

# European Position Determination System Status and Activities

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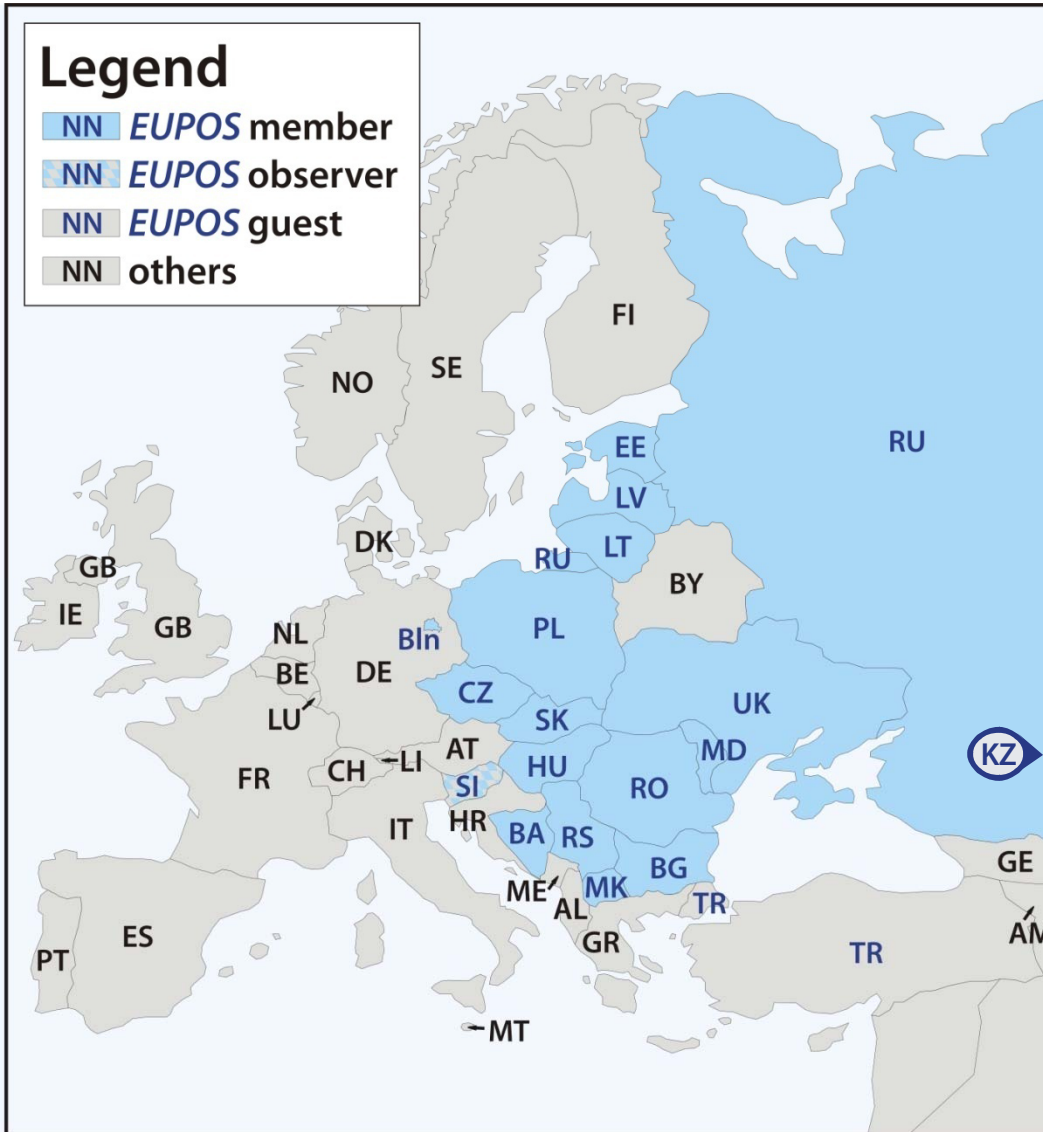
Third Meeting of the  
International Committee on Global Navigation Satellite Systems  
Pasadena, U.S.A.  
8-12 December 2008

## EUPOS members

- Bosnia and Herzegovina
- Bulgaria
- Czech Republic
- Berlin (ISCO)
- Estonia
- Hungary
- Kazakhstan (invited guest)
- Latvia
- Lithuania
- Macedonia
- Moldova
- Poland
- Romania
- Russian Federation
- Serbia
- Slovakia
- Slovenia (observer)
- Turkey (invited guest)
- Ukraine

