APPENDIX 2 : System Validation

1. System validation result

System validation result for Head 1640MHz
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 [%]
10-Jul	24.0	56	HSL1800	23.5	1640	εr	40.3	40.6	0.8	+/-5
						σ [mho/m]	1.31	1.30	-0.7	+/-5
11-Jul	24.0	54	HSL1800	23.5	1640	εr	40.3	39.3	-2.4	+/-5
						σ [mho/m]	1.31	1.25	-5.0	+/-5

εr: Relative Permittivity / σ : Coductivity
*1 The Target value is a parameter defined in FCC OET 65.

System validation result (for calibration by manufacture)

SYSTEM VALIDATION						
Date	Frequency [MHz]	SAR 1g [W/kg]				
		Forward Power 250mW Measured	Conversion 1W Calculation	Target 1W *2	Deviation [%]	Limit [%]
10-Jul	1640.00	8.08	32.32	33.30	-2.9	+/-10
11-Jul	1640.00	7.71	30.84	33.30	-7.4	+/-10

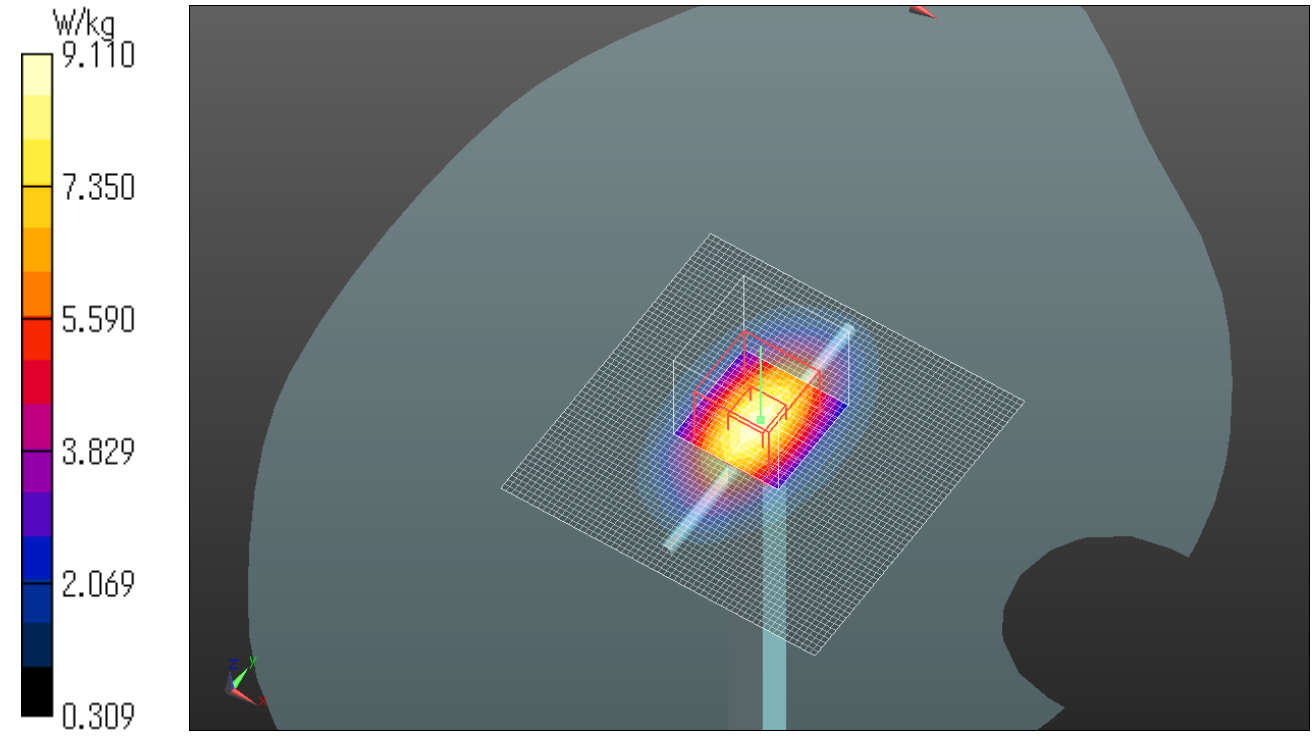
*2 The taget value is the parameter defined in 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D1640V2 SN

HEAD 1640MHz System Validation DATA / Dipole 1640MHz / Forward Conducted Power : 250mW

Communication System: UID 0, CW; Communication System Band: D1640 (1640.0 MHz); Frequency: 1640 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1640 MHz; σ = 1.301 S/m; ε_r = 40.618; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration
Probe: ET3DV6 - SN1705; ConvF(5.45, 5.45, 5.45); Calibrated: 2013/06/17
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1372; Calibrated: 2013/06/03
Phantom: SAM Twin TP1762; Type: QD000P40CD; Serial: TP:1762
Measurement SW: DASY52, Version 52.8 (7);

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 9.69 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.822 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 12.0 W/kg
SAR(1 g) = 8.08 W/kg; SAR(10 g) = 4.65 W/kg
Maximum value of SAR (measured) = 9.11 W/kg
Date: 2013/07/10
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.

