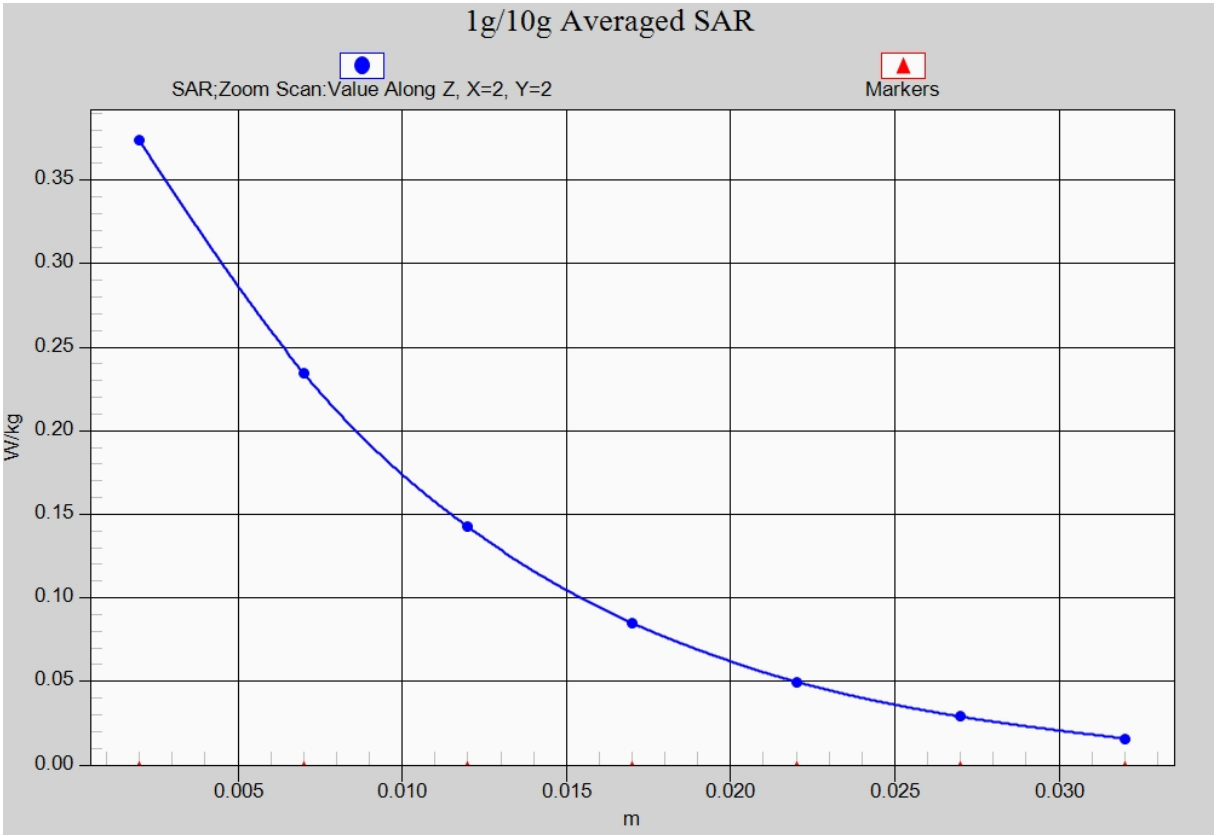


Fig. 12-1 Z-Scan at power reference point (WCDMA1900 CH9538)

LTE Band2 Left Cheek Middle with QPSK_20M_1RB_Middle – AP OFF
Date: 2014-1-23
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used: f = 1880 MHz; σ = 1.386 mho/m; εr = 39.106; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: LTE Band2 Frequency: 1880 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(7.57, 7.57, 7.57)

Cheek Middle/Area Scan (71x131x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.410 W/kg

Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.849 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.436 W/kg
SAR(1 g) = 0.328 W/kg; SAR(10 g) = 0.213 W/kg
Maximum value of SAR (measured) = 0.357 W/kg

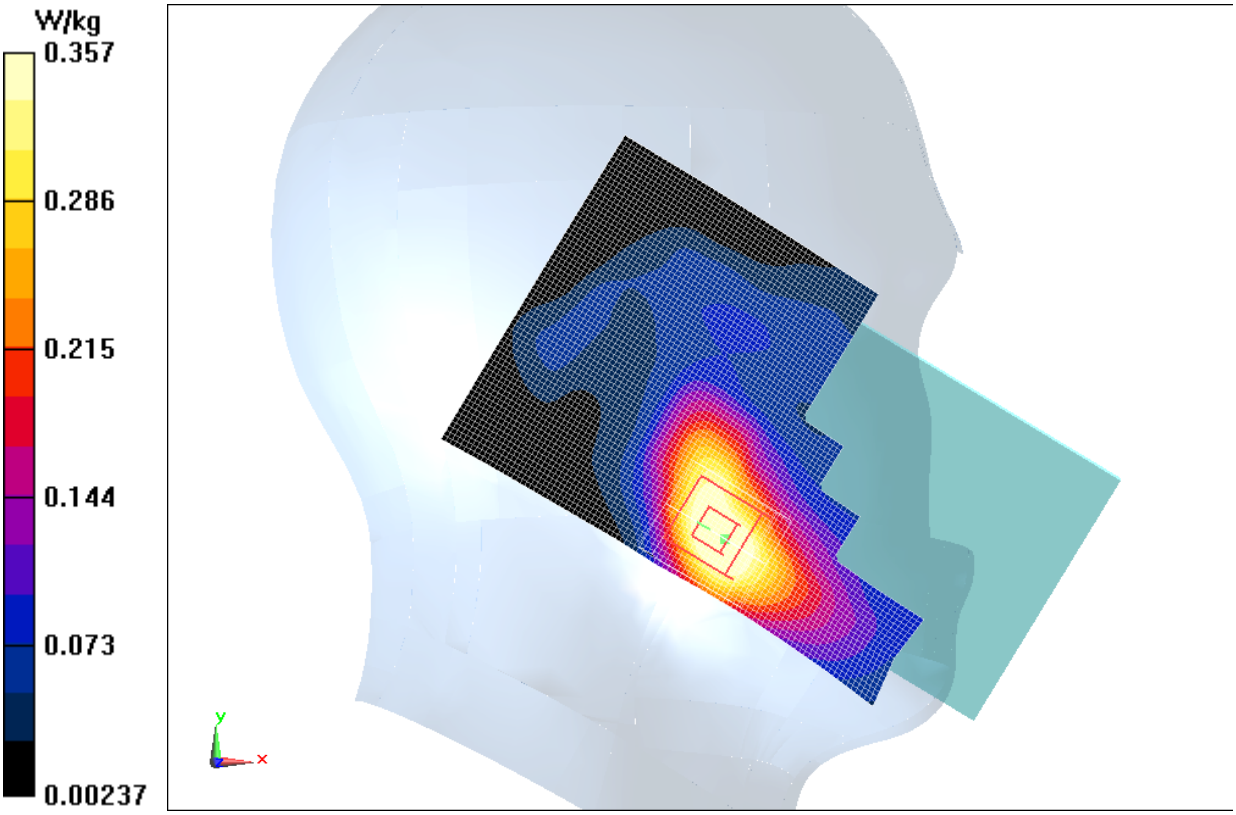


Fig.13 LTE Band2 CH18900

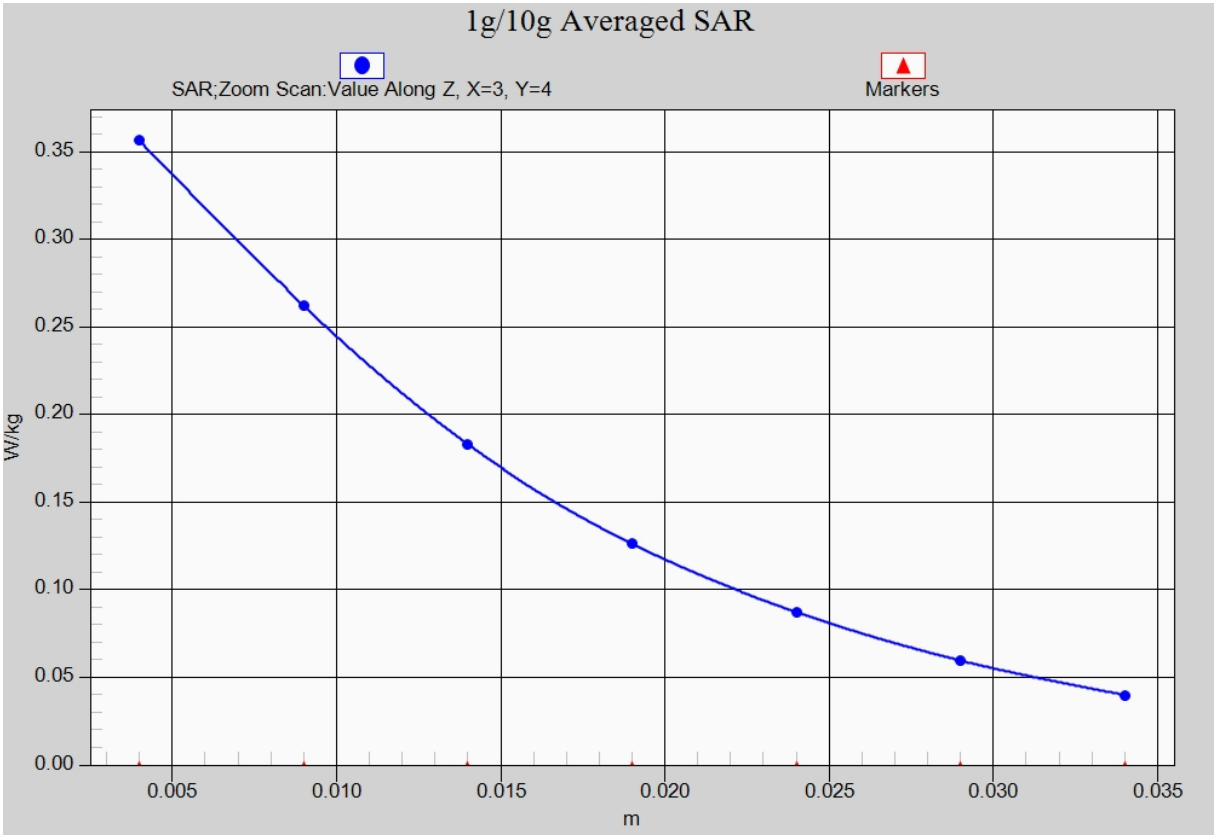


Fig. 13-1 Z-Scan at power reference point (LTE Band2 CH18900)

LTE Band2 Body Front Middle with QPSK_20M_1RB_Middle – AP OFF
Date: 2014-1-23
Electronics: DAE4 Sn771
Medium: Body 1900 MHz
Medium parameters used: f = 1880 MHz; σ = 1.49 mho/m; εr = 51.74; ρ = 1000 kg/m^3
Ambient Temperature: 22.3^{o}C Liquid Temperature: 21.8^{o}C
Communication System: LTE Band4 Frequency: 1880 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(7.03, 7.03, 7.03)

Front Middle/Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.403 W/kg

Front Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.503 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.444 W/kg
SAR(1 g) = 0.297 W/kg; SAR(10 g) = 0.181 W/kg
Maximum value of SAR (measured) = 0.384 W/kg

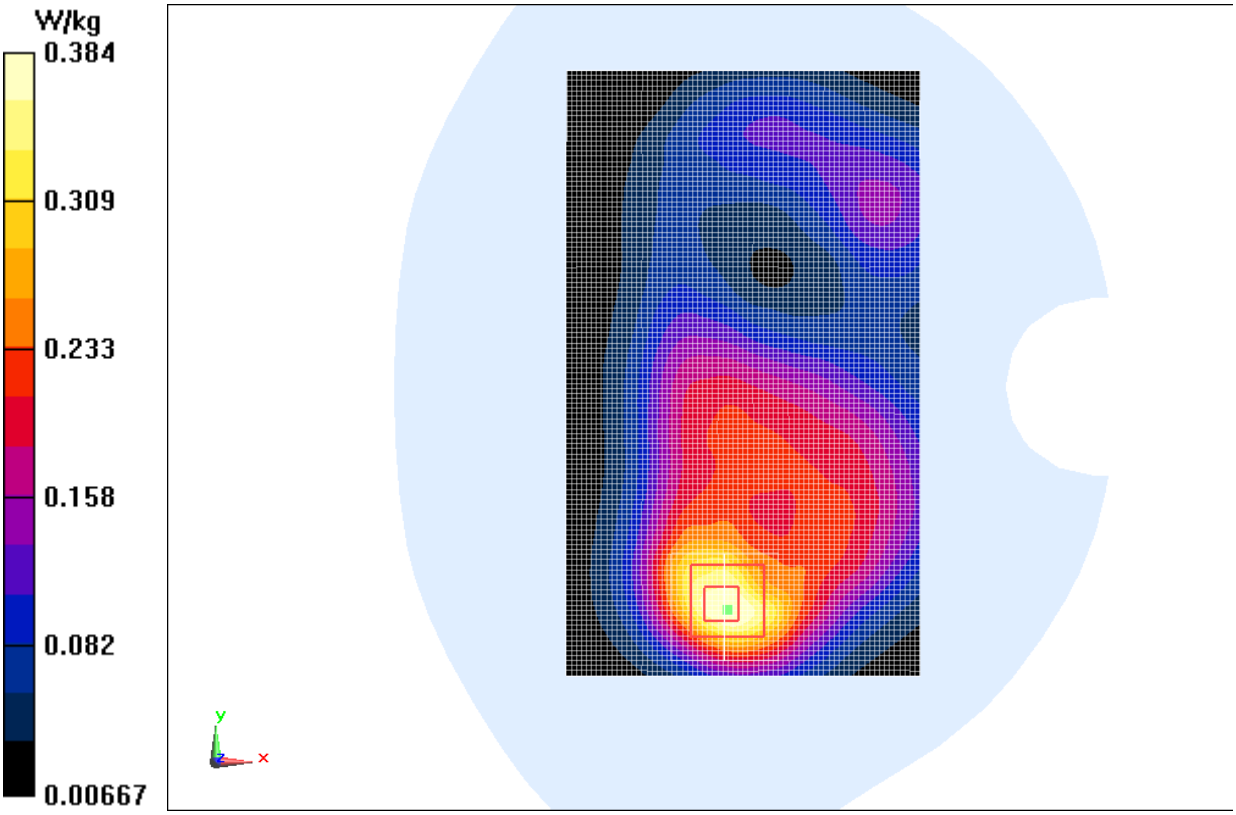


Fig.14 LTE Band2 CH18900

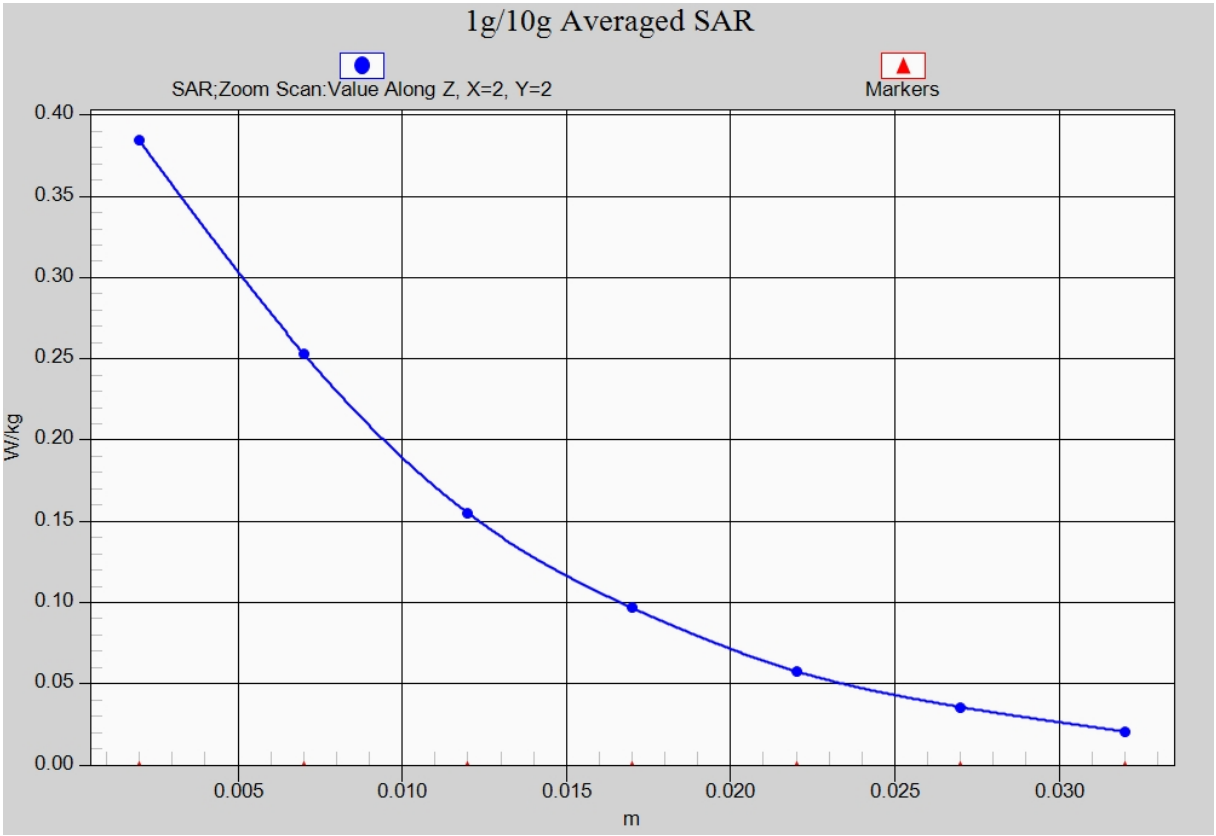


Fig. 14-1 Z-Scan at power reference point (LTE Band2 CH18900)

LTE Band2 Body Front High with QPSK_20M_1RB_Low – AP ON
Date: 2014-1-23
Electronics: DAE4 Sn771
Medium: Body 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.507 mho/m; εr = 51.692; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: LTE Band4 Frequency: 1900 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(7.03, 7.03, 7.03)

Front High/Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.327 W/kg

Front High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.287 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.408 W/kg
SAR(1 g) = 0.278 W/kg; SAR(10 g) = 0.158 W/kg
Maximum value of SAR (measured) = 0.331 W/kg

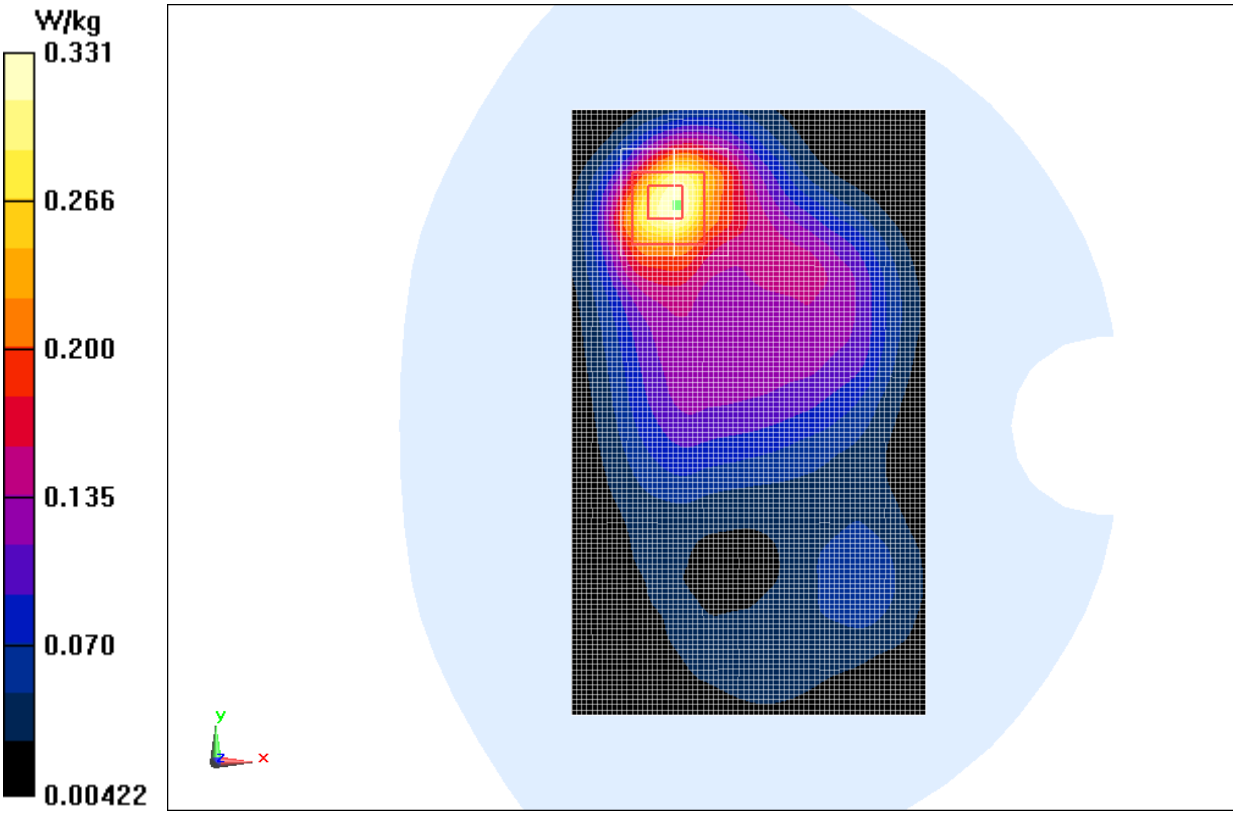


Fig.15 LTE Band2 CH19100

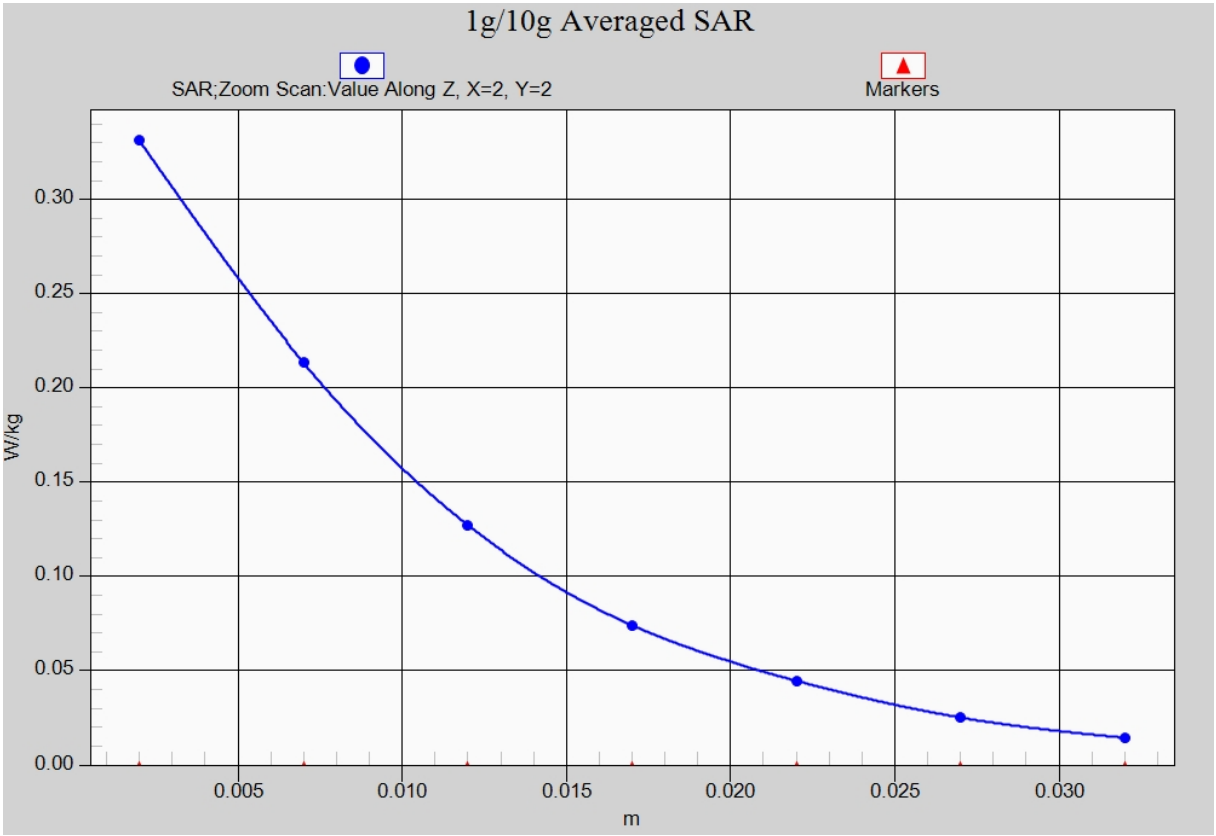


Fig. 15-1 Z-Scan at power reference point (LTE Band2 CH19100)

