MOTOROLA

ACCREDITED

CGISS EME Test Laboratory
8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

S.A.R. EME Compliance Test Report
Part 3 of 3

Attention:	FCC
Date of Report:	September 23, 2003
Report Revision:	Rev. B
Manufacturer:	Motorola
Product Description:	Portable 438-470 MHz 1-4W with and with out display and keypad
FCC ID:	**ABZ99FT4056**
Device Model:	AAH65RDC9AA1AN/ AAH65RDH9AA1AN

Test Period:	8/26/03-9/7/03
EME Tech:	Ed Church
EME Engineer:	Kim Uong Lead EME Engineer
Author:	Michael Sailsman Global EME Regulatory Affairs Liaison

Note: Based on the information and the testing results provided herein, the undersigned certifies that when used as stated in the operating instructions supplied, said product complies with the national and international reference standards and guidelines listed in section 2.0 of this report.

Signature on file — 9/24/03

Ken Enger
Senior Resource Manager, Laboratory Director, CGISS EME Lab

Date Approved

APPENDIX D

Calibration Certificates

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

Client Motorola CGISS

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1383
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	February 26, 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	Scheduled Calibration
RF generator HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	8-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

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

Date issued: February 26, 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.

DASY - Parameters of Probe: ET3DV6 SN:1383

Sensitivity in Free Space

NormX	1.80 $\mu V/(V/m)^2$
NormY	1.55 $\mu V/(V/m)^2$
NormZ	1.62 $\mu V/(V/m)^2$

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	0.59
ConvF Z	6.5 ± 9.5% (k=2)	Depth	1.97

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	0.57
ConvF Z	5.2 ± 9.5% (k=2)	Depth	2.54

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	10.0	5.2
SAR_{be} [%]	With Correction Algorithm	0.1	0.5

Head 1800 MHz Typical SAR gradient: 10 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	15.1	9.9
SAR_{be} [%]	With Correction Algorithm	0.2	0.0

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	0.5 ± 0.2	mm

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:	**1383**
Place of Assessment:	**Zurich**
Date of Assessment:	**February 28, 2003**
Probe Calibration Date:	**February 26, 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: [signature]

Dosimetric E-Field Probe ET3DV6 SN:1383

Conversion factor (± standard deviation)

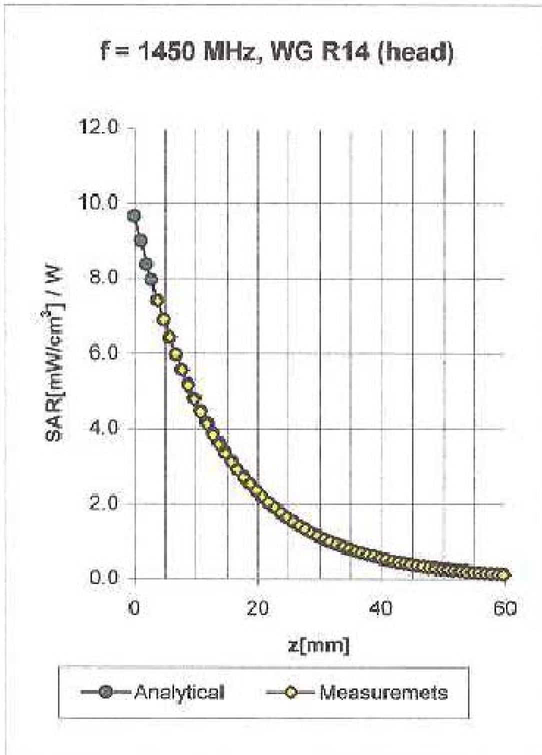
150 MHz	ConvF	8.1 ± 8%	ε_r = 61.9 σ = 0.80 mho/m (body tissue)
236 MHz	ConvF	7.9 ± 8%	ε_r = 59.8 σ = 0.87 mho/m (body tissue)
300 MHz	ConvF	7.8 ± 8%	ε_r = 58.2 σ = 0.92 mho/m (body tissue)
350 MHz	ConvF	7.8 ± 8%	ε_r = 57.7 σ = 0.93 mho/m (body tissue)
450 MHz	ConvF	7.5 ± 8%	ε_r = 56.7 σ = 0.94 mho/m (body tissue)
784 MHz	ConvF	6.5 ± 8%	ε_r = 55.4 σ = 0.97 mho/m (body tissue)
1450 MHz	ConvF	5.3 ± 8%	ε_r = 54.0 σ = 1.30 mho/m (body tissue)

Dosimetric E-Field Probe ET3DV6 SN:1383

Conversion factor (± standard deviation)

