

Body 2450MHz System Check DATA / Dipole2450MHz / 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; $\sigma = 2.023$ S/m; $\epsilon_r = 50.164$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(7.36, 7.36, 7.36); Calibrated: 2014/06/13;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: ELI v5.0 TP1207 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:1207

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Maximum value of SAR (interpolated) = 19.6 W/kg

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

Reference Value = 96.97 V/m; Power Drift = 0.04 dB

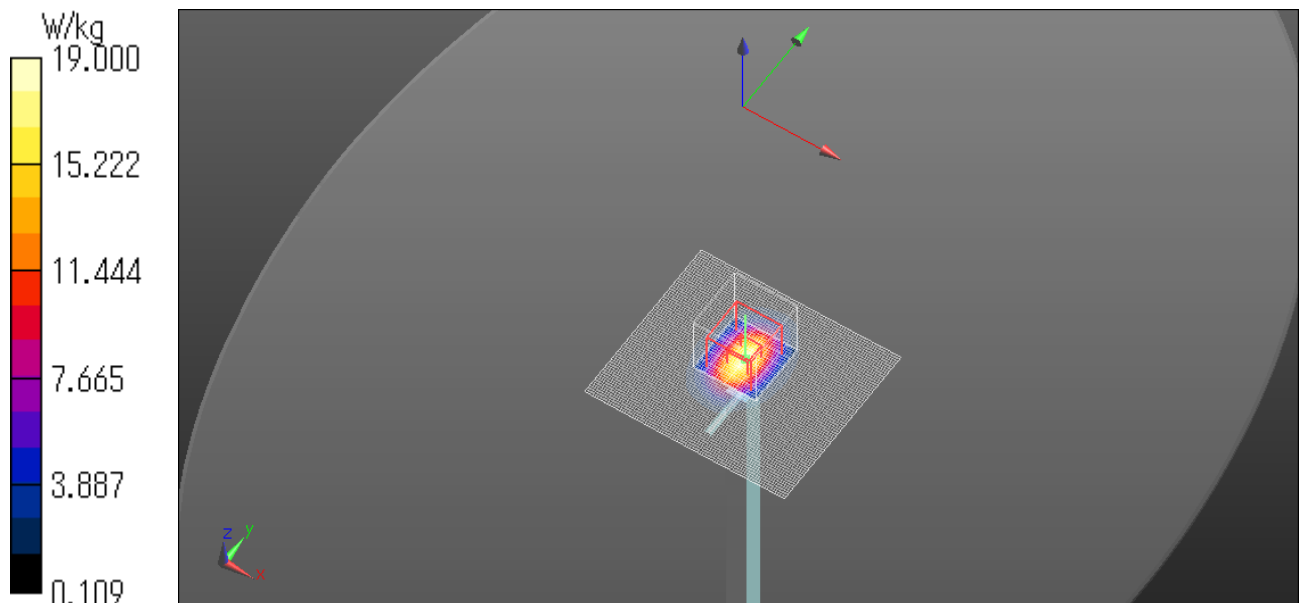
Peak SAR (extrapolated) = 25.8 W/kg

SAR(1 g) = 12.4 W/kg; SAR(10 g) = 5.68 W/kg

Maximum value of SAR (measured) = 19.0 W/kg

Date: 2015/01/20

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



Body 2450MHz System Check DATA / Dipole2450MHz / 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; $\sigma = 2.023$ S/m; $\epsilon_r = 50.164$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(7.36, 7.36, 7.36); Calibrated: 2014/06/13;

Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: ELI v5.0 TP1207 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:1207

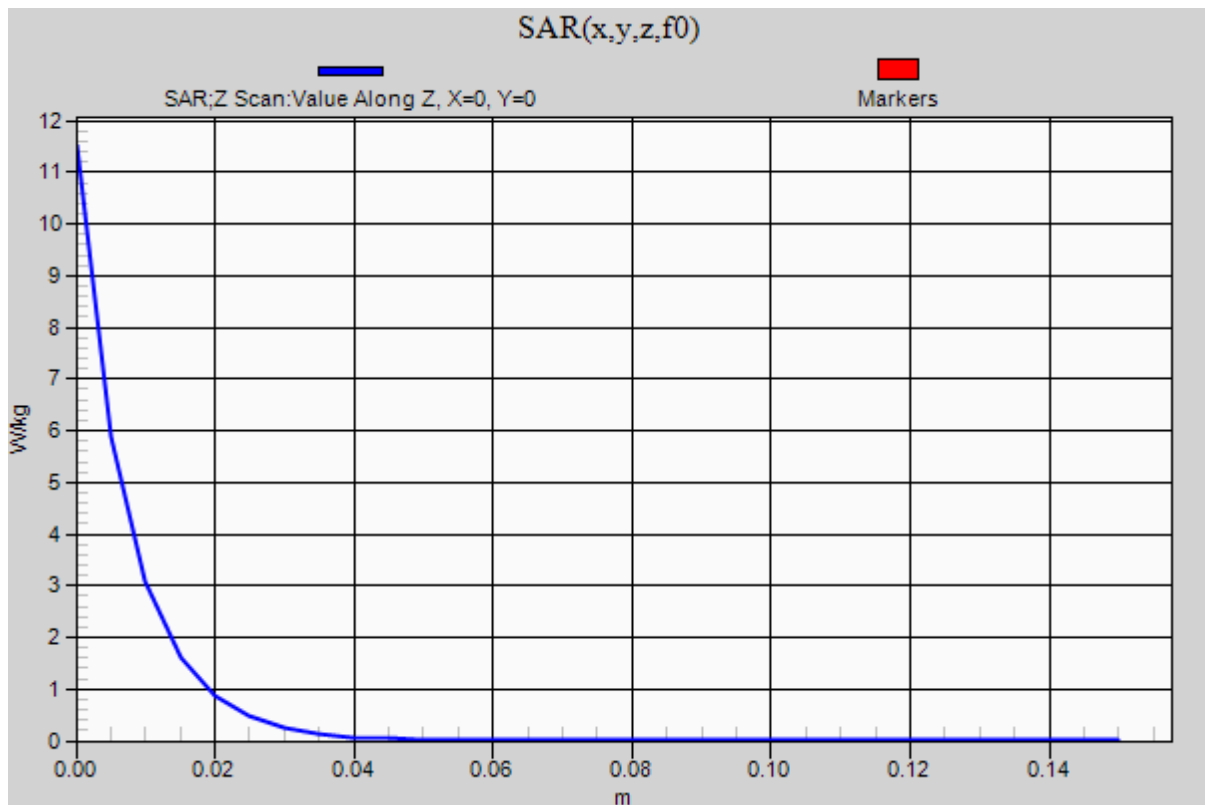
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 11.5 W/kg

Date: 2015/01/20

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



3. System Check Dipole (D2450V2,S/N:713)

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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 **UL Japan (PTT)**

Certificate No: D2450V2-713_Sep13

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 713**

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

Calibration date: **September 10, 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)	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
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 Israa El-Naouq	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 10, 2013

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

Certificate No: D2450V2-713_Sep13

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Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
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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
- 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	2450 MHz $\pm$ 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 $\pm$ 0.2) °C	39.4 $\pm$ 6 %	1.83 mho/m $\pm$ 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	13.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.6 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.1 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	52.2 $\pm$ 6 %	2.00 mho/m $\pm$ 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	12.6 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	49.7 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.89 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	23.4 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$51.8 \Omega + 0.7 j\Omega$
Return Loss	- 34.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.7 \Omega + 2.8 j\Omega$
Return Loss	- 30.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.162 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	July 05, 2002

DASY5 Validation Report for Head TSL

Date: 10.09.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 713

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.83$ S/m; $\epsilon_r = 39.4$; $\rho = 1000$ 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: 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:

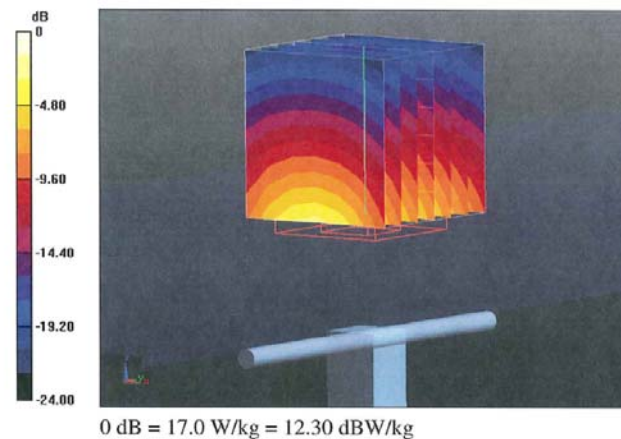
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.095 V/m; Power Drift = 0.04 dB

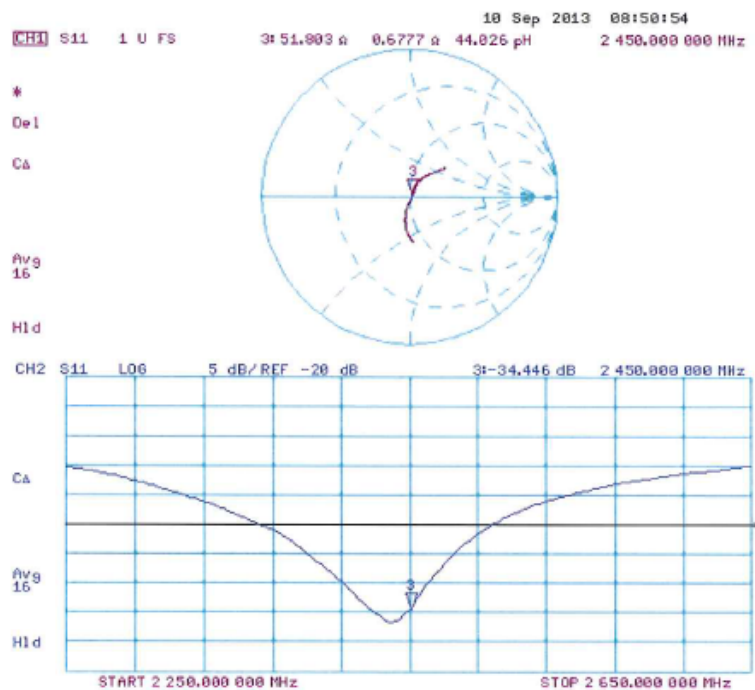
Peak SAR (extrapolated) = 26.7 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.05 W/kg

Maximum value of SAR (measured) = 17.0 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.09.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 713

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2$ S/m; $\epsilon_r = 52.2$; $\rho = 1000$ 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: 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:

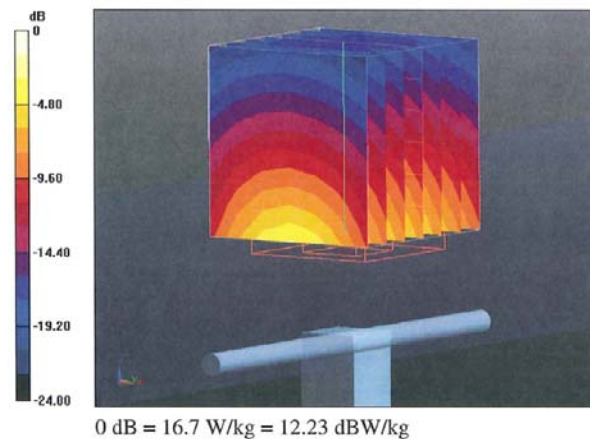
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.095 V/m; Power Drift = 0.03 dB

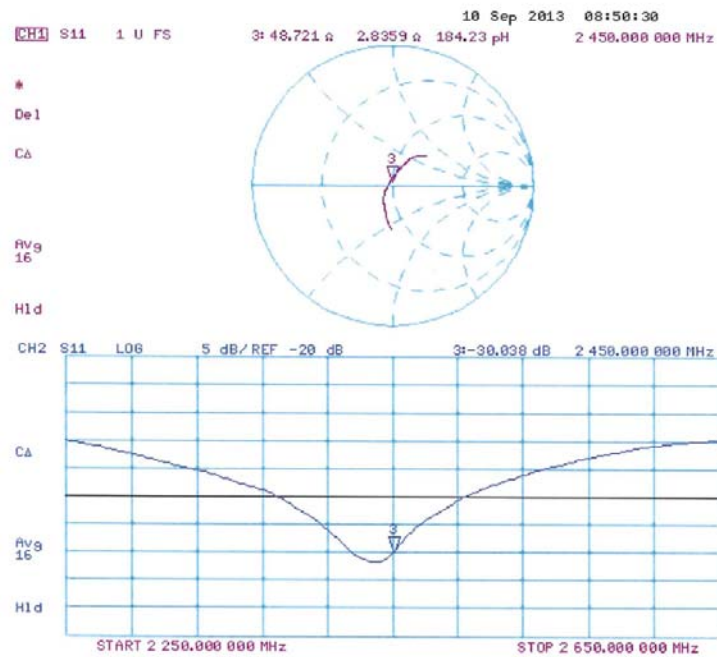
Peak SAR (extrapolated) = 26.1 W/kg

SAR(1 g) = 12.6 W/kg; SAR(10 g) = 5.89 W/kg

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



Impedance Measurement Plot for Body TSL



D2450V2 Calibration for Impedance and Return-loss

1. Test environment

Date	September 18, 2014		
Ambient Temperature	24.0 deg.C	Relative humidity	50%RH

2. Equipment used

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MNA-01	Network Analyzer	Agilent/HP	E8358A	US41080381	SAR	2014/08/21 * 12
MNCK-01	Type N Calibration Kit	Agilent	85032F	MY41495257	SAR	2014/08/18 * 12
EST-46	3.5mm ECONOMY CALIBRATION KIT	Agilent	85052D	MY43252869	SAR	2014/08/15 * 12
MPSAM-03	SAM Phantom	Schmid&Partner Engineering AG	QD000P40CD	1764	SAR	2014/06/03 * 12
MPF-03	2mmOval Flat Phantom ERI 5.0	Schmid&Partner Engineering AG	QDOVA001BB	1203	SAR	2014/06/03 * 12
MOS-30	Thermo-Hygrometer	Custom	CTH-201	3001	SAR	2014/07/06 * 12
MOS-35	Digital thermometer	HANNA	Checktemp 4	-	SAR	2014/07/06 * 12
HSL2450						Daily check
MSL2450						Daily check
SAR room1						Daily check

