

Client

JQA (MITC)

CALIBRATION CERTIFICATE

Object(s) D900V2 - SN:153

Calibration procedure(s) QA CAL-05.v2
Calibration procedure for dipole validation kits

Calibration date: February 4, 2003


Condition of the calibrated item In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date	Scheduled Calibration
RF generator HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	8-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	

Approved by:	Katja Pokovic	Laboratory Director
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Date issued: February 7, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

DASY

Dipole Validation Kit

Type: D900V2

Serial: 153

Manufactured: March 1, 2002
Calibrated: February 4, 2003

1. Measurement Conditions

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

Relative Dielectricity	40.8	$\pm 5\%$
Conductivity	0.95 mho/m	$\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.6 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 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

The dipole input power (forward power) was $250\text{mW} \pm 3\%$. 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:	10.6 mW/g
averaged over 10 cm^3 (10 g) of tissue:	6.72 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:	1.389 ns	(one direction)
Transmission factor:	0.998	(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:	$\text{Re}\{Z\} = $ 50.0 Ω
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	$\text{Im}\{Z\} = $ -4.7 Ω
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Return Loss at 900 MHz	-26.6 dB
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4. Measurement Conditions

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

Relative Dielectricity	53.5	$\pm 5\%$
Conductivity	1.03 mho/m	$\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.3 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 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

The dipole input power (forward power) was 250mW $\pm 3\%$. 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 cm³ (1 g) of tissue: **11.1 mW/g**

averaged over 10 cm³ (10 g) of tissue: **7.12 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} = 46.3 Ω**

Im {Z} = -6.4 Ω

Return Loss at 900 MHz **-22.4 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: SN153_SN1507_HSL900_030203.da4

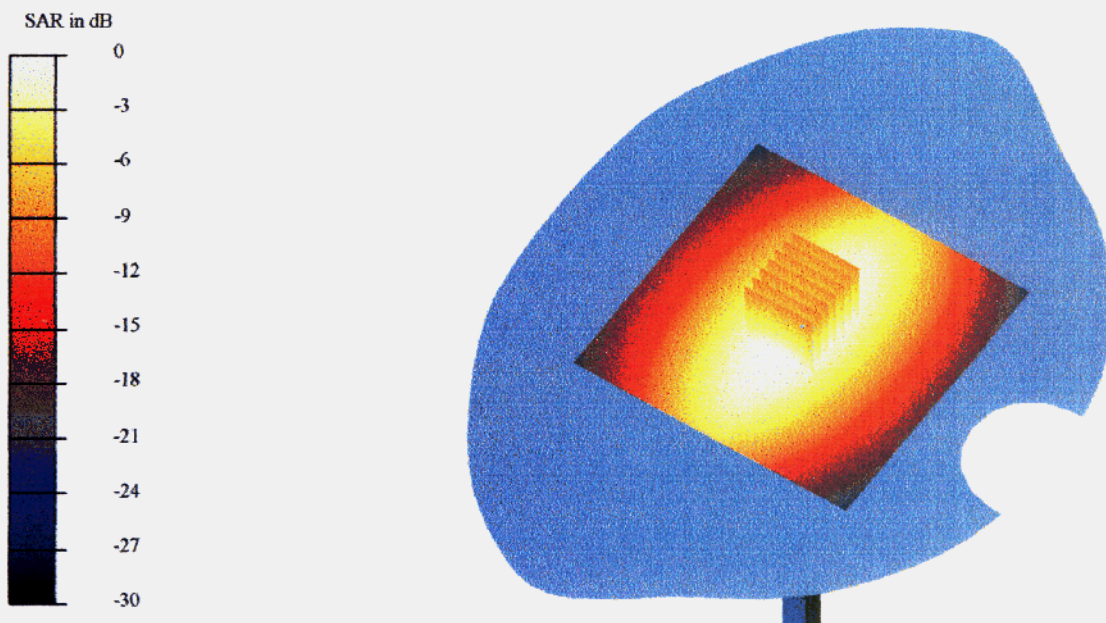
DUT: Dipole 900 MHz Type & Serial Number: D900V2 - SN153
Program: Dipole Calibration; Pin = 250 mW; d = 15 mm

