

**APPENDIX C: RELEVANT PAGES FROM PROBE CALIBRATION REPORT(S)**

The State Radio\_monitoring\_center Testing Center

**Calibration Certificate**



Instrument Dosimetric E-field Probe

Type/Model ES3DV3

Manufacturer Schmid & Partner Engineering AG

Serial No SN:3128

Name of Client The State Radio\_monitoring\_center Testing Center

Address of Client No.80 Bei Lishi Road XiCheng District

Calibration Date 2012.2.3

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3) °C and humidity<70%

Approved by  

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The State Radio\_monitoring\_center Testing Center

Reference documents of the measurement(Code, Name)
SRTC3003-V1.0.0 Working procedure for calibration——SAR testing system
Place and environmental condition of the measurement
Temperature 23.8℃ Humidity 38.2%
Location SRTC226 room

Primary Calibration Equipment used	Model/Type	ID#	Cal Date	Scheduled Calibration
Power meter	E4417A	SN: MY45101004	2011.8	2012.8
Power sensor	E9300B	SN: MY41496001	2011.8	2012.8
Power sensor	E9300B	SN: MY41496003	2011.8	2012.8
Reference DAE	DAE4	SN: 725	2011.10	2012.10
Signal generator	SML03	SN:103514	2010.8	2012.8
Network analyzer	8714ET	SN:US40372083	2011.8	2012.8
Secondary Calibration Equipment used	Model/Type	ID#		
Waveguide	WGLS R9	SN:1006		
Waveguide	WGLS R14	SN:1003		
Waveguide	WGLS R22	SN:1006		

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**Note:**

1. This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).

The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

2. This calibration certificate is not permitted to be reproduced except in full without written the approval of the only laboratory.

3. SRTC is responsible for the whole of certificate only with stamp of SRTC.

4. The calibration results would be valid only for the items calibration.

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## The State Radio\_monitoring\_center Testing Center

### Glossary

TSL	Tissue Simulating Liquid
NORM <sub>x, y, z</sub>	The sensitivity in free space
ConvF	The sensitivity of the TSL/The sensitivity in free space
DCP	Diode Compression Point
Angle $\varphi$	$\varphi$ rotation around probe axis
Angle $\theta$	$\theta$ rotation around an axis that is in the plane normal to probe axis i.e. $\theta=0$ , means that is normal to probe axis

### Calibration is preformed according to the Following Standards

IEEE Std 1528-2003  
IEC 62209-1-2005  
Federal Communication Commission Office of Engineering & Technology (FCC OET)

### Methods Applied and Interpretation of Parameters

- NORM<sub>x, y, z</sub>: Assessed for E-field polarization  $\theta=0$  for XY sensors and  $\theta=90$  for Z sensor
- NORM(f)<sub>x, y, z</sub> = NORM<sub>x, y, z</sub> \* frequency\_response. And this linearization is implemented in DASYS4 software versions later than 4.2. The uncertainty of the frequency response is included in the states uncertainty of ConvF.
- DCP<sub>x,y,z</sub>: DCP are numerical linearization parameters assessed based on the data of power sweep(no uncertainty required). DCP does not depend on frequency and medium.
- ConvF and boundary effect: Assessed in flat phantom using E-field and inside waveguide using analytical field distributions based on power measurements for  $f > 800\text{MHz}$ . The same setups are used for assessment of the parameters applied for boundary compensation(alpha,depth)of which typical uncertainty values are given. A frequency dependent ConvF is used in DASYS version 4.4 and higher which allows extending the validity from  $\pm 50\text{MHz}$  to  $\pm 100\text{MHz}$ .
- Spherical isotropy: in a locally homogeneous field realized using an open waveguide setup.

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Measurement Conditions

DASY versions	DSAY 5	V52.8.0.692
Model	Flat phantom	—

Probe Sensitivity Parameters

	Value	Unit
Axis X	1.00	$\mu V / (V / m)^2$
Axis Y	1.00	$\mu V / (V / m)^2$
Axis Z	1.00	$\mu V / (V / m)^2$

1. Diode Compression Point

	Value	Unit	Uncertainty (k=2)
Axis X	100.0	mV	10.82%
Axis Y	100.6	mV	10.82%
Axis Z	100.7	mV	10.82%

2. Probe Conversion Factors: Head Tissue Liquid

Frequency (MHz)	Validity (MHz)	Permittivity	Conductivity (mho/m)	Alpha	Depth (mm)	ConvFx/ ConvFy / ConvFz			Uncertainty (k = 2)
						$\mu V / (V / m)^2$			
900	±100	42.72	0.968	0.411	1.582	7.375	7.783	7.540	13.02%
1800	±100	39.61	1.354	0.386	1.760	5.767	6.013	5.888	13.02%
1900	±100	39.11	1.463	0.313	2.161	5.438	5.759	5.595	13.02%
2450	±100	38.30	1.890	0.406	1.755	3.770	3.979	3.882	13.02%

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3. Probe Conversion Factors: Body Tissue Liquid

Frequency (MHz)	Validity (MHz)	Permittivity	Conductivity (mho/m)	Alpha	Depth (mm)	ConvFx/ ConvFy/ConvFz $\mu V/(V/m)^2$			Uncertainty (k = 2)
900	±100	54.48	1.055	0.405	1.643	7.149	7.540	7.336	13.02%
1800	±100	53.74	1.567	0.370	2.095	6.056	6.383	6.220	13.02%
1900	±100	53.40	1.679	0.301	2.577	5.271	5.584	5.501	13.02%
2450	±100	52.70	1.950	0.494	1.585	3.783	4.000	3.888	13.02%