### Legend

- EUPOS member**
- EUPOS observer**
- EUPOS guest**
- others**



## Status of the *EUPOS* reference station infrastructure as at 14 November 2008

Country <sup>1)</sup>	Area (km <sup>2</sup> )	planned RS	realised RS	Country <sup>1)</sup>	Area (km <sup>2</sup> )	planned RS	realised RS
BA	51,000	26	0 <sup>2)</sup>	MK	25,434	14	9
BE	30,528	23	2	MD	33,700	currently not def.	0
BG	110,053	22	12	ML	35,700	currently not def.	0
BR	8,930	23	2	PL	323,520	98	98
CZ	78,870	27	27	RO	237,500	73	58
DE	891	4	4	RU	17,075,400	not def.	31 >100
DK	45,220	17	9	RS	88,360	32	32
ES	93,030	36	34	SK	40,035	21	21
FR	64,600	19	19	LV			
GR	131,700	5	5				
IE	70,276	5	5				
IT	301,345	15	15				
JP	377,915	15	15				
US (obs.)	20,270	15	15				
<b>Total</b>	<b>65,300</b>	<b>25</b>	<b>25</b>				

<sup>1)</sup> ISO 3166 Codes (Countries), <sup>2)</sup> realisation in 2009, <sup>3)</sup> by 2012

## **EUPOS Technical Specifications**

Unified international accepted standards and guaranteed downward compatibility when future developments.

Thus enables equal opportunities for business enterprises and investment protection for all EUPOS providers, users and enterprises.

Official geodetic terrestrial reference system for *EUPOS* is the European Terrestrial Reference System 1989 (ETRS 89) and its actual frame.

Use of Galileo (when operable), GPS and GLONASS recommended and Compass when operable.

Minimum availability of *EUPOS* is 99% p.a.

Basic standard medium for all services is mobile Internet, e.g. provided via GPRS, UMTS, HSDPA, WLAN, etc.

Broadcast as optional standard via media such as VHF, radio broadcast, TV broadcast, and when available Internet User Datagram Protocol (UDP) multicast, etc.

## **EUPOS Sub-Services**

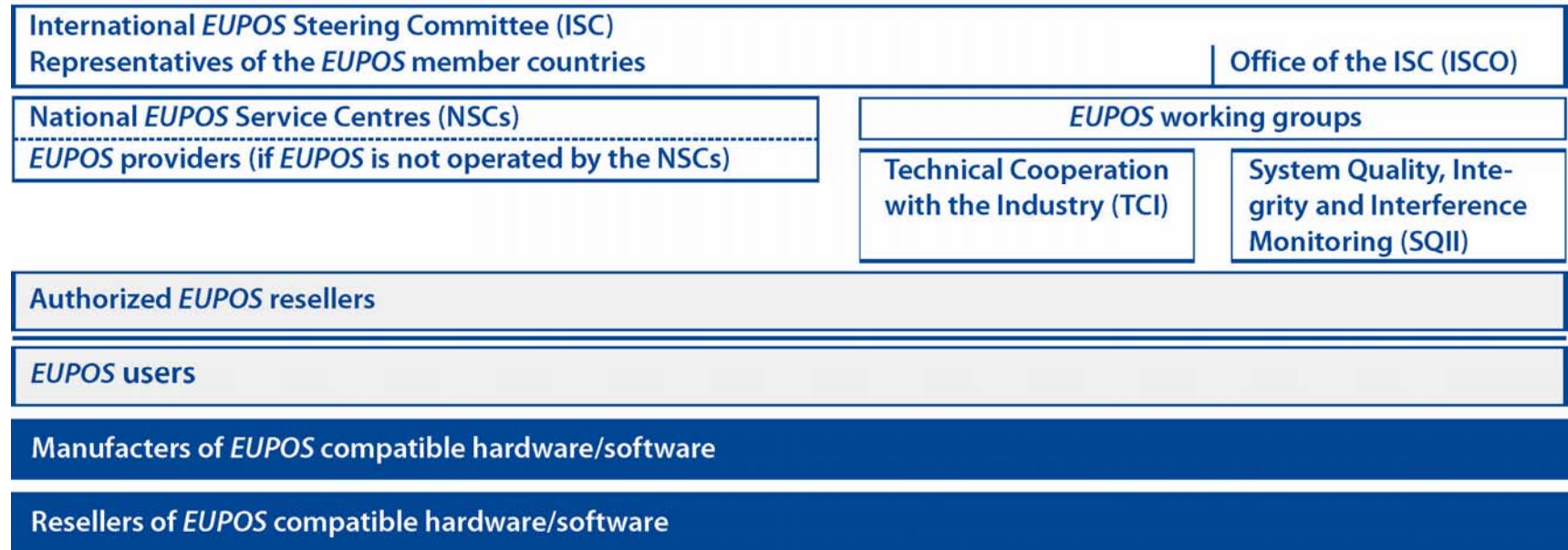
**EUPOS** DGNSS for real-time DGNSS applications by code and code-phase measurements with accuracy of 2 m up to 0.5 m for dynamic applications, and up to 20 cm for static applications, depending on the applied rover equipment;

