

ANNEX A: Test Layout

R1809A0434-S1

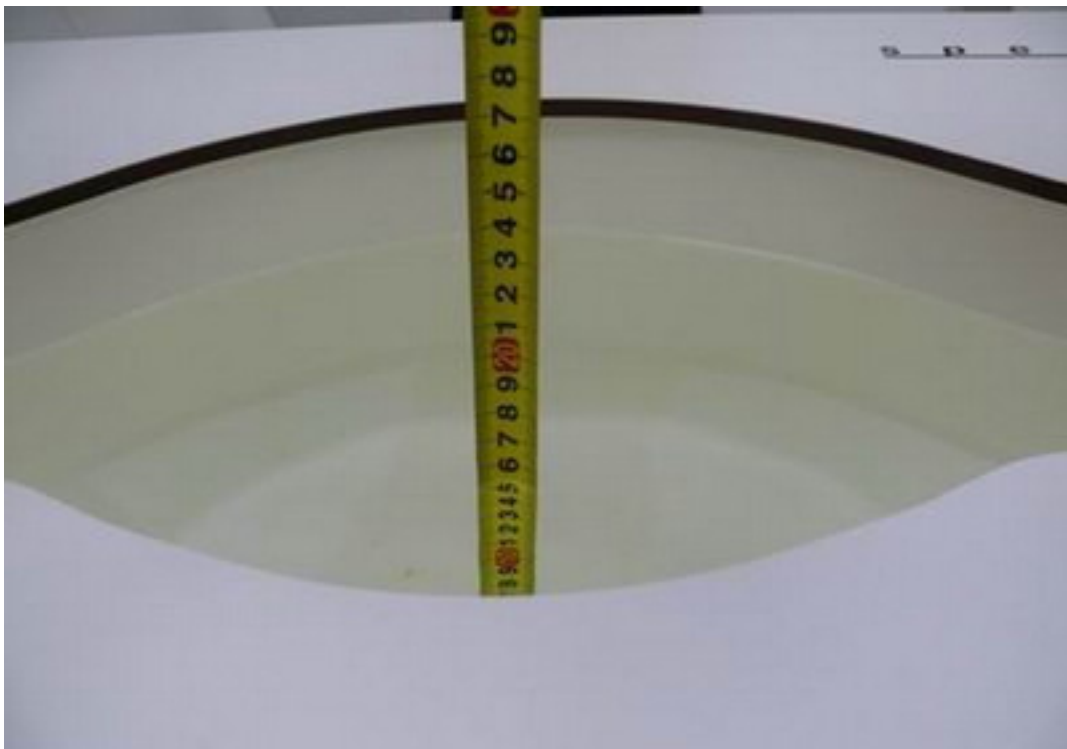


Tissue Simulating Liquids

For the measurement of the field distribution inside the flat phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For Head and Body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Picture 3 and Picture 4.



Picture 1: liquid depth in the head Phantom



Picture 2: Liquid depth in the flat Phantom

System Check_H835

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

Medium parameters used: $f = 835$ MHz; $\sigma = 0.918$ mho/m; $\epsilon_r = 42.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(6.14, 6.14, 6.14); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: TP/1378
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

system check/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.14 mW/g

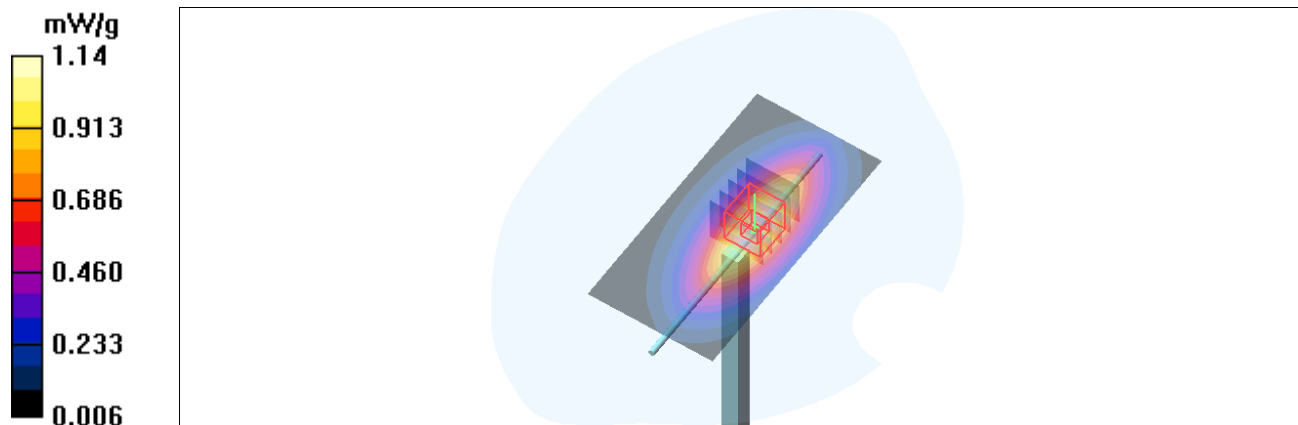
system check/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 32.8 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 1.46 W/kg

SAR(1 g) = 0.964 mW/g; SAR(10 g) = 0.619 mW/g

Maximum value of SAR (measured) = 1.14 mW/g



System Check_H1800

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.44$ mho/m; $\epsilon_r = 41$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(5.14, 5.14, 5.14); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

system check/Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 5.47 mW/g

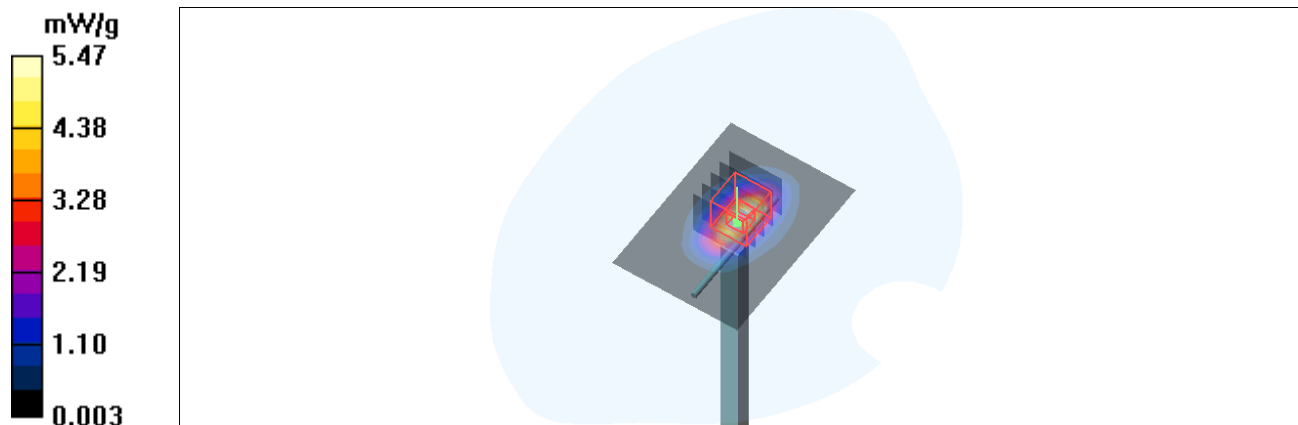
system check/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 60.3 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 7.20 W/kg

SAR(1 g) = 3.93 mW/g; SAR(10 g) = 2.05 mW/g

Maximum value of SAR (measured) = 4.95 mW/g



System Check_H1900

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.43$ mho/m; $\epsilon_r = 40.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.81, 4.81, 5.81); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASYS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

system check/Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 6.03 mW/g

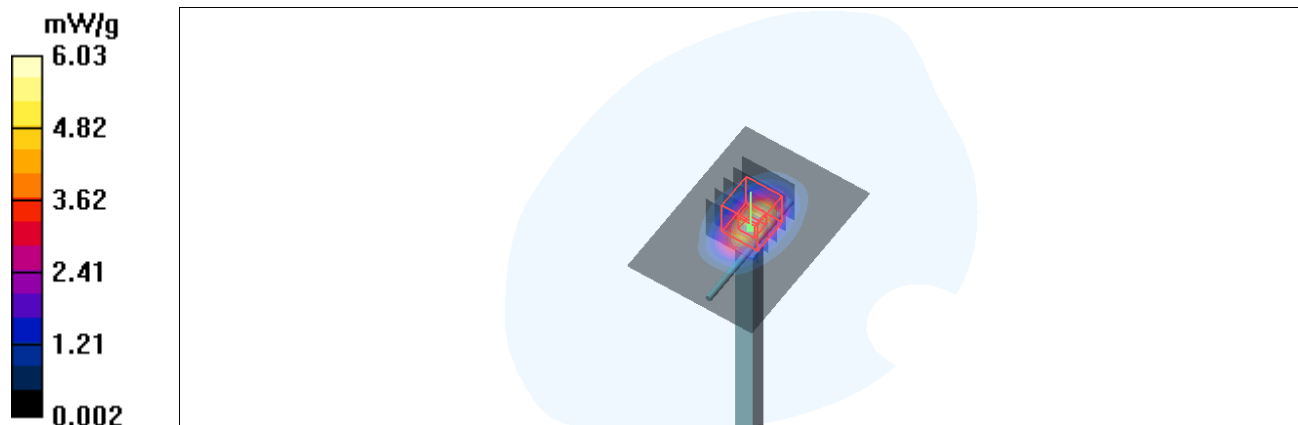
system check/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 62.6 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 7.76 W/kg

