



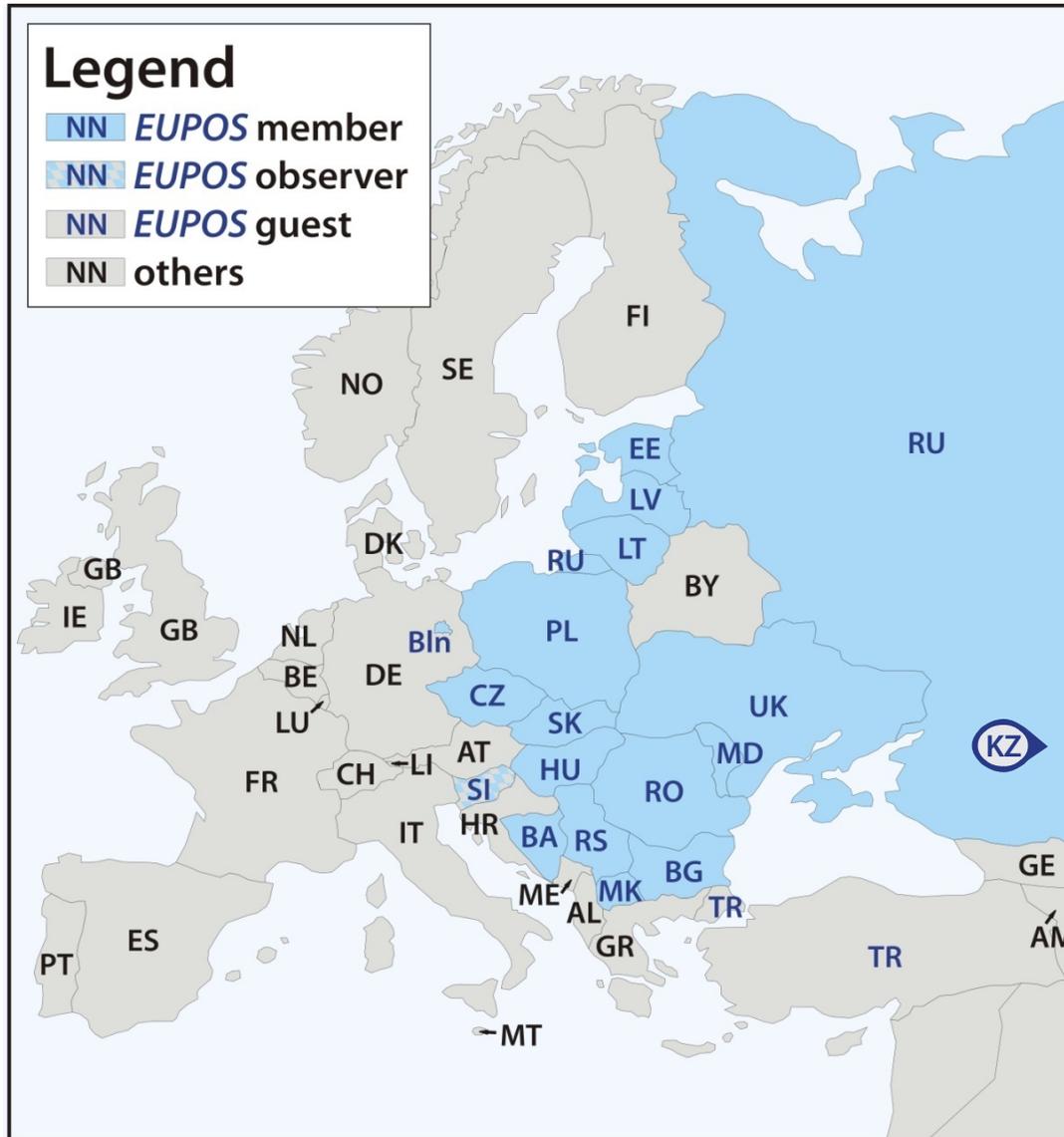
***EUPOS*[®] – Central and Eastern European Differential (D)GNSS Infrastructure, and Cooperation**

Gerd Rosenthal

Office of the International *EUPOS*[®] Steering Committee, Head
Senate Department for Urban Development, State of Berlin, Germany

**United Nations Committee on the Peaceful Uses of Outer Space
Scientific and Technical Subcommittee: 2009**

**Forty-sixth session
9 - 20 February 2009**



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

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

Country ¹⁾	Area (km ²)	planned RS	realised RS	Country ¹⁾	Area (km ²)	planned RS	realised RS
BA	51,000	26	0 ²⁾	MK	25,434	14	9
BG	110,950	23	12	MD	33,700	currently not def.	
CZ	78,870	27	27	PL	323,520	98	98
Berlin/DE	891	4	4	RO	237,500	73	58
EE	45,220	17	9	RU	17,075,400	not def.	>100
HU	93,030	36	34	RS	88,360	32	32
LV	64,600	19	19	SK	40,035	21	21
Riga/LV	307	5	5	Ukraine	603,700	27 ³⁾	5
LT	65,300	25	25	SI (obs.)	20,270	15	15

1) ISO 3166 Codes (Countries), 2) realisation will be done in 2009, 3) by 2012

EUPOS Technical Specifications

Provision of GNSS corrections in real-time and for post processing. Unified use of international accepted standards and guaranteed downward compatibility in case of future developments, thus enables equal opportunities for business enterprises and investment protection for all EUPOS providers, users and enterprises that produce DGNSS technique.