DGNSS corrections are in standard data format RTCM SC-104.

**EUPOS** Network RTK for real time DGNSS applications by carrier phase measurements with an accuracy of determination with an accuracy  $\leq 2$  cm ( $1\sigma$ , horizontally). **EUPOS** strives to provide DGNSS correction data that support all existing network RTK solutions (FKP, non-physical reference station and MAC).

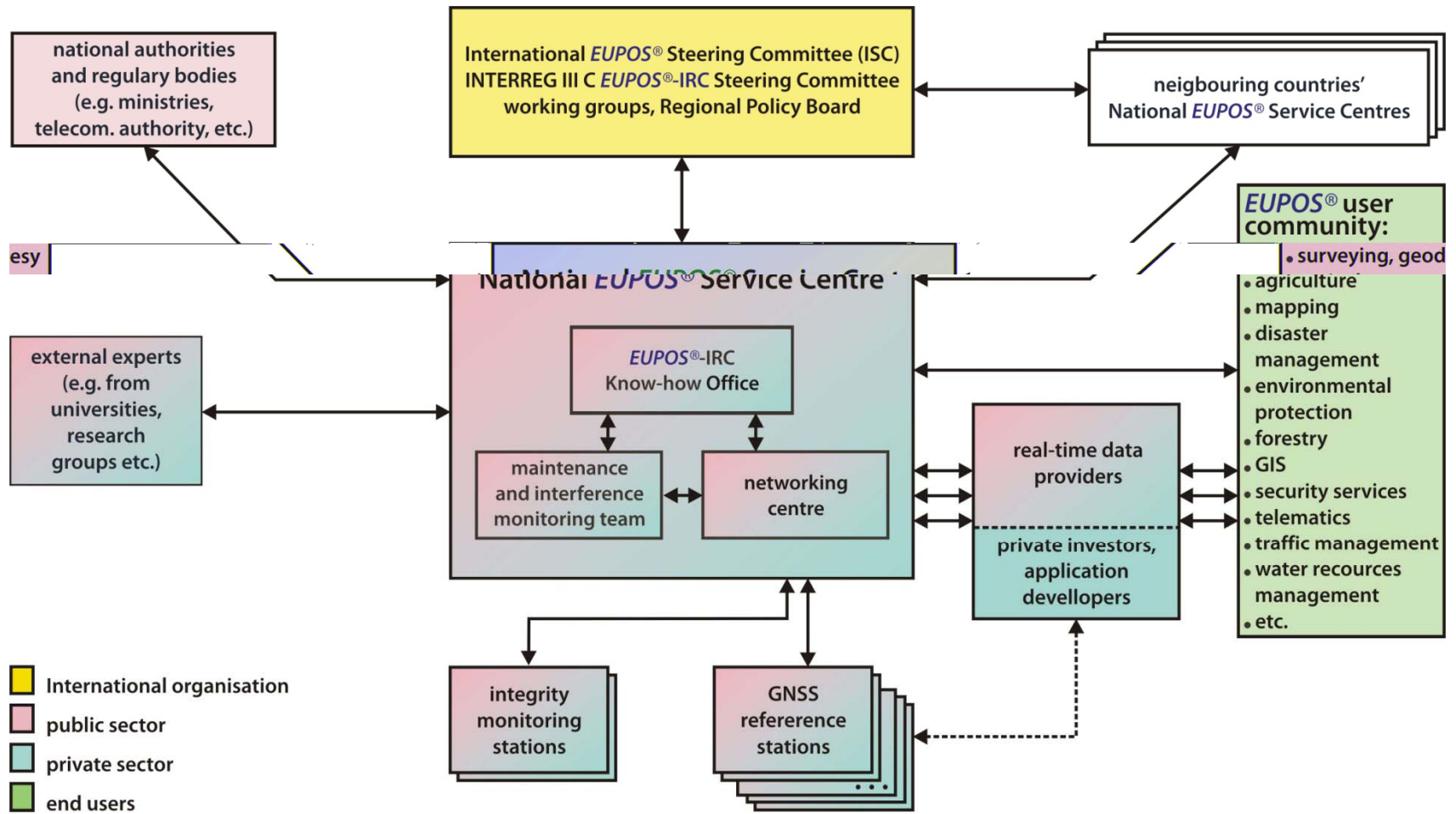
**EUPOS** Geodetic for post processing applications by code and phase measurements in static or kinematics mode with decimetre up to sub-centimetre accuracy. User interfaces are GNSS observation data in RINEX 3.0, also for the third GPS frequency L5 and Galileo. It is recommended for a limited period to provide both data formats RINEX 2.11 and 3.0.

