APPENDIX 4 : System Validation Dipole (D900V2,S/N: 155)

Schmid & Partner
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Calibration Certificate

900 MHz System Validation Dipole

Type:	D900V2
Serial Number:	155
Place of Calibration:	Zurich
Date of Calibration:	November 13, 2002
Calibration Interval:	24 months

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:	
Approved by:	

Schmid & Partner
Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

DASY

Dipole Validation Kit

Type: D900V2

Serial: 155

Manufactured: March 1, 2002
Calibrated: November 13, 2002

1. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with head simulating solution of the following electrical parameters at 900 MHz:

Relative Dielectricity	**42.4**	± 5%
Conductivity	**0.97 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.5 at 900 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**10.5 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**6.60 mW/g**

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1.391 ns**	(one direction)
Transmission factor:	**0.989**	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 900 MHz:	Re{Z} = **49.4 Ω**
	Im {Z} = **-6.9 Ω**
Return Loss at 900 MHz	**-23.1 dB**

4. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with body simulating solution of the following electrical parameters at 900 MHz:

Relative Dielectricity	**55.5**	± 5%
Conductivity	**1.03 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.2 at 900 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

5. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 4. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**10.5 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**6.76 mW/g**

6. Dipole Impedance and Return Loss

The dipole was positioned at the flat phantom sections according to section 4 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 900 MHz:	Re{Z} = **45.6 Ω**
	Im {Z} = **-8.6 Ω**
Return Loss at 900 MHz	**-19.9 dB**

7. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

8. Design

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.

9. Power Test

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

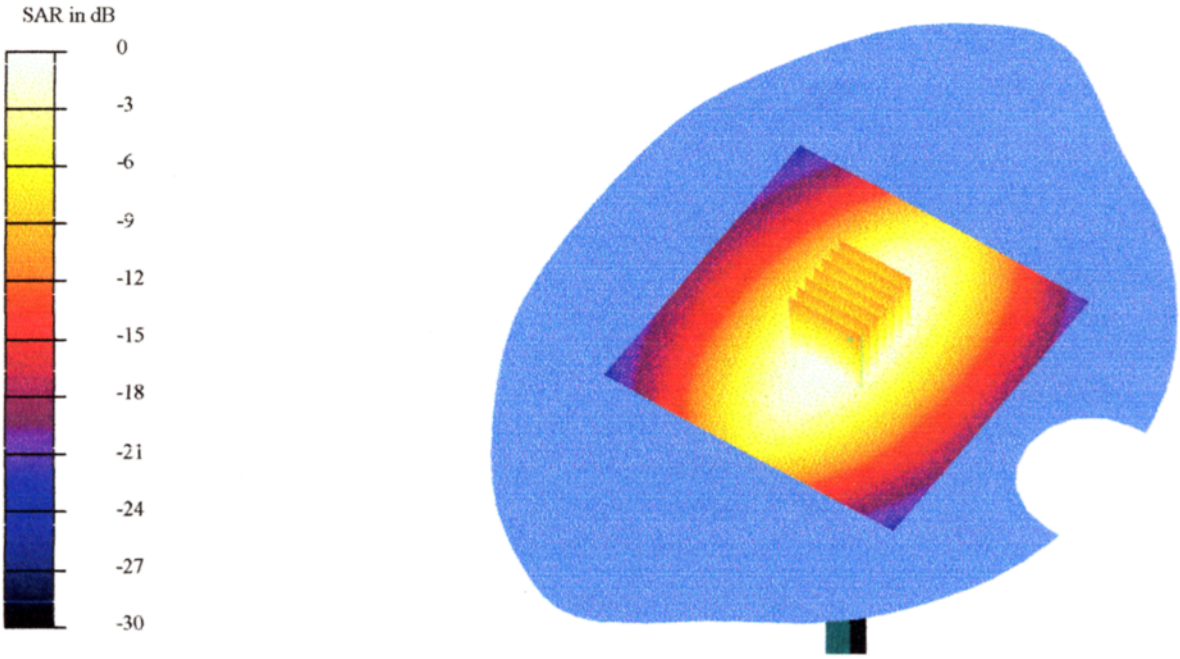
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN155_SN1507_HSL900_131102.da4

