NOKIA

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01 May 2000

Federal Communications Commission,
Authorization & Evaluation Division,
7435 Oakland Mills Road,
Columbia, MD 21046

Attention: FCC Application Processing Branch
RE: FCC ID: GMLNSD-1AW
731 Confirmation number EA96445
Correspondence reference number: 12708 & 12927

Reply to Correspondence 12708 question #2

Nokia 5185 FCC ID: GMLNSD-1AW has a provision for body-worn operations with BCH-12U belt clip with either HDC-9 headset or LPS-1 loopset (for hearing impaired customers).
As two following tables indicate, Nokia 5185 complies with requirements addressing body-worn SAR. Full test report can be found attached to this document.

Body SAR Analog Mode AMPS

Meas #	Phone position	Frequency MHz/Channel	Power [dBm]	SAR (1g)[mW/g]
1	Body worn, BCH-12U Belt Clip against flat phantom	836/383	26.0	1.19
2	Body worn, Display against flat phantom	836/383	26.0	0.78
FCC ID: GMLNSD-1AW Calculated from measured values to match 26 dBm conducted P_{out}		FCC LIMIT		1.60 mW/g (ANSI/IEEE)

Body SAR Digital Mode PCS CDMA

Meas #	Phone position	Frequency MHz/Channel	Power [dBm]	SAR (1g)[mW/g]
1	Body worn, BCH-12U Belt Clip against flat phantom	1880/600	22.5	0.40
2	Body worn, Display against flat phantom	1880/600	22.5	1.02
FCC ID: GMLNSD-1AW Measured values with 22.5 dBm conducted P_{out}		FCC LIMIT		1.60 mW/g (ANSI/IEEE)

Nokia 5185 was also evaluated for SAR in user hand. As following two tables show, Nokia 5185 complies also with these requirements. Test report for hand SAR evaluation is attached to this document.

Hand SAR Analog Mode AMPS

	Position	Frequency MHz/Channel	Power [dBm]	Hand SAR (10g)[mW/g]
	Back side	836/383	26.0	0.86
FCC ID: GMLNSD-1AW Calculated from measured values to match 26 dBm conducted P_{out}		RECOMMENDED LIMIT		4.0 mW/g

Hand SAR Digital Mode PCS CDMA

	Position	Frequency MHz/Channel	Power [dBm]	Hand SAR (10g)[mW/g]
	Back side	1880/600	22.5	1.30
FCC ID: GMLNSD-1AW Measured values with 22.5 dBm conducted P_{out}		RECOMMENDED LIMIT		4.0 mW/g

A new User Manual page with body-worn operation advisory is attached to this document.

Reply to Correspondence 12708 question #3

Attached you can find requested updated info on e-probe calibration.

NOKIA MOBILE PHONES
Sami Savela

2000-4-27

Evaluation of SAR in Body Worn Configurations GMLNSD-1AW.

Introduction

Our approach was to measure the SAR, when phone is used with body worn accessories or is against the Flat Phantom. Body worn accessory BCH-12U (Picture 1) was tested. The measurement test equipment and setup was the same as used and referred in SAR TEST REPORT of NOKIA 5185.

Picture 1. Belt Clip BCH-12U.

Test method

Measurements were done with the Dasy 2 dosimetric assessment system DAE V2, SN: 213 and with the generic Twin Phantom version 3 from Schmid & Partner Engineering Ag. The phone was positioned in body worn accessory against Flat Phantom. Additionally, the device was positioned against the Flat Phantom i.e. display and keypad touching the phantom. The point of maximum SAR was searched. Then the SAR was measured with a 3-dimensional cube measurement. The maximum output power level in middle channel was used (836 MHz on AMPS mode and 1880 MHz on CDMA PCS mode). The method overestimates the SAR, because brain equivalent liquid was used and this has higher conductivity than tissues in the body.

Results

Graphical presentations of test positions with the highest SAR values are presented in the end of this report.

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Sami Savela

2000-4-27

Analog mode AMPS

meas. nr:	Phone position	Frequency MHz / channel	Power dBm	SAR (1g)[mW/g]
1	Body Worn, Belt Clip (BCH-12U) against Flat Phantom	836 / 383	24.7	0.88
2	Body Worn, Display against Flat Phantom	836 / 383	24.7	0.58
FCC ID: GMLNSD-1AW MEASURED: 2000-4-26/NMP		FCC limit		1.60[mW/g] (ANSI/IEEE)

Digital mode CDMA PCS

meas. nr:	Phone position	Frequency MHz / channel	Power dBm	SAR (1g)[mW/g]
3	Body Worn, Belt Clip (BCH-12U) against Flat Phantom	1880 / 600	22.5	0.40
4	Body Worn, Display against Flat Phantom	1880 / 600	22.5	1.02
FCC ID: GMLNSD-1AW MEASURED: 2000-4-26/NMP		FCC limit		1.60[mW/g] (ANSI/IEEE)

Summary

The SAR values found for the portable cellular phone (FCC ID: GMLNSD-1AW) are below the maximum recommended levels of 1.6 mW/g.

