



Appendix A

Detailed System Validation Results

1. System Performance Check for Body
System Performance Check 750MHz Body
System Performance Check 835MHz Body
System Performance Check 1800MHz Body
System Performance Check 1900MHz Body
System Performance Check 2450MHz Body
System Performance Check 2600MHz Body
System Performance Check D5.2GHz Body
System Performance Check D5.6GHz Body

Test Laboratory: SGS-SAR Lab

System Performance Check 750 MHz Body

DUT: D750V3; Type: D750V3; Serial: 1126

Communication System: UID 0, CW (0); Frequency: 750 MHz; Duty Cycle: 1:1

Medium: MSL750; Medium parameters used: $f = 750$ MHz; $\sigma = 0.942$ S/m; $\epsilon_r = 56.086$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(10.41, 10.41, 10.41); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 2; Type: SAM V4.0; Serial: 1193
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=15mm, Pin=250mW/Area Scan (7x13x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 2.37 W/kg

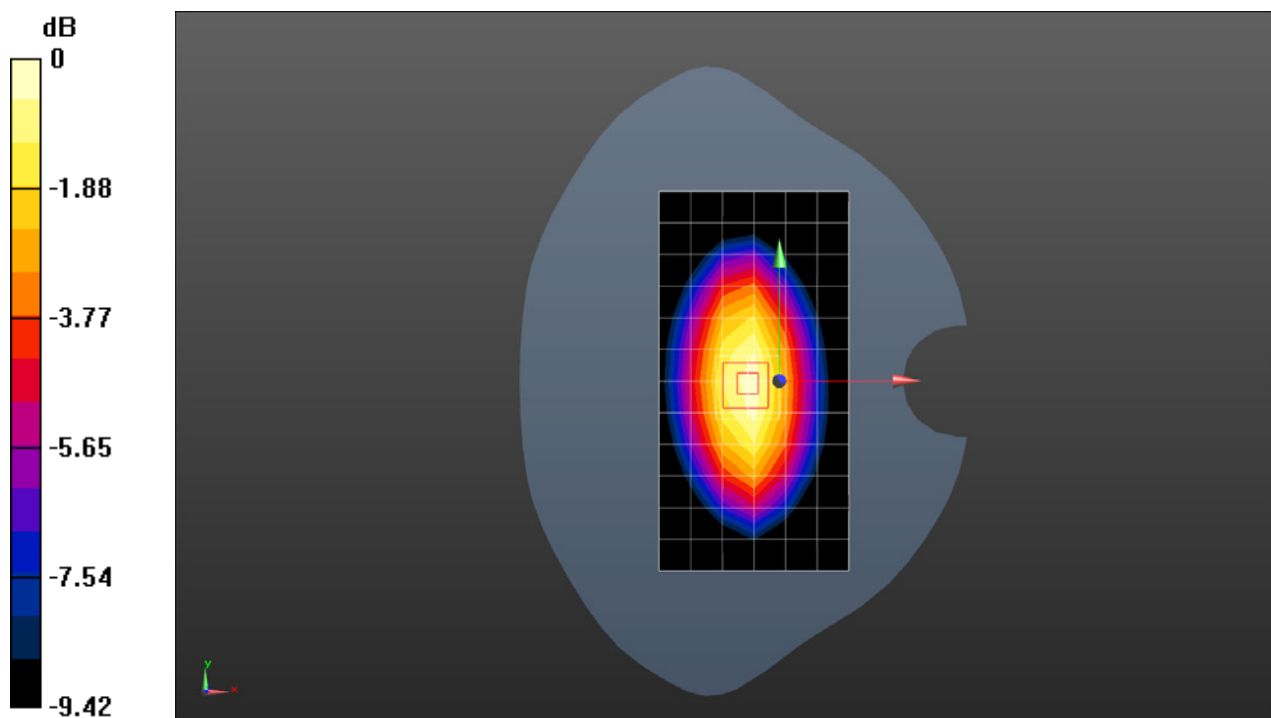
Body/d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 51.04 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.33 W/kg

SAR(1 g) = 2.26 W/kg; SAR(10 g) = 1.51 W/kg

Maximum value of SAR (measured) = 2.43 W/kg



0 dB = 2.43 W/kg = 3.86 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check 835 MHz Body

DUT: D835V2; Type: D835V2; Serial: 4d105

Communication System: UID 0, CW (0); Frequency: 835 MHz; Duty Cycle: 1:1

Medium: MSL835; Medium parameters used: $f = 835$ MHz; $\sigma = 0.98$ S/m; $\epsilon_r = 55.375$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(10.16, 10.16, 10.16); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=15mm, Pin=250mW/Area Scan (7x13x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 2.33 W/kg

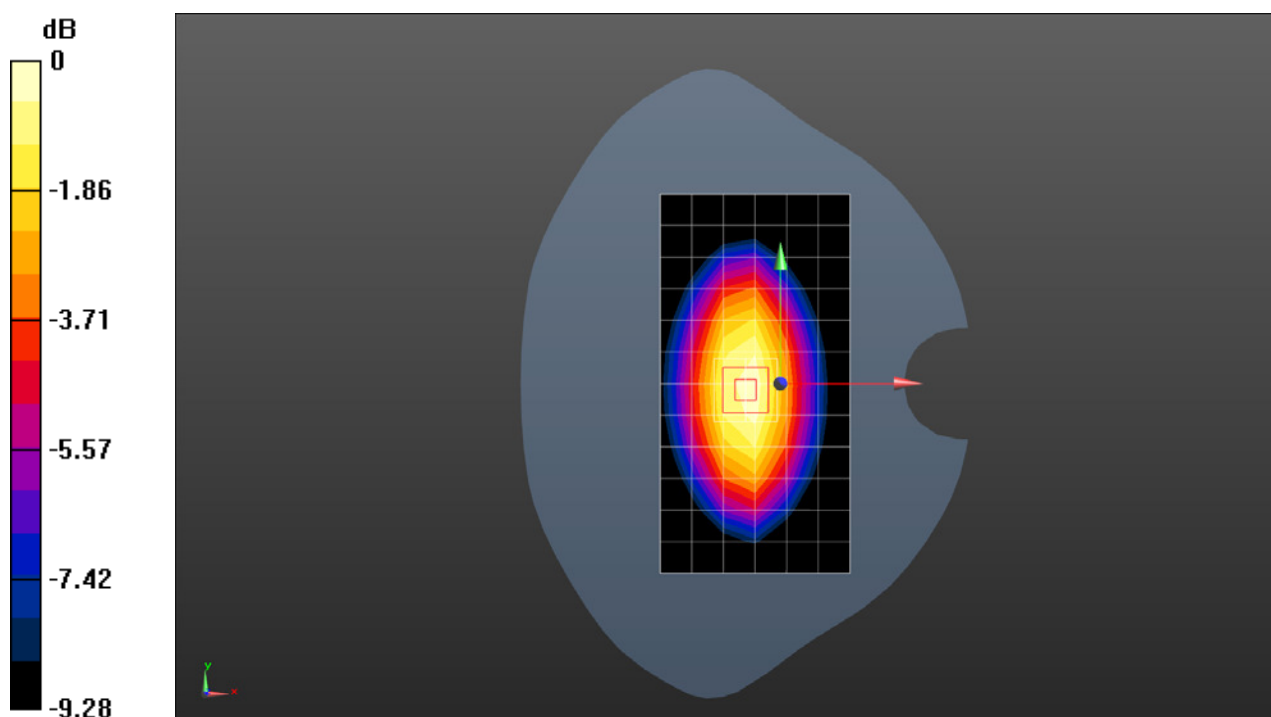
Body/d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 49.88 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 3.25 W/kg

SAR(1 g) = 2.23 W/kg; SAR(10 g) = 1.5 W/kg

Maximum value of SAR (measured) = 2.40 W/kg



0 dB = 2.40 W/kg = 3.80 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check 1800 MHz Body

DUT: D1800V2; Type: D1800V2; Serial: 2d070

Communication System: UID 0, CW (0); Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: MSL1750; Medium parameters used: $f = 1800$ MHz; $\sigma = 1.535$ S/m; $\epsilon_r = 54.359$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.49, 8.49, 8.49); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (7x13x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 10.4 W/kg

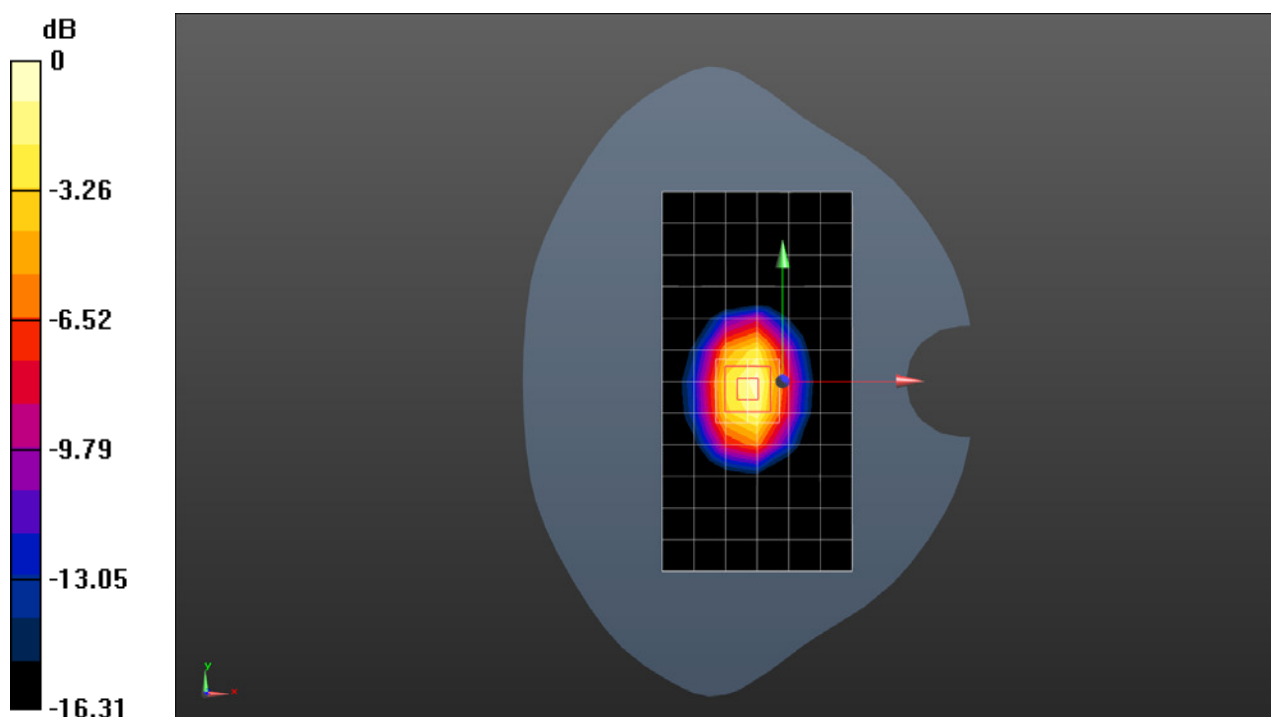
Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 86.66 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 18.7 W/kg

SAR(1 g) = 10.4 W/kg; SAR(10 g) = 5.58 W/kg

Maximum value of SAR (measured) = 11.6 W/kg



0 dB = 11.6 W/kg = 10.64 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check 1800 MHz Body

DUT: D1800V2; Type: D1800V2; Serial: 2d070

Communication System: UID 0, CW (0); Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: MSL1750; Medium parameters used: $f = 1800$ MHz; $\sigma = 1.525$ S/m; $\epsilon_r = 52.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.49, 8.49, 8.49); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (7x13x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 10.4 W/kg

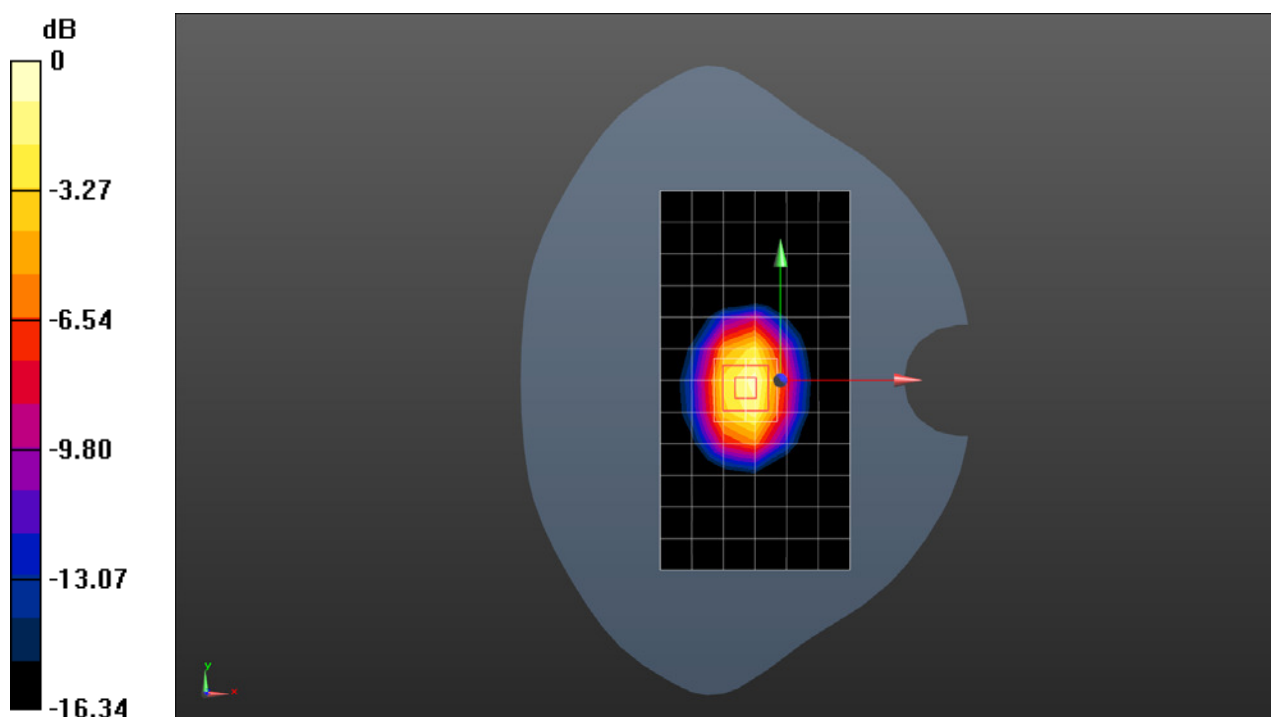
Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 86.66 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 18.6 W/kg

SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.54 W/kg

Maximum value of SAR (measured) = 11.6 W/kg



Test Laboratory: SGS-SAR Lab

System Performance Check 1900 MHz Body

DUT: D1900V2; Type: D1900V2; Serial: 5d028

Communication System: UID 0, CW (0); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL1900; Medium parameters used: $f = 1900$ MHz; $\sigma = 1.523$ S/m; $\epsilon_r = 52.205$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.2, 8.2, 8.2); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (7x11x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 11.2 W/kg

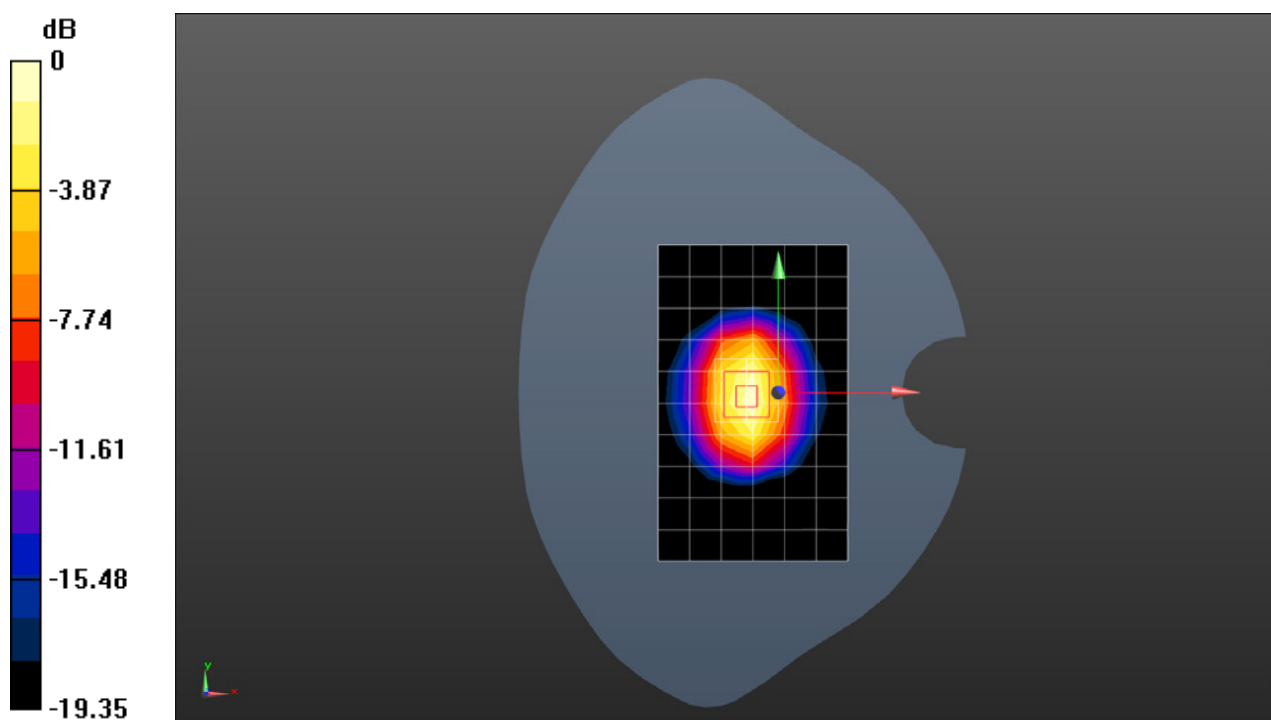
Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 87.68 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 21.0 W/kg