3. Test Result

Impedance,Transformed to feed point	Head	Deviation	Tolerance	Result
Calibration (SPEAG) 2013/09/10	51.8 Ω +0.7j Ω	-	-	-
Calibration(ULJ)2014/9/18	51.5 Ω +0.9j Ω	-0.3 Ω +0.2j Ω	+/-5 Ω +/-5j Ω	Complied

Return loss	Head	Deviation	Tolerance	Result
Calibration (SPEAG) 2013/09/10	-34.4dB	-	-	-
Calibration(ULJ)2014/9/18	-35.3dB	-0.9dB	-34.4 *+/-20%	Complied

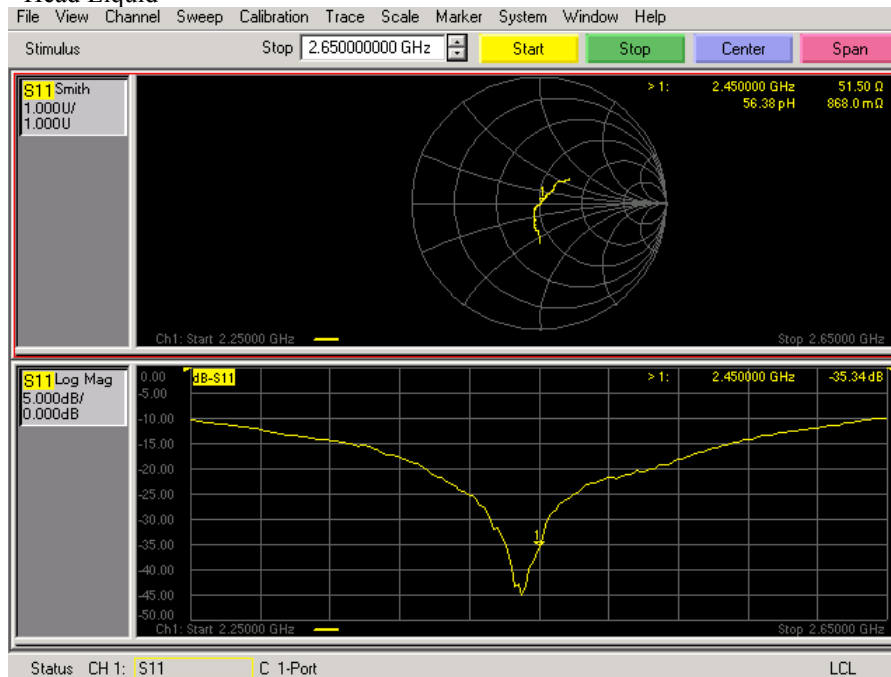
Impedance,Transformed to feed point	Body	Deviation	Tolerance	Result
Calibration (SPEAG) 2013/09/10	48.7 Ω +2.8j Ω	-	-	-
Calibration(ULJ)2014/9/18	49.6 Ω +2.8j Ω	+0.9 Ω +/-0j Ω	+/-5 Ω +/-5j Ω	Complied

Return loss	Body	Deviation	Tolerance	Result
Calibration (SPEAG) 2013/09/10	-30.0dB	-	-	-
Calibration(ULJ)2014/9/18	-31.0dB	-1.0dB	-30.0 *+/-20%	Complied

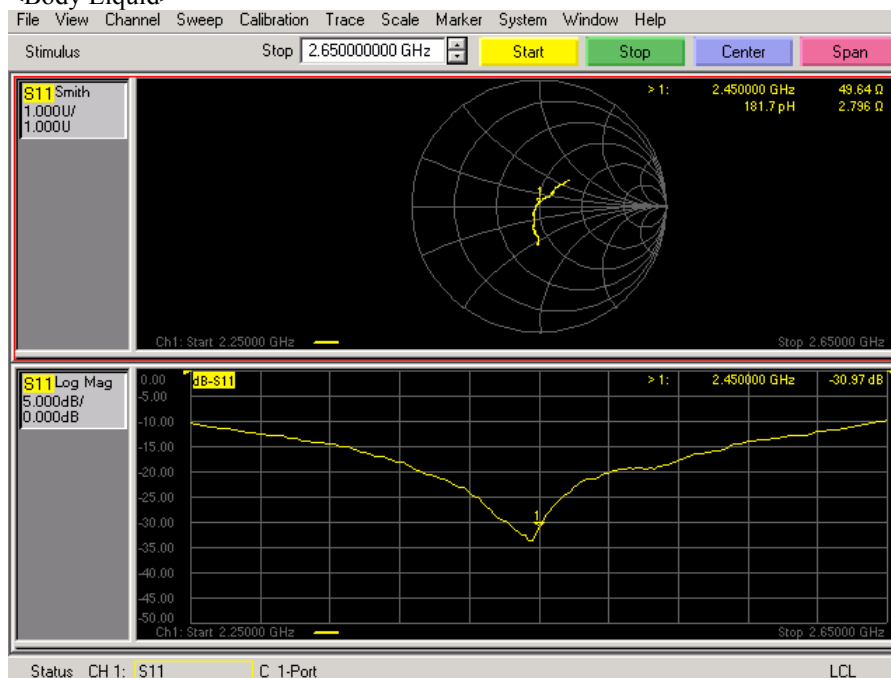
*Tolerance : According to the KDB450824D02

Measurement Plots

<Head Liquid>



<Body Liquid>



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4. System check result Head 5200MHz

(1) 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	Measured	Deviation [%]	Limit [%]	Remark
-	-	-	-	-	3000	ϵ_r	38.5	-	-	-	*1
						σ [mho/m]	2.40	-	-	-	
27-Jan	24	36	HBBL 3.5-5.8	23.5	5200	ϵ_r	36.0	35.5	-1.4	+/-5	*2
						σ [mho/m]	4.66	4.50	-3.4	+/-5	
-	-	-	-	-	5800	ϵ_r	35.3	-	-	-	*1
						σ [mho/m]	5.27	-	-	-	

ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in KDB 865664D01.

*2 The dielectric parameters should be linearly interpolated between the closest pair of target frequencies to determine the applicable dielectric parameters corresponding to the device test frequency.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
27-Jan	24	36	HBBL 3.5-5.8	23.5	5200	ϵ_r	35.5	35.5	0.0	+/-6	*3*4
						σ [mho/m]	4.55	4.50	-1.0	+/-6	

ϵ_r : Relative Permittivity / σ : Conductivity

*3 The target value is the calibrated dipole Body TSL parameters. (D5GHzV2 SN:1039, Measured Body TSL parameters)

*4 The limit is for deviation provided by manufacture.

(2) System check result (for calibration by manufacture)

SYSTEM CHECK							
Date	Frequency [MHz]	SAR 1g [W/kg]					
		Forward Power	Conversion 1W	Target Value(1W)	Deviation [%]	Limit [%]	Remark
		Measured	Calculation				
27-Jan	5200.00	8.28	82.80	80.80	2.5	+/-10	*5

*5 The target value is the parameter defined in SAR for nominal Body TSL parameters in manufacturer calibrated dipole (D5GHzV2 SN:1039) Please refer to " SAR result with Body TSL of Appendix 2 12. System Check Dipole (D5GHzV2,S/N: 1039)".

Head 5200MHz System Check 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; $\sigma = 4.503$ S/m; $\epsilon_r = 35.494$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(5.35, 5.35, 5.35); Calibrated: 2014/06/13;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: SAM Twin TP1762 (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1762

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Area Scan (101x91x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 17.8 W/kg

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

Reference Value = 65.15 V/m; Power Drift = -0.01 dB

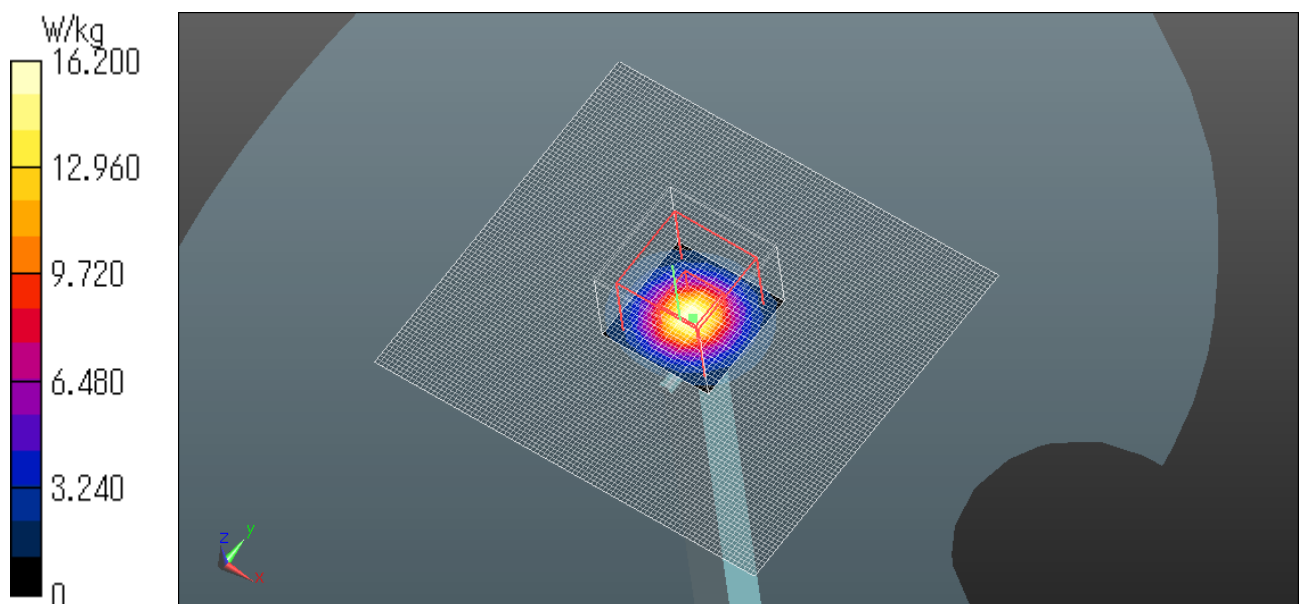
Peak SAR (extrapolated) = 34.7 W/kg

SAR(1 g) = 8.28 W/kg; SAR(10 g) = 2.34 W/kg

Maximum value of SAR (measured) = 16.2 W/kg

Date: 2015/01/27

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



Head 5200MHz System Check 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; $\sigma = 4.503$ S/m; $\epsilon_r = 35.494$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(5.35, 5.35, 5.35); Calibrated: 2014/06/13;

Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: SAM Twin TP1762 (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1762

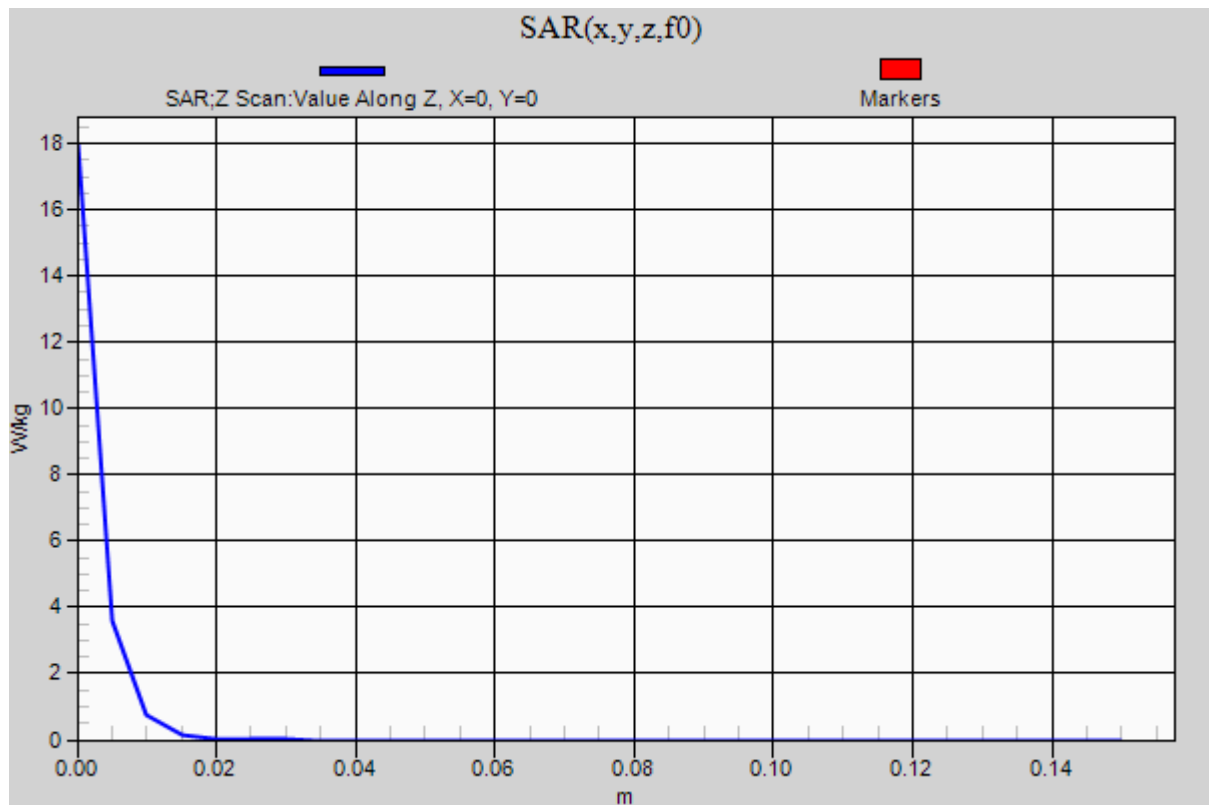
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 17.9 W/kg

Date: 2015/01/27

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



5. System check result Body 5200MHz

(1) 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	Measured	Deviation [%]	Limit [%]	Remark
-	-	-	-	-	3000	ϵ_r	52.0	-	-	-	*1
						σ [mho/m]	2.73	-	-	-	
21-Jan	24	40	MBBL 3.5-5.8	23.5	5200	ϵ_r	49.0	46.9	-4.2	+/-5	*2
						σ [mho/m]	5.30	5.43	2.5	+/-5	
-	-	-	-	-	5800	ϵ_r	48.2	-	-	-	*1
						σ [mho/m]	6.00	-	-	-	

ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in KDB 865664D01.