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2000-4-27

AM.MEA

σ = 0.80 [mho/m] ε_r = 43.2 ρ = 1.00 [g/cm^3]

Coarse Grid Dx = 15.0 Dy = 15.0 Dz = 5.0 [mm]

SAR [mW/g] Max: 0.90

SAR (1g): 0.883 [mW/g] SAR (10g): 0.620 [mW/g]

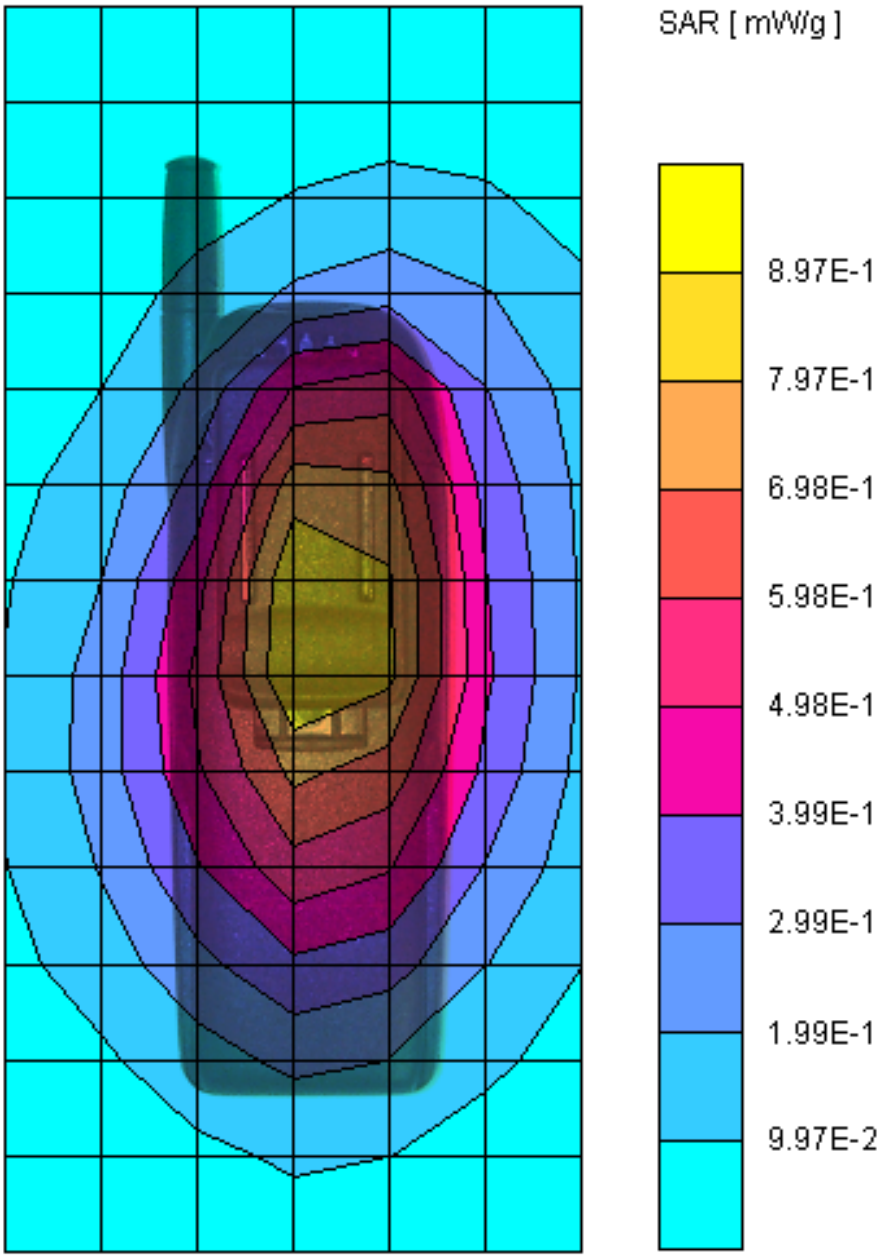

Figure 1. SAR-plot GMLNSD-1AW with Belt Clip BCH-12U

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2000-4-27

CD.MEA

σ = 1.75 [mho/m] ε_r = 41.5 ρ = 1.00 [g/cm^3]

Coarse Grid Dx = 15.0 Dy = 15.0 Dz = 5.0 [mm]

SAR [mW/g] Max: 1.12

SAR (1g): 1.02 [mW/g] SAR (10g): 0.575 [mW/g]

