835MHz Brain Dipole Validation

DUT: Dipole 835 MHz; Serial: 451

Program Name: 835MHz Diploe Validation
Procedure Name: 835MHz @ 250mW
Procedure Notes: Meas.Tissue Temp(celsius)-21.3;Test Date-08/Nov/2004

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.9 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

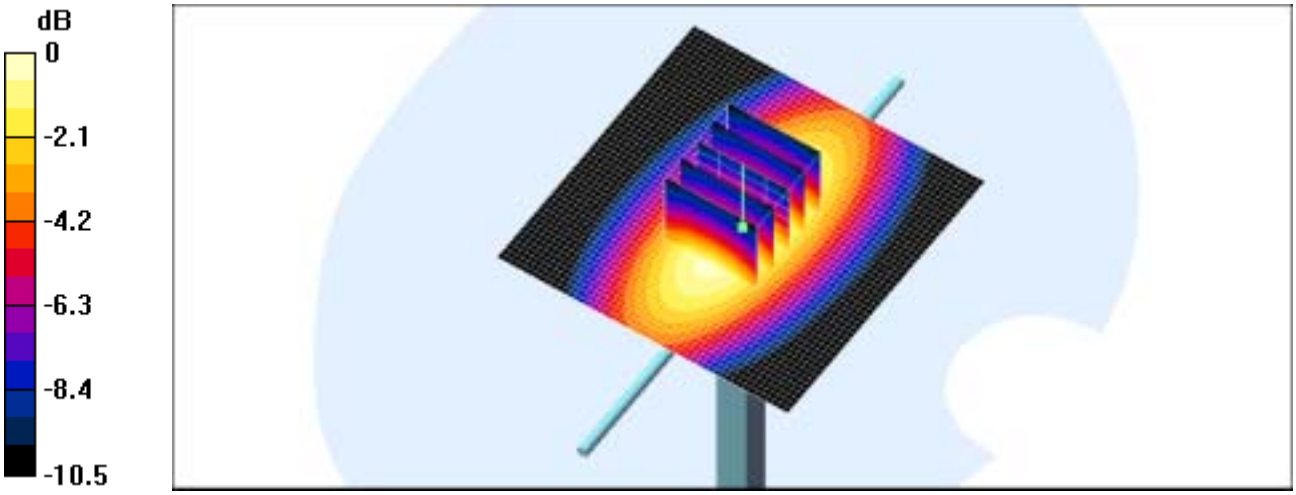
- Probe: ET3DV6 - SN1551; ConvF(6.54, 6.54, 6.54); Calibrated: 2004-04-27
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn486; Calibrated: 2004-08-23
- Phantom: SAM 835/900 MHz; Type: SAM; Serial: TP-1247
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

835MHz @ 250mW/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 2.65 mW/g

835MHz @ 250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 55.3 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 3.56 W/kg
SAR(1 g) = 2.44 mW/g
Maximum value of SAR (measured) = 2.66 mW/g



0 dB = 2.66mW/g

1900MHz Brain Dipole Validation

DUT: Dipole 1900 MHz; Serial: 5d023

Program Name: 1900 Dipole Validation
Procedure Name: 1900MHz @250mW
Procedure Notes: Meas.Tissue Temp(celsius)-21.1;Test Date-09/Nov/2004

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.4 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

