SAR EVALUATION REPORT

For

MAXON ELECTRONICS AUSTRALIA PTY. LTD.

A1, Nevesby North
New South Wales, Australia 2212

FCC ID: Q2FMM-5100P

2003-10-09

This Report Concerns:	**Equipment Type:**
☒ Original Report	CDMA 1X Network Card

Test Engineer:	Eric Hong / Hong
Report No.:	R0308292S
Test Date:	2003-09-16
Reviewed By:	Benjamin Jing / Benjamin Jing
Prepared By:	Bay Area Compliance Laboratory Corporation (BACL) 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

TABLE OF CONTENTS

SUMMARY

The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996 [1].

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

There was no SAR of any concern measured on the device for any of the investigated configurations.

1 - REFERENCE

[1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.

[2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, O_ce of Engineering & Technology, Washington, DC, 1997.

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-_eld scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.

[4] Niels Kuster, Ralph K.astle, and Thomas Schmid, \Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.

[5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.

[6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.

[7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM _ 97, Dubrovnik, October 15{17, 1997, pp. 120-24.

[8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172-175.

[9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. uhn, and Niels Kuster, \The depen-dence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.

[10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.

[11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.

[12] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.Dosimetric Evaluation of Sample device, month 1998 9

[13] NIS81 NAMAS, \The treatment of uncertainity in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.

[14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10

2 - TESTING EQUIPMENT

2.1 Equipments List & Calibration Info

Type / Model	Cal. Date	S/N:
DASY3 Professional Dosimetric System	N/A	N/A
Robot RX60L	N/A	F00/5H31A1/A/01
Robot Controller	N/A	F01/5J72A1/A/01
Dell Computer Optiplex GX110	N/A	N/A
Pentium III, Windows NT	N/A	N/A
SPEAG EDC3	N/A	N/A
SPEAG DAE3	08/26/02	456
SPEAG E-Field Probe ET3DV6	08/26/02	1604
SPEAG Dummy Probe	N/A	N/A
SPEAG Generic Twin Phantom	N/A	N/A
SPEAG Light Alignment Sensor	N/A	278
SPEAG Validation Dipole D-1800-S-2	11/6/01	BCL-049
SPEAG Validation Dipole D900V2	9/3/02	122
Brain Equivalent Matter (800MHz)	Daily	N/A
Brain Equivalent Matter (1900MHz)	Daily	N/A
Muscle Equivalent Matter (800MHz)	Daily	N/A
Muscle Equivalent Matter (1900MHz)	Daily	N/A
Robot Table	N/A	N/A
Phone Holder	N/A	N/A
Phantom Cover	N/A	N/A
HP Spectrum Analyzer HP8593GM	6/20/02	3009A00791
Microwave Amp. 8349B	N/A	2644A02662
Power Meter HP436A	4/2/02	2709A29209
Power Sensor HP8482A	4/2/02	2349A08568
Signal Generator RS SMIQ O3	2/10/02	1084800403
Network Analyzer HP-8753ES	7/30/02	820079
Dielectric Probe Kit HP85070A	N/A	N/A
Hewlett Packard HP8566B Spectrum Analyzer	7/23/02	None
Hewlett Packard HP 7470A Plotter	7/23/02	None
A.H. System SAS0200 Horn Antenna	7/23/02	None
Com-Power AB-100 Dipole Antenna	7/23/02	None
Agilent E4419b	4/8/02	GB40202891
Agilent E4412a	4/8/02	US38486529

2.2 Equipment Calibration Certificate

Please see the attached file for detailed information.

Schmid & Partner Engineering AG

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

Calibration Certificate

Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1604**
Place of Calibration:	**Zurich**
Date of Calibration:	**August 26, 2002**
Calibration Interval	**12 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	N. Vetter
Approved by:	[illegible] Katja

Schmid & Partner
Engineering AG

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

Probe ET3DV6

SN:1604

Manufactured:	July 30, 2001
Last calibration:	September 7, 2001
Recalibrated:	August 26, 2002

Calibrated for System DASY3

ET3DV6 SN:1604 August 26, 2002

DASY3 - Parameters of Probe: ET3DV6 SN:1604

Sensitivity in Free Space

NormX	1.73 $\mu V/(V/m)^2$
NormY	1.68 $\mu V/(V/m)^2$
NormZ	1.72 $\mu V/(V/m)^2$

Diode Compression

DCP X	93	mV
DCP Y	93	mV
DCP Z	93	mV

Sensitivity in Tissue Simulating Liquid

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

ConvF X	6.5 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.5 ± 9.5% (k=2)	Alpha	0.36
ConvF Z	6.5 ± 9.5% (k=2)	Depth	2.82

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

ConvF X	5.5 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.5 ± 9.5% (k=2)	Alpha	0.50
ConvF Z	5.5 ± 9.5% (k=2)	Depth	2.46

Boundary Effect

Head 900 MHz **Typical SAR gradient: 5 % per mm**

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	11.1	6.6
SAR_{be} [%]	With Correction Algorithm	0.4	0.6

Head 1800 MHz **Typical SAR gradient: 10 % per mm**

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	12.3	8.1
SAR_{be} [%]	With Correction Algorithm	0.1	0.1

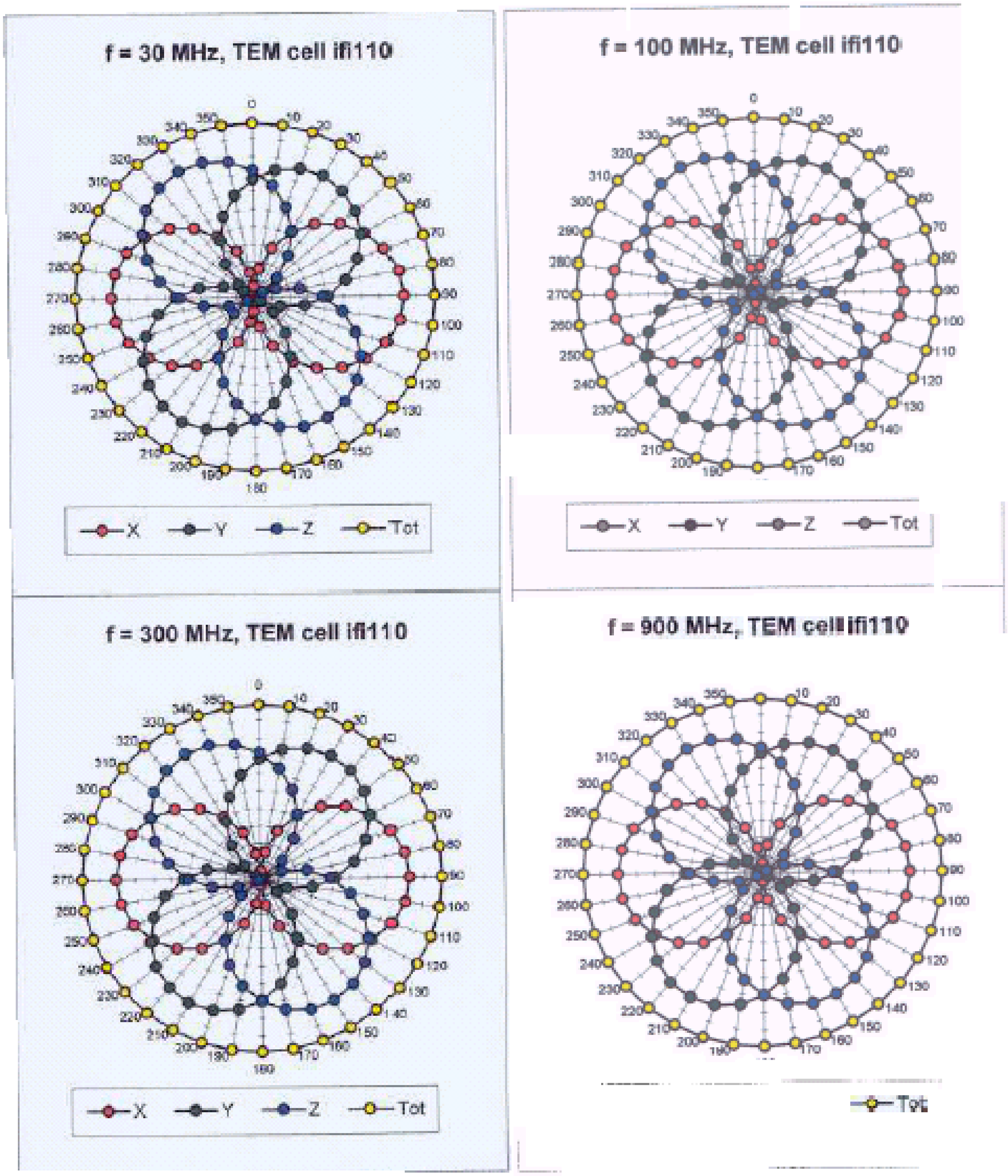
Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.3 ± 0.2	mm

