Conclusions of the EPN Analysis Centres Workshop
25-26 October 2017, Brussels, Belgium

1) The harmonization of the troposphere modelling among the EPN Analysis Centres (AC) was proposed in order to increase the consistency between AC solutions. It is agreed that from GPS week 1980 onwards it is mandatory to model the tropospheric delay using the VMF1 mapping function together with a priori hydrostatic delays from VMF1 grids (based on atmospheric pressure data from ECMWF). Therefore, ACs that currently use the GMF/GPT approach in their analyses (Table 1) are asked to change to the VMF1/ECMWF approach (starting with GPS week 1980 or earlier). Using the VMF1/ECMWF approach may also lead to better repeatability and better geophysical interpretation of the combined EPN coordinate time series. It is also recommended to use VMF1 forecast grids for rapid and ultra rapid analyses. It was shown, that coordinate solutions obtained using the VMF1 forecast grids are of similar quality as those obtained using final grids. In case of a temporal unavailability of the VMF1 forecast grids, the GMF/GPT approach should be used. It is also mandatory to estimate troposphere gradient parameters and to include them in SINEX_TRO files. The AC guidelines are going to be updated accordingly to reflect the new decisions.

2) The experiences with Galileo data processing were presented by several EPN ACs (BEK, BKG, and ROB). The possibility to use Galileo observations in operational EPN products was discussed. However, because of a small number of receiver antenna calibrations for Galileo observations, it is not yet recommended to include Galileo observations in operational EPN analysis. Nevertheless, all ACs are encouraged to make further tests using Galileo observations.

3) Noting the need to improve the quality of the rapid product (presently only 9 ACs contribute [Table 1], about 90% of EPN stations are processed and half of them are processed by only 1 or 2 ACs), it is recommended that more analysis centres will start submitting rapid solutions. Alternatively, ACs already submitting rapid solutions are asked to consider adding more EPN stations to their rapid subnetworks, so that all EPN stations could be included in combined solutions. The ACC will contact ACs about their rapid contributions.

4) The discussion about a future reprocessing project (repro3) was started. Due to discontinuities noticed between routine and repro2 coordinate solutions, the new strategy for repro3 has to be worked out aiming at the high consistency between reprocessed and routine solutions. The consistency should concern the number of contributing ACs, processing options, and used software. The routine combined solutions are based on 16 AC sub-network solutions (15 ACs use Bernese GNSS Software, and 1 AC use Gipsy Oasis II), while repro2 combined solutions were based on 5 AC solutions (3 ACs used Bernese, 1 AC used Gipsy, and 1 AC used GAMIT/GLOBK software). Three repro2 solutions computed with different software packages included all EPN stations, while two additional Bernese solutions included only selected stations. It is agreed that the same software packages should be used for routine and reprocessed solutions. Several options were discussed:

- Preferably, the same ACs should contribute to routine and reprocessed combined solutions. This might require that all ACs should contribute to the repro3 project.
- Alternatively, the decrease of the number of ACs providing routine solutions could be considered. In this case, a change of the roles of the ACs was suggested, e.g., ACs may consider switching to EPN densification activities.
- In order to decrease the impact of switching from 15 ACs with Bernese + 1 AC with Gipsy to a combination of 3 software's, the combination of solutions generated with different software could be done in two steps: 1) a combination of AC solutions created with the

same software, and 2) a combination of the resulting, software-specific solutions. However, this approach requires that all EPN stations should be routinely processed using each software package.

The different alternatives will be evaluated in the coming year.

5) The discussion about adding global sites to the EPN solutions for a better reference frame alignment was initiated. It is agreed that necessary tests should be done to analyse the impact of global sites on EPN combined coordinate solutions. Dedicated global solutions should be prepared and provided by EPN ACs (presently, such solutions could be provided by IGN and ROB). The details concerning the preparation of the testing EPN global solutions (e.g., number of ACs providing global solutions, number and list of global stations, processing strategy) will be discussed and recommendations will be provided after the workshop.

6) The EPN Central Bureau created a new database that contains specific flags for stations/epochs that suffer some kind of problem. The problems range from data format issues, to problems reported by one of the coordinators. Presently, the database contains flags coming from the EPN CB itself, the troposphere coordinator, the reference frame coordinator, and one of the EPN reprocessing analysis centres (GOP). These flags do not necessarily correspond with each other. It is agreed that the EPN CB will identify those flags that can be considered as critical and will then extend the presently used ‘excluded’ files to add the data in the historical data centre which are recommended not to be used for future data analysis.

Table 1. Characteristics of EPN AC solutions as of GPS week 1968

AC	Software	Solutions[1]	# sites	Troposphere modelling
ASI	GOA 6.2	F, R, N	53	VMF1/ECMWF
BEK	BSW 5.2	F, R	97	VMF1/ECMWF
BKG	BSW 5.2	F, R, N	117	GMF/GPT
COE	BSW 5.3	F	43	VMF1/ECMWF
IGE	BSW 5.2	F, R	91	GMF/GPT
IGN	BSW 5.2	F	64	GMF/GPT
LPT	BSW 5.3	F, R, N	60	VMF1/ECMWF
MUT	BSW 5.2	F	144	GMF/GPT
NKG	BSW 5.2	F	88	GMF/GPT
OLG/BEV	BSW 5.2	F	106	VMF1/ECMWF
RGA	BSW 5.2	F	56	VMF1/ECMWF
ROB	BSW 5.2	F, R	98	GMF/GPT
SGO	BSW 5.2	F, R	42	VMF1/ECMWF
SUT	BSW 5.2	F	59	VMF1/ECMWF
UPA	BSW 5.2	F, R	57	GMF/GPT
WUT	BSW 5.2	F, R	119	VMF1/ECMWF

[1] Solutions: F – final, R – rapid, N – near real-time