November 18, 2002
Supplement to SAR Test Report for Motorola portable cellular phone (FCC ID IHDT56CD1)

Prepared by:
Steven Hauswirth
Motorola Personal Communications Sector Product Safety & Compliance Laboratory
Harvard, Illinois

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 IHDT56CD1). The requested information is addressed below in the same numbering sequence received.

1) Please provide justification for the probe conversion factor used for 1900 MHz Brain/Body measurements.

Response: In the attached calibration certificate for Probe SN1513 (see Appendix 1), page 2 of 8 shows that the conversion factor for 1800MHz & 1900MHz Head is 5.0. This is the value that was used for testing in the original filing. Since simulated tissue targets are the same for both 1800 & 1900 MHz head and the conversion factor for both 1800 & 1900 MHz head is the same ('5.0' for Probe SN1513), it is also true for body worn that both 1800 & 1900 MHz share the same conversion factor ('4.6' for Probe SN1513) since they share the same simulated tissue targets. This is demonstrated in another probe calibration sheet that we have just received from the same manufacturer. On this additional calibration sheet for Probe SN1398 (see Appendix 2), the 1900MHz body worn conversion factor is shown on page 8 of 10. It can be seen on this page that the 1800MHz & 1900MHz body do share the common conversion factor of 4.9.

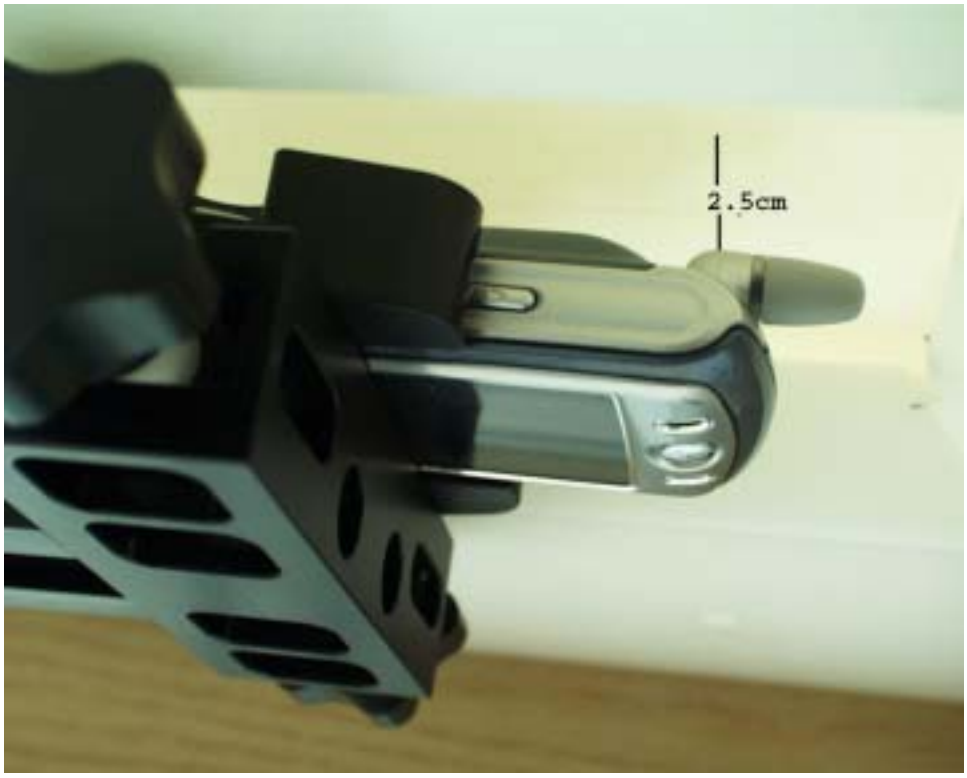
2) Please provide additional test photo/sketch for body-worn configuration. Photograph/sketch provided must clearly show the distance between the device and the flat phantom.

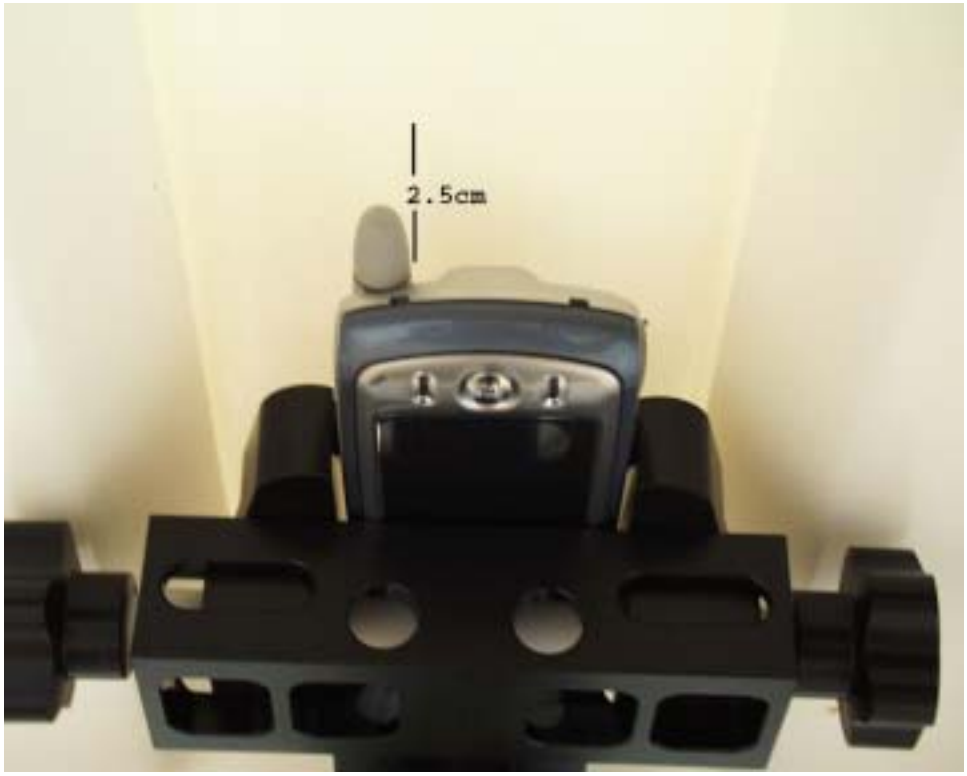
Response: Please see photographs below of the test setup described in the original filing:

Figure 1. "Twin Tub" Body-Worn Measurement Phantoms and Fixture.

Figure 2. Underside of “Twin Tub” showing DUT placement locations.

Please see photographs shown below for the body worn configuration.





3) Justification for distance used in body-worn test (2.5cm). Supplement C recommends 1.5 cm when no body-worn accessory is used. Furthermore, the photographs provided does not clearly show the one inch spacing. Please retest with a 1.5 cm gap to the body of the phone as appropriate. Please revise the users manual, as appropriate.

Response: Supplement C (Edition 01-01) states in Appendix D: SAR Measurement Procedures: "*Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm*". As stated in the original filing, the separation distance used for measurements was 2.5cm, which is in agreement above recommendation quoted from Supplement C.

4) Please address the FCC applications and RF exposure evaluations for UMTS/WCDMA and Bluetooth conditions.

Response: Per the TCB Workshop guidelines from April 04-05, 2002, an additional SAR measurement was performed with the co-located transmitter turned on in the configuration that produced the highest SAR for the dominant transmitter. Table 1 shows the SAR results with only the dominant transmitter. Table 2 shows the SAR results with both the dominant and Bluetooth transmitters on. The output plot from the additional SAR test is included in Appendix 3.

			Cheek / Touch Position									
			Left Head					Right Head				
f (MHz)	Description	Conducted Output Power (dBm)	Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)	Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)
Digital 1900MHz	Channel 512	29.80										
	Channel 661	29.87	**0.567**	**-0.11**	**0.58**	**23.0**	**22.8**	**0.647**	**-0.12**	**0.67**	**23.0**	**21.6**
	Channel 810	30.08										

Table 1: SAR measurement results for the portable cellular telephone FCC ID IHDT56CD1 at highest possible output power. Measured against the head in the Cheek/Touch Position.

			Cheek / Touch Position									
			Left Head					Right Head				
f (MHz)	Description	Conducted Output Power (dBm)	Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)	Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)
Digital 1900MHz	Channel 512	29.80										
	Channel 661	29.87						**0.432**	**-0.03**	**0.43**	**20.3**	**22.0**
	Channel 810	30.08										

Table 2: SAR measurement results for the portable cellular telephone FCC ID IHDT56CD1 at highest possible output power. Measured against the head in the Cheek/Touch Position with the Bluetooth transmitting.