SAR(1 g) = 10.6 W/kg; SAR(10 g) = 5.36 W/kg

Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check 1900 MHz Body

DUT: D1900V2; Type: D1900V2; Serial: 5d028

Communication System: UID 0, CW (0); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL1900; Medium parameters used: $f = 1900$ MHz; $\sigma = 1.501$ S/m; $\epsilon_r = 52.597$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.2, 8.2, 8.2); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (7x11x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 11.0 W/kg

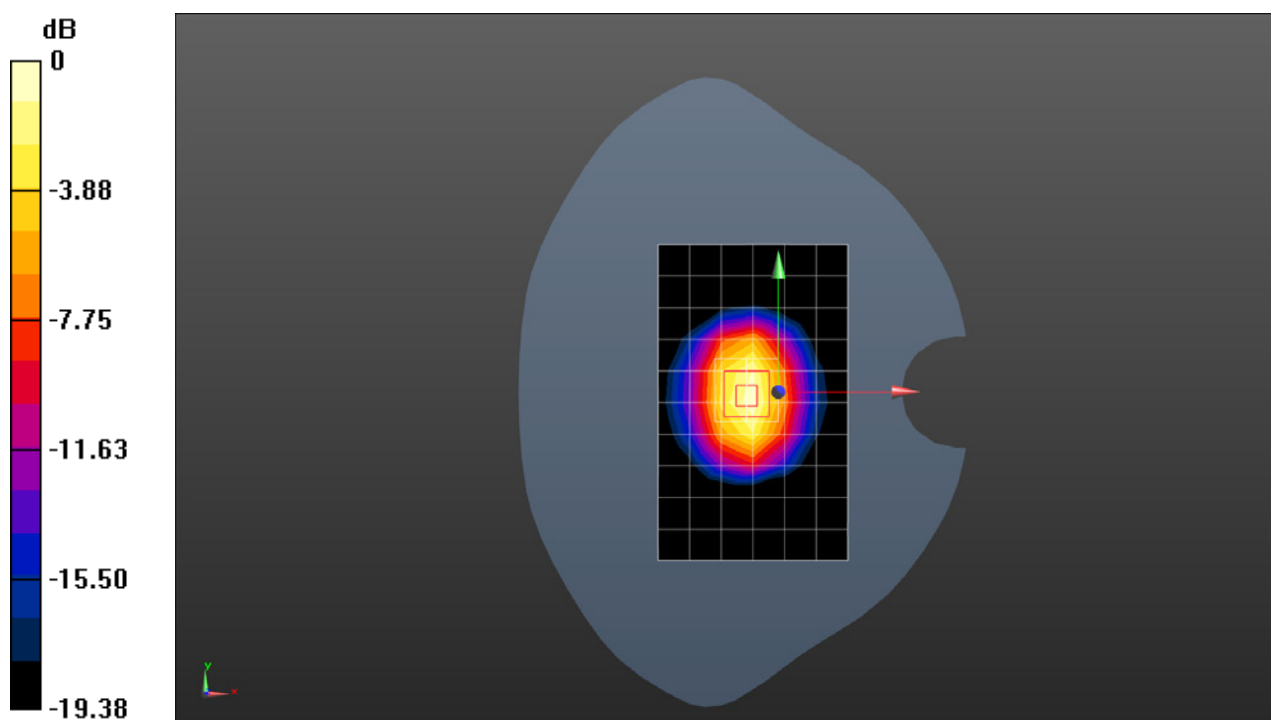
Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 87.68 V/m; Power Drift = -0.12dB

Peak SAR (extrapolated) = 20.7 W/kg

SAR(1 g) = 10.5 W/kg; SAR(10 g) = 5.29 W/kg

Maximum value of SAR (measured) = 11.7 W/kg



0 dB = 11.7 W/kg = 10.68 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check 1900 MHz Body

DUT: D1900V2; Type: D1900V2; Serial: 5d028

Communication System: UID 0, CW (0); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL1900; Medium parameters used: $f = 1900$ MHz; $\sigma = 1.528$ S/m; $\epsilon_r = 52.851$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.2, 8.2, 8.2); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (7x11x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 11.2 W/kg

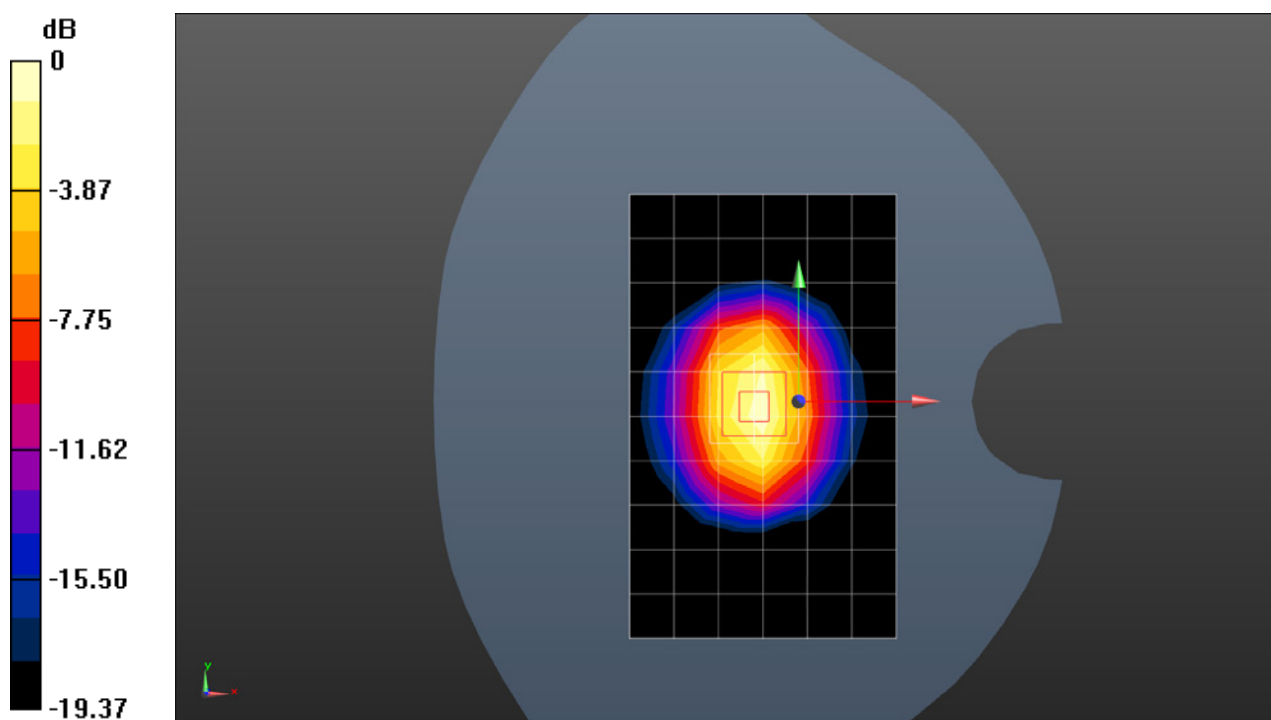
Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 87.68 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 21.1 W/kg

SAR(1 g) = 10.7 W/kg; SAR(10 g) = 5.38 W/kg

Maximum value of SAR (measured) = 11.9 W/kg



Test Laboratory: SGS-SAR Lab

System Performance Check 2450MHz Body

DUT: D2450V2; Type: D2450V2; Serial: 733

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: MSL2450; Medium parameters used: $f = 2450$ MHz; $\sigma = 1.951$ S/m; $\epsilon_r = 51.68$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(7.7, 7.7, 7.7); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (7x11x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 13.2 W/kg

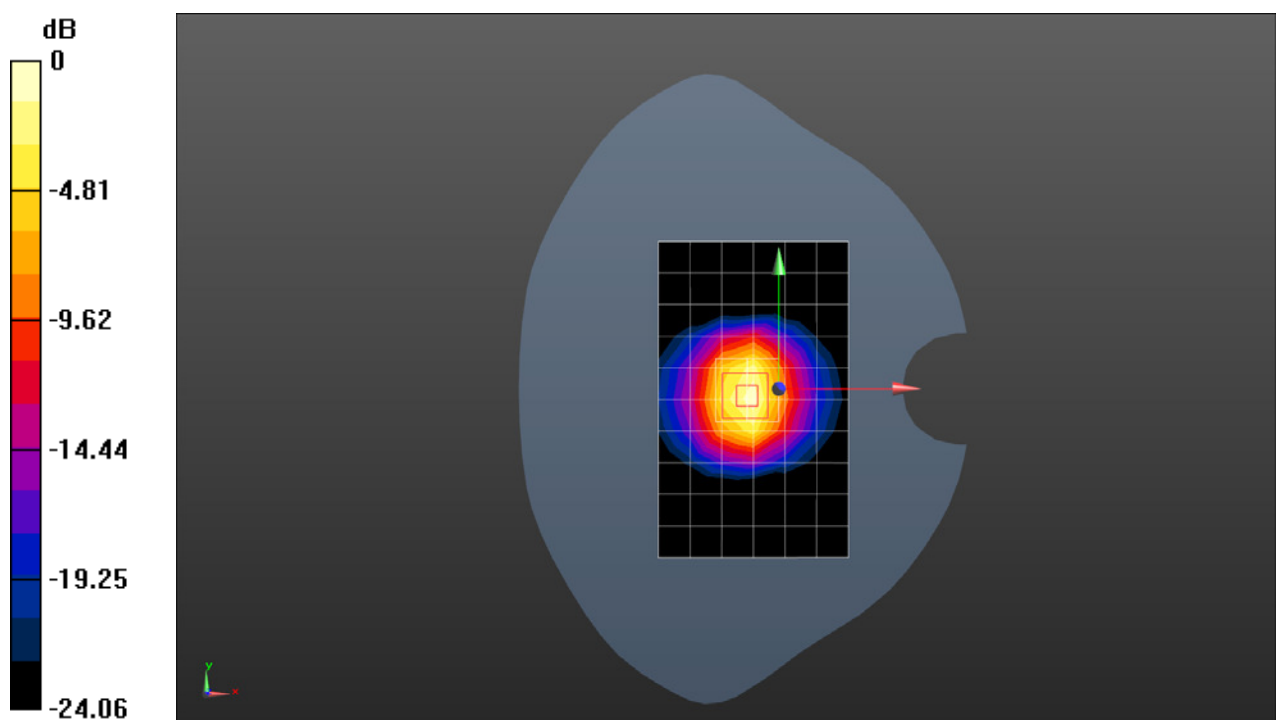
Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 89.13 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 29.2 W/kg

SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.98 W/kg

Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.41 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check 2600MHz Body

DUT: D2600V2; Type: D2600V2; Serial: 1093

Communication System: UID 0, CW (0); Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: MSL2600; Medium parameters used: $f = 2600$ MHz; $\sigma = 2.171$ S/m; $\epsilon_r = 52.866$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(7.63, 7.63, 7.63); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 2; Type: SAM V4.0; Serial: 1193
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (7x11x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 13.8 W/kg

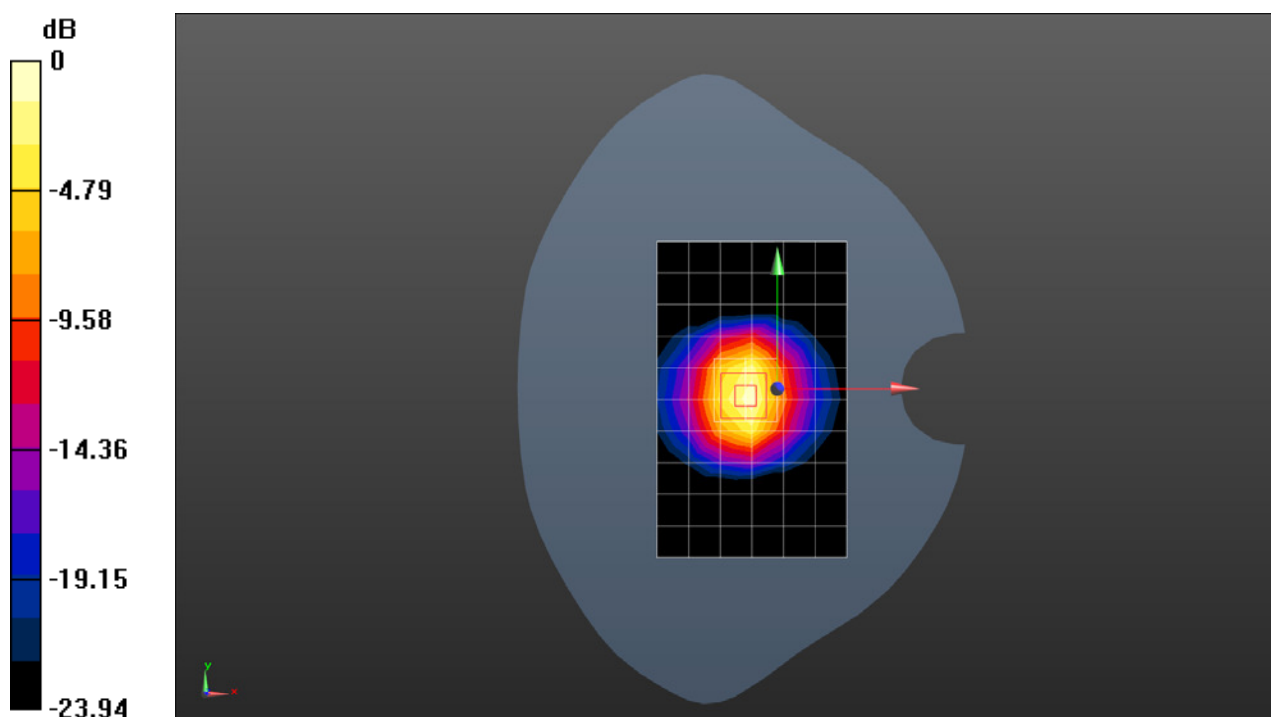
Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 80.85 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 29.3 W/kg

SAR(1 g) = 13.4 W/kg; SAR(10 g) = 5.79 W/kg

Maximum value of SAR (measured) = 14.9 W/kg



Test Laboratory: SGS-SAR Lab

System Performance Check D5.2GHz Body

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: MSL5GHz; Medium parameters used: $f = 5200$ MHz; $\sigma = 5.259$ S/m; $\epsilon_r = 47.697$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(4.15, 4.15, 4.15); Calibrated: 2015-11-27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 25.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 2; Type: SAM V4.0; Serial: 1193
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5200 MHz/Area Scan (10x10x1): Measurement grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (measured) = 18.1 W/kg

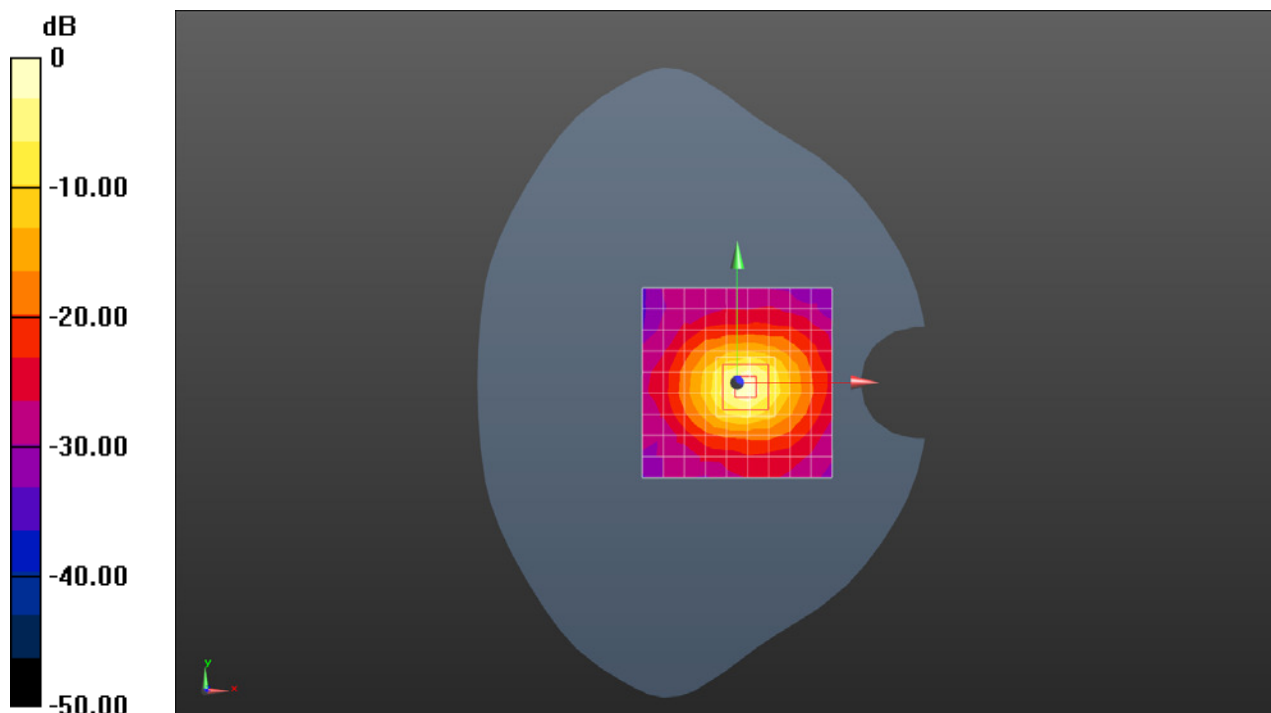
Body/d=10mm, Pin=100mW, f=5200 MHz/Zoom Scan (4x4x1.4mm, graded),

