European Position Determination System Status and Activities

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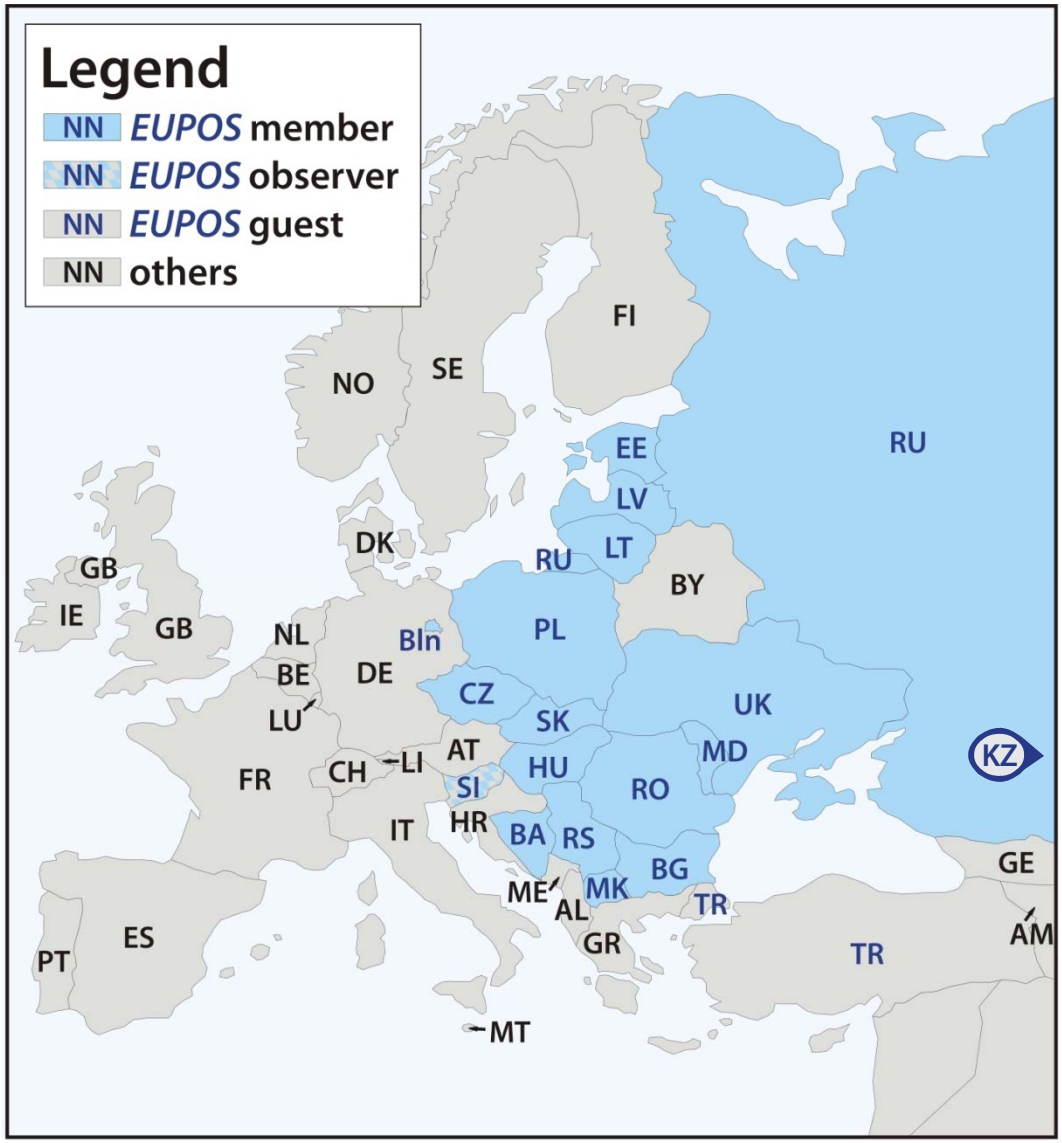
Office of the International *EUPOS*® Steering Committee, Head
c/o Senate Department for Urban Development, State of Berlin, Germany

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

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

Country[1)]	Area (km²)	planned RS	realised RS
BA	51,000	26	0[2)]
BG	110,950	23	12
CZ	78,870	27	27
Berlin/DE	891	4	4
EE	45,220	17	9
HU	93,030	36	34
LV	64,600	19	19
Riga/LV	307	5	5
LT	65,300	25	25

