Sony Ericsson

Company Internal
REPORT

Prepared (also subject responsible if other)		No.		
LD/SEMC/BGGI/NM *Hamid Kami Shirazi*		*BGGIN05:030*		
Approved	Checked	Date	Rev	Reference
LD/SEMC/BGGI/NM *Ramadan Plicanic*	*050201*	*050128*	A	File

Report issued by Accredited SAR Laboratory

for

PY7A102101B

Date of test: *24 and 27 January , 2005*

Laboratory:
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Statement of Compliance
Sony Ericsson Mobile Communications AB declares under its sole responsibility that the product

Sony Ericsson AAB-101012-BV; FCC ID:PY7A 102101B

to which this declaration relates, is in conformity with the appropriate RF exposure standards recommendations and guidelines. It also declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:
(None)

This laboratory is accredited to ISO/IEC 17025 (SWEDAC accreditation no. 1847).

Laboratories are accredited by the Swedish Board for Accreditation and Conformity Assessment (SWEDAC) under the terms of Swedish legislation. The accredited laboratory activities meet the requirements in SS-EN ISO/IEC 17025 (2000). This report may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.
The results and statements contained herein relate only to the items tested. The names of individuals involved may be mentioned only in connection with the statements or results from this report.

Sony Ericsson encourages all feedback, both positive and negative, on this report.
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2 Introduction

In this test report, compliance of the Sony Ericsson PY7A102101B portable telephone with RF safety guidelines is demonstrated. The applicable RF safety guidelines and the SAR measurement specifications used for the test are described in the *SAR Measurement Specifications of Wireless Handsets* [1].

3 Device Under Test

3.1 Antenna Description

Type	Built In	
Location	Up on the back	
Dimensions	Max length	33 mm
	Max width	22 mm
Configuration	PIFA	

3.2 Device description

Device model	PY7A102101B
Serial number	T26000YUB6
Mode	GSM1900
Multiple Access Scheme	TDMA
Maximum Output Power Setting	28.5
Factory Tolerance in Power Setting	0.5
Maximum Peak Output Power	29
Crest Factor	8
Transmitting Frequency Range(MHz)	1850 – 1910
Prototype or Production Unit	Preproduction
Device Category	Portable
RF exposure environment	General population / uncontrolled

4 Test equipment

4.1 Dosimetric system

SAR measurements were made using the DASY3 professional system (software version 3.1c) with SAM twin phantom, manufactured by Schmid & Partner Engineering AG (SPEAG). The list of calibrated equipment is given below.

Description	***Serial Number***	***Due Date***
DASY3 DAE V1	419	042005
E-field probe ETDV6	1585	032005
Dipole Validation Kit, D900V2	111	052005
Dipole Validation Kit, D1800V2	297	042005
Dipole Validation Kit, D1900V2	5d002	042005

4.2 Additional equipment

Description	***Inventory Number***	***Due Date***
Signal generator ESG-D4000A	INV 462935	092005
Directional coupler HP778D	INV 39656	012006
Power meter R&S NRVD	INV 483920	012006
Power sensor R&S NRV-Z5	INV 2333	012006
Power sensor R&S NRV-Z5	INV 2334	012006
Termination 65N50-0-11	INV 2903	072005
Network analyzer HP8753C	INV421671	092005
S-parameter test set HP85047A	INV 421670	082005
Dielectric probe kit HP8507D	INV 20000053	042005
Communication Test Set	INV20001078	092005

5 Electrical parameters on the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, ε_r, and the conductivity, σ, of the tissue simulating liquids were measured with the dielectric probe kit. These values are shown in the table below. The mass density, ρ, entered into the DASY3 software is also given. Recommended limits for permittivity ε_r, conductivity σ and mass density ρ are also shown.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ε_r	σ (S/m)	ρ (g/cm³)
1900	Head	Measured, 24/01/2005	39.3	1.47	1.00
		Recommended	40.0	1.40	1.00
1900	Body	Measured, 27/01/2005	52.7	1.58	1.00
		Recommended	53.3	1.52	1.00

6 System accuracy verification

A system accuracy verification of the DASY3 was performed using the dipole Validation kit listed in section 3.1. The system verification test was conducted on the same day as the measurement of the DUT. Measurement made in ambient temperature 22 °C and humanity 39%. The obtained results are displayed in the table below.

RF noise had been measured in liquid when all RF equipment in lab was set off. Measured value was 0.001mW/g in 1g mass.

f (MHz)	Tissue type	Measured / Reference	SAR (W/kg) 1g/10g	Dielectric Parameters			Liquid t(°C)
				ε_r	σ (S/m)	ρ (g/cm³)	
1900	Head	Measured, 24/01/2005	42.5/21.5	39.3	1.47	1.00	21
		Reference	41.6/21:5	38.8	1.44	1.00	-
1900	Body	Measured, 27/01/2005	43.7/22.5	52.7	1.58	1.00	21
		Reference	43.2/22.4	51.2	1.59	1.00	-

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7 SAR measurement uncertainty

