

ANNEX F: System Check Results(New Y520-U33)

System Performance Check at 835 MHz Head TSL

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

Date: 12/10/2014

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.92 \text{ mho/m}$; $\epsilon_r = 41.3$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3977; ConvF(9.62, 9.62, 9.62); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: $dx=1.500\text{mm}$, $dy=1.500\text{mm}$

Maximum value of SAR (interpolated) = 2.71 mW/g

d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.2 V/m ; Power Drift = -0.011 dB

Peak SAR (extrapolated) = 3.79 W/kg

SAR(1 g) = 2.51 mW/g ; SAR(10 g) = 1.58 mW/g

Maximum value of SAR (measured) = 2.66 mW/g

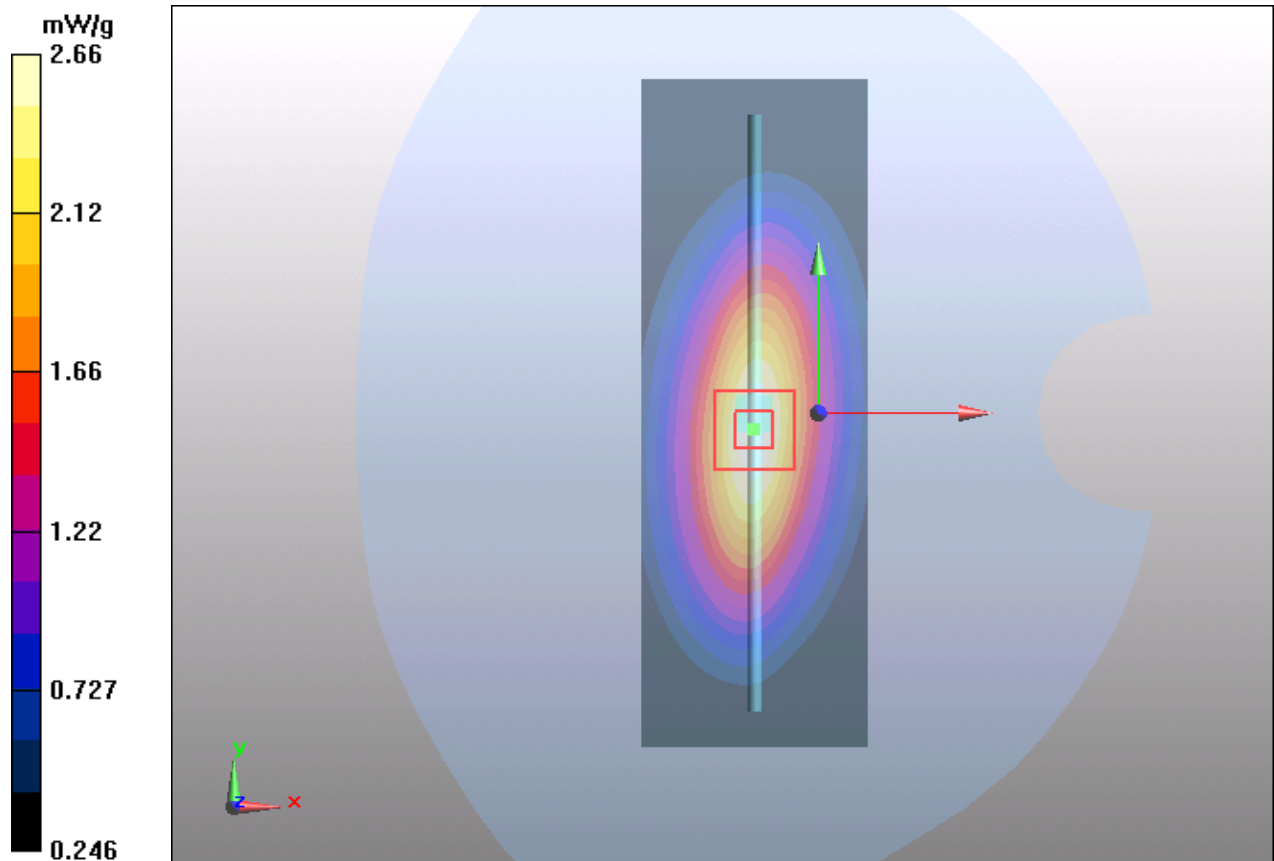


Figure 125 System Performance Check 835MHz 250mW

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System Performance Check at 835 MHz Body TSL

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

Date: 12/11/2014

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.00 \text{ mho/m}$; $\epsilon_r = 55.9$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 – SN3977; ConvF(9.74, 9.74, 9.74); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 2.55 mW/g

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

Reference Value = 51.7 V/m ; Power Drift = -0.013 dB

Peak SAR (extrapolated) = 3.6 W/kg

SAR(1 g) = 2.45 mW/g ; SAR(10 g) = 1.63 mW/g

Maximum value of SAR (measured) = 2.73 mW/g

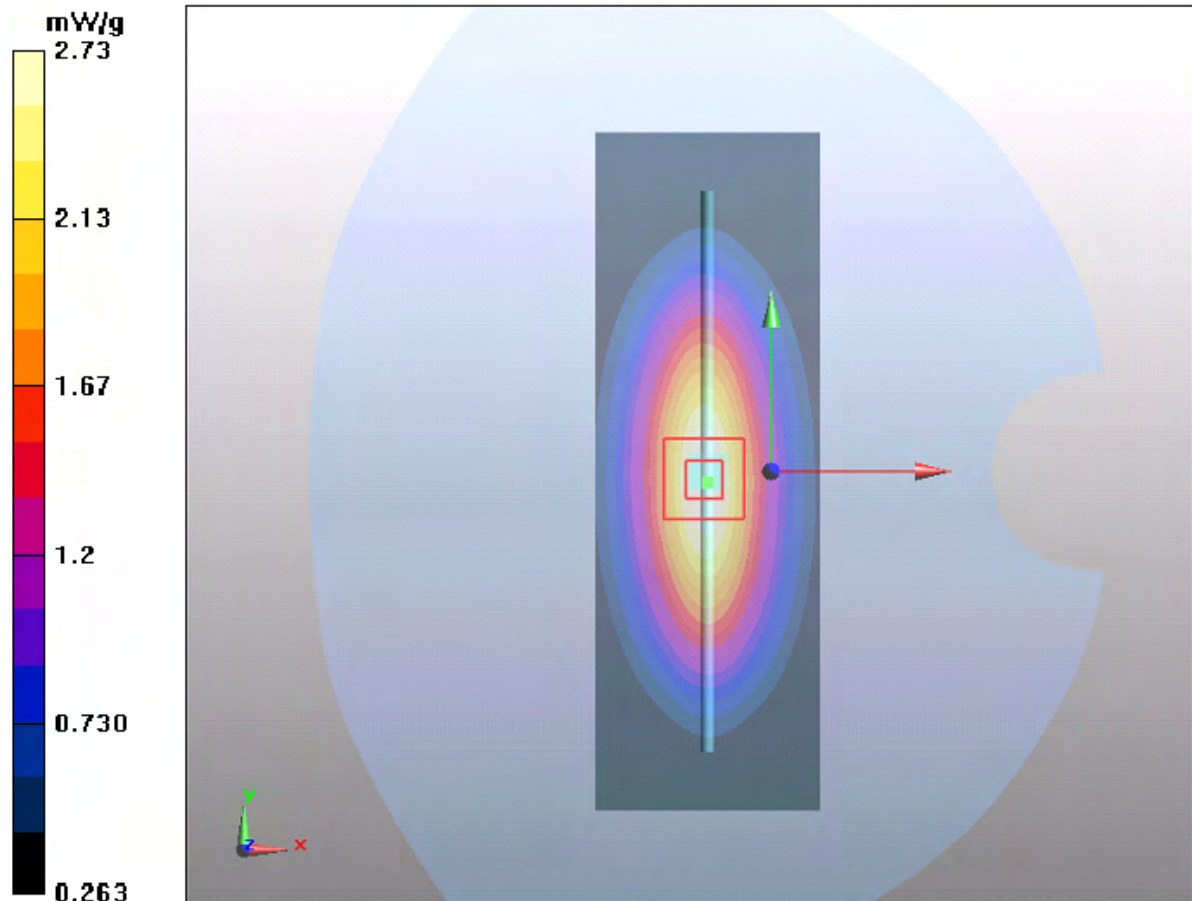


Figure 126 System Performance Check 835MHz 250Mw

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System Performance Check at 1900 MHz Head TSL

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

Date: 12/10/2014

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3977; ConvF(7.97, 7.97, 7.97); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.500mm, dy=1.500mm
Maximum value of SAR (interpolated) = 12.9 mW/g

d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 87.8 V/m; Power Drift = 0.041 dB

Peak SAR (extrapolated) = 20.1 W/kg

SAR(1 g) = 10.49 mW/g; SAR(10 g) = 5.29 mW/g

Maximum value of SAR (measured) = 11.52 mW/g

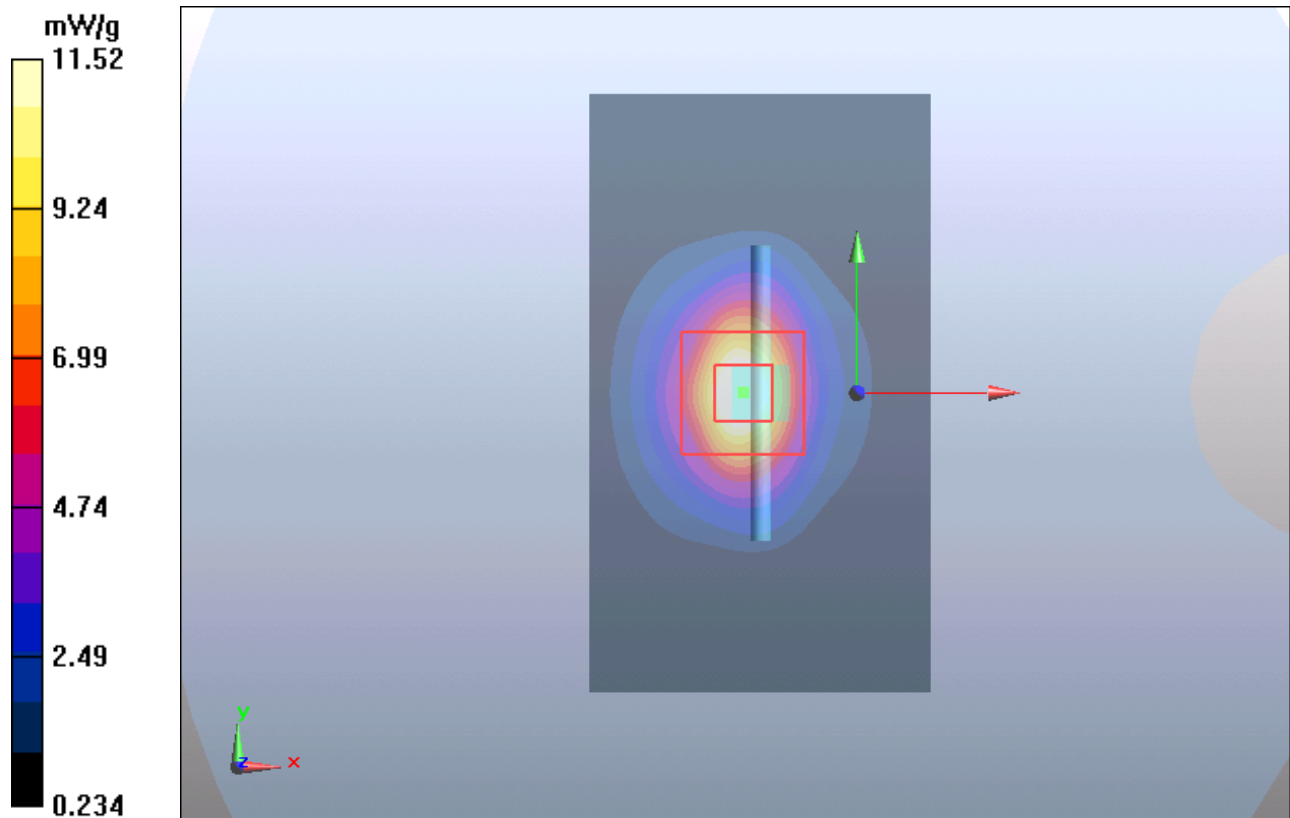


Figure 127 System Performance Check 1900MHz 250mW

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System Performance Check at 1900 MHz Body TSL

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

Date: 12/10/2014

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.52$ mho/m; $\epsilon_r = 53.2$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 – SN3977; ConvF(7.37, 7.37, 7.37); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 12.4 mW/g

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

Reference Value = 82.5 V/m; Power Drift = 0.021 dB

Peak SAR (extrapolated) = 17.5 W/kg

SAR(1 g) = 9.98 mW/g; SAR(10 g) = 5.27 mW/g

Maximum value of SAR (measured) = 11.9 mW/g

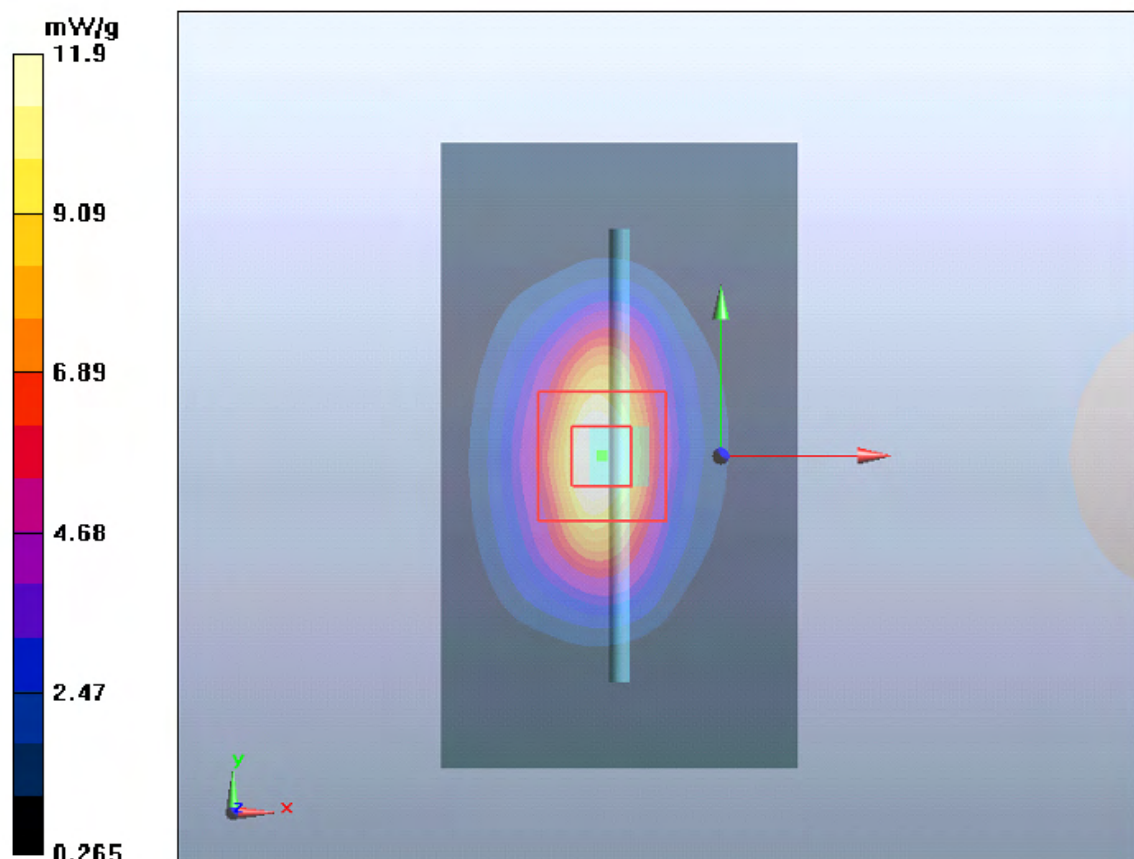


Figure 128 System Performance Check 1900MHz 250mW

ANNEX G: Plots Results(New Y520-U33)