150 MHz	ConvF	9.0 ± 8%	$\varepsilon_r = 52.3$ $\sigma = 0.76$ mho/m (head tissue)
236 MHz	ConvF	8.2 ± 8%	$\varepsilon_r = 48.3$ $\sigma = 0.82$ mho/m (head tissue)
300 MHz	ConvF	7.7 ± 8%	$\varepsilon_r = 45.3$ $\sigma = 0.87$ mho/m (head tissue)
350 MHz	ConvF	7.7 ± 8%	$\varepsilon_r = 44.7$ $\sigma = 0.87$ mho/m (head tissue)
400 MHz	ConvF	7.5 ± 8%	$\varepsilon_r = 44.4$ $\sigma = 0.87$ mho/m (head tissue - CENELEC)
450 MHz	ConvF	7.5 ± 8%	$\varepsilon_r = 43.5$ $\sigma = 0.87$ mho/m (head tissue)
784 MHz	ConvF	6.7 ± 8%	$\varepsilon_r = 41.8$ $\sigma = 0.90$ mho/m (head tissue)

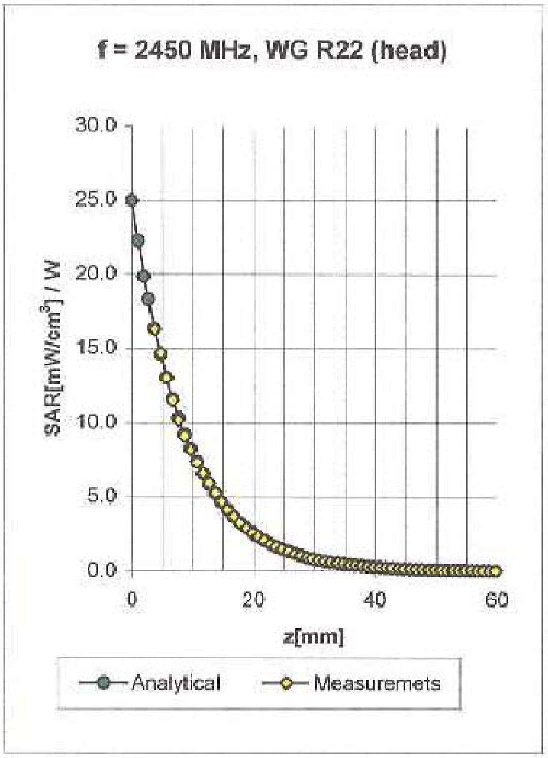
Conversion Factor Assessment

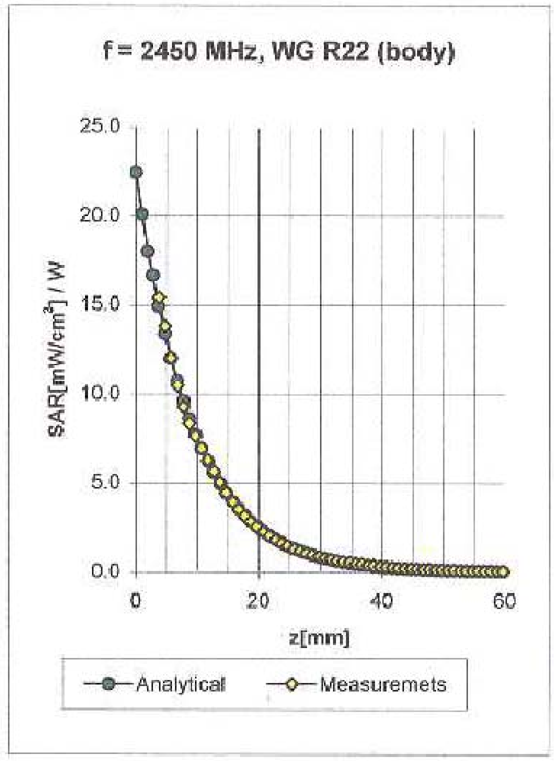


Head	1450 MHz	ε_r = 40.4 ± 5%	σ = 1.23 ± 5% mho/m

ConvF X	**5.8** ± 8.9% (k=2)		Boundary effect:	
ConvF Y	**5.8** ± 8.9% (k=2)		Alpha	**0.75**
ConvF Z	**5.8** ± 8.9% (k=2)		Depth	**1.91**