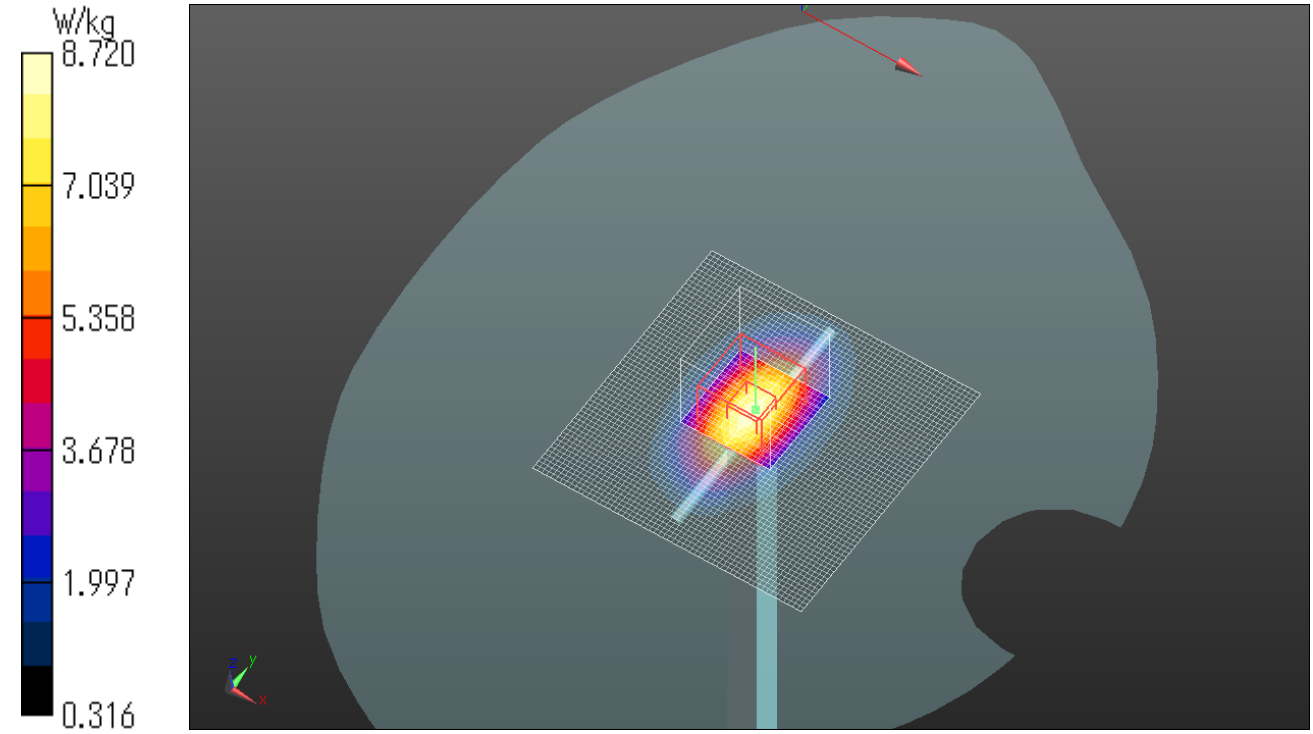


HEAD 1640MHz System Validation DATA / Dipole 1640MHz / Forward Conducted Power : 250mW

Communication System: UID 0, CW; Communication System Band: D1640 (1640.0 MHz); Frequency: 1640 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1640 MHz; σ = 1.246 S/m; ε_r = 39.327; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration
Probe: ET3DV6 - SN1705; ConvF(5.45, 5.45, 5.45); Calibrated: 2013/06/17
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1372; Calibrated: 2013/06/03
Phantom: SAM Twin TP1762; Type: QD000P40CD; Serial: TP:1762
Measurement SW: DASY52, Version 52.8 (7);

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 9.33 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.799 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 11.4 W/kg
SAR(1 g) = 7.71 W/kg; SAR(10 g) = 4.44 W/kg
Maximum value of SAR (measured) = 8.72 W/kg
Date: 2013/07/11
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



System validation result for Body 1640MHz
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 [%]
20-Aug	24.0	50	MSL1800	23.5	1640	εr	53.7	53.1	-1.2	+/-5
						σ [mho/m]	1.42	1.41	-0.5	+/-5
2-Oct	24.0	54	MSL1800	23.5	1640	εr	53.7	52.5	-2.2	+/-5
						σ [mho/m]	1.42	1.38	-2.7	+/-5

εr: Relative Permittivity / σ : Coductivity
*1 The Target value is a parameter defined in FCC OET 65.

