In Collaboration with
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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.7Ω- 3.73jΩ
Return Loss	- 27.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.0Ω- 3.95jΩ
Return Loss	- 21.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.317 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

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

DASY5 Validation Report for Head TSL Date: 06.11.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d147

Communication System: UID 0, CW; Frequency: 1800 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1800 MHz; σ = 1.387 S/m; ε_r = 40.87; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(8.00, 8.00, 8.00); Calibrated: 2014-08-28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; 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)

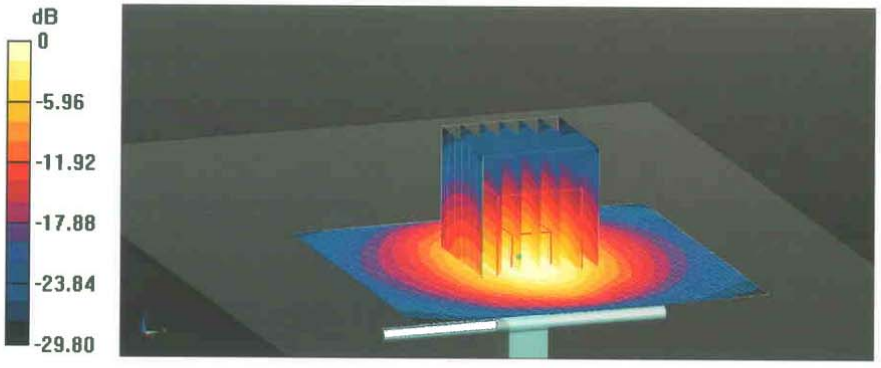
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.9 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 16.9 W/kg

SAR(1 g) = 9.49 W/kg; SAR(10 g) = 5.06 W/kg

Maximum value of SAR (measured) = 13.4 W/kg

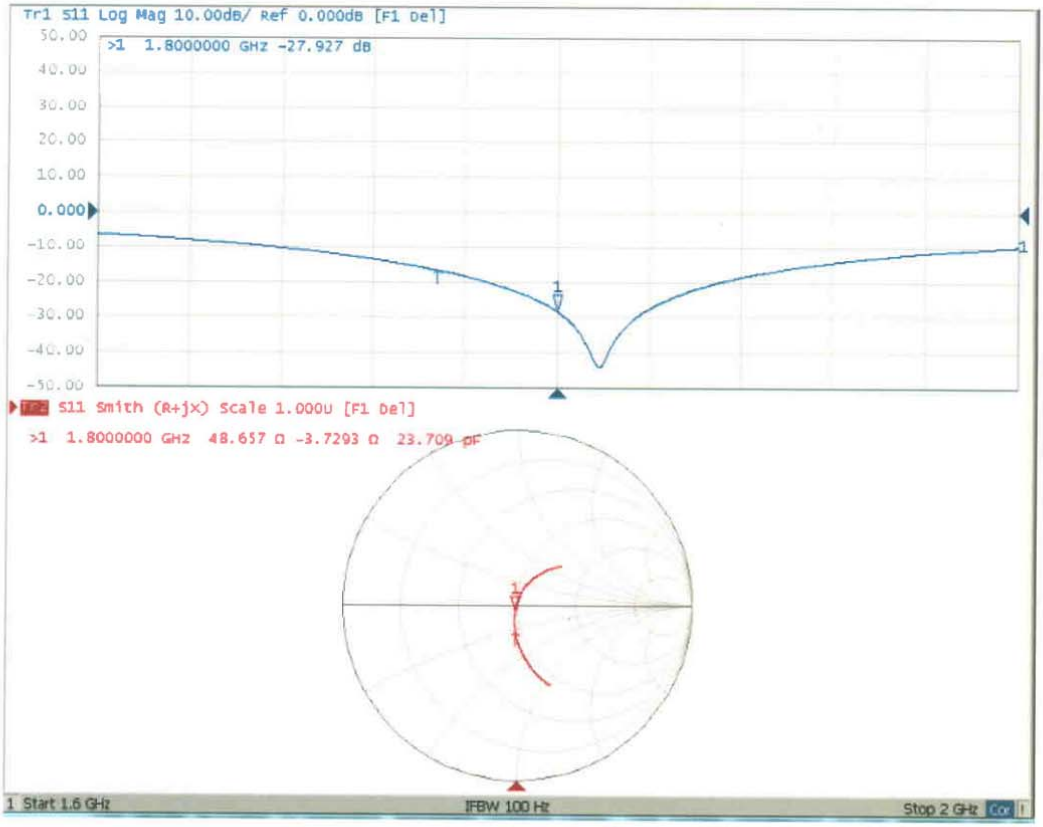


0 dB = 14.2 W/kg = 11.53 dBW/kg

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

Impedance Measurement Plot for Head TSL



©Copyright. All rights reserved by CTTL.

In Collaboration with
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

DASY5 Validation Report for Body TSL Date: 06.11.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d147

Communication System: UID 0, CW; Frequency: 1800 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1800 MHz; σ = 1.489 S/m; ε_r = 52.85; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.68, 7.68, 7.68); Calibrated: 2014-08-28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; 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)

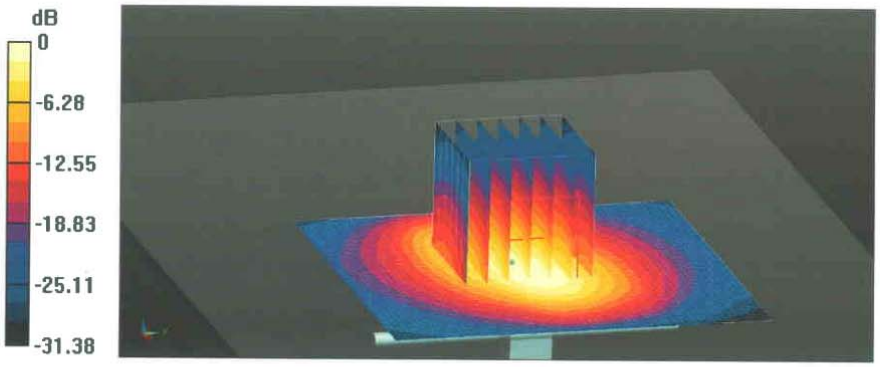
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.99 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 9.96 W/kg; SAR(10 g) = 5.24 W/kg

Maximum value of SAR (measured) = 14.1 W/kg

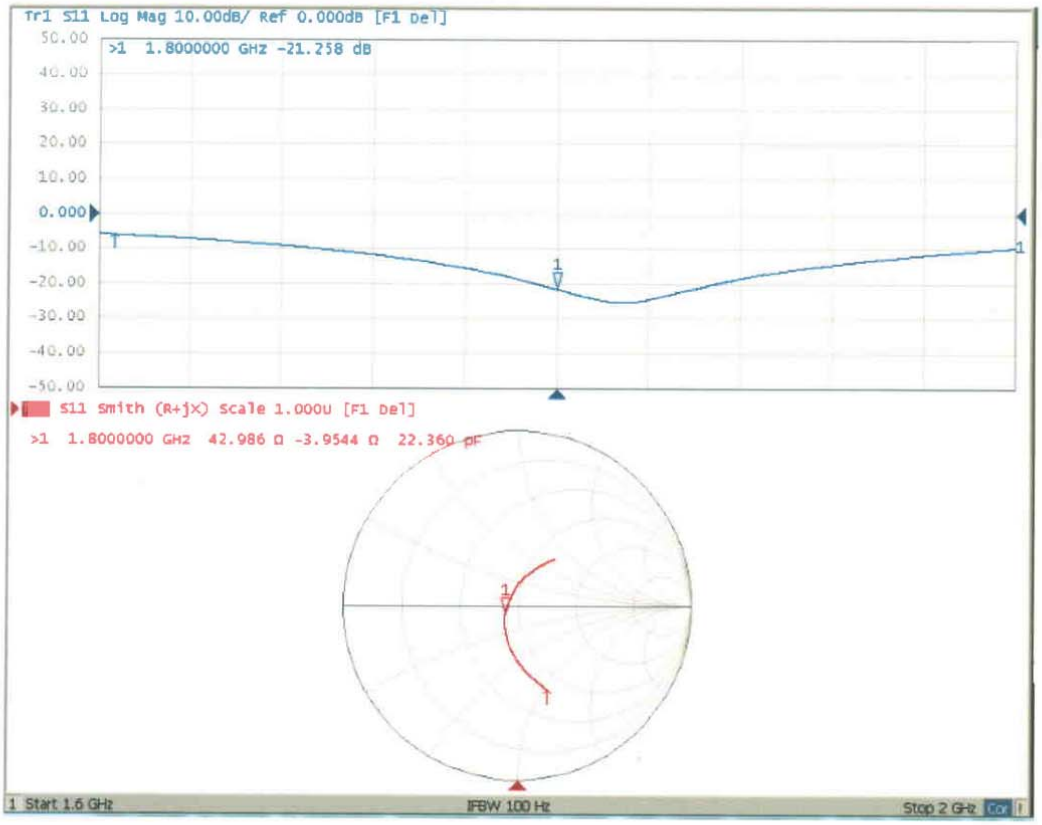


0 dB = 15.3 W/kg = 11.86 dBW/kg

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

Impedance Measurement Plot for Body TSL



©Copyright. All rights reserved by CTTL.

1900 MHz Dipole Calibration Certificate

In Collaboration with s p e a g CALIBRATION LABORATORY
受控文件
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

CALIBRATION No. L0570

Client **CTTL(South Branch)** **Certificate No: Z14-97130**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d088
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration Procedures for dipole validation kits
Calibration date:	November 5, 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 NRP2	101919	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101547	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG,No.EX3-3617_Aug14)	Aug-15
DAE4	SN 1331	23-Jan-14 (SPEAG, DAE4-1331_Jan14)	Jan-15
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGeneratorMG3700A	6201052605	01-Jul-14 (CTTL, No.J14X02145)	Jun-15
Network Analyzer E5071C	MY46110673	15-Feb-14 (TMC, No.JZ14-781)	Feb-15

	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: November 8, 2014

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

©Copyright. All rights reserved by CTTL.

