Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω + 3.2 jΩ
Return Loss	- 26.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.9 Ω + 4.8 jΩ
Return Loss	- 26.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.163 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
Manufactured on	November 10, 2009

DASY5 Validation Report for Head TSL

Date: 02.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

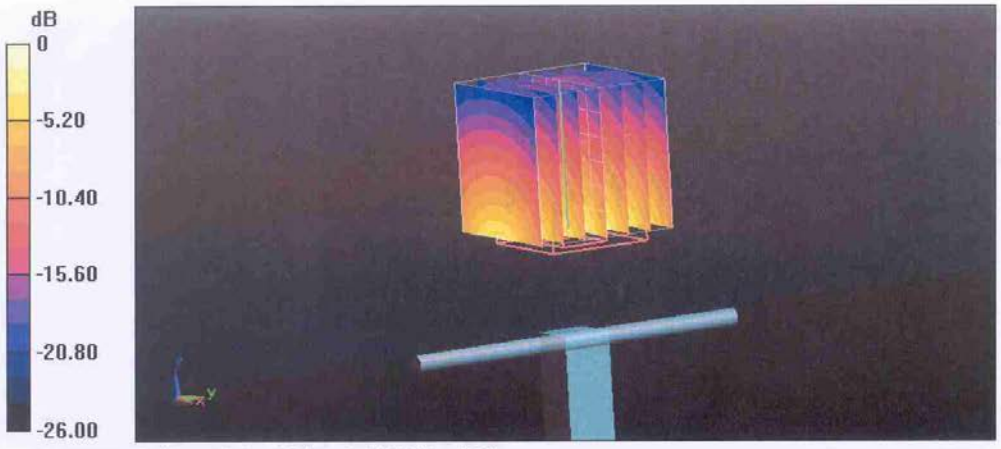
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 853

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.81 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

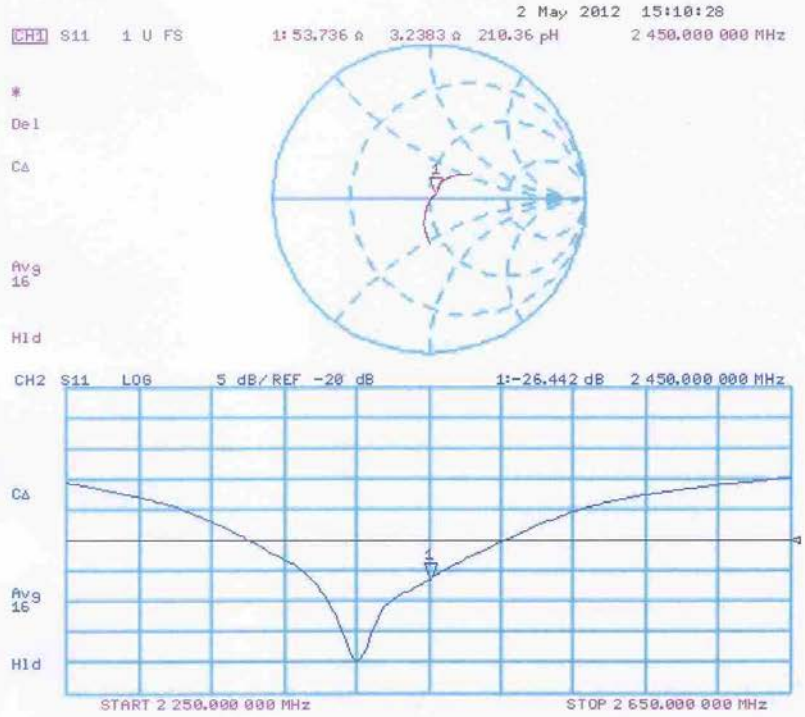
- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.0 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 26.785 mW/g
SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.09 mW/g
Maximum value of SAR (measured) = 16.7 mW/g



0 dB = 16.7 mW/g = 24.45 dB mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 02.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

