

Document

Appendices for the BlackBerry 7290 Wireless Handheld Model No. RAP40GW Test Report

Page 1(30)

Author Data

Dates of Test

Test Kepc

FCC ID:

Daoud Attayi

May 03 - 19,2004

RIM-0086-0405-01

L6ARAP40GW

APPENDIX D: PROBE & DIPOLE CALIBRATION DATA



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Author Data

Test Report No

Daoud Attayi

May 03-13 & June 08-11, 2004 RIM-0086-0405-01

L6ARAP40GW

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

Client

Object(s)	ET3DV6 - SN:	1643	er velo — Age — M
Calibration procedure(s)	QA CAL-01 v2 Calibration pro	cedure for dosimetric E-field prob	es
Calibration date:	October 9, 200	3	
Condition of the calibrated item	In Tolerance (a	occording to the specific calibration	n document)
17025 international standard.		used in the calibration procedures and conformity or year.	·
Calibration Equipment used (M&TE	critical for calibration)		
Model Type	ID#	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS No. 251-0340	Apr-04
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (Agilent, No. 20020918)	In house check: Oct 03
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03
Calibrated by:	Name Nico Vetterli	Function Technician	Signature Signature
Approved by:	Katja Pokavic	Laboratory Director	School Holy
			Date issued: October 9, 2003
This calibration certificate is issued a Calibration Laboratory of Schmid &		on until the accreditation process (based on ISO/IE is completed.	C 17025 International Standard) for



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Author Data

Dates of Test

May 03-13 & June 08-11, 2004 RIM-0086-0405-01

Test Report No

RIM-0086-0405-01

L6ARAP40GW

FCC ID:

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@speeg.com, http://www.speag.com

Probe ET3DV6

SN:1643

Manufactured: Last calibration: November 7, 2001 September 24, 2002 October 9, 2003

Recalibrated: Octob

Calibrated for DASY Systems

(Note; non-compatible with DASY2 system!)



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9, 2003

ET3DV6	SN:1643					Oct
DASY	′ - Param	eters o	f Probe: ET3	DV6 SN	I:1643	
Sensiti	vity in Free	Space		Diode	Compression	n
	NormX	1.7	3 μV/(V/m) ²		DCP X	96
	NormY	1.8	8 μV/(V/m) ²		DCP Y	96
	NormZ	1.8	1 μV/(V/m) ²		DCP Z	96
Sensitiv	vity in Tissue	e Simulatir	ng Liquid			
Head	90	0 MHz	ε_r = 41.5 ±	5%	σ = 0.97 ± 5%	mho/m
Valid for fa	=800-1000 MHz v	with Head Tiss	ue Simulating Liquid acco	ording to EN 50	361, P1528-200	X
	ConvF X		5 ± 9.5% (k=2)		Boundary et	
	ConvF Y		5 ± 9.5% (k=2)		Alpha	0.37
	ConvF Z	6.	5 ± 9.5% (k=2)		Depth	2.72
Head	180	0 MHz	ε_r = 40.0 ±	5%	$\sigma = 1.40 \pm 5\%$	mho/m
Valid for f	=1710-1910 MHz	with Head Tis	sue Simulating Liquid ac	cording to EN 5	50361, P1528-20	OX
	ConvF X	5.	2 ± 9.5% (k=2)		Boundary e	ffect:
	ConvF Y	5.	2 ± 9.5% (k=2)		Alpha	0.47
	ConvF Z	5.	2 ± 9.5% (k=2)		Depth	2.87
Bound	ary Effect					
Head	90	00 MHz	Typical SAR gradie	nt: 5 % per mi	m	
	Probe Tip to	Boundary			1 mm	2 mm
	SAR _{be} [%]	Without Co	rrection Algorithm		10.8	6.3
	SAR _{be} [%]	With Corre	ction Algorithm		0.4	0.6
Head	180	00 MHz	Typical SAR gradie	nt: 10 % per n	nm	
	Probe Tip to	Boundary			1 mm	2 mm
	SAR _{be} [%]	Without Co	rrection Algorithm		14.5	10.1
	SAR _{be} [%]	With Corre	ction Algorithm		0.2	0.1
Senso	r Offset					
	Probe Tip to	Sensor Cente	er	2.7		mm
	Ontinal Curfe	ace Detection		1.4 ± 0.	2	mm

