

**COMOSAR E-Field probe  
Calibration Report**



**Ref: CR-131-1-09-SATB-B**

Page: 1/17

Issue: B

Date: 2010/05/11

**COMOSAR E-FIELD PROBE CALIBRATION REPORT**

Prepared By: BUTET Romain, SATIMO  
Project Description: COMOSAR E-FIELD PROBE  
Prepared For (End User): CCS

This document is issued by SATIMO, in confidence and is not to be reproduced in whole or in part without the prior written permission. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or in part without the prior written permission of SATIMO.

**COMOSAR E-Field probe  
Calibration Report**



**Ref: CR-131-1-09-SATB-B**

Page: 1/17

Issue: B

Date: 2010/05/11

**COMOSAR SEPT ISOTROPIC E-FIELD PROBE CALIBRATION REPORT**

**DATE:** 5/11/2010

**OFFER REFERENCE:** PF.127.1.09.SATB.B

**OBJECT:** COMOSAR SEPT ISOTROPIC E-FIELD PROBE

**MANUFACTURER:** SATIMO

**SERIAL NUMBER:** SN 11/09 EP100

**CUSTOMER:** CCS

**CONTRACT:** B01351

**DATE OF CALIBRATION:** 5/5/2010

**WARRANTY:**

This Calibration certificate may not be reproduced other than in full. Calibration certificates without signature and seal are not valid. This documentation contains property information which is protected by copyright. All right are reserved. No part of this document may be photocopied, reproduced without the prior written agreement of SATIMO. SATIMO shall not be liable for errors contained herein or for incidental or consequential in connection with the furnishing, performance or use of this material. Warranty doesn't apply to Normal wear, Normal tear, Improper use, Improper maintain, Improper installation.

Date

11/05/2010

SAR TEAM MANAGER



# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

## PRODUCT DESCRIPTION



Frequency Range	100 MHz - 30 GHz
Probe length	330 mm
Length of one dipole	4.5 mm
Maximum external diameter	8 mm
Probe extremity diameter	6.5 mm
Distance between dipoles/probe extremity	< 2.7 mm
Resistance of the three dipole (at the connector)	Dipole 1: R1=2.5307 MΩ Dipole 2: R2=2.6353 MΩ Dipole 3: R3=2.5471 MΩ
Connector (HIROSE series SR30)	6 wire male (Hirose SR30series)

The probe could be checked by measuring the resistance of the three dipoles.

## CALIBRATION TEST EQUIPMENT

TYPE	IDENTIFICATION	DATE OF CALIBRATION
Calibration bench	CALISAR CALIBRATION SYSTEM V2.0	
Multimeter	Keithley (2000, SN: 1000572)	Date of calibration: 01-04-2011

# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

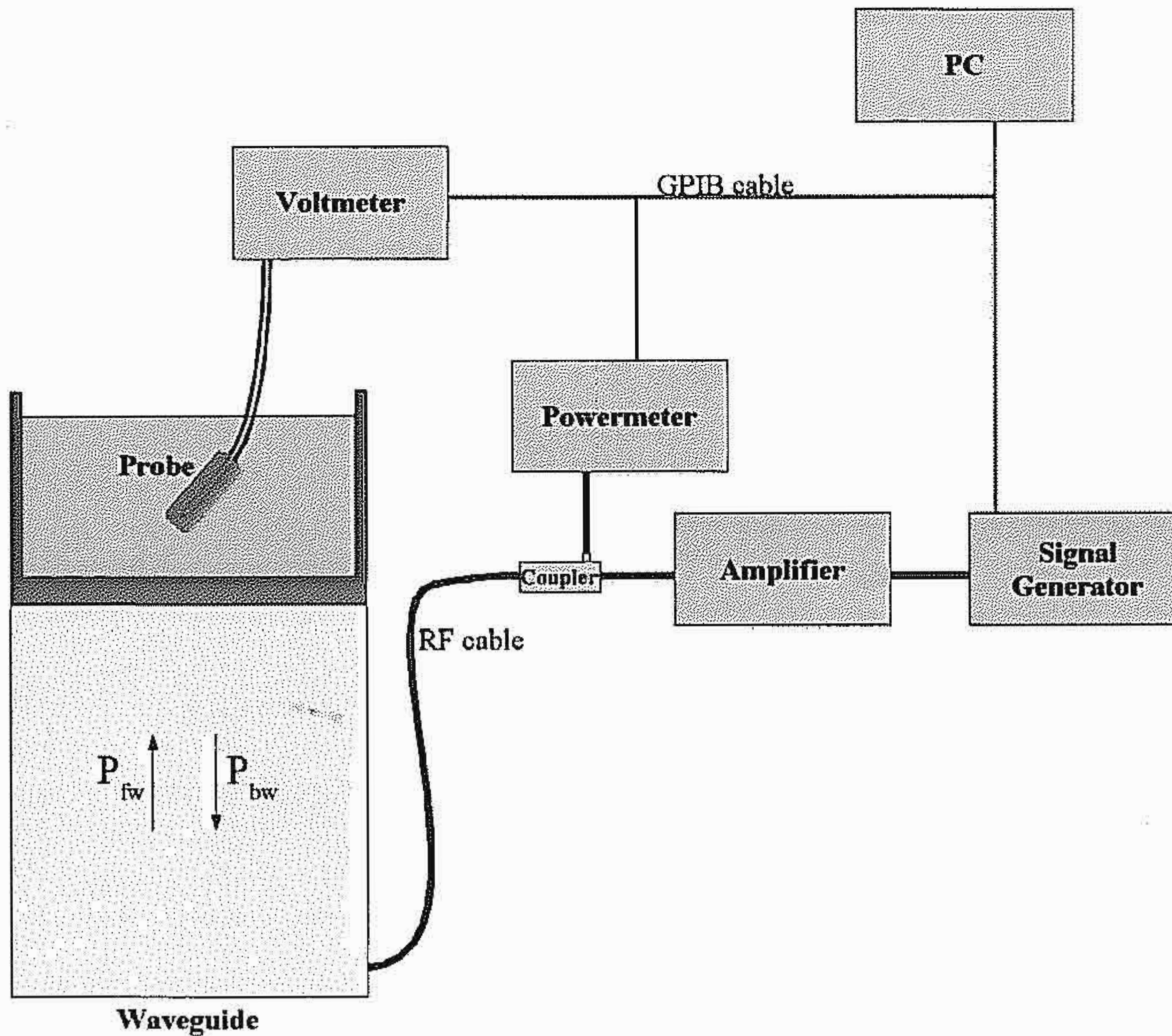
Page: 1/17

Issue: B

Date: 2010/05/11

## MEASUREMENT PROCEDURE

Probe calibration is realized, in compliance with CENELEC EN 50361 and IEEE 1528 std, with CALISAR, SATIMO proprietary calibration system. The calibration is performed with the EN 50361 annexe technique using reference guide at the five frequencies.



$$SAR = \frac{4 (P_{fw} - P_{bw})}{ab\delta} \cos^2 \left( \pi \frac{y}{a} \right) e^{-(2z/\delta)}$$

Where :

- $P_{fw}$  = Forward Power
- $P_{bw}$  = Backward Power
- a and b = Waveguide dimensions
- d = Skin depth

Keithley configuration:

Rate = Medium; Filter =ON; RDGS=10; FILTER TYPE =MOVING AVERAGE; RANGE AUTO

After each calibration, a SAR measurement is performed on a validation dipole and compared with a NPL calibrated probe, to verify it.



**COMOSAR E-Field probe  
Calibration Report**



**Ref: CR-131-1-09-SATB-B**

Page: 1/17

Issue: B

Date: 2010/05/11

**PROBE UNCERTAINTIES**

**Calibration report of dosimetric  
SATIMO probe**

**Uncertainty on calibration system**

<b>ERROR SOURCES</b>	<b>Uncertainty value (%)</b>	<b>Probability Distribution</b>	<b>Divisor</b>	<b>ci</b>	<b>Standard Uncertainty (%)</b>
Incident or forward power	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Reflected power	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Liquid conductivity	5,00%	Rectangular	$\sqrt{3}$	1	2,887%
Liquid permittivity	4,00%	Rectangular	$\sqrt{3}$	1	2,309%
Field homogeneity	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Field probe positioning	5,00%	Rectangular	$\sqrt{3}$	1	2,887%
Field probe linearity	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
<b>Combined standard uncertainty</b>					4,761%
<b>Expanded uncertainty (confidence interval of 95%)</b>					9,331%

# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

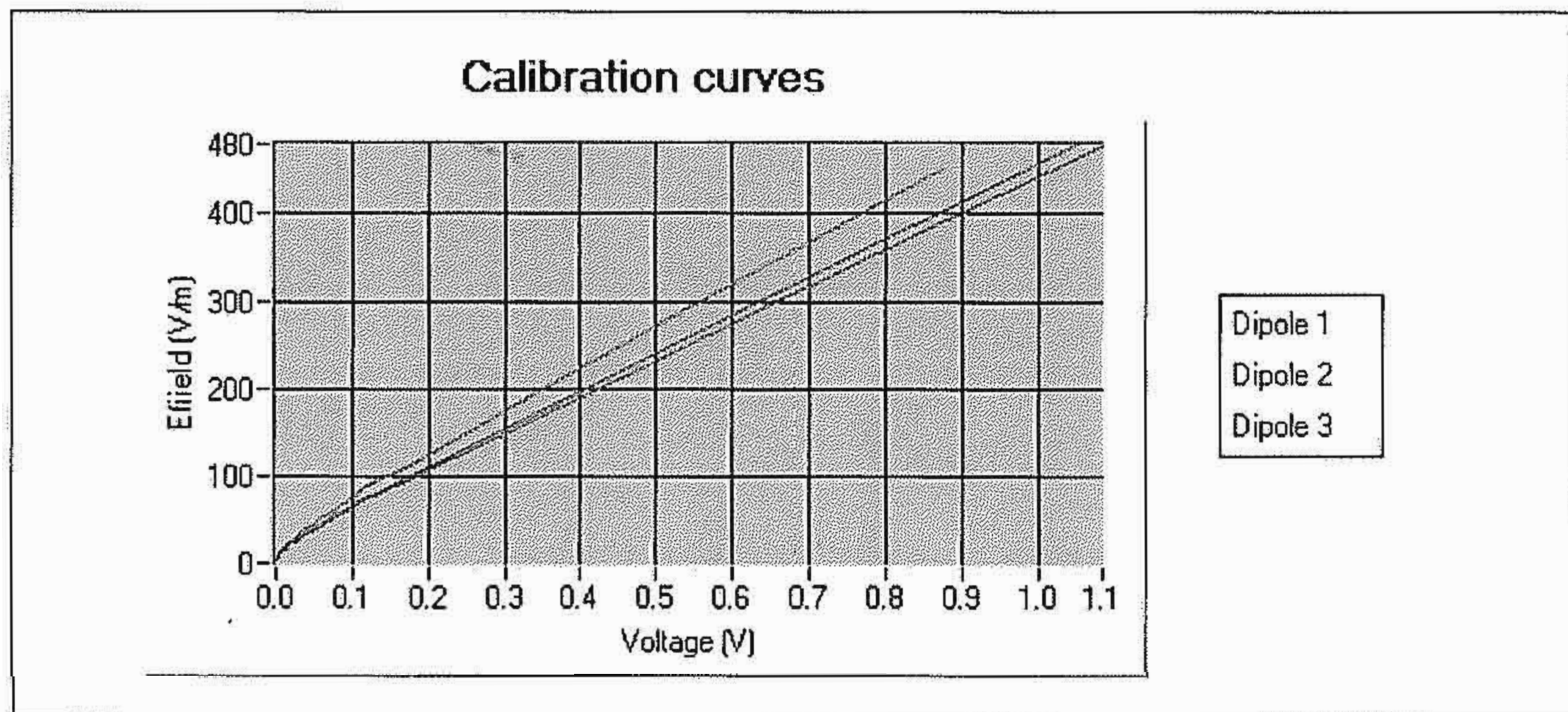
## 1. Calibration at 835.00 MHz

### A. Calibration parameters.

Label	850
Epsilon	41.81
Sigma	0.88 S/m
Temperature	21°C
Cable loss	0.12 dB
Coupler loss	20.50 dB
Waveguide S11	-11.22 dB
Low limit detection	0.824 V/m (0.604 mW/kg)

Calibration curves  $e_i=f(V)$  ( $i=1,2,3$ ) allow to obtain E-field value using the formula:

$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



The following tables represent the calibration curves linearization by curve segment in CW signal.



# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

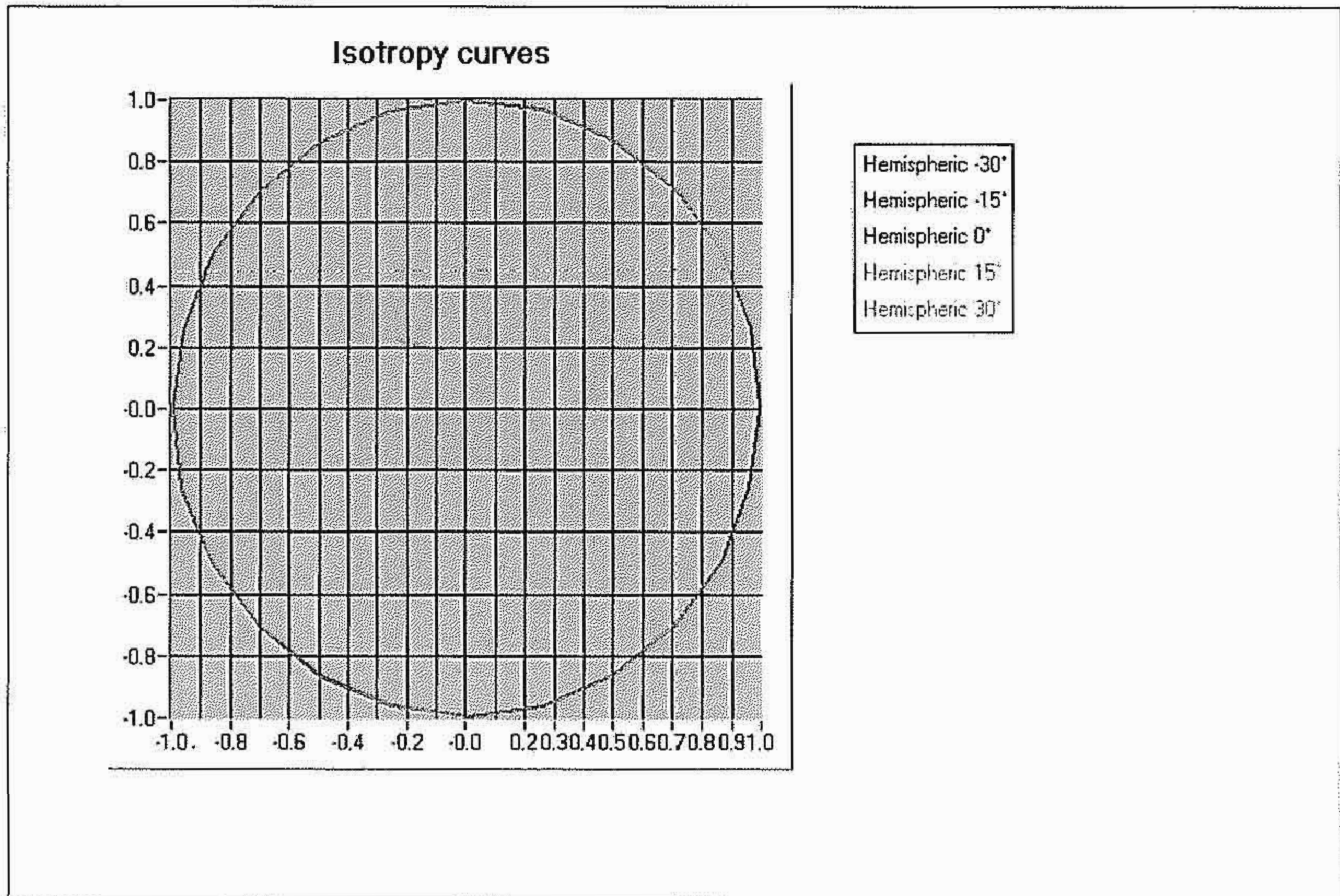
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

Liquid	Epsilon	Sigma (S/m)	CF dipole 1 (W.kg-1 (mV)-1)	CF dipole 2 (W.kg-1 (mV)-1)	CF dipole 3 (W.kg-1 (mV)-1)
Head	41.81	0.90	20.66	20.51	28.36
Body	55.51	0.94	20.00	19.88	27.77

## B. Isotropy.

- Axial isotropy: 0.029 dB
- Hemispherical isotropy: 0.030 dB



## C. Linearity.

- Linearity: 0.04 dB

# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

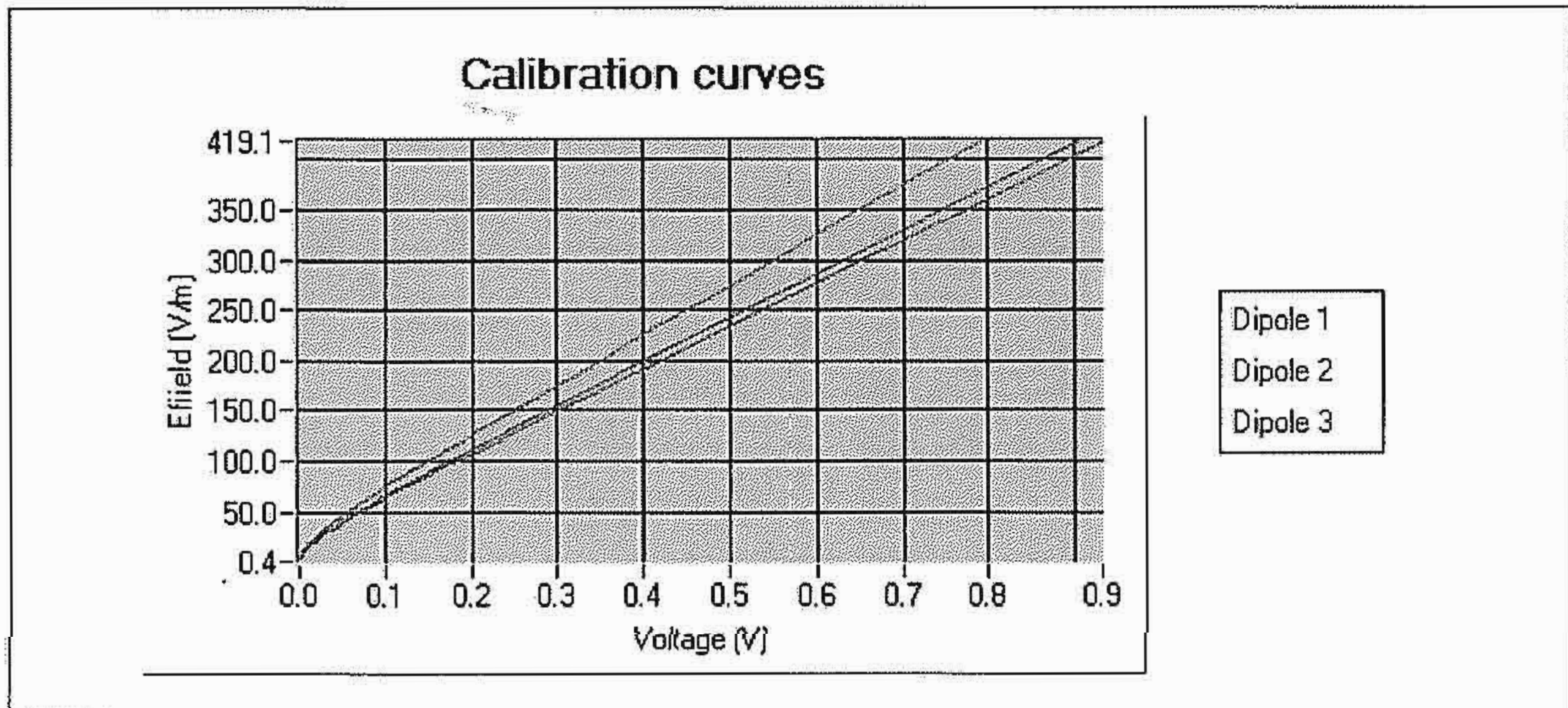
## 2. Calibration at 897.00 MHz

### A. Calibration parameters.

Label	900
Epsilon	41.22
Sigma	0.91 S/m
Temperature	21°C
Cable loss	0.11 dB
Coupler loss	20.27 dB
Waveguide S11	-16.71 dB
Low limit detection	0.795 V/m (0.59 mW/kg)

Calibration curves  $e_i=f(V)$  ( $i=1,2,3$ ) allow to obtain E-field value using the formula:

$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



The following tables represent the calibration curves linearization by curve segment in CW signal.



# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

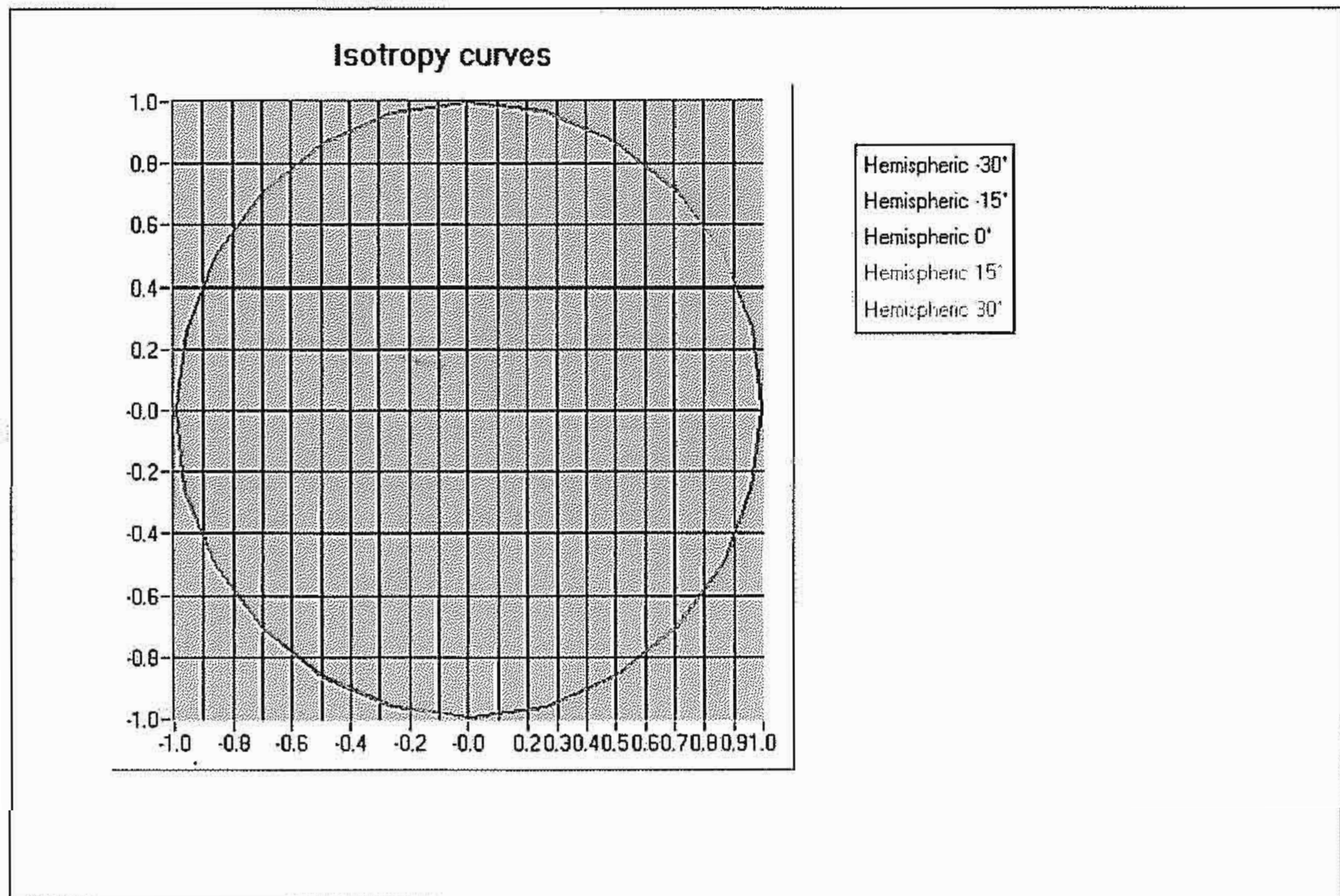
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

Liquid	Epsilon	Sigma (S/m)	CF dipole 1 (W.kg-1 (mV)-1)	CF dipole 2 (W.kg-1 (mV)-1)	CF dipole 3 (W.kg-1 (mV)-1)
Head	41.24	0.94	22.06	22.01	30.16
Body	55.69	1.00	21.56	21.36	29.10

## B. Isotropy.

- Axial isotropy: 0.029 dB
- Hemispherical isotropy: 0.030 dB

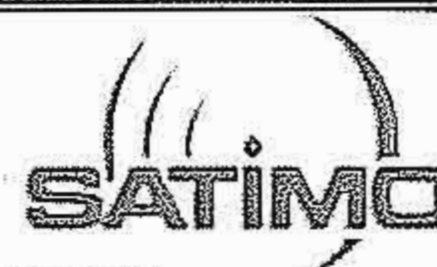


## C. Linearity.

- Linearity: 0.04 dB



# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

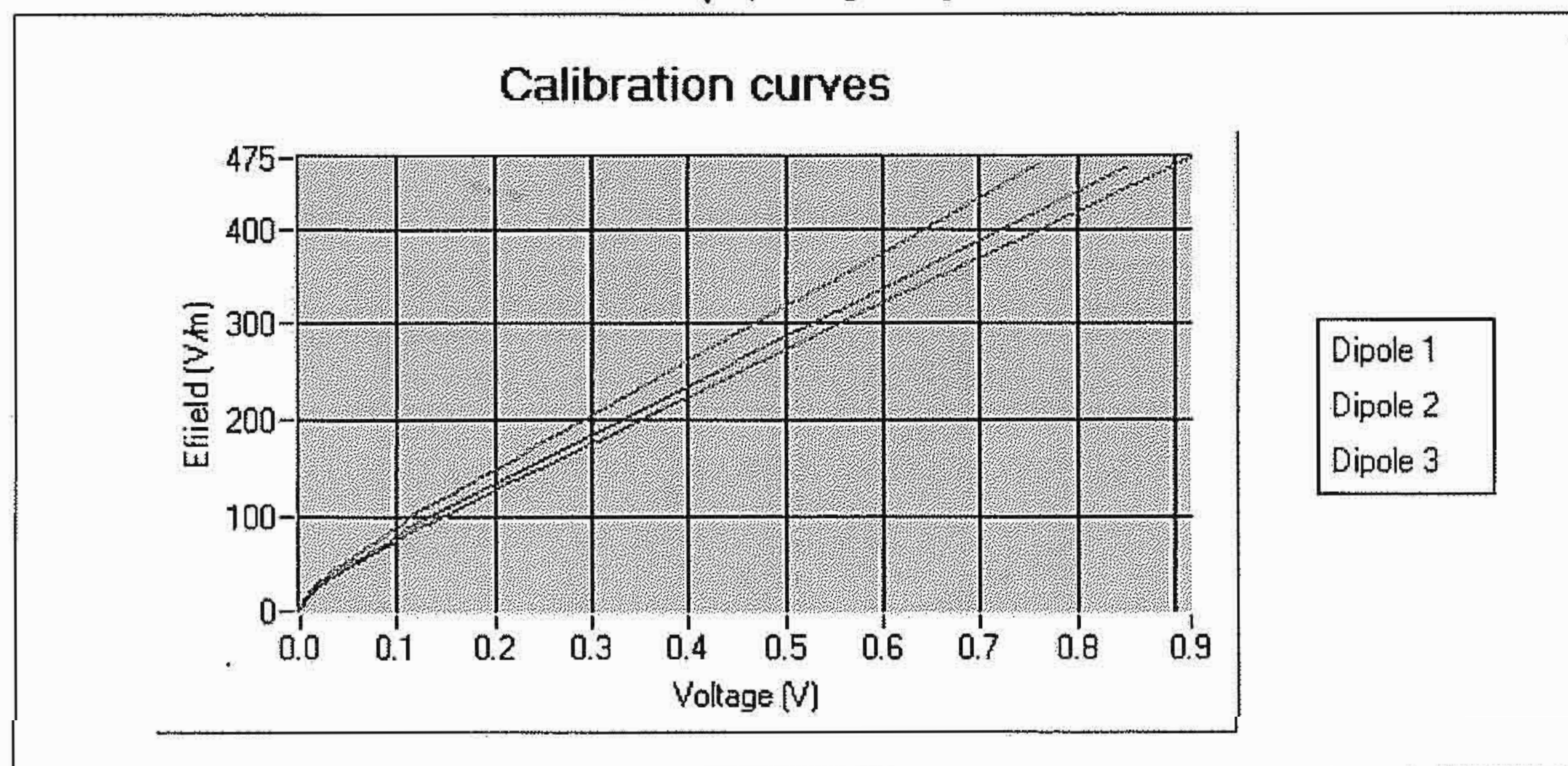
## 3. Calibration at 1747.00 MHz

### A. Calibration parameters.

Label	1800
Epsilon	38.58
Sigma	1.33 S/m
Temperature	21°C
Cable loss	0.18 dB
Coupler loss	20.22 dB
Waveguide S11	-13.13 dB
Low limit detection	0.833 V/m (0.92 mW/kg)

Calibration curves  $e_i=f(V)$  ( $i=1,2,3$ ) allow to obtain E-field value using the formula:

$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



The following tables represent the calibration curves linearization by curve segment in CW signal.



# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

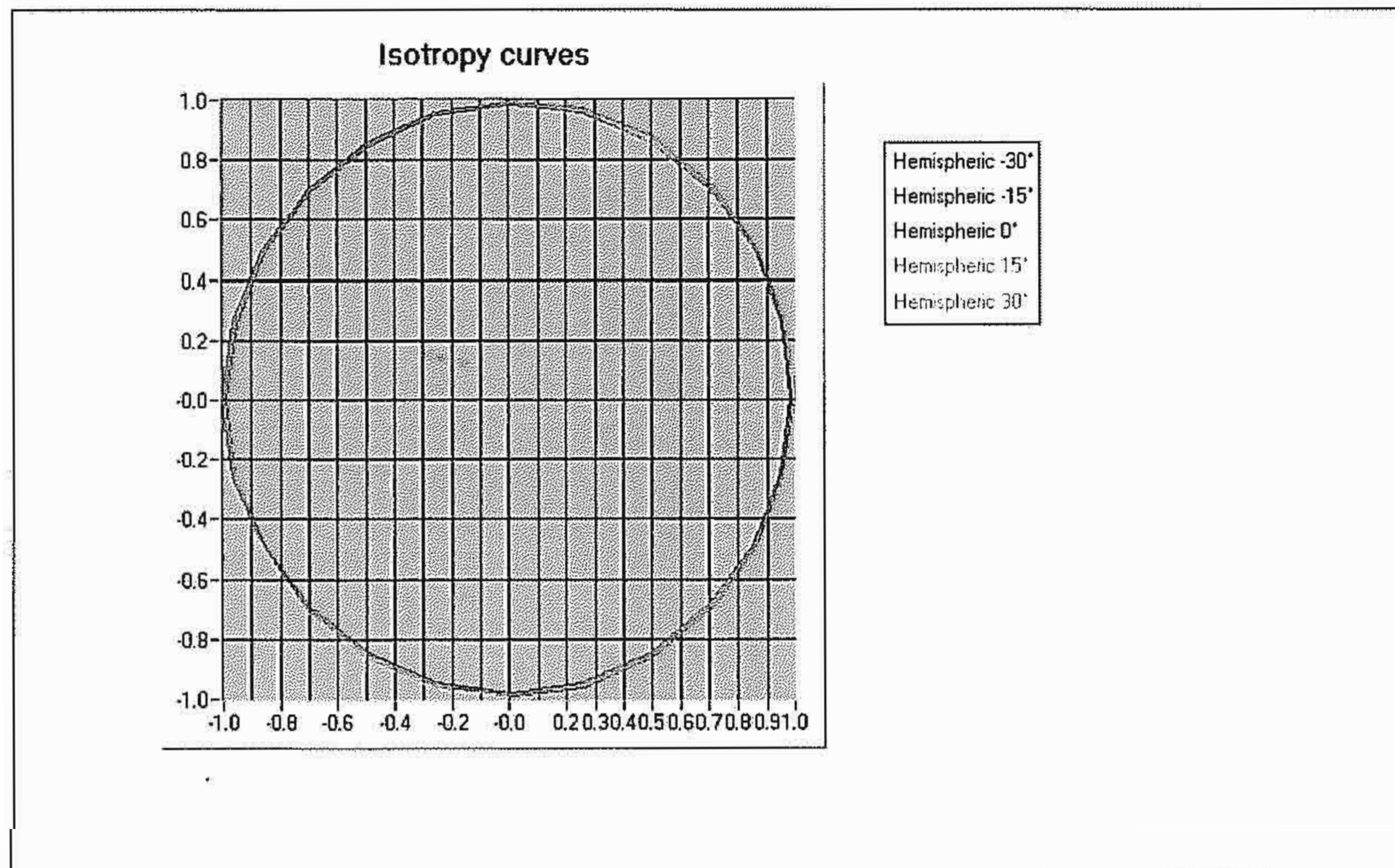
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

