Deutscher Akkreditierungs Rat

DAR

TTI-P-G 158

IMST

Appendix for the Report

Dosimetric Assessment of the Panasonic X70 (FCC ID: NWJ22B001A) According to the FCC Requirements

Calibration Data

September 15, 2003

IMST GmbH
Carl-Friedrich-Gauß-Str. 2
D-47475 Kamp-Lintfort

Customer
Panasonic (PMCDE)
2 Gables Way, Colthrop, Thatcham
Berks-RG19 4ZB

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

Client IMST

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1669
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	March 21, 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	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	D.Vetterli
Approved by:	Katja Pokovic	Laboratory Director	Pokovic Katja

Date issued: March 21, 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.

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Probe ET3DV6

SN:1669

Manufactured:	February 8, 2002
Last calibration:	March 7, 2002
Recalibrated:	March 21, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1669

Sensitivity in Free Space

NormX	**1.75**	$\mu V/(V/m)^2$
NormY	**1.84**	$\mu V/(V/m)^2$
NormZ	**1.72**	$\mu V/(V/m)^2$

Diode Compression

DCP X	**97**	mV
DCP Y	**97**	mV
DCP Z	**97**	mV

Sensitivity in Tissue Simulating Liquid

Head 835 MHz ε_r = 41.5 ± 5% σ = 0.90 ± 5% mho/m
Head 900 MHz ε_r = 41.5 ± 5% σ = 0.97 ± 5% mho/m

ConvF X	**6.8** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**6.8** ± 9.5% (k=2)		Alpha	**0.44**
ConvF Z	**6.8** ± 9.5% (k=2)		Depth	**2.20**

Head 1900 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m
Head 1800 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

ConvF X	**5.2** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**5.2** ± 9.5% (k=2)		Alpha	**0.48**
ConvF Z	**5.2** ± 9.5% (k=2)		Depth	**2.73**

Boundary Effect

Head 835 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	9.2	5.0
SAR_{be} [%]	With Correction Algorithm	0.2	0.5

Head 1900 MHz Typical SAR gradient: 10 % per mm

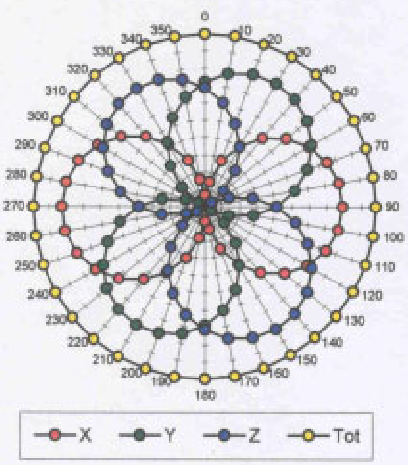
Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	13.8	9.7
SAR_{be} [%]	With Correction Algorithm	0.4	0.2

Sensor Offset

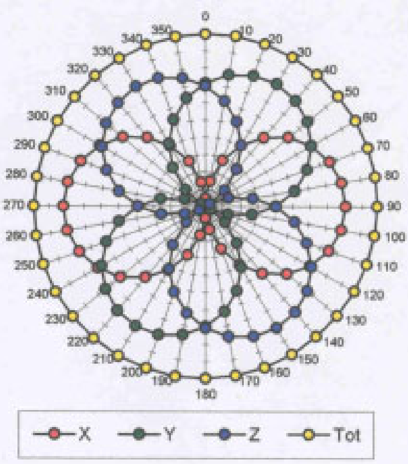
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.2 ± 0.2**	mm