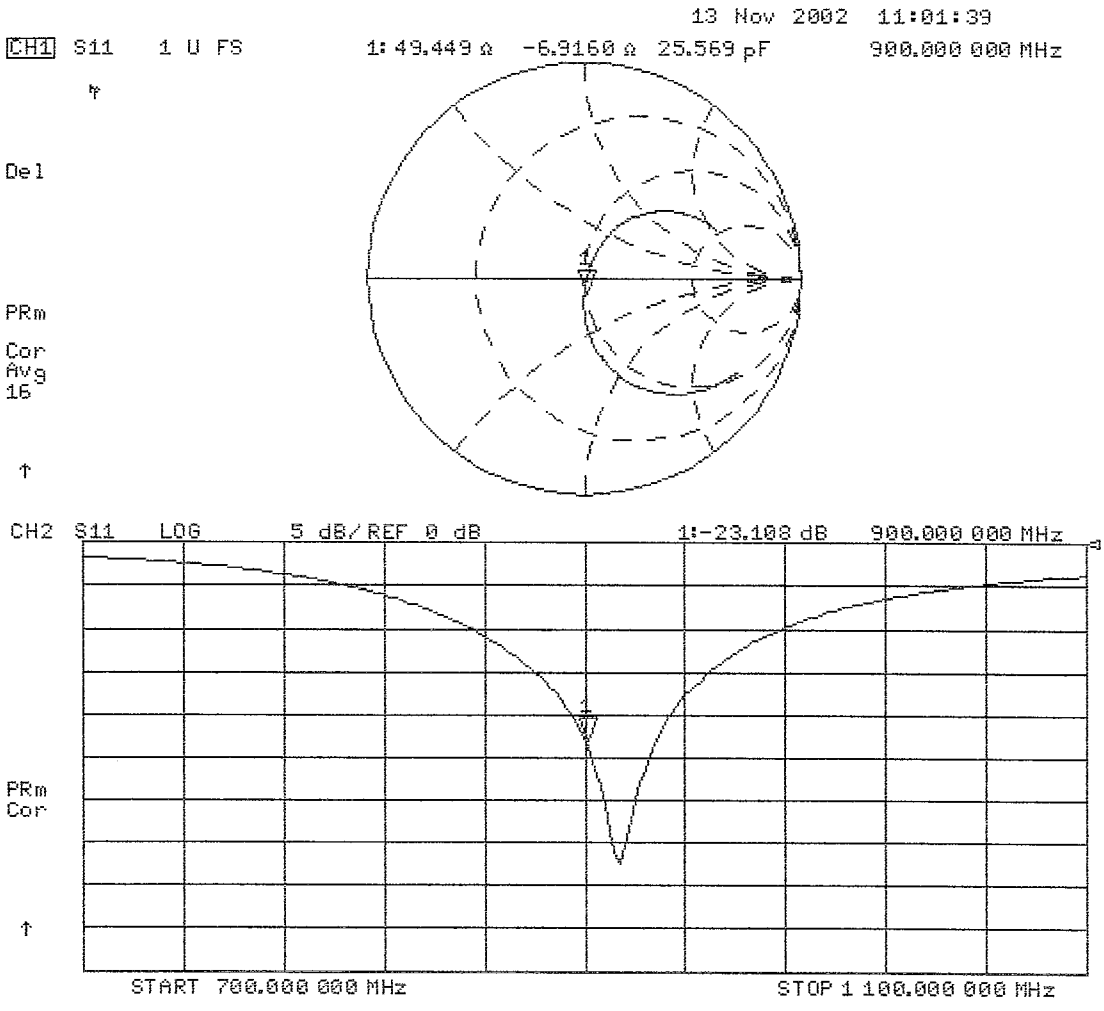
DUT: Dipole 900 MHz Type & Serial Number: D900V2 - SN155
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-900; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL 900 MHz (σ = 0.97 mho/m, ε = 42.44, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(6.5, 6.5, 6.5); Calibrated: 1/24/2002
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 35

Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 56.3 V/m
Peak SAR = 3.96 mW/g
SAR(1 g) = 2.62 mW/g; SAR(10 g) = 1.65 mW/g
Power Drift = -0.03 dB




13 Nov 2002 11:01:39
CH1 S11 1 U FS
1: 49.449 Ω -6.9160 Ω 25.569 pF
900.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF 0 dB
1:-23.108 dB 900.000 000 MHz
PRm
Cor
START 700.000 000 MHz
STOP 1 100.000 000 MHz

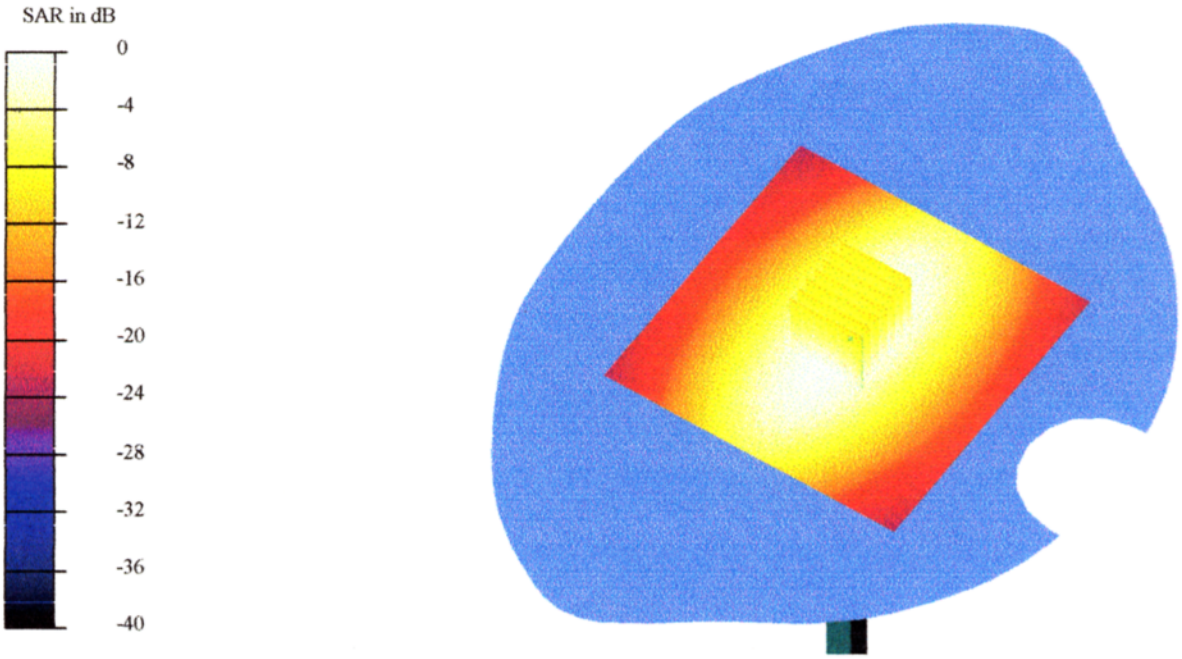
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN155_SN1507_M900_131102.da4

