 dB = 1.13 W/kg = 0.53 dBW/kg

29_LTE Band 7_20M_QPSK_1RB_49Offset_Bottom Side_10mm_Ch20850

Communication System: UID 0, FDD_LTE (0); Frequency: 2510 MHz; Duty Cycle: 1:1

Medium: MSL_2600 Medium parameters used: $f = 2510$ MHz; $\sigma = 2.129$ S/m; $\epsilon_r = 53.487$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.13, 7.13, 7.13); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20850/Area Scan (41x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 1.40 W/kg

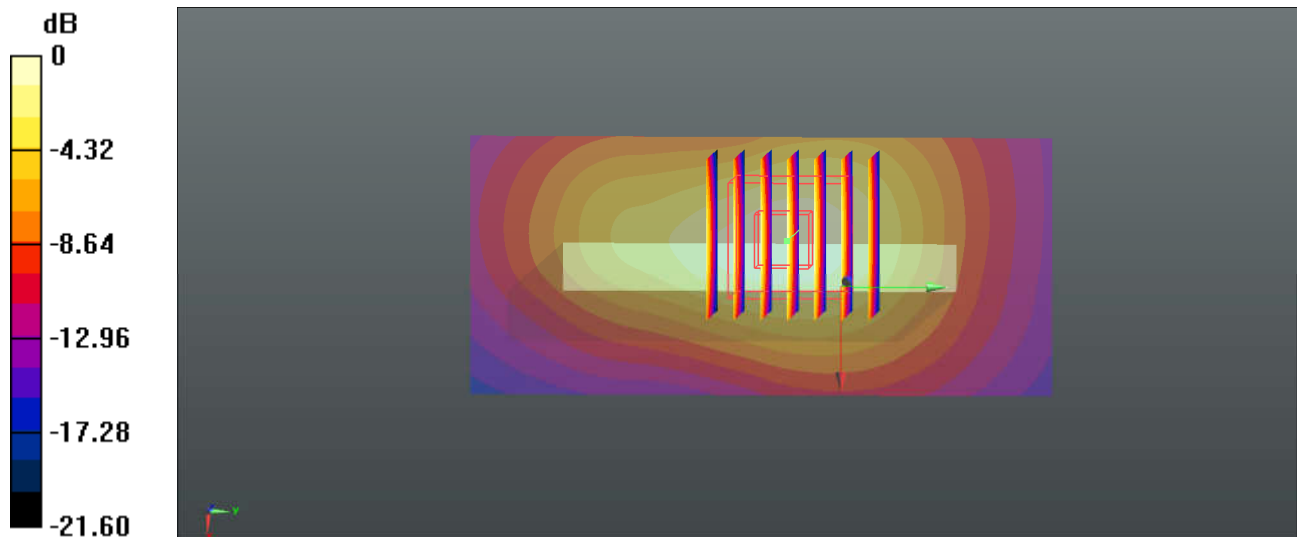
Ch20850/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.34 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 1.82 W/kg

SAR(1 g) = 0.950 W/kg; SAR(10 g) = 0.480 W/kg

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



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

30_LTE Band 41_20M_QPSK_1RB_49Offset_Back_10mm_Ch41490

Communication System: UID 0, TDD_LTE (0); Frequency: 2680 MHz; Duty Cycle: 1:1.59

Medium: MSL_2600 Medium parameters used: $f = 2680$ MHz; $\sigma = 2.279$ S/m; $\epsilon_r = 52.833$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.13, 7.13, 7.13); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch41490/Area Scan (81x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 1.25 W/kg

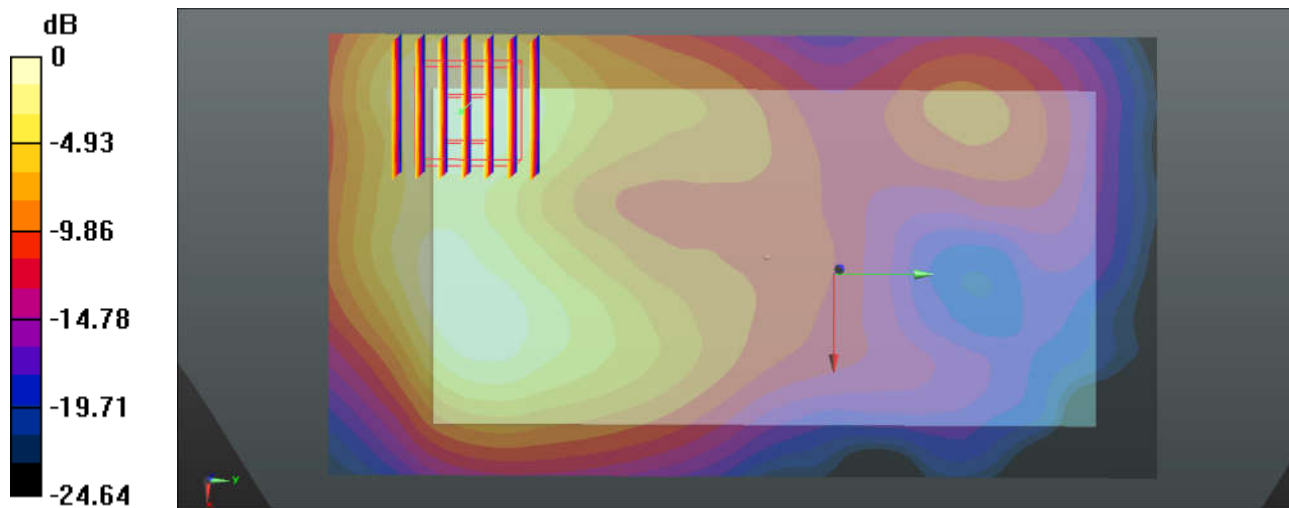
Ch41490/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.231 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 1.64 W/kg

SAR(1 g) = 0.787 W/kg; SAR(10 g) = 0.389 W/kg

Maximum value of SAR (measured) = 1.17 W/kg



0 dB = 1.02 W/kg = 0.09 dBW/kg

31_GSM 850_GSM 1 Tx slot_Front_10mm_Ch128

Communication System: UID 0, General GSM (0); Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: MSL_835 Medium parameters used: $f = 824.2$ MHz; $\sigma = 0.968$ S/m; $\epsilon_r = 54.187$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.25, 9.25, 9.25); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch128/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.399 W/kg

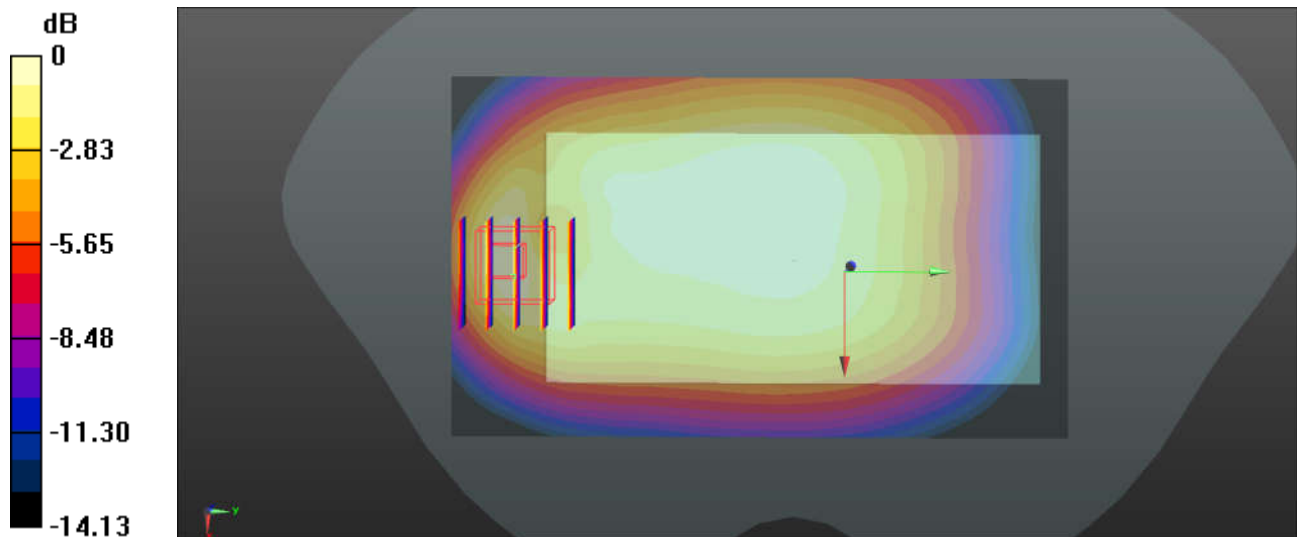
Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 19.65 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.504 W/kg