GSM 850 Left Cheek Middle

Date/Time: 12/10/2014

Communication System: UID 0, GSM (0); Frequency: 836.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 837$ MHz; $\sigma = 0.932$ S/m; $\epsilon_r = 41.357$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3977; ConvF(9.62, 9.62, 9.62); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Left Cheek Middle/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.603 W/kg

Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.310 V/m; Power Drift = -0.031 dB

Peak SAR (extrapolated) = 0.709 W/kg

SAR(1 g) = 0.580 W/kg; SAR(10 g) = 0.443 W/kg

Maximum value of SAR (measured) = 0.605 W/kg

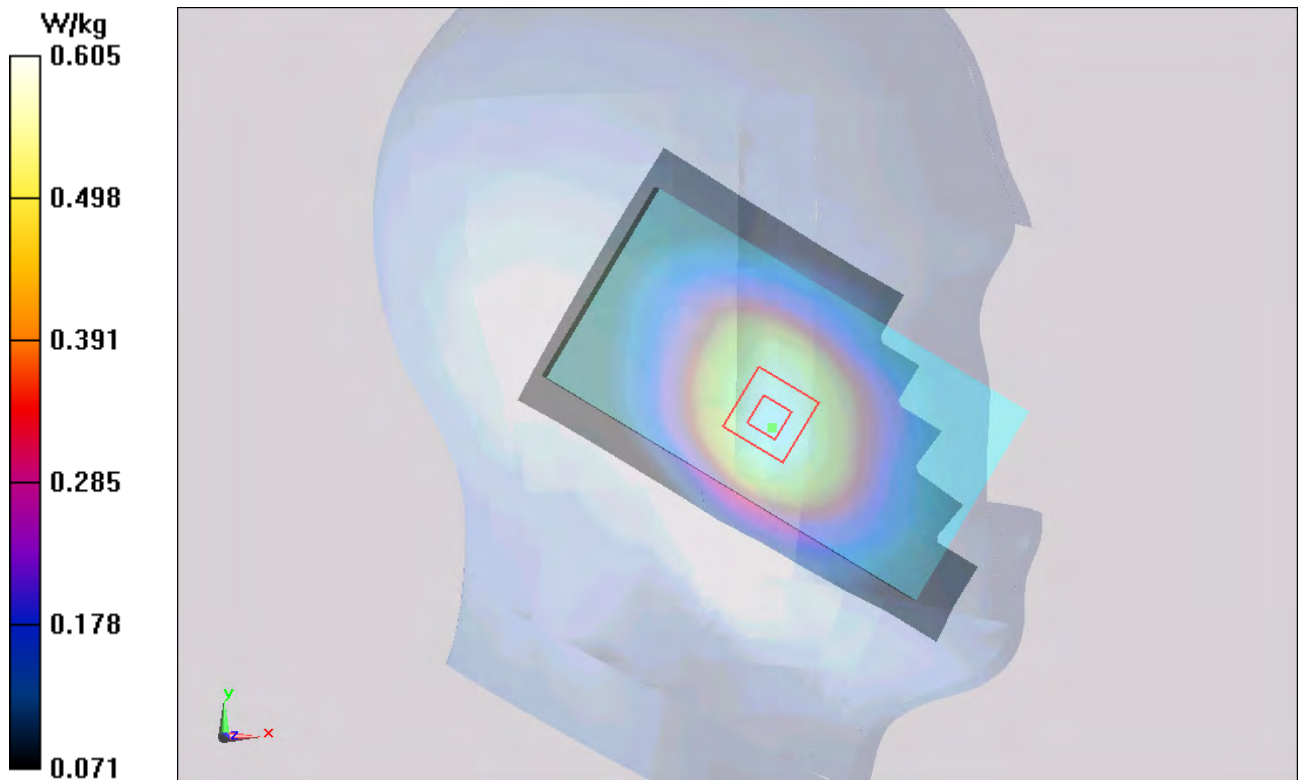


Figure 129 Left Hand Touch Cheek GSM 850 Channel 190

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GSM 850 Back Side High

Date/Time: 12/11/2014

Communication System: UID 0, GPRS 3TX (0); Frequency: 848.8 MHz; Duty Cycle: 1:2.76694

Medium parameters used: $f = 849$ MHz; $\sigma = 1.006$ S/m; $\epsilon_r = 55.736$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 – SN3977; ConvF(9.74, 9.74, 9.74); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Back Side High/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.25 W/kg

Back Side High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 35.185 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 1.49 W/kg

SAR(1 g) = 1.19 W/kg; SAR(10 g) = 0.899 W/kg

Maximum value of SAR (measured) = 1.24 W/kg

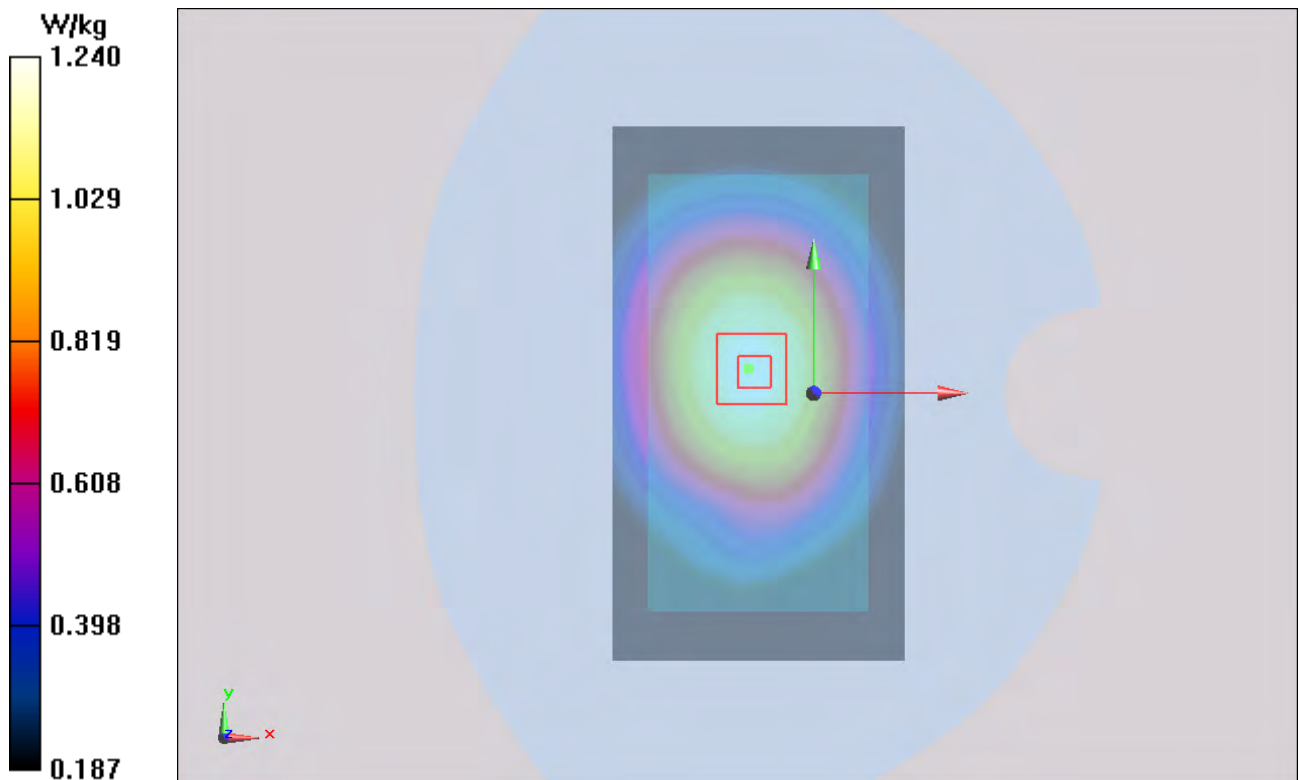


Figure 130 Body, Back Side, GSM 850 Channel 251

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GSM 850 Back Side High (1st Repeated SAR)

Date/Time: 12/11/2014

Communication System: UID 0, GPRS 3TX (0); Frequency: 848.8 MHz; Duty Cycle: 1:2.76694

Medium parameters used: $f = 849$ MHz; $\sigma = 1.006$ S/m; $\epsilon_r = 55.736$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 – SN3977; ConvF(9.74, 9.74, 9.74); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Back Side High/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.25 W/kg

Back Side High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 35.053 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 1.49 W/kg

SAR(1 g) = 1.18 W/kg; SAR(10 g) = 0.893 W/kg

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

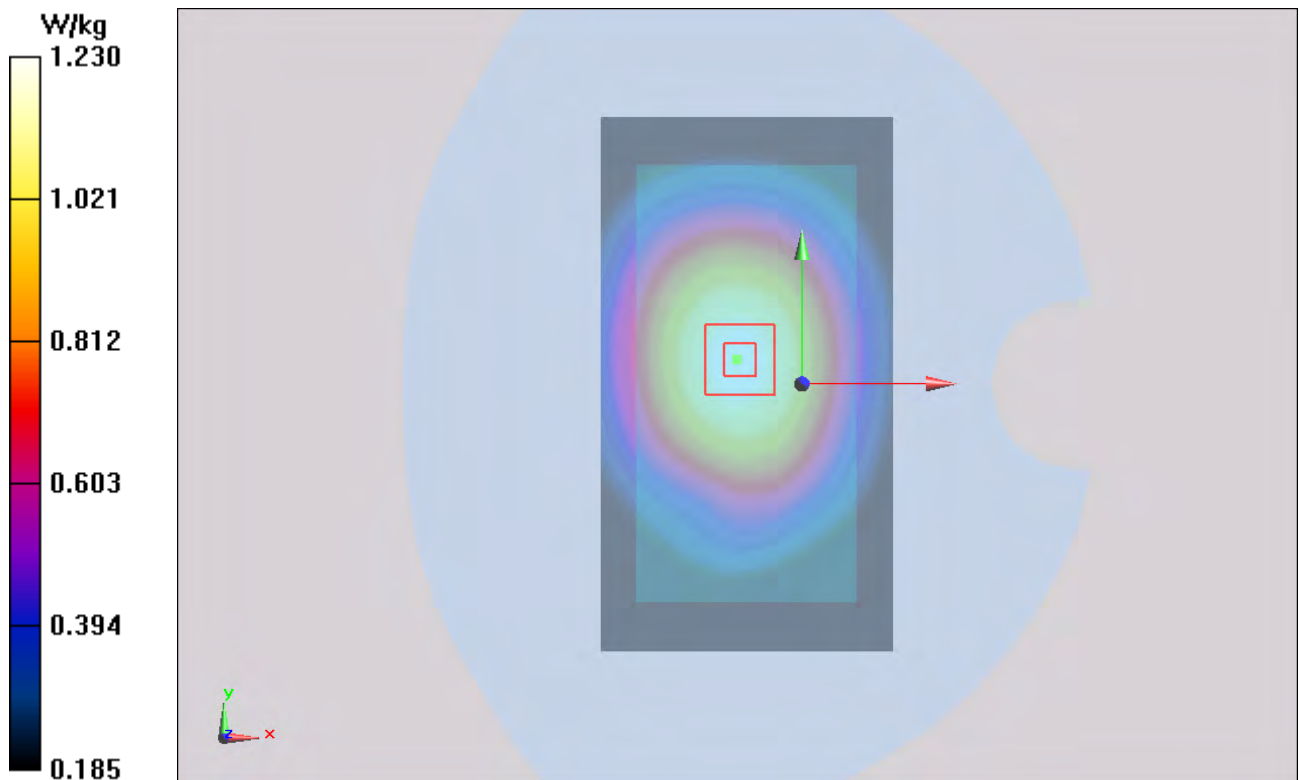


Figure 131 Body, Back Side, GSM 850 Channel 251

GSM 1900 Left Cheek Middle

Date/Time: 12/10/2014

Communication System: UID 0, GSM (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.413$ S/m; $\epsilon_r = 39.689$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3977; ConvF(7.97, 7.97, 7.97); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Left Cheek Middle/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.288 W/kg

Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.878 V/m; Power Drift = 0.047 dB

Peak SAR (extrapolated) = 0.390 W/kg

SAR(1 g) = 0.263 W/kg; SAR(10 g) = 0.162 W/kg

Maximum value of SAR (measured) = 0.278 W/kg

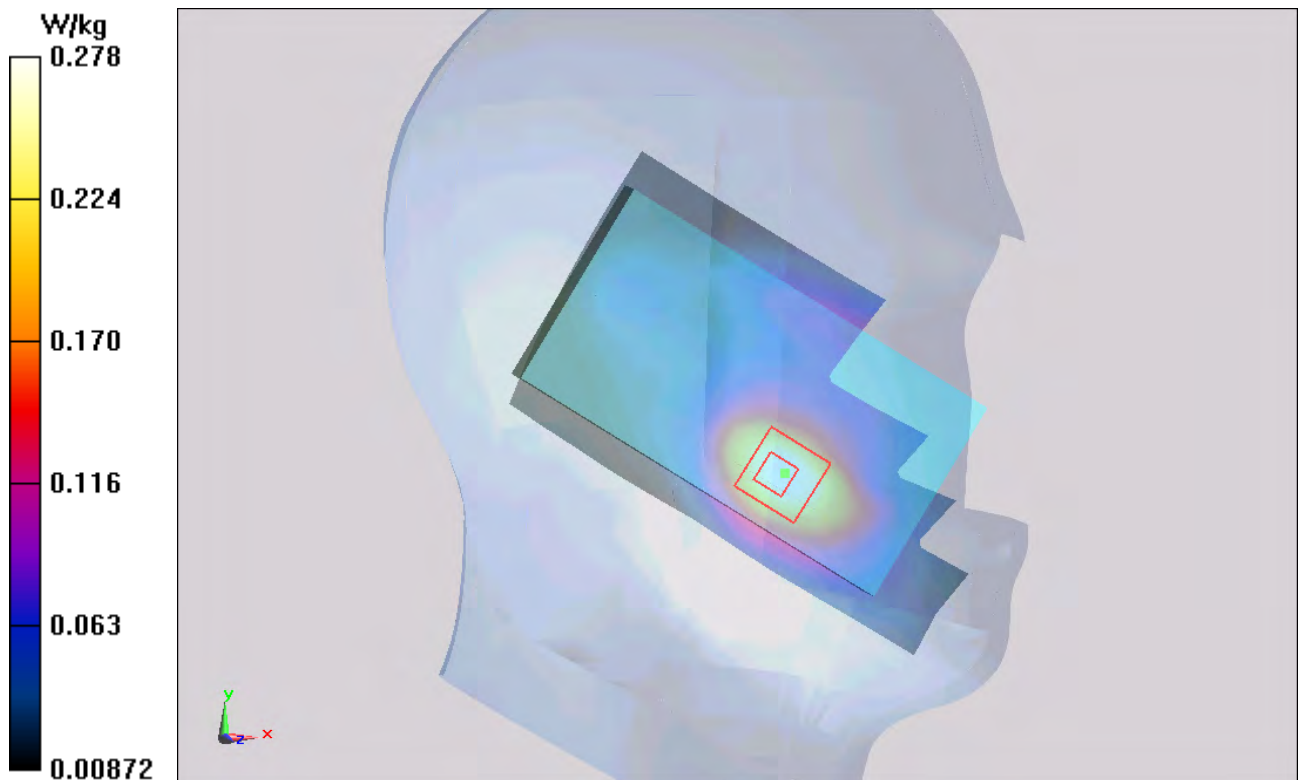


Figure 132 Left Hand Touch Cheek GSM 1900 Channel 661

GSM 1900 Back Side Middle

Date/Time: 12/10/2014

Communication System: UID 0, GPRS 2TX (0); Frequency: 1880 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.504$ S/m; $\epsilon_r = 53.137$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 – SN3977; ConvF(7.37, 7.37, 7.37); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Back Side Middle/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.605 W/kg

Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.613 V/m; Power Drift = 0.036 dB

