

**Measurement Conditions**

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

<b>DASY Version</b>	DASY4	V4.6
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V5.0	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Area Scan resolution</b>	dx, dy = 10 mm	
<b>Zoom Scan Resolution</b>	dx, dy = 4.3 mm, dz = 3 mm	
<b>Frequency</b>	5200 MHz $\pm$ 1 MHz 5800 MHz $\pm$ 1 MHz	

**Head TSL parameters at 5200 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	36.0	4.66 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	35.6 $\pm$ 6 %	4.53 mho/m $\pm$ 6 %
<b>Head TSL temperature during test</b>	(22.0 $\pm$ 0.2) °C	---	---

**SAR result with Head TSL at 5200 MHz**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	19.6 mW / g
SAR normalized	normalized to 1W	78.4 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	78.1 mW / g $\pm$ 19.9 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	5.54 mW / g
SAR normalized	normalized to 1W	22.2 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	22.0 mW / g $\pm$ 19.5 % (k=2)

<sup>1</sup> Correction to nominal TSL parameters according to c), chapter "SAR Sensitivities"

**Head TSL parameters at 5800 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	35.3	5.27 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	34.6 ± 6 %	5.09 mho/m ± 6 %
<b>Head TSL temperature during test</b>	(22.0 ± 0.2) °C	---	---

**SAR result with Head TSL at 5800 MHz**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	condition	
SAR measured	250 mW input power	19.7 mW / g
SAR normalized	normalized to 1W	78.8 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	78.2 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.51 mW / g
SAR normalized	normalized to 1W	22.0 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	21.8 mW / g ± 19.5 % (k=2)

## Appendix

### Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	52.9 $\Omega$ - 14.8 $j\Omega$
Return Loss	-16.8 dB

### Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	55.9 $\Omega$ + 6.3 $j\Omega$
Return Loss	-21.6 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns
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After long term use with 40 W 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	August 28, 2003

**DASY4 Validation Report for Head TSL**

Date/Time: 27.10.2005 15:27:01

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1008**

Communication System: CW-5GHz; Frequency: 5800 MHz Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: HSL 5800 MHz;

Medium parameters used:  $f = 5800 \text{ MHz}$ ;  $\sigma = 5.09 \text{ mho/m}$ ;  $\epsilon_r = 34.6$ ;  $\rho = 1000 \text{ kg/m}^3$  Medium parameters used:  $f = 5200 \text{ MHz}$ ;  $\sigma = 4.53 \text{ mho/m}$ ;  $\epsilon_r = 35.6$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

**DASY4 Configuration:**

- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95)ConvF(5.56, 5.56, 5.56); Calibrated: 19.03.2005
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.01.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.6 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 159

**d=10mm, Pin=250mW, f=5800 MHz/Area Scan (91x91x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 42.8 mW/g

**d=10mm, Pin=250mW, f=5200 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0:** Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

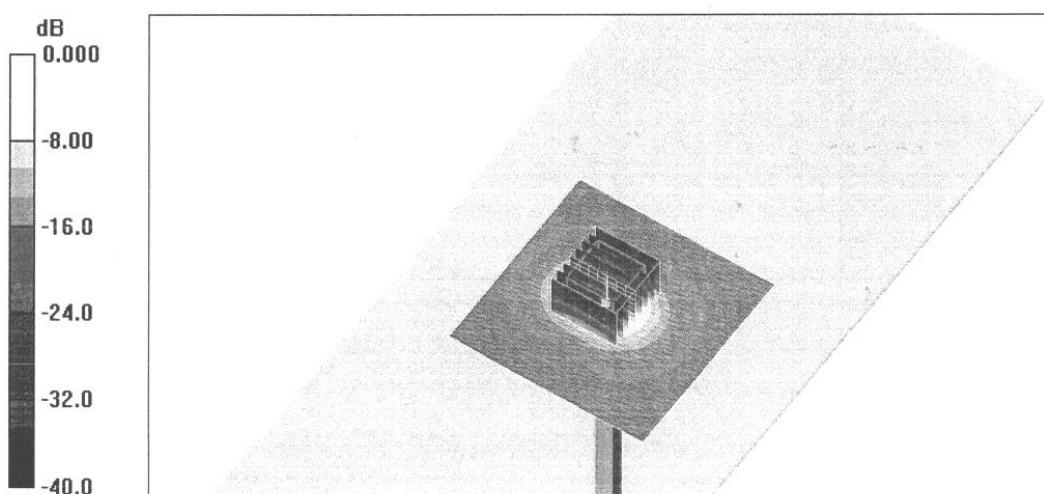
Reference Value = 78.9 V/m; Power Drift = 0.099 dB

