



Prof. Todor Stoilov, SaPPART STSM coordinator

Subject: **Preliminary Report on STSM at IFSTTAR, France**

Dear Prof. Stoilov,

On the beginning I am grateful to the Committee for the approving of my Short Term Scientific Mission candidature. The goal of this preliminary report is to briefly review the work done. But if you agree, a more precise and profound report you will receive until May 15.

Introduction

This STSM under the COST Action TU1302: Satellite Positioning Performance Assessment for Road Transport (SaPPART) entitled as '**Short-baselines DGNSS experimental assessment of GNSS receivers behaviour in sub-urban areas**' during April 18 and April 28 was an opportunity for me to exchange opinions, to generate and to test new ideas with the IFSTTAR researchers, especially with my excellent host Dr. David Betaillé. A collected set of DGNSS and the smartphones data also with the help of Dr. Miguel Ortiz is a contribution to the SaPPART action intentions. It also enhances my scope on differential positioning I the area of automotive applications.

A short description of the work

During the first three days the receivers' firmware settings and preliminary tests of the rover receivers (M8T and M8N, u-blox) were done in order to assure the maximum usability of the expected on field results. The two hours check of the receivers clock-term has been executed and the encouraging results showed the expected drift, but without slips. The receivers which were later used as base stations (PERSY Pedestrian Reference System) were tested during the STSM day 3 within the dry test inside IFSTTAR. The collection of the field rover results during the dry and field teste was referenced with IFSTTAR's specially equipped vehicle VERT (fr. Véhicule d'Essais et de Référence en Trajectographie). According to the proposed plan a two long duration experimental datasets were collected, with the two geodetically georeferenced base stations set 4,6km apart – one within the IFSTTAR area and one in the industrial area of Bouguenais. For the reference of the data collected with the base stations we have also downloaded the .nav and .obs data from the two nearest Stationary GNSS stations. Collected data processing including generating of the dedicated Matlab codes and discussions on the results filled the rest of the STSM. The first step of the collected raw data processing includes the generation of RINEX observation and navigation files, (we used RtkLib ver. 2.4.2). According to the observed limited abilities of the present version of the software package RtkLib to process the u-blox 8 outputs, a distinct .obs and .nav has been generated for the GPS only and the GLONASS only combination. For the conversion into Matlab readable format an on-site software was used. Files were then merged (on-site software) in order to achieve comparable data from the all receivers involved. Additional coding has been done in Matlab for the preliminary check of the results and also for get the bases' corrections by the known geometrical distances from the both stations and the satellites. The rovers' data were processed by the corrections and compared with the standalone solutions from the receivers, which we get by the rovers internally (iono, tropo) corrected ranges. Preliminary Horizontal Position Errors during the field tests were established. According to the results obtained, by additional tests on day 7 of the PERSYs used in field tests, we further established their positioning abilities.

A database of the collected data, including the smartphones data has been formed and at the moment it is accessible to the members of the SaPPART involved in this STSM.

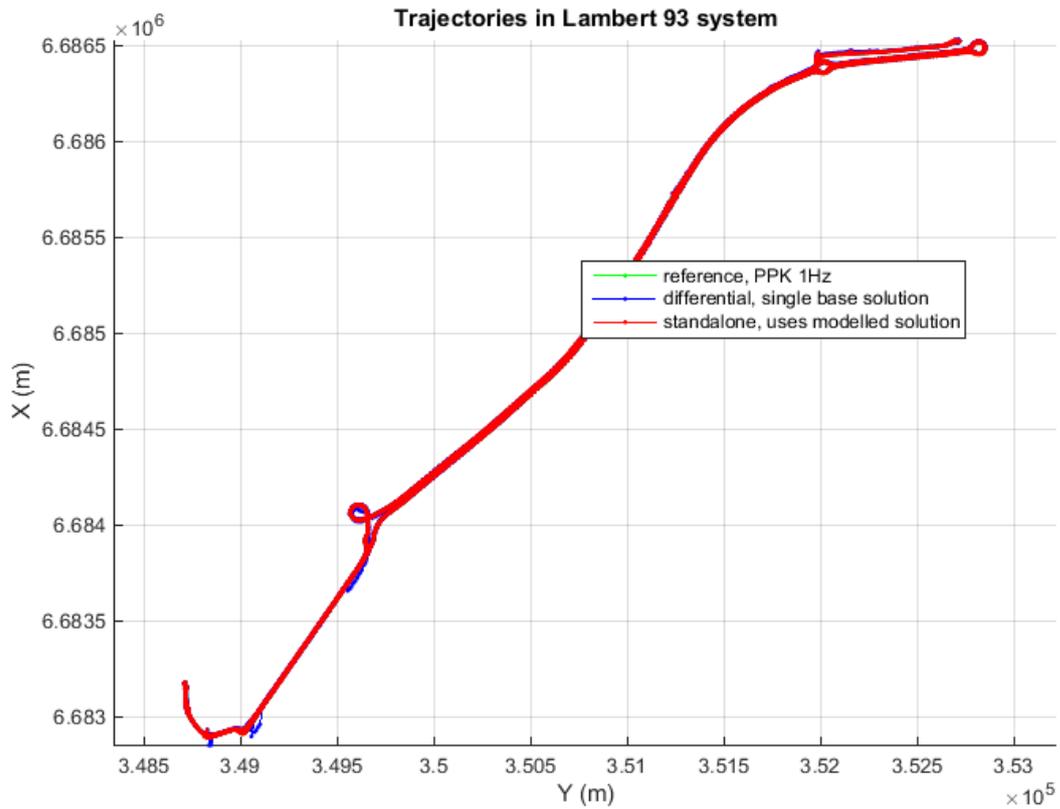


Figure.1: Trajectories obtained during the one of the 1 hour filed tests.

Results and Analyses

However further post-processing analyses of the data from GNSS receivers are on the way, the first data clearly shows the need for the quality (low noise) receiver for the base station. Since the STSM's approach has been to apply post-processing the results get by the data from the permanent reference stations are going to be presented in the final version of the report.

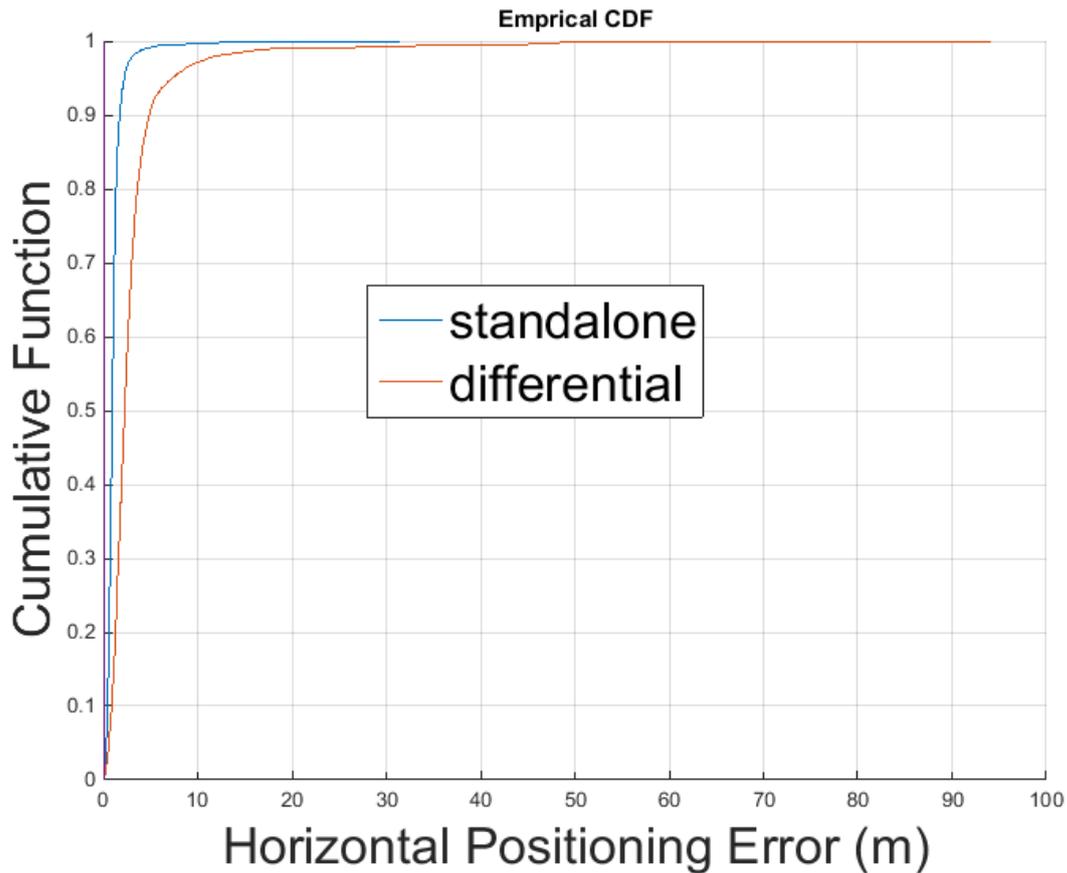


Figure.2: HPE obtained by the processing of the data of field tests.

The first conclusions

Large variations of the non-modelled base GNSS receivers' noise do not allow to overcome the standalone solution. But despite the very sophisticated solutions in nowadays mass-market standalone receivers and even the possibilities of the on-line smartphones the DGNSS using the phase data processing, has its potential.

Future

With the accomplished experimental work during the STSM I support the common goals of SaPPART and by extension of the experiments on Slovenian roads in late June I intend to generalize the conclusions with my SaPPART colleagues towards scientific publications.

Yours sincerely,
 Dr. Franc Dimc
 E-mail: franc.dimc@fpp.uni-lj.si
 Phone number (work): +386 5 6767 207
 Phone number (mobile): +386 31 22 44 35