

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.868 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-05-2009; Ambient Temp: 24.1°C; Tissue Temp: 22.4 °C

Probe: ES3DV2 - SN3022; ConvF(6.04, 6.04, 6.04); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GSM 850, Right Head, Touch, Mid.ch

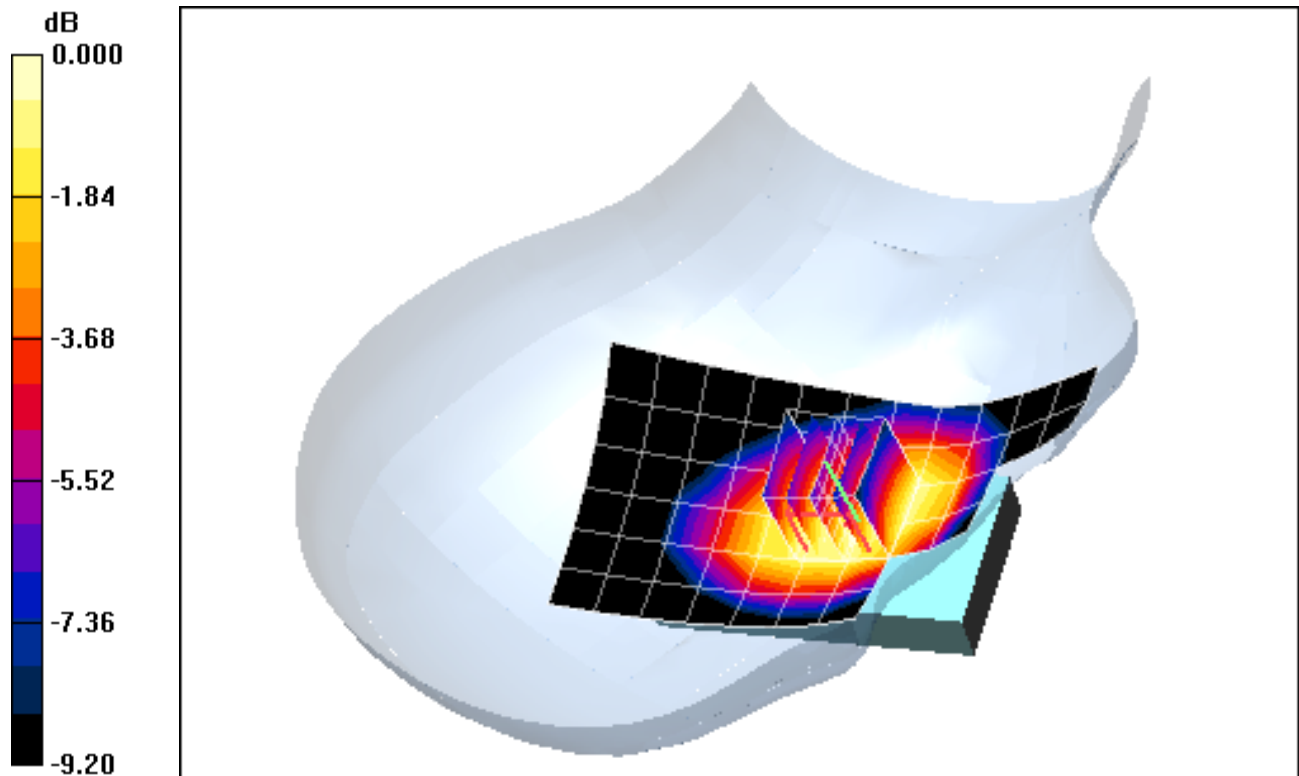
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 11.0 V/m

Peak SAR (extrapolated) = 0.628 W/kg

SAR(1 g) = 0.498 mW/g; SAR(10 g) = 0.383 mW/g



0 dB = 0.546mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.868 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-05-2009; Ambient Temp: 24.1°C; Tissue Temp: 22.4 °C

Probe: ES3DV2 - SN3022; ConvF(6.04, 6.04, 6.04); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GSM 850, Right Head, Tilt, Mid.ch

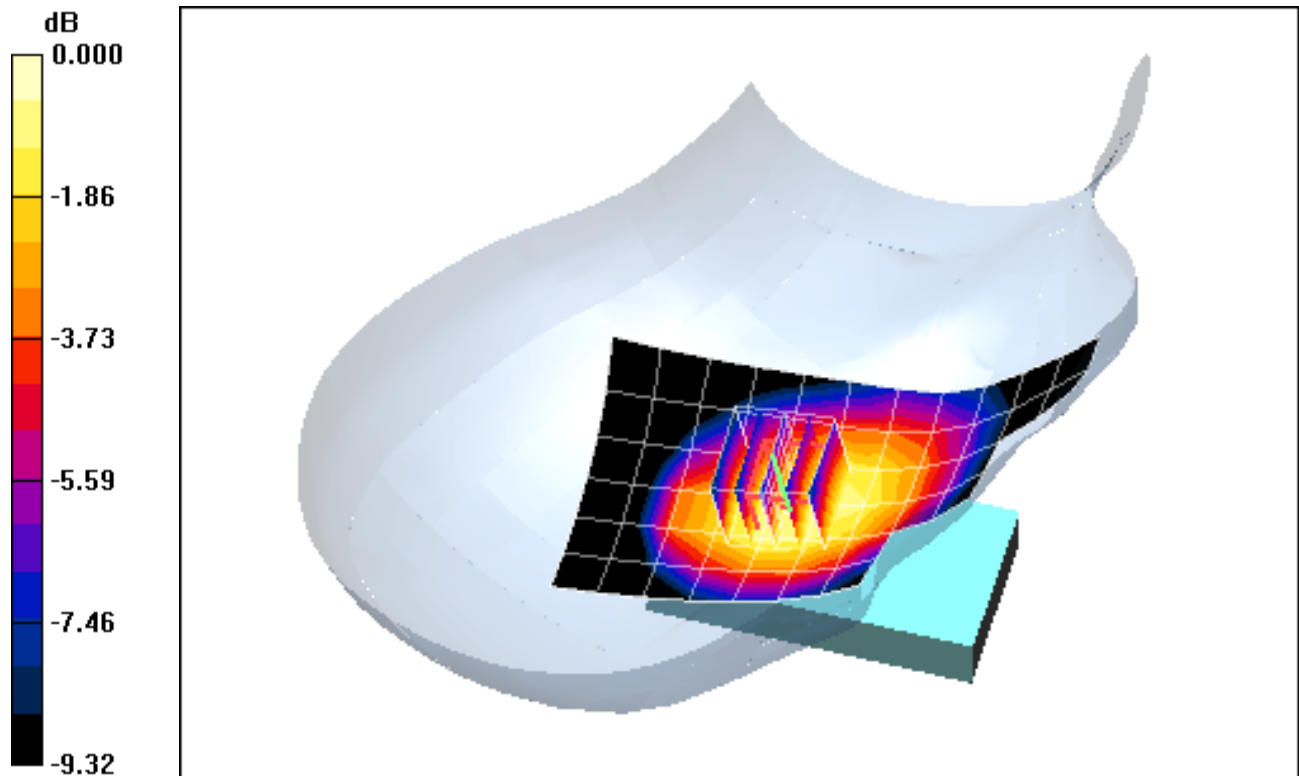
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 14.2 V/m

Peak SAR (extrapolated) = 0.437 W/kg

SAR(1 g) = 0.341 mW/g; SAR(10 g) = 0.254 mW/g



0 dB = 0.379mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.868 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-05-2009; Ambient Temp: 24.1°C; Tissue Temp: 22.4 °C

Probe: ES3DV2 - SN3022; ConvF(6.04, 6.04, 6.04); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GSM 850, Left Head, Touch, Mid.ch

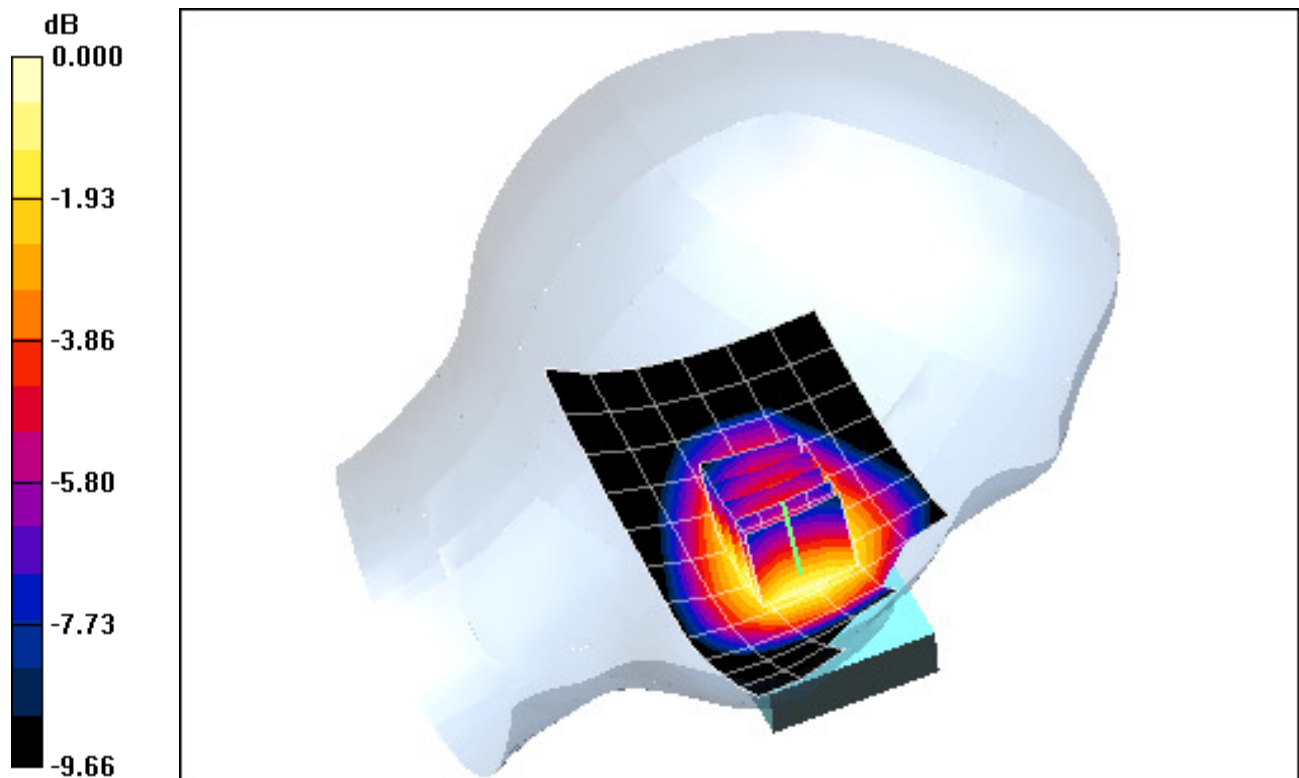
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 11.3 V/m

Peak SAR (extrapolated) = 0.579 W/kg

SAR(1 g) = 0.463 mW/g; SAR(10 g) = 0.355 mW/g



0 dB = 0.504mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.868 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-05-2009; Ambient Temp: 24.1°C; Tissue Temp: 22.4 °C

Probe: ES3DV2 - SN3022; ConvF(6.04, 6.04, 6.04); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GSM 850, Left Head, Tilt, Mid.ch

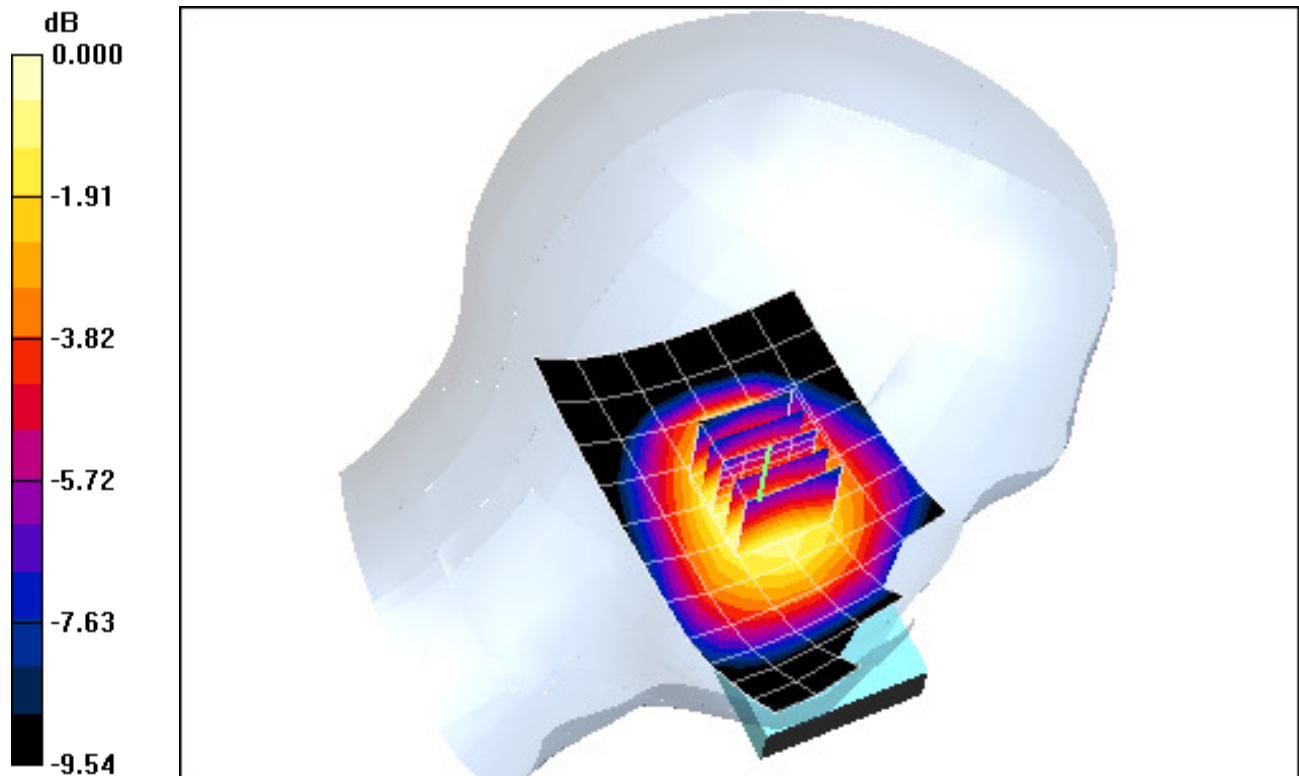
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 14.5 V/m

Peak SAR (extrapolated) = 0.390 W/kg

SAR(1 g) = 0.304 mW/g; SAR(10 g) = 0.227 mW/g



0 dB = 0.339mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM850 GPRS; 2 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium: 835 Muscle Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.98 \text{ mho/m}$; $\epsilon_r = 53.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-05-2009; Ambient Temp: 24.2°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(5.85, 5.85, 5.85); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GPRS 850, Body SAR, Back side, Mid.ch, 2 Tx Slots