Peak SAR (extrapolated) = 72.8 W/kg

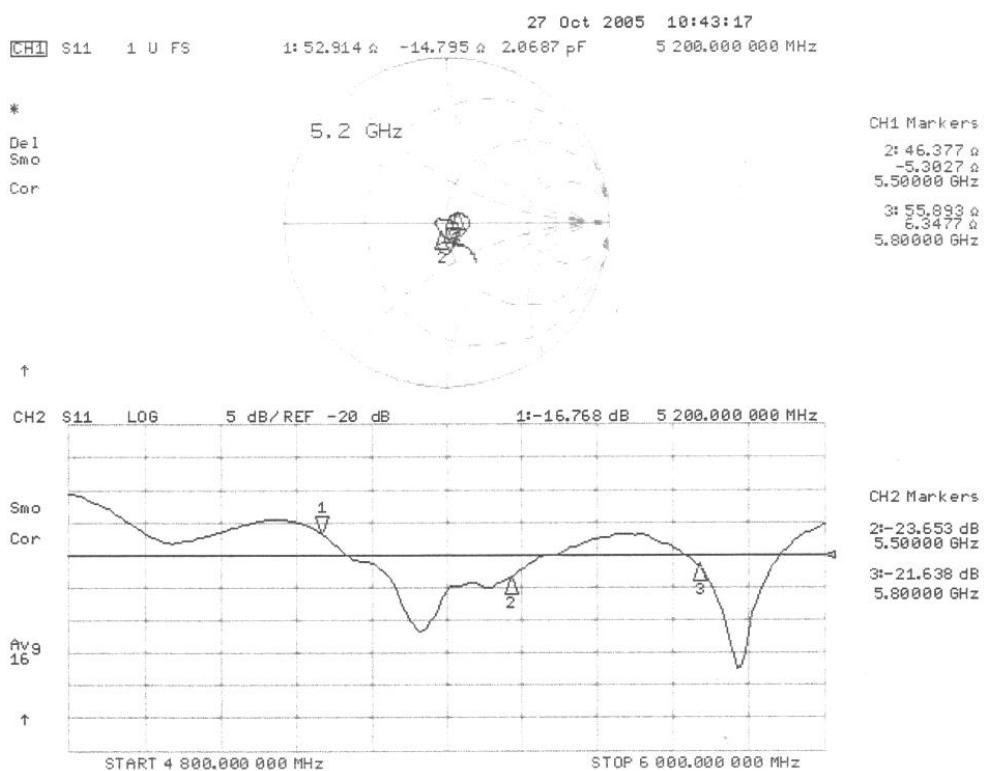
**SAR(1 g) = 19.6 mW/g; SAR(10 g) = 5.54 mW/g****d=10mm, Pin=250mW, f=5800 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0:** Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 72.6 V/m; Power Drift = 0.052 dB

Peak SAR (extrapolated) = 82.5 W/kg

**SAR(1 g) = 19.7 mW/g; SAR(10 g) = 5.51 mW/g**

## Impedance Measurement Plot for Head TSL



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



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

Accredited by the Swiss Federal Office of Metrology and Accreditation  
 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 **EMC Technologies**Certificate No: **D5GHzV2-1008\_Sep06**

