Certificate Number: 1449-02

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

Date of Report:	October 20, 2003
Report Revision:	Rev. O
Manufacturer:	Motorola South - ARAD
Product Description:	Enhanced Power Pad w/ GPRS: 0.631W GSM800, 0.809W for PCS1900; TDMA: 1:8 duty cycle, GMSK modulation; Bluetooth: 1mW, Frequency Hopping Spread Spectrum (FHSS)
FCC ID:	**AZ489FT7008**
Device Model:	F4421A

Test Period:	9/06/03-9/08/03 & 10/02/03
EME Tech:	Ed Church
Responsible Engineer:	Deanna Zakharia (Elect. Principle Staff Eng.)
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 — 10/20/2003

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:1393
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	April 16, 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	2-Apr-03	Apr-04
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. Vetter
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: April 16, 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:1393

Sensitivity in Free Space

NormX	1.80	$\mu V/(V/m)^2$
NormY	1.49	$\mu V/(V/m)^2$
NormZ	1.80	$\mu V/(V/m)^2$

Diode Compression

DCP X	94	mV
DCP Y	94	mV
DCP Z	94	mV

Sensitivity in Tissue Simulating Liquid

Head **900 MHz** ε_r **= 41.5 ± 5%** σ **= 0.97 ± 5% mho/m**

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to IEEE P1528-200X

ConvF X	**7.0** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**7.0** ± 9.5% (k=2)		Alpha	**0.31**
ConvF Z	**7.0** ± 9.5% (k=2)		Depth	**2.71**

Head **1800 MHz** ε_r **= 40.0 ± 5%** σ **= 1.40 ± 5% mho/m**

Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to IEEE P1528-200X

ConvF X	**5.5** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**5.5** ± 9.5% (k=2)		Alpha	**0.48**
ConvF Z	**5.5** ± 9.5% (k=2)		Depth	**2.51**

Boundary Effect

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

Probe Tip to Boundary	**1 mm**	**2 mm**
SAR_{be} [%] Without Correction Algorithm	9.0	5.3
SAR_{be} [%] With Correction Algorithm	0.3	0.5

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

Probe Tip to Boundary	**1 mm**	**2 mm**
SAR_{be} [%] Without Correction Algorithm	12.2	8.3
SAR_{be} [%] With Correction Algorithm	0.1	0.3

Sensor Offset

Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**0.9 ± 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:	**1393**
Place of Assessment:	**Zurich**
Date of Assessment:	**April 21, 2003**
Probe Calibration Date:	**April 16, 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:1393

Conversion factor (± standard deviation)

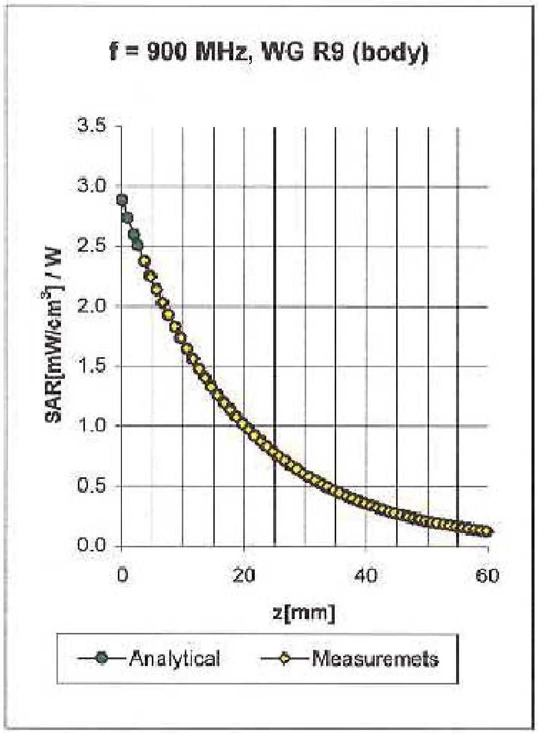
150 MHz	ConvF	**8.8 ± 8 %**	ε_r = 61.9 σ = 0.80 mho/m (body tissue)
236 MHz	ConvF	**8.6 ± 8 %**	ε_r = 59.8 σ = 0.87 mho/m (body tissue)
300 MHz	ConvF	**8.4 ± 8 %**	ε_r = 58.2 σ = 0.92 mho/m (body tissue)
350 MHz	ConvF	**8.4 ± 8 %**	ε_r = 57.7 σ = 0.93 mho/m (body tissue)
450 MHz	ConvF	**8.0 ± 8 %**	ε_r = 56.7 σ = 0.94 mho/m (body tissue)
784 MHz	ConvF	**7.0 ± 8 %**	ε_r = 55.4 σ = 0.97 mho/m (body tissue)
1450 MHz	ConvF	**5.6 ± 8 %**	ε_r = 54.0 σ = 1.30 mho/m (body tissue)

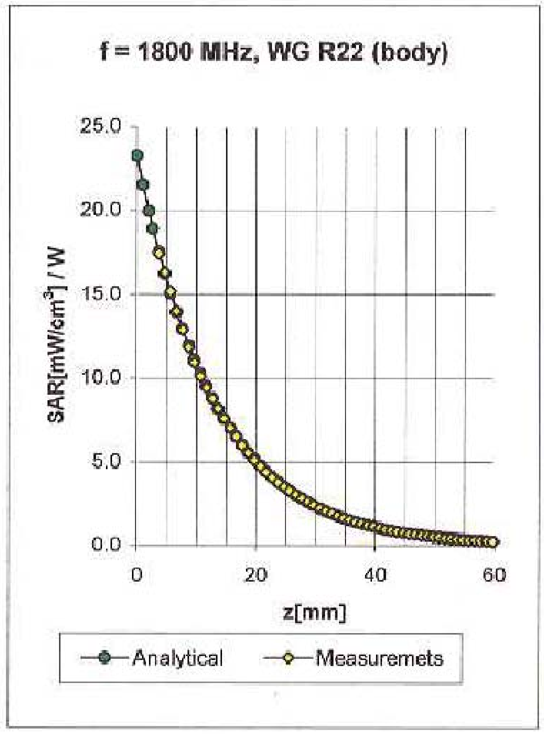
Dosimetric E-Field Probe ET3DV6 SN:1393

Conversion factor (± standard deviation)