SAR measurement uncertainty evaluation for Sonyericsson Txxx phone

Uncertainty Component	Uncer. (%)	Prob Dist.	Div.	C_i	GSM 1900 Head	GSM 1900 Body
Measurement System						
Probe Calibration	±4.4	N	1	1	±4.4	±4.4
Axial Isotropy	±4.7	R	√3	0.5	±1.4	±1.4
Spherical Isotropy	±9.6	R	√3	0.5	±2.8	±2.8
Spatial resolution	±0.0	R	√3	1	±0.0	±0.0
Boundary effect	±5.5	R	√3	1	±3.2	±3.2
Probe linearity	±4.7	R	√3	1	±2.7	±2.7
Detection limit	±1.0	R	√3	1	±0.6	±0.6
Readout electronics	±1.0	N	1	1	±1.0	±1.0
Response time	±0.8	R	√3	1	±0.5	±0.5
Integration time	±1.4	R	√3	1	±0.8	±0.8
RF Ambient Conditions	±3.0	R	√3	1	±1.7	±1.7
Mech. Constraints of robot	±0.4	R	√3	1	±0.2	±0.2
Probe positioning	±2.9	R	√3	1	±1.7	±1.7
Extrap, interpolation and integration	±3.9	R	√3	1	±2.3	±2.3
Measurement System Uncertainty					*±7.7*	*±7.7*
Test Sample Related						
Device positioning	±6.0	N	0.89	1	±6.7	±6.7
Device holder uncertainty	±5.0	N	0.84	1	±5.9	±5.9
Power drift	±3.5/1.2	R	√3	1	±2	±0.7
Test Sample Related Uncertainty					*±9.1*	*±9*
Phantom and Tissue Parameters						
Phantom uncertainty	±4.0	R	√3	1	±2.3	±2.3
Liquid conductivity (meas)	±(5.0/2.6)	R	√3	0.6	±2.9	±1.5
Liquid conductivity (target)	±5.0	R	√3	0.6	±1.7	±1.7
Liquid Permittivity (meas)	±(1.8/1.0)	R	√3	0.6	±1.0	±0.6
Liquid Permittivity (target)	±5.0	R	√3	0.6	±1.7	±1.7
Phantom and Tissue Parameters Uncertainty					*±4.4*	*±3.7*
Combined standard uncertainty					*±12.7*	*±12.4*
Extended standard uncertainty (k=2)					***±25.4***	***±24.8***

8 Test results

The measured 1-gram averaged SAR values of the device against the head are provided in Tables 1. The ambient humidity and temperature of test facility were 40±2% and 22±1 respectively. The depth of the head tissue simulating liquid was 15.8cm. A base station simulator was used to control the device during the SAR measurement. The phone was supplied with full-charged battery for each measurement.
For head measurement, the device was tested on the right-hand phantom (corresponding to the right side of the head) and the left-hand phantom in two phone position, cheek (touch) and tilt (cheek + 15deg). For all modes, the device was tested at the lowest, middle and highest frequencies in the transmit band. On position and frequency where it find max SAR values, was measured SAR with Portable hands free accessory HBH-60.

Mode	Chanel	Peak Output Power(dBm)	Phone Position	Liquid temp(°C)	SAR (W/kg) 1g mass	
					Right-hand	Left-hand
1900 GSM	512	28.9	Cheek	21/21.2	0.63	0.51
			Tilt	21.2/21.3	**0.78**	0.65
			Tilt	21.2/21.3	**0.80**	0.65
	661	29	Cheek	21/21.2	0.56	0.42
			Tilt	21.2/21.3	0.62	0.53
	810	29	Cheek	21/21.2	0.43	0.34
			Tilt	21.2/21.3	0.46	0.40

Table1: SAR measurement result for Sony Ericsson PY7A102101B telephone at highest possible output power. Measured against the head.

For body measurement, the device was tested in three different cases under flat phantom on 15mm distances between phone and phantom. In two cases phone was turn with back to the flat phantom and on frequency where it find max SAR values, was measured SAR value with a Portable hands free accessory HBH-60. In the third case phone was turned with front to the flat phantom. For all cases and phone position, the device was tested at lowest, middle and highest frequencies in the transmit band. The depth of the head tissue simulating liquid was 15.1cm. Results are provided in Table 2.

Mode	Chanel	Peak Output Power(dBm)	Phone Position	Liquid temp(°C)	SAR (W/kg)
					1g mass
1900 GSM	512	28.9	Back with HBH-60	21	**0.63**
			Back	21	0.59
			Front	21	0.12
	661	29	Back	21	0.51
			Front	21	0.11
	810	29	Back	21	0.40
			Front	21	0.09

Table2: SAR measurement result for Sony Ericsson PY7A102101B telephone at highest possible output power. Measured against the body.

9 References

[1] R.Plicanic, “SAR Measurement Specification of Wireless Handsets”, Sony Ericsson SAR Test Laboratory internal document GUG/N 03:141

[2] Basic standard for the Measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300MHz-3GHz), European Standard EN 50361, July 2001

[3] FCC, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radio Frequency Emissions,” Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01).

[4] IEEE, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques,” Std 1528-2003, June, 2003.

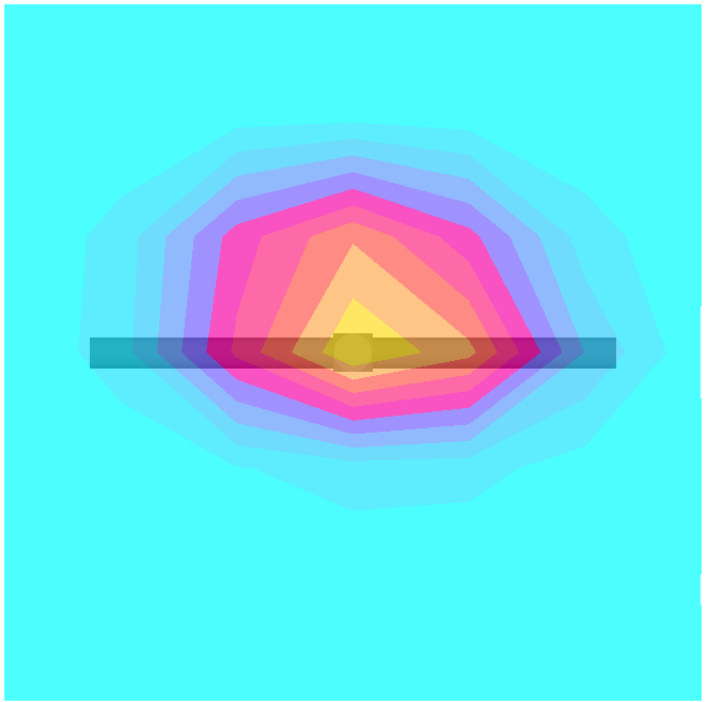
10 Appendix

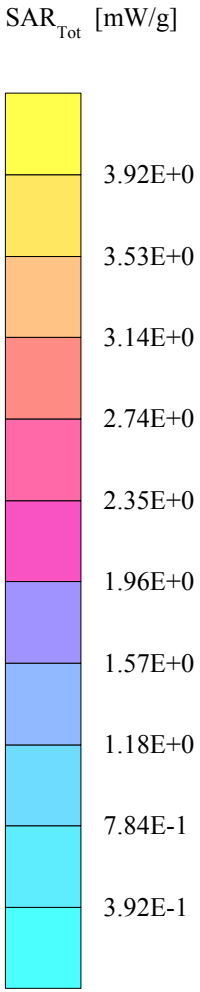
10.1 SAR distribution comparison for system accuracy verification