SAR(1 g) = 4.22 mW/g; SAR(10 g) = 2.16 mW/g

Maximum value of SAR (measured) = 5.32 mW/g



System Check_H2600

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

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.05$ mho/m; $\epsilon_r = 38.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.32, 4.32, 4.32); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

system check/Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 7.71 mW/g

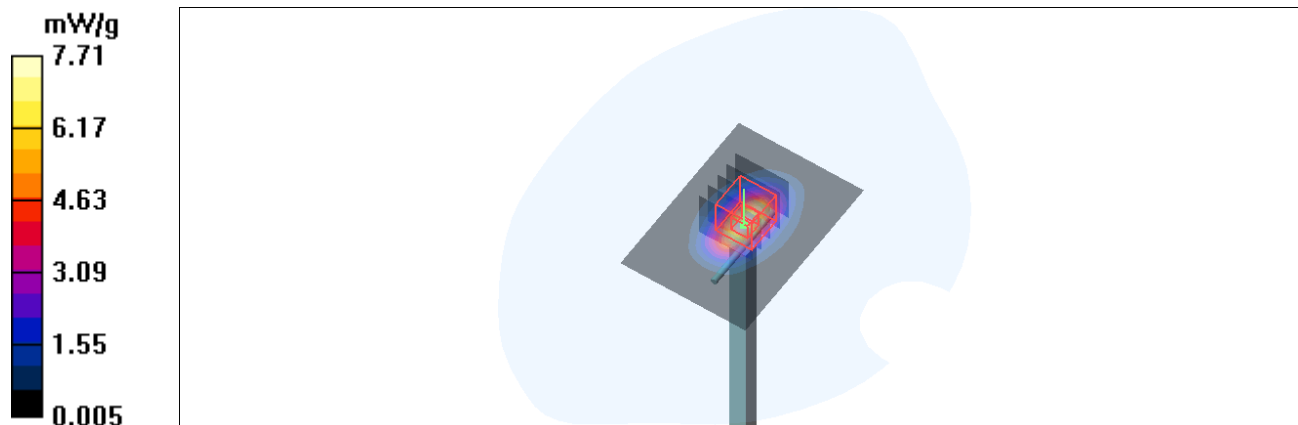
system check/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 59.8 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 9.79 W/kg

SAR(1 g) = 5.4 mW/g; SAR(10 g) = 2.84 mW/g

Maximum value of SAR (measured) = 6.81 mW/g



System Check_B835

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

Medium parameters used: $f = 835$ MHz; $\sigma = 0.978$ mho/m; $\epsilon_r = 55.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(6.21, 6.21, 6.21); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: TP/1378
- Measurement SW: DASYS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

system check/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.08 mW/g

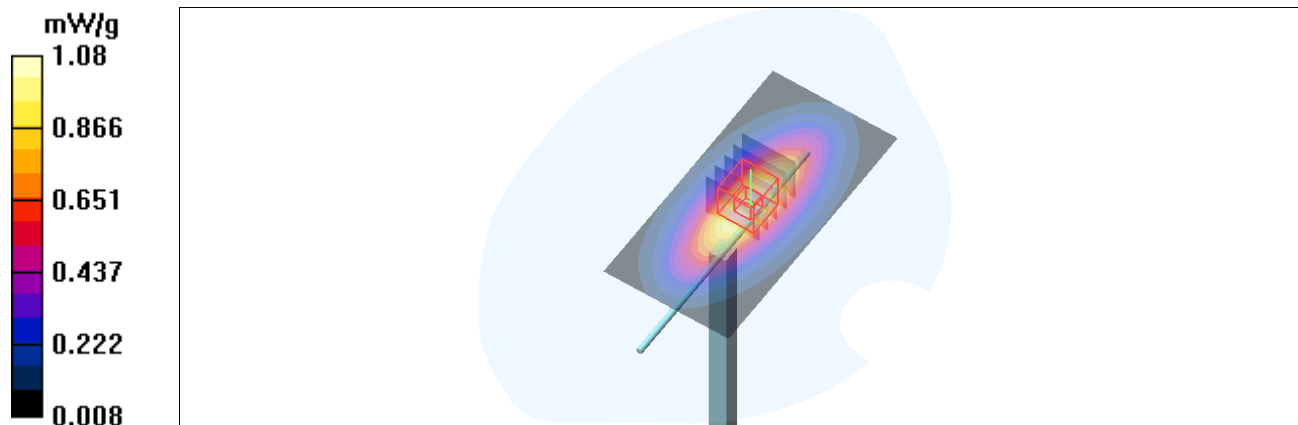
system check/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 34.6 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 1.35 W/kg

SAR(1 g) = 0.927 mW/g; SAR(10 g) = 0.606 mW/g

Maximum value of SAR (measured) = 1.08 mW/g



System Check_B1800

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.58$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.82, 4.82, 4.82); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

system check/Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 5.91 mW/g

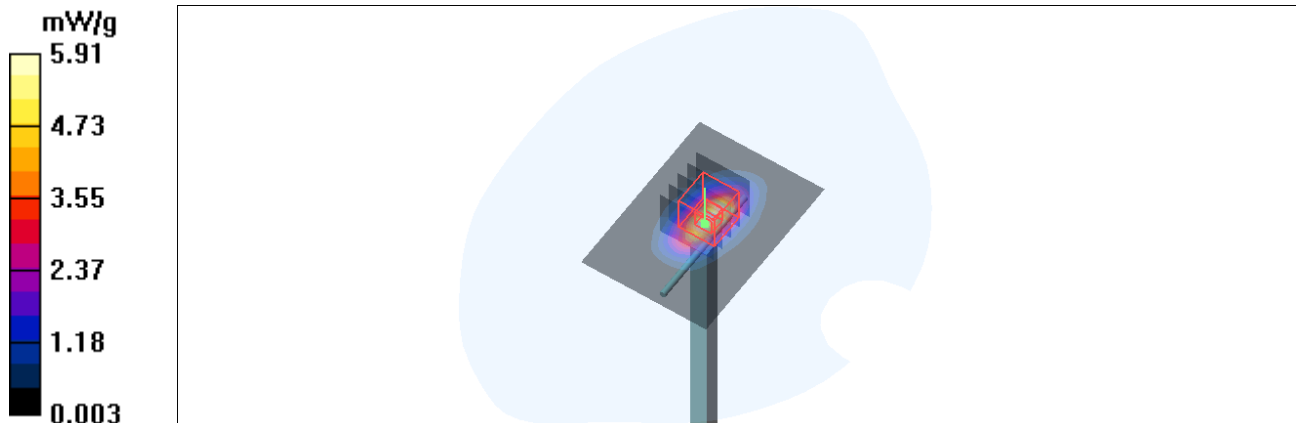
system check/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 58.6 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 7.34 W/kg

SAR(1 g) = 4.14 mW/g; SAR(10 g) = 2.19 mW/g

Maximum value of SAR (measured) = 5.14 mW/g



System Check_B1900

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.55$ mho/m; $\epsilon_r = 54.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.52, 4.52, 4.52); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASYS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

system check/Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 6.29 mW/g

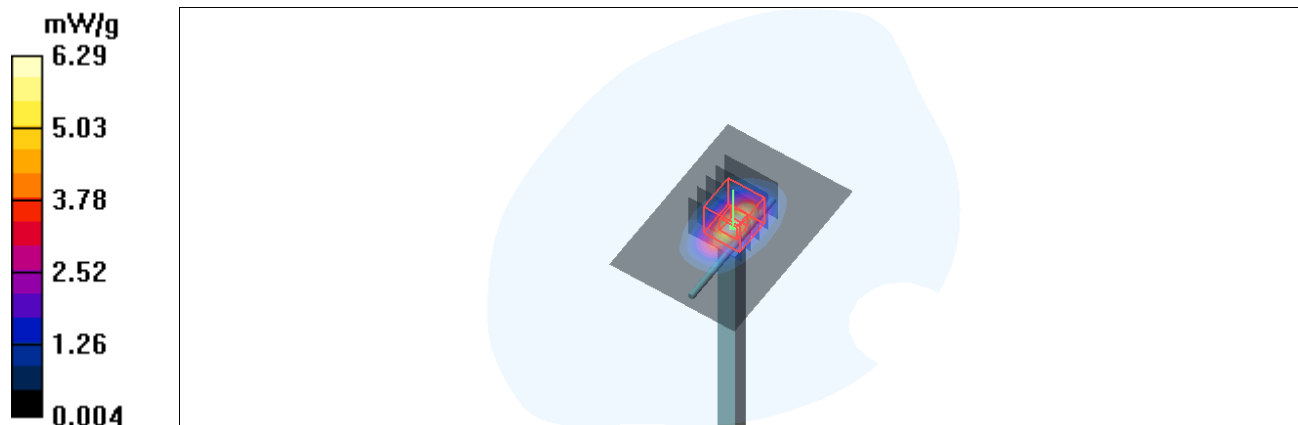
system check/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 59.8 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 7.51 W/kg

SAR(1 g) = 4.14 mW/g; SAR(10 g) = 2.13 mW/g

Maximum value of SAR (measured) = 5.25 mW/g



System Check_B2600

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

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.2$ mho/m; $\epsilon_r = 52.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.12, 4.12, 4.12); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASYS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

system check/Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 8.67 mW/g

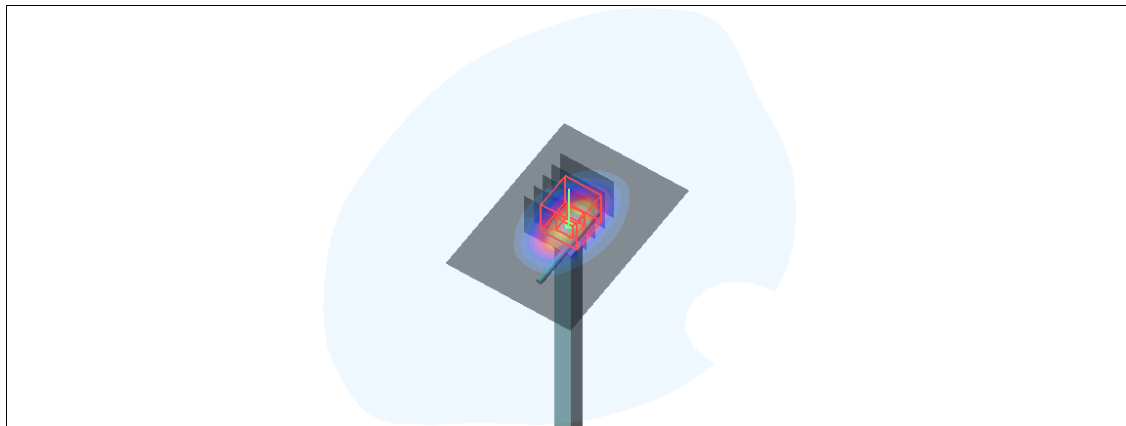
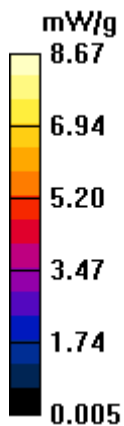
system check/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 61.2 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 11.0 W/kg

SAR(1 g) = 5.47 mW/g; SAR(10 g) = 3.19 mW/g

Maximum value of SAR (measured) = 7.66 mW/g



System Performance Check at 2450 MHz Head TSL**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786**

