

APPENDIX 2 : System Validation

1. System validation result Body 2450

Simulated Tissue Liquid Parameter confirmation

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
27-Aug	24	51	MSL 2450	23.5	2450	ϵ_r	52.7	50.7	-3.9	+/-5
						σ [mho/m]	1.95	1.94	-0.6	+/-5

ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in KDB865664.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*2	Measured	Deviation [%]	Limit*3 [%]
27-Aug	24	51	MSL 2450	23.5	2450	ϵ_r	50.7	50.7	-0.1	+/-6
						σ [mho/m]	2.01	1.94	-3.6	+/-6

ϵ_r : Relative Permittivity / σ : Conductivity

*2 The target value is the calibrated dipole Body TSL parameters. (D2450V2 SN:765, Measured Body TSL parameters)

*3 The limit is for deviation provided by manufacture.

System validation result (for calibration by manufacture)

SYSTEM VALIDATION							
Date	Frequency [MHz]	SAR 1g [W/kg]			Target 1W *1	Deviation [%]	Limit [%]
		Forward Power 250mW	Conversion 1W				
		Measured	Calculation				
27-Aug	2450.00	13.90	55.60		50.80	9.4	+/-10

*1 The target value is the parameter defined in 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D2450V2 SN:765)

Body 2450MHz System Validation DATA / Dipole2.4GHz / Forward Conducted Power : 250mW

Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.938$ S/m; $\epsilon_r = 50.666$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(7.37, 7.37, 7.37); Calibrated: 2013/06/04;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2013/06/03

Phantom: ELI v5.0 TP1207; Type: QDOVA001BB;

Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Area Scan (81x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 22.4 W/kg

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

Reference Value = 97.629 V/m; Power Drift = 0.09 dB

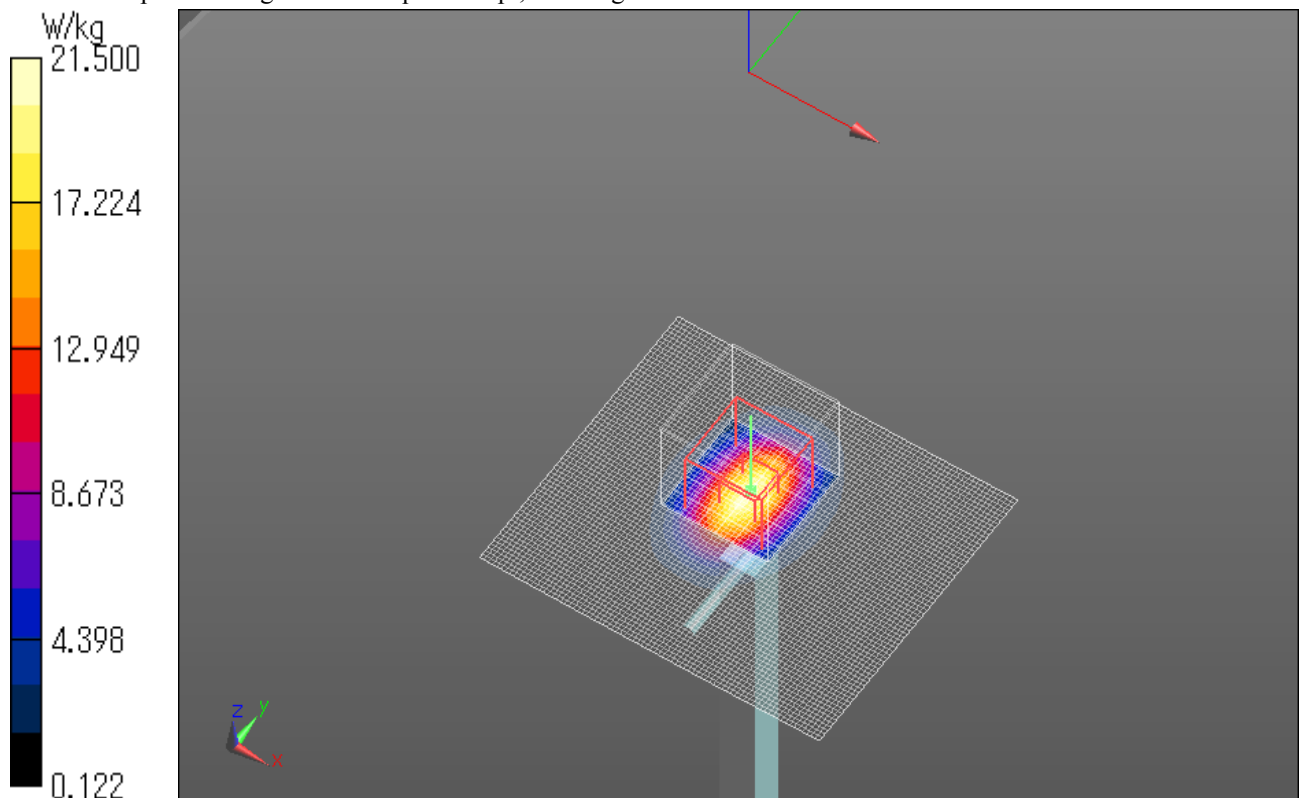
Peak SAR (extrapolated) = 29.6 W/kg

SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.44 W/kg

Maximum value of SAR (measured) = 21.5 W/kg

Date: 2013/08/27

Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



2. System validation result Body 5GHz

Simulated Tissue Liquid Parameter confirmation

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
19-Aug	24.0	55	MSL 3-6GHz	23.5	5200	ϵ_r	49.0	47.1	-3.9	+/-5
						σ [mho/m]	5.30	5.40	1.9	+/-5
20-Aug	24.0	44	MSL 3-6GHz	23.5	5200	ϵ_r	49.0	47.2	-3.8	+/-5
						σ [mho/m]	5.30	5.46	3.1	+/-5
21-Aug	24.0	48	MSL 3-6GHz	23.5	5200	ϵ_r	49.0	47.0	-4.1	+/-5
						σ [mho/m]	5.30	5.45	2.9	+/-5
21-Aug	24.0	48	MSL 3-6GHz	23.5	5500	ϵ_r	48.60	46.49	-4.3	+/-5
						σ [mho/m]	5.65	5.83	3.2	+/-5
22-Aug	24.0	47	MSL 3-6GHz	23.5	5500	ϵ_r	48.60	46.92	-3.5	+/-5
						σ [mho/m]	5.65	5.72	1.2	+/-5
23-Aug	24.0	55	MSL 3-6GHz	23.5	5800	ϵ_r	48.2	46.0	-4.5	+/-5
						σ [mho/m]	6.00	6.19	3.2	+/-5
26-Aug	24.0	58	MSL 3-6GHz	23.5	5200	ϵ_r	49.0	47.0	-4.2	+/-5
						σ [mho/m]	5.30	5.40	2.0	+/-5
26-Aug	24.0	58	MSL 3-6GHz	23.5	5500	ϵ_r	48.60	46.4	-4.5	+/-5
						σ [mho/m]	5.65	5.76	1.9	+/-5
26-Aug	24.0	58	MSL 3-6GHz	23.5	5800	ϵ_r	48.2	45.8	-4.9	+/-5
						σ [mho/m]	6.00	6.18	3.0	+/-5

ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in KDB865664 .

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*2	Measured	Deviation [%]	Limit*3 [%]
19-Aug	24.0	55	MSL 3-6GHz	23.5	5200	ϵ_r	47.0	47.1	0.2	+/-6
						σ [mho/m]	5.42	5.40	-0.4	+/-6
20-Aug	24.0	44	MSL 3-6GHz	23.5	5200	ϵ_r	47.0	47.2	0.3	+/-6
						σ [mho/m]	5.42	5.46	0.8	+/-6
21-Aug	24.0	48	MSL 3-6GHz	23.5	5200	ϵ_r	47.0	47.0	0.0	+/-6
						σ [mho/m]	5.42	5.45	0.6	+/-6
21-Aug	24.0	48	MSL 3-6GHz	23.5	5500	ϵ_r	46.5	46.49	0.0	+/-6
						σ [mho/m]	5.81	5.83	0.4	+/-6
22-Aug	24.0	47	MSL 3-6GHz	23.5	5500	ϵ_r	46.5	46.92	0.9	+/-6
						σ [mho/m]	5.81	5.72	-1.6	+/-6
23-Aug	24.0	55	MSL 3-6GHz	23.5	5800	ϵ_r	46.0	46.0	0.0	+/-6
						σ [mho/m]	6.21	6.19	-0.3	+/-6
26-Aug	24.0	58	MSL 3-6GHz	23.5	5200	ϵ_r	47.0	47.0	-0.1	+/-6
						σ [mho/m]	5.42	5.40	-0.3	+/-6
26-Aug	24.0	58	MSL 3-6GHz	23.5	5500	ϵ_r	46.5	46.4	-0.2	+/-6
						σ [mho/m]	5.81	5.76	-0.9	+/-6
26-Aug	24.0	58	MSL 3-6GHz	23.5	5800	ϵ_r	46.0	45.8	-0.3	+/-6
						σ [mho/m]	6.21	6.18	-0.5	+/-6

ϵ_r : Relative Permittivity / σ : Conductivity

*2 The target value is the calibrated dipole Body TSL parameters. (D5GHzV2 SN:1020, Measured Body TSL parameters)

*3 The limit is for deviation provided by manufacture.