Validation Dipole , measured with head simulating tissue on *day/month/year*

Dipole 1900 MHz

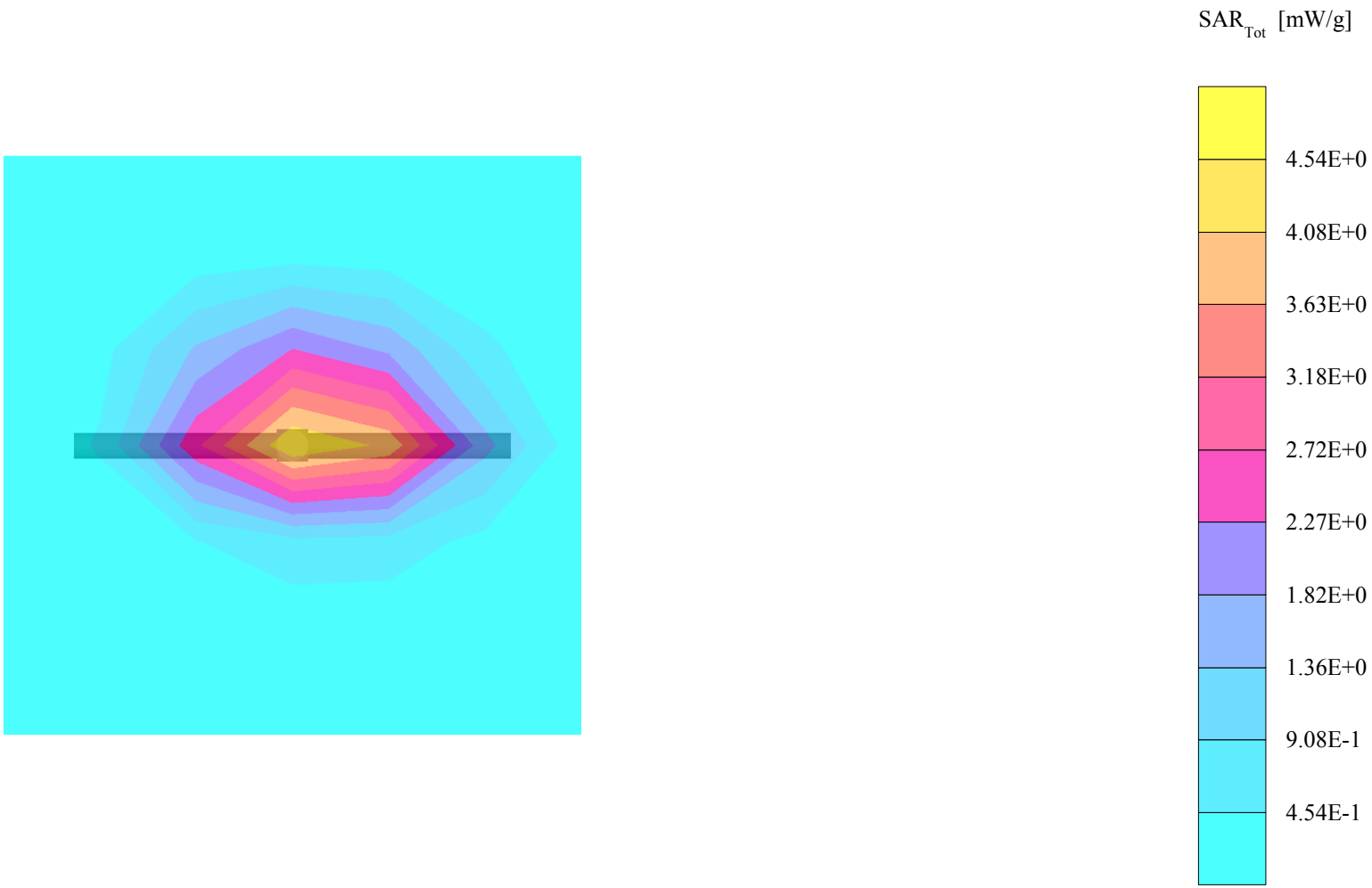
SAM 4 Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1585; ConvF(5.26,5.26,5.26); Crest factor: 1.0; Head 1900MHz: σ = 1.47 mho/m ε_r = 39.3 ρ = 1.00 g/cm^3
Cubes (2): SAR (1g): 4.25 mW/g ± 0.03 dB, SAR (10g): 2.15 mW/g ± 0.01 dB, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Powerdrift: 0.01 dB
P=100mW, d=10mm, 1900MHz dipol D1900V2 s/n 5d002
Target values: 1g mass 41.6 mW/g, 10g mass 21.5 mW/g
Measured values: 1g mass 42.5mW/g(+2.2%), 10g mass 21.5mW/g(+0%)
LIQUID'S Temprature 21C,Ambeint Temprature 21C ,humidity 42.%





Dipole 1900 MHz

SAM 4 Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1585; ConvF(4.56,4.56,4.56); Crest factor: 1.0; Muscle 1900: σ = 1.58 mho/m ε_r = 52.7 ρ = 1.00 g/cm^3
Cubes (2): SAR (1g): 4.37 mW/g ± 0.03 dB, SAR (10g): 2.25 mW/g ± 0.03 dB, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Powerdrift: -0.06 dB
P=100mW, d=10mm, 1900MHz dipol D1900V2 s/n 5d002
Target values: 1g mass 43.2mW/g, 10g mass 22.4 mW/g
Measured values: 1g mass 43.7mW/g(+1.5%), 10g mass 22.5mW/g(+0,5%)
BODY LIQUID'S Temprature 21C ; Room's Temprature 22

