

## **APPENDIX A: SAR TEST DATA**

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

Communication System: IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: 2450 Muscle; Medium parameters used (interpolated):  
 $f = 2437 \text{ MHz}$ ;  $\sigma = 1.94 \text{ mho/m}$ ;  $\epsilon_r = 52.4$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114  
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Mode: WLAN 802.11b, Lap position, LCD Flip, Mid.ch, 1 Mbps, Tx Chain B**

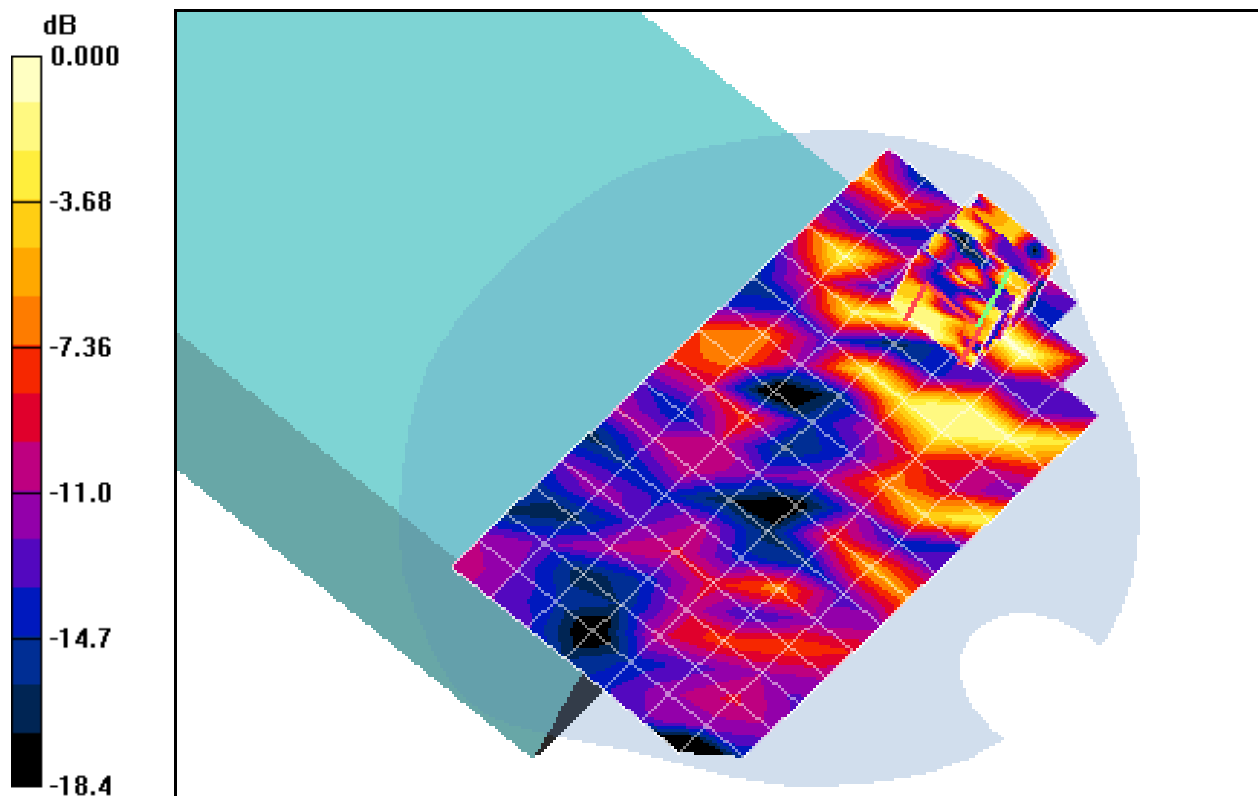
**Area Scan (8x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 6.39 V/m

Peak SAR (extrapolated) = 0.317 W/kg

**SAR(1 g) = 0.0615 mW/g; SAR(10 g) = 0.0250 mW/g**



0 dB = 0.092mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

Communication System: IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: 2450 Muscle; Medium parameters used (interpolated):  
 $f = 2437 \text{ MHz}$ ;  $\sigma = 1.94 \text{ mho/m}$ ;  $\epsilon_r = 52.4$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: WLAN 802.11b, Edge Bottom position, LCD Flip, Mid.ch, 1Mbps, Tx chain B**

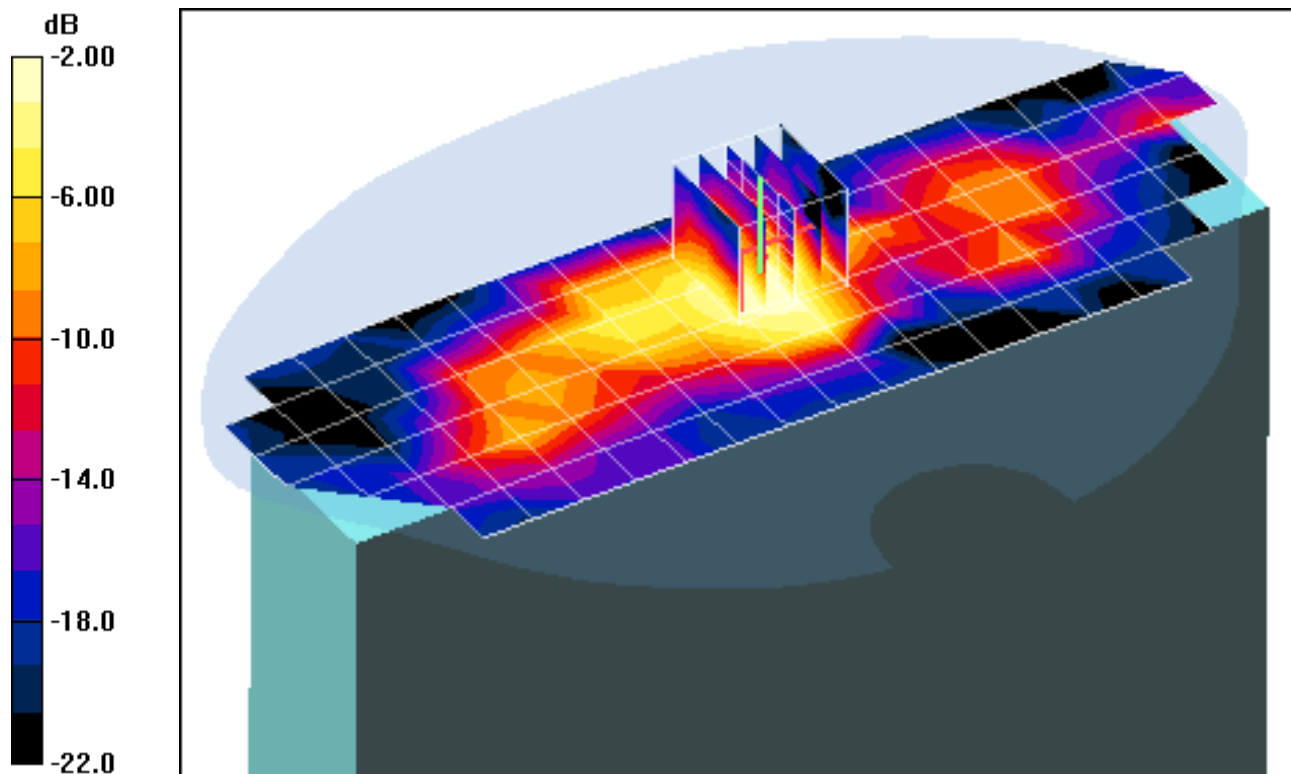
**Area Scan (7x20x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 8.95 V/m

Peak SAR (extrapolated) = 0.205 W/kg

**SAR(1 g) = 0.104 mW/g; SAR(10 g) = 0.050 mW/g**



0 dB = 0.136mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

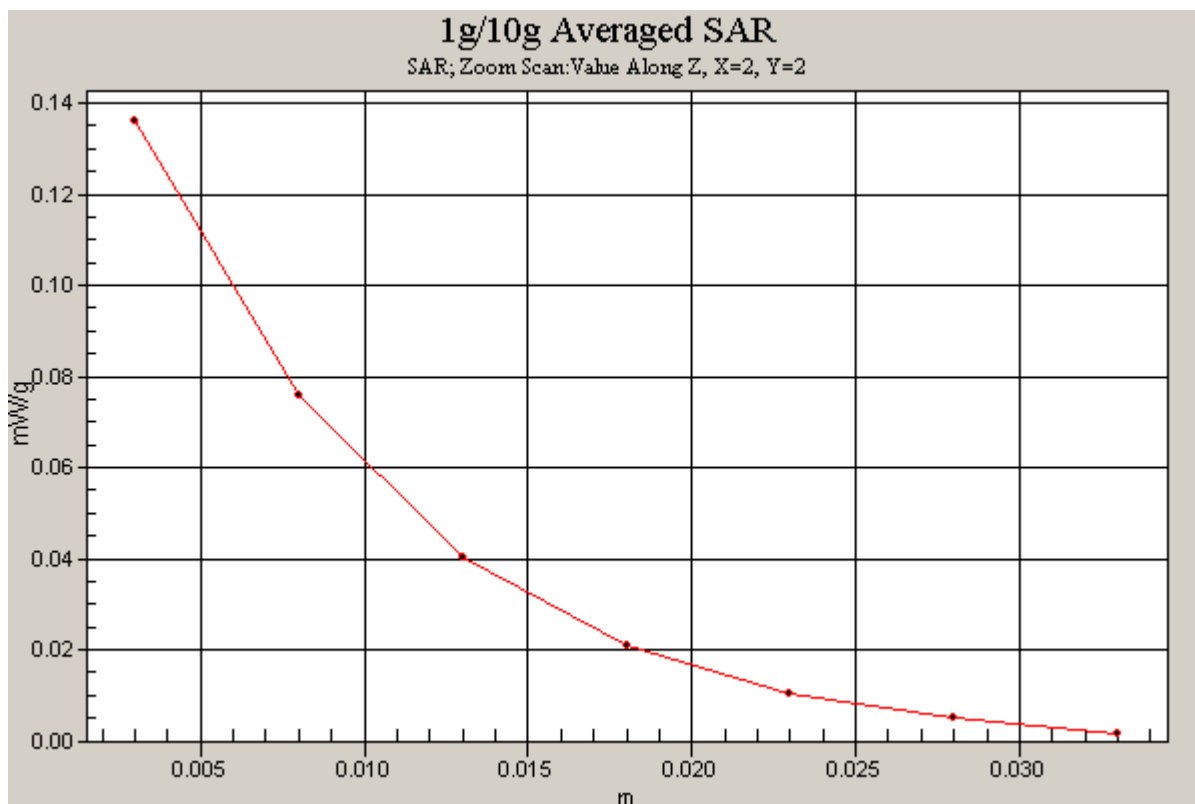
Communication System: IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: 2450 Muscle; Medium parameters used (interpolated):  
 $f = 2437 \text{ MHz}$ ;  $\sigma = 1.94 \text{ mho/m}$ ;  $\epsilon_r = 52.4$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114  
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Mode: WLAN 802.11b, Edge Bottom position, LCD Flip, Mid.ch, 1Mbps, Tx chain B**

**Area Scan (7x20x1):** Measurement grid: dx=15mm, dy=15mm  
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 8.95 V/m  
Peak SAR (extrapolated) = 0.205 W/kg  
**SAR(1 g) = 0.104 mW/g; SAR(10 g) = 0.050 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

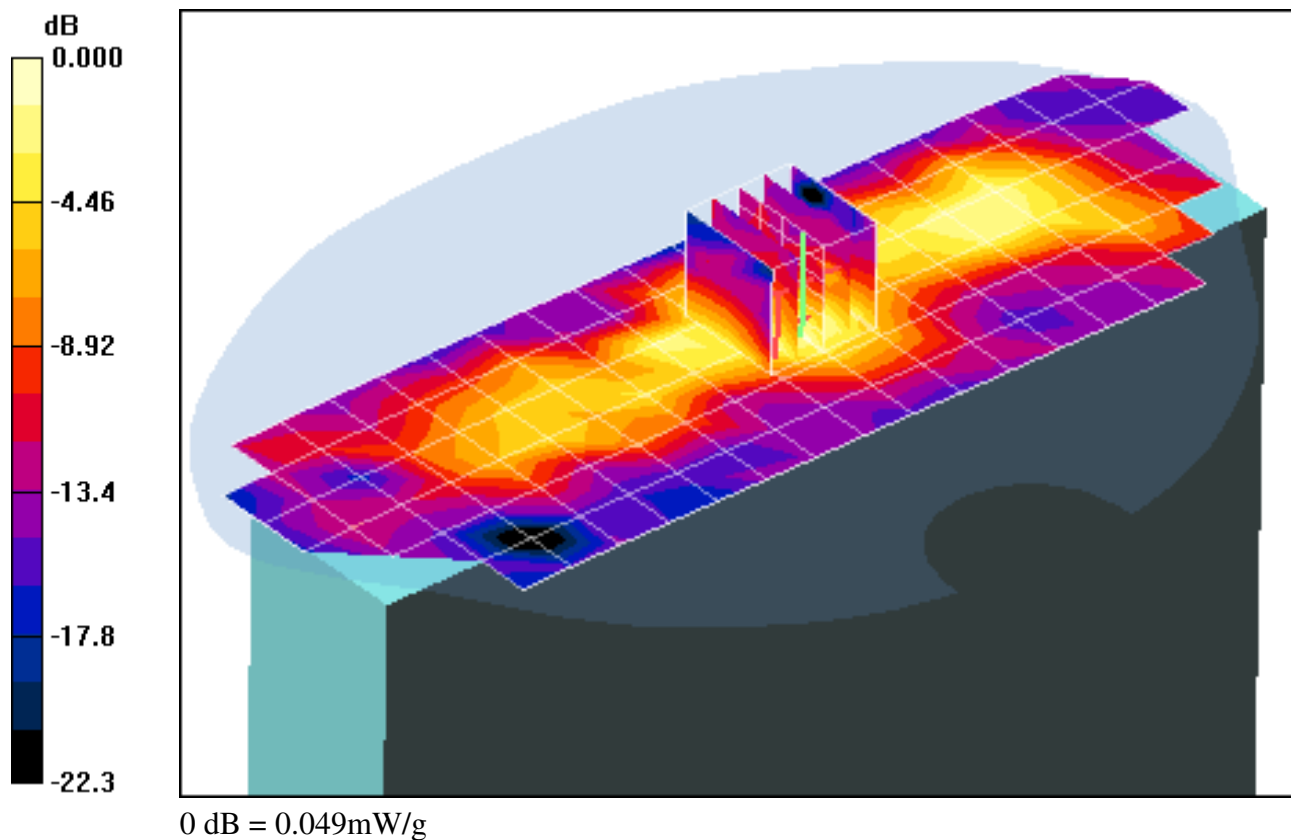
Communication System: IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: 2450 Muscle; Medium parameters used (interpolated):  
 $f = 2437 \text{ MHz}$ ;  $\sigma = 1.94 \text{ mho/m}$ ;  $\epsilon_r = 52.4$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114  
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Mode: WLAN 802.11b, Edge Top position, LCD Flip, Mid.ch, 1Mbps, Tx chain B**

**Area Scan (7x20x1):** 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 = 5.19 V/m  
Peak SAR (extrapolated) = 0.070 W/kg  
**SAR(1 g) = 0.0375 mW/g; SAR(10 g) = 0.0200 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

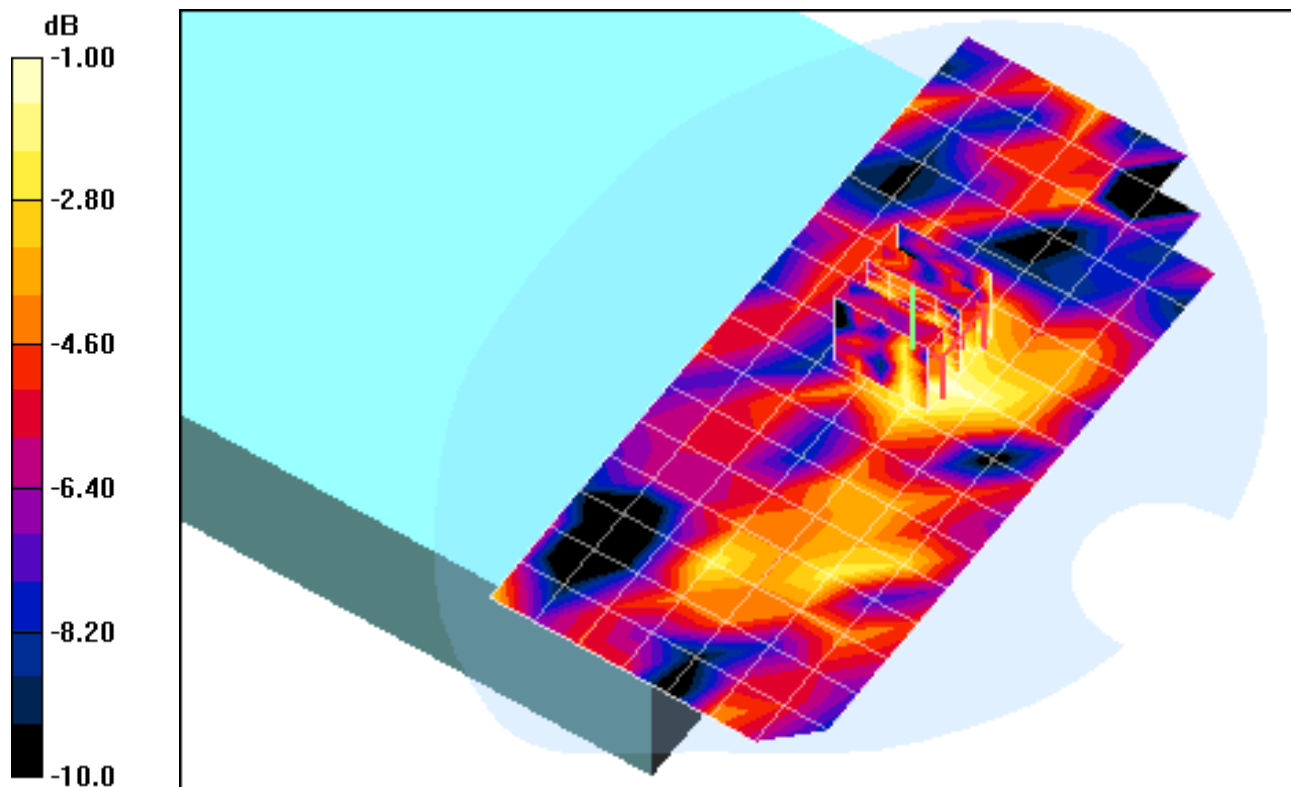
Communication System: IEEE 802.11g; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: 2450 Muscle; Medium parameters used (interpolated):  
 $f = 2437 \text{ MHz}$ ;  $\sigma = 1.94 \text{ mho/m}$ ;  $\epsilon_r = 52.4$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114  
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Mode: WLAN 802.11b, Lap position, LCD Flip, Mid.ch, 6 Mbps, Tx Chain B**

**Area Scan (8x17x1):** 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 = 2.11 V/m  
Peak SAR (extrapolated) = 0.022 W/kg  
**SAR(1 g) = 0.0121 mW/g; SAR(10 g) = 0.00668 mW/g**



0 dB = 0.015mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

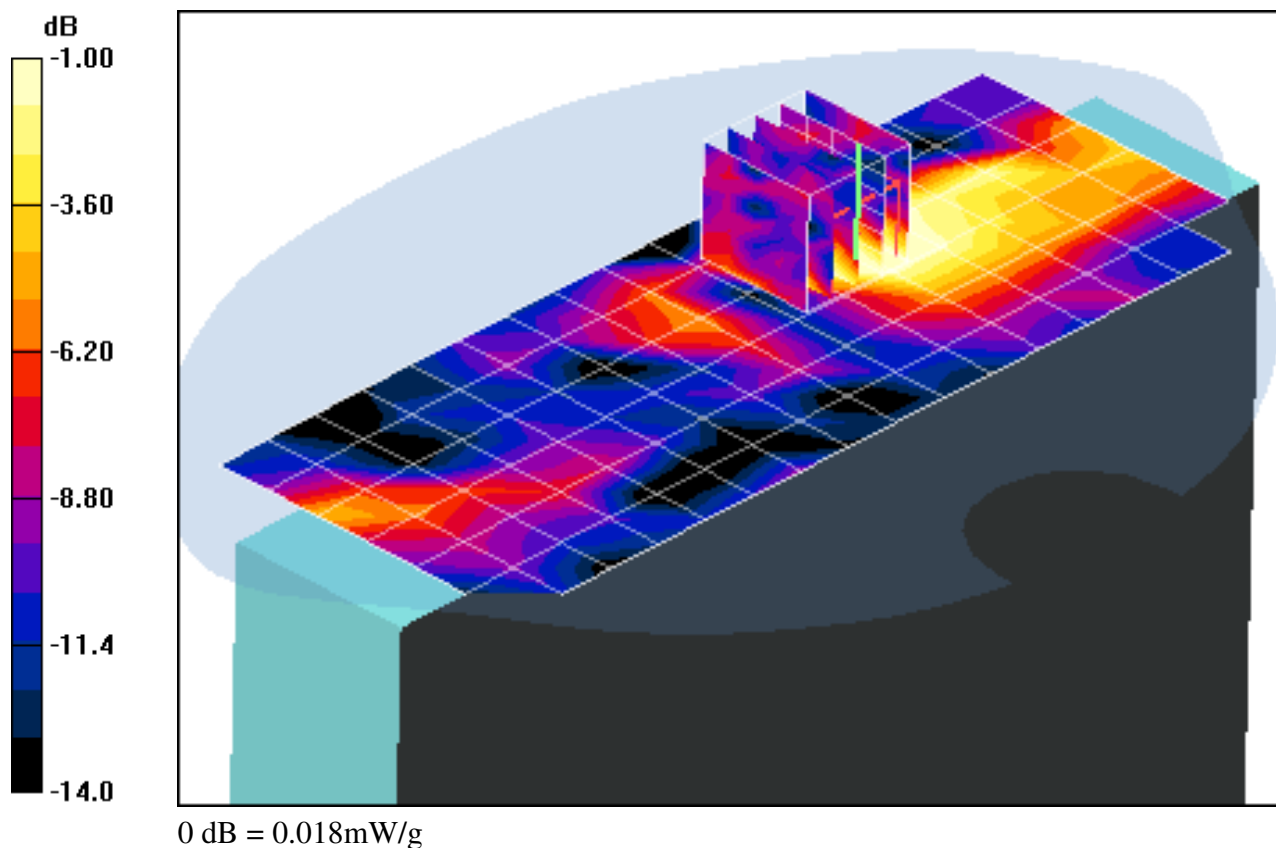
Communication System: IEEE 802.11g; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: 2450 Muscle; Medium parameters used (interpolated):  
 $f = 2437 \text{ MHz}$ ;  $\sigma = 1.94 \text{ mho/m}$ ;  $\epsilon_r = 52.4$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114  
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Mode: WLAN 802.11g, Edge Bottom position, LCD Flip, Mid.ch, 1Mbps, Tx chain B**

**Area Scan (7x17x1):** 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 = 2.77 V/m  
Peak SAR (extrapolated) = 0.031 W/kg  
**SAR(1 g) = 0.0147 mW/g; SAR(10 g) = 0.00707 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