Receiving Pattern (ϕ), $\theta = 0°$

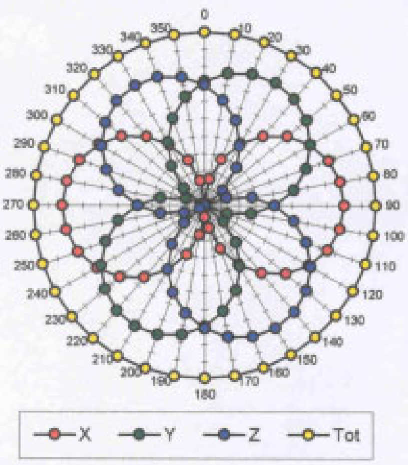
f = 30 MHz, TEM cell ifi110



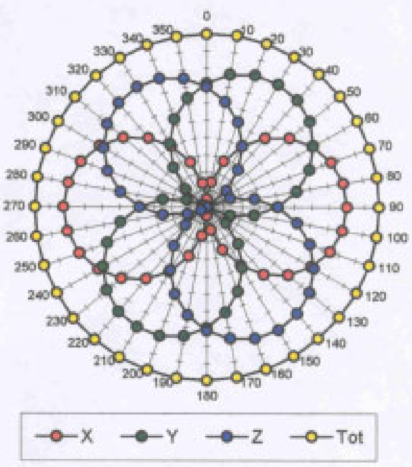
f = 100 MHz, TEM cell ifi110

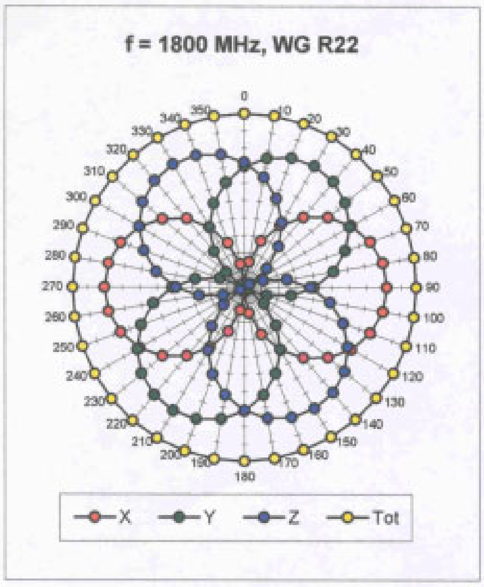


