

### Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5250 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz 5800 MHz ± 1 MHz	

### Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	4.53 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

### SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.94 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	78.7 W/kg ± 19.9 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.5 W/kg ± 19.5 % (k=2)

### Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	35.9	4.71 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	34.6 ± 6 %	4.58 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

### SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.5 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.1 W/kg ± 19.5 % (k=2)

### Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	35.9	4.76 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	34.6 ± 6 %	4.63 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

### SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.7 W/kg ± 19.5 % (k=2)

### Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	35.6	4.96 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	34.3 ± 6 %	4.82 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °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	100 mW input power	8.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.6 W/kg ± 19.5 % (k=2)

### Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	35.5	5.07 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	34.1 ± 6 %	4.93 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	---	---

### SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.4 W/kg ± 19.5 % (k=2)

### Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	35.4	5.22 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	33.9 ± 6 %	5.08 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Head TSL at 5750 MHz

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	100 mW input power	8.00 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.2 W/kg ± 19.9 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.6 W/kg ± 19.5 % (k=2)

### 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	33.9 ± 6 %	5.13 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Head TSL at 5800 MHz

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	78.4 W/kg ± 19.9 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	100 mW input power	2.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.3 W/kg ± 19.5 % (k=2)

### Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	49.0	5.30 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	47.6 ± 6 %	5.42 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

### SAR result with Body TSL at 5200 MHz

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	100 mW input power	7.50 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.6 W/kg ± 19.9 % (k=2)
<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	100 mW input power	2.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.9 W/kg ± 19.5 % (k=2)

### Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	48.9	5.36 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	47.5 ± 6 %	5.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

### SAR result with Body TSL at 5250 MHz

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	100 mW input power	7.54 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.0 W/kg ± 19.9 % (k=2)
<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	100 mW input power	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.0 W/kg ± 19.5 % (k=2)

### Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	48.9	5.42 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	47.4 ± 6 %	5.55 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Body TSL at 5300 MHz

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	100 mW input power	7.54 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.0 W/kg ± 19.9 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	100 mW input power	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.0 W/kg ± 19.5 % (k=2)

### Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	48.6	5.65 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	47.1 ± 6 %	5.82 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Body TSL at 5500 MHz

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	80.2 W/kg ± 19.9 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	100 mW input power	2.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.2 W/kg ± 19.5 % (k=2)

### Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	48.5	5.77 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	46.9 ± 6 %	5.95 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Body TSL at 5600 MHz

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	78.7 W/kg ± 19.9 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.8 W/kg ± 19.5 % (k=2)

### Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	48.3	5.94 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	46.7 ± 6 %	6.17 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Body TSL at 5750 MHz

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	100 mW input power	7.53 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.9 W/kg ± 19.9 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	100 mW input power	2.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.7 W/kg ± 19.5 % (k=2)

### Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	48.2	6.00 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	46.6 ± 6 %	6.23 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	7.72 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.8 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.2 W/kg ± 19.5 % (k=2)

**Appendix (Additional assessments outside the scope of SCS 0108)**
**Antenna Parameters with Head TSL at 5200 MHz**

Impedance, transformed to feed point	51.8 $\Omega$ - 6.3 $j\Omega$
Return Loss	- 23.8 dB

**Antenna Parameters with Head TSL at 5250 MHz**

Impedance, transformed to feed point	50.9 $\Omega$ - 2.3 $j\Omega$
Return Loss	- 32.1 dB

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

Impedance, transformed to feed point	50.3 $\Omega$ - 0.4 $j\Omega$
Return Loss	- 45.2 dB

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

Impedance, transformed to feed point	50.9 $\Omega$ - 1.6 $j\Omega$
Return Loss	- 34.8 dB

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

Impedance, transformed to feed point	55.1 $\Omega$ + 0.0 $j\Omega$
Return Loss	- 26.3 dB

**Antenna Parameters with Head TSL at 5750 MHz**

Impedance, transformed to feed point	53.3 $\Omega$ + 2.6 $j\Omega$
Return Loss	- 27.8 dB

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

Impedance, transformed to feed point	52.3 $\Omega$ + 0.8 $j\Omega$
Return Loss	- 32.5 dB

