

## General Antenna Parameters and Design

Electrical Delay (one direction)	1.154 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	July 08, 2003

## DASY5 Validation Report for Head TSL

Date: 16.11.2012

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1004**

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 4.53$  mho/m;  $\epsilon_r = 34.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5300$  MHz;  $\sigma = 4.63$  mho/m;  $\epsilon_r = 34.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5600$  MHz;  $\sigma = 4.93$  mho/m;  $\epsilon_r = 34.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5800$  MHz;  $\sigma = 5.15$  mho/m;  $\epsilon_r = 34$ ;  $\rho = 1000$  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: 30.12.2011, ConvF(5.1, 5.1, 5.1); Calibrated: 30.12.2011, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2011, ConvF(4.81, 4.81, 4.81); Calibrated: 30.12.2011;
- 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 52.8.3(988); SEMCAD X 14.6.7(6848)

### **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 = 64.614 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 29.0 W/kg

**SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.23 W/kg**

Maximum value of SAR (measured) = 18.4 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 = 65.075 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 31.8 W/kg

**SAR(1 g) = 8.45 W/kg; SAR(10 g) = 2.42 W/kg**

Maximum value of SAR (measured) = 19.9 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 = 63.984 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 33.4 W/kg

**SAR(1 g) = 8.41 W/kg; SAR(10 g) = 2.39 W/kg**

Maximum value of SAR (measured) = 20.2 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,**

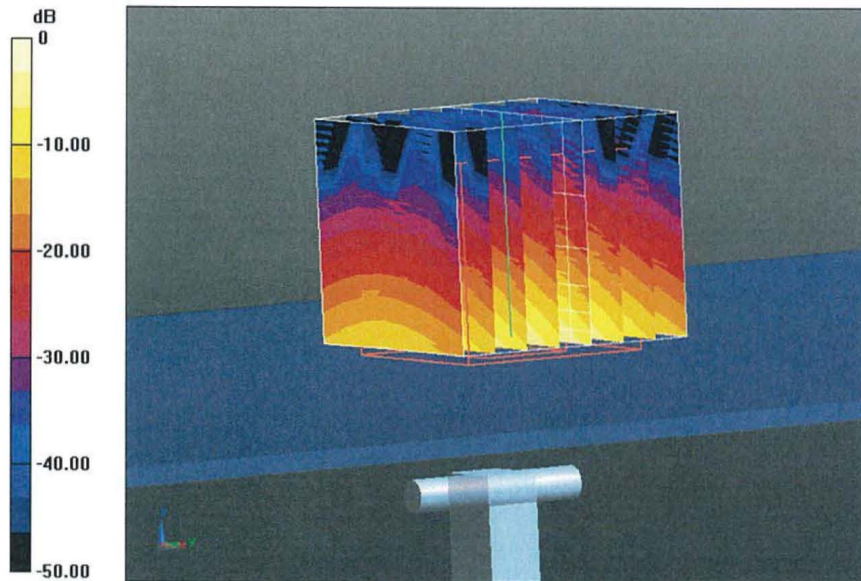
**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 61.212 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 33.5 W/kg

**SAR(1 g) = 8.05 W/kg; SAR(10 g) = 2.29 W/kg**

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



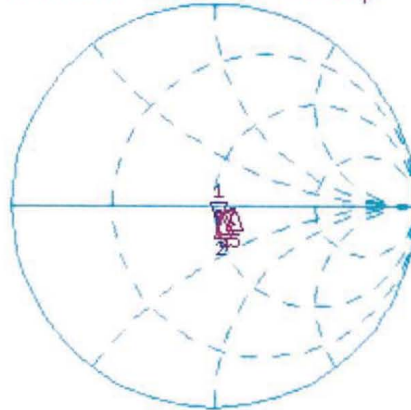
0 dB = 19.6 W/kg = 12.92 dBW/kg

# Impedance Measurement Plot for Head TSL

16 Nov 2012 17:32:44

CH1 S11 1 U FS 1: 50.922  $\Omega$  -9.7402  $\Omega$  3.1423 pF 5 200.000 000 MHz

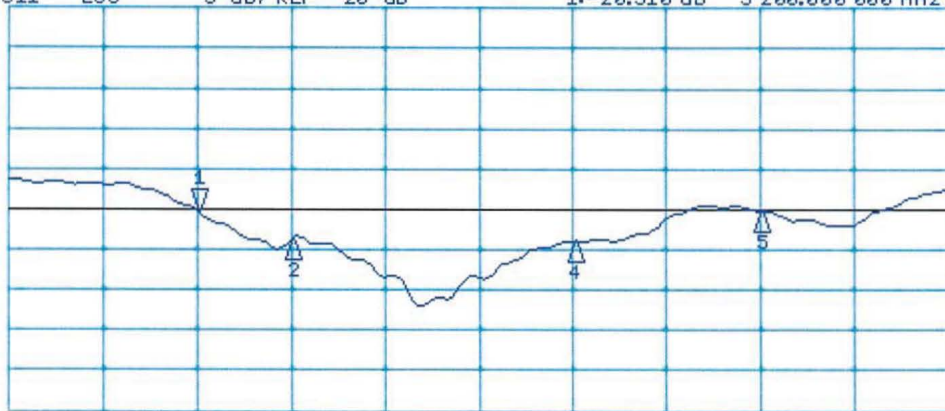
\*  
De1  
Cor  
Avg  
16  
H1d



CH1 Markers  
2: 52.570  $\Omega$   
-6.2402  $\Omega$   
5.30000 GHz  
4: 54.541  $\Omega$   
-4.8613  $\Omega$   
5.60000 GHz  
5: 60.242  $\Omega$   
-2.5625  $\Omega$   
5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -20.310 dB 5 200.000 000 MHz

Cor  
Avg  
16  
H1d



CH2 Markers  
2: -23.647 dB  
5.30000 GHz  
4: -23.937 dB  
5.60000 GHz  
5: -20.376 dB  
5.80000 GHz

START 5 000.000 000 MHz

STOP 6 000.000 000 MHz



Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1004**

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 5.35$  mho/m;  $\epsilon_r = 46.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5300$  MHz;  $\sigma = 5.47$  mho/m;  $\epsilon_r = 46.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5600$  MHz;  $\sigma = 5.86$  mho/m;  $\epsilon_r = 46.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5800$  MHz;  $\sigma = 6.13$  mho/m;  $\epsilon_r = 45.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2011, ConvF(4.67, 4.67, 4.67); Calibrated: 30.12.2011, ConvF(4.22, 4.22, 4.22); Calibrated: 30.12.2011, ConvF(4.38, 4.38, 4.38); Calibrated: 30.12.2011;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

## **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 = 58.275 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 28.8 W/kg

**SAR(1 g) = 7.25 W/kg; SAR(10 g) = 2.03 W/kg**

Maximum value of SAR (measured) = 17.1 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 = 58.841 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 31.0 W/kg

**SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.14 W/kg**

Maximum value of SAR (measured) = 18.1 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 = 58.396 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 35.4 W/kg

**SAR(1 g) = 7.95 W/kg; SAR(10 g) = 2.21 W/kg**

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

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,**

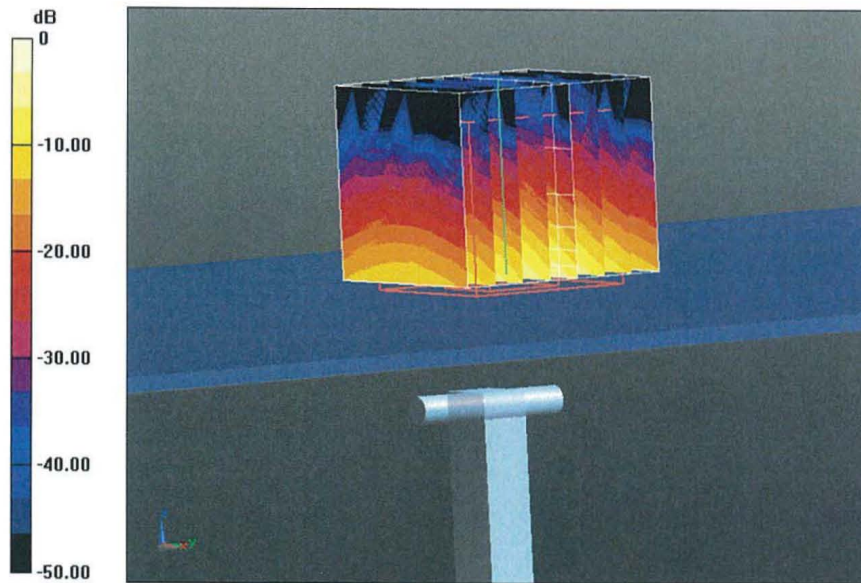
**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 55.539 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 34.8 W/kg

**SAR(1 g) = 7.42 W/kg; SAR(10 g) = 2.06 W/kg**

Maximum value of SAR (measured) = 18.3 W/kg



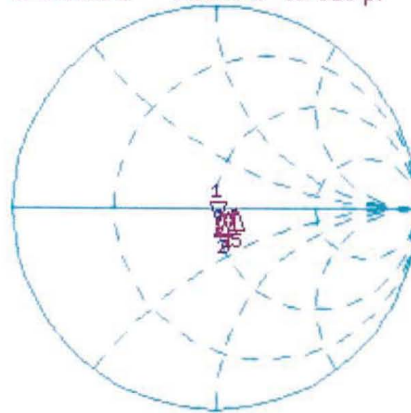
0 dB = 18.3 W/kg = 12.62 dBW/kg

# Impedance Measurement Plot for Body TSL

14 Nov 2012 10:24:27

CH1 S11 1 U FS 1: 49.490  $\Omega$  -8.1348  $\Omega$  3.7625 pF 5 200.000 000 MHz

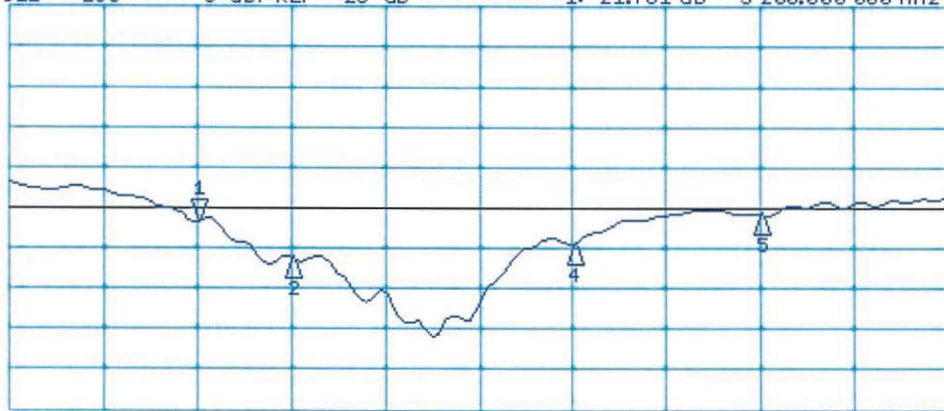
\*  
De1  
Cor  
Avg  
16  
H1d



CH1 Markers  
2: 52.301  $\Omega$   
-4.4766  $\Omega$   
5.30000 GHz  
4: 55.236  $\Omega$   
-3.4668  $\Omega$   
5.60000 GHz  
5: 59.846  $\Omega$   
-1.9766  $\Omega$   
5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -21.761 dB 5 200.000 000 MHz

Cor  
Avg  
16  
H1d



CH2 Markers  
2: -26.170 dB  
5.30000 GHz  
4: -24.483 dB  
5.60000 GHz  
5: -20.782 dB  
5.80000 GHz

START 5 000.000 000 MHz

STOP 6 000.000 000 MHz