

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

Communication System: GSM850; Frequency: 848.8 MHz; Duty Cycle: 1:8.3

Medium: 835 Brain Medium parameters used (interpolated):

$f = 848.8 \text{ MHz}$; $\sigma = 0.889 \text{ mho/m}$; $\epsilon_r = 40.55$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 02-26-2010; Ambient Temp: 23.0 °C; Tissue Temp: 21.9 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

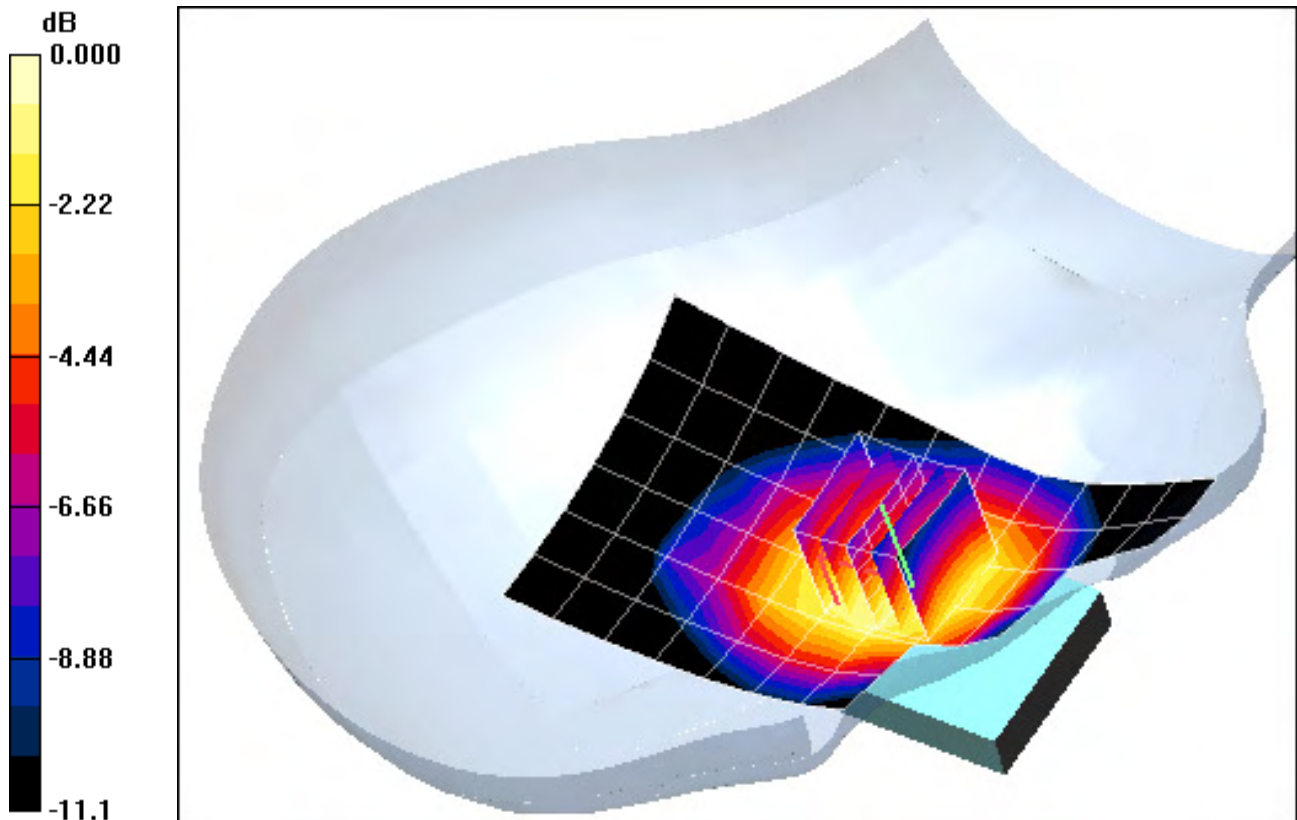
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 26.6 V/m

Peak SAR (extrapolated) = 0.744 W/kg

SAR(1 g) = 0.584 mW/g; SAR(10 g) = 0.427 mW/g



0 dB = 0.645mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

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

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.875 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 02-26-2010; Ambient Temp: 23.0 °C; Tissue Temp: 21.9 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

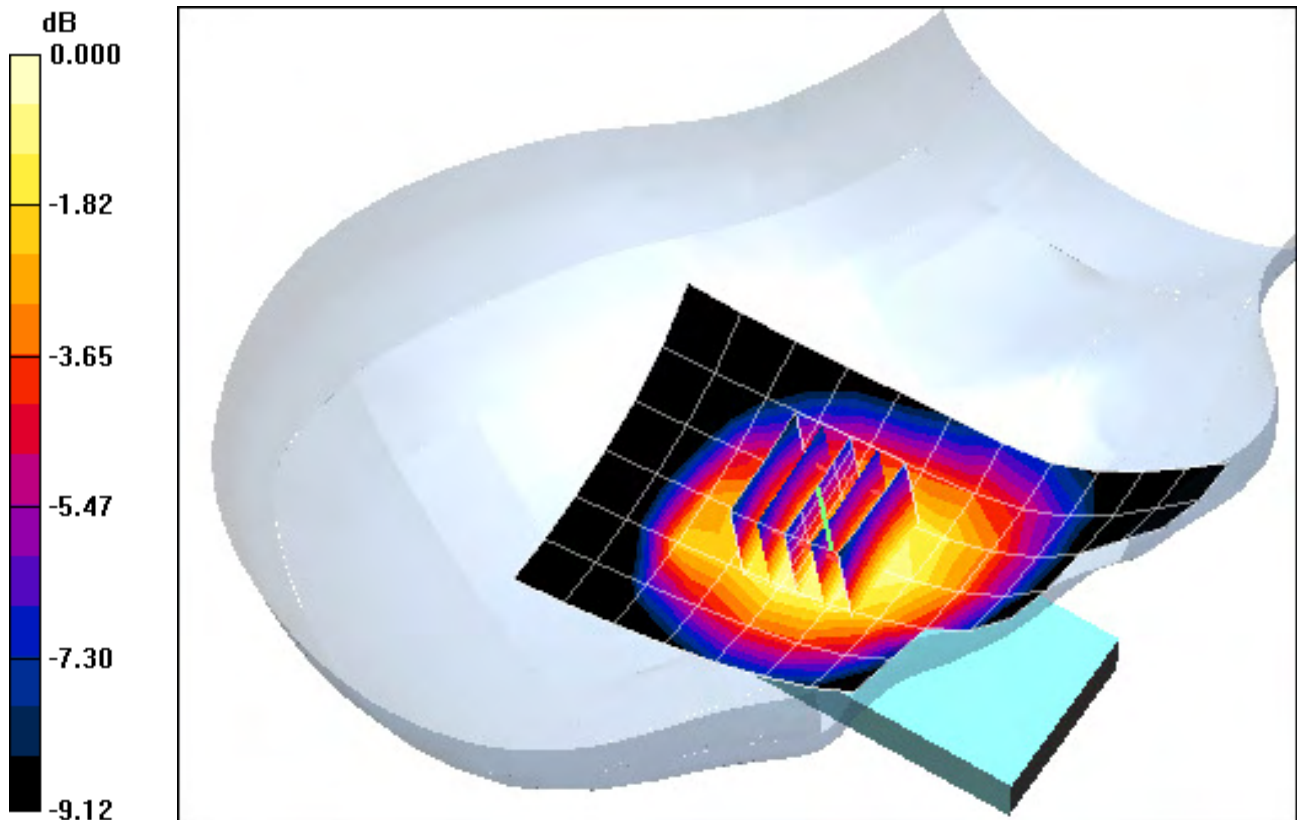
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.7 V/m

Peak SAR (extrapolated) = 0.465 W/kg

SAR(1 g) = 0.359 mW/g; SAR(10 g) = 0.265 mW/g



0 dB = 0.399mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium: 835 Brain Medium parameters used (interpolated):

$f = 824.2 \text{ MHz}$; $\sigma = 0.873 \text{ mho/m}$; $\epsilon_r = 40.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-26-2010; Ambient Temp: 23.0 °C; Tissue Temp: 21.9 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

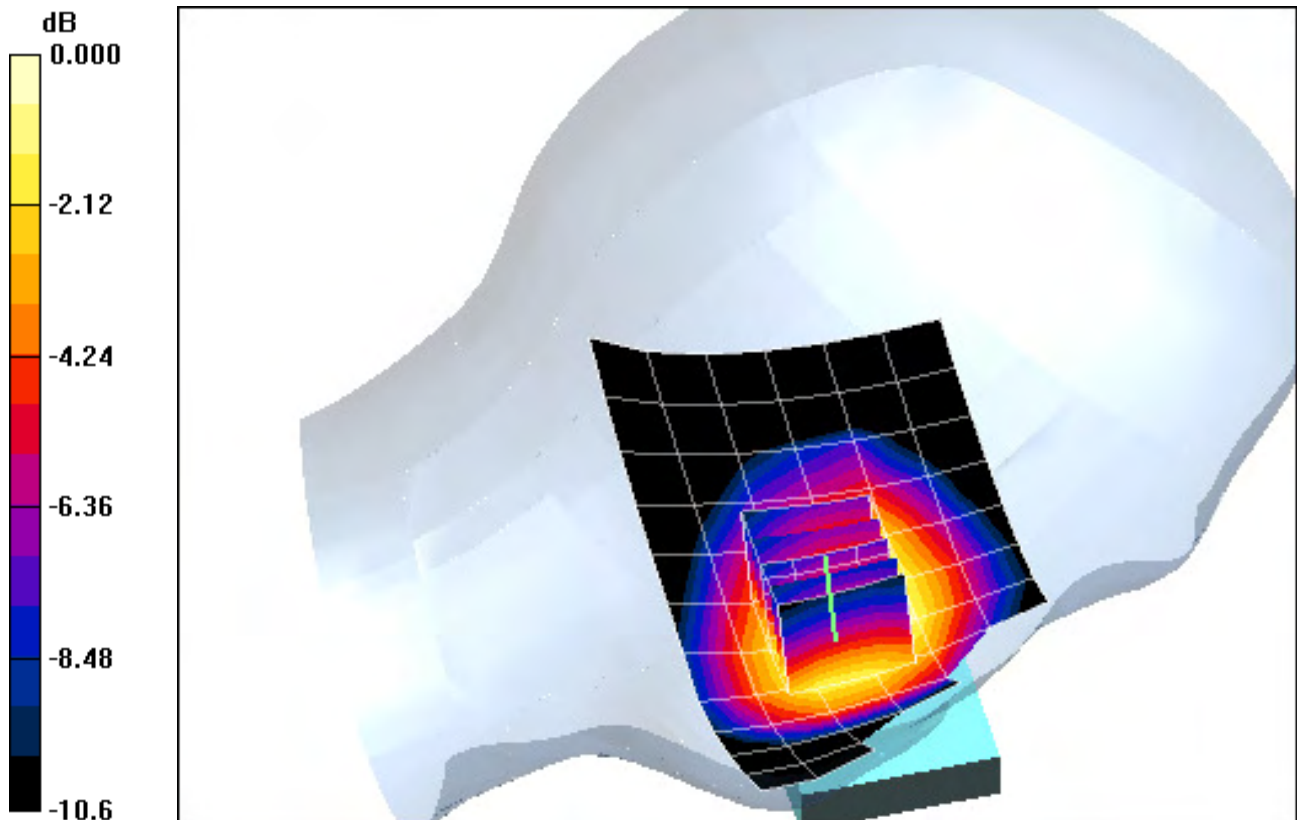
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 10.1 V/m

Peak SAR (extrapolated) = 0.701 W/kg

SAR(1 g) = 0.540 mW/g; SAR(10 g) = 0.390 mW/g



0 dB = 0.597mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium: 835 Brain Medium parameters used (interpolated):

$f = 824.2 \text{ MHz}$; $\sigma = 0.873 \text{ mho/m}$; $\epsilon_r = 40.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-26-2010; Ambient Temp: 23.0 °C; Tissue Temp: 21.9 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

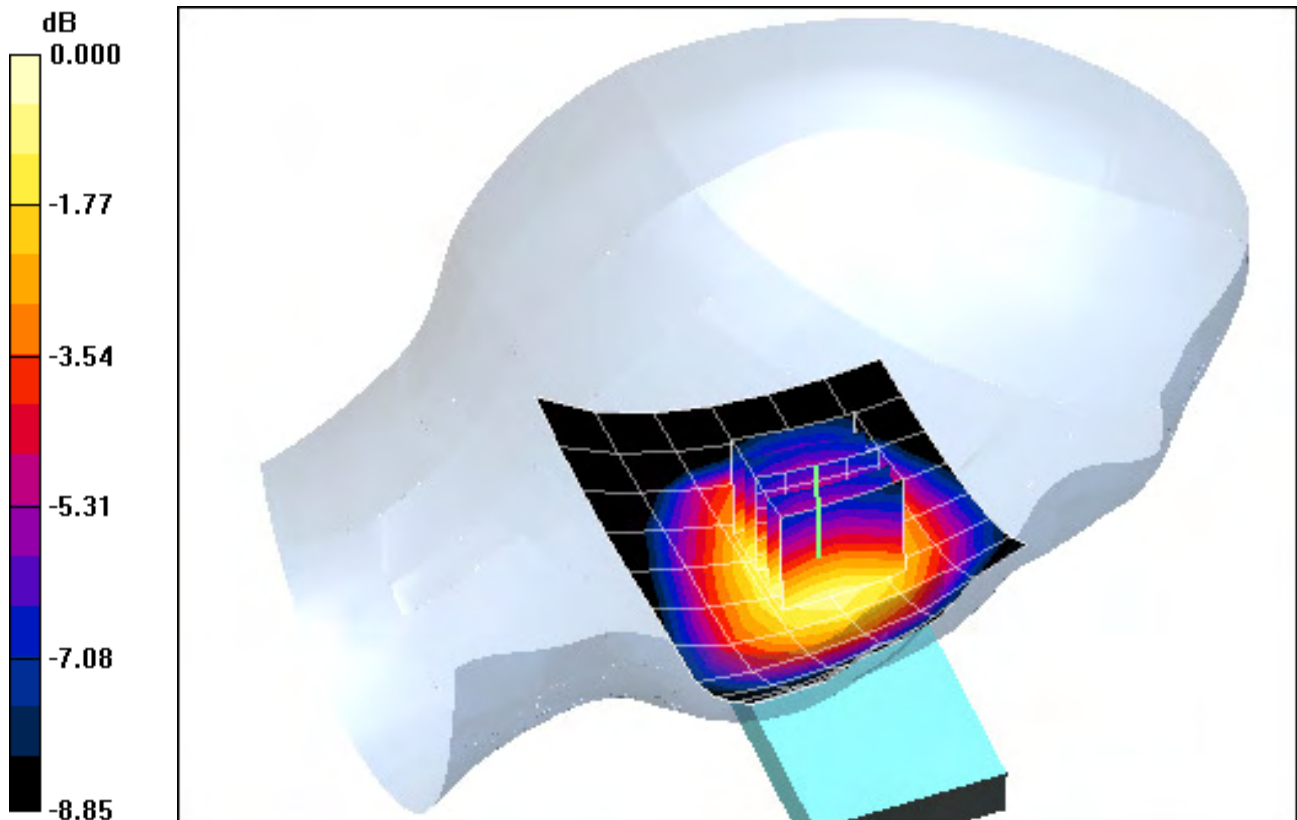
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.0 V/m

Peak SAR (extrapolated) = 0.432 W/kg

SAR(1 g) = 0.338 mW/g; SAR(10 g) = 0.250 mW/g



0 dB = 0.375mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

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

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 02-24-2010; Ambient Temp: 24.3 °C; Tissue Temp: 20.4 °C

Probe: ES3DV3 - SN3209; ConvF(5.1, 5.1, 5.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

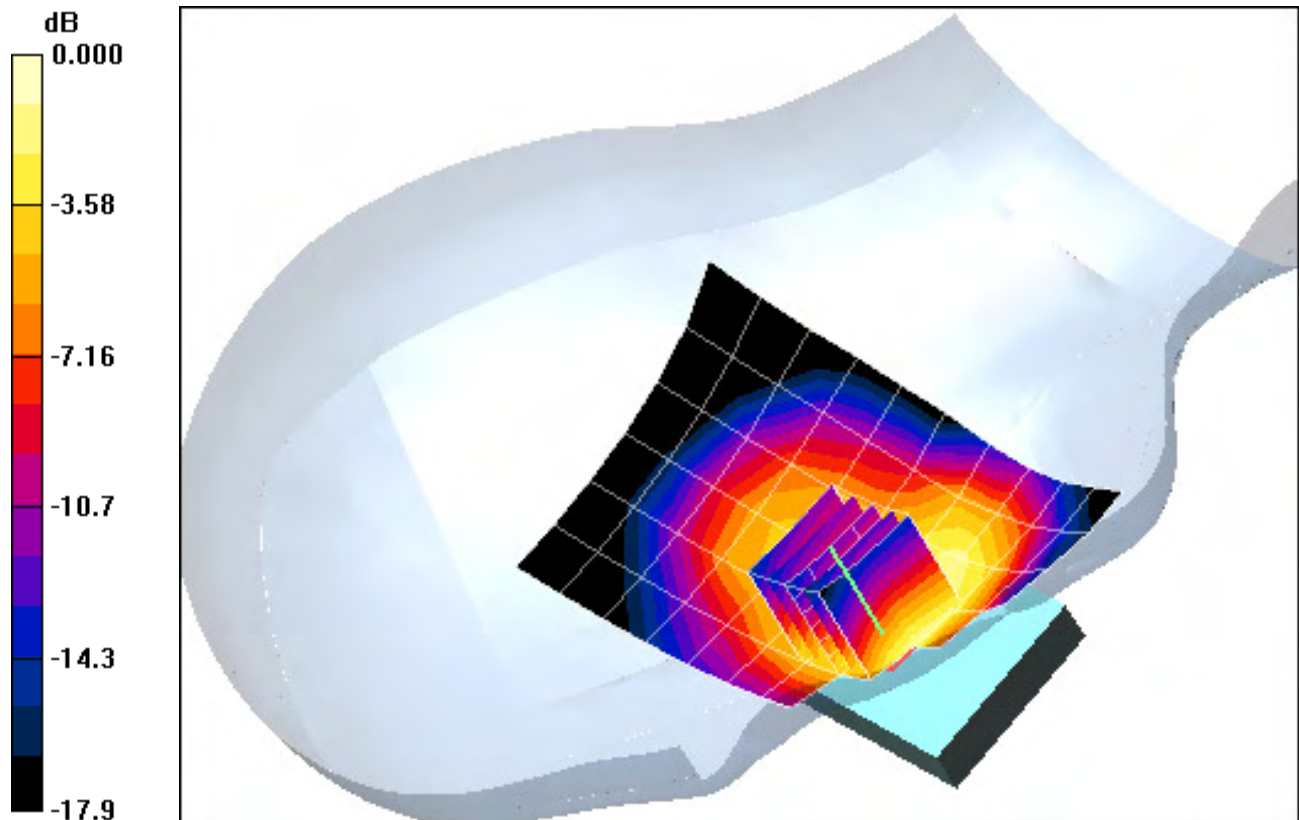
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 23.6 V/m

Peak SAR (extrapolated) = 1.21 W/kg

SAR(1 g) = 0.783 mW/g; SAR(10 g) = 0.482 mW/g



0 dB = 0.929mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

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

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 02-24-2010; Ambient Temp: 24.3 °C; Tissue Temp: 20.4 °C

Probe: ES3DV3 - SN3209; ConvF(5.1, 5.1, 5.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

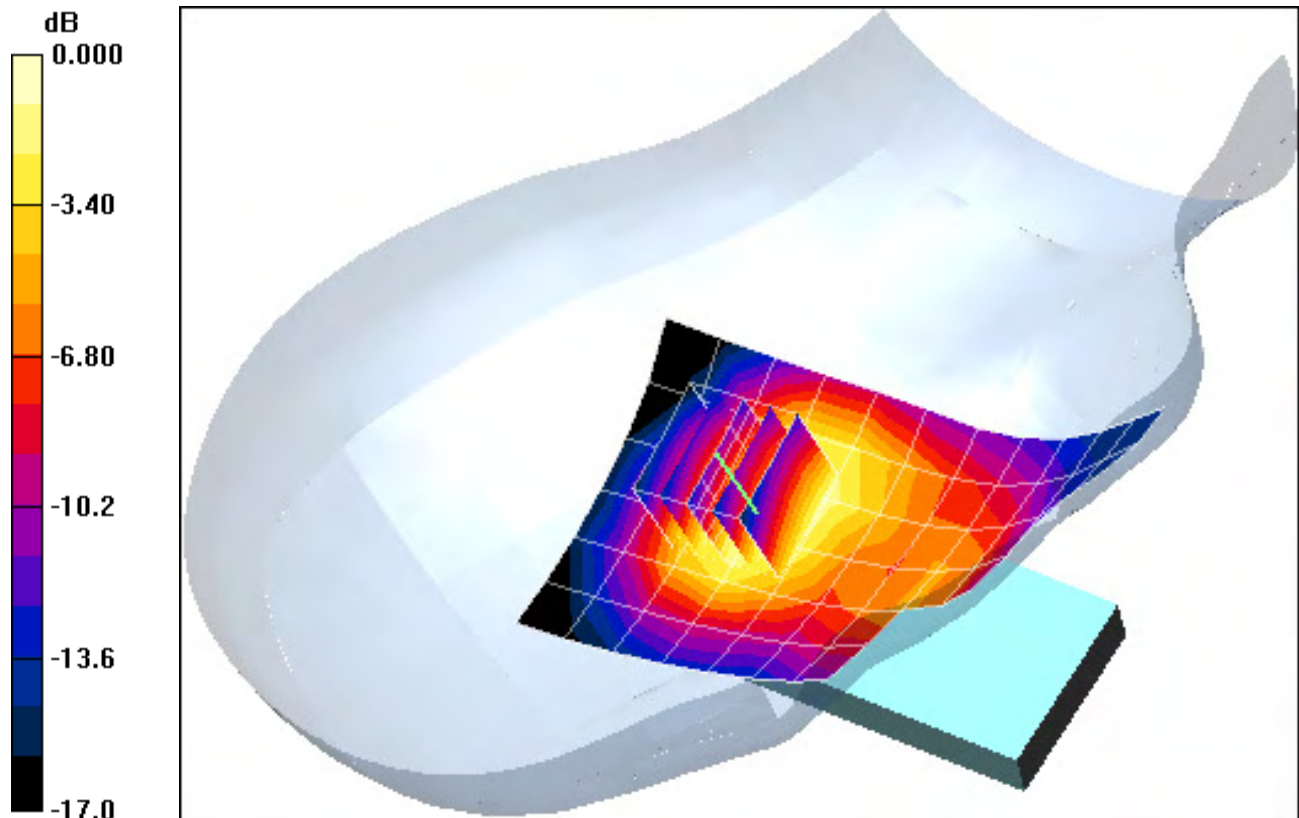
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.6 V/m

Peak SAR (extrapolated) = 0.607 W/kg

SAR(1 g) = 0.414 mW/g; SAR(10 g) = 0.258 mW/g



0 dB = 0.480mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

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

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-24-2010; Ambient Temp: 24.3 °C; Tissue Temp: 20.4 °C

Probe: ES3DV3 - SN3209; ConvF(5.1, 5.1, 5.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

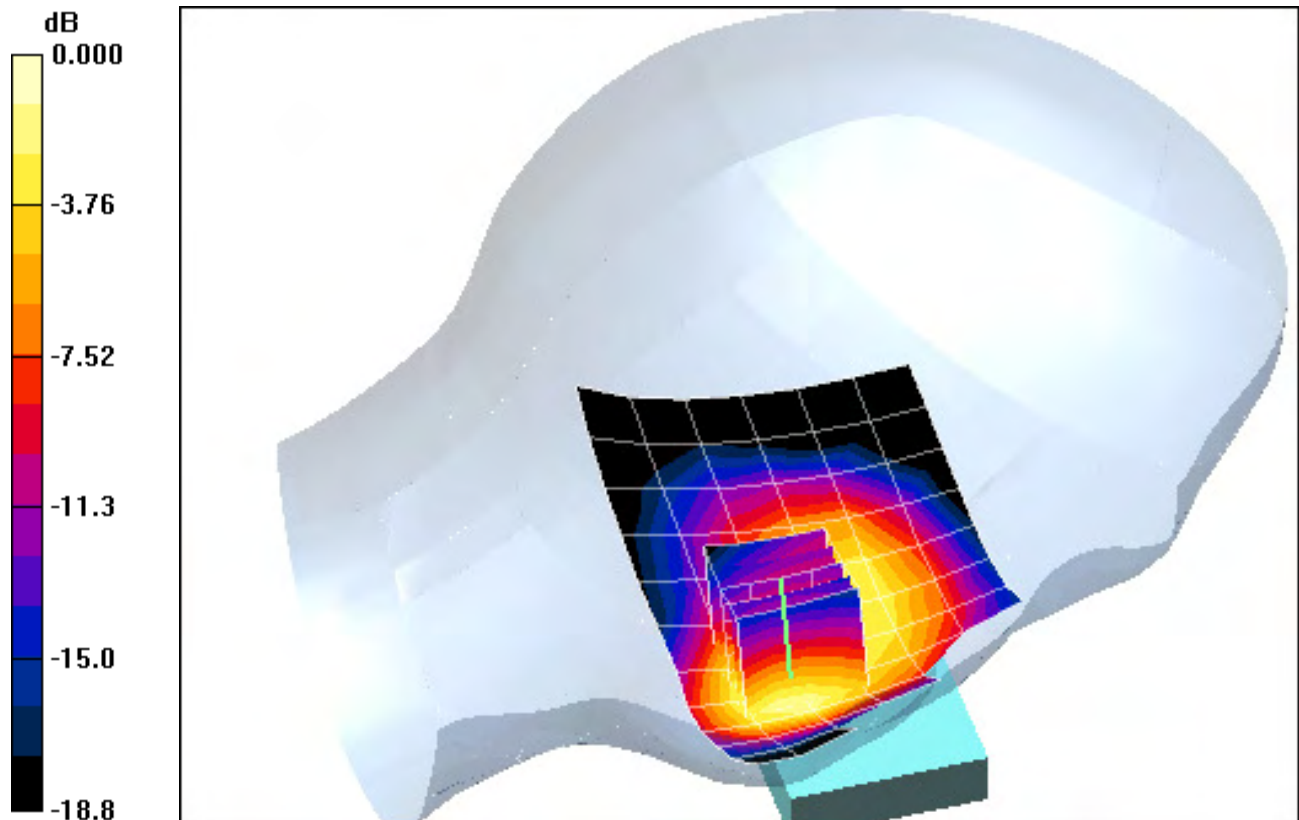
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 27.9 V/m

Peak SAR (extrapolated) = 1.65 W/kg

SAR(1 g) = 1.03 mW/g; SAR(10 g) = 0.594 mW/g



0 dB = 1.22mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

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

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-24-2010; Ambient Temp: 24.3 °C; Tissue Temp: 20.4 °C

Probe: ES3DV3 - SN3209; ConvF(5.1, 5.1, 5.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

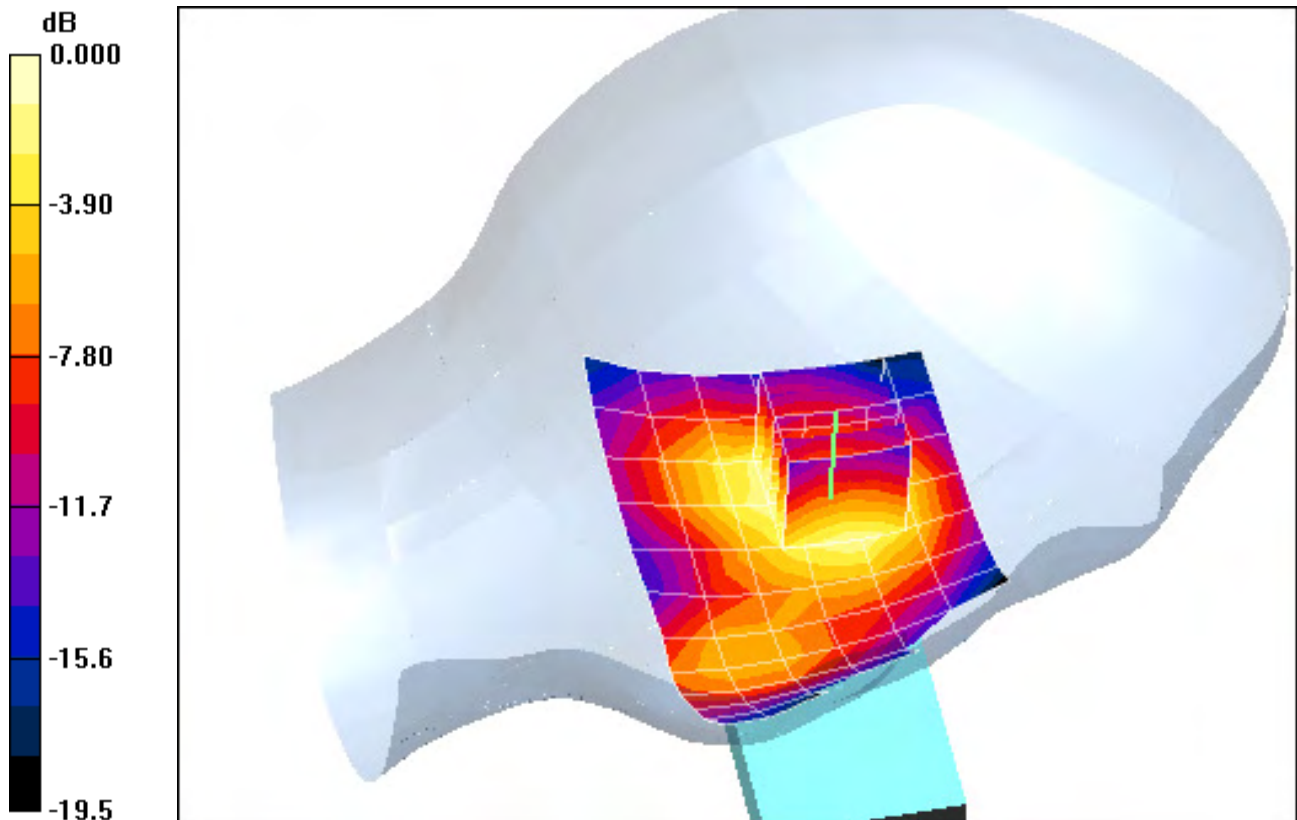
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 18.9 V/m