*2 The dielectric parameters should be linearly interpolated between the closest pair of target frequencies to determine the applicable dielectric parameters corresponding to the device test frequency.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
21-Jan	24	40	MBBL 3.5-5.8	23.5	5200	ϵ_r	47.0	46.9	-0.2	+/-6	*3*4
						σ [mho/m]	5.44	5.43	-0.1	+/-6	

ϵ_r : Relative Permittivity / σ : Conductivity

*3 The target value is the calibrated dipole Body TSL parameters. (D5GHzV2 SN:1039, Measured Body TSL parameters)

*4 The limit is for deviation provided by manufacture.

(2) System check result (for calibration by manufacture)

SYSTEM CHECK							
Date	Frequency [MHz]	SAR 1g [W/kg]			Deviation [%]	Limit [%]	Remark
		Forward Power	Conversion 1W	Target Value(1W)			
		Measured	Calculation				
21-Jan	5200.00	8.16	81.60	76.40	6.8	+/-10	*5

*5 The target value is the parameter defined in SAR for nominal Body TSL parameters in manufacturer calibrated dipole (D5GHzV2 SN:1039) Please refer to " SAR result with Body TSL of Appendix 2 12. System Check Dipole (D5GHzV2,S/N: 1039)".

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

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

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.433$ S/m; $\epsilon_r = 46.921$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.42, 4.42, 4.42); Calibrated: 2014/06/13;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: ELI v5.0 TP1207 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:1207

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Area Scan (91x91x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

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

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

Reference Value = 60.46 V/m; Power Drift = 0.06 dB

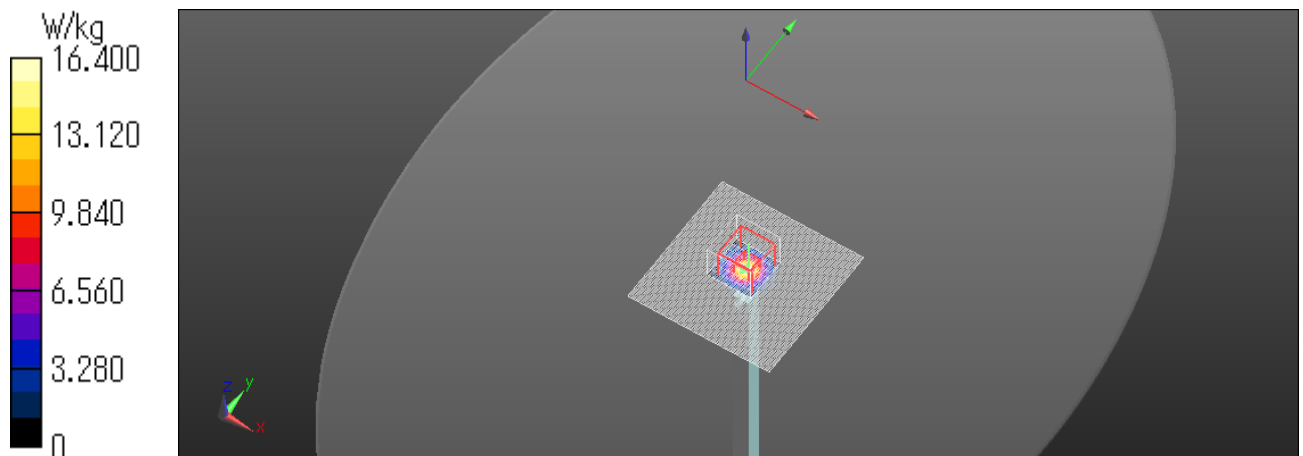
Peak SAR (extrapolated) = 32.9 W/kg

SAR(1 g) = 8.16 W/kg; SAR(10 g) = 2.3 W/kg

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

Date: 2015/01/21

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



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

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

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.433$ S/m; $\epsilon_r = 46.921$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASYS Configuration

Probe: EX3DV4 - SN3922; ConvF(4.42, 4.42, 4.42); Calibrated: 2014/06/13;

Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: ELI v5.0 TP1207 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:1207

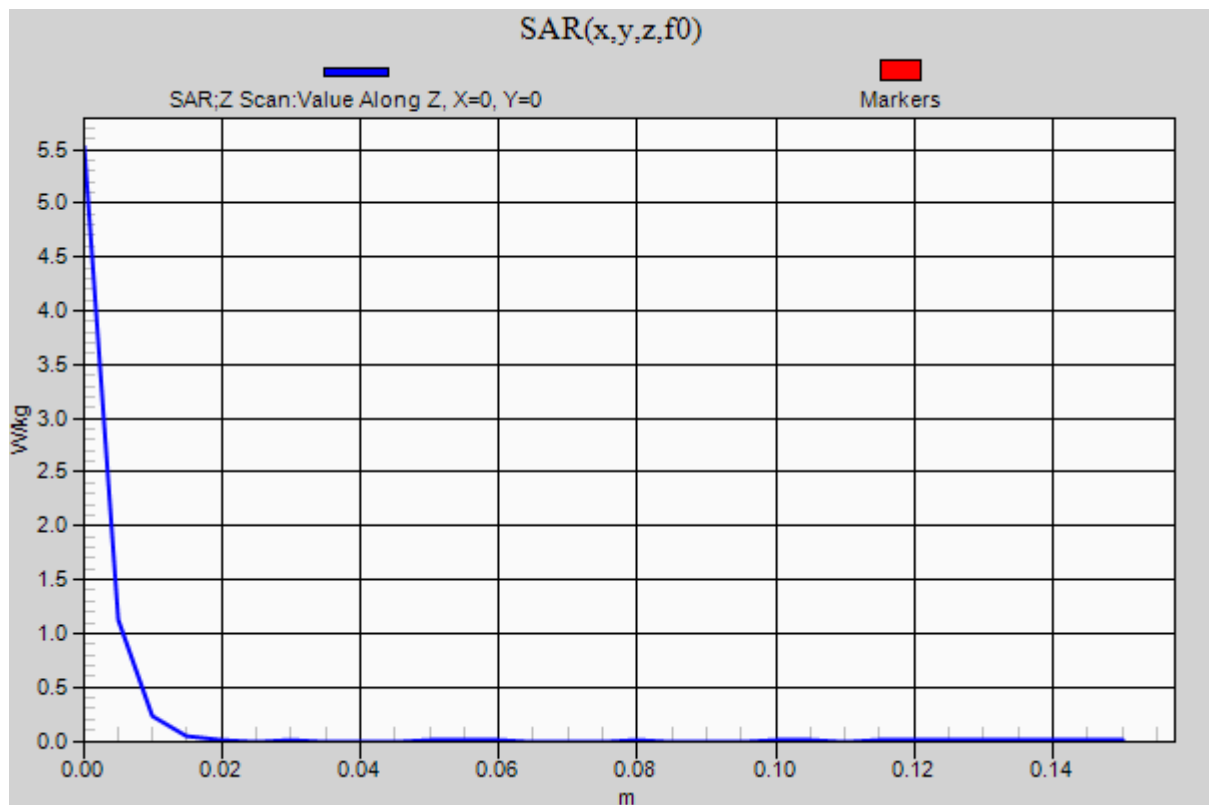
Measurement SW: DASYS2, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 5.52 W/kg

Date: 2015/01/21

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



6. System check result Head 5300MHz**(1) 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	Measured	Deviation [%]	Limit [%]	Remark
-	-	-	-	-	3000	ϵ_r	38.5	-	-	-	*1
						σ [mho/m]	2.40	-	-	-	
27-Jan	24	36	HBBL 3.5-5.8	23.5	5300	ϵ_r	35.9	35.2	-1.9	+/-5	*2
						σ [mho/m]	4.76	4.91	3.1	+/-5	
-	-	-	-	-	5800	ϵ_r	35.3	-	-	-	*1
						σ [mho/m]	5.27	-	-	-	

 ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in KDB 865664D01.

*2 The dielectric parameters should be linearly interpolated between the closest pair of target frequencies to determine the applicable dielectric parameters corresponding to the device test frequency.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
27-Jan	24	36	HBBL 3.5-5.8	23.5	5300	ϵ_r	35.4	35.2	-0.5	+/-6	*3*4
						σ [mho/m]	4.66	4.91	5.3	+/-6	

 ϵ_r : Relative Permittivity / σ : Conductivity

*3 The target value is the calibrated dipole Body TSL parameters. (D5GHzV2 SN:1039, Measured Body TSL parameters)

*4 The limit is for deviation provided by manufacture.

(2) System check result (for calibration by manufacture)

SYSTEM CHECK							
Date	Frequency [MHz]	SAR 1g [W/kg]			Deviation [%]	Limit [%]	Remark
		Forward Power	Conversion 1W	Target Value(1W)			
		Measured	Calculation				
27-Jan	5300.00	9.12	91.20	85.00	7.3	+/-10	*5

*5 The taget value is the parameter defined in SAR for nominal Body TSL parameters in manufacturer calibrated dipole (D5GHzV2 SN:1039) Please refer to " SAR result with Body TSL of Appendix 2 12. System Check Dipole (D5GHzV2,S/N: 1039)".

Head 5300MHz System Check DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5300 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5300$ MHz; $\sigma = 4.906$ S/m; $\epsilon_r = 35.231$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.94, 4.94, 4.94); Calibrated: 2014/06/13;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: SAM Twin TP1762 (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1762

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Area Scan (101x91x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 19.6 W/kg

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

Reference Value = 64.64 V/m; Power Drift = -0.06 dB

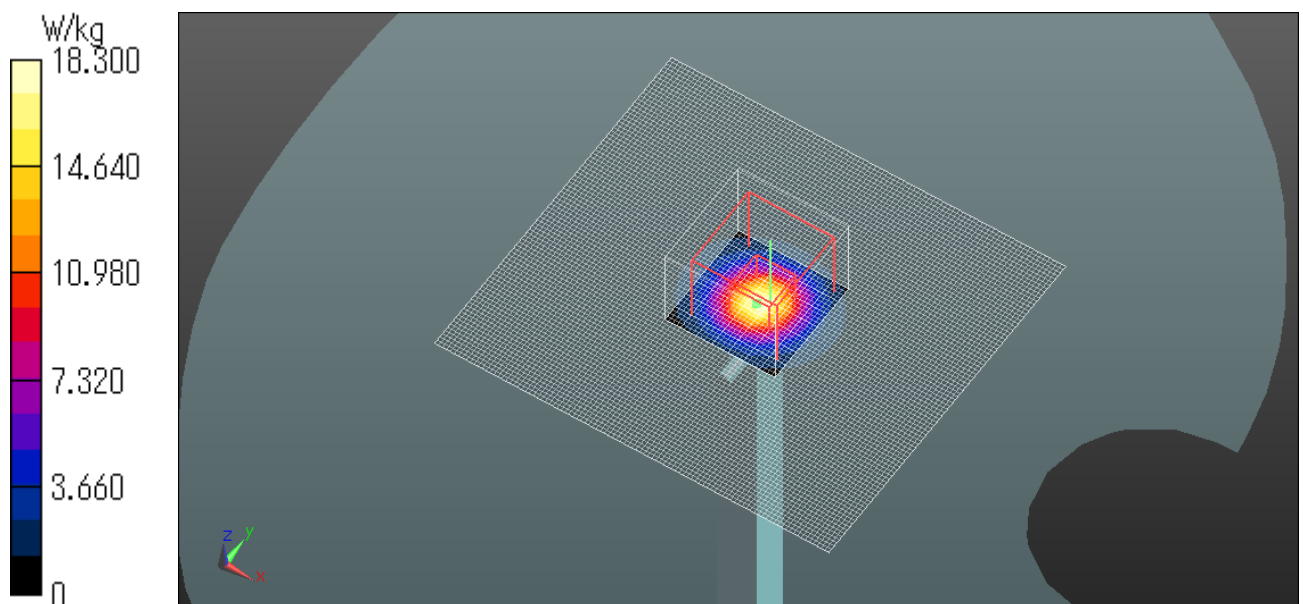
Peak SAR (extrapolated) = 37.5 W/kg

SAR(1 g) = 9.12 W/kg; SAR(10 g) = 2.57 W/kg

Maximum value of SAR (measured) = 18.3 W/kg

Date: 2015/01/27

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



Head 5300MHz System Check DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5300 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5300$ MHz; $\sigma = 4.906$ S/m; $\epsilon_r = 35.231$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.94, 4.94, 4.94); Calibrated: 2014/06/13;

Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: SAM Twin TP1762 (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1762

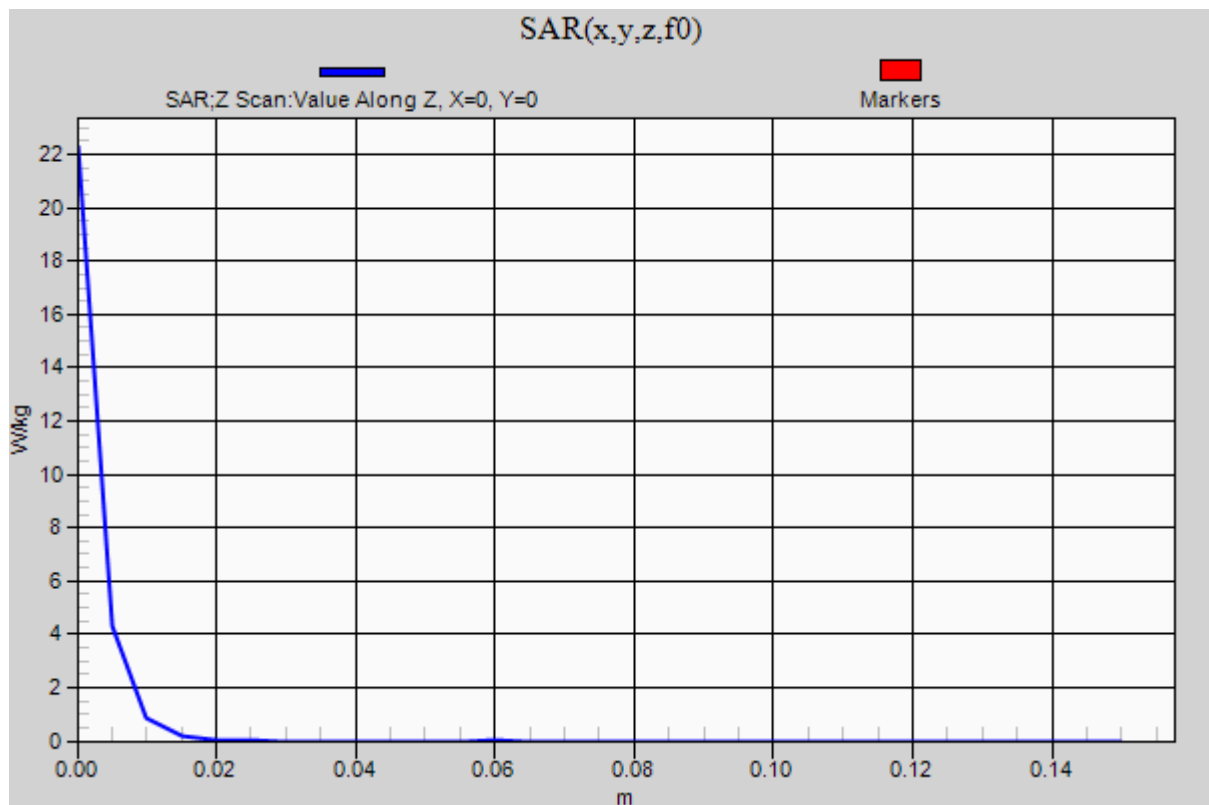
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 22.3 W/kg

Date: 2015/01/27

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



7. System check result Body 5300MHz

(1) 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	Measured	Deviation [%]	Limit [%]	Remark
-	-	-	-	-	3000	ϵ_r	52.0	-	-	-	*1
						σ [mho/m]	2.73	-	-	-	
22-Jan	24	42	MBBL 3.5-5.8	23.5	5300	ϵ_r	48.9	47.4	-3.1	+/-5	*2
						σ [mho/m]	5.42	5.65	4.2	+/-5	
-	-	-	-	-	5800	ϵ_r	48.2	-	-	-	*1
						σ [mho/m]	6.00	-	-	-	

ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in KDB 865664D01.

*2 The dielectric parameters should be linearly interpolated between the closest pair of target frequencies to determine the applicable dielectric parameters corresponding to the device test frequency.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
22-Jan	24	42	MBBL 3.5-5.8	23.5	5300	ϵ_r	46.8	47.4	1.3	+/-6	*3*4
						σ [mho/m]	5.59	5.65	1.0	+/-6	

ϵ_r : Relative Permittivity / σ : Conductivity

*3 The target value is the calibrated dipole Body TSL parameters. (D5GHzV2 SN:1039, Measured Body TSL parameters)

*4 The limit is for deviation provided by manufacture.

(2) System check result (for calibration by manufacture)

SYSTEM CHECK							
Date	Frequency [MHz]	SAR 1g [W/kg]		Target Value(1W)	Deviation [%]	Limit [%]	Remark
		Forward Power	Conversion 1W				
		Measured	Calculation				
22-Jan	5300.00	8.30	83.00	78.40	5.9	+/-10	*5

*5 The target value is the parameter defined in SAR for nominal Body TSL parameters in manufacturer calibrated dipole (D5GHzV2,S/N: 1039) Please refer to " SAR result with Body TSL of Appendix 2 12. System Check Dipole (D5GHzV2,S/N: 1039)".

Body 5300MHz System Check DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5300 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5300$ MHz; $\sigma = 5.647$ S/m; $\epsilon_r = 47.403$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.15, 4.15, 4.15); Calibrated: 2014/06/13;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: ELI v5.0 TP1207 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:1207

Measurement SW: DASYS2, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 16.3 W/kg

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

Reference Value = 62.89 V/m; Power Drift = 0.02 dB

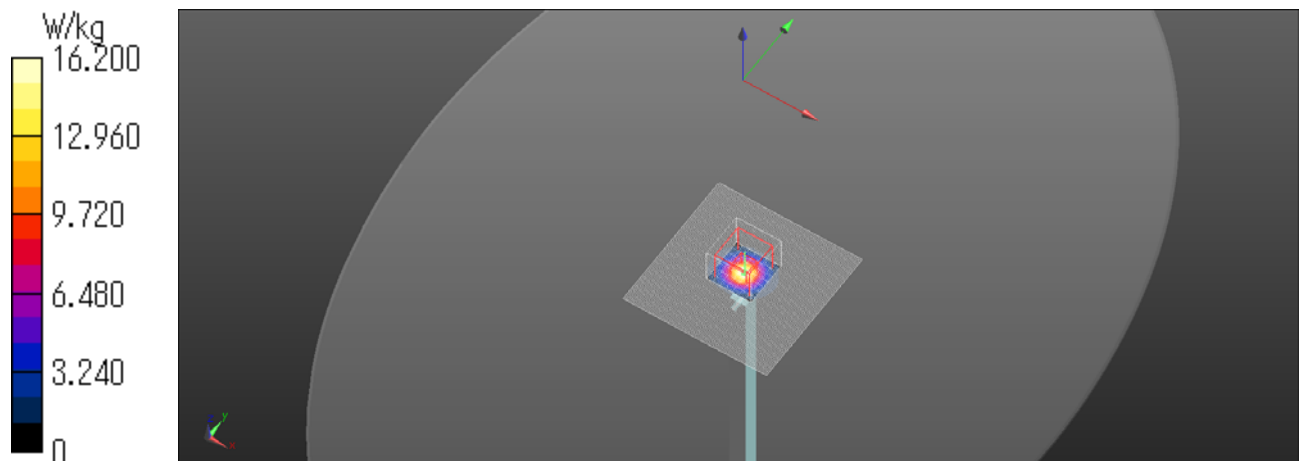
Peak SAR (extrapolated) = 33.3 W/kg

SAR(1 g) = 8.3 W/kg; SAR(10 g) = 2.33 W/kg

Maximum value of SAR (measured) = 16.2 W/kg

Date: 2015/01/22

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



Body 5300MHz System Check DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5300 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5300$ MHz; $\sigma = 5.647$ S/m; $\epsilon_r = 47.403$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.15, 4.15, 4.15); Calibrated: 2014/06/13;

Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: ELI v5.0 TP1207 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:1207

Measurement SW: DASYS2, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Area Scan (91x91x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

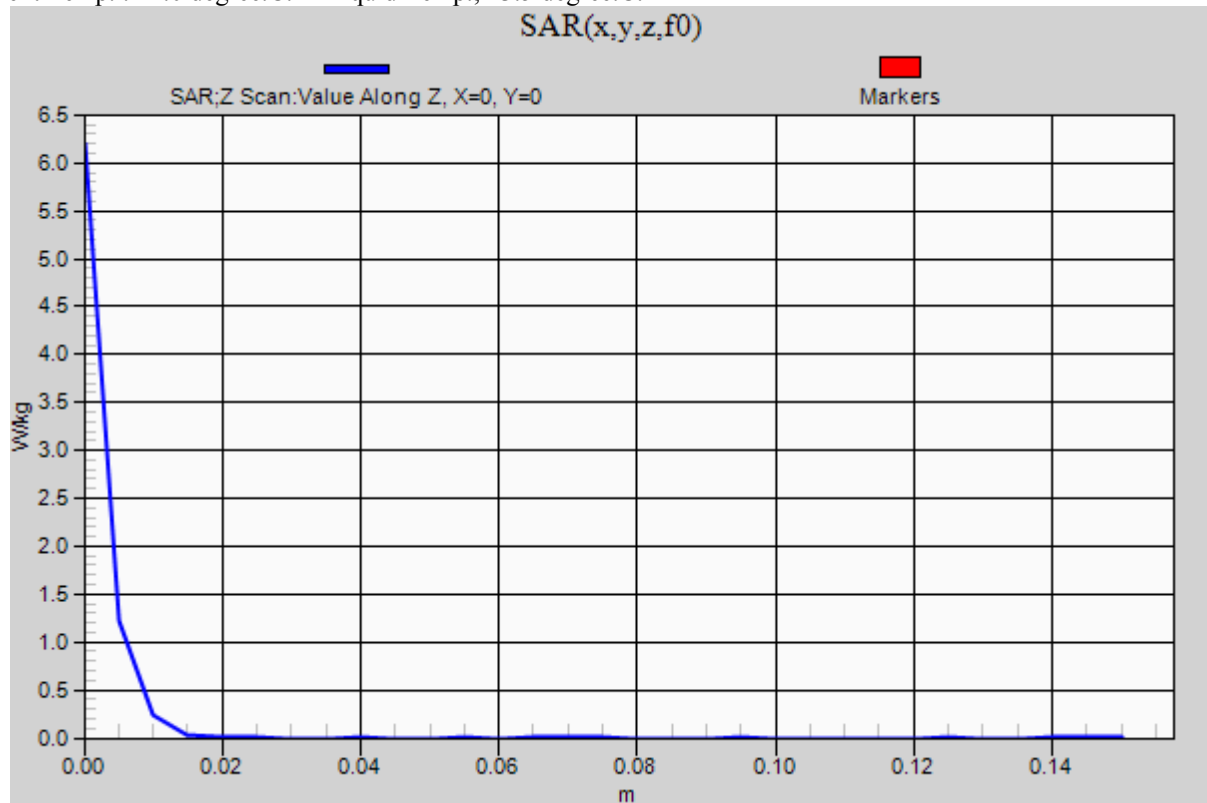
Maximum value of SAR (interpolated) = 16.3 W/kg

Z Scan (1x1x31): Measurement grid: $dx=20$ mm, $dy=20$ mm, $dz=5$ mm

Maximum value of SAR (measured) = 6.20 W/kg

Date: 2015/01/22

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



8. System check result Head 5600MHz**(1) 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	Measured	Deviation [%]	Limit [%]	Remark
-	-	-	-	-	3000	ϵ_r	38.5	-	-	-	*1
						σ [mho/m]	2.40	-	-	-	
28-Jan	24	35	HBBL 3.5-5.8	23.5	5600	ϵ_r	35.5	34.9	-1.6	+/-5	*2
						σ [mho/m]	5.07	5.04	-0.6	+/-5	
-	-	-	-	-	5800	ϵ_r	35.3	-	-	-	*1
						σ [mho/m]	5.27	-	-	-	

ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in KDB 865664D01.

*2 The dielectric parameters should be linearly interpolated between the closest pair of target frequencies to determine the applicable dielectric parameters corresponding to the device test frequency.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
28-Jan	24	35	HBBL 3.5-5.8	23.5	5600	ϵ_r	35.0	34.9	-0.2	+/-6	*3*4
						σ [mho/m]	4.96	5.04	1.7	+/-6	

ϵ_r : Relative Permittivity / σ : Conductivity

*3 The target value is the calibrated dipole Body TSL parameters. (D5GHzV2 SN:1039, Measured Body TSL parameters)

*4 The limit is for deviation provided by manufacture.