Appendix 1

Probe SN1513 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:	**ET3DV6R**
Serial Number:	**1513**
Place of Calibration:	**Zurich**
Date of Calibration:	**May 8, 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:	D. Veled
Approved by:	

Schmid & Partner
Engineering AG

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

Probe ET3DV6R

SN:1513

Manufactured:	November 24, 1999
Last calibration:	February 20, 2001
Remake ET3DV6R:	May 3, 2002
Recalibrated:	May 8, 2002

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6R SN:1513

Sensitivity in Free Space

NormX	1.96	$\mu V/(V/m)^2$
NormY	2.02	$\mu V/(V/m)^2$
NormZ	2.02	$\mu V/(V/m)^2$

Diode Compression

DCP X	95	mV
DCP Y	95	mV
DCP Z	95	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	**6.1** ± 9.5% (k=2)	Boundary effect:
	ConvF Y	**6.1** ± 9.5% (k=2)	Alpha **0.81**
	ConvF Z	**6.1** ± 9.5% (k=2)	Depth **1.64**
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	**5.0** ± 9.5% (k=2)	Boundary effect:
	ConvF Y	**5.0** ± 9.5% (k=2)	Alpha **0.61**
	ConvF Z	**5.0** ± 9.5% (k=2)	Depth **2.13**

Boundary Effect

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

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	9.3	4.6
SAR_{be} [%]	With Correction Algorithm	0.0	0.1

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

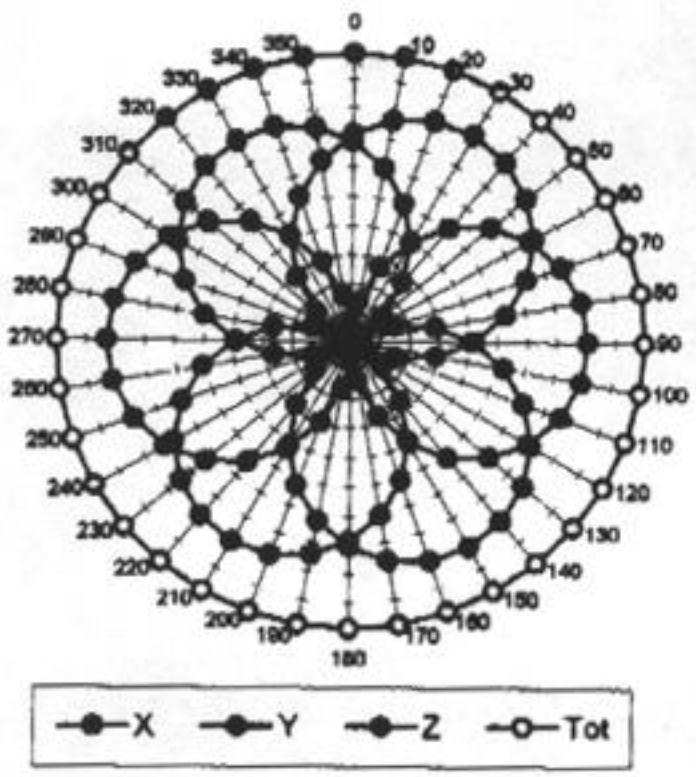
Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	11.8	7.3
SAR_{be} [%]	With Correction Algorithm	0.2	0.1