Peak SAR (extrapolated) = 0.718 W/kg

SAR(1 g) = 0.469 mW/g; SAR(10 g) = 0.291 mW/g



0 dB = 0.543mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

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

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.875 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 02-27-2010; Ambient Temp: 22.5 °C; Tissue Temp: 21.2 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

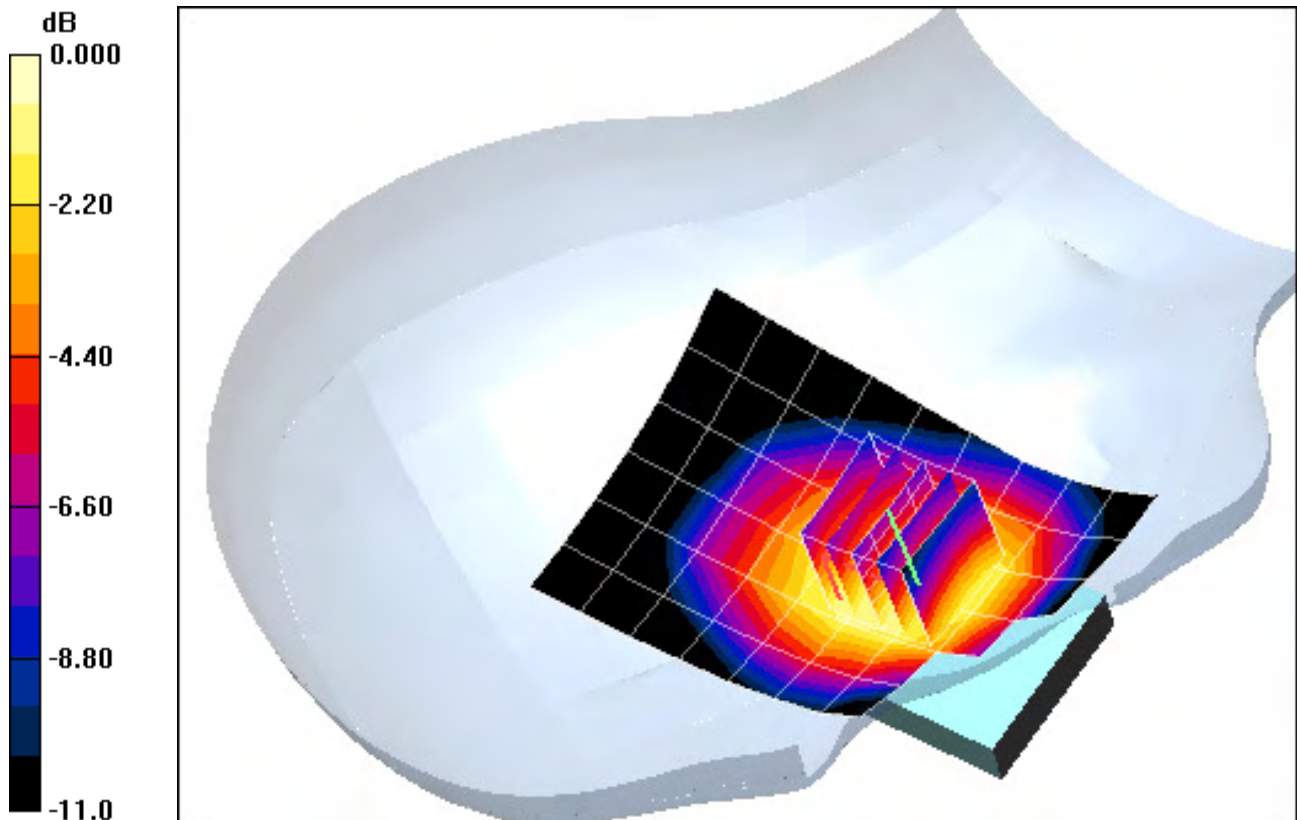
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 28.0 V/m

Peak SAR (extrapolated) = 0.854 W/kg

SAR(1 g) = 0.672 mW/g; SAR(10 g) = 0.493 mW/g



0 dB = 0.749mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

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

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.875 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 02-27-2010; Ambient Temp: 22.5 °C; Tissue Temp: 21.2 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

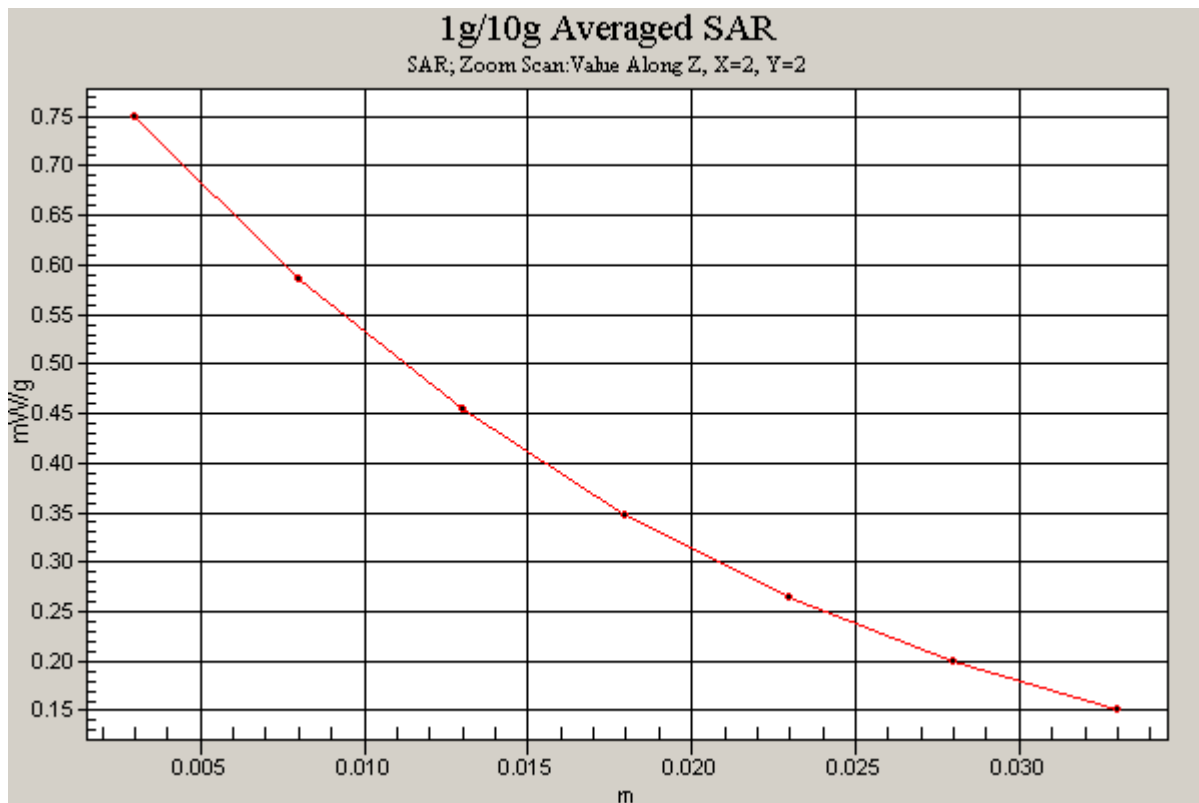
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 28.0 V/m

Peak SAR (extrapolated) = 0.854 W/kg

SAR(1 g) = 0.672 mW/g; SAR(10 g) = 0.493 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

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

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.875 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 02-27-2010; Ambient Temp: 22.5 °C; Tissue Temp: 21.2 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

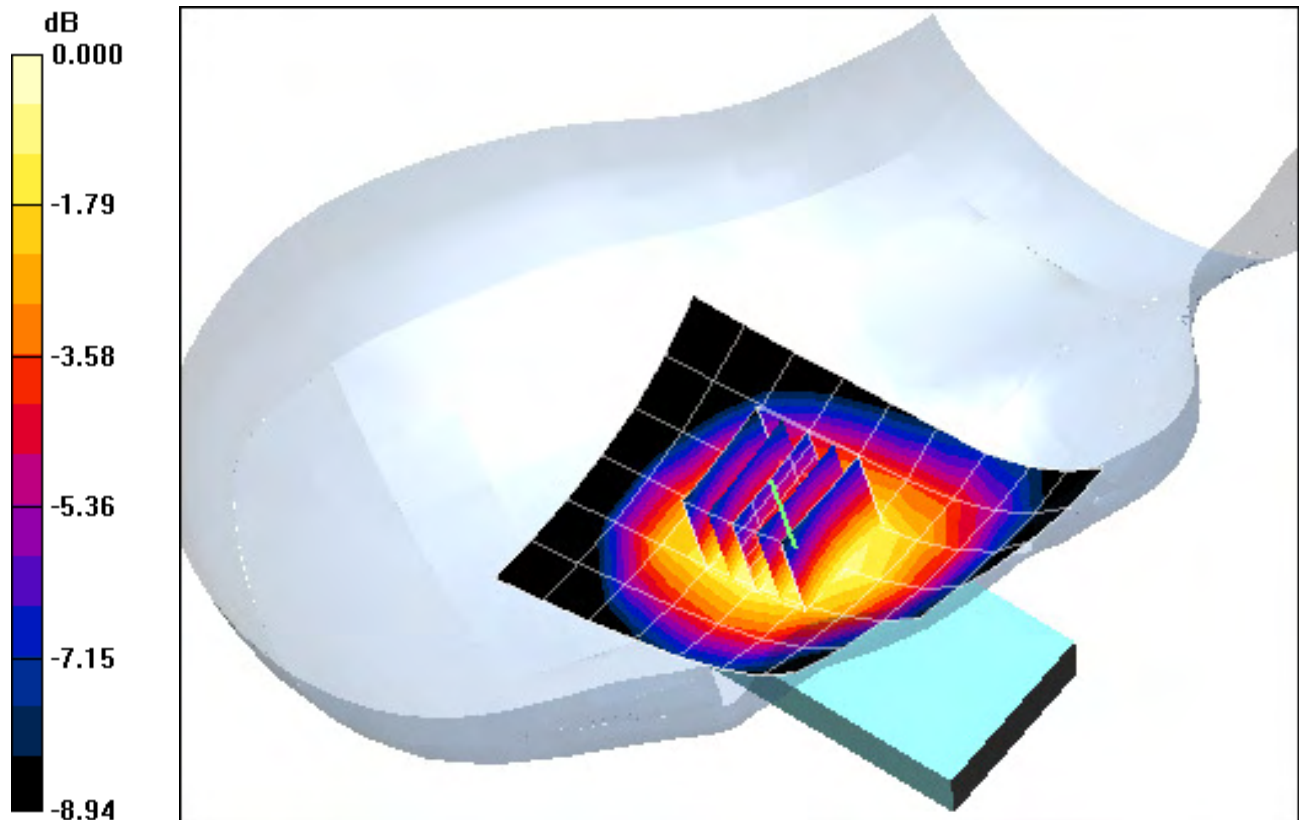
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.7 V/m

Peak SAR (extrapolated) = 0.539 W/kg

SAR(1 g) = 0.420 mW/g; SAR(10 g) = 0.310 mW/g



0 dB = 0.465mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

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

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.925 \text{ mho/m}$; $\epsilon_r = 43.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-01-2010; Ambient Temp: 23.9 °C ; Tissue Temp: 22.1 °C

Probe: ES3DV3 - SN3209; ConvF(6.1, 6.1, 6.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

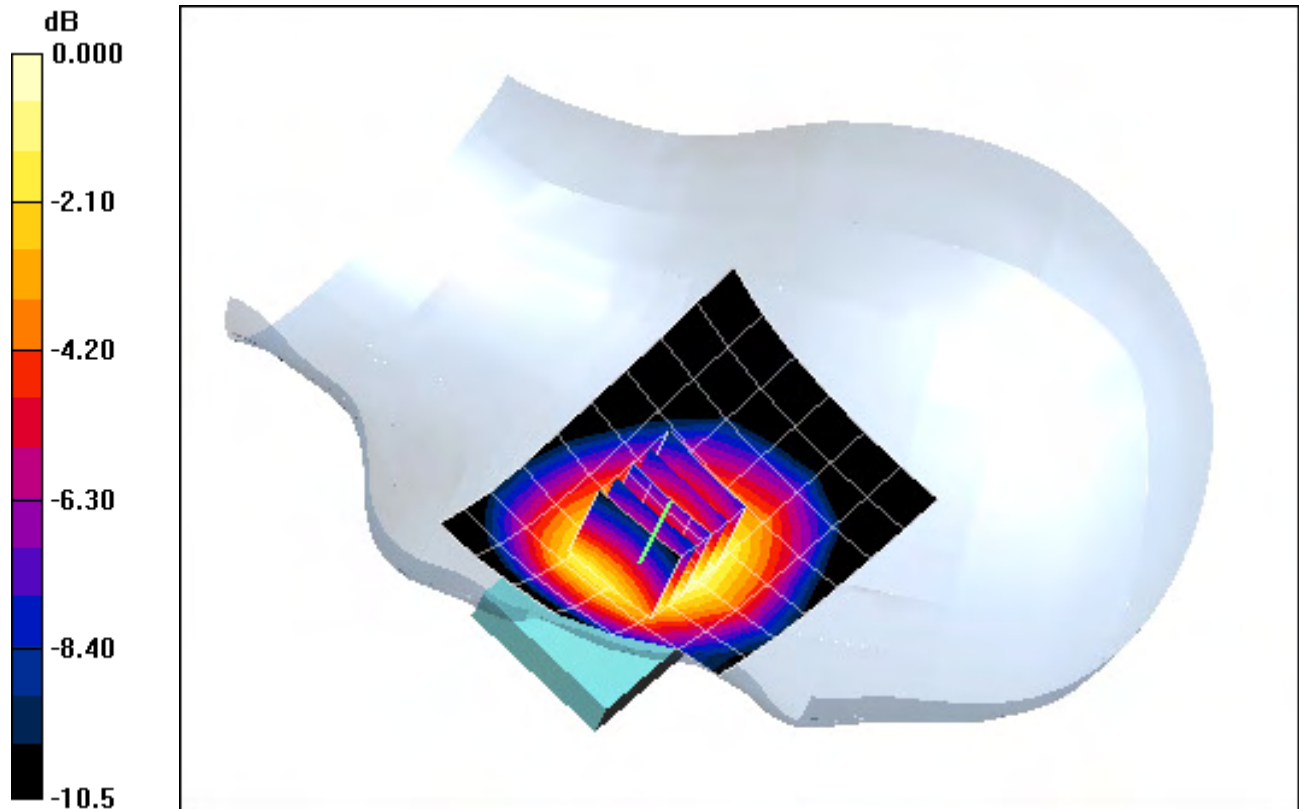
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 10.0 V/m

Peak SAR (extrapolated) = 0.850 W/kg

SAR(1 g) = 0.653 mW/g; SAR(10 g) = 0.475 mW/g



0 dB = 0.723mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

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

Medium: 835 Brain Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.875 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-27-2010; Ambient Temp: 22.5 °C; Tissue Temp: 21.2 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

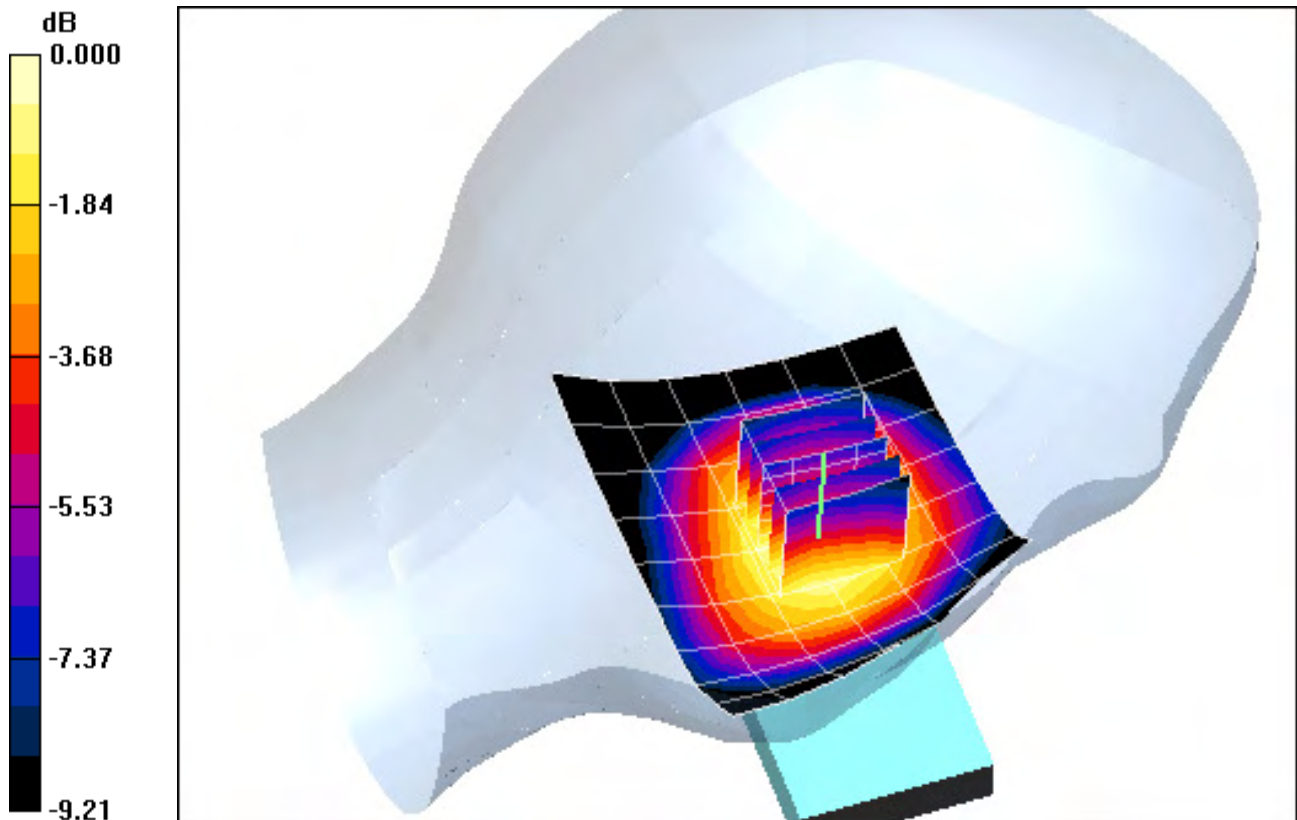
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.8 V/m

Peak SAR (extrapolated) = 0.483 W/kg

SAR(1 g) = 0.375 mW/g; SAR(10 g) = 0.276 mW/g



0 dB = 0.415mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

Communication System: WCDMA1900; Frequency: 1907.6 MHz; Duty Cycle: 1:1
Medium: 1900 Brain Medium parameters used (interpolated):

$f = 1907.6 \text{ MHz}$; $\sigma = 1.46 \text{ mho/m}$; $\epsilon_r = 40$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 02-24-2010; Ambient Temp: 24.3 °C; Tissue Temp: 20.4 °C

Probe: ES3DV3 - SN3209; ConvF(5.1, 5.1, 5.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

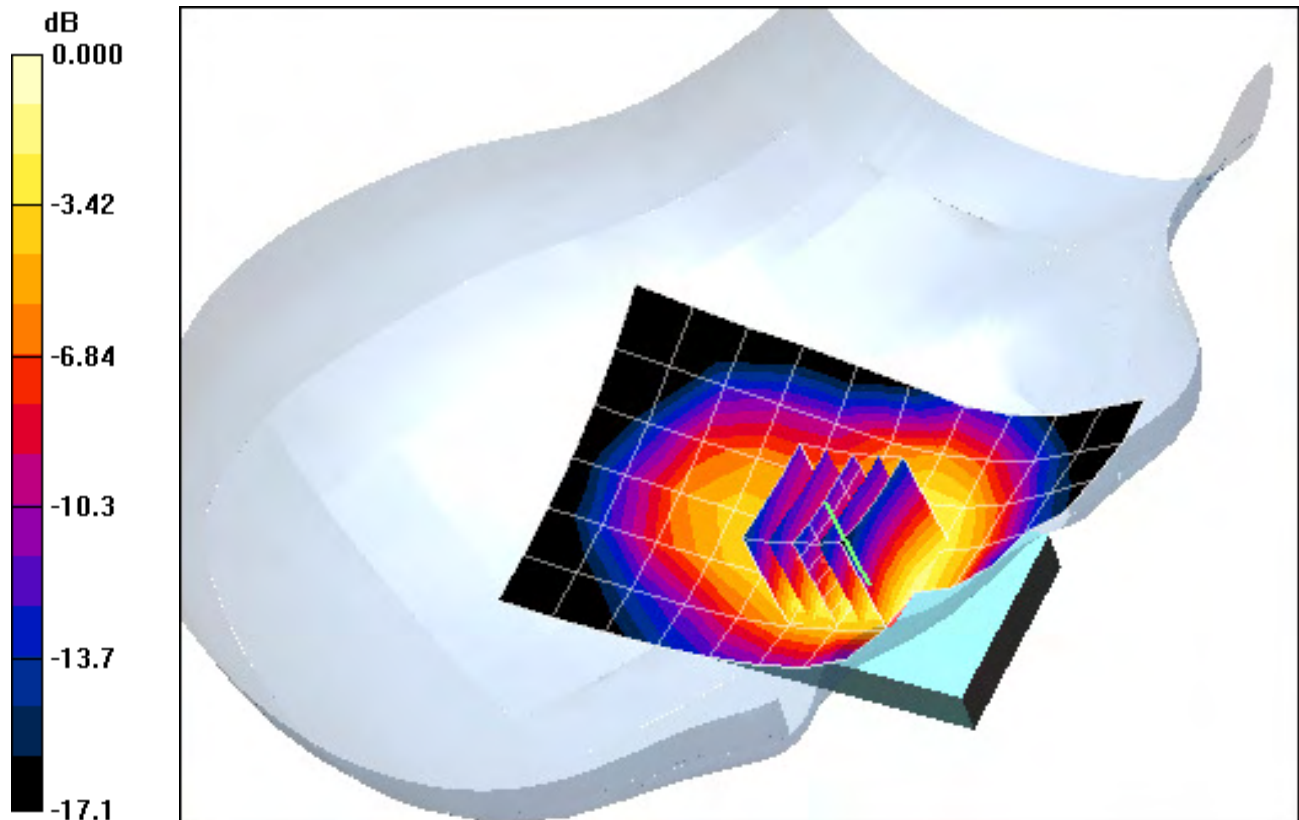
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 27.7 V/m

Peak SAR (extrapolated) = 1.53 W/kg

SAR(1 g) = 0.984 mW/g; SAR(10 g) = 0.595 mW/g



0 dB = 1.18mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

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

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 02-24-2010; Ambient Temp: 24.3 °C; Tissue Temp: 20.4 °C

Probe: ES3DV3 - SN3209; ConvF(5.1, 5.1, 5.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

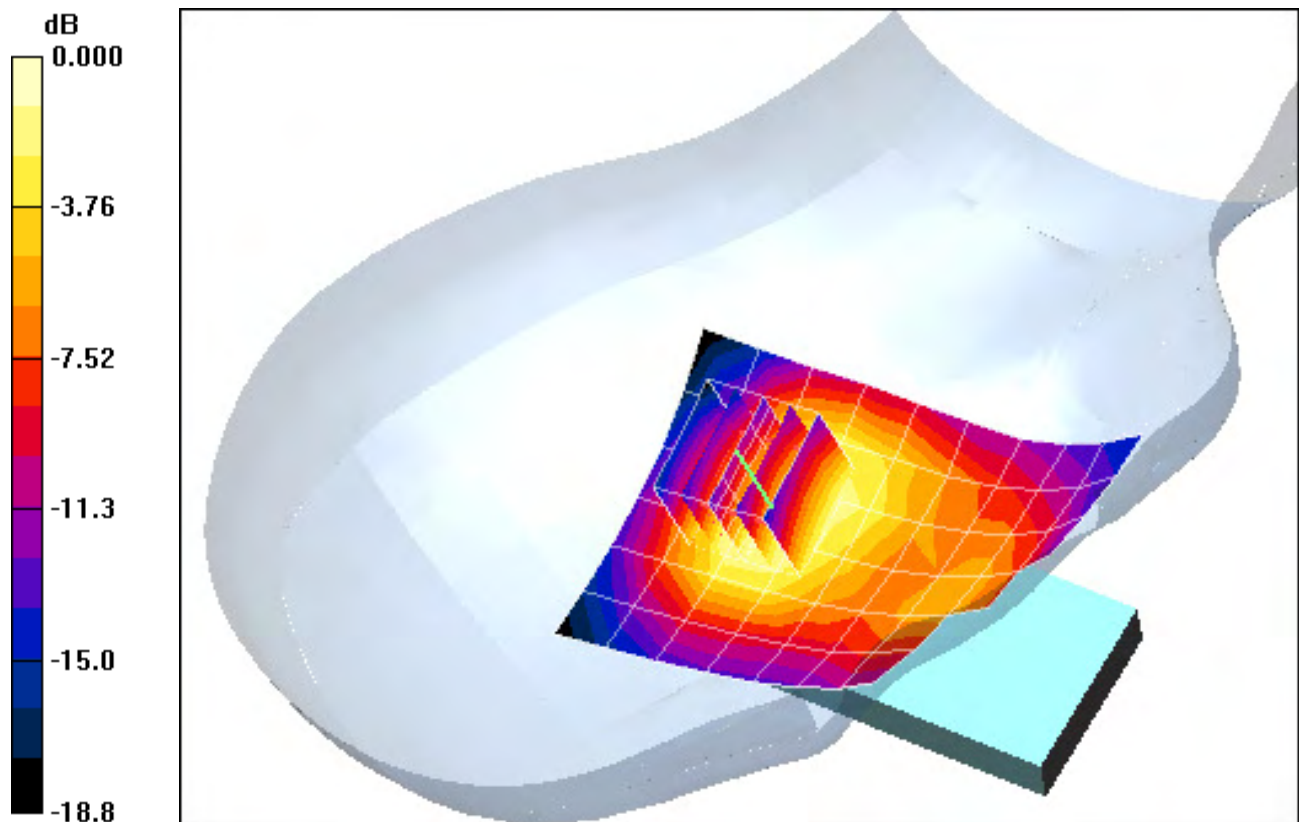
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 19.5 V/m

Peak SAR (extrapolated) = 0.796 W/kg

SAR(1 g) = 0.535 mW/g; SAR(10 g) = 0.332 mW/g



0 dB = 0.616mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

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

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-24-2010; Ambient Temp: 24.3 °C; Tissue Temp: 20.4 °C

Probe: ES3DV3 - SN3209; ConvF(5.1, 5.1, 5.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