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

Glossary:

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

Calibration is Performed According to the Following Standards:

a) 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
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.9 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.97 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**40.5 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.18 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.9 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.1 ± 6 %	1.51 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**41.1 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.35 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 mW /g ± 20.4 % (k=2)**

©Copyright. All rights reserved by CTTL.

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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.0Ω+ 6.31jΩ
Return Loss	- 22.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.5Ω+ 6.01jΩ
Return Loss	- 24.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.299 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

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

DASY5 Validation Report for Head TSL Date: 05.11.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d088

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

Medium parameters used: f = 1900 MHz; σ = 1.365 S/m; ε_r = 39.92; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.9, 7.9, 7.9); Calibrated: 2014-08-28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; 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)

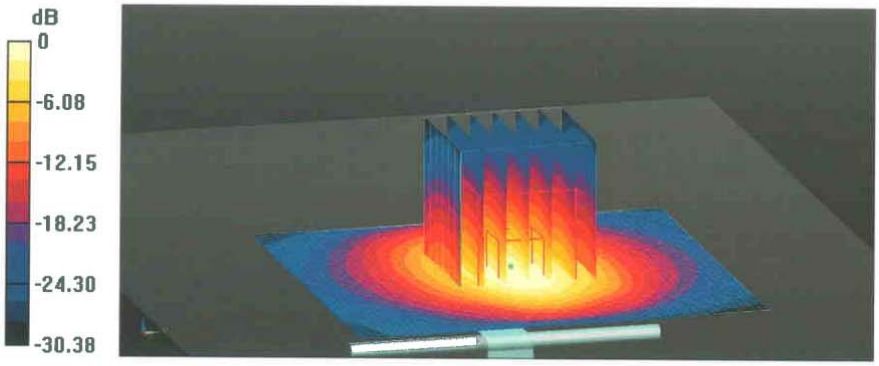
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.0 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 18.7 W/kg

SAR(1 g) = 9.97 W/kg; SAR(10 g) = 5.18 W/kg

Maximum value of SAR (measured) = 14.5 W/kg

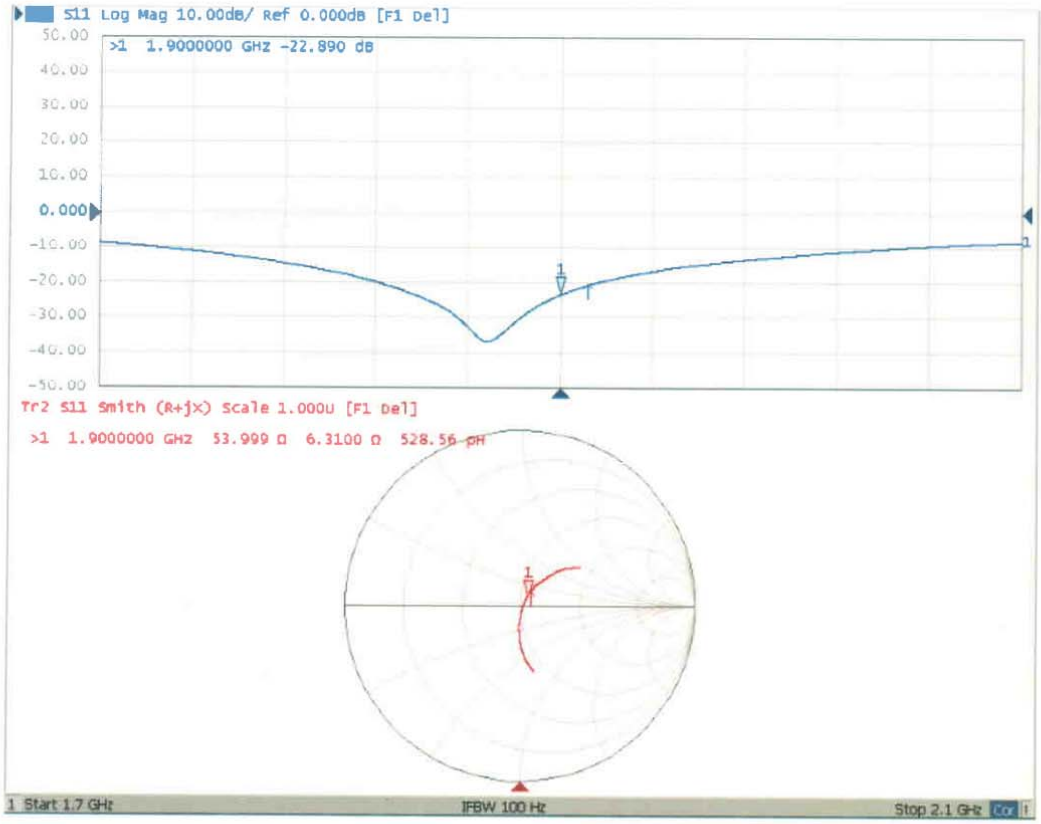


0 dB = 15.3 W/kg = 11.84 dBW/kg

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

Impedance Measurement Plot for Head TSL



©Copyright. All rights reserved by CTTL.

In Collaboration with
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

DASY5 Validation Report for Body TSL Date: 05.11.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d088

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

Medium parameters used: f = 1900 MHz; σ = 1.511 S/m; ε_r = 54.12; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.58, 7.58, 7.58); Calibrated: 2014-08-28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; 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)

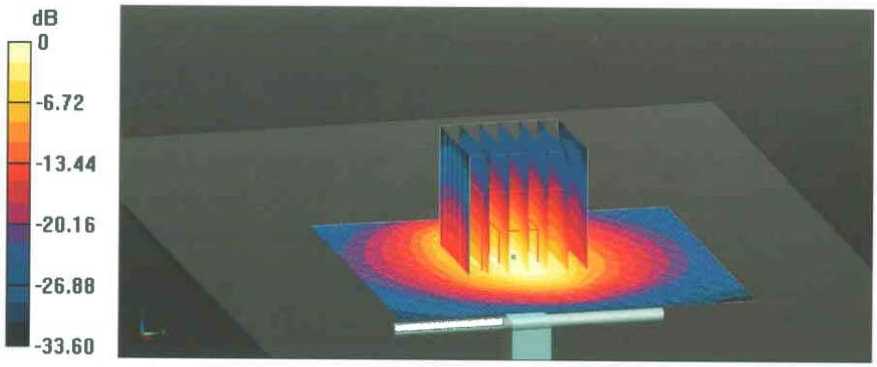
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.67 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 18.4 W/kg

SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.35 W/kg

Maximum value of SAR (measured) = 14.6 W/kg

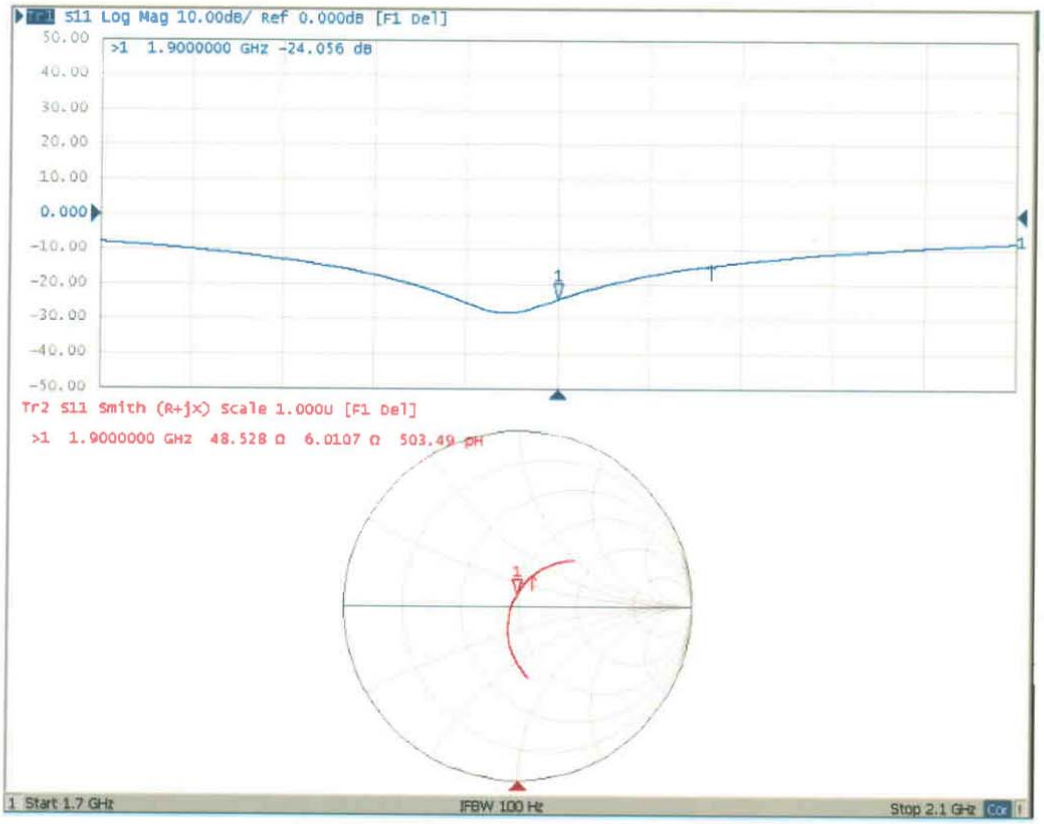


0 dB = 15.7 W/kg = 11.96 dBW/kg

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

Impedance Measurement Plot for Body TSL



©Copyright. All rights reserved by CTTL.

