

TA Technology (Shanghai) Co., Ltd.

Test Report

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.9 Ω - 3.1 $j\Omega$
Return Loss	- 27.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.7 Ω - 5.4 $j\Omega$
Return Loss	- 25.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 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.

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	April 22, 2004

DASY5 Validation Report for Head TSL

Date: 25.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.89$ mho/m; $\epsilon_r = 41.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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

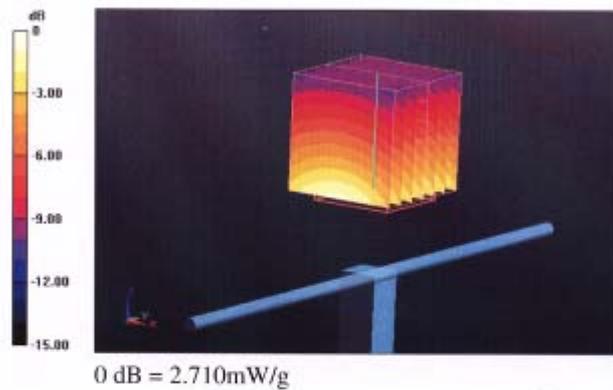
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.930 V/m; Power Drift = 0.03 dB

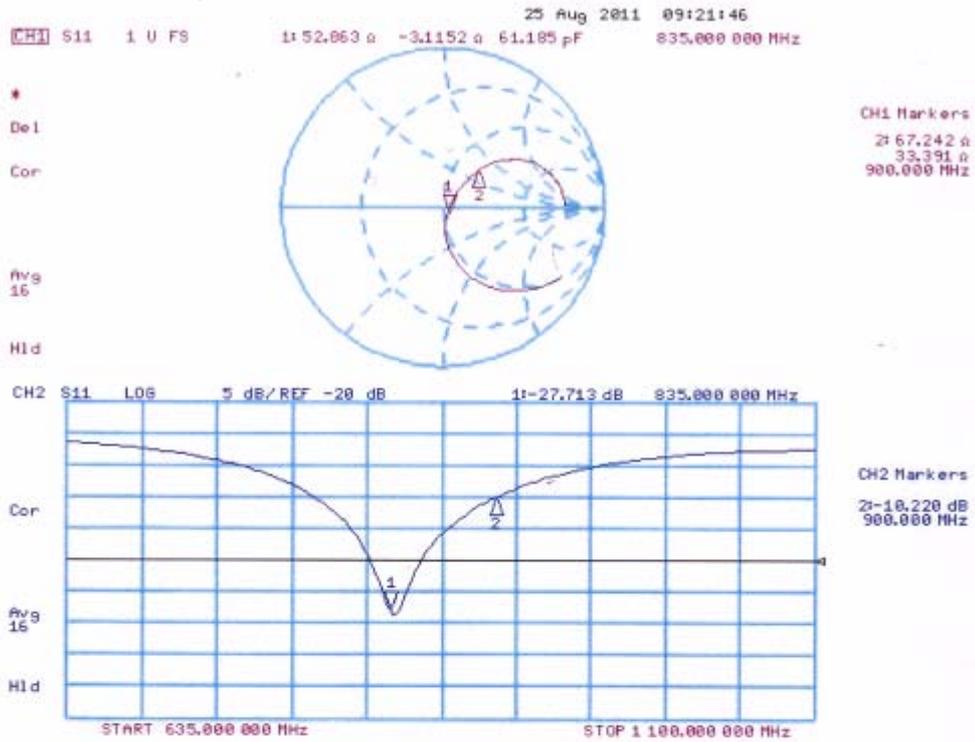
Peak SAR (extrapolated) = 3.421 W/kg

SAR(1 g) = 2.32 mW/g; SAR(10 g) = 1.52 mW/g

Maximum value of SAR (measured) = 2.708 mW/g



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 26.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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

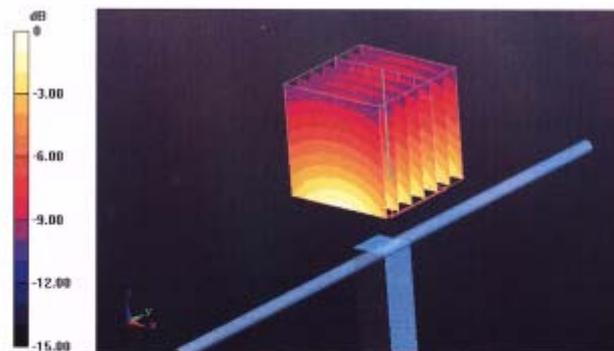
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.406 V/m; Power Drift = 0.02 dB

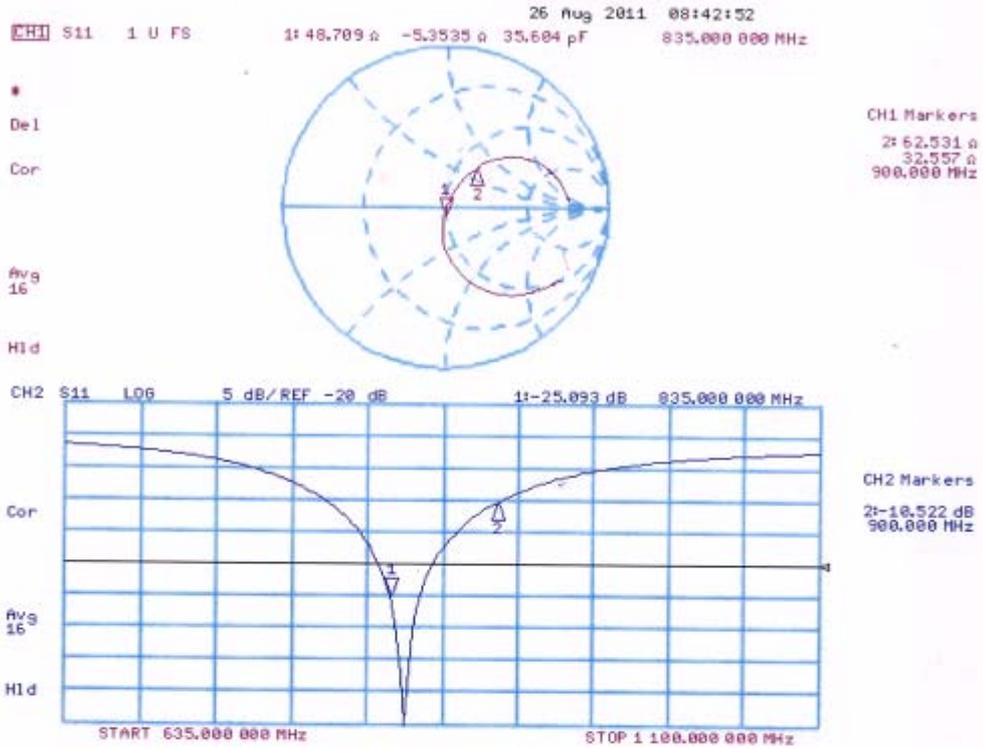
Peak SAR (extrapolated) = 3.509 W/kg

SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.59 mW/g

Maximum value of SAR (measured) = 2.827 mW/g



Impedance Measurement Plot for Body TSL



TA Technology (Shanghai) Co., Ltd.

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Report No.: RXA1411-0267SAR01R3

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ANNEX I: D835V2 Dipole Calibration Certificate(August 28,2014)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
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Client **TA(Shanghai)** Certificate No: **Z14-97073**

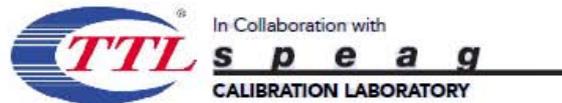
CALIBRATION CERTIFICATE			
Object	D835V2 - SN: 4d020		
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits		
Calibration date:	August 28, 2014		
<p>This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	11-Sep-13 (TMC, No.JZ13-443)	Sep-14
Power sensor NRV-Z5	100595	11-Sep-13 (TMC, No. JZ13-443)	Sep -14
Reference Probe ES3DV3 DAE3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)	Sep-14
	SN 536	23-Jan-14 (SPEAG, DAE3-536_Jan14)	Jan -15
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)	Nov-14
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)	Oct-14
Calibrated by:	Name	Function	Signature
	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	
Issued: September 4, 2014			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

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Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- KDB865664, 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.

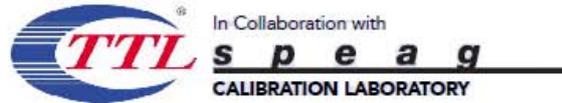
The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor $k=2$, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.5 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.54 mW/g ± 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.57 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.26 mW/g ± 20.4 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.7 ± 6 %	0.97 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

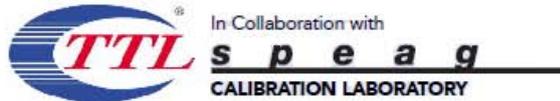
SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.37 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.54 mW/g ± 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.57 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.31 mW/g ± 20.4 % (k=2)

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.6Ω + 2.75jΩ
Return Loss	- 30.1dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	54.0Ω + 5.88jΩ
Return Loss	- 23.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.242 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.