ET3DV6 SN:1604

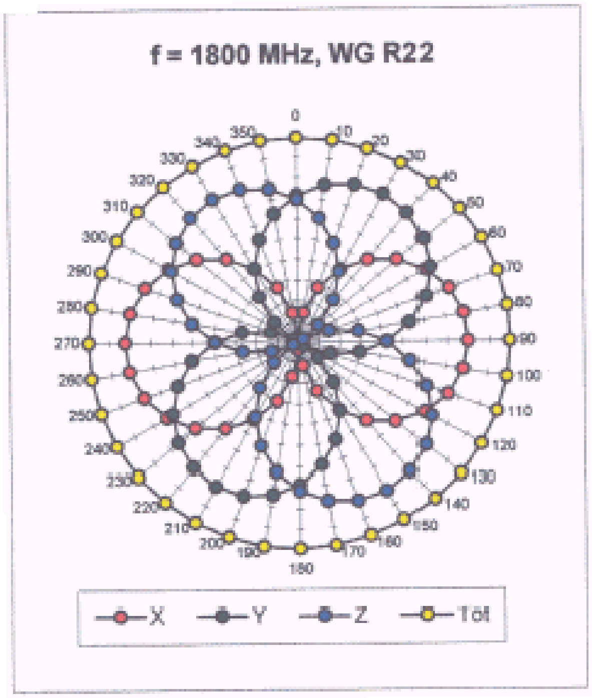
August 26, 2002

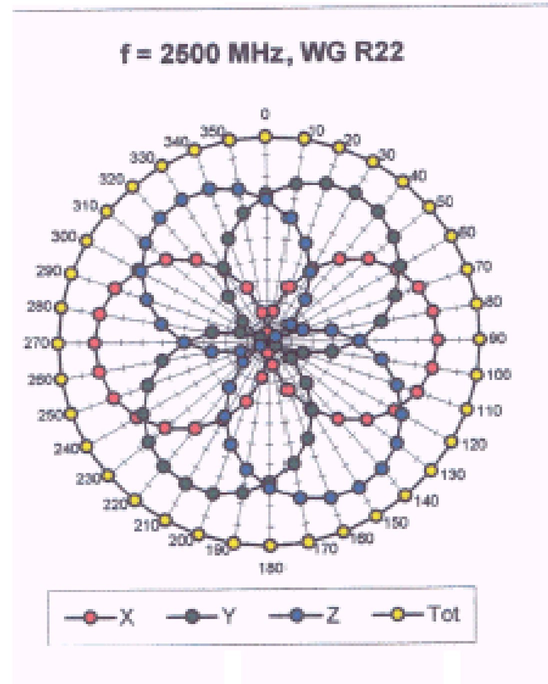
Receiving Pattern (ϕ), θ = 0°



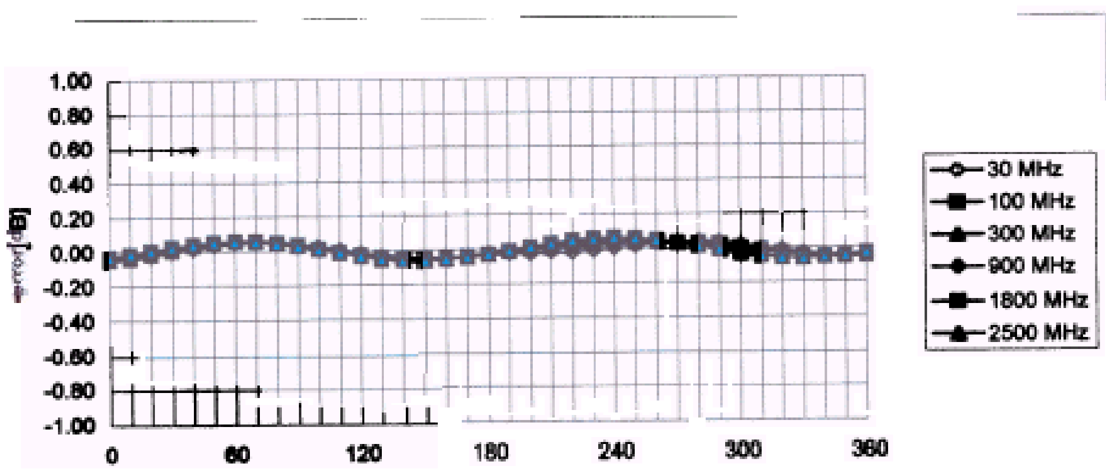
ET3DV6 SN:1604

August 26, 2002





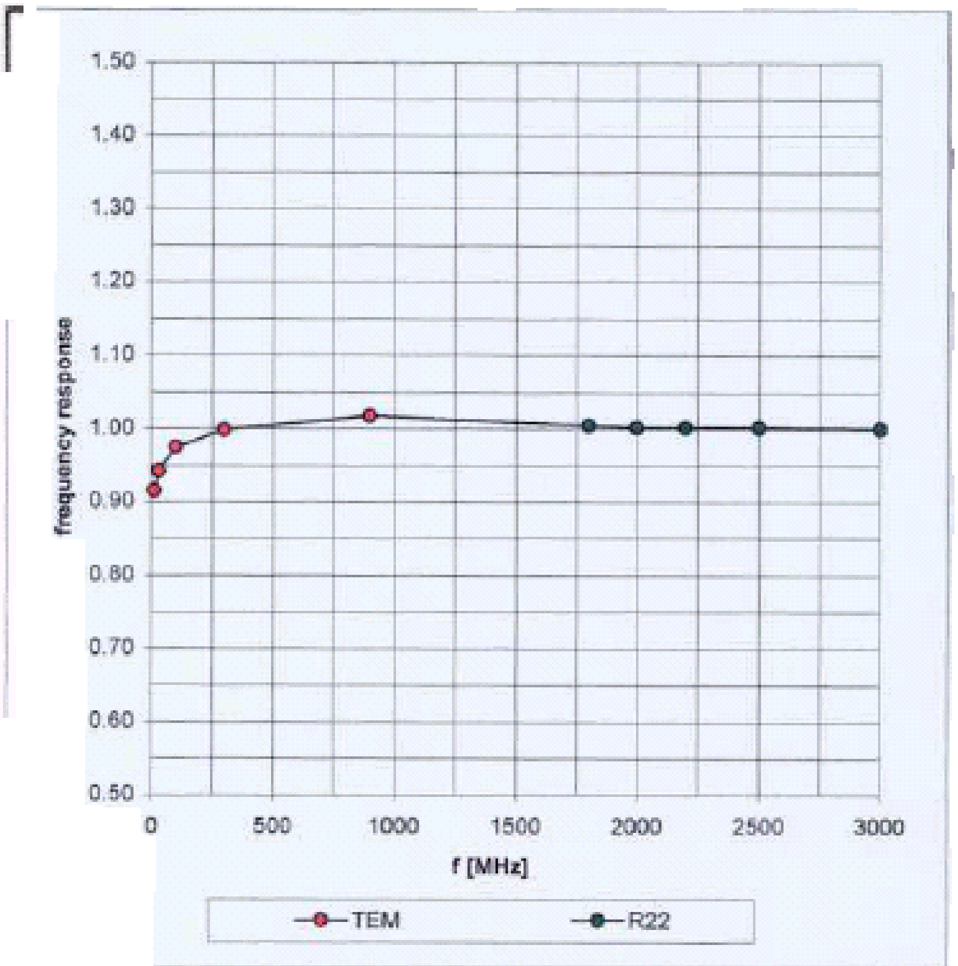
Isotropy Error (ϕ), θ = 0°



ET3DV6 SN:1604 **August 26, 2002**

Frequency Response of E-Field

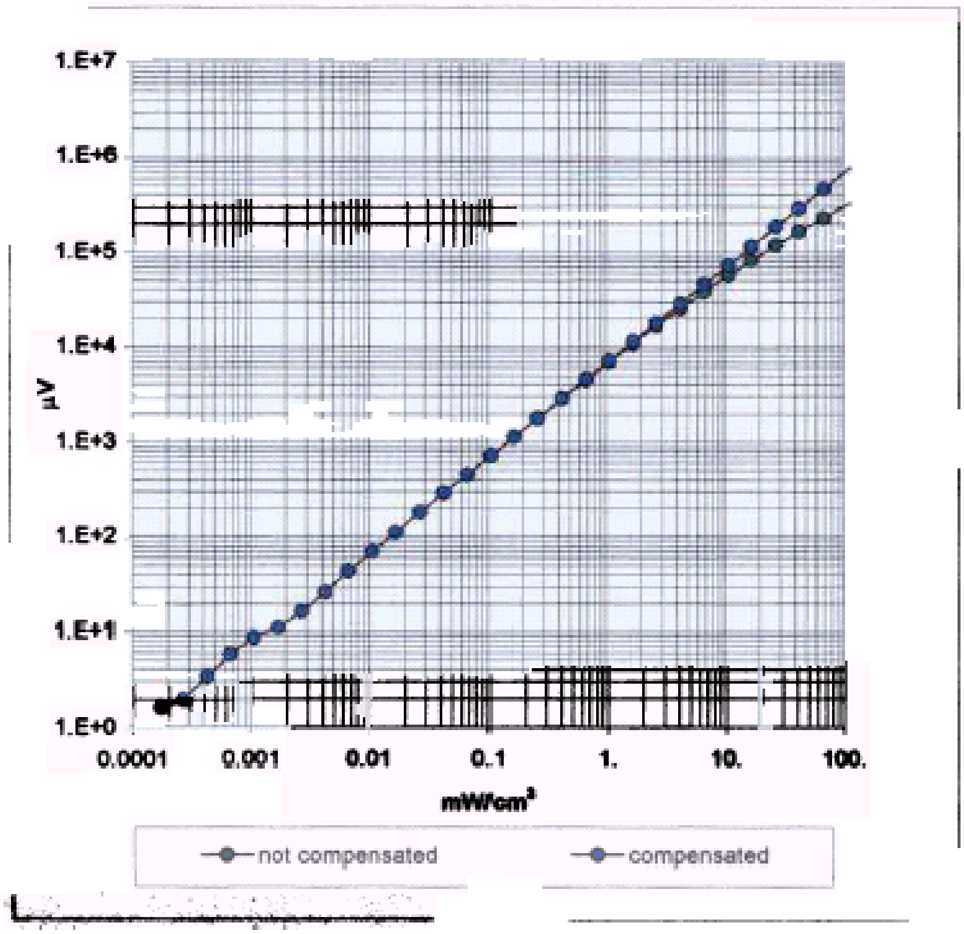
(TEM-Cell:ifi110, Waveguide R22)