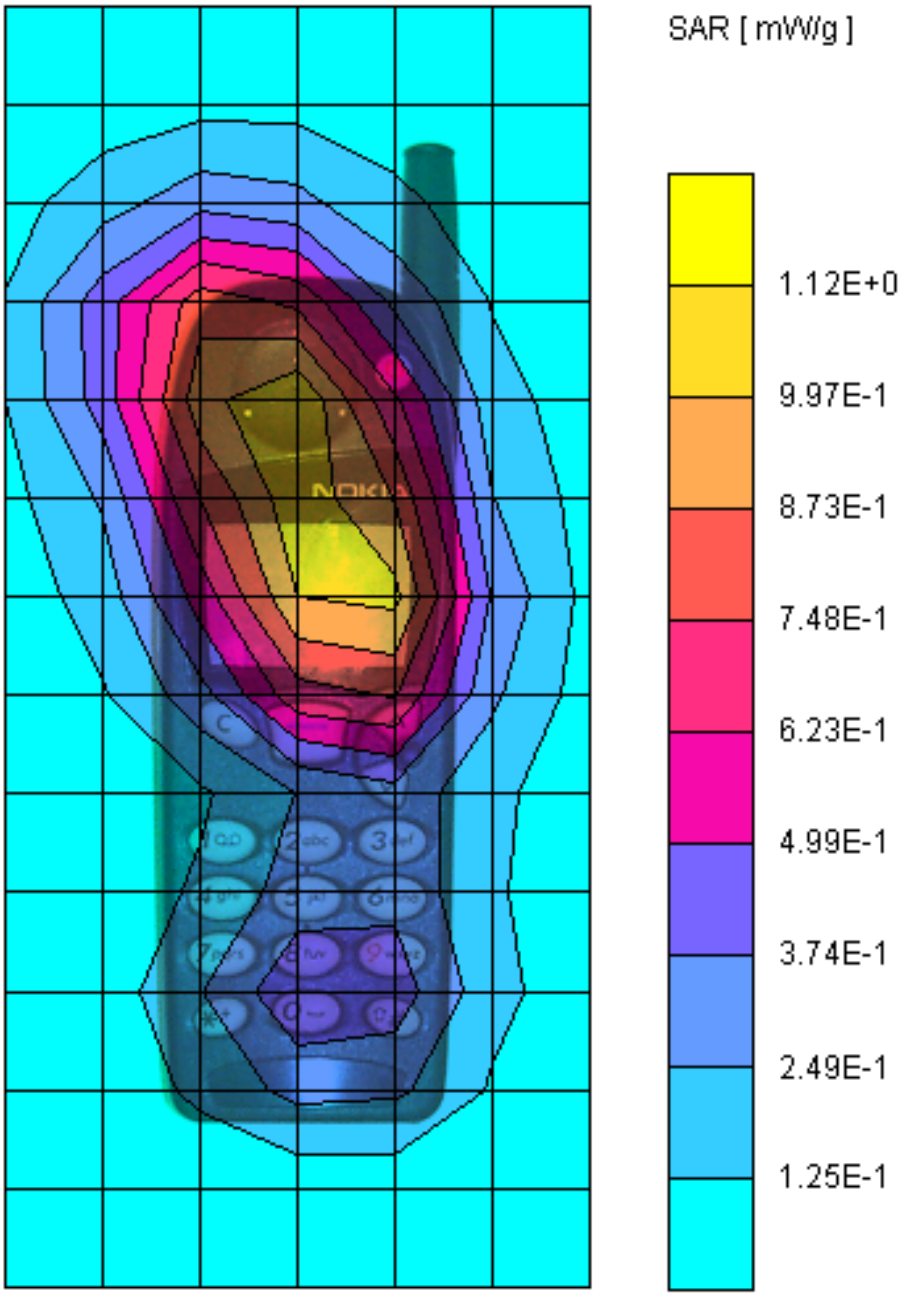

Figure 2. SAR-plot GMLNSD-1AW body worn

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2000-4-27

Evaluation of SAR in user hand for Nokia phone 5185.

FCC ID: GMLNSD-1AW.

Introduction

There is no internationally accepted method to measure the SAR-value in user hand, when the phone is used beside the head. The position of the hand is also difficult to determine. Our approach was to measure the maximum SAR, that can occur when hand covers the back of the phone. In practice the situation, however, is different, because the hand is touching the phone in many places and this can change the current distribution.

Test method

Measurements were done with the Dasy 2 dosimetric assessment system DAE V2, SN:213 and with the generic Twin Phantom version 3 from Schmid & Partner Engineering Ag. The phone was positioned back, i.e. antenna and battery, against the flat part of the phantom. The point of maximum SAR was searched. Then the SAR was measured in 10g mass. The maximum output power level was used. Middle channel on AMPS and TDMA PCS mode was used, because there was not big differencies between SAR-values of different channels originally measured with the head phantom.

The method overestimates the SAR: The whole back of the phone, including the antenna area, was scanned for the hand SAR evaluation, even though this is not consistent with the instructions in the user's guide to not touch the antenna unnecessarily. Brain equivalent liquid was used and this has higher conductivity than tissues in the hand. Furthermore a cube for 10g mass was used, which is difficult to realize in practice.

Results

Maximum SAR in hand in 10g mass

Nokia 5185 (NSD-1AW)

Back side (AMPS 836 MHz)	0.64 mW/g
Back side (CDMA 1880 MHz)	1.30 mW/g

Summary

The hand SAR values found for the portable cellular phone (FCC ID: GMLNSD-1AW) are below the maximum recommended levels of 4 mW/g.

Making an emergency call

1. If the phone is not on, switch it on.
2. Press and hold  for several seconds to ready the phone for calls.
3. Key in the emergency number for your present location (e.g. 911 or other official emergency number). Emergency numbers vary by location.
4. Press Call

If certain features are in use (Keyguard, call restrictions, etc.), you may first need to turn those features off before you can make an emergency call. Consult this document and your local cellular service provider.

When making an emergency call, remember to give all the necessary information as accurately as possible. Remember that your wireless phone may be the only means of communication at the scene of an accident - do not cut off the call until given permission to do so.

Radio frequency (RF) signals

Your wireless handheld portable telephone is a low power radio transmitter and receiver. When it is ON, it receives and also sends out radio frequency (RF) signals.

In August, 1996, the Federal Communications Commission (FCC) adopted RF exposure guidelines with safety levels for handheld wireless phones. Those guidelines are consistent with safety standards previously set by both U.S. and international standards bodies:

ANSI C95.1 (1992)*, NCRP Report 86 (1986)*, ICNIRP (1996)*.

Those standards were based on comprehensive and periodic evaluations of the relevant scientific literature. For example, over 120 scientists, engineers, and physicians from universities, government health agencies and industry reviewed the available body of research to develop the ANSI Standard (C95.1).

The design of your phone complies with the FCC guidelines (and those standards).

To maintain compliance with FCC RF exposure guidelines, use only Nokia approved accessories. When carrying the phone while it is on, place the phone in Nokia approved belt clip, carrying case or holster, or place the phone in a pocket so that the keypad faces your body.

**American National Standards Institute, National Council on Radiation Protection and Measurements; International Commission on Non-Ionizing Radiation Protection.*

Appendix 2

pages 1 - 8

PROBE ET3DV4 SN: 1105

Schmid & Partner
Engineering AG

Staffelstrasse 8, 8045 Zurich, Switzerland, Telefon +41 1 280 08 60, Fax +41 1 280 08 64

Probe ET3DV4

SN:1105

Manufactured: May 1995
Recalibrated: July 1999

Calibrated for System DASY2

DASY2 - Parameters of Probe: ET3DV4 SN:1105

Sensitivity in Free Space

NormX	**1.51** $\mu V/(V/m)^2$
NormY	**1.57** $\mu V/(V/m)^2$
NormZ	**1.4** $\mu V/(V/m)^2$

Diode Compression

DCP X	**41000** μV
DCP Y	**41000** μV
DCP Z	**41000** μV

Sensitivity in Tissue Simulating Liquid

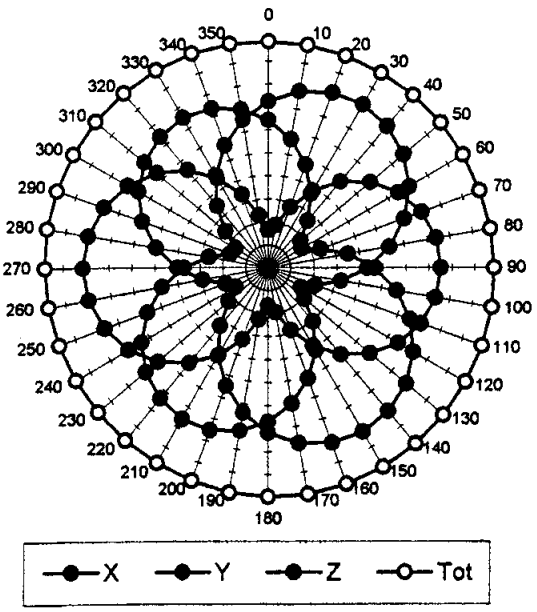
450 MHz	ConvF X	**6.50**	extrapolated	ε_r = 48 ± 5%
	ConvF Y	**6.50**	extrapolated	σ = 0.50 ± 10% mho/m
	ConvF Z	**6.50**	extrapolated	(brain tissue simulating liquid)
	Alpha	**0.86**		
	Depth	**1.28**		
900 MHz	ConvF X	**5.99**	± 10%	ε_r = 42.5 ± 5%
	ConvF Y	**5.99**	± 10%	σ = 0.86 ± 10% mho/m
	ConvF Z	**5.99**	± 10%	(brain tissue simulating liquid)
	Alpha	**0.75**		
	Depth	**1.62**		
1500 MHz	ConvF X	**5.31**	interpolated	ε_r = 41 ± 5%
	ConvF Y	**5.31**	interpolated	σ = 1.32 ± 10% mho/m
	ConvF Z	**5.31**	interpolated	(brain tissue simulating liquid)
	Alpha	**0.61**		
	Depth	**2.08**		
1800 MHz	ConvF X	**4.97**	± 10%	ε_r = 41 ± 5%
	ConvF Y	**4.97**	± 10%	σ = 1.69 ± 10% mho/m
	ConvF Z	**4.97**	± 10%	(brain tissue simulating liquid)
	Alpha	**0.54**		
	Depth	**2.31**		

Sensor Offset

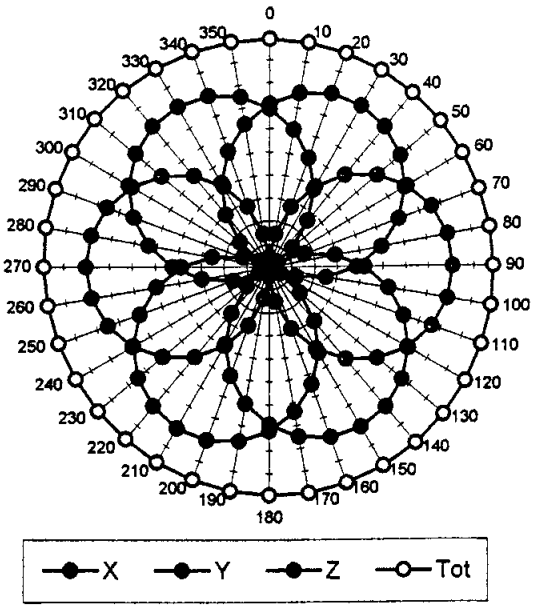
Probe Tip to Sensor Center	**2.7**	mm
Surface to Probe Tip	**1 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

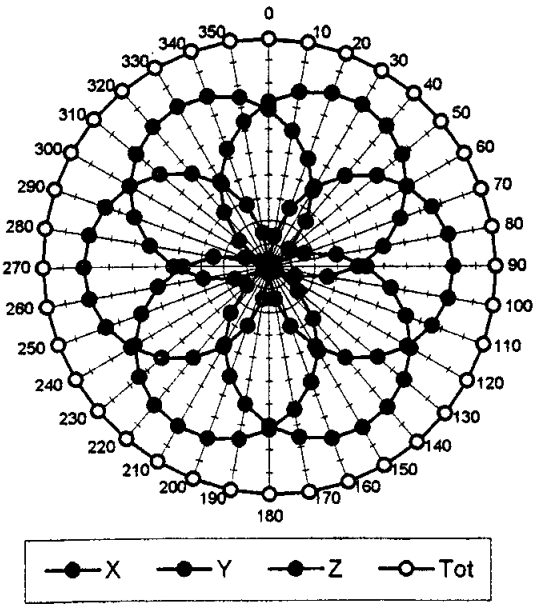
f = 30 MHz, TEM cell ifi110



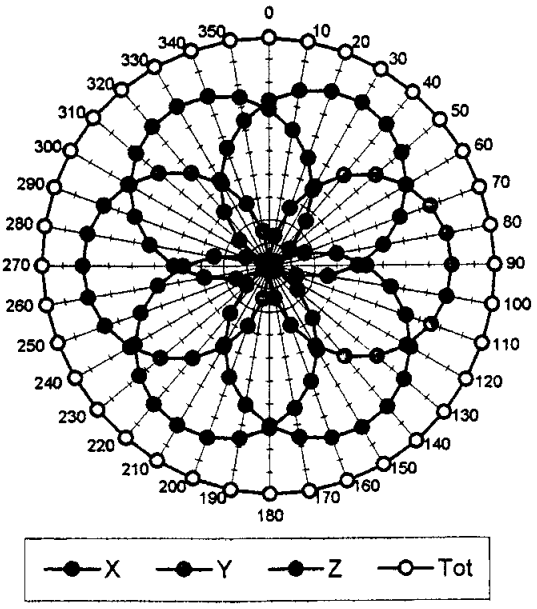
f = 100 MHz, TEM cell ifi110

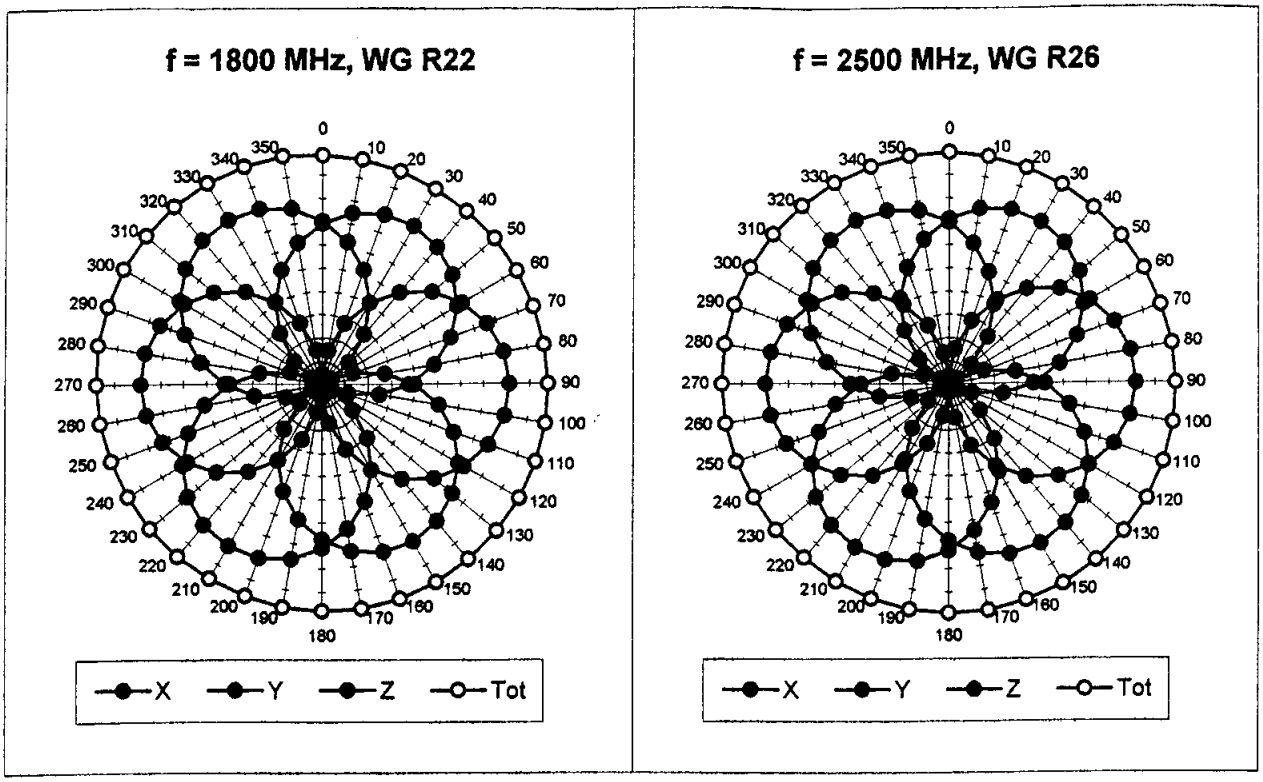


f = 300 MHz, TEM cell ifi110

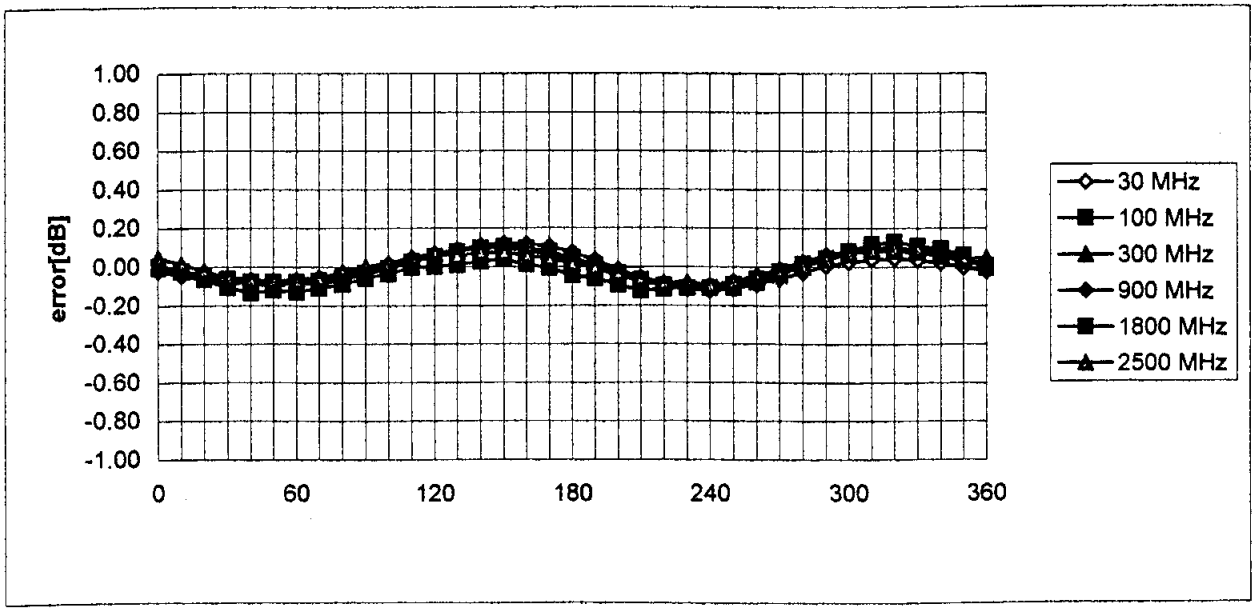


f = 900 MHz, TEM cell ifi110



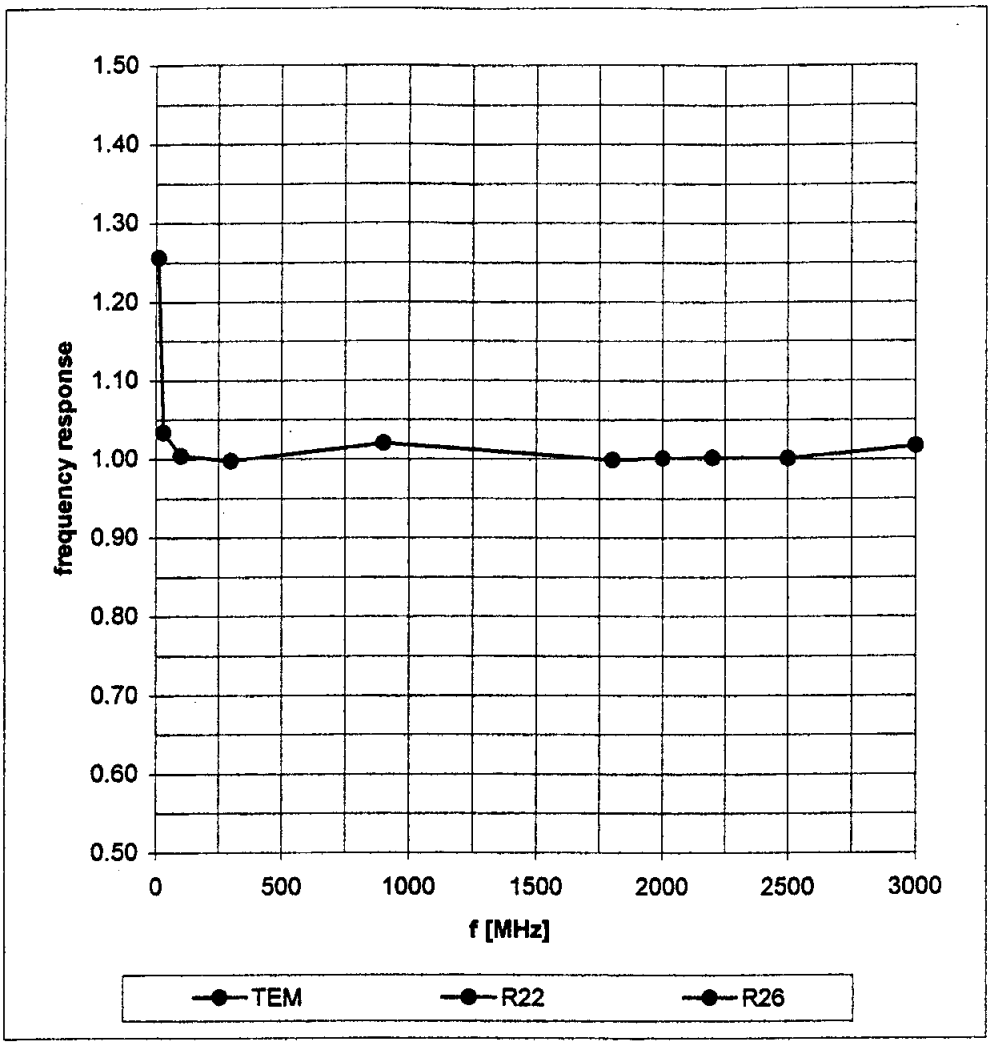


Isotropy Error (ϕ), θ = 0°



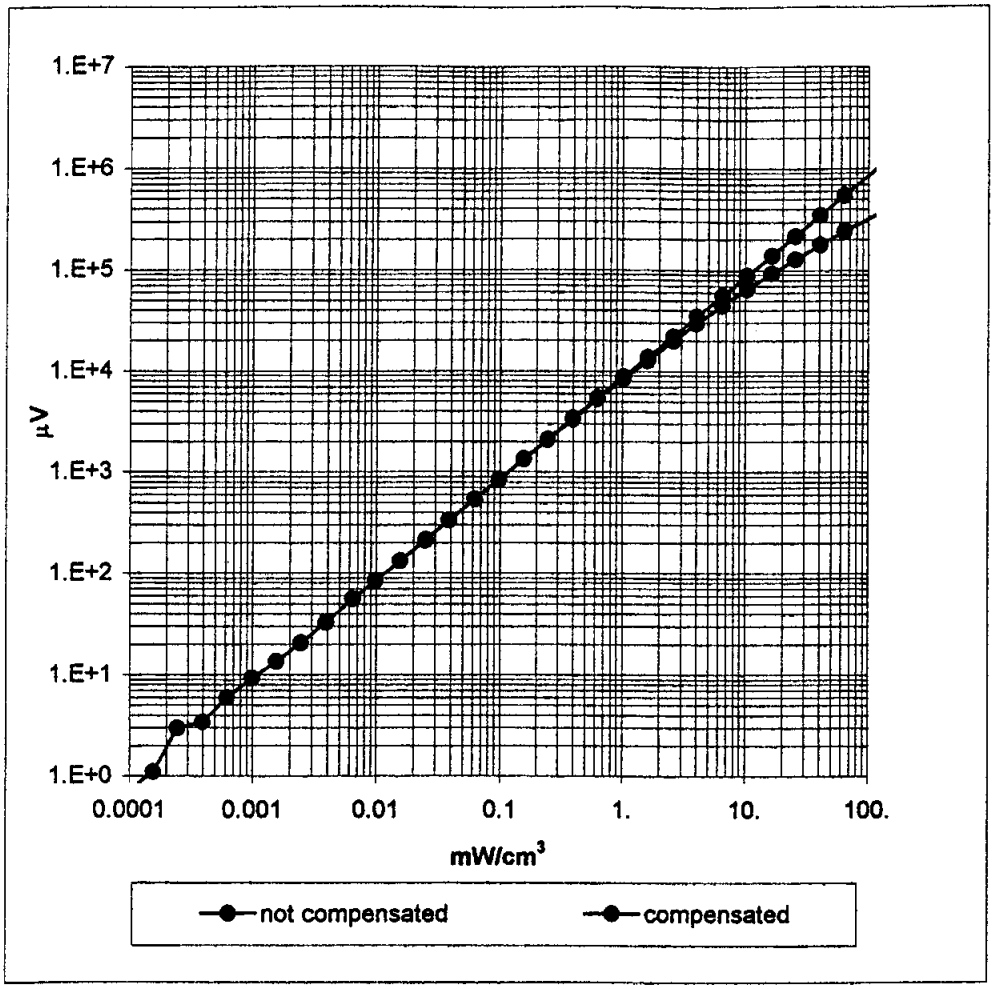
Frequency Response of E-Field

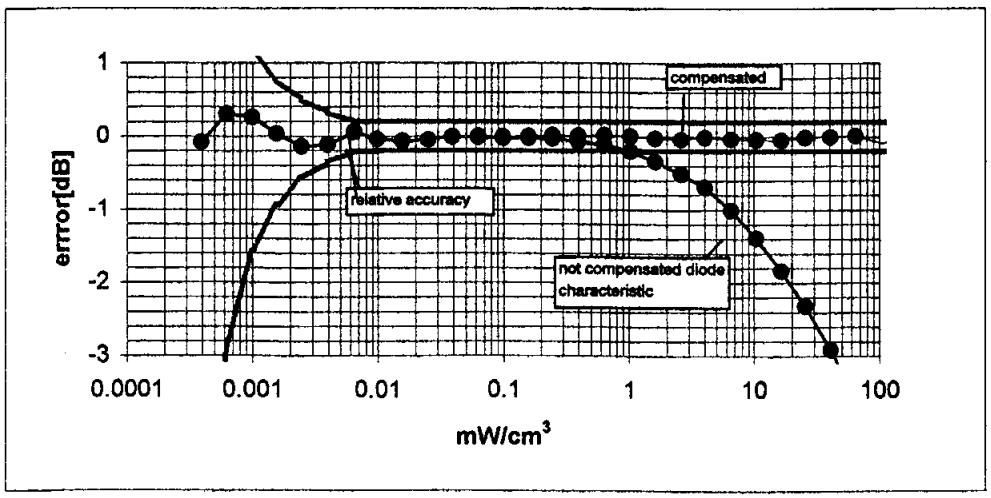
(TEM-Cell:ifi110, Waveguide R22, R26)