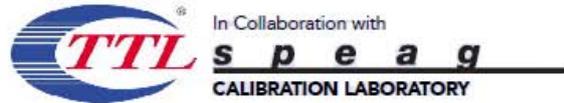
Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 28.08.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.909 \text{ S/m}$; $\epsilon_r = 42.49$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(6.21, 6.21, 6.21); Calibrated: 2013-09-05;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=250 mW,

dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

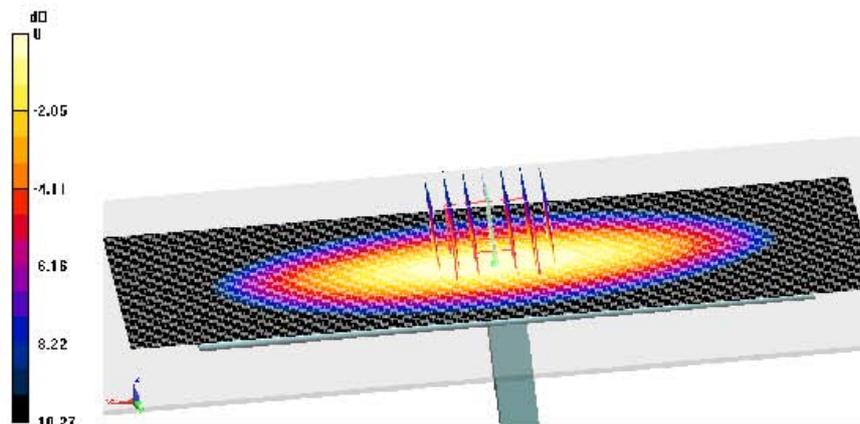
$dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.88 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.54 W/kg

SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 2.79 W/kg

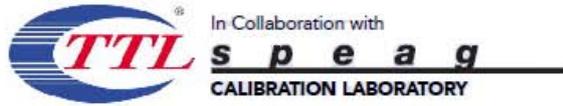


0 dB = 2.79 W/kg = 4.46 dBW/kg

TA Technology (Shanghai) Co., Ltd. Test Report

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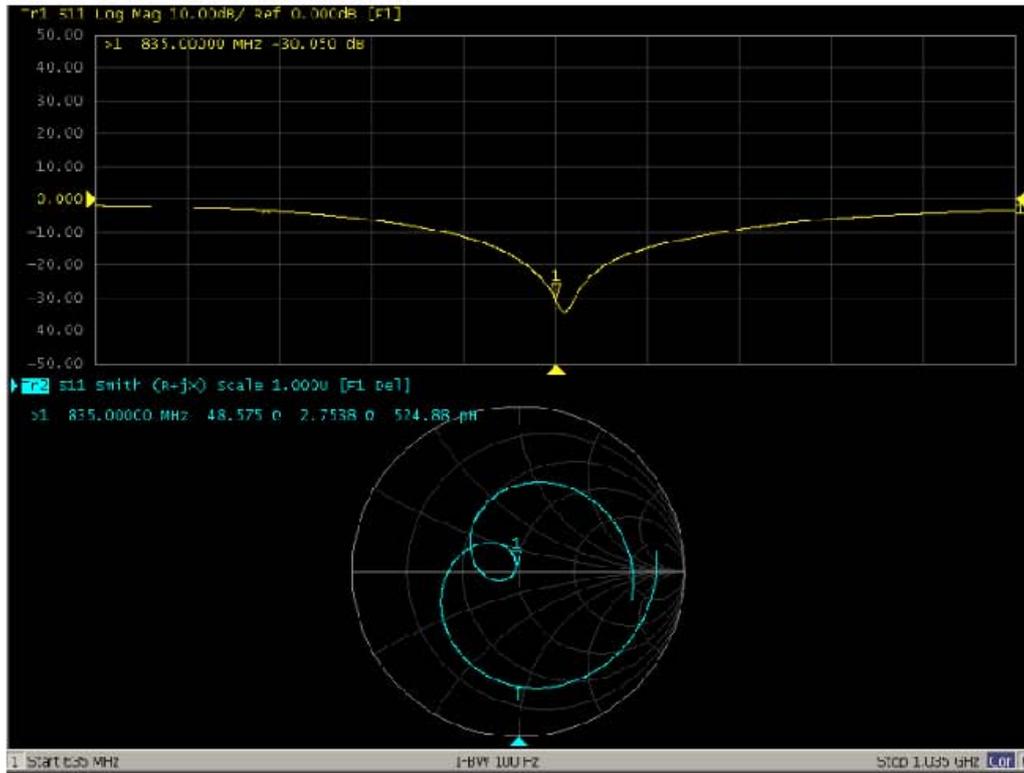
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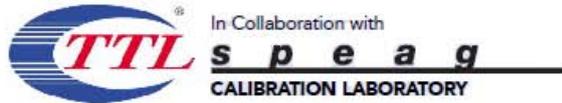
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 28.08.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

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

Medium parameters used: $f = 835$ MHz; $\sigma = 0.97$ S/m; $\epsilon_r = 56.745$; $\rho = 1000$ kg/m³

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(5.98, 5.98, 5.98); Calibrated: 2013-09-05;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

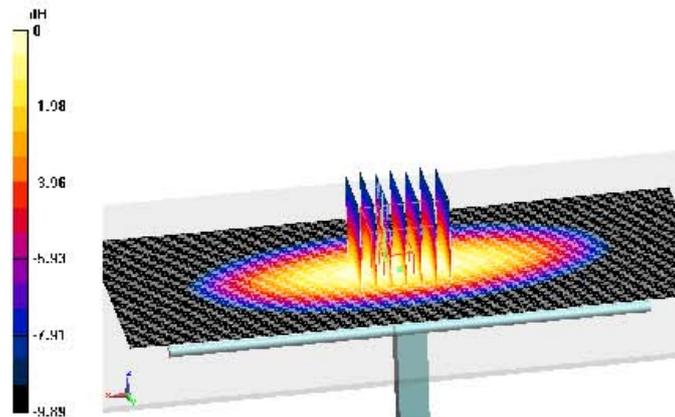
System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.515 W/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.45 W/kg

SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 2.74 W/kg

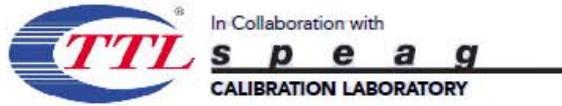


0 dB = 2.74 W/kg = 4.38 dBW/kg

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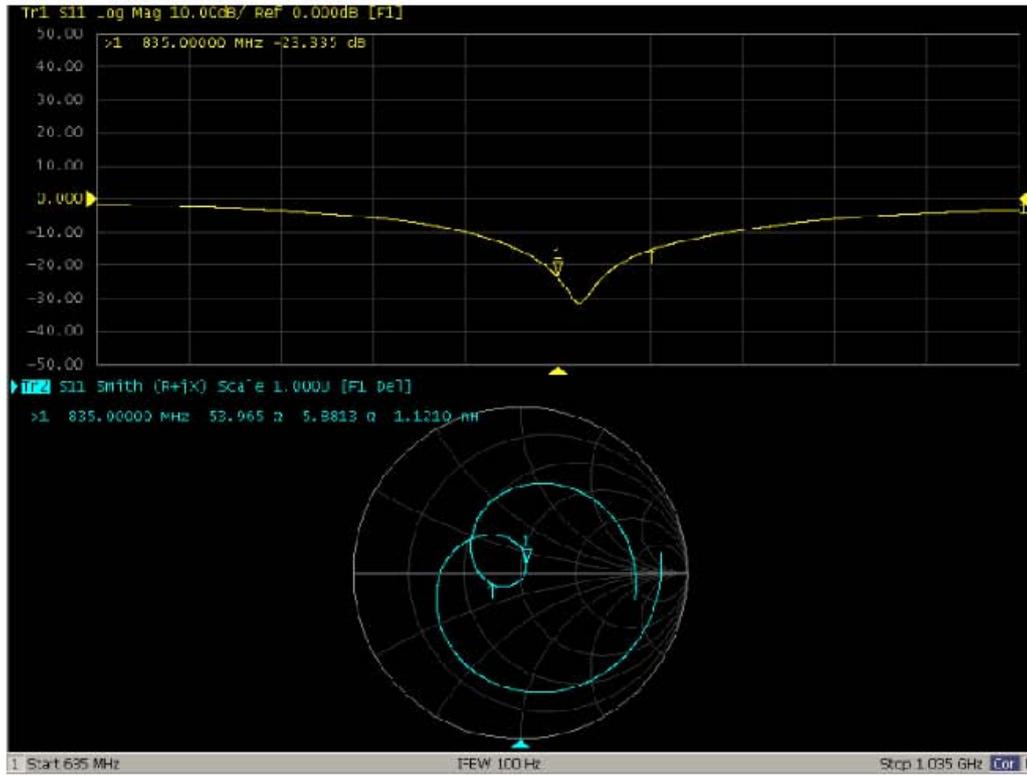
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Impedance Measurement Plot for Body TSL