Sensor Offset

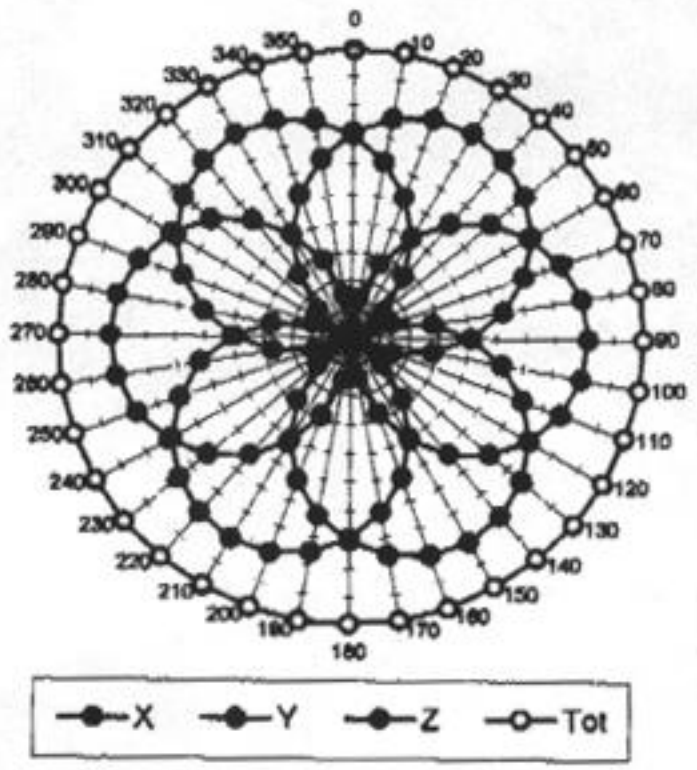
Probe Tip to Sensor Center	2.7	mm

Receiving Pattern (ϕ), θ = 0°

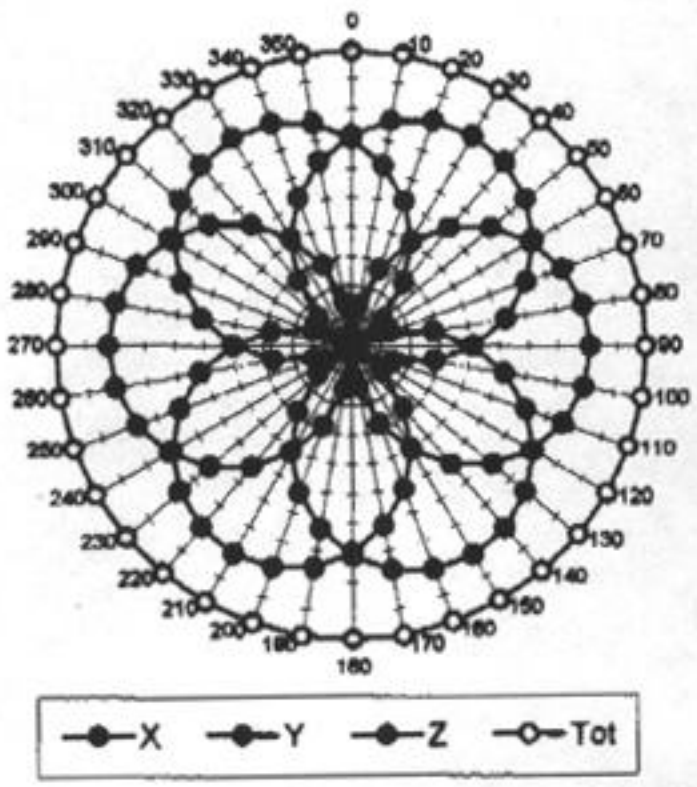
f = 30 MHz, TEM cell iff110



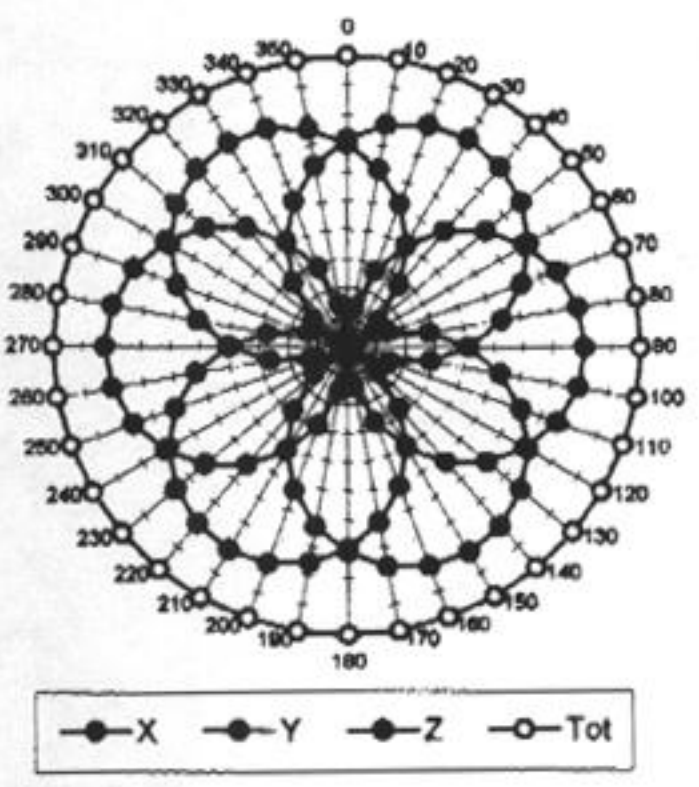
f = 100 MHz, TEM cell iff110

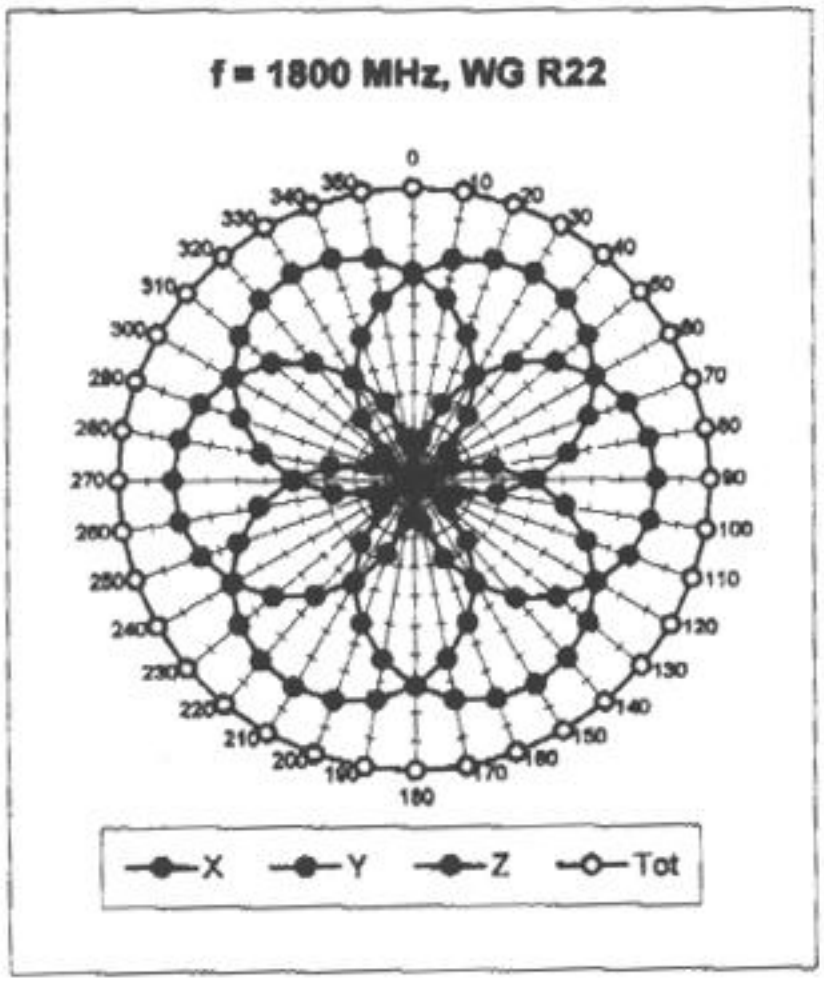


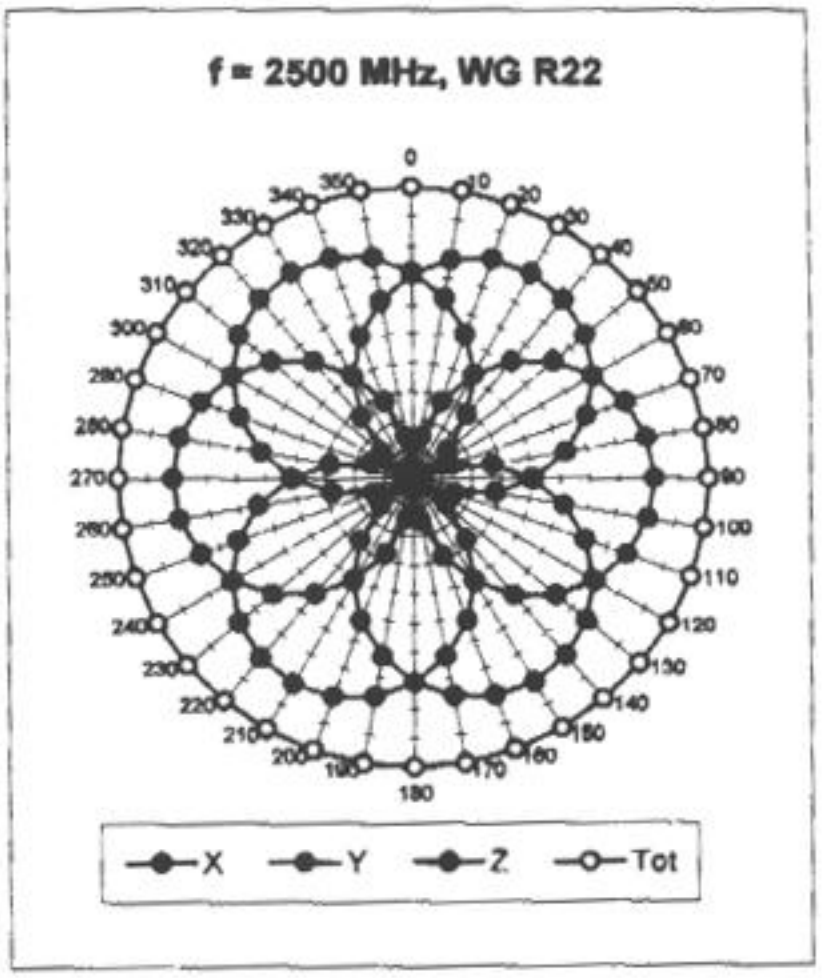
f = 300 MHz, TEM cell iff110