System validation result (for calibration by manufacture)

SYSTEM VALIDATION						
Date	Frequency [MHz]	SAR 1g [W/kg]		Target 1W *1	Deviation [%]	Limit [%]
		Forward Power 100mW	Conversion 1W			
		Measured	Calculation			
19-Aug	5200	7.51	75.10	75.00	0.1	+/-10
20-Aug	5200	7.59	75.90	75.00	1.2	+/-10
21-Aug	5200	7.94	79.40	75.00	5.9	+/-10
21-Aug	5500	8.04	80.40	80.70	-0.4	+/-10
22-Aug	5500	8.01	80.10	80.70	-0.7	+/-10
23-Aug	5800	7.55	75.50	75.50	0.0	+/-10
26-Aug	5200	8.02	80.20	75.00	6.9	+/-10
26-Aug	5500	8.11	81.10	80.70	0.5	+/-10
26-Aug	5800	7.69	76.90	75.50	1.9	+/-10

*1 The target value is the parameter defined in 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D5GHzV2 SN:1020)

Body 5200MHz System Validation DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.401$ S/m; $\epsilon_r = 47.093$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.28, 4.28, 4.28); Calibrated: 2013/06/04;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2013/06/03

Phantom: ELI v5.0 TP1207; Type: QDOVA001BB;

Measurement SW: DASYS2, Version 52.8 (7);

Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 15.2 W/kg

Zoom Scan (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 53.424 V/m; Power Drift = -0.00 dB

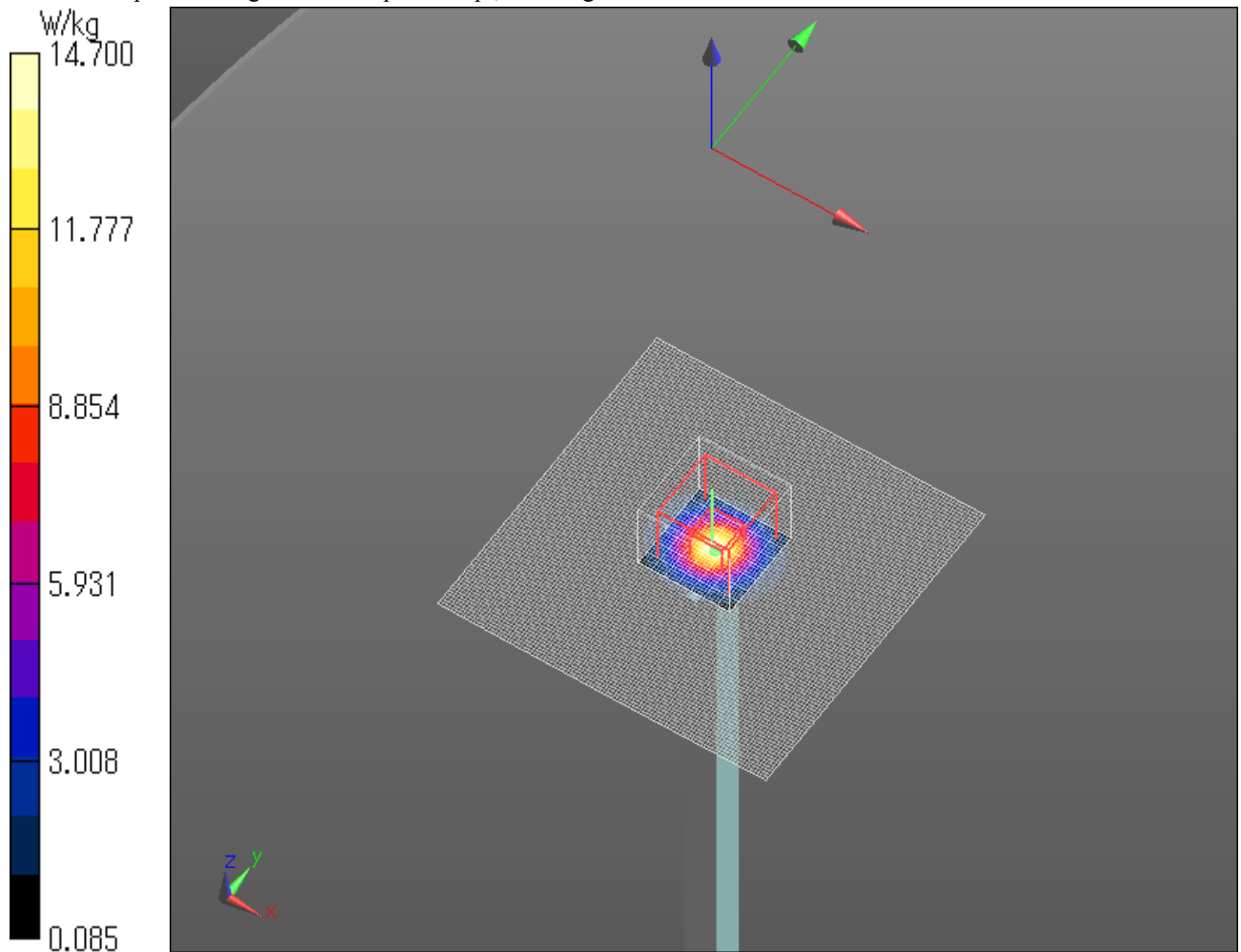
Peak SAR (extrapolated) = 29.0 W/kg

SAR(1 g) = 7.51 W/kg; SAR(10 g) = 2.2 W/kg

Maximum value of SAR (measured) = 14.7 W/kg

Date: 2013/08/19

Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



Body 5200MHz System Validation DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.463$ S/m; $\epsilon_r = 47.158$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.28, 4.28, 4.28); Calibrated: 2013/06/04;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2013/06/03

Phantom: ELI v5.0 TP1207; Type: QDOVA001BB;

Measurement SW: DASYS2, Version 52.8 (7);

Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 15.4 W/kg

Zoom Scan (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 55.344 V/m; Power Drift = 0.07 dB

