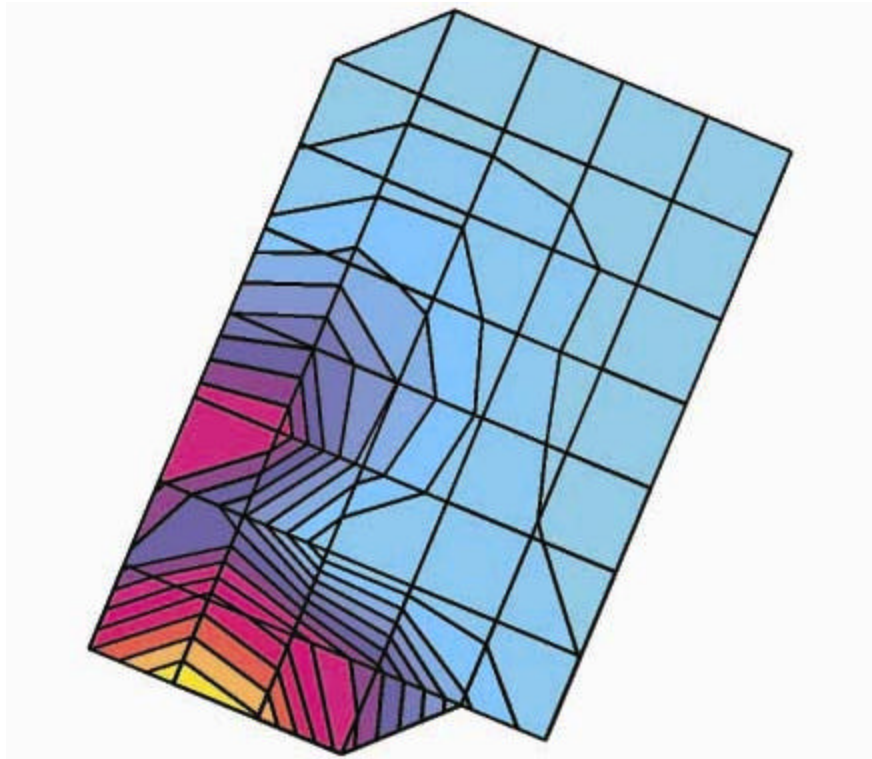


## Appendix 2

### SAR distribution plots for Phantom Head Adjacent Use

During the Cheek Touch SAR measurements in the 850MHz band and the 1900MHz band it was noted that the location of maximum SAR was near the bottom of the phone, near the mouth & jaw area of the phantom (as can be seen in the contour plot below). In this region, the angle of the probe with respect to the line normal to the surface is relatively large, e.g., greater than  $20^\circ$ . This could increase the boundary effect error to a larger level than accounted for in the uncertainty budget. To compensate for this, scans were performed with the probe tilted  $20^\circ$  back from vertical along the MB line. This orientation results in an angle less than  $20^\circ$  between the closest point on the probe-tip housing to the phantom surface in the area of maximum SAR. This probe alignment is recommended in IEEE 1528 Section 6.5.2 "Zoom Scan Recommendations". The SAR Plots included in Appendix 2 for the 850MHz and 1900MHz head adjacent cheek touch configurations will utilize a shorter coarse scan centered in the area of the maximum SAR.

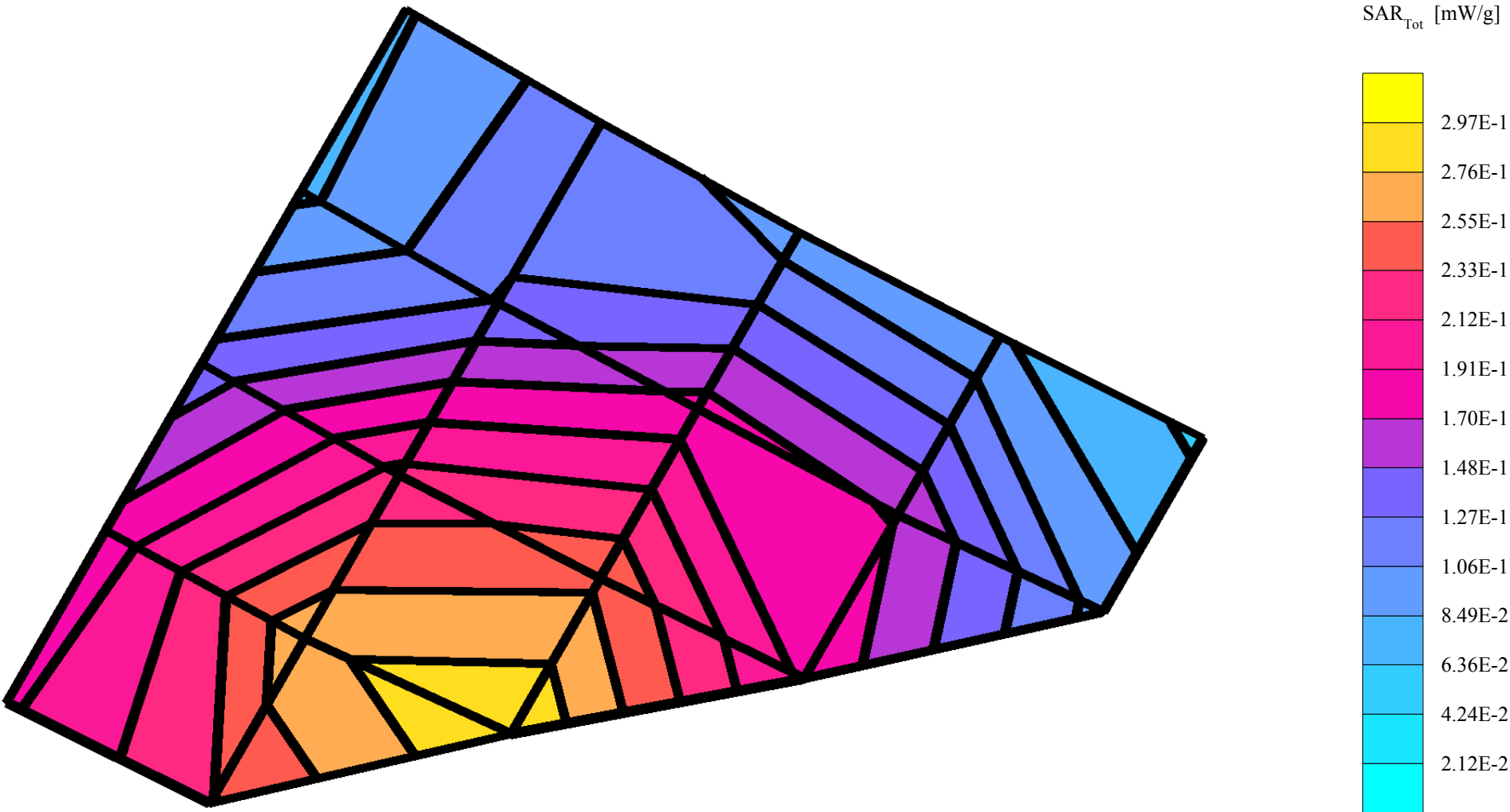


sn: 4400007088915

Ch# 190 Pwr Step: 5 ota  
Type of Modulation: 800 gsm  
DEVICE POSITION: CHEEK  
Accessory Model #: none

Antenna Position: INTERNAL  
Battery Model #: SNN5750A

R4 TP-1131 SUGAR SAM Expanded (Rev. 2)-9Jan03 Phantom; LH Front Tilt 20 Section; Position: (80°,180°); Frequency: 837 MHz  
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(6.08,6.08,6.08); Crest factor: 8.0; 835 MHz Head & Body:  $\sigma = 0.92 \text{ mho/m}$   $\epsilon_r = 43.2$   $\rho = 1.00 \text{ g/cm}^3$   
Cube 7x7x7: SAR (1g): 0.305 mW/g, SAR (10g): 0.204 mW/g, (Worst-case extrapolation)  
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0  
Penetration depth: 12.4 (10.5, 14.9) [mm]  
Powerdrift: 0.28 dB



sn: 4400007088915

Ch# 190 Pwr Step: 5 ota

Type of Modulation: 800 gsm

DEVICE POSITION: CHEEK

Accessory Model #: none

Antenna Position: INTERNAL

Battery Model #: SNN5750A

R4 TP-1131 SUGAR SAM Expanded (Rev. 2)-9Jan03 Phantom; RH Front Tilt 20 Section; Position: (80°,180°); Frequency: 837 MHz

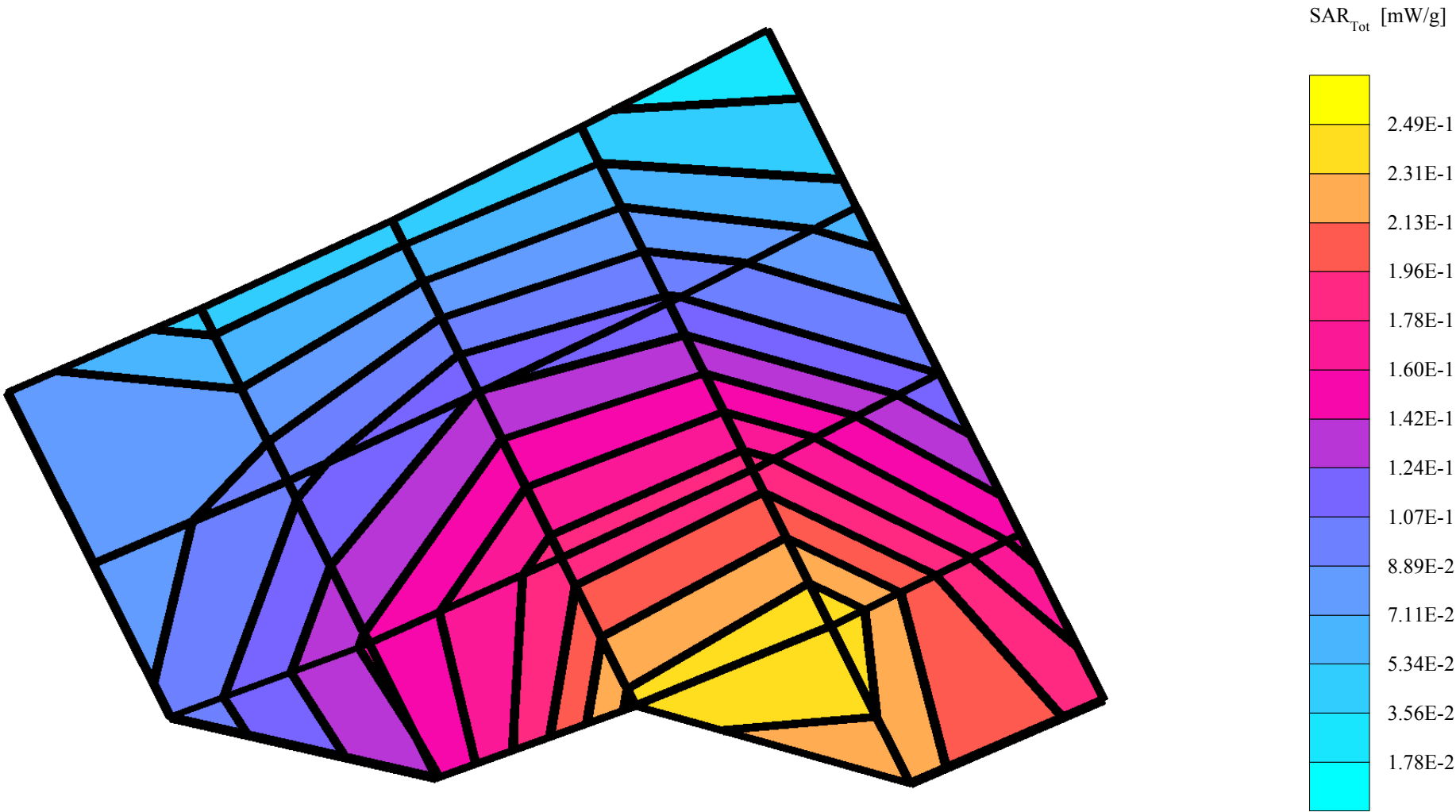
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(6.08,6.08,6.08); Crest factor: 8.0; 835 MHz Head & Body:  $\sigma = 0.92 \text{ mho/m}$   $\epsilon_r = 43.2$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.264 mW/g, SAR (10g): 0.176 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 13.9 (11.0, 17.8) [mm]

Powerdrift: -0.50 dB



sn: 4400007088915

Ch# 190 Pwr Step: 5 ota

Type of Modulation: 800 gsm

DEVICE POSITION: CHEEK

Accessory Model #: WIFI (continuous mod tx 11mbps/cck)

R4 TP-1131 SUGAR SAM Expanded (Rev. 2)-9Jan03 Phantom; LH Front Tilt 20 Section; Position: (80°,180°); Frequency: 837 MHz

Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(6.08,6.08,6.08); Crest factor: 8.0; 835 MHz Head & Body:  $\sigma = 0.92 \text{ mho/m}$   $\epsilon_r = 42.8$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.277 mW/g, SAR (10g): 0.183 mW/g, (Worst-case extrapolation)

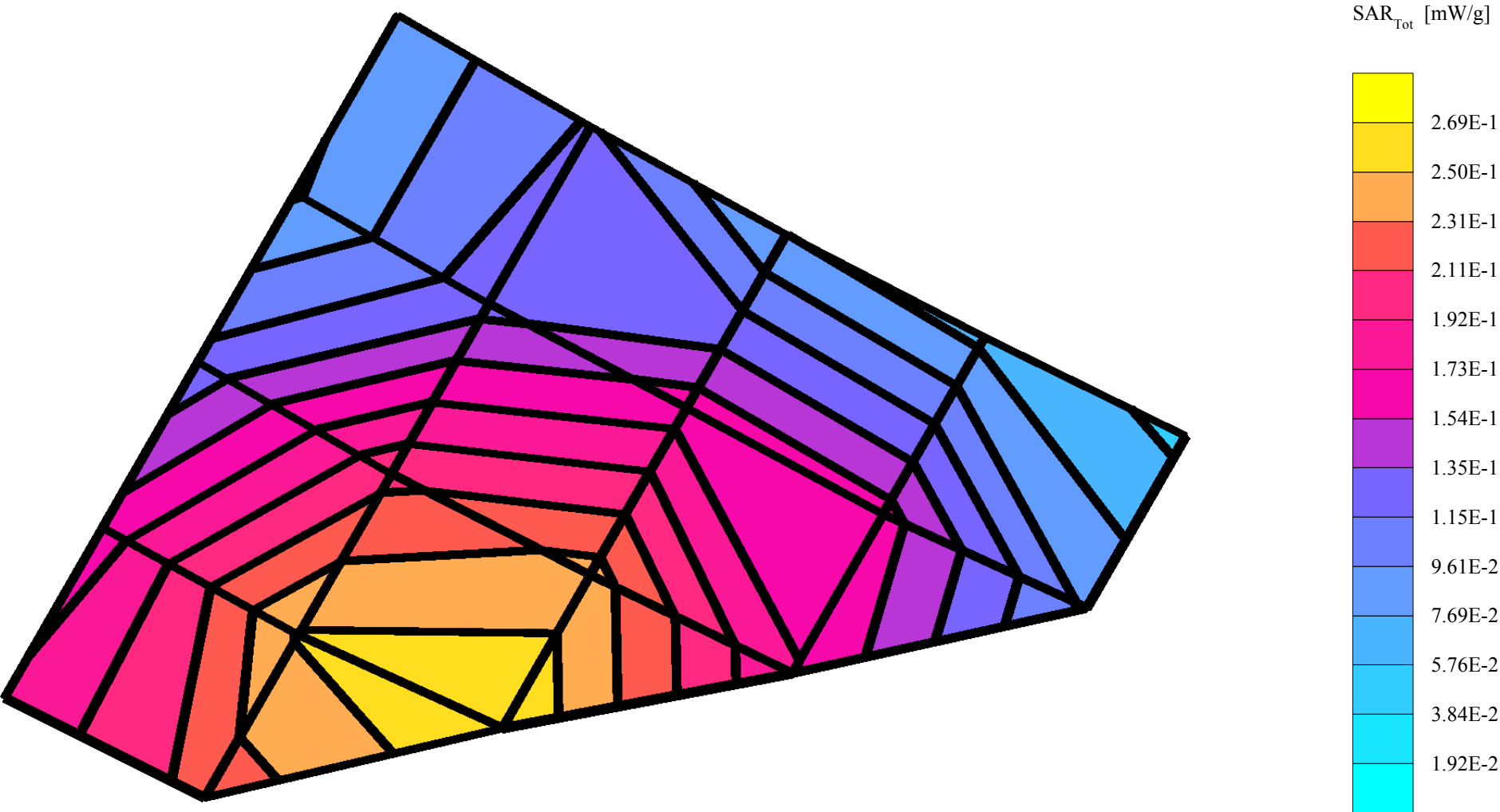
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 13.0 (11.0, 15.6) [mm]

Powerdrift: 0.33 dB

Antenna Position: INTERNAL

Battery Model #: SNN5750A

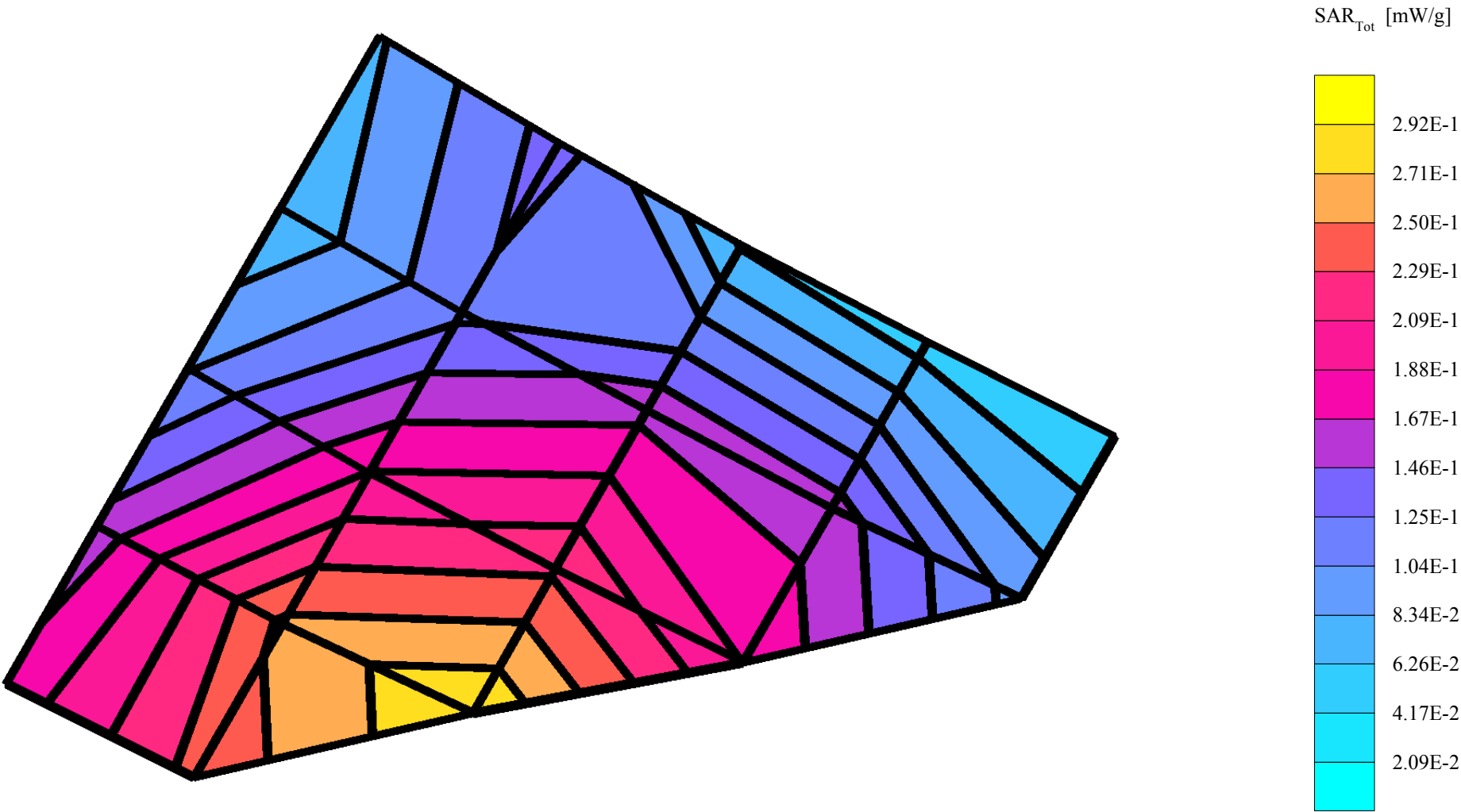


sn: 4400007088915

Ch# 190 Pwr Step: 5 ota  
Type of Modulation: 800 gsm  
DEVICE POSITION: CHEEK  
Accessory Model #: none

Antenna Position: INTERNAL  
Battery Model #: SNN5751A

R4 TP-1131 SUGAR SAM Expanded (Rev. 2)-9Jan03 Phantom; LH Front Tilt 20 Section; Position: (80°,180°); Frequency: 837 MHz  
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(6.08,6.08,6.08); Crest factor: 8.0; 835 MHz Head & Body:  $\sigma = 0.92 \text{ mho/m}$   $\epsilon_r = 43.2$   $\rho = 1.00 \text{ g/cm}^3$   
Cube 7x7x7: SAR (1g): 0.293 mW/g, SAR (10g): 0.194 mW/g \* Max outside, (Worst-case extrapolation)  
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0  
Penetration depth: 12.8 (11.1, 15.0) [mm]  
Powerdrift: -0.16 dB



sn: 4400007088915

Ch# 661 / Pwr Step: 0

Type of Modulation: GSM 1900

DEVICE POSITION (cheek or rotated): Cheek

Accessory Model #: N/A

Simulate Temp when Measured: 19.5C

Antenna Position: Internal

Battery Model #: SNN5750A

Simulate Temp after Test: 19.6C

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; LH Front Tilt 20 Section; Position: (80°,180°); Frequency: 1880 MHz

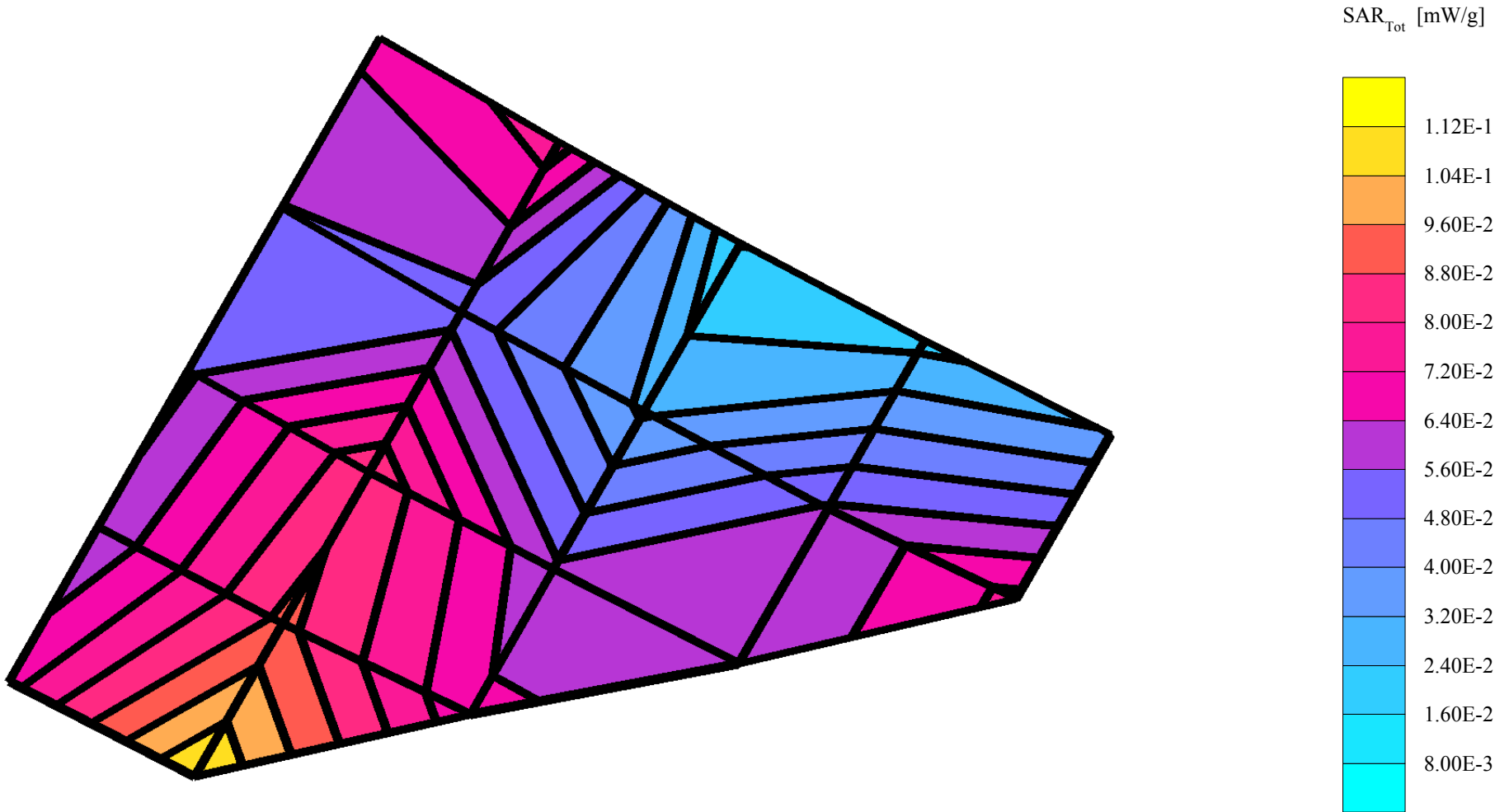
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(5.03,5.03,5.03); Crest factor: 8.0; 1880 MHz Head & Body:  $\sigma = 1.44 \text{ mho/m}$   $\epsilon_r = 38.5$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.112 mW/g, SAR (10g): 0.0739 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 12.2 (10.4, 15.0) [mm]

Powerdrift: 0.57 dB



sn: 4400007088915

Ch# 661 / Pwr Step: 0

Type of Modulation: gsm

DEVICE POSITION (cheek

tilted probe

Antenna Position: non

Battery Model #: snn5750a

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; RH Front Tilt 20 Section; Position: (80°,180°); Frequency: 1880 MHz