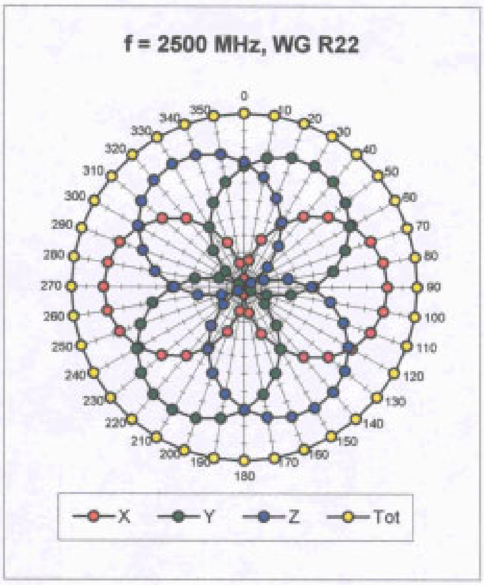
f = 300 MHz, TEM cell ifi110



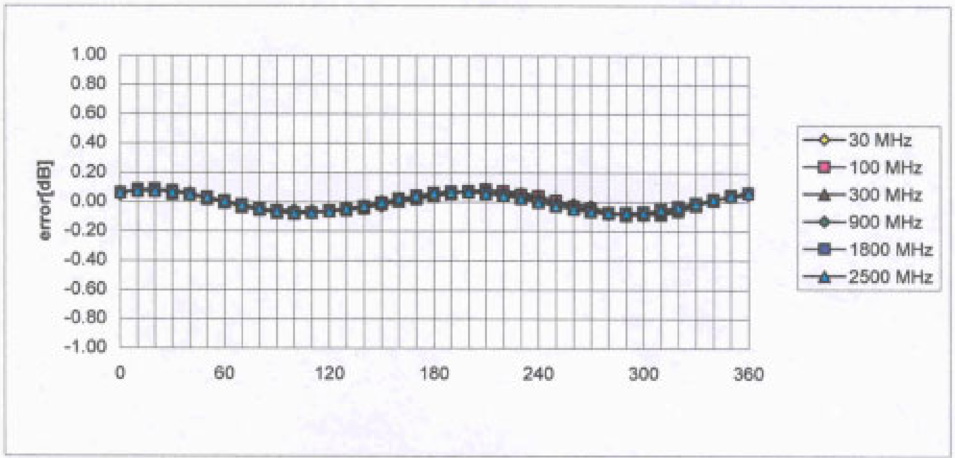
f = 900 MHz, TEM cell ifi110





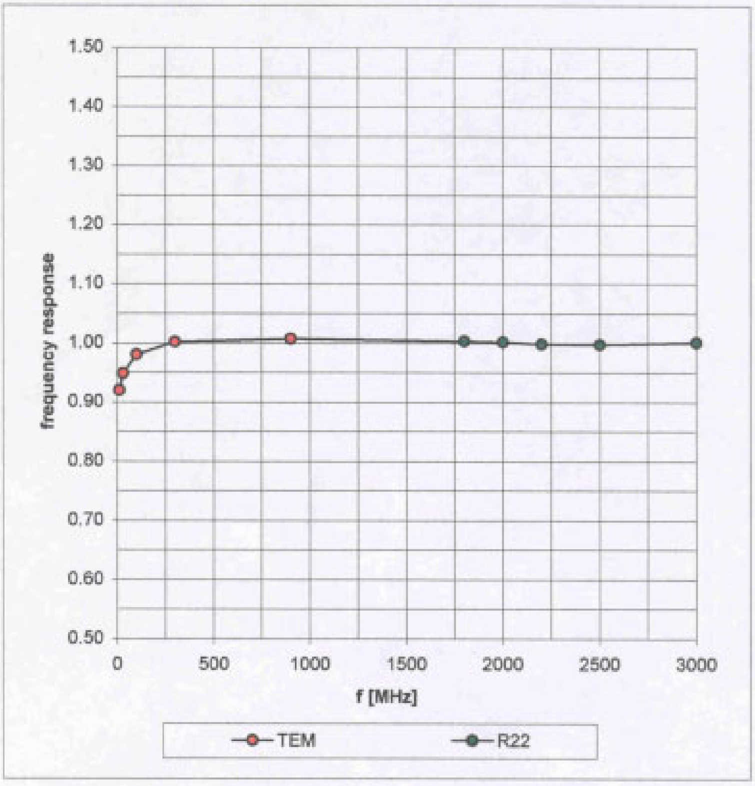


Isotropy Error (ϕ), θ = 0°



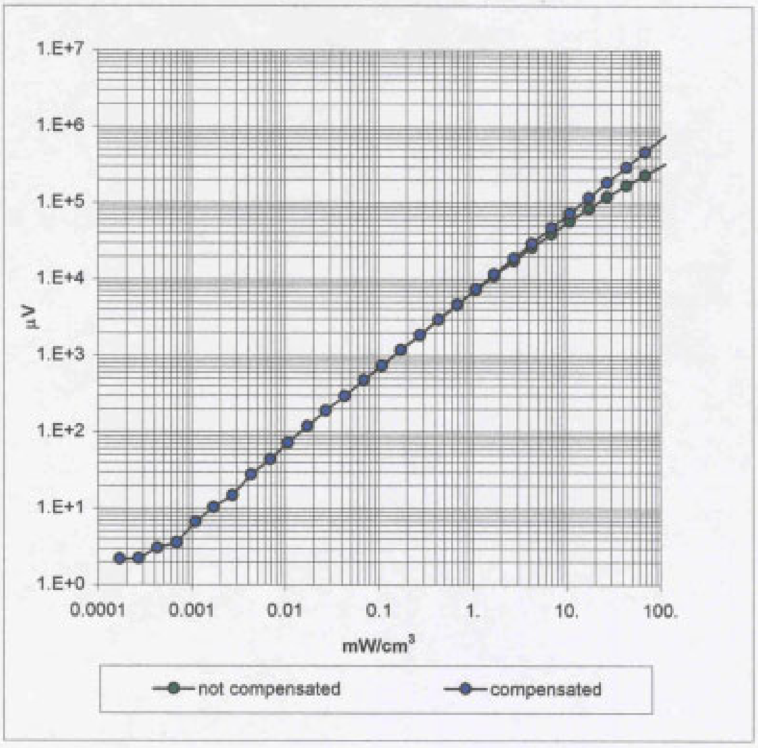