SAR(1 g) = 0.294 W/kg; SAR(10 g) = 0.168 W/kg

Maximum value of SAR (measured) = 0.403 W/kg



0 dB = 0.403 W/kg = -3.95 dBW/kg

32_GSM 1900_GSM 1 Tx slot_Front_10mm_Ch512

Communication System: UID 0, General GSM (0); Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: MSL_1900 Medium parameters used: $f = 1850.2$ MHz; $\sigma = 1.49$ S/m; $\epsilon_r = 53.374$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.4 °C ; Liquid Temperature : 22.7 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch512/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.915 W/kg

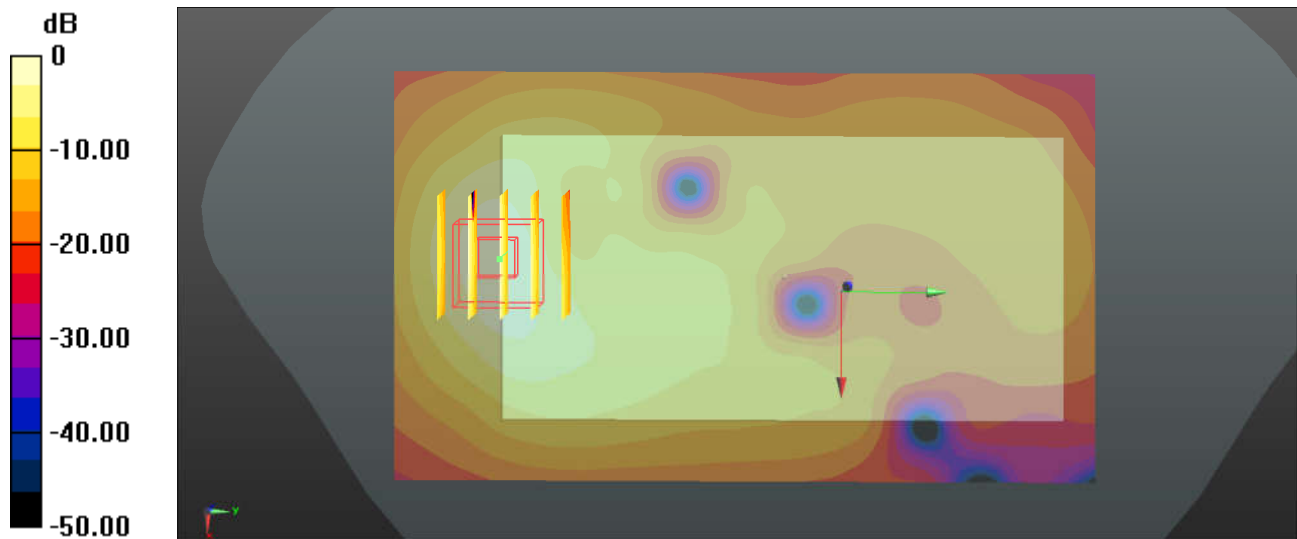
Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.565 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 1.17 W/kg

SAR(1 g) = 0.679 W/kg; SAR(10 g) = 0.355 W/kg

Maximum value of SAR (measured) = 0.954 W/kg



0 dB = 0.954 W/kg = -0.20 dBW/kg

33_WCDMA V_RMC 12.2Kbps_Front_10mm_Ch4132

Communication System: UID 0, UMTS (0); Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium: MSL_835 Medium parameters used: $f = 826.4$ MHz; $\sigma = 0.97$ S/m; $\epsilon_r = 54.166$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.25, 9.25, 9.25); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch4132/Area Scan (71x121x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm

Maximum value of SAR (interpolated) = 0.490 W/kg

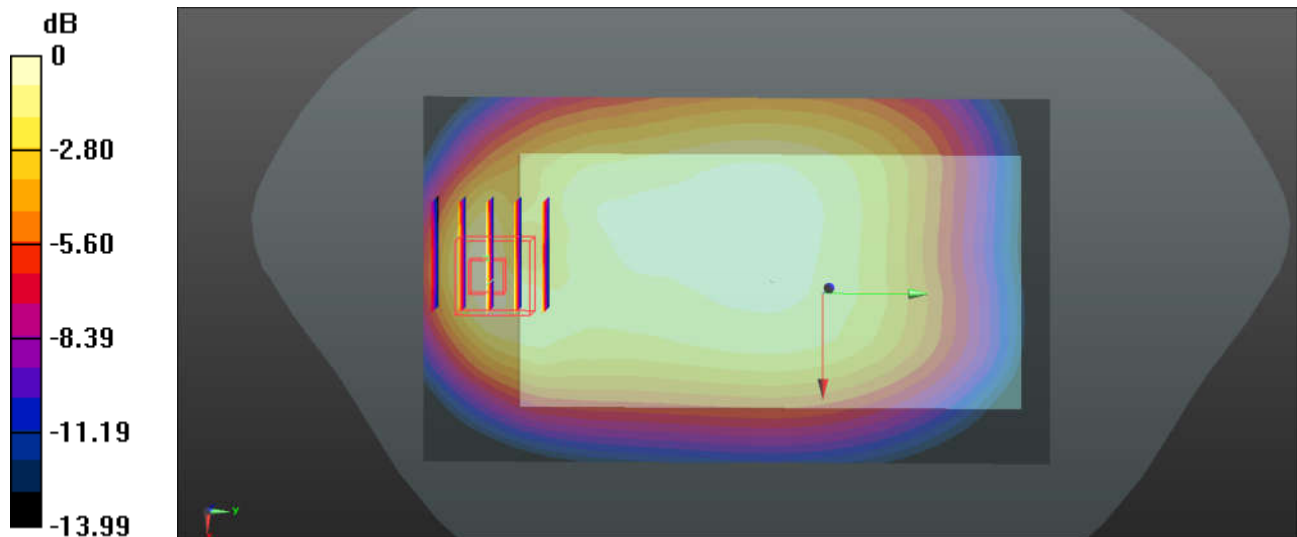
Ch4132/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 21.78 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.635 W/kg

SAR(1 g) = 0.369 W/kg; SAR(10 g) = 0.213 W/kg

Maximum value of SAR (measured) = 0.510 W/kg



0 dB = 0.510 W/kg = -2.92 dBW/kg

34_WCDMA II_RMC 12.2Kbps_Front_10mm_Ch9400

Communication System: UID 0, UMTS (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: MSL_1900 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.522$ S/m; $\epsilon_r = 53.281$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.4 °C ; Liquid Temperature : 22.7 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch9400/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.927 W/kg