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

Impedance, transformed to feed point	51.2 $\Omega$ - 4.9 $j\Omega$
Return Loss	- 26.0 dB

**Antenna Parameters with Body TSL at 5250 MHz**

Impedance, transformed to feed point	51.0 $\Omega$ - 1.0 $j\Omega$
Return Loss	- 37.0 dB

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

Impedance, transformed to feed point	$50.8 \Omega + 0.3 j\Omega$
Return Loss	- 41.8 dB

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

Impedance, transformed to feed point	$50.1 \Omega - 0.4 j\Omega$
Return Loss	- 47.7 dB

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

Impedance, transformed to feed point	$56.3 \Omega + 1.1 j\Omega$
Return Loss	- 24.4 dB

**Antenna Parameters with Body TSL at 5750 MHz**

Impedance, transformed to feed point	$54.1 \Omega + 3.4 j\Omega$
Return Loss	- 25.7 dB

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

Impedance, transformed to feed point	$52.5 \Omega + 1.6 j\Omega$
Return Loss	- 30.7 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.208 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: 18.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1103**

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz  
 Medium parameters used:  $f = 5200 \text{ MHz}$ ;  $\sigma = 4.53 \text{ S/m}$ ;  $\epsilon_r = 34.7$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5250 \text{ MHz}$ ;  $\sigma = 4.58 \text{ S/m}$ ;  $\epsilon_r = 34.6$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5300 \text{ MHz}$ ;  $\sigma = 4.63 \text{ S/m}$ ;  $\epsilon_r = 34.6$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5500 \text{ MHz}$ ;  $\sigma = 4.82 \text{ S/m}$ ;  $\epsilon_r = 34.3$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5600 \text{ MHz}$ ;  $\sigma = 4.93 \text{ S/m}$ ;  $\epsilon_r = 34.1$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5750 \text{ MHz}$ ;  $\sigma = 5.08 \text{ S/m}$ ;  $\epsilon_r = 33.9$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5800 \text{ MHz}$ ;  $\sigma = 5.13 \text{ S/m}$ ;  $\epsilon_r = 33.9$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2014, ConvF(5.45, 5.45, 5.45); Calibrated: 30.12.2014, ConvF(5.21, 5.21, 5.21); Calibrated: 30.12.2014, ConvF(5.12, 5.12, 5.12); Calibrated: 30.12.2014, ConvF(4.92, 4.92, 4.92); Calibrated: 30.12.2014, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2014, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**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 = 65.47 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 29.0 W/kg

SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.28 W/kg

Maximum value of SAR (measured) = 18.2 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.57 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 29.8 W/kg

SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.34 W/kg

Maximum value of SAR (measured) = 18.7 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan,**
**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 66.11 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 31.3 W/kg

SAR(1 g) = 8.31 W/kg; SAR(10 g) = 2.4 W/kg

Maximum value of SAR (measured) = 19.1 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 = 64.96 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 33.2 W/kg

SAR(1 g) = 8.37 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=5600 MHz/Zoom Scan,**
**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.75 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 32.8 W/kg

SAR(1 g) = 8.3 W/kg; SAR(10 g) = 2.37 W/kg

Maximum value of SAR (measured) = 19.6 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan,**
**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.07 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 32.5 W/kg

SAR(1 g) = 8 W/kg; SAR(10 g) = 2.29 W/kg

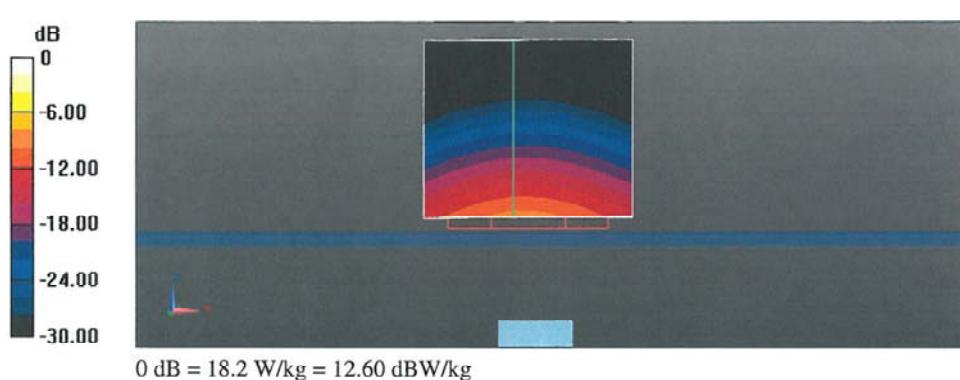
**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,**
**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 61.91 V/m; Power Drift = 0.07 dB

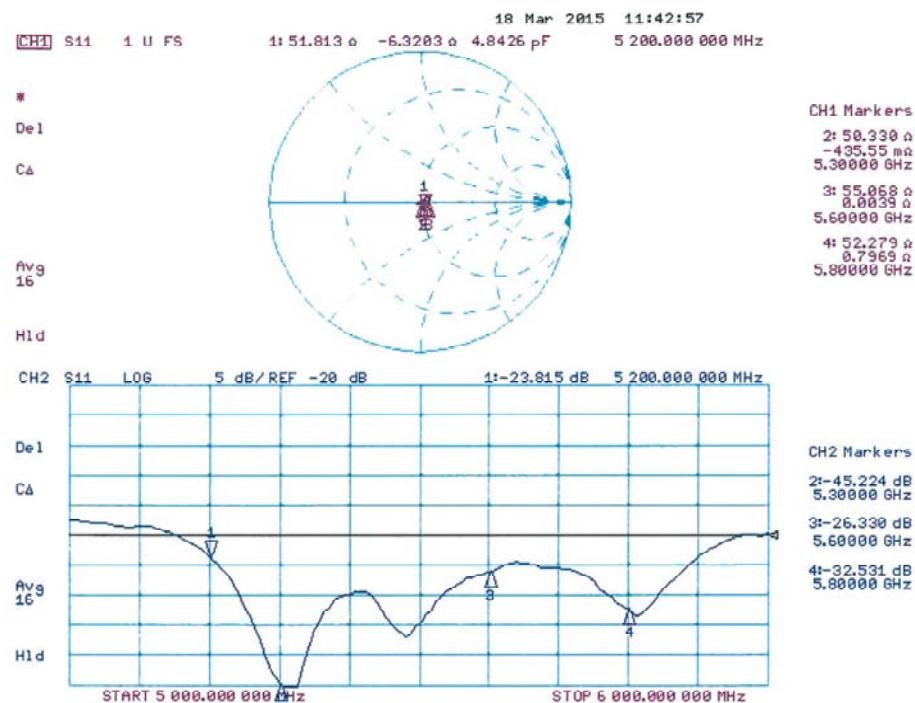
Peak SAR (extrapolated) = 32.6 W/kg

SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.26 W/kg

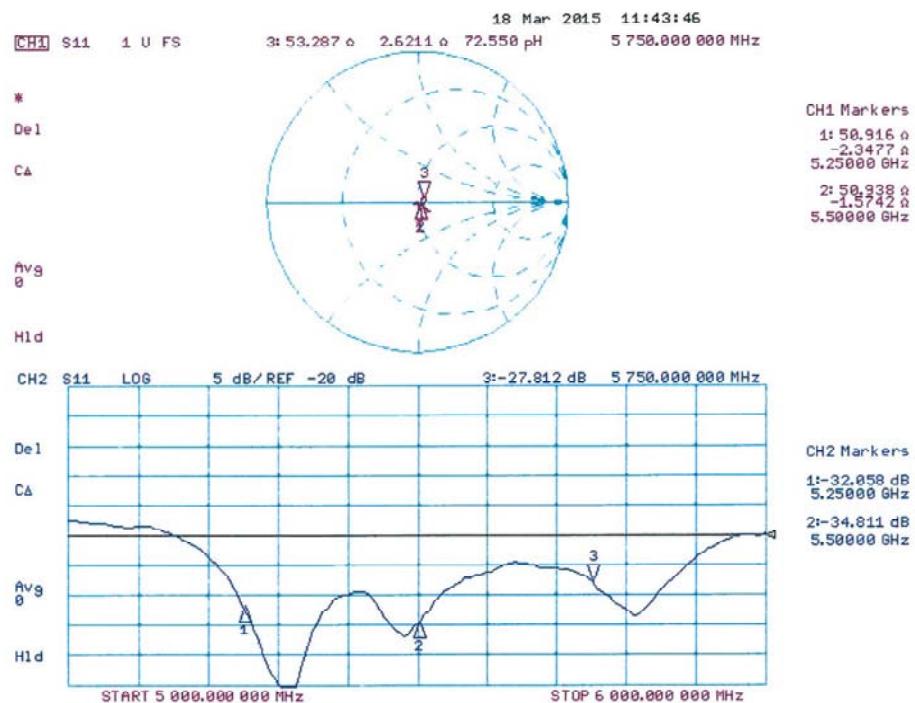
Maximum value of SAR (measured) = 19.0 W/kg



