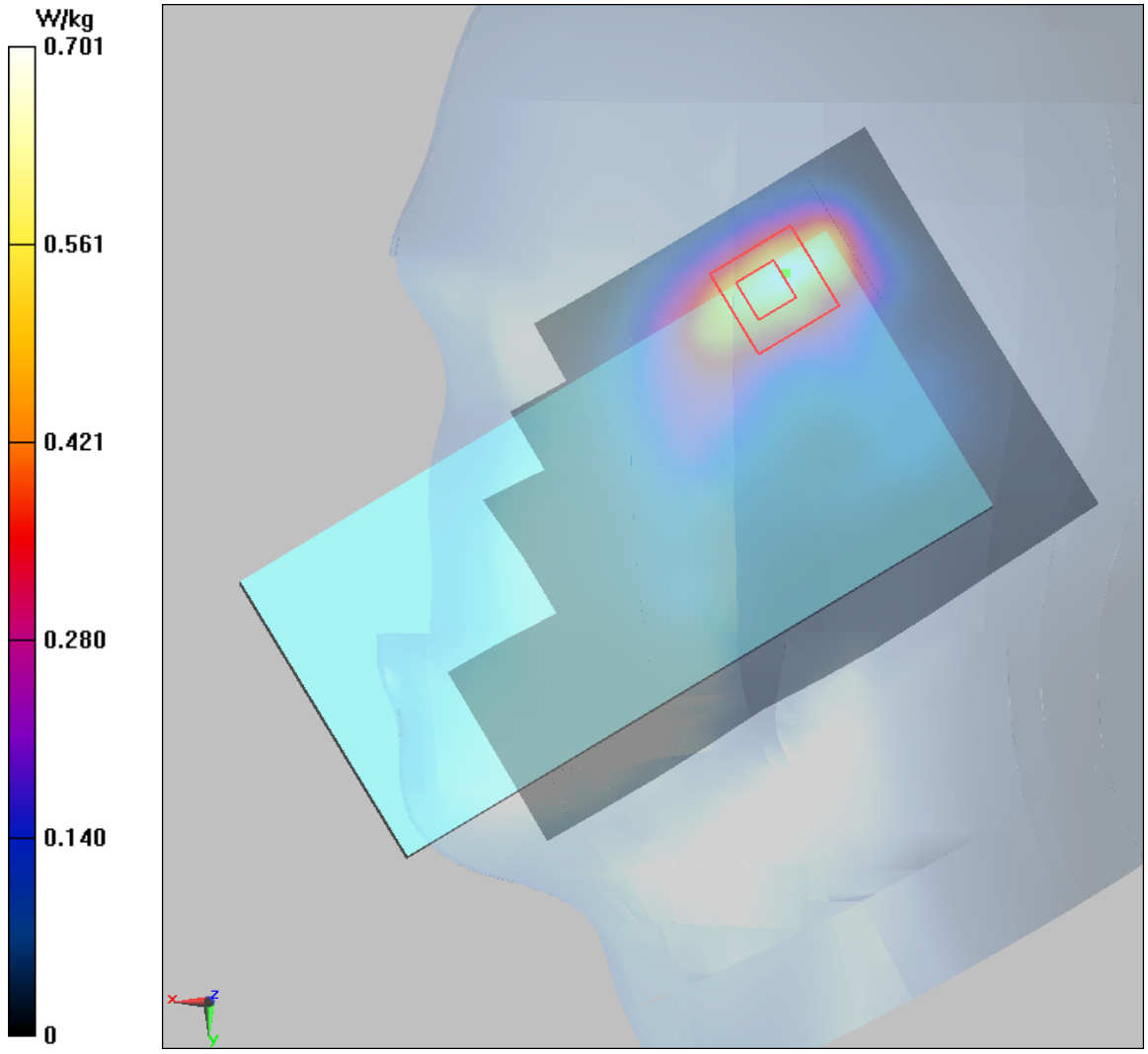
Plot 118 LTE Band 41 1RB Right Cheek Middle

Date: 7/19/2018
Communication System: UID 0, LTE_TDD (0); Frequency: 2615 MHz;Duty Cycle: 1:1.57979
Medium parameters used: f = 2615 MHz; σ = 2.034 S/m; ε_r = 39.21; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Right Section
DASY5 Configuration:
Sensor-Surface: 4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(7.28, 7.28, 7.28); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Cheek Middle/Area Scan (91x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.713 W/kg

Right Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.291 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.49 W/kg
SAR(1 g) = 0.614 W/kg; SAR(10 g) = 0.293 W/kg
Maximum value of SAR (measured) = 0.701 W/kg



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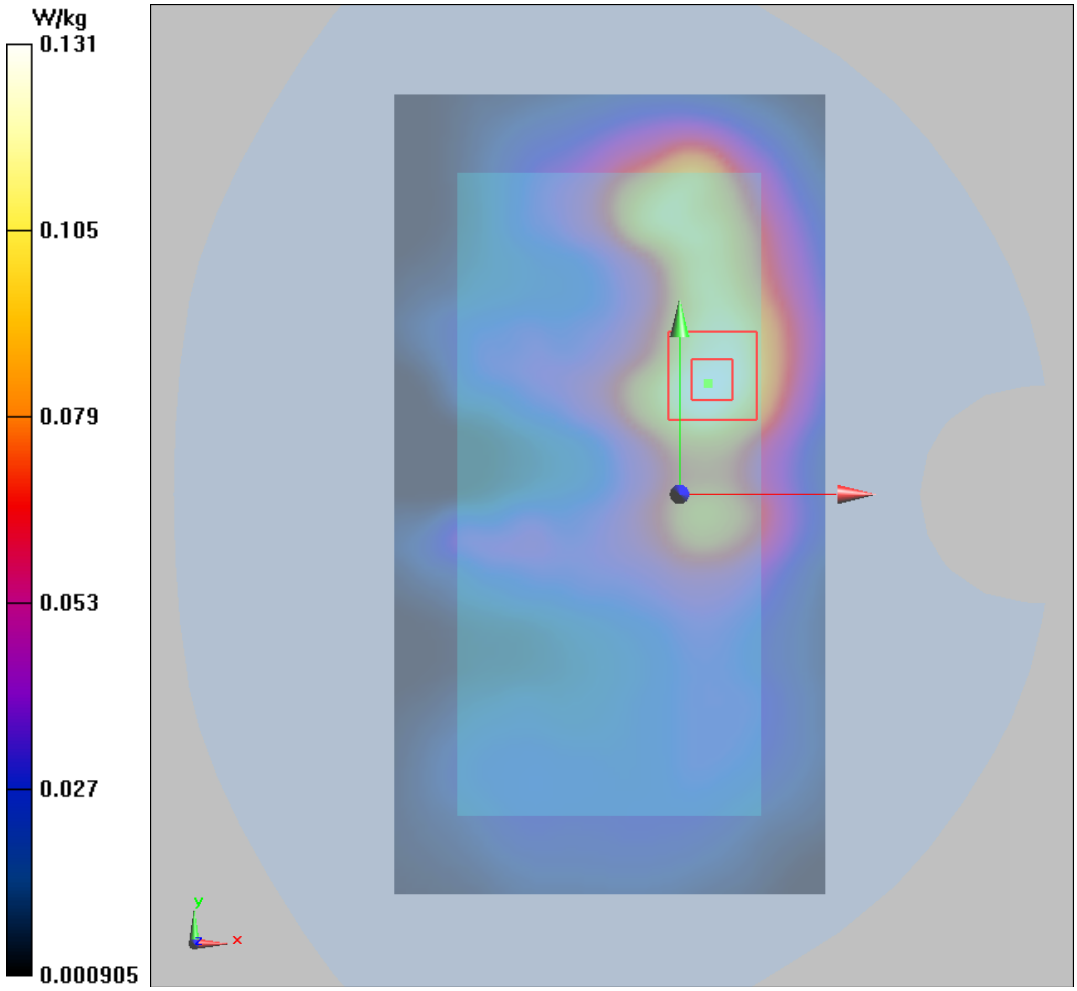
Plot 119 LTE Band 41 1RB Back Side Middle (Distance 15mm)

Date: 7/19/2018
Communication System: UID 0, LTE (0); Frequency: 2585 MHz;Duty Cycle: 1:1.57979
Medium parameters used: f = 2585 MHz; σ = 2.139 S/m; ε_r = 50.67; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(7.16, 7.16, 7.16); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (91x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.130 W/kg

Back Side Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.051 V/m; Power Drift = 0.080 dB
Peak SAR (extrapolated) = 0.218 W/kg
SAR(1 g) = 0.118 W/kg; SAR(10 g) = 0.063 W/kg
Maximum value of SAR (measured) = 0.131 W/kg



