



Appendix for the Report

Dosimetric Assessment of the Alcatel One Touch 331a (FCC ID: RAD002) According to the FCC Requirements

Calibration Data

October 10, 2003 IMST GmbH Carl-Friedrich-Gauß-Str. 2 D-47475 Kamp-Lintfort

Customer Alcatel Business Systems 32, avenue Kléber F-92707-Colombes Cedex

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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)

ID#	Cal Date	Scheduled Calibration
US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
MY41495277	Mar-02	Mar-03
MY41092180	18-Sep-02	Sep-03
GB41293874	13-Sep-02	Sep-03
US38432426	3-May-00	In house check: May 03
SN: 6295803	3-Sep-01	Sep-03
	US3642U01700 MY41495277 MY41092180 GB41293874 US38432426	US3842U01700

Calibrated by:

Name Function
Nico Vetterli Technician

Signature O. Veletin

Approved by:

Katja Pokovic Laboratory Director

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.

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: Last calibration:

Recalibrated:

February 8, 2002

March 7, 2002

March 21, 2003

Calibrated for DASY Systems

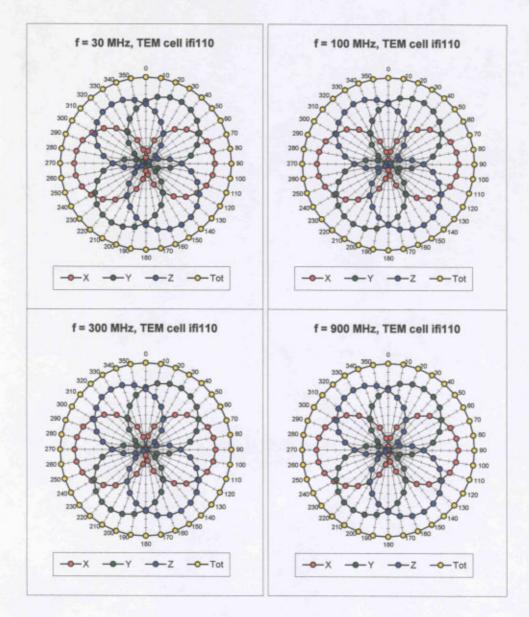
(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1669 March 21, 2003

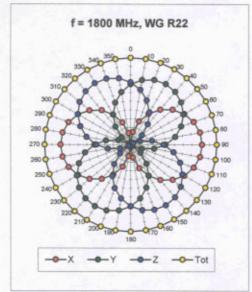
DASY - Parameters of Probe: ET3DV6 SN:1669

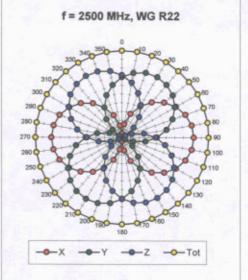
Sensit	tivity in Free	e Space		Diode C	compress	sion	
	,			2.000	zomproot	31011	
	NormX		$\mu V/(V/m)^2$		DCP X	97	mV
	NormY	1.84	$\mu V/(V/m)^2$		DCP Y	97	mV
	NormZ	1.72	$\mu V/(V/m)^2$		DCP Z	97	mV
Sensit	tivity in Tiss	ue Simu	lating Liquid				
Head	835	MHz	$\varepsilon_r = 41.5 \pm 5^\circ$	% σ=	0.90 ± 5%	mho/m	
Head	900	MHz	$\varepsilon_r = 41.5 \pm 5^\circ$	% σ=	0.97 ± 5%	mho/m	
	ConvF X	6.8	± 9.5% (k=2)		Boundary e	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	$\epsilon_r = 40.0 \pm 5^\circ$	% σ=	1.40 ± 5%	mho/m	
Head	1800	MHz	$\varepsilon_r = 40.0 \pm 5^\circ$	% σ=	1.40 ± 5%	mho/m	
	ConvF X	5.2	± 9.5% (k=2)		Boundary e	effect:	
	ConvF Y	5.2	± 9.5% (k=2)		Alpha	0.48	
	ConvF Z	5.2	± 9.5% (k=2)		Depth	2.73	
Bound	dary Effect						
Head	835	MHz	Typical SAR gradie	nt: 5 % per m	nm		
	Probe Tip to	Boundary			1 mm	2 mm	
	SAR _{be} [%]	Without Co	rrection Algorithm		9.2	5.0	
	SAR _{be} [%]	With Corre	ction Algorithm		0.2	0.5	
Head	1900	MHz	Typical SAR gradie	ent: 10 % per	mm		
	Probe Tip to	Boundary			1 mm	2 mm	
	SAR _{be} [%]	Without Co	rrection Algorithm		13.8	9.7	
	SAR _{be} [%]	With Corre	ction Algorithm		0.4	0.2	
Senso	or Offset						
	Probe Tip to	Sensor Cer	nter	2.7		mm	
	Optical Surf	ace Detection	on	1.2 ± 0.2		mm	