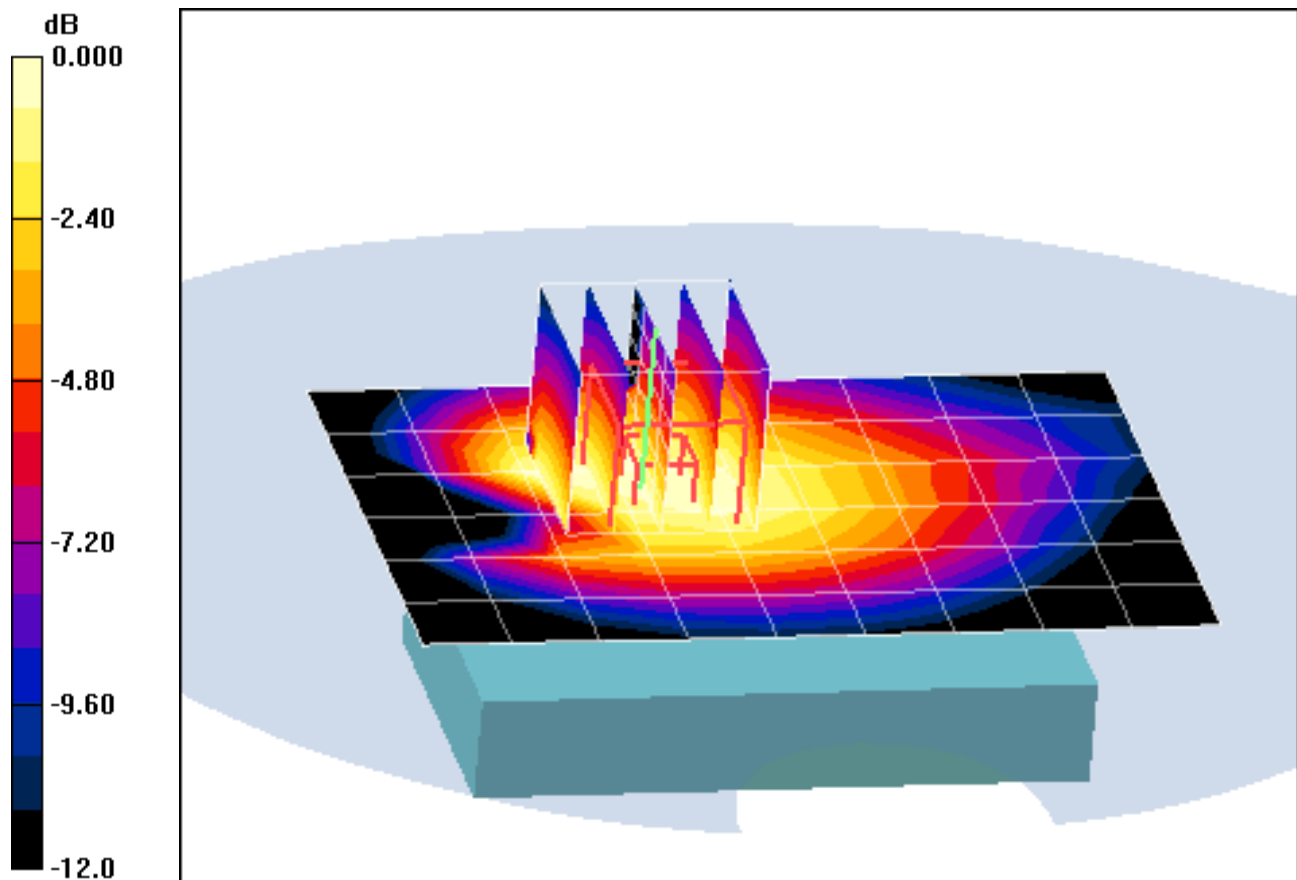
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 30.2 V/m

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.734 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.39 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-06-2009; Ambient Temp: 23.7°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.86, 4.86, 4.86); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GSM 1900, Right Head, Touch, Mid.ch

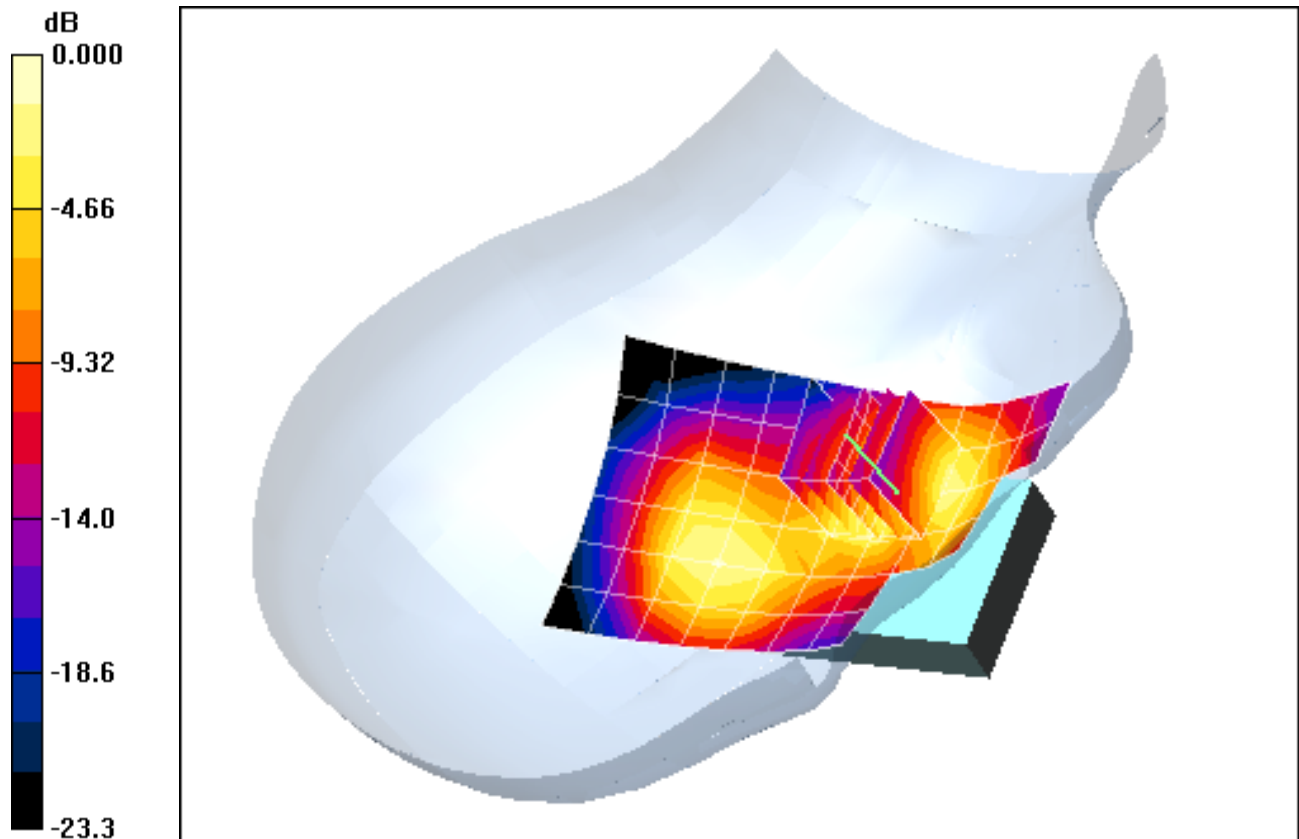
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 14.3 V/m

Peak SAR (extrapolated) = 0.750 W/kg

SAR(1 g) = 0.477 mW/g; SAR(10 g) = 0.265 mW/g



0 dB = 0.595mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.39 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-06-2009; Ambient Temp: 23.7°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.86, 4.86, 4.86); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GSM 1900, Right Head, Tilt, Mid.ch

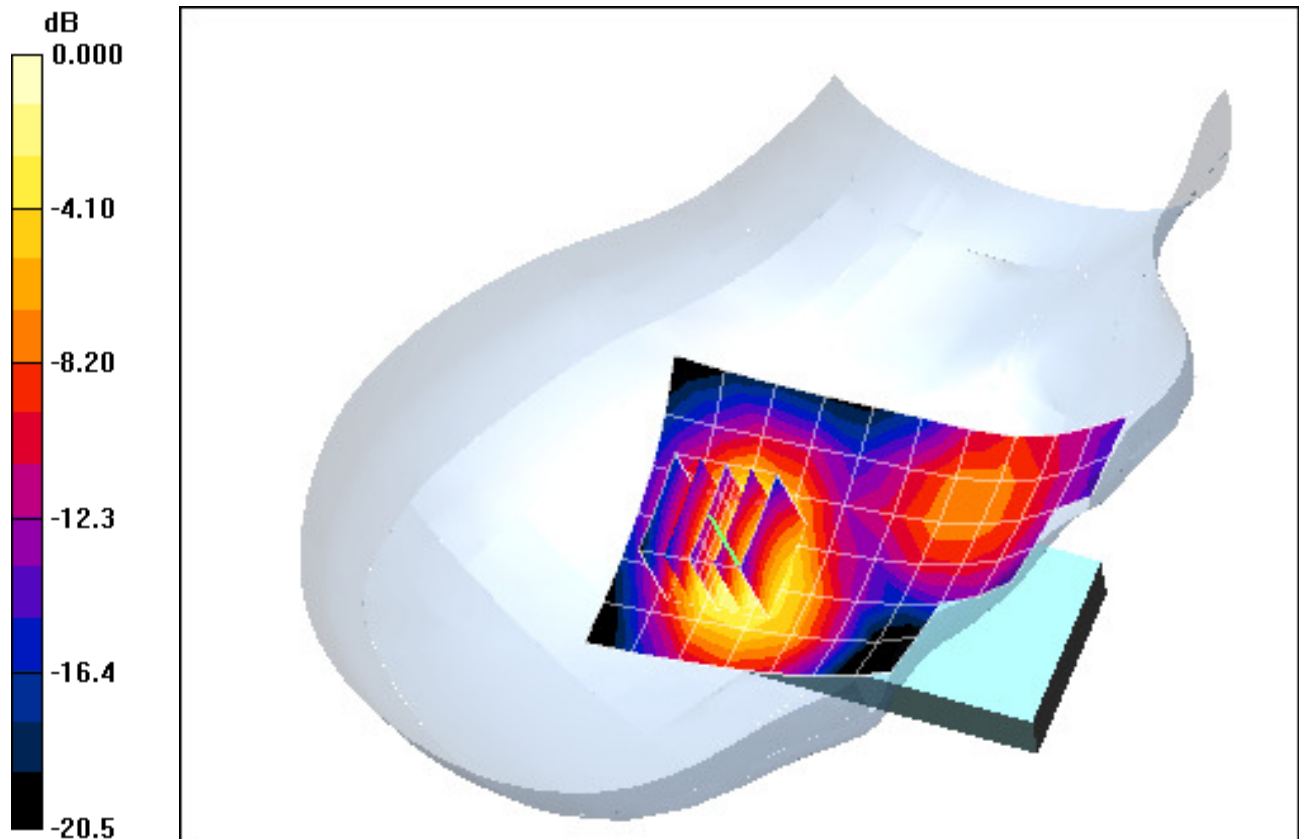
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 16.1 V/m

Peak SAR (extrapolated) = 0.562 W/kg

SAR(1 g) = 0.344 mW/g; SAR(10 g) = 0.194 mW/g



0 dB = 0.406mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.39 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-06-2009; Ambient Temp: 23.7°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.86, 4.86, 4.86); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GSM 1900, Left Head, Touch, Mid.ch

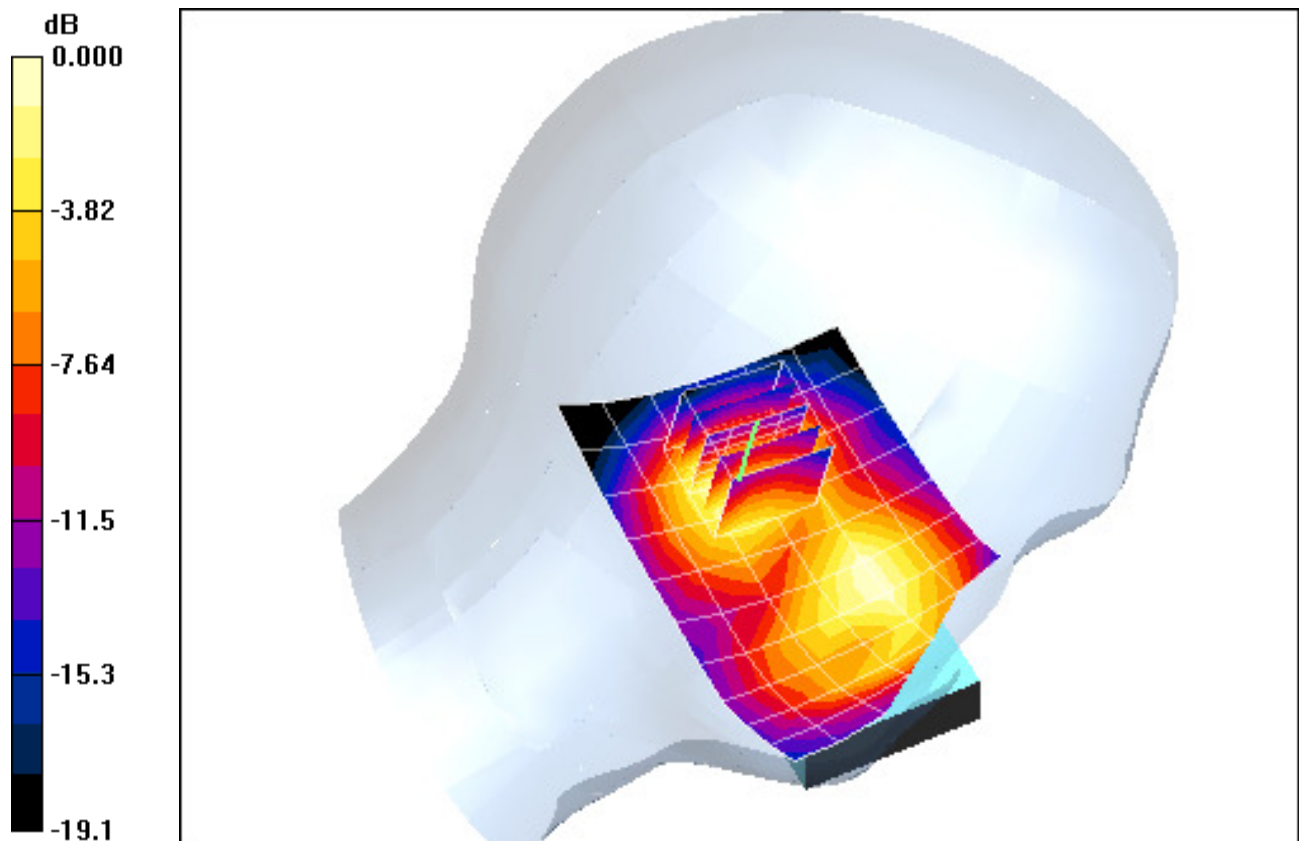
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.9 V/m

Peak SAR (extrapolated) = 0.605 W/kg

SAR(1 g) = 0.373 mW/g; SAR(10 g) = 0.218 mW/g



0 dB = 0.444mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.39 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-06-2009; Ambient Temp: 23.7°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.86, 4.86, 4.86); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GSM 1900, Left Head, Tilt, Mid.ch

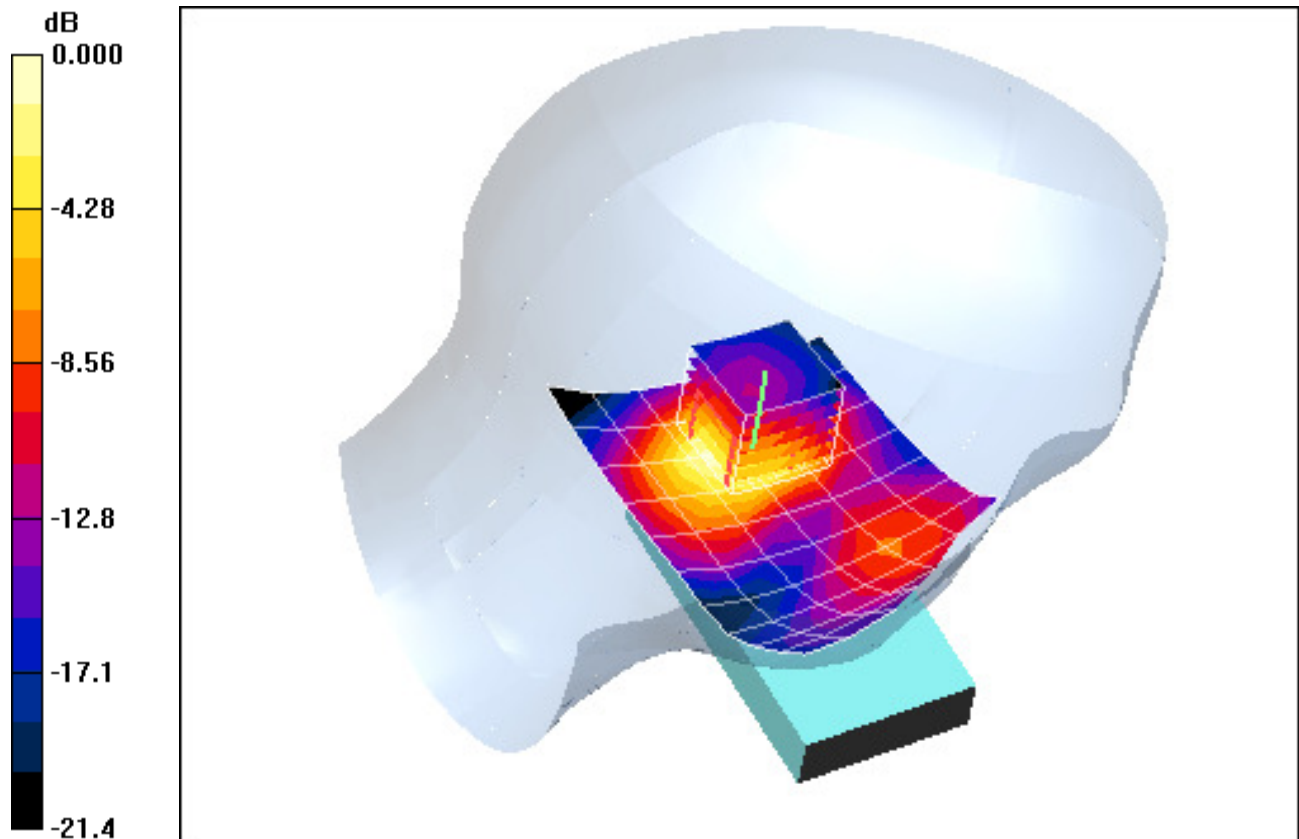
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 16.7 V/m