Date: 10/29/2018

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.85$ mho/m; $\epsilon_r = 39.7$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

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)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 18.2 mW/g

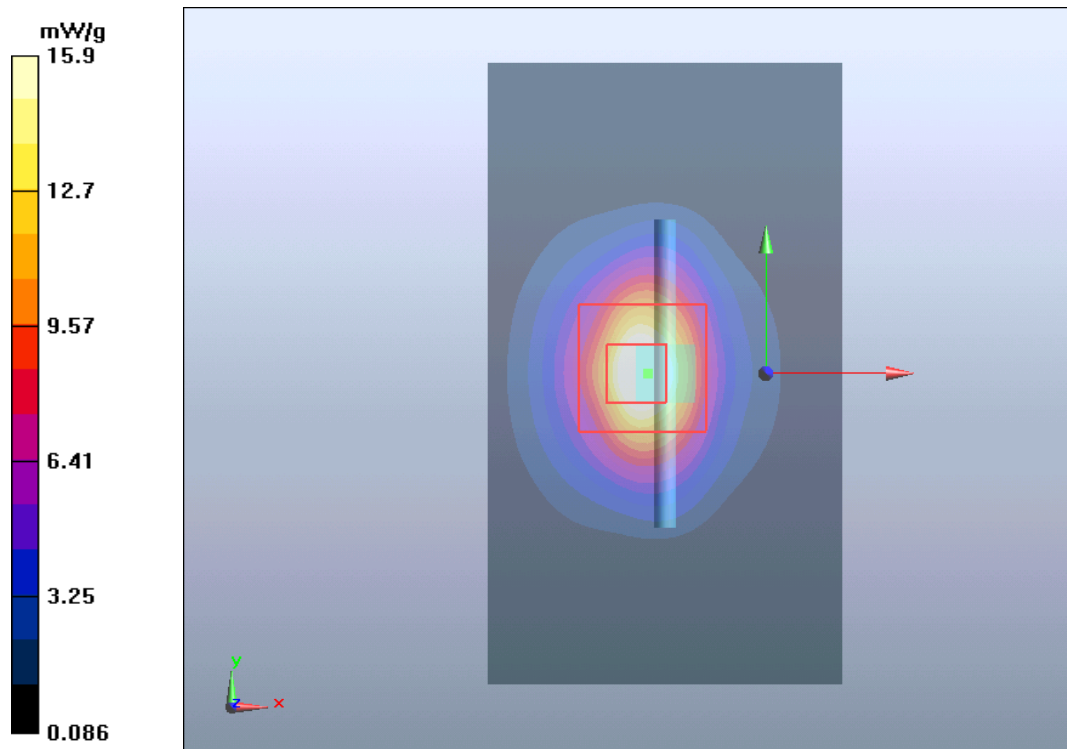
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.8 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 30 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g

Maximum value of SAR (measured) = 15.9 mW/g



System Performance Check at 2450 MHz Body TSL**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786**

Date: 10/29/2018

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.97$ mho/m; $\epsilon_r = 51.1$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

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)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 16 mW/g

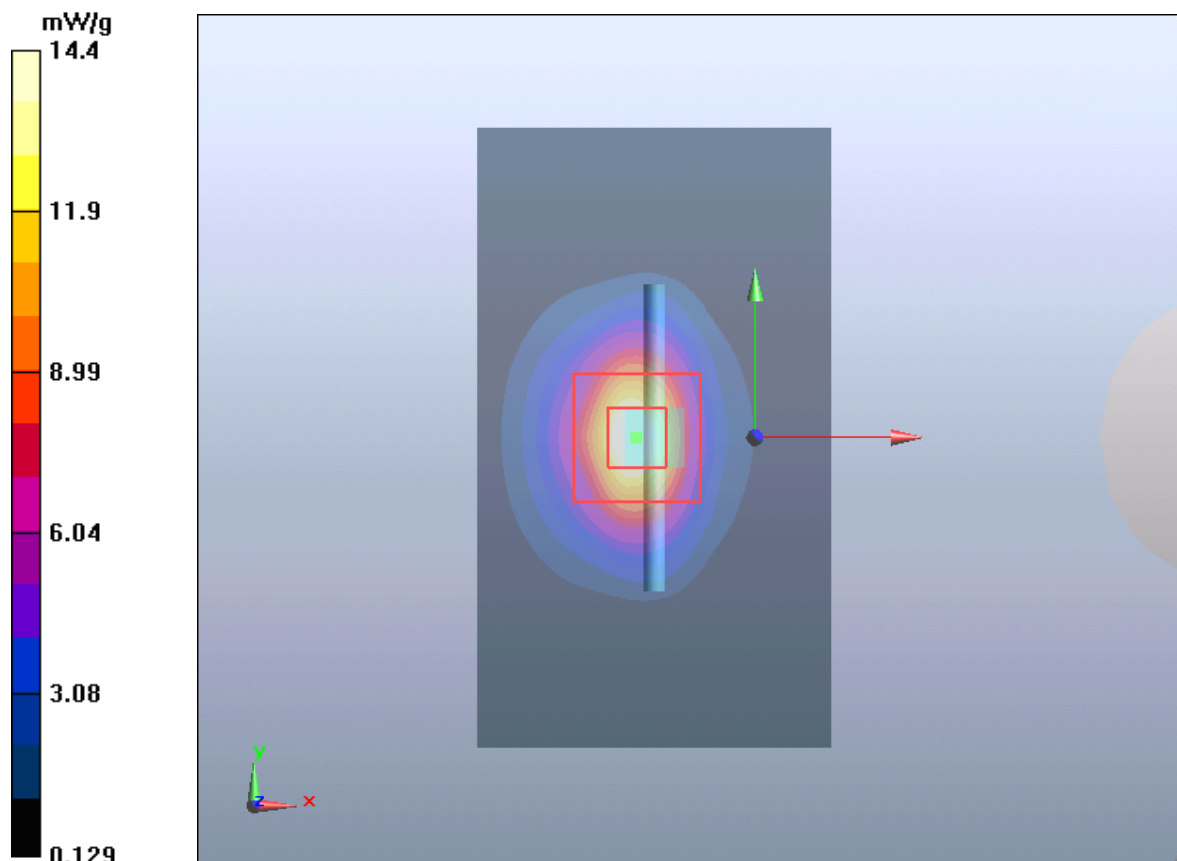
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.2 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 6.20 mW/g

Maximum value of SAR (measured) = 14.4 mW/g



P01_GSM850_GSM_Right Cheek_190

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

Medium parameters used: $f = 837$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 42.9$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(6.14, 6.14, 6.14); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: TP/1378
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.256 mW/g

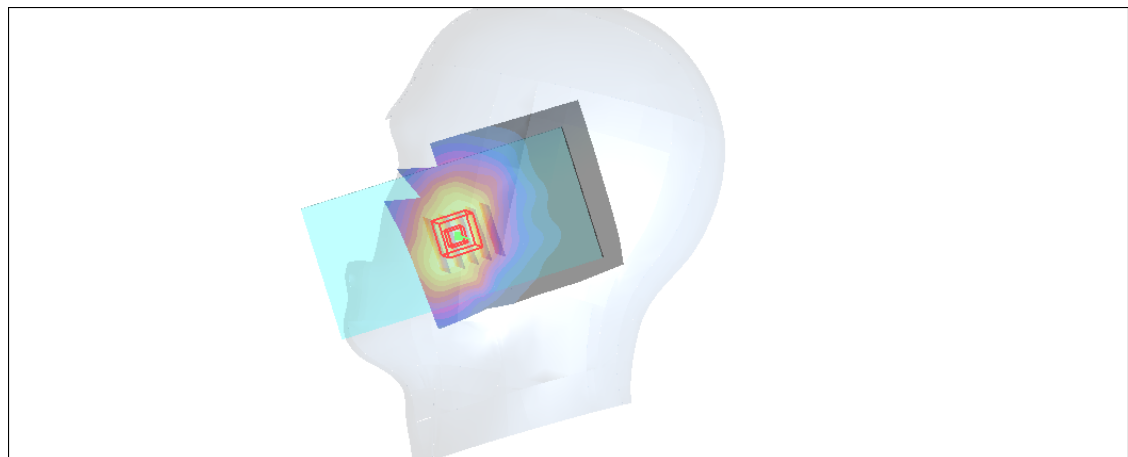
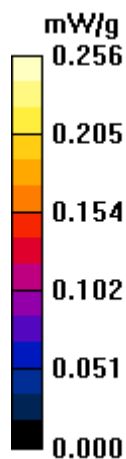
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.18 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.252 W/kg

SAR(1 g) = 0.218 mW/g; SAR(10 g) = 0.176 mW/g

Maximum value of SAR (measured) = 0.232 mW/g



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P02_GSM1900_GSM_Right Cheek_810

Communication System: PCS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 41.5$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.81, 4.81, 4.81); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DAS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.107 mW/g

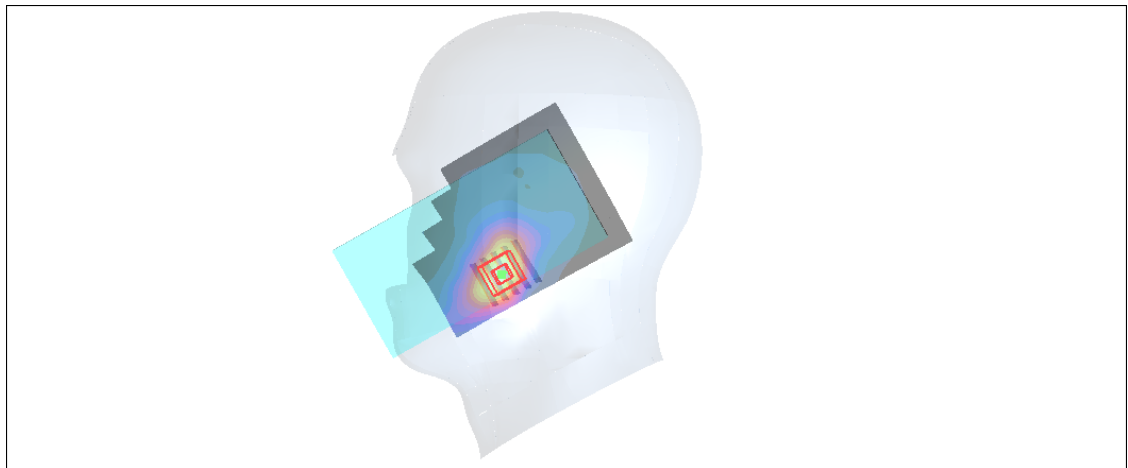
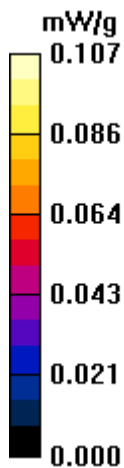
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.58 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.117 W/kg