LTE Band4 Left Cheek High with QPSK_20M_1RB_Middle – AP OFF
Date: 2014-1-22
Electronics: DAE4 Sn771
Medium: Head 1750 MHz
Medium parameters used: f = 1745 MHz; σ = 1.362 mho/m; εr = 39.335; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: LTE Band4 Frequency: 1745 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(7.85, 7.85, 7.85)

Cheek High/Area Scan (71x131x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.306 W/kg

Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.078 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.321 W/kg
SAR(1 g) = 0.244 W/kg; SAR(10 g) = 0.160 W/kg
Maximum value of SAR (measured) = 0.265 W/kg

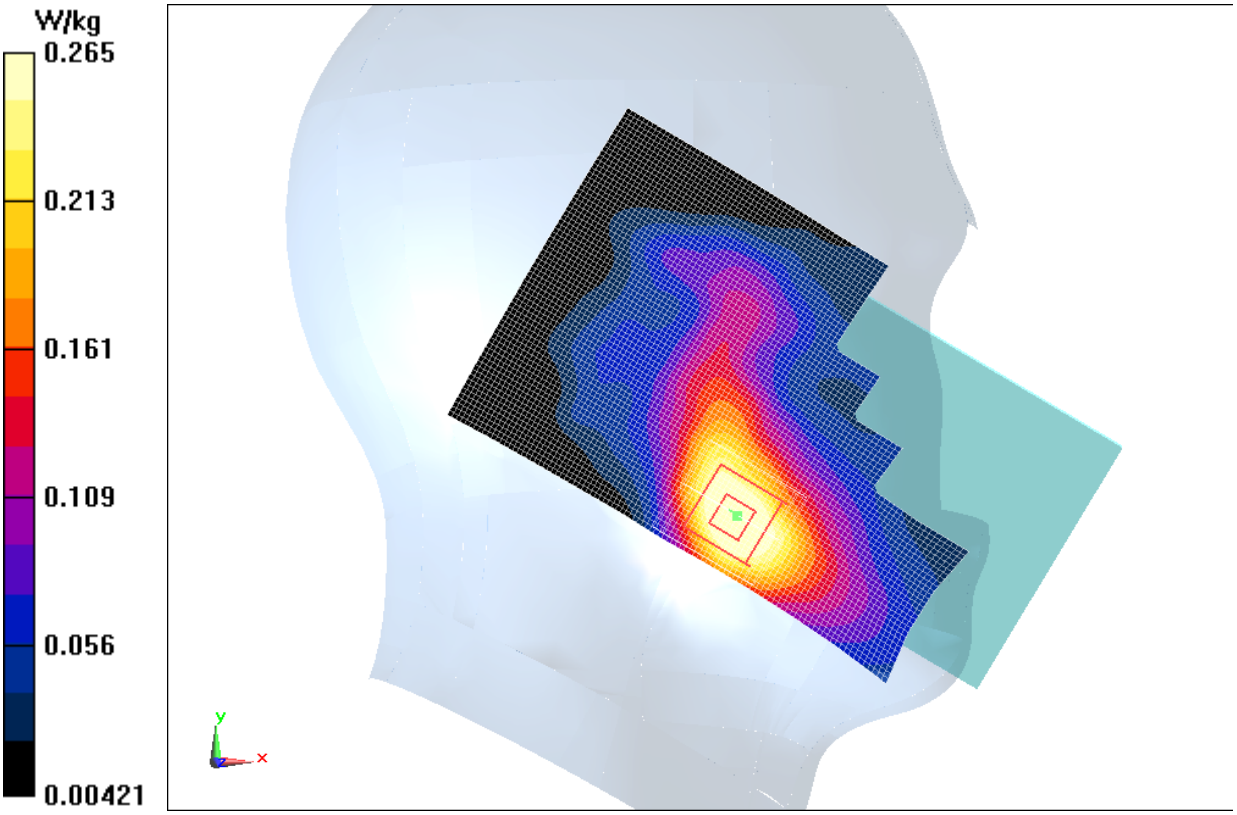


Fig.16 LTE Band4 CH20300

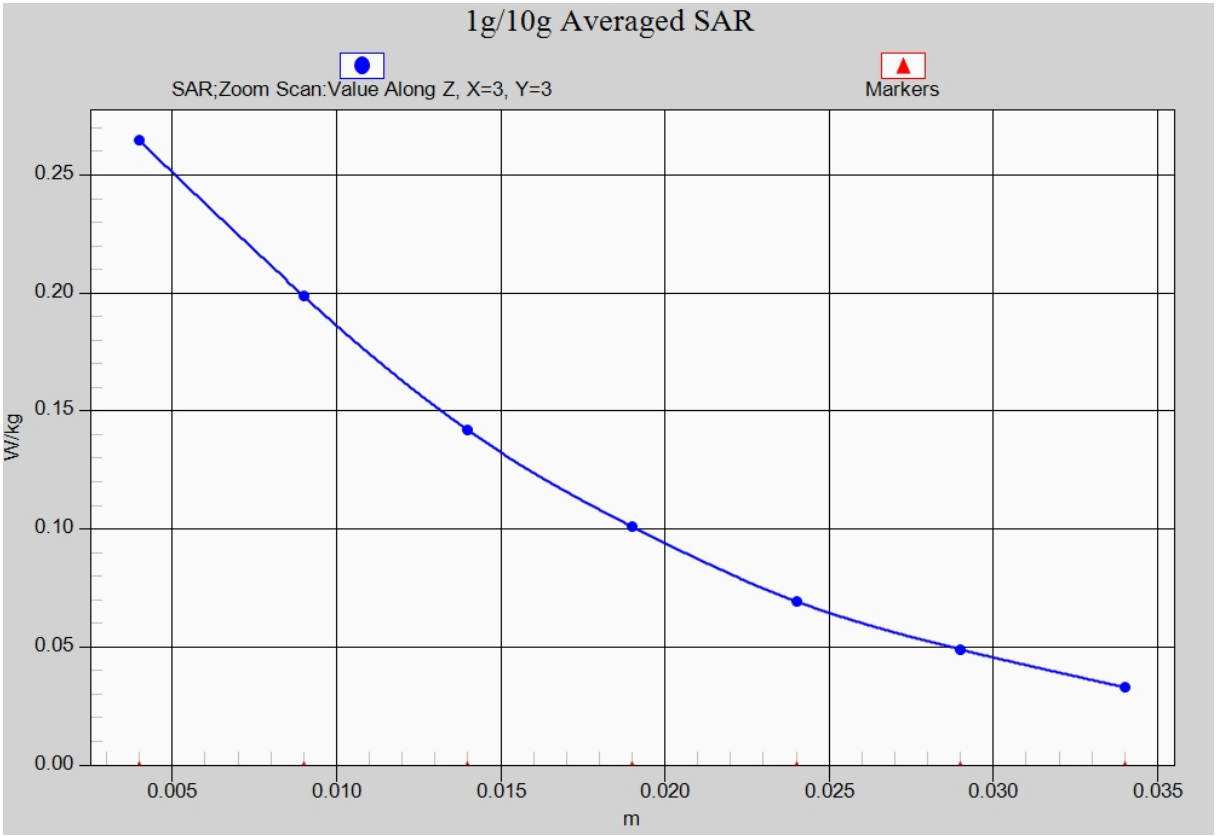


Fig. 16-1 Z-Scan at power reference point (LTE Band4 CH20300)

LTE Band4 Body Front High with QPSK_20M_1RB_Middle – AP OFF
Date: 2014-1-22
Electronics: DAE4 Sn771
Medium: Body 1750 MHz
Medium parameters used: f = 1745 MHz; σ = 1.476 mho/m; εr = 53.474; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: LTE Band4 Frequency: 1745 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(7.56, 7.56, 7.56)

Front High/Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.451 W/kg

Front High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.375 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.502 W/kg
SAR(1 g) = 0.331 W/kg; SAR(10 g) = 0.202 W/kg
Maximum value of SAR (measured) = 0.427 W/kg

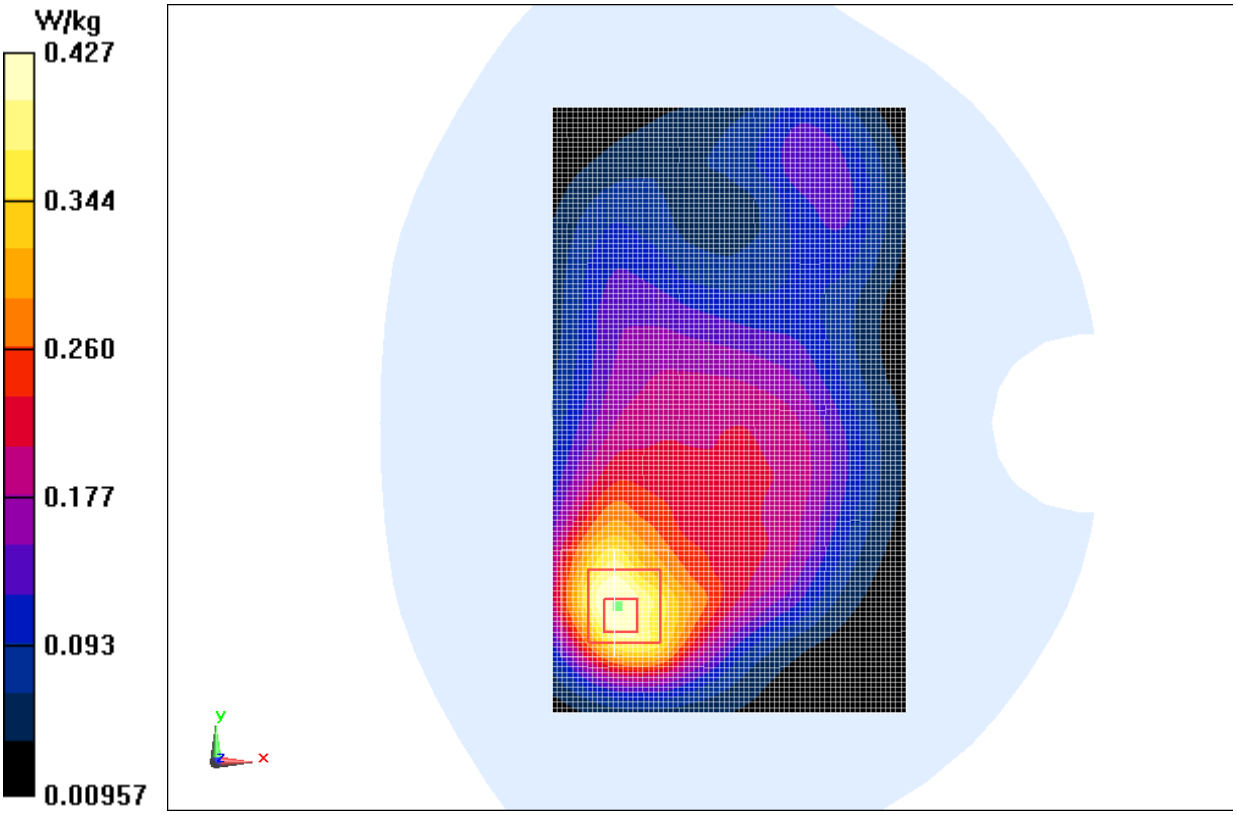


Fig.17 LTE Band4 CH20300

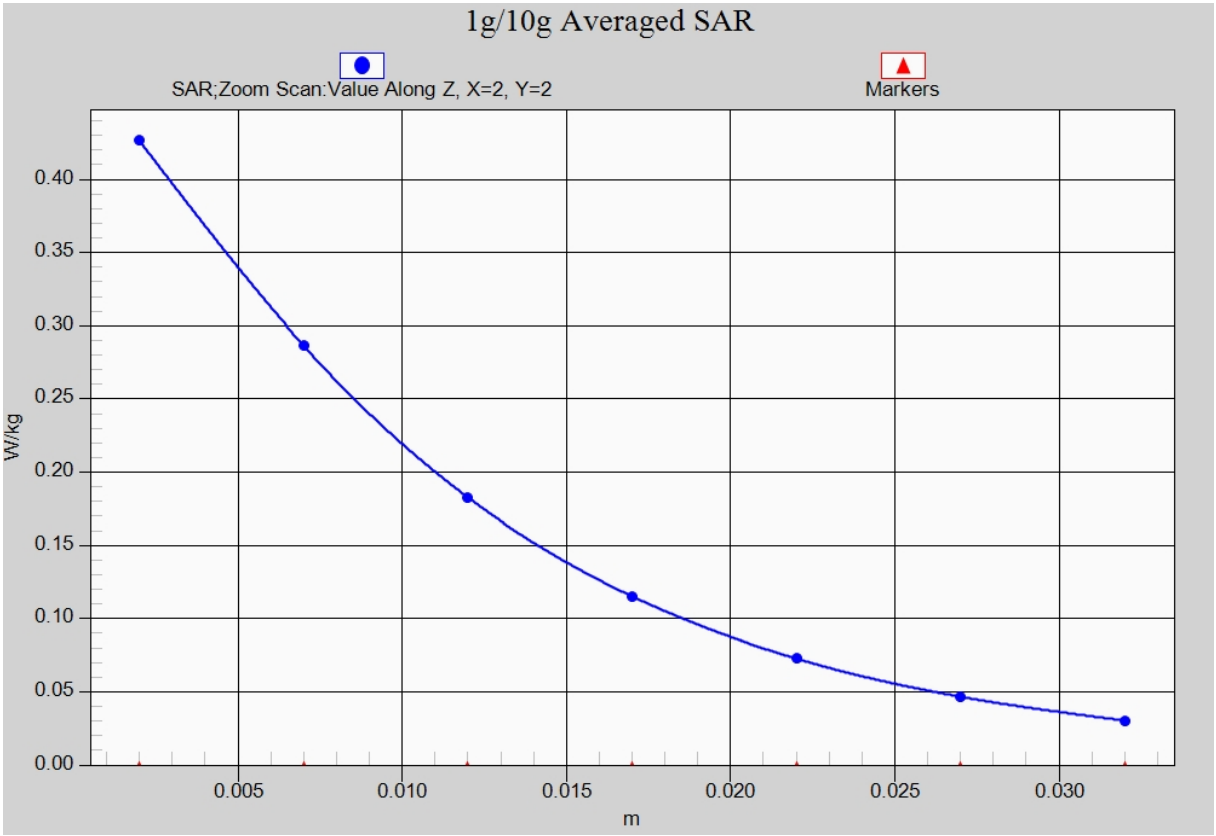


Fig. 17-1 Z-Scan at power reference point (LTE Band4 CH20300)

LTE Band4 Body Front High with QPSK_20M_50RB_Middle – AP ON
Date: 2014-1-22
Electronics: DAE4 Sn771
Medium: Body 1750 MHz
Medium parameters used: f = 1745 MHz; σ = 1.476 mho/m; εr = 53.474; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: LTE Band4 Frequency: 1745 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(7.56, 7.56, 7.56)

Front High/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.556 W/kg

Front High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.687 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 0.825 W/kg
SAR(1 g) = 0.416 W/kg; SAR(10 g) = 0.245 W/kg
Maximum value of SAR (measured) = 0.564 W/kg

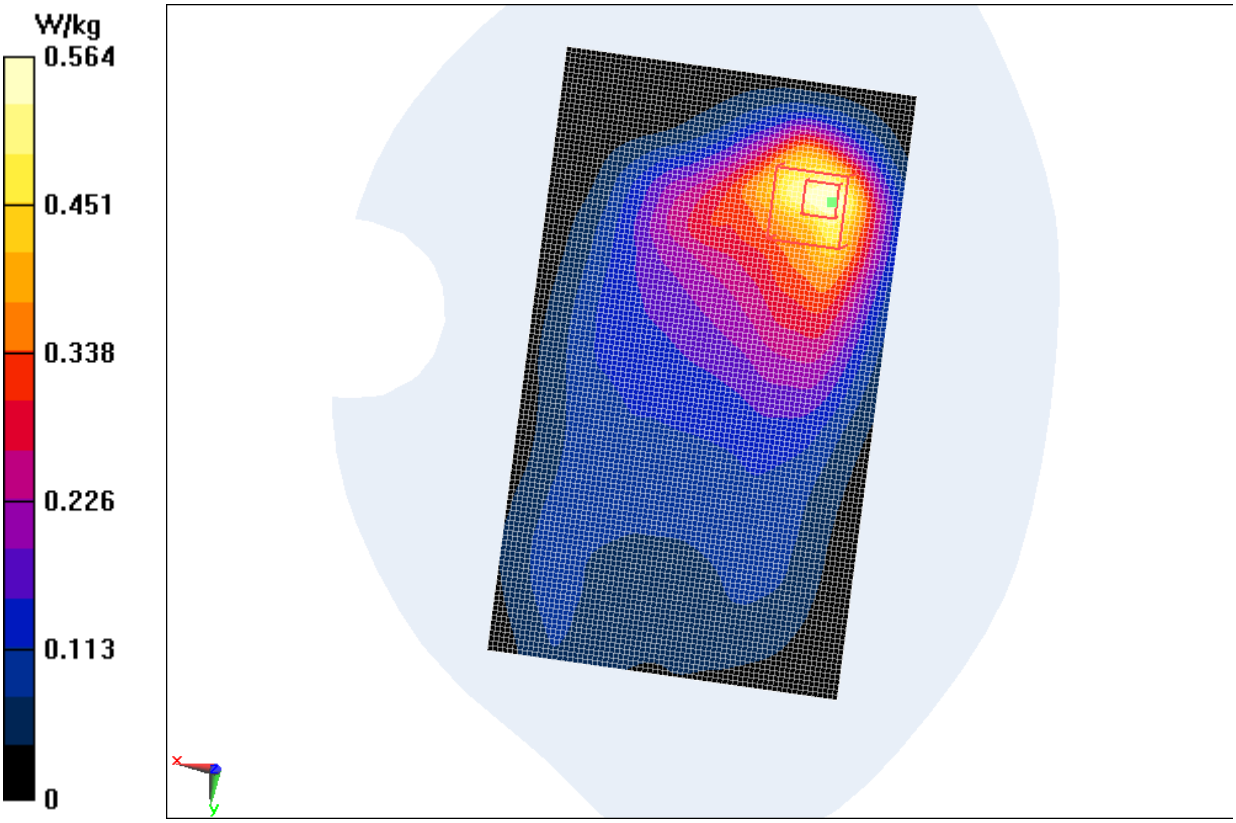


Fig.18 LTE Band4 CH20300

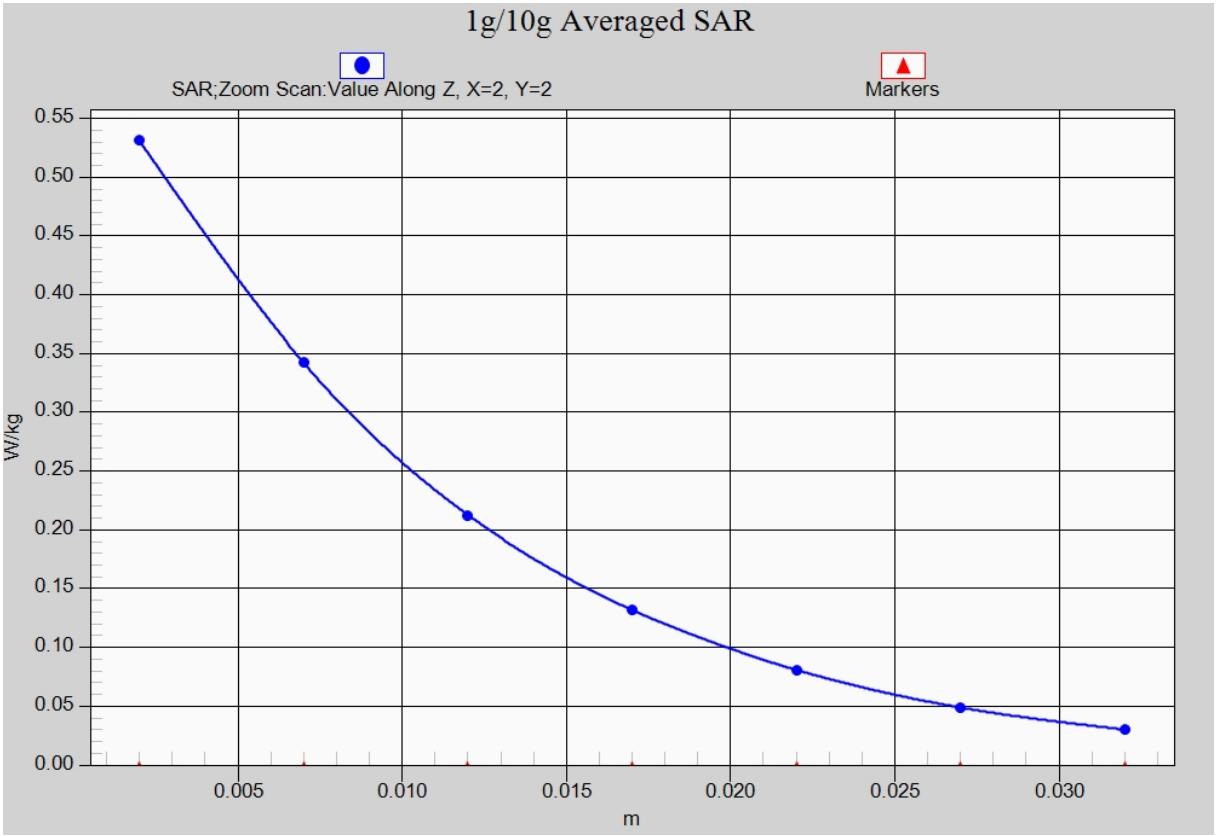


Fig. 18-1 Z-Scan at power reference point (LTE Band4 CH20300)

LTE Band7 Left Cheek Middle with QPSK_20M_1RB_Low – AP OFF
Date: 2014-1-17
Electronics: DAE4 Sn771
Medium: Head 2600 MHz
Medium parameters used: f = 2535 MHz; σ = 1.917 mho/m; εr = 39.56; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: LTE Band7 Frequency: 2535 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(6.68, 6.68, 6.68)

Cheek Middle/Area Scan (91x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0525 W/kg

Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.0530 W/kg
SAR(1 g) = 0.030 W/kg; SAR(10 g) = 0.011 W/kg
Maximum value of SAR (measured) = 0.0426 W/kg