Peak SAR (extrapolated) = 0.603 W/kg

SAR(1 g) = 0.354 mW/g; SAR(10 g) = 0.194 mW/g



0 dB = 0.427mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15

Medium: 1900 Muscle Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.53 \text{ mho/m}$; $\epsilon_r = 51.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-06-2009; Ambient Temp: 23.6°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.42, 4.42, 4.42); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 2 Tx Slots

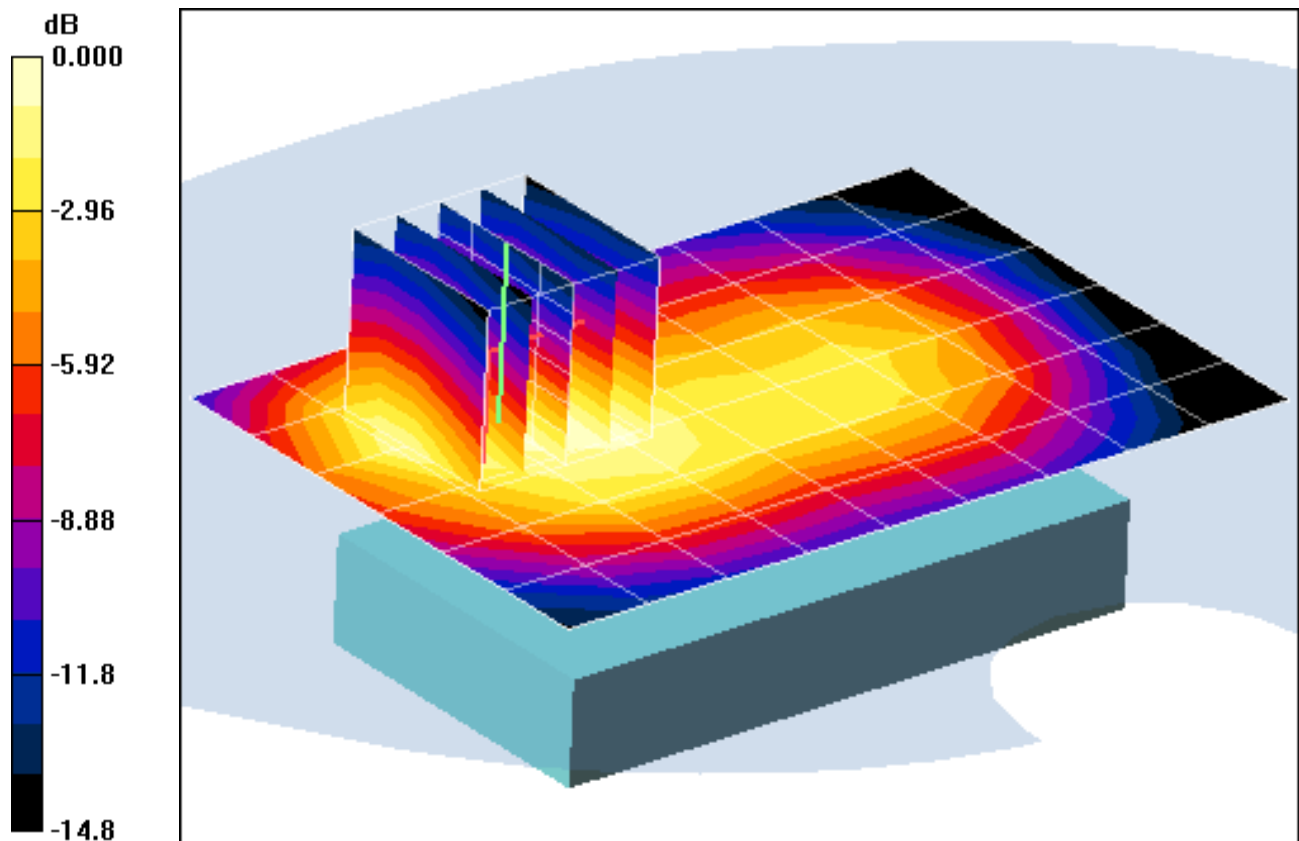
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.2 V/m

Peak SAR (extrapolated) = 0.847 W/kg

SAR(1 g) = 0.546 mW/g; SAR(10 g) = 0.330 mW/g



0 dB = 0.638mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.868 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-05-2009; Ambient Temp: 24.1°C; Tissue Temp: 22.4 °C

Probe: ES3DV2 - SN3022; ConvF(6.04, 6.04, 6.04); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 850, Right Head, Touch, Mid.ch

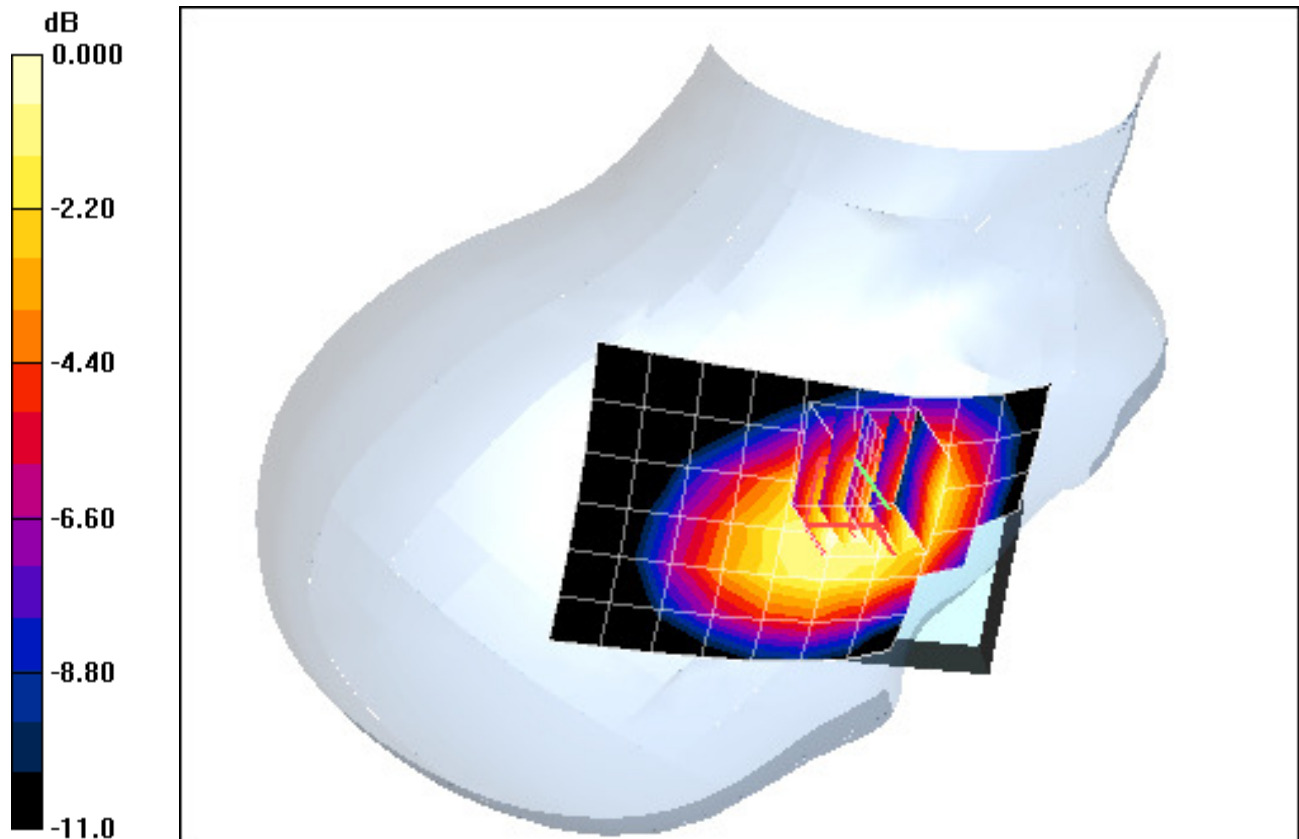
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 8.34 V/m

Peak SAR (extrapolated) = 0.506 W/kg

SAR(1 g) = 0.379 mW/g; SAR(10 g) = 0.279 mW/g



0 dB = 0.420mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.868 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-05-2009; Ambient Temp: 24.1°C; Tissue Temp: 22.4 °C

Probe: ES3DV2 - SN3022; ConvF(6.04, 6.04, 6.04); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 850, Right Head, Tilt, Mid.ch

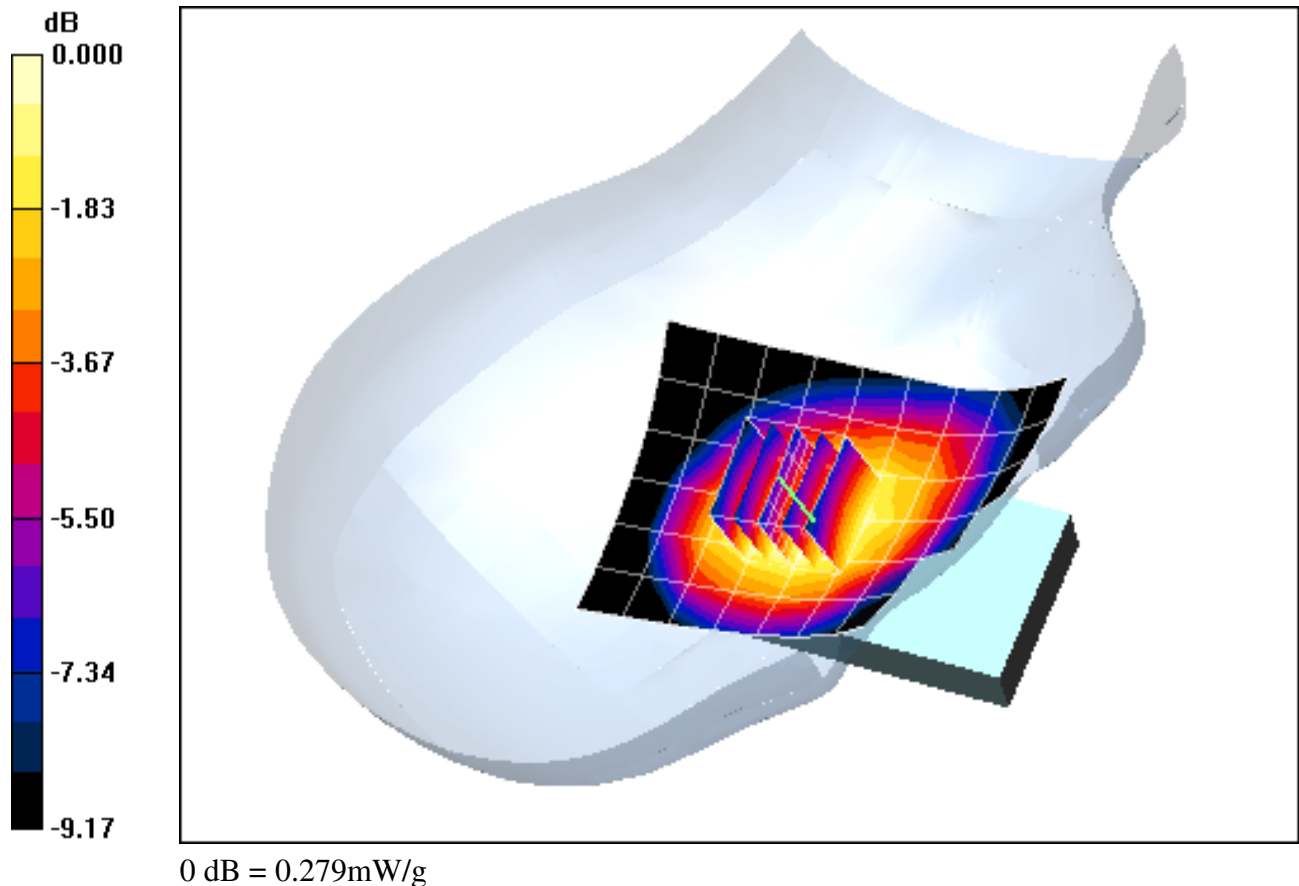
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 12.6 V/m

Peak SAR (extrapolated) = 0.323 W/kg

SAR(1 g) = 0.252 mW/g; SAR(10 g) = 0.186 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.868 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-05-2009; Ambient Temp: 24.1°C; Tissue Temp: 22.4 °C

Probe: ES3DV2 - SN3022; ConvF(6.04, 6.04, 6.04); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 850, Left Head, Touch, Mid.ch

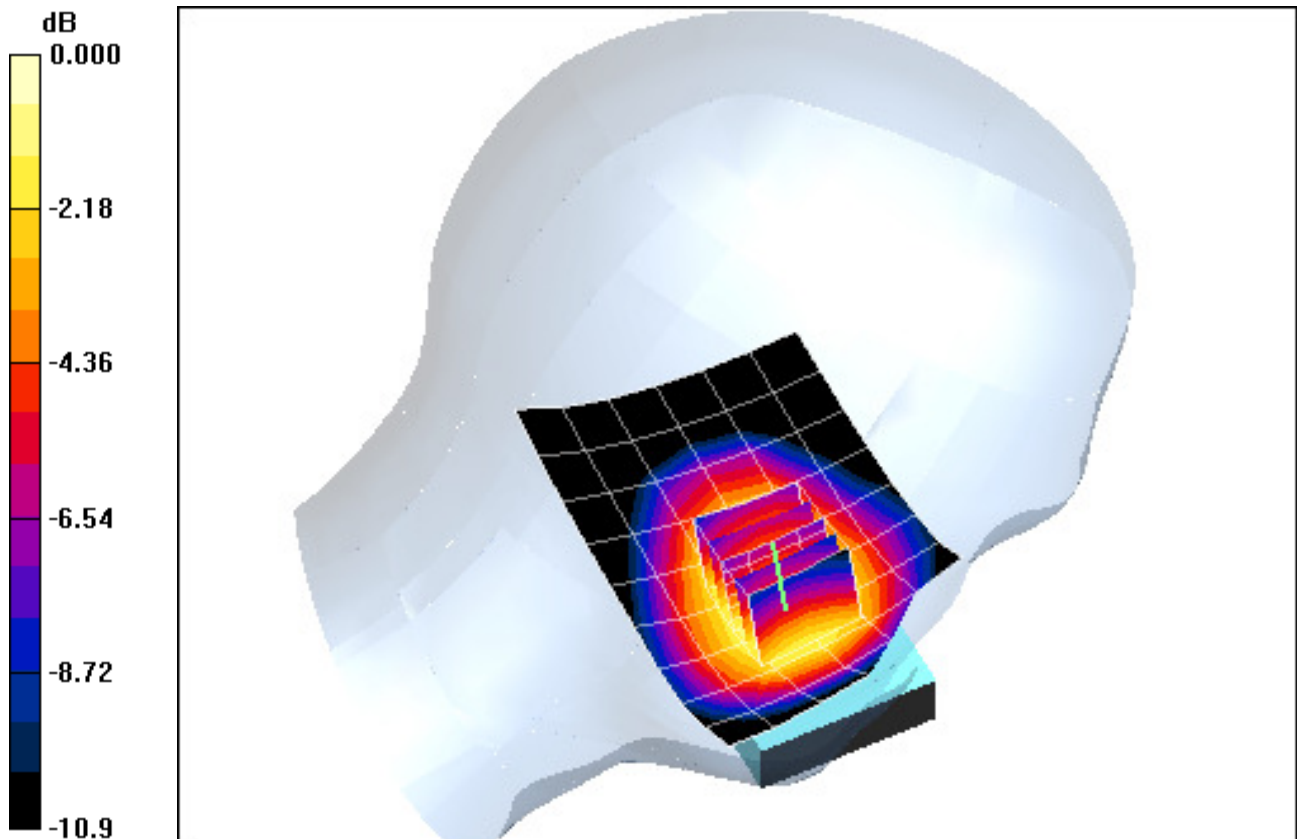
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 7.89 V/m