Use of all available GNSS is recommended: Galileo, GPS, GLONASS and Compass, etc. (if available).

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

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

Broadcast is optional standard, e.g. via digital public broadcast, TV broadcast, VHF, and when available via Internet User Datagram Protocol (UDP) multicast, etc.

EUPOS Sub-Services

EUPOS DGNS for real-time DGNS 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;

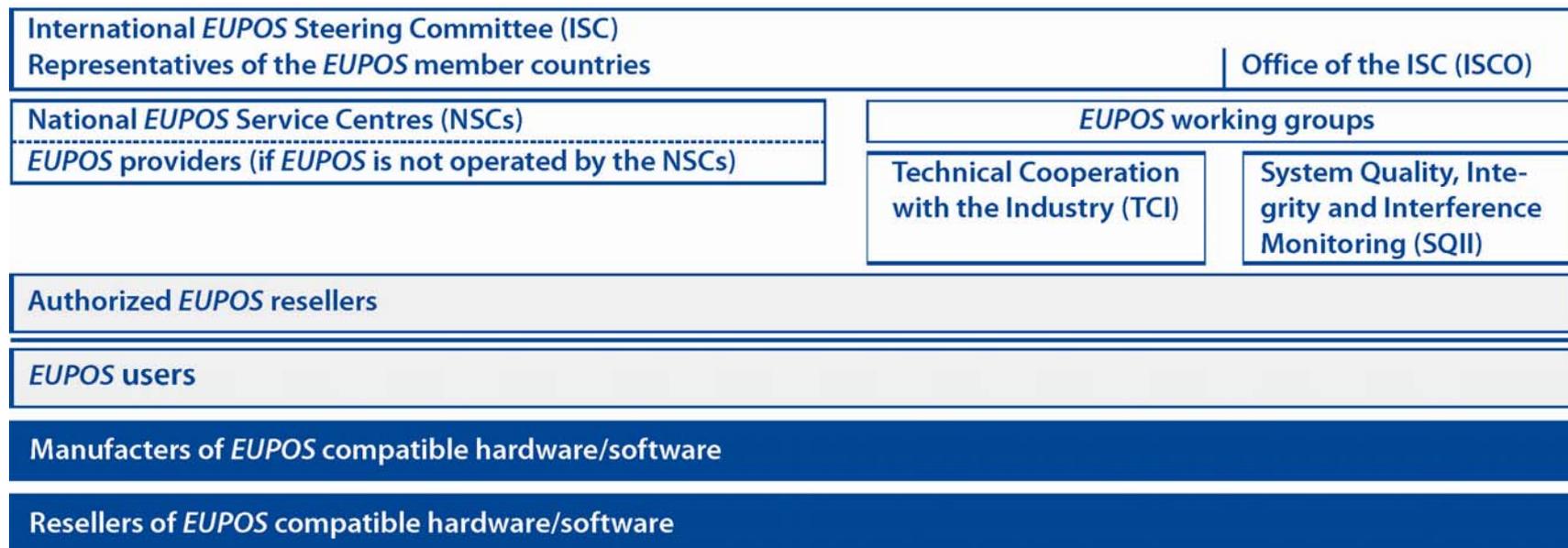
DGNS corrections are in standard data format RTCM SC-104.

EUPOS Network RTK for real time DGNS applications by carrier phase measurements with an accuracy of determination with an accuracy ≤ 2 cm (1σ , horizontally). EUPOS strives to provide DGNS 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.