Liquid	Epsilon	Sigma (S/m)	CF dipole 1 (W.kg-1 (mV)-1)	CF dipole 2 (W.kg-1 (mV)-1)	CF dipole 3 (W.kg-1 (mV)-1)
Head	38.56	1.33	37.12	38.56	50.42
Body	51.99	1.49	36.66	37.99	49.66

## B. Isotropy.

- Axial isotropy: 0.050 dB
- Hemispherical isotropy: 0.076 dB



## C. Linearity.

- Linearity: 0.03 dB

# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

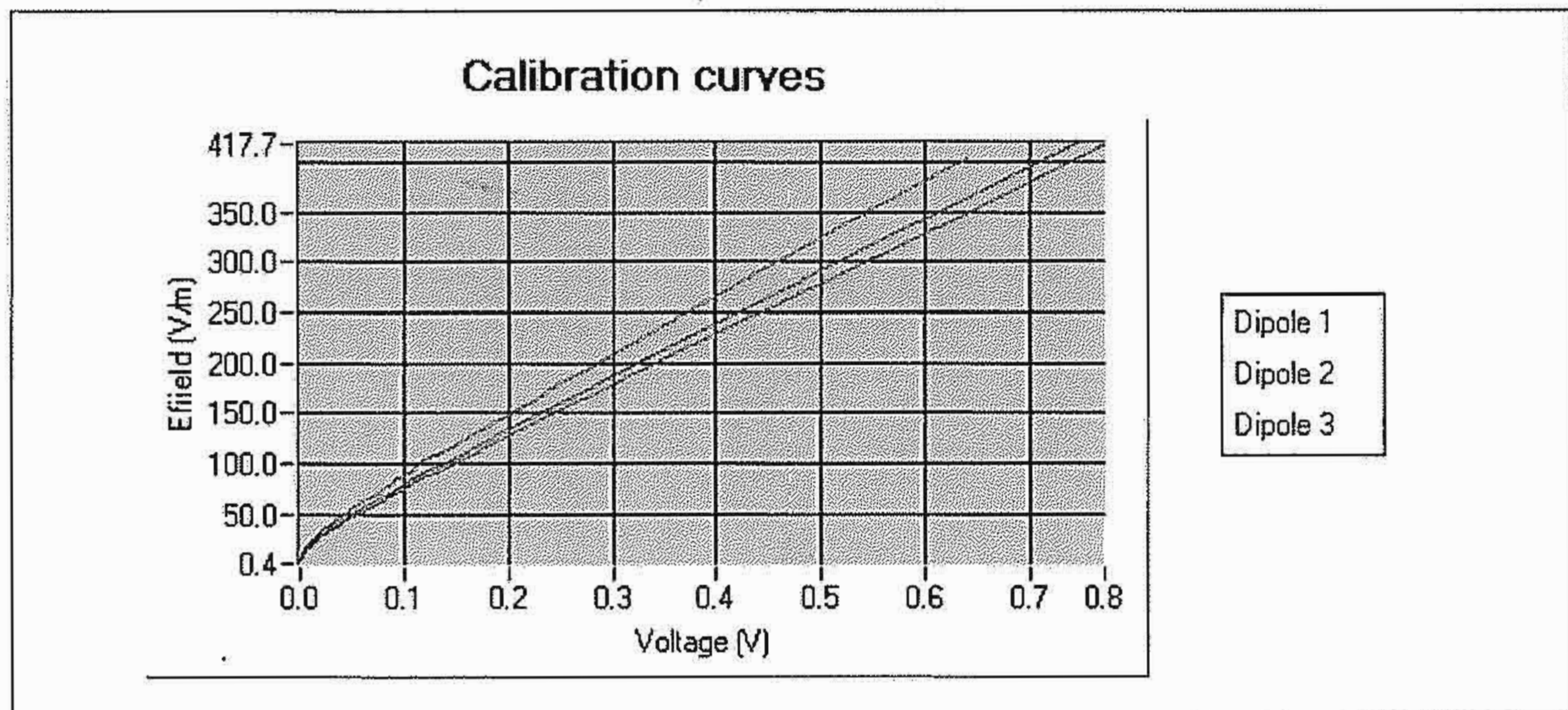
## 4. Calibration at 1880.00 MHz

### A. Calibration parameters.

Label	1900
Epsilon	38.33
Sigma	1.44 S/m
Temperature	21°C
Cable loss	0.19 dB
Coupler loss	21.14 dB
Waveguide S11	-26.91 dB
Low limit detection	0.797 V/m (0.91 mW/kg)

Calibration curves  $e_i=f(V)$  ( $i=1,2,3$ ) allow to obtain E-field value using the formula:

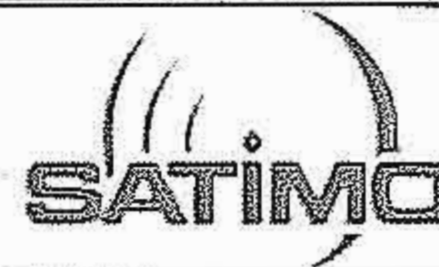
$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



The following tables represent the calibration curves linearization by curve segment in CW signal.



# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

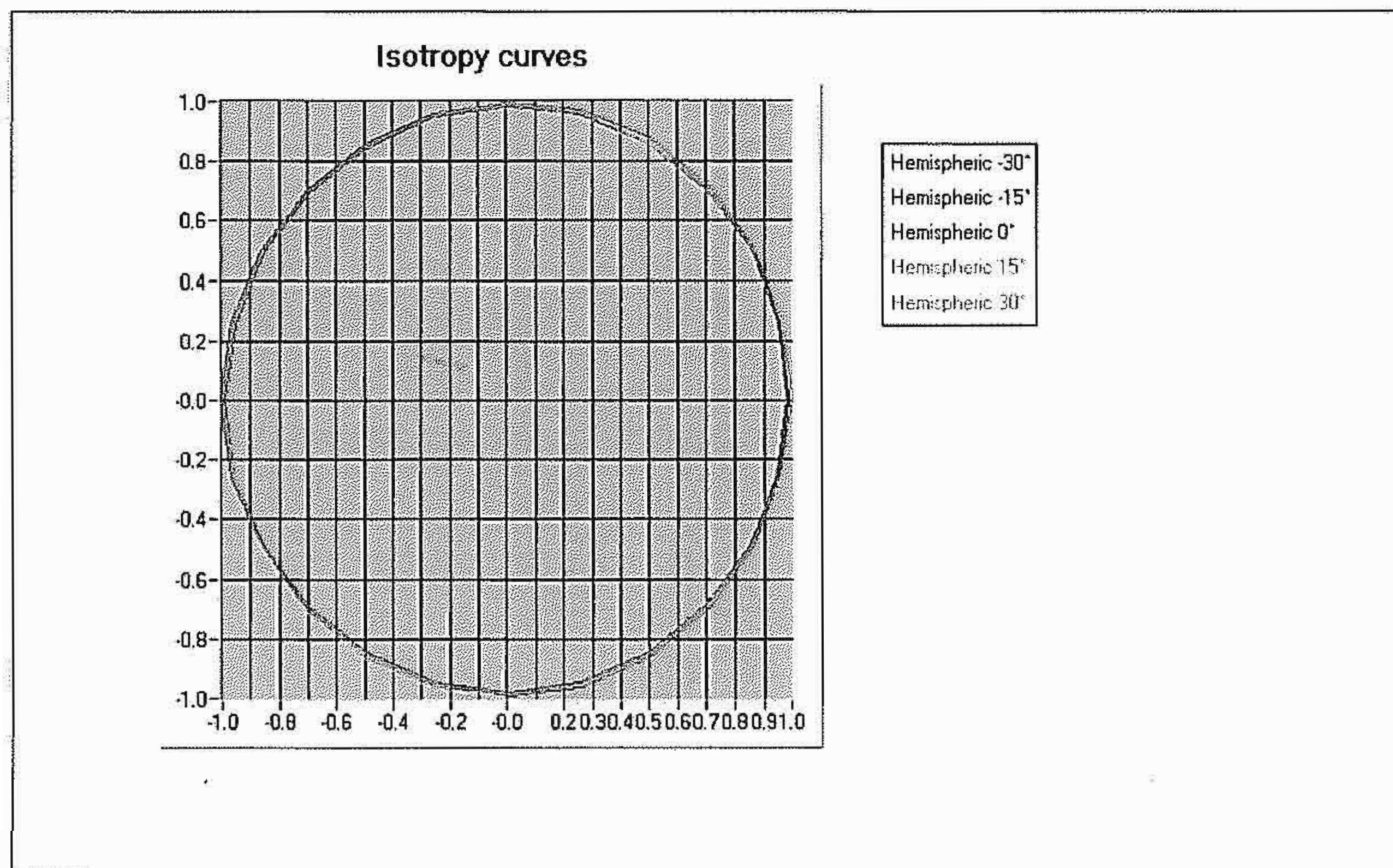
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

Liquid	Epsilon	Sigma (S/m)	CF dipole 1 (W.kg-1 (mV)-1)	CF dipole 2 (W.kg-1 (mV)-1)	CF dipole 3 (W.kg-1 (mV)-1)
Head	38.35	1.45	41.05	42.35	55.45
Body	52.12	1.52	40.42	41.12	54.75