Receiving Pattern (ϕ), $\theta = 0^{\circ}$

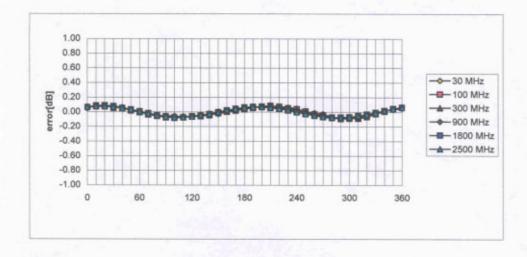


ET3DV6 SN:1669



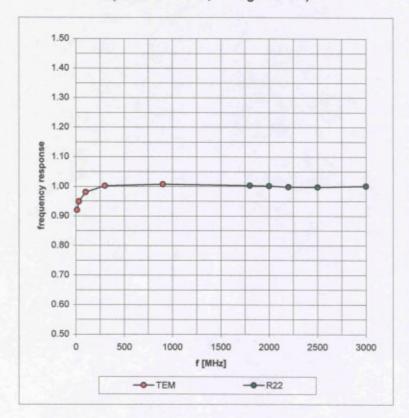


Isotropy Error (ϕ), $\theta = 0^{\circ}$



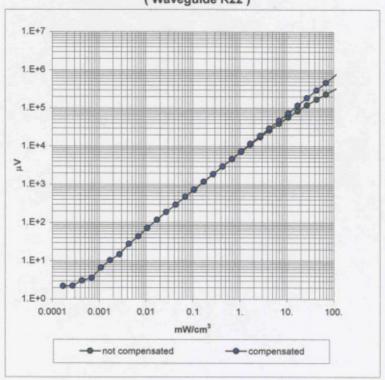
Frequency Response of E-Field

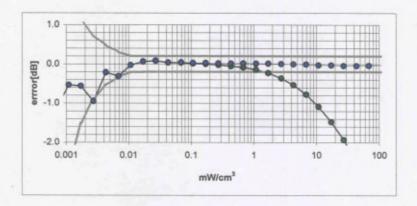
(TEM-Cell:ifi110, Waveguide R22)



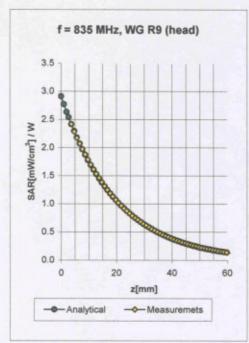
Dynamic Range f(SAR_{brain})

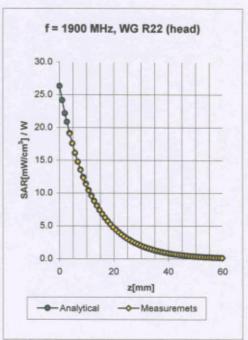
(Waveguide R22)





Conversion Factor Assessment

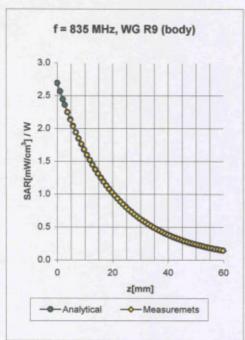


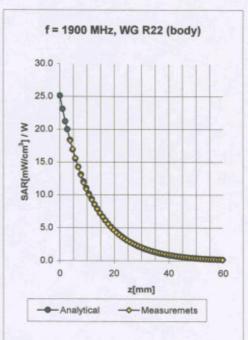


Head	835 MHz	$\varepsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	σ = 0.97 ± 5% mho/m
	ConvF X	6.8 ± 9.5% (k=2)	Boundary effect:
	ConvF Y	6.8 ± 9.5% (k=2)	Alpha 0.44
	ConvF Z	6.8 ± 9.5% (k=2)	Depth 2.20