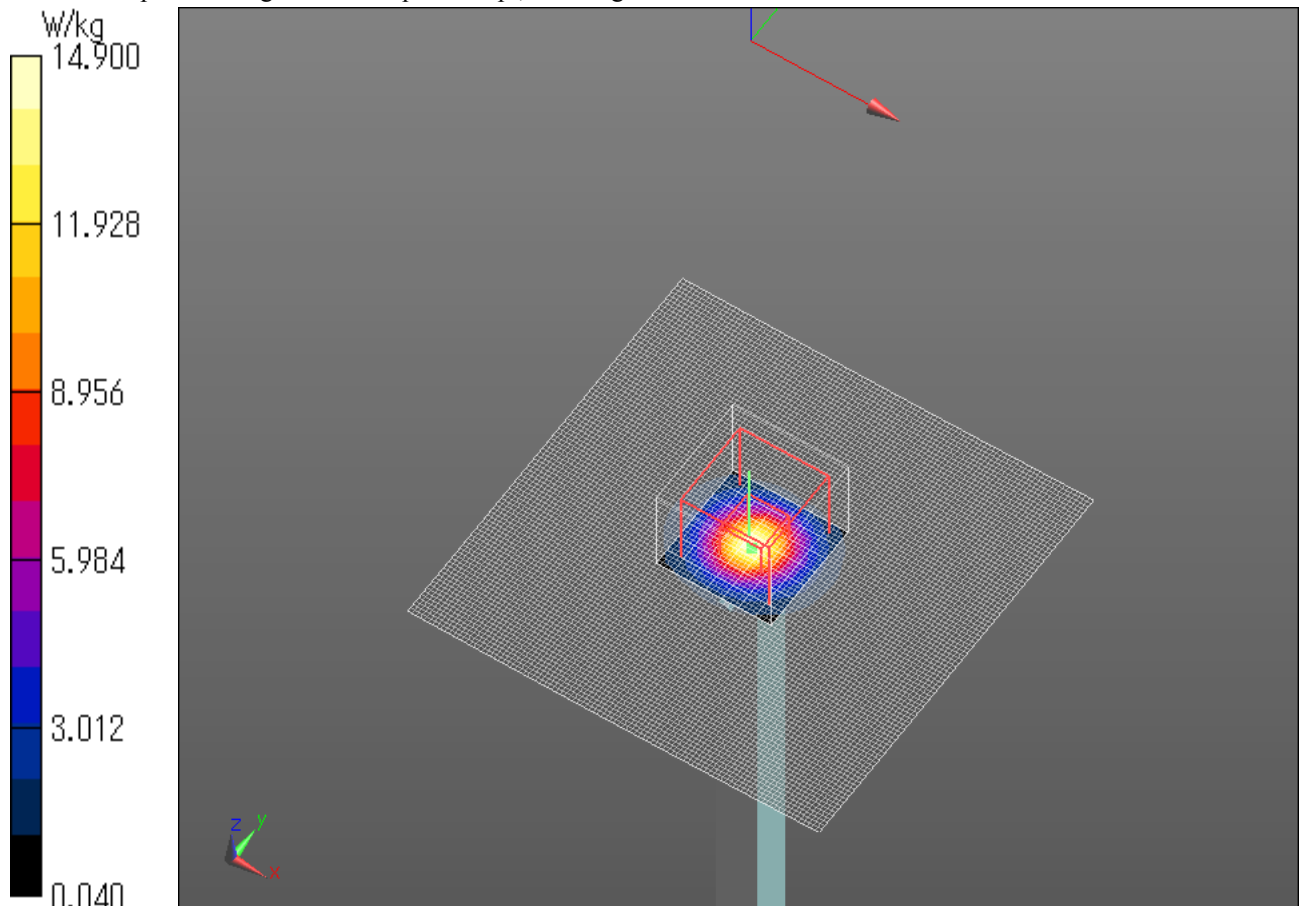
Peak SAR (extrapolated) = 29.3 W/kg

SAR(1 g) = 7.59 W/kg; SAR(10 g) = 2.18 W/kg

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

Date: 2013/08/20

Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



Body 5200MHz System Validation DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.415$ S/m; $\epsilon_r = 47.001$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.28, 4.28, 4.28); Calibrated: 2013/06/04;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2013/06/03

Phantom: ELI v5.0 TP1207; Type: QDOVA001BB;

Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 15.7 W/kg

Zoom Scan (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 55.528 V/m; Power Drift = 0.08 dB

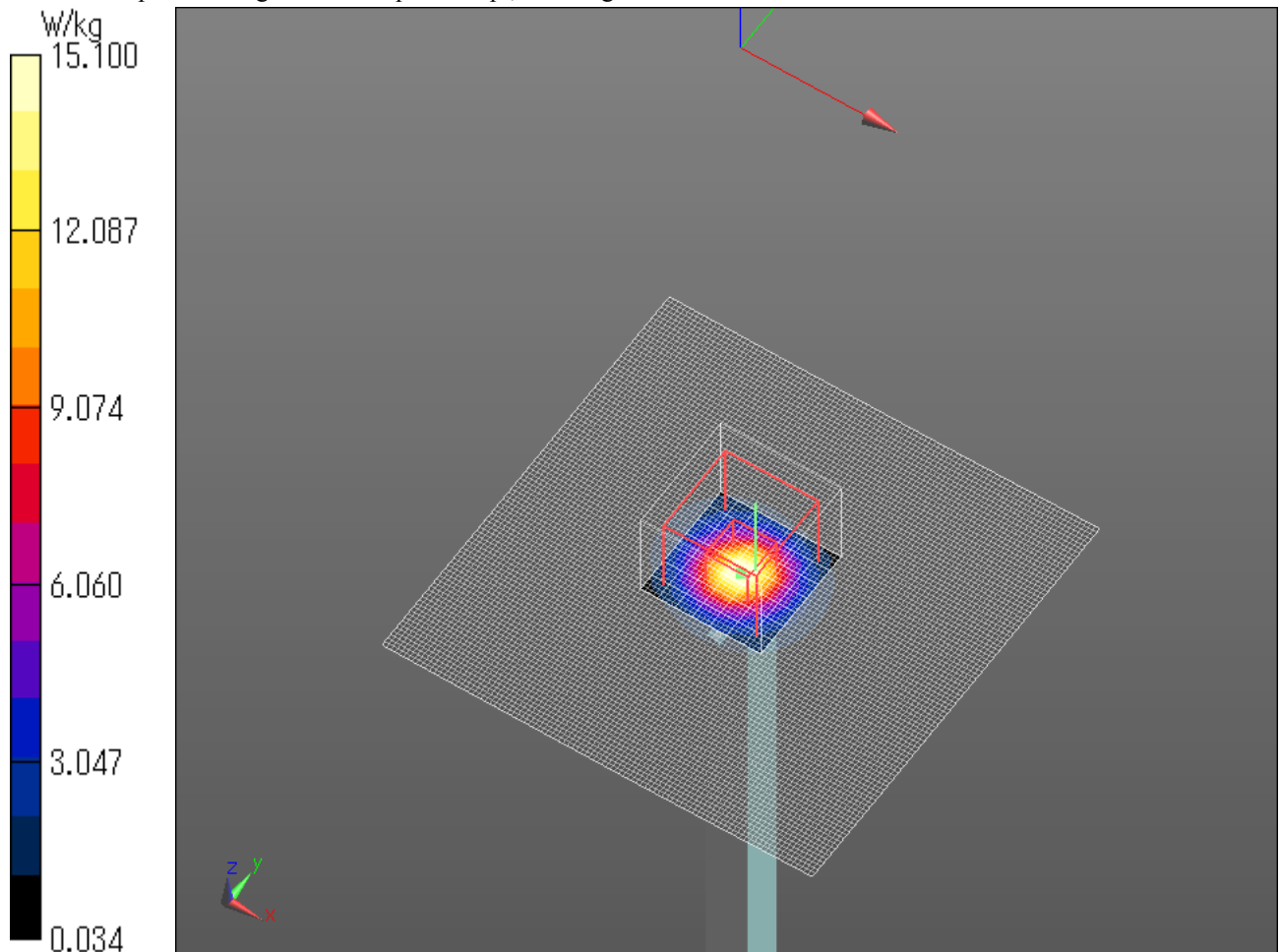
Peak SAR (extrapolated) = 30.8 W/kg

SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.28 W/kg

Maximum value of SAR (measured) = 15.1 W/kg

Date: 2013/08/21

Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



Body 5500MHz System Validation DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5500 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5500$ MHz; $\sigma = 5.831$ S/m; $\epsilon_r = 46.492$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(3.93, 3.93, 3.93); Calibrated: 2013/06/04;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2013/06/03

Phantom: ELI v5.0 TP1207; Type: QDOVA001BB;

Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 16.5 W/kg

Zoom Scan (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 54.368 V/m; Power Drift = 0.09 dB