(2) System check result (for calibration by manufacture)

SYSTEM CHECK							
Date	Frequency [MHz]	SAR 1g [W/kg]			Deviation [%]	Limit [%]	Remark
		Forward Power	Conversion 1W	Target Value(1W)			
		Measured	Calculation				
28-Jan	5600.00	9.20	92.00	85.70	7.4	+/-10	*5

*5 The target value is the parameter defined in SAR for nominal Body TSL parameters in manufacturer calibrated dipole (D5GHzV2 SN:1039) Please refer to " SAR result with Body TSL of Appendix 2 12. System Check Dipole (D5GHzV2,S/N: 1039)".

Head 5600MHz System Check DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.042$ S/m; $\epsilon_r = 34.926$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.61, 4.61, 4.61); Calibrated: 2014/06/13;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: SAM Twin TP1762 (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1762

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Area Scan (101x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 20.2 W/kg

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

Reference Value = 66.15 V/m; Power Drift = -0.05 dB

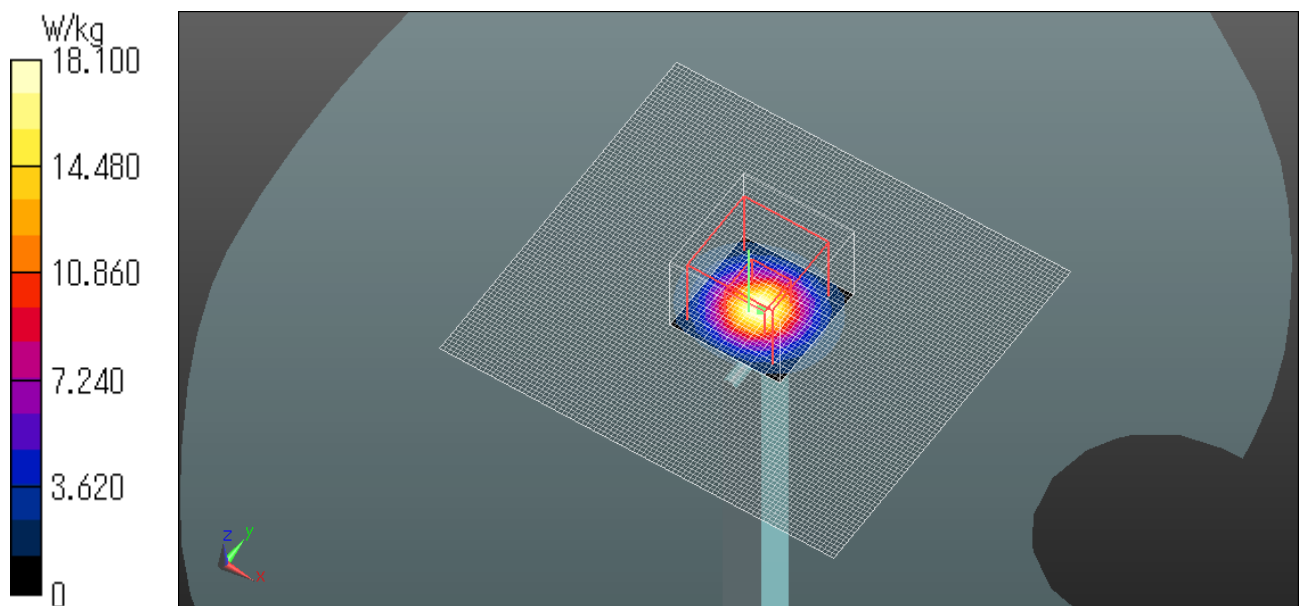
Peak SAR (extrapolated) = 39.4 W/kg

SAR(1 g) = 9.2 W/kg; SAR(10 g) = 2.59 W/kg

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

Date: 2015/01/28

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



Head 5600MHz System Check DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.042$ S/m; $\epsilon_r = 34.926$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.61, 4.61, 4.61); Calibrated: 2014/06/13;

Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: SAM Twin TP1762 (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1762

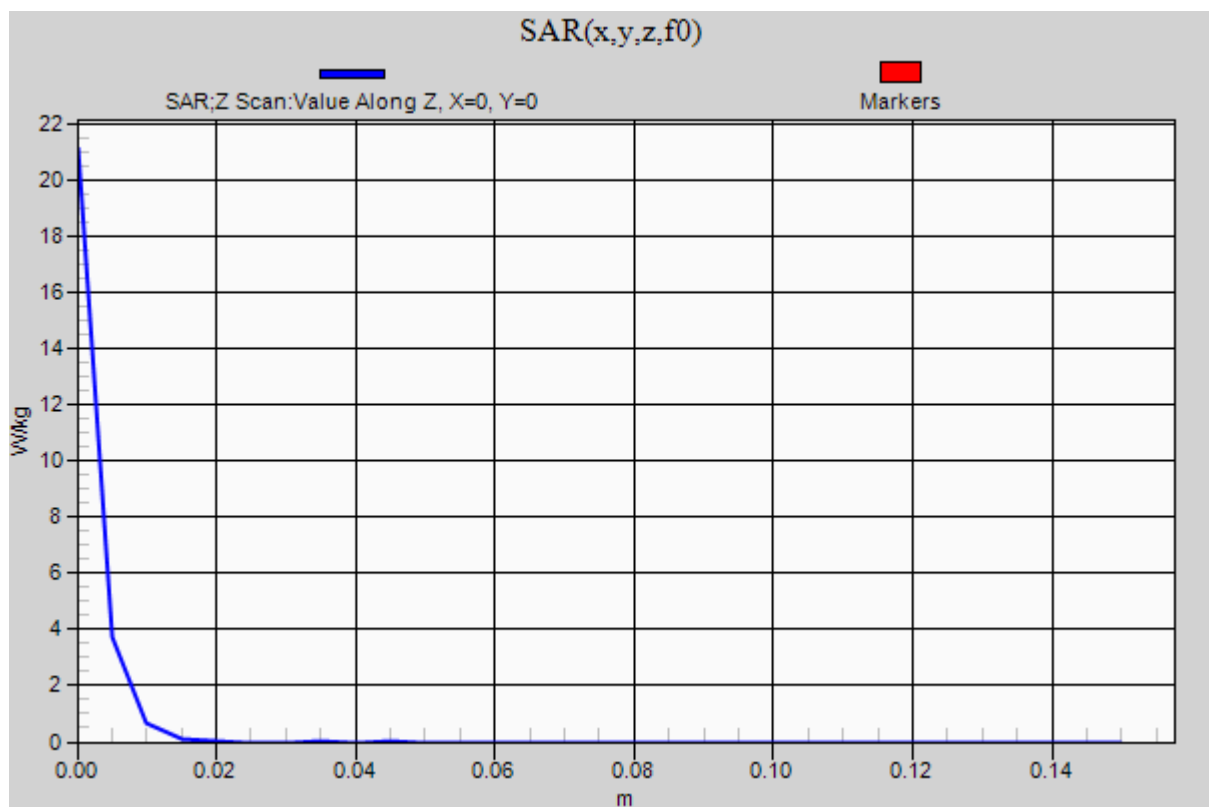
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 21.1 W/kg

Date: 2015/01/28

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



9. System check result Body 5600MHz

(1) 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	Measured	Deviation [%]	Limit [%]	Remark
-	-	-	-	-	3000	ϵ_r	52.0	-	-	-	*1
						σ [mho/m]	2.73	-	-	-	
22-Jan	24	42	MBBL 3.5-5.8	23.5	5600	ϵ_r	48.5	46.7	-3.8	+/-5	*2
						σ [mho/m]	5.77	5.78	0.2	+/-5	
-	-	-	-	-	5800	ϵ_r	48.2	-	-	-	*1
						σ [mho/m]	6.00	-	-	-	

ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in KDB 865664D01.

*2 The dielectric parameters should be linearly interpolated between the closest pair of target frequencies to determine the applicable dielectric parameters corresponding to the device test frequency.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
22-Jan	24	42	MBBL 3.5-5.8	23.5	5600	ϵ_r	46.4	46.7	0.6	+/-6	*3*4
						σ [mho/m]	5.98	5.78	-3.4	+/-6	

ϵ_r : Relative Permittivity / σ : Conductivity

*3 The target value is the calibrated dipole Body TSL parameters. (D5GHzV2 SN:1039, Measured Body TSL parameters)

*4 The limit is for deviation provided by manufacture.

(3) System check result (for calibration by manufacture)

SYSTEM CHECK							
Date	Frequency [MHz]	SAR 1g [W/kg]					
		Forward Power	Conversion 1W	Target Value(1W)	Deviation [%]	Limit [%]	Remark
		Measured	Calculation				
22-Jan	5600.00	8.13	81.30	82.90	-1.9	+/-10	*5

*5 The target value is the parameter defined in SAR for nominal Body TSL parameters in manufacturer calibrated dipole (D5GHzV2 SN:1039) Please refer to " SAR result with Body TSL of Appendix 2 12. System Check Dipole (D5GHzV2,S/N: 1039)".

Body 5600MHz System Check DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW; Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.779$ S/m; $\epsilon_r = 46.676$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(3.85, 3.85, 3.85); Calibrated: 2014/06/13;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: ELI v5.0 TP1207 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:1207

Measurement SW: DASYS2, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Area Scan (91x91x1): 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=1.4mm

Reference Value = 62.61 V/m; Power Drift = 0.06 dB

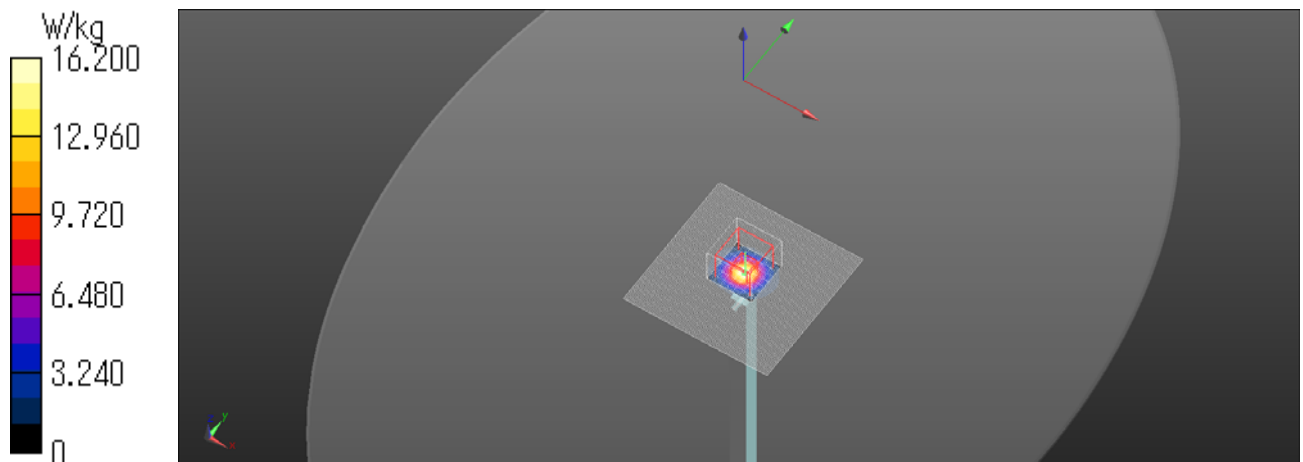
Peak SAR (extrapolated) = 35.3 W/kg

SAR(1 g) = 8.13 W/kg; SAR(10 g) = 2.24 W/kg

Maximum value of SAR (measured) = 16.2 W/kg

Date: 2015/01/22

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



Body 5600MHz System Check DATA / Dipole5GHz / Forward Conducted Power : 100mW

Communication System: UID 0, CW; Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.779$ S/m; $\epsilon_r = 46.676$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(3.85, 3.85, 3.85); Calibrated: 2014/06/13;

Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: ELI v5.0 TP1207 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:1207