# The organisational structure of *EUPOS*





# EUPOS National Service Centres structure



## ***EUPOS'* cooperation with other organisations**

Cooperation with the United Nations Office for Outer Space Affairs.

*EUPOS* is associated member of the International Committee on GNSS.

GALILEO Joint Undertaking accepted the necessity of ground-based GNSS augmentation systems and welcomed *EUPOS*.

*EUPOS* initiates cooperation of sub-Saharan African countries and GNSS enterprises under patronage of the UN/ ICG to establish "full scale accuracy" ground-based DGNSS.

Official participation of representatives both EUREF TWG and *EUPOS* ISC in the other organisation's conferences.

*EUPOS* is member of the Radio Technical Commission for Maritime Services (RTCM).





## Selected *EUPOS* activities

### Work for the completion of the *EUPOS* infrastructure

Further building up and improvement of reference stations and networking centres;

Continuing absolute PCV calibration of all *EUPOS* reference stations antennas

### Technical matters

*EUPOS* contributes to the Radio Technical Commission for Maritime Services (RTCM), e.g:

- Development of Private Service Messages (RTCM data encryption) that should become RTCM standard in 1<sup>st</sup> quarter of 2009;

- Development of real time quality information messages for DGNSS/RTK users will be proposed at the next RTCM SC 104 meeting, February 2009

Development of a self-certification procedure corresponding with the *EUPOS* technical standards, including measurements on the spot and ToR;

Collaboration on examination of multipath influences especially at GNSS reference stations

## **Selected *EUPOS* activities**

### **Administrative matters**

Establishment of National/ Regional Service Centres in every *EUPOS* country;  
Establishment of a common *EUPOS* data processing centre;  
Information provision by the means of national and international brochures,  
newsletters, *EUPOS* member websites, information days;  
Study visits for application demonstrations;  
Transfer of applications to other countries and regions;  
Cooperation with other infrastructures, organisations and projects.

### **Contributing to the UN/ ICG goals and work**

E.g. draft definition of interoperability applicable to ground-based  
differential GNSS (DGNSS) networks in cooperation with IGS etc.;;  
(Non financially) support of DGNSS “full scale accuracy ” Demonstration  
projects in sub-Saharan Africa in cooperation with the industry;  
UN/ICG/EUPOS/Berlin Symposium on GNSS, DGNSS and applications.

## Actual documents of the *EUPOS-ISC*

### *EUPOS* Terms of Reference

20 September 2007, updated on 23 April 2008

### *EUPOS* Technical Standards

complete revised second edition, 24 April 2008

### *EUPOS* Guidelines for Single Site Design

Version 2.1, 4 June 2008

### *EUPOS* Guidelines for *EUPOS* Reference Frame Fixing

Version 1.0, 21 September 2007

### *EUPOS* Guidelines for Cross-Border Data Exchange

Version 1.0, 21 September 2006

[http://www.eupos.org/index.php?option=com\\_content&task=view&id=43&Itemid=91](http://www.eupos.org/index.php?option=com_content&task=view&id=43&Itemid=91)