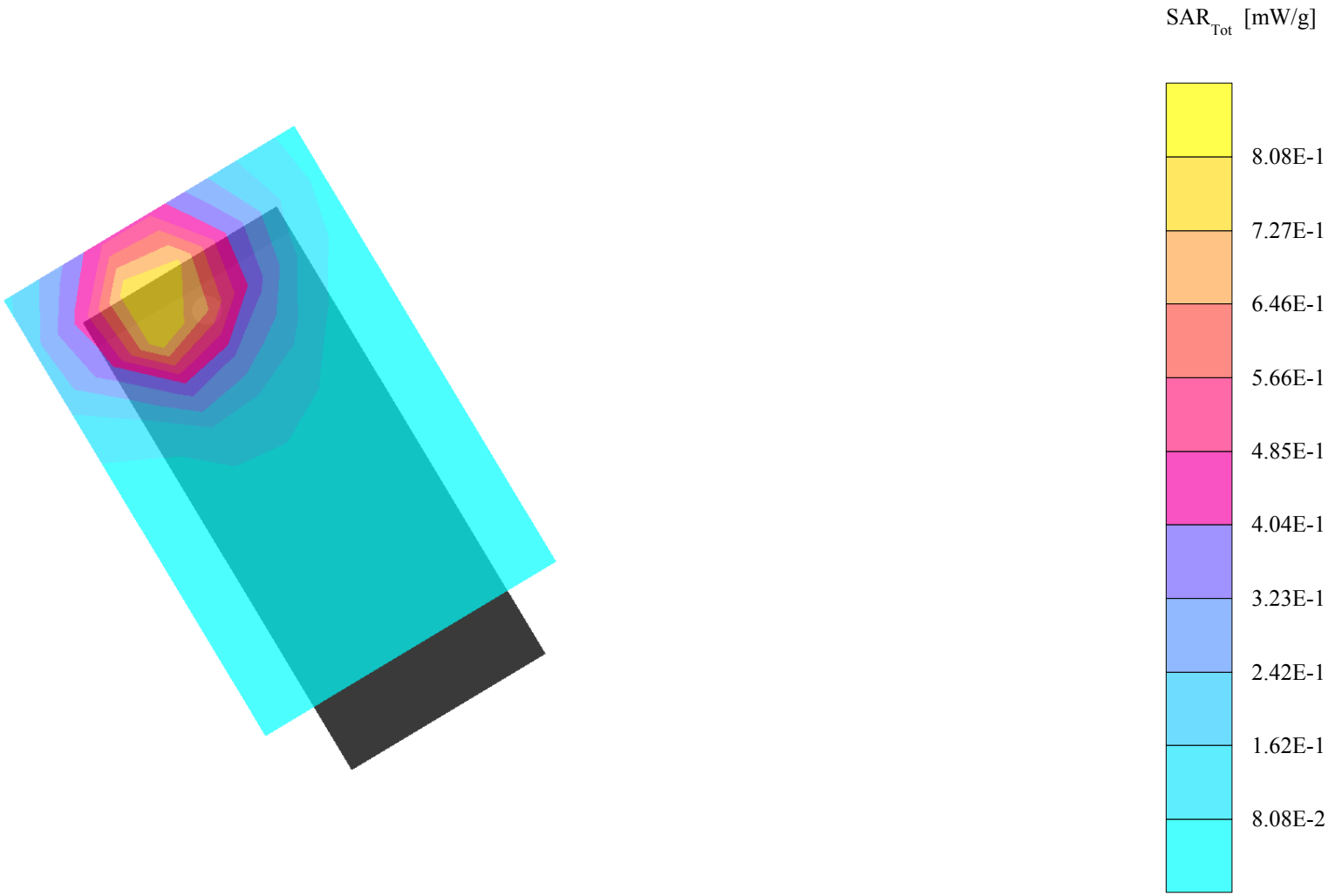


10.2 SAR distribution plot

Distribution of max SAR in GSM1900 mode at xxxxMHz. Measured against the head for cheek phone position

PY7A102101B

SAM 4 Phantom; Righ Hand Section; Position: (106°,301°); Frequency: 1850 MHz
Probe: ET3DV6 - SN1585; ConvF(5.26,5.26,5.26); Crest factor: 8.0; Head 1900MHz: σ = 1.47 mho/m ε_r = 39.3 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.785 mW/g, SAR (10g): 0.418 mW/g, (Worst-case extrapolation)
Coarse: Dx = 11.0, Dy = 11.0, Dz = 10.0
Powerdrift: -0.15 dB
PY7A102101B,s/nT26000YUB6 ;1850MHz(ch512), Tilt phone Position ;Right side phantom ,
(106°) Phone Position,Blue tooth headset HBH 60 is pared with the phone;
meas. Power=29dBm, Nom.Power=28,9dBm; 050124