## B. Isotropy.

- Axial isotropy: 0.050 dB
- Hemispherical isotropy: 0.076 dB



## C. Linearity.

- Linearity: 0.03 dB

# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

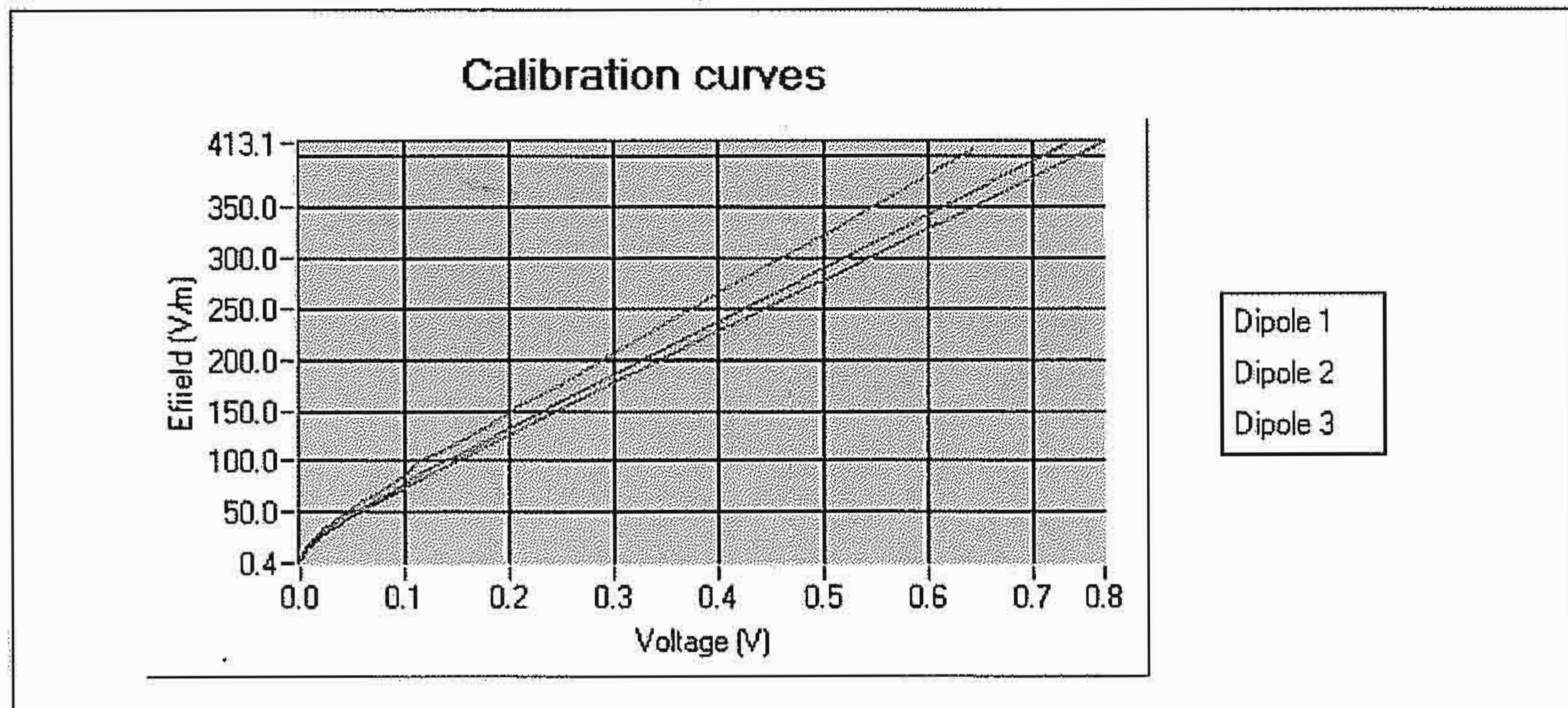
## 5. Calibration at 1950.00 MHz

### A. Calibration parameters.

Label	2000
Epsilon	38.18
Sigma	1.48 S/m
Temperature	21°C
Cable loss	0.18 dB
Coupler loss	20.09 dB
Waveguide S11	-30.09 dB
Low limit detection	0.788 V/m (0.93 mW/kg)

Calibration curves  $e_i=f(V)$  ( $i=1,2,3$ ) allow to obtain E-field value using the formula:

$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



The following tables represent the calibration curves linearization by curve segment in CW signal.



# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

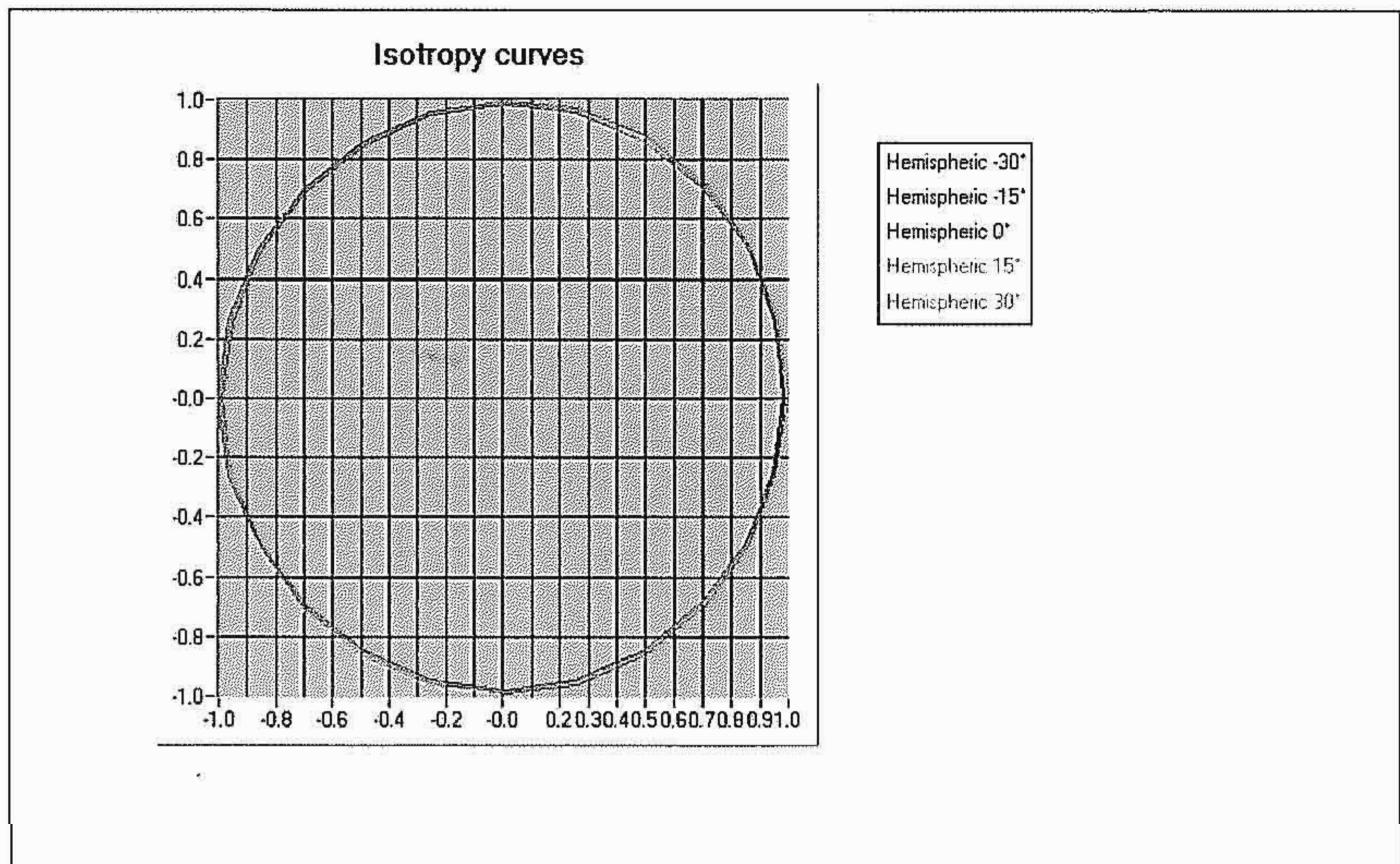
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

Liquid	Epsilon	Sigma (S/m)	CF dipole 1 (W.kg-1 (mV)-1)	CF dipole 2 (W.kg-1 (mV)-1)	CF dipole 3 (W.kg-1 (mV)-1)
Head	38.18	1.45	41.91	43.15	56.44
Body	54.05	1.52	41.01	42.41	55.65

## B. Isotropy.

- Axial isotropy: 0.050 dB
- Hemispherical isotropy: 0.076 dB



## C. Linearity.

- Linearity: 0.03 dB

# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

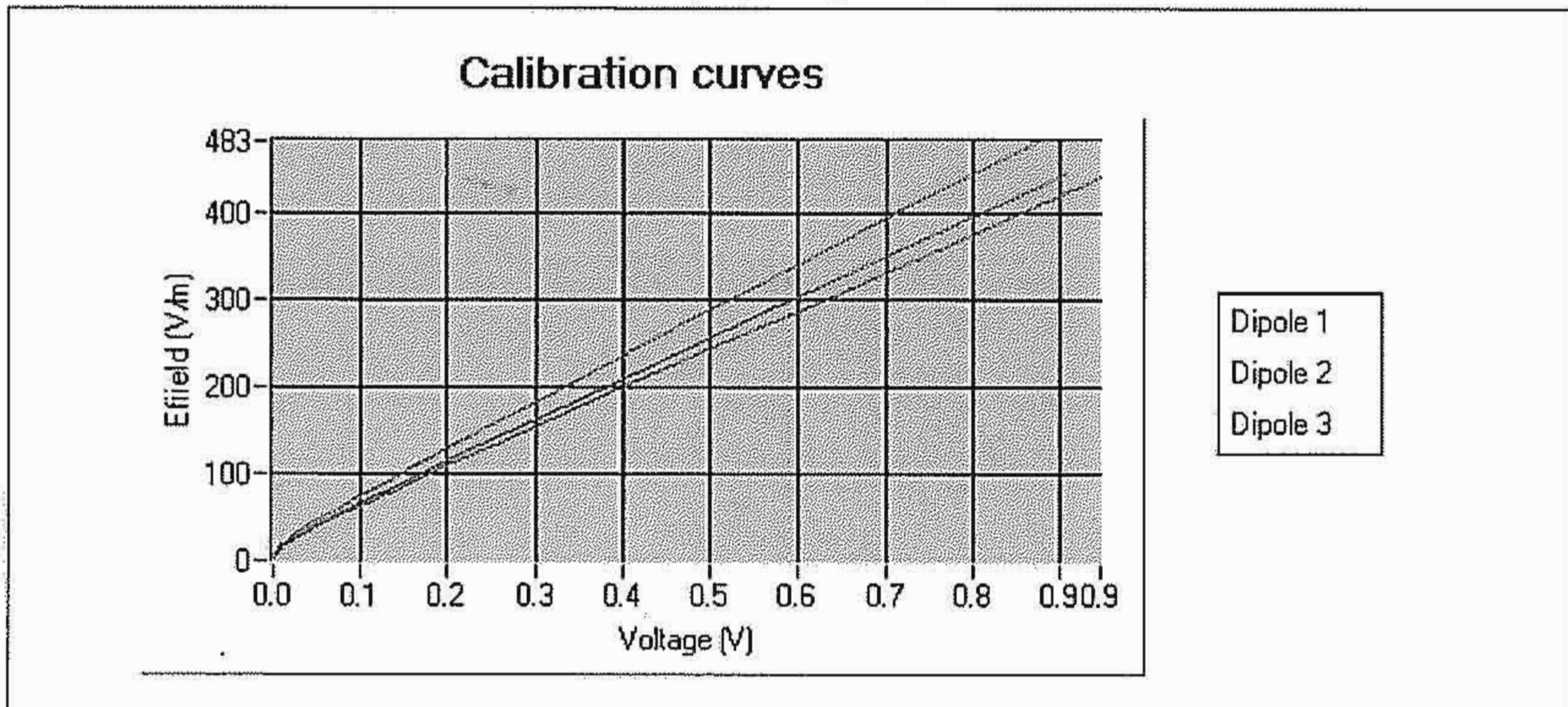
## 6. Calibration at 2450.00 MHz

### A. Calibration parameters.

Label	2450
Epsilon	37.45
Sigma	1.75 S/m
Temperature	21°C
Cable loss	0.22 dB
Coupler loss	21.52 dB
Waveguide S11	-13.66 dB
Low limit detection	0.794 V/m (1.07 mW/kg)

Calibration curves  $e_i=f(V)$  ( $i=1,2,3$ ) allow to obtain E-field value using the formula:

$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



The following tables represent the calibration curves linearization by curve segment in CW signal.



