



# NORDISKA KOMMISSIONEN FÖR GEODESI

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## The NKG Steering Committee on the on-going sub projects for "NORDIC POSITIONING SERVICE"

### Minutes of the 13<sup>th</sup> meeting

Gävle, Sweden - November 21-22, 2002

#### PRESENT

Denmark: Sigvard Stampe Villadsen  
Bo Madsen  
Finland: No representative  
Norway: Björn Engen  
Rune Hanssen  
Sweden: Bo Jonsson  
Andreas Engfeldt (secretary)

#### ITEM 1: OPENING OF THE MEETING

Björn Engen welcomed everybody to the 13<sup>th</sup> meeting of the NKG Steering Committee on the on-going sub projects for "Nordic Positioning Service".

The Steering Committee agreed to the following agenda for the meeting

1. Opening
2. Minutes from the 12<sup>th</sup> Steering Committee meeting on August 15-16 in Gävle
3. Status of a computer network between the Nordic control centres, Rune H
4. Results of the GNSMART/GPSNet test, Andreas E
5. Status of the co-operation sub projects

- B – Real time service with dm accuracy
- C1B – Evaluation of RTK algorithms
- 6. Status of the information sub-projects
  - A0 – Standard for reference stations
  - A1 – Web-site
  - A2 – Automated Computation Service
  - C1A – Distribution channel for RTK
- 7. Report from the Director Generals Meeting in Ålborg
- 8. Report from the NKG General Assembly
- 9. Ongoing activities
- 10. Future work
- 11. Other items
- 12. Next meeting and closing

#### **ACTION LIST:**

- "GPRS as distribution channel" will be a new ITEM for the next meeting.
- Rune H. will check more about GPRS before the next meeting (ITEM 6, C1A).
- The document of the classification of the reference stations that has been developed will be updated as soon as possible (ITEM 6 A0), LMV are responsible.

#### **ITEM 2: MINUTES FROM PREVIOUS MEETING**

Minutes from the 12<sup>th</sup> Steering Committee meeting on August 15-16 was approved and will be posted on the NKG Web-site.

#### **ACTION LIST FROM THE MEETING OF THE STEERING COMMITTEE ON AUGUST 15 -16 AND WHAT HAS HAPPENED:**

- On Tuesday 20 August, Örjan Z (LMV), Bo H (KMS) and somebody instead of Hanne M (SK, who is on vacation at that time) will arrange a telephone meeting to discuss the few problems which are left to solve about the computer network (ITEM 3). **Action carried out:** They had this telephone meeting and now the main part of the problems are solved. It's just on the Swedish side where a few problems remain to solve.

- LMV will distribute two diploma work reports to the rest of the Steering committee (ITEM 6, C1B). **Action carried out:** The diploma works have been distributed to the members of the Steering Committee.
- Someone from LMV will write a detailed document of the classification of the reference stations that has been developed (ITEM 5, A0). **Action carried out:** Nothing has happened, because of changes in the available resources. The present plan is that the document will be finished in February.
- Our Network-RTK test measurements should be performed during the period October 7 – October 18, by three different "measure-teams", one from each country, in the Gävle test field (ITEM 6). **Action carried out:** The campaign was delayed and took place during the period October 28 – November 1. For more details, see ITEM 4.
- At the NKG General Meeting (Assembly) this project will have a session of its own (ITEM 10). **Action carried out:** At the NKG General Meeting there was a session for the project "Nordic Positioning Service".

### **ITEM 3: STATUS OF A COMPUTER NETWORK BETWEEN THE NORDIC CONTROL CENTRES**

The specification for the computer network between the control centres in Denmark, Norway and Sweden can be found in the document "NKG Network – Architectural Design", which was updated on 20<sup>th</sup> of November 2001 (see minutes from the 9<sup>th</sup> Steering Committee Meeting, in November 2001).

The computer network is working in Denmark and Norway. Exchange of data between SATREF and the Danish network of permanent reference stations is in operation. The Norwegian positioning service DPOS can be used in Denmark, but it is running at the SATREF control centre. According to Örjan Zackrisson (LMV), the computer network will soon be in operation also in Sweden too. At the moment there is a software problem, but it should be ready and tested before the next field season starts. People from SK have tried to use Swedish stations for the Danish DPOS solution, but the solution then becomes less stable. There is a possibility that the DPOS-service could be tested all over Denmark already on the 1<sup>st</sup> of March.