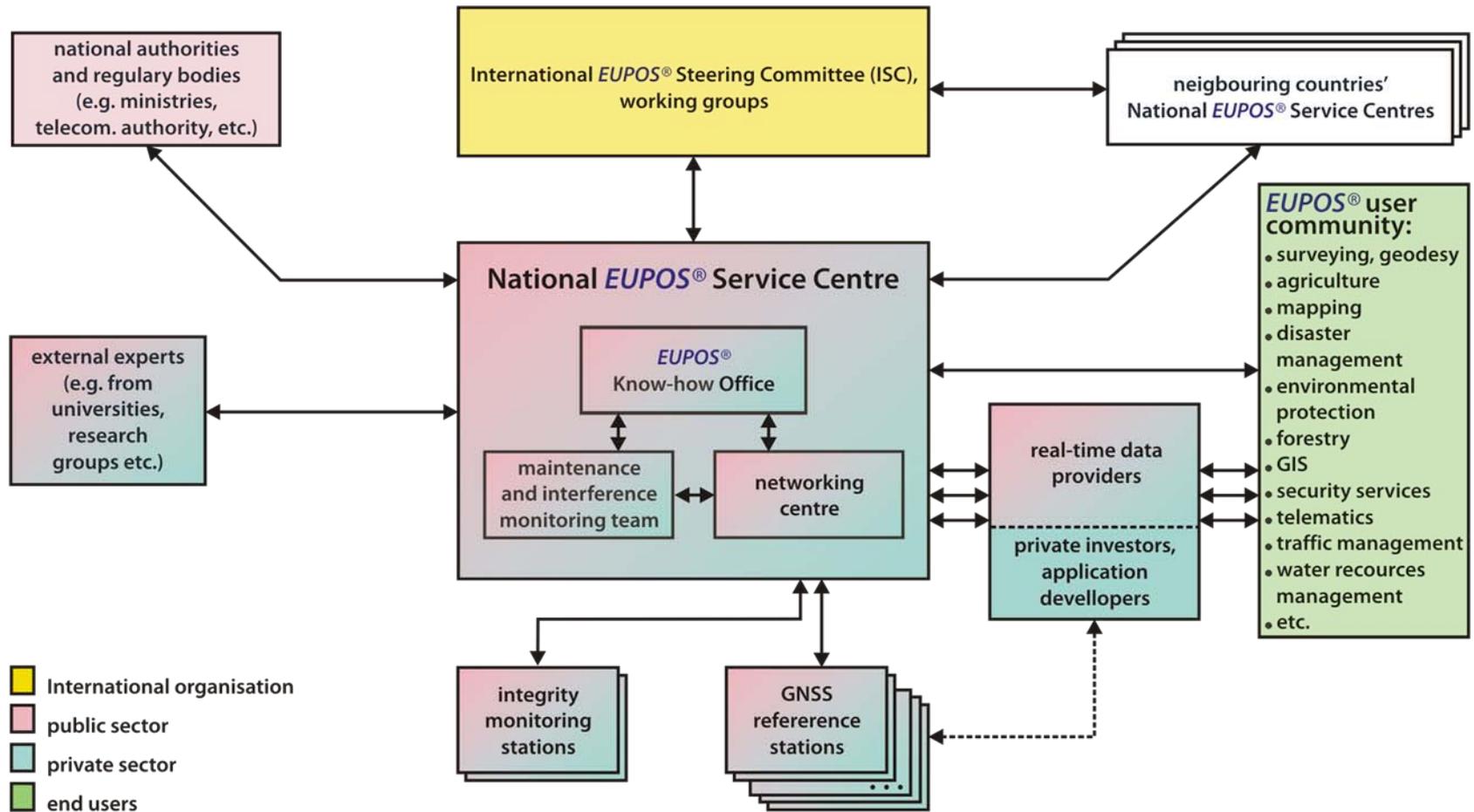


The organisational structure of *EUPOS*





EUPOS National Service Centres structure





EUPOS' cooperation with other organisations

Cooperation with the United Nations Office for Outer Space Affairs.

EUPOS is an 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 demonstration projects.

Official participation of representatives of 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 to complete the EUPOS infrastructure

The EUPOS ISC intends to strengthen the EUPOS infrastructure in all member countries in agreement with the EUPOS standards by further build-up and improvement of reference stations and networking centres;

Continuing absolute PCV calibration of all EUPOS reference stations antennas.

Some selected technical matters

EUPOS contributes to the Radio Technical Commission for Maritime Services (RTCM), e.g. by development of Private Service Messages (RTCM data encryption);

the development of a EUPOS self-certification procedure corresponding with the EUPOS technical standards, including measurements on the spot;

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. drafted 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



Photo: SenStadt Berlin

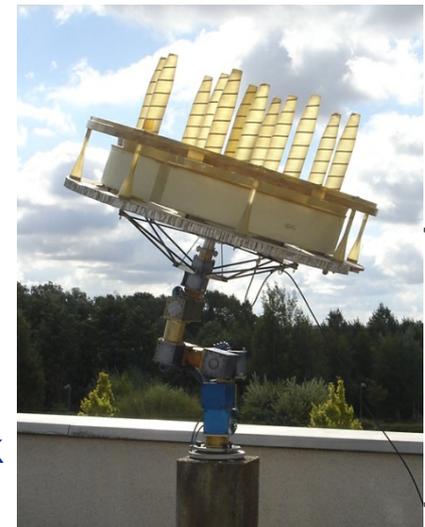


Photo: Geo++ GmbH





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 the 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 on Urban 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

<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

<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

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

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

<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

<http://eupos.vgu.lt>

Poland

ASG-EUPOS

Head Office of Geodesy and Cartography

Department of Geodesy, Cartography and Geographic Information Systems

Wspólna 2 Str., PL-00-926 Warsaw

phone: +4822 66 18 369, + 4822 73 75 430

fax: +4822 62 83 206, +4822 73 75 43 8

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 about the Symposium:

Report and photos, only German:

http://www.stadtentwicklung.berlin.de/internationales_eu/geoinformation/de/projekte/gnss2008/index.shtml

Presentations in the Symposium, only English (downloadable):

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.unoosa.org/pdf/pres/2008/berlin2008-recom.pdf>

All information which are currently only in German available, will be downloadable in English as soon as possible via the EUPOS Website

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



Thank you for your attention!

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Links:

<http://www.eupos.org>

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

http://www.stadtentwicklung.berlin.de/internationales_eu/geoinformation/

