EUPOS®
European Position Determination System

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The **EUPOS initiative**

A project was initiated by the Berlin Senate Department for Urban development and supported by the European Academy of Urban Environment (EA.UE) in Berlin, Germany, 4\(^{th}\)-5\(^{th}\) March 2002.

A Steering Committee was elected at the conference in Berlin on 4\(^{th}\) and 5\(^{th}\) March 2002, to draw up the draft proposal of the European GNSS reference network to be established in the near future.
The EUPOS initiative

EUPOS is a European regional ground-based GNSS augmentation system and an international organisation as well, providing in Central and Eastern Europe and in several Eurasian countries a network of multi-functional DGNSS reference station systems providing signals that could be used for both geodetic point positioning and land, marine and air navigation. It's a border less transition to the Asian-Pacific initiative Multi GNSS ASIA (MGA).

EUPOS fulfils all accuracy requirements of geodesy and navigation – centimetre and sub-centimetre in post-processing, and centimetre as well as metre in all real-time modes.
The **EUPROS initiative**

**EUPROS** guarantees availability, quality and a service continuity due the use of uniform technical standards in 22 countries.

**EUPROS** membership is admitted on a voluntary basis.

**EUPROS** is the densest coordinated strategic ground based GNSS infrastructure worldwide.

**EUPROS** is a multi GNSS infrastructure providing services and promoting service based applications.
EUPOS characteristic

Uniform multifunctional DGNSS reference station systems and services are going to be build up in all EUPOS participating countries.

EUPOS is an common realization of high density reference station networks (single segments).

Common terms of reference and standards for building up and managing the GNSS infrastructure.

High redundancy based on additional stations (65-70 km) and used signals L1,L2,L5 for GPS,GLONASS,GALILEO ....

ICG and SC-104 Differential GNSS Standardization

Achieving compatibility and interoperability among global and regional space-based augmentation systems guaranties the trans border worldwide use of positioning and navigation services of GBAS.
United Nations International Meeting on the Applications of Global Navigation Satellite Systems

**EUPOS members**
- Bosnia and Herzegovina
- Bulgaria
- Czech Republic
- German state Berlin (ISCO)
- Montenegro
- Estonia
- Hungary
- Kazakhstan
- Latvia + Riga
- Lithuania
- Republic of Macedonia
- Moldova
- Poland
- Romania
- Russian Federation
- Serbia
- Slovak Republic
- Ukraine
- Slovenia (observer)

Azerbaijan, Kyrgyzstan and Georgia are **EUPOS** associated country’s
<table>
<thead>
<tr>
<th>EUPOS Country (ISO 3166)</th>
<th>Areal [km²]</th>
<th>planned RS</th>
<th>realised RS</th>
<th>EUPOS Country (ISO 3166)</th>
<th>Areal [km²]</th>
<th>planned RS</th>
<th>realised RS</th>
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<td>planned RS</td>
<td>realised RS</td>
<td>EUPOS Country (ISO 3166)</td>
<td>Areal [km²]</td>
<td>planned RS</td>
<td>realised RS</td>
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<tr>
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As at 1st June 2011
United Nations International Meeting on the Applications of Global Navigation Satellite Systems

Configuration MOLDPOS network (10 stations) started November 2011

Locations for permanent stations:
1. Edineț
2. Fălești
3. Sărăteni Vechi
4. Soroca
5. Căușeni
6. Comrat
7. Cahul
8. Nisporeni
9. Leovo
10. Chișinau

*source: Agency for Land Relations and Cadastre Moldova
The organisational structure of *EUPOS*

<table>
<thead>
<tr>
<th>International <em>EUPOS</em> Steering Committee (ISC)</th>
<th>Office of the ISC (ISCO)</th>
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</thead>
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<tr>
<td>Representatives of the <em>EUPOS</em> member countries</td>
<td></td>
</tr>
<tr>
<td>National <em>EUPOS</em> Service Centres (NSCs)</td>
<td><em>EUPOS</em> working groups</td>
</tr>
<tr>
<td><em>EUPOS</em> providers (if <em>EUPOS</em> is not operated by the NSCs)</td>
<td>Technical Cooperation with the Industry (TCI)</td>
</tr>
<tr>
<td></td>
<td>System Quality, Integrity and Interference Monitoring (SQII)</td>
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</tbody>
</table>

- **Authorized *EUPOS* resellers**
- ***EUPOS* users**
  - Manufacturers of *EUPOS* compatible hardware/software
  - Resellers of *EUPOS* compatible hardware/software
**EUPOS National Service Centres structure**

- National authorities and regulatory bodies (e.g. ministries, telecom. authority, etc.)
- External experts (e.g. from universities, research groups etc.)
- International EUPOS® Steering Committee (ISC), working groups. Office of the EUPOS® ISC
- Neighbouring countries' National EUPOS® Service Centres

**EUPOS® user community**:
- Surveying, geodesy
- Agriculture
- Mapping
- Disaster management
- Environmental protection
- Forestry
- GIS
- Security services
- Telematics
- Traffic management
- Water resources management
- etc.