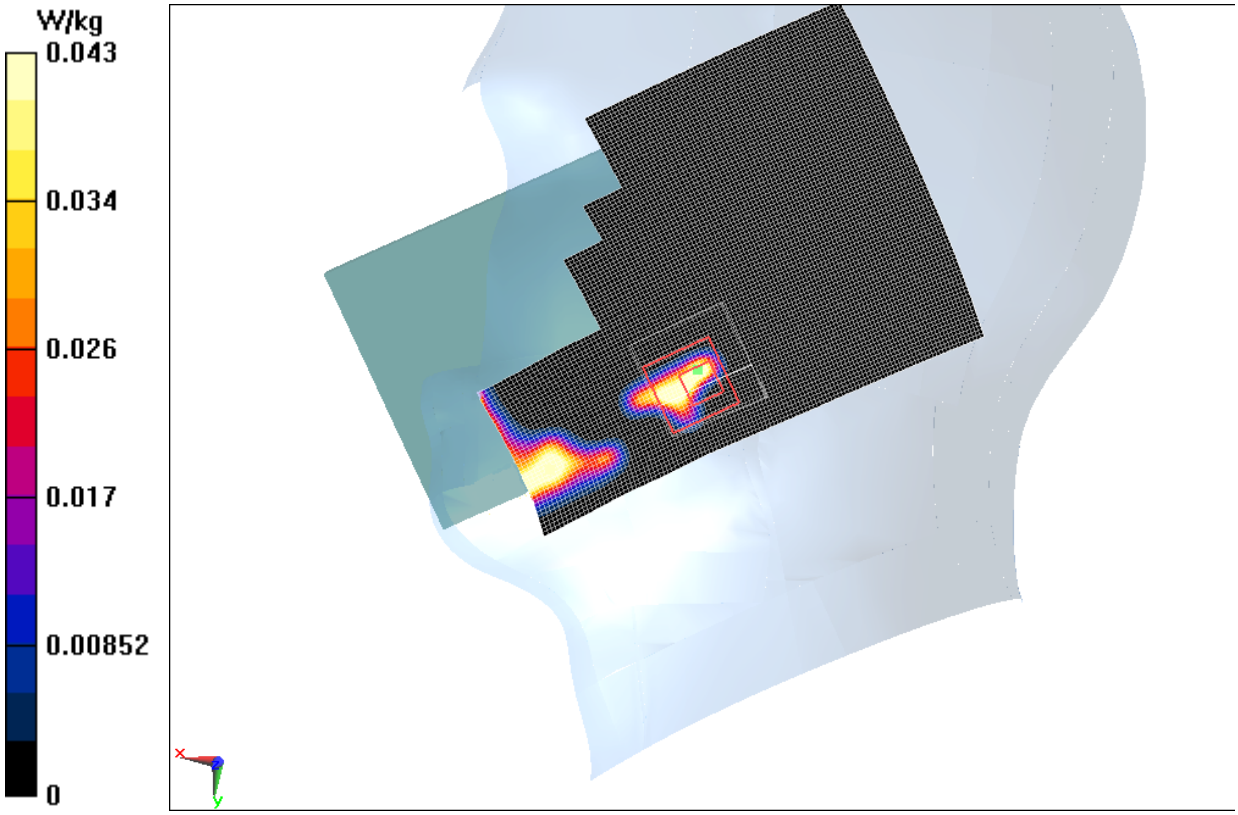


Fig.19 LTE Band7 CH21100

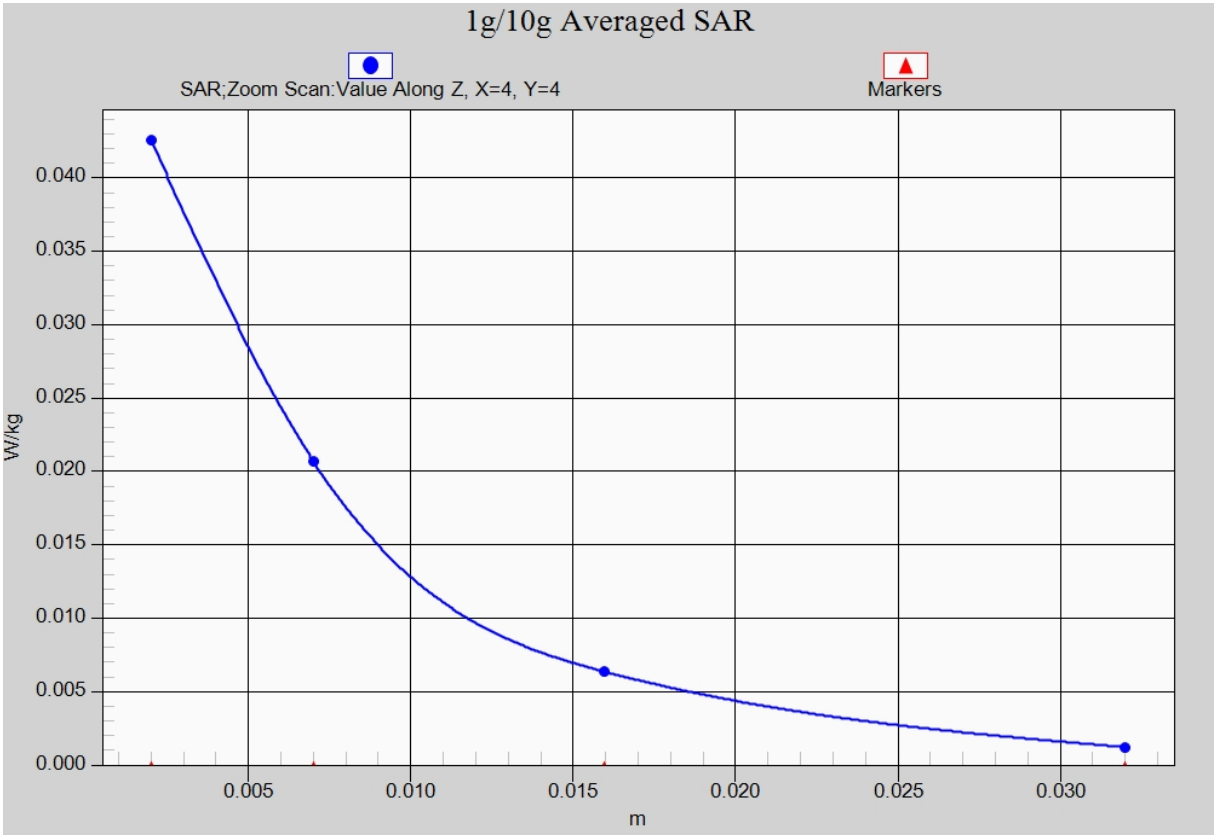


Fig. 19-1 Z-Scan at power reference point (LTE Band7 CH21100)

LTE Band7 Body Bottom Edge Middle with QPSK_20M_1RB_Low – AP OFF
Date: 2014-1-17
Electronics: DAE4 Sn771
Medium: Body 2600 MHz
Medium parameters used: f = 2535 MHz; σ = 2.108 mho/m; εr = 53.178; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: LTE Band7 Frequency: 2535 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(6.59, 6.59, 6.59)

Bottom Edge Middle/Area Scan (81x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.721 W/kg

Bottom Edge Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.901 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.895 W/kg
SAR(1 g) = 0.516 W/kg; SAR(10 g) = 0.267 W/kg
Maximum value of SAR (measured) = 0.729 W/kg

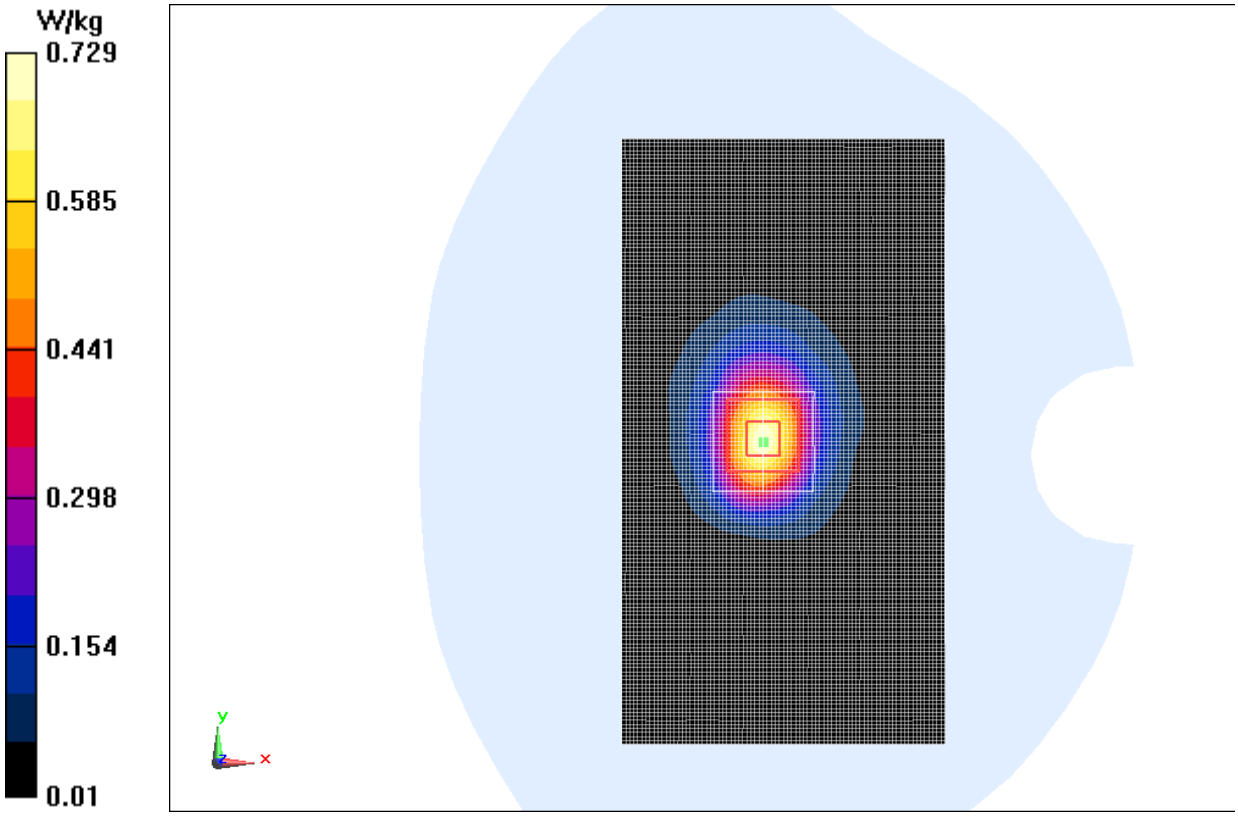


Fig.20 LTE Band7 CH21100

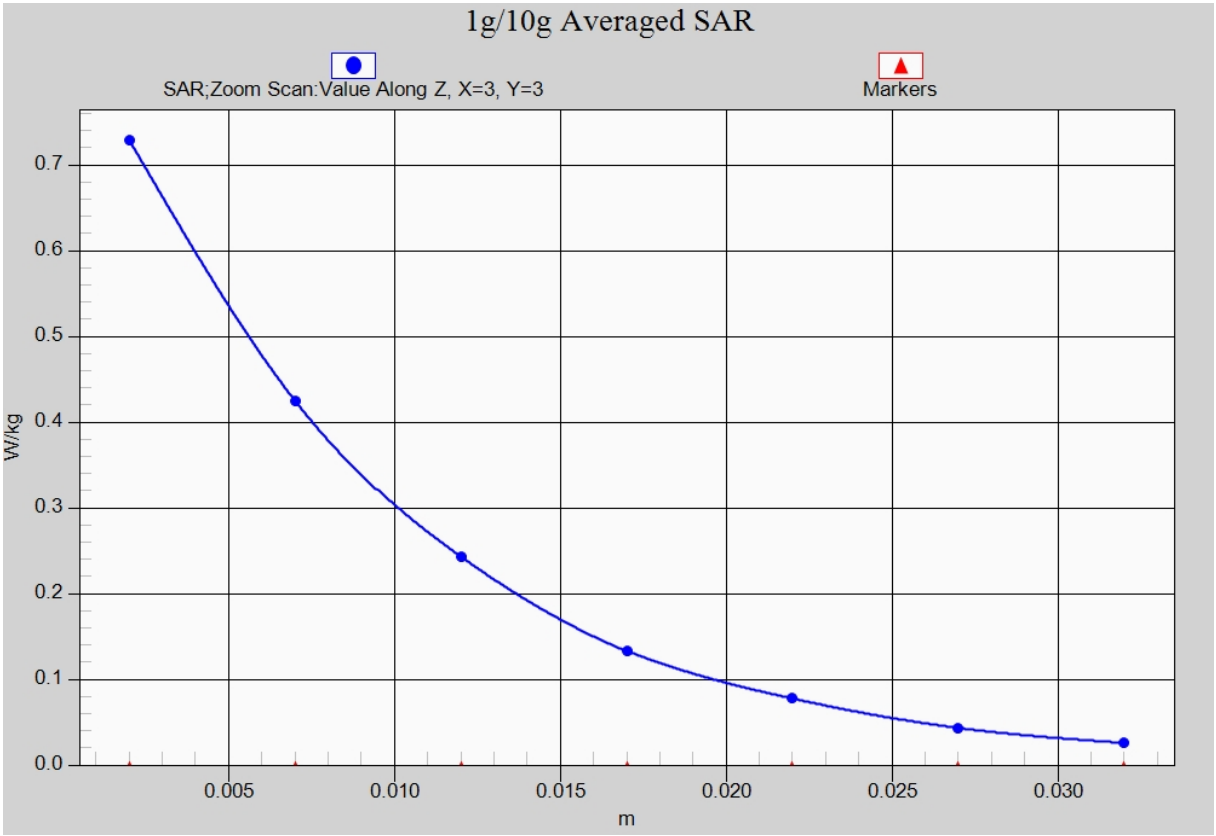


Fig. 20-1 Z-Scan at power reference point (LTE Band7 CH21100)

LTE Band7 Body Bottom Edge Low with QPSK_20M_1RB_Low – AP OFF
Date: 2014-1-17
Electronics: DAE4 Sn771
Medium: Body 2600 MHz
Medium parameters used: f = 2510 MHz; σ = 2.003 mho/m; εr = 53.458; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: LTE Band7 Frequency: 2510 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(6.59, 6.59, 6.59)

Bottom Edge Low/Area Scan (81x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.739 W/kg

Bottom Edge Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.149 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.913 W/kg
SAR(1 g) = 0.499 W/kg; SAR(10 g) = 0.227 W/kg
Maximum value of SAR (measured) = 0.747 W/kg

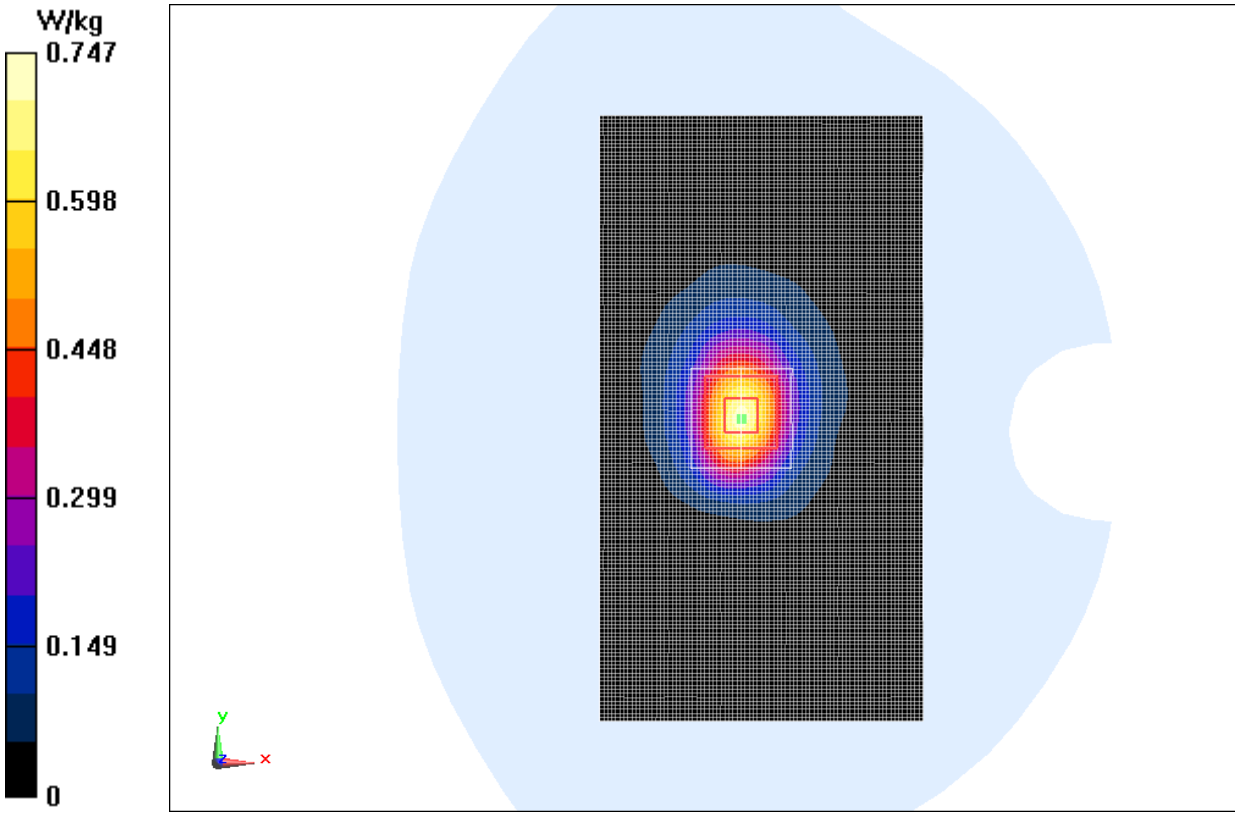


Fig.21 LTE Band7 CH20850

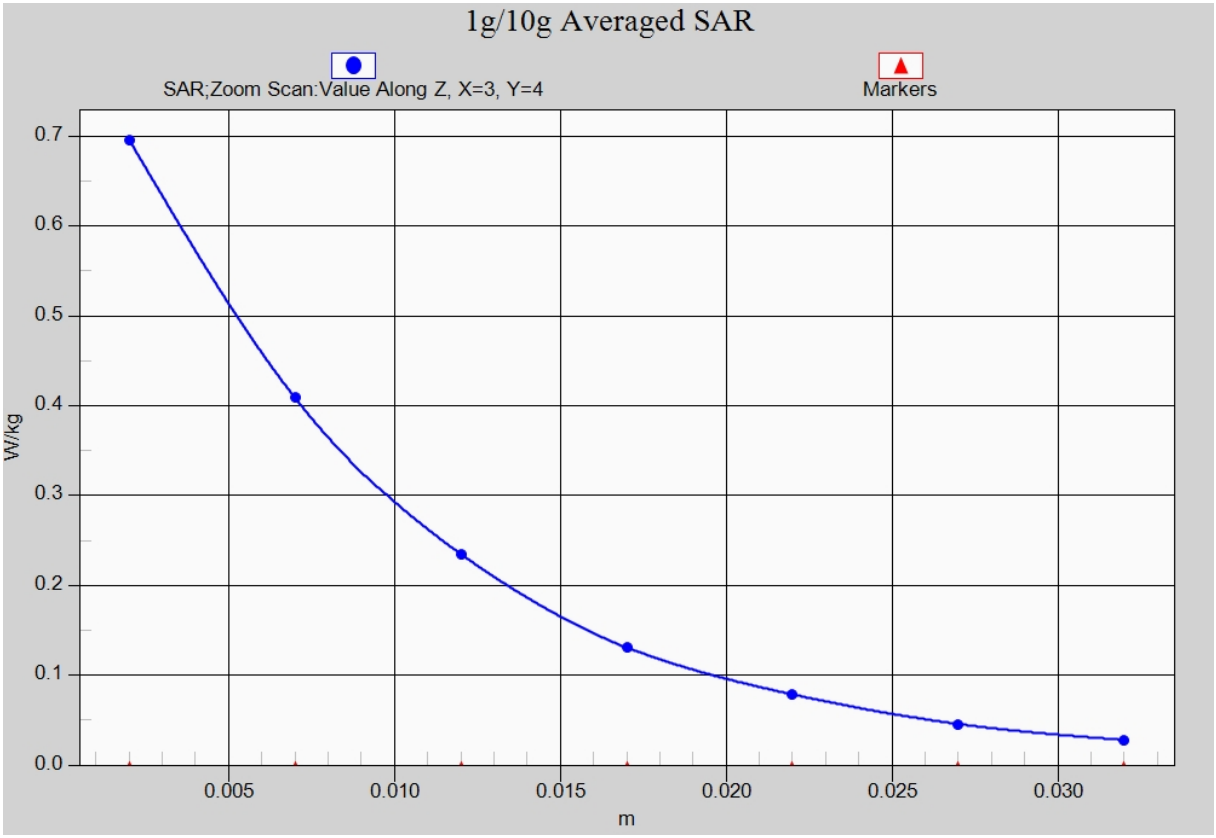


Fig. 21-1 Z-Scan at power reference point (LTE Band7 CH20850)

LTE Band17 Left Cheek High with QPSK_10M_1RB_Low – AP OFF
Date: 2014-1-24
Electronics: DAE4 Sn771
Medium: Head 750 MHz
Medium parameters used (interpolated): f = 711 MHz; σ = 0.849 mho/m; εr = 42.05; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: LTE Band17 Frequency: 711 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(9.32, 9.32, 9.32)

Cheek High/Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.184 W/kg

Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.670 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.201 W/kg
SAR(1 g) = 0.179 W/kg; SAR(10 g) = 0.148 W/kg
Maximum value of SAR (measured) = 0.183 W/kg