SAR(1 g) = 0.089 mW/g; SAR(10 g) = 0.060 mW/g

Maximum value of SAR (measured) = 0.101 mW/g



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P03_WCDMA II_RMC12.2K_Right Cheek_9400

Communication System: WCDMA Band II; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.44$ mho/m; $\epsilon_r = 41.6$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.81, 4.81, 4.81); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.209 mW/g

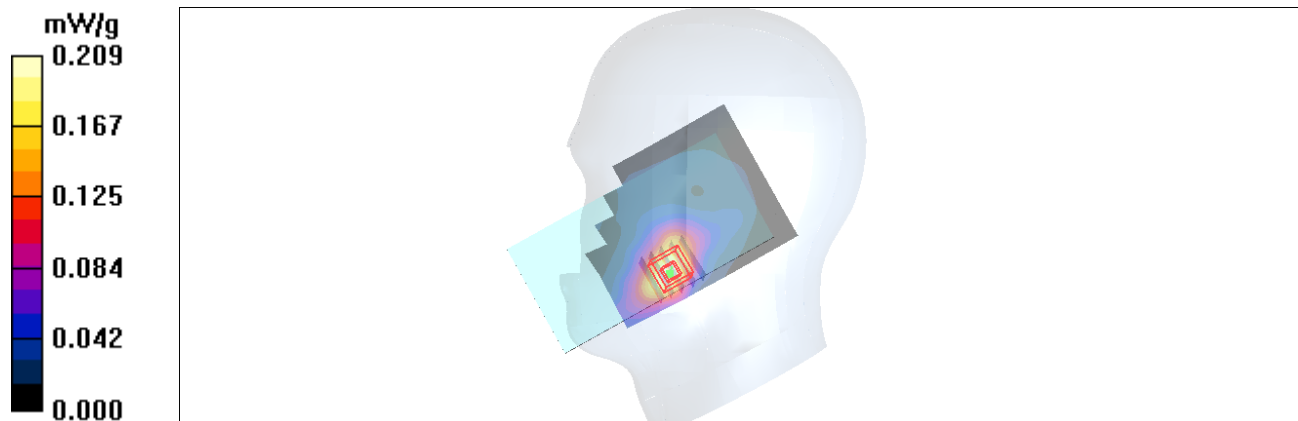
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.11 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.225 W/kg

SAR(1 g) = 0.174 mW/g; SAR(10 g) = 0.118 mW/g

Maximum value of SAR (measured) = 0.198 mW/g



P04_WCDMA V_RMC12.2K_Right Cheek_4132

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 0.909$ mho/m; $\epsilon_r = 43$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(6.14, 6.14, 6.14); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: TP/1378
- Measurement SW: DAS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.206 mW/g

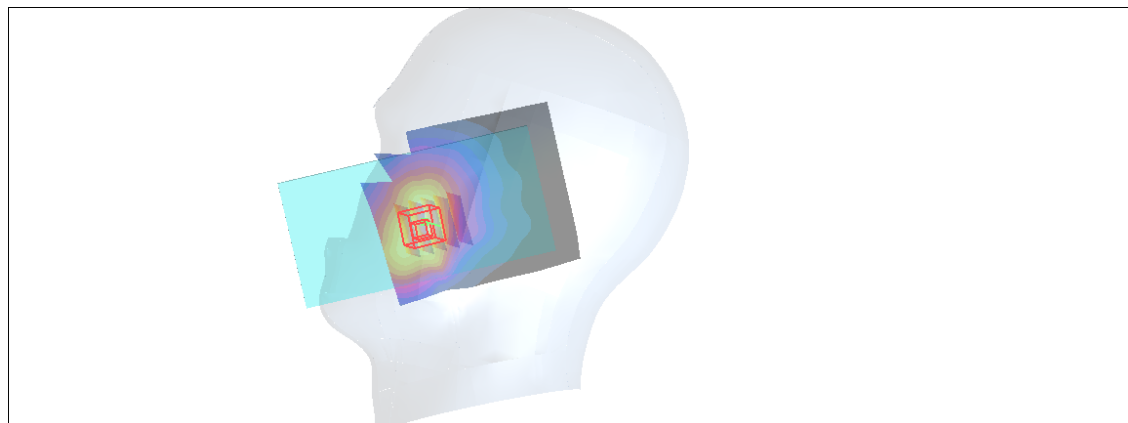
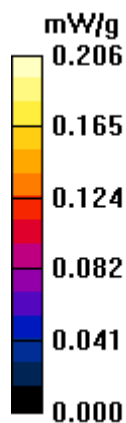
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.03 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.249 W/kg

SAR(1 g) = 0.193 mW/g; SAR(10 g) = 0.145 mW/g

Maximum value of SAR (measured) = 0.209 mW/g



P05_LTE 2_QPSK20M_Right Cheek_18900_1RB_0 Offset

Communication System: LTE Band 2; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.44$ mho/m; $\epsilon_r = 41.6$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.81, 4.81, 4.81); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASYS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.207 mW/g

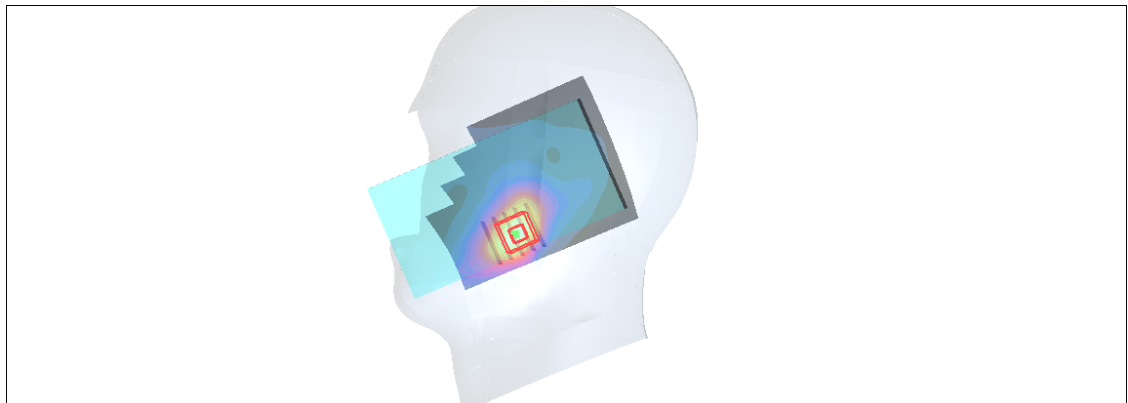
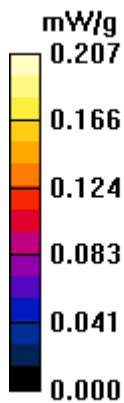
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.16 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.236 W/kg

SAR(1 g) = 0.181 mW/g; SAR(10 g) = 0.122 mW/g

Maximum value of SAR (measured) = 0.207 mW/g



P06_LTE 4_QPSK20M_Right Cheek_20050_1RB_50 Offset

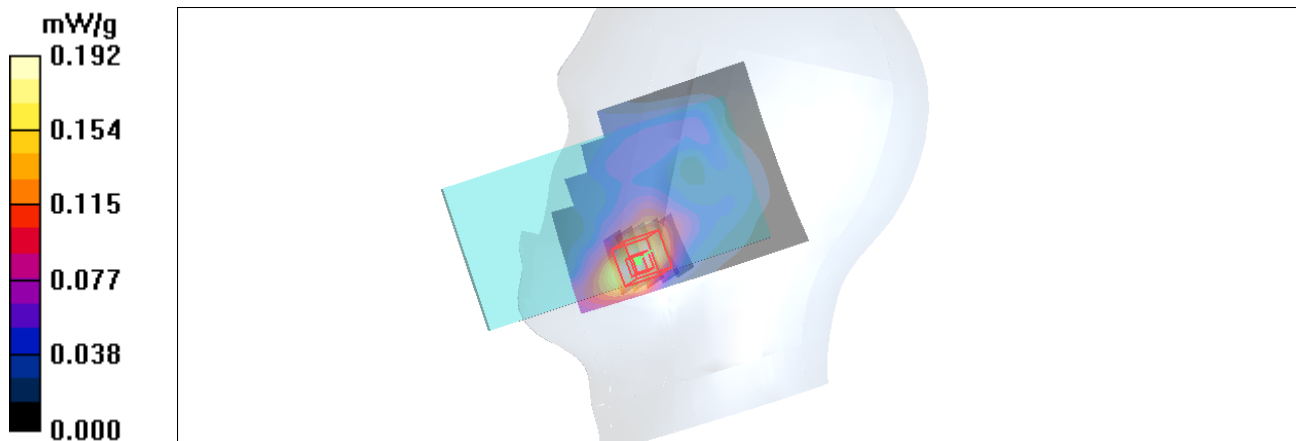
Communication System: LTE Band 4&20M; Frequency: 1720 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1720$ MHz; $\sigma = 1.34$ mho/m; $\epsilon_r = 41.2$; $\rho = 1000$ kg/m³
Phantom section: Right Section
Measurement Standard: DASy4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(5.14, 5.14, 5.14); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASy4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.192 mW/g

Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.98 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.198 W/kg
SAR(1 g) = 0.164 mW/g; SAR(10 g) = 0.117 mW/g
Maximum value of SAR (measured) = 0.176 mW/g



P07_LTE 5_QPSK10M_Right Cheek_20450_1RB_49 Offset

Communication System: LTE FDD 10M-Band 5; Frequency: 829 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 829$ MHz; $\sigma = 0.912$ mho/m; $\epsilon_r = 43$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(6.14, 6.14, 6.14); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: TP/1378
- Measurement SW: DAS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.194 mW/g