Peak SAR (extrapolated) = 0.996 W/kg

SAR(1 g) = 0.636 W/kg; SAR(10 g) = 0.377 W/kg

Maximum value of SAR (measured) = 0.720 W/kg

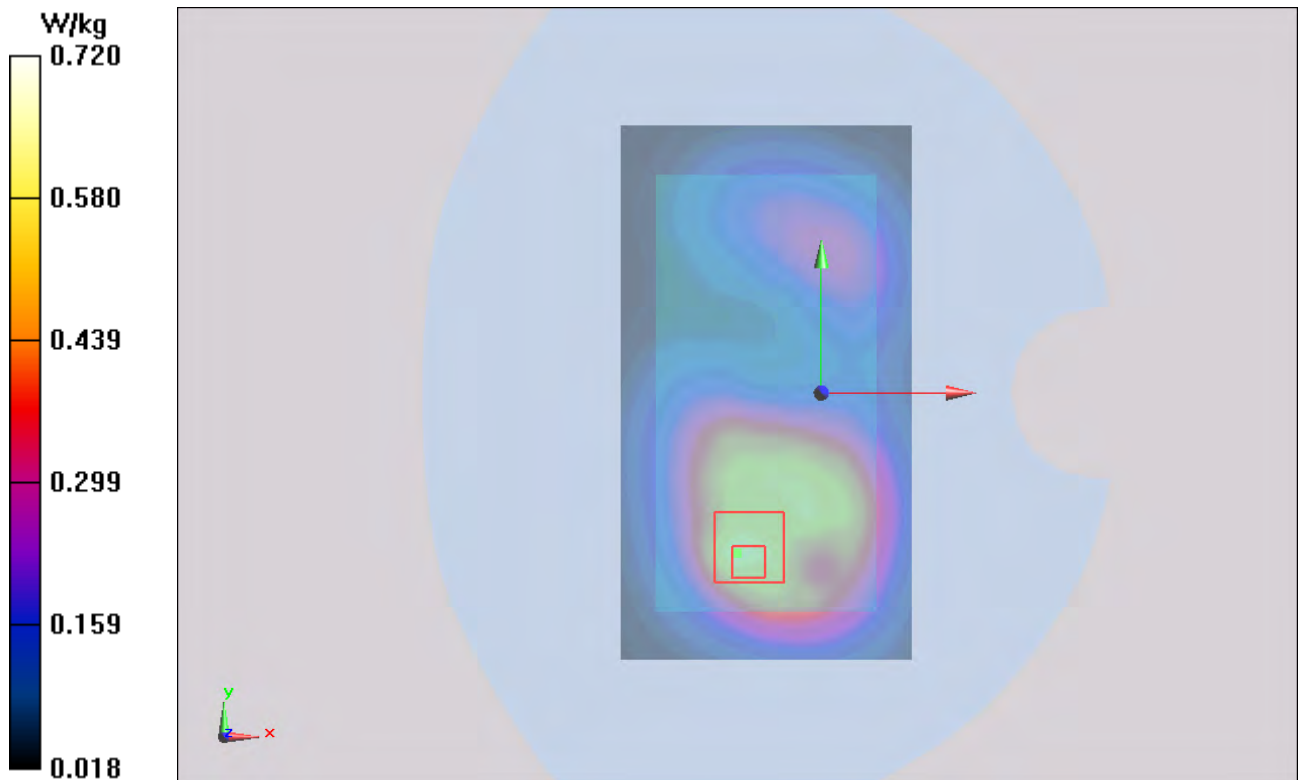


Figure 133 Body, Back Side, GSM 1900 Channel 661

UMTS Band II Left Cheek Middle

Date/Time: 12/10/2014

Communication System: UID 0, WCDMA (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.413$ S/m; $\epsilon_r = 39.689$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3977; ConvF(7.97, 7.97, 7.97); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Left Cheek Middle/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.486 W/kg

Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.828 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.659 W/kg

SAR(1 g) = 0.439 W/kg; SAR(10 g) = 0.269 W/kg

Maximum value of SAR (measured) = 0.441 W/kg

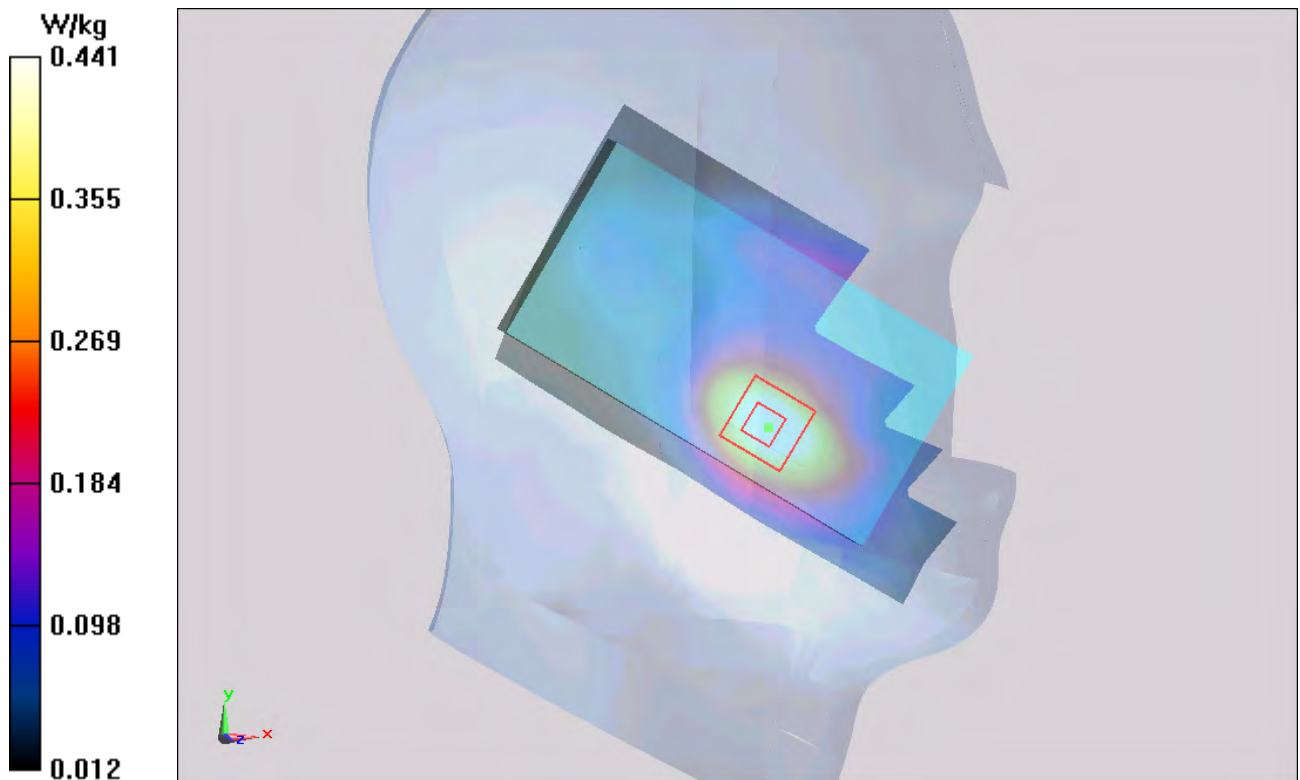


Figure 134 Left Hand Touch Cheek UMTS Band II Channel 9400

UMTS Band II Back Side Middle

Date/Time: 12/10/2014

Communication System: UID 0, WCDMA (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.504$ S/m; $\epsilon_r = 53.137$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 – SN3977; ConvF(7.37, 7.37, 7.37); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Back Side Middle/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.793 W/kg

Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.500 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 1.11 W/kg

SAR(1 g) = 0.685 W/kg; SAR(10 g) = 0.392 W/kg

Maximum value of SAR (measured) = 0.772 W/kg

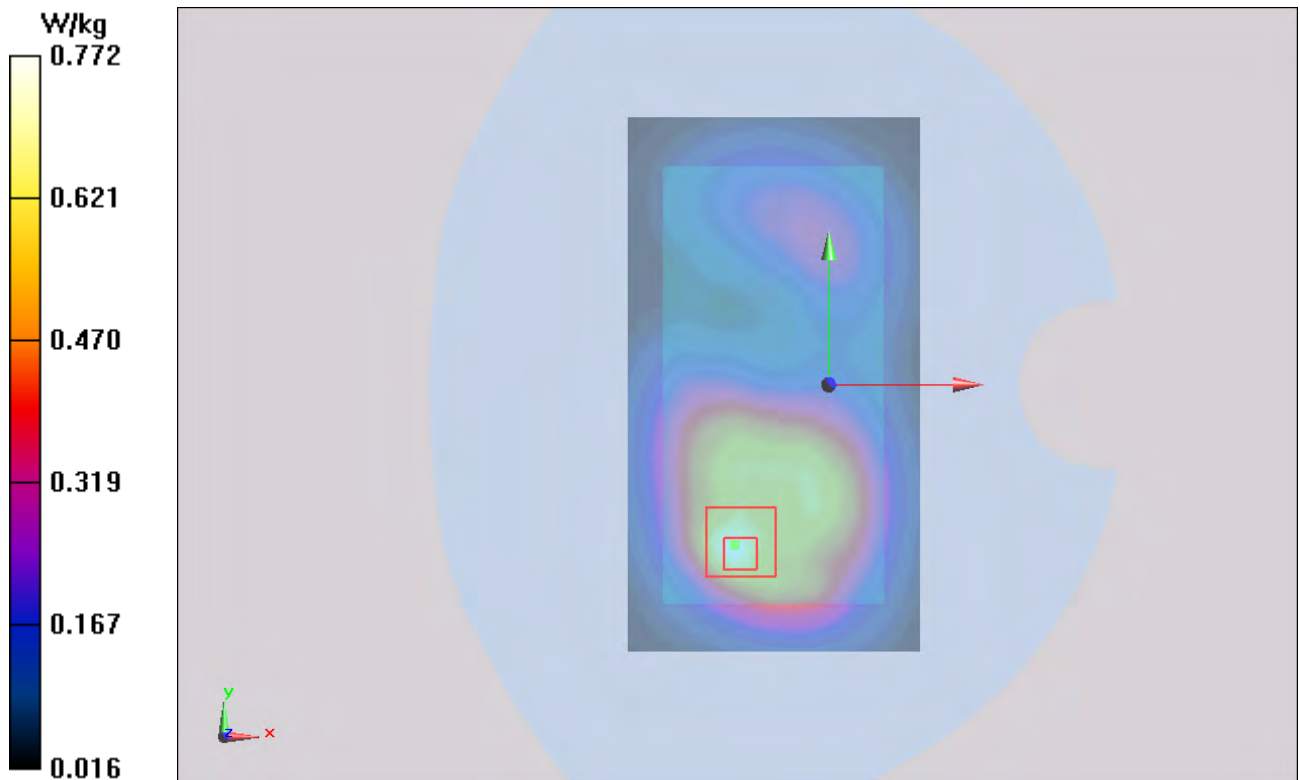


Figure 135 Body, Back Side, UMTS Band II Channel 9400

UMTS Band V Left Cheek Middle

Date/Time: 12/10/2014

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 837$ MHz; $\sigma = 0.932$ S/m; $\epsilon_r = 41.357$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3977; ConvF(9.62, 9.62, 9.62); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Left Cheek Middle/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.524 W/kg

Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.021 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.614 W/kg

SAR(1 g) = 0.503 W/kg; SAR(10 g) = 0.383 W/kg

Maximum value of SAR (measured) = 0.522 W/kg

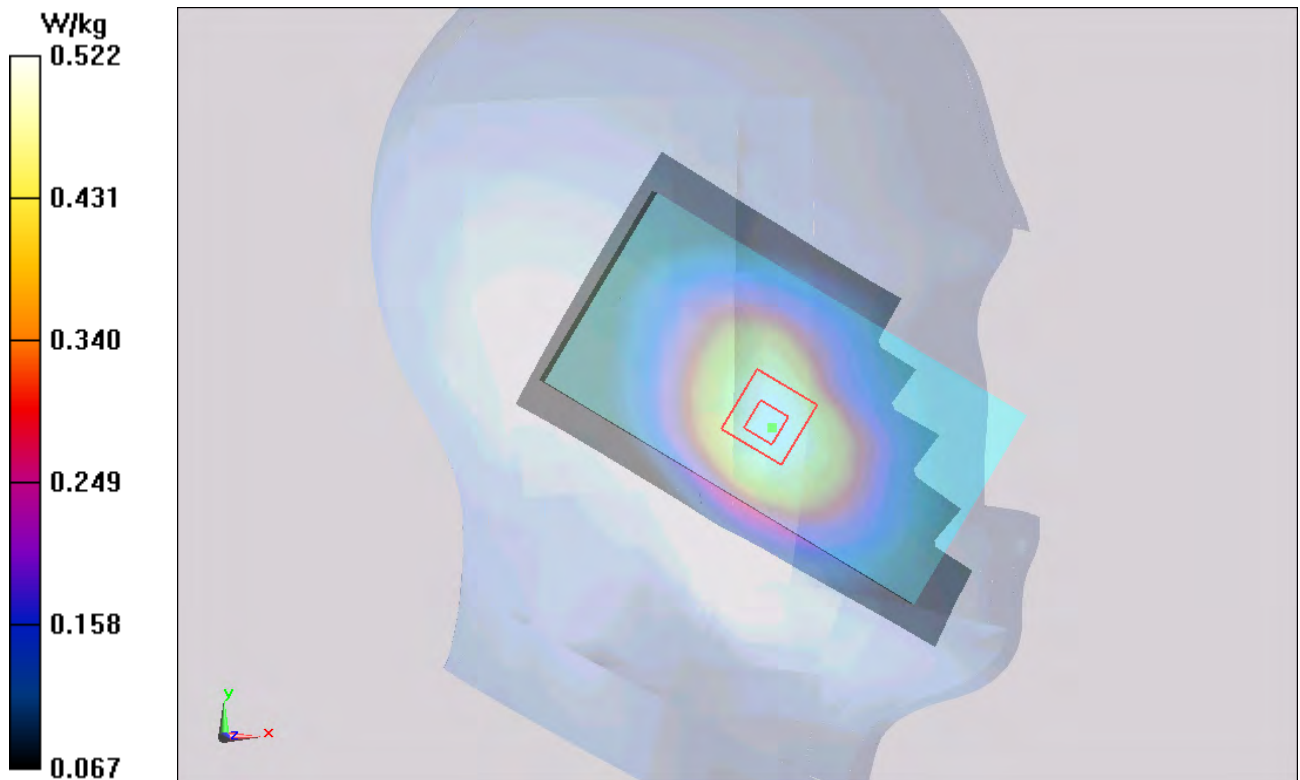


Figure 136 Left Hand Touch Cheek UMTS Band V Channel 4183

UMTS Band V Back Side High

Date/Time: 12/11/2014

Communication System: UID 0, WCDMA (0); Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 847$ MHz; $\sigma = 1.004$ S/m; $\epsilon_r = 55.772$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 – SN3977; ConvF(9.74, 9.74, 9.74); Calibrated: 2/17/2014;

Electronics: DAE4 Sn1317; Calibrated: 1/16/2014

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Back Side High/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.805 W/kg

Back Side High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 27.939 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.947 W/kg