2450 MHz Dipole Calibration Certificate

In Collaboration with
s p e a g
CALIBRATION LABORATORY
受控文件
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

CALIBRATION
No. L0570

Client **CTTL(South Branch)** **Certificate No: Z14-97131**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 873
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration Procedures for dipole validation kits
Calibration date:	November 3, 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 NRP2	101919	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101547	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG,No.EX3-3617_Aug14)	Aug-15
DAE4	SN 1331	23-Jan-14 (SPEAG, DAE4-1331_Jan14)	Jan-15
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGeneratorMG3700A	6201052605	01-Jul-14 (CTTL, No.J14X02145)	Jun-15
Network Analyzer E5071C	MY46110673	15-Feb-14 (TMC, No.JZ14-781)	Feb-15

	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: November 5, 2014

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

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

Glossary:

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

Calibration is Performed According to the Following Standards:

a) 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
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.1 ± 6 %	1.84 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**53.7 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.34 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**25.3 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.4 ± 6 %	1.99 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Head 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	**52.0 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.19 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.5 mW /g ± 20.4 % (k=2)**

©Copyright. All rights reserved by CTTL.

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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.7Ω+ 5.02jΩ
Return Loss	- 26.0dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.7Ω+ 5.68jΩ
Return Loss	- 24.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 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

©Copyright. All rights reserved by CTTL.

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

DASY5 Validation Report for Head TSL Date: 03.11.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 873

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

Medium parameters used: f = 2450 MHz; σ = 1.842 S/m; ε_r = 40.1; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.19, 7.19, 7.19); Calibrated: 2014-08-28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; 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)

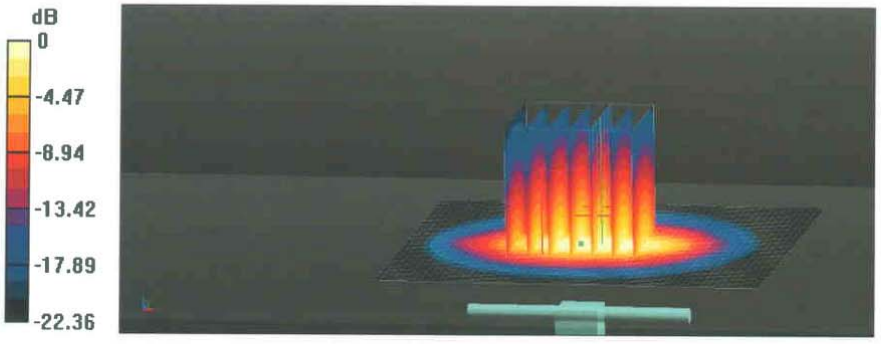
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.3 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 27.3 W/kg

SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.34 W/kg

Maximum value of SAR (measured) = 20.3 W/kg

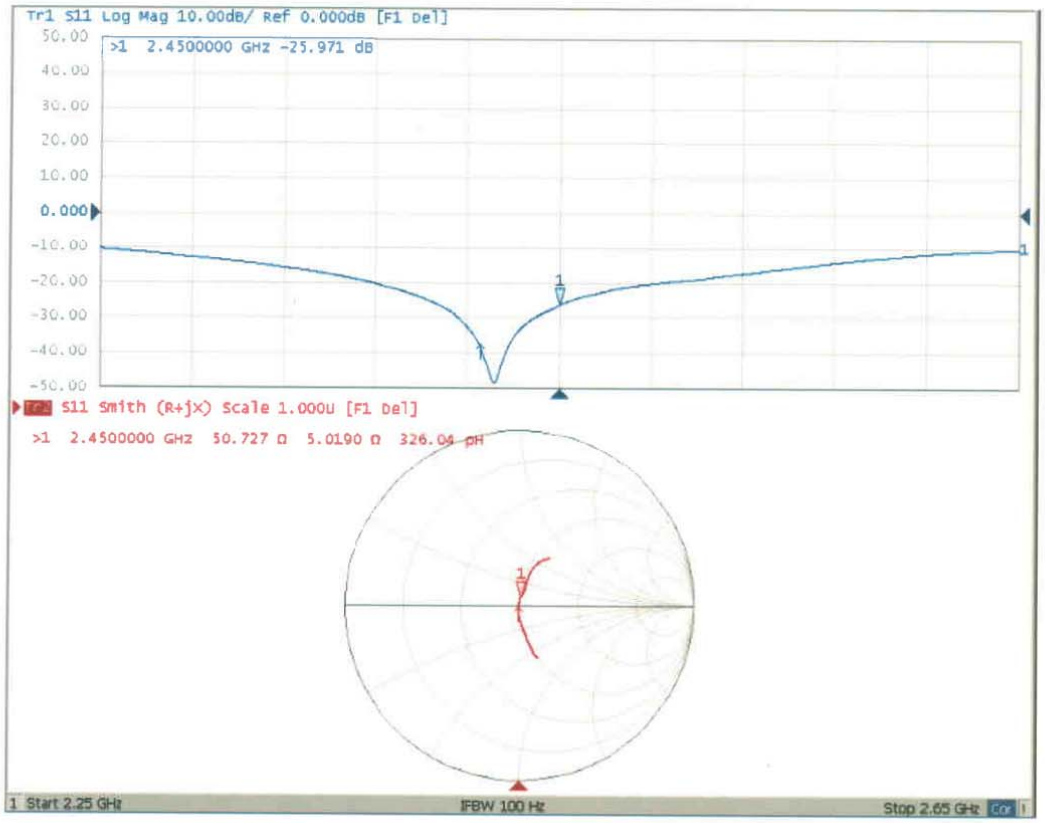


0 dB = 20.3 W/kg = 13.07 dBW/kg

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

Impedance Measurement Plot for Head TSL



©Copyright. All rights reserved by CTTL.

In Collaboration with
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

DASY5 Validation Report for Body TSL Date: 02.11.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 873

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

Medium parameters used: f = 2450 MHz; σ = 1.991 S/m; ε_r = 51.37; ρ = 1000 kg/m^3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.31, 7.31, 7.31); Calibrated: 2014-08-28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; 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)

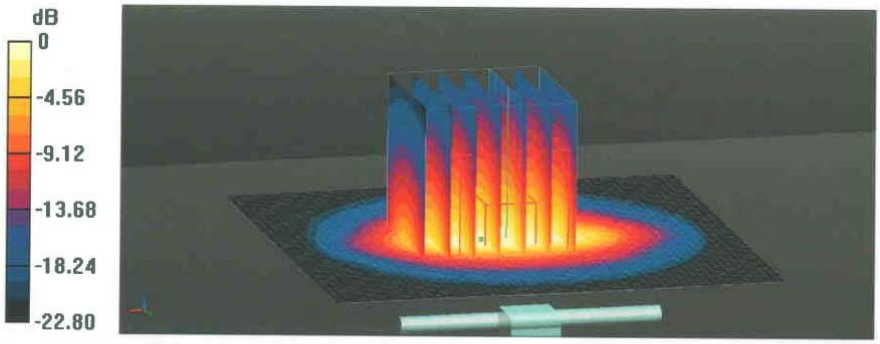
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.6 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 27.1 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.19 W/kg

Maximum value of SAR (measured) = 20.3 W/kg

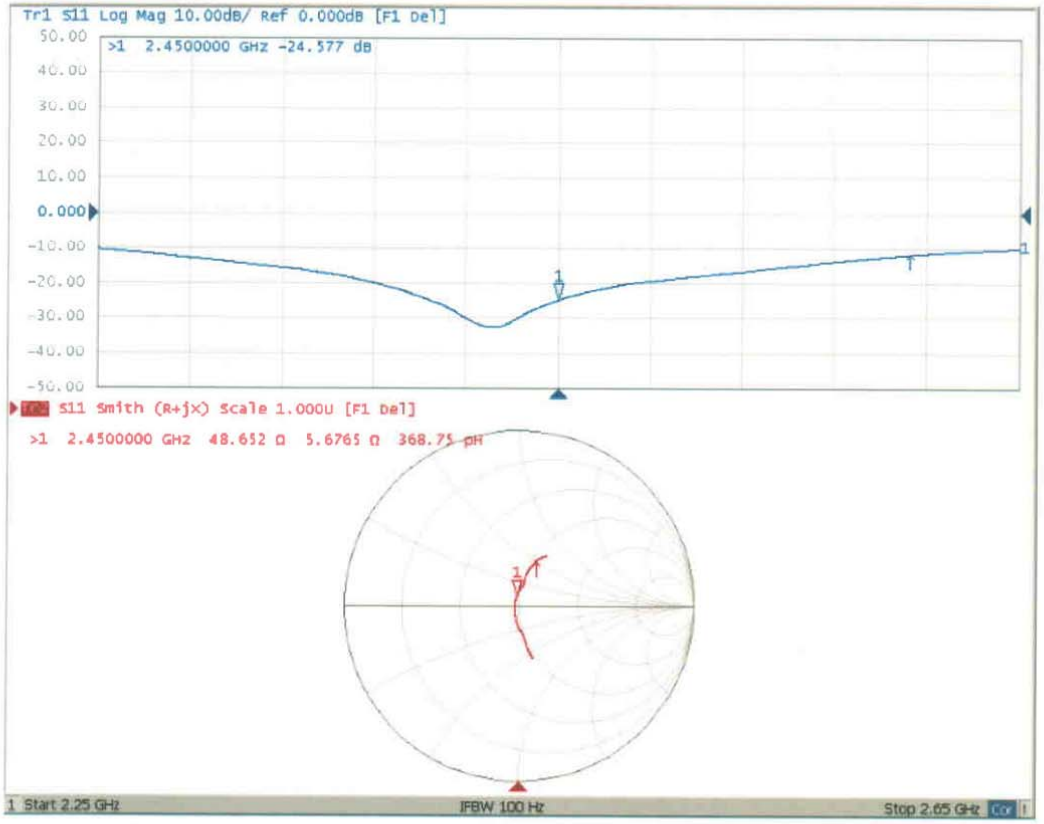


0 dB = 20.3 W/kg = 13.07 dBW/kg

©Copyright. All rights reserved by CTTL.