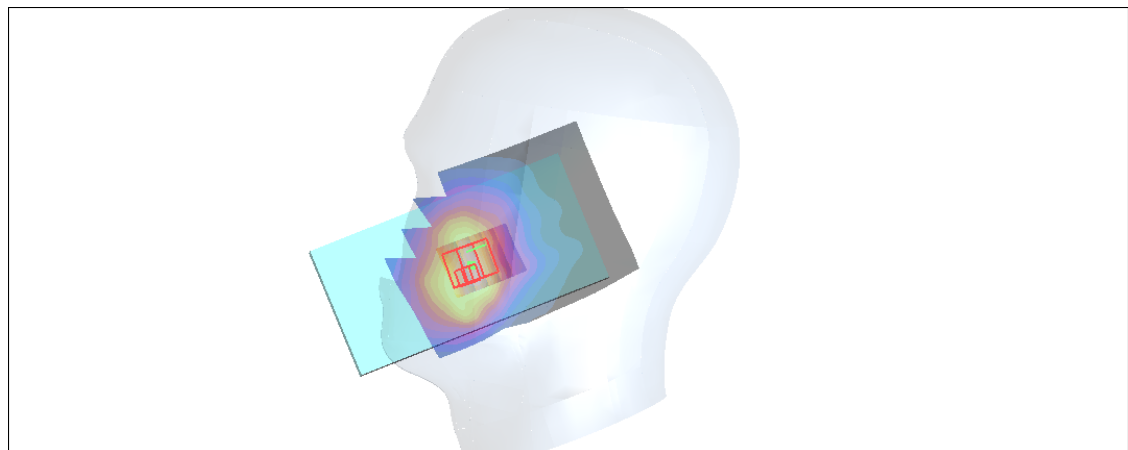
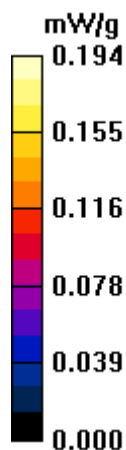
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.69 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.181 W/kg

SAR(1 g) = 0.165 mW/g; SAR(10 g) = 0.132 mW/g

Maximum value of SAR (measured) = 0.179 mW/g



P08_LTE 7_QPSK20M_Right Tilted_20850_1RB_0 Offset

Communication System: LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2510$ MHz; $\sigma = 1.95$ mho/m; $\epsilon_r = 38.7$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.48, 4.48, 4.48); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: TP/1378
- Measurement SW: DAS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.150 mW/g

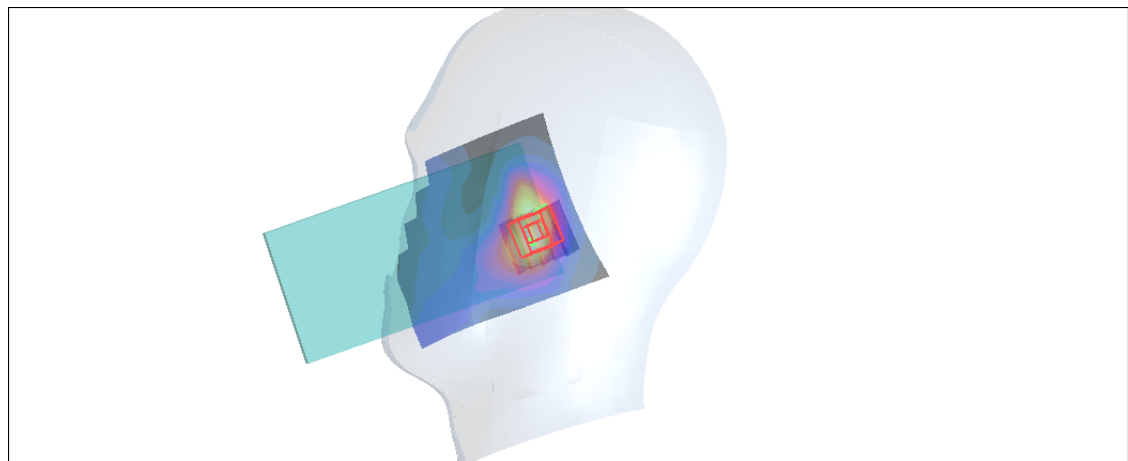
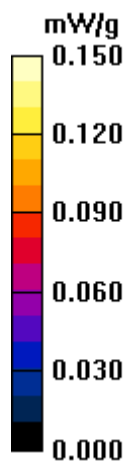
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.63 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.156 W/kg

SAR(1 g) = 0.119 mW/g; SAR(10 g) = 0.085 mW/g

Maximum value of SAR (measured) = 0.137 mW/g



P09_802.11b Left Cheek High

Date: 10/29/2018

Communication System: UID 0, 802.11b (0); Frequency: 2462 MHz; Duty Cycle: 1:1.021

Medium parameters used: $f = 2462$ MHz; $\sigma = 1.862$ S/m; $\epsilon_r = 39.703$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

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 High/Area Scan (91x171x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 1.78 W/kg

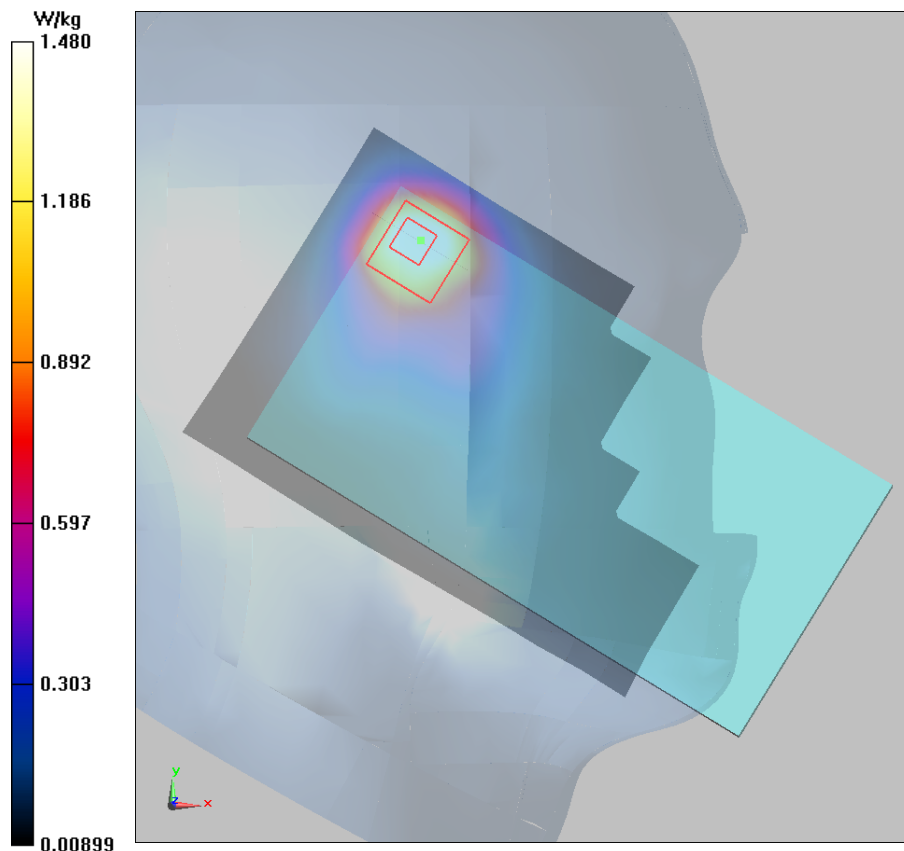
Left Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 14.72 V/m; Power Drift = 0.07dB

Peak SAR (extrapolated) = 3.33 W/kg

SAR(1 g) = 1.24 W/kg; SAR(10 g) = 0.703 W/kg

Maximum value of SAR (measured) = 1.48 W/kg



P10_BT Left Tilt Low

Date: 10/29/2018

Communication System: UID 0, BT (0); Frequency: 2402 MHz; Duty Cycle: 1:1.305

Medium parameters used: $f = 2402$ MHz; $\sigma = 1.792$ S/m; $\epsilon_r = 39.876$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

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 Tilt Low/Area Scan (101x181x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.123 W/kg

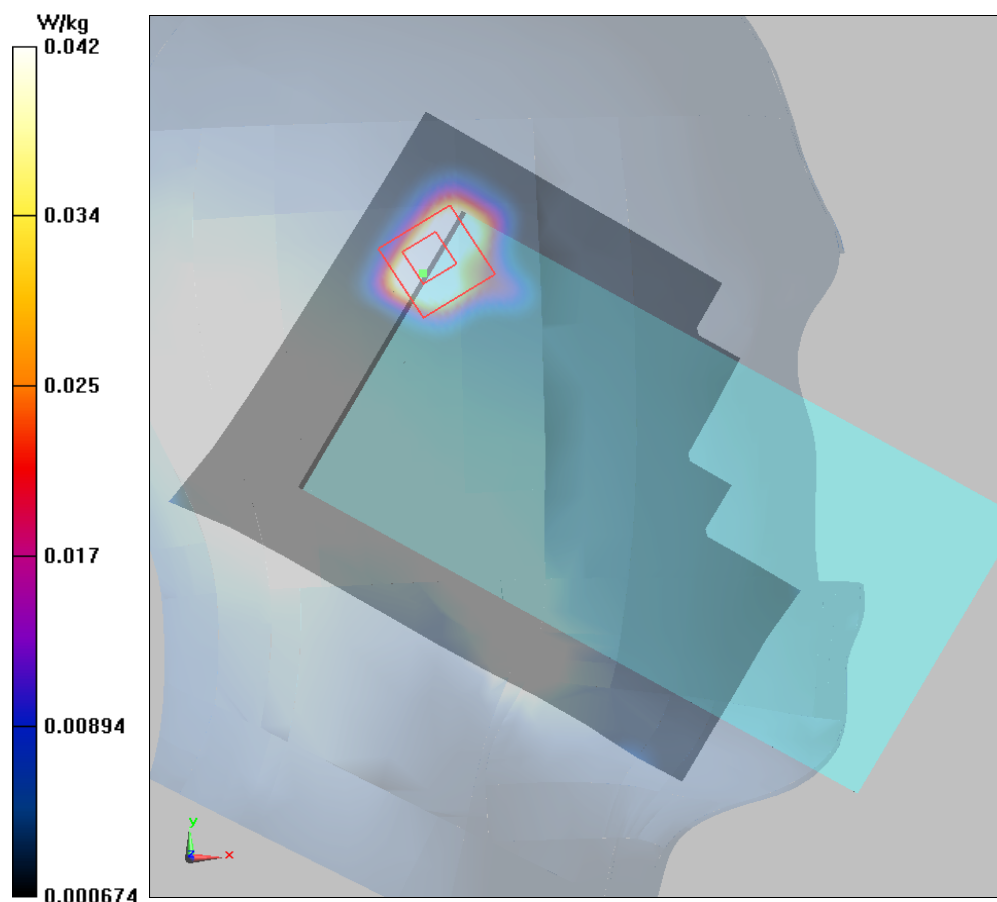
Left Tilt Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.200 V/m; Power Drift = 0.098 dB