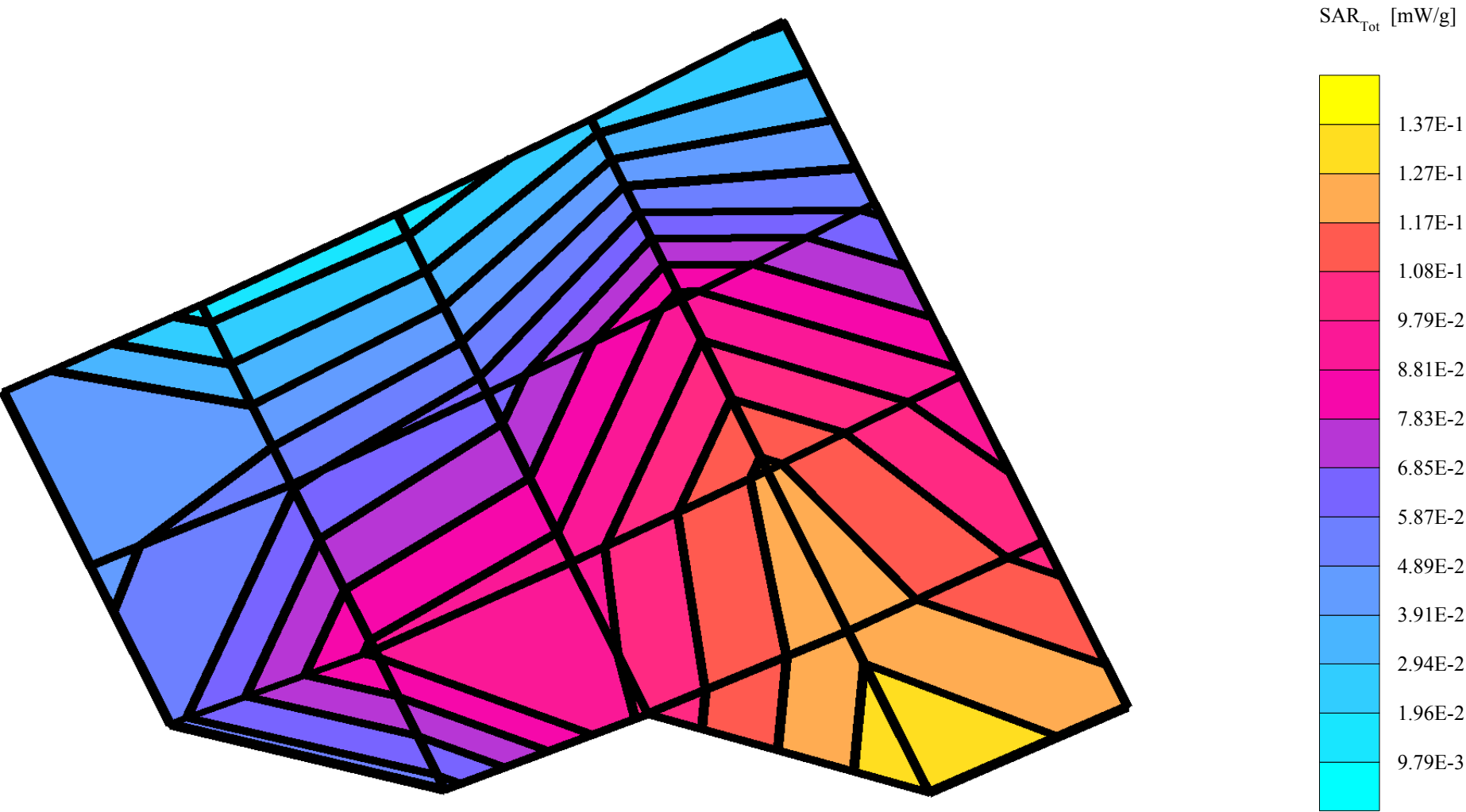
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(5.03,5.03,5.03); Crest factor: 8.0; 1880 MHz Head & Body:  $\sigma = 1.46 \text{ mho/m}$   $\epsilon_r = 38.0$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.143 mW/g, SAR (10g): 0.0884 mW/g \* Max outside, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 11.0 (8.7, 14.8) [mm]

Powerdrift: -0.53 dB

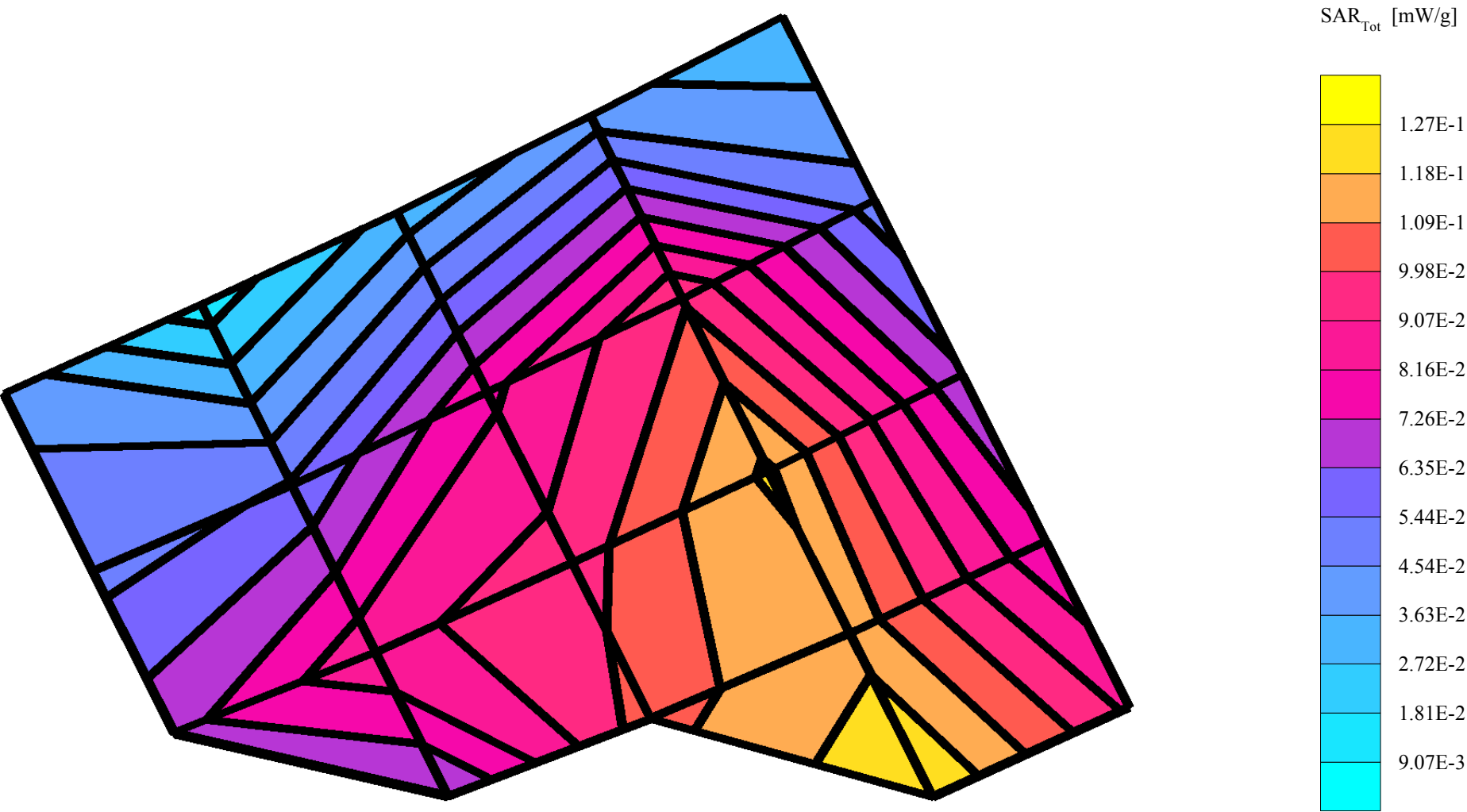


sn: 4400007088915

Ch# 661 Pwr Step: 0 ota  
Type of Modulation: 1900 gsm  
DEVICE POSITION: CHEEK

Antenna Position: INTERNAL  
Battery Model #: SNN5750A

Accessory Model #: none      WIFI (cont. mod.tx-ch6-11mbps/cc)  
R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; RH Front Tilt 20 Section; Position: (80°,180°); Frequency: 1880 MHz  
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(5.03,5.03,5.03); Crest factor: 8.0; 1880 MHz Head & Body:  $\sigma = 1.45 \text{ mho/m}$   $\epsilon_r = 38.1$   $\rho = 1.00 \text{ g/cm}^3$   
Cube 7x7x7: SAR (1g): 0.130 mW/g, SAR (10g): 0.0807 mW/g, (Worst-case extrapolation)  
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0  
Penetration depth: 10.3 (8.5, 13.4) [mm]  
Powerdrift: 0.39 dB



sn: 4400007088915

Ch# 661 / Pwr Step: 0

Type of Modulation: gsm

Antenna Position: non

Battery Model #: snn5751a extndedbatt

DEVICE POSITION (cheek

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; RH Front Tilt 20 Section; Position: (80°,180°); Frequency: 1880 MHz

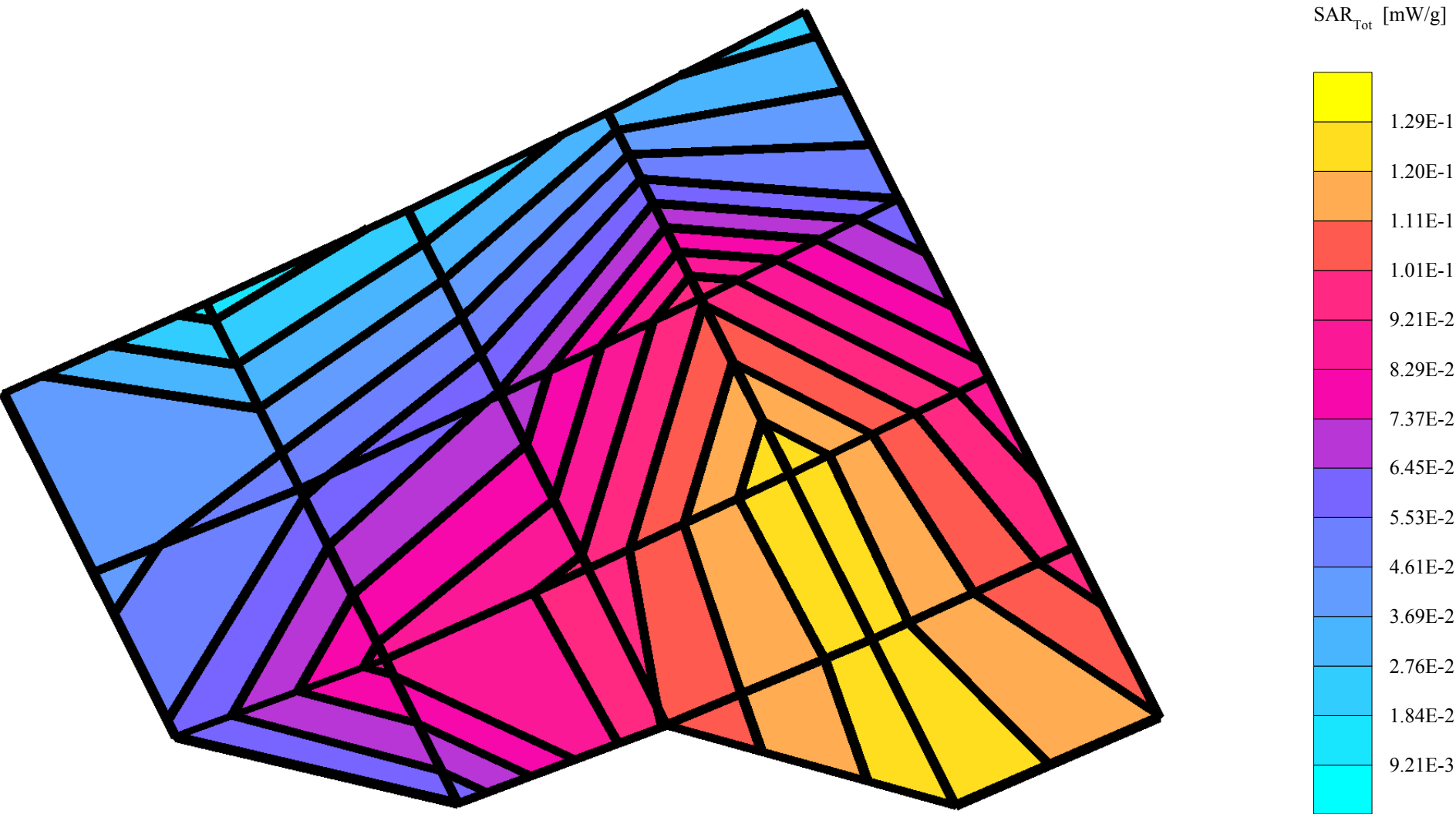
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(5.03,5.03,5.03); Crest factor: 8.0; 1880 MHz Head & Body:  $\sigma = 1.46 \text{ mho/m}$   $\epsilon_r = 38.0$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.132 mW/g, SAR (10g): 0.0801 mW/g \* Max outside, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 10.1 (9.0, 11.8) [mm]

Powerdrift: 0.38 dB



sn: 4400007088915

Ch# 6    Pwr Step:    continuous mod tx 11mbps/cck    Antenna Position:    INTERNAL  
Type of Modulation:    WIFI    Battery Model #:    SNN5750A

DEVICE POSITION:    CHEEK

Accessory Model #:    none

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Right Hand Section; Position: (90°,180°); Frequency: 2437 MHz

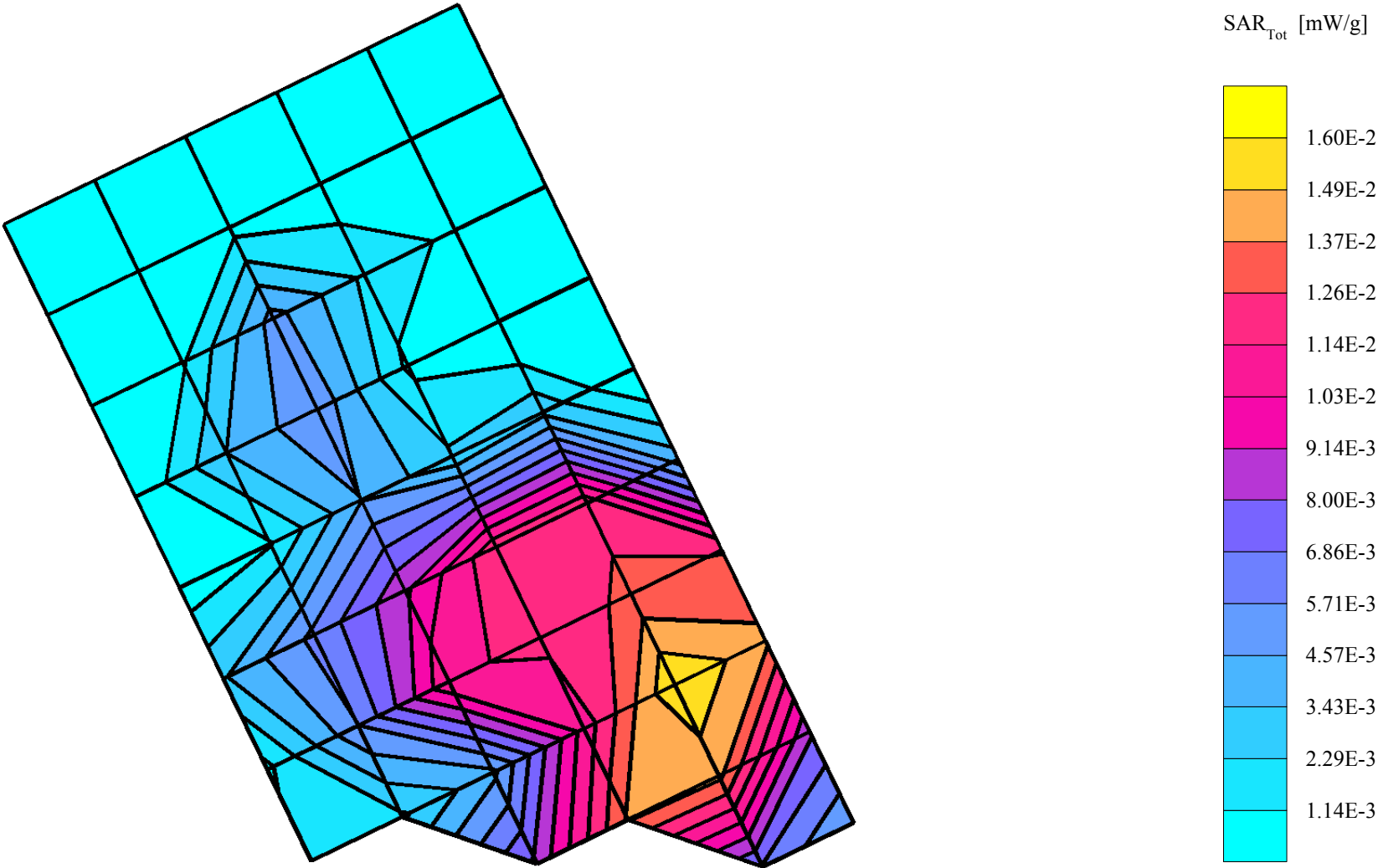
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(4.46,4.46,4.46); Crest factor: 1.0; 2450 MHz Head & Body:  $\sigma = 1.88 \text{ mho/m}$   $\epsilon_r = 37.4$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.0197 mW/g, SAR (10g): 0.0097 mW/g \* Max outside, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 7.0 (5.6, 10.3) [mm]

Powerdrift: -0.15 dB



sn: 4400007088915

Ch# 6    Pwr Step:    continuous mod tx 11mbps/cck    Antenna Position:    INTERNAL  
Type of Modulation:    WIFI    Battery Model #:    SNN5750A

DEVICE POSITION:    CHEEK

Accessory Model #:    none

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 2437 MHz

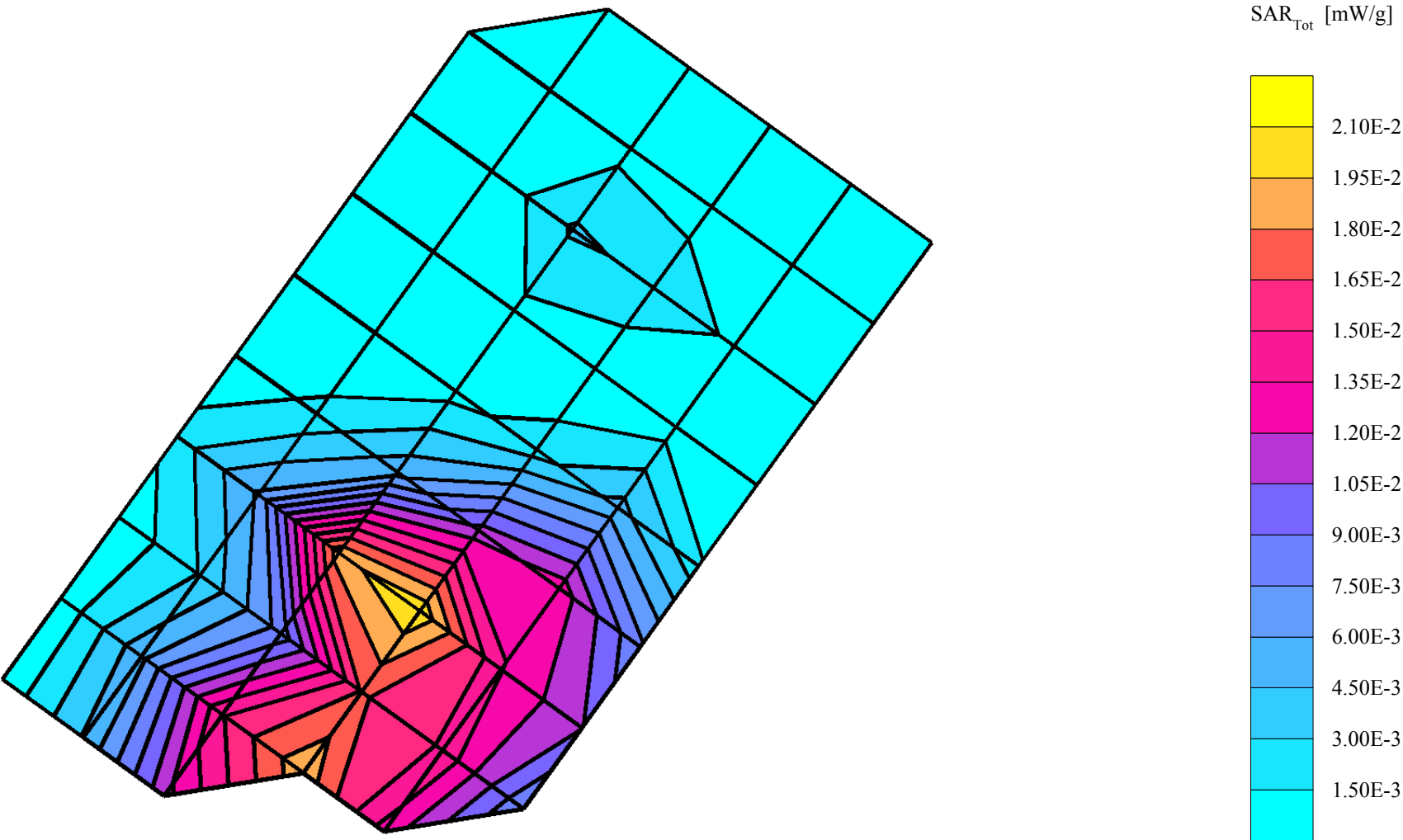
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(4.46,4.46,4.46); Crest factor: 1.0; 2450 MHz Head & Body:  $\sigma = 1.88 \text{ mho/m}$   $\epsilon_r = 37.6$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.0262 mW/g, SAR (10g): 0.0123 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 8.9 (8.5, 9.4) [mm]

Powerdrift: 0.07 dB



sn: 4400007088915

Ch# 6    Pwr Step:    continuous mod tx 11mbps/cck    Antenna Position:    INTERNAL  
Type of Modulation:    WIFI    Battery Model #:    SNN5751A

DEVICE POSITION:    CHEEK

Accessory Model #:    none

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 2437 MHz

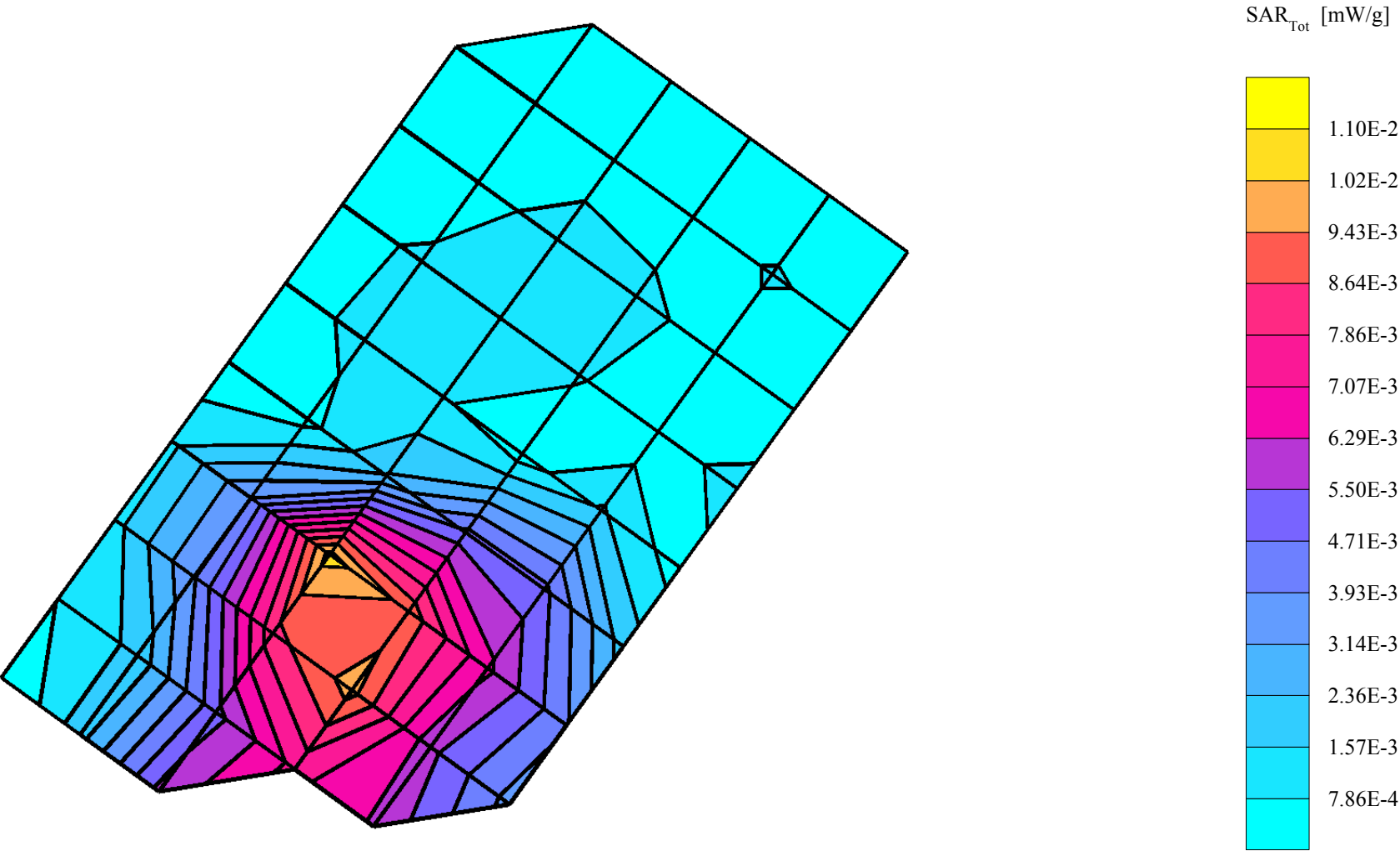
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(4.46,4.46,4.46); Crest factor: 1.0; 2450 MHz Head & Body:  $\sigma = 1.88 \text{ mho/m}$   $\epsilon_r = 37.4$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.0133 mW/g, SAR (10g): 0.0066 mW/g \* Max outside, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 10.0 (9.6, 10.8) [mm]