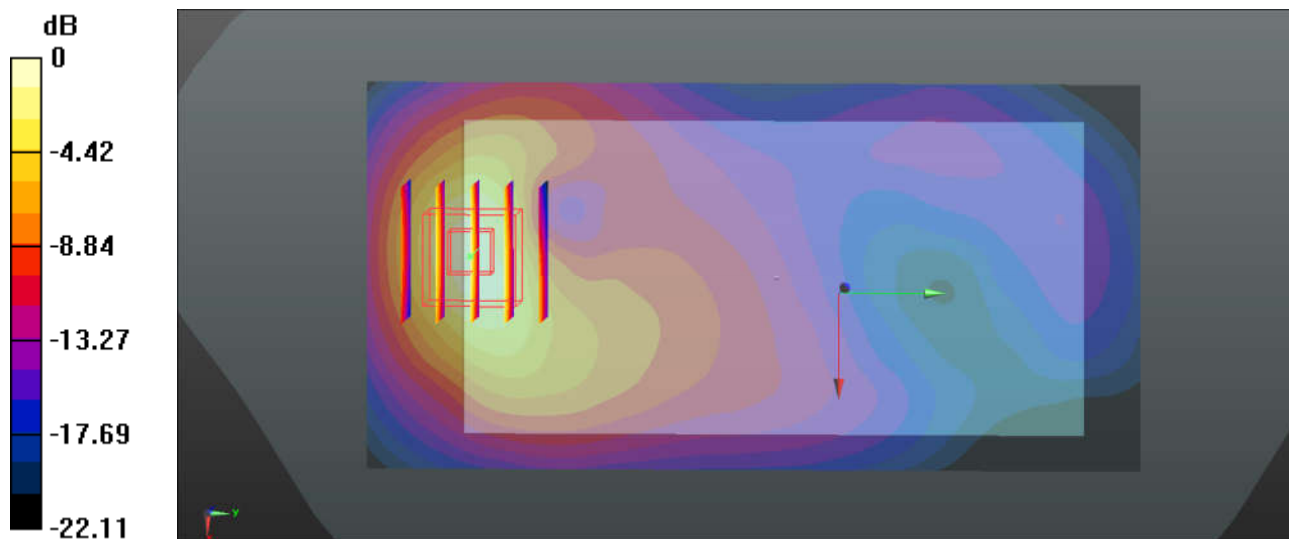
Ch9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.277 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 1.26 W/kg

SAR(1 g) = 0.719 W/kg; SAR(10 g) = 0.371 W/kg

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



0 dB = 1.01 W/kg = 0.04 dBW/kg

570-a_CDMA2000 BC10_RC3 SO32_Front_10mm_Ch580

Communication System: UID 0, CDMA2000 (0); Frequency: 820.5 MHz; Duty Cycle: 1:1
Medium: MSL_835 Medium parameters used: $f = 820.5$ MHz; $\sigma = 0.965$ S/m; $\epsilon_r = 54.22$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.25, 9.25, 9.25); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch580/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.637 W/kg

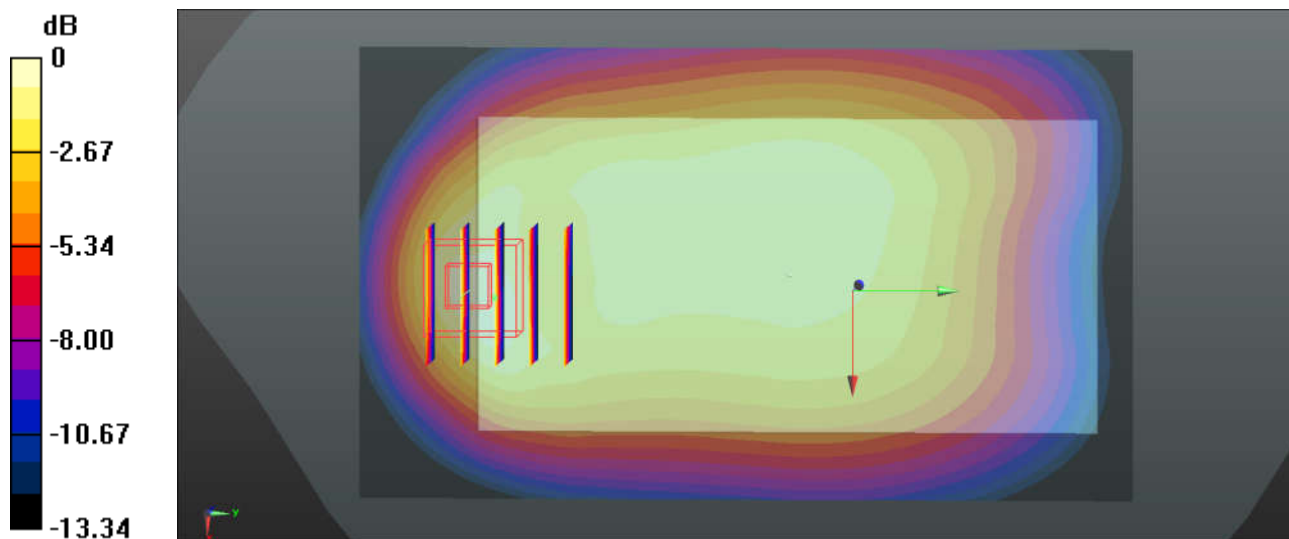
Ch580/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.05 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.870 W/kg

SAR(1 g) = 0.492 W/kg; SAR(10 g) = 0.278 W/kg

Maximum value of SAR (measured) = 0.662 W/kg



0 dB = 0.662 W/kg = -1.79 dBW/kg

36_CDMA2000 BC0_RC3 SO32_Front_10mm_Ch1013

Communication System: UID 0, CDMA2000 (0); Frequency: 824.7 MHz; Duty Cycle: 1:1
Medium: MSL_835 Medium parameters used: $f = 825$ MHz; $\sigma = 0.969$ S/m; $\epsilon_r = 54.178$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.25, 9.25, 9.25); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1013/Area Scan (71x121x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm

Maximum value of SAR (interpolated) = 0.694 W/kg

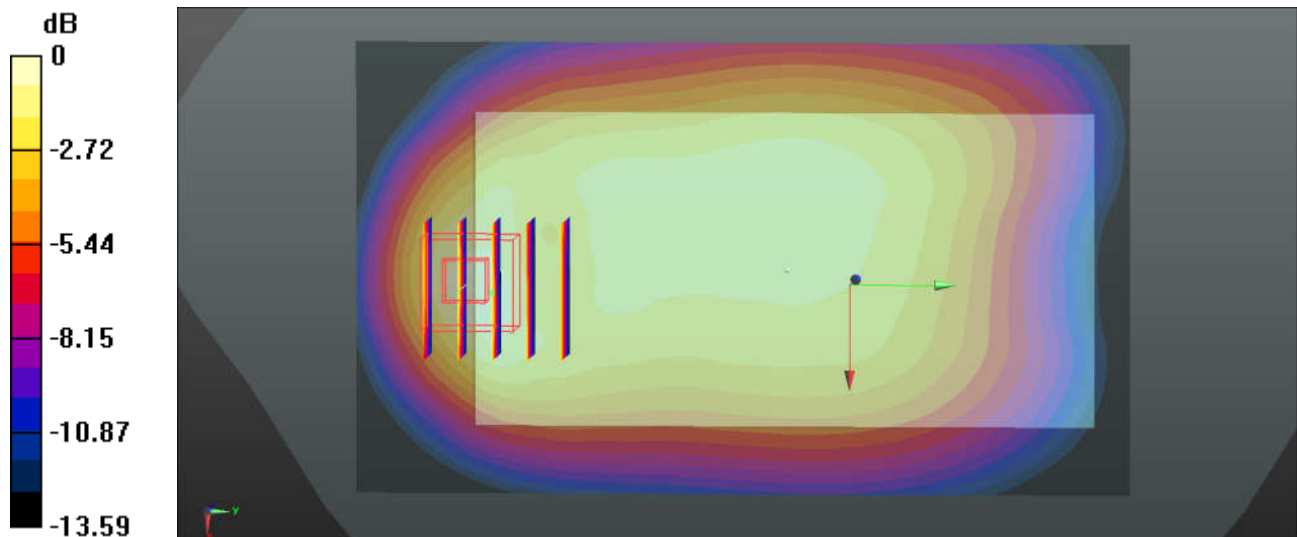
Ch1013/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 23.79 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.964 W/kg