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Author Data

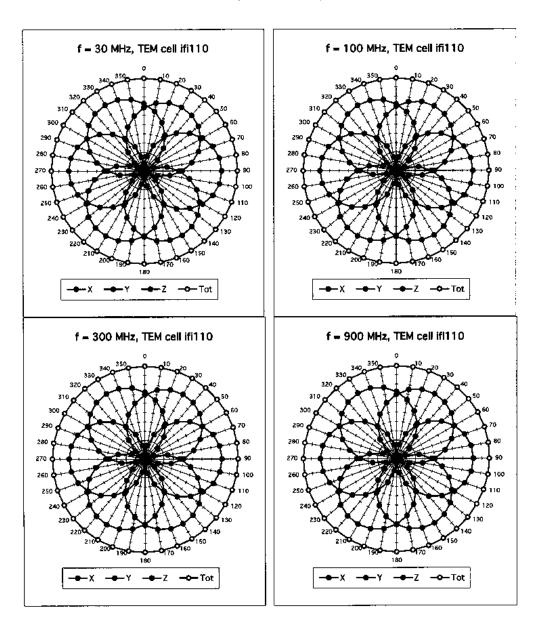
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Receiving Pattern (ϕ), $\theta = 0^{\circ}$



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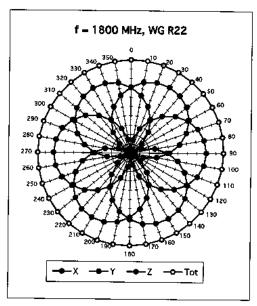
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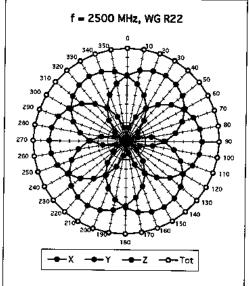
L6ARAP40GW

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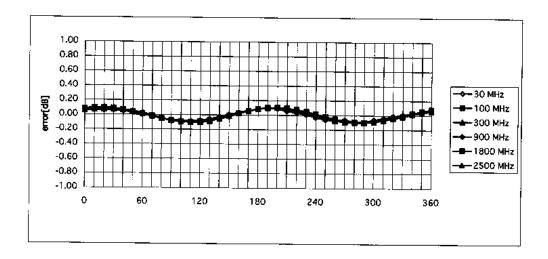
ET3DV6 SN:1643

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



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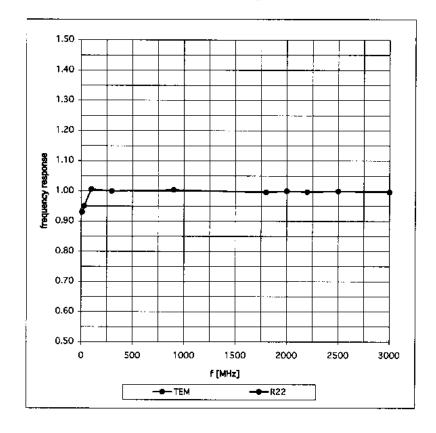
L6ARAP40GW

ET3DV6 \$N:1643

October 9, 2003

Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)



Dates of Test May 03-13 & June 08-11, 2004 | RIM-0086-0405-01 Daoud Attayi

L6ARAP40GW

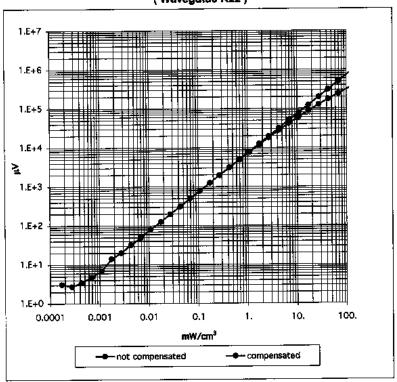
8(30)

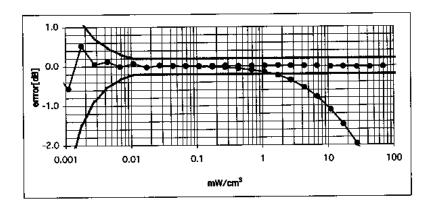
ET3DV6 SN:1643

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Dynamic Range f(SARhead)