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 61.40 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 32.3 W/kg

SAR(1 g) = 7.68 W/kg; SAR(10 g) = 2.12 W/kg



0 dB = 18.1 W/kg = 12.58 dBW/kg

Test Laboratory: SGS-SAR Lab

System Performance Check D5.6GHz Body

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: MSL5GHz; Medium parameters used: $f = 5600$ MHz; $\sigma = 5.859$ S/m; $\epsilon_r = 46.881$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(3.61, 3.61, 3.61); Calibrated: 2015-11-27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 25.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 2; Type: SAM V4.0; Serial: 1193
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5600 MHz/Area Scan (10x10x1): Measurement grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (measured) = 18.4 W/kg

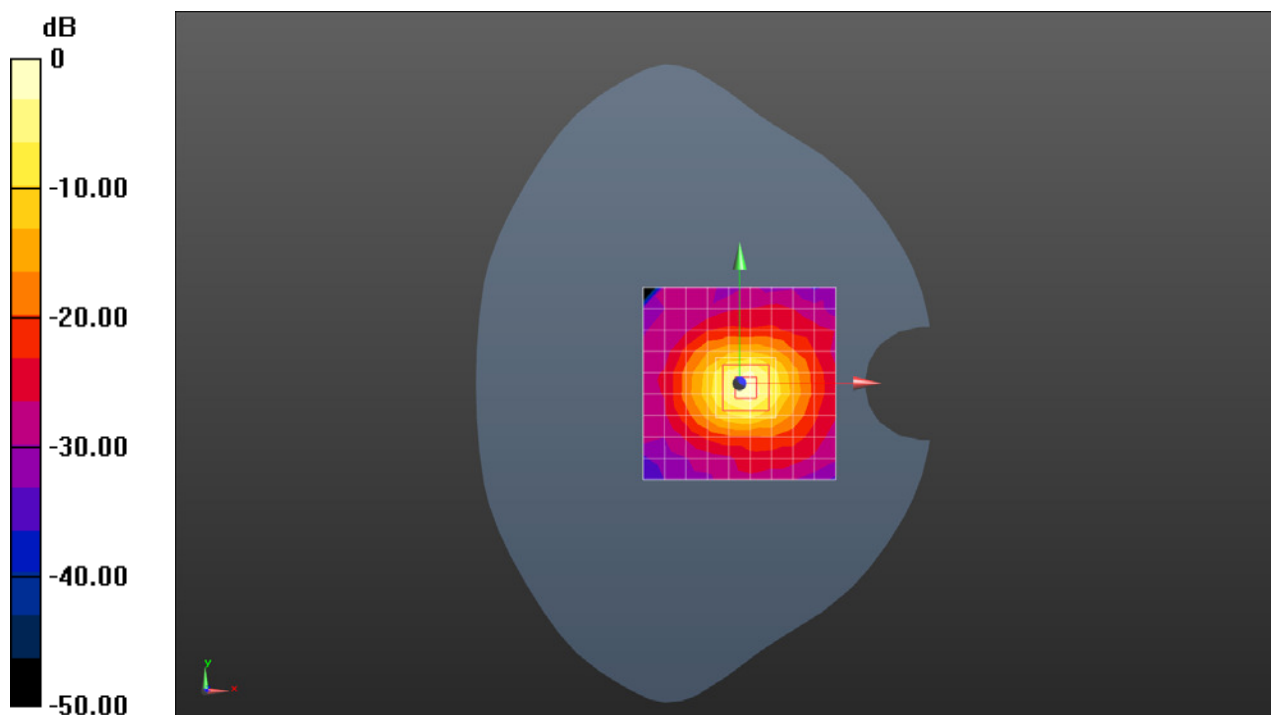
Body/d=10mm, Pin=100mW, f=5600 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 65.17 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 36.3 W/kg

SAR(1 g) = 8.21 W/kg; SAR(10 g) = 2.23 W/kg

Maximum value of SAR (measured) = 20.4 W/kg



0 dB = 20.4 W/kg = 13.10 dBW/kg



Appendix B

Detailed Test Results

1. WCDMA
WCDMA Band 2 for Body
WCDMA Band 4 for Body
2. LTE
LTE Band 2 for Body
LTE Band 4 for Body
LTE Band 12 for Body
LTE Band 17 for Body
LTE Band 25 for Body
LTE Band 26 for Body
LTE Band 41 for Body
3. WIFI
WI-FI 802.11a for Body
WI-FI 802.11b for Body
WI-FI 802.11n for Body

Test Laboratory: SGS-SAR Lab

601HW WCDMA Band 2 RMC 9262CH Right Side 10mm

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, WCDMA (0); Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: MSL1900; Medium parameters used (interpolated): $f = 1852.4$ MHz; $\sigma = 1.504$ S/m; $\epsilon_r = 53.544$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.2, 8.2, 8.2); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (8x11x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.11 W/kg

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

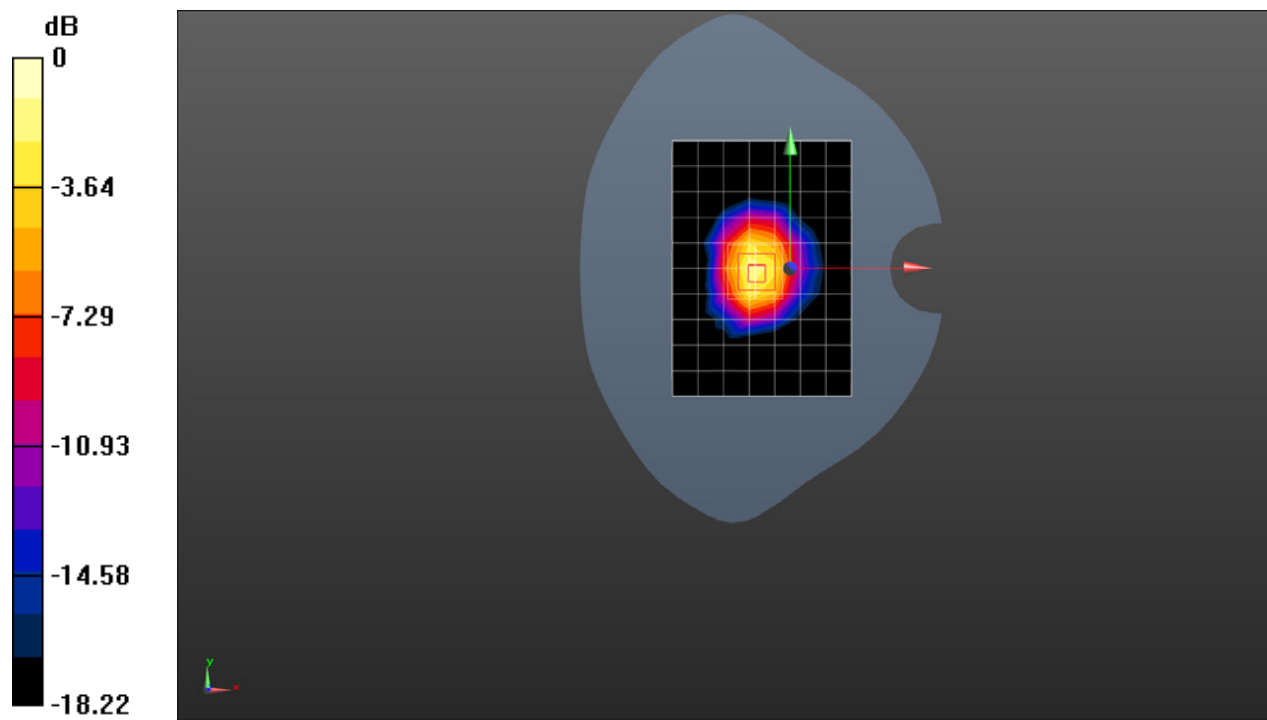
Reference Value = 28.18 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 1.79 W/kg

SAR(1 g) = 1.11 W/kg; SAR(10 g) = 0.624 W/kg

[Info: Interpolated medium parameters used for SAR evaluation.](#)

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



0 dB = 1.48 W/kg = 1.70 dBW/kg

Test Laboratory: SGS-SAR Lab

601HW WCDMA Band 4 RMC 1513CH Right Side 17mm-sensor off-repeat

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, WCDMA (0); Frequency: 1752.6 MHz; Duty Cycle: 1:1

Medium: MSL1750; Medium parameters used: $f = 1753$ MHz; $\sigma = 1.508$ S/m; $\epsilon_r = 53.057$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.49, 8.49, 8.49); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (6x9x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 1.18 W/kg

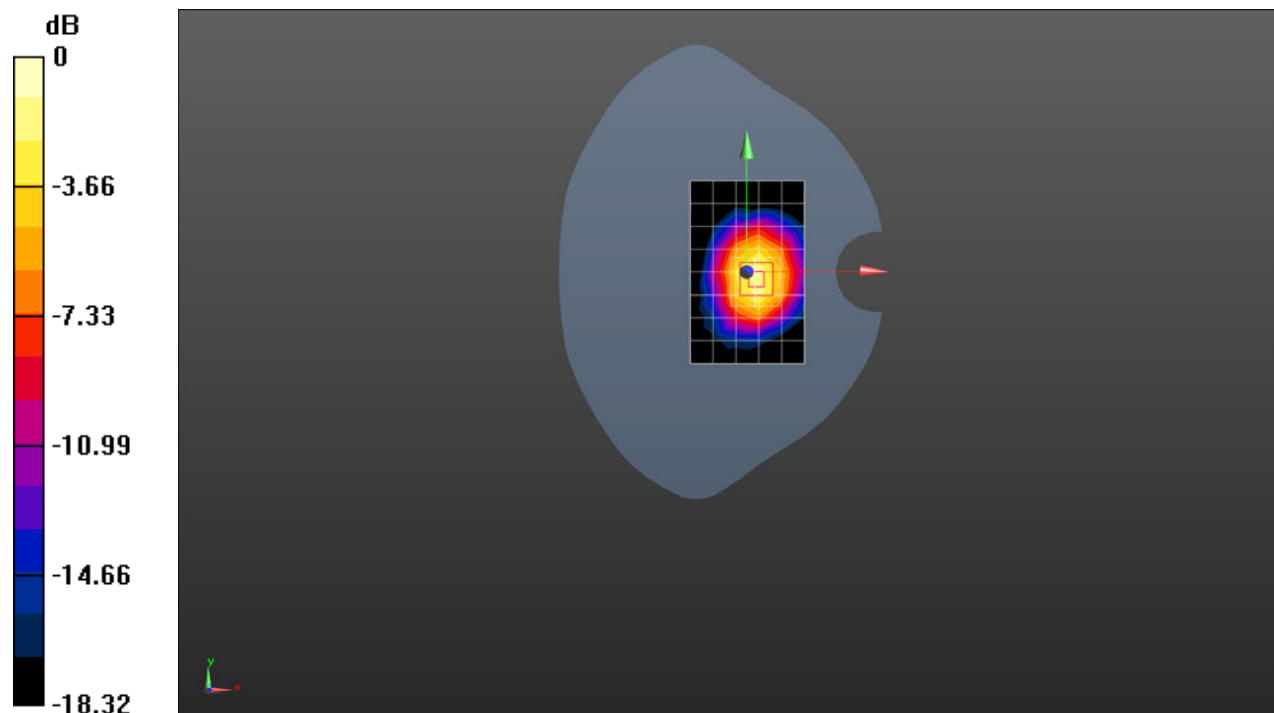
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 26.47 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.85 W/kg

SAR(1 g) = 1.18 W/kg; SAR(10 g) = 0.688 W/kg

Maximum value of SAR (measured) = 1.54 W/kg



0 dB = 1.54 W/kg = 1.88 dBW/kg

Test Laboratory: SGS-SAR Lab

601HW LTE Band2 20MHz bandwidth QPSK 1RB0 Offset 18700CH Right Side 10mm

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, LTE-FDD BW 20MHz (0); Frequency: 1860 MHz; Duty Cycle: 1:1

Medium: MSL1900; Medium parameters used: $f = 1860$ MHz; $\sigma = 1.518$ S/m; $\epsilon_r = 53.378$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.2, 8.2, 8.2); Calibrated: 2015-11-27;
- Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x10x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 1.22 W/kg

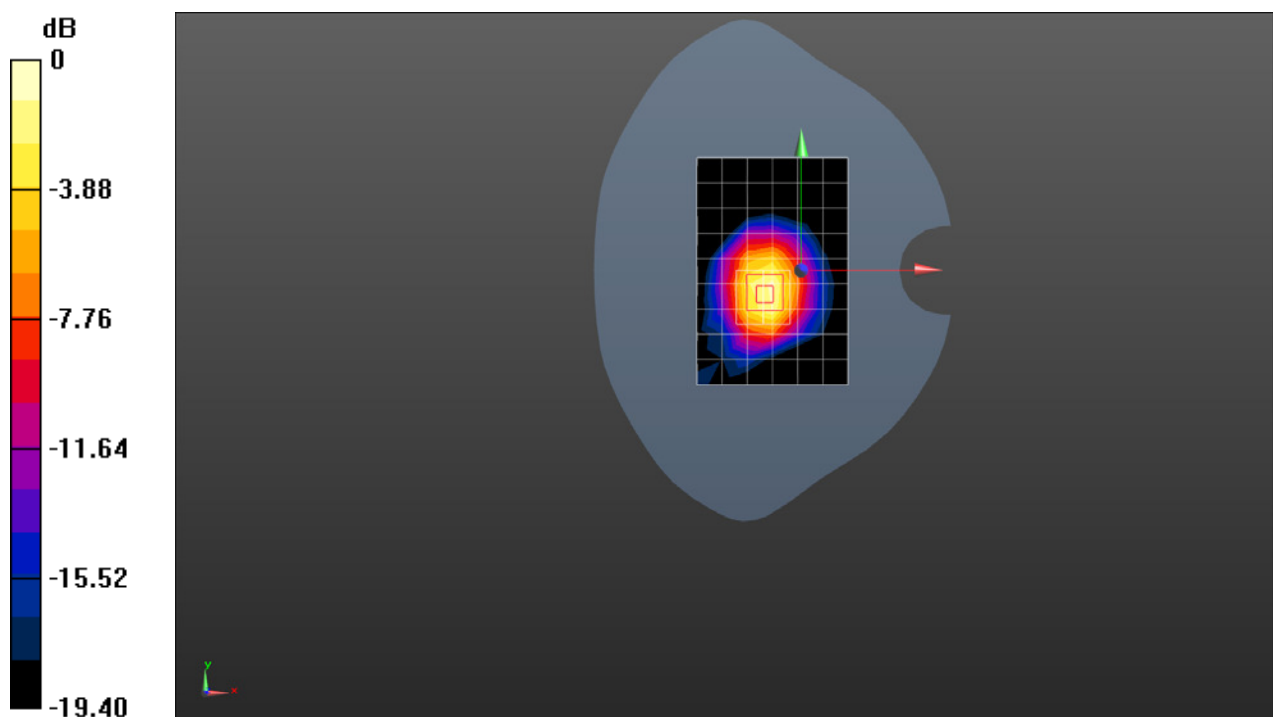
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 22.38 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 1.82 W/kg

SAR(1 g) = 1.11 W/kg; SAR(10 g) = 0.614 W/kg

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



0 dB = 1.48 W/kg = 1.70 dBW/kg

Test Laboratory: SGS-SAR Lab

**601HW LTE Band4 20MHz bandwidth QPSK 1RB0 Offset 20300CH Right Side
17mm-sensor off-repeat**

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, LTE-FDD BW 20MHz (0); Frequency: 1745 MHz; Duty Cycle: 1:1

