MOTOROLA

January 16, 2002

Supplement to SAR Test Report for Motorola portable cellular phone (FCC ID IHDT6BK1).

Prepared by:
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Libertyville, Illinois

1. Summary of FCC request for additional information

There was a request for additional information regarding Motorola's SAR Test Report for Motorola portable cellular phone (FCC ID IHDT6BK1) dated June 12, 2001. The requested information may be summarized as follows:

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1.) What is the conducted power after the SAR test. Only one data point
is needed to compare the conducted power before and after the test.

2.) Verify that there is only one battery type used with this phone.

3.) Supplement C requires touch and tilt positions for SAR measurements.
Please submit tilt data.

4.) On page 6 of SAR test report your tissue type body measured 47.8 and
recommended limits is 53.3 Supplement C requires 5% you measured 10%.
Your conductivity for body measured 1.65 and recommended limits is 1.52.
Supplement C requires 5% you measured 7.87%. Please estimate the change
in SAR when using the target parameters.

5.) Please provide probe calibration certificate data.

6.) Please explain why liquid parameter in system verification are
different from liquid used with device.

7.) Please justify your target SAR values in system verification.
Example calibration certificate.

8.) Please verify your liquid depth with photo or z-axis scan plots.

9.) Is there a car antenna option with this device?
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2. Request for Conducted Power after SAR test

The value of the SAR drift can be found on the SAR contour plots contained in the report. This follows the guidelines indicated at the FCC – TCB training workshop held during June 2001.

3. Battery Options

There is only one battery available with this cellular phone. This is the battery that was used to demonstrate compliance in the SAR report.

4. Tilt Measurements

4.1. **Results of 15° Tilted Position SAR Measurements**

A full data set output of two test conditions with the highest SAR values from the Dasy™ measurement system is included as appendix 4. The test conditions included are indicated as bold numbers in the following table. All other test conditions measured lower SAR values than those included.

f (MHz)	Description	Conducted Output Power (dBm)	SAR, 1g in the 15° Tilted Position		
			Left Head		
			Ant Fixed		
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)
Digital 1900MHz	Channel 512	29.47	**0.317**	**-0.03**	**0.32**
	Channel 660	29.44	0.308	-0.05	0.31
	Channel 810	29.45	0.301	0.03	0.30

Table 1: SAR measurement results for the portable cellular telephone FCC ID IHDT6BK1 at highest possible output power. Measured against the Left head in the 15° Tilted Position.

f (MHz)	Description	Conducted Output Power (dBm)	SAR, 1g in the 15° Tilted Position		
			Right Head		
			Ant Fixed		
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)
Digital 1900MHz	Channel 512	29.47	**0.267**	**-0.09**	**0.27**
	Channel 660	29.44	0.192	-0.08	0.20
	Channel 810	29.45	0.181	-0.06	0.18

Table 2: SAR measurement results for the portable cellular telephone FCC ID IHDT6BK1 at highest possible output power. Measured against the Right head in the 15° Tilted Position.

4.2. **Dosimetric System Equipment**

Description	Serial Number	Cal Due Date
DASY3 DAE V1	SN1522	11-May-02
E-Field Probe ETDV6	SN378	27-Jul-02
Dipole Validation Kit, DV1800V2	SN280	4-Jan-03

4.3. **Additional Equipment**

Description	Serial Number	Cal Due Date
Signal Generator HP8648C	3847A04848	19-Jan-03
Power Meter E4419B	GB39511090	28-Nov-02
Power Sensor E9301A	US39210934	24-Jan-02

4.4. Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, e_r, and the conductivity, s, of the tissue simulating liquids were measured with HP85070 Dielectric Probe Kit These values are shown in the table below. The mass density, ?, used by the dosimetric system is also given. Recommended limits for maximum permittivity, minimum conductivity and maximum mass density are also shown. It is seen that the measured parameters are satisfactory for compliance testing.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			e_r	s (S/m)	r (g/cm^3)
1900	Head	Measured, 01/14/02	38.2	1.48	1.00
		Recommended Limits	40.0	1.40	1.03

4.5. System Accuracy Verification

A system accuracy verification of the DASY3 was performed using the measurement equipment listed in Section 1.3. The test was conducted on the same day as the measurement of the DUT. The obtained results are displayed in the table below. The distributions of SAR compare well with those of the reference measurements (see Appendix 2).

f (MHz)	Description	SAR (W/kg), 1gram	Dielectric Parameters		Temp (°C)
			e_r	s (S/m)	
1900	Measured, 01/14/02	46.03	39.40	1.75	20.0
	Recommended Limits	44.40	40.00	1.71	NA

4.6 **Pictures of the Device Under Test**

Figure1. Phone Against the Head in a 15° Tilt Position

5. Tissue Simulate Targets

The body tissue simulates do exceed the 5% tolerance but in the direction that overestimates SAR. According to the sensitivities published by Schmid & Partner Engineering AG in the *Application Note: SAR Sensitivities* (attached as appendix 1):

The difference in conductivity between the Oct 30th filing and Supplement C 01-01 yields a overestimate in SAR of ~5.4%.

The difference in permittivity between the Oct 30th filing and Supplement C 01-01 yields a overestimate in SAR of ~6.9%.

6. Please provide probe calibration certificate.

The Probe calibration certificates and the additional conversion factors certificates that cover the permittivity and conductivity that were used in the original filing are attached as appendix 2.

7. System Verification Tissue Simulate Parameters

Our supplier of the system verification dipoles (SPEAG™) did not use tissue simulate parameters that conform to Supplement C 01-01 when they characterized the system verification dipole. We use these tissue simulate parameters to verify the SAR measurement system daily. We did have the probe calibrated to both the Supplement C 01-01 tissue simulate parameters and the tissue simulate that is utilized for system verification. This allows the measurement system to perform system verification using the tissue simulate used for dipole characterization and then perform SAR measurements on the cellular phone using the tissue simulate specified in Supplement C 01-01.

8. Dipole Calibration Certificate

The dipole calibration certificate is attached as appendix 3. This demonstrates that the correct system verification parameters were recorded in the original filing. Please note that the forward power into the dipole is normalized to 1W.

9. Verification of Liquid Depth

The pictures below demonstrate the tissue simulate depth at the ear reference point (ERP) is at 15.0cm ±0.5cm deep. Figure 1 shows the location of the measurement. Figure 2 is a detailed picture of the tissue simulate level on the graduated ruler indicating the depth.

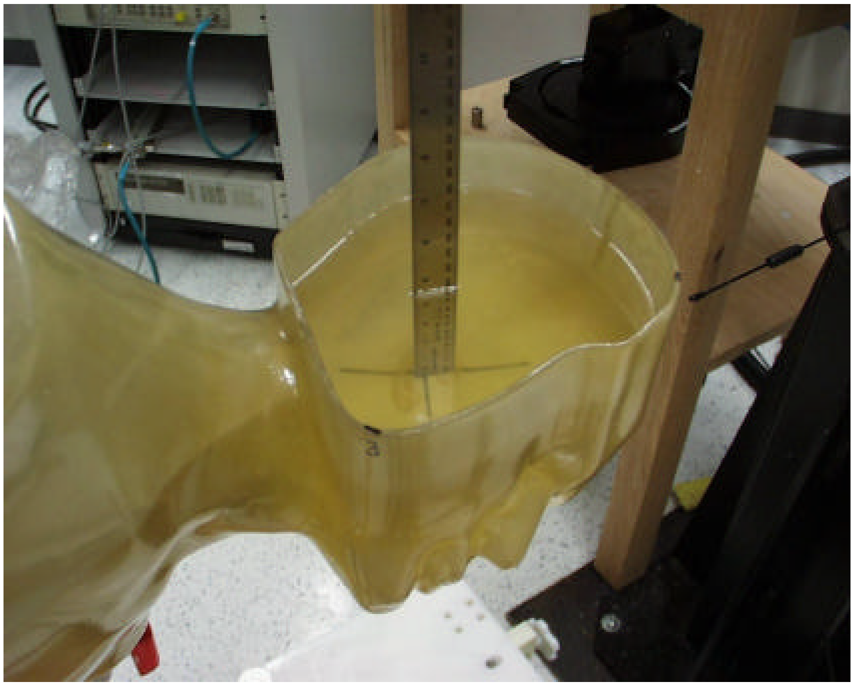


Figure 2. Location of Tissue Simulate Depth Measurement Location in Phantom Head.

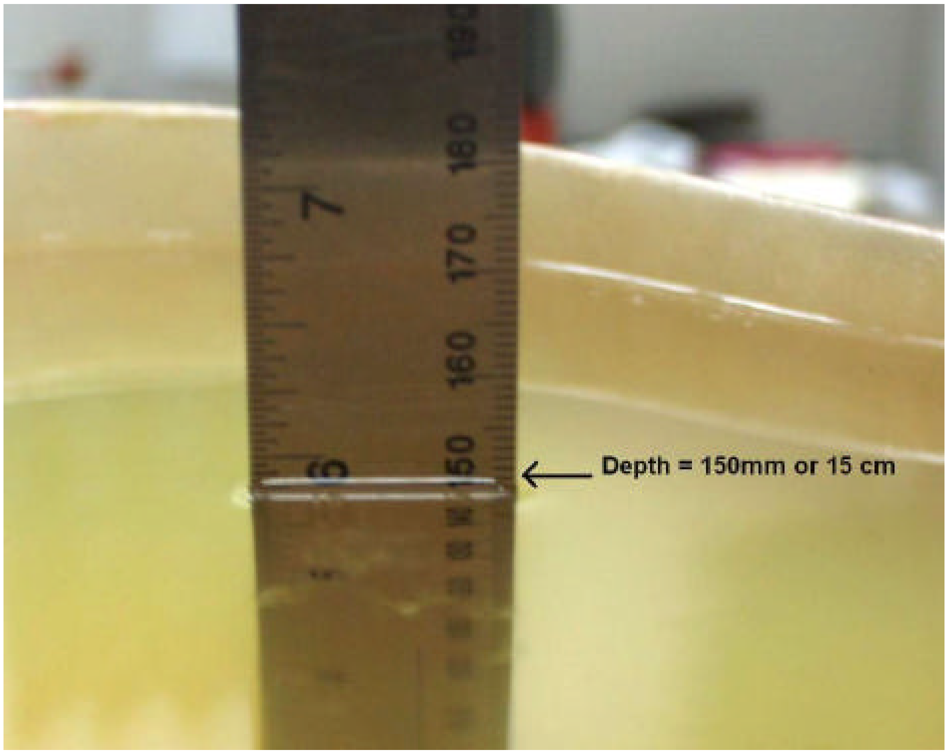


Figure 3. Measured Depth of Tissue Simulate in Phantom Head.

10. Car Antenna Option

No car antenna option is available for this device. However, an audio interface "Car Mobile Phone Accessories Kit" is available to meet safety and legal requirements for "hands-free" operation.

Appendix 1

Schmid & Partner Engineering AG in the *Application Note: SAR Sensitivities*

Application Note: SAR Sensitivities

1 Introduction

The measured SAR-values in homogeneous phantoms depend strongly on the electrical parameters of the liquid. Liquids with exactly matching parameters are difficult to produce; there is always a small error involved in the production or measurement of the liquid parameters. The following sensitivities allow the estimation of the influence of small parameter errors on the measured SAR values. The calculations are based on an approximation formula [1] for the SAR of an electrical dipole near the phantom surface and a adapted plane wave approximation for the penetration depth. The sensitivities are given in percent SAR change per percent change in the controlling parameter:

$$S(x) = \frac{d\,SAR / SAR}{d\,x / x}$$

The controlling parameters x are:

- ε : permitivity
- σ : conductivity
- ρ : brain density (= one over integration volume)
- d : distance of the radiator from the liquid surface

For example: If the liquid permitivity increases by 2 percent and the sensitivity of the SAR to permitivity is -0.62 then the SAR will decrease by 1.24 percent.

The sensitivities are given for surface SAR values and averaged SAR values for 1 g and 10 g cubes and for dipole distances d of 10mm, 15mm and 30mm from the liquid surface.

2 Sensitivities

2.1 f = 900 Mhz, e_r = 41.5, s = 0.85 S/m, r = 1 g/cm^3

	Parameter	e	s	d	r
d=10mm:	**Surface**	- 0.74	+ 0.88	- 1.55	—
	1 g	- 0.62	+ 0.62	- 1.55	0.09
	10 g	- 0.51	+ 0.39	- 1.55	0.17
d=15mm:	**Surface**	- 0.72	+ 0.89	- 1.47	—
	1 g	- 0.59	+ 0.63	- 1.47	0.09
	10 g	- 0.48	+ 0.39	- 1.47	0.17
d=30mm:	**Surface**	- 0.72	+ 0.89	- 1.71	—
	1 g	- 0.59	+ 0.63	- 1.71	0.09
	10 g	- 0.48	+ 0.39	- 1.71	0.17

2.2 f = 1500 Mhz, e_r = 40.5, s = 1.2 S/m, r = 1 g/cm^3

	Parameter	e	s	d	r
d=10mm:	**Surface**	- 0.73	+ 0.92	- 1.46	—
	1 g	- 0.56	+ 0.55	- 1.46	0.12
	10 g	- 0.42	+ 0.27	- 1.46	0.22
d=15mm:	**Surface**	- 0.73	+ 0.92	- 1.55	—
	1 g	- 0.55	+ 0.55	- 1.55	0.12
	10 g	- 0.41	+ 0.27	- 1.55	0.22
d=30mm:	**Surface**	- 0.78	+ 0.91	- 2.00	—
	1 g	- 0.60	+ 0.54	- 2.00	0.12
	10 g	- 0.47	+ 0.26	- 2.00	0.22

2.3 f = 1800 Mhz, e_r = 40, s = 1.65 S/m, r = 1 g/cm^3

	Parameter	e	s	**d**	r
d=10mm:	**Surface**	- 0.70	+ 0.89	- 1.47	—
	1 g	- 0.48	+ 0.43	- 1.47	0.16
	10 g	- 0.34	+ 0.13	- 1.47	0.26
d=15mm:	**Surface**	- 0.72	+ 0.89	- 1.70	—
	1 g	- 0.49	+ 0.42	- 1.70	0.16
	10 g	- 0.35	+ 0.13	- 1.70	0.26
d=30mm:	**Surface**	- 0.75	+ 0.88	- 2.00	—
	1 g	- 0.53	+ 0.41	- 2.00	0.16
	10 g	- 0.39	+ 0.12	- 2.00	0.26

Appendix 2

Probe Calibration Certificate

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:	1522
Place of Calibration:	Zurich
Date of Calibration:	May 11, 2001
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: Pokovic Katja

Approved by: N. Kuster

Engineering AG

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

Probe ET3DV6

SN:1522

Manufactured: March 21, 2000
Last calibration: April 7, 2000
Recalibrated: May 11, 2001

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6 SN:1522

Sensitivity in Free Space

NormX	**1.68**	$\mu V/(V/m)^2$
NormY	**1.64**	$\mu V/(V/m)^2$
NormZ	**1.71**	$\mu V/(V/m)^2$

Diode Compression

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

Sensitivity in Tissue Simulating Liquid

Head **450 MHz** **ε_r = 43.5 ± 5%** **σ = 0.87 ± 10% mho/m**

ConvF X	**6.81**	extrapolated	Boundary effect:	
ConvF Y	**6.81**	extrapolated	Alpha	**0.64**
ConvF Z	**6.81**	extrapolated	Depth	**1.92**

Head **900 MHz** **ε_r = 42 ± 5%** **σ = 0.97 ± 10% mho/m**

ConvF X	**6.31**	± 7% (k=2)	Boundary effect:	
ConvF Y	**6.31**	± 7% (k=2)	Alpha	**0.64**
ConvF Z	**6.31**	± 7% (k=2)	Depth	**1.95**

Head **1500 MHz** **ε_r = 40.4 ± 5%** **σ = 1.23 ± 10% mho/m**

ConvF X	**5.65**	interpolated	Boundary effect:	
ConvF Y	**5.65**	interpolated	Alpha	**0.64**
ConvF Z	**5.65**	interpolated	Depth	**1.98**

Head **1800 MHz** **ε_r = 40 ± 5%** **σ = 1.40 ± 10% mho/m**

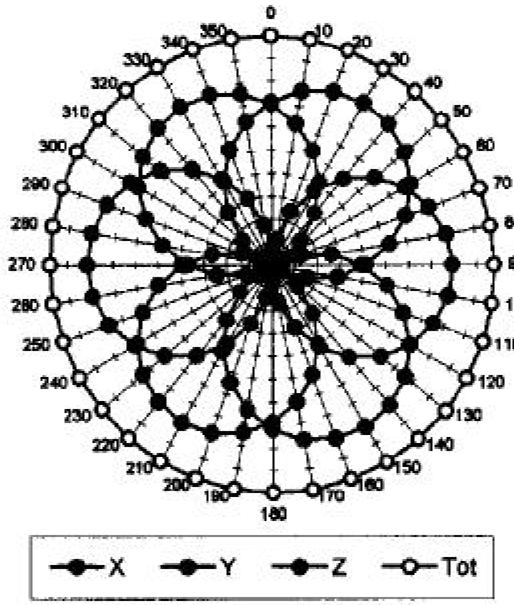
ConvF X	**5.32**	± 7% (k=2)	Boundary effect:	
ConvF Y	**5.32**	± 7% (k=2)	Alpha	**0.64**
ConvF Z	**5.32**	± 7% (k=2)	Depth	**1.99**

Sensor Offset

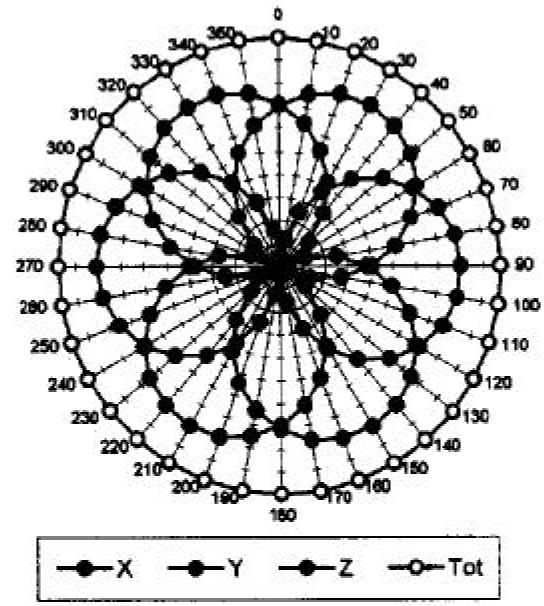
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.3 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

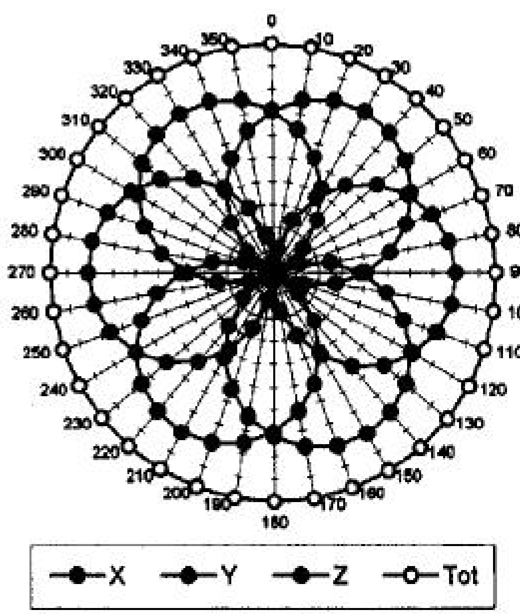
f = 30 MHz, TEM cell ifi110



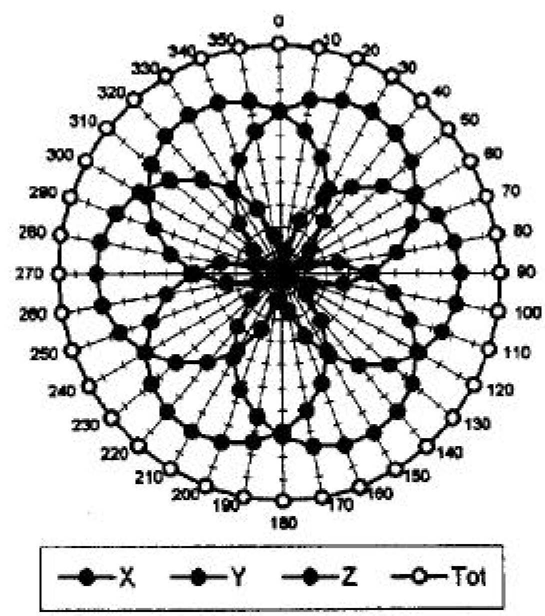
f = 100 MHz, TEM cell ifi110

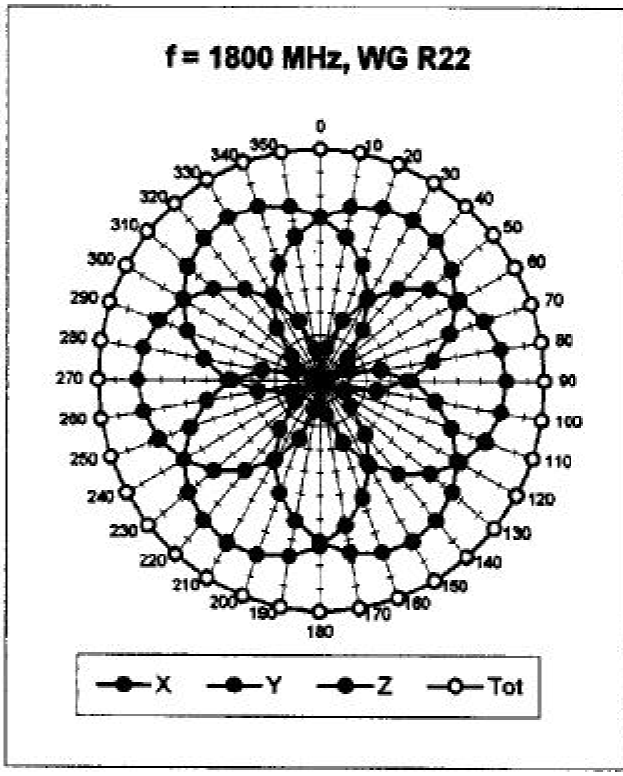


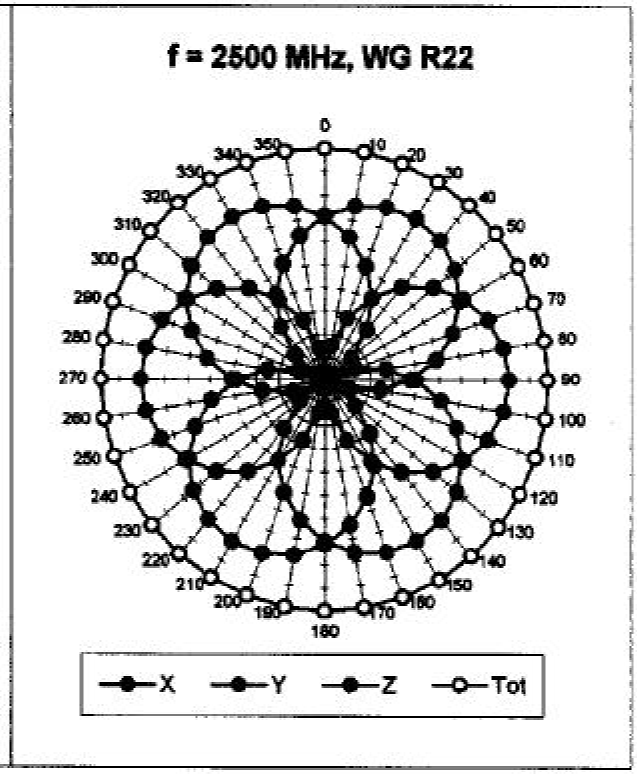
f = 300 MHz, TEM cell ifi110



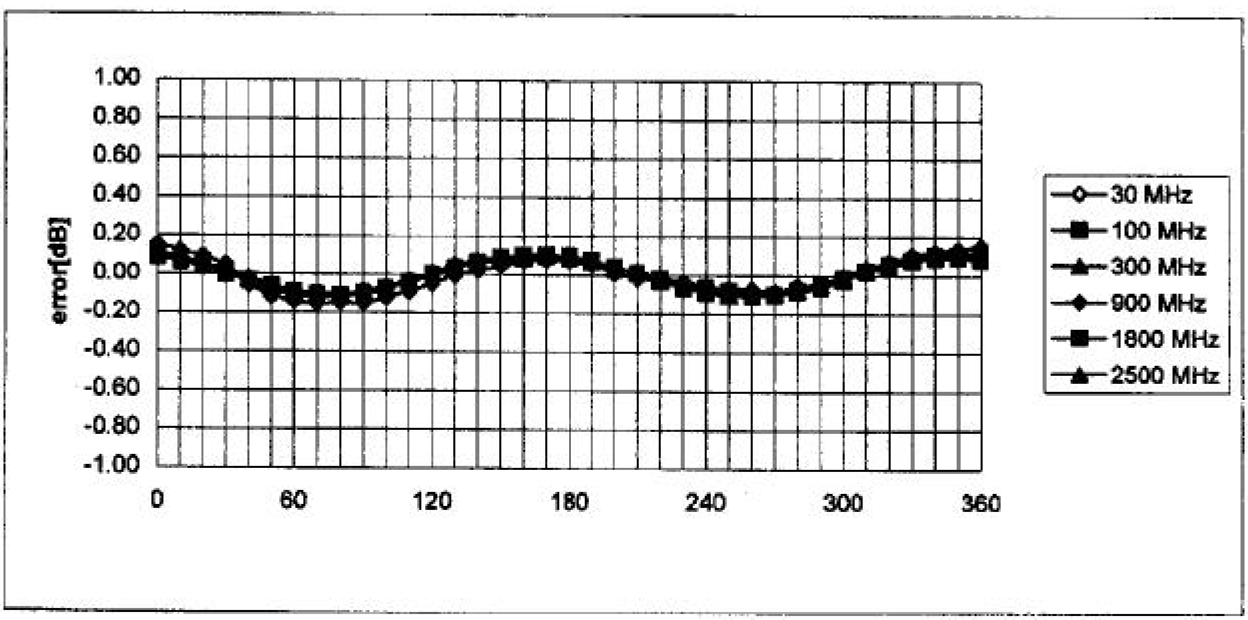
f = 900 MHz, TEM cell ifi110





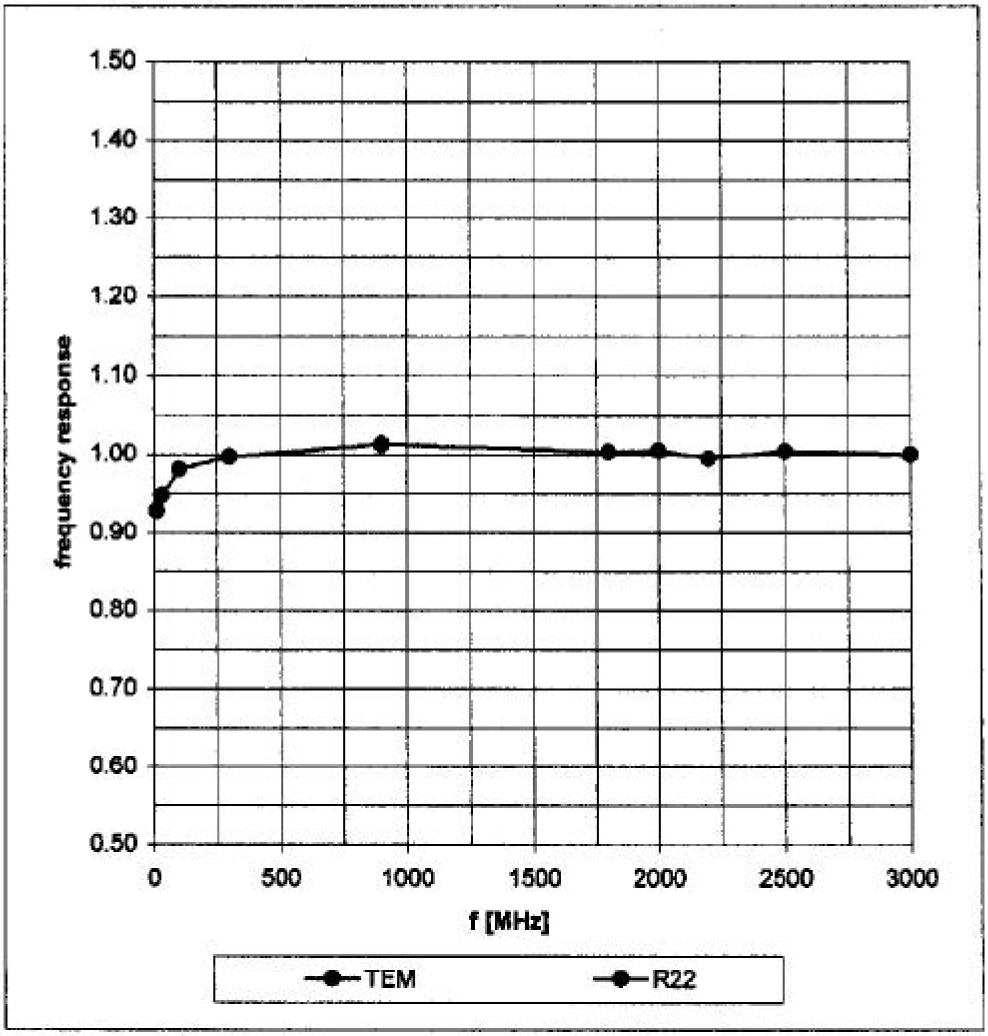


Isotropy Error (ϕ), θ = 0°



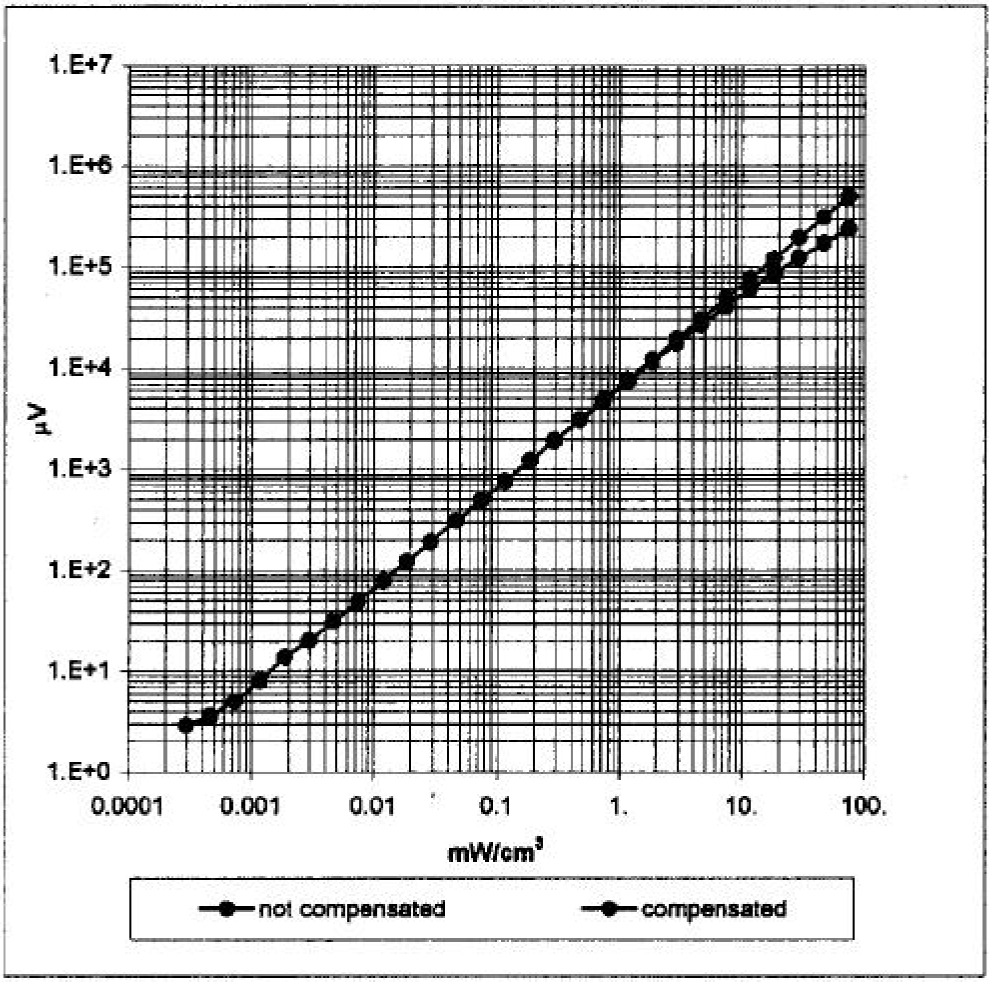
Frequency Response of E-Field

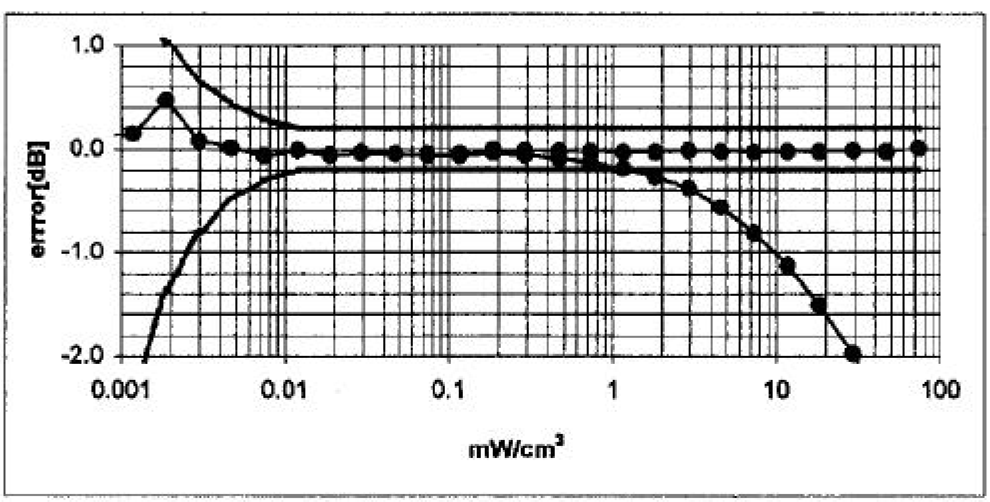
(TEM-Cell:ifi110, Waveguide R22)