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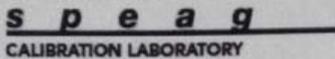
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ANNEX J: D1750V2 Dipole Calibration Certificate



TMC

In Collaboration with



s p e a g

CALIBRATION LABORATORY



ILAC-MRA



校准
CNAS L0442

Add: No 52 Huayuanbei Road, Haidian District, Beijing, 100191, China
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 E-mail: Info@emcite.com Http://www.emcite.com

Client **TA(Shanghai)**

Certificate No: **J14-2-0053**

CALIBRATION CERTIFICATE

Object: **D1750V2 - SN: 1033**

Calibration Procedure(s): **TMC-OS-E-02-194
Calibration procedure for dipole validation kits**

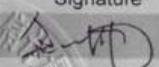
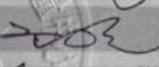
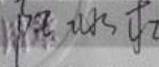
Calibration date: **January 26, 2014**

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±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	11-Sep-13 (TMC, No.JZ13-443)	Sep-14
Power sensor NRV-Z5	100595	11-Sep-13 (TMC, No. JZ13-443)	Sep -14
Reference Probe EX3DV4	SN 3846	3- Sep-13 (SPEAG, No.EX3-3846_Sep13)	Sep-14
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb -14
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No. JZ13-394)	Nov-14
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No. JZ13-278)	Oct-14

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: January 28, 2014

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

Certificate No: J14-2-0053

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E-mail: Info@emcite.com [Http://www.emcite.com](http://www.emcite.com)

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- KDB865664, 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%.

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E-mail: Info@emcite.com [Http://www.emcite.com](http://www.emcite.com)

Measurement Conditions

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

DASY Version	DASY52	52.8.7.1137
Extrapolation	Advanced Extrapolation	
Phantom	Twin Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.6 ± 6 %	1.35 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.24 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	37.2 mW / g ± 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.92 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	19.8 mW / g ± 20.4 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.8 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.63 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	38.8 mW / g ± 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.14 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.6 mW / g ± 20.4 % (k=2)



Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.5Ω- 0.63jΩ
Return Loss	- 41.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.8Ω- 3.98jΩ
Return Loss	- 24.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.031 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
-----------------	-------



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E-mail: Info@emcite.com Http://www.emcite.com

DASY5 Validation Report for Head TSL

Date: 26.01.2014

Test Laboratory: TMC, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1033

Communication System: UID 0, CW (0); Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.35$ S/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.85, 7.85, 7.85); Calibrated: 2013/9/3
- Sensor-Surface: 2mm (Mechanical Surface Detection);
- Electronics: DAE4 Sn777; Calibrated: 2013/2/22
- Phantom: SAM1593; Type: QD000P40CC; Serial: TP:1593
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

Dipole Calibration for Head Tissue/ $d=10$ mm, $P_{in}=250$ mW, $dist=2.0$ mm

(EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

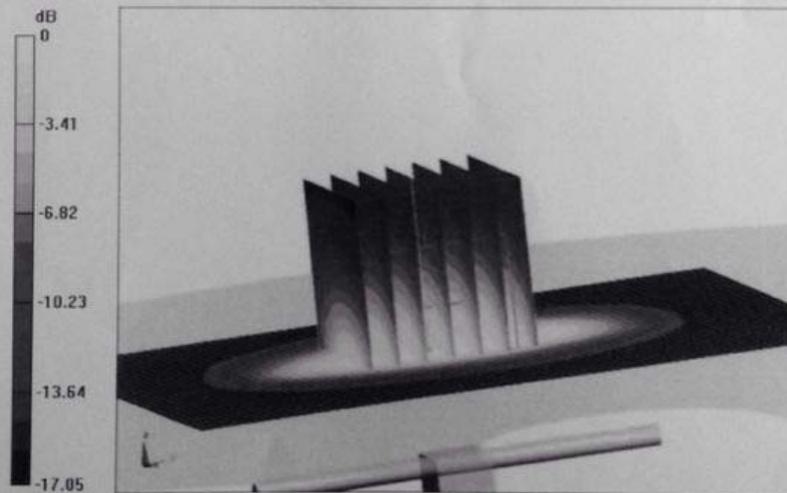
$dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 100.1 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 16.8 W/kg

SAR(1 g) = 9.24 W/kg; SAR(10 g) = 4.92 W/kg

Maximum value of SAR (measured) = 13.1 W/kg



0 dB = 13.1 W/kg = 11.17 dBW/kg

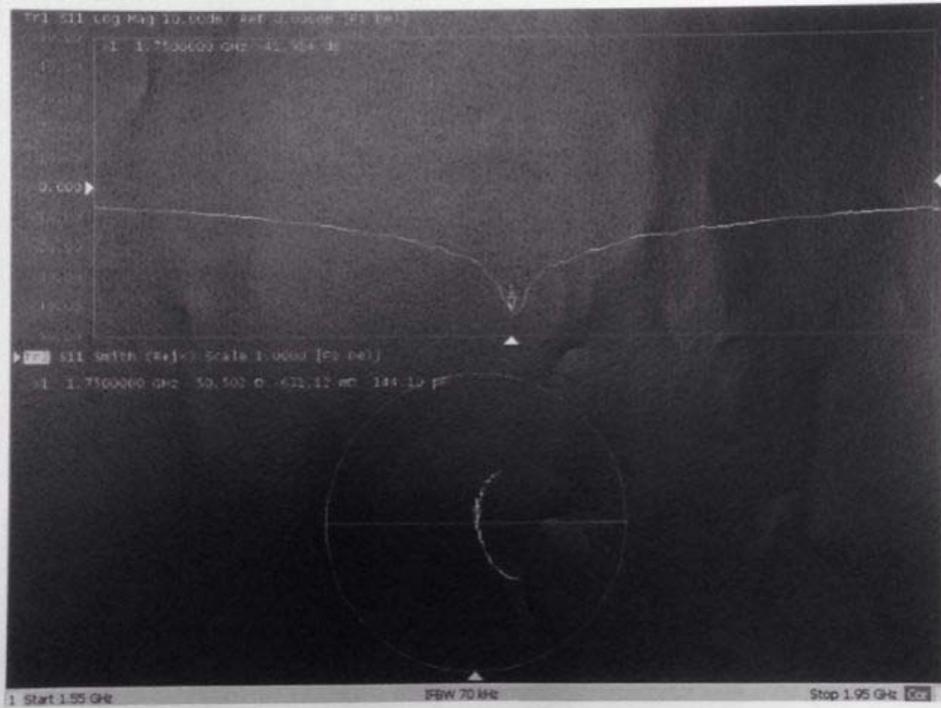
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Impedance Measurement Plot for Head TSL





Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-82304633-2079 Fax: +86-10-62304633-2504
E-mail: Info@emcite.com Http://www.emcite.com

DASY5 Validation Report for Body TSL

Date: 26.01.2014

Test Laboratory: TMC, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1033

Communication System: UID 0, CW (0); Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.47$ S/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.56, 7.56, 7.56); Calibrated: 2013/9/3
- Sensor-Surface: 2mm (Mechanical Surface Detection);
- Electronics: DAE4 Sn777; Calibrated: 2013/2/22
- Phantom: SAM 1186; Type: QD000P40CC;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

Dipole Calibration for Body Tissue/ $d=10$ mm, $P_{in}=250$ mW, $dist=2.0$ mm

(EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

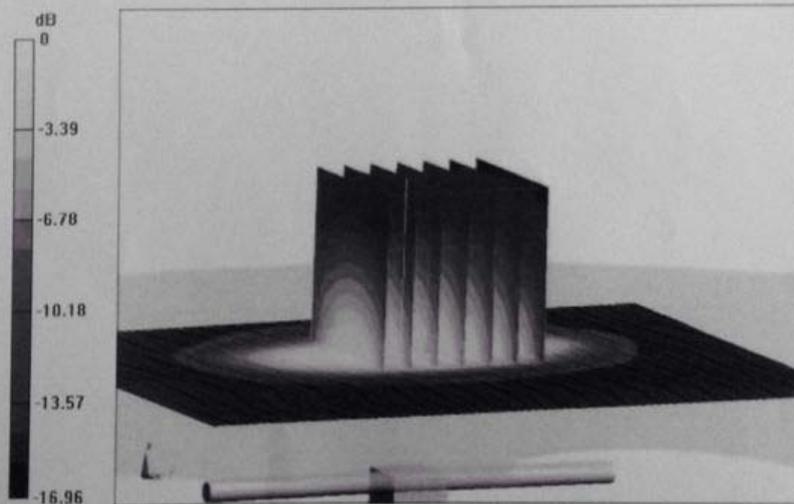
$dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 82.820 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 17.2 W/kg