System validation result (for calibration by manufacture)

SYSTEM VALIDATION						
Date	Frequency [MHz]	SAR 1g [W/kg]				
		Forward Power 250mW Measured	Conversion 1W Calculation	Target 1W *2	Deviation [%]	Limit [%]
20-Aug	1640.00	7.83	31.32	33.50	-6.5	+/-10
2-Oct	1640.00	8.15	32.60	33.50	-2.7	+/-10

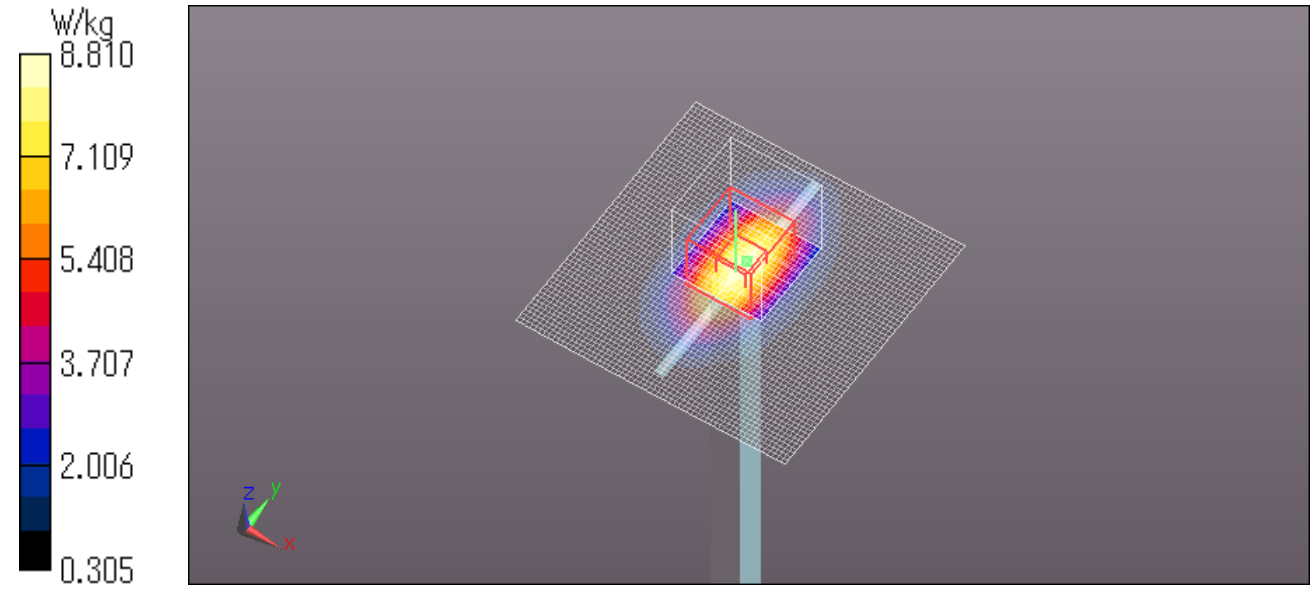
*2 The taget value is the parameter defined in 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D1640V2 SN

BODY 1640MHz System Validation DATA / Dipole 1640MHz / Forward Conducted Power : 250mW

Communication System: UID 0, CW; Communication System Band: D1640 (1640.0 MHz); Frequency: 1640 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1640 MHz; σ = 1.413 S/m; ε_r = 53.092; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration
Probe: ET3DV6 - SN1685; ConvF(5.05, 5.05, 5.05); Calibrated: 2013/07/19
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2013/07/16
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
Measurement SW: DASY52, Version 52.8 (7);

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 9.50 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 83.948 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 11.5 W/kg
SAR(1 g) = 7.83 W/kg; SAR(10 g) = 4.53 W/kg
Maximum value of SAR (measured) = 8.81 W/kg
Date: 2013/08/20
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.