Powerdrift: -0.17 dB



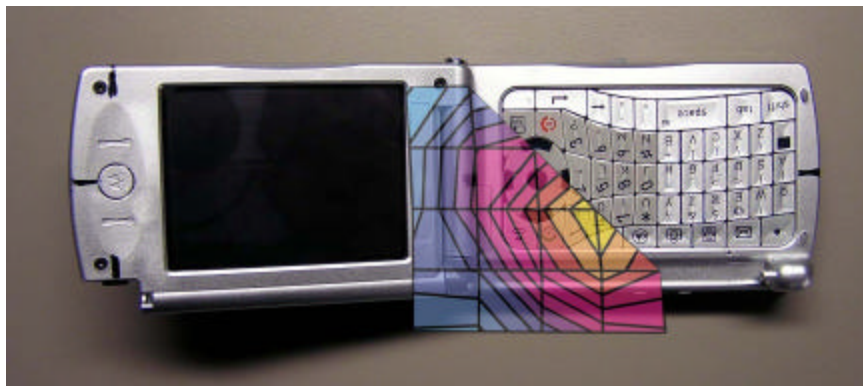


Figure 1. Typical 850MHz Head Adjacent Contour Overlaid on Phone (Cheek Touch)

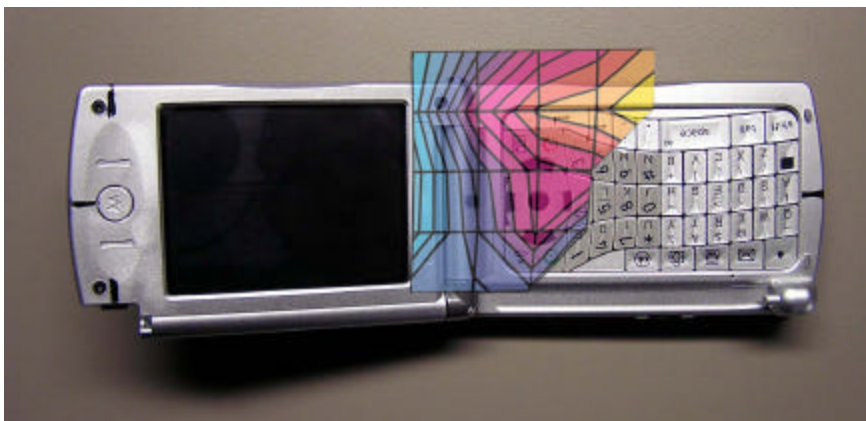


Figure 2. Typical 1900MHz Head Adjacent Contour Overlaid on Phone (Cheek Touch)

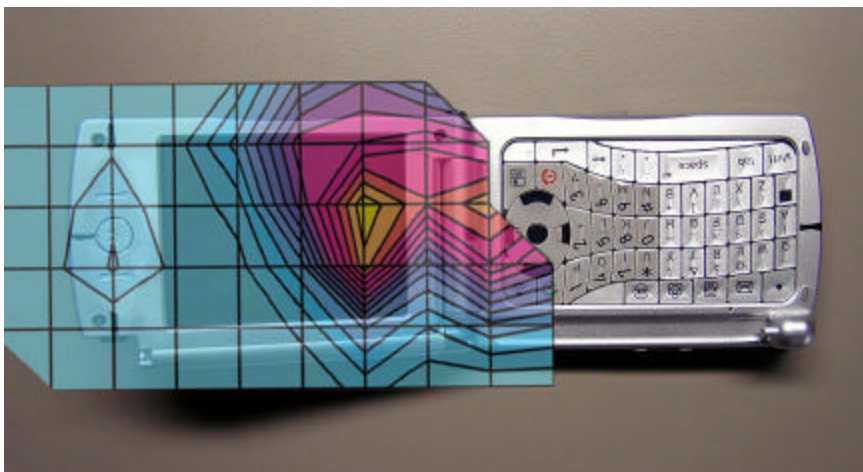


Figure 3. Typical WiFi Head Adjacent Contour Overlaid on Phone (Cheek Touch)

sn: 4400007088915

Ch# 190 / Pwr Step: 5

Antenna Position: Internal

Type of Modulation: GSM 850

Battery Model #: SNN5750A

DEVICE POSITION (cheek or rotated): Rotated

Accessory Model #: N/A

Simulate Temp when Measured: 20.0C

Simulate Temp after Test: 19.8C

R4 TP-1131 SUGAR SAM Expanded (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 837 MHz

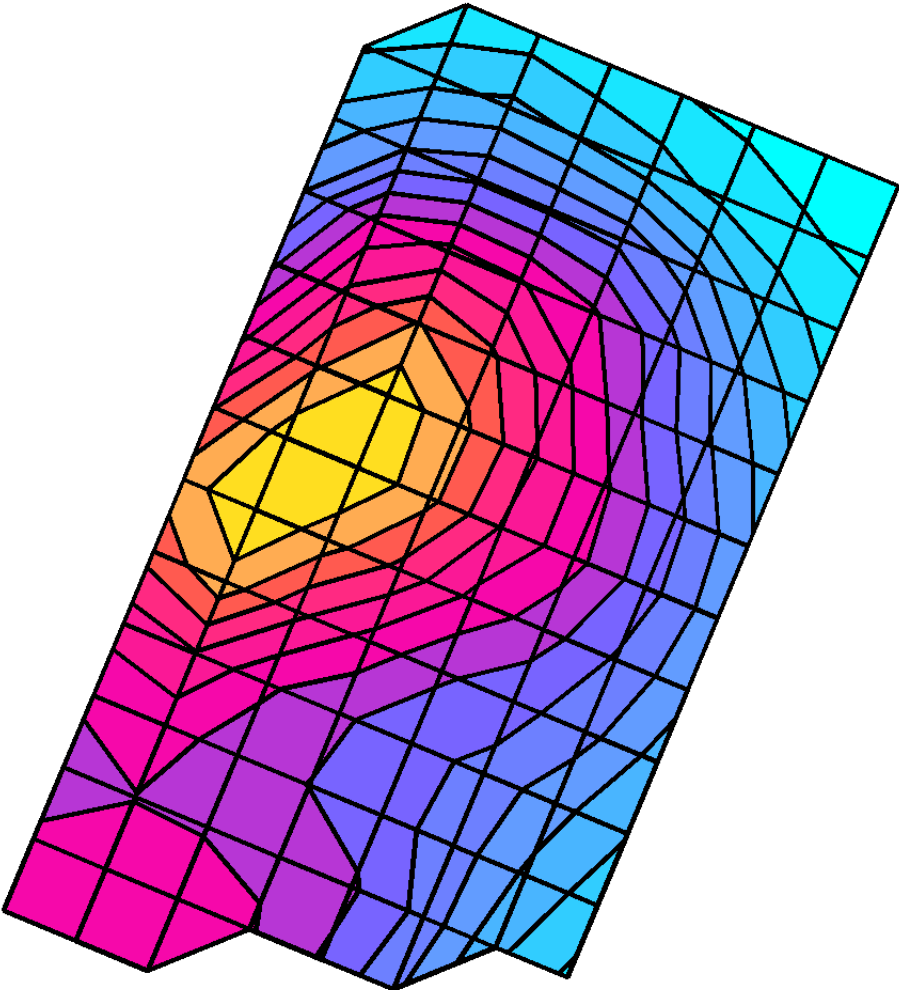
Probe: ET3DV6R - SN1506 - IEEE HEAD.2; ConvF(5.72,5.72,5.72); Crest factor: 8.0; 835 MHz Head & Body:  $\sigma = 0.92 \text{ mho/m}$   $\epsilon_r = 43.3$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.105 mW/g, SAR (10g): 0.0771 mW/g, (Worst-case extrapolation)

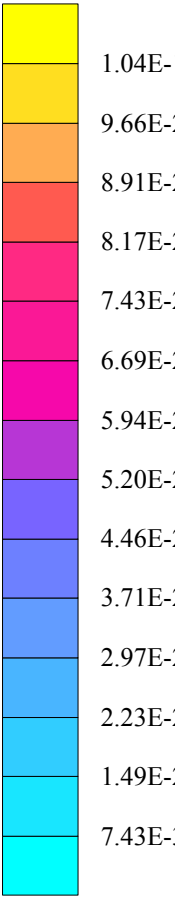
Coarse: Dx = 10.0, Dy = 10.0, Dz = 10.0

Penetration depth: 19.2 (17.4, 21.0) [mm]

Powerdrift: -0.01 dB



SAR<sub>Tot</sub> [mW/g]



sn: 4400007088915

Ch# 190 / Pwr Step: 5

Antenna Position: Internal

Type of Modulation: GSM 850

Battery Model #: SNN5750A

DEVICE POSITION (cheek or rotated): Rotated

Accessory Model #: N/A

Simulate Temp when Measured: 20.0C

Simulate Temp after Test: 19.4C

R4 TP-1131 SUGAR SAM Expanded (Rev. 2)-9Jan03 Phantom; Right Hand Section; Position: (90°,180°); Frequency: 837 MHz

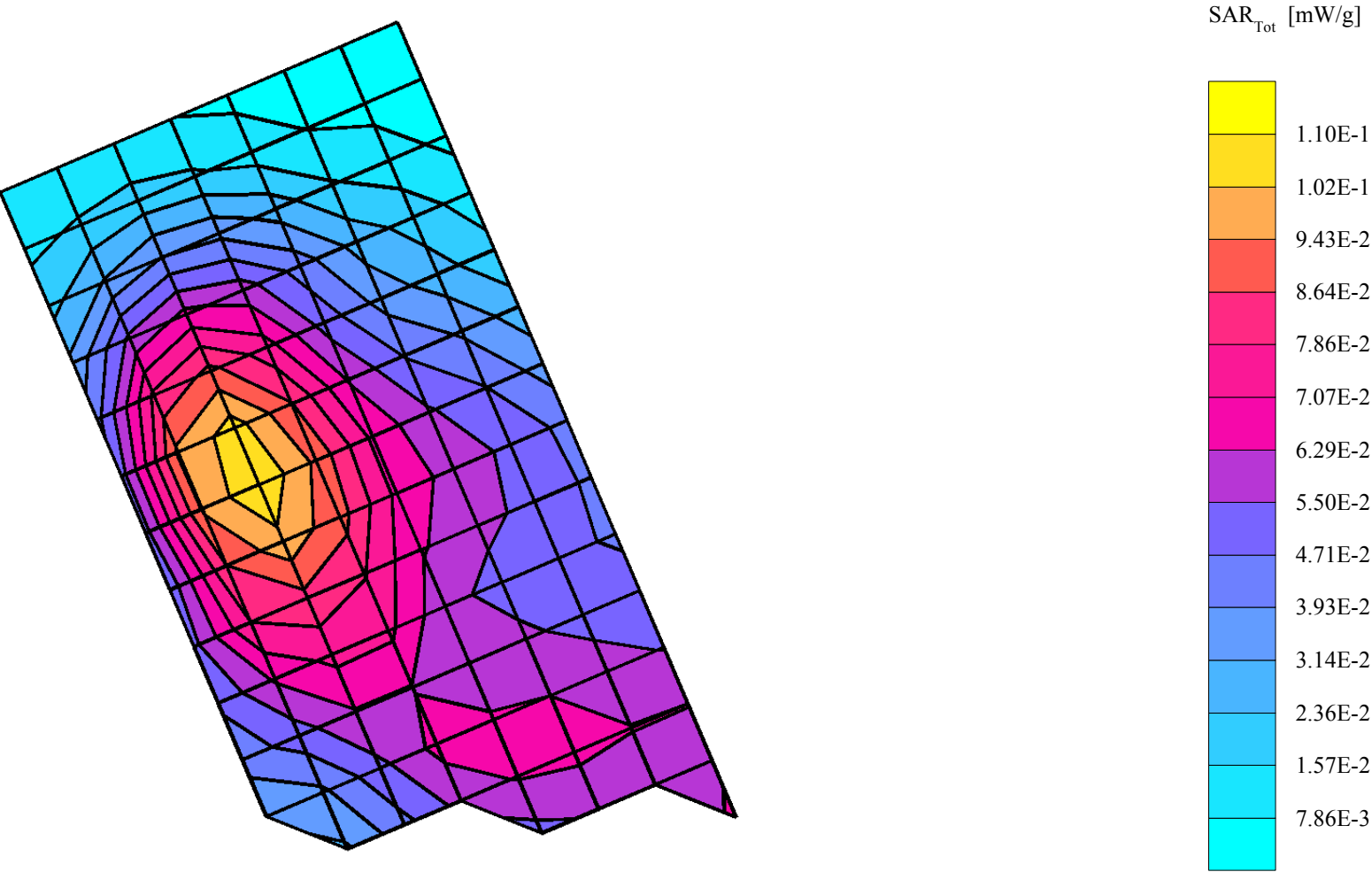
Probe: ET3DV6R - SN1506 - IEEE HEAD.2; ConvF(5.72,5.72,5.72); Crest factor: 8.0; 835 MHz Head & Body:  $\sigma = 0.92 \text{ mho/m}$   $\epsilon_r = 43.3$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.107 mW/g, SAR (10g): 0.0753 mW/g, (Worst-case extrapolation)

Coarse: Dx = 10.0, Dy = 10.0, Dz = 10.0

Penetration depth: 16.3 (14.8, 18.1) [mm]

Powerdrift: -0.26 dB



sn: 4400007088915

Ch# 661 / Pwr Step: 0

Antenna Position: Internal

Type of Modulation: GSM 1900

Battery Model #: SNN5750A

DEVICE POSITION (cheek or rotated): Rotated

Accessory Model #: N/A

Simulate Temp when Measured: 19.5C

Simulate Temp after Test: 19.3C

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 1880 MHz

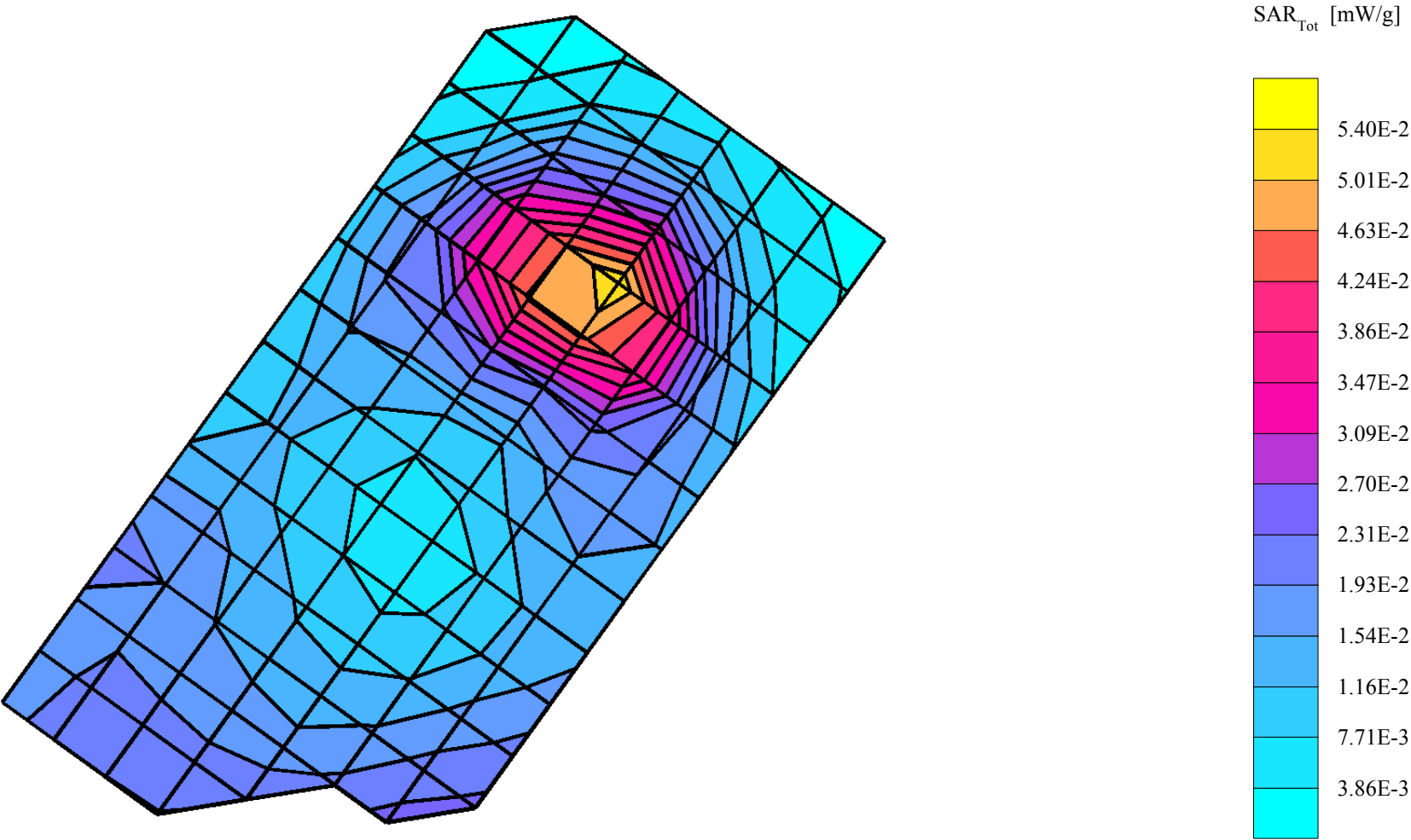
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(5.03,5.03,5.03); Crest factor: 8.0; 1880 MHz Head & Body:  $\sigma = 1.44 \text{ mho/m}$   $\epsilon_r = 38.5$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.0550 mW/g, SAR (10g): 0.0314 mW/g, (Worst-case extrapolation)

Coarse: Dx = 10.0, Dy = 10.0, Dz = 10.0

Penetration depth: 11.1 (10.5, 11.8) [mm]

Powerdrift: -0.09 dB



sn: 4400007088915

Ch# 661 / Pwr Step: 0

Type of Modulation: gsm

DEVICE POSITION tilt

Antenna Position: non

Battery Model #: snn5750a

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Right Hand Section; Position: (90°,180°); Frequency: 1880 MHz

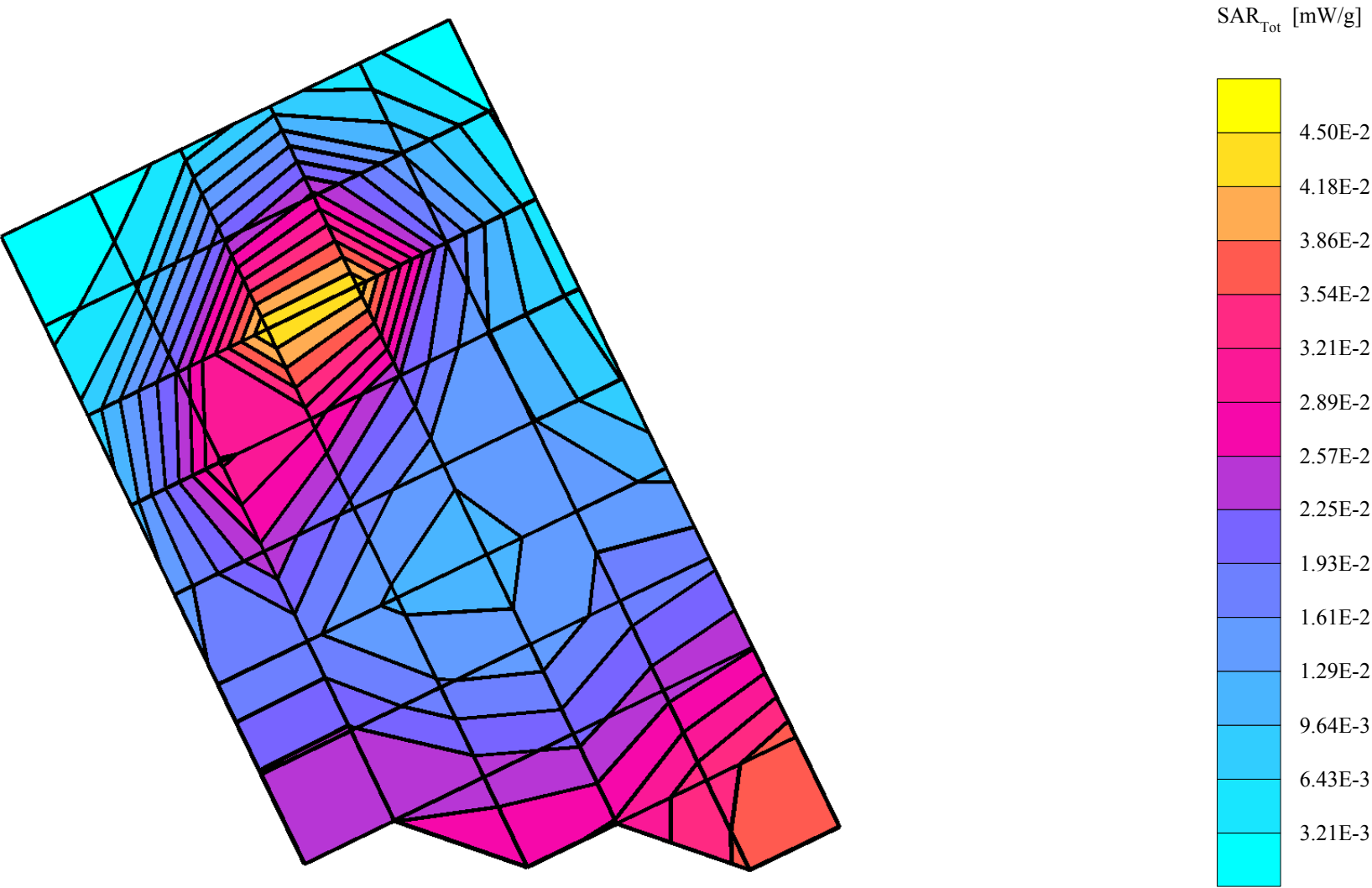
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(5.03,5.03,5.03); Crest factor: 8.0; 1880 MHz Head & Body:  $\sigma = 1.46 \text{ mho/m}$   $\epsilon_r = 38.0$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.0484 mW/g, SAR (10g): 0.0281 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 11.2 (10.6, 11.7) [mm]

Powerdrift: -0.05 dB



sn: 4400007088915

Ch# 6    Pwr Step:    continuous mod tx 11mbps/cck    Antenna Position:    INTERNAL  
Type of Modulation:    WIFI    Battery Model #:    SNN5750A

DEVICE POSITION:    ROTATED

Accessory Model #:    none

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 2437 MHz

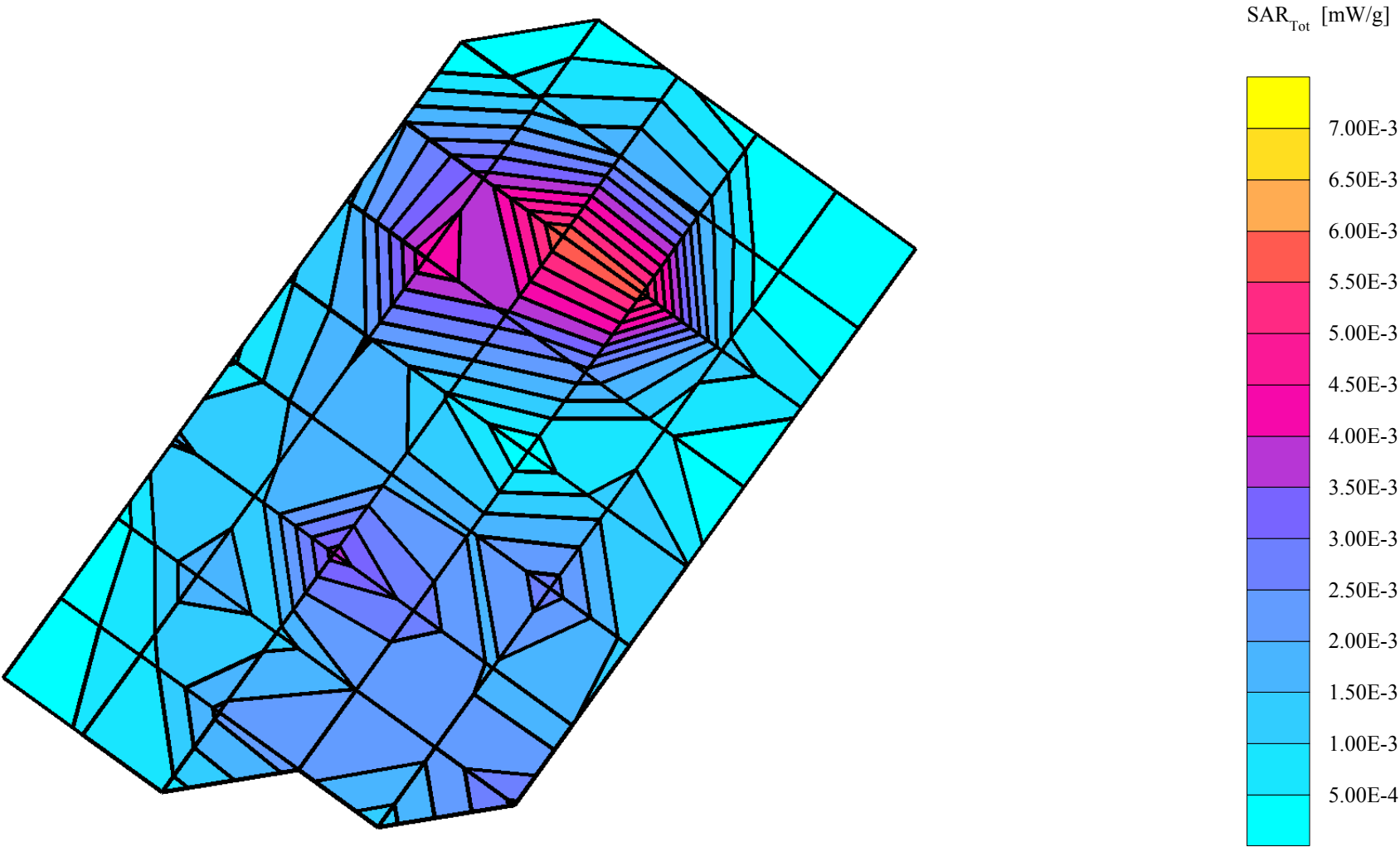
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(4.46,4.46,4.46); Crest factor: 1.0; 2450 MHz Head & Body:  $\sigma = 1.88 \text{ mho/m}$   $\epsilon_r = 37.4$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.0064 mW/g, SAR (10g): 0.0031 mW/g \* Max outside, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 9.4 (7.4, 13.8) [mm]

Powerdrift: 0.62 dB



sn: 4400007088915

Ch# 6    Pwr Step:    continuous mod tx 11mbps/cck    Antenna Position:    INTERNAL  
Type of Modulation:    WIFI    Battery Model #:    SNN5750A

DEVICE POSITION:    ROTATED

Accessory Model #:    none

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Right Hand Section; Position: (90°,180°); Frequency: 2437 MHz