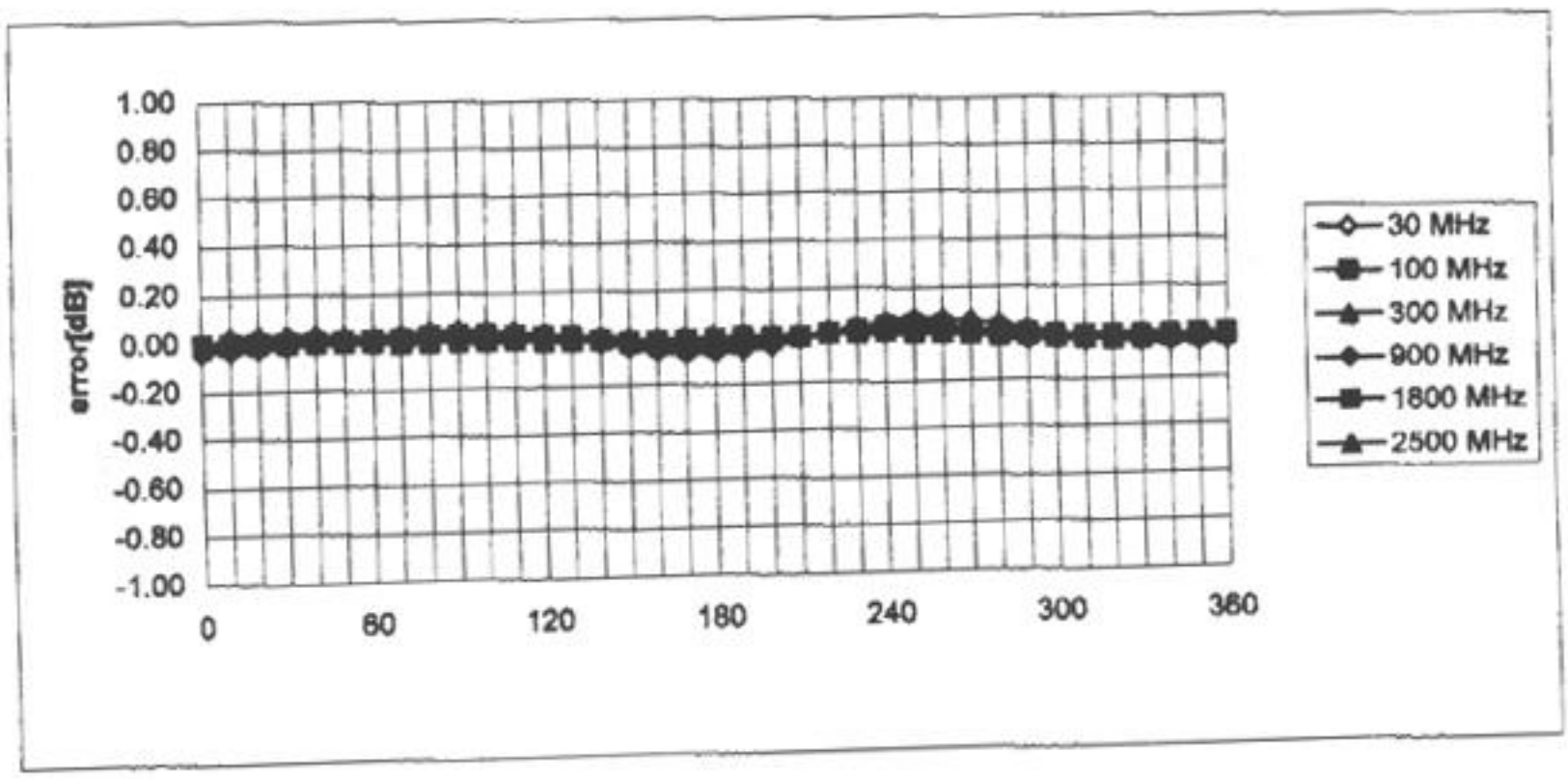
f = 900 MHz, TEM cell iff110





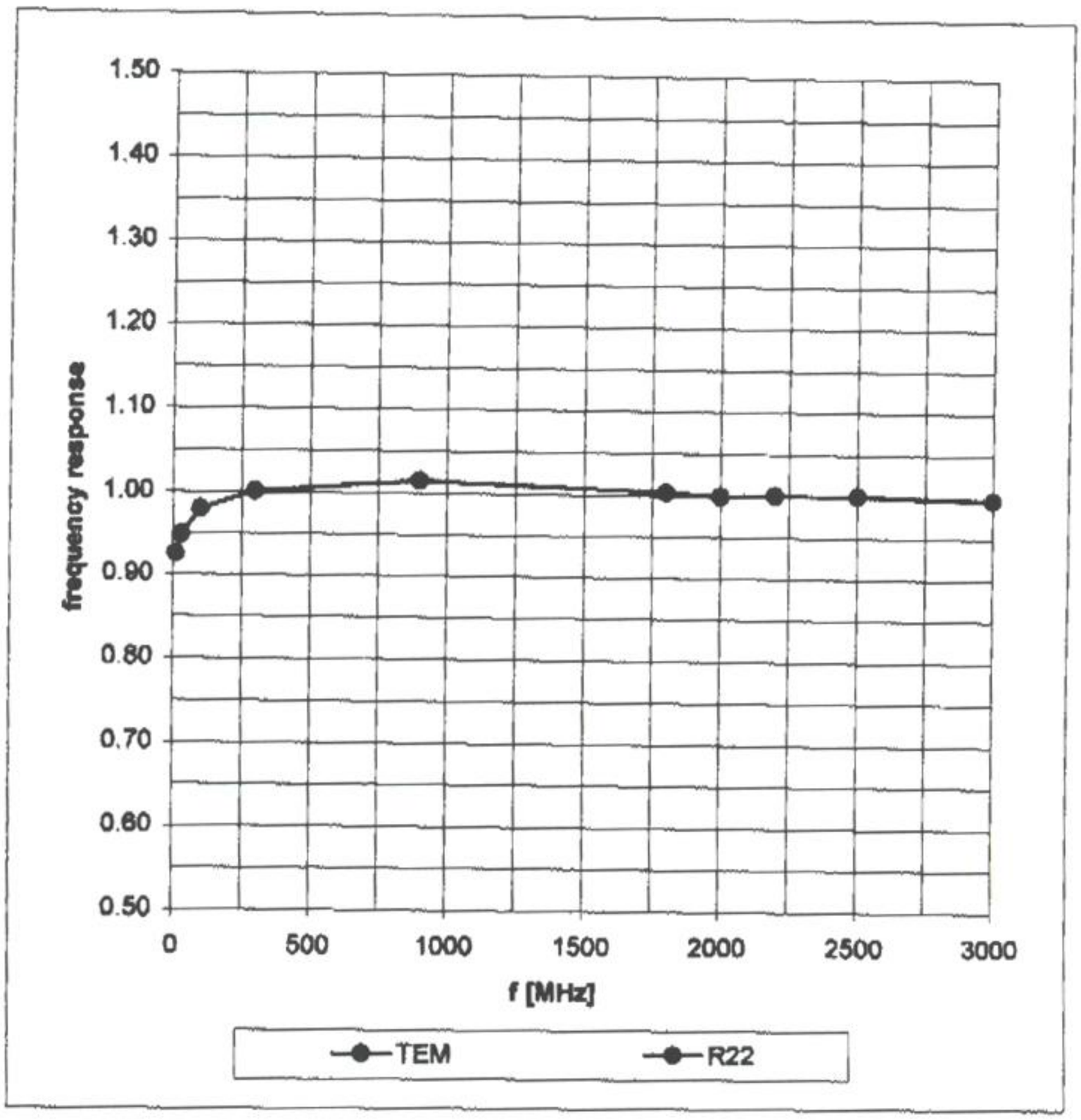


Isotropy Error (ϕ), θ = 0°



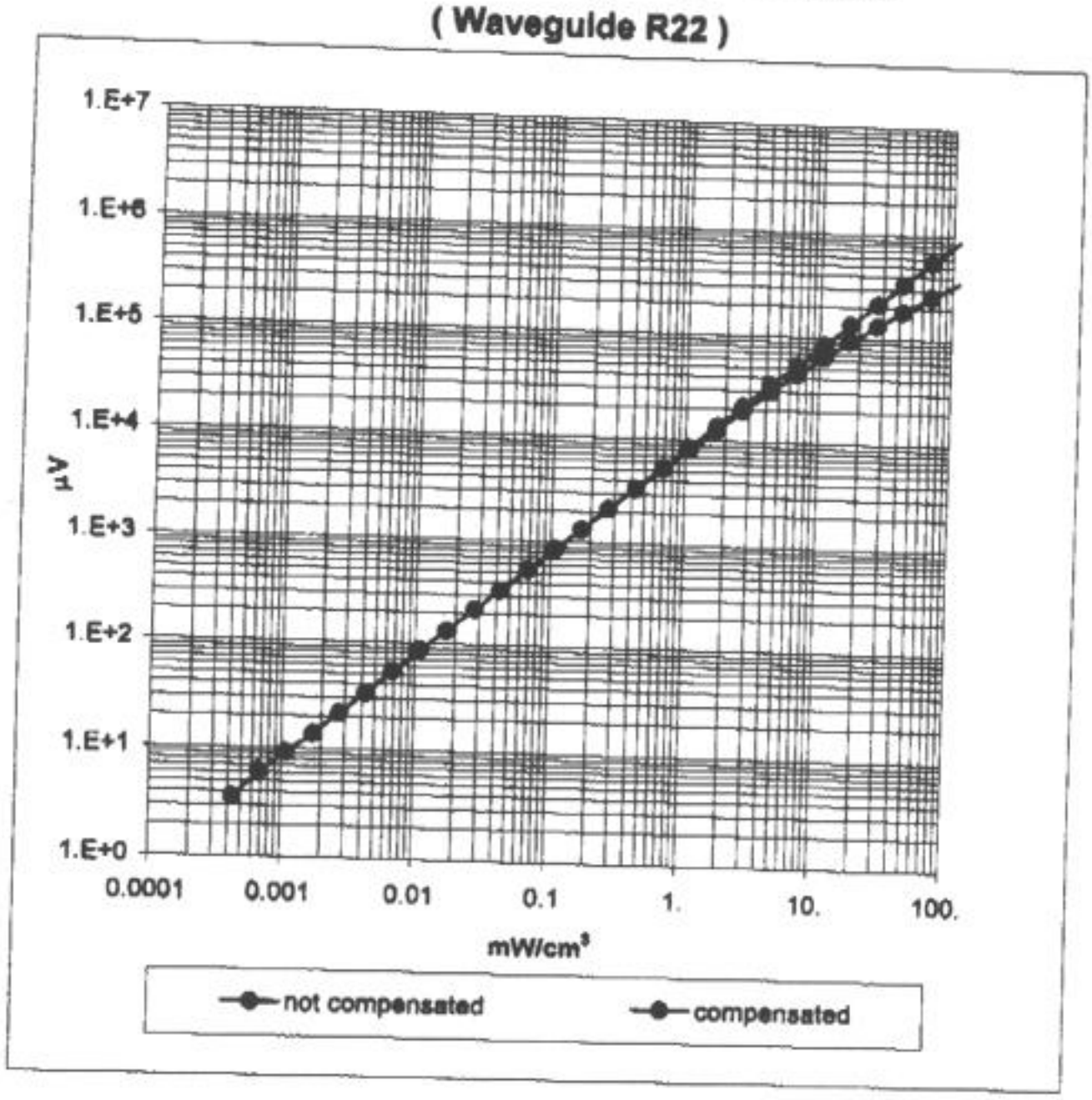
Frequency Response of E-Field

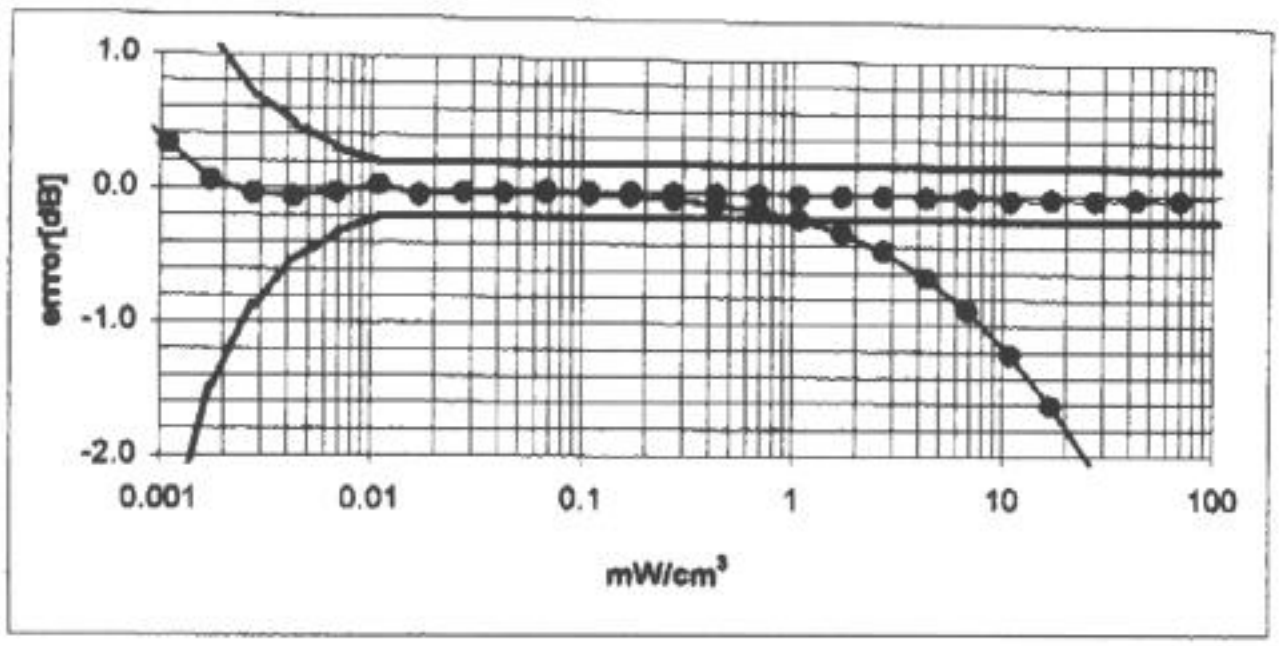
(TEM-Cell:ifi110, Waveguide R22)



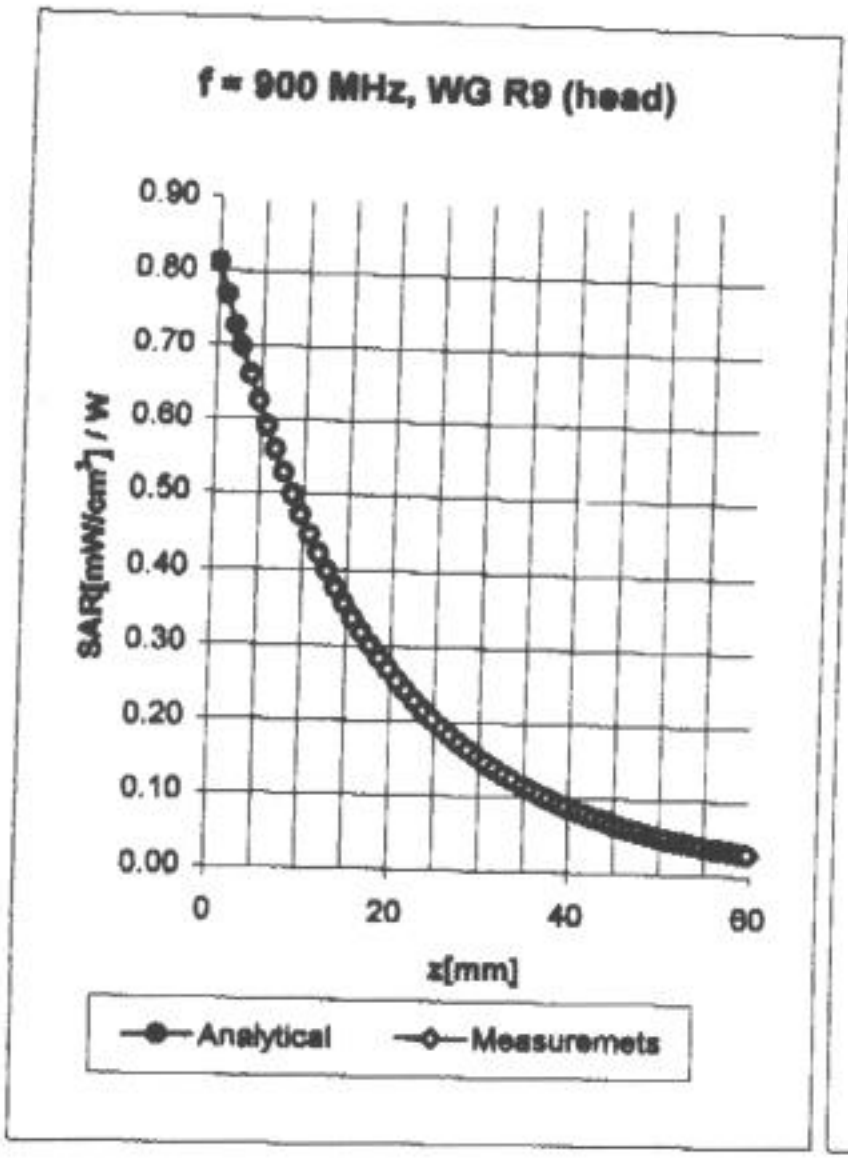
Dynamic Range f(SAR_{brain})