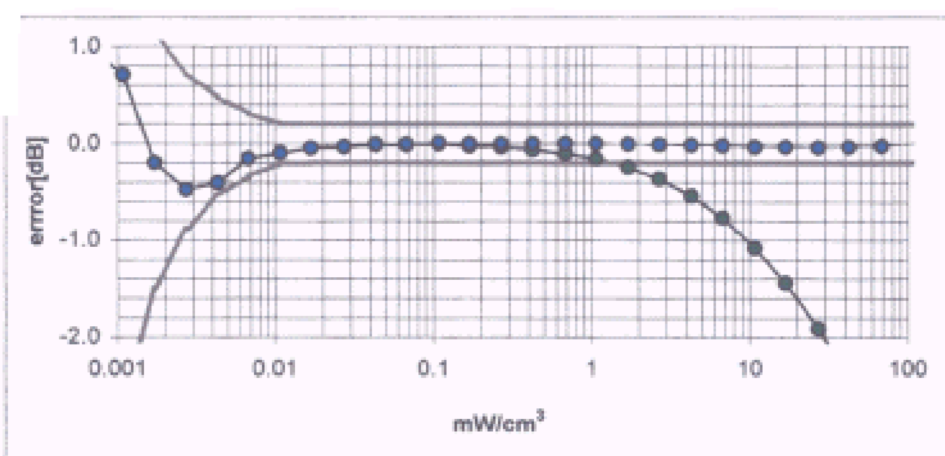


ET3DV6 SN:1604 August 26, 2002

Dynamic Range f(SAR_{brain})

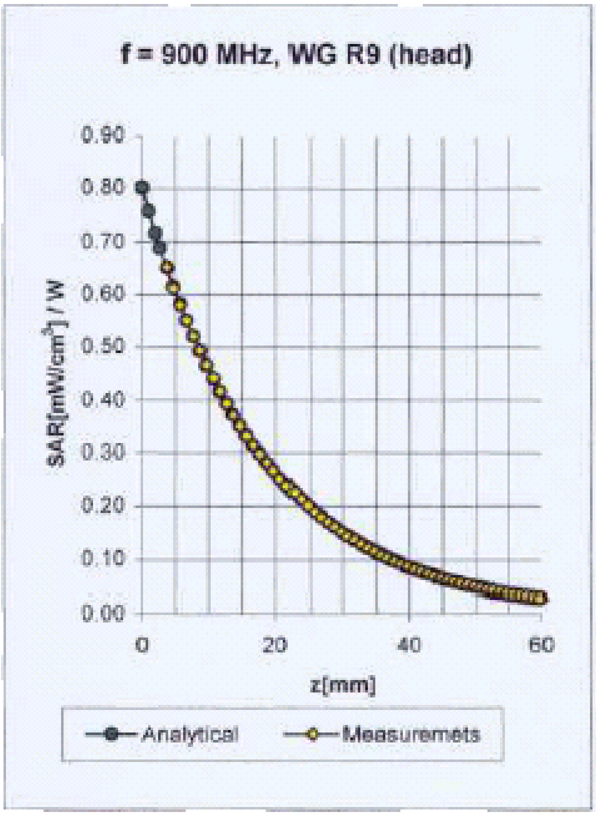
(Waveguide R22)

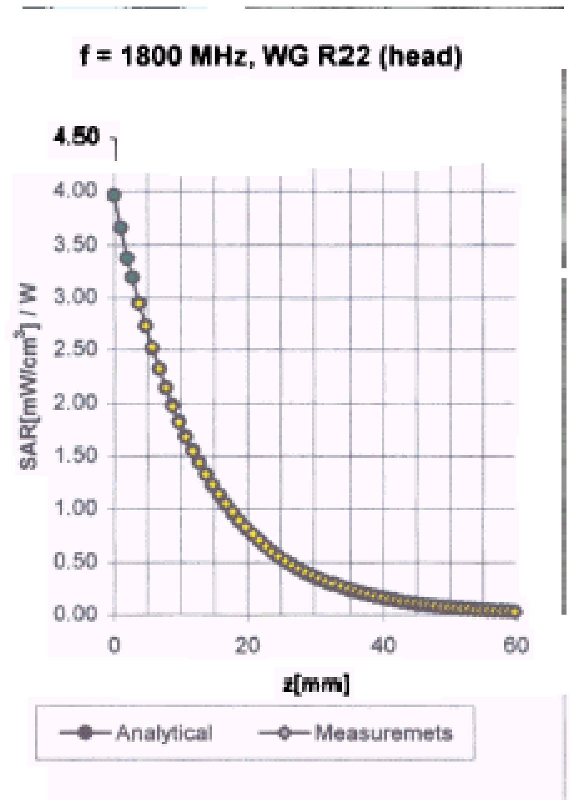




ET3DV6 SN:1604 August 26, 2002

Conversion Factor Assessment



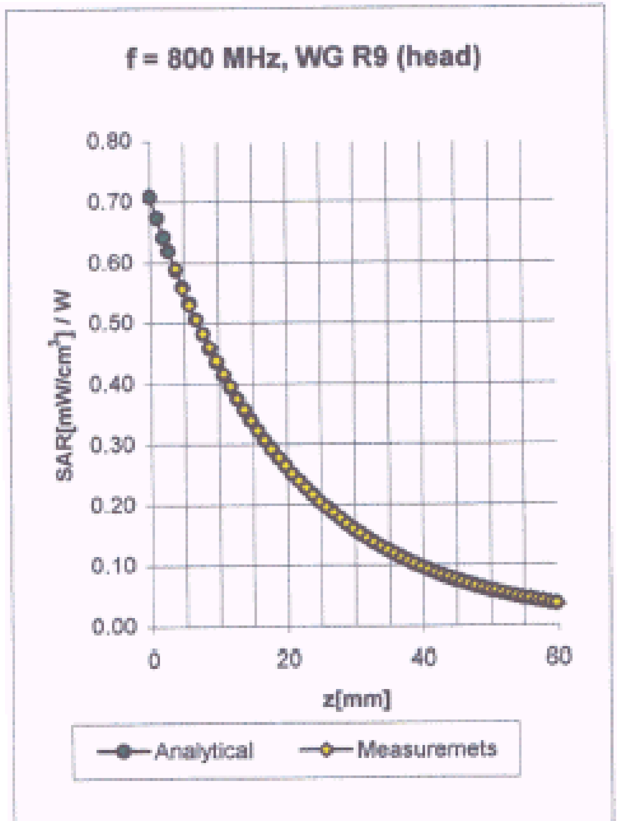


Head	900 MHz	ε_r = 41.5 ± 5%	σ = 0.97 ± 5% mho/m	
Head	835 MHz	ε_r = 41.5 ± 5%	σ = 0.90 ± 5% mho/m	
ConvF X	6.5 ± 9.5% (k=2)		Boundary effect:	
ConvF Y	6.5 ± 9.5% (k=2)		Alpha	
ConvF Z	6.5 ± 9.5% (k=2)		Depth	

Head	1800 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m	
Head	1900 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m	
ConvF X	5.5 ± 9.5% (k=2)		Boundary effect:	
ConvF Y	5.5 ± 9.5% (k=2)		Alpha	0.50
ConvF Z	5.5 ± 9.5% (k=2)		Depth	2.46

ET3DV6 SN:1604 August 26, 2002

Conversion Factor Assessment



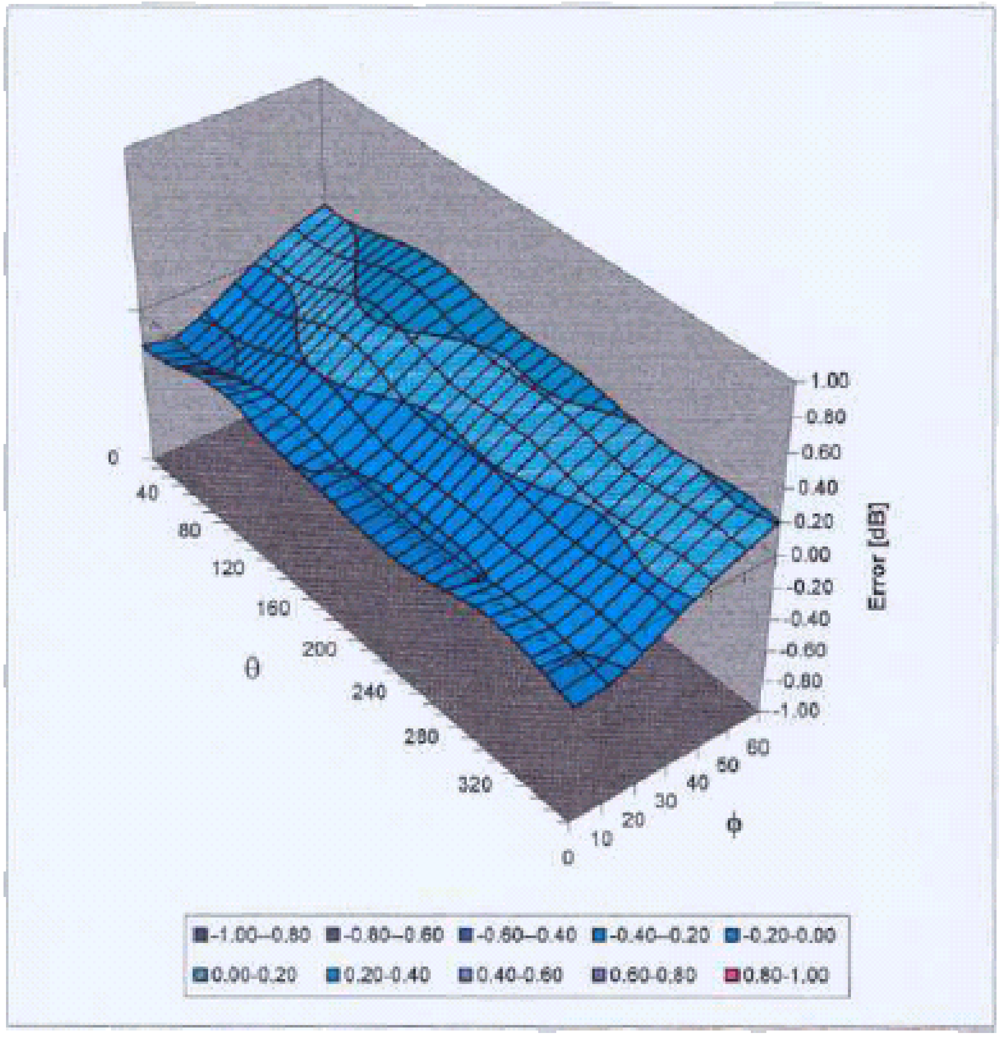
Head	800 MHz	ε_r = 41.5 ± 5%	σ = 0.88 ± 5% mho/m