#### **ITEM 4: RESULT OF THE GNSMART/GPSNet TEST**

During September the GNSMART software from the German company GEO++ started to be installed at LMV. The installation was performed by GEO++ via a remote control ISDN connection. Due to several different things, the installation became very delayed. That meant that we had to change the dates for the test campaign from 7-11 October to 28 October - 1 November.

Geo++ decided that every brand of GPS-receivers used in the test should have its specific antenna model implemented. It was solved by making different configurations for three modems, i.e. every GPS-receiver brand got a specific telephone number to use.

First on Thursday 24 October the Geo++ software was operational. Andreas E then tested the Leica equipment on all the three different phone numbers, and a fix solution for the position was established on all of the numbers.

During the time period 28 October to 1 November, Jan Nielsen (KMS), Louise Warming Holm (KMS) and Gro Grinde (SK) visited Gävle to take part in the tests of GNSMART (the software of GEO++) and GPSNet. Because of lack of Swedish resources that particular week, only Andreas E could take part from LMV. This means that only Javad and Trimble were tested that week. Leica was tested more intensively during the time period November 4 - 14 by LMV.

The test field consisted of seven points, situated at the distances 200m, 4km, 10km, 17km, 22km, 28km and 36km from the nearest reference station. All the points were static measured with Leica or Ashtech receivers and Dorne Margolin antennas during 2x3 hours. And the co-ordinates of the points were calculated in the LMV automated computation service. The computed co-ordinates were then considered as true co-ordinates.

In spite of that the Leica equipment worked together with all the modems, the other brands did not do that. It took one day to get the Trimble equipment to work with one of modems and almost two days to get the Javad equipment to work with another one of the modems. This means that less points than expected were measured with Javad. The height was not measured properly with the Javad antenna, so the antenna height for Javad is estimated with the accuracy of about 2-5 mm at three of the test points. And with the Trimble receiver, which was used for GNSMART, there were very many false fix solutions at longer distances than 4 km,

because the borrowed receiver couldn't use the RTCM-message 59. For preliminary results see Appendix A. A report will be available during February 2003.

## **ITEM 5: STATUS OF THE CO-OPERATION SUB PROJECTS**

### **B - A Nordic Real-time Service with half-meter horizontal accuracy (95 %)**

The Positioning Service DPOS, which gives a position accuracy on the decimetre level, is in operation since June 2002 and is marketed in Norway. The subscriptions on DPOS are handled with an ISDN router installed at the SATREF control centre.

When the communication links between the control centres are established a pilot project with a (WADGPS) "decimetre" service will be carried out in southern Norway, southern Sweden and Denmark using the software installed at the SATREF control centre. The SATREF control centre will collect data from the control centres for SWEPOS and the Danish reference stations. SATREF will provide a computed network model to the control centres for SWEPOS and the Danish reference stations for test and evaluation. In March 2003 a test of DPOS will be performed in København (see also ITEM 3).

The tests in Denmark and Sweden will be performed with GSM as the data distribution link. Now there is also a possibility to connect DAB on the serial port of the Pocket VRS. According to Trimble in Sunnyvale, California, the solution will be better if all the stations are included, and then also the Danish and Swedish ones. DPOS was shown on the Director General Meeting in Ålborg (see ITEM 7).

### **C1B - Evaluation of available RTK algorithms**

Nothing has happened since the last Meeting. LMV has not done any more tests with the Calgary network RTK software since the last Meeting, because of that the software still is not working.

## **ITEM 6: STATUS OF THE INFORMATION SUB PROJECTS**

### **A0 - A Nordic standard for reference stations**

At the moment it is not decided who will replace Gunnar Hedling as the chair of this sub project. It is though decided that the document of the classification of the reference stations that has been developed will be updated as soon as possible by

LMV. Then the document will be sent to the members of the sub project and to the Steering Committee.

The next step is to make an inventory of the existing Nordic reference stations. A standard form, based on e.g. an Access database, should be used. Based on this inventory and the existing standards for IGS and EUREF stations the sub project shall propose a long-term standard for the design of Nordic reference stations.

### **A1 - A Nordic Web-site for download of reference station data for post-processing purposes**

In the sub project A Nordic Web-site for download of reference station data for post-processing purposes only the installation is remaining. All the countries should have received the Web-portal.

LMV has not installed the Nordic Web portal on the Web-server, but has acquired a new Web-server, transfer of the portal from UNIX to NT environment is necessary.

SK has put up a new web-server, which is ready to be started and it will be running from New Years Day. Only the pricing for post-processing data remains.