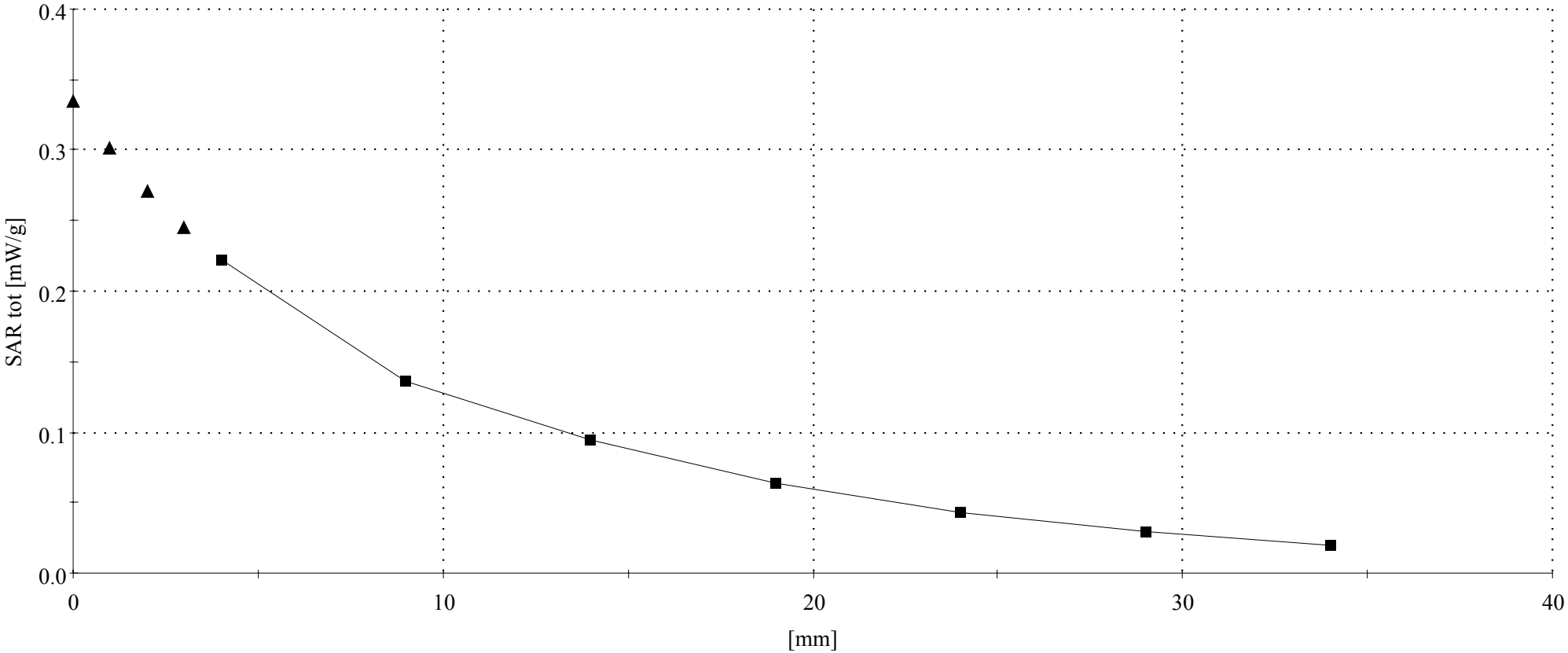


PY7A102101B

SAM 4 Phantom; Flat Section; Position: (270°,90°); Frequency: 1850 MHz
Probe: ET3DV6 - SN1585; ConvF(4.56,4.56,4.56); Crest factor: 8.0; Muscle 1900: σ = 1.58 mho/m ε_r = 52.7 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.620 mW/g, SAR (10g): 0.351 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

PY7A102101B,s/nT26000YUB6 ;1850MHz(ch512), back Side phone +15mm distance to phantom,Flat section of phantom ,(90°) Phone Position, meas. Power=29dBm, Nom.Power=28,9dBm; Bluetooth inconection with heddset HBH60 050127

Z(X)distribution of max SAR i GSM1900 Mode at CH512, Measured against the Body



PY7A102101B

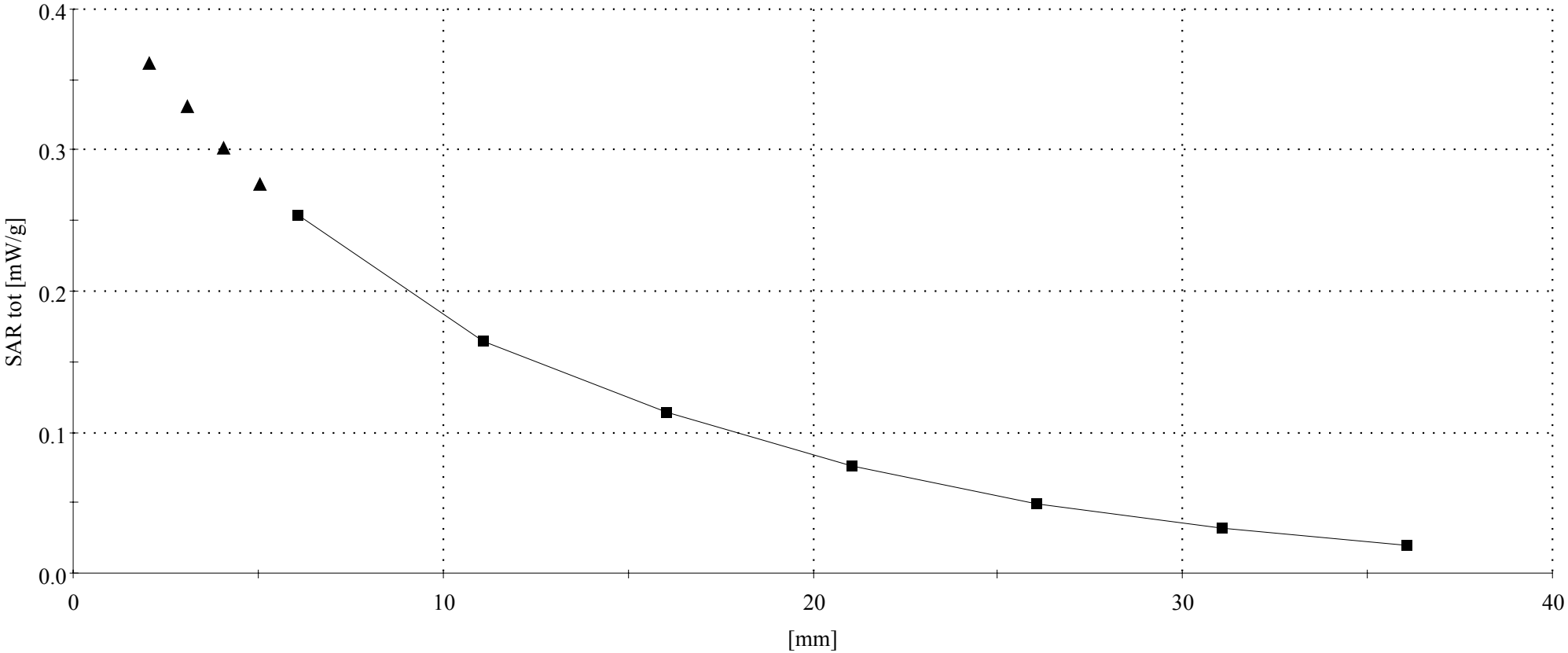
SAM 4 Phantom; Flat Section; Position: (270°,90°); Frequency: 1850 MHz
Probe: ET3DV6 - SN1585; ConvF(4.56,4.56,4.56); Crest factor: 8.0; Muscle 1900: σ = 1.58 mho/m ε_r = 52.7 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.620 mW/g, SAR (10g): 0.351 mW/g, (Worst-case extrapolation)
Coarse: Dx = 14.0, Dy = 14.0, Dz = 10.0
Powerdrift: -0.05 dB
PY7A102101B,s/nT26000YUB6 ;1850MHz(ch512), back Side phone +15mm distance to phantom,Flat section of phantom ,(90°) Phone Position, meas. Power=29dBm, Nom.Power=28,9dBm; Bluetooth inconection with heddset HBH60 050127