Conversion Factor Assessment

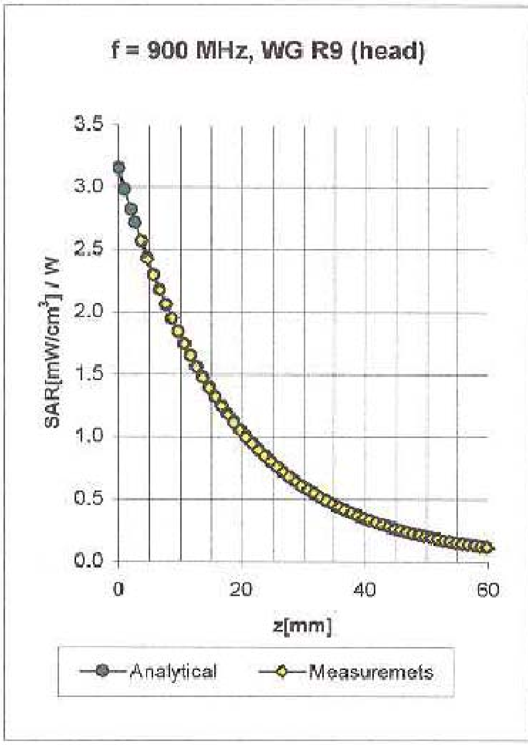


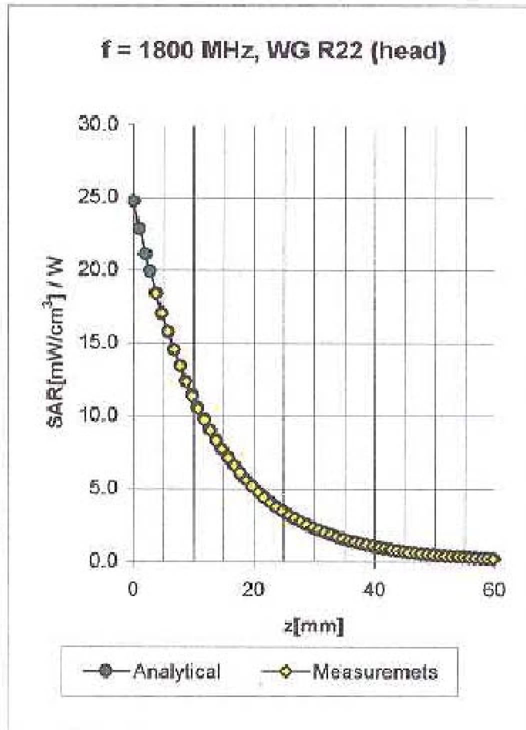


Head	**2450**	MHz	ε_r = 39.2 ± 5%	σ = 1.80 ± 5% mho/m
	ConvF X	**5.0** ± 8.9% (k=2)	Boundary effect:	
	ConvF Y	**5.0** ± 8.9% (k=2)	Alpha	**1.15**
	ConvF Z	**5.0** ± 8.9% (k=2)	Depth	**1.76**

Body	**2450**	MHz	ε_r = 52.7 ± 5%	σ = 1.95 ± 5% mho/m
	ConvF X	**4.7** ± 8.9% (k=2)	Boundary effect:	
	ConvF Y	**4.7** ± 8.9% (k=2)	Alpha	**2.00**
	ConvF Z	**4.7** ± 8.9% (k=2)	Depth	**1.24**

Conversion Factor Assessment



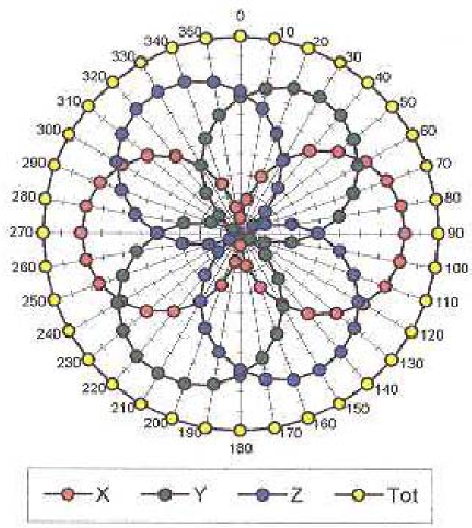


Head	900 MHz	ε_r = 41.5 ± 5%		σ = 0.97 ± 5% mho/m	
Head	835 MHz	ε_r = 41.5 ± 5%		σ = 0.90 ± 5% mho/m	
	ConvF X	6.5	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	6.5	± 9.5% (k=2)	Alpha	0.59
	ConvF Z	6.5	± 9.5% (k=2)	Depth	1.97

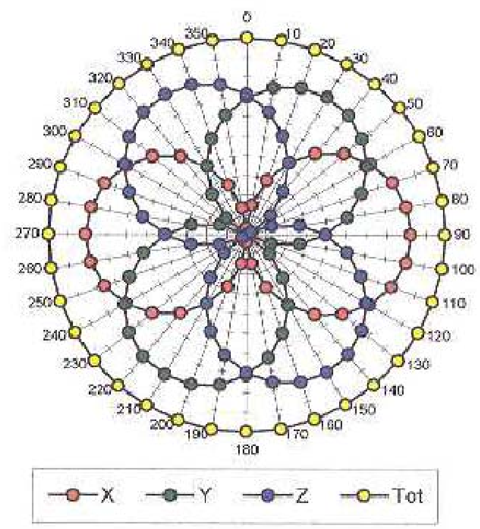
Head	1800 MHz	ε_r = 40.0 ± 5%		σ = 1.40 ± 5% mho/m	
Head	1900 MHz	ε_r = 40.0 ± 5%		σ = 1.40 ± 5% mho/m	
	ConvF X	5.2	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	5.2	± 9.5% (k=2)	Alpha	0.57
	ConvF Z	5.2	± 9.5% (k=2)	Depth	2.54