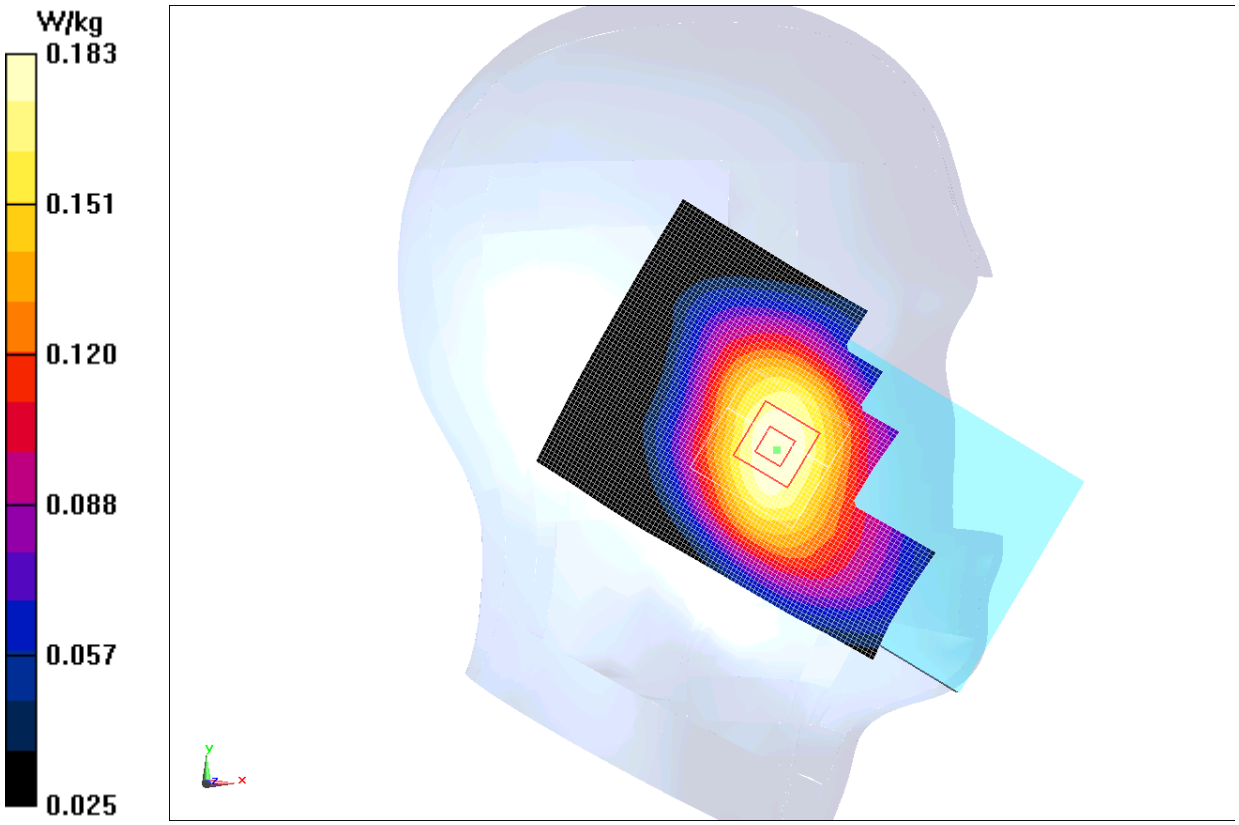


Fig.22 LTE Band17 CH23800

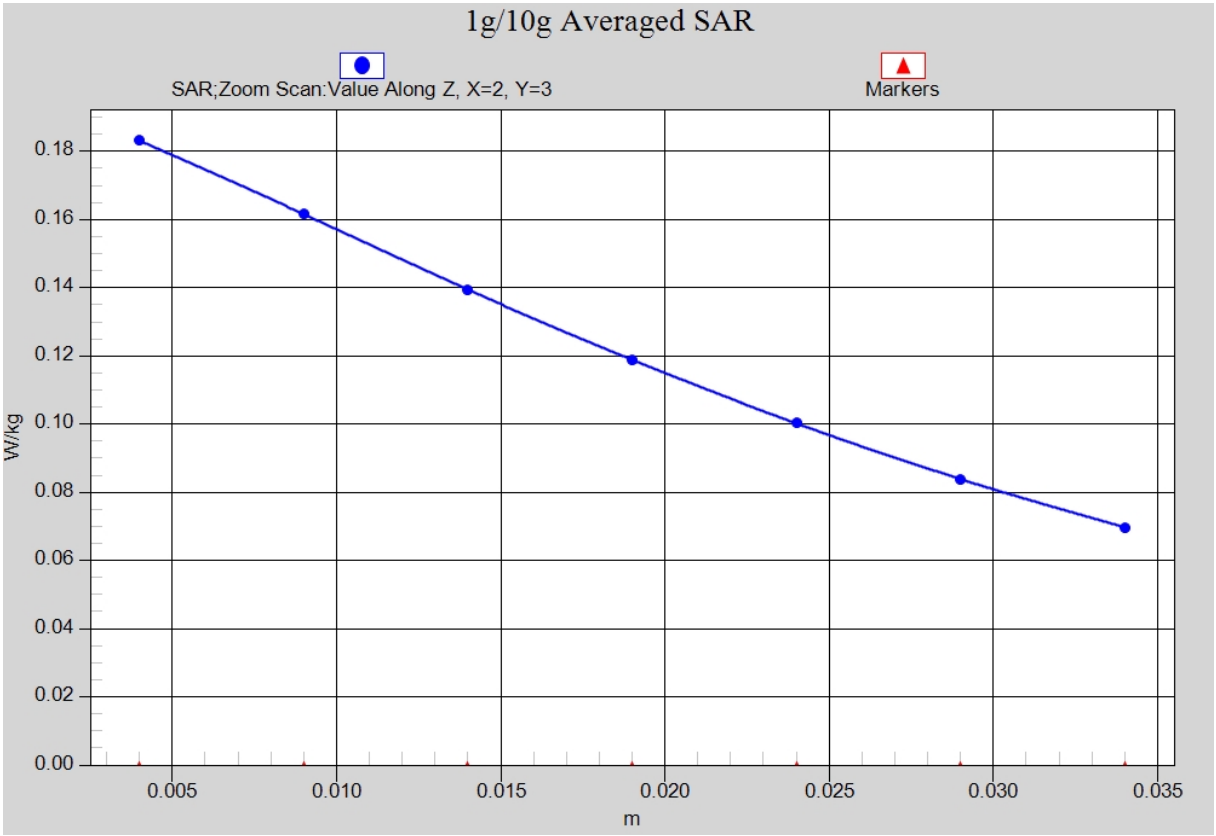


Fig. 22-1 Z-Scan at power reference point (LTE Band17 CH23800)

LTE Band17 Body Rear High with QPSK_10M_1RB_Low – AP OFF
Date: 2014-1-24
Electronics: DAE4 Sn771
Medium: Body 750 MHz
Medium parameters used (interpolated): f = 711 MHz; σ = 0.959 mho/m; εr = 56.48; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: LTE Band17 Frequency: 711 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(8.96, 8.96, 8.96)

Rear High/Area Scan (71x131x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.354 W/kg

Rear High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.222 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.417 W/kg
SAR(1 g) = 0.340 W/kg; SAR(10 g) = 0.273 W/kg
Maximum value of SAR (measured) = 0.355 W/kg

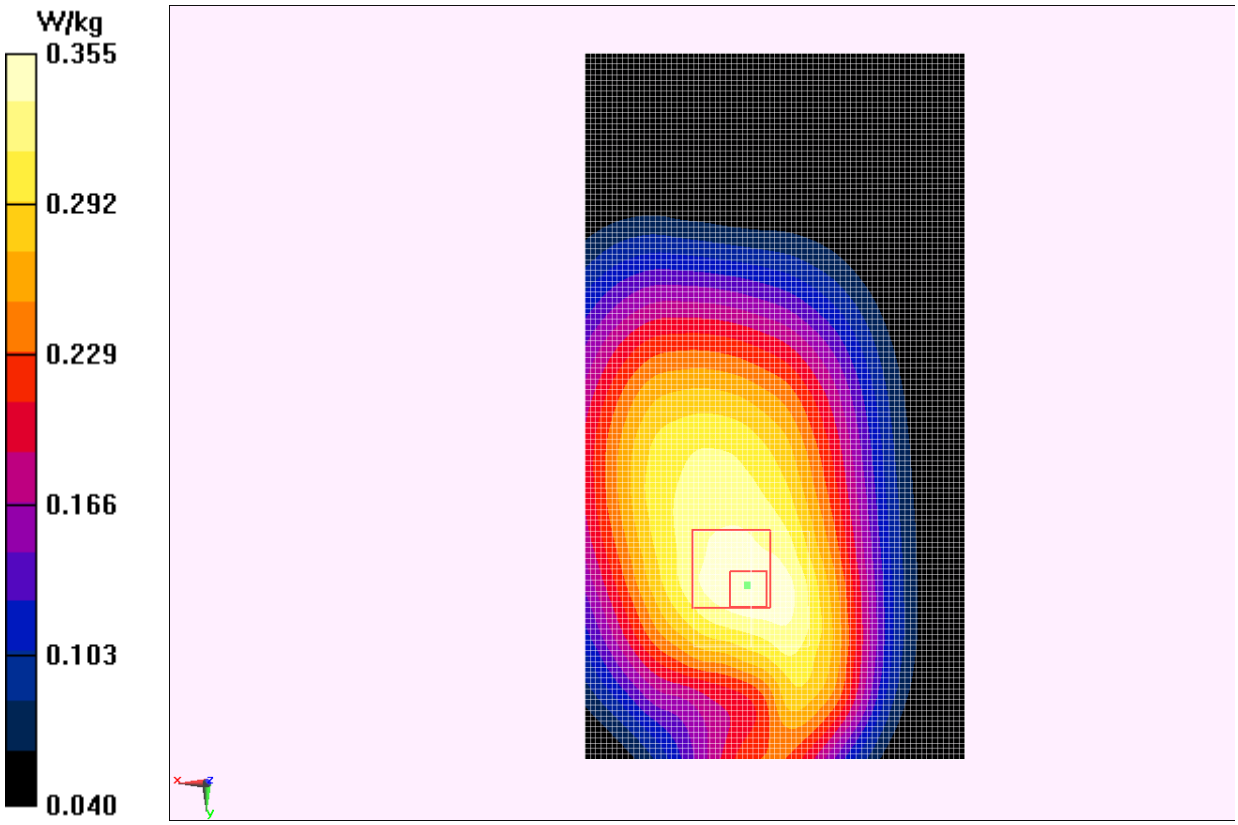


Fig.23 LTE Band17 CH23800

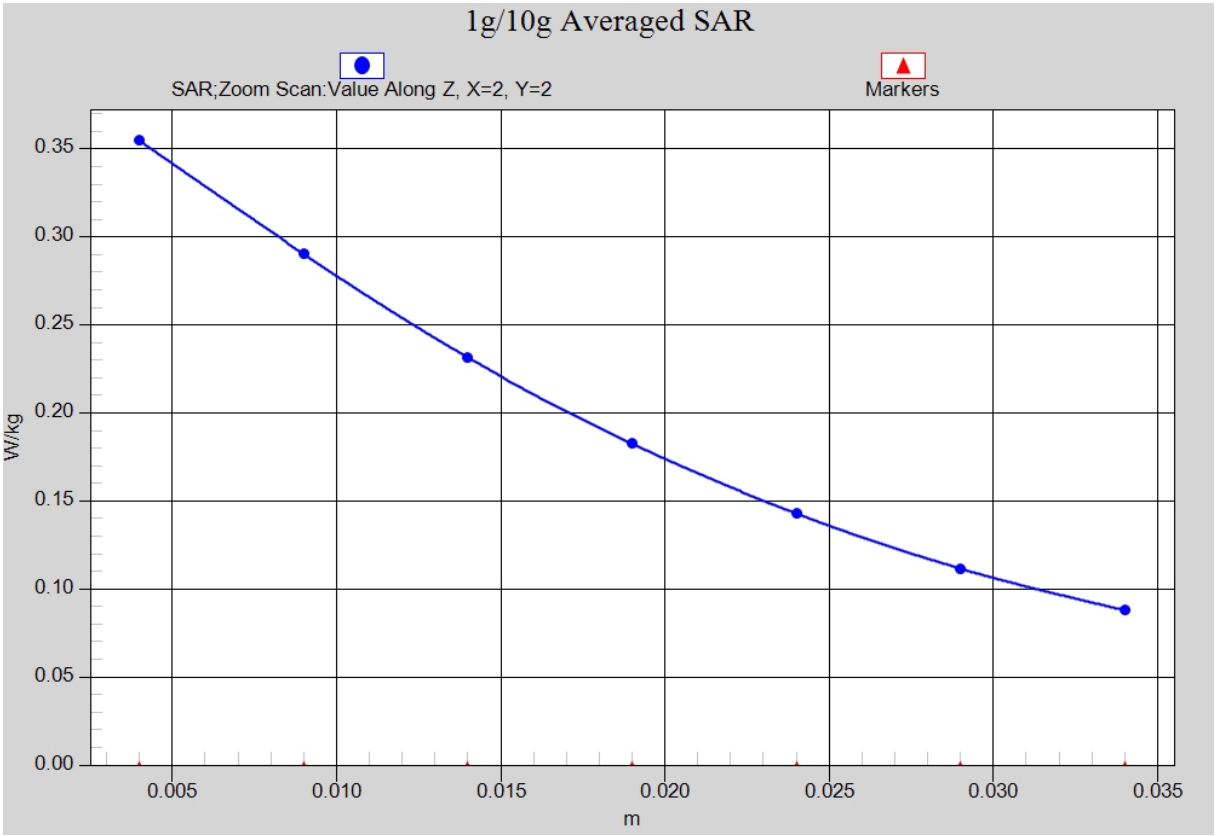


Fig. 23-1 Z-Scan at power reference point (LTE Band17 CH23800)

Wifi 802.11b Left Cheek Channel 6 – AP OFF
Date: 2014-1-16
Electronics: DAE4 Sn771
Medium: Head 2450 MHz
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.824 mho/m; ε_r = 39.502; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: WLan 2450 Frequency: 2437 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(6.78, 6.78, 6.78)

Cheek Middle/Area Scan (91x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.435 W/kg

Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.187 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.686 W/kg
SAR(1 g) = 0.299 W/kg; SAR(10 g) = 0.137 W/kg
Maximum value of SAR (measured) = 0.469 W/kg

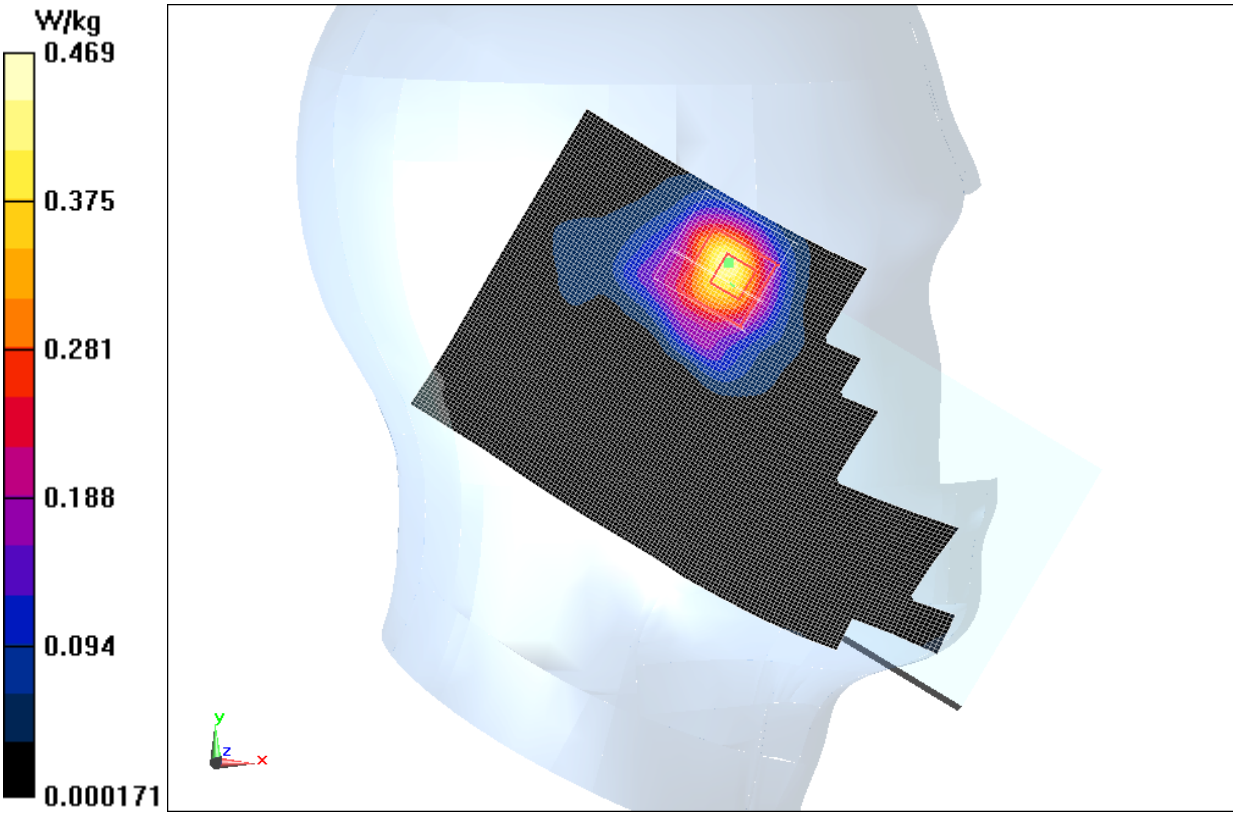


Fig.24 2450 MHz CH6

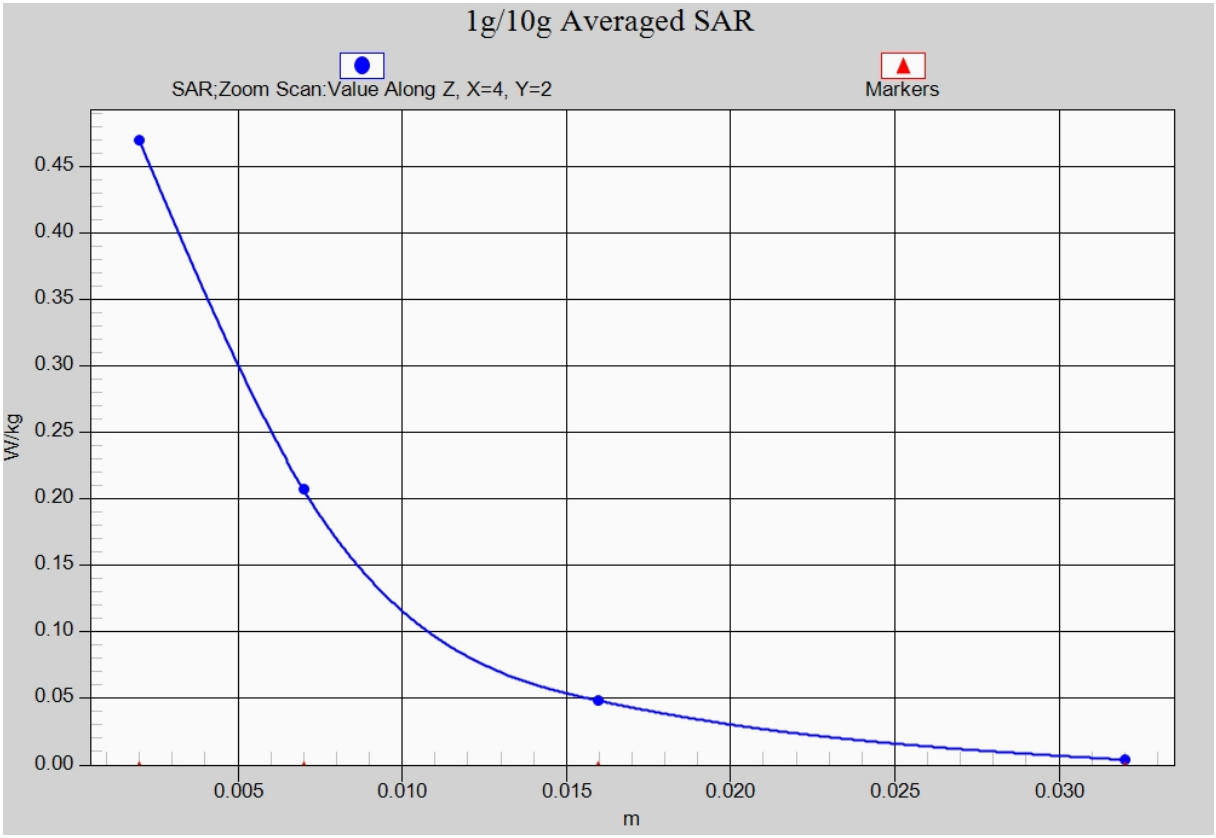


Fig. 24-1 Z-Scan at power reference point (2450 MHz CH6)

Wifi 802.11b Body Right Edge Channel 6 – AP OFF
Date: 2014-1-16
Electronics: DAE4 Sn771
Medium: Body 2450 MHz
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.947 mho/m; ε_r = 53.093; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: WLan 2450 Frequency: 2437 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(6.73, 6.73, 6.73)

Right Edge Middle/Area Scan (91x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.217 W/kg

Right Edge Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.027 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.300 W/kg
SAR(1 g) = 0.158 W/kg; SAR(10 g) = 0.076 W/kg
Maximum value of SAR (measured) = 0.235 W/kg

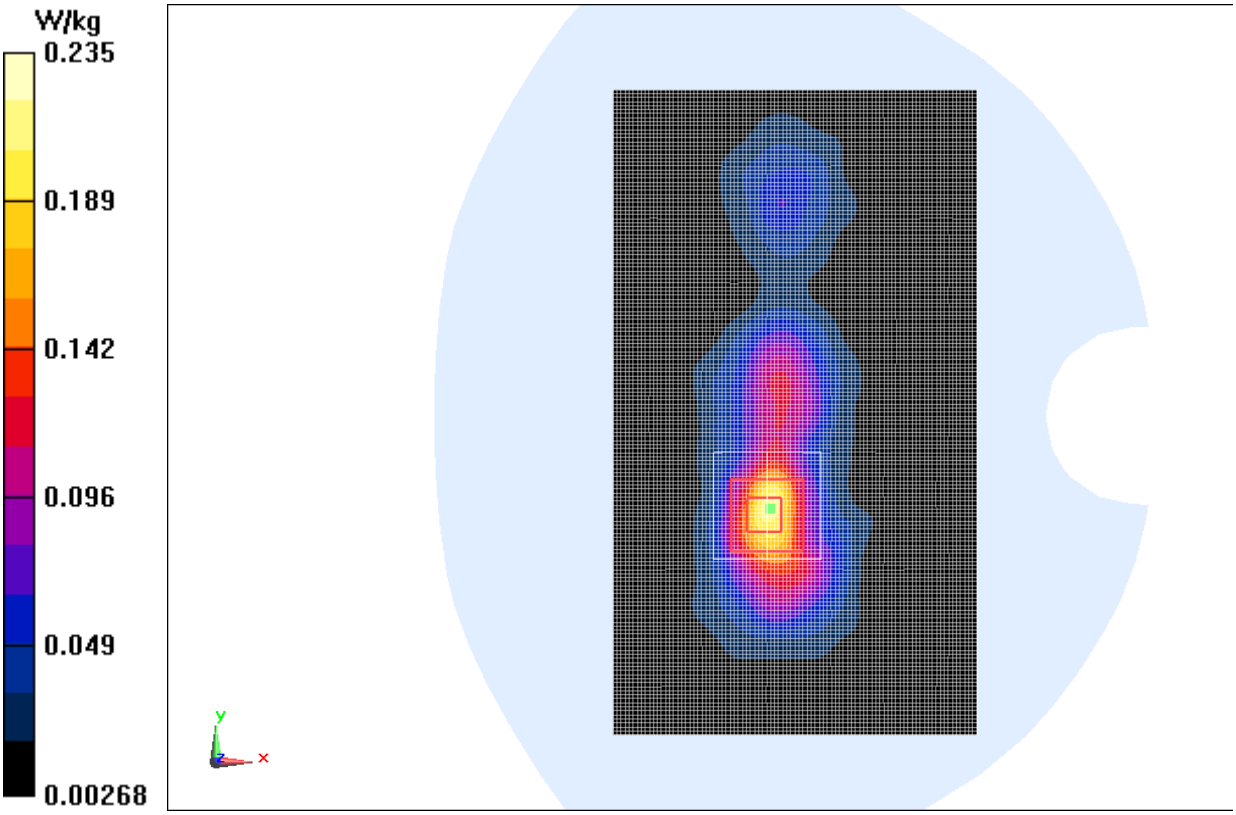


Fig.25 2450 MHz CH6

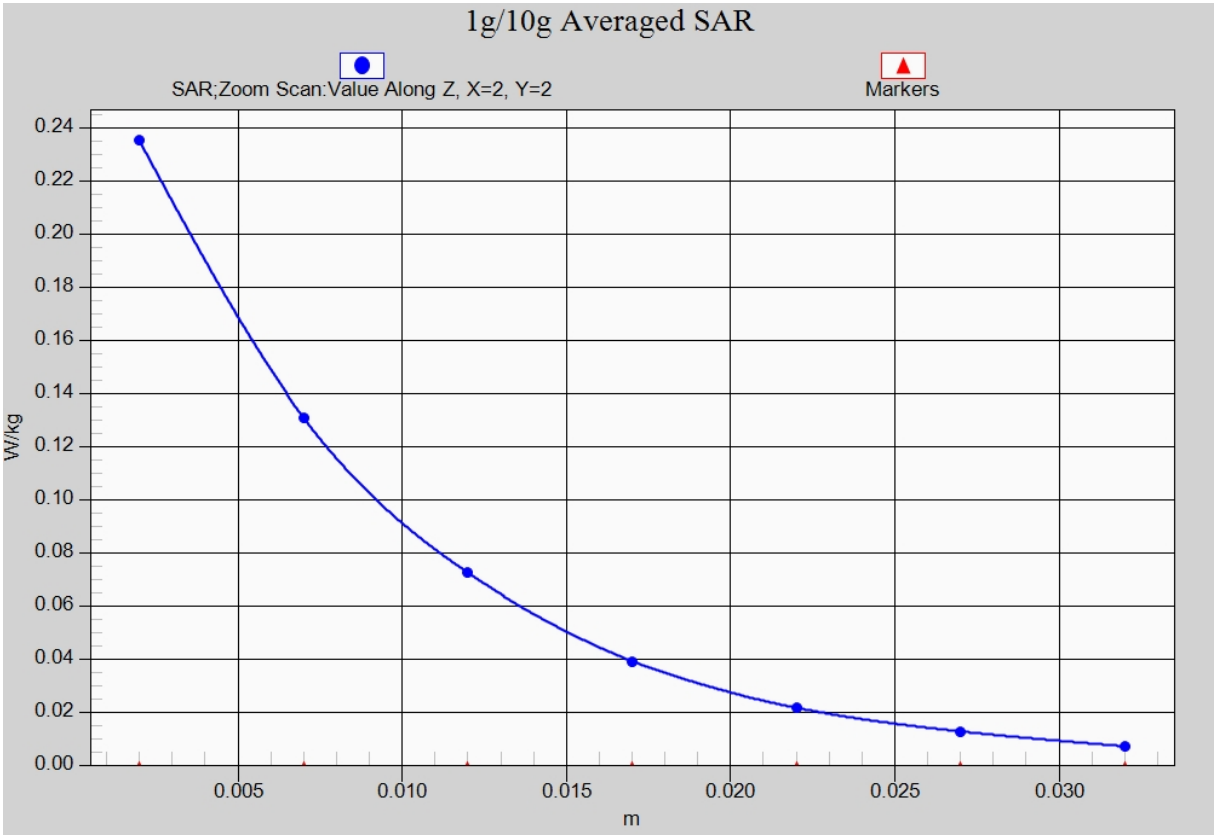


Fig. 25-1 Z-Scan at power reference point (2450 MHz CH6)

