# EMC in Railways

## Electromagnetic Field Measurement

Railway and metro systems embed modern technologies and interface with external systems, outside world and humans. This book focuses on electromagnetic field coupling and its experimental assessment.
Electromagnetics, transmission lines, antennas, the spectrum analyzer, time-frequency transforms, probability, statistics and uncertainty are the background.
Six chapters follow that discuss standards, scientific literature, measurement methods, procedures.
Emissions of rolling stock, line and substation using 2006 and 2015 versions of EN 50121 are considered, discussing infrastructure influence, variability and synchronization with train operation, consistency.
RF emissions of current collection system and impact to radio communications are evaluated by means of joint time-frequency transforms, APD and BER.
Low-frequency magnetic field is a possible threat to susceptible medical and scientific equipment.
For human exposure of personnel and passengers the presence of large power equipment, the relatively short distance and the time-varying nature of sources shall be taken into account with suitable evaluation methods against EN 50550 and ICNIRP limits.
The aim is supporting EMC and test engineers, R&D and academic staff in their activities, while planning and preparing on-site tests in modern electrified transportation systems, bridging analysis and simulation.
Examples and practical considerations are the result of many years of experience of EMC testing in railways.

**Andrea Mariscotti** was born in 1968 and degreed in 1991 in Electronics Engineering.
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