150 MHz	ConvF	**9.7 ± 8%**	**ε_r = 52.3** **σ = 0.76 mho/m** **(head tissue)**
236 MHz	ConvF	**8.8 ± 8%**	ε_r = 48.3 σ = 0.82 mho/m (head tissue)
300 MHz	ConvF	**8.5 ± 8%**	ε_r = 45.3 σ = 0.87 mho/m (head tissue)
350 MHz	ConvF	**8.5 ± 8%**	**ε_r = 44.7** **σ = 0.87 mho/m** **(head tissue)**
400 MHz	ConvF	**8.1 ± 8%**	ε_r = 44.4 σ = 0.87 mho/m (head tissue - CENELEC)
450 MHz	ConvF	**8.1 ± 8%**	ε_r = 43.5 σ = 0.87 mho/m (head tissue)
784 MHz	ConvF	**7.3 ± 8%**	ε_r = 41.8 σ = 0.90 mho/m (head tissue)

Conversion Factor Assessment





Body **900 MHz** ε_r **= 55.0 ± 5%** σ **= 1.05 ± 5% mho/m**

Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

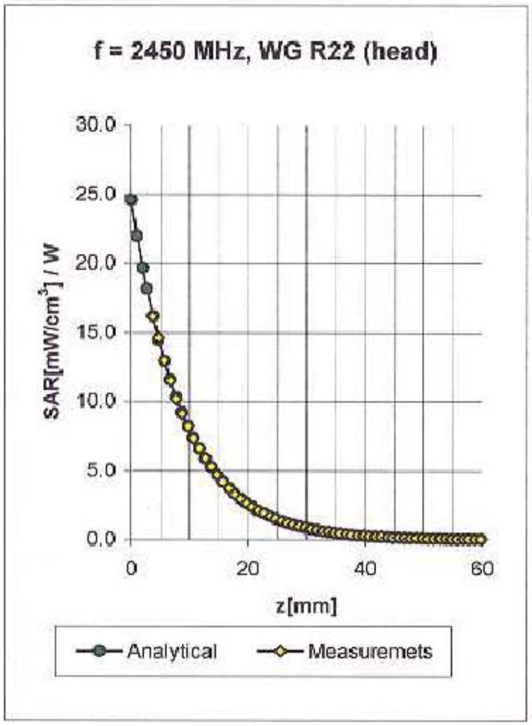
ConvF X	**6.8**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.8**	± 9.5% (k=2)	Alpha	**0.35**
ConvF Z	**6.8**	± 9.5% (k=2)	Depth	**2.48**

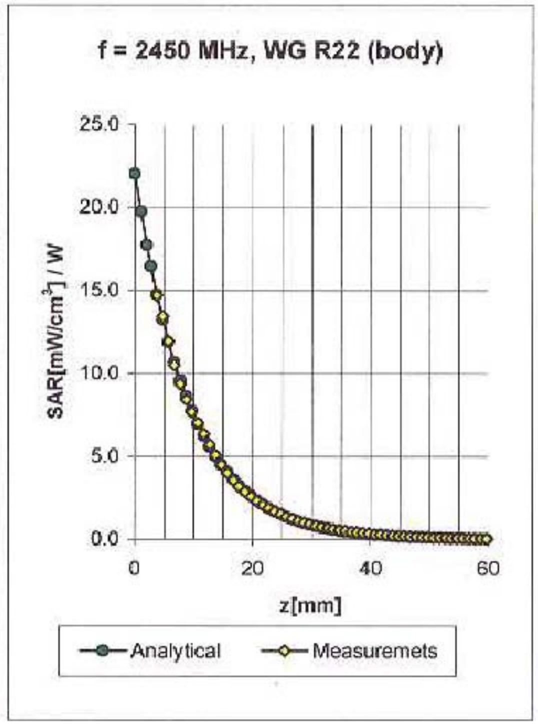
Body **1800 MHz** ε_r **= 53.3 ± 5%** σ **= 1.52 ± 5% mho/m**

Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**5.1**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.1**	± 9.5% (k=2)	Alpha	**0.51**
ConvF Z	**5.1**	± 9.5% (k=2)	Depth	**2.79**