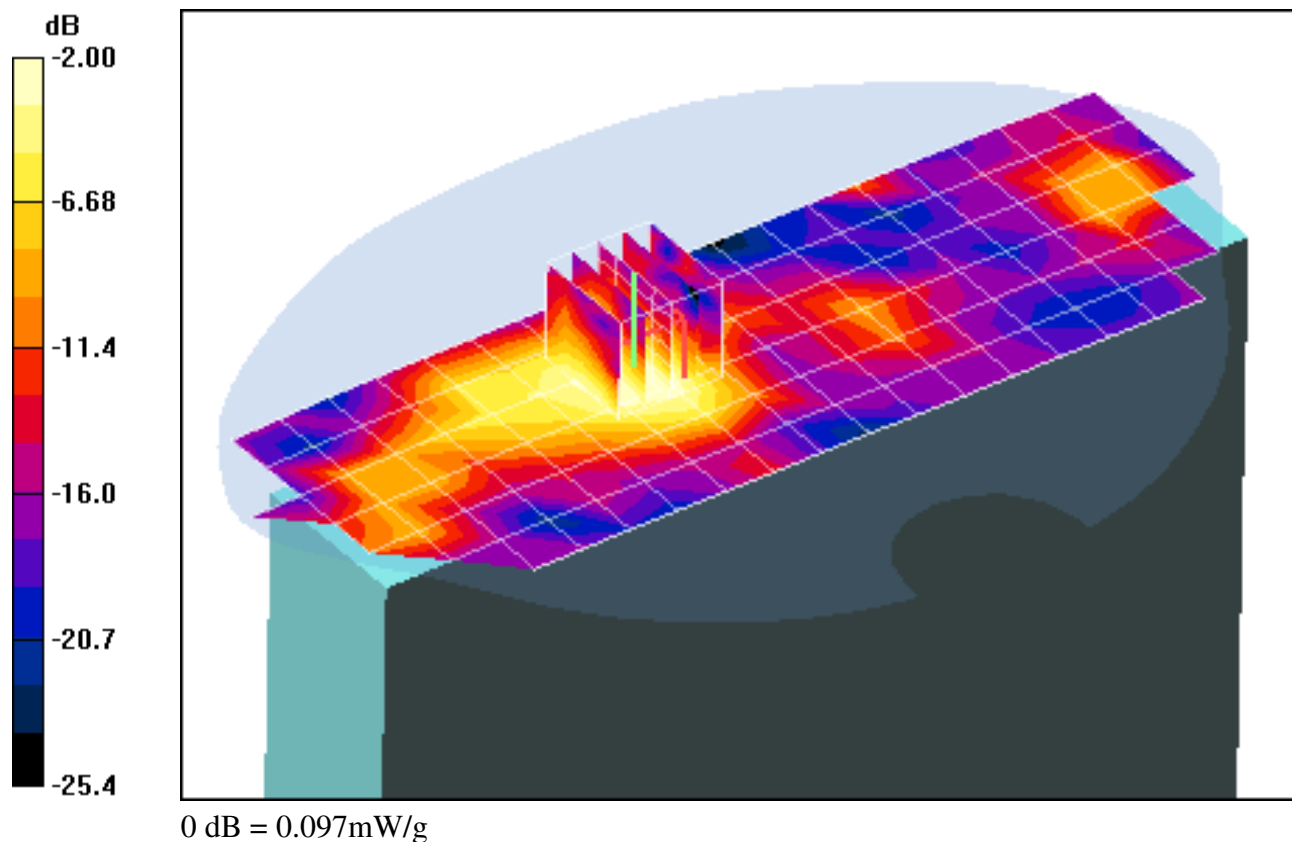
Communication System: IEEE 802.11g; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: 2450 Muscle; Medium parameters used (interpolated):  
 $f = 2437 \text{ MHz}$ ;  $\sigma = 1.94 \text{ mho/m}$ ;  $\epsilon_r = 52.4$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114  
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Mode: WLAN 802.11g, Edge Top position, LCD Flip, Mid.ch, 6 Mbps, Tx chain B**

**Area Scan (7x21x1):** 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 = 7.33 V/m  
Peak SAR (extrapolated) = 0.152 W/kg  
**SAR(1 g) = 0.0764 mW/g; SAR(10 g) = 0.0370 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

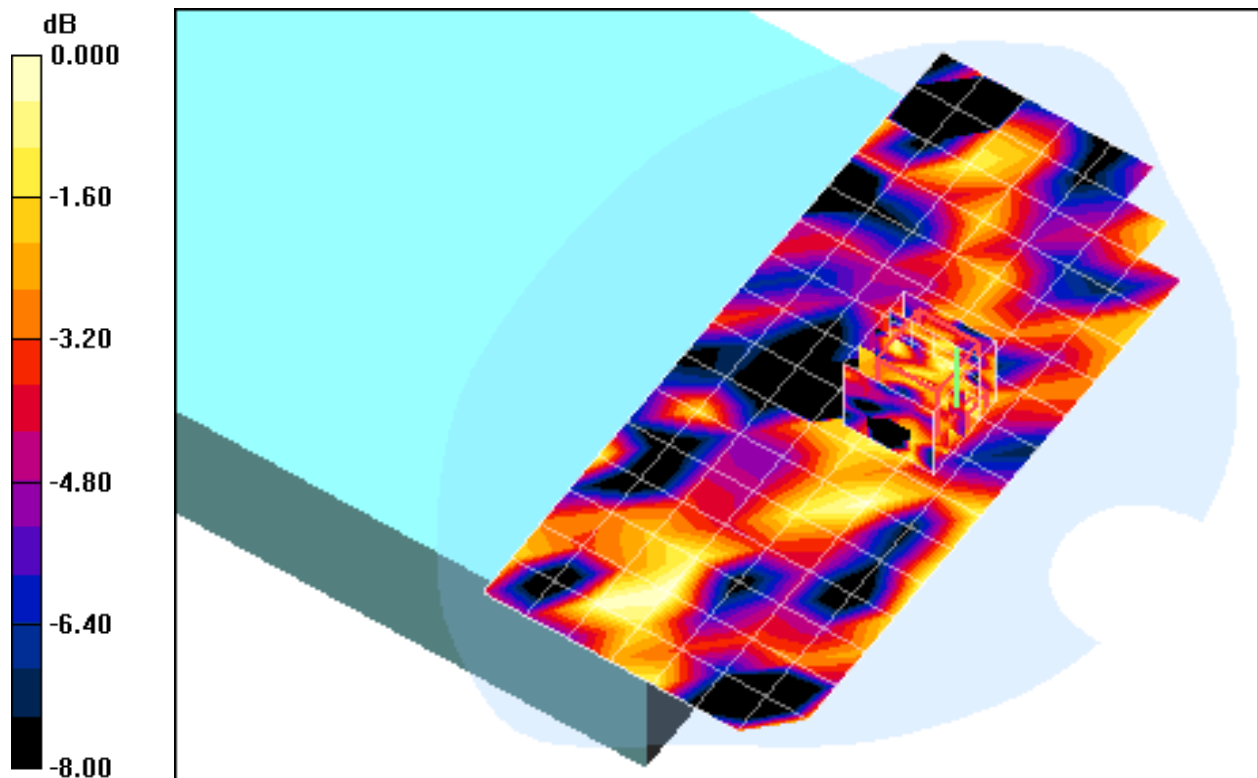
Communication System: IEEE 802.11n; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: 2450 Muscle; Medium parameters used (interpolated):  
 $f = 2437 \text{ MHz}$ ;  $\sigma = 1.94 \text{ mho/m}$ ;  $\epsilon_r = 52.4$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114  
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Mode: WLAN 802.11n, Lap position, LCD Flip, Mid.ch,  
13.5 Mbps, Tx Chain B**

**Area Scan (8x17x1):** 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 = 1.86 V/m  
Peak SAR (extrapolated) = 0.020 W/kg  
**SAR(1 g) = 0.0105 mW/g; SAR(10 g) = 0.0057 mW/g**



0 dB = 0.007mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

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

Medium: 2450 Muscle; Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$ ;  $\sigma = 1.94 \text{ mho/m}$ ;  $\epsilon_r = 52.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: WLAN 802.11n, Edge Bottom position, LCD Flip, Mid.ch,  
13.5 Mbps, Tx chain B**

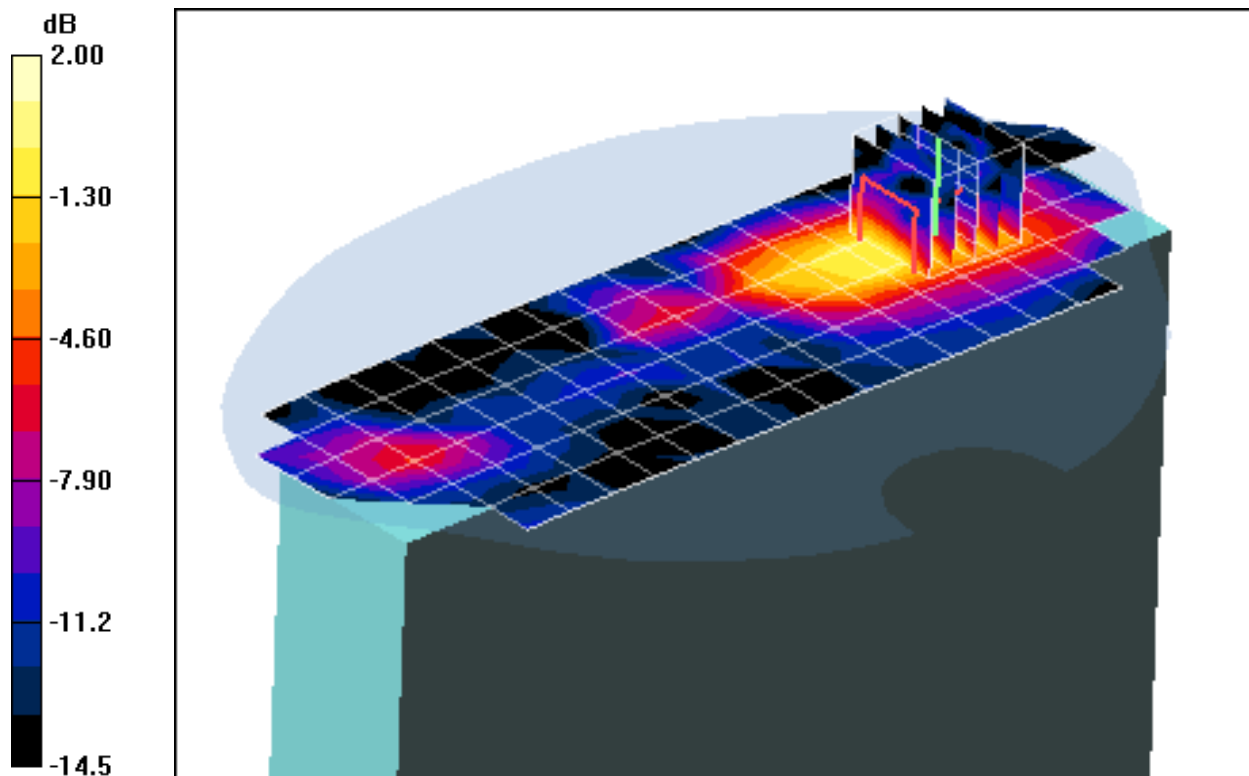
**Area Scan (7x20x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 3.38 V/m

Peak SAR (extrapolated) = 0.081 W/kg

**SAR(1 g) = 0.0211 mW/g; SAR(10 g) = 0.0110 mW/g**



0 dB = 0.027mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

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

Medium: 2450 Muscle; Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$ ;  $\sigma = 1.94 \text{ mho/m}$ ;  $\epsilon_r = 52.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: WLAN 802.11n, Edge Top position, LCD Flip, Mid ch,  
40 Mbps, Tx chain A**

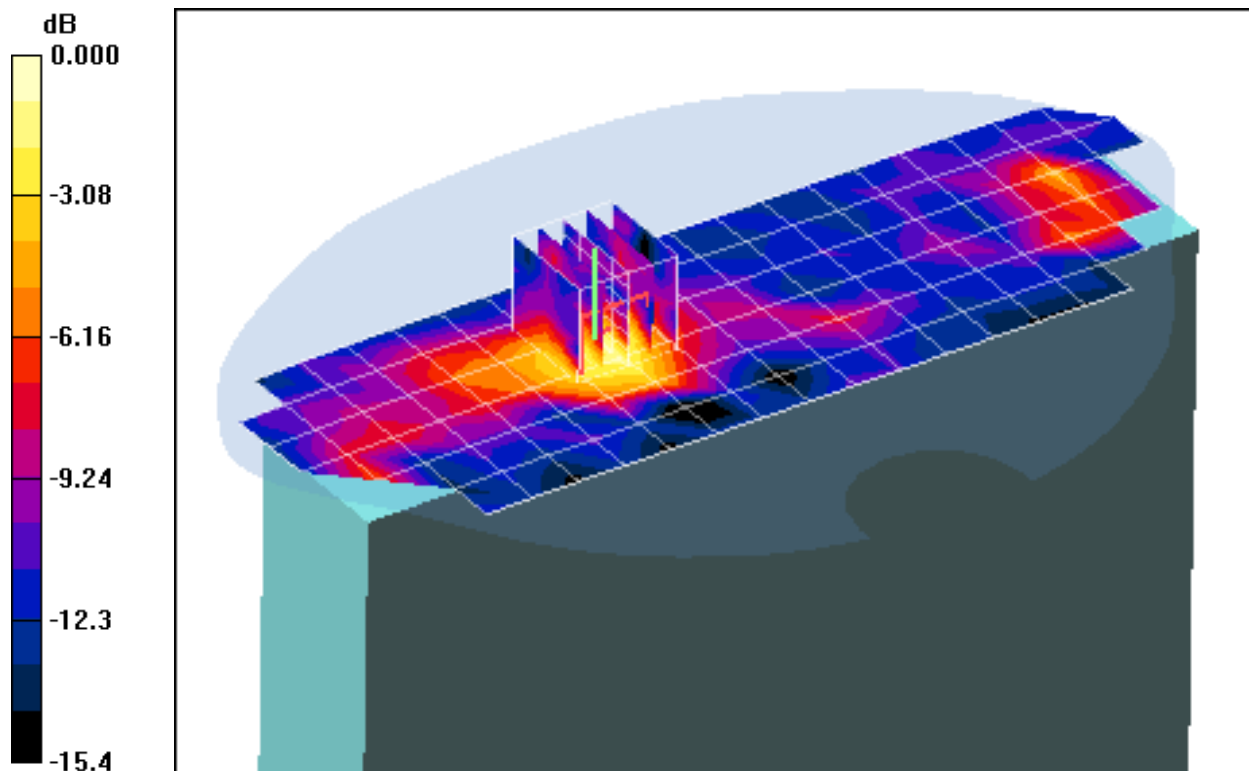
**Area Scan (7x20x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 4.74 V/m

Peak SAR (extrapolated) = 0.073 W/kg

**SAR(1 g) = 0.0352 mW/g; SAR(10 g) = 0.0180 mW/g**



0 dB = 0.027mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

Communication System: IEEE 802.11a 5.2GHz Band; Frequency: 5220 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5220 \text{ MHz}$ ;  $\sigma = 5.46 \text{ mho/m}$ ;  $\epsilon_r = 48.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-29-2010; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(3.73, 3.73, 3.73); 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: WLAN 802.11a, Lap position, LCD Flip, Ch. 48, 9 Mbps, Tx Chain A**

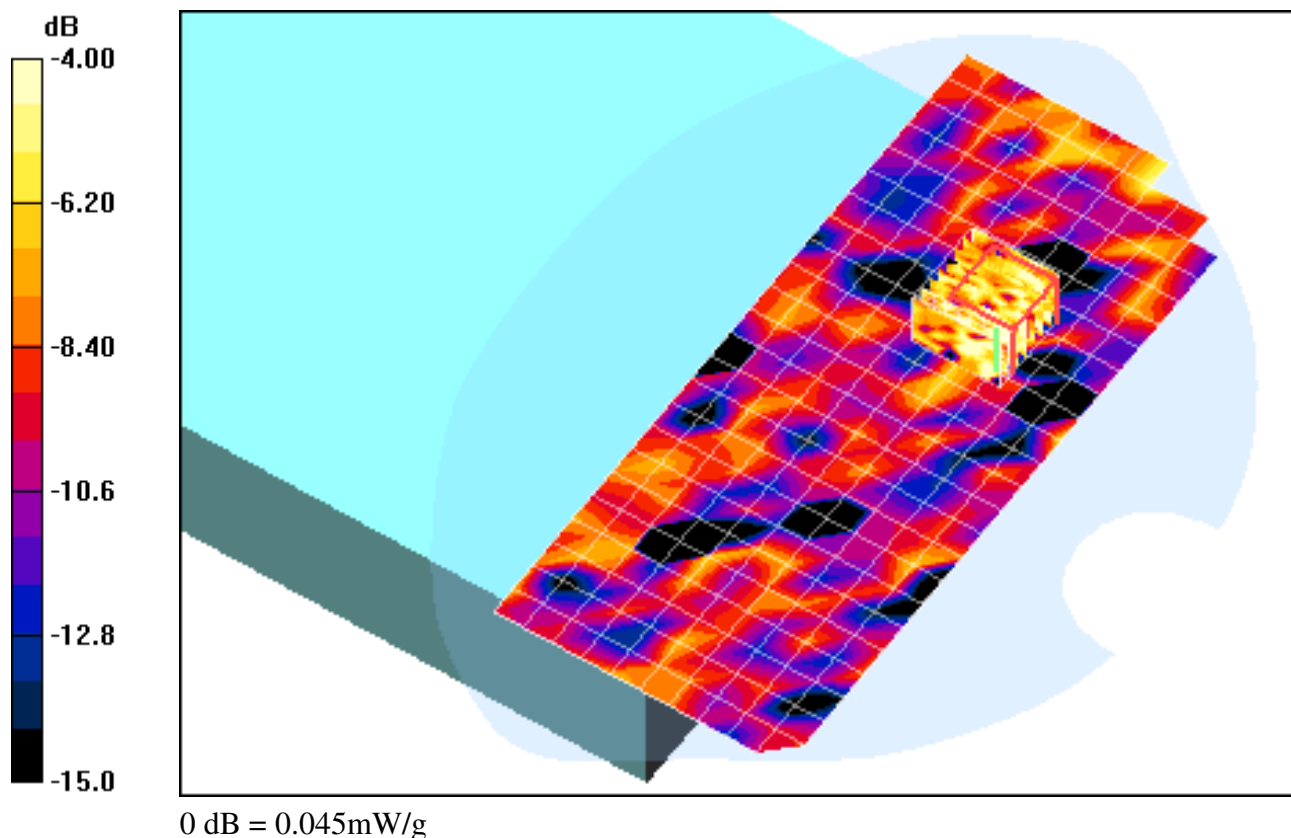
**Area Scan (11x25x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8) Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 1.44 V/m

Peak SAR (extrapolated) = 0.047 W/kg

**SAR(1 g) = 0.0268 mW/g; SAR(10 g) = 0.0110 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

Communication System: IEEE 802.11a 5.2GHz Band; Frequency: 5220 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5220 \text{ MHz}$ ;  $\sigma = 5.46 \text{ mho/m}$ ;  $\epsilon_r = 48.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-29-2010; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(3.73, 3.73, 3.73); 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: WLAN 802.11a, Edge Bottom position, LCD Flip, Ch. 44, 24 Mbps, Tx chain B**

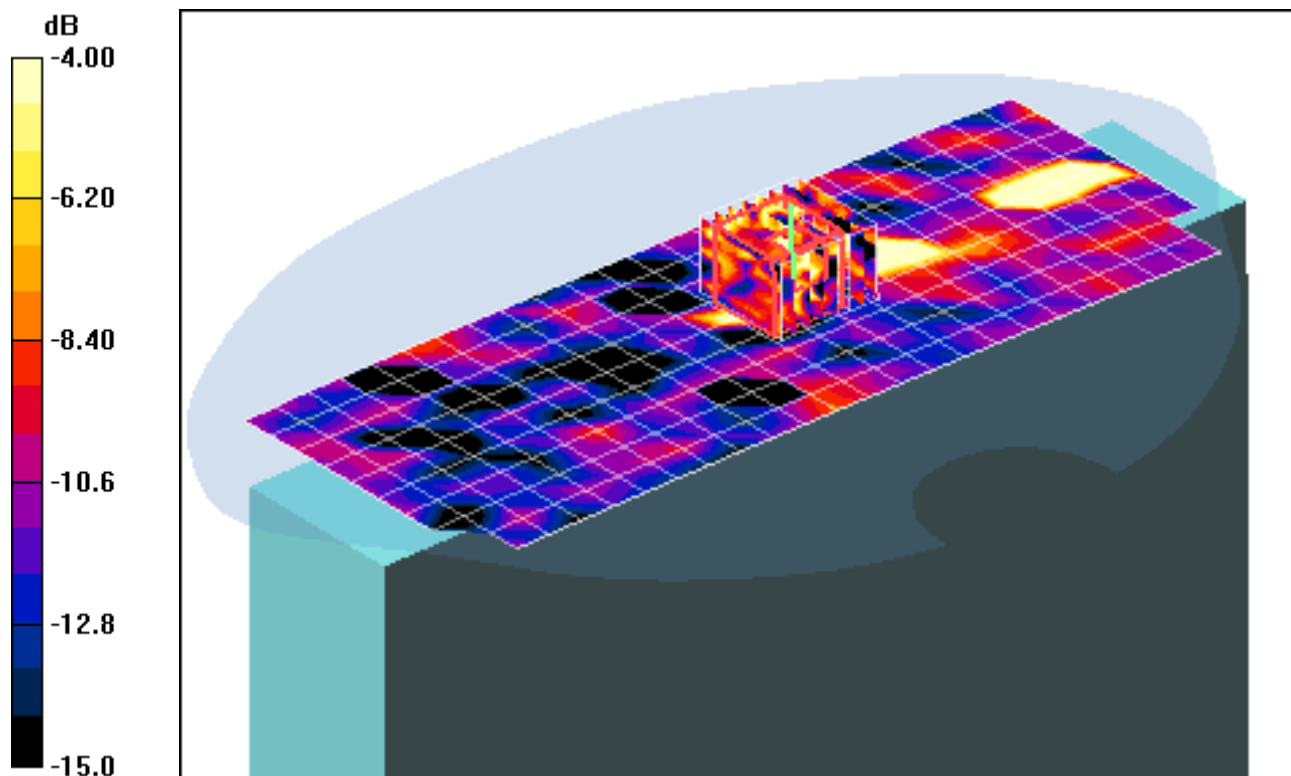
**Area Scan (10x25x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8) Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 1.309 V/m

Peak SAR (extrapolated) = 0.034 W/kg

**SAR(1 g) = 0.0118 mW/g; SAR(10 g) = 0.0038 mW/g**



0 dB = 0.026mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN**  
**Serial: 9JKSA00026**

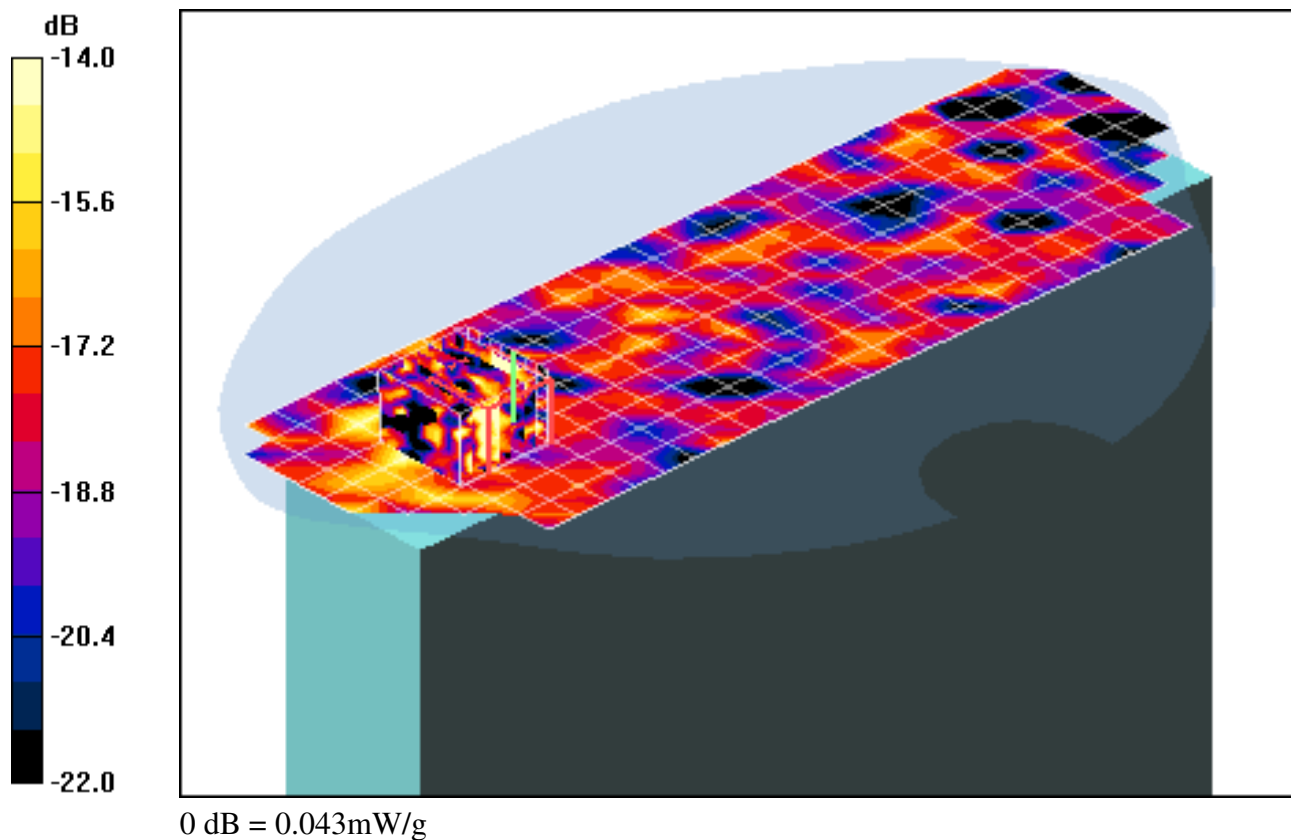
Communication System: IEEE 802.11a 5.2GHz Band; Frequency: 5220 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5220 \text{ MHz}$ ;  $\sigma = 5.46 \text{ mho/m}$ ;  $\epsilon_r = 48.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-29-2010; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(3.73, 3.73, 3.73); 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: WLAN 802.11a, Edge Top position, LCD Flip, Ch. 44, 24 Mbps, Tx chain B**