SAR(1 g) = 9.63 W/kg; SAR(10 g) = 5.14 W/kg

Maximum value of SAR (measured) = 13.6 W/kg



0 dB = 13.6 W/kg = 11.34 dBW/kg

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ANNEX K: D1900V2 Dipole Calibration Certificate(August 31,2011)

**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 **TA-Shanghai (Auden)**

Certificate No: **D1900V2-5d060_Aug11**

CALIBRATION CERTIFICATE																																															
Object	D1900V2 - SN: 5d060																																														
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz																																														
Calibration date:	August 31, 2011																																														
<p>This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Primary Standards</th> <th style="width: 15%;">ID #</th> <th style="width: 30%;">Cal Date (Certificate No.)</th> <th style="width: 25%;">Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter EPM-442A</td> <td>GB37480704</td> <td>06-Oct-10 (No. 217-01266)</td> <td>Oct-11</td> </tr> <tr> <td>Power sensor HP 8481A</td> <td>US37292783</td> <td>06-Oct-10 (No. 217-01266)</td> <td>Oct-11</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: S5086 (20b)</td> <td>29-Mar-11 (No. 217-01367)</td> <td>Apr-12</td> </tr> <tr> <td>Type-N mismatch combination</td> <td>SN: 5047.2 / 06327</td> <td>29-Mar-11 (No. 217-01371)</td> <td>Apr-12</td> </tr> <tr> <td>Reference Probe ES3DV3</td> <td>SN: 3205</td> <td>29-Apr-11 (No. ES3-3205_Apr11)</td> <td>Apr-12</td> </tr> <tr> <td>DAE4</td> <td>SN: 601</td> <td>04-Jul-11 (No. DAE4-601_Jul11)</td> <td>Jul-12</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Secondary Standards</th> <th style="width: 15%;">ID #</th> <th style="width: 30%;">Check Date (in house)</th> <th style="width: 25%;">Scheduled Check</th> </tr> </thead> <tbody> <tr> <td>Power sensor HP 8481A</td> <td>MY41092317</td> <td>18-Oct-02 (in house check Oct-09)</td> <td>In house check: Oct-11</td> </tr> <tr> <td>RF generator R&S SMT-06</td> <td>100005</td> <td>04-Aug-99 (in house check Oct-09)</td> <td>In house check: Oct-11</td> </tr> <tr> <td>Network Analyzer HP 8753E</td> <td>US37390585 S4206</td> <td>18-Oct-01 (in house check Oct-10)</td> <td>In house check: Oct-11</td> </tr> </tbody> </table>				Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration	Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11	Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11	Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12	Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12	Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-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-09)	In house check: Oct-11	RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-09)	In house check: Oct-11	Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11
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Calibrated by:	Name Dimce Iliev	Function Laboratory Technician	Signature 																																												
Approved by:	Name Katja Pokovic	Technical Manager																																													
			Issued: August 31, 2011																																												
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.																																															

TA Technology (Shanghai) Co., Ltd.

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



S Schweizerischer Kalibrierdienst
S Service suisse d'étalonnage
C 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**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

TA Technology (Shanghai) Co., Ltd.

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Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	39.5 \pm 6 %	1.42 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	40.3 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.30 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	21.1 mW / g \pm 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 \pm 0.2) °C	53.9 \pm 6 %	1.57 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	10.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	41.7 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.55 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	22.0 mW / g \pm 16.5 % (k=2)

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.6 Ω + 7.5 j Ω
Return Loss	- 22.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.3 Ω + 7.9 j Ω
Return Loss	- 21.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.194 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.

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 10, 2004

DASY5 Validation Report for Head TSL

Date: 30.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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

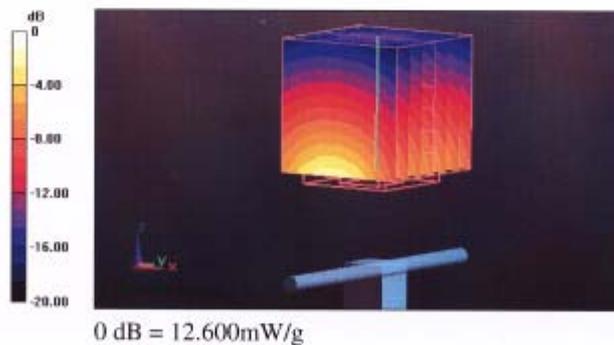
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.636 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 18.535 W/kg

SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.3 mW/g

Maximum value of SAR (measured) = 12.600 mW/g

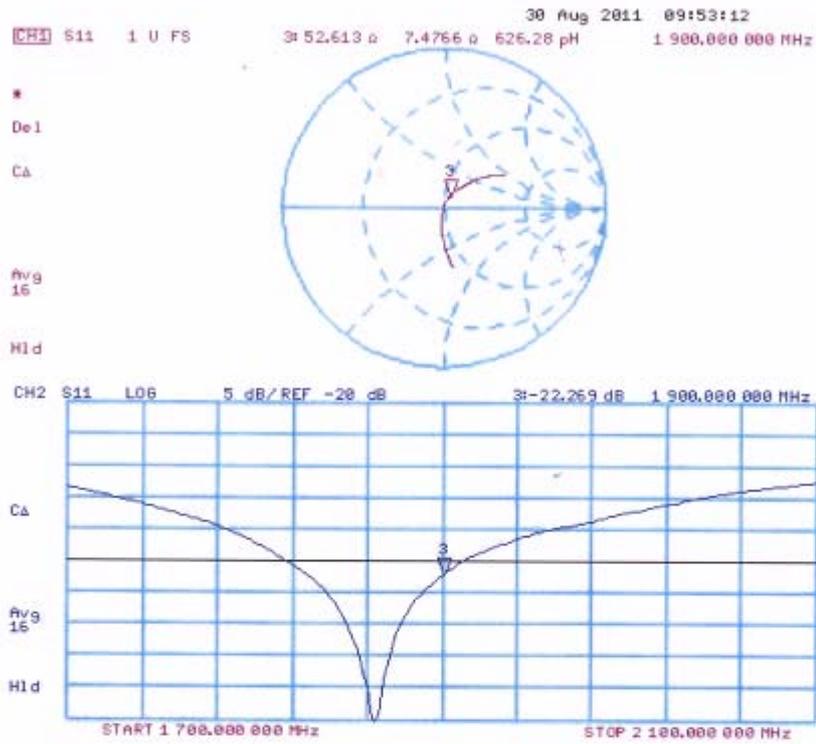


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Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 31.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.57$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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

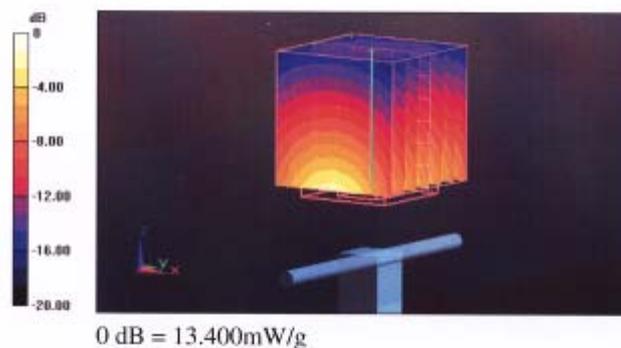
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.435 V/m; Power Drift = -0.0099 dB

Peak SAR (extrapolated) = 18.663 W/kg

SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.55 mW/g

Maximum value of SAR (measured) = 13.397 mW/g

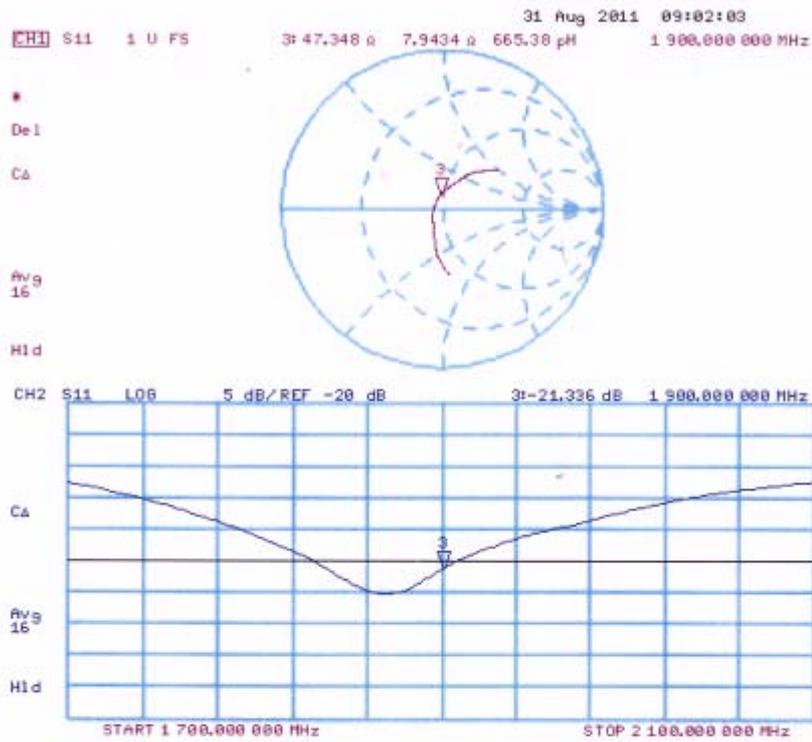


TA Technology (Shanghai) Co., Ltd. Test Report

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Impedance Measurement Plot for Body TSL



