Certificate Number: 1449-02

ACCREDITED

CGISS EME Test Laboratory

8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

S.A.R. EME Compliance Test Report

Part 3 of 3

Date of Report:	November 20, 2003
Report Revision:	Rev. O
Manufacturer:	Motorola
Product Description:	Portable 136-174 MHz, 5W, 32 CH w/ display/Limited Keypad
FCC ID:	**ABZ99FT3050**
Device Model:	PMUD1928A

Test Period:	11/6/03 – 11/13/03
EME Technician:	Ed Church
Responsible Engineer:	Kim Uong (Sr. 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 all applicable national and international reference standards and guidelines.

Deanna Zakharia Signature on File — 11/20/03

Ken Enger — Date Approved

Senior Resource Manager, Product Safety and EME Director, Phone: 954-723-6299

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:

Dosimetric E-Field Probe ET3DV6 SN:1383

Conversion factor (± standard deviation)

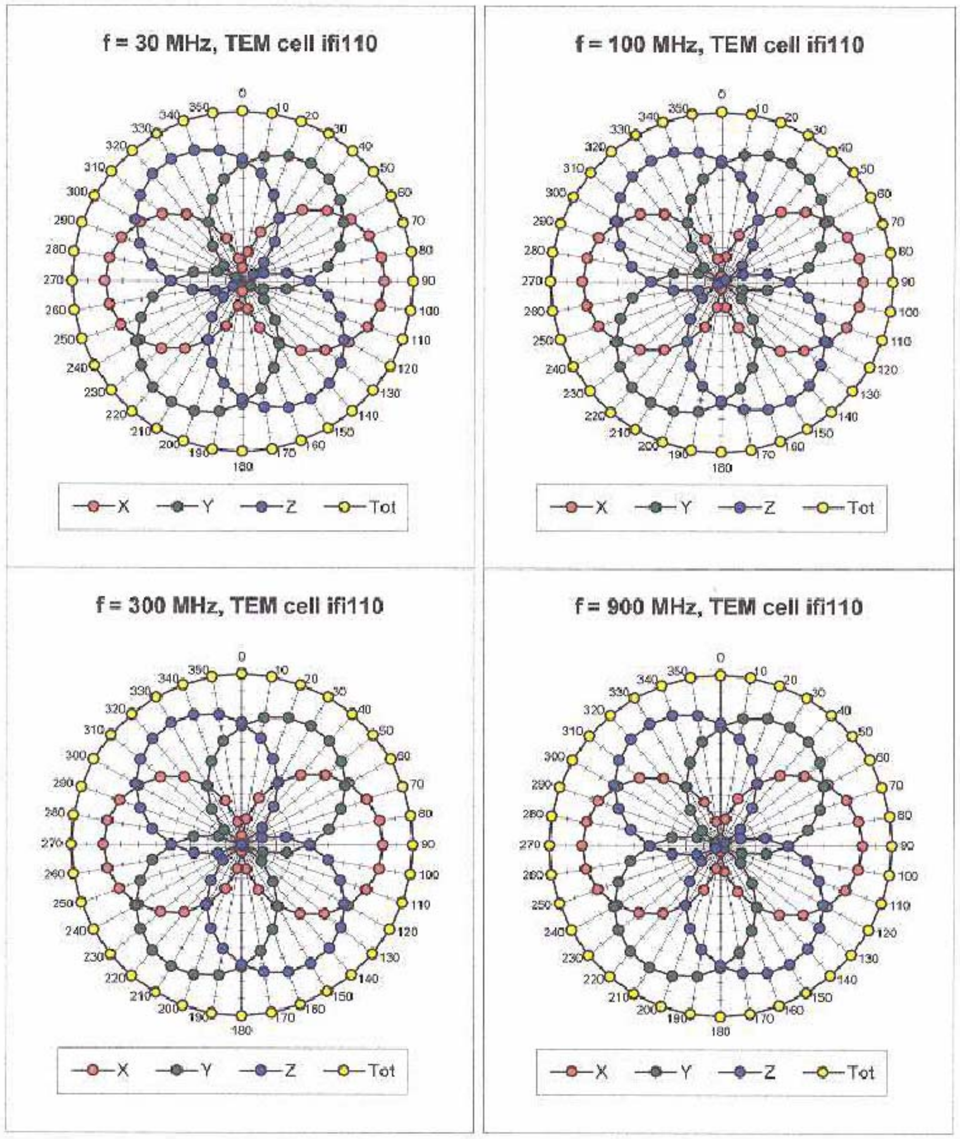
Frequency		Value	Tissue parameters
150 MHz	ConvF	8.1 ± 8%	ε_r = 61.9 σ = 0.80 mho/m (body tissue)
236 MHz	ConvF	7.9 ± 8%	ε_r = 59.8 σ = 0.87 mho/m (body tissue)
300 MHz	ConvF	7.8 ± 8%	ε_r = 58.2 σ = 0.92 mho/m (body tissue)
350 MHz	ConvF	7.8 ± 8%	ε_r = 57.7 σ = 0.93 mho/m (body tissue)
450 MHz	ConvF	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)

