ATR TRACK III: THE REAL – TIME GPS FOR PUBLIC SECURITY

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ABSTRACT

In the project a system was developed, that visualizes real time GPS navigation data over the public security system. Vehicles equipped with GPS/GSM unit can connect to the city security system (tel. 112) via Internet and multiple viewer users can track their motion in real-time. A client-server system passes GPS position data from the vehicles on the GIS editor and vector/raster MultiViewer application.

1. INTRODUCTION

Fleet vehicles navigation in present development promises to be a consumer of digital maps and GIS technology. Already there are many commercial navigation systems available in Poland but mostly they offer simple street maps which refer to global coordination system (WGS 84). They have not any connection to city GIS system, which play an important role in assisting of automobile public security fleet management. The Bydgoszcz ATR Track III system is just what we needed, i.e. universal and can be applied locally (city) and on wider scale area (region or country). The wireless and Internet communication and adequately Command Center make possible to monitor a vehicle fleet on the city GIS map in real-time or later reviewing depending on demanded option. The ATR Track III has been prepared as one of the component of the Emergency Management and Reporting System, which is put into practice in Bydgoszcz.

2. THE ATR TRACK III TECHNOLOGY

ATR Track III is based on mobile stand-alone terminals, which combine GPS and GSM technology to determinate their own position. GSM wireless networks set a two-way communication between the mobile unit and control center. ATR Track III devices use GSM/GPRS modem to connect with Internet, and then this medium allows sending position data and getting messages from remote server. After connecting to Internet, ATR track III devices retrieve MultiViewer GPS Server basing on defined IP number and try to log in. If the device IP is coincident to the list numbers defined on server then it is accepted to service. The MultiViewer GPS Server starts up to collect position data and make them available to outside clients. Every user equipped with MultiViewer GIS Integrator console can connect to server by Internet to receive position data from the whole fleet. The ATR TRACK III system architecture is shown in figure 1.

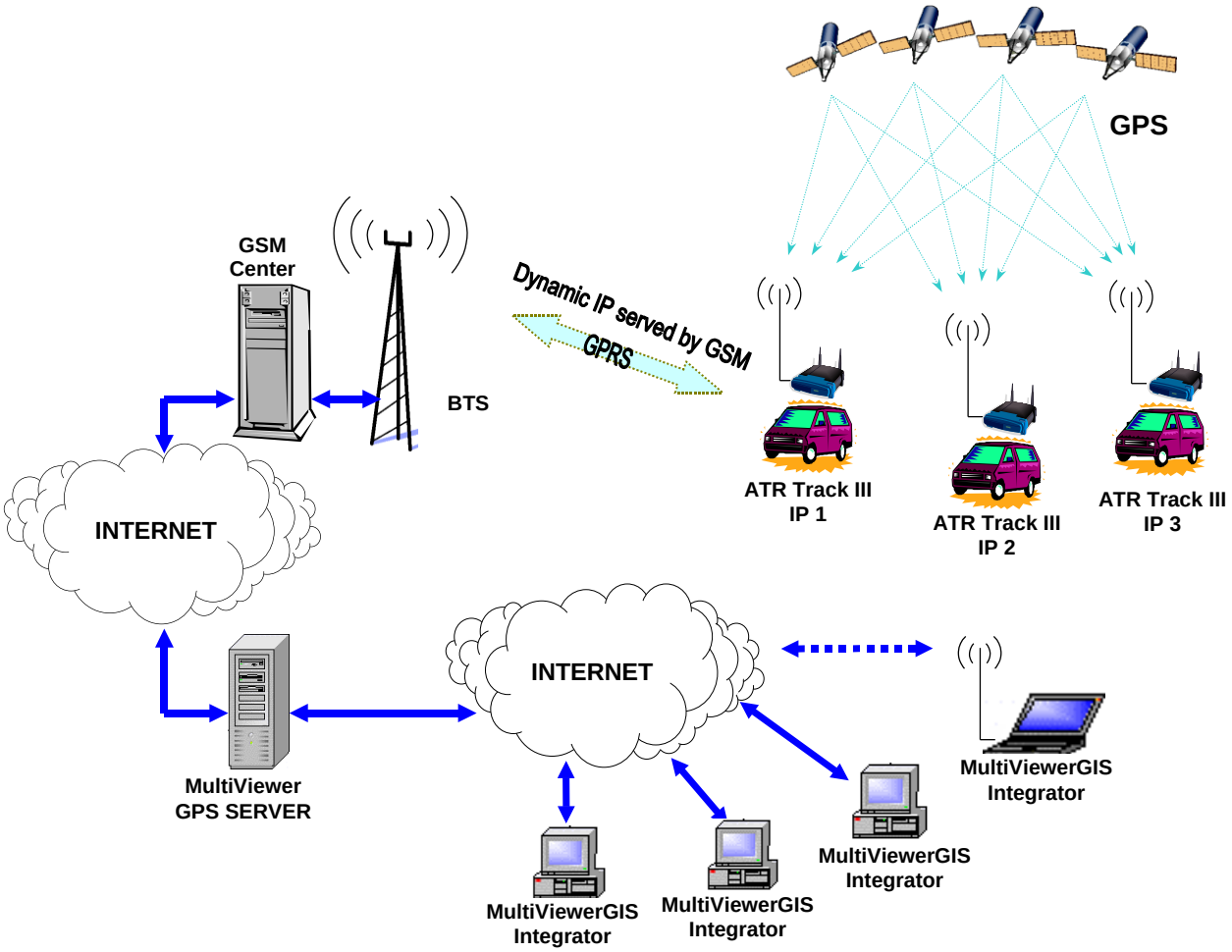

Fig. 1. The ATR TRACK III system architecture

The main components of the ATR TRACK III are:

- **GPS / GPRS / I/O integrated unit with 16 channel GPS receiver, GSM/GPRS modem and digital input/output for optional sensors (i.e. alarm signals Fig. 2).**
- **Data Server (DS) – central unit for system monitoring**
  A high-performance computer, optimized for running server applications with many users connected at the same time. The DS functionality is implemented through a software application called Multi Viewer GPS Server Console (Fig. 3). Its task is to collect, archive and distribute data coming from vehicles, which are equipped with GPS/GPRS/IO unit.
- **MultiViewer GIS Integrator Console (MGIC)**
  MGIC is an integrated and autonomous Graphical User Interface (GUI) to be designed for viewing and management of city GIS resources. Information from database about characteristics of every object can be accessed automatically at the view window when any element of the map is selected by cursor. In figure 4, one of the moving vehicles with ID label is presented at the Bydgoszcz city map.

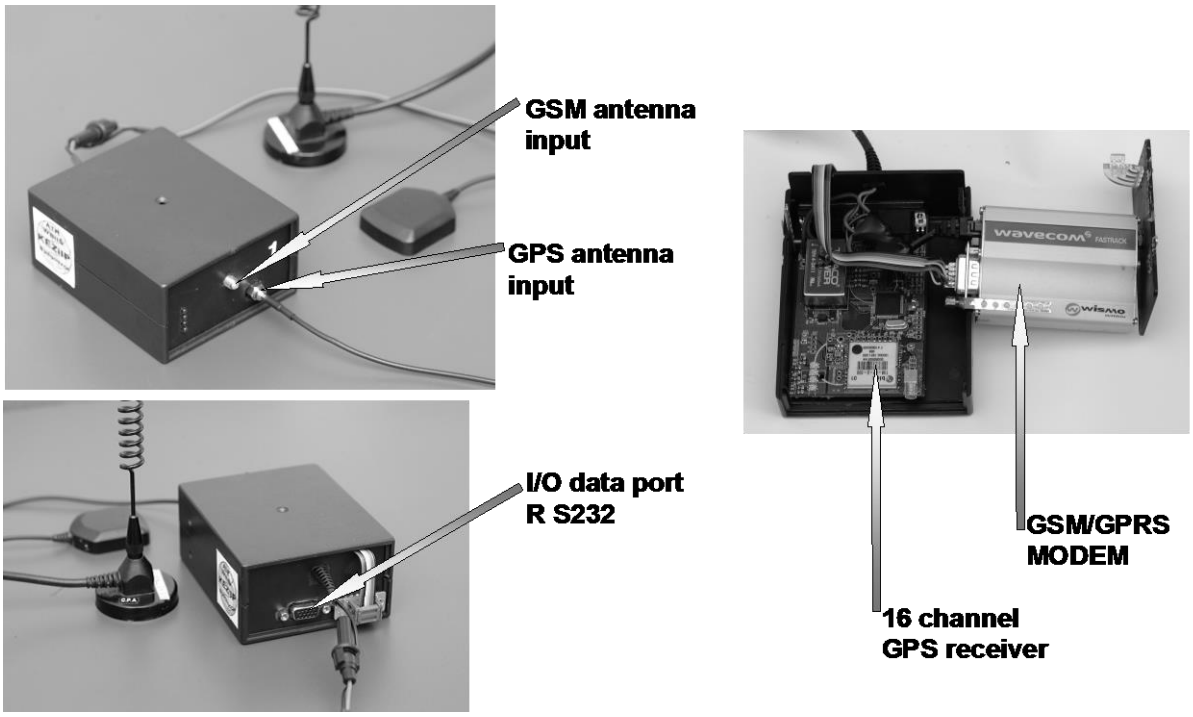

Fig. 2. GPS / GPRS / I/O integrated unit of ATR Track III

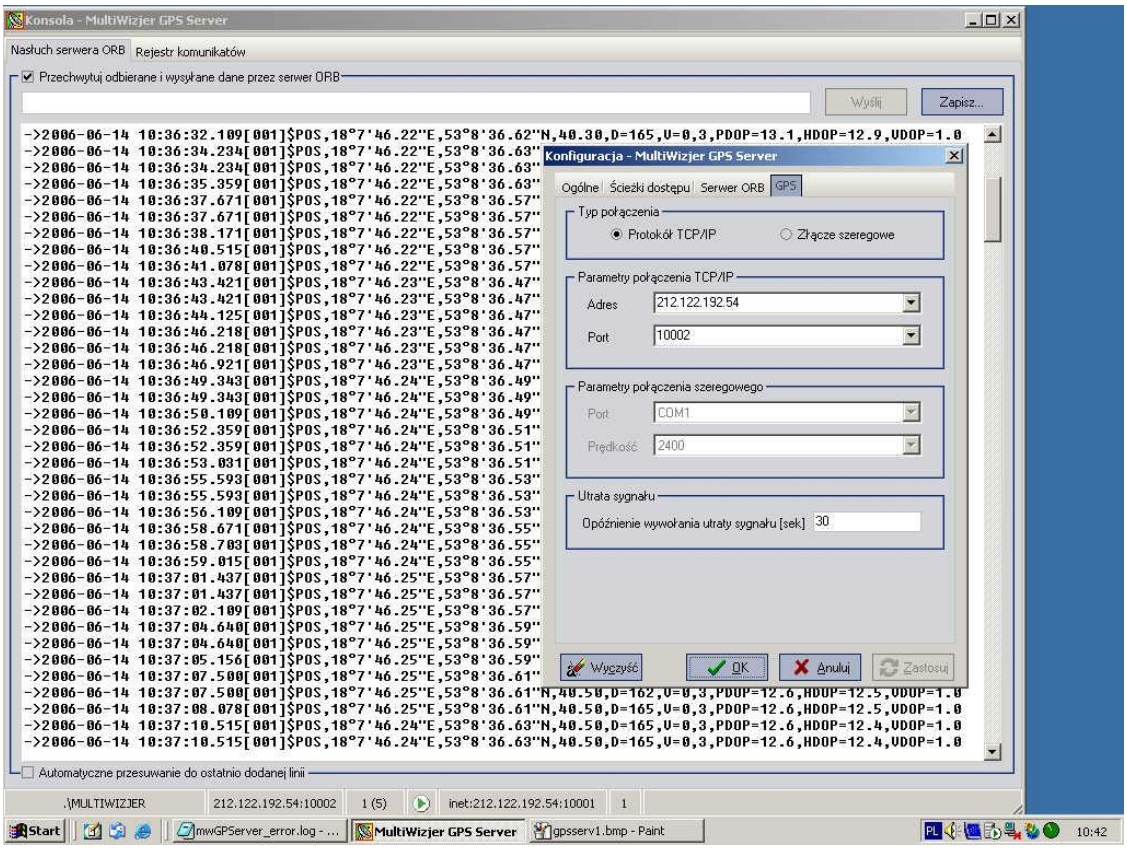

Fig. 3. MultiViewer GPS Server Console

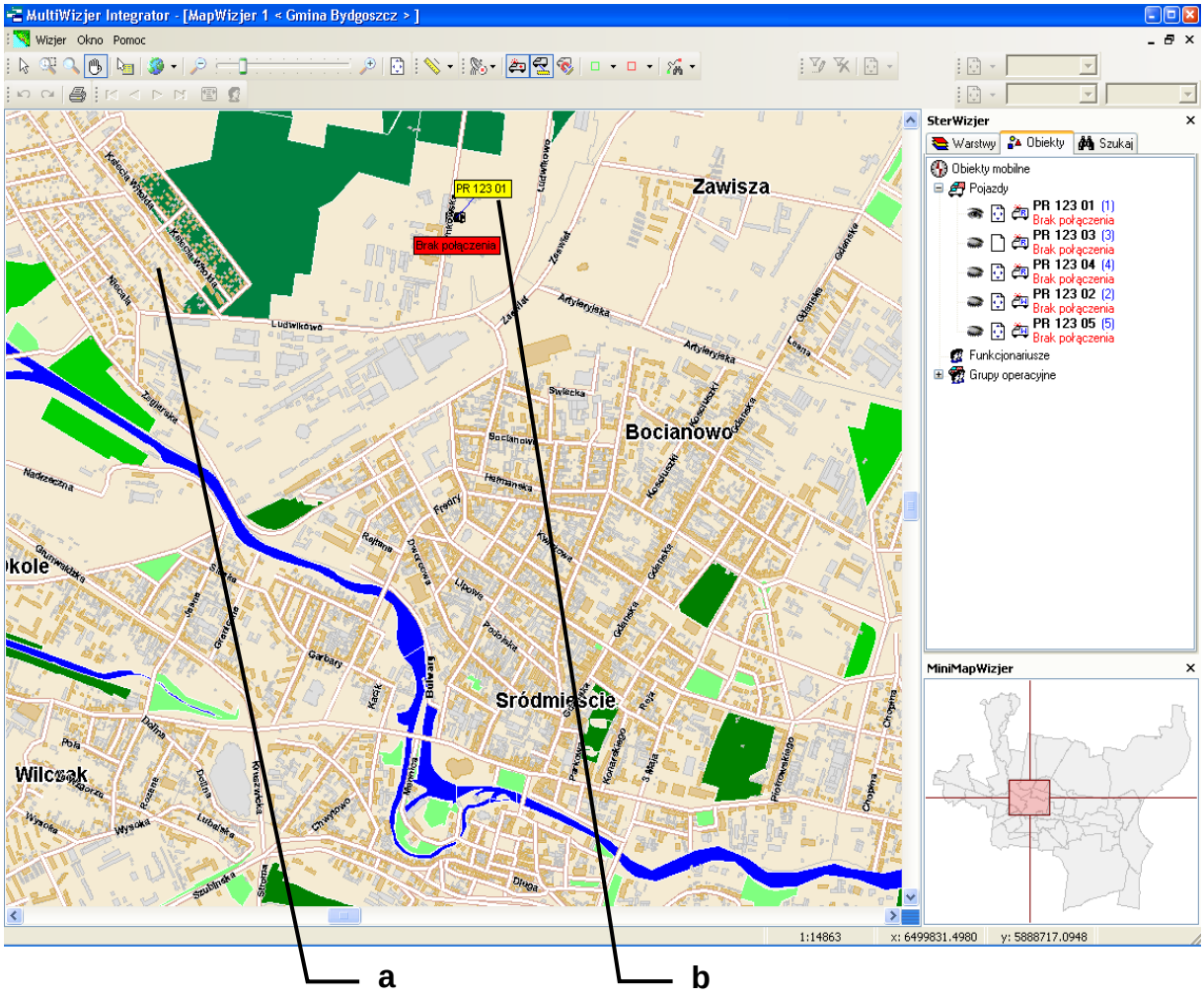

Fig. 4. MultiViewer GIS Integrator Console for vehicle monitoring: a) MapViewer window, b) Vehicle with ID label

3.TEST ROUTE DESCRIPTION

Field tests of the ATR Track III system were conducted in the city of Bydgoszcz. A 25 km traverse going in one of the city district was selected. This particular stretch of the city has significant changes in buildings and curvature, making it a suitable traverse for testing the system. In figures 5 and 6 the comparison of ATR Track III and Magellan ProMARK GPS/DGPS positions versus digital map coordinates is presented, however in figure 7 the position deviations in relation to road axis determined by DGPS in different terrain conditions are shown.

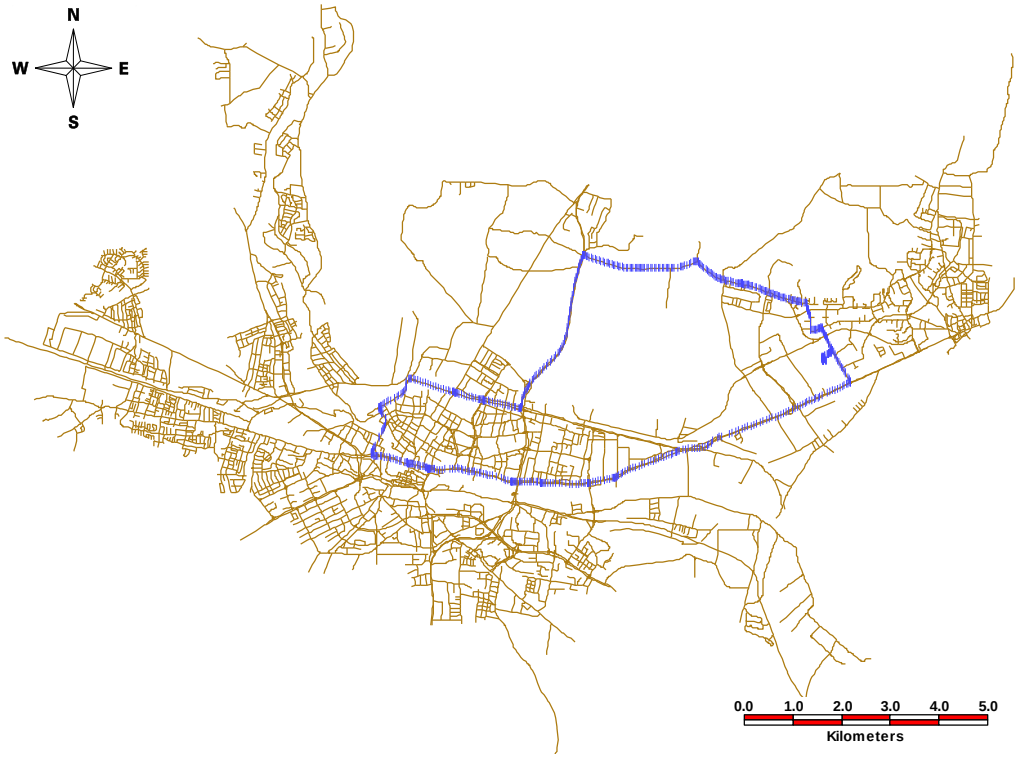

Fig. 5. The whole test route

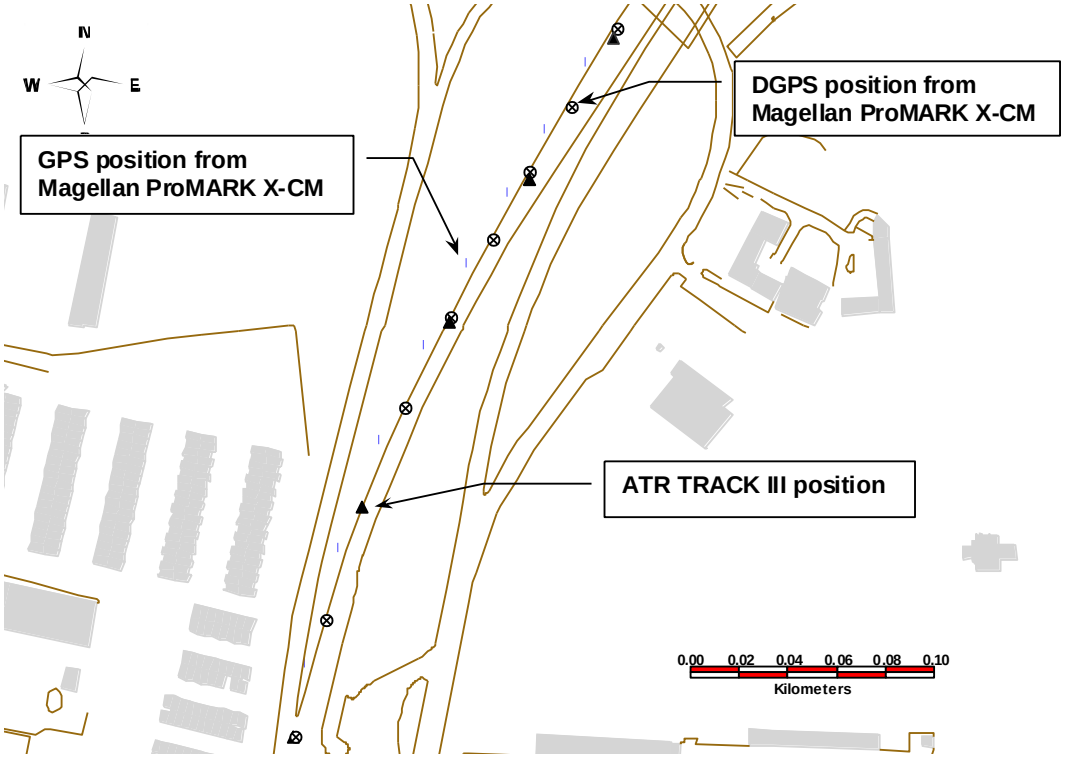

Fig. 6. The positions of ATR Track III, Magellan ProMARK X-CM (route fragment)

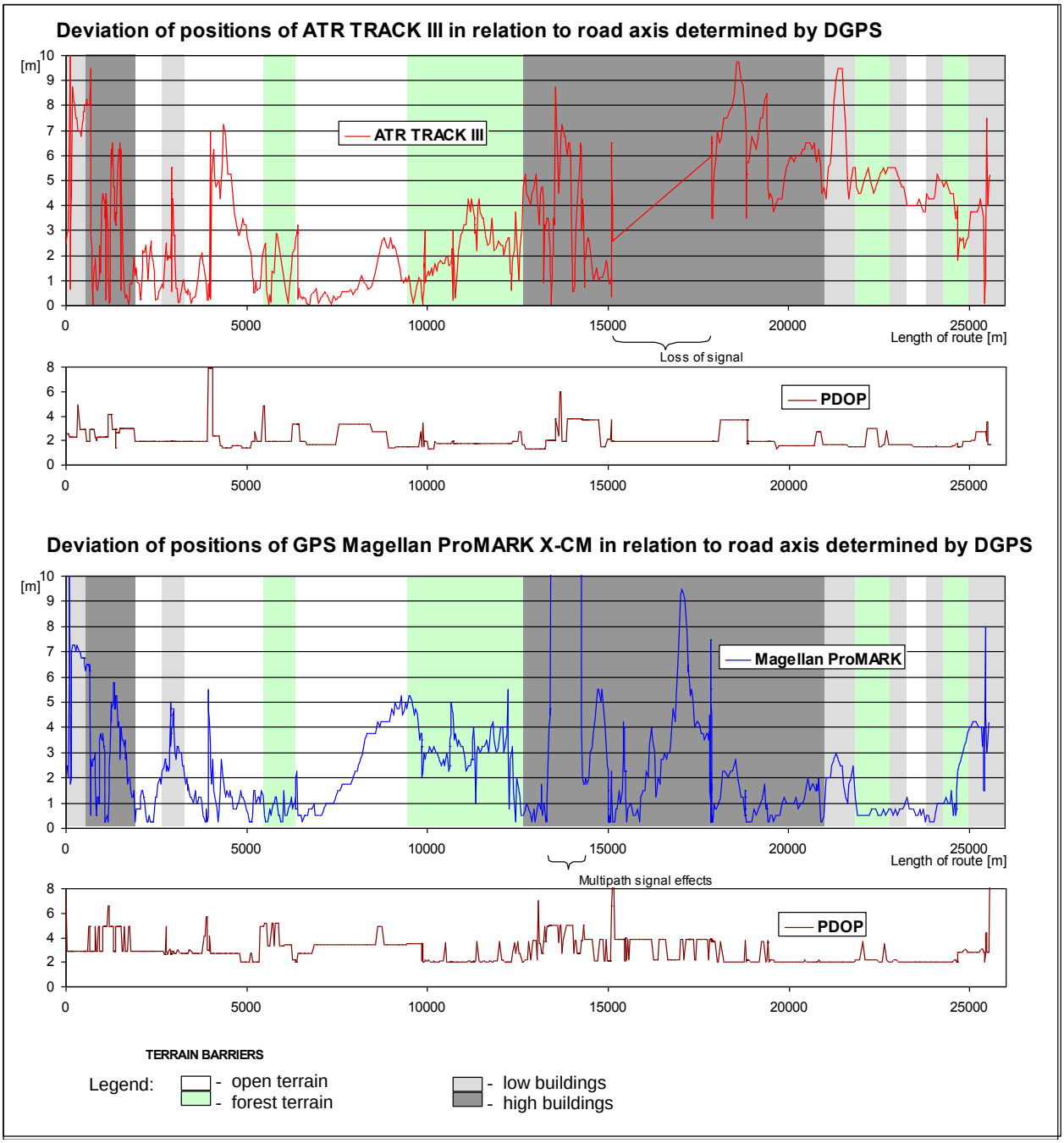

Fig.7. Vehicle route deviations in different route conditions

4. CONCLUSION

In this paper, we have presented an integrated and inter-operable system that supports the real-time navigation of city police cars. Actually as pilot project five vehicles are serviced. The final effect of system usefulness will come true after implementation more than 100 vehicles. As far as the advantages of the ATR Track III is concerned we can list the following features:

- **No limitation of monitored vehicles,**
- **No limitation in possibilities data access,**
- **Minimization of cost service and installation.**

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