Peak SAR (extrapolated) = 0.134 W/kg

SAR(1 g) = 0.041 W/kg; SAR(10 g) = 0.020 W/kg

Maximum value of SAR (measured) = 0.0420 W/kg



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P11_GSM850_GPRS12_Rear Face_1cm_251

Communication System: GPRS 850-4solt; Frequency: 848.8 MHz;Duty Cycle: 1:2
Medium parameters used: $f = 849$ MHz; $\sigma = 0.991$ mho/m; $\epsilon_r = 55.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

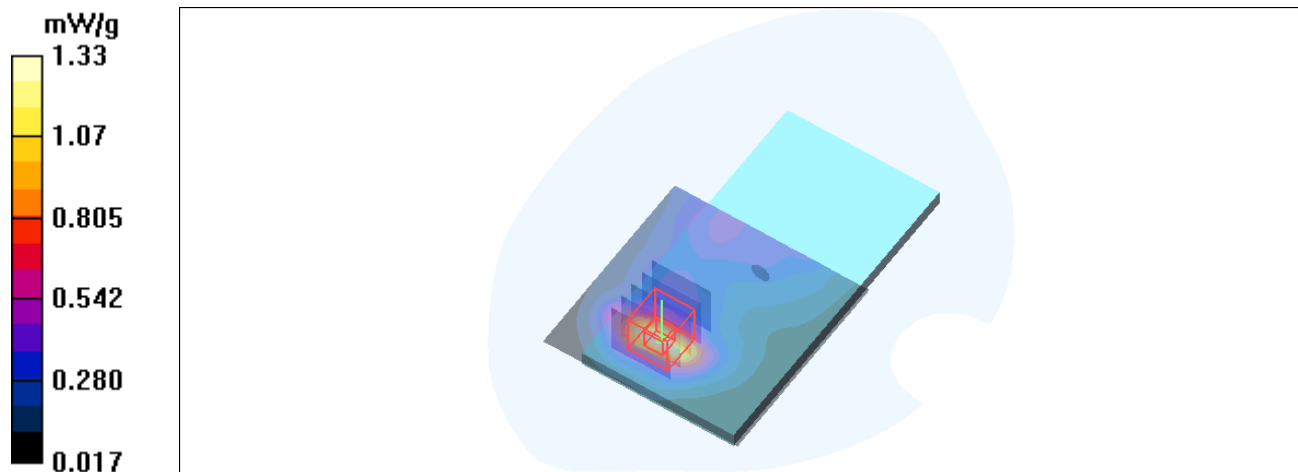
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(6.21, 6.21, 6.21); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: TP/1378
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.33 mW/g

Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.7 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.53 W/kg
SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.630 mW/g
Maximum value of SAR (measured) = 1.26 mW/g



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P12_GSM1900_GPRS12_Rear Face_1cm_661

Communication System: GPRS1900-4slots; Frequency: 1880 MHz; Duty Cycle: 1:2
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 54.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.52, 4.52, 4.52); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASYS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.770 mW/g

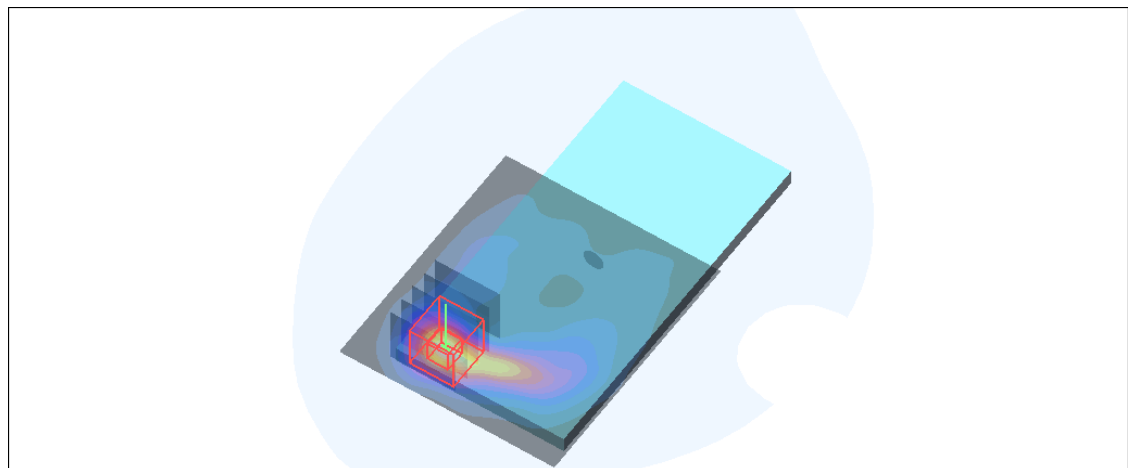
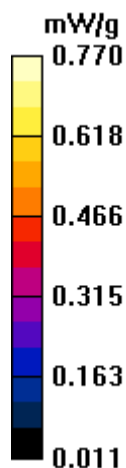
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.05 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.968 W/kg

SAR(1 g) = 0.645 mW/g; SAR(10 g) = 0.353 mW/g

Maximum value of SAR (measured) = 0.789 mW/g



P13_WCDMA II_RMC12.2K_Rear Face_1cm_9538

Communication System: WCDMA Band II; Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1908$ MHz; $\sigma = 1.51$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.52, 4.52, 4.52); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.28 mW/g

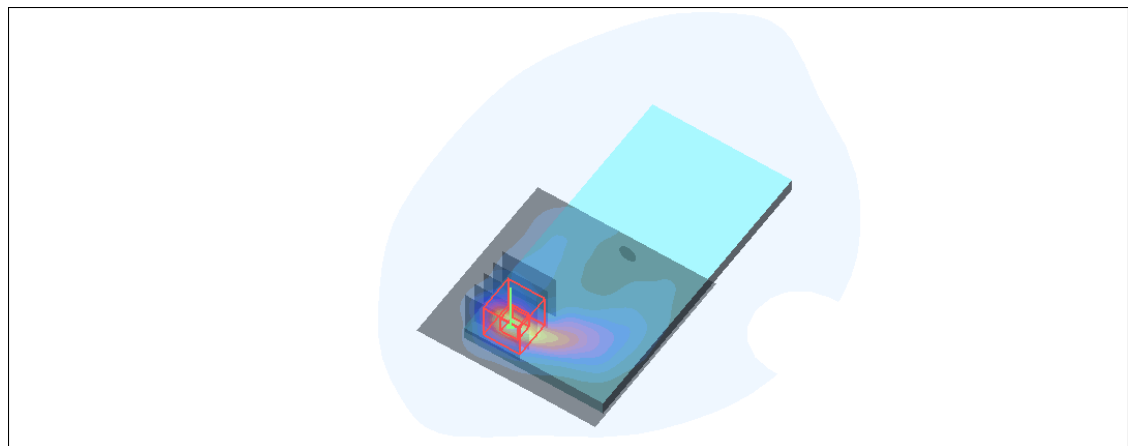
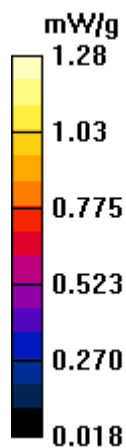
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.71 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.54 W/kg

SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.563 mW/g

Maximum value of SAR (measured) = 1.25 mW/g



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P14_WCDMA V_RMC12.2K_Rear Face_1cm_4132

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 0.969$ mho/m; $\epsilon_r = 55.7$; $\rho = 1000$

kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(6.21, 6.21, 6.21); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: TP/1378
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.446 mW/g

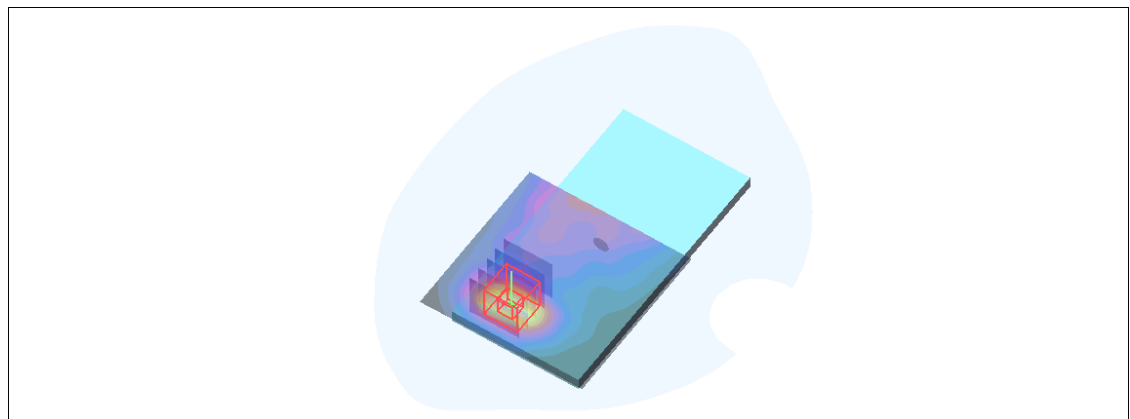
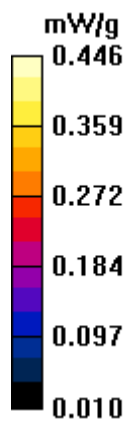
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.3 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.584 W/kg

SAR(1 g) = 0.400 mW/g; SAR(10 g) = 0.243 mW/g

Maximum value of SAR (measured) = 0.484 mW/g



P15_LTE 2_QPSK20M_Rear Face_1cm_19100_1RB_50 Offset

Communication System: LTE Band 2; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.55$ mho/m; $\epsilon_r = 54.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.52, 4.52, 4.52); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DAS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.29 mW/g