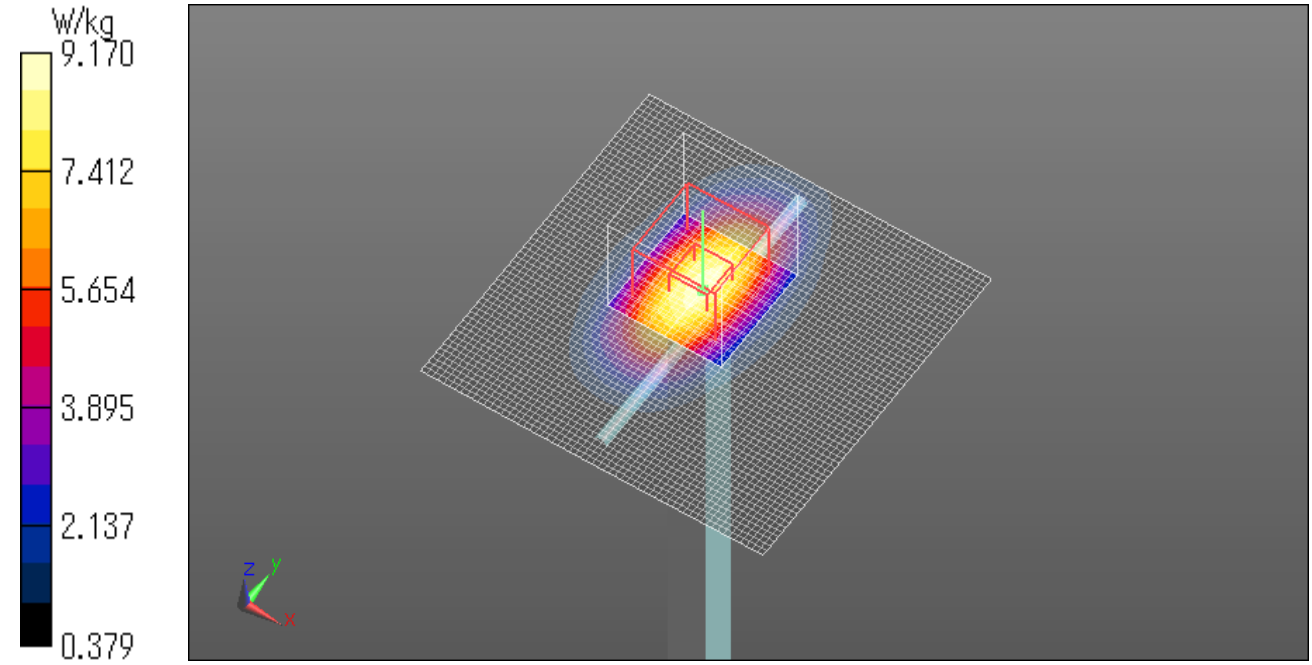


BODY 1640MHz System Validation DATA / Dipole 1640MHz / Forward Conducted Power : 250mW

Communication System: UID 0, CW; Communication System Band: D1640 (1640.0 MHz); Frequency: 1640 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1640 MHz; σ = 1.382 S/m; ε_r = 52.524; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration
Probe: ET3DV6 - SN1685; ConvF(5.05, 5.05, 5.05); Calibrated: 2013/07/19
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1372; Calibrated: 2013/06/03
Phantom: ELI v5.0 TP1207; Type: QDOVA001BB; Serial: TP:1207
Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 10.2 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.647 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 11.7 W/kg
SAR(1 g) = 8.15 W/kg; SAR(10 g) = 4.76 W/kg
Maximum value of SAR (measured) = 9.17 W/kg
Date: 2013/10/02
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



System validation result for Body-worn 1640MHz
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 [%]
10-Oct	24.0	55	MSL1800	23.5	1640	εr	53.7	53.1	-1.2	+/-5
						σ [mho/m]	1.42	1.38	-3.0	+/-5

εr: Relative Permittivity / σ : Coductivity
*1 The Target value is a parameter defined in FCC OET 65.

System validation result (for calibration by manufacture)

SYSTEM VALIDATION						
Date	Frequency [MHz]	SAR 1g [W/kg]				
		Forward Power 250mW Measured	Conversion 1W Calculation	Target 1W *2	Deviation [%]	Limit [%]
10-Oct	1640.00	7.65	30.60	33.50	-8.7	+/-10

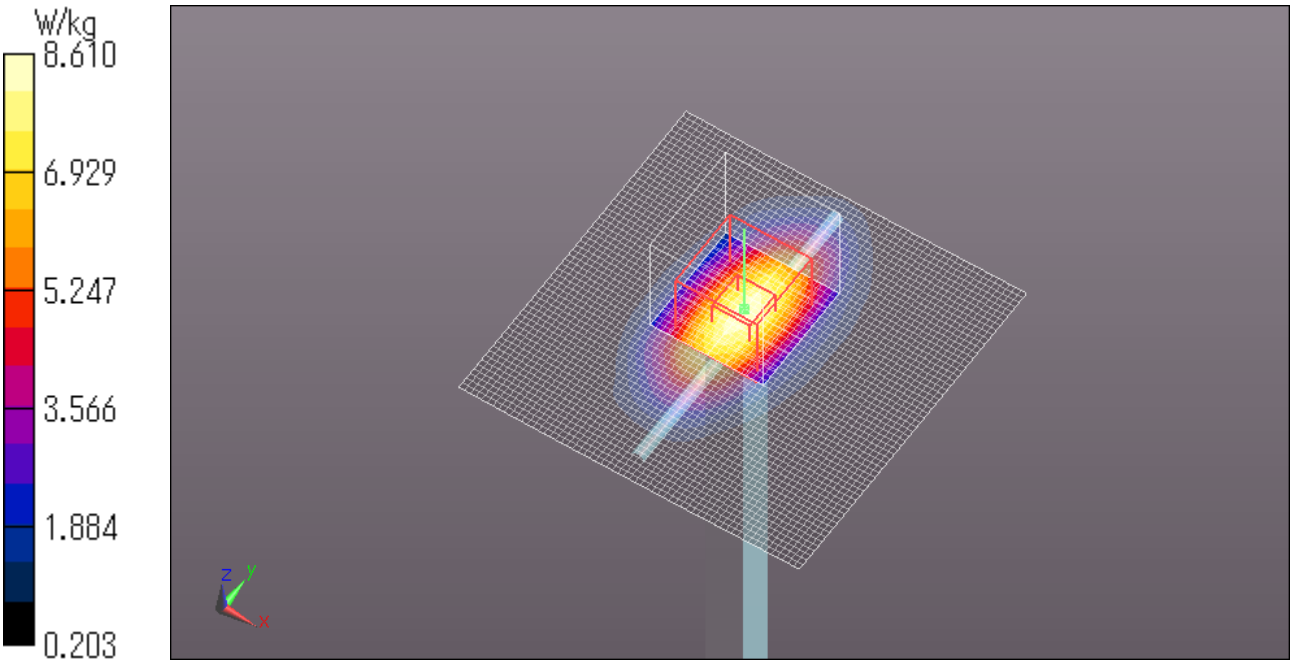
*2 The taget value is the parameter defined in 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D1640V2 SN