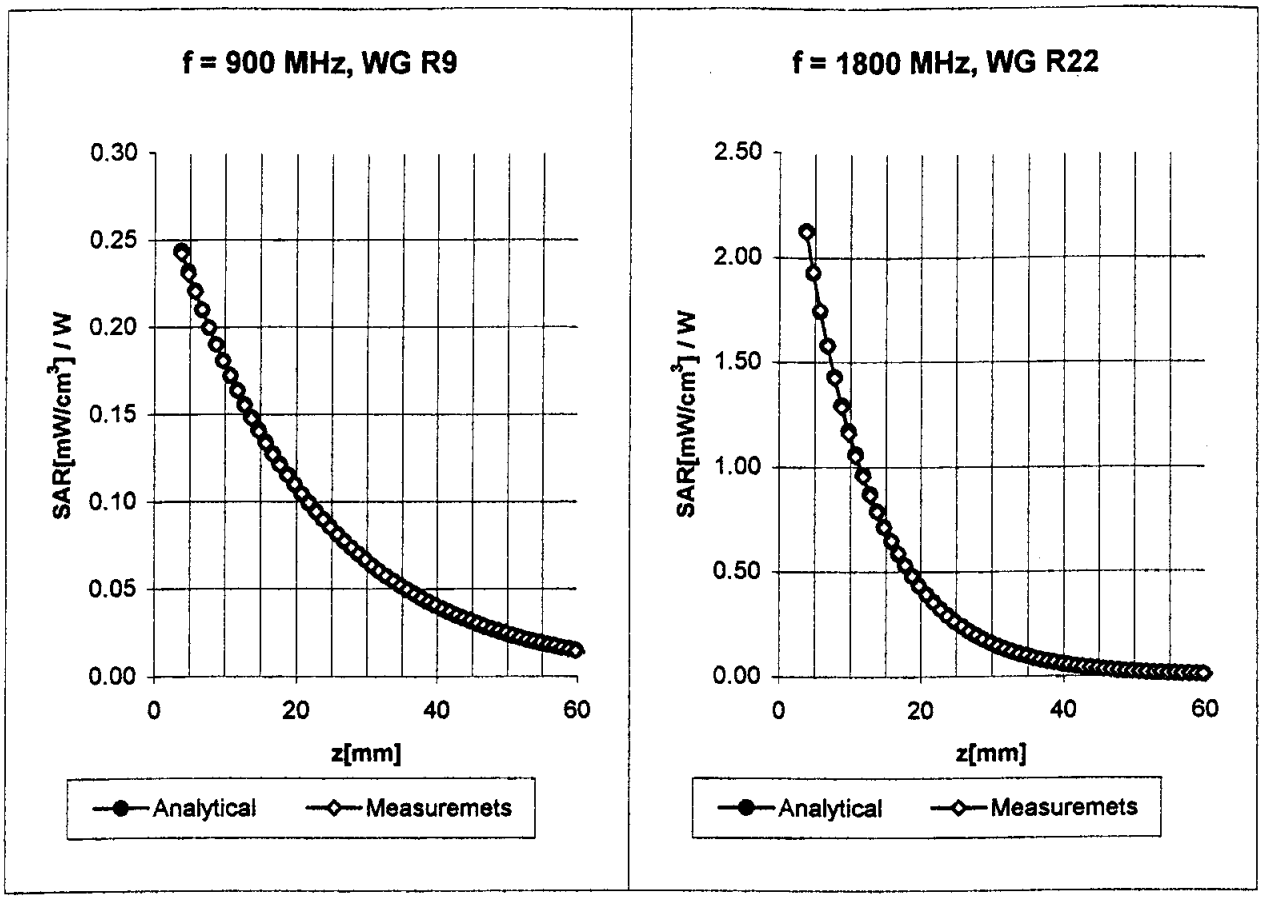
Dynamic Range f(SAR_{brain})

(TEM-Cell:ifi110)



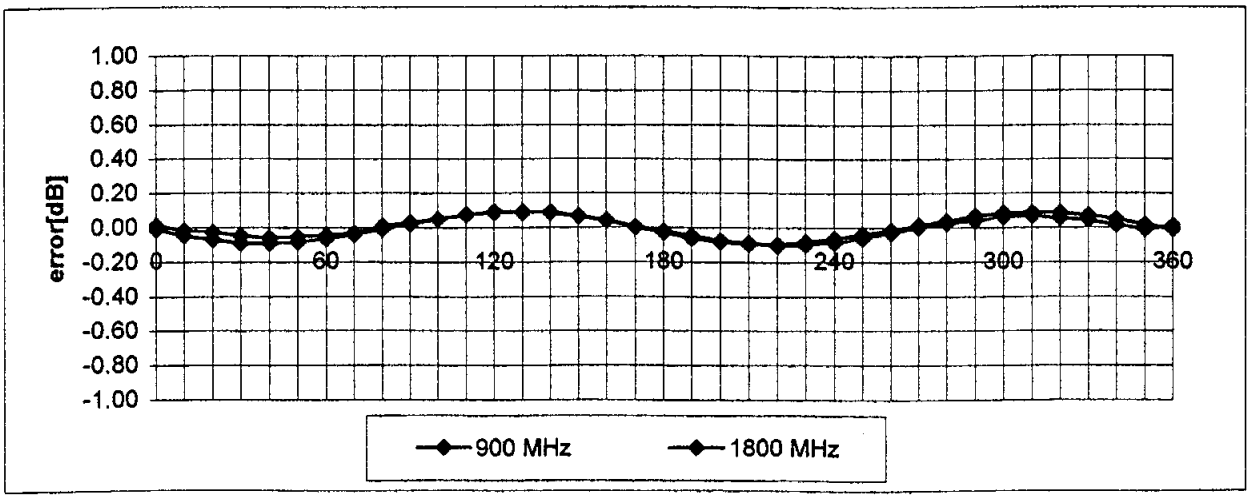


Conversion Factor Assessment



Receiving Pattern (ϕ)

(in brain tissue, z = 5 mm)



Schmid & Partner
Engineering AG

Staffelstrasse 8, 8045 Zurich, Switzerland, Telefon +41 1 280 08 60, Fax +41 1 280 08 64

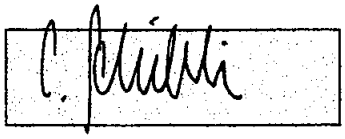
Calibration Certificate

Dosimetric E-Field Probe

Type:	**ET3DV4**
Serial Number:	**1105**
Place of Calibration:	**Zurich**
Date of Calibration:	**July 14, 1999**
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:	
Approved by: