

**Body TSL parameters at 5500 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.5 ± 6 %	5.80 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

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

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>80.0 W/kg ± 19.9 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.23 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>22.1 W/kg ± 19.5 % (k=2)</b>

**Body TSL parameters at 5600 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.4 ± 6 %	5.94 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

**SAR result with Body TSL at 5600 MHz**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.19 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>81.3 W/kg ± 19.9 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.27 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>22.5 W/kg ± 19.5 % (k=2)</b>

**Body TSL parameters at 5800 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.1 ± 6 %	6.21 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

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

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>75.5 W/kg ± 19.9 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>20.9 W/kg ± 19.5 % (k=2)</b>

**Appendix****Antenna Parameters with Head TSL at 5200 MHz**

Impedance, transformed to feed point	51.5 $\Omega$ - 5.6 j $\Omega$
Return Loss	- 24.9 dB

**Antenna Parameters with Head TSL at 5300 MHz**

Impedance, transformed to feed point	49.1 $\Omega$ - 0.6 j $\Omega$
Return Loss	- 40.0 dB

**Antenna Parameters with Head TSL at 5500 MHz**

Impedance, transformed to feed point	51.5 $\Omega$ - 0.5 j $\Omega$
Return Loss	- 36.1 dB

**Antenna Parameters with Head TSL at 5600 MHz**

Impedance, transformed to feed point	54.5 $\Omega$ + 0.0 j $\Omega$
Return Loss	- 27.3 dB

**Antenna Parameters with Head TSL at 5800 MHz**

Impedance, transformed to feed point	53.5 $\Omega$ - 0.2 j $\Omega$
Return Loss	- 29.4 dB

**Antenna Parameters with Body TSL at 5200 MHz**

Impedance, transformed to feed point	51.5 $\Omega$ - 4.3 j $\Omega$
Return Loss	- 27.0 dB

**Antenna Parameters with Body TSL at 5300 MHz**

Impedance, transformed to feed point	49.9 $\Omega$ + 0.3 j $\Omega$
Return Loss	- 49.3 dB

**Antenna Parameters with Body TSL at 5500 MHz**

Impedance, transformed to feed point	50.9 $\Omega$ - 0.4 j $\Omega$
Return Loss	- 40.3 dB

**Antenna Parameters with Body TSL at 5600 MHz**

Impedance, transformed to feed point	56.1 $\Omega$ + 1.9 j $\Omega$
Return Loss	- 24.4 dB

**Antenna Parameters with Body TSL at 5800 MHz**

Impedance, transformed to feed point	53.3 $\Omega$ + 1.3 j $\Omega$
Return Loss	- 29.4 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.207 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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

**Additional EUT Data**

Manufactured by	SPEAG
Manufactured on	September 24, 2010

**DASY5 Validation Report for Head TSL**

Date: 15.03.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1103**Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz,  
Frequency: 5600 MHz, Frequency: 5800 MHzMedium parameters used:  $f = 5200$  MHz;  $\sigma = 4.52$  S/m;  $\epsilon_r = 34.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5300$  MHz;  $\sigma = 4.62$  S/m;  $\epsilon_r = 34.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5500$  MHz;  $\sigma = 4.8$  S/m;  $\epsilon_r = 34$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5600$  MHz;  $\sigma = 4.91$  S/m;  $\epsilon_r = 33.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5800$  MHz;  $\sigma = 5.11$  S/m;  $\epsilon_r = 33.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

## DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 28.12.2012, ConvF(5.1, 5.1, 5.1); Calibrated: 28.12.2012, ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.76, 4.76, 4.76); Calibrated: 28.12.2012, ConvF(4.81, 4.81, 4.81); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.803 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 30.5 W/kg

**SAR(1 g) = 8.19 W/kg; SAR(10 g) = 2.35 W/kg**

Maximum value of SAR (measured) = 19.4 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz 2/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.616 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 31.5 W/kg

**SAR(1 g) = 8.33 W/kg; SAR(10 g) = 2.39 W/kg**

Maximum value of SAR (measured) = 19.5 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:**

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.650 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 34.3 W/kg

**SAR(1 g) = 8.63 W/kg; SAR(10 g) = 2.45 W/kg**

Maximum value of SAR (measured) = 20.9 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,****dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.075 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 34.3 W/kg

**SAR(1 g) = 8.54 W/kg; SAR(10 g) = 2.43 W/kg**

Maximum value of SAR (measured) = 20.7 W/kg

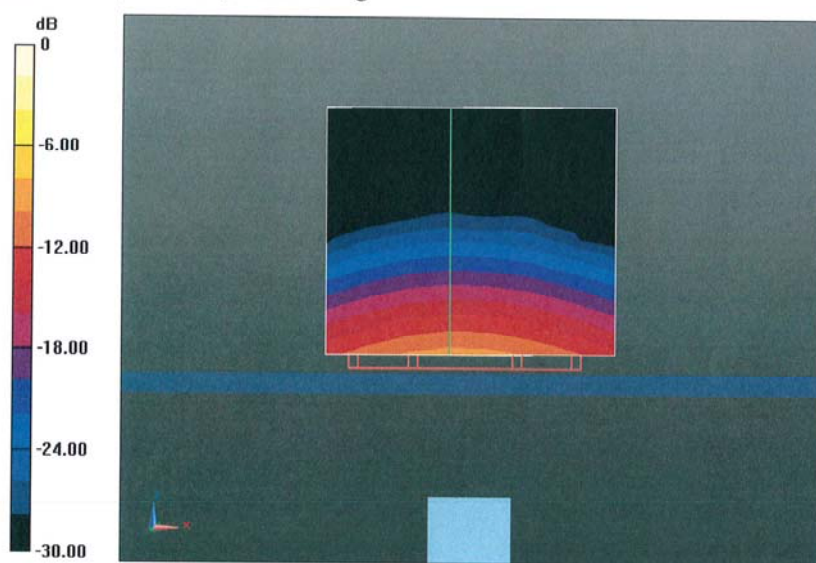
**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,****dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 62.323 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 34.1 W/kg

**SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.32 W/kg**

Maximum value of SAR (measured) = 20.1 W/kg



0 dB = 20.1 W/kg = 13.03 dBW/kg