4. Probe Isotropy

	Value	Unit	Uncertainty(k=2)
Axial Isotropy	-0.18	dB	10.18%
Spherical Isotropy	-0.20	dB	10.18%

Calibrated by 张赫佐

Checked by 刘佳

**APPENDIX D: RELEVANT PAGES FROM DAE REPORT(S)**

The State Radio\_monitoring\_center Testing Center

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**Calibration Certificate**



**Instrument** DAE

**Type/Model** DAE4

**Manufacturer** Schmid & Partner Engineering AG

**Serial No** SN:720

**Name of Client** The State Radio\_monitoring\_center Testing Center

**Address of Client** No.98 Bei Lishi Road XiCheng District

**Calibration Date** 2012.2.7

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3) °C and humidity<70%

Approved by  

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**The State Radio\_monitoring\_center Testing Center**

Reference documents of the measurement(Code, Name)
SRTC3003-V1.0.0 Working procedure for calibration——SAR testing system
Place and environmental condition of the measurement
Temperature 21.9℃ Humidity 27.8%
Location SRTC226 room

Primary Calibration Equipment used	Model/Type	ID#	Cal Date	Scheduled Calibration
Process Calibrator Protractor	Fluke 525B	1090118	2011.8	2012.8
		1001	2011.8	2012.8
Secondary Calibration Equipment used	Model/Type	ID#	Cal Date	Scheduled Calibration
Calibrator Box	V1.1	1003	---	---

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**Note:**

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3. SRTC is responsible for the whole of certificate only with stamp of SRTC.
4. The calibration results would be valid only for the items calibration.
5. The certification is written by Chinese and English. Exact meaning should be explained only on Chinese version.

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## The State Radio\_monitoring\_center Testing Center

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### Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system

### Calibration is preformed according to the Following Standards

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in Human Head from Wireless Communication Devices: Measurement Techniques", December 2003
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz) ", February 2005
- c) Federal Communication Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

### Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrates instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters contain technical information as a result from the performance test and require no uncertainty.

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### The State Radio\_monitoring\_center Testing Center

**DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage.

**Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.

**Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.

**AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage.

**Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurement.

#### DC Voltage Measurement

A/D-Converter Resolution nominal

High Range: 1LSB=6.1  $\mu$  V

Low Range: 1LSB=61nV

full range = -100...+300mV

full range = -1...+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Facto	X	Y	Z
High Range	403.358 $\pm$ 0.12%(k=2)	404.816 $\pm$ 0.12%(k=2)	403.239 $\pm$ 0.12%(k=2)
Low Range	3.948 $\pm$ 1.3%(k=2)	3.965 $\pm$ 1.3%(k=2)	3.950 $\pm$ 1.3%(k=2)

#### Connector Angle

Connector Angle to be used in DASY system	174' $\pm$ 1'
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The State Radio\_monitoring\_center Testing Center

1. DC Voltage Linearity

DC Voltage Linearity

High Range	Input ( $\mu$ V )	Reading( $\mu$ V )	Error(%)
Channel X +Input	+200000	200001.6	0.001
Channel X +Input	+20000	20008.9	0.045
Channel X -Input	-20000	-19997.9	0.011
Channel Y +Input	+200000	200001.1	0.000
Channel Y +Input	+20000	20009.2	0.046
Channel Y -Input	-20000	-19996.7	0.017
Channel Z +Input	+200000	200002.5	0.001
Channel Z +Input	+20000	20006.1	0.031
Channel Z -Input	-20000	-20004.4	0.022

Low Range	Input ( $\mu$ V )	Reading( $\mu$ V )	Error(%)
Channel X +Input	+2000	2000.5	0.03
Channel X +Input	+200	201.6	0.80
Channel X -Input	-200	-201.9	0.95
Channel Y +Input	+2000	2000.3	0.02
Channel Y +Input	+200	201.6	0.80
Channel Y -Input	-200	-201.9	0.95
Channel Z +Input	+2000	1999.0	0.05
Channel Z +Input	+200	200.2	0.10
Channel Z -Input	-200	-201.5	0.75

2. Common mode sensitivity

Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3sec

	Common mode Input Voltage(mV)	High Range Average Reading( $\mu$ V )	Low Range Average Reading( $\mu$ V )
Channel X	200	-5.6	-7.0
	-200	9.1	8.1
Channel Y	200	15.7	15.1
	-200	-15.8	-15.6
Channel Z	200	-17.2	-17.4
	-200	15.6	15.7

**The State Radio\_monitoring\_center Testing Center**

**3 .Channel separation**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3sec

	Input Voltage(mV)	Channel X( $\mu$ V)	Channel Y( $\mu$ V)	Channel Z( $\mu$ V)
Channel X	200	—	9.6	4.0
Channel Y	200	7.4	—	9.7
Channel Z	200	6.8	6.7	—

**4 .AD-Converter Values with inputs shorted**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3sec

	High Range(LSB)	Low Range (LSB)
Channel X	16150.2	16332.3
Channel Y	16218.4	17543.7
Channel Z	16450.4	15098.6

**5 .Input Offset Measurement**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3sec  
Input 10M  $\Omega$

	Average( $\mu$ V)	Min. Offset( $\mu$ V)	Max. Offset( $\mu$ V)	Std.Deviation( $\mu$ V)
Channel X	0.2	1.5	-1.3	0.5
Channel Y	-0.6	1.7	-1.7	0.4
Channel Z	-0.8	1.5	-2.4	0.7

Calibrated by 张赫作

Checked by 刘佳