BODY 1640MHz System Validation DATA / Dipole 1640MHz / Forward Conducted Power : 250mW

Communication System: UID 0, CW; Communication System Band: D1640 (1640.0 MHz); Frequency: 1640 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1640 MHz; σ = 1.378 S/m; ε_r = 53.066; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration
Probe: ET3DV6 - SN1685; ConvF(5.05, 5.05, 5.05); Calibrated: 2013/07/19; ${Probe: Calibration Date}
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2013/07/16
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
Measurement SW: DASY52, Version 52.8 (7);

Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 9.58 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.689 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 11.4 W/kg
SAR(1 g) = 7.65 W/kg; SAR(10 g) = 4.36 W/kg
Maximum value of SAR (measured) = 8.61 W/kg
Date: 2013/10/10
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



2. System Validation Dipole (D1640V2,S/N: 320)

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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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: D1640V2-320_Jun12

CALIBRATION CERTIFICATE

Object: D1640V2 - SN: 320

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: June 22, 2012

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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

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-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 22, 2012

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

Certificate No: D1640V2-320_Jun12 Page 1 of 8

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

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

Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) 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
b) 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
c) 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:

d) 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	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1640 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.2	1.31 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.0 ± 6 %	1.36 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	8.48 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**33.3 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.59 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**18.1 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.7	1.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.8 ± 6 %	1.44 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	8.49 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**33.5 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.63 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**18.4 mW / g ± 16.5 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.6 Ω + 2.8 jΩ
Return Loss	- 28.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.9 Ω + 2.8 jΩ
Return Loss	- 30.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.229 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	October 20, 2006

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DASY5 Validation Report for Head TSL

Date: 20.06.2012

Test Laboratory: SPEAG, Zurich, Switzerland

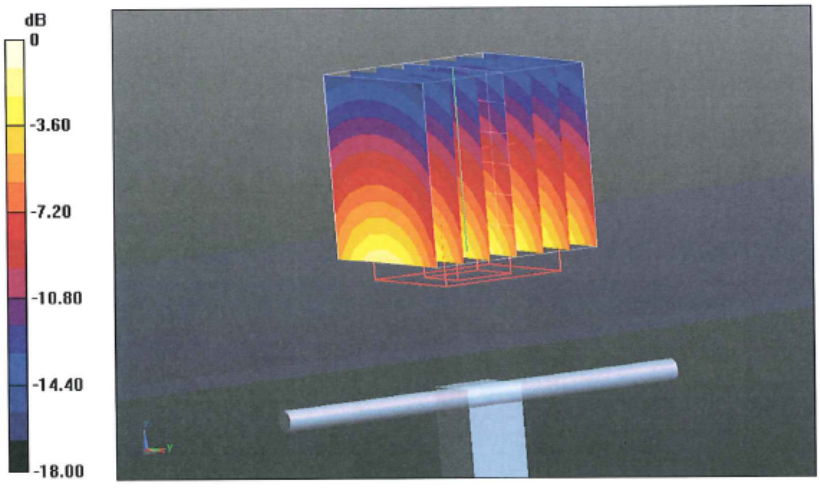
DUT: Dipole 1640 MHz; Type: D1640V2; Serial: D1640V2 - SN: 320

Communication System: CW; Frequency: 1640 MHz
Medium parameters used: f = 1640 MHz; σ = 1.36 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.31, 5.31, 5.31); Calibrated: 30.12.2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)
(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.828 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 15.166 mW/g
SAR(1 g) = 8.48 mW/g; SAR(10 g) = 4.59 mW/g
Maximum value of SAR (measured) = 9.38 mW/g