### **A2 - An Automated Computation Service**

LMV has a computation service in operation on the SWEPOS web-site, which performance is very satisfactory. During recent time we have got many new users, especially from the regional departments of Lantmäteriet.

To extend the computation service to be a Nordic service some investigations regarding the national reference systems needs to be done, a 3D-campaign must be performed. When this is done the service can be introduced e. g. in Denmark.

### **C1A - Test of distribution channels for RTK**

The prices for DAB receivers will be checked until the next Meeting. Rune H proposes that we should check GPRS. For GPRS you pay for transmitted data, not for time you are connected. If we should use GPRS, then we need a new server for GPRS. Rune will check more about this until the next Meeting. Should this also be something that FGI should be involved in? That issue will probably be handled in the next Meeting of the NKG Presidium. It will also be investigated which economical benefit we can make of it. This will be a new point on the agenda of the 14<sup>th</sup> Meeting.

## **ITEM 7: REPORT FROM THE DIRECTOR GENERALS MEETING IN ÅLBORG 9-11 September 2002**

The latest meeting of the Director Generals took place in Ålborg in the beginning of September.

Bo J informed about this project and the GNSMART/GPSNET test campaign (see ITEM 4). On this meeting there was also a demonstration of DPOS, including three Danish stations, one Swedish station and one Norwegian station. This demonstration could be called "The first operative GPS-co-operation between our three countries".

The Director Generals gave their approval to continue the co-operation projects, a Nordic dm-service (ITEM 5) and the evaluation of the two network-RTK softwares (ITEM 4).

There was one comment by the Icelandic representative, that the permanent reference stations on Iceland should be included on the map over Nordic permanent reference stations. The Finnish were invited to take part in this project, but their representative commented that they can't afford it.

## **ITEM 8: REPORT FROM THE NKG GENERAL ASSEMBLY**

At the NKG General Assembly this project had a session of its own. It took place on Saturday 5 October. This was the schedule:

09:00 - 10:30 Nordic Positioning Service and Contributed papers (Chairperson Sigvard Stampe Villadsen)

S Stampe Villadsen; Nordic Position Service, Status Report

Bjørn Engen; DPOS - a possible Nordic positioning service

Ruizhi Chen, Felix Toran and Javier Ventura-Traveset; EGNOS positioning with the relayed SIS by Mobile-IP

Bo Jonsson, Gunnar Hedling, Peter Wiklund; Some experiences of Network-RTK in the SWEPOS™-network

Tina Kempe, Lotti Jivall; SWEPOS™ Automated Processing Service

During the NKG General Assembly in Espoo the Finnish Geodetic Institute expressed some interest to participate in the sub-project about distribution channels. This will be discussed on the next meeting of the NKG presidium.

#### **ITEM 9: ONGOING ACTIVITIES AND FUTURE WORK**

In January 2003 there will be a Director General Meeting. We will contribute with a short "paper" about the status for the project Nordic Positioning Service

#### **ITEM 11. NEXT MEETING AND CLOSING**

The next meeting of the Steering Committee will take place in Norway on March 6, - March 7, 2003. Björn thanked all the participants for their contribution to a fruitful meeting.

#### **Appendix A. Results from the GNSMART/GPSNet test campaign**

*Table 1. The results from the GNSMART/GPSNet test campaign.*

Table 1 shows the horizontal and vertical deviations (from the "known" values) and the initialization time for the measurements for Leica, Javad, Trimble and Totaly for both GPSNet and GNSMART. Notice that all false fix solutions have been removed



only for the Trimble GNSMART combination, because of the lack of RTCM message 59 in the receiver. For the other brands and softwares only the solutions you could say in field were false fix solutions have been removed.

The bad height values for Trimble 67%, GNSMART, can be explained by that there is a very clear systematical height error for Trimble, caused by the antenna model that was installed from Germany (All the height values for Trimble and GNSMART were positive).

From Table 1 we can make the conclusion that there is very little difference in accuracy between the two softwares in our test area. One difference that could be noticed in field was that GNSMART in general used one more satellite than GPSNet, although receivers of the same brand were connected to the same antenna.

The standard deviations for all GNSMART observations were 23 mm in latitude, 17 mm in longitude and 49 mm in height. The standard deviations for all GPSNet observations were 24 mm in latitude, 17 mm in longitude and 43 mm in height. All observations with deviations larger than 200 mm were excluded in this computation.

The RMS-values for all GNSMART observations were 23 mm in latitude, 17 mm in longitude and 47 mm in height. The RMS-values for all GPSNET observations were 24 mm in latitude, 17 mm in longitude and 41 mm in height.