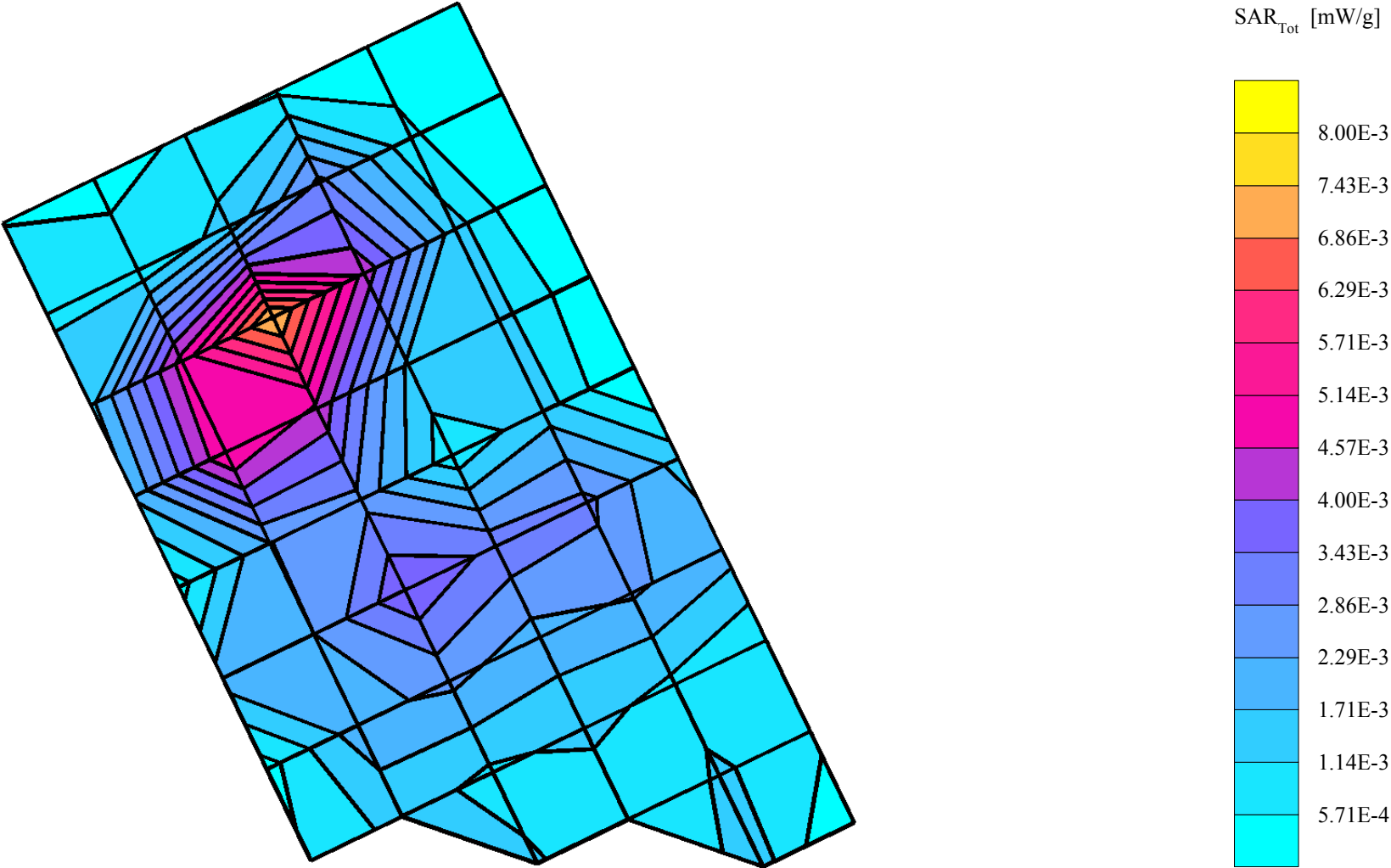
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(4.46,4.46,4.46); Crest factor: 1.0; 2450 MHz Head & Body:  $\sigma = 1.88 \text{ mho/m}$   $\epsilon_r = 37.4$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.0076 mW/g, SAR (10g): 0.0037 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 5.6 (4.5, 6.8) [mm]

Powerdrift: -0.33 dB



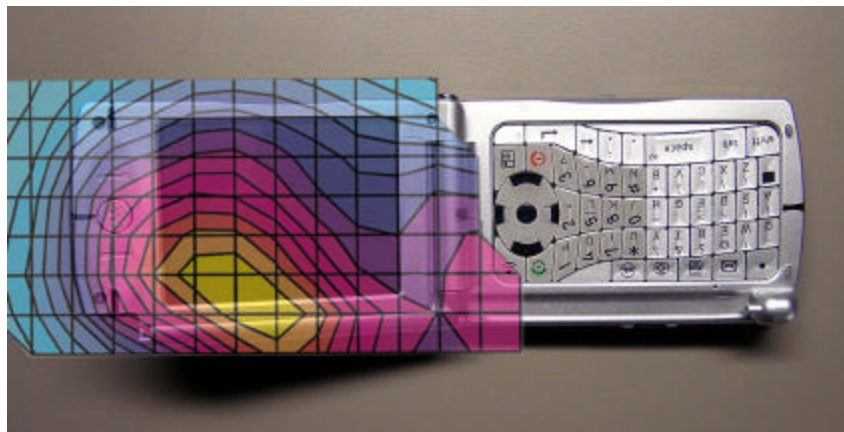


Figure 4. Typical 850MHz Head Adjacent Contour Overlaid on Phone (15 ° Tilt)

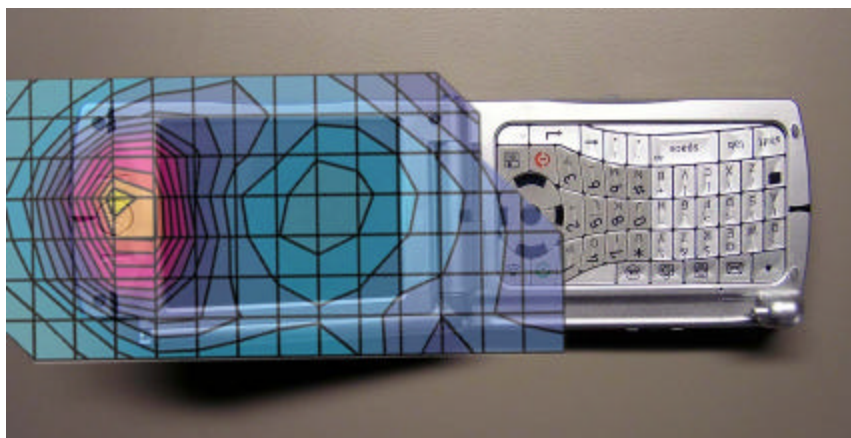


Figure 5. Typical 1900MHz Head Adjacent Contour Overlaid on Phone (15 ° Tilt)

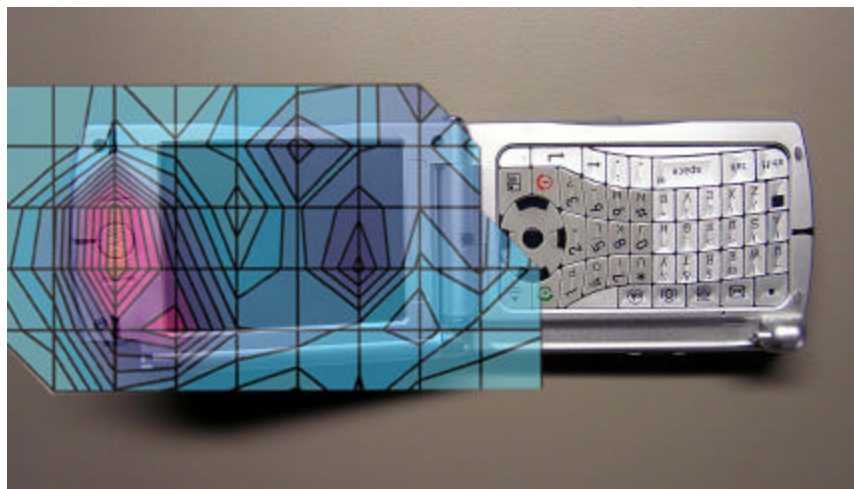


Figure 6. Typical WiFi Head Adjacent Contour Overlaid on Phone (15 ° Tilt)

### **Appendix 3**

#### **SAR distribution plots for Body Worn Configuration**

sn: 4400007088915

Ch# 190 Pwr Step: 5 ota

Type of Modulation: 800 gsm

Accessory Model # = case (SYN1070A)

R4 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 837 MHz

Probe: ET3DV6R - SN1506 FCC Body.2; ConvF(5.53,5.53,5.53); Crest factor: 8.0; 835 MHz Head & Body:  $\sigma = 0.98$  mho/m  $\epsilon_r = 53.3$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 0.626 mW/g, SAR (10g): 0.349 mW/g, (Worst-case extrapolation)

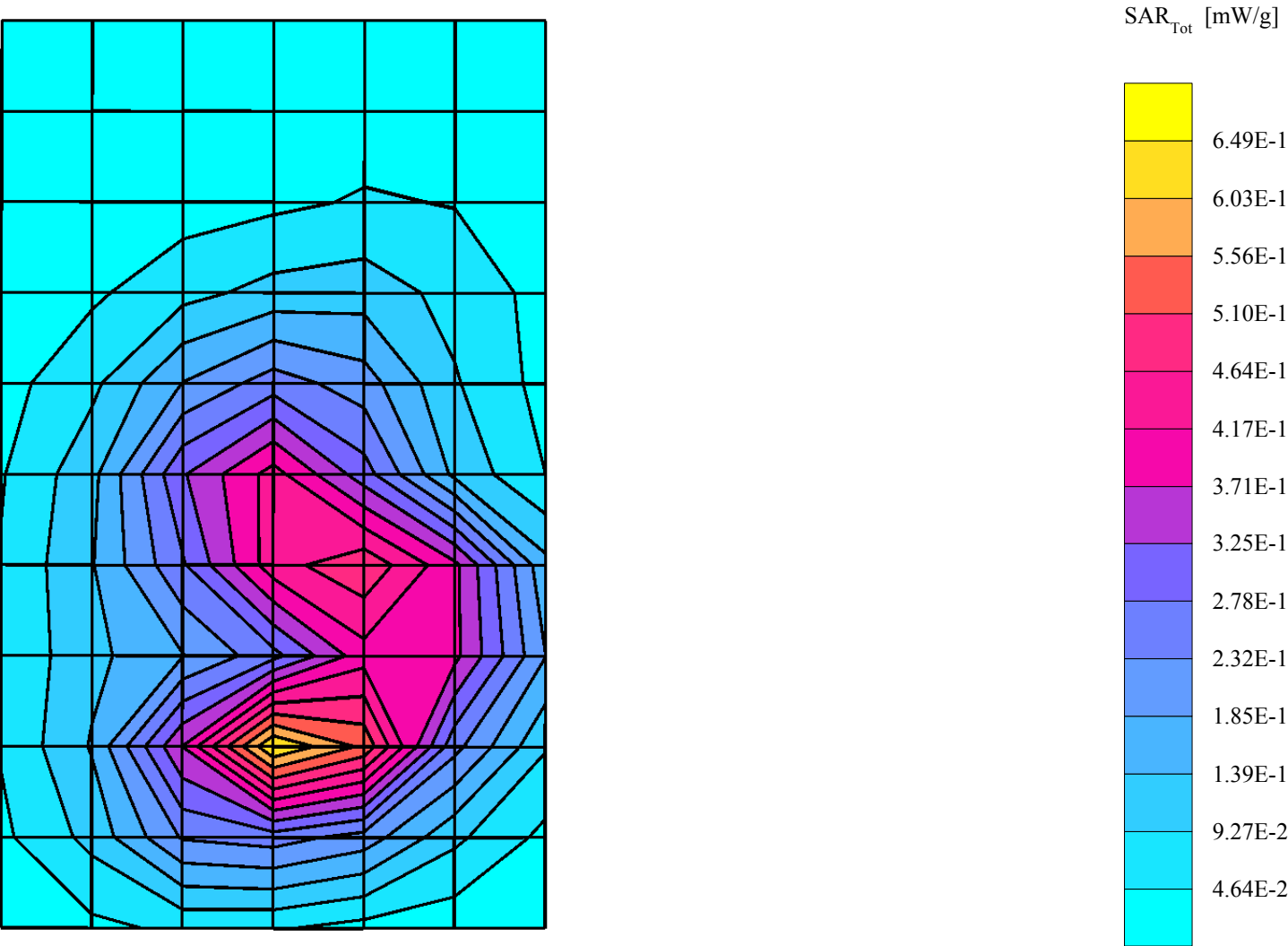
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 10.1 (9.5, 11.0) [mm]

Powerdrift: -0.11 dB

Antenna Position: INTERNAL

Battery Model #: SNN5750A



sn: 4400007088915

Ch# 190 Pwr Step: 5 ota      Antenna Position: INTERNAL  
Type of Modulation: 800 gsm      bluetooth      Battery Model #: SNN5750A

Accessory Model # = case (SYN1070A)

R4 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 837 MHz

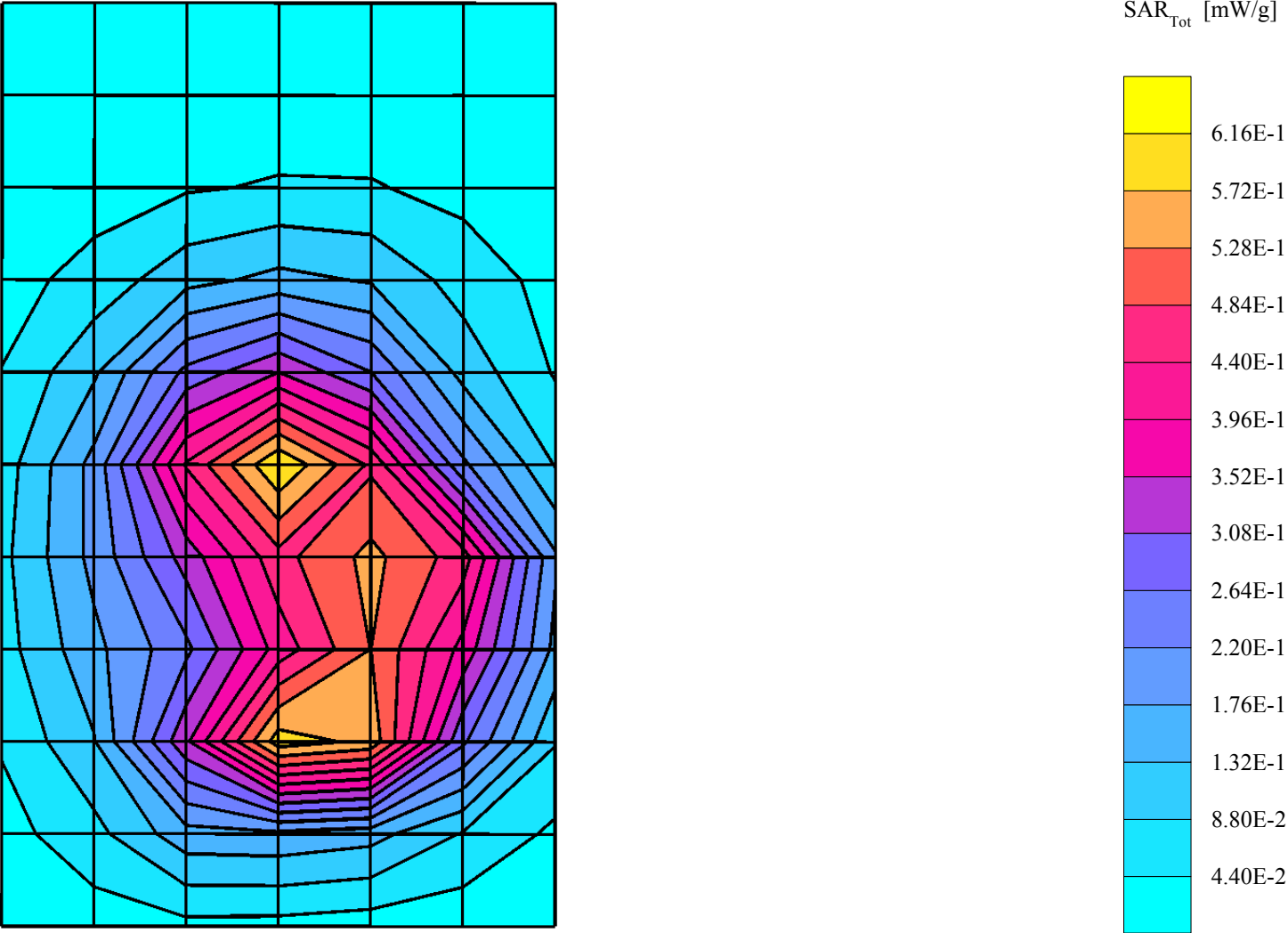
Probe: ET3DV6 - SN1514-FCC BODY2; ConvF(5.87,5.87,5.87); Crest factor: 8.0; 835 MHz    Head & Body:  $\sigma = 0.97$  mho/m  $\epsilon_r = 53.3$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 0.678 mW/g, SAR (10g): 0.389 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 10.4 (9.8, 11.4) [mm]

Powerdrift: -0.11 dB



sn: 4400007088915

Ch# 190 / Pwr Step: 5

Type of Modulation: GSM 850

Accessory Model #: SYN1070A

Antenna Position: Internal

Battery Model #: SNN5750A

Bluetooth Enabled

WiFi (WLAN) (Channel 6) Enabled

Simulate Temp when Measured: 20.5C

Simulate Temp after Test: 19.2C

R4 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 837 MHz

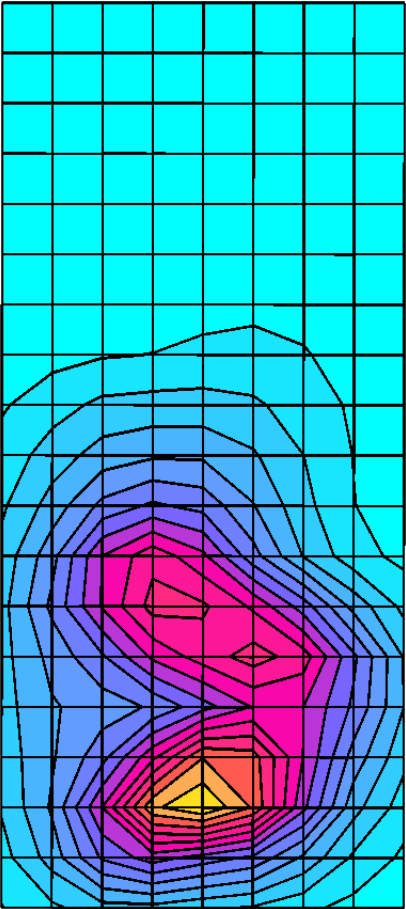
Probe: ET3DV6 - SN1514-FCC BODY2; ConvF(5.87,5.87,5.87); Crest factor: 8.0; 835 MHz Head & Body:  $\sigma = 0.98 \text{ mho/m}$   $\epsilon_r = 53.8$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.646 mW/g, SAR (10g): 0.359 mW/g, (Worst-case extrapolation)

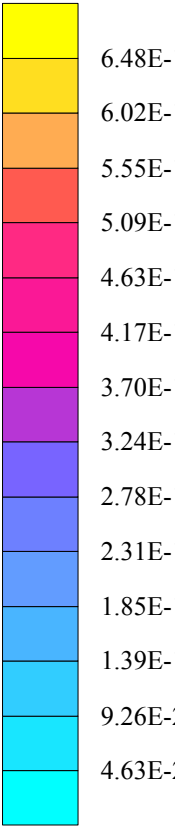
Coarse: Dx = 10.0, Dy = 10.0, Dz = 10.0

Penetration depth: 9.7 (9.1, 10.8) [mm]

Powerdrift: -0.22 dB



SAR<sub>Tot</sub> [mW/g]



sn: 4400007088915

Ch# 128 Pwr Step: burst 1 and 2=5 ota      Antenna Position: INTERNAL  
Type of Modulation: 800 gprs    bluetooth program    Battery Model #: SNN5750A  
Accessory Model # = case (SYN1070A)

R4 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 824 MHz

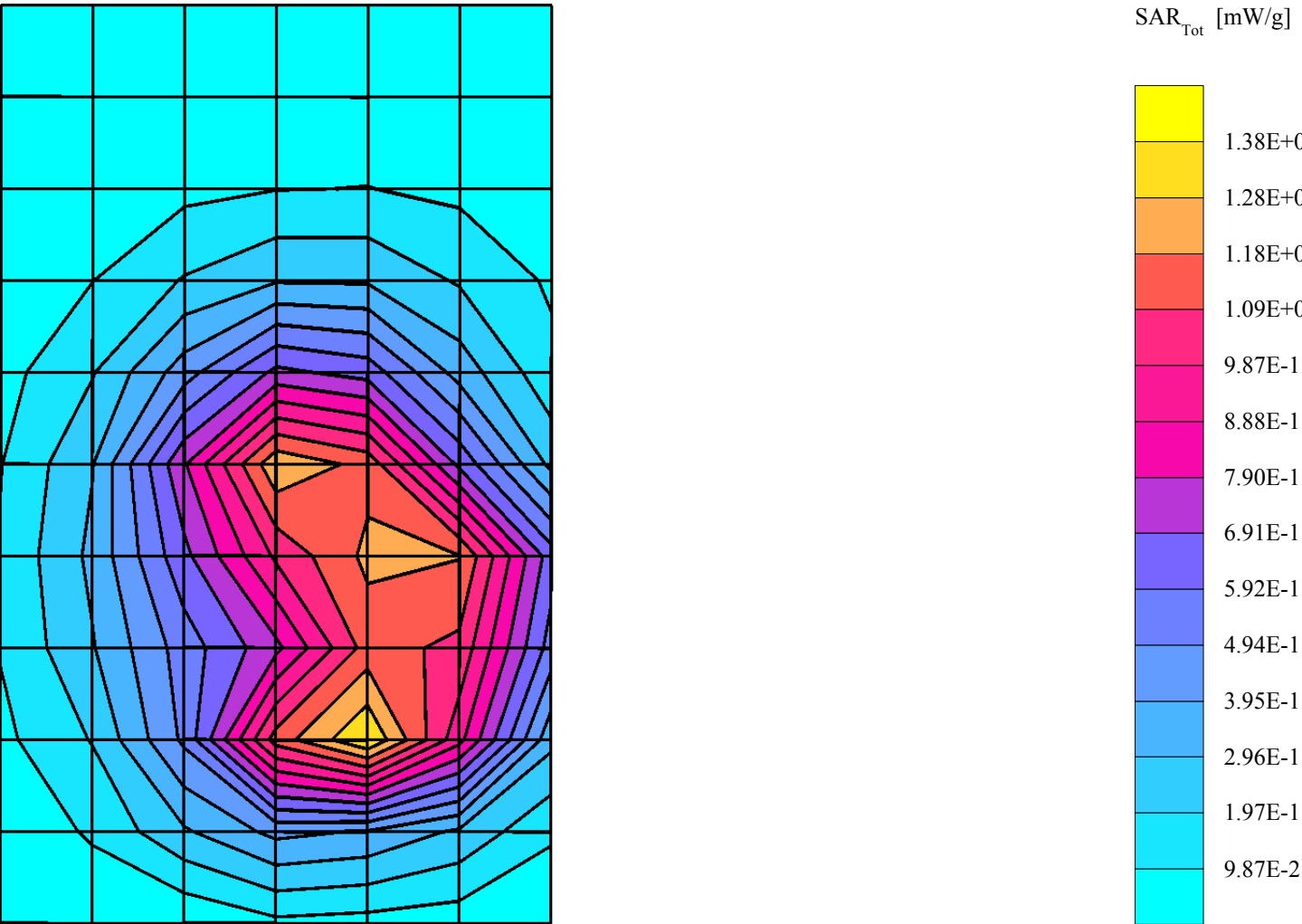
Probe: ET3DV6 - SN1514-FCC BODY2; ConvF(5.87,5.87,5.87); Crest factor: 4.0; 835 MHz    Head & Body:  $\sigma = 0.98$  mho/m  $\epsilon_r = 53.4$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 1.46 mW/g, SAR (10g): 0.863 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 10.7 (9.9, 11.7) [mm]

Powerdrift: -0.19 dB



sn: 4400007088915

Ch# 128 / Pwr Step: 5

Type of Modulation: GSM 850

Accessory Model #: SYN1070A

Antenna Position: Internal

Battery Model #: SNN5751A

Bluetooth Enabled

GPRS Mode

Simulate Temp when Measured: 20.5C

Simulate Temp after Test: 19.3C

R4 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 824 MHz

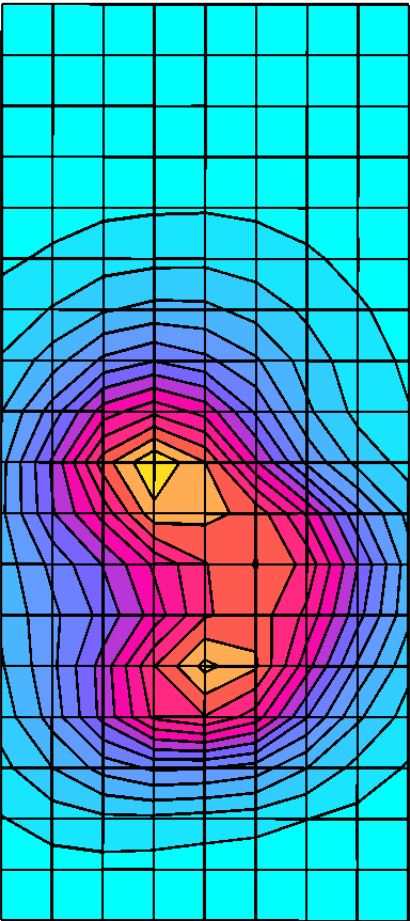
Probe: ET3DV6 - SN1514-FCC BODY2; ConvF(5.87,5.87,5.87); Crest factor: 4.0; 835 MHz Head & Body:  $\sigma = 0.98 \text{ mho/m}$   $\epsilon_r = 53.8$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 1.20 mW/g, SAR (10g): 0.808 mW/g, (Worst-case extrapolation)

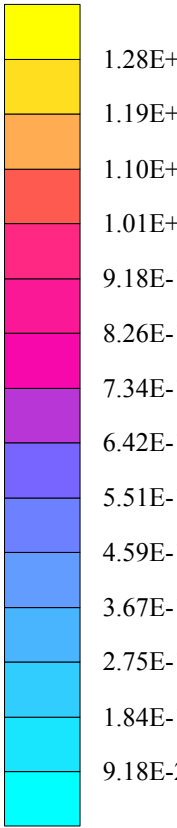
Coarse: Dx = 10.0, Dy = 10.0, Dz = 10.0

Penetration depth: 14.2 (13.6, 15.1) [mm]