Wifi 802.11a Left Cheek Channel 132
Date: 2014-1-26
Electronics: DAE4 Sn771
Medium: Head 5 GHz
Medium parameters used: f = 5660 MHz; σ = 5.227 mho/m; ε_r = 35.381; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: WLan 5G Frequency: 5660 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(4.52, 4.52, 4.52)

Cheek/Area Scan (101x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.284 W/kg

Cheek/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.551 W/kg
SAR(1 g) = 0.090 W/kg; SAR(10 g) = 0.027 W/kg
Maximum value of SAR (measured) = 0.211 W/kg

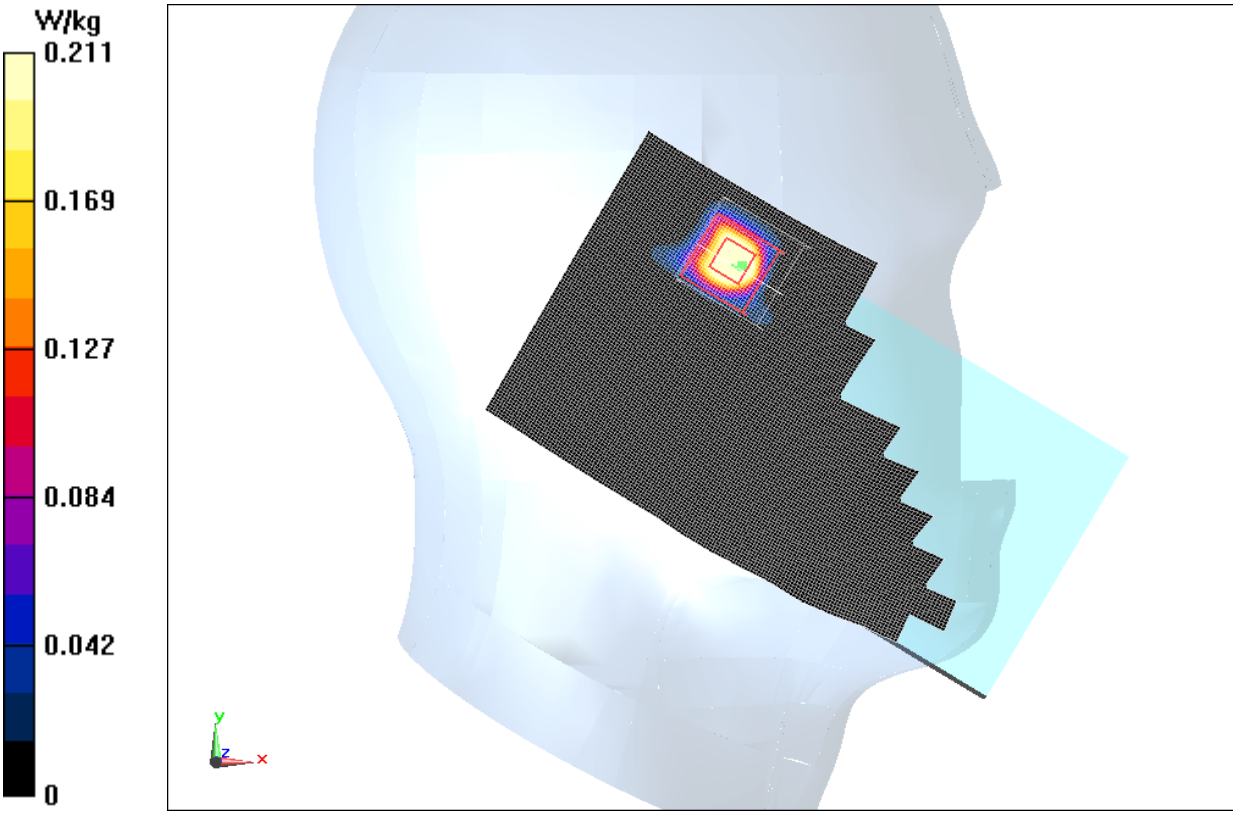


Fig.26 5GHz CH132

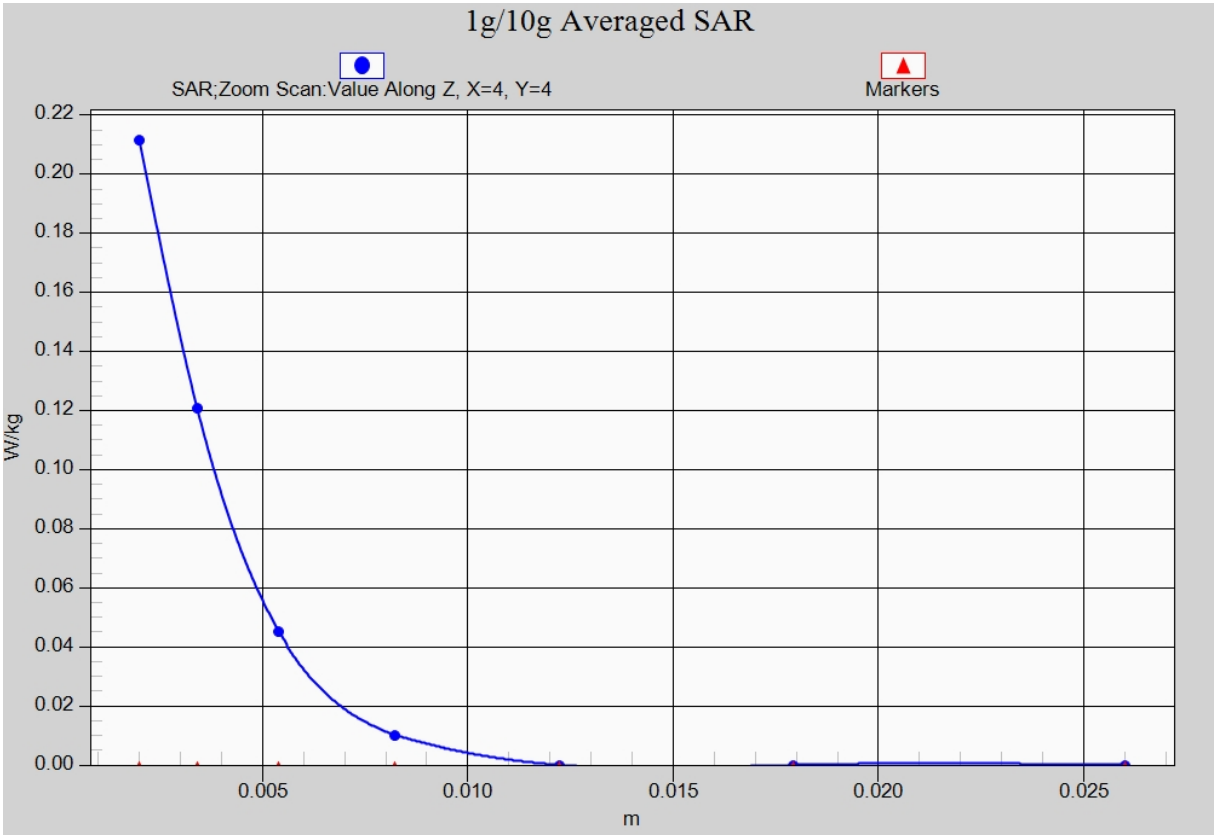


Fig. 26-1 Z-Scan at power reference point (5GHz CH132)

Wifi 802.11a Rear Channel 40
Date: 2014-1-25
Electronics: DAE4 Sn771
Medium: Body 5 GHz
Medium parameters used: f = 5200 MHz; σ = 5.175 mho/m; ε_r = 48.53; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: WLan 5G Frequency: 5200 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(4.36, 4.36, 4.36)

Rear/Area Scan (101x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.301 W/kg

Rear/Zoom Scan (8x8x18)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0.689 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.506 W/kg
SAR(1 g) = 0.154 W/kg; SAR(10 g) = 0.054 W/kg
Maximum value of SAR (measured) = 0.288 W/kg

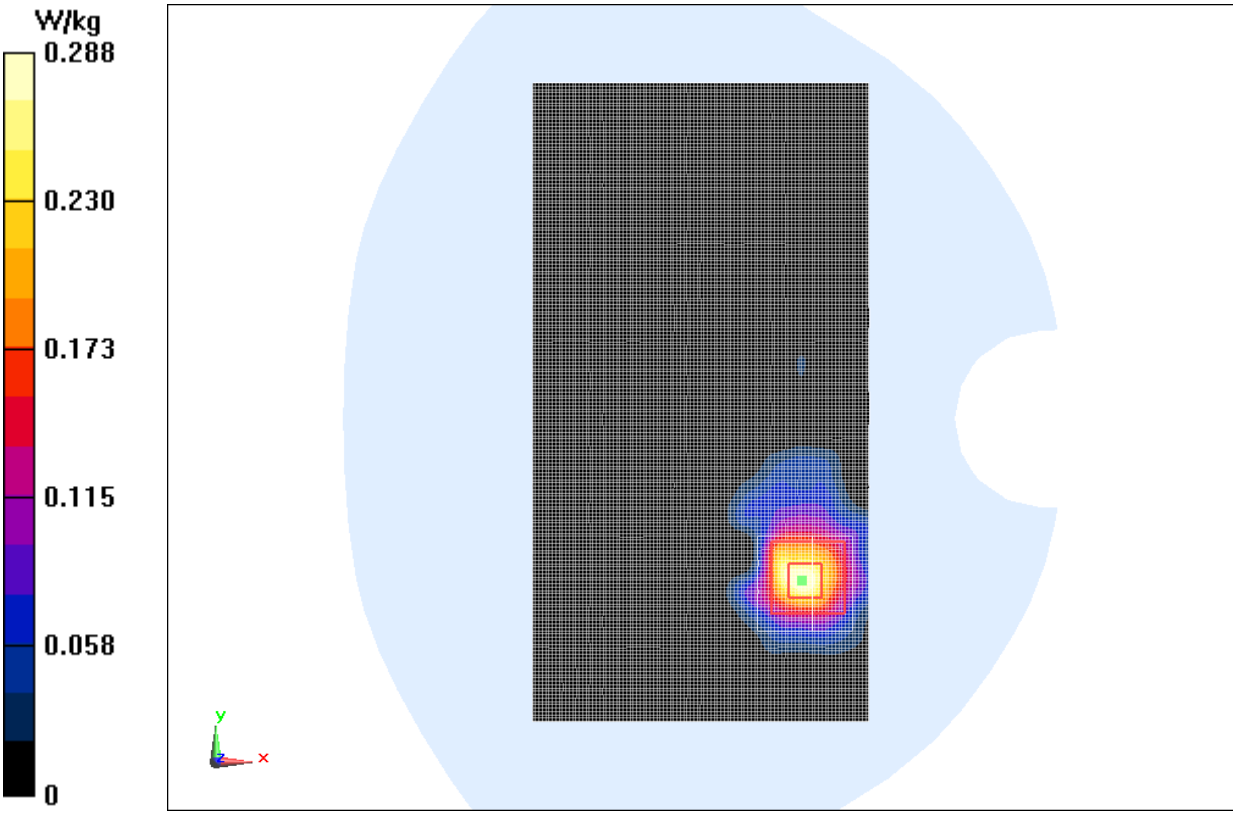


Fig.27 5GHz CH40

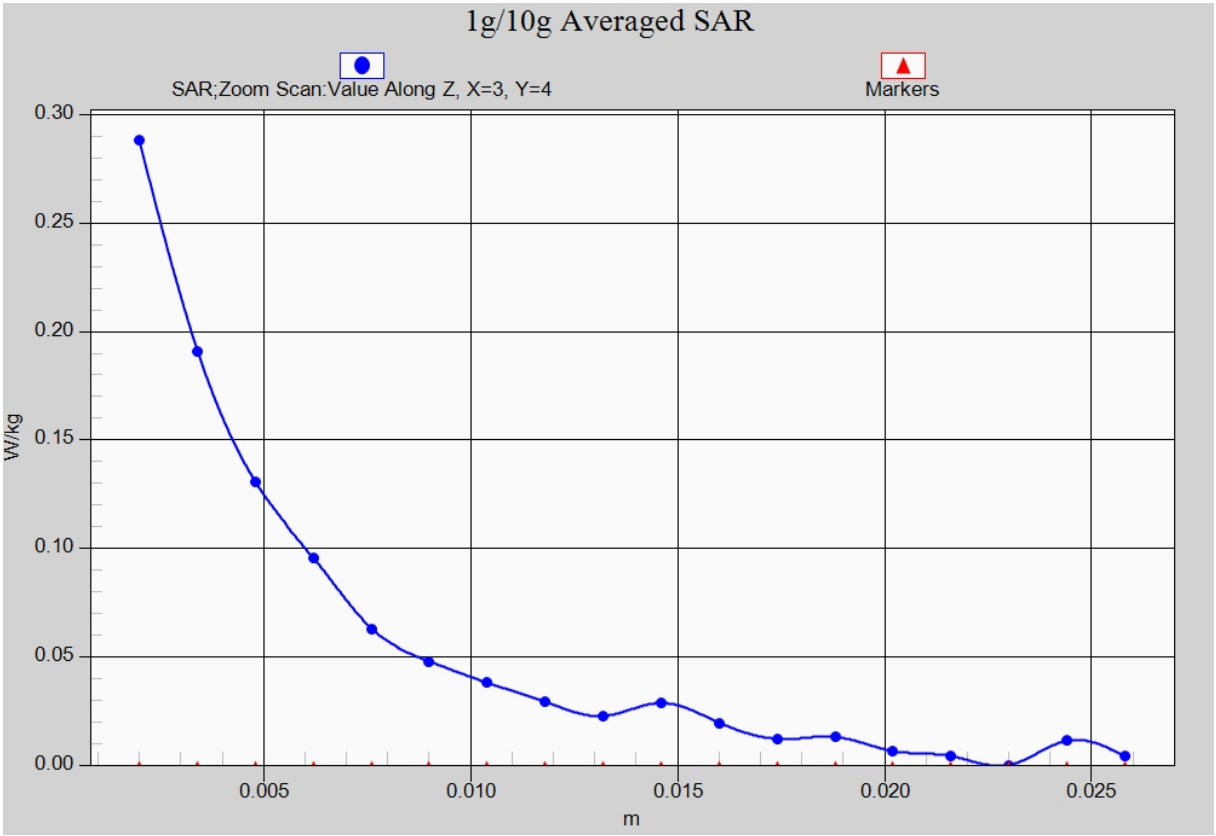


Fig. 27-1 Z-Scan at power reference point (5GHz CH40)

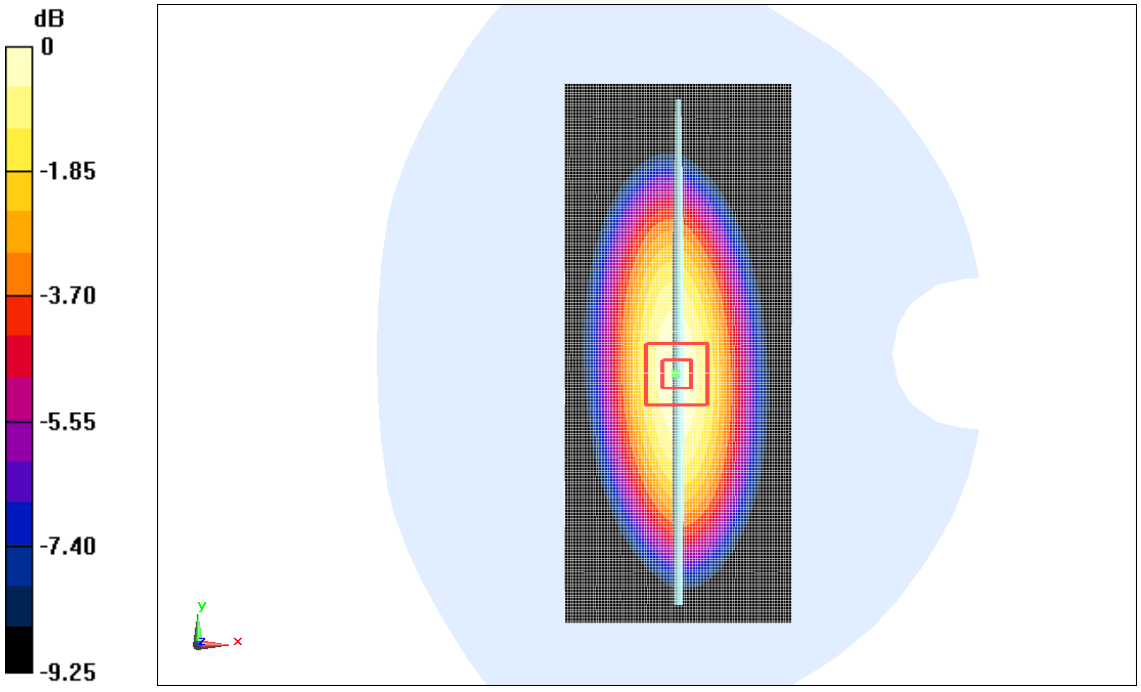
ANNEX B System Verification Results

750MHz

Date: 2014-1-24
Electronics: DAE4 Sn771
Medium: Head 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.907 mho/m; ε_r = 40.99; ρ = 1000 kg/m^3
Ambient Temperature: 22.2^{o}C Liquid Temperature: 21.7^{o}C
Communication System: CW Frequency: 750 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(9.32, 9.32, 9.32)

System Validation /Area Scan (81x191x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 50.689 V/m; Power Drift = -0.15 dB
Fast SAR: SAR(1 g) = 2.19 W/kg; SAR(10 g) = 1.44 W/kg
Maximum value of SAR (interpolated) = 2.33 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 50.689 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 3.04 W/kg
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.41 W/kg
Maximum value of SAR (measured) = 2.31 W/kg



0 dB = 2.33 W/kg = 7.35 dB W/kg

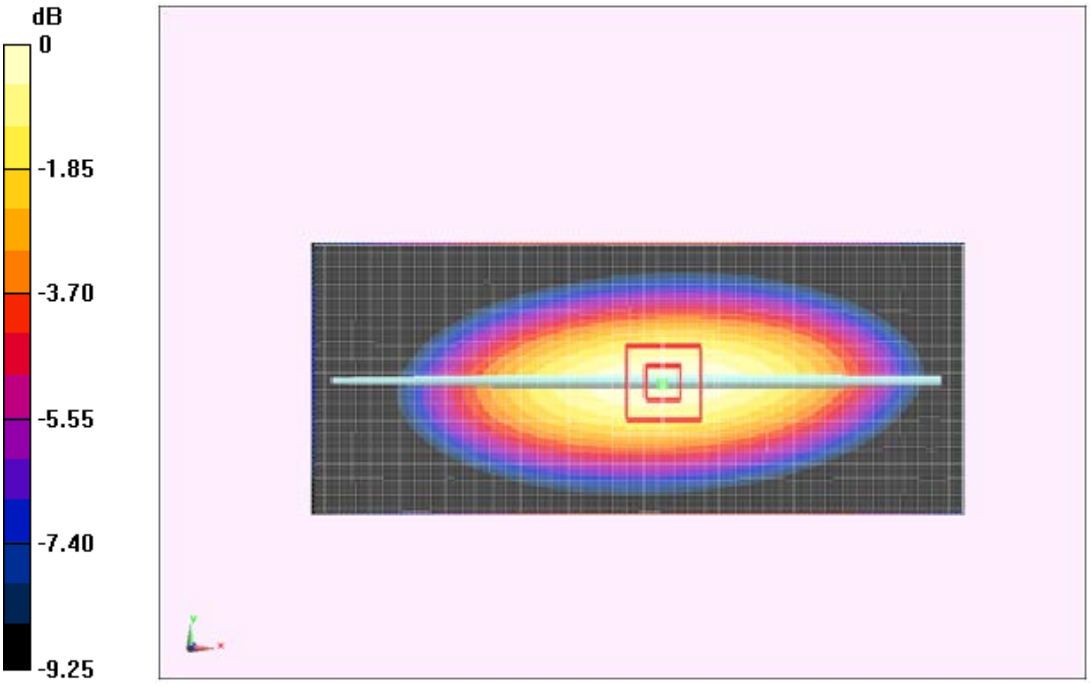
Fig.B.1 validation 750MHz 250mW

750MHz

Date: 2014-1-24
Electronics: DAE4 Sn771
Medium: Body 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.978 mho/m; ε_r = 55.89; ρ = 1000 kg/m^3
Ambient Temperature: 22.2^{o}C Liquid Temperature: 21.7^{o}C
Communication System: CW Frequency: 750 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(8.96, 8.96, 8.96)

System Validation /Area Scan (81x191x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 51.035 V/m; Power Drift = -0.09 dB
Fast SAR: SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.44 W/kg
Maximum value of SAR (interpolated) = 2.31 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.035 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 3.05 W/kg
SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.42 W/kg
Maximum value of SAR (measured) = 2.31 W/kg



0 dB = 2.31 W/kg = 7.27 dB W/kg

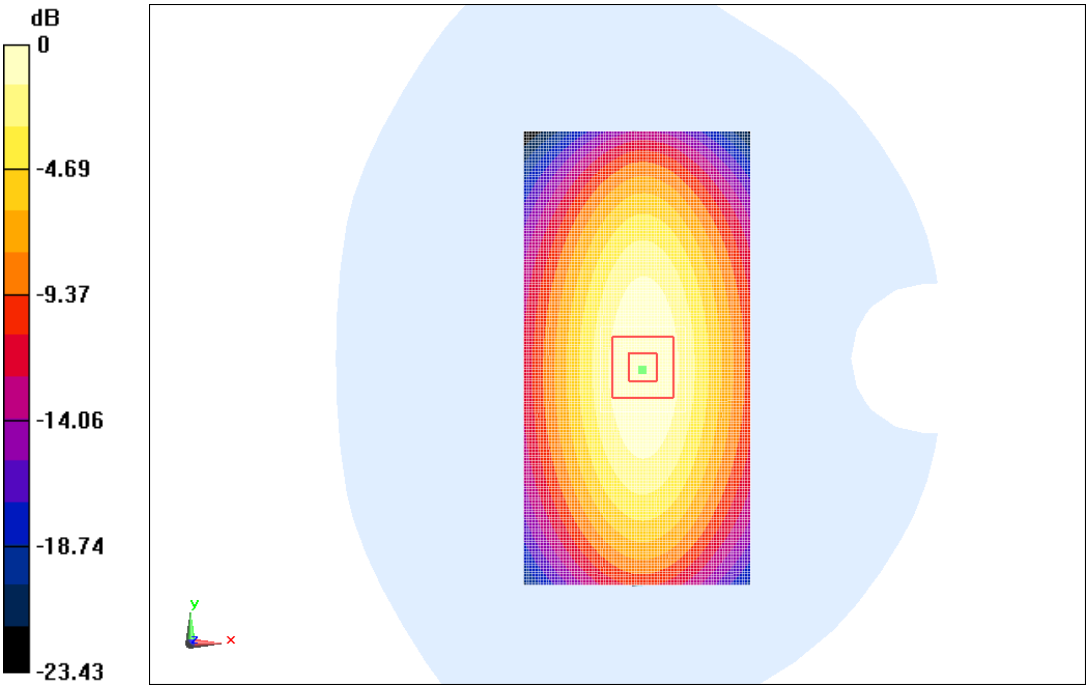
Fig.B.2 validation 750MHz 250mW

835MHz

Date: 2014-1-21
Electronics: DAE4 Sn771
Medium: Head 850 MHz
Medium parameters used: f = 835 MHz; σ = 0.911 mho/m; ε_r = 42.25; ρ = 1000 kg/m^3
Ambient Temperature: 22.3^{o}C Liquid Temperature: 21.8^{o}C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(8.92, 8.92, 8.92)