In Collaboration with
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

Impedance Measurement Plot for Body TSL



©Copyright. All rights reserved by CTTL.

ANNEX I SPOT CHECK TEST

As the test lab for 4008F from TCT Mobile Limited, we, TMC Shenzhen, declare on our sole responsibility that, according to "Declaration of changes" provided by applicant, only the Spot check test should be performed. The test results are as below.

I.1 Internal Identification of EUT used during the spot check test

EUT ID*	IMEI	HW Version	SW Version
EUT1	014281000100040	PIO	v4B2A

*EUT ID: is used to identify the test sample in the lab internally.

I.2 Conducted power of selected case

Table I.1: The conducted power results for GSM850/1900

GSM 850MHz	Conducted Power (dBm)		
	Channel 251(848.8MHz)	Channel 190(836.6MHz)	Channel 128(824.2MHz)
	32.60	/	/
GSM 1900MHz	Conducted Power (dBm)		
	Channel 810(1909.8MHz)	Channel 661(1880MHz)	Channel 512(1850.2MHz)
	29.68	/	/

Table I.2: The conducted power results for GPRS

GSM 850 GPRS (GMSK)	Measured Power (dBm)		
	251	**190**	**128**
4 Txslots	26.58	/	/
PCS1900 GPRS (GMSK)	Measured Power (dBm)		
	810	**661**	**512**
4 Txslots	24.21	/	/

Table I.3: The conducted power results for WCDMA

Item	**band**	**FDD V result**		
	ARFCN	**4233 (846.6MHz)**	**4182 (836.4MHz)**	**4132 (826.4MHz)**
WCDMA	\	22.81	/	/
Item	**band**	**FDD II result**		
	ARFCN	**9538 (1907.6MHz)**	**9400 (1880MHz)**	**9262 (1852.4MHz)**
WCDMA	\	23.20	/	/

©Copyright. All rights reserved by CTTL.

I.3 Measurement results

SAR Values (GSM 850 MHz Band - Head)

Frequency		Side	Test Position	Battery Type	SAR(1g) (W/kg)	
MHz	Ch.				Original data	Spot check data
848.8	251	Left	Touch	CAB31P0000C1	0.793	0.767

SAR Values (GSM 850 MHz Band - Body)

Frequency		Mode/Band	Test Position	Spacing (mm)	Battery Type	SAR(1g) (W/kg)	
MHz	Ch.					Original data	Spot check data
848.8	251	GPRS	Rear	10	CAB31P0000C1	0.924	0.874

SAR Values (PCS 1900 MHz Band - Head)

Frequency		Side	Test Position	Battery Type	SAR(1g) (W/kg)	
MHz	Ch.				Original data	Spot check data
1909.8	810	Left	Touch	CAB31P0000C1	0.543	0.538

SAR Values (PCS 1900 MHz Band - Body)

Frequency		Mode/Band	Test Position	Spacing (mm)	Battery Type	SAR(1g) (W/kg)	
MHz	Ch.					Original data	Spot check data
1909.8	810	GPRS	Front	10	CAB31P0000C1	0.572	0.532

SAR Values (WCDMA 850 MHz Band - Head)

Frequency		Side	Test Position	Battery Type	SAR(1g) (W/kg)	
MHz	Ch.				Original data	Spot check data
846.6	4233	Left	Touch	CAB31P0000C1	0.720	0.648

SAR Values (WCDMA 850 MHz Band - Body)

Frequency		Test Position	Spacing (mm)	Battery Type	SAR(1g) (W/kg)	
MHz	Ch.				Original data	Spot check data
846.6	4233	Rear	10	CAB31P0000C1	0.967	0.906

SAR Values (WCDMA 1900 MHz Band - Head)

Frequency		Side	Test Position	Battery Type	SAR(1g) (W/kg)	
MHz	Ch.				Original data	Spot check data
1907.6	9538	Right	Touch	CAB31P0000C1	0.864	0.670

SAR Values (WCDMA 1900 MHz Band - Body)

Frequency		Test Position	Spacing (mm)	Battery Type	SAR(1g) (W/kg)	
MHz	Ch.				Original data	Spot check data
1907.6	9538	Rear	10	CAB31P0000C1	1.10	0.894

©Copyright. All rights reserved by CTTL.

I.4 Reported SAR Comparison

Exposure Configuration	Technology Band	Reported SAR 1g (W/Kg): original	Reported SAR 1g (W/Kg): spot check
Head (Separation Distance 0mm)	GSM 850	0.90	**0.90**
	PCS 1900	0.62	**0.62**
	UMTS FDD 2	0.92	**0.83**
	UMTS FDD 5	0.99	**0.81**
Body-worn (Separation Distance 10mm)	GSM 850	1.09	**1.08**
	PCS 1900	0.67	**0.63**
	UMTS FDD 2	1.23	**1.17**
	UMTS FDD 5	1.27	**1.07**

©Copyright. All rights reserved by CTTL.

850 Left Cheek High

Date/Time: 2014-12-13
Electronics: DAE4 Sn786
Medium: Head 900 MHz
Medium parameters used (interpolated): f = 848.8 MHz; σ = 0.939 S/m; ε_r = 41.723; ρ = 1000 kg/m^3
Ambient Temperature:21.7°C Liquid Temperature:21.2°C
Communication System: GSM Frequency: 848.8 MHz Duty Cycle: 1:8.30042
Probe: ES3DV3 - SN3151 ConvF(6.04, 6.04, 6.04);

GSM850 Left/Left Cheek High/Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.814 W/kg

GSM850 Left/Left Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.811 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.965 W/kg
SAR(1 g) = 0.767 W/kg; SAR(10 g) = 0.570 W/kg
Maximum value of SAR (measured) = 0.812 W/kg

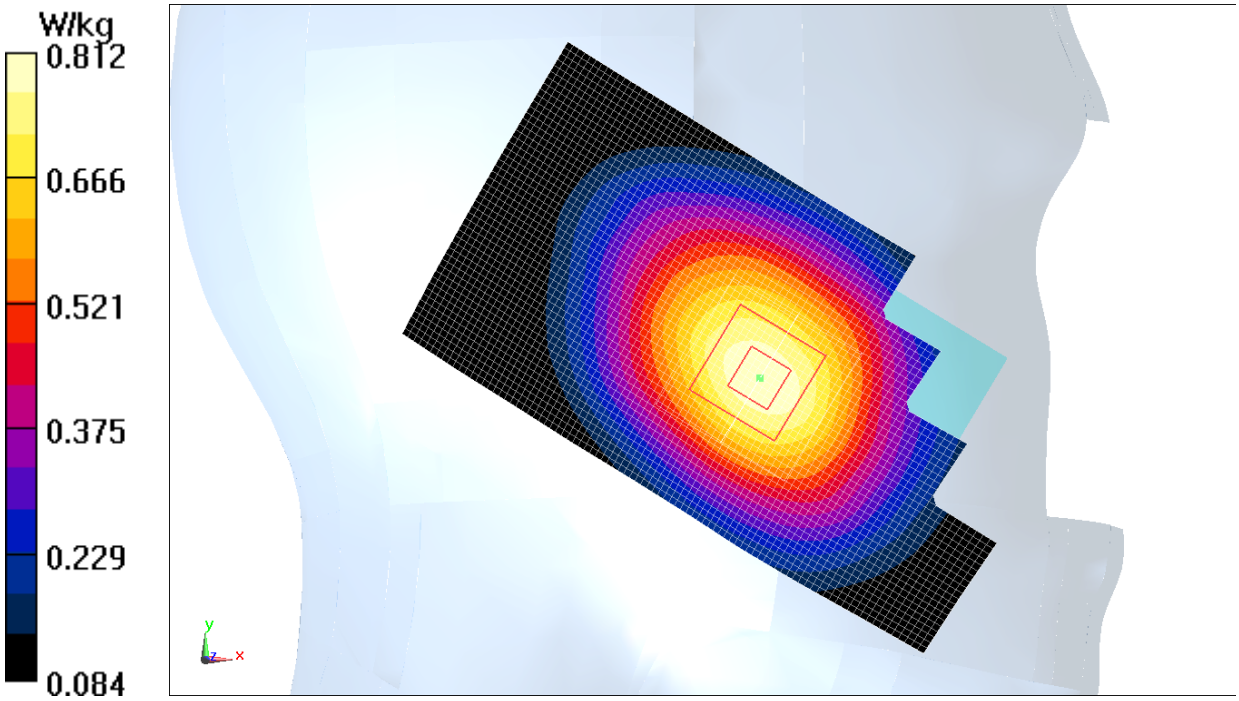


Fig.1 850MHz CH251

©Copyright. All rights reserved by CTTL.