PY7A102101B

SAM 4 Phantom; Righ Hand Section; Position: (106°,301°); Frequency: 1850 MHz
Probe: ET3DV6 - SN1585; ConvF(5.26,5.26,5.26); Crest factor: 8.0; Head 1900MHz: σ = 1.47 mho/m ε_r = 39.3 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.785 mW/g, SAR (10g): 0.418 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

PY7A102101B,s/nT26000YUB6 ;1850MHz(ch512), Tilt phone Position ;Right side phantom ,
(106°) Phone Position,Blue tooth headset HBH 60 is pared with the phone;
meas. Power=29dBm, Nom.Power=28,9dBm; 050124

Z(X)distribution of max SAR i GSM1900 Mode at CH512, Measured against the Head position.



10.3 Photographs of the device under test

Front and Back sides

Down Connector

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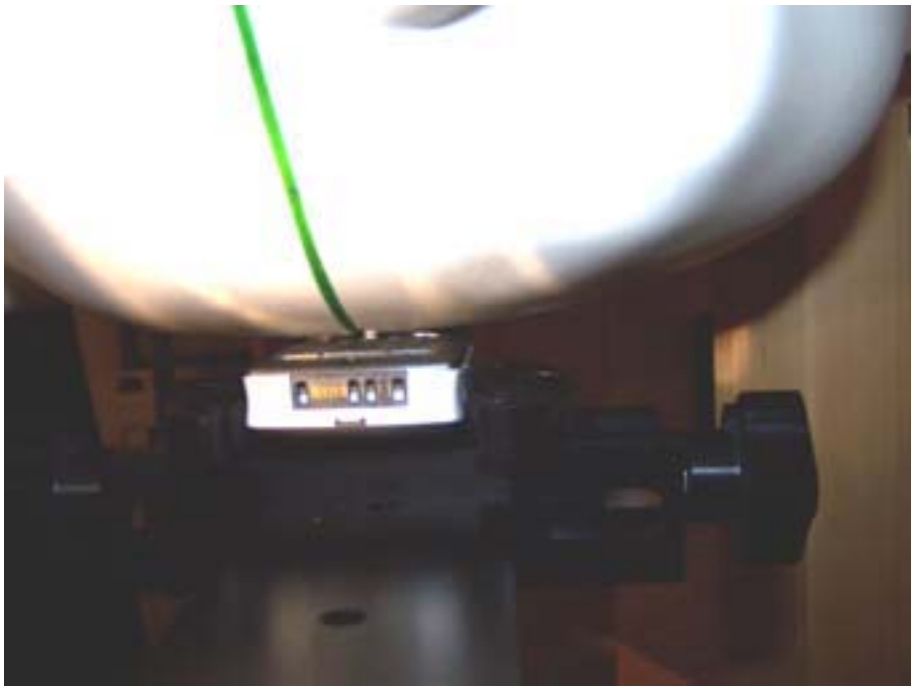
LD/SEMC/BGGI/NM	*Ramadan Plicanic*	*050201*	*050128*	A	File

Back side with battery

10.4 Device position on SAM Twins Phantom



Device position against the head: Cheek (touch) phone position

Device position against the head: Tilt (cheek+15deg) phone position

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Approved		Checked	Date	Rev	Reference
LD/SEMC/BGGI/NM	*Ramadan Plicanic*	*050201*	*050128*	A	File

Device position against the body: Phone with 15mm distance

10.5 Probe calibration parameters

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

Client **Sony Ericsson Lund**

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1585
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	March 18, 2004
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

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 (SPEAG, in house check Oct-03)	In house check: Oct 05
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 (SPEAG, in house check Oct-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	N. Vetter
Approved by:	Katja Pokovic	Laboratory Director	Pokovic Katja

Date issued: March 19, 2004

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.

Probe ET3DV6

SN:1585

Manufactured:	May 7, 2001
Last calibrated:	April 16, 2003
Recalibrated:	March 18, 2004

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1585

Sensitivity in Free Space

NormX	**1.84** $\mu V/(V/m)^2$	DCP X	**95**	mV
NormY	**1.71** $\mu V/(V/m)^2$	DCP Y	**95**	mV
NormZ	**1.90** $\mu V/(V/m)^2$	DCP Z	**95**	mV

Diode Compression[A]

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Plese see Page 7.

Boundary Effect

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

Sensor Cener to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	8.3	4.4
SAR_{be} [%]	With Correction Algorithm	0.0	0.2

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

Sensor to Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	12.1	8.2
SAR_{be} [%]	With Correction Algorithm	0.2	0.1