SAR(1 g) = 0.767 W/kg; SAR(10 g) = 0.583 W/kg

Maximum value of SAR (measured) = 0.793 W/kg

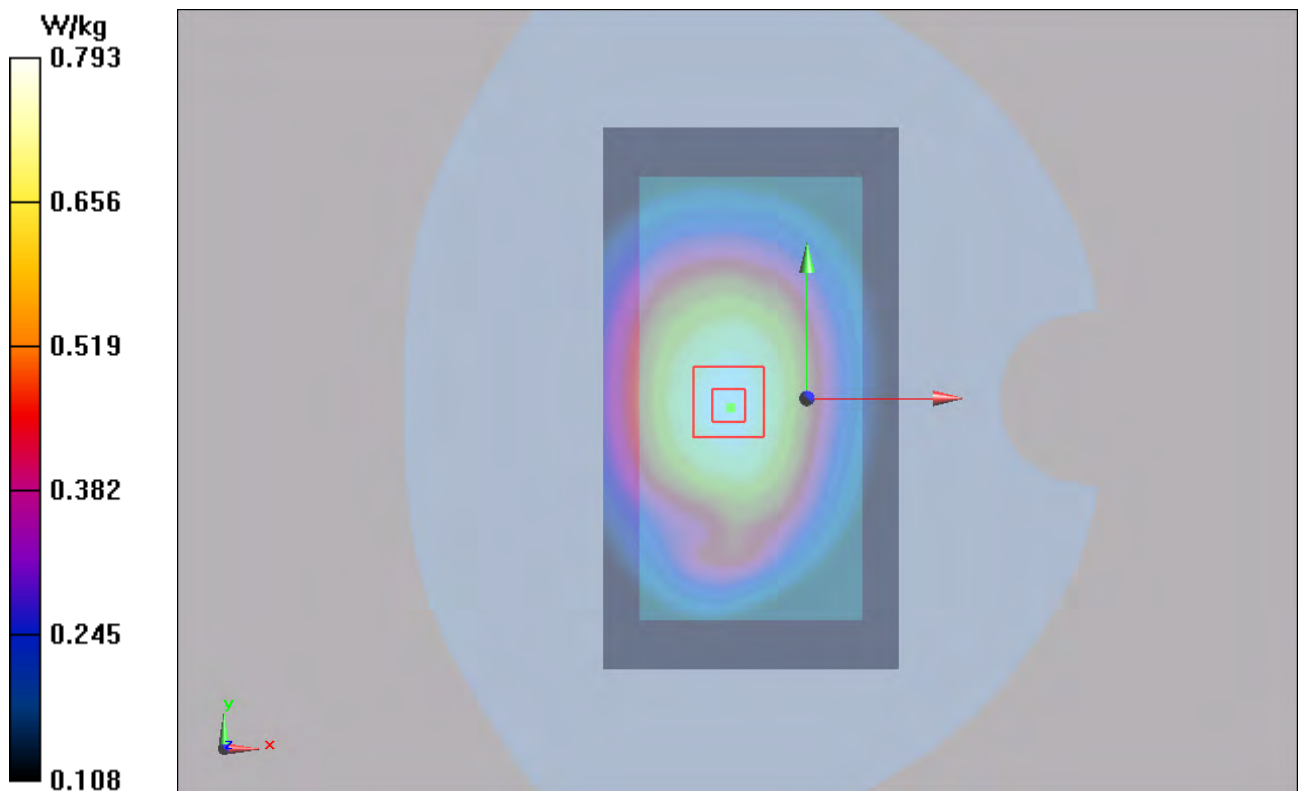


Figure 137 Body, Back Side, UMTS Band V Channel 4233

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ANNEX H: Probe Calibration Certificate(SN:3677)



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CALIBRATION LABORATORY



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

Client **TA-ShangHai**

Certificate No: **J13-2-2971**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3677**

Calibration Procedure(s) **TMC-OS-E-02-195**
Calibration Procedures for Dosimetric E-field Probes

Calibration date: **November 28, 2013**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Power sensor NRP-Z91	101547	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Power sensor NRP-Z91	101548	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Reference10dBAttenuator	BT0520	12-Dec-12(TMC,No.JZ12-867)	Dec-14
Reference20dBAttenuator	BT0267	12-Dec-12(TMC,No.JZ12-866)	Dec-14
Reference Probe EX3DV4	SN 3846	03-Sep-13(SPEAG,No.EX3-3846_Sep13)	Sep-14
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb-14
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-13 (TMC, No.JW13-045)	Jun-14
Network Analyzer E5071C	MY46110673	15-Feb-13 (TMC, No.JZ13-781)	Feb-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: November 29, 2013

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

Certificate No: J13-2-2971

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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: Info@emcite.com Http://www.emcite.com

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i $\theta=0$ is normal to probe axis

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 300MHz to 3GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta=0$ (fs900MHz in TEM-cell; f>1800MHz: waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}; A,B,C** are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for fs800MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).



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Probe EX3DV4

SN: 3677

Calibrated: November 28, 2013

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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DASY – Parameters of Probe: EX3DV4 - SN: 3677

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu V/(V/m)^2$) ^A	0.38	0.44	0.38	±10.8%
DCP(mV) ^B	99.8	100.9	101.9	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB, μV	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	93.3	±2.6%
		Y	0.0	0.0	1.0		101.7	
		Z	0.0	0.0	1.0		92.1	

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%.

^A The uncertainties of Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Page 5 and Page 6).

^B Numerical linearization parameter; uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

TA Technology (Shanghai) Co., Ltd.

Test Report

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DASY – Parameters of Probe: EX3DV4 - SN: 3677

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz] ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	9.94	9.94	9.94	0.16	1.13	± 12%
850	41.5	0.92	9.41	9.41	9.41	0.11	1.47	± 12%
1750	40.1	1.37	8.22	8.22	8.22	0.14	2.11	± 12%
1900	40.0	1.40	8.15	8.15	8.15	0.14	2.34	± 12%
2100	39.8	1.49	7.87	7.87	7.87	0.13	3.21	± 12%
2450	39.2	1.80	7.64	7.64	7.64	0.39	0.95	± 12%
5200	36.0	4.66	5.73	5.73	5.73	0.95	0.62	± 13%
5300	35.9	4.76	5.68	5.68	5.68	0.87	0.67	± 13%
5500	35.6	4.96	5.62	5.62	5.62	0.97	0.62	± 13%
5600	35.5	5.07	5.29	5.29	5.29	0.89	0.63	± 13%
5800	35.3	5.27	5.29	5.29	5.29	1.02	0.61	± 13%

^C Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.



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DASY – Parameters of Probe: EX3DV4 - SN: 3677

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz] ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	9.72	9.72	9.72	0.11	1.97	± 12%
850	55.2	0.99	9.51	9.51	9.51	0.15	1.55	± 12%
1750	53.4	1.49	7.77	7.77	7.77	0.14	3.23	± 12%
1900	53.3	1.52	7.63	7.63	7.63	0.15	2.81	± 12%
2100	53.2	1.62	7.97	7.97	7.97	0.16	4.09	± 12%
2450	52.7	1.95	7.61	7.61	7.61	0.45	0.92	± 12%
5200	49.0	5.30	4.72	4.72	4.72	0.66	1.10	± 13%
5300	48.9	5.42	4.67	4.67	4.67	0.64	1.19	± 13%
5500	48.6	5.65	4.34	4.34	4.34	0.73	0.80	± 13%
5600	48.5	5.77	4.29	4.29	4.29	0.74	0.81	± 13%
5800	48.2	6.00	4.46	4.46	4.46	0.78	0.80	± 13%

^C Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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Test Report

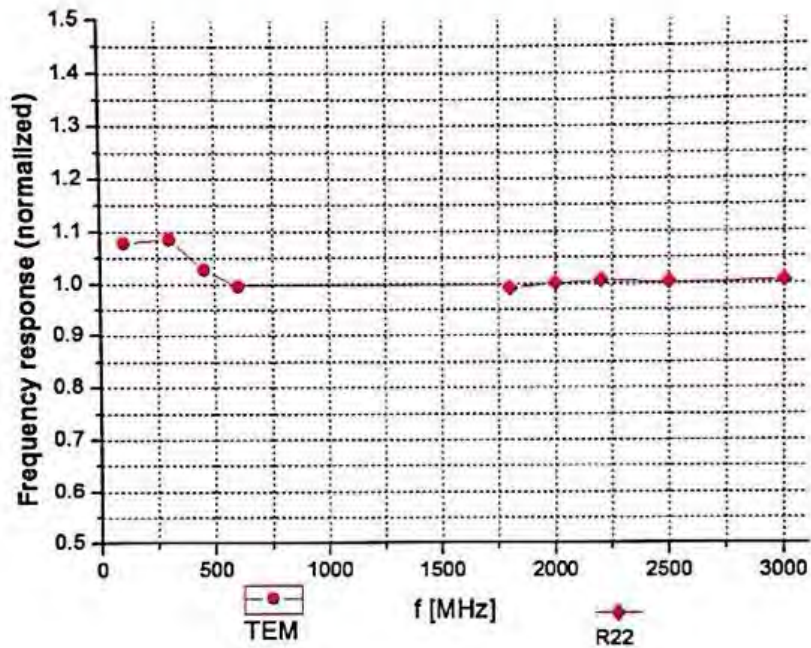
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Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: $\pm 7.5\%$ ($k=2$)

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

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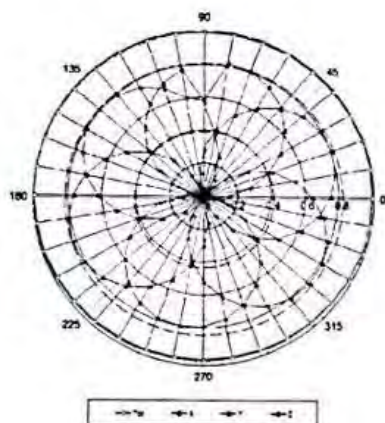
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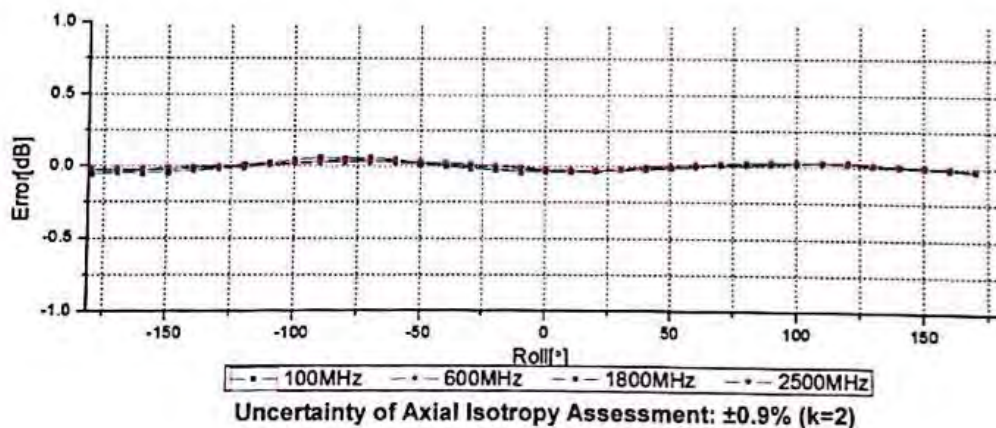
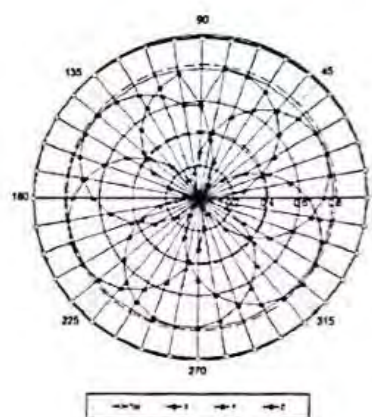
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Receiving Pattern (Φ), $\theta=0^\circ$

f=600 MHz, TEM

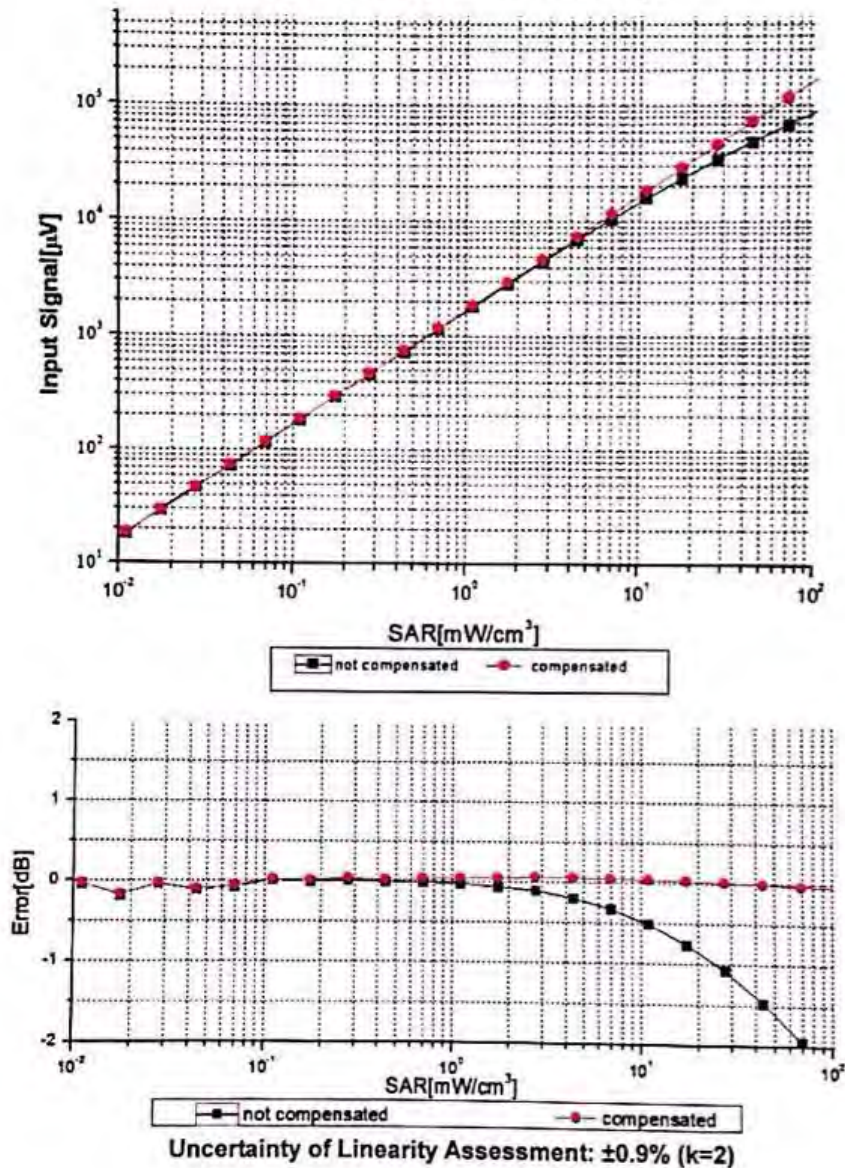


f=1800 MHz, R22





Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f = 900 \text{ MHz}$)



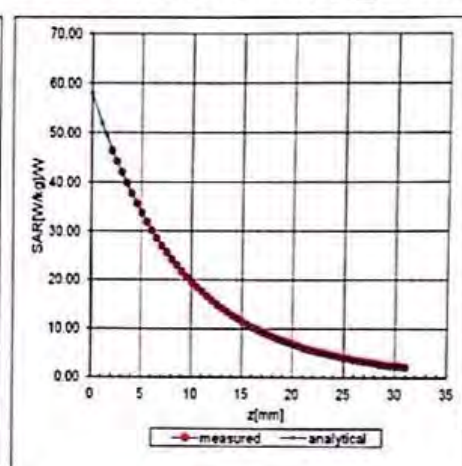
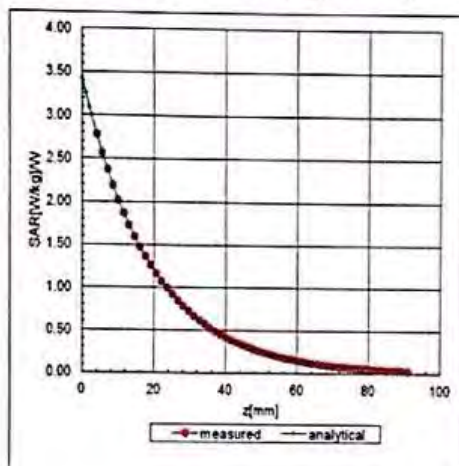


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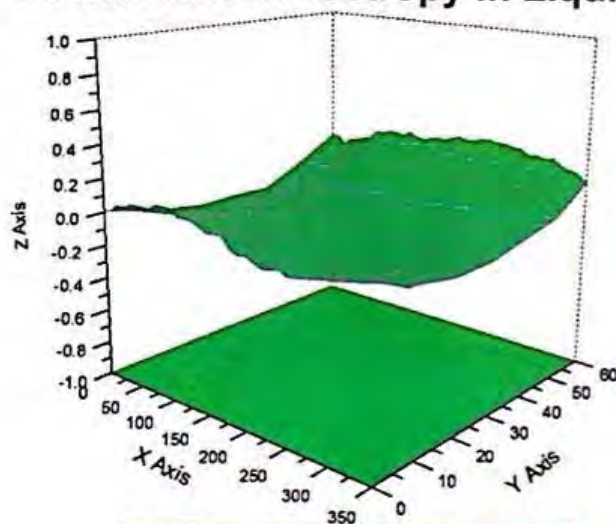
Conversion Factor Assessment

f=850 MHz, WGLS R9(H_convF)

f=2450 MHz, WGLS R26(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: $\pm 2.8\%$ (K=2)

TA Technology (Shanghai) Co., Ltd.
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DASY - Parameters of Probe: EX3DV4 - SN: 3677

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	117
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	2mm

TA Technology (Shanghai) Co., Ltd.