Head	1900 MHz	ϵ_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m
Head	1800 MHz	$\varepsilon_{\rm r}$ = 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



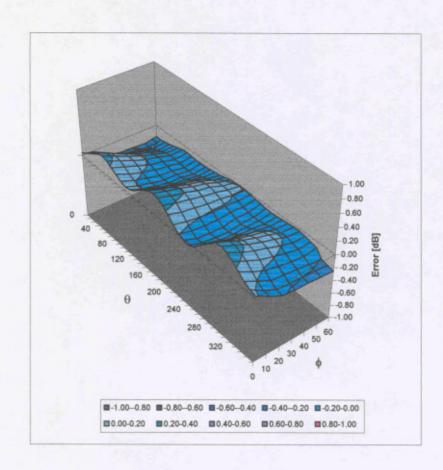


Body	835 MHz	$\epsilon_{\rm r} = 55.2 \pm 5\%$	σ = 0.97 ± 5% mho/m
Body	900 MHz	ϵ_r = 55.0 ± 5%	σ = 1.05 ± 5% mho/m
	ConvF X	6.6 ± 9.5% (k=2)	Boundary effect:
	ConvF Y	6.6 ± 9.5% (k=2)	Alpha 0.48
	ConvF Z	6.6 ± 9.5% (k=2)	Depth 2.16

Body	1900 MHz	$\varepsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$	
Body	1800 MHz	$\epsilon_{\rm r}$ = 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

835 MHz System Validation Dipole

Type: D835V2 Serial Number: 437 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:

D. Vellen

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: D835V2

Serial: 437

Manufactured: December 15, 2000 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 835 MHz:

Relative Dielectricity 43.05 $\pm 5\%$ Conductivity 0.90 mho/m $\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.6 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 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 $250 \text{mW} \pm 3$ %. The results are normalized to 1 W 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 cm³ (1 g) of tissue: 9.64 mW/g

averaged over 10 cm3 (10 g) of tissue: 6.20 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: 1.438 ns (one direction)

Transmission factor: 0.988 (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: $Re\{Z\} = 47.9 \Omega$

Im $\{Z\} = -7.6 \Omega$

Return Loss at 835 MHz -21.9 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 835 MHz:

Relative Dielectricity 55.9 ± 5% Conductivity 0.96 mho/m ± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.2 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 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 $250 \text{mW} \pm 3\%$. The results are normalized to 1 W input power.

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 <u>advanced extrapolation</u> are:

averaged over 1 cm3 (1 g) of tissue: 9.76 mW/g

averaged over 10 cm3 (10 g) of tissue: 6.40 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 835 MHz: $Re\{Z\} = 44.6 \Omega$

Im $\{Z\} = -9.4 \Omega$

Return Loss at 835 MHz -18.9 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.

Date/Time: 11/13/02 16:06:15

Test Laboratory: SPEAG, Zurich, Switzerland File Name: SN437_SN1507_HSL835_131102.da4

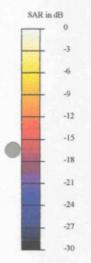
DUT: Dipole 835 MHz Type & Serial Number: D835V2 - SN437 Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

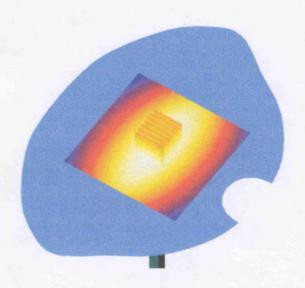
Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1 Medium: HSL 835 MHz (σ = 0.9 mho/m, ϵ = 43.05, ρ = 1000 kg/m3) Phantom section: FlatSection

DASY4 Configuration:

- Probe: ET3DV6 SN1507; ConvF(6.6, 6.6, 6.6); 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 = 55.6 V/m Peak SAR = 3.59 mW/g SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.55 mW/g Power Drift = 0.02 dB