(Waveguide R22)





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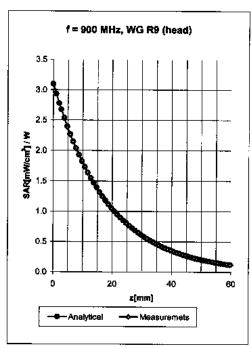
Test Report No

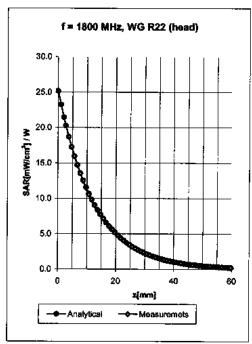
L6ARAP40GW

ET3DV6 SN:1643

October 9, 2003

Conversion Factor Assessment





Head		

900 MHz

ዱ= 41.5 ± 5%

σ = 0.97 ± 5% mho/m

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvE	¥

 $6.5 \pm 9.5\% (k=2)$

Boundary effect:

ConvF Y ConvF Z $6.5 \pm 9.5\% (k=2)$ $6.5 \pm 9.5\% (k=2)$

Alpha Depth 0.37 2.72

Head

1800 MHz

4= 40.0 ± 5%

σ = 1.40 ± 5% mho/m

Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

Canada	v
CUINE	

5.2 ± 9.5% (k=2)

Boundary effect:

ConvF Y ConvF Z $5.2 \pm 9.5\% (k=2)$ 5.2 ± 9.5% (k=2) Alpha

Depth

0.47 2.87

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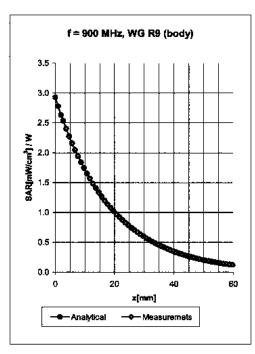
Test Report No

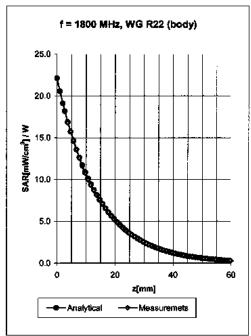
L6ARAP40GW

ET3DV6 SN:1643

October 9, 2003

Conversion Factor Assessment





900 MHz ६ = 55.0 ± 5% Body

Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X $6.3 \pm 9.5\% (k=2)$ Boundary effect:

6.3 ± 9.5% (k=2) ConvF Y Alpha 0.43

 $6.3 \pm 9.5\% (k=2)$ 2.49 ConvF Z Depth

1800 MHz &= 53.3 ± 5% Body

Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C 4.8 $\pm 9.5\%$ (k=2) ConvF X Boundary effect:

> 4.8 ± 9.5% (k=2) ConvF Y Alpha 0.57 ConvF Z 4.8 $\pm 9.5\%$ (k=2) Depth 2.74

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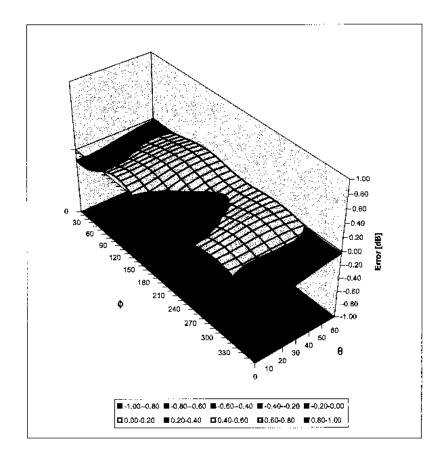
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L6ARAP40GW

ET3DV6 SN:1643 October 9, 2003

Deviation from Isotropy in HSL

Error (θ,ϕ) , f = 900 MHz





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L6ARAP40GW

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FCC ID:

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

Client

RIMULATION PORTER TO THE

Object(s)	D835V2 - SN	446	
Calibration proceduté(s)	QA CAL-05 v Calibration pr	2 ocedure for dipole validation kits	
Calibration date:	August 21, 20		
Condition of the calibrated item	g. 	(according to the specific calibration	on document)
Calibration Equipment used (M&T Model Type RF generator R&S SML-03 Power sensor HP 8481A Power meter EPM E442	E critical for calibration) ID # 100698 MY41092317 US37292783 GB37480704	Cal Date (Calibrated by, Certificate No.) 27-Mar-2002 (R&S, No. 20-92389) 18-Oct-02 (Agilent, No. 20021018) 30-Oct-02 (METAS, No. 252-0236) 30-Oct-02 (METAS, No. 252-0236)	Scheduled Calibration In house check: Mar-05 Oct-04 Oct-03 Ocr-03
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03
Salibrated by:	Name Judith Mü all et	Function (February 1997)	Signature
Approved by:	Kalja Pokovic	Lationatory Director	flow Ht-
			Date issued: August 22, 2003
	d as an intermediate sol & Partner Engineering /	fution until the accreditation process (based on ISO/	IEC 17025 International Standard) for

880-KP0301061-A

Daoud Attayi

Appendices the BlackBerry 7290 Wireless Handheld Model No. RAP40GW test report

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Author Data

May 03-13 & June 08-11, 2004 RIM-0086-0405-01

L6ARAP40GW

Schmid & Partner Engineering AG

<u>p</u> e

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

DASY

Dipole Validation Kit

Type: D835V2

Serial: 446

Manufactured: Calibrated:

October 24, 2001 August 21, 2003



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Daoud Attayi

May 03-13 & June 08-11, 2004 | RIM-0086-0405-01

L6ARAP40GW

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 43.3 ± 5% Conductivity 0.91 mbo/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.

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: $9.60 \text{ mW/g} \pm 16.8 \% (k=2)^1$ averaged over 10 cm³ (10 g) of tissue: 6.24 mW/g \pm 16.2 % (k=2)¹

validation uncertainty



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L6ARAP40GW

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:

1.395 ns (one direction)

Transmission factor:

0.983(voltage transmission, one direction)

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

Feedpoint impedance at 835 MHz:

 $Re{Z} = 48.9 \Omega$

 $Im \{Z\} = -5.5 \Omega$

Return Loss at 835 MHz

-24.9 dB

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.

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 DCsignals.

Power Test

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



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L6ARAP40GW

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Test Laboratory: SPEAG, Zurich, Switzerland File Name: <u>\$N446_SN1507_HSL835_210803.da4</u>

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN446

Program: Dipole Calibration

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1 Medium: HSL 835 MHz ($\sigma = 0.91$ mho/m, $\epsilon_r = 43.28$, $\rho = 1000$ kg/m³)

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, V1.6 Build 115

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 55.3 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 2.55 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0; Measurement grid: dx=5mm, dy=5mm, dz=5mm

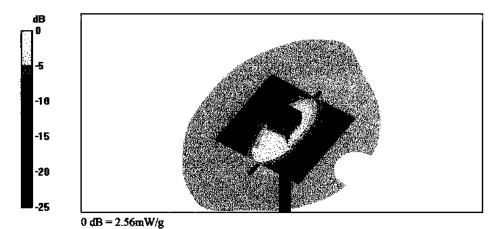
Peak SAR (extrapolated) = 3.52 W/kg

SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.56 mW/g

Reference Value = 55.3 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 2.56 mW/g





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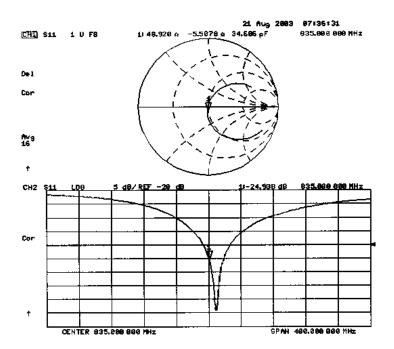
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Test Report No

L6ARAP40GW

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FCC ID:

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

Client

RIM RELEASE OF THE

object(s)	D1900V2 - SM	Nasabio (1861 - Groupe Caldelle)	
rojeci(s)	_D_1000_120.	TABLES in sealing over the control of the control	osteria vysa, a politikli a sa a stere v vili titi.
alibration procedure(s)	QA CAL-05.v	2	
	Campration pr	ocedure for dipole validation kits	
alibration date:	August 22, 20	03 Priling Transfer	
ondition of the calibrated item	In Tolerance	(according to the specific calibration	on document)
his calibration statement docum 7025 international standard.	ents traceability of M&T6	Eused in the calibration procedures and conformity	of the procedures with the ISO/IEC
di calibrations have been conduc	cted in the closed laborat	gry facility: environment temperature 22 -/- 2 degre	ees Celsus and humidity < 75%.
alibration Equipment used (M&	TE critical for calibration)		
lodel Type	1D#	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
F generator R&S SML-03 lower sensor HP 8481A	100698 MY41092317	27-Mar-2002 (R&\$, Np. 20-92389) 18-Oct-02 (Agilent, No. 20021018)	In house check: Mar-05 Oct-04
ower sensor HP 8481A	US37292783	30-Oct-D2 (METAS, No. 252-0236)	Oct-03
Power meter EPM E442	GB37480704 US37390585	30-Oct-02 (METAS, No. 252-0236) 18-Oct-01 (Aglient, No. 24BR1033101)	Oct-03 In house check: Oct 03
Network Analyzer HP 8753E	0.991.940999	10-00-01 (Adilettis 100. Expertosorio)	
	Name	Function	Signature
Calibrated by:	Judith Mueller	Technician.	ffmills.
Approved by:	Kalja Pekovic	Laboratory Director	Muchta
			Date issued: August 24, 2003
		150 ct all a second as 150	JIEC 4703E International Standard) for
			VICO 11/25 Intelligence of grandal of the
his calibration certificate is issu- calibration Laboratory of Schmi			

880-KP0301061-A

RESEARCH IN MOTION Author Data

Daoud Attayi

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L6ARAP40GW

Schmid & Partner Engineering AG

Zeughausstrasse 43, 9004 Zurich, Switzerland Phone +41 1 245 9700, Fax +41 1 245 9779 info@speeg.com, http://www.speeg.com

DASY

Dipole Validation Kit

Type: D1900V2

Serial: 545

Manufactured: November 15, 2001 August 22, 2003 Calibrated:



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L6ARAP40GW

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 1900 MHz:

40.2 ± 5% Relative Dielectricity 1.46 mbo/m ± 5% Conductivity

The DASY4 System with a desimetric 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 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.

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: 41.2 mW/g \pm 16.8 % (k=2)¹ 21.3 mW/g \pm 16.2 % (k=2)¹ averaged over 10 cm³ (10 g) of tissue:

validation uncertainty



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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:

1.198 ns (one

(one direction)

Transmission factor:

0.984

(voltage transmission, one direction)

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

Feedpoint impedance at 1900 MHz:

 $Re{Z} = 49.7 \Omega$

 $lm(Z) = 0.96 \Omega$

Return Loss at 1900 MHz

-39.9 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.

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.



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Date/Time: 08/22/03 15:40:53

Test Laboratory: SPEAG, Zurich, Switzerland File Name: <u>SN545_SN1507_HSL1900_220803.da4</u>

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN545

Program: Dipole Calibration

Communication System: CW-1900; Frequency: 1900 MHz;Duty Cycle: 1:1 Medium: HSL 1900 MHz ($\sigma = 1.46 \text{ mbo/m}$, $\epsilon_r = 40.17$, $\rho = 1000 \text{ kg/m}^3$)

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe; ET3DV6 \$N1507; ConvF(5.2, 5.2, 5.2); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 SN411; Calibrated: I/16/2003
- Phantom: SAM with CRP TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 93.6 V/m

Power Drift = 0.05 dB

Maximum value of SAR = 11.5 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm,

dz=5mm

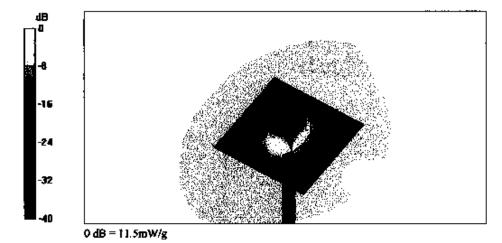
Peak SAR (extrapolated) = 17.7 W/kg

SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.32 mW/g

Reference Value = 93.6 V/m

Power Drift = 0.05 dB

Maximum value of SAR = 11.5 mW/g





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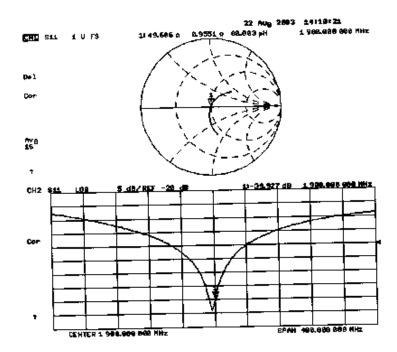
No. RAP40GW test report