# COMOSAR E-Field probe Calibration Report



Ref: CR-131-1-09-SATB-B

Page: 1/17

Issue: B

Date: 2010/05/11

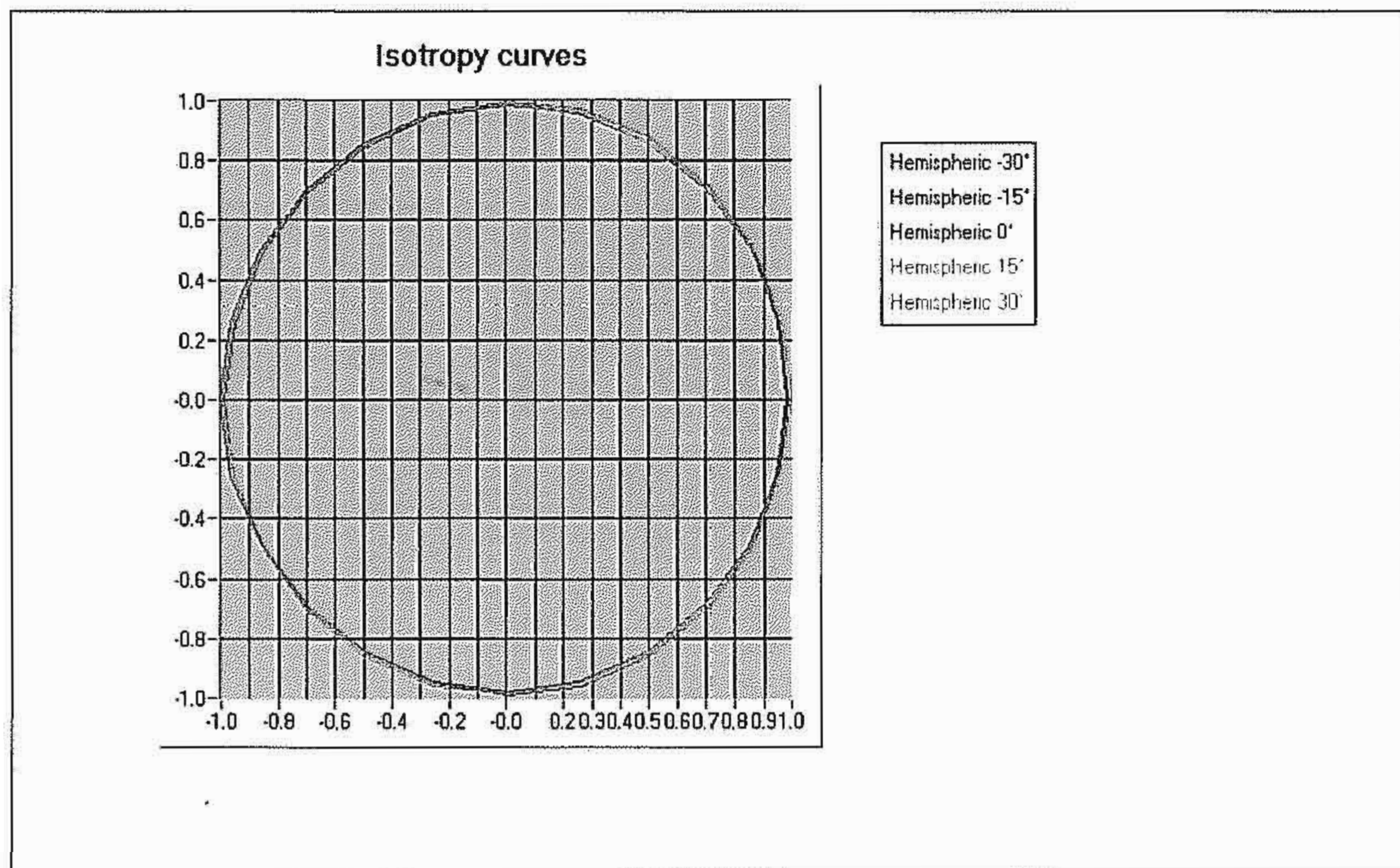
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

Liquid	Epsilon	Sigma (S/m)	CF dipole 1 (W.kg-1 (mV)-1)	CF dipole 2 (W.kg-1 (mV)-1)	CF dipole 3 (W.kg-1 (mV)-1)
Head	37.45	1.75	51.18	53.87	70.48
Body	53.70	1.95	50.35	52.98	69.78

## B. Isotropy.

- Axial isotropy: 0.050 dB
- Hemispherical isotropy: 0.076 dB



## C. Linearity.

- Linearity: 0.03 dB



**SIMT**

校准证书编号: 2011J10-10-812011  
Calibrated certificate series No.

SHANGHAI INSTITUTE OF MEASUREMENT AND TESTING TECHNOLOGY  
SHANGHAI CENTER OF MEASUREMENT AND TESTING SERVICES

CALIBRATION CERTIFICATE

# 上海市计量测试技术研究院 华东国家计量测试中心

## 校准证书

委托者 程智科技股份(昆山)有限公司  
Customer Compliance Certification Services Inc.

委托者地址 江苏省昆山市(留学创业园)伟业路10号  
Address of customer No. 10, Wei-Ye Rd., Innovation Park, Eco & Tech. Development Zone, Kun Shan City, Jiang Su, P. R. O. C.

器具名称 偶极子天线  
Name of instrument DIPOLE ANTENNA

制造厂 ANTENNESSA 公司  
Manufacturer

型号/规格 DIPOLE 835MHz  
Model/Specification

器具编号 SN 48/05 DIPC32  
No. of instrument

器具准确度 /  
Instrument accuracy

(机构校准专用章)



证书批准人 蔡斌  
Approved by

核验员 刘德  
Checked by

校准员 高晨  
Calibrated by

校准日期 2011 年 2 月 10 日  
Date for calibrated Year Month Day

投诉电话: 021-50798262

地址: 上海市张衡路 1500 号(总部) 电话: 021-38839800 传真: 021-50798390 邮编: 201203  
Address No. 1500 Zhangheng Road, Shanghai(Headquarters) Tel Fax Post Code

上海市宜山路 716 号(分部) 电话: 021-64701390 传真: 021-64701810 邮编: 200233  
No. 716 Yishan Road, Shanghai(Branch) Tel Fax Post Code



国家法定计量检定机构计量授权证书号(中心/院): (国)法计(2002)01039号/(2002)01019号  
The number of the Certificate of Metrological Authorization to The Legal Metrological Verification Institution is No. (2002) 01039 / No. (2002) 01019

中国合格评定国家认可委员会实验室认可证书号: No. CNAS L0134  
The number of the certificate accredited by CNAS is No. L0134

本次校准所依据的技术规范(代号、名称):  
Reference documents for the calibration (code, name)

JCJ/J101002.1/0-2007 SAR偶极子天线校准规范

IEEE Std 1528-2003 "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measure Techniques"

IEC 62209-1: 2005 Procedure to measure the Specific Absorption Rate (SAR) in the frequency range of 300 MHz to 3 GHz Part 1: hand-held mobile wireless communication devices

本次校准所使用的主要计量标准器具:  
Main measurement standards used in this calibration

名称/型号 Name/Model	编号 Number	证书编号/有效期限 Certificate No./Due date	测量范围/准确度 Measuring range/accuracy
VECTOR NETWORK ANALYZER ZVB 8	容-027-27	2010F31-10-001907 2011.06.26	300 kHz~8 GHz, Frequency resolution: 100 $\mu$ Hz, Measurement time: < 8 ms, Measurement bandwidths: 1 Hz~500 kHz

以上计量标准器具的量值溯源至国家基准。  
Quantity values of above measurement standards used in this calibration are traced to those of the national primary standards in the P.R. China.

校准地点及环境条件:  
Location and environmental condition for the calibration

地点: 宜山路 716 号 (No. 716 Yishan Road)  
Location

温度: 23  $^{\circ}$ C; 湿度: 48 %RH; 其它: /  
Ambient temperature Relative humidity Others

本次校准结果的扩展不确定度:  
Expanded uncertainty

+3dB 至 -15dB:  $U=0.8$  dB ( $k=2$ )  
-15dB 至 -25dB:  $U=1.2$  dB ( $k=2$ )  
-25dB 至 -35dB:  $U=3.1$  dB ( $k=2$ )

校准结果/说明:  
Results of calibration and additional explanation

Pass

The requirements of the calibration criterion: return Loss must be less than -20dB



校准结果/说明 (续页):

Results of calibration and additional explanation (continued page)

1. Calibration procedure:

Return Loss is measured with the dipole mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis. During calibration, the flat phantom is filled with the liquid whose parameters are calibrated relative to different frequency.

2. Calibration Conditions

A. The spacer from Dipole center to TSL

Distance Dipole Center - TSL	Frequency
15mm±0.2mm with spacer	835MHz

B. Head TSL parameters

The following parameters and calculation were applied.

Head TSL temperature change is well controlled to be within 22±0.2°C during test.

Frequency	Nominal Head TSL Parameters (Permittivity/ Conductivity)	Measurement Head TSL parameters (Permittivity/ Conductivity)
835 MHz	41.50/0.90	40.55/0.95

C. Body TSL parameters

The following parameters and calculation were applied.

Body TSL temperature change is well controlled to be within 22±0.2°C during test.