Receiving Pattern (ϕ), $\theta = 0°$

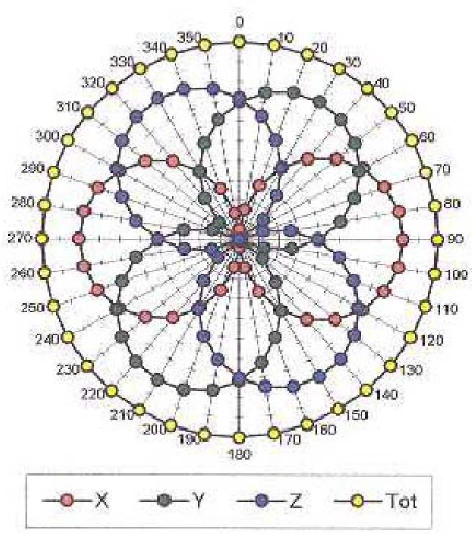
f = 30 MHz, TEM cell ifi110



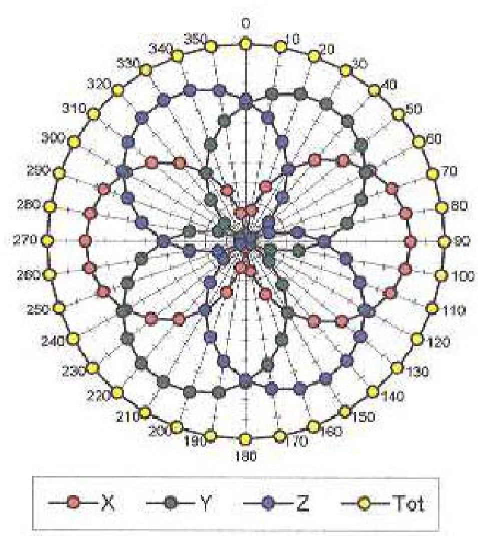
f = 100 MHz, TEM cell ifi110

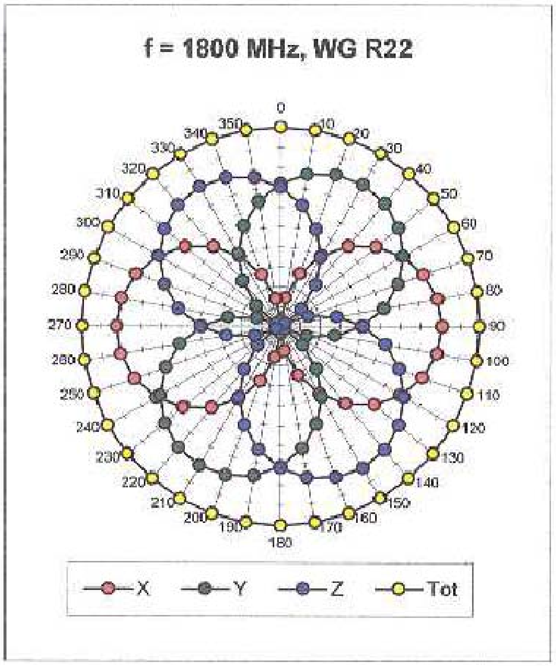