Conversion Factor Assessment

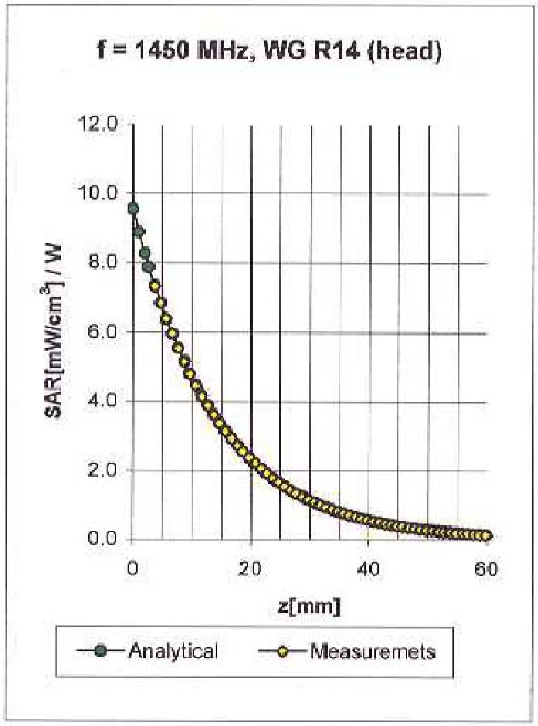




Head	**2450**	**MHz**	ε_r = **39.2 ± 5%**	σ = **1.80 ± 5% mho/m**
	ConvF X	**5.0** ± 8.9% (k=2)	Boundary effect:	
	ConvF Y	**5.0** ± 8.9% (k=2)	Alpha	**0.85**
	ConvF Z	**5.0** ± 8.9% (k=2)	Depth	**1.96**

Body	**2450**	**MHz**	ε_r = **52.7 ± 5%**	σ = **1.95 ± 5% mho/m**
	ConvF X	**4.5** ± 8.9% (k=2)	Boundary effect:	
	ConvF Y	**4.5** ± 8.9% (k=2)	Alpha	**1.24**
	ConvF Z	**4.5** ± 8.9% (k=2)	Depth	**1.68**

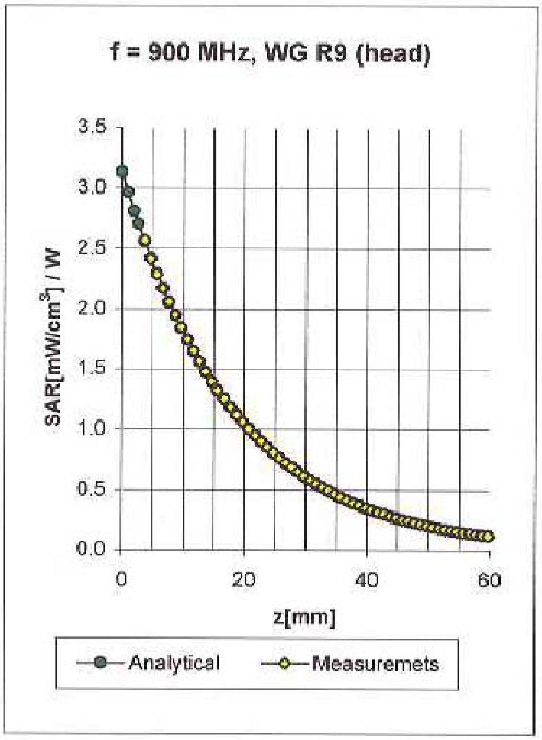
Conversion Factor Assessment

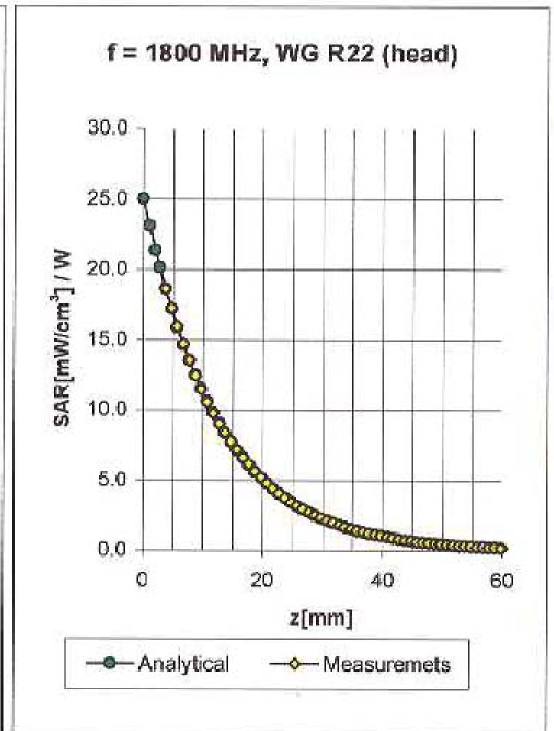


Head	1450 MHz	ε_r = 40.5 ± 5%	σ = 1.20 ± 5% mho/m

ConvF X	**6.0** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**6.0** ± 8.9% (k=2)	Alpha	**0.43**
ConvF Z	**6.0** ± 8.9% (k=2)	Depth	**2.77**

Conversion Factor Assessment





Head **900 MHz** ε_r = **41.5 ± 5%** σ = **0.97 ± 5% mho/m**

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to IEEE P1528-200X

ConvF X	**7.0**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**7.0**	± 9.5% (k=2)	Alpha	**0.31**
ConvF Z	**7.0**	± 9.5% (k=2)	Depth	**2.71**

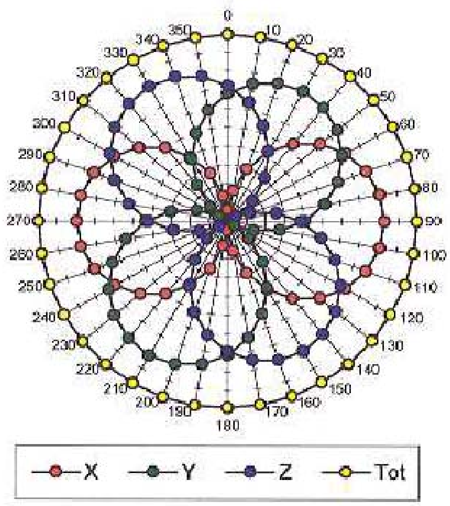
Head **1800 MHz** ε_r = **40.0 ± 5%** σ = **1.40 ± 5% mho/m**

Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to IEEE P1528-200X

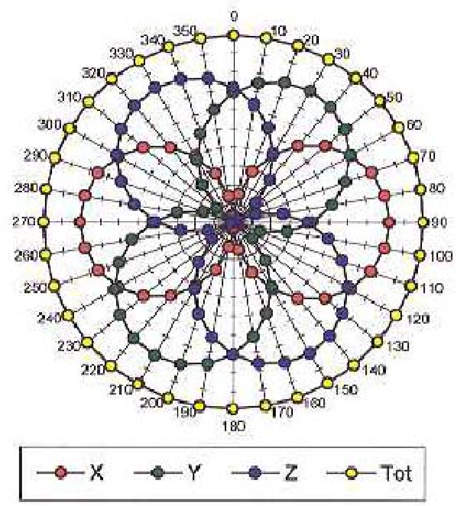
ConvF X	**5.5**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.5**	± 9.5% (k=2)	Alpha	**0.48**
ConvF Z	**5.5**	± 9.5% (k=2)	Depth	**2.51**

Receiving Pattern (ϕ, θ = 0°

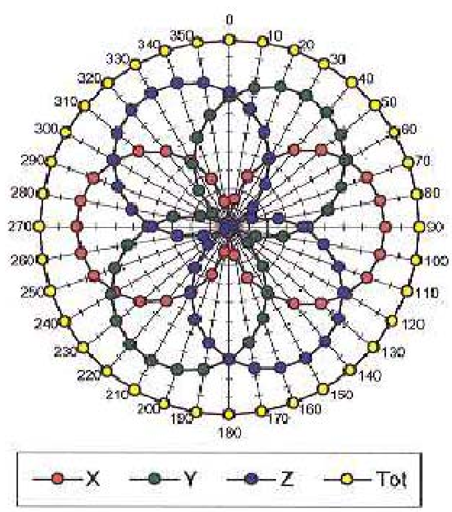