SAR(1 g) = 0.544 W/kg; SAR(10 g) = 0.307 W/kg

Maximum value of SAR (measured) = 0.735 W/kg



0 dB = 0.735 W/kg = -1.34 dBW/kg

37_CDMA2000 BC1_RC3 SO32_Front_10mm_Ch600

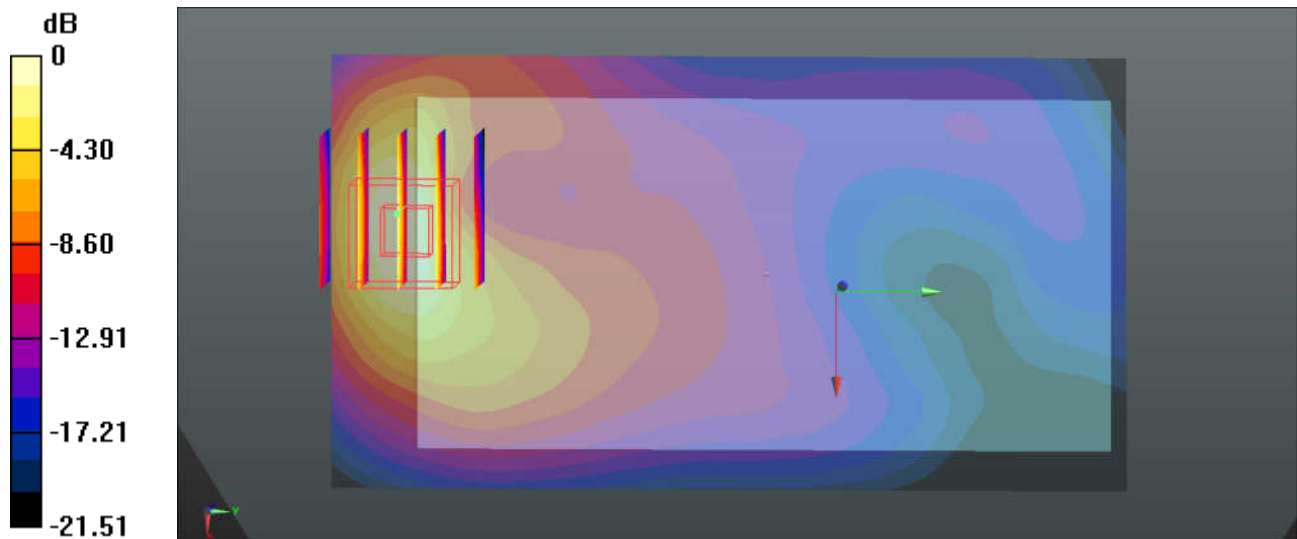
Communication System: UID 0, CDMA2000 (0); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: MSL_1900 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.522$ S/m; $\epsilon_r = 53.281$; $\rho = 1000$ kg/m³
Ambient Temperature : 23.4 °C ; Liquid Temperature : 22.7 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch600/Area Scan (61x111x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm
Maximum value of SAR (interpolated) = 0.921 W/kg

Ch600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm
Reference Value = 5.675 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.678 W/kg; SAR(10 g) = 0.343 W/kg
Maximum value of SAR (measured) = 0.910 W/kg



0 dB = 0.910 W/kg = -0.41 dBW/kg

38_LTE Band 13_10M_QPSK_1RB_25Offset_Front_10mm_Ch23230

Communication System: UID 0, FDD_LTE (0); Frequency: 782 MHz; Duty Cycle: 1:1

Medium: MSL_750 Medium parameters used: $f = 782$ MHz; $\sigma = 1.002$ S/m; $\epsilon_r = 54.462$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.45, 9.45, 9.45); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch23230/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.479 W/kg

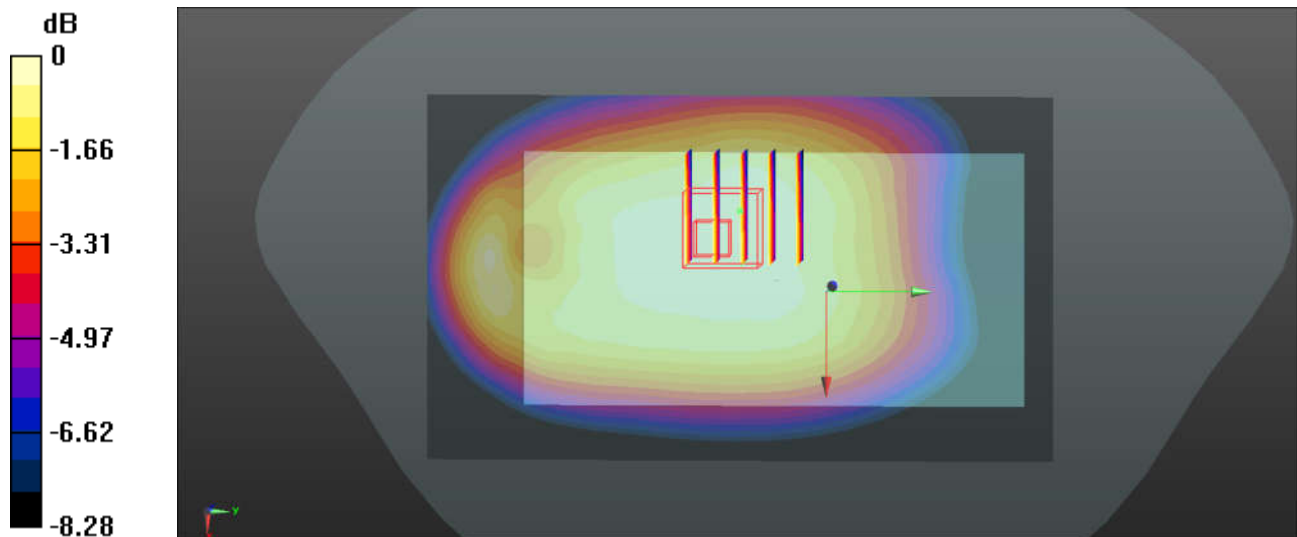
Ch23230/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.35 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 0.520 W/kg

SAR(1 g) = 0.416 W/kg; SAR(10 g) = 0.326 W/kg

Maximum value of SAR (measured) = 0.478 W/kg



0 dB = 0.478 W/kg = -3.21 dBW/kg

39_LTE Band 26_15M_QPSK_1RB_37Offset_Front_10mm_Ch26865

Communication System: UID 0, FDD_LTE (0); Frequency: 831.5 MHz; Duty Cycle: 1:1

Medium: MSL_835 Medium parameters used: $f = 831.5$ MHz; $\sigma = 0.976$ S/m; $\epsilon_r = 54.116$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(9.25, 9.25, 9.25); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch26865/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.515 W/kg

