Maurice H. ter Beek · Simon Collart-Dutilleul · Thierry Lecomte (Eds.)

Reliability, Safety, and Security of Railway Systems

Modelling, Analysis, Verification, and Certification

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6th International Conference, RSSRail 2025
Pisa, Italy, November 26–28, 2025
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Preface

This volume contains the papers presented at the 6th International Conference on Reliability, Safety, and Security of Railway Systems (RSSRail 2025), held in Pisa, Italy, during November 26–28, 2025, the year in which we celebrated 200 years of modern railway: on September 27, 1825, the first train line, between Stockton and Darlington in the United Kingdom, was opened to the public.

The railway industry is currently facing increasing pressure to improve system safety, to decrease production costs and time to market, to reduce carbon emissions and running costs, and to increase the capacity of the railway. Railway systems are now being integrated into larger multi-transport networks. Such systems require an even higher degree of automation at all levels of operation. These trends dramatically increase the complexity of railway applications and pose new challenges in developing novel methods of modelling, analysis, verification, and certification to ensure their reliability, safety, and security, as well as in supporting novel mechanisms and procedures to help make the case that development processes meet the mandated standards.

The RSSRail conference series aims to bring together researchers and engineers interested in building critical railway applications and systems, as a working conference in which research challenges and advances are discussed and evaluated by both researchers and engineers, focusing on their potential to be deployed in industrial settings. It is vital to ensure that advances in research (in both academia and industry) are driven by real industrial needs, to help ensure that such advances are followed by effective industrial deployment. Another particularly important objective is to integrate advances in research into current development processes, and make them usable and scalable. Finally, a key goal is to develop advanced methods and tools that can ensure that the systems meet the requirements imposed by regulatory standards and help in building supporting arguments.

RSSRail 2025 brought together researchers and developers working on railway system reliability, security, and safety to discuss how all of these requirements can be met in an integrated way in the context of the current digital transformation in the Railway industry.

RSSRail 2025 solicited high-quality papers reporting research results and/or experience reports, in the form of regular, short, or journal-first papers, as well as tutorials and posters related to the overall theme of Reliability, Safety, and Security of Railway Systems: Modelling, Analysis, Verification, and Certification. The Program Committee (PC), with members from 11 different countries spread over 3 continents, originally received a total of 39 submissions from 14 different countries spread over 4 continents: 18 regular papers, 10 short papers, 4 journal-first papers, 2 tutorials, and 5 posters. Each research paper went through a rigorous single-blind review process according to which all papers were reviewed by three PC members, with the help of a few external reviewers, while tutorials and journal-first papers were reviewed by two PC members of which at least one was from the Steering Committee. The decision to accept or reject a submission

was based not only on the review reports and scores, but also and in particular on the in-depth and sometimes intense discussions. In the end, the PC of RSSRail 2025 decided to accept 4 posters, all tutorials and journal-first papers, 5 short, and 12 regular papers, resulting in an acceptance rate of 60% for papers describing new research.

The conference also featured three inspiring keynotes by our invited speakers:

- *ETCS Moving Block in the ERJU programme* by Peter Tummeltshammer (Hitachi Rail, Austria)
- Empirical Formal Methods in Railways: Experiences and Roadmap by Alessio Ferrari (University College Dublin, Ireland)
- Wireless Communications Challenges for Safety Applications in Railways by Marion Berbineau (Université Gustave Eiffel, France)

The conference also featured three informative tutorials:

- *EN 50716 in Practice: New Requirements and Practices for Safe Railway Software* by Günther Siegel and Jair Gonzales (Ansys, France)
- *Advancements in the CLEARSY Safety Platform: From Academic Research to Industrial SIL4 Certification* by Thierry Lecomte (CLEARSY, France)
- *AC/DC and GO: An Ontology-based Approach to Requirements Validation* by Arne Borälv (Prover Technology, Sweden)

We are very grateful for the contributions of our invited speakers and tutorialists.

Thanks are due to all involved in RSSRail 2025. In particular, to all PC members and external reviewers for their accurate and timely reviewing, all authors for their submissions, and all attendees for their participation. We also thank the conference Organization Chairs, Industry Liaison, Web Chair, Publicity Chair, and of course the Steering Committee, all itemised on the following pages.

We are indebted to our sponsors: The Formal Route, a company offering unique expertise in applying formal methods to computerised railway signalling; EURNEX (EUropean rail Research Network of EXcellence), an association of scientific institutes in the area of rail transport and mobility; and DITECFER (District for Railway Technologies, High Speed, Networks' Safety & Security), a consortium of companies and research organisations in Italy.

Moreover, the RSSRail 2025 conference was organised by CNR–ISTI as part of the dissemination activities of Spoke 4 Rail Transportation within the MOST – Sustainable Mobility National Research Center, which received funding from the European Union NextGenerationEU.

Finally, we would like to thank Springer for publishing these proceedings and we gratefully acknowledge the support from EasyChair in assisting us in managing the entire process from submissions through these proceedings to the programme.

We hope you enjoyed the conference!

November 2025

Maurice H. ter Beek
Simon Collart Dutilleul
Thierry Lecomte

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