f = 30 MHz, TEM cell ifi110



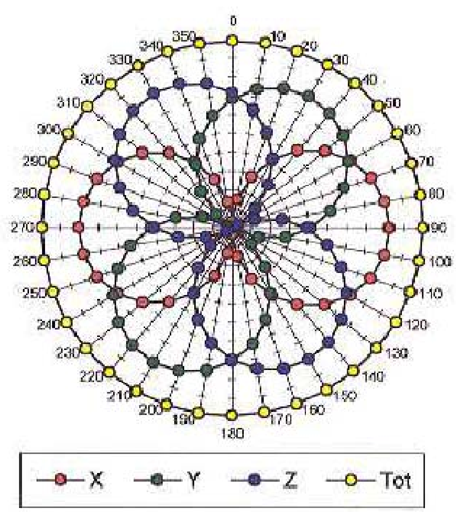
f = 100 MHz, TEM cell ifi110

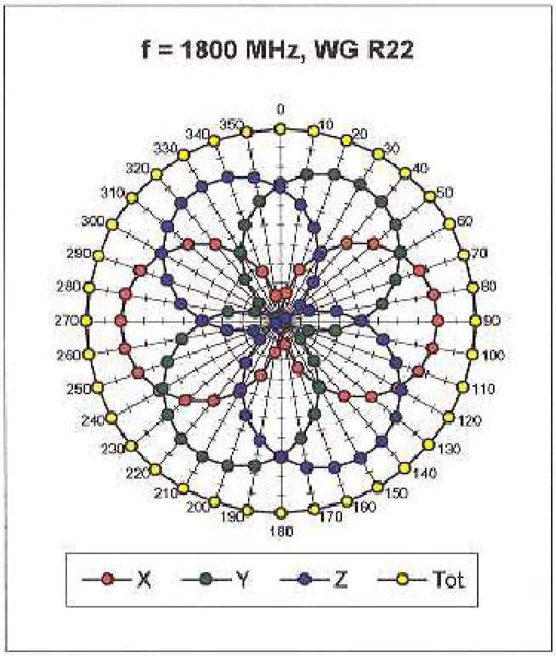


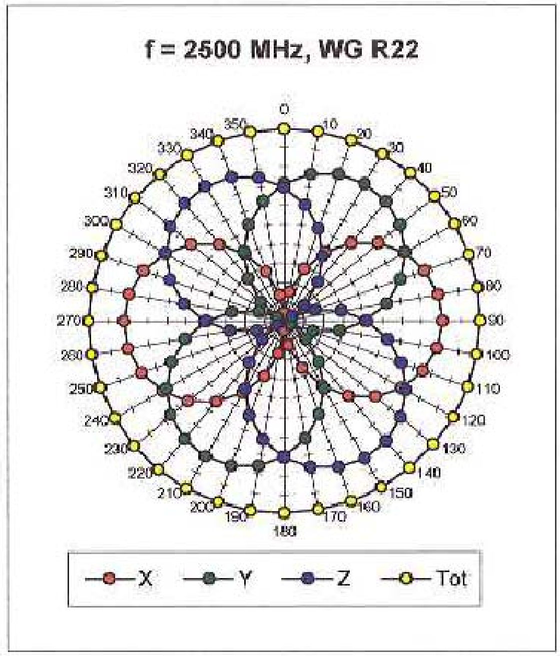
f = 300 MHz, TEM cell ifi110



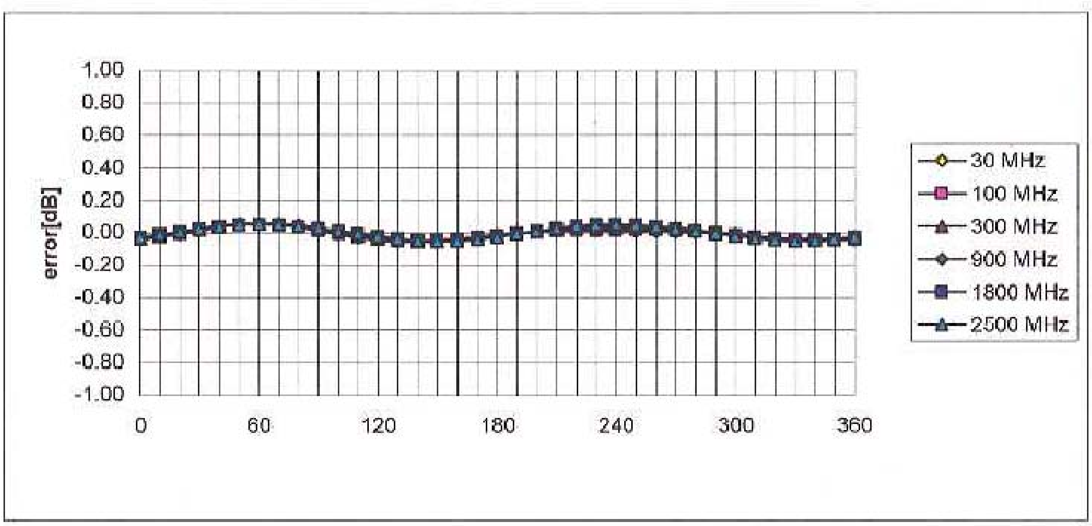
f = 900 MHz, TEM cell ifi110





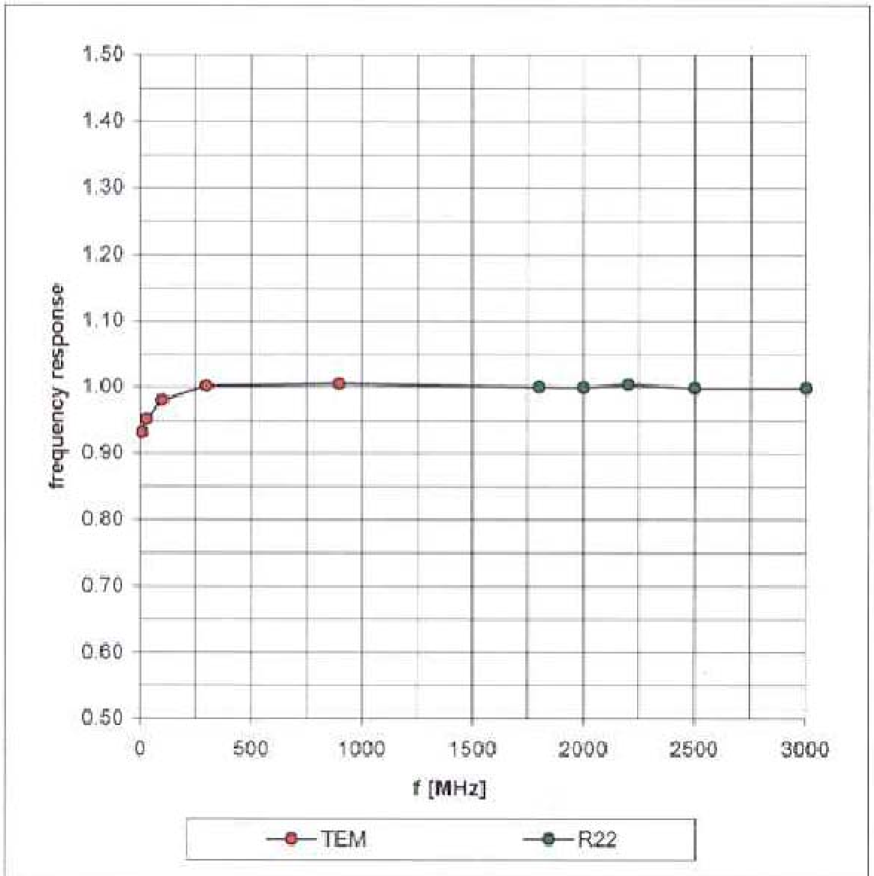