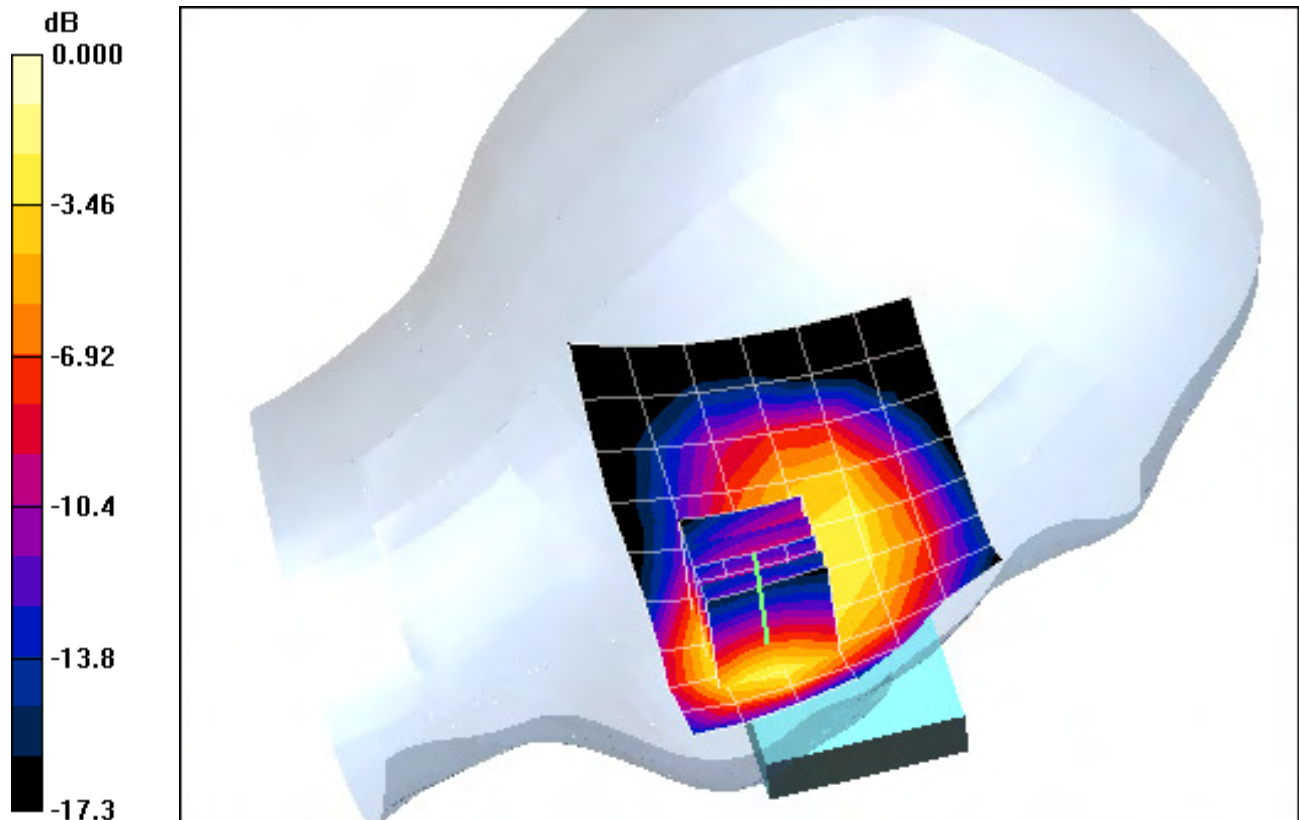
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 31.5 V/m

Peak SAR (extrapolated) = 2.04 W/kg

SAR(1 g) = 1.28 mW/g; SAR(10 g) = 0.740 mW/g



0 dB = 1.55mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

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

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-24-2010; Ambient Temp: 24.3 °C; Tissue Temp: 20.4 °C

Probe: ES3DV3 - SN3209; ConvF(5.1, 5.1, 5.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

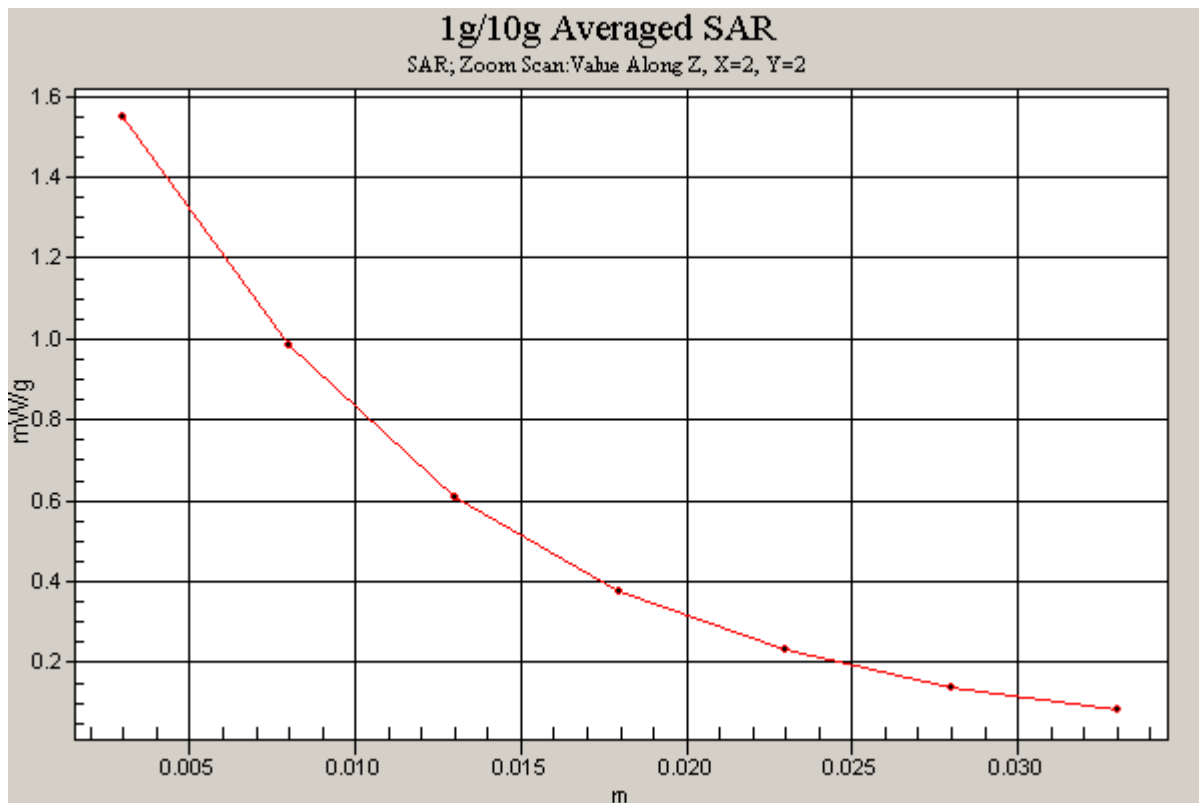
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 31.5 V/m

Peak SAR (extrapolated) = 2.04 W/kg

SAR(1 g) = 1.28 mW/g; SAR(10 g) = 0.740 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

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

Medium: 1900 Brain Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 40.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-24-2010; Ambient Temp: 24.3 °C; Tissue Temp: 20.4 °C

Probe: ES3DV3 - SN3209; ConvF(5.1, 5.1, 5.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

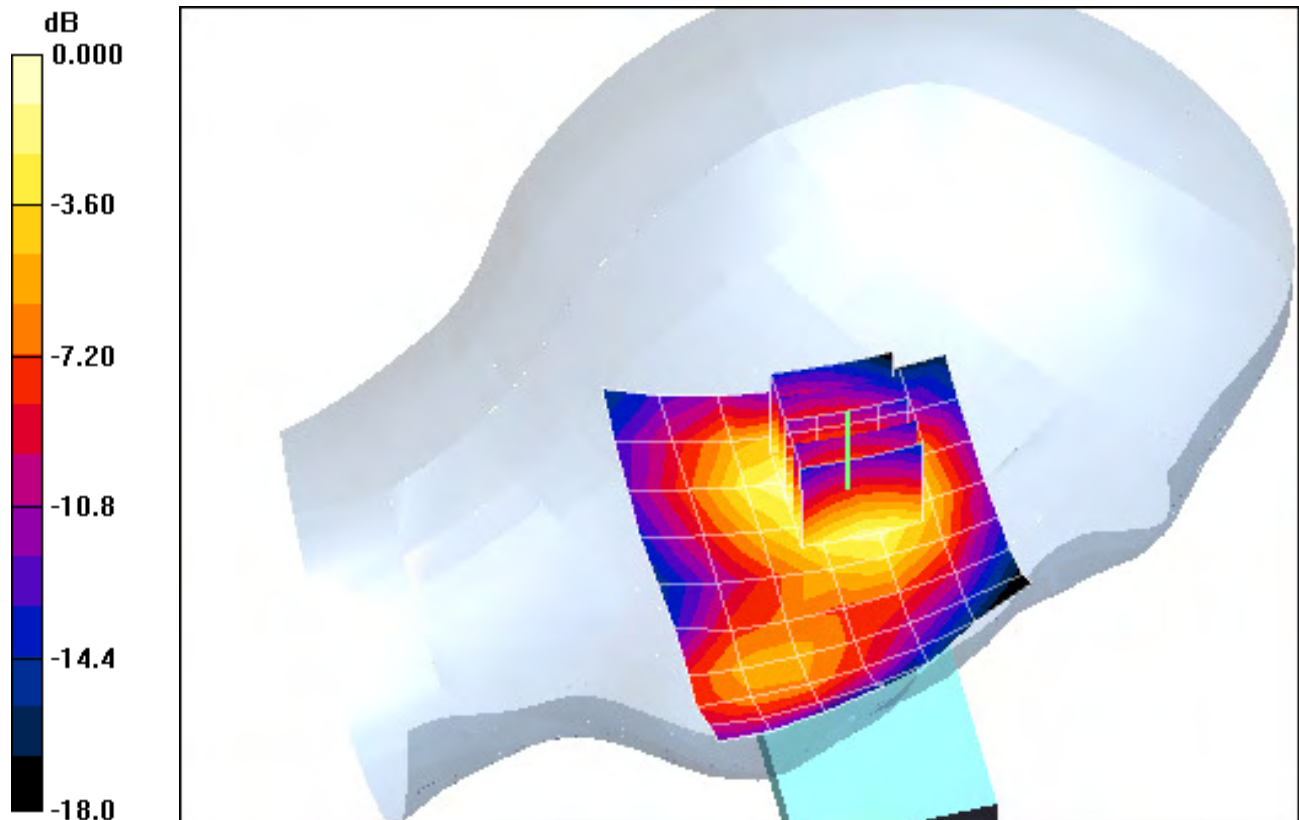
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.8 V/m

Peak SAR (extrapolated) = 0.948 W/kg

SAR(1 g) = 0.618 mW/g; SAR(10 g) = 0.380 mW/g



0 dB = 0.724mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWM3

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Brain Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.75 \text{ mho/m}$; $\epsilon_r = 39.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 03-15-2010; Ambient Temp: 23.1 °C; Tissue Temp: 22.0 °C

Probe: EX3DV4 - SN3550; ConvF(6.21, 6.21, 6.21); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Right Head, Touch, Ch 01, 1 Mbps

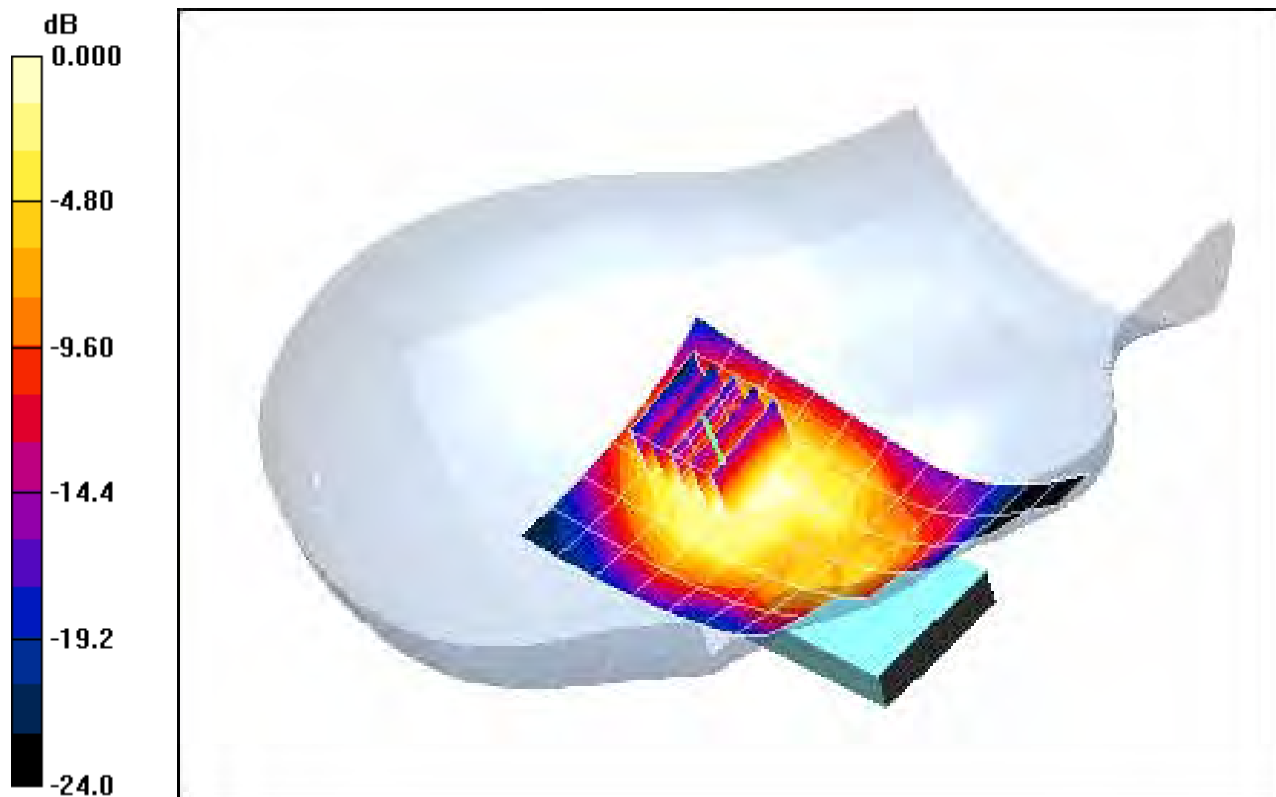
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.8 V/m

Peak SAR (extrapolated) = 0.513 W/kg

SAR(1 g) = 0.276 mW/g; SAR(10 g) = 0.152 mW/g



0 dB = 0.334mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWM3

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Brain Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.75 \text{ mho/m}$; $\epsilon_r = 39.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 03-15-2010; Ambient Temp: 23.1 °C; Tissue Temp: 22.0 °C

Probe: EX3DV4 - SN3550; ConvF(6.21, 6.21, 6.21); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Right Head, Tilt, Ch 01, 1 Mbps

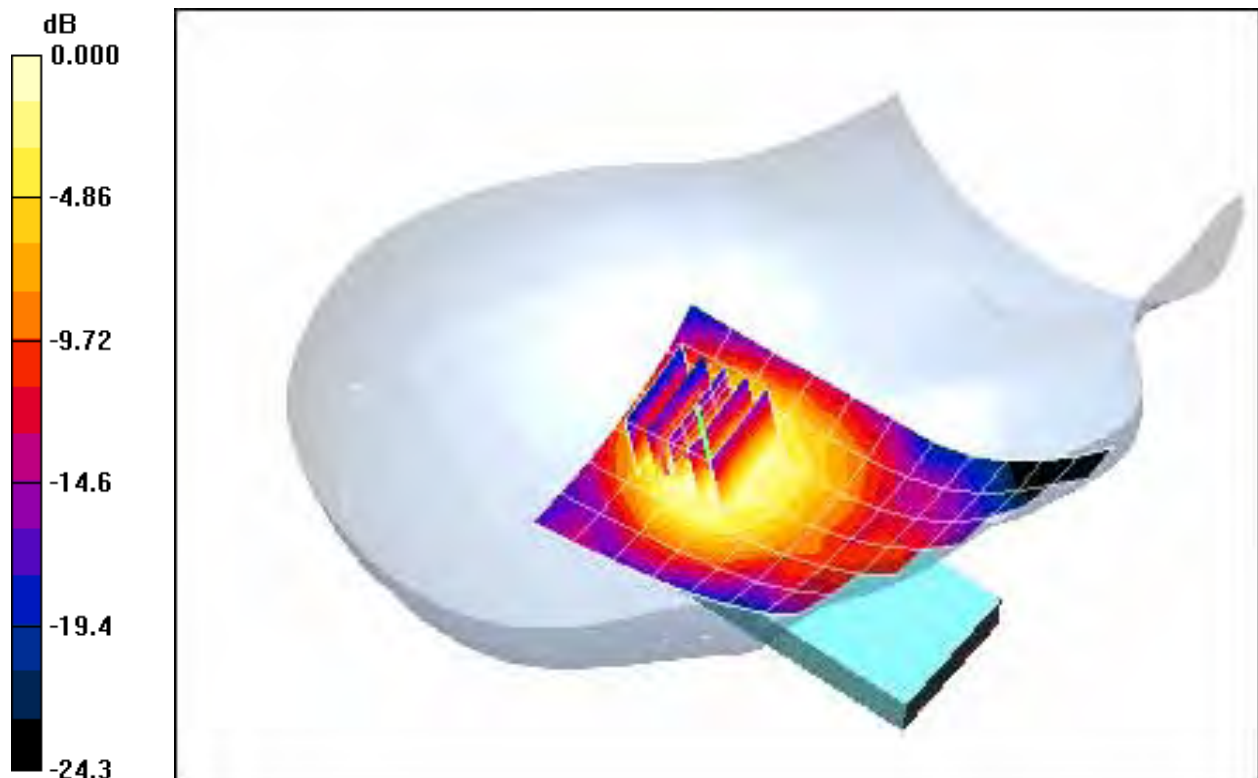
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 11.1 V/m

Peak SAR (extrapolated) = 0.417 W/kg

SAR(1 g) = 0.222 mW/g; SAR(10 g) = 0.126 mW/g



0 dB = 0.267mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWM3

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Brain Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.75 \text{ mho/m}$; $\epsilon_r = 39.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-15-2010; Ambient Temp: 23.1 °C; Tissue Temp: 22.0 °C

Probe: EX3DV4 - SN3550; ConvF(6.21, 6.21, 6.21); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Left Head, Touch, Ch 01, 1 Mbps

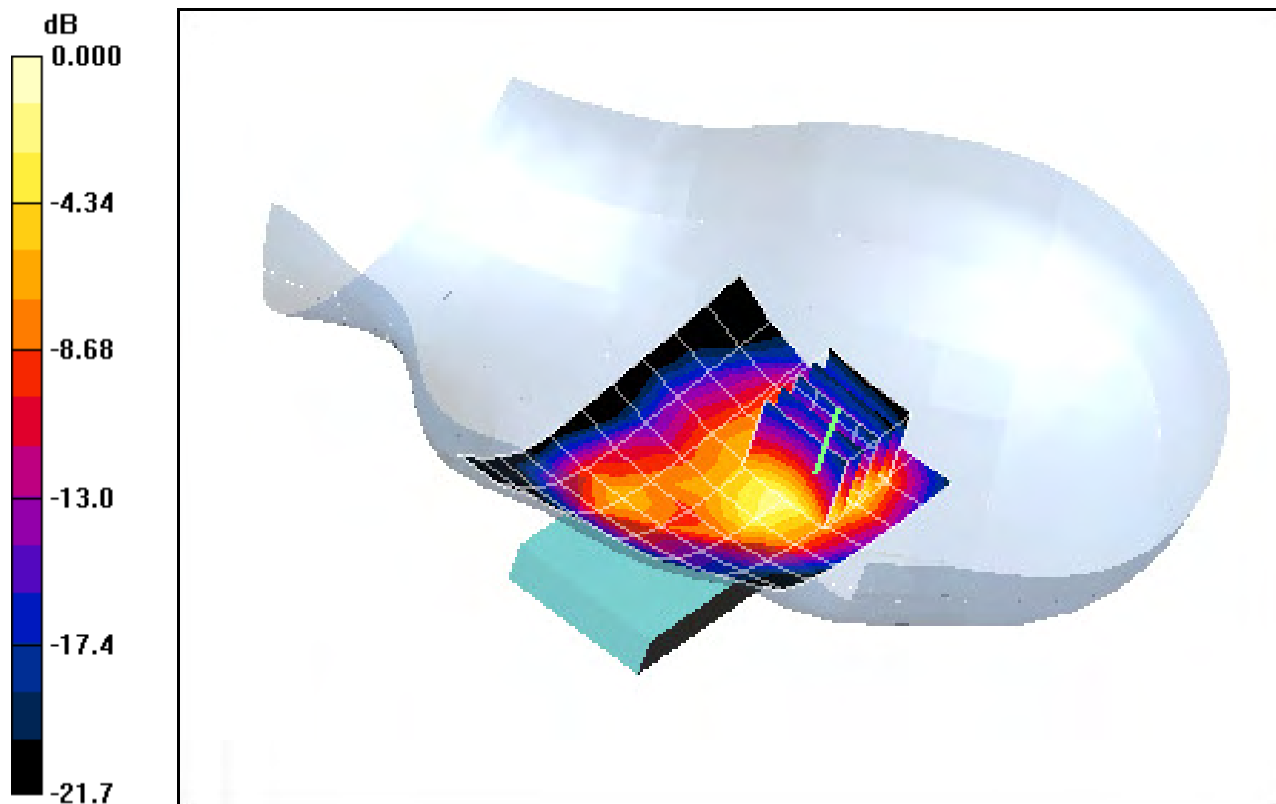
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.7 V/m

Peak SAR (extrapolated) = 1.01 W/kg

SAR(1 g) = 0.482 mW/g; SAR(10 g) = 0.231 mW/g



0 dB = 0.620mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWM3

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Brain Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.75 \text{ mho/m}$; $\epsilon_r = 39.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-15-2010; Ambient Temp: 23.1 °C; Tissue Temp: 22.0 °C

Probe: EX3DV4 - SN3550; ConvF(6.21, 6.21, 6.21); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Left Head, Touch, Ch 01, 1 Mbps

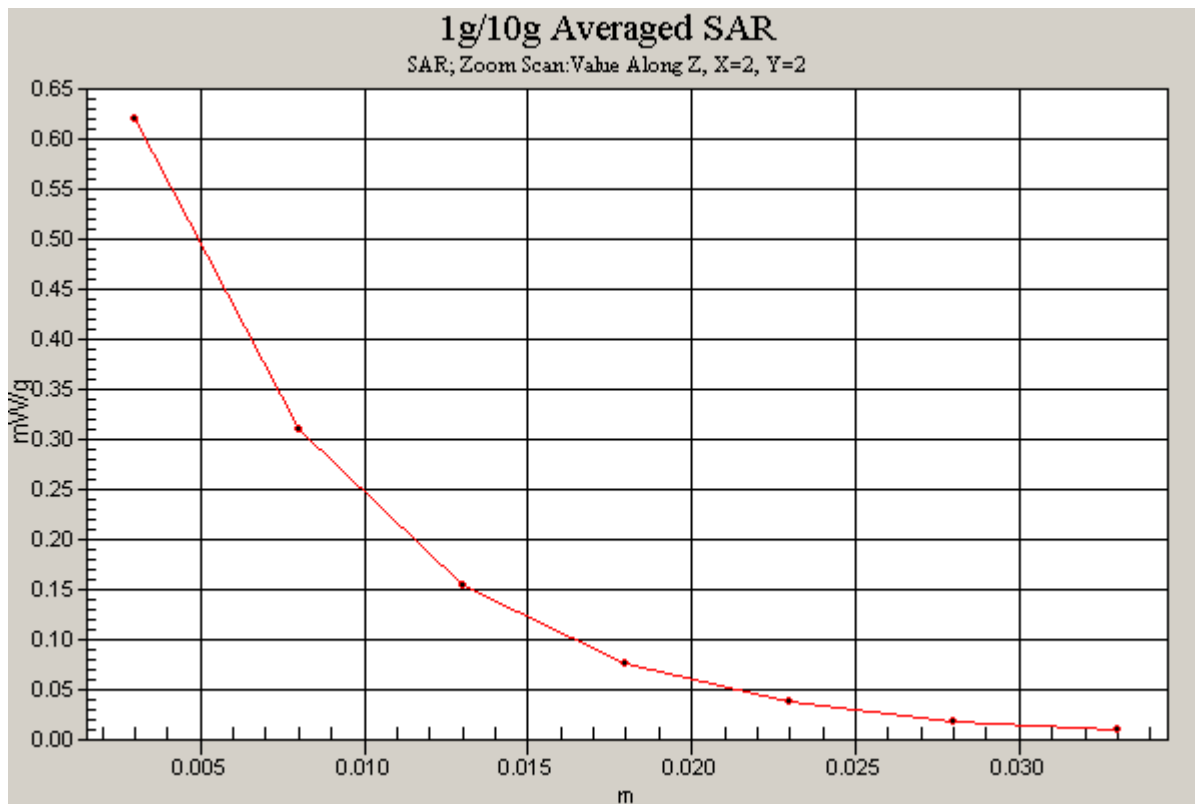
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 17.7 V/m

Peak SAR (extrapolated) = 1.01 W/kg

SAR(1 g) = 0.482 mW/g; SAR(10 g) = 0.231 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWM3

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Brain Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.75 \text{ mho/m}$; $\epsilon_r = 39.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-15-2010; Ambient Temp: 23.1 °C; Tissue Temp: 22.0 °C

Probe: EX3DV4 - SN3550; ConvF(6.21, 6.21, 6.21); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Left Head, Tilt, Ch 01, 1 Mbps

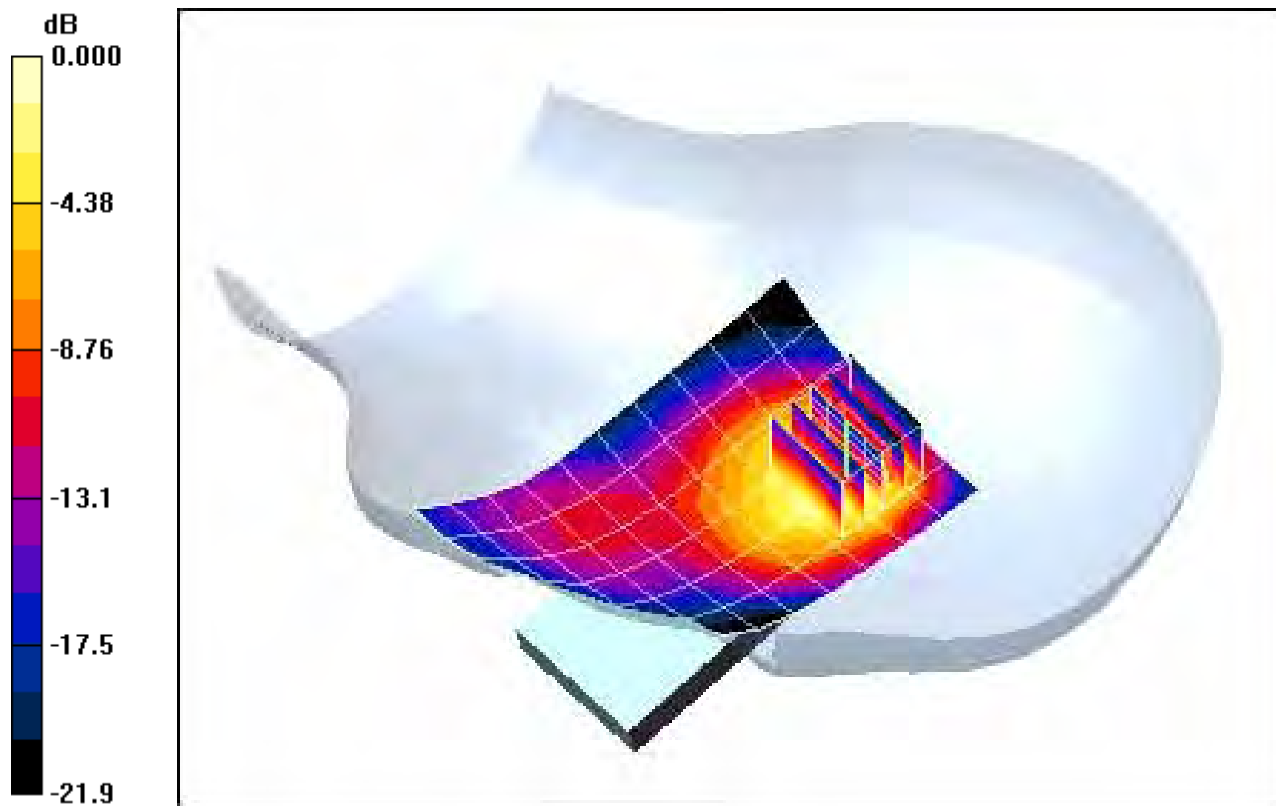
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 14.3 V/m

Peak SAR (extrapolated) = 0.731 W/kg

SAR(1 g) = 0.333 mW/g; SAR(10 g) = 0.166 mW/g



0 dB = 0.415mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

Communication System: GSM850 GPRS; 2 Tx slots; Frequency: 848.8 MHz; Duty Cycle: 1:4.15
Medium: 835 Muscle Medium parameters used (interpolated):

$f = 848.8 \text{ MHz}$; $\sigma = 1.001 \text{ mho/m}$; $\epsilon_r = 54.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2010; Ambient Temp: 23.8 °C; Tissue Temp: 22.5 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