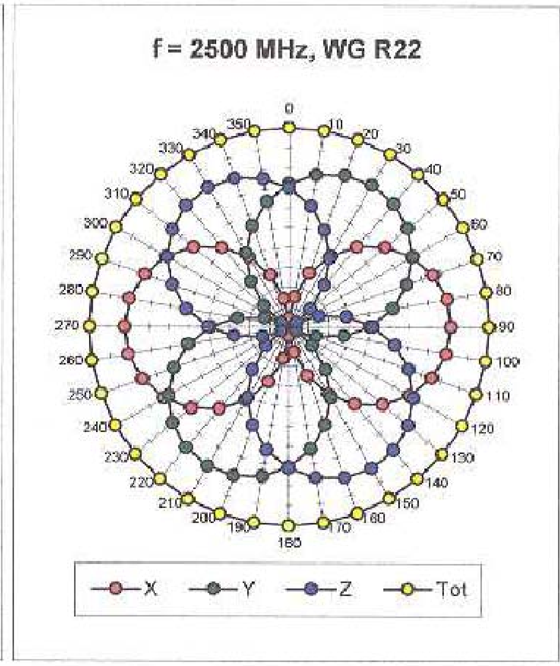
f = 300 MHz, TEM cell ifi110



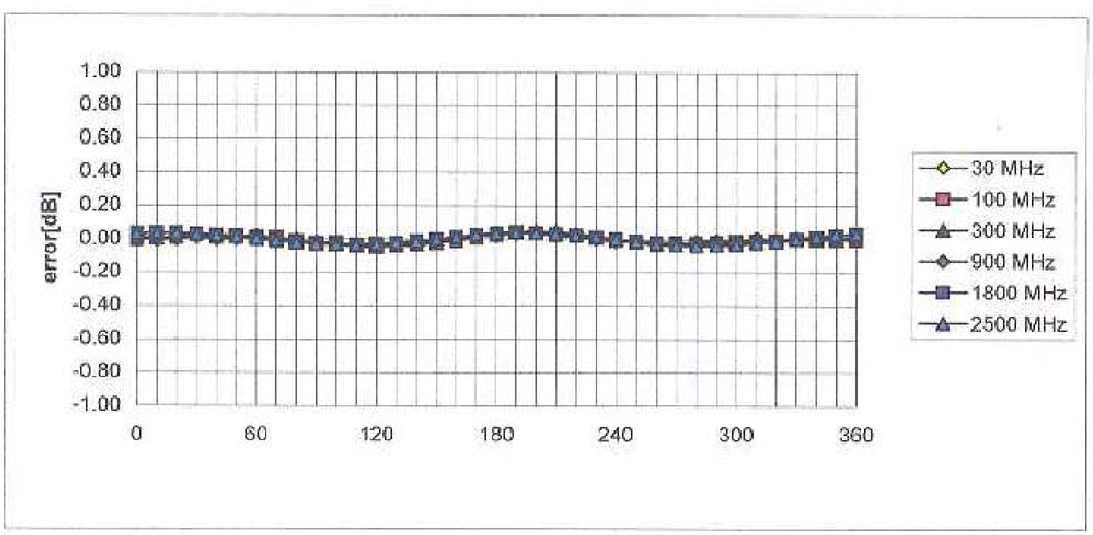
f = 900 MHz, TEM cell ifi110





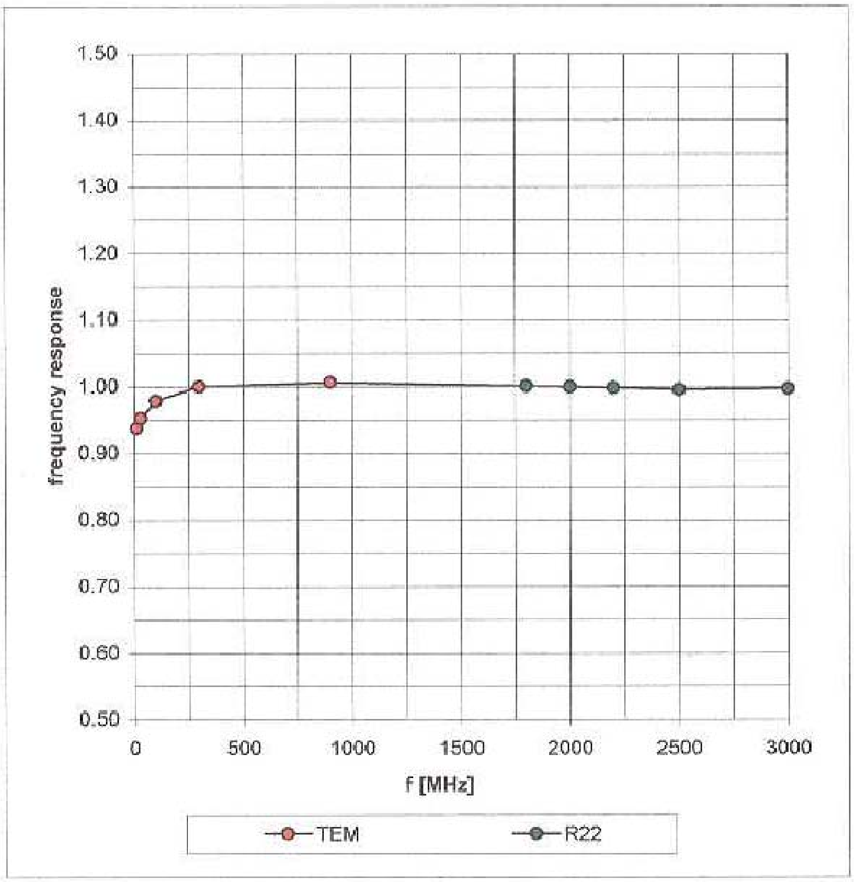


Isotropy Error (ϕ), θ = 0°