## Impedance Measurement Plot for Head TSL (5200, 5300, 5600, 5800)



## Impedance Measurement Plot for Head TSL (5250, 5500, 5750)



## DASY5 Validation Report for Body TSL

Date: 23.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1103**

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz  
 Medium parameters used:  $f = 5200 \text{ MHz}$ ;  $\sigma = 5.42 \text{ S/m}$ ;  $\epsilon_r = 47.6$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5250 \text{ MHz}$ ;  $\sigma = 5.49 \text{ S/m}$ ;  $\epsilon_r = 47.5$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5300 \text{ MHz}$ ;  $\sigma = 5.55 \text{ S/m}$ ;  $\epsilon_r = 47.4$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5500 \text{ MHz}$ ;  $\sigma = 5.82 \text{ S/m}$ ;  $\epsilon_r = 47.1$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5600 \text{ MHz}$ ;  $\sigma = 5.95 \text{ S/m}$ ;  $\epsilon_r = 46.9$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5750 \text{ MHz}$ ;  $\sigma = 6.17 \text{ S/m}$ ;  $\epsilon_r = 46.7$ ;  $\rho = 1000 \text{ kg/m}^3$ , Medium parameters used:  $f = 5800 \text{ MHz}$ ;  $\sigma = 6.23 \text{ S/m}$ ;  $\epsilon_r = 46.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95); Calibrated: 30.12.2014, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2014, ConvF(4.78, 4.78, 4.78); Calibrated: 30.12.2014, ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2014, ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2014, ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Dipole Calibration for Body 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 = 58.85 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.7 W/kg

SAR(1 g) = 7.5 W/kg; SAR(10 g) = 2.1 W/kg

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

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.90 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 29.9 W/kg

SAR(1 g) = 7.54 W/kg; SAR(10 g) = 2.11 W/kg

Maximum value of SAR (measured) = 17.8 W/kg

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan,**
**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.44 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 30.6 W/kg

**SAR(1 g) = 7.54 W/kg; SAR(10 g) = 2.11 W/kg**

Maximum value of SAR (measured) = 18.0 W/kg

**Dipole Calibration for Body 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 = 58.84 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 34.5 W/kg

**SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.24 W/kg**

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

**Dipole Calibration for Body 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 = 57.65 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 34.9 W/kg

**SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.2 W/kg**

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

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan,**
**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 55.90 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 34.7 W/kg

**SAR(1 g) = 7.53 W/kg; SAR(10 g) = 2.09 W/kg**

Maximum value of SAR (measured) = 18.8 W/kg

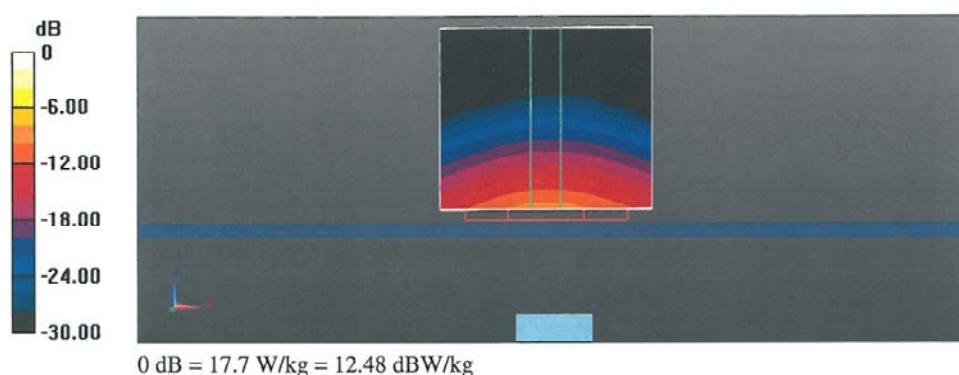
**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,**
**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 56.16 V/m; Power Drift = 0.06 dB

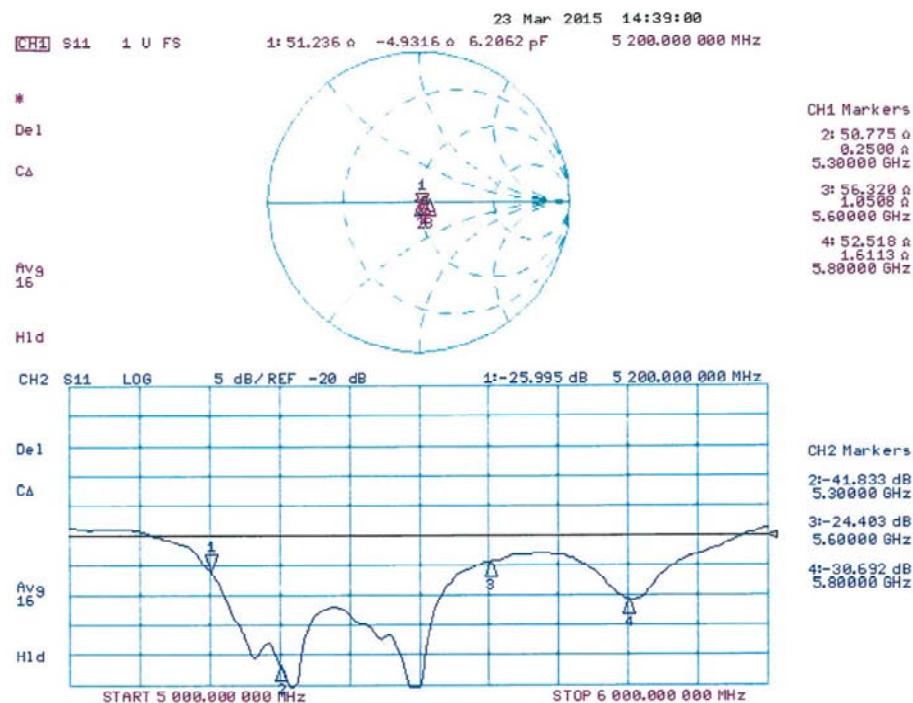
Peak SAR (extrapolated) = 35.9 W/kg

**SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.14 W/kg**

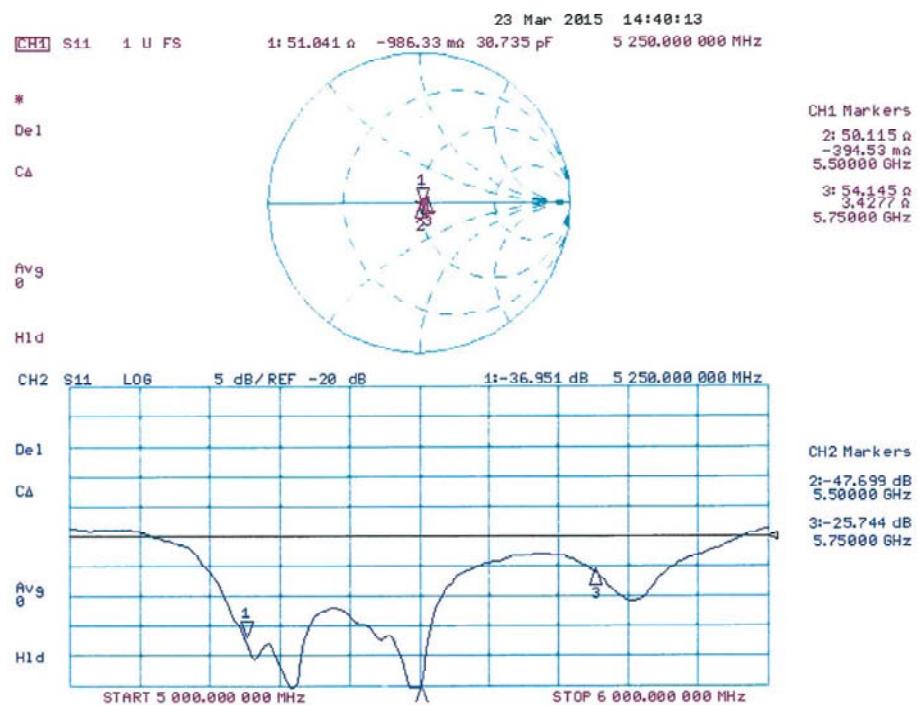
Maximum value of SAR (measured) = 19.3 W/kg



## Impedance Measurement Plot for Body TSL (5200, 5300, 5600, 5800)



## Impedance Measurement Plot for Body TSL (5250, 5500, 5750)



## Attachment 3. – SAR SYSTEM VALIDATION

## SAR System Validation

Per FCC KDB 865664 D02v01r02, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01v01r04 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

**Table Attachment 3.1 SAR System Validation Summary**

SAR System	Freq. [MHz]	Date	Probe SN	Probe Type	Probe CAL. Point		PERM. ( $\epsilon_r$ )	COND. ( $\sigma$ )	CW Validation			MOD. Validation		
									Sensitivity	Probe Linearity	Probe Isotropy	MOD. Type	Duty Factor	PAR
A	750	2015-07-29	3930	EX3DV4	750	Head	41.91	0.891	PASS	PASS	PASS	N/A	N/A	N/A
A	835	2015-07-30	3930	EX3DV4	835	Head	40.99	0.902	PASS	PASS	PASS	GMSK	PASS	N/A
A	1800	2015-07-31	3930	EX3DV4	1800	Head	40.35	1.414	PASS	PASS	PASS	N/A	N/A	N/A
A	1900	2015-08-03	3930	EX3DV4	1900	Head	40.87	1.426	PASS	PASS	PASS	GMSK	PASS	N/A
A	2450	2015-08-04	3866	EX3DV4	2450	Head	40.11	1.828	PASS	PASS	PASS	OFDM	N/A	PASS
A	5300	2015-08-05	3866	EX3DV4	5300	Head	35.96	4.751	PASS	PASS	PASS	OFDM	N/A	PASS
A	5500	2015-08-06	3866	EX3DV4	5500	Head	36.58	4.993	PASS	PASS	PASS	OFDM	N/A	PASS
A	5600	2015-08-06	3866	EX3DV4	5600	Head	35.55	5.072	PASS	PASS	PASS	OFDM	N/A	PASS
A	5800	2015-08-07	3866	EX3DV4	5800	Head	35.25	5.272	PASS	PASS	PASS	OFDM	N/A	PASS
A	750	2015-07-29	3930	EX3DV4	750	Body	55.42	0.963	PASS	PASS	PASS	N/A	N/A	N/A
A	835	2015-07-30	3930	EX3DV4	835	Body	55.28	0.971	PASS	PASS	PASS	GMSK	PASS	N/A
A	1800	2015-07-31	3930	EX3DV4	1800	Body	53.29	1.523	PASS	PASS	PASS	N/A	N/A	N/A
A	1900	2015-08-03	3930	EX3DV4	1900	Body	52.86	1.519	PASS	PASS	PASS	GMSK	PASS	N/A
A	2450	2015-08-04	3866	EX3DV4	2450	Body	52.30	1.935	PASS	PASS	PASS	OFDM	N/A	PASS

NOTE: While the probes have been calibrated for both a CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01r04 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to KDB 865664.