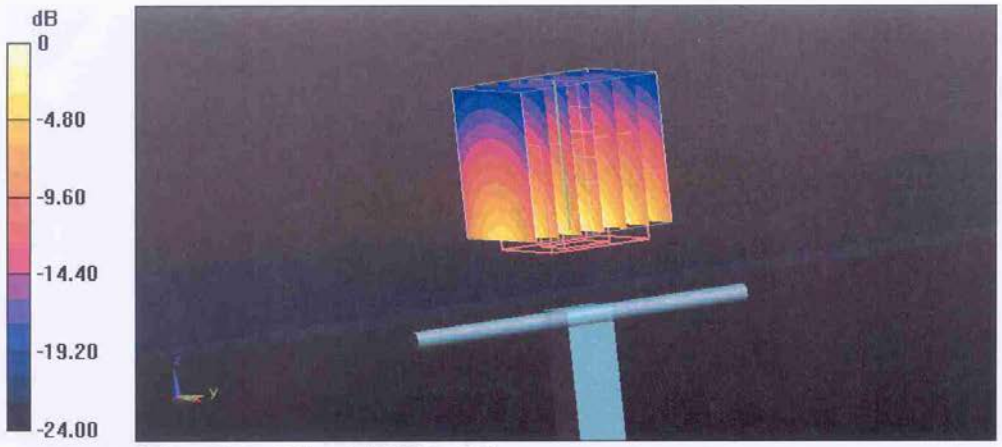
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 853

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

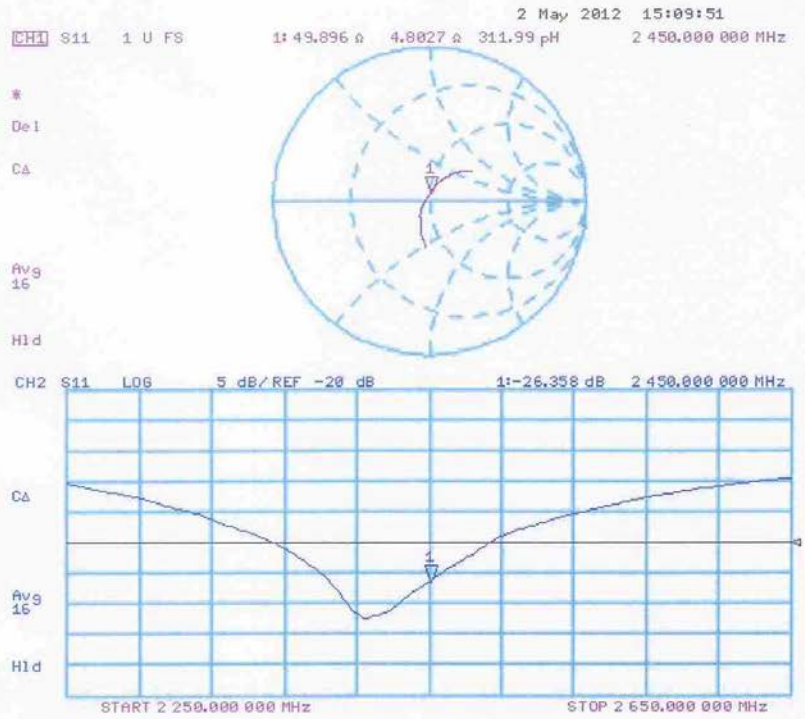
- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.306 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 26.029 mW/g
SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.92 mW/g
Maximum value of SAR (measured) = 16.8 mW/g



0 dB = 16.8 mW/g = 24.51 dB mW/g

Impedance Measurement Plot for Body TSL



ANNEX I DIPOLE QUALIFICATION FOR THE EXTENDED 3-YEAR CALIBRATION INTERVAL

I1 Dipole 835

The information and documentation below are provided to qualify the extended 3-year calibration interval of dipole.

I1.1 List of Equipment

No.	Name	Type	Serial Number
01	Network analyzer	E5071C	MY46110673
02	Power meter	NRVD	102083
03	Power sensor	NRV-Z5	100542
04	Signal Generator	E4438C	MY49070393
05	Amplifier	60S1G4	0331848
06	E-field Probe	SPEAG EX3DV4	3846
07	DAE	SPEAG DAE4	771
08	Dipole Validation Kit	SPEAG D835V2	443

I1.2 Results of Impedance, Return-loss and System validation

Dipole 835 - Head

		Year		Deviation	Limit
		2012	2013		
Impedance	Real (Ω)	50.8	53.6	2.8Ω	Deviation < 5Ω
	Imaginary (Ω)	-6.7	-2.2	4.5Ω	Deviation < 5Ω
Return-loss (dB)		-23.5	-23.3	0.2dB	Deviate < 0.2dB
System validation	10g	1.52	1.56	2.63%	Deviation < 10%
	1g	2.33	2.38	2.15%	Deviation < 10%

Dipole 835 - Body

		Year		Deviation	Limit
		2012	2013		
Impedance	Real (Ω)	46.8	49.1	2.3Ω	Deviation < 5Ω
	Imaginary (Ω)	-7.8	-3.7	4.1Ω	Deviation < 5Ω
Return-loss (dB)		-21.2	-21.4	-0.2dB	Deviate < 0.2dB
System validation	10g	1.59	1.61	1.26%	Deviation < 10%
	1g	2.42	2.42	0.00%	Deviation < 10%

According to the above tables, it is not necessary to recalibration the dipoles in 2013.

I2 Dipole 1900

The information and documentation below are provided to qualify the extended 3-year calibration interval of dipole.

I2.1 List of Equipment

No.	Name	Type	Serial Number
01	Network analyzer	E5071C	MY46110673
02	Power meter	NRVD	102083
03	Power sensor	NRV-Z5	100542
04	Signal Generator	E4438C	MY49070393
05	Amplifier	60S1G4	0331848
06	E-field Probe	SPEAG EX3DV4	3846
07	DAE	SPEAG DAE4	771
08	Dipole Validation Kit	SPEAG D1900V2	541

I2.2 Results of Impedance, Return-loss and System validation

Dipole 1900 - Head

		Year		Deviation	Limit
		2012	2013		
Impedance	Real (Ω)	52.6	50.7	-1.9 Ω	Deviation < 5 Ω
	Imaginary (Ω)	6.2	2.5	-3.7 Ω	Deviation < 5 Ω
Return-loss (dB)		-23.7	-23.5	0.2dB	Deviate < 0.2dB
System validation	10g	5.11	5.07	-0.78%	Deviation < 10%
	1g	9.62	9.61	-0.10%	Deviation < 10%

Dipole 1900 - Body

		Year		Deviation	Limit
		2012	2013		
Impedance	Real (Ω)	48.6	47.1	-1.5 Ω	Deviation < 5 Ω
	Imaginary (Ω)	6.9	3.3	-3.6 Ω	Deviation < 5 Ω
Return-loss (dB)		-23.0	-23.1	-0.1dB	Deviate < 0.2dB
System validation	10g	5.33	5.46	2.44%	Deviation < 10%
	1g	10	10.3	3.00%	Deviation < 10%

According to the above tables, it is not necessary to recalibration the dipoles in 2013.

I3 Dipole 2450

The information and documentation below are provided to qualify the extended 3-year calibration interval of dipole.

I3.1 List of Equipment

No.	Name	Type	Serial Number
01	Network analyzer	E5071C	MY46110673
02	Power meter	NRVD	102083
03	Power sensor	NRV-Z5	100542
04	Signal Generator	E4438C	MY49070393
05	Amplifier	60S1G4	0331848
06	E-field Probe	SPEAG EX3DV4	3846
07	DAE	SPEAG DAE4	771
08	Dipole Validation Kit	SPEAG D2450V2	853

I3.2 Results of Impedance, Return-loss and System validation

Dipole 2450 - Head

		Year		Deviation	Limit
		2012	2013		
Impedance	Real (Ω)	53.7	51.6	-2.1 Ω	Deviation < 5 Ω
	Imaginary (Ω)	3.2	4.8	1.6 Ω	Deviation < 5 Ω
Return-loss (dB)		-26.4	-26.5	-0.1dB	Deviate < 0.2dB
System validation	10g	6.09	6.04	-0.82%	Deviation < 10%
	1g	13.1	12.9	-1.53%	Deviation < 10%

Dipole 2450 - Body

		Year		Deviation	Limit
		2012	2013		
Impedance	Real (Ω)	49.9	52.5	2.6 Ω	Deviation < 5 Ω
	Imaginary (Ω)	4.8	4.3	-0.5 Ω	Deviation < 5 Ω
Return-loss (dB)		-26.4	-26.2	0.2dB	Deviate < 0.2dB
System validation	10g	5.92	5.98	1.01%	Deviation < 10%
	1g	12.7	12.8	0.79%	Deviation < 10%

According to the above tables, it is not necessary to recalibration the dipoles in 2013.