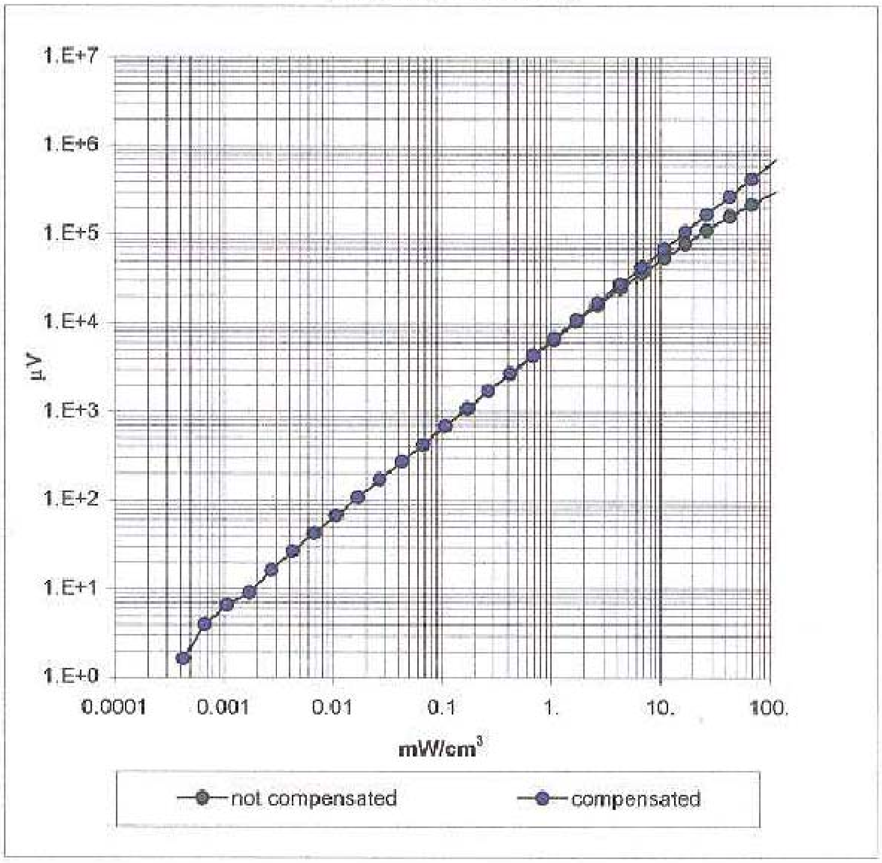
Frequency Response of E-Field

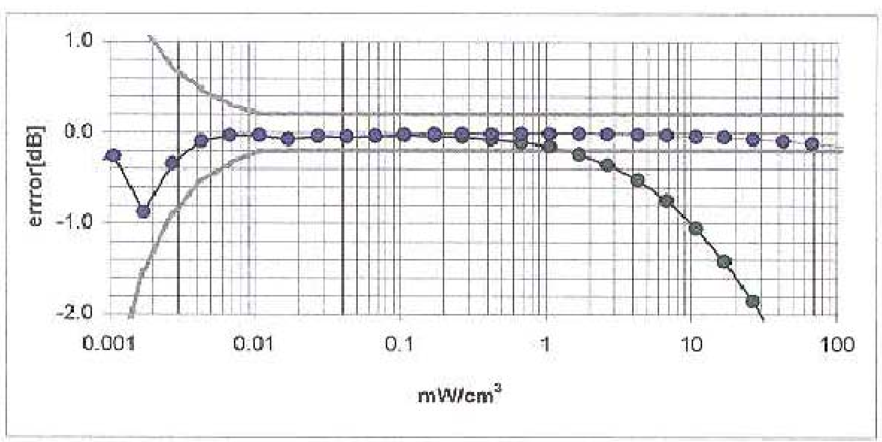
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR_{brain})

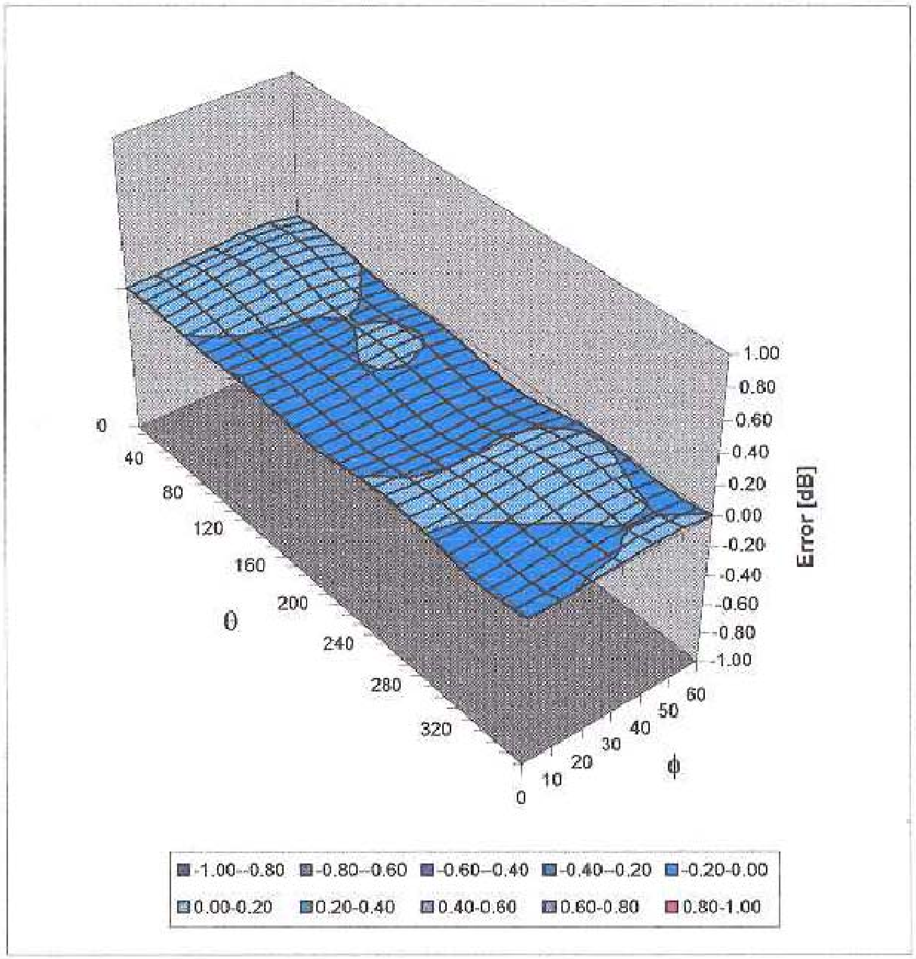
(Waveguide R22)