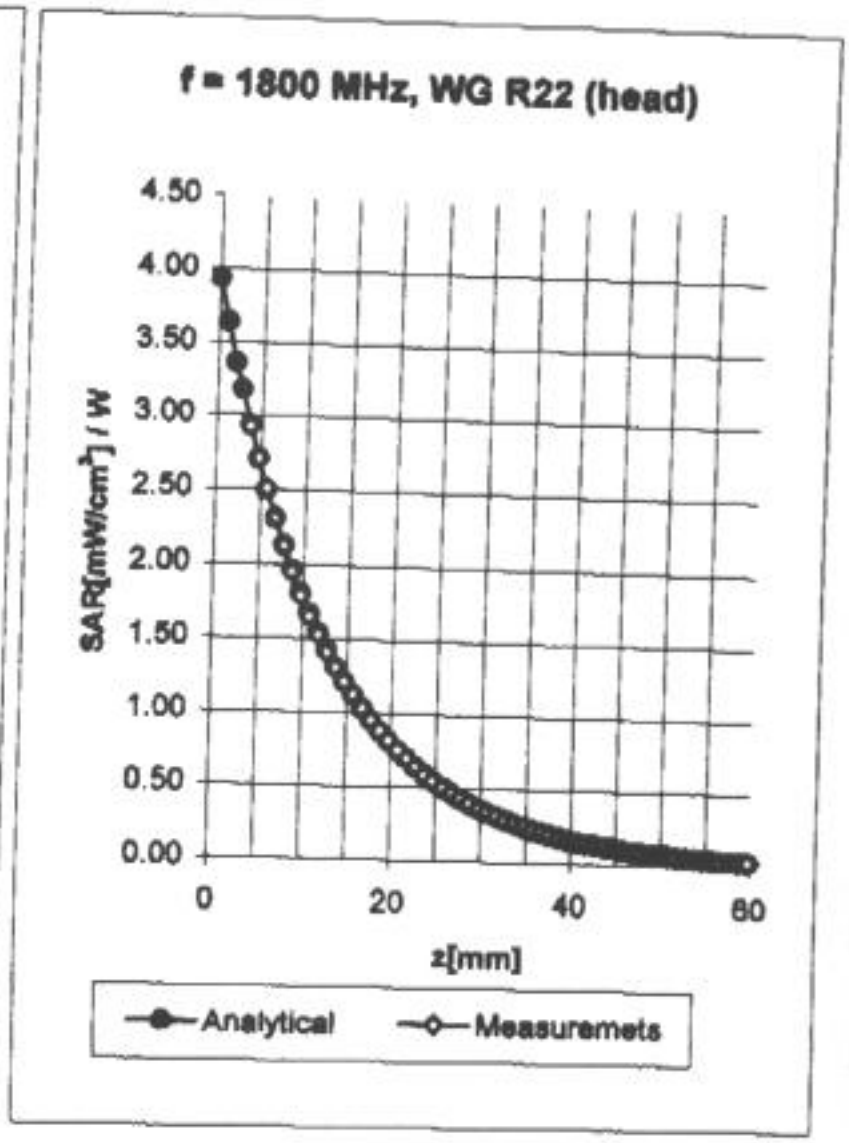
(Waveguide R22)





Conversion Factor Assessment



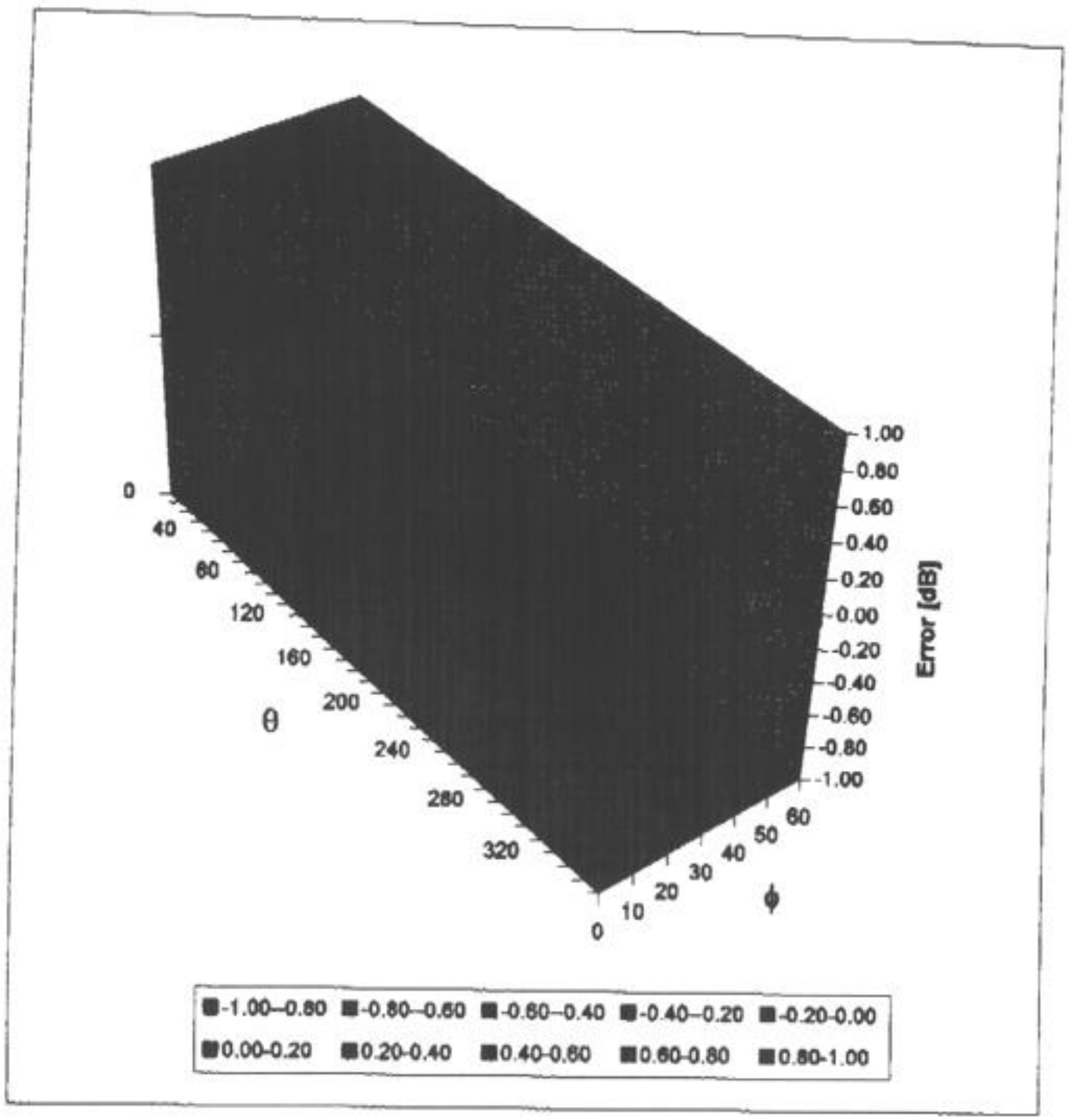


Head	**900 MHz**		ε_r = 41.5 ± 5%	σ = 0.97 ± 5% mho/m
Head	**835 MHz**		ε_r = 41.5 ± 5%	σ = 0.90 ± 5% mho/m
	ConvF X	**6.1** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**6.1** ± 9.5% (k=2)		Alpha **0.81**
	ConvF Z	**6.1** ± 9.5% (k=2)		Depth **1.64**

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	**5.0** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**5.0** ± 9.5% (k=2)		Alpha **0.61**
	ConvF Z	**5.0** ± 9.5% (k=2)		Depth **2.13**

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



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Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6R**
Serial Number:	**1513**
Place of Assessment:	**Zurich**
Date of Assessment:	**May 8, 2002**
Probe Calibration Date:	**May 8, 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: 

Dosimetric E-Field Probe ET3DV6R SN:1513

Conversion factor (± standard deviation)

835 MHz	ConvF	**6.2± 8%**	**ε_r = 41.5 ± 5%** **σ = 0.90 ± 5% mho/m** (head tissue)
1950 MHz	ConvF	**4.8 ± 8%**	**ε_r = 40.0 ± 5%** **σ = 1.40 ± 5% mho/m** (head tissue)
835 MHz	ConvF	**6.0 ± 8%**	**ε_r = 55.2 ± 5%** **σ = 0.97 ± 5% mho/m** (body tissue)
900 MHz	ConvF	**5.9 ± 8%**	**ε_r = 55.0 ± 5%** **σ = 1.05 ± 5% mho/m** (body tissue)
1800 MHz	ConvF	**4.6 ± 8%**	**ε_r = 53.3 ± 5%** **σ = 1.52 ± 5% mho/m** (body tissue)
1950 MHz	ConvF	**4.4 ± 8%**	**ε_r = 53.3 ± 5%** **σ = 1.52 ± 5% mho/m** (body tissue)