Photo: SenStadt Berlin

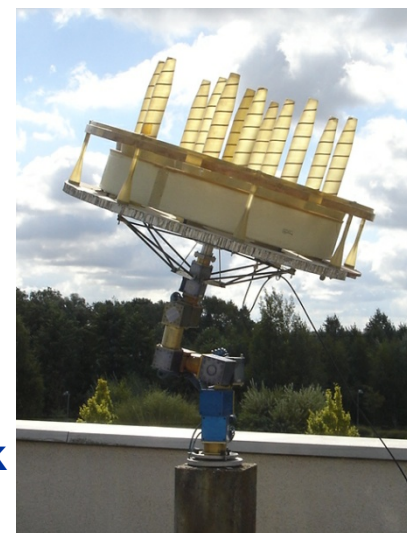


Photo: Geo++ GmbH







## **International Symposium on Global Navigation Satellite Systems, Space-Based and Ground-Based Augmentation Systems and Applications**

Ca. 200 participants of GNSS providers, DGNSS infrastructures, users and industry from 28 countries and four continents,

36 lectures about GNSS, global ground-based services and analyses, regional reference systems, quality assurance and DGNSS/RTK improvement, public and private services and activities, applications and companies' developments

Eight excursions to EUPOS/SAPOS reference station system centre and absolute GNSS antenna calibration robot, and DGNSS users: Berlin public transport company (BVG) central control office for bus transport system, Berlin fishing administration ship demonstration and German waterway and shipping administration, Berlin. One bus tour Urban on development of the centre of Berlin





# International Symposium on Global Navigation Satellite Systems, Space-Based and Ground-Based Augmentation Systems and Applications

Berlin, Germany, 11-14 November 2008

## Recommendations

### Recommendation 1

**Recognising** the present status of Global Navigation Satellite Systems (GNSS) and the prospects for continued development of a wide variety of applications critical to science, commerce, and infrastructure, the

Symposium participants recommend:

The continuation of forums such as this one; bringing together system providers, geodetic infrastructure providers, end users, and industry.

Furthermore, these forums should be encouraged to discuss and propose specific recommendations for consideration by the International Committee on GNSS (ICG)

### Recommendation 2

**Recognising** the densification of the ground-based GNSS infrastructure by the EUPOS initiative on the basis of IAG services and Sub-Commissions,

**considering** the varied degree of GNSS ground-based reference infrastructure development among different regions of the world,

**noting** the need to support the effort of African countries to implement a continental geodetic reference frame,

the Symposium participants

**recommend** that the ICG support the development of GNSS ground-based infrastructure in all regions of the world, taking into account the unique conditions present in each region and the need for tailored approaches to implementation.

## **Observation**

The Symposium participants took note of the establishment of the network of EUPOS national and regional service centres located at:

### **Czech Republic**

CZEPOS

Lands Survey Office

Geodetic Control Section

Pod sídlištěm 9/1800, CZ-18211-Prague 8

phone: +420 284 041 533

phone: +420 284 041 536

fax: +420 284 041 625

[czepos@cuzk.cz](mailto:czepos@cuzk.cz)

<http://czepos.cuzk.cz/>

### **Estonia**

ESTPOS

Estonian Land Board

Mustamäe tee 51, EE-10621 Tallinn

phone: +37 26 65 06 00

fax: +37 26 65 06 04

[maaamet@maaamet.ee](mailto:maaamet@maaamet.ee)

<http://www.maamet.ee/>

### **Berlin-Germany**

SAPOS/EUPOS

Senate Department of Urban Development

Fehrbelliner Platz 1

phone: + 49 171 22 27 019, +49 30 9012 7474

fax: +49 30 9012 3709

[sapos.infos@senstadt.berlin.de](mailto:sapos.infos@senstadt.berlin.de)

<http://www.stadtentwicklung.berlin.de/geoinformation/landesvermessung/>

[www.eupos.org](http://www.eupos.org)

### **Hungary**

GNSSNET.HU

Institute of Geodesy, Cartography and Remote Sensing

Satellite Geodetic Observatory

P.O. Box 585, HU-1592 Budapest

phone: +36 27 374 980

fax: +36 27 374 982

[support@gnssnet.hu](mailto:support@gnssnet.hu)

<http://www.gnssnet.hu/>

**Latvia**

LAPOS

Latvia Positioning Service

43 O. Vaciesa street

LV-1004 Riga

phone: +37 16 706 4202

fax: +37 16 706 4209

<http://latpos.lgia.gov.lv/>

**Riga-Latvia**

EUPOS-Riga

University of Latvia

Institute of Geodesy and Geoinformation

Boulevard Rainis 19

LV-1586 Riga

phone/fax +371 703 4436

<http://www.rigasgeometrs.lv/>

**Lithuania**

LITPOS/EUPOS

Institute of Geodesy, VGTU

Sauletekio al. 11, LT-10223 Vilnius

phone: +370 52 744 707

fax: +370 52 744 705

[gi@ap.vgtu.lt](mailto:gi@ap.vgtu.lt)