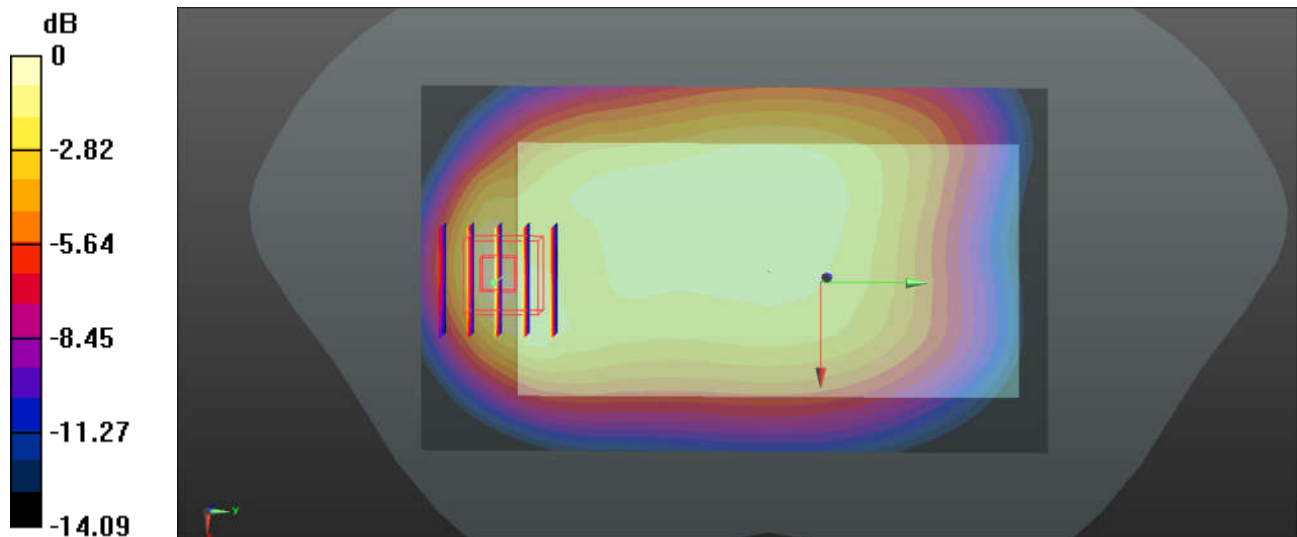
Ch26865/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.34 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.754 W/kg

SAR(1 g) = 0.430 W/kg; SAR(10 g) = 0.245 W/kg

Maximum value of SAR (measured) = 0.588 W/kg



0 dB = 0.588 W/kg = -2.31 dBW/kg

40_LTE Band 66_20M_QPSK_1RB_49Offset_Front_10mm_Ch132572

Communication System: UID 0, FDD_LTE (0); Frequency: 1770 MHz; Duty Cycle: 1:1

Medium: MSL_1750 Medium parameters used: $f = 1770$ MHz; $\sigma = 1.502$ S/m; $\epsilon_r = 54.039$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.4 °C ; Liquid Temperature : 22.7 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.81, 7.81, 7.81); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch132572/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.10 W/kg

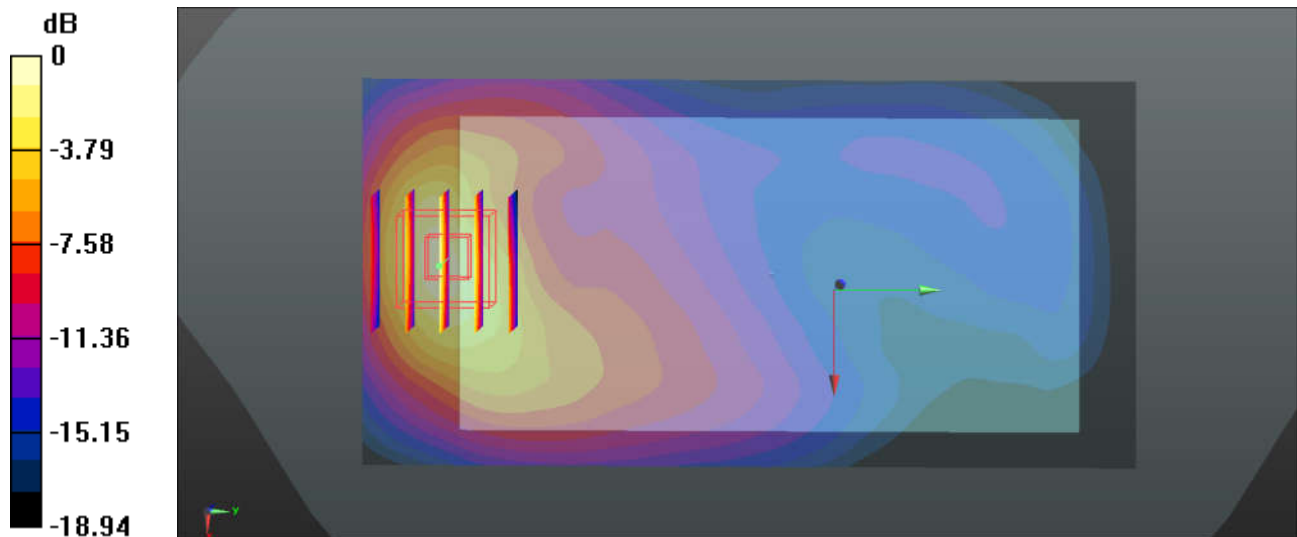
Ch132572/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.013 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 1.54 W/kg

SAR(1 g) = 0.899 W/kg; SAR(10 g) = 0.477 W/kg

Maximum value of SAR (measured) = 1.22 W/kg



0 dB = 1.22 W/kg = 0.86 dBW/kg

41_LTE Band 25_20M_QPSK_100RB_0Offset_Front_10mm_Ch26340

Communication System: UID 0, FDD_LTE (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: MSL_1900 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.522$ S/m; $\epsilon_r = 53.281$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.4 °C ; Liquid Temperature : 22.7 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch26340/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.813 W/kg

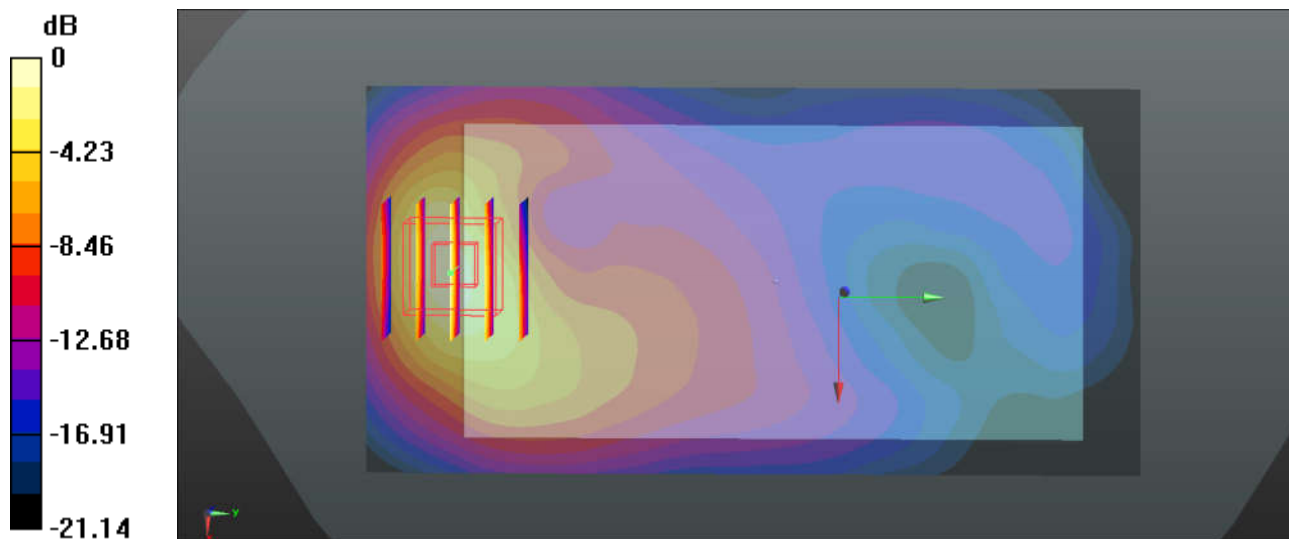
Ch26340/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.646 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 1.11 W/kg