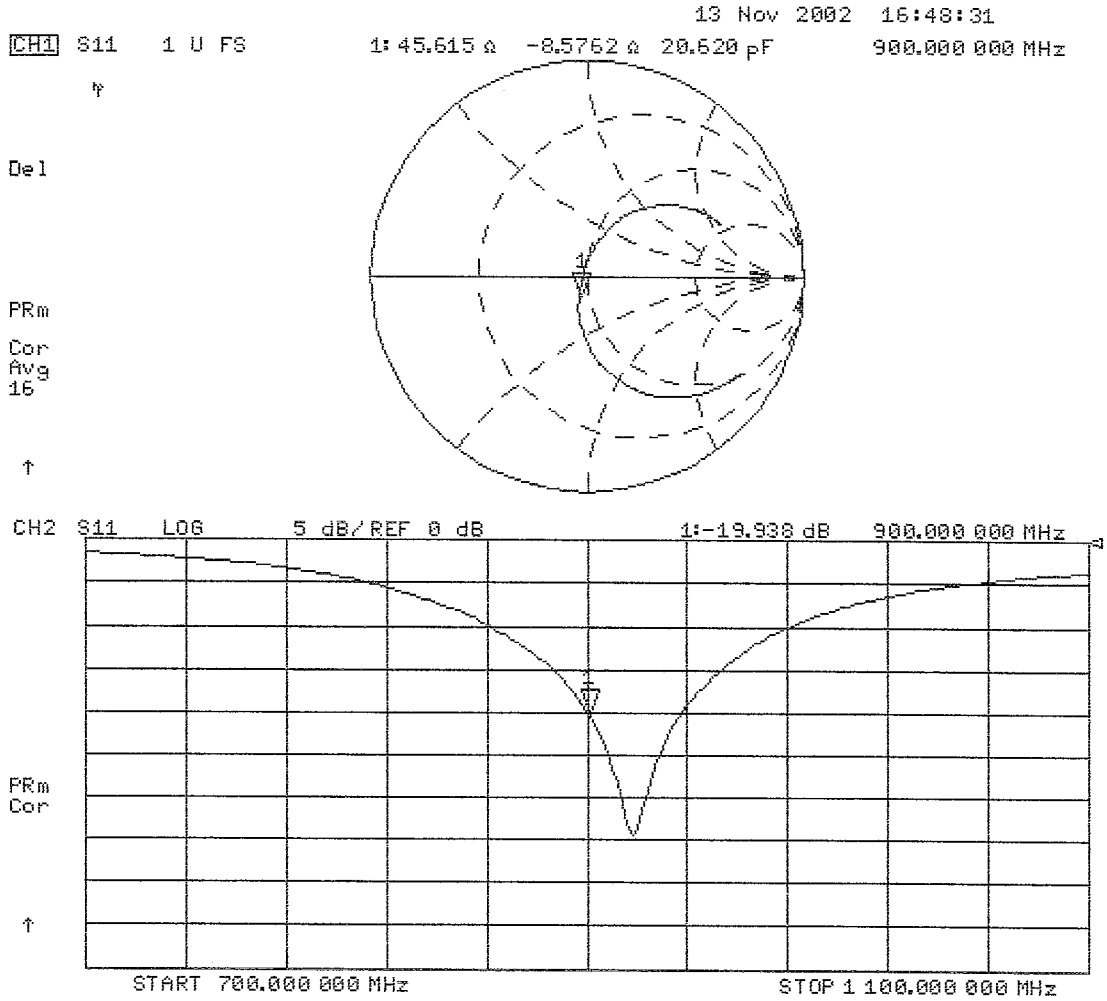
DUT: Dipole 900 MHz Type & Serial Number: D900V2 - SN155
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-900; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: Muscle 900 MHz (σ = 1.03 mho/m, ε = 55.48, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(6.2, 6.2, 6.2); Calibrated: 1/24/2002
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 35

Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 55 V/m
Peak SAR = 3.73 mW/g
SAR(1 g) = 2.62 mW/g; SAR(10 g) = 1.69 mW/g
Power Drift = 0.002 dB




13 Nov 2002 16:48:31
CH1 S11 1 U FS
1: 45.615 Ω -8.5762 Ω 20.620 pF
900.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF 0 dB
1:-19.938 dB 900.000 000 MHz
PRm
Cor
START 700.000 000 MHz
STOP 1 100.000 000 MHz