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Report No.: RXA1412-0272SAR01R2

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ANNEX I: Probe Calibration Certificate(SN:3977)

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



S Schweizerischer Kalibrierdienst
S 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 ATL (Auden)

Certificate No: EX3-3977_Feb14

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3977

Calibration procedure(s) QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5,
QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: February 17, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: February 19, 2014			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

Certificate No: EX3-3977_Feb14

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TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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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
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}; A, B, C, D** are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).

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

Report No.: RXA1412-0272SAR01R2

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EX3DV4 – SN:3977

February 17, 2014

Probe EX3DV4

SN:3977

Manufactured: November 5, 2013
Calibrated: February 17, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

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

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EX3DV4- SN:3977

February 17, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3977

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.54	0.57	0.54	$\pm 10.1 \%$
DCP (mV) ^B	99.5	100.0	99.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB/ μV	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	133.3	$\pm 3.3 \%$
		Y	0.0	0.0	1.0		134.9	
		Z	0.0	0.0	1.0		146.5	

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%.

^A The uncertainties of NormX,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter; uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

TA Technology (Shanghai) Co., Ltd.

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EX3DV4- SN:3977

February 17, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3977

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
450	43.5	0.87	11.72	11.72	11.72	0.18	1.10	± 13.3 %
750	41.9	0.89	9.98	9.98	9.98	0.36	0.88	± 12.0 %
835	41.5	0.90	9.62	9.62	9.62	0.61	0.69	± 12.0 %
900	41.5	0.97	9.48	9.48	9.48	0.77	0.63	± 12.0 %
1750	40.1	1.37	8.14	8.14	8.14	0.78	0.60	± 12.0 %
1900	40.0	1.40	7.97	7.97	7.97	0.48	0.75	± 12.0 %
2000	40.0	1.40	7.93	7.93	7.93	0.69	0.63	± 12.0 %
2300	39.5	1.67	7.59	7.59	7.59	0.37	0.83	± 12.0 %
2450	39.2	1.80	7.24	7.24	7.24	0.27	1.10	± 12.0 %
2600	39.0	1.96	7.07	7.07	7.07	0.41	0.84	± 12.0 %
5200	36.0	4.66	5.09	5.09	5.09	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.82	4.82	4.82	0.35	1.80	± 13.1 %
5500	35.8	4.96	4.76	4.76	4.76	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.55	4.55	4.55	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.52	4.52	4.52	0.40	1.80	± 13.1 %

^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

TA Technology (Shanghai) Co., Ltd.

Test Report

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EX3DV4- SN:3977

February 17, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3977

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
450	56.7	0.94	12.47	12.47	12.47	0.11	1.10	± 13.3 %
750	55.5	0.96	9.78	9.78	9.78	0.45	0.86	± 12.0 %
835	55.2	0.97	9.74	9.74	9.74	0.48	0.83	± 12.0 %
900	55.0	1.05	9.46	9.46	9.46	0.41	0.89	± 12.0 %
1750	53.4	1.49	7.69	7.69	7.69	0.41	0.88	± 12.0 %
1900	53.3	1.52	7.37	7.37	7.37	0.34	0.89	± 12.0 %
2000	53.3	1.52	7.41	7.41	7.41	0.24	1.14	± 12.0 %
2300	52.9	1.81	7.12	7.12	7.12	0.66	0.64	± 12.0 %
2450	52.7	1.95	6.97	6.97	6.97	0.80	0.50	± 12.0 %
2600	52.5	2.16	6.68	6.68	6.68	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.50	4.50	4.50	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.28	4.28	4.28	0.45	1.90	± 13.1 %
5500	48.6	5.65	4.02	4.02	4.02	0.45	1.90	± 13.1 %
5600	48.5	5.77	3.87	3.87	3.87	0.45	1.90	± 13.1 %
5800	48.2	6.00	4.12	4.12	4.12	0.50	1.90	± 13.1 %

^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the Indicated frequency band.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-5 GHz at any distance larger than half the probe tip diameter from the boundary.

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

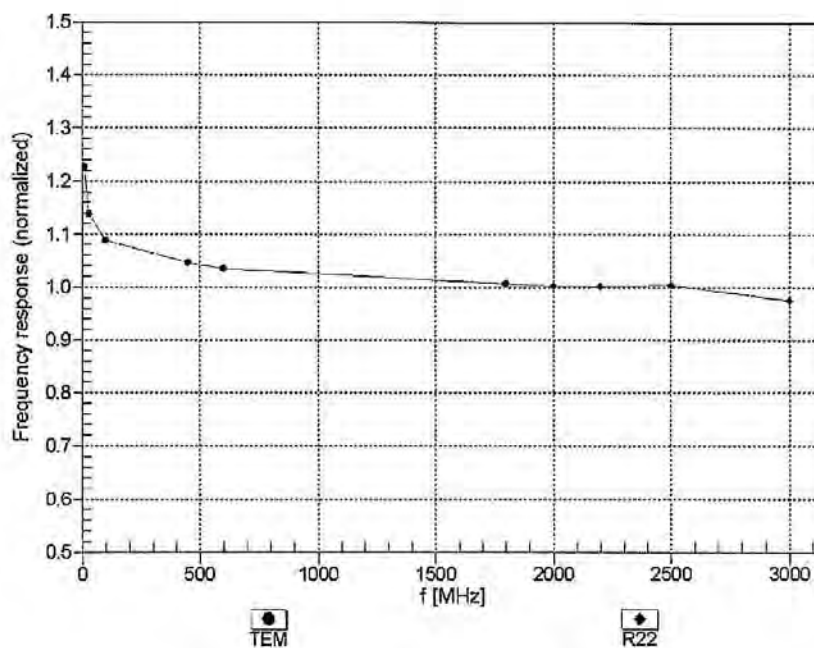
Report No.: RXA1412-0272SAR01R2

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EX3DV4- SN:3977

February 17, 2014

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

TA Technology (Shanghai) Co., Ltd.

Test Report

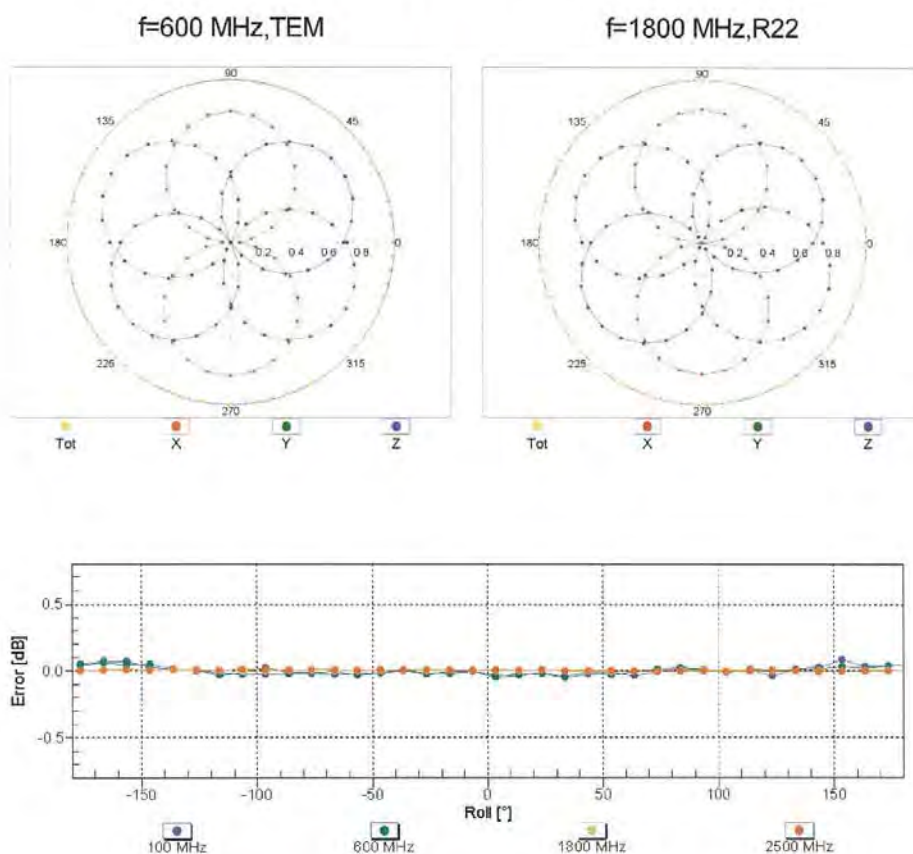
Report No.: RXA1412-0272SAR01R2

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EX3DV4- SN:3977

February 17, 2014

Receiving Pattern (ϕ), $\theta = 0^\circ$



Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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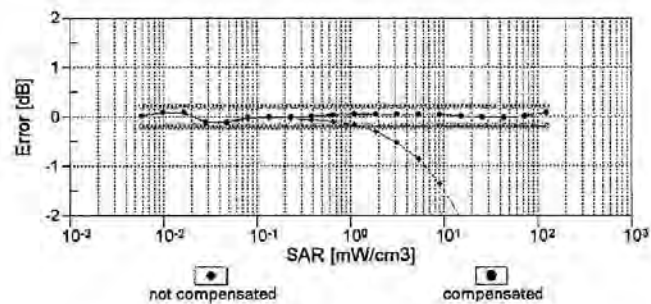
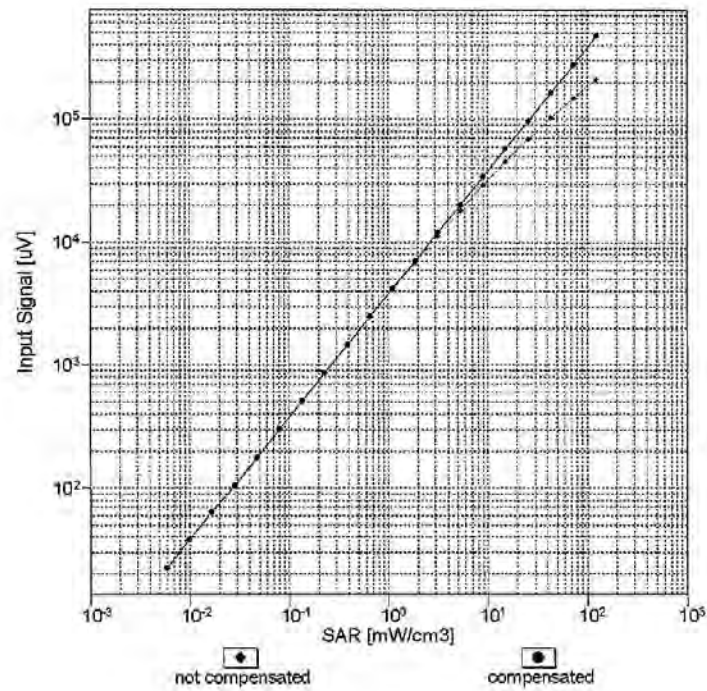
Report No.: RXA1412-0272SAR01R2

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EX3DV4—SN:3977

February 17, 2014

Dynamic Range $f(\text{SAR}_{\text{head}})$
(TEM cell, $f_{\text{eval}} = 1900 \text{ MHz}$)

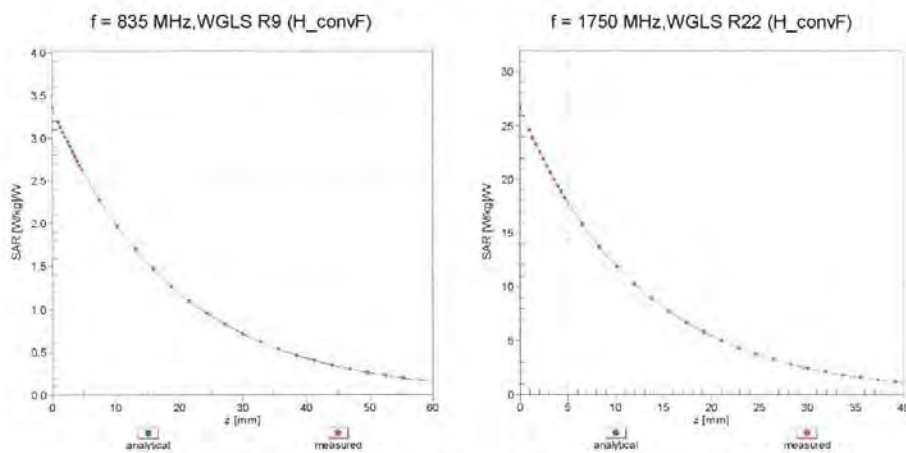


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

EX3DV4- SN:3977

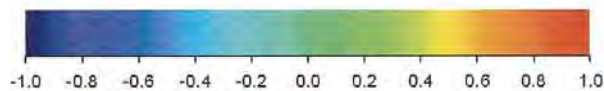
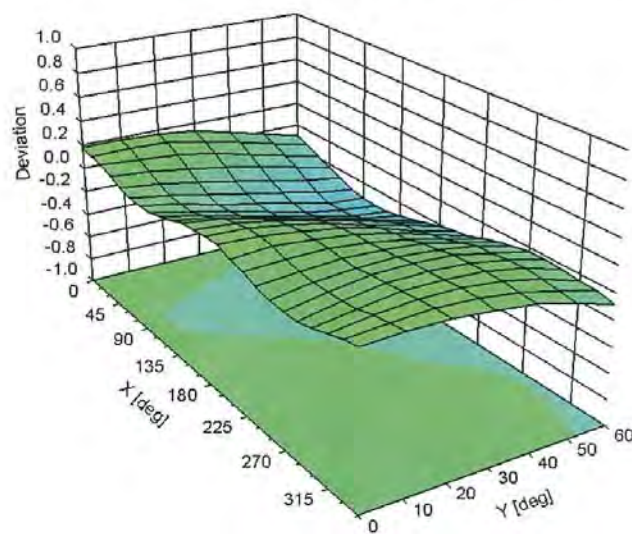
February 17, 2014

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), $f = 900 \text{ MHz}$



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

TA Technology (Shanghai) Co., Ltd.
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EX3DV4- SN:3977

February 17, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3977

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	23.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

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

Report No.: RXA1412-0272SAR01R2

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ANNEX J: D835V2 Dipole Calibration Certificate(August 26,2011)

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: **D835V2-4d020_Aug11**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d020**

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

Calibration date: **August 26, 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	08-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292763	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-05	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

Calibrated by: **Jeton Kastrati** **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Issued: August 26, 2011

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

Certificate No: D835V2-4d020_Aug11

Page 1 of 8

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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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

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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	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.1 $\pm$ 6 %	0.89 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	2.32 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.34 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	1.52 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.11 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	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	53.4 $\pm$ 6 %	0.99 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	2.42 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.46 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	1.59 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.26 mW / g $\pm$ 16.5 % (k=2)

TA Technology (Shanghai) Co., Ltd.

