SOME ASPECTS REGARDING THE USAGE OF THE GPS MEASUREMENTS DETAILED REAL TIME (RTK) IN TRACING THE ARAD-TIMSOARA-LUGOJ HIGHWAY

UNELE ASPECTE LEGATE DE UTILIZAREA MĂSURĂTORILOR GPS DETALIATE TIMP REAL (RTK) ÎN TRASAREA AUTOSTRĂZII ARAD-TIMIŞOARA-LUGOJ

CIOLAC VALERIA *, BARLA GIGI, COSMIN POPESCU *, ADRIAN ŞMULEAC *, ABALARU MARIUS****

**Universitatea de Ştiinţe Agricole şi Medicină Veterinară a Banatului Timişoara*
*** Black Licht*

Rezumat: *Ridicările topografice RTK s-au efectuat utilizând 5 receptoare Leica GPS 1200 – 1 staţie de referinţă şi 4 rovere.*
Pentru fiecare sesiune RTK, după montarea staţiei de referinţă pe o bornă de tip A , o bornă de tip B a fost ocupată cu rover receptorul, pentru a compara coordonatele RTK nou obţinute ale bornei cu coordonatele anterioare determinate STATIC. Diferenţele de coordonate au fost maxim 2 cm pe xyz după maxim 10 secunde de ocupare.

Abstract: *The RTK topographic surveys were accomplished by using 5 Leica GPS 1200 receivers – 1 reference station and 4 rovers.*
For every RTK session, after assembling the reference station on a type A landmark, a type B landmark was occupied by a rover receiver in order to compare the new obtained RTK coordinates of the landmark with the previous coordinates, determined STATICALLY. The differences between the coordinates were maximum of 2 cm per xyz after maximum 10 seconds of occupancy.

Cuvinte cheie: *ridicări topografice RTK, măsurători statistice*
Key words: *RTK survey, static measurement*

INTRODUCTION

The direction Bypass Arad begins from 552 km + 154 DN 7/E 68 Bucharest – Deva – Arad – Budapest.

MATHERIAL AND METHOD

The topographical surveys for Arad Bypass were divided into several phases: GPS measurements for determining the transformation parameters from WGS 1984 to Stereographic 1970; benchmark placement; static measurements for determining new point coordinates; RTK survey.

In order to determine the transformation parameters from WGS 1984 to Stereographic 1970 for the work area, GPS STATIC method measurements have been conducted using national geodetic network 1st rank points.

After conducting GPS measurements on national geodezic points, 6 points were used for the transformation parameters: CALACEA, TISA NOUĂ, VARIAŞU MARE, CURTICI, MOŞNIŢA and DEALUL PĂZIT (figure 1).

Two polygons were formed from these points, and three measurement sessions were conducted for each polygon, in three different days. The polygons have CALACEA – TISA NOUĂ as common starting point.

The collected data were processed using LEICA GEO OFFICE v. 3.0 software, thus obtaining the transformation parameters *for the entire polygon* (table 1).

RESULTS AND DISCUSSIONS

Benchmark placement

After an on site reconnaissance, the positions for the benchmark placement were identified taking into consideration all the conditions provided in „Methodology topographical works" (the absence of magnetic fields or reflecting surfaces, the absence of obstacles in order to receive the signal starting at a minimum height of 20^{o} „cut angle", the benchmarks were placed at cadastral limits etc.) (figure 2).

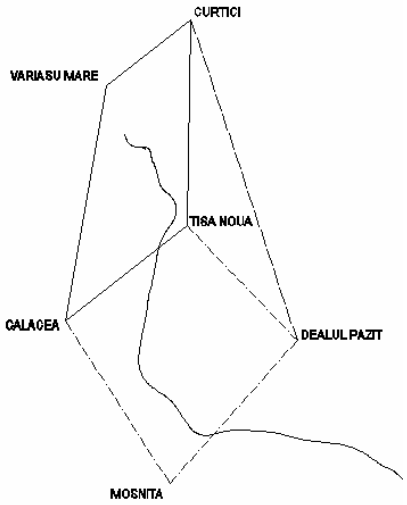

Figure 1 The national geodezic points

Table 1

Transformation parameters

ELLIPSOID A	WGS 1984
ELLIPSOID B	Krassowski
Height Mode	Orthometric
Model	Bursa Wolf
Dx	102,4110
Dy	-281,5579
Dz	103,5538
Rx	8,48984
Ry	1,99565
Rz	-10,74588
Scale factor	-0,465

Survey for the main and secondary polygonal benchmarks

The surveys for the main (type A) and secondary (type B) polygonal benchmarks were carried out by STATIC GPS method – *therefore type A and type B benchmarks have the same accuracy* – occupying 6 points – 3 points simultaneously from the main STEREO 70 network, and 3 benchmarks (type A or B).

The surveys were carried out using 5 Leica GPS 1200 and one Leica Smartstation with Raw Data Logging capability enabled.

After the data processing, using Leica Geo Office v. 3.00 software, the coordinates of the 5 Type A and 6 Type B benchmarks were calculated and compensated (Leica Geo Office, "Network Adjustment") (table 2).

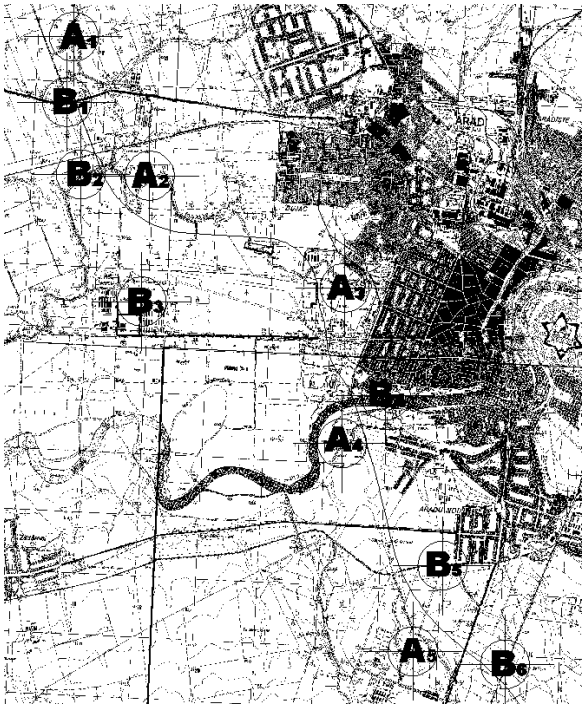

Figure 2 Benchmark placement

Table 2

Compensated Coordinates:

Point ID.	Northing	Easting	Height
A1	530436.277	209034.996	107.873
A2	528164.542	210275.148	109.051
A3	526333.819	213459.418	110.344
A4	523792.261	213416.951	109.708
A5	520395.508	214571.500	121.912
B1	529366.544	208920.928	105.859
B2	528186.991	209149.456	107.376
B3	526109.796	210143.919	107.378
B4	524571.109	214130.226	110.418
B5	521794.006	215055.154	115.621
B6	520182.072	216074.937	126.238

Real-Time Kinematic (RTK) GPS detailed survey

RTK surveys were conducted using 5 Leica GPS 1200 receivers – 1 reference station and 4 rover receivers.

For each RTK session, after setting up the reference station on a Type A benchmark, a Type B benchmark was occupied with the rover receiver, in order to compare the newly