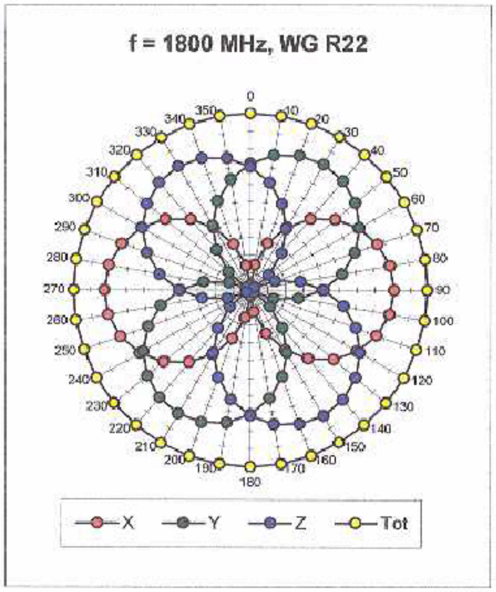
Dosimetric E-Field Probe ET3DV6 SN:1383

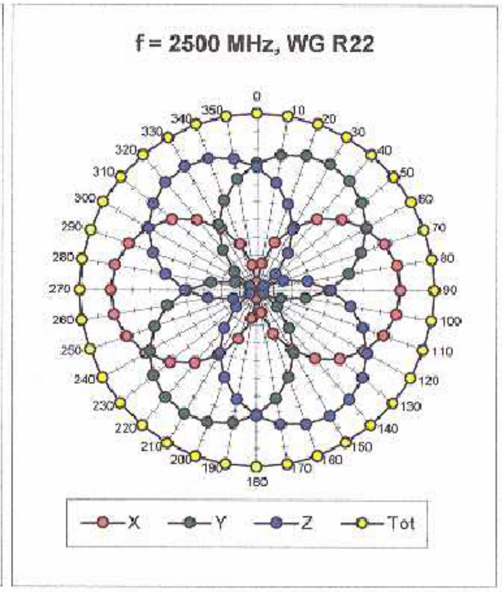
Conversion factor (± standard deviation)