SAR(1 g) = 0.637 W/kg; SAR(10 g) = 0.329 W/kg

Maximum value of SAR (measured) = 0.886 W/kg



0 dB = 0.886 W/kg = -0.53 dBW/kg

42_LTE Band 7_20M_QPSK_1RB_49Offset_Front_10mm_Ch21350

Communication System: UID 0, FDD_LTE (0); Frequency: 2560 MHz; Duty Cycle: 1:1

Medium: MSL_2600 Medium parameters used: $f = 2560$ MHz; $\sigma = 2.204$ S/m; $\epsilon_r = 53.334$; $\rho = 1000$

kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.13, 7.13, 7.13); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch21350/Area Scan (81x151x1): Interpolated grid: $dx=1.200$ mm, $dy=1.200$ mm

Maximum value of SAR (interpolated) = 1.05 W/kg

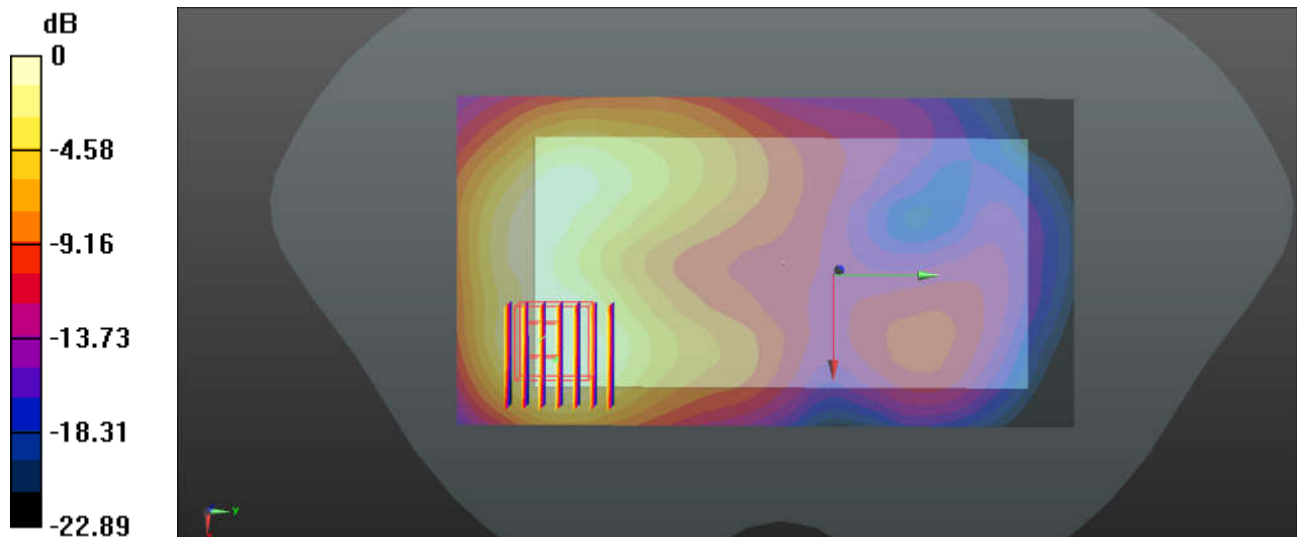
Ch21350/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 5.497 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 1.25 W/kg

SAR(1 g) = 0.634 W/kg; SAR(10 g) = 0.343 W/kg

Maximum value of SAR (measured) = 0.922 W/kg



0 dB = 0.922 W/kg = -0.35 dBW/kg



Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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

Client **Auden**

Certificate No: **D750V3-1078_Jun16**

CALIBRATION CERTIFICATE

Object **D750V3 - SN:1078**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **June 22, 2016**

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	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	15-Jun-16 (No. EX3-7349_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

Calibrated by: **Leif Klysner** Name: **Leif Klysner** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager**

Signature

Issued: June 27, 2016

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- 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.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 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	41.3 $\pm$ 6 %	0.90 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.18 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.39 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.6 $\pm$ 6 %	0.98 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.63 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.67 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	54.5 Ω - 0.7 j Ω
Return Loss	- 27.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.9 Ω - 2.9 j Ω
Return Loss	- 30.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 ns
----------------------------------	----------

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 15, 2012

DASY5 Validation Report for Head TSL

Date: 22.06.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1078

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

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.9 \text{ S/m}$; $\epsilon_r = 41.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.17, 10.17, 10.17); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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

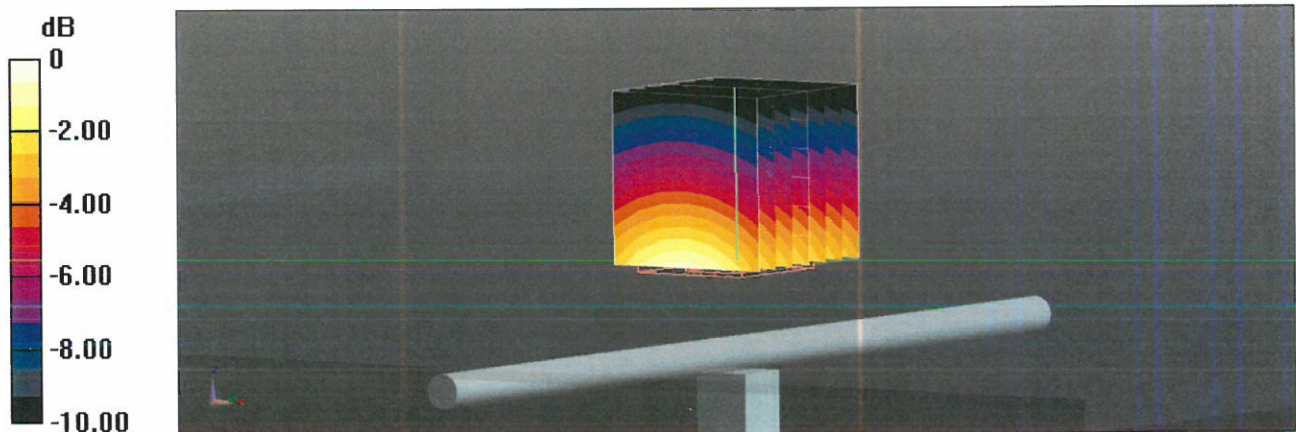
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 57.85 V/m ; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.07 W/kg

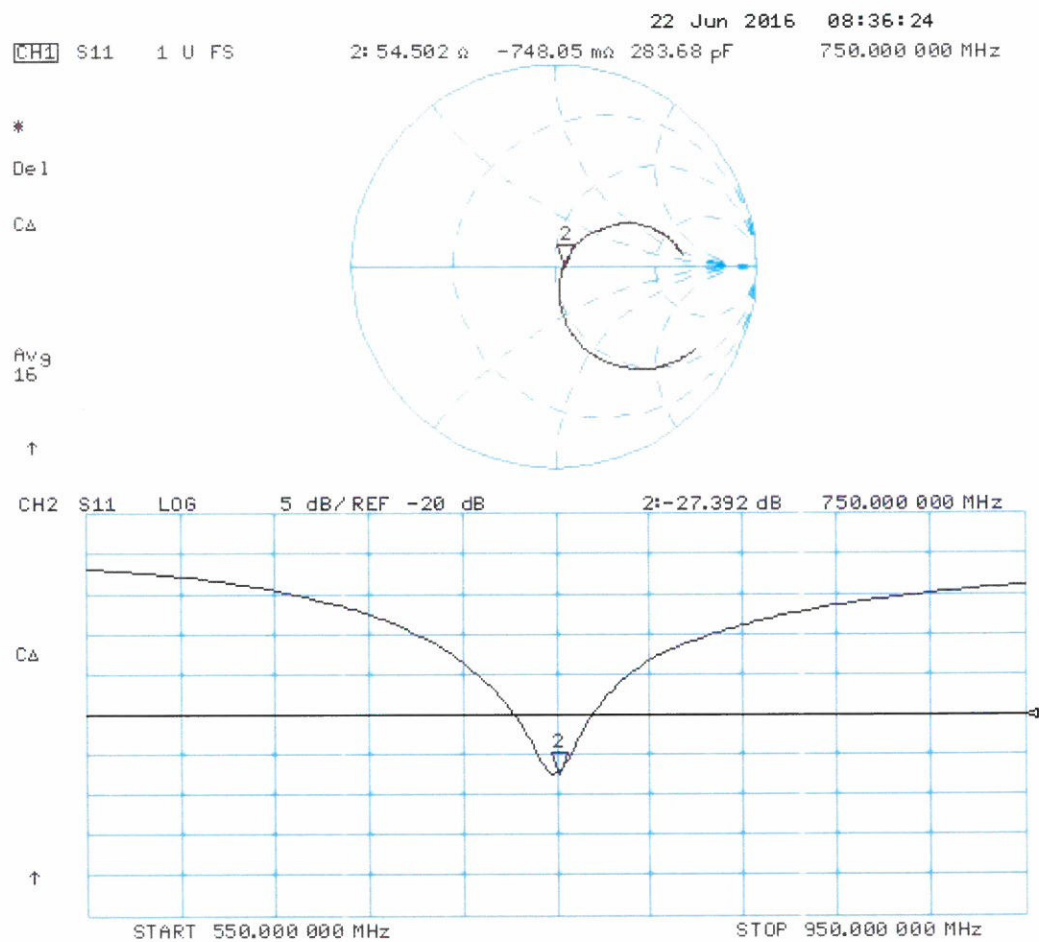
SAR(1 g) = 2.07 W/kg ; SAR(10 g) = 1.36 W/kg