Country[1)]	Area (km²)	planned RS	realised RS
MK	25,434	14	9
MD	33,700	currently not def.	
PL	323,520	98	98
RO	237,500	73	58
RU	17,075,400	not def.	>100
RS	88,360	32	32
SK	40,035	21	21
Ukraine	603,700	27[3)]	5
SI (obs.)	20,270	15	15

[1)] ISO 3166 Codes (Countries), [2)] realisation in 2009, [3)] 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

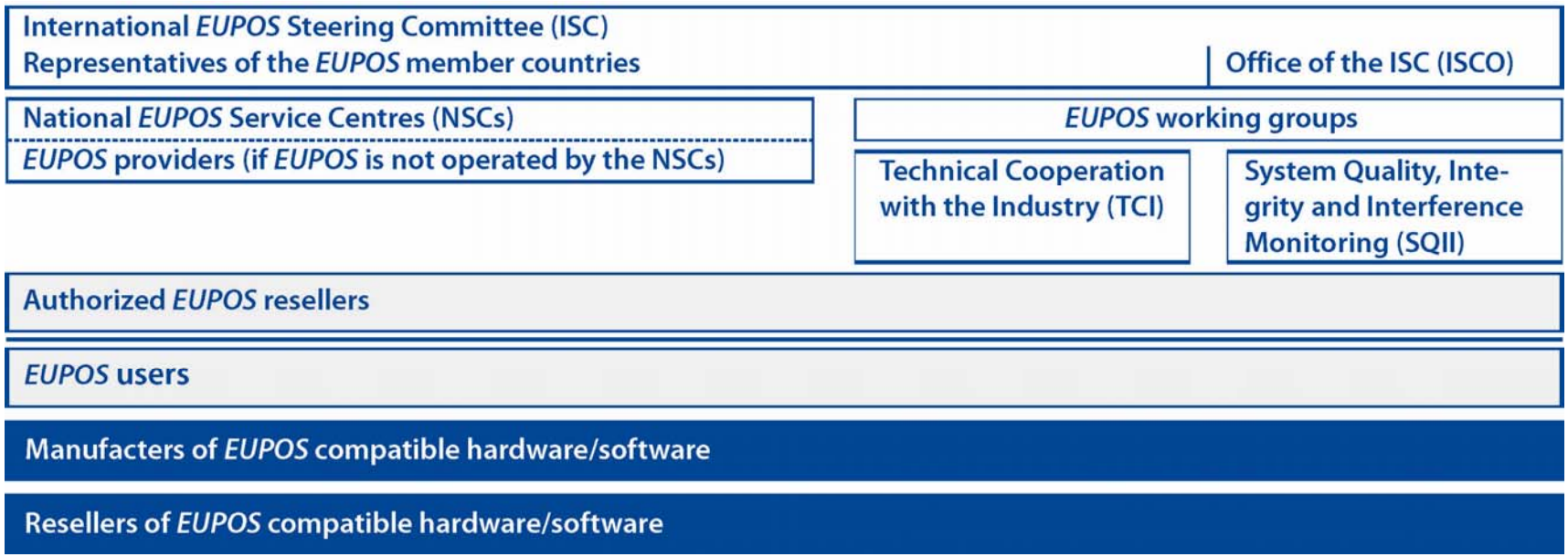
EUPOS DGNSS for real-time DGNSS applications by code and code-phase measurements with accuracy of 2 m up to 0.5 m for dynamic applications, and up to 20 cm for static applications, depending on the applied rover equipment;