## **CALIBRATION CERTIFICATE**

Object	<b>D5GHzV2 - SN: 1008</b>
Calibration procedure(s)	<b>QA CAL-22.v1</b> Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	<b>September 28, 2006</b>
Condition of the calibrated item	<b>In Tolerance</b>

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 E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No. 217-00591)	Aug-07
Reference Probe EX3DV4	SN: 3503	19-Mar-05 (SPEAG, No. EX3-3503_Mar06)	Mar-07
DAE4	SN: 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

Calibrated by:	Name	Function	Signature
	Marcel Fehr	Laboratory Technician	

Approved by:	Name	Function	Signature
	Katja Pokovic	Technical Manager	

Issued: September 29, 2006

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

**Measurement Conditions**

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Area Scan resolution	dx, dy = 10 mm	
Zoom Scan Resolution	dx, dy = 4.3 mm, dz = 3 mm	
Frequency	5500 MHz ± 1 MHz	

**Head TSL parameters at 5500 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	4.89 mho/m ± 6 %
Head TSL temperature during test	(21.6 ± 0.2) °C	---	---

**SAR result with Head TSL at 5500 MHz**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	condition	
SAR measured	250 mW input power	21.7 mW / g
SAR normalized	normalized to 1W	86.8 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	86.3 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.08 mW / g
SAR normalized	normalized to 1W	24.3 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	24.2 mW / g ± 19.5 % (k=2)

<sup>1</sup> Correction to nominal TSL parameters according to c), chapter "SAR Sensitivities"

**Body TSL parameters at 5500 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	48.6	5.65 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	47.0 ± 6 %	5.62 mho/m ± 6 %
<b>Head TSL temperature during test</b>	(21.8 ± 0.2) °C	---	---

**SAR result with Body TSL at 5500 MHz**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	condition	
SAR measured	250 mW input power	19.8 mW / g
SAR normalized	normalized to 1W	79.2 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	78.3 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.53 mW / g
SAR normalized	normalized to 1W	22.1 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	21.9 mW / g ± 19.5 % (k=2)

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Correction to nominal TSL parameters according to c), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	46.6 $\Omega$ - 4.6 $j\Omega$
Return Loss	-24.6 dB

### Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	46.4 $\Omega$ - 3.9 $j\Omega$
Return Loss	-25.3 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.200 ns
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After long term use with 40 W 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	August 28, 2003

## DASY4 Validation Report for Head TSL

Date/Time: 28.09.2006 12:05:42

Test Laboratory: SPEAG, Zurich, Switzerland

IUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1008

Communication System: CW-5GHz; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: HSL 5800 MHz;

Medium parameters used:  $f = 5500$  MHz;  $\sigma = 4.89$  mho/m;  $\epsilon_r = 35$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

## DASY4 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.18, 5.18, 5.18); Calibrated: 18.03.2006
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

## I=10mm, Pin=250mW, f=5500 MHz/Area Scan (61x61x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 49.7 mW/g

## I=10mm, Pin=250mW, f=5500 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0:

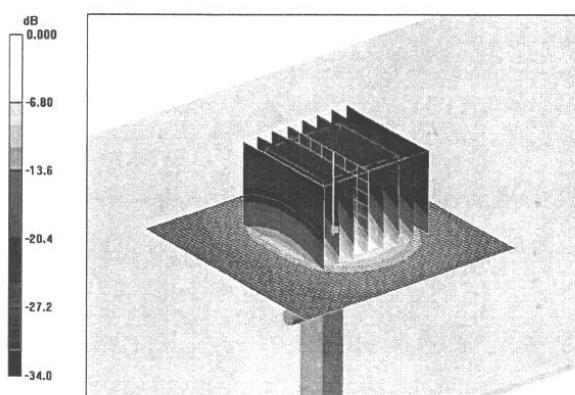
Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 77.4 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 84.2 W/kg

