

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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THE FUTURE OF GNSS TRAIN CONTROL AND MANAGEMENT SYSTEMS, THE ITALIAN
TECHNOLOGICAL INVESTMENTS

Abstract

The complete automation of transport is a target that Italy aims at in the long-term time. Preliminary results from the analysis of cost-benefit ratio in the rail sector, highlights the strong advantage of using satellite technology in rail transport, and at the same time, it generates a very strong push to search for new ideas, technologies and applications to implement. The use of the GNSS technology in train control systems would ensure the modernization of local lines in Europe, making them more efficient and safer in a favourable environment to attract investments. The Satellite navigation is set to revolutionize the rail sector, and the European Train Control Systems (ERTMS/ETCS) will make it possible monitoring the exact location of each train in real time. One of the main challenge for the adoption of GNSS is the ability to meet the Tolerable Hazard Rate of $10E-9$ /hour required for the Train Position function of ETCS. The use of GNSS systems minimizes costs reducing the number of physical balises to be installed in the tracks and, the wayside infrastructure (e.g. track circuits, axel counters) to support the Train Positioning. The priority for the modernization of such lines, is to find solutions economically sustainable, to improve the safety and to guarantee the interoperability with ERTMS/ETCS already deployed on the high speed lines. A unique test bed at regional level is being developed in Italy, with the aim of verification, validation and certification of new procedures, solutions, requirements and performance of the GNSS system in the ERTMS-ETCS environment, the results will be used to promote the evolution of the ERTMS Standard. 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 Balises, for the exact train position, in some ERTMS Operation Modes with Virtual Balises, through the use of the GNSS systems in combination with the SIL 4 on Board Odometry. Other advantages derive from the reduced exposure to vandalisms, thefts, etc. and by the improved safety for regional, low density, and freights lines. 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.