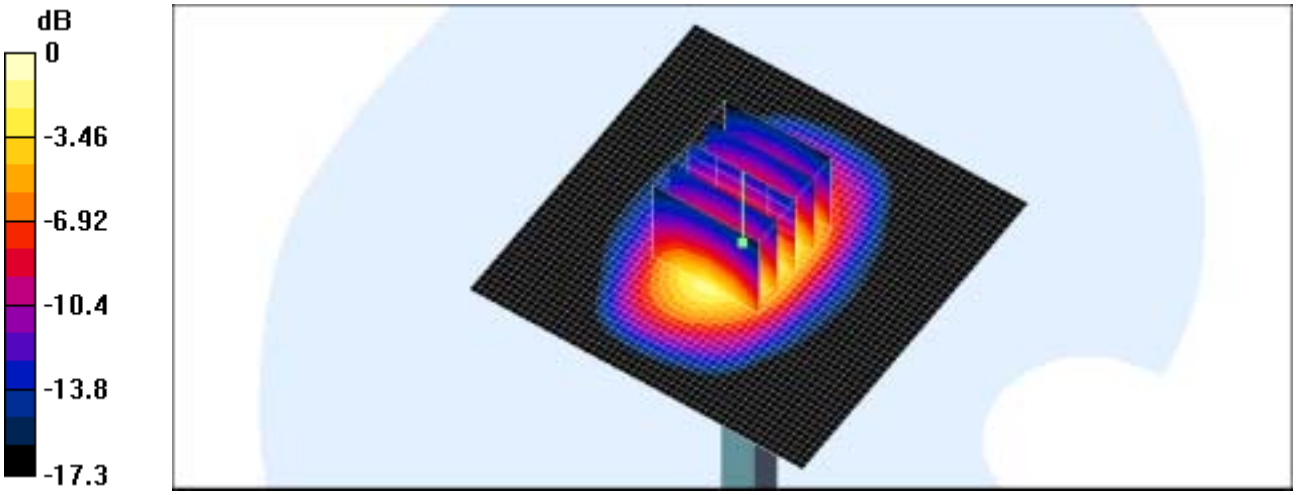
- Probe: ET3DV6 - SN1551; ConvF(5, 5, 5); Calibrated: 2004-04-27
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn486; Calibrated: 2004-08-23
- Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1248
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

1900MHz @250mW/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 16.2 mW/g

1900MHz @250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 96.4 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 10.3 mW/g
Maximum value of SAR (measured) = 11.7 mW/g



0 dB = 11.7mW/g

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client Samsung (Dymstec)

CALIBRATION CERTIFICATE

Object(s)	D835V2 - SN:451
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	November 18, 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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E442	GB37480704	6-Nov-03 (METAS, No. 252-0254)	Nov-04
Power sensor HP 8481A	US37292783	6-Nov-03 (METAS, No. 252-0254)	Nov-04
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
RF generator R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Judith Mueller	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: November 20, 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.

checked by

Schmid & Partner Engineering AG

s p e a g

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DASY

Dipole Validation Kit

Type: D835V2

Serial: 451

Manufactured:	December 24, 2001
Repaired:	November 11, 2003
Calibrated:	November 18, 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 835 MHz:

Relative Dielectricity	**41.2**	± 5%
Conductivity	**0.88 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.7 at 835 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 spacer 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 mW ± 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:	**9.32 mW/g** ± 16.8 % (k=2)[1]
averaged over 10 cm^3 (10 g) of tissue:	**6.08 mW/g** ± 16.2 % (k=2)[1]

[1] validation uncertainty

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:	**1.393 ns**	(one direction)
Transmission factor:	**0.986**	(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 835 MHz:	Re{Z} = **51.6 Ω**
	Im {Z} = **-0.9 Ω**
Return Loss at 835 MHz	**-35.0 dB**

4. 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.

5. 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.

6. Power Test

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

ConvF(6.7, 6.7, 6.7)Date/Time: 11/18/03 16:59:17

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN451

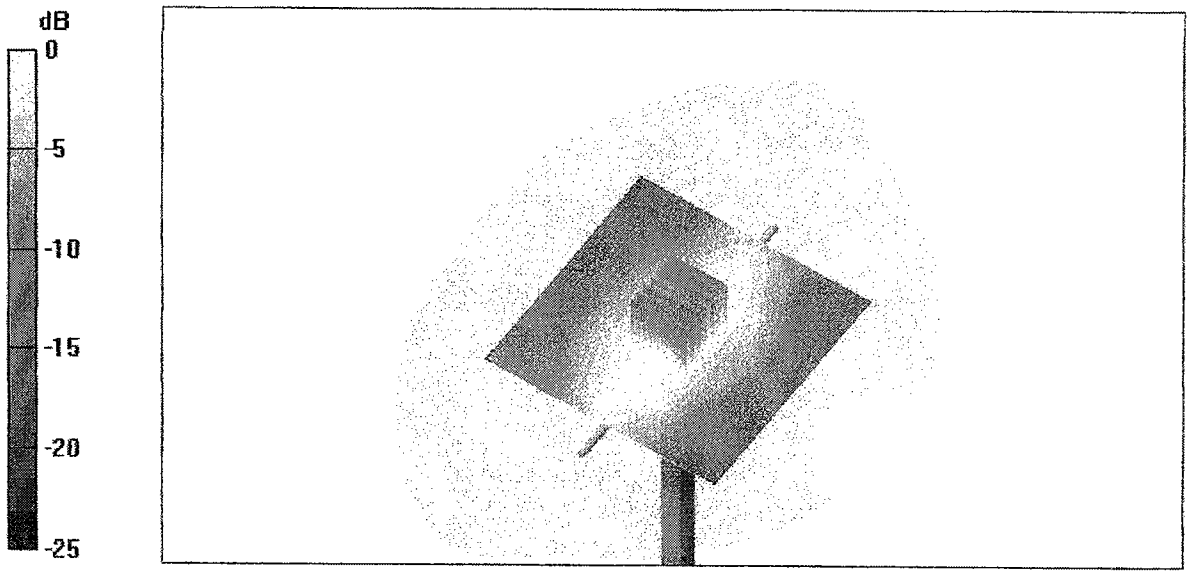
Communication System: CW-835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL 835 MHz (σ = 0.88 mho/m, ε_r = 41.22, ρ = 1000 kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.7, 6.7, 6.7); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: *DAE3 - SN411; Calibrated: 1/16/2003*
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.8 Build 60

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): *Measurement grid: dx=15mm, dy=15mm*
Reference Value = 55.5 V/m
Power Drift = -0.007 dB
Maximum value of SAR = 2.51 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.5 W/kg
SAR(1 g) = 2.33 mW/g; SAR(10 g) = 1.52 mW/g
Reference Value = 55.5 V/m
Power Drift = -0.007 dB
Maximum value of SAR = 2.51 mW/g



0 dB = 2.51mW/g

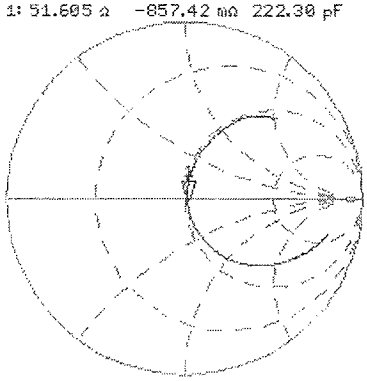
18 Nov 2003 10:33:15

CH1 S11 1 U FS 1: 51.605 Ω -857.42 mΩ 222.30 pF 835.000 000 MHz

Del

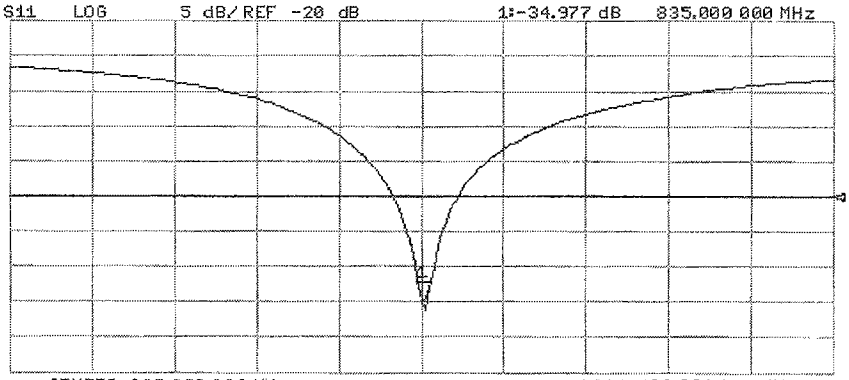
Cor

Avg
16



CH2 S11 LOG 5 dB/ REF -20 dB 1:-34.977 dB 835.000 000 MHz

Cor



CENTER 835.000 000 MHz SPAN 400.000 000 MHz

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client Samsung (Dymstec)

CALIBRATION CERTIFICATE

Object(s)	D1900V2 - SN:5d023
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	February 5, 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	Laboratory	
Approved by:	Bruno Reumer	Production Director	

Date issued: February 6, 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.

checked 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: D1900V2

Serial: 5d023

Manufactured: September 28, 2002
Calibrated: February 5, 2003

1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with head simulating glycol solution of the following electrical parameters at 1900 MHz:

Relative Dielectricity	**39.18**	± 5%
Conductivity	**1.45 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.2 at 1900 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 10mm 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 ± 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:	**41.2 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**20.84 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:	**1.191 ns**	(one direction)
Transmission factor:	**0.997**	(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 1900 MHz:	Re{Z} = **51.6 Ω**
	Im {Z} = **4.7 Ω**
Return Loss at 1900 MHz	**-26.3 dB**

4. 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.

5. 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.

6. Power Test

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

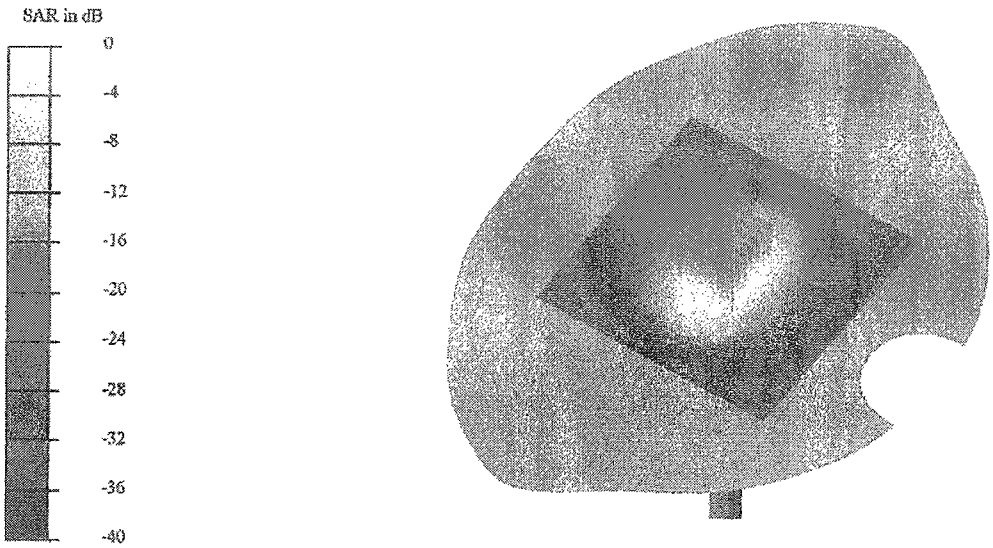
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN5d023_SN1507_HSL1900_050203.da4

DUT: Dipole 1900 MHz Type & Serial Number: D1900V2 - SN5d023
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL 1900 MHz (σ = 1.45 mho/m, ε = 39.18, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(5.2, 5.2, 5.2); 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 = 93.8 V/m
Peak SAR = 18.6 mW/g
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.21 mW/g
Power Drift = 0.005 dB



5 Feb 2003 11:19:34

Sd023

CH1 S11 1 U FS 1: 51.500 Ω 4.6563 Ω 390.03 pH 1 900.000 000 MHz

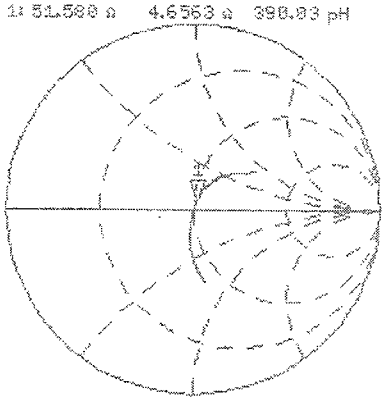
Del

PRm

Cor

Avg

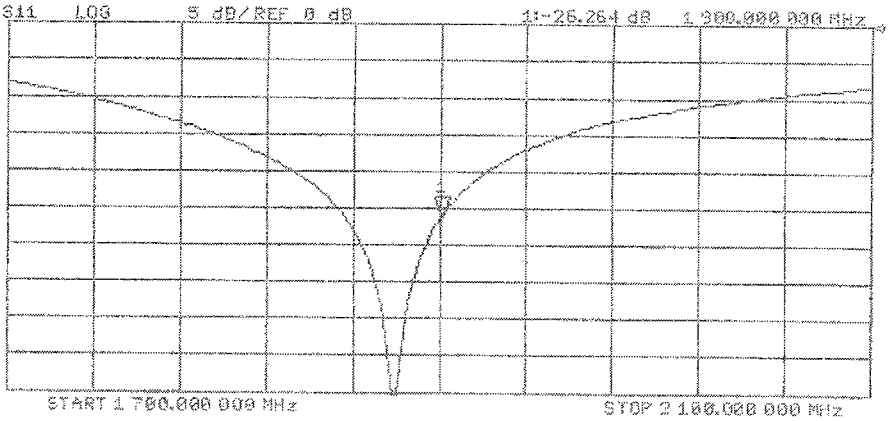
16



CH2 S11 LOG 5 dB/ REF 0 dB 1: -26.264 dB 1 900.000 000 MHz

PRm

Cor



START 1 700.000 000 MHz STOP 2 100.000 000 MHz