Test Report

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Appendix

Antenna Parameters with Head TSL

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

Antenna Parameters with Body TSL

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

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 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	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:

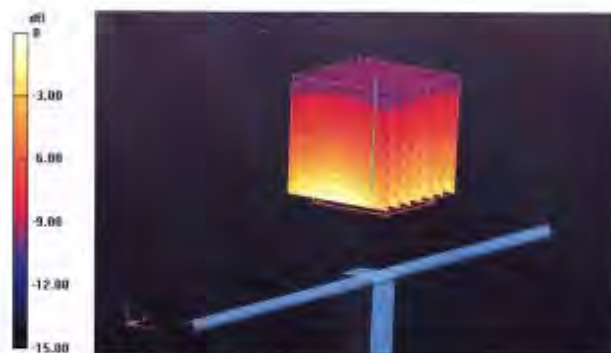
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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



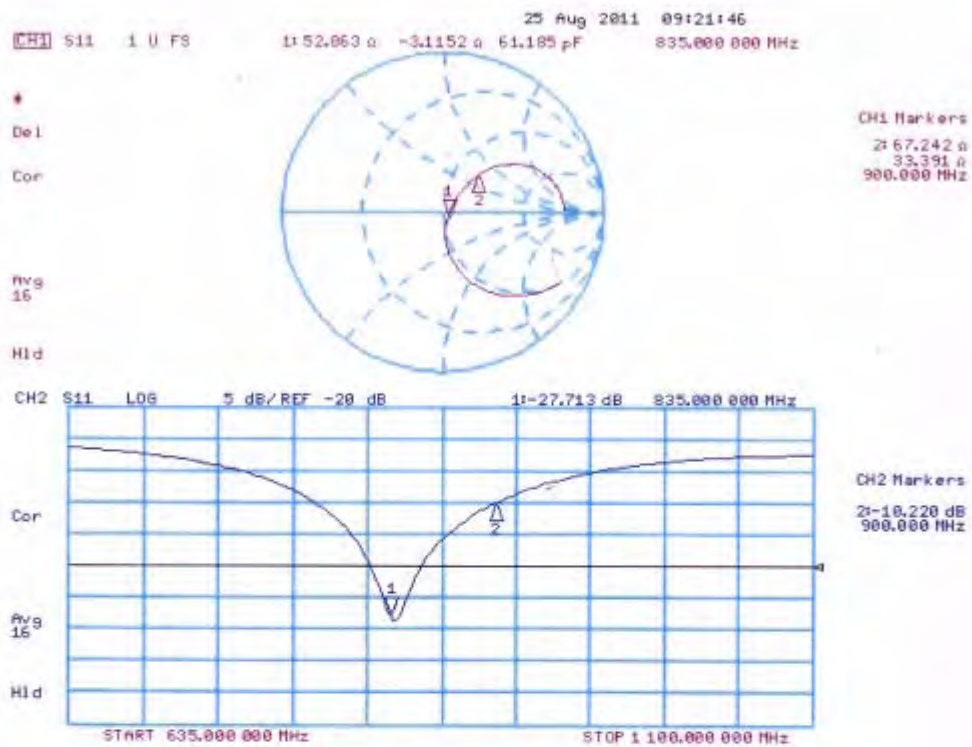
0 dB = 2.710mW/g

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

Report No.: RXA1412-0272SAR01R2

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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: $f = 835$ MHz; $\sigma = 0.99$ mho/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

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:

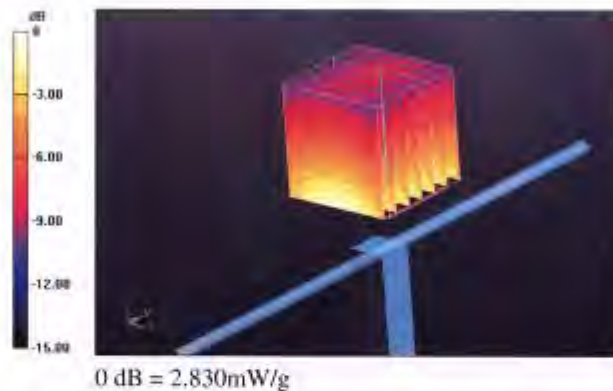
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

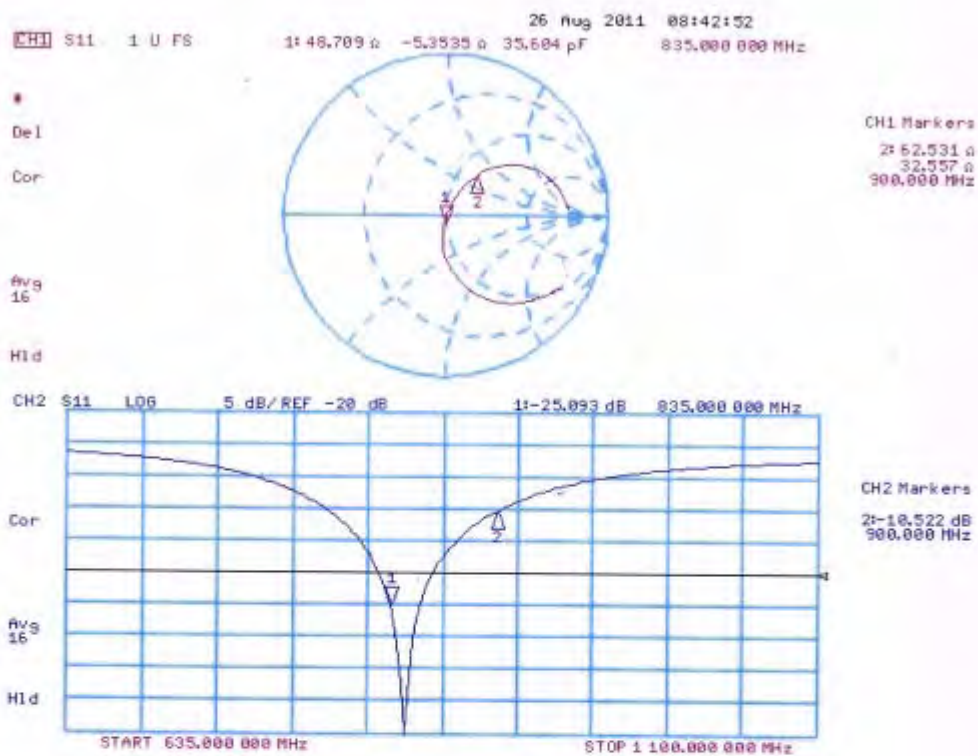


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Test Report

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Impedance Measurement Plot for Body TSL



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

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



In Collaboration with
s p e a g
CALIBRATION LABORATORY

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: **Z14-97073**

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**

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 ES3DV3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)	Sep-14
DAE3	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

	Name	Function	Signature
Calibrated by:	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.

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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CALIBRATION LABORATORY

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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

Report No.: RXA1412-0272SAR01R2

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E-mail: cttl@chinattl.com Http://www.chinattl.cn



CALIBRATION
No. L0570

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 $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	42.5 $\pm$ 6 %	0.91 mho/m $\pm$ 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 $\pm$ 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 $\pm$ 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 $\pm$ 0.2) °C	56.7 $\pm$ 6 %	0.97 mho/m $\pm$ 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 $\pm$ 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 $\pm$ 20.4 % (k=2)

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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In Collaboration with
s p e a g
CALIBRATION LABORATORY

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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttd@chinattd.com Http://www.chinattd.cn



CALIBRATION
No. L0570

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$48.6\Omega + 2.75j\Omega$
Return Loss	- 30.1dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$54.0\Omega + 5.88j\Omega$
Return Loss	- 23.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1,242 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
-----------------	-------

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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CALIBRATION LABORATORY

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CALIBRATION
No. L0570

DASY5 Validation Report for Head TSL

Date: 28.03.2014

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:

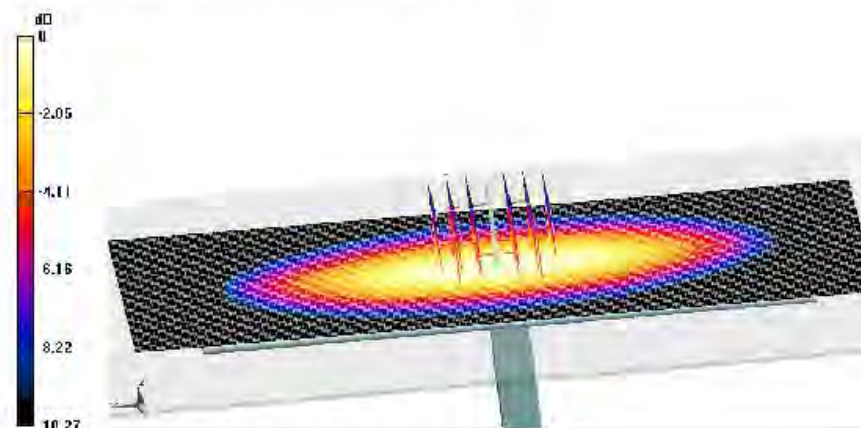
$dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

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.

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Report No.: RXA1412-0272SAR01R2

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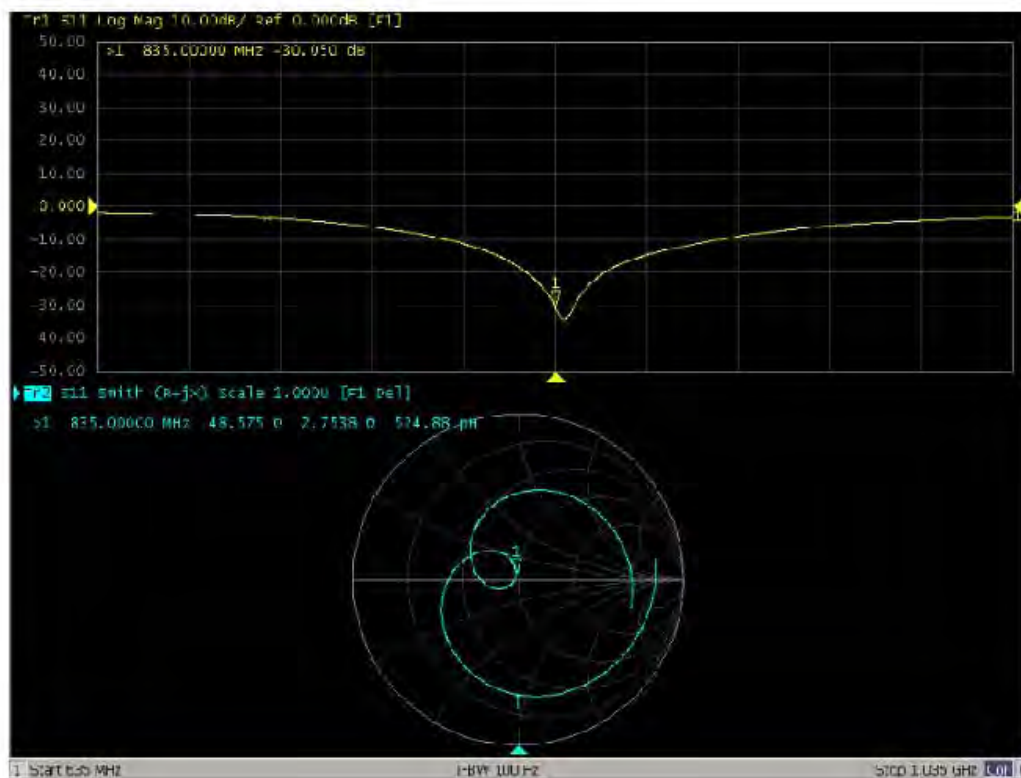
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CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
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CALIBRATION
No. L0570

Impedance Measurement Plot for Head TSL



TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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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: $f = 835 \text{ MHz}$; $\sigma = 0.97 \text{ S/m}$; $\epsilon_r = 56.745$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(5.98, 5.98, 5.98); Calibrated: 2013-09-05;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAB3 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)

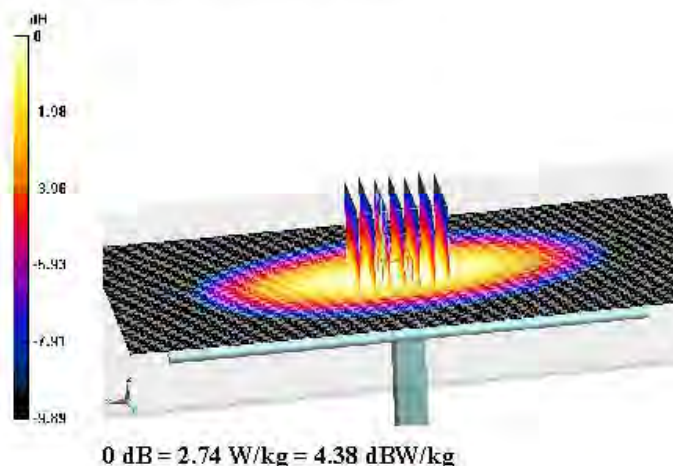
System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0; Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.515 V/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



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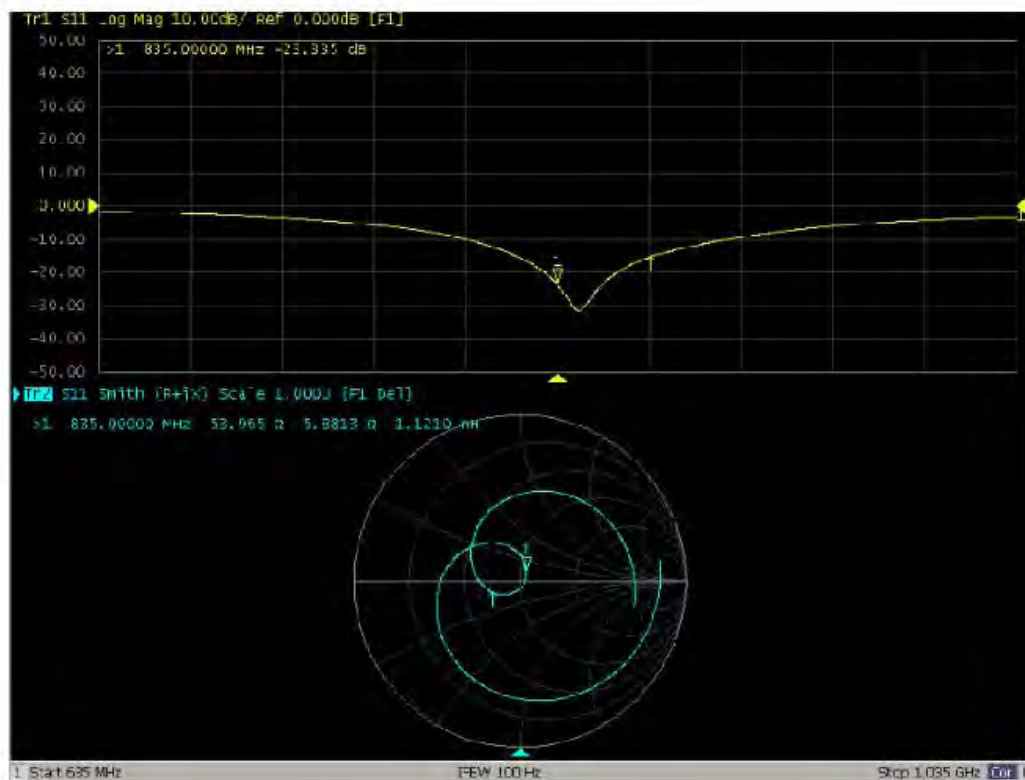
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CALIBRATION
No. L0570

Impedance Measurement Plot for Body TSL



TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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ANNEX L: D1900V2 Dipole Calibration Certificate

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**

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 B481A	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 B481A	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

Calibrated by:	Name Dimce Iliev	Function Laboratory Technician	Signature
Approved by:	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.

Test Report

Report No.: RXA1412-0272SAR01R2

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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)

TA Technology (Shanghai) Co., Ltd.