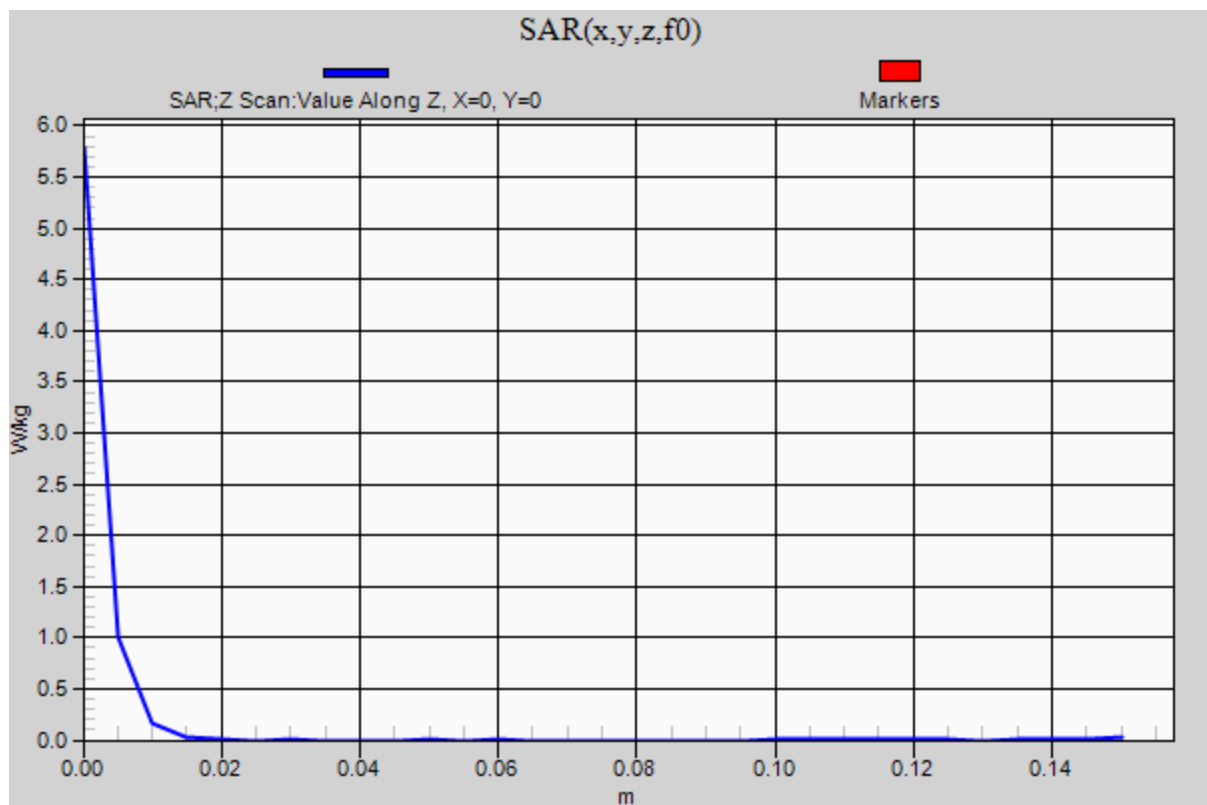
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 5.79 W/kg

Date: 2015/01/22

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



10. System check result Head 5800MHz**(1) 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	Measured	Deviation [%]	Limit [%]	Remark
28-Jan	24	35	HBBL 3.5-5.8	23.5	5800	ϵ_r	35.3	34.5	-2.3	+/-5	*1
						σ [mho/m]	5.27	5.25	-0.3	+/-5	

 ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in KDB 865664D01.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
28-Jan	24	35	HBBL 3.5-5.8	23.5	5800	ϵ_r	34.7	34.5	-0.6	+/-6	*2*3
						σ [mho/m]	5.18	5.25	1.4	+/-6	

 ϵ_r : Relative Permittivity / σ : Conductivity

*2 The target value is the calibrated dipole Body TSL parameters. (D5GHzV2 SN:1039, Measured Body TSL parameters)

*3 The limit is for deviation provided by manufacture.

(2) System check result (for calibration by manufacture)

SYSTEM CHECK							
Date	Frequency [MHz]	SAR 1g [W/kg]			Deviation [%]	Limit [%]	Remark
		Forward Power	Conversion 1W	Target Value(1W)			
		Measured	Calculation				
28-Jan	5800.00	8.54	85.40	81.40	4.9	+/-10	*4

*4 The target value is the parameter defined in SAR for nominal Body TSL parameters in manufacturer calibrated dipole (D5GHzV2 SN:1039)

Please refer to " SAR result with Body TSL of Appendix 2 12. System Check Dipole (D5GHzV2,S/N: 1039)".

Head 5800MHz System Check 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; $\sigma = 5.254$ S/m; $\epsilon_r = 34.477$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.56, 4.56, 4.56); Calibrated: 2014/06/13;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: SAM Twin TP1762 (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1762

Measurement SW: DASYS2, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Area Scan (101x91x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

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

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

Reference Value = 62.81 V/m; Power Drift = -0.03 dB

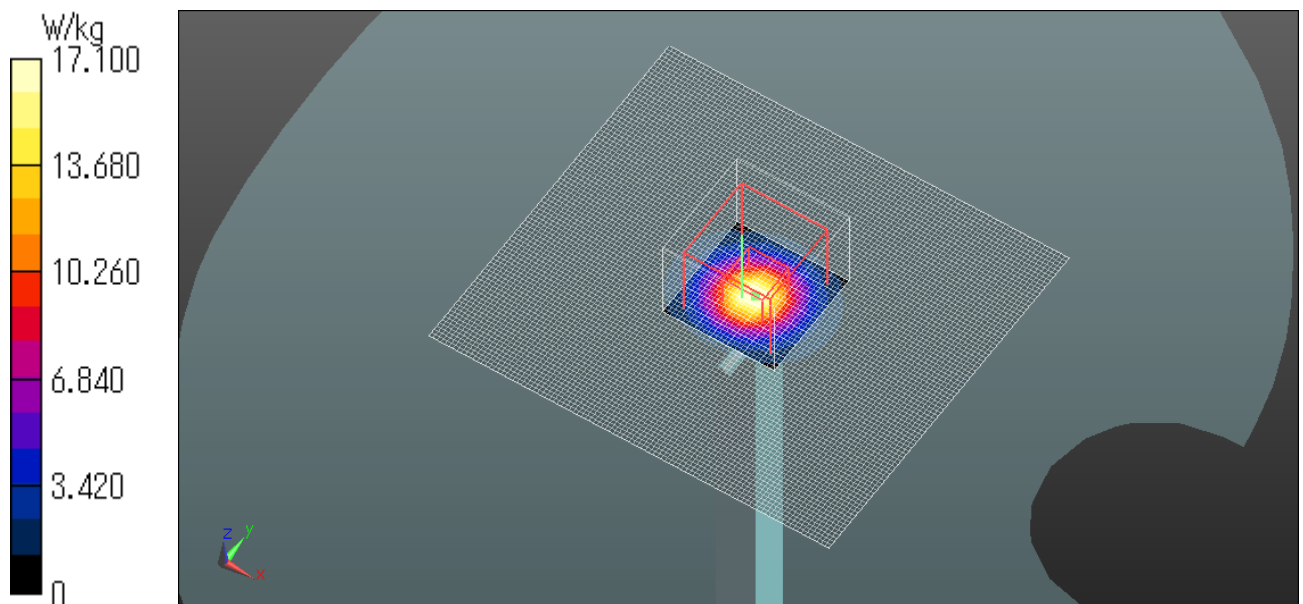
Peak SAR (extrapolated) = 37.7 W/kg

SAR(1 g) = 8.54 W/kg; SAR(10 g) = 2.4 W/kg

Maximum value of SAR (measured) = 17.1 W/kg

Date: 2015/01/28

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



Head 5800MHz System Check 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; $\sigma = 5.254$ S/m; $\epsilon_r = 34.477$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(4.56, 4.56, 4.56); Calibrated: 2014/06/13;

Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: SAM Twin TP1762 (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1762

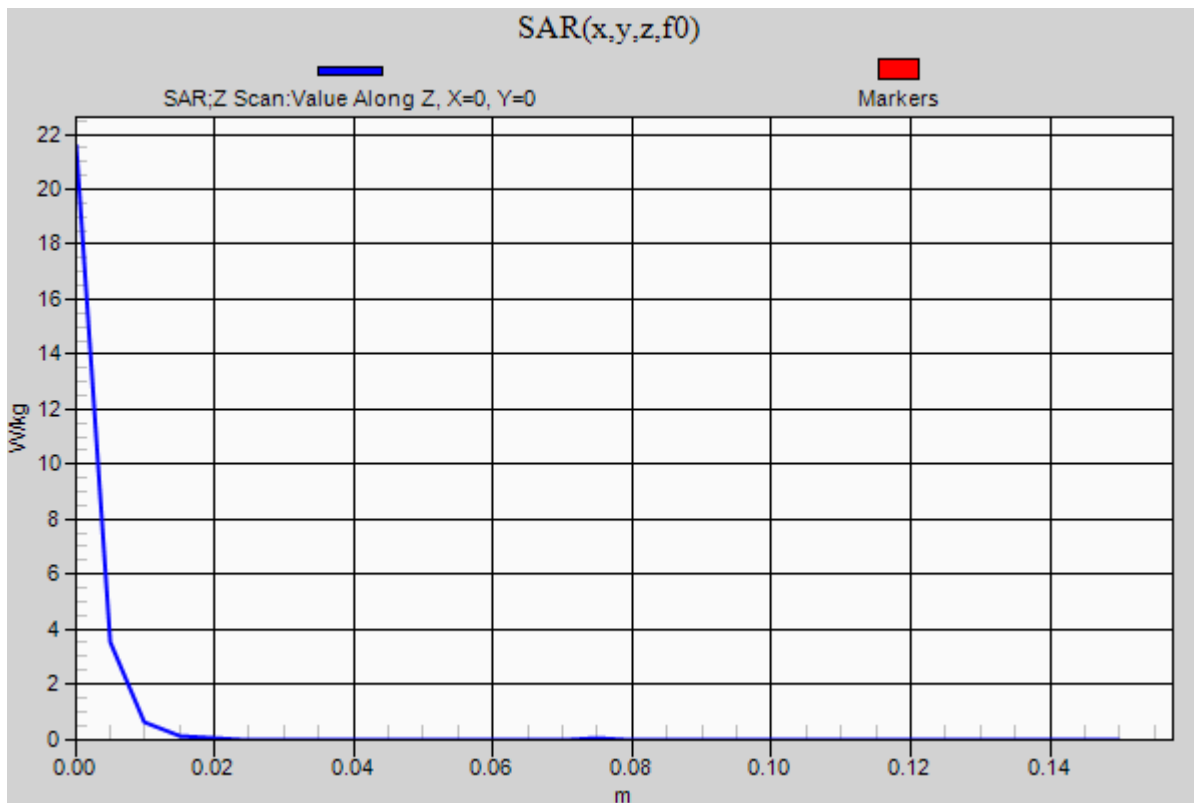
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 21.6 W/kg

Date: 2015/01/28

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



11. System check result Body 5800MHz

(1) 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	Measured	Deviation [%]	Limit [%]	Remark
23-Jan	24	38	MBBL 3.5-5.8	23.5	5800	ϵ_r	48.2	47.0	-2.4	+/-5	*1
						σ [mho/m]	6.00	5.97	-0.5	+/-5	

ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in KDB 865664D01.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
23-Jan	24	38	MBBL 3.5-5.8	23.5	5800	ϵ_r	46.0	47.0	2.3	+/-6	*2 *3
						σ [mho/m]	6.27	5.97	-4.8	+/-6	

ϵ_r : Relative Permittivity / σ : Conductivity

*2 The target value is the calibrated dipole Body TSL parameters. (D5GHzV2 SN:1039, Measured Body TSL parameters)

*3 The limit is for deviation provided by manufacture.

(2) System check result (for calibration by manufacture)

SYSTEM CHECK									
Date	Frequency [MHz]	SAR 1g [W/kg]							
		Forward Power 100mW		Conversion 1W		Target Value(1W)	Deviation [%]	Limit [%]	Remark
		Measured		Calculation					
23-Jan	5800.00	7.50		75.00		77.00	-2.6	+/-10	*4

*4 The target value is the parameter defined in SAR for nominal Body TSL parameters in manufacturer calibrated dipole (D5GHzV2 SN:1039)

Please refer to " SAR result with Body TSL of Appendix 2 12. System Check Dipole (D5GHzV2,S/N: 1039)".