<http://eupos.vgu.lt>

**Poland**

ASG-EUPOS

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[biuro.eupos@gugik.gov.pl](mailto:biuro.eupos@gugik.gov.pl)

<http://www.asg-eupos.gov.pl/>

**Romania**

ROMPOS

National Agency for Cadastre and Land Registration

B-dul Expozitiei Nr. 1 A, sect. 1

RO-012101 Bucharest

phone/fax: +40 21 224 06 14

dgc@ancpi.ro

<http://www.cngcft.ro/dgc/>

**Russian Federation**

Multifunctional Navigation-Information Centre

Russian Institute of Space Device Engineering

53, Aviamotornaya str. \*

RU-111250 Moscow

phone:+7(495) 673 97 91

fax: +7 (495) 673 43 56

contact@mnicrisde.ru

<http://www.mnicglonass.ru/>

(\* additional centres to be established)

**Serbia**

AGROS

Faculty of Technical Science

D. Obradovica Square 6

RS-21000 Novi Sad

phone: +381 21 485 2022

fax +381 45 8873

gitis@uns.ns.ac.yu

<http://gpsweb.ns.ac.yu/>

Republic Geodetic Authority

Buleva vojvode Mišića 39

RS-11000 Beograd

phone: +381 11 2650 886

fax: +381 11 2651 076

ogr@rgz.sr.gov.yu

<http://www.rgz.sr.gov.yu/>

<http://agros.rgz.gov.rs/>

**Slovak Republic**  
SKPOS  
Geodetic and Cartographic Institute  
Chlumeckeho 4  
SK-82745 Bratislava  
skpos@gku.sk  
<http://www.skpos.gku.sk/>

**Slovenia (Observer)**  
SIGNAL  
Geodetic Institute of Slovenia  
Jamova cesta 2  
SI-1000 Ljubljana  
phone: +386 1 20 02 937  
fax: +386 1 425 06 77  
gps@geod-is.si  
<http://www.gu-signal.si/>

(Owner of SIGNAL: Surveying and Mapping Authority of the Republic of Slovenia,  
Zemljemerska cesta 12, SI-1000 Ljubljana)

**Ukraine**  
UAPOS  
Research Institute of Radio-Engineering  
Measurements  
271 Akademika Pavlova str.  
UA-61054 Kharkiv  
phone: +380 57 738 22 18  
fax.: +380 57 738 41 12  
khrs@kharkov.ukrtel.net  
<http://www.khrs.kharkov.ukrtel.net/>

## **Acknowledgement**

The participants of the Symposium, which took place in Berlin from November 11 to 14, 2008,

express their cordial thanks to the organisers of the Symposium, particularly EUPOS and the Senate Department for Urban Development of the State of Berlin, for holding such a successful meeting.





## Links for further information on the Symposium:

Report and photos, only German (will be enlarged):

[http://www.stadtentwicklung.berlin.de/internationales\\_eu/geoinformation/de/projekte/gnss2008/index.shtml](http://www.stadtentwicklung.berlin.de/internationales_eu/geoinformation/de/projekte/gnss2008/index.shtml)

Presentations in the Symposium, only English (soon downloadable):

[http://www.stadtentwicklung.berlin.de/internationales\\_eu/geoinformation/de/projekte/gnss2008/programm/index.shtml](http://www.stadtentwicklung.berlin.de/internationales_eu/geoinformation/de/projekte/gnss2008/programm/index.shtml)

Recommendations of the Symposium, only English:

[http://www.stadtentwicklung.berlin.de/internationales\\_eu/geoinformation/de/projekte/gnss2008/recommendations.shtml](http://www.stadtentwicklung.berlin.de/internationales_eu/geoinformation/de/projekte/gnss2008/recommendations.shtml)

<http://www.unoosa.org/pdf/pres/2008/berlin2008-recom.pdf>

All information will be in English downloadable as soon as possible in the  
EUPOS website

<http://www.eupos.org/>

# Thank you for your attention!

## Gerd Rosenthal

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### Links:

<http://www.eu-pos.org>

<http://www.stadtentwicklung.berlin.de/geoinformation/>

[http://www.stadtentwicklung.berlin.de/internationales\\_eu/geoinformation/](http://www.stadtentwicklung.berlin.de/internationales_eu/geoinformation/)