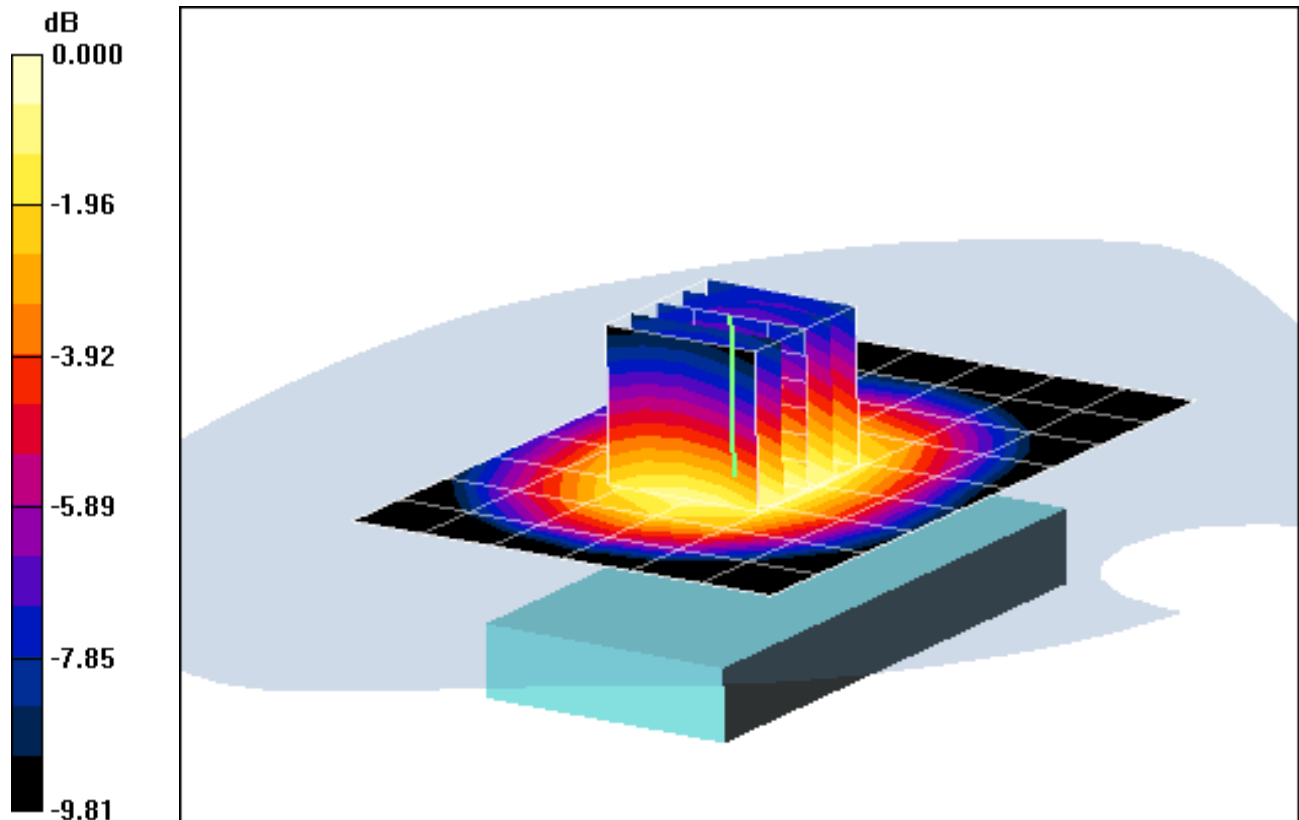
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 32.0 V/m

Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.966 mW/g; SAR(10 g) = 0.697 mW/g



0 dB = 1.09mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

Communication System: GSM850 GPRS; 2 Tx slots; Frequency: 848.8 MHz; Duty Cycle: 1:4.15
Medium: 835 Muscle Medium parameters used (interpolated):

$$f = 848.8 \text{ MHz}; \sigma = 1.016 \text{ mho/m}; \epsilon_r = 54.7; \rho = 1000 \text{ kg/m}^3$$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2010; Ambient Temp: 23.8 °C; Tissue Temp: 22.5 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

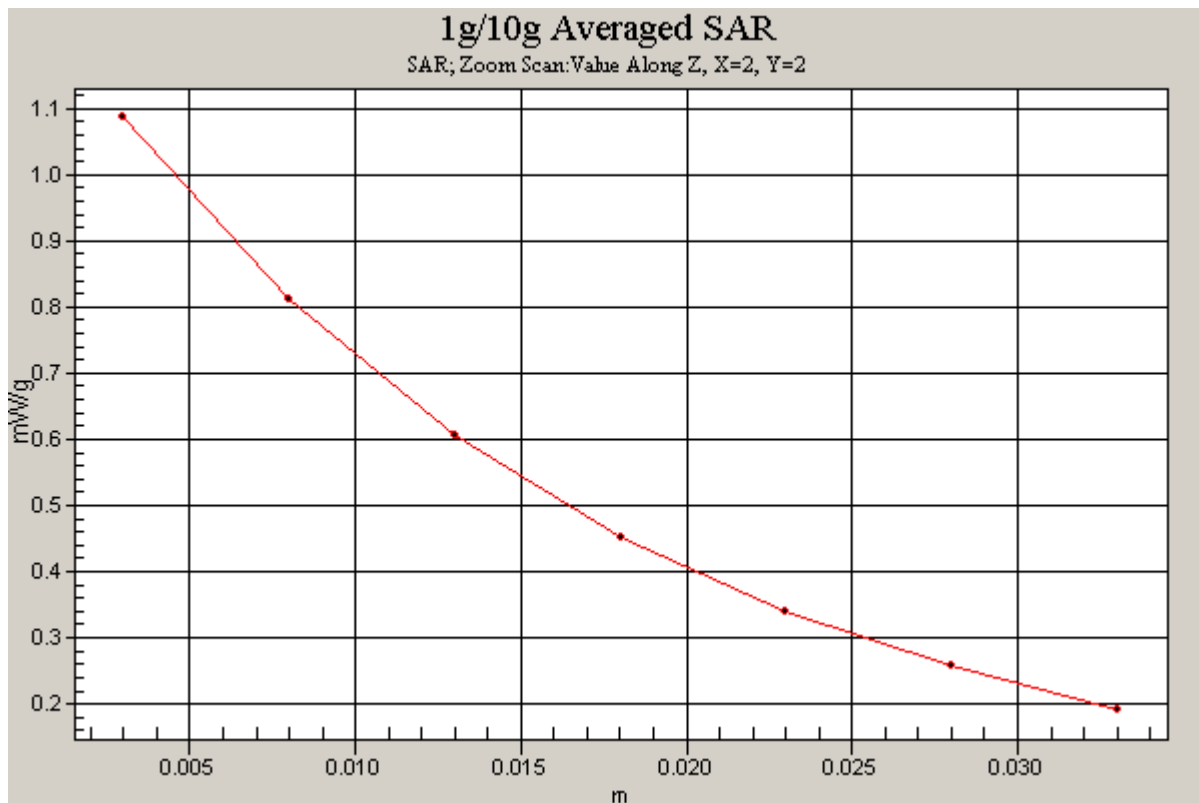
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 32.0 V/m

Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.966 mW/g; SAR(10 g) = 0.697 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium: 835 Muscle Medium parameters used (interpolated):

$f = 824.2 \text{ MHz}$; $\sigma = 1.001 \text{ mho/m}$; $\epsilon_r = 54.76$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2010; Ambient Temp: 23.8 °C; Tissue Temp: 22.5 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: GSM 850, Body SAR, Back side, Low.ch

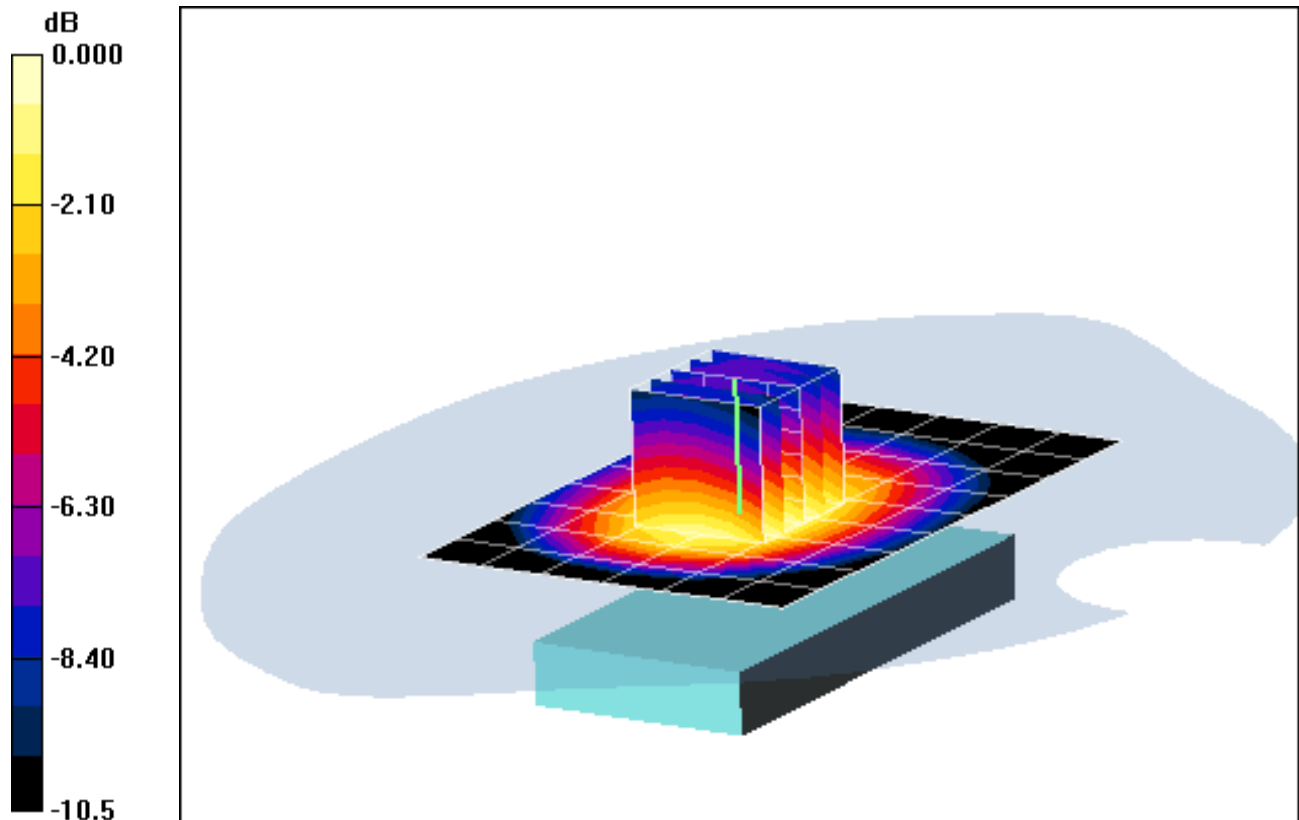
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 25.8 V/m

Peak SAR (extrapolated) = 0.851 W/kg

SAR(1 g) = 0.626 mW/g; SAR(10 g) = 0.445 mW/g



0 dB = 0.703mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1909.8 MHz; Duty Cycle: 1:4.15

Medium: 1900 Muscle Medium parameters used:

$f = 1910 \text{ MHz}$; $\sigma = 1.59 \text{ mho/m}$; $\epsilon_r = 52.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2010; Ambient Temp: 23.7 °C; Tissue Temp: 22.6 °C

Probe: ES3DV3 - SN3209; ConvF(4.55, 4.55, 4.55); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

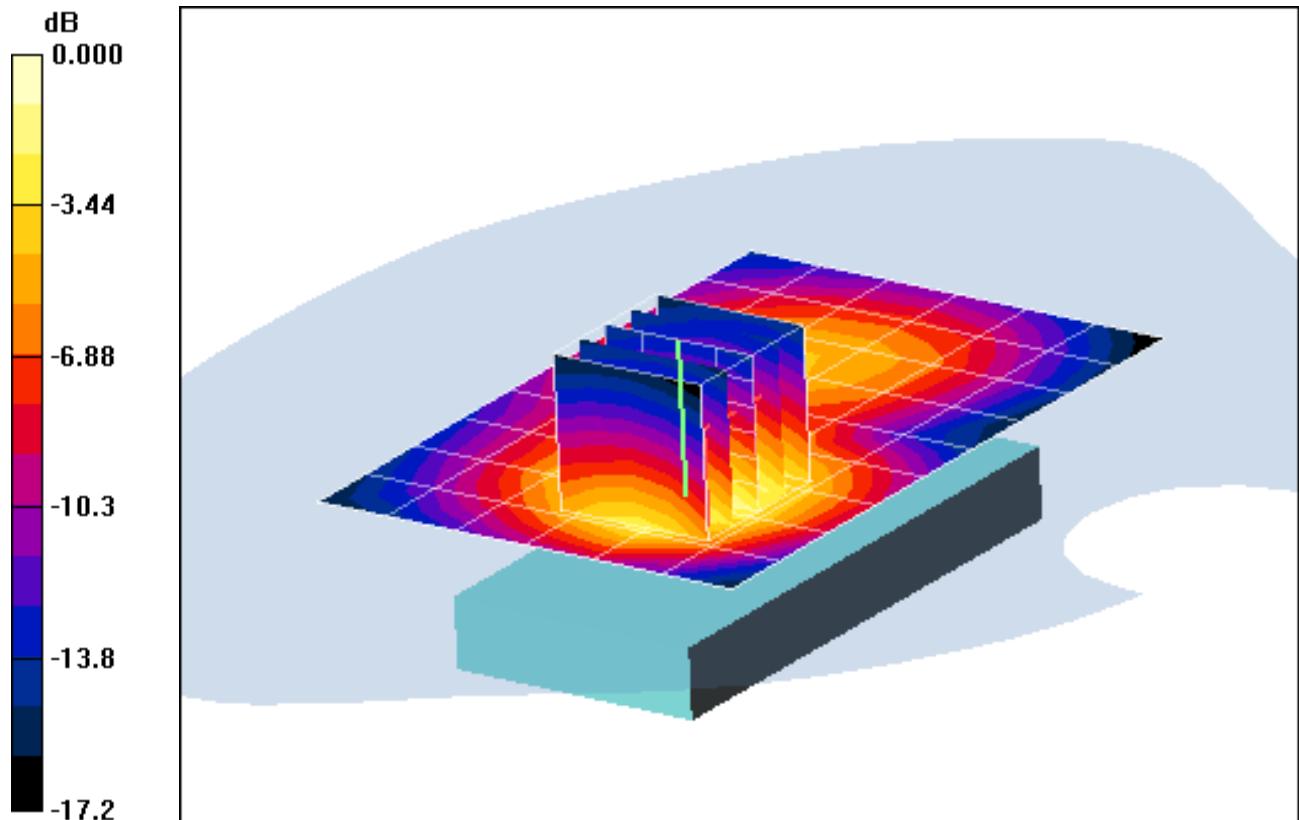
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 19.4 V/m

Peak SAR (extrapolated) = 0.901 W/kg

SAR(1 g) = 0.541 mW/g; SAR(10 g) = 0.306 mW/g



0 dB = 0.659mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1909.8 MHz; Duty Cycle: 1:4.15

Medium: 1900 Muscle Medium parameters used:

$f = 1910 \text{ MHz}$; $\sigma = 1.59 \text{ mho/m}$; $\epsilon_r = 52.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2010; Ambient Temp: 23.7 °C; Tissue Temp: 22.6 °C

Probe: ES3DV3 - SN3209; ConvF(4.55, 4.55, 4.55); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

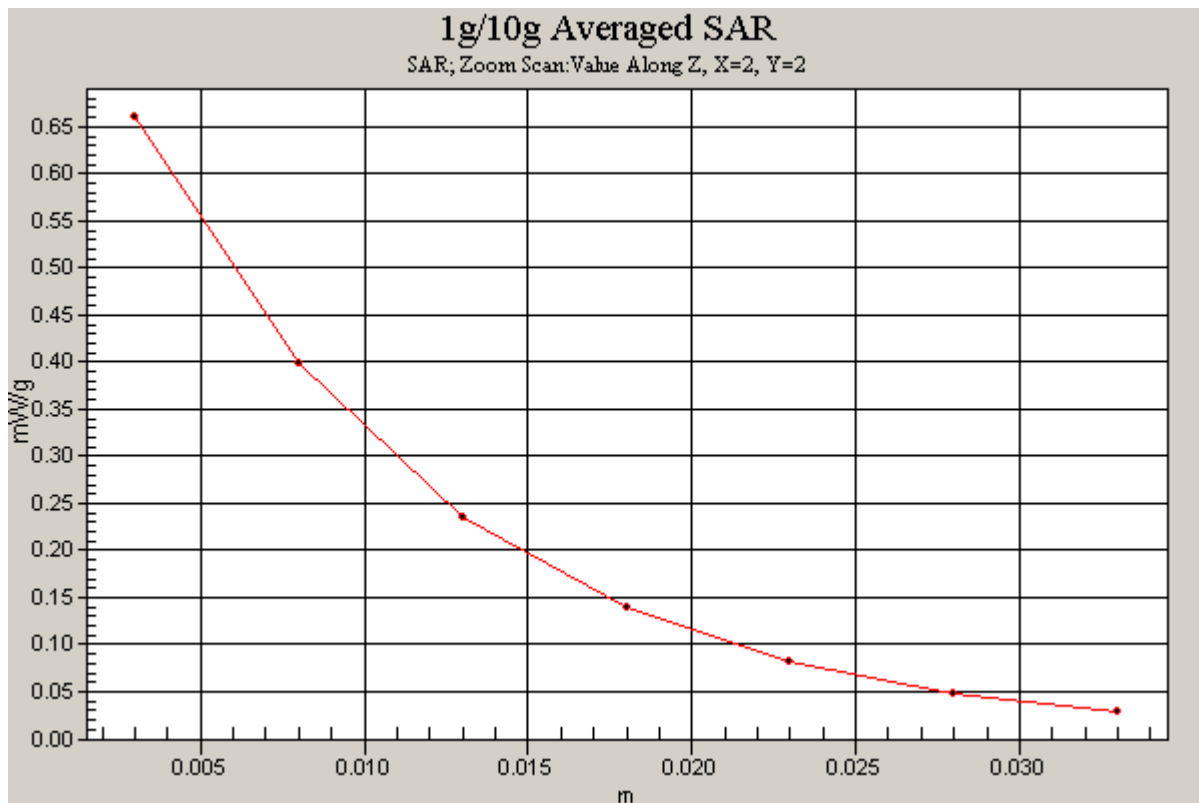
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 19.4 V/m

Peak SAR (extrapolated) = 0.901 W/kg

SAR(1 g) = 0.541 mW/g; SAR(10 g) = 0.306 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and UMTS/HSPA II,V Phone with Bluetooth and WLAN; Serial: BX9019FWUN

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

Medium: 1900 Muscle Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.56 \text{ mho/m}$; $\epsilon_r = 52.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2010; Ambient Temp: 23.7 °C; Tissue Temp: 22.6 °C

Probe: ES3DV3 - SN3209; ConvF(4.55, 4.55, 4.55); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

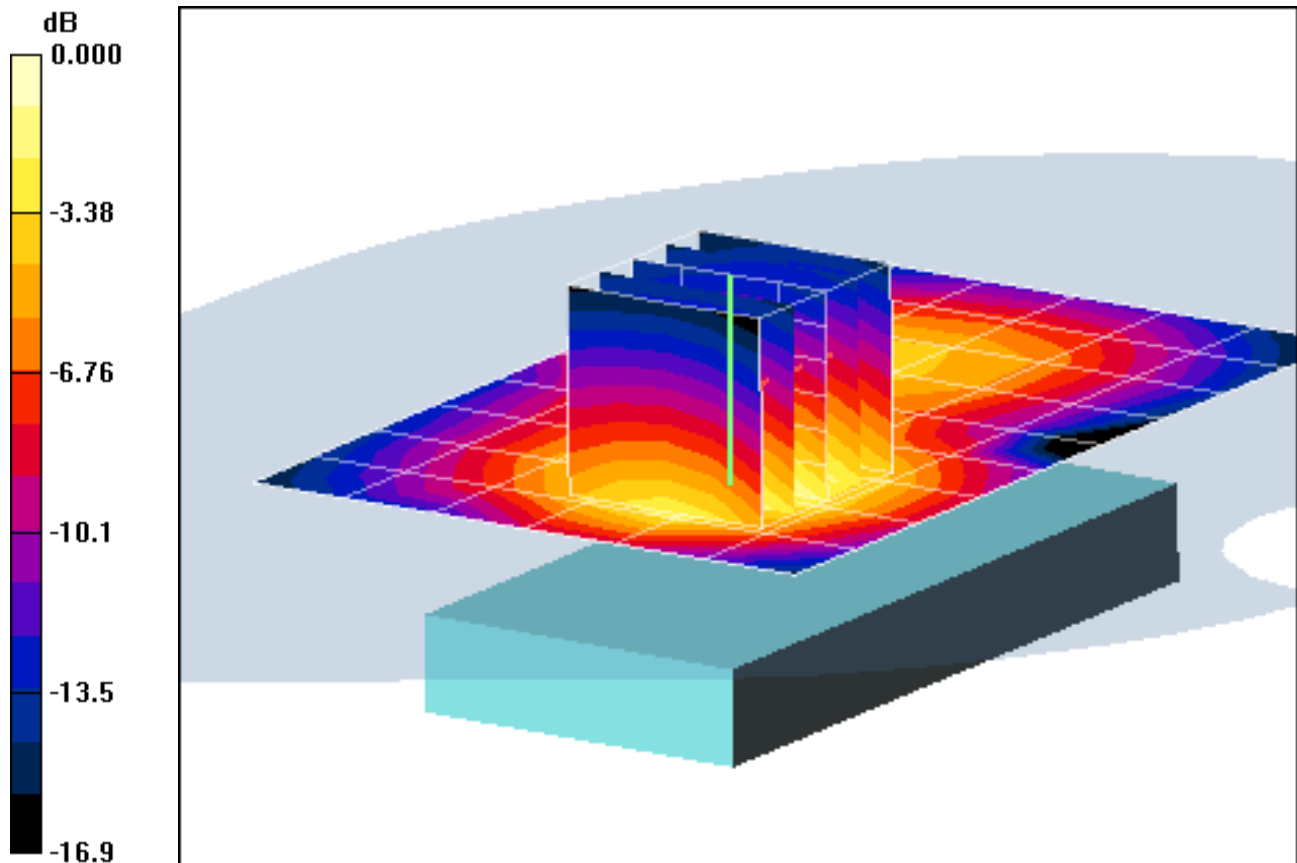
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 17.0 V/m

Peak SAR (extrapolated) = 0.675 W/kg

SAR(1 g) = 0.404 mW/g; SAR(10 g) = 0.230 mW/g



0 dB = 0.494mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019JEAK

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

Medium: 835 Muscle Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.003 \text{ mho/m}$; $\epsilon = 54.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2010; Ambient Temp: 23.8 °C; Tissue Temp: 22.5 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

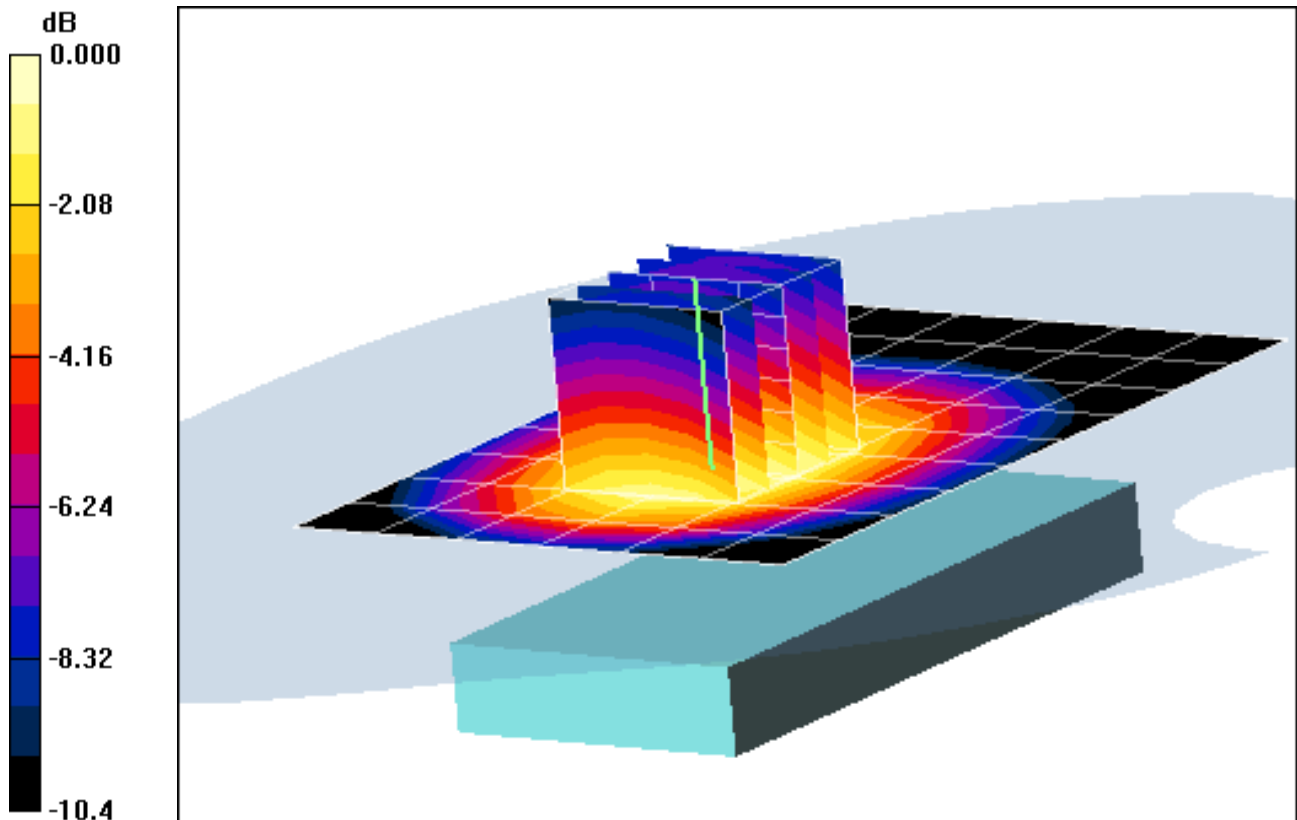
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 27.8 V/m

Peak SAR (extrapolated) = 0.981 W/kg

SAR(1 g) = 0.727 mW/g; SAR(10 g) = 0.519 mW/g



0 dB = 0.820mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWUN

Communication System: WCDMA1900; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: 1900 Muscle Medium parameters used (interpolated):

$f = 1852.4 \text{ MHz}$; $\sigma = 1.53 \text{ mho/m}$; $\epsilon_r = 52.96$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2010; Ambient Temp: 23.7 °C; Tissue Temp: 22.6 °C

Probe: ES3DV3 - SN3209; ConvF(4.55, 4.55, 4.55); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

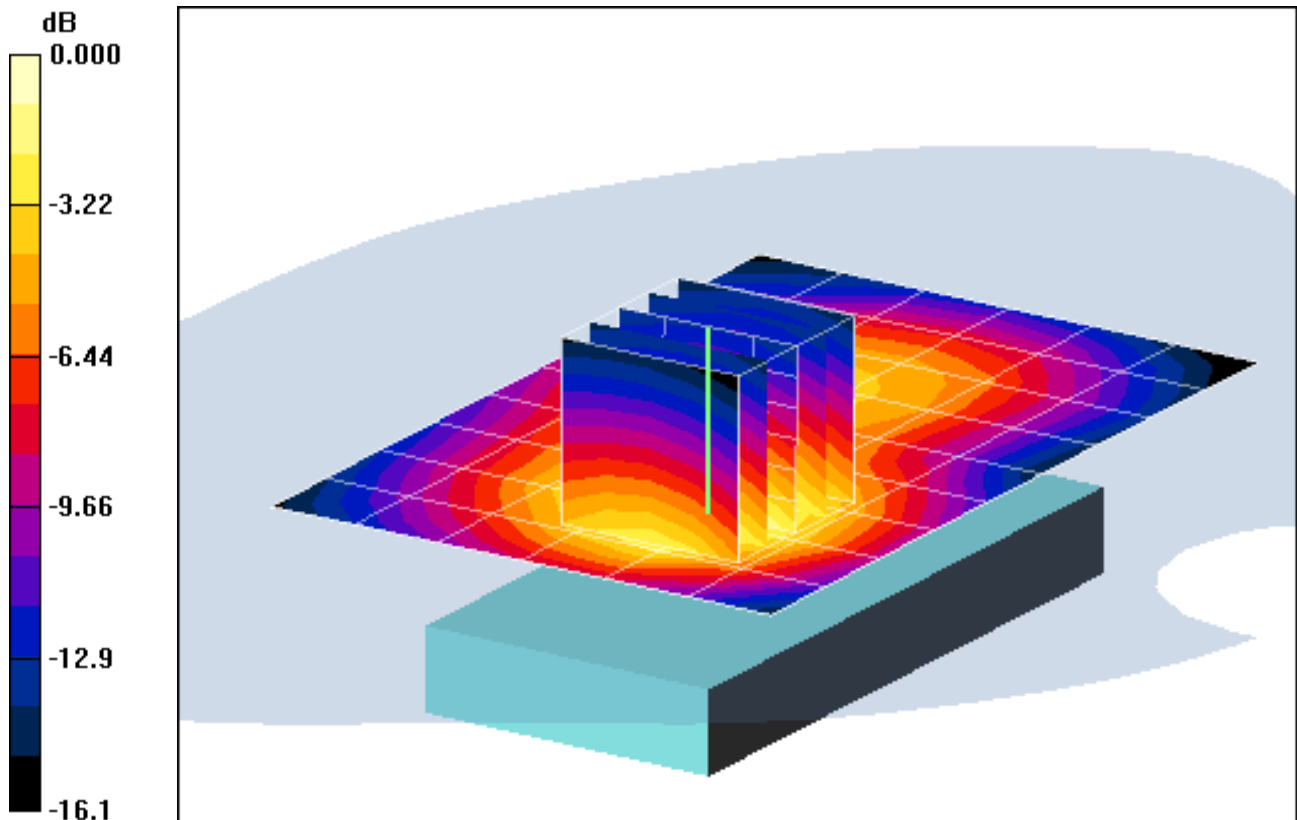
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 19.7 V/m