Sensor Offset

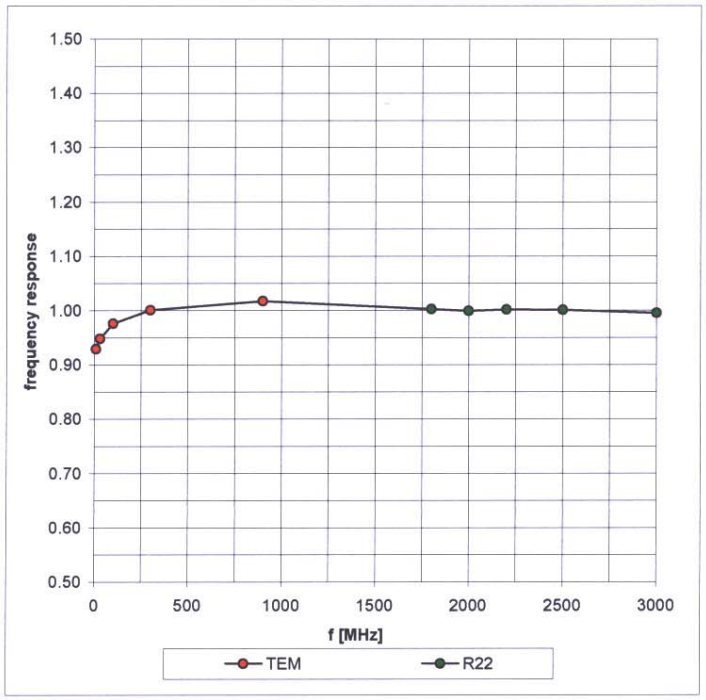
Probe Tip to Sensor Center	**2.7** mm
Optical Surface Detection	**in tolerance**

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

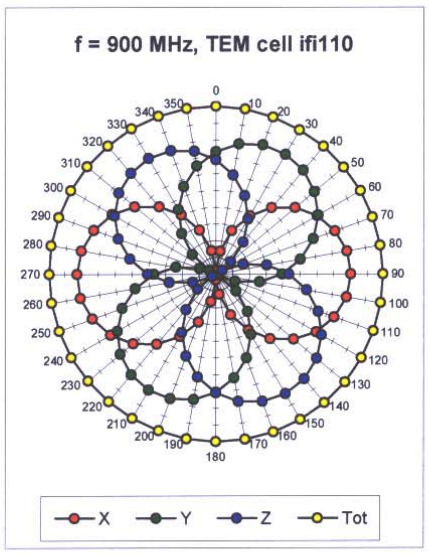
[A] numerical linearization parameter: uncertainty not required

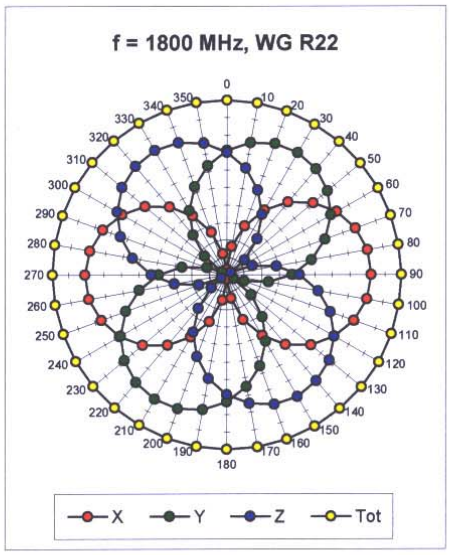
Frequency Response of E-Field

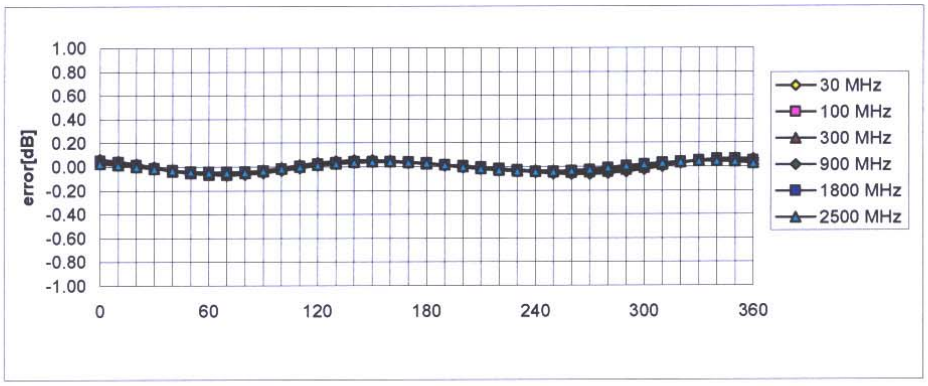
(TEM-Cell:ifi110, Waveguide R22)



Receiving Pattern (ϕ) , θ = 0°



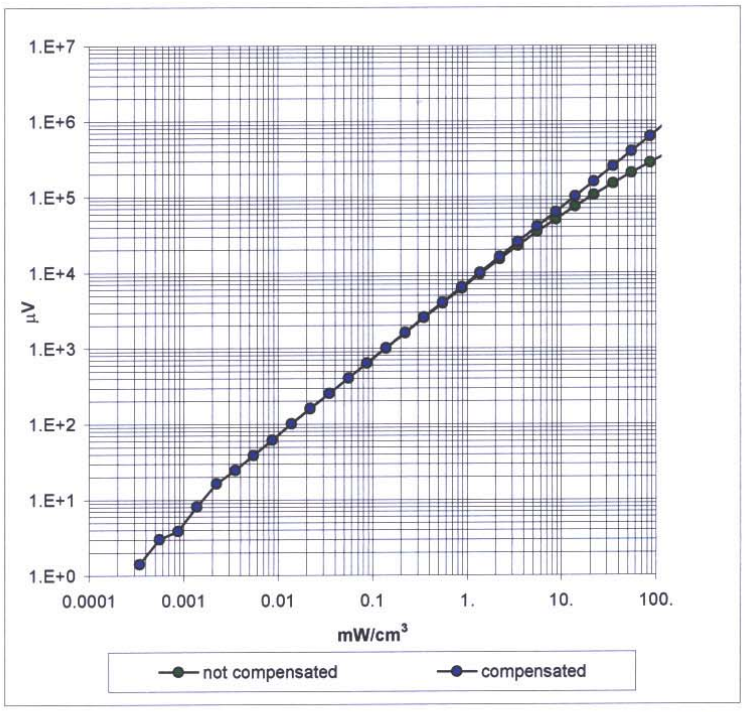


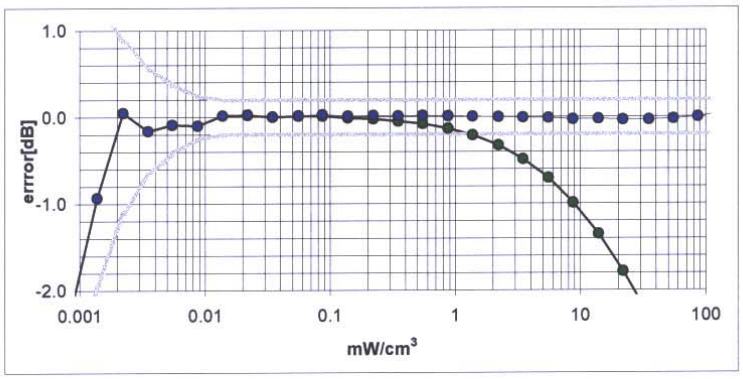


Axial Isotropy Error < ± 0.2 dB

Dynamic Range f(SAR_{head})