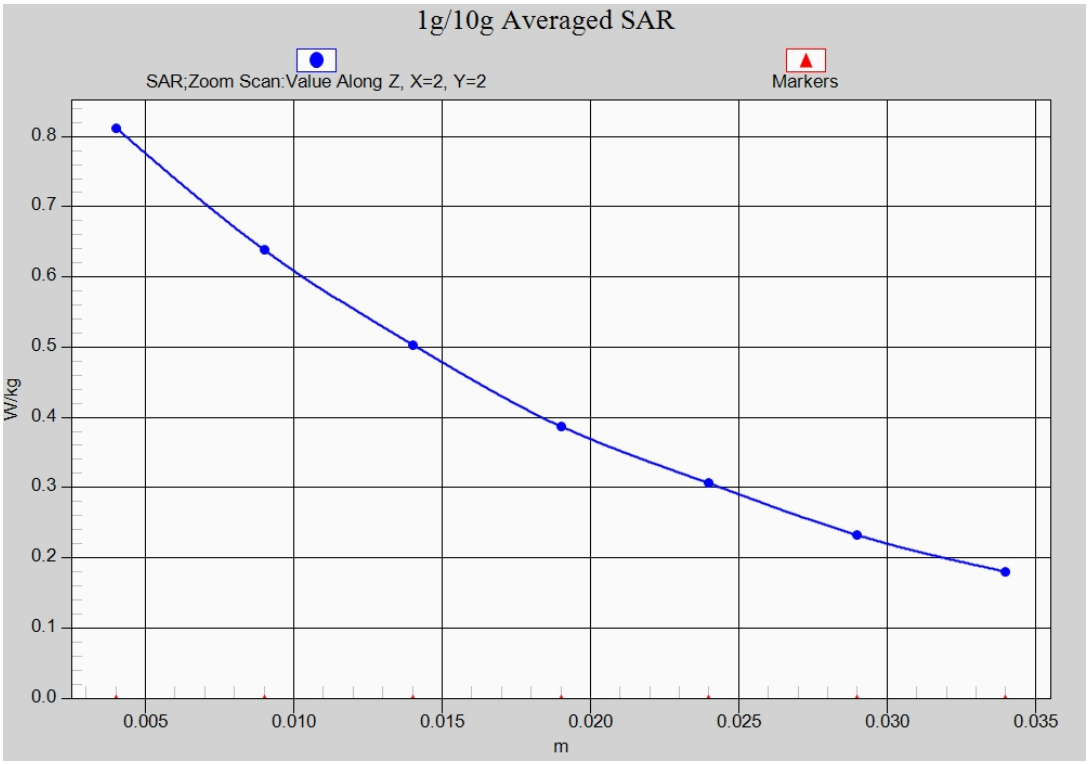


Fig. 1-1 Z-Scan at power reference point (850 MHz CH251)

©Copyright. All rights reserved by CTTL.

850 Body Rear High

Date/Time: 2014-12-13
Electronics: DAE4 Sn786
Medium: Body 900
Medium parameters used (interpolated): f = 848.8 MHz; σ = 0.977 S/m; ε_r = 55.686; ρ = 1000 kg/m^3
Ambient Temperature:21.7°C Liquid Temperature:21.2°C
Communication System: 4 slot GPRS Frequency: 848.8 MHz Duty Cycle: 1:2.08018
Probe: ES3DV3 - SN3151 ConvF(6.14, 6.14, 6.14);

GSM 850 body/Rear side High/Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.933 W/kg

GSM 850 body/Rear side High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.704 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.13 W/kg
SAR(1 g) = 0.874 W/kg; SAR(10 g) = 0.635 W/kg
Maximum value of SAR (measured) = 0.927 W/kg

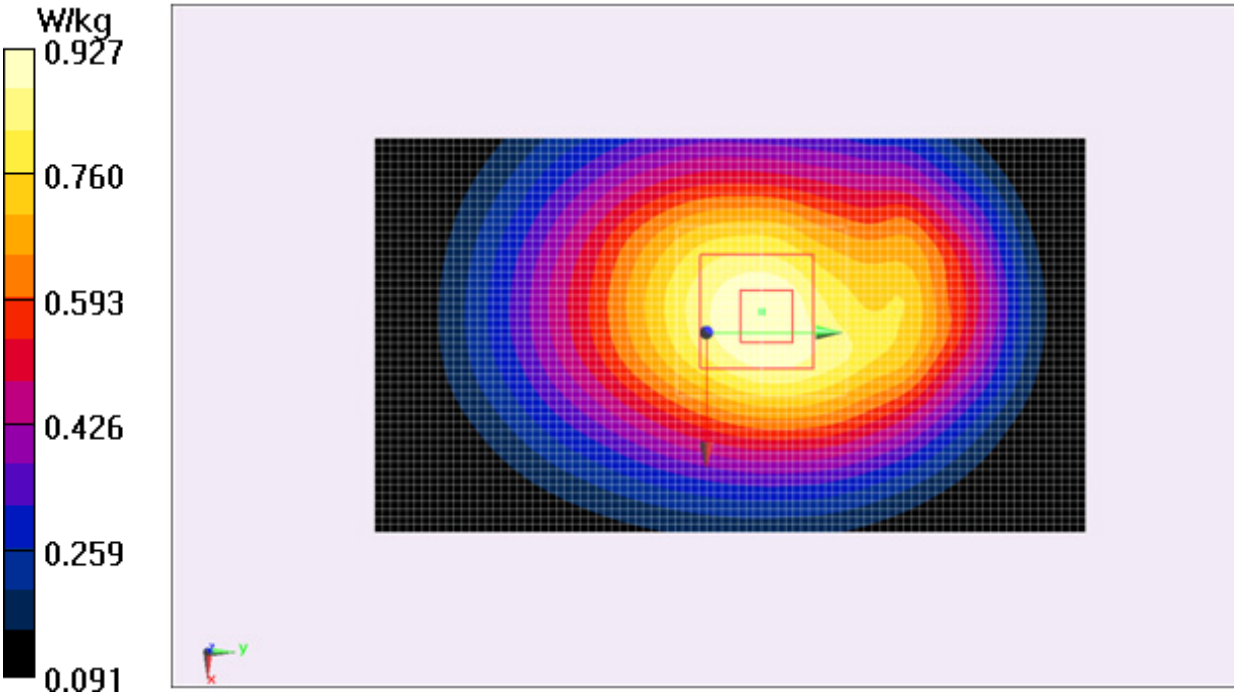


Fig.2 850 MHz CH251

©Copyright. All rights reserved by CTTL.

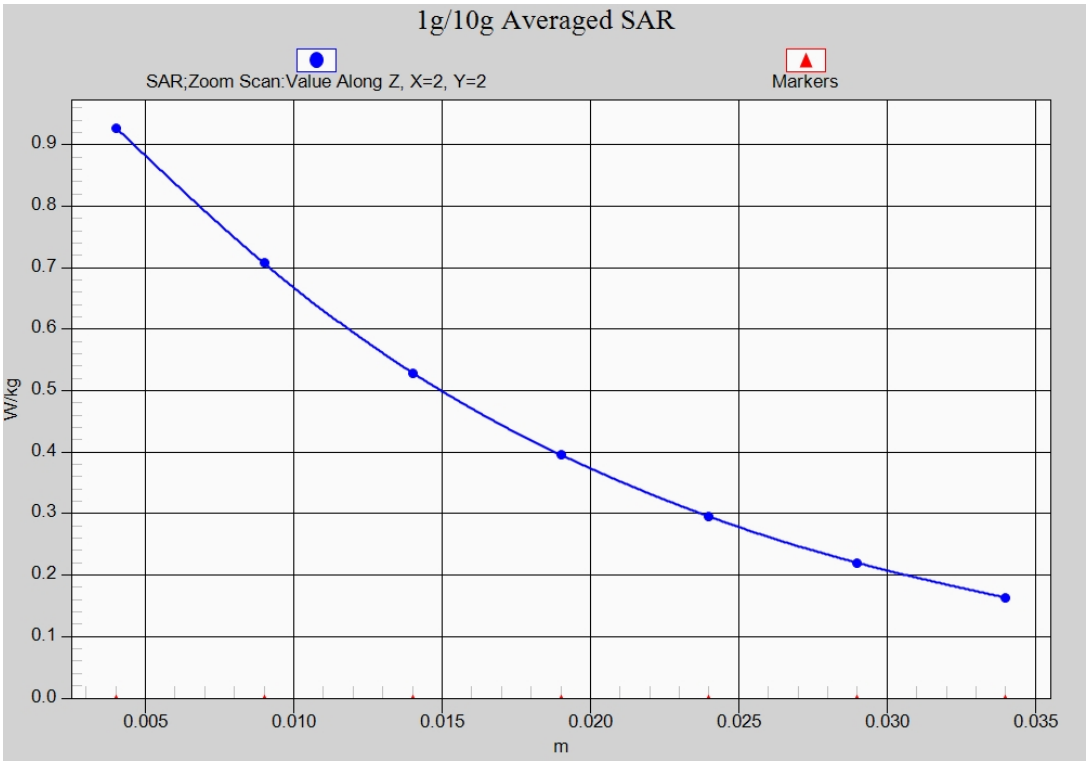


Fig. 2-1 Z-Scan at power reference point (850 MHz CH251)

©Copyright. All rights reserved by CTTL.

