

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
Space-Based Navigation Systems and Services (3)

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THE ITALIAN APPROACH ON GNSS TRAIN CONTROL AND MANAGEMENT SYSTEMS,  
CHALLENGES FOR A GLOBAL SERVICE**Abstract**

In the transportation field, the rail and maritime GNSS applications are benefitting from the Safety of Life applications already certified in the aviation field and a preliminary roadmap for the adoption of EGNOS and GALILEO is being pursued. One of the main challenge for the adoption of GNSS is the ability to meet the Tolerable Hazard Rate of  $10E-8$ /hour required by the odometer function of European Train Control Systems (ERTMS-ETCS). This requirement is more stringent respect to aviation and a proper dependability analysis is necessary in terms of "Accuracy, integrity, continuity, and Availability" of the GNSS performance in the rail environment. Compatibility of the GNSS performance with train control systems would ensure the modernization of local lines in Europe, making them more efficient and safer in a favorable environment to attract investments. In this way, the existing multi-constellations, the wide and local augmentation networks would help the development of new applications in the rail transport and competitiveness improvement.

The use of GNSS systems to eliminate the track circuitry and to reduce the operational costs are recommended for the European regional and local rail lines for passengers, representing about 50A unique test bed at regional level is being developed in Italy, with the aim of verification, validation and certification of new procedures, standards, requirements and performance of the GNSS system in the ERTMS-ETCS ecosystem. EGNOS is strategic to ensure interoperability with ERTMS system, while GALILEO is strategic to achieve independence, global reach and desired performance. The basic idea is to replace physical infrastructures like the Balises, for the exact train position, with a Virtual Balises, through the use of the GNSS systems and other sensors, may ensure the optimal positioning of the train, the track occupancy and the train integrity at lower costs and increasing safety. Other advantages derive from the reduced exposure to vandalisms, thefts, etc. and by the improved safety for freights. This article aims to highlight the potential benefits of the GNSS application for the European train Control System and to describe the innovation projects supported by ASI to verify the technology in Italy and to present the achievements of the projects currently active in this area.