Appendix 2

Probe SN1398 Calibration Certificate

Schmid & Partner
Engineering AG

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Calibration Certificate

Dosimetric E-Field Probe

Type:	ET3DV6
Serial Number:	1398
Place of Calibration:	Zurich
Date of Calibration:	September 6, 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:	D. Veller
Approved by:	

Schmid & Partner
Engineering AG

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Probe ET3DV6

SN:1398

Manufactured:	October 24, 1999
Last calibration:	August 31, 2001
Recalibrated:	September 6, 2002

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6 SN:1398

Sensitivity in Free Space

NormX	1.31 $\mu V/(V/m)^2$
NormY	1.33 $\mu V/(V/m)^2$
NormZ	1.48 $\mu V/(V/m)^2$

Diode Compression

DCP X	96	mV
DCP Y	96	mV
DCP Z	96	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	6.2 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.2 ± 9.5% (k=2)	Alpha	0.35
ConvF Z	6.2 ± 9.5% (k=2)	Depth	2.80

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	5.2 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.2 ± 9.5% (k=2)	Alpha	0.55
ConvF Z	5.2 ± 9.5% (k=2)	Depth	2.37

Boundary Effect

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

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	10.9	6.3
SAR_{be} [%]	With Correction Algorithm	0.5	0.7

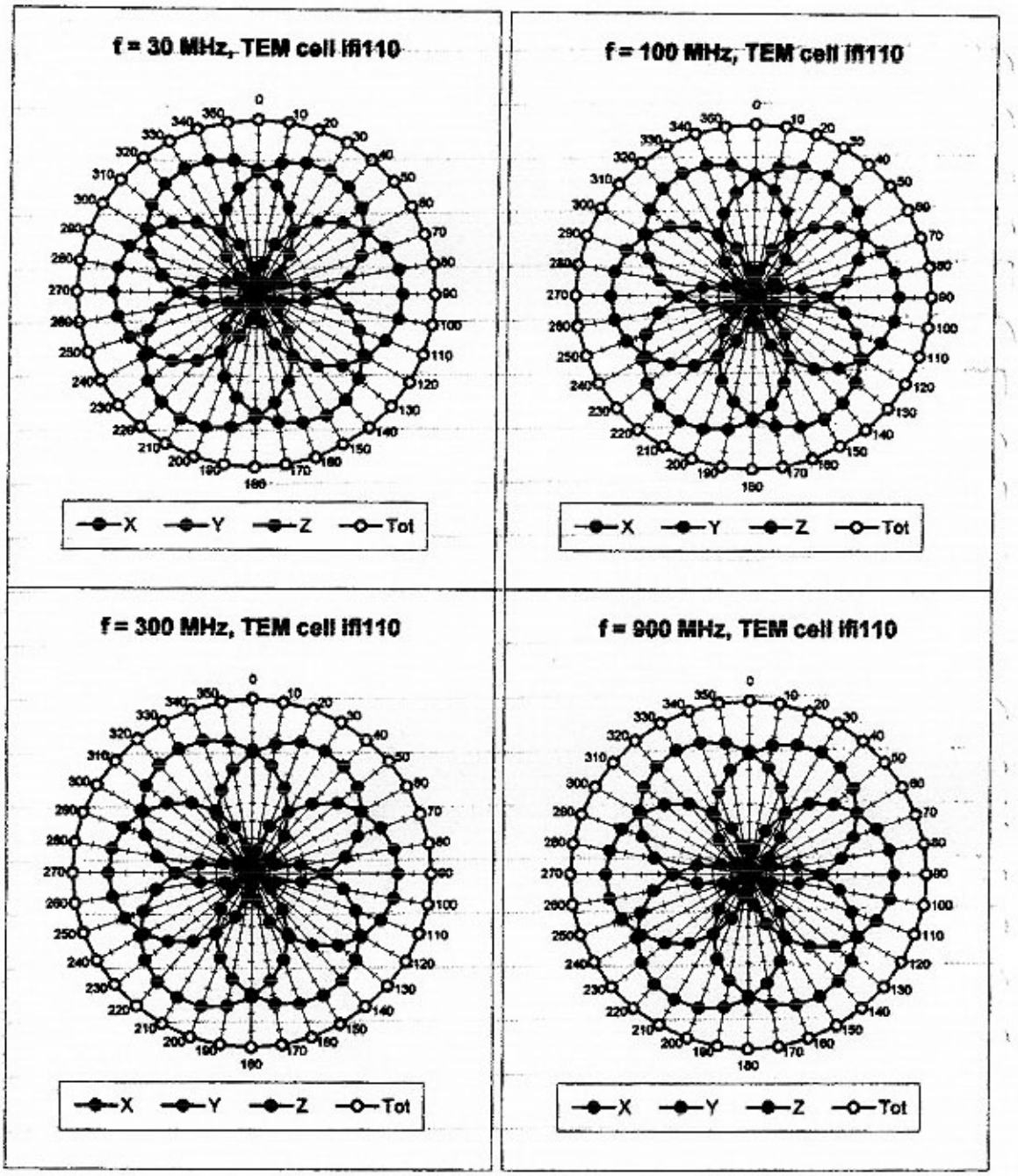
Head 1800 MHz **Typical SAR gradient: 10 % per mm**

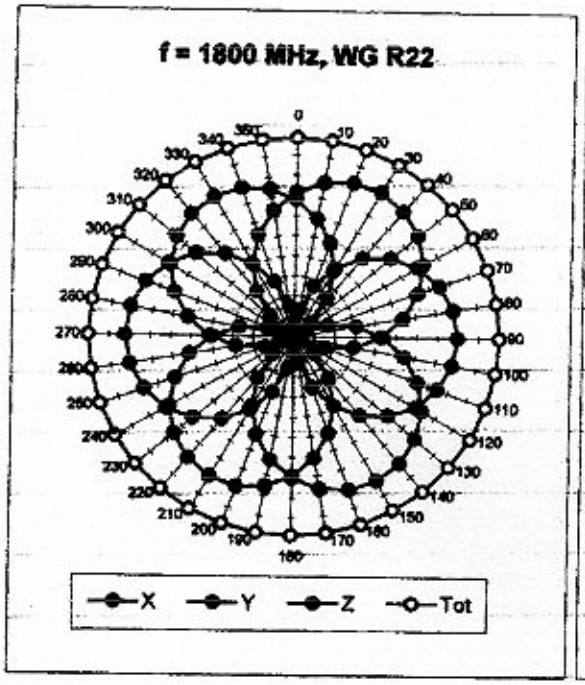
Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	12.8	8.3
SAR_{be} [%]	With Correction Algorithm	0.1	0.1

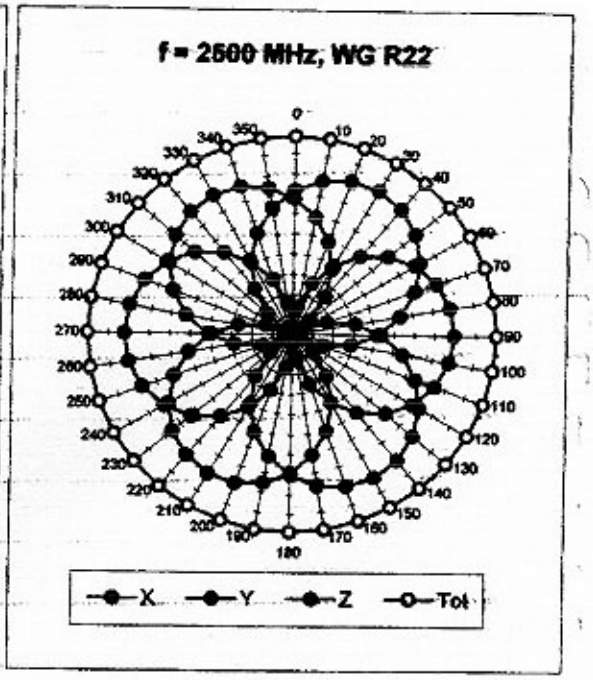
Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.0 ± 0.2	mm