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

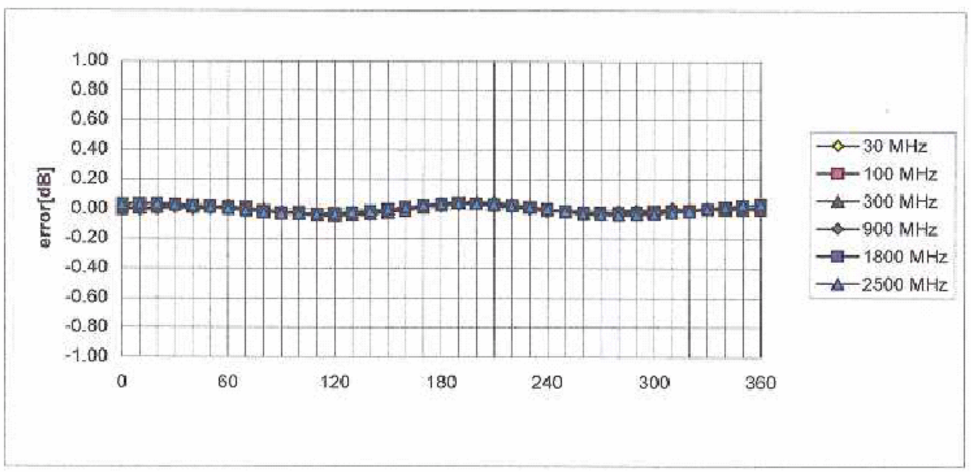
Receiving Pattern (ϕ), $\theta = 0°$





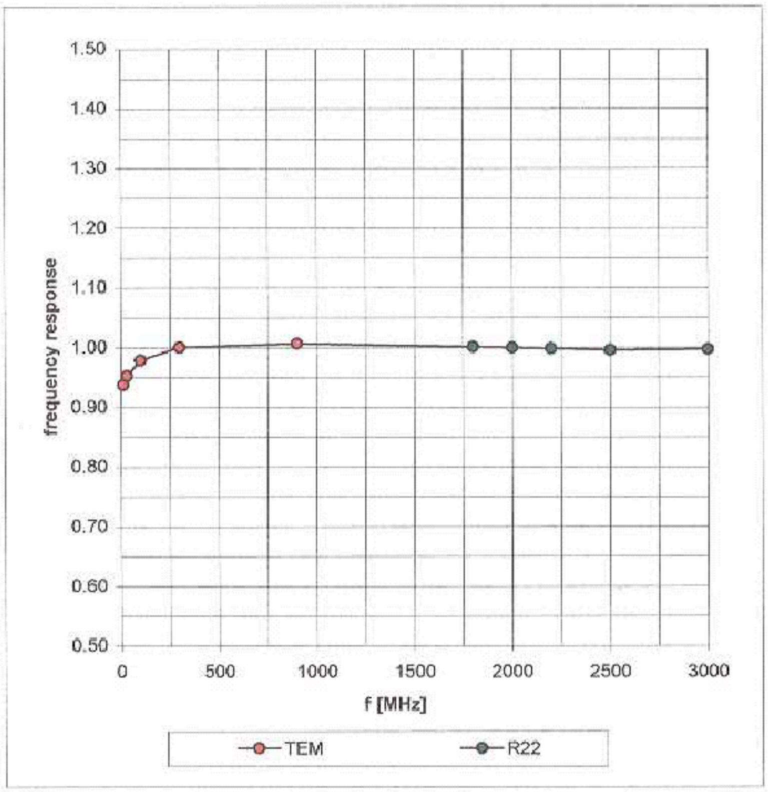


Isotropy Error (ϕ), θ = 0°