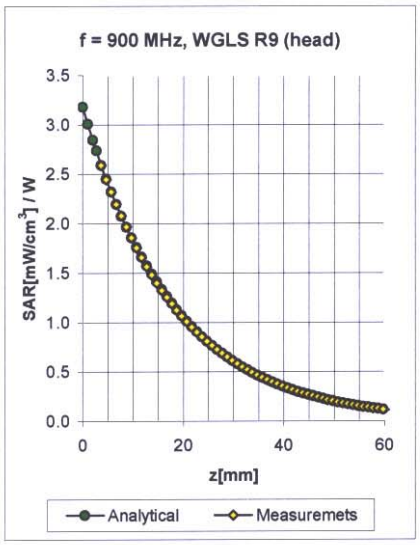
(Waveguide R22)

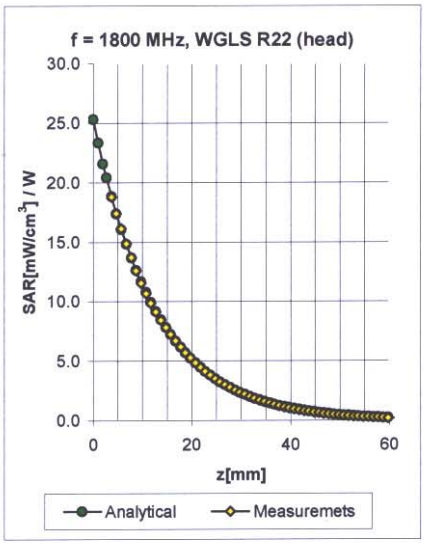




Probe Linearity < ± 0.2 dB

Conversion Factor Assessment



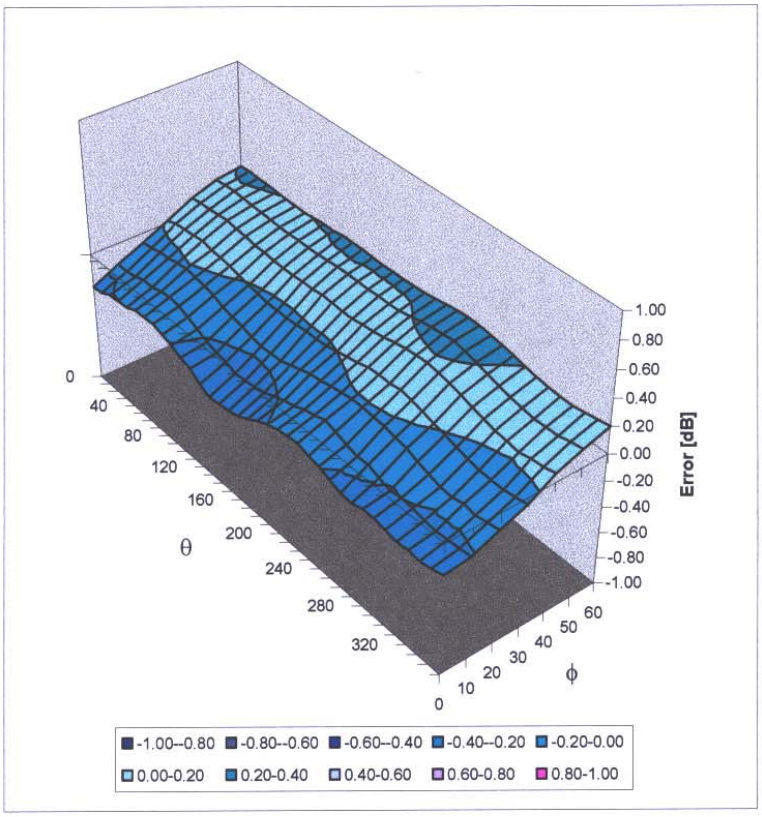


f [MHz]	Validity [MHz][B]	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	785-885	Head	41.5 ± 5%	0.90 ± 5%	0.43	2.18	6.91 ± 9.7% (k=2)
900	850-950	Head	41.5 ± 5%	0.97 ± 5%	0.58	1.83	6.67 ± 9.7% (k=2)
1750	1700-1800	Head	40.0 ± 5%	1.40 ± 5%	0.45	2.67	5.57 ± 9.7% (k=2)
1900	1850-1950	Head	40.0 ± 5%	1.40 ± 5%	0.45	2.94	5.26 ± 9.7% (k=2)
2000	1950-2050	Head	40.0 ± 5%	1.40 ± 5%	0.45	3.21	4.96 ± 9.7% (k=2)
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	0.80	2.03	4.74 ± 9.7% (k=2)
835	785-885	Body	55.2 ± 5%	0.97 ± 5%	0.46	2.10	6.58 ± 9.7% (k=2)
900	850-950	Body	55.0 ± 5%	1.05 ± 5%	0.81	1.51	6.38 ± 9.7% (k=2)
1750	1700-1800	Body	53.3 ± 5%	1.52 ± 5%	0.52	2.86	4.77 ± 9.7% (k=2)
1900	1850-1950	Body	53.3 ± 5%	1.52 ± 5%	0.56	2.88	4.56 ± 9.7% (k=2)
2000	1950-2050	Body	53.3 ± 5%	1.52 ± 5%	0.65	2.45	4.45 ± 9.7% (k=2)
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	1.01	1.60	4.36 ± 9.7% (k=2)

[B] The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



Spherical Isotropy Error < ± 0.4 dB