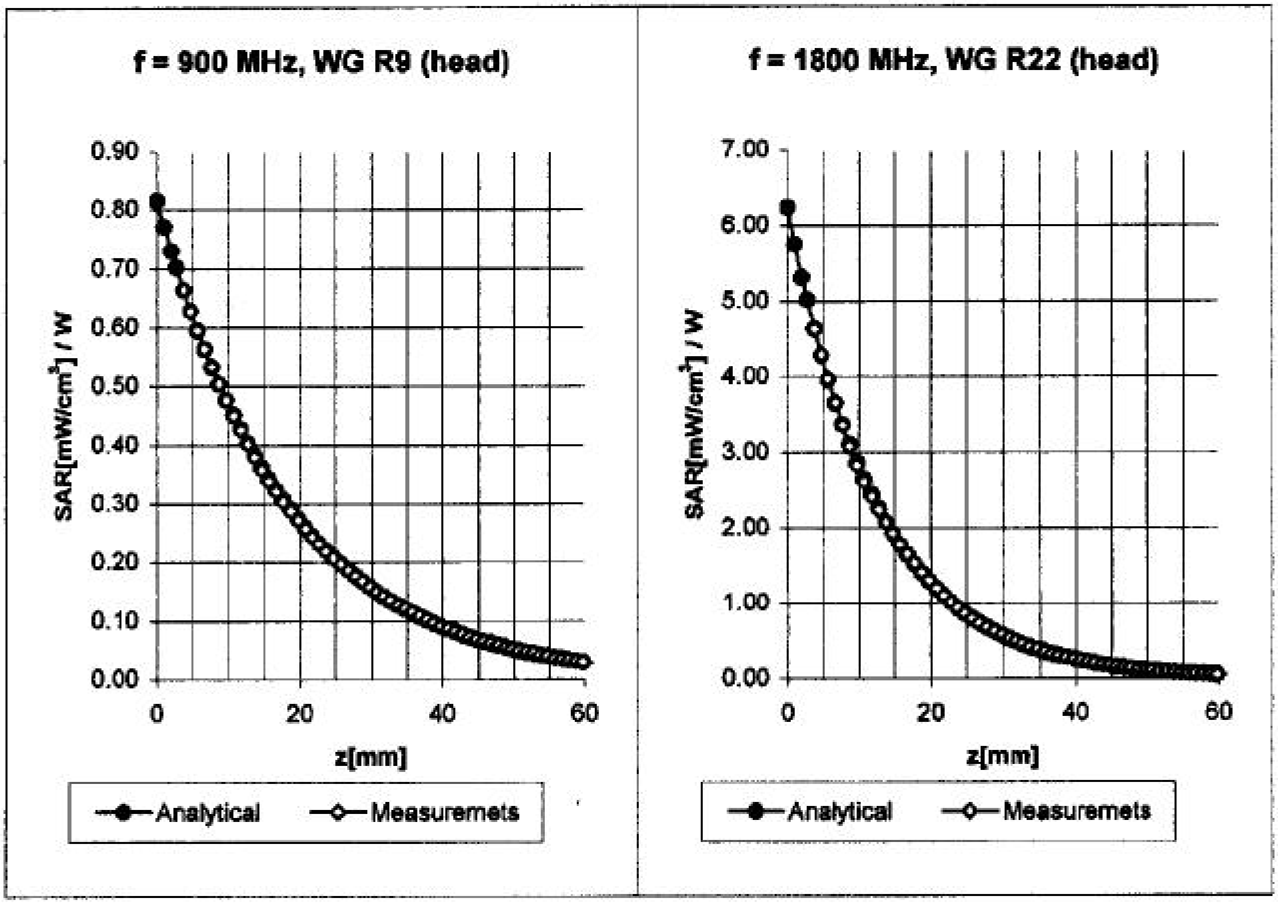
Dynamic Range f(SAR_{brain})

(TEM-Cell:ifi110)





Conversion Factor Assessment



Head	900 MHz	ε_r = 42 ± 5%	σ = 0.97 ± 10% mho/m

ConvF X	**6.31**	± 7% (k=2)	Boundary effect:	
ConvF Y	**6.31**	± 7% (k=2)	Alpha	**0.64**
ConvF Z	**6.31**	± 7% (k=2)	Depth	**1.95**

Head	1800 MHz	ε_r = 40 ± 5%	σ = 1.40 ± 10% mho/m

ConvF X	**5.32**	± 7% (k=2)	Boundary effect:	
ConvF Y	**5.32**	± 7% (k=2)	Alpha	**0.64**
ConvF Z	**5.32**	± 7% (k=2)	Depth	**1.99**

Schmid & Partner
Engineering AG

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:	**1522**
Place of Assessment:	**Zurich**
Date of Assessment:	**May 16, 2001**
Probe Calibration Date:	**May 11, 2001**

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: [signature]

Dosimetric E-Field Probe ET3DV6 SN:1522

Conversion factor (± standard deviation)

835 MHz	ConvF	**6.37 ± 8%**	**ε_r = 44.0** **σ = 0.90 mho/m** (brain tissue)
900 MHz	ConvF	**6.25 ± 8%**	**ε_r = 42.5** **σ = 0.86 mho/m** (brain tissue)
925 MHz	ConvF	**6.20 ± 8%**	**ε_r = 44.0** **σ = 0.93 mho/m** (brain tissue)
835 MHz	ConvF	**6.31 ± 8%**	**ε_r = 52.0** **σ = 1.10 mho/m** (muscle tissue)
925 MHz	ConvF	**6.16 ± 8%**	**ε_r = 52.0** **σ = 1.20 mho/m** (muscle tissue)

Dosimetric E-Field Probe ET3DV6 SN:1522

Conversion factor (± standard deviation)

1800 MHz	ConvF	**5.40 ± 8%**	**ε_r = 41.5** **σ = 1.69 mho/m** (brain tissue, sugar-water)
1800 MHz	ConvF	**5.29 ± 8%**	**ε_r = 40.3** **σ = 1.35 mho/m** (brain tissue, glycol)
1900 MHz	ConvF	**5.16 ± 8%**	**ε_r = 39.9** **σ = 1.42 mho/m** (brain tissue, glycol)
1800 MHz	ConvF	**5.05 ± 8%**	**ε_r = 50.0** **σ = 1.58 mho/m** (muscle tissue, glycol)
1900 MHz	ConvF	**4.91 ± 8%**	**ε_r = 50.0** **σ = 1.64 mho/m** (muscle tissue, glycol)