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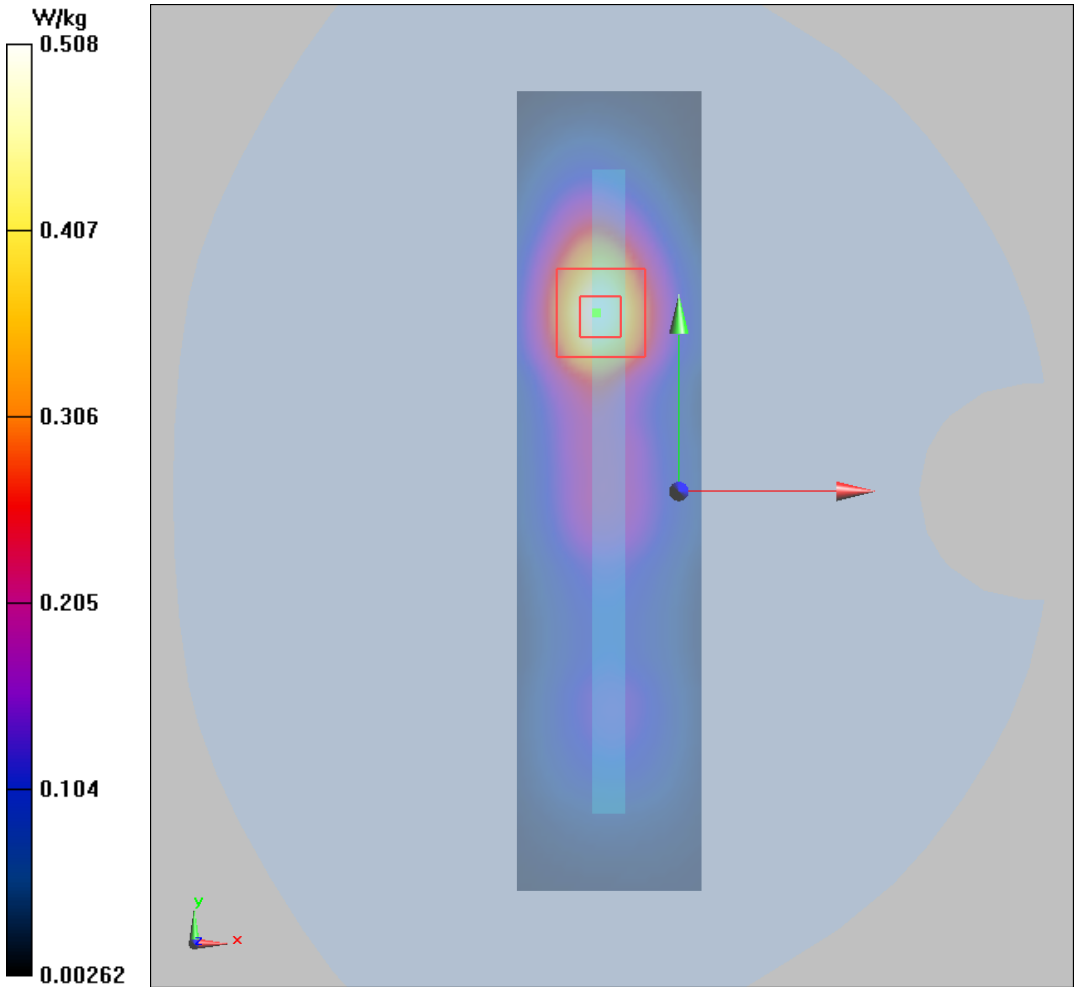
Plot 120 LTE Band 41 1RB Left Edge Middle (Distance 10mm)

Date: 7/19/2018
Communication System: UID 0, LTE (0); Frequency: 2585 MHz;Duty Cycle: 1:1.57979
Medium parameters used: f = 2585 MHz; σ = 2.139 S/m; ε_r = 50.67; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(7.16, 7.16, 7.16); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Edge Middle/Area Scan (51x201x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.505 W/kg

Left Edge Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.14 V/m; Power Drift = 0.022 dB
Peak SAR (extrapolated) = 0.859 W/kg
SAR(1 g) = 0.450 W/kg; SAR(10 g) = 0.221 W/kg
Maximum value of SAR (measured) = 0.508 W/kg



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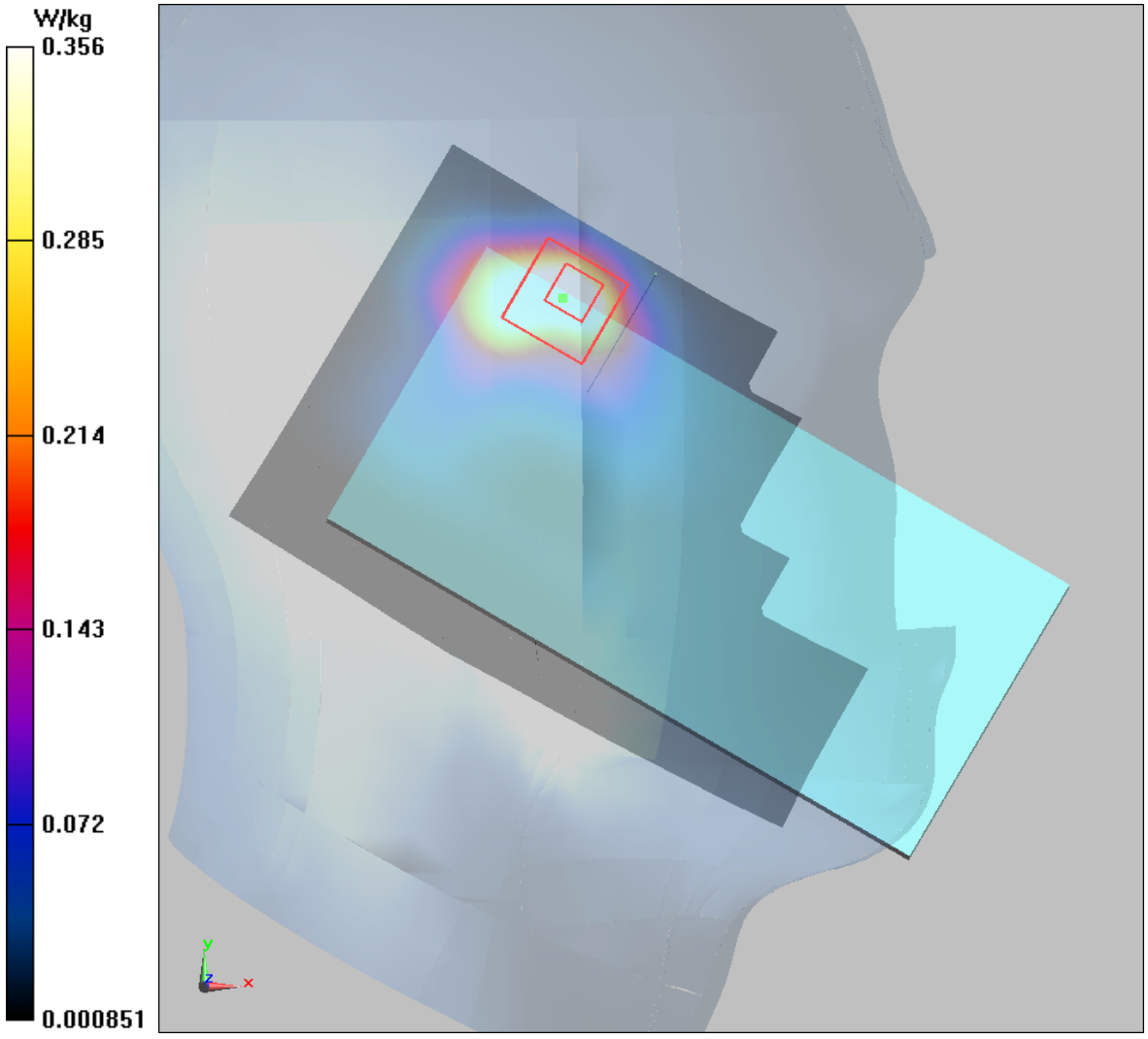
Wi-Fi-Antenna
Plot 121 802.11b Left Cheek Middle

Date: 7/20/2018
Communication System: UID 0, 802.11b (0); Frequency: 2437 MHz;Duty Cycle: 1:1.005
Medium parameters used: f = 2437 MHz; σ = 1.833 S/m; ε_r = 39.76; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Left Section
DASY5 Configuration:
Sensor-Surface: 4mm (Mechanical Surface Detection)0
Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Middle/Area Scan (91x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.465 W/kg

Left Cheek Middle /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.317 V/m; Power Drift = 0.020 dB
Peak SAR (extrapolated) = 0.862 W/kg
SAR(1 g) = 0.224 W/kg; SAR(10 g) = 0.101 W/kg
Maximum value of SAR (measured) = 0.356 W/kg



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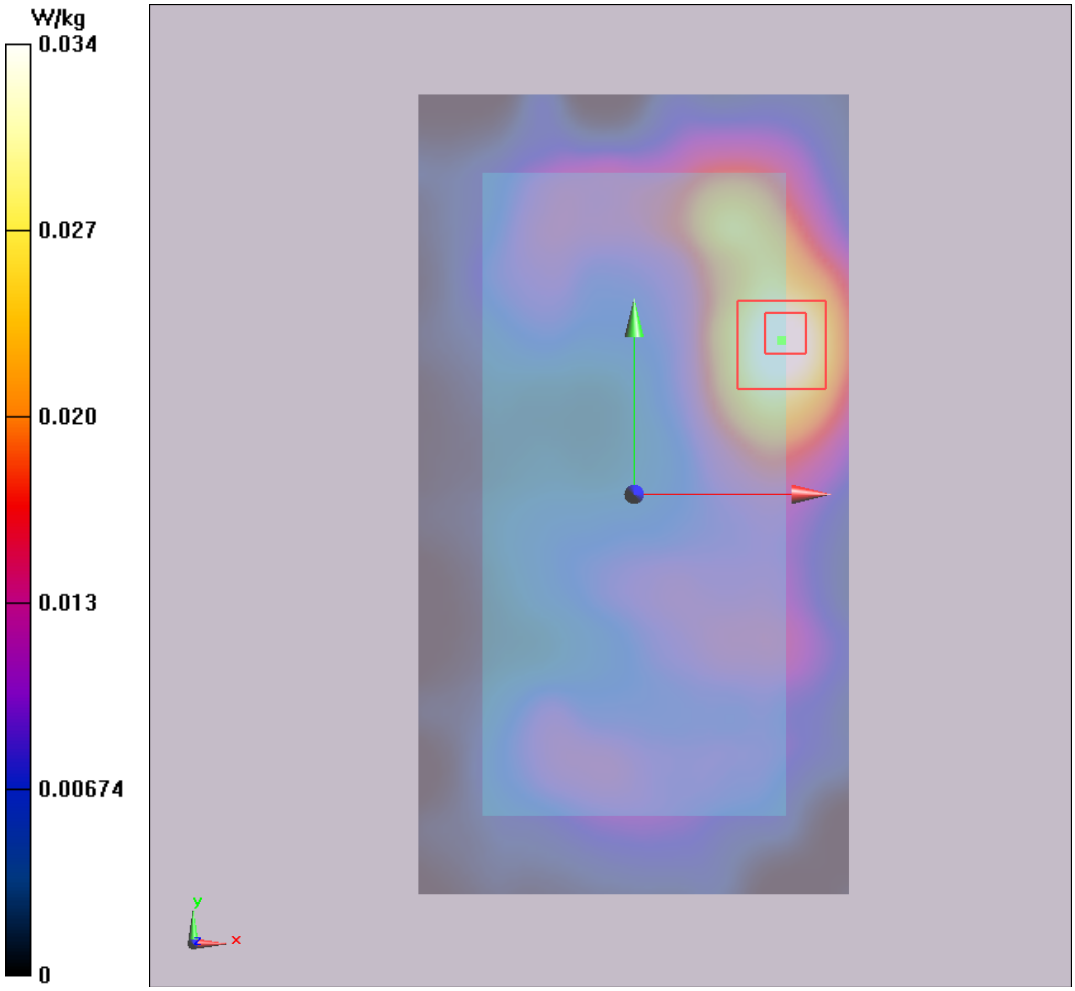
Plot 122 802.11b Front Side Low (Distance 15mm)

Date: 7/20/2018
Communication System: UID 0, WiFi (0); Frequency: 2412 MHz;Duty Cycle: 1:1.005
Medium parameters used: f = 2412 MHz; σ = 1.882 S/m; ε_r = 51.942; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(7.53, 7.53, 7.53); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Low/Area Scan (91x171x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0369 W/kg

Front Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.639 V/m; Power Drift = 0.096 dB
Peak SAR (extrapolated) = 0.0570 W/kg
SAR(1 g) = 0.032 W/kg; SAR(10 g) = 0.018 W/kg
Maximum value of SAR (measured) = 0.034 W/kg



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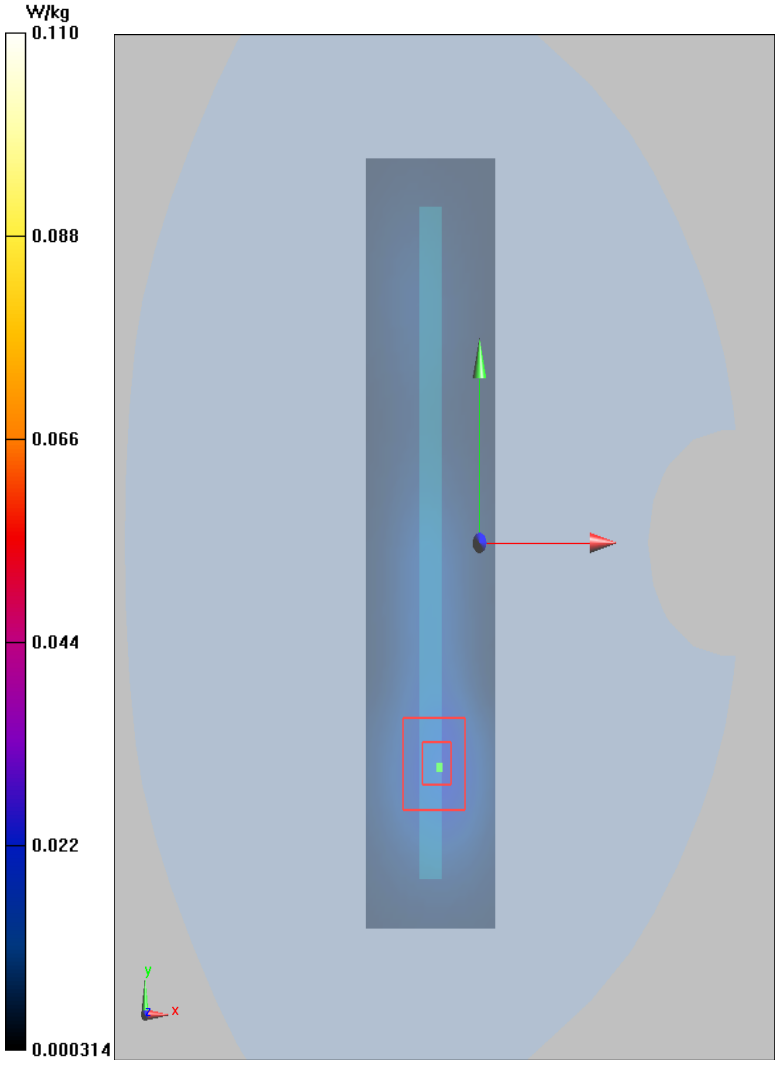
Plot 123 802.11b Right Edge Low (Distance 10mm)

Date: 7/20/2018
Communication System: UID 0, WiFi (0); Frequency: 2412 MHz;Duty Cycle: 1:1.005
Medium parameters used: f = 2412 MHz; σ = 1.882 S/m; ε_r = 51.942; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(7.53, 7.53, 7.53); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Edge Low/Area Scan (51x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0937 W/kg

Right Edge Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.032 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 0.188 W/kg
SAR(1 g) = 0.096 W/kg; SAR(10 g) = 0.047 W/kg
Maximum value of SAR (measured) = 0.110 W/kg



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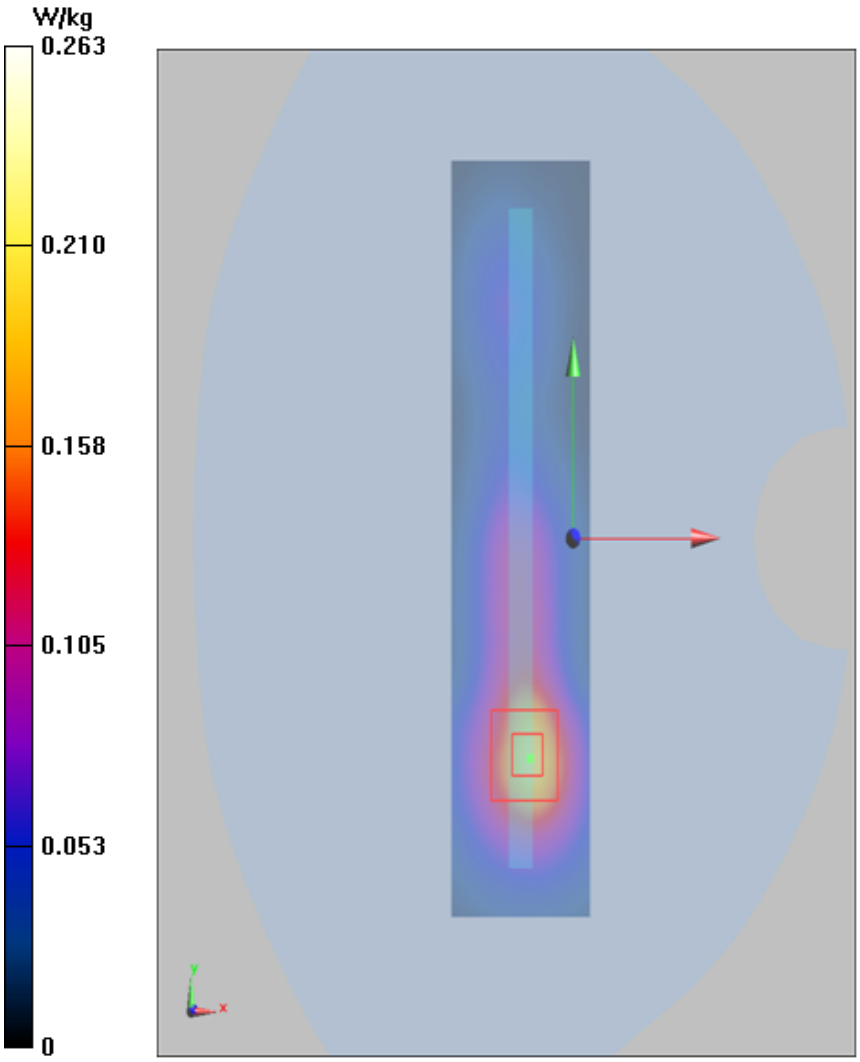
Plot 124 802.11a U-NII-1 Right Edge CH44 (Distance 10mm)

Date: 7/20/2018
Communication System: UID 0, 802.11a (0); Frequency: 5220 MHz;Duty Cycle: 1:1.022
Medium parameters used: f = 5220 MHz; σ = 5.368 S/m; ε_r = 46.8; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(5.04, 5.04, 5.04); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Edge CH44/Area Scan (51x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.268 W/kg

Right Edge CH44/Zoom Scan (7x7x12)/Cube 0:: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.411V/m; Power Drift = 0.077 dB
Peak SAR (extrapolated) = 0.613 W/kg
SAR(1 g) = 0.225 W/kg; SAR(10 g) = 0.104 W/kg
Maximum value of SAR (measured) = 0.263 W/kg



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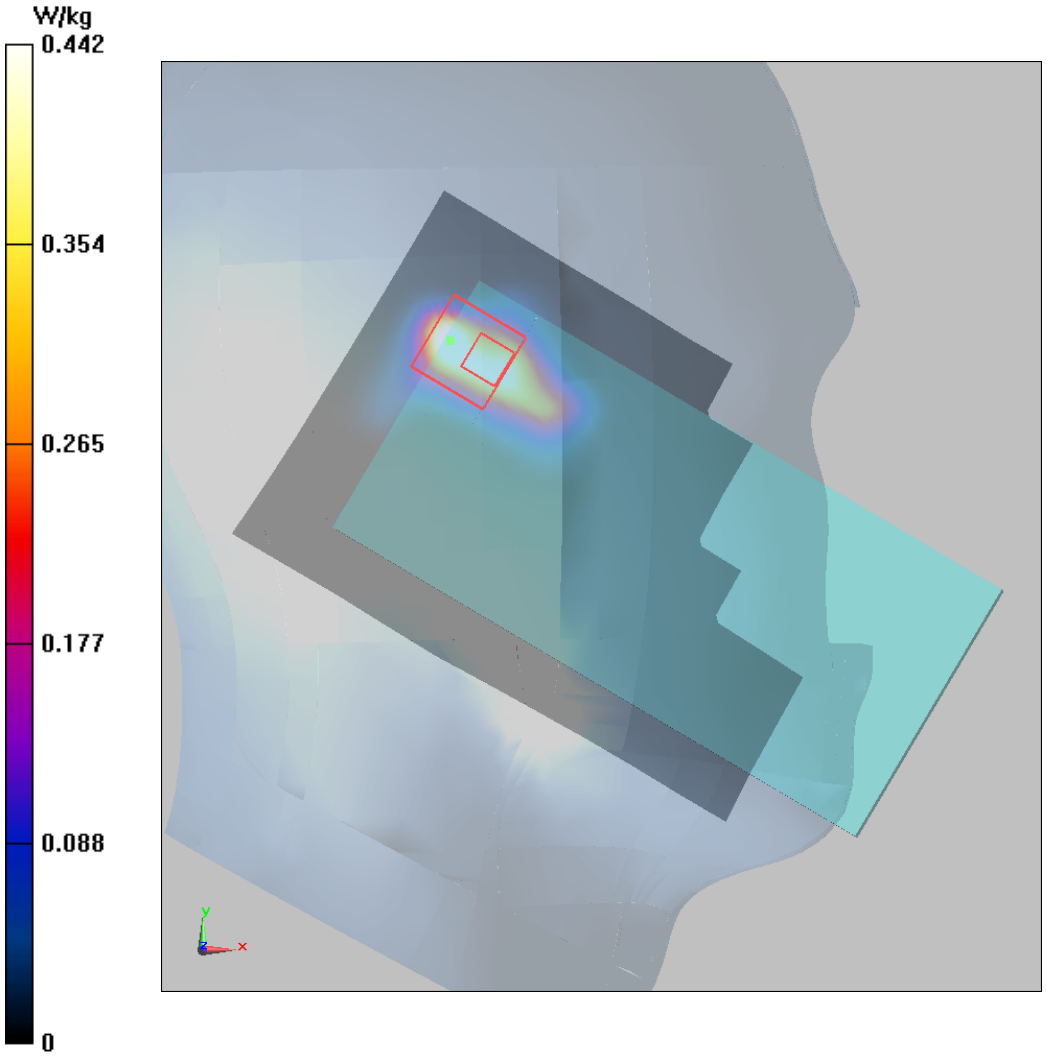
Plot 125 802.11a U-NII-2A Left Cheek CH64

Date: 6/27/2018
Communication System: UID 0, 802.11a (0); Frequency: 5320 MHz;Duty Cycle: 1:1.022
Medium parameters used: f = 5320 MHz; σ = 4.953 S/m; ε_r = 36.328; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Left Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(5.60, 5.60, 5.60); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek CH64/Area Scan (111x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.504 W/kg

Left Cheek CH64/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.944 V/m; Power Drift = 0.082 dB
Peak SAR (extrapolated) = 0.981 W/kg
SAR(1 g) = 0.311 W/kg; SAR(10 g) = 0.123 W/kg
Maximum value of SAR (measured) = 0.442 W/kg



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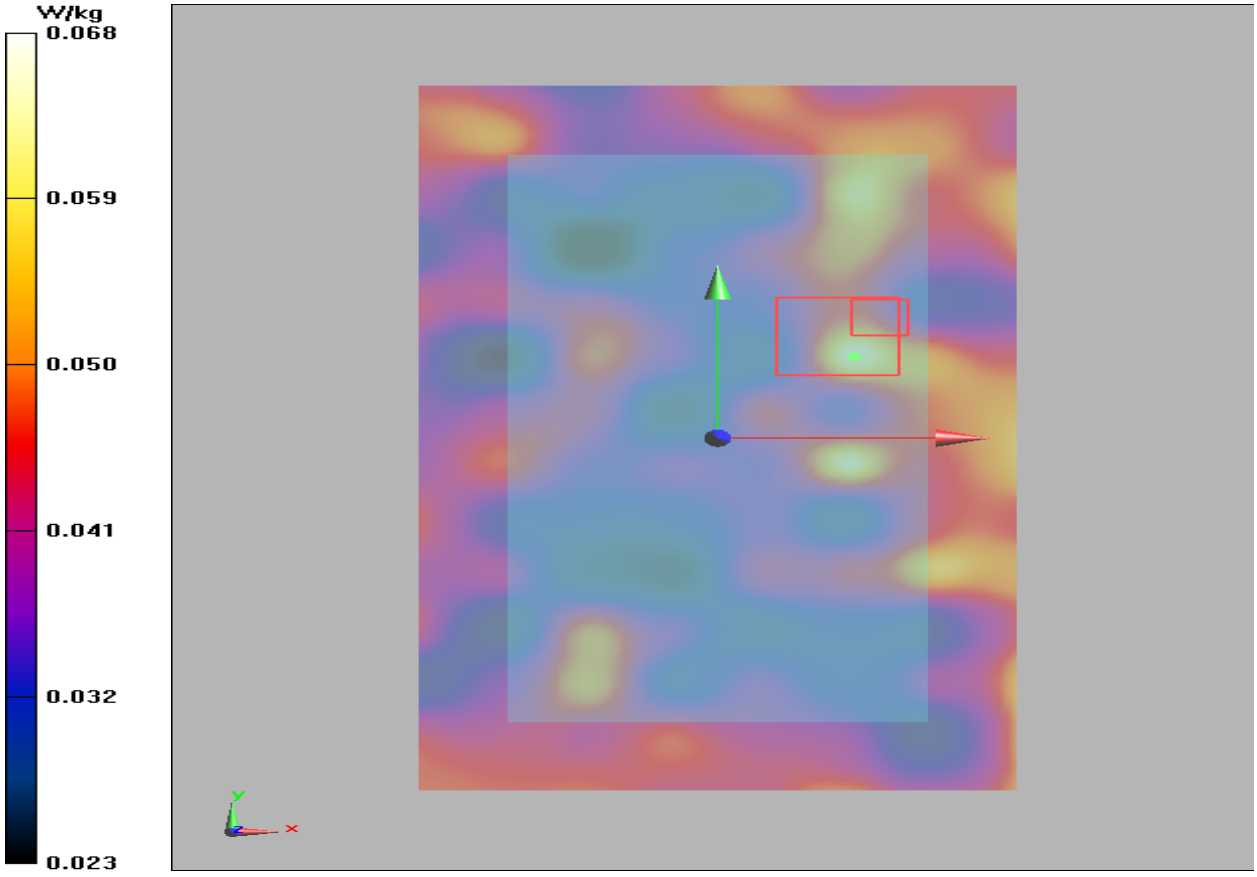
Plot 126 802.11a U-NII-2A Back Side CH64 (Distance 15mm)

Date: 7/12/2018
Communication System: UID 0, 802.11a (0); Frequency: 5320 MHz;Duty Cycle: 1:1.022
Medium parameters used: f = 5320 MHz; σ = 5.518 S/m; ε_r = 46.537; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(5.04, 5.04, 5.04); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side CH64/Area Scan (111x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0659 W/kg

Back Side CH64/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.753 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.0710 W/kg
SAR(1 g) = 0.062 W/kg; SAR(10 g) = 0.050 W/kg
Maximum value of SAR (measured) = 0.0677 W/kg



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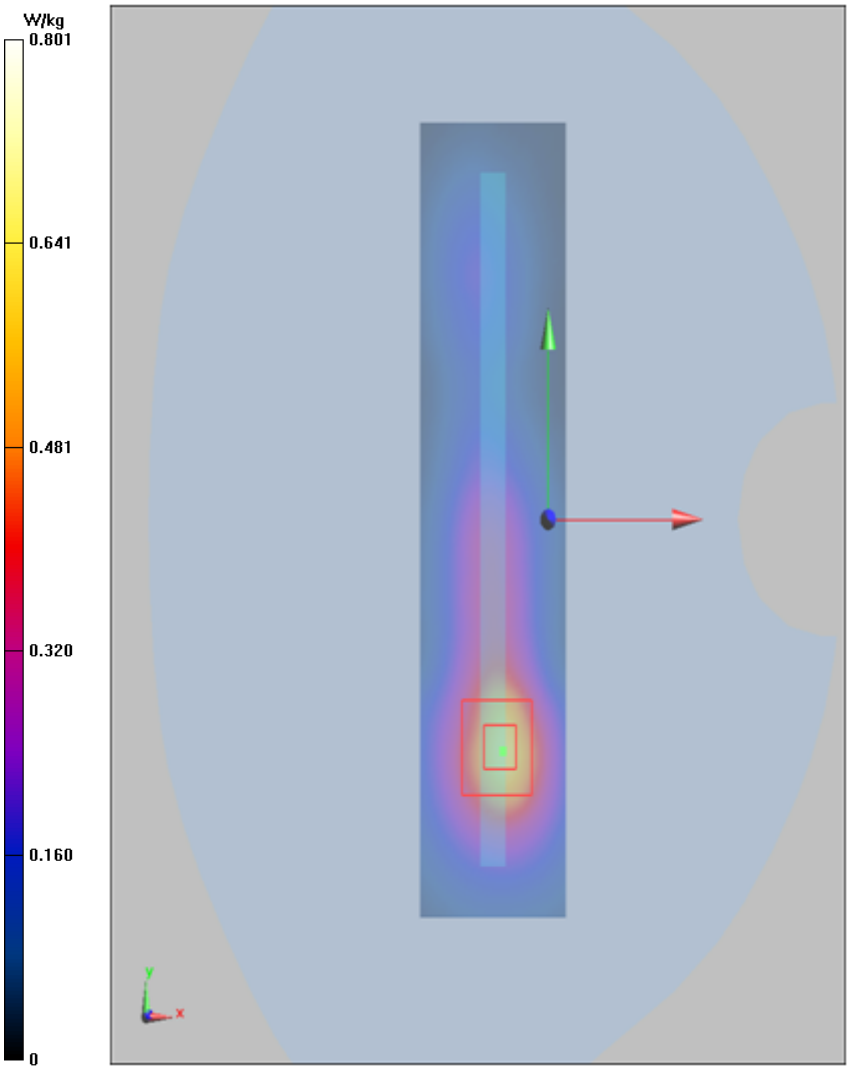
Plot 127 802.11a U-NII-2A Right Edge CH64 (Distance 0mm)

Date: 7/20/2018
Communication System: UID 0, 802.11a (0); Frequency: 5320 MHz;Duty Cycle: 1:1.02165
Medium parameters used: f = 5320 MHz; σ = 5.518S/m; ε_r = 46.54; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(5.04, 5.04, 5.04); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Edge CH64/Area Scan (41x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.874 W/kg

Right Edge CH64/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.718 V/m; Power Drift = 0.140 dB
Peak SAR (extrapolated) = 1.030 W/kg
SAR(1 g) = 0.786 W/kg; SAR(10 g) = 0.397 W/kg
Maximum value of SAR (measured) = 0.801 W/kg



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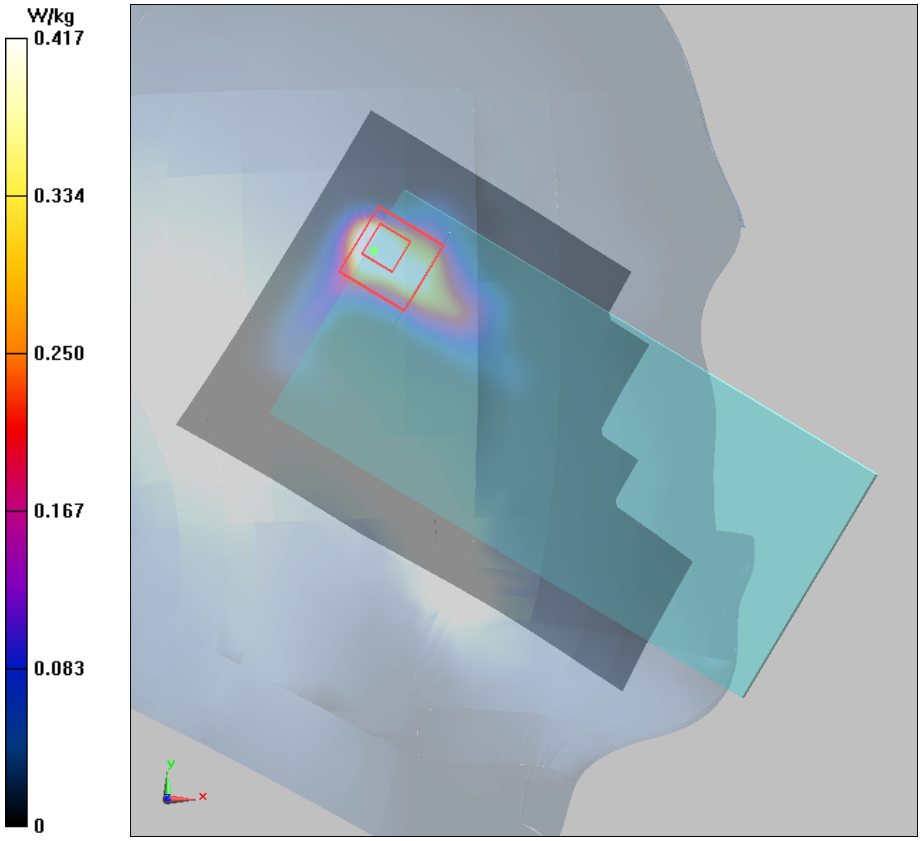
Plot 128 802.11a U-NII-2C Left Cheek CH116

Date: 6/27/2018
Communication System: UID 0, 802.11a (0); Frequency: 5580 MHz;Duty Cycle: 1:1.022
Medium parameters used: f = 5580 MHz; σ = 5.258 S/m; ε_r = 35.664; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Left Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(4.87, 4.87, 4.87); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek CH116/Area Scan (111x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.838 W/kg

Left Cheek CH116/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.854 V/m; Power Drift = 0.062 dB
Peak SAR (extrapolated) = 1.10 W/kg
SAR(1 g) = 0.359 W/kg; SAR(10 g) = 0.131 W/kg
Maximum value of SAR (measured) = 0.417 W/kg



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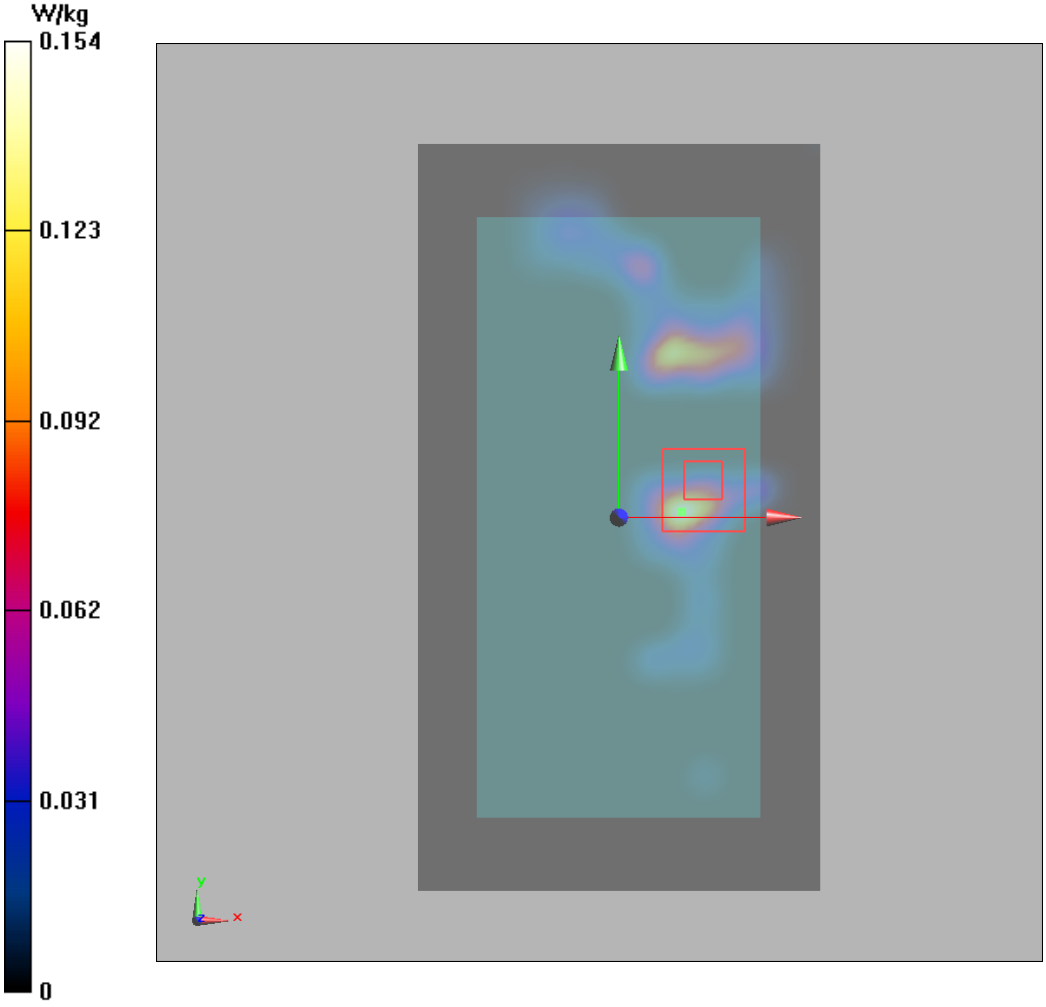
Plot 129 802.11a U-NII-2C Front Side CH100 (Distance 15mm)

Date: 7/12/2018
Communication System: UID 0, 802.11a (0); Frequency: 5500 MHz;Duty Cycle: 1:1.022
Medium parameters used: f = 5500 MHz; σ = 5.793 S/m; ε_r = 47.753; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(4.27, 4.27, 4.27); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side CH100/Area Scan (111x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.155 W/kg

Front Side CH100/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0 V/m; Power Drift = 0.099 dB
Peak SAR (extrapolated) = 0.277 W/kg
SAR(1 g) = 0.063 W/kg; SAR(10 g) = 0.021 W/kg
Maximum value of SAR (measured) = 0.154 W/kg



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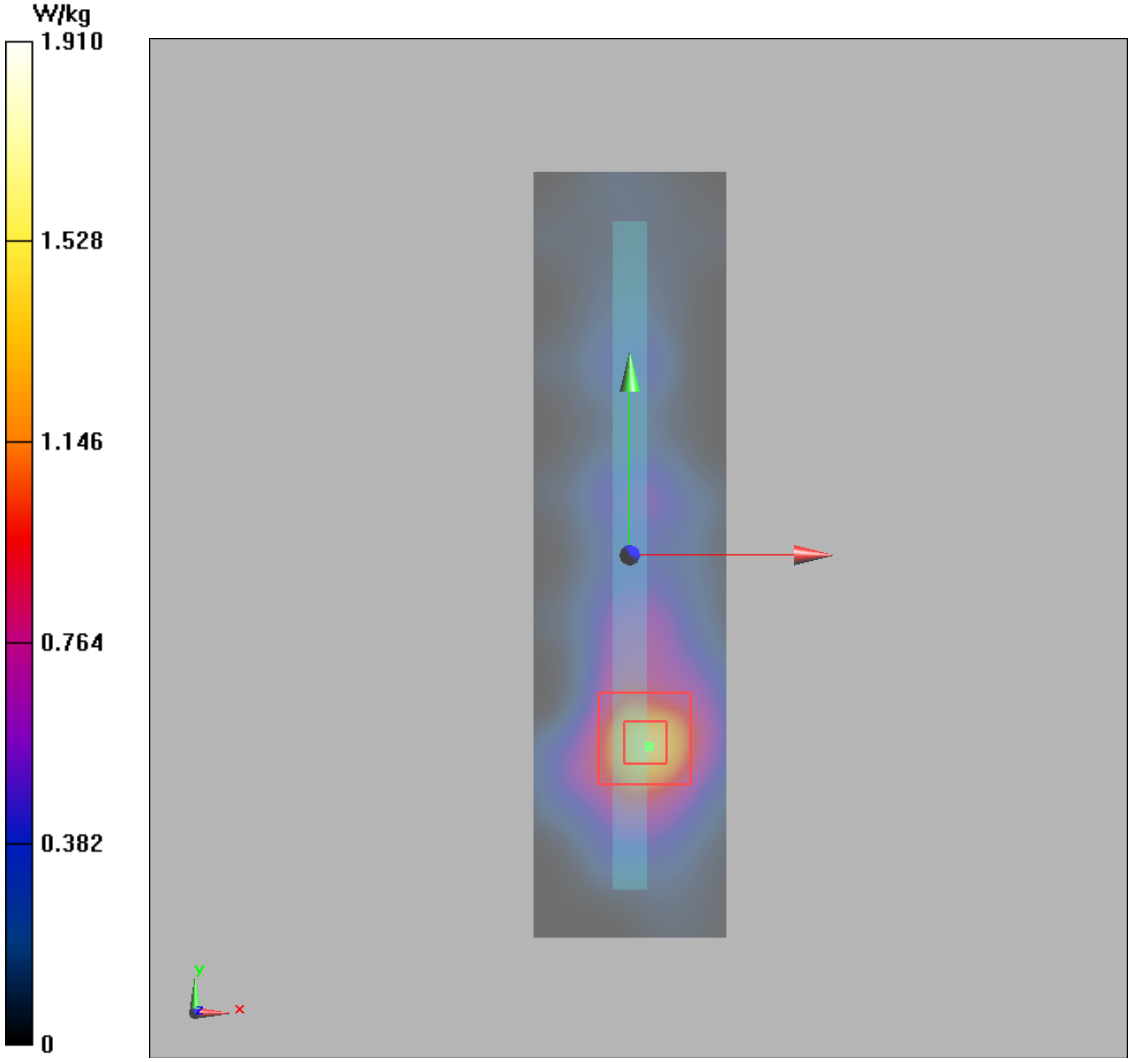
Plot 130 802.11a U-NII-2C Right Edge CH100 (Distance 0mm)

Date: 7/20/2018
Communication System: UID 0, 802.11a (0); Frequency: 5500 MHz;Duty Cycle: 1:1.022
Medium parameters used: f = 5500 MHz; σ = 5.793 S/m; ε_r = 47.753; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(4.27, 4.27, 4.27); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Edge CH100/Area Scan(41x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.923 W/kg

Right Edge CH100/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.254V/m; Power Drift = 0.010 dB
Peak SAR (extrapolated) = 3.042W/kg
SAR(1 g) = 1.607W/kg; SAR(10 g) = 0.814 W/kg
Maximum value of SAR (measured) = 1.910W/kg



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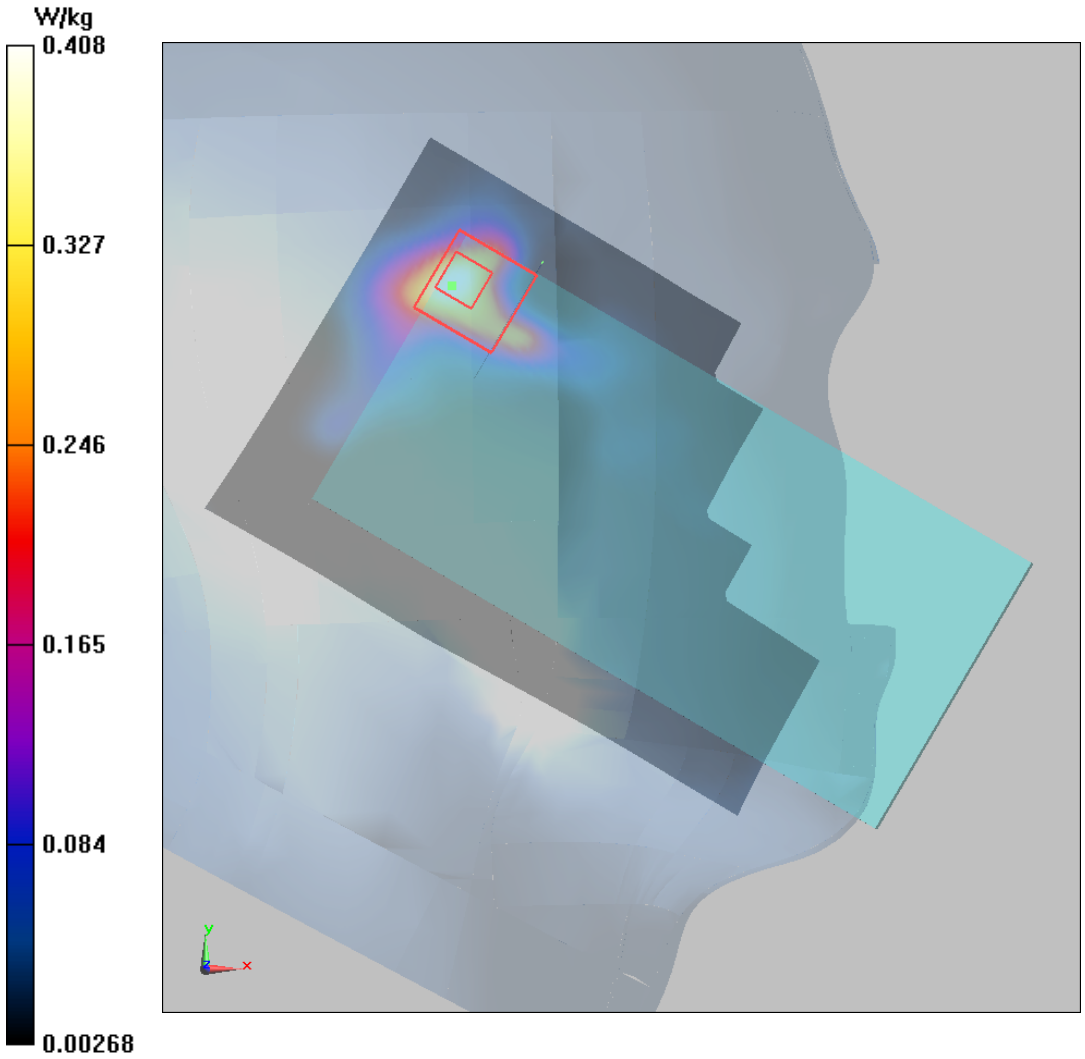
Plot 131 802.11a U-NII-3 Left Cheek CH165

Date: 6/27/2018
Communication System: UID 0, 802.11a (0); Frequency: 5825 MHz;Duty Cycle: 1:1.022
Medium parameters used: f = 5825 MHz; σ = 5.488 S/m; ε_r = 34.499; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Left Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(4.99, 4.99, 4.99); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek CH165/Area Scan (111x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.434 W/kg

Left Cheek CH165/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.315 V/m; Power Drift = 0.061 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.366 W/kg; SAR(10 g) = 0.140 W/kg
Maximum value of SAR (measured) = 0.408 W/kg



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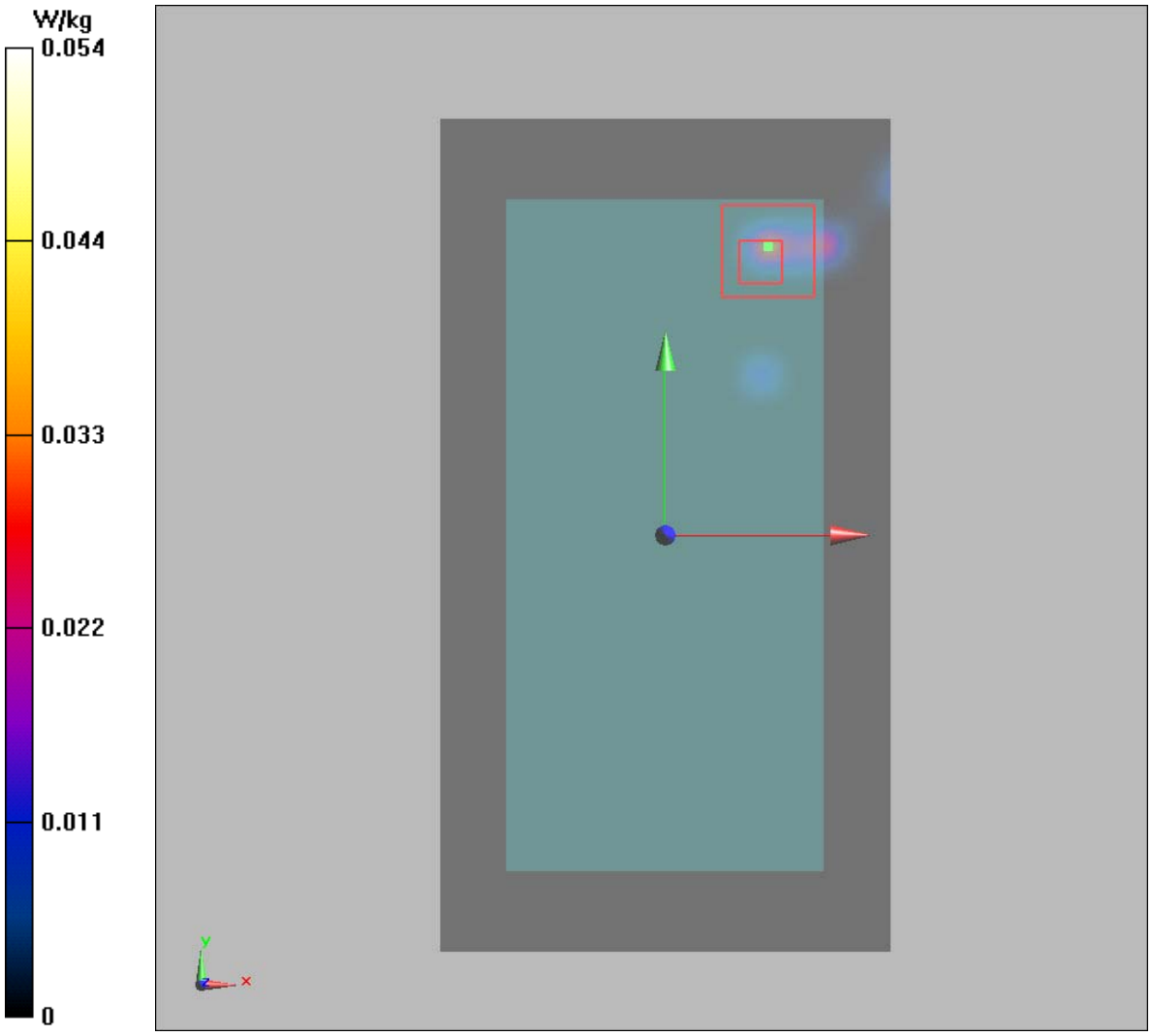
Plot 132 802.11a U-NII-3 Front Side CH149 (Distance 15mm)

Date: 7/12/2018
Communication System: UID 0, 802.11a (0); Frequency: 5745 MHz;Duty Cycle: 1:1.022
Medium parameters used: f = 5745 MHz; σ = 6.06 S/m; ε_r = 47.742; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(4.43, 4.43, 4.43); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side CH149/Area Scan (111x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0335 W/kg

Front Side CH149/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0 V/m; Power Drift = 0.023 dB
Peak SAR (extrapolated) = 0.199 W/kg
SAR(1 g) = 0.043 W/kg; SAR(10 g) = 0.014 W/kg
Maximum value of SAR (measured) = 0.054 W/kg



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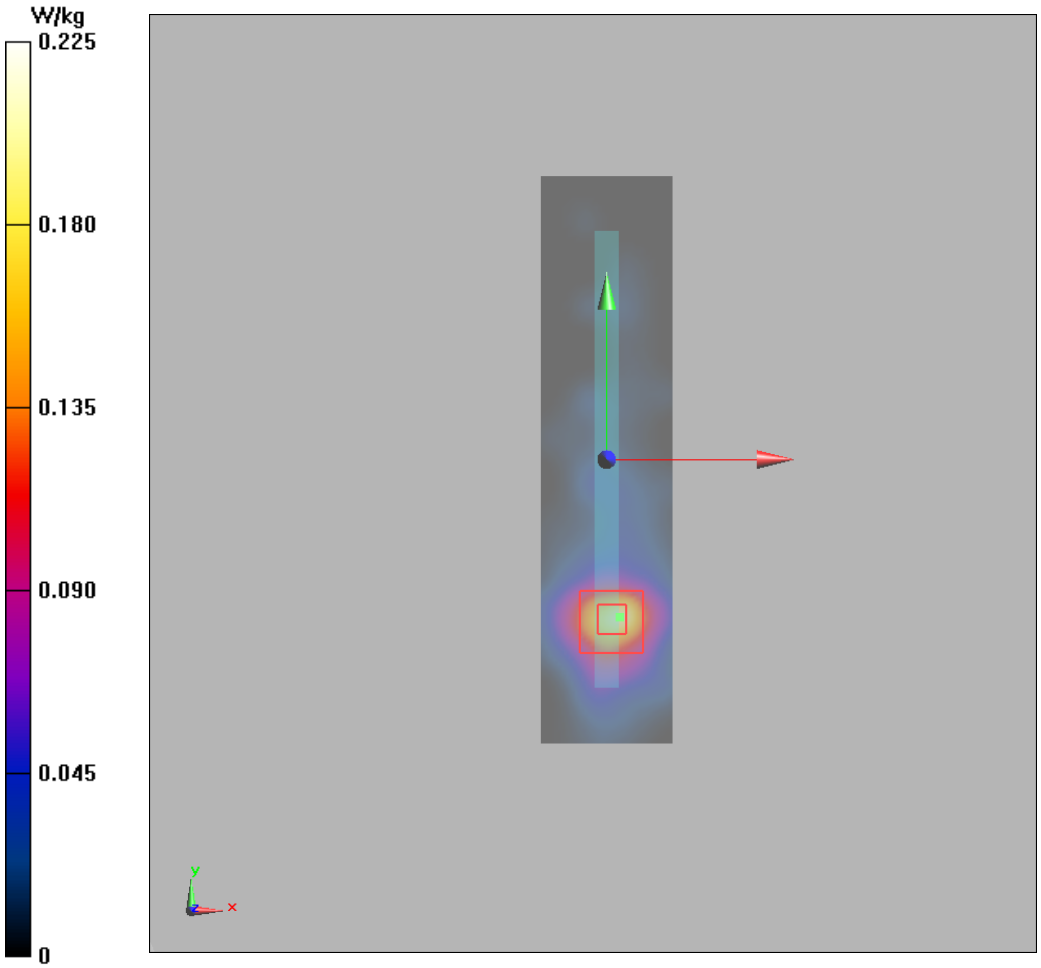
Plot 133 802.11a U-NII-3 Right Edge CH149 (Distance 10mm)

Date: 7/12/2018
Communication System: UID 0, 802.11a (0); Frequency: 5745 MHz;Duty Cycle: 1:1.022
Medium parameters used: f = 5745 MHz; σ = 6.06 S/m; ε_r = 47.742; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(4.43, 4.43, 4.43); Calibrated: 5/29/2018;
Electronics: DAE4 SN1317; Calibrated: 3/23/2018
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Edge CH149/Area Scan (41x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.206 W/kg

Right Edge CH149/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.178 V/m; Power Drift = 0.038 dB
Peak SAR (extrapolated) = 0.530 W/kg
SAR(1 g) = 0.185 W/kg; SAR(10 g) = 0.066 W/kg
Maximum value of SAR (measured) = 0.225 W/kg



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ANNEX D: Probe Calibration Certificate

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中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client TA(shanghai) Certificate No: Z18-60093

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3677
Calibration Procedure(s)	FF-Z11-004-01 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	May 29, 2018

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-17 (CTTL, No.J17X05857)	Jun-18
Power sensor NRP-Z91	101547	27-Jun-17 (CTTL, No.J17X05857)	Jun-18
Power sensor NRP-Z91	101548	27-Jun-17 (CTTL, No.J17X05857)	Jun-18
Reference10dBAttenuator	18N50W-10dB	09-Feb-18(CTTL, No.J18X01133)	Feb-20
Reference20dBAttenuator	18N50W-20dB	09-Feb-18(CTTL, No.J18X01132)	Feb-20
Reference Probe EX3DV4	SN 3846	25-Jan-18(SPEAG,No.EX3-3846_Jan18)	Jan-19
DAE4	SN 777	15-Dec-17(SPEAG, No.DAE4-777_Dec17)	Dec -18
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGeneratorMG3700A	6201052605	27-Jun-17 (CTTL, No.J17X05858)	Jun-18
Network Analyzer E5071C	MY46110673	14-Jan-18 (CTTL, No.J18X00561)	Jan -19

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: May 31, 2018

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Certificate No: Z18-60093 Page 1 of 11

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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Probe EX3DV4

SN: 3677

Calibrated: May 29, 2018

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)^A	0.41	0.46	0.41	±10.0%
DCP(mV)^B	99.9	102.7	102.1	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	152.4	±2.4%
		Y	0.0	0.0	1.0		161.7	
		Z	0.0	0.0	1.0		152.2	

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

^{A} The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 5 and Page 6).
^{B} Numerical linearization parameter: uncertainty not required.
^{E} Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	9.40	9.40	9.40	0.40	0.80	±12.1%
835	41.5	0.90	9.10	9.10	9.10	0.15	1.41	±12.1%
1750	40.1	1.37	8.19	8.19	8.19	0.21	1.15	±12.1%
1900	40.0	1.40	7.96	7.96	7.96	0.25	1.01	±12.1%
2300	39.5	1.67	7.91	7.91	7.91	0.40	0.78	±12.1%
2450	39.2	1.80	7.57	7.57	7.57	0.53	0.76	±12.1%
2600	39.0	1.96	7.28	7.28	7.28	0.64	0.70	±12.1%
5250	35.9	4.71	5.60	5.60	5.60	0.40	1.15	±13.3%
5600	35.5	5.07	4.87	4.87	4.87	0.45	1.05	±13.3%
5750	35.4	5.22	4.99	4.99	4.99	0.45	1.35	±13.3%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	55.5	0.96	9.79	9.79	9.79	0.40	0.80	±12.1%
835	55.2	0.97	9.32	9.32	9.32	0.15	1.51	±12.1%
1750	53.4	1.49	7.91	7.91	7.91	0.23	1.09	±12.1%
1900	53.3	1.52	7.70	7.70	7.70	0.20	1.18	±12.1%
2300	52.9	1.81	7.65	7.65	7.65	0.53	0.82	±12.1%
2450	52.7	1.95	7.53	7.53	7.53	0.37	1.10	±12.1%
2600	52.5	2.16	7.16	7.16	7.16	0.55	0.80	±12.1%
5250	48.9	5.36	5.04	5.04	5.04	0.50	1.55	±13.3%
5600	48.5	5.77	4.27	4.27	4.27	0.51	1.66	±13.3%
5750	48.3	5.94	4.43	4.43	4.43	0.50	1.81	±13.3%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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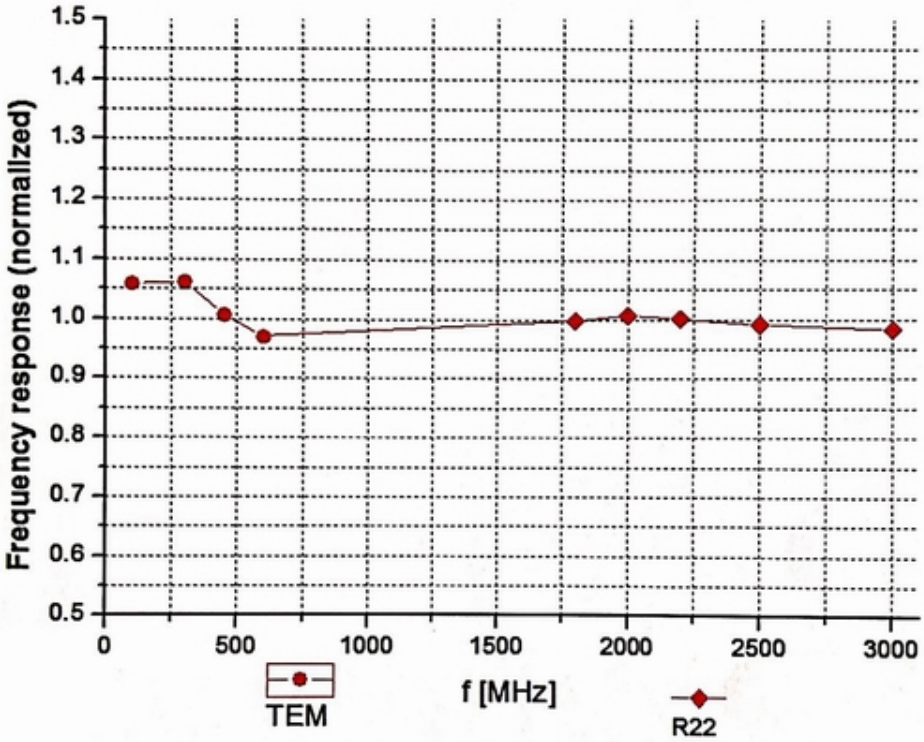
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (k=2)