TA Technology (Shanghai) Co., Ltd. Test Report

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ANNEX L: D1900V2 Dipole Calibration Certificate(September 1,2014)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn



Client	TA(Shanghai)	Certificate No: Z14-97074
CALIBRATION CERTIFICATE		
Object	D1900V2 - SN: 5d060	
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits	
Calibration date:	September 1, 2014	
<p>This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>		
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)
Scheduled Calibration		
Power Meter NRVD	102083	11-Sep-13 (TMC, No.JZ13-443)
Power sensor NRV-Z5	100595	11-Sep-13 (TMC, No. JZ13-443)
Reference Probe ES3DV3 DAE3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)
	SN 536	23-Jan-14 (SPEAG, DAE3-536_Jan14)
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)
		Sep-14
		Sep -14
		Sep-14
		Jan -15
		Nov-14
		Oct-14
Calibrated by:	Name Zhao Jing	Function SAR Test Engineer
Reviewed by:	Qi Dianyuan	SAR Project Leader
Approved by:	Lu Bingsong	Deputy Director of the laboratory
		Signature
Issued: September 4, 2014		
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.		

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1411-0267SAR01R3

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn



Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- KDB865664, 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.

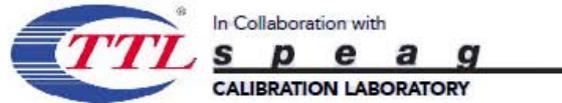
The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor $k=2$, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

TA Technology (Shanghai) Co., Ltd.

Test Report

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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.8 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.69 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	39.2 mW/g ± 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.14 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	20.7 mW/g ± 20.4 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

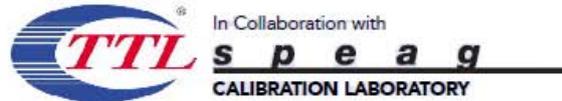
SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.98 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	40.0 mW/g ± 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.28 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.1 mW/g ± 20.4 % (k=2)

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.1Ω- 6.34jΩ
Return Loss	- 22.8dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	57.6Ω- 4.76jΩ
Return Loss	- 21.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.248 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.

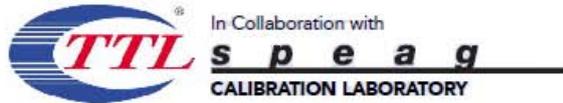
Additional EUT Data

Manufactured by	SPEAG
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TA Technology (Shanghai) Co., Ltd. Test Report

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DASY5 Validation Report for Head TSL

Date: 01.09.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.371$ S/m; $\epsilon_r = 39.83$; $\rho = 1000$ kg/m³

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(5.06, 5.06, 5.06); Calibrated: 2013-09-05;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

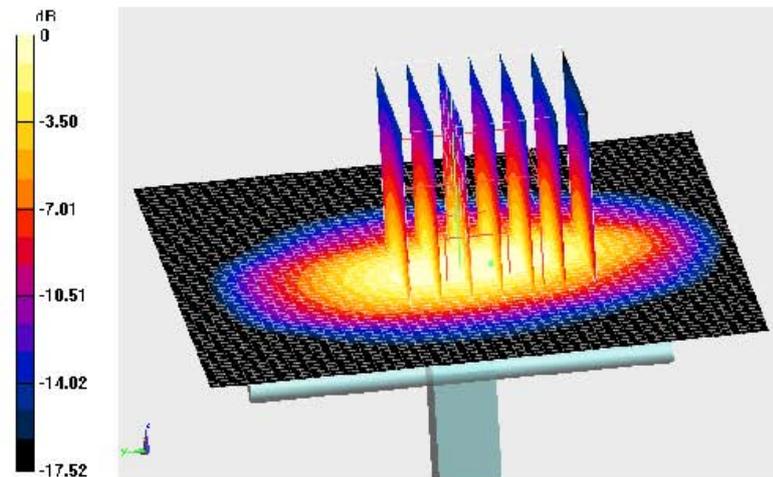
dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.911 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 17.5 W/kg

SAR(1 g) = 9.69 W/kg; SAR(10 g) = 5.14 W/kg

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



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

TA Technology (Shanghai) Co., Ltd. Test Report

Report No.: RXA1411-0267SAR01R3

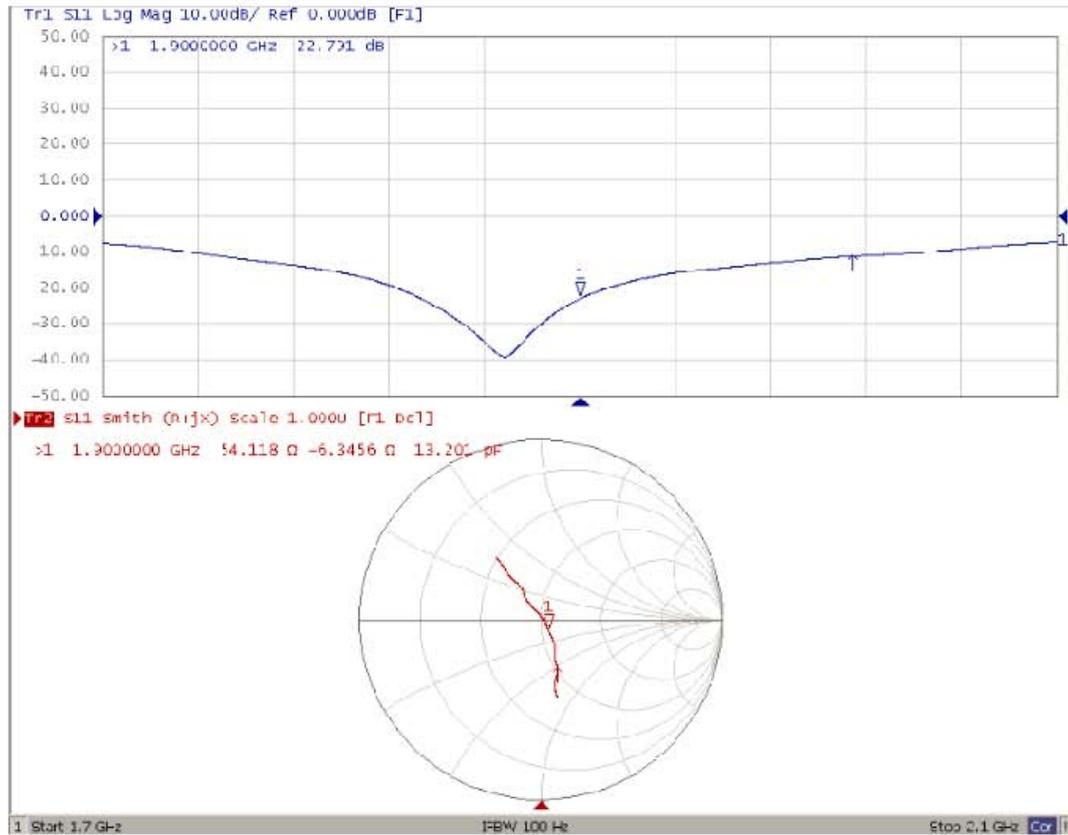
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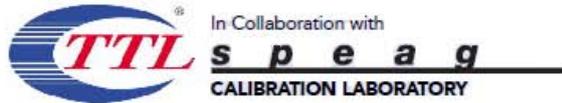
Impedance Measurement Plot for Head TSL



TA Technology (Shanghai) Co., Ltd. Test Report

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DASY5 Validation Report for Body TSL

Date: 01.09.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

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

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.5 \text{ S/m}$; $\epsilon_r = 51.78$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.72, 4.72, 4.72); Calibrated: 2013-09-03;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