Isotropy Error (ϕ), θ = 0°



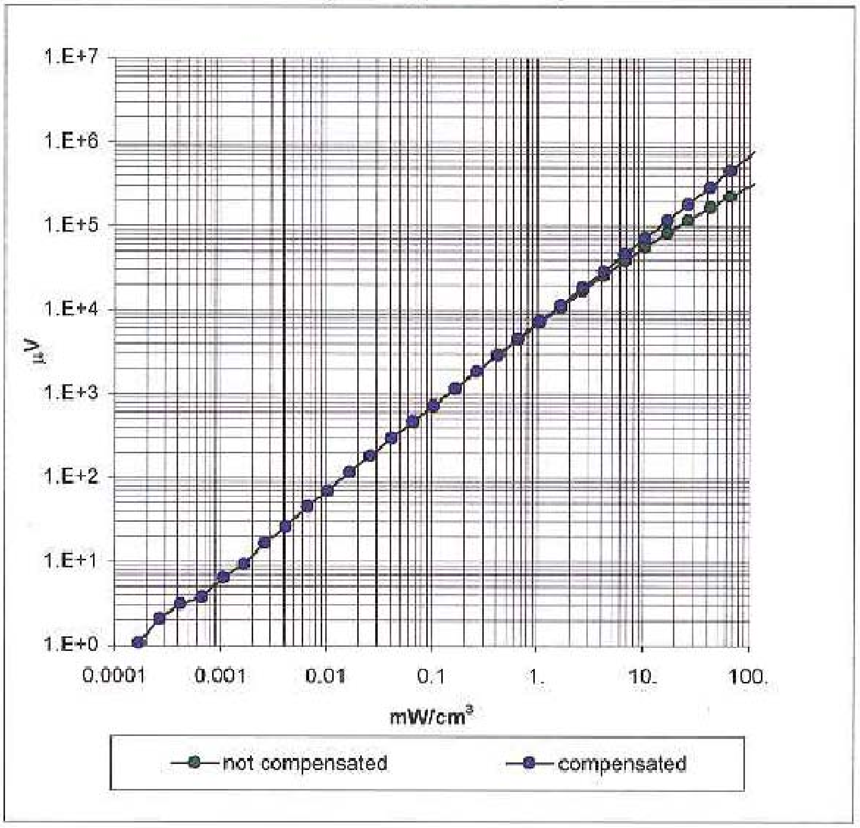
Frequency Response of E-Field

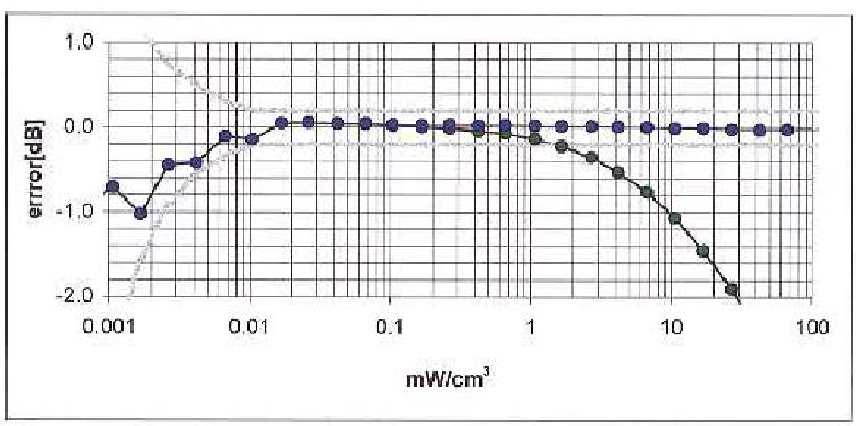
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR$_{brain}$)

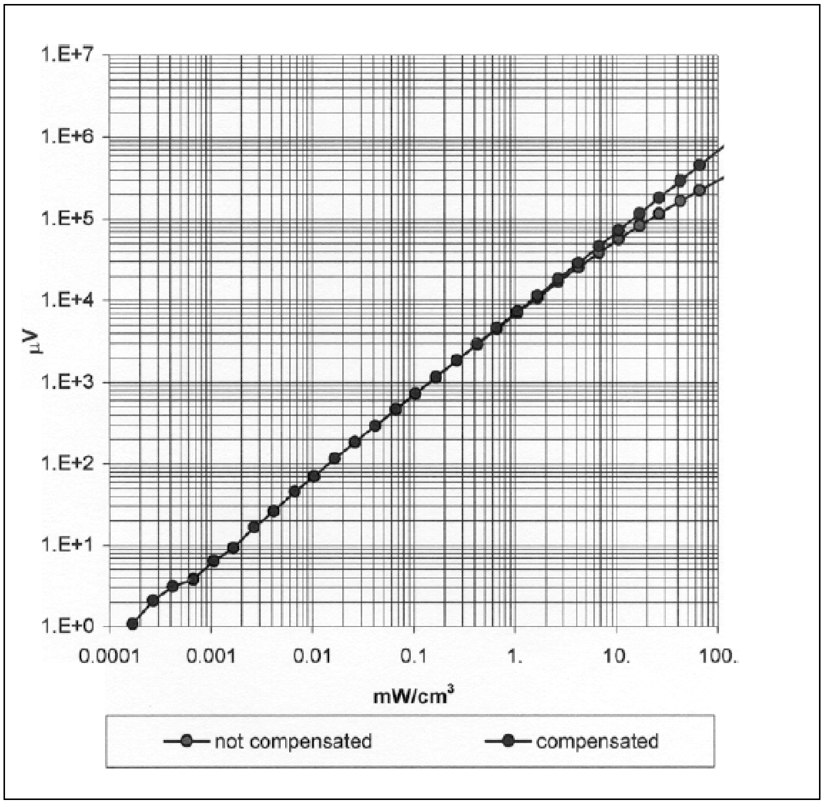
(Waveguide R22)

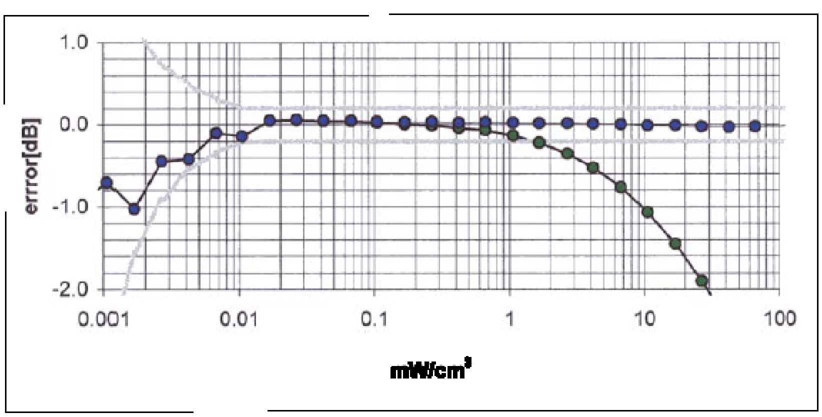




Dynamic Range f(SAR$_{brain}$)