Peak SAR (extrapolated) = 0.873 W/kg

SAR(1 g) = 0.536 mW/g; SAR(10 g) = 0.312 mW/g



0 dB = 0.652mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWM3

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Muscle Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.86 \text{ mho/m}$; $\epsilon_r = 52.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-15-2010; Ambient Temp: 23.4 °C; Tissue Temp: 22.1 °C

Probe: EX3DV4 - SN3550; ConvF(6.4, 6.4, 6.4); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Body SAR, Ch.01, 1Mbps, Back Side

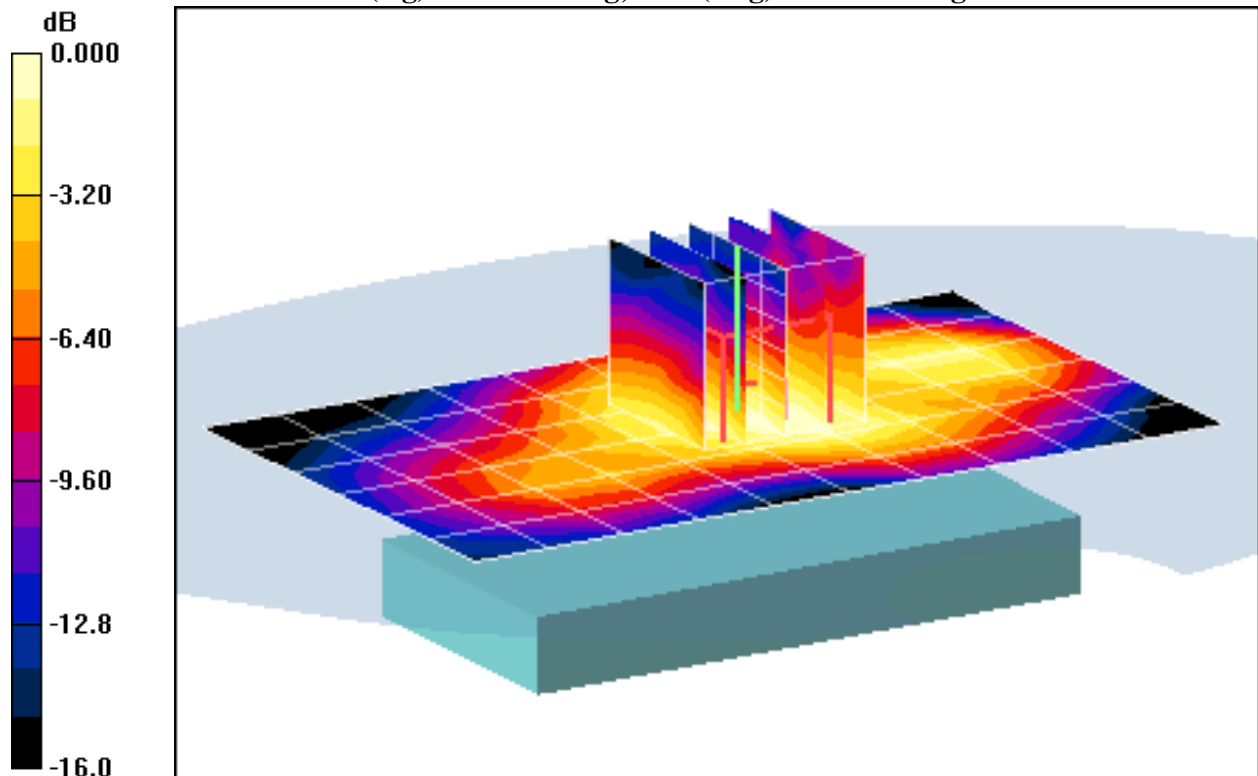
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 7.39 V/m

Peak SAR (extrapolated) = 0.166 W/kg

SAR(1 g) = 0.101 mW/g; SAR(10 g) = 0.061 mW/g



0 dB = 0.120mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PY7A3880076; Type: 850/1900 GSM/GPRS/EDGE and II/V UMTS/HSPA Phone with Bluetooth and WLAN; Serial: BX9019FWM3

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Muscle Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.86 \text{ mho/m}$; $\epsilon_r = 52.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-15-2010; Ambient Temp: 23.4°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN3550; ConvF(6.4, 6.4, 6.4); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Body SAR, Ch.01, 1 Mbps, Back Side

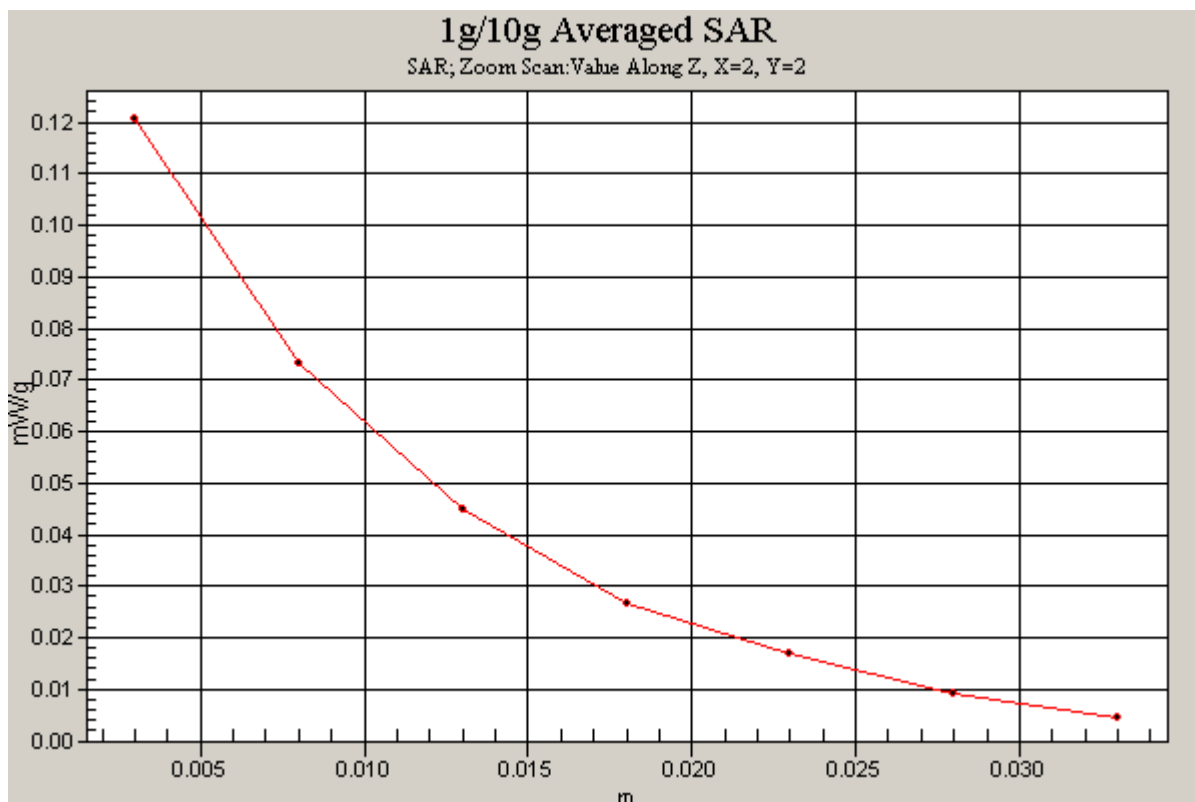
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 7.39 V/m

Peak SAR (extrapolated) = 0.166 W/kg

SAR(1 g) = 0.101 mW/g; SAR(10 g) = 0.061 mW/g



APPENDIX B: DIPOLE VALIDATION

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Brain Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.46 \text{ mho/m}$; $\epsilon_r = 40.0$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-24-2010; Ambient Temp: 24.3 °C; Tissue Temp: 20.4 °C

Probe: ES3DV3 - SN3209; ConvF(5.1, 5.1, 5.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

1900MHz Dipole Validation

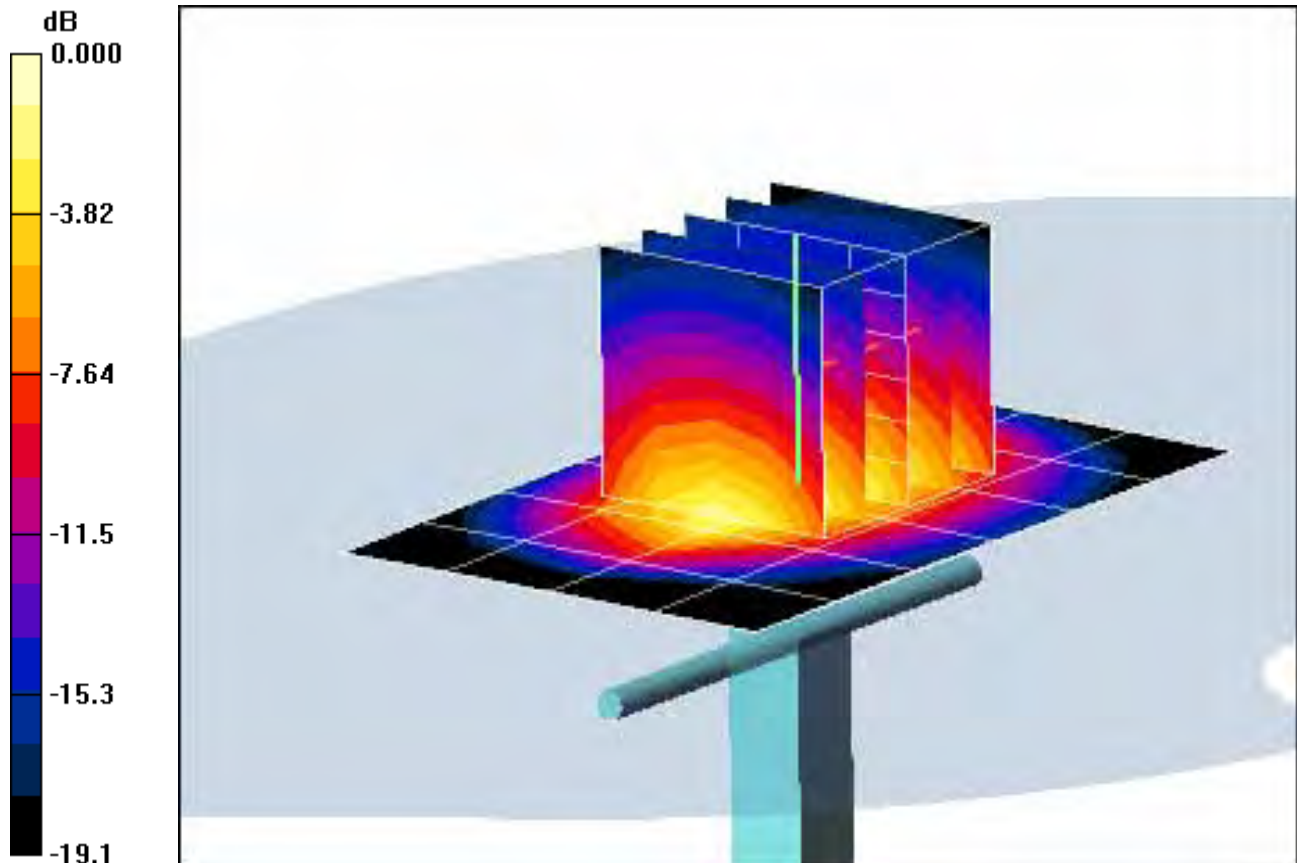
Area Scan (5x7x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Input Power = 20.00 dBm (100 mW)

SAR(1 g) = 4.08 mW/g; SAR(10 g) = 2.08 mW/g

Deviation = 2.26 %



0 dB = 5.21mW/g

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Muscle Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.58 \text{ mho/m}$; $\epsilon_r = 52.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-25-2010; Ambient Temp: 23.7 °C; Tissue Temp: 22.6 °C

Probe: ES3DV3 - SN3209; ConvF(4.55, 4.55, 4.55); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

1900MHz Dipole Validation

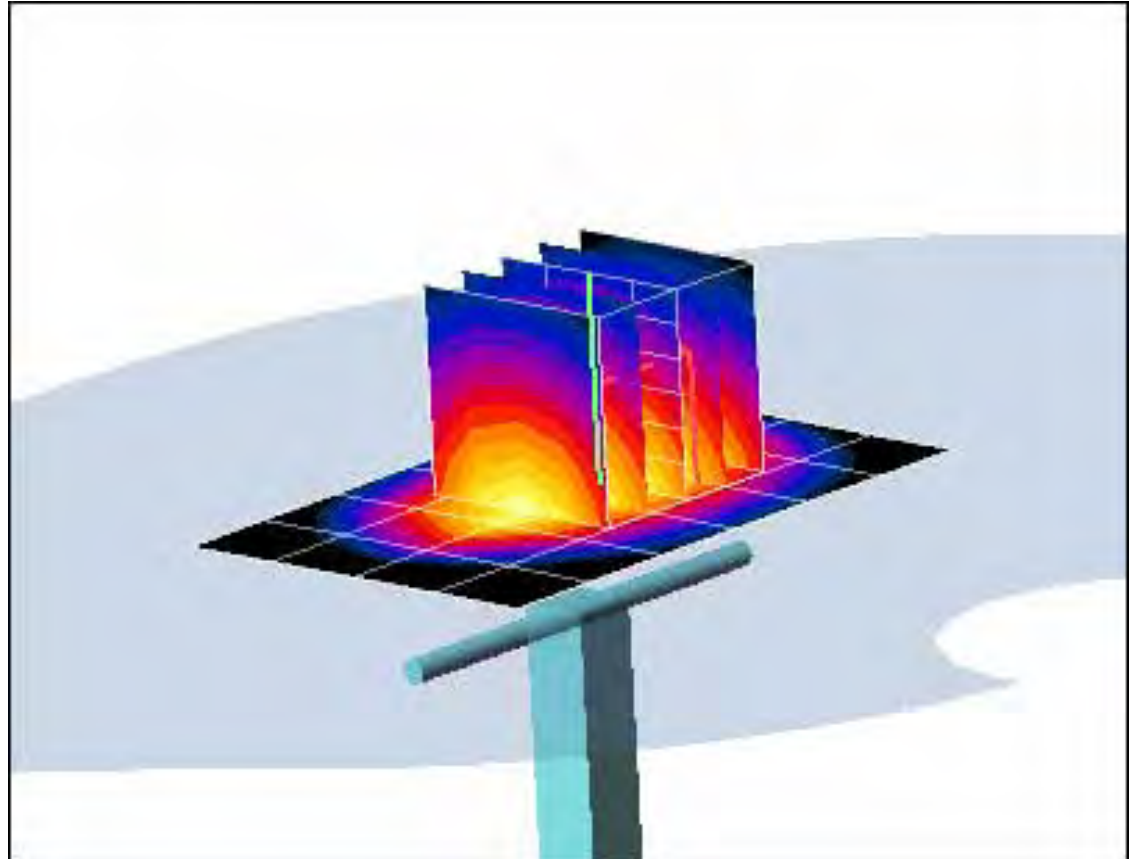
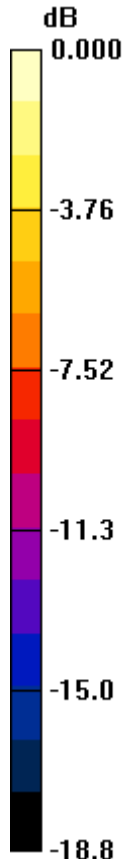
Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm

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

Input Power = 20.00 dBm (100 mW)

SAR(1 g) = 4.28 mW/g; SAR(10 g) = 2.19 mW/g

Deviation = 3.13 %



0 dB = 5.42mW/g

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Muscle Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 1.001 \text{ mho/m}$; $\epsilon = 54.75$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2010; Ambient Temp: 23.8 °C; Tissue Temp: 22.5 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

835MHz Dipole Validation

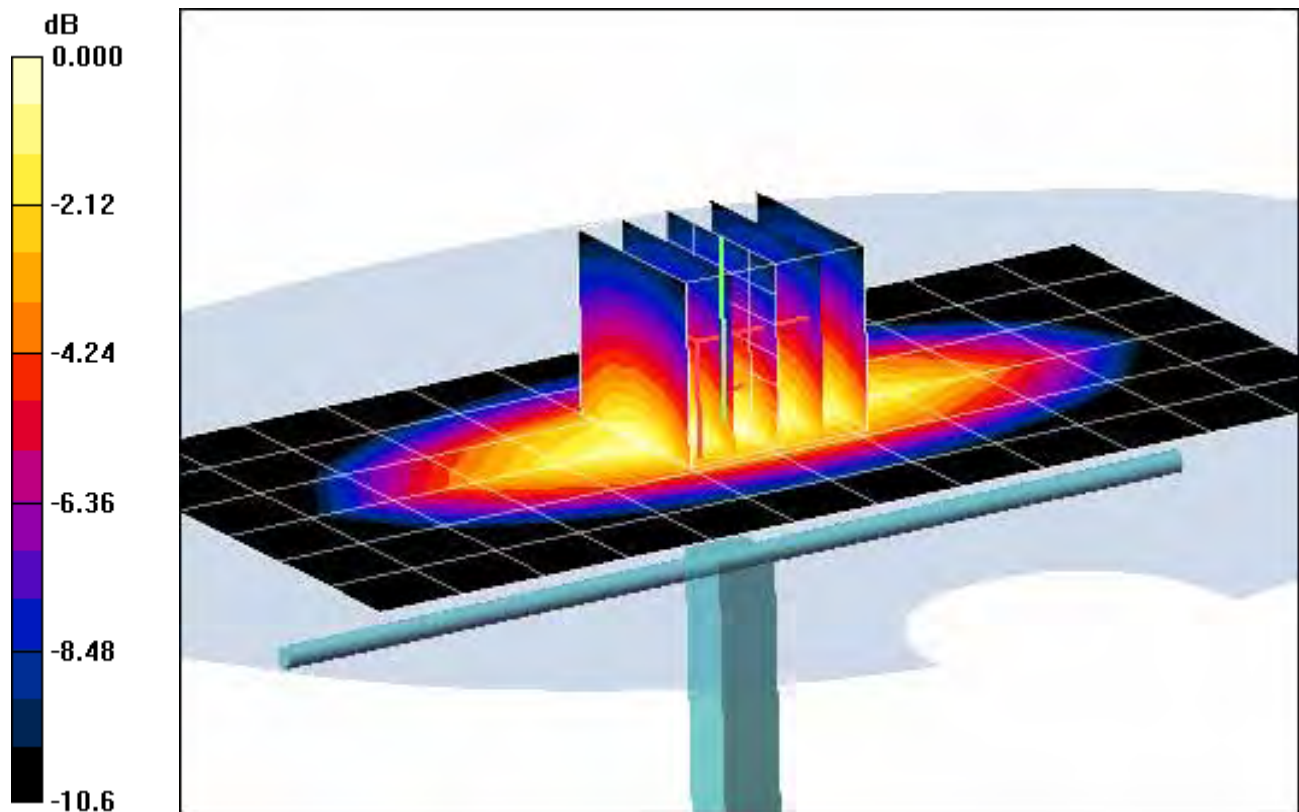
Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Input Power = 18 dBm (63 mW)

SAR(1 g) = 0.653 mW/g; SAR(10 g) = 0.427 mW/g

Deviation = 5.55 %



0 dB = 0.765mW/g

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:

$f = 835 \text{ MHz}$; $\sigma = 0.873 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-26-2010; Ambient Temp: 23.0 °C; Tissue Temp: 21.9 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

835MHz Dipole Validation

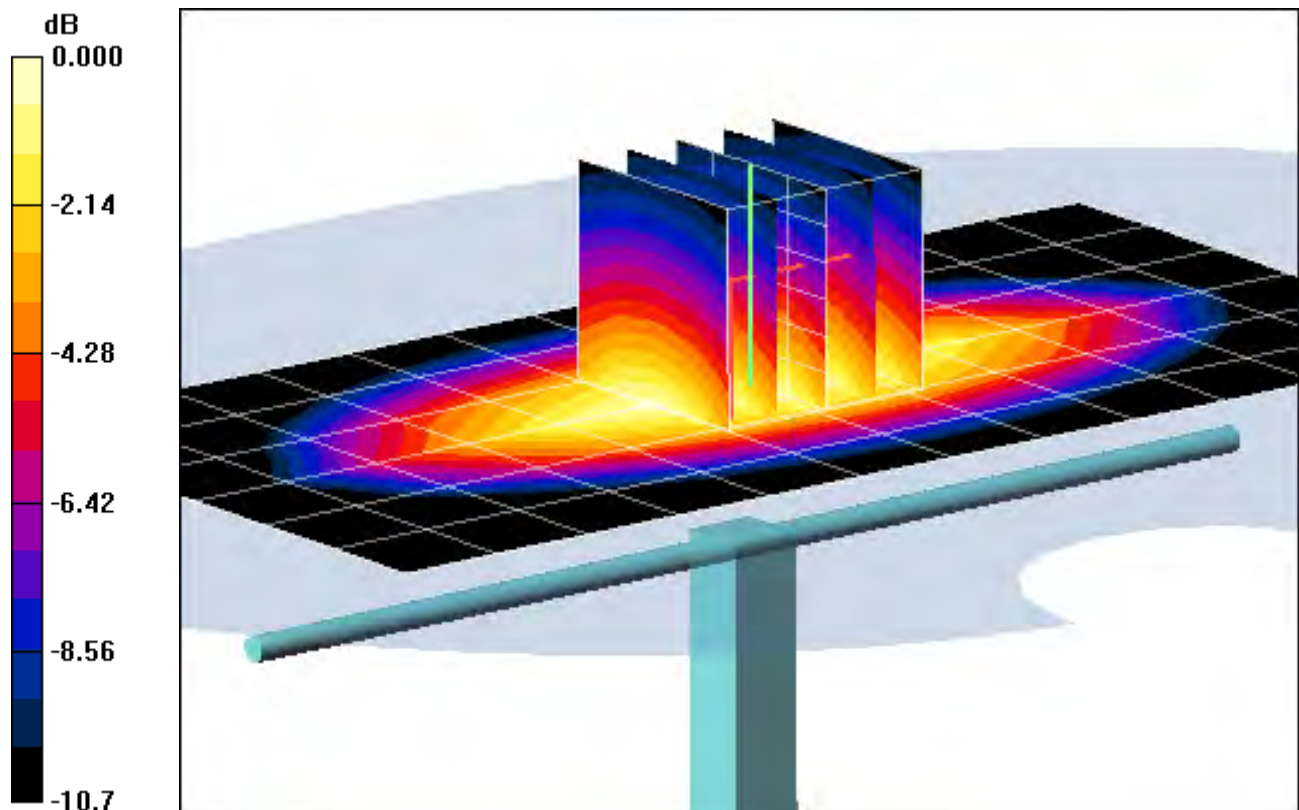
Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Input Power = 18 dBm (63 mW)

SAR(1 g) = 0.609 mW/g; SAR(10 g) = 0.396 mW/g

Deviation = 0.13 %



0 dB = 0.714mW/g

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:

$f = 835 \text{ MHz}$; $\sigma = 0.873 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-27-2010; Ambient Temp: 22.5 °C; Tissue Temp: 21.2 °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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

835MHz Dipole Validation

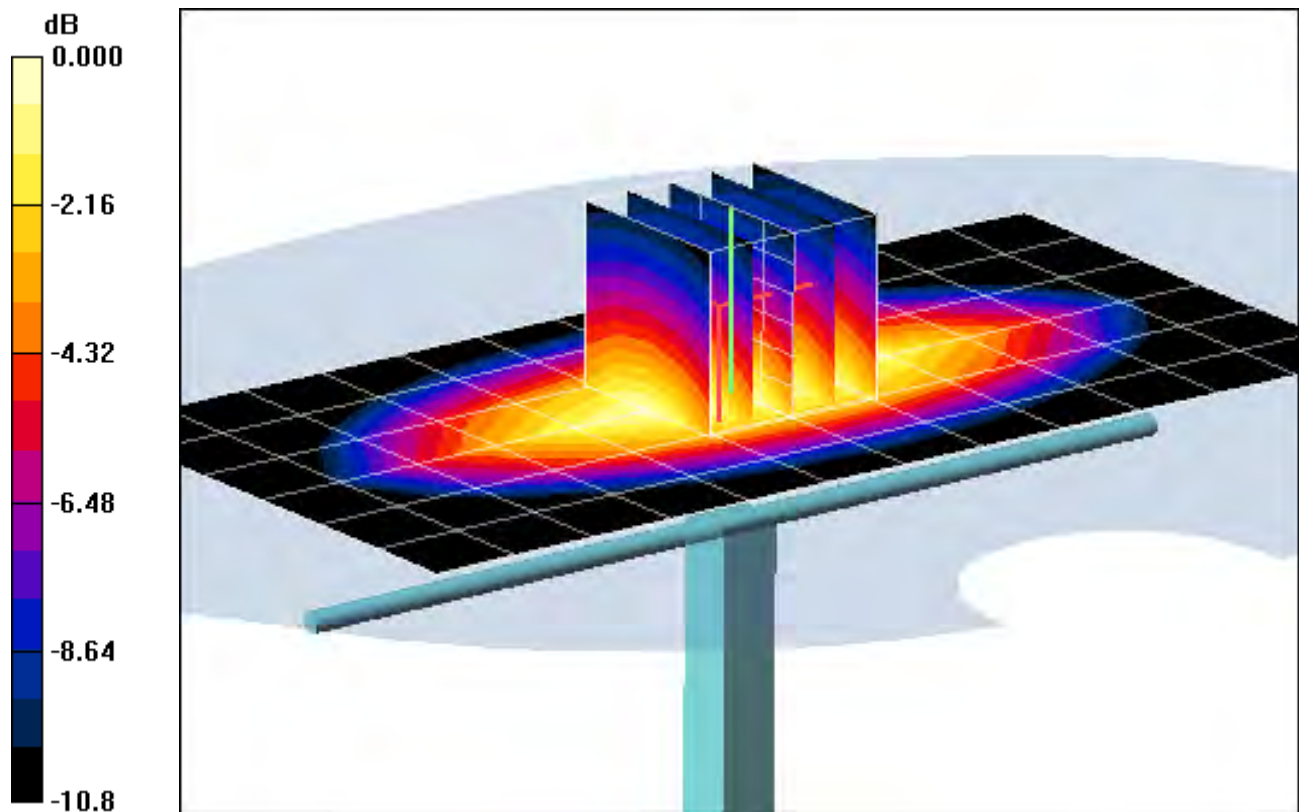
Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Input Power = 18 dBm (63 mW)

SAR(1 g) = 0.610 mW/g; SAR(10 g) = 0.396 mW/g

Deviation = 0.30 %



0 dB = 0.717mW/g

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:

$f = 835 \text{ MHz}$; $\sigma = 0.924 \text{ mho/m}$; $\epsilon_r = 43.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-01-2010; Ambient Temp: 23.9 °C; Tissue Temp: 22.1 °C

Probe: ES3DV3 - SN3209; ConvF(6.1, 6.1, 6.1); Calibrated: 4/15/2009

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 80; Postprocessing SW: SEMCAD, V1.8 Build 186