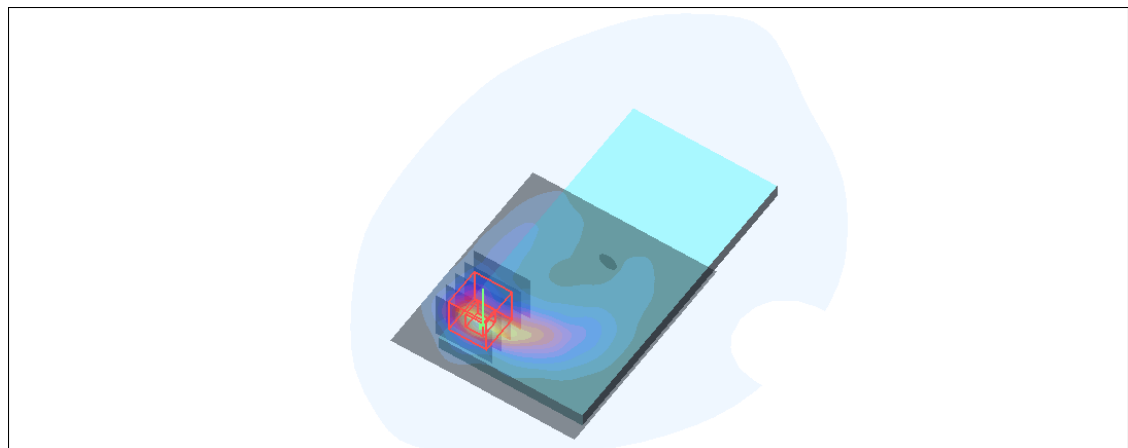
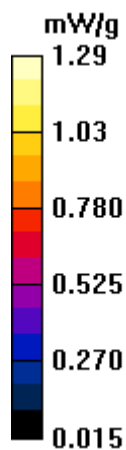
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.65 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 1.66 W/kg

SAR(1 g) = 1.11 mW/g; SAR(10 g) = 0.602 mW/g

Maximum value of SAR (measured) = 1.30 mW/g



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P16_LTE 4_QPSK20M_Rear Face_1cm_20050_1RB_50 Offset

Communication System: LTE Band 4&20M; Frequency: 1720 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1800$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

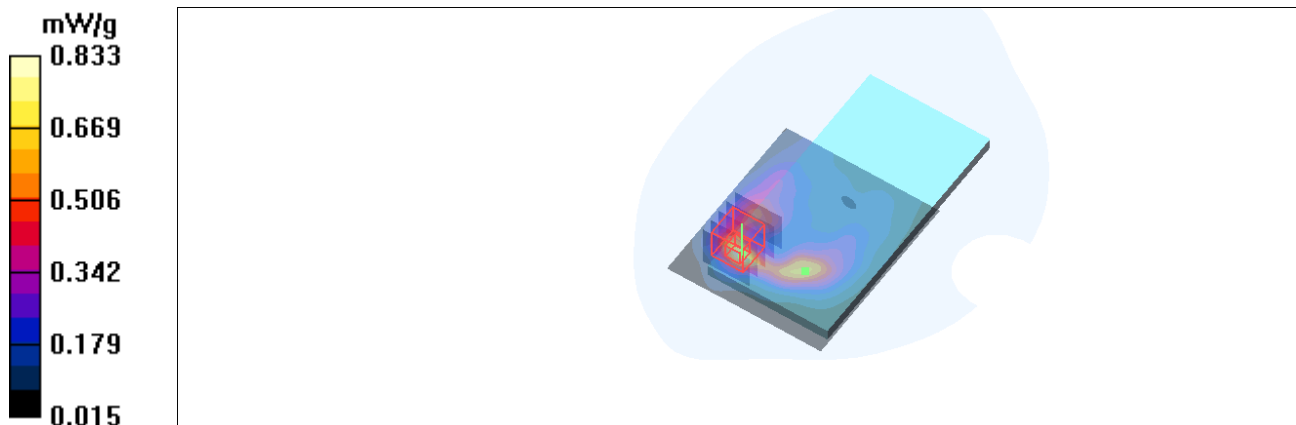
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.82, 4.82, 4.82); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.833 mW/g

Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.77 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.827 W/kg
SAR(1 g) = 0.616 mW/g; SAR(10 g) = 0.375 mW/g
Maximum value of SAR (measured) = 0.725 mW/g



P17_LTE 5_QPSK10M_Rear Face_1cm_20450_1RB_49 Offset

Communication System: LTE Band5; Frequency: 829 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 829$ MHz; $\sigma = 0.972$ mho/m; $\epsilon_r = 55.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(6.21, 6.21, 6.21); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: TP/1378
- Measurement SW: DAS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.518 mW/g

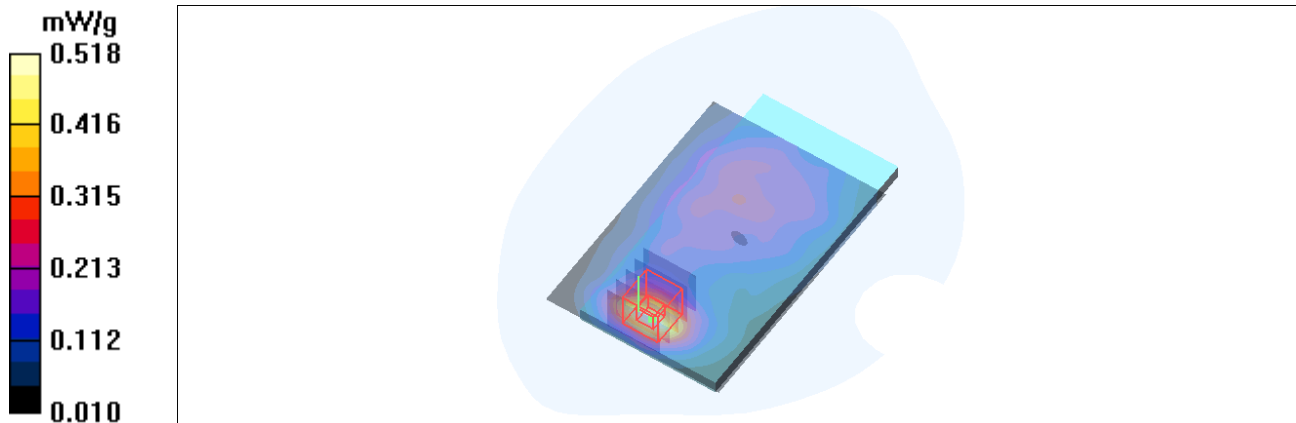
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.6 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.666 W/kg

SAR(1 g) = 0.444 mW/g; SAR(10 g) = 0.265 mW/g

Maximum value of SAR (measured) = 0.504 mW/g



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P18_LTE 7_QPSK20M_Rear Face_1cm_20850_1RB_0 Offset

Communication System: LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2510$ MHz; $\sigma = 2.09$ mho/m; $\epsilon_r = 52.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.33, 4.33, 4.33); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DAS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.486 mW/g

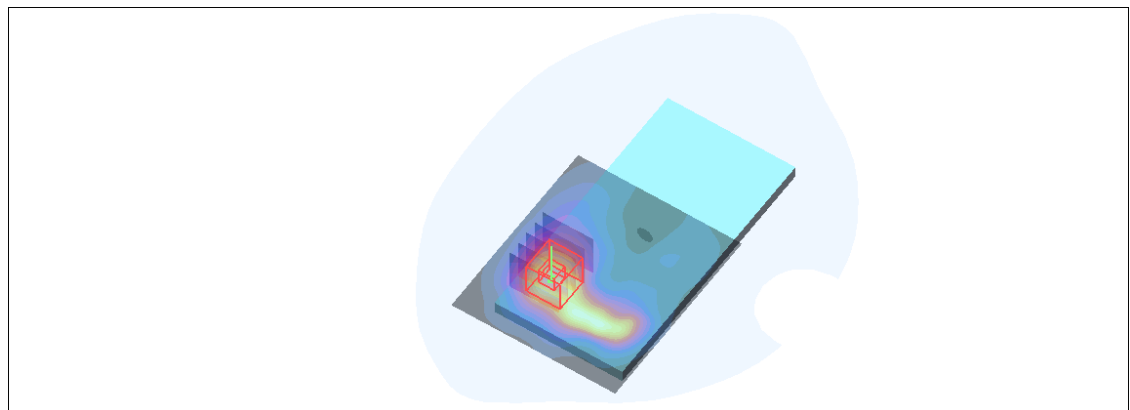
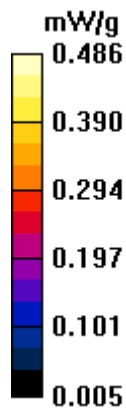
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.18 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.534 W/kg

SAR(1 g) = 0.379 mW/g; SAR(10 g) = 0.250 mW/g

Maximum value of SAR (measured) = 0.433 mW/g



P19_802.11b Back Side High

Date: 10/29/2018

Communication System: UID 0, 802.11b (0); Frequency: 2462 MHz; Duty Cycle: 1:1.021

Medium parameters used: $f = 2462$ MHz; $\sigma = 1.99$ S/m; $\epsilon_r = 51.059$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

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)

Back Side High/Area Scan (101x171x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.882 W/kg

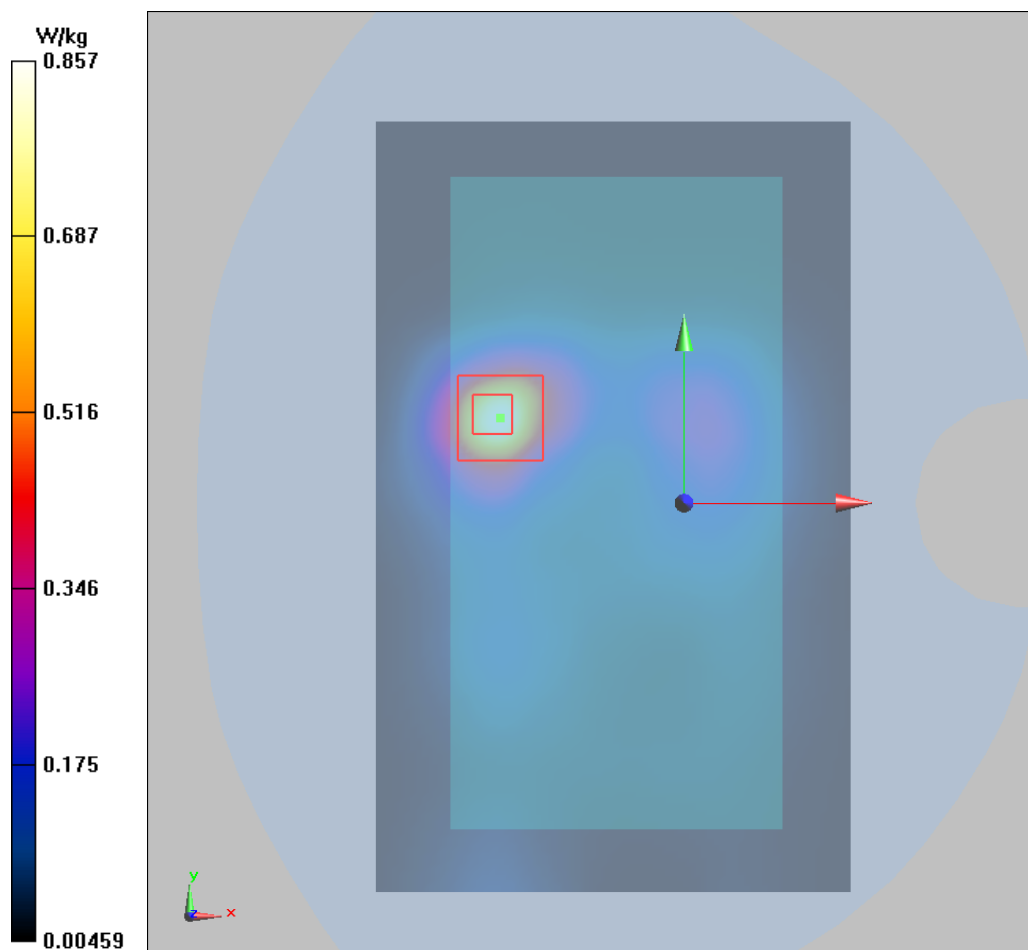
Back Side High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.879 V/m; Power Drift = -0.035 dB