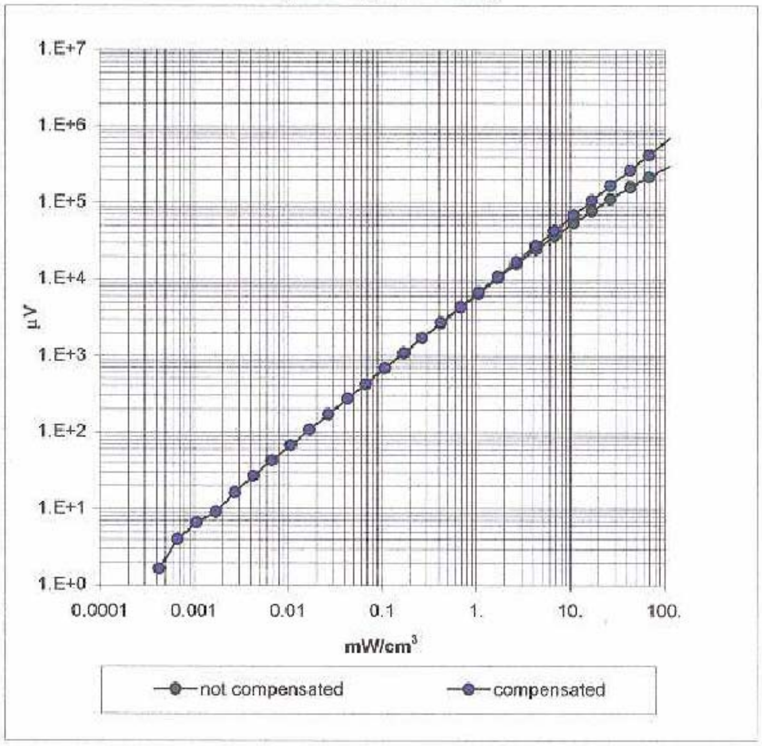
Frequency Response of E-Field

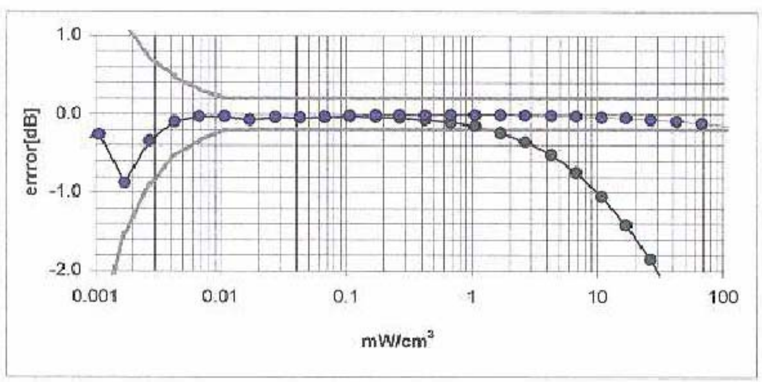
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR_{brain})

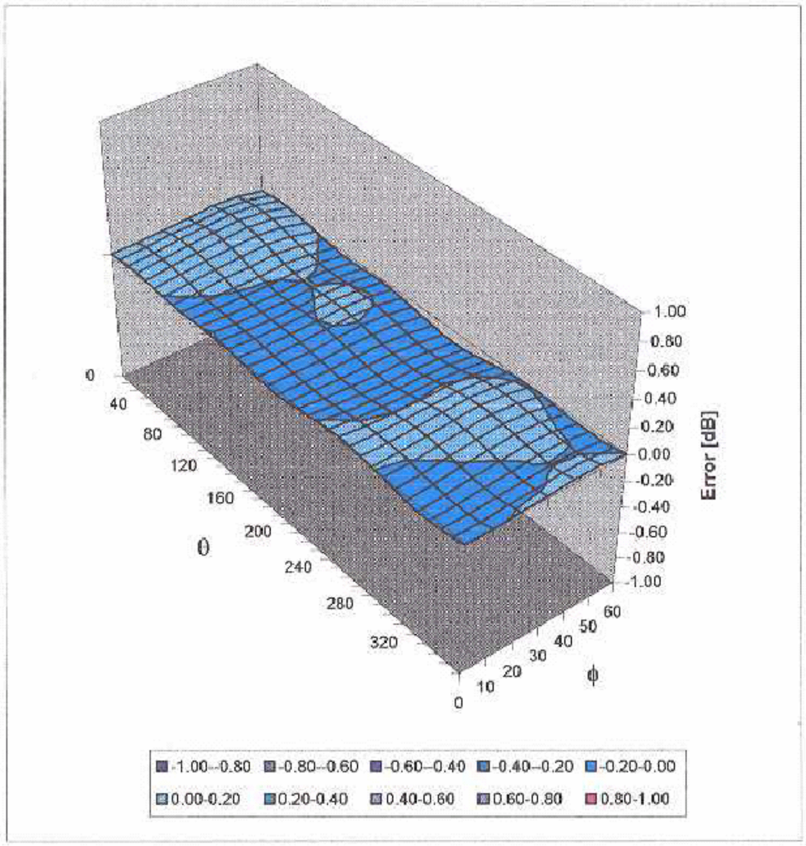
(Waveguide R22)