ConvF X	**6.7** ± 8.9% (k=2)	Boundary effect:
ConvF Y	**6.7** ± 8.9% (k=2)	Alpha
ConvF Z	**6.7** ± 8.9% (k=2)	Depth

ET3DV6 SN:1604 **August 26, 2002**

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



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

Additional Conversion Factors

for Dosimetric E-Field Probe

Type	ET3DV6
Serial Number:	1604
Place of Assessment	Zurich
Date of Assessment:	October 4, 2002
Probe Calibration Date	August 26, 2002

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by

Page of 2 October 4, 2002

Conversion factor (± standard deviation)

835 MHz	**ConvF**	**6.4 ± 8%**	ε_r = 55.2 ± 5% σ = 0.97 ± 5% mho/m (body tissue)
1900 MHz	**ConvF**	**4.9 ± 8%**	ε_r = 53.3 ± 5% σ = 1.52 ± 5% mho/m (body tissue)

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

Client Bay Area Comp. Lab (BACL)

CALIBRATION CERTIFICATE

Object(s)	ES3DV2 - SN:3019
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	October 9, 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 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

	Name	Function	Signature
Calibrated by:	[redacted]		
Approved by:	[redacted]		

Date issued: October 9, 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.

880-KP0301061-A Page 1 (1)

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

Probe ES3DV2

SN:3019

Additional Conversion Factors

Manufactured:	December 5, 2002
Last calibration:	July 12, 2003
Add. calibration:	October 9, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Page 1 of 6

DASY - Parameters of Probe: ES3DV2 SN:3019

Sensitivity in Free Space

NormX	**1.05** $\mu V/(V/m)^2$
NormY	**1.14** $\mu V/(V/m)^2$
NormZ	**0.98** $\mu V/(V/m)^2$

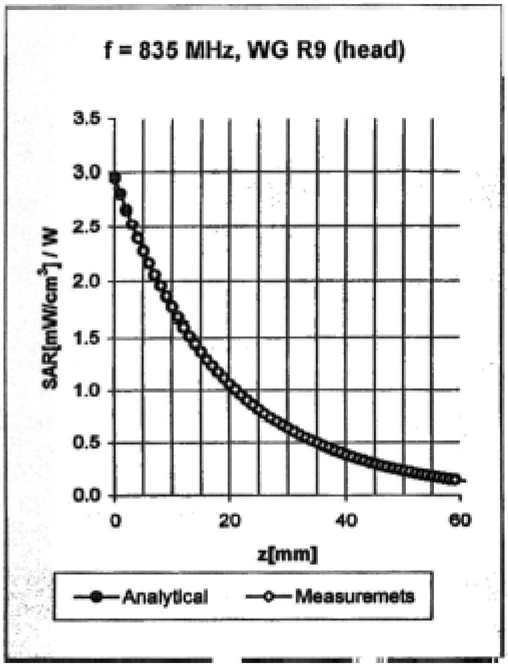
Diode Compression

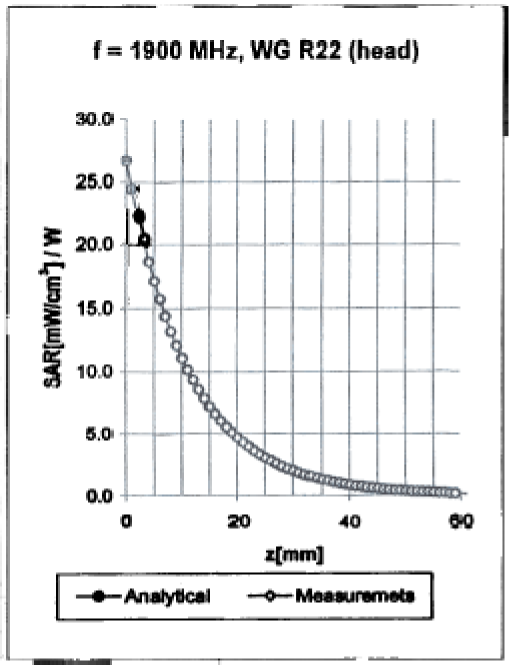
DCP X	**99**
DCP Y	**99**
DCP Z	**99**

Sensor Offset

Probe Tip to Sensor Center	**2.1**	mm

Conversion Factor Assessment





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

Valid for f=793-877 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

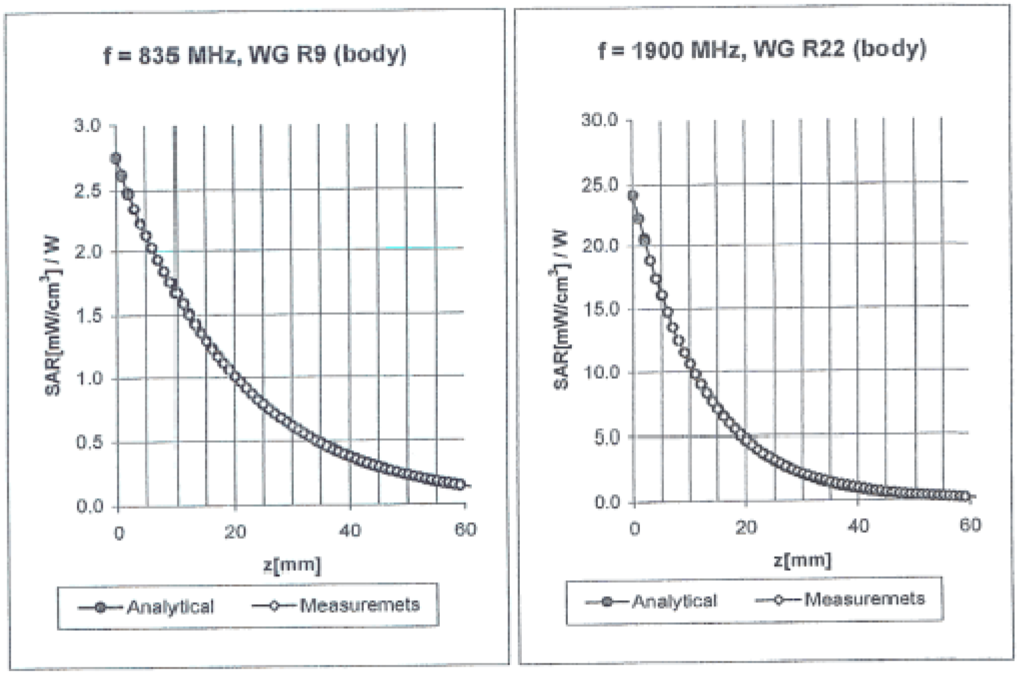
ConvF X	**6.5** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**6.5** ± 9.5% (k=2)		Alpha	**0.35**
ConvF Z	**6.5** ± 9.5% (k=2)		Depth	**1.46**

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

Valid for f=1805-1995 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**4.7** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**4.7** ± 9.5% (k=2)		Alpha	**0.22**
ConvF Z	**4.7** ± 9.5% (k=2)		Depth	**3.48**

Convers ion Factor Assessment



Body **835 MHz** **ε_r = 55.2 ± 5%** **σ = 0.97 ± 5% mho/m**

Valid for f=793-877 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

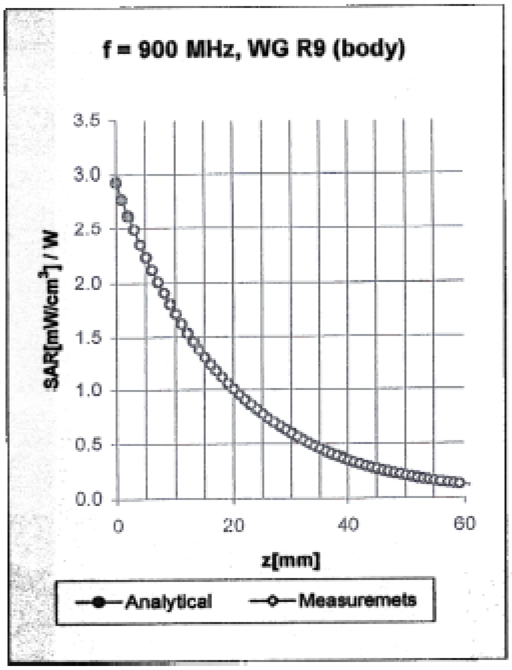
ConvF X	**6.1**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.1**	± 9.5% (k=2)	Alpha	**0.24**
ConvF Z	**6.1**	± 9.5% (k=2)	Depth	**2.00**

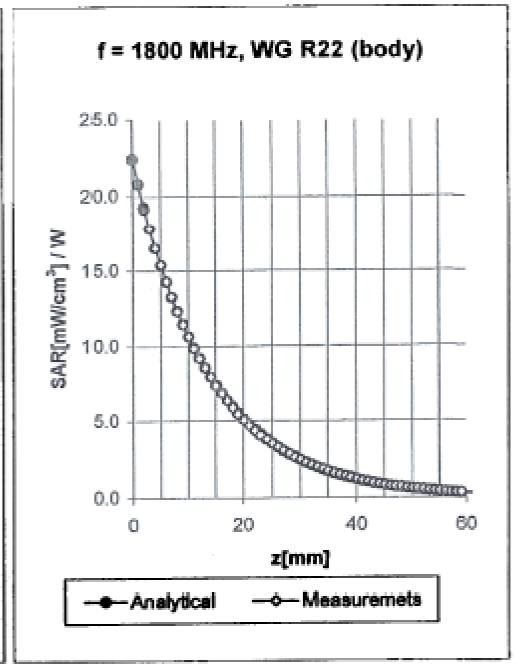
Body **1900 MHz** **ε_r = 53.3 ± 5%** **σ = 1.52 ± 5% mho/m**