Powerdrift: -0.16 dB



SAR<sub>Tot</sub> [mW/g]



sn: 4400007088915

Ch# 661 / Pwr Step: 0

Type of Modulation: gsm

Antenna Position: non

Battery Model #: snn5750a

acc: syn1070a

R4 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1880 MHz

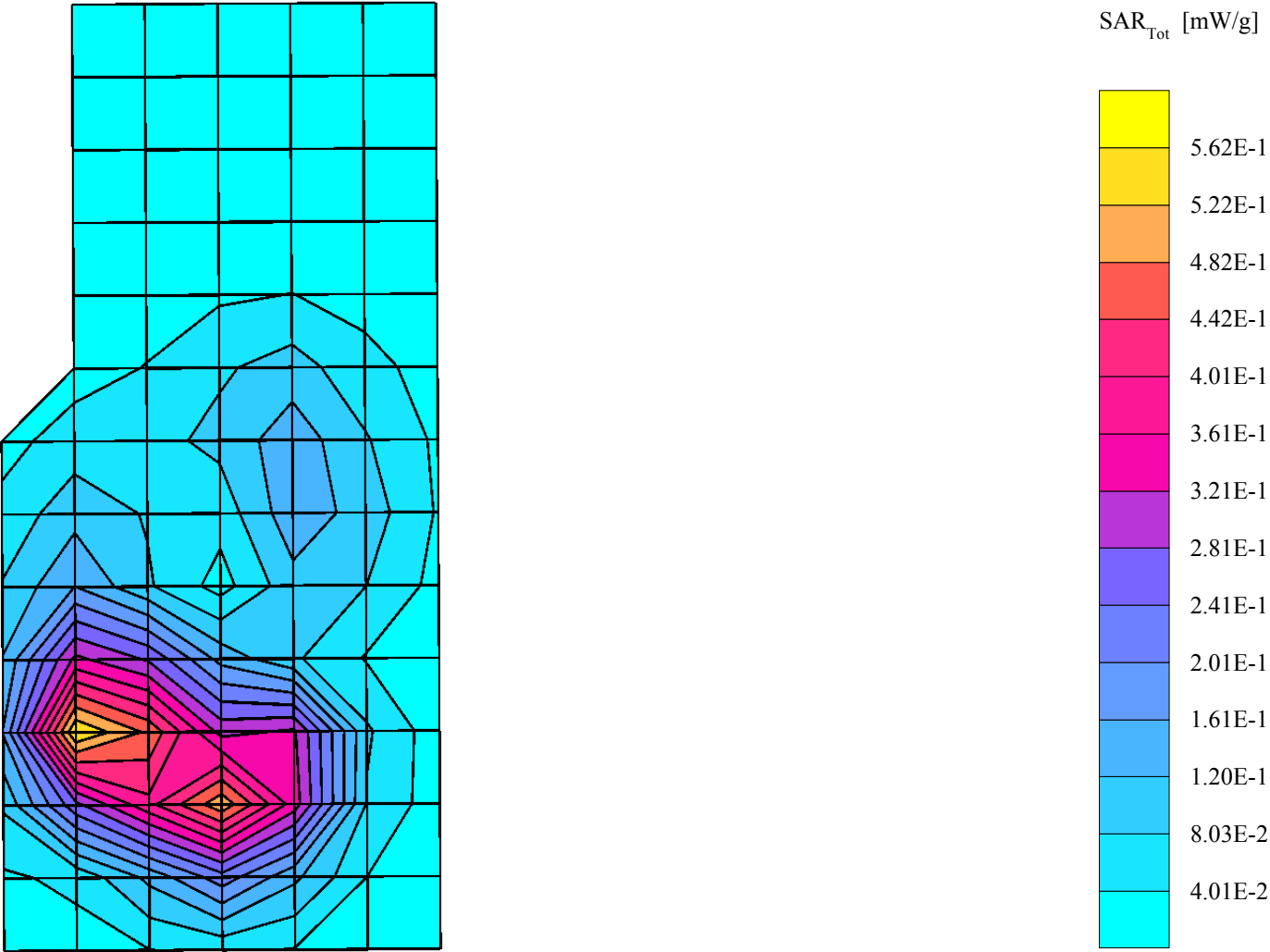
Probe: ET3DV6 - SN1514-FCC BODY2; ConvF(4.46,4.46,4.46); Crest factor: 8.0; 1880 MHz Head & Body:  $\sigma = 1.59 \text{ mho/m}$   $\epsilon_r = 52.1$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.617 mW/g, SAR (10g): 0.332 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

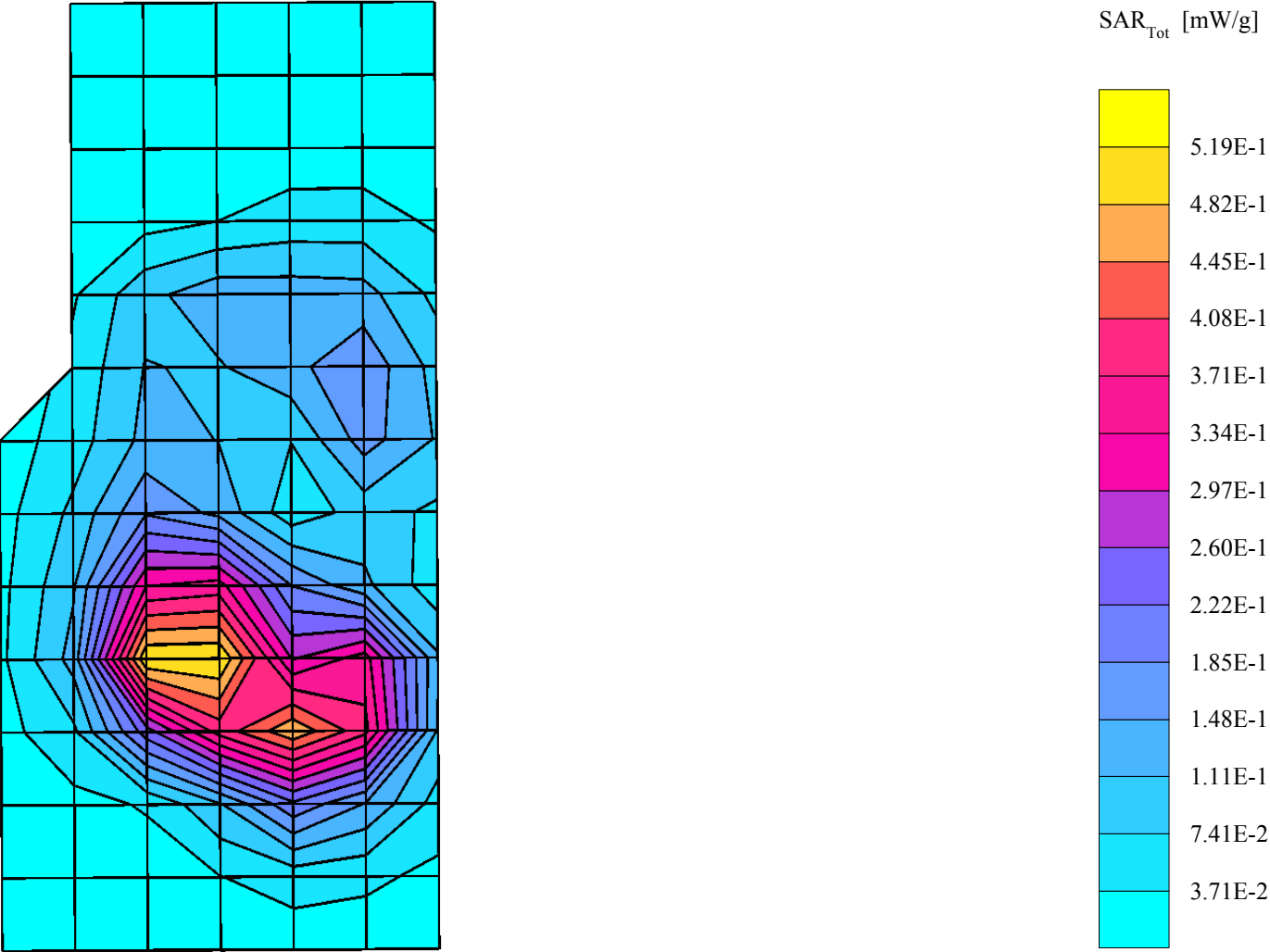
Penetration depth: 9.0 (8.1, 10.5) [mm]

Powerdrift: -0.00 dB



sn: 4400007088915

Ch# 661    Pwr Step: 0    Antenna Position: non  
Type of Modulation: gsm1900- WIFI ch6 continuous mod tx 11mbps/cck  
Battery Model #: SNN5751a  
Accessory Model # = case (SYN1070A)  
R4 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1880 MHz  
Probe: ET3DV6 - SN1514-FCC BODY2; ConvF(4.46,4.46,4.46); Crest factor: 8.0; 1880 MHz Head & Body:  $\sigma = 1.59 \text{ mho/m}$   $\epsilon_r = 52.0$   $\rho = 1.00 \text{ g/cm}^3$   
Cube 7x7x7: SAR (1g): 0.615 mW/g, SAR (10g): 0.333 mW/g, (Worst-case extrapolation)  
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0  
Penetration depth: 8.8 (7.9, 10.4) [mm]  
Powerdrift: -0.07 dB



sn: 4400007088915

Ch# 661 / Pwr Step: 0

Type of Modulation: gsm

Antenna Position: non

Battery Model #: snn5750a

acc: syn1070a w/blu2th

R4 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1880 MHz

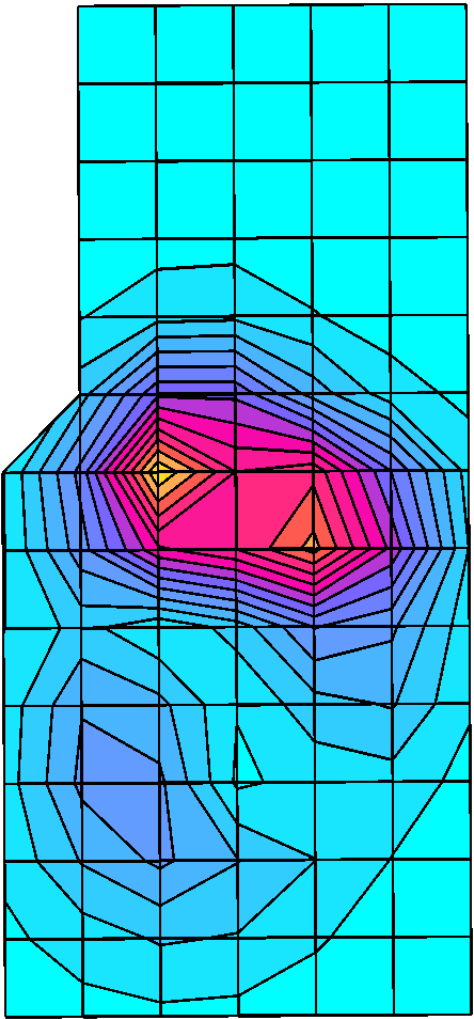
Probe: ET3DV6 - SN1514-FCC BODY2; ConvF(4.46,4.46,4.46); Crest factor: 8.0; 1880 MHz Head & Body:  $\sigma = 1.59 \text{ mho/m}$   $\epsilon_r = 52.1$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.513 mW/g, SAR (10g): 0.282 mW/g, (Worst-case extrapolation)

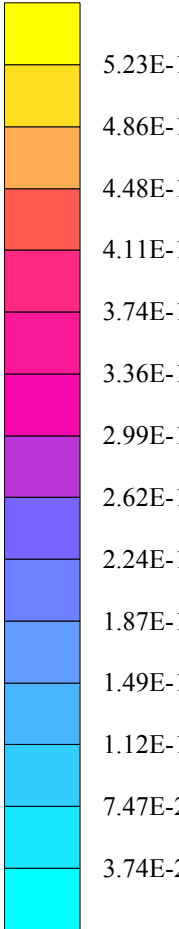
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 10.2 (9.3, 11.5) [mm]

Powerdrift: -0.12 dB



SAR<sub>Tot</sub> [mW/g]



sn: 4400007088915

Ch# 810 Pwr Step: 0 Antenna Position: non

Type of Modulation: gprs1900- bluetooth

Battery Model #: SNN5750a

Accessory Model # = case (SYN1070A)

R4 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1909 MHz

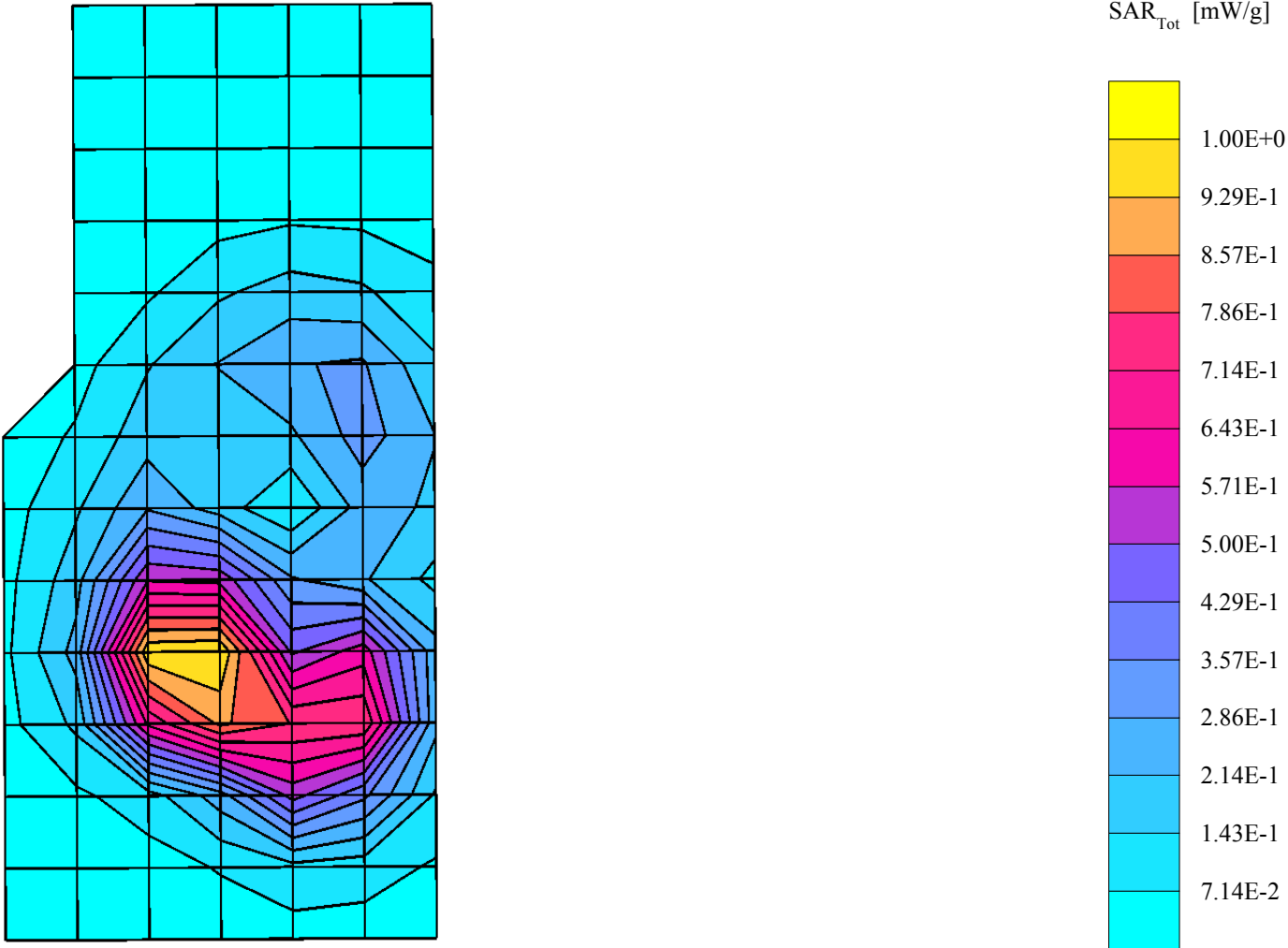
Probe: ET3DV6 - SN1514-FCC BODY2; ConvF(4.46,4.46,4.46); Crest factor: 4.0; 1880 MHz Head & Body:  $\sigma = 1.59 \text{ mho/m}$   $\epsilon_r = 52.0$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 1.22 mW/g, SAR (10g): 0.655 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 8.8 (7.9, 10.3) [mm]

Powerdrift: -0.03 dB



sn: 4400007088915

Ch# 810 Pwr Step: burst 1 and 2=0 ota      Antenna Position: INTERNAL  
Type of Modulation: 1900 gprs    bluetooth program    Battery Model #: SNN5751A  
Accessory Model # = case (SYN1070A)

R4 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1910 MHz

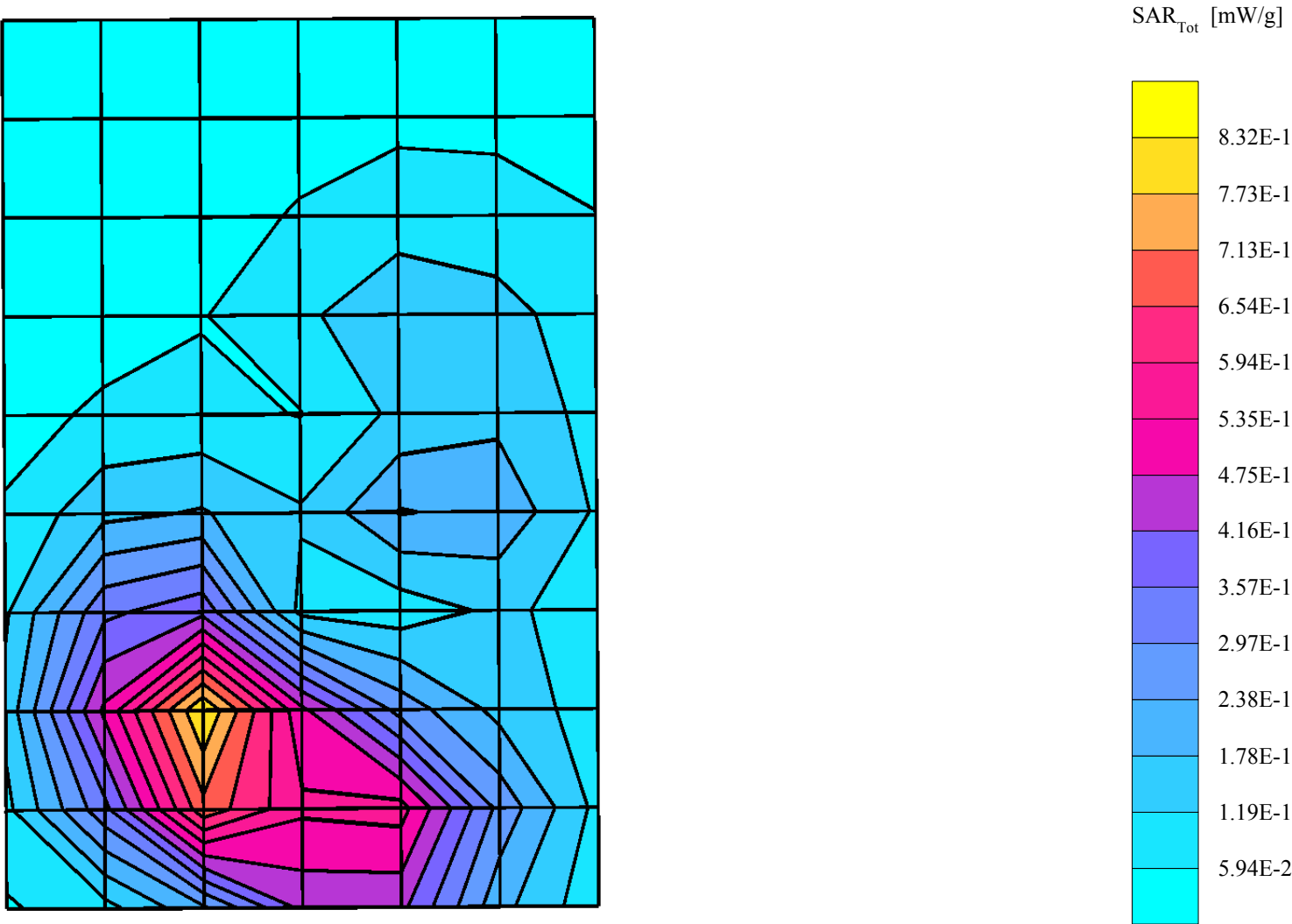
Probe: ET3DV6 - SN1514-FCC BODY2; ConvF(4.46,4.46,4.46); Crest factor: 4.0; 1880 MHz Head & Body:  $\sigma = 1.59 \text{ mho/m}$   $\epsilon_r = 51.0$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.858 mW/g, SAR (10g): 0.471 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 8.9 (8.1, 10.3) [mm]

Powerdrift: -0.09 dB



sn: 4400007088915 Phone 1

Ch# 6    Pwr Step:    continuous mod tx 11mbps/cck    Antenna Position:    INTERNAL  
Type of Modulation:    WIFI    Battery Model #:    SNN5750A

Accessory Model # = case (SYN1070A)

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Flat Section; Position: (0°,0°); Frequency: 2437 MHz

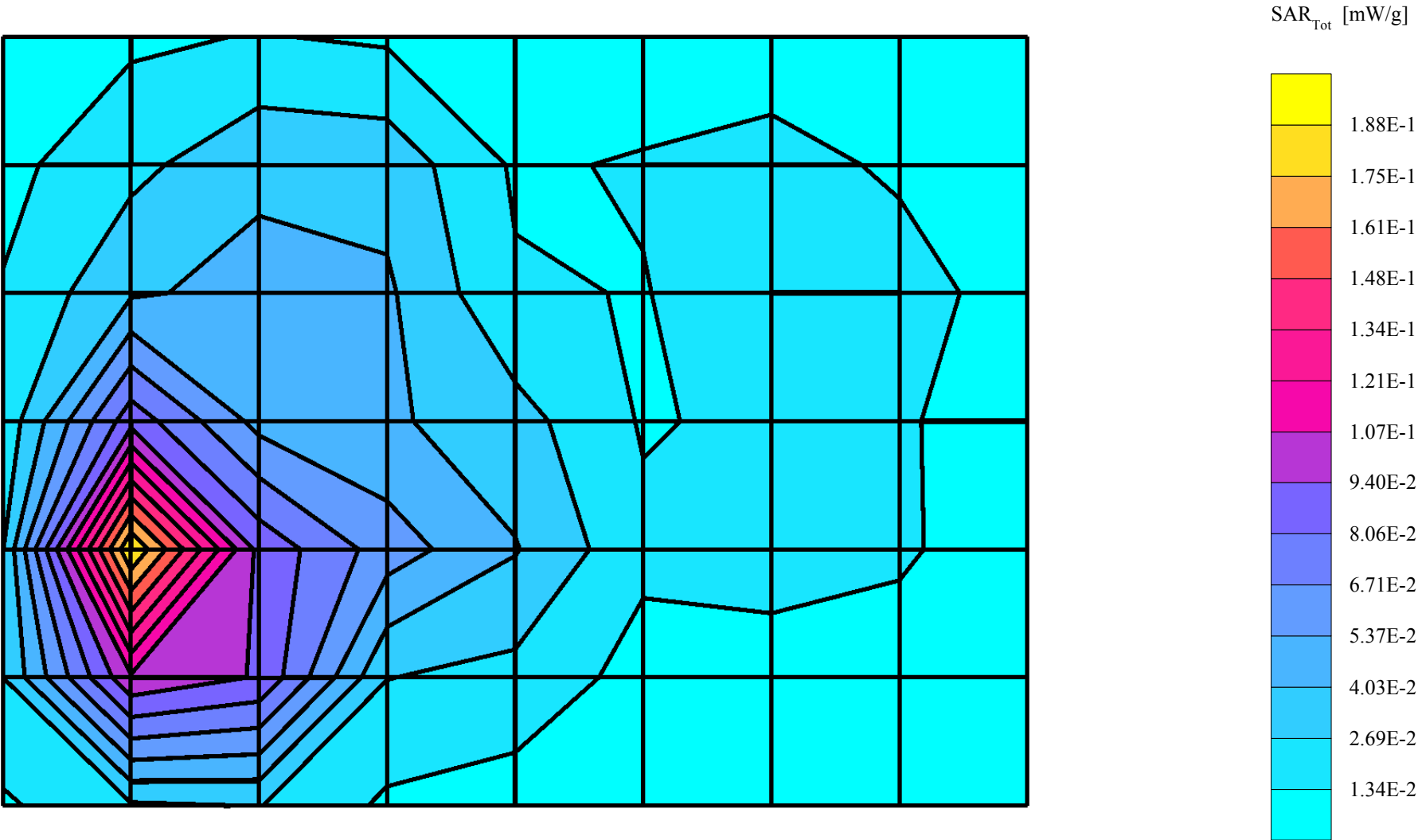
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(4.46,4.46,4.46); Crest factor: 1.0; 2450 MHz Head & Body:  $\sigma = 1.88 \text{ mho/m}$   $\epsilon_r = 37.4$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.186 mW/g, SAR (10g): 0.0859 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 6.8 (6.6, 7.2) [mm]

Powerdrift: 0.04 dB



sn: 4400007088915

Ch# 6    Pwr Step:    continuous mod tx 11mbps/cck    Antenna Position:    non  
Type of Modulation:    WIFI    Battery Model #:    SNN5751a

Accessory Model # = case (SYN1070A)

R4 TP-1250 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Flat Section; Position: (90°,180°); Frequency: 2437 MHz