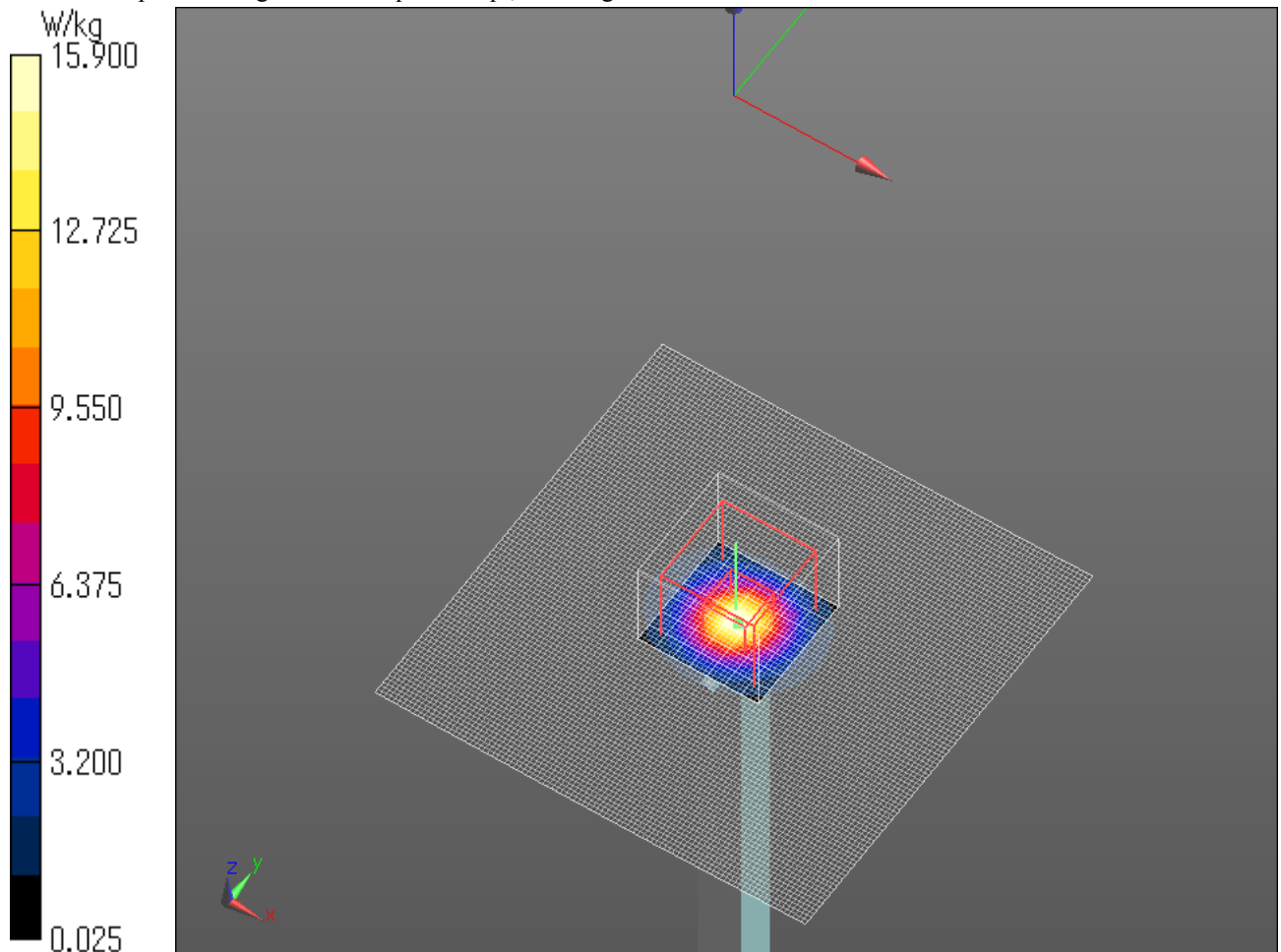
Peak SAR (extrapolated) = 33.5 W/kg

SAR(1 g) = 8.04 W/kg; SAR(10 g) = 2.27 W/kg

Maximum value of SAR (measured) = 15.9 W/kg

Date: 2013/08/21

Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



Body 5500MHz System Validation DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5500 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5500$ MHz; $\sigma = 5.716$ S/m; $\epsilon_r = 46.923$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(3.93, 3.93, 3.93); Calibrated: 2013/06/04;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2013/06/03

Phantom: ELI v5.0 TP1207; Type: QDOVA001BB;

Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 16.4 W/kg

Zoom Scan (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 54.879 V/m; Power Drift = 0.06 dB

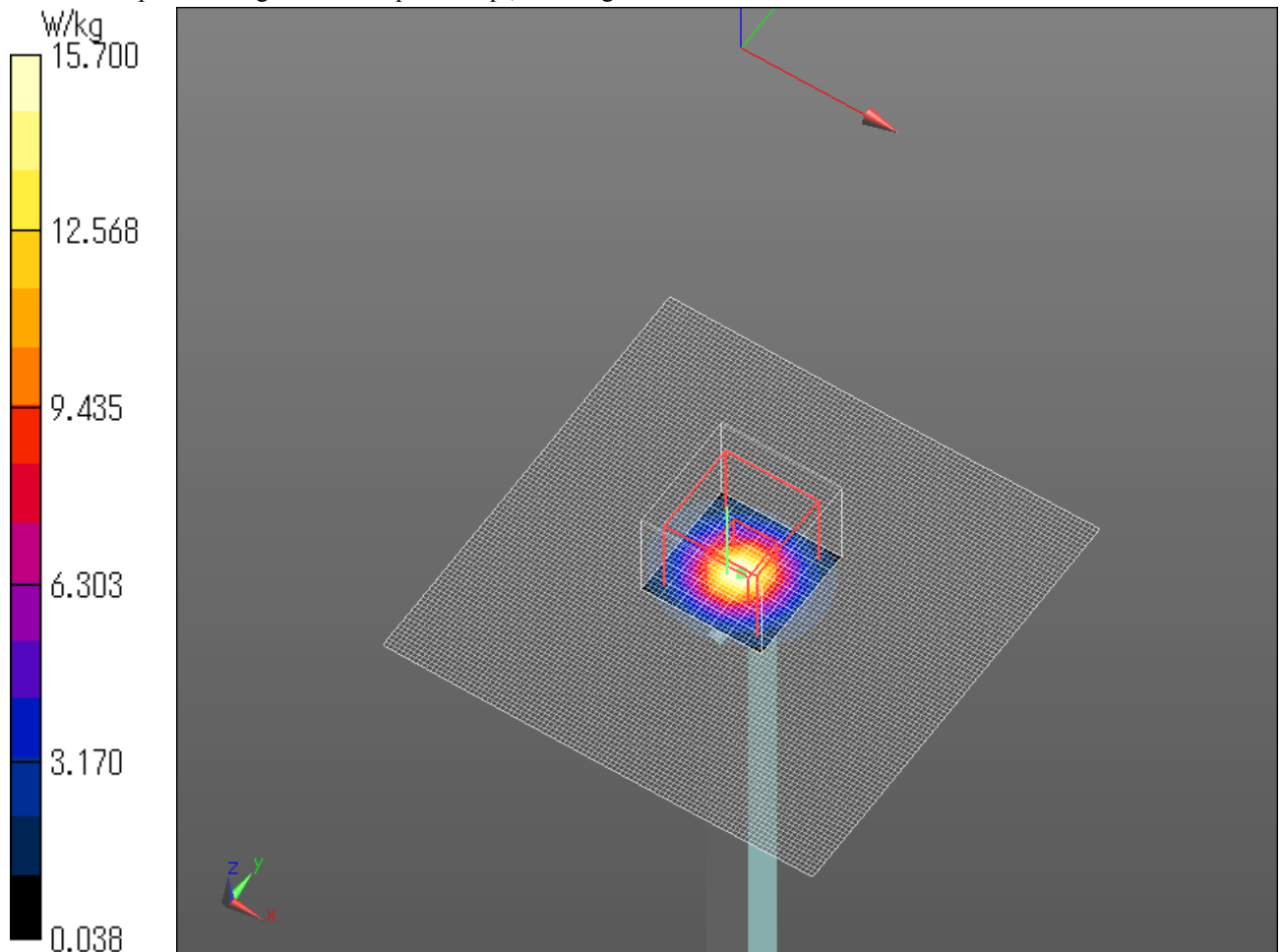
Peak SAR (extrapolated) = 33.3 W/kg

SAR(1 g) = 8.01 W/kg; SAR(10 g) = 2.28 W/kg

Maximum value of SAR (measured) = 15.7 W/kg

Date: 2013/08/22

Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



Body 5800MHz System Validation DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5800$ MHz; $\sigma = 6.19$ S/m; $\epsilon_r = 46.02$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(3.92, 3.92, 3.92); Calibrated: 2013/06/04;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2013/06/03

Phantom: ELI v5.0 TP1207; Type: QDOVA001BB;

Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 15.7 W/kg

Zoom Scan (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 53.443 V/m; Power Drift = 0.01 dB