Valid for f=1805-1995 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**4.6**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**4.6**	± 9.5% (k=2)	Alpha	**0.24**
ConvF Z	**4.6**	± 9.5% (k=2)	Depth	**2.64**

Conversion Factor Assessment





Body **900 MHz** ε_r = **55.0 ± 5%** σ = **1.05 ± 5% mho/m**

Valid for f=855-945 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**6.1** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**6.1** ± 9.5% (k=2)		Alpha	**0.27**
ConvF Z	**6.1** ± 9.5% (k=2)		Depth	**1.82**

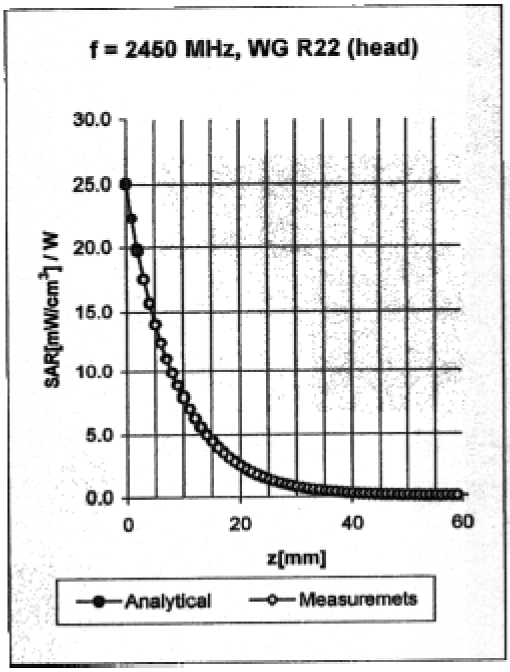
Body **1800 MHz** ε_r = **53.3 ± 5%** σ = **1.52 ± 5% mho/m**

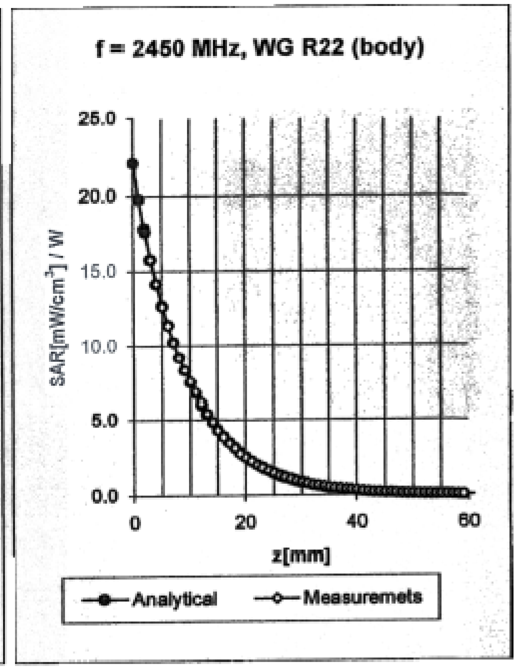
Valid for f=1710-1890 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**4.7** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**4.7** ± 9.5% (k=2)		Alpha	**0.23**
ConvF Z	**4.7** ± 9.5% (k=2)		Depth	**2.99**

Page 5 of 6

Conversion Factor Assessment





Head **2450 MHz** ε_r **= 39.2 ± 5%** σ **= 1.80 ± 5% mho/m**

Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**4.5** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**4.5** ± 9.5% (k=2)		Alpha	**0.40**
ConvF Z	**4.5** ± 9.5% (k=2)		Depth	**1.62**

Body **2450 MHz** ε_r **= 52.7 ± 5%** σ **= 1.95 ± 5% mho/m**

Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**4.2** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**4.2** ± 9.5% (k=2)		Alpha	**0.32**
ConvF Z	**4.2** ± 9.5% (k=2)		Depth	**1.98**

Page 6 of 6

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

Additional Conversion Factors

for Dosimetric E-Field Probe

'ype:	ES3DV2
Serial Number:	**3019**
Place of Assessment:	Zurich
Date of Assessment:	October 13, 2003
Probe Calibration Date:	**October 9, 2003**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:

ES3DV2-SN:3019 October 13, 2003

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

Dosimetric E-Field Probe ES3DV2 SN:3019

Conversion factor (± standard deviation)

150 MHz	ConvF	8.7 ± 8%	ε_r = 52.3 ± 5% σ = 0.76 ± 5% mho/m (head tissue)
150 MHz	ConvF	8.3 ± 8%	ε_r = 61.9 ± 5% σ = 0.80 ± 5% mho/m (body tissue)
450 MHz	ConvF	7.4 ± 8%	ε_r = 43.5 ± 5% σ = 0.87 ± 5% mho/m (head tissue)
450 MHz	ConvF	7.3 ± 8%	ε_r = 56.7 ± 5% σ = 0.94 ± 5% mho/m (body tissue)

DELL, 835MHz Head Liquid Validation

frequency	e'	e''
815000000.0000	41.7226	19.4151
815800000.0000	41.7490	19.4195
816600000.0000	41.7060	19.3846
817400000.0000	41.6984	19.3235
818200000.0000	41.6534	19.3682
819000000.0000	41.6629	19.3295
819800000.0000	41.6476	19.3544
820600000.0000	41.6830	19.2974
821400000.0000	41.6663	19.3187
822200000.0000	41.6904	19.3281
823000000.0000	41.6131	19.3524
823800000.0000	41.6069	19.3159
824600000.0000	41.6026	19.3158
825400000.0000	41.5295	19.2974
826200000.0000	41.5262	19.2682
827000000.0000	41.5449	19.2427
827800000.0000	41.5555	19.2697
828600000.0000	41.5593	19.2377
829400000.0000	41.5473	19.2490
830200000.0000	41.5096	19.1843
831000000.0000	41.5238	19.2098
831800000.0000	41.4737	19.2279
832600000.0000	41.5317	19.2401
833400000.0000	41.4784	19.1982
834200000.0000	41.4877	19.2418
835000000.0000	41.4309	19.2218
835800000.0000	41.4657	19.2472
836600000.0000	41.5103	19.2359
837400000.0000	41.5085	19.2513
838200000.0000	41.4870	19.2581
839000000.0000	41.4179	19.1862
839800000.0000	41.4202	19.3138
840600000.0000	41.4368	19.2323
841400000.0000	41.4477	19.2588
842200000.0000	41.4111	19.2474
843000000.0000	41.4731	19.2493
843800000.0000	41.4330	19.2191
844600000.0000	41.4334	19.2496
845400000.0000	41.4227	19.2725
846200000.0000	41.4218	19.2185
847000000.0000	41.4908	19.3186
847800000.0000	41.4626	19.2878
848600000.0000	41.4041	19.3217
849400000.0000	41.4130	19.3123
850200000.0000	41.4121	19.2787
851000000.0000	41.3737	19.2319
851800000.0000	41.4273	19.2933
852600000.0000	41.4516	19.3221
853400000.0000	41.4391	19.3294
854200000.0000	41.4246	19.3617
855000000.0000	41.4266	19.3349

$\sigma = \omega \varepsilon_o \varepsilon'' = 2 \pi f \varepsilon_o \varepsilon''=0.89$

where $f = 835x\ 10^6$

$\varepsilon_o = 8.854 \times 10^{-12}$

$\varepsilon'' = 19.2218$

DELL, 835MHz Body Liquid Validation

frequency	e'	e''
815000000.0000	54.6415	21.0417
815800000.0000	54.6979	21.0242
816600000.0000	54.6423	21.0206
817400000.0000	54.6749	20.9828
818200000.0000	54.6268	20.9848
819000000.0000	54.6445	20.9725
819800000.0000	54.6203	20.9673
820600000.0000	54.6323	21.0170
821400000.0000	54.6246	21.0083
822200000.0000	54.6498	20.9741
823000000.0000	54.5749	20.9396
823800000.0000	54.5762	20.9763
824600000.0000	54.6232	20.9587
825400000.0000	54.5721	20.9171
826200000.0000	54.5593	20.8340
827000000.0000	54.5771	20.8308
827800000.0000	54.5388	20.8149
828600000.0000	54.5675	20.8424
829400000.0000	54.4985	20.8645
830200000.0000	54.5074	20.8070
831000000.0000	54.5433	20.8038
831800000.0000	54.4890	20.8276
832600000.0000	54.5322	20.8297
833400000.0000	54.4852	20.7959
834200000.0000	54.5140	20.8592
835000000.0000	54.5175	20.8001
835800000.0000	54.5067	20.8022
836600000.0000	54.4814	20.7756
837400000.0000	54.5497	20.7919
838200000.0000	54.5102	20.7905
839000000.0000	54.4385	20.7784
839800000.0000	54.4889	20.7946
840600000.0000	54.4458	20.7503
841400000.0000	54.4887	20.6985
842200000.0000	54.4392	20.7830
843000000.0000	54.4319	20.7208
843800000.0000	54.4287	20.7371
844600000.0000	54.4143	20.6875
845400000.0000	54.4987	20.7353
846200000.0000	54.4346	20.7110
847000000.0000	54.4243	20.7131
847800000.0000	54.3608	20.7421
848600000.0000	54.4155	20.6531
849400000.0000	54.4162	20.6852
850200000.0000	54.3814	20.7265
851000000.0000	54.3889	20.7195
851800000.0000	54.3924	20.6611
852600000.0000	54.3555	20.6457
853400000.0000	54.3111	20.5632
854200000.0000	54.3292	20.5508
855000000.0000	54.3488	20.5244