Deviation from Isotropy in HSL

Error (θ,φ), f = 900 MHz



Schmid & Partner Engineering AG

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

Calibration Certificate

450 MHz System Validation Dipole

Type:	**D450V2**
Serial Number:	**1002**
Place of Calibration:	**Zurich**
Date of Calibration:	**April 5, 2002**
Calibration Interval:	**24 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:

1. Measurement Conditions

The measurements were performed in the flat phantom filled with head simulating liquid of the following electrical parameters at 450 MHz:

Relative Dielectricity	**44.5**	± 5%
Conductivity	**0.86 mho/m**	± 5%

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 7.2 at 450 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom and the dipole was oriented parallel to the longer side of the phantom. The standard measuring distance was 15mm from dipole center to the liquid surface including the 6mm thick phantom shell. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 389 mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 1. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm^3 (1 g) of tissue:	**4.81 mW/g** (Advanced Extrapolation)
averaged over 10 cm^3 (10 g) of tissue:	**3.19 mW/g** (Advanced Extrapolation)

Advanced extrapolation has been applied to the measured SAR values to compensate for the probe boundary effect (see DASY User Manual for details).

Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well.

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1.347 ns**	(one direction)
Transmission factor:	**0.997**	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 450 MHz:	Re{Z} = **57.2 Ω**
	Im {Z} = **-5.2 Ω**
Return Loss at 450 MHz	**-21.7 dB**

4. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

5. Design

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

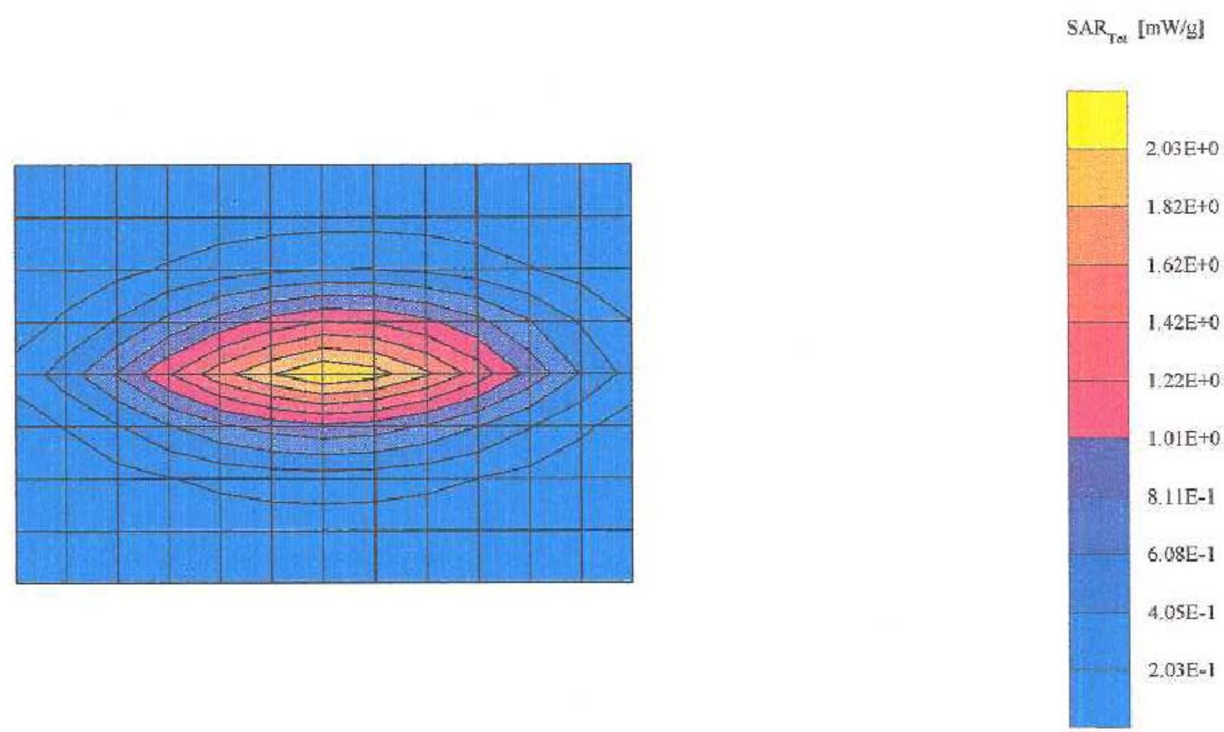
6. Power Test

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

03/27/02

Validation Dipole D450V2 SN:1002, d = 15 mm

Frequency: 450 MHz; Antenna Input Power: 389 [mW]
Phantom Name: Calibration, Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(7.20,7.20,7.20); Crest factor: 1.0; Head 450 MHz: $\sigma = 0.86$ mho/m $\varepsilon_r = 44.5$ $\rho = 1.00$ g/cm^3
Cubes (2): Peak: 2.84 mW/g ± 0.03 dB, SAR (1g): 1.87 mW/g ± 0.03 dB, SAR (10g): 1.24 mW/g ± 0.03 dB , (Advanced extrapolation)
Penetration depth: 13.0 (11.9, 14.4) [mm]