Frequency	Nominal Body TSL Parameters (Permittivity/ Conductivity)	Measurement Body TSL parameters (Permittivity/ Conductivity)
835 MHz	55.20/0.97	53.59/1.03

3. Measurement Results

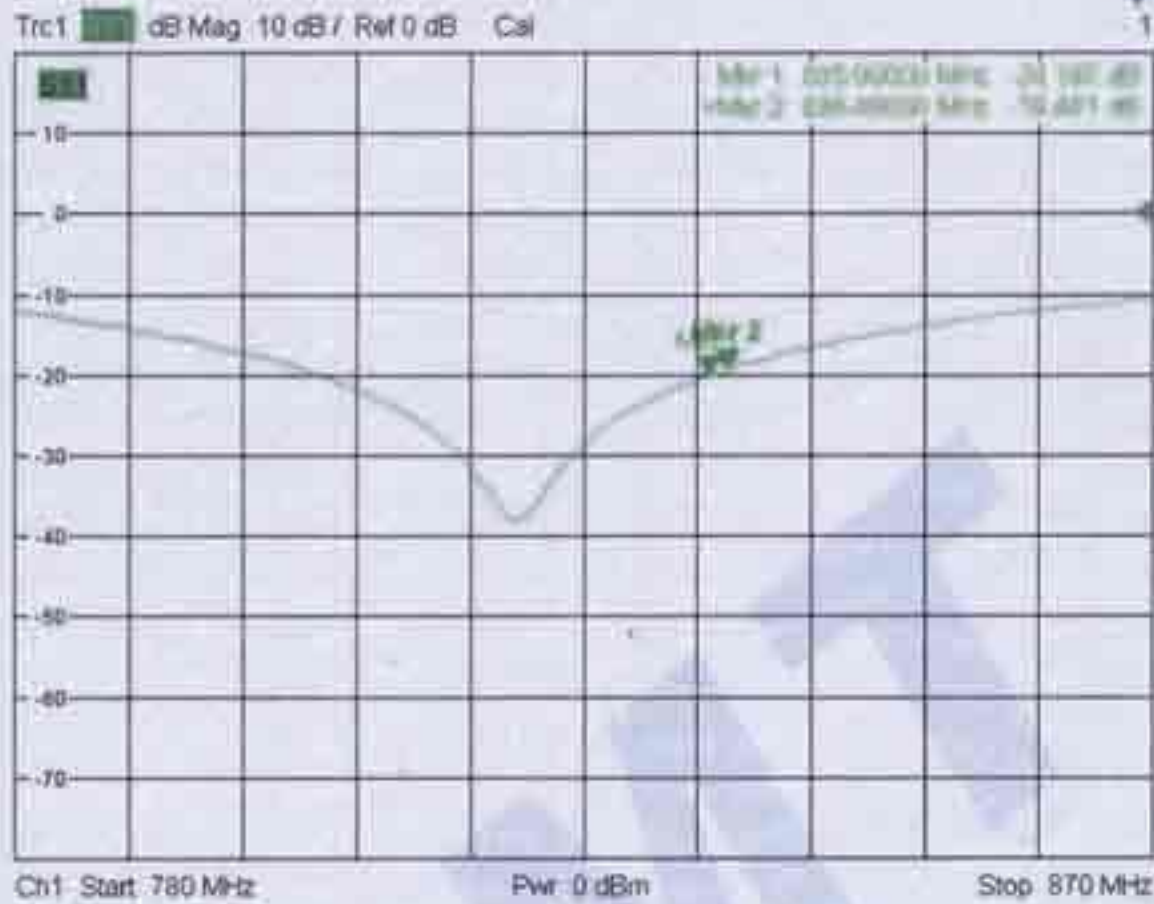
Frequency	Return Loss with Head TSL	Return Loss with Body TSL
835 MHz	-20.19 dB	-21.33 dB



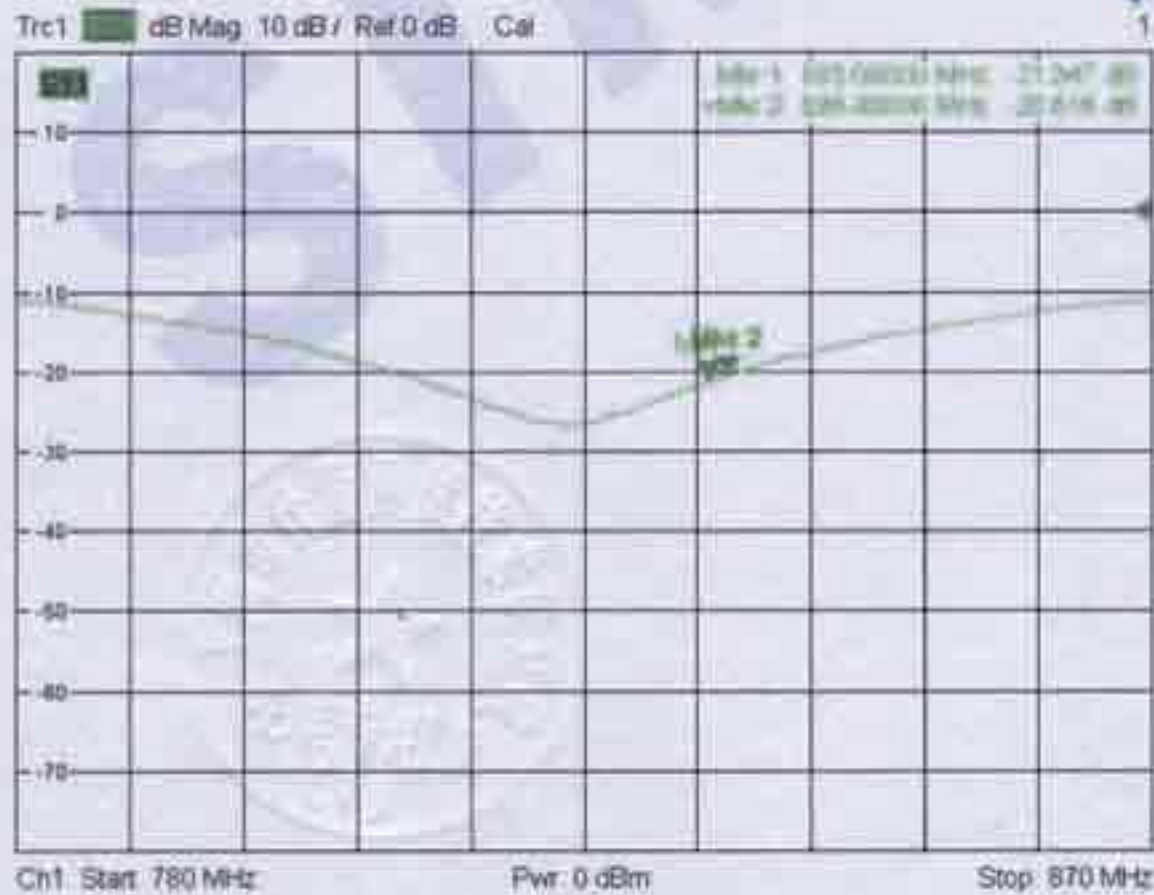
校准结果/说明 (续页):

Results of calibration and additional explanation (continued page)

Return Loss Measurement Plot for head TSL



Return Loss Measurement Plot for Body TSL



Remark: Attachment 1: SAR validation & Test equipment

End

Attachment 1: SAR validation & Test equipment

Validation	Condition	SAR Value (W/kg)	
		1g	10g
SAR measured with Head TSL	1W (input power)	9.41	6.27
SAR measured with Body TSL	1W (input power)	9.79	6.63

名称/型号 Name/Model	编号 Number	证书编号/有效期限 Certificate No./Due date	测量范围/准确度 Measuring range/accuracy
6 axis Robot KR3	容-027-01	/	6 axes, Repeatability: $\pm 0.05$ mm, Nominal payload: 3 kg
Vector Network Analyzer ZVB 8	容-027-27	2010F31-10-001907 2011.06.26	300 kHz to 8 GHz, Frequency resolution: 100 $\mu$ Hz, Measurement time: < 8 ms, Measurement bandwidths: 1 Hz to 500 kHz
Signal Generator SMT 06	容-027-15	2010F33-10-001469 2011.06.26	5 kHz - 6 GHz, Resolution: 0.1Hz, -144 to + 13 dBm, Max.RF power: 1W, Max.DC voltage: 0V / Level > -127 dBm: f<1.5 GHz: < 1dB; f>1.5 GHz: < 1.5dB; f> 3GHz: < 2dB
Power Meter NRVD	容-027-16	2010F31-10-001906 2011.06.24	100 kHz to 6 GHz, 10nW to 500mW
Millivoltmeter 2000	容-027-26	2010F11-10-001004 2011.06.19	Measurement range: 100.0000mV ~ 1000.000V Sensibility: 0.1 $\mu$ V ~ 1m V.
Power Amplifier BLMA 0820-6	容-027-18	2010F33-10-001467 2011.06.26	0.8 - 2 GHz; Output: 6W; Gain: min 37.8 / typ 40, $\pm 2$ dB; Harmonics: 2nd: 20dBc, 3rd: 20dBc; Line power: 125 W.
Isotropic E-Field Probe E-FIELD PROBE	容-027-54	2010J10-10-801001 2011.12.25	Dipole resistance (in the connector plane): 1M $\Omega$ to 2M $\Omega$ Axial isotropy in human-equivalent liquids: < 0.25dB Hemispherical Isotropy in humanequivalent liquids < 0.5dB, Linearity < 0.5dB, Lower SAR detection threshold: 0.0015 Watts/kg
SAM Phantom	容-027-22	/	/



CALIBRATION CERTIFICATE

上海市计量测试技术研究院  
华东国家计量测试中心

校准证书

委托者 Customer 程智科技股份(昆山)有限公司 Compliance Certification Services Inc.

委托者地址 Address of customer 江苏省昆山市(留学创业园)伟业路10号 No. 10, Wei-Ye Rd., Innovation park, Eco & Tec. Development Zone, Kun Shan City, Jiang Su, P. R. O. C.

器具名称 Name of instrument 偶极子天线 DIPOLE ANTENNA

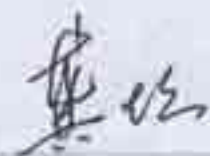
制造厂 Manufacturer ANTENNESSA 公司

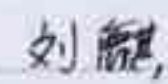
型号/规格 Model/Specification DIPOLE 1900MHz

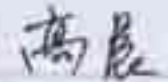
器具编号 No. of instrument SN 48/05 DIPG35

器具准确度 Instrument accuracy /

(机构校准专用章)

证书批准人 Approved by 

核验员 Checked by 刘麒 

校准员 Calibrated by 高晨 

校准日期 Date for calibrated 2011 年 2 月 10 日  
Year Month Day

投诉电话: 021-50798262

国家法定计量检定机构计量授权证书号(中心/院): (国)法计(2002)01039号/(2002)01019号  
The number of the Certificate of Metrological Authorization to The Legal Metrological Verification Institution is No. (2002) 01039 / No. (2002) 01019

中国合格评定国家认可委员会实验室认可证书号: No. CNAS L0134  
The number of the certificate accredited by CNAS is No. L0134

本次校准所依据的技术规范(代号、名称):  
Reference documents for the calibration (code, name)

JCJ/J101002.1/0-2007 SAR偶极子天线校准规范

IEEE Std 1528-2003 "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measure Techniques"

IEC 62209-1: 2005 Procedure to measure the Specific Absorption Rate (SAR) in the frequency range of 300 MHz to 3 GHz Part 1: hand-held mobile wireless communication devices

本次校准所使用的主要计量标准器具:  
Main measurement standards used in this calibration

名称/型号 Name/Model	编号 Number	证书编号/有效期限 Certificate No./Due date	测量范围/准确度 Measuring range/accuracy
VECTOR NETWORK ANALYZER ZVB 8	容-027-27	2010F31-10-001907 2011.06.26	300 kHz~8 GHz. Frequency resolution: 100 $\mu$ Hz. Measurement time: < 8 ms. Measurement bandwidths: 1 Hz~500 kHz

以上计量标准器具的量值溯源至国家基准。  
Quantity values of above measurement standards used in this calibration are traced to those of the national primary standards in the P.R. China.

校准地点及环境条件:  
Location and environmental condition for the calibration

地点: 宜山路 716 号 (No. 716 Yishan Road)  
Location

温度: 23  $^{\circ}$ C; 湿度: 43 %RH; 其它: /  
Ambient temperature Relative humidity Others

本次校准结果的扩展不确定度:  
Expanded uncertainty

+3dB 至 -15dB:  $U=0.8$  dB ( $k=2$ )

-15dB 至 -25dB:  $U=1.2$  dB ( $k=2$ )

-25dB 至 -35dB:  $U=3.1$  dB ( $k=2$ )

校准结果/说明:  
Results of calibration and additional explanation

Pass

The requirements of the calibration criterion: return Loss must be less than -20dB



校准结果/说明 (续页):

Results of calibration and additional explanation (continued page)

1. Calibration procedure

Return Loss is measured with the dipole mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis. During calibration, The flat phantom is filled with the liquid whose parameters are calibrated relative to different frequency.