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

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

Medium parameters used (interpolated): $f = 5800$ MHz; $\sigma = 5.971$ S/m; $\epsilon_r = 47.044$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(3.98, 3.98, 3.98); Calibrated: 2014/06/13;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: ELI v5.0 TP1207 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:1207

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Area Scan (91x91x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

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

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

Reference Value = 60.99 V/m; Power Drift = 0.08 dB

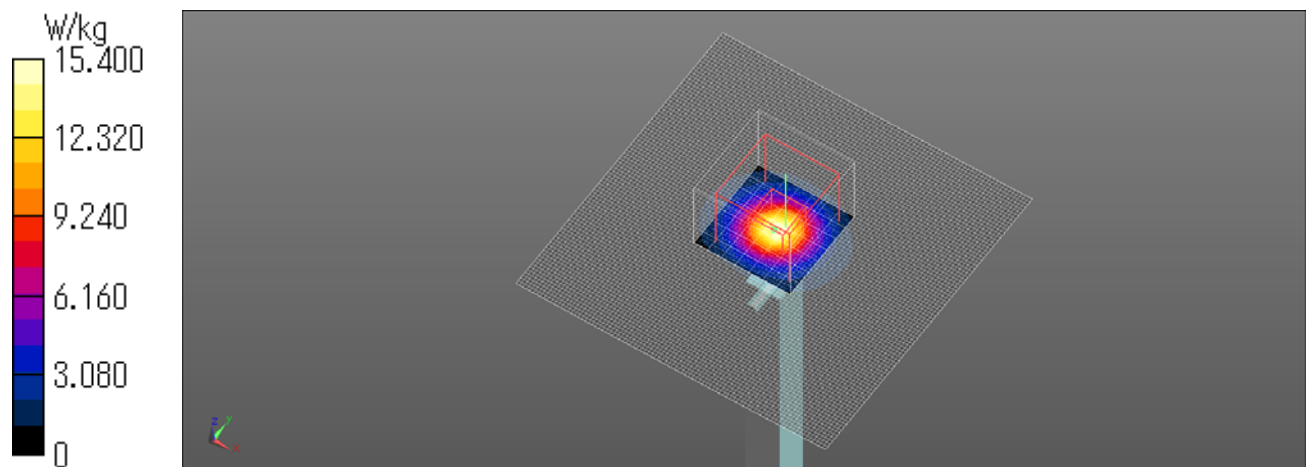
Peak SAR (extrapolated) = 34.0 W/kg

SAR(1 g) = 7.5 W/kg; SAR(10 g) = 2.08 W/kg

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

Date: 2015/01/23

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



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

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

Medium parameters used (interpolated): $f = 5800$ MHz; $\sigma = 5.971$ S/m; $\epsilon_r = 47.044$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration

Probe: EX3DV4 - SN3922; ConvF(3.98, 3.98, 3.98); Calibrated: 2014/06/13;

Sensor-Surface: 0mm (Fix Surface)

Electronics: DAE4 Sn1372; Calibrated: 2014/06/18

Phantom: ELI v5.0 TP1207 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:1207

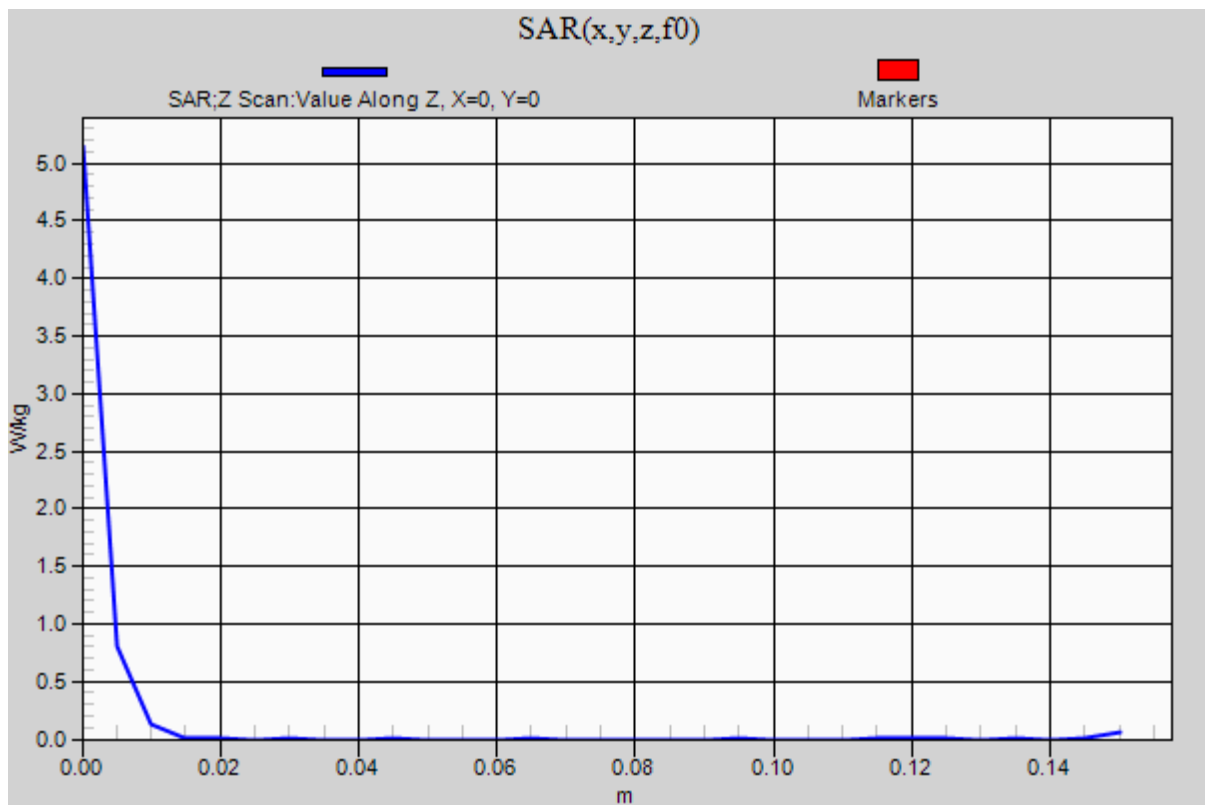
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 5.15 W/kg

Date: 2015/01/23

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



12. System Check Dipole (D5GHzV2,S/N:1039)

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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 **PTT**

Certificate No: D5GHzV2-1039_May14

CALIBRATION CERTIFICATE																																															
Object:	D5GHzV2 - SN: 1039																																														
Calibration procedure(s):	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz																																														
Calibration date:	May 13, 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 ± 2)°C and humidity < 70%. Calibration Equipment used (M&PE critical for calibration) <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter EPM-440A</td> <td>GB37690704</td> <td>09-Oct-13 (No. 217-01827)</td> <td>Oct-14</td> </tr> <tr> <td>Power sensor HP 8480A</td> <td>US32282783</td> <td>09-Oct-13 (No. 217-01827)</td> <td>Oct-14</td> </tr> <tr> <td>Power sensor HP 8480A</td> <td>MY41000317</td> <td>09-Oct-13 (No. 217-01828)</td> <td>Oct-14</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: 5088 (204)</td> <td>03-Apr-14 (No. 217-01918)</td> <td>Apr-15</td> </tr> <tr> <td>Type-N mismatch combination</td> <td>SN: 5047.2 / 06327</td> <td>03-Apr-14 (No. 217-01921)</td> <td>Apr-15</td> </tr> <tr> <td>Reference Probe EX30V4</td> <td>SN: 3503</td> <td>00-Dec-13 (No. EX3-3503_Dec13)</td> <td>Dec-14</td> </tr> <tr> <td>DAE4</td> <td>SN: 801</td> <td>00-Apr-14 (No. DAE4-801_Apr14)</td> <td>Apr-15</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Check Date (in house)</th> <th>Scheduled Check</th> </tr> </thead> <tbody> <tr> <td>RF generator P&S SMT-05</td> <td>100005</td> <td>04-Aug-09 (in house check Oct-13)</td> <td>In house check: Oct-15</td> </tr> <tr> <td>Network Analyzer HP 8753E</td> <td>US37390585 54266</td> <td>18-Oct-01 (in house check Oct-13)</td> <td>In house check: Oct-14</td> </tr> </tbody> </table>				Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration	Power meter EPM-440A	GB37690704	09-Oct-13 (No. 217-01827)	Oct-14	Power sensor HP 8480A	US32282783	09-Oct-13 (No. 217-01827)	Oct-14	Power sensor HP 8480A	MY41000317	09-Oct-13 (No. 217-01828)	Oct-14	Reference 20 dB Attenuator	SN: 5088 (204)	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 EX30V4	SN: 3503	00-Dec-13 (No. EX3-3503_Dec13)	Dec-14	DAE4	SN: 801	00-Apr-14 (No. DAE4-801_Apr14)	Apr-15	Secondary Standards	ID #	Check Date (in house)	Scheduled Check	RF generator P&S SMT-05	100005	04-Aug-09 (in house check Oct-13)	In house check: Oct-15	Network Analyzer HP 8753E	US37390585 54266	18-Oct-01 (in house check Oct-13)	In house check: Oct-14
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Calibrated by:	Name Loth Klyener	Function Laboratory Technician	Signature 																																												
Approved by:	Name Katja Pokovic	Technical Manager																																													
			Issued: May 15, 2014																																												
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.																																															

Certificate No: D5GHzV2-1039_May14

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accreditation No.: SCS 108

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

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

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 V6.0	
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 $\pm$ 1 MHz 5300 MHz $\pm$ 1 MHz 5500 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5800 MHz $\pm$ 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 $\pm$ 0.2) °C	35.5 $\pm$ 6 %	4.55 mho/m $\pm$ 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	8.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.5 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.0 W/kg $\pm$ 19.5 % (k=2)

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.4 ± 6 %	4.66 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	84.7 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.3 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	35.1 ± 6 %	4.86 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	8.77 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	87.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.49 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.8 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	4.96 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	85.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.2 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	34.7 ± 6 %	5.18 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	8.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.0 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 %	5.44 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	7.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.8 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.1 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.0	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.0 ± 6 %	5.59 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.84 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	77.8 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.19 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.7 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 %	5.85 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	XXXX	XXXX

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	8.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	81.8 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.6 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.4 ± 6 %	5.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	XXXX	XXXX

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.29 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	82.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.8 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	46.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.0 ± 6 %	6.27 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	7.70 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.0 W/kg ± 19.5 % (k=2)

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	49.5 Ω - 9.9 j Ω
Return Loss	- 20.0 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	62.4 Ω - 4.3 j Ω
Return Loss	- 26.3 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	49.0 Ω - 1.9 j Ω
Return Loss	- 33.2 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	64.0 Ω - 5.0 j Ω
Return Loss	- 24.3 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	56.6 Ω + 0.4 j Ω
Return Loss	- 24.1 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.1 Ω - 9.1 j Ω
Return Loss	- 20.7 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	53.0 Ω - 3.1 j Ω
Return Loss	- 27.5 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	49.4 Ω - 0.5 j Ω
Return Loss	- 41.9 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	54.3 Ω - 4.2 j Ω
Return Loss	- 24.8 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	57.7 Ω + 1.9 j Ω
Return Loss	- 22.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.198 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	December 30, 2005

DASY5 Validation Report for Head TSL

Date: 13.05.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1039

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: $f = 5200$ MHz; $\sigma = 4.55$ S/m; $\epsilon_r = 35.5$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 4.66$ S/m; $\epsilon_r = 35.4$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 4.86$ S/m; $\epsilon_r = 35.1$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 4.96$ S/m; $\epsilon_r = 35$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.18$ S/m; $\epsilon_r = 34.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.52, 5.52, 5.52); Calibrated: 30.12.2013, ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2013, ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.86, 4.86, 4.86); Calibrated: 30.12.2013, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

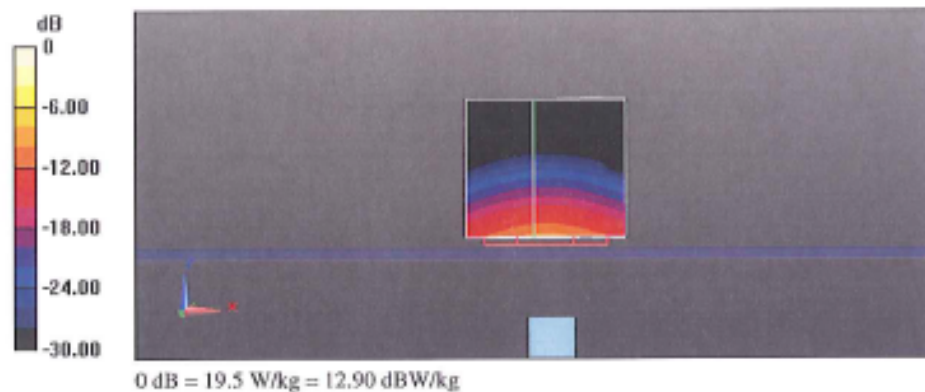
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.58 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 29.3 W/kg
SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 18.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.22 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 8.5 W/kg; SAR(10 g) = 2.44 W/kg
Maximum value of SAR (measured) = 19.6 W/kg

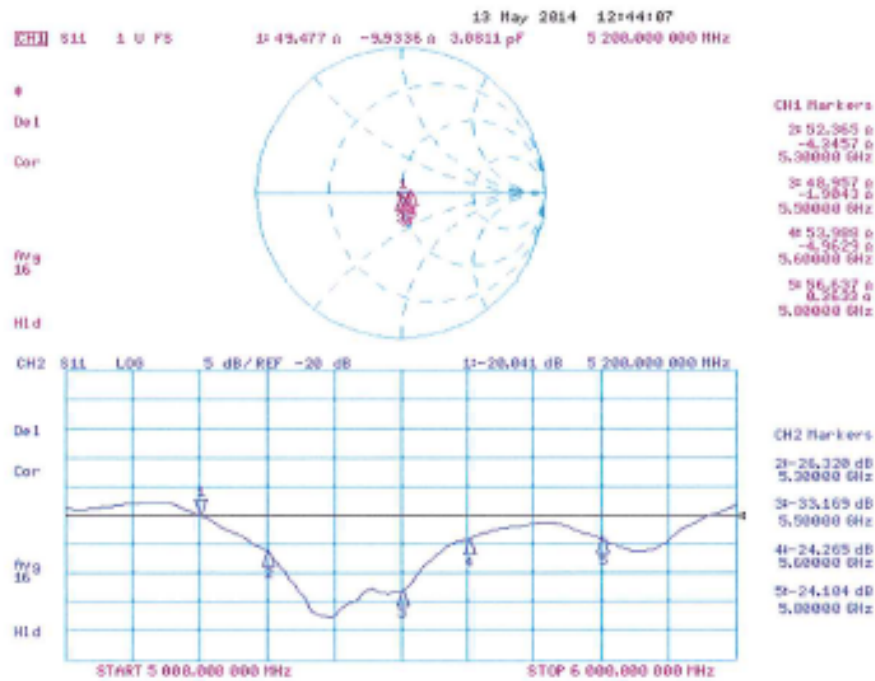
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.22 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 34.5 W/kg
SAR(1 g) = 8.77 W/kg; SAR(10 g) = 2.49 W/kg
Maximum value of SAR (measured) = 20.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.85 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 33.8 W/kg
SAR(1 g) = 8.57 W/kg; SAR(10 g) = 2.43 W/kg
Maximum value of SAR (measured) = 20.1 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 = 62.01 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 33.8 W/kg
SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 19.5 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 09.05.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1039