Peak SAR (extrapolated) = 0.423 W/kg

SAR(1 g) = 0.331 mW/g; SAR(10 g) = 0.245 mW/g



0 dB = 0.368mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.868 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-05-2009; Ambient Temp: 24.1°C; Tissue Temp: 22.4 °C

Probe: ES3DV2 - SN3022; ConvF(6.04, 6.04, 6.04); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 850, Left Head, Tilt, Mid.ch

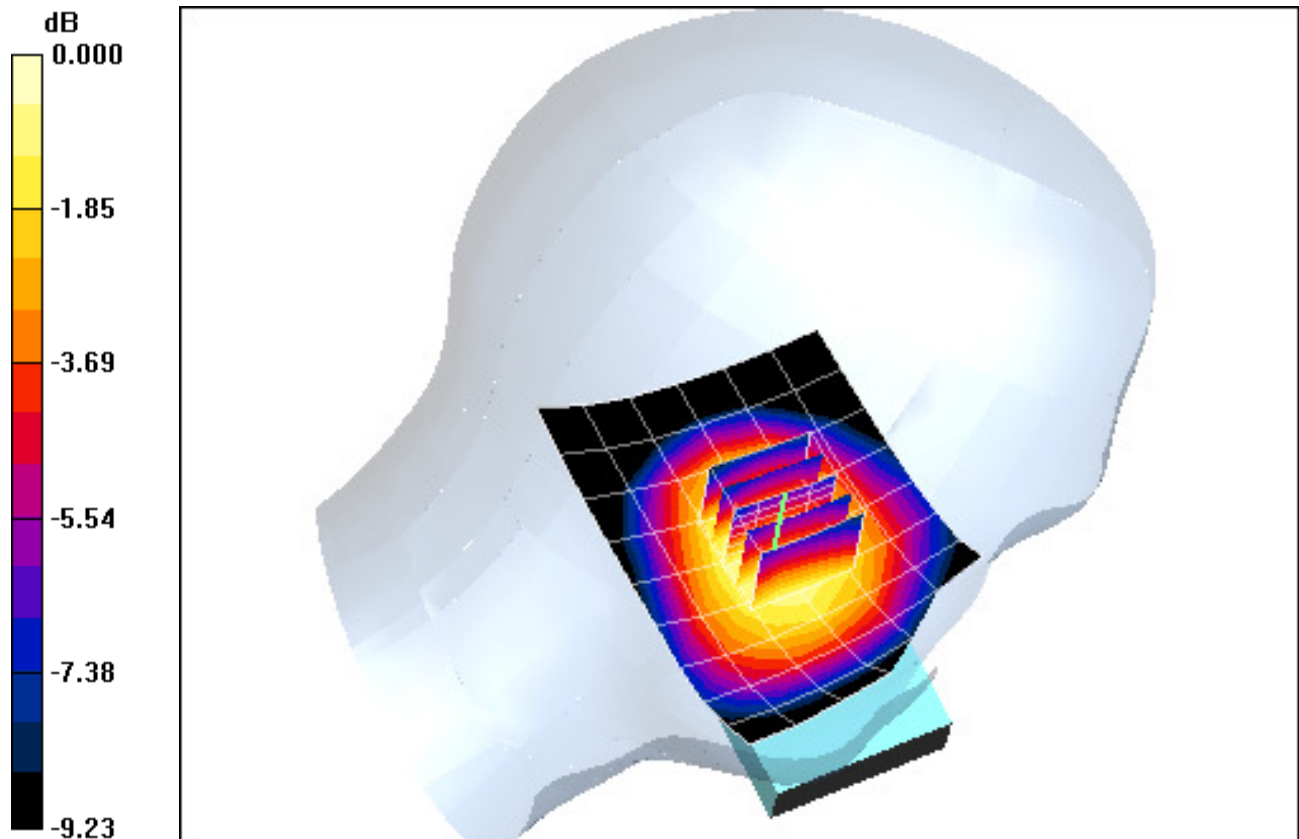
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 11.1 V/m

Peak SAR (extrapolated) = 0.265 W/kg

SAR(1 g) = 0.206 mW/g; SAR(10 g) = 0.153 mW/g



0 dB = 0.230mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Muscle Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.98 \text{ mho/m}$; $\epsilon_r = 53.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-05-2009; Ambient Temp: 24.2°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(5.85, 5.85, 5.85); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 850, Body SAR, Back side, Mid.ch

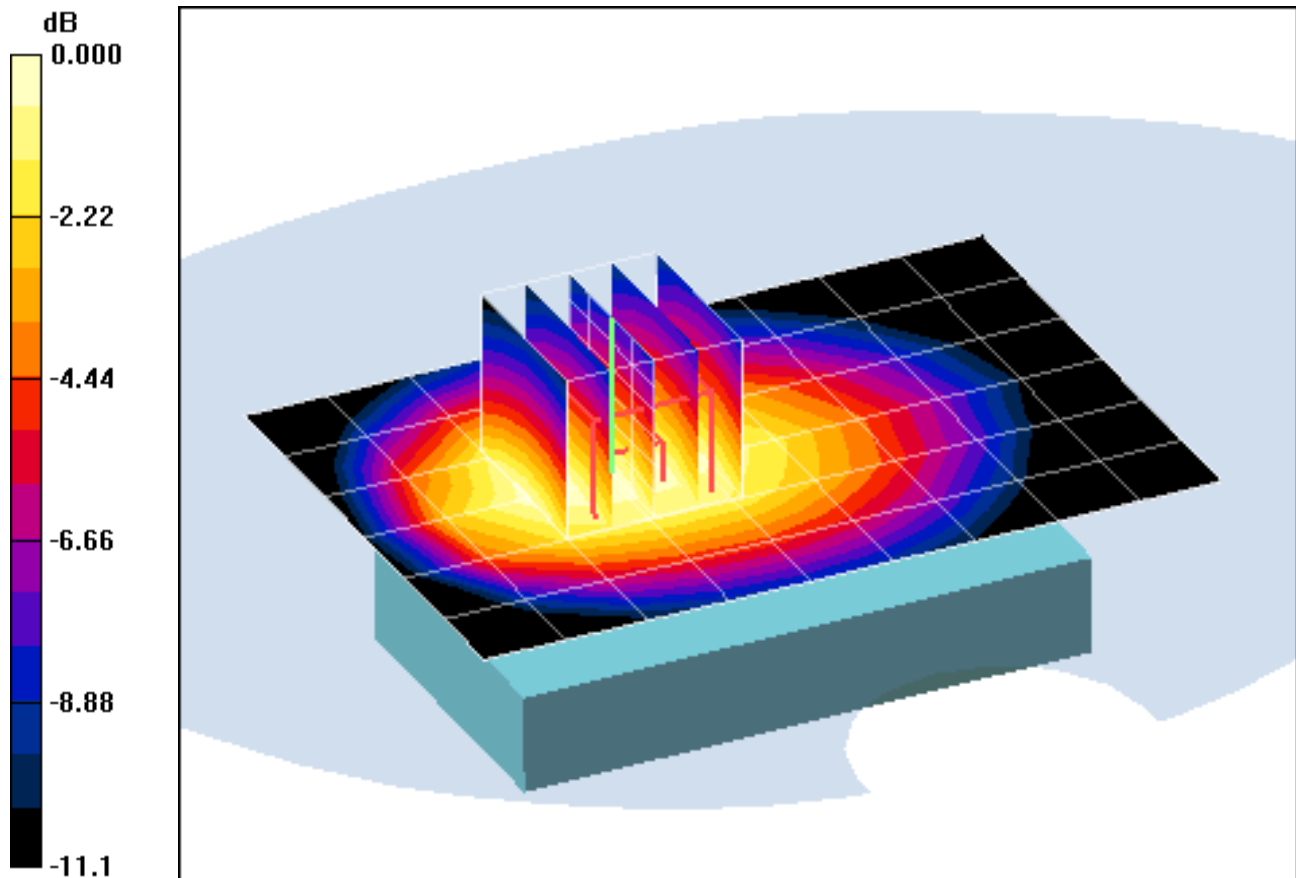
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 18.7 V/m

Peak SAR (extrapolated) = 0.559 W/kg

SAR(1 g) = 0.403 mW/g; SAR(10 g) = 0.282 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA1900; Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium: 1900 Brain Medium parameters used (interpolated):

$f = 1907.6 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 38.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-06-2009; Ambient Temp: 23.7°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.86, 4.86, 4.86); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 1900, Right Head, Touch, High.ch

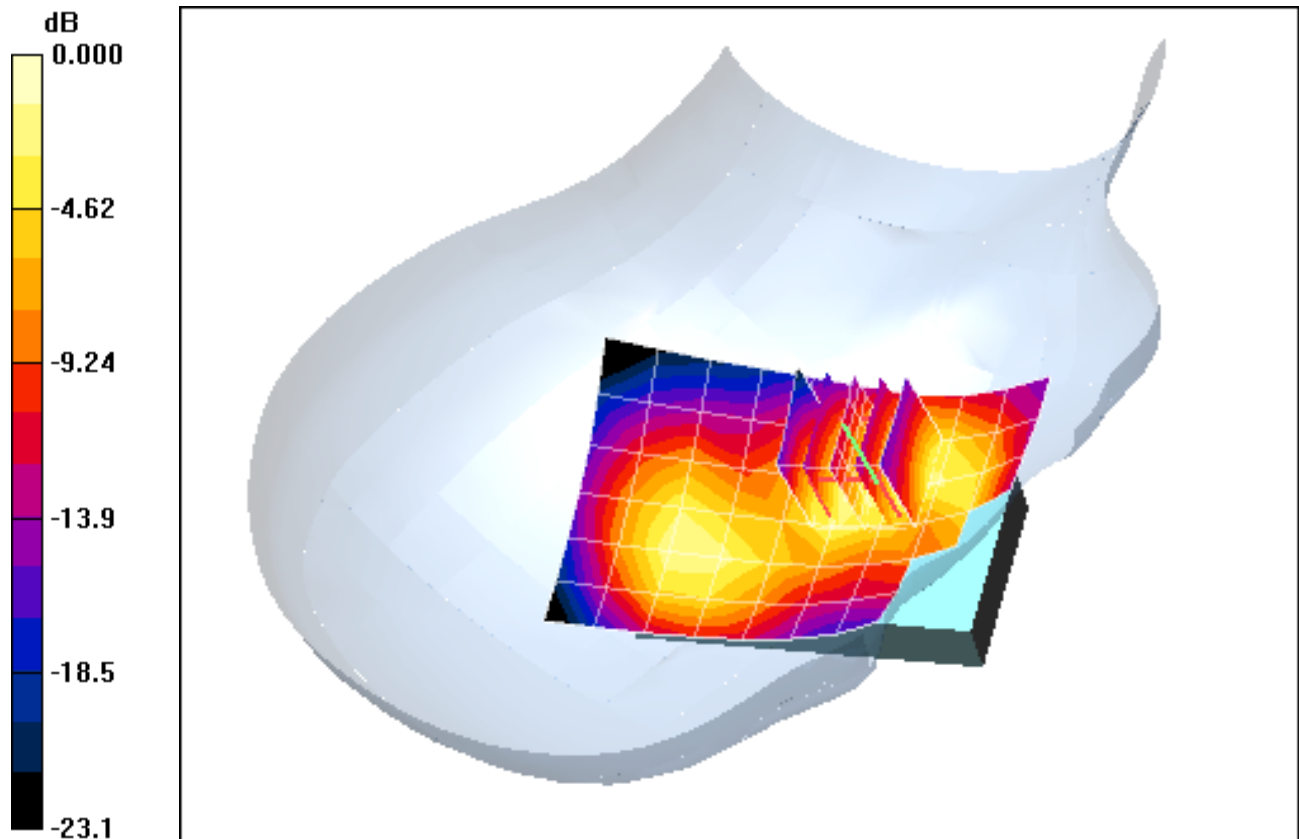
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 19.0 V/m

Peak SAR (extrapolated) = 1.51 W/kg

SAR(1 g) = 0.945 mW/g; SAR(10 g) = 0.519 mW/g



0 dB = 1.18mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.39 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-06-2009; Ambient Temp: 23.7°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.86, 4.86, 4.86); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 1900, Right Head, Tilt, Mid.ch

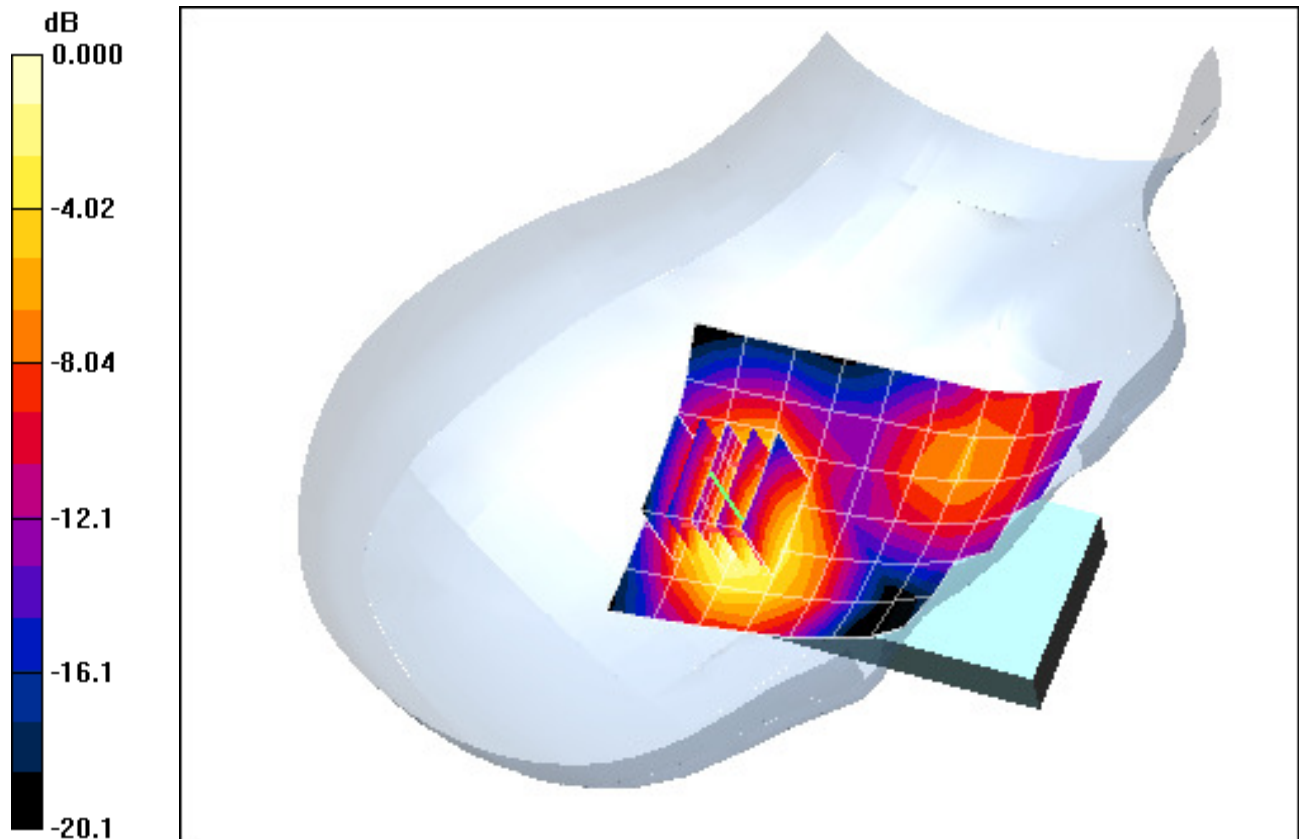
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 21.7 V/m

Peak SAR (extrapolated) = 1.02 W/kg

SAR(1 g) = 0.634 mW/g; SAR(10 g) = 0.361 mW/g



0 dB = 0.747mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.39 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-06-2009; Ambient Temp: 23.7°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.86, 4.86, 4.86); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 1900, Left Head, Touch, Mid.ch