System Validation /Area Scan (81x161x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 52.537 V/m; Power Drift = 0.13 dB
Fast SAR: SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (interpolated) = 2.57 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.537 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 3.51 W/kg
SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.56 W/kg
Maximum value of SAR (measured) = 2.58 W/kg



0 dB = 2.57 W/kg = 8.20 dB W/kg

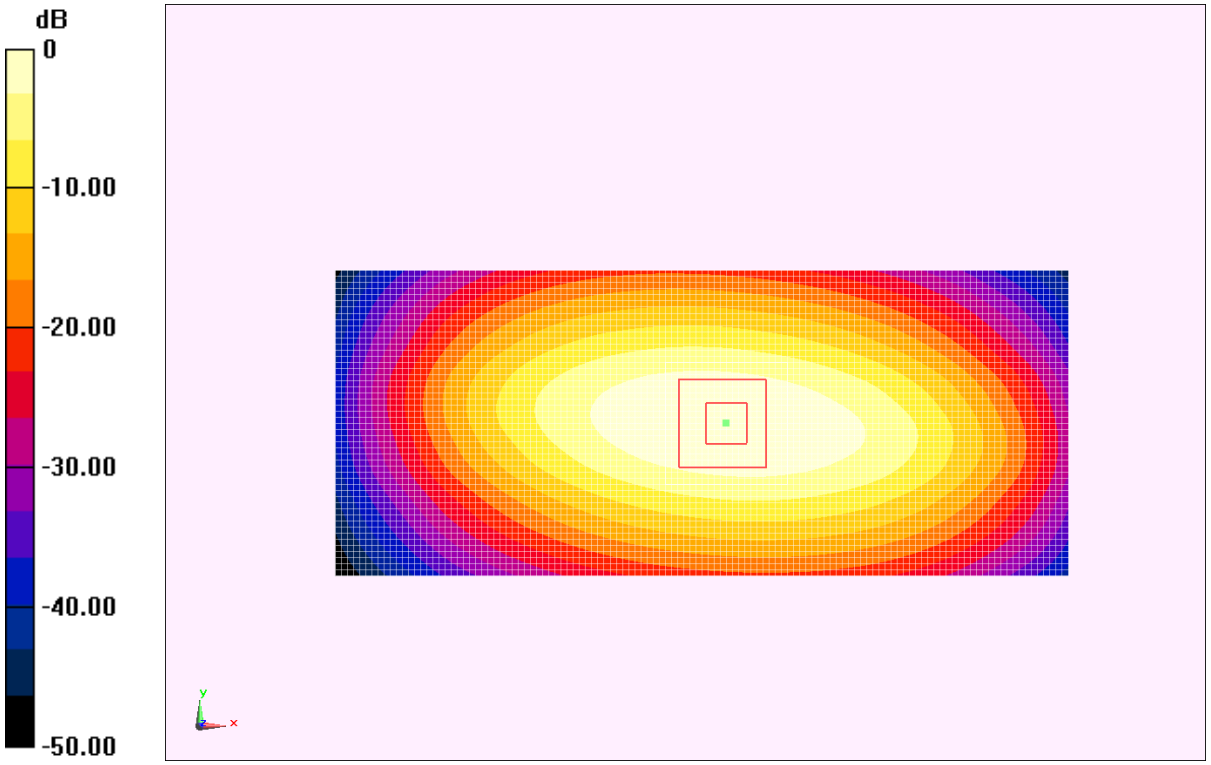
Fig.B.3 validation 835MHz 250mW

835MHz

Date: 2014-1-21
Electronics: DAE4 Sn771
Medium: Body 850 MHz
Medium parameters used: f = 835 MHz; σ = 0.963 mho/m; ε_r = 56.02; ρ = 1000 kg/m^3
Ambient Temperature: 22.3^{o}C Liquid Temperature: 21.8^{o}C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(8.73, 8.73, 8.73)

System Validation /Area Scan (81x171x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 46.38 V/m; Power Drift = 0.07 dB
Fast SAR: SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.60 W/kg
Maximum value of SAR (interpolated) = 2.59 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 46.38 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 2.57 W/kg



0 dB = 2.59 W/kg = 8.27 dB W/kg

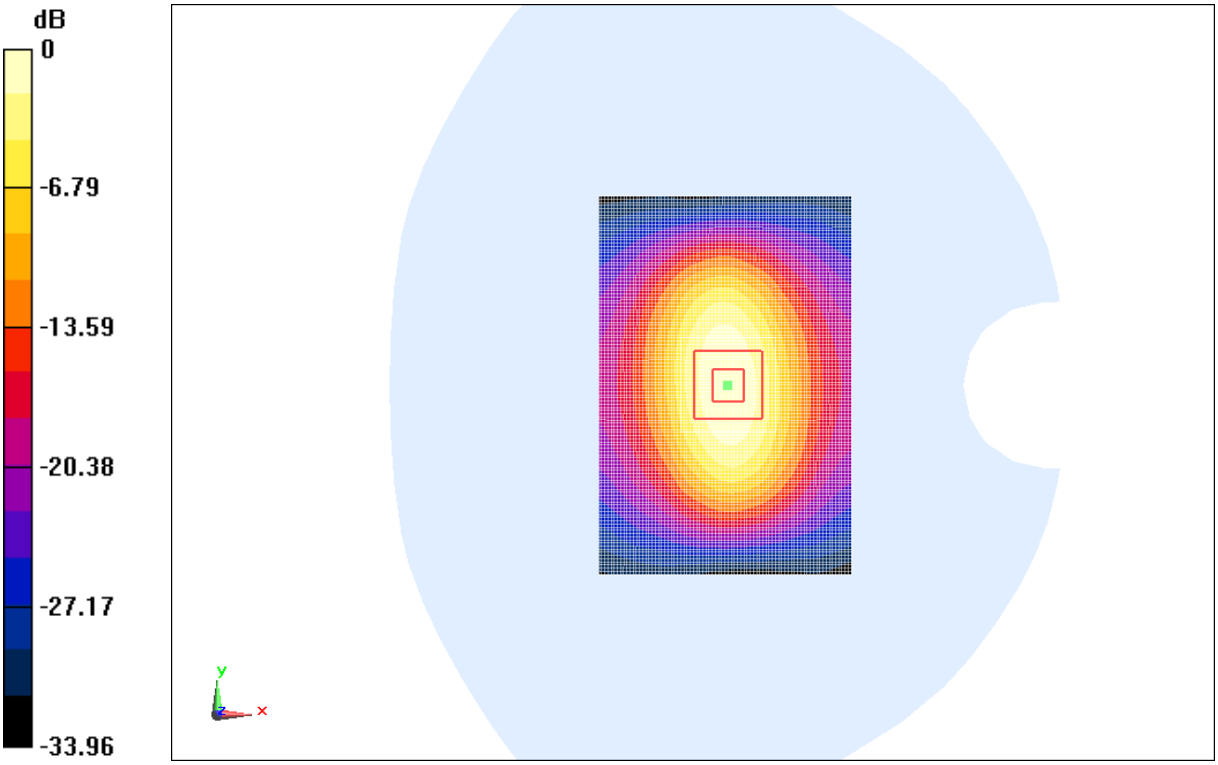
Fig.B.4 validation 835MHz 250mW

1750MHz

Date: 2014-1-22
Electronics: DAE4 Sn771
Medium: Head 1750 MHz
Medium parameters used: f=1750 MHz; σ = 1.367 mho/m; εr = 39.31; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: CW Frequency: 1750 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(7.85, 7.85, 7.85)

System Validation/Area Scan (81x121x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 94.112 V/m; Power Drift = 0.06 dB
Fast SAR: SAR(1 g) = 9.36 W/kg; SAR(10 g) = 4.97 W/kg
Maximum value of SAR (interpolated) = 10.6 W/kg

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.112 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 16.50 W/kg
SAR(1 g) = 9.39 W/kg; SAR(10 g) = 4.99 W/kg
Maximum value of SAR (measured) = 10.6 W/kg



0 dB = 10.6 W/kg = 20.51 dB W/kg

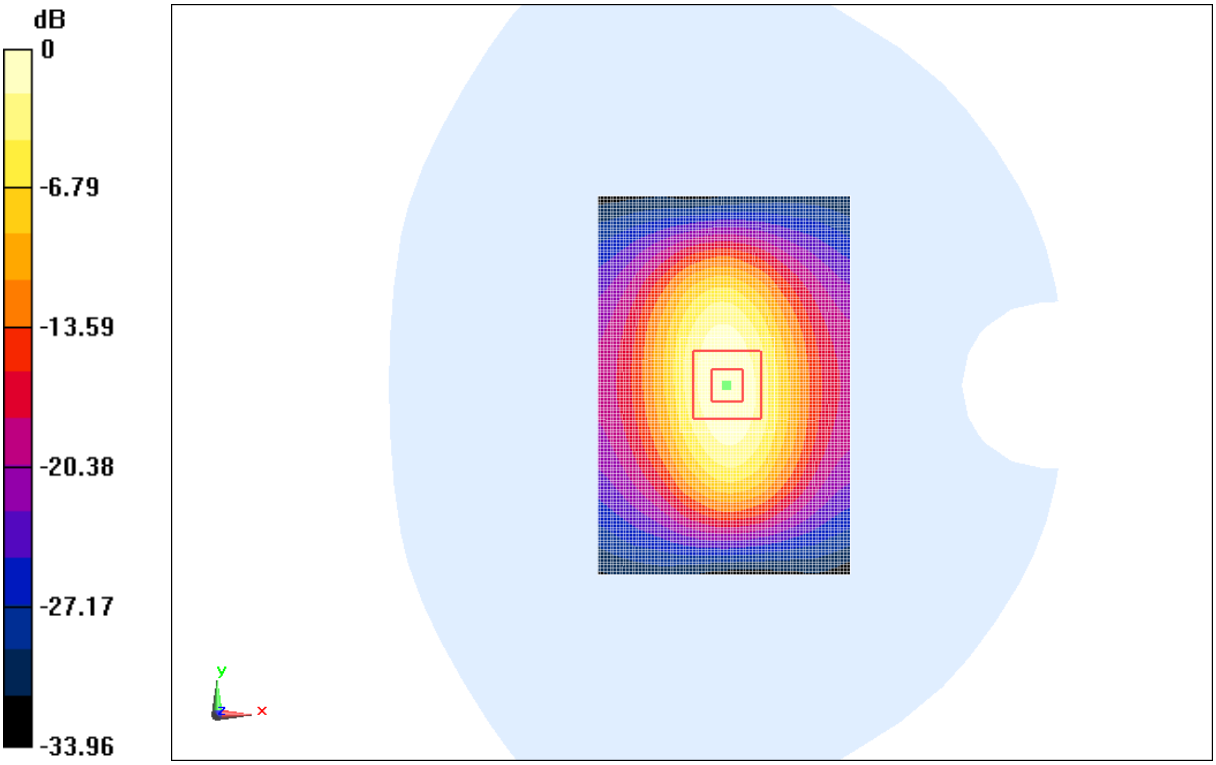
Fig.B.5 validation 1750MHz 250mW

1750MHz

Date: 2014-1-22
Electronics: DAE4 Sn771
Medium: Body 1750 MHz
Medium parameters used: f=1750 MHz; σ = 1.483 mho/m; εr = 53.45; ρ = 1000 kg/m^3
Ambient Temperature: 22.3^{o}C Liquid Temperature: 21.8^{o}C
Communication System: CW Frequency: 1750 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(7.56, 7.56, 7.56)

System Validation/Area Scan (81x121x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 94.488 V/m; Power Drift = -0.10 dB
Fast SAR: SAR(1 g) = 9.30 W/kg; SAR(10 g) = 5.04 W/kg
Maximum value of SAR (interpolated) = 10.7 W/kg

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.488 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 14.97 W/kg
SAR(1 g) = 9.32 W/kg; SAR(10 g) = 5.04 W/kg
Maximum value of SAR (measured) = 10.7 W/kg



0 dB = 10.7 W/kg = 20.59 dB W/kg

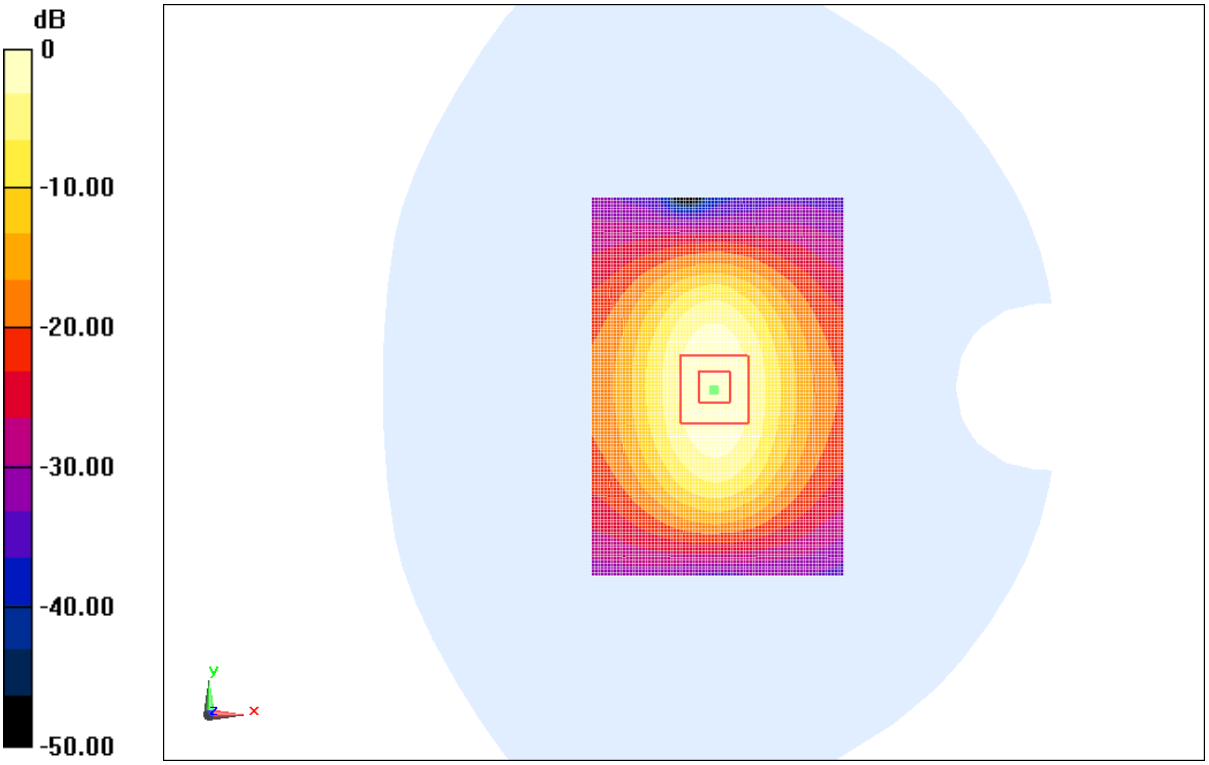
Fig.B.6 validation 1750MHz 250mW

1900MHz

Date: 2014-1-23
Electronics: DAE4 Sn771
Medium: Head 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.404 mho/m; ε_r = 39.01; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(7.57, 7.57, 7.57)

System Validation/Area Scan (81x121x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 97.391 V/m; Power Drift = -0.08 dB
Fast SAR: SAR(1 g) = 10.0 W/kg; SAR(10 g) = 5.30 W/kg
Maximum value of SAR (interpolated) = 11.3 W/kg

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.391 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 18.30 W/kg
SAR(1 g) = 9.89 W/kg; SAR(10 g) = 5.23 W/kg
Maximum value of SAR (measured) = 11.2 W/kg



0 dB = 11.3 W/kg = 21.06 dB W/kg

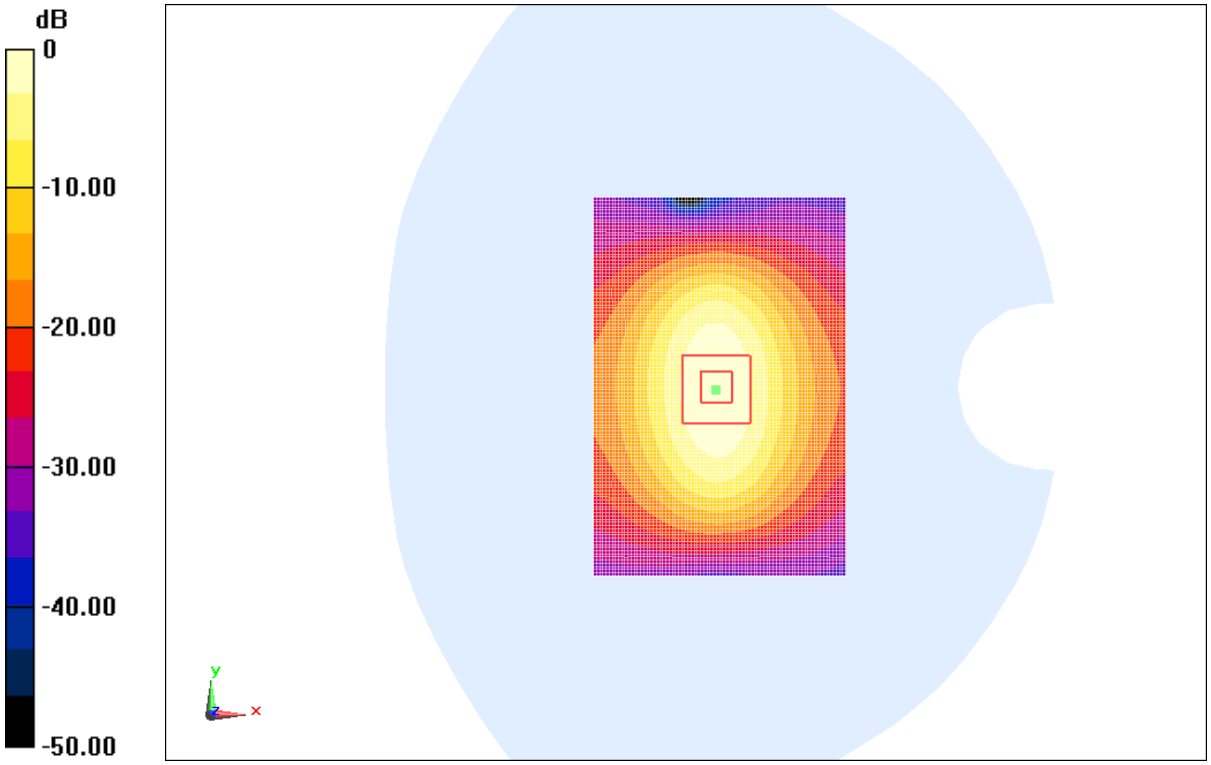
Fig.B.7 validation 1900MHz 250mW

1900MHz

Date: 2014-1-23
Electronics: DAE4 Sn771
Medium: Body 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.507 mho/m; ε_r = 51.69; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(7.03, 7.03, 7.03)

System Validation/Area Scan (81x121x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 83.712 V/m; Power Drift = 0.11 dB
Fast SAR: SAR(1 g) = 10.0 W/kg; SAR(10 g) = 5.30 W/kg
Maximum value of SAR (interpolated) = 11.4 W/kg

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 83.712 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 16.63 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.38 W/kg
Maximum value of SAR (measured) = 11.5 W/kg



0 dB = 11.4 W/kg = 21.14 dB W/kg

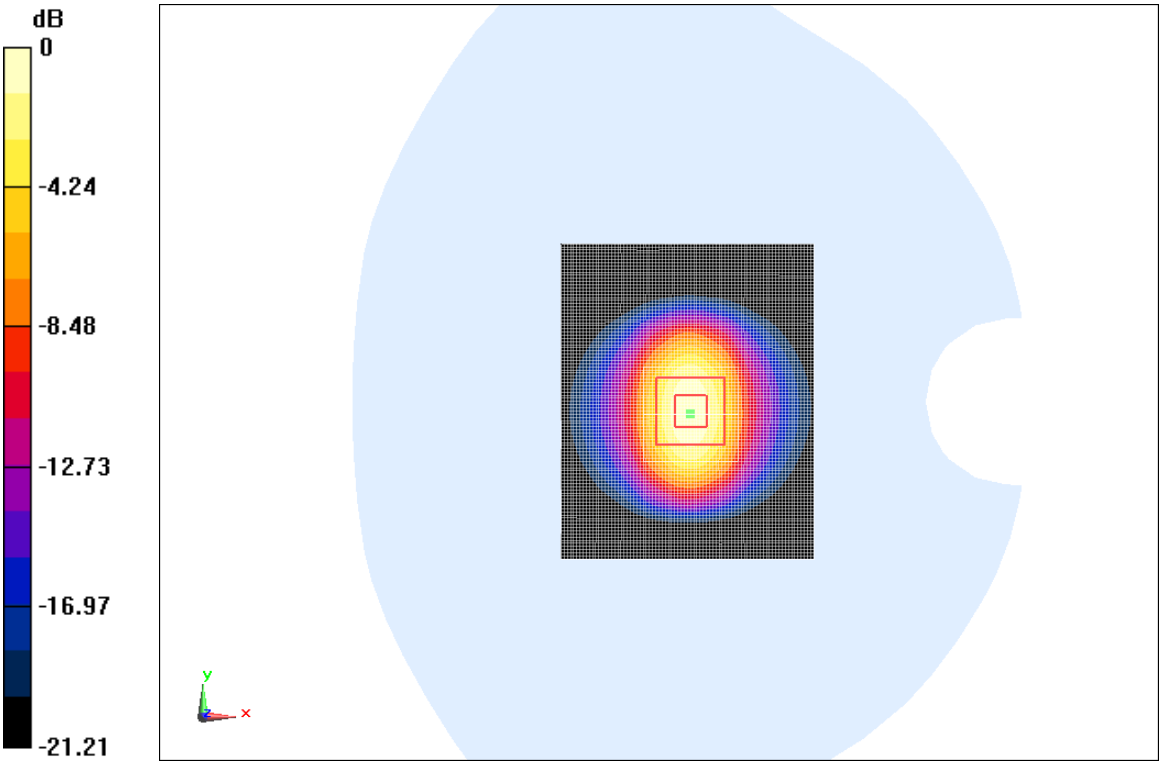
Fig.B.8 validation 1900MHz 250mW

2450MHz

Date: 2014-1-16
Electronics: DAE4 Sn771
Medium: Head 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.837 mho/m; ε_r = 39.44; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(6.78, 6.78, 6.78)

System Validation /Area Scan (81x101x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 97.057 V/m; Power Drift = -0.07 dB
Fast SAR: SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.30 W/kg
Maximum value of SAR (interpolated) = 15.1 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.057 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 26.19 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.21 W/kg
Maximum value of SAR (measured) = 15.0 W/kg