Frequency Response of E-Field

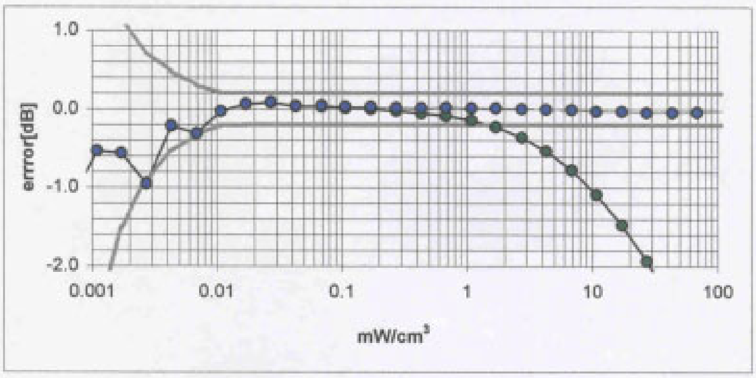
(TEM-Cell:ifi110, Waveguide R22)



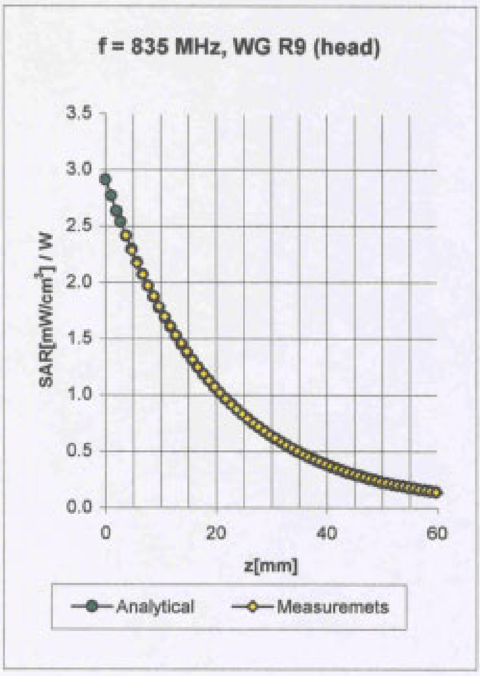
Dynamic Range f(SAR_{brain})

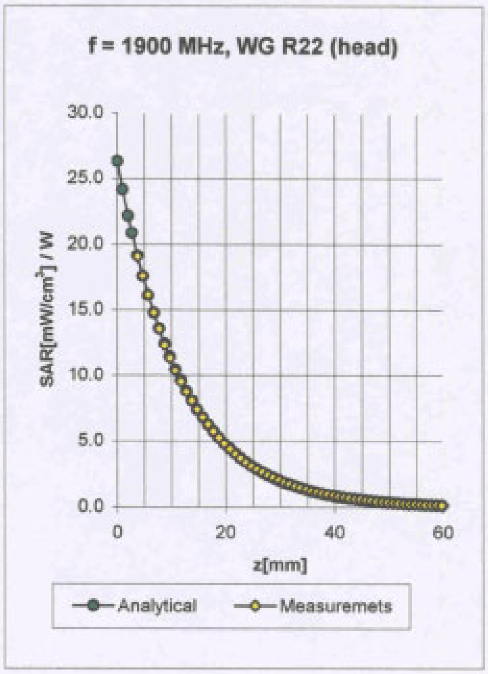
(Waveguide R22)





Conversion Factor Assessment

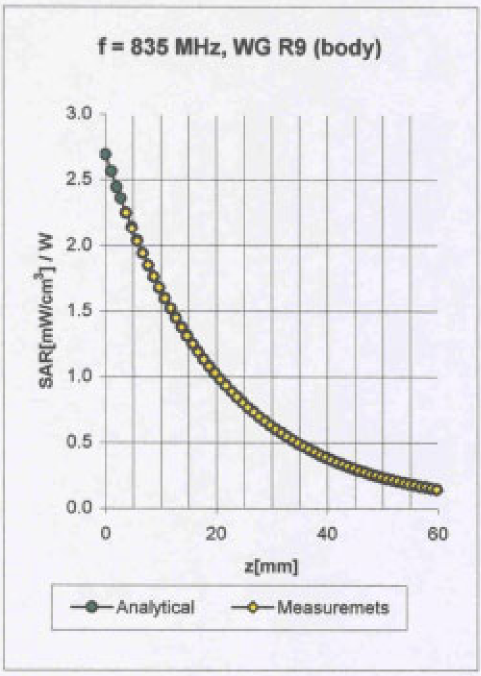


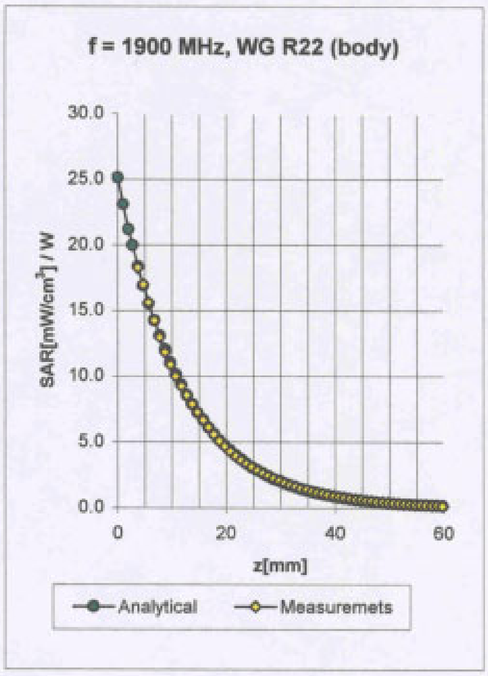


Head		**835 MHz**		ε_r **= 41.5 ± 5%**	σ **= 0.90 ± 5% mho/m**	
Head		**900 MHz**		ε_r **= 41.5 ± 5%**	σ **= 0.97 ± 5% mho/m**	
	ConvF X	**6.8**	± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**6.8**	± 9.5% (k=2)		Alpha	**0.44**
	ConvF Z	**6.8**	± 9.5% (k=2)		Depth	**2.20**

Head		**1900 MHz**		ε_r **= 40.0 ± 5%**	σ **= 1.40 ± 5% mho/m**	
Head		**1800 MHz**		ε_r **= 40.0 ± 5%**	σ **= 1.40 ± 5% mho/m**	
	ConvF X	**5.2**	± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**5.2**	± 9.5% (k=2)		Alpha	**0.48**
	ConvF Z	**5.2**	± 9.5% (k=2)		Depth	**2.73**

Conversion Factor Assessment



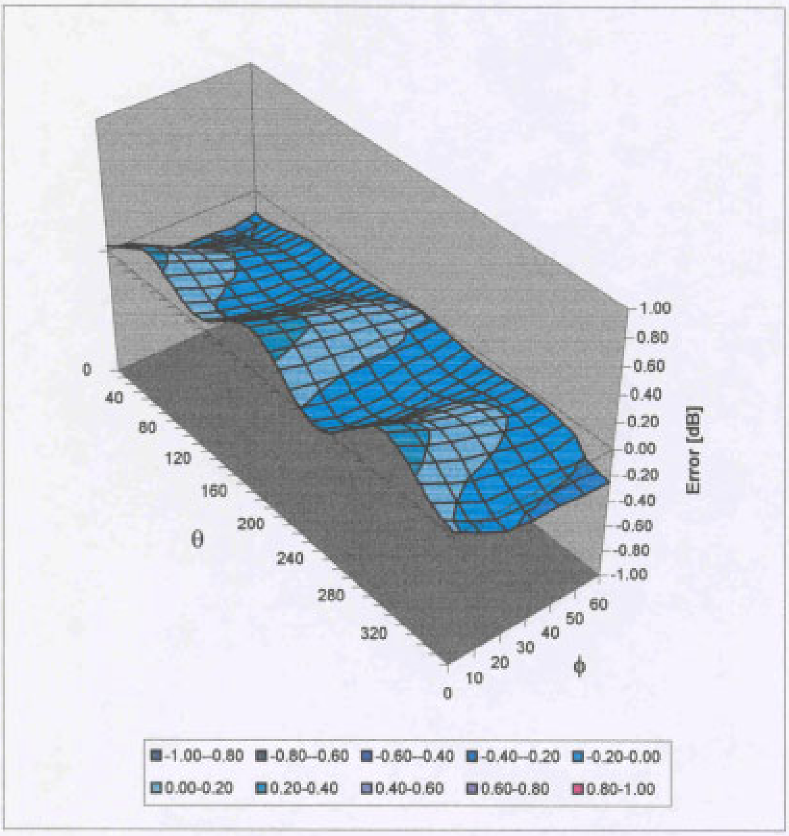


Body	835 MHz		ε_r = 55.2 ± 5%	σ = 0.97 ± 5% mho/m	
Body	900 MHz		ε_r = 55.0 ± 5%	σ = 1.05 ± 5% mho/m	
	ConvF X	**6.6**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.6**	± 9.5% (k=2)	Alpha	**0.48**
	ConvF Z	**6.6**	± 9.5% (k=2)	Depth	**2.16**

Body	1900 MHz		ε_r = 53.3 ± 5%	σ = 1.52 ± 5% mho/m	
Body	1800 MHz		ε_r = 53.3 ± 5%	σ = 1.52 ± 5% mho/m	
	ConvF X	**4.8**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**4.8**	± 9.5% (k=2)	Alpha	**0.63**
	ConvF Z	**4.8**	± 9.5% (k=2)	Depth	**2.45**

Deviation from Isotropy in HSL

Error (θ,φ), f = 900 MHz



Schmid & Partner
Engineering AG

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

Calibration Certificate

1900 MHz System Validation Dipole

Type:	**D1900V2**
Serial Number:	**535**
Place of Calibration:	**Zurich**
Date of Calibration:	**November 14, 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:	D. Vetter
Approved by:	[signature]

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: 535

Manufactured: March 22, 2001
Calibrated: November 14, 2002

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	**39.8**	± 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:	**40.8 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**20.7 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:	**1.2184 ns**	(one direction)
Transmission factor:	**0.995**	(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} = **50.9 Ω**
	Im {Z} = **3.6 Ω**
Return Loss at 1900 MHz	**-28.6 dB**

4. Measurement Conditions

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

Relative Dielectricity	**52.2**	± 5%
Conductivity	**1.57 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 4.9 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.

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:	**41.2 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**21.0 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 1900 MHz:	Re{Z} = **46.5 Ω**
	Im {Z} = **3.4 Ω**
Return Loss at 1900 MHz	**-26.0 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.

Small end caps have been added to the dipole arms in order to improve matching when loaded according to the position as explained in Section 1. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

9. Power Test

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

Date/Time: 11/14/02 17:19:55

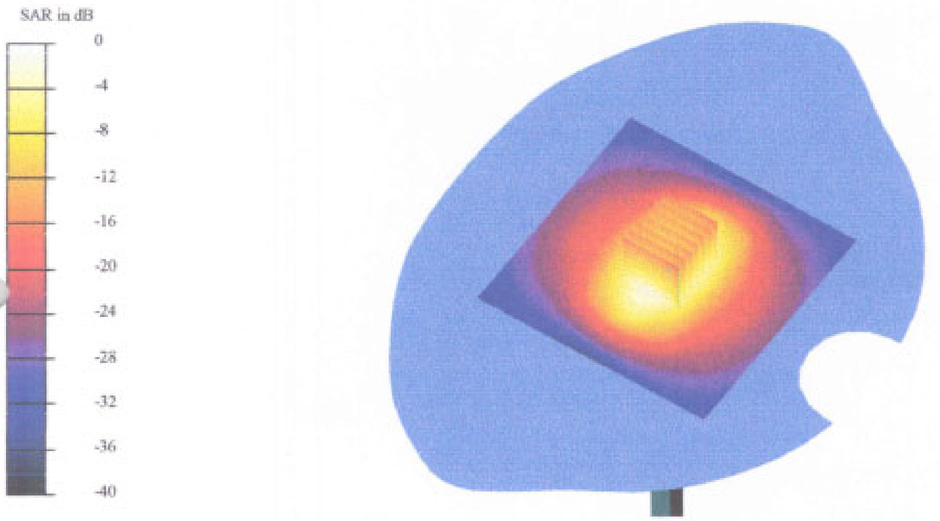
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN535caps_SN1507_HSL1900_141102.da4

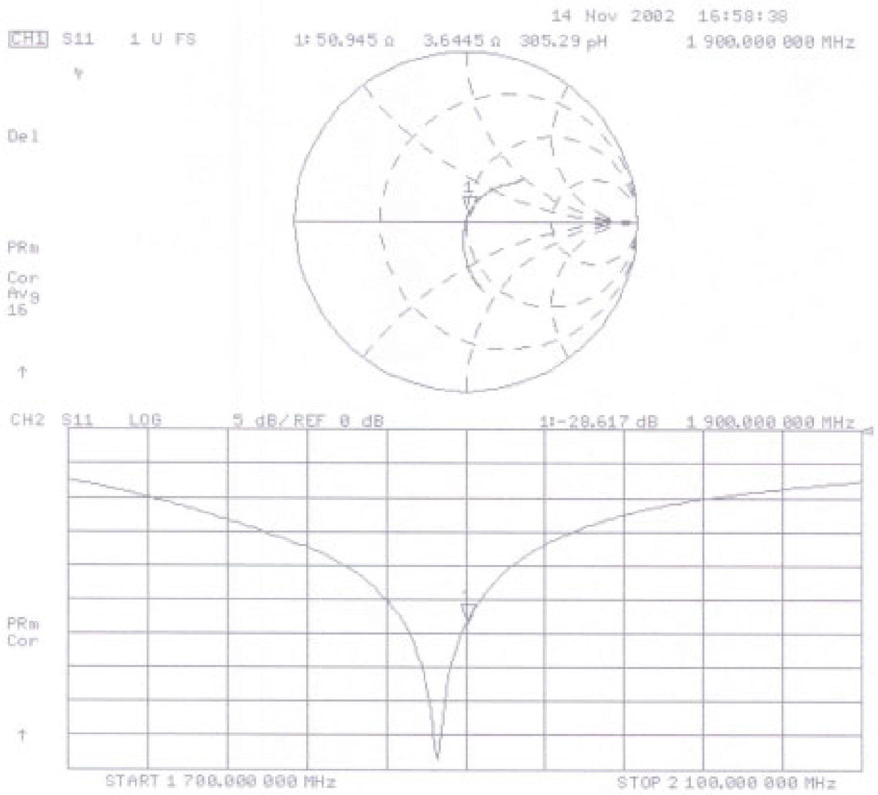
DUT: Dipole 1900 MHz   Type & Serial Number: D1900V2 - SN535
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL 1900 MHz (σ = 1.45 mho/m, ε = 39.75, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(5.2, 5.2, 5.2); 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 = 94 V/m
Peak SAR = 18.5 mW/g
SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.18 mW/g
Power Drift = -0.01 dB





14 Nov 2002 16:58:38
CH1 S11 1 U FS
1: 50.945 Ω 3.6445 Ω 305.29 pH 1 900.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/REF 0 dB 1:-28.617 dB 1 900.000 000 MHz
PRm
Cor
START 1 700.000 000 MHz
STOP 2 100.000 000 MHz

Date/Time: 11/14/02 18:52:22

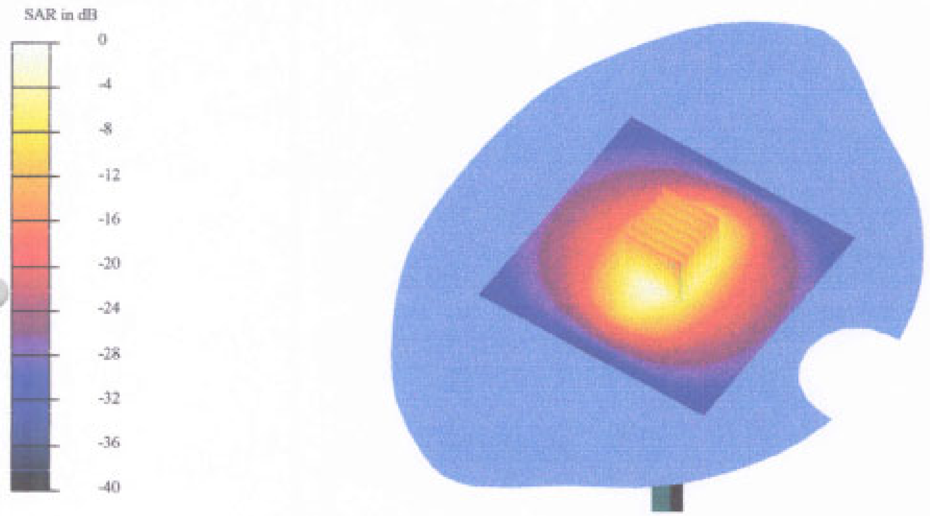
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN535_SN1507_M1900_141102.da4

DUT: Dipole 1900 MHz   Type & Serial Number: D1900V2 - SN535
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

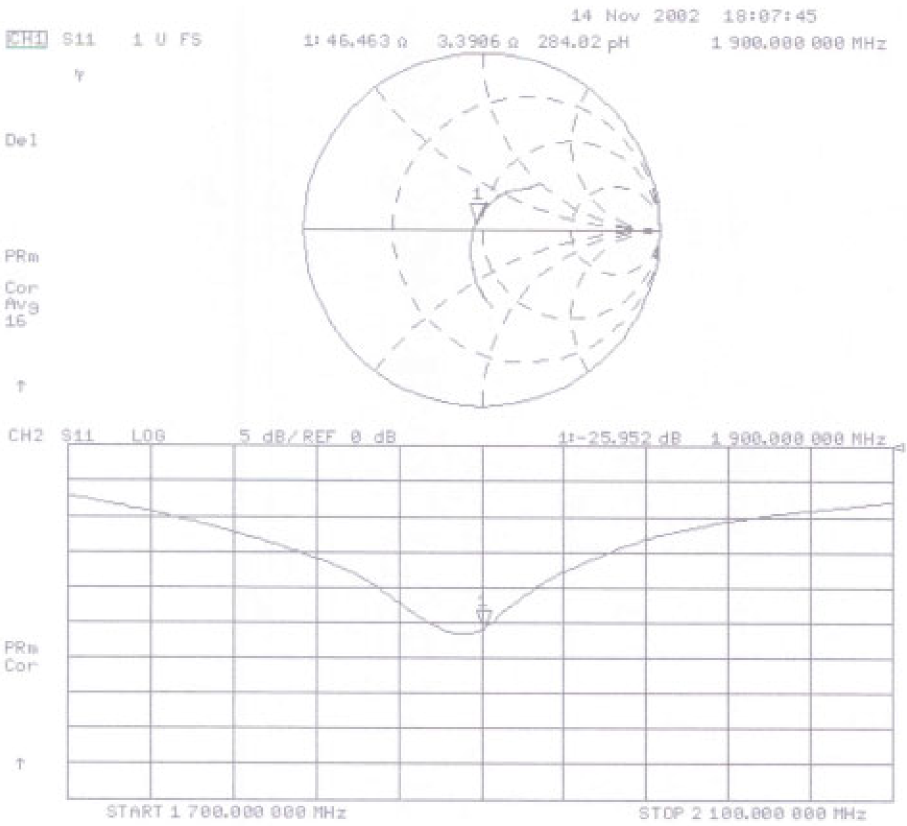
Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Muscle 1900 MHz (σ = 1.57 mho/m, ε = 52.15, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(4.9, 4.9, 4.9); 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 = 90.7 V/m
Peak SAR = 18.8 mW/g
SAR(1 g) = *10.3* mW/g; SAR(*10* g) = 5.26 mW/g
Power Drift = -0.03 dB



Muscle


14 Nov 2002 18:07:45
CH1 S11 1 U FS
1: 46.463 Ω 3.3906 Ω 284.02 pH 1 900.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/REF 0 dB 1:-25.952 dB 1 900.000 000 MHz
PRm
Cor
START 1 700.000 000 MHz
STOP 2 100.000 000 MHz