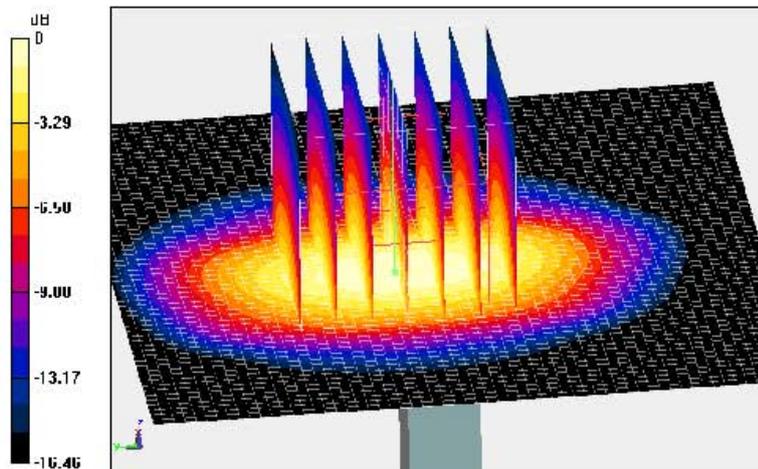
$dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 93.668 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 17.6 W/kg

SAR(1 g) = 9.98 W/kg; SAR(10 g) = 5.28 W/kg

Maximum value of SAR (measured) = 12.6 W/kg

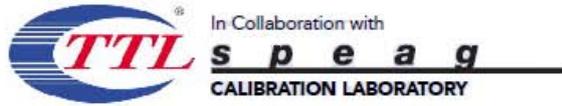


0 dB = 12.6 W/kg = 11.00 dBW/kg

TA Technology (Shanghai) Co., Ltd. Test Report

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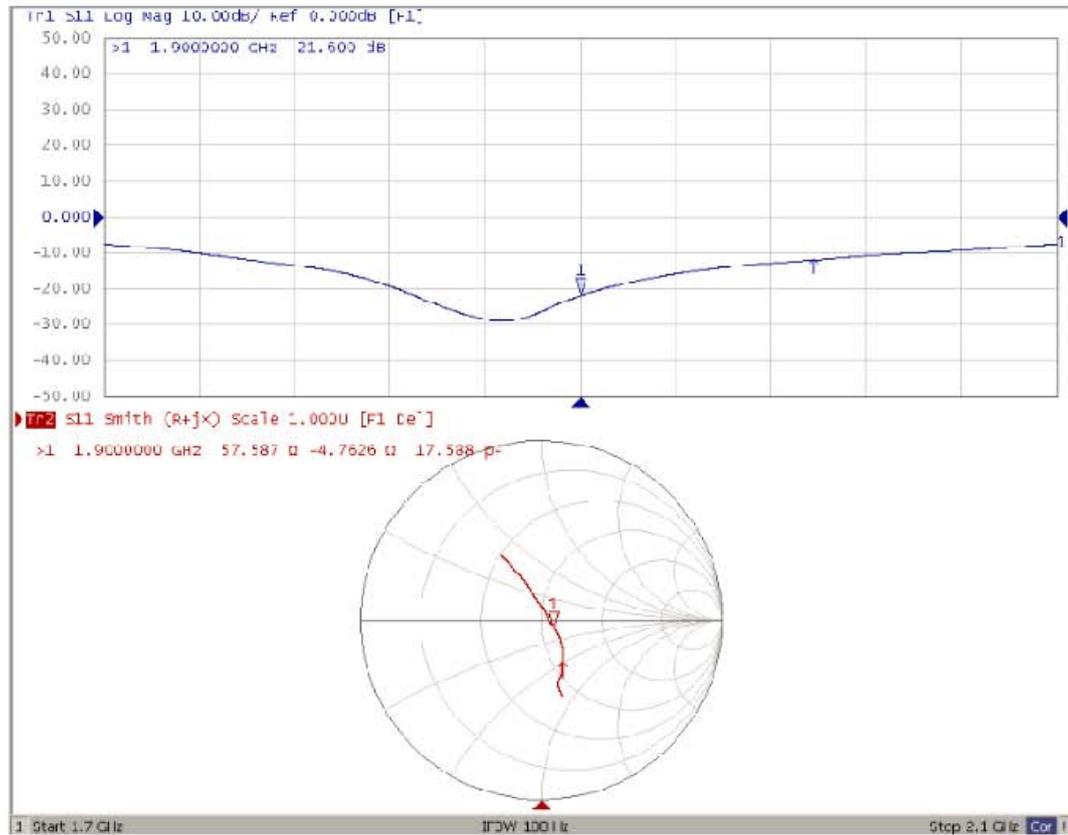
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Impedance Measurement Plot for Body TSL



TA Technology (Shanghai) Co., Ltd. Test Report

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ANNEX M: D2450V2 Dipole Calibration Certificate(August 29,2011)

**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 **TA-Shanghai (Auden)**

Certificate No: **D2450V2-786_Aug11**

CALIBRATION CERTIFICATE

Object: **D2450V2 - SN: 786**

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

Calibration date: **August 29, 2011**

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-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-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: August 29, 2011

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

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1411-0267SAR01R3

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**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**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

TA Technology (Shanghai) Co., Ltd.

Test Report

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.4 ± 6 %	1.85 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.7 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	53.8 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.41 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	25.4 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	2.02 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	13.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	51.7 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.2 mW / g ± 16.5 % (k=2)

TA Technology (Shanghai) Co., Ltd.

Test Report

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.0 Ω + 2.4 $j\Omega$
Return Loss	- 25.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.4 Ω + 3.5 $j\Omega$
Return Loss	- 29.0 dB

General Antenna Parameters and Design

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

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 06, 2005

DASY5 Validation Report for Head TSL

Date: 29.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.85$ mho/m; $\epsilon_r = 38.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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

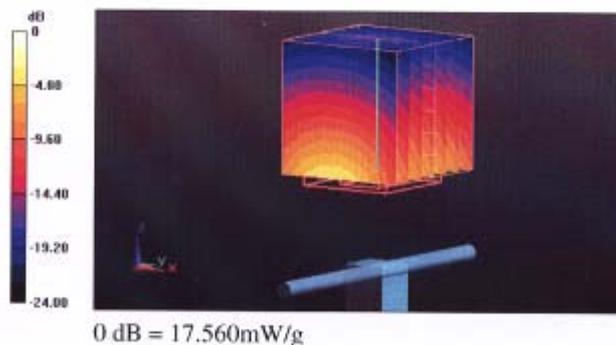
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.5 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 28.303 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.41 mW/g

Maximum value of SAR (measured) = 17.561 mW/g

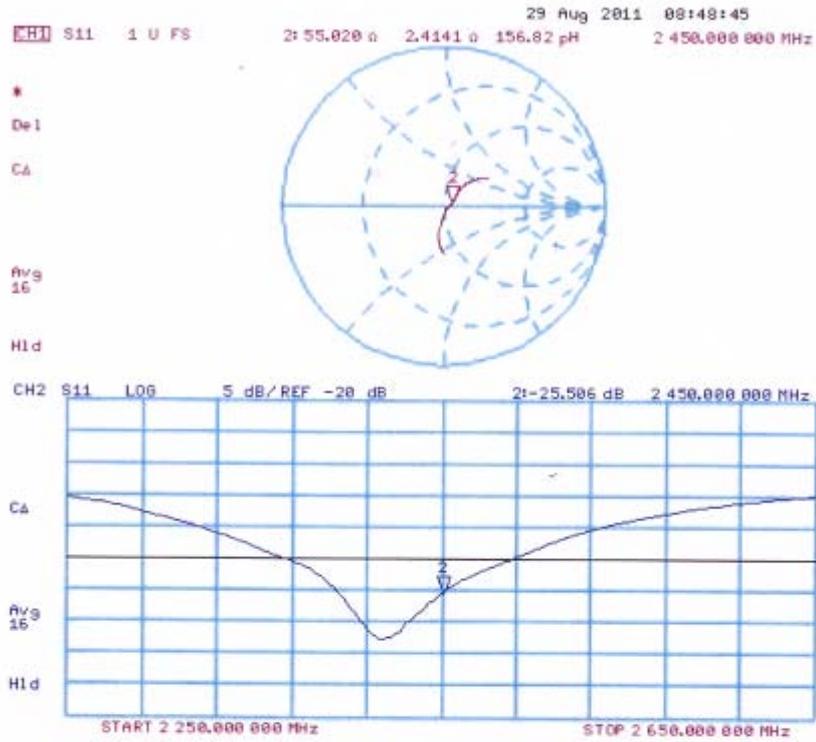


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Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 29.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.02$ mho/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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