0 dB = 9.38 mW/g = 19.44 dB mW/g

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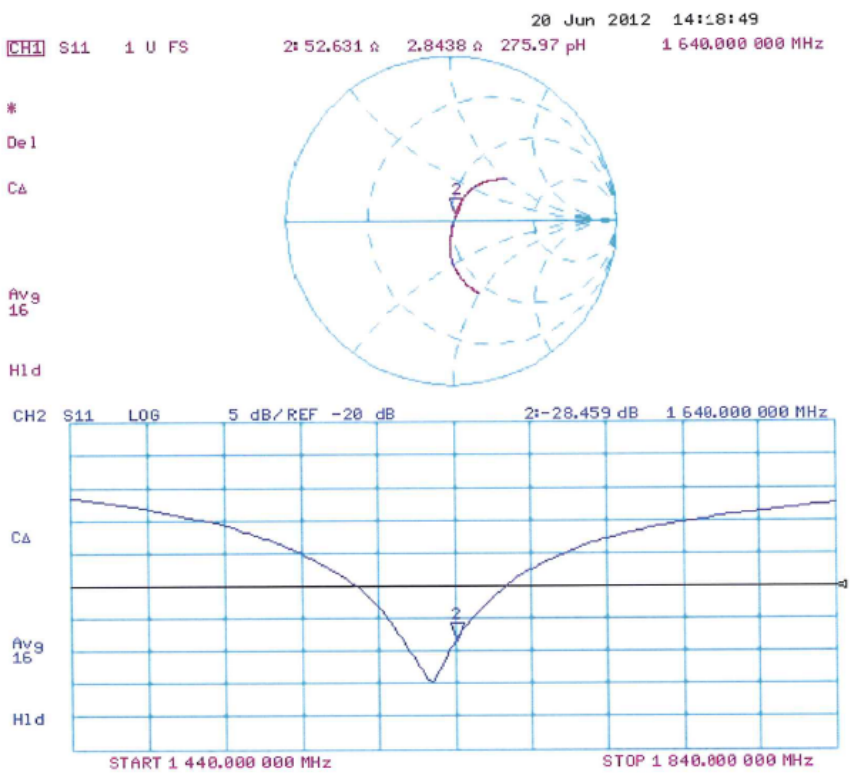
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 22.06.2012

Test Laboratory: SPEAG, Zurich, Switzerland

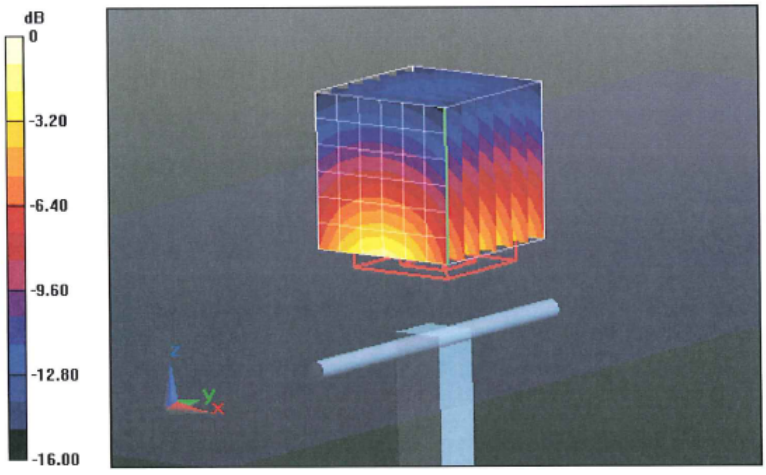
DUT: Dipole 1640 MHz; Type: D1640V2; Serial: D1640V2 - SN: 320

Communication System: CW; Frequency: 1640 MHz
Medium parameters used: f = 1640 MHz; σ = 1.44 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.14, 5.14, 5.14); Calibrated: 30.12.2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)
(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.168 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 14.859 mW/g
SAR(1 g) = 8.49 mW/g; SAR(10 g) = 4.63 mW/g
Maximum value of SAR (measured) = 9.52 mW/g



0 dB = 9.52 mW/g = 19.57 dB mW/g

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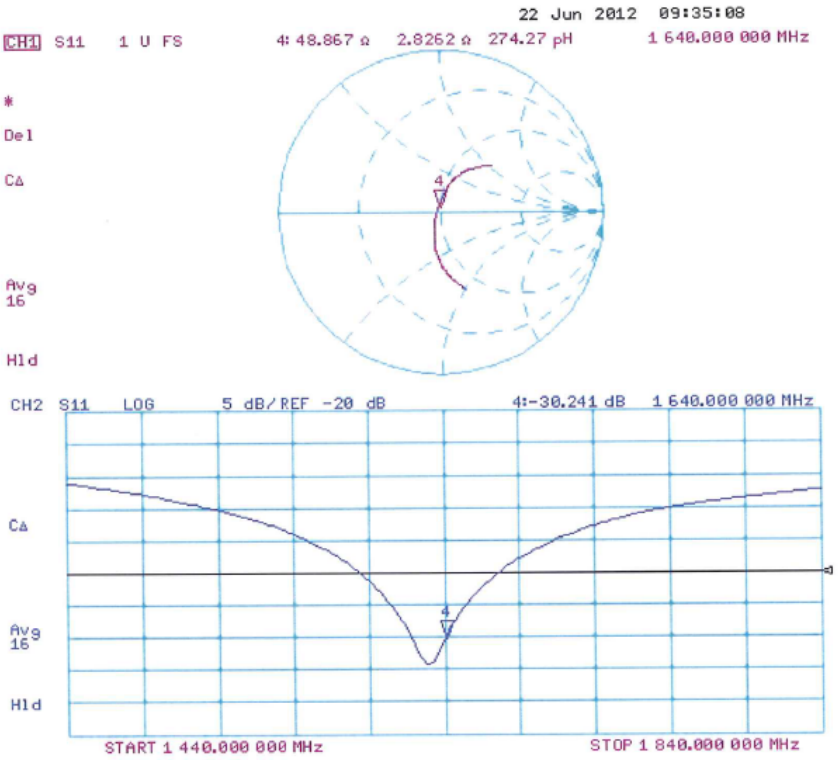
Impedance Measurement Plot for Body TSL