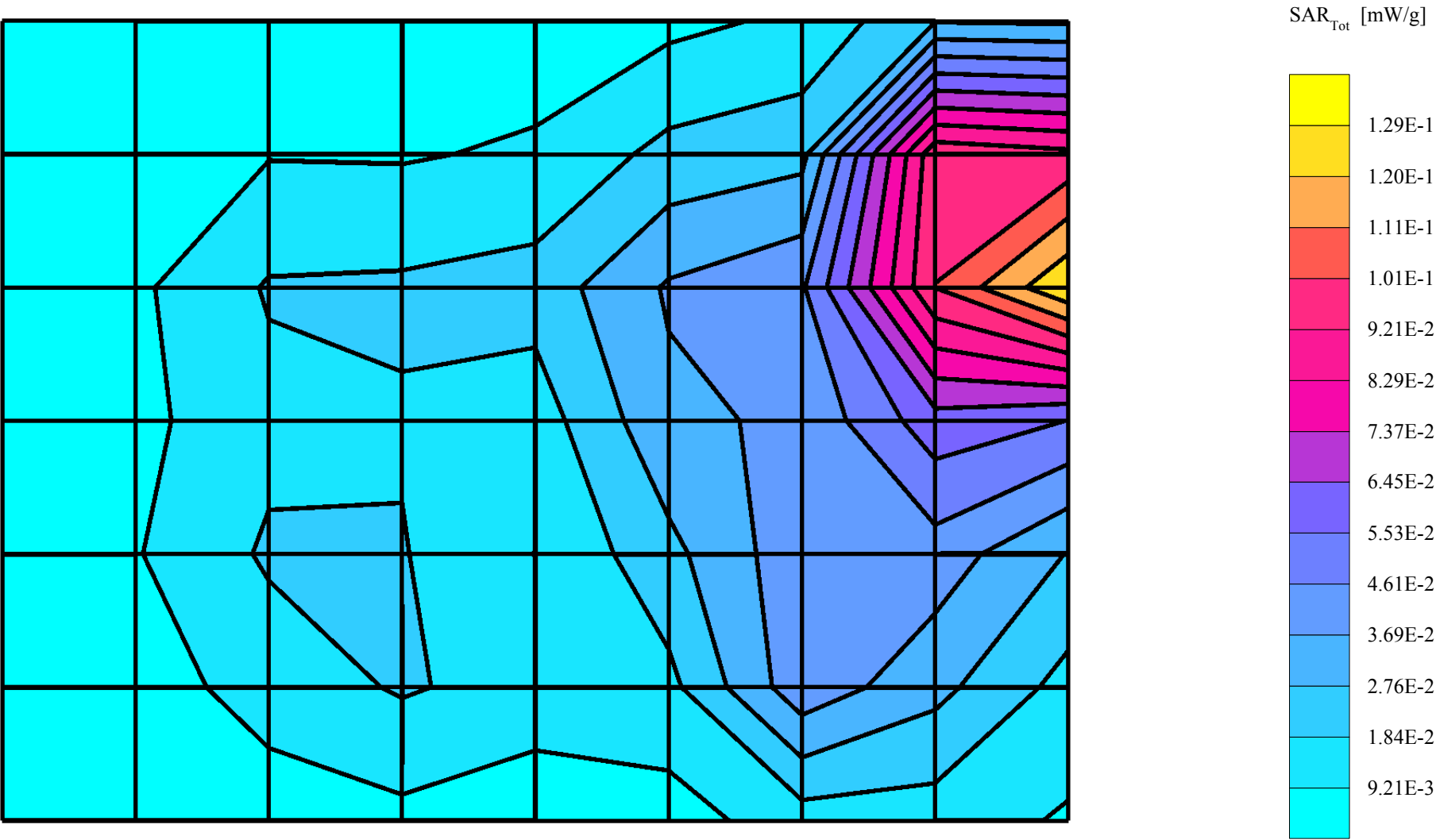
Probe: ET3DV6 - SN1514-IEEE Head2; ConvF(4.46,4.46,4.46); Crest factor: 1.0; 2450 MHz Head & Body:  $\sigma = 1.88 \text{ mho/m}$   $\epsilon_r = 37.4$   $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.167 mW/g, SAR (10g): 0.0769 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 6.7 (6.6, 6.9) [mm]

Powerdrift: -0.03 dB



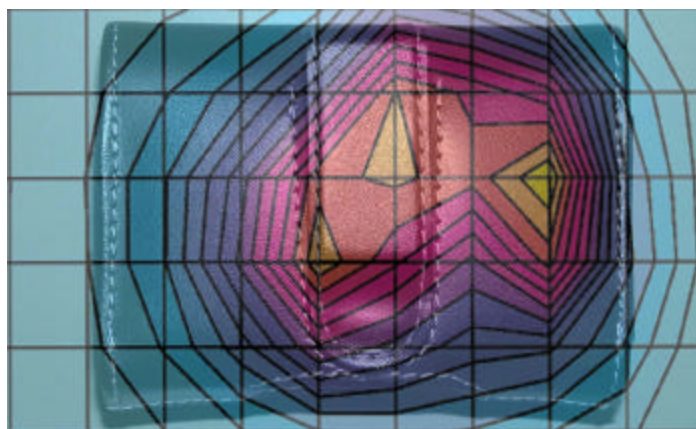


Figure 7. Typical 800 MHz Body-Worn Contour Overlaid on Phone

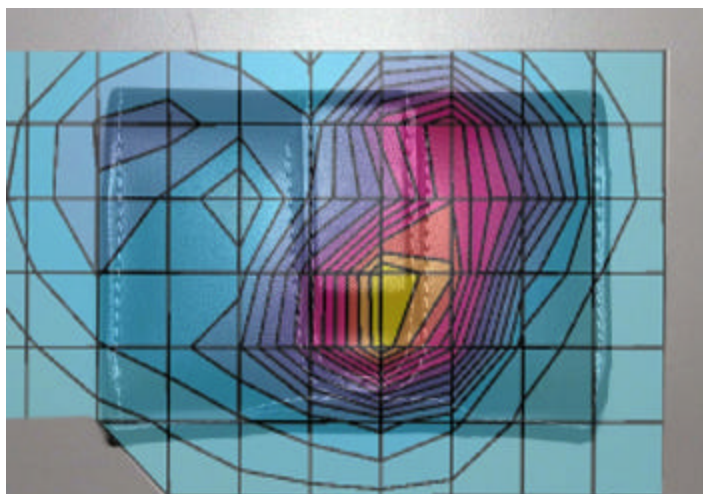


Figure 8. Typical 1900 MHz Body-Worn Contour Overlaid on Phone

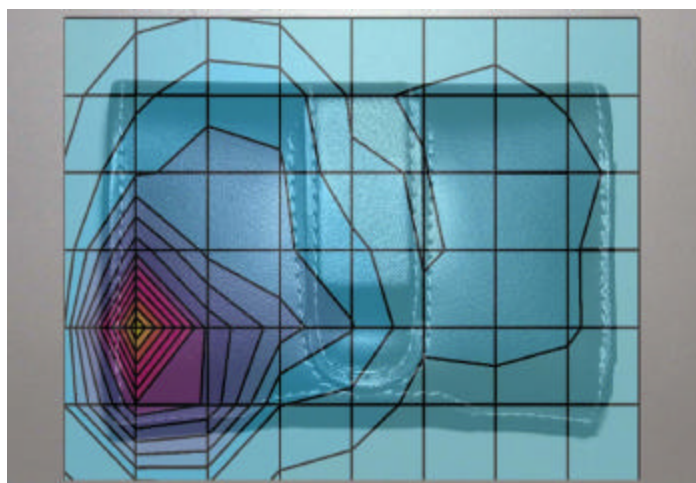


Figure 9. Typical WiFi MHz Body-Worn Contour Overlaid on Phone

**Appendix 4**

**Probe Calibration Certificate**

Client

Motorola PCS

## CALIBRATION CERTIFICATE

Object(s)

ET3DV6R - SN:1506

Calibration procedure(s)

QA CAL-01 v2  
Calibration procedure for dosimetric E-field probes

Calibration date:

May 27, 2004

Condition of the calibrated item

In Tolerance (according to the specific calibration document)

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  $22 \pm 2$  degrees Celsius and humidity  $< 75\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Model Type                        | ID #           | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration  |
|-----------------------------------|----------------|-------------------------------------------|------------------------|
| Power meter EPM E4419B            | GB41293874     | 5-May-04 (METAS, No 251-00388)            | May-05                 |
| Power sensor E4412A               | MY41495277     | 5-May-04 (METAS, No 251-00388)            | May-05                 |
| Reference 20 dB Attenuator        | SN: 5086 (20b) | 3-May-04 (METAS, No 251-00389)            | May-05                 |
| Fluke Process Calibrator Type 702 | SN: 6295803    | 8-Sep-03 (Sintrel SCS No. E-030020)       | Sep-04                 |
| Power sensor HP 8481A             | MY41092180     | 18-Sep-02 (SPEAG, in house check Oct-03)  | In house check: Oct 05 |
| RF generator HP 8684C             | US3642U01700   | 4-Aug-99 (SPEAG, in house check Aug-02)   | In house check: Aug-05 |
| Network Analyzer HP 8753E         | US37390585     | 18-Oct-01 (SPEAG, in house check Oct-03)  | In house check: Oct 05 |

Calibrated by:

Name

Function

Signature

Nico Vetterli

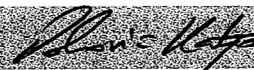
Technician



Approved by:

Katja Pokovic

Laboratory Director



Date issued: May 27, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

# Probe ET3DV6R

**SN:1506**

|                  |                  |
|------------------|------------------|
| Manufactured:    | October 24, 1999 |
| Last calibrated: | May 14, 2003     |
| Recalibrated:    | May 27, 2004     |

**Calibrated for DASY Systems**

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ET3DV6R SN:1506

### Sensitivity in Free Space

### Diode Compression<sup>A</sup>

|       |                                                 |
|-------|-------------------------------------------------|
| NormX | <b>2.30</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | <b>2.12</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | <b>1.25</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |

|       |           |    |
|-------|-----------|----|
| DCP X | <b>96</b> | mV |
| DCP Y | <b>96</b> | mV |
| DCP Z | <b>96</b> | mV |

### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

### Boundary Effect

Head                      900 MHz      Typical SAR gradient: 5 % per mm

|                                           |                              |               |               |
|-------------------------------------------|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>3.7 mm</b> | <b>4.7 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 10.5          | 5.6           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.1           | 0.2           |

Head                      1800 MHz      Typical SAR gradient: 10 % per mm

|                                           |                              |               |               |
|-------------------------------------------|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>3.7 mm</b> | <b>4.7 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 14.3          | 9.2           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.1           | 0.1           |

### Sensor Offset

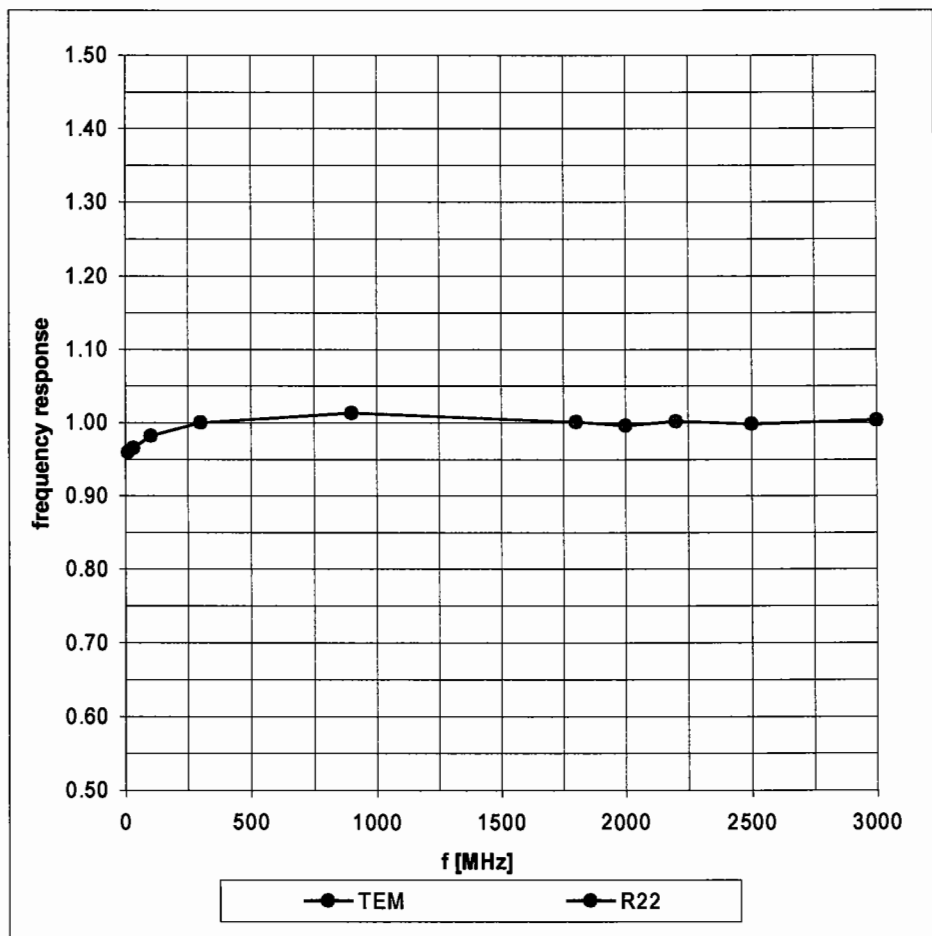
Probe Tip to Sensor Center                      **2.7**      mm

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

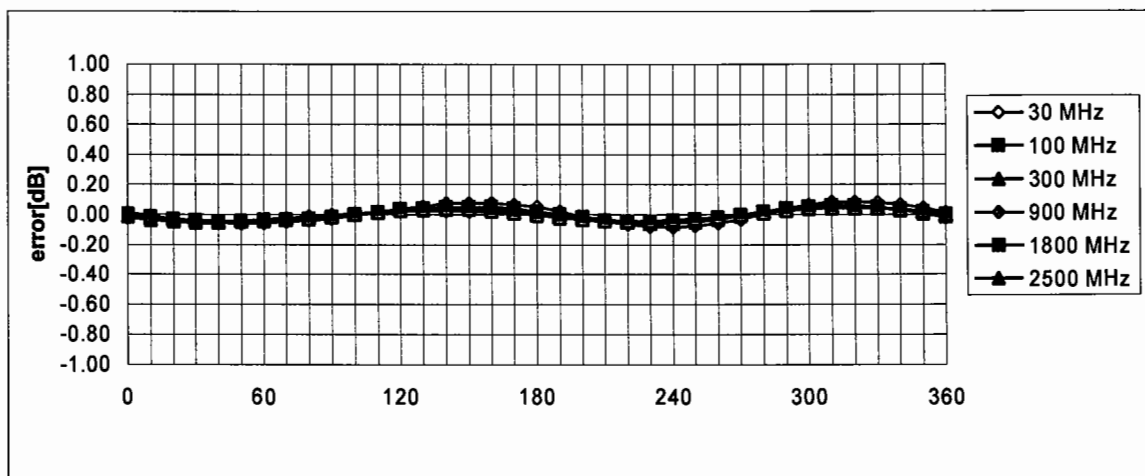
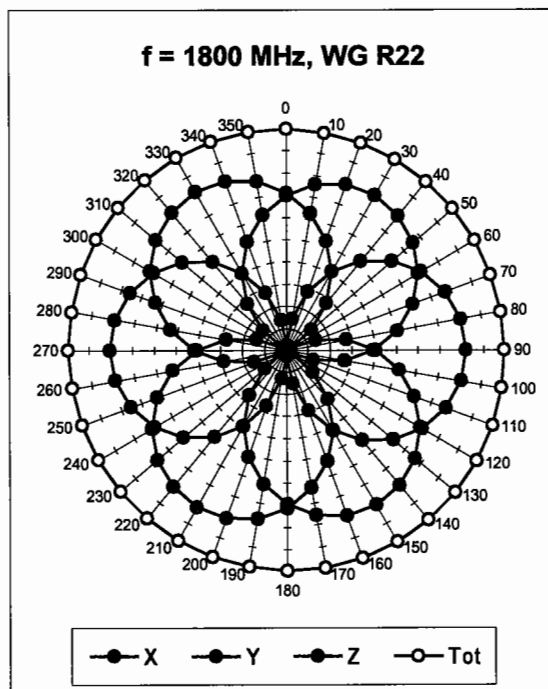
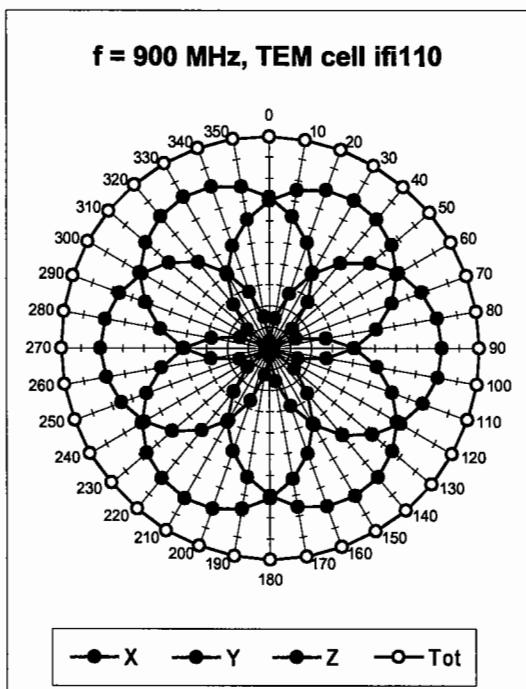
<sup>A</sup> numerical linearization parameter: uncertainty not required

## Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)

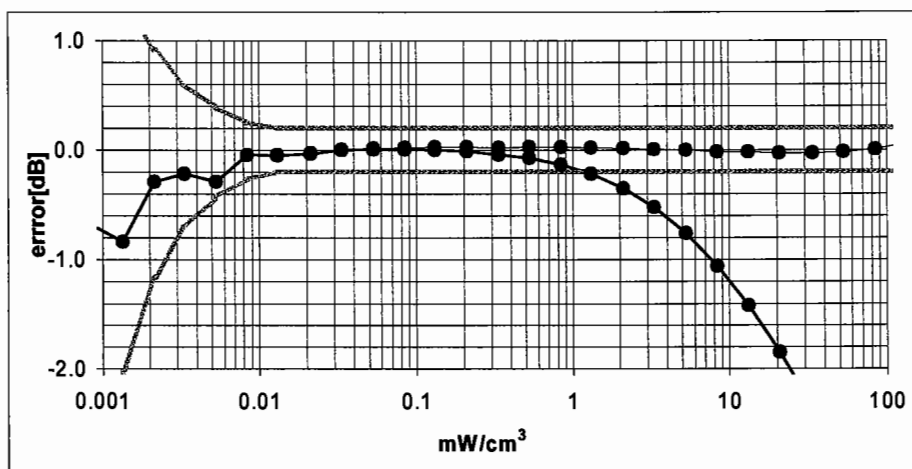
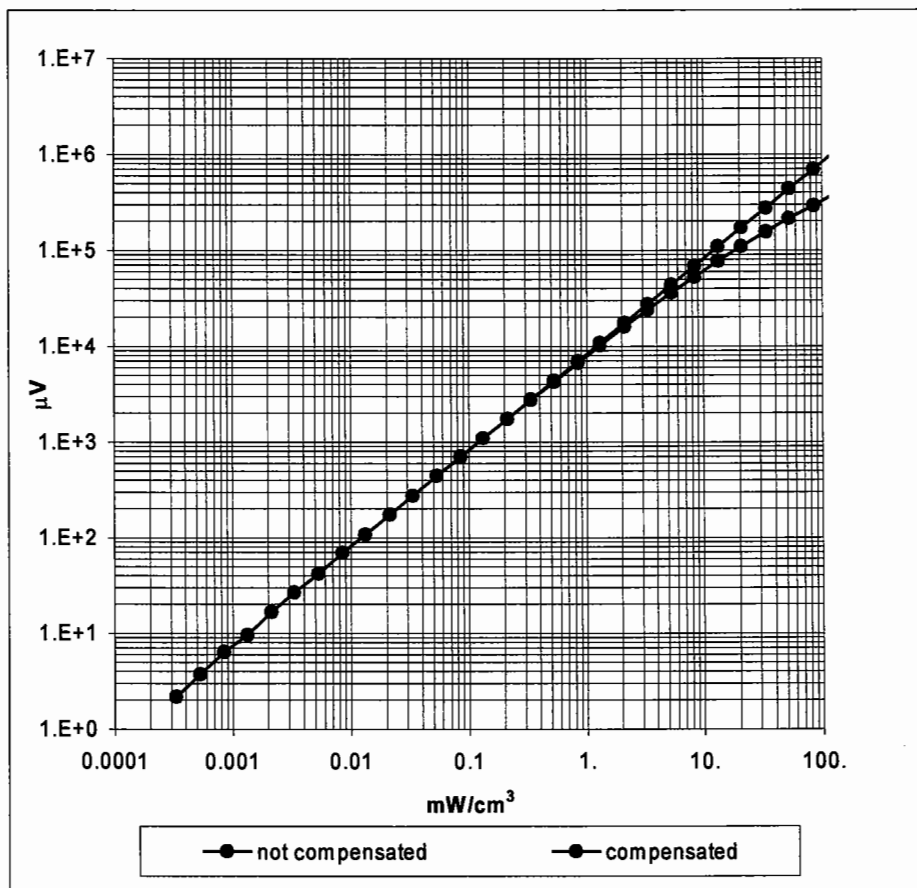


# Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



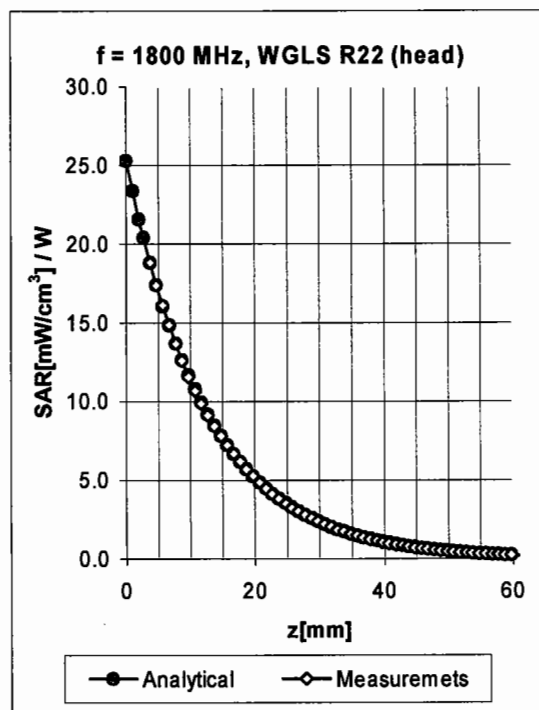
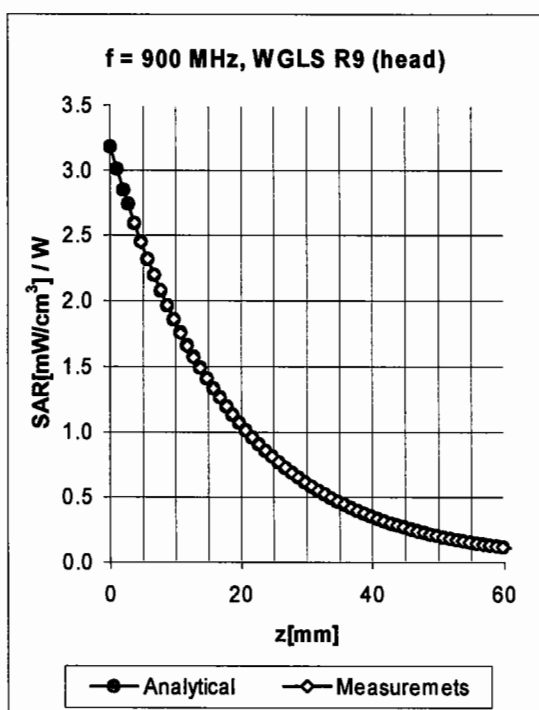
**Axial Isotropy Error  $< \pm 0.2$  dB**

## Dynamic Range f(SAR<sub>head</sub>) ( Waveguide R22 )



Probe Linearity Error <  $\pm 0.2$  dB

## Conversion Factor Assessment

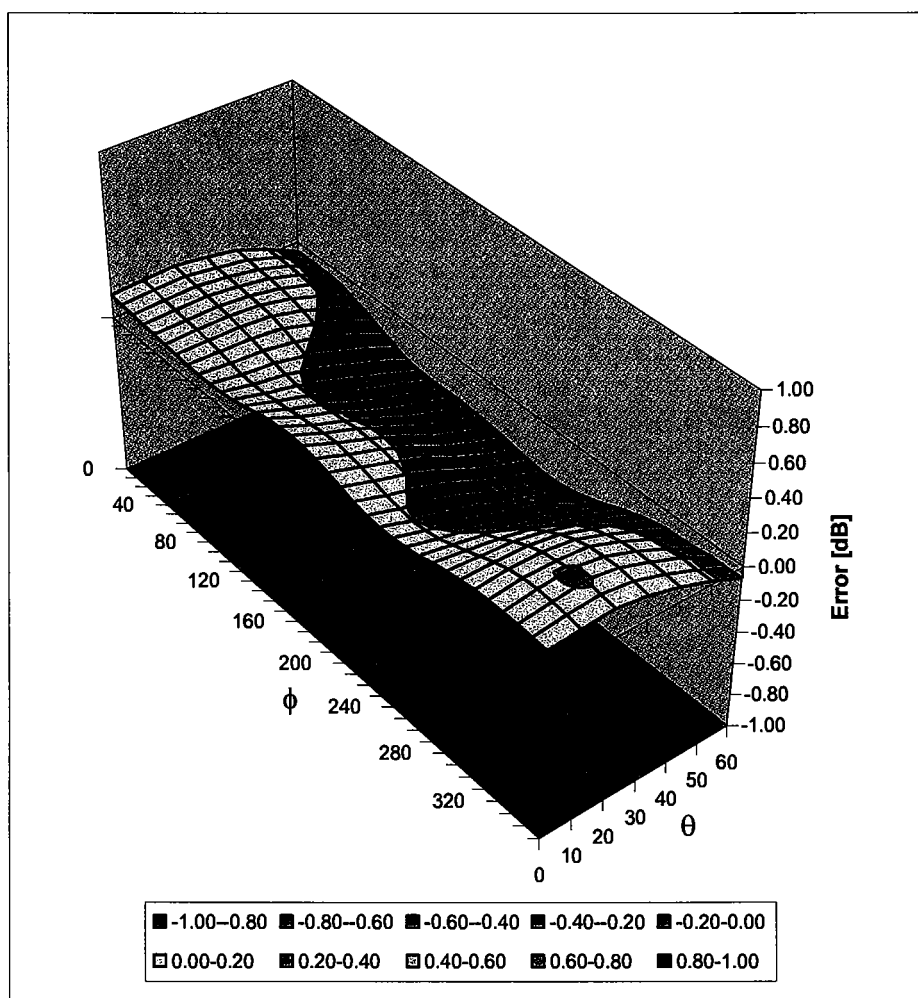


| f [MHz] | Validity [MHz] <sup>B</sup> | Tissue | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty |
|---------|-----------------------------|--------|--------------|--------------|-------|-------|-------------------|
| 900     | 800-1000                    | Head   | 41.5 ± 5%    | 0.97 ± 5%    | 0.70  | 1.84  | 5.72 ± 9.5% (k=2) |
| 1800    | 1710-1910                   | Head   | 40.0 ± 5%    | 1.40 ± 5%    | 0.54  | 2.54  | 4.77 ± 9.5% (k=2) |
| 1950    | 1900-2000                   | Head   | 40.0 ± 5%    | 1.40 ± 5%    | 0.62  | 2.48  | 4.49 ± 9.5% (k=2) |
| 900     | 800-1000                    | Body   | 55.0 ± 5%    | 1.05 ± 5%    | 0.65  | 1.93  | 5.53 ± 9.5% (k=2) |
| 1800    | 1710-1910                   | Body   | 53.3 ± 5%    | 1.52 ± 5%    | 0.63  | 2.72  | 4.18 ± 9.5% (k=2) |
| 1950    | 1900-2000                   | Body   | 53.3 ± 5%    | 1.52 ± 5%    | 0.77  | 2.35  | 4.15 ± 9.5% (k=2) |

<sup>B</sup> The stated uncertainty of calibration in according to P1528.