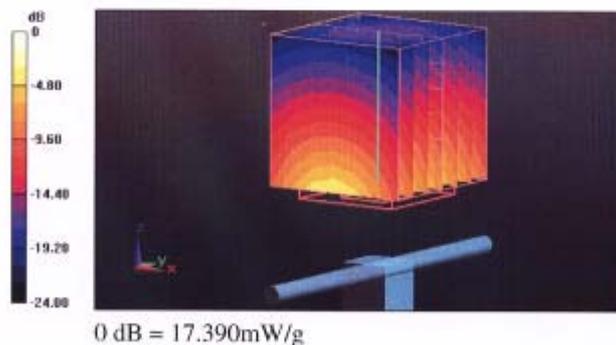
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.118 V/m; Power Drift = 0.0072 dB

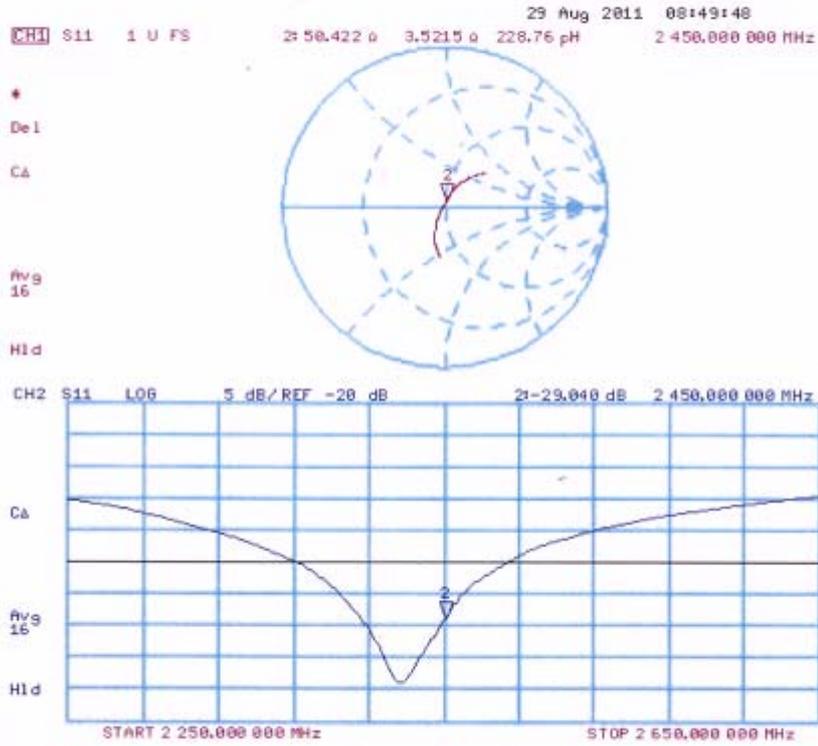
Peak SAR (extrapolated) = 27.129 W/kg

SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.1 mW/g

Maximum value of SAR (measured) = 17.387 mW/g



Impedance Measurement Plot for Body TSL



TA Technology (Shanghai) Co., Ltd. Test Report

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ANNEX N: D2450V2 Dipole Calibration Certificate(September 1,2014)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
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E-mail: cttl@chinattl.com Http://www.chinattl.cn



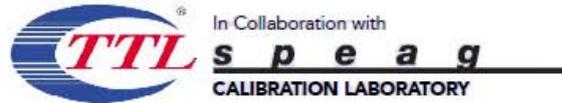
Client	TA(Shanghai)	Certificate No: Z14-97075
CALIBRATION CERTIFICATE		
Object	D2450V2 - SN: 786	
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits	
Calibration date:	September 1, 2014	
<p>This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>		
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)
		Scheduled Calibration
Power Meter NRVD	102083	11-Sep-13 (TMC, No.JZ13-443)
Power sensor NRV-Z5	100595	11-Sep-13 (TMC, No. JZ13-443)
Reference Probe ES3DV3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)
DAE3	SN 536	23-Jan-14 (SPEAG, DAE3-536_Jan14)
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)
		Oct-14
Calibrated by:	Name Zhao Jing	Function SAR Test Engineer
Reviewed by:	Qi Dianyuan	SAR Project Leader
Approved by:	Lu Bingsong	Deputy Director of the laboratory
 Issued: September 4, 2014		
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Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- KDB865664, 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%.

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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.2 ± 6 %	1.84 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	52.5 mW/g ± 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.20 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.8 mW/g ± 20.4 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.3 ± 6 %	2.00 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

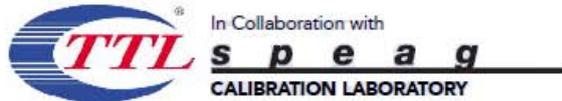
SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	52.4 mW/g ± 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.20 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.6 mW/g ± 20.4 % (k=2)

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.1Ω-0.57jΩ
Return Loss	-23.6dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	56.0Ω+3.31jΩ
Return Loss	-23.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.192 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.

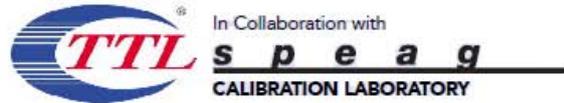
Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 01.09.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.84$ S/m; $\epsilon_r = 40.2$; $\rho = 1000$ kg/m³

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.48, 4.48, 4.48); Calibrated: 2013-09-05;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

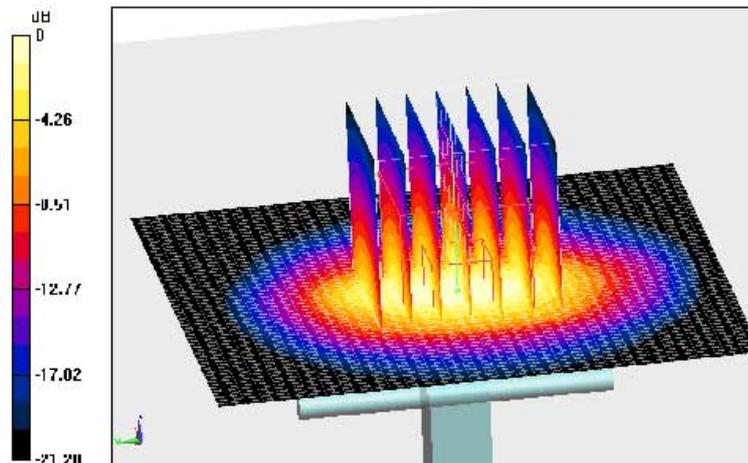
$dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 99.583 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 26.6 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.2 W/kg

Maximum value of SAR (measured) = 17.3 W/kg



0 dB = 17.3 W/kg = 12.38 dBW/kg

TA Technology (Shanghai) Co., Ltd. Test Report

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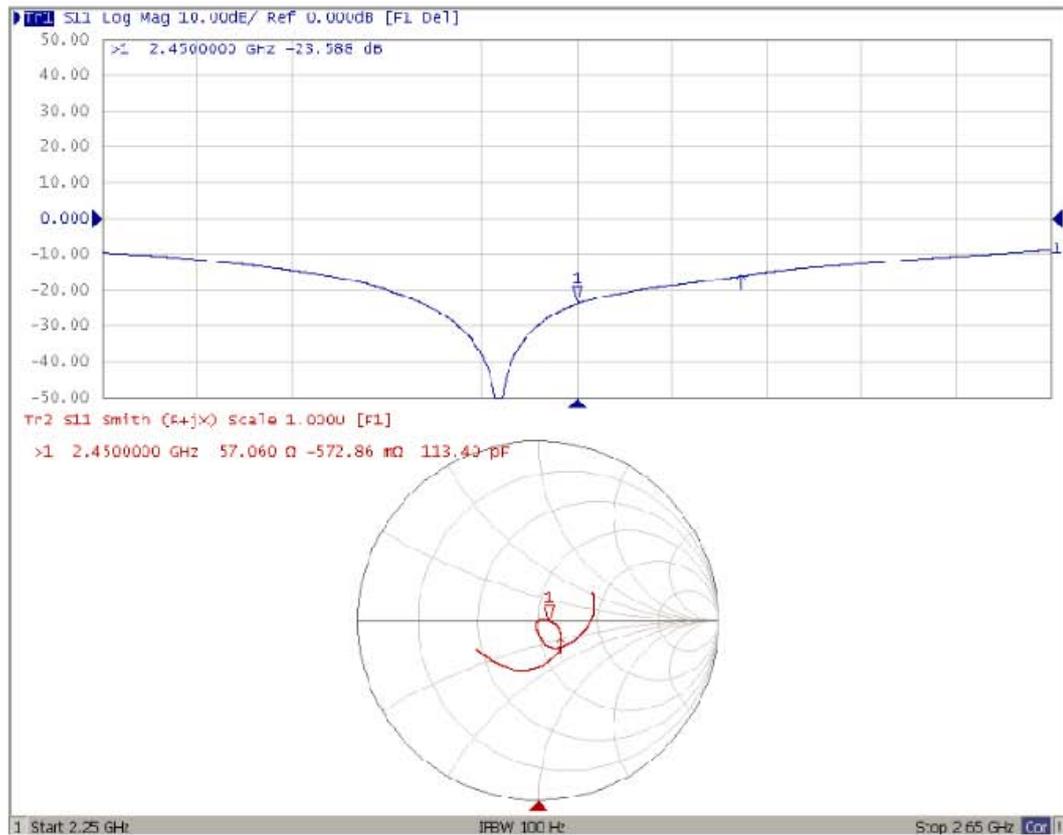
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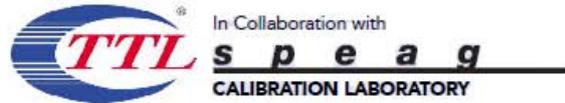
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 01.09.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.988$ S/m; $\epsilon_r = 51.25$; $\rho = 1000$ kg/m³