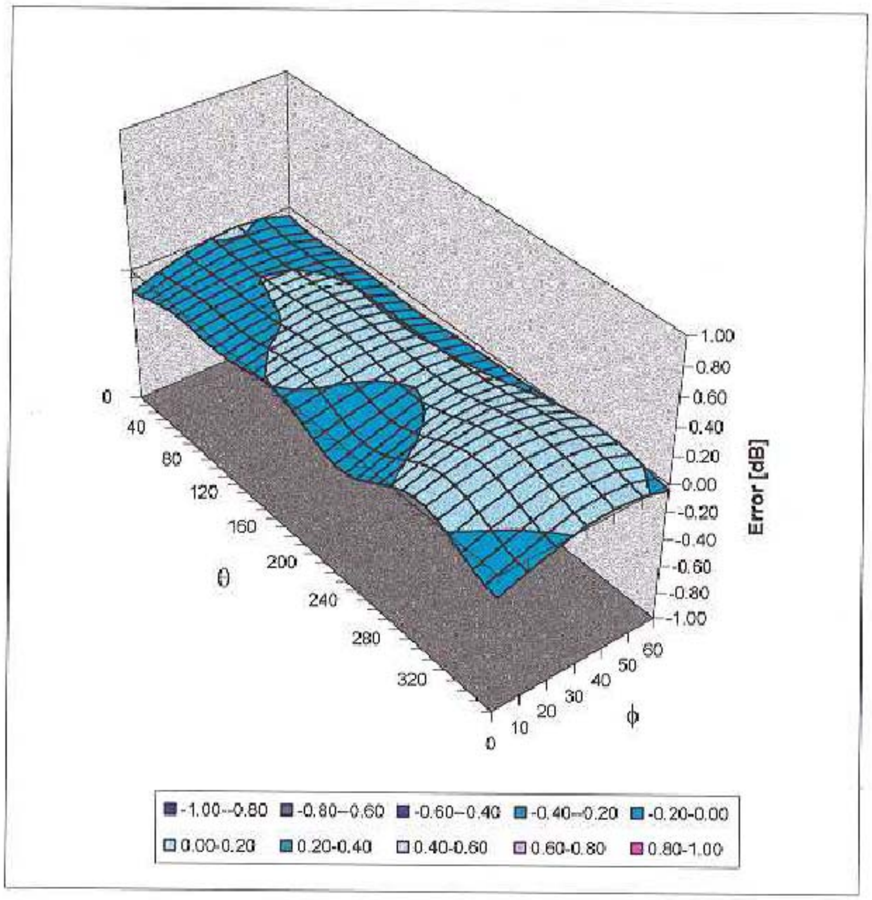
(Waveguide R22)





Deviation from Isotropy in HSL

Error (θϕ), f = 900 MHz



Schmid & Partner
Engineering AG

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Calibration Certificate

835 MHz System Validation Dipole

Type:	**D835V2**
Serial Number:	**427**
Place of Calibration:	**Zurich**
Date of Calibration:	**October 15, 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:	D. Vetter
Approved by:	[illegible]

1. Measurement Conditions

The measurements were performed in the flat section of the new SAM twin phantom filled with head simulating solution of the following electrical parameters at 835 MHz:

Relative Dielectricity	**41.3**	± 5%
Conductivity	**0.88 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.6 at 835 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 section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2 SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**9.64 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**6.20 mW/g**

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:	**1.420 ns**	(one direction)
Transmission factor:	**0.992**	(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 835 MHz:	Re{Z} = **52.1 Ω**
	Im {Z} = **0.4 Ω**
Return Loss at 835 MHz	**-33.3 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.

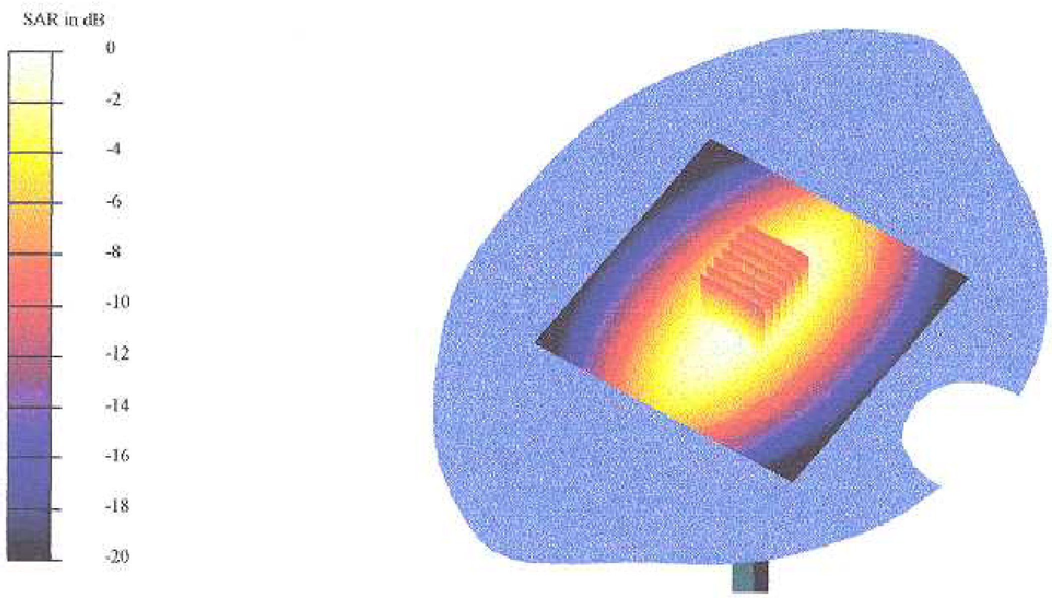
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN427_SN1507_HSL835_151002.da4