D1640V2 Calibration for Impedance and Return-loss

Equipment	Dipole Antenna	Model	D1640V2
Manufacture	Schmid&Partner Engineering AG	Serial	320
Tested by	Tomotsugu Koyama		

1. Test environment

Date	June 21, 2013		
Ambient Temperature	24.0 deg.C	Relative humidity	40%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	2012/09/14 * 12
MNCK-01	Type N Calibration Kit	Agilent	85032F	MY41495257	SAR	2012/09/18 * 12
EST-46	3.5mm ECONOMY CALIBRATION KIT	Agilent	85052D	MY43252869	SAR	2012/08/13 * 12
MDA-11	Dipole Antenna	Schmid&Partner Engineering AG	D1640V2	320	SAR	2012/06/22 * 12
MPSAM-04	SAM Phantom	Schmid&Partner Engineering AG	SAM Twin Phantom V4.0 and V5.0	1764	SAR	2013/06/11 * 12
MPF-03	2mmOval Flat Phantom ERI 5.0	Schmid&Partner Engineering AG	QD OVA 002A (ERI5.0)	1207	SAR	2013/06/18 * 12
MOS-26	Thermo-Hygrometer	Custom	CTH-201	-	SAR	2013/05/16 * 12
HSL1800						Daily check
MSL1800						Daily check
SAR room1						Daily check

3. Test Result

Impeadance,Transformed to feed point	Head	Deviation	Tolerance	Result
Calibration (SPEAG) 2012/06/22	52.6 Ω+2.8jΩ	-	-	-
Calibration(ULJ)2013/6/21	55.43Ω+1.824jΩ	+2.83Ω-0.976jΩ	+/-5Ω+/-5jΩ	Complied

Return loss	Head	Deviation	Tolerance	Result
Calibration (SPEAG) 2012/06/22	-28.5dB	-	-	-
Calibration(ULJ)2013/6/21	-25.30dB	+3.20dB	-28.5 *+/-20%	Complied

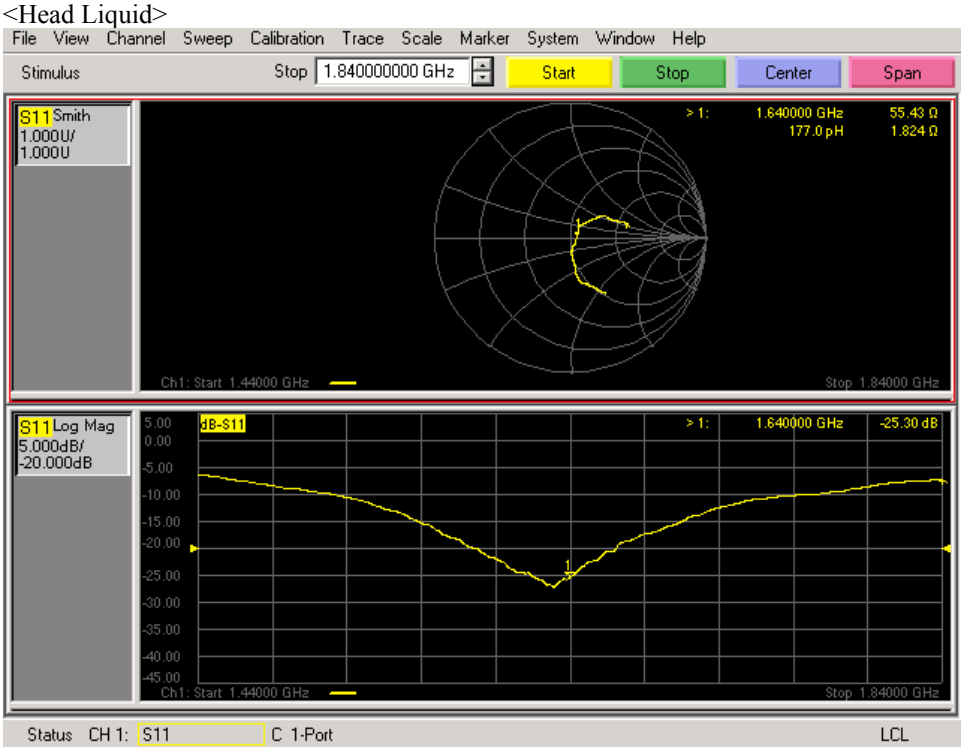
Impeadance,Transformed to feed point	Body	Deviation	Tolerance	Result
Calibration (SPEAG) 2012/06/22	48.9 Ω+2.8jΩ	-	-	-
Calibration(ULJ)2013/6/21	49.62Ω+3.801jΩ	0.72Ω+1.001jΩ	+/-5Ω+/-5jΩ	Complied