GSM1900 Right Cheek High

Date/Time: 2014-12-14
Electronics: DAE4 Sn786
Medium: 1900 Head
Medium parameters used: f = 1910 MHz; σ = 1.45 S/m; ε_r = 41.028; ρ = 1000 kg/m^3
Ambient Temperature:21.7°C Liquid Temperature:21.2°C
Communication System: GSM Frequency: 1910 MHz Duty Cycle: 1:8.30042
Probe: ES3DV3 - SN3151 ConvF(5.16, 5.16, 5.16);

GSM 1800 Right/Right Cheek High/Area Scan (51x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.526 W/kg

GSM 1800 Right/Right Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.649 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.906 W/kg
SAR(1 g) = 0.538 W/kg; SAR(10 g) = 0.307 W/kg
Maximum value of SAR (measured) = 0.595 W/kg

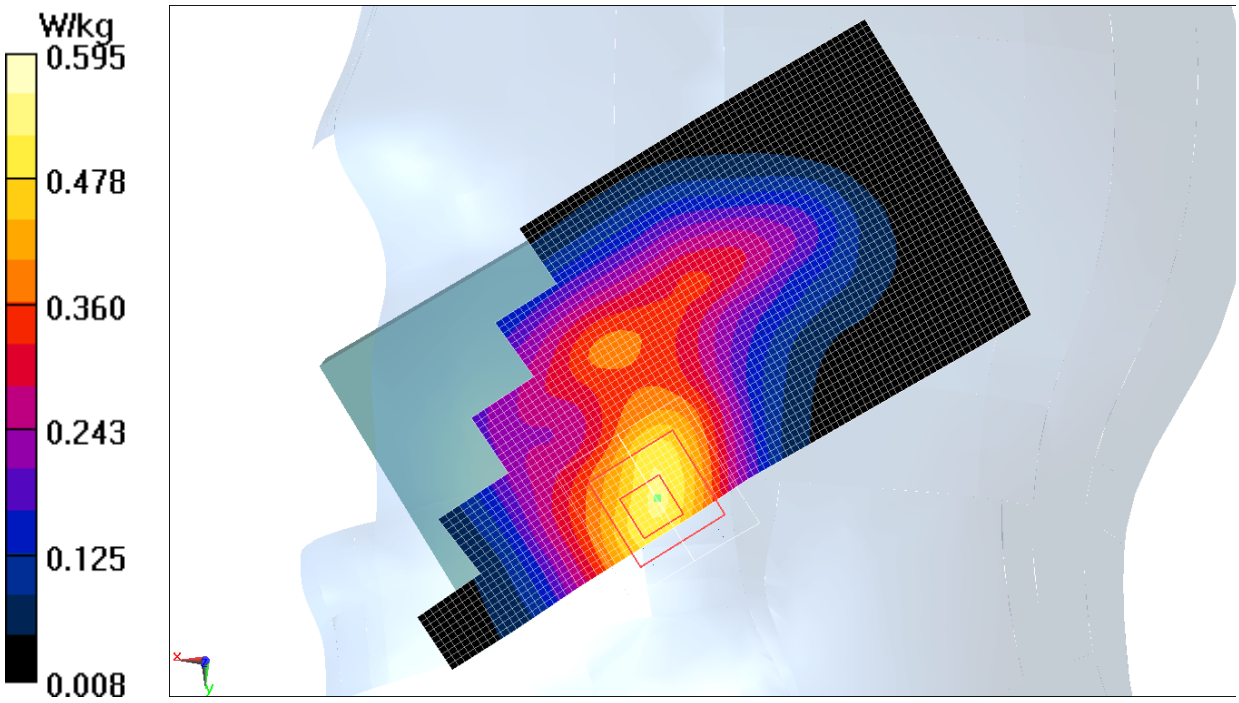


Fig.3 1900 MHz CH810

©Copyright. All rights reserved by CTTL.

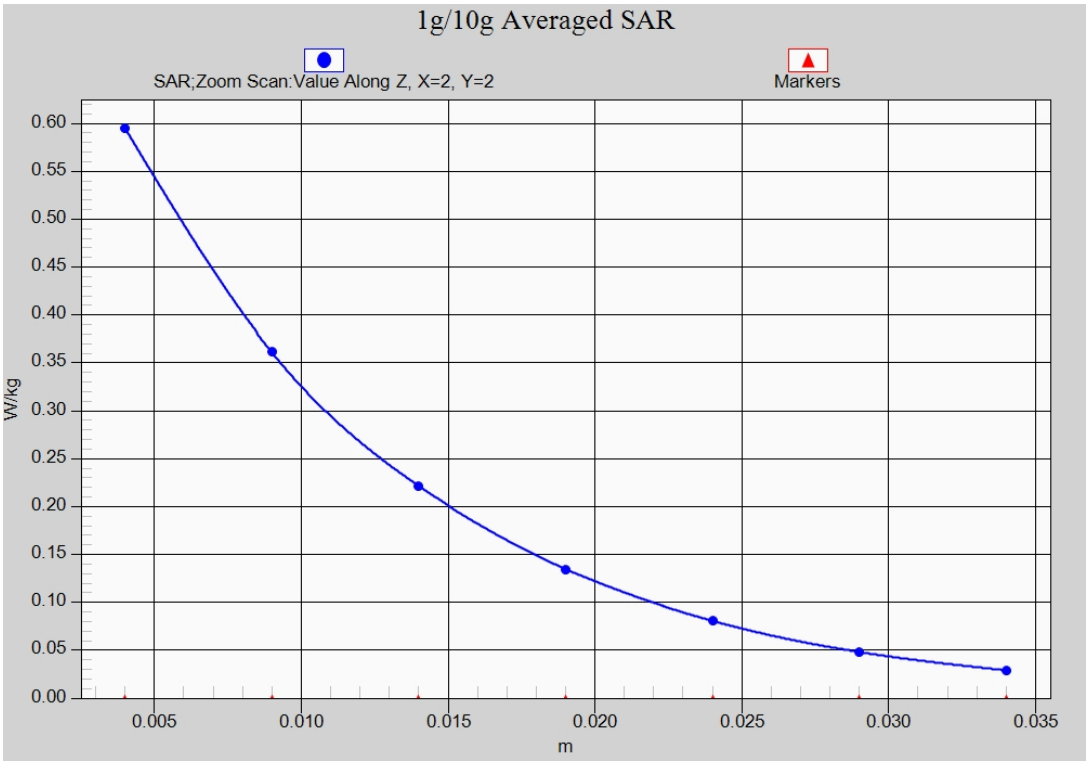


Fig. 3-1 Z-Scan at power reference point (1900 MHz CH810)

©Copyright. All rights reserved by CTTL.

GSM1900 Body Rear High

Date/Time: 2014-12-14
Electronics: DAE4 Sn786
Medium: Body 1900MHz
Medium parameters used: f = 1910 MHz; σ = 1.522 S/m; ε_r = 52.593; ρ = 1000 kg/m^3
Ambient Temperature:21.7°C Liquid Temperature:21.2°C
Communication System: 4 slot GPRS Frequency: 1909.8 MHz Duty Cycle: 1:2.08018
Probe: ES3DV3 - SN3151 ConvF(4.77, 4.77, 4.77);

GSM 1900 body/Rear side High 2/Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.616 W/kg

GSM 1900 body/Rear side High 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.747 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.896 W/kg
SAR(1 g) = 0.532 W/kg; SAR(10 g) = 0.310 W/kg
Maximum value of SAR (measured) = 0.581 W/kg

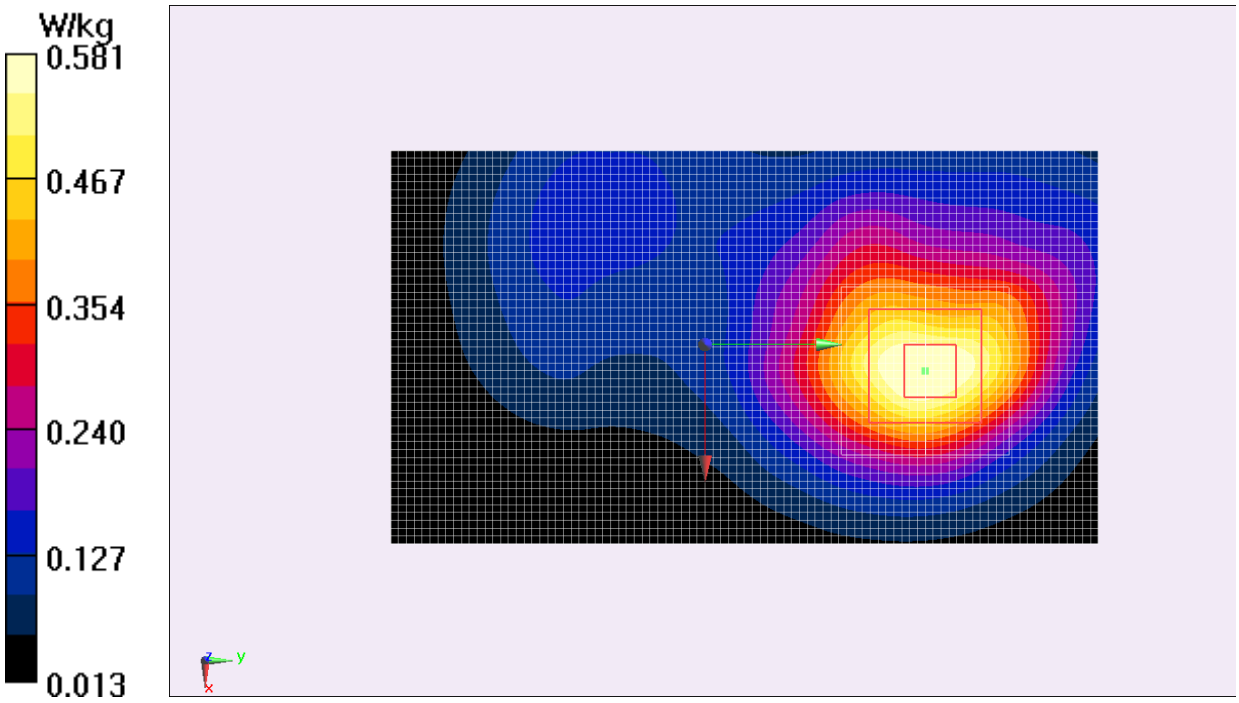


Fig.4 1900 MHz CH810

©Copyright. All rights reserved by CTTL.