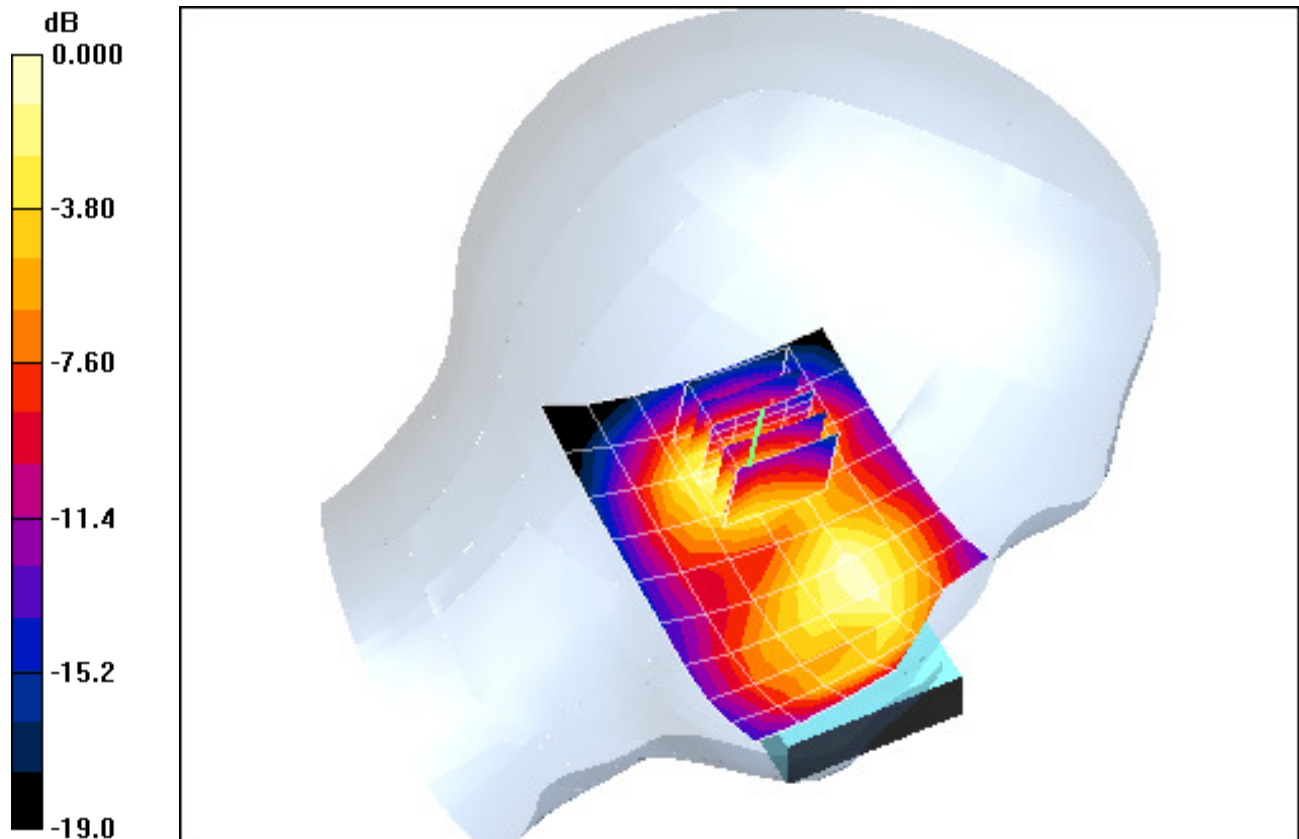
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.4 V/m

Peak SAR (extrapolated) = 1.11 W/kg

SAR(1 g) = 0.692 mW/g; SAR(10 g) = 0.401 mW/g



0 dB = 0.809mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.39 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-06-2009; Ambient Temp: 23.7°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.86, 4.86, 4.86); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 1900, Left Head, Tilt, Mid.ch

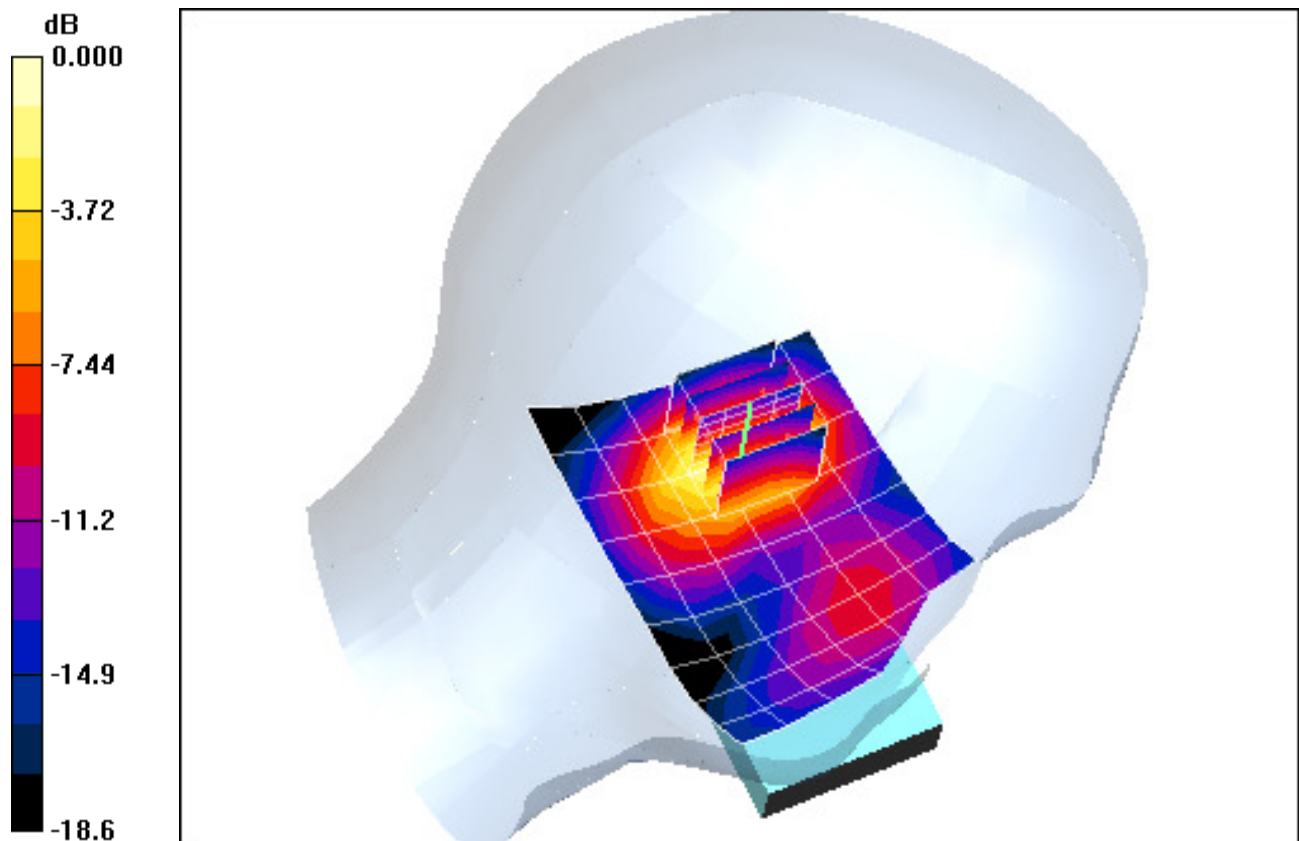
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.9 V/m

Peak SAR (extrapolated) = 1.11 W/kg

SAR(1 g) = 0.659 mW/g; SAR(10 g) = 0.363 mW/g



0 dB = 0.817mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Muscle Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.53 \text{ mho/m}$; $\epsilon_r = 51.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-06-2009; Ambient Temp: 23.6°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.42, 4.42, 4.42); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 1900, Body SAR, Back side, Mid.ch

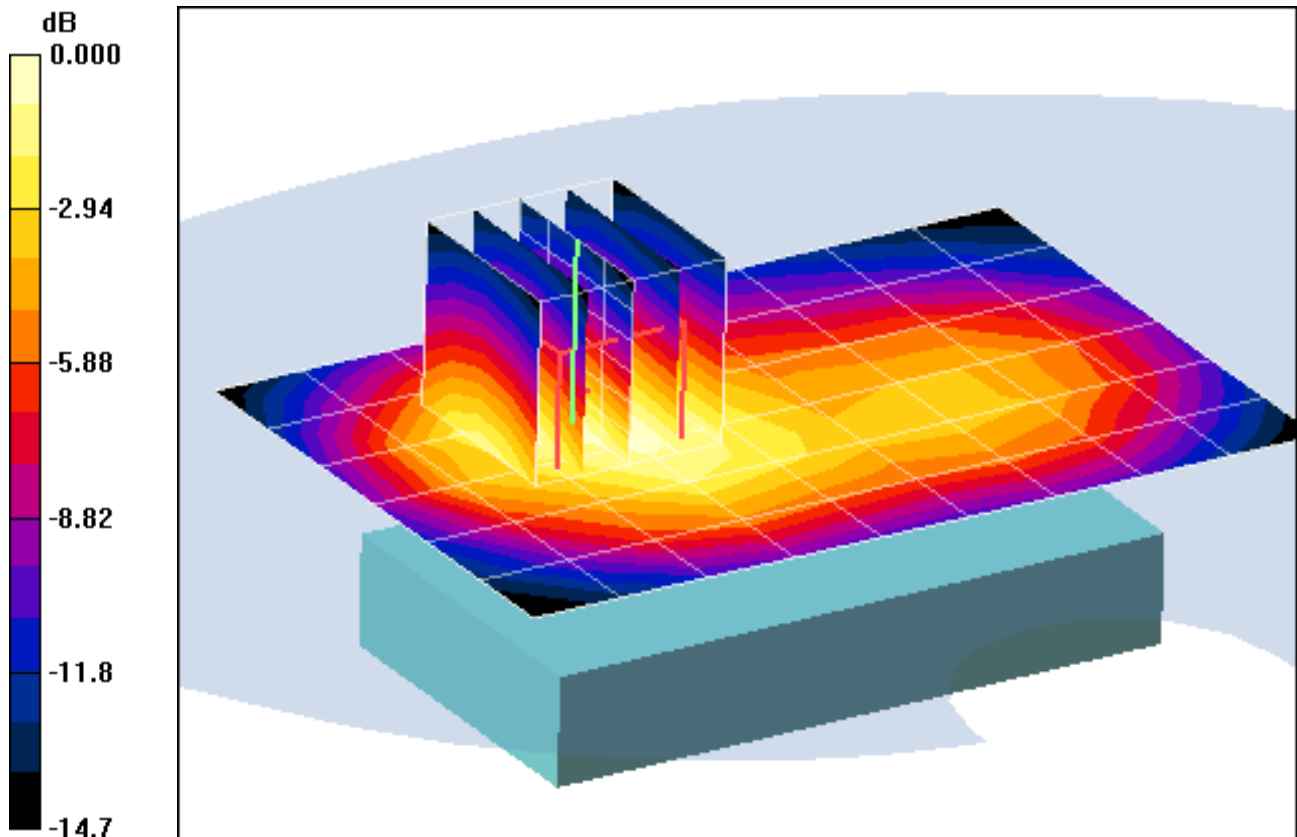
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 14.3 V/m

Peak SAR (extrapolated) = 0.832 W/kg

SAR(1 g) = 0.535 mW/g; SAR(10 g) = 0.323 mW/g



0 dB = 0.644mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: 2450 Muscle Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 2 \text{ mho/m}$; $\epsilon_r = 52.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-06-2009; Ambient Temp: 24.2°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN3550; ConvF(6.02, 6.02, 6.02); Calibrated: 1/21/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 5/25/2009

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Mode: IEEE 802.11b, Body SAR, Ch.06, 1Mbps, Main Antenna, Back Side

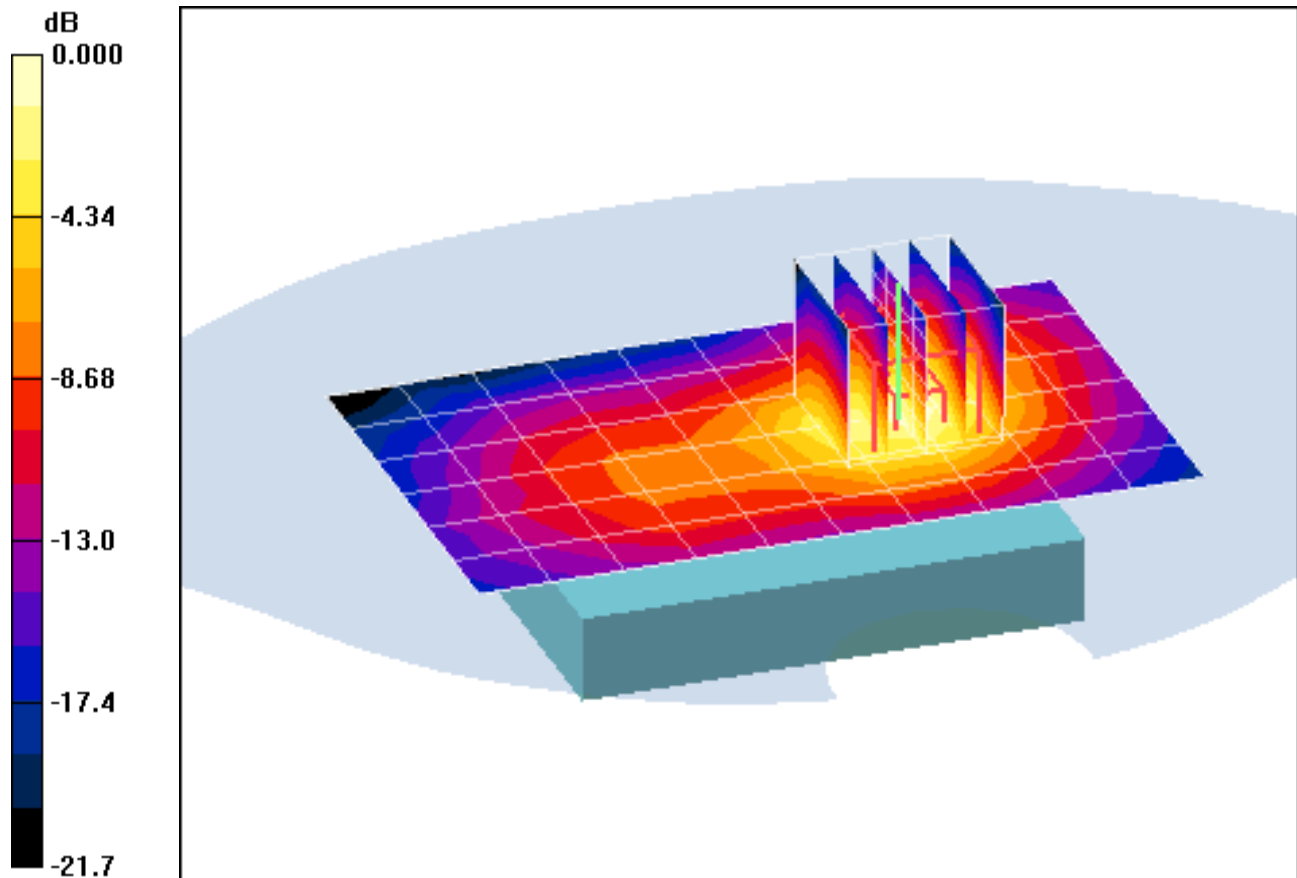
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 7.71 V/m

Peak SAR (extrapolated) = 0.600 W/kg

SAR(1 g) = 0.345 mW/g; SAR(10 g) = 0.177 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.868 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-05-2009; Ambient Temp: 24.1°C; Tissue Temp: 22.4 °C

Probe: ES3DV2 - SN3022; ConvF(6.04, 6.04, 6.04); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GSM 850, Right Head, Touch, Mid.ch