Return loss	Body	Deviation	Tolerance	Result
Calibration (SPEAG) 2012/06/22	-30.2dB	-	-	-
Calibration(ULJ)2013/6/21	-28.33dB	1.87dB	-30.2 *+/-20%	Complied

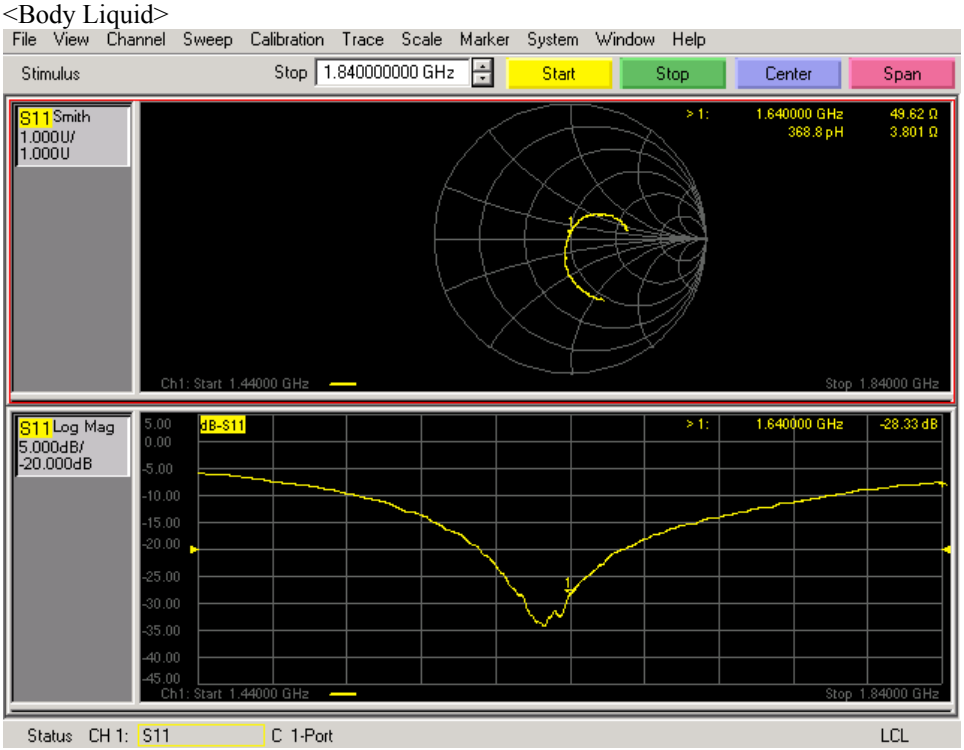
*Tolerance : According to the KDB450824D02

Measurement Plots

<Head Liquid>



<Body Liquid>



3. Validation 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.

Error Description	Uncertai value ±	Probability distribution	divisor	(ci) 1g	Standard (1g)	vi or veff
Measurement System						
Probe calibration	± 6.00	Normal	1	1	± 6.00	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	1	± 2.7	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	0	± 0.0	∞
Boundary effects	± 1.0	Rectangular	√3	1	± 0.6	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Modulation response	± 0.0	Rectangular	√3	1	± 0.0	∞
Readout electronics	± 0.3	Normal	1	1	± 0.3	∞
Response time	± 0.0	Rectangular	√3	1	± 0.0	∞
Integration time	± 0.0	Rectangular	√3	1	± 0.0	∞
RF ambient Noise	± 1.0	Rectangular	√3	1	± 0.6	∞
RF ambient Reflections	± 1.0	Rectangular	√3	1	± 0.6	∞
Probe Positioner	± 0.8	Rectangular	√3	1	± 0.5	∞
Probe positioning	± 6.7	Rectangular	√3	1	± 3.9	∞
Max.SAR Eval.	± 2.0	Rectangular	√3	1	± 1.2	∞
Dipole Related						
Deviation of exp.dipole	± 5.5	Rectangular	√3	1	± 3.2	∞
Dipole Axis to Liquid Distance	± 2.0	Rectangular	√3	1	± 1.2	∞
Input power and SAR drift meas.	± 3.4	Rectangular	√3	1	± 2.0	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.78	± 2.3	∞
Liquid conductivity (meas.)	+ 5.0	Normal	1	0.26	+ 1.3	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.78	± 2.3	∞
Liquid permittivity (meas.)	- 5.0	Normal	1	0.23	- 1.2	∞
Liquid conductivity - temp.unc (below 2deg.C.)	± 1.7	Rectangular	√3	0.78	± 0.8	∞
Liquid permittivity - temp.unc (below 2deg.C.)	± 0.3	Rectangular	√3	0.23	± 0.0	∞
Combined Standard Uncertainty					± **10.157**	
Expanded Uncertainty (k=2)					± **20.3**	

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