0 dB = 15.1 W/kg = 23.58 dB W/kg

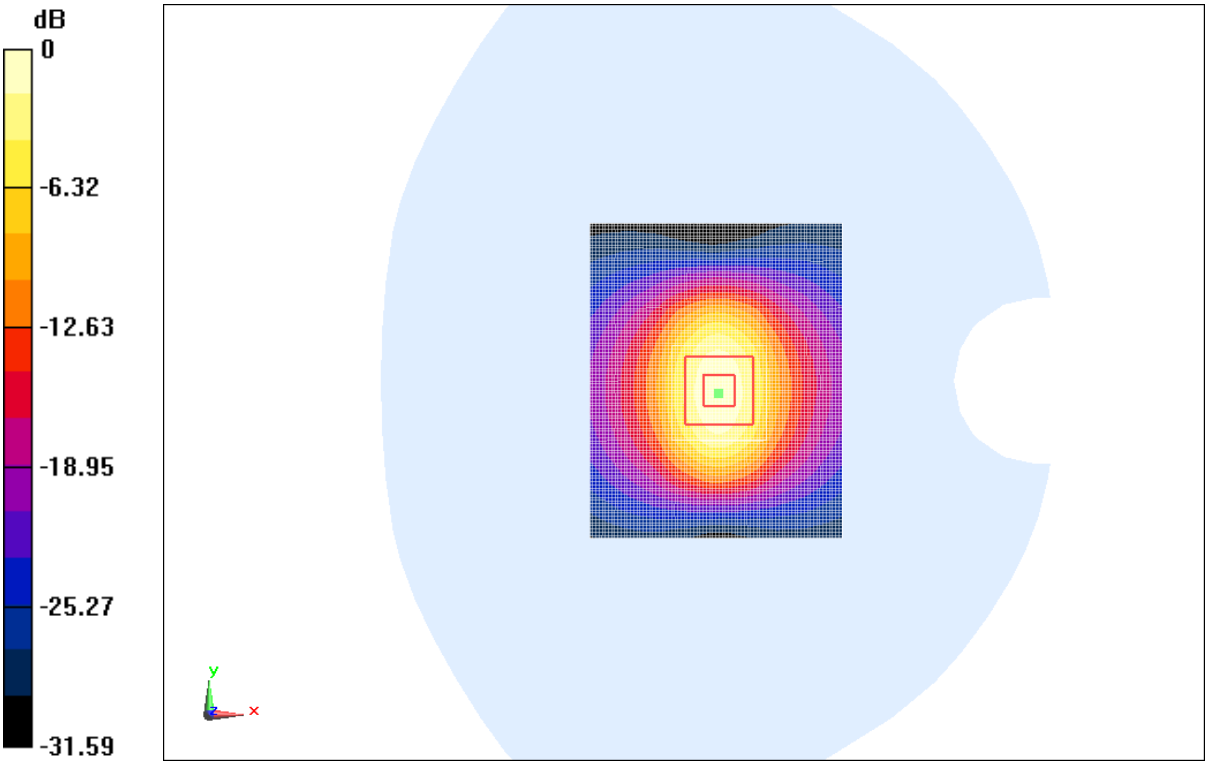
Fig.B.9 validation 2450MHz 250mW

2450MHz

Date: 2014-1-16
Electronics: DAE4 Sn771
Medium: Body 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.961 mho/m; ε_r = 53.05; ρ = 1000 kg/m^3
Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C
Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(6.73, 6.73, 6.73)

System Validation/Area Scan (81x101x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 95.497 V/m; Power Drift = 0.07 dB
Fast SAR: SAR(1 g) = 13.0 W/kg; SAR(10 g) = 6.12 W/kg
Maximum value of SAR (interpolated) = 14.9 W/kg

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.497 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 26.01 W/kg
SAR(1 g) = 12.9 W/kg; SAR(10 g) = 6.04 W/kg
Maximum value of SAR (measured) = 14.8 W/kg



0 dB = 14.9 W/kg = 23.46 dB W/kg

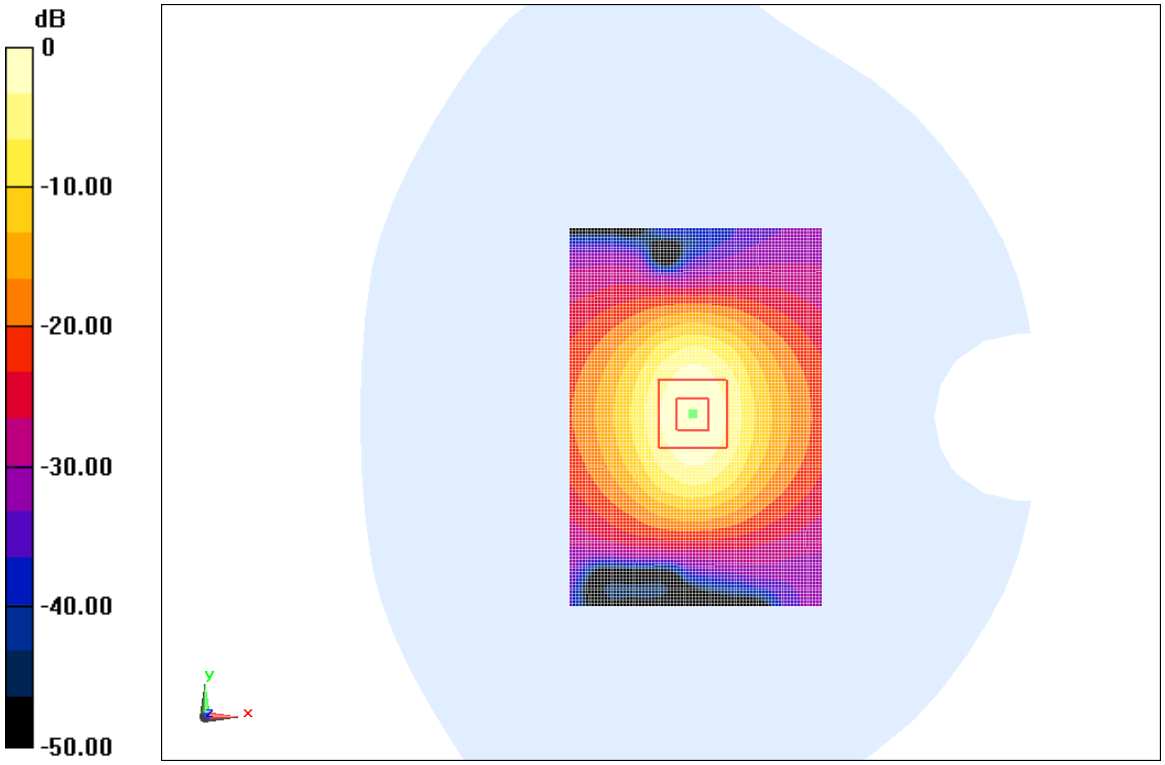
Fig.B.10 validation 2450MHz 250mW

2600MHz

Date: 2014-1-17
Electronics: DAE4 Sn771
Medium: Head 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 1.983 mho/m; ε_r = 39.31; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: CW Frequency: 2600 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(6.68, 6.68, 6.68)

System Validation /Area Scan (81x121x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 91.739 V/m; Power Drift = -0.06 dB
Fast SAR: SAR(1 g) = 14.4 W/kg; SAR(10 g) = 6.55 W/kg
Maximum value of SAR (interpolated) = 16.5 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.739 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 31.12 W/kg
SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.47 W/kg
Maximum value of SAR (measured) = 16.4 W/kg



0 dB = 16.5 W/kg = 24.35 dB W/kg

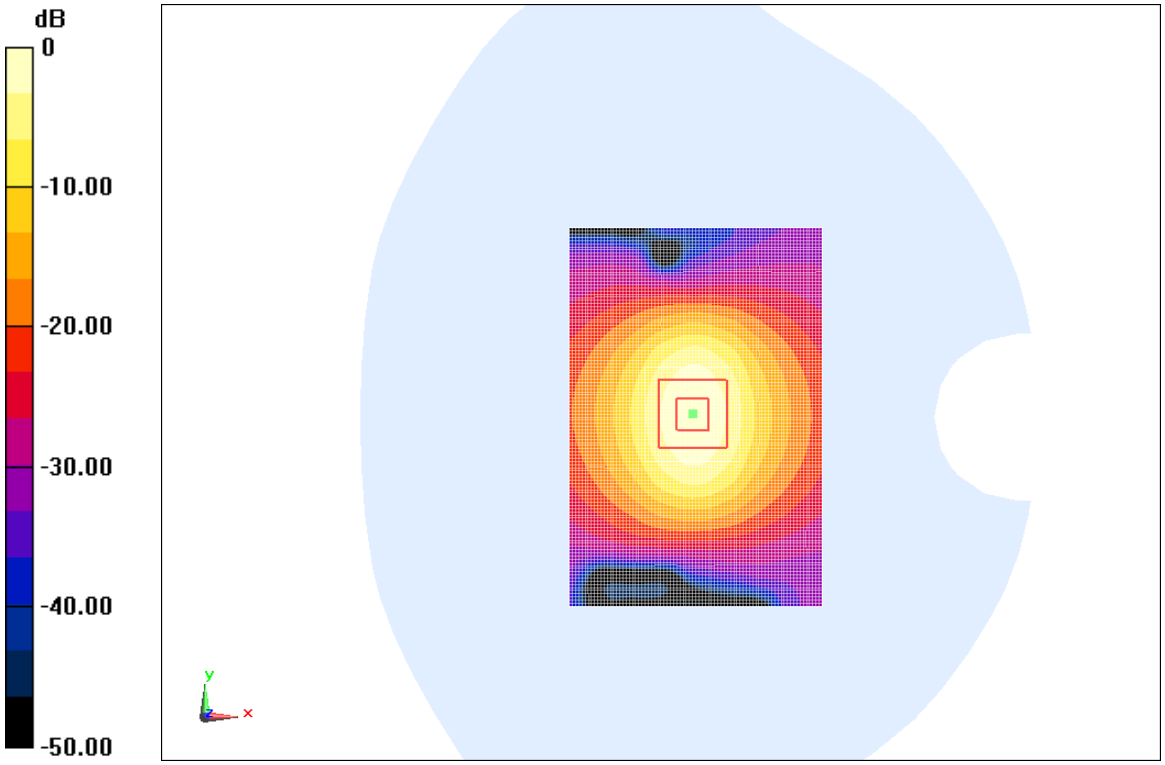
Fig.B.11 validation 2600MHz 250mW

2600MHz

Date: 2014-1-17
Electronics: DAE4 Sn771
Medium: Body 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.185 mho/m; ε_r = 52.98; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: CW Frequency: 2600 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(6.59, 6.59, 6.59)

System Validation /Area Scan (81x121x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 91.985 V/m; Power Drift = -0.14 dB
Fast SAR: SAR(1 g) = 14.4 W/kg; SAR(10 g) = 6.41 W/kg
Maximum value of SAR (interpolated) = 16.6 mW/g

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.985 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 31.11 mW/g
SAR(1 g) = 14.3 mW/g; SAR(10 g) = 6.32 mW/g
Maximum value of SAR (measured) = 16.5 mW/g



0 dB = 16.6 mW/g = 24.40 dB mW/g

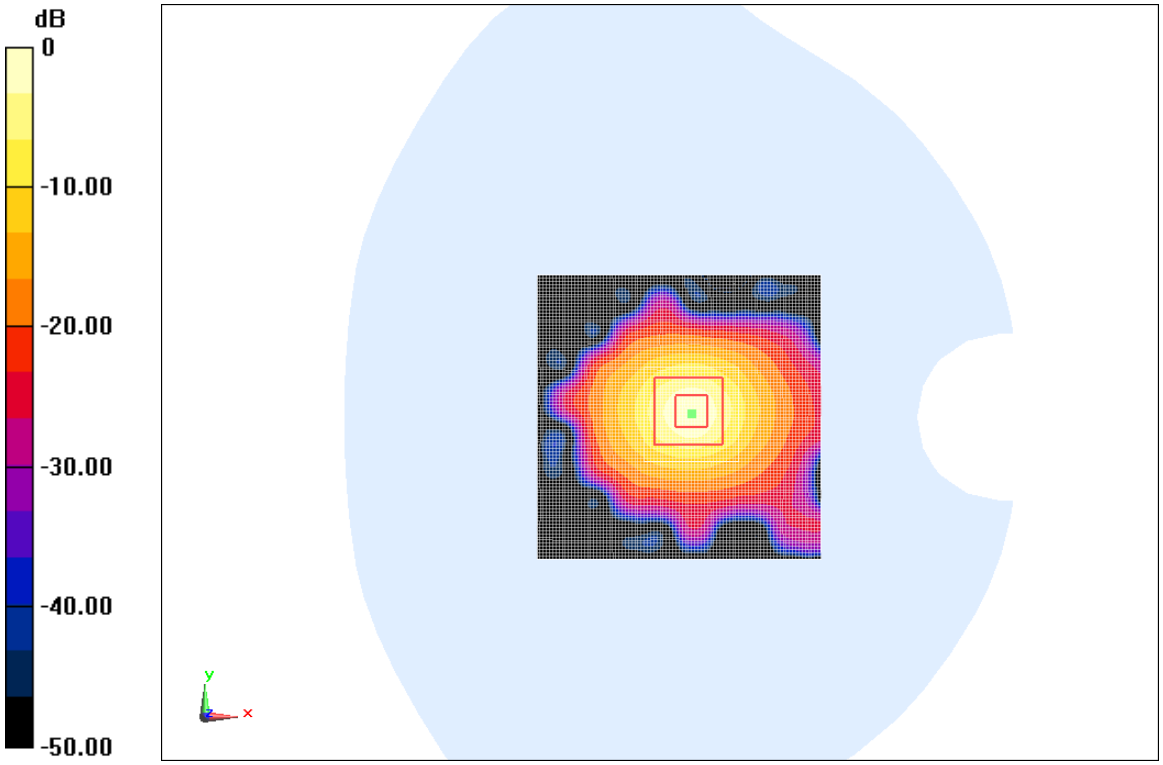
Fig.B.12 validation 2600MHz 250mW

5200MHz

Date: 2014-1-25
Electronics: DAE4 Sn771
Medium: Head 5 GHz
Medium parameters used: f = 5200 MHz; σ = 4.614 mho/m; ε_r = 36.37; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: CW Frequency: 5200 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(5.25, 5.25, 5.25)

System Validation /Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 61.579 V/m; Power Drift = -0.06 dB
Fast SAR: SAR(1 g) = 8.07 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (interpolated) = 9.78 W/kg

System Validation /Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 61.579 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 34.98 W/kg
SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.32 W/kg
Maximum value of SAR (measured) = 9.81 W/kg



0 dB = 9.78 W/kg = 19.81 dB W/kg

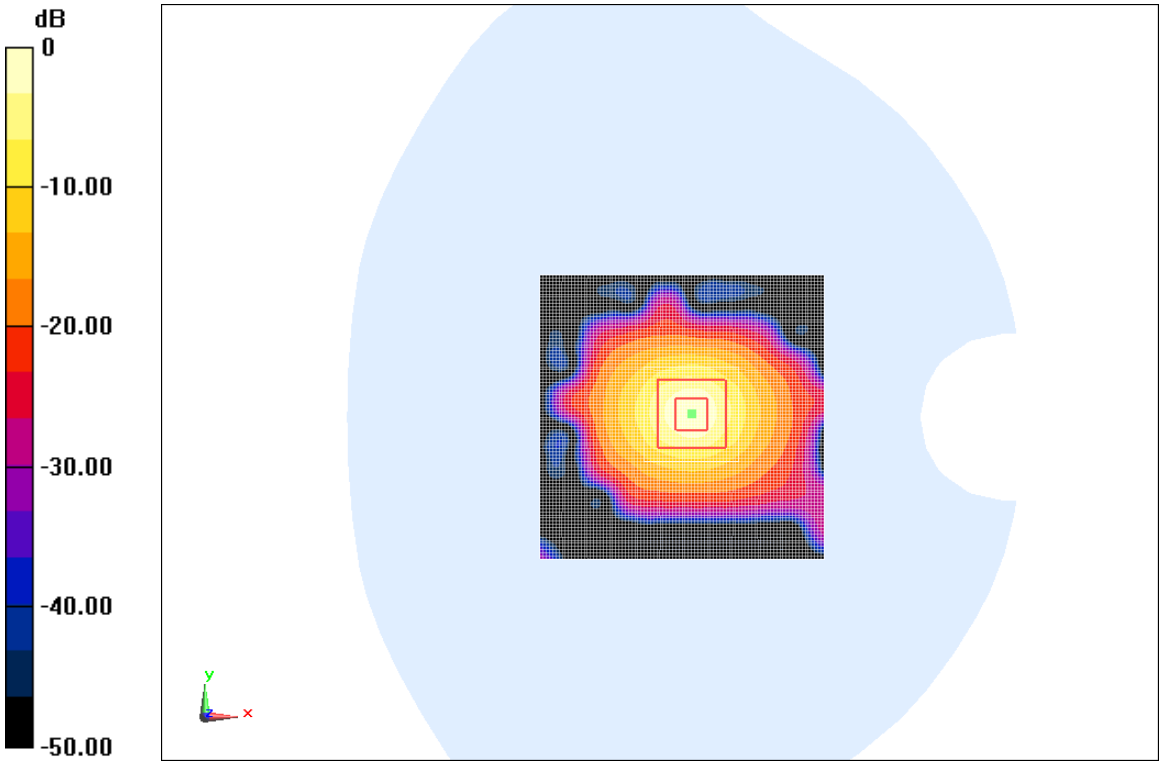
Fig.B.13 validation 5200MHz 100mW

5200MHz

Date: 2014-1-25
Electronics: DAE4 Sn771
Medium: Body 5200 MHz
Medium parameters used: f = 5200 MHz; σ = 5.175 mho/m; ε_r = 48.53; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: CW Frequency: 5200 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(4.36, 4.36, 4.36)

System Validation /Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 58.532 V/m; Power Drift = 0.10 dB
Fast SAR: SAR(1 g) = 7.26 W/kg; SAR(10 g) = 1.99 W/kg
Maximum value of SAR (interpolated) = 8.92 W/kg

System Validation /Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 58.532 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 33.20 W/kg
SAR(1 g) = 7.31 W/kg; SAR(10 g) = 2.03 W/kg
Maximum value of SAR (measured) = 8.97 W/kg



0 dB = 8.92 W/kg = 19.01 dB W/kg

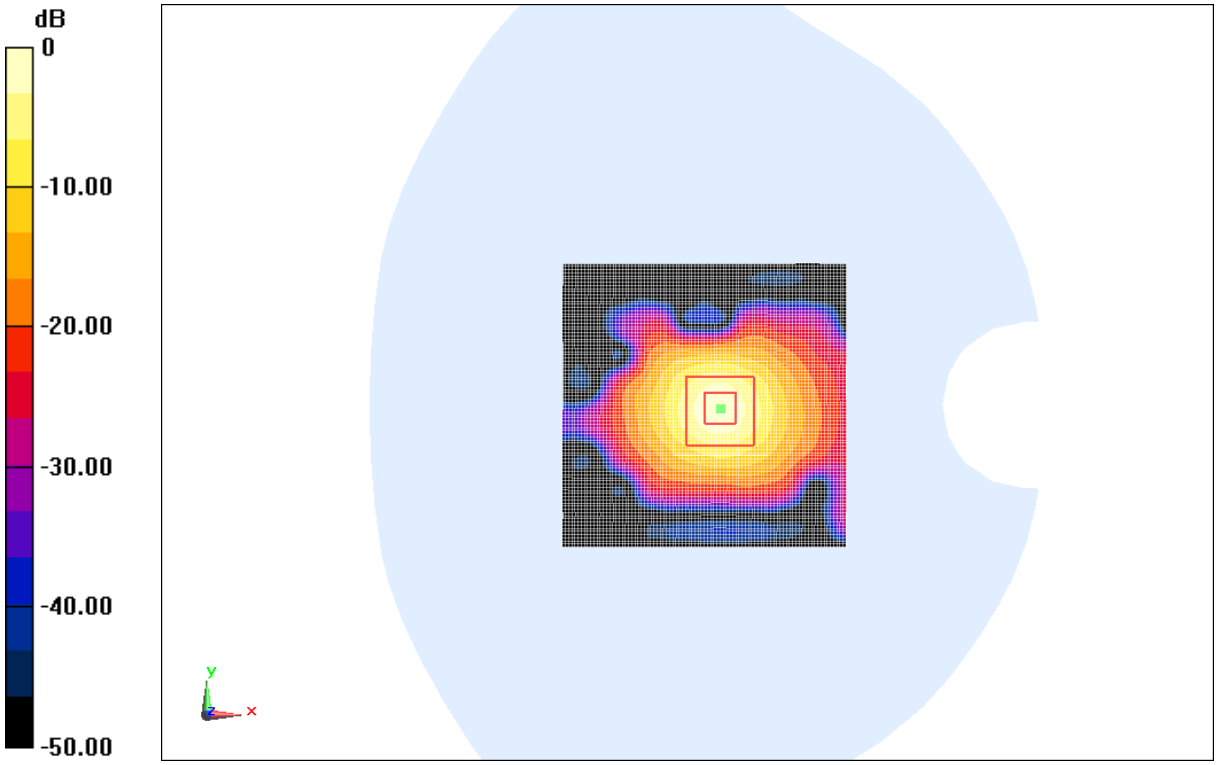
Fig.B.14 validation 5200MHz 100mW

5300MHz

Date: 2014-1-25
Electronics: DAE4 Sn771
Medium: Head 5300 MHz
Medium parameters used: f = 5300 MHz; σ = 4.745 mho/m; ε_r = 36.15; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: CW Frequency: 5300 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(5.04, 5.04, 5.04)

System Validation /Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 61.801 V/m; Power Drift = 0.09 dB
Fast SAR: SAR(1 g) = 8.11 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (interpolated) = 9.83 W/kg

System Validation /Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 61.801 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 35.01 W/kg
SAR(1 g) = 8.16 W/kg; SAR(10 g) = 2.34 W/kg
Maximum value of SAR (measured) = 9.85 W/kg



0 dB = 9.83 W/kg = 19.85 dB W/kg

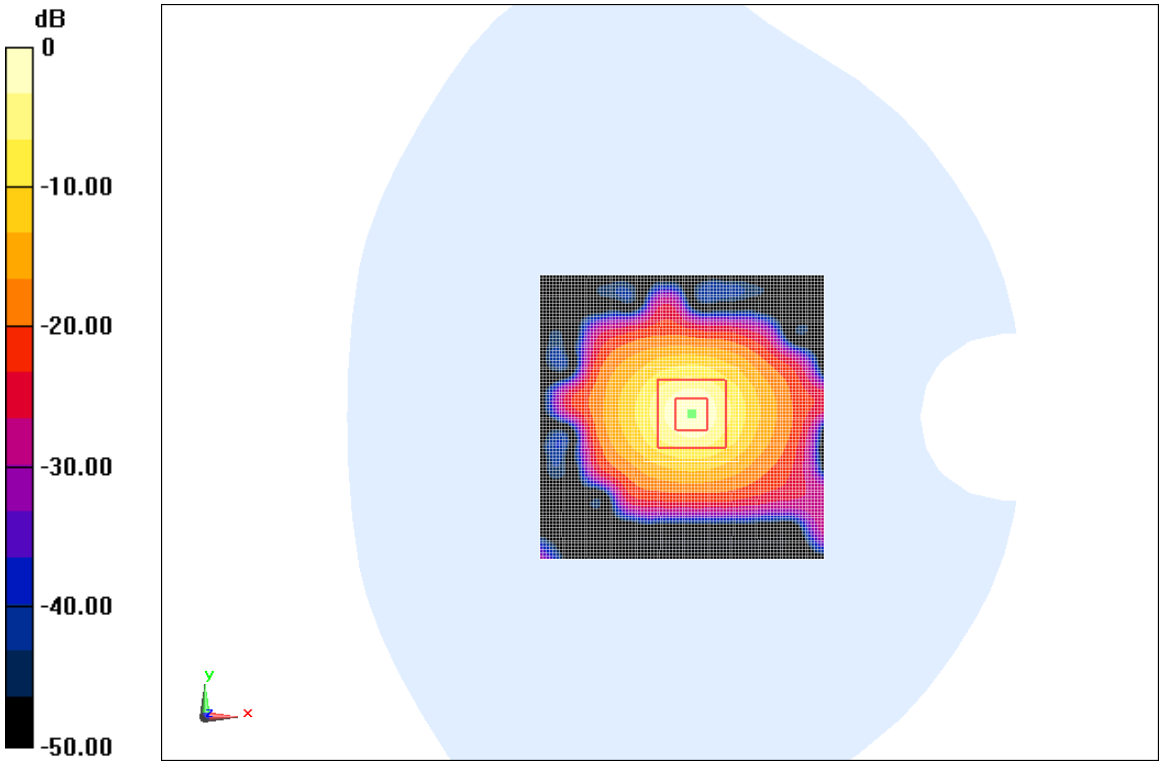
Fig.B.15 validation 5300MHz 100mW

5300MHz

Date: 2014-1-25
Electronics: DAE4 Sn771
Medium: Body 5300 MHz
Medium parameters used: f = 5300 MHz; σ = 5.33 mho/m; ε_r = 48.31; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: CW Frequency: 5300 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(4.17, 4.17, 4.17)