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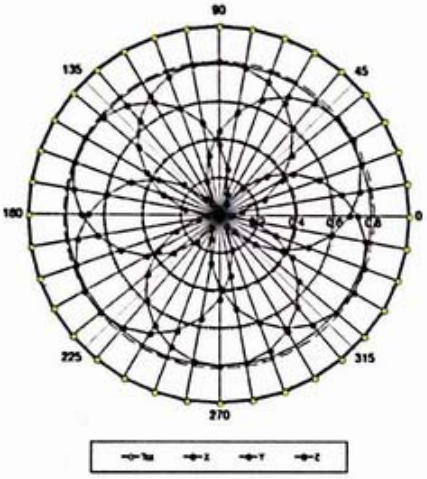
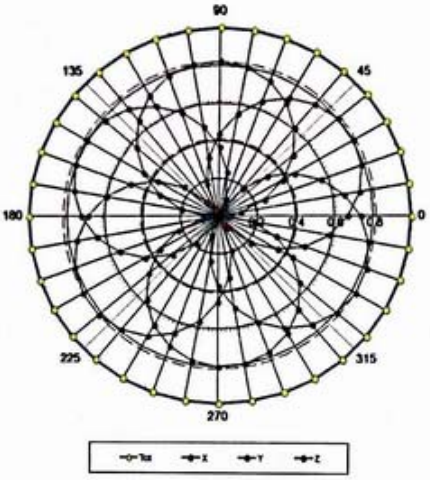
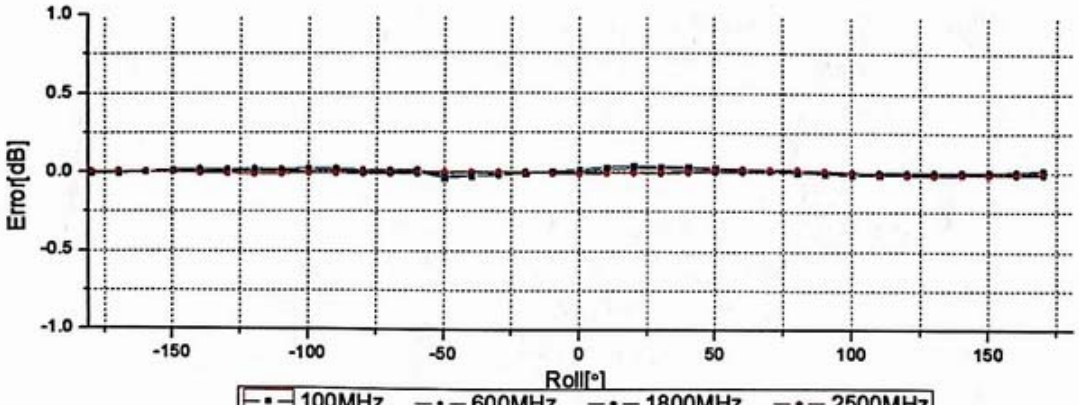
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±1.2% (k=2)

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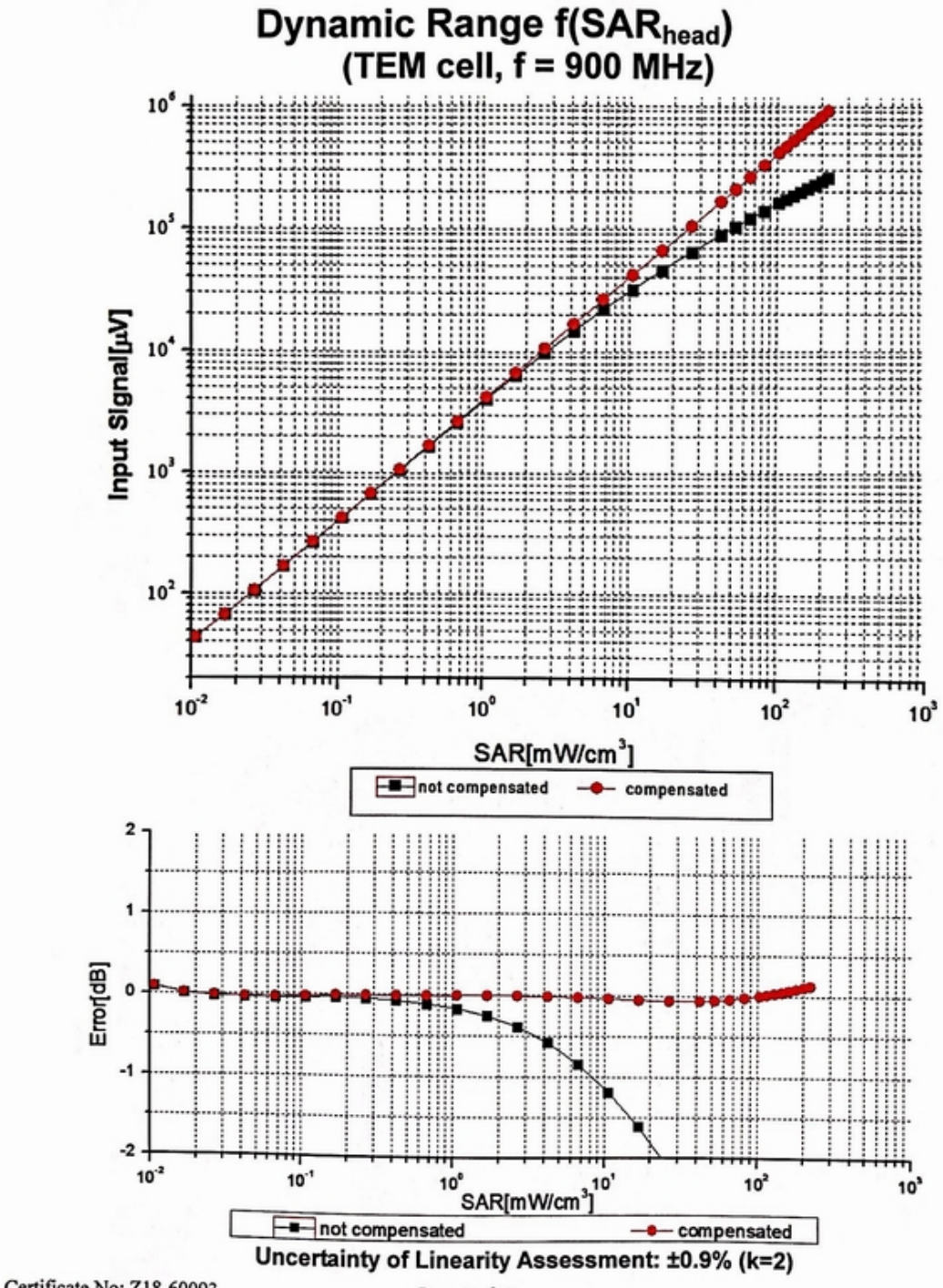

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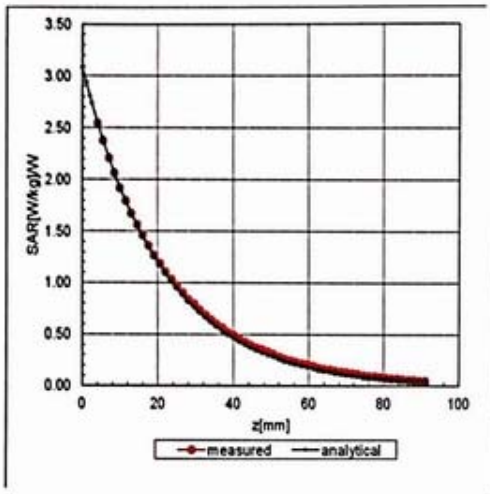
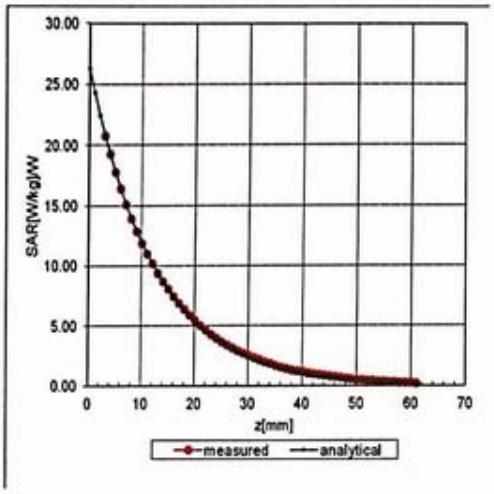
Conversion Factor Assessment

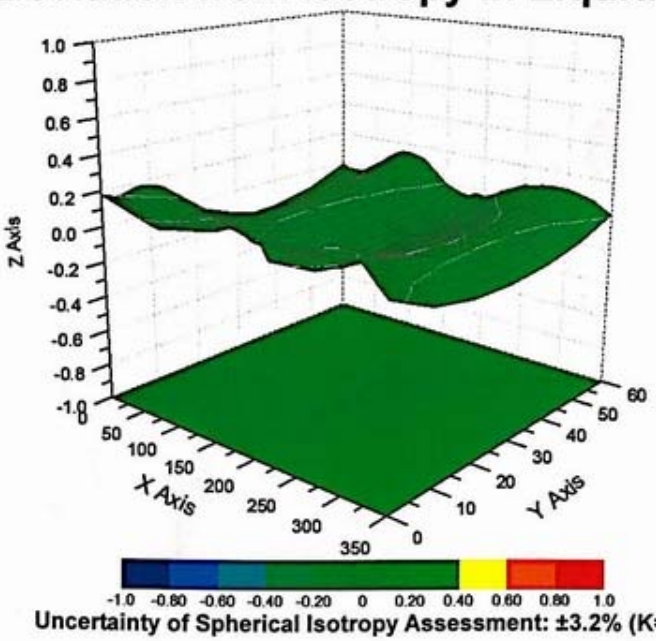
f=750 MHz, WGLS R9(H_convF)



f=1750 MHz, WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (K=2)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	118.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

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