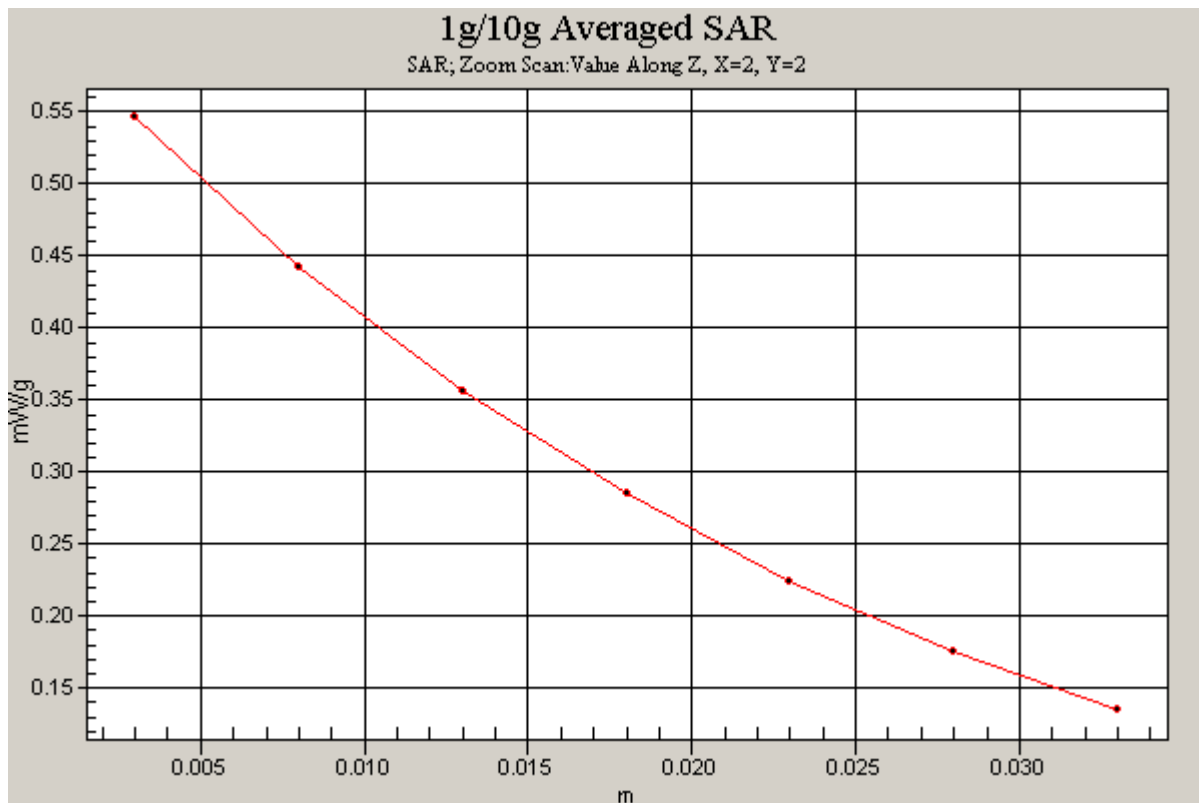
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 11.0 V/m

Peak SAR (extrapolated) = 0.628 W/kg

SAR(1 g) = 0.498 mW/g; SAR(10 g) = 0.383 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM850 GPRS; 2 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium: 835 Muscle Medium parameters used (interpolated):

$$f = 836.6 \text{ MHz}; \sigma = 0.98 \text{ mho/m}; \epsilon_r = 53.2; \rho = 1000 \text{ kg/m}^3$$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-05-2009; Ambient Temp: 24.2°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(5.85, 5.85, 5.85); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GPRS 850, Body SAR, Back side, Mid.ch, 2 Tx Slots

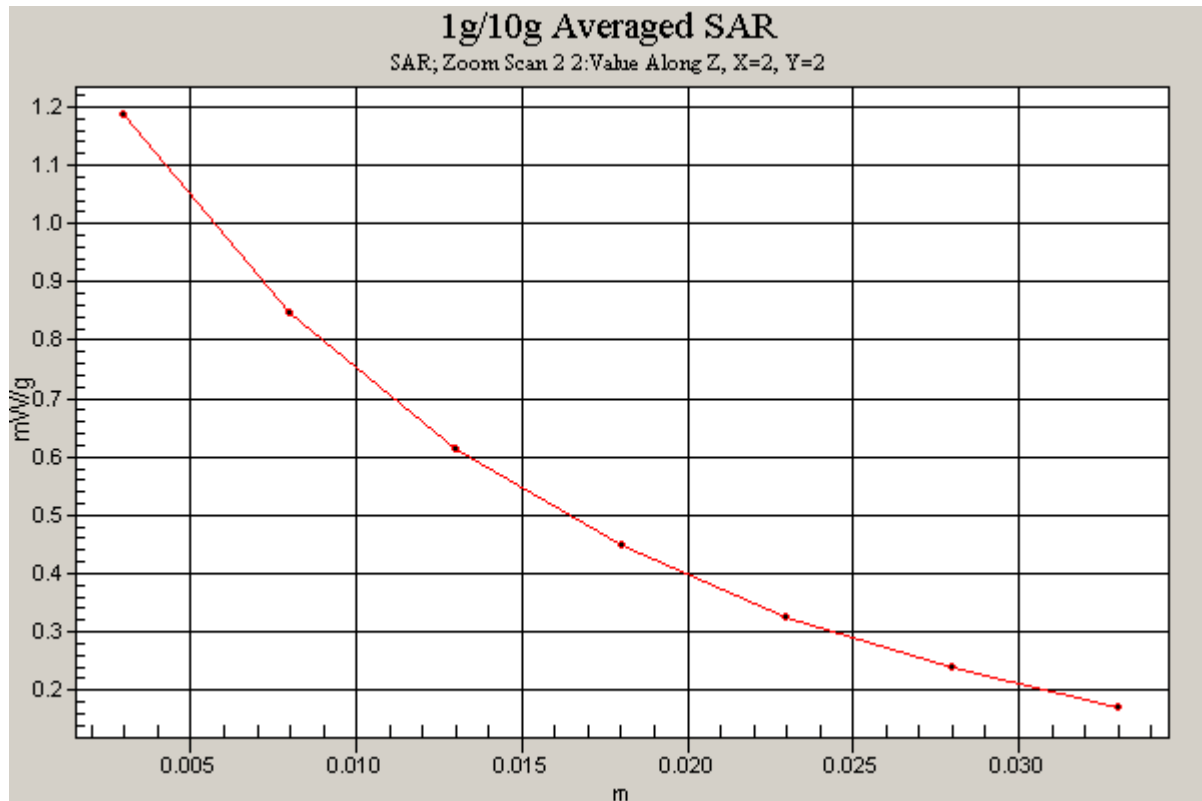
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan 2 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 30.2 V/m

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.734 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: WCDMA1900; Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium: 1900 Brain Medium parameters used (interpolated):

$f = 1907.6 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 38.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-06-2009; Ambient Temp: 23.7°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.86, 4.86, 4.86); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: WCDMA 1900, Right Head, Touch, High.ch

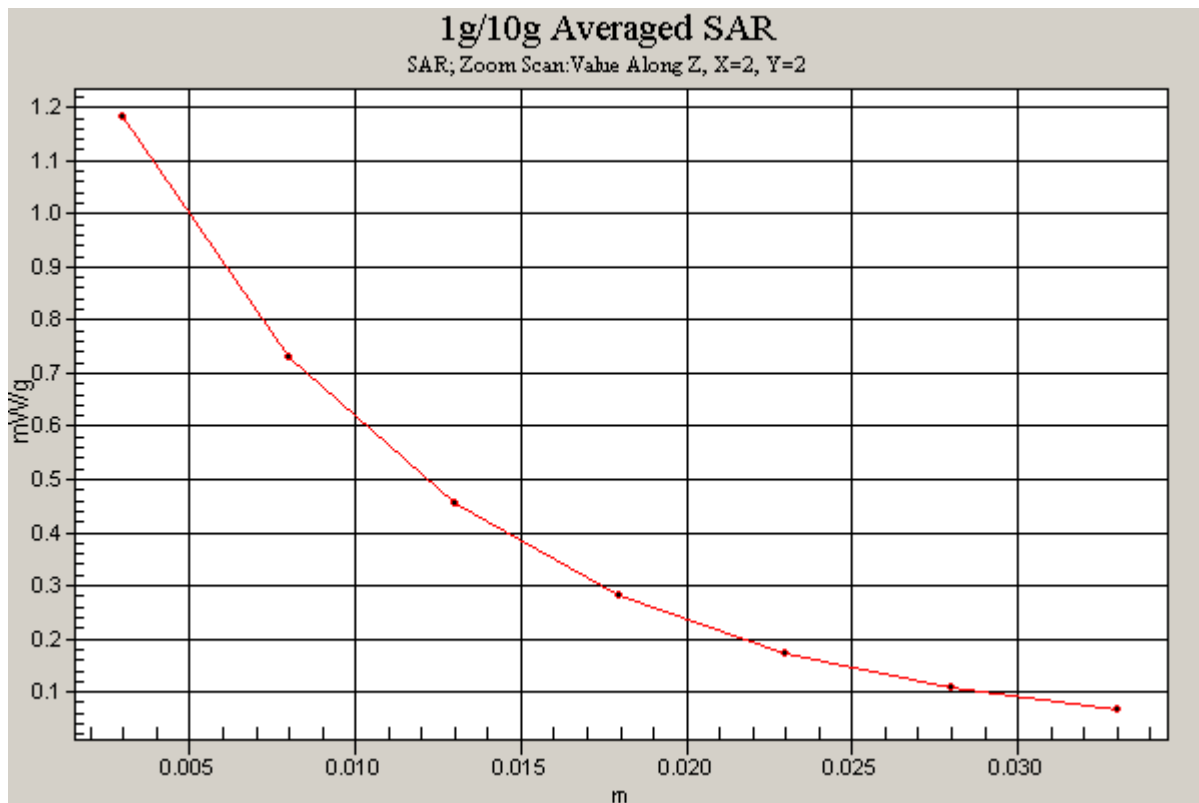
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 19.0 V/m

Peak SAR (extrapolated) = 1.51 W/kg

SAR(1 g) = 0.945 mW/g; SAR(10 g) = 0.519 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE and WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15

Medium: 1900 Muscle Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.53 \text{ mho/m}$; $\epsilon_r = 51.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-06-2009; Ambient Temp: 23.6°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.42, 4.42, 4.42); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 2 Tx Slots

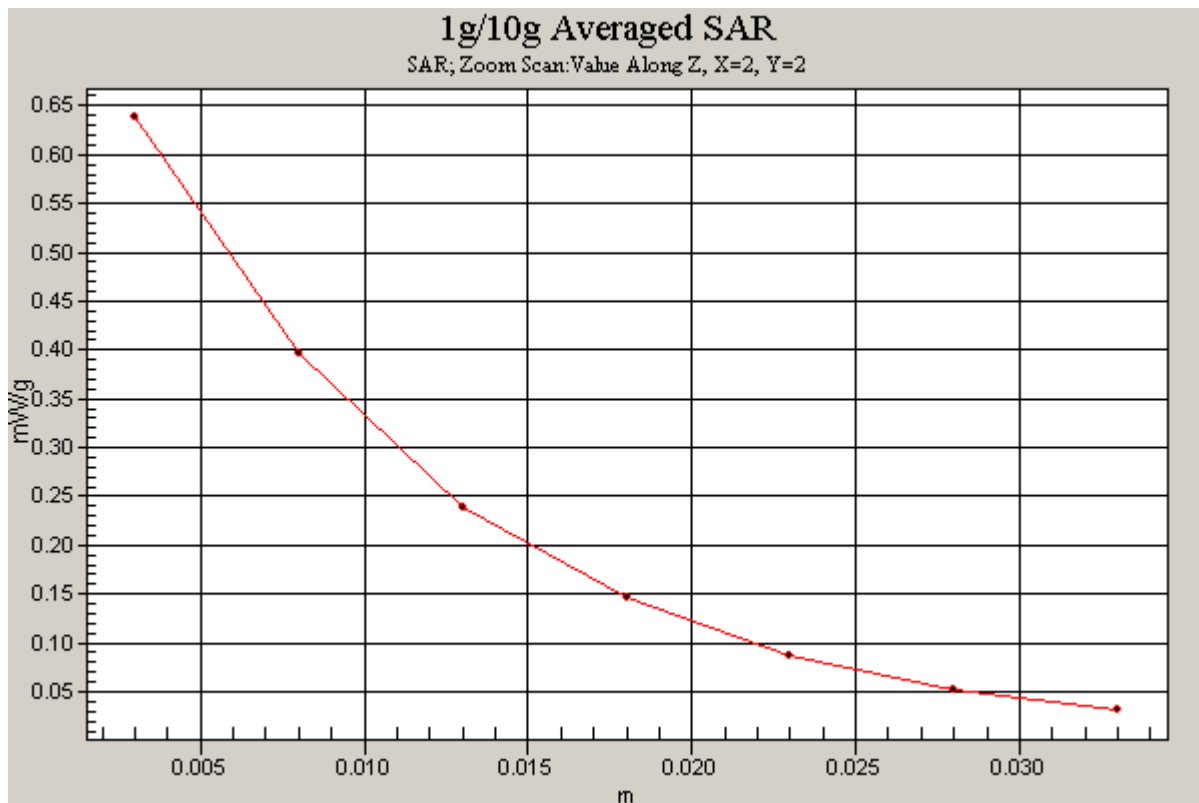
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.2 V/m

Peak SAR (extrapolated) = 0.847 W/kg

SAR(1 g) = 0.546 mW/g; SAR(10 g) = 0.330 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: GT-B5310L; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSDPA Phone with Bluetooth and WLAN; Serial: FG-270-B

Communication System: IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: 2450 Muscle Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 2 \text{ mho/m}$; $\epsilon_r = 52.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-06-2009; Ambient Temp: 24.2°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN3550; ConvF(6.02, 6.02, 6.02); Calibrated: 1/21/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 5/25/2009

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Mode: IEEE 802.11b, Body SAR, Ch.06, 1Mbps, Main Antenna, Back Side

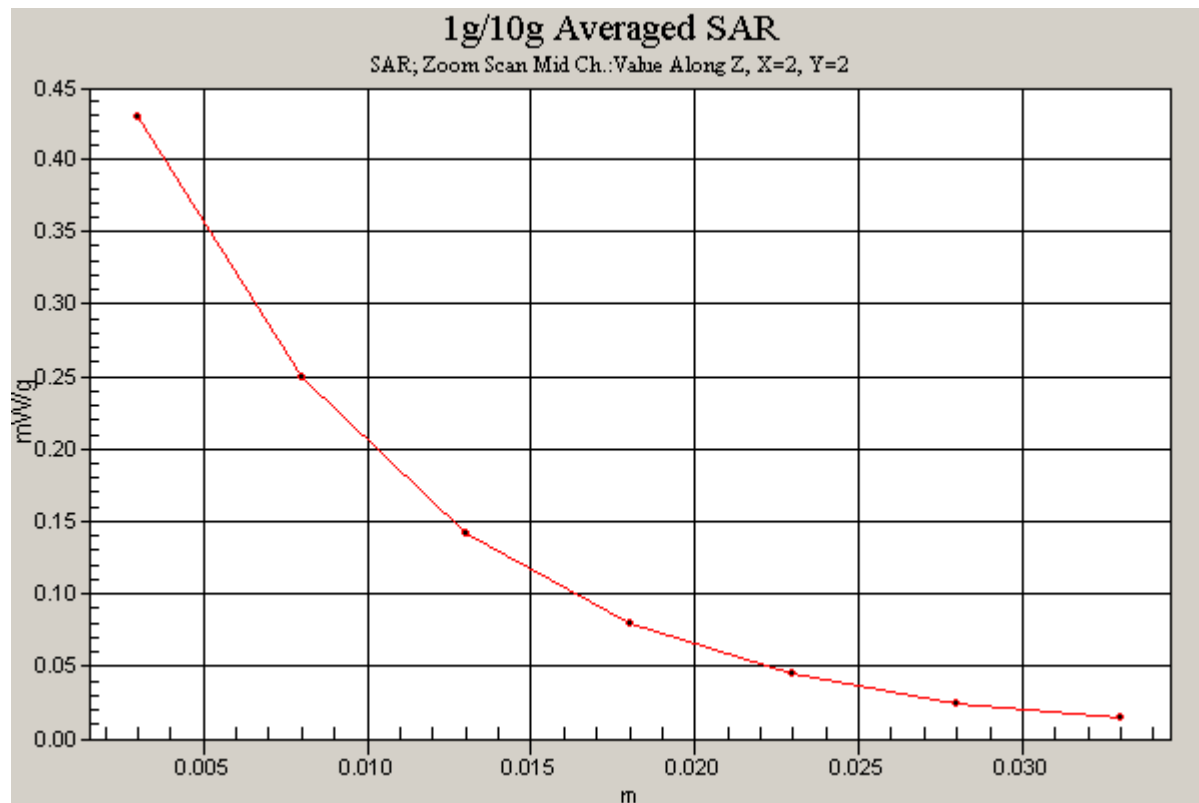
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 7.71 V/m