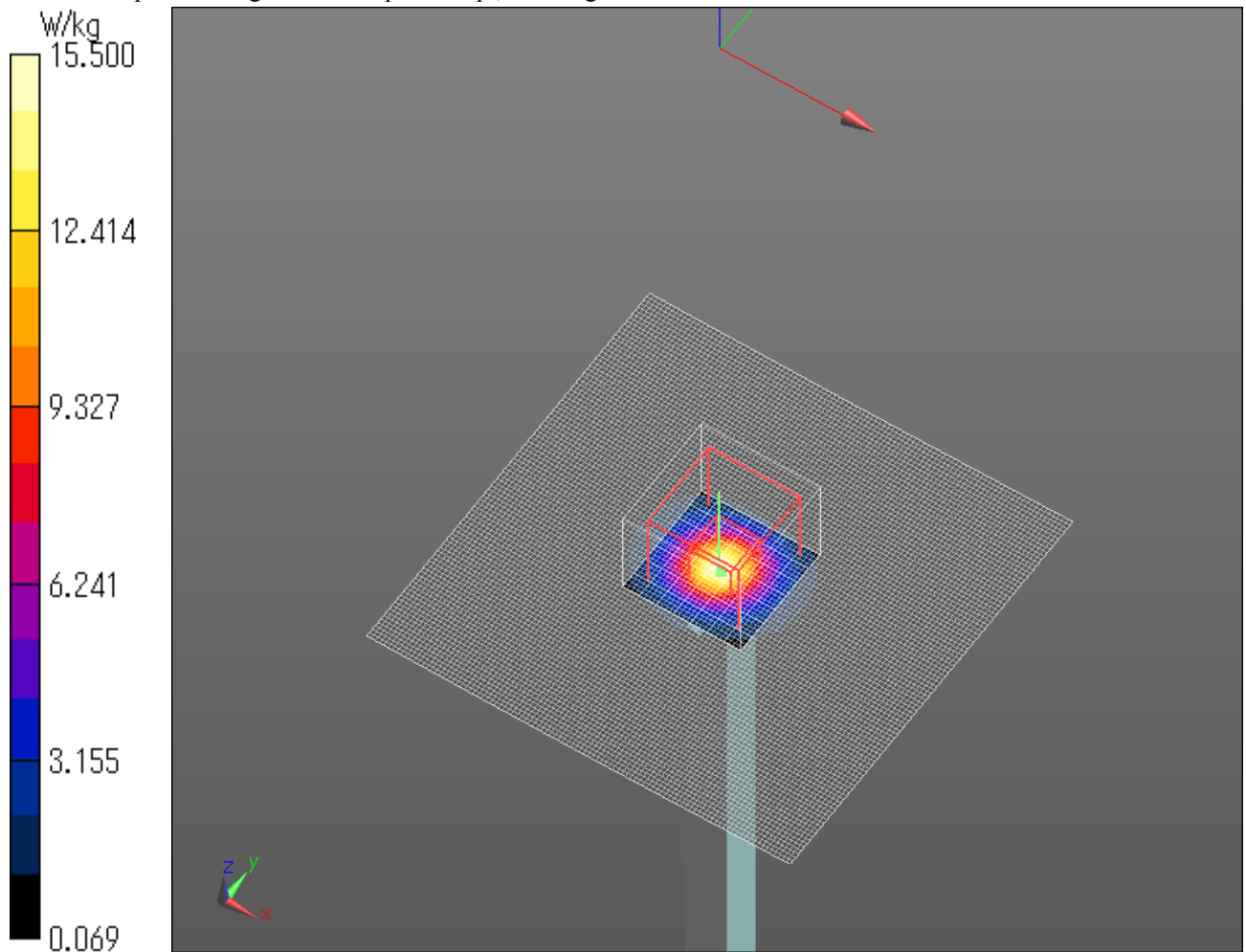
Peak SAR (extrapolated) = 32.1 W/kg

SAR(1 g) = 7.55 W/kg; SAR(10 g) = 2.16 W/kg

Maximum value of SAR (measured) = 15.5 W/kg

Date: 2013/08/23

Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



Body 5200MHz System Validation DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.404$ S/m; $\epsilon_r = 46.949$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.28, 4.28, 4.28); Calibrated: 2013/06/04;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2013/06/03

Phantom: ELI v5.0 TP1207; Type: QDOVA001BB;

Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 16.0 W/kg

Zoom Scan (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 52.129 V/m; Power Drift = 0.06 dB

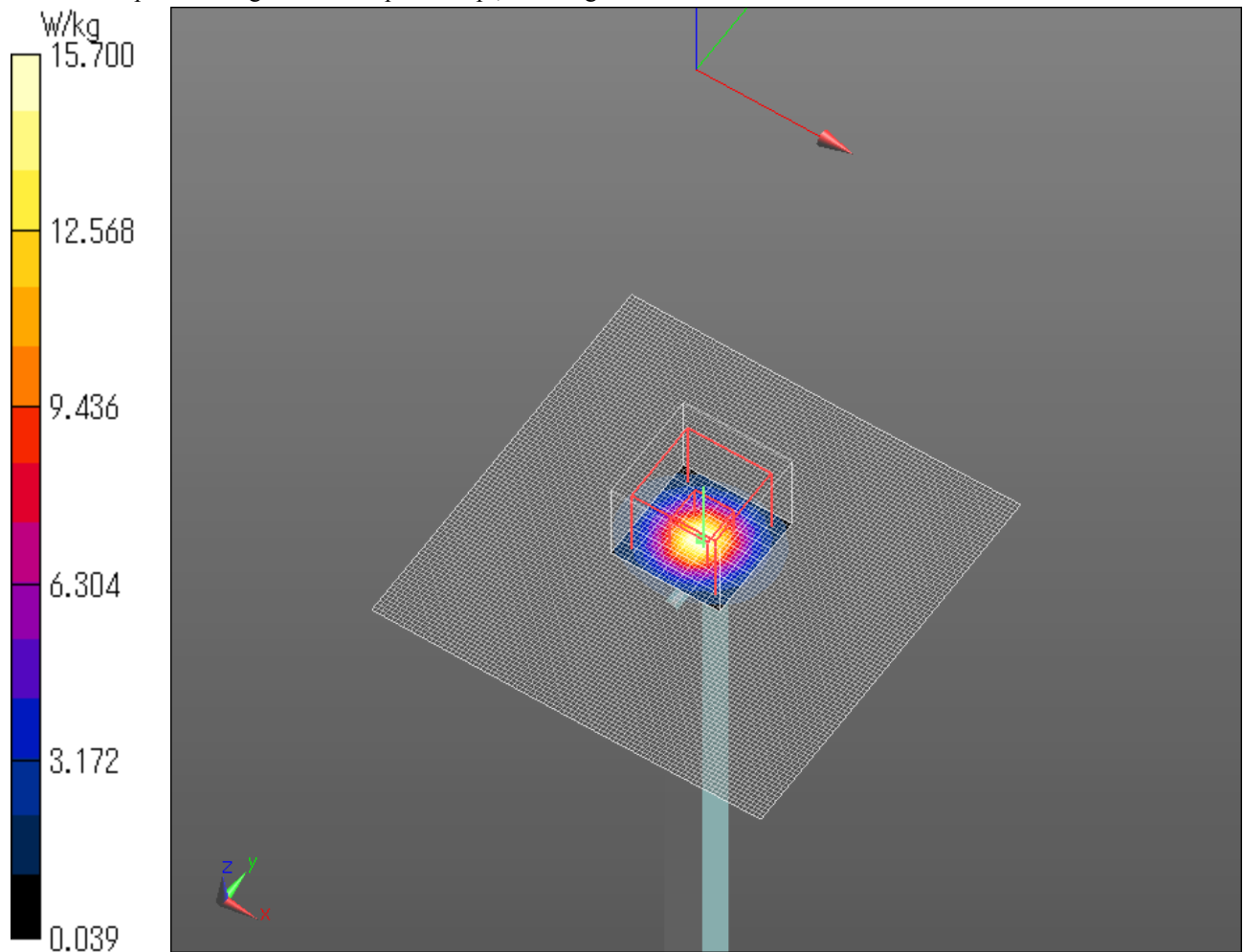
Peak SAR (extrapolated) = 32.4 W/kg

SAR(1 g) = 8.02 W/kg; SAR(10 g) = 2.29 W/kg

Maximum value of SAR (measured) = 15.7 W/kg

Date: 2013/08/26

Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



Body 5500MHz System Validation DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5500 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5500$ MHz; $\sigma = 5.758$ S/m; $\epsilon_r = 46.387$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(3.93, 3.93, 3.93); Calibrated: 2013/06/04;

Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2013/06/03

Phantom: ELI v5.0 TP1207; Type: QDOVA001BB;

Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 19.1 W/kg

Zoom Scan (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 55.691 V/m; Power Drift = 0.00 dB