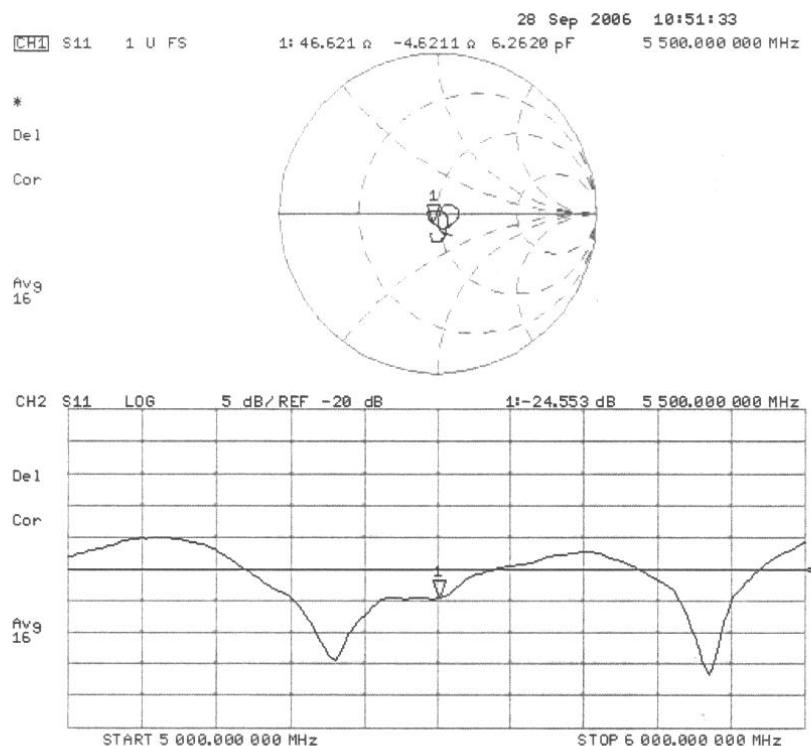
AR(1 g) = 21.7 mW/g; SAR(10 g) = 6.08 mW/g

Maximum value of SAR (measured) = 42.2 mW/g



0 dB = 42.2mW/g

## Impedance Measurement Plot for Head TSL



## DASY4 Validation Report for Body TSL

Date/Time: 28.09.2006 13:45:35

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1008

Communication System: CW-5GHz; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: MSL 5800 MHz;

Medium parameters used:  $f = 5500$  MHz;  $\sigma = 5.64$  mho/m;  $\epsilon_r = 47$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

## DASY4 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.67, 4.67, 4.67); Calibrated: 18.03.2006
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

## I=10mm, Pin=250mW, f=5500 MHz/Area Scan (91x91x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 42.6 mW/g

## I=10mm, Pin=250mW, f=5500 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0:

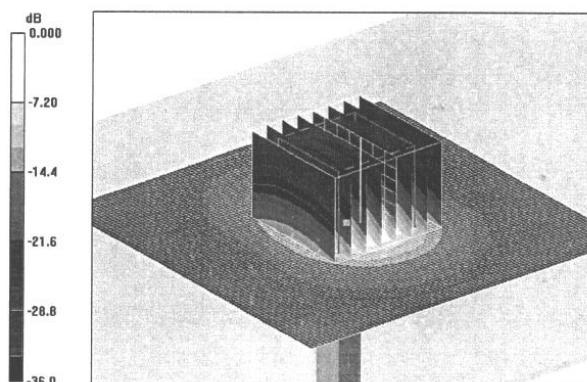
Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 75.5 V/m; Power Drift = 0.063 dB

Peak SAR (extrapolated) = 76.7 W/kg

SAR(1 g) = 19.8 mW/g; SAR(10 g) = 5.53 mW/g

Maximum value of SAR (measured) = 38.1 mW/g



0 dB = 38.1mW/g

**Impedance Measurement Plot for Body TSL**