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

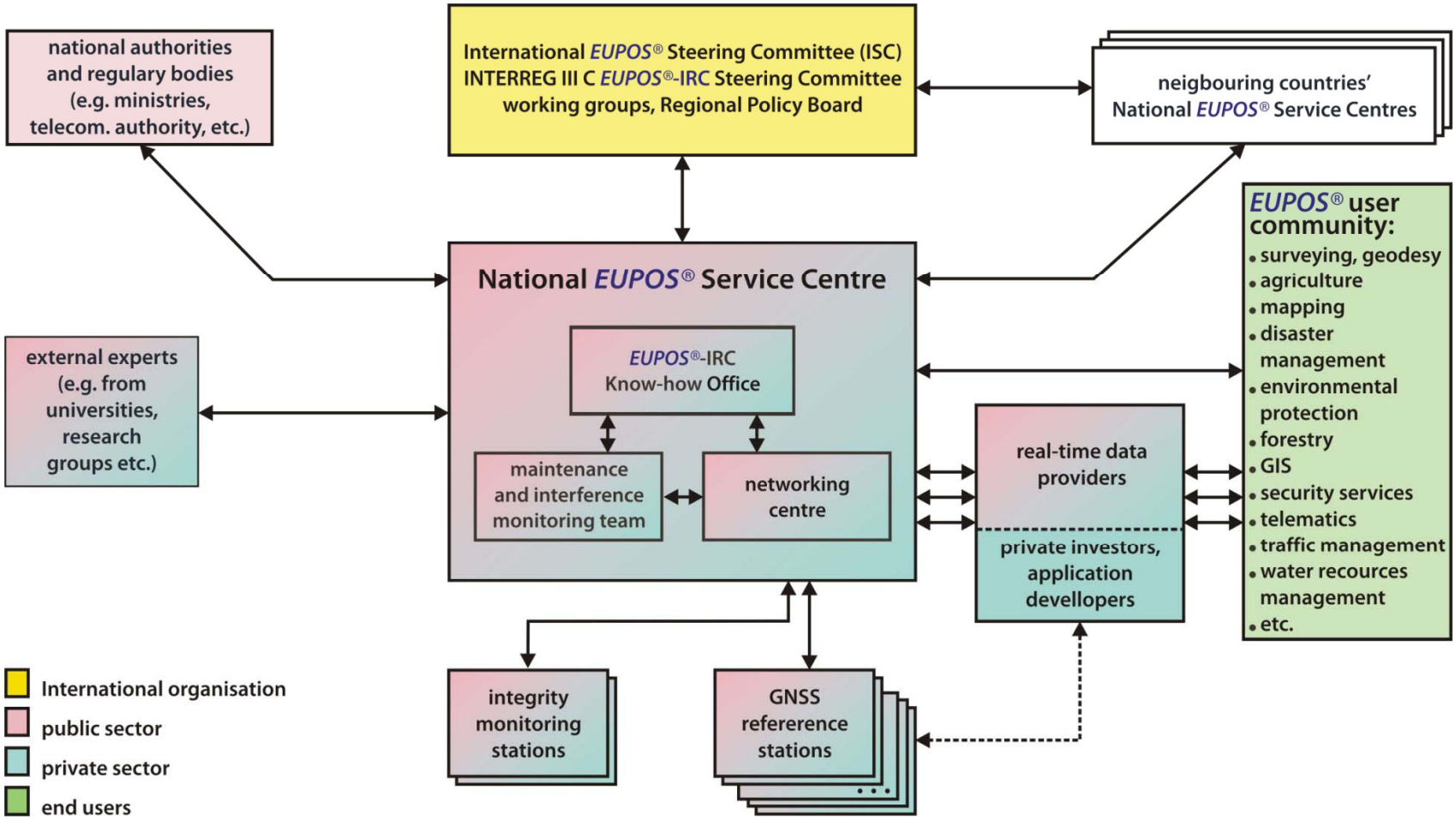
EUPOS Network RTK for real time DGNSS applications by carrier phase measurements with an accuracy of determination with an accuracy $\leq$ 2 cm (1σ, horizontally). *EUPOS* strives to provide DGNSS correction data that support all existing network RTK solutions (FKP, non-physical reference station and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

Continueing 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 1st 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

Photo: SenStadt Berlin

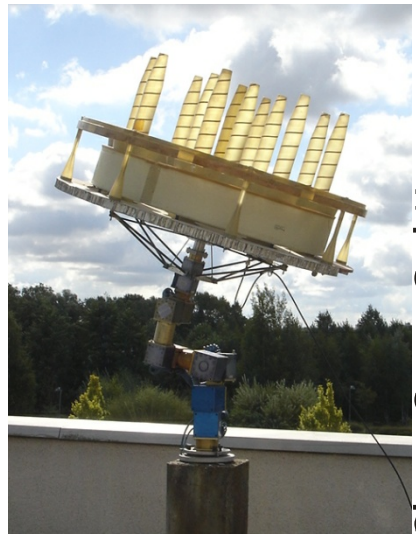


Photo: Geo++ GmbH

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

Berlin, Germany
11-14 November 2008

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 fishering 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
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/

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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/

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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

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ASG-EUPOS
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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 on the Symposium:

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

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

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

http://www.eupos.org/

Thank you for your attention!

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gerd.rosenthal@eupos-isco.org and gerd.rosenthal@senstadt.berlin.de

Links:

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