Maximum value of SAR (measured) = 2.73 W/kg



0 dB = 2.73 W/kg = 4.36 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 22.06.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1078

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

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.98 \text{ S/m}$; $\epsilon_r = 54.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.99, 9.99, 9.99); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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

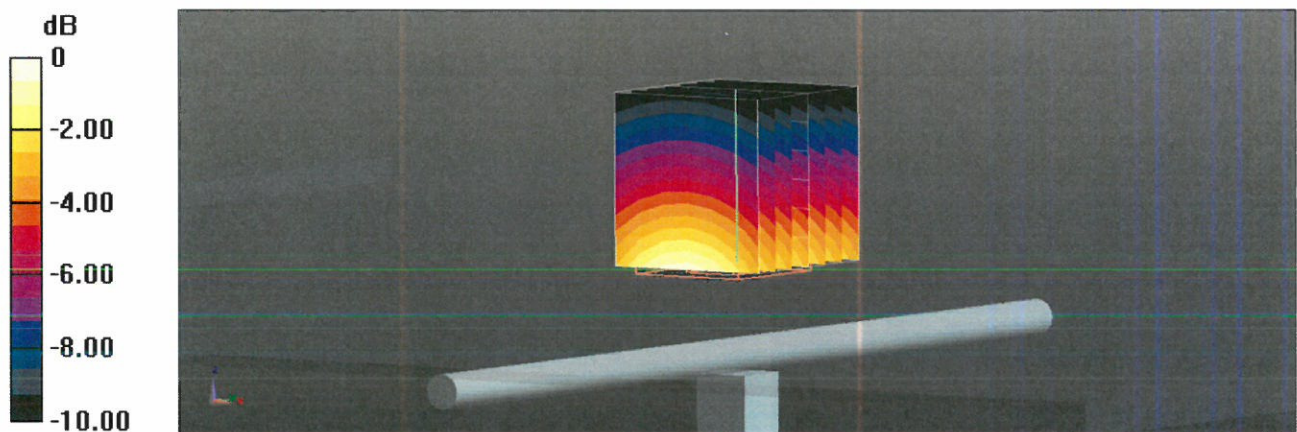
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 56.86 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.26 W/kg

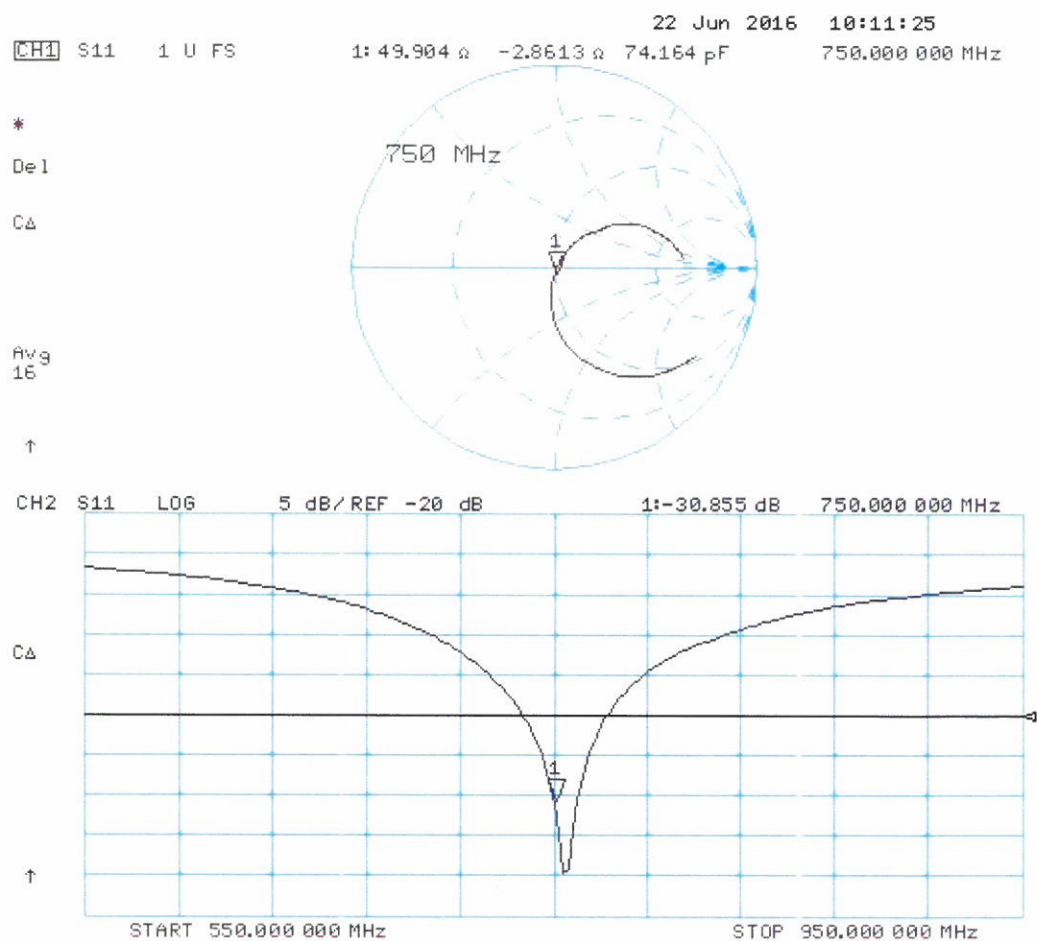
SAR(1 g) = 2.2 W/kg; SAR(10 g) = 1.44 W/kg

Maximum value of SAR (measured) = 2.91 W/kg



0 dB = 2.91 W/kg = 4.64 dBW/kg

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 0108**

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 Multilateral Agreement for the recognition of calibration certificates

Client **Sporton-CN (Auden)**

Certificate No: **D835V2-4d151_Mar16**

CALIBRATION CERTIFICATE

Object **D835V2 - SN:4d151**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **March 16, 2016**

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 EPM-442A	GB37480704	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	US37292783	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	MY41092317	07-Oct-15 (No. 217-02223)	Oct-16
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 7349	31-Dec-15 (No. EX3-7349_Dec15)	Dec-16
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100972	15-Jun-15 (in house check Jun-15)	In house check: Jun-18
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

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

Issued: March 16, 2016

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- 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.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.7 $\pm$ 6 %	0.93 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	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.26 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	1.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.05 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.5 $\pm$ 6 %	1.01 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.52 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.28 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	52.2 Ω - 3.3 j Ω
Return Loss	- 28.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.9 Ω - 4.5 j Ω
Return Loss	- 25.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.390 ns
----------------------------------	----------