Schmid & Partner Engineering AG, Zurich, Switzerland

APPENDIX E
Illustration of Body-Worn Accessories

The purpose of this appendix is to illustrate the body-worn carry accessories for FCC ID: ABZ99FT4056. The sample that was used in the following photos represents the product used to obtain the results presented herein and was used in this section to demonstrate the different body-worn accessories.

Photo 1.
Model HLN8255B
Back View

Photo 2.
Model HLN8255B
Side View

Photo 3.
Model RLN5498A
Back View

Photo 4.
Model RLN5498A
Front View

Photo 5.
Model RLN5498A
Side View

Photo 5.
Model RLN5496A
Back View

Photo 6.
Model RLN5496A
Front View

Photo 7.
Model RLN5496A
Side View

Photo 8.
Model RLN5497A
Back View

Photo 9.
Model RLN5497A
Front View

Photo 10.
Model RLN5497A
Side View

Photo 11.
Model RLN5640A
Back View

Photo 12.
Model RLN5640A
Front View

Photo 13.
Model RLN5640A
Side View

Photo 14.
Model RLN5641A
Back View

Photo 15.
Model RLN5641A
Front View

Photo 16.
Model RLN5641A
Side View

Photo 17.
Model RLN5642A
Back View

Photo 18.
Model RLN5642A
Front View

Photo 19.
Model RLN5642A
Side View

Photo 20.
HLN6602A
Universal Chest Pack

Photo 21.
NTN5243A
Shoulder Carry Strap

Photo 22.
RLN4570A
Break-Away Chest Pack w/ belt lengthener

Appendix F
Accessories and options test status and separation distances

The following table summarizes the body spacing distance provided by each of the body-worn accessories:

Carry Case Model	Tested ?	Separation distance between device and phantom surface. (mm)	Comments
HLN6602A	Yes	8-20	NA
RLN4570A	Yes	19-25	NA
NTN5243A	Yes	NA	Tested with carry case RLN5642A
HLN8255B	Yes	33-50	NA
RLN5640A	Yes	46-79	NA
RLN5641A	Yes	62-103	NA
RLN5642A	Yes	62-110	NA
RLN5498A	No	46-79	Similar to RLN5640A
RLN5496A	No	62-103	Similar to RLN5641A
RLN5497A	No	62-110	Similar to RLN5642A
HLN9985B	No	NA	Device not functional while using this carry case
Audio Acc. Model	**Tested ?**	**Separation distance between device and phantom surface. (mm)**	**Comments**
HMN9030A	Yes	NA	NA
HMN9754D	Yes	NA	NA
PMMN4001A	Yes	NA	NA
HMN9013A	Yes	NA	NA
HLN9133A	Yes	NA	Tested w/ PMLN4443A
RMN4016A	Yes	NA	NA
RLN5238A	Yes	NA	NA
HMN9021A	Yes	NA	NA
BDN6647F	Yes	NA	NA
BDN6648C	Yes	NA	NA
RMN5015A	Yes	NA	NA
RKN4090A	Yes	NA	tested with RMN5015A
RLN5411A	Yes	NA	NA
PMMN4008A	Yes	NA	NA
PMLN4425A	Yes	NA	NA
PMLN4443A	Yes	NA	NA
PMLN4444A	Yes	NA	NA
PMLN4445A	Yes	NA	NA
PMLN4294C	Yes	NA	NA
PMLN4442A	Yes	NA	NA
BDN6706B	Yes	NA	NA
0180358B38	Yes	NA	Tested w/ BDN6706B
RMN4054B	Yes	NA	NA

RMN4055A	Yes	NA	NA
RMN4051B	Yes	NA	NA
RKN4094A	Yes	NA	Tested w/ RMN4051B
HMN9727B	Yes	NA	NA
HMN9752B	Yes	NA	NA
RLN4894A	No	NA	Similar to HMN9727B
RMN4052A	No	NA	Similar to RMN4051B
RMN4053A	No	NA	Similar to RMN4051B
BDN6646C	No	NA	Similar to BDN6706B
0180300E83	No	NA	Similar to 0180358B38
RLN4895A	No	NA	Similar to HMN9754D
HMN9036A	No	NA	Similar to HMN9754D
HLN9132A	No	NA	Similar to HMN9727B
RLN5198AP	No	NA	Similar to HMN9754D
BDN6720A	No	NA	Similar to HMN9727B
HMN9022A	No	NA	Similar to HMN9021A
Additional attachments	**Tested ?**	**Separation distance between device and phantom surface. (mm)**	**Comments**
5886627Z01	Yes	NA	Tested with antenna standard and optional antenna