**Area Scan (10x29x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$   
**Zoom Scan (8x8x8) Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$   
Reference Value = 2.59 V/m  
Peak SAR (extrapolated) = 0.048 W/kg  
**SAR(1 g) = 0.0202 mW/g; SAR(10 g) = 0.0096 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN**  
**Serial: 9JKSA00026**

Communication System: IEEE 802.11a 5.3GHz Band; Frequency: 5300 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5300 \text{ MHz}$ ;  $\sigma = 5.58 \text{ mho/m}$ ;  $\epsilon_r = 48.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-29-2010; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(3.52, 3.52, 3.52); 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: WLAN 802.11 a, Lap Position, LCD Flip, Ch. 60, 12 Mbps, Tx Chain B**

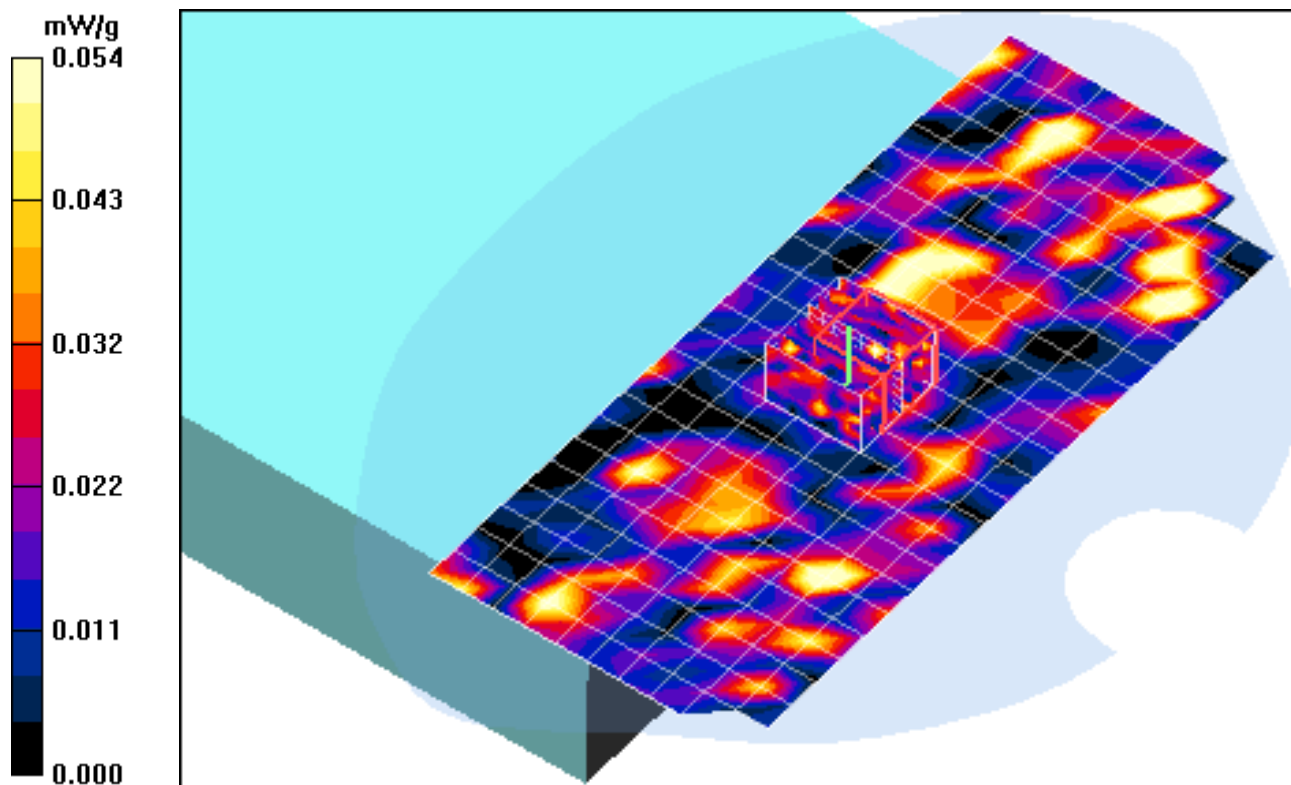
**Area Scan (11x25x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8) Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 1.44 V/m

Peak SAR (extrapolated) = 0.049 W/kg

**SAR(1 g) = 0.0319 mW/g; SAR(10 g) = 0.0218 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN**  
**Serial: 9JKSA00026**

Communication System: IEEE 802.11a 5.3GHz Band; Frequency: 5300 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5300 \text{ MHz}$ ;  $\sigma = 5.58 \text{ mho/m}$ ;  $\epsilon_r = 48.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-29-2010; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(3.52, 3.52, 3.52); 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: WLAN 802.11 a, Edge Bottom Position, LCD Flip, Ch.60, 12 Mbps, Tx Chain B**

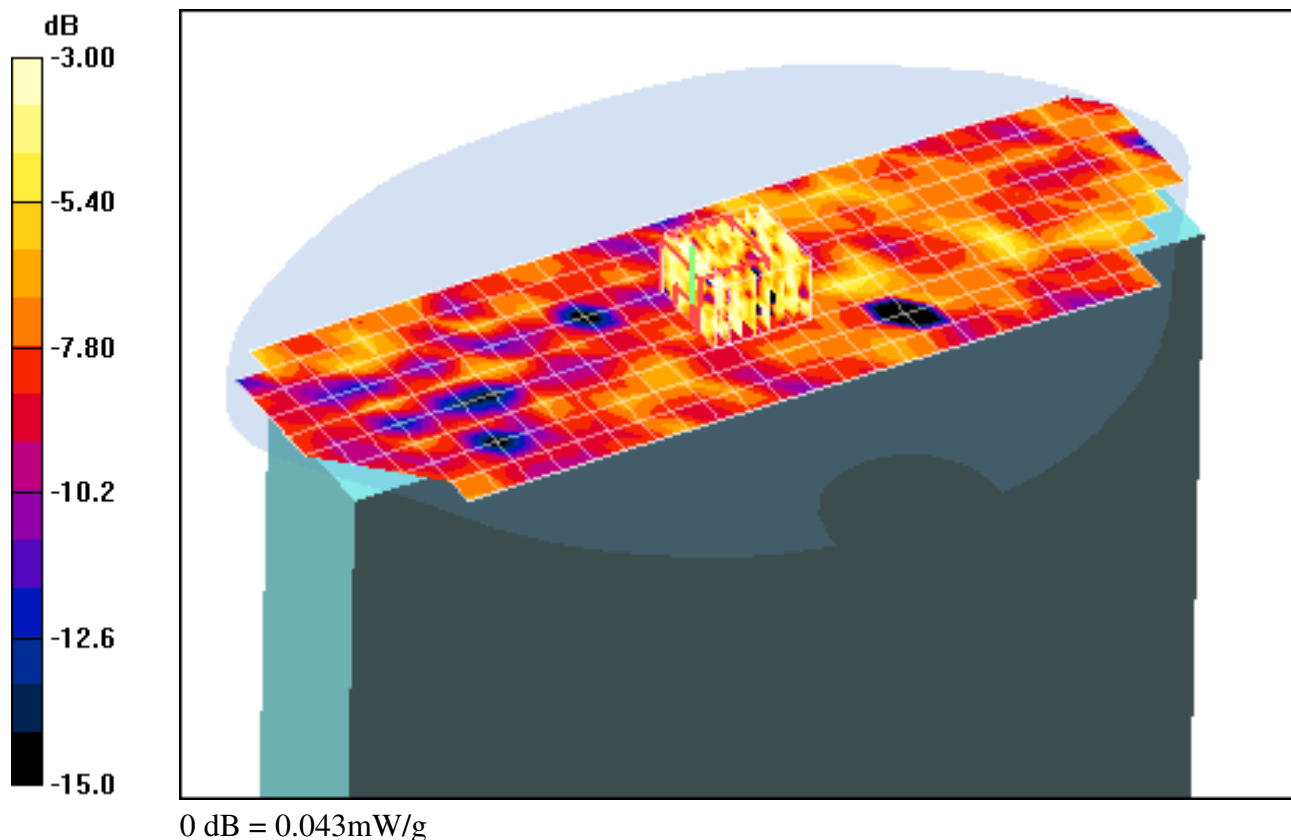
**Area Scan (10x29x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8) Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 1.282 V/m

Peak SAR (extrapolated) = 0.080 W/kg

**SAR(1 g) = 0.0262 mW/g; SAR(10 g) = 0.0117 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

Communication System: IEEE 802.11a 5.3GHz Band; Frequency: 5300 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5300 \text{ MHz}$ ;  $\sigma = 5.58 \text{ mho/m}$ ;  $\epsilon_r = 48.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-29-2010; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(3.52, 3.52, 3.52); 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: WLAN 802.11 a, Edge Top Position, LCD Flip, Ch.60, 6Mbps, Tx Chain A**

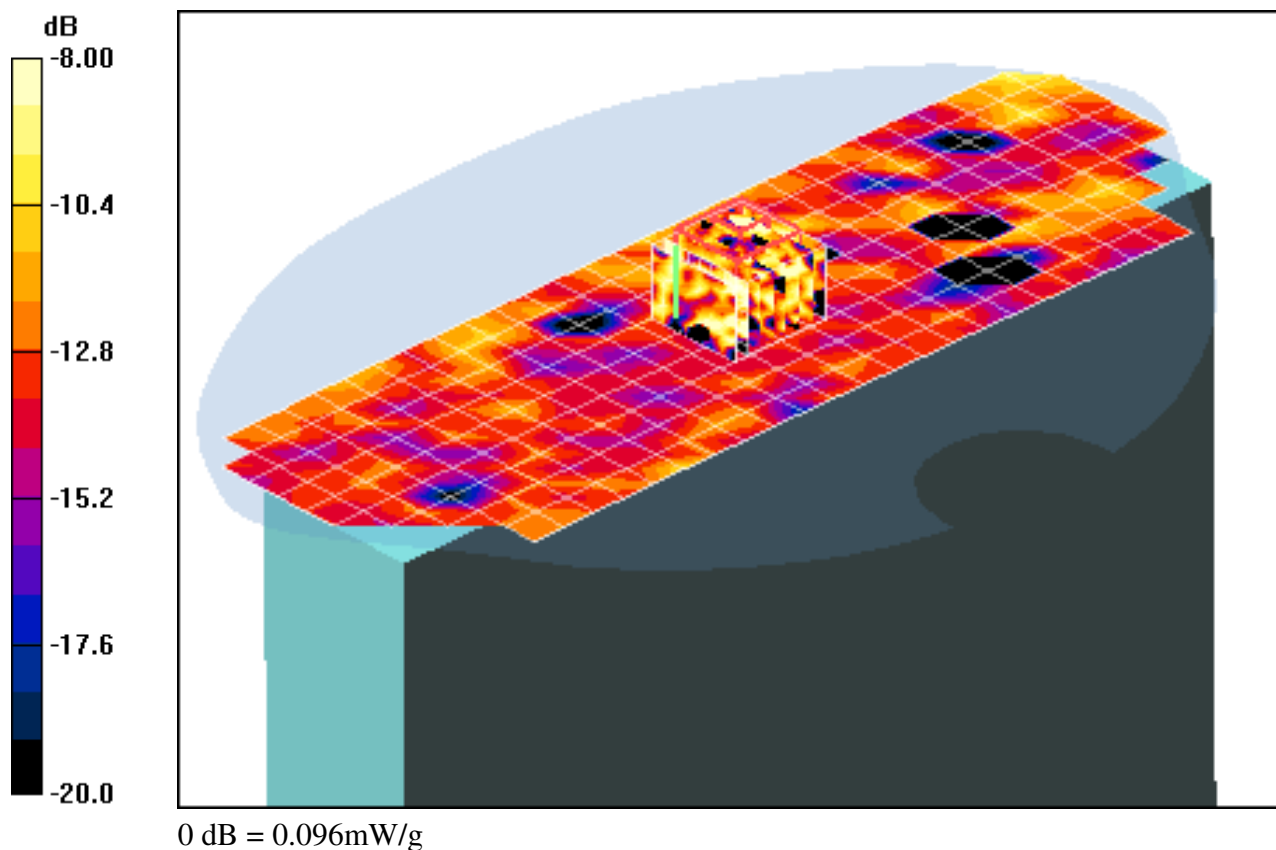
**Area Scan (10x29x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8) Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 1.45 V/m

Peak SAR (extrapolated) = 0.089 W/kg

**SAR(1 g) = 0.0440 mW/g; SAR(10 g) = 0.0162 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN**  
**Serial: 9JKSA00026**

Communication System: IEEE 802.11a 5.5GHz Band; Frequency: 5540 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5640 \text{ MHz}$ ;  $\sigma = 6.06 \text{ mho/m}$ ;  $\epsilon_r = 48.2$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-30-2010; Ambient Temp: 23.6°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN3550; ConvF(3.26, 3.26, 3.26); 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: WLAN 802.11a, Lap position, LCD Flip, Ch.128, 6 Mbps, Tx Chain A**

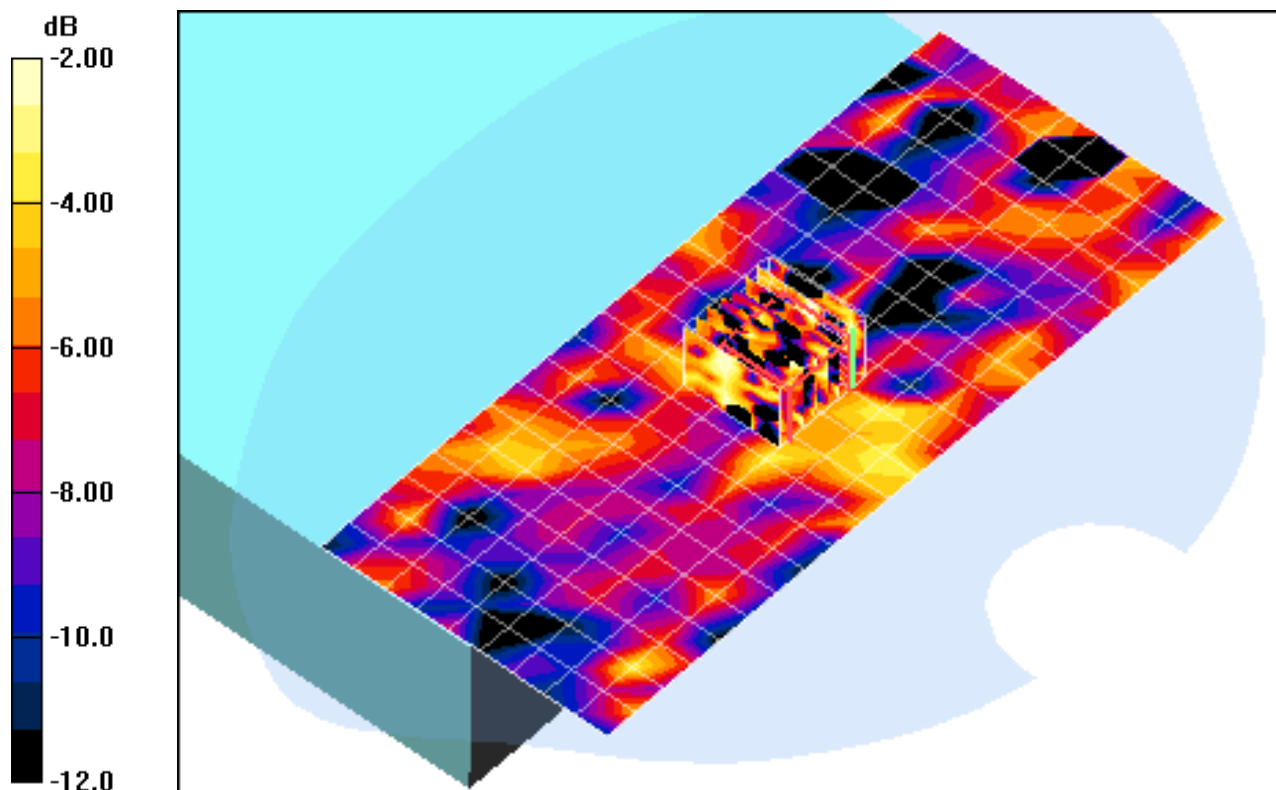
**Area Scan (10x23x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8) Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 1.72 V/m

Peak SAR (extrapolated) = 0.066 W/kg

**SAR(1 g) = 0.0383 mW/g; SAR(10 g) = 0.024 mW/g**



0 dB = 0.050mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN  
Serial: 9JKSA00026**

Communication System: IEEE 802.11a 5.5GHz Band; Frequency: 5540 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5540 \text{ MHz}$ ;  $\sigma = 5.92 \text{ mho/m}$ ;  $\epsilon_r = 48.2$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-30-2010; Ambient Temp: 23.6°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN3550; ConvF(3.26, 3.26, 3.26); 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: WLAN 802.11a, Edge Bottom position, LCD Flip, Ch.108, 6 Mbps, Tx chain B**

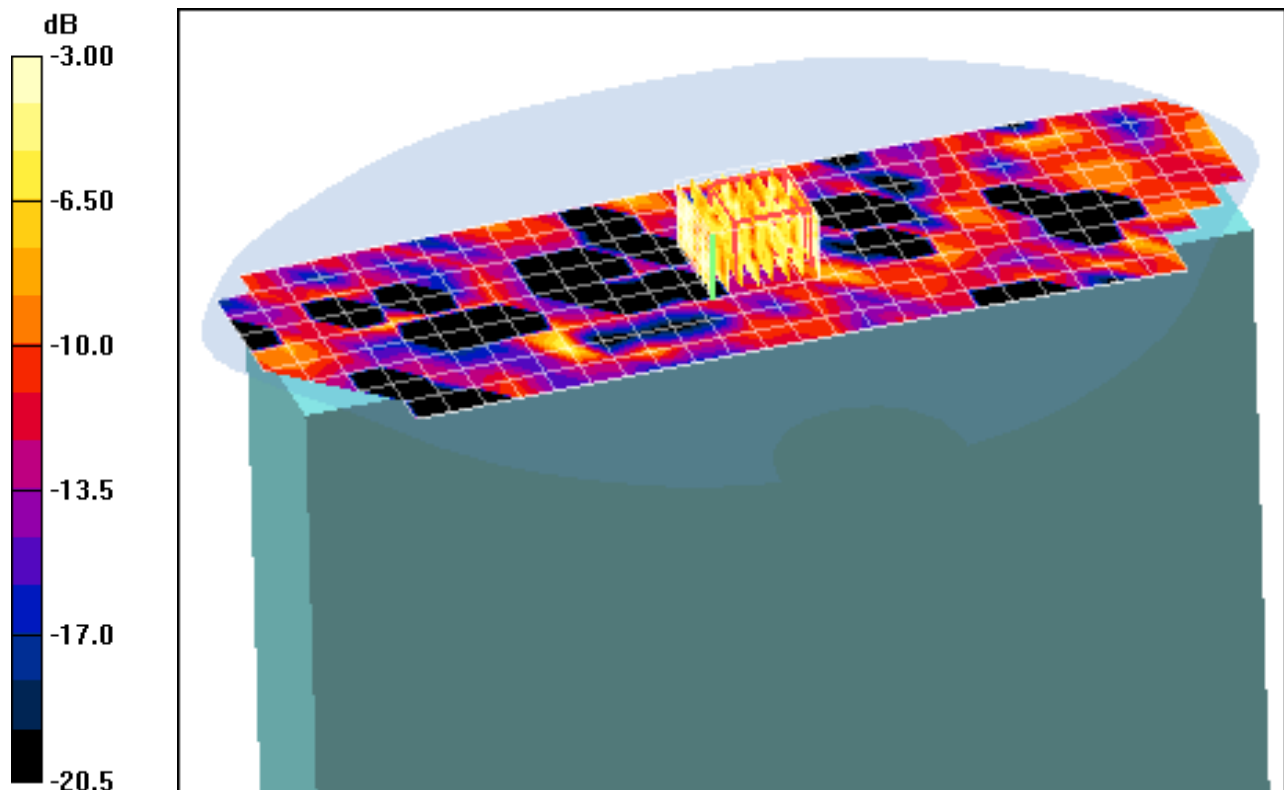
**Area Scan (10x31x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8) Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 1.166 V/m

Peak SAR (extrapolated) = 0.060 W/kg

**SAR(1 g) = 0.0331 mW/g; SAR(10 g) = 0.0174 mW/g**



0 dB = 0.059mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN**  
**Serial: 9JKSA00026**

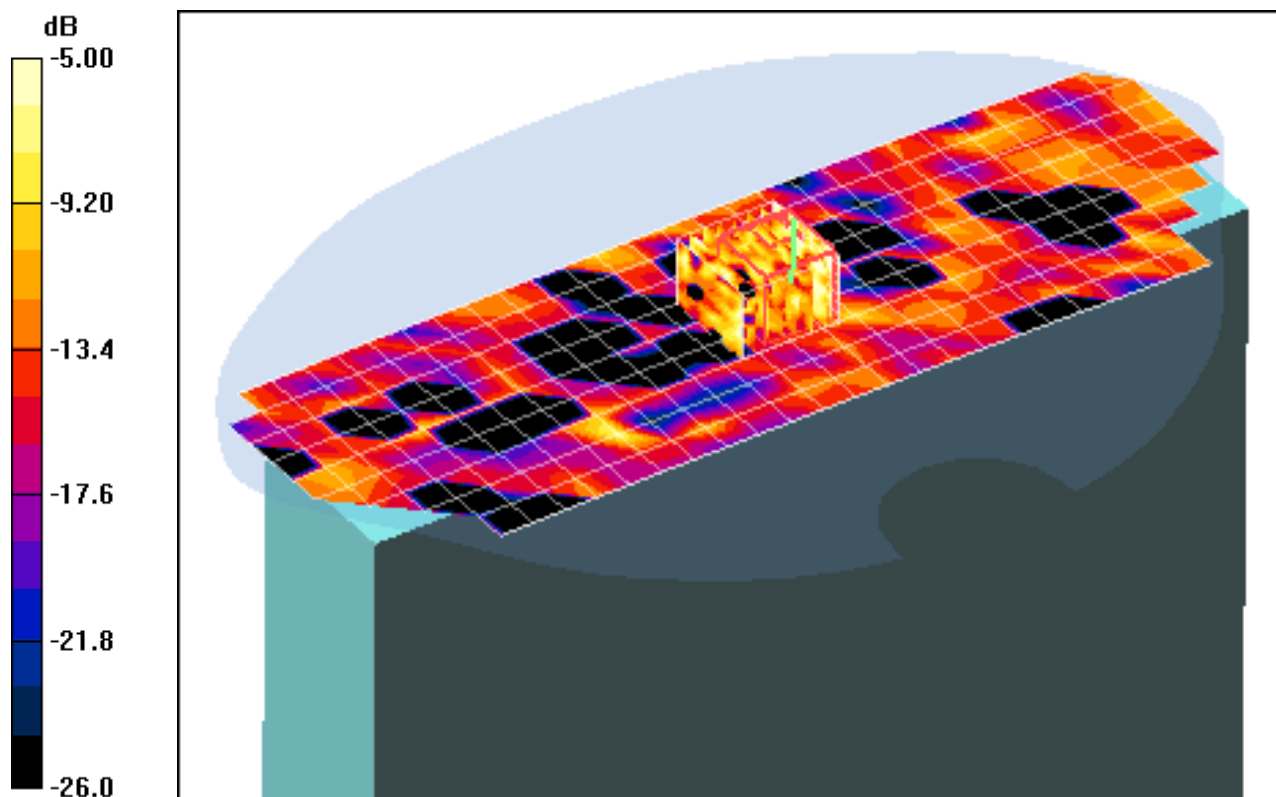
Communication System: IEEE 802.11a 5.5GHz Band; Frequency: 5540 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5640 \text{ MHz}$ ;  $\sigma = 6.06 \text{ mho/m}$ ;  $\epsilon_r = 48.2$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-30-2010; Ambient Temp: 23.6°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN3550; ConvF(3.26, 3.26, 3.26); 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: WLAN 802.11a, Edge Top position, LCD Flip, Ch.128, 6 Mbps, Tx chain A**

**Area Scan (10x31x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$   
**Zoom Scan (8x8x8) Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$   
Reference Value = 1.106 V/m  
Peak SAR (extrapolated) = 0.047 W/kg  
**SAR(1 g) = 0.0315 mW/g; SAR(10 g) = 0.0184 mW/g**



0 dB = 0.047mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN**  
**Serial: 9JKSA00026**

Communication System: IEEE 802.11a 5.8GHz Band; Frequency: 5825 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5785 \text{ MHz}$ ;  $\sigma = 6.27 \text{ mho/m}$ ;  $\epsilon_r = 47.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-31-2010; Ambient Temp: 23.7° C; Tissue Temp: 22.3° C

Probe: EX3DV4 - SN3550; ConvF(3.26, 3.26, 3.26); 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: WLAN 802.11a, Lap position, LCD Flip, Ch.157, 9 Mbps, Tx Chain A**

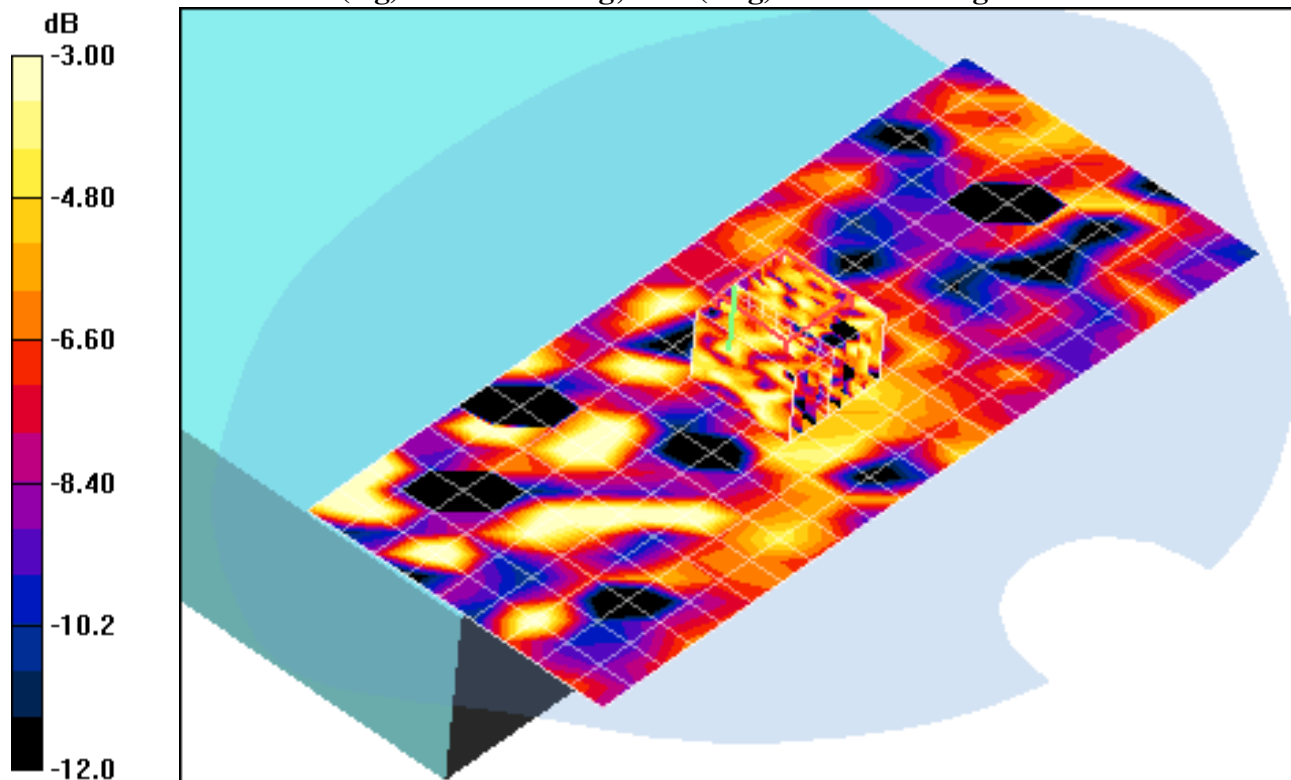
**Area Scan (10x23x1):** Measurement grid: dx=10mm, dy=10mm

**Zoom Scan (8x8x8)/Cube 0:** Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 3.26 V/m

Peak SAR (extrapolated) = 0.084 W/kg

**SAR(1 g) = 0.0406 mW/g; SAR(10 g) = 0.0220 mW/g**



0 dB = 0.068mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN**  
**Serial: 9JKSA00026**

Communication System: IEEE 802.11a 5.8GHz Band; Frequency: 5825 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5785 \text{ MHz}$ ;  $\sigma = 6.27 \text{ mho/m}$ ;  $\epsilon_r = 47.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-31-2010; Ambient Temp: 23.7°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN3550; ConvF(3.3, 3.3, 3.3); 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: WLAN 802.11a, Edge Bottom position, LCD Flip, Ch. 157, 9 Mbps, Tx chain A**

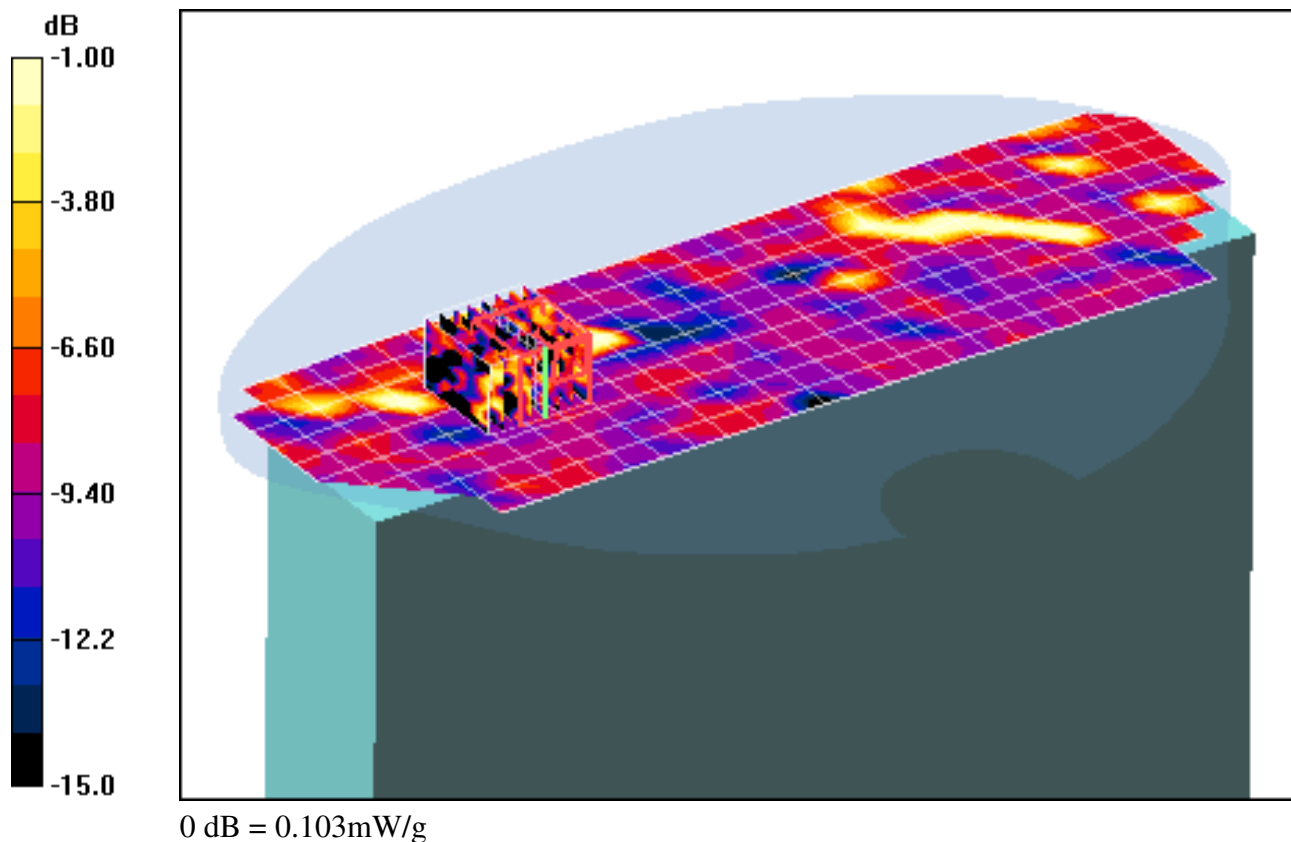
**Area Scan (10x29x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8) Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 1.69 V/m

Peak SAR (extrapolated) = 0.121 W/kg

**SAR(1 g) = 0.0965 mW/g; SAR(10 g) = 0.0322 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN**  
**Serial: 9JKSA00026**

Communication System: IEEE 802.11a 5.8GHz Band; Frequency: 5825 MHz; Duty Cycle: 1:1  
Medium: 5.2-5.8 GHz Muscle; Medium parameters used (interpolated):  
 $f = 5825 \text{ MHz}$ ;  $\sigma = 6.27 \text{ mho/m}$ ;  $\epsilon_r = 47.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-31-2010; Ambient Temp: 23.7°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN3550; ConvF(3.3, 3.3, 3.3); 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: WLAN 802.11a, Tablet Top position, LCD Flip, Ch. 157, 9 Mbps, Tx chain A**

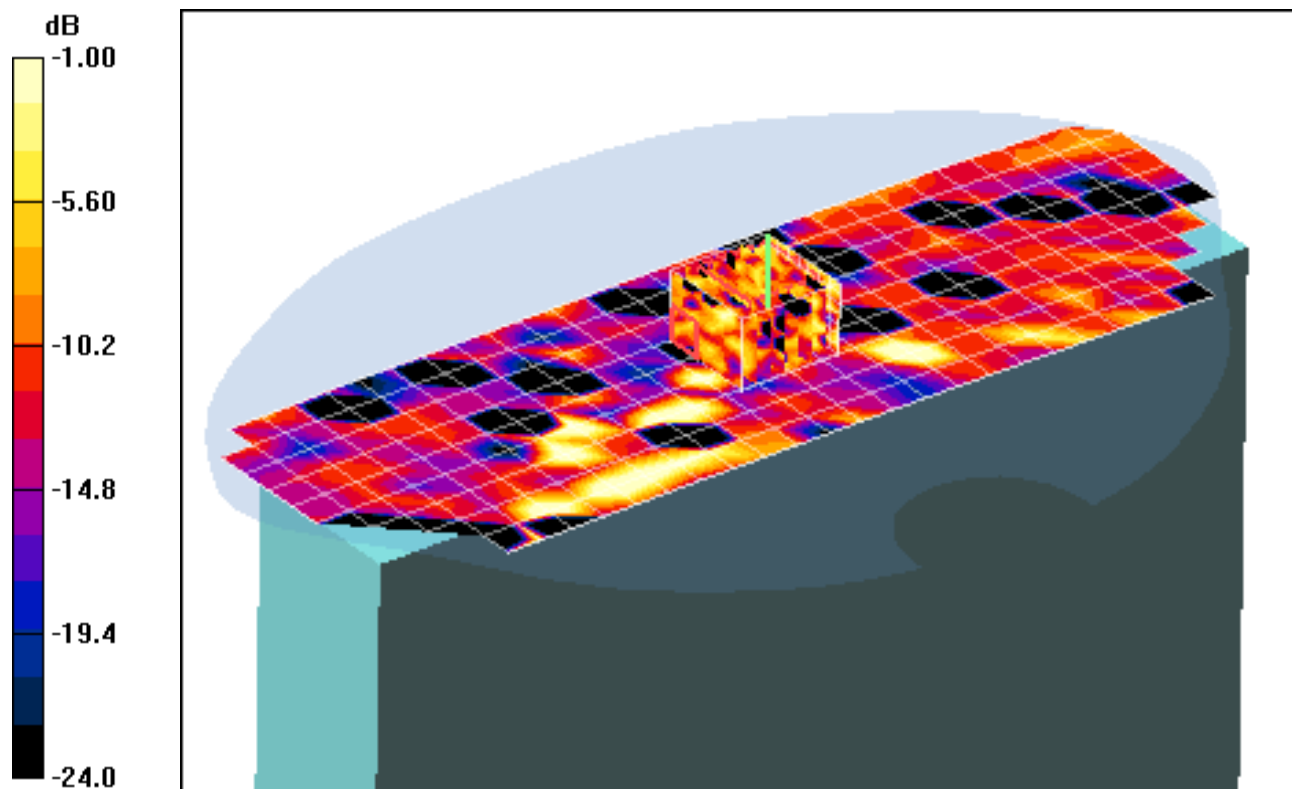
**Area Scan (10x29x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8)/Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Reference Value = 1.73 V/m

Peak SAR (extrapolated) = 0.056 W/kg

**SAR(1 g) = 0.0196 mW/g; SAR(10 g) = 0.0102 mW/g**



0 dB = 0.036mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057**

Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: 5500 Muscle; Medium parameters used (interpolated):

$f = 5500 \text{ MHz}$ ;  $\sigma = 5.87 \text{ mho/m}$ ;  $\epsilon_r = 46.8$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-30-2010; Ambient Temp: 23.6° C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN3550; ConvF(3.25, 3.25, 3.25); 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

## 5500MHz Dipole Validation

**Area Scan (7x9x1):** Measurement grid: dx=10mm, dy=10mm

**Zoom Scan (8x8x8)/Cube 0:** Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

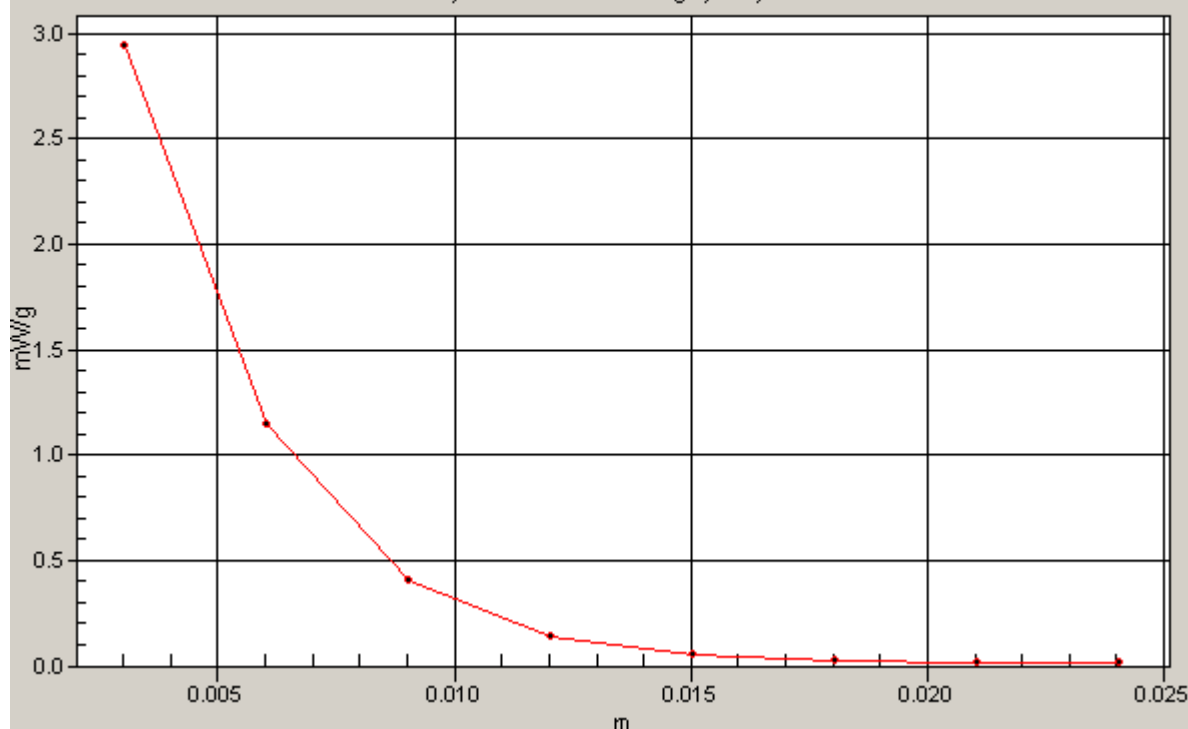
Input Power = 14 dBm (25mW)

**SAR(1 g) = 1.91 mW/g; SAR(10 g) = 0.530 mW/g**

Deviation = -6.37 %

**1g/10g Averaged SAR**

SAR; Zoom Scan: Value Along Z, X=4, Y=3



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth, and WWAN;  
Serial: 9JKSA00026**

Communication System: Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1

Medium: 2450 Muscle Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$ ;  $\sigma = 1.91 \text{ mho/m}$ ;  $\epsilon_r = 50.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-12-2010; Ambient Temp: 23.9°C; Tissue Temp: 23.0°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 Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: Bluetooth, Lap position, LCD Flip, Mid.ch, Tx**

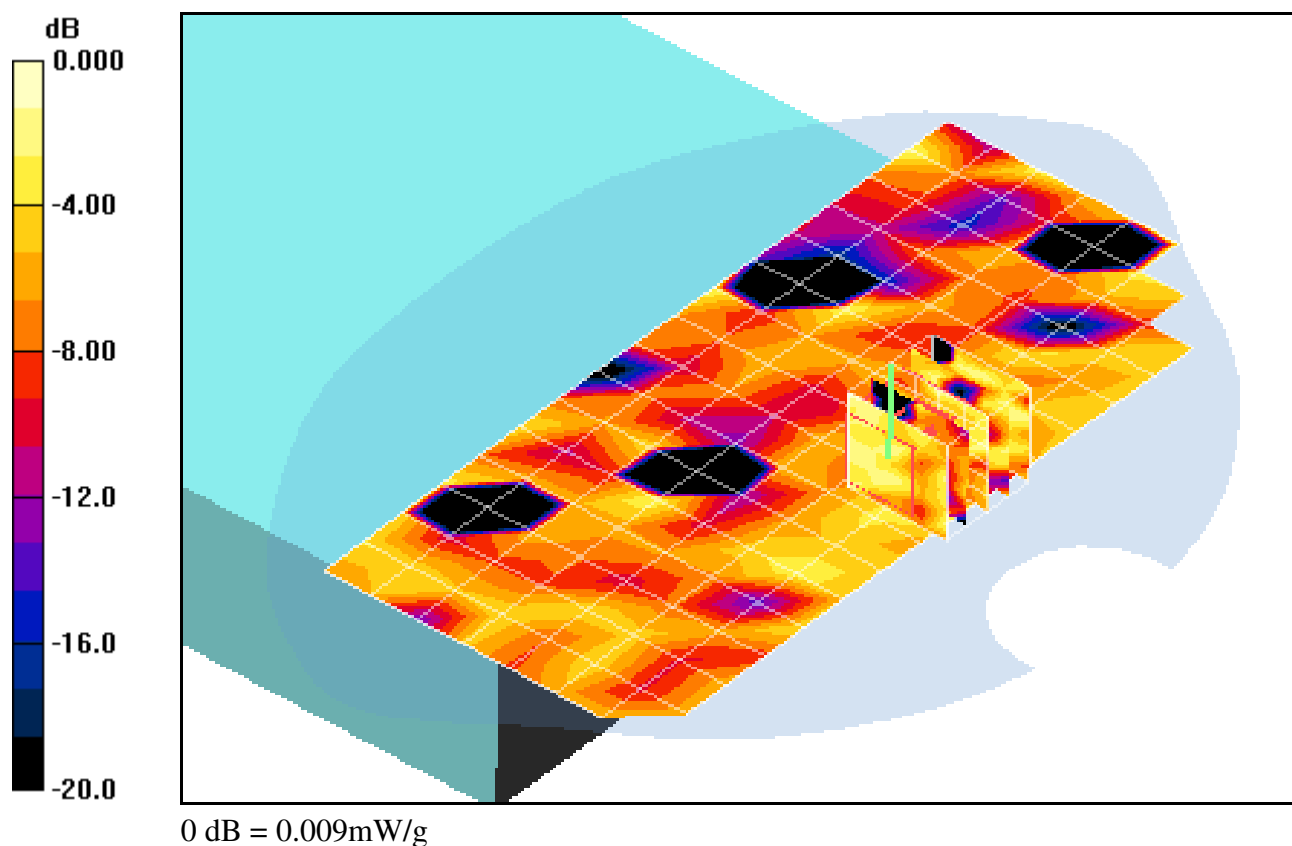
**Area Scan (8x17x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 0.652 V/m

Peak SAR (extrapolated) = 0.009 W/kg

**SAR(1 g) = 0.000161 mW/g; SAR(10 g) = 3.14e-005 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth, and WWAN;  
Serial: 9JKSA00026**

Communication System: Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1

Medium: 2450 Muscle Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$ ;  $\sigma = 1.91 \text{ mho/m}$ ;  $\epsilon_r = 50.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-12-2010; Ambient Temp: 23.9°C; Tissue Temp: 23.0°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 Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: Bluetooth, Tablet Bottom position, LCD Flip, Mid.ch, Tx**

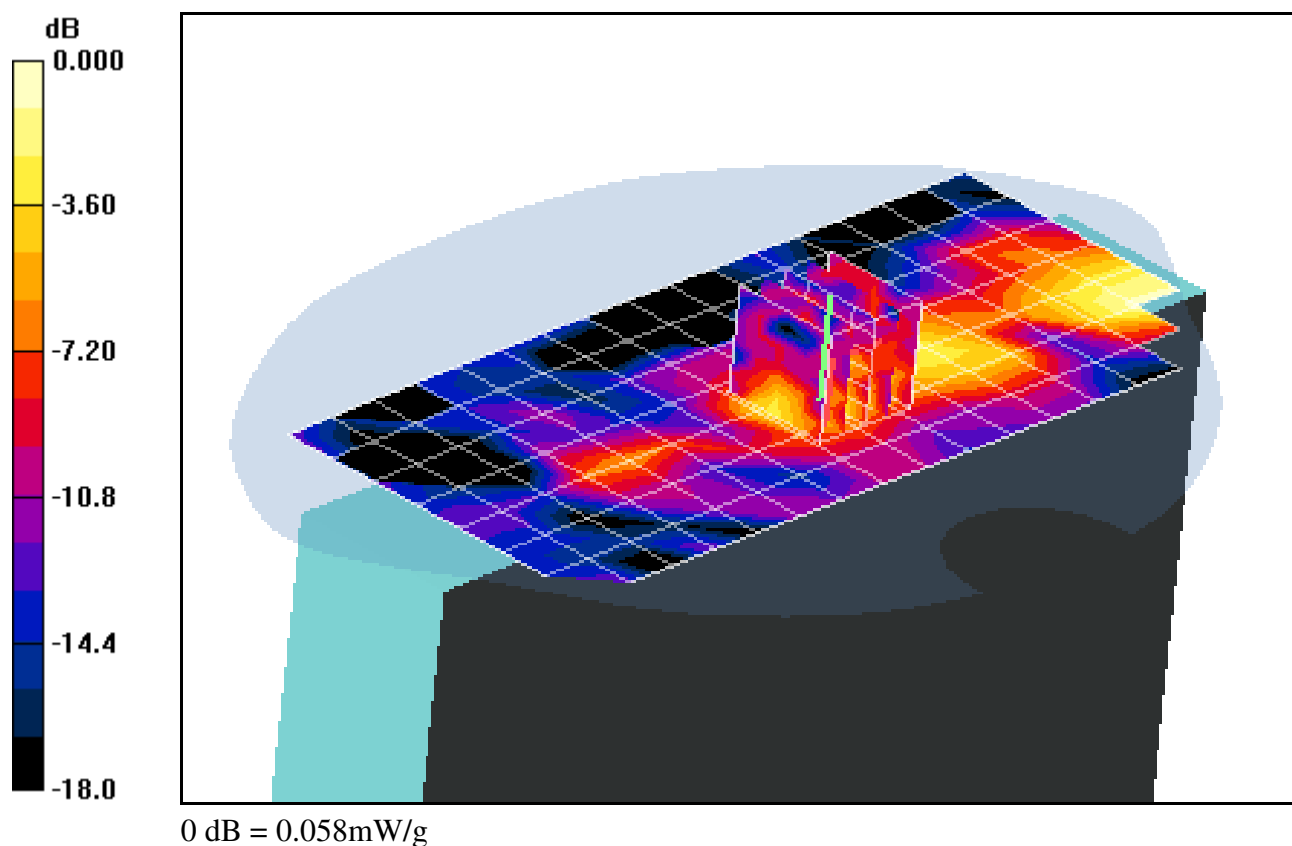
**Area Scan (8x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 5.04 V/m;

Peak SAR (extrapolated) = 0.105 W/kg

**SAR(1 g) = 0.050 mW/g; SAR(10 g) = 0.021 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth, and WWAN;  
Serial: 9JKSA00026**

Communication System: Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1

Medium: 2450 Muscle Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$ ;  $\sigma = 1.91 \text{ mho/m}$ ;  $\epsilon_r = 50.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-12-2010; Ambient Temp: 23.9°C; Tissue Temp: 23.0°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 Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: Bluetooth, Tablet Top position, LCD Flip, Mid.ch, Tx**

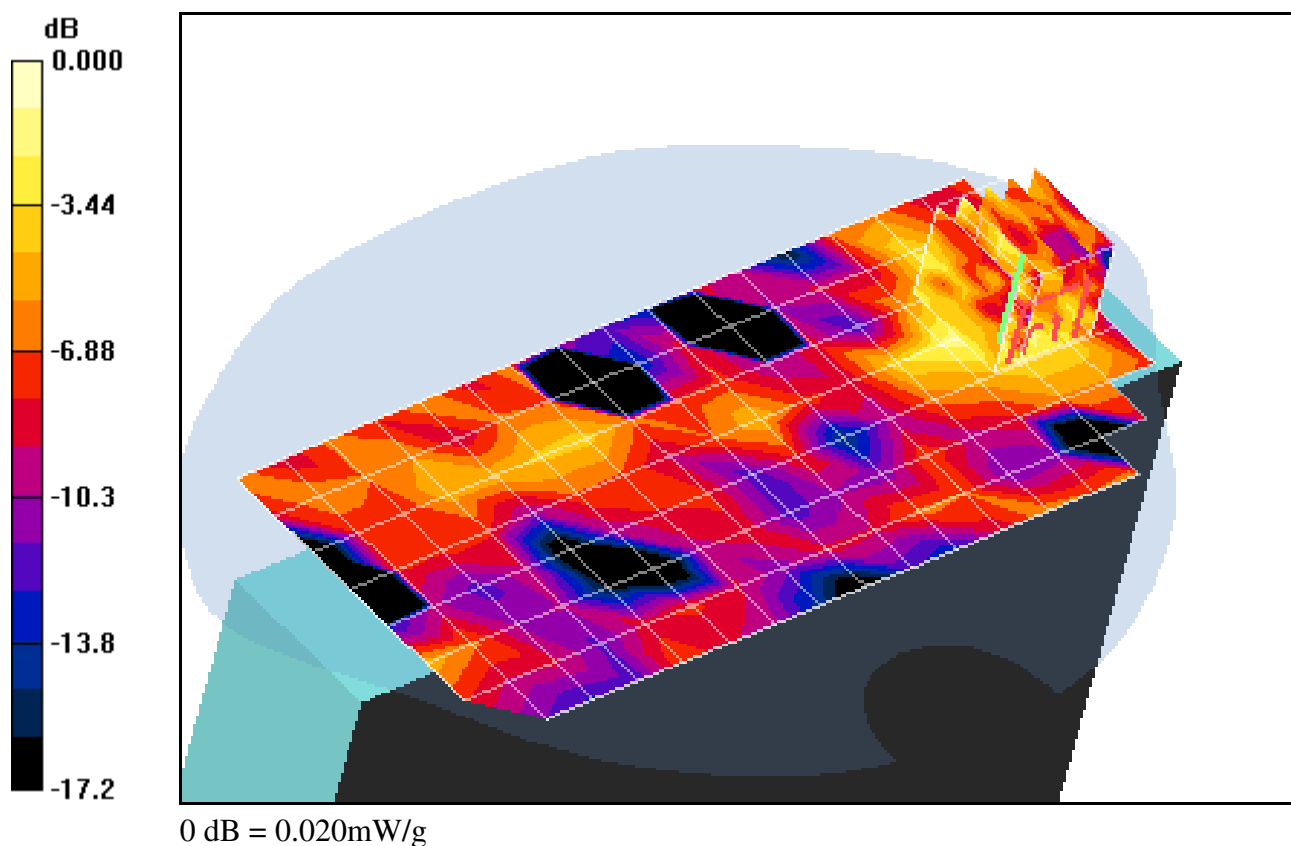
**Area Scan (8x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan 2 (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 0.973 V/m;

Peak SAR (extrapolated) = 0.044 W/kg

**SAR(1 g) = 0.00977 mW/g; SAR(10 g) = 0.00433 mW/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 Muscle Medium parameters used:

$f = 2450 \text{ MHz}$ ;  $\sigma = 1.92 \text{ mho/m}$ ;  $\epsilon_r = 50.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-12-2010; Ambient Temp: 23.9°C; Tissue Temp: 23.0°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 Main; Type: SAM 4.0; Serial: TP-1114

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

## 2450MHz System Verification

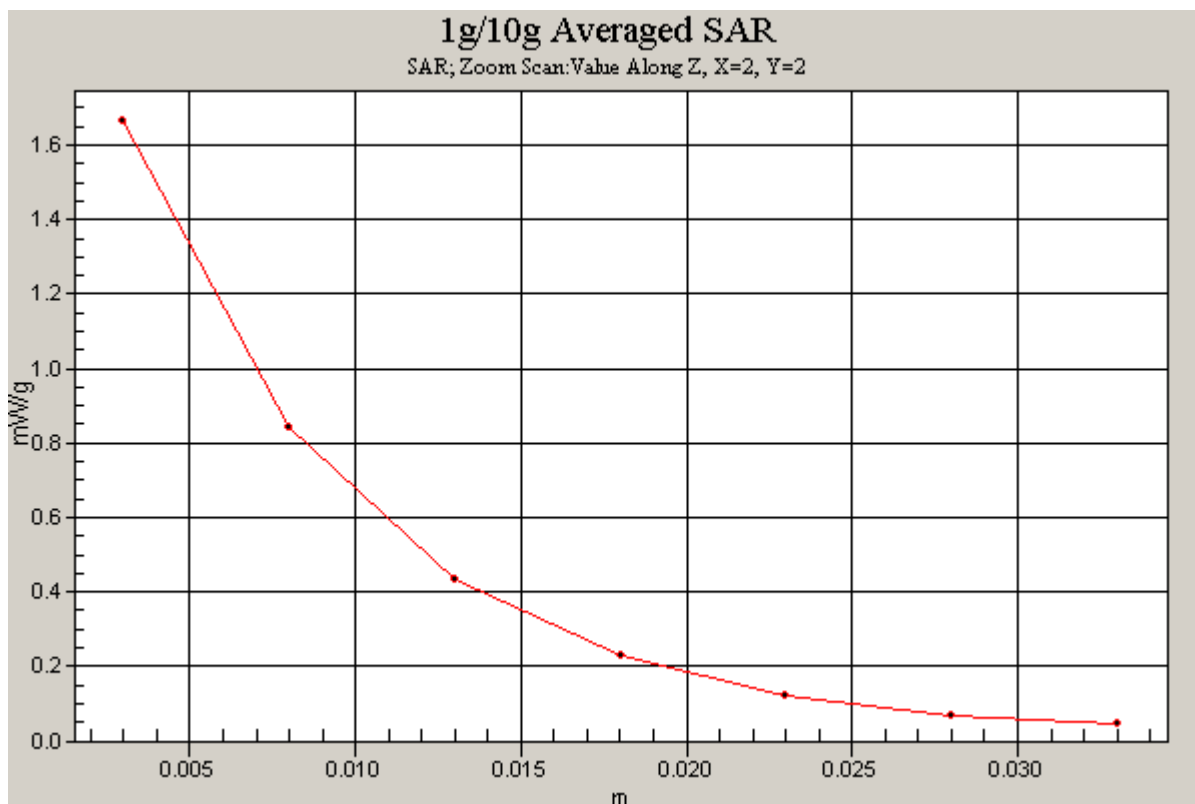
**Area Scan (5x7x1):** Measurement grid: dx=15mm, dy=15mm

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

Input Power = 14 dBm (25mW)

**SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.594 mW/g**

Deviation = 0.39%



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN;  
Serial: 9JKSA00026**

Communication System: IP Wireless 2.5GHz PCI; Frequency: 2593 MHz; Duty Cycle: 1:2.5

Medium: 2600 Muscle Medium parameters used (interpolated):

$f = 2593 \text{ MHz}$ ;  $\sigma = 2.17 \text{ mho/m}$ ;  $\epsilon_r = 50$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 05-20-2010; Ambient Temp: 24.3°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3550; ConvF(6.26, 6.26, 6.26); 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: TD-CDMA 2.5GHz, Lap position, LCD Flip Mid.ch, 6 Tx. Slots**

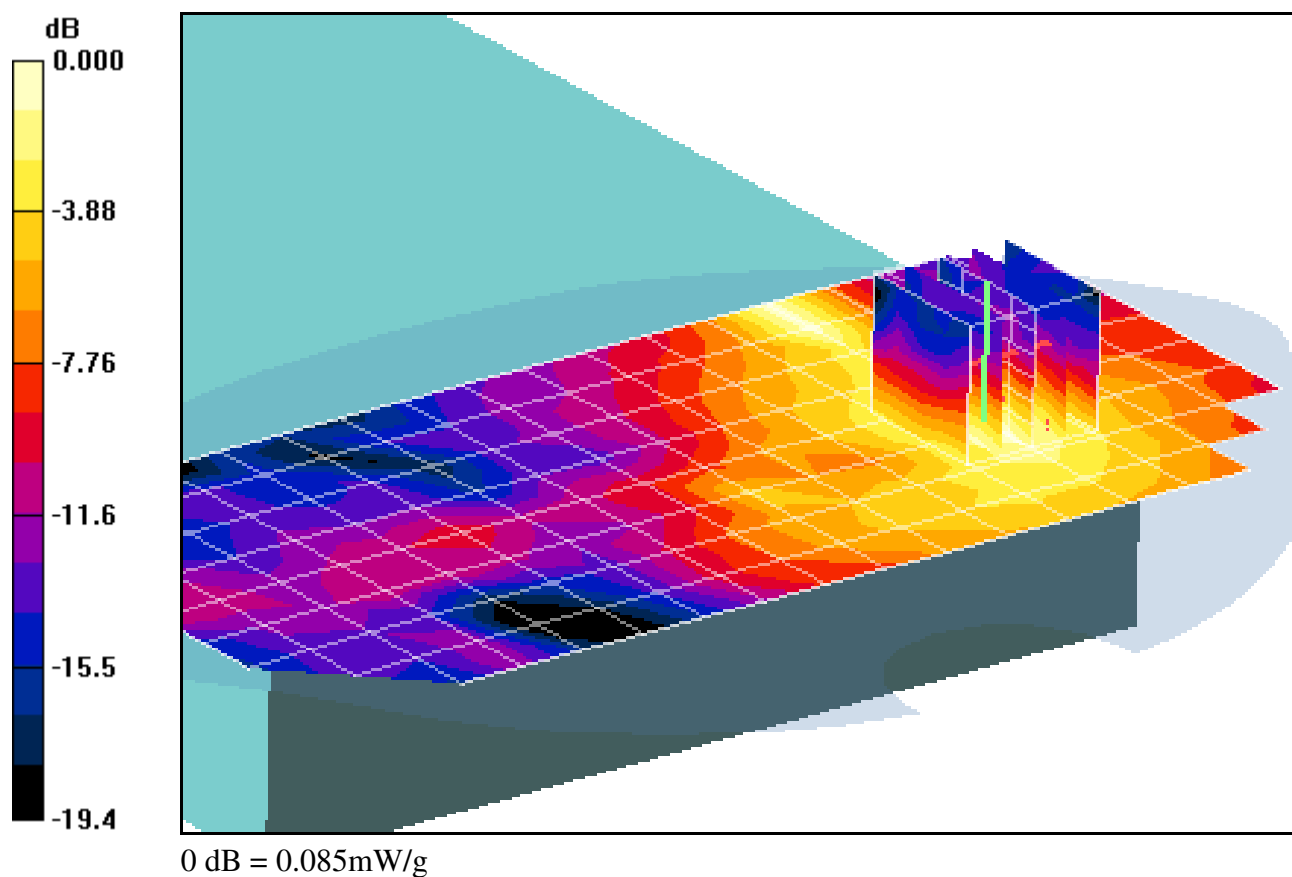
**Area Scan (9x18x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 3.34 V/m; Power Drift = -0.115 dB

Peak SAR (extrapolated) = 0.133 W/kg

**SAR(1 g) = 0.068 mW/g; SAR(10 g) = 0.036 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN;  
Serial: 9JKSA00026**

Communication System: IP Wireless 2.5GHz PCI; Frequency: 2684.6 MHz; Duty Cycle: 1:2.5  
Medium: 2600 Muscle Medium parameters used (interpolated):

$f = 2684.6 \text{ MHz}$ ;  $\sigma = 2.29 \text{ mho/m}$ ;  $\epsilon_r = 49.8$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 05-20-2010; Ambient Temp: 24.3°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3550; ConvF(6.26, 6.26, 6.26); 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: TD-CDMA 2.5GHz, Edge Bottom position, LCD Flip, High ch, 6 Tx. Slots**

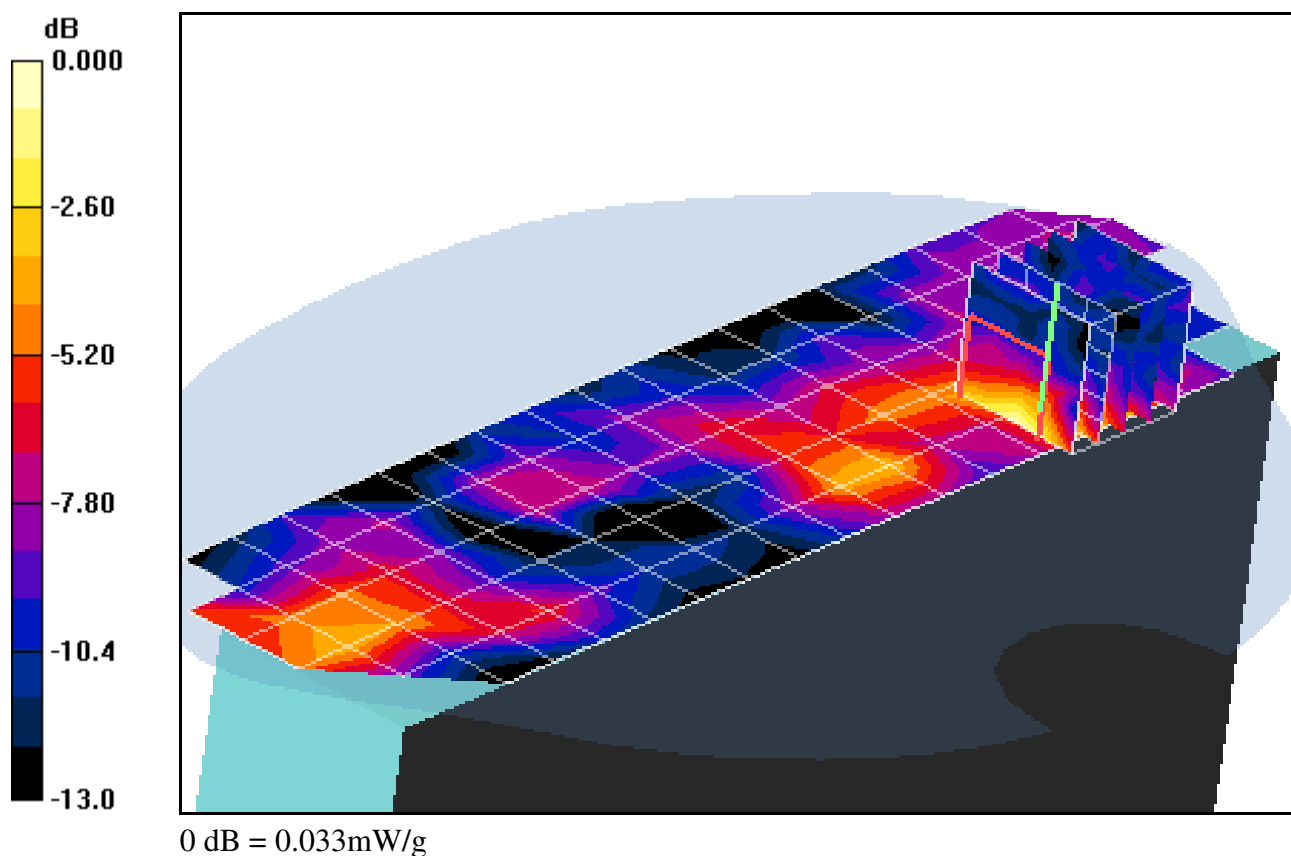
**Area Scan (6x20x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 3.44 V/m; Power Drift = -0.052 dB

Peak SAR (extrapolated) = 0.050 W/kg

**SAR(1 g) = 0.025 mW/g; SAR(10 g) = 0.013 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN;  
Serial: 9JKSA00026**

Communication System: IP Wireless 2.5GHz PCI; Frequency: 2593 MHz; Duty Cycle: 1:2.5

Medium: 2600 Muscle Medium parameters used (interpolated):

$f = 2593 \text{ MHz}$ ;  $\sigma = 2.17 \text{ mho/m}$ ;  $\epsilon_r = 50$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 05-20-2010; Ambient Temp: 24.3°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3550; ConvF(6.26, 6.26, 6.26); 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: TD-CDMA 2.5GHz, Edge Bottom position, LCD Flip, Mid. ch, 6 Tx. Slots**

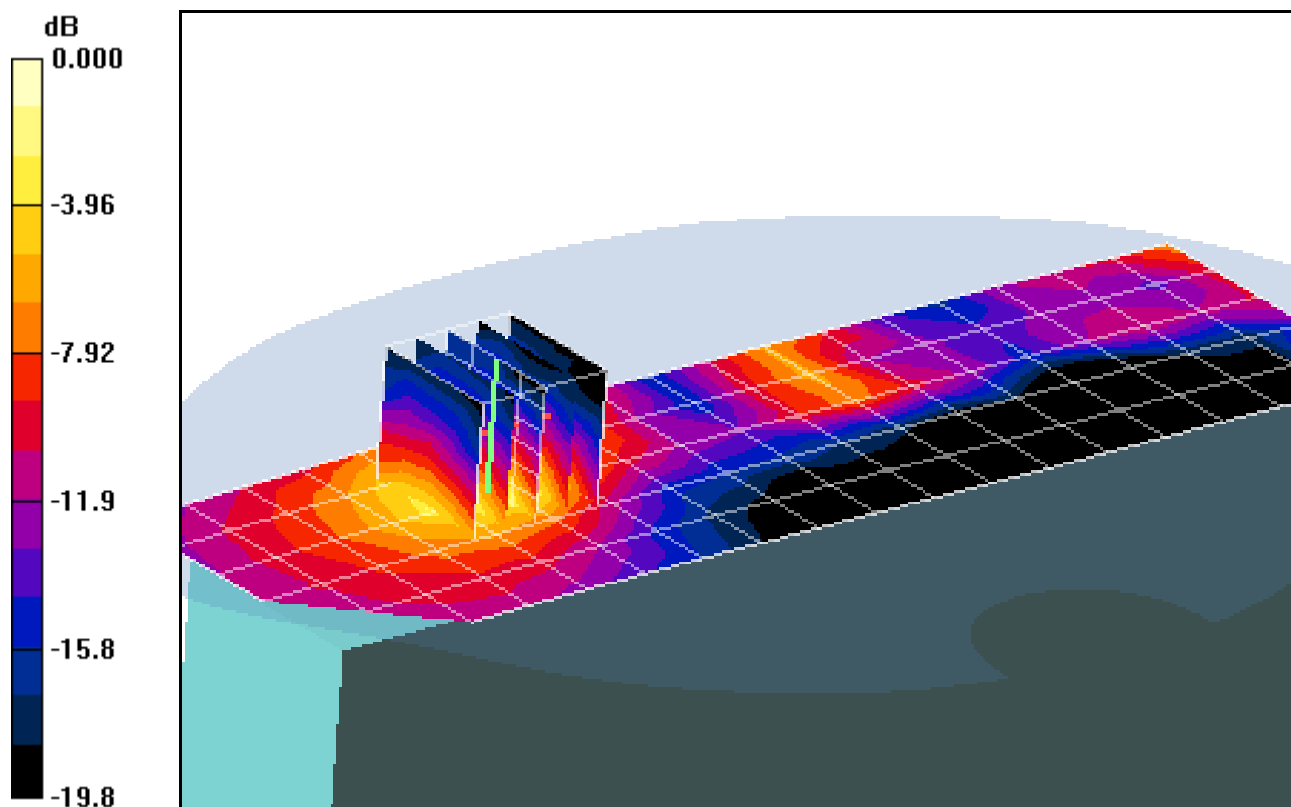
**Area Scan (6x19x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 12.9 V/m; Power Drift = -0.018 dB

Peak SAR (extrapolated) = 0.541 W/kg

**SAR(1 g) = 0.259 mW/g; SAR(10 g) = 0.123 mW/g**



0 dB = 0.355mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: CF-19; Type: Convertible Tablet PC with WLAN, Bluetooth and WWAN;  
Serial: 9JKSA00026**

Communication System: IP Wireless 2.5GHz PCI; Frequency: 2593 MHz; Duty Cycle: 1:2.5

Medium: 2600 Muscle Medium parameters used (interpolated):

$f = 2593 \text{ MHz}$ ;  $\sigma = 2.17 \text{ mho/m}$ ;  $\epsilon_r = 50$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 05-20-2010; Ambient Temp: 24.3°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3550; ConvF(6.26, 6.26, 6.26); 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: TD-CDMA 2.5GHz, Edge Bottom position, LCD Flip, Mid. ch, 6 Tx. Slots**

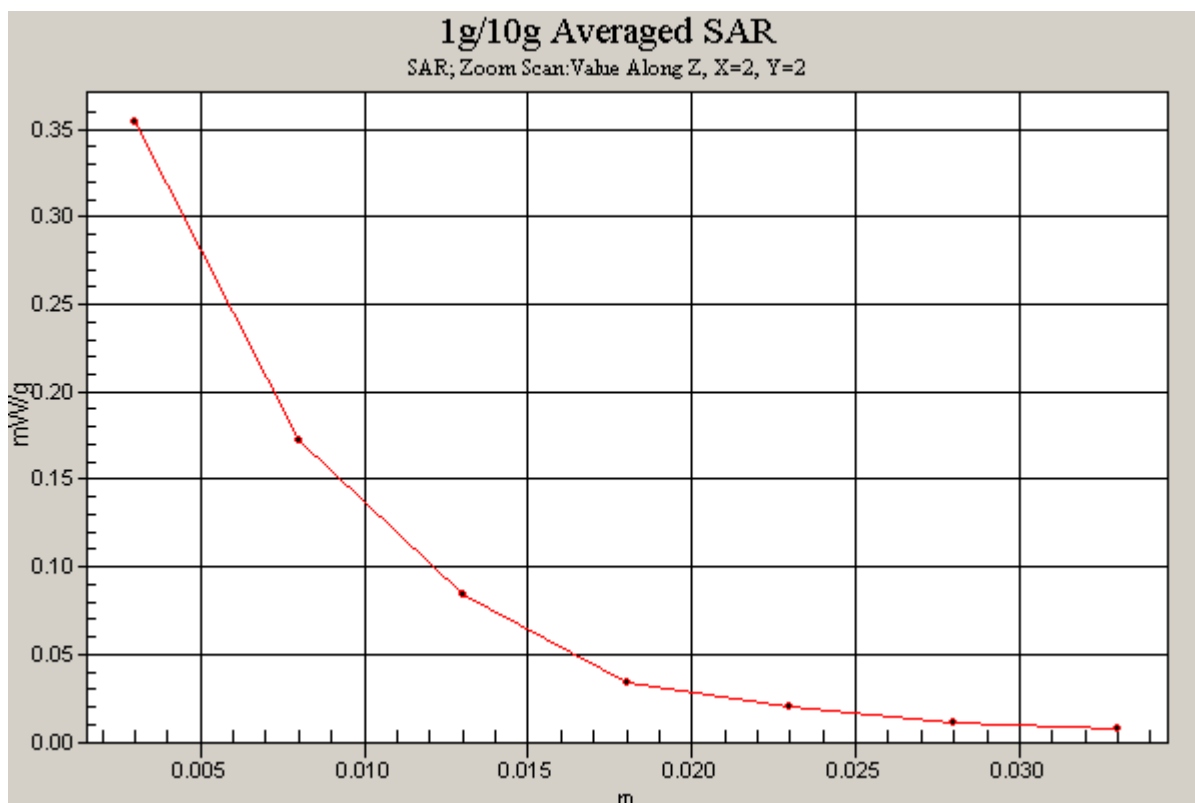
**Area Scan (6x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 12.9 V/m; Power Drift = -0.018 dB

Peak SAR (extrapolated) = 0.541 W/kg

**SAR(1 g) = 0.259 mW/g; SAR(10 g) = 0.123 mW/g**



## **APPENDIX B: DIPOLE VALIDATION**

# 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 Muscle Medium parameters used:

$f = 2450 \text{ MHz}$ ;  $\sigma = 1.92 \text{ mho/m}$ ;  $\epsilon_r = 50.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-12-2010; Ambient Temp: 23.9°C; Tissue Temp: 23.0°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 Main; Type: SAM 4.0; Serial: TP-1114

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

## 2450MHz System Verification

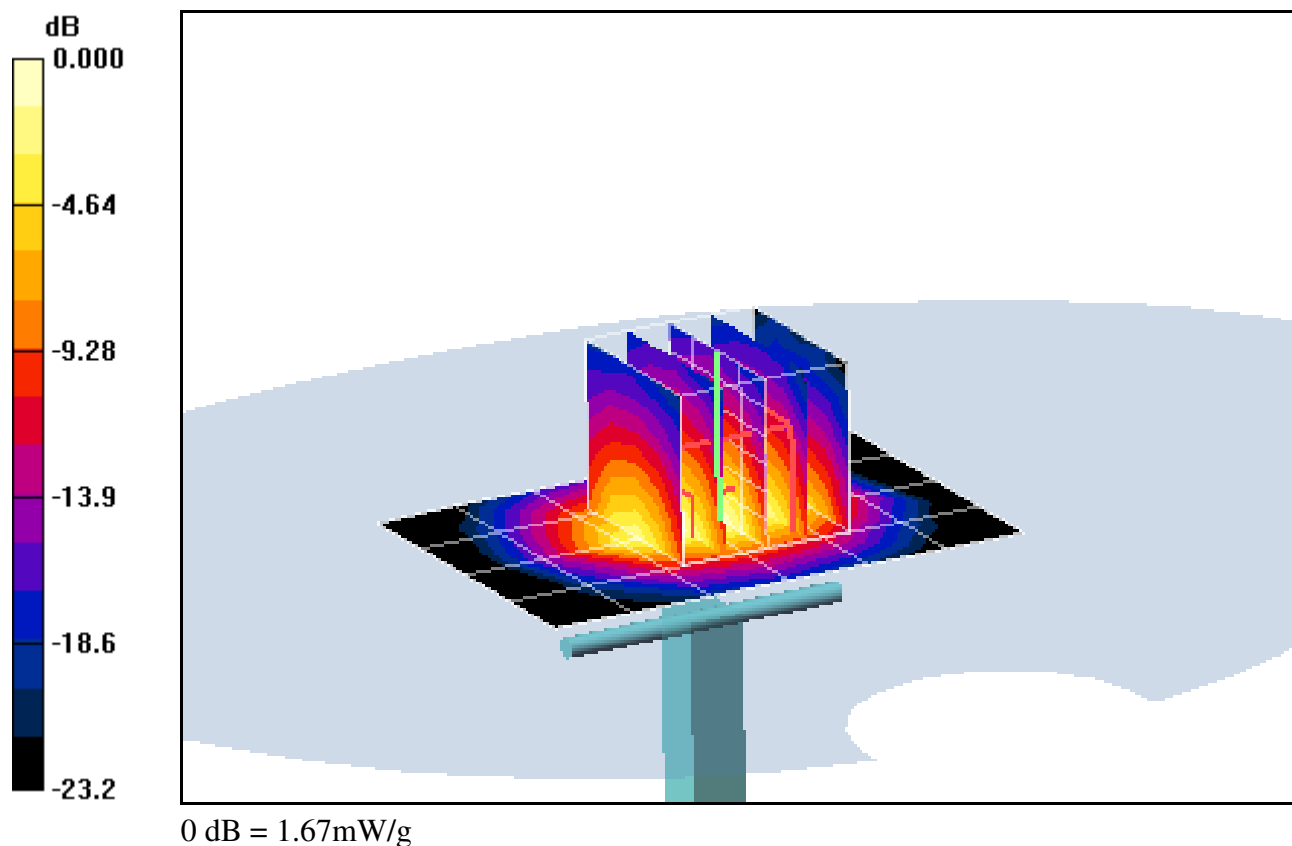
**Area Scan (5x7x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Input Power = 14 dBm (25mW)

**SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.594 mW/g**

Deviation = 0.39%



# 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 Muscle; Medium parameters used:

$f = 2450 \text{ MHz}$ ;  $\sigma = 1.96 \text{ mho/m}$ ;  $\epsilon_r = 52.3$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-22-2010; Ambient Temp: 23.9°C; Tissue Temp: 22.5°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 Main; Type: SAM 4.0; Serial: TP-1114

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

## 2450MHz SAR Verification

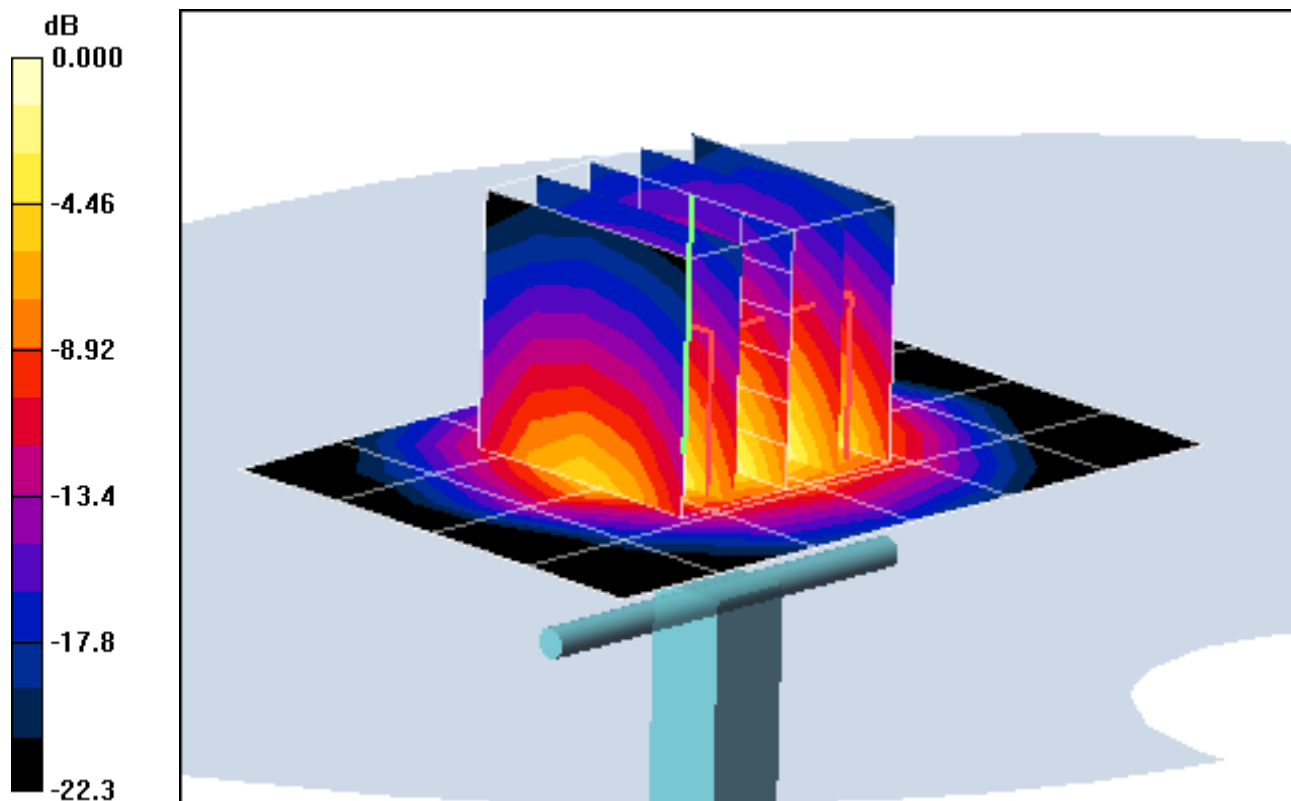
**Area Scan (5x7x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Input Power = 14 dBm (25mW)

**SAR(1 g) = 1.34 mW/g; SAR(10 g) = 0.621 mW/g**

Deviation = 4.28%



0 dB = 1.71mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1057**

Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: 5200 Muscle; Medium parameters used (interpolated):

$f = 5200 \text{ MHz}$ ;  $\sigma = 5.44 \text{ mho/m}$ ;  $\epsilon_r = 48.8$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-29-2010; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(3.73, 3.73, 3.73); 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

## 5200MHz SAR Verification

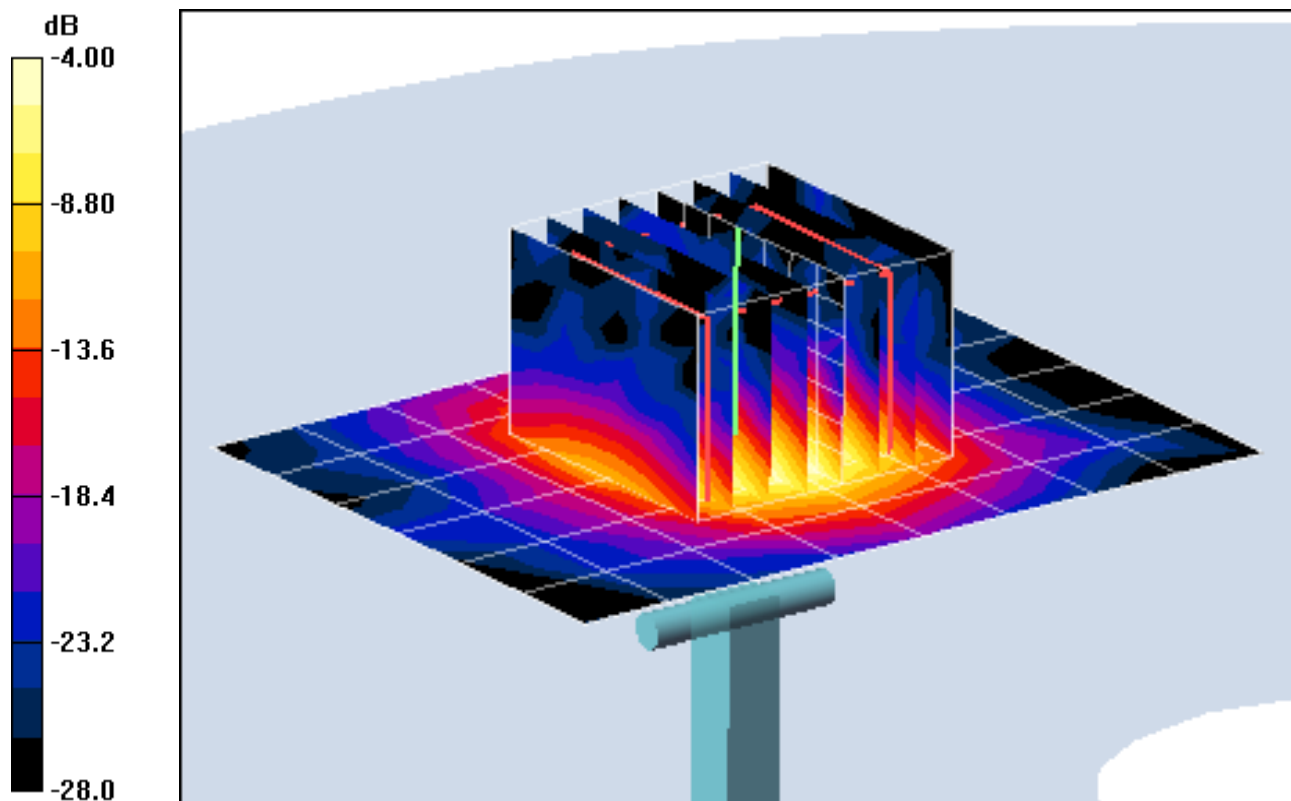
**Area Scan (7x9x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8)/Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Input Power = 14 dBm (25mW)

**SAR(1 g) = 1.91 mW/g; SAR(10 g) = 0.529 mW/g**

Deviation = -3.41 %



0 dB = 2.75mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057**

Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: 5500 Muscle; Medium parameters used (interpolated):

$f = 5500 \text{ MHz}$ ;  $\sigma = 5.87 \text{ mho/m}$ ;  $\epsilon_r = 46.8$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-30-2010; Ambient Temp: 23.6°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN3550; ConvF(3.26, 3.26, 3.26); 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

## 5500MHz SAR Verification

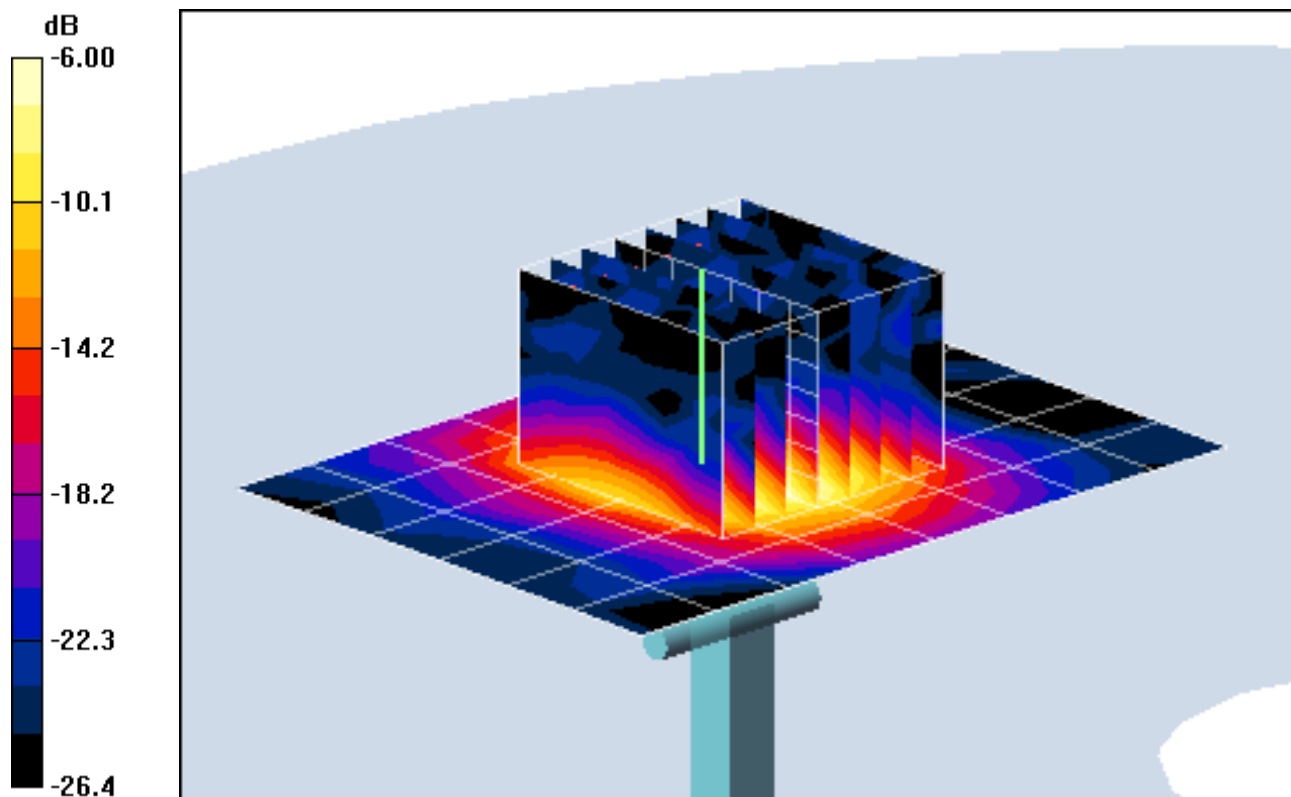
**Area Scan (7x9x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8)/Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Input Power = 14 dBm (25mW)

**SAR(1 g) = 1.91 mW/g; SAR(10 g) = 0.530 mW/g**

Deviation = -6.37 %



0 dB = 2.94mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1057**

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: 5800 Muscle; Medium parameters used (interpolated):

$f = 5800 \text{ MHz}$ ;  $\sigma = 6.28 \text{ mho/m}$ ;  $\epsilon_r = 47.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-31-2010; Ambient Temp: 23.7°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN3550; ConvF(3.3, 3.3, 3.3); 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

## 5800MHz SAR Verification

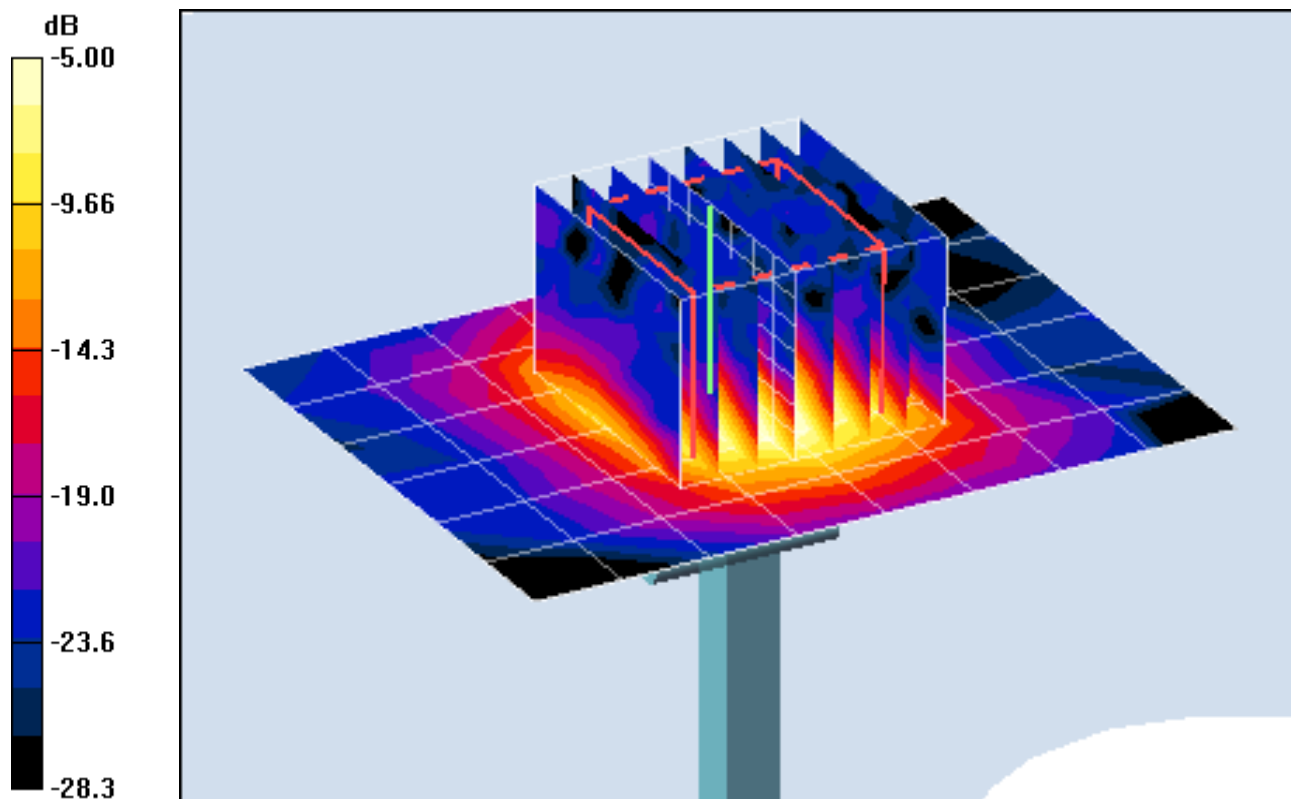
**Area Scan 2 (7x9x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

**Zoom Scan (8x8x8)/Cube 0:** Measurement grid:  $dx=4.3\text{mm}$ ,  $dy=4.3\text{mm}$ ,  $dz=3\text{mm}$

Input Power = 14 dBm (25mW)

**SAR(1 g) = 1.67 mW/g; SAR(10 g) = 0.455 mW/g**

Deviation = -6.70 %



0 dB = 2.47mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: SAR Dipole 2600 MHz; Type: D2600V2; Serial: 1004**

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

Medium: 2600 Muscle Medium parameters used:

$f = 2600 \text{ MHz}$ ;  $\sigma = 2.18 \text{ mho/m}$ ;  $\epsilon_r = 50$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-20-2010; Ambient Temp: 24.3°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3550; ConvF(6.26, 6.26, 6.26); 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

## 2600MHz System Verification

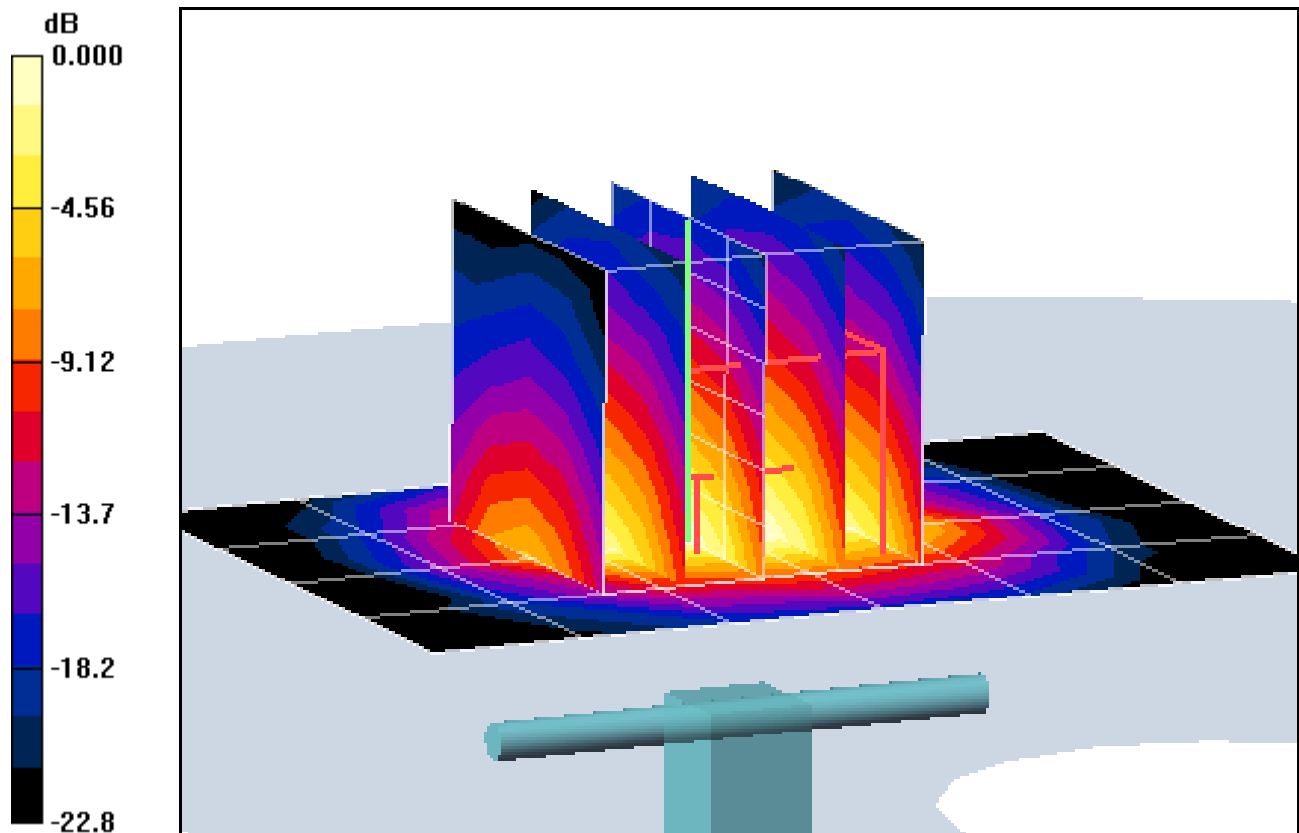
**Area Scan (5x7x1):** Measurement grid: dx=15mm, dy=15mm

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

Input Power: 14 dBm (25 mW)

**SAR(1 g) = 1.37 mW/g; SAR(10 g) = 0.602 mW/g**

Deviation: -1.44%



0 dB = 1.76mW/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: **EX3-3550\_Jan10**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3550**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2  
Calibration procedure for dosimetric 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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID #            | Cal Date (Certificate No.)     | Scheduled Calibration |
|----------------------------|-----------------|--------------------------------|-----------------------|
| Power meter 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

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 <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C                  | modulation dependent linearization parameters                                                                                                           |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>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<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* 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<sub>x,y,z</sub>**: 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<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: 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<sub>x,y,z</sub> \* 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  $\pm 50$  MHz to  $\pm 100$  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 ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.48     | 0.47     | 0.48     | ± 10.1%   |
| DCP (mV) <sup>B</sup>                                     | 92.9     | 88.4     | 91.4     |           |

### Modulation Calibration Parameters

| UID   | Communication System Name | PAR  |   | A<br>dB | B<br>dBuV | C    | VR<br>mV | Unc <sup>E</sup><br>(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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> 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] <sup>c</sup> | 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%    |

<sup>c</sup> 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

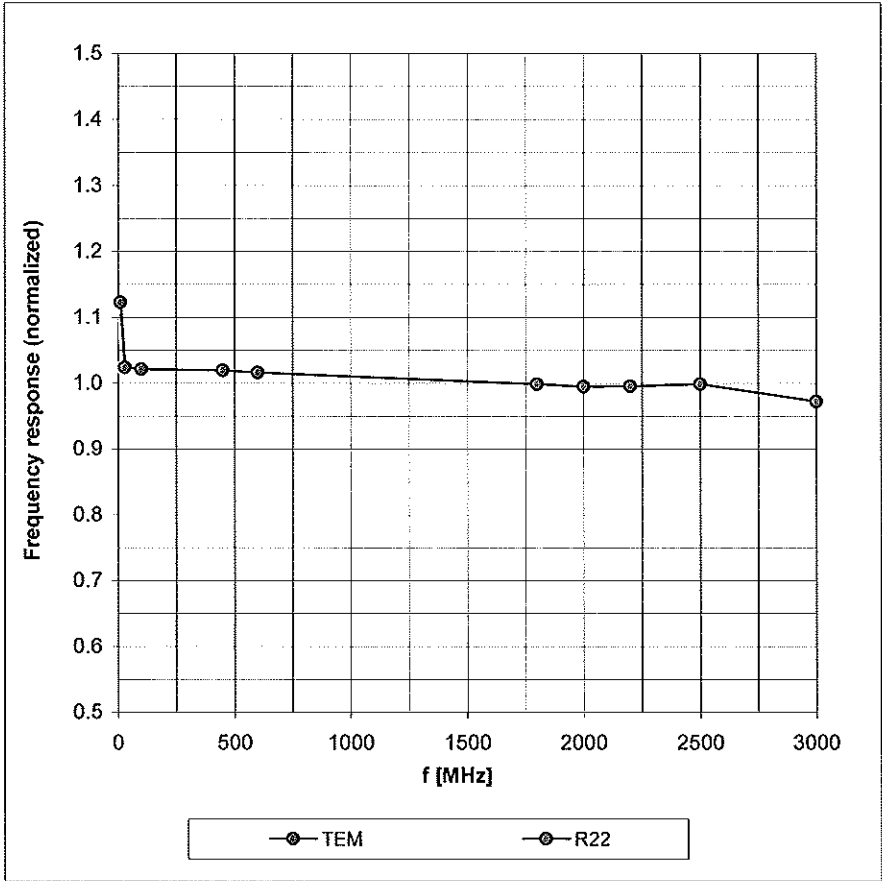
### Calibration Parameter Determined in Body Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | 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%    |

<sup>c</sup> 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.

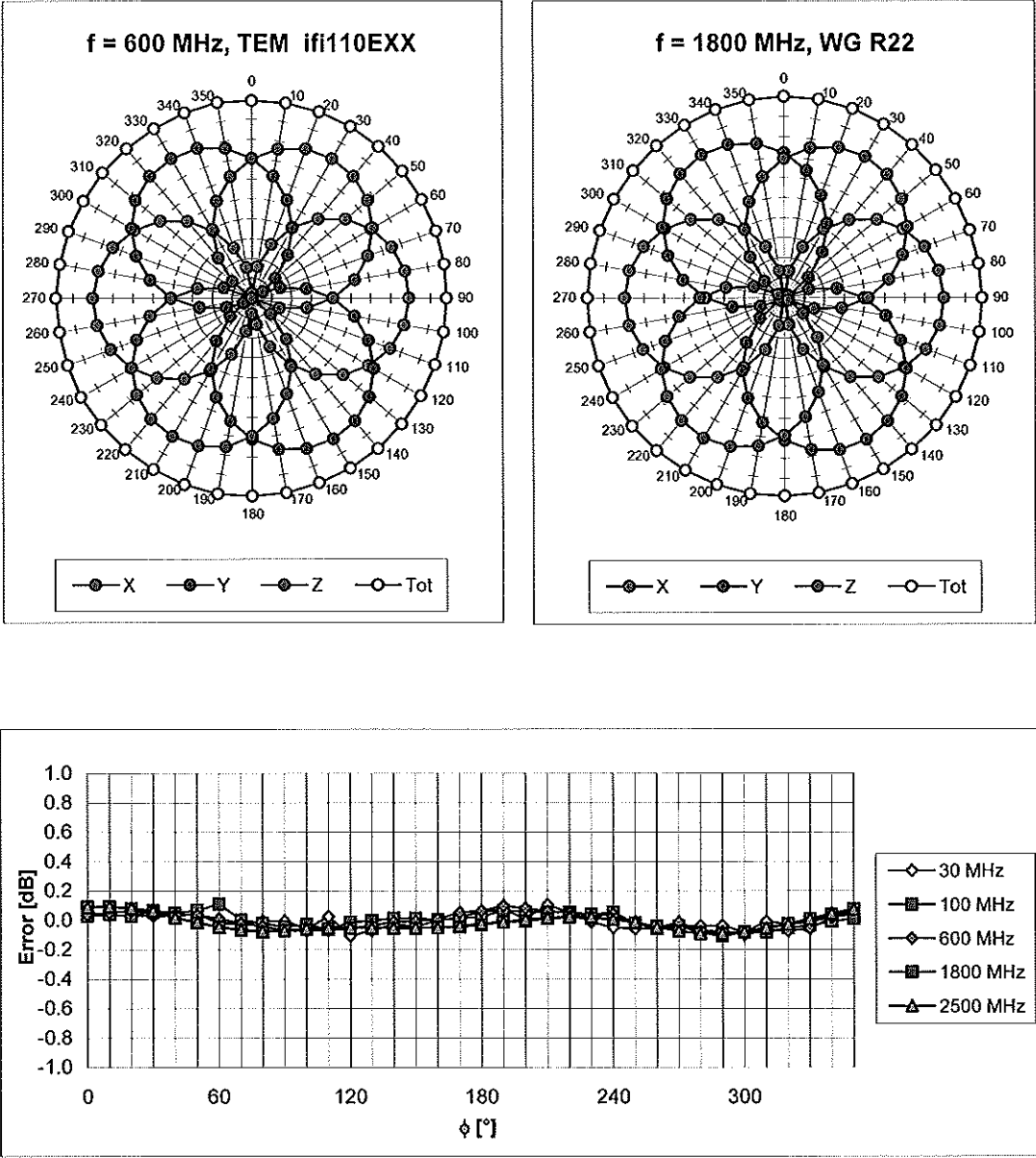
# Frequency Response of E-Field

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



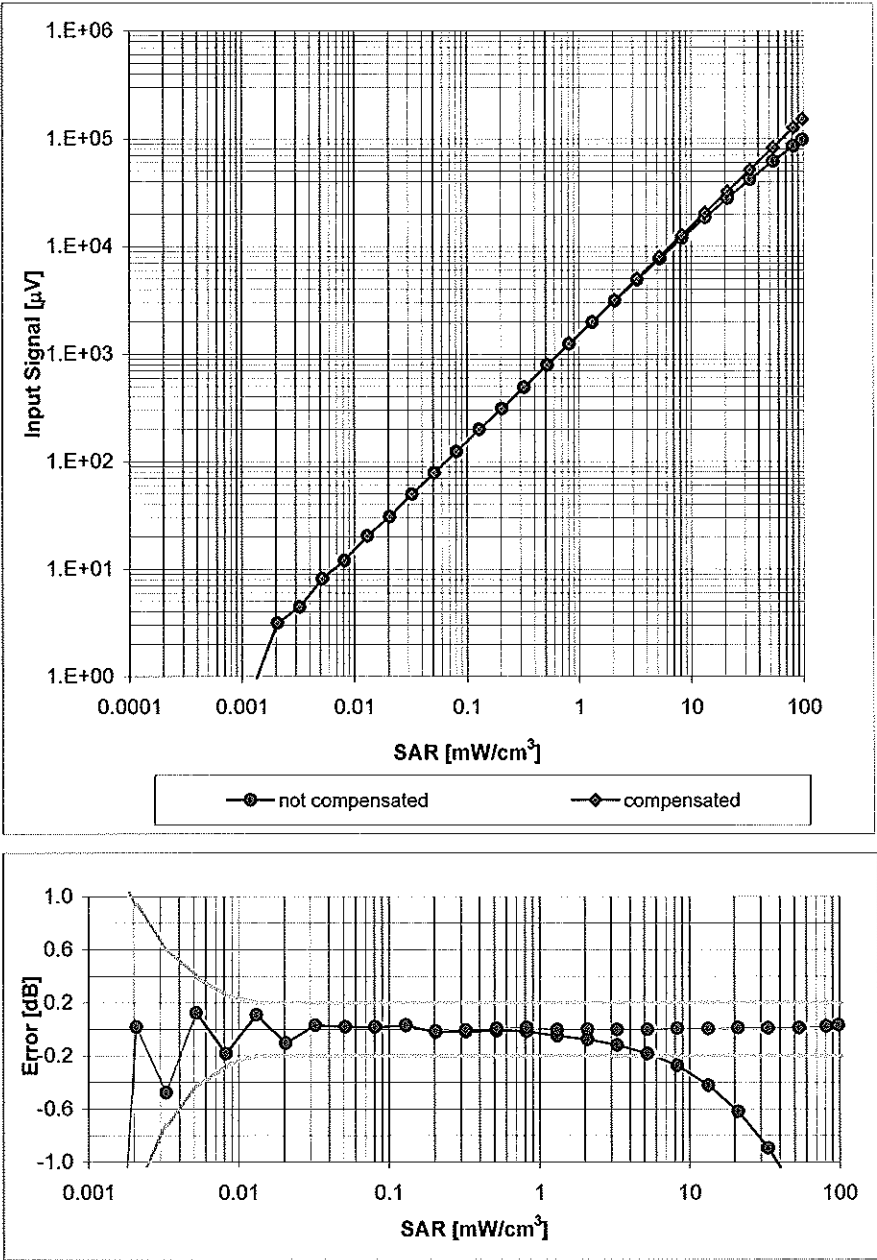
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

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



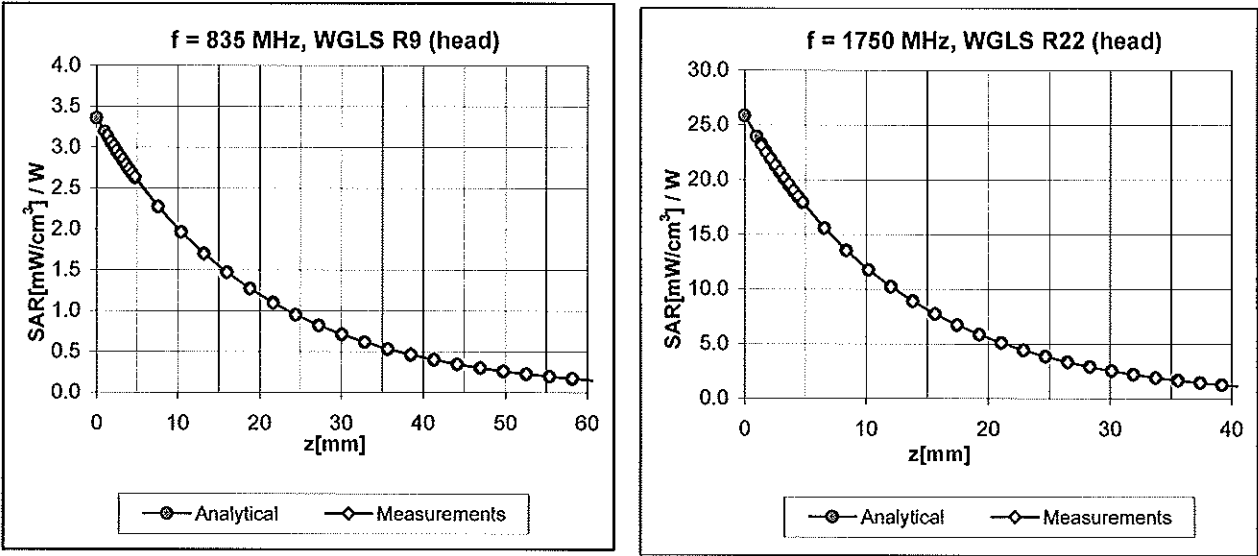
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

Dynamic Range f(SAR<sub>head</sub>)  
(Waveguide R22, f = 1800 MHz)



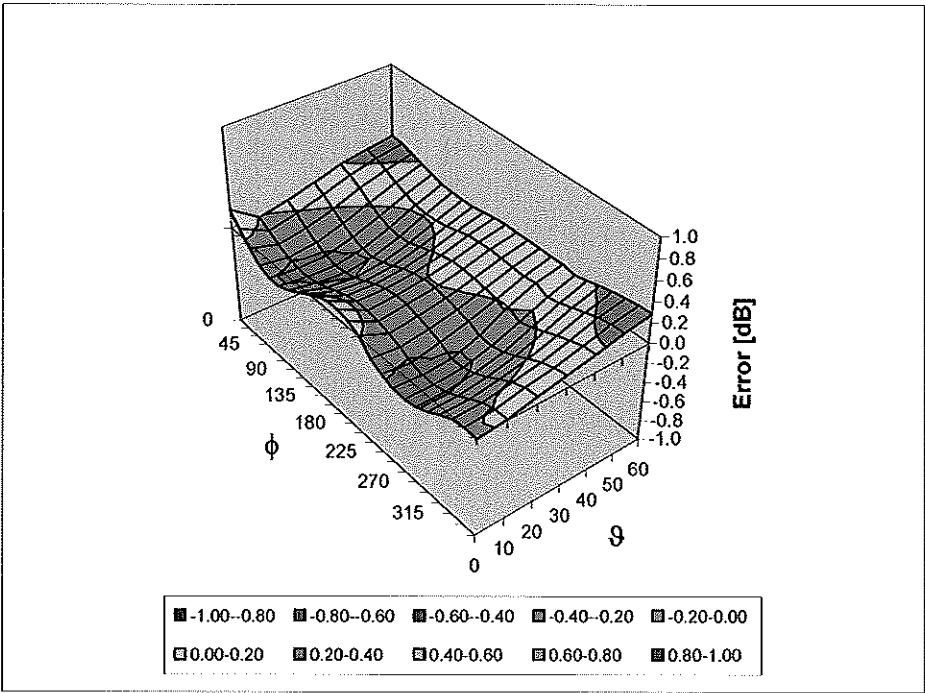
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

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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 Multilateral Agreement for the recognition of calibration certificates

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 |

|                |                       |                              |                  |
|----------------|-----------------------|------------------------------|------------------|
|                | <b>Name</b>           | <b>Function</b>              | <b>Signature</b> |
| Calibrated by: | <b>Jeton Kastrali</b> | <b>Laboratory Technician</b> |                  |
| Approved by:   | <b>Katja Pokovic</b>  | <b>Technical Manager</b>     |                  |

Issued: August 27, 2009

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Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

### Glossary:

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

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

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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.

|                                     |                           |             |
|-------------------------------------|---------------------------|-------------|
| <b>DASY Version</b>                 | <b>DASY5</b>              | <b>V5.0</b> |
| <b>Extrapolation</b>                | Advanced Extrapolation    |             |
| <b>Phantom</b>                      | Modular Flat Phantom V5.0 |             |
| <b>Distance Dipole Center - TSL</b> | 10 mm                     | with Spacer |
| <b>Zoom Scan Resolution</b>         | dx, dy, dz = 5 mm         |             |
| <b>Frequency</b>                    | 2450 MHz $\pm$ 1 MHz      |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | <b>Temperature</b>  | <b>Permittivity</b> | <b>Conductivity</b>  |
|-----------------------------------------|---------------------|---------------------|----------------------|
| <b>Nominal Head TSL parameters</b>      | 22.0 °C             | 39.2                | 1.80 mho/m           |
| <b>Measured Head TSL parameters</b>     | (22.0 $\pm$ 0.2) °C | 40.1 $\pm$ 6 %      | 1.80 mho/m $\pm$ 6 % |
| <b>Head TSL temperature during test</b> | (22.3 $\pm$ 0.2) °C | ----                | ----                 |

## SAR result with Head TSL

|                                                             |                    |                                                  |
|-------------------------------------------------------------|--------------------|--------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | <b>Condition</b>   |                                                  |
| 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 <sup>1</sup>            | normalized to 1W   | <b>53.5 mW / g <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                  |
|---------------------------------------------------------------|--------------------|--------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | <b>condition</b>   |                                                  |
| 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 <sup>1</sup>              | normalized to 1W   | <b>25.0 mW / g <math>\pm</math> 16.5 % (k=2)</b> |

<sup>1</sup> 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 <sup>3</sup> (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 <sup>2</sup>      | normalized to 1W   | 51.4 mW / g ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (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 <sup>2</sup>        | normalized to 1W   | 23.9 mW / g ± 16.5 % (k=2) |

---

<sup>2</sup> 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 |
|----------------------------------|----------|

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/m<sup>3</sup>

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

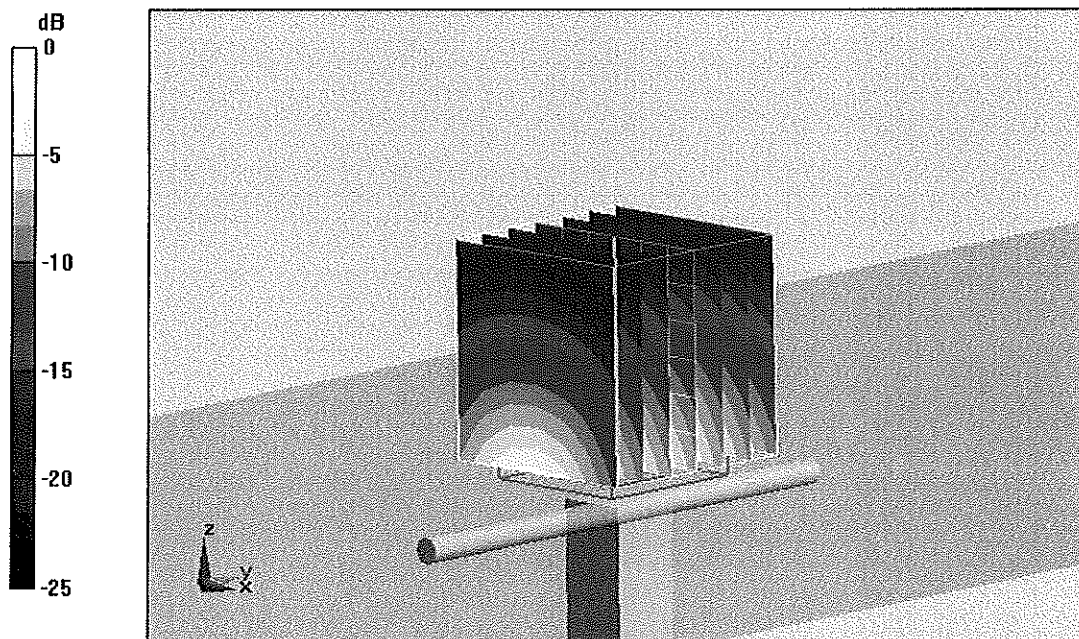
**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm**

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

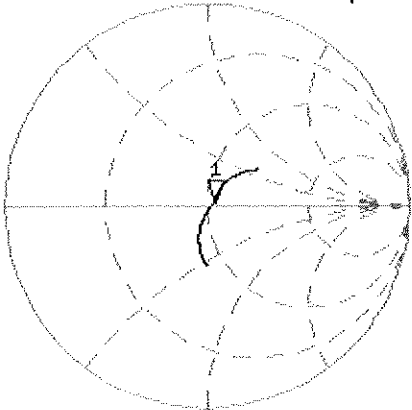


0 dB = 17.2mW/g

Impedance Measurement Plot for Head TSL

27 Aug 2009 09:14:09  
[CH1] S11 1 U FS 1: 53.385  $\Omega$  1.7910  $\Omega$  116.35 pF 2 450.000 000 MHz

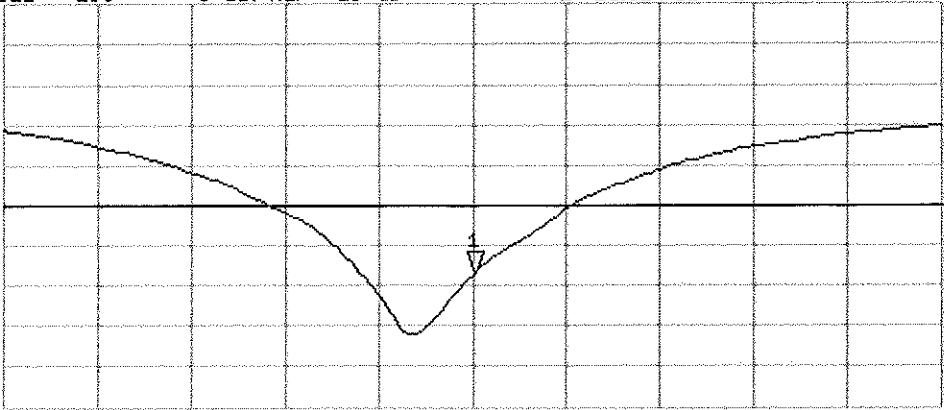
\*  
De1  
Cor



↑

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

Cor



↑

START 2 250.000 000 MHz STOP 2 650.000 000 MHz

## 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/m<sup>3</sup>

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

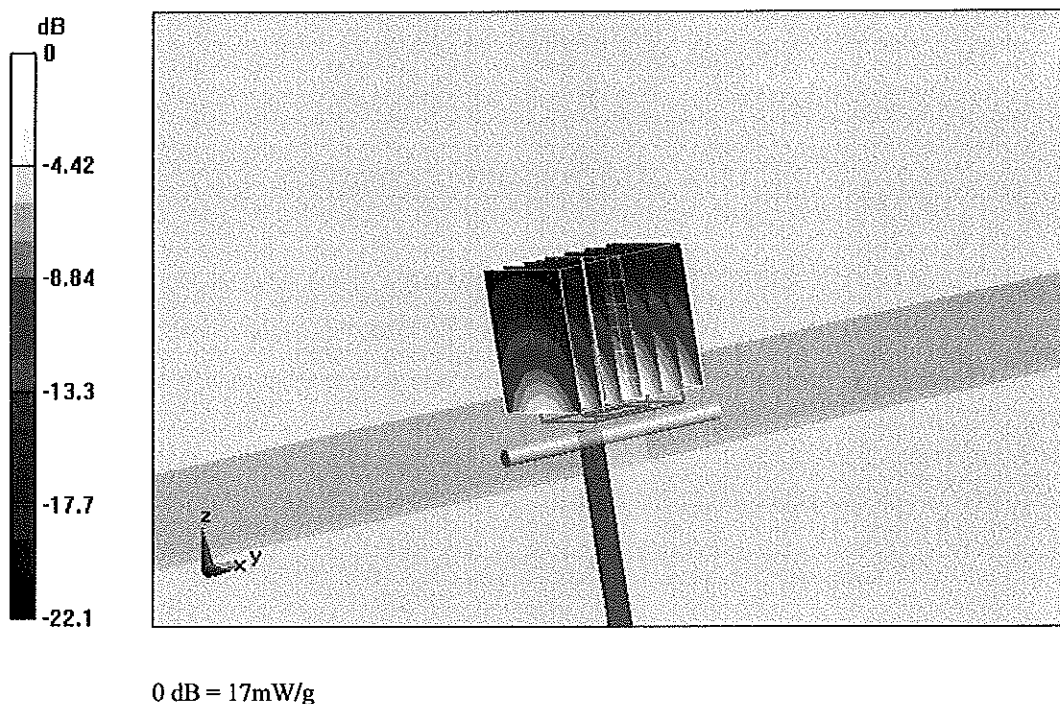
**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm**