Peak SAR (extrapolated) = 0.600 W/kg

SAR(1 g) = 0.345 mW/g; SAR(10 g) = 0.177 mW/g



APPENDIX B: DIPOLE VALIDATION

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d047

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: 835 Brain Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.867 \text{ mho/m}$; $\epsilon_r = 40.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5cm

Test Date: 10-05-2009; Ambient Temp: 24.1°C; Tissue Temp: 22.4 °C

Probe: ES3DV2 - SN3022; ConvF(6.04, 6.04, 6.04); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

835MHz Dipole Validation

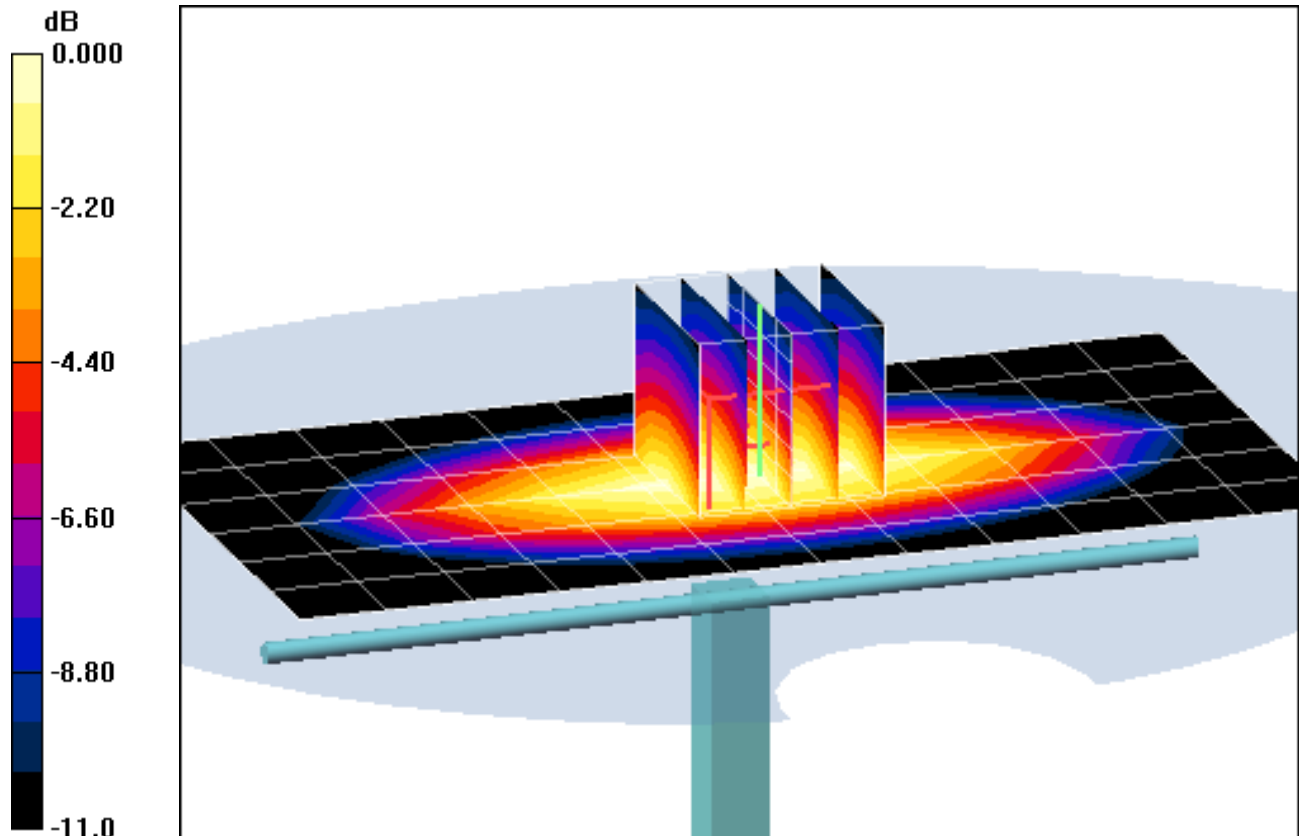
Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Input Power = 20.0 dBm (100 mW)

SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.670 mW/g

Deviation = 7.22 %



0 dB = 1.22mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: 1900MHz SAR Dipole 502; Type: D1900V2; Serial: 502

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

Medium: 1900 Brain Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 38.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-06-2009; Ambient Temp: 23.7°C; Tissue Temp: 22.6 °C

Probe: ES3DV2 - SN3022; ConvF(4.86, 4.86, 4.86); Calibrated: 9/18/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn704; Calibrated: 5/14/2009

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

1900MHz Dipole Validation

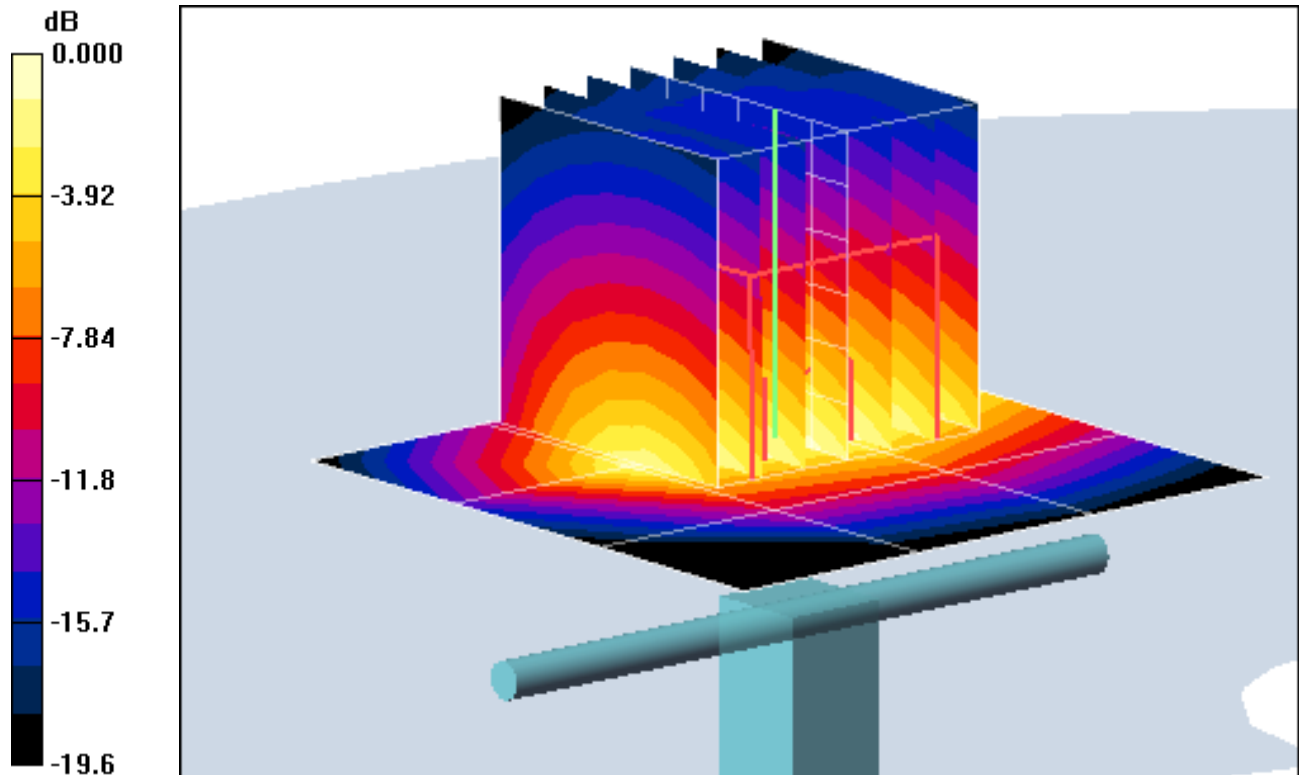
Area Scan (4x4x1): Measurement grid: $dx=20\text{mm}$, $dy=20\text{mm}$

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

Input Power = 20.0 dBm (100 mW)

SAR(1 g) = 3.94 mW/g; SAR(10 g) = 1.96 mW/g

Deviation = -1.25 %



0 dB = 5.10mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:797

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

Medium: 2450 Muscle Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 2.02 \text{ mho/m}$; $\epsilon_r = 52.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-06-2009; Ambient Temp: 24.2°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN3550; ConvF(6.02, 6.02, 6.02); Calibrated: 1/21/2009

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 5/25/2009

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 172

2450MHz Dipole Validation

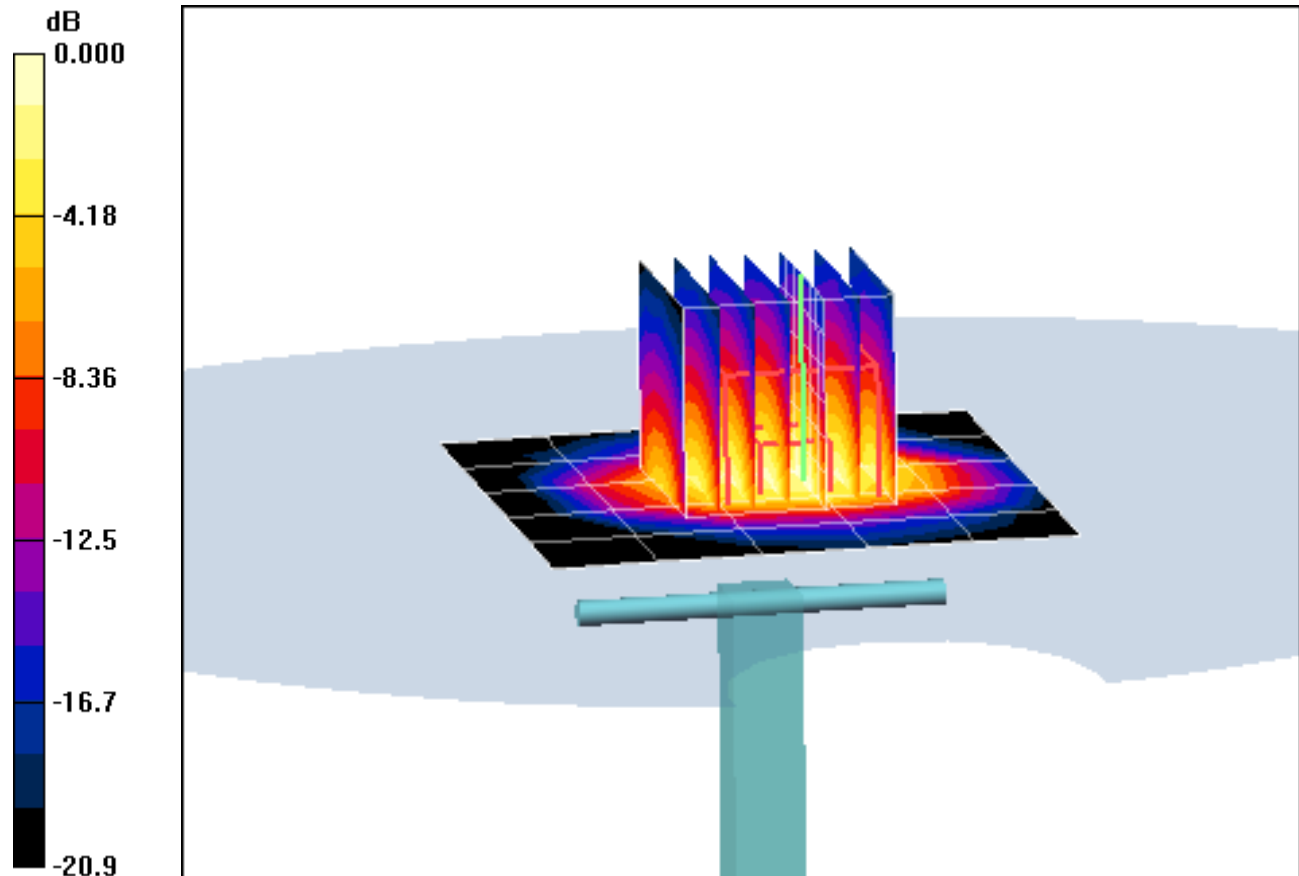
Area Scan (6x6x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Input Power = 10.0 dBm (10 mW)

SAR(1 g) = 0.548 mW/g; SAR(10 g) = 0.260 mW/g

Deviation = 3.40 %



0 dB = 0.708mW/g

APPENDIX C: PROBE CALIBRATION



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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d047_Jan09**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d047**

Calibration procedure(s) **QA CAL-05.v7**
Calibration procedure for dipole validation kits

Calibration date: **January 19, 2009**

Condition of the calibrated item **In Tolerance**

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 EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	01-Jul-08 (No. 217-00864)	Jul-09
Type-N mismatch combination	SN: 5047.2 / 06327	01-Jul-08 (No. 217-00867)	Jul-09
Reference Probe ES3DV2	SN: 3025	28-Apr-08 (No. ES3-3025_Apr08)	Apr-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

Calibrated by: **Jeton Kastrati** **Laboratory Technician**

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

Signature

Issued: January 20, 2009

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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.

Measurement Conditions

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

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
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	41.3 $\pm$ 6 %	0.91 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.5 $\pm$ 0.2) °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.45 mW / g
SAR normalized	normalized to 1W	9.80 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	9.70 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.61 mW / g
SAR normalized	normalized to 1W	6.44 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	6.39 mW / g $\pm$ 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9 Ω -3.7 j Ω
Return Loss	- 28.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω -5.5 j Ω
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 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.

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	August 16, 2006

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 ± 0.2) °C	53.5 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.53 mW / g
SAR normalized	normalized to 1W	10.1 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	9.82 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.67 mW / g
SAR normalized	normalized to 1W	6.68 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	6.54 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

DASY5 Validation Report for Head TSL

Date/Time: 19.01.2009 11:45:19

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d047

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL 900 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.91$ mho/m; $\epsilon_r = 41.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.97, 5.97, 5.97); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

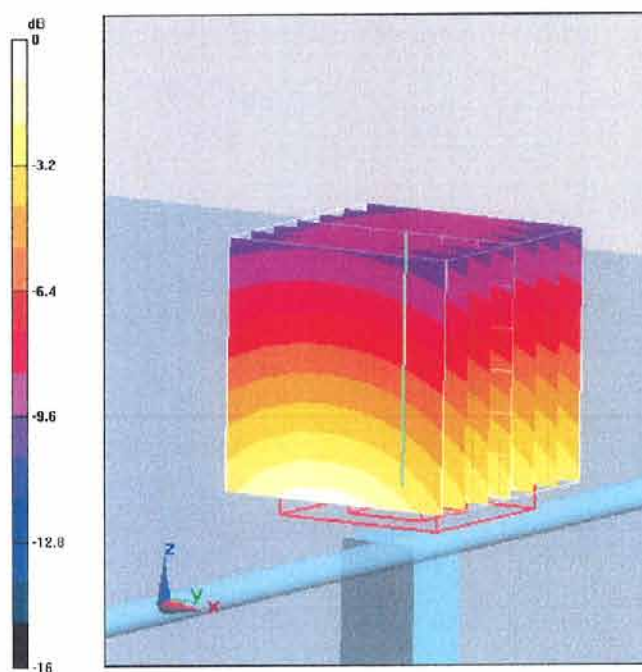
Pin=250mW; dip=15mm; dist=3.4mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.4 V/m; Power Drift = -0.00691 dB