835MHz Dipole Validation

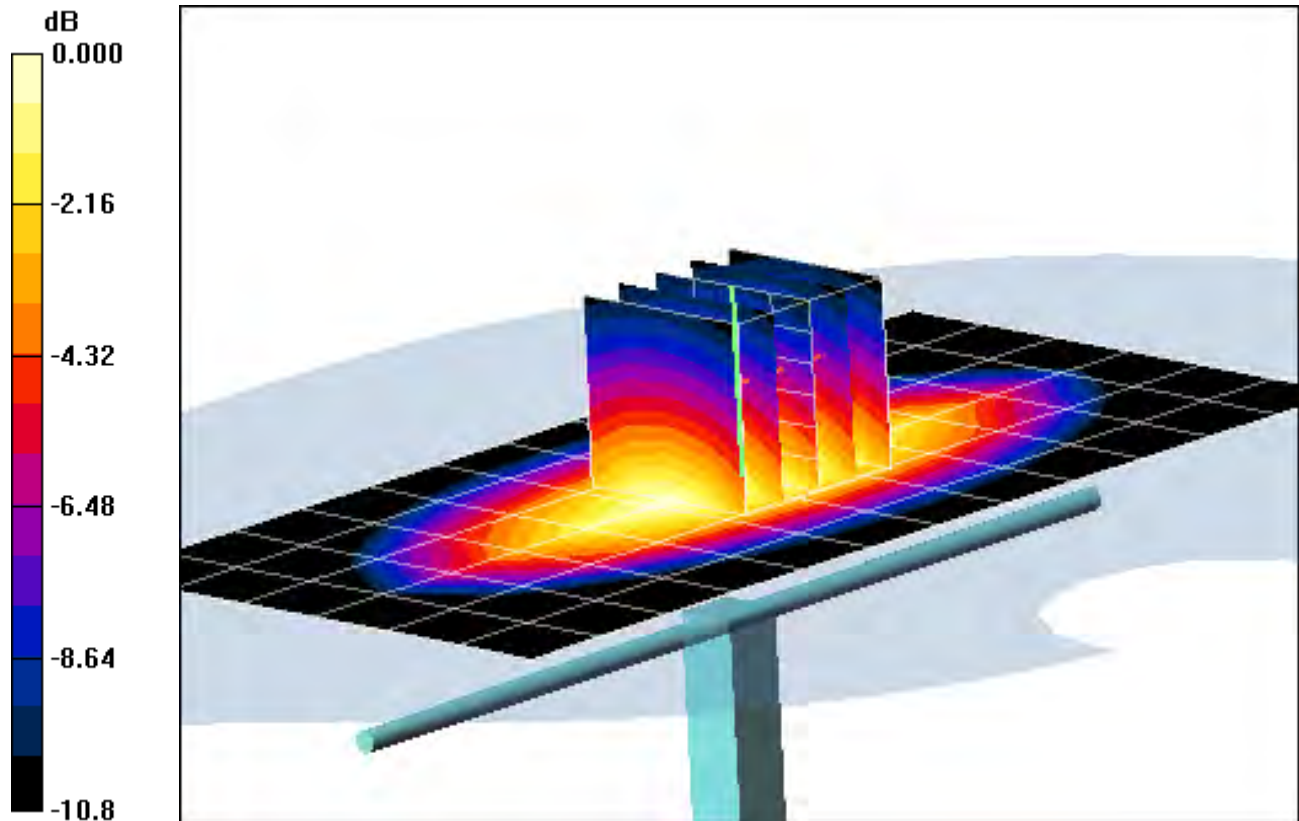
Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Input Power = 18 dBm (63 mW)

SAR(1 g) = 0.655 mW/g; SAR(10 g) = 0.426 mW/g

Deviation = 7.18 %



0 dB = 0.766mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 2450 MHz; Type: D2450V2; Serial: 719

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

Medium: 2450 Brain Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.79 \text{ mho/m}$; $\epsilon_r = 38.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-15-2010; Ambient Temp: 23.1 °C; Tissue Temp: 22.0 °C

Probe: EX3DV4 - SN3550; ConvF(6.21, 6.21, 6.21); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

2450MHz Dipole Validation

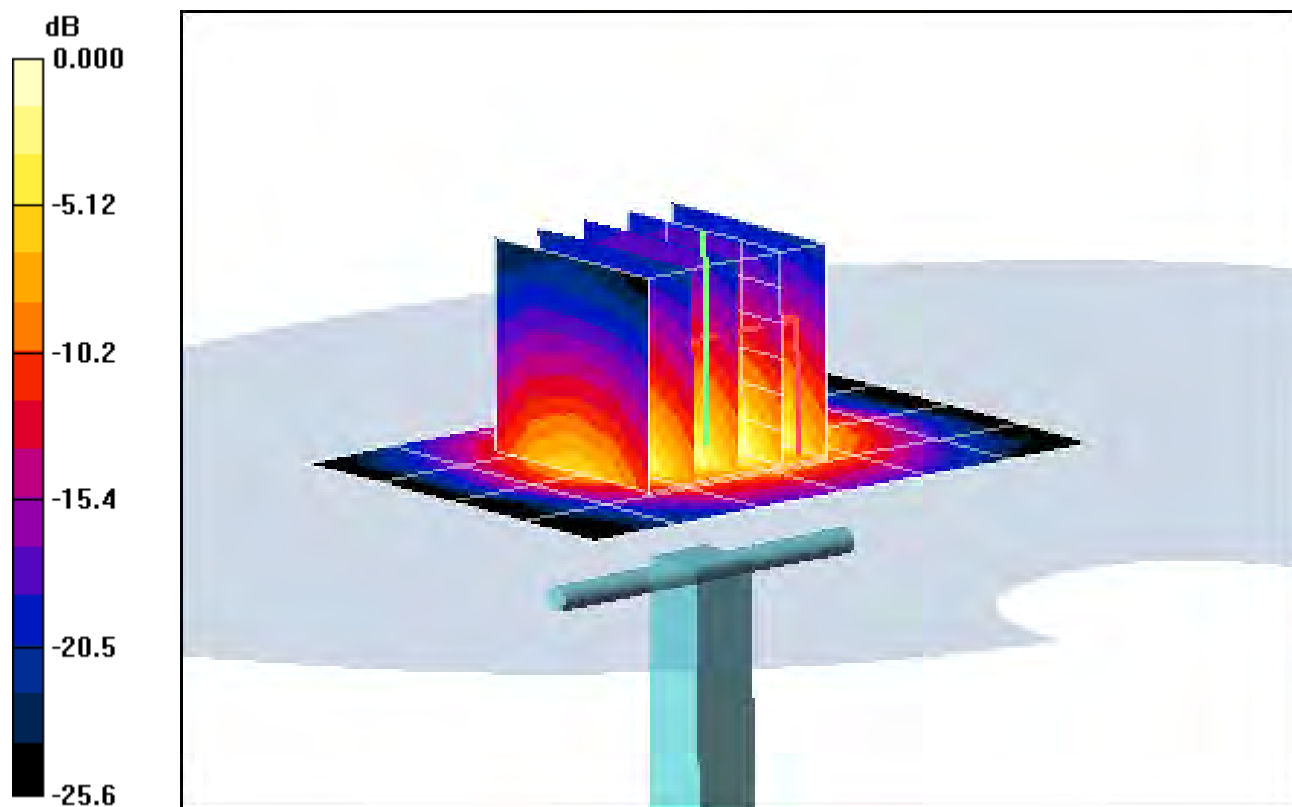
Area Scan (5x7x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Input Power = 14 dBm (25 mW)

SAR(1 g) = 1.3 mW/g; SAR(10 g) = 0.580 mW/g

Deviation = -2.84 %



0 dB = 1.67mW/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: **ES3-3022_Sep09**

CALIBRATION CERTIFICATE

Object **ES3DV2 - SN:3022**

Calibration procedure(s) **GA CAL-01.v5, GA CAL-23.v3 and GA CAL-25.v2
 Calibration procedure for domestic E-field probes**

Calibration date: **September 18, 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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

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

Issued: September 21, 2009

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



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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}:** Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(*f*)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP_{x,y,z}:** DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV2

SN:3022

Manufactured:	April 15, 2003
Last calibrated:	October 21, 2008
Recalibrated:	September 18, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV2 SN:3022

Sensitivity in Free Space^A

Diode Compression^B

NormX	1.01 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	92 mV
NormY	1.05 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	92 mV
NormZ	1.01 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	92 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 835 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR _{be} [%]	Without Correction Algorithm	8.8	5.3
SAR _{be} [%]	With Correction Algorithm	0.9	0.6

TSL 1750 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR _{be} [%]	Without Correction Algorithm	8.7	5.7
SAR _{be} [%]	With Correction Algorithm	0.6	0.3

Sensor Offset

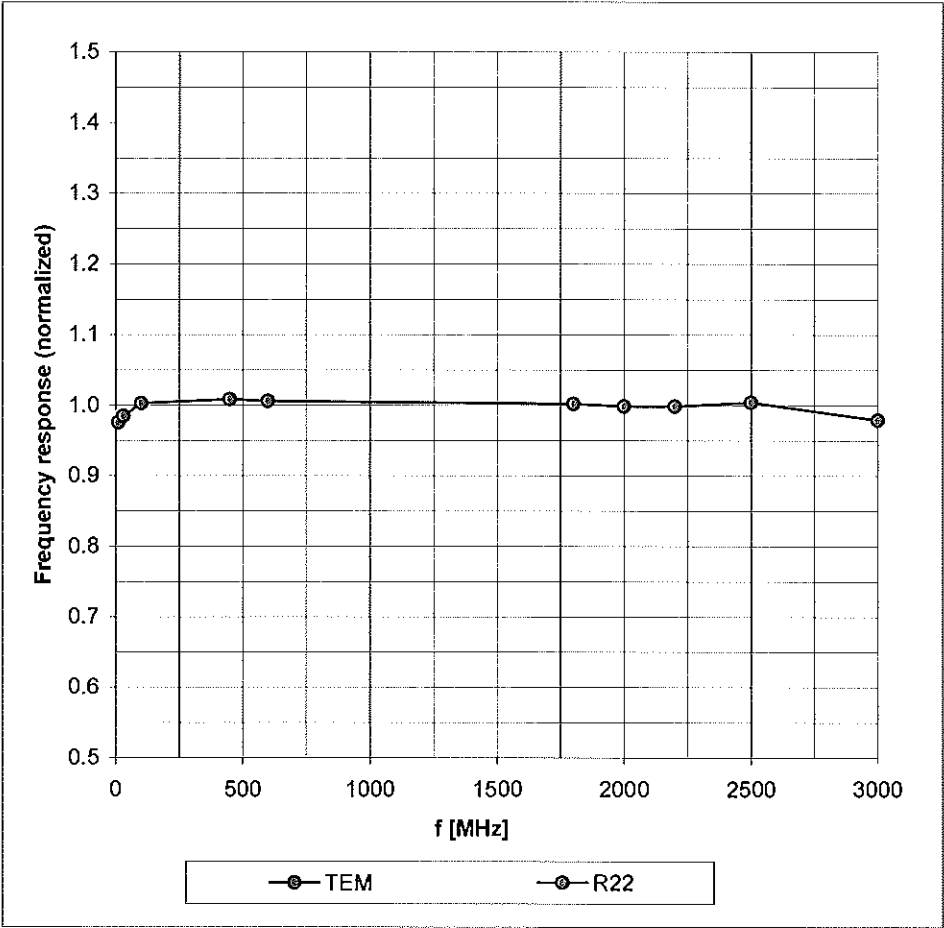
Probe Tip to Sensor Center **2.0 mm**

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%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

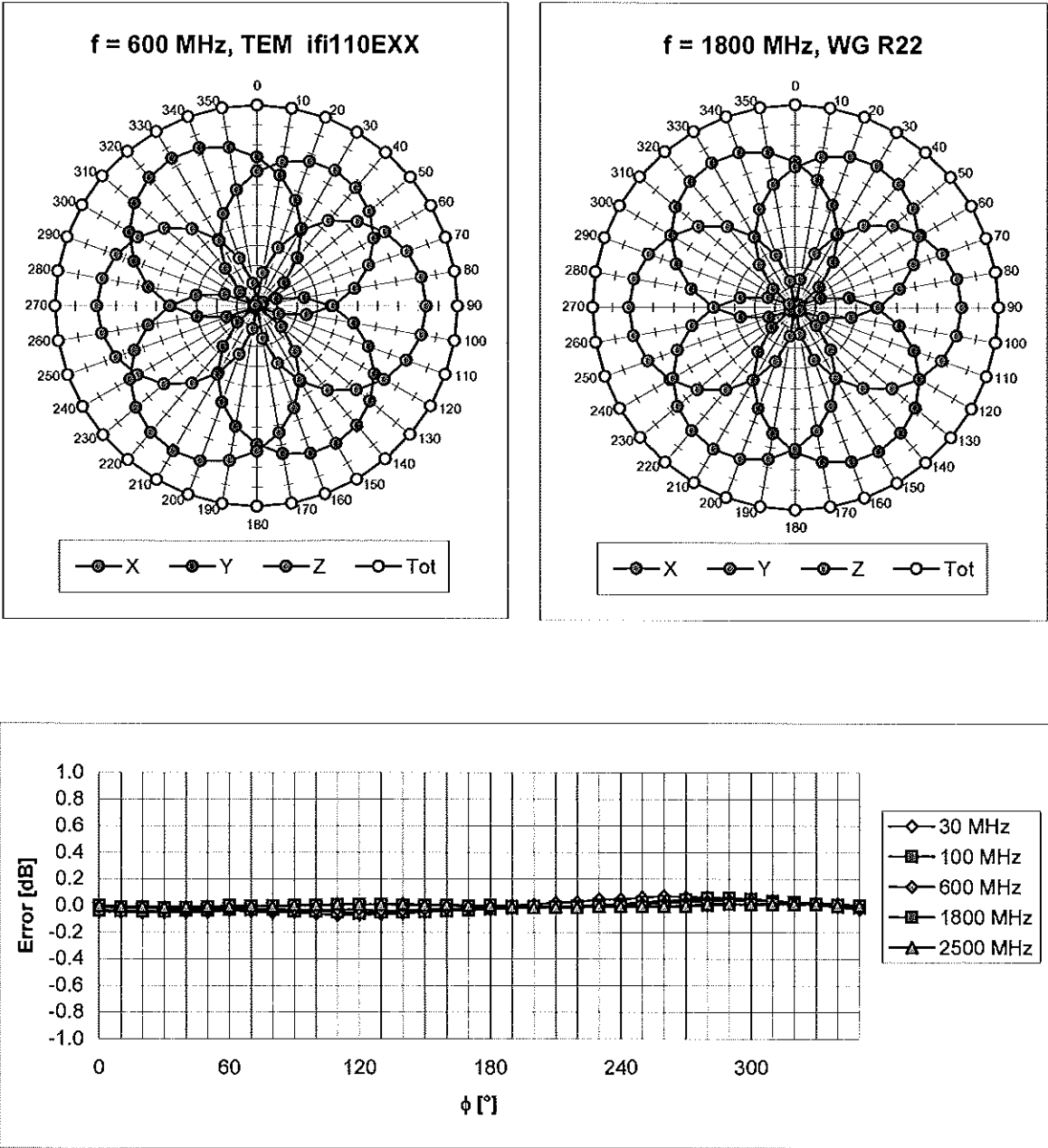
^B Numerical linearization parameter: uncertainty not required.

Frequency Response of E-Field
(TEM-Cell:Ifi110 EXX, Waveguide: R22)



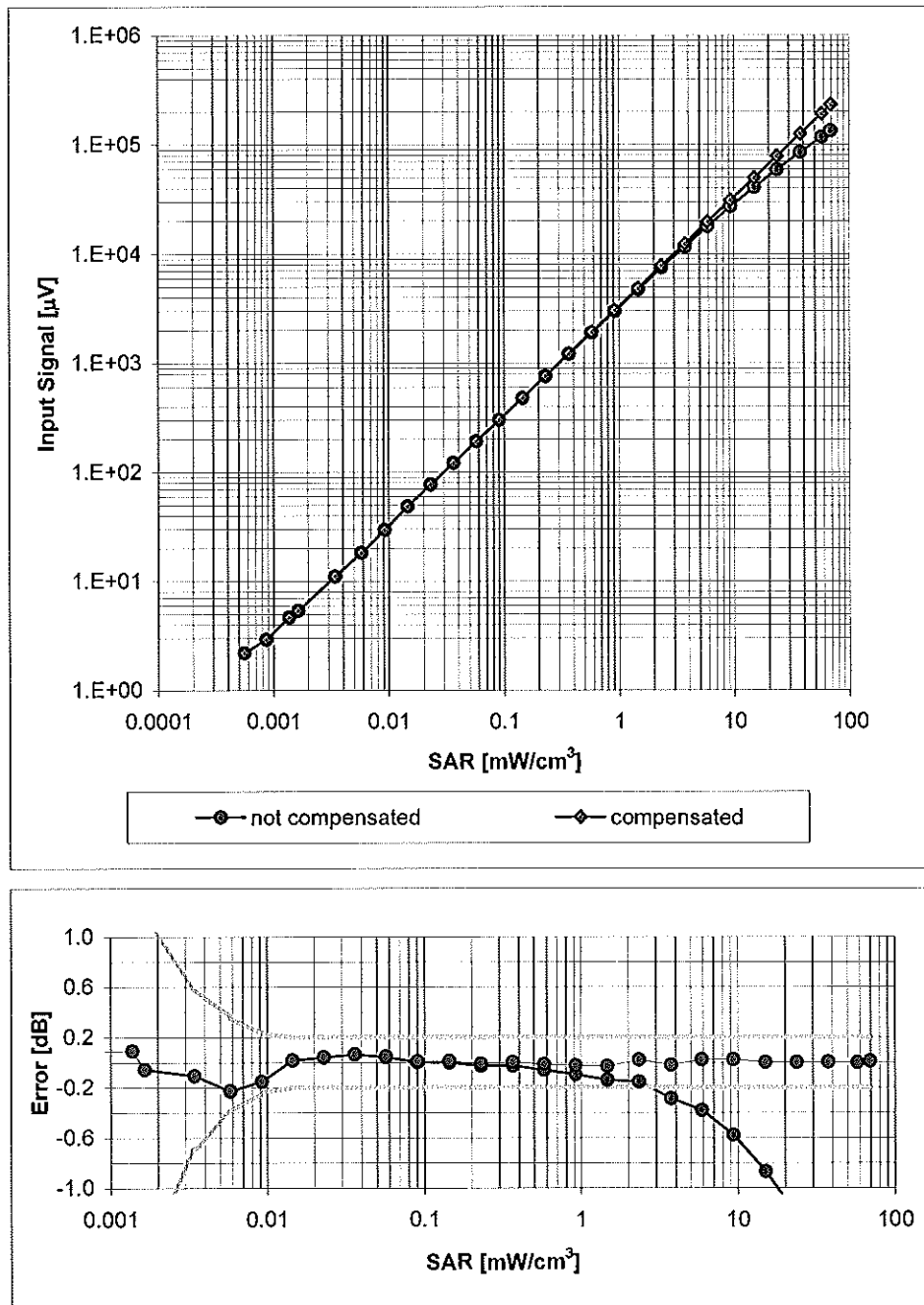
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$



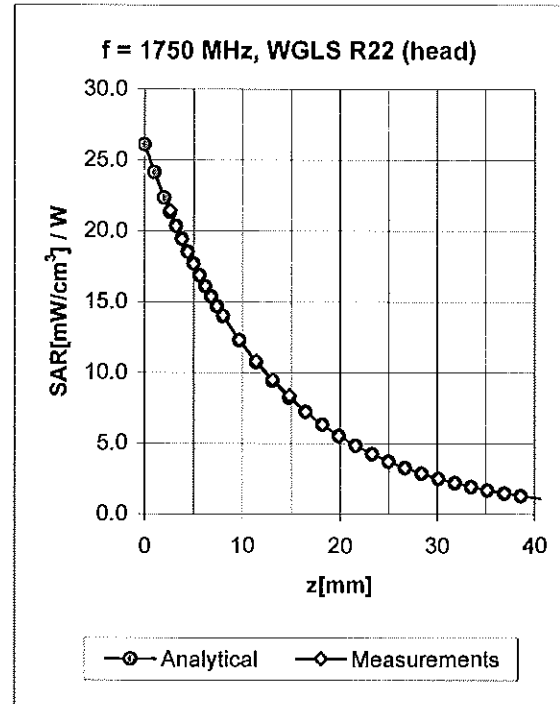
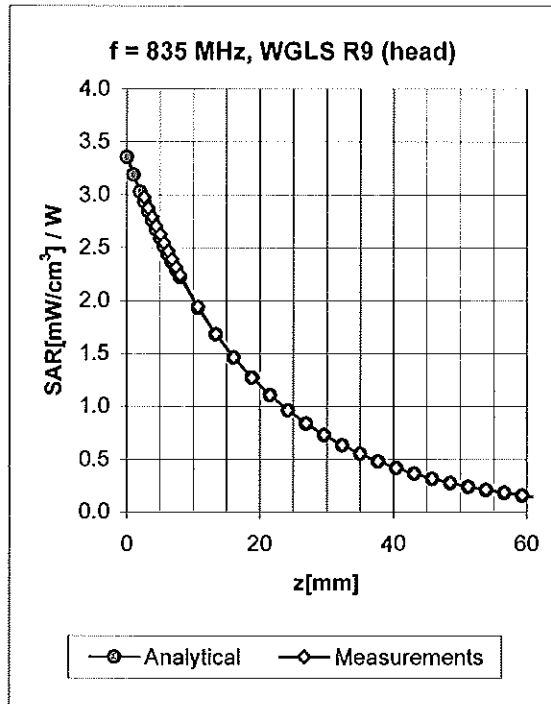
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800$ MHz)



Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

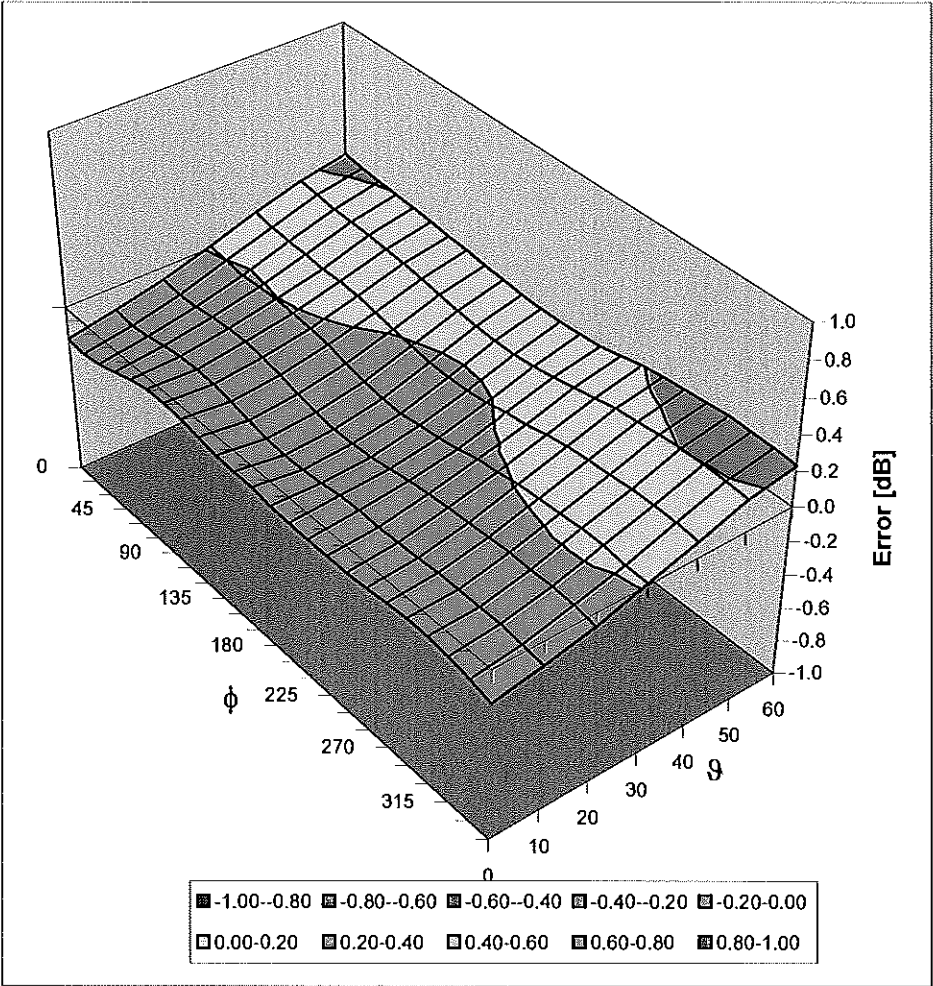
Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.60	1.19	6.04 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.32	1.84	5.11 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.39	1.67	4.86 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.33	1.91	4.25 ± 11.0% (k=2)
750	± 50 / ± 100	Body	55.5 ± 5%	0.96 ± 5%	0.63	1.20	5.83 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.51	1.35	5.85 ± 11.0% (k=2)
1640	± 50 / ± 100	Body	53.8 ± 5%	1.40 ± 5%	0.27	2.64	4.93 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.28	2.76	4.66 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.26	3.47	4.42 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.48	1.45	4.05 ± 11.0% (k=2)
2600	± 50 / ± 100	Body	52.5 ± 5%	2.16 ± 5%	0.68	1.21	3.95 ± 11.0% (k=2)

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL
Error (ϕ , θ), $f = 900 \text{ MHz}$



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)



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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**

Issued: January 20, 2009

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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"

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: $f = 835 \text{ MHz}$; $\sigma = 0.91 \text{ mho/m}$; $\epsilon_r = 41.1$; $\rho = 1000 \text{ kg/m}^3$

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

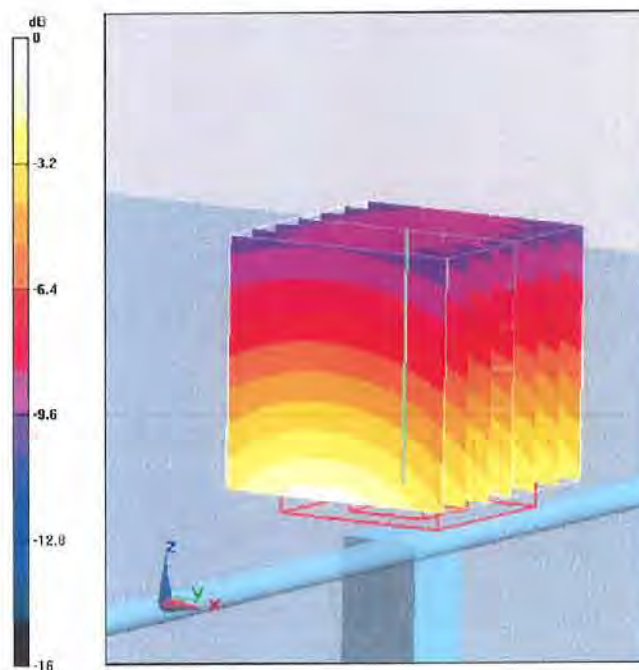
Pin=250mW; dip=15mm; dist=3.4mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

19 Jan 2009 10:48:17

CH1 S11 1 U FS

1: 50.052 Ω -3.7266 Ω 51.148 pF

835.000 000 MHz

*

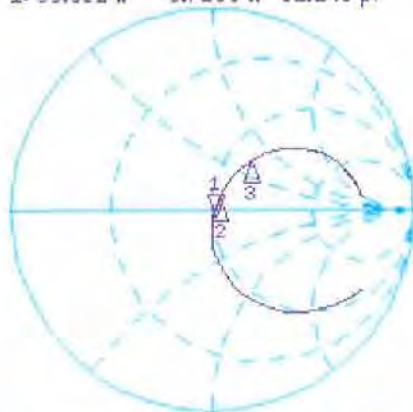
De1

Cor

Avg

15

↑



CH1 Markers

2: 53.711 Ω

4.9805 Ω

850.000 MHz

3: 63.910 Ω

32.400 Ω

900.000 MHz

CH2

S11

LOG

5 dB/REF -20 dB

1: -28.447 dB

835.000 000 MHz

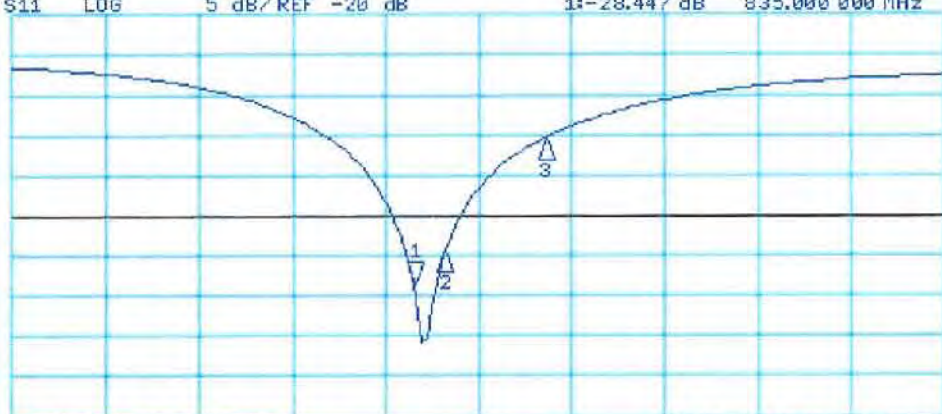
Cor

↑

Avg

15

↑



CH2 Markers

2: -24.508 dB

850.000 MHz

3: -10.504 dB

900.000 MHz

START 635.000 000 MHz

STOP 1100.000 000 MHz

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

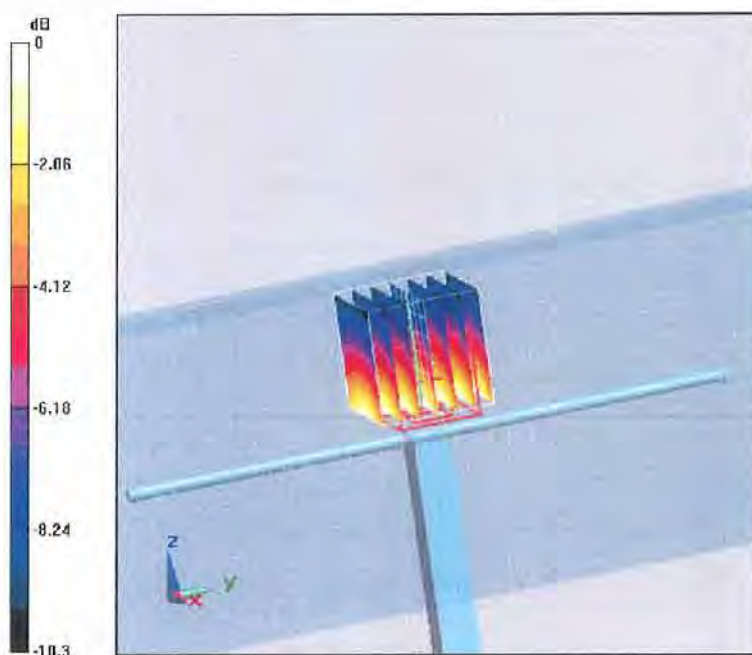
Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 3.65 W/kg

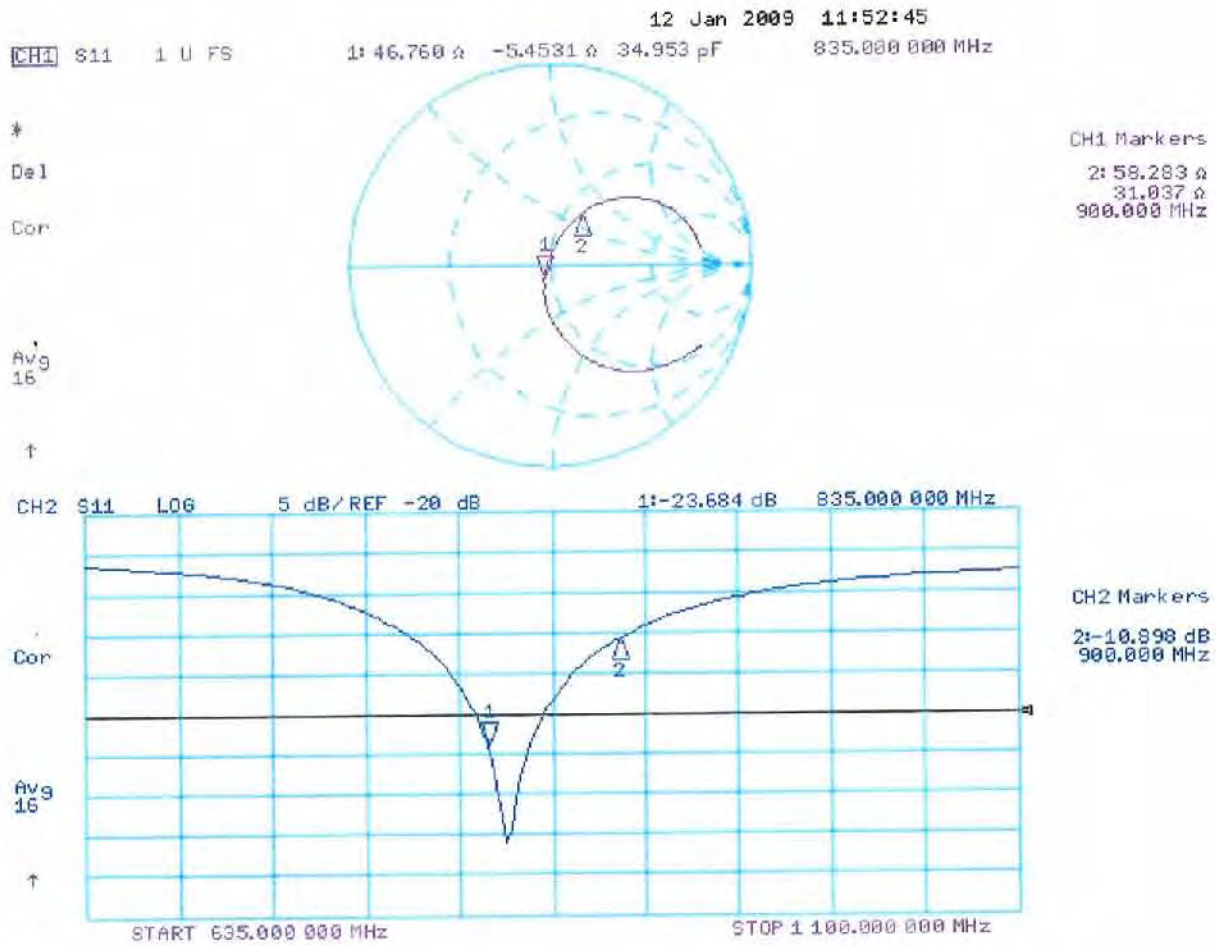
SAR(1 g) = 2.53 mW/g; SAR(10 g) = 1.67 mW/g

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



0 dB = 2.82mW/g

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **ES3-3209_Apr09**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3209**

Calibration procedure(s) **QA CAL-01 v6 and QA CAL-23 v3**
Calibration procedure for dosimetric E-field probes

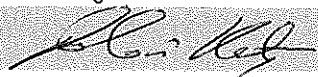
Calibration date: **April 15, 2009**

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 E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3842U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09
Calibrated by:	Name Katja Pokovic	Function Technical Manager	Signature 
Approved by:	Name Fin Bomholt	Function R&D Director	Signature 

Issued: April 15, 2009

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Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E^2 -field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * *frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * *ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV3

SN:3209

Manufactured:	October 14, 2008
Calibrated:	April 15, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV3 SN:3209

Sensitivity in Free Space^A

Diode Compression^B

NormX	1.33 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	91 mV
NormY	1.34 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	93 mV
NormZ	1.14 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	92 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL **835 MHz** Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR _{be} [%]	Without Correction Algorithm	9.5	5.5
SAR _{be} [%]	With Correction Algorithm	0.8	0.5

TSL **1750 MHz** Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR _{be} [%]	Without Correction Algorithm	8.6	5.1
SAR _{be} [%]	With Correction Algorithm	0.8	0.3

Sensor Offset

Probe Tip to Sensor Center **2.0 mm**

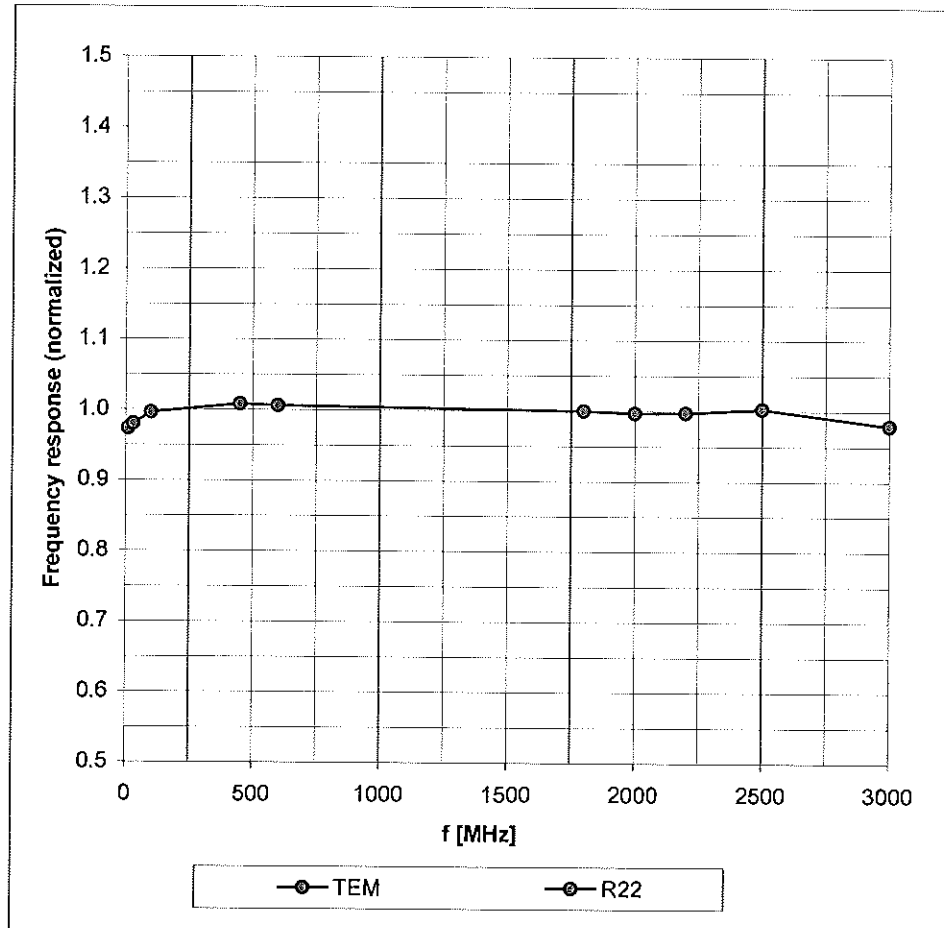
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Page 8).

^B Numerical linearization parameter: uncertainty not required.

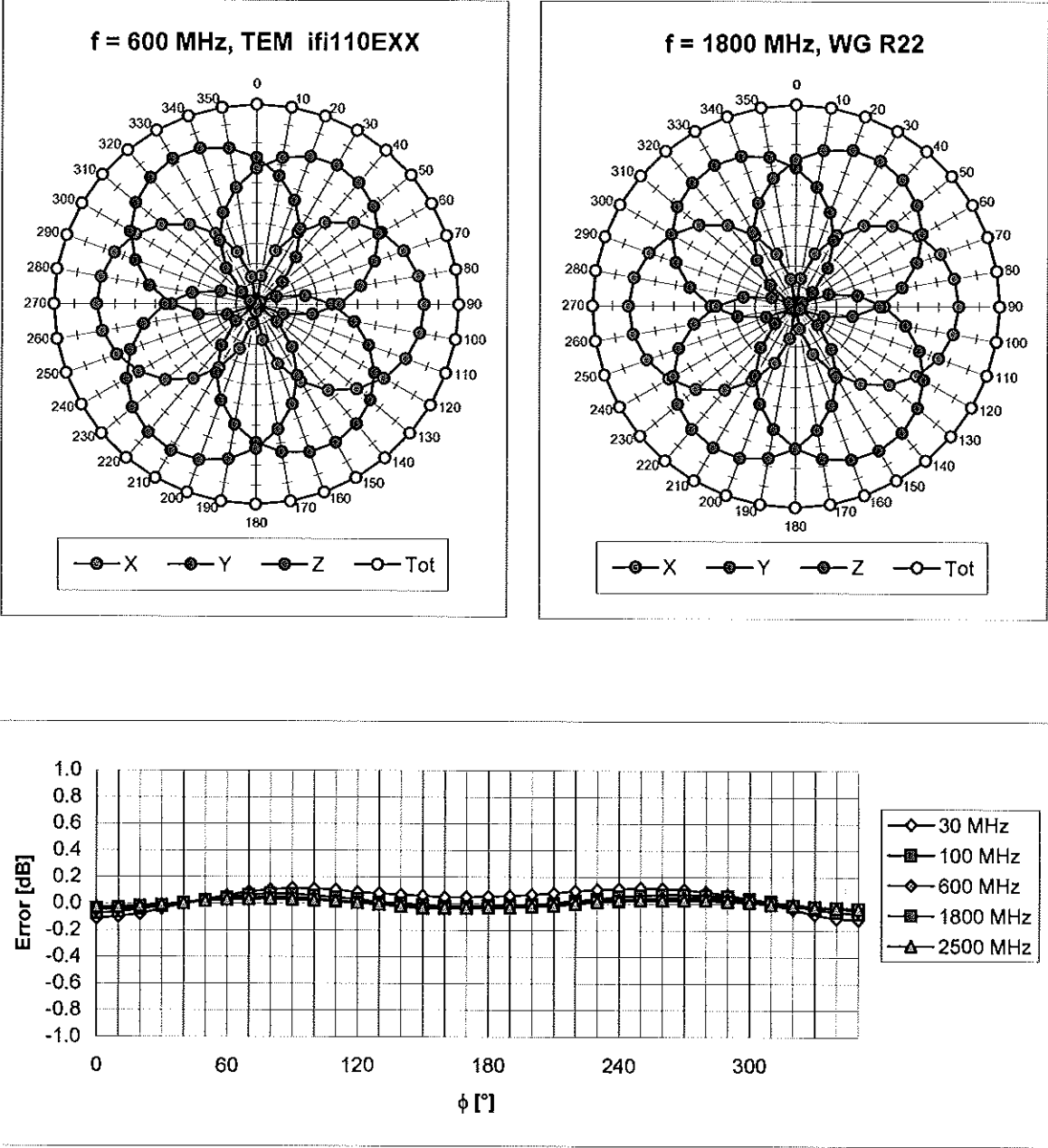
Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



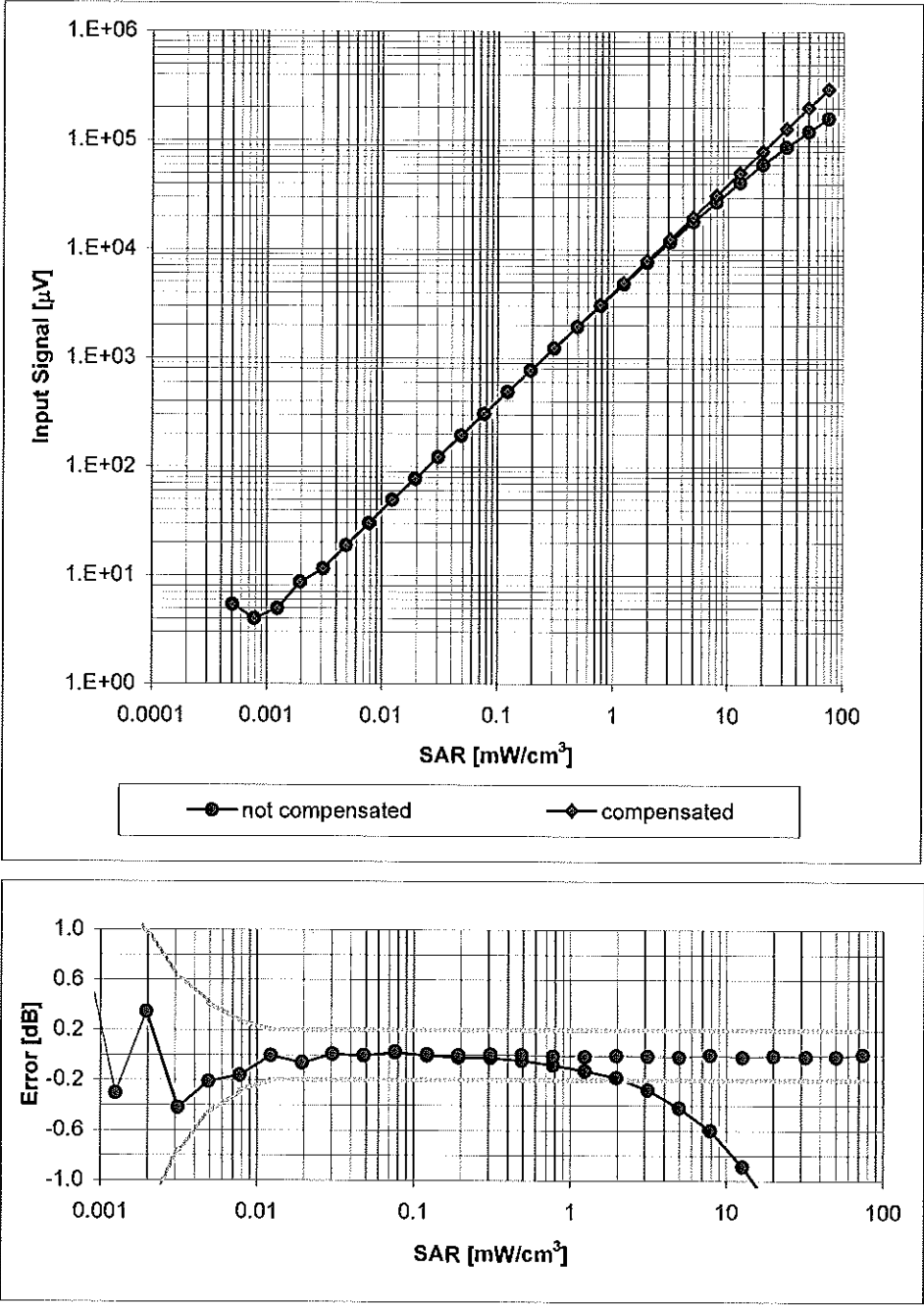
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$



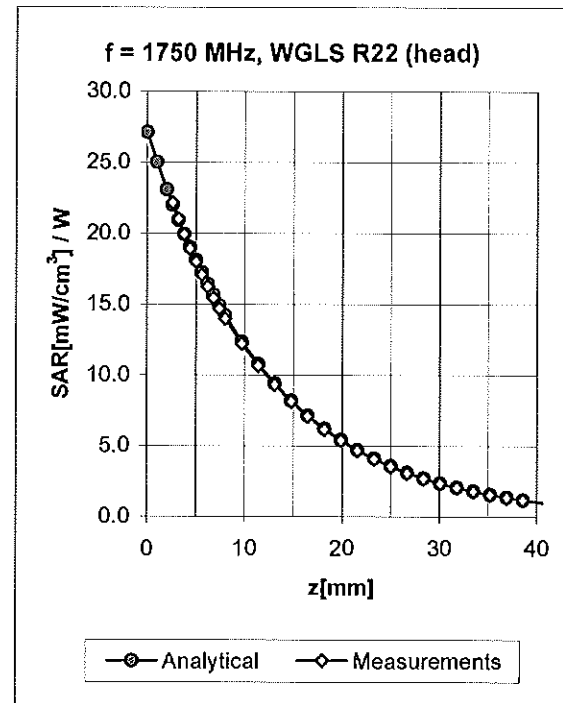
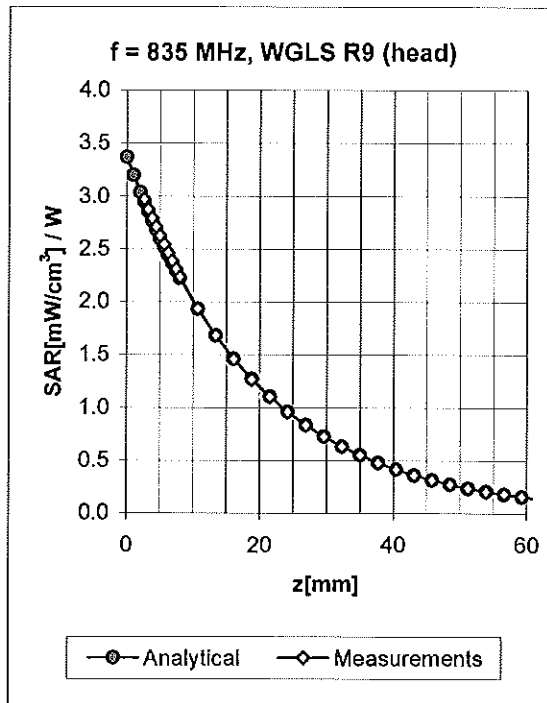
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head})
(Waveguide R22, f = 1800 MHz)



Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

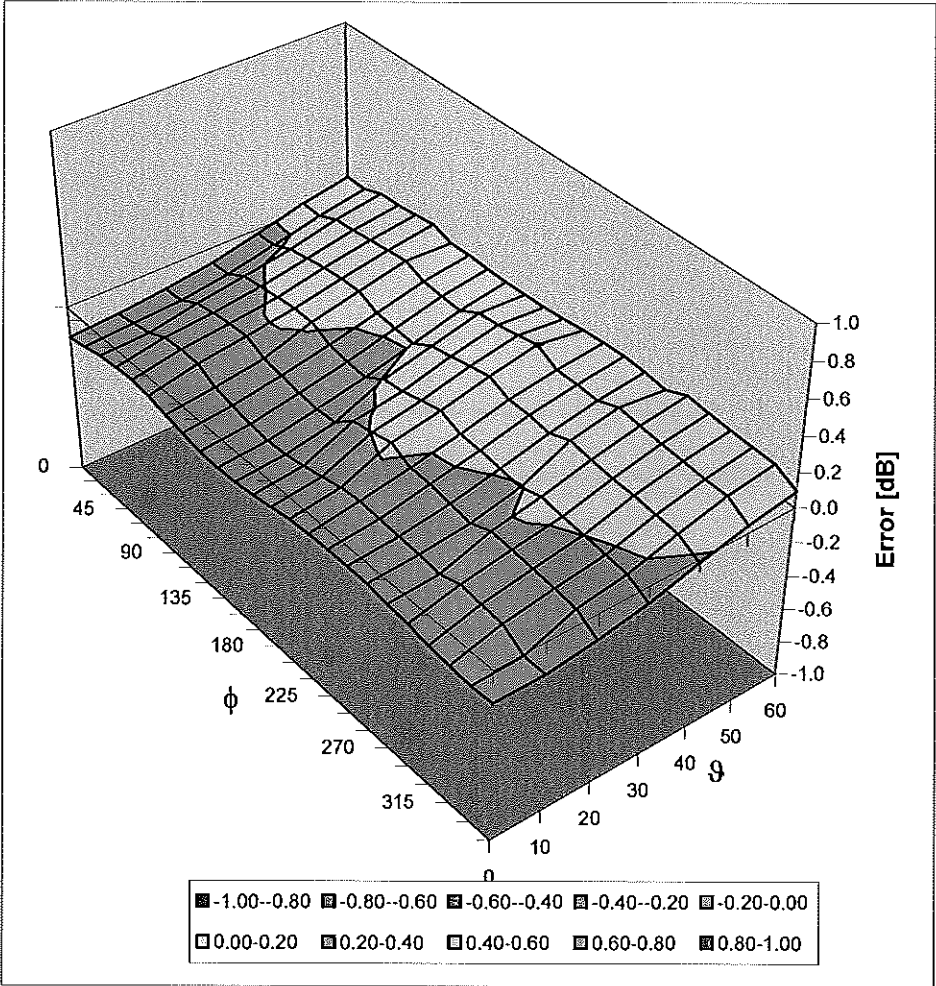
Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.84	1.10	6.10 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.40	1.74	5.29 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.36	1.83	5.10 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.78	1.17	6.07 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.33	2.21	4.83 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.31	2.41	4.55 ± 11.0% (k=2)

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL
Error (ϕ, ϑ), $f = 900 \text{ MHz}$



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ES3DV3

Serial Number:

3209

Place of Assessment:

Zurich

Date of Assessment:

September 17, 2009

Probe Calibration Date:

April 15, 2009

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. The evaluation is coupled with measured conversion factors (probe calibration date indicated above). The uncertainty of the numerical assessment is based on the extrapolation from measured value at 835 MHz or at 1750 MHz.

Assessed by:

Dosimetric E-Field Probe ES3DV3 SN:3209

Conversion factor ($\pm$ standard deviation)

750 $\pm$ 50 MHz

ConvF

6.17 $\pm$ 7%

$\epsilon_r = 55.5 \pm 5\%$ $\sigma = 0.96 \pm 5\% \text{ mho/m}$ (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also Section 4.7 of the DASY4 Manual.



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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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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)

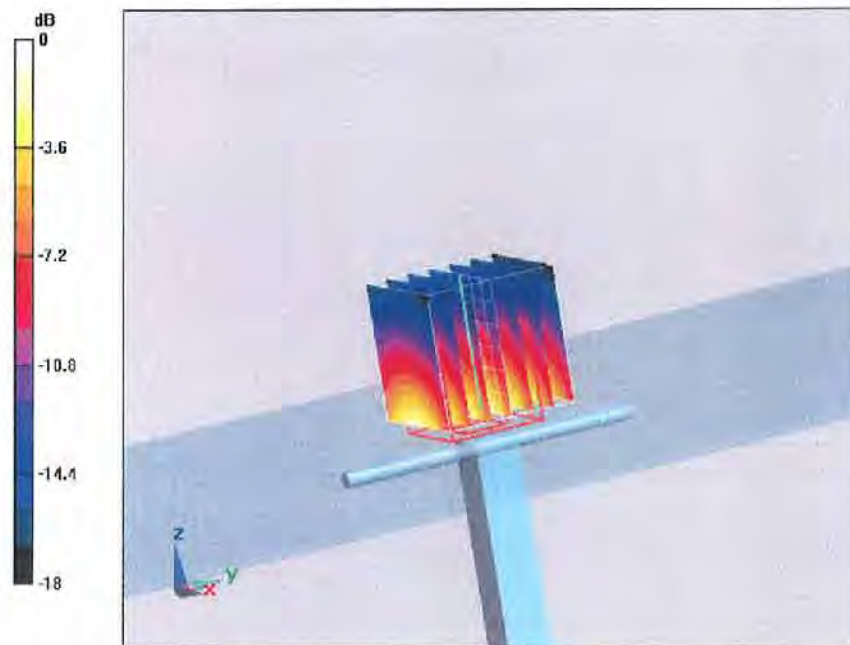
(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

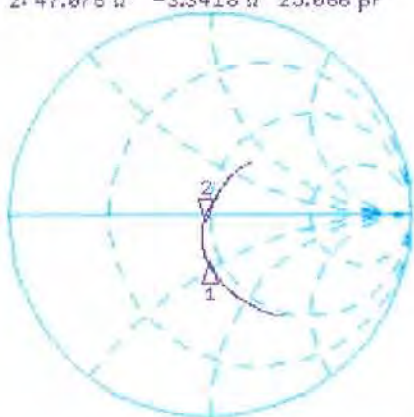
#

Del

Cor

Avg
16

↑



CH1 Markers

1: 44.506 Ω
-22.549 Ω
1.80000 GHz

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 1 600.000 000 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:**

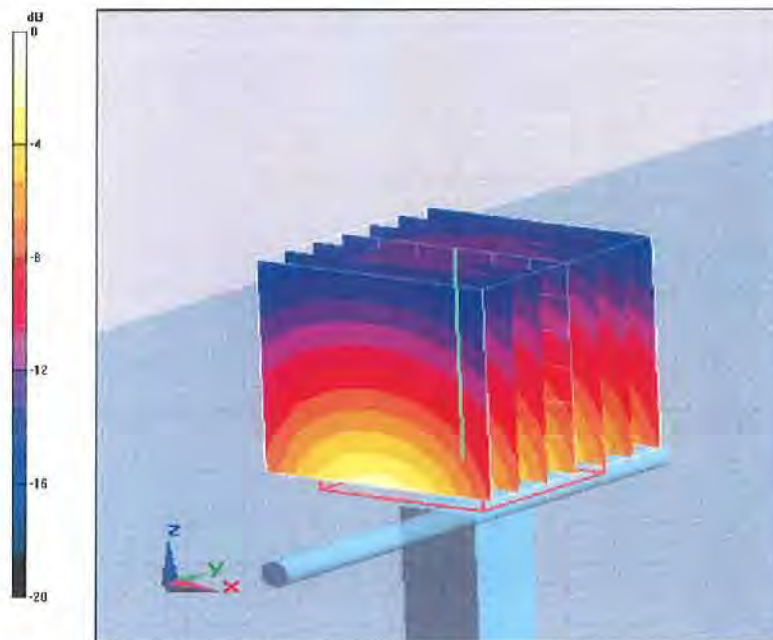
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 18.5 W/kg