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**

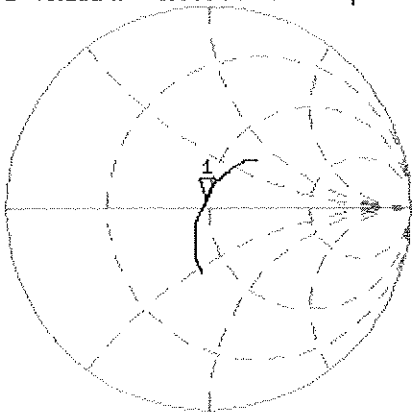
Maximum value of SAR (measured) = 17 mW/g



Impedance Measurement Plot for Body TSL

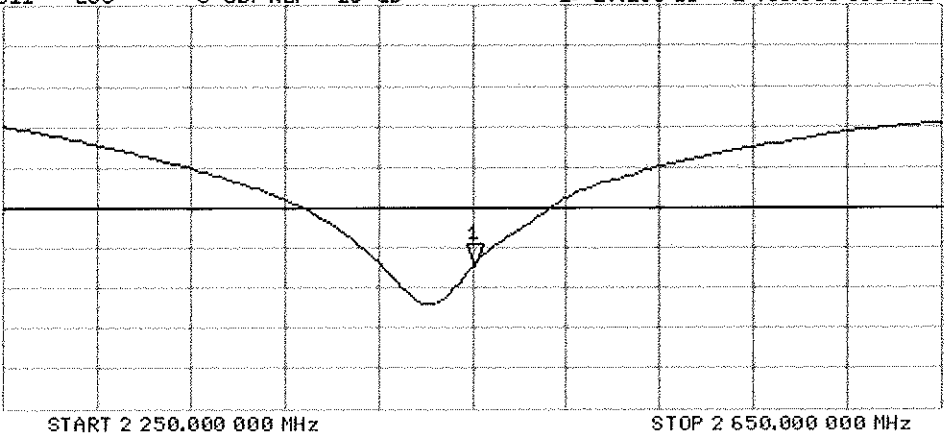
17 Aug 2009 15:56:32  
[CH1] S11 1 U FS 1: 48.221  $\Omega$  3.9004  $\Omega$  253.37 pF 2 450.000 000 MHz

\*  
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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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D2600V2-1004\_Aug09**

## CALIBRATION CERTIFICATE

Object **D2600V2 - SN: 1004**

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

Calibration date: **August 12, 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 ( $22 \pm 3$ )°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 |

Calibrated by: **Name** **Function** **Signature**  
**Mike Meili** **Laboratory Technician**

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

Issued: August 12, 2009

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

### Glossary:

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

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

- a) 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
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) 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:

- d) 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                    | 2600 MHz $\pm$ 1 MHz      |             |

## Body TSL parameters

The following parameters and calculations were applied.

|                                  | Temperature         | Permittivity   | Conductivity         |
|----------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters      | 22.0 °C             | 52.5           | 2.16 mho/m           |
| Measured Body TSL parameters     | (22.0 $\pm$ 0.2) °C | 52.9 $\pm$ 6 % | 2.14 mho/m $\pm$ 6 % |
| Body TSL temperature during test | (22.5 $\pm$ 0.2) °C | -----          | -----                |

## SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | condition          |                                |
|-------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                          | 250 mW input power | 13.8 mW / g                    |
| SAR normalized                                        | normalized to 1W   | 55.2 mW / g                    |
| SAR for nominal Body TSL parameters <sup>1</sup>      | normalized to 1W   | 55.6 mW / g $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                            | 250 mW input power | 6.16 mW / g                    |
| SAR normalized                                          | normalized to 1W   | 24.6 mW / g                    |
| SAR for nominal Body TSL parameters <sup>1</sup>        | normalized to 1W   | 24.7 mW / g $\pm$ 16.5 % (k=2) |

<sup>1</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.1 $\Omega$ - 3.4 j $\Omega$ |
| Return Loss                          | - 25.4 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.150 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 | December 23, 2006 |

## DASY5 Validation Report for Body TSL

Date/Time: 12.08.2009 12:51:52

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN1004**

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

Medium: MSL U10 BB

Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.13$  mho/m;  $\epsilon_r = 52.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.18, 4.18, 4.18); 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:**

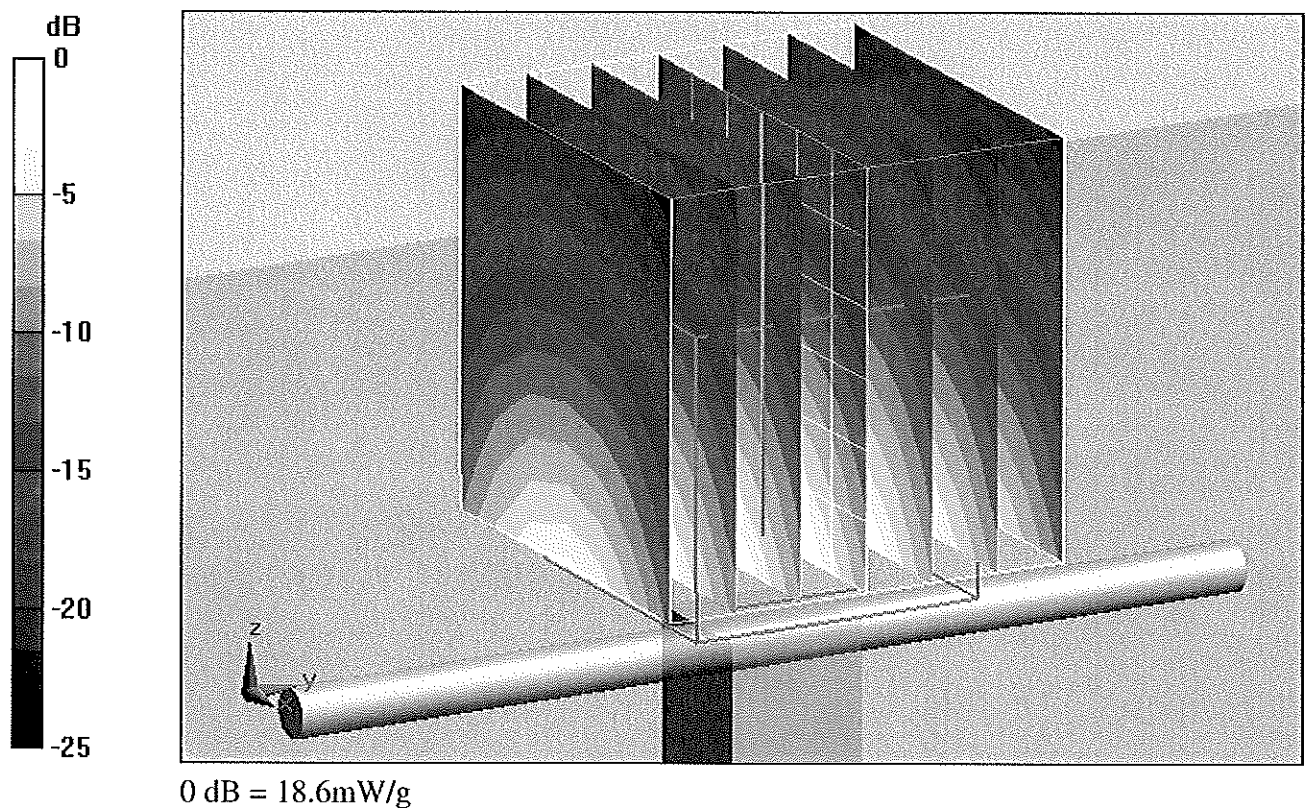
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.6 V/m; Power Drift = 0.025 dB

Peak SAR (extrapolated) = 30.3 W/kg

**SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.16 mW/g**

Maximum value of SAR (measured) = 18.6 mW/g



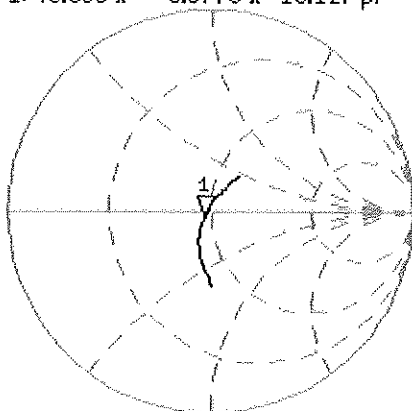
# Impedance Measurement Plot for Body TSL

12 Aug 2009 10:48:24  
 [CH1] S11 1 U FS 1: 46.098  $\Omega$  -3.3770  $\Omega$  18.127 pF 2 600.000 000 MHz

\*  
 Del  
 Cor

Avg  
 16

↑

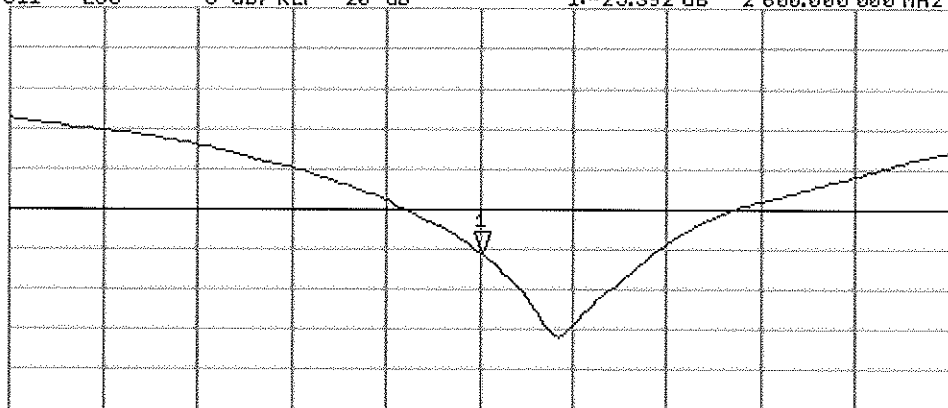


CH2 S11 LOG 5 dB/REF -20 dB 1:-25.392 dB 2 600.000 000 MHz

Cor

Avg  
 16

↑



CENTER 2 600.000 000 MHz

SPAN 400.000 000 MHz



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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D5GHzV2-1057\_Jan09**

## CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1057**

Calibration procedure(s) **QA CAL-22.v1  
Calibration procedure for dipole validation kits between 3-6 GHz**

Calibration date: **January 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 ( $22 \pm 3$ )°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 EX3DV4      | SN: 3503           | 8-Mar-08 (No. EX3-3503_Mar08)     | Mar-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 16, 2009

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



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

Accreditation No.: **SCS 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:**

- a) IEC Std 62209 Part 2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", Draft Version 0.9, December 2004
- b) 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:**

- c) 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.

|                                     |                                                                      |             |
|-------------------------------------|----------------------------------------------------------------------|-------------|
| <b>DASY Version</b>                 | DASY5                                                                | V5.0        |
| <b>Extrapolation</b>                | Advanced Extrapolation                                               |             |
| <b>Phantom</b>                      | Modular Flat Phantom V5.0                                            |             |
| <b>Distance Dipole Center - TSL</b> | 10 mm                                                                | with Spacer |
| <b>Area Scan resolution</b>         | dx, dy = 10 mm                                                       |             |
| <b>Zoom Scan Resolution</b>         | dx, dy = 4.0 mm, dz = 2.5 mm                                         |             |
| <b>Frequency</b>                    | 5200 MHz $\pm$ 1 MHz<br>5500 MHz $\pm$ 1 MHz<br>5800 MHz $\pm$ 1 MHz |             |

## Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Body TSL parameters</b>      | 22.0 °C             | 49.0           | 5.30 mho/m           |
| <b>Measured Body TSL parameters</b>     | (22.0 $\pm$ 0.2) °C | 47.4 $\pm$ 6 % | 5.34 mho/m $\pm$ 6 % |
| <b>Body TSL temperature during test</b> | (21.6 $\pm$ 0.2) °C | ----           | ----                 |

## SAR result with Body TSL at 5200 MHz

| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | condition          |                                                  |
|-------------------------------------------------------------|--------------------|--------------------------------------------------|
| SAR measured                                                | 100 mW input power | 7.96 mW / g                                      |
| SAR normalized                                              | normalized to 1W   | 79.6 mW / g                                      |
| SAR for nominal Body TSL parameters <sup>1</sup>            | normalized to 1W   | <b>79.1 mW / g <math>\pm</math> 19.9 % (k=2)</b> |

| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                                  |
|---------------------------------------------------------------|--------------------|--------------------------------------------------|
| SAR measured                                                  | 100 mW input power | 2.22 mW / g                                      |
| SAR normalized                                                | normalized to 1W   | 22.2 mW / g                                      |
| SAR for nominal Body TSL parameters <sup>1</sup>              | normalized to 1W   | <b>22.1 mW / g <math>\pm</math> 19.5 % (k=2)</b> |

<sup>1</sup> Correction to nominal TSL parameters according to c), chapter "SAR Sensitivities"

## Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

|                                  | Temperature     | Permittivity | Conductivity     |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters      | 22.0 °C         | 48.6         | 5.65 mho/m       |
| Measured Body TSL parameters     | (22.0 ± 0.2) °C | 46.7 ± 6 %   | 5.70 mho/m ± 6 % |
| Body TSL temperature during test | (21.6 ± 0.2) °C | ----         | ----             |

## SAR result with Body TSL at 5500 MHz

|                                                             |                    |                                   |
|-------------------------------------------------------------|--------------------|-----------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | condition          |                                   |
| SAR measured                                                | 100 mW input power | 8.23 mW / g                       |
| SAR normalized                                              | normalized to 1W   | 82.3 mW / g                       |
| SAR for nominal Body TSL parameters <sup>2</sup>            | normalized to 1W   | <b>81.6 mW / g ± 19.9 % (k=2)</b> |

|                                                               |                    |                                   |
|---------------------------------------------------------------|--------------------|-----------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                   |
| SAR measured                                                  | 100 mW input power | 2.27 mW / g                       |
| SAR normalized                                                | normalized to 1W   | 22.7 mW / g                       |
| SAR for nominal Body TSL parameters <sup>2</sup>              | normalized to 1W   | <b>22.5 mW / g ± 19.5 % (k=2)</b> |

## Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

|                                  | Temperature     | Permittivity | Conductivity     |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters      | 22.0 °C         | 48.2         | 6.00 mho/m       |
| Measured Body TSL parameters     | (22.0 ± 0.2) °C | 46.1 ± 6 %   | 6.03 mho/m ± 6 % |
| Body TSL temperature during test | (21.6 ± 0.2) °C | ----         | ----             |

## SAR result with Body TSL at 5800 MHz

|                                                             |                    |                                   |
|-------------------------------------------------------------|--------------------|-----------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | condition          |                                   |
| SAR measured                                                | 100 mW input power | 7.22 mW / g                       |
| SAR normalized                                              | normalized to 1W   | 72.2 mW / g                       |
| SAR for nominal Body TSL parameters <sup>2</sup>            | normalized to 1W   | <b>71.6 mW / g ± 19.9 % (k=2)</b> |

|                                                               |                    |                                   |
|---------------------------------------------------------------|--------------------|-----------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                   |
| SAR measured                                                  | 100 mW input power | 1.99 mW / g                       |
| SAR normalized                                                | normalized to 1W   | 19.9 mW / g                       |
| SAR for nominal Body TSL parameters <sup>2</sup>              | normalized to 1W   | <b>19.7 mW / g ± 19.5 % (k=2)</b> |

<sup>2</sup> Correction to nominal TSL parameters according to c), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Body TSL at 5200 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.8 $\Omega$ - 5.2 j $\Omega$ |
| Return Loss                          | -25.6 dB                       |

### Antenna Parameters with Body TSL at 5500 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 51.5 $\Omega$ - 2.8 j $\Omega$ |
| Return Loss                          | -30.2 dB                       |

### Antenna Parameters with Body TSL at 5800 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 53.5 $\Omega$ - 1.4 j $\Omega$ |
| Return Loss                          | -28.8 dB                       |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.202 ns |
|----------------------------------|----------|

After long term use with 40 W 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 27, 2006 |

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1057**

Communication System: CW-5GHz; Frequency: 5200 MHzFrequency: 5500 MHzFrequency: 5800 MHz;  
Duty Cycle: 1:1

Medium: MSL 5800 MHz

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 5.37$  mho/m;  $\epsilon_r = 47.4$ ;  $\rho = 1000$  kg/m<sup>3</sup> Medium parameters used:  $f = 5500$  MHz;  $\sigma = 5.73$  mho/m;  $\epsilon_r = 46.6$ ;  $\rho = 1000$  kg/m<sup>3</sup> Medium parameters used:  $f = 5800$  MHz;  $\sigma = 6.06$  mho/m;  $\epsilon_r = 46.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95)ConvF(4.61, 4.61, 4.61)ConvF(4.74, 4.74, 4.74); Calibrated: 08.03.2008
- Sensor-Surface: 2mm (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

**d=10mm, Pin=100mW, f=5200 MHz/Area Scan (61x61x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 16.4 mW/g

**d=10mm, Pin=100mW, f=5200 MHz/Zoom Scan (8x8x10), dist=2mm (8x8x10)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 60.1 V/m; Power Drift = -0.034 dB

Peak SAR (extrapolated) = 30.1 W/kg

**SAR(1 g) = 7.96 mW/g; SAR(10 g) = 2.22 mW/g**

Maximum value of SAR (measured) = 16.5 mW/g

**d=10mm, Pin=100mW, f=5500 MHz/Zoom Scan (8x8x10), dist=2mm (8x8x10)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 59.3 V/m; Power Drift = 0.012 dB

Peak SAR (extrapolated) = 33.9 W/kg

**SAR(1 g) = 8.23 mW/g; SAR(10 g) = 2.27 mW/g**

Maximum value of SAR (measured) = 17.6 mW/g

**d=10mm, Pin=100mW, f=5800 MHz/Zoom Scan (8x8x10), dist=2mm (8x8x10)/Cube 0:**

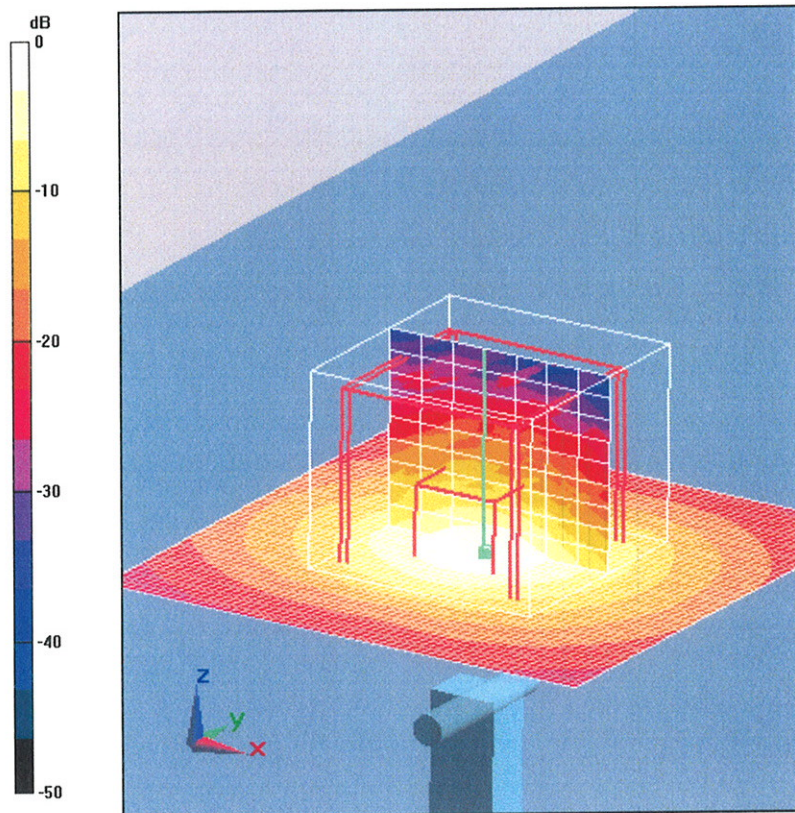
Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 54.6 V/m; Power Drift = 0.014 dB

Peak SAR (extrapolated) = 31.2 W/kg

**SAR(1 g) = 7.22 mW/g; SAR(10 g) = 1.99 mW/g**

Maximum value of SAR (measured) = 15.6 mW/g



0 dB = 15.6mW/g

# Impedance Measurement Plot for Body TSL

14 Jan 2009 14:37:11

[CH1] S11 1 U FS

1: 50.777  $\Omega$  -5.2422  $\Omega$  5.8385 pF

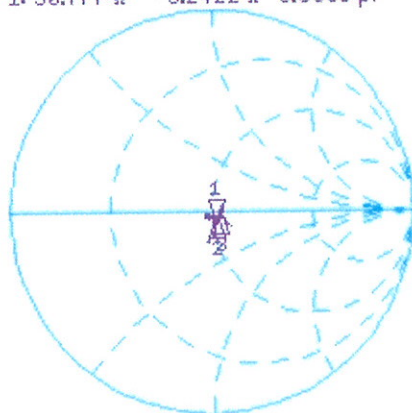
5 200.000 000 MHz

\*

Del

Cor

Avg  
16



CH1 Markers

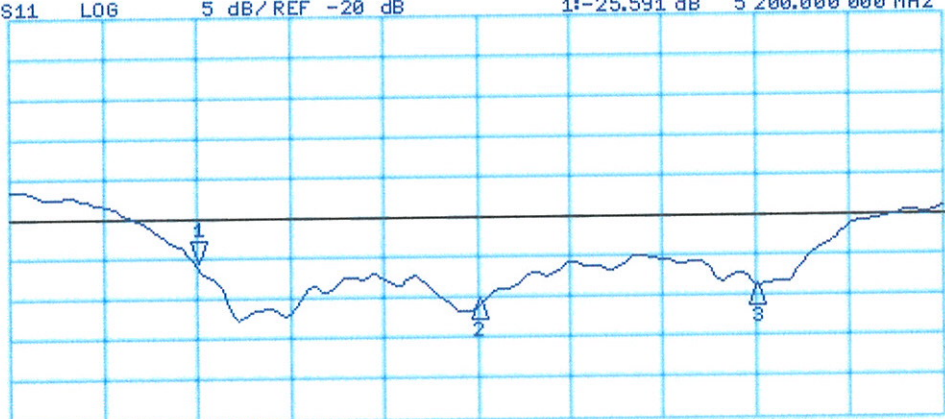
2: 51.465  $\Omega$   
-2.7676  $\Omega$   
5.50000 GHz

3: 53.498  $\Omega$   
-1.4004  $\Omega$   
5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1:-25.591 dB 5 200.000 000 MHz

Cor

Avg  
16



CH2 Markers

2:-30.210 dB  
5.50000 GHz

3:-28.778 dB  
5.80000 GHz

START 5 000.000 000 MHz

STOP 6 000.000 000 MHz