**National EUPOS® Service Centre**
- EUPOS® Know-how Office
- Networking centre
- Real-time data providers
- Private investors, application developers
- Integrity monitoring stations
- GNSS reference stations

- International organisation
- Public sector
- Private sector
- End users
Changes of the **EUPOS** Terms of Reference (excerpt of §5)

Members of the ISC are:

(a) One representative from each **EUPOS** member country. In exceptional cases a country may be granted more than one representative should this be advisable due to that country’s particular situation. They shall, nevertheless, hold a common position in the ISC decision-making process;

(b) Representatives of other states, organizations, institutions, companies etc. which joined the ISC at its founding;

(c) The head of the ISC Office (ISCO);

(d) Non-European countries can apply for the status “associated country”, which allows participation in all **EUPOS** conferences and activities. However countries which have associated country status can not vote in the **EUPOS** decision making. Associated countries receive full membership if the DGNSS infrastructure will be established and fulfill the **EUPOS** Standards.
Current technical matters

To continue the development of DGNSS ground-based augmentation systems in the EUPOS countries with regard to the EUPOS standards and guidelines.

To ensure that all antennas of the EUPOS reference stations are calibrated in consideration of absolute antenna Phase Center Variations (PCV).

To reach RTCM SC 104 Standard of encrypted data messages (Private Messages).

To develop a EUPOS self-certification procedure corresponding with the EUPOS technical standards.

To revise EUPOS technical standards (DOMES nomenclature, sitelog submission to ESDB) and EUPOS reference frame fixing guidelines.
**EUPOS co-operations and memberships**

*EUPOS* contributes to UNOOSA activities and goals in the field of DGNSS and applications, e.g. by *EUPOS* participation in UNOOSA workshops.

*EUPOS* is an associated member of the International Committee on GNSS (ICG), and a founding member of the ICG since 2004.

EGNOS and *EUPOS* have agreed on the goal of entering into a co-operation for their reciprocal benefit. A first meeting was held in Berlin on 23rd March 2011.
**EUPPOS co-operations and memberships**

EGNOS is laced with some limitations regarding coverage toward parts of Eastern European countries.

**EUPPOS** is a growing network, however lacing some white spots in the coverage area.

**EUPPOS** could be an alternative for more (e.g. farmers in precise agriculture) beyond the edge of the EGNOS coverage area.

EGNOS can help to some white spots where **EUPPOS** is not yet operable.

EGNOS and **EUPPOS** supplement each other in the means of desired precision of measurements.

More options for co-operation are currently being investigated.
EUPOS co-operations and memberships

EUPOS and EUREF have established an information exchange at the start of the co-operation. Reports on discussions and results of both EUREF and EUPOS conferences, are to be distributes each to the other organisation.

Information on German BKG activities and news are to be distributed to the International EUPOS Steering Committee, and reports on the EUPOS conferences be distributed to BKG.

EUPOS is an active member of the Radio Technical Commission for Maritime Services (RTCM).
**EUPOS’ co-operation with other organisations**

A successful series of UNOOSA/... Workshops and of **EUPOS** Symposia related on themes in the field of GNSS, DGNSS Augmentation and Applications started 2008.
Further publication of EUPOS and Berlin are available.
Conclusions

_EUPOS_ is an initiative for close co-operation of currently 19 Central and Eastern European countries, + 3 observers and one German Land that build up a ground based European regional GNSS augmentation system with uniform standards.

The coordinates of the _EUPOS_ stations are determined with high precision in geodetic reference and coordinate systems which conform the INSPIRE Directive requirements.

_EUPOS_ will use the signals of Galileo as a basic standard as soon as it is available, and GPS and GLONASS as basic standard up to complete availability of Galileo and as optional standard after complete functionality of Galileo.
Thank you for your attention!

www.eupos.org