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 27, 2012

DASY5 Validation Report for Head TSL

Date: 16.03.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d151

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.93 \text{ S/m}$; $\epsilon_r = 41.7$; $\rho = 1000 \text{ kg/m}^3$

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.83, 9.83, 9.83); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom Type: QD000P49AA
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Head Tissue EX-Probe/Pin=250 mW, d=15mm/Zoom Scan

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

Reference Value = 61.40 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.57 W/kg

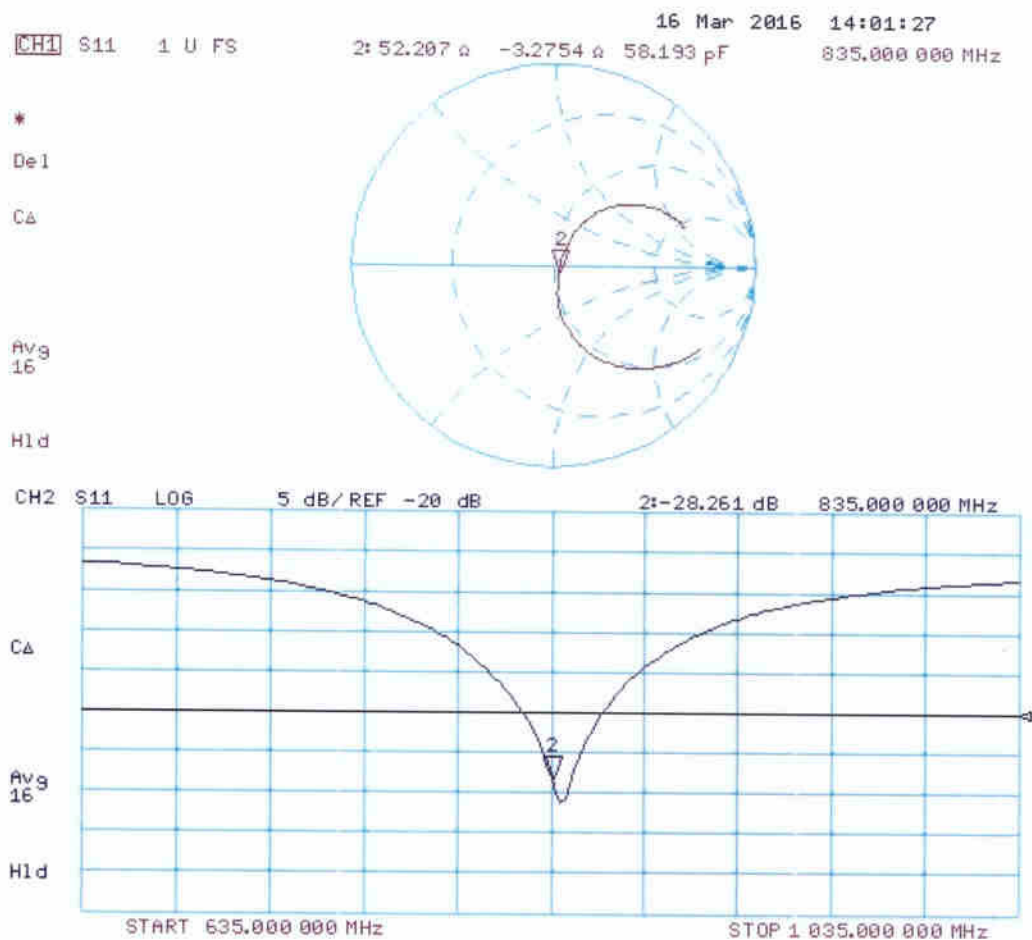
SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg

Maximum value of SAR (measured) = 3.18 W/kg



0 dB = 3.18 W/kg = 5.02 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.03.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d151

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 54.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.73, 9.73, 9.73); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Body Tissue EX-Probe/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 60.04 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.65 W/kg

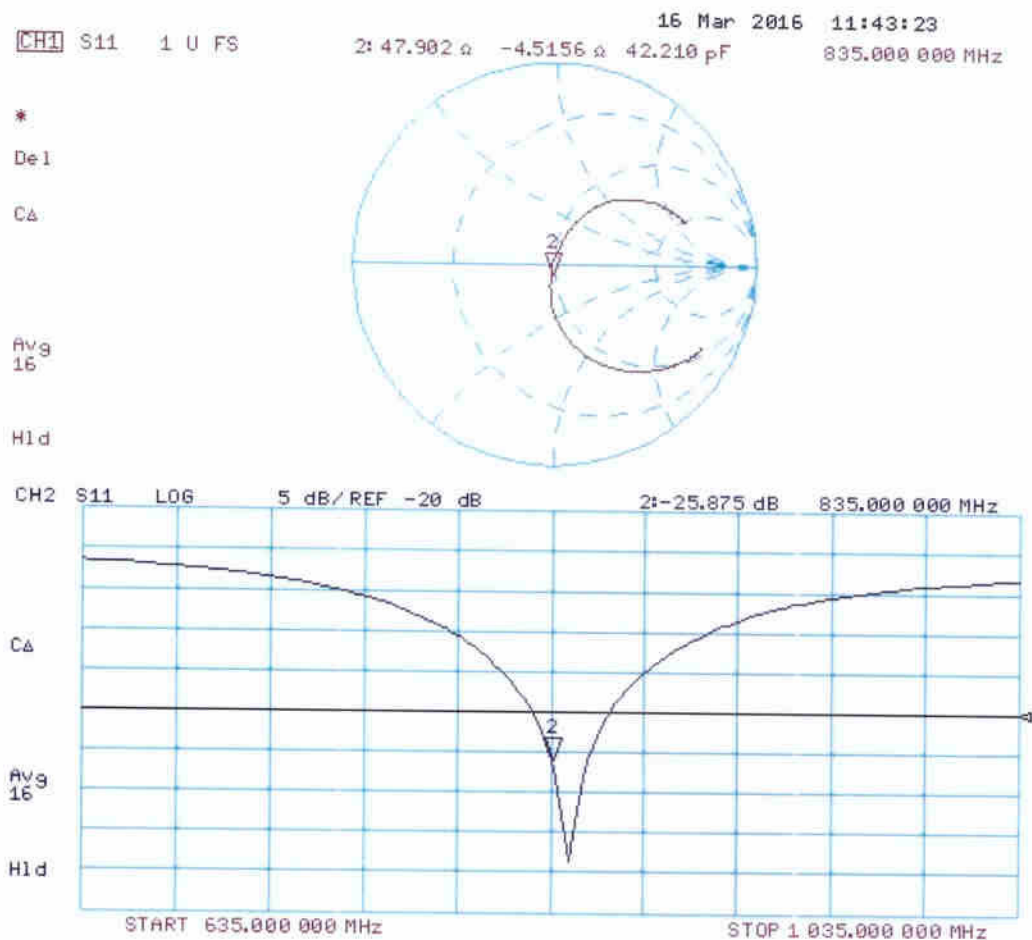
SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.61 W/kg

Maximum value of SAR (measured) = 3.26 W/kg



0 dB = 3.26 W/kg = 5.13 dBW/kg

Impedance Measurement Plot for Body TSL





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Client

Sporton_CN

Certificate No: **Z16-97070**

CALIBRATION CERTIFICATE

Object

D1750V2 - SN: 1137

Calibration Procedure(s)

FD-Z11-2-003-01

Calibration Procedures for dipole validation kits

Calibration date:

May 18, 2016

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	101919	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Power sensor NRP-Z91	101547	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Reference Probe EX3DV4	SN 7307	19-Feb-16(SPEAG,No.EX3-7307_Feb16)	Feb-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: May 20, 2016

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



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Glossary:

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

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- c) 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
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- e) DASY4/5 System Handbook

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