## Deviation from Isotropy in HSL

Error ( $\theta, \phi$ ),  $f = 900$  MHz



Spherical Isotropy Error  $< \pm 0.4$  dB

**Client**

**Motorola PCS**

## CALIBRATION CERTIFICATE

**Object(s)** ET3DV6 - SN1514

**Calibration procedure(s)** QA-CAL-01 v2  
 Calibration procedure for desimetric field probes

**Calibration date:** July 22, 2004

**Condition of the calibrated item** In Tolerance (according to the specific calibration document)

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  $22 \pm 2$  degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

| Model Type                        | ID #           | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration  |
|-----------------------------------|----------------|-------------------------------------------|------------------------|
| Power meter EPM E4419B            | GB41293874     | 5-May-04 (METAS, No 251-00388)            | May-05                 |
| Power sensor E4412A               | MY41495277     | 5-May-04 (METAS, No 251-00388)            | May-05                 |
| Reference 20 dB Attenuator        | SN: 5086 (20b) | 3-May-04 (METAS, No 251-00388)            | May-05                 |
| Fluke Process Calibrator Type 702 | SN: 6295803    | 8-Sep-03 (Sintrel SCS No. 5030020)        | Sep-04                 |
| Power sensor HP 8481A             | MY41092180     | 18-Sep-02 (SPEAG, in house check Oct03)   | In house check: Oct 05 |
| RF generator HP 8684C             | US3642U01700   | 4-Aug-99 (SPEAG, in house check Aug02)    | In house check: Aug05  |
| Network Analyzer HP 8753E         | US37390585     | 18-Oct-01 (SPEAG, in house check Oct03)   | In house check: Oct 05 |

|                       |               |                     |                                                                                       |
|-----------------------|---------------|---------------------|---------------------------------------------------------------------------------------|
|                       | <b>Name</b>   | <b>Function</b>     | <b>Signature</b>                                                                      |
| <b>Calibrated by:</b> | Stephane...   | Technician          |  |
| <b>Approved by:</b>   | Karla Pokorny | Laboratory Director |  |

Date issued: July 22, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

# Probe ET3DV6

SN:1514

|                  |                   |
|------------------|-------------------|
| Manufactured:    | November 24, 1999 |
| Last calibrated: | July 31, 2003     |
| Recalibrated:    | July 22, 2004     |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ET3DV6 SN:1514

### Sensitivity in Free Space

### Diode Compression<sup>A</sup>

|       |                                          |       |    |    |
|-------|------------------------------------------|-------|----|----|
| NormX | 1.71 $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP X | 93 | mV |
| NormY | 1.89 $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Y | 93 | mV |
| NormZ | 1.81 $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Z | 93 | mV |

### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

### Boundary Effect

Head                      900 MHz      Typical SAR gradient: 5 % per mm

|                                           |                              |        |        |
|-------------------------------------------|------------------------------|--------|--------|
| Sensor Center to Phantom Surface Distance |                              | 3.7 mm | 4.7 mm |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 10.2   | 5.3    |
| SAR <sub>bc</sub> [%]                     | With Correction Algorithm    | 0.1    | 0.3    |

Head                      1800 MHz      Typical SAR gradient: 10 % per mm

|                                           |                              |        |        |
|-------------------------------------------|------------------------------|--------|--------|
| Sensor Center to Phantom Surface Distance |                              | 3.7 mm | 4.7 mm |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 14.0   | 9.1    |
| SAR <sub>bc</sub> [%]                     | With Correction Algorithm    | 0.1    | 0.0    |

### Sensor Offset

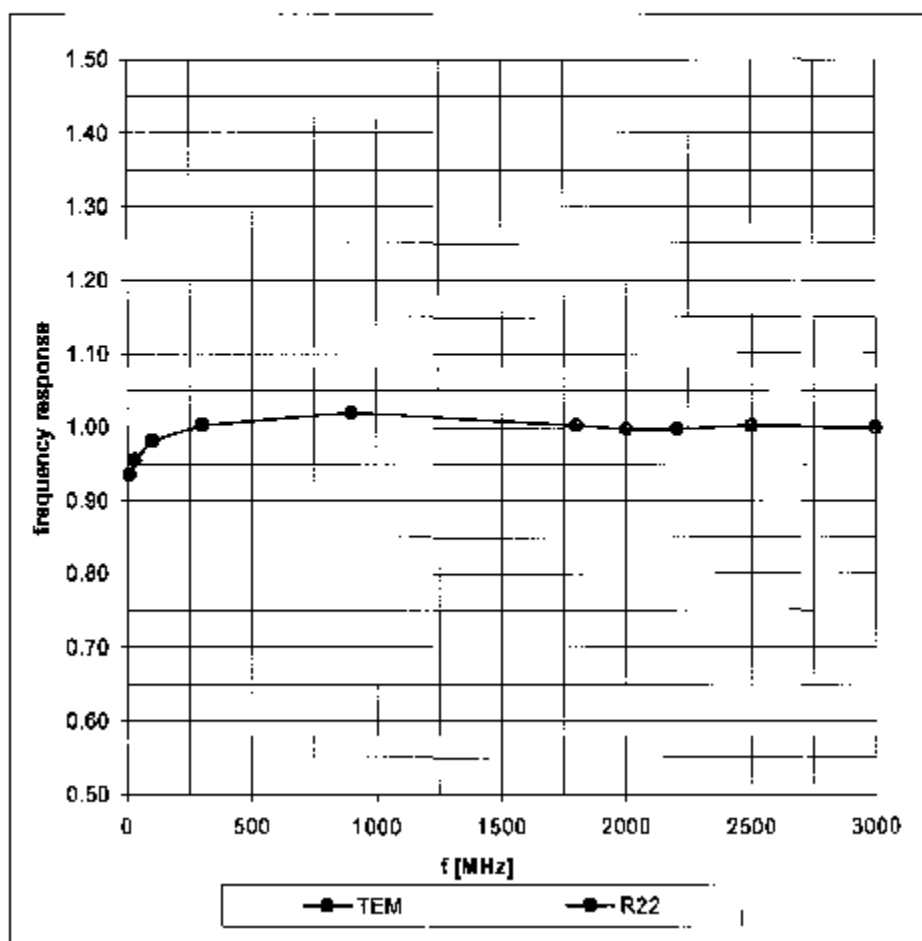
Probe Tip to Sensor Center                      2.7      mm

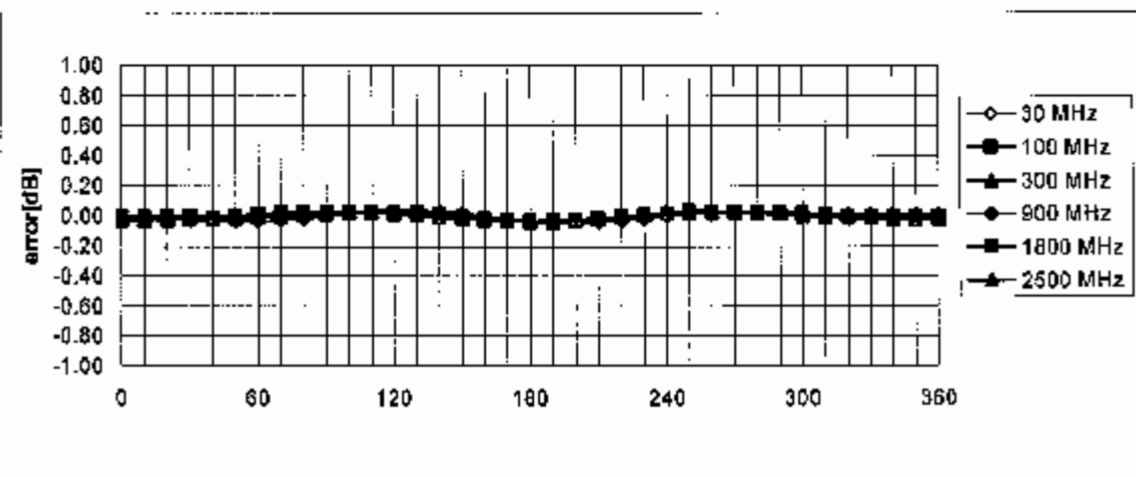
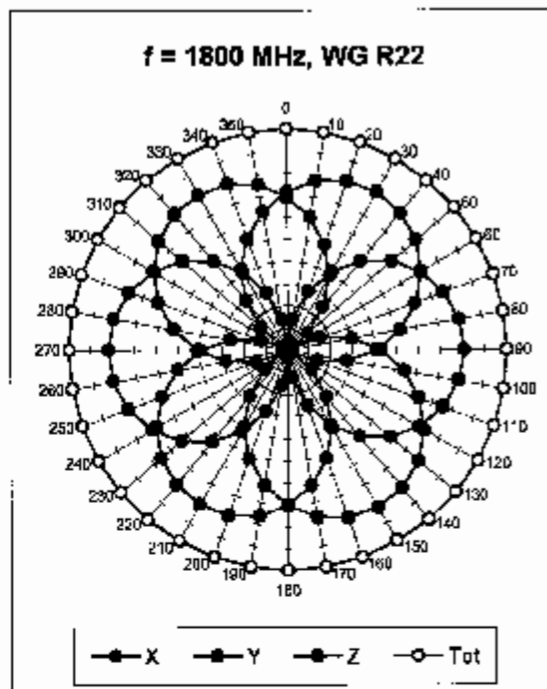
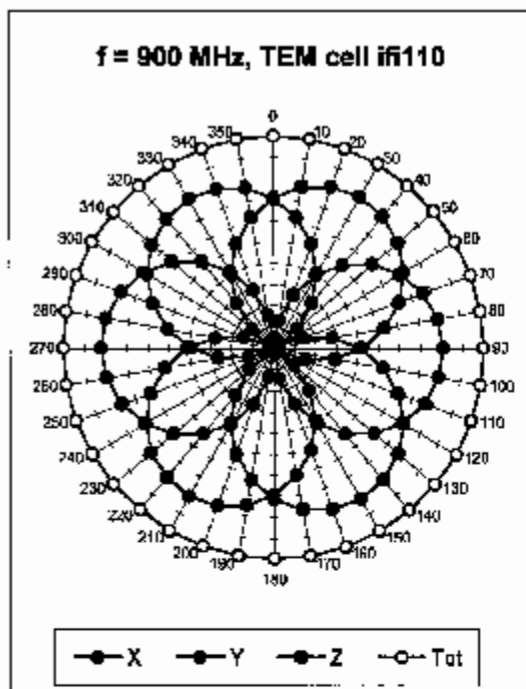
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> numerical linearization parameter: uncertainty not required

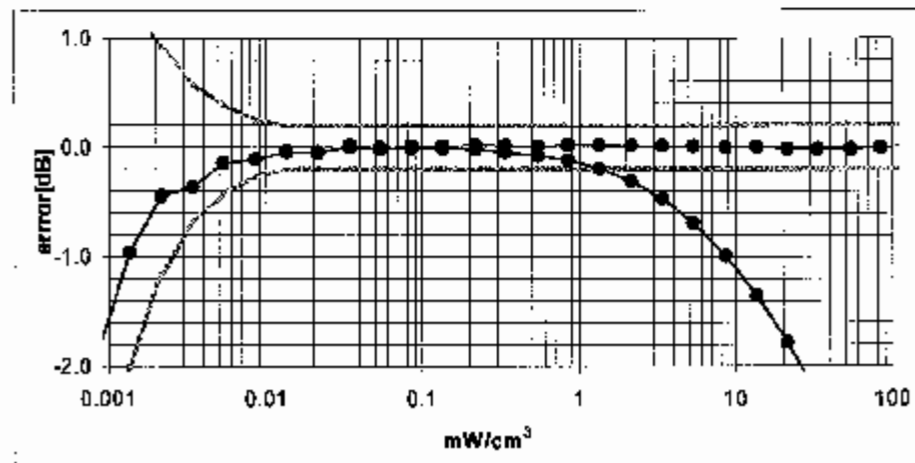
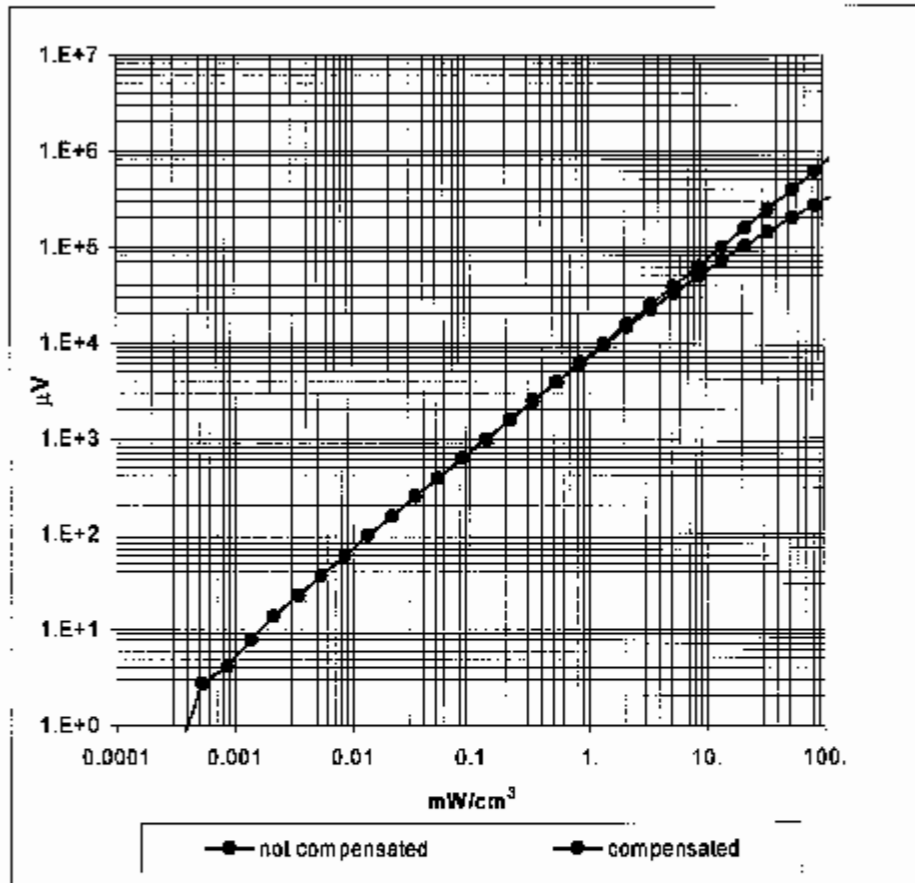
## Frequency Response of E-Field

( TEM-Cell:If1110, Waveguide R22)



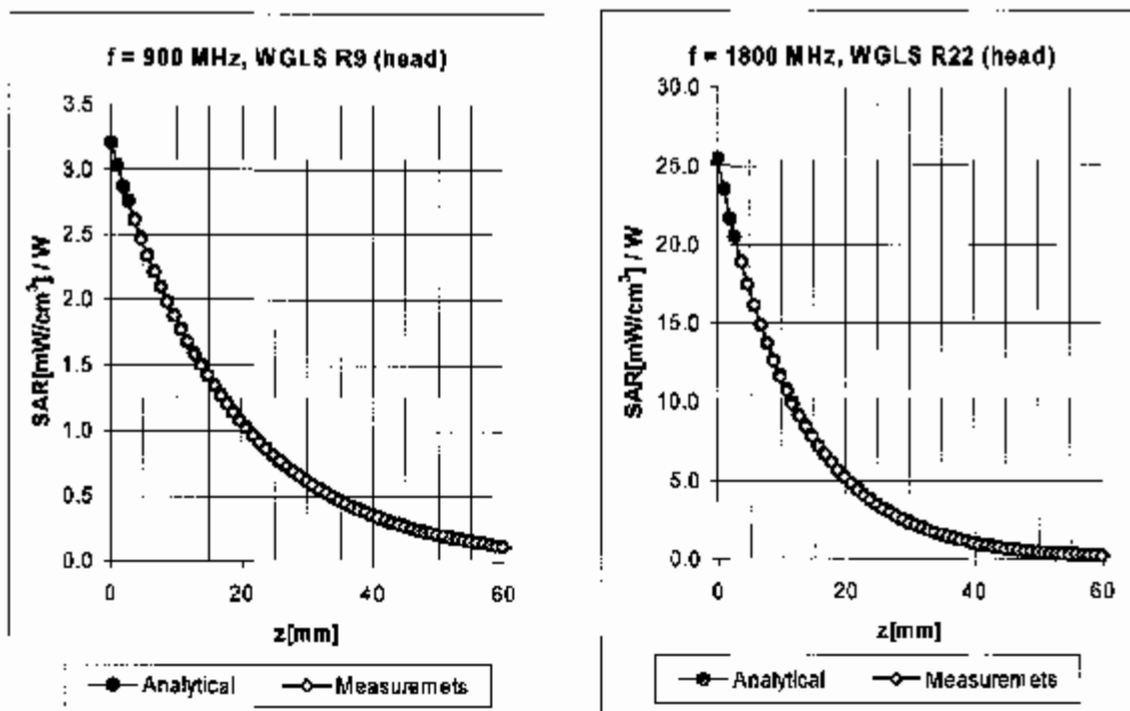
Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$ Axial Isotropy Error  $< \pm 0.2 \text{ dB}$

# Dynamic Range f(SAR<sub>head</sub>) ( Waveguide R22 )



Probe Linearity Error  $< \pm 0.2$  dB

## Conversion Factor Assessment

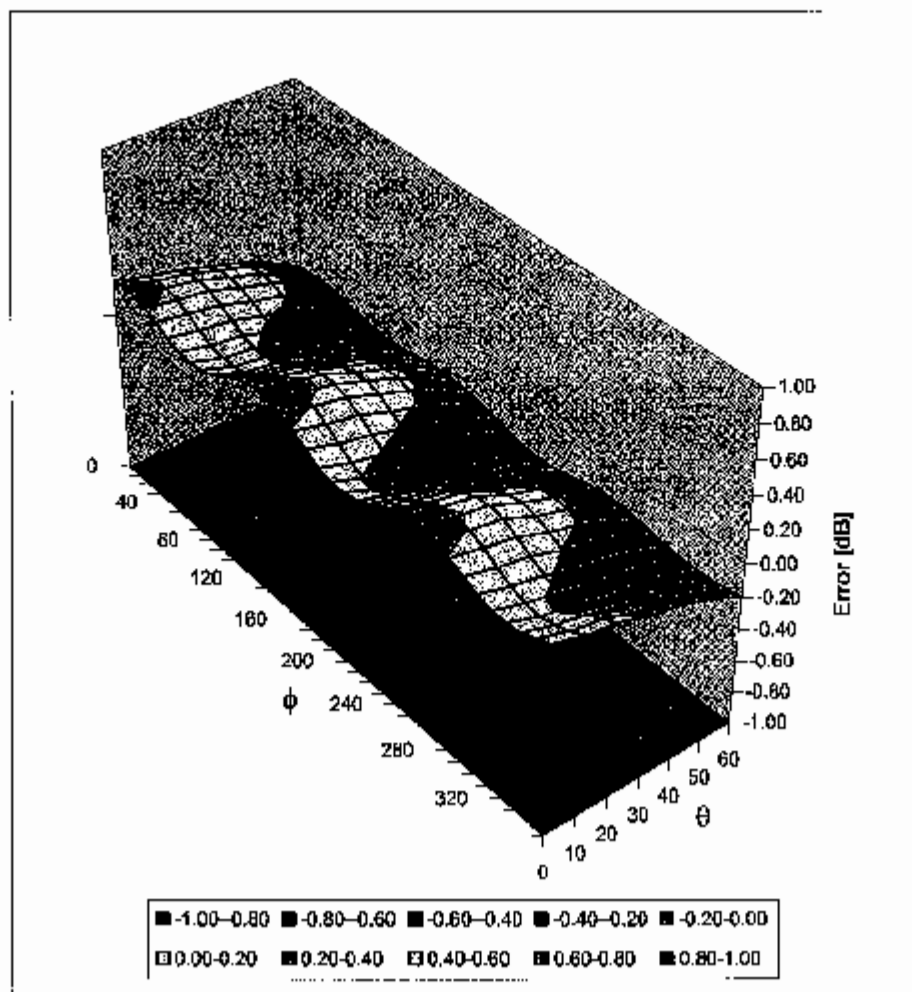


| $f$ [MHz] | Validity [MHz] <sup>B</sup> | Tissue | Permittivity   | Conductivity   | Alpha | Depth | ConvF Uncertainty      |
|-----------|-----------------------------|--------|----------------|----------------|-------|-------|------------------------|
| 900       | 800-1000                    | Head   | $41.5 \pm 5\%$ | $0.97 \pm 5\%$ | 0.72  | 1.79  | $6.08 \pm 9.5\% (k=2)$ |
| 1800      | 1710-1910                   | Head   | $40.0 \pm 5\%$ | $1.40 \pm 5\%$ | 0.53  | 2.53  | $5.03 \pm 9.5\% (k=2)$ |
| 1950      | 1900-2000                   | Head   | $40.0 \pm 5\%$ | $1.40 \pm 5\%$ | 0.60  | 2.51  | $4.74 \pm 9.5\% (k=2)$ |
| 2450      | 2400-2500                   | Head   | $39.2 \pm 5\%$ | $1.80 \pm 5\%$ | 1.11  | 1.81  | $4.46 \pm 9.5\% (k=2)$ |
|           |                             |        |                |                |       |       |                        |
| 900       | 800-1000                    | Body   | $55.0 \pm 5\%$ | $1.05 \pm 5\%$ | 0.58  | 2.10  | $5.87 \pm 9.5\% (k=2)$ |
| 1800      | 1710-1910                   | Body   | $53.3 \pm 5\%$ | $1.52 \pm 5\%$ | 0.61  | 2.67  | $4.46 \pm 9.5\% (k=2)$ |
| 1950      | 1900-2000                   | Body   | $53.3 \pm 5\%$ | $1.52 \pm 5\%$ | 0.72  | 2.39  | $4.38 \pm 9.5\% (k=2)$ |
| 2450      | 2400-2500                   | Body   | $52.7 \pm 5\%$ | $1.95 \pm 5\%$ | 1.81  | 1.30  | $4.24 \pm 9.5\% (k=2)$ |

<sup>B</sup> The stated uncertainty of calibration in according to P152B.

## Deviation from Isotropy in HSL

Error ( $\theta, \phi$ ),  $f = 900$  MHz



Spherical Isotropy Error  $< \pm 0.4$  dB

## **Appendix 5**

### **Dipole Characterization Certificate**

# Certification of System Performance Check Targets

Based on APP-0396

-Historical Data-

|                                                                         | 835MHz                                         | 900MHz                                         | 1800MHz                                         | 1900MHz                                         |        |
|-------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------|-------------------------------------------------|-------------------------------------------------|--------|
| IEEE1528 Target:<br>Advanced Extrapolation                              | 9.5                                            | 10.8                                           | 38.1                                            | 39.7                                            | (W/kg) |
| Measurement Uncertainty<br>(k=1):                                       | 9.0%                                           | 9.0%                                           | 9.0%                                            | 9.0%                                            |        |
|                                                                         |                                                |                                                |                                                 |                                                 |        |
| Measurement Period:                                                     | 1-July-03 to 1-Apr-04                          | 1-July-03 to 1-Apr-04                          | 1-July-03 to 1-Apr-04                           | 1-July-03 to 1-Apr-04                           |        |
| # of tests performed:                                                   | 214                                            | 1148                                           | 1135                                            | 62                                              |        |
| Grand Average:<br>Worst Case Extrapolation                              | 10.0                                           | 11.4                                           | 40.7                                            | 42.0                                            | (W/kg) |
| % Delta<br>(Average - IEEE1528 Target)                                  | 5.3%                                           | 5.6%                                           | 6.8%                                            | 5.8%                                            |        |
|                                                                         |                                                |                                                |                                                 |                                                 |        |
| Is % Delta <= Measurement<br>Uncertainty?                               | Yes                                            | Yes                                            | Yes                                             | Yes                                             |        |
| Accept/Reject <u>Average</u> as new<br>system performance check target? | ACCEPT                                         | ACCEPT                                         | ACCEPT                                          | ACCEPT                                          |        |
|                                                                         | Applicable<br>835MHz Dipole<br>Serial Numbers: | Applicable<br>900MHz Dipole<br>Serial Numbers: | Applicable 1800MHz<br>Dipole Serial<br>Numbers: | Applicable 1900MHz<br>Dipole Serial<br>Numbers: |        |
|                                                                         | 420(TR), 421(TR)                               | 77, 78                                         | 246(TR), 250(TR)                                | 514(TR), 518(TR)                                |        |
|                                                                         | 422(TR), 423(TR)                               | 79, 80                                         | 251(TR), 258(TR)                                | 519(TR), 520(TR)                                |        |
|                                                                         | 424(TR), 425(TR)                               | 91, 92                                         | 259(TR), 262(TR)                                | 523(TR), 524(TR)                                |        |
|                                                                         | 431(TR), 432(TR)                               | 93, 94                                         | 263(TR), 271(TR)                                | 526(TR), 527(TR)                                |        |
|                                                                         | 433(TR), 434(TR)                               | 95, 96                                         | 272(TR), 273(TR)                                | 528(TR), 529(TR)                                |        |
|                                                                         | 436(TR)                                        | 97, 55                                         | 276(TR), 277(TR)                                | 530(TR), 533(TR)                                |        |
|                                                                         |                                                |                                                | 279(TR), 280(TR)                                |                                                 |        |
|                                                                         |                                                |                                                | 281(TR), 282(TR)                                |                                                 |        |
|                                                                         |                                                |                                                | 283(TR), 284(TR)                                |                                                 |        |

-New System Performance Check Targets- per APP-0396  
(based on analysis of historical data)

| Frequency | SAR Target (W/kg) | Permittivity | Conductivity (S/m) |
|-----------|-------------------|--------------|--------------------|
| 835MHz    | 10.0              | 41.5 ± 5%    | 0.90 ± 5%          |
| 900MHz    | 11.4              | 41.5 ± 5%    | 0.97 ± 5%          |
| 1800MHz   | 40.7              | 40.0 ± 5%    | 1.40 ± 5%          |
| 1900MHz   | 42.0              | 40.0 ± 5%    | 1.40 ± 5%          |

=====

-Approvals-

Submitted by: 

Marge Kaunas

 Date: 

2-Apr-04

Signed: 

Marge Kaunas

Comments: 

Spreadsheet detailing all historical measurements available upon request.