Medium: MSL1750; Medium parameters used: $f = 1745$ MHz; $\sigma = 1.505$ S/m; $\epsilon_r = 53.204$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.49, 8.49, 8.49); Calibrated: 2015-11-27;
- Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (6x8x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 1.42 W/kg

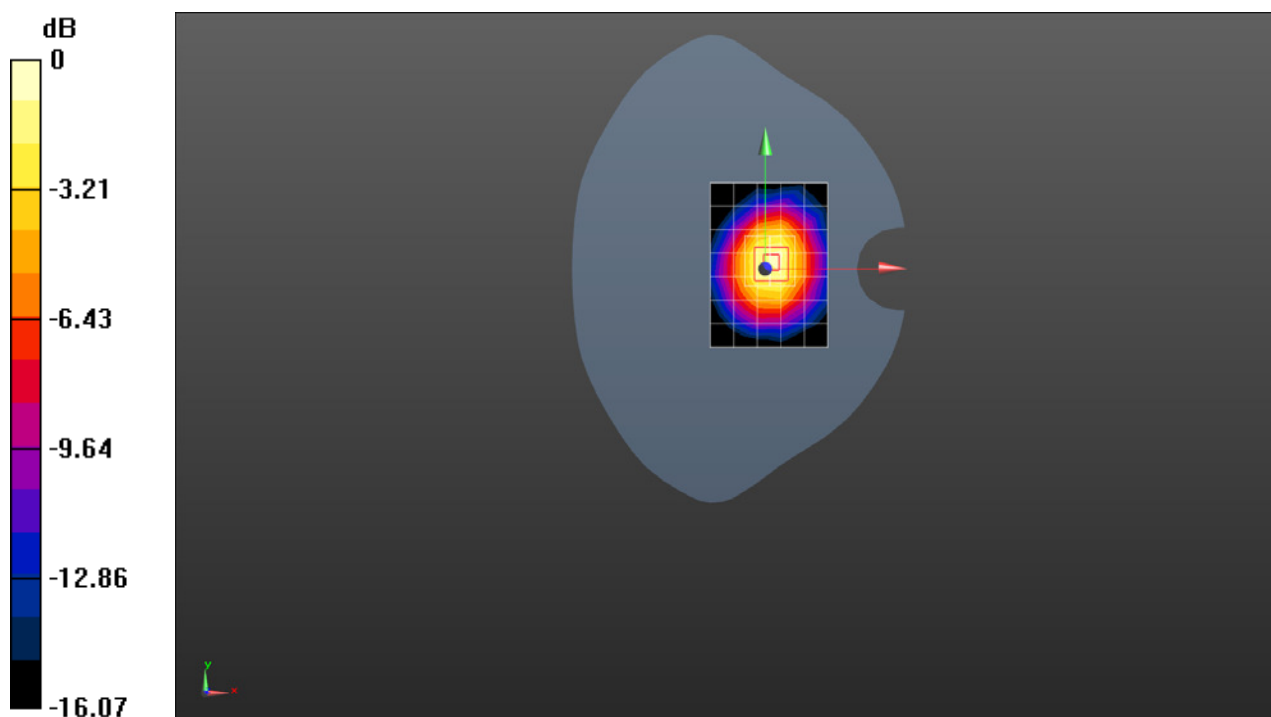
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 29.56 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 1.99 W/kg

SAR(1 g) = 1.28 W/kg; SAR(10 g) = 0.764 W/kg

Maximum value of SAR (measured) = 1.67 W/kg



0 dB = 1.67 W/kg = 2.23 dBW/kg

Test Laboratory: SGS-SAR Lab

601HW LTE Band12 10MHz bandwidth QPSK 1RB0 Offset 23095CH Back Side 10mm

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, LTE-FDD BW 10MHZ (0); Frequency: 707.5 MHz; Duty Cycle: 1:1

Medium: MSL750; Medium parameters used (interpolated): $f = 707.5$ MHz; $\sigma = 0.901$ S/m; $\epsilon_r = 56.51$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(10.41, 10.41, 10.41); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.630 W/kg

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

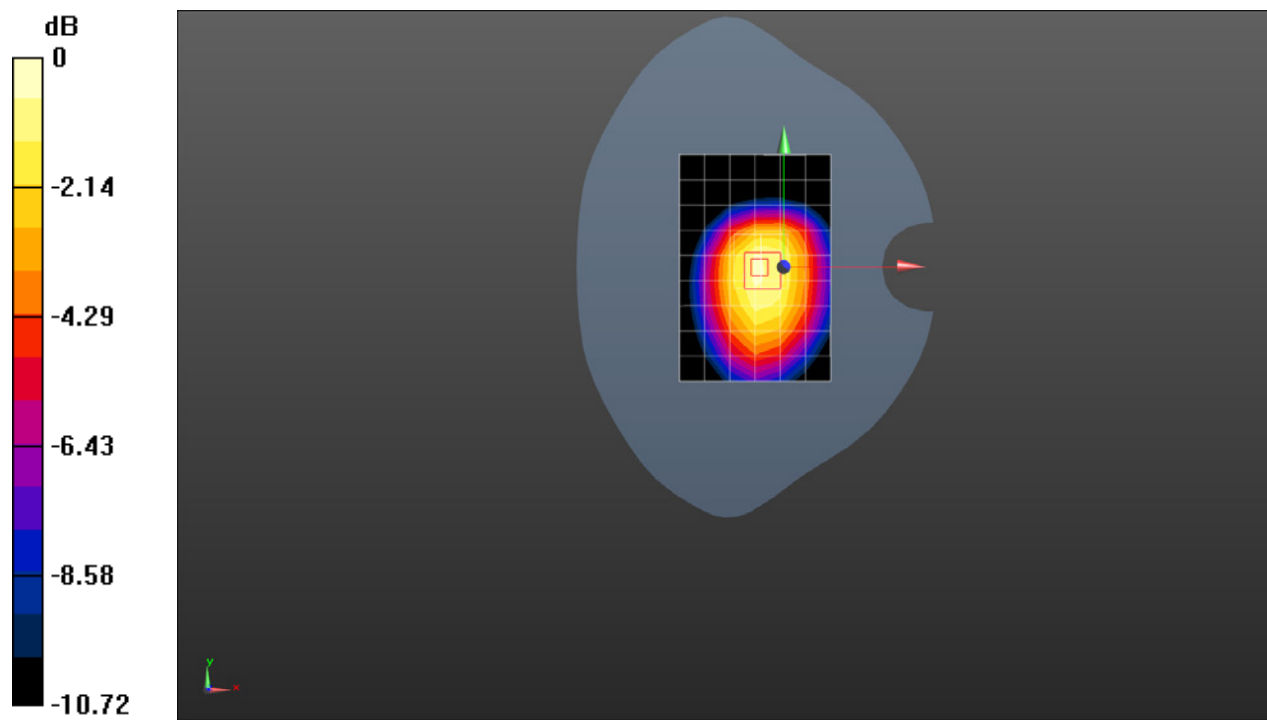
Reference Value = 26.63 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.825 W/kg

SAR(1 g) = 0.599 W/kg; SAR(10 g) = 0.435 W/kg

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.713 W/kg



0 dB = 0.713 W/kg = -1.47 dBW/kg

Test Laboratory: SGS-SAR Lab

601HW LTE Band17 10MHz bandwidth QPSK 1RB0 Offset 23790CH Back Side 10mm

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, LTE-FDD BW 10MHz (0); Frequency: 710 MHz; Duty Cycle: 1:1

Medium: MSL750; Medium parameters used: $f = 710$ MHz; $\sigma = 0.903$ S/m; $\epsilon_r = 56.484$; $\rho = 1000$ kg/m³

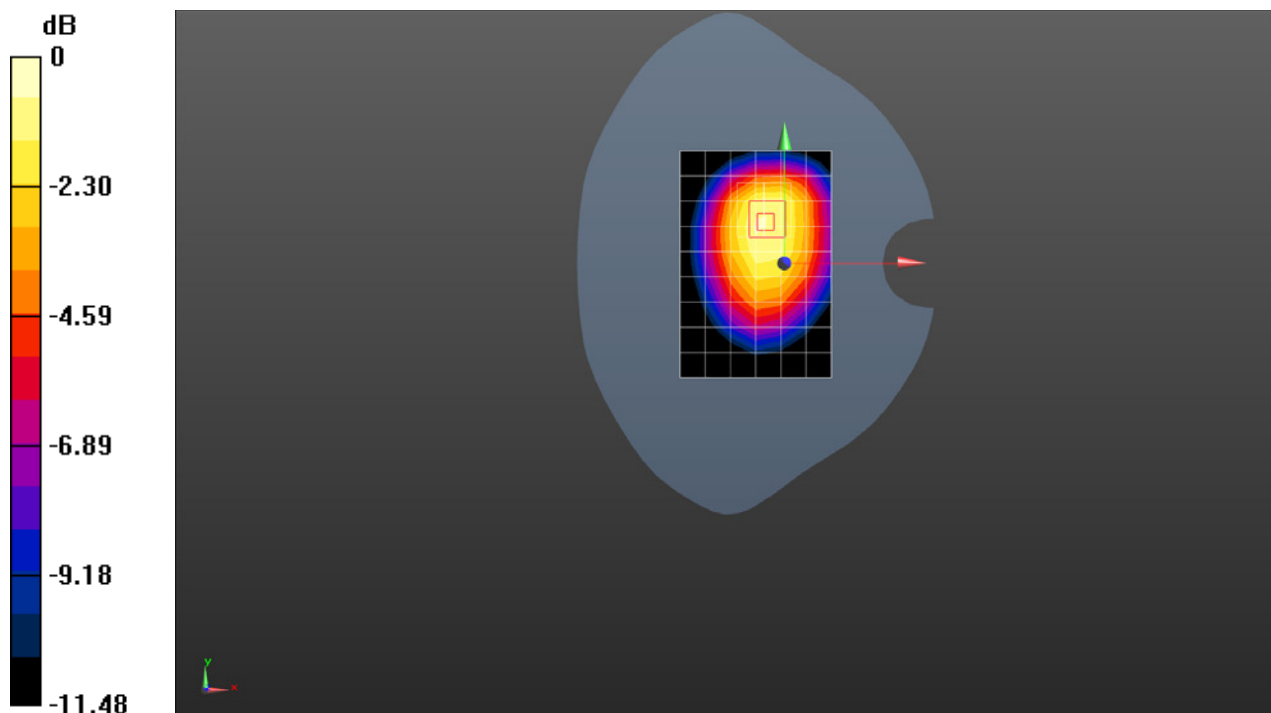
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(10.41, 10.41, 10.41); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x10x1): Measurement grid: $dx=15$ mm, $dy=15$ mm
Maximum value of SAR (measured) = 0.640 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm
Reference Value = 24.32 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.839 W/kg
SAR(1 g) = 0.624 W/kg; SAR(10 g) = 0.448 W/kg
Maximum value of SAR (measured) = 0.737 W/kg



0 dB = 0.737 W/kg = -1.33 dBW/kg

Test Laboratory: SGS-SAR Lab

601HW LTE Band25 20MHz bandwidth QPSK 1RB0 Offset 26365CH Right Side 10mm with SCUD battery

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, LTE-FDD BW 20MHz (0); Frequency: 1882.5 MHz; Duty Cycle: 1:1

Medium: MSL1900; Medium parameters used (interpolated): $f = 1882.5$ MHz; $\sigma = 1.54$ S/m; $\epsilon_r = 53.286$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.2, 8.2, 8.2); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (8x11x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.944 W/kg

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

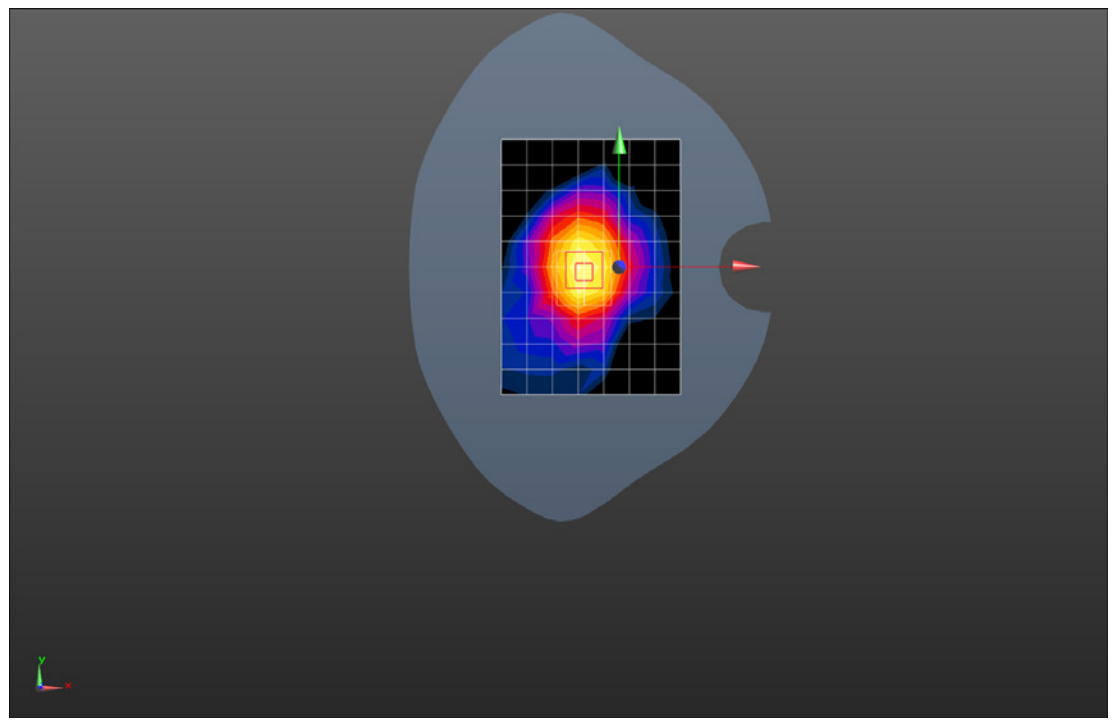
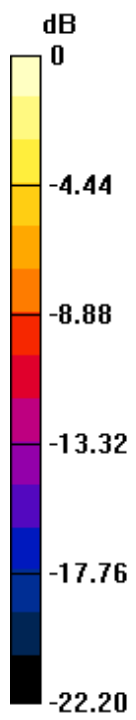
Reference Value = 24.46 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 1.53 W/kg

SAR(1 g) = 0.934 W/kg; SAR(10 g) = 0.519 W/kg

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.23 W/kg



0 dB = 1.23 W/kg = 0.90 dBW/kg

Test Laboratory: SGS-SAR Lab

601HW LTE Band26 15MHz bandwidth QPSK 1RB0 Offset 26965CH Back Side 17mm-sensor off

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, LTE-FDD BW 15MHz (0); Frequency: 841.5 MHz; Duty Cycle: 1:1

Medium: MSL835; Medium parameters used (interpolated): $f = 841.5$ MHz; $\sigma = 0.988$ S/m; $\epsilon_r = 54.109$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(10.16, 10.16, 10.16); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x10x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.819 W/kg

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

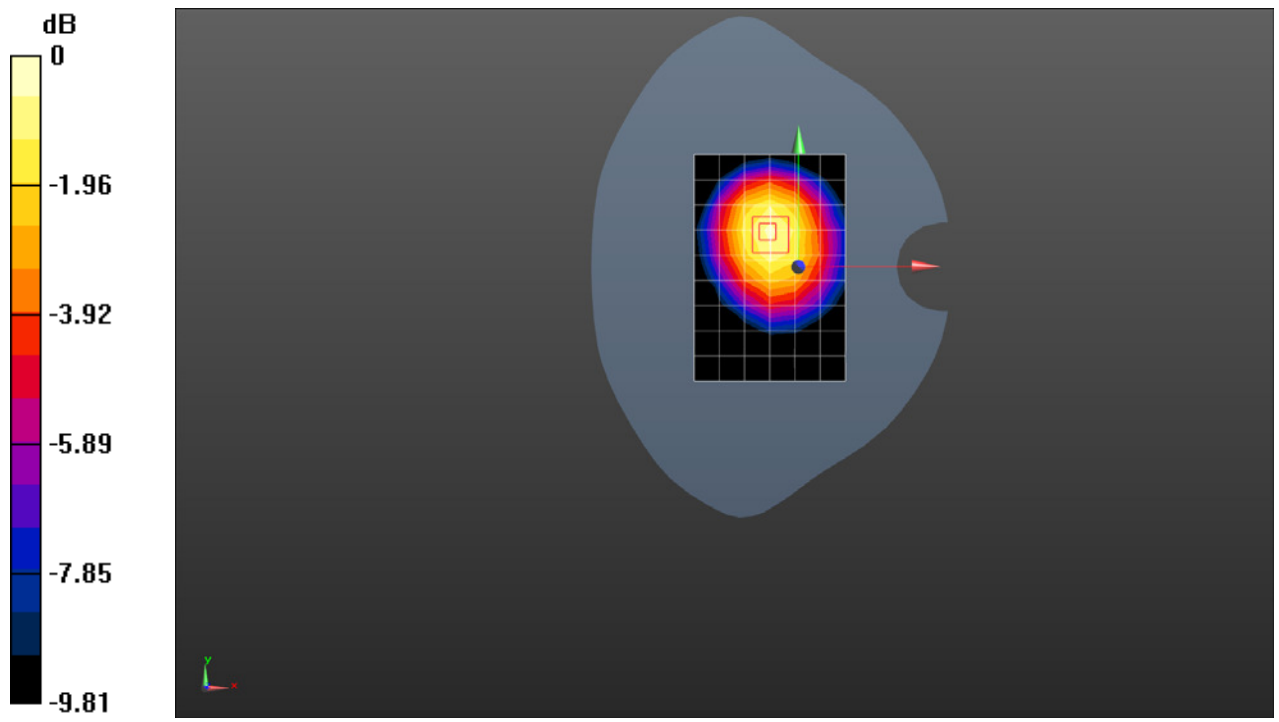
Reference Value = 25.85 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 1.03 W/kg

SAR(1 g) = 0.761 W/kg; SAR(10 g) = 0.549 W/kg

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.899 W/kg



Test Laboratory: SGS-SAR Lab

601HW LTE Band41 20MHz bandwidth QPSK 1RB0 Offset 41490CH Back Side 10mm

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, LTE-TDD BW 20MHz (0); Frequency: 2680 MHz; Duty Cycle: 1:1.57906

Medium: MSL2600; Medium parameters used: $f = 2680$ MHz; $\sigma = 2.221$ S/m; $\epsilon_r = 52.007$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(7.63, 7.63, 7.63); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = -19.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (9x13x1): Measurement grid: $dx=12$ mm, $dy=12$ mm

Maximum value of SAR (measured) = 0.875 W/kg

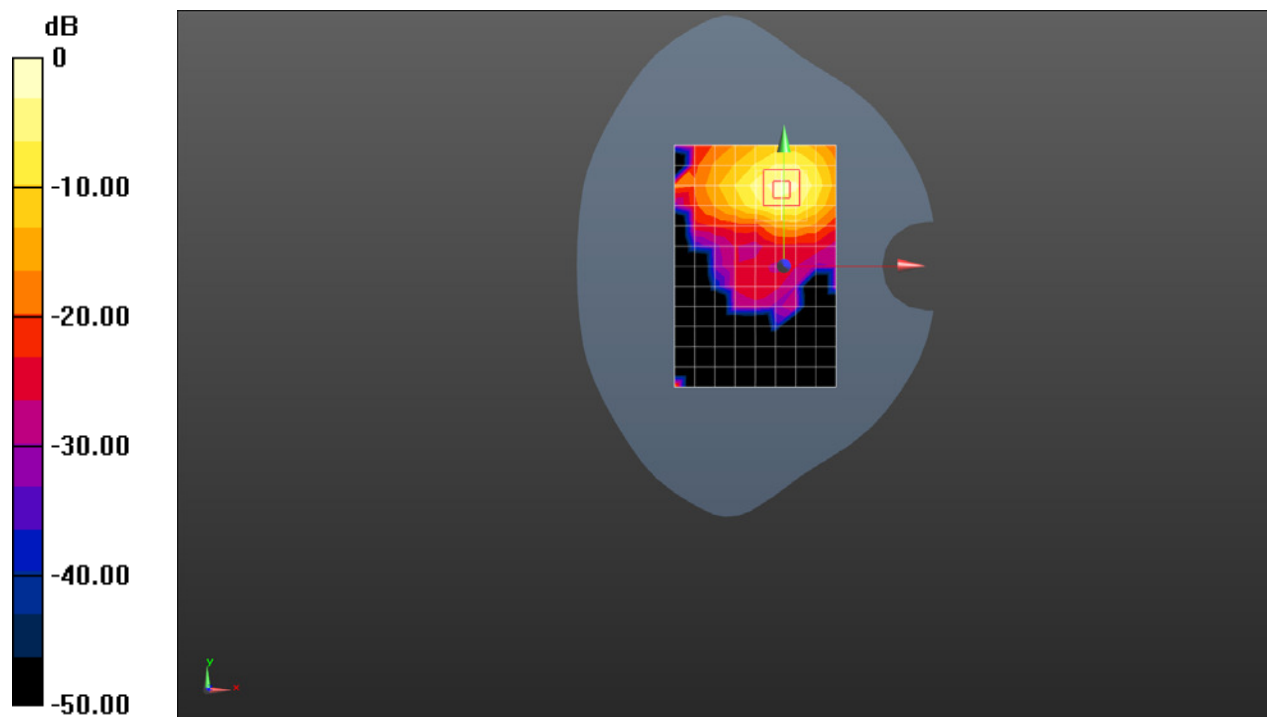
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 2.804 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 1.88 W/kg

SAR(1 g) = 0.898 W/kg; SAR(10 g) = 0.401 W/kg

Maximum value of SAR (measured) = 1.37 W/kg



Test Laboratory: SGS-SAR Lab

601HW WIFI 802.11b 1CH Bottom Side 10mm

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, WI-FI(2.4GHz) (0); Frequency: 2412 MHz; Duty Cycle: 1:1.01

Medium: MSL2450; Medium parameters used: $f = 2412$ MHz; $\sigma = 1.931$ S/m; $\epsilon_r = 51.975$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(7.7, 7.7, 7.7); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (5x10x1): Measurement grid: $dx=12$ mm, $dy=12$ mm
Maximum value of SAR (measured) = 0.229 W/kg

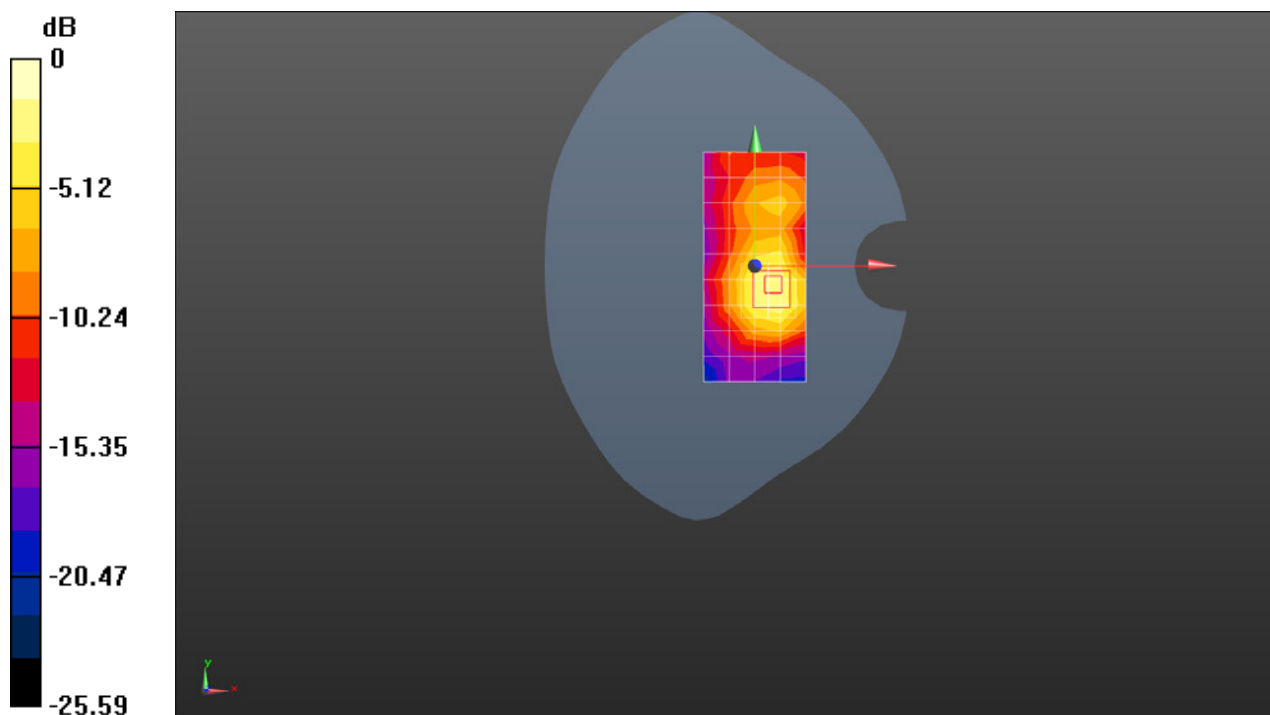
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 8.605 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.504 W/kg

SAR(1 g) = 0.246 W/kg; SAR(10 g) = 0.135 W/kg

Maximum value of SAR (measured) = 0.336 W/kg



0 dB = 0.336 W/kg = -4.74 dBW/kg

Test Laboratory: SGS-SAR Lab

601HW WIFI 802.11n MIMO 1CH Left side Side 10mm with SCUD

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, WI-FI(2.4GHz) (0); Frequency: 2412 MHz; Duty Cycle: 1:1.07

Medium: MSL2450; Medium parameters used: $f = 2412$ MHz; $\sigma = 1.931$ S/m; $\epsilon_r = 51.975$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(7.7, 7.7, 7.7); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM1; Type: SAM; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x10x1): Measurement grid: $dx=12$ mm, $dy=12$ mm

Maximum value of SAR (measured) = 0.157 W/kg

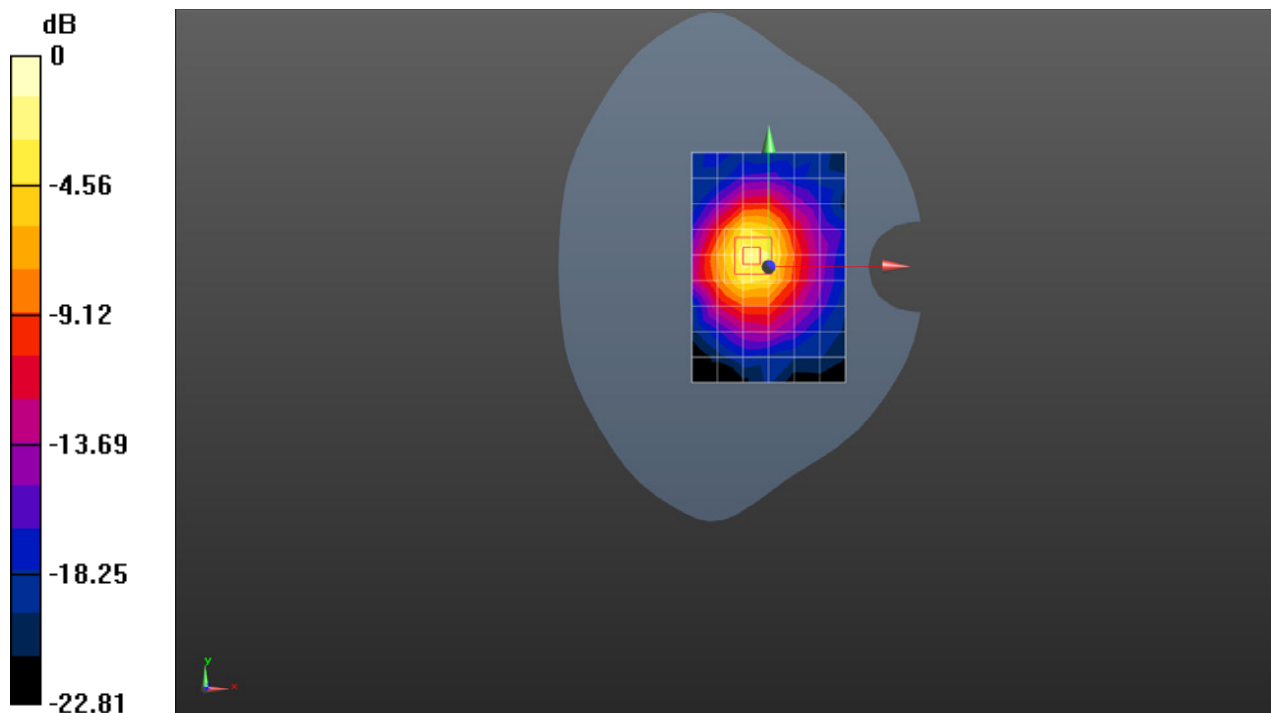
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 7.715 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.311 W/kg

SAR(1 g) = 0.172 W/kg; SAR(10 g) = 0.091 W/kg

Maximum value of SAR (measured) = 0.244 W/kg



0 dB = 0.244 W/kg = -6.13 dBW/kg

Test Laboratory: SGS-SAR Lab

601HW WIFI 802.11a 40CH Bottom Side 10mm

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5200 MHz; Duty Cycle: 1:1.07

Medium: MSL5G; Medium parameters used: $f = 5200$ MHz; $\sigma = 5.259$ S/m; $\epsilon_r = 47.697$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(4.15, 4.15, 4.15); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x14x1): Measurement grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (measured) = 0.361 W/kg

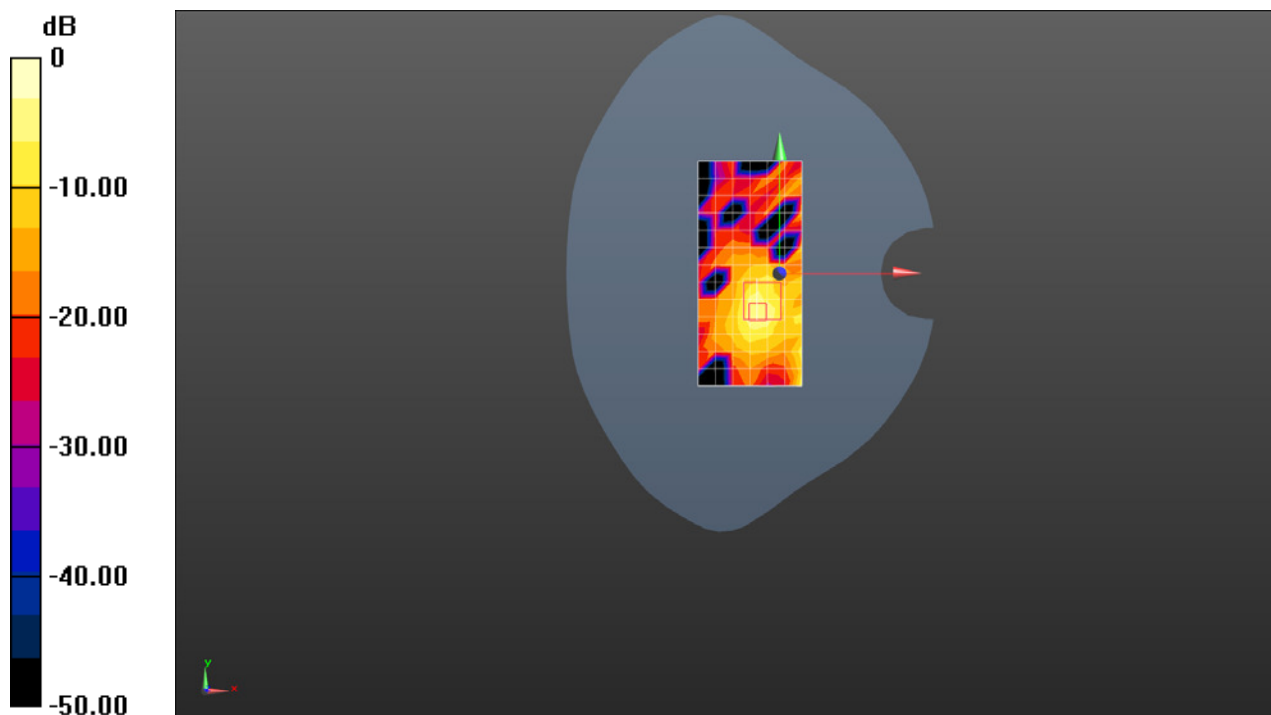
Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 8.609 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 1.24 W/kg

SAR(1 g) = 0.429 W/kg; SAR(10 g) = 0.114 W/kg

Maximum value of SAR (measured) = 0.821 W/kg



0 dB = 0.821 W/kg = -0.86 dBW/kg

Test Laboratory: SGS-SAR Lab

601HW WIFI 802.11n MIMO 44CH Bottom Side 10mm

DUT: 601HW; Type: Mobile WiFi; Serial: NA

Communication System: UID 0, WI-FI(5GHz) (0); Frequency: 5220 MHz; Duty Cycle: 1:1.06

Medium: MSL5G; Medium parameters used: $f = 5220$ MHz; $\sigma = 5.323$ S/m; $\epsilon_r = 47.633$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(4.15, 4.15, 4.15); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x14x1): Measurement grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (measured) = 0.129 W/kg

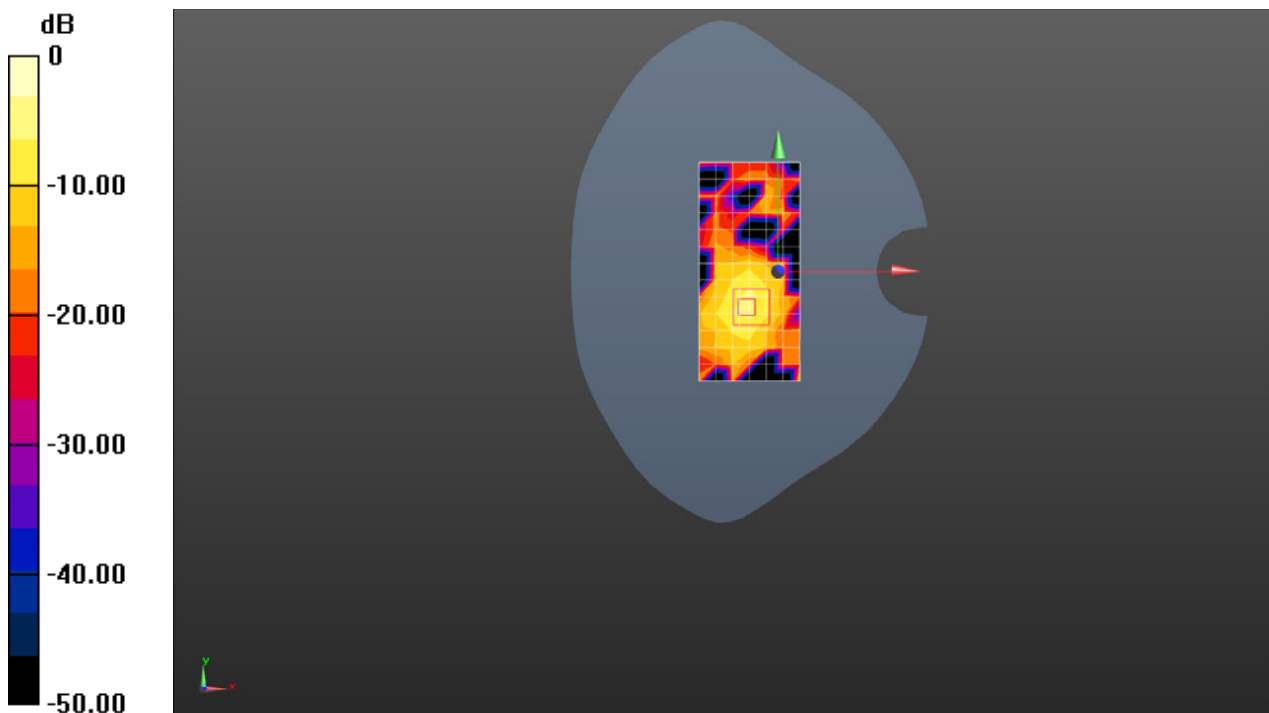
Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 3.998 V/m; Power Drift = 0.04dB

Peak SAR (extrapolated) = 0.857 W/kg

SAR(1 g) = 0.147 W/kg; SAR(10 g) = 0.047 W/kg

Maximum value of SAR (measured) = 0.394 W/kg



0 dB = 0.394 W/kg = -4.05 dBW/kg



Appendix C

Calibration certificate

1. Dipole
D750V3 -SN 1126(2014-09-19)
D835V2-SN 4d105(2013-11-25)
D1800V2-SN 2d070(2013-11-27)
D1900V2-SN 5d028(2013-11-27)
D2450V2-SN 733(2013-11-26)
D2600V2-SN 1093(2014-09-23)
D5GHzV2-SN 1165(2013-12-11)
2. DAE
DAE3-SN 569(2015-11-24)
3. Probe
EX3DV4-SN 3962(2015-11-27)



Accredited by the Swiss Accreditation Service (SAS)
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Lenovo (Auden)**

Certificate No: **D750V3-1126_Sep14**

CALIBRATION CERTIFICATE

Object **D750V3 - SN: 1126**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **September 19, 2014**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: Name **Michael Weber** Function **Laboratory Technician** Signature **M. Weber**

Approved by: **Katja Pokovic** Technical Manager

Issued: September 22, 2014

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



Accredited by the Swiss Accreditation Service (SAS)

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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	42.0 $\pm$ 6 %	0.91 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.26 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.41 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	55.0 $\pm$ 6 %	0.98 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.65 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.76 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.1 Ω - 1.4 j Ω
Return Loss	- 29.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.7 Ω - 3.2 j Ω
Return Loss	- 29.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 23, 2014

DASY5 Validation Report for Head TSL

Date: 19.09.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1126

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.91 \text{ S/m}$; $\epsilon_r = 42$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.37, 6.37, 6.37); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

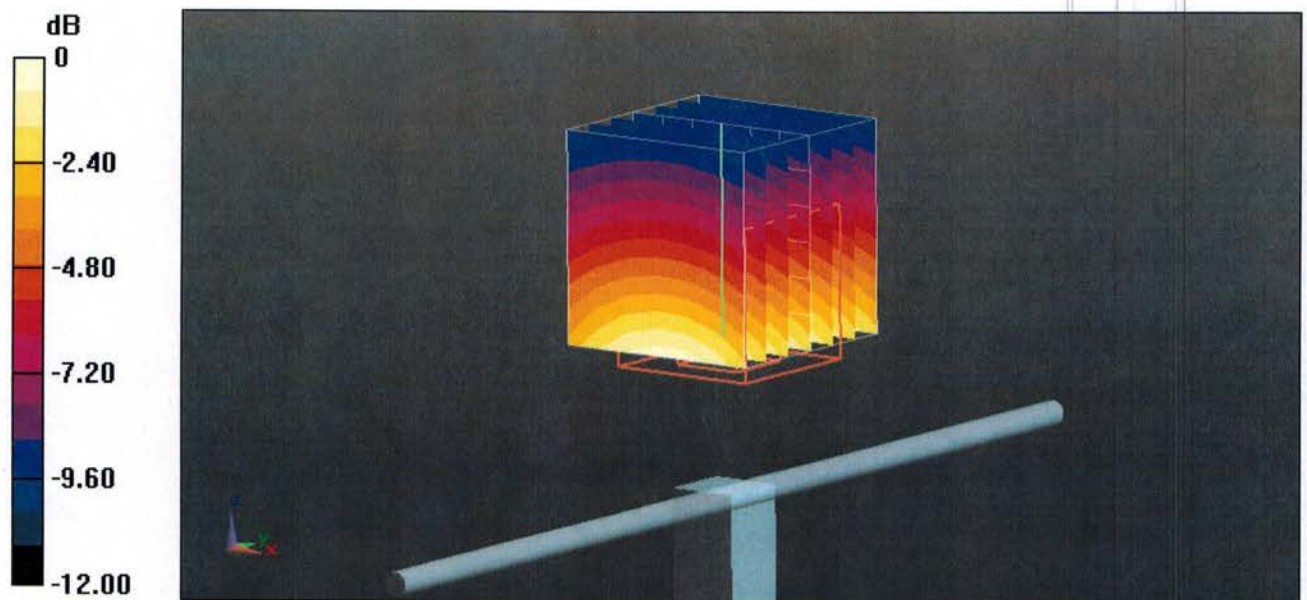
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53.42 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.12 W/kg

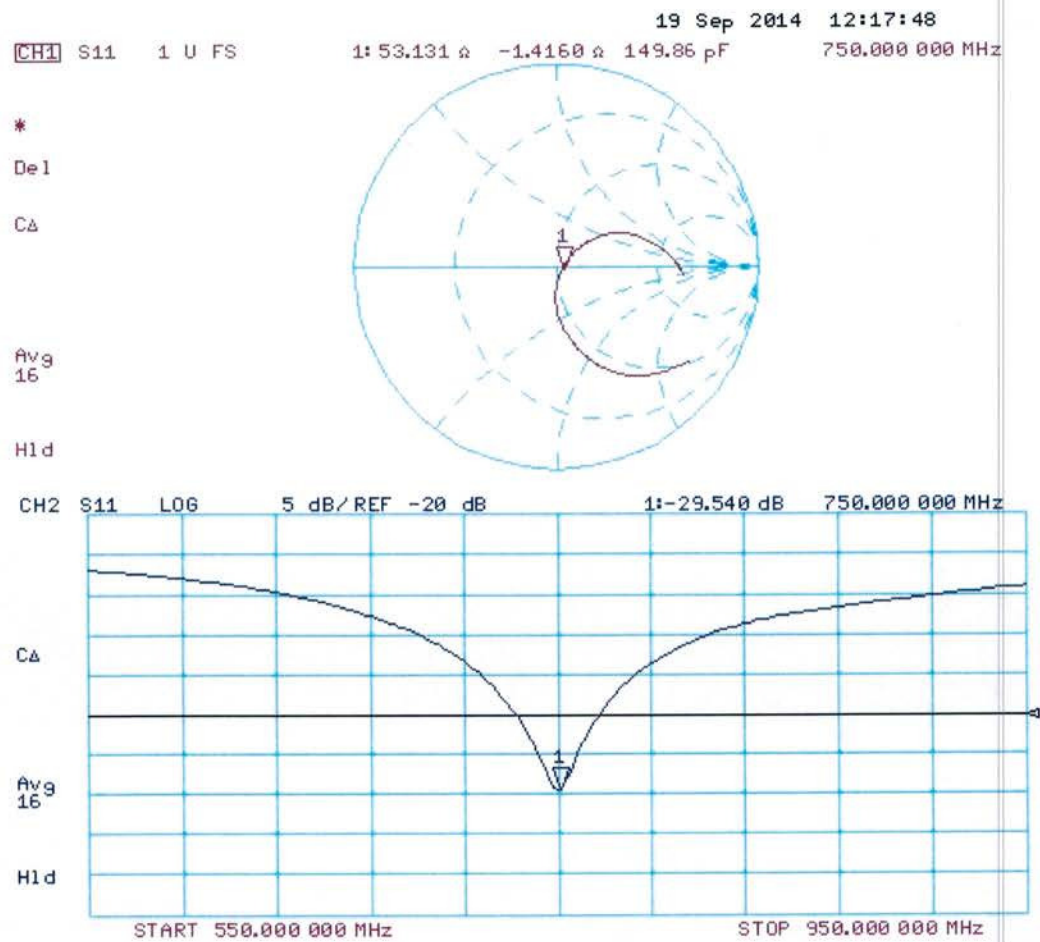
SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (measured) = 2.43 W/kg



0 dB = 2.43 W/kg = 3.86 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.09.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1126

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.98 \text{ S/m}$; $\epsilon_r = 55$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.13, 6.13, 6.13); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, $d=15\text{mm}$ /Zoom Scan (7x7x7)/Cube 0:

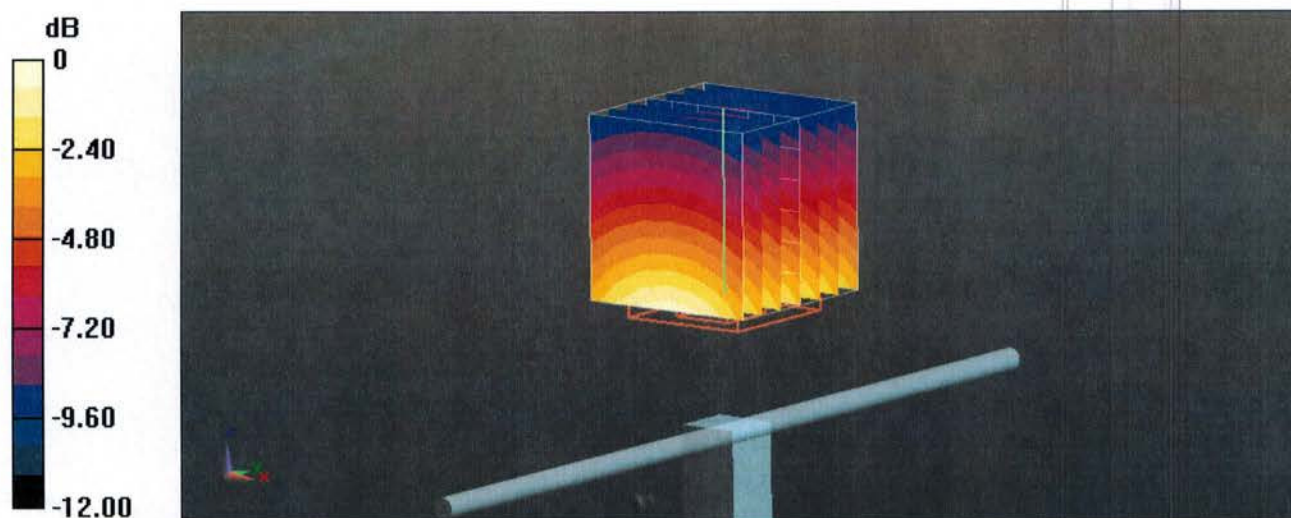
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53.03 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.20 W/kg

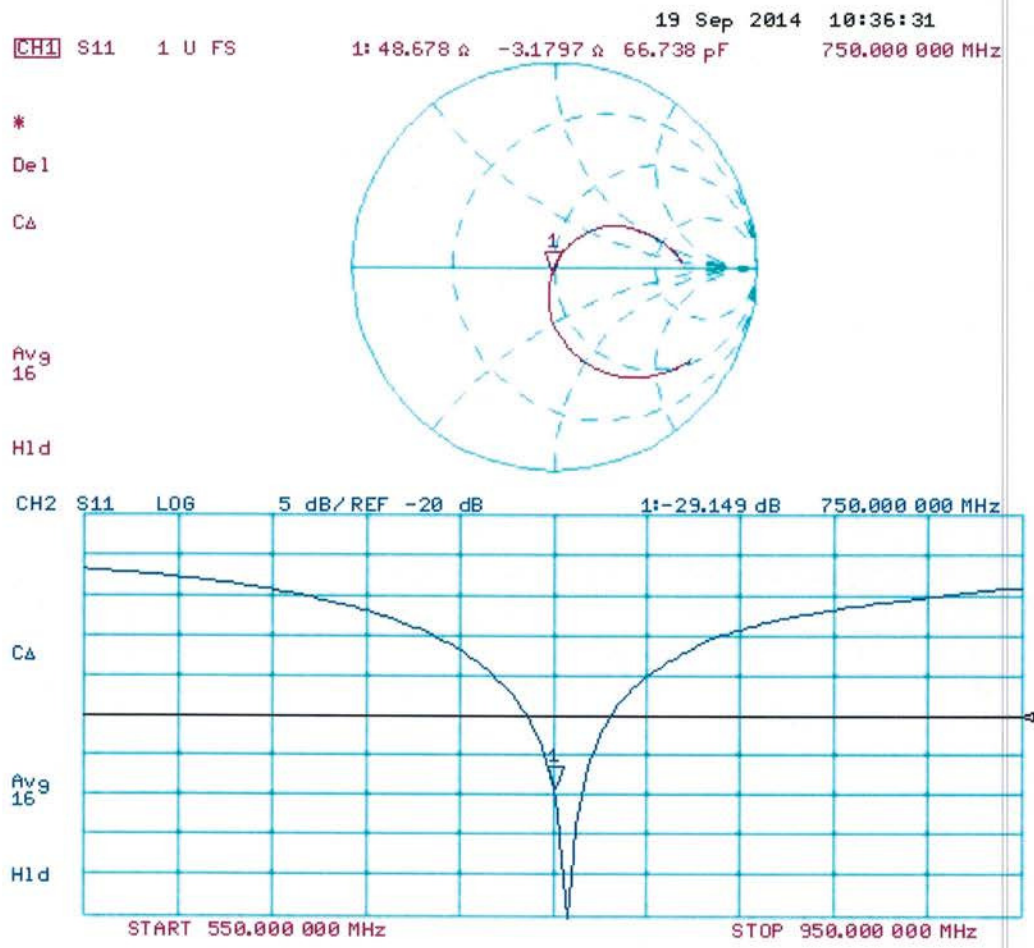
SAR(1 g) = 2.2 W/kg; SAR(10 g) = 1.46 W/kg

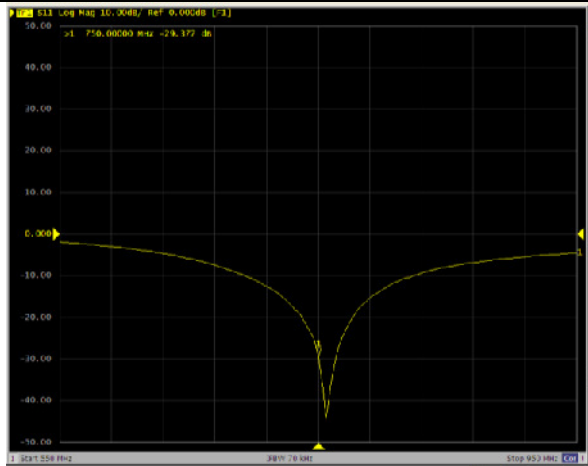
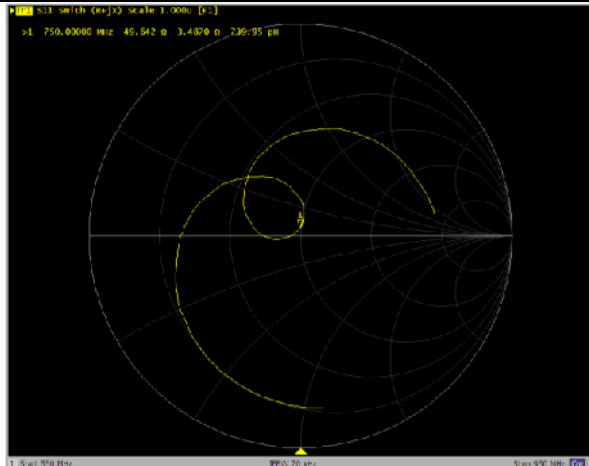
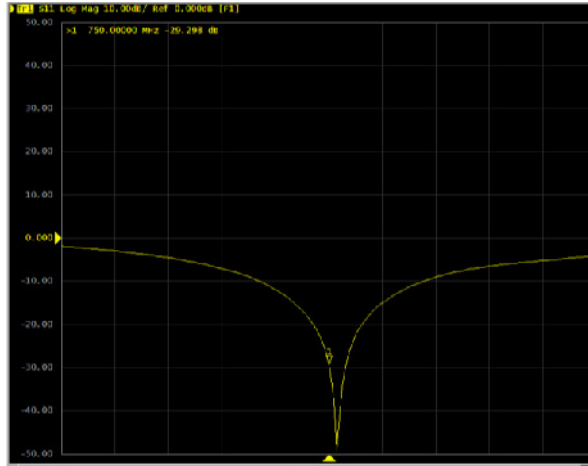
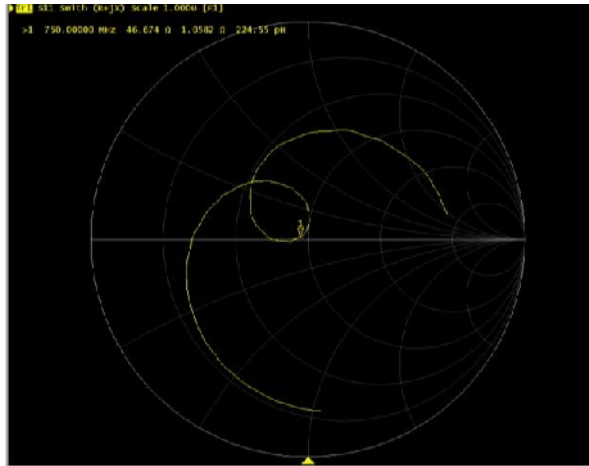
Maximum value of SAR (measured) = 2.56 W/kg



0 dB = 2.56 W/kg = 4.08 dBW/kg

Impedance Measurement Plot for Body TSL



Dipole Calibration for Impedance and Return-loss					
Model NO.:	D750V3	Serial NO.:	1126	Measurement Date:	2015-09-18
Liquid Type	Target Value:		Measured Value:		verdict
	Impedance	Return Loss	Impedance	Return Loss	
Head	53.1 Ω -1.4j Ω	-29.5dB	49.6 Ω +3.5j Ω	-29.4dB	Complied
Body	48.7 Ω -3.2j Ω	-29.1dB	46.7 Ω +1.1j Ω	-29.3dB	Complied
Remark: According to KDB 865664 D01, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements: 1) The most recent return-loss result, measured at least annually, deviates by less than 20% from the previous measurement and meeting the required 20 dB minimum return-loss requirement. 2) The most recent measurement of the real and imaginary parts of the impedance, measured at least annually, deviates by less than 5 Ω from the previous measurement.					
Return Loss for Head			Impedance for Head		
 Plot of Return Loss (dB) vs Frequency (MHz) for the Head. The y-axis ranges from -50.00 to 50.00 dB, and the x-axis ranges from 1.00E+002 MHz to 1.00E+003 MHz. A sharp dip is visible at 750.00000 MHz, reaching approximately -29.5 dB.			 Smith chart for Impedance for Head. The chart shows a point at 750.00000 MHz with an impedance of 49.642 Ω + j3.437 Ω. The scale is 1.0000 [1].		
Return Loss for Body			Impedance for Body		
 Plot of Return Loss (dB) vs Frequency (MHz) for the Body. The y-axis ranges from -50.00 to 50.00 dB, and the x-axis ranges from 1.00E+002 MHz to 1.00E+003 MHz. A sharp dip is visible at 750.00000 MHz, reaching approximately -29.1 dB.			 Smith chart for Impedance for Body. The chart shows a point at 750.00000 MHz with an impedance of 46.674 Ω + j1.0502 Ω. The scale is 1.0000 [1].		



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Client **SGS-SZ (Auden)**

Certificate No: **D835V2-4d105_Nov13**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d105**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **November 25, 2013**

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 (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-15
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 26, 2013

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Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.8 $\pm$ 6 %	0.94 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.64 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.26 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.7 $\pm$ 6 %	1.01 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.39 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.28 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.06 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω - 4.1 j Ω
Return Loss	- 27.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.9 Ω - 6.0 j Ω
Return Loss	- 23.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.395 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 26, 2010

DASY5 Validation Report for Head TSL

Date: 25.11.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d105

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.94$ S/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

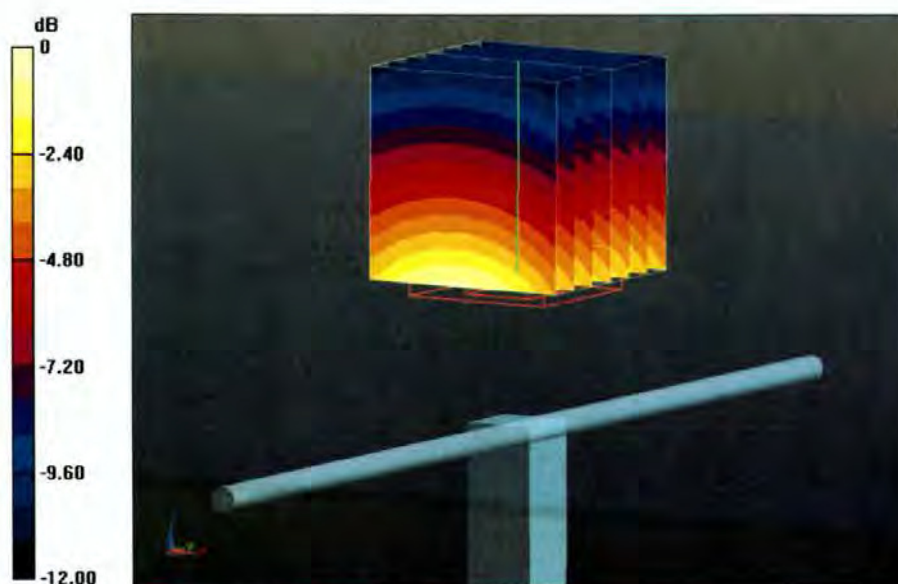
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.324 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 3.80 W/kg

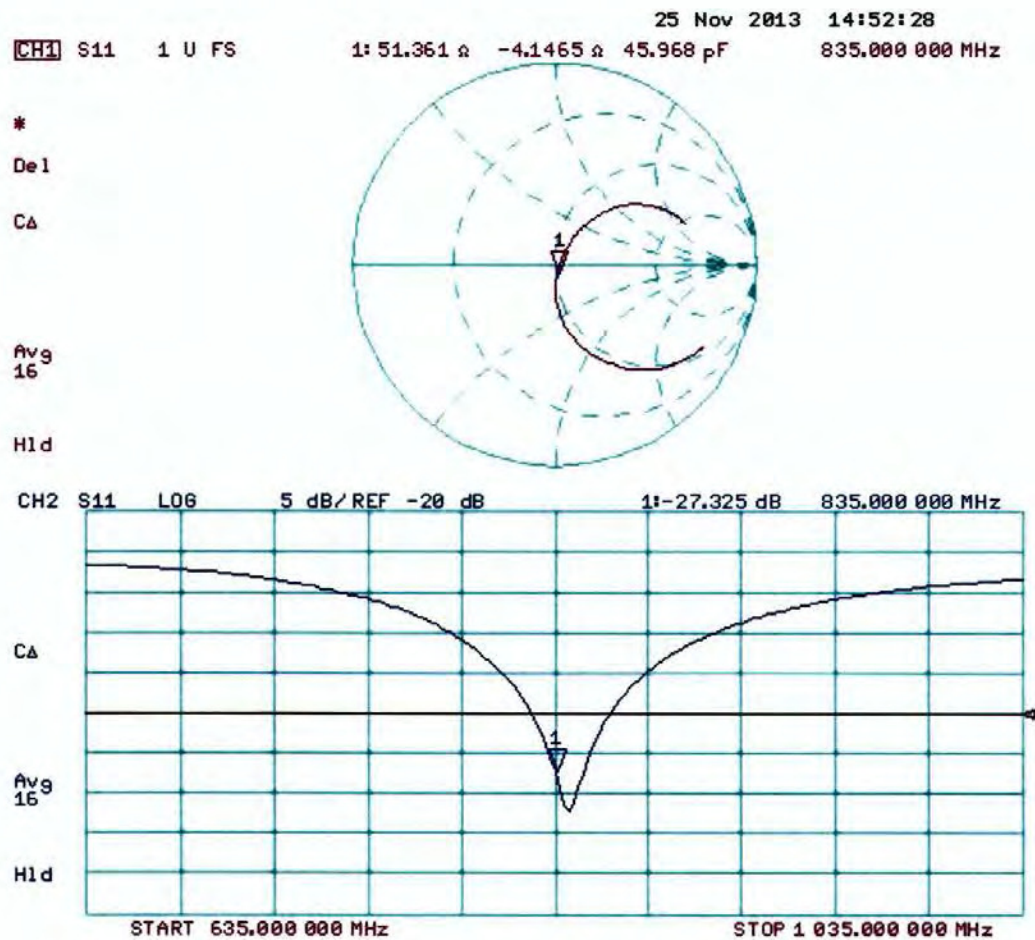
SAR(1 g) = 2.5 W/kg; SAR(10 g) = 1.61 W/kg

Maximum value of SAR (measured) = 2.92 W/kg



0 dB = 2.92 W/kg = 4.65 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 25.11.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d105

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.007 \text{ S/m}$; $\epsilon_r = 54.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

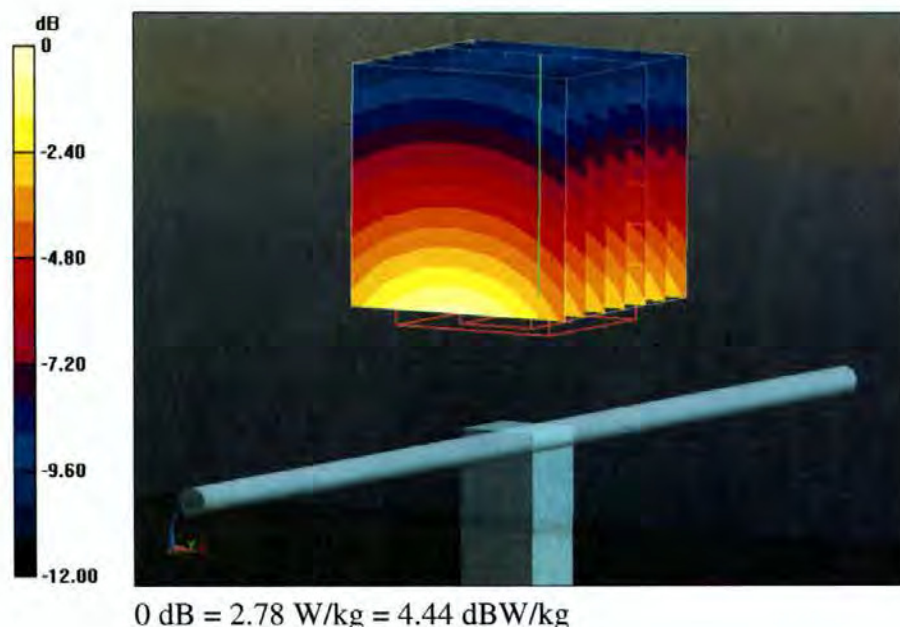
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 54.53 V/m; Power Drift = 0.00 dB

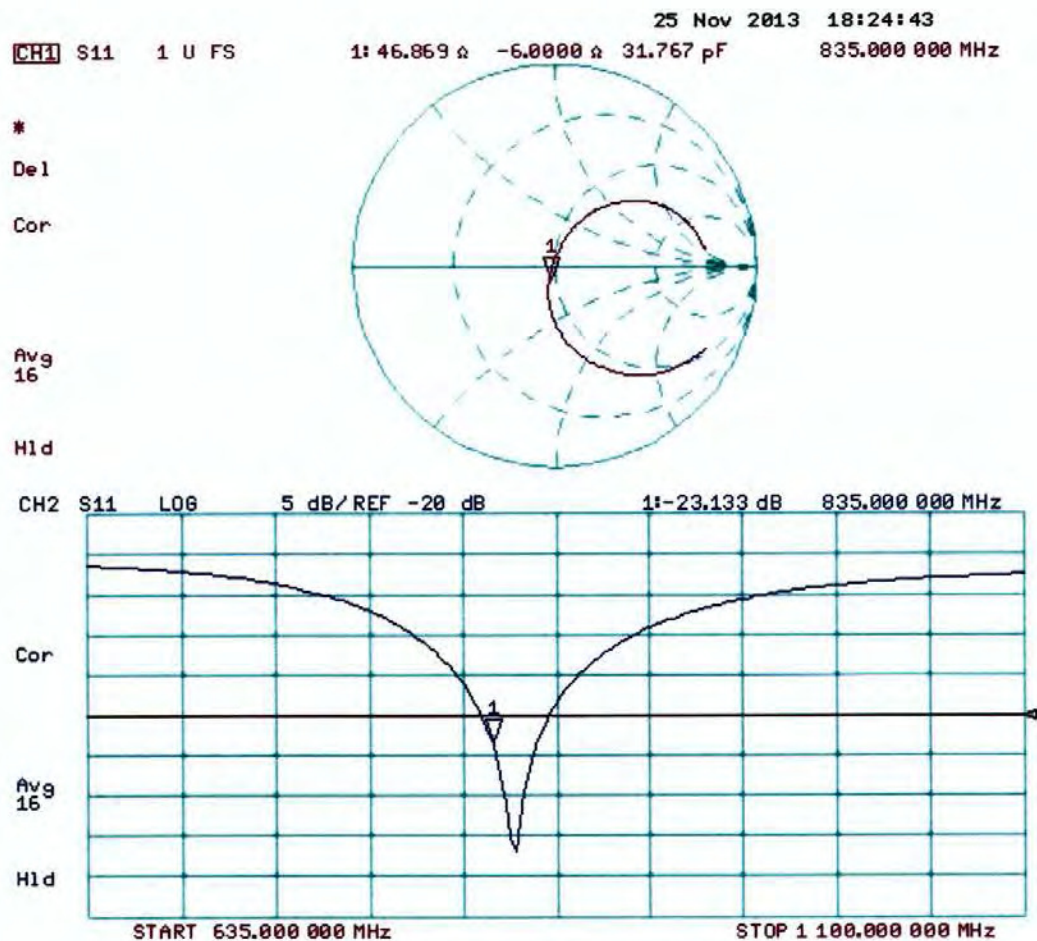
Peak SAR (extrapolated) = 3.53 W/kg

SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.55 W/kg

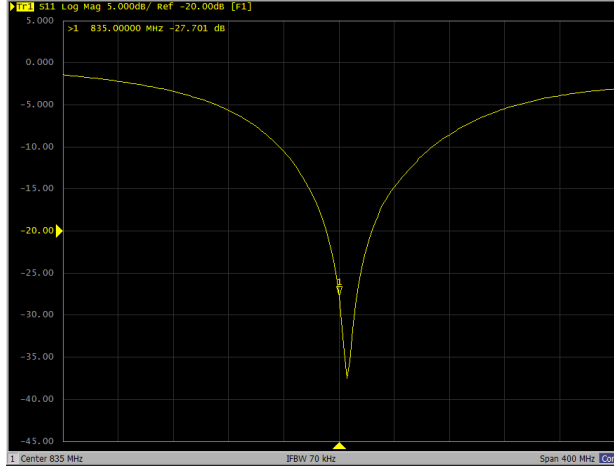
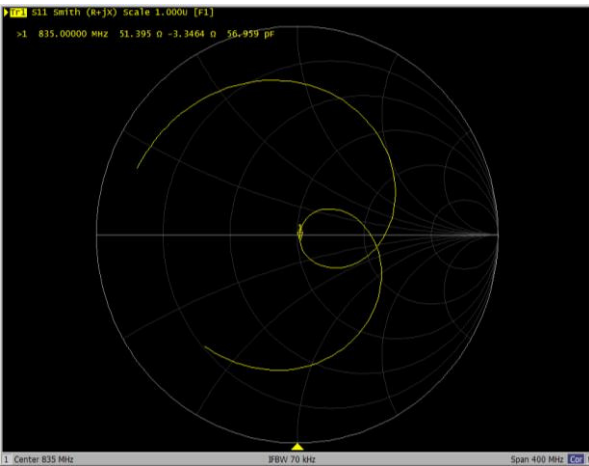
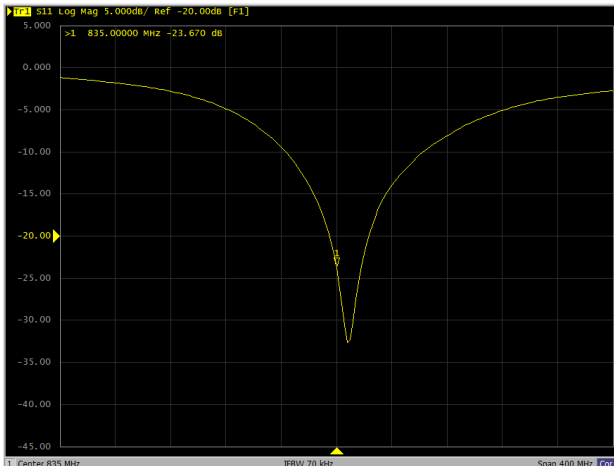
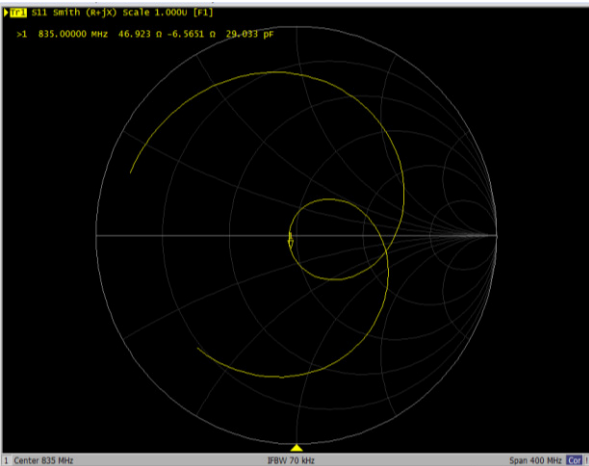
Maximum value of SAR (measured) = 2.78 W/kg