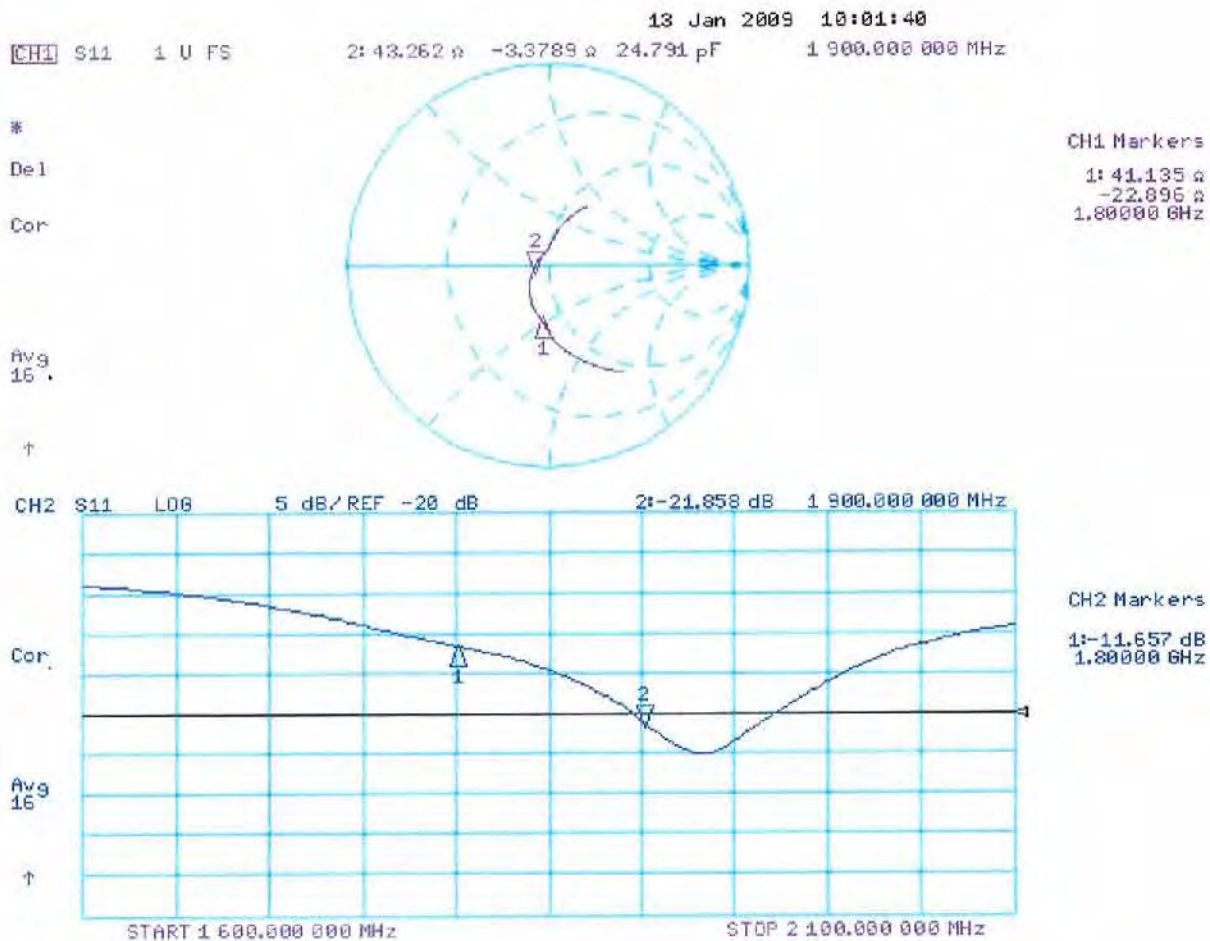
SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.55 mW/g

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



0 dB = 12.7mW/g

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **EX3-3550_Jan10**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3550**

Calibration procedure(s) **QA CAL-01 v8, QA CAL-14 v3, QA CAL-23 v3 and QA CAL-25 v3
Calibration procedure for dielectric E-field probes**

Calibration date: **January 26, 2010**

✓
1/26/10

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 E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bornholt	R&D Director	

Issued: January 26, 2010

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Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3550

Manufactured:	May 19, 2004
Last calibrated:	January 21, 2009
Recalibrated:	January 26, 2010

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: EX3DV4 SN:3550**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.48	0.47	0.48	± 10.1%
DCP (mV) ^B	92.9	88.4	91.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	± 1.5%
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

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%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

DASY - Parameters of Probe: EX3DV4 SN:3550

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	8.28	8.28	8.28	0.45	0.70 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	7.03	7.03	7.03	0.39	0.75 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	6.81	6.81	6.81	0.32	0.81 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	6.21	6.21	6.21	0.22	1.07 ± 11.0%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

DASY - Parameters of Probe: EX3DV4 SN:3550

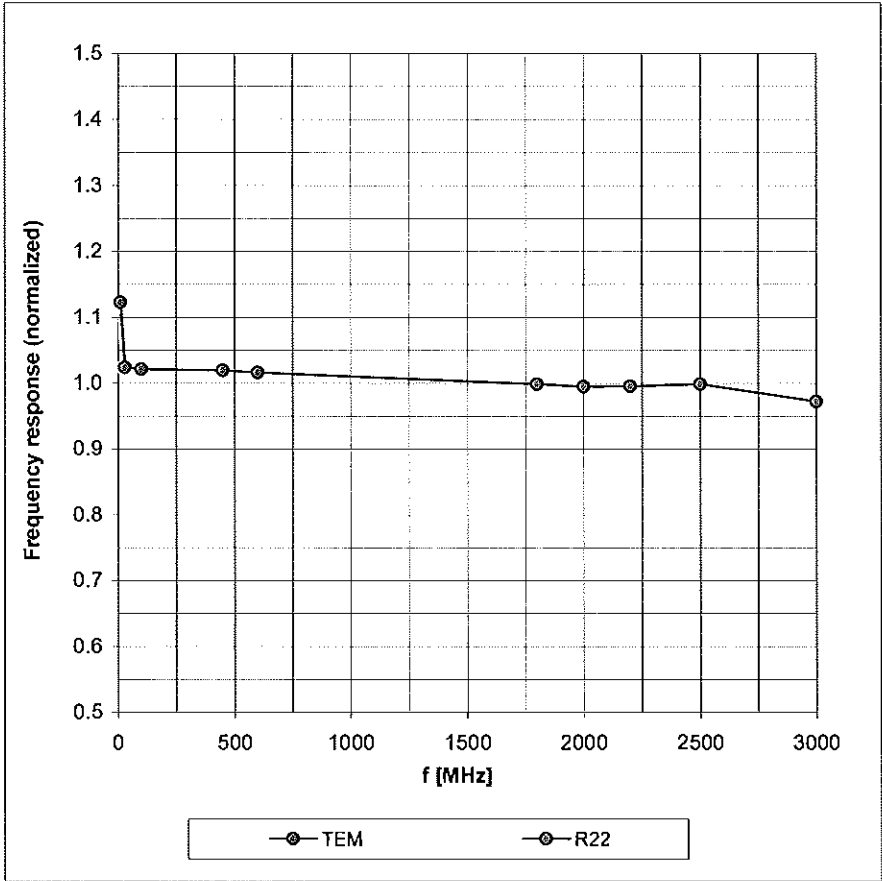
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	8.30	8.30	8.30	0.47	0.76 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	6.90	6.90	6.90	0.49	0.69 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	6.63	6.63	6.63	0.76	0.54 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	6.40	6.40	6.40	0.22	1.09 ± 11.0%
2600	± 50 / ± 100	52.5 ± 5%	2.16 ± 5%	6.26	6.26	6.26	0.19	1.42 ± 11.0%
4950	± 50 / ± 100	49.4 ± 5%	5.01 ± 5%	3.64	3.64	3.64	0.50	1.75 ± 13.1%
5200	± 50 / ± 100	49.0 ± 5%	5.30 ± 5%	3.73	3.73	3.73	0.50	1.75 ± 13.1%
5300	± 50 / ± 100	48.5 ± 5%	5.42 ± 5%	3.52	3.52	3.52	0.52	1.75 ± 13.1%
5500	± 50 / ± 100	48.6 ± 5%	5.65 ± 5%	3.26	3.26	3.26	0.55	1.80 ± 13.1%
5600	± 50 / ± 100	48.5 ± 5%	5.77 ± 5%	3.16	3.16	3.16	0.65	1.80 ± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	3.30	3.30	3.30	0.60	1.75 ± 13.1%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

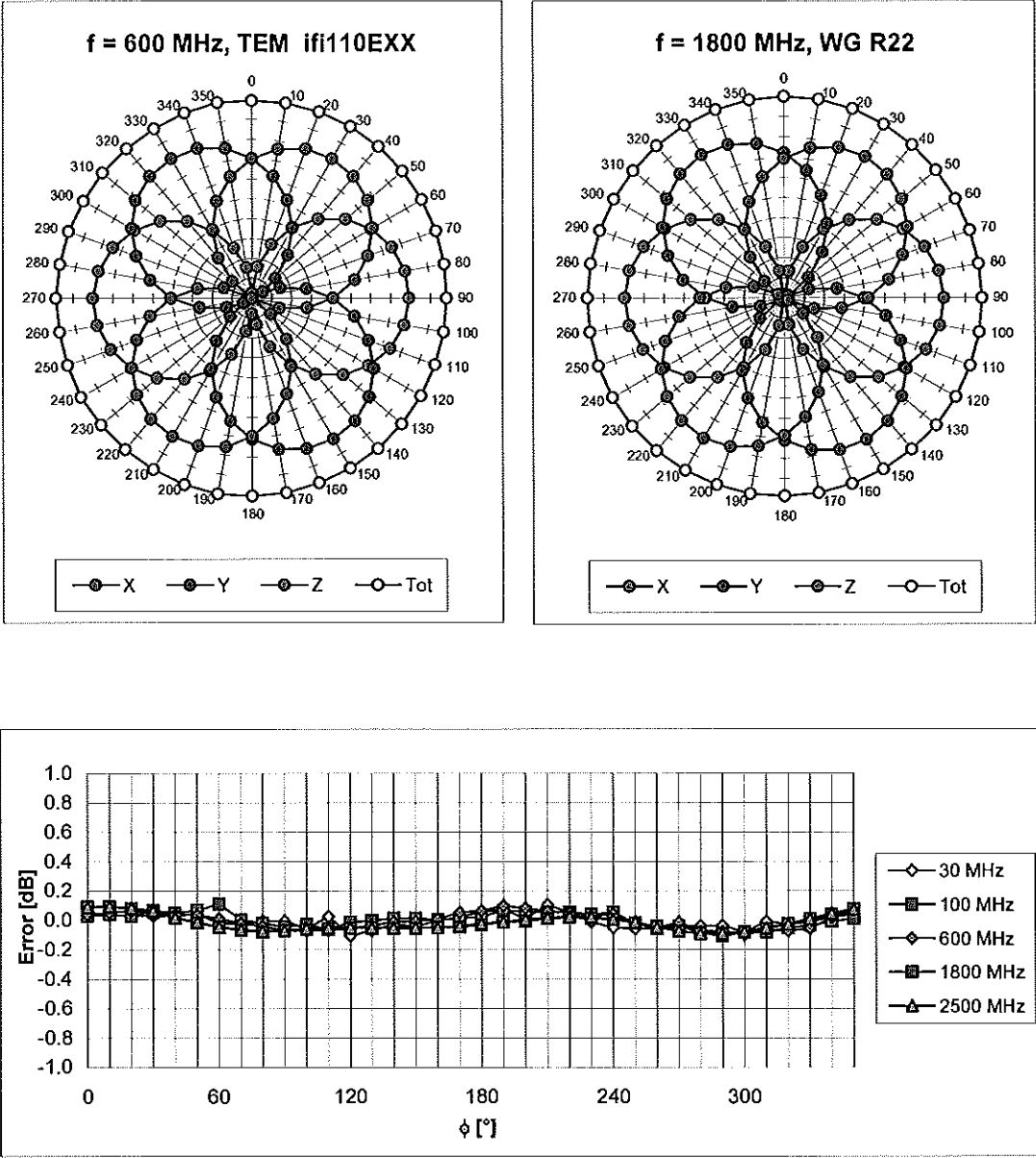
Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



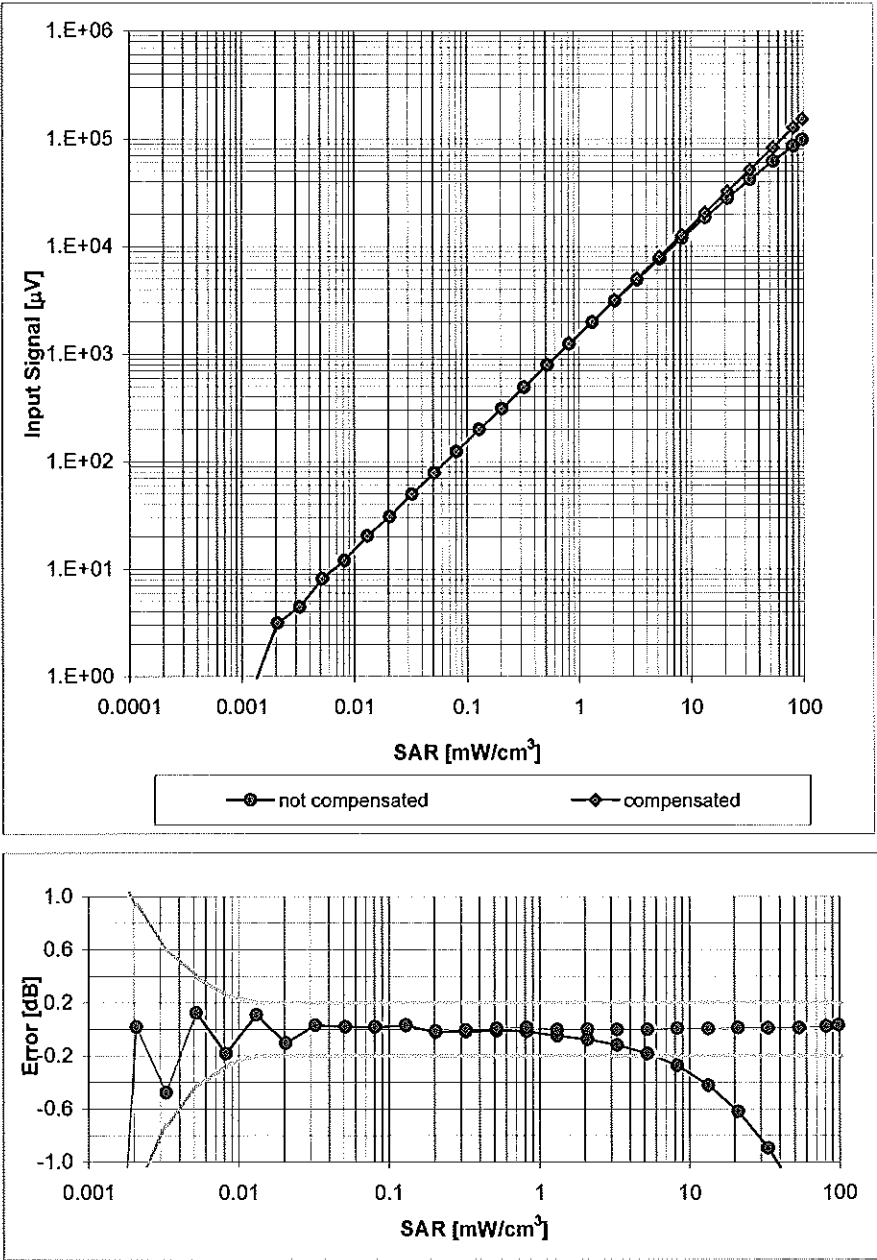
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$



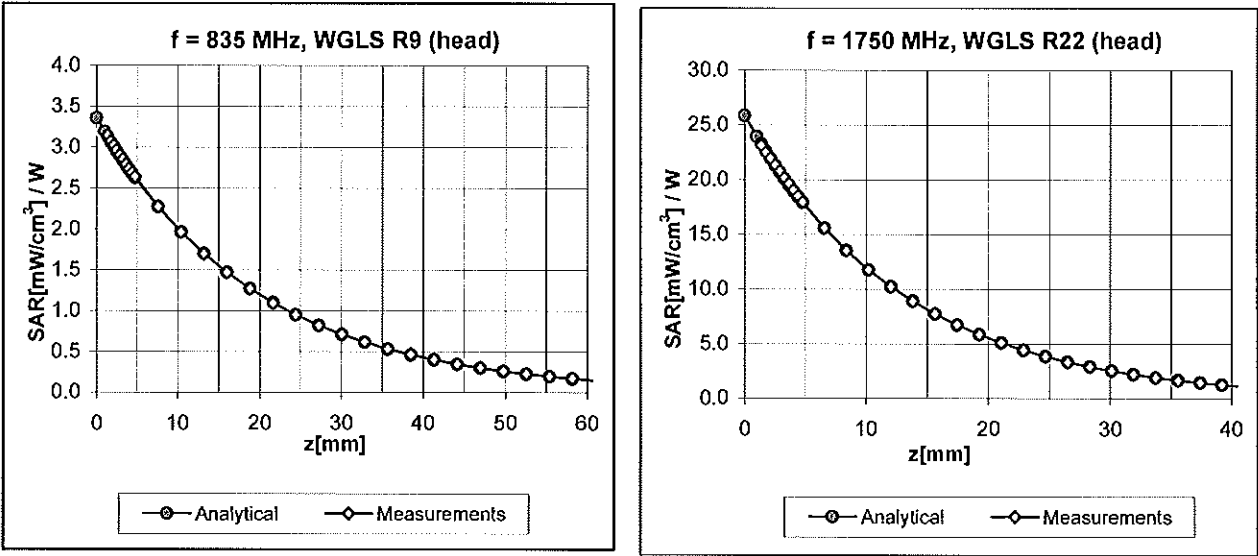
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head})
(Waveguide R22, f = 1800 MHz)



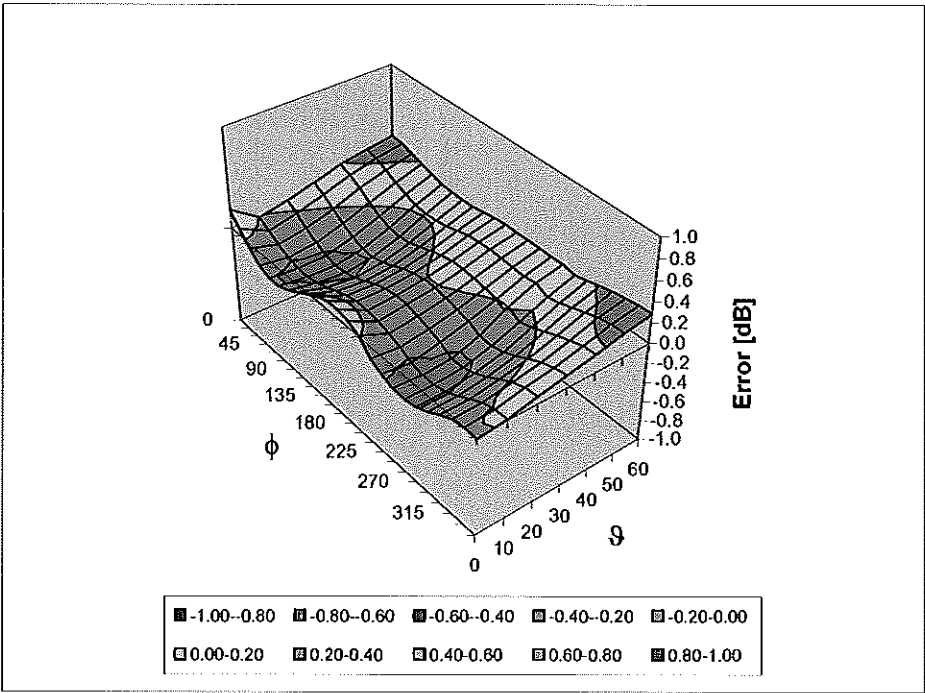
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ, θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm



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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D2450V2-719_Aug09**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 719**

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

Calibration date: **August 27, 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)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

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

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

Issued: August 27, 2009

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Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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 1528-2003, "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 V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.1 $\pm$ 6 %	1.80 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.3 $\pm$ 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	13.3 mW / g
SAR normalized	normalized to 1W	53.2 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	53.5 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.23 mW / g
SAR normalized	normalized to 1W	24.9 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	25.0 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.2 ± 6 %	2.01 mho/m ± 6 %
Body TSL temperature during test	(22.5 ± 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	13.0 mW / g
SAR normalized	normalized to 1W	52.0 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	51.4 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.00 mW / g
SAR normalized	normalized to 1W	24.0 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	23.9 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	$53.4 \Omega + 1.8 j\Omega$
Return Loss	- 28.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.2 \Omega + 3.9 j\Omega$
Return Loss	- 27.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

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	September 10, 2002

DASY5 Validation Report for Head TSL

Date/Time: 27.08.2009 11:14:47

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN719

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

Medium: HSL U11 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.8$ mho/m; $\epsilon_r = 40.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

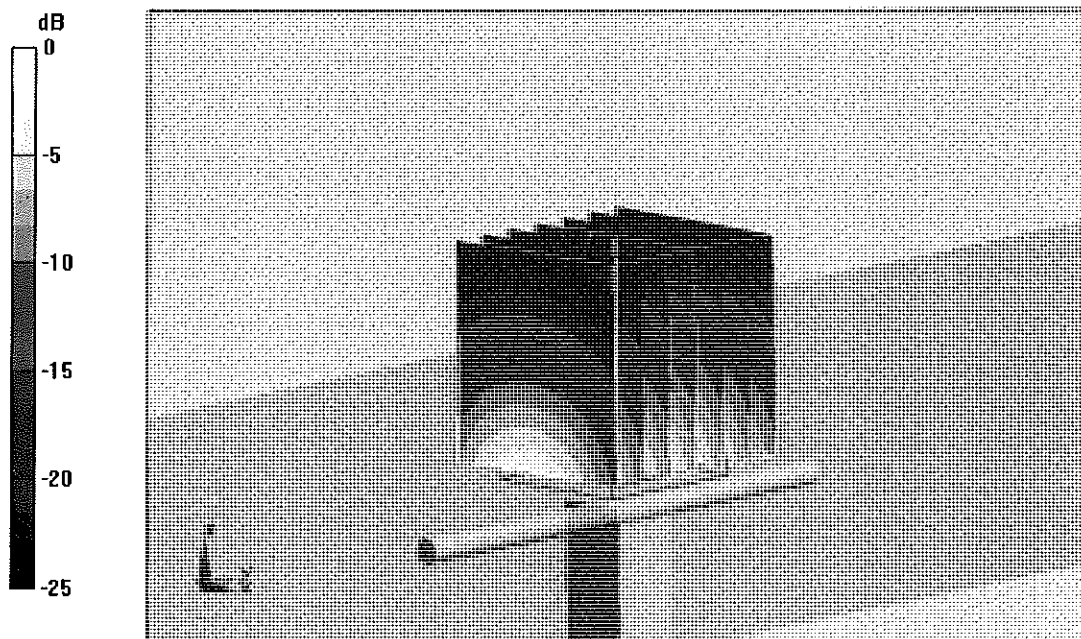
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.4 V/m; Power Drift = 0.025 dB

Peak SAR (extrapolated) = 27 W/kg

SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.23 mW/g

Maximum value of SAR (measured) = 17.2 mW/g

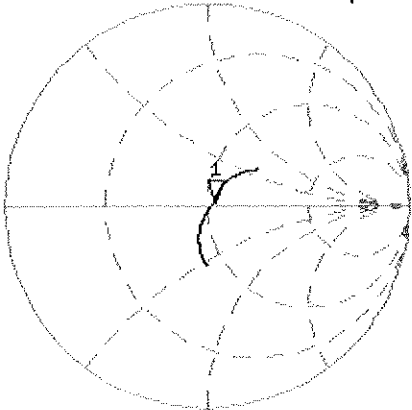


0 dB = 17.2mW/g

Impedance Measurement Plot for Head TSL

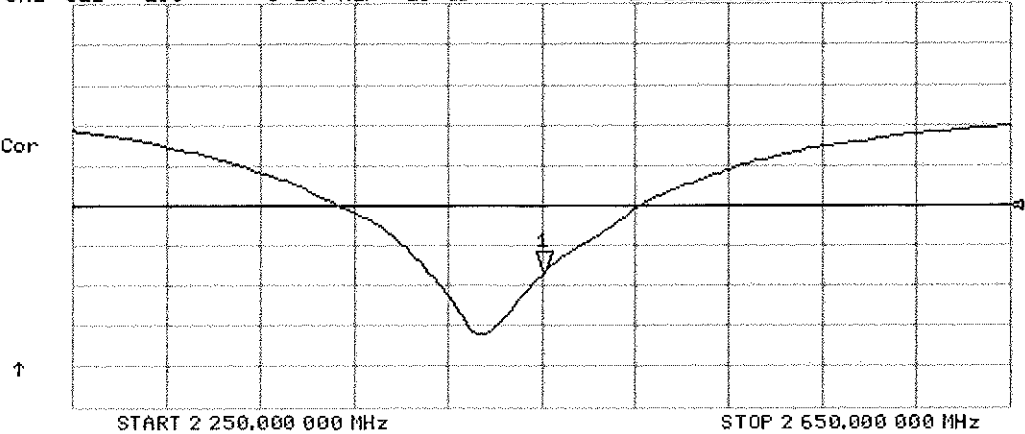
27 Aug 2009 09:14:09
[CH1] S11 1 U FS 1: 53.385 Ω 1.7910 Ω 116.35 μ H 2 450.000 000 MHz

*
De1
Cor



↑

CH2 S11 L06 5 dB/REF -20 dB 1:-28.624 dB 2 450.000 000 MHz



Cor

↑

DASY5 Validation Report for Body TSL

Date/Time: 17.08.2009 15:35:28

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:719

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

Medium: MSL U10 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.01$ mho/m; $\epsilon_r = 53.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

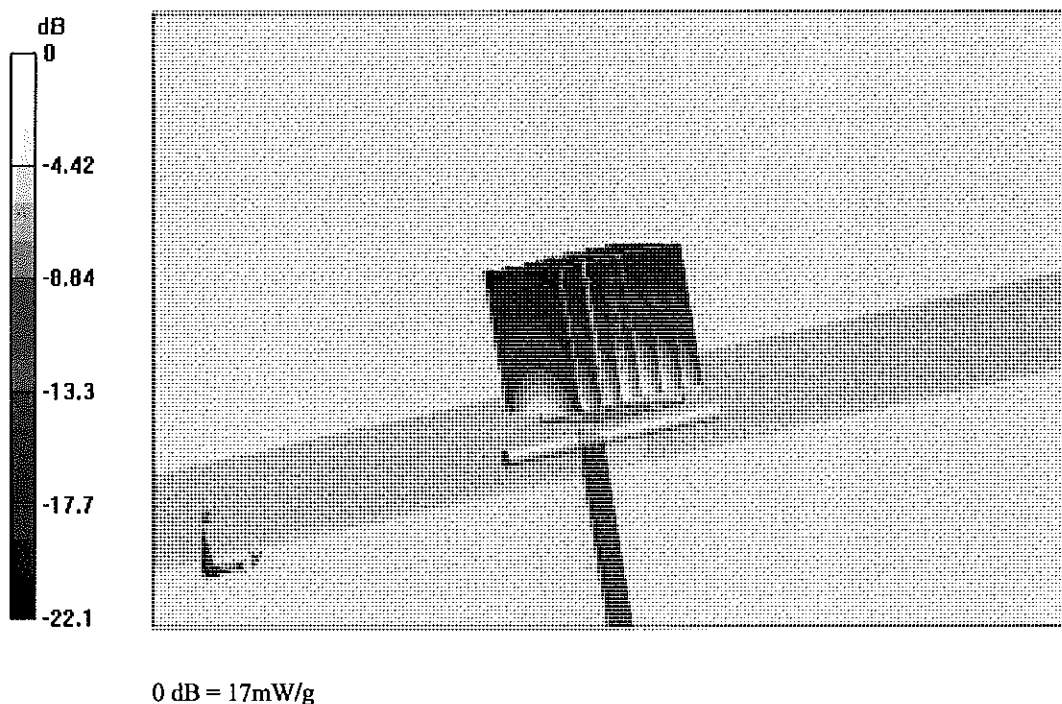
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.8 V/m; Power Drift = -0.00649 dB

Peak SAR (extrapolated) = 27.2 W/kg

SAR(1 g) = 13 mW/g; SAR(10 g) = 6 mW/g

Maximum value of SAR (measured) = 17 mW/g



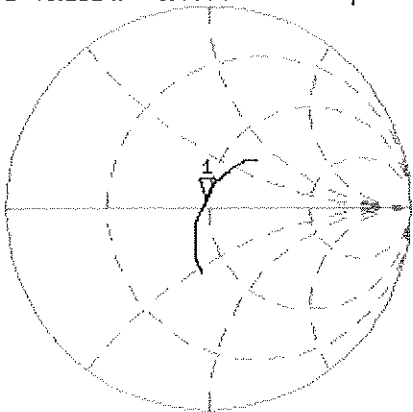
Impedance Measurement Plot for Body TSL

17 Aug 2009 15:56:32
[CH1] S11 1 U FS 1: 48.221 Ω 3.9004 Ω 253.37 pF 2 450.000 000 MHz

*
De1
Cor

Avg
16

↑



CH2 S11 LOG 5 dB/REF -20 dB 1:-27.205 dB 2 450.000 000 MHz

Cor

Avg
16

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