System Validation /Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 61.299 V/m; Power Drift = -0.15 dB
Fast SAR: SAR(1 g) = 7.37 W/kg; SAR(10 g) = 2.03 W/kg
Maximum value of SAR (interpolated) = 9.03 W/kg

System Validation /Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 61.299 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 33.31 W/kg
SAR(1 g) = 7.42 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 9.09 W/kg



0 dB = 9.03 W/kg = 19.11 dB W/kg

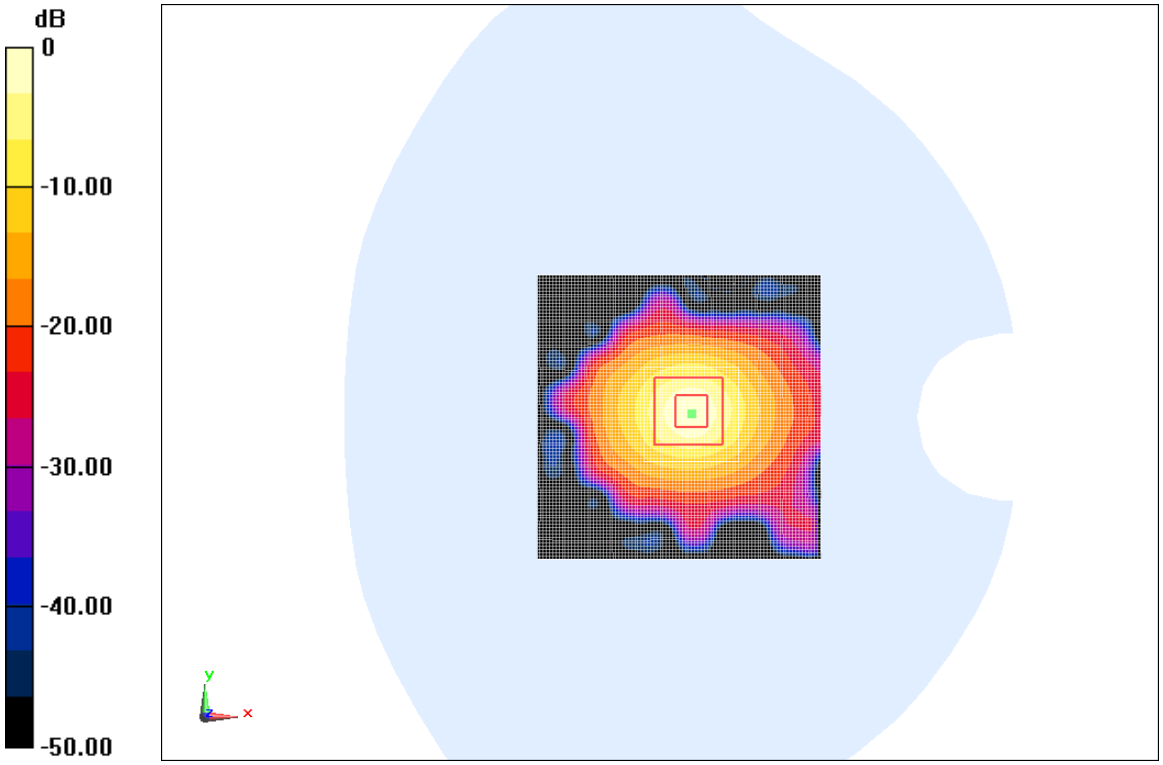
Fig.B.16 validation 5300MHz 100mW

5600MHz

Date: 2014-1-26
Electronics: DAE4 Sn771
Medium: Head 5600 MHz
Medium parameters used: f = 5600 MHz; σ = 5.147 mho/m; ε_r = 35.51; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: CW Frequency: 5600 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(4.52, 4.52, 4.52)

System Validation /Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 62.727 V/m; Power Drift = 0.06 dB
Fast SAR: SAR(1 g) = 8.52 W/kg; SAR(10 g) = 2.43 W/kg
Maximum value of SAR (interpolated) = 10.3 W/kg

System Validation /Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 62.727 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 35.41 W/kg
SAR(1 g) = 8.54 W/kg; SAR(10 g) = 2.44 W/kg
Maximum value of SAR (measured) = 10.3 W/kg



0 dB = 10.3 W/kg = 20.26 dB W/kg

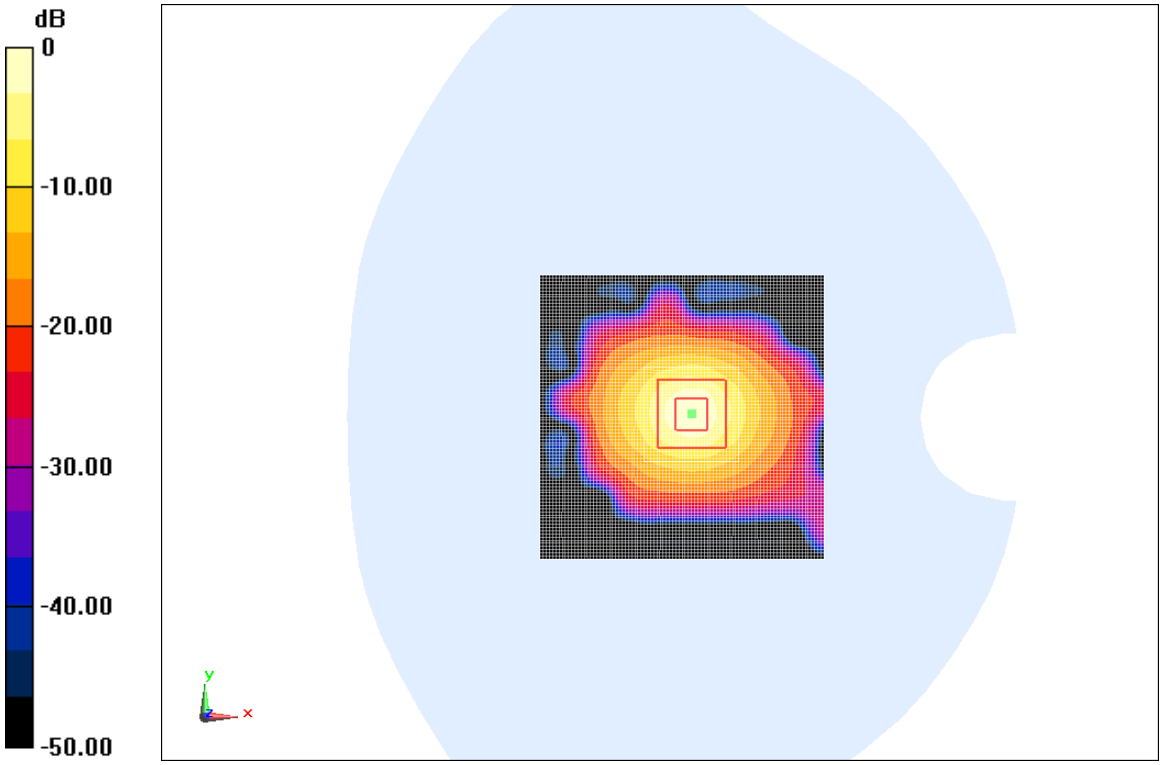
Fig.B.17 validation 5600MHz 100mW

5600MHz

Date: 2014-1-26
Electronics: DAE4 Sn771
Medium: Body 5600 MHz
Medium parameters used: f = 5600 MHz; σ = 5.806 mho/m; ε_r = 47.66; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: CW Frequency: 5600 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(3.77, 3.77, 3.77)

System Validation /Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 59.776 V/m; Power Drift = -0.07 dB
Fast SAR: SAR(1 g) = 7.75 W/kg; SAR(10 g) = 2.13 W/kg
Maximum value of SAR (interpolated) = 9.52 W/kg

System Validation /Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 59.776 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 33.81 W/kg
SAR(1 g) = 7.79 W/kg; SAR(10 g) = 2.16 W/kg
Maximum value of SAR (measured) = 9.55 W/kg



0 dB = 9.52 W/kg = 19.57 dB W/kg

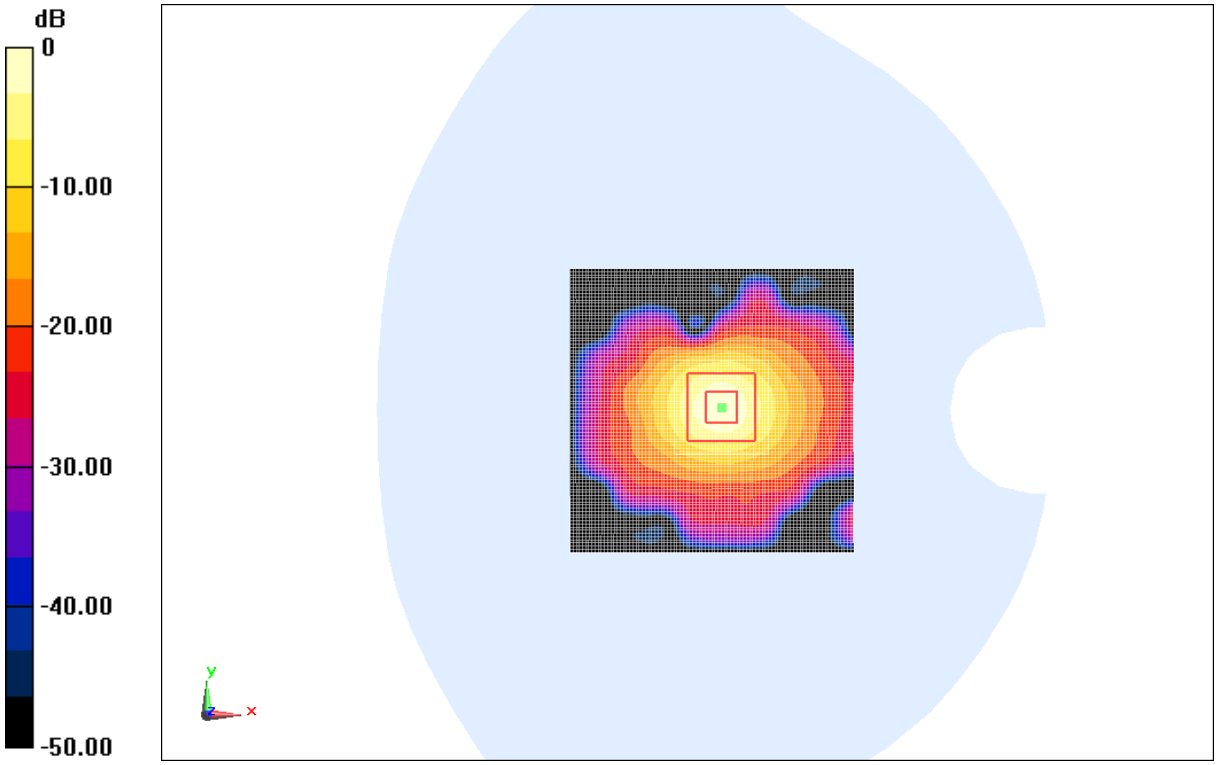
Fig.B.18 validation 5600MHz 100mW

5800MHz

Date: 2014-1-26
Electronics: DAE4 Sn771
Medium: Head 5800 MHz
Medium parameters used: f = 5800 MHz; σ = 5.41 mho/m; ε_r = 35.07; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: CW Frequency: 5800 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(4.51, 4.51, 4.51)

System Validation /Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 54.006 V/m; Power Drift = 0.08 dB
Fast SAR: SAR(1 g) = 7.85 W/kg; SAR(10 g) = 2.21 W/kg
Maximum value of SAR (interpolated) = 9.70 W/kg

System Validation /Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 54.006 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 33.80 W/kg
SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.25 W/kg
Maximum value of SAR (measured) = 9.75 W/kg



0 dB = 9.70 W/kg = 19.74 dB W/kg

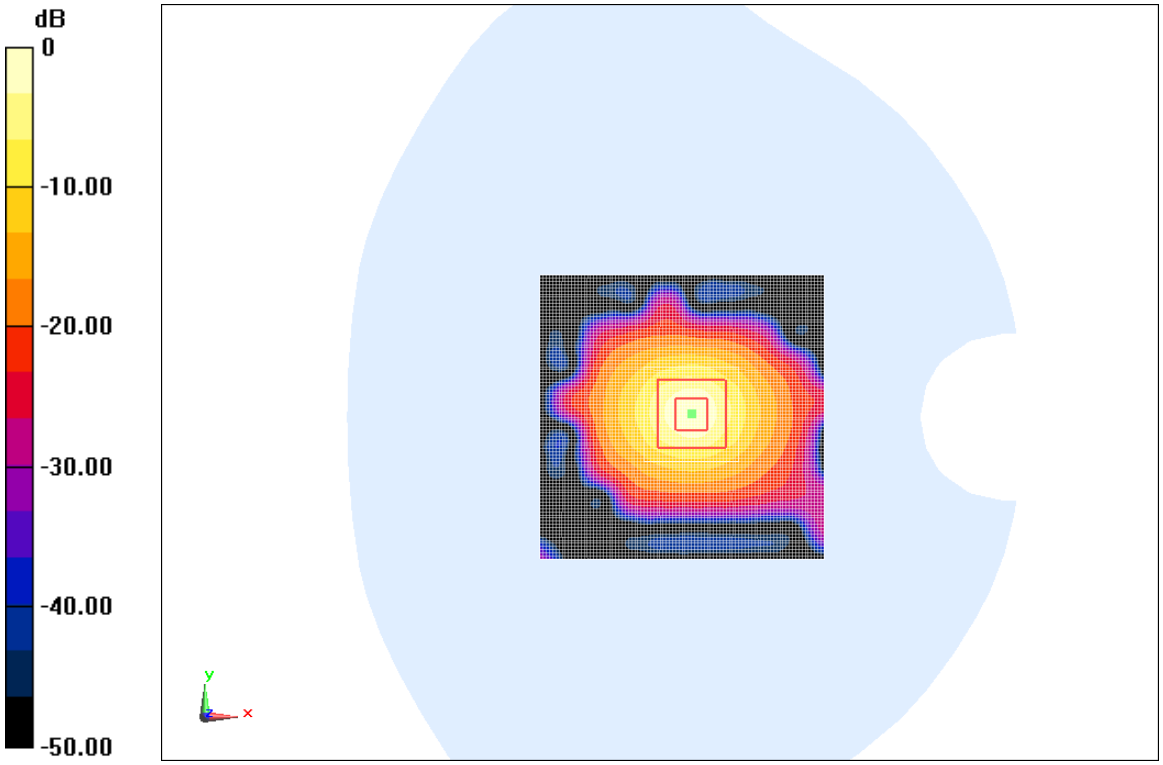
Fig.B.19 validation 5800MHz 100mW

5800MHz

Date: 2014-1-26
Electronics: DAE4 Sn771
Medium: Body 5800 MHz
Medium parameters used: f = 5800 MHz; σ = 6.135 mho/m; ε_r = 47.22; ρ = 1000 kg/m^3
Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C
Communication System: CW Frequency: 5800 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3846 ConvF(3.94, 3.94, 3.94)

System Validation /Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 60.278 V/m; Power Drift = 0.11 dB
Fast SAR: SAR(1 g) = 7.38 W/kg; SAR(10 g) = 1.98 W/kg
Maximum value of SAR (interpolated) = 8.99 W/kg

System Validation /Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 60.278 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 33.69 W/kg
SAR(1 g) = 7.44 W/kg; SAR(10 g) = 2.03 W/kg
Maximum value of SAR (measured) = 9.04 W/kg



0 dB = 8.99 W/kg = 19.08 dB W/kg

Fig.B.20 validation 5800MHz 100mW

The SAR system verification must be required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR.

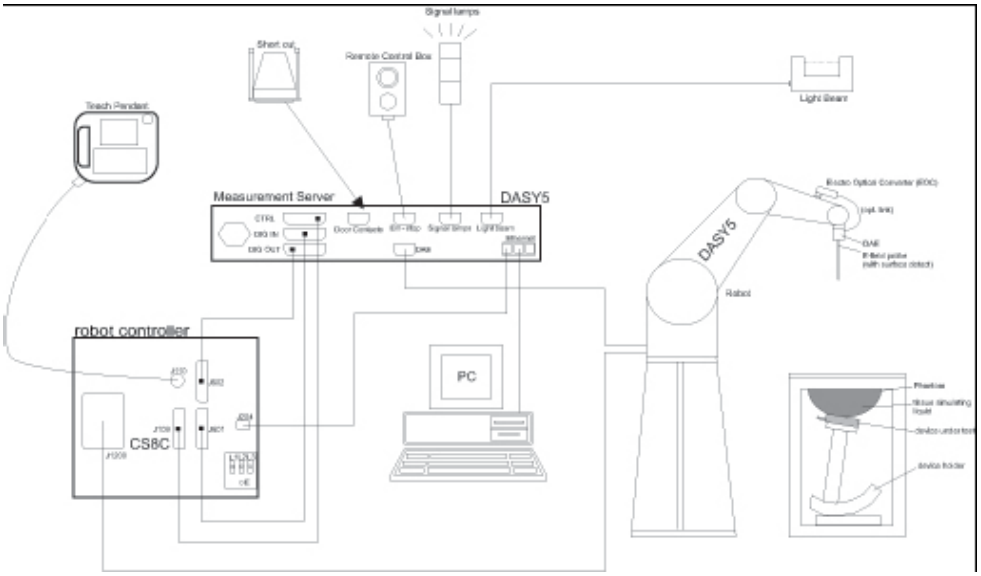
Table B.1 Comparison between area scan and zoom scan for system verification

Band	Position	Area scan (1g)	Zoom scan (1g)	Drift (%)
750	Head	2.19	2.15	1.86
750	Body	2.18	2.16	0.93
835	Head	2.37	2.39	-0.84
835	Body	2.41	2.38	1.26
1750	Head	9.36	9.39	-0.32
1750	Body	9.30	9.32	-0.21
1900	Head	10.0	9.89	1.11
1900	Body	10.0	10.1	-0.99
2450	Head	13.2	13.1	0.76
2450	Body	13.0	12.9	0.78
2600	Head	14.4	14.3	0.70
2600	Body	14.4	14.3	0.70
5200	Head	8.07	8.12	-0.62
5200	Body	7.26	7.31	-0.68
5300	Head	8.11	8.16	-0.61
5300	Body	7.37	7.42	-0.67
5600	Head	8.52	8.54	-0.23
5600	Body	7.75	7.79	-0.51
5800	Head	7.85	7.91	-0.76
5800	Body	7.38	7.44	-0.81

ANNEX C SAR Measurement Setup

C.1 Measurement Set-up

The Dasy4 or DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Picture C.1 SAR Lab Test Measurement Set-up

- A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY4 or DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as
- warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

C.2 Dasy4 or DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 or DASY5 software reads the reflection durning a software approach and looks for the maximum using 2nd ord curve fitting. The approach is stopped at reaching the maximum.

Probe Specifications:

Model: ES3DV3, EX3DV4
Frequency 10MHz — 6.0GHz(EX3DV4)
Range: 10MHz — 4GHz(ES3DV3)
Calibration: In head and body simulating tissue at Frequencies from 835 up to 5800MHz
Linearity: ± 0.2 dB(30 MHz to 6 GHz) for EX3DV4
± 0.2 dB(30 MHz to 4 GHz) for ES3DV3
Dynamic Range: 10 mW/kg — 100W/kg
Probe Length: 330 mm
Probe Tip
Length: 20 mm
Body Diameter: 12 mm
Tip Diameter: 2.5 mm (3.9 mm for ES3DV3)
Tip-Center: 1 mm (2.0mm for ES3DV3)
Application: SAR Dosimetry Testing
Compliance tests of mobile phones
Dosimetry in strong gradient fields

Picture C.2 Near-field Probe

Picture C.3 E-field Probe

C.3 E-field Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed

in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/ cm^2.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:

Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

$$SAR = \frac{|E|^2 \cdot \sigma}{\rho}$$

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

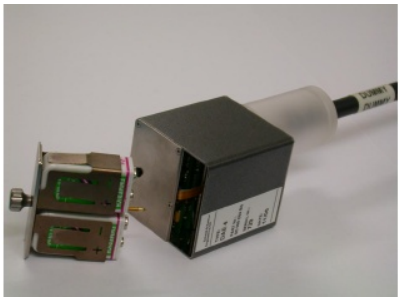
C.4 Other Test Equipment

C.4.1 Data Acquisition Electronics(DAE)

The data acquisition electronics consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



PictureC.4: DAE

C.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90XL; DASY5: RX160L) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchron motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Picture C.5 DASY 4

Picture C.6 DASY 5

C.4.3 Measurement Server

The Measurement server is based on a PC/104 CPU broad with CPU (dasy4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chipdisk (DASY4: 32 MB; DASY5: 128MB), RAM (DASY4: 64 MB, DASY5: 128MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O broad, which is directly connected to the PC/104 bus of the CPU broad.

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

Picture C.7 Server for DASY 4

Picture C.8 Server for DASY 5

C.4.4 Device Holder for Phantom

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss

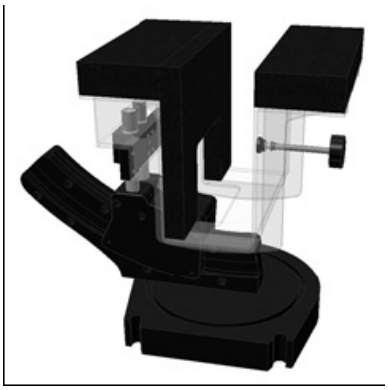
POM material having the following dielectric

parameters: relative permittivity ε =3 and loss tangent δ =0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM and ELI phantoms.

Picture C.9-1: Device Holder



Picture C.9-2: Laptop Extension Kit

C.4.5 Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to

Represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation

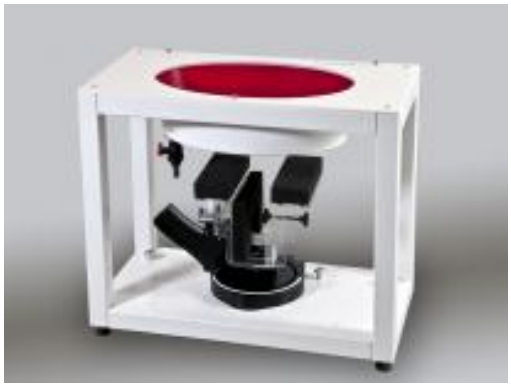
of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

Shell Thickness: 2 ± 0. 2 mm
Filling Volume: Approx. 25 liters
Dimensions: 810 x l000 x 500 mm (H x L x W)
Available: Special

Picture C.10: SAM Twin Phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

Shell Thickness: 2 ± 0. 2 mm
Filling Volume: Approx. 30 liters
Dimensions: Major axis: 600 mm, Minor axis: 400 mm



Picture C.11: ELI Phantom