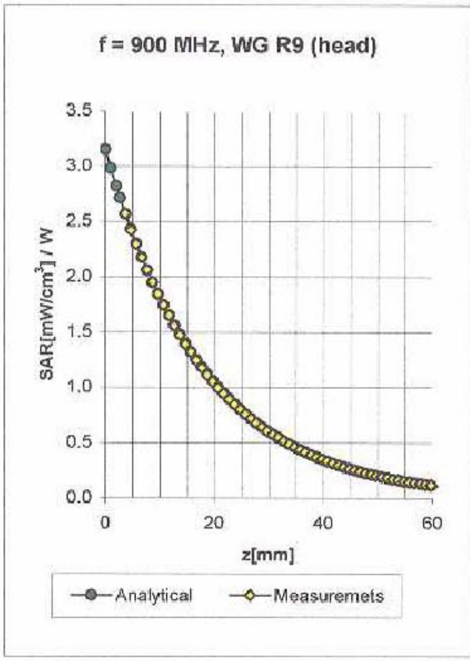


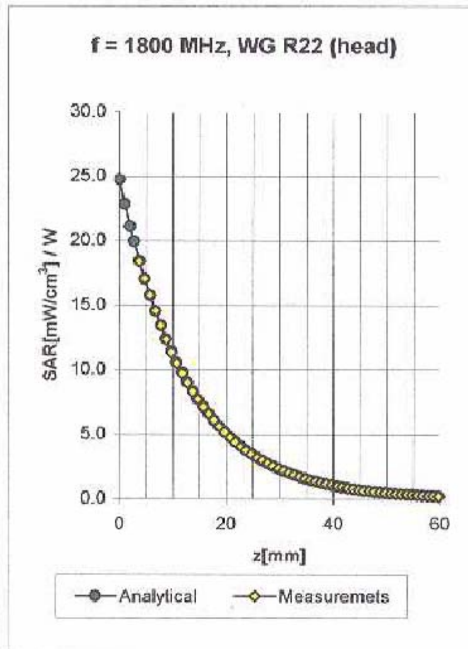
Deviation from Isotropy in HSL

Error (θ,φ), f = 900 MHz



Conversion Factor Assessment

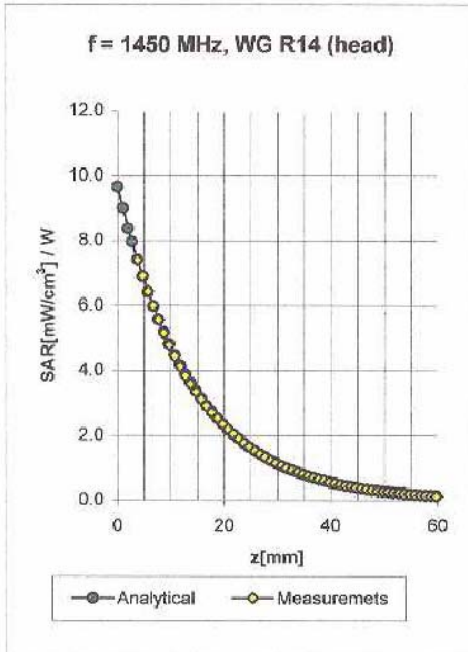




Head	900 MHz		ε_r = 41.5 ± 5%	σ = 0.97 ± 5% mho/m	
Head	835 MHz		ε_r = 41.5 ± 5%	σ = 0.90 ± 5% mho/m	
	ConvF X	6.5	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	6.5	± 9.5% (k=2)	Alpha	0.59
	ConvF Z	6.5	± 9.5% (k=2)	Depth	1.97