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APPENDIX E: SAR SET UP PHOTOS

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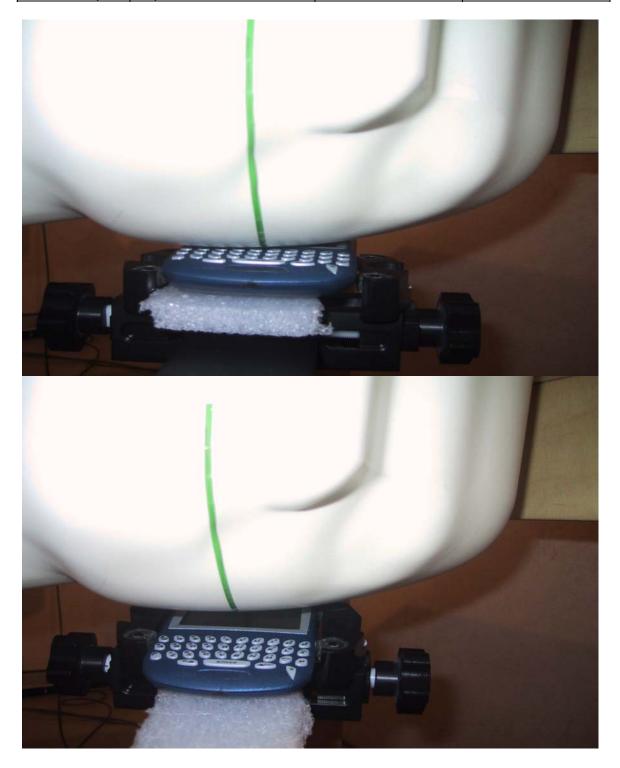


Figure E1. Left ear configuration

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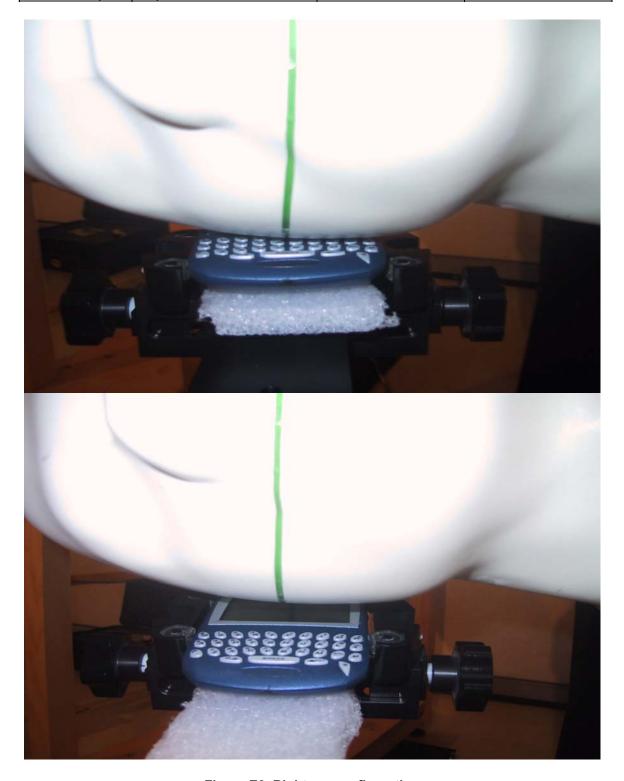


Figure E2. Right ear configuration

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Figure E3. Body worn configuration with Plastic Holster and Leather Swivel Holster

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Figure E4. Body worn configuration with Leather Swivel Holster & Headset

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Figure E5. Body worn configuration with Vertical Foam Holster

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Figure E6. Body worn configuration with Horizontal Foam Holster