$\sigma = \omega\, \varepsilon_o\, \varepsilon'' = 2\, \pi f\, \varepsilon_o\, \varepsilon''=0.97$

where $f = 835 x\, 10^6$

$\varepsilon_o = 8.854 \text{ x } 10^{-12}$

$\varepsilon'' = 20.8001$

IBM, 835MHz Head Liquid Validation

frequency	e'	e''
815000000.0000	41.7226	19.4151
815800000.0000	41.7490	19.4195
816600000.0000	41.7060	19.3846
817400000.0000	41.6984	19.3235
818200000.0000	41.6534	19.3682
819000000.0000	41.6629	19.3295
819800000.0000	41.6476	19.3544
820600000.0000	41.6830	19.2974
821400000.0000	41.6663	19.3187
822200000.0000	41.6904	19.3281
823000000.0000	41.6131	19.3524
823800000.0000	41.6069	19.3159
824600000.0000	41.6026	19.3158
825400000.0000	41.5295	19.2974
826200000.0000	41.5262	19.2682
827000000.0000	41.5449	19.2427
827800000.0000	41.5555	19.2697
828600000.0000	41.5593	19.2377
829400000.0000	41.5473	19.2490
830200000.0000	41.5096	19.1843
831000000.0000	41.5238	19.2098
831800000.0000	41.4737	19.2279
832600000.0000	41.5317	19.2401
833400000.0000	41.4784	19.1982
834200000.0000	41.4877	19.2418
835000000.0000	41.4309	19.2218
835800000.0000	41.4657	19.2472
836600000.0000	41.5103	19.2359
837400000.0000	41.5085	19.2513
838200000.0000	41.4870	19.2581
839000000.0000	41.4179	19.1862
839800000.0000	41.4202	19.3138
840600000.0000	41.4368	19.2323
841400000.0000	41.4477	19.2588
842200000.0000	41.4111	19.2474
843000000.0000	41.4731	19.2493
843800000.0000	41.4330	19.2191
844600000.0000	41.4334	19.2496
845400000.0000	41.4227	19.2725
846200000.0000	41.4218	19.2185
847000000.0000	41.4908	19.3186
847800000.0000	41.4626	19.2878
848600000.0000	41.4041	19.3217
849400000.0000	41.4130	19.3123
850200000.0000	41.4121	19.2787
851000000.0000	41.3737	19.2319
851800000.0000	41.4273	19.2933
852600000.0000	41.4516	19.3221
853400000.0000	41.4391	19.3294
854200000.0000	41.4246	19.3617
855000000.0000	41.4266	19.3349

$\sigma = \omega \varepsilon_o \varepsilon'' = 2\pi f \varepsilon_o \varepsilon''=0.89$

where $f = 835 \times 10^6$

$\varepsilon_o = 8.854 \times 10^{-12}$

$\varepsilon'' = 19.2218$

IBM, 835MHz Body Liquid Validation

frequency	e'	e''
815000000.0000	54.6415	21.0417
815800000.0000	54.6979	21.0242
816600000.0000	54.6423	21.0206
817400000.0000	54.6749	20.9828
818200000.0000	54.6268	20.9848
819000000.0000	54.6445	20.9725
819800000.0000	54.6203	20.9673
820600000.0000	54.6323	21.0170
821400000.0000	54.6246	21.0083
822200000.0000	54.6498	20.9741
823000000.0000	54.5749	20.9396
823800000.0000	54.5762	20.9763
824600000.0000	54.6232	20.9587
825400000.0000	54.5721	20.9171
826200000.0000	54.5593	20.8340
827000000.0000	54.5771	20.8308
827800000.0000	54.5388	20.8149
828600000.0000	54.5675	20.8424
829400000.0000	54.4985	20.8645
830200000.0000	54.5074	20.8070
831000000.0000	54.5433	20.8038
831800000.0000	54.4890	20.8276
832600000.0000	54.5322	20.8297
833400000.0000	54.4852	20.7959
834200000.0000	54.5140	20.8592
835000000.0000	54.5175	20.8001
835800000.0000	54.5067	20.8022
836600000.0000	54.4814	20.7756
837400000.0000	54.5497	20.7919
838200000.0000	54.5102	20.7905
839000000.0000	54.4385	20.7784
839800000.0000	54.4889	20.7946
840600000.0000	54.4458	20.7503
841400000.0000	54.4887	20.6985
842200000.0000	54.4392	20.7830
843000000.0000	54.4319	20.7208
843800000.0000	54.4287	20.7371
844600000.0000	54.4143	20.6875
845400000.0000	54.4987	20.7353
846200000.0000	54.4346	20.7110
847000000.0000	54.4243	20.7131
847800000.0000	54.3608	20.7421
848600000.0000	54.4155	20.6531
849400000.0000	54.4162	20.6852
850200000.0000	54.3814	20.7265
851000000.0000	54.3889	20.7195
851800000.0000	54.3924	20.6611
852600000.0000	54.3555	20.6457
853400000.0000	54.3111	20.5632
854200000.0000	54.3292	20.5508
855000000.0000	54.3488	20.5244

$\sigma = \omega\, \varepsilon_o\, \varepsilon'' = 2\, \pi f\, \varepsilon_o\, \varepsilon''=0.97$

where $f = 835 \times 10^6$

$\varepsilon_o = 8.854 \times 10^{-12}$

$\varepsilon'' = 20.8001$

SONY, 835MHz Head Liquid Validation, 2003-09-18

frequency	e'	e''
815000000.0000	41.0780	18.9676
815800000.0000	41.0736	18.9351
816600000.0000	41.0628	18.8969
817400000.0000	41.1056	18.8587
818200000.0000	41.0709	18.8545
819000000.0000	41.0392	18.8368
819800000.0000	41.0497	18.8645
820600000.0000	41.0770	18.8611
821400000.0000	41.0746	18.8978
822200000.0000	41.0726	18.8399
823000000.0000	41.0583	18.8772
823800000.0000	41.0210	18.8658
824600000.0000	41.0278	18.8621
825400000.0000	40.9877	18.8642
826200000.0000	40.9674	18.8751
827000000.0000	41.0053	18.8674
827800000.0000	41.0123	18.9167
828600000.0000	41.0241	18.8211
829400000.0000	41.0164	18.8638
830200000.0000	40.9972	18.8457
831000000.0000	40.9836	18.8418
831800000.0000	40.9826	18.8492
832600000.0000	40.9951	18.8391
833400000.0000	40.9414	18.8468
834200000.0000	40.9467	18.8598
835000000.0000	40.9309	18.8811
835800000.0000	40.9757	18.8706
836600000.0000	40.9836	18.9313
837400000.0000	40.9473	18.8795
838200000.0000	40.9332	18.8839
839000000.0000	40.9039	18.8700
839800000.0000	40.9273	18.9082
840600000.0000	40.8493	18.8731
841400000.0000	40.9135	18.8709
842200000.0000	40.8743	18.8933
843000000.0000	40.9253	18.8882
843800000.0000	40.9378	18.8781
844600000.0000	40.8661	18.9093
845400000.0000	40.9010	18.8944
846200000.0000	40.8838	18.8598
847000000.0000	40.8969	18.9219
847800000.0000	40.9289	18.9201
848600000.0000	40.8355	18.8957
849400000.0000	40.8266	18.9222
850200000.0000	40.8808	18.9156
851000000.0000	40.8326	18.9136
851800000.0000	40.8445	18.9317
852600000.0000	40.8592	18.9367
853400000.0000	40.8795	18.9355
854200000.0000	40.8308	18.9218
855000000.0000	40.8214	18.9164

$\sigma = \omega\, \varepsilon_o\, \varepsilon'' = 2\, \pi f\, \varepsilon_o\, \varepsilon''=0.88$

where $f = 835x\ 10^6$

$\varepsilon_o = 8.854\ x\ 10^{-12}$

$\varepsilon'' = 18.8811$

SONY, 835MHz Body Liquid Validation, 2003-09-18

frequency	e'	e''
815000000.0000	54.3061	20.8497
815800000.0000	54.3116	20.8030
816600000.0000	54.2732	20.7595
817400000.0000	54.3112	20.7514
818200000.0000	54.2892	20.7137
819000000.0000	54.2811	20.7690
819800000.0000	54.3060	20.7900
820600000.0000	54.3291	20.8254
821400000.0000	54.3800	20.7700
822200000.0000	54.3994	20.8344
823000000.0000	54.4283	20.7987
823800000.0000	54.3841	20.8536
824600000.0000	54.4926	20.8963
825400000.0000	54.4798	20.8405
826200000.0000	54.4327	20.7520
827000000.0000	54.4704	20.7798
827800000.0000	54.4774	20.7821
828600000.0000	54.5006	20.8170
829400000.0000	54.4751	20.7722
830200000.0000	54.4876	20.7582
831000000.0000	54.4261	20.7495
831800000.0000	54.4134	20.7391
832600000.0000	54.3916	20.7468
833400000.0000	54.3412	20.7058
834200000.0000	54.3664	20.7440
835000000.0000	54.4239	20.7030
835800000.0000	54.3772	20.7412
836600000.0000	54.3592	20.6932
837400000.0000	54.4456	20.7813
838200000.0000	54.4418	20.7082
839000000.0000	54.4133	20.7104
839800000.0000	54.3167	20.7020
840600000.0000	54.3419	20.6862
841400000.0000	54.3492	20.6883
842200000.0000	54.3350	20.6476
843000000.0000	54.3030	20.6071
843800000.0000	54.3141	20.6341
844600000.0000	54.3250	20.6344
845400000.0000	54.3432	20.6489
846200000.0000	54.3148	20.6156
847000000.0000	54.2708	20.6215
847800000.0000	54.2708	20.5649
848600000.0000	54.2482	20.5689
849400000.0000	54.2400	20.6101
850200000.0000	54.2210	20.6123
851000000.0000	54.2281	20.5523
851800000.0000	54.1793	20.5742
852600000.0000	54.1850	20.5639
853400000.0000	54.0948	20.4695
854200000.0000	54.1058	20.4433
855000000.0000	54.1274	20.4117

$\sigma = \omega \varepsilon_o \varepsilon'' = 2 \pi f \varepsilon_o \varepsilon''=0.96$

where $f = 835x\ 10^6$

$\varepsilon_o = 8.854 \times 10^{-12}$

$\varepsilon'' = 20.7030$

3 - EUT DESCRIPTION

Applicant:	MAXON ELECTRONICS AUSTRALIA PTY. LTD.
Product Description:	CDMA 1X Network Card
Product Model Number:	MM-5100P
FCC ID:	Q2FMM-5100P
Serial Number:	None
Maximum RF Output Power:	24.83dBm
RF Exposure environment:	General Population/Uncontrolled
Applicable Standard	FCC CFR 47, Part 22
Application Type:	Certification

The EUT was tested with 3 host Laptop PC separately. They are Dell, IBM and Sony. And the laptop PC systems were fed by the their own AC power adapters respectively.