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.21, 4.21, 4.21); Calibrated: 2013-09-03;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

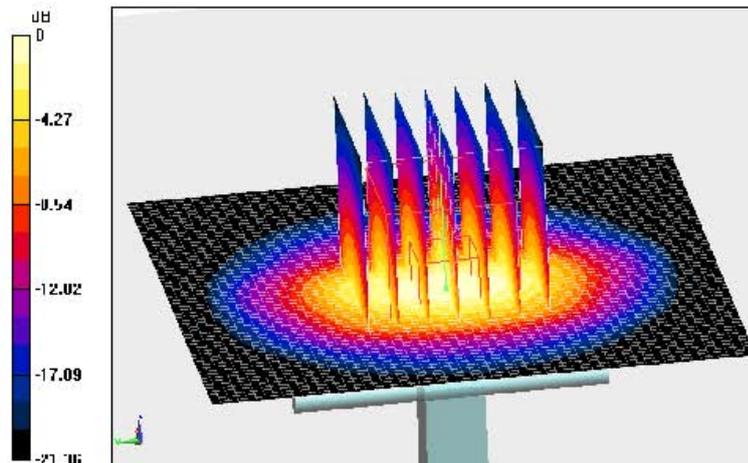
dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.120 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 27.8 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.2 W/kg

Maximum value of SAR (measured) = 17.7 W/kg



0 dB = 17.7 W/kg = 12.48 dBW/kg

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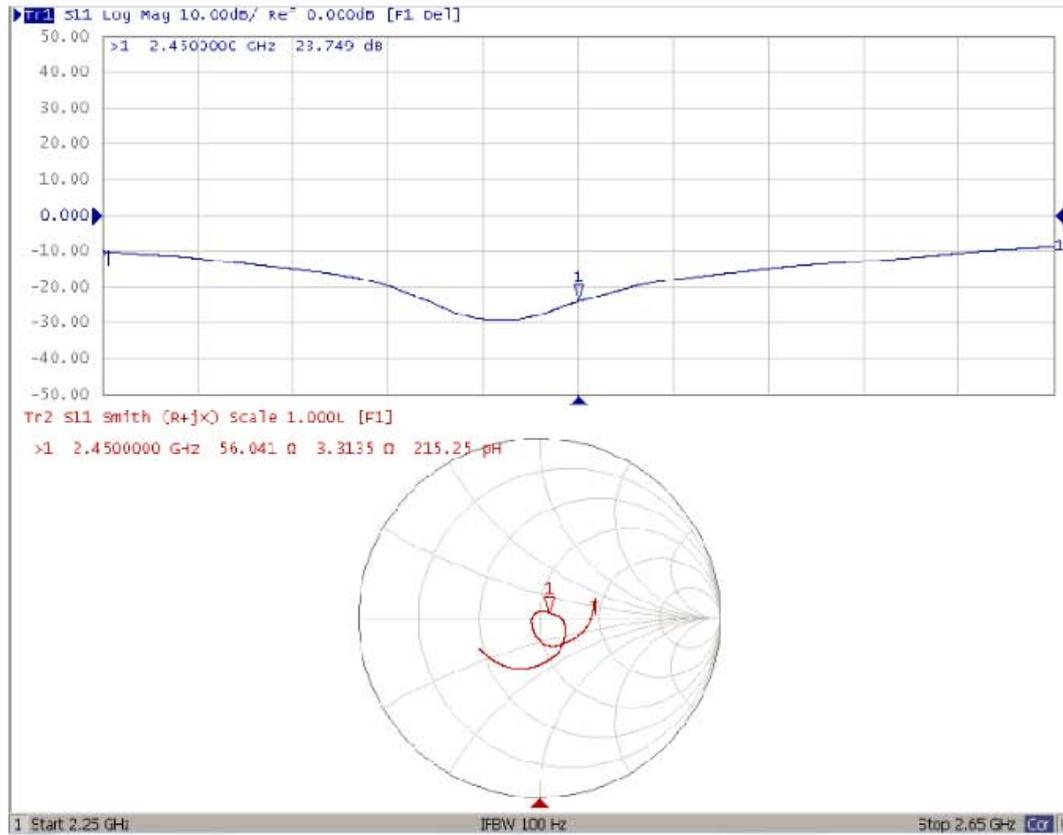
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Impedance Measurement Plot for Body TSL



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ANNEX O: DAE4 Calibration Certificate



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Client : **TA(Shanghai)**

Certificate No: **J14-2-0052**

CALIBRATION CERTIFICATE

Object: **DAE4 - SN: 1317**

Calibration Procedure(s): **TMC-OS-E-01-198
Calibration Procedure for the Data Acquisition Electronics (DAEx)**

Calibration date: **January 16, 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±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Documenting Process Calibrator 753	1971018	01-July-13 (TMC, No:JW13-049)	July-14

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: January 16, 2014

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Glossary:

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal
High Range: 1LSB = 6.1 μ V, full range = -100...+300 mV
Low Range: 1LSB = 61nV, full range = -1.....+3mV
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.058 \pm 0.15% (k=2)	404.060 \pm 0.15% (k=2)	403.954 \pm 0.15% (k=2)
Low Range	3.99002 \pm 0.7% (k=2)	3.99910 \pm 0.7% (k=2)	3.98303 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	119° \pm 1°
---	---------------

ANNEX P: The EUT Appearances and Test Configuration

ANNEX Q: System Validation

The SAR system must be validated against its performance specifications before it is deployed. When SAR probes, system components or software are changed, upgraded or recalibrated, these must be validated with the SAR system(s) that operates with such components.

Table 35: System Validation Part 1

System No.	Probe SN.	Liquid Name	Validation Date	Frequency Point	Permittivity ϵ	Conductivity σ (s/m)
1	3677	835MHz (head)	November 28, 2013	850MHz	41.5	0.92
2	3677	1900MHz (head)	November 28, 2013	1900MHz	40.0	1.40
3	3677	2450MHz (head)	November 28, 2013	2450MHz	39.2	1.80
4	3677	835MHz (body)	November 28, 2013	850MHz	55.2	0.99
5	3677	1900MHz (body)	November 28, 2013	1900MHz	53.3	1.52
6	3677	2450MHz (body)	November 28, 2013	2450MHz	52.7	1.95

System No.	Probe SN.	Liquid Name	Validation Date	Frequency Point	Permittivity ϵ	Conductivity σ (s/m)
1	3977	835MHz (head)	February 17, 2014	850MHz	41.5	0.90
2	3977	1750MHz (head)	February 17, 2014	1750MHz	40.1	1.37
3	3977	1900MHz (head)	February 17, 2014	1900MHz	40.0	1.40
4	3977	2450MHz (head)	February 17, 2014	2450MHz	39.2	1.80
5	3977	835MHz (body)	February 17, 2014	850MHz	55.2	0.97
6	3977	1750MHz (body)	February 17, 2014	1750MHz	53.4	1.49
7	3977	1900MHz (body)	February 17, 2014	1900MHz	53.3	1.52
8	3977	2450MHz (body)	February 17, 2014	2450MHz	52.7	1.95

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Table 36: System Validation Part 2

CW Validation	Sensitivity	PASS	PASS
	Probe Linearity	PASS	PASS
	Probe Isotropy	PASS	PASS
Mod Validation	MOD. Type	GMSK	GMSK
	MOD. Type	OFDM	OFDM
	Duty Factor	PASS	PASS
	PAR	PASS	PASS

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ANNEX R: Product Change Description

	Old	New
Model	HUAWEI Y520-U03	HUAWEI Y520-U03
FCC ID	QISY520-U03	QISY520-U03A
Frequency	UMTS band 1/2/5 GSM850/900/1800/1900	UMTS band 4/2/5 GSM850/900/1800/1900
PCB		Based on HUAWEI Y520-U03, there are following changes: 1. band 1 PA was changed band 4 PA 2. band 1 duplexer was changed band 4 duplexer
Hardware Version	The same	The same
Software Version	Y520-U03V100R001C00B111	Y520-U03V100R001C594B100
Dimensions	The same	The same
Appearance	The same	The same
antenna	The same	The same
Others	The same	The same

The photos of these changes