Peak SAR (extrapolated) = 1.66 W/kg

SAR(1 g) = 0.739 W/kg; SAR(10 g) = 0.346 W/kg

Maximum value of SAR (measured) = 0.857 W/kg



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P20_GSM850_GSM_Rear Face_1cm_190

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

Medium parameters used: $f = 837$ MHz; $\sigma = 0.98$ mho/m; $\epsilon_r = 55.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(6.21, 6.21, 6.21); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: TP/1378
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.553 mW/g

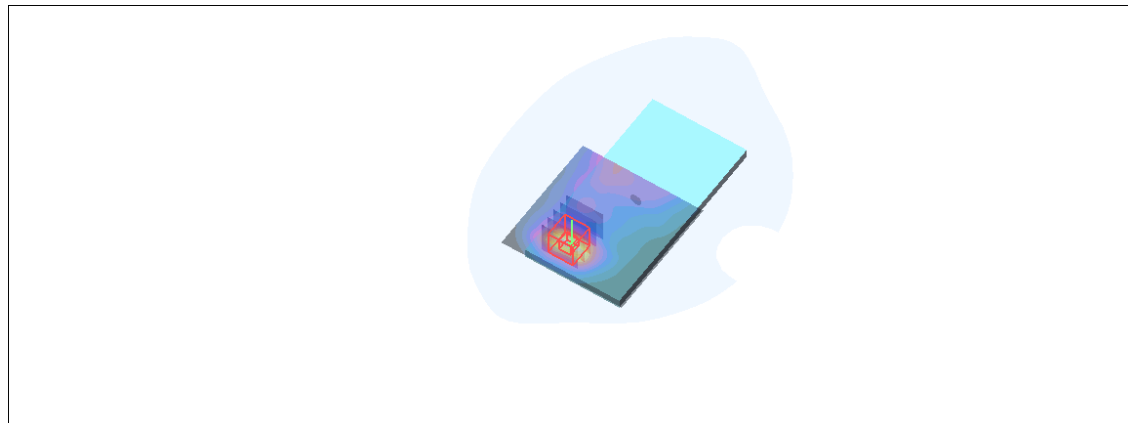
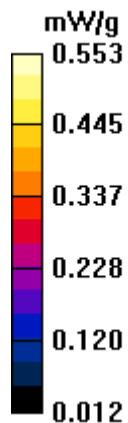
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.9 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.675 W/kg

SAR(1 g) = 0.464 mW/g; SAR(10 g) = 0.281 mW/g

Maximum value of SAR (measured) = 0.549 mW/g



P21_GSM1900_Rear Face_1cm_810

Communication System: PCS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.57$ mho/m; $\epsilon_r = 54.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3089; ConvF(4.52, 4.52, 4.52); Calibrated: 2018-5-18
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn662; Calibrated: 2018-5-11
- Phantom: SAM 2; Type: QD 000 P40 CB; Serial: TP-1376
- Measurement SW: DASYS4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Test/Area Scan (71x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.593 mW/g

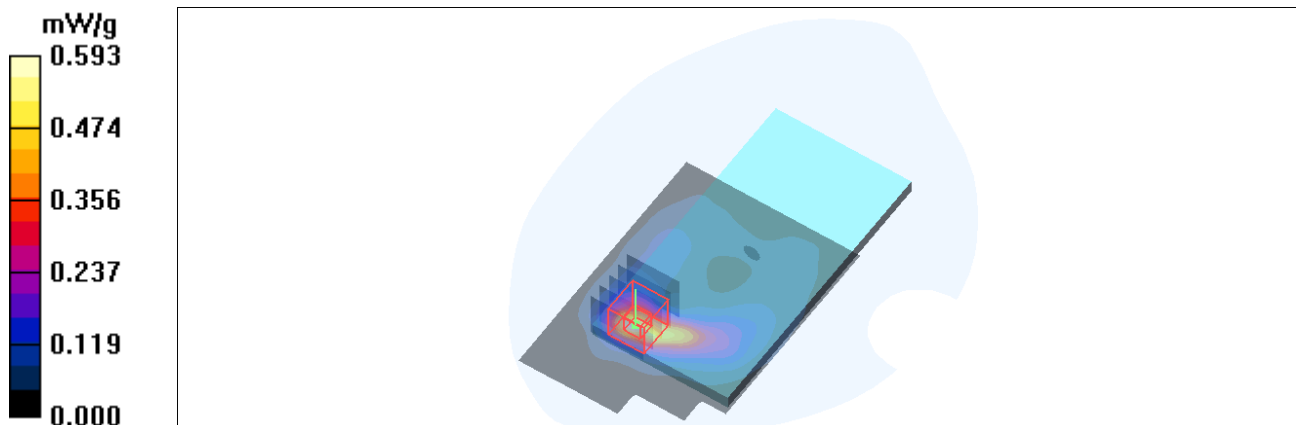
Test/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.33 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.745 W/kg

SAR(1 g) = 0.497 mW/g; SAR(10 g) = 0.271 mW/g

Maximum value of SAR (measured) = 0.603 mW/g





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CALIBRATION LABORATORY

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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)°C and humidity<70%.

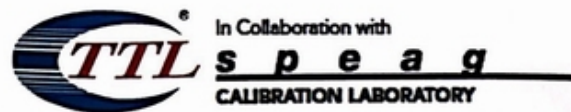
Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter 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

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



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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,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), $\theta=0$ is normal to probe axis

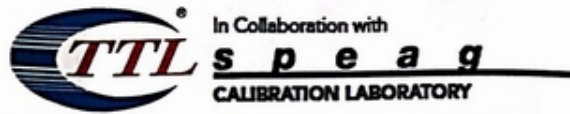
Connector Angle information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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



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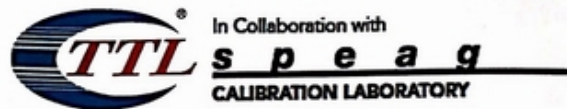
Probe EX3DV4

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($\mu\text{V}/(\text{V}/\text{m})^2$) ^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 $\sqrt{\mu\text{V}}$	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 E²-field uncertainty inside TSL (see Page 5 and Page 6).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty 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

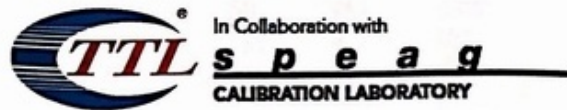
Calibration Parameter Determined in Head Tissue Simulating Media

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

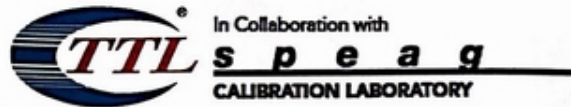
Calibration Parameter Determined in Body Tissue Simulating Media

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.

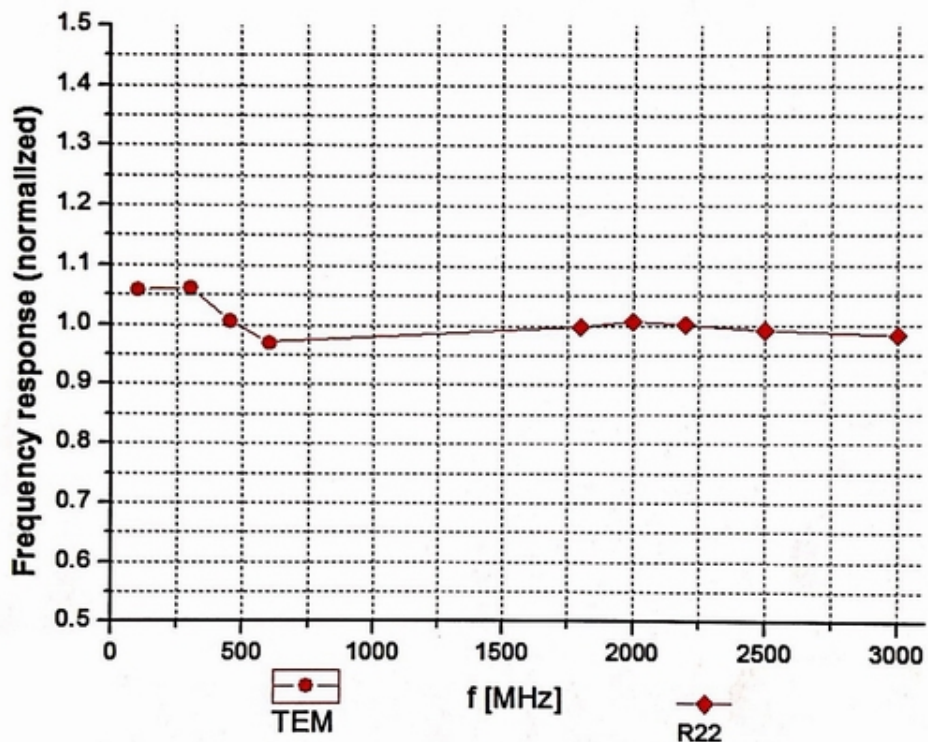
^F At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty 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: $\pm 7.4\%$ ($k=2$)