Peak SAR (extrapolated) = 3.61 W/kg

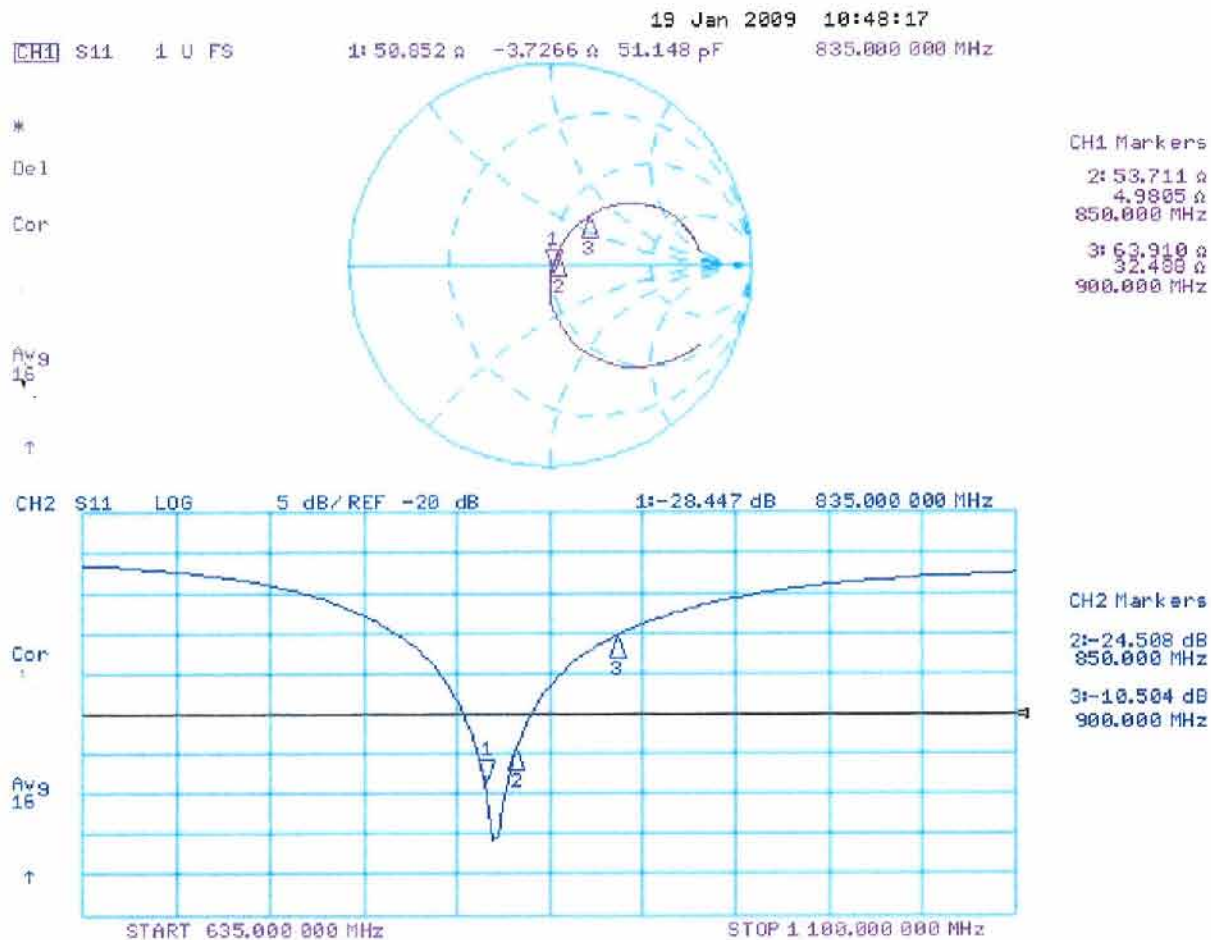
SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.61 mW/g

Maximum value of SAR (measured) = 2.77 mW/g



0 dB = 2.77mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 12.01.2009 12:18:12

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d047

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: MSL900

Medium parameters used: $f = 835$ MHz; $\sigma = 1$ mho/m; $\epsilon_r = 53.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.9, 5.9, 5.9); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

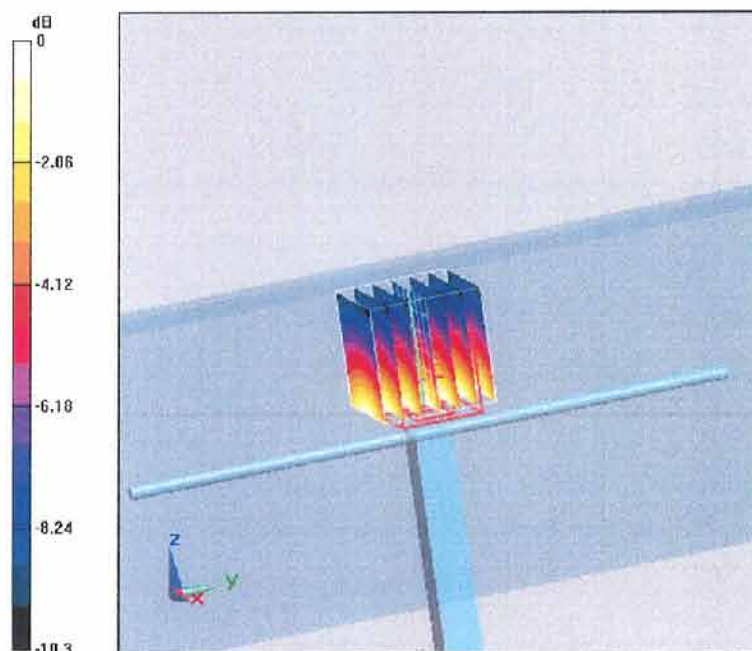
Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.5 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 3.65 W/kg

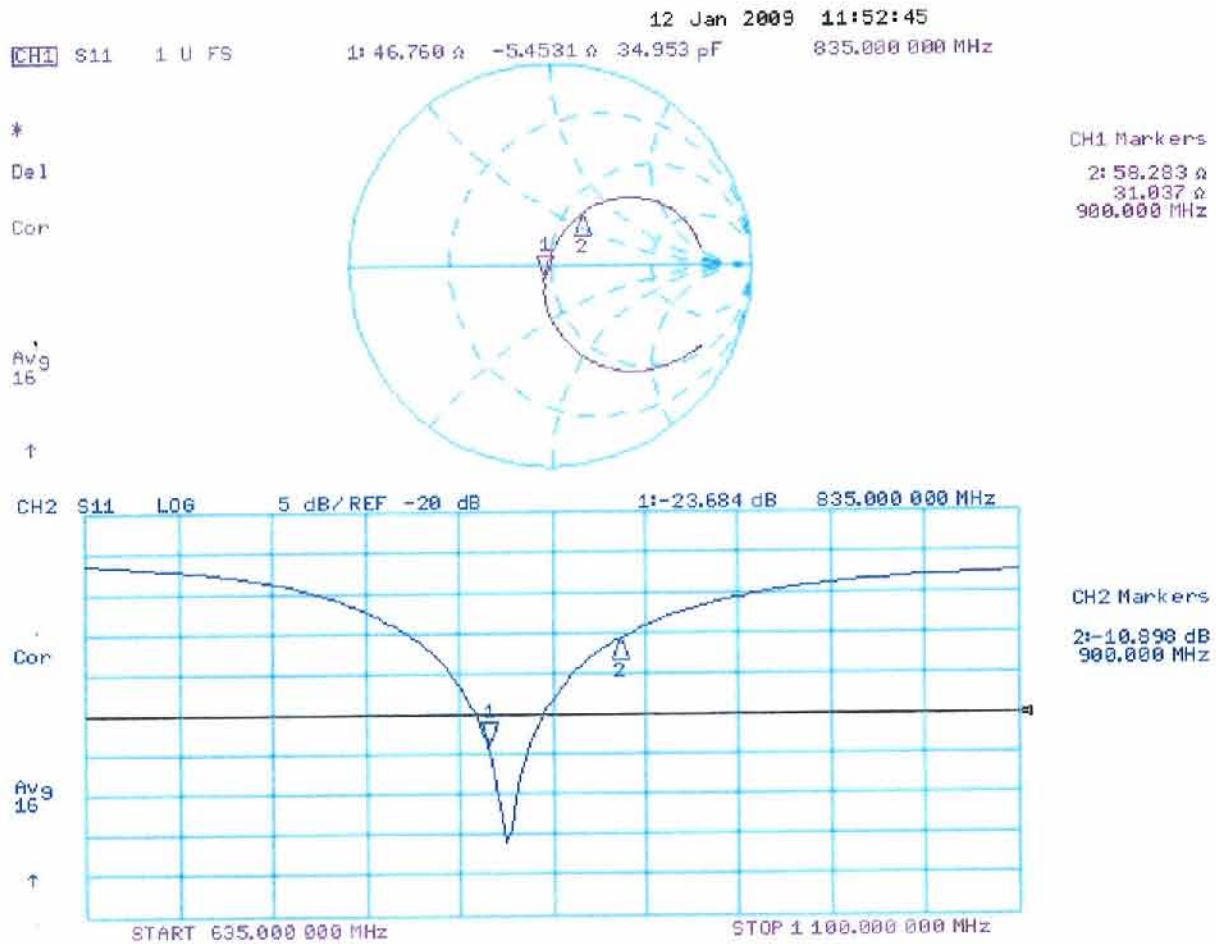
SAR(1 g) = 2.53 mW/g; SAR(10 g) = 1.67 mW/g

Maximum value of SAR (measured) = 2.82 mW/g



0 dB = 2.82mW/g

Impedance Measurement Plot for Body TSL





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1900V2-502-Jan09**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 502**

Calibration procedure(s) **QA CAL-05.v7**
Calibration procedure for dipole validation kits

Calibration date: **January 20, 2009**

Condition of the calibrated item **In Tolerance**

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	01-Jul-08 (No. 217-00864)	Jul-09
Type-N mismatch combination	SN: 5047.2 / 06327	01-Jul-08 (No. 217-00867)	Jul-09
Reference Probe ES3DV2	SN: 3025	28-Apr-08 (No. ES3-3025_Apr08)	Apr-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

Calibrated by: **Claudio Leubler** Function: **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** Technical Manager

Issued: January 21, 2009

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Accreditation No.: **SCS 108**

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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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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.

Measurement Conditions

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

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.2 $\pm$ 6 %	1.47 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.0 $\pm$ 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	10.3 mW / g
SAR normalized	normalized to 1W	41.2 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	39.9 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.32 mW / g
SAR normalized	normalized to 1W	21.3 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	20.9 mW / g $\pm$ 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.7 ± 6 %	1.57 mho/m ± 6 %
Body TSL temperature during test	(21.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.5 mW / g
SAR normalized	normalized to 1W	42.0 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	41.5 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.55 mW / g
SAR normalized	normalized to 1W	22.2 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	22.1 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.1 Ω - 3.3 j Ω
Return Loss	- 26.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.3 Ω - 3.4 j Ω
Return Loss	- 21.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.183 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.

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 14, 1998

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:502

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

Medium: HSL U10 BB

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 39.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.9, 4.9, 4.9); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; dip = 10 mm, scan at 3.4mm/Zoom Scan (dist=3.4mm, probe 0deg)

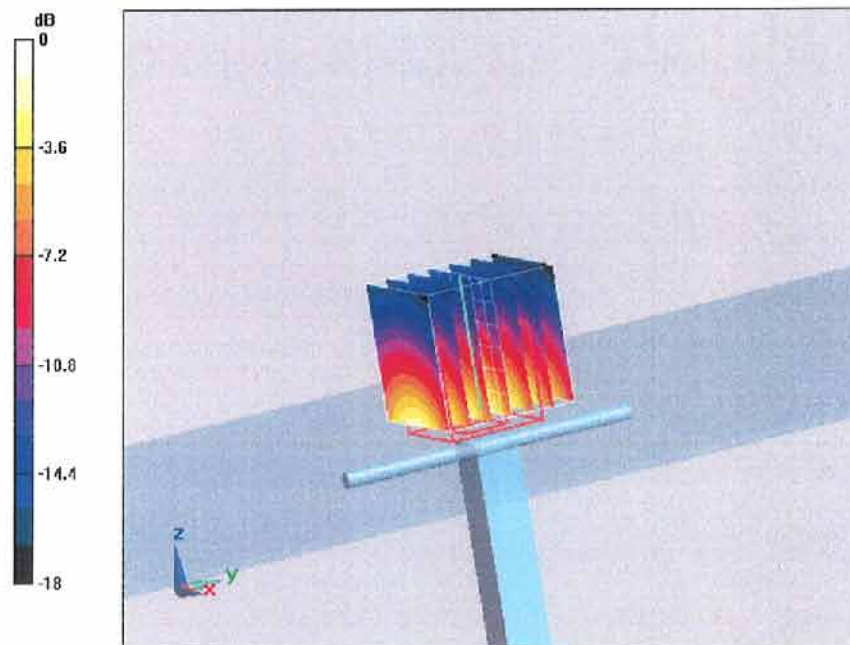
(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.1 V/m; Power Drift = 0.042 dB

Peak SAR (extrapolated) = 19.3 W/kg

SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.32 mW/g

Maximum value of SAR (measured) = 12.2 mW/g



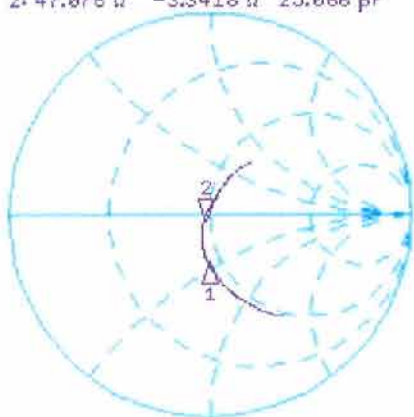
0 dB = 12.2mW/g

Impedance Measurement Plot for Head TSL

20 Jan 2009 10:59:51

CH1 S11 1 U FS 2: 47.075 Ω -3.3418 Ω 25.066 pF 1 900.000 000 MHz

Del
Cor



CH1 Markers

1: 44.506 Ω
-22.549 Ω
1.80000 GHz

Avg
16

↑

CH2 S11 LOG 5 dB/REF -20 dB 2: -26.796 dB 1 900.000 000 MHz

Cor

Avg
16

↑



CH2 Markers

1: -12.437 dB
1.80000 GHz

START 1 500.000 000 MHz

STOP 2 100.000 000 MHz

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:502

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

Medium: MSL U10 BB

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.57$ mho/m; $\epsilon_r = 54.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.5, 4.5, 4.5); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

**Pin = 250 mW; dip = 10 mm, scan at 3.4mm 2 2/Zoom Scan (dist=3.4mm, probe 0deg)
(7x7x7)/Cube 0:**

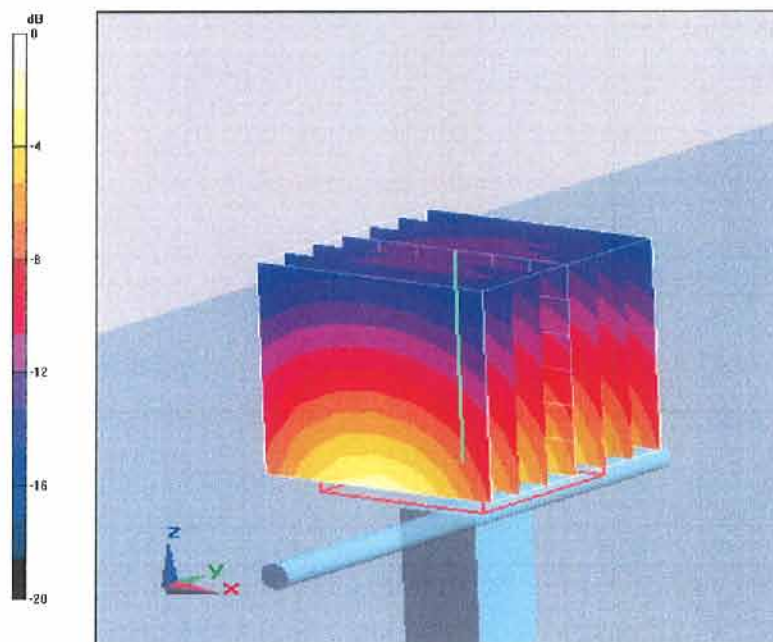
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93 V/m; Power Drift = 0.00443 dB

Peak SAR (extrapolated) = 18.5 W/kg

SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.55 mW/g

Maximum value of SAR (measured) = 12.7 mW/g



0 dB = 12.7mW/g

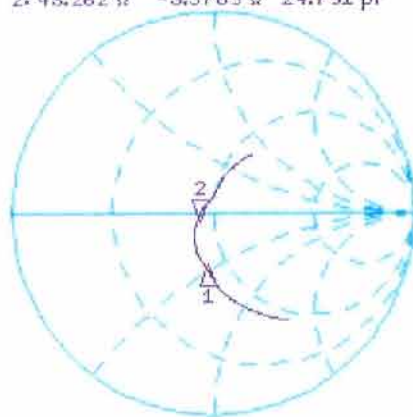
Impedance Measurement Plot for Body TSL

13 Jan 2009 10:01:40
 CH1 S11 1 U FS 2: 43.262 Ω -3.3789 Ω 24.791 pF 1 900.000 000 MHz

*
 Del
 Cor

Avg
 16

↑



CH1 Markers

1: 41.135 Ω
 -22.896 Ω
 1.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 2: -21.858 dB 1 900.000 000 MHz

Cor

Avg
 16

↑



CH2 Markers

1: -11.657 dB
 1.80000 GHz