Test Report

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.6 \Omega + 7.5 j\Omega$
Return Loss	- 22.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$47.3 \Omega + 7.9 j\Omega$
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:

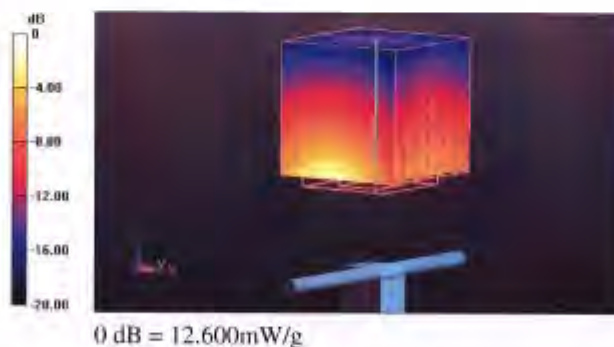
Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

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

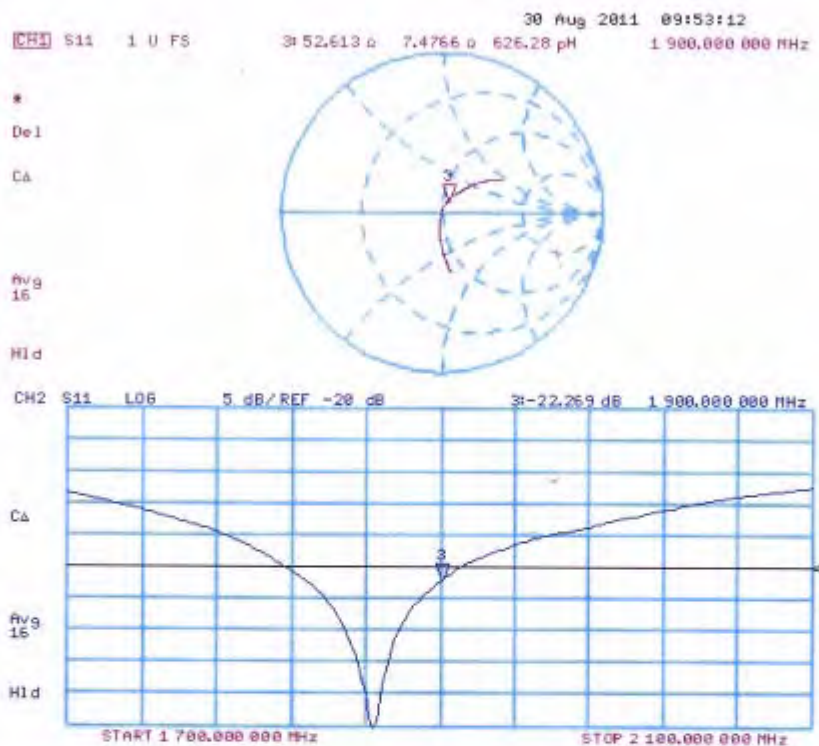


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Test Report

Report No.: RXA1412-0272SAR01R2

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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:

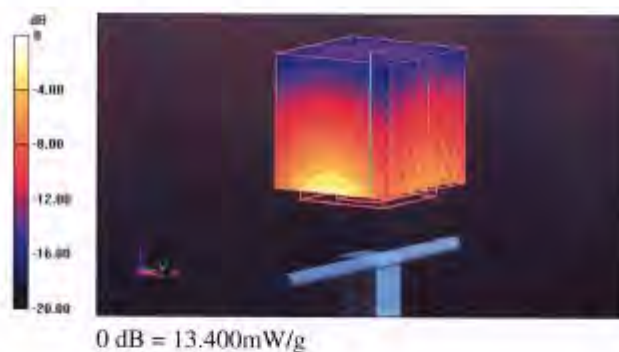
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

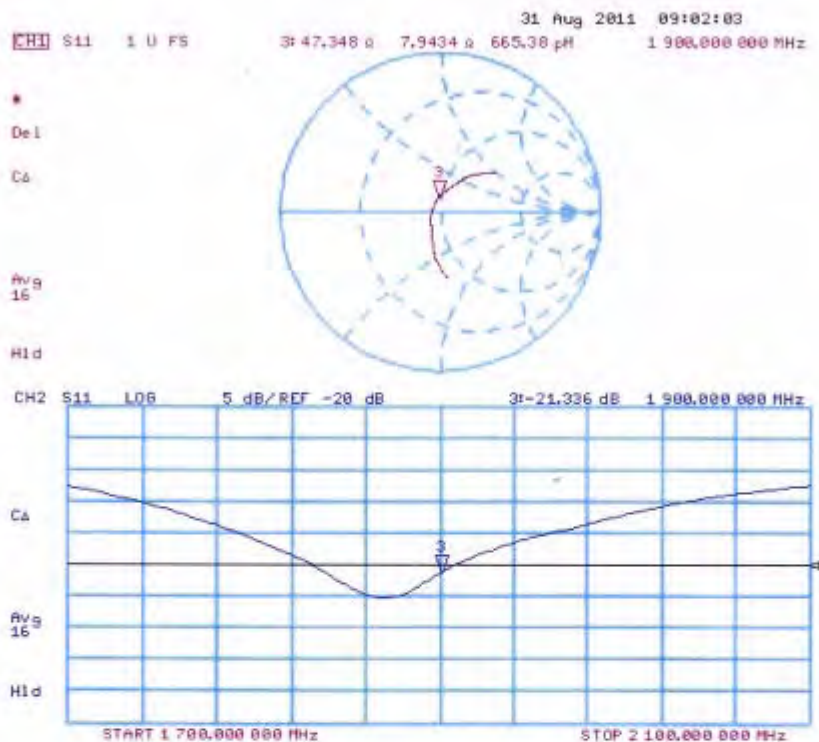


TA Technology (Shanghai) Co., Ltd.
Test Report

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Impedance Measurement Plot for Body TSL



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

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



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CALIBRATION LABORATORY

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**

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)℃ 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 ES3DV3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)	Sep-14
DAE3	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

	Name	Function	Signature
Calibrated by:	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

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Certificate No: Z14-97074

Page 1 of 8

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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E-mail: cttl@chinattl.com Http://www.chinattl.cn



CALIBRATION
No. L0570

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

Report No.: RXA1412-0272SAR01R2

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CALIBRATION
No. L0570

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 $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.8 $\pm$ 6 %	1.37 mho/m $\pm$ 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 $\pm$ 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 $\pm$ 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 $\pm$ 0.2) °C	51.8 $\pm$ 6 %	1.50 mho/m $\pm$ 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 $\pm$ 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 $\pm$ 20.4 % (k=2)

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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E-mail: cttl@chinatl.com Http://www.chinatl.cn



CALIBRATION
No. L0570

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
-----------------	-------

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.: RXA1412-0272SAR01R2

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E-mail: cttd@chinattl.com Http://www.chinattl.cn



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: $f = 1900 \text{ MHz}$; $\sigma = 1.371 \text{ S/m}$; $\epsilon_r = 39.83$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(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:

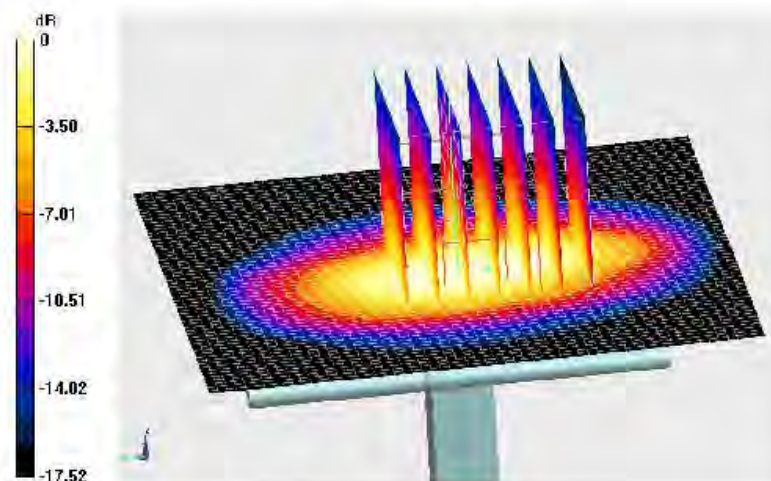
$dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

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

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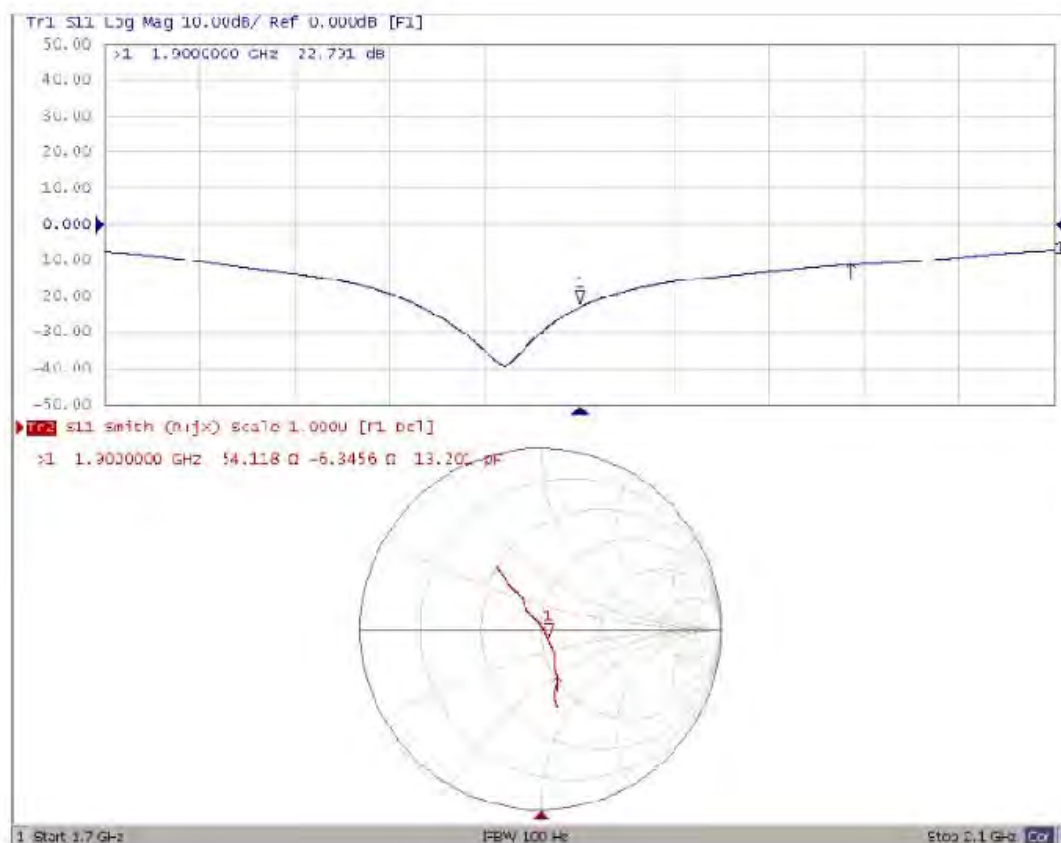
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CALIBRATION LABORATORY

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



CALIBRATION
No. L0570

Impedance Measurement Plot for Head TSL



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E-mail: cttd@chinattl.com Http://www.chinattl.cn



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:

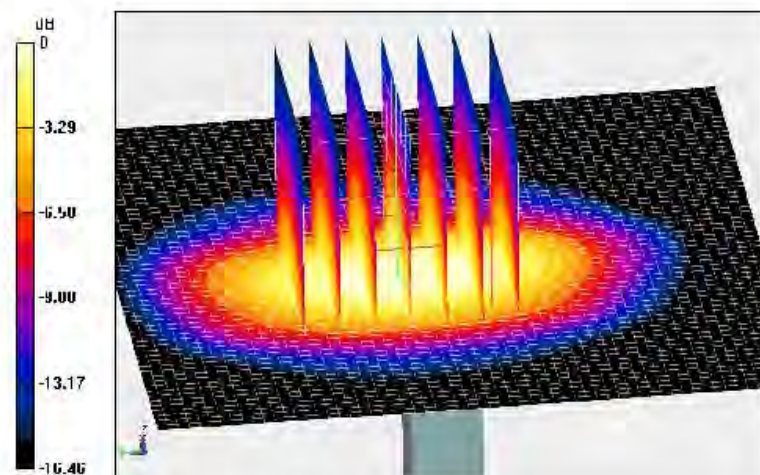
$dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

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 dB W/kg

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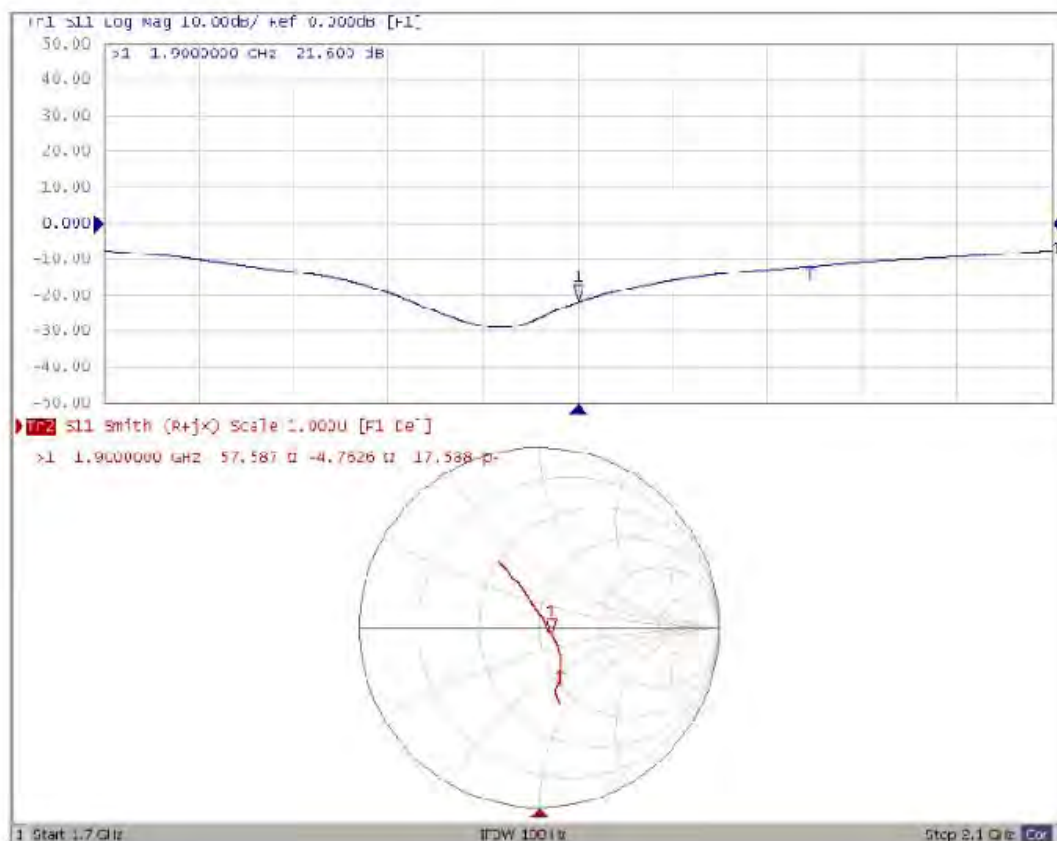
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CALIBRATION
No. L0570

Impedance Measurement Plot for Body TSL



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ANNEX N: D2450V2 Dipole Calibration Certificate

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)

Accreditation No.: **SCS 108**

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

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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	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

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

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.

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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.

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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	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

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

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.7 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	53.8 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	6.41 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	25.4 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.8 $\pm$ 6 %	2.02 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	13.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	51.7 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	6.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.2 mW / g $\pm$ 16.5 % (k=2)

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Appendix

Antenna Parameters with Head TSL

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

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$50.4\ \Omega + 3.5\ j\Omega$
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:

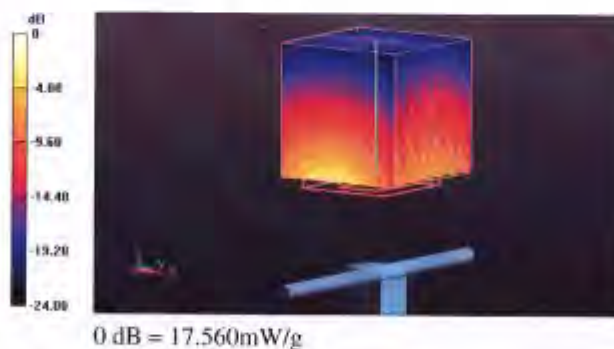
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

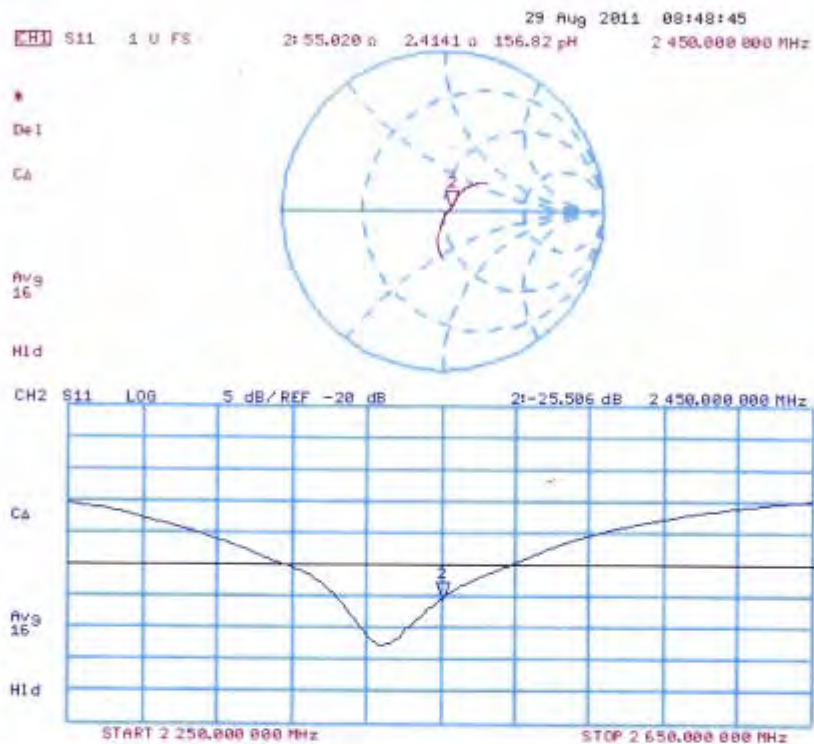


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Impedance Measurement Plot for Head TSL



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:

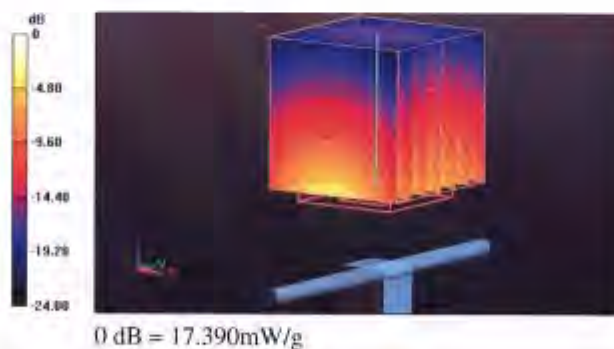
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

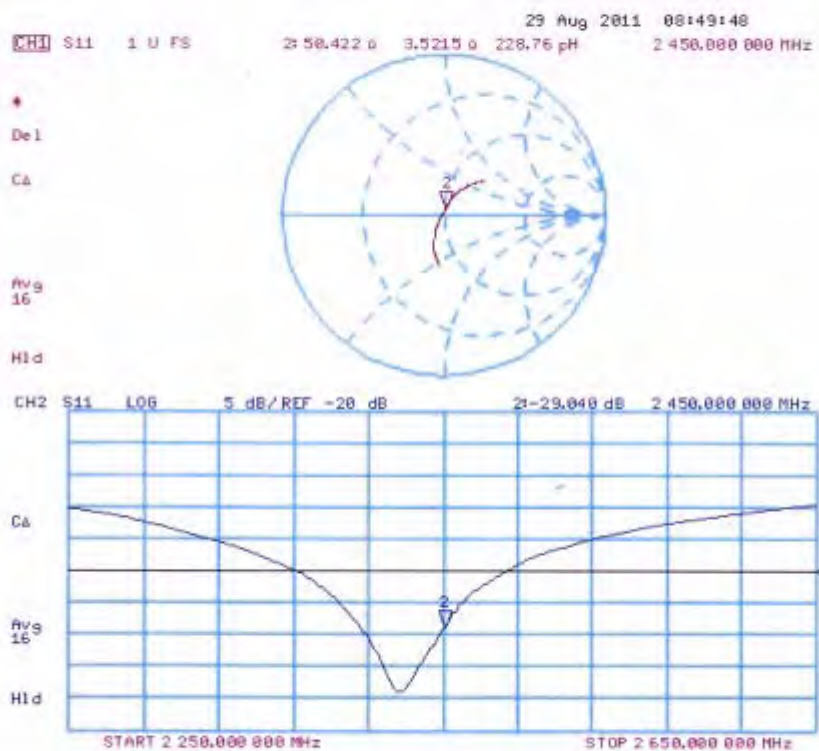


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Impedance Measurement Plot for Body TSL



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ANNEX O: DAE4 Calibration Certificate



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

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CALIBRATION LABORATORY



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

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

Certificate No: J14-2-0052

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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.

TA Technology (Shanghai) Co., Ltd.

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CALIBRATION LABORATORY

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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: info@emcite.com Http://www.emcite.com

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range 1LSB = $6.1\mu\text{V}$, full range = $-100\dots+300\text{ mV}$
Low Range 1LSB = 61 nV , full range = $-1\dots+3\text{ mV}$

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	$119^\circ \pm 1^\circ$
---	-------------------------

ANNEX P: The EUT Appearances and Test Configuration



Original



Variant

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Test Report

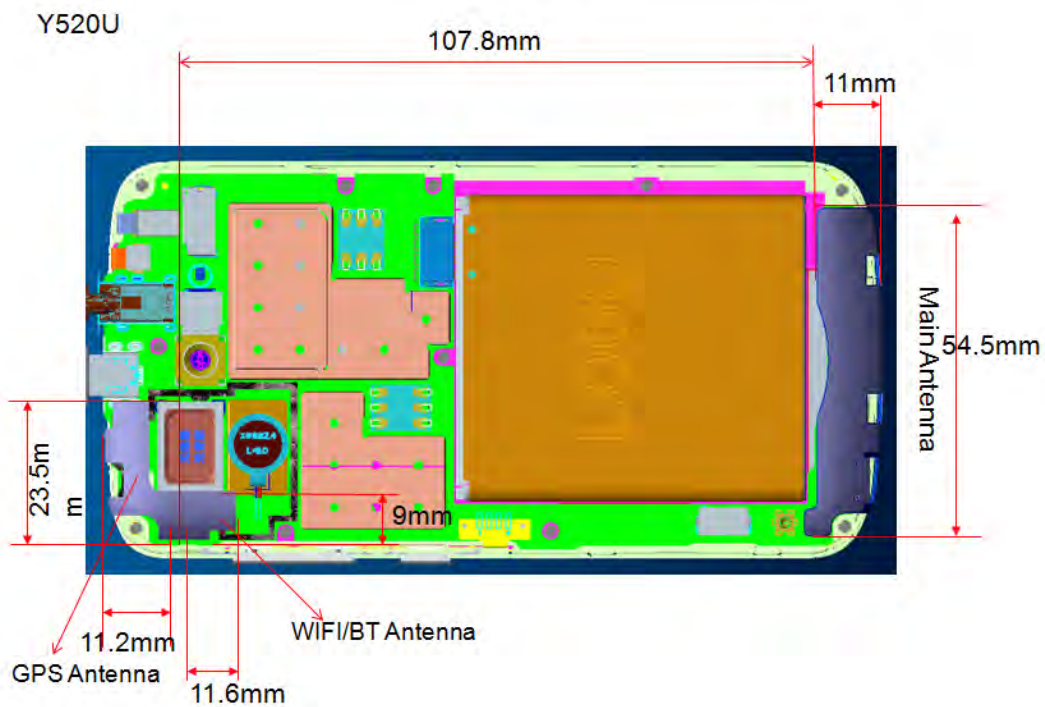
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New Y520-U33

a: EUT



b: Antenna

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Battery 1



Battery 2



Battery 3

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Battery 4

c: Battery



Earphone 1

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Earphone 2



Earphone 3

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Earphone 4



Earphone 5

d: Earphone

Picture 8: Constituents of EUT

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Picture 9: Left Hand Touch Cheek Position



Picture 10: Left Hand Tilt 15 Degree Position



Picture 11: Right Hand Touch Cheek Position

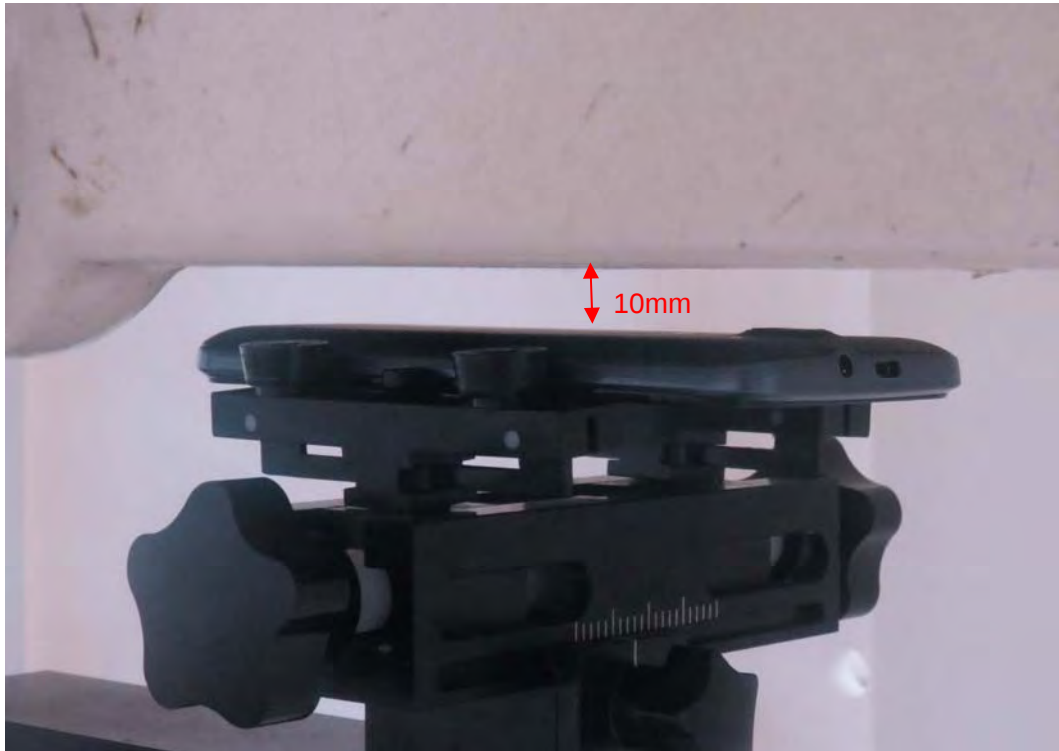


Picture 12: Right Hand Tilt 15 Degree Position

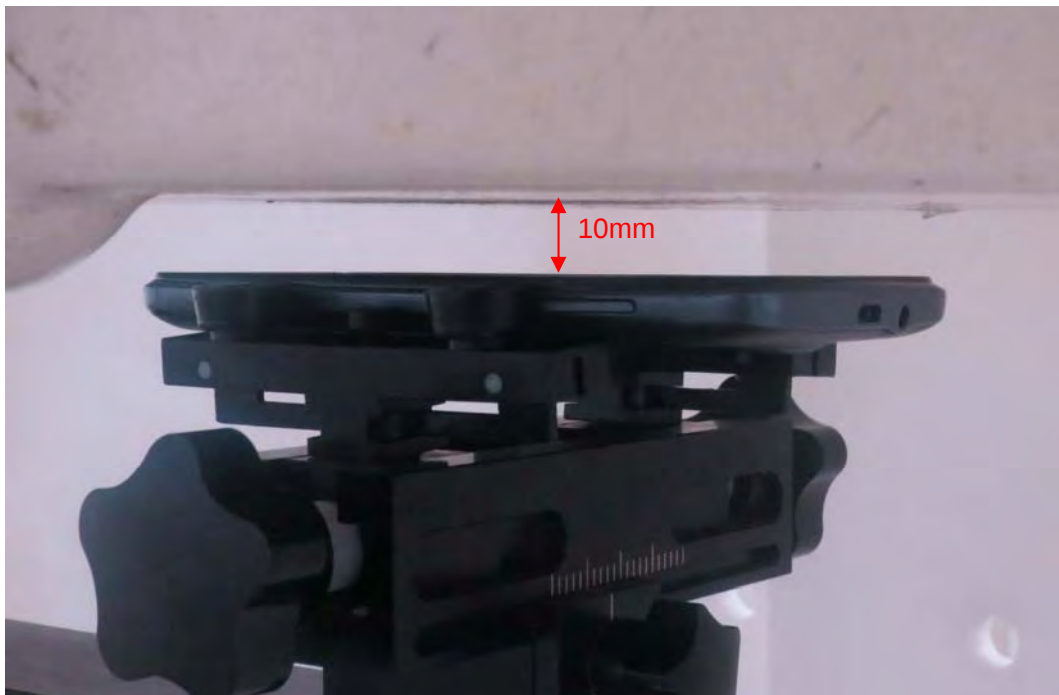
TA Technology (Shanghai) Co., Ltd.
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Picture 13: Back Side, the distance from handset to the bottom of the Phantom is 10mm



Picture 14: Front Side, the distance from handset to the bottom of the Phantom is 10mm

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Picture 15: Left Edge, the distance from handset to the bottom of the Phantom is 10mm



Picture 16: Right Edge, the distance from handset to the bottom of the Phantom is 10mm



Picture 17: Top Edge, the distance from handset to the bottom of the Phantom is 10mm



Picture 18: Bottom Edge, the distance from handset to the bottom of the Phantom is 10mm

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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 34: 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
7	3977	835MHz (head)	February 17, 2014	850MHz	41.5	0.92
8	3977	1900MHz (head)	February 17, 2014	1900MHz	40.0	1.40
9	3977	2450MHz (head)	February 17, 2014	2450MHz	39.2	1.80
10	3977	835MHz (body)	February 17, 2014	850MHz	55.2	0.99
11	3977	1900MHz (body)	February 17, 2014	1900MHz	53.3	1.52
12	3977	2450MHz (body)	February 17, 2014	2450MHz	52.7	1.95

Table 35: 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

ANNEX R: Product Change Description

Product Change Description

As the applicant of the below model, [Huawei Technologies Co., Ltd.] declares that the product,

[HUAWEI Y520-U33]

is the variant of the initial certified product,

[HUAWEI Y520-U03]

SOFTWARE MODIFICATIONS:

Protocol Stack changes: NO

MMS/STK changes: NO

JAVA changes: NO

Other changes detailed: NO

HARDWARE MODIFICATION:

Band changes: NO

Power Amplifier changes: NO

Antenna changes: NO

PCB Layout changes: NO

Components on PCB changes: NO

LCD changes: NO

Speaker changes: NO

Camera changes: NO

Vibrator changes: NO

Bluetooth changes: NO

FM changes: NO

Other changes: NO

MECHANICAL MODIFICATIONS:

Use new metal front/back cover or keypad: no

Mechanical shell changes: NO

Other changes detailed: HUAWEI Y520-U03 single SIM card; HUAWEI Y520-U33 double SIM cards

ACCESSORY MODIFICATIONS:

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Battery changes: NO

AC Adaptor changes: NO

Earphone changes: NO

APPROVED BY:

Project Manager:



Date:2014-07-29

Company: Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base, Bantian Longgang, Shenzhen

Tel:029-89282965

Fax: NA

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ANNEX S: Product Change Description (New Y520-U33)

	Old	New
Model	HUAWEI Y520-U33	HUAWEI Y520-U33
FCC ID	QISY520-U33	QISY520-U33
Frequency	UMTS band 2/5 GSM850/900/1800/1900	UMTS band 2/5 GSM850/900/1800/1900
PCB		Manufacture of W850 Power Amplifier was changed, and matching circuit component was changed.
Hardware Version	The same	The same
Software Version	The same	The same
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:

