EMC analysis of axle counters in the Italian railway network

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The need of transport interoperability in Europe is a relevant issue nowadays and particular interest is given to the signaling systems.

Axle counters are part of the security and signaling system of the railway network as they determine the state of occupation or clearance of a section through the comparison between the number of axles that enter the section and the number of axles which leave it. It is known that electric current absorbed by trains passes in the rails and reaches the feeder station through the ground: flowing near the axle counter sensors (located in the proximity of the rails), current generates a magnetic field which, if too high, could damage the axle counter system or lead it to a wrong count.

The CENELEC Technical Specification 50238-3, introducing “Railway applications—Compatibility between rolling stock and train detection systems—Part 3: Compatibility with axle counters”, set the limits for the values of the magnetic field due to the traction current at the track level. This standard is set to meet the European Union need for railway interoperability in order to let rolling stock transit all over the continent without harming axle counters or make them miscount. The EU has set up the TEN-T program, whose ultimate purpose is to ensure the cohesion, interconnection, and interoperability of the trans-European transport network. Among the projects that form the program, there is one introducing “Facilitating and Speeding up ERTMS Deployment,” whose workpackage number 11 concerns the “EMC Axle Counter Validation.”

This work developed in the frame of the TEN-T project develops a procedure to assess the frequency spectrum of the magnitude of the magnetic field, due to the traction current, at the track level. Full-wave 3-D numerical models are developed to predict the field values. The measuring system is previously tested an then used for a measurement campaign. Results are reported in terms of tables and frequency spectra

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