13 Nov 2002 11:23:23
EHI S11 1 U FS 1:47.918 a -7.6328 a 24.972 pF 835,000 000 MHz

PRm
Core
Proposition

CH2 S11 L06 5 dB/REF 0 dB 11-21.896 dB 835,000 000 MHz

PRm
Core

STOP 1 835,000 080 MHz

START 635,000 000 MHz

Date/Time: 11/13/02 19:20:06

Test Laboratory: SPEAG, Zurich, Switzerland File Name: SN437_SN1507_M835_131102.da4

DUT: Dipole 835 MHz Type & Serial Number: D835V2 - SN437 Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1 Medium: Muscle 835 MHz (σ = 0.96 mho/m, ϵ = 55.87, 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

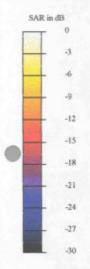
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm

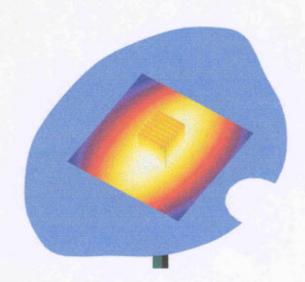
Reference Value = 55 V/m

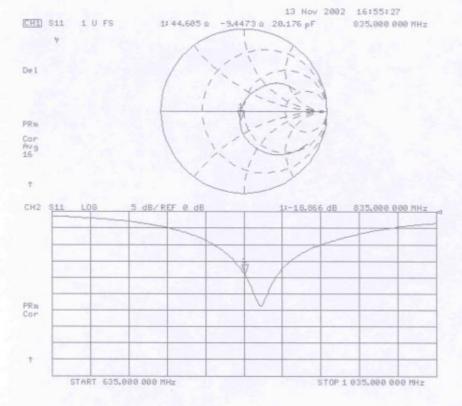
Peak SAR = 3.4 mW/g

SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g

Power Drift = 0.002 dB







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, 200	
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:

D. Velleto

Reproved 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: 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 $\pm 5\%$ Conductivity 1.45 mho/m $\pm 5\%$

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 $250 \text{mW} \pm 3$ %. 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 <u>advanced extrapolation</u> are:

averaged over 1 cm³ (1 g) of tissue: 40.8 mW/g

averaged over 10 cm³ (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: $Re\{Z\} = 50.9 \Omega$

Im $\{Z\} = 3.6 \Omega$

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 \pm 5% Conductivity 1.57 mho/m \pm 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 $250 \text{mW} \pm 3 \%$. The results are normalized to 1 W 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 <u>advanced extrapolation</u> are:

averaged over 1 cm3 (1 g) of tissue: 41.2 mW/g

averaged over 10 cm³ (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: $Re\{Z\} = 46.5 \Omega$

Im $\{Z\} = 3.4 \Omega$

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.

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

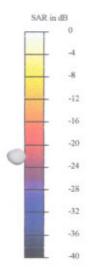
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm

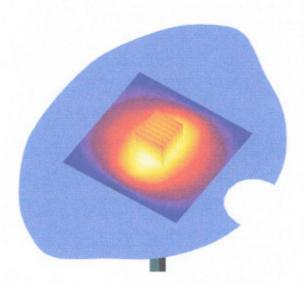
Reference Value = 94 V/m

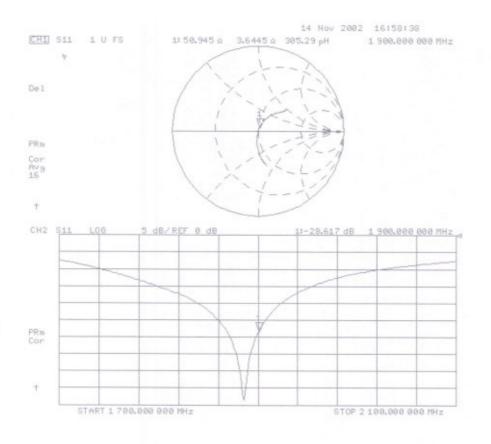
Peak SAR = 18.5 mW/g

SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.18 mW/g

Power Drift = -0.01 dB







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

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

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