Communication System: CW-900; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL 900 MHz ($\sigma = 0.95$ mho/m, $\epsilon = 40.75$, $\rho = 1000$ kg/m³)
Phantom section: FlatSection

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.6, 6.6, 6.6); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 1/14/2003
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 51

Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 57.6 V/m
Peak SAR = 3.93 mW/g
SAR(1 g) = 2.64 mW/g; SAR(10 g) = 1.68 mW/g
Power Drift = -0.002 dB



3 Feb 2003 11:24:24

[CH1] S11 1 U FS

1: 50.053 \angle -4.6934 \angle 37.679 pF

900.000 000 MHz

De1

De1

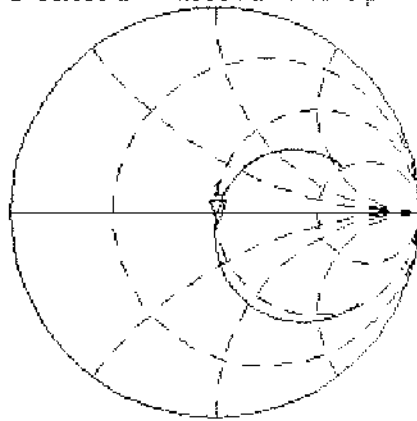
PRm

Cor

Avg

16

↑

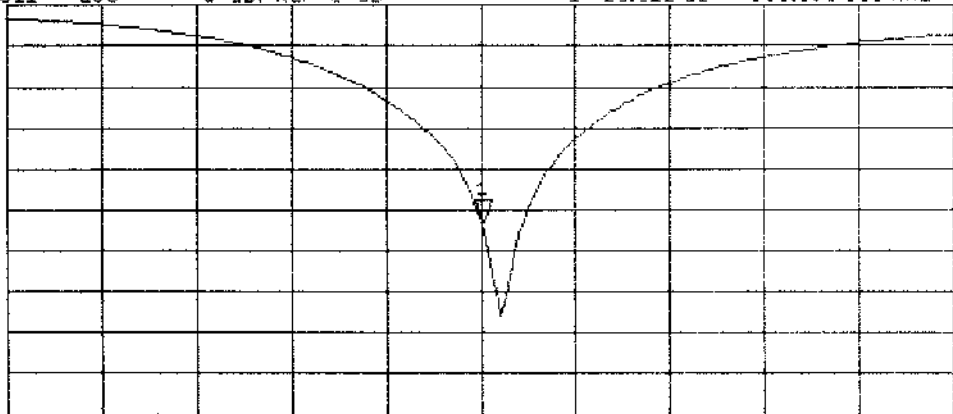


CH2 S11 LOG 5 dB/REF 0 dB 1: -26.622 dB 900.000 000 MHz

PRm

Cor

↑



START 700.000 000 MHz

STOP 1 1000.000 000 MHz

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN153_SN1507_M900_040203.da4

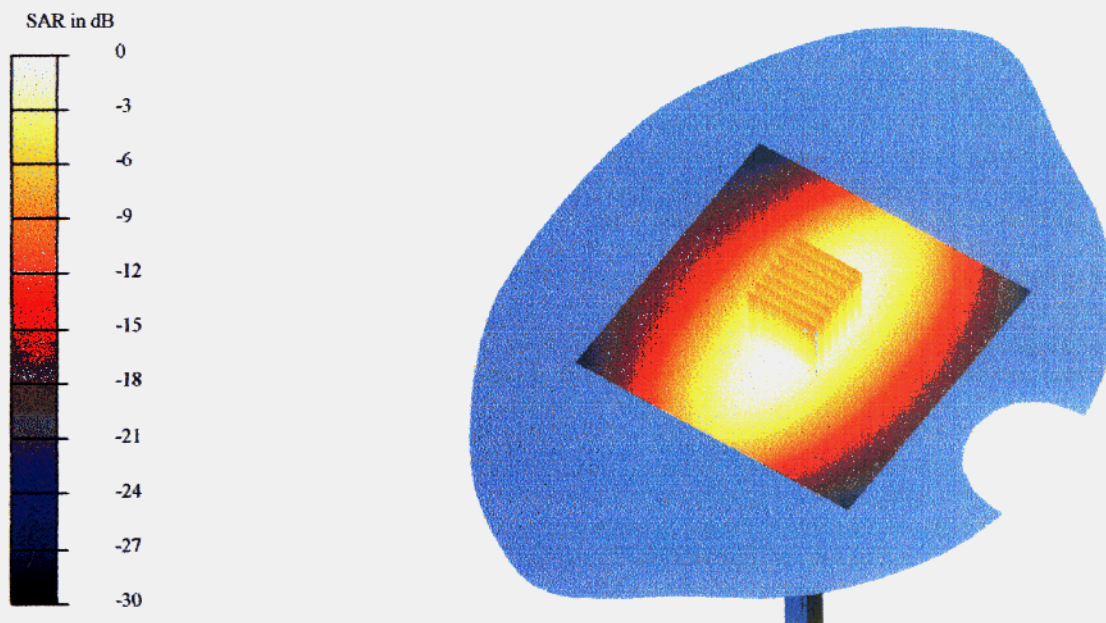