** The test data gathered are from typical production samples provided by the manufacturer.*

4 - SYSTEM TEST CONFIGURATION

4.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

4.2 EUT Exercise Procedure

The EUT exercising program used during SAR testing was designed to exercise the various system components in a manner similar to a typical use.

4.3 Equipment Modifications

No modification(s) were made to ensure that the EUT complies with the applicable limits.

5 – CONDUCTED OUTPUT POWER MEASUREMENTS

5.1 Provision Applicable

According to FCC §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

5.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

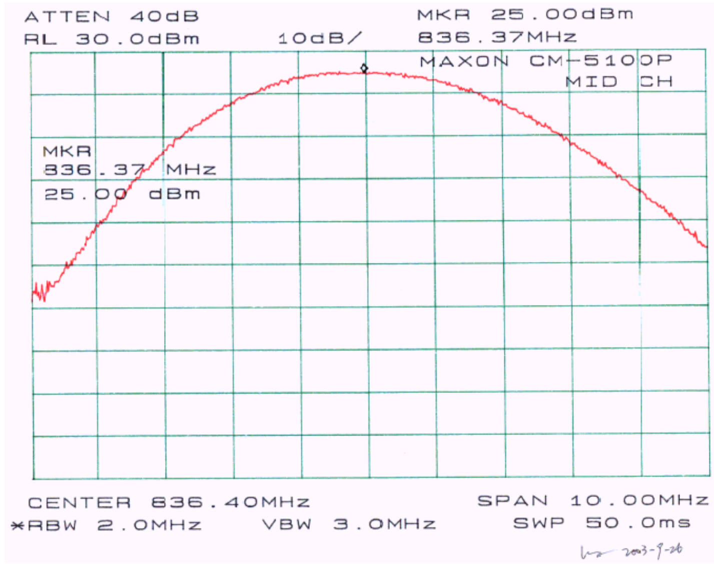
5.3 Test equipment

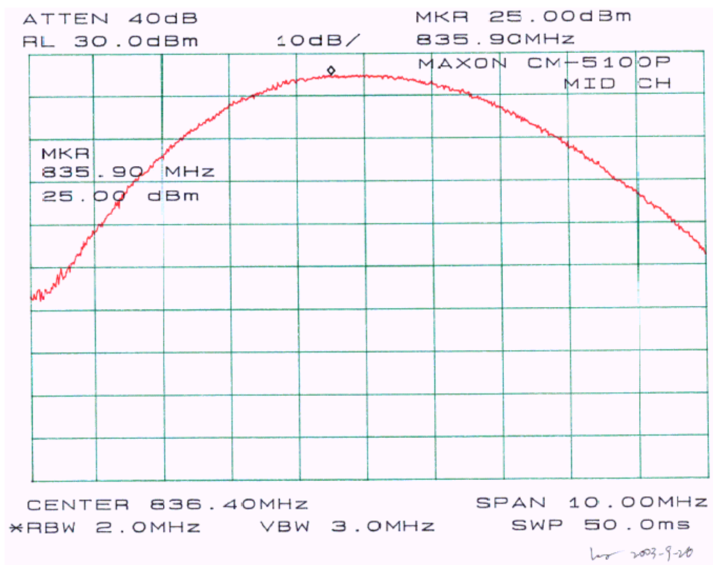
Hewlett Packard HP8564E Spectrum Analyzer, Calibration Due Date: 2004-08-01.
Hewlett Packard HP 7470A Plotter, Calibration not required.
A.H. Systems SAS200 Horn Antenna, Calibration Due Date: 2004-05-31
Com-Power AB-100 Dipole Antenna, Calibration Due Date: 2004-09-05

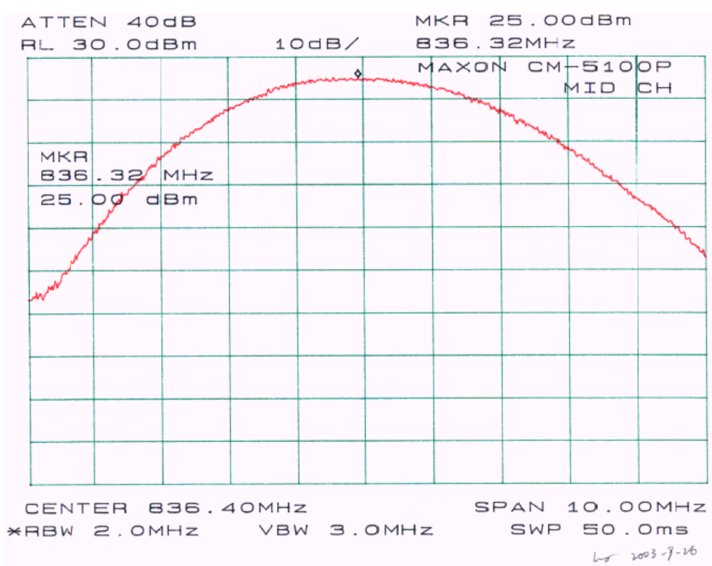
5.4 Test Results

Channel	Output Power in dBm	Output Power in W	Limit in W
836.37	25.00	0.316	7
835.90	25.00	0.316	7
836.32	25.00	0.316	7

Please refer to the following plots.


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 25.00dBm
836.37MHz
MAXON CM-5100P
MID CH
MKR
836.37 MHz
25.00 dBm
CENTER 836.40MHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 25.00dBm
835.90MHz
MAXON CM-5100P
MID CH
MKR
835.90 MHz
25.00 dBm
CENTER 836.40MHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 25.00dBm
836.32MHz
MAXON CM-5100P
MID CH
MKR
836.32 MHz
25.00 dBm
CENTER 836.40MHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms

6 - DOSIMETRIC ASSESSMENT SETUP

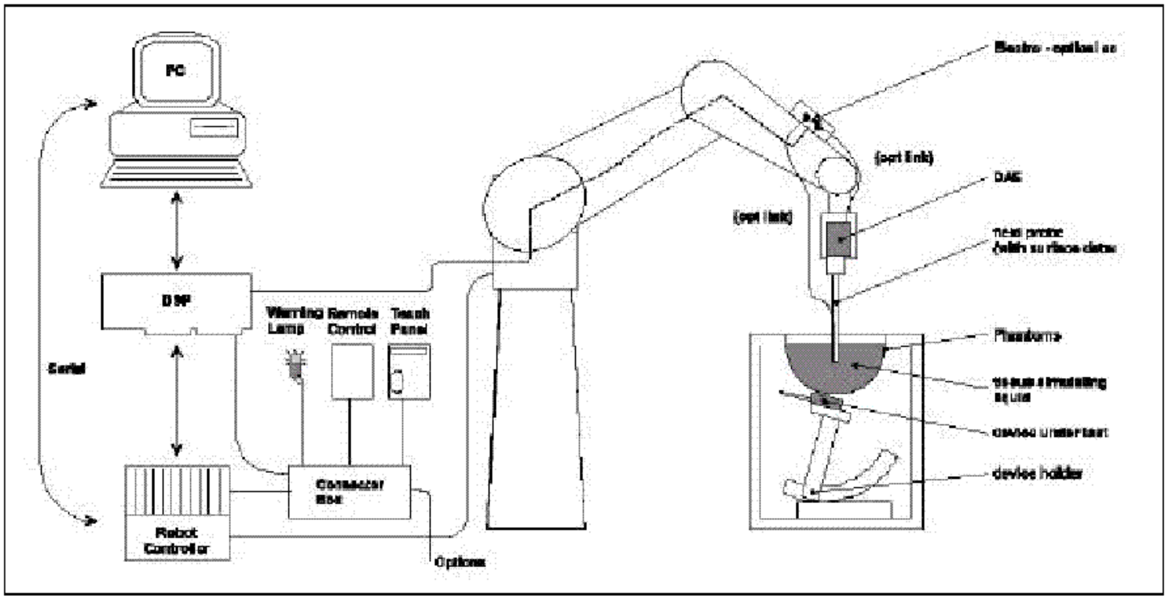
These measurements were performed with the automated near-field scanning system DASY3 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than ±0.02mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The system is described in detail in [3].

The SAR measurements were conducted with the dosimetric probe ET3DV6 SN: 1604 (manufactured by SPEAG), designed in the classical triangular configuration [3] and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [7] with accuracy of better than ±10%. The spherical isotropy was evaluated with the procedure described in [8] and found to be better than ±0.25dB.