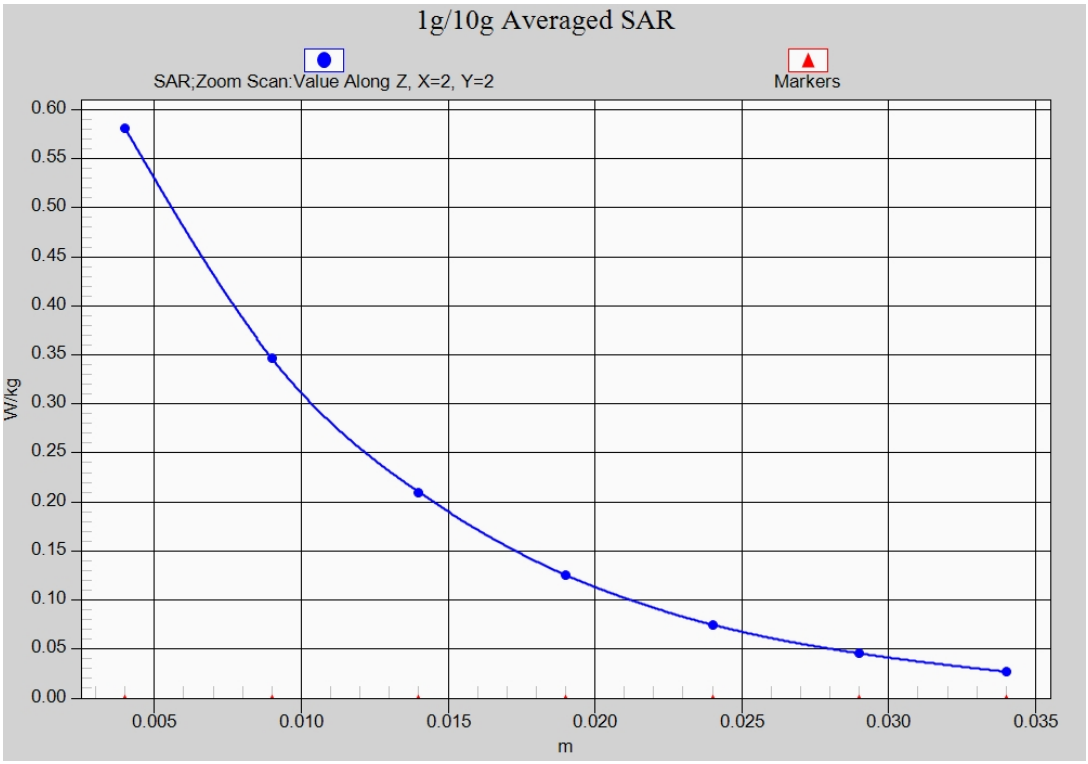


Fig.4-1 Z-Scan at power reference point (1900 MHz CH810)

©Copyright. All rights reserved by CTTL.

WCDMA 850 Left Cheek High

Date/Time: 2014-12-13
Electronics: DAE4 Sn786
Medium: Head 900 MHz
Medium parameters used (interpolated): f = 846.6 MHz; σ = 0.939 S/m; ε_r = 41.741; ρ = 1000 kg/m^3
Ambient Temperature:21.7°C Liquid Temperature:21.2°C
Communication System: WCDMA Frequency: 846.6 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(6.04, 6.04, 6.04);

WCDMA 900 Left/Left Cheek High/Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.677 W/kg

WCDMA 900 Left/Left Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.083 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.831 W/kg
SAR(1 g) = 0.648 W/kg; SAR(10 g) = 0.477 W/kg
Maximum value of SAR (measured) = 0.686 W/kg

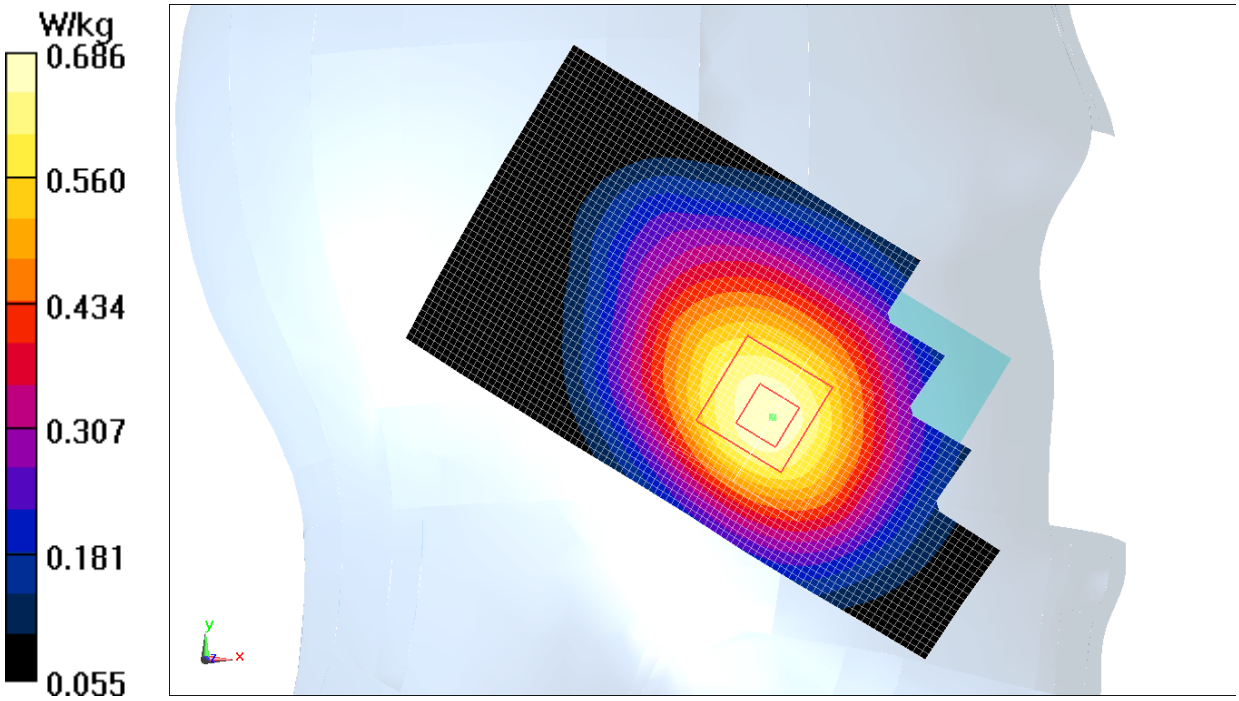


Fig.5 WCDMA 850 CH4233

©Copyright. All rights reserved by CTTL.

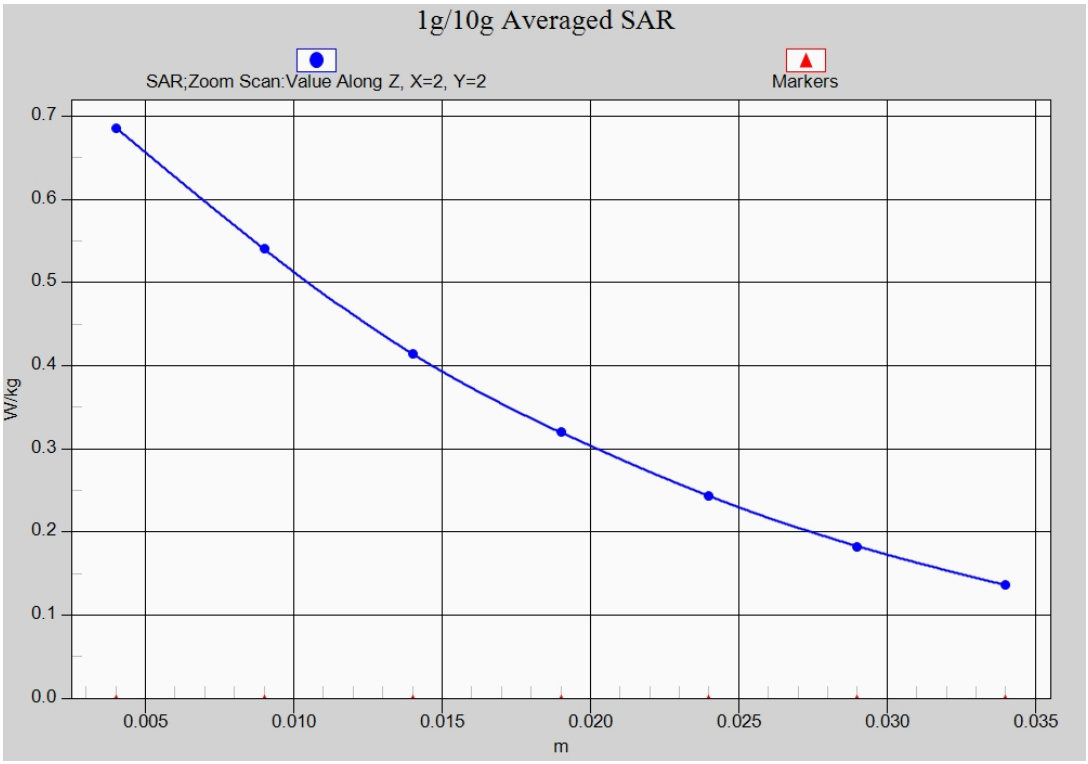


Fig. 5-1 Z-Scan at power reference point (WCDMA 850 CH4233)

©Copyright. All rights reserved by CTTL.