DUT: Dipole 835 MHz Type & Serial Number: D835V2 - SN427
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL 835 MHz (σ = 0.88 mho/m, ε = 41.3, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(6.6, 6.6, 6.6); Calibrated: 1/24/2002
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 35

Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 56.3 V/m
Peak SAR = 3.61 mW/g
SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.55 mW/g
Power Drift = 0.01 dB



Schmid & Partner
Engineering AG

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

Calibration Certificate

1900 MHz System Validation Dipole

Type:	**D1900V2**
Serial Number:	**521**
Place of Calibration:	**Zurich**
Date of Calibration:	**April 29, 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:	D. Vetterli
Approved by:	Nicolai Kuster

1. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with head simulating solution of the following electrical parameters at 1900 MHz:

Relative permitivity	**38.5**	± 5%
Conductivity	**1.44 mho/m**	± 10%

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, conversion factor 5.3 at 1800 MHz) was used for the measurements.

The dipole feedpoint was positioned below the center marking and oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. 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 250mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement

Standard SAR-measurements were performed with the head phantom according to the measurement conditions described in section 1. The results (see figure) 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:	**43.6 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**22.2 mW/g**

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. The estimated sensitivities of SAR-values and penetration depths to the liquid parameters are listed in the DASY Application Note 4: 'SAR Sensitivities'.

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:	**1.190 ns**	(one direction)
Transmission factor:	**0.973**	(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 1900 MHz:	Re{Z} = **46.5 Ω**
	Im {Z} = **-7.4 Ω**
Return Loss at 1900 MHz	**- 21.4 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.

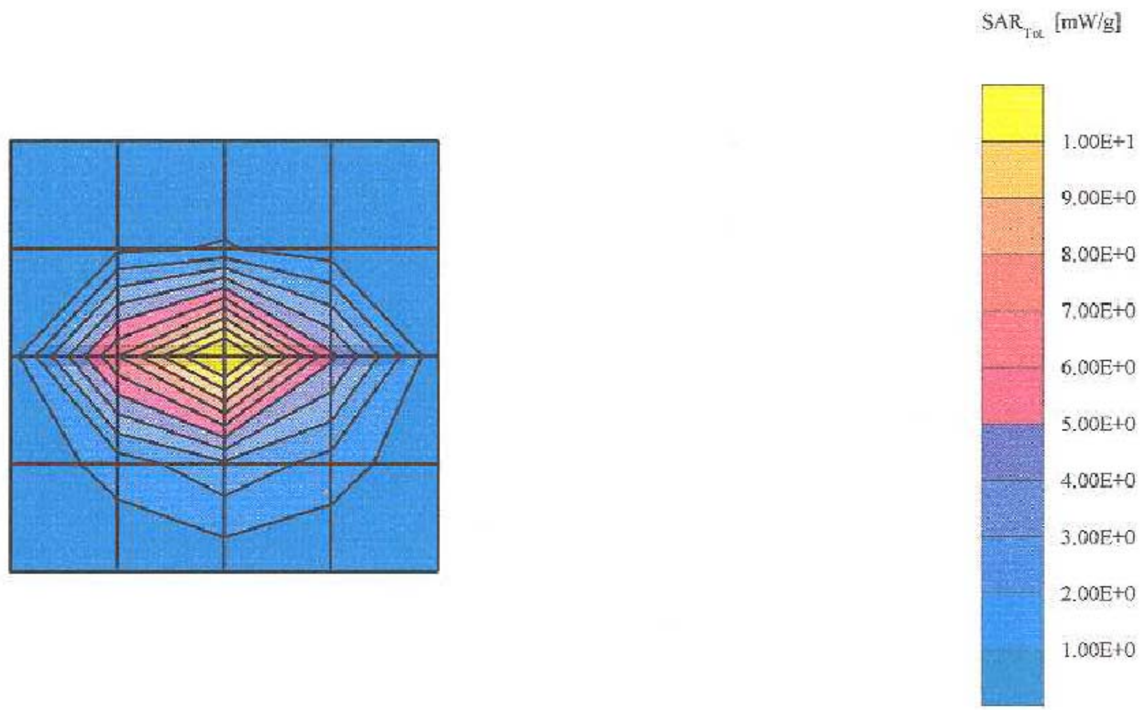
6. Power Test

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

04/29/02

Validation Dipole D1900V2 SN521, d = 10 mm

Frequency: 1900 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.30,5.30,5.30) at 1800 MHz; IEEE1528 1900 MHz: σ = 1.44 mho/m ε_r = 38.5 ρ = 1.00 g/cm³
Cubes (2): Peak: 20.9 mW/g ± 0.03 dB, SAR (1g): 10.9 mW/g ± 0.04 dB, SAR (10g): 5.56 mW/g ± 0.04 dB, (Worst-case extrapolation)
Penetration depth: 8.0 (7.5, 9.0) [mm]
Powerdrift: -0.05 dB



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APPENDIX E
Illustration of Body-Worn Accessories

The purpose of this appendix is to illustrate the body-worn carry accessories for FCC ID: AZ489FT7008. 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 accessory.

Figure 1.
Carry Case model
FHN6498A
Front view

Figure 2.
Carry Case model
FHN6498A
Side View

Appendix F
Accessory and option test status and separation distance

The following table summarizes the body spacing distance provided by the body-worn accessory:

Carry Case Model	Tested ?	Separation distance between device and phantom surface. (mm)	Comments
FHN6498A	Yes	8.25-16	NA