2. Calibration Conditions:

A. The spacer from Dipole center to TSL

Distance Dipole Center - TSL	Frequency
10mm±0.2mm with spacer	1900MHz

B. Head TSL parameters

The following parameters and calculation were applied.

Head TSL temperature change is well controlled to be within 22±0.2°C during test.

Frequency	Nominal Head TSL Parameters (Permittivity/ Conductivity)	Measurement Head TSL parameters (Permittivity/ Conductivity)
1900 MHz	40.00/1.40	38.69/1.44

C. Body TSL parameters

The following parameters and calculation were applied.

Body TSL temperature change is well controlled to be within 22±0.2°C during test.

Frequency	Nominal Body TSL Parameters (Permittivity/ Conductivity)	Measurement Body TSL parameters (Permittivity/ Conductivity)
1900 MHz	53.30/1.52	54.64/1.54

3. Measurement Results

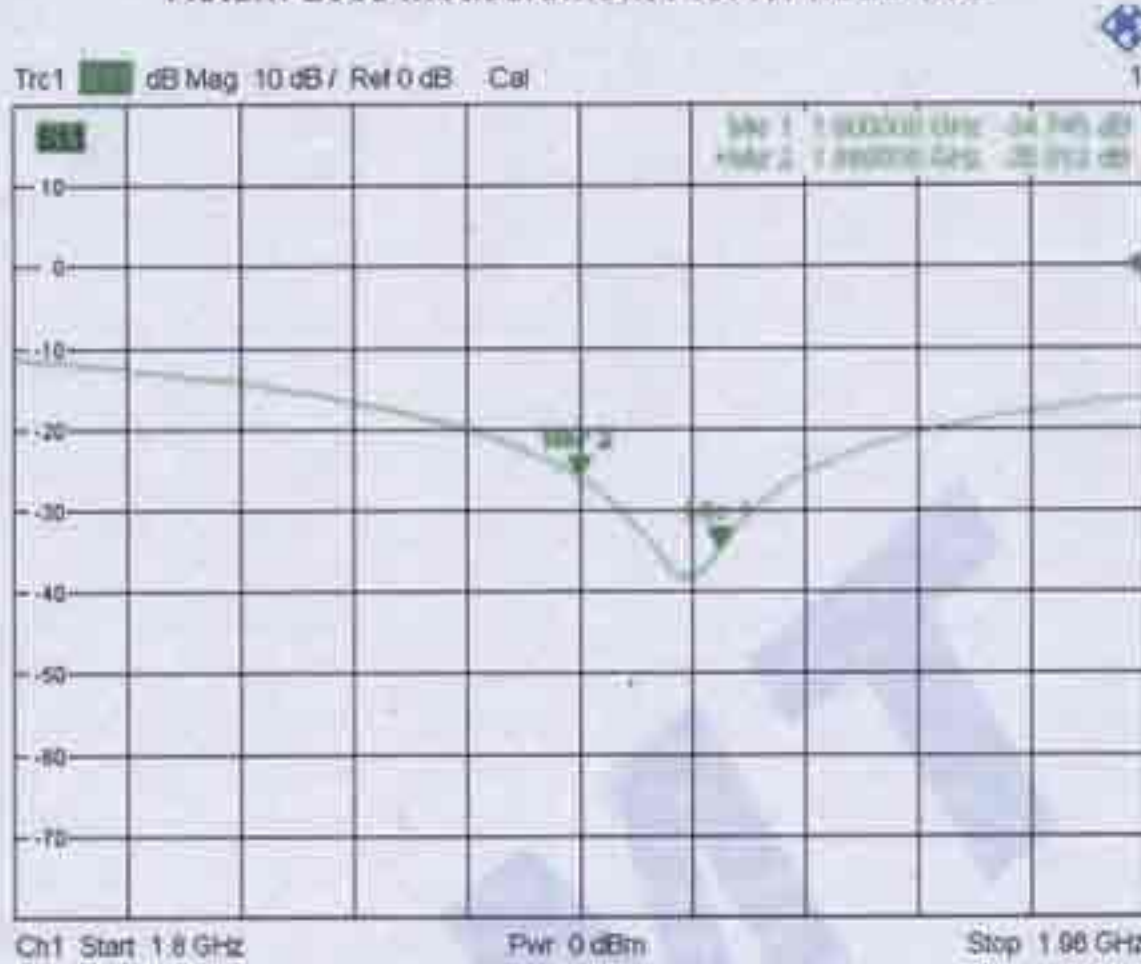
Frequency	Return Loss with Head TSL	Return Loss with Body TSL
1900 MHz	-34.74dB	-27.87dB

CHANGSHA INSTITUTE OF ELECTRONICS AND TECHNOLOGY  
 NATIONAL CENTER FOR CALIBRATION OF FORCEFUL CHINA

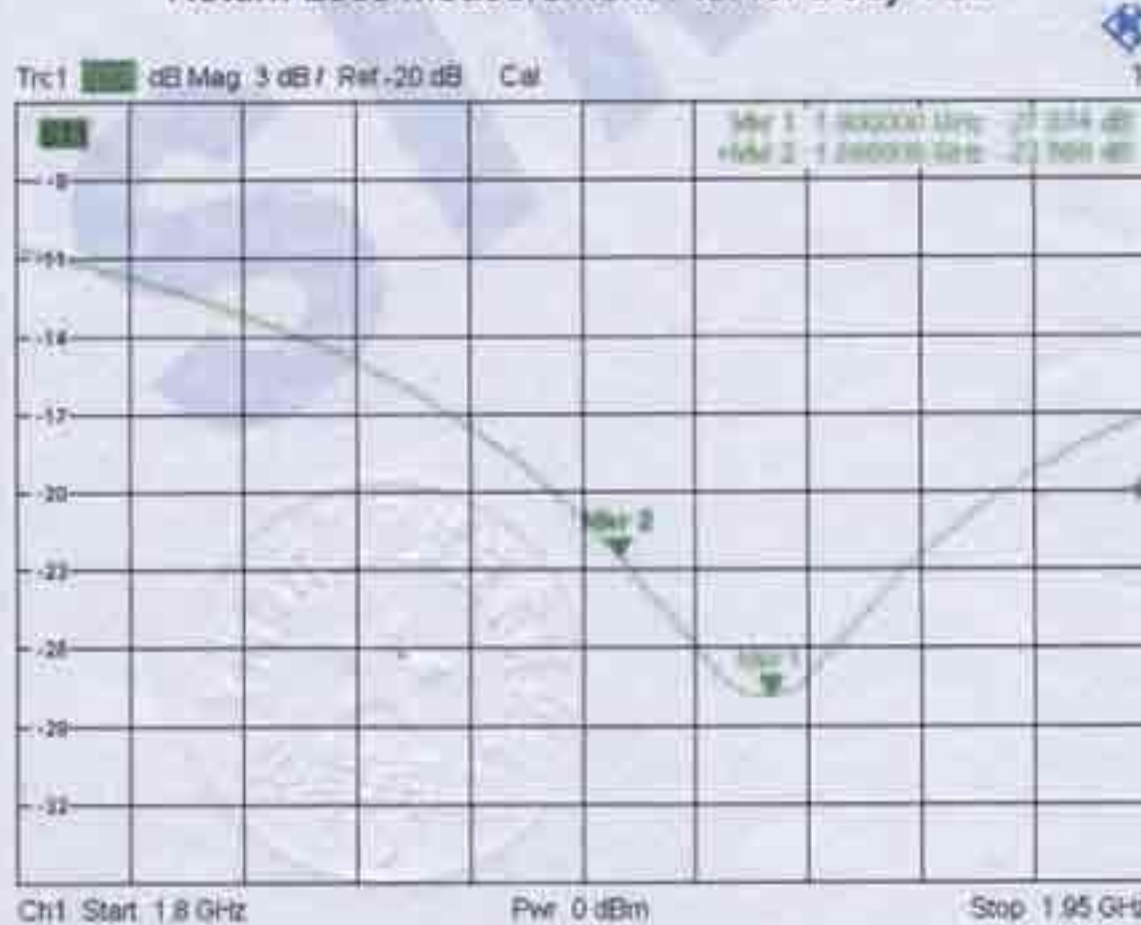
校准结果/说明 (续页):

Results of calibration and additional explanation (continued page)

Return Loss Measurement Plot for head TSL



Return Loss Measurement Plot for Body TSL



Remark: Attachment 1: SAR validation & Test equipment

End



**Attachment 1: SAR validation & Test equipment**

Validation	Condition	SAR Value (W/kg)	
		1g	10g
SAR measured with Head TSL	1W (input power)	41.35	21.39
SAR measured with Body TSL	1W (input power)	38.95	20.51

名称/型号 Name/Model	编号 Number	证书编号/有效期限 Certificate No./Due date	测量范围/准确度 Measuring range/accuracy
6 axis Robot KR3	容-027-01	/	6 axes, Repeatability: $\pm 0.05$ mm, Nominal payload: 3 kg
Vector Network Analyzer ZVB 8	容-027-27	2010F31-10-001907 2011.06.26	300 kHz to 8 GHz, Frequency resolution: 100 $\mu$ Hz, Measurement time: < 8 ms, Measurement bandwidths: 1 Hz to 500 kHz
Signal Generator SMT 06	容-027-15	2010F33-10-001469 2011.06.26	5 kHz - 6 GHz, Resolution: 0.1Hz, -144 to + 13 dBm, Max. RF power: 1W, Max. DC voltage: 0V / Level > -127 dBm: f < 1.5 GHz: < 1dB; f > 1.5 GHz: < 1.5dB; f > 3GHz: < 2dB
Power Meter NRVD	容-027-16	2010F31-10-001906 2011.06.24	100 kHz to 6 GHz, 10nW to 500mW
Millivoltmeter 2000	容-027-26	2010F11-10-001004 2011.06.19	Measurement range: 100.0000mV ~ 1000.000V Sensibility: 0.1 $\mu$ V ~ 1mV.
Power Amplifier BLMA 0820-6	容-027-18	2010F33-10-001467 2011.06.26	0.8 - 2 GHz; Output: 6W; Gain: min 37.8 / typ 40, $\pm 2$ dB; Harmonics: 2nd: 20dBc, 3rd: 20dBc; Line power: 125 W.
Isotropic E-Field Probe E-FIELD PROBE	容-027-54	2010J10-10-801001 2011.12.25	Dipole resistance (in the connector plane): 1M $\Omega$ to 2M $\Omega$ Axial isotropy in human-equivalent liquids: < 0.25dB Hemispherical Isotropy in humanequivalent liquids < 0.5dB, Linearity < 0.5dB, Lower SAR detection threshold: 0.0015 Watts/kg
SAM Phantom	容-027-22	/	/