WCDMA 850 Body Rear High

Date/Time: 2014-12-13
Electronics: DAE4 Sn786
Medium: Body 900
Medium parameters used (interpolated): f = 846.6 MHz; σ = 0.976 S/m; ε_r = 55.684; ρ = 1000 kg/m^3
Ambient Temperature:21.7°C Liquid Temperature:21.2°C
Communication System: WCDMA Frequency: 846.6 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(6.14, 6.14, 6.14);

GSM 850 body/Rear side High/Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.964 W/kg

GSM 850 body/Rear side High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 28.193 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 1.20 W/kg
SAR(1 g) = 0.906 W/kg; SAR(10 g) = 0.652 W/kg
Maximum value of SAR (measured) = 0.963 W/kg

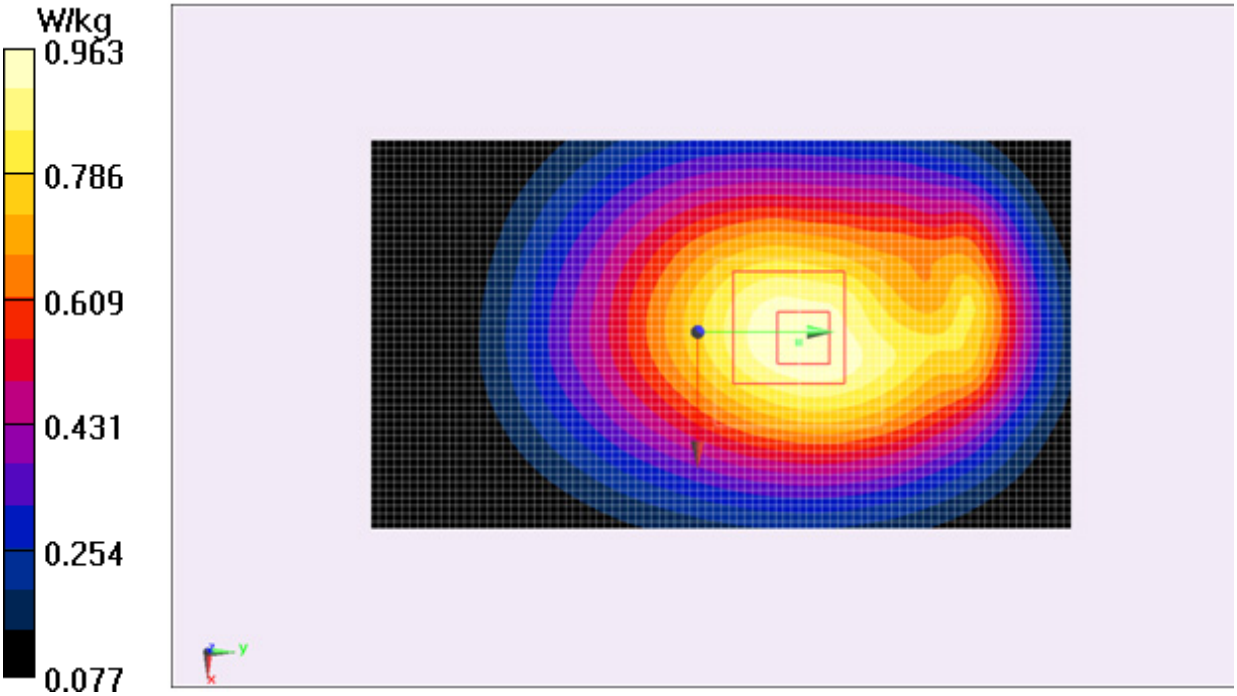


Fig.6 WCDMA 850 CH4233

©Copyright. All rights reserved by CTTL.

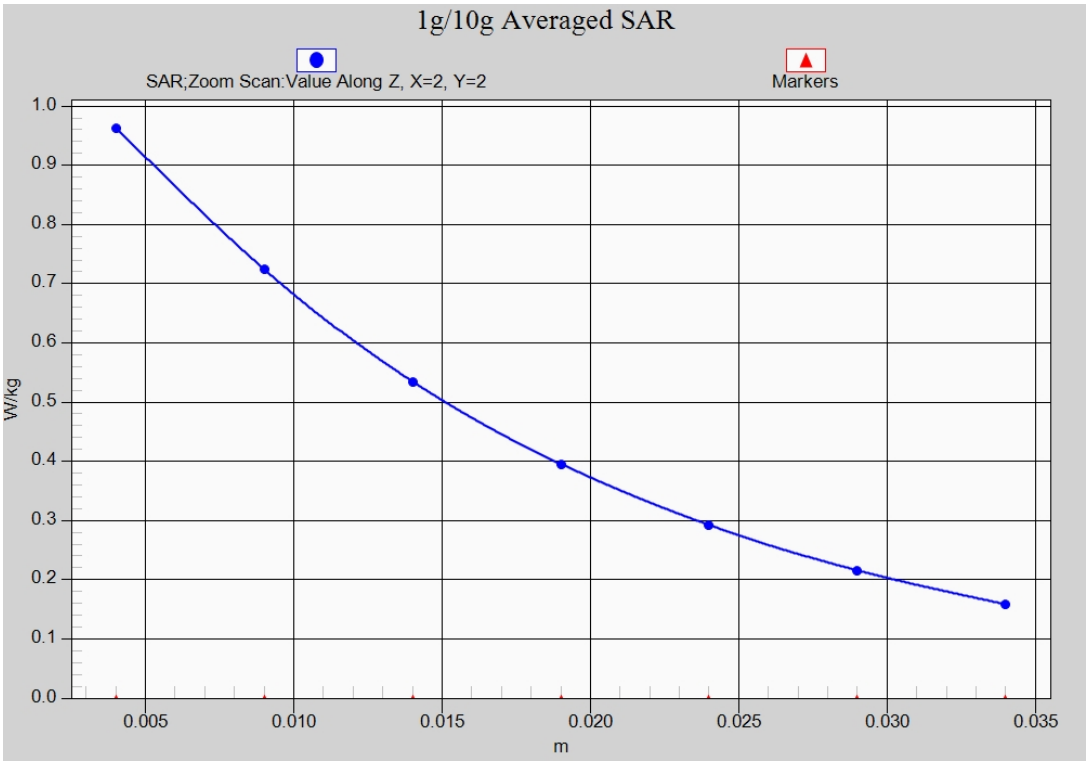


Fig. 6-1 Z-Scan at power reference point (WCDMA850 CH4233)

©Copyright. All rights reserved by CTTL.

WCDMA 1900 Right Cheek High

Date/Time: 2014-12-14
Electronics: DAE4 Sn786
Medium: Head 1900
Medium parameters used: f = 1908 MHz; σ = 1.454 S/m; ε_r = 41.033; ρ = 1000 kg/m^3
Ambient Temperature:21.7°C Liquid Temperature:21.2°C
Communication System: WCDMA Frequency: 1908 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(5.16, 5.16, 5.16);

WCDMA 900 Right/Right Cheek High 2/Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.756 W/kg

WCDMA 900 Right/Right Cheek High 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.133 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.670 W/kg; SAR(10 g) = 0.389 W/kg
Maximum value of SAR (measured) = 0.746 W/kg

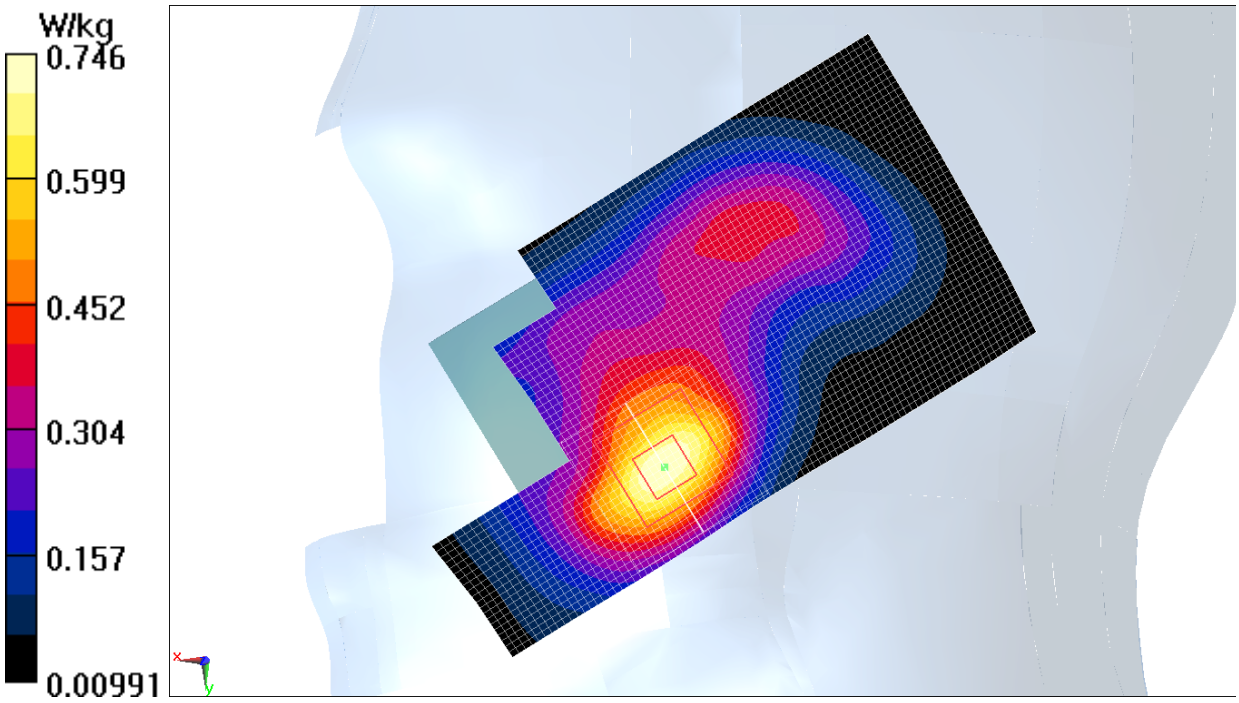


Fig.7 WCDMA1900 CH9538

©Copyright. All rights reserved by CTTL.