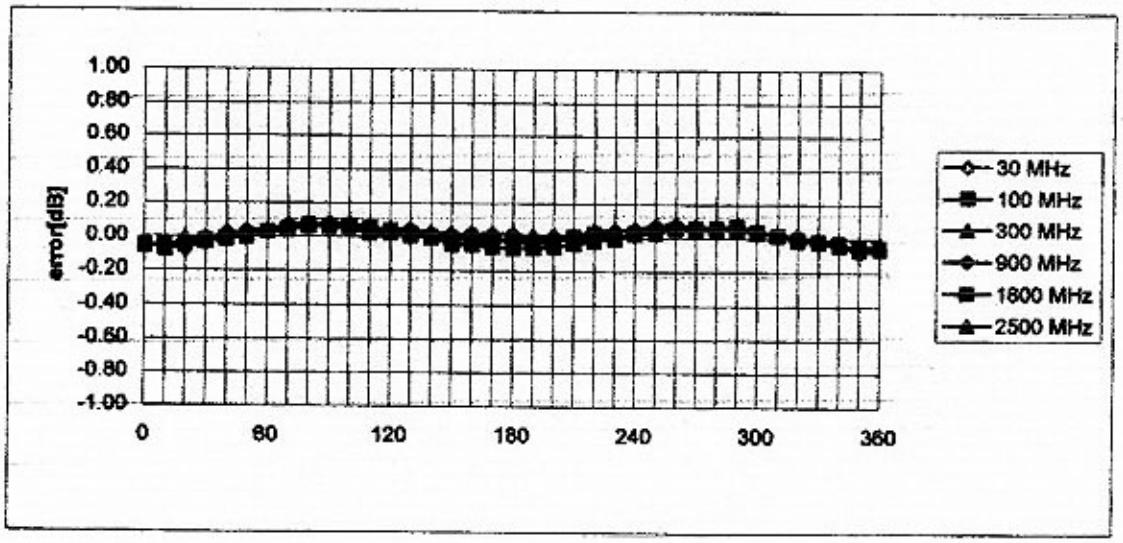
Receiving Pattern (ϕ), θ = 0°





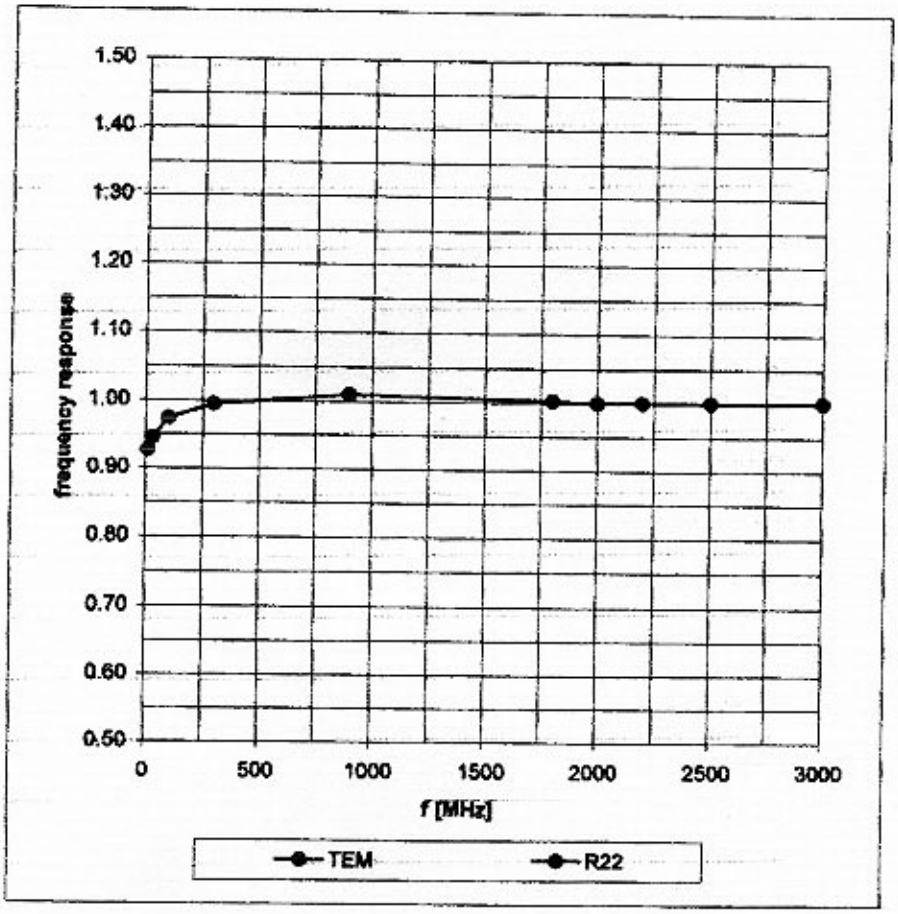


Isotropy Error (ϕ), θ = 0°



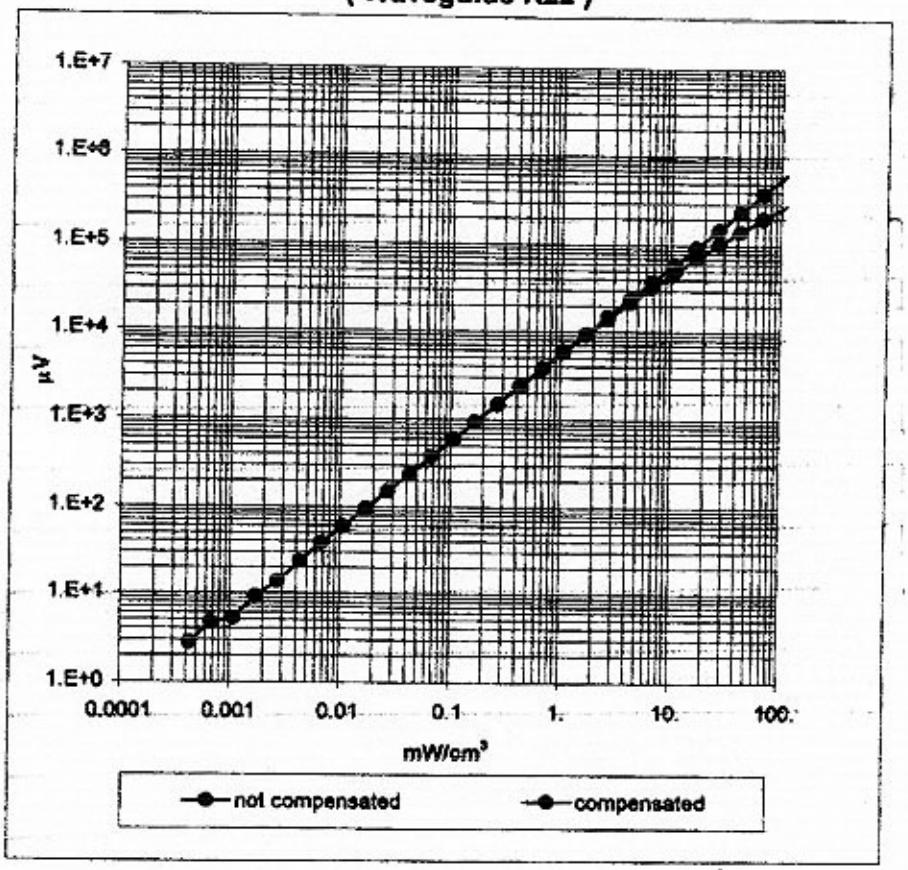
Frequency Response of E-Field

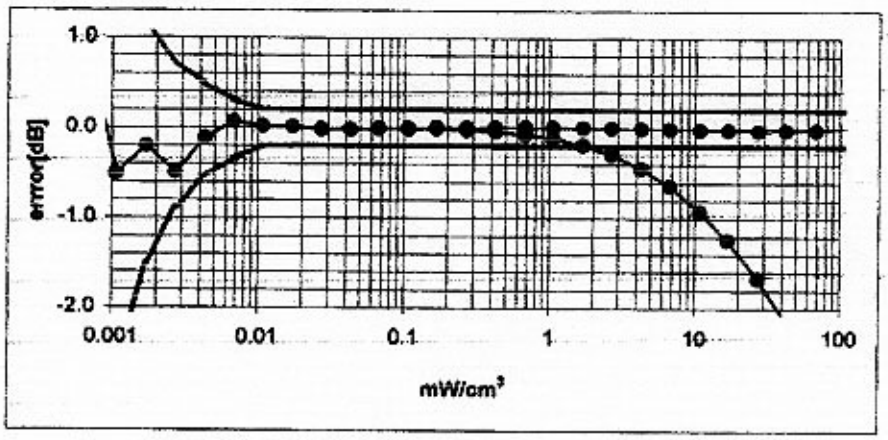
(TEM-Cell:ifi110, Waveguide R22)



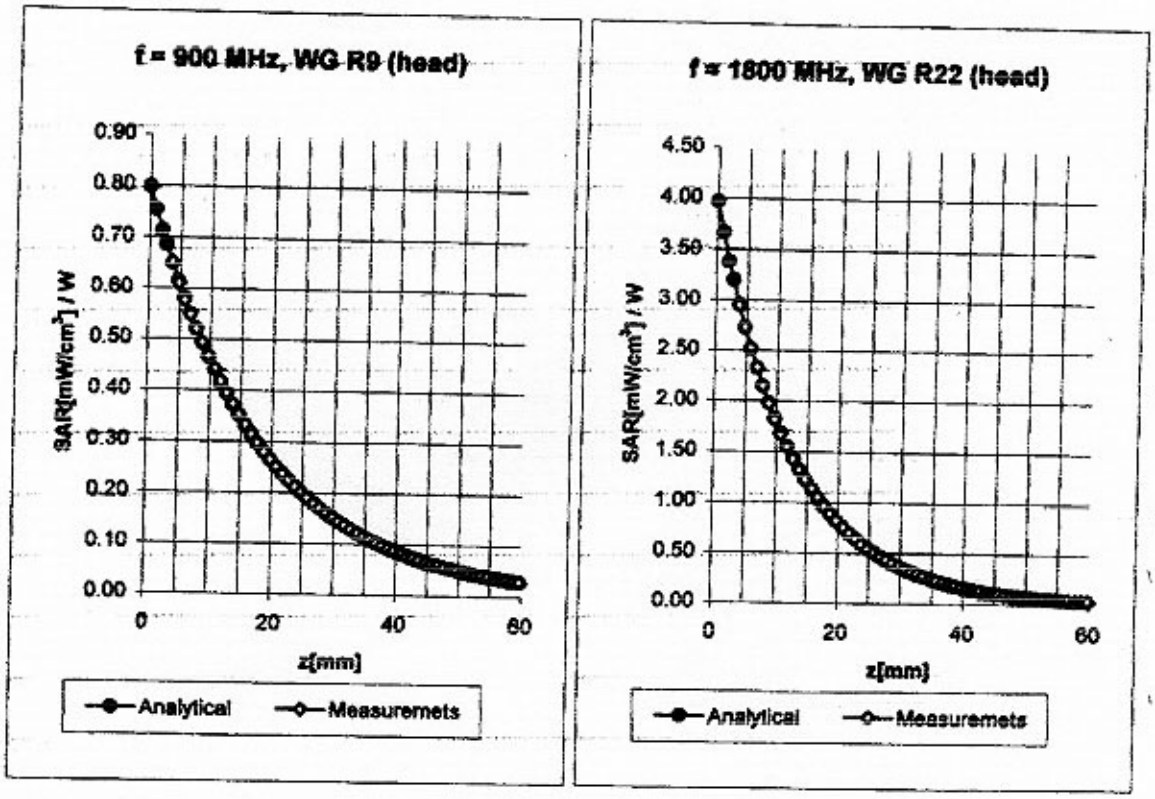
Dynamic Range f(SAR_{brain})