Impedance Measurement Plot for Body TSL





Dipole Calibration for Impedance and Return-loss					
Model NO.:	D835V2	Serial NO.:	4d015	Measurement Date:	2015-11-25
Liquid Type	Target Value:		Measured Value:		verdict
	Impedance	Return Loss	Impedance	Return Loss	
Head	51.4Ω-4.1jΩ	-27.3dB	51.4Ω-3.3jΩ	-27.7dB	Complied
Body	46.9Ω-6.0jΩ	-23.1dB	46.9Ω-6.6jΩ	-23.7dB	Complied
Remark: According to KDB 865664 D01, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements: 1) The most recent return-loss result, measured at least annually, deviates by less than 20% from the previous measurement and meeting the required 20 dB minimum return-loss requirement. 2) The most recent measurement of the real and imaginary parts of the impedance, measured at least annually, deviates by less than 5 Ω from the previous measurement.					
Return Loss for Head			Impedance for Head		
					
Return Loss for Body			Impedance for Body		
					



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Client **SGS-SZ (Auden)**

Certificate No: **D1800V2-2d070_Nov13**

CALIBRATION CERTIFICATE

Object **D1800V2 - SN: 2d070**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **November 27, 2013**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-15
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 27, 2013

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Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.8 $\pm$ 6 %	1.42 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.79 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	38.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.3 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	52.8 $\pm$ 6 %	1.53 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.72 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	38.6 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.4 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.4 Ω - 5.0 j Ω
Return Loss	- 25.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.3 Ω - 4.3 j Ω
Return Loss	- 23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.212 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 26, 2003

DASY5 Validation Report for Head TSL

Date: 27.11.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d070

Communication System: UID 0 - CW ; Frequency: 1800 MHz

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.42$ S/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.04, 5.04, 5.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

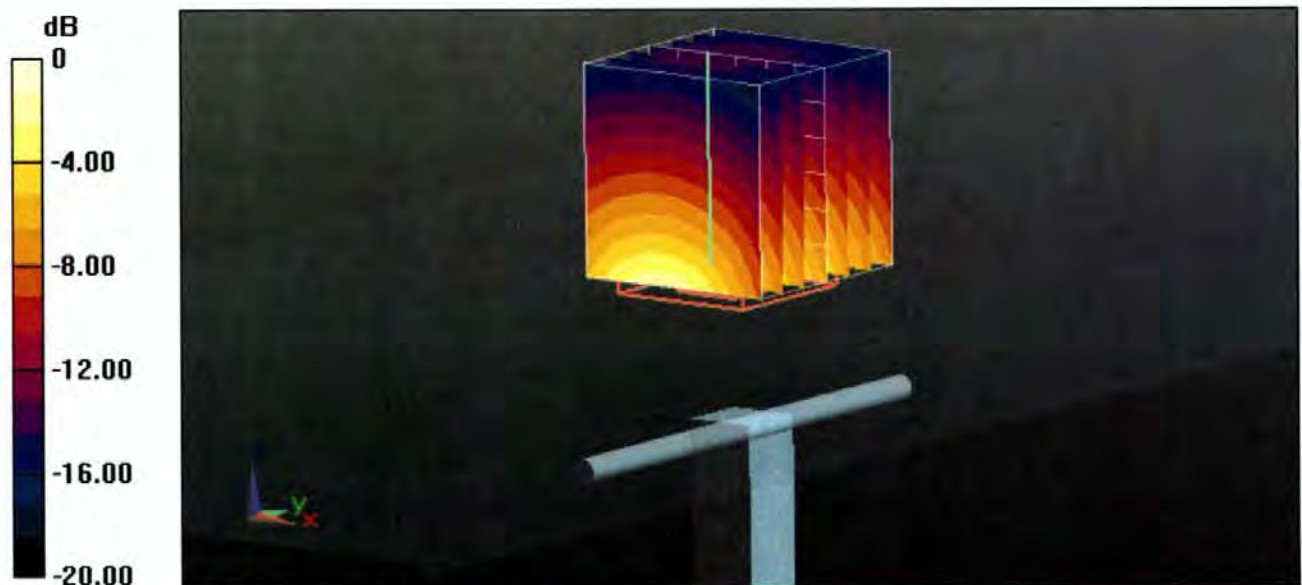
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.789 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 17.9 W/kg

SAR(1 g) = 9.79 W/kg; SAR(10 g) = 5.11 W/kg

Maximum value of SAR (measured) = 12.0 W/kg



0 dB = 12.0 W/kg = 10.79 dBW/kg

Impedance Measurement Plot for Head TSL

27 Nov 2013 10:31:34
CH1 S11 990 mU FS 2: 48.350 Ω -4.9746 Ω 17.774 pF 1 800.000 000 MHz

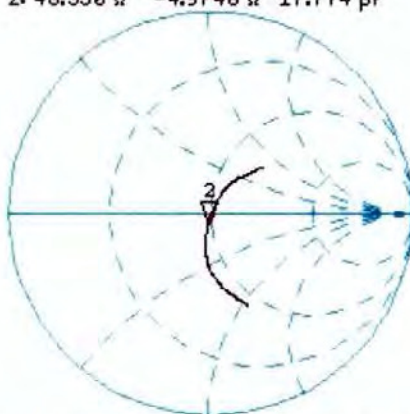
*

De1

CA

Av9
16

H1d

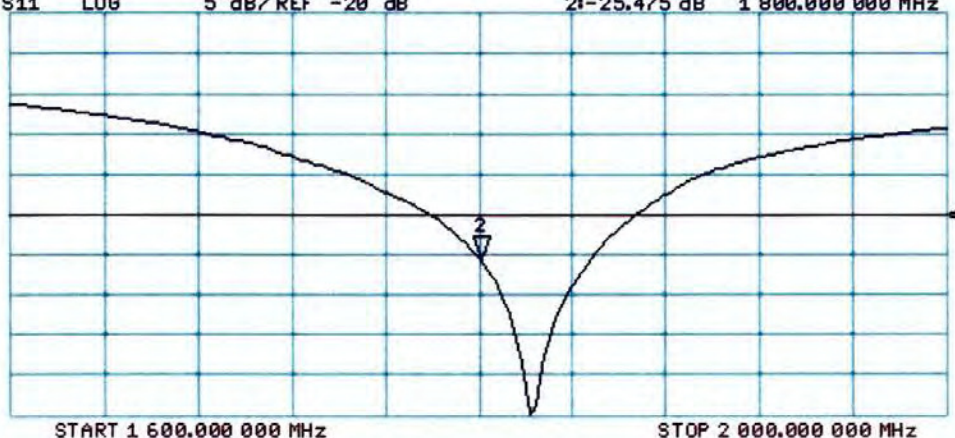


CH2 S11 LOG 5 dB/REF -20 dB 21-25.475 dB 1 800.000 000 MHz

CA

Av9
16

H1d



DASY5 Validation Report for Body TSL

Date: 25.11.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d070

Communication System: UID 0 - CW ; Frequency: 1800 MHz

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.53$ S/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.73, 4.73, 4.73); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 92.707 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 17.3 W/kg

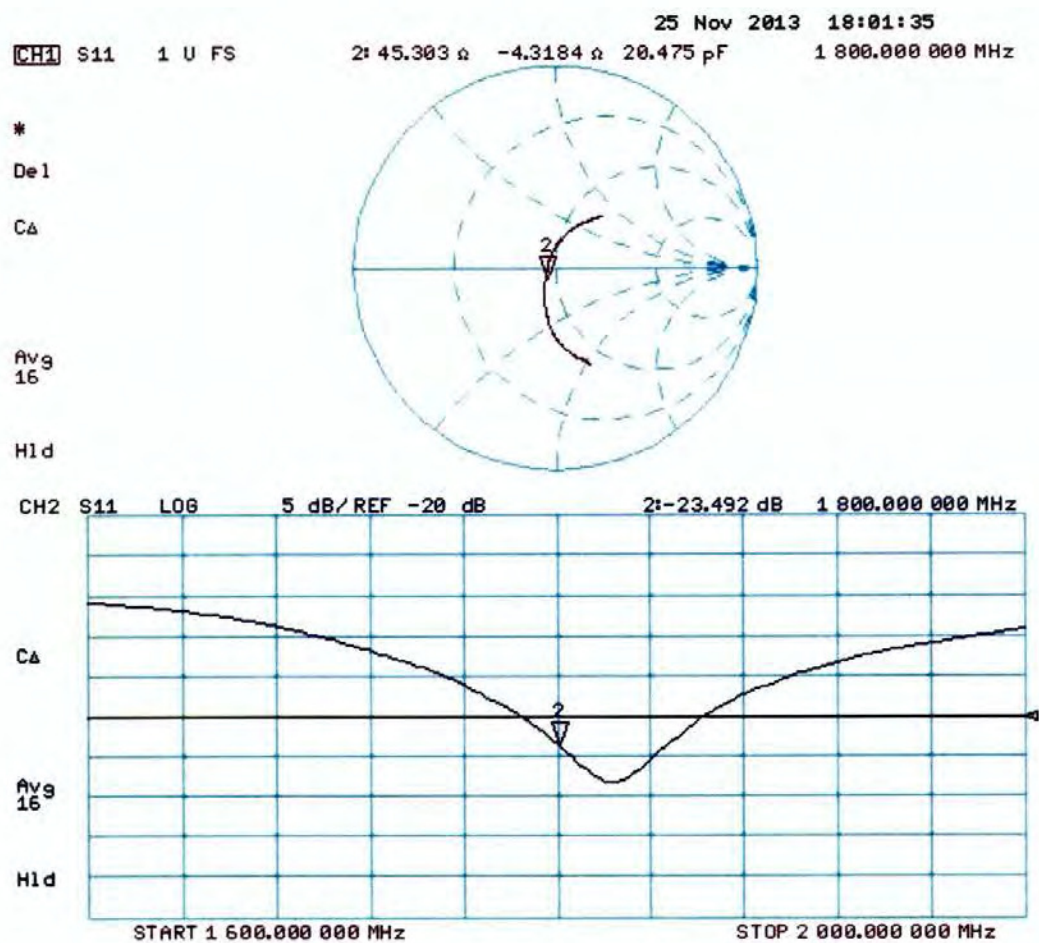
SAR(1 g) = 9.72 W/kg; SAR(10 g) = 5.13 W/kg

Maximum value of SAR (measured) = 12.2 W/kg



0 dB = 12.2 W/kg = 10.86 dBW/kg

Impedance Measurement Plot for Body TSL



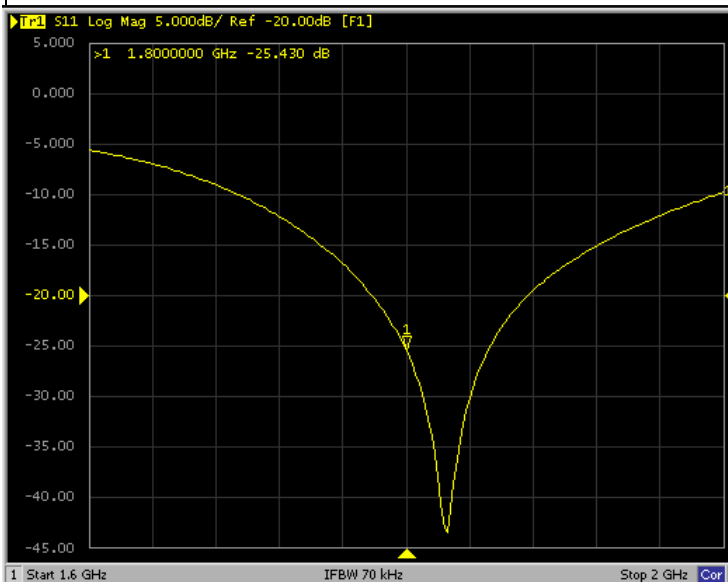
Dipole Calibration for Impedance and Return-loss

Model NO.:	D1800V2	Serial NO.:	2d070	Measurement Date:	2015-11-25
Liquid Type	Target Value:		Measured Value:		verdict
	Impedance	Return Loss	Impedance	Return Loss	
Head	48.4 Ω -5.0j Ω	-25.5dB	47.1 Ω -4.2j Ω	-25.4dB	Complied
Body	45.3 Ω -4.3j Ω	-23.5dB	46.8 Ω -3.4j Ω	-23.6dB	Complied

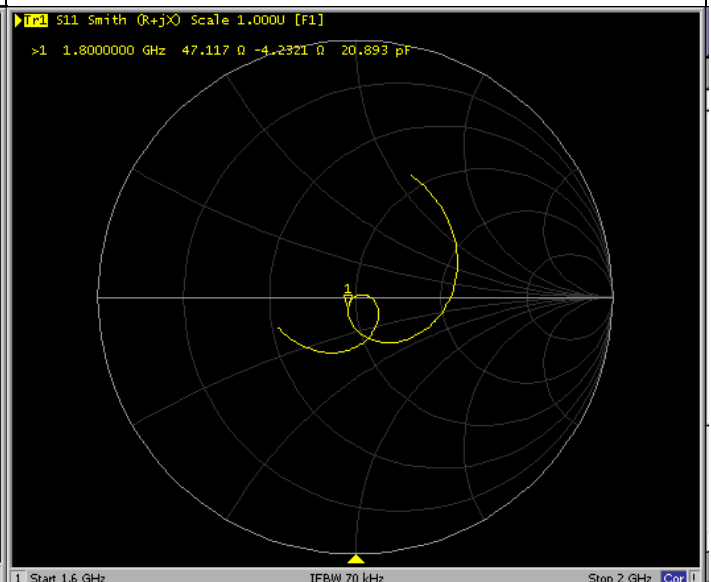
Remark: According to KDB 865664 D01, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) The most recent return-loss result, measured at least annually, deviates by less than 20% from the previous measurement and meeting the required 20 dB minimum return-loss requirement.
- 2) The most recent measurement of the real and imaginary parts of the impedance, measured at least annually, deviates by less than 5 Ω from the previous measurement.

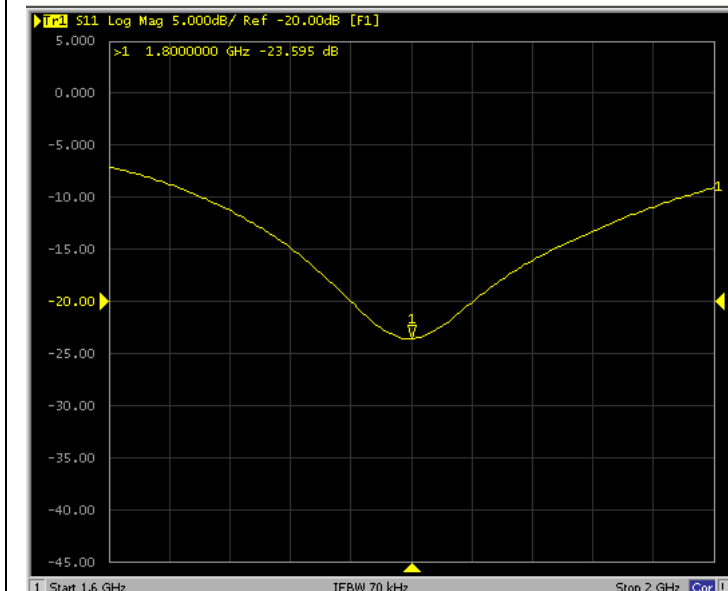
Return Loss for Head



Impedance for Head



Return Loss for Body



Impedance for Body