Approved by: 

Mark Douglas

 Date: 

2-Apr-04

Signed: 

Mark Douglas

Comments: 

Targets and associated simulant properties are derived from the IEEE 1528 standard.

=====

Client

Motorola MRO

## CALIBRATION CERTIFICATE

Object(s)

D2450V2 - SN.740

Calibration procedure(s)

QA CAL-05.v2  
Calibration procedure for dipole validation kits

Calibration date:

January 16, 2004

Condition of the calibrated item

In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

| Model Type                | ID #       | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration  |
|---------------------------|------------|-------------------------------------------|------------------------|
| Power meter EPM E442      | GB37480704 | 6-Nov-03 (METAS, No. 252-0254)            | Nov-04                 |
| Power sensor HP 8481A     | US37292783 | 6-Nov-03 (METAS, No. 252-0254)            | Nov-04                 |
| Power sensor HP 8481A     | MY41092317 | 18-Oct-02 (Agilent, No. 20021018)         | Oct-04                 |
| RF generator R&S SML-03   | 100698     | 27-Mar-2002 (R&S, No. 20-92389)           | In house check: Mar-05 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (SPEAG, in house check Nov-03)  | In house check: Oct 05 |

Calibrated by:

Name

Judith Mueller

Function

Technician

Signature

Approved by:

Katja Pekovic

Laboratory Director

Date issued: January 19, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

# DASY

## Dipole Validation Kit

Type: D2450V2

Serial: 740

Manufactured: September 18, 2003

Calibrated: January 16, 2004

## **1. Measurement Conditions**

The measurements were performed in the flat section of the SAM twin phantom filled with **head simulating solution** of the following electrical parameters at 2450 MHz:

|                        |                   |           |
|------------------------|-------------------|-----------|
| Relative Dielectricity | <b>38.4</b>       | $\pm 5\%$ |
| Conductivity           | <b>1.86 mho/m</b> | $\pm 5\%$ |

The DASY4 System with a dosimetric E-field probe ES3DV2 (SN:3013, Conversion factor 4.8 at 2450 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance spacer was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

The dipole input power (forward power) was  $250\text{mW} \pm 3\%$ . The results are normalized to 1W input power.

## **2. SAR Measurement with DASY4 System**

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ES3DV2 SN:3013 and applying the advanced extrapolation are:

|                                                  |                                                            |
|--------------------------------------------------|------------------------------------------------------------|
| averaged over $1\text{ cm}^3$ (1 g) of tissue:   | <b>57.6 mW/g <math>\pm 16.8\%</math> (k=2)<sup>1</sup></b> |
| averaged over $10\text{ cm}^3$ (10 g) of tissue: | <b>26.0 mW/g <math>\pm 16.2\%</math> (k=2)<sup>1</sup></b> |

---

<sup>1</sup> validation uncertainty

### **3. Dipole Impedance and Return Loss**

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

|                      |                 |                                       |
|----------------------|-----------------|---------------------------------------|
| Electrical delay:    | <b>1.161 ns</b> | (one direction)                       |
| Transmission factor: | <b>0.992</b>    | (voltage transmission, one direction) |

The dipole was positioned at the flat phantom sections according to section 1 and the distance spacer was in place during impedance measurements.

|                                  |                                |
|----------------------------------|--------------------------------|
| Feedpoint impedance at 2450 MHz: | $\text{Re}\{Z\} = 52.5 \Omega$ |
|----------------------------------|--------------------------------|

|  |                               |
|--|-------------------------------|
|  | $\text{Im}\{Z\} = 4.8 \Omega$ |
|--|-------------------------------|

|                         |                 |
|-------------------------|-----------------|
| Return Loss at 2450 MHz | <b>-26.6 dB</b> |
|-------------------------|-----------------|

### **4. Handling**

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

### **5. Design**

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.

Small end caps have been added to the dipole arms in order to improve matching when loaded according to the position as explained in Section 1. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

### **6. Power Test**

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN740**

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

Medium: HSL 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.86$  mho/m;  $\epsilon_r = 38.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3013; ConvF(4.8, 4.8, 4.8); Calibrated: 1/19/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 93

**Pin = 250 mW; d = 10 mm/Area Scan (81x81x1);** Measurement grid: dx=15mm, dy=15mm

Reference Value = 93.1 V/m

Power Drift = -0.005 dB

Maximum value of SAR = 16.6 mW/g

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

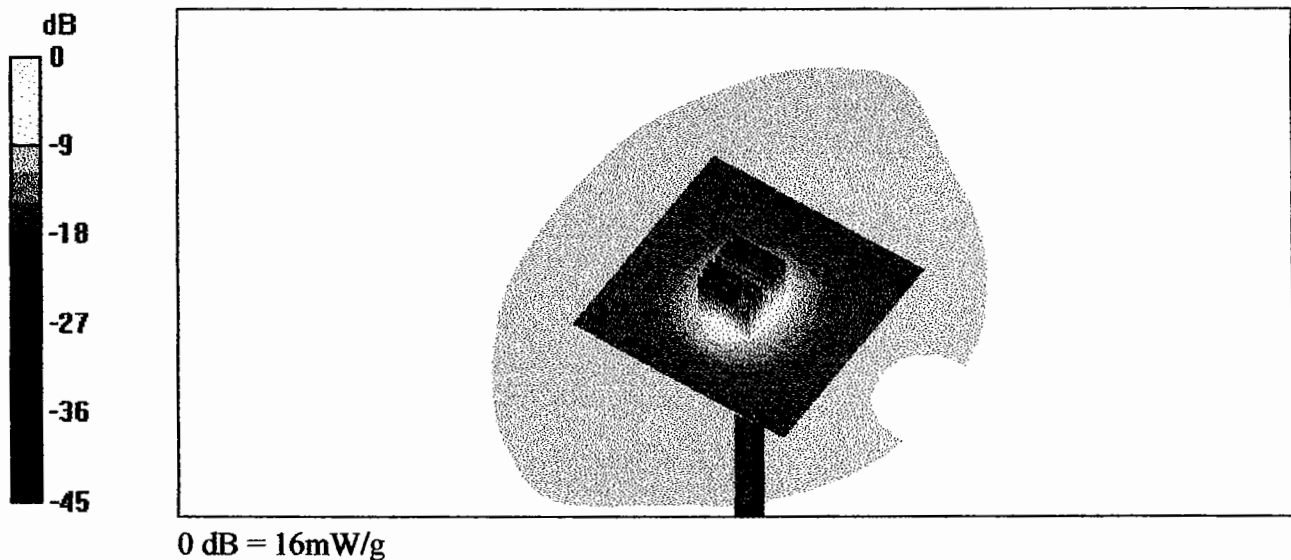
Peak SAR (extrapolated) = 32.2 W/kg

**SAR(1 g) = 14.4 mW/g; SAR(10 g) = 6.5 mW/g**

Reference Value = 93.1 V/m

Power Drift = -0.005 dB

Maximum value of SAR = 16 mW/g



CH1 S11 1 U FS

1: 52.533  $\Omega$  4.8281  $\Omega$  313.64  $\mu\text{H}$

16 Jan 2004 12:16:53

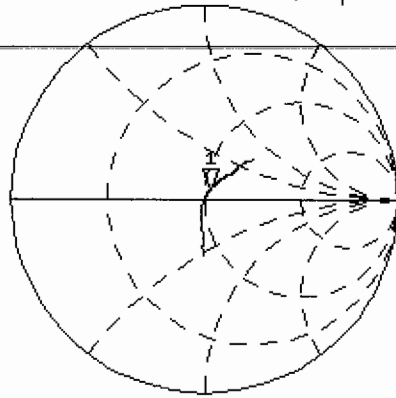
2 450.000 000 MHz

De1

Cor

Avg  
16

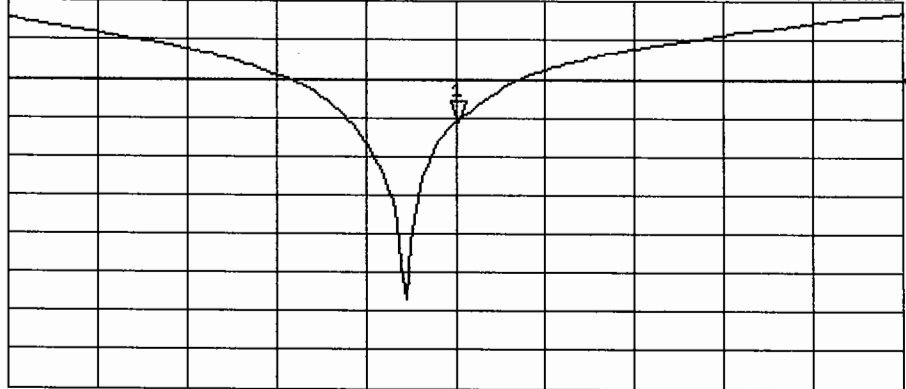
↑



CH2 S11 LOG 6 dB/REF -20 dB 1:-26.573 dB 2 450.000 000 MHz

Cor

↑



CENTER 2 450.000 000 MHz

SPAN 400.000 000 MHz

## **Appendix 6**

### **Measurement Uncertainty Budget**

| Uncertainty Budget for Device Under Test                                        |          |               |                |                   |                               |                                |                                      |                                       |                      |
|---------------------------------------------------------------------------------|----------|---------------|----------------|-------------------|-------------------------------|--------------------------------|--------------------------------------|---------------------------------------|----------------------|
| <i>a</i>                                                                        | <i>b</i> | <i>c</i>      | <i>d</i>       | <i>e = f(d,k)</i> | <i>f</i>                      | <i>g</i>                       | <i>h =<br/>c x f / e</i>             | <i>i =<br/>c x g / e</i>              | <i>k</i>             |
| Uncertainty Component                                                           | Sec.     | Tol.<br>(± %) | Prob.<br>Dist. | Div.              | <i>c<sub>i</sub></i><br>(1 g) | <i>c<sub>i</sub></i><br>(10 g) | 1 g<br><i>u<sub>i</sub></i><br>(± %) | 10 g<br><i>u<sub>i</sub></i><br>(± %) | <i>v<sub>i</sub></i> |
| <b>Measurement System</b>                                                       |          |               |                |                   |                               |                                |                                      |                                       |                      |
| Probe Calibration                                                               | E.2.1    | 9.5           | N              | 2.00              | 1                             | 1                              | 4.8                                  | 4.8                                   | ∞                    |
| Axial Isotropy                                                                  | E.2.2    | 4.7           | R              | 1.73              | 0.707                         | 0.707                          | 1.9                                  | 1.9                                   | ∞                    |
| Spherical Isotropy                                                              | E.2.2    | 9.6           | R              | 1.73              | 0.707                         | 0.707                          | 3.9                                  | 3.9                                   | ∞                    |
| Boundary Effect                                                                 | E.2.3    | 5.8           | R              | 1.73              | 1                             | 1                              | 3.3                                  | 3.3                                   | ∞                    |
| Linearity                                                                       | E.2.4    | 4.7           | R              | 1.73              | 1                             | 1                              | 2.7                                  | 2.7                                   | ∞                    |
| System Detection Limits                                                         | E.2.5    | 1.0           | R              | 1.73              | 1                             | 1                              | 0.6                                  | 0.6                                   | ∞                    |
| Readout Electronics                                                             | E.2.6    | 1.0           | N              | 1.00              | 1                             | 1                              | 1.0                                  | 1.0                                   | ∞                    |
| Response Time                                                                   | E.2.7    | 0.8           | R              | 1.73              | 1                             | 1                              | 0.5                                  | 0.5                                   | ∞                    |
| Integration Time                                                                | E.2.8    | 1.3           | R              | 1.73              | 1                             | 1                              | 0.8                                  | 0.8                                   | ∞                    |
| RF Ambient Conditions                                                           | E.6.1    | 3.0           | R              | 1.73              | 1                             | 1                              | 1.7                                  | 1.7                                   | ∞                    |
| Probe Positioner Mechanical Tolerance                                           | E.6.2    | 0.3           | R              | 1.73              | 1                             | 1                              | 0.2                                  | 0.2                                   | ∞                    |
| Probe Positioning with respect to Phantom Shell                                 | E.6.3    | 1.1           | R              | 1.73              | 1                             | 1                              | 0.6                                  | 0.6                                   | ∞                    |
| Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation | E.5      | 3.9           | R              | 1.73              | 1                             | 1                              | 2.3                                  | 2.3                                   | ∞                    |
| <b>Test sample Related</b>                                                      |          |               |                |                   |                               |                                |                                      |                                       |                      |
| Test Sample Positioning                                                         | E.4.2    | 3.6           | N              | 1.00              | 1                             | 1                              | 3.6                                  | 3.6                                   | 29                   |
| Device Holder Uncertainty                                                       | E.4.1    | 2.8           | N              | 1.00              | 1                             | 1                              | 2.8                                  | 2.8                                   | 8                    |
| Output Power Variation - SAR drift measurement                                  | 6.6.2    | 5.0           | R              | 1.73              | 1                             | 1                              | 2.9                                  | 2.9                                   | ∞                    |
| <b>Phantom and Tissue Parameters</b>                                            |          |               |                |                   |                               |                                |                                      |                                       |                      |
| Phantom Uncertainty (shape and thickness tolerances)                            | E.3.1    | 4.0           | R              | 1.73              | 1                             | 1                              | 2.3                                  | 2.3                                   | ∞                    |
| Liquid Conductivity - deviation from target values                              | E.3.2    | 5.0           | R              | 1.73              | 0.64                          | 0.43                           | 1.8                                  | 1.2                                   | ∞                    |
| Liquid Conductivity - measurement uncertainty                                   | E.3.3    | 10.0          | R              | 1.73              | 0.64                          | 0.43                           | 3.7                                  | 2.5                                   | ∞                    |
| Liquid Permittivity - deviation from target values                              | E.3.2    | 10.0          | R              | 1.73              | 0.6                           | 0.49                           | 3.5                                  | 2.8                                   | ∞                    |
| Liquid Permittivity - measurement uncertainty                                   | E.3.3    | 5.0           | R              | 1.73              | 0.6                           | 0.49                           | 1.7                                  | 1.4                                   | ∞                    |
| <b>Combined Standard Uncertainty</b>                                            |          |               | RSS            |                   |                               |                                | 11.72                                | 11.09                                 | 1363                 |
| <b>Expanded Uncertainty</b><br>(95% CONFIDENCE LEVEL)                           |          |               | <i>k</i> = 2   |                   |                               |                                | 22.98                                | 21.75                                 |                      |

**Uncertainty Budget for System Performance Check (dipole & flat phantom)**

| <i>a</i>                                                                        | <i>b</i> | <i>c</i>      | <i>d</i>       | <i>e</i> =<br><i>f</i> ( <i>d</i> , <i>k</i> ) | <i>f</i>                      | <i>g</i>                       | <i>h</i> =<br><i>c</i> × <i>f</i> /<br><i>e</i> | <i>i</i> =<br><i>c</i> × <i>g</i> /<br><i>e</i> | <i>k</i>             |
|---------------------------------------------------------------------------------|----------|---------------|----------------|------------------------------------------------|-------------------------------|--------------------------------|-------------------------------------------------|-------------------------------------------------|----------------------|
| Uncertainty Component                                                           | Sec.     | Tol.<br>(± %) | Prob.<br>Dist. | Div.                                           | <i>c<sub>i</sub></i><br>(1 g) | <i>c<sub>i</sub></i><br>(10 g) | 1 g<br><i>u<sub>i</sub></i><br>(± %)            | 10 g<br><i>u<sub>i</sub></i><br>(± %)           | <i>v<sub>i</sub></i> |
| <b>Measurement System</b>                                                       |          |               |                |                                                |                               |                                |                                                 |                                                 |                      |
| Probe Calibration                                                               | E.2.1    | 9.5           | N              | 2.00                                           | 1                             | 1                              | 4.8                                             | 4.8                                             | ∞                    |
| Axial Isotropy                                                                  | E.2.2    | 4.7           | R              | 1.73                                           | 1                             | 1                              | 2.7                                             | 2.7                                             | ∞                    |
| Spherical Isotropy                                                              | E.2.2    | 9.6           | R              | 1.73                                           | 0                             | 0                              | 0.0                                             | 0.0                                             | ∞                    |
| Boundary Effect                                                                 | E.2.3    | 5.8           | R              | 1.73                                           | 1                             | 1                              | 3.3                                             | 3.3                                             | ∞                    |
| Linearity                                                                       | E.2.4    | 4.7           | R              | 1.73                                           | 1                             | 1                              | 2.7                                             | 2.7                                             | ∞                    |
| System Detection Limits                                                         | E.2.5    | 1.0           | R              | 1.73                                           | 1                             | 1                              | 0.6                                             | 0.6                                             | ∞                    |
| Readout Electronics                                                             | E.2.6    | 1.0           | N              | 1.00                                           | 1                             | 1                              | 1.0                                             | 1.0                                             | ∞                    |
| Response Time                                                                   | E.2.7    | 0.0           | R              | 1.73                                           | 1                             | 1                              | 0.0                                             | 0.0                                             | ∞                    |
| Integration Time                                                                | E.2.8    | 0.0           | R              | 1.73                                           | 1                             | 1                              | 0.0                                             | 0.0                                             | ∞                    |
| RF Ambient Conditions                                                           | E.6.1    | 3.0           | R              | 1.73                                           | 1                             | 1                              | 1.7                                             | 1.7                                             | ∞                    |
| Probe Positioner Mechanical Tolerance                                           | E.6.2    | 0.3           | R              | 1.73                                           | 1                             | 1                              | 0.2                                             | 0.2                                             | ∞                    |
| Probe Positioning with respect to Phantom Shell                                 | E.6.3    | 1.1           | R              | 1.73                                           | 1                             | 1                              | 0.6                                             | 0.6                                             | ∞                    |
| Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation | E.5      | 3.9           | R              | 1.73                                           | 1                             | 1                              | 2.3                                             | 2.3                                             | ∞                    |
| <b>Dipole</b>                                                                   |          |               |                |                                                |                               |                                |                                                 |                                                 |                      |
| Dipole Axis to Liquid Distance                                                  | 8, E.4.2 | 1.0           | R              | 1.73                                           | 1                             | 1                              | 0.6                                             | 0.6                                             | ∞                    |
| Input Power and SAR Drift Measurement                                           | 8, 6.6.2 | 4.7           | R              | 1.73                                           | 1                             | 1                              | 2.7                                             | 2.7                                             | ∞                    |
| <b>Phantom and Tissue Parameters</b>                                            |          |               |                |                                                |                               |                                |                                                 |                                                 |                      |
| Phantom Uncertainty (shape and thickness tolerances)                            | E.3.1    | 4.0           | R              | 1.73                                           | 1                             | 1                              | 2.3                                             | 2.3                                             | ∞                    |
| Liquid Conductivity - deviation from target values                              | E.3.2    | 5.0           | R              | 1.73                                           | 0.64                          | 0.43                           | 1.8                                             | 1.2                                             | ∞                    |
| Liquid Conductivity - measurement uncertainty                                   | E.3.3    | 10.0          | R              | 1.73                                           | 0.64                          | 0.43                           | 3.7                                             | 2.5                                             | ∞                    |
| Liquid Permittivity - deviation from target values                              | E.3.2    | 10.0          | R              | 1.73                                           | 0.6                           | 0.49                           | 3.5                                             | 2.8                                             | ∞                    |
| Liquid Permittivity - measurement uncertainty                                   | E.3.3    | 5.0           | R              | 1.73                                           | 0.6                           | 0.49                           | 1.7                                             | 1.4                                             | ∞                    |
| <b>Combined Standard Uncertainty</b>                                            |          |               | RSS            |                                                |                               |                                | 10.16                                           | 9.43                                            | 99999                |
| <b>Expanded Uncertainty</b><br>(95% CONFIDENCE LEVEL)                           |          |               | <i>k</i> =2    |                                                |                               |                                | 19.92                                           | 18.48                                           |                      |

## **Appendix 7**

### **Photographs of the device under test**



Figure 10. Front of Phone



Figure 11. Back of Phone



Figure 12. Phone Open; voice flip



Figure 13. Phone Open; data flip



Figure 14. Phone in case; side view



Figure 15. Phone in case; back view

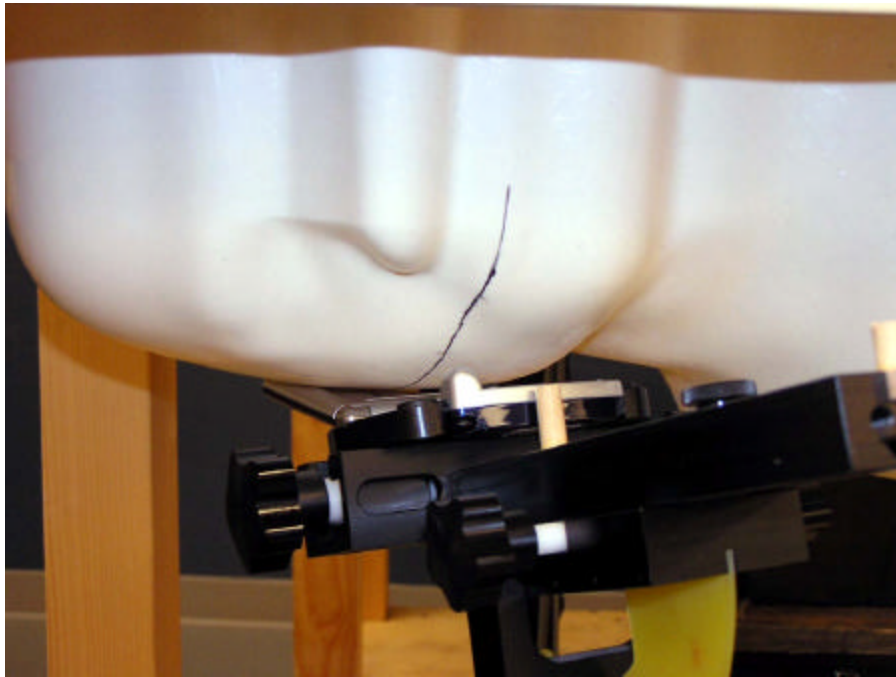


Figure 16. Front View; Cheek/Touch Position



Figure 17. Rear View; Cheek/Touch Position

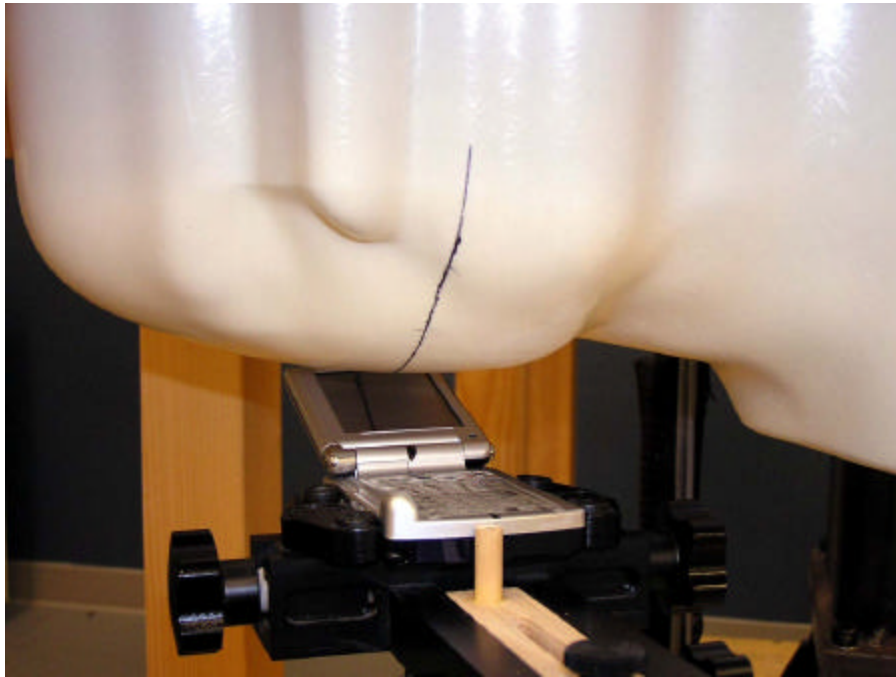


Figure 18. Front View; Tilt Position

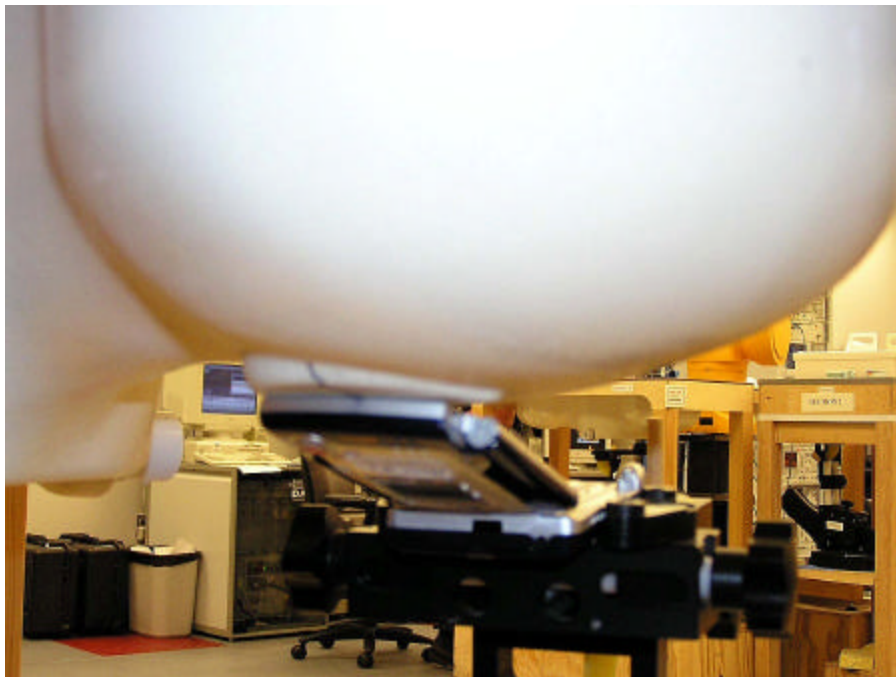


Figure 19. Rear View; Tilt Position



Figure 20. Body Worn Testing