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: $f = 5200$ MHz; $\sigma = 5.44$ S/m; $\epsilon_r = 47$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 5.59$ S/m; $\epsilon_r = 46.8$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 5.85$ S/m; $\epsilon_r = 46.5$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.98$ S/m; $\epsilon_r = 46.4$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 6.27$ 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(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013, ConvF(4.52, 4.52, 4.52); Calibrated: 30.12.2013, ConvF(4.3, 4.3, 4.3); Calibrated: 30.12.2013, ConvF(4.47, 4.47, 4.47); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

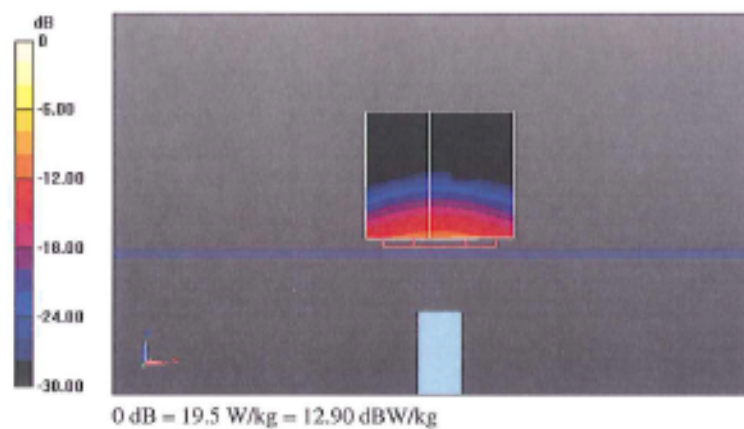
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.82 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 30.2 W/kg
SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.13 W/kg
Maximum value of SAR (measured) = 18.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.83 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 32.0 W/kg
SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.19 W/kg
Maximum value of SAR (measured) = 18.9 W/kg

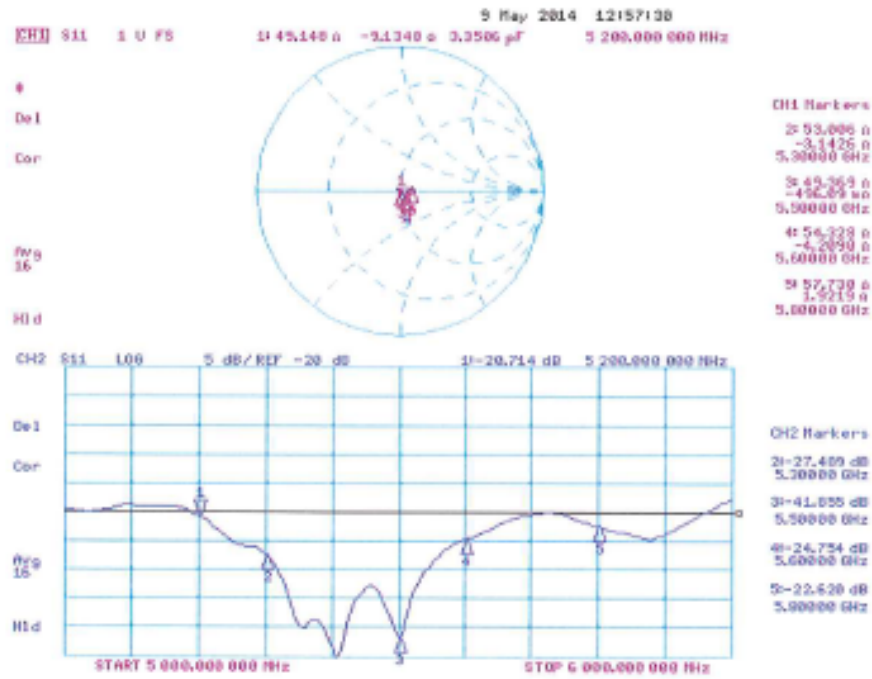
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.12 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 35.7 W/kg
SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 20.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.82 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 36.8 W/kg
SAR(1 g) = 8.29 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 20.5 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 = 55.45 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 36.1 W/kg
SAR(1 g) = 7.7 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 19.5 W/kg



Impedance Measurement Plot for Body TSL



13. System check uncertainty

The uncertainty budget has been determined for the DASY5 measurement system according to the SPEAG documents[2] and is given in the following Table.

Repeatability Budget for System Check

<0.3 – 3GHz range >

Error Description	Uncertainty value $\pm$ %	Probability distribution	divisor	(ci) 1g	Standard (1g)	vi or v _{eff}
Measurement System						
Probe calibration	± 1.8	Normal	1	1	± 1.8	∞
Axial isotropy of the probe	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Spherical isotropy of the probe	± 0.0	Rectangular	$\sqrt{3}$	0	± 0.0	∞
Boundary effects	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Probe linearity	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Detection limit	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Modulation response	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Readout electronics	± 0.0	Normal	1	1	± 0.0	∞
Response time	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Integration time	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
RF ambient Noise	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
RF ambient	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Probe Positioner	± 0.4	Rectangular	$\sqrt{3}$	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Max.SAR Eval.	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Test Sample Related						
Deviation of	± 0.0	Normal	$\sqrt{3}$	1	± 0.0	∞
Dipole Axis to Liquid Distance	± 2.0	Normal	$\sqrt{3}$	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	∞
Algorithm for correcting SAR for deviations in permittivity and conductivity	± 1.9	Normal	1	1	± 1.9	∞
Liquid conductivity (target.)	± 5.0	Rectangular	$\sqrt{3}$	0.78	± 2.3	∞
Liquid conductivity (meas.)	± 5.0	Rectangular	1	0.78	± 3.9	∞
Liquid permittivity (target.)	± 5.0	Rectangular	$\sqrt{3}$	0.26	± 0.8	∞
Liquid permittivity (meas.)	± 5.0	Rectangular	1	0.26	± 1.3	∞
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						
					± 6.587	
Expanded Uncertainty (k=2)						
					± 13.2	

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Repeatability Budget for System Check

<3 – 6GHz range>

Error Description	Uncertainty value $\pm$ %	Probability distribution	divisor	(ci) 1g	Standard (1g)	vi or veff
Measurement System						
Probe calibration	± 1.8	Normal	1	1	± 1.8	∞
Axial isotropy of the probe	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Spherical isotropy of the probe	± 0.0	Rectangular	$\sqrt{3}$	0	± 0.0	∞
Boundary effects	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Probe linearity	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Detection limit	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Modulation response	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Readout electronics	± 0.0	Normal	1	1	± 0.0	∞
Response time	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Integration time	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
RF ambient Noise	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
RF ambient	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Probe Positioner	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Probe positioning	± 6.7	Rectangular	$\sqrt{3}$	1	± 3.9	∞
Max.SAR Eval.	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Test Sample Related						
Deviation of	± 0.0	Normal	$\sqrt{3}$	1	± 0.0	∞
Dipole Axis to Liquid Distance	± 2.0	Normal	$\sqrt{3}$	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	∞
Algorithm for correcting SAR for deviations in permittivity and conductivity	± 1.9	Normal	1	1	± 1.9	∞
Liquid conductivity (target.)	± 5.0	Rectangular	$\sqrt{3}$	0.78	± 2.3	∞
Liquid conductivity (meas.)	± 5.0	Rectangular	1	0.78	± 3.9	∞
Liquid permittivity (target.)	± 5.0	Rectangular	$\sqrt{3}$	0.26	± 0.8	∞
Liquid permittivity (meas.)	± 5.0	Rectangular	1	0.26	± 1.3	∞
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						
					± 7.466	
Expanded Uncertainty (k=2)						
					± 14.9	

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2. Specifications

a) Robot TX60L

Number of Axes	:	6
Nominal Load	:	2 kg
Maximum Load	:	5kg
Reach	:	920mm
Repeatability	:	+/-0.03mm
Control Unit	:	CS8c
Programming Language	:	VAL3
Weight	:	52.2kg
Manufacture	:	Stäubli Robotics

b) E-Field Probe

Model	:	EX3DV4
Serial No.	:	3922
Construction	:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)
Frequency	:	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	:	+/-0.3 dB in HSL (rotation around probe axis) +/-0.5 dB in tissue material (rotation normal probe axis)
Dynamic Range	:	10uW/g to > 100 mW/g; Linearity +/-0.2 dB (noise: typically < 1uW/g)
Dimensions	:	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	:	Highprecision dosimetric measurement in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6GHz with precision of better 30%.
Manufacture	:	Schmid & Partner Engineering AG



EX3DV4 E-field Probe

c)Data Acquisition Electronic (DAE4)

Features	:	Signal amplifier, multiplexer, A/D converter and control logic Serial optical link for communication with DASY5 embedded system (fully remote controlled) Two step probe touch detector for mechanical surface detection and emergency robot stop
Measurement Range	:	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset voltage	:	< 5 μ V (with auto zero)
Input Resistance	:	200 M Ω
Input Bias Current	:	< 50 fA
Battery Power	:	> 10 h of operation (with two 9.6 V NiMH accus)
Dimension	:	60 x 60 x 68 mm
Manufacture	:	Schmid & Partner Engineering AG

d)Electro-Optic Converter (EOC)

Version	:	EOC 61
Description	:	for TX60 robot arm, including proximity sensor
Manufacture	:	Schmid & Partner Engineering AG

e)DASY5 Measurement server

Features	:	Intel ULV Celeron 400MHz 128MB chip disk and 128MB RAM 16 Bit A/D converter for surface detection system Vacuum Fluorescent Display Robot Interface Serial link to DAE (with watchdog supervision) Door contact port (Possibility to connect a light curtain) Emergency stop port (to connect the remote control) Signal lamps port Light beam port Three Ethernet connection ports Two USB 2.0 Ports Two serial links Expansion port for future applications
Dimensions (L x W x H)	:	440 x 241 x 89 mm
Manufacture	:	Schmid & Partner Engineering AG

f) Light Beam Switches

Version	:	LB5
Dimensions (L x H)	:	110 x 80 mm
Thickness	:	12 mm
Beam-length	:	80 mm
Manufacture	:	Schmid & Partner Engineering AG

g)Software

Item	:	Dosimetric Assessment System DASY5
Type No.	:	SD 000 401A, SD 000 402A
Software version No.	:	DASY52, Version 52.6 (1)
Manufacture / Origin	:	Schmid & Partner Engineering AG

h)Robot Control Unit

Weight	:	70 Kg
AC Input Voltage	:	selectable
Manufacturer	:	Stäubli Robotics

i) Phantom and Device Holder

Phantom

Type	:	SAM Twin Phantom V4.0
Description	:	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.
Material	:	Vinylester, glass fiber reinforced (VE-GF)
Shell Material	:	Fiberglass
Thickness	:	2.0 +/-0.2 mm
Dimensions	:	Length: 1000 mm Width: 500 mm Height: adjustable feet
Volume	:	Approx. 25 liters
Manufacture	:	Schmid & Partner Engineering AG

Type	:	2mm Flat phantom ERI4.0
Description	:	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4.5 and higher and is compatible with all SPEAG dosimetric probes and dipoles.
Material	:	Vinylester, glass fiber reinforced (VE-GF)
Shell Thickness	:	2.0 ± 0.2 mm (sagging: <1%)
Filling Volume	:	approx. 30 liters
Dimensions	:	Major ellipse axis: 600 mm Minor axis: 400 mm
Manufacture	:	Schmid & Partner Engineering AG

Device Holder

In combination with the Twin SAM Phantom V4.0/V4.0c or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).

Material	:	POM
----------	---	-----

Laptio Extensions kit

Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM, ELI4 Phantoms.

Material	:	POM, Acrylic glass, Foam
----------	---	--------------------------

Urethane

For this measurement, the urethane foam was used as device holder.

j) Simulated Tissues (Liquid)

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Mixture (%)	Frequency (MHz)									
	450		900		1800		1950		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.91	46.21	40.29	50.75	55.24	70.17	55.41	69.79	55.0	68.64
Sugar	56.93	51.17	57.90	48.21	-	-	-	-	-	-
Cellulose	0.25	0.18	0.24	0.00	-	-	-	-	-	-
Salt (NaCl)	3.79	2.34	1.38	0.94	0.31	0.39	0.08	0.2	-	-
Preventol	0.12	0.08	0.18	0.10	-	-	-	-	-	-
DGMBE	-	-	-	-	44.45	29.44	44.51	30.0	45.0	31.37
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Note: DGMBE (Diethylenglycol-monobutyl ether)

The simulated tissue (liquid) of 1800MHz was used for the test frequency of 1700MHz to 1800MHz.

Mixture (%)	Frequency (MHz)	
	650&750	1450
Tissue Type	Head and Body	Head and Body
Water	35-58%	52-75%
Sugar	40-60%	-
Cellulose	<0.3%	-
Salt (NaCl)	0-6%	<1%
Preventol	0.1-0.7%	-
DGMBE	-	25-48%

Mixture (%)	Frequency (MHz)	
	5800	
Tissue Type	Head	Body
Water	64.0	78.0
Mineral Oil	18.0	11.0
Emulsifiers	15.0	9.0
Additives and salt	3.0	2.0