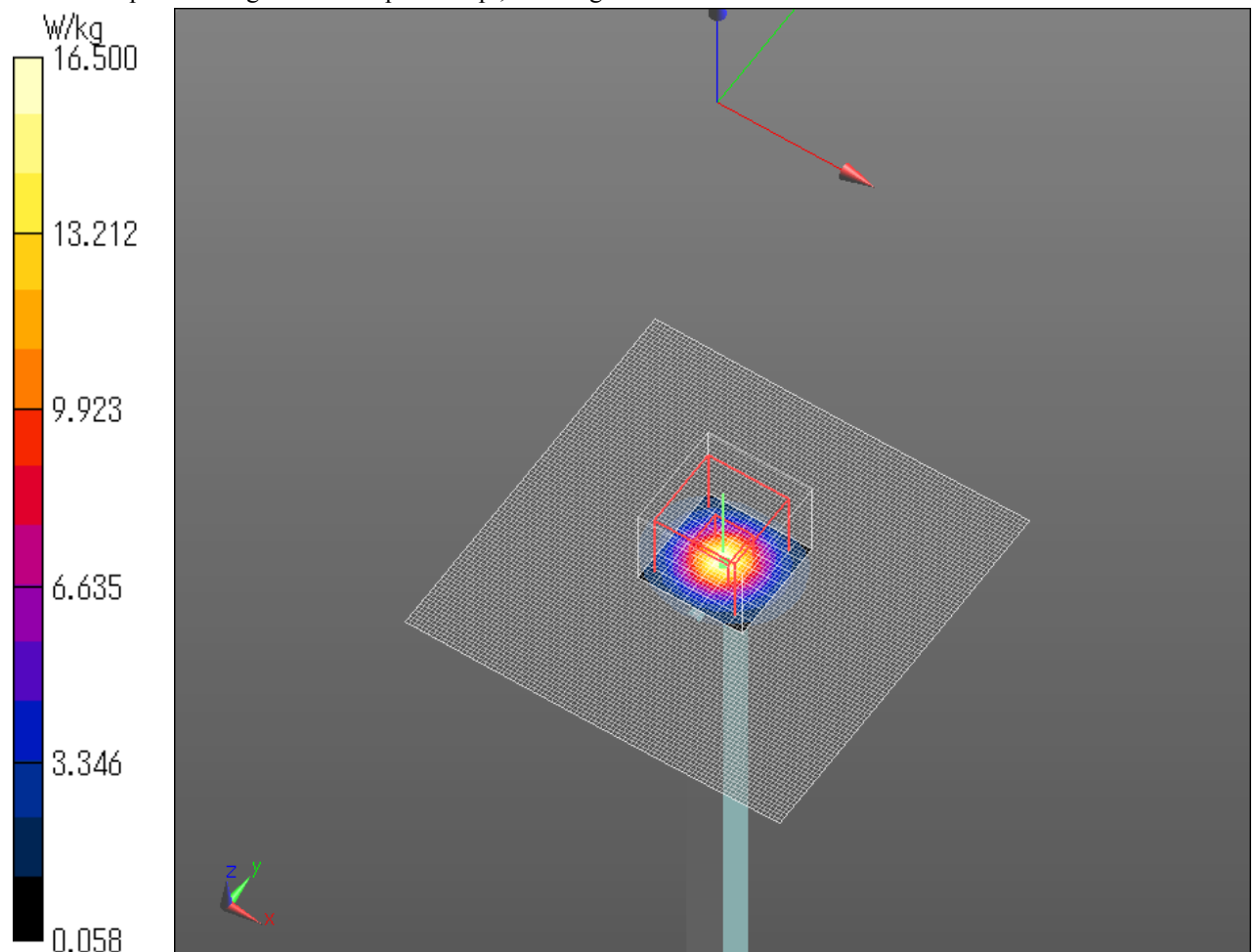
Peak SAR (extrapolated) = 34.4 W/kg

SAR(1 g) = 8.11 W/kg; SAR(10 g) = 2.33 W/kg

Maximum value of SAR (measured) = 16.5 W/kg

Date: 2013/08/26

Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



Body 5800MHz System Validation DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5800$ MHz; $\sigma = 6.181$ S/m; $\epsilon_r = 45.839$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(3.92, 3.92, 3.92); Calibrated: 2013/06/04;

Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2013/06/03

Phantom: ELI v5.0 TP1207; Type: QDOVA001BB;

Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 17.6 W/kg

Zoom Scan (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 52.649 V/m; Power Drift = 0.04 dB

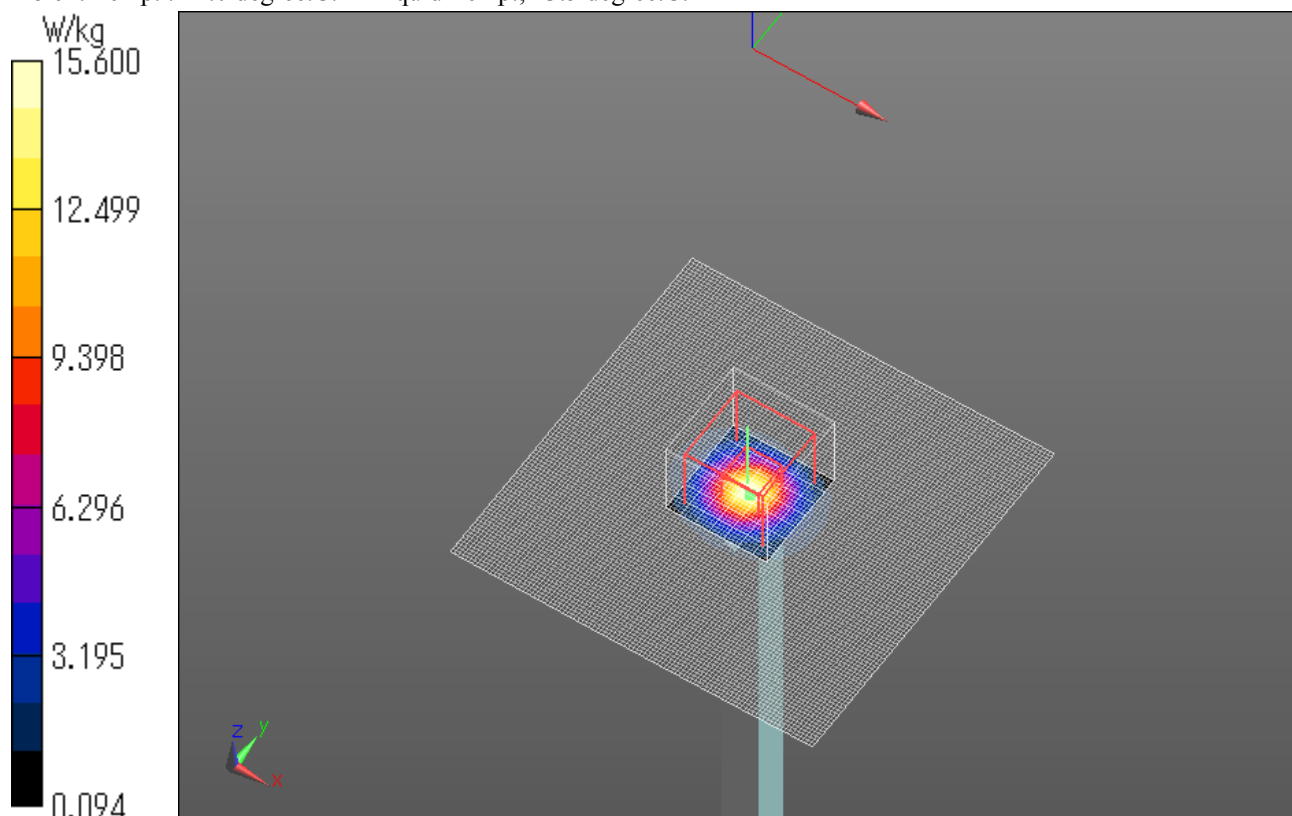
Peak SAR (extrapolated) = 33.5 W/kg

SAR(1 g) = 7.69 W/kg; SAR(10 g) = 2.2 W/kg

Maximum value of SAR (measured) = 15.6 W/kg

Date: 2013/08/26

Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



3. System Validation Dipole (D2450V2,S/N:765)

**Calibration Laboratory of
Schmid & Partner
Engineering AG**
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
S Service suisse d'étalonnage
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Accreditation No.: **SCS 108**

Client **PTT**

Certificate No: **D2450V2-765_Mar13**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 765		
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz		
Calibration date:	March 06, 2013		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13
Calibrated by:	Name Israe El-Naouq	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	
Issued: March 6, 2013			
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Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland



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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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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	V52.8.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.85 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.6 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	53.2 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.8 W/kg ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.7 ± 6 %	2.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.7 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	49.6 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.85 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	23.1 W/kg ± 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.4 Ω + 4.4 j Ω
Return Loss	- 24.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.6 Ω + 5.2 j Ω
Return Loss	- 25.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.154 ns
----------------------------------	----------

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	August 10, 2004

DASY5 Validation Report for Head TSL

Date: 06.03.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 765

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.85$ S/m; $\epsilon_r = 37.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

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

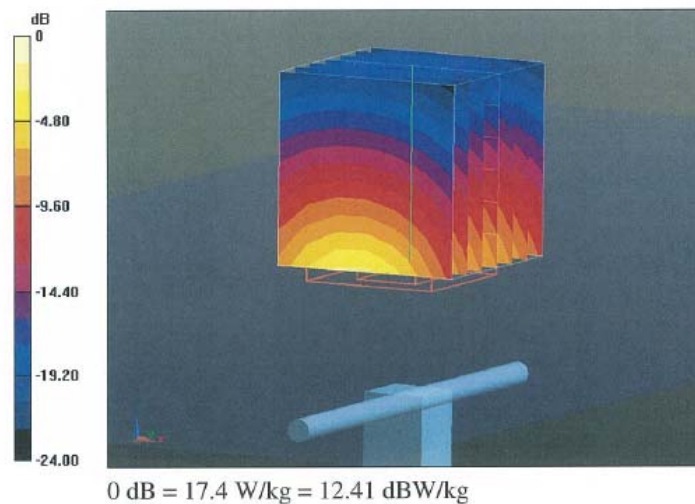
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.304 V/m; Power Drift = 0.04 dB