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

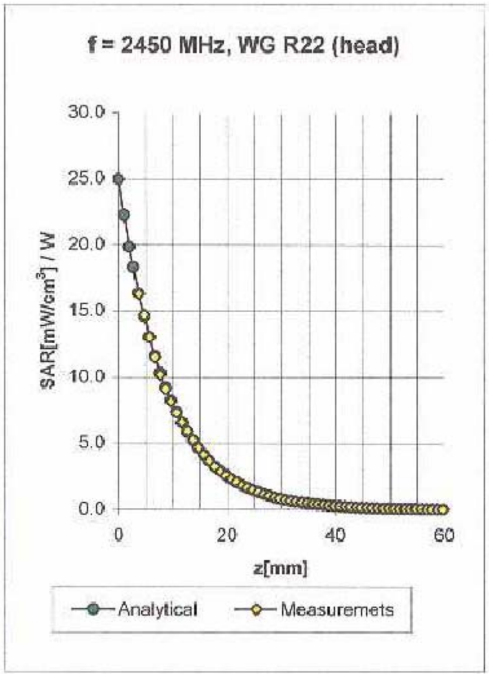
Conversion Factor Assessment

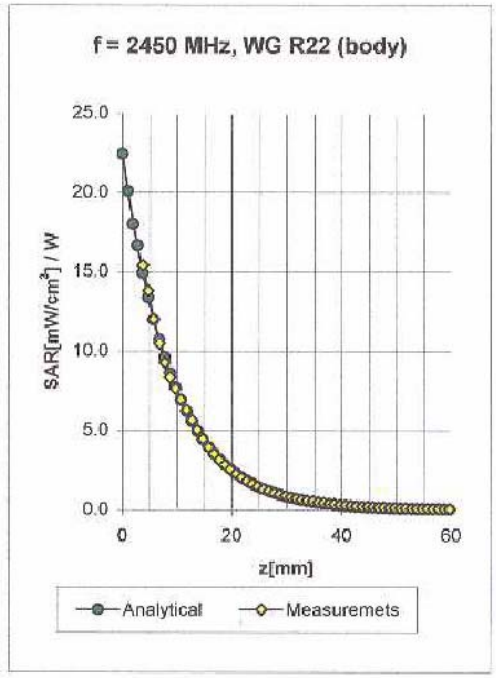


Head	1450 MHz	ε_r = 40.4 ± 5%	σ = 1.23 ± 5% mho/m

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**

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Calibration Certificate

300 MHz System Validation Dipole

Type:	D300V2
Serial Number:	1002
Place of Calibration:	Zurich
Date of Calibration:	September 11, 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 300 MHz:

Relative Dielectricity	**45.8**	± 5%
Conductivity	**0.93 mho/m**	± 5%

The DASY System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 8.5 at 300 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 400 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:	**2.83 mW/g** (Advanced Extrapolation)
averaged over 10 cm^3 (10 g) of tissue	**1.89 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:	**1.738 ns**	(one direction)
Transmission factor:	**0.995**	(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 300 MHz:	Re{Z} = **56.3 Ω**
	Im {Z} = **-3.6 Ω**
Return Loss at 300 MHz	**-23.5 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.

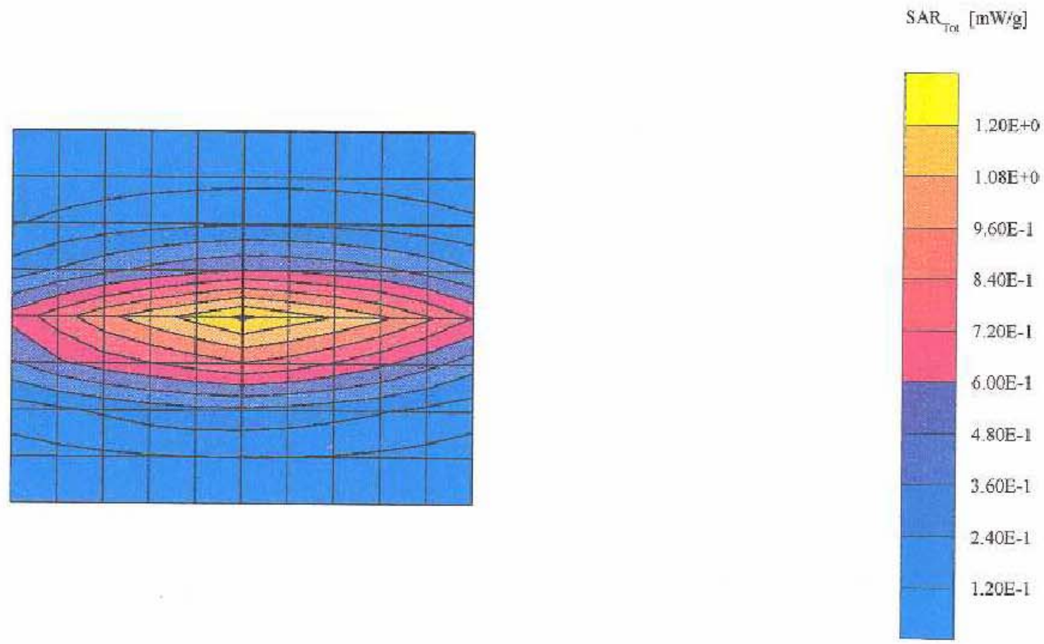
6. Power Test

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

09/11/02

Validation Dipole D300V2 SN:1002, d = 15 mm

Frequency: 300 MHz; Antenna Input Power: 400 [mW], Flat Phantom (shell thickness = 6mm)
Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(8.50,8.50,8.50); Crest factor: 1.0; Head 300 MHz: σ = 0.93 mho/m ε_r = 45.8 ρ = 1.00 g/cm³
Cubes (2): Peak: 1.74 mW/g ± 0.01 dB, SAR (1g): 1.13 mW/g ± 0.02 dB, SAR (10g): 0.754 mW/g ± 0.02 dB, (Advanced extrapolation)
Penetration depth: 12.8 (11.5, 14.6) [mm]

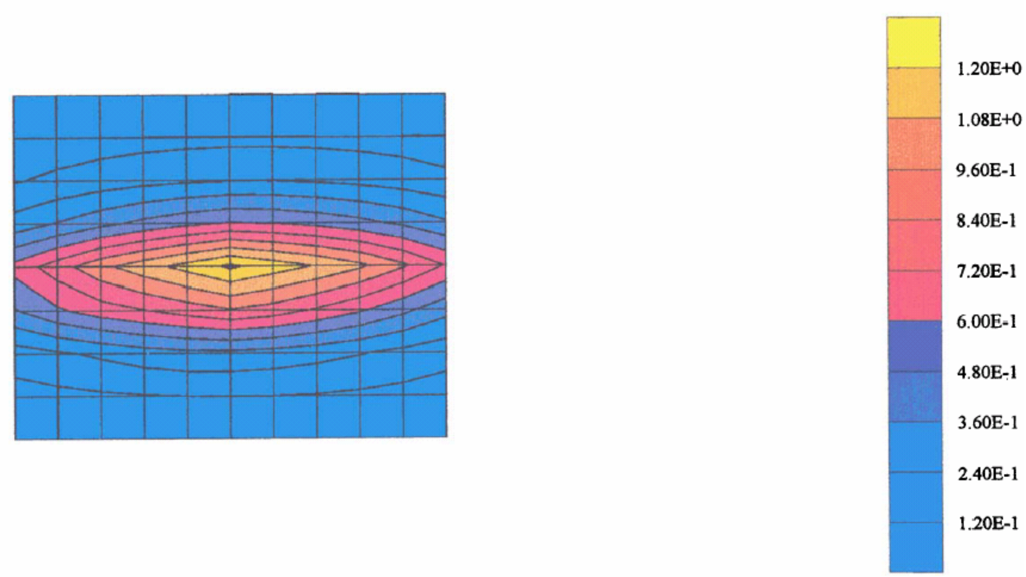


Schmid & Partner Engineering AG, Zurich, Switzerland

09/11/02

Validation Dipole D300V2 SN:1002, d = 15 mm

Frequency: 300 MHz; Antenna Input Power: 400 [mW], Flat Phantom (shell thickness = 6mm)
Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(8.50,8.50,8.50); Crest factor: 1.0; Head 300 MHz: σ = 0.93 mho/m ε_r = 45.8 ρ = 1.00 g/cm³
Cubes (2): Peak: 1.88 mW/g ± 0.01 dB, SAR (1g): 1.19 mW/g ± 0.02 dB, SAR (10g): 0.779 mW/g ± 0.02 dB , (Worst-case extrapolation)
Penetration depth: 12.2 (10.6, 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: ABZ99FT3050. 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
PMLN4467A
Back View

Photo 2.
Model
PMLN4467A
Side View

Photo 3.
Model
PMLN4467A
Front View

Photo 4.
Model
HLN9844A
Back View

Photo 5.
Model
HLN9844A
Side View

Photo 5.
Model
PMLN4468A
Back View

Photo 6.
Model
PMLN4468A
Side View

Photo 7.
Model
PMLN4468A
Front View

Photo 8.
Model
PMLN4469A
Back View

Photo 9.
Model
PMLN4468A
Side View

Photo 10.
Model
PMLN4468A
Front View

Photo 11.
Model RLN4815A

Appendix F
Applicable Accessories and options test status and separation distances

The following tables present a summary of the test status of the applicable offered options and accessories as well as separation distances provided by each of the body-worn accessories:

Carry Case Models	Tested ?	Closest Separation distances between DUT antenna and phantom surface. (mm)	Comments
HLN9844A	Yes	36-53	
PMLN4467A	Yes	42-61	
PMLN4468A	Yes	37-49	
RLN4815A	Yes	48-54	
PMLN4469A	No	37-49	Same as PMLN4468A except for color.
HLN9985B	No	NA	Water proof bag. DUT does not transmit while using the bag.

Audio Attachments	Tested ?	Closest Separation distances between DUT antenna and phantom surface. (mm)	Comments
PMLN4294C	Yes	NA	NA
PMLN4425A	Yes	NA	NA
HMN9030A	Yes	NA	NA
HMN9013A	Yes	NA	NA

Other Attachments	Tested ?	Closest Separation distances between DUT antenna and phantom surface. (mm)	Comments
4285820Z01	Yes	NA	Tested w/ PMLN4468A