The phantom used was the \Generic Twin Phantom” described in [4]. The ear was simulated as a spacer of 4 mm thickness between the earpiece of the phone and the tissue simulating liquid. The Tissue simulation liquid used for each test is in according with the FCC OET65 supplement C as listed below.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (Nacl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.5	56.7	41.5	55.2	41.5	55.0	40.0	53.3	39.2	52.7
Conductivity (s/m)	0.87	0.94	0.90	0.97	0.98	1.06	1.40	1.52	1.80	1.95

6.1 Measurement System Diagram

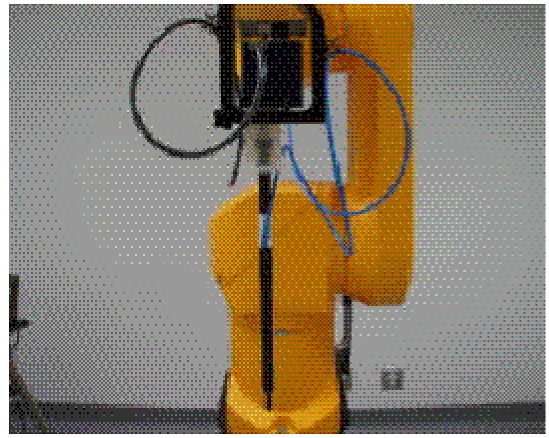


The DASY3 system for performing compliance tests consist of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
2. An arm extension for accommodating the data acquisition electronics (DAE).
3. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
4. A data acquisition electronic (DAE), which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
5. A unit to operate the optical surface detector, which is connected to the EOC. The Electro-optical coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the PC plug-in card. The functions of the PC plug-in card based on a DSP is to perform the time critical task such as signal filtering, surveillance of the robot operation fast movement interrupts.
6. A computer operating Windows 95 or larger
7. DASY3 software
8. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling testing left-hand and right-hand usage.
10. The device holder for handheld EUT.
11. Tissue simulating liquid mixed according to the given recipes (see Application Note).
12. System validation dipoles to validate the proper functioning of the system.

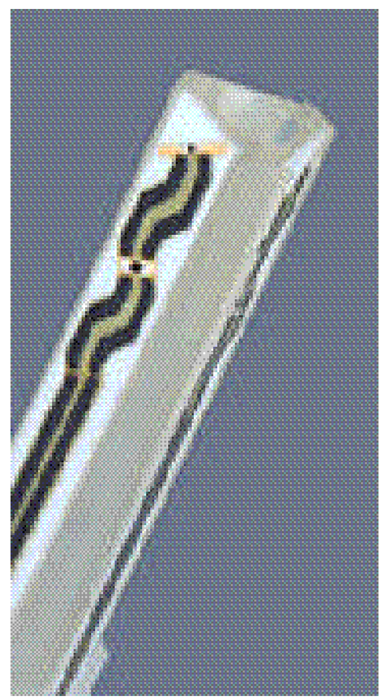
6.2. System Components

ET3DV6 Probe Specification
Construction Symmetrical design with triangular core
Built-in optical fiber for surface detection System
Built-in shielding against static charges
Calibration In air from 10 MHz to 2.5 GHz
In brain and muscle simulating tissue at
Frequencies of 450 MHz, 900 MHz and
1.8 GHz (accuracy ± 8%)
Frequency 10 MHz to > 6 GHz; Linearity: ± 0.2 dB
(30 MHz to 3 GHz)
Directivity ± 0.2 dB in brain tissue (rotation around
probe axis)
± 0.4 dB in brain tissue (rotation normal probe axis)
Dynamic 5 mW/g to > 100 mW/g;
Range Linearity: ± 0.2 dB
Surface ± 0.2 mm repeatability in air and clear liquids
Detection over diffuse reflecting surfaces.
Dimensions Overall length: 330 mm
Tip length: 16 mm
Body diameter: 12 mm
Tip diameter: 6.8 mm
Distance from probe tip to dipole centers: 2.7 mm
Application General dosimetric up to 3 GHz
Compliance tests of mobile phones
Fast automatic scanning in arbitrary phantoms



Photograph of the probe

The SAR measurements were conducted with the dosimetric probe ET3DV6 designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY3 software reads the reflection during a software approach and looks for the maximum using a 2 nd order fitting. The approach is stopped when reaching the maximum.



Inside view of ET3DV6 E-field Probe

E-Field Probe Calibration Process

Each probe is calibrated according to a dosimetric assessment procedure described in [6] with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in [7] and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a waveguide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

Data Evaluation

The DASY3 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe Parameter:	-Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	-Conversion Factor	ConvFi
	-Diode compression point	Dcp_i
Device parameter:	-Frequency	f
	-Crest Factor	cf
Media parameter:	-Conductivity	σ
	-Density	ρ

These parameters must be set correctly in the software. They can either be found in the component documents or be imported into the software from the configuration files issued for the DASY3 components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$Vi = Ui + (Ui)^2 \, cf / dcp_i$$

With Vi = compensated signal of channel i (i =x, y, z)
Ui = input signal of channel i (i =x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes: $$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes: $$H_i = \sqrt{Vi} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

With Vi = compensated signal of channel i (i =x, y, z)
$Norm_i$ = sensor sensitivity of channel i (i =x, y, z)
μV/ $(V/m)^2$ for E-field probes
ConF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strenggy of channel i in V/m
H_i = diode compression point (DASY parameter)

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \text{Square Root } [(E_x)^2 + (E_y)^2 + (E_z)^2]$$

The primary field data are used to calculate the derived field units.

$$SAR = (E_{tot})^2 \cdot \sigma / (\rho \cdot 1000)$$

With SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

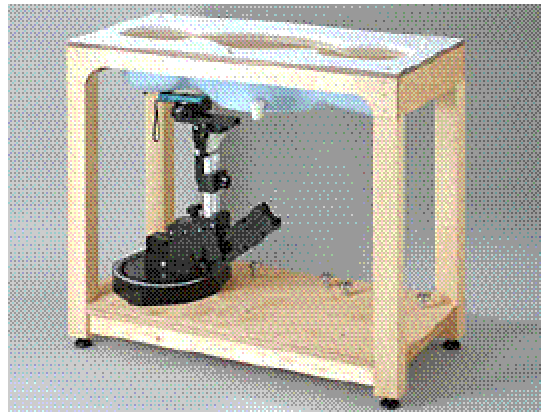
The power flow density is calculated assuming the excitation field as a free space field.

$$P_{pwe} = (E_{tot})^2 / 3770 \text{ or } P_{pwe} = (H_{tot})2 \cdot 37.7$$

With P_{pwe} = equivalent power density of a plane wave in mW/cm3
E_{tot} = total electric filed strength in V/m
H_{tot} = total magnetic filed strength in V/m

Generic Twin Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users [9][10]. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allows the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.
Shell Thickness 2 ± 0.1 mm
Filling Volume Approx. 20 liters
Dimensions 810 x 1000 x 500 mm (H x L x W)

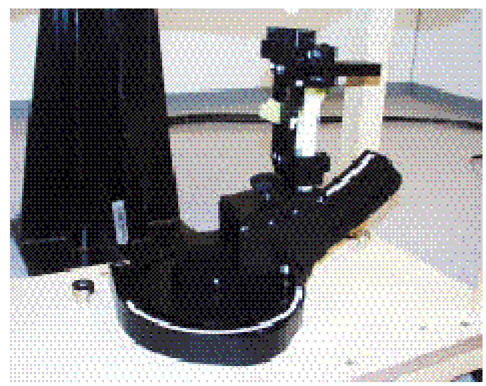


Generic Twin Phantom

Device Holder

In combination with the Generic Twin Phantom V3.0, the Mounting Device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

* Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations [10]. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.



Device Holder

6.3 Measurement Uncertainty

The uncertainty budget has been determined for the DASY3 measurement system according to the NIS81 [13] and the NIST1297 [14] documents and is given in the following Table.

Measurement Uncertainty Analysis per IEEE P1528-2002								
Description	Section	Reported Variance (%)	Probability Distribution type	Divisor	Ci (1g)	Ui (1g)	Vi	welc/satt series term
Probe Calibration	E.2.1	4.80	N	1	1	4.80	1.00E+09	5.30842E-07
Axial isotropy	E.2.2	4.70	R	1.732	0.707107	1.92	1.00E+09	1.35563E-08
Hemispherical isotropy	E.2.2	9.60	R	1.732	0.707107	3.92	1.00E+09	2.35957E-07
Boundary effects	E.2.3	8.30	R	1.732	1	4.79	1.00E+09	5.27377E-07
Linearity	E.2.4	4.70	R	1.732	1	2.71	1.00E+09	5.4225E-08
System Detection Limit	E.2.5	1.00	R	1.732	1	0.58	1.00E+09	1.11124E-10
Readout Electronics	E.2.6	0.00	N	1	1	0.00	1.00E+09	0
Response time	E.2.7	0.00	R	1.732	1	0.00	1.00E+09	0
Integration time	E.2.8	0.00	R	1.732	1	0.00	1.00E+09	0
RF Ambient conditions	E.6.1	3.00	R	1.732	1	1.73	1.00E+09	9.00106E-09
Probe positioning mechanical tolerance	E.6.2	0.40	R	1.732	1	0.23	1.00E+09	2.84478E-12
Probe positioning wrt phantom shell	E.6.3	2.90	R	1.732	1	1.67	1.00E+09	7.8596E-09
Extra/inter-polation & integration algorithmsfor max SAR evaluation	E.5.2	3.90	R	1.732	1	2.25	1.00E+09	2.57079E-08
Test sample positioning	8, E.4.2	6.00	R	1.732	1	3.46	1.00E+09	1.44017E-07
Device holder distance tolerance	E.4.1	5.00	N	1	1	5.00	1.00E+09	0.000000625
Output power and SAR drift measurement	8, E.6.6.2	5.00	R	1.732	1	2.89	1.00E+09	6.94526E-08
Phantom uncertainty, shell thickness tolerance	E.3.1	4.00	R	1.732	1	2.31	1.00E+09	2.84478E-08
Liquid conductivity, deviation from target values	E.3.2	5.00	R	1.732	0.64	1.85	1.00E+09	1.16522E-08
Liquid conductivity, measurement uncertainty	E.3.3	5.00	N	1	0.64	3.20	5	20.97152
Liquid permitivity, deviation from target values	E.3.2	5.00	R	1.732	0.6	1.73	1.00E+09	9.00106E-09
Liquid permitivity, measurement uncertainty	E.3.3	5.00	N	1	0.6	3.00	5	16.2
								689
Probe isotropy sensitivity coefficient	**0.5**							
Combined Standard Uncertainty						**12.65**	**%**	
Expanded Uncertainty, 95% confidence		**k=**	**2.004**			**25.34**	**%**	