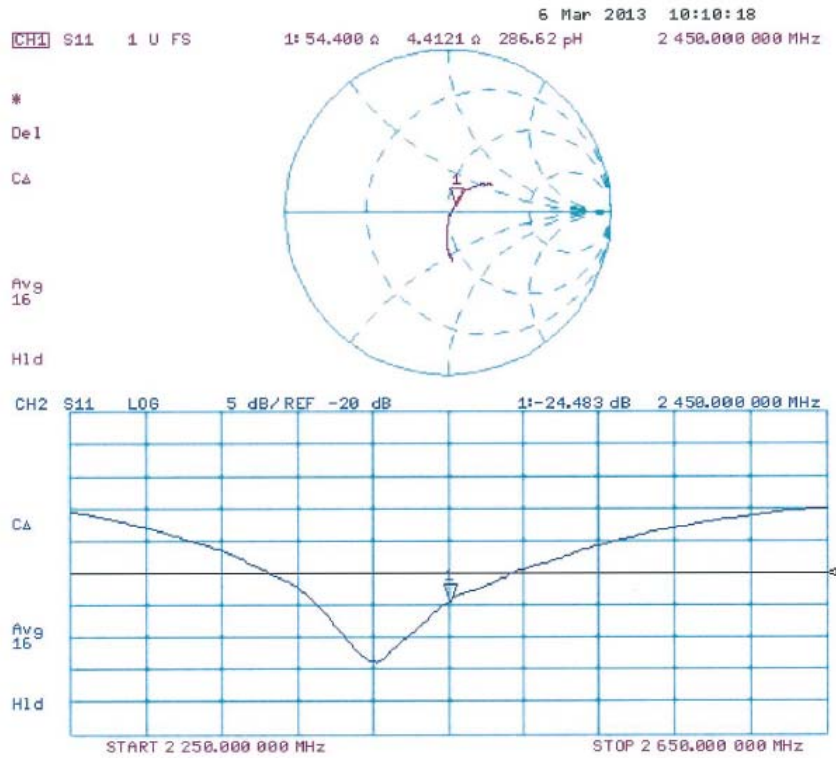
Peak SAR (extrapolated) = 28.6 W/kg

SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.29 W/kg

Maximum value of SAR (measured) = 17.4 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 06.03.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 765

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.01$ S/m; $\epsilon_r = 50.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

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

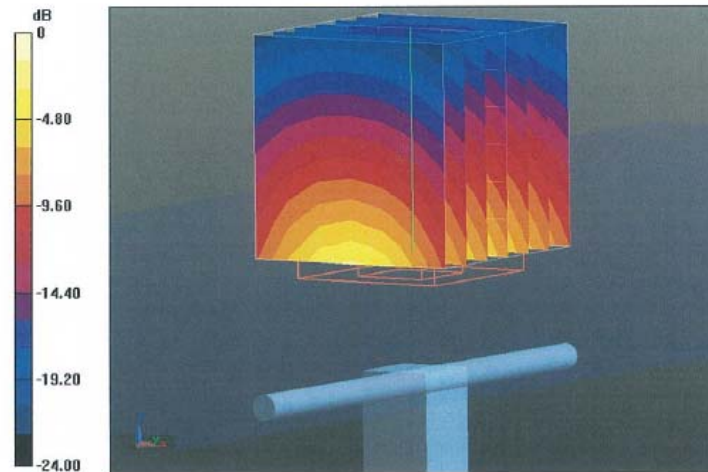
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.304 V/m; Power Drift = -0.01 dB

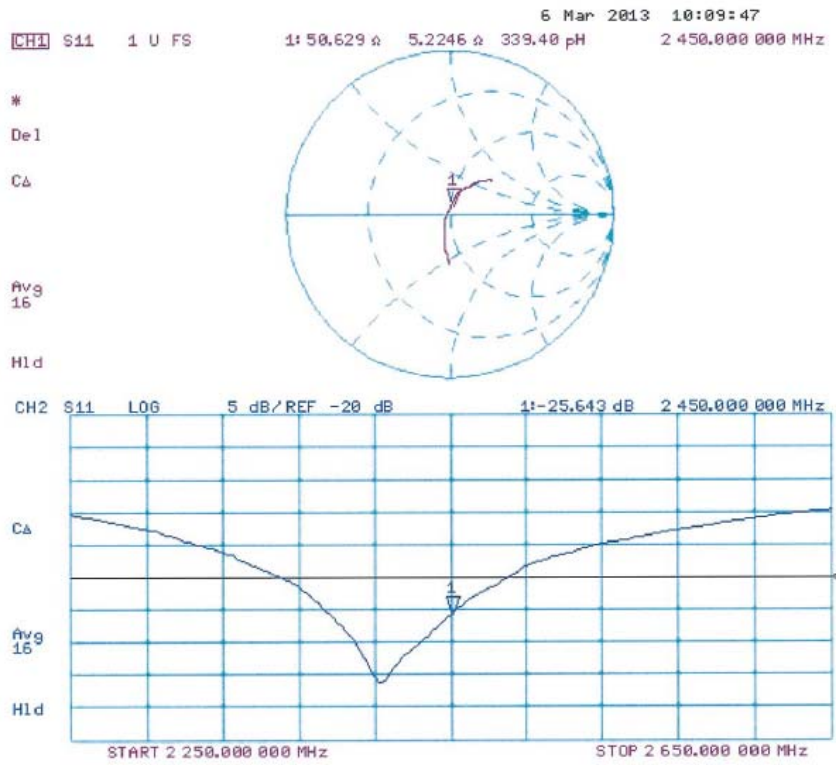
Peak SAR (extrapolated) = 26.7 W/kg

SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.85 W/kg

Maximum value of SAR (measured) = 16.7 W/kg



Impedance Measurement Plot for Body TSL



4. System Validation Dipole (D5GHzV2,S/N:1020)

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Accreditation No.: SCS 108

Client **UL Japan (PTT)**

Certificate No: **D5GHzV2-1020_Jan13**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1020**

Calibration procedure(s) **QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz**

Calibration date: **January 11, 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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe EX3DV4	SN: 3503	28-Dec-12 (No. ES3-3503_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: January 11, 2013

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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:

- IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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	V52.8.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5500 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.6 ± 6 %	4.50 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.52 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	74.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.1 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	4.79 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.0 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.6 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	33.8 ± 6 %	5.09 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.56 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	74.8 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.1 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.0 ± 6 %	5.42 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.50 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.8 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.5 ± 6 %	5.81 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	80.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.2 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.0 ± 6 %	6.21 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.55 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.7 W/kg ± 19.5 % (k=2)

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	49.6 Ω - 10.7 j Ω
Return Loss	- 19.5 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	50.2 Ω - 3.1 j Ω
Return Loss	- 30.2 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	56.8 Ω - 2.6 j Ω
Return Loss	- 23.3 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.3 Ω - 9.9 j Ω
Return Loss	- 20.0 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.5 Ω - 3.0 j Ω
Return Loss	- 30.4 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	57.4 Ω - 1.2 j Ω
Return Loss	- 23.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns
----------------------------------	----------

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	February 05, 2004

DASY5 Validation Report for Head TSL

Date: 11.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1020

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz
Medium parameters used: $f = 5200$ MHz; $\sigma = 4.5$ S/m; $\epsilon_r = 34.6$; $\rho = 1000$ kg/m³, Medium parameters used:
 $f = 5500$ MHz; $\sigma = 4.79$ S/m; $\epsilon_r = 34.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.09$
S/m; $\epsilon_r = 33.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 28.12.2012, ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.81, 4.81, 4.81); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan,

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

Reference Value = 63.407 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 28.8 W/kg

SAR(1 g) = 7.52 W/kg; SAR(10 g) = 2.14 W/kg

Maximum value of SAR (measured) = 18.0 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan,

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

Reference Value = 63.837 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 33.0 W/kg

SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.29 W/kg

Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,

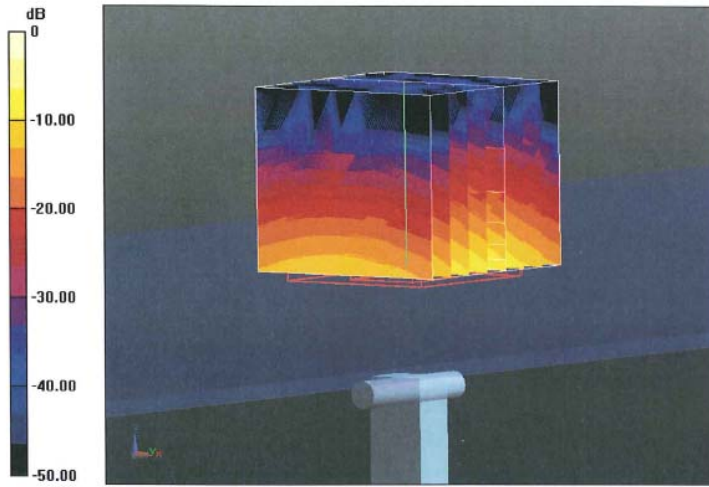
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 60.555 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 32.8 W/kg