(Waveguide R22)





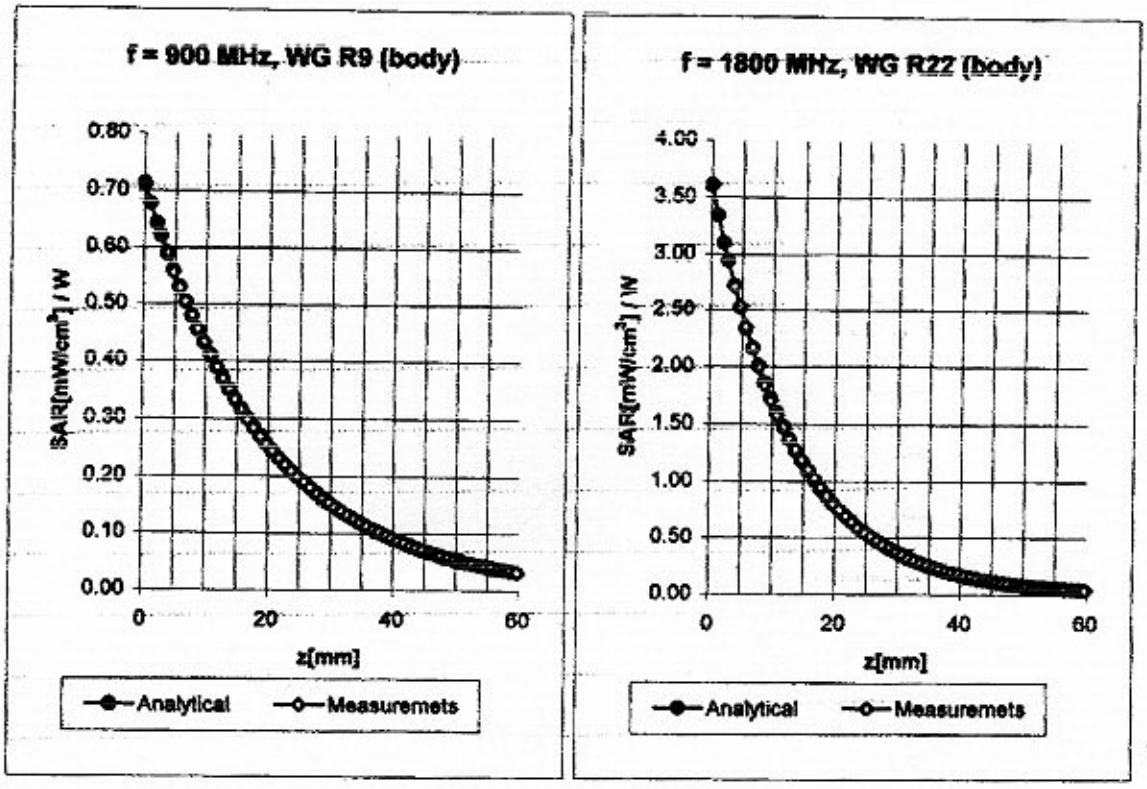
Conversion Factor Assessment



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	**6.2** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.2** ± 9.5% (k=2)	Alpha	**0.35**
	ConvF Z	**6.2** ± 9.5% (k=2)	Depth	**2.80**

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	**5.2** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.2** ± 9.5% (k=2)	Alpha	**0.55**
	ConvF Z	**5.2** ± 9.5% (k=2)	Depth	**2.37**

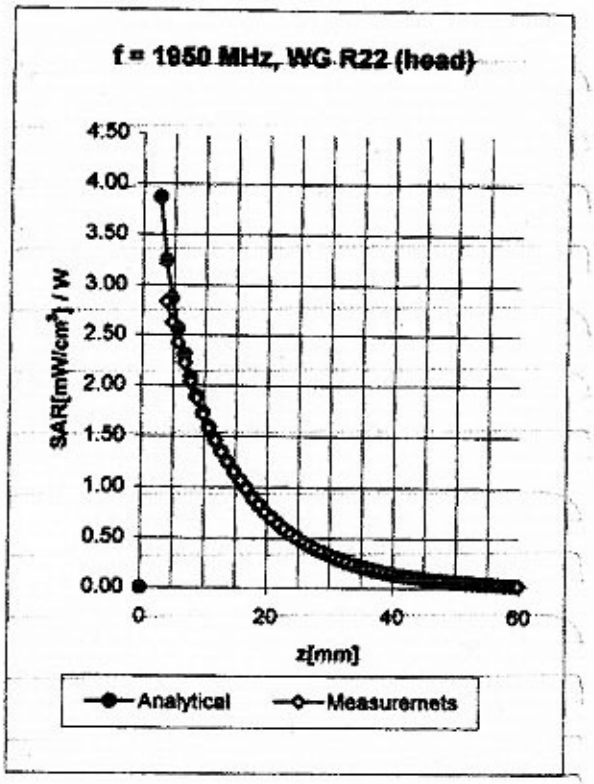
Conversion Factor Assessment



Body	**900 MHz**		ε_r = 55.0 ± 5%	σ = 1.05 ± 5% mho/m
Body	**835 MHz**		ε_r = 55.2 ± 5%	σ = 0.97 ± 5% mho/m
	ConvF X	**5.9** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**5.9** ± 9.5% (k=2)		Alpha **0.40**
	ConvF Z	**5.9** ± 9.5% (k=2)		Depth **2.70**

Body	**1800 MHz**		ε_r = 53.3 ± 5%	σ = 1.52 ± 5% mho/m
Body	**1900 MHz**		ε_r = 53.3 ± 5%	σ = 1.52 ± 5% mho/m
	ConvF X	**4.9** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**4.9** ± 9.5% (k=2)		Alpha **0.61**
	ConvF Z	**4.9** ± 9.5% (k=2)		Depth **2.41**

Conversion Factor Assessment

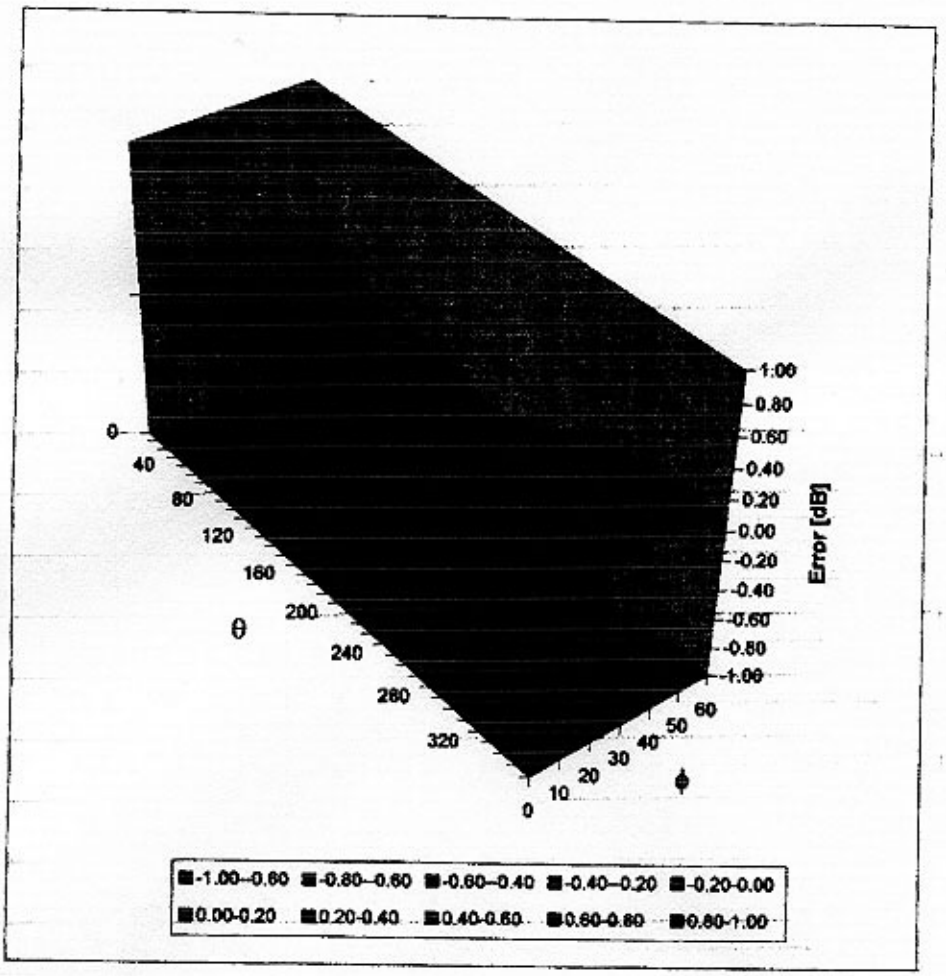


Head **1950 MHz** ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

ConvF X	**4.9** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**4.9** ± 9.5% (k=2)	Alpha	**0.63**
ConvF Z	**4.9** ± 9.5% (k=2)	Depth	**2.32**

Deviation from Isotropy in HSL

Error (θ,φ), f = 900 MHz



Appendix 3

Additional SAR Output Plot from Co-located Transmitter

11/18/02

s/n 7610010

Ch# 661 / Pwr Step: 0 / Type of Modulation: GSM1900
DEVICE POSITION (cheek or rotated): Cheek
Dominant Transmitter and Bluetooth Transmiter both turned ON
R4 TP-1105 GLYCOL sam(rev.3) Phantom; Right Hand Section; Position: (90°,180°); Frequency: 1880 MHz
Probe: ET3DV6 - SN1521 - IEEE Head; ConvF(5.40,5.40,5.40); Crest factor: 8.0; 1880 MHz Head & Body: σ = 1.47 mho/m ε_r = 40.3 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.432 mW/g, SAR (10g): 0.261 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 10.9 (10.0, 12.0) [mm]
Powerdrift: -0.03 dB