DUT: Dipole 900 MHz Type & Serial Number: D900V2 - SN153
Program: Dipole Calibration; Pin = 250 mW; d = 15 mm

Communication System: CW-900; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: Muscle 900 MHz ($\sigma = 1.03$ mho/m, $\epsilon = 53.48$, $\rho = 1000$ kg/m³)
Phantom section: FlatSection

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.3, 6.3, 6.3); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 1/14/2003
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 51

Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 56 V/m
Peak SAR = 4.03 mW/g
SAR(1 g) = 2.77 mW/g; SAR(10 g) = 1.78 mW/g
Power Drift = -0.02 dB



900 Muscle

4 Feb 2003 11:13:15

CH1 S11 1 U FS

1: 46.328 \angle -6.3613 \angle 27.799 pF

900.000 000 MHz

De1

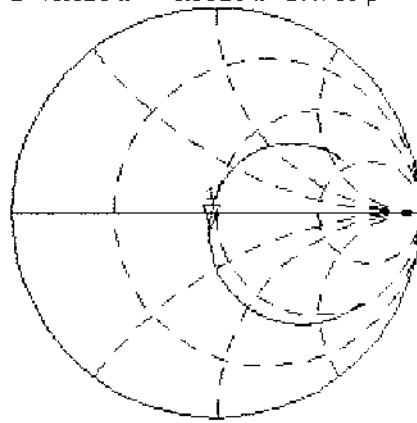
PRm

Cor

Avg

16

↑

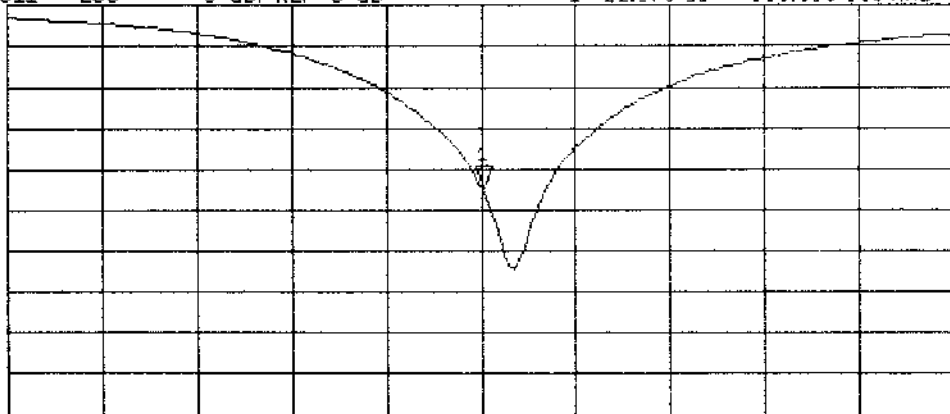


CH2 S11 LOG 5 dB/REF 0 dB 1:-22.376 dB 900.000 000 MHz

PRm

Cor

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START 700.000 000 MHz

STOP 1 100.000 000 MHz