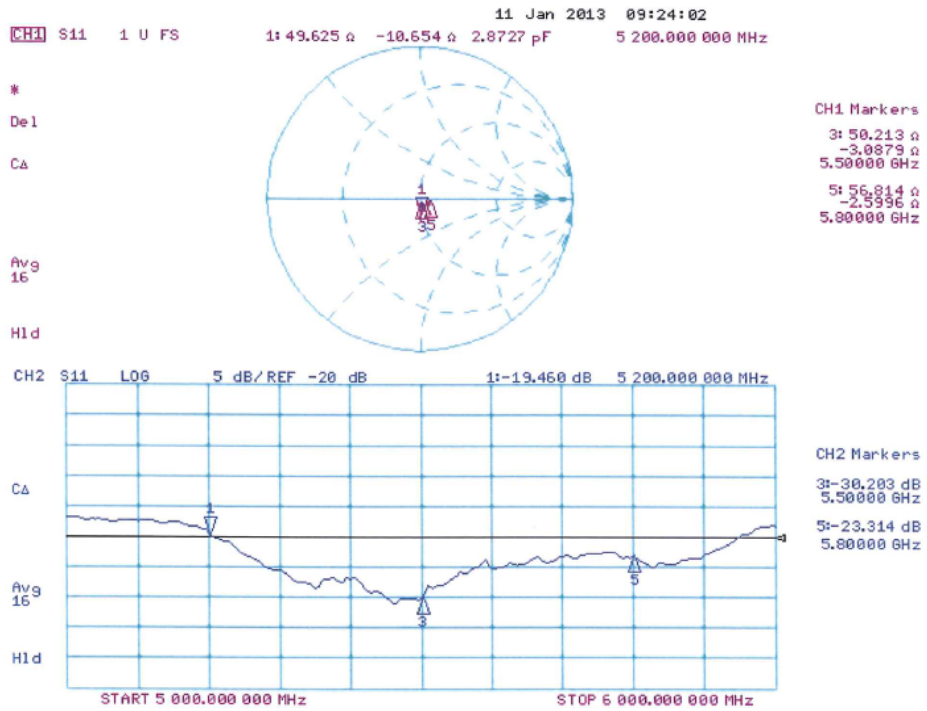
SAR(1 g) = 7.56 W/kg; SAR(10 g) = 2.14 W/kg

Maximum value of SAR (measured) = 19.1 W/kg



0 dB = 19.1 W/kg = 12.81 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1020

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz
Medium parameters used: $f = 5200$ MHz; $\sigma = 5.42$ S/m; $\epsilon_r = 47$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 5.81$ S/m; $\epsilon_r = 46.5$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 6.21$ S/m; $\epsilon_r = 46$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.43, 4.43, 4.43); Calibrated: 28.12.2012, ConvF(4.38, 4.38, 4.38); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan,

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

Reference Value = 58.674 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 30.1 W/kg

SAR(1 g) = 7.5 W/kg; SAR(10 g) = 2.1 W/kg

Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan,

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

Reference Value = 59.239 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 35.3 W/kg

SAR(1 g) = 8.07 W/kg; SAR(10 g) = 2.24 W/kg

Maximum value of SAR (measured) = 19.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,

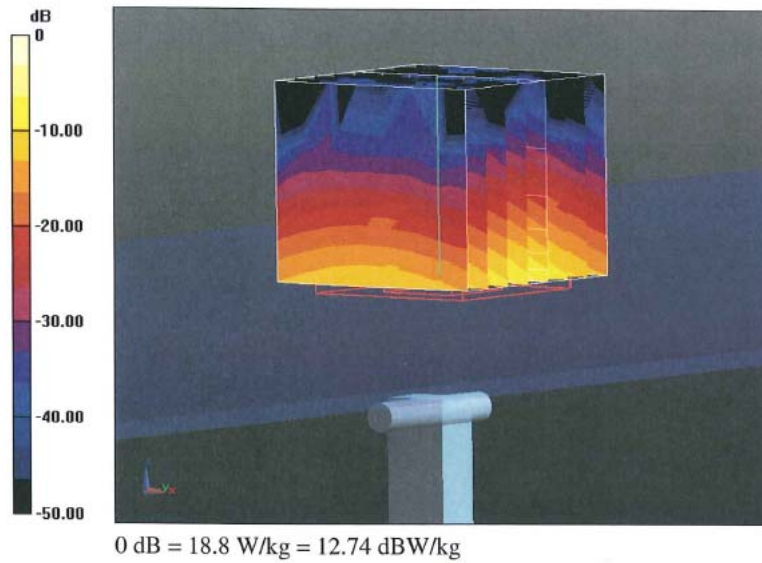
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 55.723 V/m; Power Drift = -0.04 dB

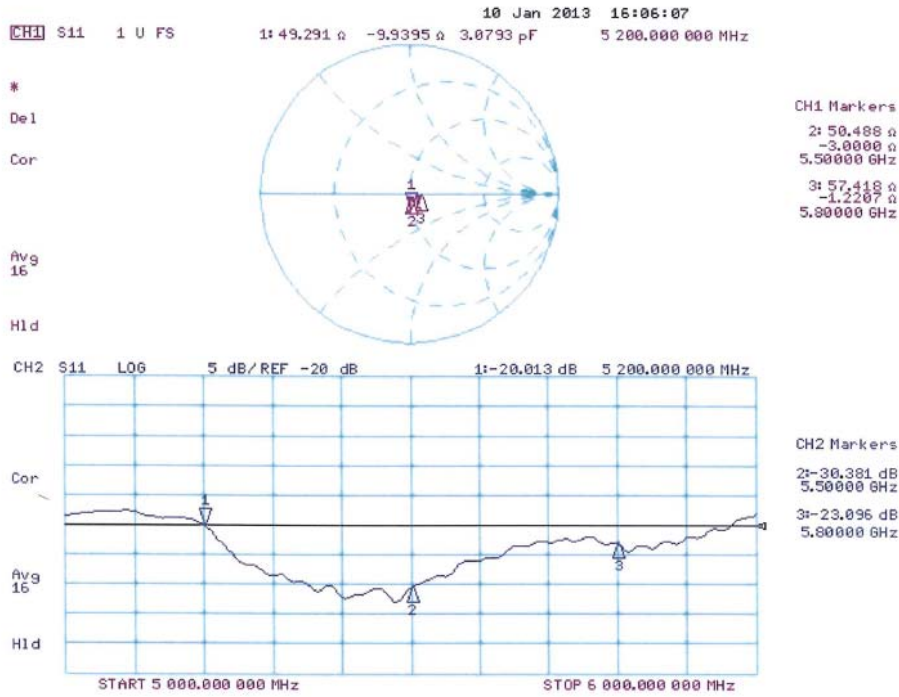
Peak SAR (extrapolated) = 35.6 W/kg

SAR(1 g) = 7.55 W/kg; SAR(10 g) = 2.09 W/kg

Maximum value of SAR (measured) = 18.8 W/kg



Impedance Measurement Plot for Body TSL



5. Validation uncertainty

The uncertainty budget has been determined for the DASYS measurement system according to the SPEAG documents[2] and is given in the following Table.

Error Description	Uncertainty value \pm	Probability distribution	divisor	(ci) lg	Standard (lg)	vi or v _{eff}
Measurement System						
Probe calibration	± 6.55	Normal	1	1	± 6.55	∞
Axial isotropy of the probe	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Spherical isotropy of the probe	± 9.6	Rectangular	$\sqrt{3}$	0	± 0.0	∞
Boundary effects	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Probe linearity	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Modulation response	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Readout electronics	± 0.3	Normal	1	1	± 0.3	∞
Response time	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Integration time	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
RF ambient Noise	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
RF ambient Reflections	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Probe Positioner	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Probe positioning	± 6.7	Rectangular	$\sqrt{3}$	1	± 3.9	∞
Max.SAR Eval.	± 2.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Dipole Related						
Deviation of exp.dipole	± 5.5	Rectangular	$\sqrt{3}$	1	± 3.2	∞
Dipole Axis to Liquid Distance	± 2.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Input power and SAR drift meas.	± 3.4	Rectangular	$\sqrt{3}$	1	± 2.0	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.78	± 2.3	∞
Liquid conductivity (meas.)	+ 3.2	Normal	1	0.26	+ 0.8	∞
Liquid permittivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.78	± 2.3	∞
Liquid permittivity (meas.)	- 4.9	Normal	1	0.23	- 1.1	∞
Liquid conductivity - temp.unc (below 2deg.C.)	± 1.7	Rectangular	$\sqrt{3}$	0.78	± 0.8	∞
Liquid permittivity - temp.unc (below 2deg.C.)	± 0.3	Rectangular	$\sqrt{3}$	0.23	± 0.0	∞
Combined Standard Uncertainty					± 10.441	
Expanded Uncertainty (k=2)					± 20.9	

Note: This uncertainty budget for validation is worst-case.